



# P-DUKE POWER

## DOS10-05T · DOH10-05T Series

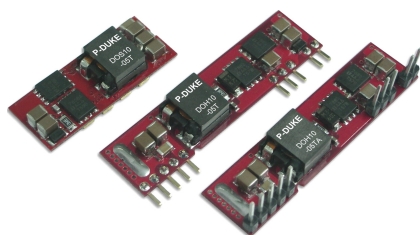
DC-DC Converter  
Up to 10 Amps

### 3

YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway

c US

CB CE

**NO**  
Min. Load  
Required

REMOTE  
**ON**  
**OFF**

**OCP**

**SCP**

**UVP**

### PART NUMBER STRUCTURE

**DOS10** -

Series Name

**05**

Input  
Voltage  
(VDC)

**T**

Package

-

**P**

Remote Control  
Option

**DOS10**: SMD TYPE  
**DOH10**: SIP TYPE

**05**: 2.4~5.5

SMD TYPE  
SIP TYPE

**T**: No Assembly  
**T**: Vertical Mounting SIP  
**TA**: Horizontal Mounting SIP

☐: Negative Logic  
**P**: Positive Logic

## 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 Vin(nom) @ No Load | Efficiency Vin(nom),3.3VDC @Full Load | Maximum Capacitor Load                           |
|--------------|-------------------------|----------------|---------------------------|----------------------------------|---------------------------------------|--------------------------------------------------|
|              | VDC                     | VDC            | A                         | 0.75VDC / 3.3VDC                 | %                                     | ESR $\geq$ 1m $\Omega$ / ESR $\geq$ 10m $\Omega$ |
|              |                         |                |                           | mA                               |                                       | $\mu$ F                                          |
| DOS10-05T    |                         |                |                           |                                  |                                       |                                                  |
| DOS10-05T-P  |                         |                |                           |                                  |                                       |                                                  |
| DOH10-05T    | 2.4 ~ 5.5               | 0.75 ~ 3.3     | 10                        | 100 / 130                        | 95                                    | 1000 / 5000                                      |
| DOH10-05T-P  | Vin(min.)=Vout(set)+0.5 |                |                           |                                  |                                       |                                                  |
| DOH10-05TA   |                         |                |                           |                                  |                                       |                                                  |
| DOH10-05TA-P |                         |                |                           |                                  |                                       |                                                  |

## INPUT SPECIFICATIONS

| Parameter                     | Conditions                                                                                                                                                                                                                                                                                                                                                           | Min. | Typ. | Max.           | Unit |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|----------------|------|
| Operating input voltage range | Vout(set) < Vin-0.5VDC                                                                                                                                                                                                                                                                                                                                               | 2.4  | 5    | 5.5            | VDC  |
| Maximum input current         | Vin=2.4 to 5.5VDC, Io=Io(max.)                                                                                                                                                                                                                                                                                                                                       |      | 10   |                | A    |
| Start up voltage              |                                                                                                                                                                                                                                                                                                                                                                      |      |      | 2.4            | VDC  |
| Shutdown voltage              |                                                                                                                                                                                                                                                                                                                                                                      | 1.6  | 2.0  | 2.2            | VDC  |
| Input filter                  | <p>*It's necessary to equip the external input capacitors at the input of the module.</p> <p>The capacitors should connect as close as possible to the input terminals that ensuring module stability.</p> <p>The external C<sub>in</sub> is 3pcs of 150<math>\mu</math>F low-ESR polymer capacitors // 2pcs of 47<math>\mu</math>F ceramic capacitors at least.</p> |      |      | Capacitor type |      |

## OUTPUT SPECIFICATIONS

| Parameter                        | Conditions                                                                                                                                                                                                                                     | Min.   | Typ. | Max. | Unit                            |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|------|---------------------------------|
| Voltage accuracy                 | % of Vout(set)                                                                                                                                                                                                                                 | -2.0   |      | +2.0 | %                               |
| Line regulation                  | Vin=Vout(set)+0.5VDC to Vin(max.) at Full Load                                                                                                                                                                                                 | -0.3   |      | +0.3 | %                               |
| Load regulation                  | No Load to Full Load                                                                                                                                                                                                                           | -0.4   |      | +0.4 | %                               |
| Voltage adjustability            |                                                                                                                                                                                                                                                | 0.7525 |      | 3.63 | VDC                             |
| Ripple and noise                 | Measured by 20MHz bandwidth, with a 1 $\mu$ F MLCC & a 10 $\mu$ F T/C                                                                                                                                                                          |        |      | 15   | mVrms                           |
|                                  |                                                                                                                                                                                                                                                |        |      | 50   | mVp-p                           |
| Temperature coefficient          |                                                                                                                                                                                                                                                | -0.4   |      | +0.4 | %/°C                            |
| Dynamic load response            | <p>With a 1<math>\mu</math>F MLCC &amp; a 10<math>\mu</math>F T/C</p> <p><math>\Delta</math> Io/ <math>\Delta</math> t=2.5A/<math>\mu</math>s, Vin(nom) Peak deviation</p> <p>50% load step change Setting time(Vout&lt;10%peak deviation)</p> |        | 200  |      | mV                              |
|                                  |                                                                                                                                                                                                                                                |        | 25   |      | $\mu$ s                         |
|                                  | <p>With 2pcs of 150<math>\mu</math>F polymer capacitors</p> <p><math>\Delta</math> Io/ <math>\Delta</math> t=2.5A/<math>\mu</math>s, Vin(nom) Peak deviation</p> <p>50% load step change Setting time(Vout&lt;10%peak deviation)</p>           |        | 100  |      | mV                              |
|                                  |                                                                                                                                                                                                                                                |        | 100  |      | $\mu$ s                         |
| Over load protection             | % of Iout rated                                                                                                                                                                                                                                |        | 200  |      | %                               |
| Short circuit protection         |                                                                                                                                                                                                                                                |        |      |      | Continuous, automatics recovery |
| Output voltage overshoot-startup | Vin=2.4~5.5VDC at Full Load                                                                                                                                                                                                                    |        | 1.0  |      | %                               |

## GENERAL SPECIFICATIONS

| Parameter           | Conditions               | Min. | Typ. | Max.                        | Unit |
|---------------------|--------------------------|------|------|-----------------------------|------|
| Isolation voltage   |                          |      |      | None                        |      |
| Switching frequency |                          | 270  | 300  | 330                         | kHz  |
| Safety approvals    | IEC/ UL/ EN60950-1       |      |      | UL:E193009<br>CB:UL(Demko)  |      |
| Weight              |                          |      |      | 6.0g (0.21oz)               |      |
| MTBF                | MIL-HDBK-217F, Full load |      |      | 3.239 x 10 <sup>6</sup> hrs |      |

## ENVIRONMENTAL SPECIFICATIONS

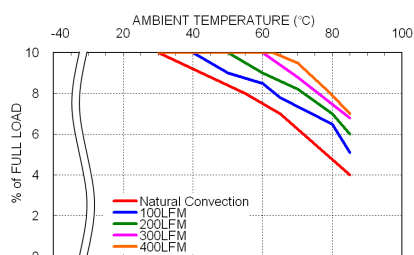
| Parameter                         | Conditions    | Min. | Typ. | Max.                       | Unit |
|-----------------------------------|---------------|------|------|----------------------------|------|
| Operating ambient temperature     | With derating | -40  |      | +85                        | °C   |
| Over temperature protection       |               |      | 125  |                            | °C   |
| Storage temperature range         |               | -55  |      | +125                       | °C   |
| Thermal shock                     |               |      |      | MIL-STD-810F               |      |
| Vibration                         |               |      |      | MIL-STD-810F               |      |
| Relative humidity(non-condensing) |               |      |      | 5% to 95% RH               |      |
| Lead-free reflow solder process   |               |      |      | IPC J-STD-020D             |      |
| Moisture sensitivity level(MSL)   |               |      |      | IPC J-STD-033B<br>Level 2a |      |

## FEATURE SPECIFICATIONS

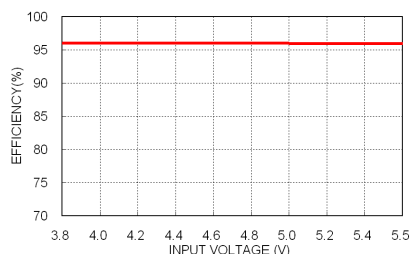
| Parameter          | Conditions                                                                                                                                                                                                                                                                                                                                                                     | Min. | Typ. | Max. | Unit     |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|----------|
| Remote ON/OFF      | Referred to GND pin<br>Negative logic DC-DC ON<br>(Standard) DC-DC OFF<br>Positive logic DC-DC ON<br>(Option) DC-DC OFF<br>Input current of Ctrl pin<br>Remote off input current<br><br>*Positive logic:ON/OFF is open collector/drain logic input<br>Negative logic:ON/OFF pin is open collector/drain logic input with external pull –up resistor                            | 0.01 |      | 1.0  | mA<br>mA |
| Remote sense range |                                                                                                                                                                                                                                                                                                                                                                                |      |      | 0.5  | VDC      |
| Rise time          | Time for Vout to rise from 10% to 90%of Vout(set)                                                                                                                                                                                                                                                                                                                              |      |      | 6    | ms       |
| Turn-on delay time | Case 1, Case 2<br><br>*Case 1: ON/OFF input is set to logic low (module on) and then input power is applied<br>(delay from instant at which Vin=Vin(min.) until Vout=10% of Vout(set))<br><br>*Case 2:Input power is applied for at least one second and then the ON/OFF input is set to logic low<br>(delay form instant at which Von/off=0.3VDC until Vout=10% of Vout(set)) |      | 1    |      | ms       |

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

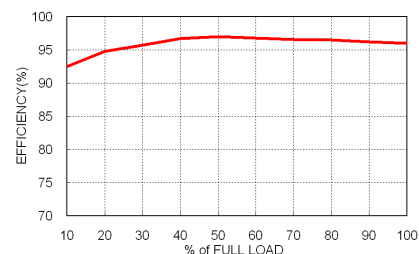
## CHARACTERISTIC CURVE



DOS10-05T, Vout=3.3V  
Derating Curve



DOS10-05T, Vout=3.3V  
Efficiency vs. Input Voltage



DOS10-05T, Vout=3.3V  
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.

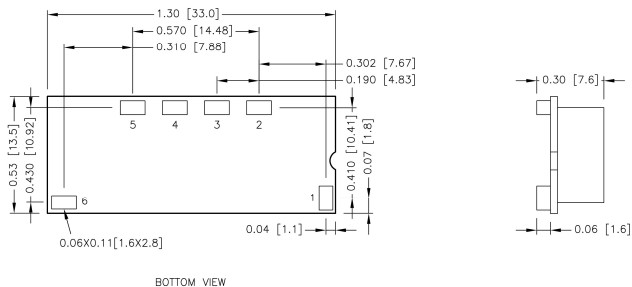
The input line fuse suggest as below :

| Model        | Fuse Rating (A) | Fuse Type   |
|--------------|-----------------|-------------|
| DOS10-05T□□□ | 15              | Fast-Acting |
| DOH10-05T□□□ | 15              | Fast-Acting |

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

## MECHANICAL DRAWING

### DOS10-05T

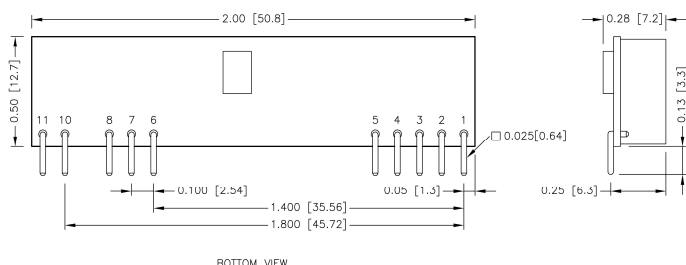


BOTTOM VIEW

### PIN CONNECTION

| PIN | DEFINE |
|-----|--------|
| 1   | Ctrl   |
| 2   | +Sense |
| 3   | Trim   |
| 4   | +Vout  |
| 5   | GND    |
| 6   | +Vin   |

### DOH10-05T

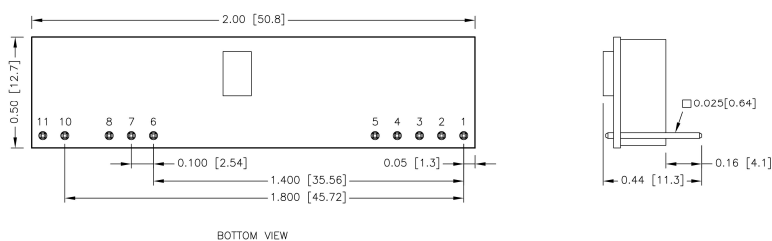


BOTTOM VIEW

### PIN CONNECTION

| PIN | DEFINE |
|-----|--------|
| 1   | +Vout  |
| 2   | +Vout  |
| 3   | +Sense |
| 4   | +Vout  |
| 5   | GND    |
| 6   | GND    |
| 7   | +Vin   |
| 8   | +Vin   |
| 10  | Trim   |
| 11  | Ctrl   |

### DOH10-05TA



BOTTOM VIEW

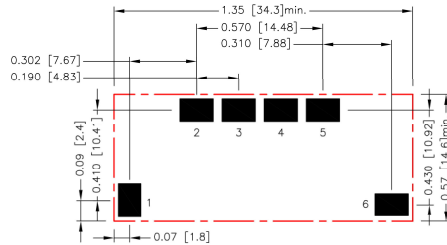
### PIN CONNECTION

| PIN | DEFINE |
|-----|--------|
| 1   | +Vout  |
| 2   | +Vout  |
| 3   | +Sense |
| 4   | +Vout  |
| 5   | GND    |
| 6   | GND    |
| 7   | +Vin   |
| 8   | +Vin   |
| 10  | Trim   |
| 11  | Ctrl   |

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 pitch tolerance ±0.01 [0.25]
4. Pin dimension tolerance ±0.004[0.10]

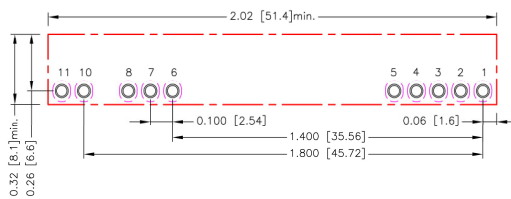
## RECOMMENDED PAD LAYOUT

### DOS10-05T



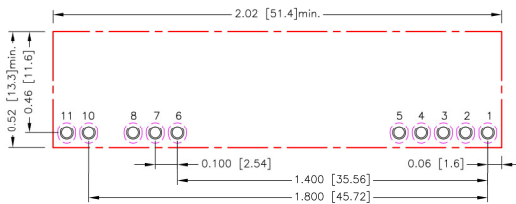
All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Top view pad1.2.3.4.5.6:0.150x0.102[3.80x2.60]

### DOH10-05T



All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.4.5.6.7.8.10.11:  $\Phi 0.047$ [1.20]  
 Top view pad 1.2.3.4.5.6.7.8.10.11:  $\Phi 0.059$ [1.50]  
 Bottom view pad 1.2.3.4.5.6.7.8.10.11:  
 Groove R0.040[1.02]L-0.094[2.40]

### DOH10-05TA



All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3.4.5.6.7.8.10.11:  $\Phi 0.047$ [1.20]  
 Top view pad 1.2.3.4.5.6.7.8.10.11:  $\Phi 0.059$ [1.50]  
 Bottom view pad 1.2.3.4.5.6.7.8.10.11:  
 Groove R0.040[1.02]L-0.094[2.40]

## 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, convention, 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 115°C.

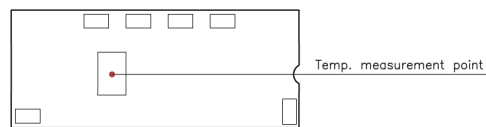
When Operating, adequate cooling must be provided to maintain the test point temperature at or below 115°C.

Although the maximum point Temperature of the power modules is 115°C, you can limit this Temperature to a lower value for extremely high reliability. The unit will shutdown if the thermal reference point exceeds 125°C (typical), but the thermal shutdown is not intended as a guarantee that the unit will survive temperature beyond its rating.

The module will automatically restarts after it cools down.

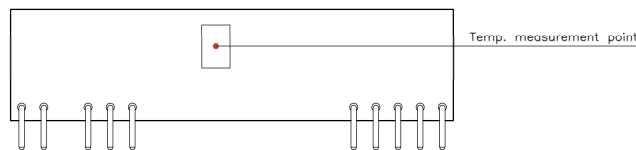
- Thermal test condition with vertical direction by natural convection (20LFM).

### DOS10-05T



BOTTOM VIEW

### DOH10-05T



BOTTOM VIEW

### DOH10-05TA

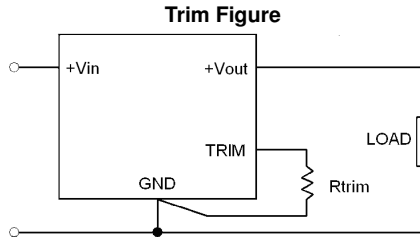


BOTTOM VIEW

## OUTPUT VOLTAGE PROGRAMMING

Output voltage programmable from 0.75V to 3.3V by connecting a single resistor (shown as Trim Table) between the Trim and GND pins of the module. To calculate the value of the resistor Rtrim for a particular output voltage Vout, use the following equation:

■ **Rtrim Equation :** 
$$R_{trim} = \left[ \frac{21070}{V_{out} - 0.7525} - 5110 \right] \Omega$$



**Trim Table**

| Vout(set) (VDC) | Rtrim (kΩ) |
|-----------------|------------|
| 0.7525          | Open       |
| 1.2             | 41.973     |
| 1.5             | 23.077     |
| 1.8             | 15.004     |
| 2.5             | 6.974      |
| 3.3             | 3.160      |