



P-DUKE POWER

PDS02 • PDH02 Series

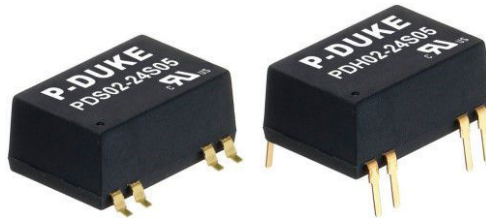
DC-DC Converter
Up to 2 Watts

3

YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



3000
VDC
Isolation
Voltage

1600
VDC
Isolation
Voltage

2 : 1
Input
Range

TINY
Output
Ripple

NO
Min. Load
Required

REMOTE
ON
OFF

SCP

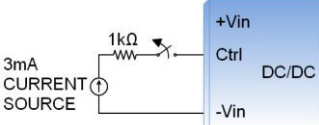
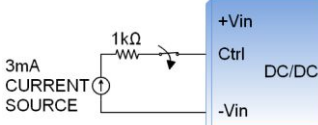
PART NUMBER STRUCTURE

| | | | | |
|----------------|---------------------|-----------------|----------------------|-------------------|
| PDS02 - | 48 | S | 05 | H |
| Series Name | Input Voltage (VDC) | Output Quantity | Output Voltage (VDC) | Isolation Options |

| | | | | |
|--|---|--|--|---|
| PDS : SMD type PDH : DIP type | 05 :4.5~9 12 :9~18 24 :18~36 48 :36~75 | S :Single D :Dual | 3P3 :3.3 05 :5 09 :9 12 :12 15 :15 05 :±5 12 :±12 15 :±15 | <input type="checkbox"/> :Standard type 1600VDC isolation 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)02-05S3P3 | 4.5 ~ 9 | 3.3 | 500 | 35 | 74 | 3300 |
| PDS(H)02-05S05 | 4.5 ~ 9 | 5 | 400 | 35 | 80 | 1680 |
| PDS(H)02-05S09 | 4.5 ~ 9 | 9 | 222 | 40 | 79 | 1000 |
| PDS(H)02-05S12 | 4.5 ~ 9 | 12 | 167 | 35 | 81 | 820 |
| PDS(H)02-05S15 | 4.5 ~ 9 | 15 | 134 | 40 | 83 | 680 |
| PDS(H)02-05D05 | 4.5 ~ 9 | ±5 | ±200 | 40 | 78 | ±1000 |
| PDS(H)02-05D12 | 4.5 ~ 9 | ±12 | ±83 | 40 | 81 | ±470 |
| PDS(H)02-05D15 | 4.5 ~ 9 | ±15 | ±67 | 40 | 82 | ±330 |
| PDS(H)02-12S3P3 | 9 ~ 18 | 3.3 | 500 | 20 | 75 | 3300 |
| PDS(H)02-12S05 | 9 ~ 18 | 5 | 400 | 20 | 81 | 1680 |
| PDS(H)02-12S09 | 9 ~ 18 | 9 | 222 | 20 | 79 | 1000 |
| PDS(H)02-12S12 | 9 ~ 18 | 12 | 167 | 20 | 81 | 820 |
| PDS(H)02-12S15 | 9 ~ 18 | 15 | 134 | 20 | 84 | 680 |
| PDS(H)02-12D05 | 9 ~ 18 | ±5 | ±200 | 25 | 78 | ±1000 |
| PDS(H)02-12D12 | 9 ~ 18 | ±12 | ±83 | 25 | 83 | ±470 |
| PDS(H)02-12D15 | 9 ~ 18 | ±15 | ±67 | 25 | 82 | ±330 |
| PDS(H)02-24S3P3 | 18 ~ 36 | 3.3 | 500 | 10 | 75 | 3300 |
| PDS(H)02-24S05 | 18 ~ 36 | 5 | 400 | 10 | 81 | 1680 |
| PDS(H)02-24S09 | 18 ~ 36 | 9 | 222 | 10 | 79 | 1000 |
| PDS(H)02-24S12 | 18 ~ 36 | 12 | 167 | 10 | 84 | 820 |
| PDS(H)02-24S15 | 18 ~ 36 | 15 | 134 | 10 | 84 | 680 |
| PDS(H)02-24D05 | 18 ~ 36 | ±5 | ±200 | 10 | 79 | ±1000 |
| PDS(H)02-24D12 | 18 ~ 36 | ±12 | ±83 | 10 | 84 | ±470 |
| PDS(H)02-24D15 | 18 ~ 36 | ±15 | ±67 | 10 | 84 | ±330 |
| PDS(H)02-48S3P3 | 36 ~ 75 | 3.3 | 500 | 7 | 75 | 3300 |
| PDS(H)02-48S05 | 36 ~ 75 | 5 | 400 | 7 | 81 | 1680 |
| PDS(H)02-48S09 | 36 ~ 75 | 9 | 222 | 7 | 79 | 1000 |
| PDS(H)02-48S12 | 36 ~ 75 | 12 | 167 | 7 | 82 | 820 |
| PDS(H)02-48S15 | 36 ~ 75 | 15 | 134 | 7 | 82 | 680 |
| PDS(H)02-48D05 | 36 ~ 75 | ±5 | ±200 | 7 | 78 | ±1000 |
| PDS(H)02-48D12 | 36 ~ 75 | ±12 | ±83 | 7 | 83 | ±470 |
| PDS(H)02-48D15 | 36 ~ 75 | ±15 | ±67 | 7 | 83 | ±330 |

| INPUT SPECIFICATIONS | | | | | | | | |
|-------------------------------|----------------------------------|---|--|----------------|------|------------------------|------|-----|
| Parameter | Conditions | | | Min. | Typ. | Max. | Unit | |
| Operating input voltage range | 05Vin(nom) | | | 4.5 | 5 | 9 | VDC | |
| | 12Vin(nom) | | | 9 | 12 | 18 | | |
| | 24Vin(nom) | | | 18 | 24 | 36 | | |
| | 48Vin(nom) | | | 36 | 48 | 75 | | |
| Start up time | Constant resistive load | Power up | | 5 | | | ms | |
| | | Remote ON/OFF | | 5 | | | | |
| Input surge voltage | 1 second, max. | 05Vin(nom) | | | | | 15 | VDC |
| | | 12Vin(nom) | | | | | 25 | |
| | | 24Vin(nom) | | | | | 50 | |
| | | 48Vin(nom) | | | | | 100 | |
| Input filter | | | | Capacitor type | | | | |
| Remote ON/OFF | Ctrl pin applied current via 1kΩ | DC-DC ON | | | | Open or high impedance | | |
| | | DC-DC OFF | | 2 | 3 | 4 | mA | |
| | | Remote off input current | | | | 2.5 | mA | |
| Application circuit | | DC-DC ON | DC-DC OFF | | | | | |
| | |  |  | | | | | |

| 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 100% Full Load | Single | | -0.5 | | +0.5 | |
| | | Dual | | -0.8 | | +0.8 | |
| Cross regulation | Asymmetrical load 25%/100% FL | Dual | | | | +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 | Input to Output | Standard Type | 1600 | | | VDC |
| | | | Suffix "H" | 3000 | | | |
| Isolation resistance | 500VDC | | | 1 | | | GΩ |
| Isolation capacitance | | | | Standard Type | | | pF |
| | | | | Suffix "H" | | | |
| Switching frequency | Full load to minimum load | | | 100 | | | kHz |
| Safety approvals | IEC/ EN/ UL62368-1 | | | | | | UL:E193009 CB:UL(Demko) |
| Weight | | | | | | | 4.5g (0.16oz) |
| MTBF | MIL-HDBK-217F | | | | | | 7.137 x 10 ⁶ hrs |

ENVIRONMENTAL SPECIFICATIONS

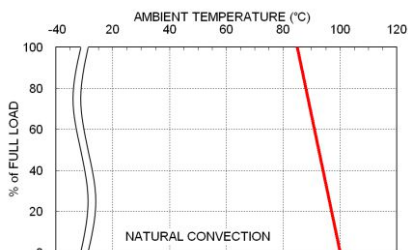
| Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---------------------------------|---|------------|------|-------------|---|
| Operating ambient temperature | Without derating With derating | -40 +85 | | +85 +100 | °C |
| Maximum case temperature | | | | 100 | °C |
| Storage temperature range | | -55 | | +125 | °C |
| Thermal shock | | | | | MIL-STD-810F |
| Vibration | | | | | MIL-STD-810F |
| Relative humidity | | | | | 5% to 95% RH |
| Moisture sensitivity level(MSL) | Only for SMD type Verification according to IPC J-STD-020E | | | | IPC J-STD-033C Level 2a |
| Lead-free reflow solder process | Only for SMD type | | | | The time above 217°C 30~60sec. Peak temperature 245°C max. Time above 240°C 10sec. max. |

EMC SPECIFICATIONS

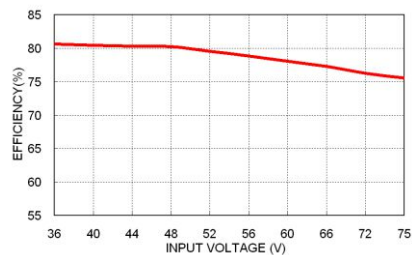
| Parameter | Conditions | Level |
|--------------------------------|---|------------------|
| EMI | EN55032 With external components | Class A, Class B |
| EMS | EN55035 | |
| ESD | EN61000-4-2 Air ± 8kV and Contact ± 6kV | Perf. Criteria A |
| Radiated immunity | EN61000-4-3 10 V/m | Perf. Criteria A |
| Fast transient | EN61000-4-4 ± 2kV | Perf. Criteria A |
| Surge | EN61000-4-5 ±1kV With an external input filter capacitor (Nippon chemi-con KY series, 220µF/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.

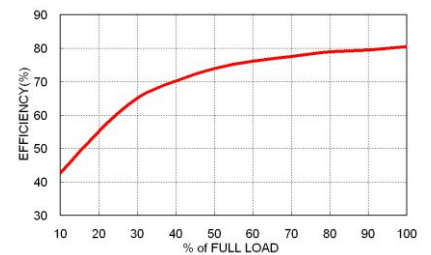
CHARACTERISTIC CURVE



PDS02-48S05 Derating Curve



PDS02-48S05 Efficiency vs. Input Voltage



PDS02-48S05 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.

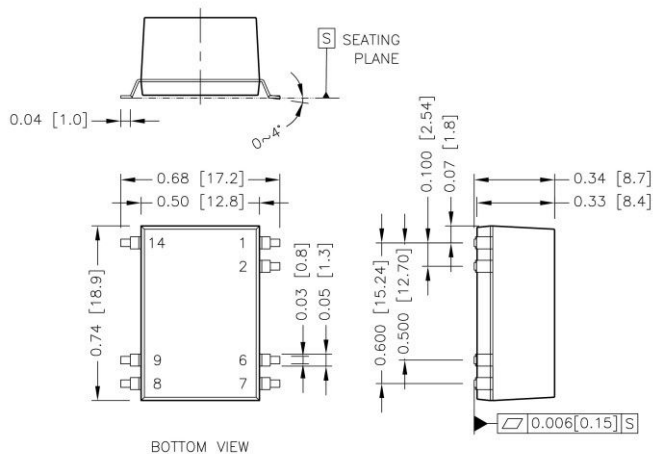
The input line fuse suggest as below :

| Model | Fuse Rating (A) | Fuse Type |
|-------------------------------|-----------------|-----------|
| PDS(H)02-05S□□、PDS(H)02-05D□□ | 2 | Slow-Blow |
| PDS(H)02-12S□□、PDS(H)02-12D□□ | 1.5 | Slow-Blow |
| PDS(H)02-24S□□、PDS(H)02-24D□□ | 1 | Slow-Blow |
| PDS(H)02-48S□□、PDS(H)02-48D□□ | 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

PDS02



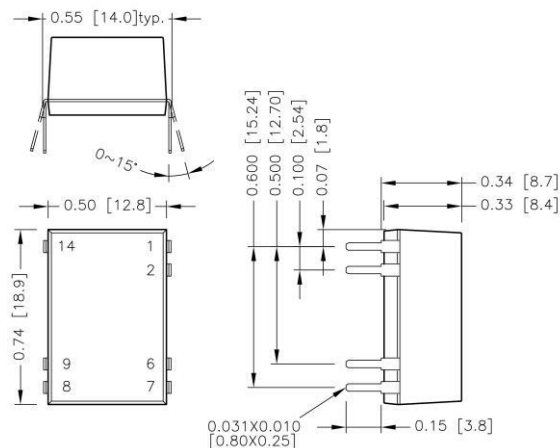
BOTTOM VIEW

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 |

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

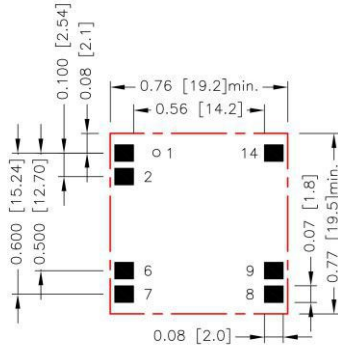
PDH02



BOTTOM VIEW

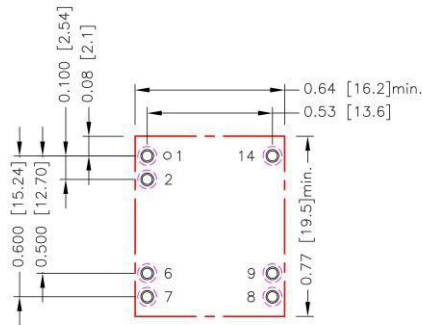
RECOMMENDED PAD LAYOUT

PDS02



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

PDH02

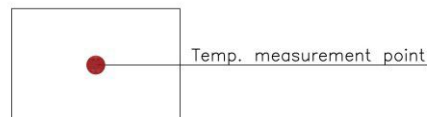


All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole1.2.6.7.8.9.14: Φ 0.043[1.10]
Top view pad1.2.6.7.8.9.14: Φ 0.055[1.40]
Bottom view pad1.2.6.7.8.9.14: Φ 0.080[2.04]

THERMAL CONSIDERATIONS

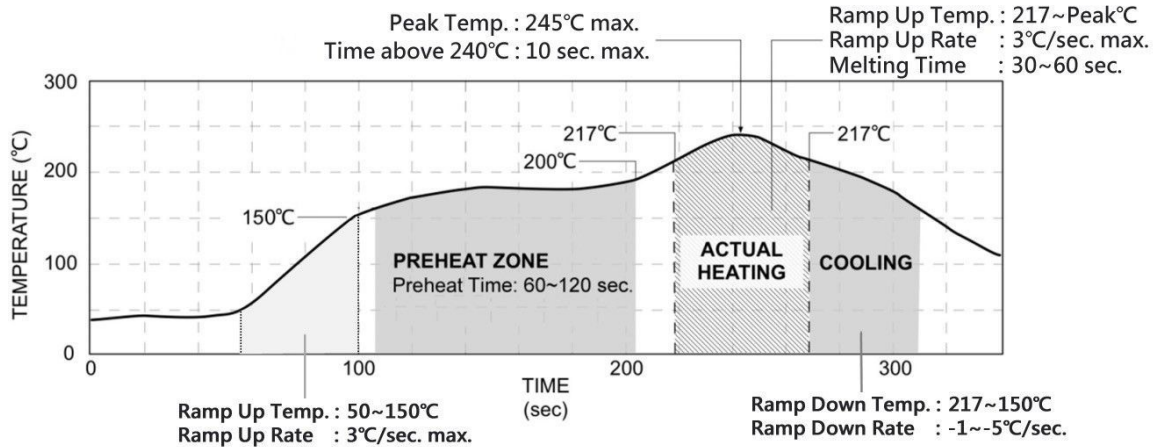
The power module operates in a variety of thermal environments. However, sufficient cooling should be provided to help ensure reliable operation of the unit. Heat is removed by conduction, convection, and radiation to the surrounding environment. Proper cooling can be verified by measuring the point 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.