NDH Series

Isolated 3W Dual Output DC/DC Converters

Murata Power Solutions



FEATURES

- RoHS compliant
- 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/cm^3
- Remote on/off
- No electrolytic capacitors
- Low noise

PRODUCT OVERVIEW

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.

RoHS COMPLIANT

For full details go to
www.murata-ps.com/rohs

SELECTION GUIDE

Order Code	Input Voltage	Rated Output Voltage	Output Current		Input Current[2]	Efficiency (MIN.)	Isolation Capacitance	
			Min Load[3]	Full Load				
	V (NOM.)	V	mA	mA	mA	%	pF	
NDH2412SC	24	±12	±32	125	157	81	36	
NDH2415SC	24	±15	±25	100	155	82	36	
Obsolete								**Recommended Alternative**
NDH4812SC	48	±12	±32	125	78	78	40	Contact Murata
NDH4815SC	48	±15	±25	100	78	78	40	Contact Murata

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 = 20Hz 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	%

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 can be used but higher levels of output ripple may be experienced, this condition may also cause the output voltage to exceed its specification transiently during power down when the input voltage also falls below its rated minimum.

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	
Case temperature rise above ambient	12V & 15V output types @ 100% load			36	

MTTF (MEAN TIME TO FAILURE)

Part Number	MTTF	Units	Conditions
NDH2412SC	2077	kHrs	Calculated using MIL-HDBK 217F with Nominal input at full voltage (ground benign) at 25°C.
NDH2415SC	2080		
NDH4812SC	2090		
NDH4815SC	2045		

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

TECHNICAL NOTES

ISOLATION VOLTAGE

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Murata Power Solutions NDH series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 second.

A question commonly asked is, "What is the continuous voltage that can be applied across the part in normal operation?"

For a part holding no specific agency approvals, such as the NDH series, both input and output should normally be maintained within SELV limits i.e. 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 several hundred 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

It is well known that 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. The NDH series has an EI ferrite core, with no 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 this enamel (typically polyurethane) is susceptible to eventual chemical degradation when subject to very high applied voltages thus implying that the number of tests should be strictly limited. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

This consideration equally applies to agency recognized parts rated for better than functional isolation where the wire enamel insulation is always supplemented by a further insulation system of physical spacing or barriers.

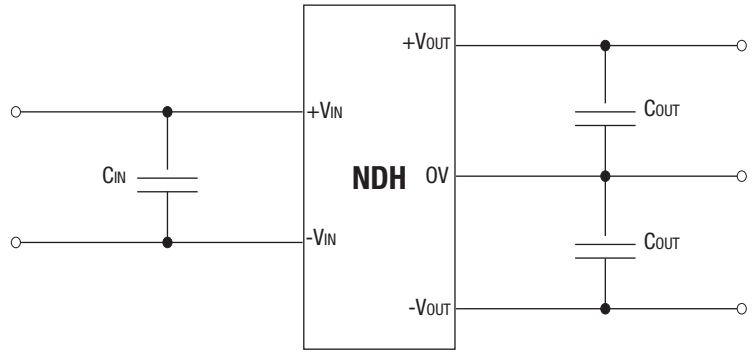
APPLICATION NOTES

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.

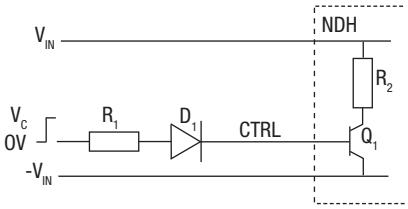
Value	
C_{IN}	C_{OUT}
10µF, 200V	47µF, 25V

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.



D_1 (eg 1N4001) is required to provide high impedence 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 R_1 can be derived as follows:

$$R_1 = \frac{V_C - V_D - V_Q}{I_C}$$

Assuming V_C=5V, V_D=0.7V and V_Q=1V:

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

Cross Regulation

Load regulation is at its best when the positive and negative loads are balanced. When the loads are asymmetric, the negative output is not as tightly regulated as the positive output. To meet ripple specification a total minimum load of 25% full load is required, however, the NDH can be used with much lighter loading at the expense of increased ripple. A small load is required on the negative output of 150mW to ensure the maximum negative output voltage is not exceeded.
Cross regulation is defined as change in the negative output voltage as a percentage of nominal as the positive output load is changed from 12.5% to 50% with the negative load is fixed at 50% of full load.

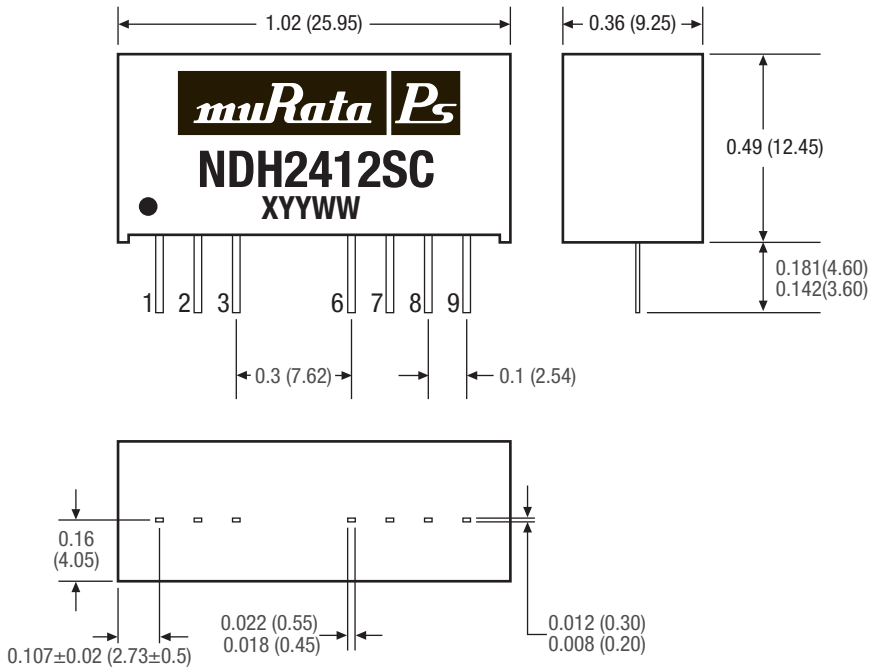
RoHS COMPLIANCE INFORMATION

RoHS COMPLIANT

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300ºC for 10 seconds. The pin termination finish on this product series is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The series is backward compatible with Sn/Pb soldering systems.
For further information, please visit www.murata-ps.com/rohs

PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



PIN CONNECTIONS

Pin	Function
1	$-V_{IN}$
2	$+V_{IN}$
3	CTRL
6	$+V_{OUT}$
7	0V
8	N/A
9	$-V_{OUT}$

Package weight: 6.5g

N/A - Not available for electrical connection

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).

Murata Power Solutions, Inc.
11 Cabot Boulevard, Mansfield, MA 02048-1151 U.S.A.
ISO 9001 and 14001 REGISTERED

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Refer to: http://www.murata-ps.com/requirements/

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