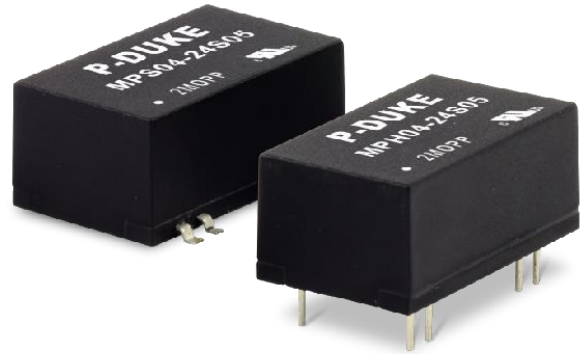


## Features

- 2:1 Wide Input 4.5~75V DC
- Operating Temperature Range: -40~105°C
- Approved to cURus, UKCA, CE, RoHS & REACH
- Safety Standards to IEC/UL/EN60601-1-2 and FCC
- Part 18 / 15
- Efficiency upto 83%
- EMC Class A &
- Single 3.5W Output Models



Ideal Power's 43MPH04-xyz 3.5W Series DC/DC Converters are certified to cURus, UKCA, CE, FCC, CB, RoHS, REACH & IEC/EN/ES 60601-1-2 & EN55024 Standards and comply with Efficiency Regulations. These are primarily used in ITE, Video & Audio, Medical Industries and customised solutions are available upon request.

### Part Number Structure

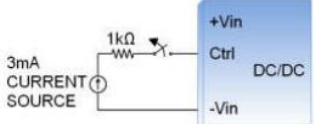
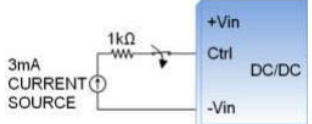
MPS04	-	48	S	05
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)
<b>MPS04:</b> SMD type		<b>05:</b> 4.5 ~ 12	<b>S:</b> Single	<b>05:</b> 5
<b>MPH04:</b> DIP type		<b>12:</b> 9 ~ 18		<b>09:</b> 9
		<b>24:</b> 18 ~ 36		<b>12:</b> 12
		<b>48:</b> 36 ~ 75		<b>15:</b> 15
				<b>24:</b>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

**Models**

Model Number	Input Range V DC	Output Voltage V DC	Output current @Full Load A	Input Current @ No Load A	Efficiency %	Maximum Capacitor Load μF
43MPH04-05S05	4.5 ~ 12	5	700	70	77	1470
43MPH04-05S09	4.5 ~ 12	9	389	70	78	680
43MPH04-05S12	4.5 ~ 12	12	292	70	82	470
43MPH04-05S15	4.5 ~ 12	15	234	90	82	330
43MPH04-05S24	4.5 ~ 12	24	146	90	82	170
43MPH04-05D12	4.5 ~ 12	±12	±146	90	82	±220
43MPH04-05D15	4.5 ~ 12	±15	±117	95	81	±160
43MPH04-12S05	9 ~ 18	5	700	40	79	1470
43MPH04-12S09	9 ~ 18	9	389	40	79	680
43MPH04-12S12	9 ~ 18	12	292	45	82	470
43MPH04-12S15	9 ~ 18	15	234	45	82	330
43MPH04-12S24	9 ~ 18	24	146	50	82	170
43MPH04-12D12	9 ~ 18	±12	±146	50	82	±220
43MPH04-12D15	9 ~ 18	±15	±117	50	82	±160
43MPH04-24S05	18 ~ 36	5	700	25	79	1470
43MPH04-24S09	18 ~ 36	9	389	25	80	680
43MPH04-24S12	18 ~ 36	12	292	25	83	470
43MPH04-24S15	18 ~ 36	15	234	25	83	330
43MPH04-24S24	18 ~ 36	24	146	30	82	170
43MPH04-24D12	18 ~ 36	±12	±146	30	82	±220
43MPH04-24D15	18 ~ 36	±15	±117	30	82	±160
43MPH04-48S05	36 ~ 75	5	700	12	79	1470
43MPH04-48S09	36 ~ 75	9	389	12	80	680
43MPH04-48S12	36 ~ 75	12	292	13	82	470
43MPH04-48S15	36 ~ 75	15	234	13	82	330
43MPH04-48S24	36 ~ 75	24	146	13	82	170
43MPH04-48D12	36 ~ 75	±12	±146	13	82	±220
43MPH04-48D15	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	V DC
	12Vin(nom)		9	12	18	
	24Vin(nom)		18	24	36	
	48Vin(nom)		36	48	75	
Start-up voltage	5Vin(nom)				4.5	V DC
	12Vin(nom)				9	
	24Vin(nom)				18	
	48Vin(nom)				36	
Shutdown voltage	5Vin(nom)		2	3	4	V DC
	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	5Vin(nom)				15	V DC
	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	Open or high impedance			
		DC-DC OFF	2.0	3.0	4.0	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	%
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	%/°C
Transient response recovery time	25% Load step change			500		µs
Over voltage protection	5Vout		6.0		8.0	V DC
	9Vout		10.0		14.0	
	12Vout		13.0		19.0	
	15Vout		16.0		22.0	
	24Vout		25.0		35.0	
Short circuit protection			Continuous, automatic recovery			

**General Specifications**

Parameter	Conditions	Min	Typ	Max	Unit
Isolation voltage	1 minute Reinforced insulation for 250 VAC working voltage	5000			V AC
Isolation resistance	500V DC	10			GΩ
Isolation capacitance			16	20	pF
Leakage current	240V AC, 60Hz			2	μA
Switching frequency		100			kHz
Clearance/Creepage		8			mm
Safety approvals	EC/ 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 <sup>6</sup> hrs

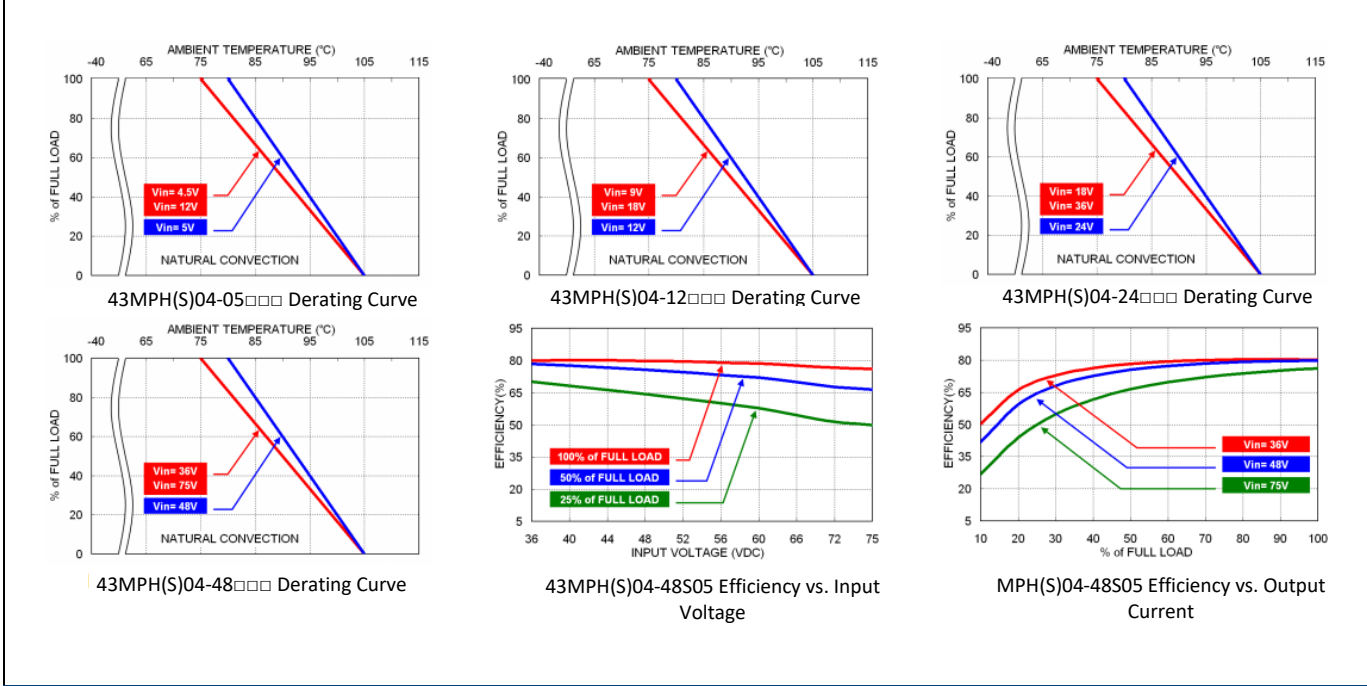
**Environmental Specifications**

Parameter	Conditions	Min	Typ	Max	Unit
Operating ambient temperature	With derating	-40		+105	°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
Lead-free reflow solder process	Only for SMD type				PC J-STD-020E
Moisture sensitivity level (MSL)	Only for SMD type				IPC J-STD-033C Level 2

## EMC Specifications

Parameter	Conditions		Level
EMI	EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15 With external components		Class A, Class B
EMS	EN55024 and EN60601-1-2		
ESD	EN61000-4-2	Air $\pm 15$ kV and Contact $\pm 8$ kV	
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	$\pm 2$ kV	Perf. Criteria A
	43MPH(S)04-05□□□	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 1000 $\mu$ F/25V) and a TVS (SMAJ18A, 18V, 400Watt peak pulse power) in parallel.	
	43MPH(S)04-12□□□ 43MPH(S)04-24□□□	With an external input filter capacitor (Nippon chemi-con KY series, 470 $\mu$ F/50V)	
Surge	EN61000-4-5	$\pm 1$ kV	Perf. Criteria A
	43MPH(S)04-05□□□	With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 1000 $\mu$ F/25V) and a TVS (SMAJ18A, 18V, 400Watt peak pulse power) in parallel	
	43MPH(S)04-12□□□ 43MPH(S)04-24□□□	With an external input filter capacitor (Nippon chemi-con KY series, 470 $\mu$ F/50V)	
Conducted immunity	EN61000-4-6	10 Vr.m.s	Perf. Criteria A
	EN61000-4-8	100A/m continuous, 1000A/m 1 second	
Power frequency magnetic field	EN61000-4-8	100A/m continuous, 1000A/m 1 second	Perf. Criteria A

## Characteristic Curve



### Fuse Considerations

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.

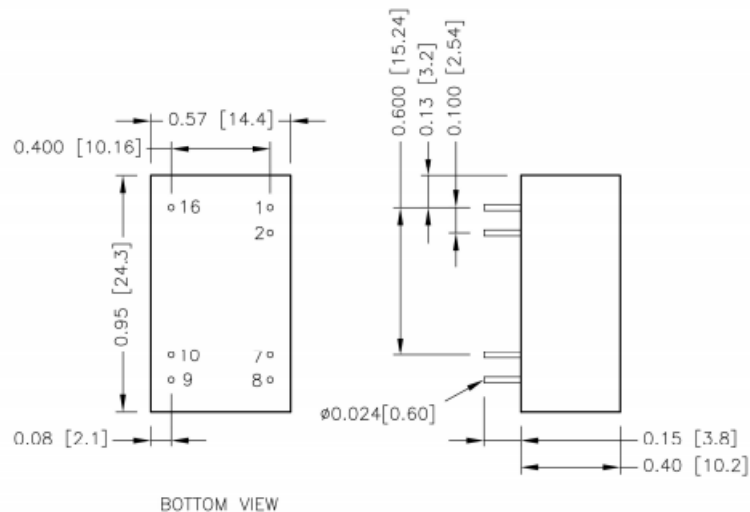
The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
43MPH(S)04-05S□□, 43MPH(S)04-05D□□	1.6	Slow-Blow
43MPH(S)04-12S□□, 43MPH(S)04-12D□□	0.8	Slow-Blow
43MPH(S)04-24S□□, 43MPH(S)04-24D□□	0.5	Slow-Blow
43MPH(S)04-48S□□, 43MPH(S)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

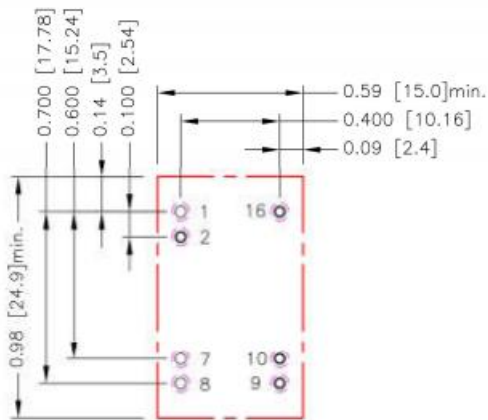
#### MPH04



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]

### 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

**Recommended Pad Layout**
**MPH04**


All dimensions in inch[mm]

Pad size (lead free recommended)

Through hole 1.2.7.8.9.10.16:  $\varnothing 0.035$ [0.90]

Top view pad 1.2.7.8.9.10.16:  $\varnothing 0.044$ [1.13]

Bottom view pad 1.2.7.8.9.10.16:  $\varnothing 0.071$ [1.80]

**Thermal Considerations**

The power module operates in a variety of thermal environments.

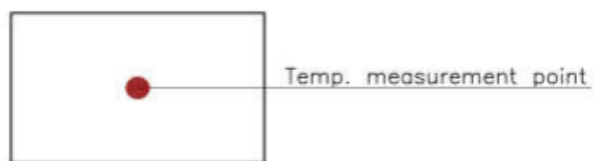
However, sufficient cooling should be provided to help ensure reliable operation of the unit.

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