MR1S Series

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

Features

- Rated power: 1W max
- Input voltage range ±5%
- Tightly regulated output
- High efficiency up to 72%
- Isolation voltage 1.5KVDC
- Operating temp. range: -40 ~ +85°C ambient
- RoHS compliant
- Compact SIP7 package
- Continuous short circuit protection
- Meet UL/EN/IEC 62368-1 EN 55032 Class B
- 5 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]	Output Voltage [VDC]	Output Current [mA] Max.	Efficiency [%] Typ.	Capacitive Load [uF] Max.
MR1S-0503 [1]	5 [4.75~5.25]	3.3	250	69	2400
MR1S-0505 [1]		5	200	69	2400
MR1S-0509 [1]		9	111	69	1000
MR1S-0512 [1]		12	84	69	560
MR1S-0515 [1]		15	67	69	560
MR1S-0524		24	41	69	100
MR1S-1203	12 [11.4~12.6]	3.3	250	69	2400
MR1S-1205		5	200	72	2400
MR1S-1209		9	111	72	1000
MR1S-1212		12	84	72	560
MR1S-1215		15	67	72	560
MR1S-2403	24 [22.8~25.2]	3.3	250	69	2400
MR1S-2405		5	200	72	2400
MR1S-2409		9	111	72	1000
MR1S-2412		12	83	72	560
MR1S-2415		15	67	72	560

Note [1]: Models that are certified to UL62368-1.

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
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
Surge voltage 1 second max	V_{IN}=5V V_{IN}=12V V_{IN}=24V	-0.7 -0.7 -0.7	-	9 18 30	VDC
Output voltage accuracy		-	-	±3	%
Line regulation For V_{IN} change of ±1%		-	-	±0.25	%
Load regulation [2] 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}=15V Others	-	80 50	150 100	mVp-p
Output short circuit protection		Continuous, automatic recovery			
Input filter		Capacitor			
Hot plug		None			

Note [2]: 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.

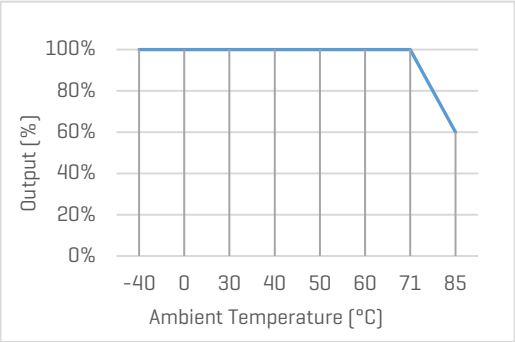
General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage 1 minute, leakage current <1mA	Input to Output	1500	-	-	VDC
Isolation resistance Tested at 500VDC	Input to Output	1000	-	-	M ohm
Isolation capacitance 100KHz, 0.1V	Input to Output	-	20	-	pF
Switching frequency	Full load	-	250	-	KHz
Temperature rise at case	Full load	-	25	-	°C
Operating temperature	See "Derating Curve"	-40	-	+85	°C
Storage temperature		-55	-	+125	°C
Storage humidity	Non-condensing	5	-	95	%RH
Pin soldering resistance 1.5mm away from case for 10 sec		-	-	300	°C
Case material		Black plastic UL94-V0			
Cooling method		Free air convection			
Vibration		10-150Hz, 5G, 0.75mm along X, Y and Z			
MTBF	MIL-HDBK-217F	>3,500,000 Hours, T_A=25°C			
Safety standards		UL/EN/IEC 62368-1			
EMC standards	CISPR32, EN55032	Class B with "External Circuit"			
ESD	IEC/EN61000-4-2	Contact ±4kV, Air ±8kV, perf. Criteria B			
Size & Weight		19.65x6x10.16mm, 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 mandatory.

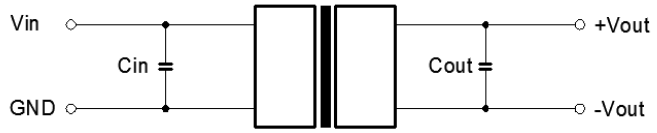


Figure 1. Typical external circuit

[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, 25V

EMC Enhancement for EN55032 Class B

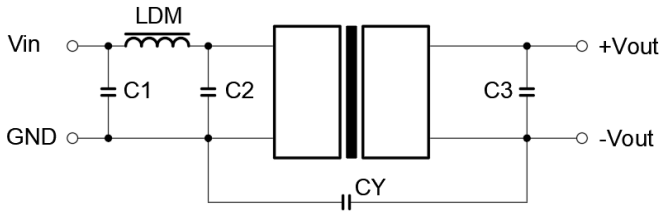


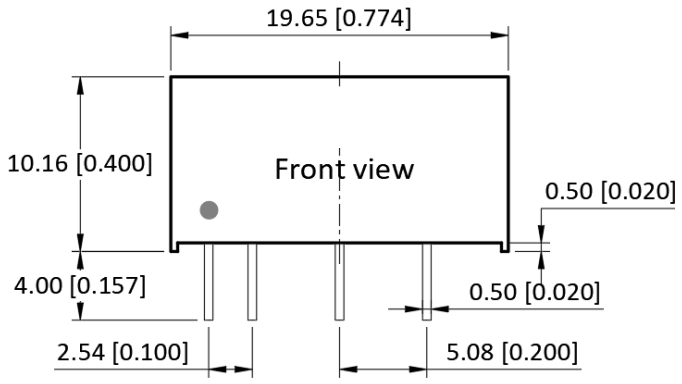
Figure 2. Circuit for EMC enhancement

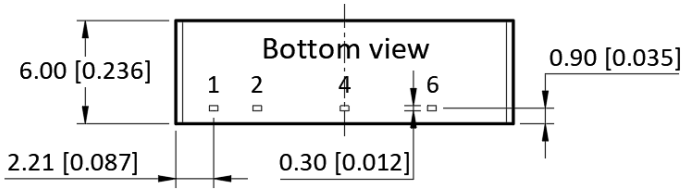
[Table 3] Recommended component spec

Component	LDM	C1, C2	C3	CY [3]
V_{IN}=5V	6.8uH	4.7uF, 25V	refer to C_{OUT} in [Table 2]	1nF, 2KV
V_{IN}=12, 24V	6.8uH	4.7uF, 50V		270pF, 2KV

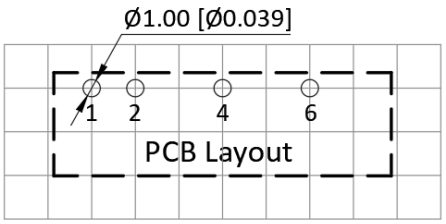
Note [3]: "**CY**" is omitted for $5V_{IN}$ models, with V_{OUT} = 3.3 ... 9V

Mechanical Specifications





Single



Pin Definition

Pin #	Single Out
1	$+V_{IN}$
2	$-V_{IN}$
4	$-V_{OUT}$
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