



# P-DUKE POWER

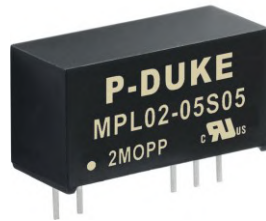
## MPL02 Series

DC-DC Converter  
Up to 2 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

**2 : 1**  
Input  
Range

**HIGH**  
Efficiency

**LOW**  
Leakage  
Current

Operating  
Altitude  
**5000**  
meter

**SCP**

**UVP**

### PART NUMBER STRUCTURE

MPL02 -	05	S	05
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)
	05: 4.5~13.2 12: 9~18 24: 18~36	S: Single	3P3: 3.3 05: 5 12: 12 15: 15
		D: Dual	05: ± 5 12: ±12 15: ±15

**TECHNICAL SPECIFICATION** All specifications are typical at nominal input, full load and 25°C 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
MPL02-05S3P3	4.5 ~ 13.2	3.3	600	5	77	2000
MPL02-05S05	4.5 ~ 13.2	5	400	5	82	820
MPL02-05S12	4.5 ~ 13.2	12	167	12	83	470
MPL02-05S15	4.5 ~ 13.2	15	134	20	84	470
MPL02-05D05	4.5 ~ 13.2	±5	±200	5	82	±470
MPL02-05D12	4.5 ~ 13.2	±12	±83	20	83	±220
MPL02-05D15	4.5 ~ 13.2	±15	±67	25	81	±220
MPL02-12S3P3	9 ~ 18	3.3	600	4	79	2000
MPL02-12S05	9 ~ 18	5	400	4	81	820
MPL02-12S12	9 ~ 18	12	167	6	85	470
MPL02-12S15	9 ~ 18	15	134	10	83	470
MPL02-12D05	9 ~ 18	±5	±200	4	81	±470
MPL02-12D12	9 ~ 18	±12	±83	6	83	±220
MPL02-12D15	9 ~ 18	±15	±67	10	81	±220
MPL02-24S3P3	18 ~ 36	3.3	600	3	78	2000
MPL02-24S05	18 ~ 36	5	400	3	80	820
MPL02-24S12	18 ~ 36	12	167	6	82	470
MPL02-24S15	18 ~ 36	15	134	6	82	470
MPL02-24D05	18 ~ 36	±5	±200	3	80	±470
MPL02-24D12	18 ~ 36	±12	±83	6	81	±220
MPL02-24D15	18 ~ 36	±15	±67	6	80	±220

**INPUT SPECIFICATIONS**

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	5Vin(nom)	4.5	5	13.2	VDC
	12Vin(nom)	9	12	18	
	24Vin(nom)	18	24	36	
Start up voltage	5Vin(nom)			4.5	VDC
	12Vin(nom)			9	
	24Vin(nom)			18	
Shutdown voltage	5Vin(nom)	3	3.8	4.4	VDC
	12Vin(nom)	6.5	7.6	8.8	
	24Vin(nom)	15.2	16.4	17.6	
Start up time	Constant resistive load		10	20	ms
Input surge voltage	1 second, max.	5Vin(nom)		15	
		12Vin(nom)		25	
		24Vin(nom)		40	

**OUTPUT SPECIFICATIONS**

Parameter	Conditions	Min.	Typ.	Max.	Unit
Voltage accuracy		-2.5		+2.5	%
Line regulation	Low Line to High Line at Full Load	-1.0		+1.0	%
Load regulation	10% Load to 100% Load	-3.0		+3.0	%
Minimum Load	Reference Characteristic Curve	0			%
Cross regulation	Asymmetrical load 25%/100% FL		±4		%
Ripple and noise	Measured by 20MHz bandwidth	3.3Vout,5Vout,±5Vout	100		mVp-p
		Others	125		
Temperature coefficient		-0.03		+0.03	%/°C
Transient response recovery time	25% load step change		300		μs
Short circuit protection					Continuous, automatics recovery

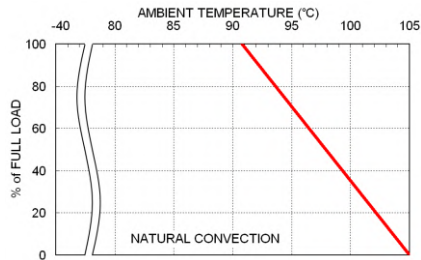
GENERAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output	5000			VAC
Isolation resistance	500VDC		10			GΩ
Isolation capacitance				10	20	pF
Leakage current	240VAC,60Hz				2	μA
Switching frequency			180		360	kHz
Clearance/Creepage			8.0			mm
Safety approvals	IEC/ EN/ ANSI/ AAMI ES60601-1 IEC/ EN/ UL62368-1					UL:E360199 UL:E193009 CB:UL(Demko)
Case material						Non-conductive black plastic
Base material						None
Potting material						Potting compound (UL94 V-0)
Weight						5.1g (0.18oz)
MTBF	MIL-HDBK-217F, Full load					1.302 x 10 <sup>7</sup> hrs

ENVIRONMENTAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Without derating		-40		+85	°C
Maximum case temperature					105	°C
Storage temperature range			-55		+125	°C
Operating altitude					5000	m
Thermal shock						MIL-STD-810F
Shock						MIL-STD-810F
Vibration						MIL-STD-810F
Relative humidity						5% to 95% RH

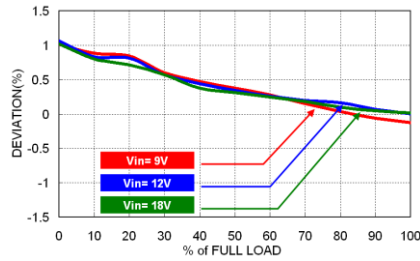
EMC SPECIFICATIONS			
Parameter	Conditions		Level
EMI	EN55011, EN55032, EN60601-1-2 With external components		Class A, Class B
EMS	EN55035 and EN60601-1-2		Perf. Criteria A
ESD	EN61000-4-2	Air ± 15kV and Contact ± 8kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV External input filter circuit is required, for further information, please contact P-DUKE.	Perf. Criteria A
Surge	EN61000-4-5	± 2kV External input filter circuit is required, for further information, please contact P-DUKE.	Perf. Criteria A
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.

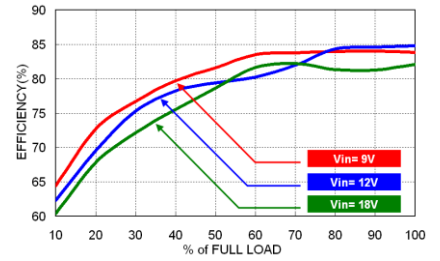
## CHARACTERISTIC CURVE



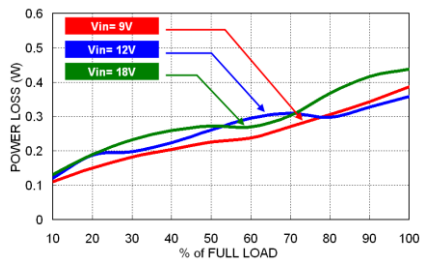
MPL02-12S12 Derating Curve



MPL02-12S12 Vout Deviation vs. Output Load



MPL02-12S12 Efficiency vs. Output Load



MPL02-12S12 Power Dissipation 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.

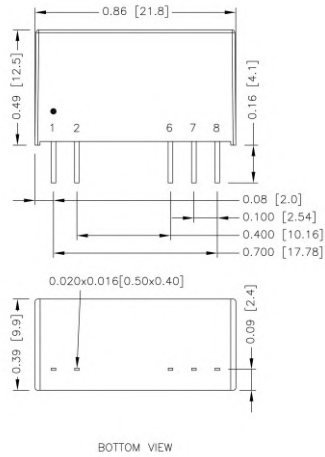
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Modules	Fuse Rating (A)	Fuse Type
MPL02-05S□□、MPL02-05D□□	1.00	Slow-Blow
MPL02-12S□□、MPL02-12D□□	0.50	Slow-Blow
MPL02-24S□□、MPL02-24D□□	0.315	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

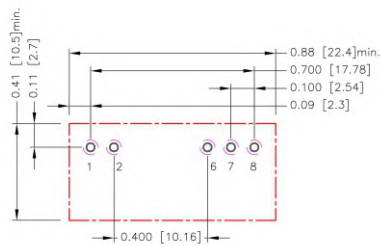


### PIN CONNECTION

PIN	SINGLE	DUAL
1	-Vin	-Vin
2	+Vin	+Vin
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout

1. All dimensions in inch [mm]
2. Tolerance :  $x.xx \pm 0.02$  [ $x.xx \pm 0.5$ ]  
 $x.xxx \pm 0.010$  [ $x.xx \pm 0.25$ ]
3. Pin dimension tolerance  $\pm 0.004$  [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 1.2.6.7.8:  $\varnothing 0.035$  [0.90]  
 Top view pad 1.2.6.7.8:  $\varnothing 0.043$  [1.10]  
 Bottom view pad 1.2.6.7.8:  $\varnothing 0.063$  [1.60]

## 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).

