P-DUKE POWER

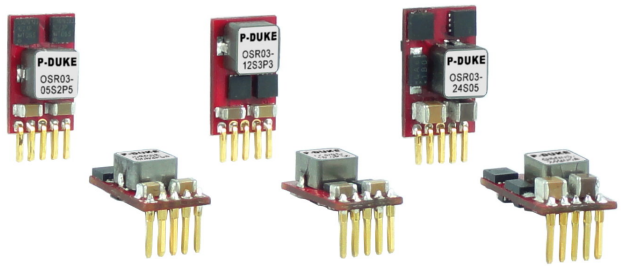
OSR03 Series

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

CE

NON -isolation | ADJ. Output Voltage | NO Min. Load Required | Positive to Negative Output Appl. | REMOTE ON OFF | OCP | SCP

PART NUMBER STRUCTURE

OSR03	-	24	S	05	A
Series Name		**Input Voltage (VDC)**	**Output Quantity**	**Output Voltage (VDC)**	**Assembly Options**
	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℃ unless otherwise noted

Positive output application

Model Number	Input Range	Output Voltage	Output Current @FullLoad	Input Current @ No Load	Efficiency	Maximum Capacitor Load	
						ESR≧1mΩ	ESR≧10mΩ
	VDC	VDC	A	mA	%	μF	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
	VDC	VDC	A	mA	%	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 maxmum 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)	05Vin(nom), 0.6 ~ 3.3Vout	2.5		5.5	
	12S3P3 (Vin>Vo+2.0V)	12Vin(nom), 0.59 ~ 6.0Vout	4.5		14	
	24S05 (Vin>Vo+3.0V)	24Vin(nom), 3.0 ~ 6.0Vout	10		30	
	24S12 (Vin>Vo+3.0V)	24Vin(nom), 5.0 ~ 15Vout	10		30	VDC
	Negative output application					
	12S3P3 ($Vin._{max}$=14-|Vo|)	12Vin(nom), -0.59 ~ -6.0Vout	4.7		13	
	24S05 ($Vin._{max}$=30-|Vo|)	12Vin(nom), -3.0 ~ -6.0Vout	10		27	
	24S12 ($Vin._{max}$=30-|Vo|)	12Vin(nom), -5.0 ~ -15Vout	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)	05S2P5			3.0	A
		12S3P3			2.6	
		24S05			2.2	
		24S12			3.0	
Input filter				Capacitor type		

OUTPUT SPECIFICATIONS

Parameter	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy			-2.0		+2.0	%
Line regulation		Vo≧2.5V		0.2		%
		Vo<2.5V		5		mV
Load regulation	0% to 100% of F.L	Vo≧2.5V		0.8		%
		Vo<2.5V		20		mV
	10% to 90% of F.L	Vo≧2.5V		0.6		%
		Vo<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)					
		12S3P3		60		mVp-p
	With a C1=10μF/50V MLCC and	24S05		75		
	a C2=10μF/25V MLCC	24S12		150		
Temperature regulation	T_A= -40℃ to +85℃		-1		+1	%
Dynamic load response	50% load step change	Peak deviation Others		150	250	mV
		Peak deviation 24S12		250	500	mV
		Recovery time		120	220	μs
Over load protection	% of Iout 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 Vo to rise from 10% to 90% Vo	05S2P5；12S3P3			6	ms
		24S05；24S12			10	
Remote on/off	The ON/OFF control pin voltage is referenced to GND (Positive logic)	05S2P5	ON = Open or Vin(max) OFF=0V < Vr < 0.3V			
		Others	ON = 1V < Vr < 12V OFF=0V < Vr < 0.3V			

GENERAL SPECIFICATIONS

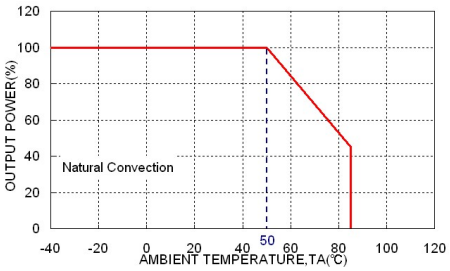
Parameter	Conditions		Min.	Typ.	Max.	Unit
Switching frequency		05S2P5；12S3P3	540	600	660	kHz
		24S05；24S12	270	300	330	
Safety meets			IEC/ EN/ UL62368-1			
Case material			Open frame			
Potting material			None			
Weight		05S2P5；12S3P3	1.7g(0.060oz)			
		24S05；24S12	2.1g(0.074oz)			
MTBF	MIL-HDBK-217F, Full load		4.467×10^6 hrs			

ENVIRONMENTAL SPECIFICATIONS

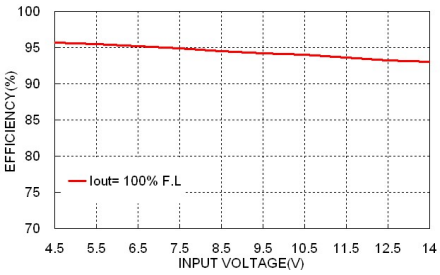
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating temperature range		-40		+85	℃
Storage temperature range		-55		+125	℃
Thermal shock				MIL-STD-810F	
Relative humidity	Non-condensing			5% to 95% RH	

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

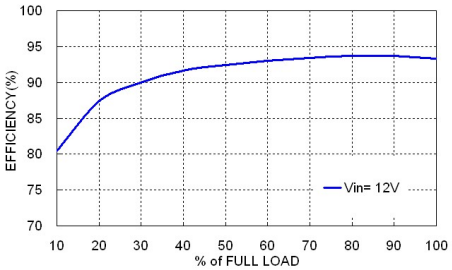
CHARACTERISTIC CURVE



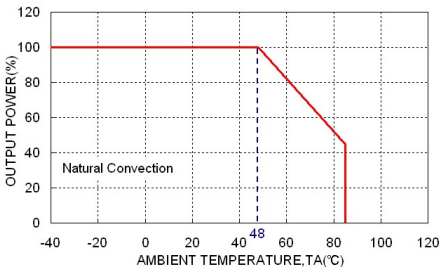
OSR03-12S3P3 Derating Curve
Positive output application



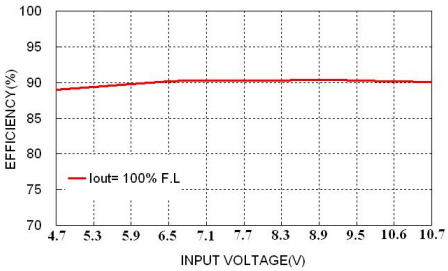
OSR03-12S3P3 Efficiency vs. Input Voltage
Positive output application



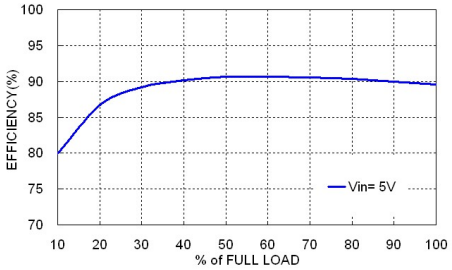
OSR03-12S3P3 Efficiency vs. Output Load
Positive output application



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

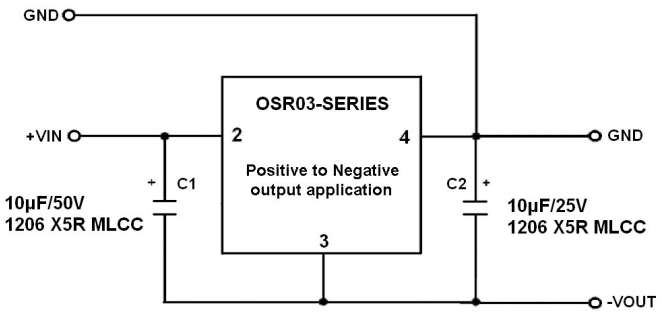


Figure 1
C1 and C2 are required and should be fitted close to the converter pins

TRIM APPLICATION

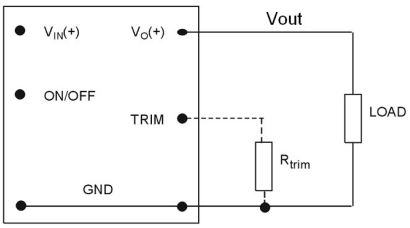


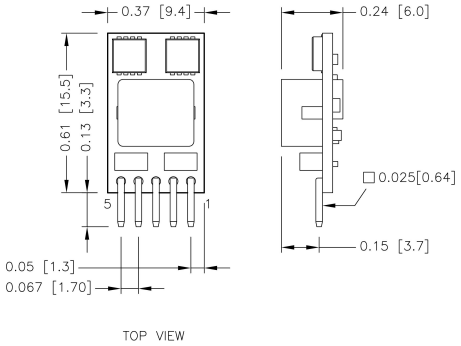
Figure 2

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

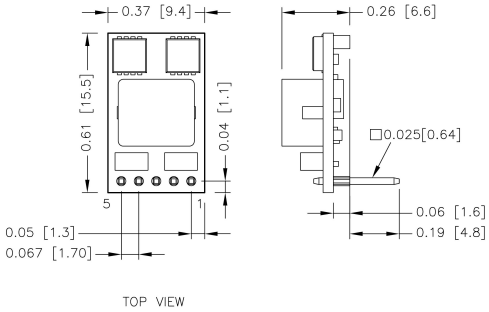
Table 1

MECHANICAL DRAWING

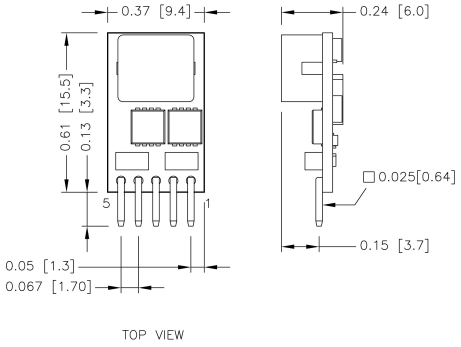
OSR03-05S2P5



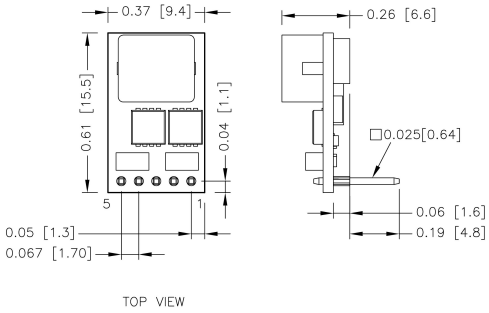
OSR03-05S2P5A



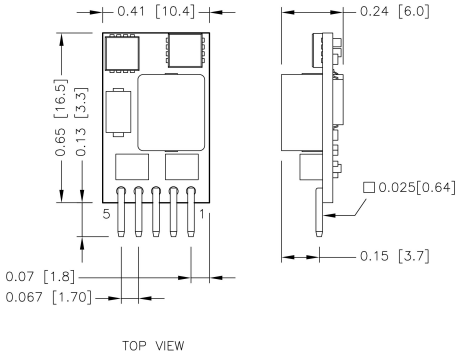
OSR03-12S3P3



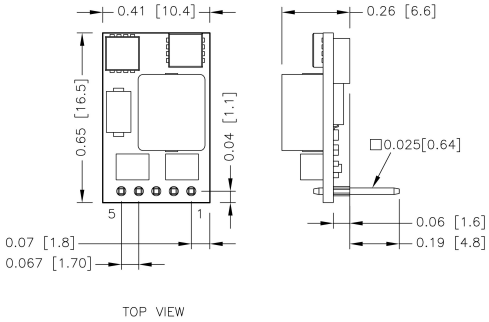
OSR03-12S3P3A



OSR03-24S05/OSR03-24S12



OSR03-24S05A/OSR03-24S12A



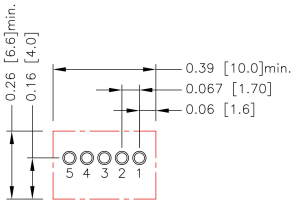
PIN CONNECTION

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

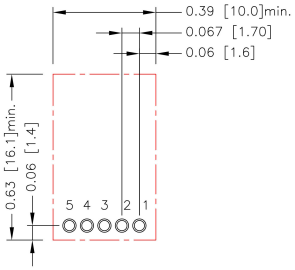
1. All dimensions in inch [mm]
2. Tolerance :x.xx±0.02 [x.x±0.5]
   x.xxx±0.01 [x.xx±0.25]
3. Pin dimension tolerance ±0.004[0.10]

RECOMMENDED PAD LAYOUT

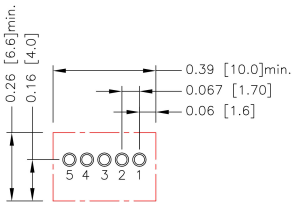
OSR03-05S2P5



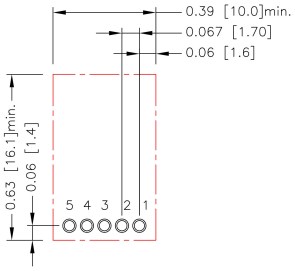
OSR03-05S2P5A



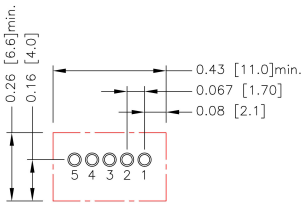
OSR03-12S3P3



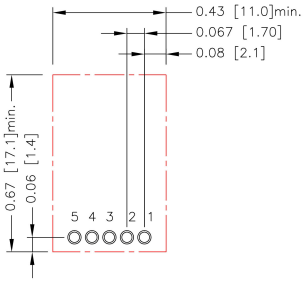
OSR03-12S3P3A



OSR03-24S05/OSR03-24S12



OSR03-24S05A/OSR03-24S12A

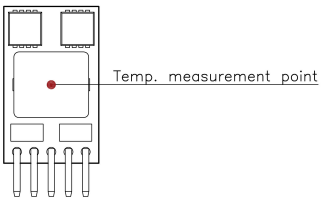


All dimensions in inch[mm]
Pad size(lead free recommended)
Through hole 1.2.3.4.5: Φ0.039[1.00]
Top view pad 1.2.3.4.5: Φ0.051[1.30]
Bottom view pad 1.2.3.4.5: Φ0.051[1.30]

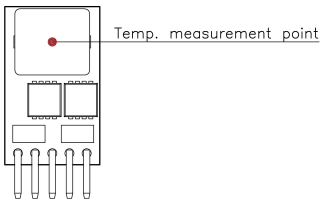
THERMAL CONSIDERATIONS

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℃.
When Operating, adequate cooling must be provided to maintain the test point temperature at or below 100℃.
Although the maximum point Temperature of the power modules is 85℃, you can limit this Temperature to a lower value for extremely high reliability.

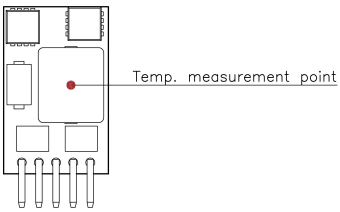
■ Thermal test condition with vertical direction by natural convection (20LFM).



OSR03-05S2P5



OSR03-12S3P3



OSR03-24S05/OSR03-24S12

P-DUKE Technology Co., Ltd.

Tel +886-4-2359-0668
Fax +886-4-2359-1337
Email sale@pduke.com
Web www.pduke.com
Add No. 36, 22nd Rd., Taichung Industrial Park, Taichung, Taiwan, R.O.C.