

# 10 Watt TC Dual Series DC/DC Converters

## [查询"48D12.400TC"供应商](#)

### Features

- 3:1 Extra Wide Input Voltage Range, 20-60 VDC
- Low Noise, Highly Regulated Dual Outputs
- Efficiency > 72% for All Line Conditions
- No Derating to 80°C Case Temperature
- Six-sided Shielded Low Thermal Gradient Copper Case
- 700 VDC Minimum Input to Output Isolation
- Overvoltage Protected Input and Outputs
- Pulse-by-pulse Digital Current Limiting
- Overtemperature Protection Circuit
- 5 Year Warranty

### Description

These converters provide low noise bipolar outputs from a wide range of input voltages. The converters' small 2.02" x 1.62" size makes them ideal for telecommunications, instrumentation or industrial control applications.

The dual outputs are cross regulated with a high loop gain current mode control method that provides good regulation with a true, high efficiency switching DC/DC topology. The large amount of loop gain insures excellent input ripple rejection and line transient response.

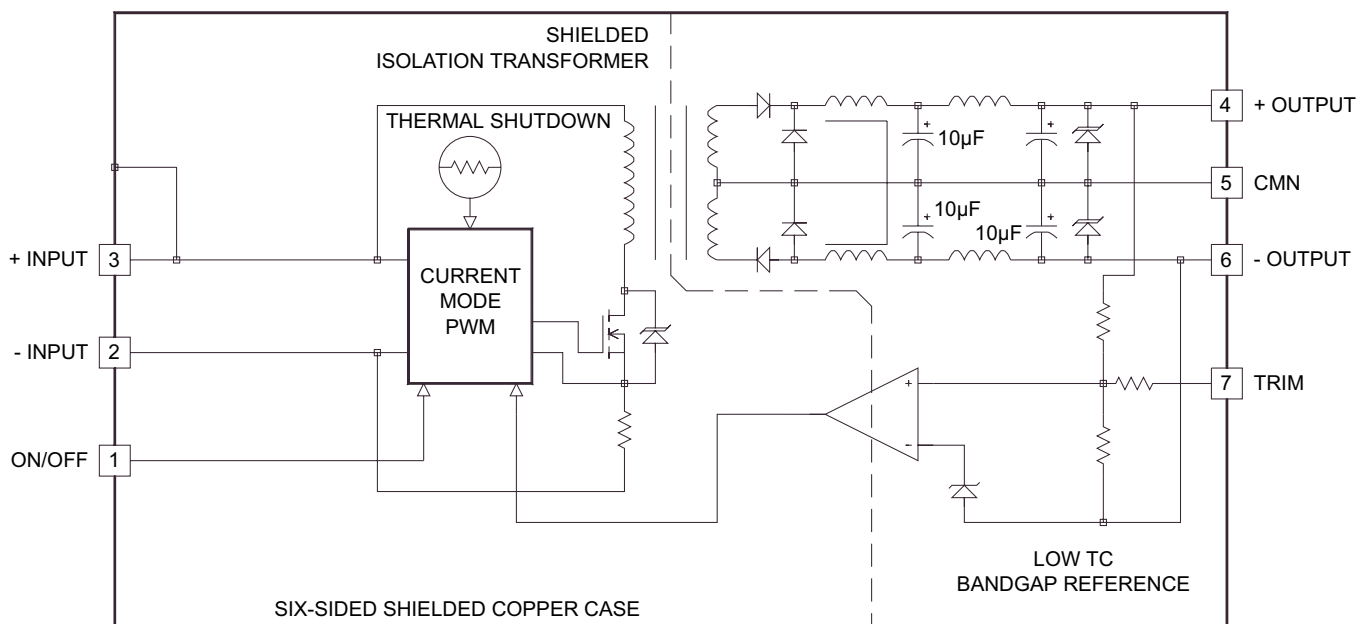
Also included is a logic (open collector TTL / CMOS compatible) shutdown pin to control converter operation.

The modules in the TC Dual Series are protected from output shorts by a high speed, pulse-by-pulse, digital current limit circuit and a thermal overload sensing circuit.

The input and output are overvoltage protected.

| Selection Chart |                 |      |             |            |
|-----------------|-----------------|------|-------------|------------|
| Model           | Input Range VDC |      | Outputs VDC | Outputs mA |
|                 | MIN             | MAX  |             |            |
| 48D12.400TC     | 20.0            | 60.0 | ±12         | 400        |
| 48D15.350TC     | 20.0            | 60.0 | ±15         | 350        |

10 Watt Dual Series Block Diagram



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| Input Parameters*                             |            |              |              |        |
|-----------------------------------------------|------------|--------------|--------------|--------|
| Model                                         |            | 48D12.400TC  | 48D15.350TC  | Units  |
| Voltage Range                                 | MIN<br>MAX | 20.0<br>60.0 | 20.0<br>60.0 | VDC    |
| Reflected Ripple (2) (3), 0-20Mhz bw          | TYP        | 700          |              | mA RMS |
| Input Current Full Load                       | TYP        | 250          | 285          | mA     |
| No Load                                       | TYP        | 6            | 6            |        |
| Efficiency                                    | TYP        | 79           | 75           | %      |
| Switching Frequency                           | TYP        | 120          |              | kHz    |
| Maximum Input Overvoltage,<br>100ms No Damage | MAX        | 75           |              | VDC    |
| Turn-on Time, 1% Output Error                 | TYP        | 10           |              | ms     |
| Recommended Fuse                              |            | (4)          |              |        |

| Output Parameters*                                    |                   |                                                                                                         |                            |         |
|-------------------------------------------------------|-------------------|---------------------------------------------------------------------------------------------------------|----------------------------|---------|
| Model                                                 |                   | 48D12.400TC                                                                                             | 48D15.350TC                | Units   |
| Output Voltage                                        |                   | ±12                                                                                                     | ±15                        | VDC     |
| Rated Current (5)                                     | MIN<br>MAX        | 100<br>400                                                                                              | 90<br>350                  | mA      |
| Voltage Range<br>100% Load                            | MIN<br>TYP<br>MAX | 11.900<br>12.000<br>12.100                                                                              | 14.900<br>15.000<br>15.100 | VDC     |
| Output Balance<br>(Plus to Minus Output, Full Load)   | TYP<br>MAX        | 0.1<br>0.5                                                                                              | 0.1<br>0.5                 | %       |
| Load Regulation<br>Min-Max Full Load (5)              | TYP<br>MAX        | 0.1<br>0.5                                                                                              | 0.1<br>0.5                 | %       |
| Cross Regulation, Min-Max Load (6)                    | TYP<br>MAX        | 1.0<br>2.0                                                                                              | 1.3<br>2.5                 | %       |
| Line Regulation<br>Vin = Min-Max VDC                  | TYP<br>MAX        | 0.1<br>0.2                                                                                              | 0.1<br>0.2                 | %       |
| Short Term Stability (7)                              | TYP               | 0.02                                                                                                    | 0.02                       | %       |
| Long Term Stability                                   | TYP               | 0.2                                                                                                     | 0.2                        | %/kHrs  |
| Transient Response (8)                                | TYP               | 200                                                                                                     | 200                        | µs      |
| Dynamic Response (6)                                  | TYP               | 135                                                                                                     | 125                        | mV peak |
| Input Ripple Rejection (10)                           | TYP               | >60                                                                                                     | >60                        | dB      |
| Noise, 0-20MHz bw (2)                                 | TYP<br>MAX        | 20<br>50                                                                                                | 20<br>50                   | mV P-P  |
| Temperature Coefficient                               | TYP<br>MAX        | 50<br>150                                                                                               | 50<br>150                  | ppm/°C  |
| Overvoltage Clamp (11)                                | TYP               | 15                                                                                                      | 18                         | VDC     |
| Short Circuit Protection to<br>Common for all Outputs |                   | Provides minimum of 8 hours continuous protection with current limiting and thermal overload protection |                            |         |

## NOTES

\* All parameters measured at Tc = 25° C, nominal input voltage and full rated load unless otherwise noted. Refer to the CALEX Application Notes for the definition of terms, measurement circuits and other information.

(2) Noise is measured per CALEX Application Notes found in our Power conversion Design Guide and Catalog.

(3) An external capacitor capable of withstanding at least 700 mA RMS of 120 kHz ripple current must be connected directly across the + and - inputs. Suggested capacitors are:

**Sprague Electric:** 672D686H100DM3C, 68µF, 100V

672D127H100ET3C, 120µF, 100V

**Panasonic:** ECEA2AFE101, 100µF, 100V

ECEA2AFE121, 120µF, 100V

**United Chemi-Con:** SXE100VB120M12.5X25LL, 120µF, 100V

SXE100VB180M12.5X30LL, 180µF, 100V

SXE100VB220M12.5X35LL, 220µF, 100V

Note: All of the above capacitors are 105°C Rated. Multiple smaller sized capacitors may be used in parallel as long as their total ripple capability is above 700 mA RMS (see IRR curve).

(4) Determine the correct fuse size by calculating the maximum DC current drain at low line input, maximum load and then adding 20 to 25% to get the desired fuse size. A slow blow type fuse is recommended.

(5) Load regulation for the outputs is specified as the voltage change when both outputs are changed from maximum to minimum load at the same time. Minimum load is required for specified regulation only. The converter can be run at no load on either or both outputs with no damage.

(6) Cross regulation is defined as the change in one output when the other output is changed from maximum to minimum load.

(7) Short term stability is specified after a 30 minute warm-up at full load, constant line and recording the drift over a 24 hour period.

(8) The transient response is specified as the time required to settle from a 50 to 75 % step load change (rise time of step = 2 µSec) to a 50 mV error band.

(9) Dynamic response is the peak overshoot during a transient as defined in note 8 above.

(10) The input ripple rejection is specified for DC to 120 Hz ripple with a modulation amplitude of 1% of Vin.



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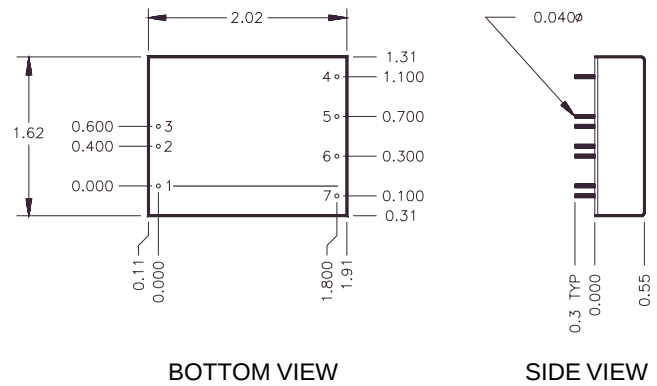
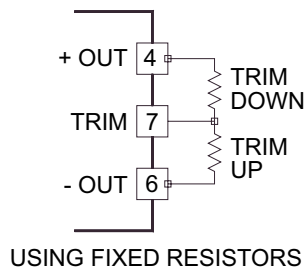
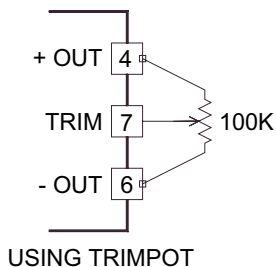
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| General Specifications *                    |     |     |         |
|---------------------------------------------|-----|-----|---------|
| All Models                                  |     |     | Units   |
| <b>ON/OFF Function (12)</b>                 |     |     |         |
| ON Logic Level or Leave Pin Open            | MIN | 8.0 | VDC     |
| Off Logic Level                             | MAX | 2.0 | VDC     |
| Input Resistance                            | TYP | 100 | kohms   |
| Converter Idle Current ON/OFF Pin Low       | TYP | 1   | mA      |
| <b>Isolation (13)</b>                       |     |     |         |
| Isolation Voltage 10µA Leakage Input-Output | MIN | 700 | VDC     |
| Input to Output Capacitance                 | TYP | 60  | pF      |
| <b>Output Trim Function</b>                 |     |     |         |
| Input Resistance                            | TYP | 35  | kohms   |
| Programming Range                           | MIN | ±10 | %       |
| <b>Environmental</b>                        |     |     |         |
| Case Operating Range No Derating            | MIN | -25 | °C      |
|                                             | MAX | 80  |         |
| Case Functional Range (14)                  | MIN | -40 | °C      |
|                                             | MAX | 90  |         |
| Storage Range                               | MIN | -55 | °C      |
|                                             | MAX | 105 |         |
| Thermal Impedance (15)                      | TYP | 10  | °C/Watt |
| Thermal Shutdown Case Temperature           | TYP | 90  | °C      |
| <b>General</b>                              |     |     |         |
| Unit Weight                                 | TYP | 1.9 | oz      |

- (11) For module protection only, see also note 4.
- (12) The logic ON/OFF pin is Open Collector TTL, CMOS, and relay compatible. The input to this pin is referenced to Pin 2, -Input and is protected to +100 VDC.
- (13) Case is tied to Pin 3, + Input.
- (14) The functional temperature range is intended to give an additional data point for use in evaluating this power supply. At the low functional temperature the power supply will function with no side effects, however, sustained operation at the high functional temperature will reduce expected operational life. The data sheet specifications are not guaranteed over the functional temperature range.
- (15) The case thermal impedance is specified as the case temperature rise over ambient per package watt dissipated.

## Connections for Output Trim

Use one resistor for either trim up or trim down. The values can range from infinity to zero ohms with zero ohms giving the most trim.



Mechanical tolerances unless otherwise noted:

X.XX dimensions: ±0.020 inches

X.XXX dimensions: ±0.005 inches

Seal around terminals is not hermetic. Do not immerse units in any liquid.

| Pin | Function   |
|-----|------------|
| 1   | ON/OFF     |
| 2   | -INPUT     |
| 3   | +INPUT     |
| 4   | +OUTPUT    |
| 5   | OUTPUT CMN |
| 6   | -OUTPUT    |
| 7   | TRIM       |

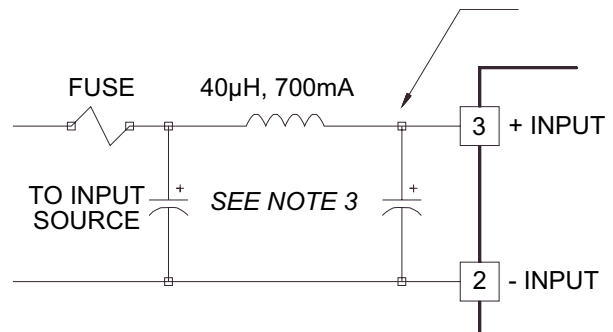
## Low Noise Input Circuit

The circuit shown below will reduce reflected ripple to 50 mA P-P. Keep all components as close to the converter as possible

The inductor is 35 turns on a Micro-Metals T50-26 Iron Powder Core.

See note 3 for capacitor recommendations and note 4 for fuse sizing.

**THIS CAPACITOR IS REQUIRED FOR PROPER OPERATION**



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Typical Performance (T<sub>c</sub>=25°C, V<sub>in</sub>=48VDC, Full Rated Load)

