DC/DC Converters

TEN 20WI Series, 20 Watt

not recommended for new design in

Features

- Ultra wide 4 : 1 input range
- Extended operating temperature range –40°C to +85°C
- I/O isolation 1500 VDC
- Input filter meets EN 55022, class A and FCC, Level A
- Remote On/Off
- Adjustable output
- Industry standard footprint
- Shielded metal case with insulated baseplate
- Optional heatsink
- Lead free design - RoHS compliant
- 3-year product warranty

The TEN 20WI series is a family of high performance 20W DC/DC converter modules featuring ultra wide 4:1 input voltage ranges in a compact 2" x 1.6" low profile package with industry-standard footprint. A very high efficiency allows an operating temperature range of –40°C to 85°C. A built-in EMI input filter complies with EN 55022, class A. 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 20-2411WI		5 VDC	4'000 mA	79 %
TEN 20-2412WI		12 VDC	1'670 mA	81 %
TEN 20-2413WI	**9 – 36 VDC**	15 VDC	1'330 mA	81 %
TEN 20-2421WI	(24 VDC nominal)	±5 VDC	±2'000 mA	79 %
TEN 20-2422WI		±12 VDC	±835 mA	81 %
TEN 20-2423WI		±15 VDC	±665 mA	82 %
TEN 20-4811WI		5 VDC	4'000 mA	80 %
TEN 20-4812WI		12 VDC	1'670 mA	81 %
TEN 20-4813WI	**18 – 75 VDC**	15 VDC	1'330 mA	81 %
TEN 20-4821WI	(48 VDC nominal)	±5 VDC	±2'000 mA	79 %
TEN 20-4822WI		±12 VDC	±835 mA	83 %
TEN 20-4823WI		±15 VDC	±665 mA	84 %

Input Specifications

Input current at no load	24 Vin models: 48 Vin models:	**35 mA typ.** **25 mA typ.**
Input current at full load	24 Vin models: 48 Vin models:	**1000 mA typ.** **500 mA typ.**
Surge voltage (100 msec. max.)	24 Vin models: 48 Vin models:	**50 V max.** **100 V max.**
Conducted noise (input)	24 Vin models: 48 Vin models:	**EN 55022 level A, FCC part 15, level A** **without external components** **with capacitor 2.2 µF/100V, 1812 MLCC**
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		**±2 %**
Output voltage adjustment		**±10 %**
Regulation	– Input variation Vin min. to Vin max. – Load variation 25 – 100%: single output models: dual output models:	**0.2 % max.** **±0.5 % max.** **±3 % max.** (balanced load) **±5 % max.** (load cross variation 25 % / 100 %)
Temperature coefficient		**±0.02 %/K**
Ripple and noise (20 MHz Bandwidth)	single output models: dual output models:	**75 mVpk-pk max.** **100 mVpk-pk max.**
Start up time (nominal Vin and constant resistive load)		**20 ms typ.**
Transient Response (25% load step change)		**500 µs typ.**
Short circuit protection		**indefinite** (automatic recovery)
Over load protection		**150 % of Iout max typ. foldback**
Over voltage protection	5 Vout models: 12 Vout models: 15 Vout models:	**6.2 V** **15 V** **18 V**
Minimum load		**10% of rated max current** (operation at lower load condition will not damage these converters, however, they may not meet all listed specifications)
Capacitive load	5 Vout models / ± 5 Vout models: 12 Vout models / ±12 Vout models: 15 Vout models / ±15 Vout models:	**6'800 µF max. / ±3'400 µF max.** **2'200 µF max. / ±680 µF max.** **755 µF max. / ±450 µF max.**

General Specifications

Temperature ranges	– Operating – Case temperature – Storage	**–40°C to +85°C** **+100°C max.** **–55°C to +105°C**
Thermal impedance	– with heat-sink TEN-HS2 – without heat-sink	**8.24 K/watt** **10 K/watt**
Derating		**see graphs on page 3 to 5**
Humidity (non condensing)		**95 % rel H max.**
Reliability, calculated MTBF (MIL-HDBK-217F, at +70°C, ground benign)		**>1.9 Mio. h**
Isolation voltage (60 sec.)	– Input/Output	**1'500 VDC**
Isolation capacitance	– Input/Output	**300 pF typ.**
Isolation resistance	– Input/Output (500 VDC)	**>1'000 M Ohm**

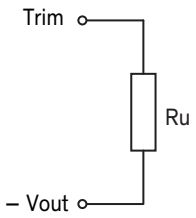
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

General Specifications

Switching frequency (fixed)		300 kHz typ. (Pulse width modulation PWM)
Vibration		10–55Hz, 2G, 30 minutes along X,Y,Z
Remote On/Off	– ON: – OFF: – OFF idle current:	3.5 ... 12 VDC or open circuit. 0 ... 1.2 VDC or short circuit pin 3 and pin 2 20 mA typ.
Safety standards		UL 1950, IEC/EN 60950-1 compliance UL 62368-1
Safety approvals	– UL/cUL	www.ul.com > UL File no.: e188913
Environmental compliance	– Reach – RoHS	www.tracopower.com/products/reach-declaration.pdf RoHS directive 2011/65/EU

Output Voltage Adjustment

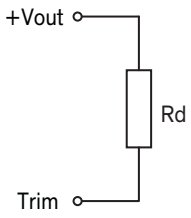
Trim up



Ru [kohm]*

output	5V	12V	15V
+5%	3.9	56	470
+10%	0.47	6.8	2.2
output	**±5V**	**±12V**	**±15V**
+5%	10	22	39
+10%	0.82	1.5	6.8

Trim down



Rd [kohm]*

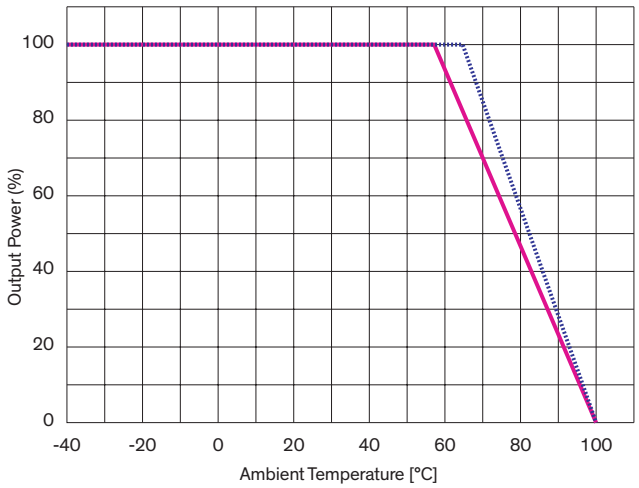
output	5V	12V	15V
–5%	5.6	47	56
–10%	0.68	2.7	1.8
output	**±5V**	**±12V**	**±15V**
–5%	15	47	47
–10%	1.2	10	8.2

*approximate values

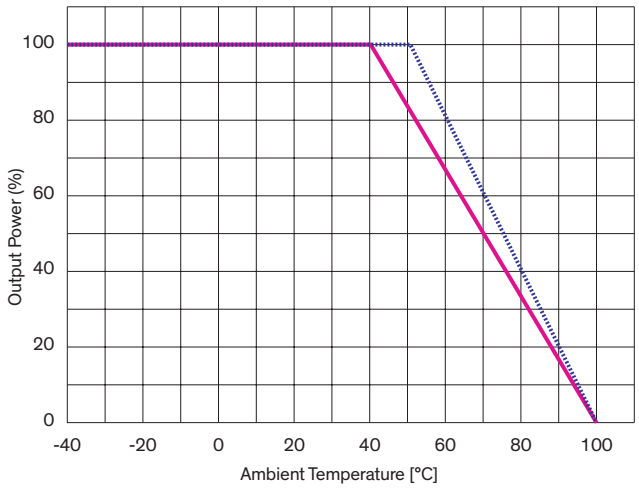
Power De-rating

Natural convection with heat-sink TEN-HS2
Natural convection without heat-sink

TEN 20-2410WI

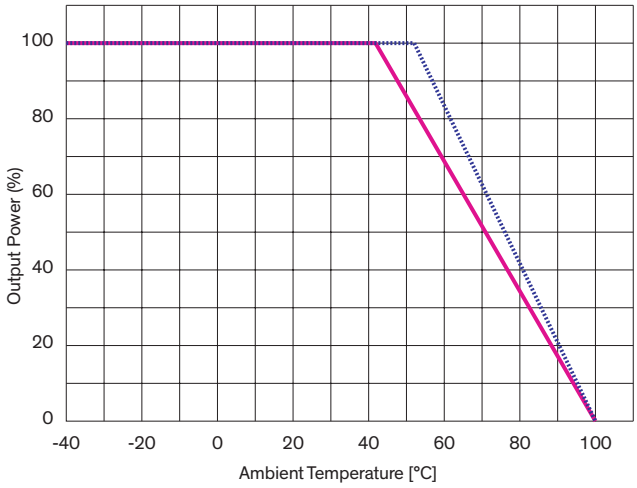


TEN 20-2411WI



Power De-rating

TEN 20-2412WI



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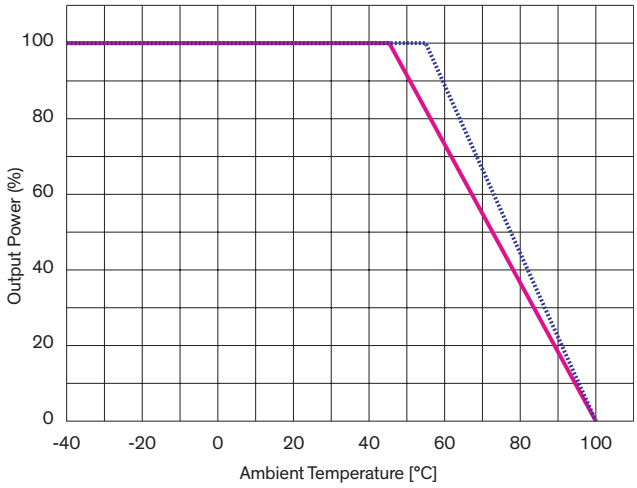

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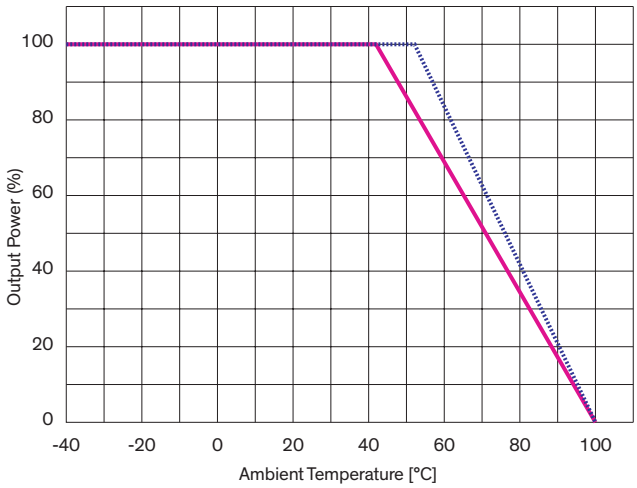

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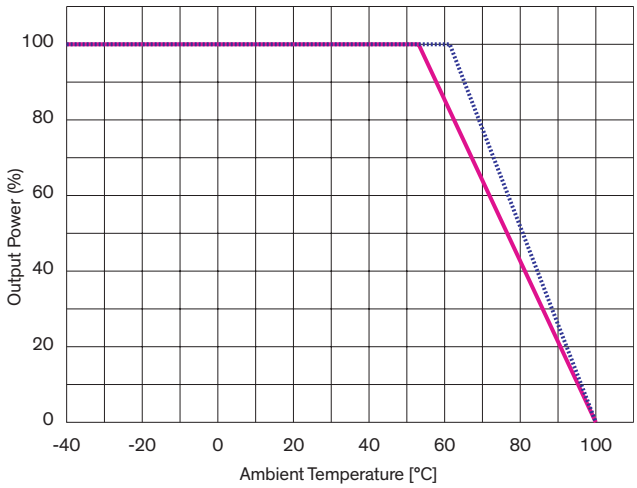

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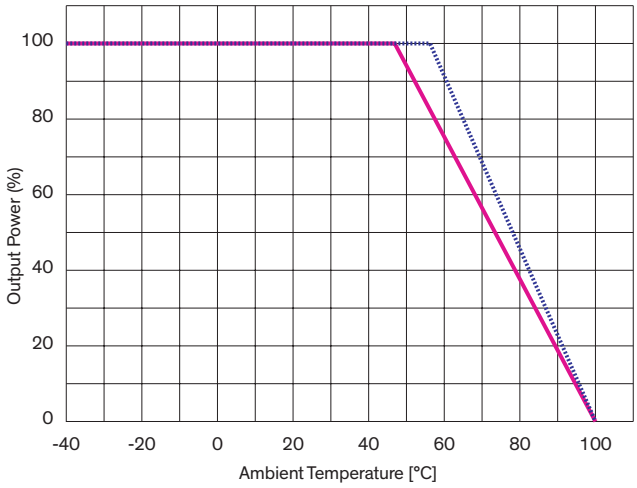
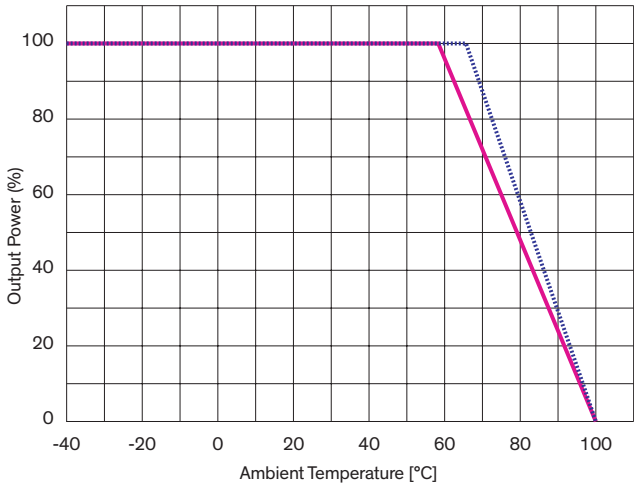
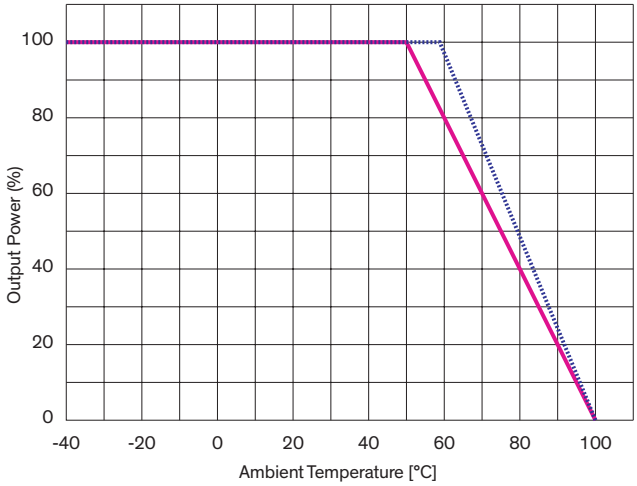


TEN 20-4810WI



Power De-rating

TEN 20-4811WI



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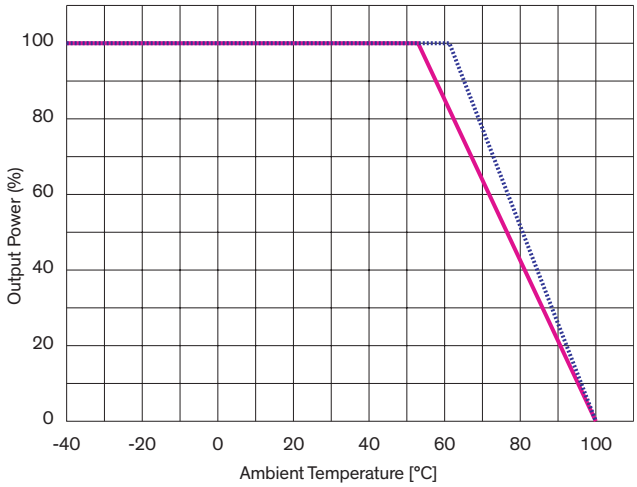

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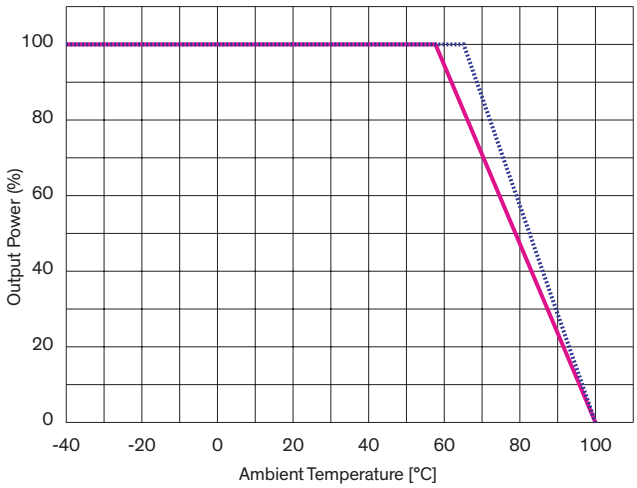

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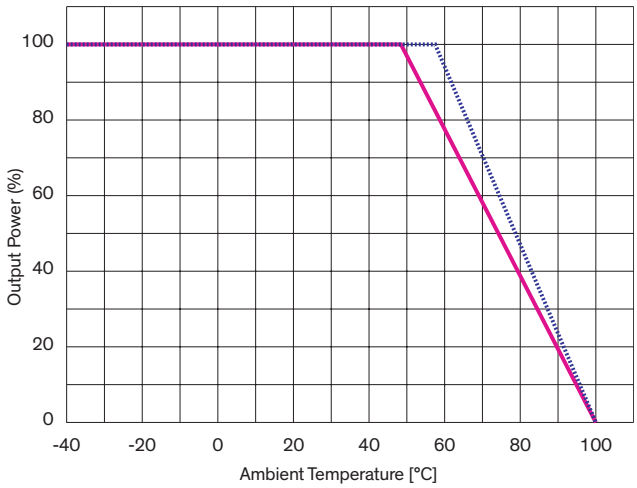

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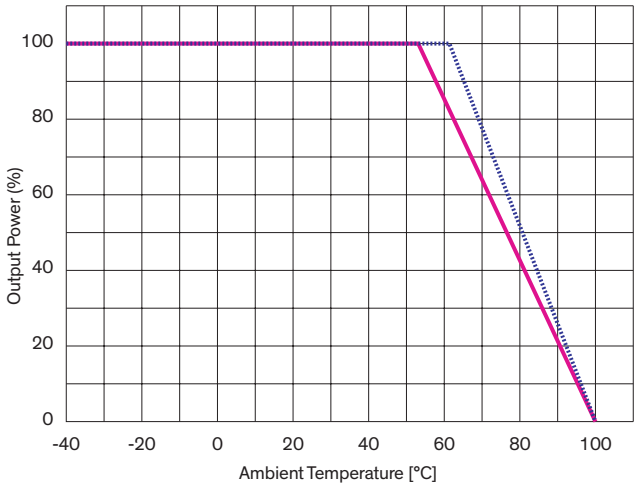

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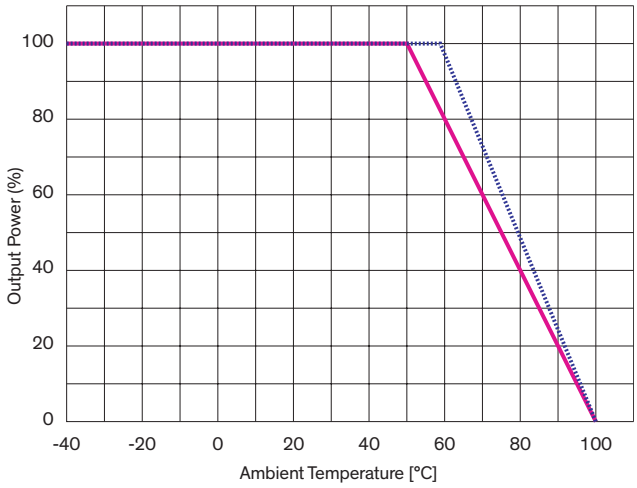
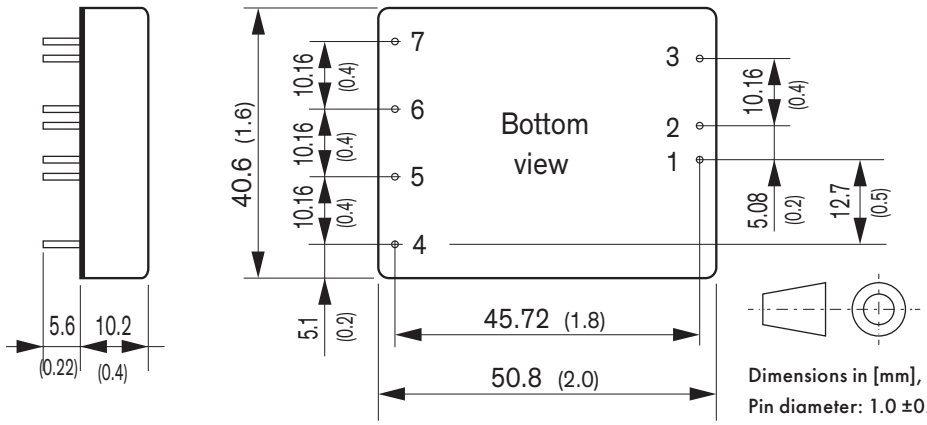


Physical Specifications

Casing material	copper, nickel plated
Baseplate material	non conductive FR4
Potting material	epoxy (UL 94V-0 rated)
Weight	50 g (1.2oz)
Soldering temperature	max. 265°C / 10 sec.

Outline Dimensions

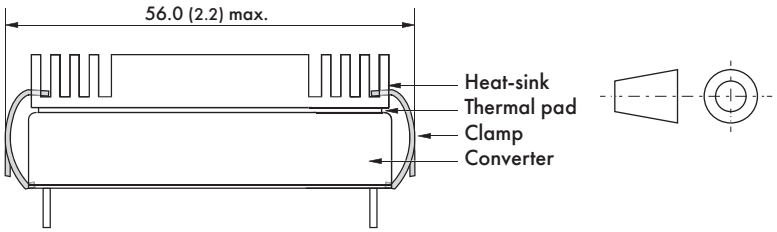


Dimensions in [mm], () = Inch
Pin diameter: 1.0 ±0.05 (0.02 ±0.002)
Pin pitch tolerances: ±0.35 (±0.014)
Casing tolerances: ±0.5 (±0.02)

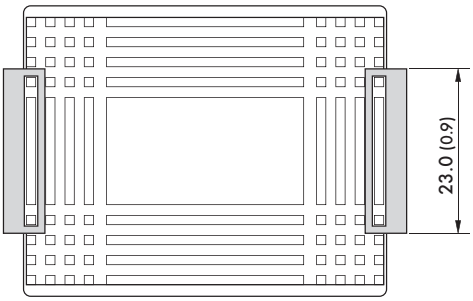
Pin-Out

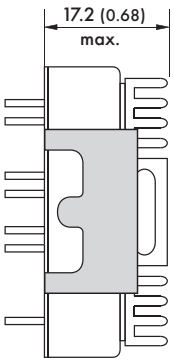
Pin	Single	Dual
1	+Vin (Vcc)	+Vin (Vcc)
2	–Vin (GND)	–Vin (GND)
3	Remote On/Off	
4	No pin	+Vout
5	+Vout	Common
6	–Vout	–Vout
7	Trim	

Heat-sink TEN-HS2



Order code: **TEN-HS2**
(cont.: heat-sink, thermal pad, 2 clamps)
Material: Aluminum
Finish: Anodic treatment (black)
Weight: 19 g (0.67oz) (without converter)





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.