



# P-DUKE POWER

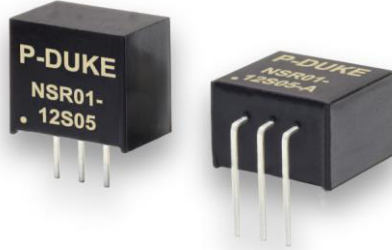
## NSR01 Series

DC-DC Converter  
Up to 15 Watts

**3**  
YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



Medical



PV



Railway



**NON**  
-isolation

**LOW**  
Standby  
Power

**NO**  
Min. Load  
Required

**Positive**  
to  
**Negative**  
Output Appl.

**OCP**

**OTP**

**SCP**

### PART NUMBER STRUCTURE

NSR01	-	12	S	05	-	A
Series Name		Input Voltage (VDC)	Output Quantity	Output Voltage (VDC)		Mounting Options

See table

S: Single

See table

□: Vertical Mounting

A: Horizontal Mounting

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

Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load A	Input Current @ No Load mA	Efficiency		Maximum Capacitor Load μF
					Min. Vin %	Max. Vin %	
NSR01-12S1P2	4.6 ~ 36	1.2	1	1.0	73.0	62.0	470
NSR01-12S1P5	4.6 ~ 36	1.5		1.0	77.0	66.5	
NSR01-12S1P8	4.6 ~ 36	1.8		1.0	80.5	70.0	
NSR01-12S2P5	4.6 ~ 36	2.5		1.0	83.5	75.5	
NSR01-12S3P0	4.6 ~ 36	3.0		1.5	86.5	78.5	
NSR01-12S3P3	4.6 ~ 36	3.3		1.5	87.5	79.5	
NSR01-12S05	6.5 ~ 36	5.0		2.5	91.5	83.0	
NSR01-12S6P5	8.0 ~ 36	6.5		3.0	93.0	86.0	
NSR01-12S09	10.5 ~ 36	9.0		3.5	94.5	88.5	
NSR01-24S12	13.5 ~ 36	12		2.5	95.0	91.5	
NSR01-24S15	16.5 ~ 36	15		3.5	95.5	92.5	

**NEGATIVE OUTPUT APPLICATION**

Model Number	Input Range VDC	Output Voltage VDC	Output Current @Full Load A	Input Current @ No Load mA	Efficiency		Maximum Capacitor Load μF
					Min. Vin %	Max. Vin %	
NSR01-12S1P2	4.6 ~ 32	-1.2	-0.6	1.0	62.0	61.0	470
NSR01-12S1P5	4.6 ~ 32	-1.5	-0.6	1.0	69.5	64.5	
NSR01-12S1P8	4.6 ~ 32	-1.8	-0.6	1.0	72.0	67.5	
NSR01-12S2P5	4.6 ~ 32	-2.5	-0.6	1.0	72.0	74.0	
NSR01-12S3P0	4.6 ~ 32	-3.0	-0.6	2.0	73.0	76.5	
NSR01-12S3P3	4.6 ~ 32	-3.3	-0.6	2.0	74.0	77.5	
NSR01-12S05	4.6 ~ 31	-5.0	-0.4	3.0	79.5	78.5	
NSR01-12S6P5	7.0 ~ 29	-6.5	-0.3	4.0	84.5	80.0	
NSR01-12S09	7.0 ~ 27	-9.0	-0.3	7.0	85.0	82.0	
NSR01-24S12	7.0 ~ 24	-12	-0.3	8.0	85.0	85.5	
NSR01-24S15	7.0 ~ 21	-15	-0.2	10	85.5	84.5	

**INPUT SPECIFICATIONS**

Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating input voltage range	Positive application	4.6		36	VDC
	Negative application				
Start up time	Constant resistive load		5		ms
Rise time	Power up		3.5		ms
Input filter	Time for Vout rises from 10% to 90% of Vout			Capacitor type	
Input reflected ripple current			100		mAp-p

OUTPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Voltage accuracy			-2.0		+2.0	%
Line regulation	Low Line to High Line at Full Load		-0.2		+0.2	%
Load regulation	10% to 100% of Full Load					
	Vertical mounting	1.5Vout	-0.6		+0.6	%
		Others	-0.4		+0.4	
	Horizontal mounting	1.5Vout, 1.8Vout	-1.2		+1.2	
Others		-0.4		+0.4		
Ripple and noise	Measured by 20MHz bandwidth	Vout ≤ 6.5VDC Vout ≥ 9.0VDC		50 75		mVp-p
Temperature coefficient			-0.015		+0.015	%/°C
Dynamic load response	50% load step change	Peak deviation		150	250	mV
		Recovery time		250	350	µs
Output start-up overshoot					+1	%
Over load protection				2		A
Short circuit protection			Continuous, automatic recovery			

GENERAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Switching frequency	Vout ≤ 3.3VDC		240	300	360	kHz
	Vout ≥ 5.0VDC		464	580	696	
Safety meets			IEC/ EN/ UL62368-1			
Case material			Non-conducted black plastic			
Potting material			Silicone (UL94 V-0)			
Weight			1.9g (0.067oz)			
MTBF	MIL-HDBK-217F, Full load		2.009×10 <sup>7</sup> hrs			

ENVIRONMENTAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	With derating		-40		+100	°C
Over temperature protection	Internal IC junction			170		°C
Storage temperature range			-55		+125	°C
Thermal shock			MIL-STD-810F			
Shock			MIL-STD-810F			
Vibration			MIL-STD-810F			
Relative humidity			5% to 95% RH			

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

### NEGATIVE OUTPUT APPLICATION

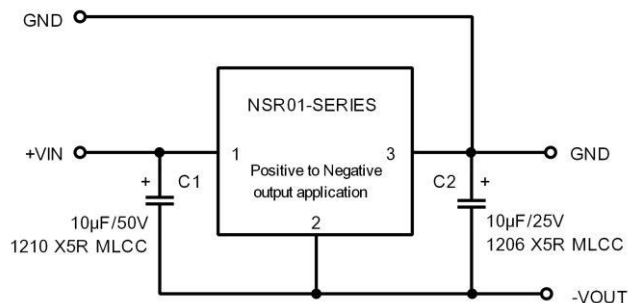
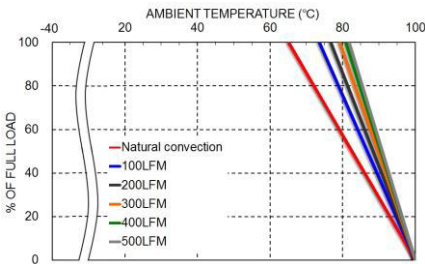


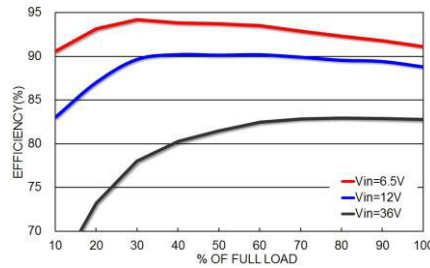
Figure 1

C1 and C2 are required that should be fitted close to the converter's pins.  
Maximum capacitive load including C2 is 470µF.

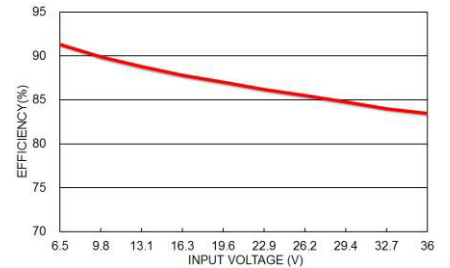
## CHARACTERISTIC CURVE



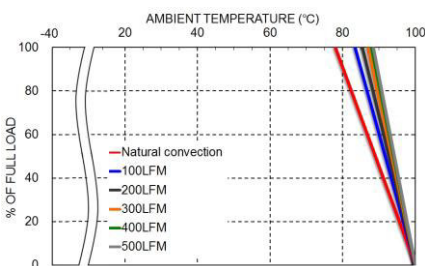
NSR01-12S05; Derating Curve  
Positive application



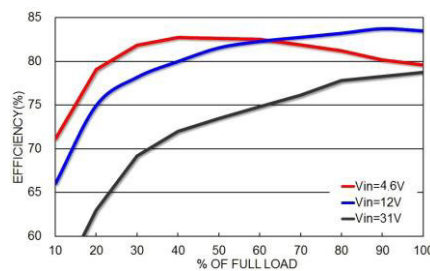
NSR01-12S05; Efficiency vs. load  
Positive application



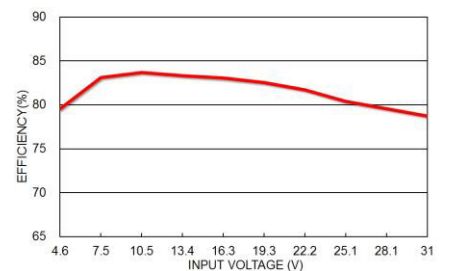
NSR01-12S05; Efficiency vs. line  
Positive application



NSR01-12S05; Derating Curve  
Negative application



NSR01-12S05; Efficiency vs. load  
Negative application



NSR01-12S05; Efficiency vs. line  
Negative 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.

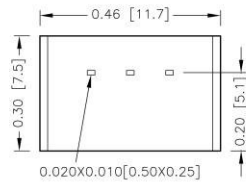
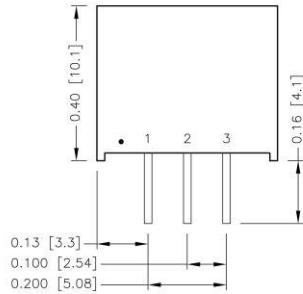
The input line fuse suggest as below :

Model	Fuse Rating (A)	Fuse Type
NSR01-□□S□□	2.0	Slow-Blow

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

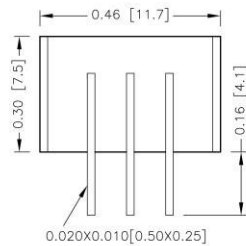
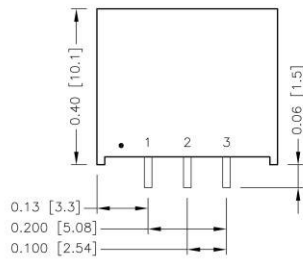
**MECHANICAL DRAWING**

**Standard type:** Vertical mounting



BOTTOM VIEW

**Suffix-A:** Horizontal mounting

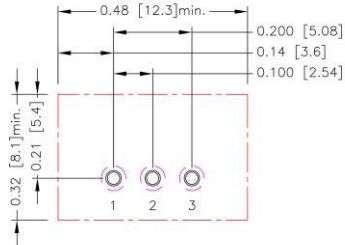
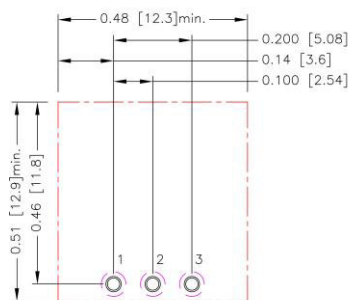


BOTTOM VIEW

**PIN CONNECTION**

PIN	DEFINE
1	+Vin
2	GND
3	+Vout

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**
**Standard type:** Vertical mounting

**Suffix-A:** Horizontal mounting


All dimensions in inch[mm]  
 Pad size(lead free recommended)  
 Through hole 1.2.3:  $\varnothing 0.031[0.80]$   
 Top view pad 1.2.3:  $\varnothing 0.039[1.00]$   
 Bottom view pad 1.2.3:  $\varnothing 0.063[1.60]$

**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.

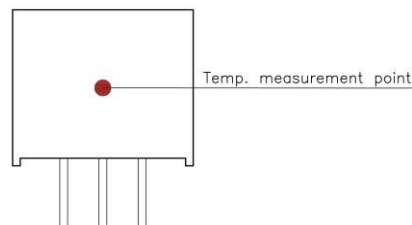
The temperature at this location should not exceed 100°C.

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 100°C, you can limit this Temperature to a lower value for extremely high reliability.

The unit will shutdown if the internal IC junction exceeds 170°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).



BACK VIEW