

S2A00R Series

3 Watts Low Cost DIP DC/DC Converters

Single and Dual Outputs

Key Features

- Low Cost
- Regulated Outputs
- 40mV P-P Ripple and Noise
- I / O Isolation 500VDC
- Short Circuit Protection
- Industry Standard Pinout
- MTBF > 600,000 Hours



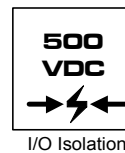
Minmax's S2A00R Model 3W DC/DC's are specially designed to provide 40mA output ripple, continuous short circuit in a low-profile 24 pin DIP package.

The series consists of 20 models with input voltages of 5V, 12V and 24V and 48V, and offers regulated output voltages of 5V, 12V, 15V, $\pm 12V$ and $\pm 15V$.

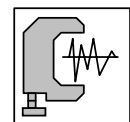
The -25°C to $+71^{\circ}\text{C}$ operating temperature range makes it ideal for data communication equipments, mobile battery driven equipments, distributed power systems, telecommunication equipments, mixed analog/digital subsystems, automatic test instrumentation and industrial robot systems.



Low Cost



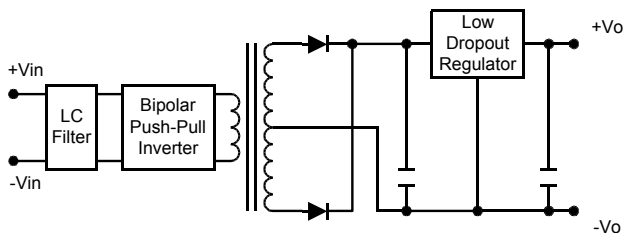
I/O Isolation



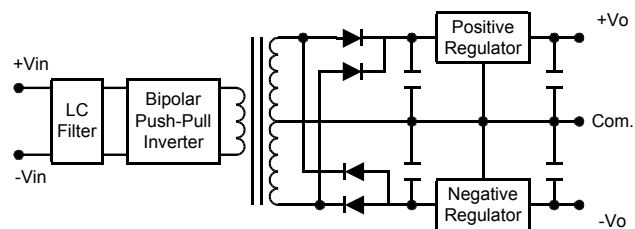
Low Noise

Block Diagram

Single Output



Dual Output



Model Selection Guide

Model Number	Input Voltage	Output Voltage	Output Current		Input Current		Reflected Ripple Current	Efficiency
			Max.	Min.	@Max. Load	@No Load		@Max. Load
	VDC	VDC	mA	mA	mA (Typ.)	mA (Typ.)	mA (Typ.)	% (Typ.)
S2A01R	5 (4.5 ~ 5.5)	5	600	0	1000	100	100	60
S2A02R		12	250		960			62
S2A03R		15	200		960			62
S2A04R		±12	±125		1000			60
S2A05R		±15	±100		1000			60
S2A06R	12 (10.8 ~ 13.2)	5	600	0	420	50	40	60
S2A07R		12	250		400			62
S2A08R		15	200		400			62
S2A09R		±12	±125		420			60
S2A10R		±15	±100		420			60
S2A11R	24 (21.6 ~ 26.4)	5	600	0	210	25	25	60
S2A12R		12	250		195			64
S2A13R		15	200		195			64
S2A14R		±12	±125		210			60
S2A15R		±15	±100		210			60
S2A16R	48 (43.2 ~ 52.8)	5	600	0	105	15	10	60
S2A17R		12	250		100			62
S2A18R		15	200		100			62
S2A19R		±12	±125		105			60
S2A20R		±15	±100		105			60

Absolute Maximum Ratings

Parameter	Min.	Max.	Unit	
Input Surge Voltage (1000 mS)	5VDC Input Models	-0.7	7.5	VDC
	12VDC Input Models	-0.7	15	VDC
	24VDC Input Models	-0.7	30	VDC
	48VDC Input Models	-0.7	55	VDC
Lead Temperature (1.5mm from case for 10 Sec.)	---	260	°C	
Internal Power Dissipation	---	3,000	mW	

Exceeding these values can damage the module. These are not continuous operating ratings.

Note :

- Specifications typical at $T_a = +25^\circ\text{C}$, resistive load, nominal input voltage, rated output current unless otherwise noted.
- Transient recovery time is measured to within 1% error band for a step change in output load of 50% to 100%.
- Ripple & Noise measurement bandwidth is 0–20 MHz.
- All DC/DC converters should be externally fused at the front end for protection.
- Other input and output voltage may be available, please contact factory.
- Specifications subject to change without notice.

Environmental Specifications

Parameter	Conditions	Min.	Max.	Unit
Operating Temperature	Ambient	-25	+71	°C
Operating Temperature	Case	-25	+90	°C
Storage Temperature		-40	+125	°C
Humidity		---	95	%
Cooling	Free-Air Convection			

Input Specifications

Parameter	Model	Min.	Typ.	Max.	Unit
Input Voltage Range	5V Input Models	4.5	5	5.5	VDC
	12V Input Models	10.8	12	13.2	
	24V Input Models	21.6	24	26.4	
	48V Input Models	43.2	48	52.8	
Reverse Polarity Input Current	All Models	---	---	0.5	A
Short Circuit Input Power		---	---	2500	mW
Input Filter		Pi Filter			

Output Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		---	±2.0	±4.0	%
Output Voltage Balance	Dual Output Balance Load	---	±1.0	±3.0	%
Line Regulation	Vin=Min. to Max.	---	±0.2	±0.5	%
Load Regulation	Io=10% to 100%	---	±0.2	±0.5	%
Ripple & Noise (20MHz)		---	40	50	mV P-P
Ripple & Noise (20MHz)	Over Line, Load & Temp	---	---	75	mV P-P
Ripple & Noise (20MHz)		---	---	5	mV rms.
Over Load		120	---	---	%
Transient Recovery Time	50% Load Step Change	---	---	50	uS
Transient Response Deviation		---	---	±6	%
Temperature Coefficient		---	±0.01	±0.02	%/°C
Output Short Circuit	Continuous				

General Specifications

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	60 Seconds	500	---	---	VDC
Isolation Test Voltage	Flash Tested for 1 Second	550	---	---	VDC
Isolation Resistance	500VDC	1000	---	---	MΩ
Isolation Capacitance	100KHz, 1V	---	100	150	pF
Switching Frequency		40	80	---	KHz
MTBF	MIL-HDBK-217F @ 25°C, Ground Benign	600	---	---	K Hours

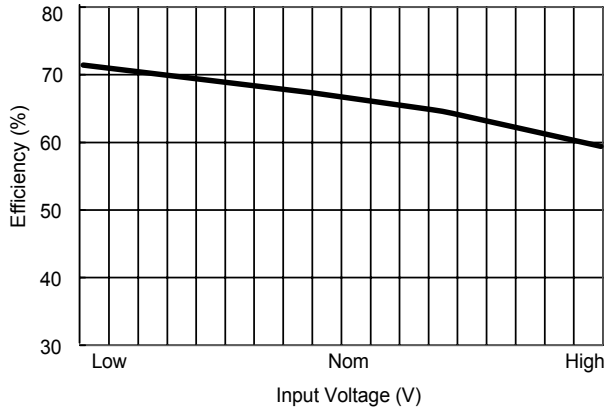
Capacitive Load

Models by Vout	5V	12V	15V	±12V #	±15V #	Unit
Maximum Capacitive Load	470	470	470	220	220	uF

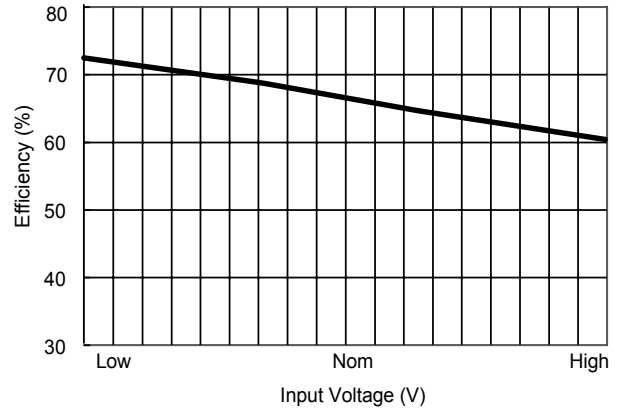
Note: # For each output .

Input Fuse Selection Guide

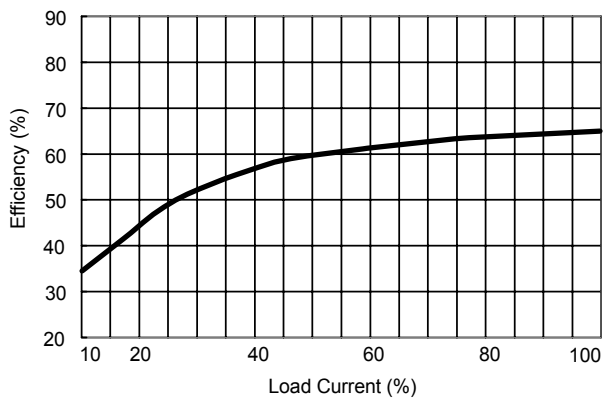
5V Input Models	12V Input Models	24V Input Models	48V Input Models
2000mA Slow – Blow Type	1000mA Slow – Blow Type	500mA Slow – Blow Type	200mA Slow – Blow Type



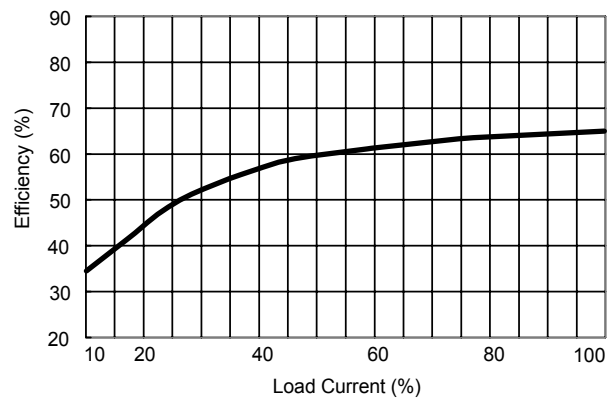
Efficiency vs Input Voltage (Single Output)



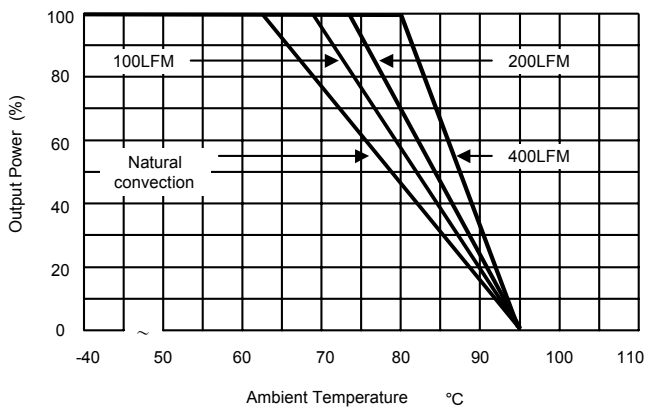
Efficiency vs Input Voltage (Dual Output)



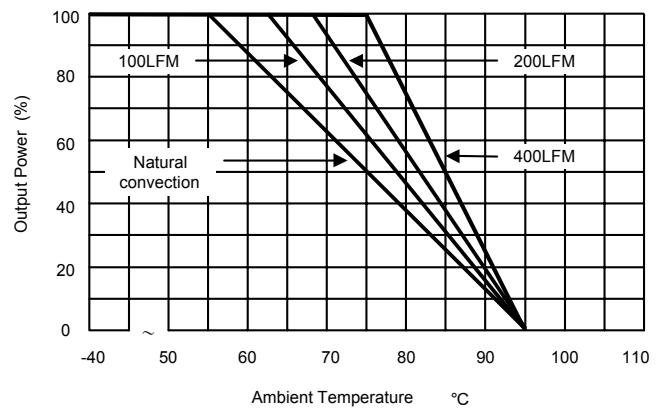
Efficiency vs Output Load (Single Output)



Efficiency vs Output Load (Dual Output)



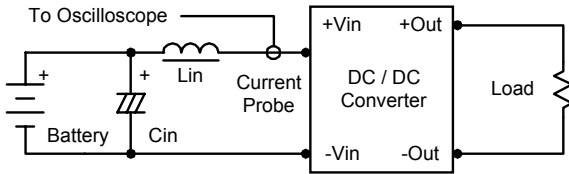
Derating Curve (single output)



Derating Curve (dual output)

Test Configurations

Input Reflected-Ripple Current Test Setup



Input reflected-ripple current is measured with an inductor L_{in} (4.7uH) and C_{in} (220uF, ESR < 1.0Ω at 100 KHz) to simulate source impedance.

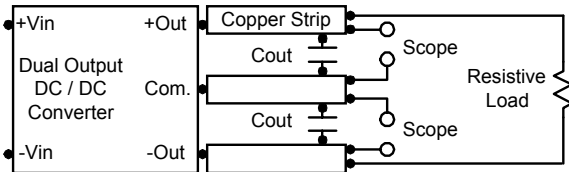
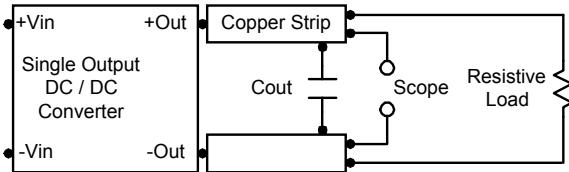
Capacitor C_{in} , offsets possible battery impedance.

Current ripple is measured at the input terminals of the module, measurement bandwidth is 0–500 KHz.

Peak-to-Peak Output Noise Measurement Test

Use a C_{out} 0.33uF ceramic capacitor.

Scope measurement should be made by using a BNC socket, measurement bandwidth is 0–20 MHz. Position the load between 50 mm and 75 mm from the DC/DC Converter.



Design & Feature Considerations

Maximum Capacitive Load

The S2A00R 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 220uF maximum capacitive load for dual outputs and 470uF capacitive load for single outputs.

The maximum capacitance can be found in the data.

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.

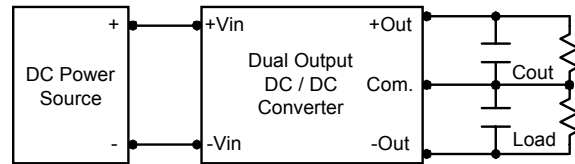
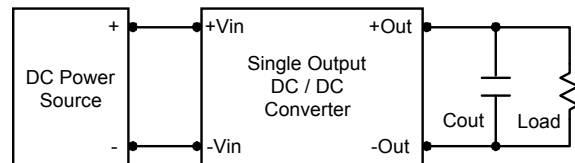
In applications where power is supplied over long lines and output loading is high, it may be necessary to use a capacitor at the input to ensure startup.

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 < 1.0Ω at 100 KHz) capacitor of a 2.2uF for the 5V input devices, a 1.0uF for the 12V input devices and a 0.47uF for the 24V and 48V devices.

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.

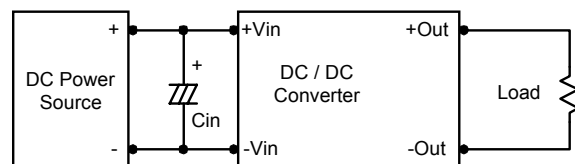
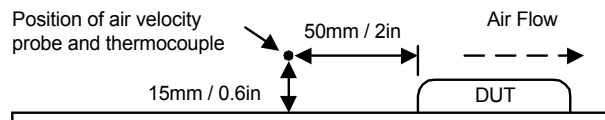
To reduce output ripple, it is recommended to use 1.5uF capacitors at the output.



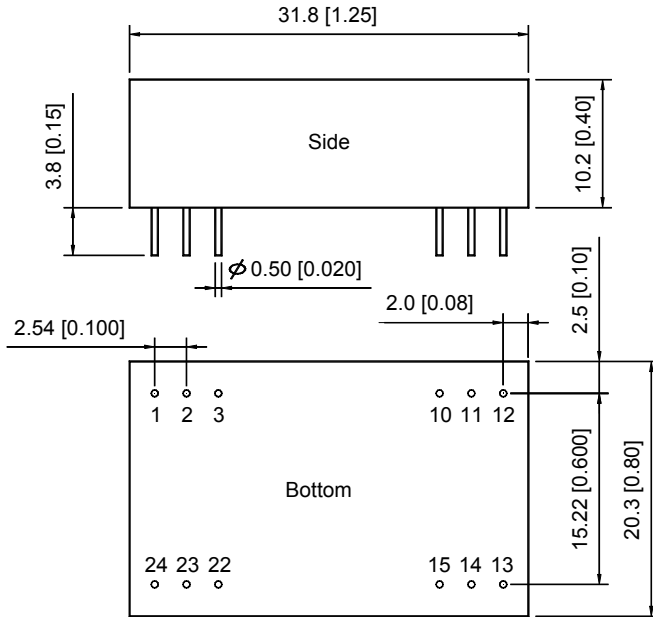
Thermal Considerations

Many conditions affect the thermal performance of the power module, such as orientation, airflow over the module and board spacing. To avoid exceeding the maximum temperature rating of the components inside the power module, the case temperature must be kept below 85°C.

The derating curves are determined from measurements obtained in an experimental apparatus.



Mechanical Data

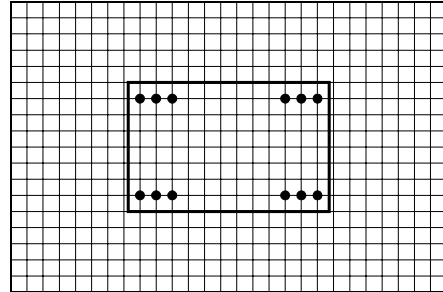


Tolerance	Millimeters	Inches
	.X±0.25	.XX±0.01
	.XX±0.25	.XXX±0.01
Pin	±0.05	±0.002

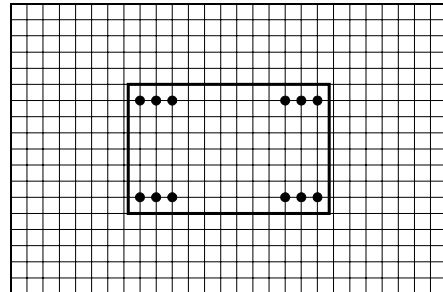
Connecting Pin Patterns

Top View (2.54 mm / 0.1 inch grids)

Single Output



Dual Output



Pin Connections

Pin	Single Output	Dual Output
1	+Vin	+Vin
2	NC	-Vout
3	NC	Common
10	-Vout	Common
11	+Vout	+Vout
12	-Vin	-Vin
13	-Vin	-Vin
14	+Vout	+Vout
15	-Vout	Common
22	NC	Common
23	NC	-Vout
24	+Vin	+Vin

NC: No Connection

Physical Characteristics

Case Size : 31.8×20.3×10.2 mm
1.25×0.8×0.4 inches

Case Material : Black Coated Metal

Weight : 14g

Flammability : UL94V-0

Units are encapsulated in a low thermal resistance molding compound which has excellent chemical resistance and electrical properties in high humidity environment and over a wide operating temperature range. The encapsulant and outer shell of the unit have UL94V-0 ratings. The leads are tin plated for better soldering.