

NS2H-2W Series



2W Unregulated Dual output

Features

- SIP7 Package
- Ultra-High I/O Isolation 5000VAC with Reinforced Insulation, rated for 300 Vrms working Voltage
- CMTI 100 KV/ μ s at 1.5KV Common mode Voltage
- Low coupling capacitance
- Continuous Short Circuit Protection
- Over Load Protection
- Efficiency up to 86%
- -40 ~ 95°C Operation Temperature Range
- Suitable for IGBT and SiC applications
- Input Under Voltage Protection and Over Voltage Protection
- "X" Option for Input / Output Clearance > 8.2mm with alternative pinout



PART NUMBER STRUCTURE

NS **2** **H** - **05** **20** **05** **D** **X**
(1) (2) (3) (4) (5) (6) (7) (8)

(1) Series

(4) Input Voltage Range

(7) Output Type

(2) Watt

2 - 2 W

05 - 4.5 - 5.5V

12 - 10.8 - 13.2V

15 - 13.5 - 16.5V

24 - 21.6 - 26.4V

D - Dual output

(3) High Isolation

(5) Positive Output Voltage

15 - 15 V

18 - 18 V

20 - 20 V

(8) PinOut Type

Blank - 2.54mm Pin Pitch

X - 2.0mm Pin Pitch

(6) Negative Output Voltage

3R5 - 3.5 V

05 - 5 V

ALL SPECIFICATIONS ARE TYPICAL AT 25°C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED

MODEL NUMBER	INPUT Voltage Range (VDC)	INPUT Current		OUTPUT Voltage (VDC)	OUTPUT Current		EFFICIENCY @FL (%, typ.)	Capacitive Load (μF, max.)	Certification
		No-Load (mA, max.)	Full Load (mA, typ.)		Min. load (mA)	Full load (mA)			
NS2H-05153R5D	4.5-5.5	40	493.8	+15 / -3.5	0	+66 / -300 +100 / -140	81	+47 / -470	UL / CB / CE
NS2H-051505D	4.5-5.5	40	481.9	+15 / -5	0	+66 / -200 +100 / -80	83	+47 / -470	CE
NS2H-05183R5D	4.5-5.5	40	493.8	+18 / -3.5	0	+55 / -300 +80 / -140	81	+47 / -470	UL / CB / CE
NS2H-051805D	4.5-5.5	40	481.9	+18 / -5	0	+55 / -200 +80 / -80	83	+47 / -470	CE
NS2H-05203R5D	4.5-5.5	40	487.8	+20 / -3.5	0	+50 / -300 +80 / -140	82	+47 / -470	CE
NS2H-052005D	4.5-5.5	40	481.9	+20 / -5	0	+50 / -200 +80 / -80	83	+47 / -470	UL / CB / CE
NS2H-12153R5D	10.8-13.2	25	198.4	+15 / -3.5	0	+66 / -300 +100 / -140	84	+47 / -470	UL / CB / CE
NS2H-121505D	10.8-13.2	25	193.8	+15 / -5	0	+66 / -200 +100 / -80	86	+47 / -470	CE
NS2H-12183R5D	10.8-13.2	25	198.4	+18 / -3.5	0	+55 / -300 +80 / -140	84	+47 / -470	UL / CB / CE
NS2H-121805D	10.8-13.2	25	193.8	+18 / -5	0	+55 / -200 +80 / -80	86	+47 / -470	CE
NS2H-12203R5D	10.8-13.2	25	198.4	+20 / -3.5	0	+50 / -300 +80 / -140	84	+47 / -470	CE
NS2H-122005D	10.8-13.2	25	193.8	+20 / -5	0	+50 / -200 +80 / -80	86	+47 / -470	UL / CB / CE
NS2H-15153R5D	13.5-16.5	20	158.7	+15 / -3.5	0	+66 / -300 +100 / -140	84	+47 / -470	UL / CB / CE
NS2H-151505D	13.5-16.5	20	155.0	+15 / -5	0	+66 / -200 +100 / -80	86	+47 / -470	CE
NS2H-15183R5D	13.5-16.5	20	158.7	+18 / -3.5	0	+55 / -300 +80 / -140	84	+47 / -470	UL / CB / CE
NS2H-151805D	13.5-16.5	20	155.0	+18 / -5	0	+55 / -200 +80 / -80	86	+47 / -470	CE
NS2H-15203R5D	13.5-16.5	20	158.7	+20 / -3.5	0	+50 / -300 +80 / -140	84	+47 / -470	CE
NS2H-152005D	13.5-16.5	20	155.0	+20 / -5	0	+50 / -200 +80 / -80	86	+47 / -470	UL / CB / CE
NS2H-24153R5D	21.6-26.4	15	99.2	+15 / -3.5	0	+66 / -300 +100 / -140	84	+47 / -470	UL / CB / CE
NS2H-241505D	21.6-26.4	15	96.9	+15 / -5	0	+66 / -200 +100 / -80	86	+47 / -470	CE
NS2H-24183R5D	21.6-26.4	15	99.2	+18 / -3.5	0	+55 / -300 +80 / -140	84	+47 / -470	UL / CB / CE
NS2H-241805D	21.6-26.4	15	96.9	+18 / -5	0	+55 / -200 +80 / -80	86	+47 / -470	CE
NS2H-24203R5D	21.6-26.4	15	99.2	+20 / -3.5	0	+50 / -300 +80 / -140	84	+47 / -470	CE
NS2H-242005D	21.6-26.4	15	96.9	+20 / -5	0	+50 / -200 +80 / -80	86	+47 / -470	UL / CB / CE

INPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range	5V Input		4.5	5	5.5	VDC
	12V Input		10.8	12	13.2	
	15V Input		13.5	15	16.5	
	24V Input		21.6	24	26.4	
Under Voltage Protection	5V Input	Module ON			4.3	VDC
		Module OFF	3			
	12V Input	Module ON			10.5	
		Module OFF	8			
	15V Input	Module ON			13	VDC
		Module OFF	11			
	24V Input	Module ON			21	
		Module OFF	18			
Over Voltage Protection	5V Input	Module ON	5.7			VDC
		Module OFF			6.5	
	12V Input	Module ON	14			
		Module OFF			15.5	
	15V Input	Module ON	17			VDC
		Module OFF			20	
	24V Input	Module ON	27			
		Module OFF			31	
Input Filter			Capacitor			
Input Reflected Ripple Current (1)				20		mApk-pk
Start up Time	Nominal Vin and constant resistive load			5		ms
Recommended input fuse (slow blow)	5V Input		1.0			A
	12V Input		0.4			
	15V Input		0.4			
	24V Input		0.2			
Note : 1. Measured with a simulated source inductance of 22μH and a source capacitor Cin (47μF, ESR<1.0Ω at 100kHz).						

OUTPUT SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	3.5V Output		-7		+3	%
	Other Output		-4		+3	%
Line Regulation	For 1% Vin Change		-1.3		+1.3	%
Load Regulation	From 10% to 100% Load	Vin 5V	-3.5V 、 -5V		18	%
		Vin 5V	+15V 、 +18V 、 +20V		15	
		Other Vin	-3.5V		13	
		Other Vin	-5V 、 +15V 、 +18V 、 +20V		10	
	From 0% to 100% Load				40	
Ripple & Noise(1)	20MHz bandwidth.	+Vo: +15V 、 +18V 、 +20V		75		mVpk-pk
		-Vo: -3.5V 、 -5V		50		mVpk-pk

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Over Current Protection		120		170	% of FL
Short Circuit Protection		Continuous and automatic recovery			
Temperature Coefficient		-0.03		+0.03	%/°C
Maximum Capacitive Load	Minimum Vin and constant resistive load	See Table			
Note : 1. Measured with a 0.1μF MLCC.					

ENVIRONMENT SPECIFICATIONS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Ambient Temperature	See the Derating Curve	-40		95	°C
Maximum Case Temperature				115	°C
Thermal Impedance		30			°C/W
Operating Altitude				5000	m
Pollution Degree		PD2			
Storage Humidity				95	% rel. H
Storage Temperature		-55		125	°C
Cooling	Natural Convection	30-65 LFM			
Common Mode Transient Immunity	1.5KV Common mode Voltage	100			KV/μs

GENERAL SPECIFICATIONS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output, and rated for 60sec	5000			VAC
Isolation Resistance	Input-output	1000			MΩ
Isolation Capacitance	Input-output			10	pF
Leakage Current	250VAC, 60Hz		2.0		μA
Clearance / Creepage		6			mm
Working voltage				300	Vrms
Overvoltage category		OV2			
Clearance / Creepage for X type		8.2			mm
Working voltage for X				300	Vrms
Overvoltage category for X type		OV3			
Switching Frequency			200		kHz
MTBF	MIL-HDBK-217 F @ 25°C	2.6			M hours
Safety Approval	IEC / EN / UL 62368-1	DK-174840-UL, E252573			
Insulation Grade		Reinforced Insulation			
Environmental compliance		RoHS			

EMC SPECIFICATIONS			
Parameter	Standard	Condition	Criterion
Conducted Emissions	EN55032	with external components	B
Radiated Emissions	EN55032	with external components	B
ESD	IEC 61000-4-2	Air ± 15kV	A
RS	IEC 61000-4-3	10V/m	A
EFT	IEC 61000-4-4	±2kV with external components	A
Surge	IEC 61000-4-5	±2kV with external components	A
CS	IEC 61000-4-6	10Vrms	A
PFMF	IEC 61000-4-8	100A/m	A

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PHYSICAL SPECIFICATIONS

Parameter	Value
Case Material	Nonconductive black plastic (UL94V-0 rated)
Pin Material	Tinned Copper
Potting Material	Silicone (UL94V-0 rated)
Weight	4.2 g, typ.
Dimensions	0.77" x 0.39" x 0.49"

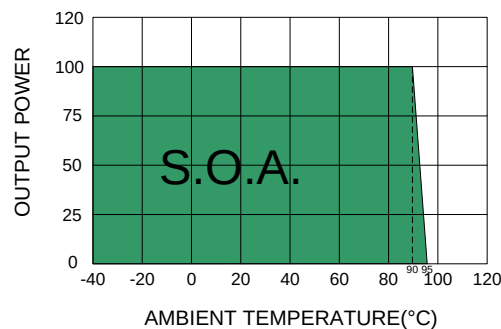
ABSOLUTE MAXIMUM RATINGS

Parameter	Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage	5V Input			5.7	VDC
	12V Input			14	
	15V Input			17	
	24V Input			27	
Soldering Temperature	1.5mm from case 10sec max.			260	°C

Note : These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.

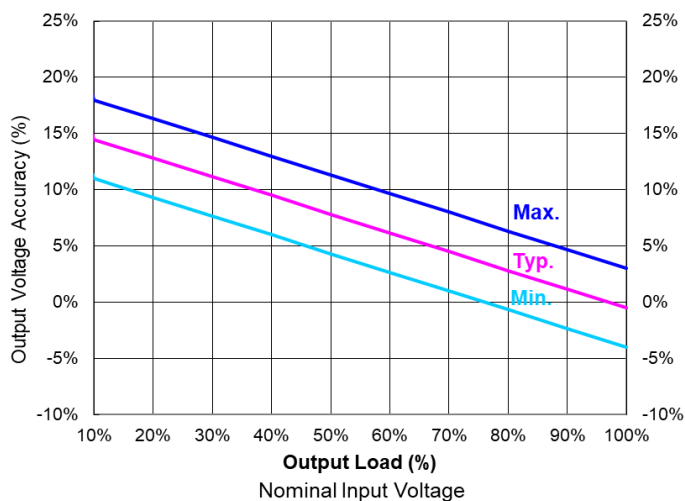
ELECTRICAL CHARACTERISTIC CURVES

Derating Curve



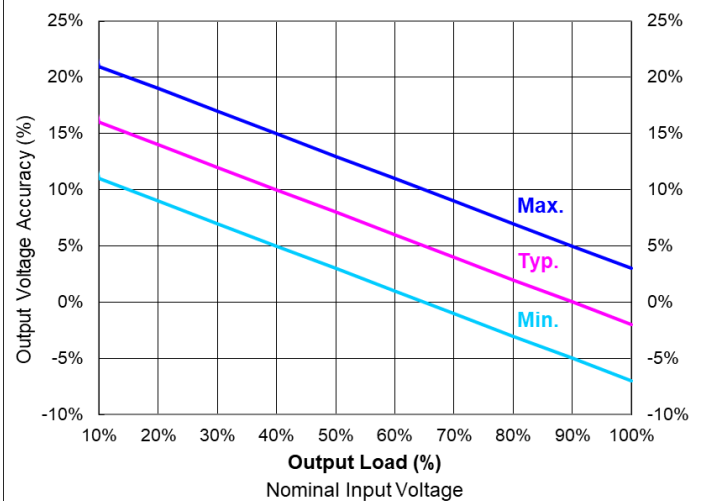
TOLERANCE ENVELOPE CURVES

+Vo Output Voltage Tolerance



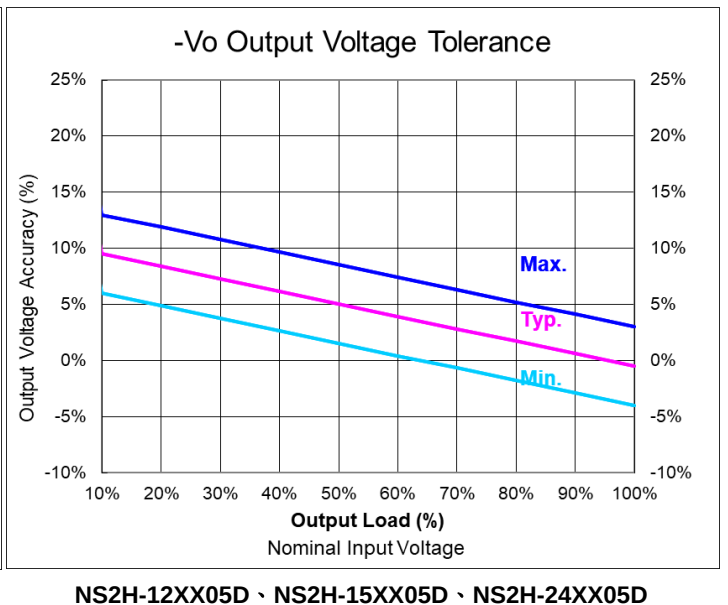
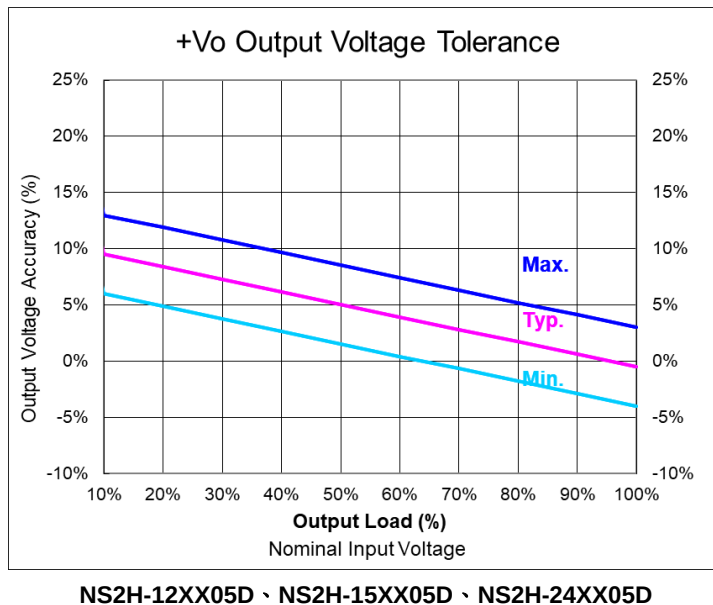
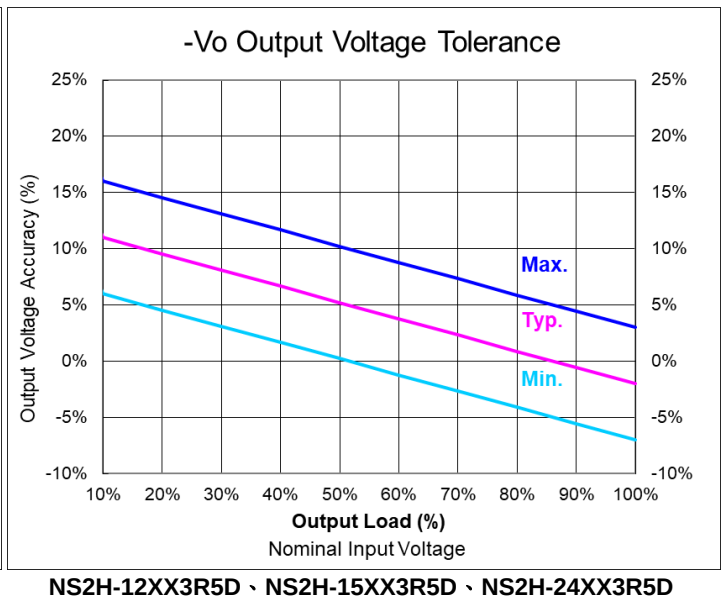
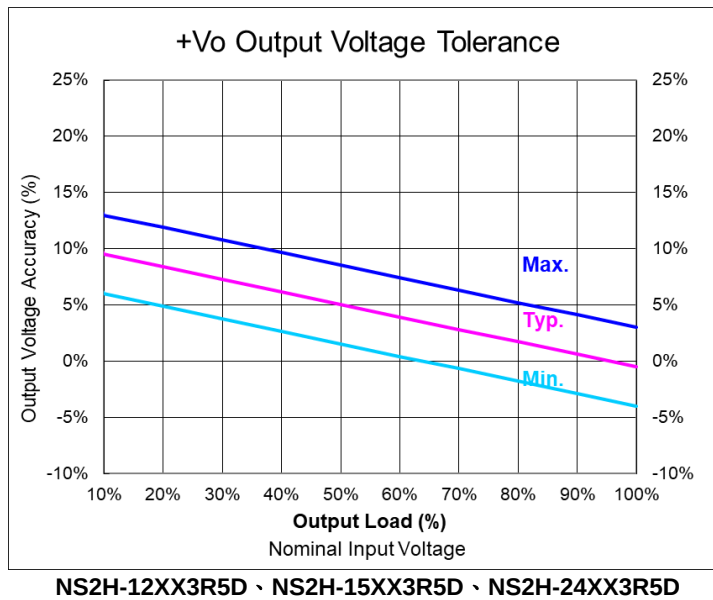
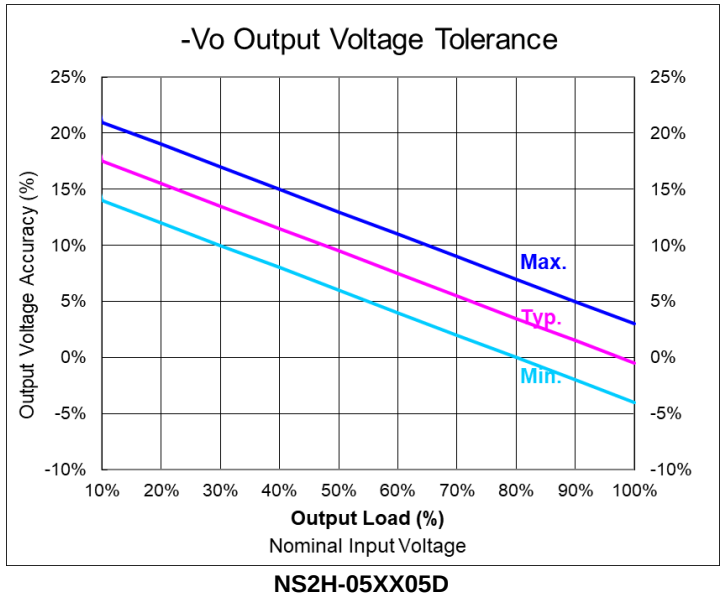
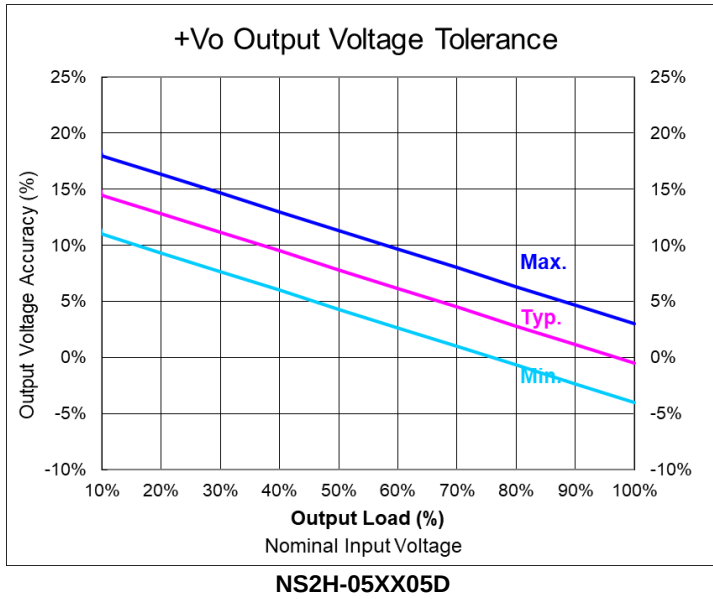
NS2H-05XX3R5D

-Vo Output Voltage Tolerance



NS2H-05XX3R5D

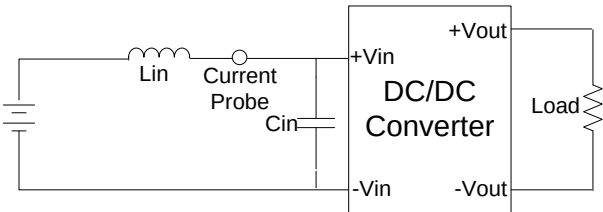
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TEST CONFIGURATIONS

Input Reflected Ripple Current Test Step

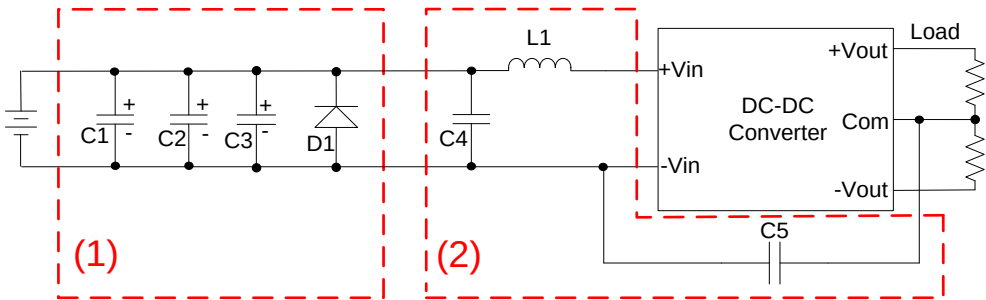
Input reflected ripple current is measured with a source inductor L_{in} ($22\mu H$) and a source capacitor C_{in} ($47\mu F$, $ESR < 1.0\Omega$ at $100kHz$) at nominal input and full load.



DESIGN & FEATURE CONFIGURATIONS

EMC Filter

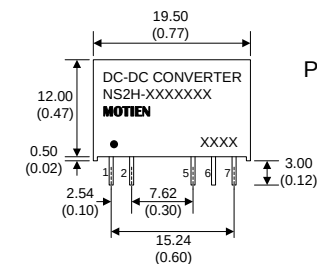
The part (1) Circuit is used to meet Surge & EFT test, and the part (2) Circuit is used to meet EMI test.



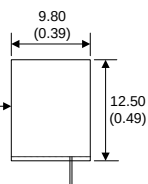
Vin	C1	C2	C3	D1	C4	L1	C5
05	680uF / 100V	680uF / 100V	680uF / 100V	SMDJ8.0A	4.7uF / 50V	6.8uH	22pF/400VAC Y1
12	680uF / 100V	470uF / 100V	DNP	SMDJ16.0A	4.7uF / 50V	6.8uH	22pF/400VAC Y1
15	680uF / 100V	470uF / 100V	DNP	SMDJ18.0A	4.7uF / 50V	6.8uH	22pF/400VAC Y1
24	680uF / 100V	DNP	DNP	SMDJ28.0A	4.7uF / 50V	6.8uH	22pF/400VAC Y1

MECHANICAL SPECIFICATIONS

Standard Type:



Printed Face

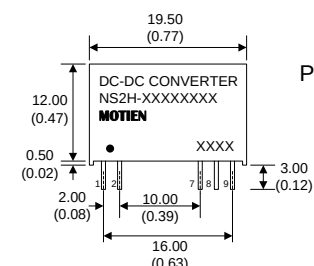


Notes : All dimensions are typical in millimeters (inches).

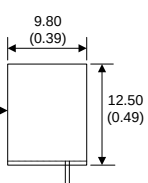
1. Pin dimension tolerance: ± 0.05 (± 0.002)
2. Pin pitch and length tolerance: ± 0.35 (± 0.014)
3. Case tolerance: ± 0.5 (± 0.02)
4. Pin to Case tolerance: ± 0.5 (± 0.02)

PIN CONNECTIONS	
PIN NUMBER	FUNCTION
1	+Vin
2	-Vin
5	-Vout
6	COM
7	+Vout

X Type:



Printed Face



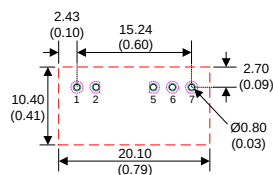
Notes : All dimensions are typical in millimeters (inches).

1. Pin dimension tolerance: ± 0.05 (± 0.002)
2. Pin pitch and length tolerance: ± 0.35 (± 0.014)
3. Case tolerance: ± 0.5 (± 0.02)
4. Pin to Case tolerance: ± 0.5 (± 0.02)

PIN CONNECTIONS	
PIN NUMBER	FUNCTION
1	+Vin
2	-Vin
7	-Vout
8	COM
9	+Vout

RECOMMEND FOOTPRINT DETAILS

Standard Type:



Notes : 1. All dimensions are typical in mm (inches).

Through hole 1 ~ 7: $\varnothing 0.80$ (0.031)

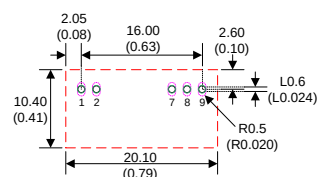
Top view pad 1 ~ 7: $\varnothing 1.00$ (0.039)

Bottom view pad 1 ~ 7: $\varnothing 1.60$ (0.063)

pad 2 to pad 5 spacing: 6.00 (0.236)

2. There should be at least 6mm distance between primary and secondary circuit.

X Type :



Notes : 1. All dimensions are typical in mm (inches).

Through hole 1 ~ 9: $\varnothing 0.90$ (0.035)

Top view pad 1 ~ 9: $\varnothing 1.00$ (0.039)

Bottom view pad 1 ~ 9: Groove R0.50 (0.020) L0.80 (0.031)

2. There should be at least 9mm distance between primary and secondary circuit.



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