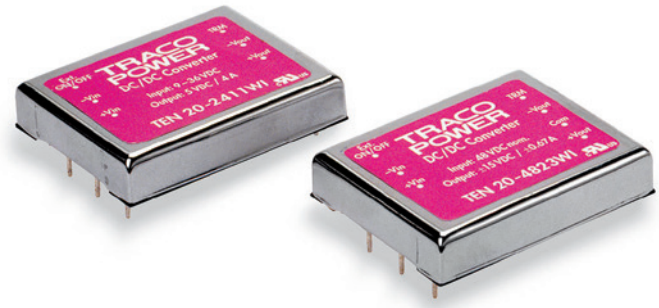
# DC/DC Converters

## TEN 20WI Series, 20 Watt



### 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 | 9 – 36 VDC (24 VDC nominal) | 5 VDC | 4'000 mA | 79 % |
| TEN 20-2412WI | | 12 VDC | 1'670 mA | 81 % |
| TEN 20-2413WI | | 15 VDC | 1'330 mA | 81 % |
| TEN 20-2421WI | | ±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 | 18 – 75 VDC (48 VDC nominal) | 5 VDC | 4'000 mA | 80 % |
| TEN 20-4812WI | | 12 VDC | 1'670 mA | 81 % |
| TEN 20-4813WI | | 15 VDC | 1'330 mA | 81 % |
| TEN 20-4821WI | | ±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:<br>48 Vin models: | 35 mA typ.<br>25 mA typ. |
| Input current at full load | 24 Vin models:<br>48 Vin models: | 1000 mA typ.<br>500 mA typ. |
| Surge voltage (100 msec. max.) | 24 Vin models:<br>48 Vin models: | 50 V max.<br>100 V max. |
| Conducted noise (input) | 24 Vin models:<br>48 Vin models: | EN 55022 level A, FCC part 15, level A<br>without external components<br>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.<br>– Load variation 25 – 100%:<br>single output models:<br>dual output models: | 0.2 % max.<br><br>±0.5 % max.<br>±3 % max. (balanced load)<br>±5 % max. (load cross variation 25 % / 100 %) |
| Temperature coefficient | | ±0.02 %/K |
| Ripple and noise (20 MHz Bandwidth) | single output models:<br>dual output models: | 75 mVpk-pk max.<br>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:<br>12 Vout models:<br>15 Vout models: | 6.2 V<br>15 V<br>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:<br>12 Vout models / ±12 Vout models:<br>15 Vout models / ±15 Vout models: | 6'800 µF max. / ±3'400 µF max.<br>2'200 µF max. / ±680 µF max.<br>755 µF max. / ±450 µF max. |

## General Specifications

| | | |
|---|---|---|
| Temperature ranges | – Operating<br>– Case temperature<br>– Storage | –40°C to +85°C<br>+100°C max.<br>–55°C to +105°C |
| Thermal impedance | – with heat-sink TEN-HS2<br>– without heat-sink | 8.24 K/watt<br>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 |

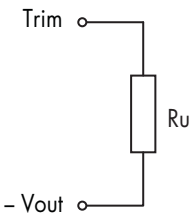
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## 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:<br>– OFF:<br>– OFF idle current: | 3.5 ... 12 VDC or open circuit.<br>0 ... 1.2 VDC or short circuit pin 3 and pin 2<br>20 mA typ. |
| Safety standards | | UL 1950, IEC/EN 60950-1 compliance<br>up to 60 VDC input voltage (SELV limit) |
| Safety approvals | – UL/cUL | www.ul.com > UL File no.: e188913 |
| Environmental compliance | – Reach<br>– RoHS | www.tracopower.com/products/reach-declaration.pdf<br>RoHS directive 2011/65/EU |

## Output Voltage Adjustment

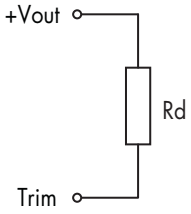
### Trim up




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]*

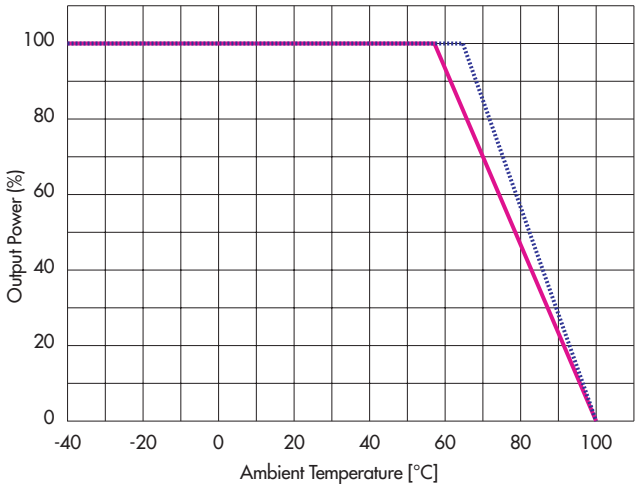
| output | 5V | 12V | 15V |
|---|---|---|---|
| –5% | 5.6 | 47 | 56 |
| –10% | 0.68 | 2.7 | 1.8 |
| **output** | **±5V** | **±12V** | **±15V** |
| –5% | 15 | 47 | 47 |
| –10% | 1.2 | 10 | 8.2 |

*approximate values

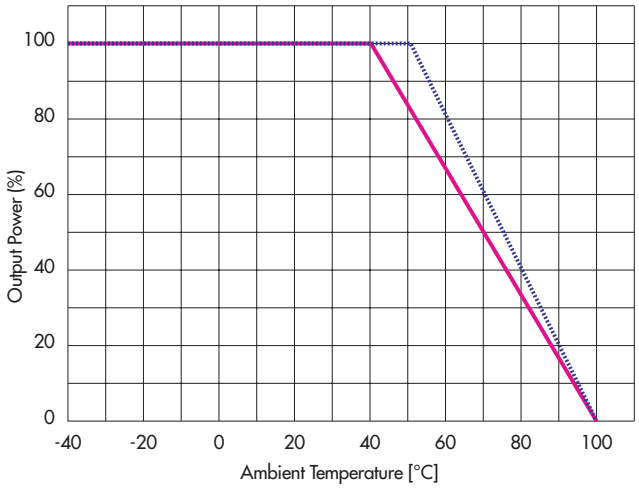
## Power De-rating

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

TEN 20-2410WI

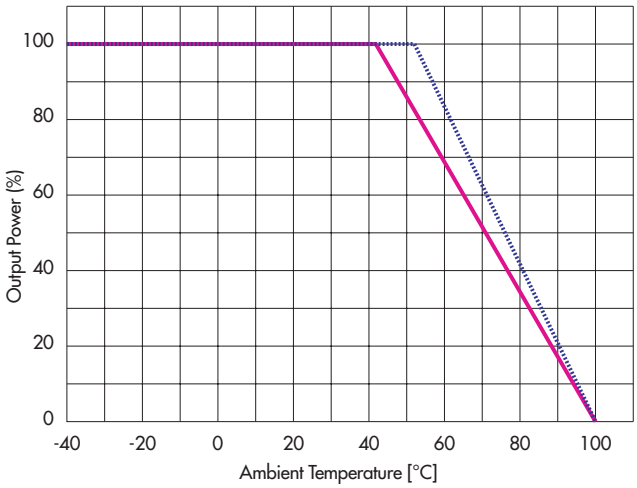



TEN 20-2411WI

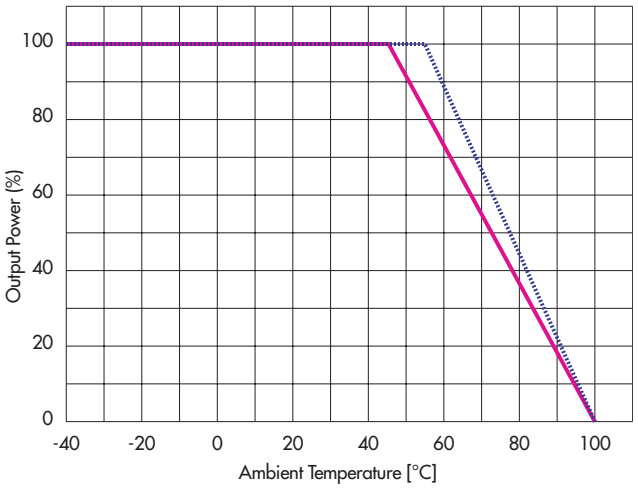


## Power De-rating

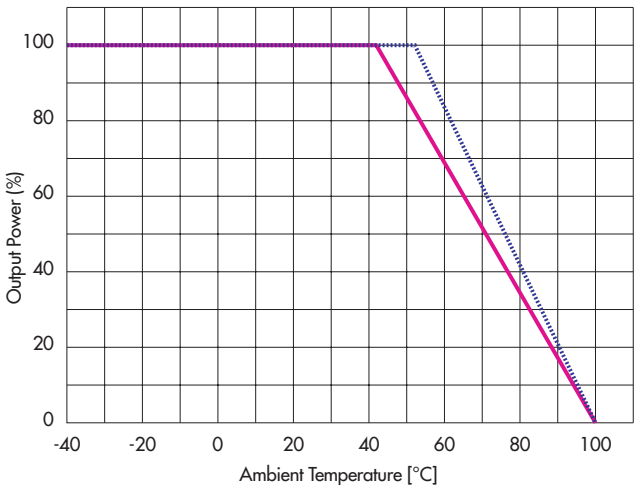
TEN 20-2412WI




TEN 20-2413WI




TEN 20-2421WI

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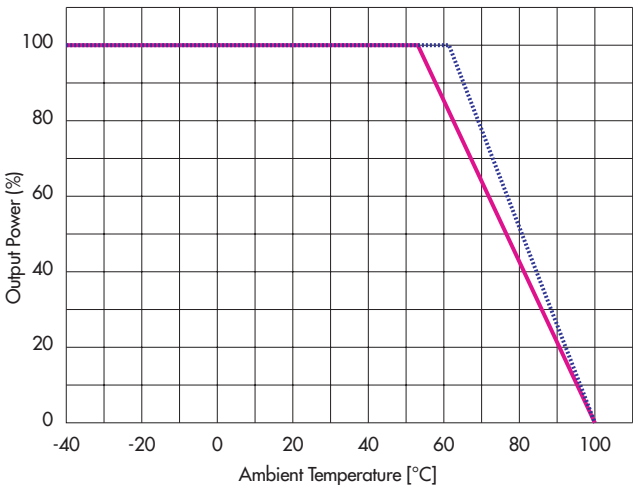
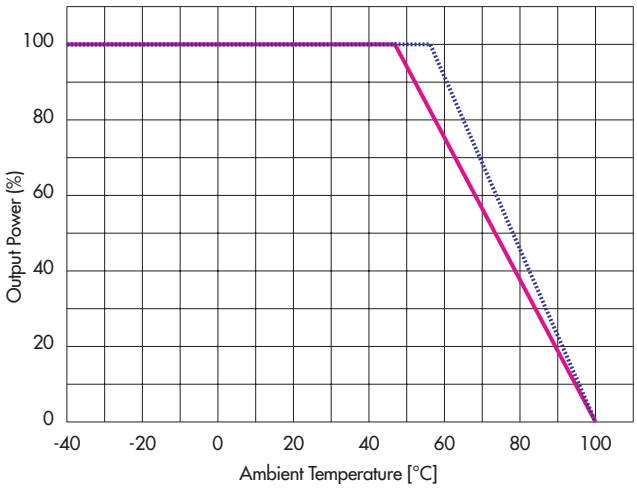
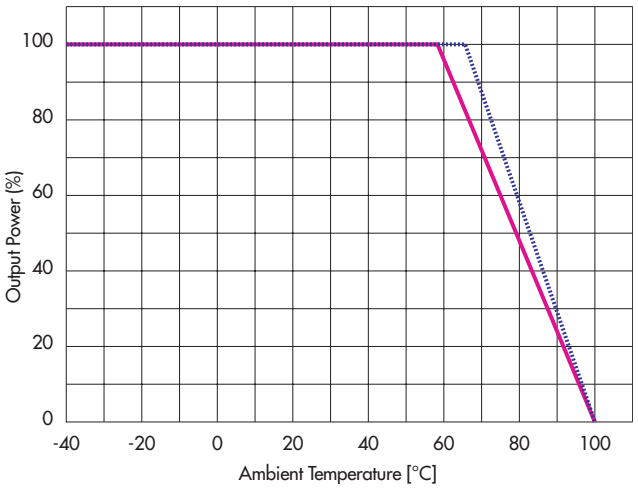



TEN 20-2423WI

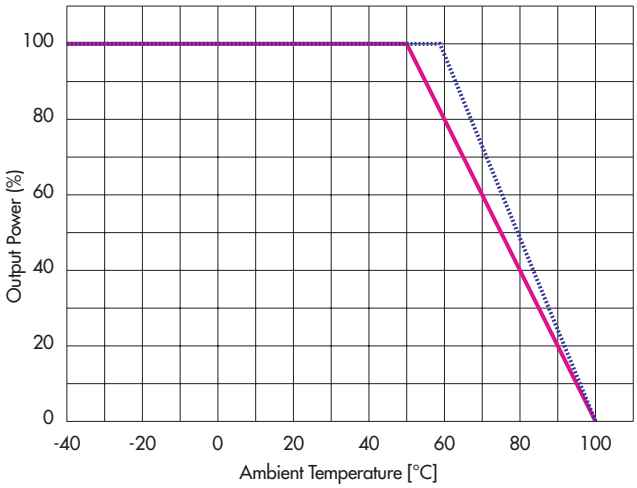



TEN 20-4810WI

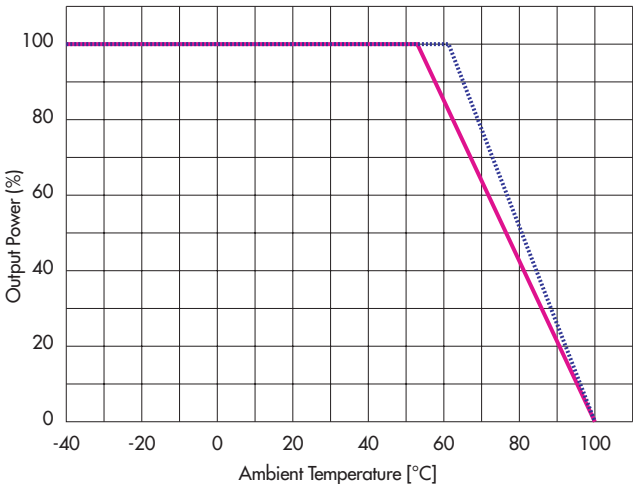


## Power De-rating

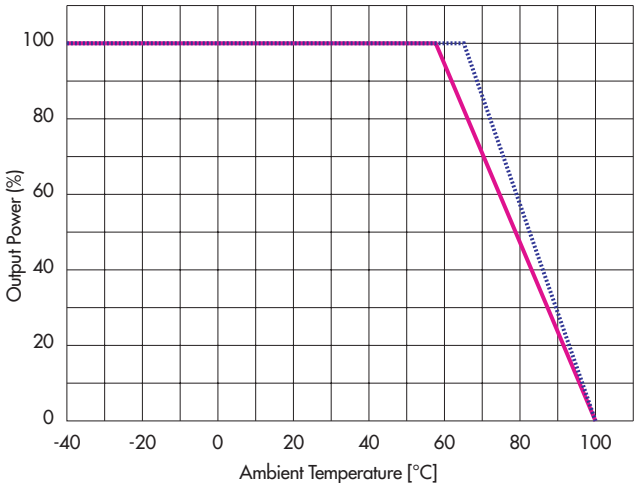
TEN 20-4811WI



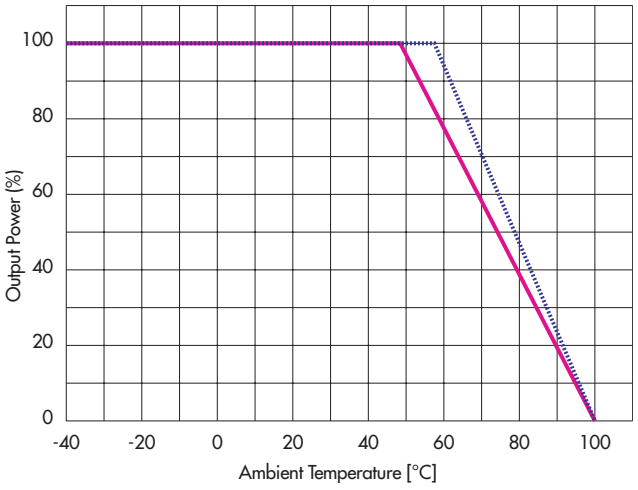

TEN 20-4812WI



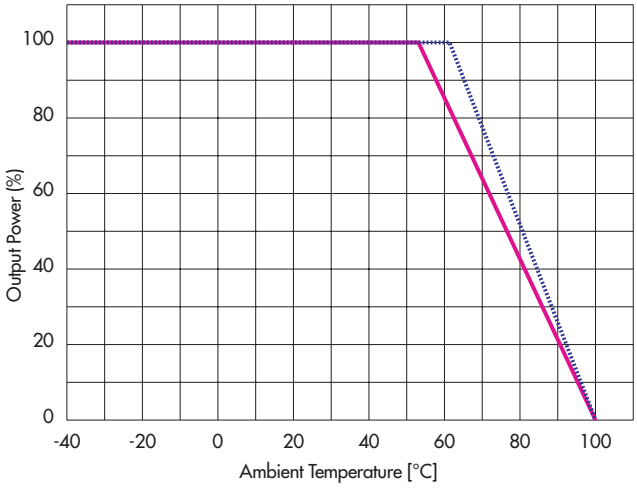

TEN 20-4813WI



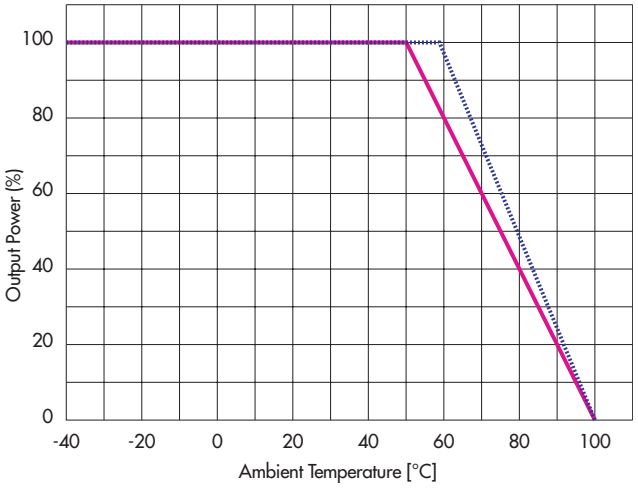

TEN 20-4821WI




TEN 20-4822WI



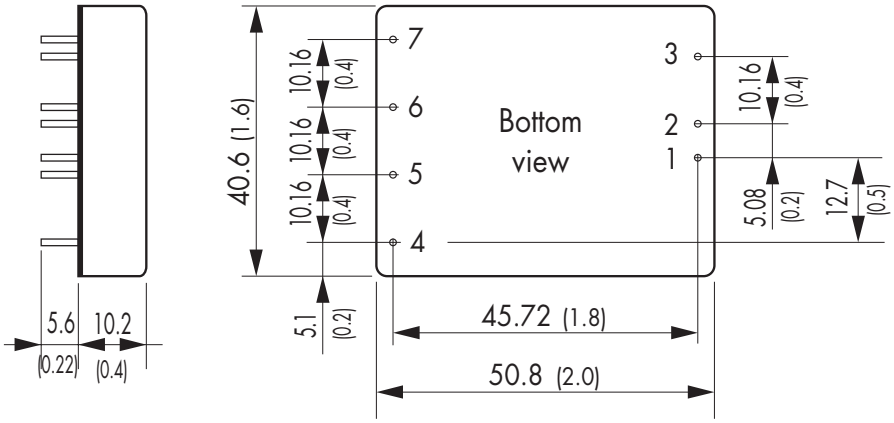

TEN 20-4823WI



## 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. |

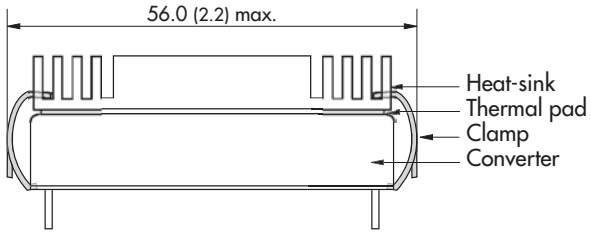
## Outline Dimensions



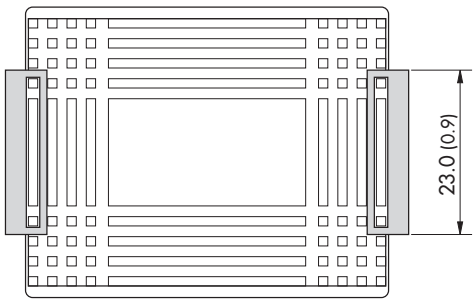

| Pin-Out | | |
|---|---|---|
| **Pin** | **Single** | **Dual** |
| **1** | +Vin (Vcc) | +Vin (Vcc) |
| **2** | –Vin (GND) | –Vin (GND) |
| **3** | Remote On/Off | |
| **4** | No pin | +Vout |
| **5** | +Vout | Common |
| **6** | –Vout | –Vout |
| **7** | Trim | |

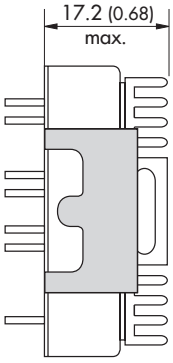
Dimensions in [mm], () = Inch
Pin diameter: 1.0 ±0.05 (0.02 ±0.002)
Pin pitch tolerances: ±0.35 (±0.014)
Casing tolerances: ±0.5 (±0.02)

### 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.

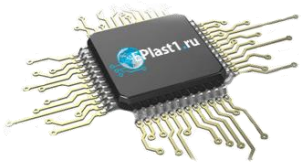
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

**Телефон:** 8 (812) 309 58 32 (многоканальный)
**Факс:** 8 (812) 320-02-42
**Электронная почта:** org@eplast1.ru
**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.