



# P-DUKE POWER

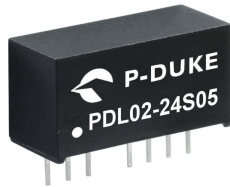
## PDL02 Series

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

**NO**  
Min. Load  
Required

REMOTE  
**ON**  
**OFF**

**SCP**

### PART NUMBER STRUCTURE

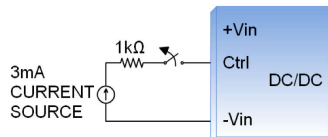
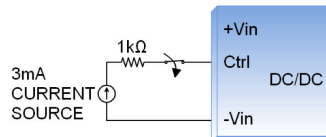
**PDL02 - 48 S 05 H - M3**

Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Isolation Option	Operating Temp. Option
	05:4.5~9 12:9~18 24:18~36 48:36~75	S:Single  D: Dual	33:3.3 05:5 09:9 12:12 15:15  05:±5 12:±12 15:±15	□:Standard type 1600VDC isolation H:3000VDC isolation	□: Standard -40~+100°C With derating <b>M3</b> : M3 Version -55~+100°C With derating

**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
PDL02-05S33	4.5 ~ 9	3.3	500	35	76	2200
PDL02-05S05	4.5 ~ 9	5	400	35	80	1000
PDL02-05S09	4.5 ~ 9	9	222	40	82	470
PDL02-05S12	4.5 ~ 9	12	167	40	81	170
PDL02-05S15	4.5 ~ 9	15	134	40	83	110
PDL02-05D05	4.5 ~ 9	±5	±200	40	79	±470
PDL02-05D12	4.5 ~ 9	±12	±83	40	82	±100
PDL02-05D15	4.5 ~ 9	±15	±67	40	81	±47
PDL02-12S33	9 ~ 18	3.3	500	20	77	2200
PDL02-12S05	9 ~ 18	5	400	20	81	1000
PDL02-12S09	9 ~ 18	9	222	20	82	470
PDL02-12S12	9 ~ 18	12	167	20	83	170
PDL02-12S15	9 ~ 18	15	134	20	84	110
PDL02-12D05	9 ~ 18	±5	±200	30	81	±470
PDL02-12D12	9 ~ 18	±12	±83	30	83	±100
PDL02-12D15	9 ~ 18	±15	±67	30	84	±47
PDL02-24S33	18 ~ 36	3.3	500	15	78	2200
PDL02-24S05	18 ~ 36	5	400	15	81	1000
PDL02-24S09	18 ~ 36	9	222	15	82	470
PDL02-24S12	18 ~ 36	12	167	15	83	170
PDL02-24S15	18 ~ 36	15	134	15	84	110
PDL02-24D05	18 ~ 36	±5	±200	15	80	±470
PDL02-24D12	18 ~ 36	±12	±83	15	83	±100
PDL02-24D15	18 ~ 36	±15	±67	15	82	±47
PDL02-48S33	36 ~ 75	3.3	500	8	76	2200
PDL02-48S05	36 ~ 75	5	400	8	78	1000
PDL02-48S09	36 ~ 75	9	222	8	84	470
PDL02-48S12	36 ~ 75	12	167	8	83	170
PDL02-48S15	36 ~ 75	15	134	8	83	110
PDL02-48D05	36 ~ 75	±5	±200	8	80	±470
PDL02-48D12	36 ~ 75	±12	±83	8	81	±100
PDL02-48D15	36 ~ 75	±15	±67	8	81	±47

**INPUT SPECIFICATIONS**

Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range		5Vin(nom) 12Vin(nom) 24Vin(nom) 48Vin(nom)	4.5 9 18 36	5 12 24 48	9 18 36 75	VDC
Start up time	Constant resistive load	Power up Remote ON/OFF		5 5		ms
Input surge voltage	100 ms, max.	5Vin(nom) 12Vin(nom) 24Vin(nom) 48Vin(nom)			15 36 50 100	VDC
Input filter					Capacitor type	
Remote ON/OFF	Ctrl pin applied current via 1kΩ	DC-DC ON DC-DC OFF Remote off input current	2	3	4 2.5	mA 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 Dual	-1.0 -1.0		+1.0 +1.0	%
	10% Load to 90% Full Load	Single Dual	-0.5 -0.8		+0.5 +0.8	%
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	%/°C
Transient response recovery time		25% load step change		500		μs
Short circuit protection						Continuous, automatic recovery

**GENERAL SPECIFICATIONS**

Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute	Input to Output Standard Type Suffix "H"	1600 3000			VDC
Isolation resistance			1			GΩ
Isolation capacitance		Standard Type Suffix "H"			200 40	pF
Switching frequency		Full load to minimum load	100			kHz
Safety approvals		IEC /UL/ EN60950-1			UL:E193009 CB:UL(Demko)	
Case material					Non-conductive black plastic	
Base material					None	
Potting material					Silicone (UL94 V-0)	
Weight					4.8g (0.17oz)	
MTBF		MIL-HDBK-217F			4.903 x 10 <sup>6</sup> hrs	

## ENVIRONMENTAL SPECIFICATIONS

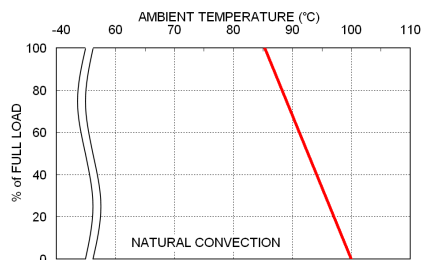
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Standard M3 Version	With derating	-40		+100	°C
		With derating	-55		+100	
Maximum case temperature					+100	°C
Storage temperature range			-55		+125	°C
Thermal shock						MIL-STD-810F
Vibration						MIL-STD-810F
Relative humidity						5% to 95% RH

## EMC SPECIFICATIONS

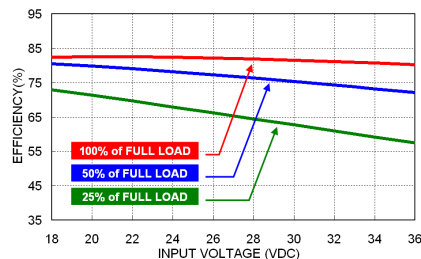
Parameter	Conditions		Level
EMI	EN55032	With external components	Class A · Class B
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV	Perf. Criteria A
		With an external input filter capacitor (Nippon chemi-con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

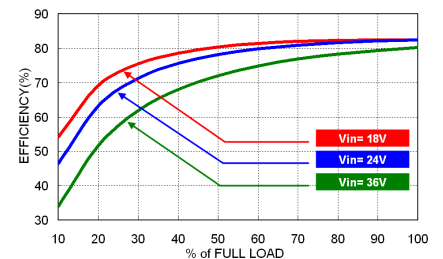
## CHARACTERISTIC CURVE



PDL02-24S05 Derating Curve



PDL02-24S05 Efficiency vs. Input Voltage



PDL02-24S05 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.

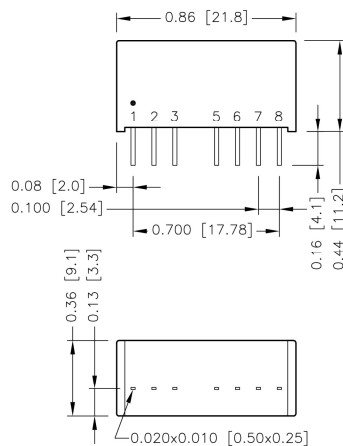
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
PDL02-05S□□、PDL02-05D□□	1.6	Slow-Blow
PDL02-12S□□、PDL02-12D□□	1	Slow-Blow
PDL02-24S□□、PDL02-24D□□	1	Slow-Blow
PDL02-48S□□、PDL02-48D□□	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



BOTTOM VIEW

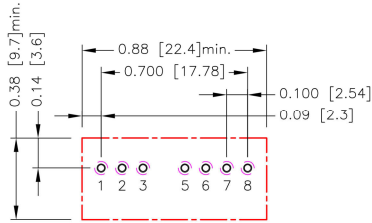
PIN	SINGLE	DUAL
1	-Vin	-Vin
2	+Vin	+Vin
3	Ctrl	Ctrl
5	NC*/ No pin**	NC*/ No pin**
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout

\*NC pin for standard type model.

\*\*No pin for 3KVDC isolation model (suffix "H").

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

**RECOMMENDED PAD LAYOUT**

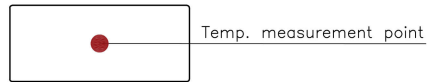


All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.5.6.7.8:  $\Phi 0.031[0.80]$   
 Top view pad 1.2.3.5.6.7.8:  $\Phi 0.039[1.00]$   
 Bottom view pad 1.2.3.5.6.7.8:  $\Phi 0.063[1.60]$

**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