



P-DUKE POWER

SSR01 Series

DC-DC Converter
Up to 15 Watts

3
YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



NON
-isolation

ADJ.
Output
Voltage

LOW
Standby
Power

NO
Min. Load
Required

Positive
to
Negative
Output Appl.

REMOTE
ON
OFF

OCP

OTP

SCP

PART NUMBER STRUCTURE

POSITIVE OUTPUT

Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)
SSR01 -	12	S	05
	05: 3.0 ~ 5.5	S:Single	2P5:2.5
	12: 4.6 ~ 36		3P3:3.3
	6.5 ~ 36		05:5
	10.5 ~ 36		09:9
	24: 13.5 ~ 36		12:12
	16.5 ~ 36		15:15

PART NUMBER STRUCTURE (CONTINUED)
NEGATIVE OUTPUT

SSR01	-	12	S	05
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)
		12: 4.6 ~ 32 4.6 ~ 31 7 ~ 72	S: Single	3P3: 3.3 05: 5 09: 9 12: 12 15: 15
		24: 7 ~ 24 7 ~ 21		

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25°C otherwise noted

POSITIVE OUTPUT APPLICATION

Model Number	Nominal Input	Min. Vin	Max. Vin	Output Voltage Trim Range	Output Current		Input Current @ No Load	Efficiency (1)	
					@Min. Load	@Full Load		Min. Vin	Max. Vin
	VDC	VDC	VDC	VDC	A	A	mA	%	%
SSR01-05S2P5	5	3.0	5.5	1.2 ~ 3.63	0	1	6	95.5	95.0
SSR01-12S3P3	12	4.6	36*	1.5 ~ 5.5			1.5	87.5	80.0
SSR01-12S05	12	6.5		2.5 ~ 8.0			3	91.5	83.5
SSR01-12S09	12	10.5		4.5 ~ 12.6			4	94.5	89.0
SSR01-24S12	24	13.5		4.5 ~ 13.5			4	95.0	91.0
SSR01-24S15	24	16.5		4.5 ~ 15.5			4	95.5	92.5

* The value could be high than 36 to the maximum value of 42 if choose 22μF for Input capacitor use.

NEGATIVE OUTPUT APPLICATION

Model Number	Nominal Input	Min. Vin	Max. Vin	Output Voltage Trim Range	Output Current		Input Current @ No Load	Efficiency (1)	
					@Min. Load	@Full Load		Min. Vin	Max. Vin
	VDC	VDC	VDC	VDC	mA	mA	mA	%	%
SSR01-12S3P3	12	4.6	$\leq 36^{**} - V_{out} $	-1.5 ~ -5.5	0	-600	3	74.0	77.5
SSR01-12S05	12	4.6		-2.5 ~ -8.0		-400	3	80.0	78.5
SSR01-12S09	12	7		-4.5 ~ -12.6		-300	7	85.0	82.0
SSR01-24S12	12	7	$\leq 36 - V_{out} $	-4.5 ~ -13.5		-300	7	84.5	86.0
SSR01-24S15	12	7		-4.5 ~ -15.5		-200	10	85.5	84.0

** The value could be high than 36 to the maximum value of 42 if choose 22μF for C1 use. Please refer to the schematic in Negative Output Application section.

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range for Positive output	$V_{in} > V_{out(set)} + 0.5V$ $V_{in} > V_{out(set)} + 1.5V$	3.0 4.6		5.5 36	VDC
Operating input voltage range for Negative output	$V_{in} + V_{out} \leq 36V$	4.6		32	VDC
Maximum input current	$V_{in} = V_{in(min)}$; $I_o = I_o(max)$			1	A
Input filter				Capacitor type	

OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Voltage accuracy		-2.0		+2.0	%
Line regulation		-0.2		+0.2	%
Load regulation	0% to 100% of Full Load 10% to 90% of Full Load	-0.6 -0.3		+0.6 +0.3	%
Ripple and noise	Measured by 20MHz bandwidth $V_{out} = 1.2 \sim 8VDC$ $V_{out} = 8.1 \sim 15.5VDC$		50 75		mVp-p
Temperature coefficient		-0.015		+0.015	%/°C
Dynamic load response	50% load step change		150 250	250 350	mV μs
Over load protection	Positive output SSR01-05S2P5 Others		400 200		%
Short circuit protection				Continuous, automatics recovery	
Capacitor Load ⁽³⁾				470	μF
Output voltage overshoot-startup				1.0	%

FEATURE SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Start up time	Nominal input and Constant resistive load		5 5		ms
Remote ON/OFF	Positive output : Referred to GND pin Negative output : Referred to -Vout pin		DC-DC ON DC-DC OFF	Open or 2 ~ 5VDC Short or 0 ~ 0.8VDC	
	Input current of Ctrl pin Remote off input current	-0.1		0.1	mA mA
			1.2		

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching frequency	Nominal input, Full Load		410 300 580 580 580 580		kHz
Safety meets				IEC/ EN/ UL62368-1	
Case material				Non-conductive black plastic	
Base materia				Non-conductive black plastic	
Weight				1.7g(0.060oz)	
MTBF	MIL-HDBK-217F, Full load			1.457 x 10 ⁷	hrs

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating temperature range	With derating	-40		+105	°C
Maximum case temperature				105	°C
Over temperature protection	Internal IC junction		170		°C
Storage temperature range		-55		+125	°C
Lead-free reflow solder process				IPC J-STD-020E	
Moisture sensitivity level(MSL)				IPC J-STD-033C Level 1	
Thermal shock				MIL-STD-810F	
Vibration				MIL-STD-810F	
Relative humidity	Non-condensing			5% to 95% RH	

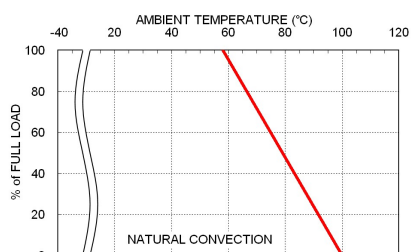
Note:

1. Typical value at min. or max. input voltage and full load.
2. Test by minimum input and constant resistive load.

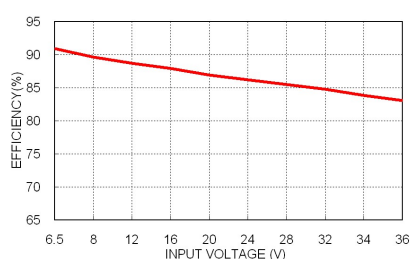
CAUTION: This power module is not internally fused. An input line fuse must always be used.

CHARACTERISTIC CURVE

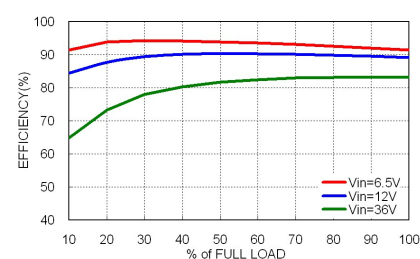
POSITIVE OUTPUT



SSR01-12S05 Derating Curve

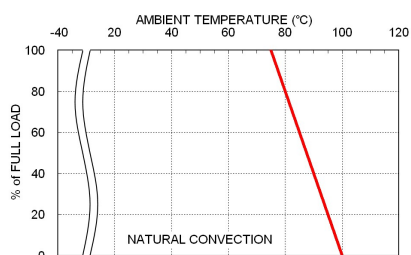


SSR01-12S05 Efficiency vs. Input Voltage

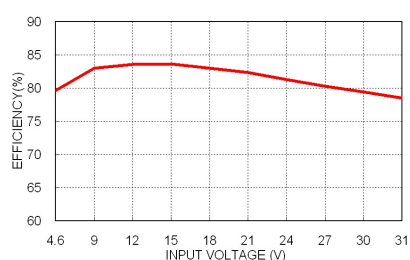


SSR01-12S05 Efficiency vs. Output Load

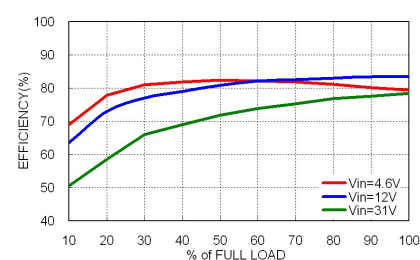
NEGATIVE OUTPUT



SSR01-12S05 Derating Curve



SSR01-12S05 Efficiency VS Input Voltage



SSR01-12S05 Efficiency VS Output Load

FUSE CONSIDERATION

This power module is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

POSITIVE OUTPUT

Model	Fuse Rating (A)	Fuse Type
SSR01-05S□□	2	Slow-Blow
SSR01-12S□□	2.5	Slow-Blow
SSR01-24S□□	1.6	Slow-Blow

NEGATIVE OUTPUT

Model	Fuse Rating (A)	Fuse Type
SSR01-12S□□	1.6	Slow-Blow
SSR01-24S□□	1.25	Slow-Blow

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

NEGATIVE OUTPUT APPLICATION

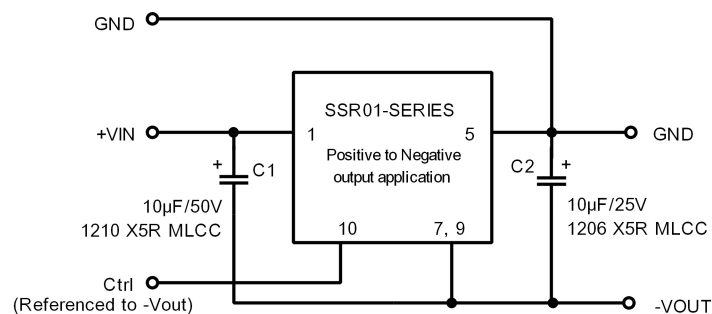


Figure 1

C1 and C2 are required and should be fitted close to the converter pins.
Maximum capacitive load including C2 is 470uF.

TRIM APPLICATION

Output voltage can be programmed by connecting an external resistor between Trim and GND pins or Trim and +Vout pin.

Without this external resistor, the output voltage will be $V_{out,nom}$.

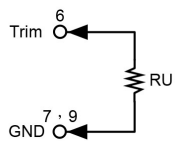
Using the following equation to calculate the value of external resistor for desired output voltage.

The external Trim resistor needs to be at least 1/16W resistors.

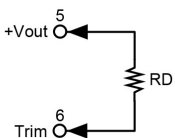
EXTERNAL OUTPUT TRIMMING

Output can be externally trimmed by using the method shown below.

Trim-up

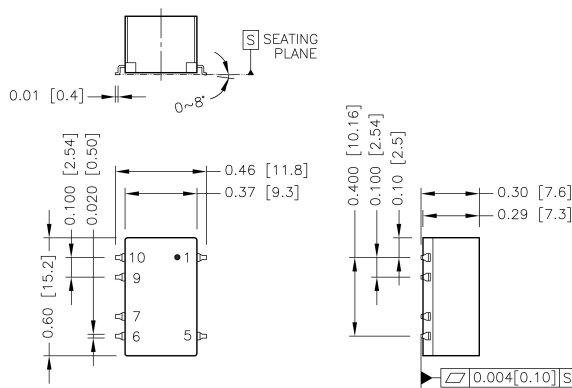


Trim-down



Model Number	$V_{out,nom}$	Trim up	Trim down
		$R_U(k\Omega)$	$R_D(k\Omega)$
SSR01-05S2P5	$\pm 2.5V$	$= \frac{40.75}{V_o - 2.5}$	$= \frac{50.75 \cdot V_o - 40.75}{2.5 - V_o}$
SSR01-12S3P3	$\pm 3.3V$	$= \frac{26.4}{V_o - 3.3}$	$= \frac{33 \cdot V_o - 26.4}{3.3 - V_o}$
SSR01-12S05	$\pm 5.0V$	$= \frac{160}{V_o - 5.0}$	$= \frac{200 \cdot V_o - 160}{5.0 - V_o}$
SSR01-12S09	$\pm 9.0V$	$= \frac{80}{V_o - 9.0}$	$= \frac{100 \cdot V_o - 80}{9.0 - V_o}$
SSR01-24S12	$\pm 12.0V$	$= \frac{240}{V_o - 12.0}$	$= \frac{300 \cdot V_o - 240}{12.0 - V_o}$
SSR01-24S15	$\pm 15.0V$	$= \frac{240}{V_o - 15.0}$	$= \frac{300 \cdot V_o - 240}{15.0 - V_o}$

MECHANICAL DRAWING



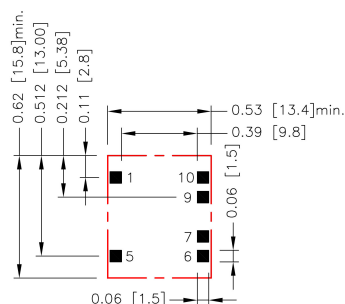
BOTTOM VIEW

PIN CONNECTION

PIN	DEFINE
1	+Vin
5	+Vout
6	Trim
7	GND
9	GND
10	Ctrl

1. All dimensions in inch [mm]
2. Tolerance : $x.xx \pm 0.02$ [$x.x \pm 0.5$]
 $x.xxx \pm 0.01$ [$x.xx \pm 0.25$]
3. Pin dimension tolerance ± 0.004 [0.10]

RECOMMENDED PAD LAYOUT



All dimensions in inch[mm]
Pad size(lead free recommended)
Top view pad: 0.060x0.060[1.50x1.50]

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments.

However, sufficient cooling should be provided to help ensure reliable operation of the unit.

Heat is removed by conduction, convection, and radiation to the surrounding Environment.

Proper cooling can be verified by measuring the point as the figure below.

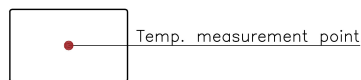
The temperature at this location should not exceed "Maximum case temperature".

When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

You can limit this Temperature to a lower value for extremely high reliability.

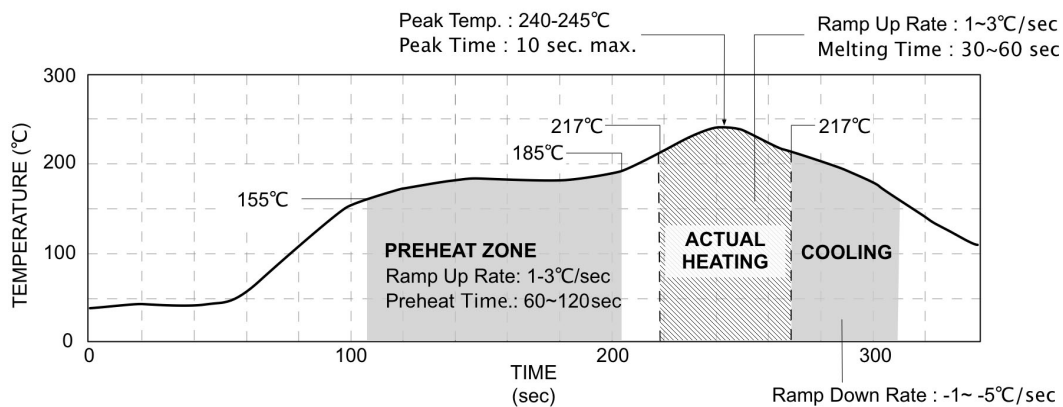
The unit will shutdown if the internal IC junction exceeds 170°C (typical), but the thermal shutdown is not intended as a guarantee that the unit will survive temperature beyond its rating. The module will automatically restarts after it cools down.

- Thermal test condition with vertical direction by natural convection (20LFM).



TOP VIEW

LEAD FREE REFLOW PROFILE



*The curves define the maximum peak reflow temperature permissible measured on pin1 or Vin pin.