P-DUKE POWER

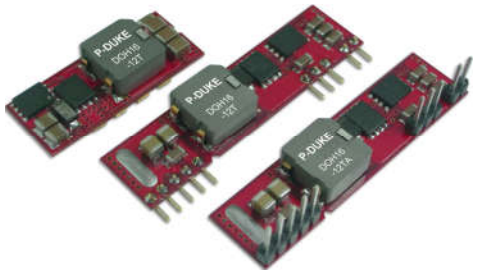
DOS16-12T • DOH16-12T Series

DC-DC Converter
Up to 16 Amps

3 YEARS WARRANTY

RoHS COMPLIANT

REACH COMPLIANT



Automation | Datacom | IPC

Industry | Measurement | Telecom

Automobile | Boat | Charger

Medical | PV | Railway

NO Min. Load Required | REMOTE ON OFF | OCP | SCP | UVP

PART NUMBER STRUCTURE

DOS16 - 12 T - P R

Series Name	Input Voltage (VDC)	Package		Remote Control Option	Conformal Coating Option
DOS16: SMD TYPE **DOH16:** SIP TYPE	**12:** 8.3~14	SMD TYPE SIP TYPE	**T:** No Assembly **T:** Vertical Mounting SIP **TA:** Horizontal Mounting SIP	**□:** Negative Logic **P:** Positive Logic	**□:** None **R:** Conformal Coating

TECHNICAL SPECIFICATION All specifications are typical at nominal input, full load and 25℃ unless otherwise noted

Model Number	Input Range	Output Voltage	Output Current @Full Load	Input Current Vin(nom) @ No Load 0.75VDC / 5.0VDC	Efficiency Vin(nom),3.3VDC @Full Load	Maximum Capacitor Load ESR≧1mΩ / ESR≧10mΩ
	VDC	VDC	A	mA	%	μF
DOS16-12T DOS16-12T-P DOH16-12T DOH16-12T-P DOH16-12TA DOH16-12TA-P	Vout(set)≦3.63 Vin = 8.3 ~ 14 Vout(set)＞3.63 Vin = 8.3 ~ 13.2	0.75 ~ 5	16	40 / 100	92	1000 / 5000

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	Vout(set)≦3.63VDC Vout(set)＞3.63VDC	8.3 8.3	12 12	14 13.2	VDC
Maximum input current	Vin=8.3 to 14VDC, Io=Io(max.)		10		A
Start up voltage				8.3	VDC
Shutdown voltage		6.5	7.5	8	VDC
Input filter	*It's necessary to equip the external input capacitors at the input of the module. The capacitors should connect as close as possible to the input terminals that ensuring module stability. The external C_{in} is 6pcs of 47μF ceramic capacitors at least.		Capacitor type		

OUTPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Voltage accuracy	% of Vout(set)	-2.0		+2.0	%
Line regulation	Vin=Vin(min.) to Vin(max.) at Full Load % of Vout(set)	-0.3		+0.3	%
Load regulation	No Load to Full Load % of Vout(set)	-0.4		+0.4	%
Voltage adjustability		0.7525		5	VDC
Ripple and noise	Measured by 20MHz bandwidth,with a 1μF MLCC & a 10μF T/C			30 75	mVrms mVp-p
Temperature coefficient		-0.4		+0.4	%/℃
Dynamic load response	With a 1μF MLCC & a 10μF T/C △Io/△t=2.5A/μs,Vin(nom) Peak deviation 50% load step change Setting time(Vout<10%peak deviation) With 2pcs of 150μF polymer capacitors △Io/△t=2.5A/μs,Vin(nom) Peak deviation 50% load step change Setting time(Vout<10%peak deviation)		200 25 100 50		mV μs mV μs
Over load protection	% of Iout rated		180		%
Short circuit protection			Continuous, automatics recovery		
Output voltage overshoot-startup	Vin= Vin(min.) to Vin(max.) at Full Load % of Vout(set)		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 CB:UL(Demko)
Weight					6.0g (0.21oz)
MTBF	MIL-HDBK-217F, Full load				3.416 x 10^6 hrs

ENVIRONMENTAL SPECIFICATIONS

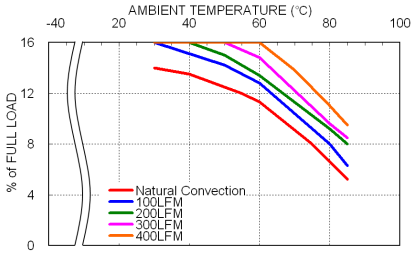
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating	-40		+85	℃
Over temperature protection			125		℃
Storage temperature range		-55		+125	℃
Thermal shock					MIL-STD-810F
Vibration					MIL-STD-810F
Relative humidity(non-condensing)					5% to 95% RH
Lead-free reflow solder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

FEATURE SPECIFICATIONS

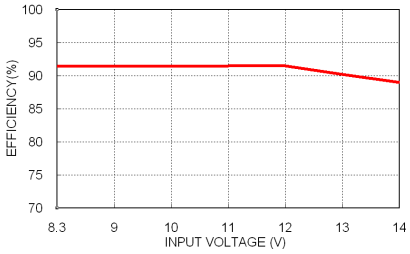
Parameter	Conditions			Min.	Typ.	Max.	Unit
Remote ON/OFF	Referred to GND pin	Negative logic (Standard)	DC-DC ON		Open or 0 ~ 0.3VDC		
			DC-DC OFF		2.5VDC ~ Vin(max.)		
		Positive logic (Option)	DC-DC ON		Open or (Vin-4) ~ Vin(max.)		
			DC-DC OFF		0 ~ 0.3VDC		
		Input current of Ctrl pin		0.01		1.0	mA
		Remote off input current			2.0		mA
	*Positive logic:ON/OFF is open collector/drain logic input Negative logic:ON/OFF pin is open collector/drain logic input with external pull –up resistor						
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 *Case 1: ON/OFF input is set to logic low (module on) and then input power is applied (delay from instant at which Vin=Vin(min.) until Vout=10% of Vout(set)) *Case 2:Input power is applied for at least one second and then the ON/OFF input is set to logic low (delay from instant at which Von/off=0.3VDC until Vout=10% of Vout(set))				3		ms

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

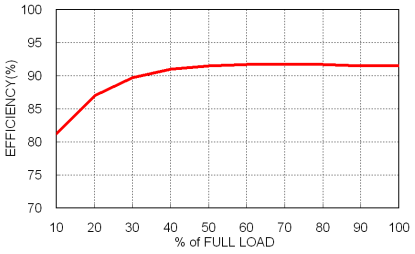
CHARACTERISTIC CURVE



DOS16-12T, Vout=3.3V
Derating Curve



DOS16-12T, Vout=3.3V
Efficiency vs. Input Voltage



DOS16-12T, Vout=3.3V
Efficiency vs. Output Load

FUSE CONSIDERATION

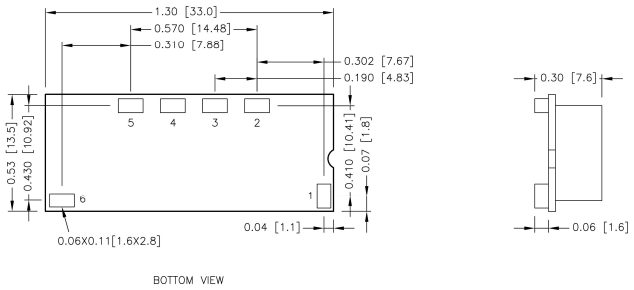
This power module is not internally fused. An input line fuse must always be used.
This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.
To maximum flexibility, internal fusing 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
DOS16-12T□□□	15	Fast-Acting
DOH16-12T□□□	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

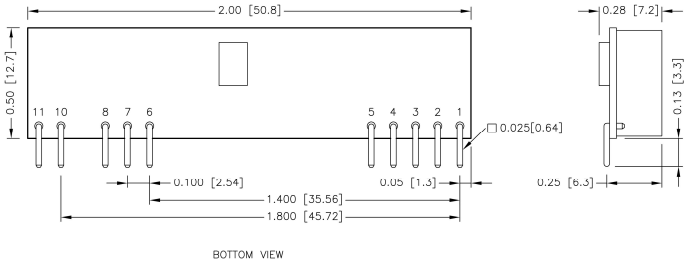
DOS16-12T



PIN CONNECTION

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

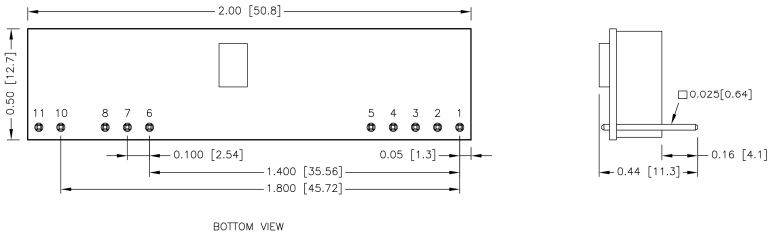
DOH16-12T



PIN CONNECTION

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

DOH16-12TA



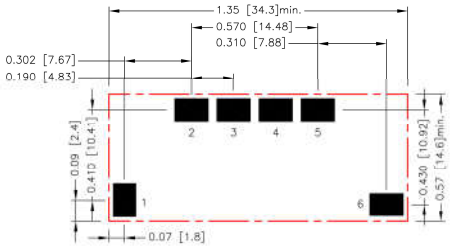
PIN CONNECTION

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

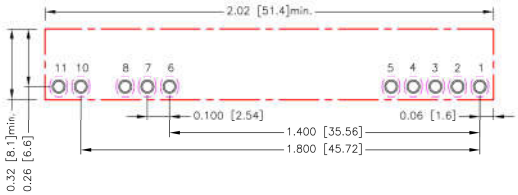
RECOMMENDED PAD LAYOUT

DOS16-12T



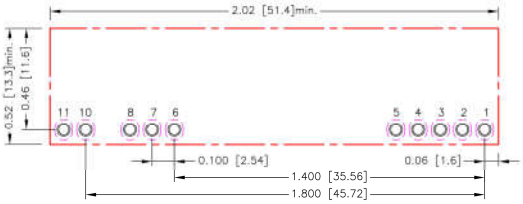
All dimensions in inch[mm]
Pad size(lead free recommended)
Top view pad1.2.3.4.5.6:0.150x0.102[3.80x2.60]

DOH16-12T



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6.7.8.10.11: Φ0.047[1.20]
Top view pad 1.2.3.4.5.6.7.8.10.11: Φ0.059[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]

DOH16-12TA



All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5.6.7.8.10.11: Φ0.047[1.20]
Top view pad 1.2.3.4.5.6.7.8.10.11: Φ0.059[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]

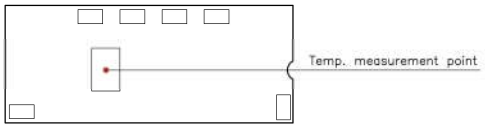
THERMAL CONSIDERATIONS

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℃.
When Operating, adequate cooling must be provided to maintain the test point temperature at or below 115℃.
Although the maximum point Temperature of the power modules is 115℃, you can limit this Temperature to a lower value for extremely high reliability.

The unit will shutdown if the thermal reference point exceeds 125℃ (typical), but the thermal shutdown is not intended as a guarantee that the unit will survive temperature beyond its rating.
The module will automatically restart after it cools down.

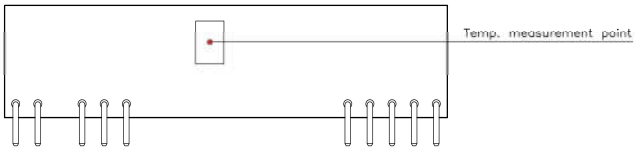
■ Thermal test condition with vertical direction by natural convection (20LFM).

DOS16-12T



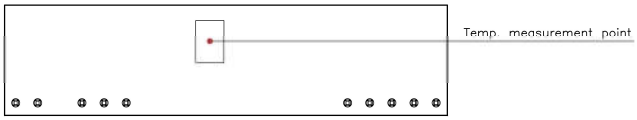
BOTTOM VIEW

DOH16-12T



BOTTOM VIEW

DOH16-12TA



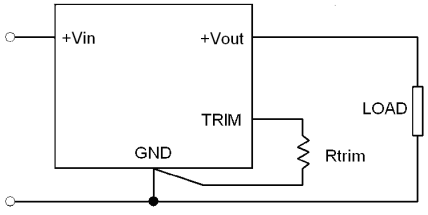
BOTTOM VIEW

OUTPUT VOLTAGE PROGRAMMING

Output voltage programmable from 0.7525V to 5V 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 :** $Rtrim = \left[\frac{10500}{Vout - 0.7525} - 1000\right]\Omega$

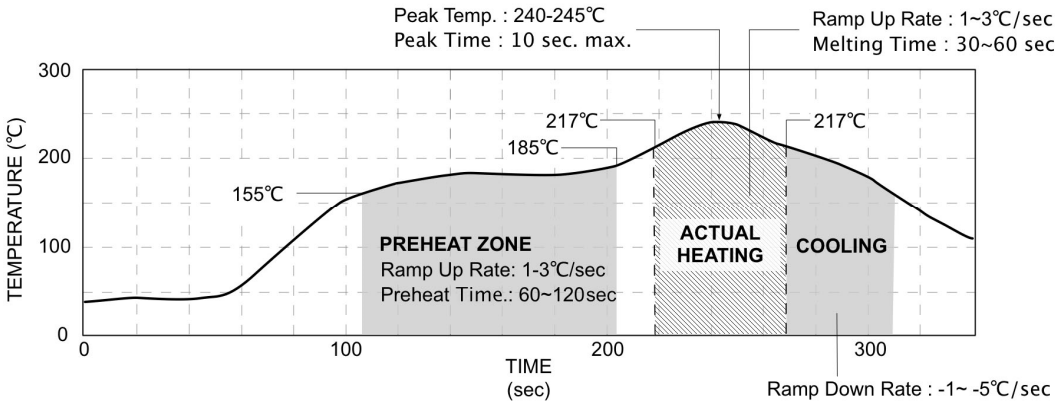
Trim Figure



Trim Table

Vout(set) (VDC)	Rtrim (kΩ)
0.7525	Open
1.2	22.46
1.5	13.05
1.8	9.024
2.5	5.009
3.3	3.122
5	1.472

LEAD FREE REFLOW PROFILE For SMD Type



*The curves define the maximum peak reflow temperature permissible measured on pin1 or Vin pin.

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