



P-DUKE POWER

LDL03 Series

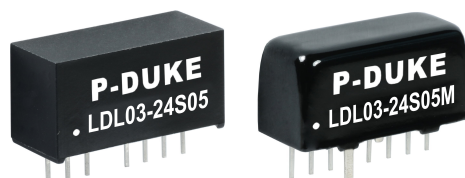
DC-DC Converter
Up to 3 Watts

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

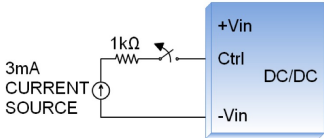
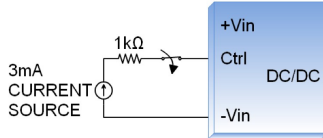
PART NUMBER STRUCTURE

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 D:Dual	3P3:3.3 05:5 09:9 12:12 15:15 24:24 05:±5 12:±12 15:±15	□:Standard Plastic case M: Metal case

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) 12Vin(nom) 24Vin(nom) 48Vin(nom)	4.5 9 18 36	5 12 24 48	13.2 18 36 75	VDC
Start up voltage	5Vin(nom) 12Vin(nom) 24Vin(nom) 48Vin(nom)			4.5 9 18 36	VDC
Shutdown voltage	5Vin(nom) 12Vin(nom) 24Vin(nom) 48Vin(nom)	2 6 13 29	3 7 15 32	4 8 17 35	VDC
Start up time	Constant resistive load Power up Remote ON/OFF		30 30		ms
Input surge voltage	1 second, max. 5Vin(nom) 12Vin(nom) 24Vin(nom) 48Vin(nom)			15 25 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 Application circuit DC-DC ON  DC-DC OFF 	2	3	4 2.5	mA 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 Single Dual 10% Load to 90% Load Single Dual	-1.0 -1.0 -0.5 -0.8		+1.0 +1.0 +0.5 +0.8	%
Cross regulation	Asymmetrical load 25%/100% FL Dual	-5.0		+5.0	%
Ripple and noise	Measured by 20MHz bandwidth Without any external output capacitor 10μF capacitor on each output		10 5	15 10	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	1600			VDC
			Suffix "M"	1600			
		Input (Output) to Case	Suffix "M"	1000			
Isolation resistance	500VDC			1			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

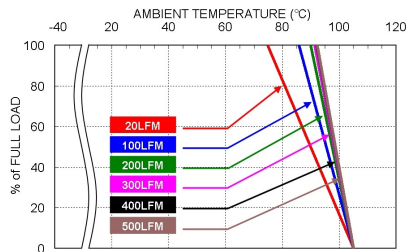
Parameter	Conditions			Min.	Typ.	Max.	Unit
Operating ambient temperature		With derating		-40		+105	°C
Maximum case temperature						105	°C
Storage temperature range				-55		+125	°C
Thermal shock						MIL-STD-810F	
Vibration						MIL-STD-810F	
Relative humidity						5% to 95% RH	

EMC SPECIFICATIONS

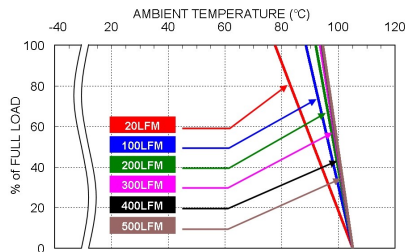
Parameter	Conditions			Level		
EMI	EN55032	With external components				Class A, Class B
EMS	EN55024					
ESD	EN61000-4-2	Air ± 8kV and Contact ± 6kV				Perf. Criteria A
Radiated immunity	EN61000-4-3	10 V/m				Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV				Perf. Criteria A
Surge	EN61000-4-5	With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)				Perf. Criteria A
		±1kV				
Conducted immunity	EN61000-4-6	With an external input filter capacitor (Nippon chemi-con KY series, 220μF/100V)				Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	10 Vr.m.s				Perf. Criteria A
		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.

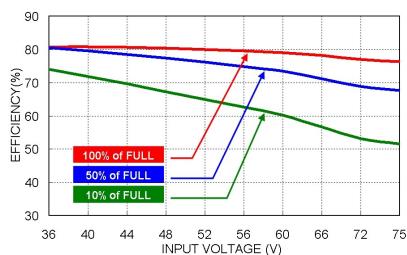
CHARACTERISTIC CURVE



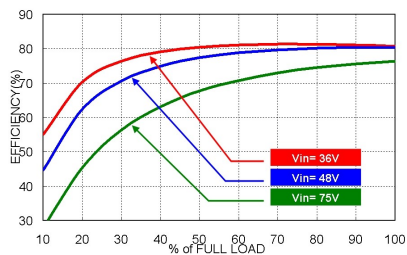
LDL03-48S05 Derating Curve



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.

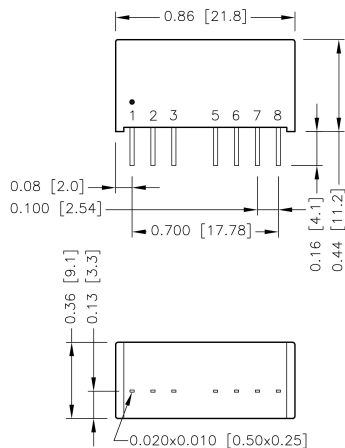
The input line fuse suggest as below :

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.

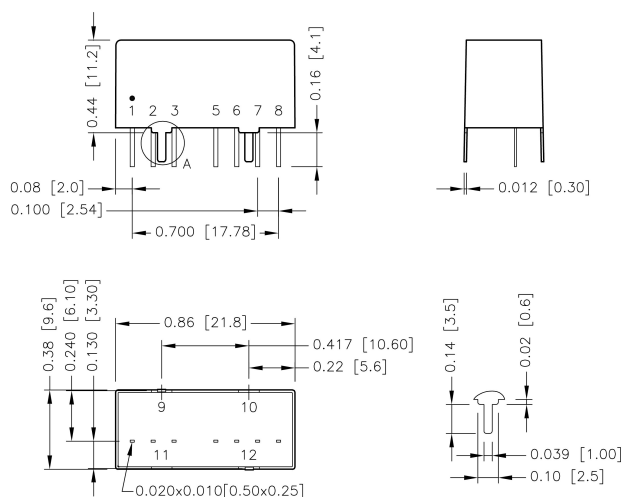
MECHANICAL DRAWING

Standard type



BOTTOM VIEW

Suffix "M"



BOTTOM VIEW

A VIEW

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]

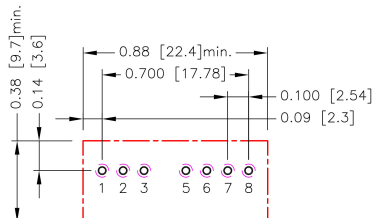
PIN CONNECTION

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]

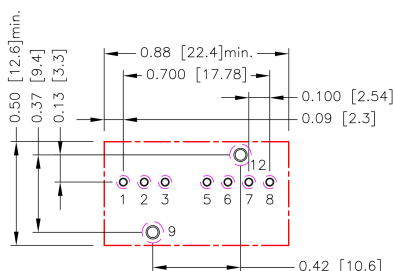
RECOMMENDED PAD LAYOUT

STARDANDS



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.

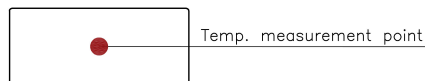
Proper cooling can be verified by measuring the point as the figure below.

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