P-DUKE POWER

MPS04 · MPH04 Series

DC-DC Converter
Up to 3.5 Watts

5 YEARS WARRANTY

RoHS COMPLIANT

REACH COMPLIANT



Medical
PV
Automation
Datacom
IPC
Industry
Measurement
Telecom
Automobile
Boat
Charger
Railway

c UL us CB CE UKCA

2 x MOPP | 5000 VAC Reinforced Insulation | 2 : 1 Input Range | LOW Leakage Current | Operating Altitude 5000 meter | REMOTE ON OFF | OVP | SCP | UVP

PART NUMBER STRUCTURE

MPS04 - 48 S 05

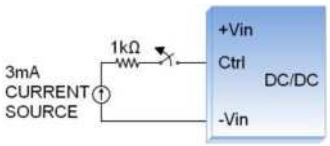
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)
MPS04: SMD type **MPH04:** DIP type	**05:**4.5~12 **12:**9~18 **24:**18~36 **48:**36~75	**S:**Single	**05:**5 **09:**9 **12:**12 **15:**15 **24:**24
		D:Dual	**12:**±12 **15:**±15

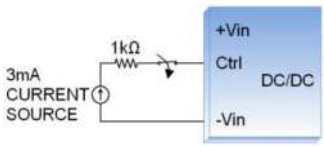
TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25℃ unless otherwise noted

Model Number	Input Range	Output Voltage	Output Current @ Full Load	Input Current @ No Load	Efficiency	Maximum Capacitor Load
	VDC	VDC	mA	mA	%	μF
MPS(H)04-05S05	4.5 ~ 12	5	700	70	77	1470
MPS(H)04-05S09	4.5 ~ 12	9	389	70	78	680
MPS(H)04-05S12	4.5 ~ 12	12	292	70	82	470
MPS(H)04-05S15	4.5 ~ 12	15	234	90	82	330
MPS(H)04-05S24	4.5 ~ 12	24	146	90	82	170
MPS(H)04-05D12	4.5 ~ 12	±12	±146	90	82	±220
MPS(H)04-05D15	4.5 ~ 12	±15	±117	95	81	±160
MPS(H)04-12S05	9 ~ 18	5	700	40	79	1470
MPS(H)04-12S09	9 ~ 18	9	389	40	79	680
MPS(H)04-12S12	9 ~ 18	12	292	45	82	470
MPS(H)04-12S15	9 ~ 18	15	234	45	82	330
MPS(H)04-12S24	9 ~ 18	24	146	50	82	170
MPS(H)04-12D12	9 ~ 18	±12	±146	50	82	±220
MPS(H)04-12D15	9 ~ 18	±15	±117	50	82	±160
MPS(H)04-24S05	18 ~ 36	5	700	25	79	1470
MPS(H)04-24S09	18 ~ 36	9	389	25	80	680
MPS(H)04-24S12	18 ~ 36	12	292	25	83	470
MPS(H)04-24S15	18 ~ 36	15	234	25	83	330
MPS(H)04-24S24	18 ~ 36	24	146	30	82	170
MPS(H)04-24D12	18 ~ 36	±12	±146	30	82	±220
MPS(H)04-24D15	18 ~ 36	±15	±117	30	82	±160
MPS(H)04-48S05	36 ~ 75	5	700	12	79	1470
MPS(H)04-48S09	36 ~ 75	9	389	12	80	680
MPS(H)04-48S12	36 ~ 75	12	292	13	82	470
MPS(H)04-48S15	36 ~ 75	15	234	13	82	330
MPS(H)04-48S24	36 ~ 75	24	146	13	82	170
MPS(H)04-48D12	36 ~ 75	±12	±146	13	82	±220
MPS(H)04-48D15	36 ~ 75	±15	±117	13	82	±160

INPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range		5Vin(nom)	4.5	5	12	VDC
		12Vin(nom)	9	12	18	
		24Vin(nom)	18	24	36	
		48Vin(nom)	36	48	75	
Start up voltage		5Vin(nom)			4.5	VDC
		12Vin(nom)			9	
		24Vin(nom)			18	
		48Vin(nom)			36	
Shutdown voltage		5Vin(nom)	2	3	4	VDC
		12Vin(nom)	6	7	8	
		24Vin(nom)	13	15	17	
		48Vin(nom)	29	32	35	
Start up time	Constant resistive load	Power up Remote ON/OFF		10	20	ms
Input surge voltage	1 second, max.	5Vin(nom)			15	VDC
		12Vin(nom)			25	
		24Vin(nom)			50	
		48Vin(nom)			100	
Input filter				Capacitor type		
Remote ON/OFF	Referred to –Vin pin and Ctrl pin applied current	DC-DC ON DC-DC OFF Remote off input current	Open or high impedance 2.0	 3.0 2.5	 4.0	mA 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	%
Load regulation	No Load to Full Load	Single	-1.0		+1.0	%
		Dual	-1.0		+1.0	
	10% Load to 90% Load	Single	-0.5		+0.5	%
		Dual	-0.8		+0.8	
Cross regulation	Asymmetrical load 25%/100% FL	Dual	-5.0		+5.0	%
Ripple and noise	Measured by 20MHz bandwidth	5Vout		50		mVp-p
		9Vout		50		
		12Vout		50		
		15Vout		50		
		24Vout		75		
		±12Vout		75		
		±15Vout		75		
Temperature coefficient			-0.02		+0.02	%/℃
Transient response recovery time	25% load step change			500		μs
Over voltage protection		5Vout	6.0		8.0	VDC
		9Vout	10.0		14.0	
		12Vout	13.0		19.0	
		15Vout	16.0		22.0	
		24Vout	25.0		35.0	
Short circuit protection			Continuous, automatics recovery			

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute Reinforced insulation for 250 VAC working voltage	5000			VAC
Isolation resistance	500VDC	10			GΩ
Isolation capacitance			16	20	pF
Leakage current	240VAC,60Hz			2	μA
Switching frequency		100			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					7.0g (0.24oz)
MTBF	MIL-HDBK-217F, Full load				5.041 x 10^6 hrs

ENVIRONMENTAL SPECIFICATIONS

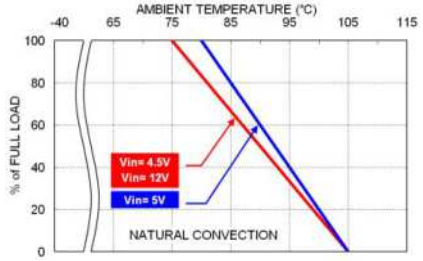
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating	-40		+105	℃
Maximum case temperature				105	℃
Storage temperature range		-55		+125	℃
Operating altitude				5000	m
Thermal shock					MIL-STD-810F
Shock					MIL-STD-810F
Vibration					MIL-STD-810F
Relative humidity					5% to 95% RH
Moisture sensitivity level(MSL)	Only for SMD type Verification according to IPC J-STD-020E				IPC J-STD-033C Level 2
Lead-free reflow solder process	Only for SMD type				The time above 217℃ 30~60sec. Peak temperature 245℃ max. Time above 240℃ 10sec. max.

EMC SPECIFICATIONS

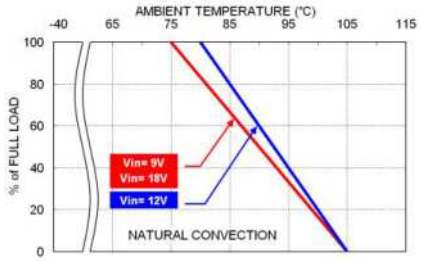
Parameter	Conditions		Level
EMI	EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15 With external components		Class A, Class B
EMS	EN55035 and EN60601-1-2		
ESD	EN61000-4-2	Air ± 15kV and Contact ± 8kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV	Perf. Criteria A
	MPS(H)04-05□□□	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 1000μF/25V)and a TVS(SMAJ18A, 18V, 400Watt peak pulse power) in parallel.	
	MPS(H)04-12□□□ MPS(H)04-24□□□	With an external input filter capacitor (Nippon chemi-con KY series, 470 μF/50V)	
	MPS(H)04-48□□□	With an external input filter capacitor (Nippon chemi-con KY series, 220 μF/100V)	
Surge	EN61000-4-5	± 1kV	Perf. Criteria A
	MPS(H)04-05□□□	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 1000μF/25V)and a TVS(SMAJ18A, 18V, 400Watt peak pulse power) in parallel.	
	MPS(H)04-12□□□ MPS(H)04-24□□□	With an external input filter capacitor (Nippon chemi-con KY series, 470 μF/50V)	
	MPS(H)04-48□□□	With an external input filter capacitor (Nippon chemi-con KY series, 220 μF/100V)	
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.

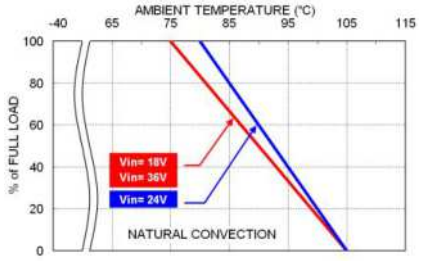
CHARACTERISTIC CURVE



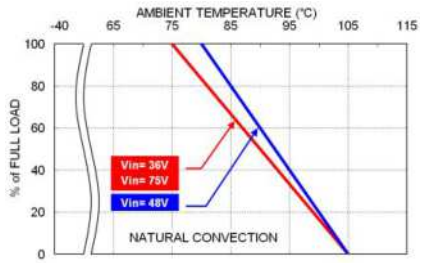
MPS(H)04-05□□□ Derating Curve



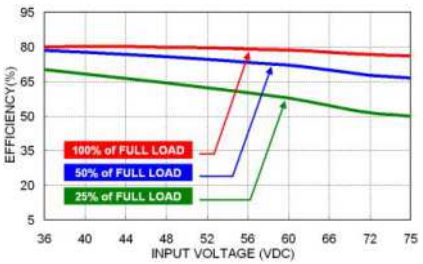
MPS(H)04-12□□□ Derating Curve



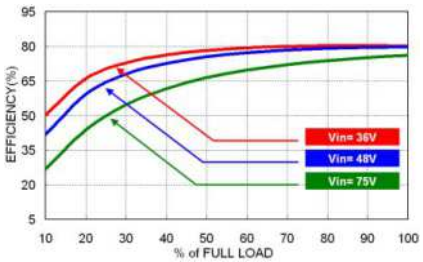
MPS(H)04-24□□□ Derating Curve



MPS(H)04-48□□□ Derating Curve



MPS(H)04-48S05 Efficiency vs. Input Voltage



MPS(H)04-48S05 Efficiency vs. Output Current

FUSE CONSIDERATION

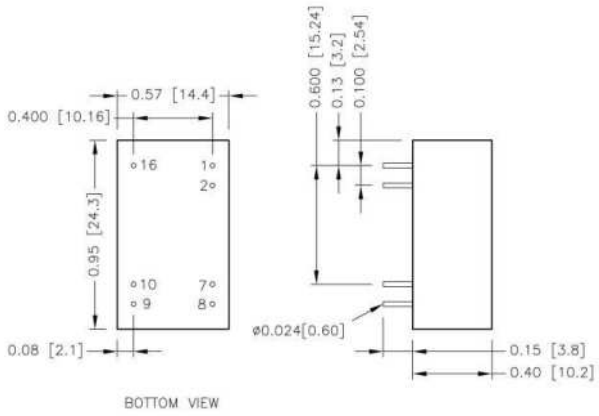
This power module is not internally fused. An input line fuse must always be used.
This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.
To maximum flexibility, internal fusing 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
MPS(H)04-05S□□、MPS(H)04-05D□□	1.6	Slow-Blow
MPS(H)04-12S□□、MPS(H)04-12D□□	0.8	Slow-Blow
MPS(H)04-24S□□、MPS(H)04-24D□□	0.5	Slow-Blow
MPS(H)04-48S□□、MPS(H)04-48D□□	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

MPH04

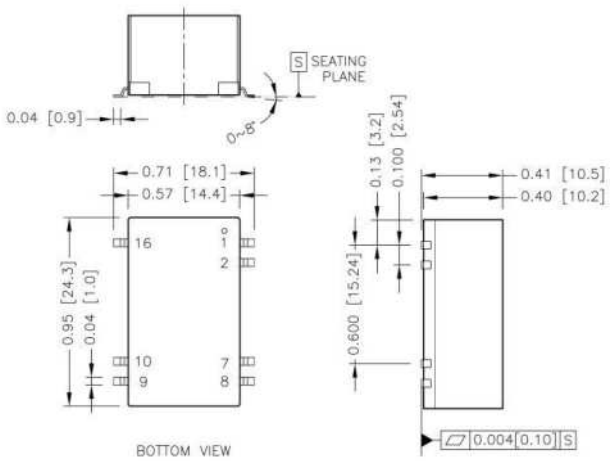


PIN CONNECTION

PIN	SINGLE	DUAL
1	-Vin	-Vin
2	Ctrl	Ctrl
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

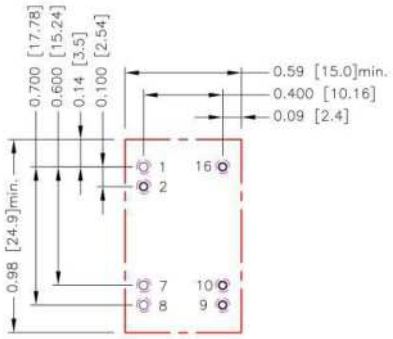
1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
   x.xxx±0.010 [x.xx±0.25]
3. Pin pitch tolerance ±0.010 [0.25]
4. Pin dimension tolerance ±0.004[0.10]

MPS04



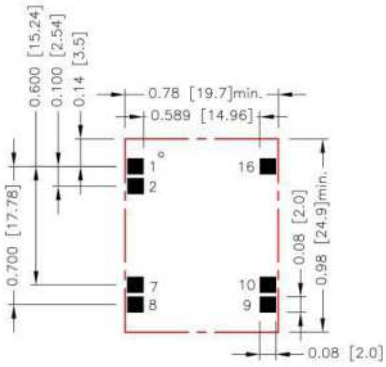
RECOMMENDED PAD LAYOUT

MPH04



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.7.8.9.10.16: ∅0.035[0.90]
Top view pad 1.2.7.8.9.10.16: ∅0.044[1.13]
Bottom view pad 1.2.7.8.9.10.16: ∅0.071[1.80]

MPS04

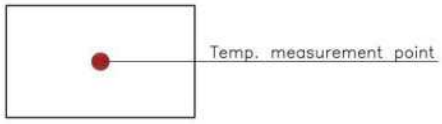


All dimensions in inch[mm]
Pad size(lead free recommended)
Top view pad:0.080x0.080[2.00x2.00]

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

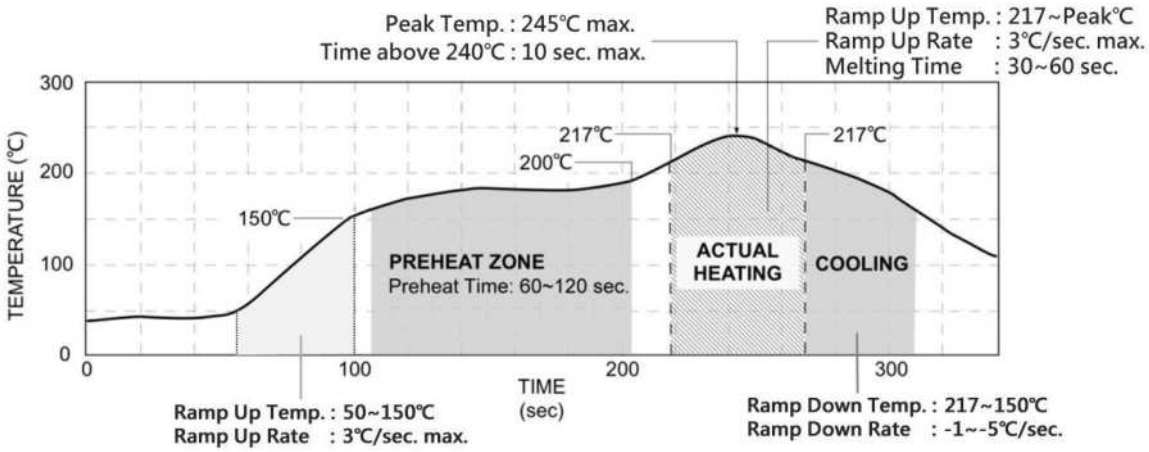
THERMAL CONSIDERATIONS

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.



TOP VIEW

LEAD FREE REFLOW PROFILE For SMD Type



*The curves define the maximum peak reflow temperature permissible measured on pin1 or Vin pin.

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