

FEATURES

- RoHS compliant
- 2:1 Wide range voltage input
- Operating temperature range -40°C to 85°C
- 0.2% Typical load regulation
- 1.5kVDC Isolation
- Efficiency from 81%
- 5V, 12V, 24V, & 48V Nominal input
- Single & dual outputs
- Power density $0.94\text{W}/\text{cm}^3$
- Optional remote On/Off
- UL 94V-0 Package materials
- No electrolytic capacitors
- Low noise

PRODUCT OVERVIEW

The NDS6 series of DC/DC converters offer single and dual output voltages from four input voltage ranges of 4.5-9V, 9-18V, 18-36V and 36-75V. The NDS6 is housed in an industry standard package with a standard pinout. The NDS6 is packaged in a metal case for improved EMI shielding and is also encapsulated for superior thermal performance. Versions with optional remote on/off control pin are also available.

Applications include telecommunications, battery powered systems, process control and distributed power systems.

SELECTION GUIDE

Order Code ²	Input Voltage	Output Voltage	Output Current		Input Current			Ripple & Noise	Efficiency		MTTF ¹
	Nom.	V	Min. Load	$\pm 100\%$ Load	0% Load	100% Load	Shut Down		Min.	Typ.	
	V	V	A	A	mA	mA	mA	mV p-p	%	%	kHrs
NDS6D0505C	5	± 5	± 0.06	± 0.6	Contact factory for availability						
NDS6D0512C	5	± 12	± 0.025	± 0.250							
NDS6D0515C	5	± 15	± 0.020	± 0.200							
NDS6D1205C	12	± 5	± 0.06	± 0.6							
NDS6D1212C	12	± 12	± 0.025	± 0.250							
NDS6D1215C	12	± 15	± 0.020	± 0.200							
NDS6D2405C	24	± 5	± 0.06	± 0.6	7	300	1.1	40	81	83	
NDS6D2412C	24	± 12	± 0.025	± 0.250	7	290	1.1	40	86	87	
NDS6D2415C	24	± 15	± 0.020	± 0.200	7	290	1.1	45	85	87	
NDS6D4805C	48	± 5	± 0.06	± 0.6	Contact factory for availability						
NDS6D4812C	48	± 12	± 0.025	± 0.250							
NDS6D4815C	48	± 15	± 0.020	± 0.200							
NDS6S0505C	5	5	0.12	1.2							
NDS6S0512C	5	12	0.05	0.5							
NDS6S0515C	5	15	0.04	0.4							
NDS6S1205C	12	5	0.12	1.2							
NDS6S1212C	12	12	0.05	0.5							
NDS6S1215C	12	15	0.04	0.4							
NDS6S2405C	24	5	0.12	1.2							
NDS6S2412C	24	12	0.05	0.5							
NDS6S2415C	24	15	0.04	0.4							
NDS6S4805C	48	5	0.12	1.2							
NDS6S4812C	48	12	0.05	0.5							
NDS6S4815C	48	15	0.04	0.4							

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	All NDS6D05 & NDS6S05 types	4.5	5	9	V
	All NDS6D12 & NDS6S12 types	9	12	18	
	All NDS6D24 & NDS6S24 types	18	24	36	
	All NDS6D48 & NDS6S48 types	36	48	75	
Reflected ripple current	All NDS6D05 & NDS6S05 types				mA p-p
	All NDS6D12 & NDS6S12 types		3.5		
	All NDS6D24 & NDS6S24 types				
	All NDS6D48 & NDS6S48 types				

¹ Calculated using MIL-HDBK-217F with nominal input voltage at full load.

² To order with optional control pin, prefix C with "E". For example NDS6D0505EC.

All specifications typical at $T_A=25^{\circ}\text{C}$, nominal input voltage and rated output current unless otherwise specified.



OUTPUT CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Rated power				6	W
Voltage set point accuracy				±2	%
Line regulation	Low line to high line		0.01	0.1	%
Load regulation	10% total load to 100% total load		0.003	0.5	%
Cross regulation	% voltage change on negative output when positive load varies from 12.5% to 37.5% with negative load fixed at 50%	5V		5	%
		12V & 15V		2	

ISOLATION CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested for 1 second	1500			VDC
Resistance	Viso = 1kVDC	1			GΩ
Capacitance	5V input				pF
	12V input				
	24V input		200		
	48V input				

ABSOLUTE MAXIMUM RATINGS	
Short-circuit protection (Max. time at 25°C)	2 minutes
Internal power dissipation	1.7W
Lead temperature 1.0mm from case for 10 seconds (to JEDEC JESD22-B106 ISS C)	260°C
Minimum output load for specification	10% of rated load on each output
Control pin input voltage	±25V
Input voltage, NDS6 5V input types	10V
Input voltage, NDS6 12V input types	20V
Input voltage, NDS6 24V input types	40V
Input voltage, NDS6 48V input types	80V

GENERAL CHARACTERISTICS ¹					
Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency			130		kHz
Control pin input voltage	Module ON (or pin unconnected)	3.0			V
				0	mA
	Module OFF			1	V
				1	mA

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Operation		-40		85	°C
Storage		-50		130	
Case temperature rise above ambient	100% Load, Nom V _{IN} , Still Air,	5V		33	
		12V		26	
		15V		23	
Thermal shutdown	Case Temperature			110	

APPLICATION NOTES

Control Pin

This provides an OFF function, which puts the converter into a low power mode, when the voltage applied to the pin is less than 1V. When the pin is high or un-connected, the converter is on.

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 datasheet specification, a minimum load of 10% of output load current is required on each output. The NDS6 can be used with much lighter loading but the negative output voltage may rise above maximum datasheet specification.

Output Capacitors

The NDS6 series does not require output capacitors to meet datasheet specification. To meet datasheet specification, output capacitance should not exceed:

Output Voltage (V)	Output Capacitance (µF)
5	470
12	470
15	220

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 NDS6 series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1.5kVDC 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 NDS6 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 NDS6 series has an ER 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.

RoHS COMPLIANCE INFORMATION



This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds. The pin termination finish on this product series is a Gold flash (0.05-0.10 micron) over Nickel Preplate. The series is backward compatible with Sn/Pb soldering systems. For further information, please visit www.murata-ps.com/rohs

CHARACTERISATION TEST METHODS

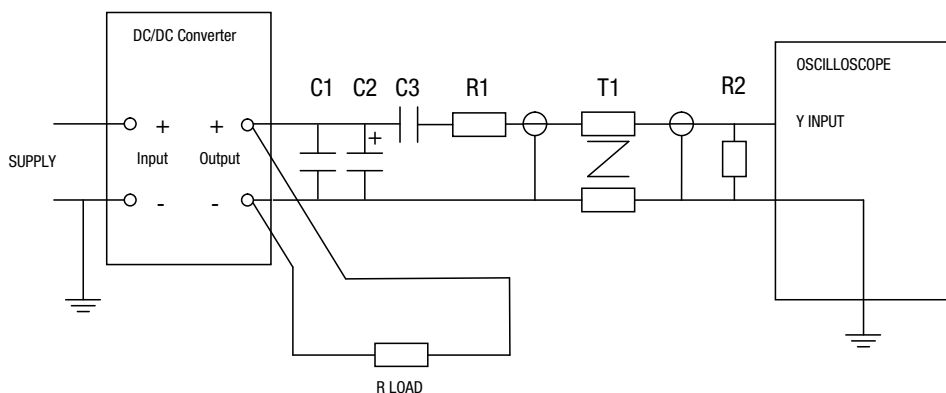
Ripple & Noise Characterisation Method

Ripple and noise measurements are performed with the following test configuration.

C1	1uF X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC/DC converter
C2	10uF tantalum capacitor, voltage rating to be a minimum of 1.5 times the output voltage of the DC/DC converter with an ESR of less than 100mΩ at 100 kHz
C3	100nF multilayer ceramic capacitor, general purpose
R1	450Ω resistor, carbon film, +/-1% tolerance
R2	50Ω BNC termination
T1	3T of the coax cable through a ferrite toroid
RLOAD	Resistive load to the maximum power rating of the DC/DC converter. Connections should be made via twisted wires

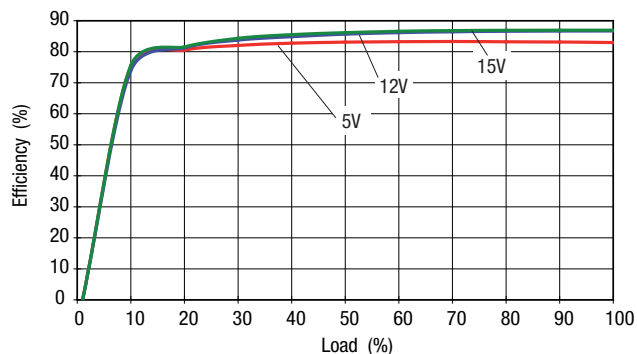
Measured values are multiplied by 10 to obtain the specified values.

Differential Mode Noise Test Schematic



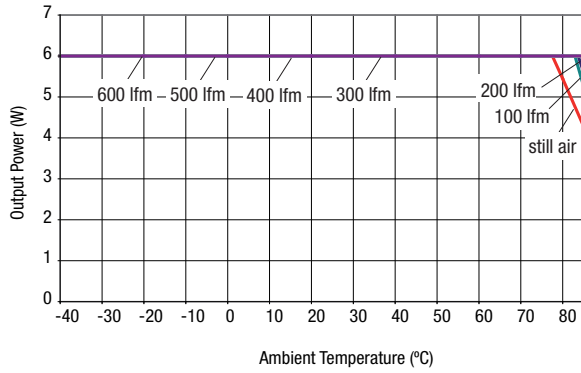
EFFICIENCY VS LOAD

NDS 24V Input, Dual Output

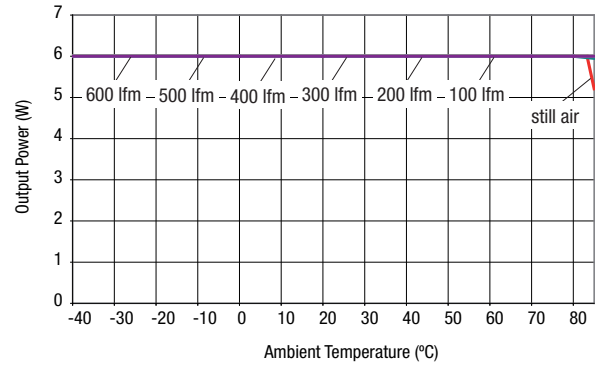


TEMPERATURE DERATING

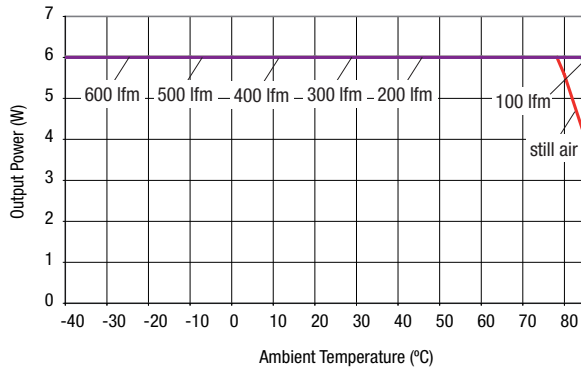
NDS6D2405C



NDS6D2412C

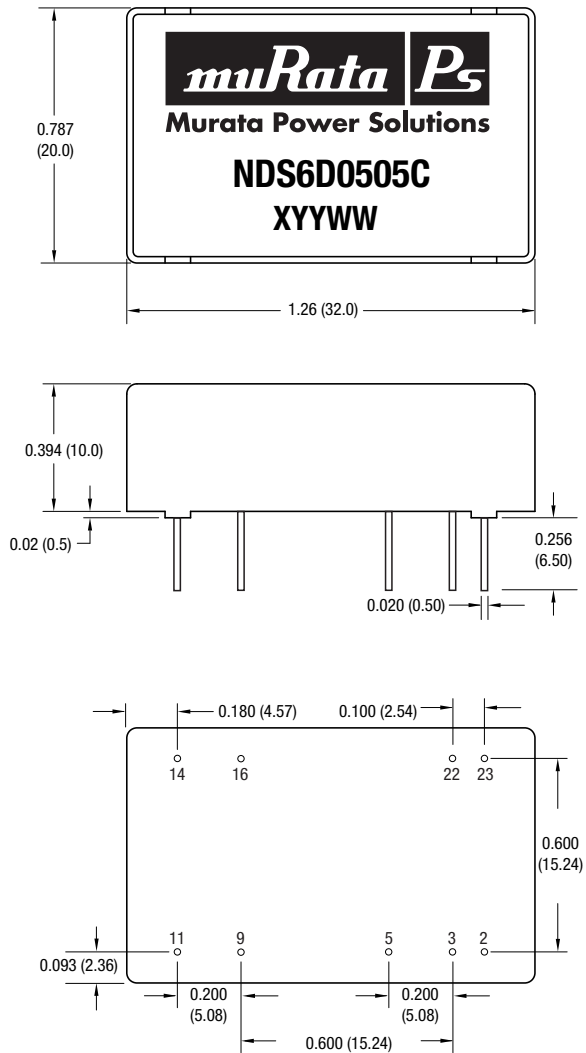


NDS6D2415C



PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS



* Optional pin
 All dimensions in inches ± 0.010 (mm 0.25mm).
 All pins on a 0.100 (2.54) pitch and within 0.010 (0.25) of true position.

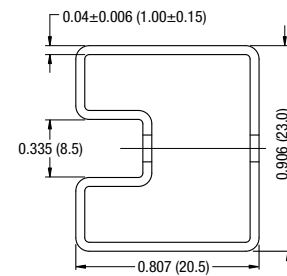
Weight: 16g

PIN CONNECTIONS

Pin	Function	
	Single	Dual
2	-V _{IN}	-V _{IN}
3	-V _{IN}	-V _{IN}
5*	On/Off	On/Off
9	N/C	0V
11	N/C	-V _{OUT}
14	+V _{OUT}	+V _{OUT}
16	-V _{OUT}	0V
22	+V _{IN}	+V _{IN}
23	+V _{IN}	+V _{IN}

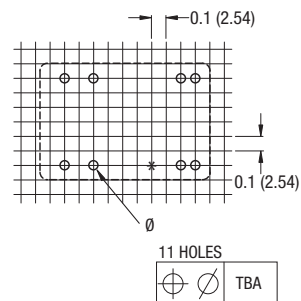
* Optional pin

TUBE OUTLINE DIMENSIONS



Tube length 20.47 (520)
 All dimensions in inches ± 0.010 (mm 0.25mm). Quantity: 15

RECOMMENDED FOOTPRINT DETAILS



* Optional pin
 All dimensions in inches ± 0.010 (mm 0.25mm).