Company Profile

TRACO ELECTRONIC AG is a Swiss company with headquarters based in Zurich, Switzerland. As a leading power supply specialist with more than 30 years of experience we are dedicated to the design and manufacturing of high quality DC/DC and AC/DC power conversion products. We are marketing our products worldwide under the registered trademark **TRACOPOWER.** Our mission is to provide customers with an optimal power supply solution in terms of performance, quality and price for their specific application.

Product Range

Our product range is focused on five market segments for which we can offer one of the most comprehensive programs of standard products:
– Low Power DC/DC Converter Modules, 1–60 W
– Encapsulated AC/DC Power Modules, 5–40 W
– AC/DC Power Supplies (open frame / encased), 10–600 W
– Industrial Power Supplies for DIN-Rail Mounting, 20–600 W
– High Power AC/DC and DC/DC Converter 150 W up to 22 kW
Detailed technical data of all products can be downloaded from our website at **www.tracopower.com.**

Quality Management

All our products are 100 % ATE tested prior to shipment to guarantee full compliance to published specifications. TRACO's global manufacturing facilities are certified to ISO 9001/9002 to assure that quality management systems used in design, production and testing meet highest standards.
TRACO's commitment to quality is supported by a full **3 Year product warranty.**

RoHS Compliance

TRACO ELECTRONIC AG is committed to supply all products in this catalogue in full compliance to RoHS Directive 2002/95/EC by July 2006 latest. Please check our website for actual RoHS status of each product series.

Technical Support

Our experienced team of application engineers is ready to answer any question concerning a TRACOPOWER product, from product specifications to applicable safety standards. If you have a technical problem or question please e-mail your request to **techsupport@traco.ch.**

Availability

The majority of products in this selection guide are normally available ex-stock and can be shipped from our warehouse in Zurich within 48 hours. For price and delivery information please contact our headquarters in Switzerland or our franchised local distributors. More information on our sales and distribution network you can find on our website.

Product Index

DC/DC Converters

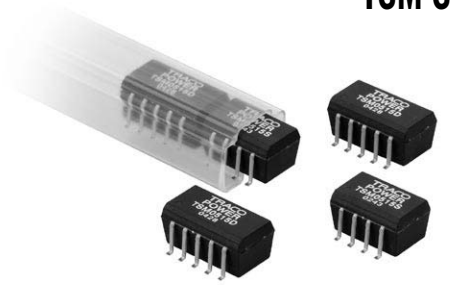
DC/DC Converters

AC/DC Power Supplies

DC/DC Converters

TSM Series, 1 Watt

- SMD Package (SOIC-14/18)
- Single and Dual Output Models
- I/O Isolation 1000 VDC
- High Efficiency
- Operating Temperature Range –40 °C to +85 °C
- Lead Frame Construction
- High Accuracy of Pin Co-Planarity
- Reflow Solder Temperature up to +250 °C allowed
- Available in Tape and Reel Package

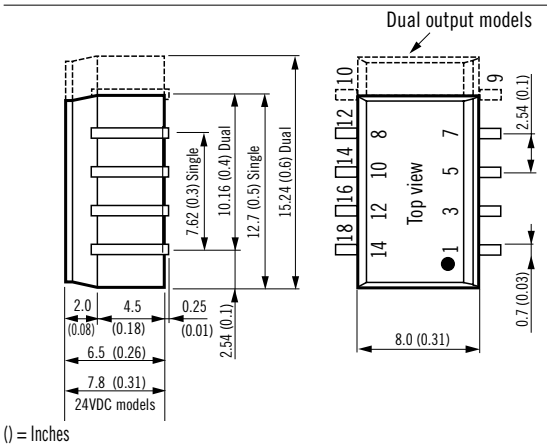


NEW 24VDC INPUT MODELS

Models

Order Code	Input voltage	Output voltage	Output current max.
TSM 0505S		5 VDC	200 mA
TSM 0509S		9 VDC	110 mA
TSM 0512S		12 VDC	80 mA
TSM 0515S	5 VDC ± 10%	15 VDC	65 mA
TSM 0505D		± 5 VDC	±100 mA
TSM 0512D		±12 VDC	± 40 mA
TSM 0515D		±15 VDC	± 30 mA
TSM 1205S		5 VDC	200 mA
TSM 1209S		9 VDC	110 mA
TSM 1212S		12 VDC	80 mA
TSM 1215S	12 VDC ± 10%	15 VDC	65 mA
TSM 1205D		± 5 VDC	±100 mA
TSM 1212D		±12 VDC	± 40 mA
TSM 1215D		±15 VDC	± 30 mA
NEW TSM 2405S		5 VDC	200 mA
TSM 2409S		9 VDC	110 mA
TSM 2412S		12 VDC	80 mA
TSM 2415S	24 VDC ± 10%	15 VDC	65 mA
TSM 2405D		± 5 VDC	±100 mA
TSM 2412D		±12 VDC	± 40 mA
TSM 1215D		±15 VDC	± 30 mA

Line regulation:	non regulated
Load regulation:	±10 % max.
Ripple & Noise:	<120 mVpk-pk (20 MHz BW)
Short circuit protection:	limited 1 sec.
Efficiency:	80% typ.
Operating temperature range:	–40 °C … +85 °C (no derating)
I/O isolation voltage:	1000 VDC
Case:	plastic (UL 94 V-0 rating)



() = Inches

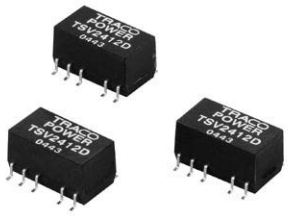
Pin-Out		
Pin	Single output	Dual output
1	– Vin (GND)	– Vin (GND)
3	+ Vin (Vcc)	+ Vin (Vcc)
5	No con.	No con.
7	– Vout	Common
8	+ Vout	
9		– Vout
10	No con.	No con.
12	No con.	+ Vout
14	No con.	No con.
16		No con.
18		No con.

Download full datasheet at
http://www.tracopower.com/products/tsm.pdf

DC/DC Converters

TSV Series, 1 Watt

- SMD Package (SOIC-22)
- I/O Isolation 3000 VDC
- Single and Dual Output Models
- High Efficiency
- Operating Temperature Range –40 °C to +85 °C
- Lead Frame Construction
- High Accuracy of Pin Co-Planarity
- Reflow Solder Temperature up to +250 °C allowed
- Available in Tape and Reel Package

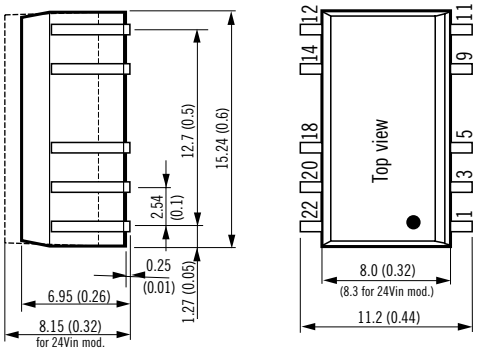


NEW Product

Models

Order code	Input voltage	Output voltage	Output current max.
TSV 0505S	5 VDC ± 10 %	5 VDC	200 mA
TSV 0512S		12 VDC	80 mA
TSV 0515S		15 VDC	65 mA
TSV 0505D		± 5 VDC	±100 mA
TSV 0512D		± 12 VDC	± 40 mA
TSV 0515D		± 15 VDC	± 30 mA
TSV 1205S	12 VDC ± 10 %	5 VDC	200 mA
TSV 1212S		12 VDC	80 mA
TSV 1215S		15 VDC	65 mA
TSV 1205D		± 5 VDC	±100 mA
TSV 1212D		± 12 VDC	± 40 mA
TSV 1215D		± 15 VDC	± 30 mA
TSV 2405S	24 VDC ± 10 %	5 VDC	200 mA
TSV 2412S		12 VDC	80 mA
TSV 2415S		15 VDC	65 mA
TSV 2405D		± 5 VDC	±100 mA
TSV 2412D		± 12 VDC	± 40 mA
TSV 2415D		± 15 VDC	± 30 mA

Line regulation	non regulated
Load regulation:	±10 % max.
Ripple & Noise:	<100mVpk-pk (20 MHz BW)
Short circuit protection:	limited 0.5 sec.
Efficiency:	80 % typ.
Operating temperature range:	–40 °C … +85 °C (no derating)
I/O isolation voltage:	3000 VDC
I/O isolation capacitance:	60 pF typ.
I/O isolation resistance:	>10 Gohm
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin-Out

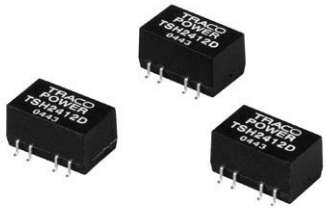
Pin	Single output	Dual output
1	–Vin (GND)	–Vin (GND)
3	+Vin	+Vin
5	No con.	No con.
9	–Vout	Common
11	No con.	–Vout
12	No con.	No con.
14	+Vout	+Vout
18	No con.	No con.
20	No con.	No con.
22	No con.	No con.

Download full datasheet at
http://tracopower.com/products/tsv.pdf

DC/DC Converters

TSH Series, 2 Watt

- Ultracompact SMD Package (SOIC-14/18)
- Single and Dual Output Models
- I/O Isolation 1000 VDC
- High Efficiency
- Operating Temperature Range –40 °C to +85 °C
- Lead Frame Construction
- High Accuracy of Pin Co-Planarity
- Reflow Solder Temperature up to +250 °C allowed
- Available in Tape and Reel Package

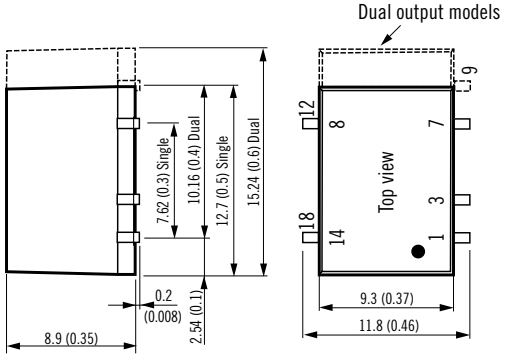


NEW Product

Models

Order code	Input voltage	Output voltage	Output current max.
TSH 0505S	5 VDC ± 10 %	5 VDC	400 mA
TSH 0512S		12 VDC	165 mA
TSH 0512D		± 12 VDC	± 80 mA
TSH 0515D		± 15 VDC	± 65 mA
TSH 1205S	12 VDC ± 10 %	5 VDC	400 mA
TSH 1212S		12 VDC	165 mA
TSH 1212D		± 12 VDC	± 80 mA
TSH 1215D		± 15 VDC	± 65 mA
TSH 2405S	24 VDC ± 10 %	5 VDC	400 mA
TSH 2412S		12 VDC	165 mA
TSH 2412D		± 12 VDC	± 80 mA
TSH 2415D		± 15 VDC	± 65 mA

Line regulation:	non regulated
Load regulation:	±10 % max.
Ripple & Noise:	<120 mVpk-pk (20 MHz BW)
Short circuit protection:	limited 1 sec.
Efficiency:	80 % typ.
Operating temperature range:	–40 °C … +85 °C (no derating)
I/O isolation voltage:	1000 VDC
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin-Out

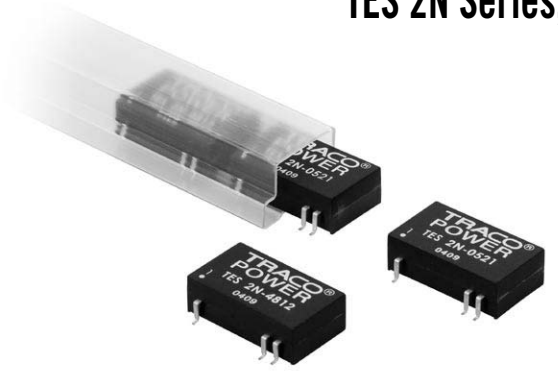
Pin	Single output	Dual output
1	– Vin (GND)	– Vin (GND)
3	+ Vin (Vcc)	+ Vin (Vcc)
7	– Vout	Common
8	+ Vout	
9		– Vout
12		+ Vout
14	No con.	
18		No con.

Download full datasheet at
http://tracopower.com/products/tsh.pdf

DC/DC Converters

TES 2N Series, 2 Watt

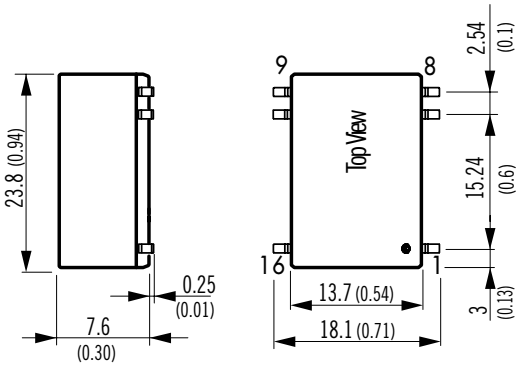
- Low Profile Package
- Wide 2:1 Input Range
- Regulated Output
- I/O Isolation 1500 VDC
- Operating Temperature Range –40 °C to +71 °C
- Low Ripple and Noise
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Reflow Solder Temperature up to +250 °C allowed



Models

Order code	Input voltage	Output voltage	Output current max.
TES 2N-0510	4.5 – 9 VDC	3.3 VDC	500 mA
TES 2N-0511		5 VDC	400 mA
TES 2N-0512		12 VDC	165 mA
TES 2N-0513		15 VDC	135 mA
TES 2N-0521		± 5 VDC	±200 mA
TES 2N-0522		± 12 VDC	± 85 mA
TES 2N-0523		± 15 VDC	± 65 mA
TES 2N-1210	9 – 18 VDC	3.3 VDC	500 mA
TES 2N-1211		5 VDC	400 mA
TES 2N-1212		12 VDC	165 mA
TES 2N-1213		15 VDC	135 mA
TES 2N-1221		± 5 VDC	±200 mA
TES 2N-1222		± 12 VDC	± 85 mA
TES 2N-1223		± 15 VDC	± 65 mA
TES 2N-2410	18 – 36 VDC	3.3 VDC	500 mA
TES 2N-2411		5 VDC	400 mA
TES 2N-2412		12 VDC	165 mA
TES 2N-2413		15 VDC	135 mA
TES 2N-2421		± 5 VDC	±200 mA
TES 2N-2422		± 12 VDC	± 85 mA
TES 2N-2423		± 15 VDC	± 65 mA
TES 2N-4810	36 – 72 VDC	3.3 VDC	500 mA
TES 2N-4811		5 VDC	400 mA
TES 2N-4812		12 VDC	165 mA
TES 2N-4813		15 VDC	135 mA
TES 2N-4821		± 5 VDC	±200 mA
TES 2N-4822		± 12 VDC	± 85 mA
TES 2N-4823		± 15 VDC	± 65 mA

Line regulation:	±0.5 % max.
Load regulation:	Single output models: ±0.75 % max. Dual output models: ±2.0 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Conducted EMI:	EN55022, class A, and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	78 % typ.
Operating temperature range:	–40 °C … +71 °C
I/O isolation voltage:	1500 VDC
Safety standards:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin-Out

Pin	Single output	Dual output
1	– Vin (GND)	– Vin (GND)
7	No con.	No con.
8	No con.	Common
9	+ Vout	+ Vout
10	– Vout	– Vout
16	+ Vin	+ Vin

Download full datasheet at
http://www.tracopower.com/products/tes2n.pdf

DC/DC Converters

TES 3 Series, 3 Watt

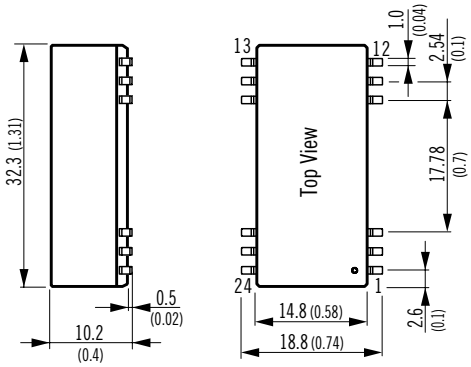
- SMD-Package
- Wide 2:1 Input Range
- I/O Isolation 1500 VDC
- Operating Temperature Range –40 °C to +71 °C
- Short Circuit Protection
- Reflow Solder Temperature up to +250 °C allowed

cULus

Models

Order code	Input voltage	Output voltage	Output voltage max.
TES 3-1210	9 – 18 VDC	3.3 VDC	700 mA
TES 3-1211		5 VDC	600 mA
TES 3-1212		12 VDC	250 mA
TES 3-1222		± 12 VDC	±125 mA
TES 3-1223		± 15 VDC	±100 mA
TES 3-2410	18 – 36 VDC	3.3 VDC	700 mA
TES 3-2411		5 VDC	600 mA
TES 3-2412		12 VDC	250 mA
TES 3-2422		± 12 VDC	±125 mA
TES 3-2423		± 15 VDC	±100 mA
TES 3-4810	36 – 75 VDC	3.3 VDC	700 mA
TES 3-4811		5 VDC	600 mA
TES 3-4812		12 VDC	250 mA
TES 3-4822		± 12 VDC	±125 mA
TES 3-4823		± 15 VDC	±100 mA

Line regulation:	±0.3 % max.
Load regulation:	– Single output models: ±1.0 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Input filter:	Pi-filter
Short circuit protection:	continuous, no automatic recovery
Efficiency:	80 % typ.
Operating temperature range:	–40 °C … +71 °C (no derating)
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin-Out

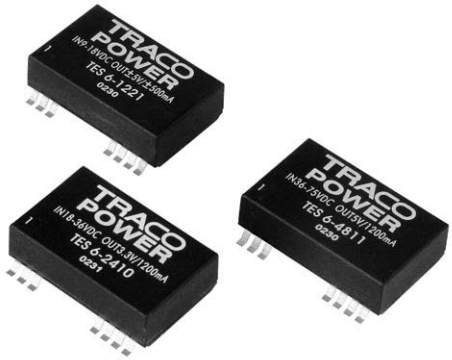
Pin	Single output	Dual output
1	– Vin (GND)	– Vin (GND)
2	– Vin (GND)	– Vin (GND)
3	No con.	No con.
10	No con.	Common
11	No con.	No con.
12	No con.	– Vout
13	+ Vout	+ Vout
14	No con.	No con.
15	– Vout	Common
22	No con.	No con.
23	+ Vin (Vcc)	+ Vin (Vcc)
24	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://www.tracopower.com/products/tes3.pdf

DC/DC Converters

TES 6 Series, 6 / 7,5 Watt

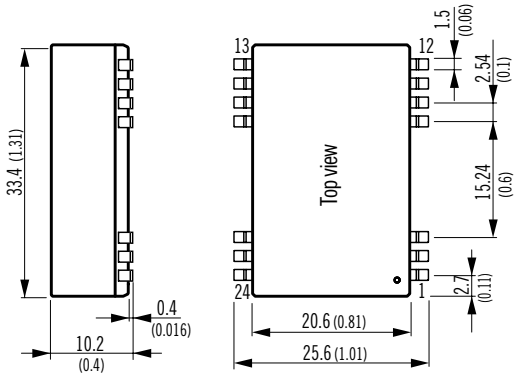
- Compact SMD-Package
- Wide 2:1 Input Range
- High Efficiency up to 85 %
- Operating Temperature Range –40 °C to +71 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A



Models

Order code	Input voltage	Output voltage	Output current max.
TES 6-1210	9 – 18 VDC	3.3 VDC	1200 mA
TES 6-1211		5 VDC	1200 mA
TES 6-1212		12 VDC	625 mA
TES 6-1213		15 VDC	500 mA
TES 6-1221		± 5 VDC	± 500 mA
TES 6-1222		± 12 VDC	± 310 mA
TES 6-1223		± 15 VDC	± 250 mA
TES 6-2410	18 – 36 VDC	3.3 VDC	1200 mA
TES 6-2411		5 VDC	1200 mA
TES 6-2412		12 VDC	625 mA
TES 6-2413		15 VDC	500 mA
TES 6-2421		± 5 VDC	± 500 mA
TES 6-2422		± 12 VDC	± 310 mA
TES 6-2423		± 15 VDC	± 250 mA
TES 6-4810	36 – 75 VDC	3.3 VDC	1200 mA
TES 6-4811		5 VDC	1200 mA
TES 6-4812		12 VDC	625 mA
TES 6-4813		15 VDC	500 mA
TES 6-4821		± 5 VDC	± 500 mA
TES 6-4822		± 12 VDC	± 310 mA
TES 6-4823		± 15 VDC	± 250 mA

Line regulation	±0.3 % max.
Load regulation:	–Single output models: ±1.0 % max. –Dual output models: ±1.0 % max.
Ripple & Noise:	<75 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	85 % typ.
Operating temperature range:	–40 °C … +71 °C above 60 °C derating 2 %/K
I/O isolation voltage:	1500 VDC
Safety standards:	cUL/UL 60950, IEC/EN 60950
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin-Out

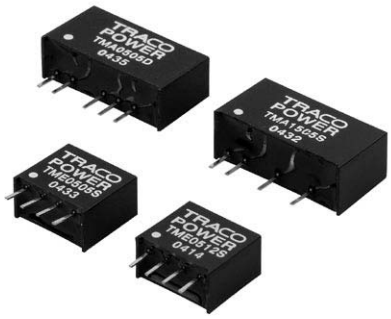
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No con.	No con.
10	No con.	Common
11	– Vout	– Vout
12	– Vout	– Vout
13	+ Vout	– Vout
14	+ Vout	+ Vout
15	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)
24	– Vin (GND)	– Vin (GND)

Download full datasheet at
http://www.tracopower.com/products/tes6.pdf

DC/DC Converters

TMA / TME Series, 1 Watt

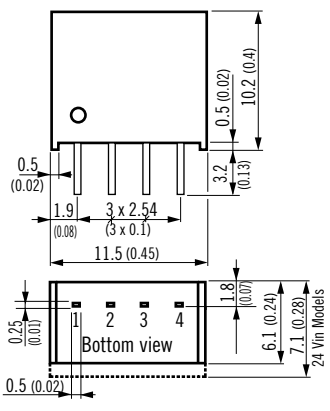
- Single-in-Line Package (SIP)
- Single and Dual Output Models
- I/O-Isolation 1000 VDC
- High Efficiency
- Operating Temperature Range –40 °C to +85 °C
- Industry Standard Pinout
- 100 % Burn-in

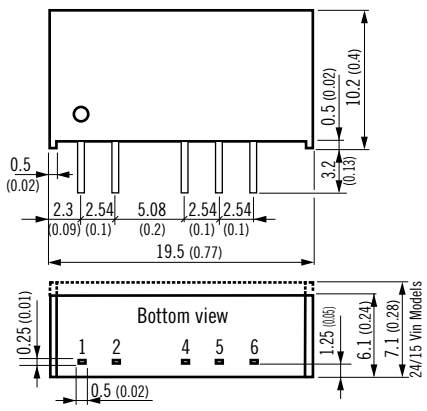


Models

Order Code		Input voltage	Output voltage	Output current max.
TMA 0505S	TME 0505S		5 VDC	200 mA
	TME 0509S		9 VDC	110 mA
TMA 0512S	TME 0512S		12 VDC	80 mA
TMA 0515S	TME 0515S	5 VDC ± 10 %	15 VDC	65 mA
TMA 0505D			± 5 VDC	±100 mA
TMA 0512D			± 12 VDC	± 40 mA
TMA 0515D			± 15 VDC	± 35 mA
TMA 1205S	TME 1205S		5 VDC	200 mA
	TME 1209S		9 VDC	110 mA
TMA 1212S	TME 1212S		12 VDC	80 mA
TMA 1215S	TME 1215S	12 VDC ± 10%	15 VDC	65 mA
TMA 1205D			± 5 VDC	±100 mA
TMA 1212D			± 12 VDC	± 40 mA
TMA 1215D			± 15 VDC	± 35 mA
TMA 1505S			5 VDC	200 mA
TMA 1512S			12 VDC	80 mA
TMA 1515S			15 VDC	65 mA
TMA 1505D		15 VDC ± 10%	± 5 VDC	±100 mA
TMA 1512D			± 12 VDC	± 40 mA
TMA 1515D			± 15 VDC	± 35 mA
TMA 2405S	TME 2405S		5 VDC	200 mA
	TME 2409S		9 VDC	110 mA
TMA 2412S	TME 2412S		12 VDC	80 mA
TMA 2415S	TME 2415S	24 VDC ± 10%	15 VDC	65 mA
TMA 2405D			± 5 VDC	±100 mA
TMA 2412D			± 12 VDC	± 40 mA
TMA 2415D			± 15 VDC	± 35 mA

Line regulation:	non regulated
Load regulation:	±10% max.
Ripple & Noise:	– TMA <75 mVpk-pk (20 MHz BW) – TME <150 mVpk-pk (20 MHz BW)
Short circuit protection:	limited 1 sec.
Efficiency:	80 % typ.
Operating temperature range:	–40 °C … +85 °C (no derating)
I/O isolation voltage:	1000 VDC
Case:	plastic (UL 94 V-0 rating)





() = Inches

Pin-Out

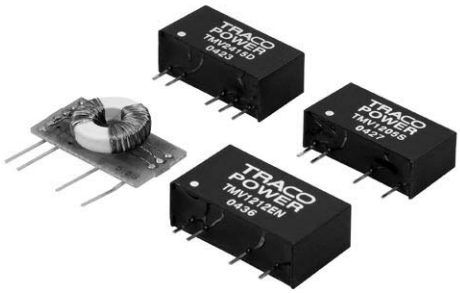
Pin	TMA Single output	TMA Dual output	TME Single output
1	+ Vin (Vcc)	+ Vin (Vcc)	– Vin (GND)
2	– Vin (GND)	– Vin (GND)	+ Vin (Vcc)
3	No Pin	No Pin	– Vout
4	– Vout	– Vout	+ Vout
5	No Pin	Common	
6	+ Vout	+ Vout	

Download full datasheet at
http://www.tracopower.com/products/tma.pdf
http://www.tracopower.com/products/tme.pdf

DC/DC Converters, High Isolation

TMV / TMV-EN Series, 1 Watt

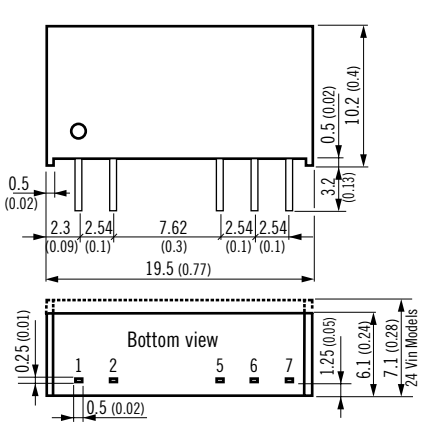
- Single-in-Line Package (SIP)
- Single and Dual Output Models
- I/O Isolation Voltage 3000 VDC (TMV-EN 3000 VAC)
- Operating Temperature Range –40 °C to +85 °C
- Supplementary Insulation rated for 250 VAC Working Voltage (TMV-EN)
- Safety Barrier 100 % Production tested (TMV-EN)
- 100 % Burn-in

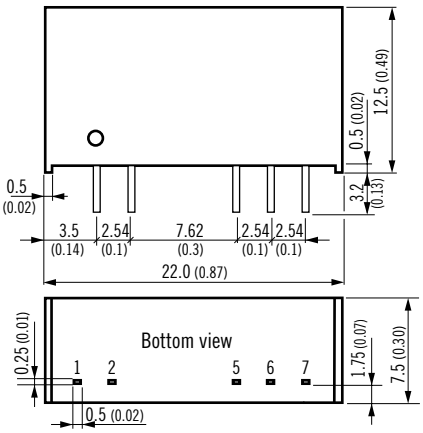


Models

Order code		Input voltage	Output voltage	Output current max.
TMV 0505S	TMV 0505 EN	5 VDC ± 10 %	5 VDC	200 mA
TMV 0512S	TMV 0512 EN		12 VDC	80 mA
TMV 0515S	TMV 0515 EN		15 VDC	65 mA
TMV 0505D	TMV 0505D EN		± 5 VDC	±100 mA
TMV 0512D	TMV 0512D EN		± 12 VDC	± 40 mA
TMV 0515D	TMV 0515D EN		± 15 VDC	± 30 mA
TMV 1205S	TMV 1205 EN	12 VDC ± 10 %	5 VDC	200 mA
TMV 1212S	TMV 1212 EN		12 VDC	80 mA
TMV 1215S	TMV 1215 EN		15 VDC	65 mA
TMV 1205D	TMV 1205D EN		± 5 VDC	±100 mA
TMV 1212D	TMV 1212D EN		± 12 VDC	± 40 mA
TMV 1215D	TMV 1215D EN		± 15 VDC	± 30 mA
TMV 2405S		24 VDC ± 10 %	5 VDC	200 mA
TMV 2412S			12 VDC	80 mA
TMV 2415S			15 VDC	65 mA
TMV 2405D			± 5 VDC	±100 mA
TMV 2412D			± 12 VDC	± 40 mA
TMV 2415D			± 15 VDC	± 30 mA

Line regulation:	non regulated
Load regulation:	±10 % max.
Ripple & Noise:	<100 mVpk-pk (20 MHz BW)
Short circuit protection:	limited 1 sec.
Efficiency:	– TMV: 77 % typ. – TMV-EN: 67 % typ.
Operating temperature range:	–40 °C … +85 °C (no derating)
I/O isolation voltage (rated):	– TMV: 3000 VDC (60 sec) – TMV-EN: 3000 VACrms (60 sec)
I/O isolation test voltage:	– TMV-EN: 6000 Vpk (1 sec)
I/O isolation capacitance:	– TMV: 60 pF typ. – TMV-EN: 10 pF typ.
I/O isolation resistance:	>10 Gohm
Safety standards / approvals:	TMV-EN: IEC/EN 60950 (rated for 250 VAC working voltage)
Case:	plastic (UL 94 V-0 rating)





() = Inches

Pin-Out

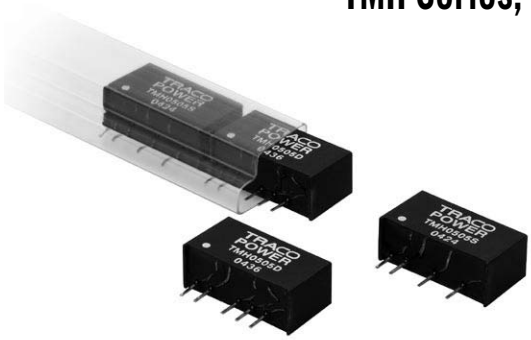
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
5	– Vout	– Vout
6	No pin	Common
7	+ Vout	+ Vout

Download full datasheet at
http://www.tracopower.com/products/tmv.pdf
http://www.tracopower.com/products/tmv-en.pdf

DC/DC Converters

TMH Series, 2 Watt

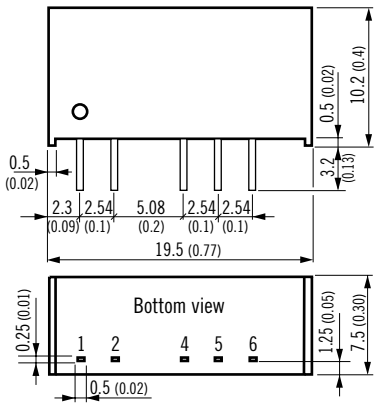
- Single-in-Line Package (SIP)
- Single and Dual Output Models
- I/O Isolation 1000 VDC
- High Efficiency
- Operating Temperature Range –40 °C to +85 °C
- Industry Standard Pinout
- 100 % Burn-in



Models

Order code	Input voltage	Output voltage	Output current max.
TMH 0505S	5 VDC ± 10 %	5 VDC	400 mA
TMH 0512S		12 VDC	165 mA
TMH 0515S		15 VDC	130 mA
TMH 0505D		± 5 VDC	± 200 mA
TMH 0512D		± 12 VDC	± 80 mA
TMH 0515D		± 15 VDC	± 65 mA
TMH 1205S	12 VDC ± 10 %	5 VDC	400 mA
TMH 1212S		12 VDC	165 mA
TMH 1215S		15 VDC	130 mA
TMH 1205D		± 5 VDC	± 200 mA
TMH 1212D		± 12 VDC	± 80 mA
TMH 1215D		± 15 VDC	± 65 mA
TMH 2405S	24 VDC ± 10 %	5 VDC	400 mA
TMH 2412S		12 VDC	165 mA
TMH 2415S		15 VDC	130 mA
TMH 2405D		± 5 VDC	± 200 mA
TMH 2412D		± 12 VDC	± 80 mA
TMH 2415D		± 15 VDC	± 65 mA

Line regulation:	non regulated
Load regulation:	±10 % max.
Ripple & Noise:	– 5 Vin models: < 75 mVpk-pk (20 MHz BW) – 12/24 Vin models: <150 mVpk-pk (20 MHz BW)
Short circuit protection:	limited 1 sec.
Efficiency:	81 % typ. 5 VDC output models: 78 % typ.
Operating temperature range:	–40 °C … +85 °C above 70°C derating 3 %/K
I/O isolation voltage:	1000 VDC
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin-Out

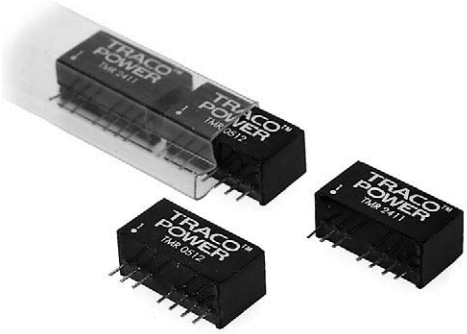
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
4	– Vout	– Vout
5	No pin	Common
6	+ Vout	+ Vout

Download full datasheet at
http://tracopower.com/products/tmh.pdf

DC/DC Converters

TMR 2 Series, 2 Watt

- Miniature SIP-Package
- Wide 2:1 Input Range
- Regulated Outputs
- I/O Isolation 1000 VDC
- Operating Temperature Range –40 °C to +75 °C
- Low Ripple and Noise
- Short Circuit Protection
- Remote On/Off



Models

Order code	Input voltage	Output voltage	Output current max.
TMR 0510	4.5 – 9.0 VDC	3.3 VDC	500 mA
TMR 0511		5 VDC	400 mA
TMR 0512		12 VDC	165 mA
TMR 0521		± 5 VDC	±200 mA
TMR 0522		± 12 VDC	± 85 mA
TMR 0523		± 15 VDC	± 65 mA
TMR 1210	9 – 18 VDC	3.3 VDC	500 mA
TMR 1211		5 VDC	400 mA
TMR 1212		12 VDC	165 mA
TMR 1221		± 5 VDC	±200 mA
TMR 1222		± 12 VDC	± 85 mA
TMR 1223		± 15 VDC	± 65 mA
TMR 2410	18 – 36 VDC	3.3 VDC	500 mA
TMR 2411		5 VDC	400 mA
TMR 2412		12 VDC	165 mA
TMR 2421		± 5 VDC	±200 mA
TMR 2422		± 12 VDC	± 85 mA
TMR 2423		± 15 VDC	± 65 mA
TMR 4810	36 – 75 VDC	3.3 VDC	500 mA
TMR 4811		5 VDC	400 mA
TMR 4812		12 VDC	165 mA
TMR 4821		± 5 VDC	±200 mA
TMR 4822		± 12 VDC	± 85 mA
TMR 4823		± 15 VDC	± 65 mA

Line regulation: ±0.5 % max.

Load regulation: – Single output models: ±0.75 % max.
– Dual output models: ±1.0 % max.

Ripple & Noise: <50 mVpk-pk (20 MHz BW)
(no external output capacitor required)

Short circuit protection: continuous,automatic recovery

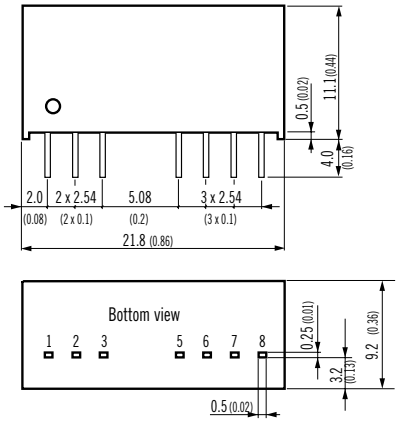
Efficiency: 78 % typ.
5 VDC input models: 70 % typ.

Operating temperature range: –40 °C … +75 °C (no derating)

I/O isolation voltage: 1000 VDC

Case: plastic (UL94 V-0 rating)

Remote On/Off: shutdown input for low input current (1 mA) in standby operation



() = Inches

Pin-Out

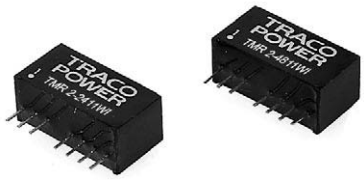
Pin	Single Output	Dual Output
1	– Vin (GND)	– Vin (GND)
2	+ Vin (Vcc)	+ Vin (Vcc)
3	Remote On/Off	Remote On/Off
5	No con.	No con.
6	+ Vout	+ Vout
7	– Vout	Common
8	No con.	– Vout

Download full datasheet at
http://www.tracopower.com/products/tmr.pdf

DC/DC Converters

TMR 2WI Series, 2 Watt

- Miniature SIP-Package
- Ultrawide 4:1 Input Range
- Regulated Outputs
- I/O Isolation 1000 VDC
- Operating Temperature Range –40 °C to +75 °C
- Low Ripple and Noise
- Short Circuit Protection
- Remote On/Off



NEW Product

Models

Order code	Input voltage	Output voltage	Output current max.
TMR 2-2410WI		3.3 VDC	500 mA
TMR 2-2411WI		5 VDC	400 mA
TMR 2-2412WI		12 VDC	165 mA
TMR 2-2413WI	9 – 36 VDC	15 VDC	135 mA
TMR 2-2421WI		± 5 VDC	±200 mA
TMR 2-2422WI		± 12 VDC	± 85 mA
TMR 2-2423WI		± 15 VDC	± 65 mA
TMR 2-4810WI		3.3 VDC	500 mA
TMR 2-4811WI		5 VDC	400 mA
TMR 2-4812WI		12 VDC	165 mA
TMR 2-4813WI	18 – 75 VDC	15 VDC	135 mA
TMR 2-4821WI		± 5 VDC	±200 mA
TMR 2-4822WI		± 12 VDC	± 85 mA
TMR 2-4823WI		± 15 VDC	± 65 mA

Line regulation: ±0.5 % max.

Load regulation: – Single output models: ±0.75 % max.
– Dual output models: ±1.0 % max.

Ripple & Noise: <50 mVpk-pk (20 MHz BW)
(no external output capacitor required)

Short circuit protection: continuous, automatic recovery

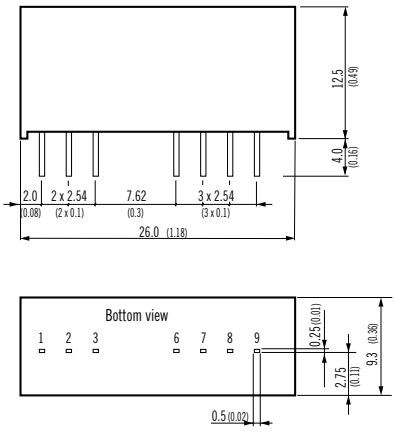
Efficiency: 78 % typ.
5 VDC input models: 70 % typ.

Operating temperature range: –40 °C … +75 °C
above 65 °C derating 3 %/K

I/O isolation voltage: 1000 VDC

Case: plastic (UL94 V-0 rating)

Remote On/Off: shutdown input for low input current (1 mA)
in standby operation



() = Inches

Pin-Out

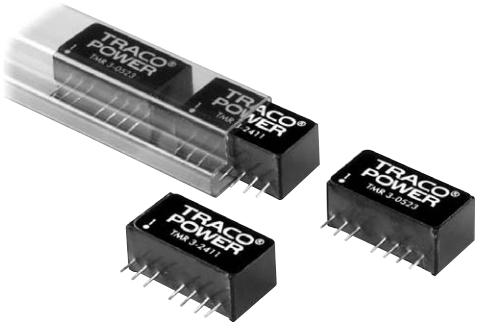
Pin	Single Output	Dual Output
1	– Vin (GND)	– Vin (GND)
2	+ Vin (Vcc)	+ Vin (Vcc)
3	Remote On/Off	Remote On/Off
6	+ Vout	+ Vout
7	No con.	Common
8	No con.	No con.
9	– Vout	– Vout

Download full datasheet at
http://www.tracopower.com/products/tmr2wi.pdf

DC/DC Converters

TMR 3 Series, 3 Watt

- Highest Power Density in SIP-Package
- Wide 2:1 Input Range
- Regulated Outputs
- I/O Isolation 1000 VDC
- Operating Temperature Range –40 °C to +75 °C
- Low Ripple and Noise
- Short Circuit Protection
- Remote On/Off

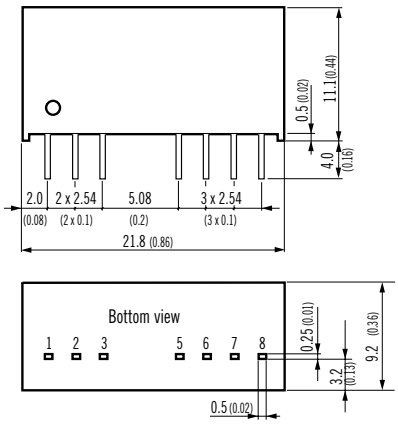


NEW Product

Models

Order code	Input voltage	Output voltage	Output current max.
TMR 3-0510	4.5 – 9.0 VDC	3.3 VDC	700 mA
TMR 3-0511		5 VDC	600 mA
TMR 3-0512		12 VDC	250 mA
TMR 3-0513		15 VDC	200 mA
TMR 3-0521		± 5 VDC	±200 mA
TMR 3-0522		± 12 VDC	±125 mA
TMR 3-0523		± 15 VDC	±100 mA
TMR 3-1210	9 – 18 VDC	3.3 VDC	700 mA
TMR 3-1211		5 VDC	600 mA
TMR 3-1212		12 VDC	250 mA
TMR 3-1213		15 VDC	200 mA
TMR 3-1221		± 5 VDC	±200 mA
TMR 3-1222		± 12 VDC	±125 mA
TMR 3-1223		± 15 VDC	±100 mA
TMR 3-2410	18 – 36 VDC	3.3 VDC	700 mA
TMR 3-2411		5 VDC	600 mA
TMR 3-2412		12 VDC	250 mA
TMR 3-2413		15 VDC	200 mA
TMR 3-2421		± 5 VDC	±200 mA
TMR 3-2422		± 12 VDC	±125 mA
TMR 3-2423		± 15 VDC	±100 mA
TMR 3-4810	36 – 75 VDC	3.3 VDC	700 mA
TMR 3-4811		5 VDC	600 mA
TMR 3-4812		12 VDC	250 mA
TMR 3-4813		15 VDC	200 mA
TMR 3-4821		± 5 VDC	±200 mA
TMR 3-4822		± 12 VDC	±125 mA
TMR 3-4823		± 15 VDC	±100 mA

Line regulation:	±0.2 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<75 mVpk-pk (20 MHz BW) (no external output capacitor required)
Short circuit protection:	continuous, automatic recovery
Efficiency:	79 % typ.
Operating temperature range:	–40 °C … +75 °C (no derating)
I/O isolation voltage:	1000 VDC
Case:	plastic (UL94 V-0 rating)
Remote On/Off:	shutdown input for low input current (1 mA) in standby operation



() = Inches

Pin-Out

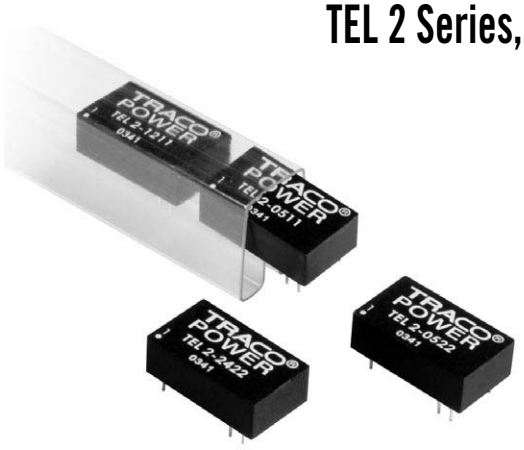
Pin	Single Output	Dual Output
1	– Vin (GND)	– Vin (GND)
2	+ Vin (Vcc)	+ Vin (Vcc)
3	Remote On/Off	Remote On/Off
5	No con.	No con.
6	+ Vout	+ Vout
7	– Vout	Common
8	No con.	– Vout

Download full datasheet at
http://www.tracopower.com/products/tmr3.pdf

DC/DC Converters

TEL 2 Series, 2 Watt

- Ultracompact DIP-16 Package
- Wide 2:1 Input Range
- I/O Isolation 1500 VDC
- Operating Temperature Range –25 °C to +75 °C
- Low Ripple and Noise
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Cost optimized Design

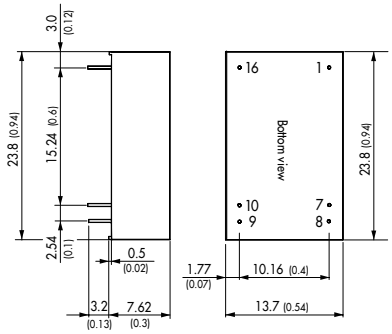


UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEL 2-0510		3.3 VDC	500 mA
TEL 2-0511		5 VDC	400 mA
TEL 2-0512		12 VDC	165 mA
TEL 2-0513	4.5 – 9 VDC	15 VDC	135 mA
TEL 2-0521		± 5 VDC	± 200 mA
TEL 2-0522		± 12 VDC	± 85 mA
TEL 2-0523		± 15 VDC	± 65 mA
TEL 2-1210		3.3 VDC	500 mA
TEL 2-1211		5 VDC	400 mA
TEL 2-1212		12 VDC	165 mA
TEL 2-1213	9 – 18 VDC	15 VDC	135 mA
TEL 2-1221		± 5 VDC	± 200 mA
TEL 2-1222		± 12 VDC	± 85 mA
TEL 2-1223		± 15 VDC	± 65 mA
TEL 2-2410		3.3 VDC	500 mA
TEL 2-2411		5 VDC	400 mA
TEL 2-2412		12 VDC	165 mA
TEL 2-2413	18 – 36 VDC	15 VDC	135 mA
TEL 2-2421		± 5 VDC	± 200 mA
TEL 2-2422		± 12 VDC	± 85 mA
TEL 2-2423		± 15 VDC	± 65 mA
TEL 2-4810		3.3 VDC	500 mA
TEL 2-4811		5 VDC	400 mA
TEL 2-4812		12 VDC	165 mA
TEL 2-4813	36 – 75 VDC	15 VDC	135 mA
TEL 2-4821		± 5 VDC	± 200 mA
TEL 2-4822		± 12 VDC	± 85 mA
TEL 2-4823		± 15 VDC	± 65 mA

Line regulation	±0.5 % max.
Load regulation:	– Single output models: ±0.75 % max. – Dual output models: ±2.0 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Conducted EMI:	EN55022, class A and FCC, level A (internal Filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	78 % typ.
Operating temperature range:	–25 °C … +75 °C (no derating)
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

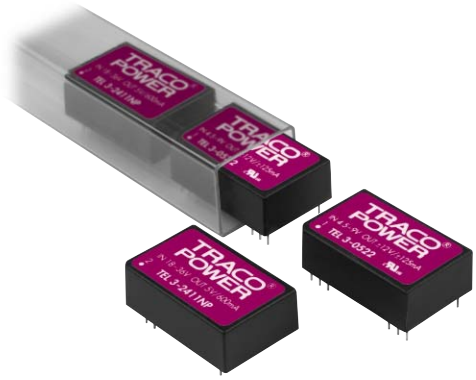
Pin	Single output	Dual output
1	– Vin (GND)	– Vin (GND)
7	No con.	No con.
8	No con.	Common
9	+ Vout	+ Vout
10	– Vout	– Vout
16	+ Vin	+ Vin

Download full datasheet at
http://www.tracopower.com/products/tel2.pdf

DC/DC Converters

TEL 3 Series, 3 Watt

- DIP-24 Plastic Package
- Wide 2:1 and 3:1 Input Range
- I/O Isolation 1500 VDC
- Operating Temperature Range –25 °C to +75 °C
- Short Circuit Protection
- Available with Industry Standard Pinout
- Cost optimized Design



c SP us
UL 60950

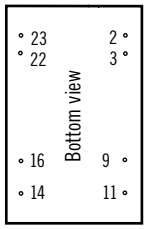
Models

Order code	Input voltage	Output voltage	Output current max.
TEL 3-0511*	4.5 – 9 VDC	5 VDC	600 mA
TEL 3-0512*		12 VDC	250 mA
TEL 3-0513		15 VDC	200 mA
TEL 3-0522*		± 12 VDC	±125 mA
TEL 3-0523*		± 15 VDC	±100 mA
TEL 3-1211*	9 – 18 VDC	5 VDC	600 mA
TEL 3-1212*		12 VDC	250 mA
TEL 3-1213		15 VDC	200 mA
TEL 3-1222*		± 12 VDC	±125 mA
TEL 3-1223*		± 15 VDC	±100 mA
TEL 3-2011	10 – 30 VDC	5 VDC	600 mA
TEL 3-2012		12 VDC	250 mA
TEL 3-2013		15 VDC	200 mA
TEL 3-2022		± 12 VDC	±125 mA
TEL 3-2023		± 15 VDC	±100 mA
TEL 3-2411*	18 – 36 VDC	5 VDC	600 mA
TEL 3-2412*		12 VDC	250 mA
TEL 3-2413		15 VDC	200 mA
TEL 3-2422*		± 12 VDC	±125 mA
TEL 3-2423*		± 15 VDC	±100 mA
TEL 3-4811	36 – 75 VDC	5 VDC	600 mA
TEL 3-4812		12 VDC	250 mA
TEL 3-4813		15 VDC	200 mA
TEL 3-4822		± 12 VDC	±125 mA
TEL 3-4823		± 15 VDC	±100 mA

*** Suffix NP for models with industry standard pinout for (example: TEL 3-2423NP)**

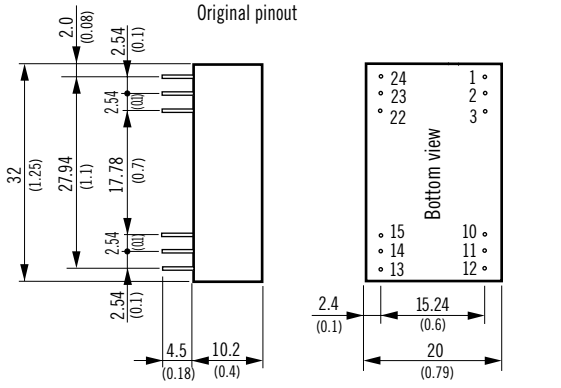
Line regulation:	±0.5 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<60 mVpk-pk (20 MHz BW)
Input filter:	Pi-filter
Short circuit protection:	continuous, automatic recovery
Efficiency:	80 % typ.
Operating temperature range:	–25 °C … +75 °C (no derating)
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94 V-0 rating)
Option:	metal case

Industry standard pinout (suffix NP)



Pin-out table same as for TEL 5 Series. See next page

Original pinout



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

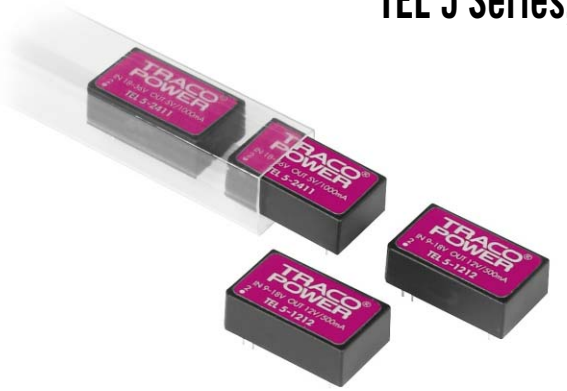
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	No con.	– Vout
3	No con.	Common
10	– Vout	Common
11	+ Vout	+ Vout
12	– Vin (GND)	– Vin (GND)
13	– Vin (GND)	– Vin (GND)
14	+ Vout	+ Vout
15	– Vout	Common
22	No con.	Common
23	No con.	– Vout
24	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://www.tracopower.com/products/tel3.pdf

DC/DC Converters

TEL 5 Series, 6 Watt

- DIP-24 Plastic Package
- Wide 2:1 Input Range
- High Efficiency up to 86 %
- I/O Isolation 1500 VDC
- Operating Temperature Range –25 °C to +75 °C
- Short Circuit Protection
- Industry Standard Pinout
- Cost optimized Design

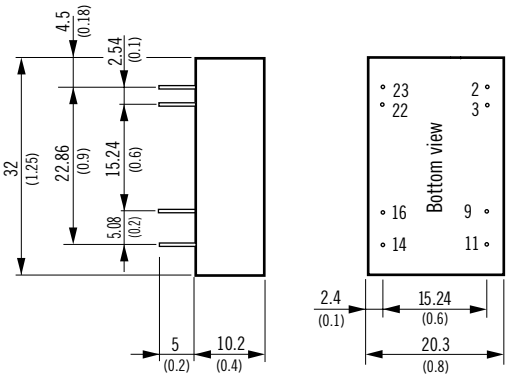


c SP us
UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEL 5-1210		3.3 VDC	1200 mA
TEL 5-1211		5 VDC	1000 mA
TEL 5-1212	9 – 18 VDC	12 VDC	500 mA
TEL 5-1222		± 12 VDC	± 250 mA
TEL 5-1223		± 15 VDC	± 200 mA
TEL 5-2410		3.3 VDC	1200 mA
TEL 5-2411		5 VDC	1000 mA
TEL 5-2412	18 – 36 VDC	12 VDC	500 mA
TEL 5-2422		± 12 VDC	± 250 mA
TEL 5-2423		± 15 VDC	± 200 mA

Line regulation:	±0.3 % max.
Load regulation:	– Single output models: ±1 % max. – Dual output models: ±2 % max.
Ripple & Noise:	<75 mVpk-pk (20 MHz BW)
Input filter:	Pi-filter
Short circuit protection:	continuous, automatic recovery
Efficiency:	84 % typ.
Operating temperature range:	–25 °C … +75 °C (no derating)
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

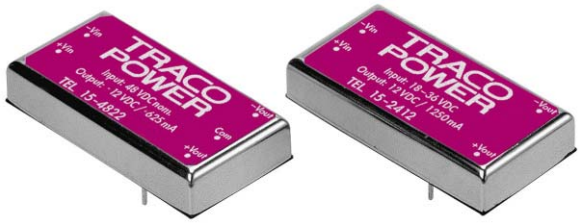
Pin	Single output	Dual output
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No pin	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://tracopower.com/products/tel5.pdf

DC/DC Converters

TEL 15 Series, 15 Watt

- 51x25x10 mm Metal Package
- Wide 2:1 Input Range
- High Efficiency up to 86 %
- Operating Temperature Range –25 °C to +71 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Industry Standard Pinout
- Cost optimized Design

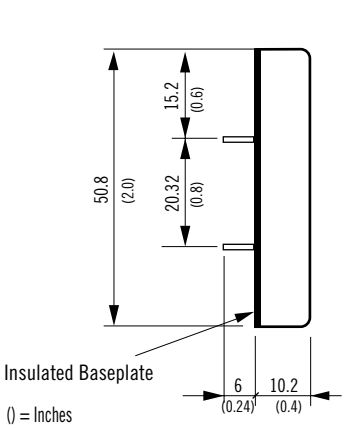


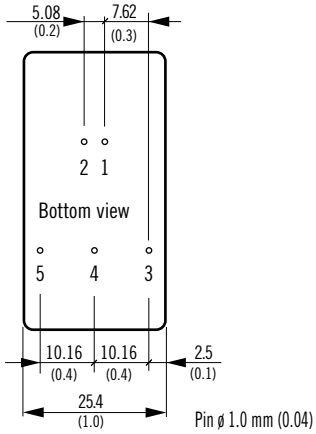
UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEL 15-1210		3.3 VDC	4000 mA
TEL 15-1211		5.1 VDC	3000 mA
TEL 15-1212		12 VDC	1250 mA
TEL 15-1213	9 – 18 VDC	15 VDC	1000 mA
TEL 15-1222		± 12 VDC	± 625 mA
TEL 15-1223		± 15 VDC	± 500 mA
TEL 15-2410		3.3 VDC	4000 mA
TEL 15-2411		5.1 VDC	3000 mA
TEL 15-2412		12 VDC	1250 mA
TEL 15-2413	18 – 36 VDC	15 VDC	1000 mA
TEL 15-2422		± 12 VDC	± 625 mA
TEL 15-2423		± 15 VDC	± 500 mA
TEL 15-4810		3.3 VDC	4000 mA
TEL 15-4811		5.1 VDC	3000 mA
TEL 15-4812		12 VDC	1250 mA
TEL 15-4813	36 – 75 VDC	15 VDC	1000 mA
TEL 15-4822		± 12 VDC	± 625 mA
TEL 15-4823		± 15 VDC	± 500 mA

Line regulation:	±1.0 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<75 mVpk-pk (20 MHz BW)
Input filter:	Pi-filter
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–25 °C … +71 °C (no derating)
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL /UL 60950-1 IEC/EN 60950-1
Case:	metal, 6-side shielded with insulated baseplate





Pin-Out

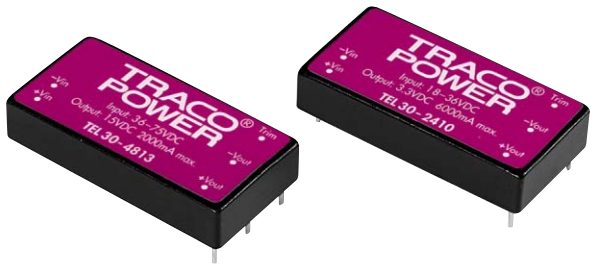
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	No pin	Common
5	– Vout	– Vout

Download full datasheet at
http://www.tracopower.com/products/tel15.pdf

DC/DC Converters

TEL 30 Series, 30 Watt

- Highest Power Density in 51x25x10 mm Metal Package
- Wide 2:1 Input Range
- Very high Efficiency up to 88 %
- Operating Temperature Range –25 °C to +71 °C
- I/O Isolation 1500 VDC
- Under- / Over-Voltage Lockout
- Short Circuit Protection
- Remote On/Off
- Adjustable Output Voltage
- Industry Standard Pinout
- Cost optimized Design

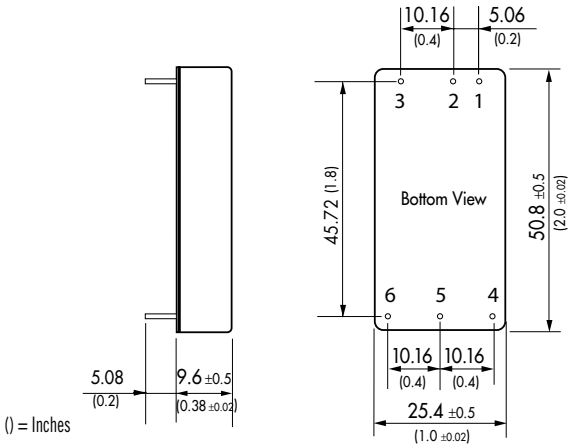


UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEL 30-2409		2.5 VDC	6000 mA
TEL 30-2410		3.3 VDC	6000 mA
TEL 30-2411	18 – 36 VDC	5.1 VDC	5000 mA
TEL 30-2412		12 VDC	2500 mA
TEL 30-2413		15 VDC	2000 mA
TEL 30-4809		2.5 VDC	6000 mA
TEL 30-4810		3.3 VDC	6000 mA
TEL 30-4811	36 – 75 VDC	5.1 VDC	5000 mA
TEL 30-4812		12 VDC	2500 mA
TEL 30-4813		15 VDC	2000 mA

Line regulation	±0.3 % max.
Load regulation:	±1.0 % max.
Output voltage adjustment:	±10 % (by external resistor)
Ripple & Noise:	<100 mVpk-pk (20 MHz BW)
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–25 °C … +71 °C above 50 °C derating 2 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded, with insulated baseplate
Remote On/Off:	shutdown input for low input current (5 mA) in standby operation



() = Inches

Pin ø1.0 mm (0.04)

Pin-Out

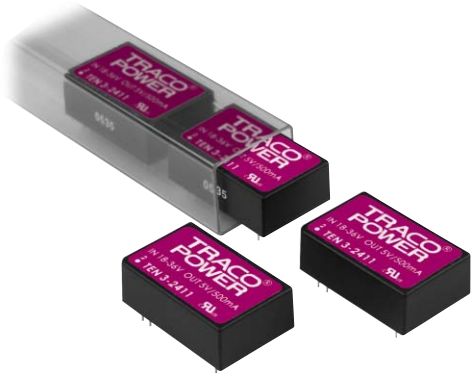
Pin	Single Output
1	+ Vin (Vcc)
2	– Vin (GND)
3	Remote On/Off
4	+ Vout
5	– Vout
6	Trim

Download full datasheet at
http://tracopower.com/products/tel30.pdf

DC/DC Converters

TEN 3 Series, 3 Watt

- DIP-24 Plastic Package
- Wide 2:1 Input Range
- I/O Isolation 1500 VDC
- Operating Temperature Range –40 °C to +85 °C
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Industry Standard Pinout

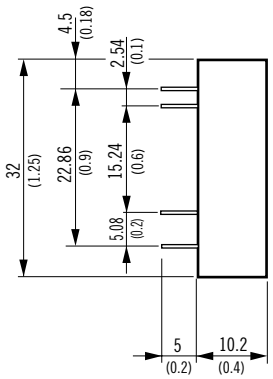


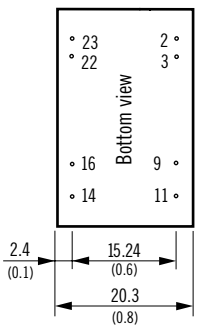
UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 3-0510		3.3 VDC	600 mA
TEN 3-0511		5 VDC	500 mA
TEN 3-0512		12 VDC	250 mA
TEN 3-0513	4.5 – 9 VDC	15 VDC	200 mA
TEN 3-0521		± 5 VDC	±250 mA
TEN 3-0522		± 12 VDC	±125 mA
TEN 3-0523		± 15 VDC	±100 mA
TEN 3-1210		3.3 VDC	600 mA
TEN 3-1211		5 VDC	500 mA
TEN 3-1212		12 VDC	250 mA
TEN 3-1213	9 – 18 VDC	15 VDC	200 mA
TEN 3-1221		± 5 VDC	±250 mA
TEN 3-1222		± 12 VDC	±125 mA
TEN 3-1223		± 15 VDC	±100 mA
TEN 3-2410		3.3 VDC	600 mA
TEN 3-2411		5 VDC	500 mA
TEN 3-2412		12 VDC	250 mA
TEN 3-2413	18 – 36 VDC	15 VDC	200 mA
TEN 3-2421		± 5 VDC	±250 mA
TEN 3-2422		± 12 VDC	±125 mA
TEN 3-2423		± 15 VDC	±100 mA
TEN 3-4810		3.3 VDC	600 mA
TEN 3-4811		5 VDC	500 mA
TEN 3-4812		12 VDC	250 mA
TEN 3-4813	36 – 72 VDC	15 VDC	200 mA
TEN 3-4821		± 5 VDC	±250 mA
TEN 3-4822		± 12 VDC	±125 mA
TEN 3-4823		± 15 VDC	±100 mA

Line regulation:	±0.5 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	80 % typ.
Operating temperature range:	–40 °C … +85 °C above 70 °C derating 3 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94 V-0 rating)





() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

Pin	Single output	Dual output
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No pin	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at

http://www.tracopower.com/products/ten3.pdf

DC/DC Converters

TEN 3WI Series, 3 Watt

- DIP-24 Plastic Package
- Ultrawide 4:1 Input Range
- I/O Isolation 1500 VDC
- Operating Temperature Range –40 °C to +85 °C
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Industry Standard Pinout

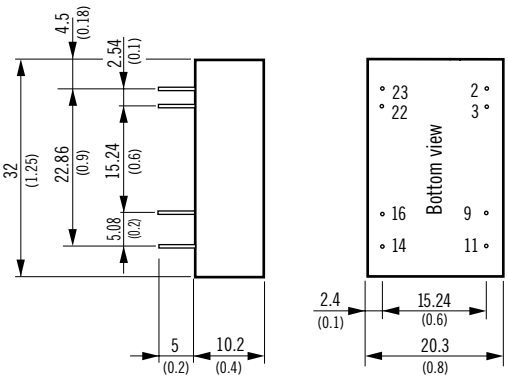
NEW Product

cULus pending

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 3-2410WI	9 – 36 VDC	3.3 VDC	600 mA
TEN 3-2411WI		5 VDC	500 mA
TEN 3-2412WI		12 VDC	250 mA
TEN 3-2413WI		15 VDC	200 mA
TEN 3-2422WI		± 12 VDC	±125 mA
TEN 3-2423WI		± 15 VDC	±100 mA
TEN 3-4810WI	18 – 75 VDC	3.3 VDC	600 mA
TEN 3-4811WI		5 VDC	500 mA
TEN 3-4812WI		12 VDC	250 mA
TEN 3-4813WI		15 VDC	200 mA
TEN 3-4822WI		± 12 VDC	±125 mA
TEN 3-4823WI		± 15 VDC	±100 mA

Line regulation:	±1.0 % max.
Load regulation:	– Single output models: ±1.0 % max. – Dual output models: ±3.0 % max.
Ripple & Noise:	<85 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	82 % typ.
Operating temperature range:	–40 °C … +85 °C above 70 °C derating 3 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94 V-0 rating)



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

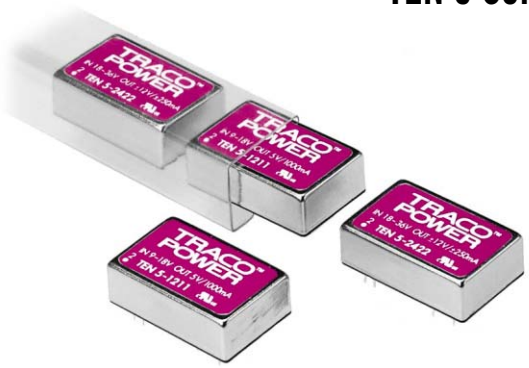
Pin	Single output	Dual output
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No pin	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://www.tracopower.com/products/ten3wi.pdf

DC/DC Converters

TEN 5 Series, 6 Watt

- DIP-24 Metal Package
- Wide 2:1 Input Range
- High Efficiency up to 86 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Industry Standard Pinout



UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 5-0510		3.3 VDC	1200 mA
TEN 5-0511		5 VDC	1000 mA
TEN 5-0512		12 VDC	500 mA
TEN 5-0513	4.5 – 7 VDC	15 VDC	400 mA
TEN 5-0521		± 5 VDC	± 500 mA
TEN 5-0522		± 12 VDC	± 250 mA
TEN 5-0523		± 15 VDC	± 200 mA
TEN 5-1210		3.3 VDC	1200 mA
TEN 5-1211		5 VDC	1000 mA
TEN 5-1212		12 VDC	500 mA
TEN 5-1213	9 – 18 VDC	15 VDC	400 mA
TEN 5-1221		± 5 VDC	± 500 mA
TEN 5-1222		± 12 VDC	± 250 mA
TEN 5-1223		± 15 VDC	± 200 mA
TEN 5-2410		3.3 VDC	1200 mA
TEN 5-2411		5 VDC	1000 mA
TEN 5-2412		12 VDC	500 mA
TEN 5-2413	18 – 36 VDC	15 VDC	400 mA
TEN 5-2421		± 5 VDC	± 500 mA
TEN 5-2422		± 12 VDC	± 250 mA
TEN 5-2423		± 15 VDC	± 200 mA
TEN 5-4810		3.3 VDC	1200 mA
TEN 5-4811		5 VDC	1000 mA
TEN 5-4812		12 VDC	500 mA
TEN 5-4813	36 – 75 VDC	15 VDC	400 mA
TEN 5-4821		± 5 VDC	± 500 mA
TEN 5-4822		± 12 VDC	± 250 mA
TEN 5-4823		± 15 VDC	± 200 mA

Line regulation: ±0.3 % max.

Load regulation: – Single output models: ±1.0 % max.
– Dual output models: ±2.0 % max.

Ripple & Noise: <50 mVpk-pk (20 MHz BW)

Conducted EMI: EN 55022, class A and FCC, level A (internal filter)

Short circuit protection: continuous, automatic recovery

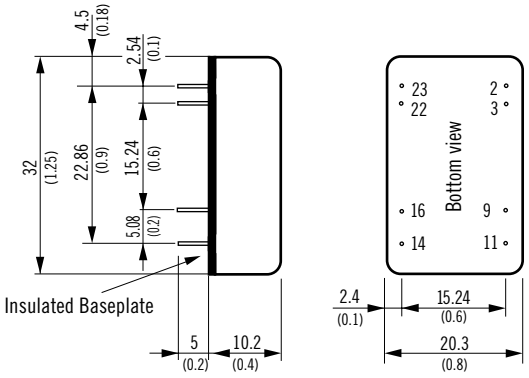
Efficiency: 85 % typ.
3.3 VDC models: 79 % typ.

Operating temperature range: –40 °C … +85 °C
above 70°C derating 3.5 %/K

I/O isolation voltage: 1500 VDC

Safety standards / approvals: cUL/UL 60950-1, IEC/EN 60950-1

Case: metal, with insulated baseplate



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

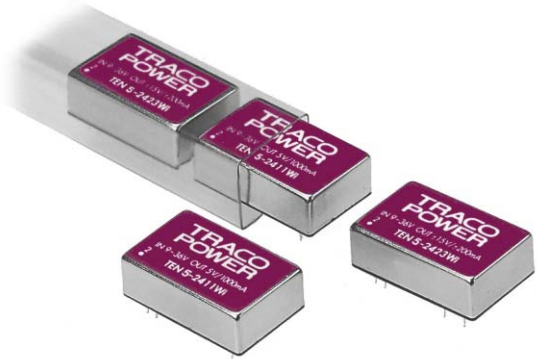
Pin	Single output	Dual output
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No pin	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://www.tracopower.com/products/ten5.pdf

DC/DC Converters

TEN 5WI Series, 6 Watt

- DIP-24 Metal Package
- Ultrawide 4:1 Input Range
- High Efficiency up to 84 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Industry Standard Pinout

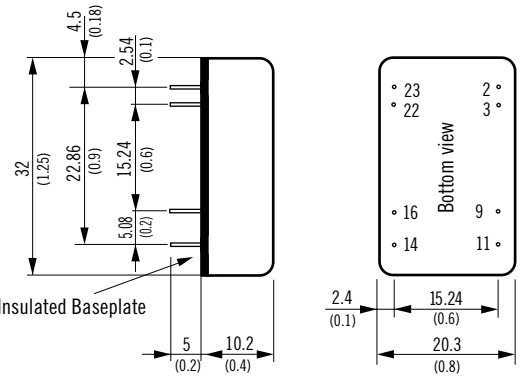


UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 5-2410WI		3.3 VDC	1200 mA
TEN 5-2411WI		5 VDC	1000 mA
TEN 5-2412WI		12 VDC	500 mA
TEN 5-2413WI	9 – 36 VDC	15 VDC	400 mA
TEN 5-2421WI		± 5 VDC	± 500 mA
TEN 5-2422WI		± 12 VDC	± 250 mA
TEN 5-2423WI		± 15 VDC	± 200 mA
TEN 5-4810WI		3.3 VDC	1200 mA
TEN 5-4811WI		5 VDC	1000 mA
TEN 5-4812WI		12 VDC	500 mA
TEN 5-4813WI	18 – 75 VDC	15 VDC	400 mA
TEN 5-4821WI		± 5 VDC	± 500 mA
TEN 5-4822WI		± 12 VDC	± 250 mA
TEN 5-4823WI		± 15 VDC	± 200 mA

Line regulation:	±0.3 % max.
Load regulation:	– Single output models: ±2.0 % max. – Dual output models: ±2.0 % max.
Ripple & Noise:	<75 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	82 % typ. 3.3 VDC models: 76 % typ.
Operating temperature range:	–40 °C … +85 °C above 70 °C derating 3.5 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, with insulated baseplate



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

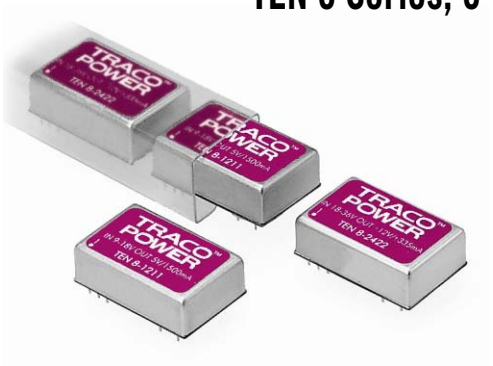
Pin	Single output	Dual output
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No pin	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://tracopower.com/products/ten5wi.pdf

DC/DC Converters

TEN 8 Series, 8 Watt

- High Power Density in DIP-24 Metal Package
- Wide 2:1 Input Range
- High Efficiency up to 85 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Remote On/Off
- Industry Standard Pinout



cULus

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 8-1210	9 – 18 VDC	3.3 VDC	2000 mA
TEN 8-1211		5 VDC	1500 mA
TEN 8-1212		12 VDC	665 mA
TEN 8-1213		15 VDC	535 mA
TEN 8-1221		± 5 VDC	± 800 mA
TEN 8-1222		± 12 VDC	± 335 mA
TEN 8-1223		± 15 VDC	± 265 mA
TEN 8-2410	18 – 36 VDC	3.3 VDC	2000 mA
TEN 8-2411		5 VDC	1500 mA
TEN 8-2412		12 VDC	665 mA
TEN 8-2413		15 VDC	535 mA
TEN 8-2421		± 5 VDC	± 800 mA
TEN 8-2422		± 12 VDC	± 335 mA
TEN 8-2423		± 15 VDC	± 265 mA
TEN 8-4810	36 – 75 VDC	3.3 VDC	2000 mA
TEN 8-4811		5 VDC	1500 mA
TEN 8-4812		12 VDC	665 mA
TEN 8-4813		15 VDC	535 mA
TEN 8-4821		± 5 VDC	± 800 mA
TEN 8-4822		± 12 VDC	± 335 mA
TEN 8-4823		± 15 VDC	± 265 mA

Line regulation: ±0.2 % max.

Load regulation: – Single output models: ±0.5 % max.
– Dual output models: ±1.0 % max.

Ripple & Noise: <50 mVpk-pk (20 MHz BW)

Conducted EMI: EN 55022, class A and FCC, level A (internal filter)

Short circuit protection: continuous,automatic recovery

Efficiency: 83 % typ.

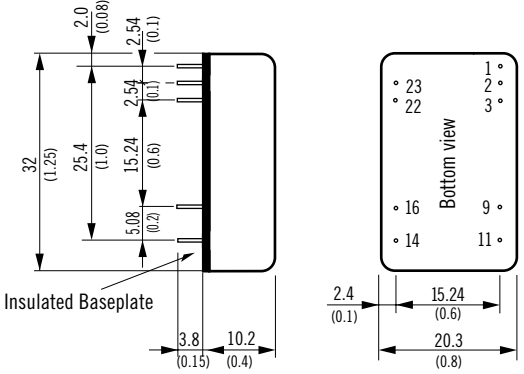
Operating temperature range: –40 °C … +85 °C
above 60 °C derating 2 %/K

I/O isolation voltage: 1500 VDC

Safety standards / approvals: cUL /UL 60950, IEC/EN 60950

Case: metal, 6-side shielded with insulated baseplate

Remote On/Off: shutdown input for low input current (2.5 mA)
in standby operation



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

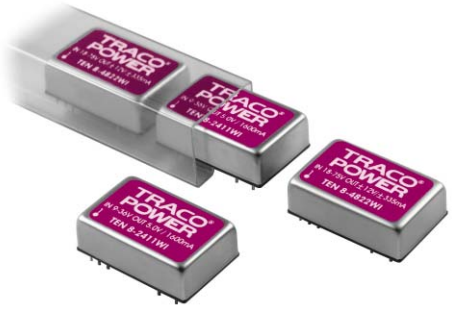
Pin	Single output	Dual output
1	Remote On/Off	Remote On/Off
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No con.	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://www.tracopower.com/products/ten8.pdf

DC/DC Converters

TEN 8WI Series, 8 Watt

- High Power Density in DIP-24 Metal Package
- Ultrawide 4:1 Input Range
- High Efficiency up to 88 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Remote On/Off
- Industry Standard Pinout



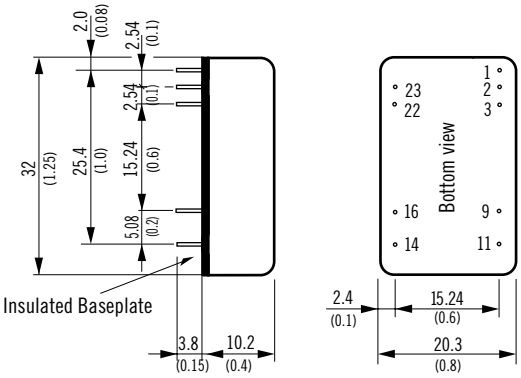
NEW Product

cULus pending

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 8-2410WI	9 – 36 VDC	3.3 VDC	2400 mA
TEN 8-2411WI		5 VDC	1600 mA
TEN 8-2412WI		12 VDC	665 mA
TEN 8-2413WI		15 VDC	535 mA
TEN 8-2421WI		± 5 VDC	± 800 mA
TEN 8-2422WI		± 12 VDC	± 335 mA
TEN 8-2423WI		± 15 VDC	± 265 mA
TEN 8-4810WI	18 – 75 VDC	3.3 VDC	2400 mA
TEN 8-4811WI		5 VDC	1600 mA
TEN 8-4812WI		12 VDC	665 mA
TEN 8-4813WI		15 VDC	535 mA
TEN 8-4821WI		± 5 VDC	± 800 mA
TEN 8-4822WI		± 12 VDC	± 335 mA
TEN 8-4823WI		± 15 VDC	± 265 mA

Line regulation:	±0.2 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (with external capacitor)
Short circuit protection:	continuous,automatic recovery
Efficiency:	83 % typ.
Operating temperature range:	–40 °C … +85 °C above 75 °C derating 3 %/K
I/O isolation voltage:	1500 VDC
Safety standards:	cUL /UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded with insulated baseplate
Remote On/Off:	shutdown input for low input current (2.5 mA) in standby operation



Pin-Out		
Pin	**Single output**	**Dual output**
1	Remote On/Off	Remote On/Off
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No con.	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

() = Inches

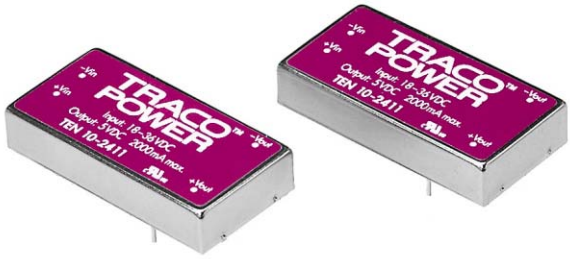
Pin ø 0.5 mm (0.02)

Download full datasheet at
http://www.tracopower.com/products/ten8wi.pdf

DC/DC Converters

TEN 10 Series, 10 Watt

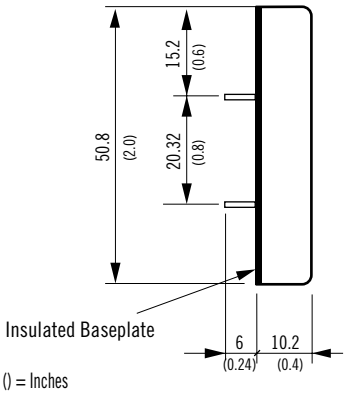
- 51x25x10 mm Metal Package
- Wide 2:1 Input Range
- High Efficiency up to 83 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Industry Standard Pinout



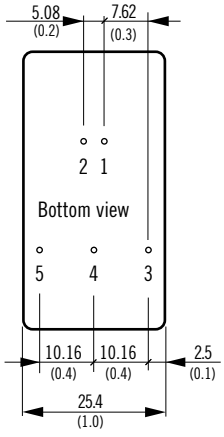
Models

Order code	Input voltage	Output voltage	Output current max.
TEN 10-1210	9 – 18 VDC	3.3 VDC	2400 mA
TEN 10-1211		5 VDC	2000 mA
TEN 10-1212		12 VDC	830 mA
TEN 10-1213		15 VDC	670 mA
TEN 10-1215		24 VDC	415 mA
TEN 10-1221		± 5 VDC	±1000 mA
TEN 10-1222		± 12 VDC	± 415 mA
TEN 10-1223		± 15 VDC	± 330 mA
TEN 10-2410	18 – 36 VDC	3.3 VDC	2400 mA
TEN 10-2411		5 VDC	2000 mA
TEN 10-2412		12 VDC	830 mA
TEN 10-2413		15 VDC	670 mA
TEN 10-2415		24 VDC	415 mA
TEN 10-2421		± 5 VDC	±1000 mA
TEN 10-2422		± 12 VDC	± 415 mA
TEN 10-2423		± 15 VDC	± 330 mA
TEN 10-4810	36 – 75 VDC	3.3 VDC	2400 mA
TEN 10-4811		5 VDC	2000 mA
TEN 10-4812		12 VDC	830 mA
TEN 10-4813		15 VDC	670 mA
TEN 10-4815		24 VDC	415 mA
TEN 10-4821		± 5 VDC	±1000 mA
TEN 10-4822		± 12 VDC	± 415 mA
TEN 10-4823		± 15 VDC	± 330 mA

Line regulation:	±0.2 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	81 % typ. 3.3VDC models: 75 % typ.
Operating temperature range:	–40 °C … +85 °C above 70°C derating 4 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL /UL 60950, IEC/EN 60950
Case:	metal, 6-side shielded with insulated baseplate



() = Inches



Pin ø 1.0 mm (0.04)

Pin-Out

Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	No pin	Common
5	– Vout	– Vout

Download full datasheet at
http://www.tracopower.com/products/ten10.pdf

DC/DC Converters

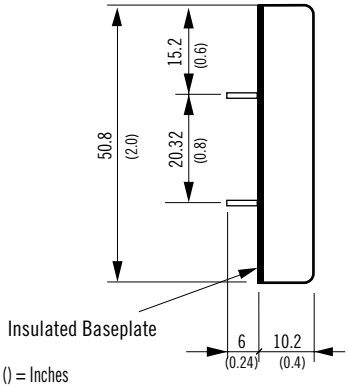
TEN 12WI Series, 12 Watt

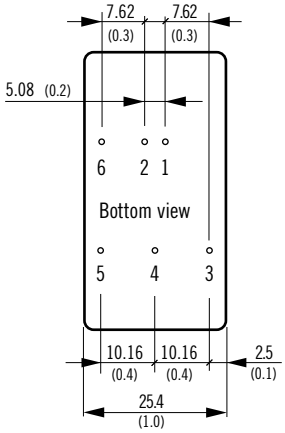
- 51x25x10 mm Metal Package
- Ultrawide 4:1 Input Range
- Very high Efficiency up to 84 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Remote On/Off (option)
- Industry Standard Pinout

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 12-2410		3.3 VDC	2400 mA
TEN 12-2411		5 VDC	2000 mA
TEN 12-2412		12 VDC	1000 mA
TEN 12-2413	9 – 36 VDC	15 VDC	800 mA
TEN 12-2421		± 5 VDC	±1000 mA
TEN 12-2422		± 12 VDC	± 500 mA
TEN 12-2423		± 15 VDC	± 400 mA
TEN 12-4810		3.3 VDC	2400 mA
TEN 12-4811		5 VDC	2000 mA
TEN 12-4812		12 VDC	1000 mA
TEN 12-4813	18 – 75 VDC	15 VDC	800 mA
TEN 12-4821		± 5 VDC	±1000 mA
TEN 12-4822		± 12 VDC	± 500 mA
TEN 12-4823		± 15 VDC	± 400 mA

Line regulation	±0.5 % max.
Load regulation:	–Single output models: ±0.5 % max. –Dual output models: ±0.5 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	83 % typ. 3.3 VDC models: 78 % typ.
Operating temperature range:	–40 °C … +85 °C above 60°C derating 2 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950, IEC/EN 60950
Case:	metal, 6-side shielded with insulated baseplate
Option:	shutdown input for low input current (10 mA) in standby operation





() = Inches

Pin ø 1.0 mm (0.04)

Pin-Out

Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	No pin	Common
5	– Vout	– Vout
6	Remote On/Off (option)	Remote On/Off (option)

Download full datasheet at
http://www.tracopower.com/products/ten12wi.pdf

DC/DC Converters

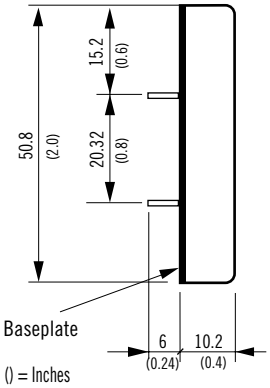
TEN 15 Series, 15 Watt

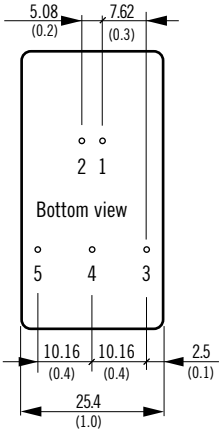
- 51x25x10 mm Metal Package
- Wide 2:1 Input Range
- Very high Efficiency up to 86 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Industry Standard Pinout

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 15-1210	9 – 18 VDC	3.3 VDC	4000 mA
TEN 15-1211		5 VDC	3000 mA
TEN 15-1212		12 VDC	1250 mA
TEN 15-1213		15 VDC	1000 mA
TEN 15-1221		± 5 VDC	±1500 mA
TEN 15-1222		± 12 VDC	± 625 mA
TEN 15-1223		± 15 VDC	± 500 mA
TEN 15-2410	18 – 36 VDC	3.3 VDC	4000 mA
TEN 15-2411		5 VDC	3000 mA
TEN 15-2412		12 VDC	1250 mA
TEN 15-2413		15 VDC	1000 mA
TEN 15-2421		± 5 VDC	±1500 mA
TEN 15-2422		± 12 VDC	± 625 mA
TEN 15-2423		± 15 VDC	± 500 mA
TEN 15-4810	36 – 75 VDC	3.3 VDC	4000 mA
TEN 15-4811		5 VDC	3000 mA
TEN 15-4812		12 VDC	1250 mA
TEN 15-4813		15 VDC	1000 mA
TEN 15-4821		± 5 VDC	±1500 mA
TEN 15-4822		± 12 VDC	± 625 mA
TEN 15-4823		± 15 VDC	± 500 mA

Line regulation:	±1.0 % max.
Load regulation:	– Single output models: ±1.0 % max. – Dual output models: ±2.0 % max.
Ripple & Noise:	– Single output models: <50 mVpk-pk (20 MHz BW) – Dual output models: <75 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	84 % typ. 3.3 V models: 80 % typ.
Operating temperature range:	–40 °C … +85 °C for derating see datasheet
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950, IEC/EN 60950
Case:	metal, 6-side shielded with insulated baseplate





Pin ø 1.0 mm (0.04)

Pin-Out		
Pin	**Single output**	**Dual output**
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	No pin	Common
5	– Vout	– Vout

Download full datasheet at
http://www.tracopower.com/products/ten15.pdf

DC/DC Converters

TEN 15WI Series, 15 Watt

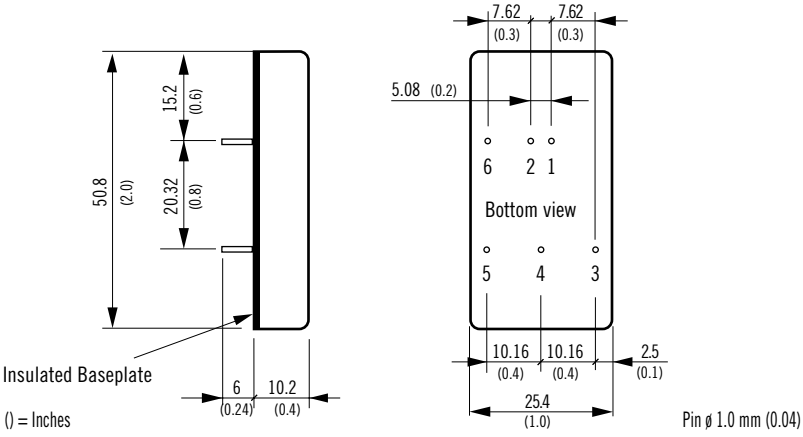
- 51x25x10 mm Metal Package
- Ultrawide 4:1 Input Range
- Very high Efficiency up to 86 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Remote On/Off
- Industry Standard Pinout

UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 15-2410WI		3.3 VDC	3000 mA
TEN 15-2411WI		5.1 VDC	3000 mA
TEN 15-2412WI	9 – 36 VDC	12 VDC	1250 mA
TEN 15-2422WI		± 12 VDC	± 625 mA
TEN 15-2423WI		± 15 VDC	± 500 mA
TEN 15-4810WI		3.3 VDC	3000 mA
TEN 15-4811WI		5.1 VDC	2950 mA
TEN 15-4812WI	18 – 75 VDC	12 VDC	1250 mA
TEN 15-4822WI		± 12 VDC	± 625 mA
TEN 15-4823WI		± 15 VDC	± 500 mA

Line regulation	±0.5 % max.
Load regulation:	–Single output models: ±2.0 % max. –Dual output models: ±2.0 % max.
Ripple & Noise:	<80 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–40 °C … +85 °C above 70 °C derating 3.5 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded with insulated baseplate
Remote On/Off:	shutdown input for low input current (5 mA) in standby operation



Pin-Out

Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	No pin	Common
5	– Vout	– Vout
6	Remote On/Off	Remote On/Off

Download full datasheet at
http://tracopower.com/products/ten15wi.pdf

DC/DC Converters

TEN 20 Series, 20 Watt

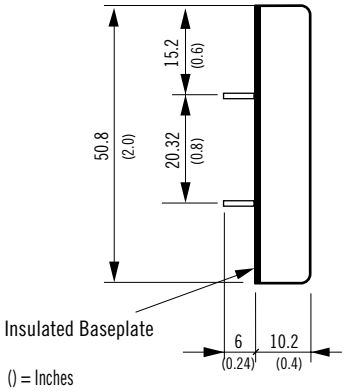
- High Power Density in 51x25x10 mm Package
- Wide 2:1 Input Range
- Very high Efficiency up to 89 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Remote On/Off
- Industry Standard Pinout

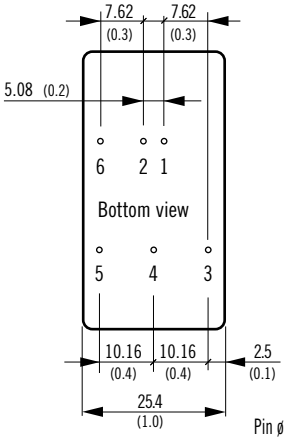
UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 20-1210	9 – 18 VDC	3.3 VDC	4000 mA
TEN 20-1211		5 VDC	4000 mA
TEN 20-1212		12 VDC	1670 mA
TEN 20-1213		15 VDC	1340 mA
TEN 20-1222		± 12 VDC	± 835 mA
TEN 20-1223		± 15 VDC	± 670 mA
TEN 20-2410	18 – 36 VDC	3.3 VDC	4000 mA
TEN 20-2411		5 VDC	4000 mA
TEN 20-2412		12 VDC	1670 mA
TEN 20-2413		15 VDC	1340 mA
TEN 20-2422		± 12 VDC	± 835 mA
TEN 20-2423		± 15 VDC	± 670 mA
TEN 20-4810	36 – 75 VDC	3.3 VDC	4000 mA
TEN 20-4811		5 VDC	4000 mA
TEN 20-4812		12 VDC	1670 mA
TEN 20-4813		15 VDC	1340 mA
TEN 20-4822		± 12 VDC	± 835 mA
TEN 20-4823		± 15 VDC	± 670 mA

Line regulation:	±0.3 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Ripple & Noise:	<80 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A
Short circuit protection:	continuous, automatic recovery
Efficiency:	85 % typ.
Operating temperature range:	–40 °C ... +85 °C above 70 °C derating 3.5 %/K 5 V models: above 60 °C derating 4 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded with insulated baseplate
Remote On/Off:	shutdown input for low input current (5 mA) in standby operation





Pin-Out

Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	No pin	Common
5	– Vout	– Vout
6	Remote On/Off	Remote On/Off

Download full datasheet at
http://www.tracopower.com/products/ten20.pdf

DC/DC Converters

TEN 20WIN Serie, 20 Watt

- High Power Density in 51x25x10 mm Package
- Ultrawide 4:1 Input Range
- High Efficiency up to 86 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Remote On/Off
- Adjustable Output Voltage
- Industry Standard Pinout

NEW Product

cULus pending

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 20-2410WIN		3.3 VDC	5500 mA
TEN 20-2411WIN		5 VDC	4000 mA
TEN 20-2412WIN		12 VDC	1670 mA
TEN 20-2413WIN	9 – 36 VDC	15 VDC	1330 mA
TEN 20-2421WIN		± 5 VDC	±2000 mA
TEN 20-2422WIN		± 12 VDC	± 835 mA
TEN 20-2423WIN		± 15 VDC	± 665 mA
TEN 20-4810WIN		3.3 VDC	5500 mA
TEN 20-4811WIN		5 VDC	4000 mA
TEN 20-4812WIN		12 VDC	1670 mA
TEN 20-4813WIN	18 – 75 VDC	15 VDC	1330 mA
TEN 20-4821WIN		± 5 VDC	±2000 mA
TEN 20-4822WIN		± 12 VDC	± 835 mA
TEN 20-4823WIN		± 15 VDC	± 665 mA

Line regulation: ±0.2 % max.

Load regulation:
– Single output models: ±0.5 % max.
– Dual output models: ±3.0 % max.

Output voltage adjustment: Single output models only: ±10 % (by external resistor)

Ripple & Noise:
– Single output models: <75 mVpk-pk (20 MHz BW)
– Dual output models: <100 mVpk-pk (20 MHz BW)

Conducted EMI: EN 55022, class A and FCC, level A (with external capacitor)

Short circuit protection: continuous, automatic recovery

Efficiency: 85 % typ.

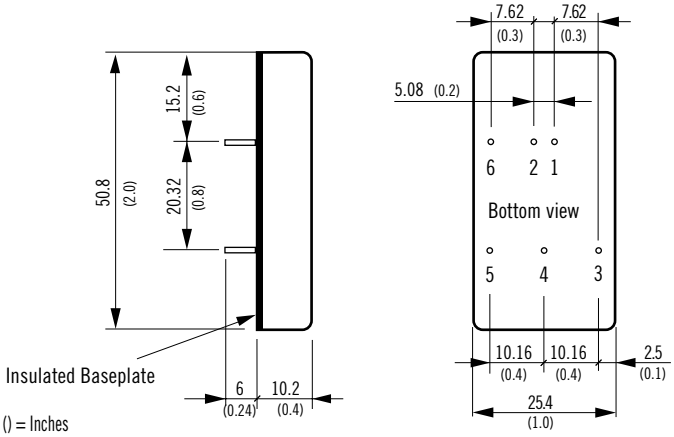
Operating temperature range: –40 °C … +85 °C
above 65 °C derating 2.5 %/K

I/O isolation voltage: 1500 VDC

Safety standards : cUL/UL 60950-1, IEC/EN 60950-1

Case: metal, with insulated baseplate

Remote On/Off: shutdown input for low input current (2.5 mA) in standby operation



() = Inches

Pin ø 1.0 mm (0.04)

Pin-Out

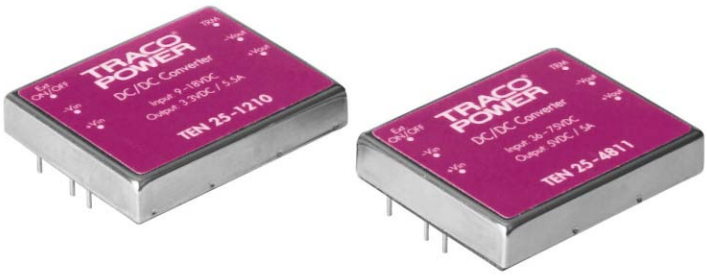
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	Trim	Common
5	– Vout	– Vout
6	Remote On/Off	Remote On/Off

Download full datasheet at
http://www.tracopower.com/products/ten20win.pdf

DC/DC Converters

TEN 25 Series, 25 / 30 Watt

- 51x41x9.3 mm Package
- Wide 2:1 Input Range
- Very high Efficiency up to 89 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Remote On/Off
- Adjustable Output Voltage
- Industry Standard Pinout

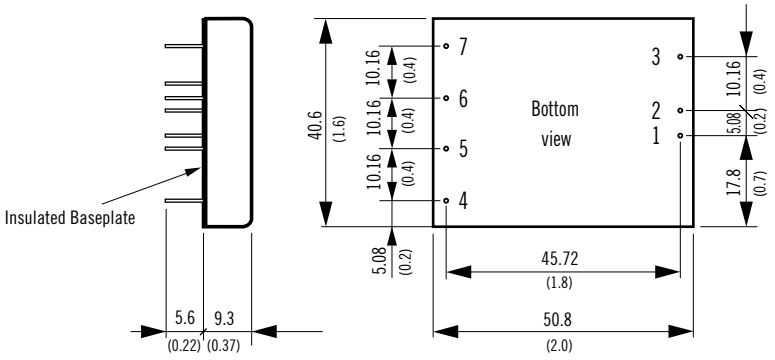


c SP us
UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 25-1210	9 – 18 VDC	3.3 VDC	5500 mA
TEN 25-1211		5 VDC	5000 mA
TEN 25-1212		12 VDC	2500 mA
TEN 25-1213		15 VDC	2000 mA
TEN 25-1222		± 12 VDC	±1250 mA
TEN 25-1223		± 15 VDC	±1000 mA
TEN 25-2410	18 – 36 VDC	3.3 VDC	5500 mA
TEN 25-2411		5 VDC	5000 mA
TEN 25-2412		12 VDC	2500 mA
TEN 25-2413		15 VDC	2000 mA
TEN 25-2422		± 12 VDC	±1250 mA
TEN 25-2423		± 15 VDC	±1000 mA
TEN 25-4810	36 – 75 VDC	3.3 VDC	5500 mA
TEN 25-4811		5 VDC	5000 mA
TEN 25-4812		12 VDC	2500 mA
TEN 25-4813		15 VDC	2000 mA
TEN 25-4822		± 12 VDC	±1250 mA
TEN 25-4823		± 15 VDC	±1000 mA

Line regulation:	±0.3 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Output voltage adjustment:	±10 % (by external resistor)
Ripple & Noise:	<80 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	88 % typ.
Operating temperature range:	–40 °C … +85 °C above 60 °C derating 2.5 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded with insulated baseplate
Remote On/Off:	shutdown input for low input current (5 mA) in standby operation



() = Inches

Pin ø 1.0 mm (0.04)

Pin-Out

Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	Remote On/Off	Remote On/Off
4	No pin	+ Vout
5	+ Vout	Common
6	– Vout	– Vout
7	Trim	Trim

Download full datasheet at
http://www.tracopower.com/products/ten25.pdf

DC/DC Converters

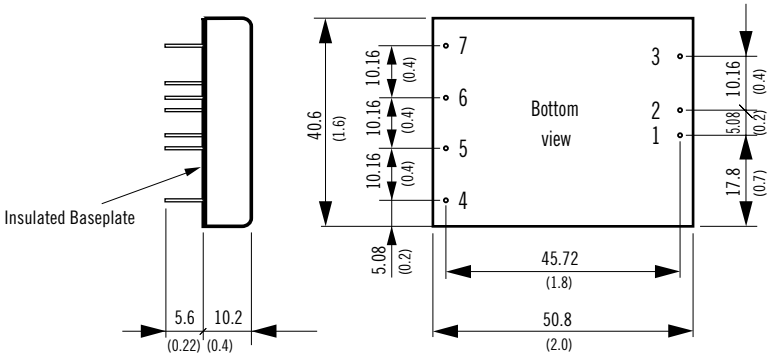
TEN 30WI Series, 30 Watt

- High Power Density in 51x41x10 mm Package
- Ultrawide 4:1 Input Range
- Very high Efficiency up to 88 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Under- / Over-Voltage Lockout
- Short Circuit Protection
- Remote On/Off
- Adjustable Output Voltage
- Industry Standard Pinout

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 30-2408WI	10 – 40 VDC	1.8 VDC	8000 mA
TEN 30-2409WI		2.5 VDC	8000 mA
TEN 30-2410WI		3.3 VDC	6000 mA
TEN 30-2411WI		5 VDC	6000 mA
TEN 30-2412WI		12 VDC	2500 mA
TEN 30-2413WI		15 VDC	2000 mA
TEN 30-2422WI		± 12 VDC	± 1250 mA
TEN 30-2423WI		± 15 VDC	± 1000 mA
TEN 30-4808WI	18 – 75 VDC	1.8 VDC	8000 mA
TEN 30-4809WI		2.5 VDC	8000 mA
TEN 30-4810WI		3.3 VDC	6000 mA
TEN 30-4811WI		5 VDC	6000 mA
TEN 30-4812WI		12 VDC	2500 mA
TEN 30-4813WI		15 VDC	2000 mA
TEN 30-4822WI		± 12 VDC	± 1250 mA
TEN 30-4823WI		± 15 VDC	± 1000 mA

Line regulation:	±0.5 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual output models: ±1.0 % max.
Output voltage adjustment:	±10 % (by external resistor)
Ripple & Noise:	<75 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (with external capacitor)
Short circuit protection:	continuous, automatic recovery
Overvoltage protection:	120–170 % of Vout nom.
Efficiency:	85 % typ.
Operating temperature range:	–40 °C … +85 °C for derating see datasheet
Thermal shutdown:	at 115 °C
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950, IEC/EN 60950
Case:	metal, with insulated baseplate
Remote On/Off:	shutdown input for low input current (3 mA) in standby operation



() = Inches

Pin ø 1.0 mm (0.04)

Pin-Out

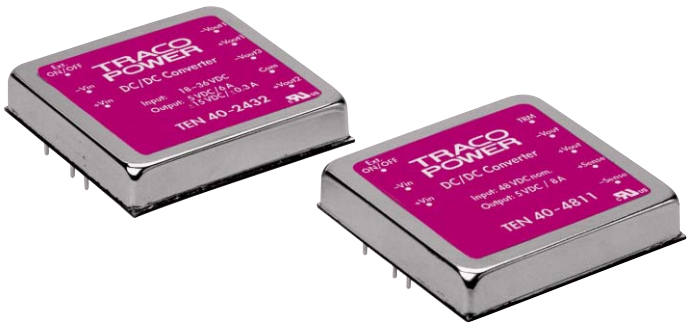
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	Remote On/Off	Remote On/Off
4	No pin	+ Vout
5	+ Vout	Common
6	– Vout	– Vout
7	Trim	No con.

Download full datasheet at
http://www.tracopower.com/products/ten30wi.pdf

DC/DC Converters

TEN 40 Series, 40 Watt

- High Power Density in 51x51x10 mm Metal Package
- Models with 2 isolated Outputs (3.3 V / 5 V) and with triple Output
- Wide 2:1 Input Range
- Very high Efficiency up to 90 %
- Operating Temperature Range –40 °C to +85 °C
- Under- / Over-Voltage Lockout
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Remote On/Off
- Adjustable Output Voltage

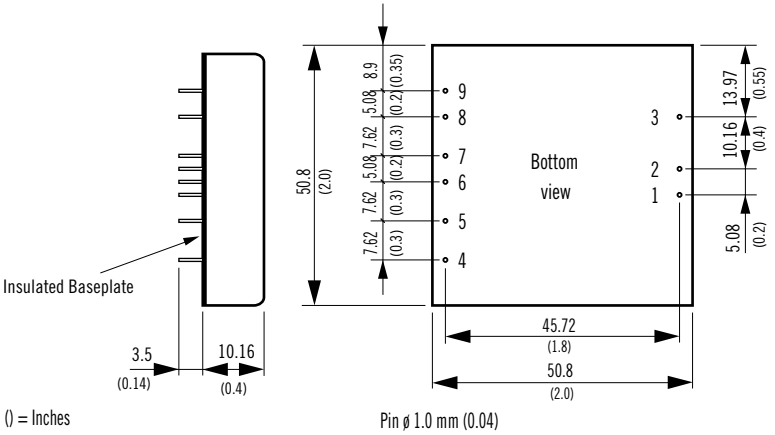


Models

Order code	Input voltage	Output 1 Vout / Imax.	Output 2/3 Vout / Imax.
TEN 40-1210	9 – 18 VDC	3.3 VDC / 8.0 A	
TEN 40-1211		5 VDC / 8.0 A	
TEN 40-1212		12 VDC / 3.3 A	
TEN 40-1220		*3.3 VDC / 8.0 A	*5 VDC / 8.0 A
TEN 40-1222		+ 12 VDC / 1.8 A	-12 VDC / 1.8 A
TEN 40-1223		+ 15 VDC / 1.4 A	-15 VDC / 1.4 A
TEN 40-1233		3.3 VDC / 6.0 A	± 12 VDC / ± 0.4 A
TEN 40-1234		3.3 VDC / 6.0 A	± 15 VDC / ± 0.3 A
TEN 40-1231		5 VDC / 6.0 A	± 12 VDC / ± 0.4 A
TEN 40-1232		5 VDC / 6.0 A	± 15 VDC / ± 0.3 A
TEN 40-2410	18 – 36 VDC	3.3 VDC / 8.0 A	
TEN 40-2411		5 VDC / 8.0 A	
TEN 40-2412		12 VDC / 3.3 A	
TEN 40-2420		*3.3 VDC / 8.0 A	*5 VDC / 8.0 A
TEN 40-2422		+ 12 VDC / 1.8 A	-12 VDC / 1.8 A
TEN 40-2423		+ 15 VDC / 1.4 A	-15 VDC / 1.4 A
TEN 40-2433		3.3 VDC / 6.0 A	± 12 VDC / ± 0.4 A
TEN 40-2434		3.3 VDC / 6.0 A	± 15 VDC / ± 0.3 A
TEN 40-2431		5 VDC / 6.0 A	± 12 VDC / ± 0.4 A
TEN 40-2432		5 VDC / 6.0 A	± 15 VDC / ± 0.3 A
TEN 40-4810	36 – 75 VDC	3.3 VDC / 8.0 A	
TEN 40-4811		5 VDC / 8.0 A	
TEN 40-4812		12 VDC / 3.3 A	
TEN 40-4820		*3.3 VDC / 8.0 A	*5 VDC / 8.0 A
TEN 40-4822		+ 12 VDC / 1.8 A	-12 VDC / 1.8 A
TEN 40-4823		+ 15 VDC / 1.4 A	-15 VDC / 1.4 A
TEN 40-4833		3.3 VDC / 6.0 A	± 12 VDC / ± 0.4 A
TEN 40-4834		3.3 VDC / 6.0 A	± 15 VDC / ± 0.3 A
TEN 40-4831		5 VDC / 6.0 A	± 12 VDC / ± 0.4 A
TEN 40-4832		5 VDC / 6.0 A	± 15 VDC / ± 0.3 A

*dynamic current allocation, max. 8 A total output current

Line regulation:	±1.0 % max.
Load regulation:	– Single output models: ±0.5 % max. – Dual/Triple output models: ±4.0 % max.
Output voltage adjustment:	– Single output models only: ±10 % (by external resistor)
Ripple & Noise:	– 3.3 / 5 VDC output models: <50 mVpk-pk (20 MHz BW) – all other output models: <75 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (with external capacitor)
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–40 °C … +85 °C for derating see datasheet
Thermal shutdown:	at 115 °C
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL /UL 60950, IEC/EN 60950
Case:	metal, 6-side shielded with insulated baseplate
Remote On/Off:	shutdown input for low input current (2.5 mA) in standby operation



() = Inches

Pin ø 1.0 mm (0.04)

Pin-Out

Pin	Single output	Dual output	Triple output
1	+ Vin (Vcc)	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)	– Vin (GND)
3	Remote On/Off	Remote On/Off	Remote On/Off
4	No con.	+ Vout 1	+ Vout 2
5	– Sense	– Vout 1	Common
6	+ Sense	No con.	– Vout 3
7	+ Vout	No con.	+ Vout 1
8	– Vout	+ Vout 2	– Vout 1
9	Trim	– Vout 2	No con.

Download full datasheet at
http://www.tracopower.com/products/ten40.pdf

DC/DC Converters

TEN 40WI Series, 40 Watt

- Highest Power Density in 51x51x10 mm Metal Package
- Ultrawide 4:1 Input Range
- Very high Efficiency up to 88 %
- Operating Temperature Range –40 °C to +75 °C
- Under- / Over-Voltage Lockout
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Remote On/Off
- Adjustable Output Voltage

NEW Product

cULus pending

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 40-2410WI	9 – 36 VDC	3.3 VDC	10'000 mA
TEN 40-2411WI		5 VDC	8'000 mA
TEN 40-2412WI		12 VDC	3330 mA
TEN 40-2413WI		15 VDC	2660 mA
TEN 40-2422WI		± 12 VDC	± 1660 mA
TEN 40-2423WI		± 15 VDC	± 1330 mA
TEN 40-4810WI	18– 75 VDC	3.3 VDC	10'000 mA
TEN 40-4811WI		5 VDC	8'000 mA
TEN 40-4812WI		12 VDC	3330 mA
TEN 40-4813WI		15 VDC	2660 mA
TEN 40-4822WI		± 12 VDC	± 1660 mA
TEN 40-4823WI		± 15 VDC	± 1330 mA

Line regulation: ±1.0 % max.

Load regulation: – Single output models: ±0.5 % max.
– Dual output models: ±1.0 % max.

Output voltage adjustment: ±10 % (by external resistor)

Ripple & Noise: – 3.3 / 5 VDC output models: <50 mVpk-pk (20 MHz BW)
– all other output models: <75 mVpk-pk (20 MHz BW)

Conducted EMI: EN 55022, class A and FCC, level A
(with external capacitor)

Short circuit protection: continuous, automatic recovery

Efficiency: 86 % typ.

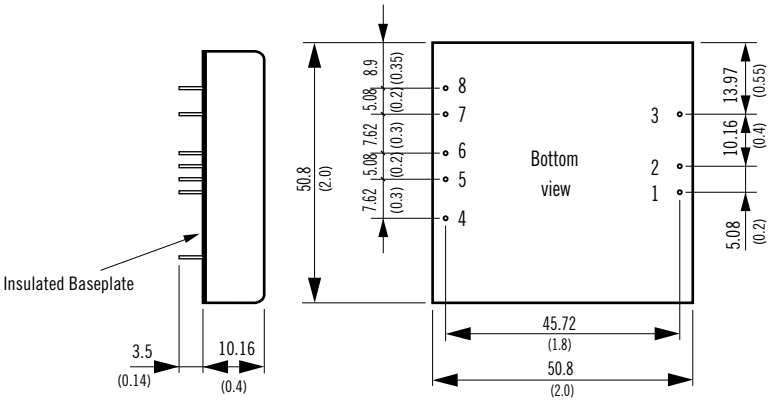
Operating temperature range: –40 °C … +85 °C
for derating see datasheet

I/O isolation voltage: 1500 VDC

Safety standards / approvals: cUL /UL 60950-1, IEC/EN 60950-1

Case: metal, 6-side shielded with insulated baseplate

Remote On/Off: shutdown input for low input current (3 mA)
in standby operation



() = Inches

Pin ø 1.0 mm (0.04)

Pin-Out

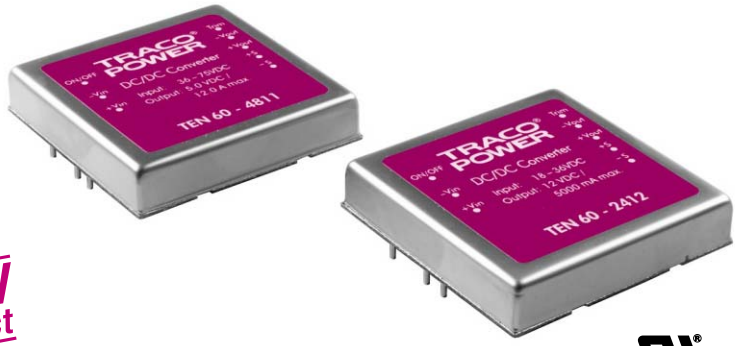
Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	Remote On/Off	Remote On/Off
4	– Sense	+ Vout
5	+ Sense	Common
6	+ Vout	Common
7	– Vout	– Vout 2
8	Trim	Trim

Download full datasheet at
http://www.tracopower.com/products/ten40wi.pdf

DC/DC Converters

TEN 60 Series, 60 Watt

- Highest Power Density in 51x51x10 mm Metal Package
- Wide 2:1 Input Range
- Very high Efficiency up to 91 %
- Operating Temperature Range –40 °C to +85 °C
- Under- / Over-Voltage Lockout
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Remote On/Off
- Adjustable Output Voltage



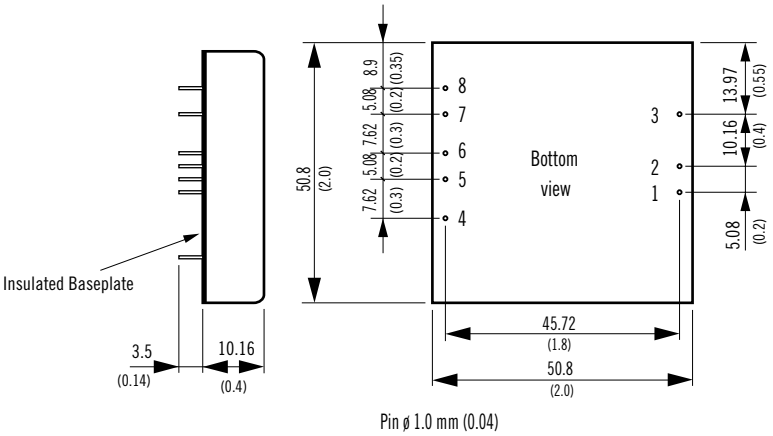
NEW Product

cULus pending

Models

Order code	Input voltage	Output voltage	Output current max.
TEN 60-2410	18 – 36 VDC	3.3 VDC	14'000 mA
TEN 60-2411		5 VDC	12'000 mA
TEN 60-2412		12 VDC	5'000 mA
TEN 60-2413		15 VDC	4'000 mA
TEN 60-4810	36 – 75 VDC	3.3 VDC	14'000 mA
TEN 60-4811		5 VDC	12'000 mA
TEN 60-4812		12 VDC	5'000 mA
TEN 60-4813		15 VDC	4'000 mA

Line regulation:	±0.2 % max.
Load regulation:	±0.5 % max.
Output voltage adjustment:	– ±10 % (by external resistor)
Ripple & Noise:	– 3.3 / 5 VDC output models: <50 mVpk-pk (20 MHz BW) – all other output models: <75 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (with external capacitor)
Short circuit protection:	continuous, automatic recovery
Efficiency:	90 % typ.
Operating temperature range:	–40 °C … +85 °C above 50 °C derating 2 %/K
I/O isolation voltage:	1500 VDC (basic insulation)
Safety standards / approvals:	cUL /UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded with insulated baseplate
Remote On/Off:	shutdown input for low input current (2.5 mA) in standby operation



Pin ø 1.0 mm (0.04)

Pin-Out

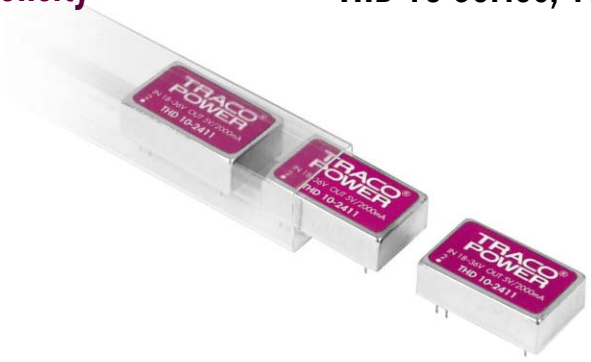
Pin	Single output
1	+ Vin (Vcc)
2	– Vin (GND)
3	Remote On/Off
4	– Sense
5	+ Sense
6	+ Vout
7	– Vout
8	Trim

Download full datasheet at
http://www.tracopower.com/products/ten60.pdf

DC/DC Converters, High Power Density

THD 10 Series, 10 Watt

- DIP-24 Package
- Wide 2:1 Input Range
- Very high Efficiency up to 87 %
- Operating Temperature Range –40 °C to +85 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Industry Standard Pinout

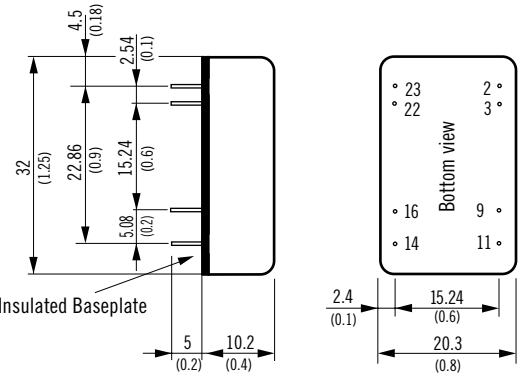


UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
THD 10-1209	9 – 18 VDC	2.5 VDC	3000 mA
THD 10-1210		3.3 VDC	3000 mA
THD 10-1211		5 VDC	2000 mA
THD 10-1212		12 VDC	830 mA
THD 10-1222		± 12 VDC	± 415 mA
THD 10-1223		± 15 VDC	± 330 mA
THD 10-2409	18 – 36 VDC	2.5 VDC	3000 mA
THD 10-2410		3.3 VDC	3000 mA
THD 10-2411		5 VDC	2000 mA
THD 10-2412		12 VDC	830 mA
THD 10-2422		± 12 VDC	± 415 mA
THD 10-2423		± 15 VDC	± 330 mA
THD 10-4809	36 – 75 VDC	2.5 VDC	3000 mA
THD 10-4810		3.3 VDC	3000 mA
THD 10-4811		5 VDC	2000 mA
THD 10-4812		12 VDC	830 mA
THD 10-4822		± 12 VDC	± 415 mA
THD 10-4823		± 15 VDC	± 330 mA

Line regulation:	±1.0 % max.
Load regulation:	– Single output models: ±1.2 % max. – Dual output models: ±1.2 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	85 % typ.
Operating temperature range:	–40 °C … +85 °C above 70 °C derating 3 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded, with insulated baseplate



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

Pin	Single output	Dual output
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No pin	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

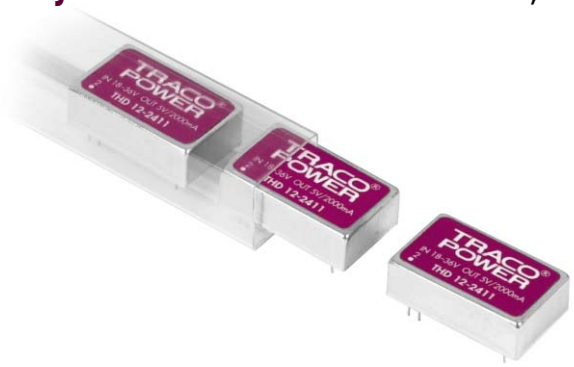
Download full datasheet at

http://www.tracopower.com/products/thd10.pdf

DC/DC Converters, High Power Density

THD 12 Series, 12 Watt

- Highest Power Density in DIP-24 Package
- Wide 2:1 Input Range
- Very high Efficiency up to 88 %
- Operating Temperature Range –40 °C to +85 °C
- I/O-Isolation 1500 VDC
- Undervoltage Lockout
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Remote On/Off
- Industry Standard Pinout

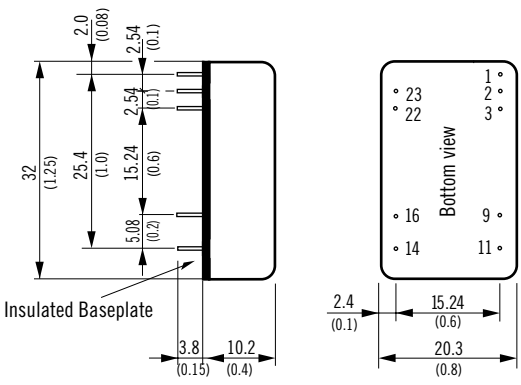


cULus

Models

Order code	Input voltage	Output voltage	Output current max.
THD 12-1209	9 - 18 VDC	2.5 VDC	3500 mA
THD 12-1210		3.3 VDC	3500 mA
THD 12-1211		5.1 VDC	2400 mA
THD 12-1212		12 VDC	1000 mA
THD 12-1222		± 12 VDC	± 500 mA
THD 12-1223		± 15 VDC	± 400 mA
THD 12-2409	18 - 36 VDC	2.5 VDC	3500 mA
THD 12-2410		3.3 VDC	3500 mA
THD 12-2411		5.1 VDC	2400 mA
THD 12-2412		12 VDC	1000 mA
THD 12-2422		± 12 VDC	± 500 mA
THD 12-2423		± 15 VDC	± 400 mA
THD 12-4809	36 - 75 VDC	2.5 VDC	3500 mA
THD 12-4810		3.3 VDC	3500 mA
THD 12-4811		5.1 VDC	2400 mA
THD 12-4812		12 VDC	1000 mA
THD 12-4822		± 12 VDC	± 500 mA
THD 12-4823		± 15 VDC	± 400 mA

Line regulation:	±0.5 % max.
Load regulation:	- Single output models: ±1.0 % max. - Dual output models: ±1.0 % max.
Ripple & Noise:	<85 mVpk-pk (20MHz BW)
Conducted EMI:	EN 55022 class A and FCC level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–40 °C ... +85°C above 60 °C derating 2.5 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded, with insulated baseplate
Remote On/Off:	shutdown input for low current (2.5 mA) in standby operation



() = Inches

Pin Ø 0.5 mm (0.04)

Pin-Out

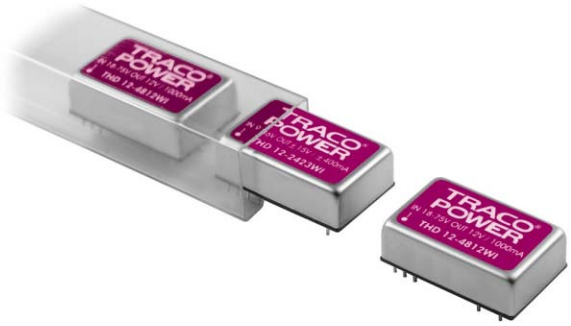
Pin	Single output	Dual output
1	Remote On/Off	Remote On/Off
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No con.	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://tracopower.com/products/thd12.pdf

DC/DC Converters, High Power Density

THD 12WI Series, 12 Watt

- Highest Power Density in DIP-24 Package
- Wide 2:1 Input Range
- Very high Efficiency up to 88 %
- Operating Temperature Range –40 °C to +85 °C
- I/O-Isolation 1500 VDC
- Undervoltage Lockout
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A
- Remote On/Off
- Industry Standard Pinout



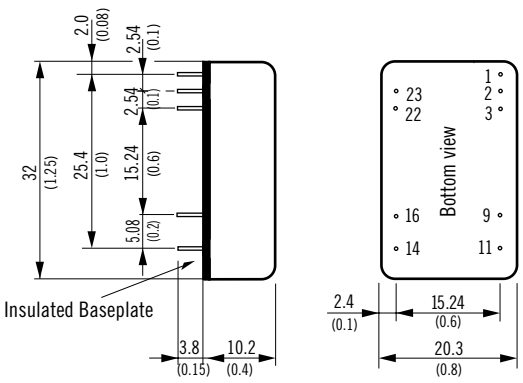
NEW Product

cULus pending

Models

Order code	Input voltage	Output voltage	Output current max.
THD 12-2410WI	9 – 36 VDC	3.3 VDC	3500 mA
THD 12-2411WI		5.1 VDC	2400 mA
THD 12-2412WI		12 VDC	1000 mA
THD 12-2413WI		15 VDC	800 mA
THD 12-2421WI		± 5 VDC	± 1200 mA
THD 12-2422WI		± 12 VDC	± 500 mA
THD 12-2423WI		± 15 VDC	± 400 mA
THD 12-2410WI	18 – 75 VDC	3.3 VDC	3500 mA
THD 12-2411WI		5.1 VDC	2400 mA
THD 12-2412WI		12 VDC	1000 mA
THD 12-2413WI		15 VDC	800 mA
THD 12-2421WI		± 5 VDC	± 1200 mA
THD 12-2422WI		± 12 VDC	± 500 mA
THD 12-2423WI		± 15 VDC	± 400 mA

Line regulation:	±0.2 % max.
Load regulation:	- Single output models: ±0.5 % max. - Dual output models: ±1.0 % max.
Ripple & Noise:	< 85 mVpk-pk (20MHz BW)
Conducted EMI:	EN 55022 class A and FCC level A (with external capacitor)
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–40 °C ... +85 °C above 65 °C derating 2.5 %/K
I/O isolation voltage:	1500 VDC
Safety standards:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	metal, 6-side shielded, with insulated baseplate
Remote On/Off:	shutdown input for low current (2.5 mA) in standby operation



() = Inches

Pin Ø 0.5 mm (0.04)

Pin-Out

Pin	Single output	Dual output
1	Remote On/Off	Remote On/Off
2	– Vin (GND)	– Vin (GND)
3	– Vin (GND)	– Vin (GND)
9	No con.	Common
11	No con.	– Vout
14	+ Vout	+ Vout
16	– Vout	Common
22	+ Vin (Vcc)	+ Vin (Vcc)
23	+ Vin (Vcc)	+ Vin (Vcc)

Download full datasheet at
http://tracopower.com/products/thd12wi.pdf

DC/DC Converters, High Power Density

THD 15 Series, 15 Watt

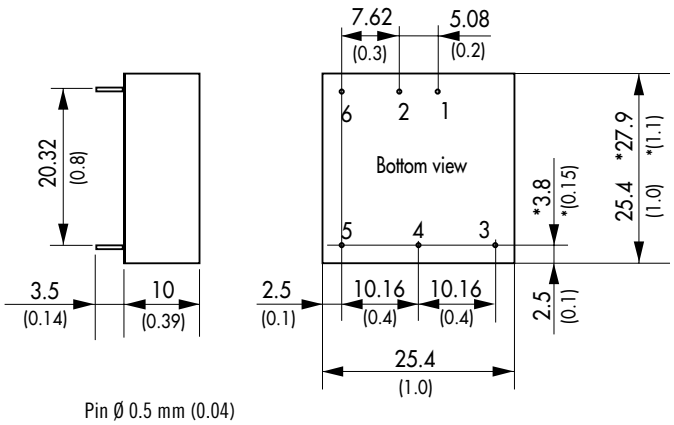
- Smallest encapsulated 15 W Converter
- 25x25x10 mm Plastic Package
- Wide 2:1 Input Range
- Very high Efficiency up to 87 %
- Operating Temperature Range –25 °C to +71 °C
- I/O Isolation 1500 VDC
- Short Circuit Protection
- Remote On/Off
- Industry Standard Pinout

UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
THD 15-2410	18 - 36 VDC	3.3 VDC	3500 mA
THD 15-2411		5.1 VDC	3000 mA
THD 15-2412		12 VDC	1250 mA
THD 15-2413		15 VDC	1000 mA
THD 15-2422		± 12 VDC	± 600 mA
THD 15-2423		± 15 VDC	± 500 mA
THD 15-4810	36 - 75 VDC	3.3 VDC	3500 mA
THD 15-4811		5.1 VDC	3000 mA
THD 15-4812		12 VDC	1250 mA
THD 15-4813		15 VDC	1000 mA
THD 15-4822		± 12 VDC	± 600 mA
THD 15-4823		± 15 VDC	± 500 mA

Line regulation	±0.5 % max.
Load regulation:	–Single output models: ±0.5 % max. –Dual output models: ±2.0 % max.
Ripple & Noise:	<80 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (with external capacitor)
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–25 °C … +71 °C above 50 °C derating 2.5 %/K
I/O isolation voltage:	1500 VDC
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Case:	plastic (UL 94V-0 rating)



*Dual output models

Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	– Vin (GND)	– Vin (GND)
3	+ Vout	+ Vout
4	No pin	Common
5	– Vout	– Vout
6	Remote On/Off	Remote On/Off

() = Inches

Pin Ø 0.5 mm (0.04)

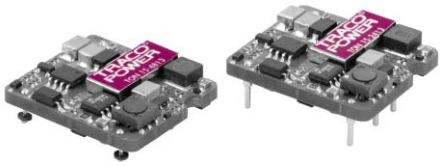
Download full datasheet at

http://tracopower.com/products/thd15.pdf

DC/DC Converters, High Power Density

TON 15 Series, 15 Watt

- Smallest 15 W Converter with Open Frame Design
- Wide 2:1 Input Range
- Very high Efficiency up to 89 %
- I/O-Isolation 2250 VDC
- Operating Temperature Range –40 °C to +85 °C
- Input Filter to meet EN 55022, Class A
- Remote On/Off
- Adjustable Output Voltage
- SMD and Trough-Hole Version
- Industry Standard Pinout



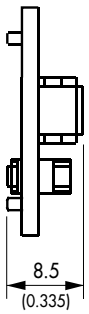
Models

Order code*	Input voltage	Output voltage	Output current max.
TON 15-2410	18 – 36 VDC	3.3 VDC	3500 mA
TON 15-2411		5 VDC	3000 mA
TON 15-2412		12 VDC	1250 mA
TON 15-2413		15 VDC	1000 mA
TON 15-4810	36 – 75 VDC	3.3 VDC	3500 mA
TON 15-4811		5 VDC	3000 mA
TON 15-4812		12 VDC	1250 mA
TON 15-4813		15 VDC	1000 mA

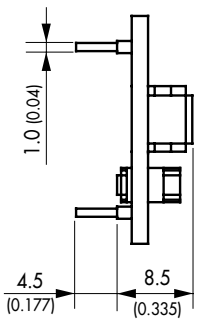
* Add suffix SM for models with SMD package for surface mount (example: TON 15-2411SM)

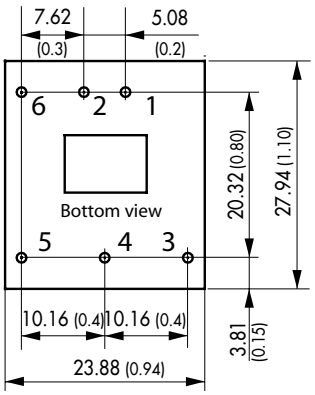
Line regulation	±0.3 % max.
Load regulation:	±0.2 % max.
Ripple & Noise:	<75 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, class A and FCC, level A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	86 % typ.
Operating temperature range:	–40 °C … +85 °C above 70 °C derating 3 %/K
I/O isolation voltage:	2250 VDC (basic insulation)
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1
Remote On/Off:	shutdown input for low current (20 mA) in standby operation

SMD Version (SM)



Trough Hole Version





Pin-Out

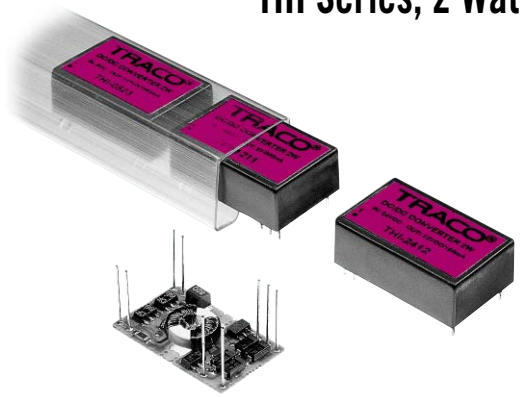
Pin	Single output
1	+ Vin (VCC)
2	– Vin (GND)
3	+ Vout
4	Trim
5	– Vout
6	Remote On/Off

Download full datasheet at
http://tracopower.com/products/ton15.pdf

DC/DC Converters, Reinforced Insulation

THI Series, 2 Watt

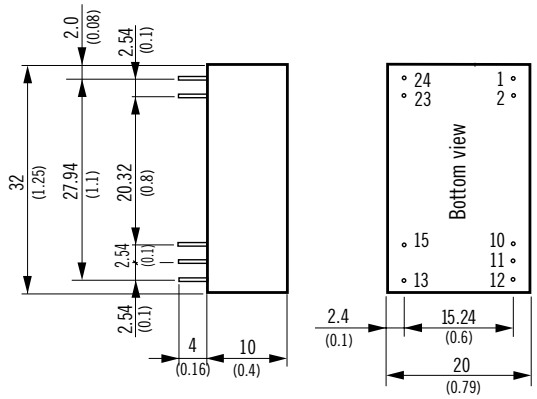
- DIP-24 Plastic Package
- I/O Isolation Voltage 2500 VAC
- Supplementary Insulation rated for Working Voltage 250 VAC
- Complies with IEC/EN 60950 and 60601-1 Safety Standard
- Operating Temperature Range –40 °C to +85 °C
- I/O-Clearance 2.5 mm min.
- Low Coupling Capacity
- Short Circuit Protection



Models

Order code	Input voltage	Output voltage	Output current max.
THI 0511		5 VDC	400 mA
THI 0512		12 VDC	165 mA
THI 0513	5 VDC ±10 %	15 VDC	130 mA
THI 0520		± 5 VDC	±100 mA
THI 0521		± 12 VDC	± 80 mA
THI 0522		± 15 VDC	± 65 mA
THI 1211		5 VDC	400 mA
THI 1212		12 VDC	165 mA
THI 1213	12 VDC ±10 %	15 VDC	130 mA
THI 1220		± 5 VDC	±100 mA
THI 1221		± 12 VDC	± 80 mA
THI 1222		± 15 VDC	± 65 mA
THI 2411		5 VDC	400 mA
THI 2412		12 VDC	165 mA
THI 2413	24 VDC ±10 %	15 VDC	130 mA
THI 2420		± 5 VDC	±100 mA
THI 2421		± 12 VDC	± 80 mA
THI 2422		± 15 VDC	± 65 mA

Line regulation:	±0.5 % max.
Load regulation:	– Single output models: ± 1 % max. – Dual output models: ± 1 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
Input filter:	Pi-filter
Short circuit protection:	continuous, automatic recovery
Efficiency:	61 % typ.
Operating temperature range:	–40 °C … +85 °C above 70 °C derating 3 %/K
I/O isolation voltage (rated):	2500 VACrms (60sec)
I/O isolation test voltage:	6000 Vpk (1 sec.)
I/O isolation capacitance:	20 pF typ.
I/O isolation resistance:	>10,000 Mohm
I/O clearance and creepage distances:	2.5 mm resp. 4.0 mm min.
Safety standards / approvals:	IEC/EN 60950, IEC/EN 60601-1 (rated for 250 VAC working voltage) test report by BSI (British Standards Institute)
Case:	plastic (UL 94V-0 rating)



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

Pin	Single output	Dual output
1	+ Vin (Vcc)	+ Vin (Vcc)
2	+ Vin (Vcc)	+ Vin (Vcc)
10	No pin	Common
11	No pin	Common
12	– Vout	No pin
13	+ Vout	– Vout
15	No pin	+ Vout
23	– Vin (GND)	– Vin (GND)
24	– Vin (GND)	– Vin (GND)

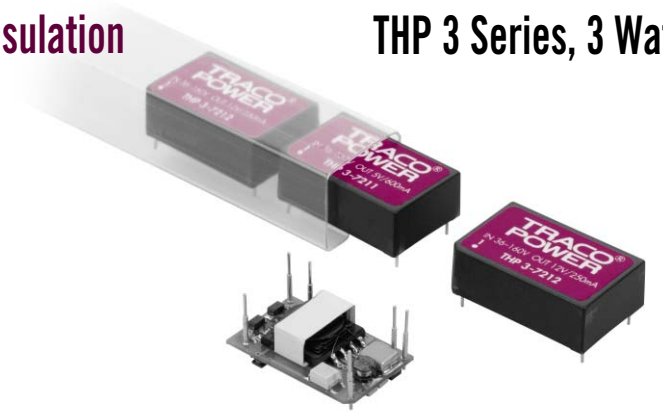
Download full datasheet at

http://www.tracopower.com/products/thi.pdf

DC/DC Converters, Reinforced Insulation

THP 3 Series, 3 Watt

- Very wide Input Voltage Ranges
- Input Voltage up to 160 VDC
- I/O Isolation Voltage 4000 VAC
- Reinforced Insulation rated for Working Voltage 300 VAC
- Complies with Railroad and Medical Safety Standards
- I/O Clearances 2.5 mm min.
- Operating Temperature Range –40 °C to +85 °C
- Short Circuit Protection
- Input Filter to meet EN 55022, Class A

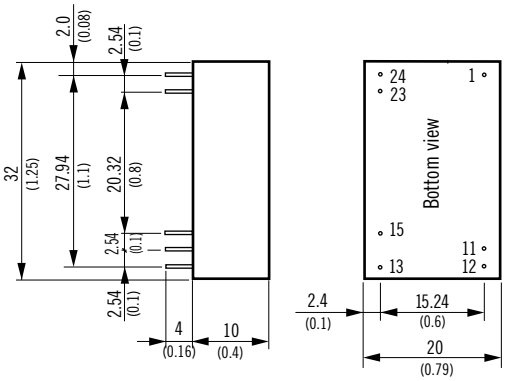


c SP us
UL 60950

Models

Order code	Input voltage	Output voltage	Output current max.
THP 3-2411	9 – 40 VDC	5 VDC	600 mA
THP 3-2412		12 VDC	250 mA
THP 3-2422		± 12 VDC	±125 mA
THP 3-2423		± 15 VDC	±100 mA
THP 3-4811	18 – 80 VDC	5 VDC	600 mA
THP 3-4812		12 VDC	250 mA
THP 3-4822		± 12 VDC	±125 mA
THP 3-4823		± 15 VDC	±100 mA
THP 3-7211	36 – 160 VDC	5 VDC	600 mA
THP 3-7212		12 VDC	250 mA
THP 3-7222		± 12 VDC	±125 mA
THP 3-7223		± 15 VDC	±100 mA

Line regulation:	±0.5 % max.
Load regulation:	±1.0 % max.
Ripple & Noise:	<100 mVpk-pk (20 MHz BW) for 5 VDC models <150 mVpk-pk (20 MHz BW) for other models
Conducted EMI:	EN 55022, class A (internal filter)
Short circuit protection:	continuous, automatic recovery
Efficiency:	83 % typ.
Operating temperature range:	–40 °C … +85 °C above 75 °C derating 4 %/K
I/O isolation voltage (rated):	4000 VACrms (60sec)
I/O isolation test voltage:	6000 Vpk (1sec)
Safety standards / approvals:	cUL/UL 60950-1, IEC/EN 60950-1, EN 50124-1, IEC/EN 60601-1 (rated for 300 VAC working voltage)
Case:	plastic (UL 94V-0 rating)



() = Inches

Pin ø 0.5 mm (0.02)

Pin-Out

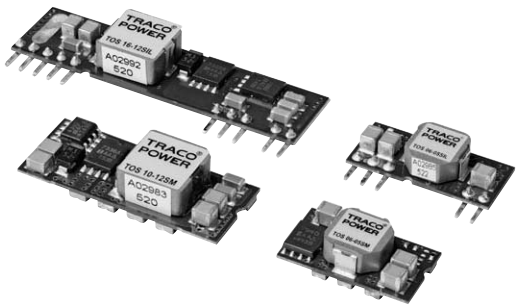
Pin	Single output	Dual output
1	+ Vin (VCC)	+ Vin (VCC)
11	No pin	Common
12	– Vout	No pin
13	+ Vout	– Vout
15	No pin	+ Vout
23	– Vin (GND)	– Vin (GND)
24	– Vin (GND)	– Vin (GND)

Download full datasheet at
http://www.tracopower.com/products/thp3.pdf

DC/DC Converters, Non-isolated (POL) Converters

TOS Series

- High Power Density: Models with 6, 10 and 16 A
- Programmable Output Voltage from 0.75 to 5.0 VDC
- Very high Efficiency up to 96 %
- Input Voltage 5 or 12 VDC
- Remote On/Off
- Input Under-voltage Lockout
- Over Temperature Protection
- Surface Mount (SM) or SIP-Version
- Surface Mount Version fully compatible with DOSA Standard



Models

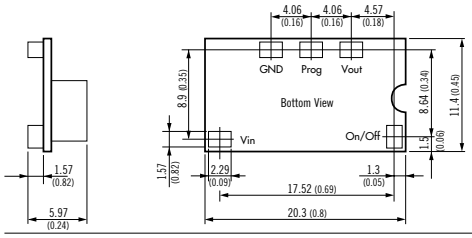
Order code SM-version	Input voltage range	Output voltage range	Output current max.
TOS 06-05SM			6 A
TOS 10-05SM	2.4 – 5.5 VDC	0.75 – 3.3 VDC	10 A
TOS 16-05SM			16 A
TOS 06-12SM			6 A
TOS 10-12SM	8.3 – 14.0 VDC	0.75 – 5.0 VDC	10 A
TOS 16-12SM			16 A

Order code SIP-version	Input voltage range	Output voltage range	Output current max.
TOS 06-05SIL			6 A
TOS 10-05SIL	2.4 – 5.5 VDC	0.75 – 3.3 VDC	10 A
TOS 16-05SIL			16 A
TOS 06-12SIL			6 A
TOS 10-12SIL	8.3 – 14.0 VDC	0.75 – 5.0 VDC	10 A
TOS 16-12SIL			16 A

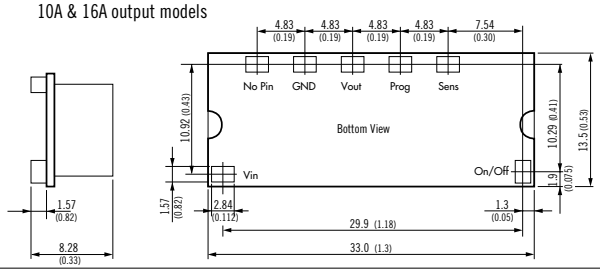
Line regulation:	±0.3 % max.
Load regulation:	±0.4 % max.
Output voltage:	programmable by external resistor
Ripple & Noise:	<50 mVpk-pk (with output capacitors)
Transient response time:	50 µsec. typ. (50% load change)
Short circuit protection:	continuous, automatic recovery
Efficiency:	93 % typ.
Operating temperature range:	–40 °C … +85 °C
Remote On/Off:	negative logic shutdown input for standby mode
Input under-voltage lockout:	– shutdown at 2.0 VDC resp. 7.8 VDC – startup at 2.2 VDC resp. 7.9 VDC

Surface Mount (SM-Version)

6 A output Models

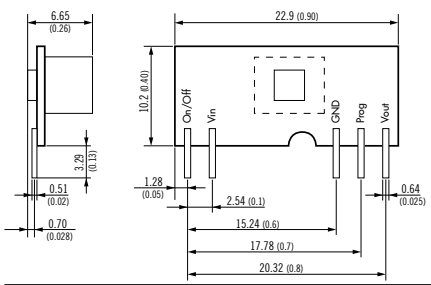


10A & 16A output models

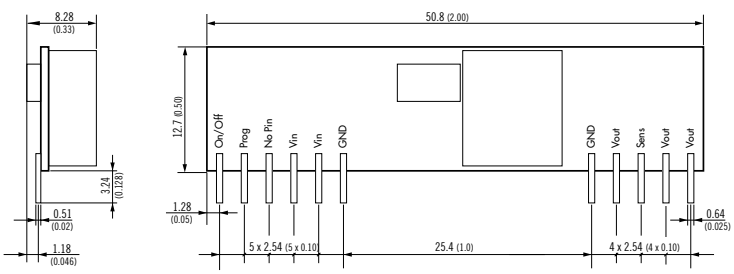


Single-in-Line (SIP-Version)

6 A output Models



10A & 16A output models



Download full datasheet at
http://tracopower.com/products/tos.pdf

DC/DC Converters, High-Voltage Output

MHV / PHV Series, 2/5 Watt

- Ultracompact High Voltage Power Supplies
- Full SMD-Design with Ceramic Capacitors for high Reliability
- Excellent Output Stability
- Low Temperature Drift
- Remote Voltage Programming
- Short Circuit Protection
- PCB-Mount or Flying Lead Version
- Shielded Metal Case

Models

Order code	Input voltage	Output voltage	Output current max.	Case
MHV Models 2 Watt				
MHV 12-180 S 15 P (N)	12 VDC 10.8–13.2 VDC	0–180 VDC	15 mA	A
MHV 12-300 S 10 P (N)		0–300 VDC	10 mA	A
MHV 12-350 S 07 P (N)		0–350 VDC	7 mA	A
*MHV 12-0.5 K 6000 P (N)	12 VDC 10.8–16.5 VDC	0–500 VDC	6 mA	B
*MHV 12-1.0 K 2000 P (N)		0–1000 VDC	2 mA	B
*MHV 12-1.5 K 1300 P (N)		0–1500 VDC	1.3 mA	B
*MHV 12-2.0 K 1000 P (N)		0–2000 VDC	1 mA	B
PHV Models 5 Watt				
PHV 12-350 S 10 P (N)	12 VDC 10.8–16.5 VDC	0–350 VDC	10 mA	D
PHV 12-0.5 K 1000 P (N)		0–500 VDC	10 mA	D
PHV 12-1.0 K 5000 P (N)		0–1000 VDC	5 mA	D
PHV 12-2.0 K 2500 P (N)		0–2000 VDC	2.5 mA	D

* Models with flying leads available, Case C

Order code P for positive output polarity
Order code N for negative polarity

Line regulation: ±0.03 % for MHV
±0.01 % for PHV

Load regulation: – MHV models: ±0.08 %
– PHV models: ±0.1 %

Output voltage adjustment: 0…100 % (by external resistor or reference voltage)

Ripple & Noise: MHV: < 30 mVpk-pk (20 MHz BW)
PHV: <100 mVpk-pk (20 MHz BW)

Short circuit protection: continuous

Efficiency: 65 % typ.

Operating temperature range: –10 °C … +75 °C
above 50 °C derating 4 %/K

Temperature coefficient: ±0.01 %/K

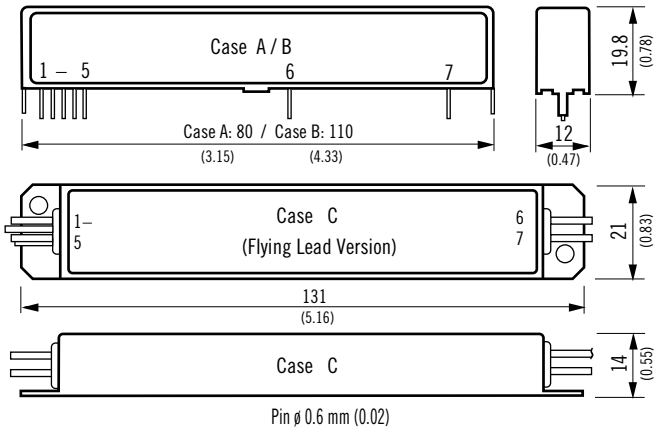
Stability: 0.05 %/8 h drift

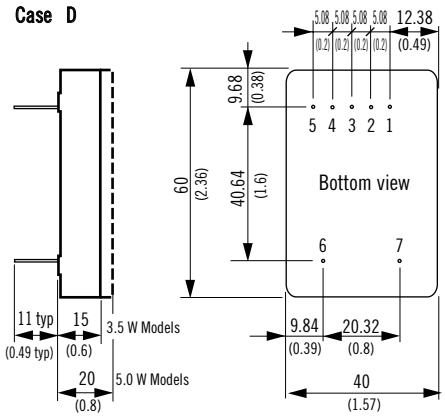
Case: metal

Remote On/Off: Input for MHV 500–2,000 VDC models, optional for PHV models

Pin-Out

Pin	Case A	Case B/C	Case D
1	+ Vin (VCC)	+ Vin (VCC)	+ Vin (VCC)
2	– Vin (GND)	– Vin (GND)	– Vin (GND)
3	Vadj.	Vadj.	Vadj.
4	Vref.	Vref.	Vref.
5	Common	Remote On/Off	Remote On/Off
6	Vout	Common	Common
7	No pin	Vout	Vout





Download full datasheet at
http://tracopower.com/products/mhv.pdf
http://tracopower.com/products/phv.pdf

DC/DC Converters

TZL Series, 60 – 300 Watt

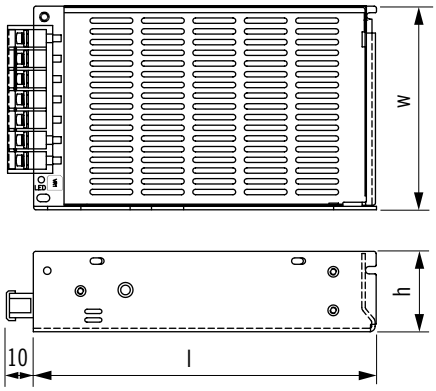
- Compact Metal Case with Screw Terminal Block
- Models with 60 W, 100 W, 150 W and 300 W
- Wide 2:1 Input Range
- I/O-Isolation 1500 VDC
- Input reverse Polarity Protection
- Soft Start, low Inrush Current
- Overload and Short Circuit Protection
- EMC Compliance with EN61000-6-1 and EN 50082-1
- Adjustable Output Voltage
- Cost optimized Design

CE

Models

Order code	Input voltage	Output voltage	Output current max.
TZL 060-2412	18 – 36 VDC	12 VDC	5.0 A
TZL 060-2424		24 VDC	2.5 A
TZL 060-4812	36 – 72 VDC	12 VDC	5.0 A
TZL 060-4824		24 VDC	2.5 A
TZL 100-2412	18 – 36 VDC	12 VDC	8.5 A
TZL 100-2424		24 VDC	4.2 A
TZL 100-4812	36 – 72 VDC	12 VDC	8.5 A
TZL 100-4824		24 VDC	4.2 A
TZL 150-2412	18 – 36 VDC	12 VDC	12.5 A
TZL 150-2424		24 VDC	6.3 A
TZL 150-4812	36 – 72 VDC	12 VDC	12.5 A
TZL 150-4824		24 VDC	6.3 A
TZL 300-4812	36 – 72 VDC	12 VDC	25.0 A
TZL 300-4824		24 VDC	12.5 A

Line regulation:	±1.0 % max.
Load regulation:	±1.0 %
Output voltage adjustment:	±10 % (by internal potentiometer)
Ripple & Noise:	– 12 VDC output models: <100 mVpk-pk (20 MHz BW) – 24 VDC output models: <150 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55011 class B, EN 55022 class B and FCC, Level B
EMC immunity:	EN 61000-6-1 (light industry)
Short circuit protection:	foldback, automatic recovery
Efficiency:	80 % typ.
Operating temperature range:	-10 °C … +60 °C above 50 °C derating 2.5 %/K
I/O isolation voltage:	1500 VDC
Safety standards:	IEC/EN 60950
Case:	aluminium / steel



Dimensions

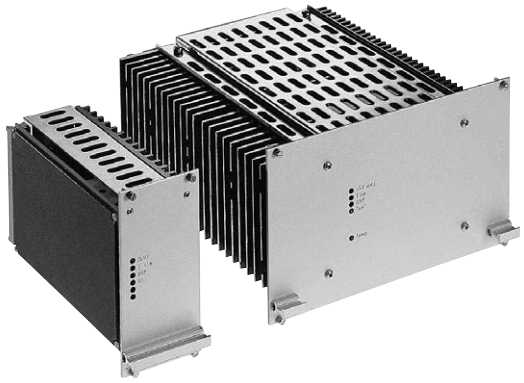
Type	Length l	Width w	Height h
TZL 060	159 (6.26)	95 (3.74)	38 (1.50)
TZL 100	198 (7.80)	95 (3.74)	38 (1.50)
TZL 150	198 (7.80)	99 (3.90)	50 (1.97)
TZL 300	212 (8.35)	115 (4.53)	50 (1.97)

Download full datasheet at
http://tracopower.com/products/tzl.pdf

DC/DC Converters, High Power

TSC Series, 150 W–5000 W

- Plug-in Modules for 19"-Subracks
- Robust mechanical Design for Industrial Applications
- Input Voltages: from 10 to 800 VDC
- Also AC-Input 115/230 VAC or 400/480 VAC 3P
- Standard Models with Output Voltages up to 400 VDC
- EMI complies with EN 55022, Class A
- Available with many Standard Options



Models

Input voltage range	Output power	Output voltage range
10 – 16 VDC 18 – 36 VDC 36 – 75 VDC 80 – 160 VDC 160 – 320 VDC 320 – 640 VDC 450 – 800 VDC	Models with 150W – 5000W available	4.5 – 5.5 VDC 8 – 10 VDC 11 – 13 VDC 14 – 16 VDC 23 – 26 VDC 26 – 30 VDC 45 – 55 VDC 58 – 68 VDC 100 – 130VDC 200 – 250 VDC 380 – 400 VDC 570 – 600 VDC 760 – 800 VDC

Options:
- DIN-rail mounting (150–500 W)
- Inrush current limiting
- Input voltage: 115/230 VAC, single phase or 200/400/480 VAC, three phase
- Input polarity protection
- Output decoupling diode for redundant / parallel operation
- Active current sharing for parallel operation
- Remote On/Off (inhibit)
- Output programmable via analogue signal
- Monitoring of input an output voltage
- RS232 or IEEE488 interface
- Wall mounting
- Increased mechanical strength
- Tropical protection

for model selection visit TRACOPOWER website

Line regulation:	±0.1 % max.
Load regulation:	±0.2 % max.
Ripple & Noise:	<1 % Vout + 30 mVpk-pk (20 MHz BW)
Conducted EMI:	EN 55022, Class A
Short circuit protection:	continuous, automatic recovery
Overvoltage protection:	105 % of Vout
Efficiency:	85 % typ.
Operating temperature range:	–20 °C ... +75 °C
I/O isolation voltage:	2100 VDC (Vin < 60 VDC) 3500 VDC (Vin > 60 VDC & VAC input models)
Safety standards:	IEC/EN 60950

Dimensions

Power [Watts]	Width [mm]	Depth [mm]	Height [mm]
150	71	160	133 3(U)
250	107		
500	213		
400	107	220	
800	213		
200	51	160	267 6(U)
400	71		
600	107		
1200	213		
850	107	220	
1250	142		
1700	213		
2500	284		
2500	142	300	
5000	284		

Download full datasheet at
http://tracopower.com/products/tsc.pdf

DC/DC Converters, High Power

TSC 19" Series, 5 kW–22 kW

- 19"-Subracks
- Robust mechanical Design for Industrial Applications
- Also with AC-Input 115/230 VAC or 400/480 VAC 3P available
- Standard Models with Output Voltages up to 800 VDC
- EMI complies with EN 55022, Class A
- Available with many Standard Options

Product Range

Input voltage range	Output power	Output voltage range
18 – 36 VDC 36 – 75 VDC 80 – 160 VDC 160 – 320 VDC 320 – 640 VDC 450 – 800 VDC	Models with 5kW – 22kW available	4.5 – 5.5 VDC 8 – 10 VDC 11 – 13 VDC 14 – 16 VDC 23 – 26 VDC 26 – 30 VDC 45 – 55 VDC 58 – 68 VDC 100 – 130VDC 200 – 250 VDC 380 – 400 VDC 570 – 600 VDC 760 – 800 VDC

Options:
- **Input voltage:** **115/230 VAC, single phase or** 200/400/480 VAC, three phase
- Input polarity protection
- Output decoupling diode for redundant / parallel operation
- Active current sharing for parallel operation
- Remote On/Off (inhibit)
- Output programmable via analogue signal
- Monitoring of input an output voltage
- RS232 or IEEE488 interface
- Wall mounting
- Increased mechanical strength
- Automatic/manual setting of output characteristic
- Temperature compensated battery charging voltage
- Digital Volt- and Ampere meter
- Tropical protection

for model selection visit TRACOPOWER website

Line regulation:	±0.1 % max.
Load regulation:	±0.2 % max.
Ripple & Noise:	0.5 % Vmrs
Cunducted EMI:	EN 55022-A
Noise Immunity:	EN 50082
Short circuit protection:	continuous, automatic recovery
Overvoltage protection:	105 % of Vout
Efficiency:	90 % typ.
Operating temperature range:	–10 °C ... +50 °C
I/O isolation voltage:	2100 VDC (Vin < 60 VDC) 3500 VDC (Vin > 60 VDC & VAC input models)
Safety standards:	IEC/EN 60950

Dimensions

Power [kW]	Width [mm]	Depth [mm]	Heigth [mm]
5/7.5/10	19"	600	178 (4U)
6/8/12	19"	360/460*	267/400 (6/9U)
22	19"	600	356 (8U)

* depending on output current

Download full datasheet at
http://tracopower.com/products/tsc.pdf

DC/AC Sine Wave Inverters

TSD Serie, 200 VA – 30 kVA

- Single Phase or 3-Phase Output
- Isolation between Input and Output
- Regulated Sine Wave Output Voltage
- DC Input 18 – 800 VDC
- Compact and robust Design for Industrial Environment
- Low Stand-by Power Consumption
- 19"-Subrack

Models

Input voltage range	Output power	Output voltage
18 – 36 VDC 36 – 75 VDC 45 – 90 VDC 80 – 160 VDC 160 – 320 VDC 320 – 380 VDC 380 – 450 VDC 450 – 550 VDC 550 – 640 VDC Single-phase 115/230 VAC Three-phase 200/400/480 VAC	Models with 200VA – 30kVA available	Single-phase 115/230 VAC Three-phase 200/400/480 VAC

Options:
- Inrush current limiting
- Input polarity protection
- Remote On/Off (inhibit)
- Output programmable via analog signal
- Monitoring of input and output voltage
- RS232 or IEEE488 interface
- Wall mounting
- Increased mechanical strength
- Tropical protection
- Static Switch for uninterruptible power supply

Line regulation :	0.1 % to 2 % depending on model
Load regulation :	1 % typ.
Harmonic distortion:	3 % typ.
EMC Suppression:	EN 55022, Class A
EMC Immunity:	according to EN 61000-6-2
Output current limitation: (steady state)	at 105 % of Iout max.
Short circuit current	electronically limited to 3x Iout max.
Surge power:	2 x Pnom. for 1 sec.
Efficiency:	75–94 %
No-load input power:	20 Watt typ.
Operating temperature:	–20 °C…+75 °C above 55 °C derating 2.5 %/K
I/O isolation voltage:	3000 VDC
Safety standards:	IEC/EN60950

Models with 1-phase output

POWER [kVA]	Depth [mm]	Width [mm]	Height [mm]
up to 0.6	160	213	267 (6U)
up to 1.2	220		
up to 1.6		284	
up to 2.5	300		
up to 10	460	19"	

19" = 483 mm

Models with 3-phase output

POWER [kVA]	Depth [mm]	Width	Height [mm]
0.6–10	460	19"	267 (6U)
up to 30			267 (3x 6U)

* for low input voltages there will be less power in relation to the size

° for power ratings >3.6 kVA the transformer needs to be installed externally because of weight and size

Download full datasheet at
http://tracopower.com/products/tsd.pdf

AC/DC Encapsulated Modules

TMS Series, 6 – 25 Watt

- Miniature encapsulated Power Supplies
- 3 Package Styles available:
  - for PCB Mounting with Solder Pins
  - for Chassis Mounting with FASTON-Tabs
  - for Chassis Mounting with Screw Terminal Block
- Universal Input 85–264 VAC
- EMI meets 55022, Class B and FCC, Level B
- Short Circuit Protection

Models

*Order code	Output power	Output 1	Output 2
TMS 06105	6 W	5 VDC 1200 mA	
TMS 06112		12 VDC 500 mA	
TMS 06115		15 VDC 400 mA	
TMS 06124		24 VDC 250 mA	
TMS 06212		+ 12 VDC 250 mA	– 12 VDC 250 mA
TMS 06215		+ 15 VDC 200 mA	– 15 VDC 200 mA
*TMS 10105	10 W	5 VDC 2000 mA	
*TMS 10112		12 VDC 900 mA	
*TMS 10115		15 VDC 700 mA	
*TMS 10124		24 VDC 450 mA	
*TMS 10212		+ 12 VDC 450 mA	– 12 VDC 450 mA
*TMS 10215		+ 15 VDC 350 mA	– 15 VDC 350 mA
*°TMS 15105	15 W	5 VDC 3000 mA	
*°TMS 15112		12 VDC 1300 mA	
*°TMS 15115		15 VDC 1000 mA	
*°TMS 15124		24 VDC 650 mA	
*°TMS 15212		+ 12 VDC 650 mA	– 12 VDC 650 mA
*°TMS 15215		+ 15 VDC 500 mA	– 15 VDC 500 mA
*°TMS 25105	25 W	5 VDC 4600 mA	
*°TMS 25112		12 VDC 2000 mA	
*°TMS 25115		15 VDC 1600 mA	
*°TMS 25124		24 VDC 1000 mA	
*°TMS 25212		+ 12 VDC 1000 mA	– 12 VDC 1000 mA
*°TMS 25215		+ 15 VDC 800 mA	– 15 VDC 800 mA

without suffix: PCB mounting Version
*suffix F: Chassis mounting with Faston-Tabs (Example TMS 25105 F)
°suffix C: Chassis mounting with Screw Terminal Block (Example TMS 25105 C)

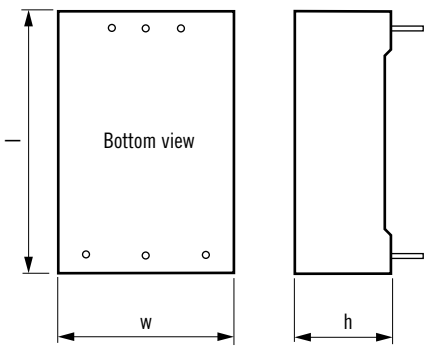
Input voltage range:	85–264 VAC, 50/60 Hz 110–375 VDC
Line regulation:	±0.4 % max.
Load regulation:	±1.0 % max. for single output models ±2.0 % max. for dual output models
Ripple & Noise:	<100 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55011 class B, EN 55022 class B and FCC, level B
EMC immunity:	EN 61000-6-1
Output current limitation:	>130 % Iout max., foldback, automatic recovery
Efficiency:	78 % typ.
Operating temperature:	–25 °C … +60 °C above 50 °C derating 5 %/K 5 Vout models: above 40 °C derating 2.5 %/K
Safety standards / approvals:	cUL/UL 60950, IEC/EN 60950, CB-report
Degree of protection:	safety class I
Case:	plastic (UL 94V-0 rating)

Dimensions

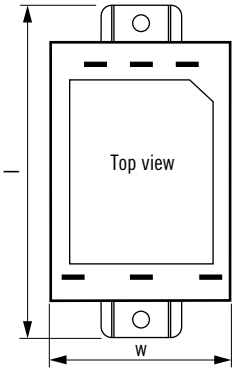
Type	Length l	Width w	Height h
TMS 06	50 (1.97)	40 (1.57)	20 (0.79)
TMS 10	55 (2.17)	45 (1.77)	24 (0.94)
TMS 15	64 (2.52)	45 (1.77)	24 (0.94)
TMS 25	76 (2.99)	51 (2.01)	28 (1.10)
TMS 10F	75 (2.95)	45 (1.77)	24 (0.94)
TMS 15F	84 (3.31)	45 (1.77)	24 (0.94)
TMS 25F	96 (3.78)	51 (2.01)	29 (1.14)
TMS 15C	84 (3.31)	45 (1.77)	26.5 (1.04)
TMS 25C	96 (3.78)	51 (2.01)	29.5 (1.16)

() = Inches

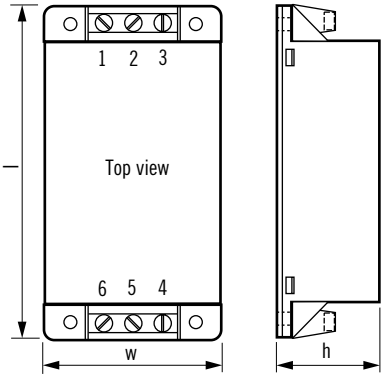
PCB mounting Version



Chassis mounting with Faston-Tabs



Chassis mounting with Screw Terminal Block



Download full datasheet at
http://www.tracopower.com/products/tms.pdf

AC/DC Encapsulated Modules

TMT Series, 15 / 30 Watt

- Ultra compact, fully encapsulated Power Supplies
- 2 Package Styles available:
  – for PCB Mounting with Solder Pins
  – for Chassis Mounting with Screw Terminal Block
- DIN-Rail Mounting with additional Adaptor
- Single- and Dual-Output Models
- Universal Input 85–264 VAC
- Safety Class II Product
- EN/UL 60601-1 Medical Safety Standard
- Short Circuit and Overload Protection

NEW Product

Models

Order code*	Output power	Output 1	Output 2
TMT 15105	15 W	5 VDC / 3000 mA	
TMT 15112		12 VDC / 1250 mA	
TMT 15115		15 VDC / 1000 mA	
TMT 15124		24 VDC / 625 mA	
TMT 15212		+ 12 VDC / 625 mA	– 12 VDC / 625 mA
TMT 15215		+ 15 VDC / 500 mA	– 15 VDC / 500 mA
TMT 30105	30 W	5 VDC / 6000 mA	
TMT 30112		12 VDC / 2500 mA	
TMT 30115		15 VDC / 2000 mA	
TMT 30124		24 VDC / 1250 mA	
TMT 30212		+ 12 VDC / 1250 mA	– 12 VDC / 1250 mA
TMT 30215		+ 15 VDC / 1000 mA	– 15 VDC / 1000 mA

*suffix C: Chassis Mounting (Example: TMT 30105C)

DIN-Rail mounting Adapter

Order code*	
TMT-MK1	For 15 W Models
TMT-MK2	For 30 W Models

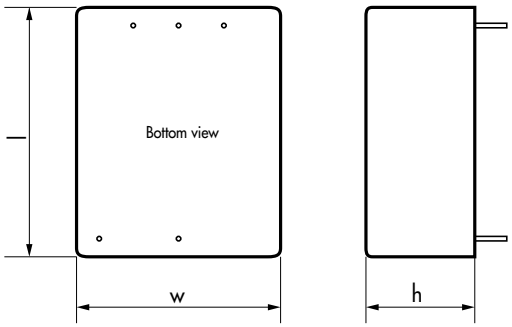
Input voltage range:	85–264 VAC and 47–440 Hz
Line regulation:	±0.1 % max.
Load regulation:	±1.0 % max. for single output models ±5.0 % max. for dual output models
Ripple & Noise:	<150 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55011 class B, EN 55022 class B and FCC, level B
EMC immunity:	EN 60601-1-2
Output current limitation:	>105 % Inom., foldback, automatic recovery
Efficiency:	83 % typ.
Operating temperature:	–25 °C … +50 °C above 40 °C derating 2.5 %/K
Safety standards / approvals:	cUL/UL 60950-1, EN 60950-1, UL 60601-1, IEC 60601-1
Degree of protection:	safety class II
Case:	plastic (UL 94 V-0 rating)
Option:	kit for DIN-Rail mounting

Dimensions

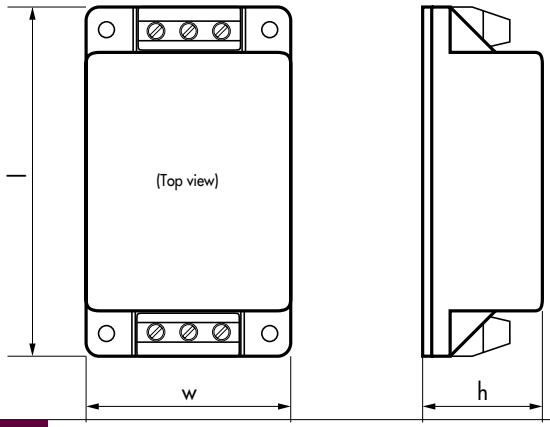
() = Inches

Type	PCB mounting Length l	PCB mounting Width w	PCB mounting Height h	Chassis mounting Length l	Chassis mounting Width w	Chassis mounting Height h
TMT 15xxx	55 (2.17)	45 (1.77)	24 (0.95)	77 (3.03)	45 (1.77)	26.4 (1.04)
TMT 30xxx	76 (2.99)	51 (2.01)	28 (1.10)	96 (3.03)	51 (2.01)	29.5 (1.16)

PCB mounting Version



Chassis mounting with Screw Terminals



Download full datasheet at
http://www.tracopower.com/products/tmt.pdf

AC/DC Encapsulated Modules

TML Series, 5 – 30 Watt

- Fully encapsulated Power Supplies
- 2 Package Styles available:
  – for PCB Mounting with Solder Pins
  – for Chassis Mounting with Screw Terminal Block
- Single-, Dual- and Triple-Output Models
- Universal Input 85–264 VAC
- EMI meets EN 55022, Class B and FCC, Level B
- Short Circuit and Overload Protection
- Cost optimized Design

Models

Order code		Output power	Output 1	Output 2/3
TML 05105			5 VDC / 1000 mA	
TML 05112			12 VDC / 416 mA	
TML 05115			15 VDC / 333 mA	
TML 05124		5 W	24 VDC / 200 mA	
TML 05205			5 VDC / 500 mA	– 5 VDC / 500 mA
TML 05212			12 VDC / 200 mA	– 12 VDC / 200 mA
TML 05215			15 VDC / 160 mA	– 15 VDC / 160 mA
	TMLM 10103		3.3 VDC / 2500 mA	
TML 10105	TMLM 10105		5 VDC / 2000 mA	
TML 10112	TMLM 10112		12 VDC / 830 mA	
TML 10115	TMLM 10115		15 VDC / 666 mA	
TML 10124	TMLM 10124	10 W	24 VDC / 420 mA	
TML 10205			5 VDC / 800 mA	– 5 VDC / 800 mA
TML 10212			12 VDC / 380 mA	– 12 VDC / 380 mA
TML 10215			15 VDC / 300 mA	– 15 VDC / 300 mA
**TML 15105			5 VDC / 3000 mA	
**TML 15112			12 VDC / 1250 mA	
**TML 15115			15 VDC / 1000 mA	
**TML 15124			24 VDC / 625 mA	
**TML 15205		15 W	5 VDC / 1500 mA	– 5 VDC / 1500 mA
**TML 15212			12 VDC / 650 mA	– 12 VDC / 650 mA
**TML 15215			15 VDC / 500 mA	– 15 VDC / 500 mA
**TML 15512			5 VDC / 2000 mA	± 12 VDC / ± 200 mA
**TML 15515			5 VDC / 2000 mA	± 15 VDC / ± 150 mA
**TML 30103			3.3 VDC / 6000 mA	
**TML 30105			5 VDC / 6000 mA	
**TML 30112			12 VDC / 2500 mA	
**TML 30115			15 VDC / 2000 mA	
**TML 30124			24 VDC / 1250 mA	
**TML 30205		30 W	5 VDC / 3000 mA	– 5 VDC / 3000 mA
**TML 30212			12 VDC / 1300 mA	– 12 VDC / 1300 mA
**TML 30215			15 VDC / 1000 mA	– 15 VDC / 1000 mA
**TML 30252			*5 VDC / 3000 mA	*12 VDC / 1250 mA
**TML 30512			*5 VDC / 3000 mA	± 12 VDC / ± 630 mA
**TML 30515			*5 VDC / 3000 mA	± 15 VDC / ± 500 mA

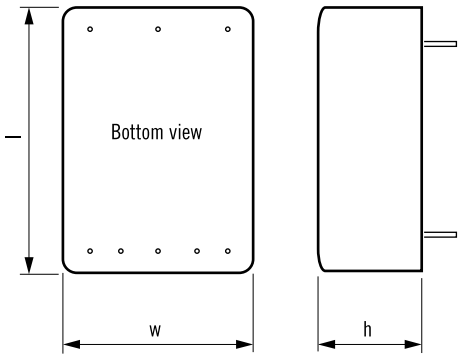
** suffix C: Chassis Mounting (Example: TML 30105 C) * Output floating

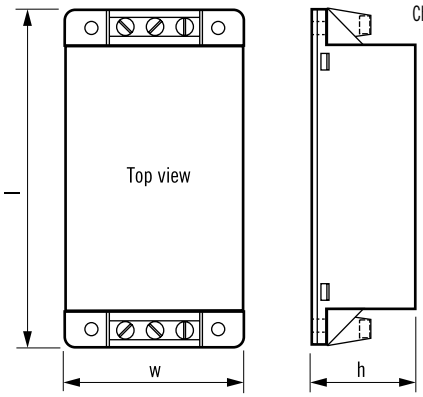
Input voltage range:	85–264 VAC and 47–440 Hz
Line regulation:	±0.3 % max.
Load regulation:	±1.0 % max. for single output models ±5.0 % max. for multi output models
Ripple & Noise:	<1.0 % of Vout (20 MHz BW) <1.5 % of Vout for 3.3 & 5 VDC models (20 MHz BW)
EMI suppression:	EN 55011 class B, EN 55022 class B and FCC, level B
EMC immunity:	EN 61000-6-1
Output current limitation:	foldback, automatic recovery
Efficiency:	80 % typ.
Operating temperature:	–25 °C … +60 °C above 50 °C derating 4 %/K
Safety standards / approvals:	cUL/UL 60950, EN 60950
Degree of protection:	safety class I (TML 30 W models safety class II)
MTBF:	>660,000 h @ +25 °C
Case:	plastic (UL 94 V-0 rating)

Dimensions

Type	PCB mounting Length l	Width b	Height h	Chassis mounting Length l	Width b	Height h
TML 05xxx	55 (2.17)	45 (1.77)	20.5 (0.79)			
TMLM 10xxx	52.5 (2.06)	27 (1.07)	23 (0.91)			
TML 10xxx	64 (2.52)	45 (1.77)	20.5 (0.79)			
TML 15xxx	74 (2.91)	54 (2.13)	22 (0.87)	96 (3.78)	54 (2.13)	27 (1.06)
TML 30xxx	89 (3.50)	63.5 (2.50)	25 (0.98)	112 (4.41)	64 (2.52)	30 (1.18)

PCB mounting Version





Chassis mounting with Screw Terminals

Download full datasheet at
http://www.tracopower.com/products/tml.pdf
http://www.tracopower.com/products/tmlm.pdf

AC/DC Encapsulated Modules

TPM Series, 5 – 40 Watt

- Fully encapsulated Power Supplies
- 2 Package Styles available:
  – for PCB Mounting with Solder Pins
  – for Chassis Mounting with Screw Terminal Block
- Single-, Dual- and Triple-Output Models
- Universal Input 85–264 VAC, 47–440 Hz
- EMI meets EN 55022, Class B
- Short Circuit, Overload- and Over-Temperature-Protection
- Safety Class II Product

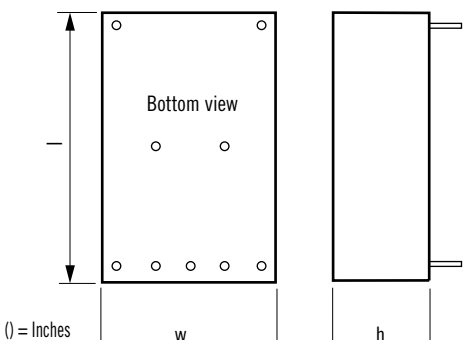
Models

Order code	Output power	Output 1	Output 2/3
TPM 05105		5 VDC / 1000 mA	
TPM 05112		12 VDC / 420 mA	
TPM 05124	5 W	24 VDC / 210 mA	
TPM 05212		+ 12 VDC / 250 mA	–12 VDC / 150 mA
TPM 05215		+ 15 VDC / 150 mA	–15 VDC / 150 mA
**TPM 10105		5 VDC / 2000 mA	
**TPM 10112		12 VDC / 840 mA	
**TPM 10124		24 VDC / 420 mA	
**TPM 10212	10 W	+ 12 VDC / 400 mA	–12 VDC / 400 mA
**TPM 10215		+ 15 VDC / 300 mA	–15 VDC / 300 mA
**TPM 10512		*5 VDC / 1200 mA	±12 VDC / ±120 mA
**TPM 10515		*5 VDC / 1200 mA	±15 VDC / ±100 mA
**TPM 15105		5 VDC / 3000 mA	
**TPM 15112		12 VDC / 1300 mA	
**TPM 15124		24 VDC / 600 mA	
**TPM 15212	15 W	+ 12 VDC / 600 mA	–12 VDC / 400 mA
**TPM 15215		+ 15 VDC / 500 mA	–15 VDC / 400 mA
**TPM 15512		*5 VDC / 1600 mA	±12 VDC / ±150 mA
**TPM 15515		*5 VDC / 1600 mA	±15 VDC / ±150 mA
**TPM 30105		5 VDC / 6000 mA	
**TPM 30112		12 VDC / 2500 mA	
**TPM 30124		24VDC / 1300 mA	
**TPM 30212		12 VDC / 1200 mA	–12 VDC / 1200 mA
**TPM 30215	30 W	15 VDC / 1000 mA	–15 VDC / 1000 mA
**TPM 30252		*5 VDC / 3000 mA	*12 VDC / 1200 mA
**TPM 30254		*5 VDC / 3000 mA	*24 VDC / 600 mA
**TPM 30512		*5 VDC / 3000 mA	±12 VDC / ±600 mA
**TPM 30515		*5 VDC / 3000 mA	±15 VDC / ±500 mA
**TPM 40105		5 VDC / 7000 mA	
**TPM 40112	40 W	12 VDC / 3300 mA	
**TPM 40124		24 VDC / 1800 mA	

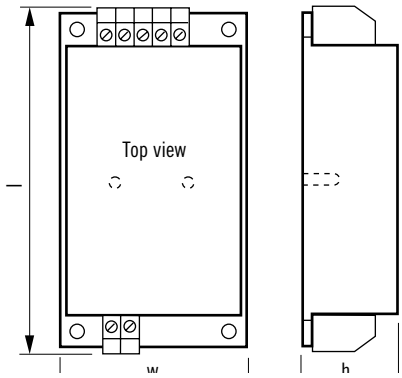
** suffix C: Chassis mounting with Screw Terminal Block (Example TPM 30105 C)
* Output floating

Input voltage range:	85–264 VAC and 47–440 Hz 100–375 VDC
Line regulation:	±0.5 % max.
Load regulation:	±0.5 % max.
Ripple & Noise:	<100 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55011 class B, EN 55022 class B and FCC, level B
EMC immunity:	EN 61000-6-2 (industrial environment)
Output current limitation:	105–130 % Iout max., constant current
Efficiency:	70–80 % (depending on model)
Operating temperature:	–25 °C … +60 °C above 50 °C derating 5 %/K
Safety standards / approvals:	cUL/UL 60950, EN 60950
Degree of protection:	safety class II
Case:	plastic (UL94 V-0 rating)

PCB mounting Version



Chassis mounting with Screw Terminal Block



Dimensions

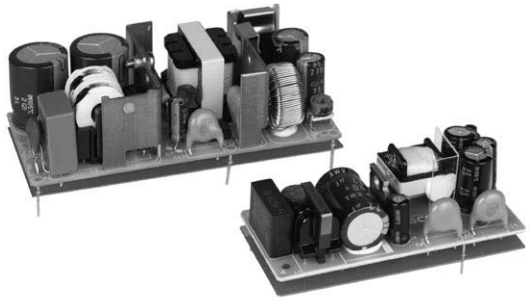
Type	Length l	Width w	Height h
TPM 05	51 (2.0)	51 (2.0)	20 (0.79)
TPM 10/15	76 (2.99)	51 (2.01)	22.5 (0.89)
TPM 10C/15C	110 (4.33)	51 (2.01)	23 (0.91)
TPM 30	90 (3.54)	65 (2.56)	33 (1.30)
TPM 30C	120 (4.75)	65 (2.56)	33 (1.30)
TPM 40	90.5 (3.58)	65.5 (2.59)	33.5 (1.33)
TPM 40C	120 (4.75)	65 (2.56)	33 (1.30)

Download full datasheet at
http://www.tracopower.com/products/tpm.pdf

AC/DC Open Frame

TOM Series, 12 / 25 Watt

- PCB mountable with Solder Pins
- Ultracompact Design
- Universal Input 85–264 VAC
- EMI meets EN 55022, Class B and FCC, Level B
- Short Circuit Protection

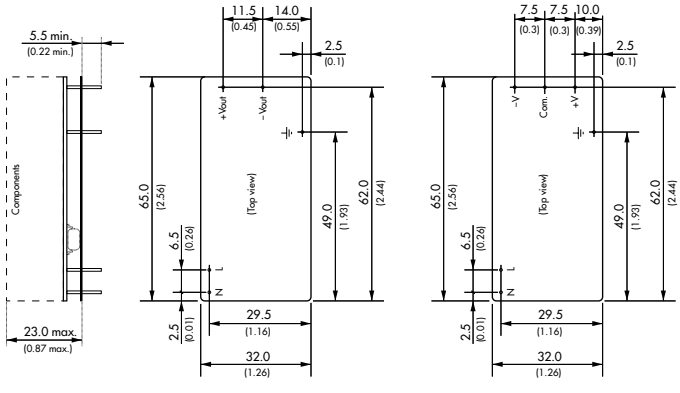


Models

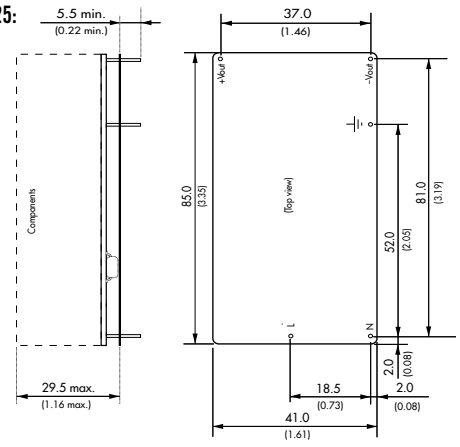
Order code	Output voltage	Output current max. at input 230 VAC	Output current max. at input 115 VAC
TOM 12103	3.3 VDC	2000 mA	2000 mA
TOM 12105	5 VDC	2000 mA	2000 mA
TOM 12112	12 VDC	1000 mA	840 mA
TOM 12115	15 VDC	800 mA	670 mA
TOM 12124	24 VDC	500 mA	420 mA
TOM 12212	±12 VDC	±500 mA	±420 mA
TOM 12215	±15 VDC	±420 mA	±350 mA
TOM 25103	3.3 VDC	6000 mA	6000 mA
TOM 25105	5 VDC	5000 mA	5000 mA
TOM 25112	12 VDC	2100 mA	2100 mA
TOM 25115	15 VDC	1700 mA	1700 mA
TOM 25124	24 VDC	1100 mA	1100 mA

Input voltage range:	85–264 VAC and 47–63 Hz
Line regulation:	±0.5 % max.
Load regulation:	±0.5 % max. for single output models ±5.0 % max. for dual output models
Ripple & Noise:	<150 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55022 class B and FCC, level B
Output current limitation:	105–130 % Iout nom. foldback, automatic recovery
Efficiency:	79 % typ
Operating temperature:	–25 °C … +71 °C above 60 °C derating 5 %/K
Safety standards / approvals:	cUL /UL 60950, EN 60950

TOM 12: Single output Dual output



TOM 25:

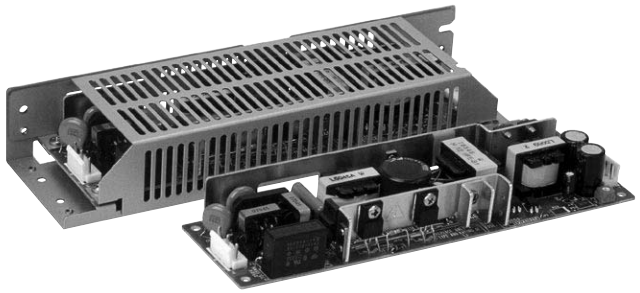


Download full datasheet at
http://www.tracopower.com/products/tom.pdf

AC/DC Open Frame Design

TOL Series, 10 – 300 Watt

- Compact Design
- Optional with Chassis and Cover
- Pin Connector Termination
- Universal Input 85–264 VAC
- Output Voltage adjustable
- EMI meets EN 55022, Class B and FCC, Level B
- Compliance to EN 61000-3-2 (PFHC)
- Short Circuit and Overvoltage Protection
- Highest Industrial Quality Standard



Models

Order code	Output power	Output voltage max.	Output current max.
TOL 10-05	10 Watt	5 VDC	2 A
TOL 10-12		12 VDC	0.9 A
TOL 10-24		24 VDC	0.5 A
TOL 15-05	15 Watt	5 VDC	3 A
TOL 15-12		12 VDC	1.3 A
TOL 15-24		24 VDC	0.7 A
TOL 30-05	30 Watt	5 VDC	6 A
TOL 30-12		12 VDC	2.5 A
TOL 30-24		24 VDC	1.3 A
TOL 50-05	50 Watt	5 VDC	10 A
TOL 50-12		12 VDC	4.3 A
TOL 50-24F		24 VDC	2.2 A (3.0 A)*
TOL 75-05	75 Watt	5 VDC	15 A
TOL 75-12		12 VDC	6.3 A
TOL 75-24F		24 VDC	3.2 A (4.5 A)*
TOL 100-05	100 Watt	5 VDC	20 A
TOL 100-12		12 VDC	8.5 A
TOL 100-24F		24 VDC	4.5 A (6.3 A)*
TOL 100-48		48 VDC	2.1 A
TOL 150-05	150 Watt	5 VDC	30 A
TOL 150-12		12 VDC	13 A
TOL 150-24F		24 VDC	6.5 A (9.1 A)*
TOL 150-48		48 VDC	3.3 A
TOL 300-12	300 Watt	12 VDC	27 A
TOL 300-24		24 VDC	14 A
TOL 300-48		48 VDC	6.3 A

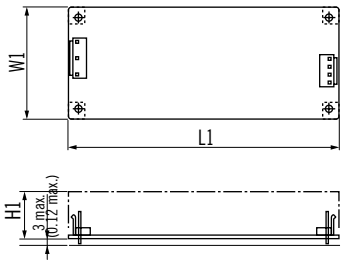
* Peak current for max. 10 sec.

Accessories

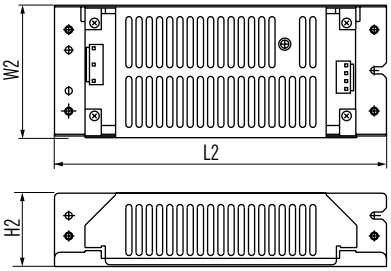
Mating connectors with pre-wired flying leads (500 mm)		Chassis / cover kit	
TOL-C31	input cable for all models	TOL 10-MC	for TOL 10 series
TOL-C41	TOL 10/15 output cable	TOL 15-MC	for TOL 15 series
TOL-C42	TOL 30/50 output cable	TOL 30-MC	for TOL 30 series
TOL-C61	TOL 75 output cable	TOL 50-MC	for TOL 50 series
TOL-C62	TOL 150 output cable+	TOL 75-MC	for TOL 75 series
TOL-C71	TOL 150 output cable–	TOL 100-MC	for TOL 100 series
TOL-C81	TOL 100 output cable	TOL 150-MC	for TOL 150 series
		TOL 300-MC	for TOL 300 series

Input voltage range:	85–264 VAC, 50/60 Hz
Line regulation:	±0.5 % max.
Load regulation:	±0.8 % max.
Outputvoltage adjustment:	±10 % of Vout nom. with potentiometer
Ripple & Noise:	5 VDC output models: <100 mVpk-pk (20 MHz BW) 12/24 VDC output models: <180 mVpk-pk (20 MHz BW) 48 VDC output models: <300 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55011 class B, EN 55022, class B and FCC, level B EN 61000-3-2
EMC immunity:	EN61000-6-1
Output current limitation:	at 105–140 % of Inom. (except for F-models), constant current
Over voltage protection:	at 115–135 % of Vout nom.
Efficiency:	75 % typ.
Operating temperature:	–10 °C … +60 °C above 50 °C derating 2.5 %/K
Safety standards / approvals:	cUL/UL 60950, EN 60950
Connection:	Pin connector (screw terminal block for TOL 300 models)
Options:	– Chassis & cover kit (stainless steel) – Mating connectors with pre-wired flying leads of 500 mm length

Open Frame (Standard)



With Chassis and Cover (Optional Accessory)



Dimensions

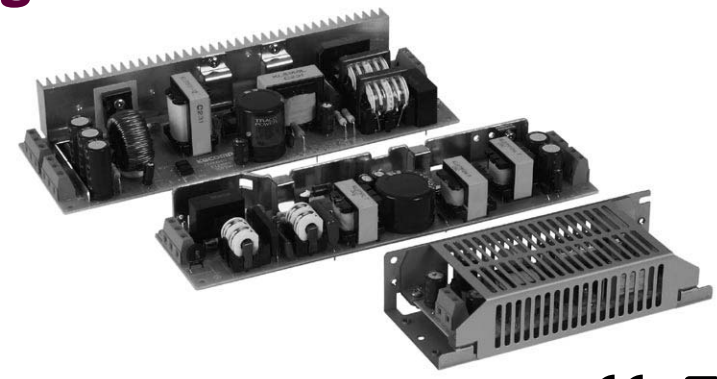
Type	Length L1	Width B1	Height H1	Length L2	Width B2	Height H2
TOL 10	105 (4.13)	50 (1.97)	18 (0.71)	125 (4.92)	57 (2.24)	32 (1.26)
TOL 15	125 (4.92)	50 (1.97)	18 (0.71)	145 (4.92)	57 (2.24)	32 (1.26)
TOL 30	133 (5.24)	55 (2.17)	23 (0.91)	163 (6.42)	65 (2.56)	36 (1.42)
TOL 50	195 (7.68)	55 (2.17)	23 (0.91)	225 (8.86)	65 (2.56)	36 (1.42)
TOL 75	222 (8.74)	55 (2.17)	29 (1.14)	252 (9.92)	65 (2.56)	42 (1.65)
TOL 100	222 (8.74)	62 (2.44)	32 (1.26)	252 (9.92)	72 (2.83)	45 (1.77)
TOL 150	222 (8.74)	75 (2.95)	37 (1.46)	252 (9.92)	85 (3.35)	51 (2.00)
TOL 300	255 (10.04)	108 (4.25)	47 (1.85)	285 (11.22)	118 (4.65)	61 (2.40)

Download full datasheet at
http://www.tracopower.com/products/tol.pdf

AC/DC Open Frame Design

TOF Series, 10 – 150 Watt

- Compact Design
- Optional with Chassis and Cover
- Screw Terminals for easy Installation
- Universal Input 85–264 VAC
- Output Voltage adjustable
- EMI meets EN 55022, Class B and FCC, Level B
- Compliance to EN 61000-3-2 (PFHC)
- Short Circuit and Overvoltage Protection
- Highest Industrial Quality Standard



Models

Order code	Output power max.	Output voltage	Output current max.
TOF 10-05		5 VDC	2 A
TOF 10-12	10 Watt	12 VDC	0.9 A
TOF 10-15		15 VDC	0.7 A
TOF 10-24		24 VDC	0.5 A
TOF 15-05		5 VDC	3 A
TOF 15-12	15 Watt	12 VDC	1.3 A
TOF 15-15		15 VDC	1 A
TOF 15-24		24 VDC	0.7 A
TOF 30-05		5 VDC	6 A
TOF 30-12	30 Watt	12 VDC	2.5 A
TOF 30-15		15 VDC	2 A
TOF 30-24		24 VDC	1.3 A
TOF 50-05		5 VDC	10 A
TOF 50-12	50 Watt	12 VDC	4.3 A
TOF 50-15		15 VDC	3.5 A
TOF 50-24F		24 VDC	2.2 A (3.0)*
TOF 75-05		5 VDC	15 A
TOF 75-12	75 Watt	12 VDC	6.3 A
TOF 75-15		15 VDC	5 A
TOF 75-24F		24 VDC	3.2 A (4.5)*
TOF 100-05		5 VDC	20 A
TOF 100-12	100 Watt	12 VDC	8.5 A
TOF 100-15		15 VDC	6.7 A
TOF 100-24F		24 VDC	4.5 A (6.3)*
TOF 150-05		5 VDC	30 A
TOF 150-12	150 Watt	12 VDC	12.5 A
TOF 150-15		15 VDC	10 A
TOF 150-24F		24 VDC	6.5 A (9.1)*

* Peak current for max. 10 sec.

Triple Output Models

Order code	Output power max.	* Output 1	* Output 2/3
TOF 15-0522T	15 Watt	5 VDC / 2 A	±12 VDC / ±0.5 A
TOF 15-0533T		5 VDC / 2 A	±15 VDC / ±0.45 A
TOF 30-0522T	30 Watt	5 VDC / 4 A	±12 VDC / +1.2 A/-0.5 A
TOF 30-0533T		5 VDC / 4 A	±15 VDC / +1.0 A/-0.5 A

*Total power should not exceed nominal power

Input voltage range: 85–264 VAC, 50/60 Hz
110–370 VDC (10…50 Watt single output models)

Line regulation: ±0.5 % max.

Load regulation: ±0.5 % max.

Output voltage adjustment: ±5 % (10…50 Watt single output models)
±10 % (75–150 Watt single output models)
±15 % on output 1 ±2.5% on output 2 and 3 (15…30 Watt multi output models)

Ripple & Noise: <1 % Vout + 50mVpk-pk (20 MHz BW)

EMI suppression: EN55022, class B and FCC part 15, level B
IEC/EN61000-3-2, (75…150 Watt models)

EMC immunity: EN61000-6-1

Output current limitation: >105 % of Inom.

Efficiency: 78 % typ. (single output models)
70 % typ. (multi output models)

Operating temperature: –10 °C … +60 °C
above 50 °C derating 2.5 %/K

Safety standards / approvals: cUL/UL 60950, IEC/EN60950

Connection: screw terminal block

Dimensions

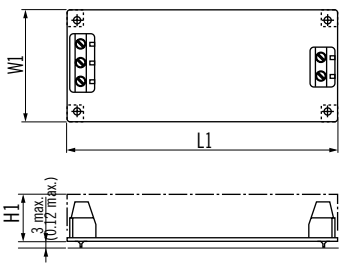
Type	Length L1	Width W1	Height H1	Length L2	Width W2	Height H2
TOF 10	105 (4.13)	50 (1.97)	20 (0.79)	125 (4.92)	57 (2.24)	32 (1.26)
TOF 15	125 (4.92)	50 (1.97)	20 (0.79)	145 (4.92)	57 (2.24)	32 (1.26)
TOF 30	133 (5.24)	55 (2.17)	25 (0.98)	163 (6.42)	65 (2.56)	36 (1.42)
TOF 50	195 (7.68)	55 (2.17)	25 (0.98)	225 (8.86)	65 (2.56)	36 (1.42)
TOF 75	222 (8.74)	55 (2.17)	26 (1.02)	252 (9.92)	65 (2.56)	42 (1.65)
TOF 100	222 (8.74)	62 (2.44)	32 (1.26)	252 (9.92)	72 (2.83)	45 (2.00)
TOF 150	222 (8.74)	75 (2.95)	37 (1.46)	252 (9.92)	85 (3.35)	51 (2.00)
TOF 15-T	127 (5.0)	50 (1.97)	22.6 (0.89)	147 (5.8)	57 (2.25)	38 (1.5)
TOF 30-T	140 (5.5)	65 (2.56)	22.6 (0.89)	160 (6.3)	72 (2.83)	38 (1.5)

() = Inches

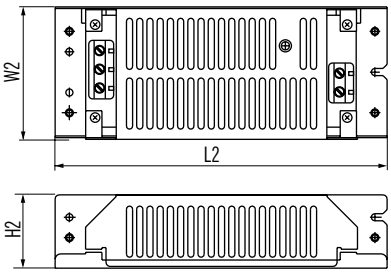
Chassis / cover kit

Order code	for models
TOL 10-MC	TOF 10-xx
TOL 15-MC	TOF 15-xx
TOL 30-MC	TOF 30-xx
TOL 50-MC	TOF 50-xx
TOL 75-MC	TOF 75-xx
TOL 100-MC	TOF 100-xx
TOL 150-MC	TOF 150-xx
TOF 15T-MC	TOF 15-xxxT
TOF 30T-MC	TOF 30-xxxT

Open Frame (Standard)



With Chassis and Cover (Optional Accessory)

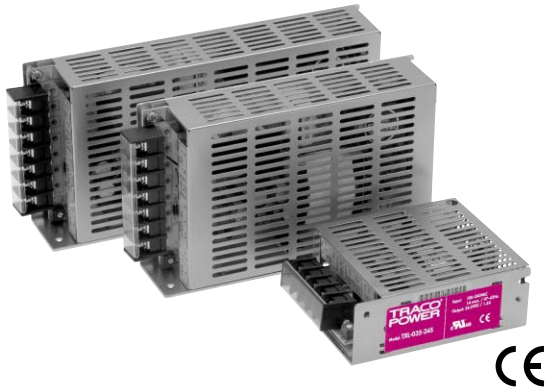


Download full datasheet at
http://www.tracopower.com/products/tof.pdf

AC/DC Enclosed Case

TXL Series, 25–600 Watt

- Compact Metal Case with Screw Terminal Block
- Single-, Dual- and Triple-Output Models
- Multi-Output Models with isolated Outputs
- Universal Input 85–264 VAC
- Adjustable Output Voltage
- EMI/EMC Compliance with EN 61000-6-3 / 61000-6-1
- Compliance to EN 61000-3-2 (PFHC)
- Short Circuit and Overvoltage Protection
- Cost-optimized Design



Models

Order code	Output power max.	Output voltage nom.	Output current max.	Case
TXL 025-3.3S	25 Watt	3.3 VDC	6.0 A	C
TXL 025-05 S		5 VDC	5.0 A	
TXL 025-12 S		12 VDC	2.1 A	
TXL 025-15 S		15 VDC	1.7 A	
TXL 025-24 S		24 VDC	1.1 A	
TXL 025-48 S		48 VDC	0.57 A	
TXL 035-3.3S	35 Watt	3.3 VDC	9.0 A	D
TXL 035-05 S		5 VDC	7.0 A	
TXL 035-12 S		12 VDC	3.0 A	
TXL 035-15 S		15 VDC	2.4 A	
TXL 035-24 S		24 VDC	1.5 A	
TXL 035-48 S		48 VDC	0.75 A	
TXL 050-05 S	50/60 Watt	5 VDC	10.0 A	D
TXL 060-12 S		12 VDC	5.0 A	
TXL 060-15 S		15 VDC	4.0 A	
TXL 060-24 S		24 VDC	2.5 A	
TXL 060-3.3S	60/70 Watt	3.3 VDC	15.0 A	E
TXL 060-05 S		5 VDC	12.0 A	
TXL 070-12 S		12 VDC	6.0 A	
TXL 070-15 S		15 VDC	4.8 A	
TXL 070-24 S		24 VDC	3.0 A	
TXL 070-48 S		48 VDC	1.5 A	
TXL 100-3.3S	100 Watt	3.3 VDC	25.0 A	J
TXL 100-05 S		5 VDC	20.0 A	
TXL 100-12 S		12 VDC	8.5 A	
TXL 100-15 S		15 VDC	6.8 A	
TXL 100-24 S		24 VDC	4.5 A	
TXL 100-48 S		48 VDC	2.1 A	
TXL 120-12 S	120 Watt	12 VDC	10.0 A	K
TXL 120-15 S		15 VDC	8.0 A	
TXL 120-24 S		24 VDC	5.0 A	
TXL 120-48 S		48 VDC	2.5 A	
TXL 150-05 S	150 Watt	5 VDC	30.0 A	L
TXL 150-12 S		12 VDC	12.5 A	
TXL 150-24 S		24 VDC	6.3 A	
TXL 150-48 S		48 VDC	3.2 A	
TXL 220-12 S	220 Watt	12 VDC	18.4 A	N
TXL 220-24 S		24 VDC	9.2 A	
TXL 220-48 S		48 VDC	4.6 A	
TXL 300-24 S	300 Watt	24 VDC	12.5 A	O
TXL 300-48 S		48 VDC	6.5 A	
TXL 600-24 S	600 Watt	24 VDC	25.0 A	P
TXL 600-48 S		48 VDC	12.5 A	

Multi Output Models

Order code	Output power	*Output 1 max.	*Output 2	*Output3	Case
TXL 035-0512D	35 Watt	+5 VDC / 4.0 A	+12 VDC / 1.5 A		D
TXL 035-0524D		+5 VDC / 4.0 A	+24 VDC / 1.3 A		
TXL 035-1212D		+12 VDC / 1.5 A	–12 VDC / 1.5 A		
TXL 035-1515D		+15 VDC / 1.3 A	–15 VDC / 1.3 A		
TXL 060-0512DI	60 Watt	+5 VDC / 8.0 A	+12 VDC / 4.0 A		E
TXL 060-0524DI		+5 VDC / 8.0 A	+24 VDC / 2.2 A		
TXL 060-0521TI		+5 VDC / 8.0 A	+12 VDC / 3.5 A	-5 VDC / 1.0 A	
TXL 060-0522TI		+5 VDC / 7.0 A	+12 VDC / 3.5 A	-12 VDC / 1.0 A	
TXL 060-0533TI		+5 VDC / 7.0 A	+15 VDC / 3.0 A	-15 VDC / 1.0 A	
TXL 060-0534TI		+5 VDC / 6.0 A	+12 VDC / 1.5 A	+24VDC / 1.2 A	
TXL 100-0512DI	100 Watt	+5 VDC / 12 A	+12 VDC / 6.0 A		J
TXL 100-0524DI		+5 VDC / 10 A	+24 VDC / 4.0 A		
TXL 100-0521TI		+5 VDC / 12 A	+12 VDC / 5.0 A	-5 VDC / 1.5 A	
TXL 100-0522TI		+5 VDC / 12 A	+12 VDC / 5.0 A	-12 VDC / 1.5 A	
TXL 100-0533TI		+5 VDC / 12 A	+15 VDC / 3.0 A	-15 VDC / 1.5 A	
TXL 100-0534TI		+5 VDC / 12 A	+12 VDC / 3.0 A	+24VDC / 2.0 A	

60 & 100 Watt models with fully isolated outputs

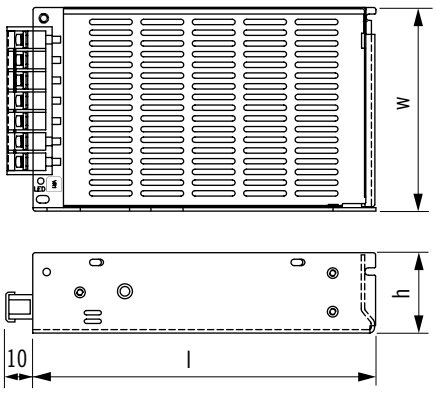
*Total power must not exceed specified output power

Input voltage range:	85–264 VAC, 50/60 Hz
Line regulation:	±1.0 %
Load regulation:	±2.0 %
Output voltage adjustment:	±10 % of Vout nom. with potentiometer
Ripple & Noise:	<1 % of Vout nom.
EMI suppression:	EN 55011, class B, EN 55022, class B and FCC, part 15, level B EN 61000-3-2
EMC immunity:	EN 61000-6-1
Output current limitation:	at 105–150 % of Iout max. (foldback, automatic recovery)
Overvoltage protection:	at 115–140 % of Vout nom.
Efficiency:	80 % typ.
Operating temperature:	–10 °C … +60 °C above 45 °C derating 2 %/K
Safety standards / approvals:	cUL/UL 60950-1, EN 60950-1, CB Report
Connection:	screw terminal block
Case:	aluminium / steel

Dimensions

Case Type	Length l	Width w	Height h
C	79 (3.11)	51 (2.01)	29 (1.14)
D	99 (3.90)	82 (3.23)	35 (1.38)
E	160 (6.30)	95 (3.74)	38 (1.50)
J	198 (7.80)	95 (3.74)	38 (1.50)
K	178 (7.00)	99 (3.90)	35 (1.38)
L	198 (7.80)	99 (3.90)	50 (1.97)
N	198 (7.80)	99 (3.90)	45 (1.77)
O	212 (8.35)	115 (4.53)	50 (1.97)
P	275 (10.83)	125 (4.92)	63 (2.48)

() = Inches



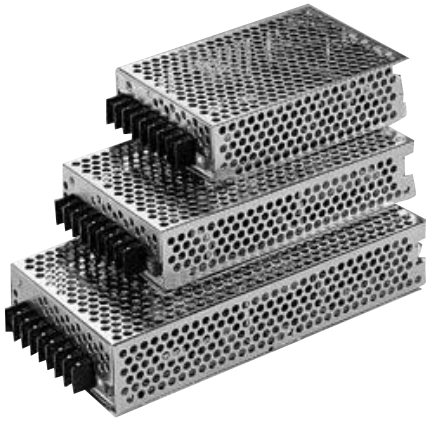
Download full datasheet at

http://www.tracopower.com/products/txl.pdf

AC/DC Enclosed Case

ESP Series, 18 – 150 Watt

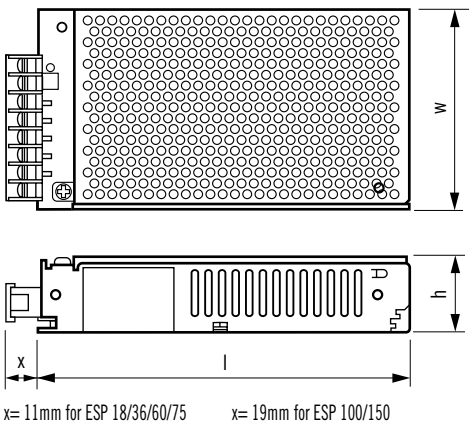
- Compact Metal Case with Screw Terminals Block
- Universal Input 85–264 VAC
- Adjustable Output Voltage
- EMI/EMC Compliance with EN 61000-6-3/EN 61000-6-1
- Short Circuit and Overvoltage Protection
- Highest Industrial Quality Standard



Models

Order code	Output power max.	Output voltage	Output current max.
ESP 18-05SN		5 VDC	3.6 A
ESP 18-12SN		12 VDC	1.5 A
ESP 18-15SN	18 Watt	15 VDC	1.2 A
ESP 18-24SN		24 VDC	0.8 A
ESP 18-48SN		48 VDC	0.4 A
ESP 36-05SN		5 VDC	6 A
ESP 36-12SN		12 VDC	3 A
ESP 36-15SN	36 Watt	15 VDC	2.5 A
ESP 36-24SN		24 VDC	1.5 A
ESP 36-48SN		48 VDC	0.8 A
ESP 60-05SN		5 VDC	10 A
ESP 60-12SN		12 VDC	5 A
ESP 60-15SN	60 Watt	15 VDC	4 A
ESP 60-24SN		24 VDC	2.5 A
ESP 60-48SN		48 VDC	1.2 A
ESP 75-05S		5 VDC	15 A
ESP 75-12S		12 VDC	6.5 A
ESP 75-15S	75 Watt	15 VDC	5.2 A
ESP 75-24S		24 VDC	3.2 A
ESP 75-48S		48 VDC	1.6 A
ESP 100-05S		5 VDC	20 A
ESP 100-12S		12 VDC	8.6 A
ESP 100-15S	100 Watt	15 VDC	7 A
ESP 100-24S		24 VDC	4.4
ESP 100-48S		48 VDC	2.2 A
ESP 150-05S		5 VDC	30 A
ESP 150-12S		12 VDC	13 A
ESP 150-15S	150 Watt	15 VDC	10 A
ESP 150-24S		24 VDC	6.5 A
ESP 150-48S		48 VDC	3.3 A

Input voltage range:	85–264 VAC, 50/60 Hz
Line regulation:	±0.2 % max.
Load regulation:	±1.0 % max.
Output voltage adjustment:	±10 % of Vout nom. with potentiometer
Ripple & Noise:	<75 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55011, class B, EN 55022, class B and FCC, level B EN 61000-3-2, class D
EMC immunity:	EN 61000-6-1
Output current limitation:	at 105–120 % of Inom. (constant current)
Over voltage protection:	at 110–130 % of Vout nom.
Efficiency:	80 % typ.
Operating temperature:	–10 °C … +60 °C above 50 °C derating 2.0 %/K
Safety standards / approvals:	cUL/UL 60950, IEC/EN 60950, CB-Report
Connection:	screw terminal block
Case	stainless steel



x= 11mm for ESP 18/36/60/75 x= 19mm for ESP 100/150

Dimensions

Type	Length l	Width w	Height h
ESP18	87 (3.41)	71 (2.80)	32 (1.26)
ESP36	115 (4.53)	75 (2.95)	32 (1.26)
ESP60	135 (5.31)	81 (3.15)	37 (1.46)
ESP75	162 (6.38)	88 (3.46)	38 (1.50)
ESP100	187 (7.36)	93 (3.66)	39 (1.54)
ESP150	196 (7.72)	107 (4.21)	45 (1.77)

() = Inches

Download full datasheet at
http://www.tracopower.com/products/esp-n.pdf

Industrial Power Supplies

TCL Series, 24 – 120 Watt

- Compact Plastic Case for DIN-Rail Mounting
- For Industrial-, Office- and Residential Environments
- With detachable Screw Terminals or Cage Clamps available
- Standard Models with 5, 12, 24 and 48 VDC
- Universal Input 85–264 VAC
- Adjustable Output Voltage
- Power Good Signal
- Short Circuit Protection
- Parallel and Redundant Operation
- Worldwide Safety Approval Package

NEW MODELS

Models

Order code	Output power max.	Output voltage (adjustable output)	Output current max.
TCL 024-105		5.1 VDC	4.0 A
TCL 024-112	24 Watt	12 VDC	2.0 A
TCL 024-124 (C)		24 VDC	1.0 A
TCL 060-112 (C)		12 VDC	4.0 A
TCL 060-124 (C)	60 Watt	24 VDC	2.5 A
TCL 060-148 (C)		48 VDC	1.25 A
TCL 120-112 (C)		12 VDC	8.0 A
TCL 120-124 (C)	120 Watt	24 VDC	5.0 A

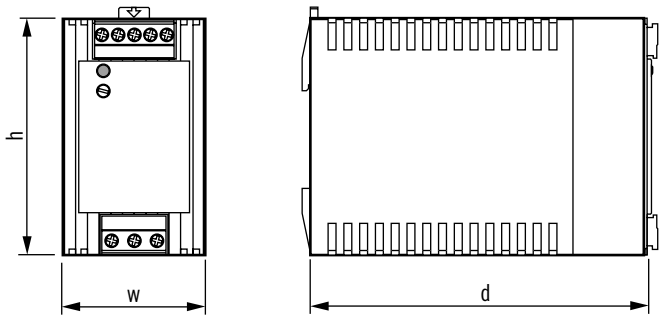
without suffix: detachable screw terminal block
with suffix C: cage clamps (example TCL 060-124C)

DC Input Model 24 Watt

Order code	Input voltage max.	Output voltage (adjustable output)	Output current max.
NEW TCL 012-112 DC	9.5–18 VDC	24 VDC	1.0 A
NEW TCL 024-105 DC		5 VDC	5.0 A
NEW TCL 024-112 DC	18–75 VDC	12 VDC	2.0 A
TCL 024-124 DC		24 VDC	1.0 A

For specifications see datasheet: **http://tracopower.com/products/tcl_dc.pdf**

Input voltage range:	85–264 VAC universal input 50/60 Hz 85–375 VDC.
Output regulation:	±1.25 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55011, class B, EN 55022, class B, EN61000-6-3
EMC immunity:	EN 61000-6-2 (industrial environment)
Output current limitation:	at 130 % of Iout max.
Over voltage protection:	at 140 % of Vout nom.
Efficiency:	90 % typ.
DC-OK Signal:	open collector / max. 30 mA
Operating temperature:	–10 °C … +70 °C above 50 °C derating 1.7 %/K
Safety standards / approvals:	cUL/UL 60950, UL 508C listed, IEC/EN 60950, CB-Report EN 50178, EN 60204, EN 61588-2-8
Connection:	detachable screw terminals or cage clamp terminals
Case:	plastic (UL 94V-0 rated)
Mounting:	snap-on mounting on 35 mm DIN-rail or chassis mounting with mounting bracket
Options:	– output current characteristics suitable for battery charging applications – decoupling diode module for redundancy operation (model TCL-REM240)



Dimensions

Type	Width w	Heigth h	Depth d
TCL 012	27 (1.06)	75 (2.95)	100 (3.94)
TCL 024	27 (1.06)	75 (2.95)	100 (3.94)
TCL 060	45 (1.77)	75 (2.95)	100 (3.94)
TCL 120	85 (3.35)	75 (2.95)	100 (3.94)

() = Inches

Download full datasheet at
http://www.tracopower.com/products/tcl.pdf

Industrial Power Supplies

TSP Series, 78 – 600 Watt

- DIN-Rail or Wall Mounting
- Rugged, ultra compact metal case for harsh Industrial Environments
- Operating Temperature Range –25 °C to 70 °C
- Industrial Safety Approval Package
- ATEX Certification for hazardous Locations (Opt.)
- Add-on Function Modules (see page 63)
- Overload and Over-Temperature Protection
- Vibration and Shock Proof
- Detachable Screw Terminal Block
- Power Good Signal, Remote On/Off

NEW Product

UL 60950
UL 508

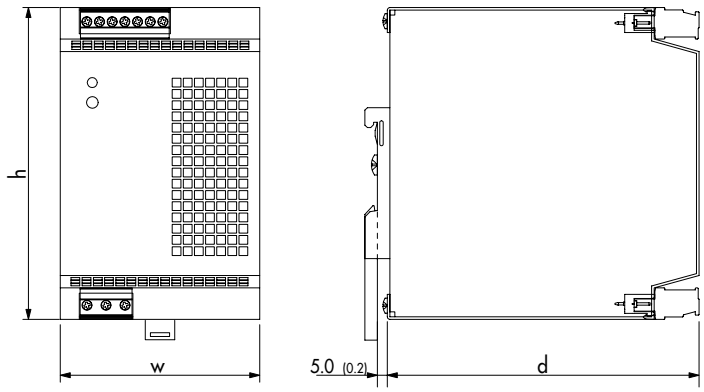
ATEX

Models

[1] Order code	Output power max.	[2] Output voltage nom.	[3] Output current max.
TSP 070-112	78 Watt	12 VDC	6.5 A
TSP 090-124	90 Watt	24 VDC	3.75 A
TSP 090-124N[4]	90 Watt	24 VDC	3.75 A
TSP 140-112	156 Watt	12 VCD	13.0 A
TSP 180-124	180 Watt	24 VDC	7.5 A
TSP 360-124	360 Watt	24 VDC	15.0 A
TSP 600-124	600 Watt	24 VDC	25.0 A

[1] Suffix EX: For ATEX certified models (Example TSP 180-112 EX)
[2] Output voltage adjustable 12-14 VDC resp. 24-28 VDC
[3] Max. current at nominal output voltage and max. 40°C ambient temperature
[4] Model meets EN 60950 sect. 2.5 and NEC Class2 (limited power source)

Input voltage range:	85–264 VAC, 47–63 Hz, autorange
Line regulation:	±0.5 % max.
Load regulation:	±0.5 % max.
Ripple & Noise:	<150 mVpk-pk
EMI suppression:	EN 61204-3, EN 61000-6-3
EMC immunity:	EN 61204-3, EN 61000-6-2 (industrial environment)
Output current limitation:	at max. output current (constant current, automatic restart)
Over-temperature protection:	switch off at over-temperature, automatic restart
Output characteristic:	selectable for parallel operation or battery charging application
Over voltage protection:	20V for 12VDC models, 35V for 24VDC models
Efficiency:	87 % typ.
Operating temperature:	–25 °C … +70 °C above 40 °C derating 2 %/K
Safety standards /approvals:	UL 60950-1 recognized, UL 508 listed, IEC/EN 60950-1, (CB-Report), EN 50178, EN 60204, EN 61558-2-4, SEMI F47, FM 3611, IEC/EN 60079-15 (Class I, Div. 2), ATEX 94/9/EC (opt. EX)
Degree of protection:	degree of electrical protection 1 (IEC 536)
Case protection:	IP20 (IEC 529)
Vibration/Shock:	IEC 60068-2-6 / IEC 60068-2-27
Connection:	detachable screw terminals
Case:	aluminium (chassis) / stainless steel (cover)
Mounting:	– snap-on mounting on 35 mm DIN-Rail – wall mounting brackets (option)



() = Inches

Dimensions

Type	Width w	Height h	Depth d
TSP 070/090	35 (1.38)	110 (4.33)	110 (4.33)
TSP 140/180	54 (2.13)	110 (4.33)	110 (4.33)
TSP 360	80 (3.15)	125 (4.92)	125 (4.92)
TSP 600	165 (6.50)	125 (4.92)	125 (4.92)

() = Inches

Download full datasheet at
http://www.tracopower.com/products/tsp.pdf

Industrial Power Supplies

TSP-WR Series, 78 – 600 Watt

- For worldwide Operation – with ultra-wide Input Range from 100 to 550VAC, for Single- and 3 Phase Networks
- DIN-Rail or Wall Mounting
- Rugged, ultra compact metal case for harsh Industrial Environments
- Operating Temperature Range –25 °C to 70 °C
- Industrial Safety Approval Package
- ATEX Certification for hazardous Locations (Opt.)
- Add-on Function Modules
- Overload and Over-Temperature Protection
- Vibration and Shock Proof
- Detachable Screw Terminal Block
- Power Good Signal, Remote On/Off

NEW Product

UL 60950
UL 508

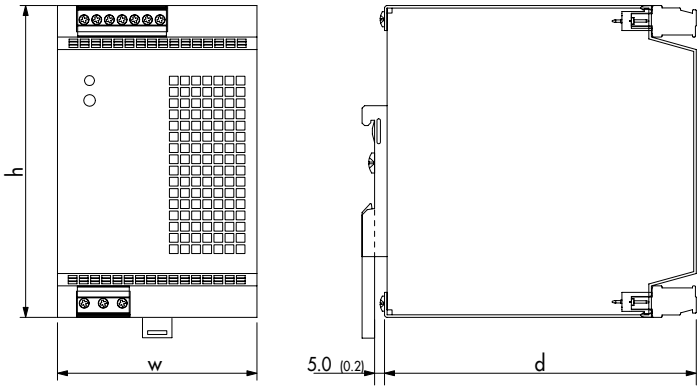
ATEX

Models

[1] Order code	Output power max.	[2] Output voltage nom.	[3] Output current max.
TSP 180-124WR	180 Watt	24 VDC	7.5 A
TSP 360-124WR	360 Watt	24 VDC	15.0 A
TSP 600-124WR	600 Watt	24 VDC	25.0 A

[1] Suffix EX: For ATEX certified models (Example TSP 180-124WR EX)
[2] Output voltage adjustable 12-14 VDC resp. 24-28 VDC
[3] Max. current at nominal output voltage and max. 40°C ambient temperature

Applicable 3-Phase Networks:	– TN, TT:	500 VAC Star configuration (EN60950+UL508) 500 VAC Delta (UL508 only)
	– IT:	400 VAC Delta (IEC-62103) 230 VAC Delta (IEC-60950) 500 VAC (UL508 only)
Input Voltage Ranges:		85–132 / {187–264 / 323–550 autorange} selectable by manual slide switch
Line regulation:		±0.5 % max.
Load regulation:		±0.5 % max.
Ripple & Noise:		<150 mVpk-pk
EMI suppression:		EN 61204-3, EN 61000-6-3
EMC immunity:		EN 61204-3, EN 61000-6-2 (industrial environment)
Output current limitation:		at max. output current (constant current, automatic restart)
Over-temperature protection:		switch off at over-temperature, automatic restart
Output characteristic:		selectable for parallel operation or battery charging application
Over voltage protection:		at 35V
Efficiency:		88 % typ.
Operating temperature:		–25 °C … +70 °C above 40 °C derating 2 %/K
Safety standards /approvals:		UL 60950-1 recognized, UL 508 listed, IEC/EN 60950-1, (CB-Report), EN 50178, EN 60204, EN 61558-2-4, SEMI F47, FM 3611, IEC/EN 60079-15 (Class I, Div. 2), ATEX 94/9/EC (opt. EX)
Degree of protection:		degree of electrical protection 1 (IEC 536)
Case protection:		IP20 (IEC 529)
Vibration/Shock:		IEC 60068-2-6 / IEC 60068-2-27
Connection:		detachable screw terminals
Case:		aluminium (chassis) / stainless steel (cover)
Mounting:		– snap-on mounting on 35 mm DIN-Rail – wall mounting brackets (option)



() = Inches

Dimensions

Type	Width w	Height h	Depth d
TSP 180	54 (2.13)	110 (4.33)	110 (4.33)
TSP 360	80 (3.15)	125 (4.92)	125 (4.92)
TSP 600	190 (7.48)	125 (4.92)	125 (4.92)

() = Inches

Download full datasheet at
http://www.tracopower.com/products/tsp.pdf

Industrial Power Supplies

Function Modules for TSP-Series

- TSP-REM360 Redundancy Module with active Current Sharing for highly reliable Power Systems
- TSP-BCM24 Battery Controller Module to configurate professional DC-Backup Systems (DC-UPS)
- TSP-BAT24 Battery Packs with capacity 3.4 to 12 Ah
- TSP-BFM24 Buffer Module to bridge Voltage Dips and Black-outs up to 4 sec. without Batteries

NEW Product

Models

Redundancy Module

Order code	Input	Max. power per input	Output voltage adjust	Output power max.
TSP-REM360	2 x 24 VDC 2 x Control input	360 W	**24 VDC** 24 – 27 VDC	**360 W**

Battery Controller Module

Order code	Input	Input power max.	Output voltage nom.	Output power max.
TSP-BCM24	24 VDC Power Supply and 24 V Battery	360W	**24 VDC**	**360 W**

Battery Pack

Order code	Nominal Voltag	Charge Current max.	Nominal Capacity (at 25°C, 77°F)
TSP-BAT24-034		0.80 A	**3.4 Ah**
TSP-BAT24-034	24 VDC	1.75 A	**7.2 Ah**
TSP-BAT24-034		3.00 A	**12.0 Ah**

Buffer Module

Order code	Output voltage range	Buffer time	Output power max.
TSP-BFM24	24...28VDC	200ms typ. @ 25A max. 4.0s max. @ 1.2A	**600 W**

Dimensions Function Modules

Type	Width	Height	Depth
TSP-REM360	35 (1.38)	110 (3.94)	110 (4.33)
TSP-BCM24	35 (1.38)	110 (3.94)	110 (4.33)
TSP-BFM24	54 (2.13)	110 (4.33)	110 (4.33)

Dimensions Battery Packs

Type	Width	Height	Depth
TSP-BAT24-034	137 (5.39)	140 (5.51)	76 (2.99)
TSP-BAT24-072	133 (5.24)	157 (6.18)	110 (4.33)
TSP-BAT24-120	199 (7.83)	157 (6.18)	110 (4.33)

() = Inches

Redundancy Module
With this module and two power supplies of the TSP series (90, 180 and 360 W models) a highly reliable, true redundant power system can be configured without any additional components. This module provides:

- Operation with true current sharing
- Alarm outputs and redundancy OK signal
- Hot swappable inputs can be loaded up to 15A each

Battery Controller Module
This module provides a professional battery controller to charge and monitor an external lead-acid battery. Together with a power supply of the TSP series and a battery pack a perfect DC-UPS system can be configured. This module provides:

- Battery protection for over voltage, deep discharge, short circuit and reverse connection
- Remote On/Off for battery and power supply
- Alarm outputs for input, output and battery
- Controlled end of charge voltage by temperature sensor

Battery Packs
Sealed, maintenance free Lead-Acid batteries incl. wall mounting kit.
Available with 3.4, 7.2 and 12 Ah capacity.

Buffer Module
This module will maintain the output voltage of a 24 VDC power supply during typical mains faults, short time blackouts or voltage dips of up to ten full 50 Hz cycles. During this buffer period no deterioration of the 24 VDC output voltage will occur. This module provides:

- Guaranteed Hold-up-time 200 ms/25 A to 4 s/1.2 A max.
- Capacitor bank for energy storage, no battery needed!
- Output 24 to 28 VDC, 600 W max.
- Active ready and inhibit signals

Download full datasheet at
http://www.tracopower.com/products/tsp.pdf

Industrial Power Supplies

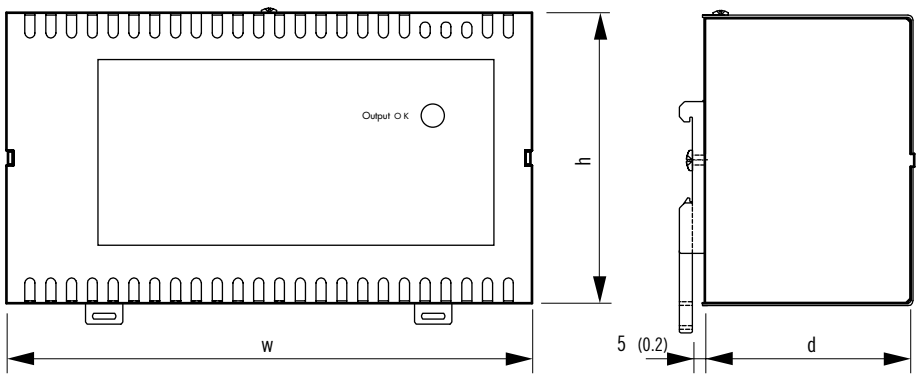
TIS Series, 50 – 600 Watt

- Low Profile Metal Case for DIN-Rail Mounting
- Standard Models with 12, 24, 48 and 72 VDC
- For System Applications expandable with built-in Function Modules (see next page)
- Adjustable Output Voltage
- Overload Protection
- Conducted Emission to EN 55011, Class B
- Worldwide Safety Approvals

Models

Order code	Output power max.	Output voltage (adjustable range)	Output current max.
TIS 50-112	50 Watt	12 VDC (12–14 VDC)	3.5 A
TIS 50-124		24 VDC (24–28 VDC)	2 A
TIS 75-112	75 Watt	12 VDC (12–14 VDC)	6 A
TIS 75-124		24 VDC (24–28 VDC)	3 A
TIS 75-148		48 VDC (48–52 VDC)	1.5 A
TIS 150-124	150 Watt	24 VDC (24–28 VDC)	6 A
TIS 150-148		48 VDC (48–52 VDC)	3 A
TIS 300-124	300 Watt	24 VDC (24–28 VDC)	12 A
TIS 300-148		48 VDC (48–52 VDC)	6 A
TIS 300-172		72 VDC (60–76 VDC)	4.2 A
TIS 500-124-230	500 Watt	24 VDC (24–28 VDC)	20 A
TIS 500-124-115		24 VDC (24–28 VDC)	20 A
TIS 600-124	600 Watt	24 VDC (24–28 VDC)	24 A
TIS 600-148		48 VDC (48–52 VDC)	12 A
TIS 600-172		72 VDC (60–76 VDC)	8.5 A

Input voltage range:	– 93–132 VAC / 187–264 VAC (user selectable) 50/60 Hz – TIS 50 models: 93–264 VAC (universal input) 50/60 Hz – TIS 500-124-230: 187–264 VAC 50 Hz – TIS 500-124-115: 93–132 VAC 60 Hz
Line regulation:	±0.2 % max.
Load regulation:	±1.0 % max.
Ripple & Noise:	<50 mVpk-pk (20 MHz BW)
EMI suppression:	EN 55011, class B, EN 55022, class B and FCC,level B
EMC immunity:	EN 61000-6-2
Output current limitation:	at 110 % of Iout max. (constant current)
Overvoltage protection:	at 140 % of Vout nom.
Efficiency:	90 % typ.
Operating temperature:	–25 °C … +70 °C above 50 °C derating 2 %/K
Safety standard / approvals:	cUL/UL 60950-1, UL 508C listed, UL 1604 listed (except for models with options), IEC/EN 60950-1, CB-report
Connection:	detachable screw terminals (plugs included) (TIS 600 models: screw terminal blocks)
Case:	stainless steel, aluminium
Mounting:	snap-on mounting on 35 mm DIN-Rail or chassis mounting
Note:	Output current characteristics suitable for battery charging applications



Dimensions

Type	Width w	Heigth h	Depth d
TIS 50	75 (2.95)	100 (3.94)	56.7 (2.23)
TIS 75	90 (3.54)	114.6 (4.51)	56.7 (2.23)
TIS 150	157 (6.18)	114.6 (4.51)	56.7 (2.23)
TIS 300	207 (8.15)	114.6 (4.51)	83.0 (3.27)
TIS 500	220 (8.66)	130 (8.66)	83.0 (3.27)
TIS 600	243 (9.57)	177.2 (6.98)	83.0 (3.27)

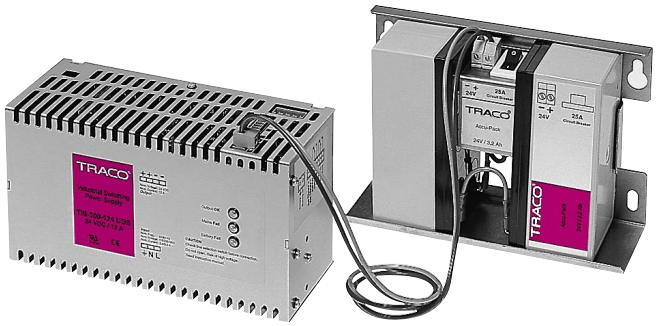
() = Inches

Download full datasheet at
http://www.tracopower.com/products/tis.pdf

Industrial Power Supplies

TIS Series with Function Modules

- Additional Functions for System Applications in Process Automation, Machine Tools, etc.
- Basic TIS Series Power Supplies can be extended with one of the following integrated Function Modules:
  - RED: for True N+1 Redundancy Operation
  - SIG: AC-Power Fail, DC-OK Signal and Remote On/Off
  - UDS: Battery Controller Module to configurate DC-Backup Systems



Models

Description	*Order code	Output power max.	Output voltage nominal	Output current max.
Models with RED Module	TIS 150-124 RED	150 Watt	24 VDC	6 A
	TIS 150-148 RED	150 Watt	48 VDC	3 A
	TIS 300-124 RED	300 Watt	24 VDC	12 A
	TIS 300-148 RED	300 Watt	48 VDC	6 A
	TIS 600-124 RED	600 Watt	24 VDC	24 A
	TIS 600-148 RED	600 Watt	48 VDC	12 A
Models with SIG Module	TIS 150-124 SIG	150 Watt	24 VDC	6 A
	TIS 150-148 SIG	150 Watt	48 VDC	3 A
	TIS 300-124 SIG	300 Watt	24 VDC	12 A
	TIS 300-148 SIG	300 Watt	48 VDC	6 A
	TIS 600-124 SIG	600 Watt	24 VDC	24 A
	TIS 600-148 SIG	600 Watt	48 VDC	12 A
Models with UDS Module	TIS 300-124 UDS	300 Watt	24 VDC	12 A
	TIS 600-124 UDS	600 Watt	24 VDC	24 A
Battery Pack	TIS 24-32 AP		24 VDC	3.2 Ah
	TIS 24-70 AP		24 VDC	7 Ah

* includes power supply, relative function module and terminal plugs

RED Module
With this module it is possible to parallel up to 5 power supplies with active current sharing for true N+1 operation. De-coupling diodes (OR-ring diodes) and also alarm output to signal a unit failure are included in this option.

SIG Module
This module provides 3 functions: AC-Power fail signal and DC-OK signal, both with isolated relay contacts. In addition a remote On/Off input is available to control the power supply.

UDS Module
With this module, a professional battery management system to charge and monitor an external battery is added to the basic power supply. In case of a power failure the battery is switched automatically and without any interruption to the DC-output.
Power fail and low battery alarm signals are available. During normal operation battery status is checked periodically and the external battery is fully protected under any operation condition.

Battery Pack
The battery pack contains high quality, maintenance free lead-acid batteries with 3.2 Ah resp. 7.0 Ah capacity fixed together with a resetable fuse in a mounting frame. Together with models TIS 300-124 UDS or TIS 600-124 UDS the battery pack provides a complete and reliable DC-UPS system.
Backup time depends on load current and battery capacity.

For further information and power supply specifications please refer to Industrial Power Supplies TIS Series 50–600 Watt. Dimensions same as basic models.

Download full datasheet at
http://www.tracopower.com/products/tis.pdf

Glossary of Power Conversion Terminology

A

Absolute Maximum Ratings

Limit of specifications that, if exceeded, could cause permanent damage to the power supplies and converters. These are not continuous ratings, and proper operation is not implied.

Ambient Temperature

The temperature of still air immediately surrounding a power supply or converter. The temperature measurement should be made about 100 mm (4 inch) from the body of the converter or underneath of the power supply. See also **Operating Temperatur**e.

ATEX

ATEX 94/9/EC is an European Directive which provides the technical requirements to be applied to equipment intended to use in potentially explosive atmospheres. It is named after the French «**AT**mosphere **EX**plosible».

B

Base Plate

A substrate to which circuit components are mounted or, a metal plate to which the power system is attached. Normally used to draw heat away from critical circuits components.

Boost Regulator

A switching converter topology in which an input inductor is used to store energy. This energy is transferred to the output when the shunt switch is turned off. The boost regulator will take an unregulated input voltage, and produce a higher, regulated output voltage.

Bridge Converter

A switching converter topology that employs four switching elements (full bridge) or two switching elements (half bridge). Bridge converters provide high output power and low ripple, but are significantly more complex than other types of converter topologies.

Burn-In

The operation of newly manufactured power supplies or converters under load conditions for a period of time prior to shipment. The intend is to eliminate infant mortality of components .The time period and conditions (input power cycling, load switching, temperature, etc.) will vary from product to product.

C

Case Temperature

The temperature of the power supply or converter case under normal operating conditions. Often used as a specification for DC/DC converters with extended temperature ranges, case temperature is referred to also as base plate temperature.

CB-Report

Document necessary for the mutual recognition of approvals between different national safety test standards. http://www.cbscheme.org/

CE Marking

CE

The mark consist of the letters CE (**C**ommunaute **E**uropeen, European Comitee) and indicates compliance with all relevant EC-directives which concern the marked product. It means that the natural or juristic person which executed or ordered marking has made sure that the good complies with all harmonised directives and has passed all conformity testing procedures required.

CENELEC

The Comite pour Européen de Normalisation Electronique (European Committee for Electrotechnical Standardisation) is a technical committee that recommends standards for adoption by the European Community (EC). These standards (referred to in the applicable EC directive issued by the committee) cover EMI/RFI interferences, intrinsic safety, immunity, etc.
http://www.cenelec.org/Cenelec/Homepage.htm

Chassis Ground

The voltage potential of the chassis or enclosure surrounding a power system.

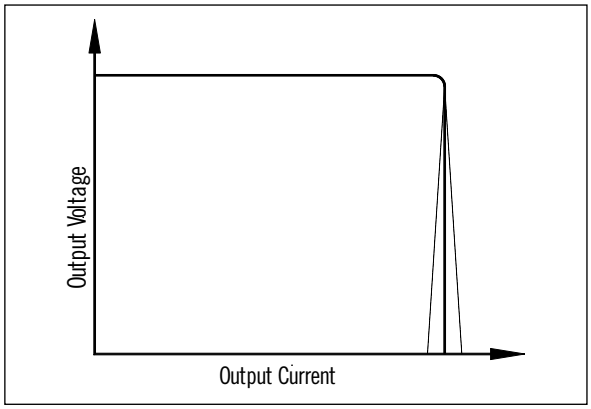
Clearance Distance The shortest distance (through air) separating two conductors or circuit components.

Common A conductive path used as a return for two or more circuits. Common is often used interchangeably with ground, which is not technically correct unless it is connected to earth.

Common-Mode Noise The component of noise which is common to both the DC output and returns lines with respect to an electrically fixed point, usually the chassis ground.

Constant Current A power supply or converter that regulates its output current to within a specified range regardless of changes in output load, input line and ambient temperature.

Constant Current Limiting Current-limiting circuit that holds output current at some maximum value whenever an overload of any magnitude is experienced. **See graph 1**.



Graph 1:
Constant Current Limiting

Continuous Shield see **Six-Sided Shielding**.

Convection Cooling The dissipation of heat via still air. (in contrary to **Forced Air Cooling**)

Converter (DC/DC) A device that accepts a DC input voltage and produces a DC output voltage. Typically the output produced is a different voltage level than the input. However, converters sometimes have the same input/output voltage, and are used to provide potential isolation, noise isolation, power bus regulation, etc.

Creepage Distance The shortest distance between two conductors (typically one conductor primary and one conductor secondary).

Cross Regulation In a multiple output power supply or converter, the percent voltage change at one output caused by the load change on another output.

CSA **C**anadian **S**tandards **A**ssociation. An independent Canadian organisation testing for public safety, similar to the function of Underwriters Laboratories (UL) in the United States.
http://www.csa-international.org/

Current Foldback See **Foldback Current Limiting**.

Current Limiting A circuit feature that protects the power supply or DC/DC converter (or load) from damage under overload condition. The maximum power supply or CD/DC converter output current is automatically limited to a predetermined, safe value. If the power supply or DC/DC converter is specified for auto restart, normal operation is automatically restored when the overload condition is removed.

Current Limit Knee On a plot of output voltage vs. output current, the point at which at which current begins to limit or foldback.

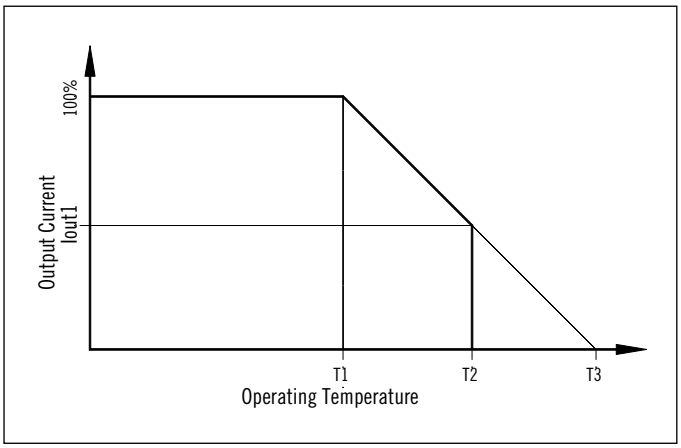
Current Share Multiple power supplies or DC/DC converters are often connected redundantly (to increase system reliability) or in parallel (to increase system power). When connected in this way, their outputs are connected together

and each power supply or DC/DC converter supplies approximately an equal «share» of the load current. Current sharing can be achieved with external passive circuits (by synchronising multiple power supplies or DC/DC converters and trimming their outputs within a very tight error band) or active circuits (power supplies or converters that feature internal circuits to monitor and adjust output load current). The most popular redundant topology is the «N+1» circuit.

D

Derating

The specified reduction of an operating parameter to improve reliability. Generally for power supplies and DC/DC converters, it is the reduction in output currentr at elevated temperatures. **See graph 2**.



Graph 2: Derating

Differential Mode Noise

That component of noise measured with respect to output or input to its returns; it does not include common-mode noise. **See Ripple and Noise.**

Drift

The change in output voltage of a power supply or DC/DC converter over a specified period of time, following a warm-up period, with all other operating parameters such as line, load and ambient temperature held constant.

Dynamic Current Allocation

A system for a dual positive output power supplies or DC/DC converters where the full rated max. current may be taken from either output in whatever combination is required.

Dynamic Load

An output load that changes rapidly. Normally specified as a load change value during a specified period of time.

Dynamic Response

The output overshoot that occurs when the output load of a power supply or DC/DC converter is a turned on/off or abruptly changed. This overshoot defines the high frequency output impedance of the converter.

E

Efficiency

The ratio of total output power to input power expressed in percent. It is normally specified at full load and nominal input voltage.

Electrical Strength

See **Working Voltage**

EMC

Electromagnetic Compatibility, relating to compliance with electromagnetic emissions and susceptibility (immunity) standards.

EMI

Electromagnetic Interferences are electronic disturbances that may interrupt, disturb or otherwise impair the performance of electronic equipment.

EMI Filter

Switch mode power supplies and most DC/DC converters are filtered by using an EMI filter on the input or primary side to be compliant with applicable EMC standards. When power supplies or converters are used in

«real» situations, driving active electronic circuits, especially those featuring high speed and/or high power switching, the characteristic of the interferences generated can change dramatically, thereby reducing the effectiveness of the EMI-filter. It is the final equipment as an entity, that is required to conform to the regulations, not the individual internal sub assemblies, like power supplies or converters. So, specifying a power supply or converter which meets the EMI classes does not remove the need for testing of the completed equipment for conformity. The employment of EMI compliant power supplies or converters is not a guarantee of system compliance.

EMI conducted

Also called radio frequency interference (RFI). Conducted EMI is unwanted high-frequency energy caused by the switching transistors, output rectifiers, and transformers in switching power supplies and DC/DC converters and reflected back into the power line. That portion that is present on the input and output lines is known as Conducted EMI. Most Conducted EMI measurements are done between 150 kHz and 30 MHz.

EMI radiated

Also called radiofrequency interference (RFI). Radiated EMI is unwanted high-frequency energy caused by the switching transistor, output rectifiers, and zener diodes in switching power supplies and DC/DC converters and emitted into the area surrounding a power supply or DC/DC converter. That portion that is radiated through space is known as Radiated EMI. Most Conducted EMI measurements are done between 30 MHz and 300 MHz or 30 MHz and 1 GHz.

ESD

Electrostatic Discharge. ESD is the current produced by two objects having a static charge when they are brought close enough to produce an arc or discharge.

ESR

Equivalent Series Resistance. The amount of resistance in series with an ideal (loss less) capacitor, which exactly duplicates the performance of a real capacitor. In general, the lower the ESR, the higher the quality of the capacitor and the more effective it is as a filtering device. ESR is a prime determinant of ripple in switching power supplies.

F

Faraday Shield

An electrostatic shield between input and output windings of a transformer. This can be used to reduce coupling capacitance, which in turn reduces output common mode noise.

FCC

The **F**ederal **C**ommunications **C**ommission is a US government agency that sets standards for, and governs the testing of conducted and radiated emissions. These are system level standards, but they are also used in power supplies and DC/DC converter specifications.

Ferroresonant

A transformer in which part of the core is driven into saturation by a resonant tank circuit. The output of the transformer, taken from the saturated portion, is relatively immune to variations in input voltage. A principle used for simple open-loop (non-feedback) voltage regulation of power supplies or DC/DC converters.

Floating Output

A power supply or DC/DC converter output that is ungrounded and not referenced to another output. Typically, floating outputs are fully isolated and may be referenced positive or negative by the user. Outputs that are not floating share a common return and as such, are referenced to one another.

Flyback Converter

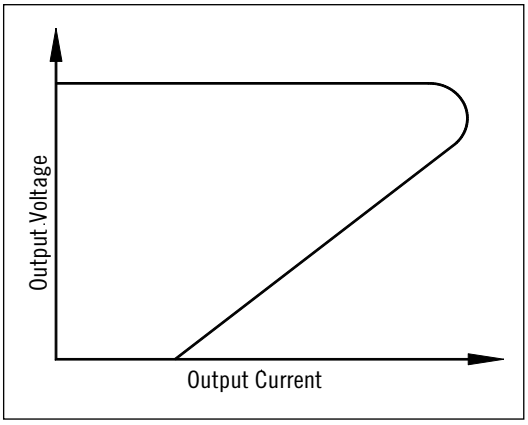
Also called «Buck-Boost» converter, this topology typically uses a single transistor switch and eliminates the need for an output inductor. Energy is stored in the transformer primary during the first half of the switching period when the transistor switches «ON». During the second half of «Flyback period when the transistor is OFF», this energy is transferred to the transformer secondary and load. This technique is cost effective because of a minimum number of components required.

Foldback Current Limiting

A power supply or DC/DC converter output protection circuit whereby the output current decreases with increasing overload, reaching a minimum at short circuit. This minimises the internal power dissipation under overload conditions. **See graph 3 on page 71.**

Forced Air Cooling

The use of a fan (or other air moving equipment) within a system to move air across heat producing components in order to reduce the ambient temperature.



Graph 3: Foldback Current Limiting

Forward Converter Also called a «Buck-Derived» converter, this topology, like the flyback converter, typically used a single transistor switch. Unlike the flyback converter, energy is transferred to the transformer secondary while the transistor is «ON», and stored in an output inductor.

Free Convection An operating environment in which the natural movement of air (unassisted by fans or blowers) is sufficient to maintain the power supply or DC/DC converter within its operating limits. See also **Convection Cooling**.

Full Bridge Converter A topology that typically operates as a forward converter but uses a bridge circuit, consisting of four switching transistors, to drive the transformer primary, used to handle high power levels.

Full Load The maximum value of output load specified for a power supply or DC/DC converter under continuous operating conditions.

Full Wave Rectifier A circuit (bridge or centre tapped) that rectifiers both halves of an AC waveform.

G

Galvanic Isolation Two circuits which have no ohmic connection are considered to be «galvanically isolated» from each other. Galvanic isolation (separation) is achieved by using a transformer, opto-coupler, etc.

Ground An electrical connection that is made to earth (or to some conductor that is connected to earth). A power supply or DC/DC converter «common» is not actually ground unless it is connected to earth.

Ground Loop A feedback problem caused by two or more circuits sharing a common electrical line, usually a common ground line. Voltage gradients in this line caused by one circuit may be capacitively, inductively, or resistively coupled into the other circuits via the common line.

H

Half Bridge Converter A power switching circuit similar to the full bridge converter except that only two transistors are used, with the other two replaced by capacitors.

Half-Wave Rectifier Single-diode rectifier circuit that rectifiers one-half the AC input wave.

Harmonic Current See **Harmonic Distortion**.

Harmonic Distortion For sinusoidal AC current waveforms, the distortion characterise by the present of multiple harmonics of the fundamental frequencies. This distortion is caused by the switching action of the power supply.

Heat Sink A metal plate, extrusion, case, etc. that is used to transfer heat away from sensitive components and/or circuits.

Hicc-up Mode

Also called Cycle-to-Cycle Mode. An operating mode triggered by an output fault condition (short circuit) in which the power supply or DC/DC converter cycles on and off. The duty cycle of on time to off time maintains the internal power dissipation at a safe level until the fault condition is corrected.

Hold-Up Time

The time during which a power supply's or DC/DC converter's output voltage remains within specification following the loss of input power.

IEC

International **E**lectrotechnical **C**ommission. The IEC is an organisation based in Switzerland (Geneva) that sets standards for electronic products and components. IEC does not conduct any testing, however, their standards have been adopted by most of worldwide national safety agencies.
http://www.iec.ch/

Input Transient

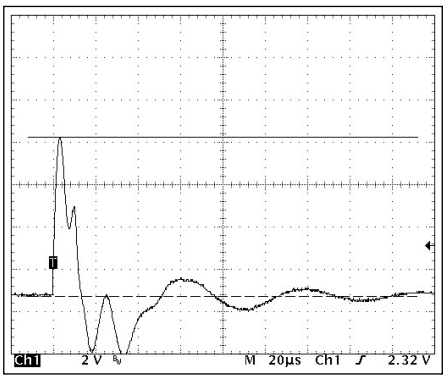
A spike or step change in the input line to a power supply or DC/DC converter. Input transient protection circuits are used to shield sensitive components (such as semiconductors)from possible damage due to transient voltages.

Input Voltage Range

The high and low input voltage limits within which a power supply or DC/DC converter may be operated. A common specification for DC/DC converters is to specify the ratio of high line to low line (i.e. a range of 18VDC to 36VDC is 2:1 or a range of 18VDC to 72VDC is 4:1).

Inrush Current

A high surge of input current that occurs in power supplies, DC/DC converters, switchers and occasionally in linears upon initial turn on, caused by charging of the input capacitors. Also called Input Surge Current. See **graph 4**.



Graph 4: Inrush Current

Inrush Current Limiting

A circuit which limits the inrush current during turn-on of a power supplies and DC/DC converters.

Insulation

Operational Insulation: Insulation needed for the correct operation of the equipment. Operational Insulation by definition does not protect against electrical shock, It may, however, serve to minimize exposure to ignition and fire

Basic Insulation: Insulation to provide basic protection against electrical shock.

Supplementary Insulation: Independent insulation applied in addition to Basic Insulation in order to ensure protection against electrical shock in the event of a failure of the Basic Insulation.

Double Insulation: Insulation comprising both Basic Insulation and Supplementary Insulation.

Reinforced Insulation: A single insulation system which provides a degree of protection against electric shock equivalent to Double Insulation under the conditions specified in the applicable standards. Note: The term «insulation system» does not imply that the insulation has to be in one homogeneous piece. It may comprise several layers which cannot be tested as supplementary or Basic Insulation.

Insulation Resistance

The resistance offered by an insulating material to current flow.

Internal Power Dissipation The power dissipated (as heat) within the power supply or DC/DC converter during normal operation. Primarily a function of the power handling capability and efficiency of the power supply or DC/DC converter. Internal power dissipation is given as a maximum specification that cannot be exceeded without risking damage to the power supply or DC/DC converter.

Inverter A device that delivers AC power when energised from a source of DC power. Inverters may be frequency, amplitude, or pulse-width modulated to vary output voltage.

Isolation The electrical separation between input and output of a power supply or DC/DC converter by means of the power transformer. The isolation resistance (normally in megaohms) and isolation capacitance (normally in picofarads) are generally specified and are a function of materials and spacings employed throughout the power supply or DC/DC converter.

Isolation Test Voltage A test to determine if the breakdown voltage of a transformer, power supply or DC/DC converter exceeds the minimum requirements. It is performed by applying a high voltage between the two isolated test points. In production the isolation of a power supply or DC/DC converter will be tested for a time period of 1 to 6 seconds max.(according to EN 50116) in order not to cause stress to the insulation material.

Isolation Voltage (rated) Rated Isolation voltage is defined as the maximum voltage across the isolation barrier (i.e. input to output for converters or primary to secondary for power supplies and transformers) a device can withstand for a fixed time period. Normally this time period is specified with 60 seconds (according to UL/EN/IEC 60950). The actual breakdown voltage is typically in excess of 1000V higher than the rated isolation voltage. The reason for rating a conservative isolation voltage is to ensure that the isolation testing of a power supply or converter does not degrade the isolation barrier in any way.

L

Leakage Current The current flowing from input to output or input to ground/chassis or output to ground/chassis of an isolated power supply or DC/DC converter at a specified voltage level.

Line Regulation The variation of an output voltage due to a change in the input voltage, with all other factors held constant. Line regulation is expressed as the maximum percentage change in output voltage as the input voltage varied over its specified range.

Line Voltage The AC input voltage to a power supply or the DC input voltage to a DC/DC converter.

Linear Regulator A stabilisation circuit in which a control device is placed in series (or parallel) with the load to give a constant voltage across the load. The control device is always conducting. The term «linear» is used because the voltage drop across the control device is varied continuously to dissipated unused power.

Load The electronic components or circuitry connected to the output of a power supply or DC/DC converter. The characteristic (resistance, reactance, etc.) of the load determines the amount of power drawn from the power supply or DC/DC converter. For voltage regulated power supplies and DC/DC converters, the load is the output current.

Load Regulation Variation of the output voltage due to a change in the output's load within a specified range with all other factors held constant. The load change may be specified for other than no load to full load such as 20 % load to full load or 10 % load to 90 % load and it is expressed as a percentage of the nominal DC output voltage.

Load Sharing See **Current Share**.

M

Maximum Operating Temperature The maximum operating temperature at which a power supply or DC/DC converter will start up and operate within the specified operating parameters.

Minimum Load

The minimum amount of output load required maintaining normal continuous operating specifications. Usually associated with PWM (Puls Width Modulation) controlled power supplies or DC/DC converters.

Minimum Operating Temperature

The minimum temperature at which the power supply or DC/DC converter will start up and operate to within specified operating parameters.

Module

A fully encapsulated AC/DC power supply or DC/CD converter.

MTBF

The Mean Time Between Failure is a unit of measure, expressed in hours, that gives an indication of the relative reliability of a power supply or DC/DC converter. MTBF is based upon actual operating data (demonstrated) or derived per the conditions of IEC 61709 standard (calculated). Traco Electronic AG calculates MTBF values for their products in general for ground benign and at +25 ° C ambient.

N

N+1

A power system technology used to achieve high reliability levels trough system redundancy. The system consists of a number of power supplies or DC/DC converters connected in parallel, sharing the power drawn by the system load. One more power supply or DC/DC converter than is necessary to provide full load current is used (i.e. for a 600 W load, three 300 W power supplies are used). Thus, if any single power supply or DC/DC converter fails, the remaining ones will continue to supply current to the load.

Natural Convection

See **Free Convection**.

Noise

Noise is the aperiodic, random component of undesired deviations in output voltage. Normally called Ripple and Noise and given as a peak-to-peak value with a specified bandwidth (typically 20 MHz). See also **Ripple and Noise**.

Nominal Values

An ideal value that is used as a reference point. Typically it is not the same as the value actually measured.

O

Open Frame

A construction of power supplies or DC/DC converters, which are not encased in a metal or plastic case and are not covered with a potting compound.

Operating Temperature Range

The range of temperatures within which a power supply or DC/DC converter will perform within specified operating parameters.

OR-ing Diodes

Also called decoupling diodes. Diodes, that isolates a faulty power supply or DC/DC converter from the load or other power supplies or DC/DC converters. Typically, these diodes are used externally in the output circuit of a power supply or DC/DC converter.

Output Voltage Accuracy

The maximum allowed deviation of the DC output of a power supply or DC/DC converter from its ideal or nominal value. Expressed as a percentage of output voltage. Often called output voltage tolerance.

OTP

Over Temperature Protection. A protection system for power supplies or DC/DC converters where the power supply or DC/DC converter shuts down if the ambient temperature exceeds the ratings. OTP is intended to save the power supply or DC/DC converter in the event of a failure of the cooling system. OTP usually measures the hottest spot in the power supply or DC/DC converter rather than the ambient temperature.

Overload Protection

See **Current Limiting**.

OVP

Over Voltage Protection. A protection mechanism for the load circuit which shuts down the supply or crowbars or clamps the output, when its voltage exceeds a preset level.

P

Parallel Operation
The connection of the outputs of two or more power supplies or DC/DC converters of the same output voltage to obtain a higher output current than from either power supply or DC/DC converter alone. This requires power supplies or DC/DC converters specifically designed to share the load.

Peak Transient Output Current
The maximum peak current that can be delivered to a load during transient load conditions, such as electric motor starts.

Pi-Filter
A commonly used filter at the input of a switching power supply or DC/DC converter to reduce reflected ripple current. The filter usually consists of two parallel capacitors and a series inductance.

Power Density
The ratio of a power supply or DC/DC converter output power to its volume.

Power Factor
In a power supply, the ratio of true input power to apparent input power. In these circuits, power factor is a measure of the input current that is in phase with the input voltage and thus constributing to the average power.

Power Factor Correction
(PFC) Standard power supplies draw line current in pulses around the peaks in line voltage. This may be undesirable for several reasons. PFC circuits ensure that the line current is drawn sinusoidal and in phase with the sinusoidal line voltage. This reduces the harmonics distortion of the power supply and increases the useful power drawn from the mains. PFC circuits can be active or passive.

Power Fail Detect
A circuit that senses the DC voltage across the input capacitors of a switching power supply. Should the AC input line fail, it senses an abnormally low DC level across the capacitors and provides an logic output signal warning of imminent loss of output power.

Power Good Signal
A signal that indicates the status of the DC output of the primary channel of a power supply or a DC/DC converter. Also called DC-OK.

Puls Width Modulation
A circuit used in switching power supplies or DC/DC converters where the switching frequency is held constant and the width of the power pulses is varied, controlling both line and load changes with minimal dissipation.

Push-Pull Converter
A converter topology that typically is configured as a forward converter but uses two transistor switches and a centre tapped transformer. The transistor switches turn on and off alternately.

R

Redundant Operation
The ability to connect power supplies or DC/DC converters in parallel so that if one fails the other will provide continuous power to the load. This mode is used in systems when a power supply or a DC/DC converter failure cannot be tolerated. See also **N+1 Redundancy**.

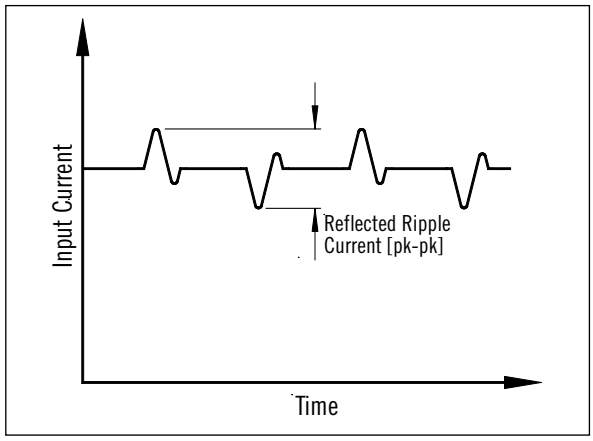
Reflected Ripple Current
The AC component generated at the input of a power supply or DC/DC converter by the switching operation of the converter, stated as peak-to-peak or RMS. See **graph 5**.

Remote Sensing
A method of moving the measuring point for the regulation from the output terminals to the load. Compensates voltage drops in the power distribution bus, but negative impact on dynamic load behaviour must be tolerated.

Reverse Voltage Protection
A feature, which protects a power supply or DC/DC converter against a reverse voltage, applied at the input or output terminals.

RFI
Radio Frequency Interference. See **EMI, EMI-Conducted** and **EMI-Radiated**.

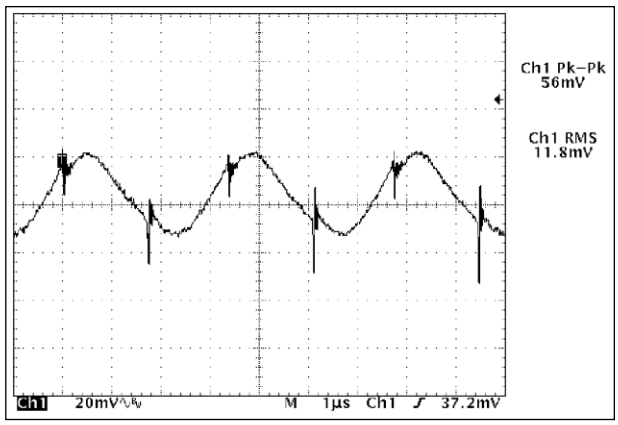
Ripple
The periodic AC noise component of the power supply or DC/DC converter output voltage. See **graph 6 on page 76**.



Graph 5: Reflected Ripple Current

Ripple and Noise

The magnitude of AC voltage on the output of a power supply or DC/DC converter, expressed in millivolts peak-to-peak or RMS, at a specified band width (typically 20MHz). This is the result of the feed through of the rectified line frequency, internal switching transients and other random noise. See **graph 6**.



Graph 6: Ripple and Nois

RoHS Directive

This European Directive (2002/95/EC) specifies the maximum concentration of lead and 5 other hazardous substances for 10 categories of electronic products listed in this Directive. Component (built-in) power supplies and DC/DC converter products are not falling under this Directive by law.
http://europa.eu.int/eur-lex/pri/en/oj/dat/2003/l_037/l_03720030213en00190023.pdf

Royer Converter

A self-oscillating push-pull switching circuit that is commonly used in low cost, low power DC/DC converter designs. Also called the Classic Converter.

S

Safety Class II

The safety class II symbol specifies a power supply product which is double insulated and due to that no protective earth connection is available nor needed. That means that the product is designed with two layers of insulations between hazardous voltage and accessible parts.

SELV

Safety Extra Low Voltage. A term used by safety regulatory body (IEC,UL, CSA, CENELEC, etc.) to describe the highest voltage level (single fault condition included) than can be contacted by a person without causing injury. It is usually defined as 60 VDC or 42.4 Vpk max..

Sense Lines

An output line used in «Remote Sensing» connection to route the output voltage (at the load or direct on the power supplies or DC/DC converters output) back to control feedback loop. See **Remote Sensing**.

Short Circuit Protection

A feature, which limits the output current of a power supply or DC/DC converter under short circuit conditions, so that the power supply or DC/DC converter will not be damaged.

Six-Sided Shielding

A construction technique in which the circuit is placed into a metal case. This metal shielding minimises any noise radiation from the converter components. A continuous shielded case has the base (or header) welded together, further reducing potential noise leakage.

Soft Start

A feature which limits the start-up switching current (inrush current) of a switching power supply or DC/DC converter and causes the output voltage to rise gradually to its final value.

Standby Current

The current drawn by a power supply or DC/DC converter when it is no load and/or has been shut down by a control signal.

Still Air

An operating environment in which the air surrounding the power supply or DC/DC converter is restricted in small enclosures (often sealed) where it cannot move freely.

Storage Temperature

The range of ambient temperatures over which a power supply or DC/DC converter can be safely stored, non-operating, with no damage to its components.

Surface Mount Technology

(SMT). A space saving technique whereby special leadless components are soldered onto a surface of a PCB.

Switching Frequency

The rate at which the DC voltage is switched in a DC/DC converter or switching power supply.

Switching Regulator

A high-efficiency non-isolated DC/DC converter consisting of inductors and capacitors to store energy and switching elements (typically transistors or SCR's), which open and close as necessary to regulate voltage across the load. The switching duty cycle is generally controlled by a feedback loop to stabilise the output voltage, generally by means of a Pulse-Width Modulation.

Synchronous Rectifiers

A circuit arrangement where the output rectifier diodes of a power supply or DC/DC converter are replaced with active switches such as MOSFET's. The switches are turned on and off under control and act as rectifier. This results in considerably lower losses in the output stage and subsequently much higher efficiency. They are particularly useful with low voltage outputs.

T

Temperature Coefficient

The average percent change in output voltage per degrees centigrade change in ambient temperature over a specified temperature range, with load and input voltage held constant.

Thermistor

A device with relatively high electrical resistance when cold and almost no resistance when at operating temperature. Thermistors are sometimes used to limit inrush current in off-line switchers.

Transient Recovery Time

The time required for the output voltage of a power supply or DC/DC converter to settle within specified output accuracy limits following a step change in output load current or a step change in input voltage.

U

UL listing Mark

c UL us
LISTED

The UL listing mark shows that the whole equipment is approved by UL according to the relevant US safety standard requirements. If a product or equipment is carrying the UL listing mark no additional testing by UL is required. UL will only investigate if the product or equipment is used according to the manufacturers published specifications which has to comply with the UL test report. The «c» in front of the UL listing mark means that the product complies with relative Canadian safety standards as well.

UL recognition Mark

c UL us

The UL recognition mark shows that the product is recognised as a component and has been approved by UL according to the relevant US safety standard requirements. The «c» in front of the UL listing mark means that the product complies with relative Canadian safety standards as well.

UL

Underwriter Laboratories, an independent, non-profit organisation testing for public safety in the United States. UL recognition or listing is required for equipments used in specific applications.
http://www.ul.com/

Universal Input

An AC input to a power supply that accept all the standard voltage levels available from the mains. Typically specified at 85 VAC to 264 VAC (100, 110, 230 and 240 VAC).

UPS

Uninterruptible Power Supply. A system designed to supply power in the event of temporary or permanent loss of AC line power. This is accomplished by means of a back-up battery and a DC/AC inverter or DC/DC converter.

Under Voltage Lockout

A protection system for power supplies or DC/DC converters where the power supply or DC/DC converter is deliberately shut down if the input voltage drops below a pre-defined level. Some hystereses is usually present to prevent the power supply or DC/DC converter oscillating on and off. Under voltage lockout is usually needed with battery systems where the voltage decreases gradually with the time rather than snaps off quickly.

V

Voltage Balance

The difference in magnitude, in percent, between the two output voltages of a dual output power supply or DC/DC converter where the voltages have equal nominal values with opposite polarities.

W

Warm-up Time

The time required, after initial turn-on, for a power supply or DC/DC converter to operate within its specifications.

Working voltage (rated)

Rated working voltage or electrical strength is the maximum continuous voltage that can be sustained continuously across the isolation barrier of a power supply or converter without causing stress to the isolation barrier. The rated working voltage is typically much lower than the rated isolation voltage. To define the max. working voltage from a specified isolation voltage is difficult since it depends much on the material and construction of the insulation. A relative conversion table can be found in the IEC/EN/UL 60950 safety standard.