



# P-DUKE POWER

## RDL03W Series

DC-DC Converter  
Up to 3 Watts

# 3

YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Railway



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



3000  
VDC  
Isolation  
Voltage

4 : 1  
Wide  
Input  
Range

LOW  
Standby  
Power

NO  
Min. Load  
Required

REMOTE  
ON  
OFF

OCP

SCP

### PART NUMBER STRUCTURE

| Series Name | Input Voltage (VDC)               | Output Quantity | Output Voltage (VDC)                               | Input Range | Operating Ambient Temperature Options |
|-------------|-----------------------------------|-----------------|----------------------------------------------------|-------------|---------------------------------------|
| RDL03 -     | 48                                | S               | 05                                                 | W           | M3                                    |
|             | 24:9~36<br>48:18~75<br>110:43~160 | S: Single       | 3P3:3.3<br>05:5<br>09:9<br>12:12<br>15:15<br>24:24 | 4:1         | □: -40~+100°C<br>M3: -55~+100°C       |
|             |                                   | D: Dual         | 05:±5<br>12:±12<br>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                     |
| RDL03-24S3P3W  | 9 ~ 36      | 3.3            | 700                       | 4                       | 76         | 1100                   |
| RDL03-24S05W   | 9 ~ 36      | 5              | 600                       | 4                       | 81         | 550                    |
| RDL03-24S09W   | 9 ~ 36      | 9              | 333                       | 4                       | 81         | 340                    |
| RDL03-24S12W   | 9 ~ 36      | 12             | 250                       | 4                       | 83         | 240                    |
| RDL03-24S15W   | 9 ~ 36      | 15             | 200                       | 4                       | 83         | 240                    |
| RDL03-24S24W   | 9 ~ 36      | 24             | 125                       | 4                       | 82         | 90                     |
| RDL03-24D05W   | 9 ~ 36      | ±5             | ±300                      | 6                       | 80         | ±340                   |
| RDL03-24D12W   | 9 ~ 36      | ±12            | ±125                      | 6                       | 82         | ±170                   |
| RDL03-24D15W   | 9 ~ 36      | ±15            | ±100                      | 8                       | 82         | ±90                    |
| RDL03-48S3P3W  | 18 ~ 75     | 3.3            | 700                       | 4                       | 75         | 1100                   |
| RDL03-48S05W   | 18 ~ 75     | 5              | 600                       | 4                       | 81         | 550                    |
| RDL03-48S09W   | 18 ~ 75     | 9              | 333                       | 4                       | 81         | 340                    |
| RDL03-48S12W   | 18 ~ 75     | 12             | 250                       | 4                       | 82         | 240                    |
| RDL03-48S15W   | 18 ~ 75     | 15             | 200                       | 4                       | 82         | 240                    |
| RDL03-48S24W   | 18 ~ 75     | 24             | 125                       | 4                       | 82         | 90                     |
| RDL03-48D05W   | 18 ~ 75     | ±5             | ±300                      | 6                       | 80         | ±340                   |
| RDL03-48D12W   | 18 ~ 75     | ±12            | ±125                      | 6                       | 82         | ±170                   |
| RDL03-48D15W   | 18 ~ 75     | ±15            | ±100                      | 8                       | 82         | ±90                    |
| RDL03-110S3P3W | 43 ~ 160    | 3.3            | 700                       | 2                       | 76         | 1100                   |
| RDL03-110S05W  | 43 ~ 160    | 5              | 600                       | 2                       | 80         | 550                    |
| RDL03-110S09W  | 43 ~ 160    | 9              | 333                       | 2                       | 81         | 340                    |
| RDL03-110S12W  | 43 ~ 160    | 12             | 250                       | 2                       | 82         | 240                    |
| RDL03-110S15W  | 43 ~ 160    | 15             | 200                       | 2                       | 83         | 240                    |
| RDL03-110S24W  | 43 ~ 160    | 24             | 125                       | 2                       | 83         | 90                     |
| RDL03-110D05W  | 43 ~ 160    | ±5             | ±300                      | 2                       | 80         | ±340                   |
| RDL03-110D12W  | 43 ~ 160    | ±12            | ±125                      | 2                       | 83         | ±170                   |
| RDL03-110D15W  | 43 ~ 160    | ±15            | ±100                      | 2                       | 81         | ±90                    |

| INPUT SPECIFICATIONS          |                         |                           |  |      |                    |           |
|-------------------------------|-------------------------|---------------------------|--|------|--------------------|-----------|
| Parameter                     | Conditions              |                           |  | Min. | Typ.               | Max. Unit |
| Operating input voltage range |                         | 24Vin(nom)                |  | 9    | 24                 | 36        |
|                               |                         | 48Vin(nom)                |  | 18   | 48                 | 75        |
|                               |                         | 110Vin(nom)               |  | 43   | 110                | 160       |
|                               |                         |                           |  |      |                    | VDC       |
| Start up time                 | Constant resistive load | Power up                  |  |      | 50                 | 75        |
|                               |                         | Remote ON/OFF             |  |      | 50                 | 75        |
| Input surge voltage           | 1 second, max.          | 24Vin(nom)                |  |      |                    | 50        |
|                               |                         | 48Vin(nom)                |  |      |                    | 100       |
|                               |                         | 110Vin(nom)               |  |      |                    | 185       |
|                               |                         |                           |  |      |                    | VDC       |
| Input filter                  |                         |                           |  |      | Capacitor type     |           |
| Remote ON/OFF                 | Referred to -Vin pin    | DC-DC ON                  |  |      | Open or 0 ~ 0.5VDC |           |
|                               |                         | DC-DC OFF                 |  |      | 3 ~ 12VDC          |           |
|                               |                         | Input current of Ctrl pin |  | 2    | 4                  | 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                 | Measured by 20MHz bandwidth<br>With a 1 $\mu$ F/50V X7R MLCC |                                | 50   | 75    | mVp-p   |
| Temperature coefficient          |                                                              | -0.02                          |      | +0.02 | %/°C    |
| Transient response recovery time | 25% load step change                                         |                                | 250  |       | $\mu$ s |
| Over load protection             | % of Iout rated; Hiccup mode                                 |                                | 180  |       | %       |
| Short circuit protection         |                                                              | Continuous, automatic recovery |      |       |         |

**GENERAL SPECIFICATIONS**

| Parameter             | Conditions               | Min. | Typ. | Max.                        | Unit                |
|-----------------------|--------------------------|------|------|-----------------------------|---------------------|
| Isolation voltage     | 1 minute                 | 3000 |      |                             | VDC                 |
|                       | Input to Output          | 1500 |      |                             |                     |
|                       | Input (Output) to Case   |      |      |                             |                     |
| Isolation resistance  | 500VDC                   | 1    |      |                             | G $\Omega$          |
| Isolation capacitance |                          |      |      | 100                         | pF                  |
| Switching frequency   | 110Vin                   | 270  | 300  | 330                         | kHz                 |
|                       | Others                   | 360  | 400  | 440                         |                     |
| Safety approvals      | IEC/ EN/ UL62368-1       |      |      | UL:E193009<br>CB:UL(Demko)  |                     |
| Standard approvals    | EN50155<br>EN45545-2     |      |      |                             |                     |
| Case material         |                          |      |      |                             | Copper              |
| Base material         |                          |      |      |                             | None                |
| Potting material      |                          |      |      |                             | Silicone (UL94 V-0) |
| Weight                |                          |      |      | 5.9g (0.21oz)               |                     |
| MTBF                  | MIL-HDBK-217F, Full load |      |      | 5.535 x 10 <sup>6</sup> hrs |                     |

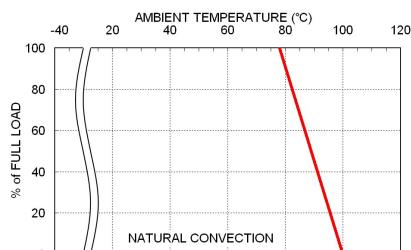
**ENVIRONMENTAL SPECIFICATIONS**

| Parameter                  | Conditions    | Min. | Typ. | Max.                  | Unit |
|----------------------------|---------------|------|------|-----------------------|------|
| Operating case temperature | 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          |      |
| Shock                      |               |      |      | EN61373, MIL-STD-810F |      |
| Vibration                  |               |      |      | EN61373, MIL-STD-810F |      |
| Relative humidity          |               |      |      | 5% to 95% RH          |      |

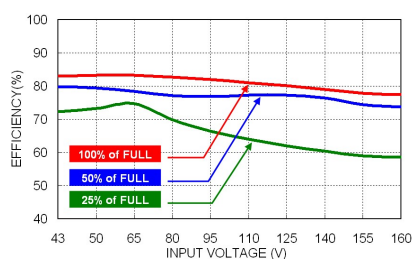
**EMC SPECIFICATIONS**

| Parameter                      | Conditions           |                                                                                                                                                                             | Level            |
|--------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| EMI                            | EN55032, EN50121-3-2 | With external components                                                                                                                                                    | Class A, Class B |
| EMS                            | EN55024, 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 |
|                                | RDL03-24□□□W         | With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 220 $\mu\text{F}$ /100V) and a TVS (SMDJ70A, 70V, 3000Watt peak pulse power) to connect in parallel.   |                  |
|                                | RDL03-48□□□W         | With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 220 $\mu\text{F}$ /100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel. |                  |
|                                | RDL03-110□□□W        | With an aluminum electrolytic capacitor (Nippon chemi-con KXJ series, 150 $\mu\text{F}$ /200V) and a TVS (SMB250A, 250V, 600Watt peak pulse power) to connect in parallel.  |                  |
| Surge                          | EN61000-4-5          | $\pm 2\text{kV}$                                                                                                                                                            | Perf. Criteria A |
|                                | RDL03-24□□□W         | With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 220 $\mu\text{F}$ /100V) and a TVS (SMDJ70A, 70V, 3000Watt peak pulse power) to connect in parallel.   |                  |
|                                | RDL03-48□□□W         | With an aluminum electrolytic capacitor (Nippon chemi-con KY series, 220 $\mu\text{F}$ /100V) and a TVS (SMDJ120A, 120V, 3000Watt peak pulse power) to connect in parallel. |                  |
|                                | RDL03-110□□□W        | With an aluminum electrolytic capacitor (Nippon chemi-con KXJ series, 150 $\mu\text{F}$ /200V) and a TVS (SMB250A, 250V, 600Watt 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 |

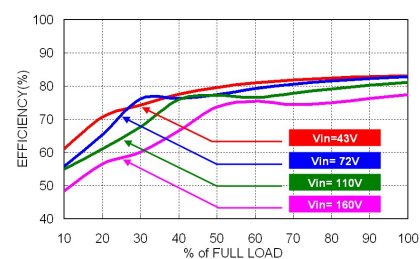
**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

**CHARACTERISTIC CURVE**


RDL03-110S05W Derating Curve



RDL03-110S05W Efficiency vs. Input Voltage



RDL03-110S05W 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.

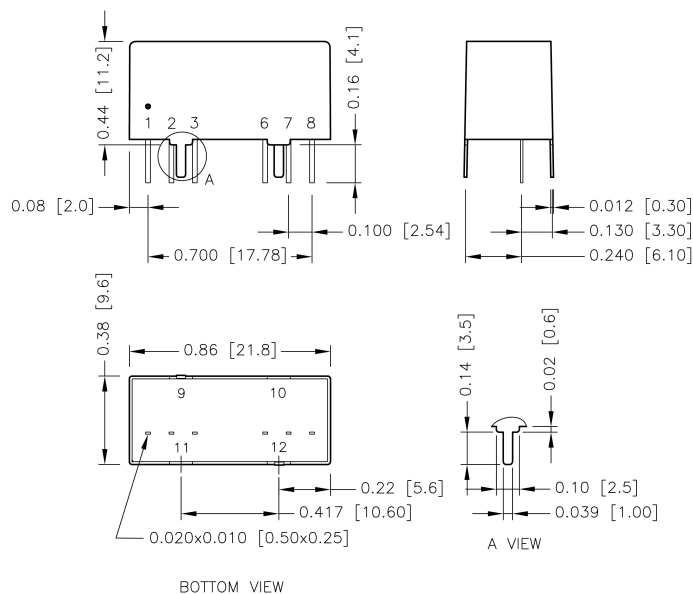
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system protection, always use an input line fuse.

The input line fuse suggest as below :

| Model         | Fuse Rating (A) | Fuse Type |
|---------------|-----------------|-----------|
| RDL03-24□□□W  | 0.8             | Slow-Blow |
| RDL03-48□□□W  | 0.5             | Slow-Blow |
| RDL03-110□□□W | 0.16            | 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



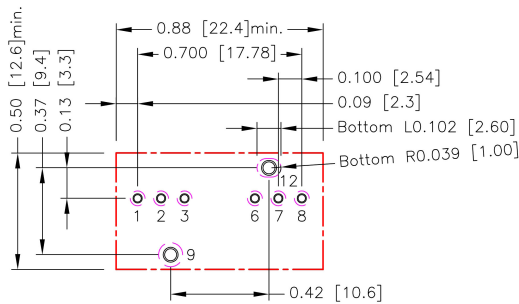
## PIN CONNECTION

| 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      |

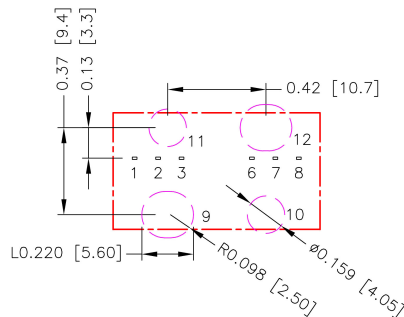
1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]  
x.xxx±0.01 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

\* Case pins should not be connected to any circuit.

## RECOMMENDED PAD LAYOUT



All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.6.7.8:  $\Phi 0.031$ [0.80]  
 Through hole 9.12:  $\Phi 0.051$ [1.30]  
 Top view pad 1.2.3.6.7.8:  $\Phi 0.039$ [1.00]  
 Top view pad 9.12:  $\Phi 0.064$ [1.63]  
 Bottom view pad 1.2.3.6.7.8:  $\Phi 0.063$ [1.60]  
 Bottom view pad 9:  $\Phi 0.102$ [2.60]  
 Bottom view pad 12: Groove R0.039[1.00] L0.102[2.60]



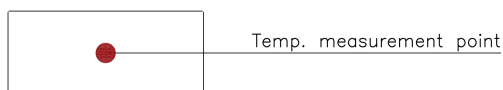
Area 9.10.11.12 don't layout  
 Area 10.11 size:  $\Phi 0.159$ [4.05]  
 Area 9.12 size: Groove R0.098[2.50] L0.220[5.60]  
 The layout distance between Pin3 and Pin6 is at least 3mm

\* 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).



TOP VIEW