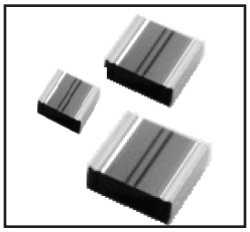
Multilayer Acrylic Polymer Film Capacitors

NSPH Series

FEATURES

- HIGH CAPACITANCE (UP TO 22μF)
- WIDE VOLTAGE & TEMPERATURE RANGE (16 ~ 100V, -55°C ~ +125°C or ±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	0.01μF ~ 22μF*				0.001μF ~ 0.047μF*	0.068μF ~ 0.1μF*
Voltage Ratings	16, 25, 35, 50 & 63VDC				100VDC	
Capacitance Tolerance	±10% (K), ±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 ≤ 0.1μF: 3,000MΩ Minimum C > 0.1μF: 300M • μF Minimum				1,000MΩ 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 ≤ 5Vrms, 1KHz

ENVIRONMENTAL CHARACTERISTICS

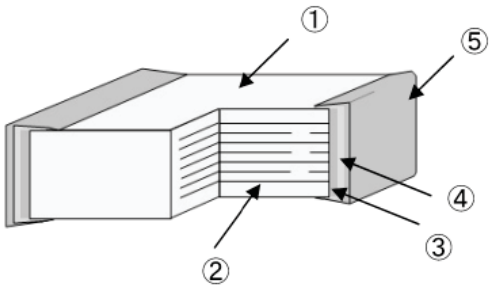
High Temperature Life Test* 16V ~ 63V: +125°C ±3°C, 1,000 Hrs +48/-0 Hrs 100V: +105°C ±3°C, 1,000 Hrs +48/-0 Hrs 125% of Rated Voltage	Capacitance Change	Within +5%/-20% of Initial Value
	Dissipation Factor	1.65% Maximum @ 1KHz
	Insulation Resistance	16V ~ 63V, C > 0.1μF: 30MΩ • μF Minimum 16V ~ 63V, C ≤ 0.1μF & 100V: 300MΩ 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 > 0.1μF: 30MΩ • μF Minimum 16V ~ 63V, C ≤ 0.1μF & 100V: 300MΩ Minimum
Temperature Cycling* No Load, 5 cycles of -55°C (30 minutes), Room temperature ≤ 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 > 0.1μF: 30MΩ • μF Minimum 16V ~ 63V, C ≤ 0.1μF & 100V: 300MΩ 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 > 0.1μF: 100MΩ • μF Minimum 16V ~ 63V, C ≤ 0.1μF & 100V: 1,000MΩ 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	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



PART NUMBER SYSTEM

NSPH 106 M 16V 1812 TR L F

- F: RoHS compliant
- L: Optional 255mm reel size*
- TR: Tape & Reel
- 1812: Size Code
- 16V: Voltage
- M: Tolerance Code: K=±10%, M=±20%
- 106: Capacitance in pF, 1st two digits are significant, 3rd digit is no. of zeros
- NSPH: Series

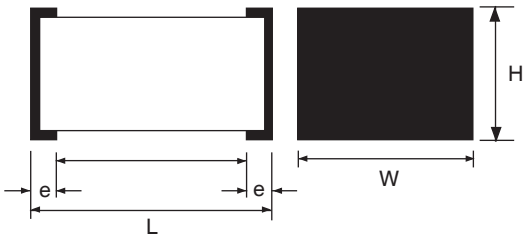
*Contact NIC for availability of larger 255mm reels

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
NSPH105M16V1206TRF	16	1.0	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	0.5	1210	2,000
NSPH475M16V1812TRF	16	4.7	4.5	3.2	1.4	0.5	1812	1,000
NSPH685M16V1812TRF	16	6.8	4.5	3.2	1.8	0.5	1812	1,000
NSPH106M16V1812TRF	16	10	4.5	3.2	2.6	0.5	1812	500
NSPH156M16V2220TRF	16	15	5.7	5	1.8	0.5	2220	1,000
NSPH226M16V2220TRF	16	22	5.7	5	2.6	0.5	2220	500
NSPH684M25V1206TRF	25	0.68	3.2	1.6	1.4	0.5	1206	2,000
NSPH105M25V1206TRF	25	1.0	3.2	1.6	1.4	0.5	1206	2,000
NSPH155M25V1210TRF	25	1.5	3.2	2.5	2.0	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
NSPH475M25V1812TRF	25	4.7	4.5	3.2	1.8	0.5	1812	1,000
NSPH685M25V1812TRF	25	6.8	4.5	3.2	2.6	0.5	1812	500
NSPH106M25V2220TRF	25	10	5.7	5	1.8	0.5	2220	1,000
NSPH156M25V2220TRF	25	15	5.7	5	2.6	0.5	2220	500
NSPH474M35V1206TRF	35	0.47	3.2	1.6	1.0	0.5	1206	3,000
NSPH684M35V1206TRF	35	0.68	3.2	1.6	1.4	0.5	1206	2,000
NSPH105M35V1210TRF	35	1.0	3.2	2.5	1.4	0.5	1210	2,000
NSPH155M35V1210TRF	35	1.5	3.2	2.5	2.0	0.5	1210	2,000
NSPH225M35V1812TRF	35	2.2	4.5	3.2	1.4	0.5	1812	1,000
NSPH335M35V1812TRF	35	3.3	4.5	3.2	1.8	0.5	1812	1,000
NSPH475M35V1812TRF	35	4.7	4.5	3.2	2.6	0.5	1812	500
NSPH685M35V2220TRF	35	6.8	5.7	5	1.8	0.5	2220	1,000
NSPH106M35V2220TRF	35	10	5.7	5	2.6	0.5	2220	500
NSPH104M50V1206TRF	50	0.1	3.2	1.6	1.0	0.5	1206	3,000
NSPH154M50V1206TRF	50	0.15	3.2	1.6	1.0	0.5	1206	3,000
NSPH224M50V1206TRF	50	0.22	3.2	1.6	1.0	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	1.0	4.5	3.2	1.4	0.5	1812	1,000
NSPH155M50V1812TRF	50	1.5	4.5	3.2	1.8	0.5	1812	1,000
NSPH225M50V1812TRF	50	2.2	4.5	3.2	2.6	0.5	1812	500
NSPH335M50V2220TRF	50	3.3	5.7	5	1.8	0.5	2220	1,000
NSPH475M50V2220TRF	50	4.7	5.7	5	2.6	0.5	2220	500
NSPH103M63V1206TRF	63	0.01	3.2	1.6	1.0	0.5	1206	3,000
NSPH153M63V1206TRF	63	0.015	3.2	1.6	1.0	0.5	1206	3,000
NSPH223M63V1206TRF	63	0.022	3.2	1.6	1.0	0.5	1206	3,000
NSPH333M63V1206TRF	63	0.033	3.2	1.6	1.0	0.5	1206	3,000
NSPH473M63V1206TRF	63	0.047	3.2	1.6	1.0	0.5	1206	3,000
NSPH683M63V1206TRF	63	0.068	3.2	1.6	1.0	0.5	1206	3,000
NSPH104M63V1206TRF	63	0.1	3.2	1.6	1.0	0.5	1206	3,000
NSPH154M63V1206TRF	63	0.15	3.2	1.6	1.0	0.5	1206	3,000
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
NSPH105M63V1812TRF	63	1.0	4.5	3.2	1.8	0.5	1812	1,000
NSPH155M63V1812TRF	63	1.5	4.5	3.2	2.6	0.5	1812	500
NSPH225M63V2220TRF	63	2.2	5.7	5	1.8	0.5	2220	1,000
NSPH335M63V2220TRF	63	3.3	5.7	5	2.6	0.5	2220	500

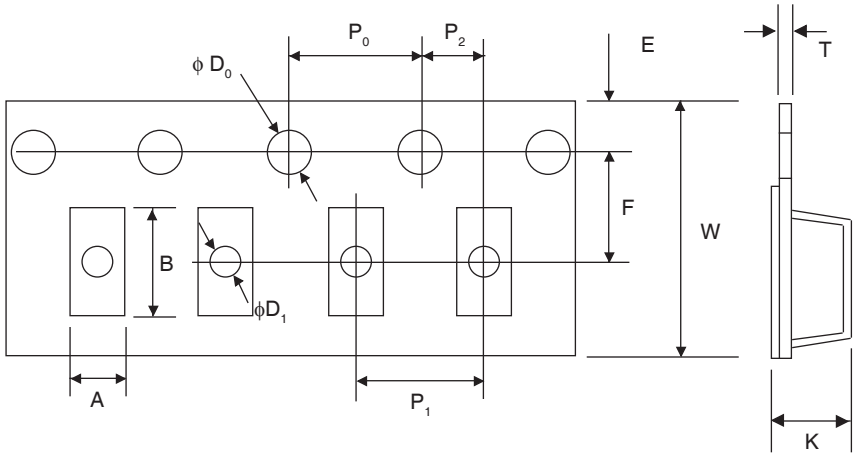
STANDARD VALUES AND CASE SIZES (mm)

Part Number	Voltage (VDC)	Capacitance (µF)	L±0.3	W±0.3	H±0.2	e±0.3	Case Size	Reel Qty 180mm
NSPH102M100V1206TRF	100	0.001	3.2	1.6	1.0	0.5	1206	3,000
NSPH152M100V1206TRF	100	0.0015	3.2	1.6	1.0	0.5	1206	3,000
NSPH222M100V1206TRF	100	0.0022	3.2	1.6	1.0	0.5	1206	3,000
NSPH332M100V1206TRF	100	0.0033	3.2	1.6	1.0	0.5	1206	3,000
NSPH472M100V1206TRF	100	0.0047	3.2	1.6	1.0	0.5	1206	3,000
NSPH682M100V1206TRF	100	0.0068	3.2	1.6	1.0	0.5	1206	3,000
NSPH103M100V1206TRF	100	0.01	3.2	1.6	1.0	0.5	1206	3,000
NSPH153M100V1206TRF	100	0.015	3.2	1.6	1.0	0.5	1206	3,000
NSPH223M100V1206TRF	100	0.022	3.2	1.6	1.0	0.5	1206	3,000
NSPH333M100V1206TRF	100	0.033	3.2	1.6	1.0	0.5	1206	3,000
NSPH473M100V1206TRF	100	0.047	3.2	1.6	1.4	0.5	1206	2,000
NSPH683M100V1210TRF	100	0.068	3.2	2.5	1.4	0.5	1210	2,000
NSPH104M100V1210TRF	100	0.1	3.2	2.5	1.8	0.5	1210	2,000



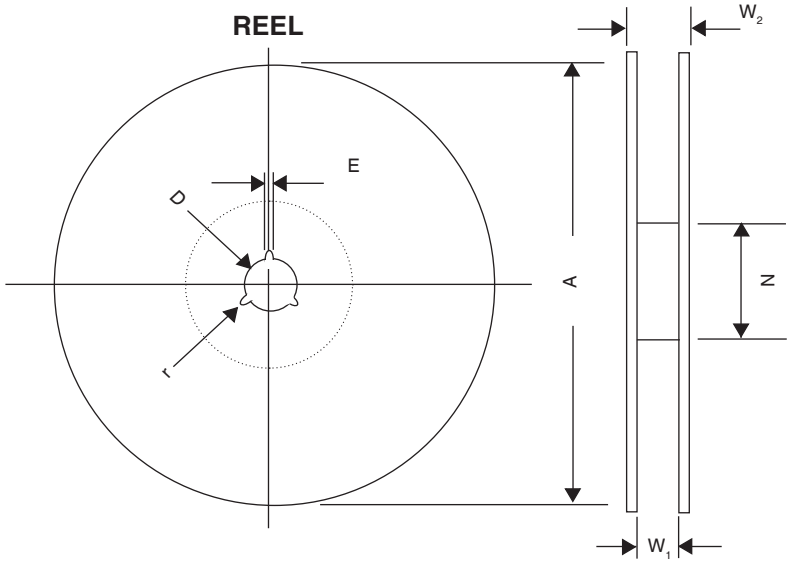
EMBOSSED PLASTIC CARRIER DIMENSIONS (mm)

Size	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	ϕD_0 ± 0.1	ϕD_1 ± 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

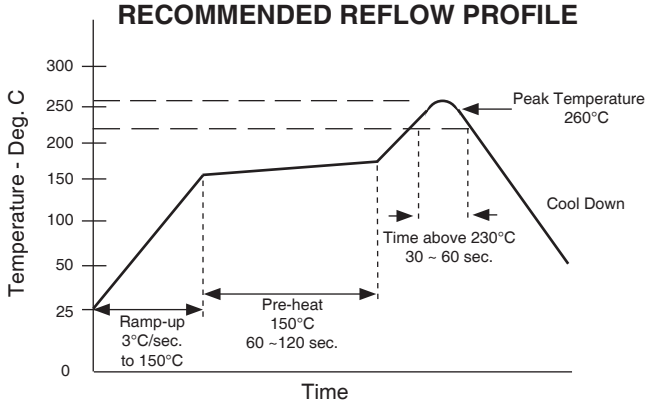


REEL DIMENSIONS (mm)

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



RECOMMENDED REFLOW PROFILE



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.

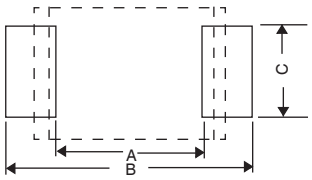
STORAGE TIME LIMIT AFTER OPENING MOISTURE BARRIER PACKAGING

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

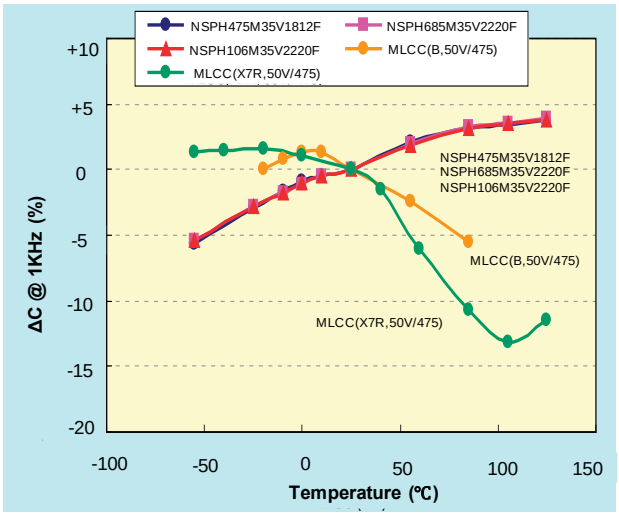
*IPC/JEDEC J-STD-020-C

LAND PATTERN DIMENSIONS (mm)

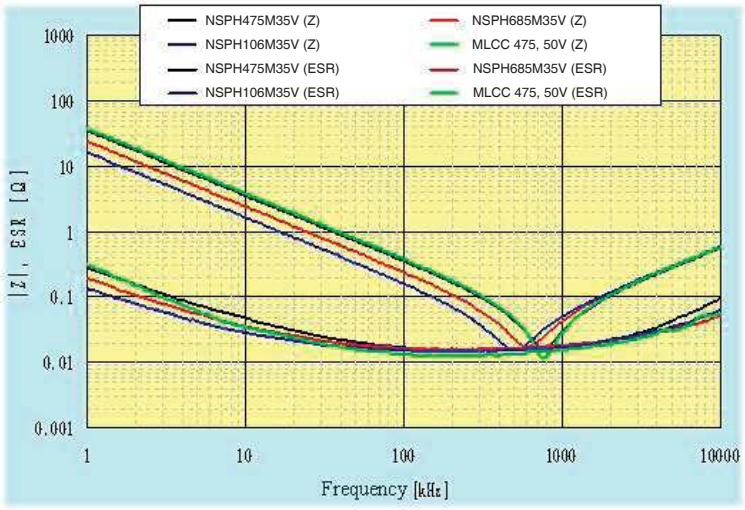
EIA Size	A ± 0.1	B ± 0.1	C ± 0.2
1206	1.8	3.6	1.4
1210	1.8	3.6	2.3
1812	2.7	5.7	3.0
2220	3.5	7.8	4.5



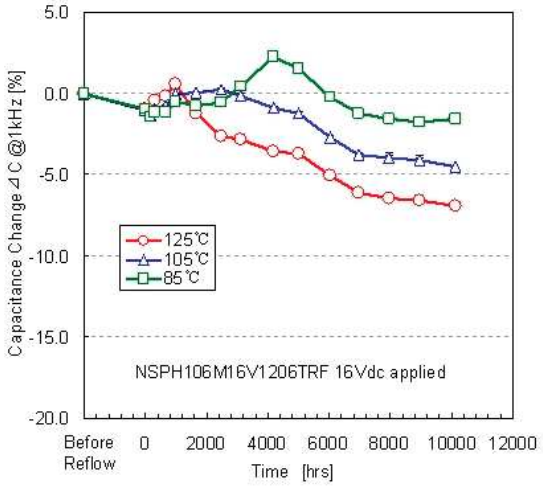
Typical Capacitance vs. Temperature (NSPH vs. MLCC)

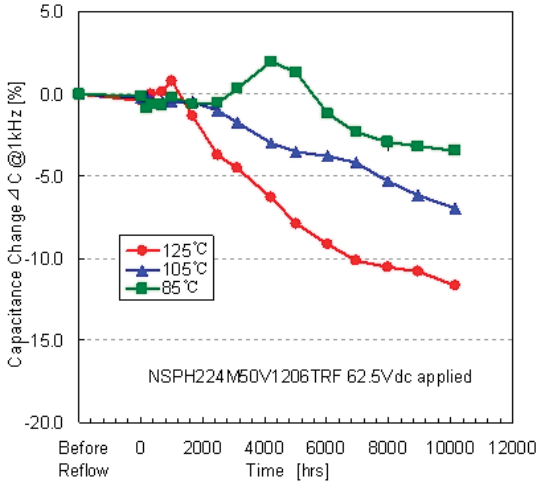


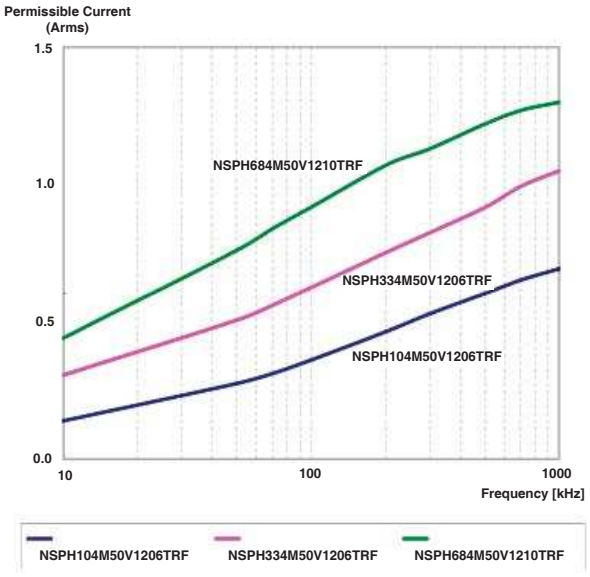
Typical ESR & Z vs. Frequency (NSPH vs. MLCC)



High Temperature Load Life Test (Typical Performance)







1. Self-heating temperature rise due to current should not exceed 10°C

2. Contact NIC top review your circuit requirements: tpmg@niccomp.com