

# S9 Series

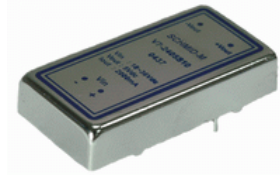
20W 4:1 Regulated Single & Dual output



**SCHMID-M**  
DC/DC - Converter

## Features

- Ultra Wide 4:1 Input Range
- Full SMD Technology
- 1600 VDC Isolation
- No Minimum Load Required
- Efficiency up to 91%
- Extended Operating Temperature Range -40 ~ 85°C max.
- Adjustable Output Voltage
- Remote On/Off Control (CTRL)
- Continuous Short Circuit Protection
- Over Current Protection
- Over Voltage Protection
- Soft Start



The S9 series is a family of cost effective 20W single & dual output DC-DC converters. These converters combine nickle-coated copper package in a 2"x1" case with high performance features such as Active Clamp Technology, continuous short circuit protection with automatic restart and tight line / load regulation. Devices are encapsulated using flame retardant resin. Input voltages of 24 and 48 with output voltage of 3.3 , 5, 12, 15,  $\pm 5$ ,  $\pm 12$ ,  $\pm 15$ Vdc. High performance features include high efficiency operation up to 91% and output voltage accuracy of  $\pm 1\%$  maximum.

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

OUTPUT SPECIFICATIONS	
Output Voltage Accuracy	$\pm 1\%$
Output Voltage Adjustability(Trim)	Single output: $\pm 10\%$ , max
Maximum Output Current	See table
Line Regulation	$\pm 0.5\%$ , max
Load Regulation( $I_o=0\%$ to 100%)	Single: $\pm 0.5\%$ , max Dual: $\pm 1\%$ , max(balanced load)
Cross Regulation (Dual Output) (1)	$\pm 5\%$
Ripple&Noise (2)	75mVp-p, max
	3.3V output 3.9V
	5V output 6.2V
Over Voltage Protection	12V output 15V
( Zener diode clamp)	15V output 18V
	$\pm 5$ V output $\pm 6.2$ V
	$\pm 12$ V output $\pm 15$ V
	$\pm 15$ V output $\pm 18$ V
Over Current Protection	120% of FL, typ
Short Circuit Protection	Indefinite(hiccup) (Automatic Recovery)
Temperature Coefficient	$\pm 0.02\%/^{\circ}\text{C}$
Capacitive Load (3)	See table
Transient Recovery Time (4)	250us, typ
Transient Response Deviation(4)	$\pm 3\%$ , max

GENERAL SPECIFICATIONS	
Efficiency	See table, typ
I/O Isolation Voltage(3 sec)	
Input/Output	1600Vdc
Case/Input & Output	1600Vdc
Isolation Resistance	1000 M $\Omega$ , min
Isolation Capacitance	1200 pF, typ
Switching frequency	330kHz, typ
Humidity	95% rel H
Reliability Calculated MTBF(MIL-HDBK-217 F)	>560 khrs
Safety Standard (designed to meet)	IEC/EN 60950-1

EMC CHARACTERISTICS		
Radiated Emissions	EN55022	CLASS A
Conducted Emissions(7)	EN55022	CLASS A
ESD	EN61000-4-2	Perf. Criteria B
RS	EN61000-4-3	Perf. Criteria A
EFT(8)	EN61000-4-4	Perf. Criteria B
Surge (8)	EN61000-4-5	Perf. Criteria B
CS	EN61000-4-6	Perf. Criteria A
PFMF	EN61000-4-8	Perf. Criteria A

INPUT SPECIFICATIONS	
Input Voltage Range	See table
Under Voltage Lockout	
24V Modes	Module ON / OFF 8.6Vdc / 7.9Vdc, typ
48V Modes	Module ON / OFF 17.8Vdc / 16Vdc, typ
Start up Time	20mS, typ
(Nominal Vin and constant resistive load)	
Input Filter	Pi Type
Input Current(No-Load)	See table, typ
Input Current(Full-Load)	See table, max
Input Reflected Ripple Current(5)	20mA <sub>p-p</sub> , typ
Remote On/Off (CTRL)(6)	
ON:	3.0 ... 12Vdc or open circuit
OFF:	0 ... 1.2Vdc or Short circuit pin2 and pin 6
OFF idle current:	5 mA, typ

PHYSICAL SPECIFICATIONS	
Case Material	Nickel-coated Copper
Base Material	Non-conductive Black Plastic(UL94V-0 rated)
Pin Material	1.0mm Brass Solder-coated
Potting Material	Epoxy (UL94V-0 rated)
Weight	30.0g
Dimensions	2"x1"

ABSOLUTE SPECIFICATIONS (9)	
These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.	
Input Voltage(100mS)	
24 Modes	-0.7~50 Vdc
48 Modes	-0.7~100 Vdc
Lead Soldering Temperature	260C max.
(1.5mm from case 10 sec. Max.)	

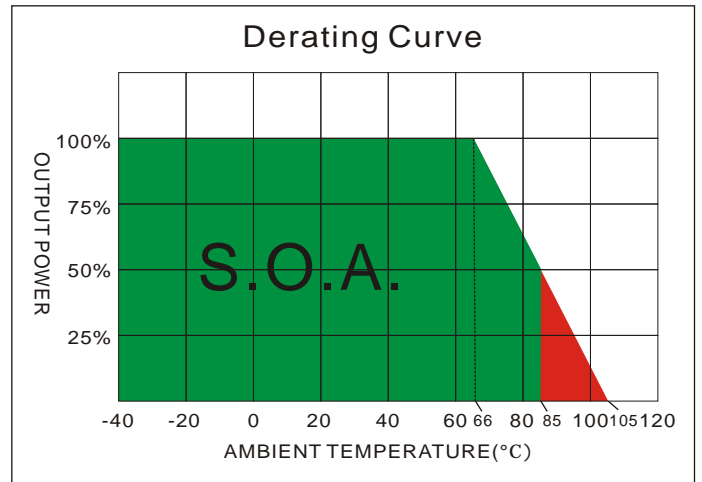
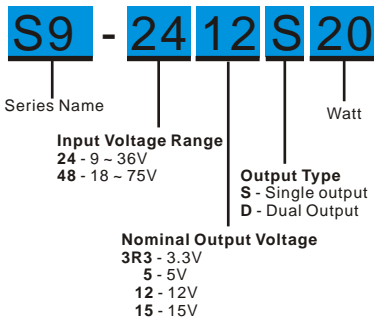
  

ENVIRONMENTAL SPECIFICATIONS	
Operating Ambient Temperature	-40°C ~ +85°C(See Derating Curve) -40°C ~ +66°C(For 100% load)
Maximum Case Temperature	105°C
Storage Temperature	-40°C ~ +125°C
Cooling	Nature Convection

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**PART NUMBER STRUCTURE**

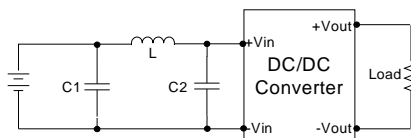


**MODEL SELECTION GUIDE**

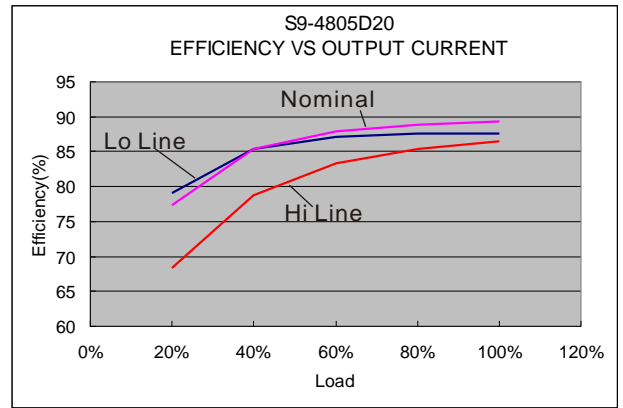
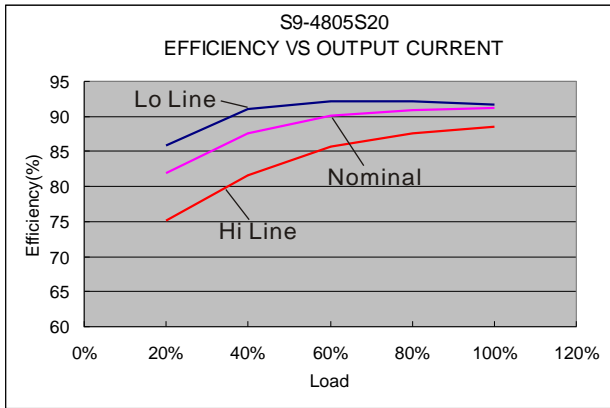
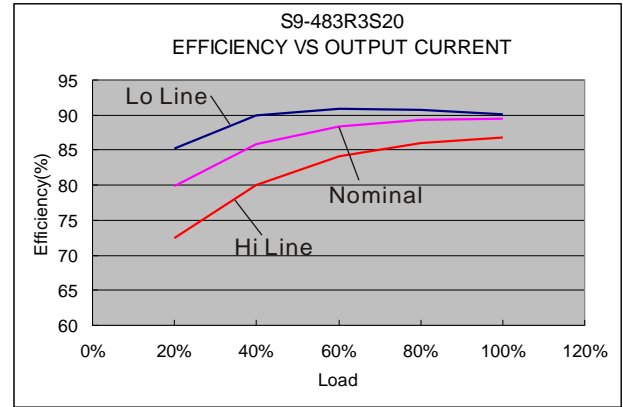
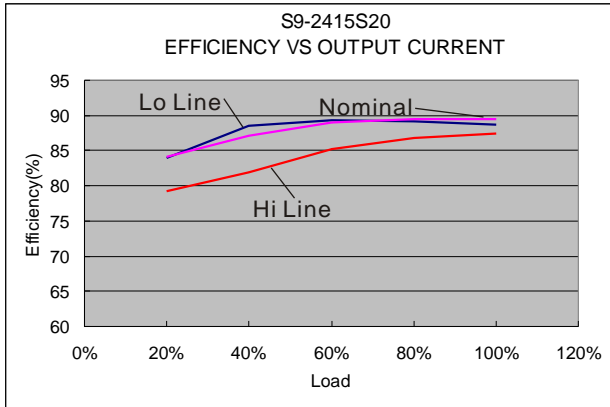
MODEL NUMBER	INPUT Voltage Range (Vdc)	INPUT Current		OUTPUT Voltage (Vdc)	OUTPUT Current		EFFICIENCY @FL(%)	Capacitor Load(uF)
		No-Load (mA)	Full Load (mA)		Min. load (mA)	Full load (mA)		
S9-243R3S20	9-36	50	879	3.3	0	5500	89	10000
S9-2405S20	9-36	50	957	5	0	4000	91	6800
S9-2412S20	9-36	22	980	12	0	1670	89	1000
S9-2415S20	9-36	22	968	15	0	1330	89	680
S9-483R3S20	18-75	30	440	3.3	0	5500	89	10000
S9-4805S20	18-75	30	473	5	0	4000	91	6800
S9-4812S20	18-75	15	484	12	0	1670	89	1000
S9-4815S20	18-75	15	484	15	0	1330	89	680
S9-2405D20	9-36	65	969	±15	0	±2000	89	±2200
S9-2412D20	9-36	25	980	±12	0	±835	88	±470
S9-2415D20	9-36	25	980	±15	0	±665	89	±330
S9-4805D20	18-75	40	484	±5	0	±2000	89	±2200
S9-4812D20	18-75	15	490	±12	0	±835	88	±470
S9-4815D20	18-75	15	490	±15	0	±665	89	±330

**NOTE**

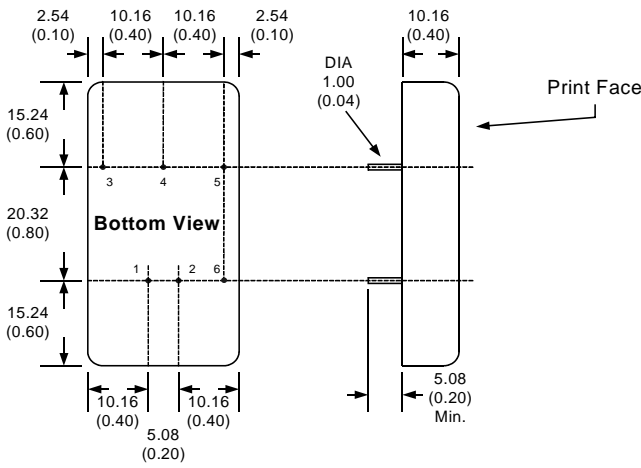
- One load is 25% to 100% load, the other load is 100% load, the output voltage variable rate is within ±5%.
- Measured with 20MHz bandwidth and 1.0uF ceramic capacitor.
- Tested by minimal Vin and constant resistive load.
- Tested by normal Vin and 25% load step change ( 75%-50%-25% of Io ).
- Measured Input reflected ripple current with a simulated source inductance of 12uH.
- The remote on/off control pin is referenced to -Vin(pin2).
- Input filter components (C1, C2, L) are used to help meet conducted emissions requirement for the module. These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.
- An external filter capacitor is required if the module has to meet EN61000-4-4 and EN61000-4-5. The filter capacitor Schmid-M suggest: Nippon chemi-con KY series, 220uF/100V.
- Exceeding the absolute ratings of the unit could cause damage.



	C1	L	C2
S9-24XXXXX	1210, 2.2uF/100V	12uH	1210, 2.2uF/100V
S9-48XXXXX	1210, 2.2uF/100V	12uH	1210, 2.2uF/100V



**MECHANICAL SPECIFICATIONS**



- All dimensions are typical in millimeters ( inches ).
1. Pin diameter:  $1.0 \pm 0.05$  (  $0.04 \pm 0.002$  )
  2. Pin pitch tolerance:  $\pm 0.35$  (  $\pm 0.014$  )
  3. Case Tolerance:  $\pm 0.5$  (  $\pm 0.02$  )

PIN CONNECTIONS		
PIN NUMBER	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	+Vout	+Vout
4	Trim	Com
5	-Vout	-Vout
6	CTRL	CTRL

**EXTERNAL OUTPUT TRIMMING**

Output can be externally trimmed by using the method as below. (single output models only)