



MPP06(W) SERIES

DC-DC CONVERTER
2:1 & 4:1 WIDE INPUT RANGE
UP TO 6 WATTS



FEATURES

- REINFORCED INSULATION FOR 250VAC WORKING VOLTAGE
- CLEARANCE AND CREEPAGE DISTANCE :8.0mm/2MOPP
- 5000VAC INPUT TO OUTPUT 2MOPP ISOLATION
- BUILT-IN EMI CLASS A FILTER
- 2μA PATIENT LEAKAGE CURRENT
- SAFETY MEETS ANSI/AAMI ES60601-1, EN60601-1 AND IEC60601-1
- CE MARK MEETS 2006/95/EC, 2011/95/EC AND 2004/108/EC
- COMPLIANT TO RoHS EU DIRECTIVE 2011/65/EU

APPLICATIONS

MEDICAL EQUIPMENT
TELECOM/DATACOM
INDUSTRY CONTROL SYSTEM
MEASUREMENT EQUIPMENT
SEMICONDUCTOR EQUIPMENT
PV POWER SYSTEM
IGBT GATE DRIVER

5000VAC ISOLATION	UVP	OCP	SCP	OVP	LOW STANDBY POWER
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TECHNICAL SPECIFICATION

All specifications are typical at nominal input, full load and 25°C otherwise noted

Model Number	Input Range	Output Voltage	Output Current @ Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	mA	mA	%	μF
MPP06-05S3P3A/B	4.5 ~9	3.3	1800	10	81.5	2100
MPP06-05S05A/B	4.5 ~9	5	1200	10	86	1500
MPP06-05S12A/B	4.5 ~9	12	500	15	86	260
MPP06-05S15A/B	4.5 ~9	15	400	15	86	210
MPP06-05S24A/B	4.5 ~9	24	250	20	87	75
MPP06-05D05A/B	4.5 ~9	±5	±600	25	84	± 860
MPP06-05D12A/B	4.5 ~9	±12	±250	25	86.5	± 150
MPP06-05D15A/B	4.5 ~9	±15	±200	25	87.5	± 110
MPP06-12S3P3A/B	9 ~ 18	3.3	1800	10	83.5	2100
MPP06-12S05A/B	9 ~ 18	5	1200	10	86	1500
MPP06-12S12A/B	9 ~ 18	12	500	10	89	260
MPP06-12S15A/B	9 ~ 18	15	400	10	89	210
MPP06-12S24A/B	9 ~ 18	24	250	10	88.5	75
MPP06-12D05A/B	9 ~ 18	±5	±600	10	84	± 860
MPP06-12D12A/B	9 ~ 18	±12	±250	10	89	± 150
MPP06-12D15A/B	9 ~ 18	±15	±200	10	88	± 110
MPP06-24S3P3A/B	18 ~ 36	3.3	1800	6	83	2100
MPP06-24S05A/B	18 ~ 36	5	1200	6	86.0	1500
MPP06-24S12A/B	18 ~ 36	12	500	6	89	260
MPP06-24S15A/B	18 ~ 36	15	400	6	89	210
MPP06-24S24A/B	18 ~ 36	24	250	6	88.5	75
MPP06-24D05A/B	18 ~ 36	±5	±600	6	85	± 860
MPP06-24D12A/B	18 ~ 36	±12	±250	6	88.5	± 150
MPP06-24D15A/B	18 ~ 36	±15	±200	6	88	± 110
MPP06-48S3P3A/B	36 ~ 75	3.3	1800	4	82.5	2100
MPP06-48S05A/B	36 ~ 75	5	1200	4	86.5	1500
MPP06-48S12A/B	36 ~ 75	12	500	4	88	260
MPP06-48S15A/B	36 ~ 75	15	400	4	88.5	210
MPP06-48S24A/B	36 ~ 75	24	250	4	88	75
MPP06-48D05A/B	36 ~ 75	±5	±600	4	85	± 860
MPP06-48D12A/B	36 ~ 75	±12	±250	4	88	± 150
MPP06-48D15A/B	36 ~ 75	±15	±200	4	88	± 110

Model Number	Input Range	Output Voltage	Output Current @ Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	mA	mA	%	μF
MPP06-24S3P3WA/B	9 ~ 36	3.3	1800	6	83	2100
MPP06-24S05WA/B	9 ~ 36	5	1200	6	86.0	1500
MPP06-24S12WA/B	9 ~ 36	12	500	6	89	260
MPP06-24S15WA/B	9 ~ 36	15	400	6	89	210
MPP06-24S24WA/B	9 ~ 36	24	250	6	88.5	75
MPP06-24D05WA/B	9 ~ 36	±5	±600	6	85	± 860
MPP06-24D12WA/B	9 ~ 36	±12	±250	6	88.5	± 150
MPP06-24D15WA/B	9 ~ 36	±15	±200	6	88	± 110
MPP06-48S3P3WA/B	18 ~ 75	3.3	1800	4	82.5	2100
MPP06-48S05WA/B	18 ~ 75	5	1200	4	86.5	1500
MPP06-48S12WA/B	18 ~ 75	12	500	4	88	260
MPP06-48S15WA/B	18 ~ 75	15	400	4	88.5	210
MPP06-48S24WA/B	18 ~ 75	24	250	4	88	75
MPP06-48D05WA/B	18 ~ 75	±5	±600	4	85	± 860
MPP06-48D12WA/B	18 ~ 75	±12	±250	4	88	± 150
MPP06-48D15WA/B	18 ~ 75	±15	±200	4	88	± 110

PART NUMBER STRUCTURE

Series name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Pin Connection Option	Remote On/Off Option	Trim Option
MPP06	48	S	05	W	A	P	T
	05: 4.5~9 12: 9~18 24: 18~36 48: 36~75	S: Single	3P3: 3.3 05: 5V 12: 12 15: 15 24: 24	□: 2:1 W: 4:1	A: A type(Standard) B: B type	□: No On/Off control P: Remote On/Off (Only for B type Pin connection)	□: No Trim T: Trim (Only for B type Pin connection)
	W: 24: 9~36 48: 18~75	D: Dual	05: ±5 12: ±12 15: ±15				

INPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range	2:1	5Vin(nom)	4.5	5	9	VDC
		12Vin(nom)	9	12	18	
	(W) 4:1	24Vin(nom)	18	24	36	VDC
		48Vin(nom)	36	48	75	
Start-up voltage	2:1	5Vin(nom)			4.5	VDC
		12Vin(nom)			9	
	(W) 4:1	24Vin(nom)			18	VDC
		48Vin(nom)			36	
Shutdown voltage	2:1	5Vin(nom)		4		VDC
		12Vin(nom)		8		
	(W) 4:1	24Vin(nom)		16		VDC
		48Vin(nom)		33		
Start up time	Constant resistive load	Power up		30		ms
		Remote ON/OFF		30		
Input surge voltage	3 second, max.	2:1	5Vin(nom)		16	VDC
			12Vin(nom)		25	
	3 second, max.	(W) 4:1	24Vin(nom)		50	VDC
			48Vin(nom)		100	
Input filter					Pi type	
Remote ON/OFF (Only for B-type Pin connection option)	Referenced to - INPUT pin	DC-DC ON DC-DC OFF	OPEN or 0 ~ 1.2VDC			mA
			2.2 ~ 12VDC			
		Input current of CTRL pin	-0.5	1		
		Remote off input current		2.5		

OUTPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit	
Voltage accuracy			-1.0		+1.0	%	
Line regulation	Low Line to High Line at Full Load	Single	-0.2		+0.2	%	
		Dual	-0.5		+0.5		
Load regulation	No Load to Full Load	Single	-0.2		+0.2	%	
		Dual	-1.0		+1.0		
Cross regulation	Asymmetrical load 25%/100% FL		-5.0		+5.0	%	
Voltage adjustability (Only for B-type Pin connection option)	Single output		3.3Vout, 5Vout, 12Vout		+10	%	
			15Vout, 24Vout		+20		
	Dual output		±5Vout, ±12Vout, ±15Vout		+10	%	
Ripple and noise	Measured by 20MHz bandwidth With a 10µF/25V X7R MLCC		3.3Vout, 5Vout	30		mVp-p	
			12Vout, 15Vout	40			
	With a 4.7µF/50V X7R MLCC		24Vout	50			
Temperature coefficient			-0.02		+0.02	%/°C	
Transient response recovery time	25% load step change			250		µs	
Over voltage protection			3.3Vout	3.7	5.4	VDC	
			5Vout	5.6	7.0		
	Continuous clamp			12Vout	13.5		19.6
				15Vout	18.3		22.0
				24Vout	29.1		32.5
Over load protection	% of Iout rated; Hiccup mode			150		%	
Short circuit protection						Continuous, automatic recovery	

GENERAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output	5000			VAC
Isolation capacitance				12	17	pF
Leakage current	240VAC, 60Hz				2	µA
Switching frequency			225	250	275	kHz
Clearance/Creepage			8			mm
Design meet safety standard			ANSI/AAMI ES60601-1 IEC60601-1, EN60601-1			
Case material			Non-conductive black plastic			
Base material			Non-conductive black plastic			
Potting material			Silicone (UL94-V0)			
Dimensions			1.25 X 0.80 X 0.40 Inch (31.8×20.3×10.2 mm)			
Weight			14g (0.48oz)			
MTBF	MIL-HDBK-217F Ta=25°C, Full load		4.718 x 10 ⁶ hrs			

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Without derating		-40		+88	°C
	With derating		+88		+105	
Storage temperature range			-55		+125	°C
Thermal impedance	Natural convection (20LFM)				18	°C/W
Thermal shock						MIL-STD-810F
Vibration						MIL-STD-810F
Relative humidity						5% to 95% RH

EMC SPECIFICATIONS

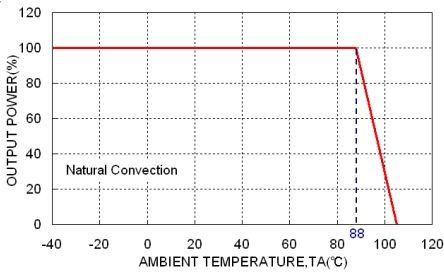
Parameter	Conditions		Level		
EMI ⁽¹⁾	EN55011, EN55022 and FCC Part 18		Class A, Class B		
ESD	EN61000-4-2	Air ± 8kV	Perf. Criteria A		
		Contact ± 6kV			
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A		
Fast transient ⁽²⁾	EN61000-4-4	± 2kV	Perf. Criteria A		
Surge ⁽²⁾	EN61000-4-5	± 2kV	Perf. Criteria A		
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A		

Note:

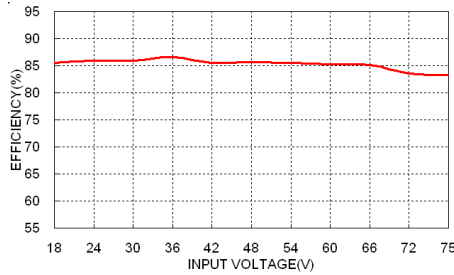
- The MPP06 (W) series can meet EMI Class A with no external filter. And Class B only with external components. For more detail information, please contact with P-DUKE.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The MPP06-05S□□□□ recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 1000µF/25V). And a reverse diode (Vishay V10P45) to connect in parallel. The MPP06-12&24S□□□□□ recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 470µF/50V). The MPP06-48S□□□□□ recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 330µF/100V).

CAUTION: This power module is not internally fused. An input line fuse must always be used.

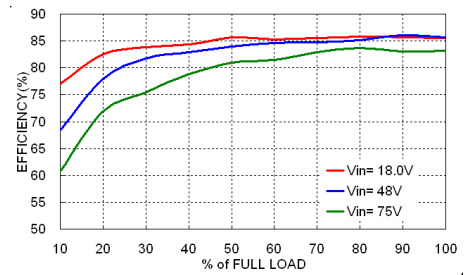
CHARACTERISTIC CURVE



MPP06-48S05WA Derating Curve



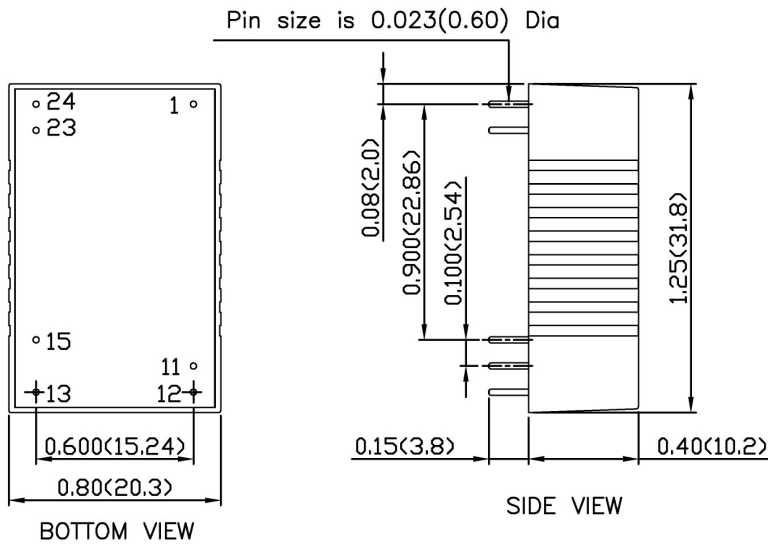
MPP06-48S05WA Efficiency VS Input Voltage



MPP06-48S05WA Efficiency VS Output Load

MECHANICAL DRAWING

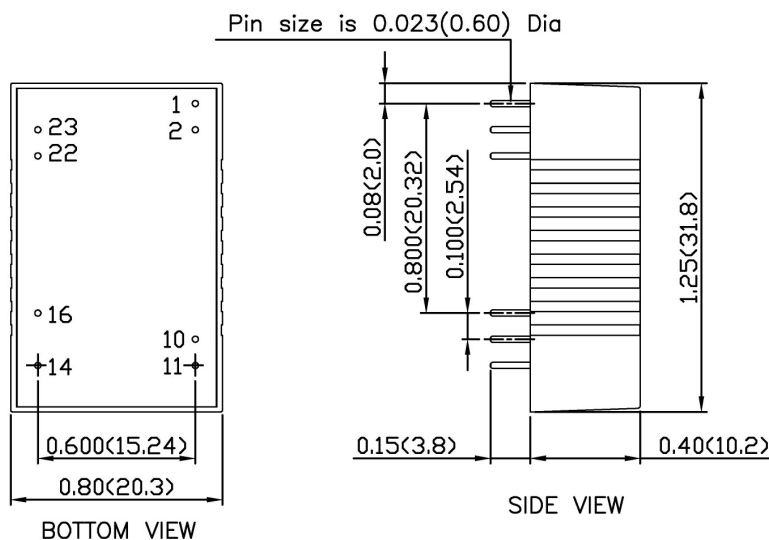
A type Pin connection (Standard)



DIP PIN CONNECTION		
PIN	SINGLE	DUAL
1	+ INPUT	+ INPUT
11	NO PIN	COMMON
12	-OUTPUT	NO PIN
13	+OUTPUT	-OUTPUT
15	NO PIN	+OUTPUT
23	- INPUT	- INPUT
24	- INPUT	- INPUT

- All dimensions in Inch (mm)
Tolerance: X.XX±0.02 (X.X±0.5)
X.XXX±0.01 (X.XX±0.25)
- Pin pitch tolerance ±0.01 (0.25)
- Pin dimension tolerance ±0.004 (0.1)

B type Pin connection



DIP PIN CONNECTION		
PIN	SINGLE	DUAL
1	CTRL (Option)	CTRL (Option)
2	- INPUT	- INPUT
10	TRIM (Option)	TRIM (Option)
11	NO PIN / NC (**)	-OUTPUT
14	+OUTPUT	+OUTPUT
16	-OUTPUT	COMMON
22	+INPUT	+INPUT
23	+INPUT	+INPUT

** : The Pin 11 is "NO PIN" when single output with Trim option (Suffix: -T).
The Pin 11 is "NC" when single output without TRIM pin.

- All dimensions in Inch (mm)
Tolerance: X.XX±0.02 (X.X±0.5)
X.XXX±0.01 (X.XX±0.25)
- Pin pitch tolerance ±0.01 (0.25)
- Pin dimension tolerance ±0.004 (0.1)