27 to 30 Watt LE Triple Series DC/DC Converters

Features

- Triple Output
- Wide 4:1 Input Voltage Range (9-36 or 18-72 VDC)
- High Efficiency, up to 85%
- No Derating to 85°C Case Temperature
- LC Input Filter, Dual Section Output Filters
- PCB Mounting With Optional Heat Sink and Chassis Mounting Kit
- Five Year Warranty

Description

The 4:1 input range of the LE Triple Series makes them ideal for a wide variety of power requirements including battery and unregulated input applications. Each converter's +5V is tightly regulated and useful for driving standard logic circuits.

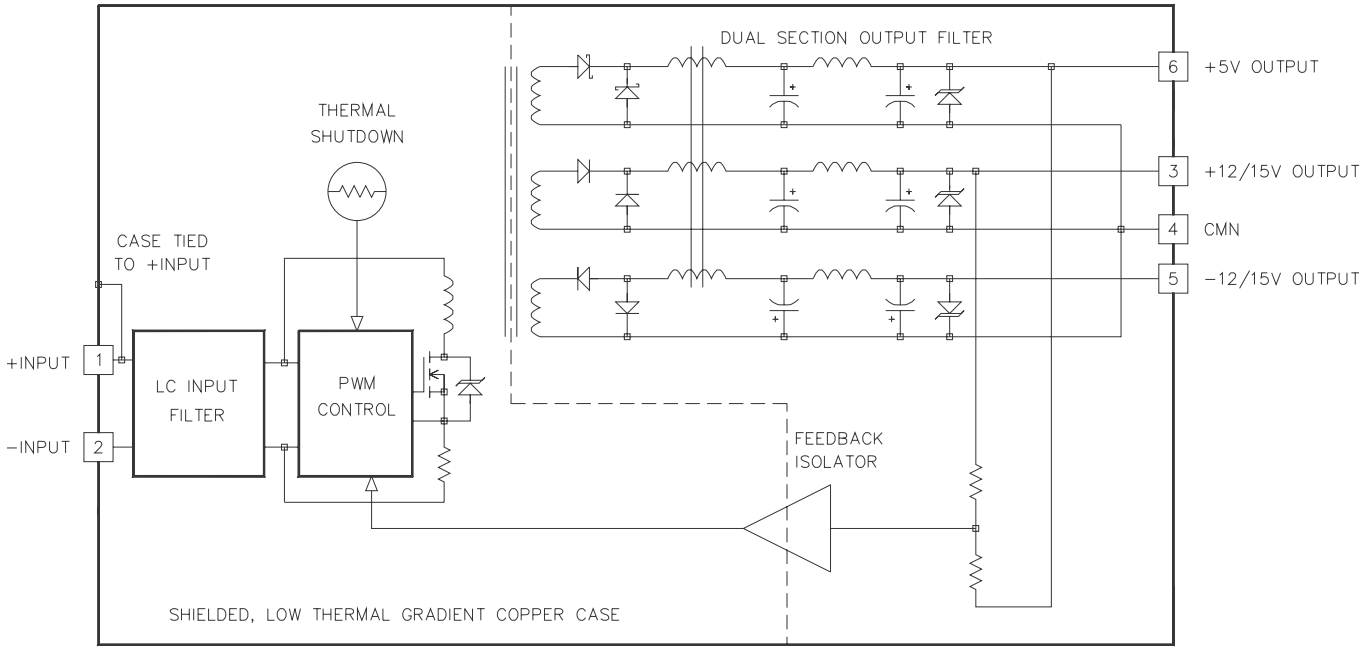
These 27-30 Watt converters have dual output filters. They provide a low output noise of 50 mV P-P typical and are fully specified and tested to the maximum specifications. Input filtering significantly reduces the reflected ripple noise.

Unlike comparable converters, all inputs and outputs are protected from transient overvoltage conditions. Overload protection is provided by current sensing of the primary switching current and an independent thermal sensor. The 27-30 Watt Triple Series, like all CALEX converters, carries the full 5 Year CALEX Warranty.

Selection Chart

Model	Input Range VDC		Outputs VDC	Outputs mA
	Min	Max		
12T5.12LE	9	36	5, ±12	3000, ±500
12T5.15LE	9	36	5, ±15	3000, ±400
48T5.12LE	18	72	5, ±12	3000, ±625
48T5.15LE	18	72	5, ±15	3000, ±500

27-30 Watt Triple Series Block Diagram



27 to 30 Watt LE Triple Series DC/DC Converters

Input Parameters*						
Model		**12T5.12LE**	**12T5.15LE**	**48T5.12LE**	**48T5.15LE**	**Units**
Voltage Range	MIN MAX	9.0 36.0		18.0 72.0		VDC
Reflected Ripple (2), 0-20MHz bw	TYP	200		165		mA P-P
Input Current Full Load No Load	TYP TYP	2715 12		735 14		mA
Efficiency	TYP	83		85		%
Switching Frequency	TYP	100				kHz
Maximum Input Overvoltage, 100ms No Damage	MAX	45		85		VDC
Turn-on Time	TYP	60		45		mSec
Recommended Fuse		(3)				AMPS

Output Parameters*								
Model		**12T5.12LE 12T5.15LE 48T5.12LE 48T5.15LE**	**12T5.12LE**	**48T5.12LE**	**12T5.15LE**	**48T5.15LE**	**Units**
Output Voltage		+5	±12		±15		VDC
Rated Load (4)	MIN MAX	750 3000	125 500	160 625	100 400	125 500	mA
Voltage Range 100% Load	MIN TYP MAX	4.950 5.000 5.050	11.600 12.000 12.400		14.500 15.000 15.500		VDC
Output Balance (Plus to Minus Output, Full Load)	TYP	N/A	0.3		0.3		%
Load Regulation Min-Max (5)	TYP MAX	1.2 2.0	1.5 3.0		1.1 3.0		%
Cross Regulation (6)	TYP	0.3	3.1		3.1		%
Line Regulation Vin = Min-Max VDC	TYP MAX	0.1 0.5	0.3 1.0		0.3 1.0		%
Short Term Stability (7)	TYP	< 0.02	< 0.1		< 0.1		%
Long Term Stability	TYP	< 0.2	< 0.3		< 0.3		%/kHrs
Transient Response (8)	TYP	350	Never Exceeds 1%		Never Exceeds 1%		µSec
Dynamic Response (9)	TYP	130	60		60		mV peak
Noise, 0-20MHz bw (10)	TYP MAX	50 100	35 70		35 70		mV P-P
Temperature Coefficient	TYP MAX	50 150	50 200		50 200		ppm/°C
Overvoltage Clamp (11)	TYP	6.8	15		18		VDC
Short Circuit Protection to CMN for all Outputs		Provides continuous protection with current limiting and thermal overload techniques					

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 the CALEX Power Conversion Design Guide & Catalog. Measurement bandwidth is 0 - 20 MHz. See the applications section of this note for more information. Input reflected ripple is measured with a 3.3 to 33µF, 0.5 to 5 ohm ESR, 100 Volt aluminum electrolytic capacitor connected directly across the input pins.

(3) Refer to the CALEX Application Notes for information on fusing.

(4) Optimum performance is obtained when this power supply is operated within the minimum to maximum load specifications. With other load currents the output voltage may be outside of the specification limits. Tests should be run for the specific application.

(5) Dual output regulation is specified by simultaneously changing both ±12V or ±15V outputs from minimum to maximum load and noting the change in each output.

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

(7) Short term stability is specified after a 30 minute warm up at full load, constant line, load and ambient conditions.

(8) Transient response is defined as the time for the output to settle from a 50 to 75% step load change to a 1% error band (rise time of step = 2µs).

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

(10) A 1µF 35V Tantalum capacitor is connected from each output pin to the CMN pin, directly at the converter. Noise is measured per CALEX application notes. Measurement bandwidth is 0 - 20MHz.

(11) 500 Watt peak pulse power transient suppression diodes used.

(12) 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. Sustained operation at the high functional temperature will reduce the expected operational life. The data sheet specifications are not guaranteed over the functional temperature range.

(13) The case thermal impedance is specified as the case temperature rise over ambient per package watt dissipated.

(14) Specifications subject to change without notice.

General Specifications*			
All Models			**Units**
Isolation			
Isolation Voltage Input to Output 12T Input to Output 48T 10µA Leakage	 MIN MIN	 700 1544	VDC
Input to Output Capacitance	TYP	350	pF
Environmental			
Case Operating Range No Derating	MIN MAX	-25 85	°C
Case Functional Range (12)	MIN MAX	-40 90	°C
Storage Range	MIN MAX	-40 105	°C
Thermal Impedance (13)	TYP	4.4	°C/Watt
Thermal Shutdown Case Temperature	TYP	95	°C
General			
Unit Weight		7	oz
Mounting Options			
MS9		Chassis Mounting Kit	
- I Suffix on Part Number		Inserts In Case	
- HS		Heat Sink Option	

(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.

Heat Sink Option

The 27-30 Watt Triple can be ordered with a "-I" configuration which provides 3 inserts on the top surface of the case for attaching a heat sink. When ordered with an "-HS" configuration, CALEX will ship the converter with the heat sink attached. The CALEX heat sink was specially developed for this model and will reduce the case temperature rise to below 3.3°C/W with natural convection and even lower with moving air.

Customer installed heat sinks may also be used. It is recommended that only liquid heat sink compound be used on the heat sink interface. Avoid so called "Dry" pad heat sink materials. In our experience these materials are actually worse than using no compound at all.

Chassis Mounting Kit - MS9

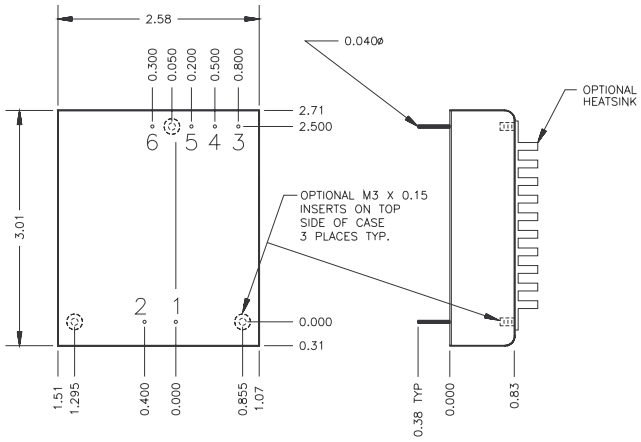
The MS9 chassis mounting kit allows for direct wire connection through two barrier strips. The MS9 may be conveniently attached to a chassis by using the 4-0.156 inch diameter mounting holes provided in each corner.

Although the MS9 comes with solderless sockets, it is recommended that the converter be soldered to the mounting kit for improved reliability under severe environmental or vibration conditions.

Typical Application

Figure 1 shows the recommended connections for the 27-30 Watt Triple DC/DC converter.

A fuse is recommended to prevent unlimited current flow in the event of a system failure and to protect the DC/DC converter input circuit.



BOTTOM VIEW SIDE VIEW

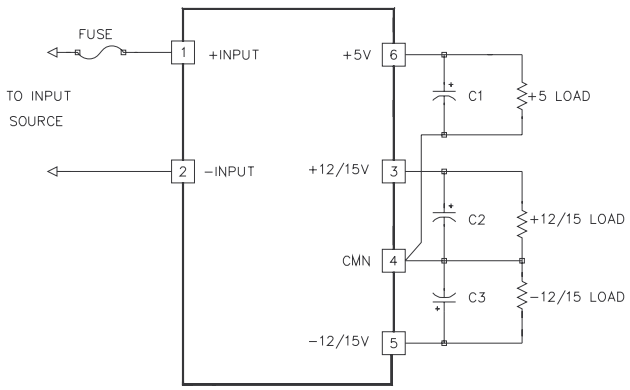
Mechanical tolerances unless otherwise noted:

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	+INPUT
2	-INPUT
3	+12/15V
4	CMN
5	-12/15V
6	+5V



C1-C3=1µF/35V, TANTALUM

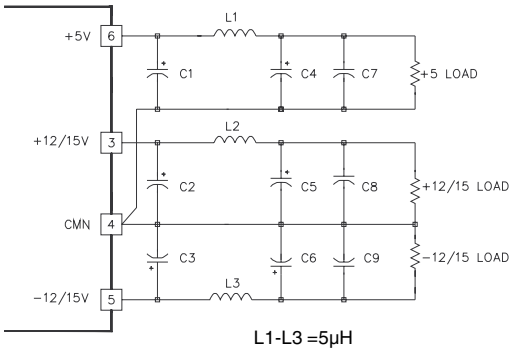
Figure 1.

Recommended Application Circuit

Low Noise Output Filtering Circuit

To minimize noise, connect a 1µF 35 Volt Tantalum capacitor directly at each output pin to CMN. These capacitors reduce common mode switching currents from showing at the converter's output as a normal mode output noise. The usual addition of other small value bypass capacitors at the load will also reduce noise.

Do not use the lowest ESR, largest value capacitor that you can find! This can only lead to reduced system performance or oscillation. For more information, see our application note "Understanding Power Supply Output Impedance for Optimum Decoupling".



L1-L3 =5µH
C1-C3 =1µF/35V, TANTALUM
C4-C6 =10µF/35V, TANTALUM
C7-C9 = 0.01µF, CERAMIC

Figure 2.

Low Noise Output Filter Circuit

Extra output filtering can be added to further reduce the noise. The optional circuit shown in Figure 2 can reduce the +5V noise to less than 10 mV P-P, and the ±V output noise to less than 15 mV P-P. Use an inductor for L1 that is rated for 3 Amps DC minimum, and 650 mA DC minimum for L2 and L3.

Low Noise Input Filtering Circuit

The circuit of Fig 3 can be added to reduce the input reflected ripple current to less than 50 mA P-P (12V models) and less than 30 mA P-P (48V models). For L4, use a 5µH-4 Amp DC inductor for 12V models, and a 20µH-2 Amp DC inductor for 48V models. C10 and C11 are 10µF/100V and can be nearly any 105°C rated capacitor. To prevent input filter peaking the ESR should be in range of 0.5 to 2 ohms. Do not use a low ESR capacitor for this part as peaking of the filter's transfer function may occur and render the filter ineffective.

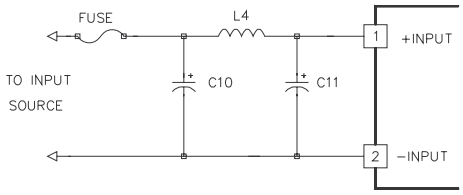


Figure 3.

Low Noise Input Filter Circuit

Case Grounding

The case serves not only as a heat sink but also as an EMI shield. The case/header shield is tied to the +Input pin as shown in the block diagram.

Temperature Derating/Mounting Options

The LE Triple Series can operate up to 85°C case temperature without derating. The case temperature may be roughly calculated from ambient by knowing that the LE Triple's case temperature rise is 4.4°C per package Watt dissipated. For example, if the converter was functioning at an output of 30 Watts, at what ambient could it expect to run with no moving air and no additional heat sinks?

Efficiency is approximately 85% which calculates to an input power of 35 Watts. 35 - 30 = 5 Watts dissipated internally in the package. The case temperature rise would be 5 Watts x 4.4 = 22°C. The 22°C is subtracted from the maximum case temperature of 85°C so, in this example, the unit can operate up to a 63°C ambient.

This is a rough approximation of the maximum ambient temperature. Because of the difficulty of defining ambient and the possibility that the load's dissipation may actually increase the local ambient temperature significantly, these calculations should be verified by actual measurement before committing to a production design.

Typical Performance (Tc=25°C, Vin=Nom VDC, Rated Load).