MU50H Series

50W, Wide 4:1 Input, 1.5KV Isolation, DIP2"X1" DC/DC Converters

Features

- Rated power: 50W Max.
- Input voltage range 4:1
- Regulated output with ±10% trimming range
- High efficiency up to 91%
- Isolation voltage 1.5KVDC
- Remote On/Off control
- Operating temperature range -40 ~ +85°C ambient
- RoHS compliant
- Standard 2"x1" package
- Six-sided metal shielding package
- Over voltage, over current, and short circuit protection
- Meet UL/EN/IEC 62368-1
- 3 year warranty

Overview

The MU50H series are 1.5KV isolated 50Watt DC/DC converters with standard DIP2"x1" footprint. Designed with high efficiency, they operate in a wide temperature range from -40°C to +85°C. Other features include wide 4:1 input voltage range, remote on/off control, 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.		
MU50H-2405	24	9~36	40	5	10000	0	88	10000
MU50H-2412	24	9~36	40	12	4167	0	90	2700
MU50H-2415	24	9~36	40	15	3333	0	91	1680
MU50H-2424	24	9~36	40	24	2087	0	91	680
MU50H-4805	48	18~75	80	5	10000	0	88	10000
MU50H-4812	48	18~75	80	12	4167	0	90	2700
MU50H-4815	48	18~75	80	15	3333	0	91	1680
MU50H-4824	48	18~75	80	24	2087	0	91	680

* Input voltage exceed the Max. value may cause permanent damage.
* Only typical models are listed. Other models may be available upon request.

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	$V_{IN, Nom}$=24V $V_{IN, Nom}$=48V	-	2289 1144	-	mA	
Input current No load	V_{OUT}=5V Others	-	60 12	-	mA	
Reflected ripple current		-	30		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	
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% I_{OUT}=0% to 100%	-	±1 ±1	±3 ±5	%	
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	%	
Output ripple and noise 20MHz bandwidth, peak to peak		-	75	150	mVp-p	
Temperature coefficiency	Full load	-	-	0.03	%/°C	
Dynamic load response I_{OUT}=25%~50%~75% of $I_{OUT, rated}$	Peak deviation** Peak deviation Recovery time	-	±5 ±3 250	±8 ±5 500	% V_{OUT} % V_{OUT} uS	**V_{OUT}=5V
Output voltage trim	Trim range	-	±10	-	% V_{OUT}	
Output over voltage protection		110	-	-	% V_{OUT}	
Output over current protection		110	-	-	% 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	-	300	-	KHz	PWM mode
Operating temperature	See "Derating Curve"	-40	-	+85	°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	
Case material		Aluminum alloy				
Cooling method		Free air convection				
Vibration		10-150Hz, 5G, 0.75mm along X, Y and Z				
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, 40g				

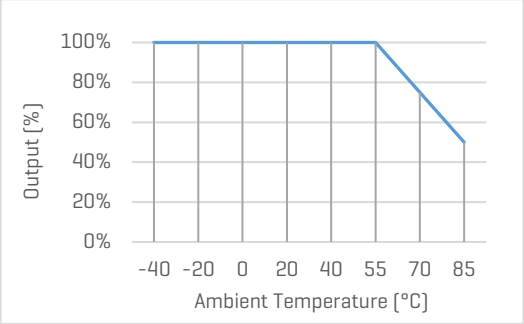
* Switching frequency is measured at full load. The converter reduces the switching frequency at low load (less than 50% load) for better efficiency.

Characteristic Curves

Derating Curve

Output vs Ambient Temperature

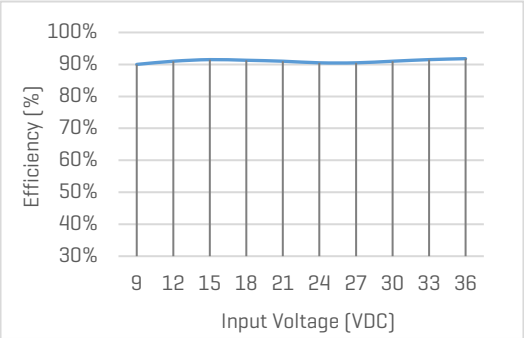
All models, with no heatsink



Efficiency Curve

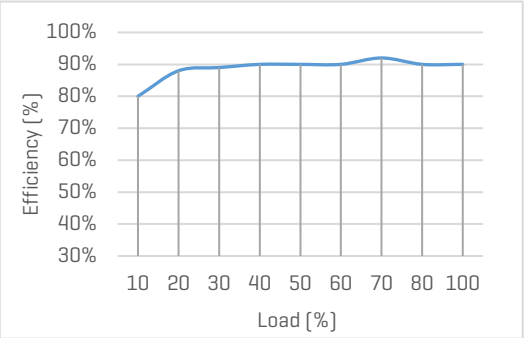
Efficiency vs Input Voltage

MU50H-2424, with full Load



Efficiency vs Load

MU50H-2424, with nominal input voltage



Recommended Application Circuit

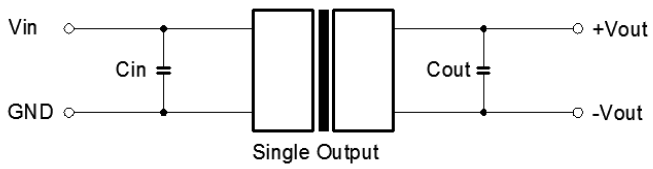


Figure 1. Typical external circuit

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 ... 24V
C_{OUT}	100uF, 50V

Circuit for EMC Enhancement

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

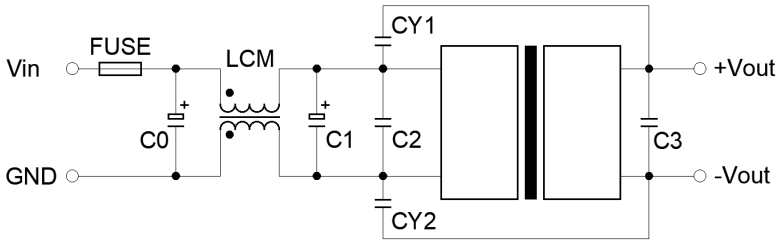


Figure 2. Circuit for EMC enhancement

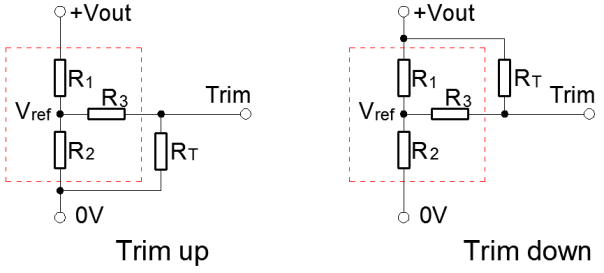
[Table 3] Recommended component spec

Component	LCM	C0	C1	C2	CY1, CY2
$V_{IN, Nom}$=24V	1mH	680uF, 50V	330uF, 50V	4.7uF, 50V	1nF, 2KV
$V_{IN, Nom}$=48V	1mH	330uF, 100V	330uF, 100V	2.2uF, 100V	1nF, 2KV

* "Fuse" to be selected according to application needs. "C3" refer to relative "C_{OUT}" values in Table 2.

Circuits for Output Trim

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



Internal Component Spec

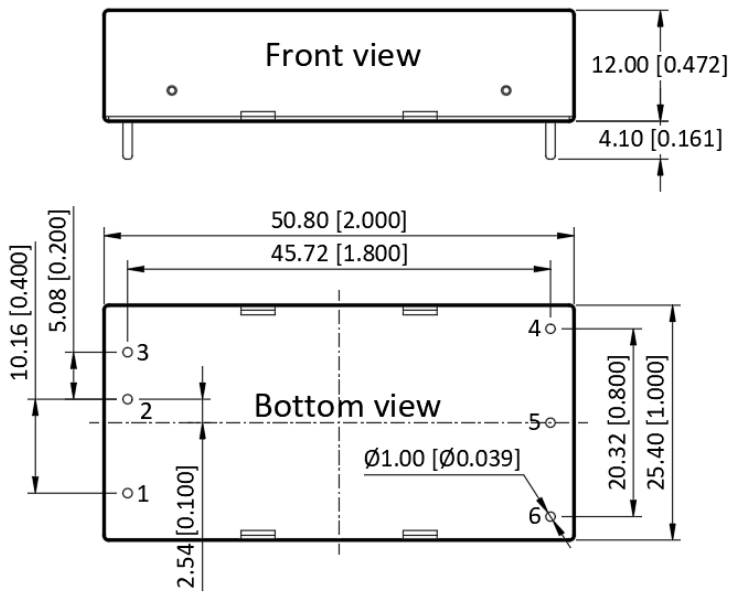
V_{OUT} [V]	R1 [K Ohm]	R2 [K Ohm]	R3 [K Ohm]	V_{ref} [V]
5	2.4	2.34	13.62	2.5
12	8.2	2.15	17.35	2.5
15	12	2.39	21.02	2.5
24	10	1.16	10.71	2.5

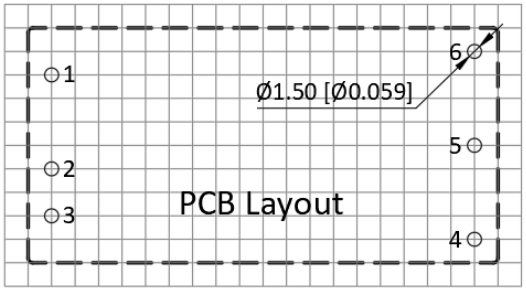
* The formulas to calculate the desired resistance of Trim resistor "R_T".

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

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

Mechanical Specifications





Pin Definition

Pin #	Single Out
1	Ctrl
2	GND
3	V_{IN}
4	$+V_{OUT}$
5	OV
6	Trim

* 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