



P-DUKE POWER

RDL10W Series

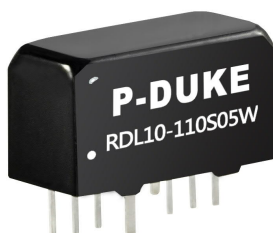
DC-DC Converter
Up to 10 Watts

3

YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Railway



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV

UL[®] CB CE

3000
VDC
Isolation
Voltage

2250
VDC
Isolation
Voltage

4 : 1
Wide
Input
Range

LOW
Standby
Power

NO
Min. Load
Required

Operating
Altitude
5000
meter

REMOTE
ON
OFF

OCP

SCP

UVP

PART NUMBER STRUCTURE

RDL10 - 48 S 05 W

Series Name

Input
Voltage
(VDC)

Output
Quantity

Output
Voltage
(VDC)

Input
Range

24: 9~36
48: 18~75
110: 40~160

S: Single

3P3: 3.3
05: 5
12: 12
15: 15
24: 24

4:1

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
RDL10-24S3P3W	9 ~ 36	3.3	2500	8	87	3600
RDL10-24S05W	9 ~ 36	5	2000	8	88	1800
RDL10-24S12W	9 ~ 36	12	840	8	89	680
RDL10-24S15W	9 ~ 36	15	670	8	89	680
RDL10-24S24W	9 ~ 36	24	420	8	89	300
RDL10-24D05W	9 ~ 36	±5	±1000	8	86	±1100
RDL10-24D12W	9 ~ 36	±12	±420	8	89	±560
RDL10-24D15W	9 ~ 36	±15	±336	8	89	±300
RDL10-48S3P3W	18 ~ 75	3.3	2500	4	87	3600
RDL10-48S05W	18 ~ 75	5	2000	4	88	1800
RDL10-48S12W	18 ~ 75	12	840	4	89	680
RDL10-48S15W	18 ~ 75	15	670	4	89	680
RDL10-48S24W	18 ~ 75	24	420	4	89	300
RDL10-48D05W	18 ~ 75	±5	±1000	4	86	±1100
RDL10-48D12W	18 ~ 75	±12	±420	4	89	±560
RDL10-48D15W	18 ~ 75	±15	±336	4	89	±300
RDL10-110S3P3W	40 ~ 160	3.3	2500	3.5	86	3600
RDL10-110S05W	40 ~ 160	5	2000	3	87	1800
RDL10-110S12W	40 ~ 160	12	840	3	88	680
RDL10-110S15W	40 ~ 160	15	670	3	88	680
RDL10-110S24W	40 ~ 160	24	420	3	88	300
RDL10-110D05W	40 ~ 160	±5	±1000	3	85	±1100
RDL10-110D12W	40 ~ 160	±12	±420	3	88	±560
RDL10-110D15W	40 ~ 160	±15	±336	3	88	±300

INPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating input voltage range		24Vin(nom)	9	24	36	VDC
		48Vin(nom)	18	48	75	
		110Vin(nom)	40	110	160	
Start up voltage		24Vin(nom)			9	VDC
		48Vin(nom)			18	
		110Vin(nom)			40	
Shutdown voltage		24Vin(nom)	6.2	7.2	8.2	VDC
		48Vin(nom)	12.5	14.5	16.4	
		110Vin(nom)	31.8	33.8	35.6	
Start up time	Constant resistive load	Power up		50	75	ms
		Remote ON/OFF		50	75	
Input surge voltage	1 second, max.	24Vin(nom)			50	VDC
		48Vin(nom)			100	
		110Vin(nom)			200	
Input filter					Capacitor type	
Remote ON/OFF	Referred to –Vin pin	DC-DC ON		0.5	Open or 0 ~ 0.8VDC	
		DC-DC OFF			3 ~ 12VDC	
		Input current of Ctrl pin			2.5	mA
		Remote off input current				

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	%
	Single Dual	-0.5		+0.5	%
Load regulation	No Load to Full Load	-0.5		+0.5	%
	Single Dual	-1.0		+1.0	%
Cross regulation	Asymmetrical load 25%/100% FL	-5.0		+5.0	%
Ripple and noise	Measured by 20MHz bandwidth With a 1 μ F/50V X7R MLCC		50 75		mVp-p
	3.3Vout, 5Vout 12Vout, 15Vout, 24Vout				
Temperature coefficient		-0.02		+0.02	%/°C
Transient response recovery time	25% load step change		250		μ s
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 110Vin(nom)	3000			
	Input to Output	1500			
	Input (Output) to Case				VDC
	1 minute 24Vin(nom), 48Vin(nom)	2250			
	Input to Output	1500			
	Input (Output) to Case				
Isolation resistance	500VDC	1			G Ω
Isolation capacitance				600	pF
Switching frequency	110Vin(nom)		300 380 420 450		kHz
	3.3Vout 5Vout, $\pm$ 5Vout 12Vout, 15Vout, $\pm$ 12Vout, $\pm$ 15Vout 24Vout				
	24Vin(nom), 48Vin(nom)		290 350		kHz
	3.3Vout Others				
Safety approvals	IEC/ EN/ UL62368-1			UL:E193009 CB:UL(Demko)	
Standard approvals	EN50155 EN45545-2				
Case material					Copper
Base material					None
Potting material				Silicone (UL94 V-0)	
Weight				7.2g (0.26oz)	
MTBF	MIL-HDBK-217F, Full load			2.021 x 10 ⁵ hrs	

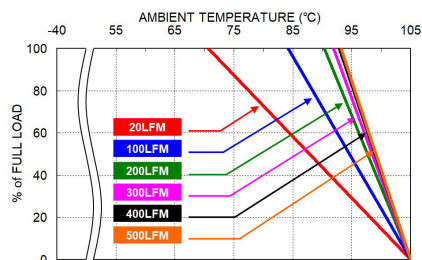
ENVIRONMENTAL SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating case temperature	With derating	-40		+105	°C
Maximum case temperature				105	°C
Storage temperature range		-55		+125	°C
Operating altitude				5000	m
Thermal impedance	For details please refer to THERMAL CONSIDERATIONS		25		°C/W
Thermal shock				MIL-STD-810F	
Shock				EN61373, MIL-STD-810F	
Vibration				EN61373, MIL-STD-810F	
Relative humidity				5% to 95% RH	

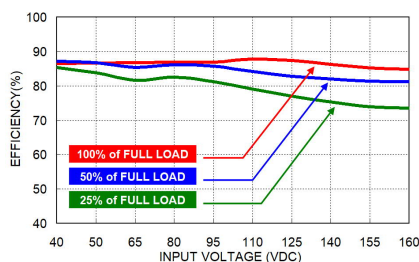
EMC SPECIFICATIONS			
Parameter	Conditions		Level
EMI	EN55032, EN50121-3-2	With external components	Class A, Class B
EMS	EN55035, EN50121-3-2		
ESD	EN61000-4-2	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	Perf. Criteria A
Radiated immunity	EN61000-4-3	20V/m	Perf. Criteria A
Fast transient	EN61000-4-4	$\pm 2\text{kV}$	Perf. Criteria A
	RDL10-24□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 820 μF /50V) and a TVS (SMDJ70A, 70V, 3000Watt peak pulse power) to connect in parallel.	
	RDL10-48□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 330 μF /100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel.	
	RDL10-110□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KXJ series, 330 μF /200V) and a TVS (SMDJ200A, 200V, 3000Watt peak pulse power) to connect in parallel.	
Surge	EN61000-4-5	EN55035: $\pm 1\text{kV}$ and EN50121-3-2: $\pm 2\text{kV}$	Perf. Criteria A
	RDL10-24□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 820 μF /50V) and a TVS (SMDJ70A, 70V, 3000Watt peak pulse power) to connect in parallel.	
	RDL10-48□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KZN series, 330 μF /100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel.	
	RDL10-110□□□W	With an aluminum electrolytic capacitor (Nippon chemi-con KXJ series, 330 μF /200V) and a TVS (SMDJ200A, 200V, 3000Watt peak pulse power) to connect in parallel.	
Conducted immunity	EN61000-4-6	10Vr.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.

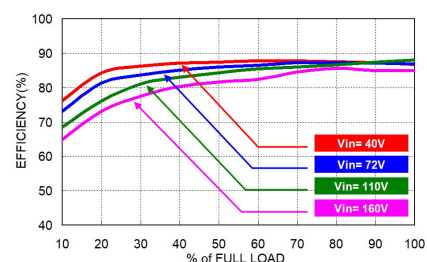
CHARACTERISTIC CURVE



RDL10-110S12W Derating Curve
With Recommended PCB Layout



RDL10-110S12W Efficiency vs. Input Voltage



RDL10-110S12W 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.

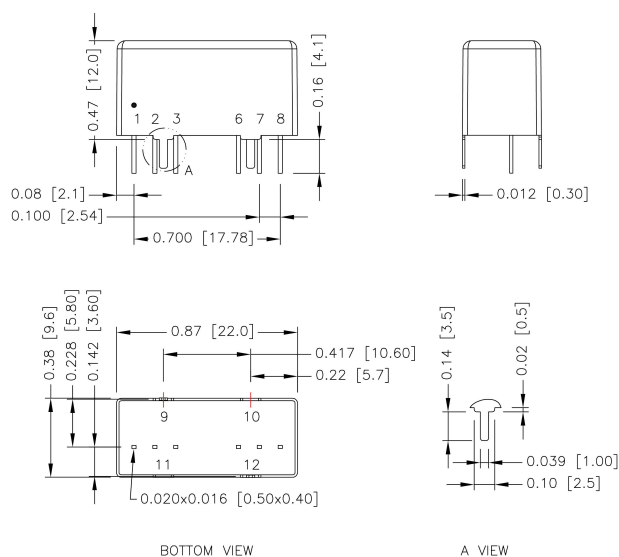
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
RDL10-24□□□W	2	Slow-Blow
RDL10-48□□□W	1.25	Slow-Blow
RDL10-110□□□W	0.63	Slow-Blow

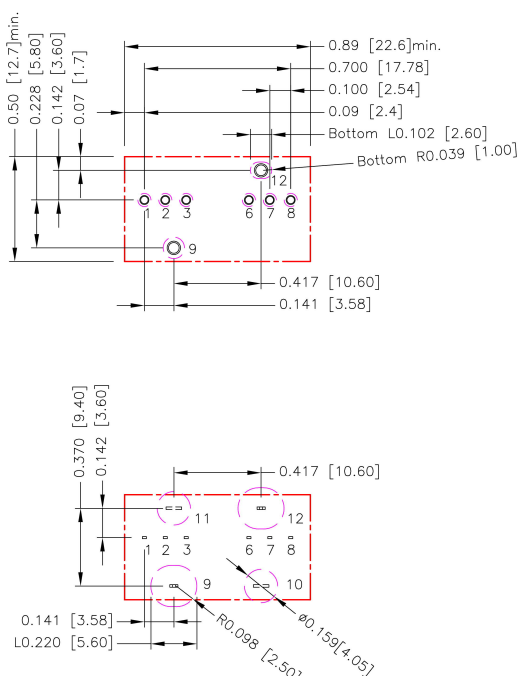
The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

MECHANICAL DRAWING



* Case pins should not be connected to any circuit.

RECOMMENDED PAD LAYOUT



PIN CONNECTION

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.x±0.5]
x.xxx±0.01 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

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: $\Phi 0.159[4.05]$
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.

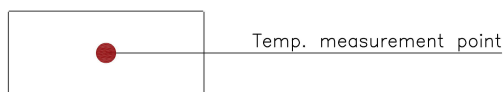
Proper cooling can be verified by measuring the point as the figure below.

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

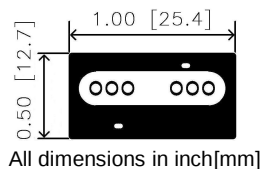
When operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

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