P-DUKE POWER

MPM20 · MPM20W Series

DC-DC Converter
Up to 20 Watts

5 YEARS WARRANTY

RoHS COMPLIANT

REACH COMPLIANT

Medical PV Automation

Datacom IPC Industry

Measurement Telecom Automobile

Boat Charger Railway

2 x MOPP | 5000 VAC Reinforced Insulation | 4 : 1 Wide Input Range | 2 : 1 Input Range | Internal EN55032 Class A Filter | LOW Leakage Current | LOW Standby Power | NO Min. Load Required | Operating Altitude 5000 meter | REMOTE ON OFF | OCP | OTP | OVP | SCP | UVP

PART NUMBER STRUCTURE

MPM20 - 48 S 05 W - P

Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Input Range	Remote On/Off Options
	12:9~18 **24:**18~36 **48:**36~75	**S:**Single	**05:**5 **12:**12 **15:**15 **24:**24	□: 2:1	□:No pin **P:**Positive logic **N:**Negative logic
		D:Dual	**05:**±5 **12:**±12 **15:**±15		
	24:9~36 **48:**18~75	**S:**Single	**05:**5 **12:**12 **15:**15 **24:**24	**W:** 4:1	□:No pin **P:**Positive logic **N:**Negative logic
		D:Dual	**05:**±5 **12:**±12 **15:**±15		

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25℃ unless 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
MPM20-12S05	9 ~ 18	5	4000	8	88.5	5000
MPM20-12S12	9 ~ 18	12	1670	12	88.5	850
MPM20-12S15	9 ~ 18	15	1330	13	89	700
MPM20-12S24	9 ~ 18	24	833	11	89	220
MPM20-12D05	9 ~ 18	±5	±2000	11	86	±2500
MPM20-12D12	9 ~ 18	±12	±833	11	89	±500
MPM20-12D15	9 ~ 18	±15	±667	14	89	±350
MPM20-24S05	18 ~ 36	5	4000	8	90	5000
MPM20-24S12	18 ~ 36	12	1670	9	90	850
MPM20-24S15	18 ~ 36	15	1330	9	90	700
MPM20-24S24	18 ~ 36	24	833	9	90	220
MPM20-24D05	18 ~ 36	±5	±2000	11	86	±2500
MPM20-24D12	18 ~ 36	±12	±833	9	90	±500
MPM20-24D15	18 ~ 36	±15	±667	11	90	±350
MPM20-48S05	36 ~ 75	5	4000	9	89.5	5000
MPM20-48S12	36 ~ 75	12	1670	9	88.5	850
MPM20-48S15	36 ~ 75	15	1330	9	89	700
MPM20-48S24	36 ~ 75	24	833	9	88.5	220
MPM20-48D05	36 ~ 75	±5	±2000	9	86	±2500
MPM20-48D12	36 ~ 75	±12	±833	9	88.5	±500
MPM20-48D15	36 ~ 75	±15	±667	9	89	±350
MPM20-24S05W	9 ~ 36	5	4000	8	88.5	5000
MPM20-24S12W	9 ~ 36	12	1670	11	88.5	850
MPM20-24S15W	9 ~ 36	15	1330	10	89	700
MPM20-24S24W	9 ~ 36	24	833	10	88.5	220
MPM20-24D05W	9 ~ 36	±5	±2000	9	86	±2500
MPM20-24D12W	9 ~ 36	±12	±833	10	88.5	±500
MPM20-24D15W	9 ~ 36	±15	±667	11	89	±350
MPM20-48S05W	18 ~ 75	5	4000	9	89.5	5000
MPM20-48S12W	18 ~ 75	12	1670	9	88.5	850
MPM20-48S15W	18 ~ 75	15	1330	9	89	700
MPM20-48S24W	18 ~ 75	24	833	9	88.5	220
MPM20-48D05W	18 ~ 75	±5	±2000	9	86	±2500
MPM20-48D12W	18 ~ 75	±12	±833	9	88.5	±500
MPM20-48D15W	18 ~ 75	±15	±667	9	89	±350

INPUT SPECIFICATIONS

Parameter	Conditions			Min.	Typ.	Max.	Unit
Operating input voltage range	2:1	12Vin(nom)		9	12	18	VDC
		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	12Vin(nom)				9	VDC
		24Vin(nom)				18	
		48Vin(nom)				36	
	(W) 4:1	24Vin(nom)				9	VDC
		48Vin(nom)				18	
Shutdown voltage	2:1	12Vin(nom)		7.8	8	8.6	VDC
		24Vin(nom)		15.8	16	17.4	
		48Vin(nom)		32	33	34	
	(W) 4:1	24Vin(nom)		7.8	8	8.6	VDC
		48Vin(nom)		15.8	16	17.4	
Start up time	Constant resistive load	Power up			30	60	ms
		Remote ON/OFF			30	60	
Input surge voltage	3 second, max.	12Vin(nom)				25	VDC
		24Vin(nom)				50	
		48Vin(nom)				100	
	3 second, max.	24Vin(nom)				50	VDC
		48Vin(nom)				100	
Input filter					Pi type		
Remote ON/OFF (Option)	Referred to - Vin pin	Positive logic	DC-DC ON		Open or 3.5 ~ 12VDC		
			DC-DC OFF		Short or 0 ~ 1.2VDC		
		Negative logic	DC-DC ON		Short or 0 ~ 1.2VDC		
			DC-DC OFF		Open or 3.5 ~ 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	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	Dual	-5.0		+5.0	%
Voltage adjustability	Single output	5Vout, 12Vout	-10		+10	%
		15Vout, 24Vout	-10		+20	
Ripple and noise	Measured by 20MHz bandwidth					mVp-p
		Single				
	With a 10μF/25V X7R MLCC	5Vout		50		
	With a 10μF/25V X7R MLCC	12Vout		75		
	With a 10μF/25V X7R MLCC	15Vout		75		
	With a 4.7μF/50V X7R MLCC	24Vout		100		
		Dual				
	With a 10μF/25V X7R MLCC	±5Vout		50		
	With a 10μF/25V X7R MLCC	±12Vout		75		
	With a 10μF/25V X7R MLCC	±15Vout		75		
Temperature coefficient			-0.02		+0.02	%/°C
Transient response recovery time	25% load step change			250		μs
Over voltage protection	Zener diode clamp	5Vout		6.2		VDC
		12Vout		15		
		15Vout		20		
		24Vout		30		
Over load protection	% of Iout rated; Hiccup mode			150	185	%
Short circuit protection				Continuous, automatics recovery		

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute Input to Output Reinforced insulation for 250VAC working voltage	5000			VAC
Isolation resistance	500VDC	10			GΩ
Isolation capacitance			20		pF
Leakage current	240VAC,60Hz		2	2.5	μA
Switching frequency		225	250	285	kHz
Clearance / Creepage		8			mm
Safety approvals	IEC/ EN/ ANSI/AAMI ES 60601-1 IEC/ EN/ UL 62368-1				UL:E360199 UL:E193009 CB:UL(Demko)
Case material					Non-conductive black plastic
Base material					Non-conductive black plastic
Potting material					Silicone (UL94 V-0)
Weight					24g (0.85oz)
MTBF	MIL-HDBK-217F, Full load				1.712×10^6 hrs

ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating	-40		+105	℃
Maximum case temperature				105	℃
Over temperature protection			115		℃
Storage temperature range		-55		+125	℃
Thermal impedance			14.36		℃/W
Operating altitude				5000	m
Thermal shock					MIL-STD-810F
Vibration					MIL-STD-810F
Relative humidity					5% to 95% RH

EMC SPECIFICATIONS

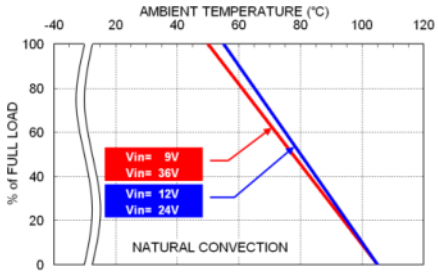
Parameter	Conditions		Level
EMI	EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15		
		Without external components.	Class A
		With external components.	Class B
EMS	EN55035 and EN60601-1-2		
ESD	EN61000-4-2	Air ± 15kV and Contact ± 8kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV	Perf. Criteria A
	MPM20-12□□□	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ36A, 36V, 3000 Watt peak pulse power) in parallel.	
	MPM20-24□□□□	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ58A, 58V, 3000 Watt peak pulse power) in parallel.	
	MPM20-48□□□□	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ120A,120V, 3000 Watt peak pulse power) in parallel.	

EMC SPECIFICATIONS(CONTINUED)

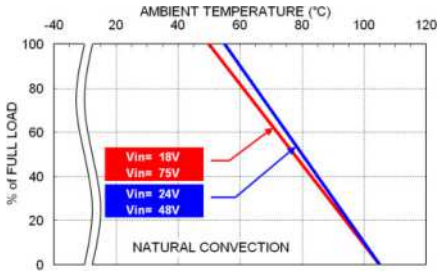
Parameter	Conditions		Level
Surge	EN61000-4-5	± 2kV	Perf. Criteria A
	MPM20-12□□□	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ36A, 36V, 3000 Watt peak pulse power) in parallel.	
	MPM20-24□□□□	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ58A, 58V, 3000 Watt peak pulse power) in parallel.	
	MPM20-48□□□□	With 2 pcs of aluminum electrolytic capacitor (Nippon chemi-con KY series, 220μF/100V) and a TVS (SMDJ120A,120V, 3000 Watt peak pulse power) in parallel.	
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	100A/m continuous; 1000A/m 1 second	Perf. Criteria A

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

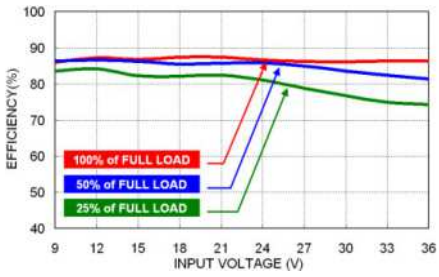
CHARACTERISTIC CURVE



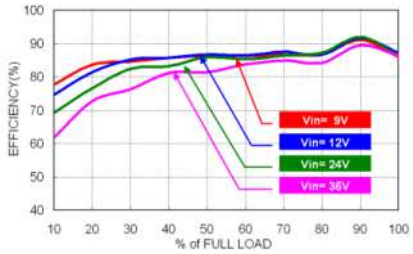
MPM20-24S□□W Derating Curve



MPM20-48S□□W Derating Curve



MPM20-24S05W Efficiency vs. Input Voltage



MPM20-24S05W Efficiency vs. Output Load

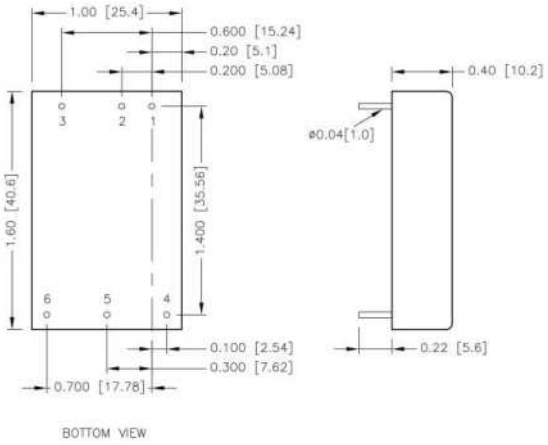
FUSE CONSIDERATION

This power module is not internally fused. An input line fuse must always be used.
This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.
The input line fuse suggest as below：

Model	Fuse Rating (A)	Fuse Type
MPM20-12□□□、24□□□W	4	Slow-Blow
MPM20-24□□□、48□□□W	2	Slow-Blow
MPM20-48□□□	1	Slow-Blow

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

MECHANICAL DRAWING

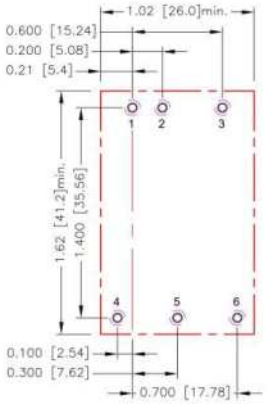


PIN CONNECTION

PIN	SINGLE	DUAL
1	+Vin	+Vin
2	-Vin	-Vin
3	Ctrl (Option)	Ctrl (Option)
4	+Vout	+Vout
5	-Vout	Common
6	Trim	-Vout

1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
   x.xxx±0.01 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

RECOMMENDED PAD LAYOUT



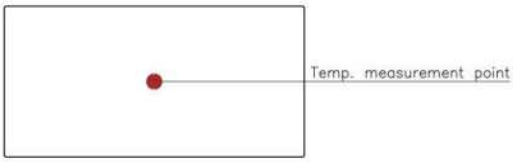
* There should be at least 8mm distance between primary and secondary circuit.
** For further information, please contact P-DUKE.

All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6: ∅0.051[1.30]
Top view pad 1.2.3.4.5.6: ∅0.064[1.63]
Bottom view pad 1.2.3.4.5.6: ∅0.102[2.60]

THERMAL CONSIDERATIONS

The power module operates in a variety of thermal environments.
However, sufficient cooling should be provided to help ensure reliable operation of the unit.
Heat is removed by conduction, convection, and radiation to the surrounding environment.
Proper cooling can be verified by measuring the point as the figure below.
The temperature at this location should not exceed “Maximum case temperature”.
When operating, adequate cooling must be provided to maintain the test point temperature at or below “Maximum case temperature”.
You can limit this temperature to a lower value for extremely high reliability.

■ Thermal test condition with vertical direction by natural convection (20LFM).



TOP VIEW

OUTPUT VOLTAGE ADJUSTMENT

It allows the user to increase or decrease the output voltage of the module.
This is accomplished by connecting an external resistor between the Trim pin and either the +Vout or -Vout pins.
With an external resistor between the Trim and -Output pin, the output voltage increases.
With an external resistor between the Trim and +Output pin, the output voltage decreases.
The external Trim resistor needs to be at least 1/16W of rated power.

■ **Trim Up Equation**

$$R_U = \left[\frac{G \times L}{(V_{o,up} - L - K)} - H \right] \Omega$$

■ **Trim Down Equation**

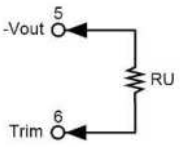
$$R_D = \left[\frac{(V_{o,down} - L) \times G}{(V_o - V_{o,down})} - H \right] \Omega$$

■ **Trim Constants**

Module	G	H	K	L
MPM20-□□S05、□□S05W	5110	2050	2.5	2.5
MPM20-□□S12、□□S12W	10000	5110	9.5	2.5
MPM20-□□S15、□□S15W	10000	5110	12.5	2.5
MPM20-□□S24、□□S24W	56000	13000	21.5	2.5

EXTERNAL OUTPUT TRIMMING
Output can be externally trimmed by using the method shown below.

Trim-up



□□S05、□□S05W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	5.05	5.1	5.15	5.2	5.25	5.3	5.35	5.4	5.45	5.5
RU	(kΩ)	253.450	125.700	83.117	61.825	49.050	40.533	34.450	29.888	26.339	23.500

□□S12、□□S12W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	12.12	12.24	12.36	12.48	12.6	12.72	12.84	12.96	13.08	13.2
RU	(kΩ)	203.223	99.057	64.334	46.973	36.557	29.612	24.652	20.932	18.038	15.723

□□S15、□□S15W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	15.15	15.3	15.45	15.6	15.75	15.9	16.05	16.2	16.35	16.5
RU	(kΩ)	161.557	78.223	50.446	36.557	28.223	22.668	18.700	15.723	13.409	11.557

△V	(%)	11	12	13	14	15	16	17	18	19	20
Vout	(V)	16.65	16.8	16.95	17.1	17.25	17.4	17.55	17.7	17.85	18
RU	(kΩ)	10.042	8.779	7.711	6.795	6.001	5.307	4.694	4.149	3.662	3.223

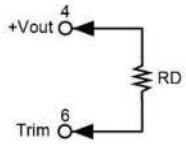
□□S24、□□S24W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	24.24	24.48	24.72	24.96	25.2	25.44	25.68	25.92	26.16	26.4
RU	(kΩ)	570.333	278.667	181.444	132.833	103.667	84.222	70.333	59.917	51.815	45.333

△V	(%)	11	12	13	14	15	16	17	18	19	20
Vout	(V)	26.64	26.88	27.12	27.36	27.6	27.84	28.08	28.32	28.56	28.8
RU	(kΩ)	40.030	35.611	31.872	28.667	25.889	23.458	21.314	19.407	17.702	16.167

OUTPUT VOLTAGE ADJUSTMENT(CONTINUED)

Trim-down



□□S05、□□S05W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	4.95	4.9	4.85	4.8	4.75	4.7	4.65	4.6	4.55	4.5
RD	(kΩ)	248.340	120.590	78.007	56.715	43.940	35.423	29.340	24.778	21.229	18.390

□□S12、□□S12W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	11.88	11.76	11.64	11.52	11.4	11.28	11.16	11.04	10.92	10.8
RD	(kΩ)	776.557	380.723	248.779	182.807	143.223	116.834	97.985	83.848	72.853	64.057

□□S15、□□S15W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	14.85	14.7	14.55	14.4	14.25	14.1	13.95	13.8	13.65	13.5
RD	(kΩ)	818.223	401.557	262.668	193.223	151.557	123.779	103.938	89.057	77.483	68.223

□□S24、□□S24W

△V	(%)	1	2	3	4	5	6	7	8	9	10
Vout	(V)	23.76	23.52	23.28	23.04	22.8	22.56	22.32	22.08	21.84	21.6
RD	(kΩ)	4947.667	2439.333	1603.222	1185.167	934.333	767.111	647.667	558.083	488.407	432.667

P-DUKE

P-DUKE Technology Co., Ltd.

Tel +886-4-2359-0668
Fax +886-4-2359-1337
Email sales@pduke.com
Web www.pduke.com
Add No. 36, 22nd Rd., Taichung Industrial Park, Taichung, Taiwan, R.O.C.