

MU40H Series

40W, Wide 4:1 Input, 1.5KV Isolation, DIP2"x1" DC/DC Converters



Features

- Rated power: 40W Max
- Input voltage range 4:1
- Regulated output with 10% trimming range
- High efficiency up to 93%
- Isolation voltage 1.5KVDC
- Remote On/Off control
- Operating temperature range: -40 ~ +80°C ambient
- RoHS compliant
- Standard 2"x1" package
- Six-sided metal shielding package
- Under voltage, over voltage, over current, and short circuit protection
- Meet UL/EN/IEC 62368-1
- 3 year warranty



Overview

The MU40H series are 1.5KV isolated 40Watt DC/DC converters with standard DIP2"x1" footprint. Designed with high efficiency, they operate in a wide temperature range from -40°C to +80°C. Other features include wide 4:1 input voltage range, remote on/off control, under voltage, over voltage, over current, and short circuit protections. These converters are ideally suitable for industrial control system, measurement equipment, telecom, wireless network.

Model Numbers

Model Number	Input Voltage [VDC]			V _{OUT} [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	Range	*Max.		Max.	Min.		
MU40H-2405	24	9~36	40	5	8000	0	91	15000
MU40H-2409	24	9~36	40	9	4444	0	91	4700
MU40H-2412	24	9~36	40	12	3333	0	92	3000
MU40H-2415	24	9~36	40	15	2666	0	93	2200
MU40H-2424	24	9~36	40	24	1666	0	92	1300
MU40H-2412D	24	9~36	40	±12	±1666	0	87	1000
MU40H-2415D	24	9~36	40	±15	±1333	0	87	680
MU40H-2424D	24	9~36	40	±24	±833	0	87	470
MU40H-4805	48	18~75	80	5	8000	0	91	15000
MU40H-4812	48	18~75	80	12	3333	0	92	3000
MU40H-4815	48	18~75	80	15	2666	0	93	2200
MU40H-4824	48	18~75	80	24	1666	0	92	1300
MU40H-4812D	48	18~75	80	±12	±1666	0	87	1000
MU40H-4815D	48	18~75	80	±15	±1333	0	87	680
MU40H-4824D	48	18~75	80	±24	±833	0	87	470

* Input voltage exceed the Max. value may cause permanent damage.

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

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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	Note
Input current Full load, $V_{IN, Nom}=24V$	$V_{OUT}=5V$ Others	-	1894 1852	-	mA	
Input current Full load, $V_{IN, Nom}=48V$			926	-	mA	
Input current No load			12	-	mA	
Reflected ripple current		-	40	-	mA	
Input voltage surge 1 second max	$V_{IN, Nom}=24V$ $V_{IN, Nom}=48V$	-0.7 -0.7	-	50 100	VDC	
Startup input voltage	$V_{IN, Nom}=24V$ $V_{IN, Nom}=48V$	-	-	9 18	VDC	
Startup time	Resistive load	-	10	-	mS	
Input under voltage shutdown	$V_{IN, Nom}=24V$ $V_{IN, Nom}=48V$	5.5 12	6.5 15.5	-	VDC	
Remote On/Off control "Ctrl" pin open or logic high [ON] "Ctrl" pin grounded or logic low [OFF]	Logic high Logic low Ctrl pin current	3.5 0 -	- - 5	12 1.2 10	VDC VDC mA	Positive Logic
Output voltage accuracy	$I_{OUT}=5\%$ to 100%	-	± 1	± 3	%	
Line regulation Full load, $V_{IN}=V_{IN, Min}$ to $V_{IN, Max}$		-	± 0.2	± 0.5	%	
Load regulation $I_{OUT}=5\%$ to 100% of $I_{OUT, rated}$		-	± 0.5	± 1.0	%	
Cross regulation $+I_{OUT}=50\%$, $-I_{OUT}=10\%$ to 100%	Dual output models	-	-	± 5	%	
Output ripple and noise 20MHz bandwidth, peak to peak		-	100	200	mVp-p	
Temperature coefficiency	Full load	-	-	0.03	%/ $^{\circ}\text{C}$	
Dynamic load response $I_{OUT}=25\%\sim 50\%\sim 75\%$ of $I_{OUT, rated}$	Peak deviation Recovery time	-	± 5 250	± 8 500	% V_{OUT} μS	
Output voltage trim	Trim range	-	-	± 10	% V_{OUT}	

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Electrical Specifications [continued]

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Output over voltage protection		110	-	160	% V _{OUT}	
Output over current protection		110	140	-	% I _{OUT}	
Output short circuit protection		Continuous, automatic recovery				
Input filter		PI filter				
Hot plug		None				

* Operating with less than 5% of rated load will not cause damage to the converters, but the performances data may not fall into the specifications, and stable operating is not assured.

General Specifications

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Isolation voltage 1 minute, leakage current 1mA max.	I/P to O/P	1500	-	-	VDC	
Isolation resistance Tested at 500VDC	I/P to O/P	1000	-	-	M ohm	
Isolation capacitance 100KHz, 0.1V	I/P to O/P	-	2000	-	pF	
Switching frequency*	Full load	-	330	-	KHz	PWM mode
Operating temperature	See "Derating Curve"	-40	-	80	°C	
Storage temperature		-55	-	125	°C	
Storage humidity	None condensing	5	-	95	%RH	
Pin soldering resistance 1.5mm away from case for 10 sec		-	-	300	°C	
Vibration		IEC/EN61373 – Category 1, Grade B				
Cooling method		Free air convection				
Case material		Aluminum alloy				
MTBF	MIL-HDBK-217F	>1,000,000 Hours, T _A =25°C				
Design based on standards		UL/EN/IEC 62368-1				
Safety certifications		EN/IEC 62368-1				
EMC		CISPR32, EN55032 Class B with external circuit IEC/EN61000-4-2, 3, 4, 5, 6				
Size, and Weight		50.8 x 25.4 x 12 mm, 41g				

* Switching frequency is measured at full load. The converter reduces the switching frequency at low load [less than 50% load] for better efficiency.

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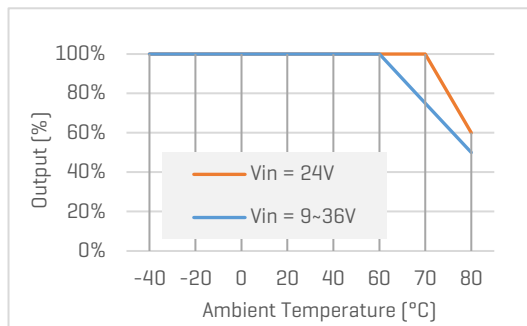


Characteristic Curves

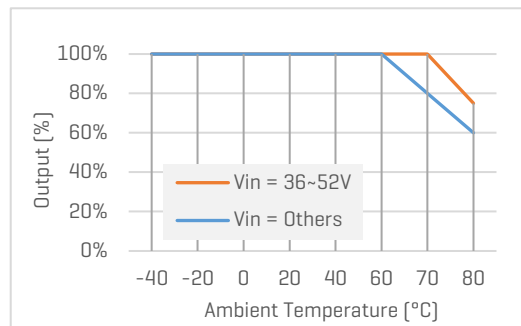
Derating Curve

Output vs Ambient Temperature

MU40H-24xx, No heatsink



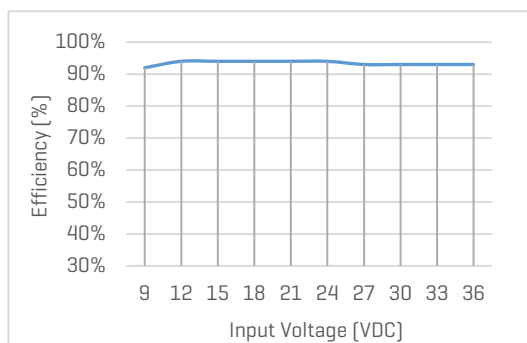
MU40H-48xx, No heatsink



Efficiency Curve

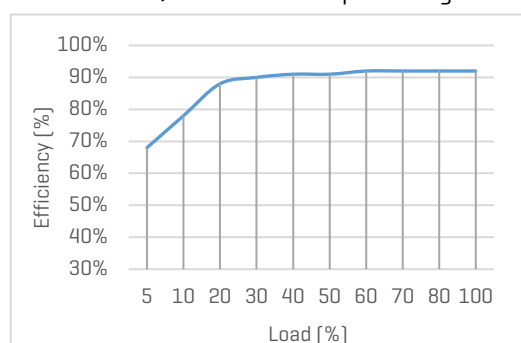
Efficiency vs Input Voltage

MU40H-2405, with full Load



Efficiency vs Load

MU40H-2405, with nominal input voltage



Recommended Application Circuit

Typical External Circuit



Figure 1. Typical external circuit

Note

*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.

[Table 1] Recommended component spec

Input voltage	24V	48V
C_{IN}	100uF, 50V	100uF, 100V

[Table 2] Recommended component spec

Output voltage	5 ... 15V	24V
C_{OUT}	100uF, 24V	47uF, 50V

Circuit for EMC Enhancement

*Use this application circuit to meet Class B EMC performance.

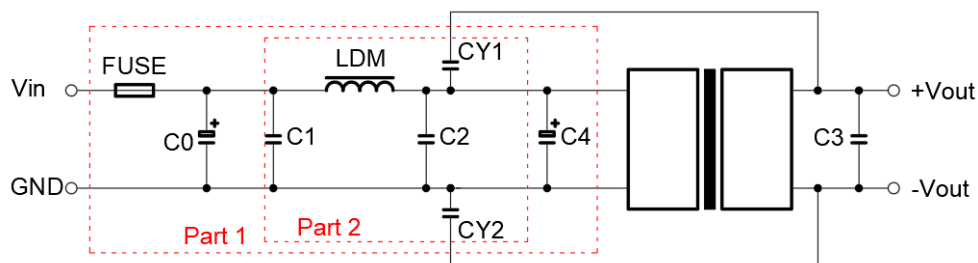


Figure 2. Circuit for EMC enhancement

[Table 3] Recommended component spec

Component	LDM	C0, C4	C1, C2	CY1, CY2
$V_{IN}=24V$	2.2uH, 4A	330uF, 50V	4.7uF, 50V	1nF, 2KV
$V_{IN}=48V$	2.2uH, 2A	330uF, 100V	4.7uF, 100V	1nF, 2KV

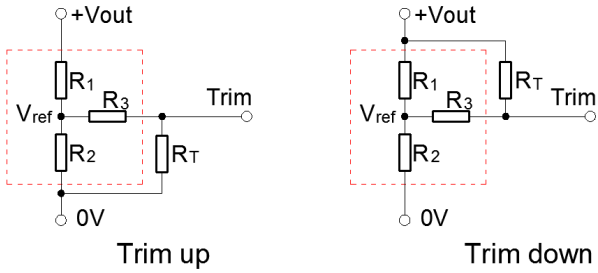
* Fuse to be selected according to application needs.

* C3 refer to relative C_{OUT} values in Table 2.

Recommended Application Circuit [continued]

Circuits for Output Trim

* Components within the red block are internal components of the converter.



[Table 3] Internal Component Spec

V _{OUT} [V]	R1 [K Ohm]	R2 [K Ohm]	R3 [K Ohm]	V _{ref} [V]
5	2.4	2.344	13.622	2.5
12	8.2	2.153	17.346	2.5
15	12	2.388	21.016	2.5
24	10	1.158	10.714	2.5

* The formulas to calculate the desired resistance of Trim resistor “R_T”.

Trim up: $R_T = \frac{a R_2}{R_2 - a} - R_3$ $a = \frac{V_{ref}}{V_{OUT} - V_{ref}} R_1$

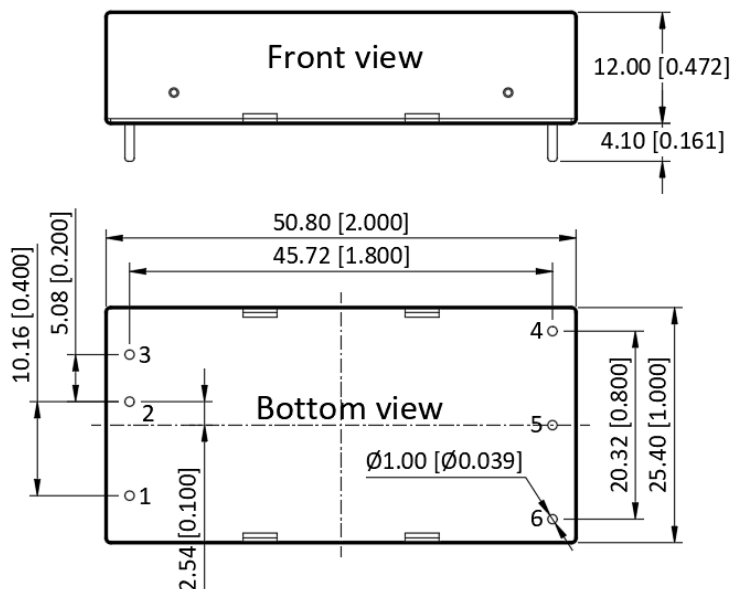
Trim down: $R_T = \frac{a R_1}{R_1 - a} - R_3$ $a = \frac{V_{OUT} - V_{ref}}{V_{ref}} R_2$

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Mechanical Specifications



Pin Definition

Pin #	Single Out	Dual Out
1	Ctrl	Ctrl
2	GND	GND
3	V _{IN}	V _{IN}
4	+V _{OUT}	+V _{OUT}
5	OV	COM
6	Trim	-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