20W Isolated DC to DC Converters - Single Output

multicomp PRO

20W isolated DC-DC converter DIP package, Ultra-wide input and regulated single output

RoHS Compliant

Features

- Ultra-wide 4:1 input voltage range
- High efficiency up to 91%
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short circuit, over-current, over–voltage protection
- Operating ambient temperature range -40°C to +105°C
- IEC62368, UL62368, EN62368 approved

c UL us CE CB Patent Protection

These series of isolated 6W DC-DC converter products with an ultra-wide range of voltage input of 9-36VDC(24VDC input), 18-75VDC(48VDC input), input to output isolation is tested with 1500VDC, output over-voltage protection and output short-circuit protection. They meet CLASS A of CISPR32/EN55032 EMI standards without external components and they are widely used in fields such as industrial control, electric power, instruments, communication. and railway applications.

Selection Guide

Part Number	Input Voltage (VDC)		Output		Full Load Efficiency (%) Min./Typ.	Capacitive Load(μF)* Max.
	Nominal (Range)	Max.	Voltage (VDC)	Current (mA) Max./Min.		
MPRB2403YMD-20W	24 (9 to 36)	40	3.3	5000/0	86/88	10000
MPRB2405YMD-20W			5	4000/0	88/90	10000
MPRB2412YMD-20W			12	1667/0	88/90	1600
MPRB2415YMD-20W			15	1333/0	89/91	1000
MPRB2424YMD-20W			24	833/0	89/91	500
MPRB4803YMD-20W	48 (18 to 75)	80	3.3	5000/0	86/88	10000
MPRB4805YMD-20W			5	4000/0	88/90	10000
MPRB4812YMD-20W			12	1667/0	89/91	1600
MPRB4815YMD-20W			15	1333/0	89/91	1000
MPRB4824YMD-20W			24	833/0	89/91	500
Notes: Absolute maximum stress rating without damage (not recommended);						

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	24VDC nominal input series, nominal input voltage	3.3V output	--	782/30	800/50	mA
		5V output		926/35	947/55	
		12V output		926/6	947/15	
		15V output		916/6	937/15	
		24V output		916/10	937/20	
	48VDC nominal input series, nominal input voltage	3.3V output		391/15	400/30	
		5V output		463/20	474/30	
		12V output		458/3	469/15	
		15V output		458/3	469/15	
		24V output		458/4	469/15	
Reflected Ripple Current	Nominal input series		--	30	--	
Surge Voltage (1sec. max.)	24VDC nominal input series		-0.7	--	50	V DC
	48VDC nominal input series		-0.7	--	100	
Start-up Voltage	24VDC nominal input series		--	--	9	
	48VDC nominal input series		--	--	18	
Under-voltage Protection	24VDC nominal input series		5.5	6.5	--	
	48VDC nominal input series		12	15.5	--	
Start-up Time	Nominal input voltage & constant resistance load		--	10	--	ms
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl*	Module on		Ctrl pin open or pulled high (TTL 3.5-12VDC)			
	Module off		Ctrl pin pulled low to GND (0-1.2VDC)			
	Input current when off		-	2	7	mA
Note: : *The Ctrl pin voltage is referenced to input GND.						

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	0%-100% load		--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load			±0.2	±0.5	
Load Regulation	5% -100% load			±0.5	±1	
Transient Recovery Time	25% load step change, nominal input voltage			300	500	µs
Transient Response Deviation		3.3V/ 5V/ 6V output		±5	±8	%
		Others		±3	±5	
Temperature Coefficient	Full load			--	±0.03	%/°C
Ripple & Noise*	20MHz bandwidth, 5%-100% load			50	100	mVp-p
Trim	Input voltage range		90	--	110	%Vo
Over-voltage Protection			110	--	160	

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Over-current Protection	Input voltage range	110	150	190	%Io
Short-circuit Protection		Hiccup, continuous, self-recovery			
Note: *Ripple & Noise at < 5% load is 5%Vo max. The ”parallel cable” method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.					

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max		1500	-	-	VDC
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.		1000			
Insulation Resistance	Input-output resistance at 500VDC		1000	-	-	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		-	2000	-	pF
Operating Temperature	See Fig. 1	3.3V/ 5V /6V output	-40	-	+95	°C
		Others			+105	
Storage Temperature			-55	-	+125	
Storage Humidity	Non-condensing		5	--	95	%RH
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds		-	-	+300	°C
Vibration			10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency*	PWM mode	3.3V/ 5V/ 6V output	-	300	-	kHz
		Others		270		
MTBF	MIL-HDBK-217F@25°C		1000	-	-	k hours
Note:*Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.						

Mechanical Specifications

Case Material	Aluminum alloy	
Dimensions	Horizontal package (without heat sink)	25.4mm × 25.4mm × 11.7mm
Weight	without heat sink	15g/38g/58g(Typ.)
Cooling Method	Free air convection	

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig.3-2 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig.3-2 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±4KV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (see Fig.3-1 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2KV (see Fig.3-1for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A

Typical Characteristic Curves

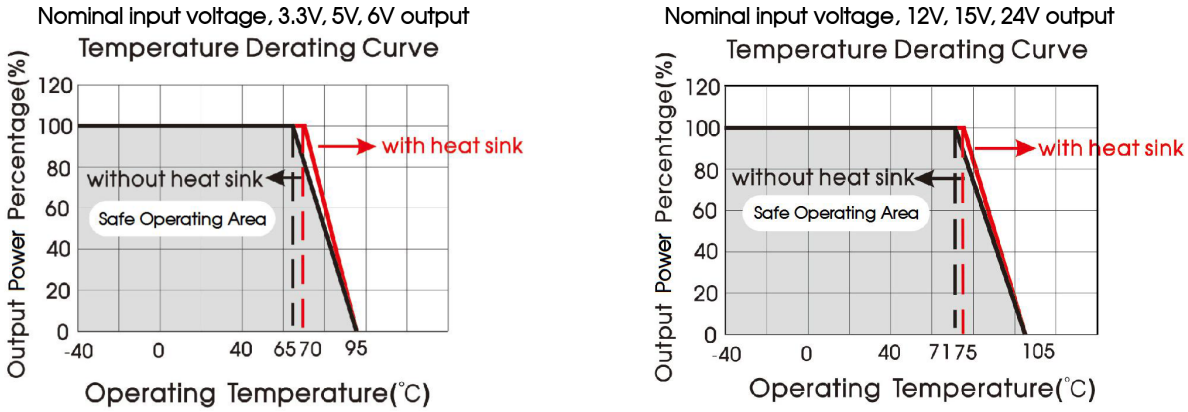
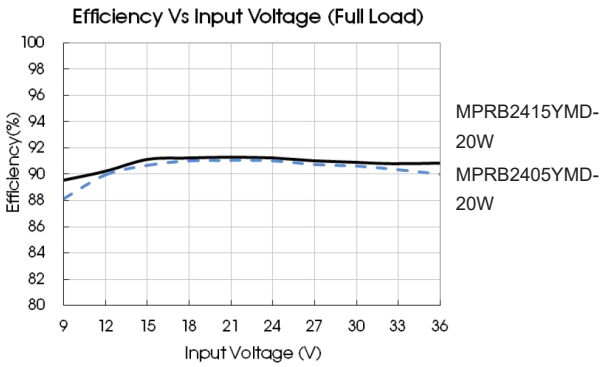
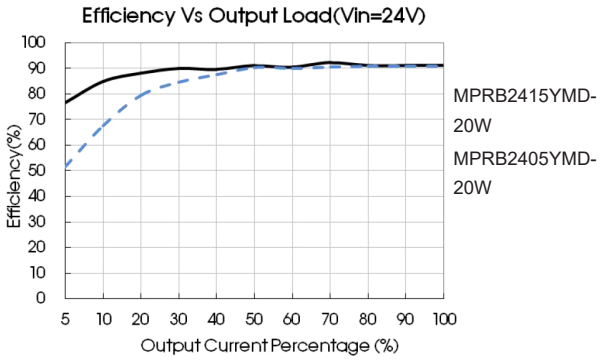
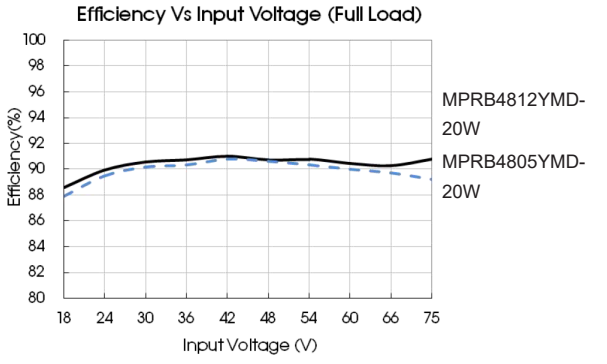
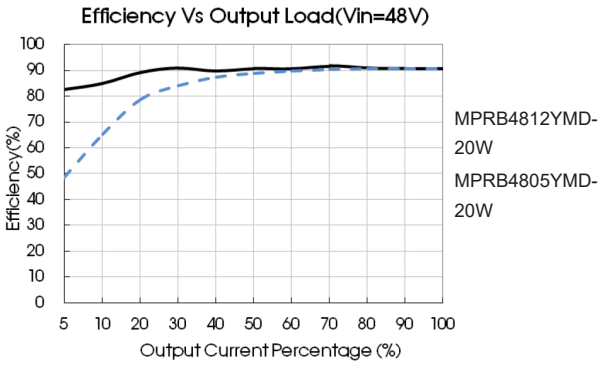


Fig. 1









Design Reference

Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

Fig. 2

Vout (VDC)	Cin (μF)	Cout (μF)
3.3/5/6/12/15	100	100
24		47

EMC compliance circuit

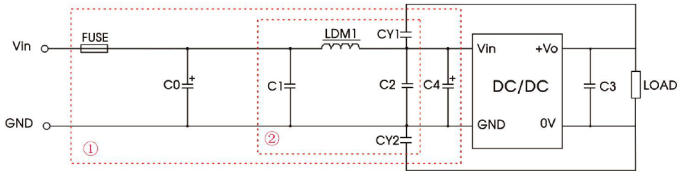


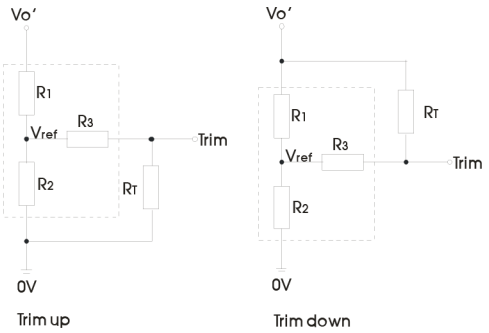
Fig. 3

Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test. Selecting based on needs.

Parameter description:

Model	Vin:24V	Vin:48V
FUSE	Select fuse value according to actual input current	
C0, C4	330μF/50V	330μF/100V
C1, C2	4.7μF/50V	4.7μF/100V
C3	Refer to the Cout in Fig.2	
LDM1	2.2μH/4A	2.2μH/2A
CY1, CY2	1nF/2KV	

Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

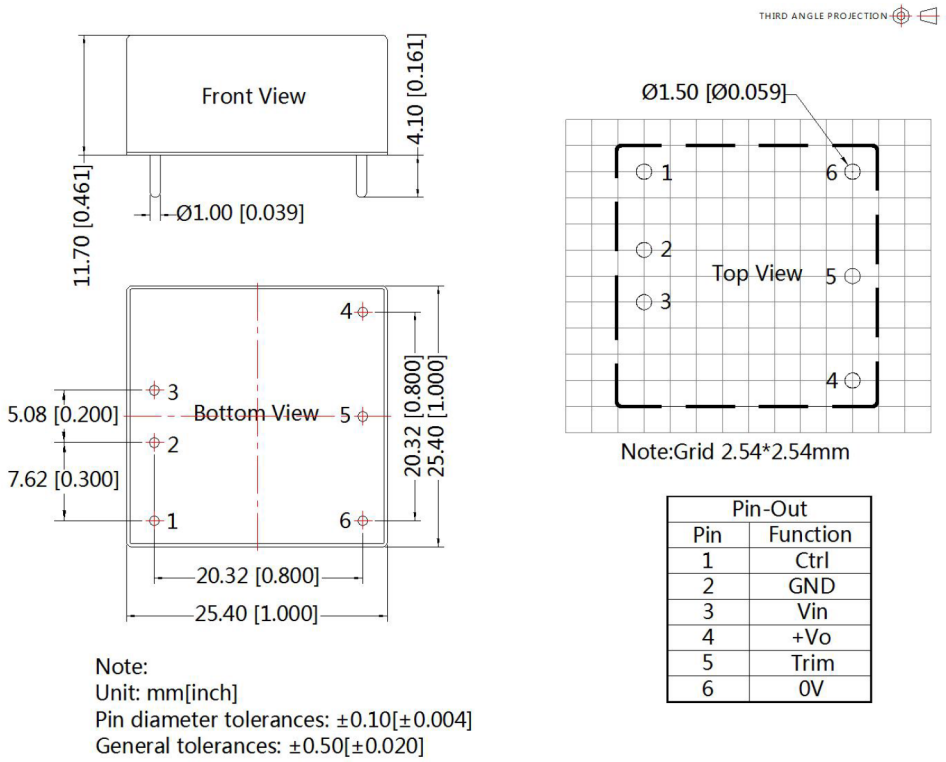
$$up:\ R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{V_{ref}}{Vo' - V_{ref}} \cdot R_1$$

$$down:\ R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vo' - V_{ref}}{V_{ref}} \cdot R_2$$

R_T = Trim Resistor value;
a = self-defined parameter;
Vo' = desired output voltage

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	4.829	2.87	15	1.24
5	2.894	2.87	10	2.5
6	4.064	2.87	10	2.5
12	11.000	2.87	17.4	2.5
15	14.494	2.87	17.4	2.5
24	24.872	2.87	20	2.5

Horizontal Package (without heat sink) Dimensions and Recommended Layout



Pin-Out	
Pin	Function
1	Ctrl
2	GND
3	Vin
4	+Vo
5	Trim
6	0V

Note:
Unit: mm[inch]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

Notes:

1. The maximum capacitive load offered were tested at input voltage range and full load;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see “Features” and “EMC”;
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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