



# P-DUKE POWER

## PDS03 · PDH03 Series

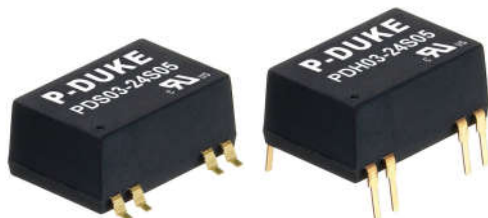
DC-DC Converter  
Up to 3 Watts

### 3

YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway

c US

CB CE

**3000**  
VDC  
Isolation  
Voltage

**1600**  
VDC  
Isolation  
Voltage

**2 : 1**  
Input  
Range

**TINY**  
Output  
Ripple

**NO**  
Min. Load  
Required

**REMOTE**  
**ON**  
**OFF**

**SCP**

### PART NUMBER STRUCTURE

**PDS03** -

**48**

**S**

**05**

**H**

Series Name

Input  
Voltage  
(VDC)

Output  
Quantity

Output  
Voltage  
(VDC)

Isolation  
Option

**PDS**: SMD type  
**PDH**: DIP type

**05**: 4.5~9  
**12**: 9~18  
**24**: 18~36  
**48**: 36~75

**S**: Single

**3P3**: 3.3  
**05**: 5  
**09**: 9  
**12**: 12  
**15**: 15

**D**: Dual

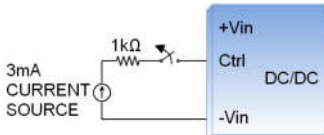
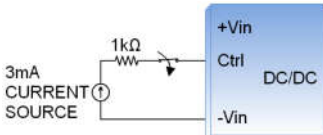
**05**: ±5  
**12**: ±12  
**15**: ±15

**□**: Standard type  
**H**: 3000VDC isolation

**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                     |
| PDS(H)03-05S3P3 | 4.5 ~ 9     | 3.3            | 700                       | 40                      | 75         | 3300                   |
| PDS(H)03-05S05  | 4.5 ~ 9     | 5              | 600                       | 40                      | 79         | 1680                   |
| PDS(H)03-05S09  | 4.5 ~ 9     | 9              | 333                       | 40                      | 79         | 1000                   |
| PDS(H)03-05S12  | 4.5 ~ 9     | 12             | 250                       | 40                      | 80         | 820                    |
| PDS(H)03-05S15  | 4.5 ~ 9     | 15             | 200                       | 50                      | 81         | 680                    |
| PDS(H)03-05D05  | 4.5 ~ 9     | ±5             | ±300                      | 50                      | 80         | ±1000                  |
| PDS(H)03-05D12  | 4.5 ~ 9     | ±12            | ±125                      | 50                      | 80         | ±470                   |
| PDS(H)03-05D15  | 4.5 ~ 9     | ±15            | ±100                      | 55                      | 81         | ±330                   |
| PDS(H)03-12S3P3 | 9 ~ 18      | 3.3            | 700                       | 30                      | 76         | 3300                   |
| PDS(H)03-12S05  | 9 ~ 18      | 5              | 600                       | 30                      | 81         | 1680                   |
| PDS(H)03-12S09  | 9 ~ 18      | 9              | 333                       | 30                      | 80         | 1000                   |
| PDS(H)03-12S12  | 9 ~ 18      | 12             | 250                       | 30                      | 82         | 820                    |
| PDS(H)03-12S15  | 9 ~ 18      | 15             | 200                       | 30                      | 82         | 680                    |
| PDS(H)03-12D05  | 9 ~ 18      | ±5             | ±300                      | 30                      | 80         | ±1000                  |
| PDS(H)03-12D12  | 9 ~ 18      | ±12            | ±125                      | 30                      | 82         | ±470                   |
| PDS(H)03-12D15  | 9 ~ 18      | ±15            | ±100                      | 30                      | 83         | ±330                   |
| PDS(H)03-24S3P3 | 18 ~ 36     | 3.3            | 700                       | 13                      | 76         | 3300                   |
| PDS(H)03-24S05  | 18 ~ 36     | 5              | 600                       | 13                      | 81         | 1680                   |
| PDS(H)03-24S09  | 18 ~ 36     | 9              | 333                       | 13                      | 82         | 1000                   |
| PDS(H)03-24S12  | 18 ~ 36     | 12             | 250                       | 13                      | 82         | 820                    |
| PDS(H)03-24S15  | 18 ~ 36     | 15             | 200                       | 13                      | 83         | 680                    |
| PDS(H)03-24D05  | 18 ~ 36     | ±5             | ±300                      | 13                      | 80         | ±1000                  |
| PDS(H)03-24D12  | 18 ~ 36     | ±12            | ±125                      | 13                      | 83         | ±470                   |
| PDS(H)03-24D15  | 18 ~ 36     | ±15            | ±100                      | 13                      | 83         | ±330                   |
| PDS(H)03-48S3P3 | 36 ~ 75     | 3.3            | 700                       | 10                      | 76         | 3300                   |
| PDS(H)03-48S05  | 36 ~ 75     | 5              | 600                       | 10                      | 81         | 1680                   |
| PDS(H)03-48S09  | 36 ~ 75     | 9              | 333                       | 10                      | 80         | 1000                   |
| PDS(H)03-48S12  | 36 ~ 75     | 12             | 250                       | 10                      | 82         | 820                    |
| PDS(H)03-48S15  | 36 ~ 75     | 15             | 200                       | 10                      | 82         | 680                    |
| PDS(H)03-48D05  | 36 ~ 75     | ±5             | ±300                      | 10                      | 81         | ±1000                  |
| PDS(H)03-48D12  | 36 ~ 75     | ±12            | ±125                      | 10                      | 83         | ±470                   |
| PDS(H)03-48D15  | 36 ~ 75     | ±15            | ±100                      | 10                      | 83         | ±330                   |

## INPUT SPECIFICATIONS

| Parameter                     | Conditions                                                                        |                                                      | Min.                                                                               | Typ.                | Max.                  | Unit     |
|-------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------------------------------------------|---------------------|-----------------------|----------|
| Operating input voltage range |                                                                                   | 05Vin(nom)<br>12Vin(nom)<br>24Vin(nom)<br>48Vin(nom) | 4.5<br>9<br>18<br>36                                                               | 5<br>12<br>24<br>48 | 9<br>18<br>36<br>75   | VDC      |
| Start up time                 | Constant resistive load                                                           | Power up<br>Remote ON/OFF                            |                                                                                    | 5<br>5              |                       | ms       |
| Input surge voltage           | 1 second, max.                                                                    | 05Vin(nom)<br>12Vin(nom)<br>24Vin(nom)<br>48Vin(nom) |                                                                                    |                     | 15<br>25<br>50<br>100 | VDC      |
| Input filter                  |                                                                                   |                                                      | Capacitor type                                                                     |                     |                       |          |
| Remote ON/OFF                 | Ctrl pin applied current via 1kΩ                                                  | DC-DC ON<br>DC-DC OFF<br>Remote off input current    | Open or high impedance                                                             |                     |                       |          |
|                               | Application circuit<br>DC-DC ON                                                   | DC-DC OFF                                            | 2                                                                                  | 3                   | 4<br>2.5              | mA<br>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<br>Single<br>Dual<br>10% Load to 100% Full Load<br>Single<br>Dual | -1.0<br>-1.0<br>-0.5<br>-0.8 |      | +1.0<br>+1.0<br>+0.5<br>+0.8   | %     |
| Cross regulation                 | Asymmetrical load 25%/100% FL<br>Dual                                                  | -5.0                         |      | +5.0                           | %     |
| Ripple and noise                 | 20MHz bandwidth                                                                        |                              | 30   |                                | mVp-p |
| Temperature coefficient          |                                                                                        | -0.02                        |      | +0.02                          | %/°C  |
| Transient response recovery time | 25% load step change                                                                   |                              | 250  |                                | μs    |
| Short circuit protection         |                                                                                        |                              |      | Continuous, automatic recovery |       |

## GENERAL SPECIFICATIONS

| Parameter             | Conditions                                                 | Min.         | Typ. | Max.                        | Unit       |
|-----------------------|------------------------------------------------------------|--------------|------|-----------------------------|------------|
| Isolation voltage     | 1 minute<br>Input to Output<br>Standard Type<br>Suffix "H" | 1600<br>3000 |      |                             | VDC        |
| Isolation resistance  | 500VDC                                                     | 1            |      |                             | G $\Omega$ |
| Isolation capacitance | Standard Type<br>Suffix "H"                                |              |      | 50<br>50                    | pF         |
| Switching frequency   | Full load to minimum load                                  | 100          |      |                             | kHz        |
| Safety approvals      | IEC /UL/ EN60950-1                                         |              |      | UL:E193009<br>CB:UL(Demko)  |            |
| Weight                |                                                            |              |      | 4.5g (0.16oz)               |            |
| MTBF                  | MIL-HDBK-217F                                              |              |      | 6.263 x 10 <sup>6</sup> hrs |            |

## ENVIRONMENTAL SPECIFICATIONS

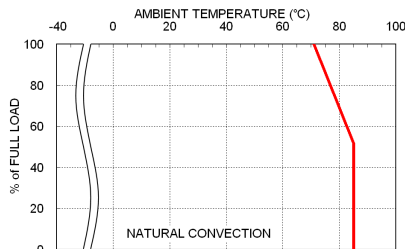
| Parameter                       | Conditions                        | Min.       | Typ. | Max.                       | Unit |
|---------------------------------|-----------------------------------|------------|------|----------------------------|------|
| Operating ambient temperature   | Without derating<br>With derating | -40<br>+71 |      | +71<br>+85                 | °C   |
| Maximum case temperature        |                                   |            |      | 100                        | °C   |
| Storage temperature range       |                                   | -55        |      | +125                       | °C   |
| Thermal shock                   |                                   |            |      | MIL-STD-810F               |      |
| Vibration                       |                                   |            |      | MIL-STD-810F               |      |
| Relative humidity               |                                   |            |      | 5% to 95% RH               |      |
| Lead-free reflow solder process | Only for SMD type                 |            |      | IPC J-STD-020E             |      |
| Moisture sensitivity level(MSL) | Only for SMD type                 |            |      | IPC J-STD-033C<br>Level 2a |      |

## EMC SPECIFICATIONS

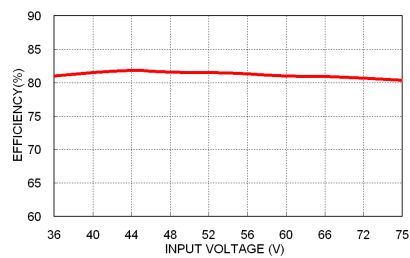
| Parameter                      | Conditions                                                                                                                                                                                                | Level             |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| EMI                            | EN55032 With external components                                                                                                                                                                          | Class A , Class B |
| ESD                            | EN61000-4-2 Air $\pm$ 8kV and Contact $\pm$ 6kV                                                                                                                                                           | Perf. Criteria A  |
| Radiated immunity              | EN61000-4-3 10 V/m                                                                                                                                                                                        | Perf. Criteria A  |
| Fast transient                 | EN61000-4-4 $\pm$ 2kV                                                                                                                                                                                     | Perf. Criteria A  |
| Surge                          | EN61000-4-5 With an external input filter capacitor (Nippon chemi-con KY series, 220 $\mu$ F/100V)<br>$\pm$ 1kV<br>With an external input filter capacitor (Nippon chemi-con KY series, 220 $\mu$ F/100V) | 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.

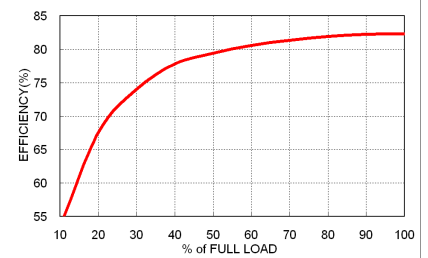
## CHARACTERISTIC CURVE



PDS03-48S05 Derating Curve



PDS03-48S05 Efficiency vs. Input Voltage



PDS03-48S05 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.

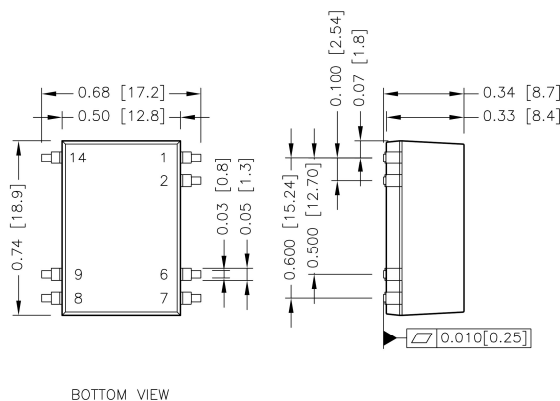
The input line fuse suggest as below :

| Model                         | Fuse Rating (A) | Fuse Type |
|-------------------------------|-----------------|-----------|
| PDS(H)03-05S□□、PDS(H)03-05D□□ | 3               | Slow-Blow |
| PDS(H)03-12S□□、PDS(H)03-12D□□ | 3               | Slow-Blow |
| PDS(H)03-24S□□、PDS(H)03-24D□□ | 1.5             | Slow-Blow |
| PDS(H)03-48S□□、PDS(H)03-48D□□ | 1.5             | 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

### PDS03



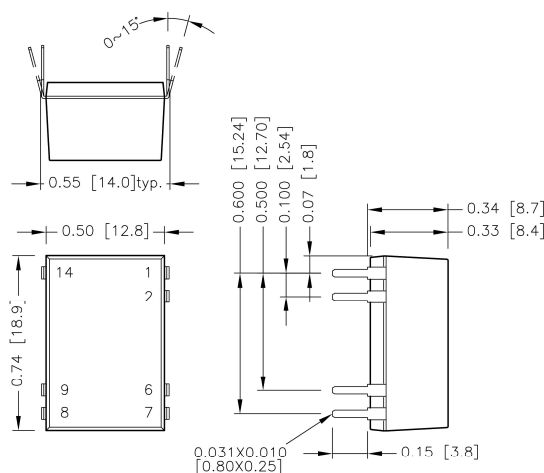
BOTTOM VIEW

### PIN CONNECTION

| PIN | SINGLE | DUAL   |
|-----|--------|--------|
| 1   | -Vin   | -Vin   |
| 2   | Ctrl   | Ctrl   |
| 6   | NC     | Common |
| 7   | NC     | -Vout  |
| 8   | +Vout  | +Vout  |
| 9   | -Vout  | Common |
| 14  | +Vin   | +Vin   |

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]

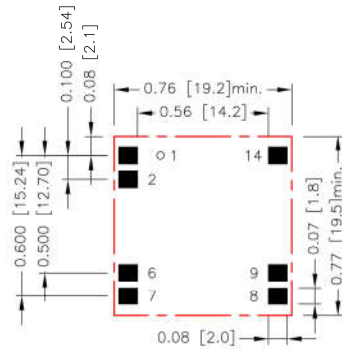
### PDH03



BOTTOM VIEW

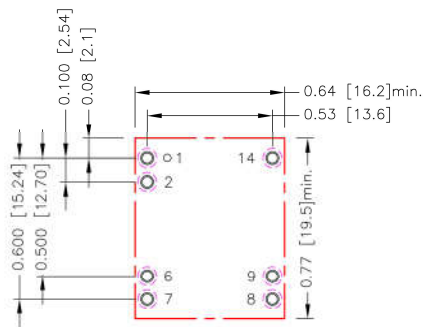
## RECOMMENDED PAD LAYOUT

### PDS03



All dimensions in inch[mm]  
Pad size(lead free recommended)  
Top view pad:0.080x0.070[2.00x1.80]

### PDH03



All dimensions in inch[mm]  
Pad size(lead free recommended)  
Through hole1.2.6.7.8.9.14:  $\Phi 0.043$ [1.10]  
Top view pad1.2.6.7.8.9.14:  $\Phi 0.055$ [1.40]  
Bottom view pad1.2.6.7.8.9.14:  $\Phi 0.080$ [2.04]

## 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.

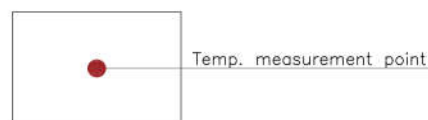
Proper cooling can be verified by measuring the point as the figure below.

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".

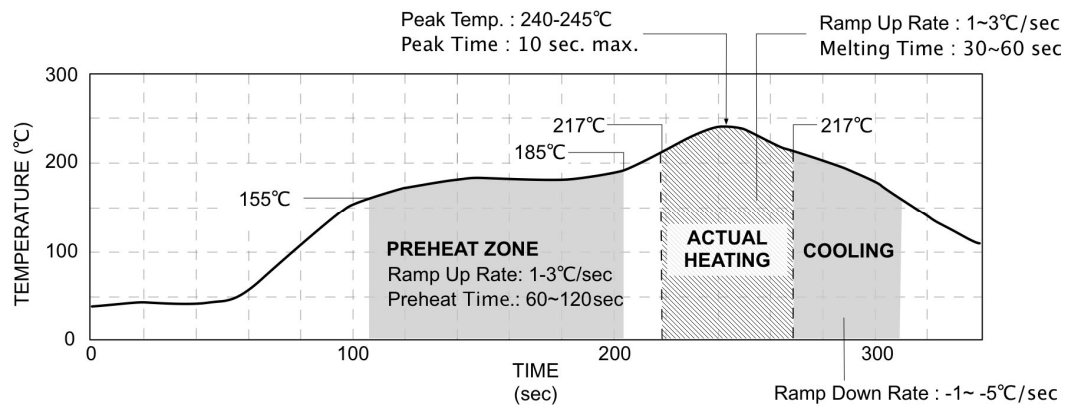
You can limit this Temperature to a lower value for extremely high reliability.

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



TOP VIEW

### LEAD FREE REFLOW PROFILE For SMD Type



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