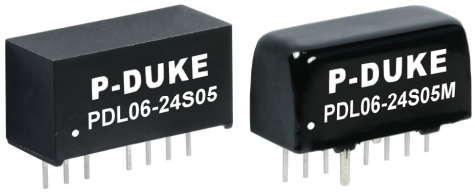
POWER MATE TECHNOLOGY CO., LTD.

# PDL06 SERIES

**DC-DC CONVERTER**

**2:1 WIDE INPUT RANGE**
**UP TO 6 Watts**




## FEATURES

- NO MINIMUM LOAD REQUIRED
- UP TO 3000VDC INPUT TO OUTPUT ISOLATION
- SMALL SIZE AND LOW PROFILE：0.86 X 0.36 X 0.44 INCH
- LOW OUTPUT RIPPLE AND NOISE
- UL60950-1, EN60950-1, & IEC60950-1 SAFETY APPROVALS
- CE MARKED
- COMPLIANT TO RoHS II & REACH

## APPLICATIONS

- WIRELESS NETWORK
- TELECOM/DATACOM
- INDUSTRY CONTROL SYSTEM
- DISTRIBUTED POWER ARCHITECTURES
- SEMICONDUCTOR EQUIPMENT

| 3000VDC ISOLATION | 1600VDC ISOLATION | REMOTE CONTROL | OCP | SCP |
|---|---|---|---|---|

## TECHNICAL SPECIFICATION

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

| Model Number | Input Range VDC | Output Voltage VDC | Output Current @Full Load mA | Input Current @ No Load mA | Efficiency % | Maximum Capacitor Load μF |
|---|---|---|---|---|---|---|
| PDL06-05S3P3 | 4.5 ~ 9 | 3.3 | 1300 | 65mA | 77 | 6600 |
| PDL06-05S05 | 4.5 ~ 9 | 5 | 1200 | 105mA | 81 | 3300 |
| PDL06-05S09 | 4.5 ~ 9 | 9 | 666 | 105mA | 83 | 2000 |
| PDL06-05S12 | 4.5 ~ 9 | 12 | 500 | 105mA | 84 | 1600 |
| PDL06-05S15 | 4.5 ~ 9 | 15 | 400 | 105mA | 84 | 1400 |
| PDL06-05S24 | 4.5 ~ 9 | 24 | 250 | 105mA | 84 | 680 |
| PDL06-05D05 | 4.5 ~ 9 | ±5 | ±600 | 105mA | 81 | ±2000 |
| PDL06-05D12 | 4.5 ~ 9 | ±12 | ±250 | 105mA | 84 | ±900 |
| PDL06-05D15 | 4.5 ~ 9 | ±15 | ±200 | 105mA | 84 | ±660 |
| PDL06-12S3P3 | 9 ~ 18 | 3.3 | 1300 | 40mA | 78 | 6600 |
| PDL06-12S05 | 9 ~ 18 | 5 | 1200 | 55mA | 83 | 3300 |
| PDL06-12S09 | 9 ~ 18 | 9 | 666 | 55mA | 85 | 2000 |
| PDL06-12S12 | 9 ~ 18 | 12 | 500 | 55mA | 85 | 1600 |
| PDL06-12S15 | 9 ~ 18 | 15 | 400 | 55mA | 85 | 1400 |
| PDL06-12S24 | 9 ~ 18 | 24 | 250 | 55mA | 84 | 680 |
| PDL06-12D05 | 9 ~ 18 | ±5 | ±600 | 55mA | 82 | ±2000 |
| PDL06-12D12 | 9 ~ 18 | ±12 | ±250 | 55mA | 84 | ±900 |
| PDL06-12D15 | 9 ~ 18 | ±15 | ±200 | 55mA | 85 | ±660 |
| PDL06-24S3P3 | 18 ~ 36 | 3.3 | 1300 | 20mA | 78 | 6600 |
| PDL06-24S05 | 18 ~ 36 | 5 | 1200 | 28mA | 83 | 3300 |
| PDL06-24S09 | 18 ~ 36 | 9 | 666 | 28mA | 85 | 2000 |
| PDL06-24S12 | 18 ~ 36 | 12 | 500 | 28mA | 86 | 1600 |
| PDL06-24S15 | 18 ~ 36 | 15 | 400 | 28mA | 86 | 1400 |
| PDL06-24S24 | 18 ~ 36 | 24 | 250 | 28mA | 85 | 680 |
| PDL06-24D05 | 18 ~ 36 | ±5 | ±600 | 28mA | 82 | ±2000 |
| PDL06-24D12 | 18 ~ 36 | ±12 | ±250 | 28mA | 85 | ±900 |
| PDL06-24D15 | 18 ~ 36 | ±15 | ±200 | 28mA | 85 | ±660 |
| PDL06-48S3P3 | 36 ~ 75 | 3.3 | 1300 | 14mA | 78 | 6600 |
| PDL06-48S05 | 36 ~ 75 | 5 | 1200 | 14mA | 82 | 3300 |
| PDL06-48S09 | 36 ~ 75 | 9 | 666 | 14mA | 84 | 2000 |
| PDL06-48S12 | 36 ~ 75 | 12 | 500 | 14mA | 85 | 1600 |
| PDL06-48S15 | 36 ~ 75 | 15 | 400 | 14mA | 86 | 1400 |
| PDL06-48S24 | 36 ~ 75 | 24 | 250 | 14mA | 84 | 680 |
| PDL06-48D05 | 36 ~ 75 | ±5 | ±600 | 14mA | 82 | ±2000 |
| PDL06-48D12 | 36 ~ 75 | ±12 | ±250 | 14mA | 84 | ±900 |
| PDL06-48D15 | 36 ~ 75 | ±15 | ±200 | 14mA | 85 | ±660 |

## PART NUMBER STRUCTURE

PDL06 - 48 S 05 H

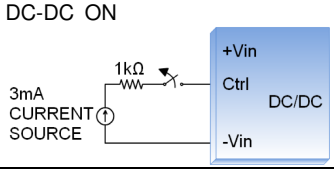
| Series Name | Input Voltage (VDC) | Output Quantity | Output Voltage (VDC) | Case & Isolation Option |
|---|---|---|---|---|
| | **05:** 4.5~9 | **S:** Single | **3P3:** 3.3 | □: Standard type Plastic case 1600VDC isolation |
| | **12:** 9~18 | | **05:** 5 | |
| | **24:** 18~36 | | **09:** 9 | |
| | **48:** 36~75 | | **12:** 12 | **H:** Plastic case 3000VDC isolation |
| | | | **15:** 15 | |
| | | | | **M:** Metal case 1600VDC isolation |
| | | **D:** Dual | **05:** ± 5 | |
| | | | **12:** ±12 | |
| | | | **15:** ±15 | |

## INPUT SPECIFICATIONS

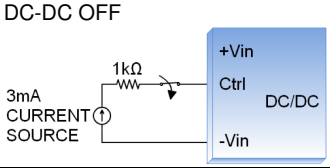
| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Operating input voltage range | | 5Vin(nom) | 4.5 | 5 | 9 | VDC |
| | | 12Vin(nom) | 9 | 12 | 18 | |
| | | 24Vin(nom) | 18 | 24 | 36 | |
| | | 48Vin(nom) | 36 | 48 | 75 | |
| Start up voltage | | 5Vin(nom) | | | 4.5 | VDC |
| | | 12Vin(nom) | | | 9 | |
| | | 24Vin(nom) | | | 18 | |
| | | 48Vin(nom) | | | 36 | |
| Shutdown voltage | | 5Vin(nom) | | 3.5 | | VDC |
| | | 12Vin(nom) | | 7 | | |
| | | 24Vin(nom) | | 15 | | |
| | | 48Vin(nom) | | 33 | | |
| Start up time | Constant resistive load | Power up | | 5 | 10 | ms |
| | | Remote ON/OFF | | 5 | 10 | |
| Input surge voltage | 1 second, max. | 5Vin(nom) | | | 15 | VDC |
| | | 12Vin(nom) | | | 36 | |
| | | 24Vin(nom) | | | 50 | |
| | | 48Vin(nom) | | | 100 | |
| Input reflected ripple current | | | | 30 | | mAp-p |
| Input filter | | | | Capacitor type | | |
| Remote ON/OFF | | DC-DC ON | | Open or high impedance | | |
| | Ctrl pin applied current via 1kΩ | 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 | |
| Cross regulation | Asymmetrical load 25%/100% FL | Dual | -5.0 | | +5.0 | % |
| Ripple and noise | 20MHz bandwidth | | | 50 | | mVp-p |
| Temperature coefficient | | | -0.02 | | +0.02 | %/℃ |
| Transient response recovery time | 25% load step change | | | 500 | | μs |
| Short circuit protection | | | Continuous, automatics recovery | | | |

## GENERAL SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Isolation voltage | 1 minute Input to Output | Standard Type | 1600 | | | VDC |
| | | Suffix "H" | 3000 | | | |
| | | Suffix "M" | 1600 | | | |
| | Input (Output) to Case | Suffix "M" | 1000 | | | |
| Isolation resistance | 500VDC | | 1 | | | GΩ |
| Isolation capacitance | | Standard Type | | | 50 | pF |
| | | Suffix "H" | | | 50 | |
| | | Suffix "M" | | | 50 | |
| Switching frequency | Full load to minimum load | | 100 | | | kHz |
| Safety approvals | | | | | | UL60950-1<br>EN60950-1<br>IEC60950-1 |
| Case material | | Standard Type | | | | Non-conductive black plastic |
| | | Suffix "H" | | | | Non-conductive black plastic |
| | | Suffix "M" | | | | Copper |
| Base material | | | | | | None |
| Potting material | | | | | | Silicone (UL94 V-0) |
| Weight | | Standard Type | | | | 4.8g (0.17oz) |
| | | Suffix "H" | | | | 4.8g (0.17oz) |
| | | Suffix "M" | | | | 5.9g (0.21oz) |
| MTBF | MIL-HDBK-217F | Standard Type | | | | $2.135 \times 10^6$ hrs |
| | | Suffix "H" | | | | $2.135 \times 10^6$ hrs |
| | | Suffix "M" | | | | $2.360 \times 10^6$ hrs |

## ENVIRONMENTAL SPECIFICATIONS

| Parameter | Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Operating ambient temperature | Standard type | Without derating | -40 | | +65 | ℃ |
| | | With derating | +65 | | +90 | |
| | Suffix "H" | Without derating | -40 | | +65 | |
| | | With derating | +65 | | +90 | |
| | Suffix "M" | Without derating | -40 | | +70 | |
| | | With derating | +70 | | +95 | |
| Storage temperature range | | | -55 | | +125 | ℃ |
| Thermal shock | | | | | MIL-STD-810F | |
| Vibration | | | | | MIL-STD-810F | |
| Relative humidity | | | | | 5% to 95% RH | |

## EMC SPECIFICATIONS

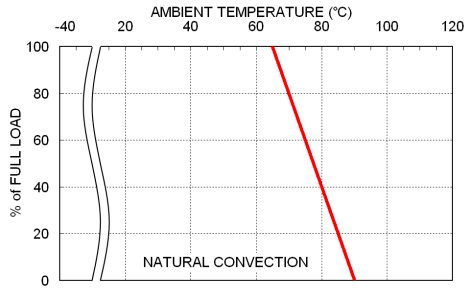
| Parameter | Conditions | | Level |
|---|---|---|---|
| EMI(1) | EN55022 | | Class A、Class B |
| ESD | EN61000-4-2 | Air ± 8kV and Contact ± 6kV | Perf. Criteria A |
| Radiated immunity | EN61000-4-3 | 10 V/m | Perf. Criteria A |
| Fast transient (2) | EN61000-4-4 | ± 2kV | Perf. Criteria A |
| Surge (2) | EN61000-4-5 | ±1kV | Perf. Criteria A |
| Conducted immunity | EN61000-4-6 | 10 Vr.m.s | Perf. Criteria A |

**Note:**

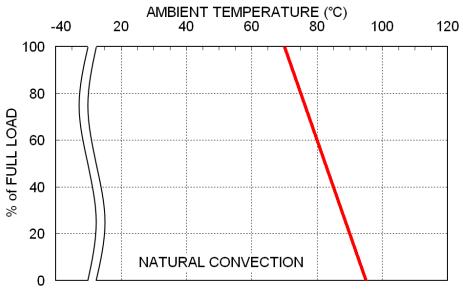
1. The standard modules meet EMI Class A or Class B with external components. For further information, please contact with P-DUKE.
2. An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5.
   The filter capacitor Power Mate suggest: 5 VDC input : Nippon chemi-con KY series, 330μF/50V.
   Others : Nippon chemi-con KY series, 220μF/100V.

**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

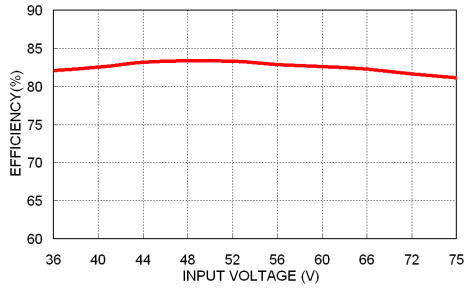
## CHARACTERISTIC CURVE



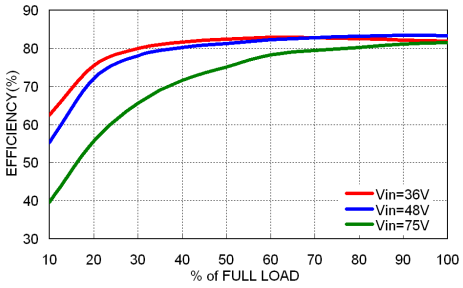

PDL06-48S05 Derating Curve




PDL06-48S05M Derating Curve



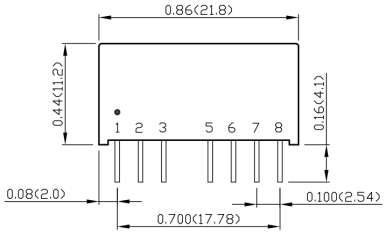

PDL06-48S05 Efficiency vs. Input Voltage

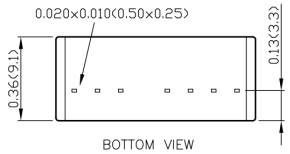



PDL06-48S05 Efficiency vs. Output Load

## MECHANICAL DRAWING

**Standard type, Suffix "H"**



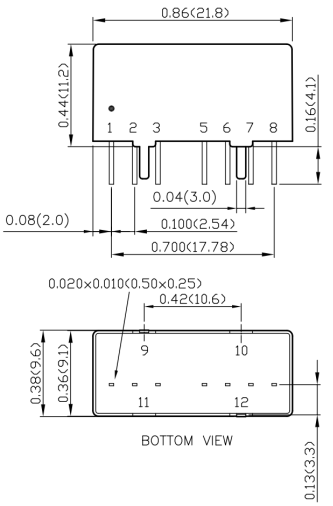

**PIN CONNECTION**

| PIN | SINGLE | DUAL |
|---|---|---|
| 1 | -Vin | -Vin |
| 2 | +Vin | +Vin |
| 3 | Ctrl | Ctrl |
| 5 | NC*/No pin** | NC*/No pin** |
| 6 | +Vout | +Vout |
| 7 | -Vout | Common |
| 8 | NC | -Vout |

*NC pin for standard type model.
**No pin for 3kVDC isolation model (suffix "H").

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 pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)

**Suffix "M"**




**PIN CONNECTION**

| PIN | SINGLE | DUAL |
|---|---|---|
| 1 | -Vin | -Vin |
| 2 | +Vin | +Vin |
| 3 | Ctrl | Ctrl |
| 5 | NC | NC |
| 6 | +Vout | +Vout |
| 7 | -Vout | Common |
| 8 | NC | -Vout |
| 9 | Case | Case |
| 10 | Stand off | Stand off |
| 11 | Stand off | Stand off |
| 12 | Case | Case |

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 pitch tolerance ±0.01 (0.25)
4. Pin dimension tolerance ±0.004(0.1)