

# 10 Watt TC Single Series DC/DC Converters

## Features

- Extra Wide 3:1 Input Voltage Range, 20-60 VDC
- Low Noise, Highly Regulated Single Outputs
- Efficiency 75% for All Line Conditions
- No Derating to 80°C Case Temperature
- Six-Sided Shielded Low Thermal Gradient Copper Case
- 500 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 single output converters are designed for wide input range, low noise, telecommunications, industrial control, medical and instrument applications. The extra wide input range (3:1) is ideal for battery or unregulated input applications.

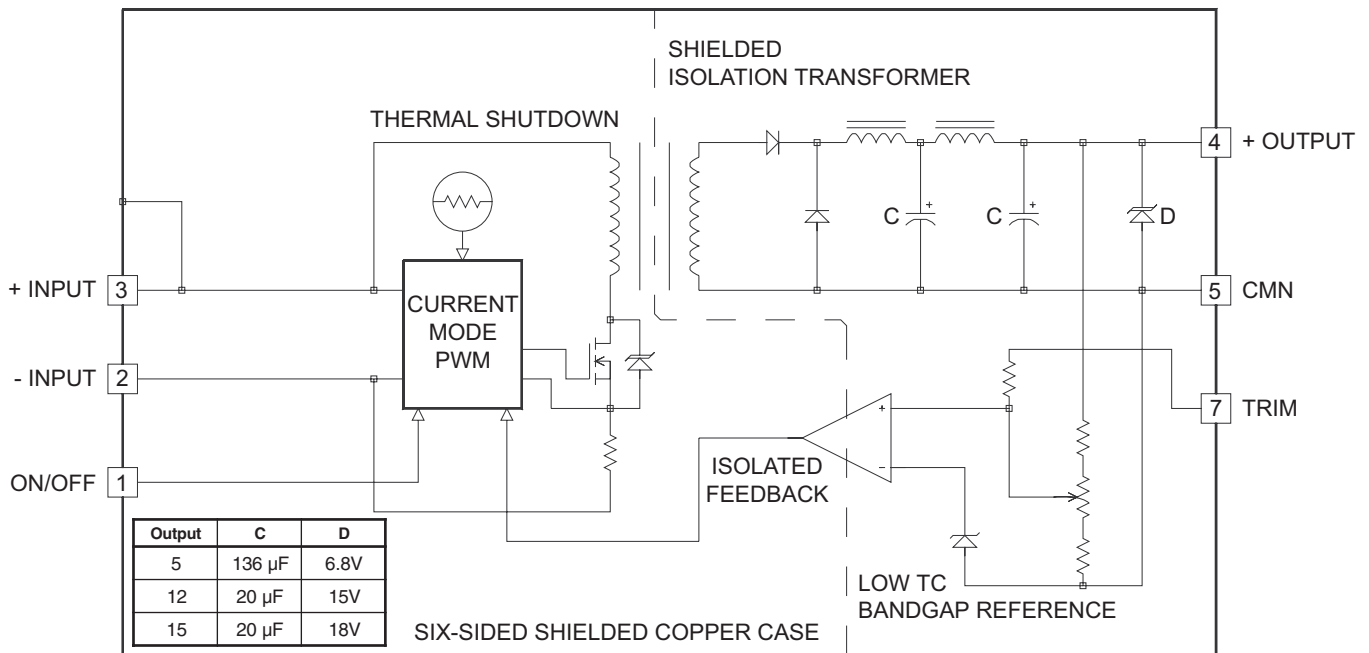
These converters are state-of-the-art 120kHz MOSFET based designs that provide outstanding line and load regulation. The single outputs are regulated with a high loop gain current mode control method that provides linear regulator type performance.

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

The TC Single Series is protected from output shorts to common by a high speed, pulse by pulse digital, current limit circuit and a thermal overload sensing circuit.

Selection Chart				
Model	Input Range VDC		Outputs VDC	Outputs mA
	MIN	MAX		
48S5.2000TC	20.0	60.0	5	2000
48S12.850TC	20.0	60.0	12	850
48S15.700TC	20.0	60.0	15	700

10 Watt TC Single Series Block Diagram



# 10 Watt TC Single Series DC/DC Converters

Input Parameters*					
Model		48S5.2000TC	48S12.850TC	48S15.700TC	Units
Voltage Range	MIN	20.0			VDC
	TYP	48.0			
	MAX	60.0			
Reflected Ripple (2) (3), 0-20Mhz bw	TYP	700			mA RMS
Input Current Full Load	TYP	265	265	273	mA
	No Load	10	10	10	
Efficiency	TYP	78	80	80	%
Switching Frequency	TYP	120			kHz
Maximum Input Overvoltage, 100ms No Damage	MAX	75			VDC
Turn-on Time	TYP	10			ms
Recommended Fuse		(4)			

Output Parameters*					
Model		48S5.2000TC	48S12.850TC	48S15.700TC	Units
Output Voltage		5	12	15	VDC
Rated Current (5)	MIN	0	0	0	mA
	MAX	2000	850	700	
Voltage Range 100% Load	MIN	4.950	11.900	14.900	VDC
	TYP	5.000	12.000	15.000	
	MAX	5.050	12.100	15.100	
Load Regulation 0-100% Full Load	TYP	0.1	0.05	0.04	%
	MAX	0.3	0.1	0.1	
Line Regulation Vin = Min-Max VDC	TYP	0.01	0.01	0.01	%
	MAX	0.15	0.1	0.1	
Short Term Stability (6)	TYP	0.02			%
Long Term Stability	TYP	0.2			%/kHrs
Transient Response (7)	TYP	50	100	150	µs
Dynamic Response (8)	TYP	55	100	110	mV peak
Input Ripple Rejection (9)	TYP	60			dB
Noise, 0-20MHz bw	TYP	35	20	20	mV P-P
	MAX	75	50	50	
Temperature Coefficient	TYP	50			ppm/°C
	MAX	150			
Overvoltage Clamp (10)	TYP	6.8	15	18	VDC
Short Circuit Protection to Common for all Outputs		Provides of Continuous, 8 hours Minimum Current Limit and Thermal Overload			

## 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.
- (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

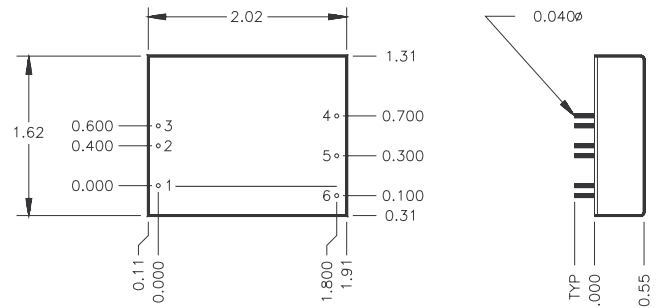
Note: All of the above capacitors are 105°C Rated. Multiple smaller sized capacitors may be used in parallel as long as their total ripple capability is above 700 mA RMS (see IRR curve).

- (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%. A slow blow type fuse is recommended.
- (5) No minimum load required.
- (6) Short term stability is specified after a 30 minute warm-up at full load, and with constant line, load and ambient conditions.

- (7) The transient response is specified as the time required to settle from 50 to 75% step load change (rise time of step = 2µ Sec.) to a 50 mV error band.
- (8) Dynamic response is the peak overshoot voltage during the transient response time defined in note 7 above.
- (9) The input ripple rejection is specified for DC to 120Hz ripple with a modulation amplitude of 1% Vin.
- (10) For module protection only, see also note 4.
- (11) The logic shutdown 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.
- (12) Case is tied to Pin 3, +Input.
- (13) 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.
- (14) The case thermal impedance is specified as the case temperature rise over ambient per package watt dissipated.
- (15) Water Washability - Calex DC/DC converters are designed to withstand most solder/wash processes. Careful attention should be used when assessing the applicability in your specific manufacturing process. Converters are not hermetically sealed.

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General Specifications *			
All Models			Units
<b>Logic Shutdown (11)</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 Shut Down Pin Low	TYP	1	mA
<b>Isolation</b>			
Isolation Voltage (12) 10 mA Leakage Input-Output	MIN	500	VDC
Input to Output Capacitance	TYP	70	pF
<b>Output Trim Function</b>			
Input Resistance	TYP	20	kohms
Programming Range	MIN	±10	%
<b>Environmental</b>			
Case Operating Range No Derating	MIN	-25	°C
	MAX	80	
Case Functional Range (13)	MIN	-40	°C
	MAX	90	
Storage Range	MIN	-55	°C
	MAX	105	
Thermal Impedance (14)	TYP	11	°C/Watt
Thermal Shutdown Case Temperature	TYP	90	°C
<b>General</b>			
Unit Weight	TYP	1.9	oz



BOTTOM VIEW

SIDE VIEW

Mechanical tolerances unless otherwise noted:

X.XX dimensions: ±0.020 inches

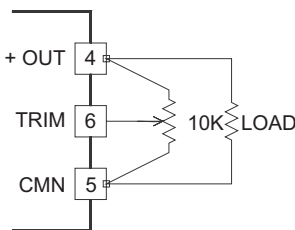
X.XXX dimensions: ±0.005 inches

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

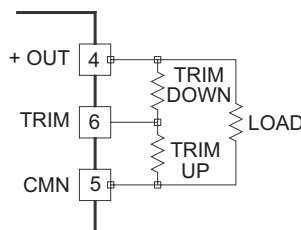
Pin	Function
1	ON/OFF
2	-INPUT
3	+INPUT
4	+OUTPUT
5	CMN
6	TRIM

## 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.



USING TRIMPOT



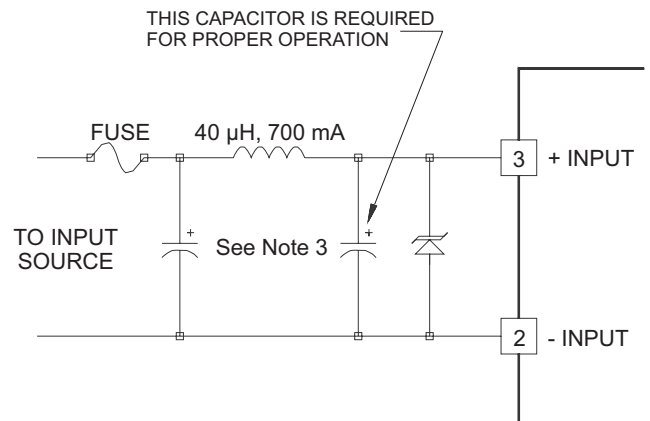
USING FIXED RESISTORS

## 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.



# 10 Watt TC Single Series DC/DC Converters

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

