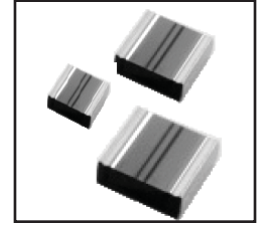


FEATURES

- HIGH CAPACITANCE (UP TO 22 μ F)
- WIDE VOLTAGE & TEMPERATURE RANGE (16 ~ 63V, -55°C ~ +125°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
Capacitance Range	0.1 μ F ~ 22 μ F (measured at \leq 5Vrms, 1KHz)			
Voltage Ratings	16, 25, 35, 50 & 63VDC			
Capacitance Tolerance	\pm 20% (M)			
Temperature Range	-55°C ~ +125°C			
Dissipation Factor (20°C)	1.5% (measured at 5Vrms, 1KHz)			
Insulation Resistance (20°C)	\geq 300M Ω • μ F (after 60 seconds at rated voltage)			
Dielectric Withstanding Voltage	No abnormalities after application of 150% of rated voltage for 1 minute or 175% of rated voltage for 1 ~ 5 seconds			

ENVIRONMENTAL CHARACTERISTICS

High Temperature Life Test* +125°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	30M Ω • μ F 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	30M Ω • μ F Minimum
Temperature Cycling* No Load, 5 cycles of -55°C (30 minutes), room temperature \leq 3 minutes, +125°C (30 minutes)	Capacitance Change	Within +5%/-20% of Initial Value
	Dissipation Factor	1.65% Maximum @ 1KHz
	Insulation Resistance	30M Ω • μ F 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	100M Ω • μ F Minimum

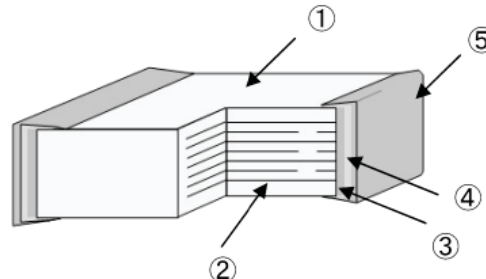
PART NUMBER SYSTEM

NSPH 106 M 16 TR 1812 E

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

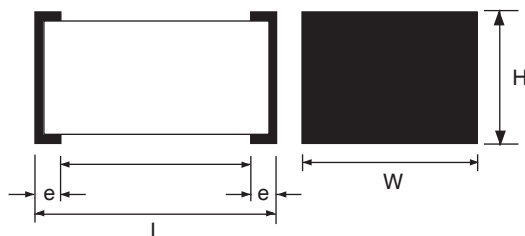
CONSTRUCTION

Part	Materials	
1	Capacitor Element	Acrylic base polymer film
2	Internal Electrode	Vapor deposited aluminum
3	First Termination Layer	Copper alloy
4	Second Termination Layer	Conductive paste
5	Third Termination Layer	100% Sn (tin) plating



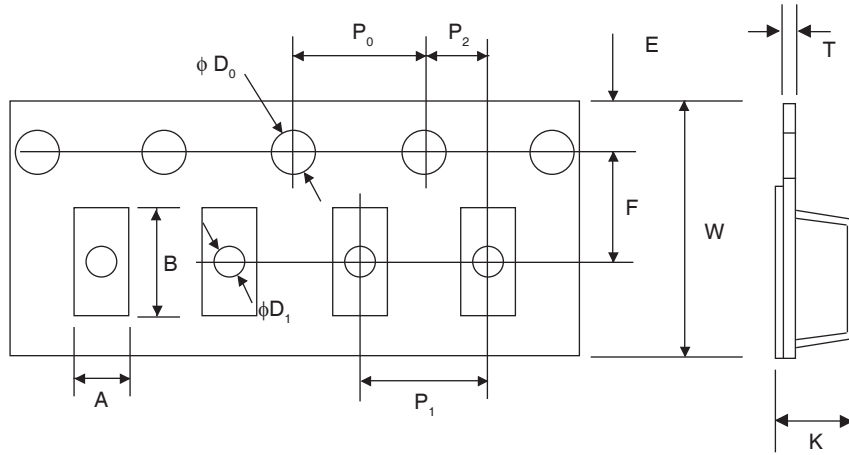
STANDARD VALUES AND CASE SIZES (mm)

Part Number	Voltage (VDC)	Capacitance (μF)	L±0.3	W±0.3	H±0.2	e±0.3	Case Size	Reel Qty	
								180mm	255mm
NSPH105M16V1206TRF	16	1	3.2	1.6	1.4	0.5	1206	2,000	-
NSPH155M16V1206TRF	16	1.5	3.2	1.6	1.4	0.5	1206	2,000	-
NSPH225M16V1210TRF	16	2.2	3.2	2.5	1.8	0.5	1210	2,000	-
NSPH335M16V1210TRF	16	3.3	3.2	2.5	2	0.5	1210	2,000	-
NSPH475M16V1812TRF	16	4.7	4.5	3.2	1.4	0.5	1812	1,000	2,000
NSPH685M16V1812TRF	16	6.8	4.5	3.2	1.8	0.5	1812	1,000	2,000
NSPH106M16V1812TRF	16	10	4.5	3.2	2.6	0.5	1812	500	1,500
NSPH156M16V2220TRF	16	15	5.7	5	1.8	0.5	2220	1,000	2,000
NSPH226M16V2220TRF	16	22	5.7	5	2.6	0.5	2220	500	1,500
NSPH684M25V1206TRF	25	0.68	3.2	1.6	1.4	0.5	1206	2,000	-
NSPH105M25V1206TRF	25	1	3.2	1.6	1.4	0.5	1206	2,000	-
NSPH155M25V1210TRF	25	1.5	3.2	2.5	2	0.5	1210	2,000	-
NSPH225M25V1210TRF	25	2.2	3.2	2.5	1.8	0.5	1210	2,000	-
NSPH335M25V1812TRF	25	3.3	4.5	3.2	1.4	0.5	1812	1,000	2,000
NSPH475M25V1812TRF	25	4.7	4.5	3.2	1.8	0.5	1812	1,000	2,000
NSPH685M25V1812TRF	25	6.8	4.5	3.2	2.6	0.5	1812	500	1,500
NSPH106M25V2220TRF	25	10	5.7	5	1.8	0.5	2220	1,000	2,000
NSPH156M25V2220TRF	25	15	5.7	5	2.6	0.5	2220	500	1,500
NSPH474M35V1206TRF	35	0.47	3.2	1.6	1	0.5	1206	3,000	-
NSPH684M35V1206TRF	35	0.68	3.2	1.6	1.4	0.5	1206	2,000	-
NSPH105M35V1210TRF	35	1	3.2	2.5	1.4	0.5	1210	2,000	-
NSPH155M35V1210TRF	35	1.5	3.2	2.5	2	0.5	1210	2,000	-
NSPH225M35V1812TRF	35	2.2	4.5	3.2	1.4	0.5	1812	1,000	2,000
NSPH335M35V1812TRF	35	3.3	4.5	3.2	1.8	0.5	1812	1,000	2,000
NSPH475M35V1812TRF	35	4.7	4.5	3.2	2.6	0.5	1812	500	1,500
NSPH685M35V2220TRF	35	6.8	5.7	5	1.8	0.5	2220	1,000	2,000
NSPH106M35V2220TRF	35	10	5.7	5	2.6	0.5	2220	500	1,500
NSPH104M50V1206TRF	50	0.1	3.2	1.6	1	0.5	1206	3,000	-
NSPH224M50V1206TRF	50	0.22	3.2	1.6	1	0.5	1206	3,000	-
NSPH334M50V1206TRF	50	0.33	3.2	1.6	1.4	0.5	1206	2,000	-
NSPH474M50V1210TRF	50	0.47	3.2	2.5	1.4	0.5	1210	2,000	-
NSPH684M50V1210TRF	50	0.68	3.2	2.5	1.8	0.5	1210	2,000	-
NSPH105M50V1812TRF	50	1	4.5	3.2	1.4	0.5	1812	1,000	2,000
NSPH155M50V1812TRF	50	1.5	4.5	3.2	1.8	0.5	1812	1,000	2,000
NSPH225M50V1812TRF	50	2.2	4.5	3.2	2.6	0.5	1812	500	1,500
NSPH335M50V2220TRF	50	3.3	5.7	5	1.8	0.5	2220	1,000	2,000
NSPH475M50V2220TRF	50	4.7	5.7	5	2.6	0.5	2220	500	1,500
NSPH224M63V1206TRF	63	0.22	3.2	1.6	1.4	0.5	1206	2,000	-
NSPH334M63V1210TRF	63	0.33	3.2	2.5	1.4	0.5	1210	2,000	-
NSPH474M63V1210TRF	63	0.47	3.2	2.5	1.8	0.5	1210	2,000	-
NSPH684M63V1812TRF	63	0.68	4.5	3.2	1.4	0.5	1812	1,000	2,000
NSPH105M63V1812TRF	63	1	4.5	3.2	1.8	0.5	1812	1,000	2,000
NSPH155M63V1812TRF	63	1.5	4.5	3.2	2.6	0.5	1812	500	1,500
NSPH225M63V2220TRF	63	2.2	5.7	5	1.8	0.5	2220	1,000	2,000
NSPH335M63V2220TRF	63	3.3	5.7	5	2.6	0.5	2220	500	1,500



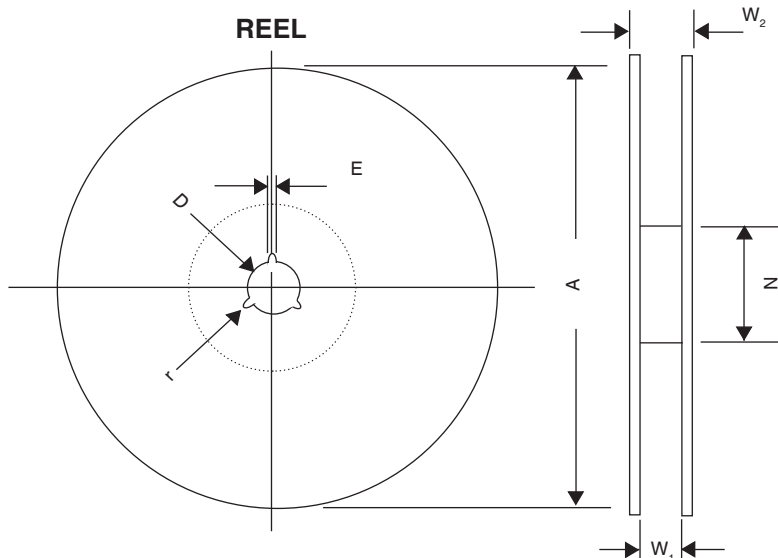
EMBOSSED PLASTIC CARRIER DIMENSIONS (mm)

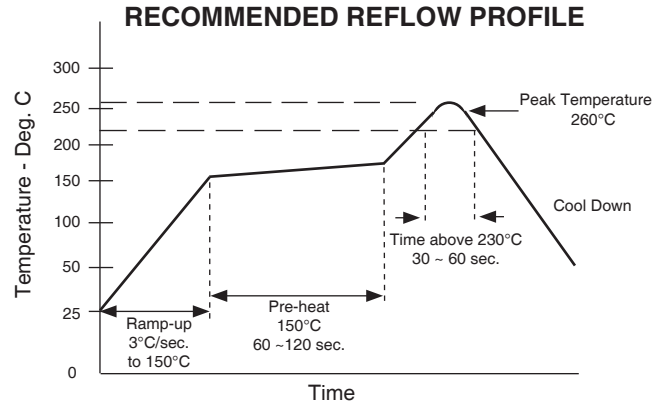
Case Code	A ± 0.1	B ± 0.1	W ± 0.3	F ± 0.5	E ± 0.1	P ₁ ± 0.5	P ₂ ± 0.4	P ₀ ± 0.1	φ D ₀ ± 0.1	φ D ₁ ± 0.1	K ± 0.1	T ± 0.05
A1	2	3.6	8	3.5	1.75	4	2	4	1.5	1	1.4	0.2
A2											1.8	0.25
B1	2.9	3.6	8	3.5	1.75	4	2	4	1.5	1	1.8	0.25
B2											2.2	0.25
B3											2.4	0.25
C1	3.6	4.9	12	5.5	1.75	8	2	4	1.5	1.5	1.8	0.25
C2											2.2	0.25
C3											2.4	0.25
C4											3.0	0.25
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.

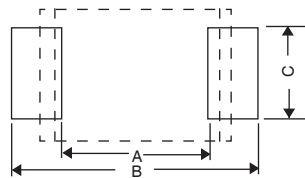
STORAGE TIME LIMIT AFTER OPENING MOISTURE BARRIER PACKAGING

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

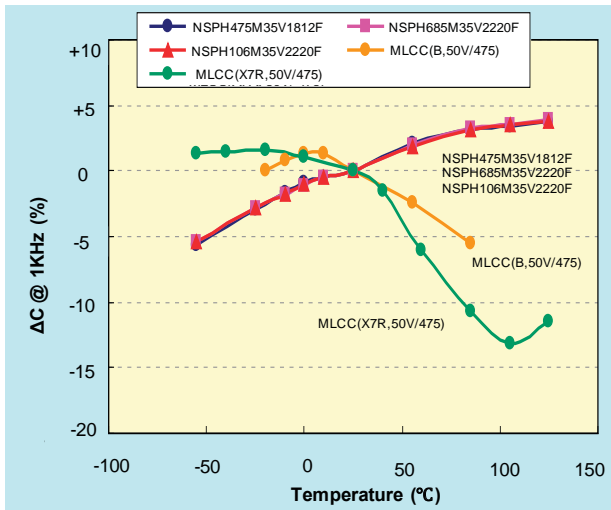
*IPC/JEDEC J-STD-020-C

LAND PATTERN DIMENSIONS (mm)

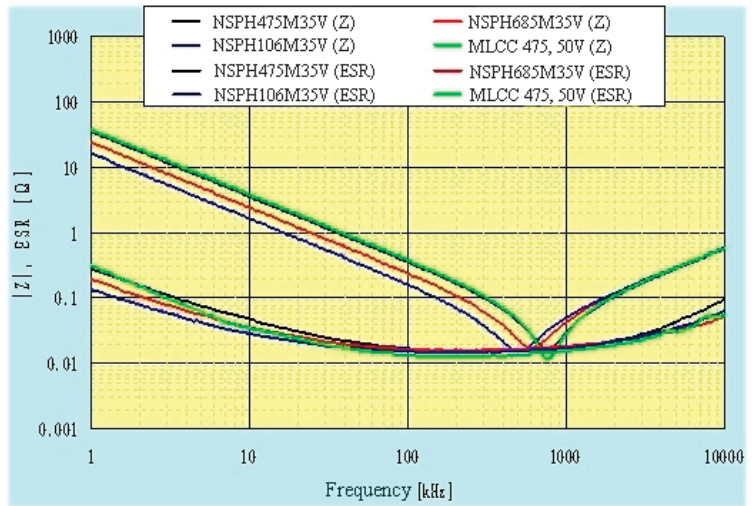
EIA Size	A ± 0.1	B ± 0.1	C ± 0.2
1206	1.8	3.6	1.4
1210	1.8	3.6	2.3
1812	2.7	5.7	3.0
2220	3.5	7.8	4.5



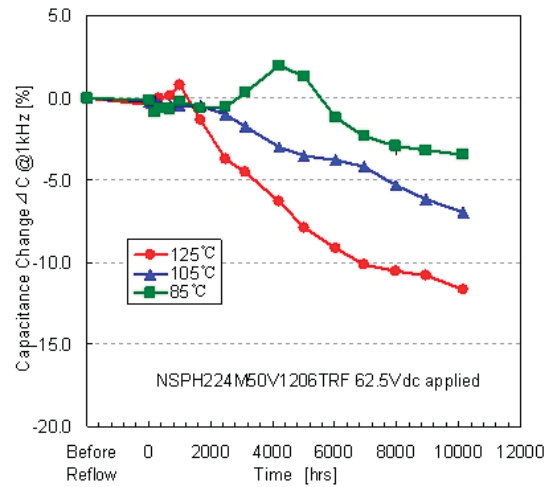
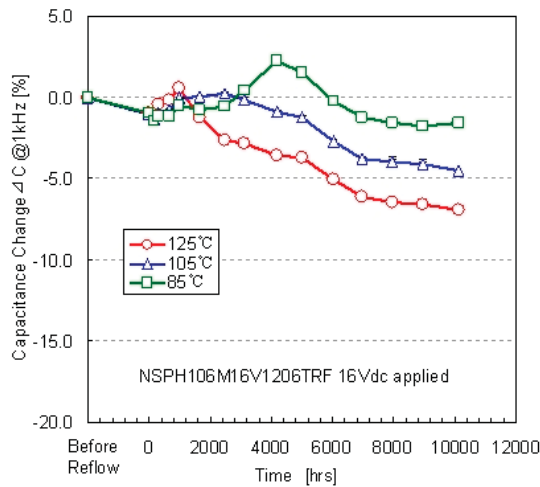
**Typical Capacitance vs. Temperature
(NSPH vs. MLCC)**



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



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



**Permissible Current
(Maximum $\Delta T = 10^\circ C$)**

