

MU15G Series

15W, Wide 4:1 Input, 1.5KV Isolation, DIP1"x1" DC/DC Converters



Features

- Rated power: 15W Max
- Input voltage range 4:1
- Regulated single or dual out
- High efficiency up to 91%
- Isolation voltage 1.5KVDC
- Remote On/Off control
- Output trimming $\pm 10\%$
- Operating temperature range: $-40 \sim +85^{\circ}\text{C}$ ambient
- RoHS compliant
- Compact 1"x1" package
- Under voltage, over voltage, over current, and short circuit protection
- Designed to meet UL/EN/IEC 62368-1
- 3 year warranty

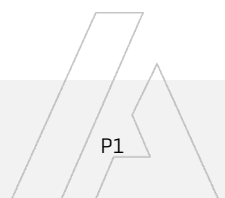


Overview

The MU15G series are 1.5KV isolated 15Watt DC/DC converters with standard DIP1"x1" footprint. Designed with high efficiency, they operate in a wide temperature range from -40°C to $+85^{\circ}\text{C}$. Other features include wide 4:1 input voltage range, remote on/off control, output trimming, under voltage, over voltage, over current, and short circuit protections. These converters are ideally suitable for battery operated equipment, measurement equipment, telecom, wireless network, industrial control system.

Model Numbers

Model Number	Input Voltage [VDC]			V _{OUT} [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [μF] Max.
	Nom.	Range	*Max.		Max.	Min.		
MU15G-2403	24	9-36	40	3.3	4000	0	88	4700
MU15G-2405	24	9-36	40	5	3000	0	90	4700
MU15G-2412	24	9-36	40	12	1250	0	90	1000
MU15G-2415	24	9-36	40	15	1000	0	91	820
MU15G-2418	24	9-36	40	18	833	0	90	470
MU15G-2424	24	9-36	40	24	625	0	91	270
MU15G-2405D	24	9-36	40	± 5	± 1500	0	87	1500
MU15G-2412D	24	9-36	40	± 12	± 625	0	90	470
MU15G-2415D	24	9-36	40	± 15	± 500	0	90	330
MU15G-2424D	24	9-36	40	± 24	± 312	0	89	200
MU15G-4803	48	18-75	80	3.3	4000	0	88	4700
MU15G-4805	48	18-75	80	5	3000	0	90	4700
MU15G-4812	48	18-75	80	12	1250	0	91	1000
MU15G-4815	48	18-75	80	15	1000	0	91	820
MU15G-4824	48	18-75	80	24	625	0	91	270



MU15G Series

15W, Wide 4:1 Input, 1.5KV Isolation, DIP1"X1" DC/DC Converters



Model Numbers [continued]

Model Number	Input Voltage [VDC]			V _{OUT} [VDC]	Output Current [mA]		Efficiency [%] Typ.	Capacitive Load [uF] Max.
	Nom.	Range	*Max.		Max.	Min.		
MU15G-4805D	48	18-75	80	±5	±1500	0	86	1500
MU15G-4812D	48	18-75	80	±12	±625	0	89	470
MU15G-4815D	48	18-75	80	±15	±500	0	89	330
MU15G-4824D	48	18-75	80	±24	±312	0	90	200

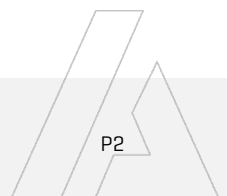
* Only typical models are listed. Other models may be available upon request.

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

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	-	694 348	-	mA	
Input current No load	V _{IN, Nom} = 24V V _{IN, Nom} = 48V	-	30 15	-	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	
Input under voltage shutdown	V _{IN, Nom} =24V V _{IN, Nom} =48V	5.5 12	6.5 15.5	-	VDC	
Startup time			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 -	- - 2	12 1.2 7	VDC VDC mA	Positive Logic
Output voltage accuracy	I _{OUT} =0 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		-	50	100	mVp-p	
Temperature coefficient	Full load	-	-	±0.02	%/°C	



MU15G Series

15W, Wide 4:1 Input, 1.5KV Isolation, DIP1"X1" DC/DC Converters



Electrical Specifications [continued]

Parameters	Conditions	Min.	Typ.	Max.	Unit	Note
Dynamic load response $I_{OUT}=25\% \sim 50\% \sim 75\%$ of $I_{OUT, rated}$	Peak deviation**		±3	±7	% V_{OUT}	** $V_{OUT}=3.3, 5V$
	Peak deviation	-	±3	±5	% V_{OUT}	
	Recovery time		300	500	µS	
Output voltage trim	Trim range	-	-	±10	% V_{OUT}	
Output over voltage protection		110		160	% V_{OUT}	
Output over current protection		110	150	190	% 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		-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	
Vibration		IEC/EN61373 – Category 1, Grade B				
Cooling method		Free air convection				
Case material		Aluminum alloy				
MTBF	MIL-HDBK-217F	>1,000,000 Hours, $T_A=25^\circ C$				
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		25.4 x 25.4 x 12mm, 15g				

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

MU15G Series

15W, Wide 4:1 Input, 1.5KV Isolation, DIP1"X1" DC/DC Converters

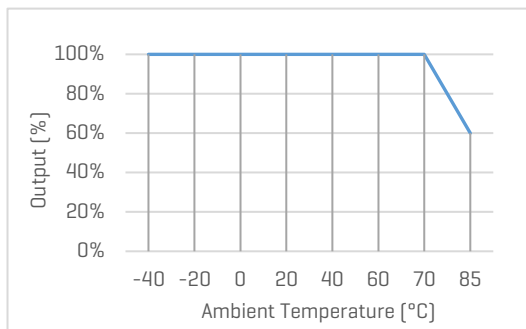


Characteristic Curves

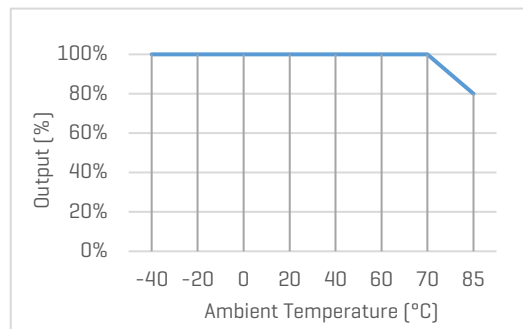
Derating Curve

Output vs Ambient Temperature

$V_{OUT}=3.3, 5V$, no heatsink



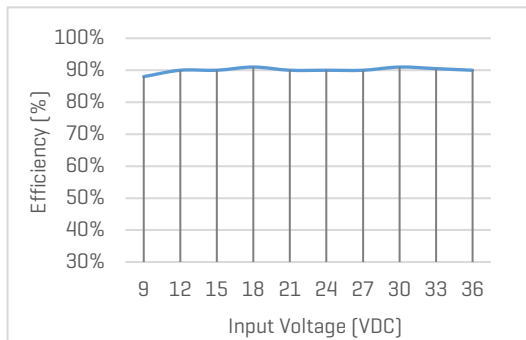
$V_{OUT}=12, 15, 24V$, no heatsink



Efficiency Curve

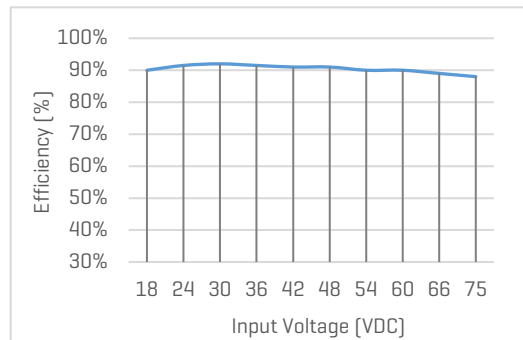
Efficiency vs Input Voltage

MU15G-2405, with full Load

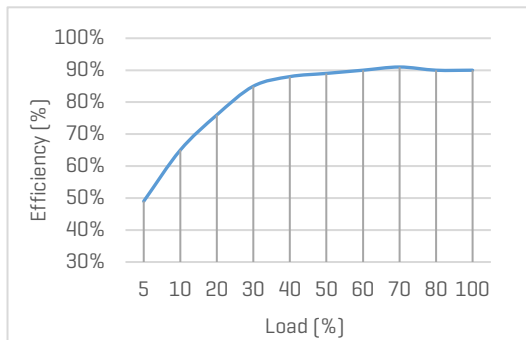


Efficiency vs Load

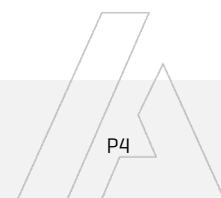
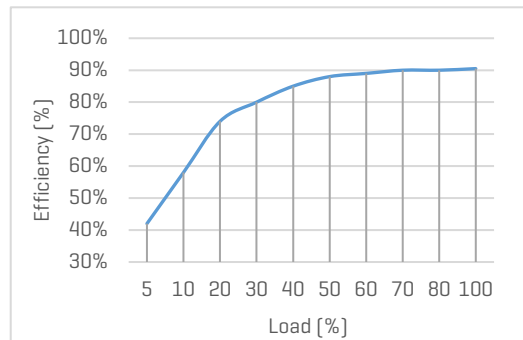
MU15G-2405, with nominal input voltage



MU15G-4805, with full Load



MU15G-4805, with nominal input voltage



MU15G Series

15W, Wide 4:1 Input, 1.5KV Isolation, DIP1"X1" DC/DC Converters



Recommended Application Circuit

Typical Application Circuit

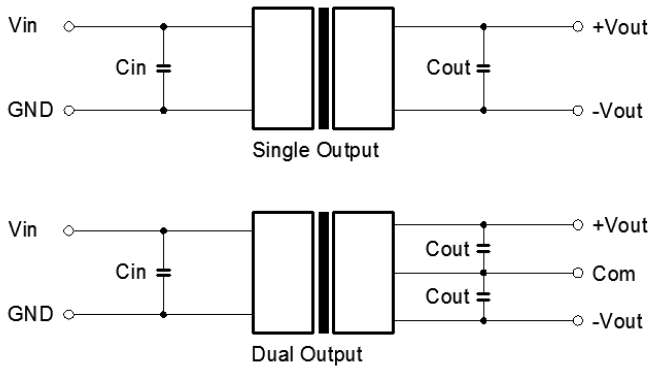


Figure 1. Typical external circuit

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

Output voltage	3.3, 5, 12, 15V	24V
C_{IN}	100uF	100uF
C_{OUT}	100uF, 50V	47uF, 50V

Circuit for EMC Enhancement

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

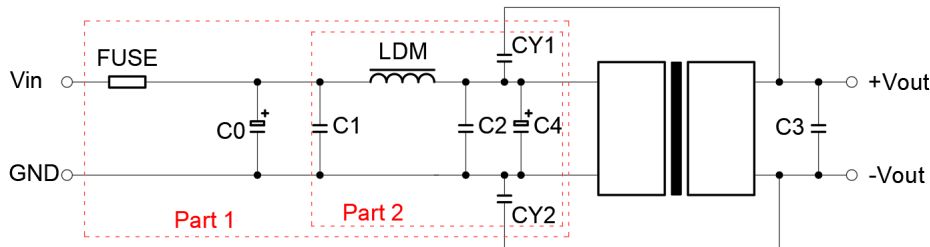


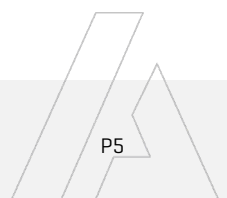
Figure 2. Circuit for EMC enhancement

[Table 2] Recommended component spec

Items	LDM1	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.

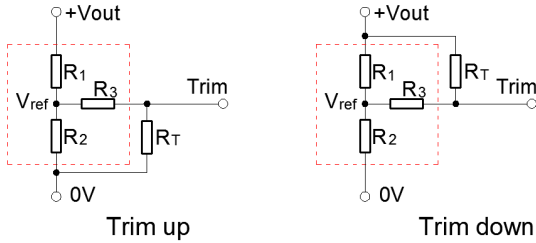
* C3 refer to relative C_{OUT} values in Table 1



Recommended Application Circuit [continued]

Circuits for Output Trim

* Items in the red blocks are internal components of the converter.



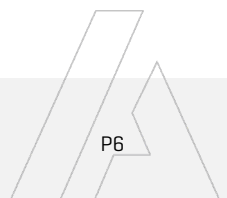
* The formulas to calculate the desired resistance of Trim resistor "RT".

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

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

[Table 3] Internal component spec

V _{OUT} [V]	R1 [K Ohm]	R2 [K Ohm]	R3 [K Ohm]	V _{ref} [V]
3.3	10	6.064	13.622	1.24
5	2.4	2.344	17.346	2.5
12	8.2	2.153	21.016	2.5
15	12	2.388	21.016	2.5
24	10	1.158	10.714	2.5

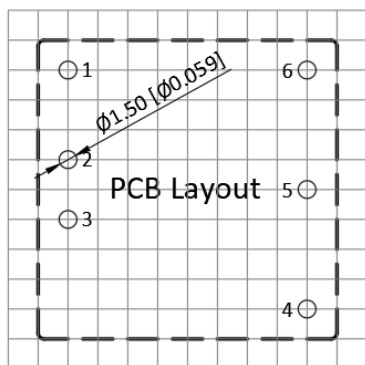
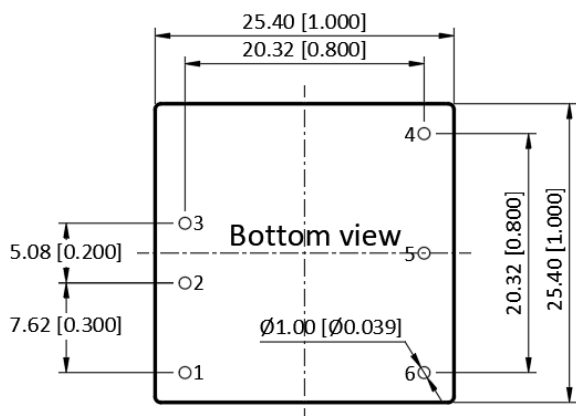
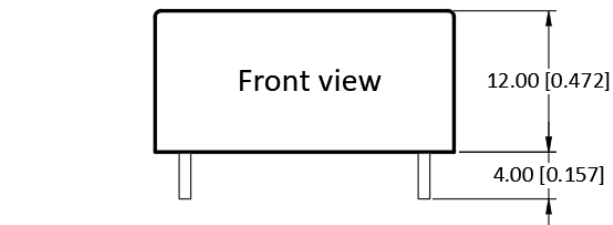


MU15G Series

15W, Wide 4:1 Input, 1.5KV Isolation, DIP1"X1" DC/DC Converters



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	Trim	0V
6	0V	-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