



P-DUKE POWER

OSR03 Series

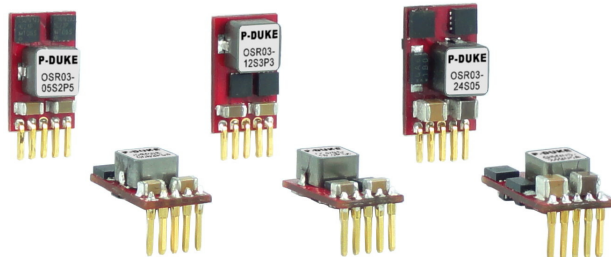
DC-DC Converter
Up to 45 Watts

3

YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



NON
-isolation

ADJ.
Output
Voltage

REMOTE
ON
OFF

OCP

SCP

PART NUMBER STRUCTURE

OSR03

-

24

S

05

A

Series Name

Input
Voltage
(VDC)

Output
Quantity

Output
Voltage
(VDC)

Assembly
Option

Positive

05:2.5~5.5
12:4.5~14
24:10~30

S:Single

2P5: 0.6~ 3.3
3P3: 0.59~6.0
05: 3.0~6.0
12: 5.0~15

□: Standard
A: Horizontal type

Negative

05:4.7~13
12:10~27
24:10~25

3P3:-0.59~ -6.0
05:-3.0~ -6.0
12:-5.0~ -15

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

Positive output application

Model Number	Input Range	Output Voltage	Output Current @FullLoad	Input Current @ No Load	Efficiency	Maximum Capacitor Load	
						ESR $\geq 1\text{m}\Omega$	ESR $\geq 10\text{m}\Omega$
						μF	
OSR03-05S2P5	2.5 ~ 5.5	0.6 ~ 3.3	3	20	95.0@2.5Vo	1000	3000
OSR03-12S3P3	4.5 ~ 14	0.59 ~ 6.0	3	25	93.0@3.3Vo	1000	3000
OSR03-24S05	10 ~ 30	3.0 ~ 6.0	3	25	91.0@5.0Vo	1000	3000
OSR03-24S12	10 ~ 30	5.0 ~ 15	3	30	95.0@12Vo	500	1200

Negative output application

Model Number	Input Range	Output Voltage	Output Current @FullLoad	Input Current @ No Load	Efficiency	Maximum Capacitor Load	
						μF	
						μF	
OSR03-12S3P3	4.7 ~ 13	-0.59 ~ -6.0	-2.2	35	90.0@-3.3Vo	780	
OSR03-24S05	10 ~ 27	-3.0 ~ -6.0	-2.2	35	90.0@-5.0Vo	2200	
OSR03-24S12	10 ~ 25	-5.0 ~ -15	-1.2	60	91.0@-12Vo	580	

*OSR03-12S3P3: When use negative output application and |Vo| trim up >3.3V, the Output Current maximum is 1.5A

*Please see page 2 input specifications for input range details.

INPUT SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	Positive output application				
	05S2P5 (Vin>Vo+0.5V)	2.5		5.5	
	12S3P3 (Vin>Vo+2.0V)	4.5		14	
	24S05 (Vin>Vo+3.0V)	10		30	
	24S12 (Vin>Vo+3.0V)	10		30	VDC
	Negative output application				
	12S3P3 (Vin _{max} =14- Vo)	4.7		13	
	24S05 (Vin _{max} =30- Vo)	10		27	
	24S12 (Vin _{max} =30- Vo)	10		25	
	*OSR03-12S3P3:When Vo,set < 0.9V, the input voltage range is 4.5V to 9V.				
Maximum input current	Vin=Vin(min); Io=Io(max)			3.0	
				2.6	
				2.2	
				3.0	A
Input filter				Capacitor type	

OUTPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy			-2.0		+2.0	%
Line regulation		$V_o \geq 2.5V$		0.2		%
		$V_o < 2.5V$		5		mV
Load regulation	0% to 100% of F.L.	$V_o \geq 2.5V$		0.8		%
		$V_o < 2.5V$		20		mV
	10% to 90% of F.L.	$V_o \geq 2.5V$		0.6		%
		$V_o < 2.5V$		15		mV
Ripple and noise	Positive output application Measured by 20MHz bandwidth	05S2P5		30		mVp-p
		12S3P3		60		
	With a 2.2μF MLCC	24S05		75		
	With a 2.2μF MLCC	24S12		150		
	Negative output application (In Figure 1)					mVp-p
		12S3P3		60		
	With a C1=10μF/50V MLCC and	24S05		75		
	a C2=10μF/25V MLCC	24S12		150		
Temperature coefficient			-1		+1	%/°C
Dynamic load response	50% load step change	Peak deviation Others		150		mV
		Peak deviation 24S12		250		mV
		Recovery time		120		μs
Over load protection	% of lout rated; Hiccup mode	05S2P5		280		%
		12S3P3 ; 24S05 ; 24S12		220		
Short circuit protection			Continuous, automatics recovery			
Output voltage overshoot-startup					1	%
Voltage adjustability	(See Figure 2)	05S2P5	0.6		3.3	VDC
		12S3P3	0.59		6	
		24S05	3		6	
		24S12	5		15	
	*Output voltage can be adjusted by connecting a single resistor between the TRIM and GND pins of the module. To calculate the value of the resistor Rtrim for a particular output voltage Vo , use the following equation: in Table1					

FEATURE SPECIFICATIONS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Rise time	Time for V_o to rise from 10% to 90% V_o			6	ms
	05S2P5 ; 12S3P3			10	
	24S05 ; 24S12				
Remote on/off	The ON/OFF control pin voltage is referenced to GND (Positive logic)				
	05S2P5				
	Others				
		ON = Open or $V_{in(max)}$ OFF=0V < V_r < 0.3V ON = 1V < V_r < 12V OFF=0V < V_r < 0.3V			

GENERAL SPECIFICATIONS

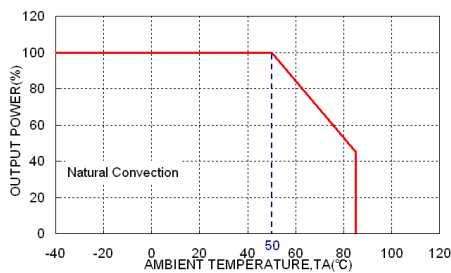
Parameter	Conditions	Min.	Typ.	Max.	Unit
Switching frequency	05S2P5 ; 12S3P3 24S05 ; 24S12	540 270	600 300	660 330	kHz
Safety meets		IEC /UL/ EN60950-1			
Case material		Open frame			
Potting material		None			
Weight	05S2P5 ; 12S3P3 24S05 ; 24S12	1.7g(0.060oz) 2.1g(0.074oz)			
MTBF	MIL-HDBK-217F, Full load	4.467 x 10 ⁶ hrs			

ENVIRONMENTAL SPECIFICATIONS

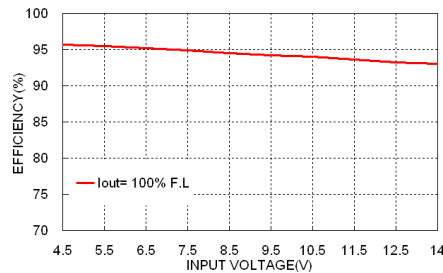
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating temperature range		-40		+85	°C
Storage temperature range		-55		+125	°C
Thermal shock				MIL-STD-810F	
Relative humidity	Non-condensing			5% to 95% RH	

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

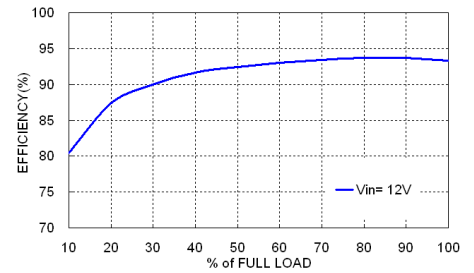
CHARACTERISTIC CURVE



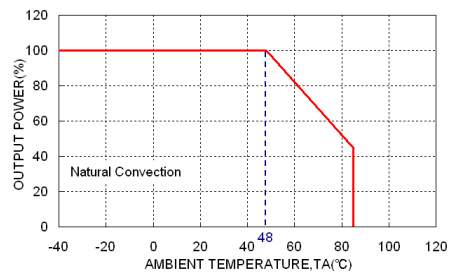
OSR03-12S3P3 Derating Curve
Positive output application



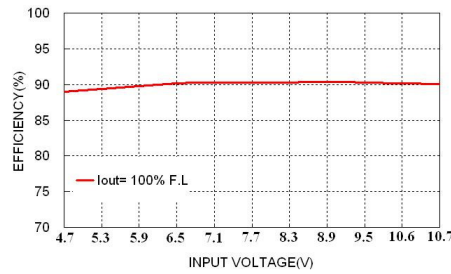
OSR03-12S3P3 Efficiency vs. Input Voltage
Positive output application



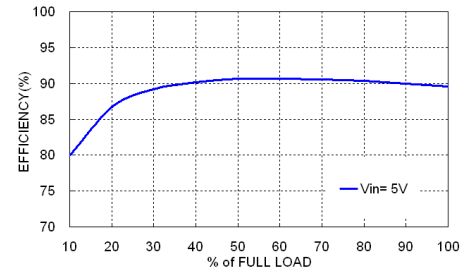
OSR03-12S3P3 Efficiency vs. Output Load
Positive output application



OSR03-12S3P3 Derating Curve
Negative output application



OSR03-12S3P3 Efficiency vs. Input Voltage
Negative output application



OSR03-12S3P3 Efficiency vs. Output Load
Negative output application

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
OSR03-05S2P5	5	Slow-Blow
OSR03-12S3P3	5	Slow-Blow
OSR03-24S05	5	Slow-Blow
OSR03-24S12	5	Slow-Blow

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

NEGATIVE OUTPUT APPLICATION

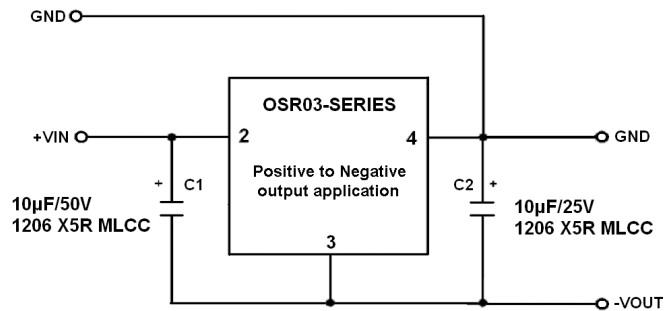


Figure 1

C1 and C2 are required and should be fitted close to the converter pins

TRIM APPLICATION

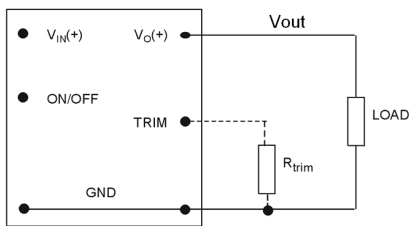


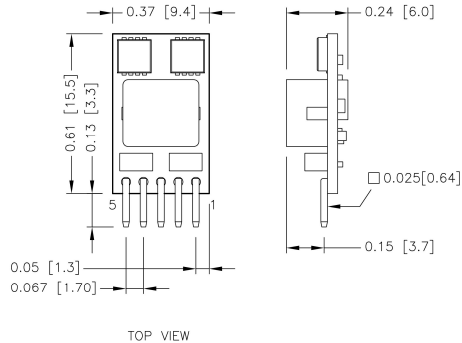
Figure 2

Model	$R_{trim_up} (k\Omega)$
OSR03-05S2P5	$\left(\frac{1.2}{V_o - 0.6} \right) - 0.01$
OSR03-12S3P3	$\left(\frac{1.18}{V_o - 0.59} \right)$
OSR03-24S05	$\left(\frac{11.2}{V_o - 3} \right)$
OSR03-24S12	$\left(\frac{8.4}{V_o - 5} \right)$

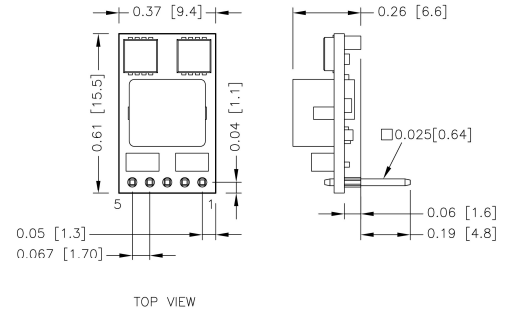
Table 1

MECHANICAL DRAWING

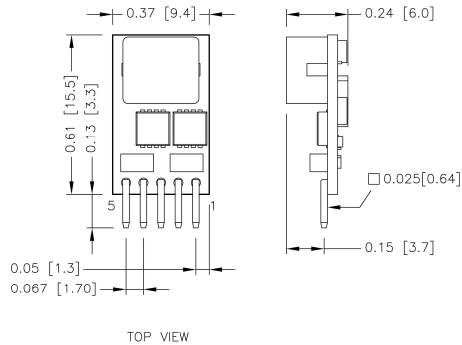
OSR03-05S2P5



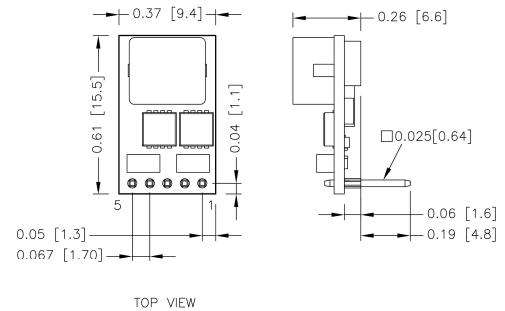
OSR03-05S2P5A



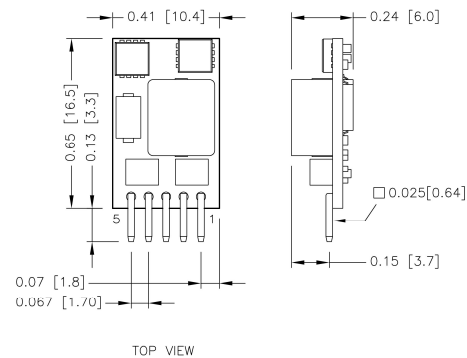
OSR03-12S3P3



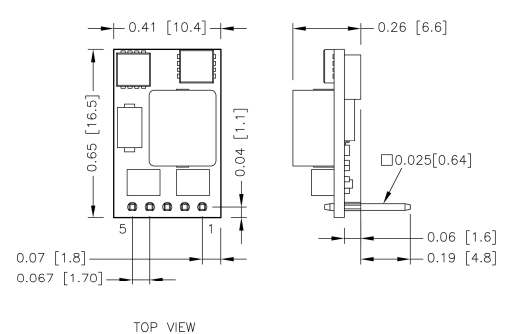
OSR03-12S3P3A



OSR03-24S05/OSR03-24S12



OSR03-24S05A/OSR03-24S12A



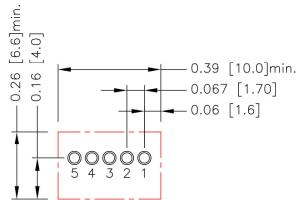
PIN CONNECTION

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

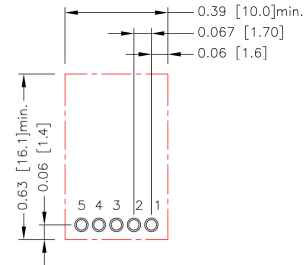
1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
3. Pin pitch tolerance ±0.01 [0.25]
4. Pin dimension tolerance ±0.004[0.10]

RECOMMENDED PAD LAYOUT

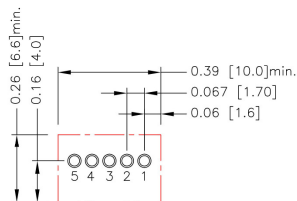
OSR03-05S2P5



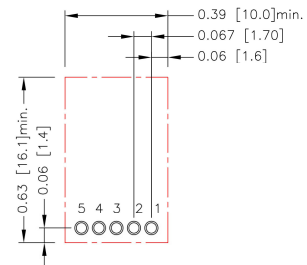
OSR03-05S2P5A



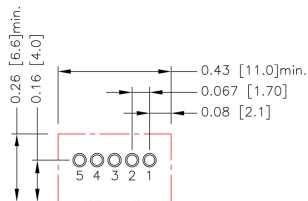
OSR03-12S3P3



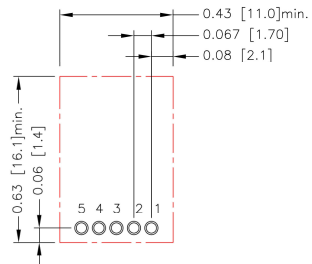
OSR03-12S3P3A



OSR03-24S05/OSR03-24S12



OSR03-24S05A/OSR03-24S12A



All dimensions in inch[mm]

Pad size(lead free recommended)

Through hole 1.2.3.4.5: $\Phi 0.039$ [1.00]

Top view pad 1.2.3.4.5: $\Phi 0.051$ [1.30]

Bottom view pad 1.2.3.4.5: $\Phi 0.051$ [1.30]

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.

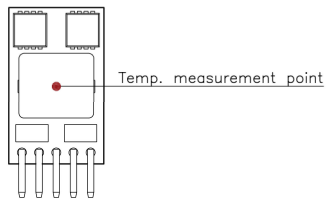
Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed 100°C.

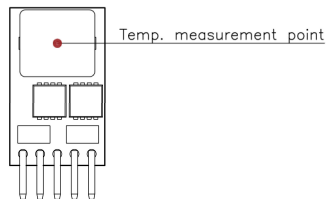
When Operating, adequate cooling must be provided to maintain the test point temperature at or below 100°C.

Although the maximum point Temperature of the power modules is 85°C, you can limit this Temperature to a lower value for extremely high reliability.

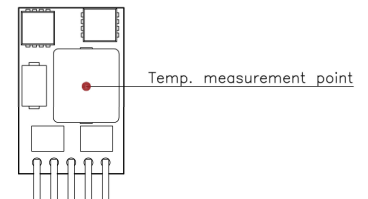
- Thermal test condition with vertical direction by natural convection (20LFM).



OSR03-05S2P5



OSR03-12S3P3



OSR03-24S05/OSR03-24S12