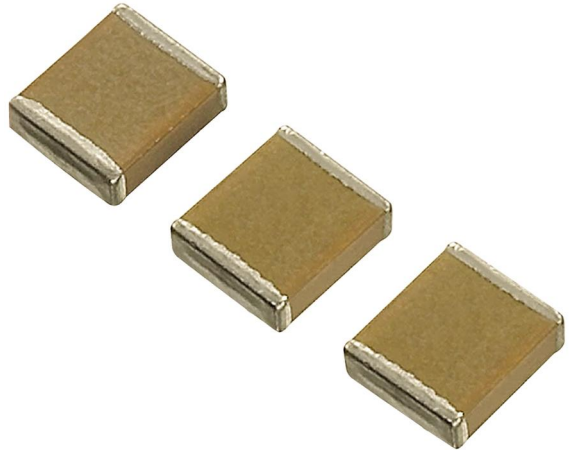


## FEATURES

- Small size
- Excellent Break down voltage, low DF
- Suit to re-flow soldering, wave soldering, hand soldering

# TS18H



## APPLICATIONS

- TS18H SMD is widely used in Analog & Digital Modems, LAN/WAN Interface, Lighting Ballast Circuits, Voltage Multipliers, DC-DC Converter, Back-lighting Inverters.

### ◆ OUTSIDE DIMENSION

Type		Dimension (mm)		
British expression	Metric expression	L (mm)	W (mm)	T max (mm)
0603	1608	1.52 ± 0.25	0.76 ± 0.25	1.01
0805	2012	2.00 ± 0.25	1.25 ± 0.25	1.45
1206	3216	3.20 ± 0.30	1.60 ± 0.30	1.90
1210	3225	3.20 ± 0.40	2.50 ± 0.30	2.80
1808	4520	4.50 ± 0.40	2.00 ± 0.25	2.80
1812	4532	4.50 ± 0.40	3.20 ± 0.40	3.10
2220	5750	5.70 ± 0.40	5.00 ± 0.40	3.00
2225	5763	5.70 ± 0.50	6.30 ± 0.50	6.20

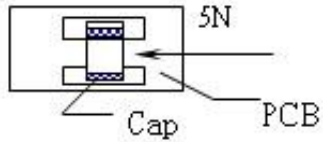
### Coefficient

Parameter	NPO Temperature Wave	X7R Temperature Wave	
Temperature Coefficient			
Dissipation Factor	DF ≤ 0.15%	DF ≤ 2.50%	
Aging	None	≤ 2.5% decade hour	
Insulation Resistance	≥ 100GΩ	≥ 500ΩF OR 50 GΩ	
Dielectric Strength	Rated Voltage	Test Voltage	Time
	Ur = 100V	2.5Ur	60 ± 5S
	200V ≤ Ur ≤ 1000V	1.5Ur	60 ± 5S
	Ur > 1000V	1.2Ur	60 ± 5S

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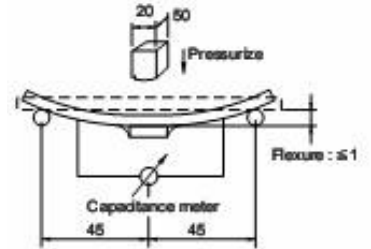
SPECIFICATIONS										
Item	Specifications				Test Method					
Operating Temperature Range	Class I	NPO: -55 ~ +125°C								
		X7R: -55 ~ +125°C								
	Class II	X5R: -55 ~ +85°C								
		Y5V: -30 ~ +85°C								
		Z5U: +10 ~ +85°C								
Tolerance	±5%, ±10% ±20%									
Appearance	No visual defects				Visual inspection					
Capacitance	Class I	Should be within the specified tolerance			Capacitance	Test Frequency	Test Voltage	Temperature		
					≤ 1000pF	1MHz±10%				
					> 1000pF	1KHz±10%	25±2°C			
	Class II	Should be within the specified tolerance			≤ 10μF	1KHz±10%		1.0±0.2Vrms		
					> 10μF	120±24Hz		0.5±0.1Vrms		
					Z5U	1.0±0.1KHz	0.5±0.05Vrms			
Dissipation Factor (D.F.)	Class I	≤ 0.15%			Test Method: The same as "Capacitance"					
	Class I	X7R	≥ 50V	25V						16V
		X5R	≤ 2.5%	≤ .35%						≤ 3.5%
	Class II	Y5V	≤ 7.0% (C < 1.0μF)	≤ 12.5%						≤ 12.5%
Z5U	≤ 9.0% (C ≥ 1.0μF)									
Insulation Resistance (I.R.)	Class I	C ≤ 10nF, Ri ≥ 50000MΩ			Rated Voltage	Tes Voltage	Duration	Charge/Discharge Current	Temperature: 25 ± 2°C Humidity: < 75%	
		C > 10nF, Ri * CR ≥ 500ΩF								
	Class II	X7R	C ≤ 25nF, Ri ≥ 10000MΩ		Ur < 500V	Ur	60 ± 5 sec	≤ 50 mA		
		X5R	C > 25nF, Ri * CR > 100ΩF							
		Y5V	C ≤ 25nF, Ri ≥ 4000MΩ		Ur < 500V	500V	60 ± 5 sec	≤ 50 mA		
Z5U	C > 25nF, Ri * CR > 100ΩF									

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S P E C I F I C A T I O N S						
Item	Specifications		Test Method			
Dielectric Withstanding Voltage (D.W.V.)	No breakdown or visual defects		Rated Voltage	Test Voltage	Duration	Charge/Discharge Current
			$U_r < 200V$	$2.5U_r$	1~5sec.	$\leq 50mA$
			$200V \leq U_r \leq 1000V$	$1.5U_r$	1~5sec.	
			$U_r > 1000V$	$1.2U_r$	1~5sec.	
Dielectric withstanding voltage testing may requires immersion of the capacitor in a isolation fluid,at test voltage over 2000Vdc.						
Capacitance Temperature Characteristic / Coefficient	Class I	NPO: $0 \pm 30ppm/^{\circ}C$	Perform a heat temperature at $150 \pm 0 / -10^{\circ}C$ for 1hrs,then place room temp. for $24 \pm 2$ hrs.			
			According to the following sequence, measure the capacitance after temperature stabilize for 30min . ( $\Delta C$ based on T3)			
	Class II		X7R: $\leq \pm 15\%$	T1	25 $\pm 2$	
			X5R: $\leq \pm 15\%$	T2	Low-category temp.	
			Y5V: $+22\% \sim -82\%$	T3	25 $\pm 2$	
			Z5U: $+22\% \sim -56\%$	T4	High-category temp.	
			T1	25 $\pm 2$		
Solderability	No defects, $\geq 90\%$ of each terminal should be covered with fresh solder		Preheating Conditions: $80 \sim 120^{\circ}C$ ; $10 \sim 30$ sec.			
			Solder Temperature : $245 \pm 5^{\circ}C$		Immersing Speed: $25 \pm 0.25mm/s$	
			Duration: $2 \pm 0.5$ sec.			
Adhesive Strength of Termination	Appearance: No visible damage.		Applied Force:5N			
			Duration: $10 \pm 1$ sec.			
			Speed:1mm/sec			

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S P E C I F I C A T I O N S					
Resistance to Flexure Stresses	Appearance	No crack or marked defects should occur.	Solder the capacitor on the test jig, using a eutectic solder. Then apply a force in the direction. Deflection: 1mm Speed: 1mm/sec		
	$\Delta C/C$	Class I : $\leq \pm 5\%$ Class II: $\leq \pm 10\%$			
Resistance to Soldering Heat	Appearance	No defects, $\geq 90\%$ of each terminal should be covered with fresh solder	Preheat the capacitor at 100 to 200°C for 10±2 minute. Immerse the capacitor in a eutectic solder at 265±5°C for 5±1 seconds. Store at room temperature for 24±2 hours before measuring electric properties.		
	$\Delta C/C$	Class I: $\leq \pm 0.5\%$ or $\pm 0.5pF$ (whichever is larger) Class II: X7R X5R: -5~+10% Y5V Z5U: -10~+20%			
	D.F.	Meets Initial Values (As Above)			
	I.R.	Meets Initial Values (As Above)			
Temperature Cycle	Appearance	No visual defect	Perform a heat temperature at 150+0/-10°C for 1hrs, then place room temp. for 24±2hrs.		
	$\Delta C/C$	Class I: $\leq \pm 1\%$ or $\pm 1pF$ (whichever is larger) Class II: X7R X5R $\leq \pm 10\%$ Z5U Y5V $\leq \pm 20\%$	Fix the capacitor to the supporting jig, Perform the five cycles according to the four heat treatments listed in the following table. Store at room temperature for 24±2 hours before measuring electric properties.		
	D.F.	Meets Initial Values (As Above)	Step	Temperature (°C)	Time (min.)
			1	Low-category temp.	30
	I.R.	Meets Initial Values (As Above)	2	25±2	3
3			High-category temp.	30	
		4	25±2	3	



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S P E C I F I C A T I O N S					
Humidity Steady State	Appearance	No visual defect	Let the capacitor sit at 40±2°C and 90 to 95% humidity for 500+24/-0 hours. Remove and let sit for 48±2 hours at room temperature before measuring electric properties.		
	ΔC/C	Class I: ≤±2% or ±1pF (whichever is larger)			
		Class II: X7R X5R ≤±10%			
		Z5U Y5V ≤±30%			
	D.F.	≤Initial Values *2 (See Above)			
I.R.	Class I: Ri ≥ 2500MΩ or Ri*CR > 25ΩF (whichever is smaller)				
	Class II: Ri ≥ 1000MΩ or Ri*CR > 25ΩF (whichever is smaller)				
Loading Life	Appearance	No visual defect	Rated Voltage	Applied Voltage	Charge/Discharge Current
	ΔC/C	Class I: ≤±2% or ±1pF (whichever is larger)	Ur < 500V	2Ur	≤ 50mA
			500V ≤ Ur ≤ 1000V	1.5Ur	
		Class II: X7R X5R ≤±20% Z5U Y5V ≤±30%	Ur > 1000V	1.2Ur	
	D.F.	≤Initial Values *2 (See Above)			
I.R.	Class I: Ri ≥ 4000MΩ or Ri*CR > 40ΩF (whichever is smaller)				
	Class II: Ri ≥ 2000MΩ or Ri*CR > 50ΩF (whichever is smaller)				

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## Precautions on the use of MLCC:

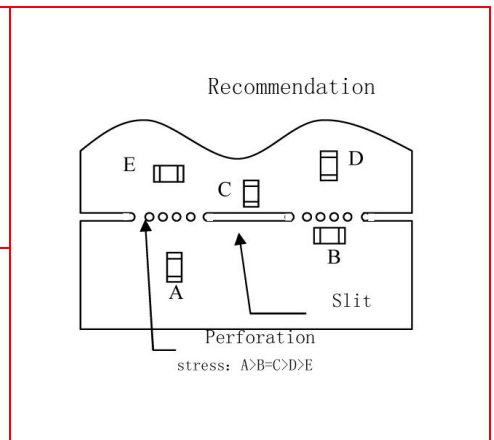
### 1. General Precautions On The Use Of MLCC:

The Multi-layer Ceramic Capacitors MLCC may fail when subjected to severe conditions of electrical environment and mechanical stress beyond the specified "rating" and specified condition in the specification. Following the precautions for safety .

### 2. PCB Design

The amount of solder applied can affect the ability of chips to withstand mechanical stresses, which may lead to breaking or cracking. Therefore, when designing land-patterns it is necessary to consider the appropriate size and configuration of the solder pads, which determines the amount of solder necessary to form the fillets.

When designing the position of solder pads and SMD capacitors, it should be carefully performed to minimize stress. SMD capacitors should be located to minimize any possible mechanical stresses from board warp or deflection.



### 3. Considerations For Automatic Placement

If the lower limit of the pick-up nozzle is low, too much force may be imposed on the capacitors, causing damage. To avoid this, the following points should be considered before lowering the pick-up nozzle:

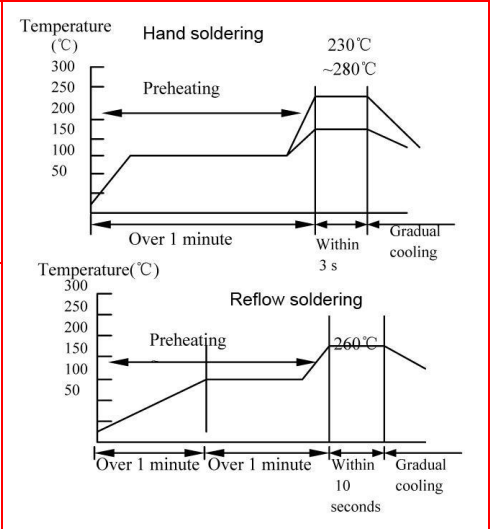
- The lower limit of the pick-up nozzle should be adjusted to the surface level of the PC board after correcting for deflection of the board.
- The pick-up pressure should be adjusted between 1 and 3 N static loads.
- To reduce the amount of deflection of the board caused by impact of the pick-up nozzle, supporting pins of back-up should be used the under PC board.

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## 4. Soldering

The ceramic section and metal section combine to the MLCC. As the poor heat conductivity of the ceramic section, ceramic chip capacitors are susceptible to thermal shock when exposed to rapid or concentrated heating or rapid cooling, especially for large s

When hand soldering, use a soldering iron with a maximum power of 25W and a maximum tip diameter of 1.0mm. The soldering iron should not touch the capacitor directly .



## 5. Cleaning

The temperature difference between the components and cleaning process should not be greater than 100°C. In the case of ultrasonic cleaning, too much power output can cause excessive vibration of the PC board which may lead to the cracking of the capacitor or the soldered portion, or decrease the terminal electrodes' strength, thus the following condition

- Ultrasonic output : Below 20W/L
- Ultrasonic frequency: Below 40KHZ
- Ultrasonic washing period: 5min or less

## 6. Breakaway PC Boards

When splitting the PC board after mounting capacitors and other components, care is required so as not to give any stresses of twisting to board. 1. Be careful not to subject the capacitors to excessive mechanical shocks.

Board separation should not be done manually, but by using the appropriate devices.

## 7. Storage Conditions

To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, recommended conditions as the following:

- Temperature: 5-40°C; Humidity: 20-70% RH

Even though MLCC are stored in a good condition, the solderability of MLCC terminal electrodes will decrease as time goes by, so components should be used within 6 months from the time of delivery.

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## Capacitance & Voltage

Size	Rated Voltage	Capacitance Range (pF)		Size	Rated Voltage	Capacitance Range (pF)		
		NPO	X7R			NPO	X7R	
0603	100V	1 ~ 470	100~22 000	1812	100V	3.3~8 200	220~470 000	
	200V	1~330	100~8 200		200V	3.3~6 800	220~180 000	
0805	100V	1~1 000	100~56 000		500V	3.3~4 700	220~150 000	
	200V	1~820	100~27 000		1000V	3.3~1 200	220~27 000	
	500V	1~560	100~12 000		2000V	3.3~390	220~12 000	
1206	100V	1.5~3 300	100~220 000		3000V	3.3~270	220~5 600	
	200V	1.5~2 200	100~120 000		4000V	3.3~220	220~1 500	
	500V	1.5~1 000	100~56 000		2225	100V	10~12 000	470~1000 000
	1000V	1.5~680	100~12 000			200V	10~8 200	470~1000 000
	1000V	1.5~10	100~5 600			500V	10~5 600	470~470 000
1210	100V	2~5 600	150~330 000	1000V		10~2 700	470~68 000	
	200V	2~3 900	150~150 000	2000V		10~1 000	470~33 000	
	500V	2~2 200	150~100 000	3000V	10~680	470~4 700		
	1000V	2~820	150~15 000	4000V	10~560	470~3 900		
	2000V	2~470	150~8 200	3035	100V	10~56 000	470~2200 000	
1808	100V	2~3 900	150~390 000		200V	10~47 000	470~2200 000	
	200V	2~3 000	150~180 000		500V	10~12 000	470~1000 000	
	500V	2~1 800	150~120 000		1000V	10~10 000	470~390 000	
	1000V	2~820	150~22 000		2000V	10~5 600	470~270 000	
	3000V	2~150	150~2 700		3000V	10~3 900	470~8 200	
	4000V	2~100	150~1 000		4000V	10~560	470~3 000	

Note: Specification are subject to change without notice. For more detail and update, please visit our website.