MR1S Series

1W, Regulated, 1.5KV Isolation, SIP7 Package DC/DC Converters

Features

- Rated power: 1W Max
- Input voltage range ±5%
- Regulated output
- High efficiency up to 72%
- Isolation voltage 1.5KVDC
- Operating temperature range: -40 ~ +85°C ambient
- RoHS compliant
- Industrial standard SIP7 package
- Continuous short circuit protection
- Meet EN/IEC 62368-1
- 3 year warranty

Overview

The MR1S series are SIP7 package DC/DC converters with tightly regulated single output, and 1.5KVDC isolation. These converters feature high efficiency, low ripple and noise, short circuit protection, and wide operating temperature range. They are widely used in distributed power system in industrial applications where isolation and voltage converting is needed.

Model Numbers

Model Number	Input Voltage [VDC] ±5%	Output Voltage [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [uF] Max.
			Max.	Min.		
MR1S-0503	5	3.3	250	25	69	2400
MR1S-0505	5	5	200	20	69	2400
MR1S-0509	5	9	111	12	69	1000
MR1S-0512	5	12	84	9	69	560
MR1S-0515	5	15	67	7	69	560
MR1S-0524	5	24	41	4	69	100
MR1S-1203	12	3.3	250	25	69	2400
MR1S-1205	12	5	200	20	72	2400
MR1S-1209	12	9	111	12	72	1000
MR1S-1212	12	12	84	9	72	560
MR1S-1215	12	15	67	7	72	560
MR1S-2403	24	3.3	250	25	69	2400
MR1S-2405	24	5	200	20	72	2400
MR1S-2409	24	9	111	12	72	1000
MR1S-2412	24	12	83	9	72	560
MR1S-2415	24	15	67	7	72	560

* Only typical models are listed. Other models may be available upon request.

* See MRK1S series for 3KVDC isolation models.

Electrical Specifications

Unless otherwise indicated, specifications are measured at T_A=25°C, nominal input voltage, full load after warm up.

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Input current Full load	V_{IN}=5V V_{IN}=12V V_{IN}=24V	-	260 110 57	-	mA	
Input current No load	V_{IN}=5V V_{IN}=12V V_{IN}=24V	-	15 8 4	-	mA	
Reflected ripple current		-	15	-	mA	
Output voltage accuracy		-	-	±3	%	
Line regulation For V_{IN} change of ±1%		-	-	±0.25	%	
Load regulation I_{OUT}=10% to 100% of $I_{OUT, rated}$	V_{OUT}=3.3V Others	-	-	±3 ±2	%	
Temperature coefficiency	Full load	-	±0.02	-	%/°C	
Output ripple and noise 20MHz bandwidth	V_{OUT}=15, 24V Others	-	80 50	150 100	mVp-p	
Output short circuit protection		Continuous, automatic recovery				
Input filter		Capacitor				
Hot plug		None				

* Operating with less than 10% of rated load will not cause permanent damage to the converters, but the performances data may not fall into the specifications, and reliable operating is not assured.

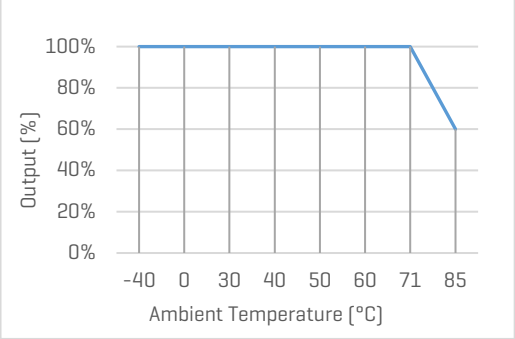
General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Isolation voltage 1 minute, leakage current 1mA max	Input to Output	1500	-	-	VDC	
Isolation resistance 500VDC	Input to Output	1000	-	-	M ohm	
Isolation capacitance 100KHz, 0.1V	Input to Output	-	20	-	pF	
Operating temperature	See "Derating Curve"	-40	-	+85	°C	
Storage temperature		-55	-	+125	°C	
Temperature rise at full load		-	25	-	°C	
Storage humidity		-	-	95	%RH	
Switching frequency	Full load	-	250	-	KHz	
Pin soldering resistance 1.5mm away from case for 10 sec		-	-	300	°C	
Vibration		10-150Hz, 5G, 0.75mm along X, Y and Z				
Case material		Black plastic UL94-V0				
Cooling method		Free air convection				
Design based on standards		UL/EN/IEC 62368-1				
Safety certifications		EN/IEC 62368-1				
EMC	Emissions Immunity	CISPR32, EN55032 Class B* IEC/EN61000-4-2				
MTBF	MIL-HDBK-217F	>3,500,000 Hours, T_A=25°C				
Size & Weight		19.65 x 6.0 x 10.16 mm, 2.1g Typ.				

Characteristic Curves

Derating Curve

Output vs Ambient Temperature



Recommended External Circuit

Typical Application Circuit

*Typical application circuit is to further lower the input and output ripple. It is not required for general use.

*Recommended component specifications are typical values. Excessive external capacitive load may cause startup problem.

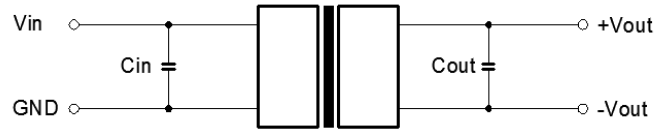


Figure 1. Typical external circuit

[Table 1] Recommended component spec

Input voltage	5V	12V	24V
C_{IN}	4.7uF, 16V	2.2uF, 25V	1uF, 50V

[Table 2] Recommended component spec

Output voltage	3.3, 5V	9, 12V	15, 24V
C_{OUT}	10uF, 16V	2.2uF, 25V	1uF, 50V

EMC Enhancement for EN55032 Class B

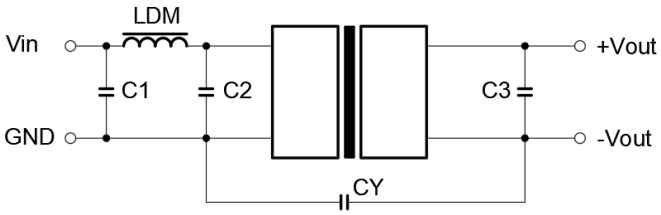


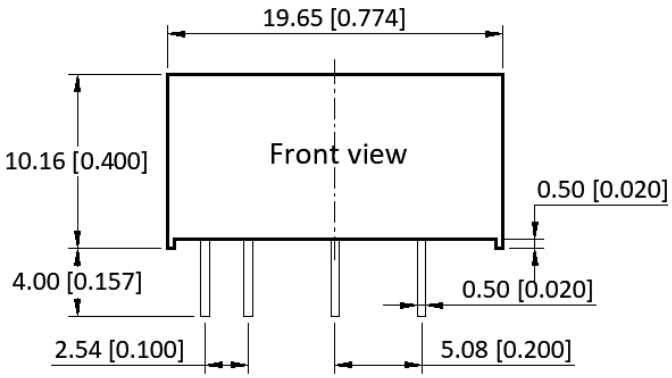
Figure 2. Circuit for EMC enhancement

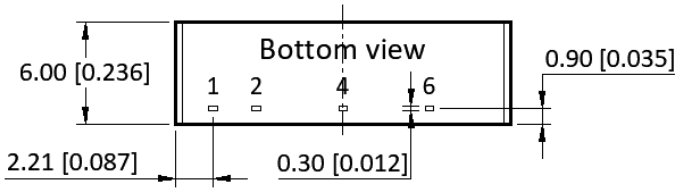
[Table 3] Recommended component spec

Component	LDM	C1, C2	CY
V_{IN}=5V	6.8uH	4.7uF, 25V	1nF, 2KV
V_{IN}=12, 24V	6.8uH	4.7uF, 50V	270pF, 2KV

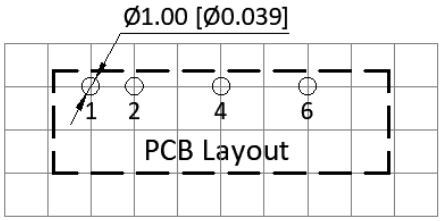
*C3 refer to C_{OUT} in [Table 2]

Mechanical Specifications





Single



Pin Definition

Pin #	Single Out
1	V_{IN}
2	GND
4	0V
6	$+V_{OUT}$

* Unless otherwise specified unit: mm [inch]
* General tolerance: ±0.50 [±0.020]
* Pin thickness: ±0.10 [±0.004]
* Footprint grid 2.54 x 2.54 mm