SNR - 2.0 Series

2A Output Current, Non-Isolated DC-DC converter

SCHMID-M

Features

- 3 Pin SIL, Full SMD Technology
- Non-Isolated Regulator with Very Low Standby Current
- Wide Input Range,Step-down switching DC-DC converter
- High voltage input range, up to 36V
- Continuous Short Circuit Protection
- Pin-out compatible with LM78XX three terminals positive Regulator
- Efficiency up to 96%
- Low ripple and noise

CE

The SNR-2.0 series is a family of cost effective 2.4~30W single output buck DC-DC converters. These converters are encapsulated in a non-conductive black plastic package 3-pin SIL case, continuous short circuit protection with automatic restart, good line/load regulation and ultra low quiescence current. Devices are filled up with flame retardant resin. Input voltages of 3~5.5Vdc and 4.6~36Vdc with output voltage of 1.2, 1.5, 1.8, 2.5, 3.3, 5, 6.5, 9, 12 and 15Vdc. High performance features include high efficiency operation up to 96%.

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

OUTPUT SPECIFICATIONS

Voltage Accuracy			±2%, max.
Output Current (Full Load)			2000mA, max.
Line regulation			±0.5%, max.
Load regulation	05 Series	For All Vo (From 0% to 100% Load)	±1.0%, max.
	24 Series	For Vo ≧5.0Vdc (From 0% to 100% Load)	±1.0%, max.
		For Vo ≦3.3Vdc (From 0% to 100% Load)	±1.5%, max.
		For All Vo (From 10% to 100% Load)	±1.0%, max.
Ripple & Noise (20 MHz bandwidth)(1)		For Vo ≦6.5Vdc	50mVpk-pk, typ.
		For Vo ≧9.0Vdc	75mVpk-pk, typ.
Short Circuit Protection			Continuous (Automatic Recovery)
Over Load Protection (Hiccup mode)			05 series : 8.5A, typ.
			24 series : 3.5A, typ.
Temperature coefficient			±0.02%/°C
Capacitor Load (2)			See table
Transient Recovery Time (3)			150μs, typ.
Transient Response Deviation (3)			±3%, max.

INPUT SPECIFICATIONS

Input Voltage Range	See table
Start up Time (Nominal Vin and constant resistive load)	5mS, typ.
Input Current (No-Load)	See table, typ.
Input Current (Full-Load)	See table, typ.
Input Filter	Capacitors
Input Reflected Ripple Current (4)	35mA pk-pk, typ.

ENVIRONMENT SPECIFICATIONS

Operating Temperature	-40°C~100°C(See Derating Curve)
Maximum Case Temperature	105°C
Thermal Impedance (Mounting at FR4 (1.18*1.18 inch) PCB	34°C/W, min.
Storage Temperature	-55°C~+125°C
Cooling (5)	Nature Convection

GENERAL SPECIFICATIONS

Efficiency	See table, typ.
Switching Frequency	05 series : 1200 Khz, typ.
	24 serise : 410 Khz, typ.
Humidity	95% rel H
Reliability Calculated MTBF (MIL-HDBK-217 F)	05 series : 16 Mhrs, min.
	24 serise : 2.6 Mhrs, min.
Safety Standard (design to meet)	IEC/EN 60950-1
	IEC/EN 62368-1

PHYSICAL SPECIFICATIONS

Case Material	Non-conductive Black Plastic(UL94V-0 rated)
Pin Material	0.46x0.46mm Copper Matte tin-coated
Potting Material	Silicon (UL94V-0 rated)
Weight	2.4g
Dimensions	0.55”x0.30”x0.40”

EMC CHARACTERISTICS

Radiated Emissions (6)	EN55032	CLASS B
Conducted Emissions (6)	EN55032	CLASS B
ESD	IEC61000-4-2	Perf. Criteria A
RS	IEC61000-4-3	Perf. Criteria A
EFT (7)	IEC61000-4-4	Perf. Criteria A
Surge (7)	IEC61000-4-5	Perf. Criteria A
CS	IEC61000-4-6	Perf. Criteria A
PFMF	IEC61000-4-8	Perf. Criteria A

ABSOLUTE MAXIMUM RATINGS(8)

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

Input Surge Voltage (100mS)	05 series : 6Vdc, max.
	24 series : 40Vdc, max.
Soldering Temperature (1.5mm from case 10sec max.)	260°C, max.

NOTE

1. Ripple/Noise measured with a 0.1uF ceramic capacitor.
2. Tested by nominal Vin and constant resistive load.
3. Tested by normal Vin and 25% load step change (75%-50%-25% of Io).
4. Input reflected ripple current is measured through a source inductor L1(12μH) and a source capacitor C1(10μF) at nominal input and full load.
5. "Nature Convection" is usually about 30-65 LFM but it’s not equal to still air (0 LFM).
6. The SNR-2.0 series can meet EN55032 Class B with an external filter in parallel with the input pins.
7. An external filter capacitor and TVS is required if the module has to meet IEC61000-4-4 and IEC61000-4-5.
8. Do NOT operate converters exceeding the absolute maximum rating, over rating will cause damage to converters.
9. Operation under no-load conditions will not damage these devices, however they may not meet all listed specifications.

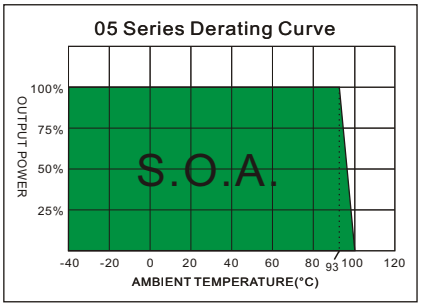
SNR-2.0 Series

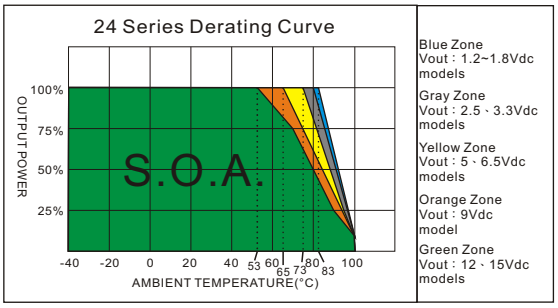
2.0A Output Current, Non-Isolated DC-DC Converter

PART NUMBER STRUCTURE

SNR - 24 3R3 - 2.0

- **SNR** — Series Name
- **24** — Input voltage Range
  - **05** - 3~5.5Vdc
  - **24** - 4.6~36Vdc
- **3R3** — Output Voltage
  - **1R2** - 1.2Vdc
  - **1R5** - 1.5Vdc
  - **1R8** - 1.8Vdc
  - **2R5** - 2.5Vdc
  - **3R3** - 3.3Vdc
  - **05** - 5Vdc
  - **6R5** - 6.5Vdc
  - **09** - 9Vdc
  - **12** - 12Vdc
  - **15** - 15Vdc
- **2.0** — Output Current 2.0 - 2A





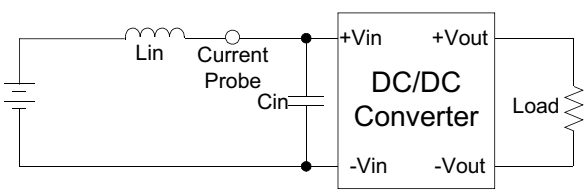
MODEL SELECTION GUIDE

MODEL NUMBER	INPUT Voltage Range (Vdc)	INPUT Current No-Load (mA, typ.)	INPUT Current Full Load (mA, typ.) @Min. Vin	INPUT Current Full Load (mA, typ.) @Max. Vin	OUTPUT Voltage (Vdc)	OUTPUT Current Full Load (mA)	EFFICIENCY Full Load (%, typ.) @Min. Vin	EFFICIENCY Full Load (%, typ.) @Max. Vin	Capacitor Load @FL (μF, max.)
SNR-051R2-2.0	5 (3-5.5)	0.5	889	507	1.2	2000	90	86	4200
SNR-051R5-2.0	5 (3-5.5)	0.5	1099	620	1.5	2000	91	88	3700
SNR-051R8-2.0	5 (3-5.5)	0.5	1304	727	1.8	2000	92	90	3300
SNR-052R5-2.0	5 (3.8-5.5)	0.5	1385	988	2.5	2000	95	92	1800
SNR-241R2-2.0	24 (4.6-36)	1.0	621	89	1.2	2000	84	75	2500
SNR-241R5-2.0	24 (4.6-36)	1.0	758	108	1.5	2000	86	77	2000
SNR-241R8-2.0	24 (4.6-36)	1.0	900	127	1.8	2000	87	79	1600
SNR-242R5-2.0	24 (4.6-36)	1.0	1221	167	2.5	2000	89	83	1200
SNR-243R3-2.0	24 (4.75-36)	1.0	1527	213	3.3	2000	91	86	900
SNR-2405-2.0	24 (6.5-36)	1.0	1637	312	5	2000	94	89	600
SNR-246R5-2.0	24 (9-36)	1.0	1537	397	6.5	2000	94	91	470
SNR-2409-2.0	24 (12-36)	1.0	1579	544	9	2000	95	92	330
SNR-2412-2.0	24 (15-36)	1.0	1684	717	12	2000	95	93	270
SNR-2415-2.0	24 (18-36)	1.0	1736	887	15	2000	96	94	200

TEST CONFIGURATIONS

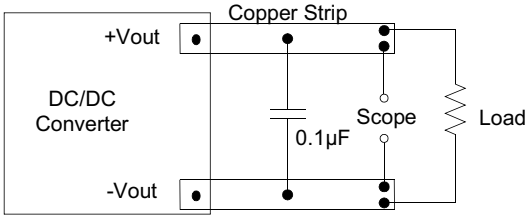
Input Reflected Ripple Current Test Step

Input reflected ripple current is measured through a source inductor Lin(12μH) and a source capacitor Cin(10μF, ESR<1.0Ω at 100kHz) at nominal input and full load.



Output Ripple & Noise Measurement Test

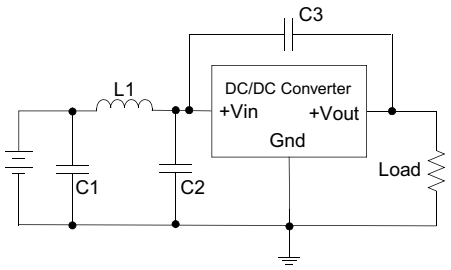
Measure with a 0.1μF ceramic capacitor.
The Scope measurement bandwidth is 0-20MHz.



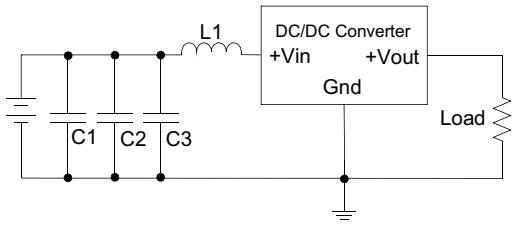
EMC COUNTERMEASURES

EMI Countermeasures

Input filter components (C1, C2, C3, L1) are used to help meet EMI 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.



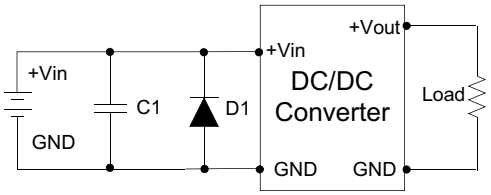
	C1	L1	C2	C3
SNR-05XX-2.0	1206 10uF,50V	22uH	1206 10uF,50V	0805 1nF,50V



	C1、C2、C3	L1
SNR-24XX-2.0	1206 10uF,50V	22uH

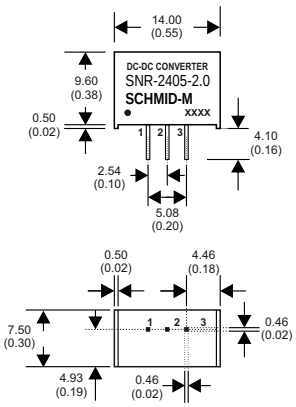
EFT & Surge Test Countermeasures

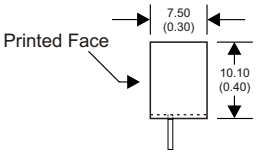
The filter SCHMID-M suggest: 05 Vin models : Nippon - chemi - con KY series , 3300uF/10V and a TVS , 3KW , 6.0V
24 Vin models : Nippon - chemi - con KY series , 220uF/100V and a TVS , 3KW , 36V



	C1	D1
SNR-05XX-2.0	3300uF/10V	SMDJ6.0A
SNR-24XX-2.0	220uF/100V	SMDJ36A

MECHANICAL SPECIFICATIONS





PIN CONNECTIONS	
PIN NUMBER	SINGLE
1	+V Input
2	GND
3	+V Output

Notes : All dimensions are typical in millimeters (inches).
1. Pin diameter: 0.65±0.15 (0.03±0.006)
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)

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