

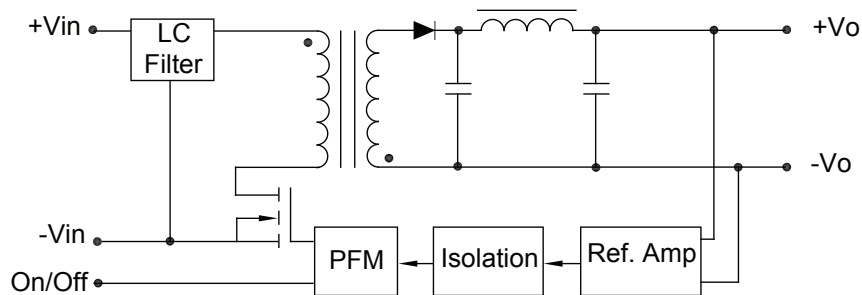
# 5 WATT SMT SINGLE



## Features

- SMT Technology
- 2:1 Input Range
- Efficiency up to 85%
- I/O Isolation 1500VDC
- Remote on/off Control
- Short Circuit Protection
- MTBF > 1,000,000 Hours
- RoHS Compliant
- MSL2 (Moisture Sensitivity Level per IPC/JEDEC J-STD-020D)

Selection Chart			
Model	Input Range	Output	
		VDC	mA
12S3R3.1200SMT	9.0 - 18.0	3.3	1200
12S5.1000SMT	9.0 - 18.0	5	1000
12S12.417SMT	9.0 - 18.0	12	417
12S15.333SMT	9.0 - 18.0	15	333
24S3R3.1200SMT	18.0 - 36.0	3.3	1200
24S5.1000SMT	18.0 - 36.0	5	1000
24S12.417SMT	18.0 - 36.0	12	417
24S15.333SMT	18.0 - 36.0	15	333
48S3R3.1200SMT	36.0 - 75.0	3.3	1200
48S5.1000SMT	36.0 - 75.0	5	1000
48S12.417SMT	36.0 - 75.0	12	417
48S15.333SMT	36.0 - 75.0	15	333



Block Diagram

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Input Parameters							
Model		12S3R3.1200SMT	12S5.1000SMT	12S12.417SMT	12S15.333SMT	Units	
Voltage Range	MIN TYP MAX	9.0 12.0 18.0				VDC	
Input Current	No Load Full Load	TYP TYP	45 434	45 521	45 502	45 502	mA
Under Voltage Shutdown	MAX	8				VDC	
Reverse Polarity Input Current	MAX	1				A	
Input Filter		Pi Filter					
Efficiency	TYP	76	80	83	83	%	
Switching Frequency	TYP	260				kHz	
Input Surge Voltage (1000 ms)	MIN MAX	-0.7 25				VDC	
Recommended Fuse		1500 mA Slow - Blow Type				mA	
Model		24S3R3.1200SMT	24S5.1000SMT	24S12.417SMT	24S15.333SMT	Units	
Voltage Range	MIN TYP MAX	18.0 24.0 36.0				VDC	
Input Current	No Load Full Load	TYP TYP	15 212	15 254	15 245	15 245	mA
Under Voltage Shutdown	MAX	17				VDC	
Reverse Polarity Input Current	MAX	1				A	
Input Filter		Pi Filter					
Efficiency	TYP	78	82	85	85	%	
Switching Frequency	TYP	260				kHz	
Input Surge Voltage (1000 ms)	MIN MAX	-0.7 50				VDC	
Recommended Fuse		700 mA Slow - Blow Type				mA	
Model		48S3R3.1200SMT	48S5.1000SMT	48S12.417SMT	48S15.333SMT	Units	
Voltage Range	MIN TYP MAX	36.0 48.0 75.0				VDC	
Input Current	No Load Full Load	TYP TYP	6 106	6 127	6 123	6 122	mA
Under Voltage Shutdown	MAX	34				VDC	
Reverse Polarity Input Current	MAX	1				A	
Input Filter		Pi Filter					
Efficiency	TYP	78	82	85	85	%	
Switching Frequency	TYP	260				kHz	
Input Surge Voltage (1000 ms)	MIN MAX	-0.7 100				VDC	
Recommended Fuse		350 mA Slow - Blow Type				mA	

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Output Parameters						
Models		12S3R3.1200SMT 24S3R3.1200SMT 48S3R3.1200SMT	12S5.1000SMT 24S5.1000SMT 48S5.1000SMT	12S12.417SMT 24S12.417SMT 48S12.417SMT	12S15.333SMT 24S15.333SMT 48S15.333SMT	Units
Output Voltage		3.3	5	12	15	VDC
Output Current	MIN MAX	120 1200	100 1000	41.7 417	33.3 333	mA
Output Voltage Accuracy	TYP MAX	±0.5 ±1.0				%
Load Regulation I <sub>o</sub> = 20% to 100%	TYP MAX	±0.3 ±1.0				%
Line Regulation V <sub>in</sub> = Min. to Max.	TYP MAX	±0.1 ±0.3				%
Ripple & Noise (20MHz)	TYP MAX	50 85				mV P-P
Ripple & Noise (20MHz) Over Line, Load & Temp	MAX	100				mV P-P
Ripple & Noise (20MHz)	MAX	15				mV RMS
Capacitive Load	MAX	680				µF
Transient Recovery Time, 25% Load Step Change	TYP MAX	250 500				µs
Transient Response Deviation, 25% Load Step Change	TYP MAX	±2 ±6				%
Temperature Coefficient	TYP MAX	±0.01 ±0.02				% / °C
Short Circuit Protection		Continuous				

Remote On/Off Control				
Parameter	Conditions	Min.	Max.	Unit
Supply On	2.5 to 5.5 VDC or Open Circuit			
Supply Off		-0.7	0.8	VDC
Device Standby Input Current		----	10.0	mA
Control Input Current (on)	V <sub>in</sub> = Min. to Max.	---	-200	µA
Control Input Current (off)	V <sub>in</sub> = Min. to Max.	----	-300	µA
Control Common	Referenced to Negative Input			

## Notes:

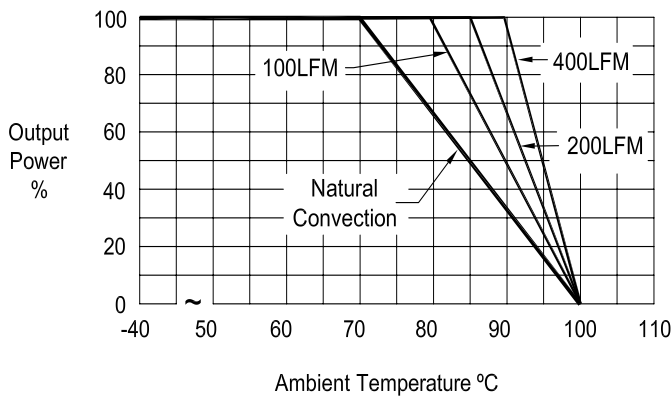
- All parameters measured at T<sub>c</sub>=+25°C, resistive load, nominal input voltage, full rated output current unless otherwise noted.
- Transient recovery time is measured to within 1% error band for a step change in output load 75% to 100%.
- The 5 Watt Single series has limitation of maximum connected capacitance at the output. The power module may be operated in current limiting mode during start-up, affecting the ramp-up and the startup time. For optimum performance we recommend 680µF maximum capacitive load.
- When measuring output ripple & noise, an external 0.1µF ceramic capacitor is recommended to be placed from +V<sub>out</sub> to -V<sub>out</sub>.
- When measuring peak-to-peak output noise, use a Cout 0.47µF ceramic capacitor. Scope measurement should be made by using a BNC socket, measurement bandwidth is 0-20MHz. Position the load between 50mm and 75mm from the DC/DC converter.
- Specifications subject to change without notice
- 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.
- RoHS Compliance means conformity to EU Directive 2002/95/EC of 27 January 2003, on the restriction of the use of certain hazardous substances in electrical and electronic equipment, lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls, and polybrominated diphenyl ethers are not present in quantities exceeding the following maximum concentrations in any homogeneous material, except for applicable exemptions. 0.1% (by weight of homogeneous material) lead, mercury, hexavalent chromium, polybrominated biphenyls, polybrominated diphenyl ethers, or 0.01% (by weight of homogeneous material) cadmium. The RoHS marking is as follows.



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General Specifications			
All Models			Units
<b>Isolation</b>			
Isolation Voltage, 60 seconds	MIN	1500	VDC
Isolation Resistance, 500VDC	MIN	1000	Mohms
Isolation Capacitance, 100kHz, 1V	TYP MAX	650 750	pF
<b>Environmental</b>			
Operating Temperature Case	MIN MAX	-40 +90	°C
Storage Temperature	MIN MAX	-50 +125	°C
Humidity	MAX	95	%
MTBF MIL-HDBK-217F @25°C, Ground Benign	MIN	1000	K Hours
Cooling	Free-Air Convection		
<b>General</b>			
Case Size	1.31 x 0.81 x 0.40 inches 33.4 x 20.6 x 10.2 mm		
Case Material	Non Conductive Black Plastic		
Weight	14g		

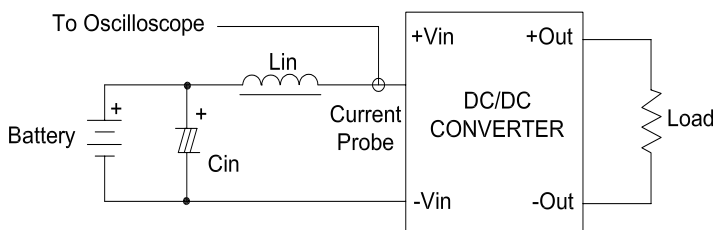
## Derating Curve



## Testing

Input reflected-ripple current is measured with an inductor  $L_{in}$  ( $4.7\mu H$ ) and  $C_{in}$  ( $220\mu F$ ,  $ESR < 1.0\Omega$  at  $100kHz$ ) to simulate source impedance.

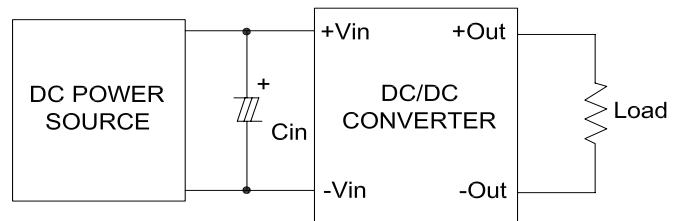
Capacitor  $C_{in}$ , offsets possible battery impedance. Current ripple is measured at the input terminals of the module, measurement bandwidth is 0-500kHz.



## Input Source Impedance

The power module should be connected to a low ac-impedance input source. Highly inductive source impedances can affect the stability of the power module. In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

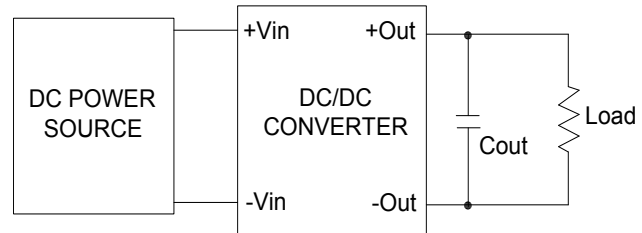
Capacitor mounted close to the power module helps ensure stability of the unit, it is recommended to use a good quality low Equivalent Series Resistance ( $ESR < 1.0\Omega$  at  $100kHz$ ) capacitor of a  $3.3\mu F$  for the 12V input devices and a  $2.2\mu F$  for the 24V and 48V units.



## Output Ripple Reduction

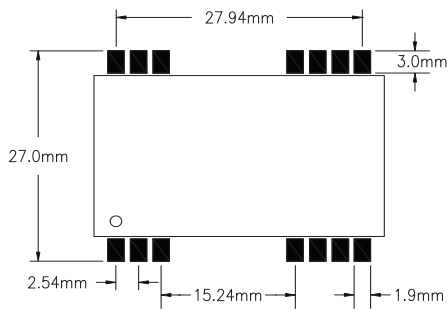
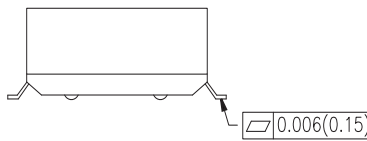
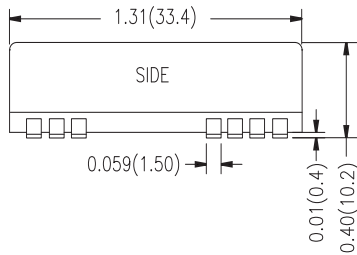
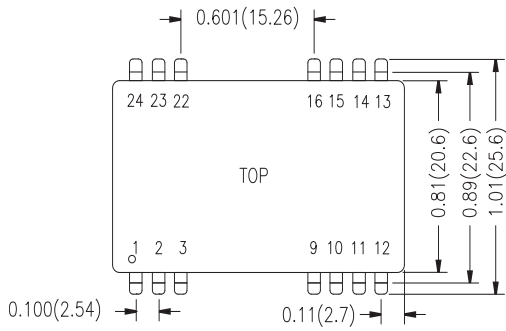
A good quality low ESR capacitor placed as close as practicable across the load will give the best ripple and noise performance.

To reduce output ripple, it is recommended to use  $3.3\mu F$  capacitors at the output.



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## Case Mechanical Dimensions inches (mm)



### Connecting Pin Pattern Dimensions are mm ( $\pm 0.05$ )

Pin	Name
1	Remote On/Off
2	-Vin
3	-Vin
9	NC
10	NC
11	NC
12	NC
13	NC
14	+Vout
15	NC
16	-Vout
22	+Vin
23	+Vin
24	NC

TOLERANCE: ALL DIMENSIONS ARE TYPICAL IN INCHES (mm) UNLESS OTHERWISE NOTED:	
X.X	$\pm 0.01$ (0.25)
X.XX	$\pm 0.005$ (0.13)
PINS	$\pm 0.002$ (0.05)