

NP2 Series

2W Unregulated Single & Dual output

Features

- SIP7 Package
- Continuous Short Circuit Protection
- 3000 / 6000 VDC Isolation
- Efficiency up to 87%
- Operation Temperature Range -40 ~ 90°C max.
- Non-Conductive Black Plastic Case



PART NUMBER STRUCTURE

NP2 - **24** **15** **S** **H**
(1) (2) (3) (4) (5)

(1) Series

(2) Input Voltage Range

3R3 - 2.97-3.63 V

05 - 4.5-5.5 V

12 - 10.8-13.2 V

24 - 21.6-26.4 V

(4) Output Type

S - Single Output

D - Dual Output

(3) Output Voltage Range

3R3 - 3.3 V

05 - 5 V

12 - 12 V

15 - 15 V

(5) Isolation Voltage

Blank- 3000 VDC

H- 6000 VDC

X- 3000 VDC, refer to
Pin connections.

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 Full Load (mA)	Efficiency @FL(%)	Capacitive Load (μ F, max.)
		No-Load (mA), max.	Full Load (mA), typ.				
NP2-3R33R3S	2.97-3.63	55	657.89	3.3	500	76	3300
NP2-3R305S	2.97-3.63	65	777.00	5	400	78	2200
NP2-3R312S	2.97-3.63	70	739.06	12	166.66	82	470
NP2-3R315S	2.97-3.63	80	748.20	15	133.33	81	470
NP2-053R3S	4.5-5.5	50	423.07	3.3	500	78	3300
NP2-0505S	4.5-5.5	50	493.82	5	400	81	2200
NP2-0512S	4.5-5.5	50	470.56	12	166.66	85	470
NP2-0515S	4.5-5.5	50	465.10	15	133.33	86	470
NP2-123R3S	10.8-13.2	25	174.05	3.3	500	79	3300
NP2-1205S	10.8-13.2	30	200.80	5	400	83	2200
NP2-1212S	10.8-13.2	35	193.79	12	166.66	86	470
NP2-1215S	10.8-13.2	30	193.79	15	133.33	86	470
NP2-243R3S	21.6-26.4	20	88.14	3.3	500	78	3300
NP2-2405S	21.6-26.4	20	100.40	5	400	83	2200
NP2-2412S	21.6-26.4	20	95.78	12	166.66	87	470
NP2-2415S	21.6-26.4	20	95.78	15	133.33	87	470
NP2-3R33R3D	2.97-3.63	50	632.91	\pm 3.3	\pm 250	79	\pm 1680
NP2-3R305D	2.97-3.63	60	748.22	\pm 5	\pm 200	81	\pm 1000
NP2-3R312D	2.97-3.63	70	730.16	\pm 12	\pm 83.33	83	\pm 220
NP2-3R315D	2.97-3.63	80	721.42	\pm 15	\pm 66.66	84	\pm 220
NP2-053R3D	4.5-5.5	45	407.40	\pm 3.3	\pm 250	81	\pm 1680
NP2-0505D	4.5-5.5	55	481.92	\pm 5	\pm 200	83	\pm 1000
NP2-0512D	4.5-5.5	50	459.75	\pm 12	\pm 83.33	87	\pm 220
NP2-0515D	4.5-5.5	60	459.72	\pm 15	\pm 66.66	87	\pm 220
NP2-123R3D	10.8-13.2	30	169.75	\pm 3.3	\pm 250	81	\pm 1680
NP2-1205D	10.8-13.2	30	196.07	\pm 5	\pm 200	85	\pm 1000
NP2-1212D	10.8-13.2	35	193.79	\pm 12	\pm 83.33	86	\pm 220
NP2-1215D	10.8-13.2	40	191.55	\pm 15	\pm 66.66	87	\pm 220
NP2-243R3D	21.6-26.4	20	84.87	\pm 3.3	\pm 250	81	\pm 1680
NP2-2405D	21.6-26.4	20	98.03	\pm 5	\pm 200	85	\pm 1000
NP2-2412D	21.6-26.4	25	95.78	\pm 12	\pm 83.33	87	\pm 220
NP2-2415D	21.6-26.4	25	95.77	\pm 15	\pm 66.66	87	\pm 220

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INPUT SPECIFICATIONS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	3.3 V Input	2.97	3.3	3.63	VDC
	5 V Input	4.5	5	5.5	
	12 V Input	10.8	12	13.2	
	24 V Input	21.6	24	26.4	
Input Filter		Capacitor			
Input Reflected Ripple Current (1)			20		mApk-pk
Start up Time	Nominal Vin and constant resistive load			10	ms
Recommended input fuse (slow blow)	3.3 V Input	1.5			A
	05 V Input	1.0			
	12 V Input	0.5			
	24 V Input	0.2			
Note :					
1. Measured with a simulated source inductance of 12 μ H and a source capacitor Cin(47 μ F, ESR<1.0 Ω at 100kHz).					

OUTPUT SPECIFICATIONS						
Parameter	Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	Nominal Vin	-3.0		+3.0	%	
Line Regulation	For 1% Vin Change	-1.2		+1.2	%	
Load Regulation	From 10% to 100% Load	3.3V , 5V Output	-20		+20	%
		12V , 24V Output	-15		+15	
Cross Regulation	Asymmetrical Load 25% / 100% for Dual Output	3.3V , 5V Input	-8		+8	%
		12V , 24V Input	-6		+6	
Ripple & Noise (1)	20MHz bandwidth		100	200	mVpk-pk	
Short Circuit Protection		Continuous and automatic recovery				
Temperature Coefficient		-0.02		+0.02	%/°C	
Maximum Capacitive Load	Nominal Vin and constant resistive load	See Table				
Note.						
1. Measured with a 0.1 μ F MLCC.						

GENERAL SPECIFICATIONS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Efficiency		See Table			
Isolation Voltage	Input-output, and rated for 60sec	The others	3000		VDC
		Suffix "H"	6000		
Isolation Resistance	Input-output	1000			M Ω
Isolation Capacitance	Input-output			65	pF
Switching Frequency			100		kHz
MTBF	MIL-HDBK-217 F @ 25°C	2.32			M hours
Safety Standard	IEC / EN / UL 62368-1	Designed to meet			
Environmental compliance		RoHS			

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ENVIRONMENT SPECIFICATIONS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Operating Ambient Temperature	See the Derating Curve	-40		90	°C
Maximum Case Temperature				115	°C
Thermal Impedance		45			°C/W
Storage Humidity				95	% rel. H
Storage Temperature		-40		125	°C
Cooling	Natural Convection	30-65 LFM			

ABSOLUTE MAXIMUM RATINGS					
Parameter	Conditions	Min.	Typ.	Max.	Unit
Input Surge Voltage (100 ms)	3.3 V Input			6	VDC
	5 V Input			9	
	12 V Input			18	
	24 V Input			30	
Soldering Temperature	1.5mm from case 10sec max.			260	°C

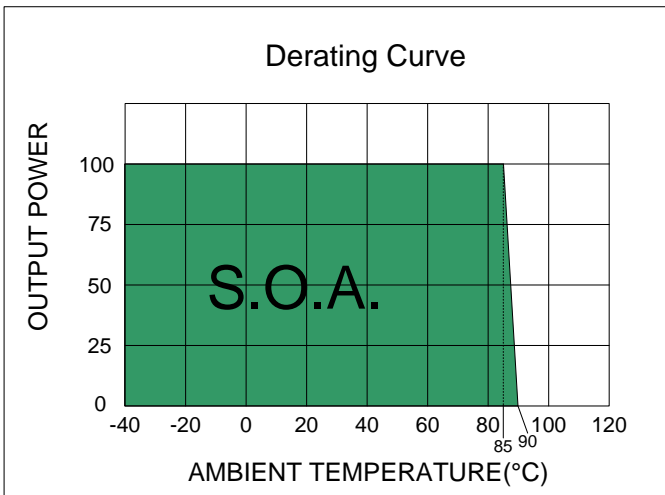
Note : These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.

EMC SPECIFICATIONS			
Parameter	Standard	Condition	Perf. Criteria
Conducted Emissions	EN55032	with external components	B
Radiated Emissions	EN55032		B
ESD	IEC 61000-4-2	Contact ±8kV , 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

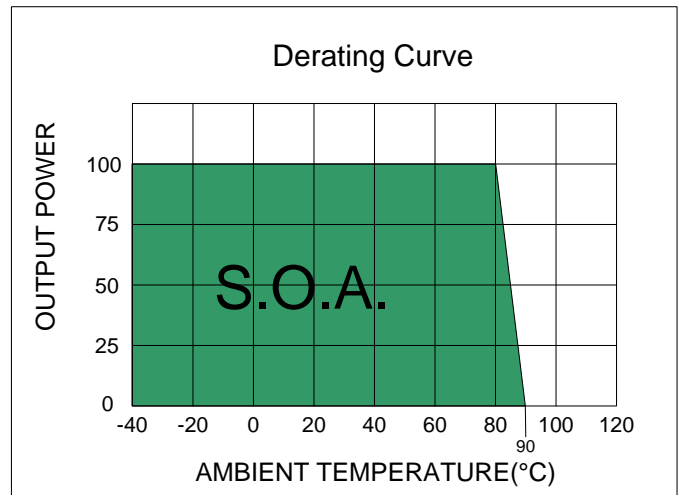
PHYSICAL SPECIFICATIONS	
Parameter	Value
Case Material	Non-conductive Black Plastic (UL94V-0 rated)
Pin Material	Tinned Copper
Potting Material	Silicone (UL94V-0 rated)
Weight	2.3 g, typ.
Dimensions	0.76" x 0.24" x 0.39"

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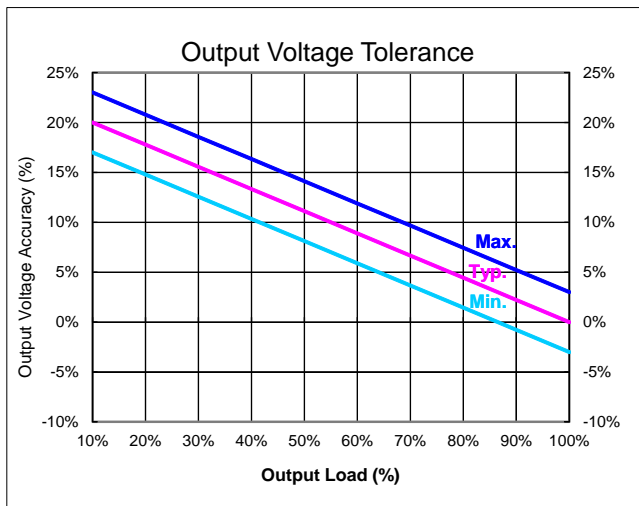
ELECTRICAL CHARACTERISTIC CURVES



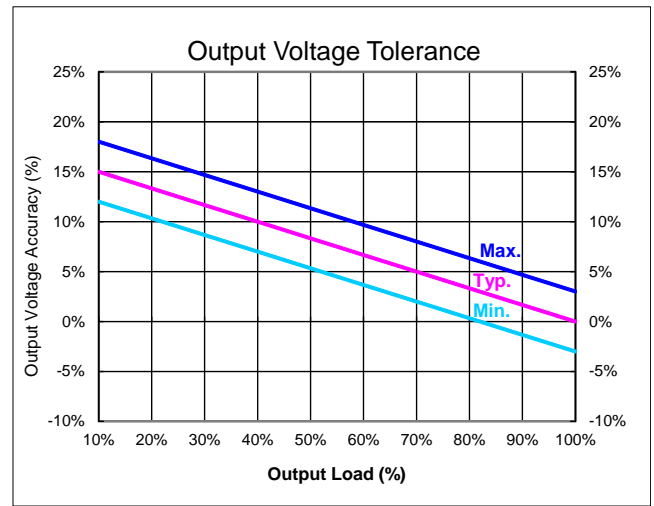
Efficiency \geq 85%



24V input and the others



3.3V and 5V output

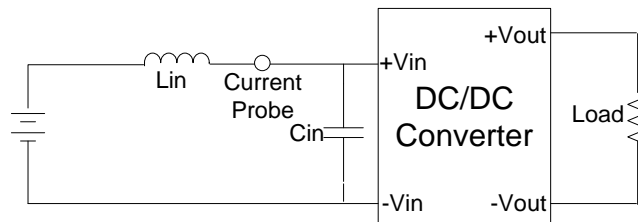


12V and 24V output

TEST CONFIGURATIONS

Input Reflected Ripple Current Test Step

Input reflected ripple current is measured with a source inductor L_{in} ($12\mu\text{H}$) and a source capacitor C_{in} ($47\mu\text{F}$, $\text{ESR} < 1.0\Omega$ at 100kHz) at nominal input and full load.



DESIGN & FEATURE CONFIGURATIONS

Isolation Voltage

This series is designed to meet the functional insulation of UL, both input and output should be maintained within SELV limits (less than 42.4V peak, or 60VDC).

The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with hundreds of volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

Repeated High-Voltage Isolation Testing

Repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment.

This series has isolation transformers without additional insulation between primary and secondary windings of enameled wire.

While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation.

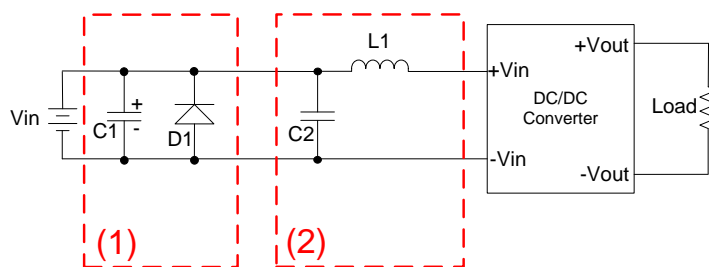
Any material including the enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltage, thus implying that the number of tests should be strictly limited.

We strongly advise against repeated high voltage isolation testing, but if it is absolutely required, the isolation test voltage should be reduced by 20% from specified test voltage.

DESIGN & FEATURE CONFIGURATIONS

EMC Filter

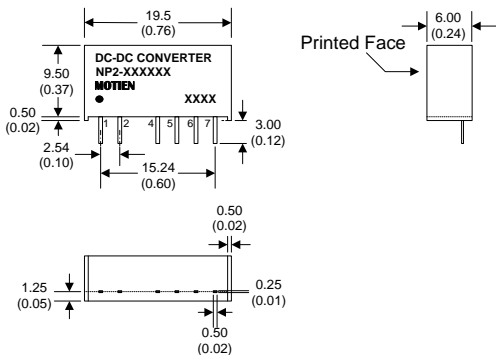
The part (1) Circuit is used to meet Surge & EFT test, and the part (2) Circuit is used to meet EMI test.



	C1	D1	C2	L1
NP2-3R3YZG	NIPPON Chemi-con KY series 470uF / 100V	SMDJ6.0A	MLCC 10uF / 50V	10uH
NP2-05YZG	NIPPON Chemi-con KY series 470uF / 100V	SMDJ9.0A	MLCC 10uF / 50V	10uH
NP2-12YZG	NIPPON Chemi-con KY series 470uF / 100V	SMDJ18.0A	MLCC 10uF / 50V	10uH
NP2-24YZG	NIPPON Chemi-con KY series 680uF / 100V	SMDJ30.0A	MLCC 10uF / 50V	22uH

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MECHANICAL SPECIFICATIONS

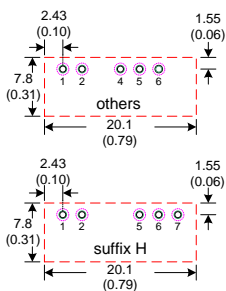


PIN CONNECTIONS				
PIN NUMBER	SINGLE SINGLE-H	DUAL DUAL-H	SINGLE-X	DUAL-X
1	+Vin	+Vin	+Vin	+Vin
2	-Vin	-Vin	-Vin	-Vin
4	N.P.	N.P.	-Vout	-Vout
5	-Vout	-Vout	N.P.	COM
6	N.P.	COM	+Vout	+Vout
7	+Vout	+Vout	N.P.	N.P.

*N.P. : No pin.

- 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. Pin to case tolerance: ± 0.5 (± 0.02)
 4. Case tolerance: ± 0.5 (± 0.02)

RECOMMENDED FOOTPRINT



- Notes : All dimensions are typical in millimeters (inches).
1. Through hole 1,2,4,5,6,7 : $\varnothing 0.8$ (0.031)
 2. Top view pad 1,2,4,5,6,7 : $\varnothing 1.0$ (0.039)
 3. bottom view pad 1,2,4,5,6,7 : $\varnothing 1.6$ (0.063)