

FEATURES

- Compact SIP form factor
- 2:1 Wide range voltage input
- Continuous short circuit protection with current foldback
- Operating temperature range -40°C to +85°C
- 0.5% Load Regulation
- 1kVDC Isolation
- 24V & 48V Nominal input
- 12V & 15V Output
- Power density 1.00W/cm³
- Remote on/off
- No electrolytic capacitors
- Low noise

DESCRIPTION

The NDH series is a range of high performance miniature DC/DC converters having regulated outputs over the wide temperature range of -40°C to +85°C. The input voltage range is 2:1 and the input to output isolation is 1kVDC. Continuous short circuit protection, external control and extremely small SIP packaging provide state of the art functionality. The use of ceramic capacitors and a ceramic substrate, and SMD construction, provide genuine high reliability. Nominal input voltages of 24 and 48V with output voltages of 12 and 15V are available as standard with custom parts on request. The plastic case is rated to UL 94V-0 with encapsulant to UL 94V-1.

SELECTION GUIDE

Order Code	Input Voltage	Rated Output Voltage	Output Current		Input Current ²	Efficiency (min.)	Isolation Capacitance
	V (nom.)	V	Min Load ³	Full Load			
NDH2412S	24	±12	±32	125	157	81	36
NDH2415S	24	±15	±25	100	155	82	36
NDH4812S	48	±12	±32	125	78	78	40
NDH4815S	48	±15	±25	100	78	78	40

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	All NDH24 types	18	24	36	V
	All NDH48 types	36	48	72	
Reflected ripple current	All NDH24 types when 10µF at input		200	250	mA p-p
	All NDH48 types when 10µF at input		105	150	
Shutdown Power	V _{IN} nominal 24XX		8		mW
	V _{IN} nominal 48XX		16		

OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage set point accuracy	With external input/output capacitors		±1	±5	%
Line regulation	Low line to high line with external input/output capacitors		0.05	0.2	%
Load regulation	Minimum load to rated load with external input/output capacitors		0.2	0.5	%
Ripple	BW = 20MHz to 300kHz with external input/output capacitors		15	30	mV rms
Ripple & noise	BW = DC to 20MHz with external input/output capacitors		90	150	mV p-p
Cross regulation	% voltage change on negative output when positive load varies from 12% to 50% with negative load fixed at 50%		2.1	5.0	%

GENERAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Control pin (CTRL) input current	Please refer to control pin application note	6		15	mA
Switching frequency	Load causing lowest frequencies, 100% load V _{IN} Min.	100	125	150	kHz
	Load causing highest frequencies, 25% load V _{IN} Max.	300	400	500	

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested for 1 second	1000			V _{DC}
Resistance	V _{ISO} = 1000V _{DC}	1			GΩ

ABSOLUTE MAXIMUM RATINGS

Short-circuit protection	Continuous
Lead temperature 1.5mm from case for 10 seconds	300°C
Minimum output load for specification ³	25% of rated output
Control pin input current	15mA
Input voltage 24 types ¹	40V
Input voltage 48 types ¹	80V
Free air space	10mm min. around component

1 Absolute maximum value for 30 seconds. Prolonged operation may damage the product.

2 Measured at full load with external input/output capacitors. Refer to application note.

3 A lower load condition is entirely safe but higher levels of output ripple will be experienced.

All specifications typical at T_A=25°C, nominal input voltage and rated output current unless otherwise specified.

TEMPERATURE CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification		-40		85	°C
Operation		-40		100	
Storage		-50		130	
Temperature rise above ambient	12V & 15V output types @ 100% load			36	

MTTF (MEAN TIME TO FAILURE)

Part Number	MTTF	Units	Conditions
NDH2412S	2077	kHrs	Calculated using MIL-HDBK 217F with nominal input at full voltage (ground benign) at 25°C.
NDH2415S	2080		
NDH4812S	2090		
NDH4815S	2045		

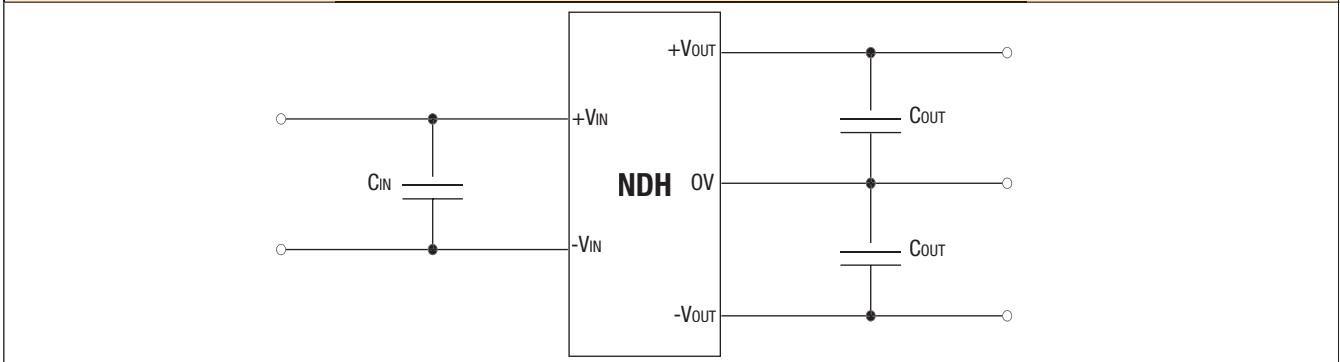
APPLICATION NOTES

External capacitance

Although these converters will work without external capacitors, they are necessary in order to guarantee the full parametric performance over the full line and load range. All parts have been tested and characterized using the following values and test circuit.

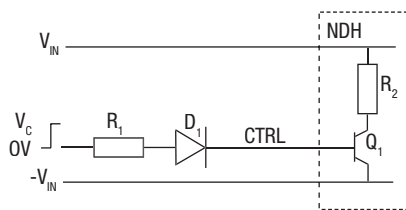
Value	
C _{IN}	C _{OUT}
10µF, 200V	47µF, 25V

Test circuit



Control Pin

The NDH converters have a shutdown feature which enables the user to put the converter into a low power state. The control pin connects directly to the base of an internal transistor, and the switch off mechanism for the NDH works by forward biasing this NPN transistor. If the pin is left open (high impedance), the converter will be ON (there is no allowed low state for this pin), but once a control voltage is applied with sufficient drive current, the converter will be switched OFF. A suitable application circuit is shown below.



D₁ (eg 1N4001) is required to provide high impedance when the signal is low. From the NDH specification, the drive current to operate this function is recommended to be 6mA, and hence the value of R₁ can be derived as follows:

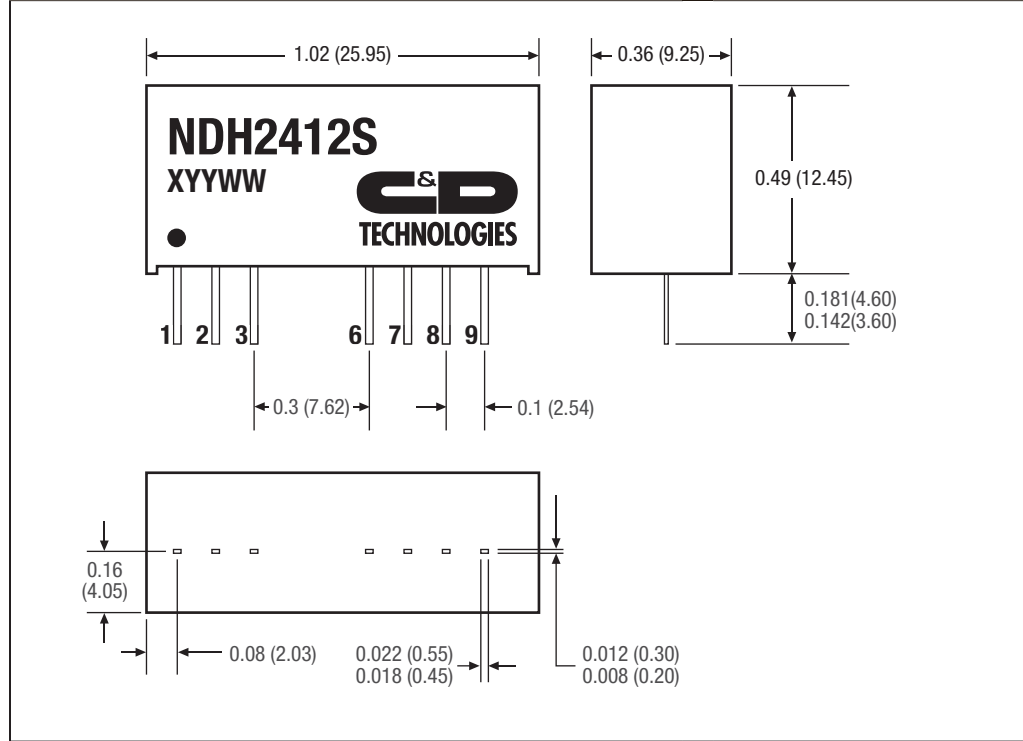
$$R_1 = \frac{V_c - V_D - V_0}{I_c}$$

Assuming V_c=5V, V_D=0.7V and V₀=1V:

$$R_1 = \frac{5 - 0.7 - 1.0}{6 \times 10^{-3}} = 550\Omega$$

PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



PIN CONNECTIONS

Pin	Function
1	-V _{IN}
2	+V _{IN}
3	CTRL
4	No Connection
5	No Connection
6	+V _{OUT}
7	0V
8	N/A
9	-V _{OUT}

Package weight: 6.5g

All pins on a 0.1(2.54) pitch and within ±0.01(0.25) of true position.

Unless otherwise stated all dimensions in inches(mm) ±0.01(0.25).