

# MU10D Series

10W, Wide 4:1 Input Range, 1.5KV Isolation, DIP24 Package DC/DC Converters

## Features

- ▶ Rated power: 10W Max
- ▶ Input voltage range 4:1
- ▶ Regulated single or dual out
- ▶ High efficiency up to 88%
- ▶ Isolation voltage 1.5KVdc
- ▶ Remote On/Off control
- ▶ Operating temperature range: -40 ~ +85°C ambient
- ▶ RoHS compliant
- ▶ Six side metal shielding
- ▶ Compact DIP24 package
- ▶ Under voltage, over voltage, over current, and short circuit protection
- ▶ Meet IEC/EN62368-1
- ▶ 3 year warranty



## Overview

The MU10D series are 1.5KV isolated 10Watt DC/DC converters with standard DIP24 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, under voltage, over voltage, over current, and short circuit protections. These converters are ideally suitable for measurement equipment, telecom, wireless network, industrial control system, where isolated, tightly regulated voltages are desired.

## Model Numbers

Model Number	Input Voltage [VDC]			V <sub>OUT</sub> [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	*Range	*Max.		Max.	Min.		
MU10D-2403	24	9-36	40	3.3	2400	0	86	1200
MU10D-2405	24	9-36	40	5	2000	0	87	1000
MU10D-2412	24	9-36	40	12	833	0	87	470
MU10D-2415	24	9-36	40	15	667	0	87	330
MU10D-2424	24	9-36	40	24	416	0	88	100
MU10D-2405D	24	9-36	40	±5	±1000	0	83	1000
MU10D-2412D	24	9-36	40	±12	±416	0	87	470
MU10D-2415D	24	9-36	40	±15	±333	0	87	330
MU10D-4803	48	18-75	80	3.3	2400	0	85	1200
MU10D-4805	48	18-75	80	5	2000	0	86	1000
MU10D-4812	48	18-75	80	12	833	0	87	470
MU10D-4815	48	18-75	80	15	667	0	87	330
MU10D-4824	48	18-75	80	24	416	0	88	100
MU10D-4805D	48	18-75	80	±5	±1000	0	83	1000
MU10D-4812D	48	18-75	80	±12	±416	0	87	470
MU10D-4815D	48	18-75	80	±15	±333	0	87	330

\* 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  $T_A=25^{\circ}\text{C}$ , nominal input voltage, full load after warm up.

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
<b>Input current</b> Full load, $V_{IN, Nom} = 24\text{V}$	$V_{OUT} = 3.3\text{V}$ $V_{OUT} = 5\text{V}$ Others	-	380 474 502	-	mA	
<b>Input current</b> Full load, $V_{IN, Nom} = 48\text{V}$	$V_{OUT} = 3.3\text{V}$ $V_{OUT} = 5\text{V}$ Others	-	192 240 251	-	mA	
<b>Input current</b> No load		-	6	-	mA	
<b>Reflected ripple current</b>		-	30	-	mA	
<b>Input voltage surge</b> 1 second max	$V_{IN, Nom} = 24\text{V}$ $V_{IN, Nom} = 48\text{V}$	-0.7 -0.7	-	50 100	Vdc	
<b>Startup input voltage</b>	$V_{IN, Nom} = 24\text{V}$ $V_{IN, Nom} = 48\text{V}$	-	-	9 18	Vdc	
<b>Input under voltage shutdown</b>	$V_{IN, Nom} = 24\text{V}$ $V_{IN, Nom} = 48\text{V}$	5.5 14.0	6.5 15.5	-	Vdc	
<b>Output voltage accuracy</b>		-	$\pm 1$	$\pm 3$	%	
<b>Output voltage balance</b> Dual output with balanced load		-	$\pm 0.5$	$\pm 1.5$	%	
<b>Line regulation</b> Full load, $V_{IN} = V_{IN, Min}$ to $V_{IN, Max}$	Main output Other output	-	$\pm 0.2$ $\pm 0.5$	$\pm 0.5$ $\pm 1.0$	%	
<b>Load regulation</b> $I_{OUT}=5\%$ to $100\%$ of $I_{OUT, rated}$	Main output Other output	-	$\pm 0.5$ $\pm 0.5$	$\pm 1.0$ $\pm 1.5$	%	
<b>Temperature coefficient</b>	Full load	-	-	0.03	%/ $^{\circ}\text{C}$	
<b>Output ripple and noise</b> 20MHz bandwidth, peak to peak		-	40	85	mV	
<b>Remote On/Off control</b> "Ctrl" pin open or logic high [ON] "Ctrl" pin grounded or logic low [OFF]	Logic high Logic low Ctrl pin current	3.5 0 -	- - 6	12 1.2 10	Vdc Vdc mA	Positive Logic
<b>Dynamic load response</b> $I_{OUT}=25\% \sim 50\% \sim 75\%$ of $I_{OUT, rated}$	Peak deviation** Peak deviation Recovery time	-	$\pm 5$ $\pm 3$ 300	$\pm 8$ $\pm 5$ 500	% $V_{OUT}$ % $V_{OUT}$ $\mu\text{s}$	** $V_{OUT}=3.3\text{V}$ , 5V, $\pm 5\text{V}$
<b>Output over voltage protection</b>		110	-	160	% $V_{OUT}$	
<b>Output over current protection</b>		110	140	230	% $I_{OUT}$	
<b>Output short circuit protection</b>		Continuous, automatic recovery, hiccup				

\* 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
<b>Isolation voltage</b> 1 minute, leakage current 1mA max.	I/P to O/P	1500	-	-	VDC	
<b>Isolation resistance</b> Tested at 500VDC	I/P to O/P	1000	-	-	M ohm	
<b>Isolation capacitance</b> 100KHz, 0.1V	I/P to O/P	-	2000	-	pF	
<b>Switching frequency*</b>	Full load	-	300	-	KHz	PWM mode
<b>Operating temperature</b>	See "Derating Curve"	-40	-	+85	°C	
<b>Storage temperature</b>		-55	-	+125	°C	
<b>Storage humidity</b>	None condensing	5	-	95	%RH	
<b>Pin soldering temperature</b>		-	-	300	°C	
<b>Vibration</b>		IEC/EN61373 – Category 1, Grade B				
<b>Cooling method</b>		Free air convection				
<b>Case material</b>		Aluminum alloy				
<b>MTBF</b>	MIL-HDBK-217F	>1,000,000 Hours, T <sub>A</sub> =25°C				
<b>Design based on standards</b>		UL/EN/IEC 62368-1				
<b>Safety certifications</b>		EN/IEC 62368-1				
<b>EMC</b>		CISPR32, EN55032 Class B with external circuit IEC/EN61000-4-2, 3, 4, 5, 6				
<b>Size, and Weight</b>		32 x 20 x 11.1 mm, 14g				

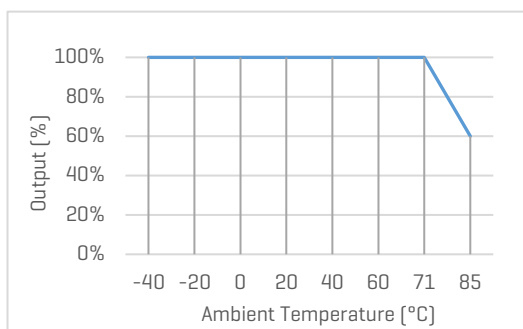
\* Switching frequency is measured at full load. The converter reduces the switching frequency at low load [less than 50% load] for better efficiency.

## Characteristic Curves

### Derating Curve

#### Output vs Ambient Temperature

No heatsink



## Recommended Application Circuit

### Typical Application Circuit

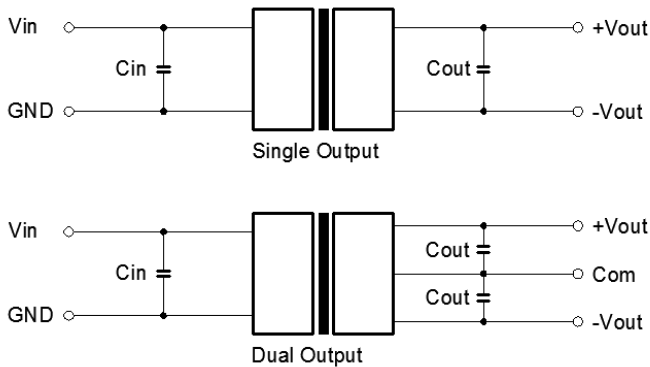


Figure 1. Typical external circuit

**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	10...47uF, 100V
$C_{OUT}$	10uF, 50V	

### Circuit for EMC Enhancement

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

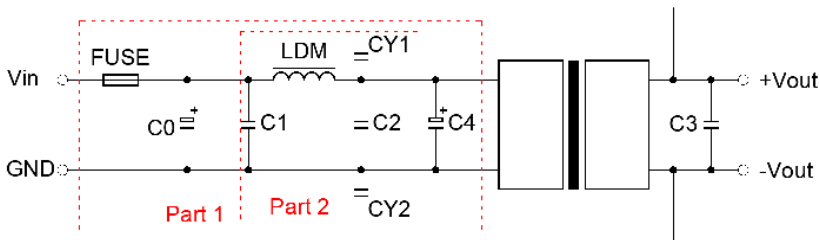


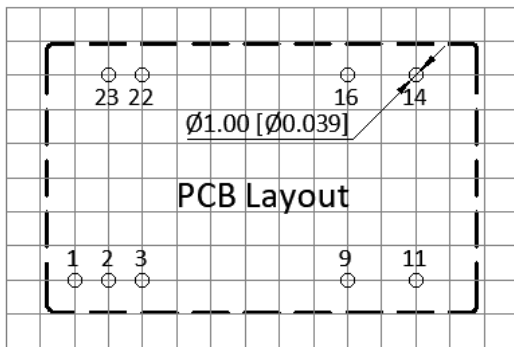
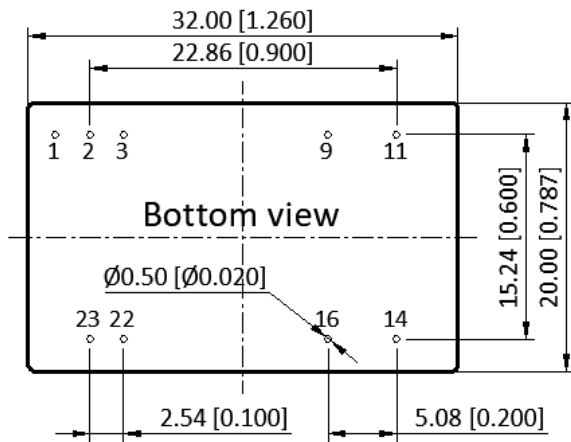
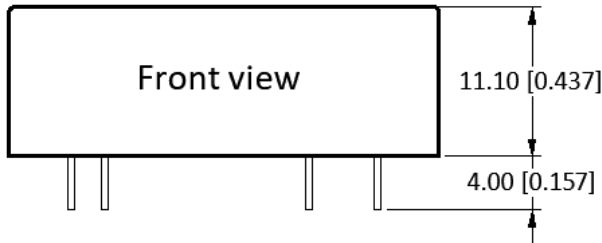
Figure 2. Circuit for EMC enhancement

[Table 2] Recommended component spec

Component	LDM	C0, C4	C1, C2	CY1, CY2
$V_{IN}=24V$	10uH	330uF, 50V	10uF, 50V	1nF, 2KV
$V_{IN}=48V$	10uH	330uF, 100V	10uF, 100V	1nF, 2KV

\* "Fuse" to be selected according to application needs. "C3" refer to relative  $C_{OUT}$  values in Table 1.

## Mechanical Specifications



### Pin Definition

Pin #	Single Out	Dual Out
1	Ctrl	Ctrl
2, 3	GND	GND
9	No pin	COM
11	No connection	-V <sub>OUT</sub>
14	+V <sub>OUT</sub>	+V <sub>OUT</sub>
16	OV	COM
22, 23	V <sub>IN</sub>	V <sub>IN</sub>

\* 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

### FAVOTEK LIMITED

#17 Canton Road, Tsim Sha Tsui, Kowloon, Hong Kong  
 Tel: +852 8191 6662  
 Eml: info@favotek.com

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hello@conexotech.com | +44 118 402 3430

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