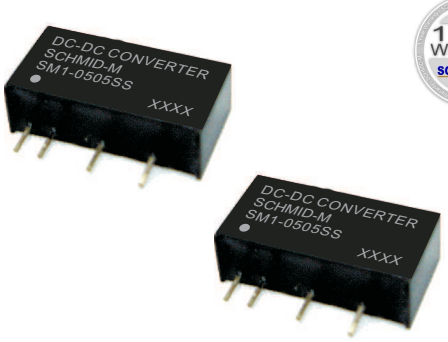
SM1 Series

1W Semi-regulated Single & Dual output

Features

- 7 Pin SIL Package
- Semi-regulated output
- 1000 VDC Isolation
- Up to 3000 VDC Isolation
- Low Ripple and Noise
- Efficiency up to 89%
- -40 ~ 85°C Operation Temperature Range
- Non-Conductive Black Plastic Case



The SM1 series is a family of cost effective 1W single & dual output DC-DC converters. These converters achieve low cost, high efficiency,semi-regulated and ultra-miniature SIP 7 pin size. Devices are encapsulated using flame retardant resin. The models operate from input voltage of 5, 12,15, 24, 48 Vdc with output voltage of 5,9,12,15,±5,±9,±12,±15 Vdc. High efficiency operation and output voltage accuracy of ±3% maximum. Standard features include an input range of ±10% tolerance and low output noise and ripple.

All specifications typical at Ta=25°C, nominal input voltage and full load unless otherwise specified

OUTPUT SPECIFICATIONS

Voltage accuracy		±3%
Line regulation		±1.2% / Per 1% Vin Change
Load regulation(From 10% to 100% Load)		See table
Ripple & noise (20 MHz bandwidth)(1)		50mV pk-pk
Temperature coefficient		±0.02%/°C
Capacitor load(2)		See table

EMC SPECIFICATIONS

Radiated Emissions	EN55022	CLASS B
Conducted Emissions (3)	EN55022	CLASS B
ESD	IEC 61000-4-2	Perf. Criteria A
RS	IEC 61000-4-3	Perf. Criteria A
EFT(4)	IEC 61000-4-4	Perf. Criteria A
CS	IEC 61000-4-6	Perf. Criteria A
PFMF	IEC 61000-4-8	Perf. Criteria A

INPUT SPECIFICATIONS

Voltage Range		±10%
Max. Input Current		See table
No-Load Input Current		See table
Input Filter		Capacitors
Input Reflected Ripple Current	5V	20mA pk-pk
	12V	20mA pk-pk
	15V	30mA pk-pk
	24V	40mA pk-pk
	48V	50mA pk-pk

PHYSICAL SPECIFICATIONS

Case Material	Non-conductive Black Plastic(UL94V-0 rated)
Pin Material	C5191R-H Solder-coated
Potting Material	Epoxy (UL94V-0 rated)
Weight	
Vin=5V / 12V / 15V / 24V	2.4g,typ.
Vin=48V	2.8g,typ.
Dimensions	
Vin=5V / 12V / 15V / 24V	SIP Case 0.76"x0.24"x0.39"
Vin=48V	SIP Case 0.76"x0.28"x0.39"

GENERAL SPECIFICATIONS

Efficiency	See table
I/O Isolation Voltage(60 sec)	
Input/Output	1000~3000Vdc
I/O Isolation Capacitance	60 pF typ.
I/O Isolation Resistance	1G Ohm
Switching Frequency	Variable 70kHz
Humidity	95% rel H
Reliability Calculated MTBF(MIL-HDBK-217 F)	>2 Mhrs
Safety Standard : (designed to meet)	IEC 60950-1

ENVIRONMENT SPECIFICATIONS

Operating Temperature	-40°C~85°C(See Derating Curve)
Maximum Case Temperature	100°C
Storage Temperature	-40°C~125°C
Cooling	Nature Convection

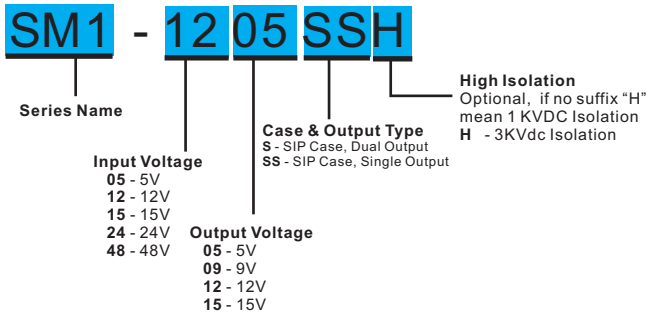
ABSOLUTE MAXIMUM RATINGS(5)

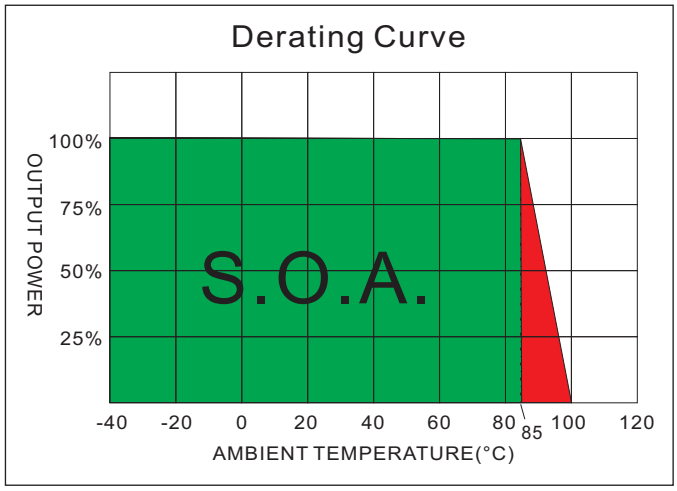
These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.

Input Surge Voltage(100mS)	
5 Models	9 Vdc, max.
12 Models	18 Vdc, max.
15 Models	20 Vdc, max.
24 Models	30 Vdc, max.
48 Models	54 Vdc, max.
Soldering Temperature (1.5mm from case 10 sec.max.)	260°C

SM1 - 1W Semi-regulated Single & Dual output

PART NUMBER STRUCTURE





MODEL SELECTION GUIDE

MODEL NUMBER	INPUT Voltage Range (Vdc)	INPUT Current No-Load (mA)	INPUT Current Full Load (mA)	OUTPUT Voltage (Vdc)	OUTPUT Current Full load (mA)	LOAD Regulation %	EFFICIENCY @FL(%)	Capacitor Load(uF)
SM1-0505S	5	20	230	±5	±100	6	84	±100
SM1-0509S	5	30	230	±9	±55.55	5.5	86	±100
SM1-0512S	5	20	228	±12	±41.67	5.5	87	±47
SM1-0515S	5	20	228	±15	±33.33	5	87	±47
SM1-1205S	12	15	98	±5	±100	4	85	±100
SM1-1209S	12	15	95	±9	±55.55	3.5	86	±100
SM1-1212S	12	15	94	±12	±41.67	3.5	87	±47
SM1-1215S	12	15	94	±15	±33.33	3.5	87	±47
SM1-1505S	15	10	78	±5	±100	3.5	85	±100
SM1-1509S	15	10	76	±9	±55.55	2.5	87	±100
SM1-1512S	15	10	76	±12	±41.67	2.5	87	±47
SM1-1515S	15	10	75	±15	±33.33	2.5	88	±47
SM1-2405S	24	7	51	±5	±100	3.5	82	±100
SM1-2409S	24	7	49	±9	±55.55	2.5	85	±100
SM1-2412S	24	7	48	±12	±41.67	2.5	87	±47
SM1-2415S	24	7	48	±15	±33.33	2.5	87	±47
SM1-4805S	48	5	27	±5	±100	3	77	±100
SM1-4809S	48	5	26	±9	±55.55	3	81	±100
SM1-4812S	48	5	26	±12	±41.67	3	82	±47
SM1-4815S	48	5	26	±15	±33.33	2	81	±47
SM1-0505SS	5	20	250	5	200	6	83	220
SM1-0509SS	5	20	230	9	111.1	5.5	86	220
SM1-0512SS	5	20	230	12	83.3	5.5	87	100
SM1-0515SS	5	20	230	15	66.7	5	87	100
SM1-1205SS	12	15	98	5	200	4	84	220
SM1-1209SS	12	15	96	9	111.1	3.5	86	220
SM1-1212SS	12	15	95	12	83.3	3.5	88	100
SM1-1215SS	12	15	95	15	66.7	3	88	100
SM1-1505SS	15	10	79	5	200	4	84	220
SM1-1509SS	15	10	77	9	111.1	3.5	86	220
SM1-1512SS	15	10	76	12	83.3	3.5	87	100
SM1-1515SS	15	10	76	15	66.7	3	89	100
SM1-2405SS	24	7	51	5	200	4	81	220
SM1-2409SS	24	7	50	9	111.1	3.5	84	220
SM1-2412SS	24	7	49	12	83.3	3.5	85	100
SM1-2415SS	24	7	49	15	66.7	2.5	86	100
SM1-4805SS	48	5	27	5	200	4	78	220
SM1-4809SS	48	5	26	9	111.1	3.5	80	220
SM1-4812SS	48	5	26	12	83.3	3	81	100
SM1-4815SS	48	5	26	15	66.7	3	81	100

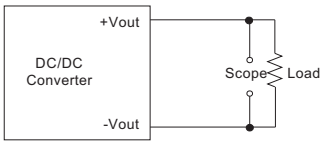
NOTE

1. Ripple/Noise measured with 20MHz bandwidth.
2. Tested by minimal Vin and constant resistive full load.
3. Input filter components (C1, L,C2, C3) 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.
4. An external filter capacitor is required if the module has to meet IEC61000-4-4
   The filter capacitor SCHMID-M suggest: Nippon chemi-con KY series, 220uF/100V.
5. Exceeding the absolute ratings of the unit could cause damage. It is not allowed for continuous operating.
6. Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications.

TEST CONFIGURATIONS

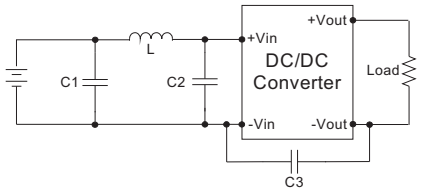
Output Ripple & Noise Measurement Test

The Scope measurement bandwidth is 0-20MHz.



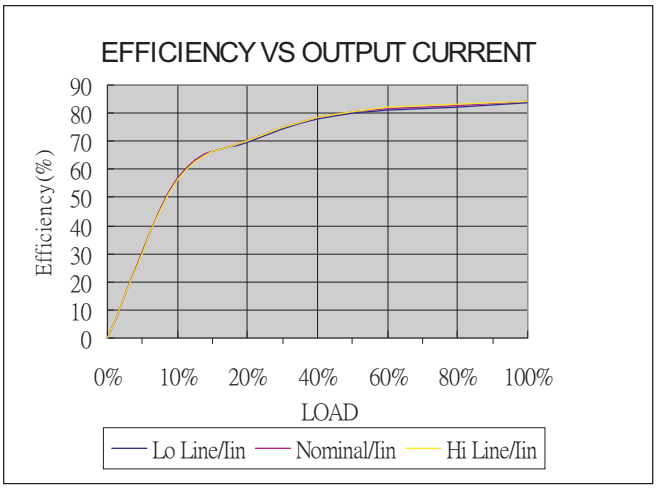
EMI Filter

Input filter components (C1, L,C2,C3) 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.

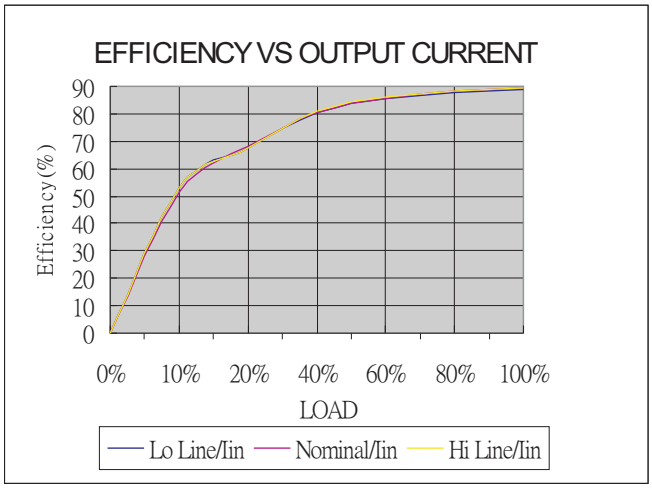


	C1	L	C2	C3
SM1-05XXXXX	1210, 2.2uF/100V	18uH		
SM1-12XXXXX	1210, 2.2uF/100V	18uH		
SM1-15XXXXX	1210, 2.2uF/100V	18uH		
SM1-24XXXXX	1210, 2.2uF/100V	18uH	1210, 2.2uF/100V	1206, 470pF/2KV
SM1-48XXXXX	1210, 2.2uF/100V	18uH	1210, 2.2uF/100V	1206, 470pF/2KV

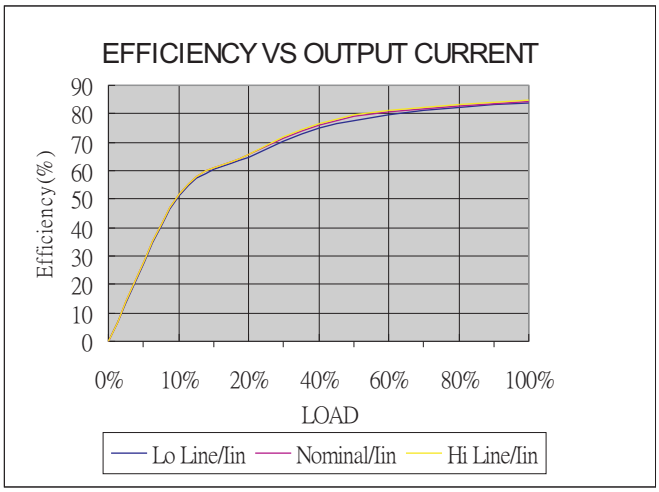
ELECTRICAL CHARACTERISTIC CURVES



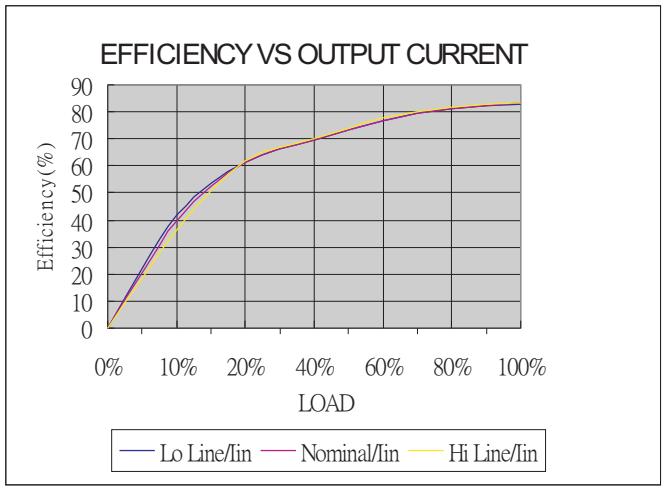
SM1-0505SS



SM1-1215S

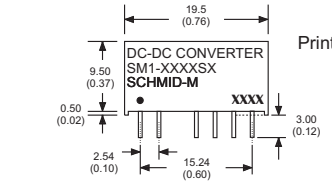


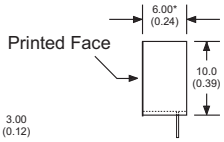
SM1-2405SS



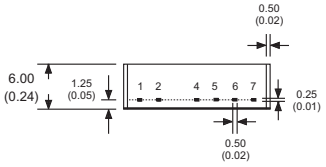
SM1-4815S

MECHANICAL SPECIFICATIONS





* The thickness of 48V input voltage model is 7.20(0.28)



7 Pin SIL Package

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

PIN CONNECTIONS				
PIN NUMBER	SINGLE	DUAL	SINGLE-H	DUAL-H
1	+V Input	+V Input	+V Input	+V Input
2	−V Input	−V Input	−V Input	−V Input
4	−V Output	−V Output	N.P.	N.P.
5	N.P.	Common	−V Output	−V Output
6	+V Output	+V Output	N.P.	Common
7	N.P.	N.P.	+V Output	+V Output