OUTPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power	T_A=-40°C to 120°C, see derating graphs			1.0	W
Voltage Set Point Accuracy	See tolerance envelope				
Line regulation	High V_{IN} to low V_{IN}		1.0	1.2	%/%
Load Regulation[1]	10% load to rated load, 3.3V output types & 0309		10	15	%
	10% load to rated load, 5V output types		12	15	
	10% load to rated load, 9V output types		7.5	10	
	10% load to rated load, 12V output types		6.5	9.5	
	10% load to rated load, 15V output types		6.0	8.5	
Ripple and Noise	BW=DC to 20MHz, 3.3V output types & 0305, 0505SEC, 0505DEC		40	80	mV p-p
	BW=DC to 20MHz, other 5V output types		77	100	
	BW=DC to 20MHz, 9V output types		43	90	
	BW=DC to 20MHz, 12V output types		35	65	
	BW=DC to 20MHz, 15V output types		32	55	

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation test voltage	Flash tested for 1 second	3000			VDC
Resistance	Viso= 1000VDC		10		GΩ

GENERAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Switching frequency	All output types		115		kHz

TEMPERATURE CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types, See safety approval section for UL temperature specification[1]	-40		85	°C
Storage		-50		130	
Case temperature rise above ambient	0505D/S, 1205D/S			41	
	All other output types			32	
Cooling	Free air convection				

ABSOLUTE MAXIMUM RATINGS

Lead temperature 1.5mm from case for 10 seconds	260°C
Wave Solder	Wave Solder profile not to exceed the profile recommended in IEC 61760-1 Section 6.1.3. Please refer to application notes for further information.
Input voltage V_{IN}, NKE03 types	5.5V
Input voltage V_{IN}, NKE05 types	7V
Input voltage V_{IN}, NKE12 types	15V

1. 12V input types have typically 3% less load regulation.

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 NKE series of DC-DC converters are all 100% production tested at their stated isolation voltage. This is 3000V DC for 1 second.

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

The NKE series has been recognised by Underwriters Laboratory for functional insulation. 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. While manufactured parts can 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.

RoHS COMPLIANCE INFORMATION

RoHS COMPLIANT

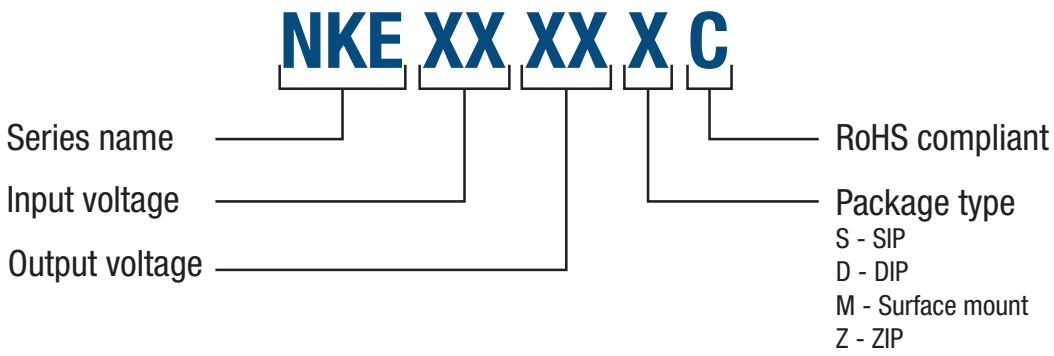
This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds. Please refer to application notes for further information. The pin termination finish on the SIP package type is Tin Plate, Hot Dipped over Matte Tin with Nickel Preplate. The DIP types are Matte Tin over Nickel Preplate. Both types in this series are backward compatible with Sn/Pb soldering systems.

For further information, please visit www.murata-ps.com/rohs

SAFETY APPROVAL

The NKE series has been recognised by Underwriters Laboratory (UL) to UL 60950 for functional insulation in a maximum ambient temperature of 85ºC and/or case temperature limit of 130ºC. Case temperature measured on the face opposite the pins. File number E151252 applies.

PART NUMBER STRUCTURE



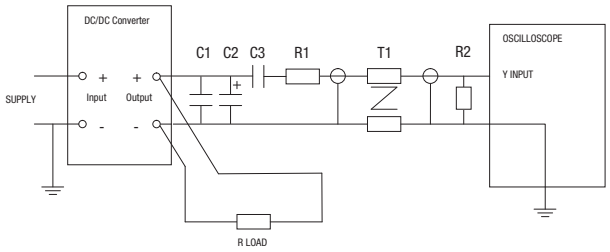
CHARACTERISATION TEST METHODS

Ripple & Noise Characterisation Method

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

C1	1µF X7R multilayer ceramic capacitor, voltage rating to be a minimum of 3 times the output voltage of the DC-DC converter
C2	10µF 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



APPLICATION NOTES

Minimum load

The minimum load to meet datasheet specification is 10% of the full rated load across the specified input voltage range. Lower than 10% minimum loading will result in an increase in output voltage, which may rise to typically double the specified output voltage if the output load falls to less than 5%.

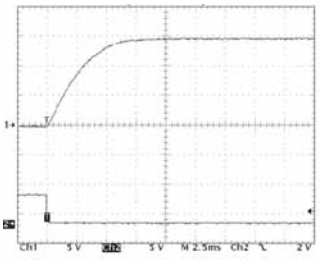
Capacitive loading and start up

Typical start up times for this series, with a typical input voltage rise time of 2.2µs and output capacitance of 10µF, are shown in the table below. The product series will start into a capacitance of 47µF with an increased start time, however, the maximum recommended output capacitance is 10µF.

	Start-up time
	µs
NKE0303SC	544
NKE0305SC	1306
NKE0309SC	5250
NKE0503SC	496
NKE0505SC	1075
NKE0505SEC	894
NKE0509SC	3140

	Start-up time
	µs
NKE0512SC	5040
NKE0515SC	9940
NKE1205SC	1671
NKE1209SC	2835
NKE1212SC	5295
NKE1215SC	8475

Typical Start-Up Wave Form



APPLICATION NOTES (Continued)

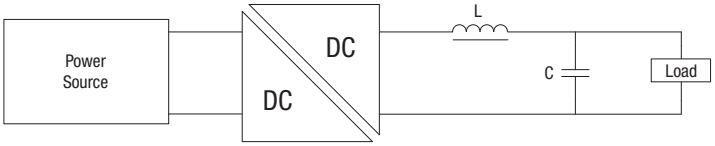
Output Ripple Reduction

By using the values of inductance and capacitance stated, the output ripple at the rated load is lowered to 5mV p-p max.

Component selection

Capacitor: It is required that the ESR (Equivalent Series Resistance) should be as low as possible, ceramic types are recommended.
The voltage rating should be at least twice (except for 15V output), the rated output voltage of the DC-DC converter.

Inductor: The rated current of the inductor should not be less than that of the output of the DC-DC converter. At the rated current, the DC resistance of the inductor should be such that the voltage drop across the inductor is <2% of the rated voltage of the DC-DC converter. The SRF (Self Resonant Frequency) should be >20MHz.

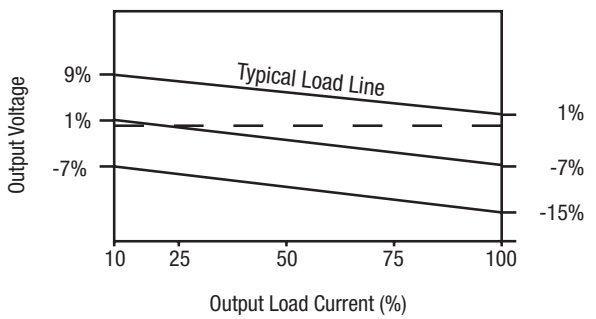


	Inductor			Capacitor
	L, µH	SMD	Through Hole	C, µF
NKE0303xC	10	82103C	11R103C	4.7µF
NKE0305xC	47	82473C	11R473C	4.7µF
NKE0309xC	47	82473C	11R473C	1µF
NKE0503xC	10	82103C	11R103C	4.7µF
NKE0505xC	47	82473C	11R473C	4.7µF
NKE0505xEC	47	82473C	11R473C	4.7µF
NKE0509SC	47	82473C	11R473C	1µF
NKE0512xC	68	82683C	11R683C	0.68µF
NKE0515xC	100	82104C	11R104C	2.2µF
NKE1205xC	47	82473C	11R473C	4.7µF
NKE1209xC	47	82473C	11R473C	1µF
NKE1212xC	68	82683C	11R683C	0.47µF
NKE1215xC	100	82104C	11R104C	2.2µF

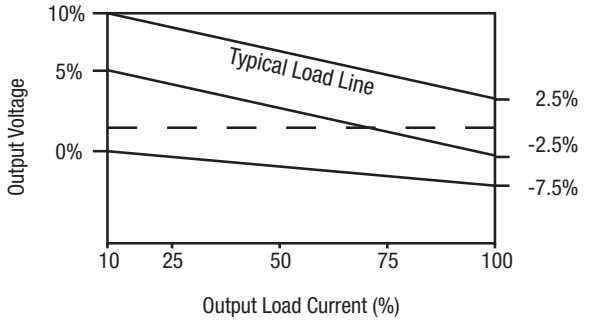
TOLERANCE ENVELOPES

The voltage tolerance envelope shows typical load regulation characteristics for this product series. The tolerance envelope is the maximum output voltage variation due to changes in output loading.

3.3V OUTPUT TYPES



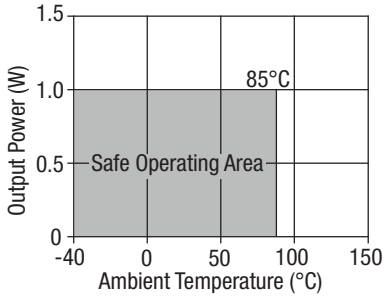
ALL OTHER TYPES



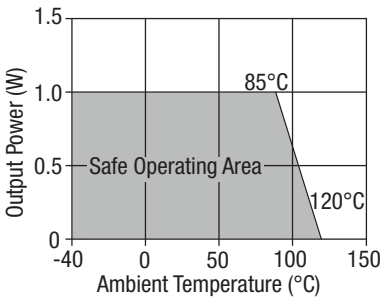
TEMPERATURE DERATING GRAPHS

NKE 0303DC/SC, 0305DC/SC, 0309DC/SC, 0503DC/SC, 0505DEC/SEC types only.

UL recognition to a maximum ambient temperature of 85ºC and/or case temperature limit of 130ºC.



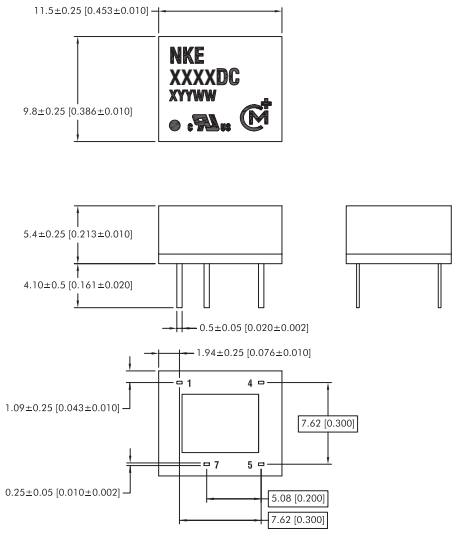
All other types.



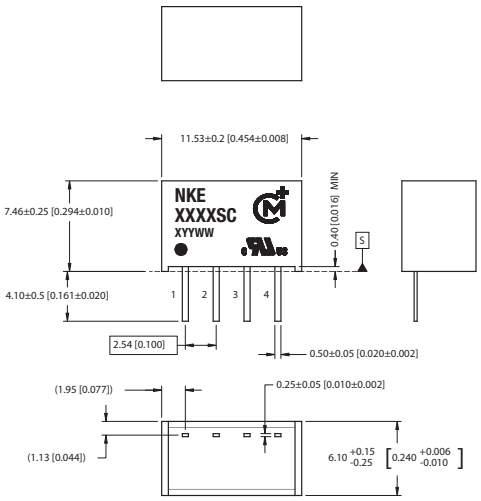
PACKAGE SPECIFICATIONS

MECHANICAL DIMENSIONS

DIP Package



SIP Package



All dimensions in mm (inches) Controlling dimension is mm.

All pins on a 2.54 (0.100) pitch and within ±0.1 (0.004) of true position from pin 1 at seating plane 'S'

Weight: 1.09g (SIP) 1.25g (DIP)

PIN CONNECTIONS - 8 PIN DIP

Pin	Function
1	-V_{IN}
4	+V_{IN}
5	+V_{OUT}
7	-V_{OUT}

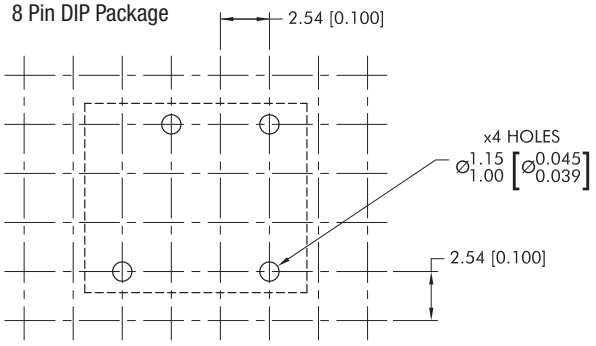
PIN CONNECTIONS - 4 PIN SIP

Pin	Function
1	-V_{IN}
2	+V_{IN}
3	-V_{OUT}
4	+V_{OUT}

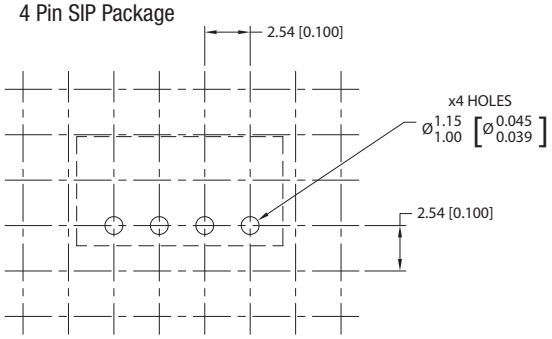
PACKAGE SPECIFICATIONS (Continued)

RECOMMENDED FOOTPRINT DETAILS

8 Pin DIP Package

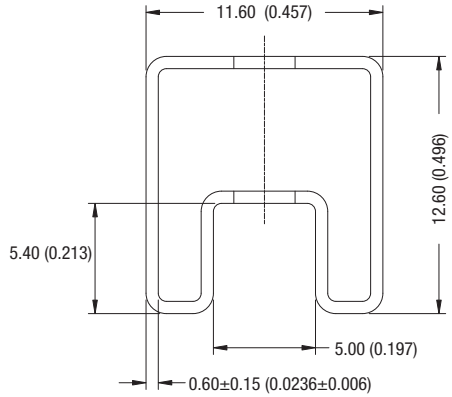


4 Pin SIP Package

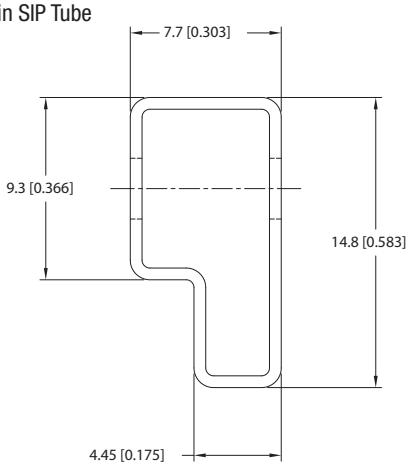


TUBE OUTLINE DIMENSIONS

8 Pin DIP Tube



4 Pin SIP Tube



Unless otherwise specified all dimensions in mm [inches] ±0.55mm [0.022].
Tube length (8 Pin DIP) : 520mm ± 2mm (20.47).
Tube length (4 Pin SIP) : 525mm ±2mm (20.67).

Tube Quantity : 40

DISCLAIMER

Unless otherwise stated in the datasheet, all products are designed for standard commercial and industrial applications and NOT for safety-critical and/or life-critical applications.

Particularly for safety-critical and/or life-critical applications, i.e. applications that may directly endanger or cause the loss of life, inflict bodily harm and/or loss or severe damage to equipment/property, and severely harm the environment, a prior explicit written approval from Murata is strictly required. Any use of Murata standard products for any safety-critical, life-critical or any related applications without any prior explicit written approval from Murata shall be deemed unauthorised use.

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- Undersea equipment
- Power plant control equipment
- Medical equipment
- Transportation equipment (automobiles, trains, ships, etc.)
- Traffic signal equipment
- Disaster prevention / crime prevention equipment
- Data Processing equipment

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