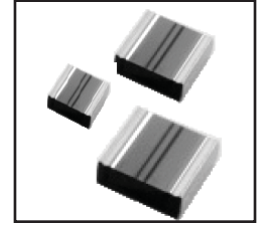


### FEATURES

- HIGH CAPACITANCE (UP TO 22 $\mu$ F)
- WIDE VOLTAGE & TEMPERATURE RANGE (16 ~ 100V, -55°C ~ +125°C or  $\pm$ 105°C)
- UPGRADE PERFORMANCE VS. MLCC's
  - STABLE OVER FREQUENCY, TEMPERATURE & VOLTAGE
  - NO PIEZO ELECTRIC EFFECT
- IDEAL FOR AUDIO APPLICATIONS
- TYPICAL OPEN FAILURE MODE
- +260°C REFLOW SOLDERING COMPATIBLE



SPECIFICATIONS	Case Sizes					
	1206	1210	1812	2220	1206	1210
Capacitance Range	0.01 $\mu$ F ~ 22 $\mu$ F*				0.001 $\mu$ F ~ 0.047 $\mu$ F*	0.068 $\mu$ F ~ 0.1 $\mu$ F*
Voltage Ratings	16, 25, 35, 50 & 63VDC				100VDC	
Capacitance Tolerance	$\pm$ 10% (K), $\pm$ 20% (M)					
Temperature Range	-55°C ~ +125°C				-55°C ~ +105°C	
Dissipation Factor (20°C)	1.5% (measured at 5Vrms, 1KHz)					
Insulation Resistance (20°C)	C $\leq$ 0.1 $\mu$ F: 3,000M $\Omega$ Minimum C > 0.1 $\mu$ F: 300M $\cdot$ $\mu$ F Minimum				1,000M $\Omega$ Minimum	
Dielectric Withstanding Voltage	No abnormalities after application of 150% of rated voltage for 1 minute or 175% of rated voltage for 1 ~ 5 seconds					

\*Measured at  $\leq$  5Vrms, 1KHz

### ENVIRONMENTAL CHARACTERISTICS

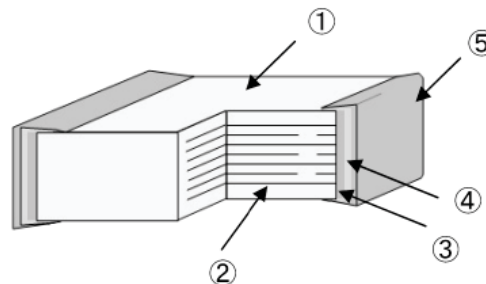
High Temperature Life Test* 16V ~ 63V: +125°C $\pm$ 3°C, 1,000 Hrs +48/-0 Hrs 100V: +105°C $\pm$ 3°C, 1,000 Hrs +48/-0 Hrs 125% of Rated Voltage	Capacitance Change	Within +5%/-20% of Initial Value
	Dissipation Factor	1.65% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 $\mu$ F: 30M $\Omega$ $\cdot$ $\mu$ F Minimum 16V ~ 63V, C $\leq$ 0.1 $\mu$ F & 100V: 300M $\Omega$ Minimum
Humidity Load Life* 500 Hours, +40°C & 90% ~ 95% RH at rated voltage	Capacitance Change	Within +20%/-5% of Initial Value
	Dissipation Factor	2.25% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 $\mu$ F: 30M $\Omega$ $\cdot$ $\mu$ F Minimum 16V ~ 63V, C $\leq$ 0.1 $\mu$ F & 100V: 300M $\Omega$ Minimum
Temperature Cycling* No Load, 5 cycles of -55°C (30 minutes), Room temperature $\leq$ 3 minutes +125°C or +105°C (30 minutes)	Capacitance Change	Within +5%/-20% of Initial Value
	Dissipation Factor	1.65% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 $\mu$ F: 30M $\Omega$ $\cdot$ $\mu$ F Minimum 16V ~ 63V, C $\leq$ 0.1 $\mu$ F & 100V: 300M $\Omega$ Minimum
Resistance to Soldering Heat (Soldering using recommended reflow conditions, 2 times)	Capacitance Change	Within +5%/-10% of Initial Value
	Dissipation Factor	1.65% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1 $\mu$ F: 100M $\Omega$ $\cdot$ $\mu$ F Minimum 16V ~ 63V, C $\leq$ 0.1 $\mu$ F & 100V: 1,000M $\Omega$ Minimum

### AC VOLTAGE RATINGS

NSPH Vdc Rating	Vrms	Vpeak
16Vdc	11.3	16
25Vdc	17.7	25
35Vdc	24.7	35
50Vdc	35.4	50
63Vdc	44.5	63
100Vdc	70.8	100

### CONSTRUCTION

Part	Materials
1	Capacitor Element
2	Internal Electrode
3	First Termination Layer
4	Second Termination Layer
5	Third Termination Layer



### PART NUMBER SYSTEM

NSPH 106 M 16V 1812 TR L E

- Series
- Capacitance in pF, 1st two digits are significant, 3rd digit is no. of zeros
- Tolerance Code: K= $\pm$ 10%, M= $\pm$ 20%
- Voltage
- Size Code
- Optional 255mm reel size\*
- Tape & Reel
- RoHS compliant

\*Contact NIC for availability of larger 255mm reels



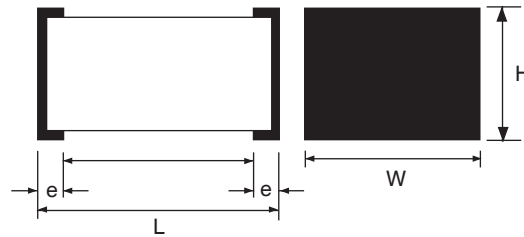
### STANDARD VALUES AND CASE SIZES (mm)

Part Number	Voltage (VDC)	Capacitance (μF)	Available Tolerance	L±0.3	W±0.3	H±0.2	e±0.3	Case Size	Reel Qty
									180mm
NSPH105_16V1206TRF	16	1.0	±10% (K), ±20% (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH155_16V1206TRF	16	1.5	±10% (K), ±20% (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH225_16V1210TRF	16	2.2	±10% (K), ±20% (M)	3.2	2.5	1.8	0.5	1210	2,000
NSPH335_16V1210TRF	16	3.3	±10% (K), ±20% (M)	3.2	2.5	2.0	0.5	1210	2,000
NSPH475_16V1812TRF	16	4.7	±10% (K), ±20% (M)	4.5	3.2	1.4	0.5	1812	1,000
NSPH685_16V1812TRF	16	6.8	±10% (K), ±20% (M)	4.5	3.2	1.8	0.5	1812	1,000
NSPH106_16V1812TRF	16	10	±10% (K), ±20% (M)	4.5	3.2	2.6	0.5	1812	500
NSPH156_16V2220TRF	16	15	±10% (K), ±20% (M)	5.7	5	1.8	0.5	2220	1,000
NSPH226_16V2220TRF	16	22	±10% (K), ±20% (M)	5.7	5	2.6	0.5	2220	500
NSPH684_25V1206TRF	25	0.68	±10% (K), ±20% (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH105_25V1206TRF	25	1.0	±10% (K), ±20% (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH155_25V1210TRF	25	1.5	±10% (K), ±20% (M)	3.2	2.5	2.0	0.5	1210	2,000
NSPH225_25V1210TRF	25	2.2	±10% (K), ±20% (M)	3.2	2.5	1.8	0.5	1210	2,000
NSPH335_25V1812TRF	25	3.3	±10% (K), ±20% (M)	4.5	3.2	1.4	0.5	1812	1,000
NSPH475_25V1812TRF	25	4.7	±10% (K), ±20% (M)	4.5	3.2	1.8	0.5	1812	1,000
NSPH685_25V1812TRF	25	6.8	±10% (K), ±20% (M)	4.5	3.2	2.6	0.5	1812	500
NSPH106_25V2220TRF	25	10	±10% (K), ±20% (M)	5.7	5	1.8	0.5	2220	1,000
NSPH156_25V2220TRF	25	15	±10% (K), ±20% (M)	5.7	5	2.6	0.5	2220	500
NSPH474_35V1206TRF	35	0.47	±10% (K), ±20% (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH684_35V1206TRF	35	0.68	±10% (K), ±20% (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH105_35V1210TRF	35	1.0	±10% (K), ±20% (M)	3.2	2.5	1.4	0.5	1210	2,000
NSPH155_35V1210TRF	35	1.5	±10% (K), ±20% (M)	3.2	2.5	2.0	0.5	1210	2,000
NSPH225_35V1812TRF	35	2.2	±10% (K), ±20% (M)	4.5	3.2	1.4	0.5	1812	1,000
NSPH335_35V1812TRF	35	3.3	±10% (K), ±20% (M)	4.5	3.2	1.8	0.5	1812	1,000
NSPH475_35V1812TRF	35	4.7	±10% (K), ±20% (M)	4.5	3.2	2.6	0.5	1812	500
NSPH685_35V2220TRF	35	6.8	±10% (K), ±20% (M)	5.7	5	1.8	0.5	2220	1,000
NSPH106_35V2220TRF	35	10	±10% (K), ±20% (M)	5.7	5	2.6	0.5	2220	500
NSPH104_50V1206TRF	50	0.1	±10% (K), ±20% (M)	3.2	1.6	1.0	0.5	1206	3,000
<a href="#">NSPH154_50V1206TRF</a>	<a href="#">50</a>	<a href="#">0.15</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
NSPH224_50V1206TRF	50	0.22	±10% (K), ±20% (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH334_50V1206TRF	50	0.33	±10% (K), ±20% (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH474_50V1210TRF	50	0.47	±10% (K), ±20% (M)	3.2	2.5	1.4	0.5	1210	2,000
NSPH684_50V1210TRF	50	0.68	±10% (K), ±20% (M)	3.2	2.5	1.8	0.5	1210	2,000
NSPH105_50V1812TRF	50	1.0	±10% (K), ±20% (M)	4.5	3.2	1.4	0.5	1812	1,000
NSPH155_50V1812TRF	50	1.5	±10% (K), ±20% (M)	4.5	3.2	1.8	0.5	1812	1,000
NSPH225_50V1812TRF	50	2.2	±10% (K), ±20% (M)	4.5	3.2	2.6	0.5	1812	500
NSPH335_50V2220TRF	50	3.3	±10% (K), ±20% (M)	5.7	5	1.8	0.5	2220	1,000
NSPH475_50V2220TRF	50	4.7	±10% (K), ±20% (M)	5.7	5	2.6	0.5	2220	500
<a href="#">NSPH103_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.01</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
<a href="#">NSPH153_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.015</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
<a href="#">NSPH223_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.022</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
<a href="#">NSPH333_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.033</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
<a href="#">NSPH473_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.047</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
<a href="#">NSPH683_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.068</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
<a href="#">NSPH104_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.1</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
<a href="#">NSPH154_63V1206TRF</a>	<a href="#">63</a>	<a href="#">0.15</a>	±10% (K), ±20% (M)	<a href="#">3.2</a>	<a href="#">1.6</a>	<a href="#">1.0</a>	<a href="#">0.5</a>	<a href="#">1206</a>	<a href="#">3,000</a>
NSPH224_63V1206TRF	63	0.22	±10% (K), ±20% (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH334_63V1210TRF	63	0.33	±10% (K), ±20% (M)	3.2	2.5	1.4	0.5	1210	2,000
NSPH474_63V1210TRF	63	0.47	±10% (K), ±20% (M)	3.2	2.5	1.8	0.5	1210	2,000
NSPH684_63V1812TRF	63	0.68	±10% (K), ±20% (M)	4.5	3.2	1.4	0.5	1812	1,000
NSPH105_63V1812TRF	63	1.0	±10% (K), ±20% (M)	4.5	3.2	1.8	0.5	1812	1,000
NSPH155_63V1812TRF	63	1.5	±10% (K), ±20% (M)	4.5	3.2	2.6	0.5	1812	500
NSPH225_63V2220TRF	63	2.2	±10% (K), ±20% (M)	5.7	5	1.8	0.5	2220	1,000
NSPH335_63V2220TRF	63	3.3	±10% (K), ±20% (M)	5.7	5	2.6	0.5	2220	500



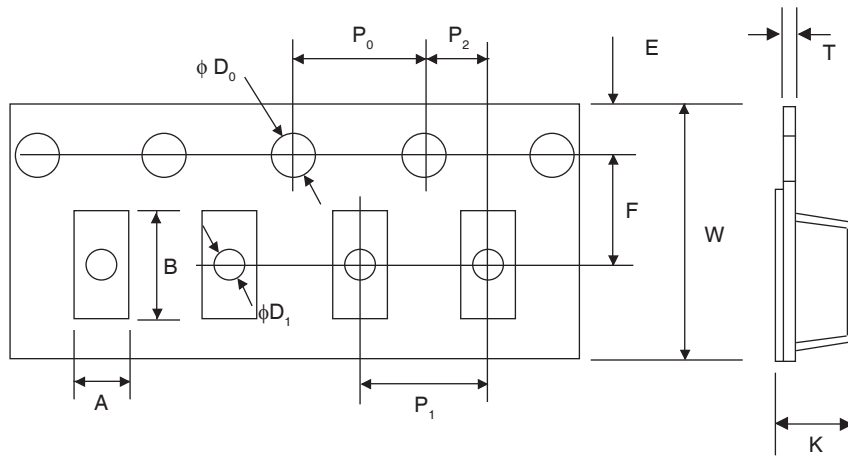
### STANDARD VALUES AND CASE SIZES (mm)

Part Number	Voltage (VDC)	Capacitance ( $\mu\text{F}$ )	Available Tolerance	$L \pm 0.3$	$W \pm 0.3$	$H \pm 0.2$	$e \pm 0.3$	Case Size	Reel Qty
									Tolerance
NSPH102_100V1206TRF	100	0.001	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH152_100V1206TRF	100	0.0015	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH222_100V1206TRF	100	0.0022	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH332_100V1206TRF	100	0.0033	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH472_100V1206TRF	100	0.0047	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH682_100V1206TRF	100	0.0068	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH103_100V1206TRF	100	0.01	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH153_100V1206TRF	100	0.015	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH223_100V1206TRF	100	0.022	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH333_100V1206TRF	100	0.033	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.0	0.5	1206	3,000
NSPH473_100V1206TRF	100	0.047	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	1.6	1.4	0.5	1206	2,000
NSPH683_100V1210TRF	100	0.068	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	2.5	1.4	0.5	1210	2,000
NSPH104_100V1210TRF	100	0.1	$\pm 10\%$ (K), $\pm 20\%$ (M)	3.2	2.5	1.8	0.5	1210	2,000



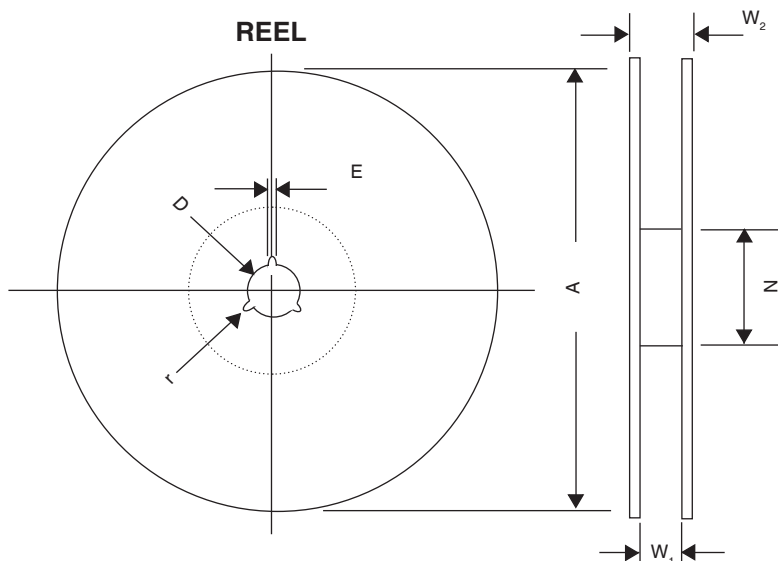
### EMBOSED PLASTIC CARRIER DIMENSIONS (mm)

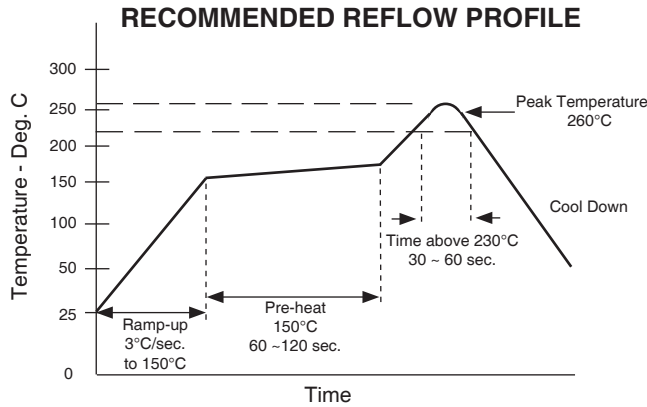
Size	Case Code	A ± 0.1	B ± 0.1	W ± 0.3	F ± 0.5	E ± 0.1	P <sub>1</sub> ± 0.5	P <sub>2</sub> ± 0.4	P <sub>0</sub> ± 0.1	φ D <sub>0</sub> ± 0.1	φ D <sub>1</sub> ± 0.1	K ± 0.1	T ± 0.05
1206	A1	2	3.6	8	3.5	1.75	4	2	4	1.5	1	1.4	0.2
	A2											1.8	0.25
1210	B1	2.9	3.6	8	3.5	1.75	4	2	4	1.5	1	1.8	0.25
	B2											2.2	0.25
	B3											2.4	0.25
1812	C1	3.6	4.9	12	5.5	1.75	8	2	4	1.5	1.5	1.8	0.25
	C2											2.2	0.25
	C3											2.4	0.25
	C4											3.0	0.25
2220	D1	5.4	6.1	12	5.5	1.75	8	2	4	1.5	1.5	2.2	0.25
	D2											2.6	0.25
	D3											3.0	0.25



### REEL DIMENSIONS (mm)

Case Code	A ± 1.0	N ± 1.0	W1 ± 1.0	W2 ± 1.0	φD ± 0.2	E ± 0.5	r ± 0.2
A & B	180	60	9.5	13.1	13	2	1
C & D	180	60	13.5	18.5	13	2	1
	255	80	13.5	18.5	13	2	1





Note: These capacitors are sensitive to moisture. The parts should be used within one year of shipping date while stored unopened in moisture barrier packaging at +5°C ~ 30°C and a relative humidity of ≤70% RH.

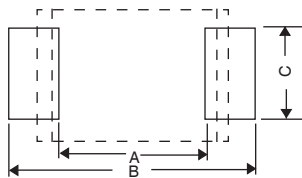
### STORAGE TIME LIMIT AFTER OPENING MOISTURE BARRIER PACKAGING

Size	Open Bag Storage Limit (+30°C/<60% RH)	MSL*
1206	96 hours	4
1210	96 hours	4
1812	48 hours	5
2220	48 hours	5

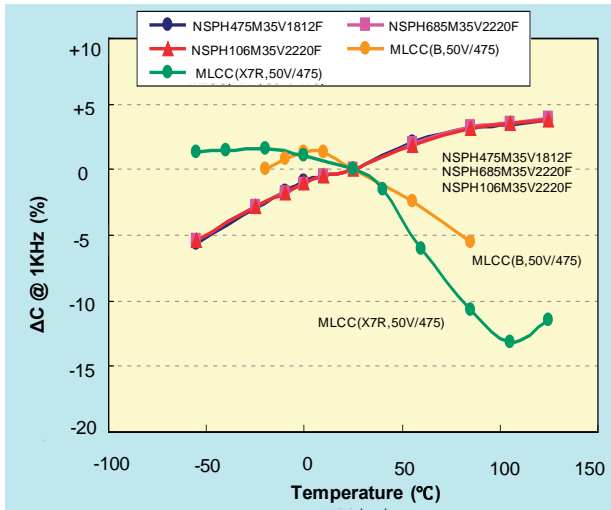
\*IPC/JEDEC J-STD-020-C

### LAND PATTERN DIMENSIONS (mm)

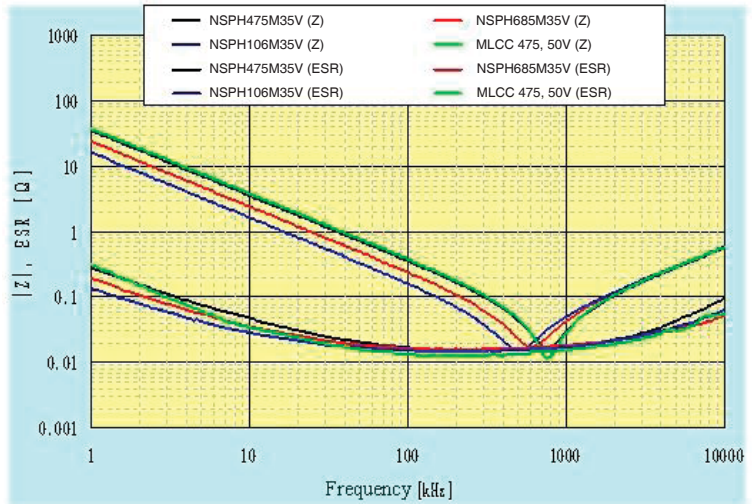
EIA Size	A ± 0.1	B ± 0.1	C ± 0.2
1206	1.8	3.6	1.4
1210	1.8	3.6	2.3
1812	2.7	5.7	3.0
2220	3.5	7.8	4.5



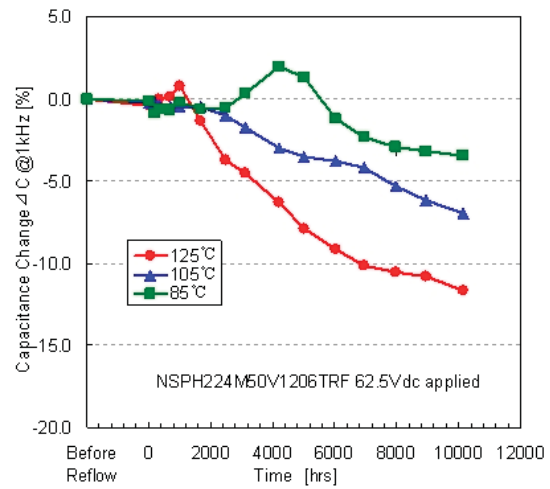
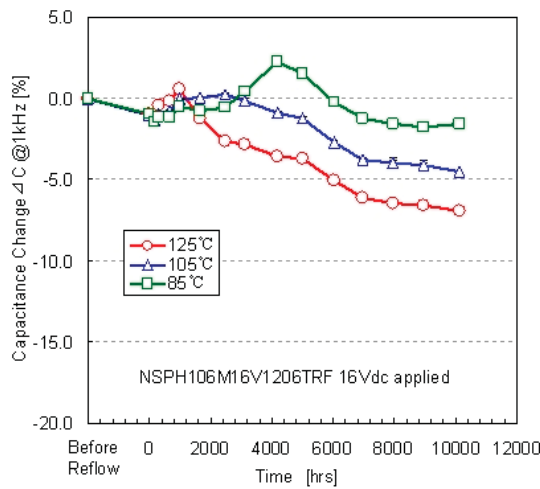
### Typical Capacitance vs. Temperature (NSPH vs. MLCC)



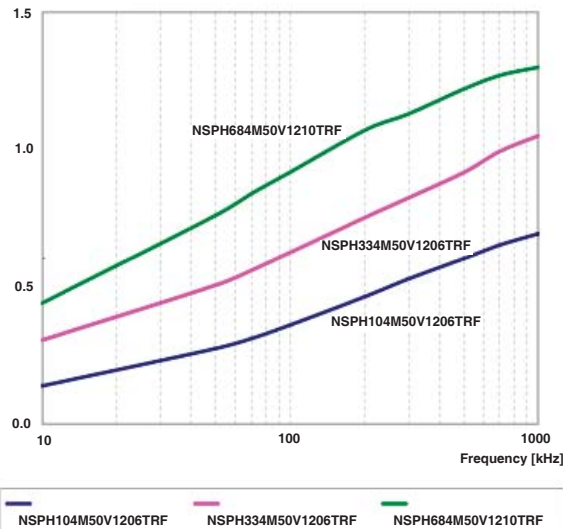
### Typical ESR & Z vs. Frequency (NSPH vs. MLCC)



### High Temperature Load Life Test (Typical Performance)



### Permissible Current (Arms)



1. Self-heating temperature rise due to current should not exceed 10°C
2. Contact NIC top review your circuit requirements: [tpmg@niccomp.com](mailto:tpmg@niccomp.com)

