

MOP10(W) SERIES

DC-DC CONVERTER
2:1 & 4:1 WIDE INPUT RANGE
UP TO 10.05 WATTS



FEATURES

- REINFORCED INSULATION FOR 300VAC WORKING VOLTAGE
- CLEARANCE AND CREEPAGE DISTANCE :6.6mm/2MOOP
- 3000VAC INPUT TO OUTPUT 2MOOP 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

3000VAC 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
MOP10-05S3P3A/B	4.5 ~ 9	3.3	2500	10	80	3000
MOP10-05S05A/B	4.5 ~ 9	5	2000	10	84	2500
MOP10-05S12A/B	4.5 ~ 9	12	830	15	86.5	430
MOP10-05S15A/B	4.5 ~ 9	15	670	15	87	350
MOP10-05S24A/B	4.5 ~ 9	24	416	20	85.5	125
MOP10-05D05A/B	4.5 ~ 9	±5	±1000	25	83	± 1440
MOP10-05D12A/B	4.5 ~ 9	±12	±416	25	85.5	± 250
MOP10-05D15A/B	4.5 ~ 9	±15	±333	25	86.5	± 180
MOP10-12S3P3A/B	9 ~ 18	3.3	2500	10	83	3000
MOP10-12S05A/B	9 ~ 18	5	2000	10	85.5	2500
MOP10-12S12A/B	9 ~ 18	12	830	10	88	430
MOP10-12S15A/B	9 ~ 18	15	670	10	89	350
MOP10-12S24A/B	9 ~ 18	24	416	10	89	125
MOP10-12D05A/B	9 ~ 18	±5	±1000	10	84	± 1440
MOP10-12D12A/B	9 ~ 18	±12	±416	10	89	± 250
MOP10-12D15A/B	9 ~ 18	±15	±333	10	88	± 180
MOP10-24S3P3A/B	18 ~ 36	3.3	2500	6	83	3000
MOP10-24S05A/B	18 ~ 36	5	2000	6	86.5	2500
MOP10-24S12A/B	18 ~ 36	12	830	6	89	430
MOP10-24S15A/B	18 ~ 36	15	670	6	89	350
MOP10-24S24A/B	18 ~ 36	24	416	6	89	125
MOP10-24D05A/B	18 ~ 36	±5	±1000	6	85	± 1440
MOP10-24D12A/B	18 ~ 36	±12	±416	6	89	± 250
MOP10-24D15A/B	18 ~ 36	±15	±333	6	88	± 180
MOP10-48S3P3A/B	36 ~ 75	3.3	2500	4	82.5	3000
MOP10-48S05A/B	36 ~ 75	5	2000	4	86.5	2500
MOP10-48S12A/B	36 ~ 75	12	830	4	89	430
MOP10-48S15A/B	36 ~ 75	15	670	4	89	350
MOP10-48S24A/B	36 ~ 75	24	416	4	88.5	125
MOP10-48D05A/B	36 ~ 75	±5	±1000	4	85	± 1440
MOP10-48D12A/B	36 ~ 75	±12	±416	4	88	± 250
MOP10-48D15A/B	36 ~ 75	±15	±333	4	88	± 180

Model Number	Input Range	Output Voltage	Output Current @ Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	mA	mA	%	μF
MOP10-24S3P3WA/B	9 ~ 36	3.3	2500	6	83	3000
MOP10-24S05WA/B	9 ~ 36	5	2000	6	86.5	2500
MOP10-24S12WA/B	9 ~ 36	12	830	6	89	430
MOP10-24S15WA/B	9 ~ 36	15	670	6	89	350
MOP10-24S24WA/B	9 ~ 36	24	416	6	89	125
MOP10-24D05WA/B	9 ~ 36	±5	±1000	6	85	± 1440
MOP10-24D12WA/B	9 ~ 36	±12	±416	6	89	± 250
MOP10-24D15WA/B	9 ~ 36	±15	±333	6	88	± 180
MOP10-48S3P3WA/B	18 ~ 75	3.3	2500	4	82.5	3000
MOP10-48S05WA/B	18 ~ 75	5	2000	4	86.5	2500
MOP10-48S12WA/B	18 ~ 75	12	830	4	89	430
MOP10-48S15WA/B	18 ~ 75	15	670	4	89	350
MOP10-48S24WA/B	18 ~ 75	24	416	4	88.5	125
MOP10-48D05WA/B	18 ~ 75	±5	±1000	4	85	± 1440
MOP10-48D12WA/B	18 ~ 75	±12	±416	4	88	± 250
MOP10-48D15WA/B	18 ~ 75	±15	±333	4	88	± 180

PART NUMBER STRUCTURE

Series name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Pin Connection Option	Remote On/Off Option	Trim Option
MOP10 - 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	
	24Vin(nom)	18	24	36	
	48Vin(nom)	36	48	75	
(W) 4:1	24Vin(nom)	9	24	36	VDC
	48Vin(nom)	18	48	75	
Start-up voltage	2:1 5Vin(nom)			4.5	VDC
	12Vin(nom)			9	
	24Vin(nom)			18	
	48Vin(nom)			36	
(W) 4:1	24Vin(nom)			9	VDC
	48Vin(nom)			18	
Shutdown voltage	2:1 5Vin(nom)		4		VDC
	12Vin(nom)		8		
	24Vin(nom)		16		
	48Vin(nom)		33		
(W) 4:1	24Vin(nom)		8		VDC
	48Vin(nom)		16		
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	
	24Vin(nom)			50	
	48Vin(nom)			100	
3 second, max. (W) 4:1	24Vin(nom)			50	VDC
	48Vin(nom)			100	
Input filter					Pi type
Remote ON/OFF	Referenced to - INPUT pin	DC-DC ON	OPEN or 0 ~ 1.2VDC		
(Only for B-type Pin connection option)		DC-DC OFF	2.2 ~ 12VDC		
		Input current of CTRL pin	-0.5	1	mA
		Remote off input current	2.5		mA

OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Voltage accuracy		-1.0		+1.0	%
Line regulation	Low Line to High Line at Full Load	-0.2		+0.2	%
	Single Dual	-0.5		+0.5	%
Load regulation	No Load to Full Load	-0.2		+0.2	%
	Single Dual	-1.0		+1.0	%
Cross regulation	Asymmetrical load 25%/100% FL	-5.0		+5.0	%
Voltage adjustability	Single output	3.3Vout, 5Vout, 12Vout		+10	%
(Only for B-type Pin connection option)		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		5.4	
		5Vout		7.0	
	Continuous clamp	12Vout		19.6	VDC
		15Vout		22.0	
		24Vout		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	3000			VAC
Isolation capacitance	Input to Output		12	17	pF
Leakage current	240VAC, 60Hz			2	μA
Switching frequency		270	300	330	kHz
Clearance/Creepage		6.6			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			3.849 x 10 ⁶ hrs	

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	Without derating	-40		+77	°C
	With derating	+77		+105	°C
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

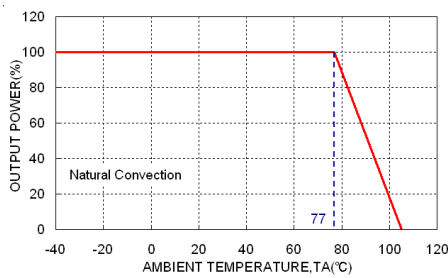
Parameter	Conditions	Level
EMI ⁽¹⁾	EN55011, EN55022 and FCC Part 18	Class A, Class B
ESD	EN61000-4-2	Perf. Criteria A
	Air ± 8kV	
	Contact ± 6kV	
Radiated immunity	EN61000-4-3	Perf. Criteria A
Fast transient ⁽²⁾	EN61000-4-4	Perf. Criteria A
	± 2kV	
Surge ⁽²⁾	EN61000-4-5	Perf. Criteria A
	± 2kV	
Conducted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

Note:

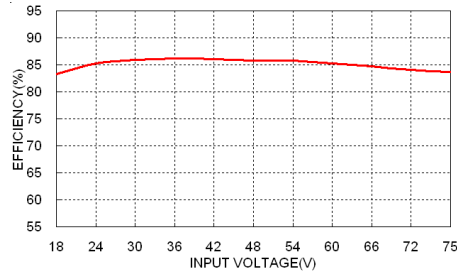
- The MOP10(W) series can meet EMI Class A with no external filter. And Class B only with external components. For more detail information, please contact with P-DUKE.
- An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
The MOP10-05S□□□□ recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 1000μF/25V). And a reverse diode (Vishay V10P45) to connect in parallel.
The MOP10-12&24S□□□□□ recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 470μF/50V).
The MOP10-48S□□□□□ 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.

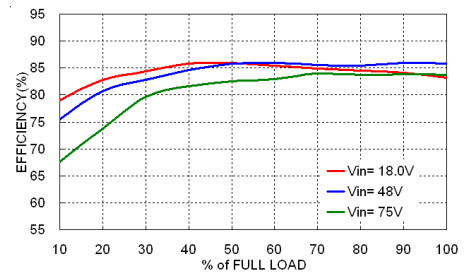
CHARACTERISTIC CURVE



MOP10-48S05WA Derating Curve



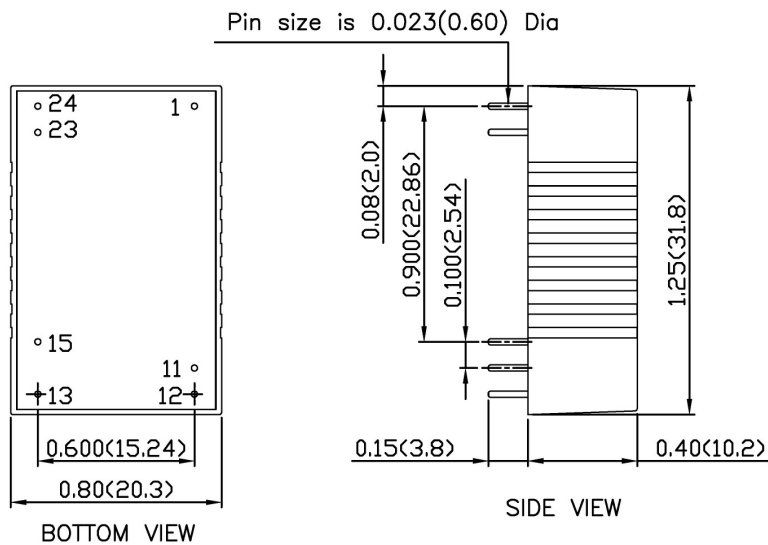
MOP10-48S05WA Efficiency VS Input Voltage



MOP10-48S05WA Efficiency VS Output Load

MECHANICAL DRAWING

A type Pin connection (Standard)

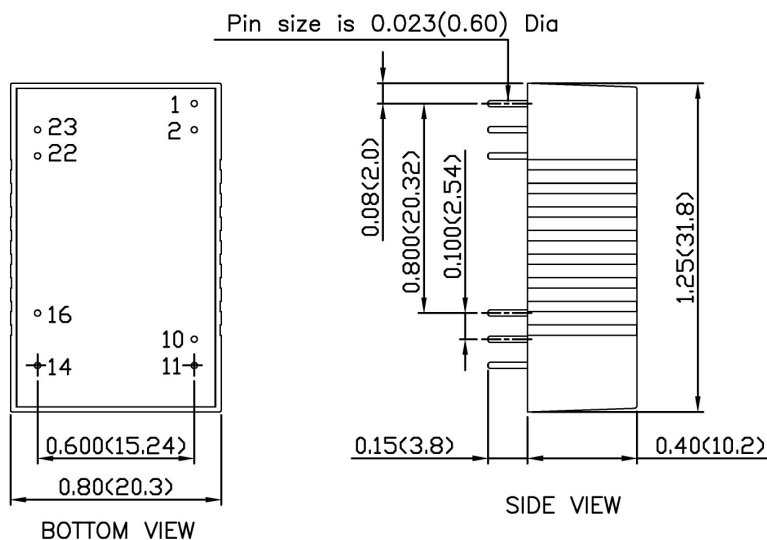


DIP PIN CONNECTION

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)