



THE DATASHEET OF TEN 6-1221N



- 2:1 input voltage range
- High efficiency
- Operating temperature range -40°C to $+85^{\circ}\text{C}$
- Input filter meets EN 55032, class A
- Overload protection
- I/O-isolation 1'500 VDC
- DIP-24 plastic package
- Industry standard pinout
- 3-year product warranty



UL 62368-1 IEC 62368-1

The TEN 6N series is designed for an optimized cost/performance ratio of DC/DC converters with output power of 6 Watt.

General features like no minimum load requirement, overload protection, internal filter for EN55032 class A and high efficiency make these converters easy to design in. With the popular DIP-24 standard package they are also a drop in replacement for many cost critical applications.

| Models | | | | | | |
|-------------|------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TEN 6-1210N | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 1'200 mA | | | 75 % |
| TEN 6-1211N | | 5 VDC | 1'200 mA | | | 78 % |
| TEN 6-1212N | | 12 VDC | 500 mA | | | 82 % |
| TEN 6-1213N | | 15 VDC | 400 mA | | | 82 % |
| TEN 6-1215N | | 24 VDC | 250 mA | | | 84 % |
| TEN 6-1221N | | +5 VDC | 500 mA | -5 VDC | 500 mA | 78 % |
| TEN 6-1222N | | +12 VDC | 250 mA | -12 VDC | 250 mA | 82 % |
| TEN 6-1223N | | +15 VDC | 200 mA | -15 VDC | 200 mA | 82 % |
| TEN 6-2410N | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 1'200 mA | | | 77 % |
| TEN 6-2411N | | 5 VDC | 1'200 mA | | | 80 % |
| TEN 6-2412N | | 12 VDC | 500 mA | | | 84 % |
| TEN 6-2413N | | 15 VDC | 400 mA | | | 84 % |
| TEN 6-2415N | | 24 VDC | 250 mA | | | 84 % |
| TEN 6-2421N | | +5 VDC | 500 mA | -5 VDC | 500 mA | 80 % |
| TEN 6-2422N | | +12 VDC | 250 mA | -12 VDC | 250 mA | 84 % |
| TEN 6-2423N | | +15 VDC | 200 mA | -15 VDC | 200 mA | 84 % |
| TEN 6-4810N | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 1'200 mA | | | 77 % |
| TEN 6-4811N | | 5 VDC | 1'200 mA | | | 80 % |
| TEN 6-4812N | | 12 VDC | 500 mA | | | 84 % |
| TEN 6-4813N | | 15 VDC | 400 mA | | | 84 % |
| TEN 6-4815N | | 24 VDC | 250 mA | | | 84 % |
| TEN 6-4821N | | +5 VDC | 500 mA | -5 VDC | 500 mA | 80 % |
| TEN 6-4822N | | +12 VDC | 250 mA | -12 VDC | 250 mA | 84 % |
| TEN 6-4823N | | +15 VDC | 200 mA | -15 VDC | 200 mA | 84 % |

Input Specifications

| | | |
|---------------------------|----------------|---|
| Input Current | - At no load | 12 Vin models: 40 mA typ. 24 Vin models: 20 mA typ. 48 Vin models: 10 mA typ. |
| | - At full load | 12 Vin models: 440 mA max. (3.3 Vout model) 610 mA max. (5 Vout model) 610 mA max. (12 Vout model) 610 mA max. (15 Vout model) 610 mA max. (24 Vout model) 530 mA max. (5 / -5 Vout model) 610 mA max. (12 / -12 Vout model) 610 mA max. (15 / -15 Vout model) 24 Vin models: 220 mA max. (3.3 Vout model) 300 mA max. (5 Vout model) 300 mA max. (12 Vout model) 300 mA max. (15 Vout model) 300 mA max. (24 Vout model) 260 mA max. (5 / -5 Vout model) 300 mA max. (12 / -12 Vout model) 300 mA max. (15 / -15 Vout model) 48 Vin models: 110 mA max. (3.3 Vout model) 150 mA max. (5 Vout model) 150 mA max. (12 Vout model) 150 mA max. (15 Vout model) 150 mA max. (24 Vout model) 130 mA max. (5 / -5 Vout model) 150 mA max. (12 / -12 Vout model) 150 mA max. (15 / -15 Vout model) |
| Surge Voltage | | 12 Vin models: 25 VDC max. (1 s max.) 24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.) |
| Start-up Voltage | | 12 Vin models: 7 VDC min. / 8 VDC typ. / 9 VDC max. 24 Vin models: 14 VDC min. / 16 VDC typ. / 18 VDC max. 48 Vin models: 32 VDC min. / 34 VDC typ. / 36 VDC max. |
| Under Voltage Lockout | | 12 Vin models: 8.5 VDC max. 24 Vin models: 16 VDC max. 48 Vin models: 35 VDC max. |
| Reflected Ripple Current | | 12 Vin models: 30 mA typ. 24 Vin models: 20 mA typ. 48 Vin models: 15 mA typ. |
| Recommended Input Fuse | | 12 Vin models: 1'500 mA (slow blow) 24 Vin models: 700 mA (slow blow) 48 Vin models: 350 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal Pi-Type |
| Short Circuit Input Power | | 3 W max. |

Output Specifications

| | | |
|----------------------|---|--|
| Voltage Set Accuracy | | ±2% max. |
| Regulation | - Input Variation (Vmin - Vmax) | single output models: 0.5% max. dual output models: 0.5% max. |
| | - Load Variation (0 - 100%) | single output models: 1.2% max. dual output models: 1.2% max. (Output 1) 1.2% max. (Output 2) |
| | - Voltage Balance (symmetrical load) | dual output models: 2% max. |
| | | |

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

| | | |
|---------------------------|---|---|
| Ripple and Noise | - 20 MHz Bandwidth | 80 mVp-p max. |
| Capacitive Load | - single output | 3.3 Vout models: 470 µF max. |
| | | 5 Vout models: 470 µF max. |
| | | 12 Vout models: 100 µF max. |
| | - dual output | 15 Vout models: 100 µF max. |
| | | 24 Vout models: 47 µF max. |
| | | 5 / -5 Vout models: 100 / 100 µF max. |
| | 12 / -12 Vout models: 100 / 100 µF max. | |
| | 15 / -15 Vout models: 100 / 100 µF max. | |
| Minimum Load | | Not required |
| Temperature Coefficient | | ±0.02 %/K max. |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Overload Protection | | Foldback Mode |
| Output Current Limitation | | 110% min. of Iout max. |
| | | 145% typ. of Iout max. |
| Transient Response | - Response Deviation | 3% typ. / 5% max. (75% to 100% Load Step) |
| | - Response Time | 300 µs typ. / 600 µs max. (75% to 100% Load Step) |

Safety Specifications

| | | |
|-----------------------|-----------------------------|--|
| Standards | - IT / Multimedia Equipment | CSA-C22.2, No. 60950-1 EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1 |
| | - Certification Documents | www.tracopower.com/overview/ten6n |
| Pollution Degree | | PD 3 |
| Over Voltage Category | | Not mains connected |

EMC Specifications

| | | |
|---------------|---------------------------|--|
| EMI Emissions | - Conducted Emissions | EN 55032 class A (internal filter) |
| | - Radiated Emissions | EN 55032 class A (with external filter) |
| | External filter proposal: | www.tracopower.com/overview/ten6n |

General Specifications

| | | |
|---------------------------|---------------------------------|---|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature | -40°C to +85°C |
| | - Case Temperature | +100°C max. |
| | - Storage Temperature | -50°C to +125°C |
| Power Derating | - High Temperature | 2.5 %/K above 60°C (3.3 & 5.0 Vout models) |
| | | 3.3 %/K above 70°C (other models) |
| | See application note: | www.tracopower.com/overview/ten6n |
| Cooling System | | Natural convection (20 LFM) |
| Altitude During Operation | | 6'000 m max. |
| Switching Frequency | | 330 kHz typ. (PWM) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | 1'500 VDC |
| | - Input to Output, 1 s | 1'800 VDC |
| Isolation Resistance | - Input to Output, 500 VDC | 1'000 MΩ min. |
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 1'000 pF typ. |
| Reliability | - Calculated MTBF | 1'000'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf |
| Housing Material | | Non-conductive Plastic (UL 94 V-0 rated) |

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

| | |
|--------------------------|---|
| Potting Material | Epoxy (UL 94 V-0 rated) |
| Pin Material | Copper Alloy (C6801) |
| Pin Foundation Plating | Nickel (2.5 µm min.) |
| Pin Surface Plating | Gold (75 - 125 nm), glossy |
| Housing Type | Plastic Case |
| Mounting Type | PCB Mount |
| Connection Type | THD (Through-Hole Device) |
| Footprint Type | DIP24 |
| Soldering Profile | Lead-Free Wave Soldering 260°C / 10 s max. |
| Weight | 12.7 g |
| Environmental Compliance | <p>- REACH Declaration www.tracopower.com/info/reach-declaration.pdf</p> <p>REACH SVHC list compliant REACH Annex XVII compliant</p> <p>- RoHS Declaration www.tracopower.com/info/rohs-declaration.pdf</p> <p>Exemptions: 7a (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))</p> <p>- SCIP Reference Number 72797e98-402f-4a39-ba0d-432ee696cc89</p> |

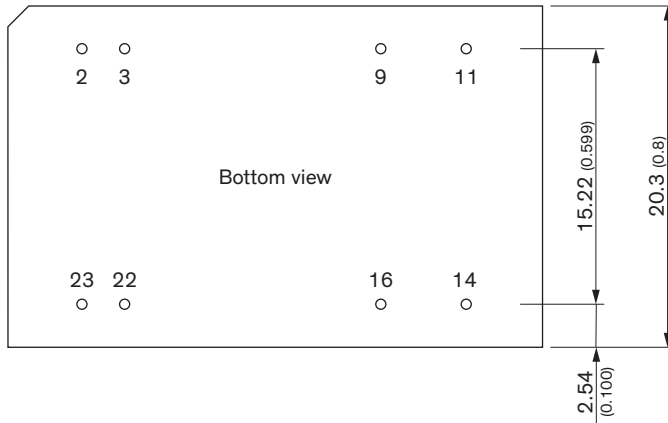
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/ten6n

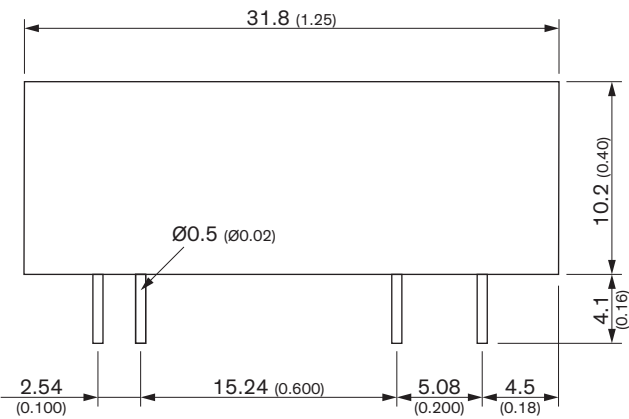
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Outline Dimensions



| Pinout | | |
|--------|------------|------------|
| Pin | Single | Dual |
| 2 | -Vin (GND) | -Vin (GND) |
| 3 | -Vin (GND) | -Vin (GND) |
| 9 | No pin | Common |
| 11 | NC | -Vout |
| 14 | +Vout | +Vout |
| 16 | -Vout | Common |
| 22 | +Vin (Vcc) | +Vin (Vcc) |
| 23 | +Vin (Vcc) | +Vin (Vcc) |



NC: Not connected



Dimensions in mm (inch)
 Tolerances x.x ±0.25 (x.xx ±0.01)
 x.xx ±0.13 (x.xxx ±0.005)
 Pin diameter tolerance: x.x ±0.05 (x.xx ±0.002)

Looking for pricing, stock, or lifecycle information?

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