

### FEATURES

- UL 60950 recognised
- Wide temperature performance at full 1 Watt load, -40°C to 85°C
- UL 94V-0 package material
- Industry standard pinout
- 1kVDC isolation 'Hi Pot Test'
- 5V input
- 5V output
- Fully encapsulated with toroidal magnetics
- No external components required
- No electrolytic or tantalum capacitors

### PRODUCT OVERVIEW

The CRR1 series of industrial temperature range DC-DC converters is the standard building block for on-board distributed power systems. It is ideally suited for providing single rail supplies on primarily digital boards with the added benefit of galvanic isolation to reduce switching noise. Surface mount technology and advanced packaging materials produce rugged reliable performance over an extended temperature range from -40°C to 85°C.

### SELECTION GUIDE

Order Code	Nominal Input Voltage	Output Voltage	Output Current	Input Current at Rated Load	Load Regulation (Typ)	Load Regulation (Max)	Ripple & Noise (Typ) <sup>1</sup>	Ripple & Noise (Max) <sup>1</sup>	Efficiency (Min)	Efficiency (Typ)	Isolation Capacitance	MTTF <sup>2</sup>	
	V	V	mA		%		mVp-p		%		pF	MIL. kHrs	Tel. kHrs
<b>CRR1S0505SC</b>	5	5	200	290	12	14	6	10	67	69	28	1847	

### INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation	4.5	5	5.5	V
Reflected ripple current			1.6	2	mA p-p

### OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power <sup>3</sup>	T <sub>A</sub> = -40°C to 85°C, See derating curve			1.0	W
Voltage Set Point Accuracy	See tolerance envelope				
Line regulation	High V <sub>IN</sub> to low V <sub>IN</sub>		1.1	1.2	%/%

### ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested for 1 second	1000			VDC
Resistance	Viso = 1000VDC	10			GΩ

### GENERAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency			110		kHz

### TEMPERATURE CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types, see safety approval section for UL temperature specification	-40		85	°C
Storage		-50		130	
Case Temperature above ambient				33	
Cooling	Free air convection				

### ABSOLUTE MAXIMUM RATINGS

Lead temperature 1.5mm from case for 10 seconds	260°C
Wave Solder	Wave Solder profile not to exceed the profile recommended in IEC 61760-1 Section 6.1.3. Please refer to <a href="#">application notes</a> for further information.
Input voltage V <sub>IN</sub>	7V

1. See Ripple & Noise characterisation method.
2. Calculated using MIL-HDBK-217 FN2 and Telcordia SR-332 calculation model with nominal input voltage at full load.
3. See derating graph.

All specifications typical at T<sub>A</sub> = 25°C, nominal input voltage and rated output current unless otherwise specified.



For full details go to [www.murata-ps.com/rohs](http://www.murata-ps.com/rohs)





**CHARACTERISATION TEST METHODS**

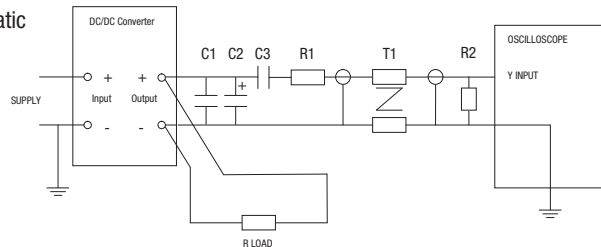
**Ripple & Noise Characterisation Method**

Ripple and noise measurements are performed with the following test configuration.

C1	1µF X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC-DC converter
C2	10µF tantalum capacitor, voltage rating to be a minimum of 1.5 times the output voltage of the DC-DC converter with an ESR of less than 100mΩ at 100 kHz
C3	100nF multilayer ceramic capacitor, general purpose
R1	450Ω resistor, carbon film, ±1% tolerance
R2	50Ω BNC termination
T1	3T of the coax cable through a ferrite toroid
RLOAD	Resistive load to the maximum power rating of the DC-DC converter. Connections should be made via twisted wires

Measured values are multiplied by 10 to obtain the specified values.

**Differential Mode Noise Test Schematic**



**APPLICATION NOTES**

**Minimum load**

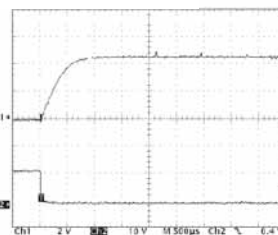
The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

**Capacitive loading and start up**

Typical start up times for this series, with a typical input voltage rise time of 2.2µs and output capacitance of 10µF, are shown in the table below. The product series will start into a capacitance of 47µF with an increased start time, however, the maximum recommended output capacitance is 10µF.

Typical Start-Up Wave Form

	Start-up time
	µs
CRR1S0505SC	2301



**APPLICATION NOTES (Continued)**

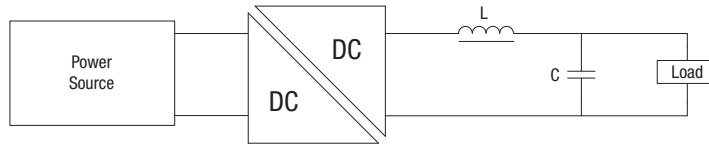
**Output Ripple Reduction**

By using the values of inductance and capacitance stated, the output ripple at the rated load is lowered to 5mV p-p max.

**Component selection**

**Capacitor:** It is required that the ESR (Equivalent Series Resistance) should be as low as possible, ceramic types are recommended. The voltage rating should be at least twice (except for 15V output), the rated output voltage of the DC-DC converter.

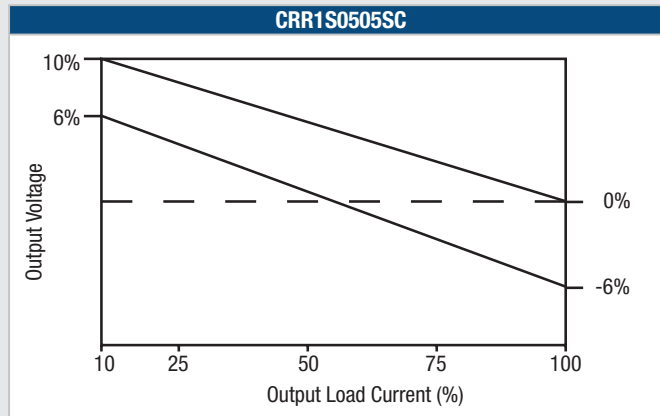
**Inductor:** The rated current of the inductor should not be less than that of the output of the DC-DC converter. At the rated current, the DC resistance of the inductor should be such that the voltage drop across the inductor is <2% of the rated voltage of the DC-DC converter. The SRF (Self Resonant Frequency) should be >20MHz.



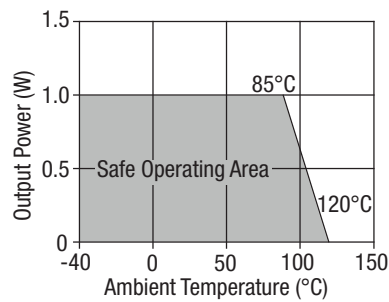
	Inductor			Capacitor
	L, $\mu$ H	SMD	Through Hole	C, $\mu$ F
CRR1S0505SC	10	82103C	11R103C	4.7

## TOLERANCE ENVELOPE

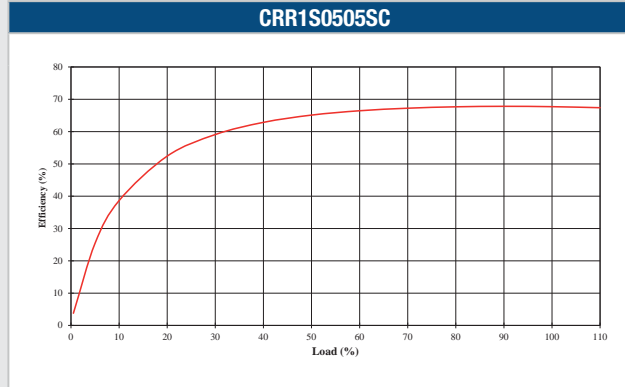
The voltage tolerance envelope shows typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading.



## TEMPERATURE DERATING GRAPH



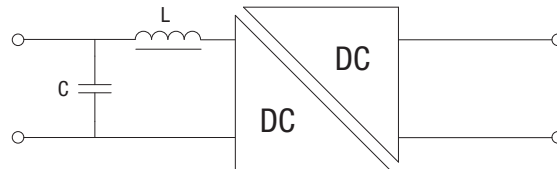
## EFFICIENCY VS LOAD



**EMC FILTERING AND SPECTRA**

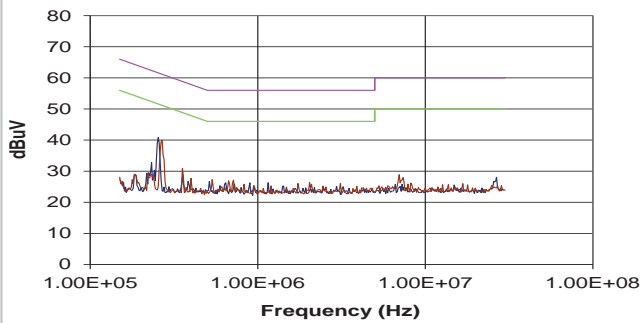
**FILTERING**

The following table shows the additional input capacitor and input inductor typically required to meet EN 55022 Curve B Quasi-Peak EMC limit, as shown in the following plots. The following plots show positive and negative quasi peak and CISPR22 Average Limit B (pink line) and Quasi Peak Limit B (green line) adherence limits. The recommended input capacitor to use for this circuit is 50V 16V X7R ceramic capacitor.



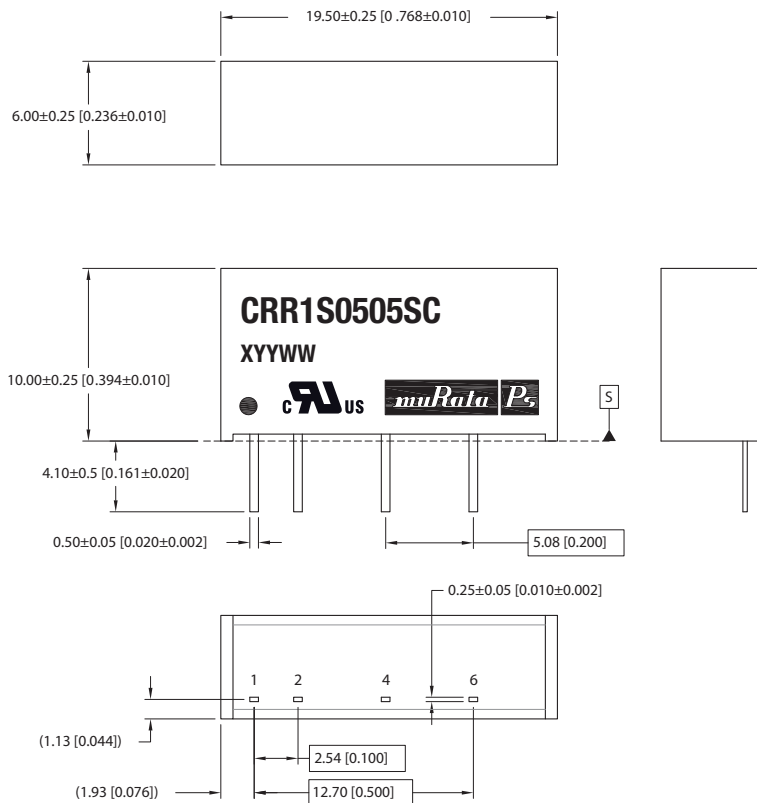
Part Number	Inductor			Capacitor
	L, $\mu$ H	SMD	Through Hole	C, $\mu$ F
CRR1S0505SC	4.7		13R472C	4.7

**CRR1S0505SC**



## PACKAGE SPECIFICATIONS

### MECHANICAL DIMENSIONS



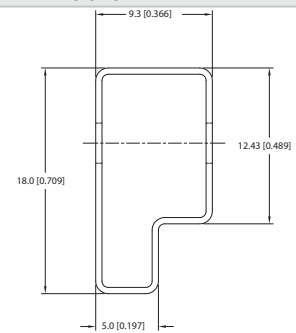
All dimensions in mm (inches) Controlling dimension is mm.  
All pins on a 2.54 (0.100) pitch and within ±0.1 (0.004) of true position from in 1 at seating plane 'S'

Weight: 2.1g

### PIN CONNECTIONS

Pin	Function
1	+VIN
2	-VIN
4	-VOUT
6	+VOUT

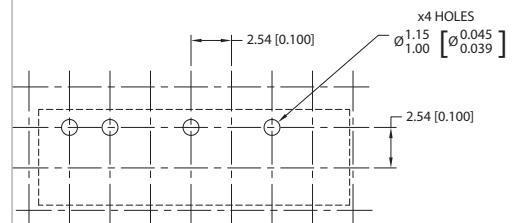
### TUBE OUTLINE DIMENSIONS



Unless otherwise specified all dimensions in mm [inches] ±0.55mm  
Tube Length : 520mm [20.472] ±2.0 [0.079].

Tube quantity: 35

### RECOMMENDED FOOTPRINT DETAILS



All dimensions in mm (inches) Controlling dimension is mm.



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