

1. INTRODUCTION

MLCC consists of a conducting material and electrodes. To manufacture a chip-type SMT and achieve miniaturization, high density and high efficiency, ceramic condensers are used.

WTC HH series MLCC is used at high frequencies generally have a small temperature coefficient of capacitance, typical within the $\pm 30\text{ppm}/^\circ\text{C}$ required for NP0 (C0G) classification and have excellent conductivity internal electrode. Thus, WTC HH series MLCC will be with the feature of low ESR and high Q characteristics.

2. FEATURES

- High Q and low ESR performance at high frequency.
- Quality improvement of telephone calls for low power loss and better performance.

3. APPLICATIONS

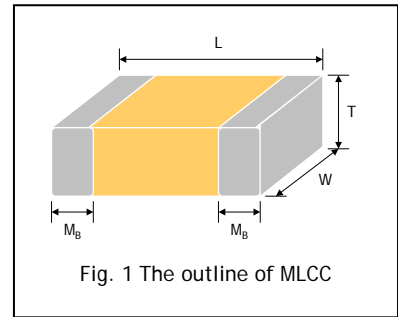
- Mobile telecommunication: Mobile phone, WLAN.
- RF module: Power amplifier, VCO.
- Tuners.

4. HOW TO ORDER

<u>HH</u>	<u>15</u>	<u>N</u>	<u>100</u>	<u>G</u>	<u>500</u>	<u>L</u>	<u>I</u>
<u>Series</u>	<u>Size</u>	<u>Dielectric</u>	<u>Capacitance</u>	<u>Tolerance</u>	<u>Rated voltage</u>	<u>Termination</u>	<u>Packaging</u>
HH=High Q/ Low ESR	15=0402 (1005) 18=0603 (1608) 21=0805 (2012)	N=NP0 (C0G)	Two significant digits followed by no. of zeros. And R is in place of decimal point. eg.: R47=0.47pF 0R5=0.5pF 1R0=1.0pF 100=10x10 ⁰ =10pF	B=±0.1pF C=±0.25pF D=±0.5pF F=±1% G=±2% J=±5%	Two significant digits followed by no. of zeros. And R is in place of decimal point. 160=16 VDC 250=25 VDC 500=50 VDC 101=100 VDC	L=Ag/Ni/Sn	T=7" reeled G= 13" reeled

5. EXTERNAL DIMENSIONS

Size Inch (mm)	L (mm)	W (mm)	T (mm)/Symbol		M _B (mm)
0402 (1005)	1.00±0.05	0.50±0.05	0.50±0.05	N	0.25 +0.05/-0.10
0603 (1608)	1.60±0.10	0.80±0.10	0.80±0.07	S	0.40±0.15
0805 (2012)	2.00±0.15	1.25±0.10	0.60±0.10	A	0.50±0.20



6. GENERAL ELECTRICAL DATA

Dielectric	NP0
Size	0402, 0603
Capacitance*	0402: 0.5pF to 470pF 0603: 0.5pF to 3300pF 0805: 0.5pF to 150pF
Capacitance tolerance	Cap≤5pF: B (±0.1pF), C (±0.25pF) 5pF<Cap<10pF: C (±0.25pF), D (±0.5pF) Cap≥10pF: F (±1%), G (±2%), J (±5%)
Rated voltage (WVDC)	16V, 25V, 50V, 100V
Q*	Cap<30pF: Q≥400+20C Cap≥30pF: Q≥1000
Insulation resistance at U_r	≥10GΩ
Operating temperature	-55 to +125°C
Capacitance change	±30ppm
ESR	Cap<2.2pF: ≤1000mΩ@900±100MHz 2.2pF≤Cap≤470pF: ≤500mΩ@900±100MHz Cap>470pF: ≤500mΩ@60±10MHz
Termination	Ni/Sn (lead-free termination)

* Measured at the conditions of 25°C ambient temperature and 30~70% related humidity.

Apply 1.0±0.2V_{rms}, 1.0MHz±10% for Cap≤1000pF and 1.0±0.2V_{rms}, 1.0kHz±10% for Cap>1000pF.

7. CAPACITANCE RANGE

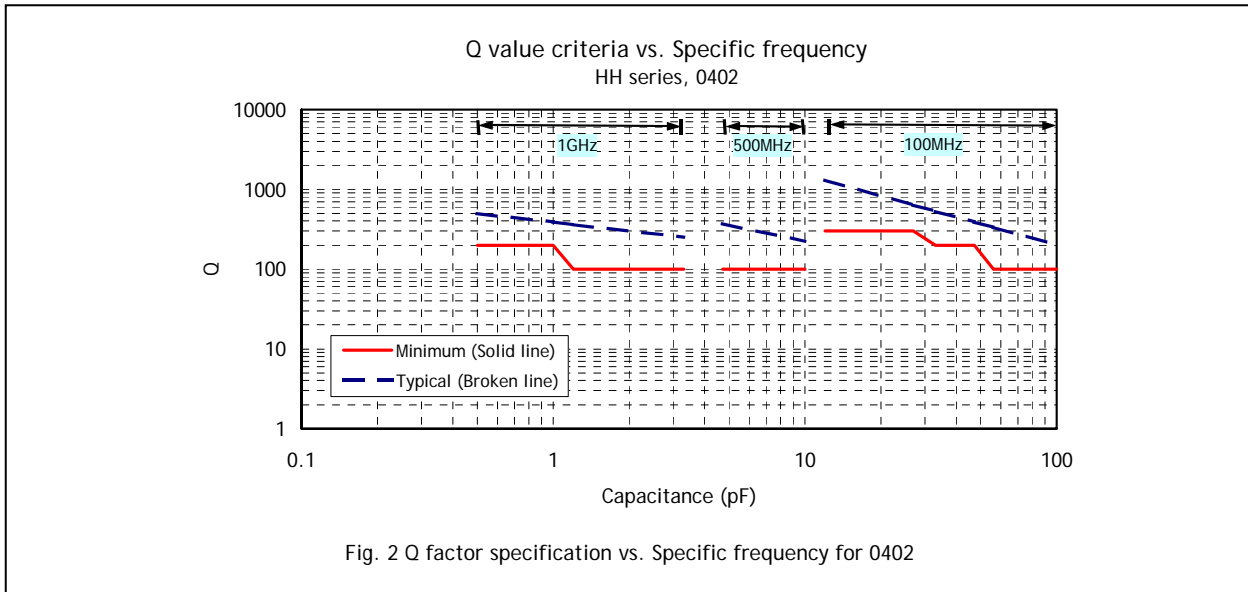
DIELECTRIC		NP0								
SIZE		0402			0603				0805	
RATED VOLTAGE		16	25	50	16	25	50	100	50	100
Capacitance	0.5pF (0R5)									
	0.6pF (0R6)									
	0.7pF (0R7)									
	0.8pF (0R8)									
	0.9pF (0R9)									
	1.0pF (1R0)									
	1.2pF (1R2)									
	1.5pF (1R5)									
	1.8pF (1R8)									
	2.2pF (2R2)									
	2.7pF (2R7)									
	3.3pF (3R3)									
	3.9pF (3R9)									
	4.7pF (4R7)									
	5.6pF (5R6)									
	6.8pF (6R8)									
	8.2pF (8R2)									
	10pF (100)									
	12pF (120)									
	15pF (150)									
	18pF (180)									
	22pF (220)									
	27pF (270)									
	33pF (330)									
	39pF (390)									
	47pF (470)									
	56pF (560)									
	68pF (680)									
	82pF (820)									
	100pF (101)									
	120pF (121)									
	150pF (151)									
	180pF (181)									
220pF (221)										
270pF (271)										
330pF (331)										
390pF (391)										
470pF (471)										
560pF (561)										
680pF (681)										
820pF (821)										
1,000pF (102)										
1,200pF (122)										
1,500pF (152)										
1,800pF (182)										
2,200pF (222)										
2,700pF (272)										
3,300pF (332)										

1. The letter in cell is expressed the symbol of product thickness.

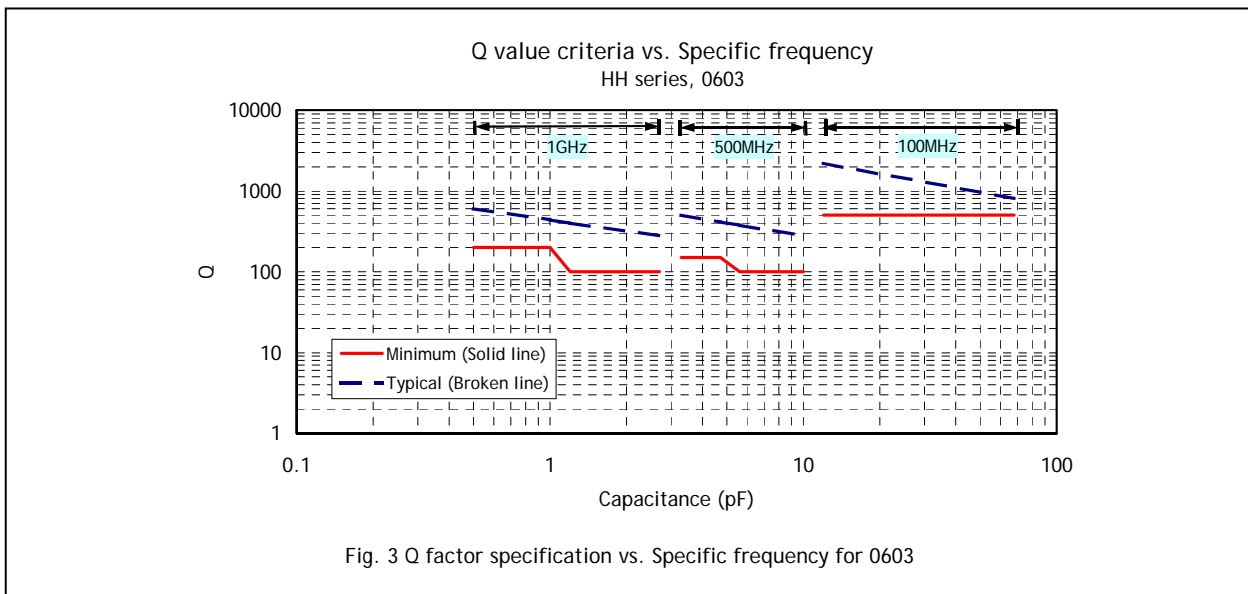
2. For more information about products with special capacitance or other data, please contact WTC local representative.

8. ELECTRICAL CHARACTERISTICS

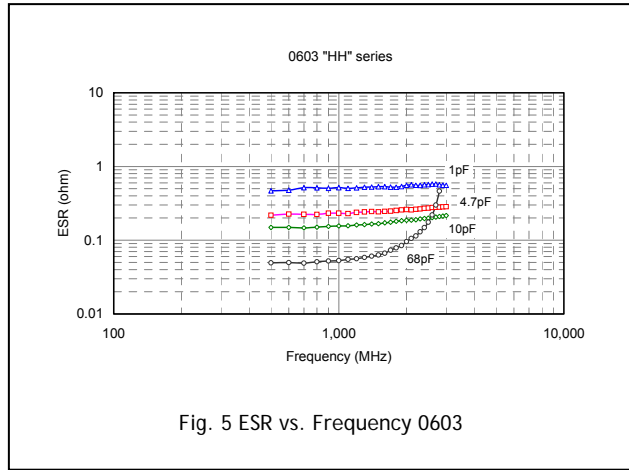
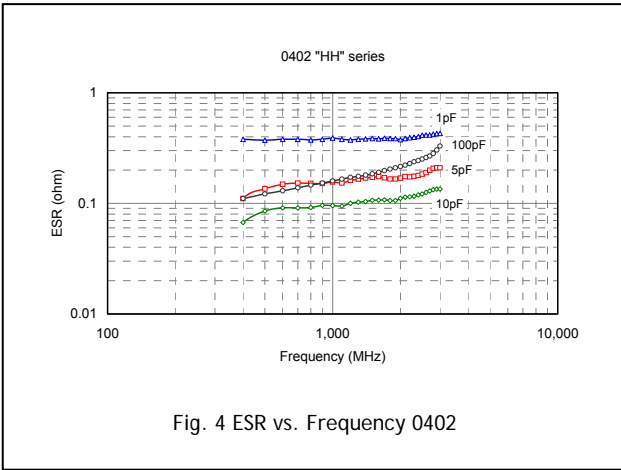
Q factor specification vs. Specific frequency



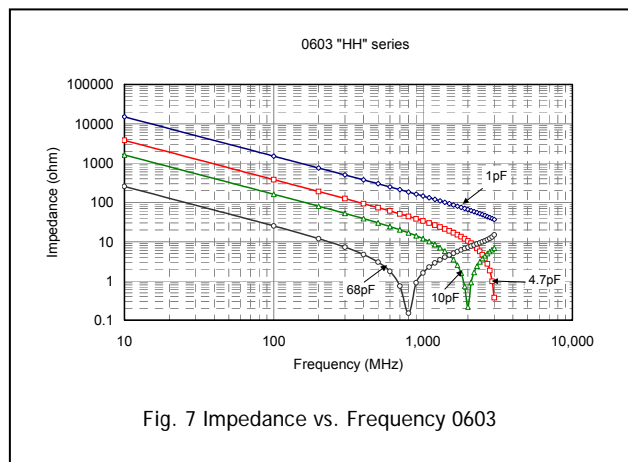
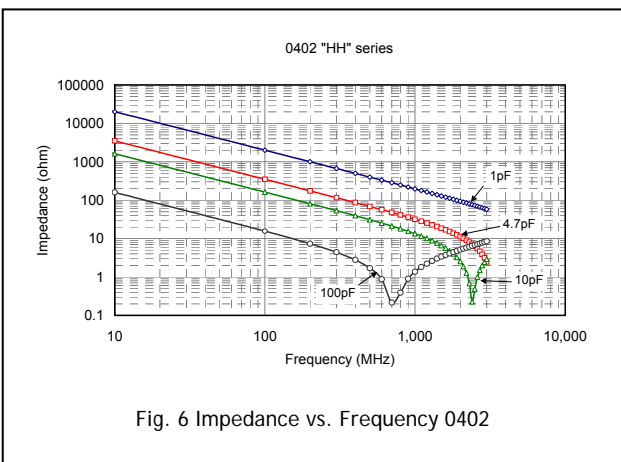
Q factor specification vs. Specific frequency



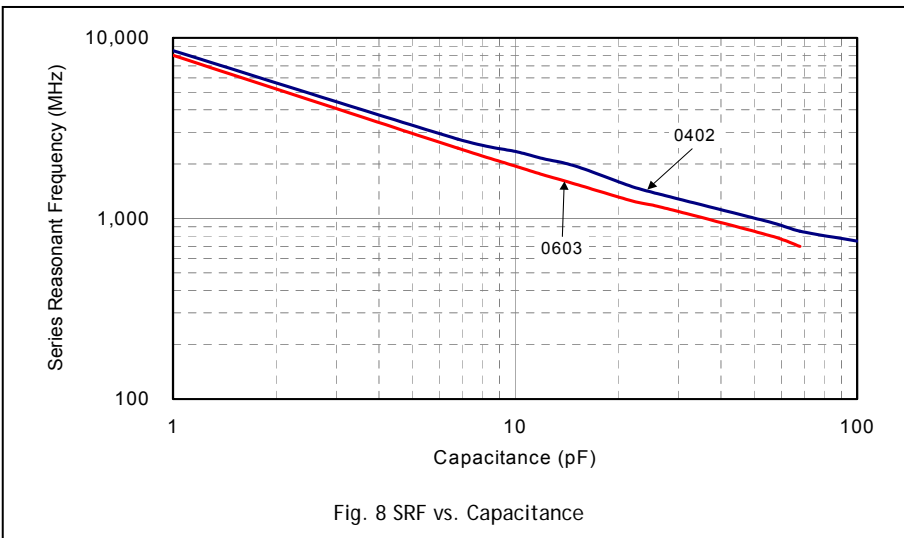
Typical ESR vs. Frequency



Typical Impedance vs. Frequency



SRF vs. Capacitance



9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS

No.	Item	Test Conditions	Requirements															
1.	Visual and Mechanical		<ul style="list-style-type: none"> * No remarkable defect. * Dimensions to conform to individual specification sheet. 															
2.	Capacitance	Cap≤1000pF, 1.0±0.2Vrms, 1MHz±10%	* Shall not exceed the limits given in the detailed spec.															
3.	Q/ D.F. (Dissipation Factor)	Cap>1000pF, 1.0±0.2Vrms, 1KHz±10% At 25°C ambient temperature.	* NP0: Cap≥30pF, Q≥1000; Cap<30pF, Q≥400+20C															
4.	Dielectric Strength	<ul style="list-style-type: none"> * To apply voltage: 250% of rated voltage. * Duration: 1 to 5 sec. * Charge and discharge current less than 50mA. 	* No evidence of damage or flash over during test.															
5.	Insulation Resistance	To apply rated voltage for max. 120 sec.	≥10GΩ															
6.	Temperature Coefficient	With no electrical load. Operating temperature: -55~125°C at 25°C	* Capacitance change: within ±30ppm/°C															
7.	Adhesive Strength of Termination	<ul style="list-style-type: none"> * Pressurizing force : 5N (≤0603) and 10N (>0603) * Test time: 10±1 sec. 	* No remarkable damage or removal of the terminations.															
8.	Vibration Resistance	<ul style="list-style-type: none"> * Vibration frequency: 10~55 Hz/min. * Total amplitude: 1.5mm * Test time: 6 hrs. (Two hrs each in three mutually perpendicular directions.) 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change and Q/D.F.: To meet initial spec. 															
9.	Solderability	<ul style="list-style-type: none"> * Solder temperature: 235±5°C * Dipping time: 2±0.5 sec. 	95% min. coverage of all metalized area.															
10.	Bending Test	<ul style="list-style-type: none"> * The middle part of substrate shall be pressurized by means of the pressurizing rod at a rate of about 1 mm per second until the deflection becomes 1 mm and then the pressure shall be maintained for 5±1 sec. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: within ±5.0% or ±0.5pF whichever is larger. (This capacitance change means the change of capacitance under specified flexure of substrate from the capacitance measured before the test.) 															
11.	Resistance to Soldering Heat	<ul style="list-style-type: none"> * Solder temperature: 270±5°C * Dipping time: 10±1 sec * Preheating: 120 to 150°C for 1 minute before immerse the capacitor in a eutectic solder. * Measurement to be made after keeping at room temp. for 24±2 hrs. (Class I) or 48±4 hrs. (Class II). 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: within ±2.5% or ±0.25pF whichever is larger. * Q/D.F., I.R. and dielectric strength: To meet initial requirements. * 25% max. leaching on each edge. 															
12.	Temperature Cycle	<ul style="list-style-type: none"> * Conduct the five cycles according to the temperatures and time. <table border="1"> <thead> <tr> <th>Step</th> <th>Temp. (°C)</th> <th>Time (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Min. operating temp. +0/-3</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room temp.</td> <td>2~3</td> </tr> <tr> <td>3</td> <td>Max. operating temp. +3/-0</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room temp.</td> <td>2~3</td> </tr> </tbody> </table> <ul style="list-style-type: none"> * Measurement to be made after keeping at room temp. for 24±2 hrs. 	Step	Temp. (°C)	Time (min.)	1	Min. operating temp. +0/-3	30±3	2	Room temp.	2~3	3	Max. operating temp. +3/-0	30±3	4	Room temp.	2~3	<ul style="list-style-type: none"> * No remarkable damage. * Cap change : within ±2.5% or ±0.25pF whichever is larger. * Q/D.F., I.R. and dielectric strength: To meet initial requirements.
Step	Temp. (°C)	Time (min.)																
1	Min. operating temp. +0/-3	30±3																
2	Room temp.	2~3																
3	Max. operating temp. +3/-0	30±3																
4	Room temp.	2~3																

9. RELIABILITY TEST CONDITIONS AND REQUIREMENTS(Cont.)

No.	Item	Test Condition	Requirements
13.	Humidity (Damp Heat) Steady State	<ul style="list-style-type: none"> * Test temp.: 40±2°C * Humidity: 90~95% RH * Test time: 500+24/-0hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: within ±5.0% or ±0.5pF whichever is larger. * Q/D.F. value: NP0: Cap≥30pF, Q≥350; 10pF≤Cap<30pF, Q≥275+2.5C Cap<10pF; Q≥200+10C * I.R.: ≥1GΩ.
14.	Humidity (Damp Heat) Load	<ul style="list-style-type: none"> * Test temp.: 40±2°C * Humidity: 90~95%RH * Test time: 500+24/-0 hrs. * To apply voltage : rated voltage * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: within ±7.5% or ±0.75pF whichever is larger. * Q/D.F. value: NP0: Cap≥30pF, Q≥200; Cap<30pF, Q≥100+10/3C * I.R.: ≥500MΩ.
15.	High Temperature Load (Endurance)	<ul style="list-style-type: none"> * Test temp.: NP0, X7R: 125±3°C * To apply voltage: 200% of rated voltage. * Test time: 1000+24/-0 hrs. * Measurement to be made after keeping at room temp. for 24±2 hrs. 	<ul style="list-style-type: none"> * No remarkable damage. * Cap change: within ±3.0% or ±0.3pF whichever is larger. * Q/D.F. value: NP0: Cap≥30pF, Q≥350 10pF≤Cap<30pF, Q≥275+2.5C Cap<10pF, Q≥200+10C * I.R.: ≥1GΩ.