15 Watt BR Single Series DC/DC Converters

Features

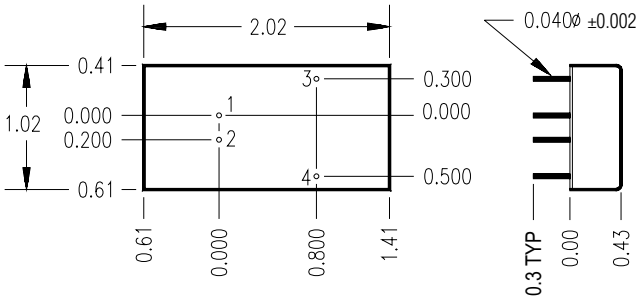
- Up to15 Watts of Output Power
- Wide Input Range
- Rated to 100°C Case Operating Temperature
- 24 & 48 Volt Nominal Inputs,
  1.8, 2.5, 3.3, 5, 12 and 15 Volt Outputs
- Five Year Warranty
- Water Washable Design

Description

The Calex BR series are 15 Watt DC/DC converters in a 1" x 2" case with a 4:1 input ratio. The input voltage range is 9 to 36 VDC for 24 Volt models and 18 to 72 for 48 Volt models.

The BR series requires a low source impedance at the input terminals by using an external capacitor (see note 7). These models do not have an internal input filter.

The units are filled with a compound which allows them to withstand a normal water wash after being soldered to a PC board.



BOTTOM VIEW SIDE VIEW

Mechanical tolerances unless otherwise noted:

X.XX dimensions: ±0.020 inches

X.XXX dimensions: ±0.005 inches

Selection Chart

Model	Input Range VDC		Output VDC	Output mA
	Min	Max		
24S1R8.4500BR	9	36	1.8	4500
24S2R5.4500BR	9	36	2.5	4500
24S3R3.4500BR	9	36	3.3	4500
24S5.3000BR	9	36	5	3000
24S12.1250BR	9	36	12	1250
24S15.1000BR	9	36	15	1000
48S1R8.4500BR	18	72	1.8	4500
48S2R5.4500BR	18	72	2.5	4500
48S3R3.4500BR	18	72	3.3	4500
48S5.3000BR	18	72	5	3000
48S12.1250BR	18	72	12	1250
48S15.1000BR	18	72	15	1000

Pin	Function
1	+INPUT
2	-INPUT
3	+OUTPUT
4	CMN

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Electrical Characteristics

Unless otherwise specified, all parameters are full load, nominal line, T_A=25°C, and thermal steady state.

Input Parameters (1)								
Model		**24S1R8.4500BR**	**24S2R5.4500BR**	**24S3R3.4500BR**	**24S5.3000BR**	**24S12.1250BR**	**24S15.1000BR**	**Units**
Voltage Range	MIN NOM MAX	9 24 36						VDC
Input Current , No Load Full Load	TYP TYP	10 473	10 630	10 780	10 753	10 744	10 744	mADC
Efficiency Vin=24VDC, Full Load	TYP	72	75	80	83	84	84	%
Switching Frequency	TYP	400						kHz
Maximum Input Overvoltage, 100ms	MAX	40						VDC
Recommended Fuse		(2)						AMPS
Required RMS Current Rating of Input Cap (7)		0.9						AMPS
Model		**48S1R8.4500BR**	**48S2R5.4500BR**	**48S3R3.4500BR**	**48S5.3000BR**	**48S12.1250BR**	**48S15.1000BR**	**Units**
Voltage Range	MIN NOM MAX	18 48 72						VDC
Input Current , No Load Full Load	TYP TYP	10 236	10 320	10 385	10 377	10 372	10 372	mADC
Efficiency Vin=48VDC, Full Load	TYP	72	75	80	83	84	84	%
Switching Frequency	TYP	400						kHz
Maximum Input Overvoltage, 100ms	MAX	80						VDC
Recommended Fuse		(2)						AMPS
Required RMS Current Rating of Input Cap (7)		0.45						AMPS

Output Parameters (1)								
Model		**24S1R8.4500BR 48S1R8.4500BR**	**24S2R5.4500BR 48S2R5.4500BR**	**24S3R3.4500BR 48S3R3.4500BR**	**24S5.3000BR 48S5.3000BR**	**24S12.1250BR 48S12.1250BR**	**24S15.1000BR 48S15.1000BR**	**Units**
Output Voltage		1.8	2.5	3.3	5	12	15	VDC
Output Voltage Accuracy	MIN TYP MAX	1.750 1.800 1.850	2.450 2.500 2.550	3.234 3.300 3.366	4.90 5.00 5.10	11.76 12.00 12.24	14.70 15.00 15.30	VDC
Rated Load Range (3)	MIN MAX	0.68 4.54	0.68 4.54	0.68 4.54	0.45 3.00	0.19 1.25	0.15 1.00	ADC
Load Regulation 1/4 FL - FL	TYP MAX	0.1 1						%
Line Regulation Vin = Min-Max VDC	TYP MAX	0.02 0.1						%
Power On Overshoot	TYP	0.5						V
Load Transient Recovery Time (1) error band = ±1%	TYP	200						µs
Load Transient Overshoot	TYP	150				300		mV peak
Noise (4) bw = 0.01 - 1MHz bw = 0 - 20 MHz	 TYP TYP	 100 150						mV P-P
Temperature Coefficient	TYP MAX	50 150						ppm/°C
Short Circuit Protection, Output to Common		Continuous						

NOTES:

(1) Refer to the CALEX Application Notes for the definition of terms, measurement circuits, and other information.

Load Transient Overshoot is the output voltage peak amplitude referenced to the final value due to a step load change of 50-75% occuring only on the measured output. "Load Transient Overshoot" and "Dynamic Response" are the same specification. Load Transient Recovery Time is the time for the output to return to within the specified voltage error band centered about the final value. "Load Transient Recovery Time" and "Transient Response" are the same specification.

(2) See CALEX Application Notes to determine the correct fuse. A fuse is required only for system protection, but must be used for reverse voltage protection of the input.

(3) Below the minimum rated load, the output may exhibit noise performance degradation. Operation with less than the minimum rated load will not damage unit, and DC regulation is not significantly affected.

(4) Noise is measured per CALEX Application Notes. Output noise is measured with a 10 µF tantalum capacitor and a 0.01µF ceramic capacitor connected across the output pins.

(5) The Case is tied to the -input pin.

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

(7) Customer must provide external bypassing capacitor (see note 5) across the input pins. Aluminum electrolytic capacitors are recommended. Use a capacitor(s) rated for the tabulated input capacitor RMS current.

(8) Specifications subject to change without notice.

General Specifications			
All Models			**Units**
Isolation (7)			
Isolation Voltage Input to Output 24S Input to Output 48S	 MIN MIN	 700 1500	VDC
Input to Output Capacitance	TYP	1600	pF
Environmental			
Case Operating Range	MIN MAX	-40 100	°C
Storage Range	MIN MAX	-55 125	°C
Thermal Impedance (6)	TYP	15	°C/Watt
General			
Unit Weight	TYP	1.1	oz
Chassis Mounting Kit		MS8	
MTBF		> 1 M Hours	
Agency Approvals		CSA/UL 60950	

Picking An External Input Capacitor

If an input capacitor is needed at the input to the converter it must be sized correctly for proper converter operation. Several system tradeoffs must be made for each particular system application to correctly size the input capacitor.

The probable result of undersizing the capacitor is increased self heating, shortening it's life. Oversizing the capacitor can have a negative effect on your products cost and size, although this kind of overdesign does not result in shorter life of any components.

There is no one optimum value for the input capacitor. The size and capacity depend on the following factors:

1) Expected ambient temperature and your temperature derating guidelines.
2) Your ripple current derating guidelines.
3) The maximum anticipated load on the converter.
4) The input operating voltage, both nominal and excursions.
5) The statistical probability that your system will spend a significant time at any worst case extreme.

Factors 1 and 2 depend on your system design guidelines. These can range from 50 to 100% of the manufacturers listed maximum rating, although the usual derating factor applied is about 70%. 70% derating means if the manufacturer rated the capacitor at 1 A RMS you would not use it over 0.7 A RMS in your circuit.

Factors 3 and 4 realistically determine the worst case ripple current rating required for the capacitor along with the RMS ripple current curve.

Factor 5 is not easy to quantify. At CALEX we can make no assumptions about a customers system so we leave to you the decision of how you define how big is big enough.

Suitable capacitors for use at the input of the converter are given at the end of this section.

Suggested Capacitor Sources

These capacitors may be used to lower your sources input impedance at the input of the converter. These capacitors will work for 100% load, worst case input voltage and ambient temperature extremes. They however, may be oversized for your exact usage, see "Picking An External Input Capacitor" above for more information. You may also use several smaller capacitors in parallel to achieve the same ripple current rating. This may save space in some systems.

United Chemi-Con
Suggested Part: SXE100VB181M12.5X30LL
180µF, 100V, 105°C Rated
ESR=0.11 ohms
Allowable Ripple at 105 °C = 1.27 A

Elna
Suggested Part: RSH-100V181MA64
180µF, 100V, 105°C Rated
ESR=0.090 ohms
Allowable Ripple at 105°C = 1.12 A