



#### Features

- ◆ High Power Density in 1" x 2" Metal Package
- ◆ Ultra wide 4 : 1 Input Range
- ◆ Extended Operating Temperature Range – 40°C to +85°C max.
- ◆ No Minimum Load required
- ◆ I/O-Isolation 1500 VDC
- ◆ Remote On/Off
- ◆ Adjustable Output Voltage
- ◆ Industry Standard Footprint
- ◆ Shielded Metal Case with insulated Baseplate
- ◆ Optional Heatsink
- ◆ Lead free Design - RoHS compliant
- ◆ 3 Year Product Warranty



The TEN 20WIN series is a family of high performance 20W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a ultra compact 2" x 1" low profile package with industry-standard footprint. A very high efficiency allows an operating temperature range of –40°C to 85°C. Further standard features include remote On/Off, output voltage trimming, over voltage protection and short-circuit protection.

Typical applications for these converters are battery operated equipment and distributed power architectures in communication and industrial electronics, everywhere where isolated, tightly regulated voltages are required.

#### Models

Order code	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEN 20-2410WIN	9 – 36 VDC (24 VDC nominal)	3.3 VDC	5'500 mA	85 %
TEN 20-2411WIN		5 VDC	4'000 mA	88 %
TEN 20-2412WIN		12 VDC	1'670 mA	86 %
TEN 20-2413WIN		15 VDC	1'330 mA	86 %
TEN 20-2421WIN		± 5 VDC	± 2'000 mA	88 %
TEN 20-2422WIN		± 12 VDC	± 835 mA	87 %
TEN 20-2423WIN		± 15 VDC	± 665 mA	87 %
TEN 20-4810WIN	18 – 75 VDC (48 VDC nominal)	3.3 VDC	5'500 mA	85 %
TEN 20-4811WIN		5 VDC	4'000 mA	88 %
TEN 20-4812WIN		12 VDC	1'670 mA	87 %
TEN 20-4813WIN		15 VDC	1'330 mA	87 %
TEN 20-4821WIN		± 5 VDC	± 2'000 mA	89 %
TEN 20-4822WIN		± 12 VDC	± 835 mA	88 %
TEN 20-4823WIN		± 15 VDC	± 665 mA	88 %

### Input Specifications

Input current at no load	24 Vin models: 50 mA typ. 48 Vin models: 35 mA typ.
Input current at full load	24 Vin models: 1000 mA typ. 48 Vin models: 500 mA typ.
Surge voltage (100 msec. max.)	24 Vin models: 50 V max. 48 Vin models: 100 V max.
Input voltage variation (dv/dt)	5 V / ms, max. (complies to ETS 300 132 part. 4.4)
Start-up voltage / under voltage lockout	24 Vin models: 9 VDC / 7.5 VDC typ. 48 Vin models: 18 VDC / 15 VDC typ.
Conducted noise (input)	EN 55022 level A, FCC part 15, level A with external capacitor (see note 1)
ESD (input)	EN 61000-4-2, perf. criteria B
Fast transient (input)	EN 61000-4-4, perf. criteria B
Surge (input)	EN 61000-4-5, perf. criteria B

### Output Specifications

Voltage set accuracy	± 1 %
Output voltage adjustment	± 10 % (single output models only)
Regulation	<ul style="list-style-type: none"> <li>- Input variation Vin min. to Vin max. 0.2 % max.</li> <li>- Load variation 0 – 100%: <ul style="list-style-type: none"> <li>single output models: 0.5 % max.</li> <li>dual output models: 1 % max. (balanced load)</li> </ul> </li> <li>- Load cross variation 25 % / 100 % 5 % max.</li> </ul>
Temperature coefficient	0.02 % /K
Ripple and noise (20 MHz Bandwidth)	<ul style="list-style-type: none"> <li>single output models: 75 mVpk-pk max.</li> <li>dual output models: 100 mVpk-pk max.</li> </ul>
Start up time (nominal Vin and constant resistive load)	20 ms typ.
Transient Response (25% load step change)	250 µs typ.
Short circuit protection	indefinite (automatic recovery)
Over load protection	150% of Iout max typ.
Over voltage protection	<ul style="list-style-type: none"> <li>3.3 Vout models: 3.9 V</li> <li>5 /±5 Vout models: 6.2 /±6.2 V</li> <li>12 /±12 Vout models: 15 /±15 V</li> <li>15 /±15 Vout models: 18 /±18 V</li> </ul>
Capacitive load	<ul style="list-style-type: none"> <li>3.3 Vout models: 18'000 µF max.</li> <li>5 Vout models / ± 5 Vout models: 9'600 µF max. / ± 4'800 µF max.</li> <li>12 Vout models / ±12 Vout models: 1'600 µF max. / ± 800 µF max.</li> <li>15 Vout models / ±15 Vout models: 1'000 µF max. / ± 500 µF max.</li> </ul>

### General Specifications

Temperature ranges	<ul style="list-style-type: none"> <li>- Operating - 40 °C ... + 85 °C (see power derating)</li> <li>- Case temperature + 105 °C max.</li> <li>- Storage - 55 °C ... + 125 °C</li> </ul>
Humidity (non condensing)	95 % rel H max.

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

**General Specifications**

Reliability, calculated MTBF (MIL-HDBK-217F ground benign)	>560'000 h @ + 25 °C
Isolation voltage (60 sec.) – Input/Output	1'500 VDC
Isolation capacity – Input/Output	1500 pF max
Isolation resistance – Input/Output	>1'000 M Ohm
Switching frequency (fixed)	400 kHz typ. (pulse width modulation PWM)
Vibration	10-55Hz, 10G, 30 minutes along X,Y,Z
Remote On/Off – On:	3.0 ... 12 VDC or open circuit.
– Off:	0 ... 1.2 VDC or short circuit pin 2 and pin 4
– Off idle current:	2.5 mA typ.
Safety standards	UL 60950,-1 EN 60950-1, IEC 60950-1
Safety approvals	UL /cUL pending

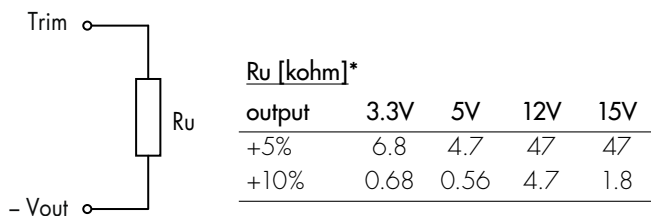
Application notes can be downloaded under:  
[www.tracopower.com/products/tmr2\\_application.pdf](http://www.tracopower.com/products/tmr2_application.pdf)

**Note 1:**

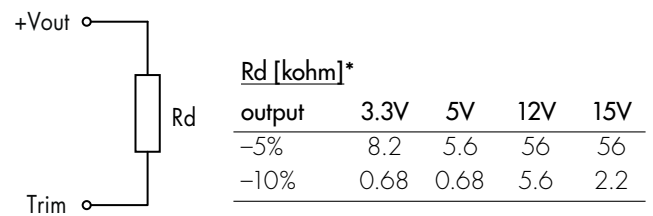
In order to meet conducted emissions EN55022-A and EN55011-A a capacitor between +Vin and -Vin has to be installed. The capacitor should be capable to handle 1 A ripple current. A suggestion is KMF Series of Nippon chemi-con, 220µF/100V, ESR 90mOhm.

**Output Voltage Adjustment (single output models only)**

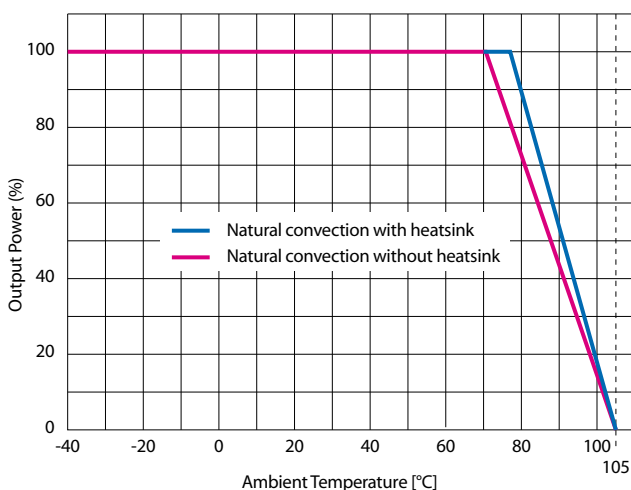
**Trim up**



**Trim down**



**Power Derating**

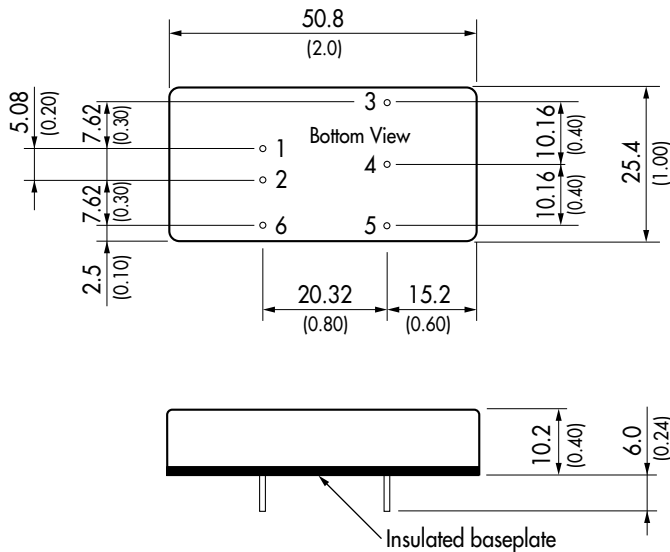


All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**Physical Specifications**

Case material	copper, nickel plated
Baseplate material	non conductive FR4
Potting material	epoxy (UL 94V-0 - rated)
Weight	27 g (0.95 oz)
Soldering temperature	max. 265 °C / 10 sec.

**Outline Dimensions**



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

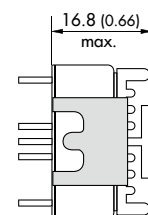
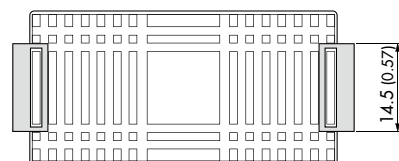
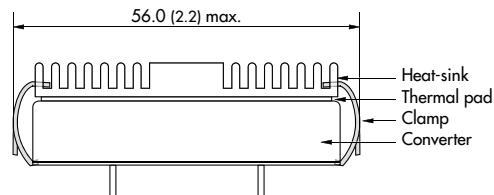
Dimensions in [mm], ( ) = Inch  
 Pin diameter: 1.0 ±0.05 (0.02 ±0.002)  
 Pin pitch tolerances: ±0.35 (±0.014)  
 Case tolerances: ±0.5 (±0.02)

**Heat-Sink (Option)**

**Order code:** TEN-HS1  
 (cont.: heat-sink, thermal pad, 2 clamps)  
**Material:** Aluminum  
**Finish:** Anodic treatment (black)  
**Weight:** 17g (0.60oz) without converter  
 Thermal impedance after assembling: 10 K/W



**Note:**  
 The product label on converter has to be removed before mounting the heat-sink.  
 For volume orders converters will be supplied with heat-sinks already mounted. Please contact factory for quotation.  
 Separate heat-sinks are only available for prototypes and small quantity orders.



Specifications can be changed any time without notice