

10 Watt TC Dual Series DC/DC Converters

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.

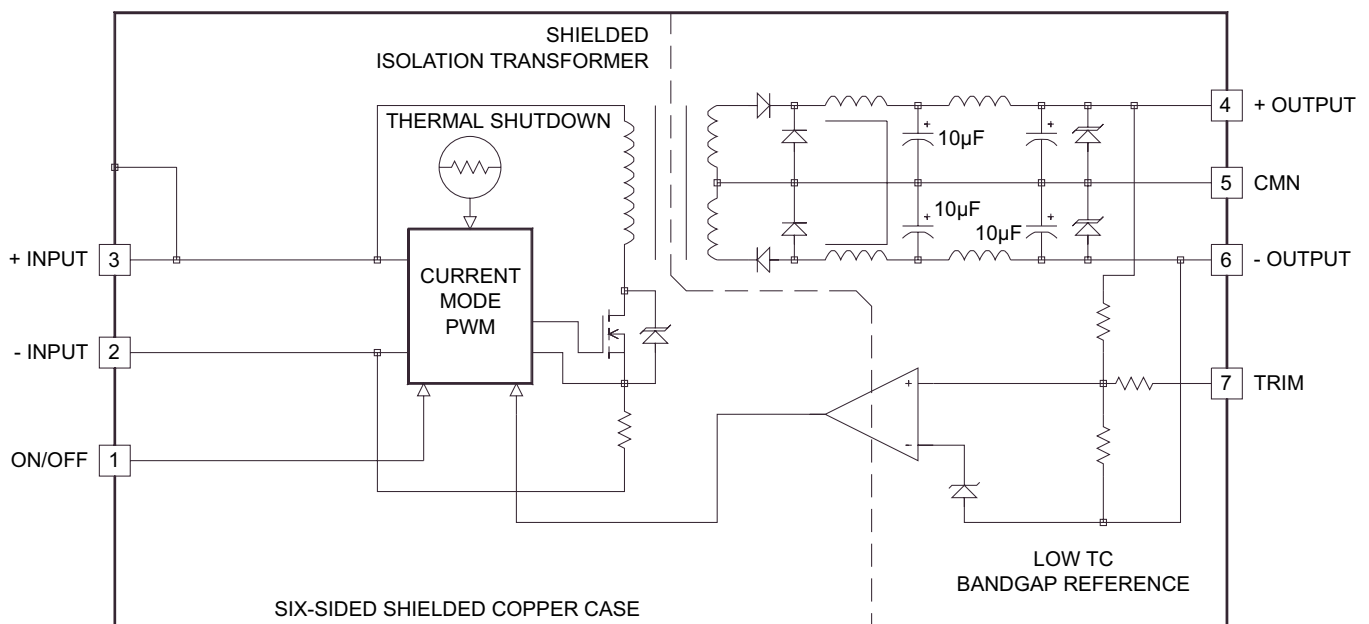
Also included is a logic (open collector TTL / CMOS compatible) shutdown pin to control converter operation.

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	20.0	20.0	VDC
	MAX	60.0	60.0	
Reflected Ripple (2) (3), 0-20Mhz bw		700		mA RMS
Input Current Full Load	TYP	250	285	mA
	No Load	6	6	
Efficiency	TYP	79	75	%
Switching Frequency	TYP	120		kHz
Maximum Input Overvoltage, 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	100	90	mA
	MAX	400	350	
Voltage Range 100% Load	MIN	11.900	14.900	VDC
	TYP	12.000	15.000	
	MAX	12.100	15.100	
Output Balance (Plus to Minus Output, Full Load)	TYP	0.1	0.1	%
	MAX	0.5	0.5	
Load Regulation Min-Max Full Load (5)	TYP	0.1	0.1	%
	MAX	0.5	0.5	
Cross Regulation, Min-Max Load (6)	TYP	1.0	1.3	%
	MAX	2.0	2.5	
Line Regulation Vin = Min-Max VDC	TYP	0.1	0.1	%
	MAX	0.2	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	20	20	mV P-P
	MAX	50	50	
Temperature Coefficient	TYP	50	50	ppm/°C
	MAX	150	150	
Overvoltage Clamp (11)	TYP	15	18	VDC
Short Circuit Protection to 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.



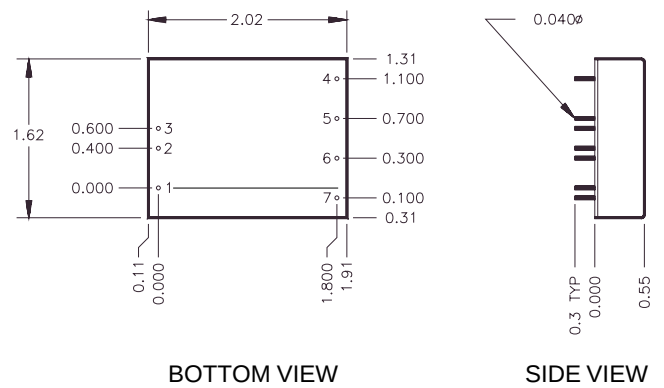
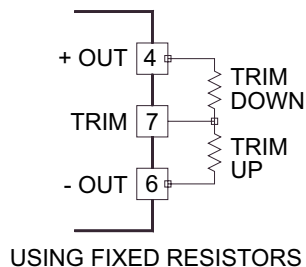
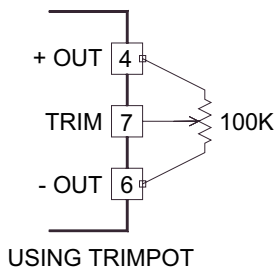
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General Specifications *			
All Models			Units
ON/OFF Function (12)			
ON Logic Level or Leave Pin Open	MIN	8.0	VDC
Off Logic Level	MAX	2.0	VDC
Input Resistance	TYP	100	kohms
Converter Idle Current ON/OFF Pin Low	TYP	1	mA
Isolation (13)			
Isolation Voltage 10µA Leakage Input-Output	MIN	700	VDC
Input to Output Capacitance	TYP	60	pF
Output Trim Function			
Input Resistance	TYP	35	kohms
Programming Range	MIN	±10	%
Environmental			
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
General			
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

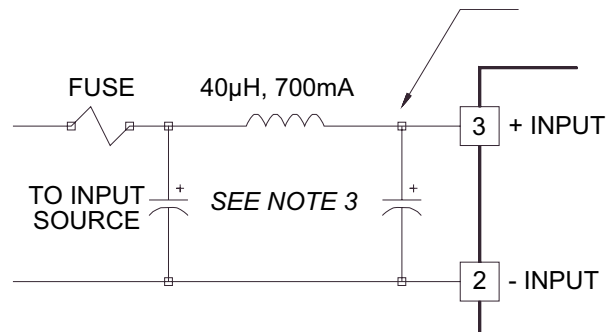
Low Noise Input Circuit

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 ($T_c=25^\circ\text{C}$; $V_{in}=48\text{VDC}$, Full Rated Load)

