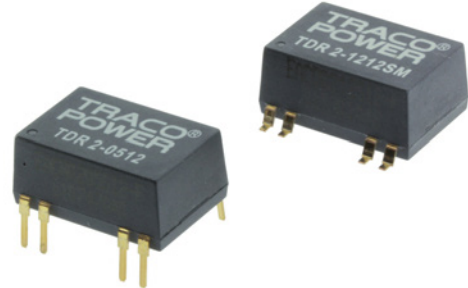


Features

- ◆ Compact design in SMD or DIP package
- ◆ Wide 2:1 input voltage range
- ◆ Fully regulated outputs
- ◆ Low ripple and noise
- ◆ No minimum load required
- ◆ Temperature range -40°C to $+85^{\circ}\text{C}$ without derating
- ◆ I/O isolation 1500 VDC
- ◆ Continuous short-circuit protection
- ◆ Remote On/Off control
- ◆ Fully RoHS compliant
- ◆ 3-year product warranty



The TDR-2 series is a family of compact 2 W dc/dc-converters with 2:1 input voltage ranges and tightly regulated output voltages even under no load conditions. The product is available in SMD-package or in DIP-package. They work with high efficiency over the full load range and come with a remote On/Off input.

The usability in temperature ranges of up to 85°C without power derating, continuous short circuit protection and excellent immunity against environmental influences make these converters very reliable.

A TDR-2 converter is the ideal solution for space critical high end applications in communication equipment, instrumentation and industrial electronics.

Models

Order code DIP models	Order code SMD models	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TDR 2-0511	TDR 2-0511SM	4.5 – 9.0 VDC (5 VDC nominal)	5.0 VDC	400 mA	80 %
TDR 2-0512	TDR 2-0512SM		12 VDC	167 mA	81 %
TDR 2-0513	TDR 2-0513SM		15 VDC	134 mA	83 %
TDR 2-0522	TDR 2-0522SM		± 12 VDC	± 83 mA	81 %
TDR 2-0523	TDR 2-0523SM		± 15 VDC	± 67 mA	82 %
TDR 2-1211	TDR 2-1211SM	9 – 18 VDC (12 VDC nominal)	5.0 VDC	400 mA	81 %
TDR 2-1212	TDR 2-1212SM		12 VDC	167 mA	81 %
TDR 2-1213	TDR 2-1213SM		15 VDC	134 mA	84 %
TDR 2-1222	TDR 2-1222SM		± 12 VDC	± 83 mA	83 %
TDR 2-1223	TDR 2-1223SM		± 15 VDC	± 67 mA	82 %
TDR 2-2411	TDR 2-2411SM	18 – 36 VDC (24 VDC nominal)	5.0 VDC	400 mA	81 %
TDR 2-2412	TDR 2-2412SM		12 VDC	167 mA	84 %
TDR 2-2413	TDR 2-2413SM		15 VDC	134 mA	84 %
TDR 2-2422	TDR 2-2422SM		± 12 VDC	± 83 mA	84 %
TDR 2-2423	TDR 2-2423SM		± 15 VDC	± 67 mA	84 %
TDR 2-4811	TDR 2-4811SM	36 – 75 VDC (48 VDC nominal)	5.0 VDC	400 mA	81 %
TDR 2-4812	TDR 2-4812SM		12 VDC	167 mA	82 %
TDR 2-4813	TDR 2-4813SM		15 VDC	134 mA	82 %
TDR 2-4822	TDR 2-4822SM		± 12 VDC	± 83 mA	83 %
TDR 2-4823	TDR 2-4823SM		± 15 VDC	± 67 mA	83 %

Input Specifications

Input current at no load (nominal input voltage)	5 Vin models: 40 mA typ. 12 Vin models: 20 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 7 mA typ.
Input current at full load (nominal input voltage)	5 Vin models: 520 mA typ. 12 Vin models: 215 mA typ. 24 Vin models: 105 mA typ. 48 Vin models: 55 mA typ.
Surge voltage (1 sec. max.)	5 Vin models: 15 V max. 12 Vin models: 25 V max. 24 Vin models: 50 V max. 48 Vin models: 100 V max.
Input filter	capacitor type (see EMC considerations page 3 for compliance to EN 55022 class A/B)
ESD (electrostatic discharge)	EN 61000-4-2, air ± 8 kV, contact ± 6 kV, perf. criteria A
Radiated immunity	EN 61000-4-3 10 V/m, perf. criteria A
Fast transient / Surge	EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 1 kV perf. criteria A with external input capacitor e.g. Nippon chemi-con KY 220 μ F, 100 V, ESR 48 mOhm
Conducted immunity	EN 61000-4-6, 10 Vrms, perf. criteria A
Reflected ripple current (measured with input filter according class A)	5 Vin models: 80 mA-p-p typ. 12 Vin models: 40 mA-p-p typ. 24 Vin models: 30 mA-p-p typ. 48 Vin models: 20 mA-p-p typ.

Output Specifications

Voltage set accuracy		±1 % max
Regulation	– Input variation V_{in} min. to V_{in} max. – Load variation 0 – 100 % – Load variation 10 – 90 % – Load cross regulation 25/100 %	0.2 % max. single output models: 1.0 % max. dual output models: 1.0 % max. balanced load single output models: 0.5 % max. dual output models: 0.8 % max. balanced load 5.0 % max. (dual output models)
Minimum load		0 % of rated max. load
Temperature coefficient		±0.02 %/K
Ripple and noise (20 MHz bandwidth)		30 mVp-p typ.
Start up time (constant resistive load)	– Power On – Remote On	5 ms typ. 5 ms typ.
Transient response setting time (25 % load step change)		250 µs typ.
Short circuit protection		indefinite, automatic recovery
Capacitive load	5 VDC models: 12 VDC models: 15 VDC models: ±12 VDC models: ±15 VDC models:	1680 µF max. 820 µF max. 680 µF max. ±470 µF max. ±330 µF max.

General Specifications

Temperature ranges	– Operating	–40°C to +85°C (with no derating)
	– Storage	–55°C to +125°C
	– Case temperature	+100°C max.

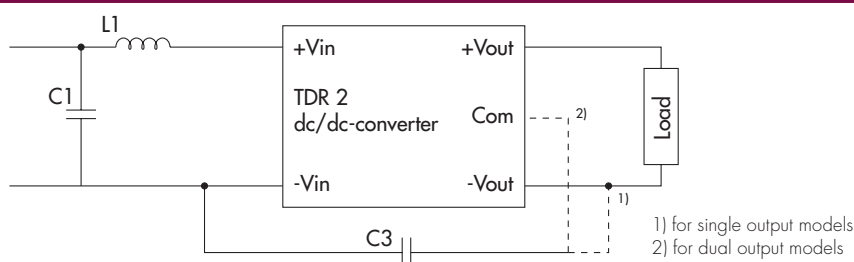
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

General Specifications

Humidity (non condensing)	5 % to 90 % rel. H max.
Thermal shock	acc. MIL-STD-810F
Vibration	acc. MIL-STD-810F
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)	>2.8 Mio h
Isolation voltage (60sec.) – Input/Output	1500 VDC
Isolation capacitance – Input/Output	50 pF max.
Isolation resistance – Input/Output (500 VDC)	>10 GOhm
Altitude during operation	tba.
Safety standard (designed to meet)	IEC/EN 60950-1, UL 60950-1
Safety approvals – UL/cUL	www.ul.com -> certifications -> File: e188913
Switching frequency	100 kHz (PWM)
Remote On/Off – On: – Off: – Off stand by input current	open or high impedance 2...4 mA current applied via 1KOhm resistor 2.5 mA max.
Environmental compliance – Reach – RoHS	www.tracopower.com/products/tdr2-reach.pdf RoHS directive 2011/65/EU

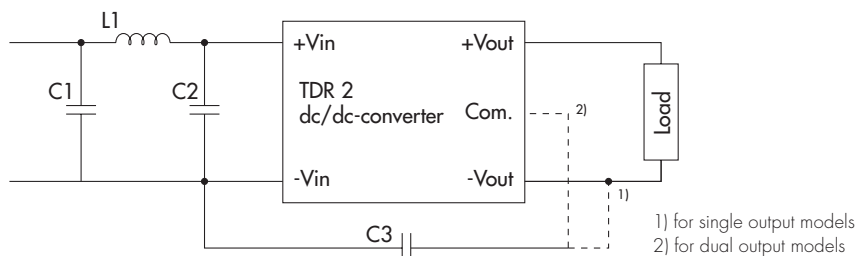
EMC Consideration

Recommended filter for
EN 55022 class A compliance



Input models	C1	C3	L1 value	order code (SMD type)	datasheet
5 VDC	10 μ F / 25 V 1812 MLCC	220pF / 3 kV 1808 MLCC	2.2 μ H	TCK-059	www.tracopower.com/products/tck059.pdf
12 VDC	6.8 μ F / 50 V 1812 MLCC		18 μ H	TCK-046	www.tracopower.com/products/tck046.pdf
24 VDC	4.7 μ F / 50 V 1812 MLCC				
48 VDC	4.7 μ F / 100 V 1812 MLCC				

Recommended filter for
EN 55022 class B compliance



Input models	C1 & C2	C3	L1 value	order code (SMD type)	datasheet
5 VDC	10 μ F / 25 V 1812 MLCC	220pF / 3 kV 1808 MLCC	2.2 μ H	TCK-059	www.tracopower.com/products/tck059.pdf
12 VDC	2.2 μ F / 50 V 1812 MLCC		18 μ H	TCK-046	www.tracopower.com/products/tck046.pdf
24 VDC			27 μ H	TCK-063	www.tracopower.com/products/tck063.pdf
48 VDC			18 μ H	TCK-046	www.tracopower.com/products/tck046.pdf

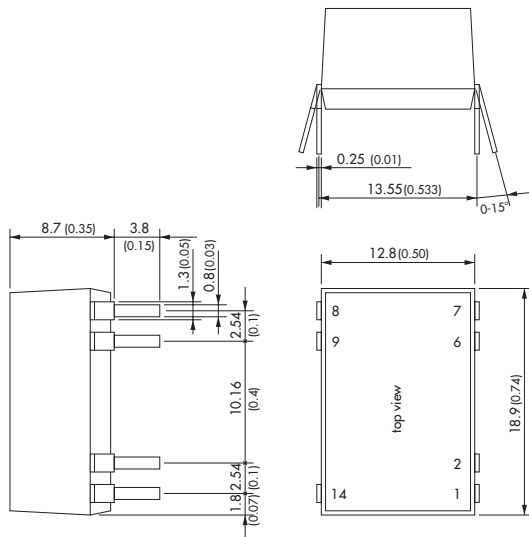
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Physical Specifications

Casing material	non-conductive plastic (UL94V-0 rated)
Package weight	4.5 g (0.16 oz)
Soldering profile for DIP-package models	max. 265°C / 10 sec. (wave soldering)
Lead-free reflow solder process for SMD-package models	as per J-STD-020D.01 (to find at: www.jedec.org - free registration required)
Moisture sensitivity level (for SMD-package models)	level 2a as per J-STD-033B.01 (to find at: www.jedec.org - free registration required)
Environmental compliance	– Reach – RoHS www.tracopower.com/products/tdr2-reach.pdf RoHS directive 2011/65/EU
Packaging	– Tube – Tape & Reel (only SMD models, add suffix -TR) 10 pcs packing unit 200 pcs packing unit

Outline Dimensions

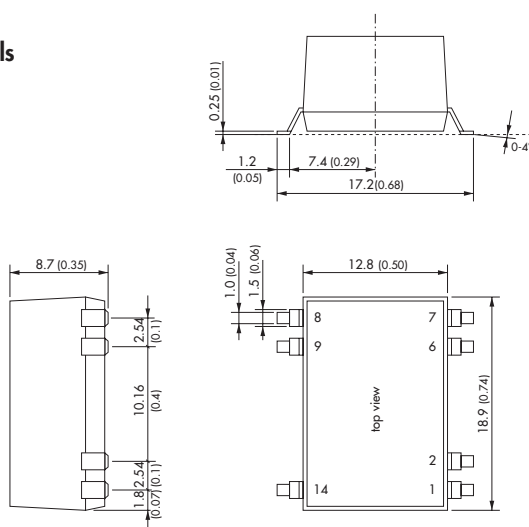
DIP-Models



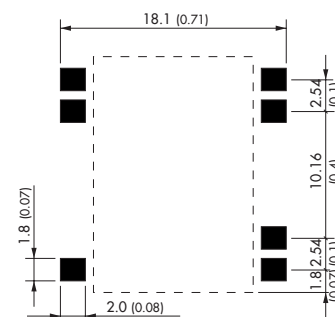
Pin-Out		
Pin	Single	Dual
1	–Vin (GND)	–Vin (GND)
2	Remote On/Off	Remote On/Off
6	NC	Common
7	NC	–Vout
8	+Vout	+Vout
9	–Vout	Common
14	+Vin (Vcc)	+Vin (Vcc)

NC = not to connect

SMD-Models



Recommended Solder Pad Dimension:



Dimensions in [mm], () = Inch
Tolerances: ± 0.5 (± 0.02)
Pin pitch tolerances: ± 0.25 (± 0.01)

Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at www.tracopower.com