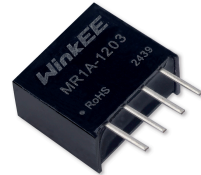


MR1A Series

0.75W, Regulated, 1.5KV Isolation, DC/DC Converters

Features

- ▶ Rated power: 0.75W max
- ▶ Input voltage range $\pm 5\%$
- ▶ Tightly regulated output
- ▶ High efficiency up to 74%
- ▶ Isolation voltage 1.5KVDC
- ▶ Small no load input current
- ▶ Operating temp. range: -40 ~ +85°C ambient
- ▶ RoHS compliant
- ▶ Compact SIP4 package
- ▶ Continuous short circuit protection
- ▶ Meet UL/EN/IEC 62368-1 EN 55032 Class B
- ▶ 5 year warranty



Overview

The MR1A series are SIP4 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 [μ F] Max.
MR1A-0503 ^[1]	5 [4.75~5.25]	3.3	200	68	2400
MR1A-0505 ^[1]		5	150	72	2400
MR1A-0509		9	83	72	1000
MR1A-0512 ^[1]		12	62	73	560
MR1A-0515		15	50	74	560
MR1A-1203	12 [11.4~12.6]	3.3	200	68	2400
MR1A-1205		5	150	72	2400
MR1A-1212		12	62	73	560
MR1A-1215		15	50	74	560
MR1A-2403	24 [22.8~25.2]	3.3	200	68	2400
MR1A-2405		5	150	72	2400
MR1A-2412		12	62	73	560
MR1A-2415		15	50	74	560

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

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Electrical Specifications

Unless otherwise indicated, specifications are measured at $T_A=25^{\circ}\text{C}$, nominal input voltage, full load after warm up.

Parameters	Conditions	Min.	Typ.	Max.	Unit
Input current Full load	$V_{IN}=5\text{V}$	-	209	-	mA
	$V_{IN}=12\text{V}$	-	89	-	
	$V_{IN}=24\text{V}$	-	45	-	
Input current No load	$V_{IN}=5\text{V}$	-	15	-	mA
	$V_{IN}=12\text{V}$	-	8	-	
	$V_{IN}=24\text{V}$	-	4	-	
Reflected Ripple Current		-	15	-	mA
Surge voltage 1 second max	$V_{IN}=5\text{V}$	-0.7	-	9	VDC
	$V_{IN}=12\text{V}$	-0.7	-	18	
	$V_{IN}=24\text{V}$	-0.7	-	30	
Output voltage accuracy		-	-	± 3	%
Line regulation For V_{IN} change of $\pm 1\%$		-	-	± 0.25	%
Load regulation [2] $I_{OUT}=10\%$ to 100% of $I_{OUT, rated}$	$V_{OUT}=3.3\text{V}$	-	-	± 3	%
	Others	-	-	± 2	
Temperature coefficient	Full load	-	± 0.02	-	$\%/^{\circ}\text{C}$
Output ripple and noise 20MHz bandwidth	$V_{OUT}=15\text{V}$	-	80	150	mVp-p
	Others	-	50	100	
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.

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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	-	220	-	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		11.6x6x10.2mm, 1.3g Typ.			

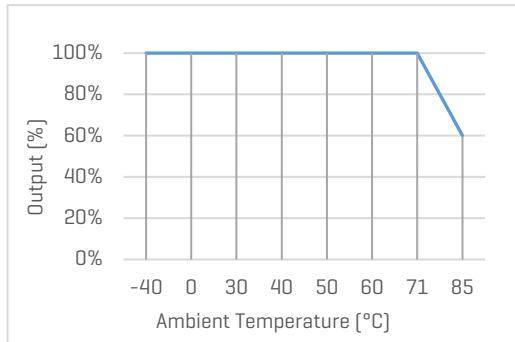
MR1A Series

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Characteristic Curves

Derating Curve

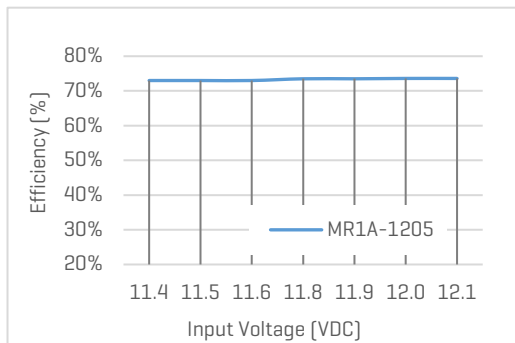
Output vs Ambient Temperature



Efficiency Curves

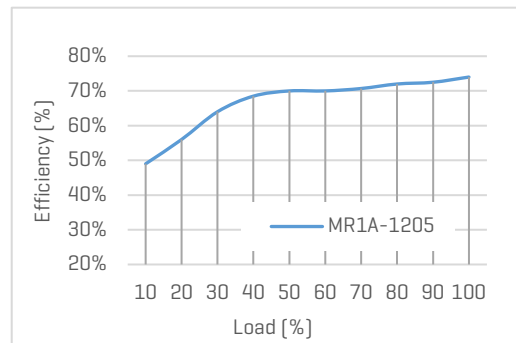
Efficiency vs Input Voltage

Full load



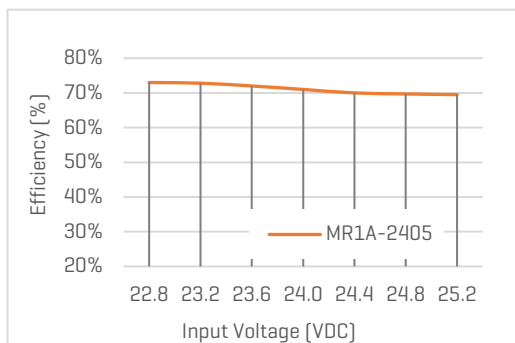
Efficiency vs Load

Nominal input voltage



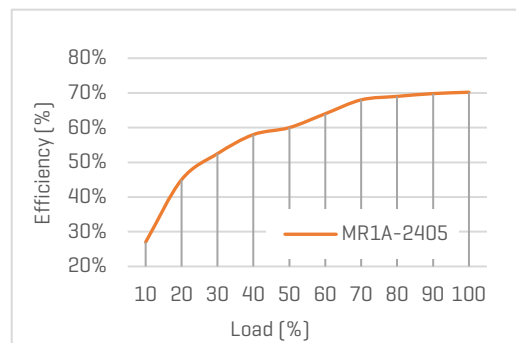
Efficiency vs Input Voltage

Full load



Efficiency vs Load

Nominal input voltage



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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}	4.7 μ F, 16V	2.2 μ F, 25V	1 μ F, 50V

[Table 2] Recommended component spec

Output voltage	3.3, 5V	12V	15V
C_{OUT}	10 μ F, 16V	2.2 μ F, 25V	1 μ F, 25V

EMC Enhancement for EN55032 Class B

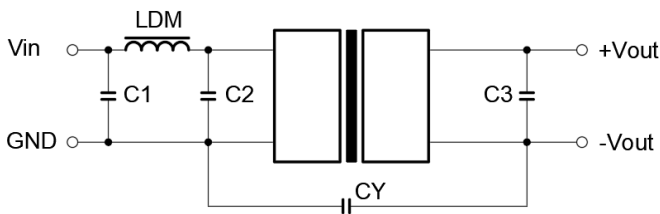


Figure 2. Circuit for EMC enhancement

[Table 3] Recommended component spec

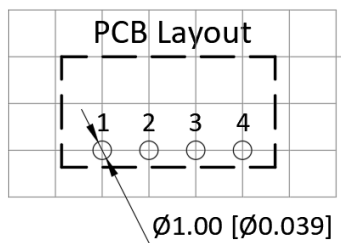
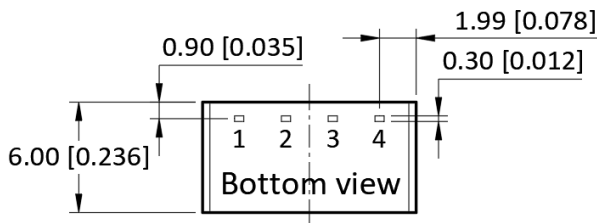
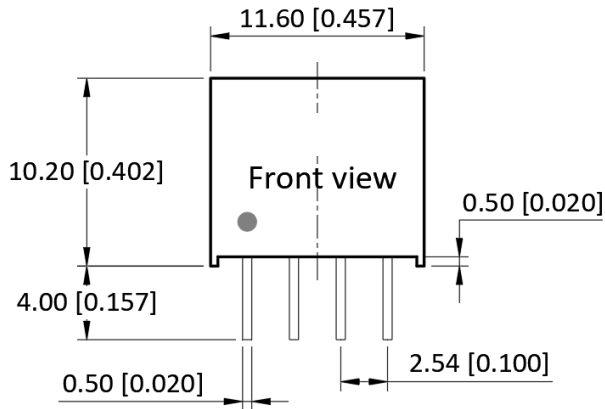
Component	LDM	C1, C2	C3	CY ^[3]
$V_{IN}=5V$	6.8 μ H	4.7 μ F, 25V	refer to C_{OUT} in [Table 2]	1nF, 2KV
$V_{IN}=12, 24V$	6.8 μ H	4.7 μ F, 50V		270pF, 2KV

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

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Mechanical Specifications



Pin Definition

Pin #	Single Out
1	-V _{IN}
2	+V _{IN}
3	-V _{OUT}
4	+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