

## FEATURES

- RoHS compliant
- Efficiency up to 82%
- Wide temperature performance at full 1 Watt load, -40°C to 85°C
- UL 94V-0 package material
- Reduced footprint at 0.98cm<sup>2</sup>
- Industry standard pinout
- Power sharing on output
- 3.3V, 5V & 12V Input
- 3.3V, 5V, 9V, 12V and 15V output
- Internal SMD construction
- Fully encapsulated with toroidal magnetics
- No external components required
- MTTF up to 1.6 Million hours
- No electrolytic or tantalum capacitors

## DESCRIPTION

The NKA sub-miniature series of industrial temperature range DC/DC converters are the standard building blocks for on-board distributed power systems. The series offers smaller package size, improved efficiency, lower output ripple and 3kVDC isolation capability through the use of state of the art packaging and technology. Ideally suited for providing dual rail supplies on primarily digital boards with the added benefit of galvanic isolation to reduce switching noise. All of the rated power may be drawn from a single pin provided the total load does not exceed 1 watt.

## SELECTION GUIDE

Order Code	Nominal Input Voltage	Output Voltage	Output Current	Input Current at Rated Load	Efficiency	Isolation Capacitance	MTTF <sup>1</sup>	Package Style
	(V)	(V)	(mA)	(mA)	%	pF	kHrs	
NKA0303DC	3.3	±3.3	±152	407	74	20	195	DIP
NKA0305DC	3.3	±5	±100	383	79	22	1121	
NKA0309DC	3.3	±9	±56	402	75	30	1035	
NKA0312DC	3.3	±12	±42	390	78	31	375	
NKA0315DC	3.3	±15	±33	384	79	32	206	
NKA0303SC	3.3	±3.3	±152	407	74	20	195	SIP
NKA0305SC	3.3	±5	±100	383	79	22	1121	
NKA0309SC	3.3	±9	±56	402	75	30	1035	
NKA0312SC	3.3	±12	±42	390	78	31	375	
NKA0315SC	3.3	±15	±33	384	79	32	206	
NKA0503DC	5	±3.3	±152	259	77	22	205	DIP
NKA0505DC	5	±5	±100	285	70	21	1697	
NKA0505DEC	5	±5	±100	249	80	26	1557	
NKA0509DC	5	±9	±56	263	76	25	682	
NKA0512DC	5	±12	±42	255	78	28	343	
NKA0515DC	5	±15	±33	253	79	29	188	SIP
NKA0503SC	5	±3.3	±152	259	77	22	205	
NKA0505SC	5	±5	±100	285	70	21	1697	
NKA0505SEC	5	±5	±100	249	80	26	1557	
NKA0509SC	5	±9	±56	263	76	25	682	
NKA0512SC	5	±12	±42	255	78	28	343	DIP
NKA0515SC	5	±15	±33	253	79	29	188	
NKA1205DC	12	±5	±100	112	74	33	559	
NKA1209DC	12	±9	±56	106	79	48	375	
NKA1212DC	12	±12	±42	104	81	55	243	
NKA1215DC	12	±15	±33	102	82	60	154	SIP
NKA1205SC	12	±5	±100	112	74	33	559	
NKA1209SC	12	±9	±56	106	79	48	375	
NKA1212SC	12	±12	±42	104	81	55	243	
NKA1215SC	12	±15	±33	102	82	60	154	

When operated **with** additional external load capacitance the rise time of the input voltage will determine the maximum external capacitance value for guaranteed start up. The slower the rise time of the input voltage the greater the maximum value of the additional external capacitance for reliable start up.  
 NKA0505DEC/NKA0505SEC offer higher efficiency than NKA0505SC/NKA0505DC but over a narrower operating temperature range. See temperature characteristics graph.

## INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Voltage range	Continuous operation, 3.3V input types	2.97	3.3	3.63	V
	Continuous operation, 5V input types	4.5	5	5.5	
	Continuous operation, 12V input types	10.8	12	13.2	
Reflected ripple current	3.3V input types		30	60	mA p-p
	All other types		20	35	

## ABSOLUTE MAXIMUM RATINGS

Short-circuit protection <sup>2</sup>	1 second
Lead temperature 1.5mm from case for 10 seconds	300°C
Internal power dissipation	550mW
Input voltage V <sub>IN</sub> , NKA03 types	5.5V
Input voltage V <sub>IN</sub> , NKA05 types	7V
Input voltage V <sub>IN</sub> , NKA12 types	15V

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

2. Supply voltage must be discontinued at the end of the short circuit duration.

All specifications typical at T<sub>A</sub>=25°C, nominal input voltage and rated output current unless otherwise specified.





OUTPUT CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Rated Power <sup>1</sup>	T <sub>A</sub> =-40°C to 120°C			1	W
Voltage Set Point Accuracy	See tolerance envelope				
Line regulation	High V <sub>IN</sub> to low V <sub>IN</sub>		1.0	1.2	%/%
Load Regulation <sup>2</sup>	10% load to rated load, 0312 & 0315		8	14	%
	10% load to rated load, 3.3V output types		10	15	
	10% load to rated load, 5V output types		10	12	
	10% load to rated load, 9V output types		6.5	8	
	10% load to rated load, 12V output types		6	8.5	
	10% load to rated load, 15V output types		6	7	
Ripple and Noise	BW=DC to 20MHz, 0312 & 0315		25	60	mV p-p
	BW=DC to 20MHz, 3.3V output types		40	80	
	BW=DC to 20MHz, 5V output types		50	75	
	BW=DC to 20MHz, 9V output types		40	65	
	BW=DC to 20MHz, 12V output types		40	60	
	BW=DC to 20MHz, 15V output types		40	60	

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	0303, 0305, 0312, 0315, 0503 and 0505XE		95		kHz
	All other types		120		

TEMPERATURE CHARACTERISTICS					
Parameter	Conditions	Min.	Typ.	Max.	Units
Specification	All output types	-40		85	°C
Storage		-50		130	
Case temperature rise above ambient	5V output types		30		
	All other output types		21		
Cooling	Free air convection				

TECHNICAL NOTES					
<p><b>ISOLATION VOLTAGE</b></p> <p>‘Hi Pot Test’, ‘Flash Tested’, ‘Withstand Voltage’, ‘Proof Voltage’, ‘Dielectric Withstand Voltage’ &amp; ‘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.</p> <p>SHINOHM Technologies NKA series of DC/DC converters are all 100% production tested at their stated isolation voltage. This is 1kVDC for 1 second.</p> <p>A question commonly asked is, “What is the continuous voltage that can be applied across the part in normal operation?”</p> <p>For a part holding no specific agency approvals, such as the NKA 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.</p> <p><b>REPEATED HIGH-VOLTAGE ISOLATION TESTING</b></p> <p>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 NKA series has toroidal isolation transformers, 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.</p> <p>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.</p>					

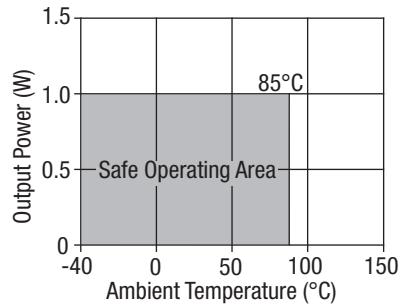
1. See Derating Graphs.

2. 12V input types have typically 3% less load regulation.

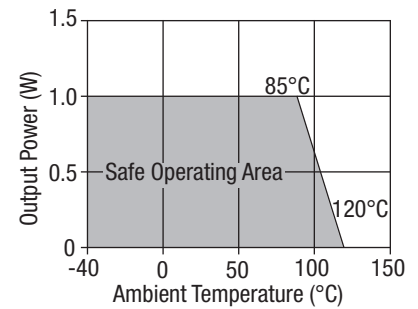


### TEMPERATURE DERATING GRAPHS

NKA0303DC/SC, 0305DC/SC  
0309DC/SC, 0505DEC/SEC  
types only.

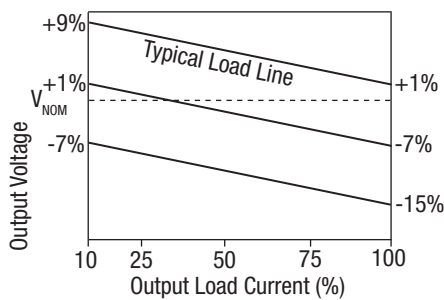


All other types.

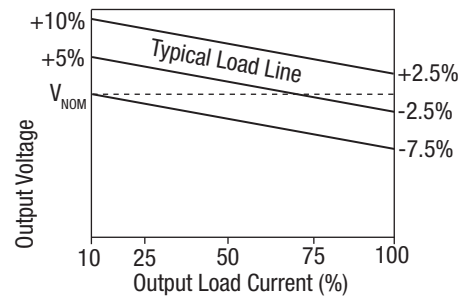


### TOLERANCE ENVELOPES

3.3V output types.

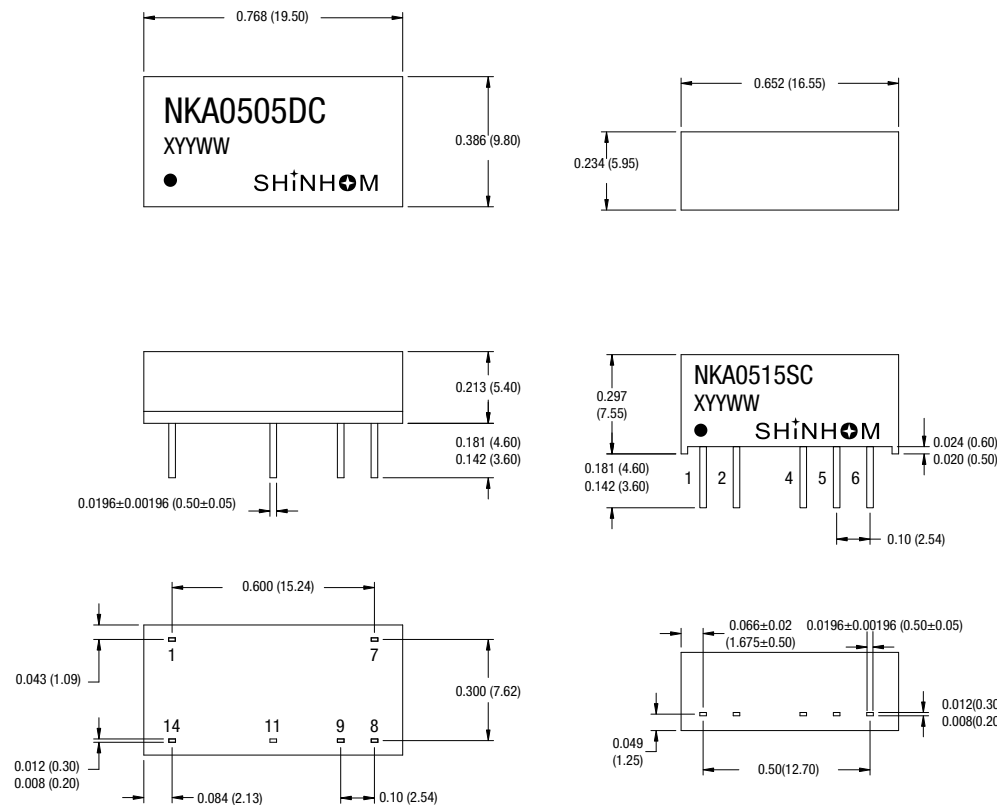


All other types.



### PACKAGE SPECIFICATIONS

#### MECHANICAL DIMENSIONS



All dimensions in inches  $\pm 0.01$  (mm  $\pm 0.25$ mm). All pins on a 0.1 (2.54) pitch and within  $\pm 0.01$  (0.25) of true position.

Weight: 1.4g (SIP) 1.9g (DIP)

#### PIN CONNECTIONS - 14 PIN DIP

Pin	Function
1	-V <sub>IN</sub>
7	NC
8	OV
9	+V <sub>OUT</sub>
11	-V <sub>OUT</sub>
14	+V <sub>IN</sub>

#### PIN CONNECTIONS - 6 PIN SIP

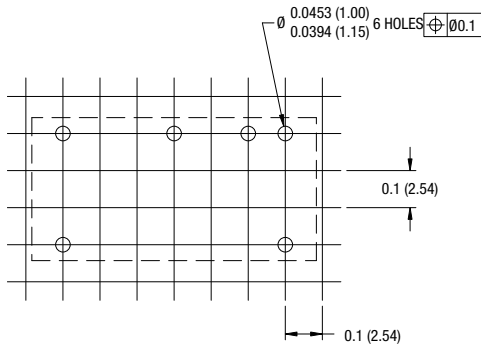
Pin	Function
1	+V <sub>IN</sub>
2	-V <sub>IN</sub>
4	-V <sub>OUT</sub>
5	OV
6	+V <sub>OUT</sub>



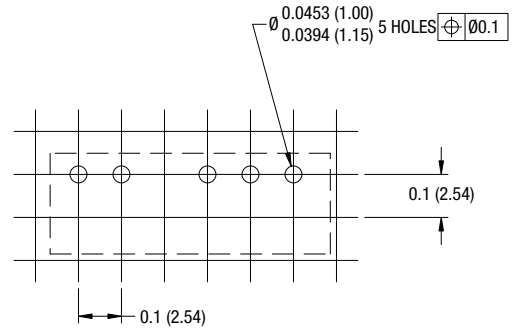
### PACKAGE SPECIFICATIONS (continued)

#### RECOMMENDED FOOTPRINT DETAILS

14 Pin DIP Package

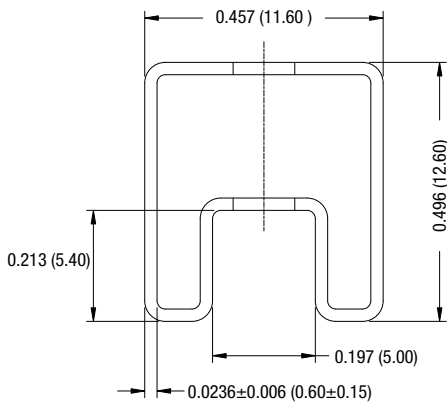


6 Pin SIP Package



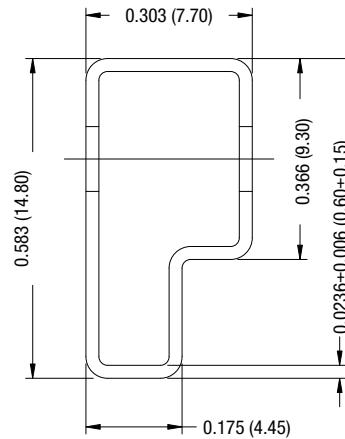
#### TUBE OUTLINE DIMENSIONS

14 Pin DIP Tube



Unless otherwise stated all dimensions in inches (mm) ±0.5mm.  
 Tube length (14 Pin DIP) : 20.47 (520mm ±2mm).  
 Tube length (6 Pin SIP) : 20.67 (525mm ±2mm).

6 Pin SIP Tube



DIP Tube Quantity : 25  
 SIP Tube Quantity : 30

### RoHS COMPLIANCE INFORMATION



This series is compatible with RoHS soldering systems with a peak wave solder temperature of 300°C for 10 seconds. 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.