



3

YEARS
WARRANTY

ROHS
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Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



3000
VDC
Isolation
Voltage

1600
VDC
Isolation
Voltage

4 : 1
Wide
Input
Range

LOW
Standby
Power

NO
Min. Load
Required

REMOTE
ON
OFF

OCP

SCP

UVP

PART NUMBER STRUCTURE

PDL12 -

48

S

05

W

H

Series Name

Input
Voltage
(VDC)

Output
Quantity

Output
Voltage
(VDC)

Input
Range

Isolation
Option

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

S: Single

3P3: 3.3
05: 5
5P1: 5.1
09: 9
12: 12
15: 15
24: 24

4 : 1

□: Standard type
1600VDC isolation
H: 3000VDC isolation

D: Dual

05: ±5
12: ±12
15: ±15

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
PDL12-12S3P3W	4.5 ~ 18	3.3	3000	25	87	3500
PDL12-12S05W	4.5 ~ 18	5	2400	25	88.5	1800
PDL12-12S5P1W	4.5 ~ 18	5.1	2400	25	88.5	1800
PDL12-12S09W	4.5 ~ 18	9	1333	12	87	1100
PDL12-12S12W	4.5 ~ 18	12	1000	12	89	680
PDL12-12S15W	4.5 ~ 18	15	800	12	89	680
PDL12-12S24W	4.5 ~ 18	24	500	12	90	300
PDL12-12D05W	4.5 ~ 18	±5	±1200	12	85.5	±1100
PDL12-12D12W	4.5 ~ 18	±12	±500	12	89	±560
PDL12-12D15W	4.5 ~ 18	±15	±400	12	89	±300
PDL12-24S3P3W	9 ~ 36	3.3	3000	6	87	3500
PDL12-24S05W	9 ~ 36	5	2400	6	89	1800
PDL12-24S5P1W	9 ~ 36	5.1	2400	7	89	1800
PDL12-24S09W	9 ~ 36	9	1333	6	87	1100
PDL12-24S12W	9 ~ 36	12	1000	6	89	680
PDL12-24S15W	9 ~ 36	15	800	6	89	680
PDL12-24S24W	9 ~ 36	24	500	6	90	300
PDL12-24D05W	9 ~ 36	±5	±1200	6	86	±1100
PDL12-24D12W	9 ~ 36	±12	±500	6	89	±560
PDL12-24D15W	9 ~ 36	±15	±400	6	89	±300
PDL12-48S3P3W	18 ~ 75	3.3	3000	3	87	3500
PDL12-48S05W	18 ~ 75	5	2400	3	89	1800
PDL12-48S5P1W	18 ~ 75	5.1	2400	3.5	89	1800
PDL12-48S09W	18 ~ 75	9	1333	3	87	1100
PDL12-48S12W	18 ~ 75	12	1000	3	89	680
PDL12-48S15W	18 ~ 75	15	800	3	89	680
PDL12-48S24W	18 ~ 75	24	500	3	90	300
PDL12-48D05W	18 ~ 75	±5	±1200	3	86	±1100
PDL12-48D12W	18 ~ 75	±12	±500	3	89.5	±560
PDL12-48D15W	18 ~ 75	±15	±400	3	89	±300

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	12Vin(nom) 24Vin(nom) 48Vin(nom)	4.5 9 18	12 24 48	18 36 75	VDC
Start up voltage	12Vin(nom) 24Vin(nom) 48Vin(nom)			4.5 9 18	VDC
Shutdown voltage	12Vin(nom) 24Vin(nom) 48Vin(nom)	2.5 6.2 12.5	3.5 7.2 14.5	4.4 8.2 16.4	VDC
Start up time	Constant resistive load		50	75	ms
	Power up		50	75	ms
	Remote ON/OFF		50	75	ms
Input surge voltage	1 second, max.			25 50 100	VDC
Input filter					Capacitor type
Remote ON/OFF	Referred to –Vin pin				Open or 0 ~ 1.0VDC
	DC-DC ON				3 ~ 12VDC
	DC-DC OFF				
	Input current of Ctrl pin	0.5		1.0	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	-0.5		+0.5	%
	Single	-1.0		+1.0	%
	Dual				
Cross regulation	Asymmetrical load 25%/100% FL	-5.0		+5.0	%
Ripple and noise	20MHz bandwidth With a 1µF/50V X7R MLCC		50 75		mVp-p
	3.3Vout, 5Vout, 5.1Vout 9Vout, 12Vout, 15Vout, 24Vout				
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change		250		µs
Over load protection	% of Iout rated; Hiccup mode		160		%
Short circuit protection		Continuous, automatic recovery			

GENERAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	1 minute Input to Output	1600			VDC
	Standard Type	3000			
	Suffix "H"	1000			
	Input (Output) to Case	1500			
	Standard Type				
	Suffix "H"				
Isolation resistance	500VDC	1			GΩ
Isolation capacitance				600	pF
Switching frequency	Single		290		kHz
	3.3Vout		390		
	5Vout, 5.1Vout		460		
	9Vout, 12Vout, 15Vout, 24Vout				
	Dual		460		kHz
	All				
Safety approvals	IEC /EN/ UL62368-1			UL:E193009 CB:UL(Demko)	
Case material				Copper	
Base material				None	
Potting material				Silicone (UL94 V-0)	
Weight				7.2g (0.26oz)	
MTBF	MIL-HDBK-217F, Full load			9.06 x 10 ⁵ hrs	

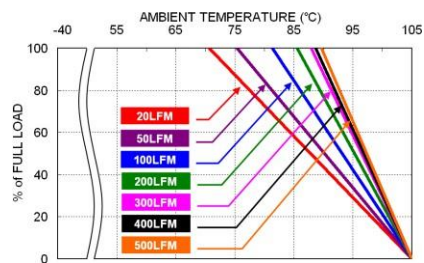
ENVIRONMENTAL SPECIFICATIONS

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
Thermal impedance	For details please refer to THERMAL CONSIDERATIONS		24		°C/W
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
EMS	EN55024		
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
	PDL12-12□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 3300 μ F/25V) and a TVS (SMDJ30A, 30V, 3000Watt peak pulse power) to connect in parallel.	
	PDL12-24□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 1200 μ F/50V) and a TVS (SMDJ70A, 70V, 3000Watt peak pulse power) to connect in parallel.	
	PDL12-48□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 390 μ F/100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel.	
Surge	EN61000-4-5	$\pm$ 2kV	Perf. Criteria A
	PDL12-12□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 3300 μ F/25V) and a TVS (SMDJ30A, 30V, 3000Watt peak pulse power) to connect in parallel.	
	PDL12-24□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 1200 μ F/50V) and a TVS (SMDJ70A, 70V, 3000Watt peak pulse power) to connect in parallel.	
	PDL12-48□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 390 μ F/100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel.	
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.

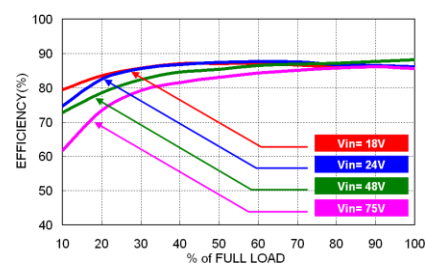
CHARACTERISTIC CURVE



PDL12-48S05W Derating Curve
With Recommended PCB Layout



PDL12-48S05W Efficiency vs. Input Voltage



PDL12-48S05W Efficiency vs. Output Load

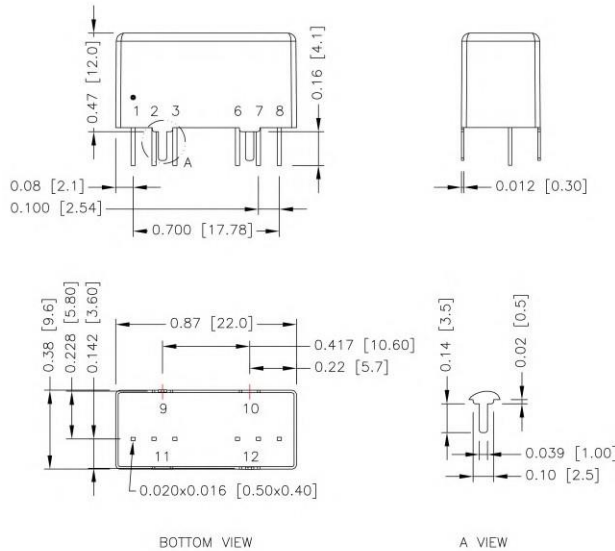
FUSE CONSIDERATION

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
PDL12-12□□□W	5.0	Slow-Blow
PDL12-24□□□W	2.5	Slow-Blow
PDL12-48□□□W	1.25	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



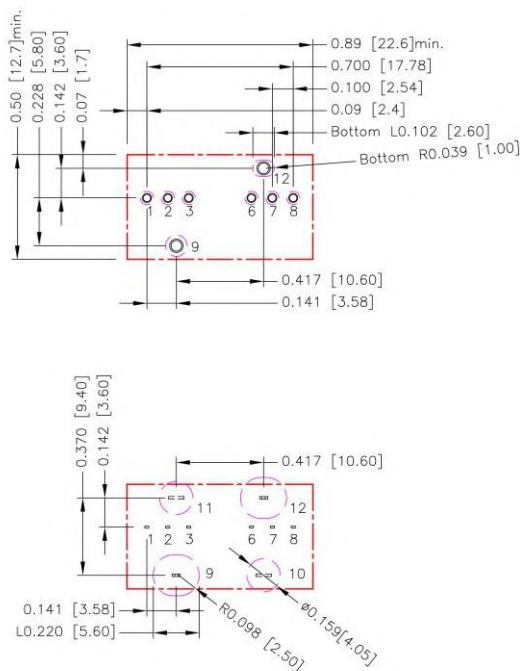
* Case pins should not be connected to any circuit.

PIN CONNECTION

PIN	SINGLE	DUAL
1	-Vin	-Vin
2	+Vin	+Vin
3	Ctrl	Ctrl
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.xx±0.5]
x.xxx±0.01 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

RECOMMENDED PAD LAYOUT



All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 1.2.3.6.7.8:Ø0.035[0.90]
 Through hole 9.12:Ø0.051[1.30]
 Top view pad 1.2.3.6.7.8:Ø0.043[1.10]
 Top view pad 9.12:Ø0.064[1.63]
 Bottom view pad 1.2.3.6.7.8:Ø0.063[1.60]
 Bottom view pad 9:Ø0.102[2.60]
 Bottom view pad 12:Groove R0.039[1.00] L0.102[2.60]

Area 9.10.11.12 don't layout
 Area 10.11 size: Ø0.159[4.05]
 Area 9.12 size:Groove R0.098[2.50] L0.220[5.60]
 The layout distance between Pin 3 and Pin 6 is at least 3mm

* We recommend putting PCB trace on bottom side .

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.

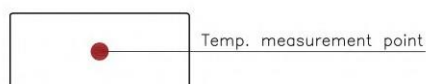
Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed "Maximum case temperature".

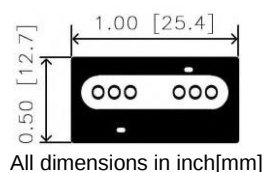
When operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

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

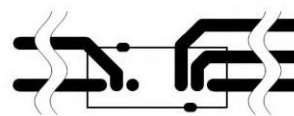
- Thermal test condition with vertical direction by natural convection (20LFM)
- We recommend placing a 25.4x12.7mm 2oz copper on the top side for thermal considerations, and placing >2mm PCB trace on the bottom side for isolation considerations.



TOP VIEW



Top View



Bottom View

25.4x12.7mm Recommended PCB Layout