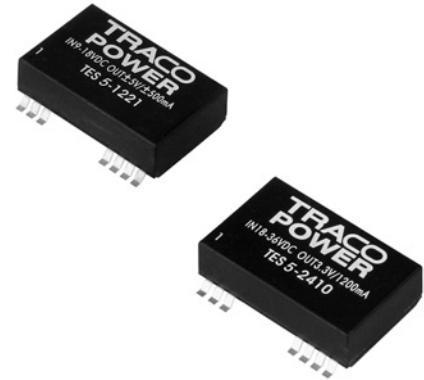


### Features

- ◆ Compact low profile SMD package
- ◆ Wide 2:1 input voltage range
- ◆ I/O isolation 1500VDC
- ◆ Operating temp. range -40°C to +85°C max.
- ◆ Short circuit protection
- ◆ Remote On/Off
- ◆ High accuracy of pin co-planarity
- ◆ Lead free design – RoHS compliant
- ◆ 3-years product warranty



The TES-5 series is a new range of high performance 5W dc-dc converter modules in low profile SMD package with compact dimensions of only 33.4 x 20.6 x 10.2 mm. The 18 available models feature wide 2:1 input voltage range and tightly regulated output voltage. High efficiency allows operating temperatures up to 71°C at full load.

Further features are built-in EMI-filter to meet EN 55022, class A and FCC, level A without additional components and remote On/Off control. The products are qualified for soldering in a high temperature lead-free reflow solder process. Typical applications for these converters are battery powered equipment, instrumentation, communication systems and industrial controls.

### Models

Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TES 5-1210	9 – 18 VDC (12 VDC nominal)	3.3 VDC	1200 mA	76 %
TES 5-1211		5 VDC	1000 mA	80 %
TES 5-1212		12 VDC	420 mA	83 %
TES 5-1213		15 VDC	335 mA	83 %
TES 5-1221		±5 VDC	±500 mA	80 %
TES 5-1222		±12 VDC	±210 mA	83 %
TES 5-1223		±15 VDC	±165 mA	83 %
TES 5-2410	18 – 36 VDC (24 VDC nominal)	3.3 VDC	1200 mA	78 %
TES 5-2411		5 VDC	1000 mA	82 %
TES 5-2412		12 VDC	420 mA	85 %
TES 5-2413		15 VDC	335 mA	85 %
TES 5-2421		±5 VDC	±500 mA	82 %
TES 5-2422		±12 VDC	±210 mA	85 %
TES 5-2423		±15 VDC	±165 mA	85 %
TES 5-4810	36 – 75 VDC (48 VDC nominal)	3.3 VDC	1200 mA	78 %
TES 5-4811		5 VDC	1000 mA	82 %
TES 5-4812		12 VDC	420 mA	85 %
TES 5-4813		15 VDC	335 mA	85 %
TES 5-4821		±5 VDC	±500 mA	82 %
TES 5-4822		±12 VDC	±210 mA	85 %
TES 5-4823		±15 VDC	±165 mA	85 %

### Input Specifications

Input current no load	12 Vin models	20 mA
	24 Vin models	5 mA
	48 Vin models	3 mA
Input current full load	12 Vin models	500 mA typ.
	24 Vin models	250 mA typ.
	48 Vin models	125 mA typ.
Start-up voltage / under voltage shut down	12 Vin models	8 VDC / 7 VDC typ.
	24 Vin models	16 VDC / 15 VDC typ.
	48 Vin models	33 VDC / 31 VDC typ.
Surge voltage (1 sec. max.)	12 Vin models	25 V max.
	24 Vin models	50 V max.
	48 Vin models	100 V max.
Reverse voltage protection	1.0 A max.	
Conducted noise (input)	EN 55022 level A, FCC part 15, class A	

### Output Specifications

Voltage set accuracy		±1 %
Regulation	– Input variation Vin min. to Vin max.	0.3 % max.
	– Load variation 20 – 100 %	single output models 1 % max.
	dual output models balanced load	2 % max.
Ripple and noise (20 MHz Bandwidth)		85 mVpk-pk max.
Temperature coefficient		±0.02 %/°C
Output current limitation		>115 % of Iout max., constant current
Short circuit protection		indefinite, automatic recovery
Capacitive load	single output models	680 µF max.
	dual output models	100 µF max. (esch output)

### General Specifications

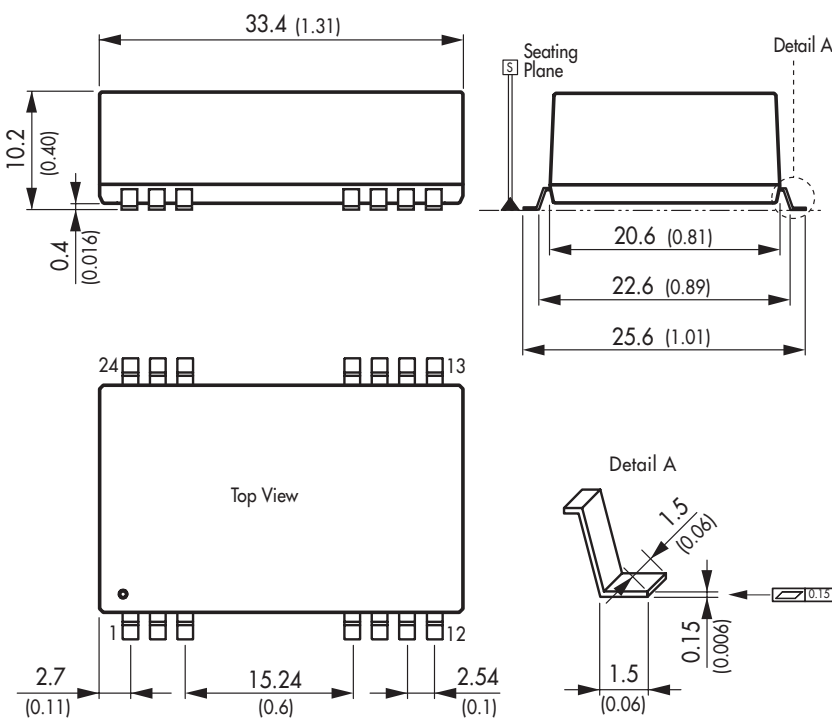
Temperature ranges	– Operating	–40°C to +85°C
	– Case temperature	+100°C max.
	– Storage	–40°C to +125°C
Derating		3.5 %/K above 70°C
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)		>1 Mio. h
Isolation voltage (60sec.)	– Input/Output	1'500 VDC
Isolation capacitance	– Input/Output	650 pF typ.
Isolation resistance	– Input/Output (500 VDC)	>1'000 MOhm
Switching frequency		260 kHz typ.
Safety standards		UL 60950-1 , IEC/EN 60950-1
Safety approvals	– CSA certificate according UL 60950-1	<a href="http://www.tracopower.com/products/tes5-csa60950.pdf">www.tracopower.com/products/tes5-csa60950.pdf</a>
Remote On/Off	– On:	2.5 ... 5.5 VDC or open circuit
	– Off:	-0.7 ... 0.8 VDC or short circuit pin 1 and 2(/3)
	– Off idle current:	10 mA

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

**Physical Specifications**

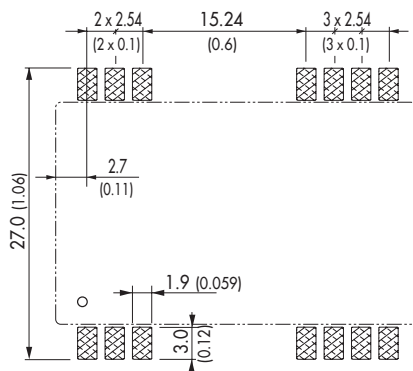
Casing material	non conductive plastic
Potting material	epoxy (UL 94V-0 rated)
Weight	14 g (0.55oz)
Lead-free reflow solder process	as per J-STD-020D.01 (to find at: <a href="http://www.jedec.org">www.jedec.org</a> - free registration required)
Moisture sensivity level (MSL)	level 2 as per J-STD-033B.01 (to find at: <a href="http://www.jedec.org">www.jedec.org</a> - free registration required)
Washing process	<a href="http://www.tracopower.com/products/smd-wash.pdf">www.tracopower.com/products/smd-wash.pdf</a>
Packaging	<a href="http://www.tracopower.com/products/tes5-pack.pdf">www.tracopower.com/products/tes5-pack.pdf</a>

**Outline Dimensions**



Pin-Out		
Pin	Single	Dual
1	Remote On/Off	Remote On/Off
2	-Vin (GND)	-Vin (GND)
3	-Vin (GND)	-Vin (GND)
9	No con.	Common
10	No con.	No con.
11	No con.	-Vout
12	No con.	No con.
13	No con.	No con.
14	+Vout	+Vout
15	No con.	No con.
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)
24	No con.	No con.

Pin Patterns:



Dimensions in [mm], ( ) = Inch  
Tolerances ±0.25 (±0.02)  
Pin pitch tolerances ±0.13 (±0.005)

Specifications can be changed any time without notice.