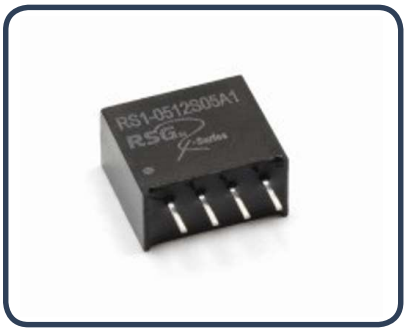
RS1-S20v2

2 W Unregulated Single Output DC/DC Converter

- **SIL4 Package**
- **Input Range ± 10 %**
- **Efficiency up to 86 %**
- **Isolation 3000 VDC**
- **Continuous Short Circuit Protection**
- **Operation Temperature Range -40 ~ 90 °C max.**
- **Non Conductive Black Plastic Case**

RoHS



Picture similar

Number Structure

RS1	-	05	05	S	20	A	3
Series / Package		**Input Voltage**	**Output Voltage**	**Output Type**	**Power**	**Int. Code**	**Isolation Voltage**
RS1 = SIL4		03 = 3.3 Vdc 05 = 5.0 Vdc 12 = 12 Vdc 24 = 24 Vdc	03 = 3.3 Vdc 05 = 5.0 Vdc 12 = 12 Vdc 15 = 15 Vdc	S = Single Output	20 = 2 W	Logistics Code	3 = 3000 Vdc

v2 = 2nd Version

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Model Selection Guide

Model Number	Input Voltage Range (VDC)	Input Current		Output Voltage (VDC)	Output Current Full Load (mA)	Efficiency @ FL (%, typ.)	Capacitive Load @ FL (µF, max.)
		No-Load (mA, max.)	Full Load (mA, typ.)				
RS1-0303S20A3v2	2.97-3.63	60	657.89	3.3	500	76	3300
RS1-0305S20A3v2	2.97-3.63	60	767.16	5	400	79	2200
RS1-0312S20A3v2	2.97-3.63	75	757.57	12	167	80	470
RS1-0315S20A3v2	2.97-3.63	75	739.09	15	133	82	470
RS1-0503S20A3v2	4.5-5.5	45	417.72	3.3	500	79	3300
RS1-0505S20A3v2	4.5-5.5	50	487.8	5	400	82	2200
RS1-0512S20A3v2	4.5-5.5	50	470.58	12	167	85	470
RS1-0515S20A3v2	4.5-5.5	55	465.11	15	133	86	470
RS1-1203S20A3v2	10.8-13.2	30	174.05	3.3	500	79	3300
RS1-1205S20A3v2	10.8-13.2	30	203.25	5	400	82	2200
RS1-1212S20A3v2	10.8-13.2	30	193.79	12	167	86	470
RS1-1215S20A3v2	10.8-13.2	30	193.79	15	133	86	470
RS1-2403S20A3v2	21.6-26.4	15	88.14	3.3	500	78	3300
RS1-2405S20A3v2	21.6-26.4	15	101.62	5	400	82	2200
RS1-2412S20A3v2	21.6-26.4	15	96.89	12	167	86	470
RS1-2415S20A3v2	21.6-26.4	15	96.89	15	133	86	470

ALL SPECIFICATIONS ARE TYPICAL AT 25 °C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED.

Input Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	3.3 Vdc Input	2.97	3.3	3.63	VDC
	5.0 Vdc Input	4.5	5.0	5.5	
	12 Vdc Input	10.8	12	13.2	
	24 Vdc Input	21.6	24	26.4	
Input Current (No Load)		See Table			mA
Input Current (Full Load)		See Table			mA
Input Filter		Capacitor			-
Input Reflected Ripple Current [(1)]			20		mApk-pk
Start up Time	Nominal Vin and constant resistive load			10	ms
Recommended input fuse (slow blow)	3.3 Vdc Input		1.5		A
	5.0 Vdc Input		1.0		
	12 Vdc Input		0.5		
	24 Vdc Input		0.2		
Note： 1. Measured with a simulated source inductance of 12 µH and a source capacitor Cin (47 µF, ESR < 1 Ω at 100 kHz).					

Output Specifications						
Parameter	Conditions			Min.	Typ.	Max.	Unit
Output Voltage Accuracy				-3.0		+3.0	%
Line Regulation	For 1 % Vin Change			-1.2		+1.2	%
Load Regulation	From 10 % to 100 % Load	3.3V Input	All Output			20	%
		5.0V Input	3.3V, 5.0V Output			20	
			12V, 15V Output			15	
		Other Input	3.3V, 5.0V Output			15	
			12V, 15V Output			10	
	From 0 % to 100 % Load					35	
Ripple & Noise [(1)]	20 MHz Bandwidth				150	200	mVpk-pk
Short Circuit Protection				Continuous and automatic recovery			
Temperature Coefficient				-0.02		+0.02	%/°C
Maximum Capacitive Load	Nominal Vin and constant resistive load			See Table			
Note： 1. Measured with a 0.1µF ceramic capacitor.							

Absolute Maximum Ratings					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (100 ms)	3.3 Vdc Input			6	VDC
	5.0 Vdc Input			9	
	12 Vdc Input			18	
	24 Vdc Input			30	
Soldering Temperature	1.5 mm from case 10 sec. max.			260	°C
Note： These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.					

General Specifications						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Efficiency			See Table			%
Isolation Voltage	Input-output, and rated for 60 sec.	Suffix “3”	3000			VDC
Isolation Resistance	Input-output		1000			MΩ
Isolation Capacitance	Input-output				65	pF
Switching Frequency				100		kHz
Reliability Calculated MTBF	MIL-HDBK-217 F @ 25 °C			2100		k hours
Safety Standard	IEC / EN / UL 62368-1		Designed to meet			
Environmental compliance	RoHS		Designed to meet			

Environmental Specifications					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Ambient Temperature	See the Derating Curve	-40		90	°C
Maximum Case Temperature				115	°C
Thermal Impedance		45			°C/W
Storage Humidity				95	% rel. H
Storage Temperature		-55		125	°C
Cooling	Natural Convection	30 - 65 LFM			

EMC Specifications			
Parameter	Standard	Condition	Criterion
Conducted Emissions	EN55032	with external components	B
Radiated Emissions	EN55032		B
ESD	IEC 61000-4-2	Air: ±15 kV, Indirect: ±8 kV	A
RS	IEC 61000-4-3	10 V/m	A
EFT	IEC 61000-4-4	±2.0 kV with external components	A
Surge	IEC 61000-4-5	±2.0 kV with external components	A
CS	IEC 61000-4-6	10 Vrms	A
PFMF	IEC 61000-4-8	100 A/m	A

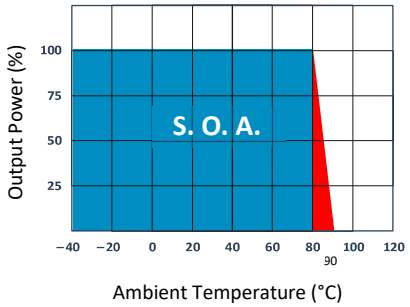
Physical Specifications	
Parameter	Value
Case Material	Nonconductive Black Plastic (UL94V-0 rated)
Pin Material	Tinned Copper
Potting Material	Silicone UL94V 0 rated
Weight	1.9 g, typ.
Dimensions	0.46" x 0.29" x 0.40"

Electrical Characteristic Curves

Thermal Derating

To enhance the system reliability, the power module should always be operated below the maximum operating temperature. If the temperature exceeds the maximum operating temperature, reliability of the unit may be affected.

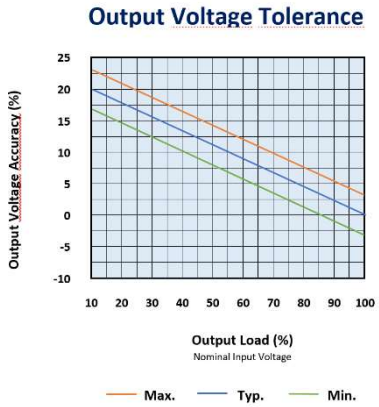
Temperature Derating Curve



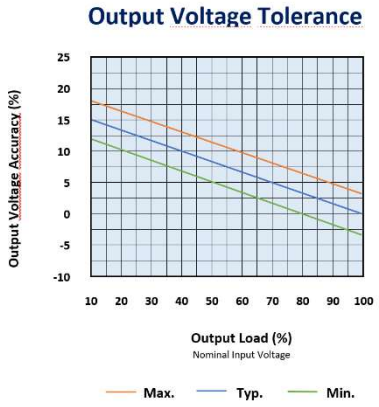
All Models

Output Voltage Tolerance Envelope Curve

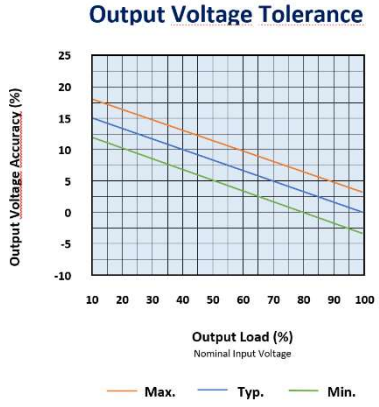
Output Voltage Tolerance Envelope Curve



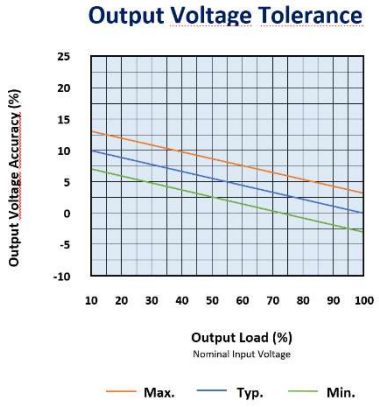
3.3V & 5V input with 3.3V & 5V output



5V input with 12V & 15V output



12V & 24V input with 3.3V & 5V output

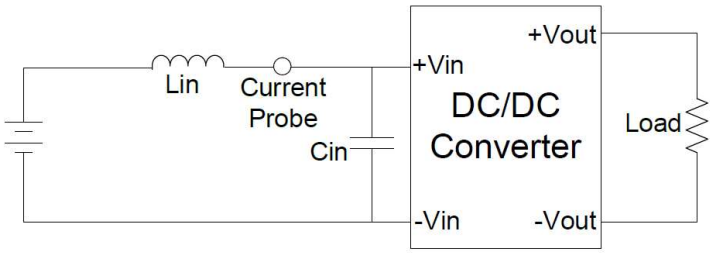


12V & 24V input with 12V & 15V output

Test Configurations

Input Reflected Ripple Current Test Step

Input reflected ripple current is measured with a source inductor Lin (12 µH) and a source capacitor Cin (47 µF, ESR < 1.0 Ω at 100 kHz) at nominal input and full load.



Design & Feature Configurations

Isolation Voltage

This series is designed to meet the functional insulation of UL, both input and output should be maintained within SELV limits (less than 42.4 V peak, or 60 Vdc).
The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with hundreds of volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

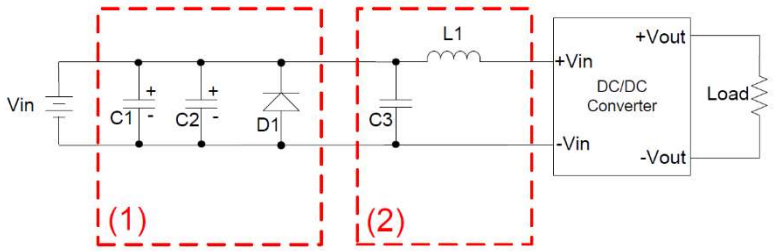
Repeated High-Voltage Isolation Testing

Repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment.
This series has isolation transformers without additional insulation between primary and secondary windings of enameled wire.
While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation.
Any material including the enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltage, thus implying that the number of tests should be strictly limited.
We strongly advise against repeated high voltage isolation testing, but if it is absolutely required, the isolation test voltage should be reduced by 20 % from specified test voltage.

EMC Filter Details

EMC Filter

The part (1) Circuit is used to meet Surge & EFT test, and the part (2) Circuit is used to meet EMI test.

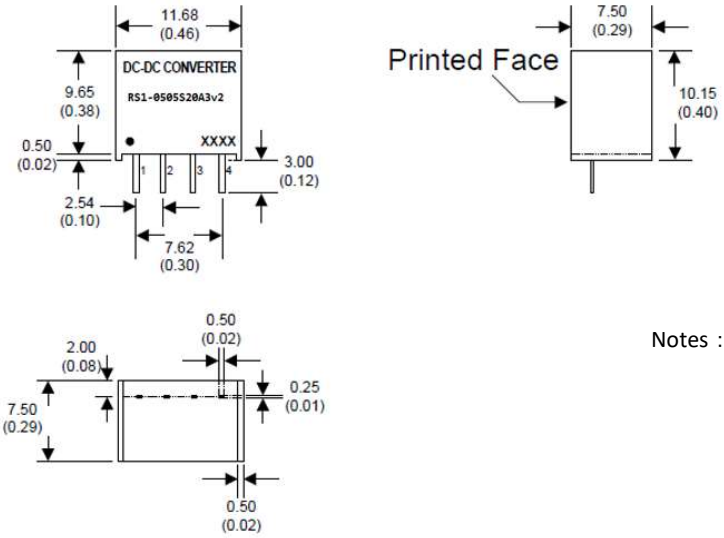


V in	C1	C2	D1	C3	L1
3.3 Vdc	Nippon Chemi-con KY-Series 470µF / 100V	DNP	SMDJ6.0A	MLCC 10µF / 50V	10µH
5 Vdc			SMDJ9.0A		
12 Vdc			SMDJ18.0A		
24 Vdc		Nippon Chemi-con KY-Series 680µF / 100V	SMDJ30.0A		22µH

Pin Connections

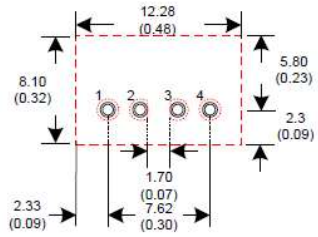
SIL 4 Package	
PIN NUMBER	**SINGLE**
1	-Vin
2	+Vin
3	-Vout
4	+Vout

Mechanical Specifications



Notes : All dimensions are typical in millimeters (inches).
1. Pin dimension tolerance: ±0.05 (±0.002)
2. Pin pitch and length tolerance: ±0.35 (±0.014)
3. Pin to case tolerance: ±0.5 (±0.02)
4. Case Tolerance: ±0.5 (±0.02)

Recommended Footprint Details



Notes : All dimensions are typical in millimeters (inches).
Pad size(lead free recommended)
1. Through hole (black): Ø 0.80 (0.031)
2. Top view pad (green): Ø 1.00 (0.039)
3. Bottom view pad (pink): Ø 1.60 (0.063)
4. The extra protection of the pads between input (PIN 2) and output (PIN 3) should be needed in order to ensure that the isolation function won't be affected after the module mounts on the PCB.

Notes

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