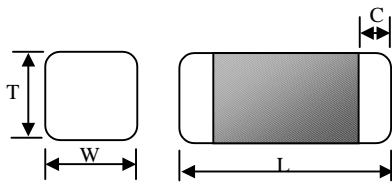


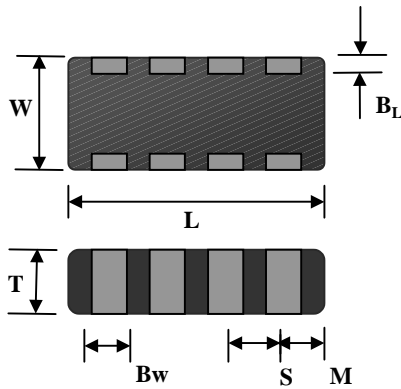
## Multilayer Chip Varistors

### ■ Shape & Dimensions (1 element chip)



Size Code	L	W	T max	C min
1005 ( 0402 )	$1.0\pm 0.05$	$0.5\pm 0.05$	0.55	0.1
1608 ( 0603 )	$1.6\pm 0.15$	$0.8\pm 0.15$	0.9	0.2
2012 ( 0805 )	$2.0\pm 0.20$	$1.25\pm 0.20$	1.3	0.2
3216 ( 1206 )	$3.2\pm 0.25$	$1.60\pm 0.20$	1.4	0.2
3225 ( 1210 )	$3.2\pm 0.25$	$2.50\pm 0.25$	1.7	0.2

### Shape & Dimensions (4 element chip)

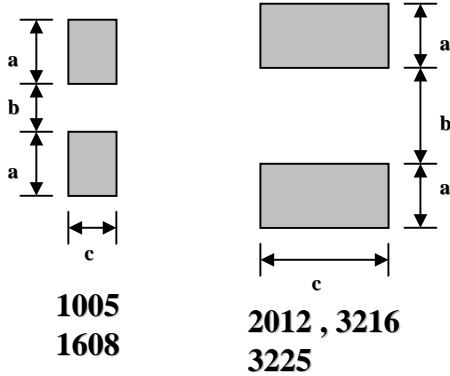


TYPE	MP2N1220	MP4N1632
<b>L</b>	$2.0\pm 0.20$	$3.2\pm 0.2$
<b>W</b>	$1.25\pm 0.20$	$1.60\pm 0.20$
<b>T</b>	$0.8\pm 0.1$	1.2 max
<b>S</b>	$0.76\pm 0.1$	$0.80\pm 0.1$
<b>M</b>	$0.62\pm 0.1$	$0.40\pm 0.1$
<b>BL</b>	$0.4\pm 0.15$	$0.4\pm 0.15$
<b>BW</b>	0.10~0.18	0.20~0.45

# Multi Layer Chip Varistors

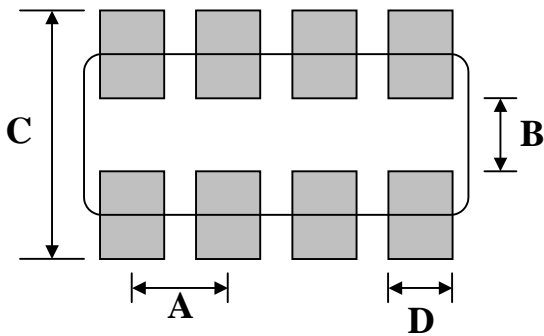
## Land Pattern Design

### General Chip Pattern



SIZE	a	b	c
1005	0.7	0.5	0.5
1608	1.0	0.8	0.8
2012	1.0	1.0	1.2
3216	1.1	2.2	1.6
3225	1.1	2.2	2.5

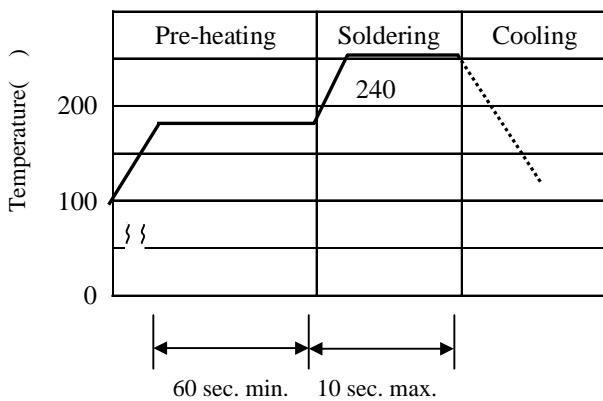
### Array Pattern



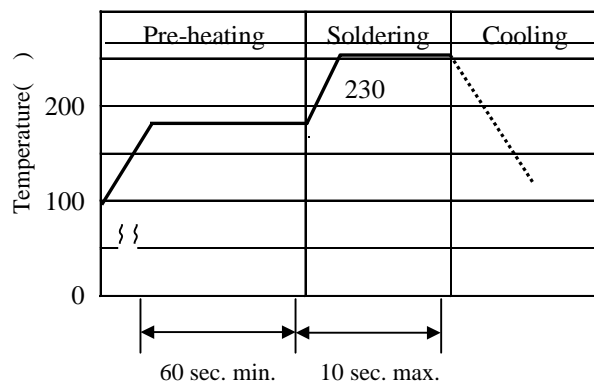
SIZE	MP2N1220	MP4N1632
A	1.2	0.8
B	0.6	0.8
C	2.6	3.0
D	0.4	0.4

## Soldering profile

### Flow Soldering



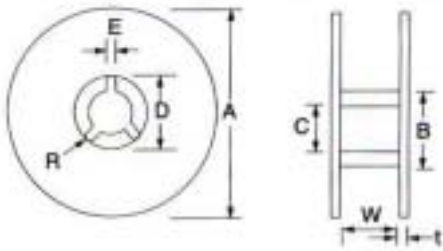
### Reflow Soldering



## Multi Layer Chip Varistors

### ■ Packing ( Reel , Emboss Packing )

#### Reel Dimension

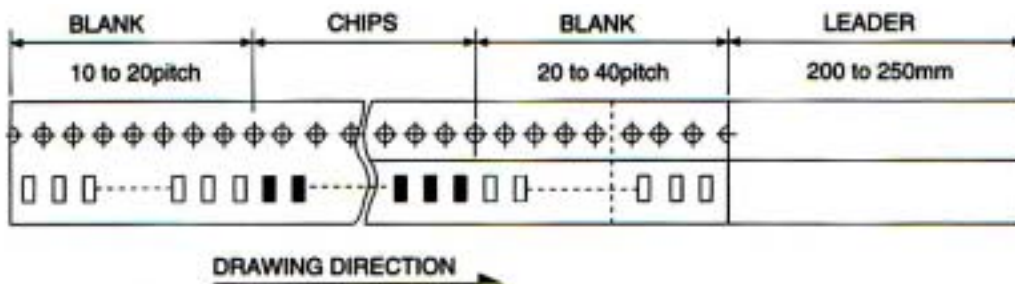


#### Number of packages

Type	Quantity (pcs/Reel)
1005 (0402)	10,000
1608 (0603)	4,000
2012 (0805)	4,000
3216 (1206)	3,000
3225 (1210)	3,000

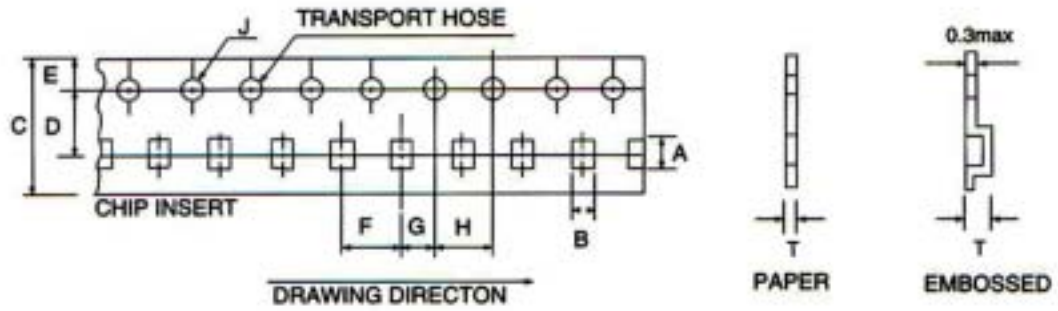
A	B	C	D	E	W	R	t
178±2	50min	13±0.5	21.0±0.8	2.0±0.5	10.0±0.5	1.0	2.0±0.5

#### Leader and blank portion



## Multi Layer Chip Varistors

### ■ Taping dimension



TYPE	EIA CODE	A	B	C	D	E	
1005	0402	1.15±0.1	0.65±0.1	8.0±0.3	3.5±0.05	1.75±0.1	
1608	0603	2.0±0.2	1.20±0.2				
2012	0805	2.4±0.2	1.65±0.2				
3216	1206	3.6±0.2	2.00±0.2				
3225	1210	3.6±0.2	2.90±0.2				
TYPE	EIA CODE	F	G	H	J	T ( max )	
						Paper	Emboss
1005	0402	2.0±0.05	1.0±0.05	2.0±0.05	1.5 +0.1/-0	0.8	-
1608	0603	4.0±0.1	2.0±0.05	4.0±0.1		1.1	-
2012	0805					1.1	2.0
3216	1206					1.1	2.0
3225	1210					-	2.0

# MULTILAYER CHIP VARISTORS

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## ■ Terminology

Working Voltage

$V_w(\text{dc})$  - Maximum Continuous DC Voltage with which the waveform is flat. When a ripple voltage is supplied as from a rectifier source, make sure that the peak voltage is kept under the  $V_{\text{dcm}}$ .

$V_w(\text{ac})$  - Maximum Continuous AC Voltage from a sine-wave shape. When the distortion in the waveform is extensive, make sure that the peak voltage is less than 2 times the  $V_w(\text{AC})$

Varistor Voltage (  $V_b$  (@1mA) , Breakdown Voltage )

The varistor terminal voltage which measured with supplying 1mA DC current.

Maximum Transient Clamping Voltage (  $V_c$  )

The peak terminal voltage which measured with an 8/20 $\mu\text{s}$  impulse of a given peak current

Transient Energy Rating	Specified Peak Current & Waveform
0.05J	1A 8/20 $\mu\text{s}$
0.1 J	2A 8/20 $\mu\text{s}$
0.2 ~ 0.3 J	5A 8/20 $\mu\text{s}$
0.4 J	10A 8/20 $\mu\text{s}$

Maximum Transient Peak Current (  $I_p$  )

Maximum single peak current which is based on 8/20 $\mu\text{s}$  current wave shape , without the device failure

Maximum Transient Energy (  $E_t$  )

Maximum allowable transient energy for a single impulse of 10/1000 $\mu\text{s}$  current without device failure

Capacitance

The Capacitance measured at a specified frequency 1MHz and zero voltage bias with 0.5  $V_{\text{rms}}$

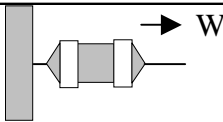
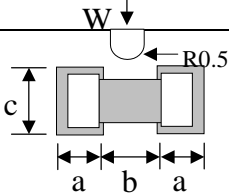
## MULTILAYER CHIP VARISTORS

### ■ Reliability and Test conditions

Item	Requirements	Test Condition
Operating Temp. Range	- 55 ~ + 125	-
Storage Temp	40 max , 70% RH max	At packing condition
Solderability	More than 90% of the terminal electrode shall be covered with new solder $\Delta V/V1mA \pm 10\%$	Preheat temperature : 120 ~ 150 Solder : 60 Sn / 40 Pb Preheat time : 60 sec. Solder temperature : 230 $\pm$ 5 Soldering time : 3 $\pm$ 1 Sec.
Resistance to Soldering Heat	No visible damage such as cracks $\Delta V/V1mA \pm 10\%$	Preheat : 120 ~ 150 1min Solder temperature : 260 $\pm$ 5 Immersion time : 10 $\pm$ 1 sec. Take it out and set if for 1~2hours then measure.
Vibration	No visible damage	Frequency : 10 ~ 55 Hz Length : 1.5 mm Direction : X, Y, Z Sweep time : 2 hours for each axis
Humidity Resistance	No visible damage $\Delta V/V1mA \pm 10\%$	Temperature : 40 $\pm$ 2 Humidity : 90 ~ 95 % RH Time : 500 $\pm$ 12 hours Measurement at room temperature after placing for 24 hours
Humidity Load Resistance	No visible damage $\Delta V/V1mA \pm 10\%$	Temperature : 40 $\pm$ 2 Humidity : 90 ~ 95 % RH Applied voltage : rated Vdc Time : 500 $\pm$ 12 hours Measurement at room ambient Temperature after placing for 24 hours
High Temperature Load Resistance	No visible damage $\Delta V/V1mA \pm 10\%$	Temperature : 125 $\pm$ 5 Applied voltage : rated Voltage Time : 1000 +72/-24 hours Measurement at room ambient Temperature after placing for 24 hours

## MULTILAYER CHIP VARISTORS

### ■ Reliability and Test conditions

Item	Requirements	Test Condition				
Temperature cycle	No visible damage $\Delta V/V1mA \pm 10\%$	1. $-40 \pm 3$ for 30 minutes 2. $85 \pm 3$ for 30 minutes 3. repeat 100 cycle				
Terminal Strength	The terminal electrode shall be neither break off nor the chip damage					
	Chip size	1005	1608	2012		3216
	W [kgf]	-	1.0	2.0		2.5
Lateral Push Strength	No mechanical damage					
	Chip size	1005	1608	2012		3216
	a [mm]	-	1.0	1.0		1.3
	b [mm]	-	0.8	1.0		1.5
	c [mm]	-	1.3	1.3		3.0
	W [kgf]	-	2.0	4.0		5.0
Bending Strength	No visible damage $\Delta V/V1mA \pm 10\%$	According to JIS C 6485 Distance : 1mm Speed : 30 mm/min				
Maximum Peak Current $I_p$ (A)	No visible damage $\Delta V/V1mA \pm 10\%$	8/20 $\mu s$ waveform impulse of +/- each polarity Measurement at room temperature after placing for 24 hours				
Max Transient Energy Et (J)	No visible damage $\Delta V/V1mA \pm 10\%$	On standard circumstance Impulse the 10/1000 $\mu s$ specified current wave 1 times Measurement at room temperature after placing for 24 hours				
ESD Test	No visible damage $\Delta V/V1mA \pm 10\%$	ESD Test IEC 61000-4-2 Contact discharge 8kV +/- Polarity 10000 times 10 sec interval ESD Life 15kV Air discharge 10 times, 10 sec interval Measurement at room temperature after placing for 24 hours				

## MULTILAYER CHIP VARISTORS

### ■ How to order (VSN, VSL, VSH Series)

**VSN 1608 A 05 T R**

#### Series Name

Code	Product Name
VSN	Chip Varistor SMD Type
VSL	SMD Low Capacitance Type
VSH	SMD High Surge current Type

#### Size Code

The first two digits : length(mm)

The last two digits : width (mm)

#### Energy Rating Code

Code	Energy rating		
A	0.1 J	H	1.2 J
B	0.2 J	J	1.5 J
C	0.3 J	K	2.0 J
D	0.4 J	P	3.0 J
E	0.6 J	U	0.01 J
F	0.7 J	V	0.02 J
G	0.9 J	X	0.05 J

#### Maximum allowable working voltage

Code	Working voltage
03	3.5 Vdc
05	5.6 Vdc
09	9.0 Vdc
	Two digits are real value

#### Termination Code

T : Ag / Pd / Pt, Ag/Pt

P : Ag / Pd

N : Nickel barrier

#### Packaging Code

Code	Packaging
B	Bulk Pack
R	Tape & Reel Pack
E	Embossed Tape Pack

### ■ How to order (VHS Series)

**V 1005 HS 03**

#### Series Name

Code	Product Name
VHS	High Speed Type

#### Size Code

The first two digits : length(mm)

The last two digits : width (mm)

#### Capacitance Code

Code	Capacitance
03	3pF
12	12pF



## CHIP VARISTORS ARRAYS

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### How to order (Array Type)

**MP 4 N 1632 A 05 T R**

#### Series Name

**Multi-Line Protection  
Chip Varistor Array**

#### Array Type

4 : 4 Arrays

2 : 2 Arrays

#### Style

N: Normal construction

L: Low capacitance type

#### Size Code

The first two digits : width(mm)

The last two digits : length(mm)

#### Energy Rating Code

A: 0.1 Joules

X: 0.05 Joules

#### Wording voltage code

Code	Working voltage
<b>05</b>	5.6 Vdc
<b>09</b>	9.0 Vdc
<b>14</b>	14 Vdc
	Two digits are real value

#### Termination Type

T : Ag/Pd/Pt, Ag/Pt

P : Ag/Pd

N : Nickel barrier

#### Packing Code

Code	Packaging
<b>B</b>	Bulk Pack
<b>R</b>	Tape & Reel Pack
<b>E</b>	Embossed Tape Pack