



P-DUKE POWER

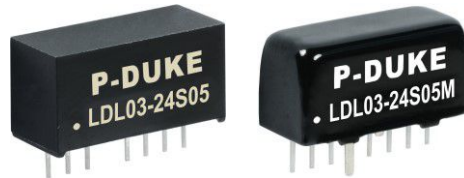
LDL03 Series

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



1600
VDC
Isolation
Voltage

2 : 1
Input
Range

NO
Min. Load
Required

REMOTE
ON
OFF

TINY
Output
Ripple

SCP

UVP


PART NUMBER STRUCTURE

LDL03 -	48	S	05	M
Series Name	Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)	Case Options
	05:4.5~13.2 12:9~18 24:18~36 48:36~75	S:Single	3P3:3.3 05:5 09:9 12:12 15:15 24:24	□:Standard Plastic case M: Metal case
		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
LDL03-05S3P3	4.5 ~ 13.2	3.3	700	45	75	4400
LDL03-05S05	4.5 ~ 13.2	5	600	45	79	2200
LDL03-05S09	4.5 ~ 13.2	9	333	55	81	1300
LDL03-05S12	4.5 ~ 13.2	12	250	55	83	1000
LDL03-05S15	4.5 ~ 13.2	15	200	65	83	820
LDL03-05S24	4.5 ~ 13.2	24	125	60	82	470
LDL03-05D05	4.5 ~ 13.2	±5	±300	55	78	±1200
LDL03-05D12	4.5 ~ 13.2	±12	±125	60	82	±520
LDL03-05D15	4.5 ~ 13.2	±15	±100	70	82	±440
LDL03-12S3P3	9 ~ 18	3.3	700	25	77	4400
LDL03-12S05	9 ~ 18	5	600	25	81	2200
LDL03-12S09	9 ~ 18	9	333	30	83	1300
LDL03-12S12	9 ~ 18	12	250	30	85	1000
LDL03-12S15	9 ~ 18	15	200	30	85	820
LDL03-12S24	9 ~ 18	24	125	30	84	470
LDL03-12D05	9 ~ 18	±5	±300	30	80	±1200
LDL03-12D12	9 ~ 18	±12	±125	30	84	±520
LDL03-12D15	9 ~ 18	±15	±100	30	83	±440
LDL03-24S3P3	18 ~ 36	3.3	700	12	77	4400
LDL03-24S05	18 ~ 36	5	600	12	82	2200
LDL03-24S09	18 ~ 36	9	333	14	85	1300
LDL03-24S12	18 ~ 36	12	250	12	85	1000
LDL03-24S15	18 ~ 36	15	200	15	85	820
LDL03-24S24	18 ~ 36	24	125	15	85	470
LDL03-24D05	18 ~ 36	±5	±300	14	80	±1200
LDL03-24D12	18 ~ 36	±12	±125	15	85	±520
LDL03-24D15	18 ~ 36	±15	±100	15	85	±440
LDL03-48S3P3	36 ~ 75	3.3	700	10	75	4400
LDL03-48S05	36 ~ 75	5	600	10	80	2200
LDL03-48S09	36 ~ 75	9	333	11	83	1300
LDL03-48S12	36 ~ 75	12	250	12	84	1000
LDL03-48S15	36 ~ 75	15	200	12	85	820
LDL03-48S24	36 ~ 75	24	125	12	84	470
LDL03-48D05	36 ~ 75	±5	±300	12	80	±1200
LDL03-48D12	36 ~ 75	±12	±125	12	85	±520
LDL03-48D15	36 ~ 75	±15	±100	12	83	±440

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit	
Operating input voltage range	5Vin(nom)	4.5	5	13.2	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)	2	3	4	VDC	
	12Vin(nom)	6	7	8		
	24Vin(nom)	13	15	17		
	48Vin(nom)	29	32	35		
Start up time	Constant resistive load	Power up	30		ms	
Input surge voltage	1 second, max.	5Vin(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
		Remote off input current			2.5	mA
Application circuit						

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	%	
		Dual		+1.0		
	10% Load to 90% Load	Single	-0.5			+0.5
		Dual	-0.8			+0.8
Cross regulation	Asymmetrical load 25%/100% FL	-5.0		+5.0	%	
Ripple and noise	Measured by 20MHz bandwidth		10	15	mVp-p	
	Without any external output capacitor		5	10		
	With 10μF capacitor on each output					
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	1600			VDC
		Input (Output) to Case	Suffix "M"	1600			
Isolation resistance	500VDC			1000			GΩ
Isolation capacitance						1500	pF
Switching frequency	Full load to minimum load			100			kHz
Safety meets							IEC/ EN/ UL62368-1
Case material			Standard Type				Non-conductive black plastic
			Suffix "M"				Copper
Base material							None
Potting material							Silicone (UL94 V-0)
Weight			Standard Type				4.8g (0.17oz)
			Suffix "M"				5.9g (0.21oz)
MTBF	MIL-HDBK-217F		Standard Type				5.221 x 10 ⁶ hrs
			Suffix "M"				5.607 x 10 ⁶ hrs

ENVIRONMENTAL SPECIFICATIONS

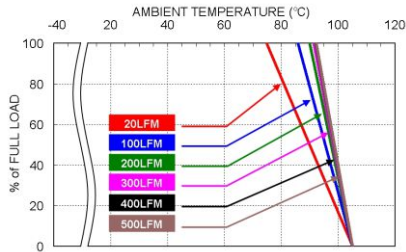
Parameter	Conditions			Min.	Typ.	Max.	Unit
Operating ambient temperature			With derating	-40		+105	°C
Maximum case temperature						105	°C
Storage temperature range				-55		+125	°C
Thermal shock							MIL-STD-810F
Vibration							MIL-STD-810F
Relative humidity							5% to 95% RH

EMC SPECIFICATIONS

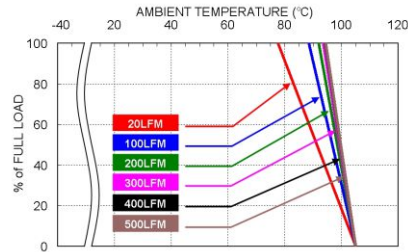
Parameter	Conditions		Level
EMI	EN55032	With external components	Class A, Class B
EMS	EN55035		
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV	Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV	Perf. Criteria A
		With an external input filter capacitor (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.

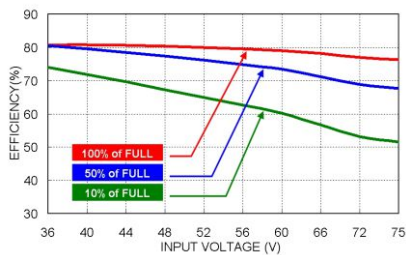
CHARACTERISTIC CURVE



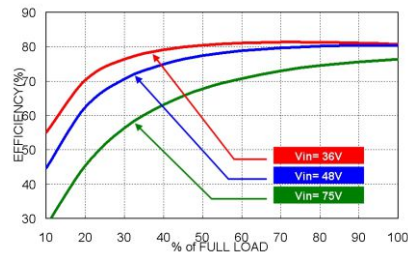
LDL03-48S05 Derating Curve



LDL03-48S05M Derating Curve



LDL03-48S05 Efficiency vs. Input Voltage



LDL03-48S05 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.

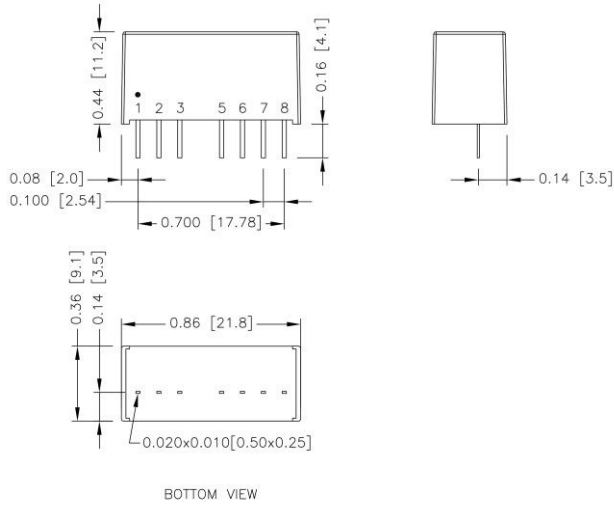
The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
LDL03-05□□□	1.6	Slow-Blow
LDL03-12□□□	0.8	Slow-Blow
LDL03-24□□□	0.5	Slow-Blow
LDL03-48□□□	0.315	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

Standard type

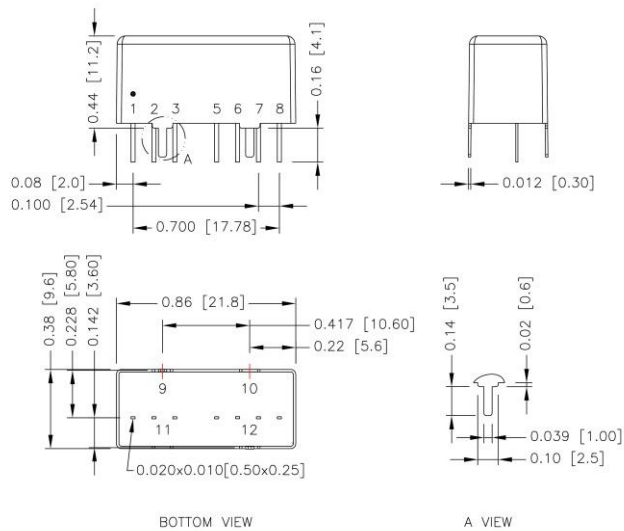


PIN CONNECTION

PIN	SINGLE	DUAL
1	-Vin	-Vin
2	+Vin	+Vin
3	Ctrl	Ctrl
5	NC	NC
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout

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]

Suffix "M"



PIN CONNECTION

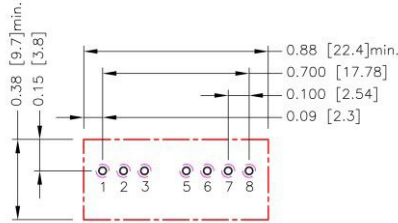
PIN	SINGLE	DUAL
1	-Vin	-Vin
2	+Vin	+Vin
3	Ctrl	Ctrl
5	NC	NC
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout
9	Case	Case
10	Stand off	Stand off
11	Stand off	Stand off
12	Case	Case

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 dimension tolerance ±0.004 [0.10]

* Case pins should not be connected to any circuit.

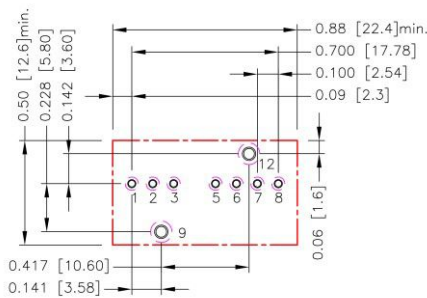
RECOMMENDED PAD LAYOUT

Standard type



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: $\Phi 0.063[1.60]$

Suffix "M"

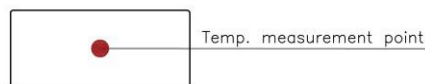


All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 1.2.3.5.6.7.8: $\Phi 0.031[0.80]$
 Through hole 9.12: $\Phi 0.051[1.30]$
 Top view pad 1.2.3.5.6.7.8: $\Phi 0.039[1.00]$
 Top view pad 9.12: $\Phi 0.064[1.63]$
 Bottom view pad 1.2.3.5.6.7.8: $\Phi 0.063[1.60]$
 Bottom view pad 9.12: $\Phi 0.102[2.60]$

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