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## Terms and Descriptions

; / Working DC Voltage (  $V_{W(DC)}$  )

This is the maximum continuous DC voltage which may be applied up to the maximum operating temperature of the device. The rated DC operating voltage (working voltage) is also used as the reference point for leakage current.

This voltage is always less than the breakdown voltage of the device.

; / Working AC Voltage (  $V_{W(DC)}$  )

This is the maximum continuous sinusoidal RMS voltage which may be applied at any temperature up to the maximum operating temperature of the device.

; / Maximum Surge Current (  $I_S$  )

This is the maximum Peak current which may be applied for an 8/20 $\mu$ s impulse, with rated line voltage also applied, without causing device failure. The pulse can be applied to the device in either polarity with the same confidence factor.

; / Maximum Surge Energy (  $W_S$  )

This is the maximum rated transient energy which may be dissipated for a single current pulse at a specified impulse duration (10/100 $\mu$ s) with the rated DC or RMS voltage applied, without causing device failure.

; / Leakage (  $I_L$  ) at Rated DC Voltage

In the nonconduction mode, the device is at a very high impedance (approaching  $10^9 \Omega$ ) and appears as an almost open circuit in the system. The leakage current drawn at this level is very low (<50 $\mu$ A, at ambient temperature).

; / Varistor Voltage (  $V_{B(DC)}$  )

This is the voltage at which the device changes from the off-state to the on-state and enters its conduction mode of operation. The voltage is usually characterized at the 1 $\mu$ A point and has a specified minimum and maximum voltage listed.

; / Clamping Voltage (  $V_C$  )

This is the peak voltage appearing across the suppressor when measured at conditions of specified pulse current and specified waveform (8/20 $\mu$ s). It is important to note the peak current and peak voltage may not necessarily be coincidental in time.

; / Capacitance (  $C$  )

This is the capacitance of the device at a specified frequency (1 $\mu$ s) and bias. (1Vp.p).

# CHIP SURGE ABSORBERS

## Features

1. Fast response time.
2. Low capacitance.
3. Excellent Solderability.
4. SMD type Chip Surge Absorbers provide highly reliable surface mount application

## Applications

1. Protection from ESD.
2. Car audio, Antenna.

## Ordering Information

$\frac{SA}{(1)}$  -  $\frac{D}{(2)}$   $\frac{2012}{(3)}$  -  $\frac{101}{(4)}$   $\frac{01}{(5)}$   $\frac{J}{(6)}$   $\frac{T}{(7)}$

(1) Series  
IEC-1000-4-2, ESD( 1/30ns, HBM ) protection

(2) Material & Design  
B, D

(3) Diminsions  
The first two digits : length(mm)  
The last two digits : width(mm)

(4) Maximum continuous working voltage

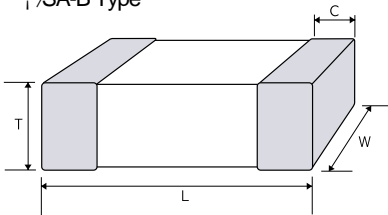
(5) Capacitance  
01 : Max. 1pF  
03: Max. 3pF  
12 : Max. 12pF

(6) Termination  
J : Nickel barrier

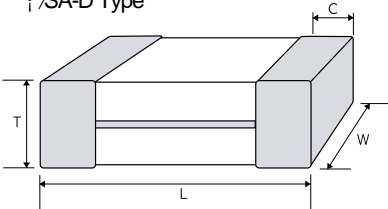
(7) Packing  
B : Bulk Pack  
T : Tape & Reel ( " 178mm [ .7 inches ] )  
L : Tape & Reel ( " 254mm [ 10 inches ] )

## Shape and Dimensions

i /SA-B Type



i /SA-D Type

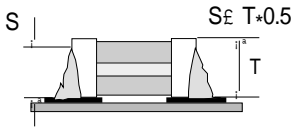
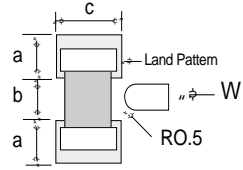
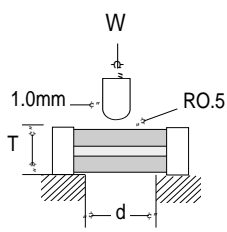


unit : mm[inches]

Type	L	W	T(max.)	C(max.)
SA- 1608-	1.6 ± 0.15 [.063 ± .006]	0.8 ± 0.15 [.031 ± .006]	0.95 [.037]	0.5 [.020]
SA- 2012-	2.0 ± 0.2 [.079 ± .008]	1.25 ± 0.2 [.049 ± .008]	1.2 [.047]	0.6 [.024]
SA- 3216-	3.2 ± 0.2 [.126 ± .008]	1.6 ± 0.2 [.063 ± .008]	1.4 [.055]	0.7 [.028]

# RELIABILITY AND TEST CONDITIONS

## CHIP SURGE ABSORBERS

ITEM	REQUIREMENTS					TEST CONDITION		
	1005	1608	2012	3216	-			
Operating temp. range	-55 ; ~+125 ;					—		
Storage temp. & humidity range	40 ; max. , 70% RH max.					at packing condition		
Resistance to solder heat	1. No damage such as cracks should be caused in chip element. 2. More than 75% of the terminal electrode shall be covered with new solder.					Preheat temperature : 100 to 150 ; Preheat time : 1min. Solder temperature : 260 ; 10 ; Dipping time : 10 ; 0.5sec.		
Solderability	1. More than 90% of the terminal electrode shall be covered with new solder.					Preheat temperature : 100 to 150 ; Preheat time : 1min. Solder temperature : 230 ; 10 ; Dipping time : 3 ; 1sec.		
Reflow soldering	1. More than 50% of the terminal electrode shall be covered with new solder. 2. Varistor voltage change : ; within 10%					Preheat temperature : 150 ; Preheat time : 1min. Solder temperature : 230 ; Soldering time: 10 sec. max. (Reflow soldering profile)		
Tensile strength (Terminal strength)	1. No mechanical damage							
	W	-	0.7	1.2	2.0		-	unit:Kgf (W)
Adhesion of terminal electrode (Flexure strength)	1. No mechanical damage							
	a	-	1.0	1.0	1.3		-	unit: mm (a,b,c) , Kgf (W)
	b	-	0.8	1.0	1.5		-	
	c	-	1.3	1.3	3.0		-	
	W	-	1.0	2.0	2.4		-	
Body strength (Bending strength)	1. The body shall not be damaged by forces applied on the right.							
	d	-	1.3	1.3	2.0		-	unit: mm (d) , Kgf (W)
	W	-	1.0	2.0	3.0		-	

## CHIP SURGE ABSORBERS

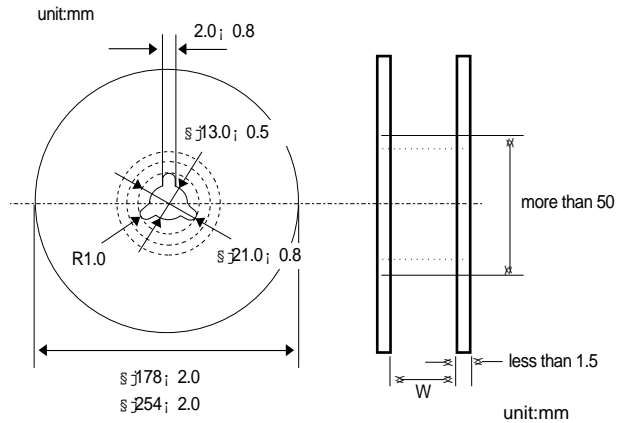
ITEM	REQUIREMENTS					TEST CONDITION
	1005	1608	2012	3216	-	
Drop	1. No mechanical damage					Drop 10 times on a concrete floor from a height of 91cm.
Vibration	1. No mechanical damage					Frequency : 10~55~10Hz Amplitude : 1.52 mm Direction and time : X,Y,Z directions for 2 hours
Thermal shock (Temperature cycle)	1. No mechanical damage 2. Varistor voltage change : ; within 10%					Step1. -40 ; 3; 30 ; 3min. Step2. 85 ; 3; 30 ; 3min. Number of cycle : 100 times
Heat load resistance	1. No mechanical damage 2. Varistor voltage change : ; within 10%					Temperature : 85 ; 2; Applied Voltage : DC Bias Voltage 1,000 hours Measured at room ambient temperature after placing for 24 hours
Low temp. resistance	1. No mechanical damage 2. Varistor voltage change : ; within 10%					Temperature : -40 ; 5; Time : 1,000 hours Measured at room ambient temperature after placing for 24 hours
Humidity resistance	1. No mechanical damage 2. Varistor voltage change : ; within 10%					Temperature : 40 ; 2; Humidity : 90~95% RH Time : 500 hours Measured at room ambient temperature after placing for 24 hours
Humidity load resistance	1. No mechanical damage 2. Varistor voltage change : ; within 10%					Temperature : 40 ; 2; Humidity : 90~95% RH Applied Voltage : Bias Voltage Time : 500 hours Measured at room ambient temperature after placing for 24 hours

# PACKING

## STANDARD QUANTITY

Type	QTY(PCS)	REMARKS
0603	15,000	
	10,000	
1005	50,000	BULK CASSETTE
	10,000	
1608	4,000	4mm pitch
	8,000	
2012	3,000	
	7,000	254mm
3216	3,000	
	7,000	254mm
4516	3,000	
4532	1,500	
5750	1,000	

## REEL DIMENSION

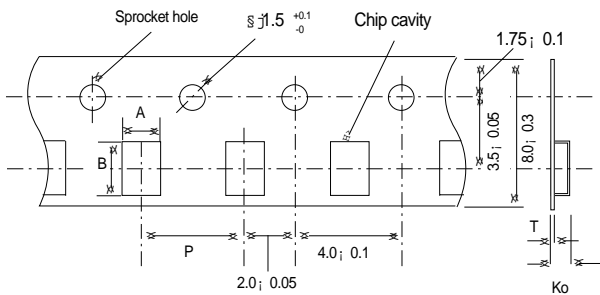


Type	W[mm]
0603, 1005, 1608, 2012, 3216 Array	$9.0 \pm 0.3$
4516, 4532, 5750	$13.0 \pm 0.3$

## TAPING DIMENSION / 8mm wide

### Embossing Tape

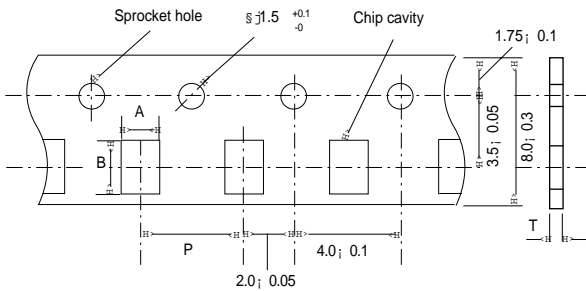
unit:mm



PRODUCT	Type	A <sub>i</sub> 0.1	B <sub>i</sub> 0.1	P <sub>i</sub> 0.1	Ko <sub>i</sub> 0.1	T(max.)
CHIP BEADS	1608	1.00	1.80	4.0	0.95	0.3
CHIP BEADS ARRAY						
CHIP FERRITE INDUCTOR	2012	1.45	2.25	4.0	0.08	0.3
CHIP EMI SUPPRESSION FILTER					1.00	
CHIP EMI FILTER ARRAY	2012	1.90	2.25	4.0	1.35	0.3
CHIP LC FILTER						
CHIP COMMON MODE FILTER	3216	1.90	3.60	4.0	1.00	0.3
CHIP FEEDTHRU						
CHIP VARISTOR	3216	1.90	3.60	4.0	1.35	0.3
CHIP VARISTOR ARRAY						
CHIP SURGE ABSORBER						

; Paper Tape

unit:mm

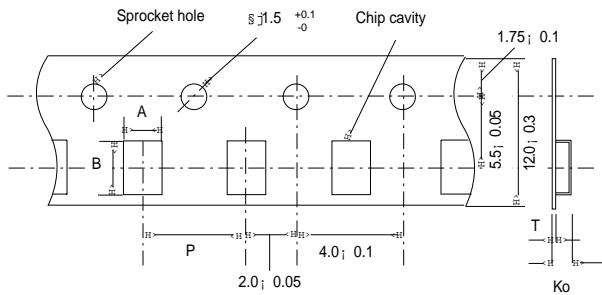


PRODUCT	Type	A <sub>i</sub> 0.1	B <sub>i</sub> 0.1	P <sub>i</sub> 0.1	T(max.)
MICRO INDUCTOR CHIP BEADS CHIP INDUCTOR CHIP VARISTOR CHIP SURGE ARRAY	0603	0.37 ± 0.02	0.67 ± 0.02	4.0 ± 0.1	0.45
	1005	0.65 ± 0.1	1.15 ± 0.1	2.0 ± 0.1	0.8
	1608	1.00 ± 0.1	1.8 ± 0.1	2.0 ± 0.1	1.1

TAPING DIMENSION / 12mm wide

; Embossing Tape

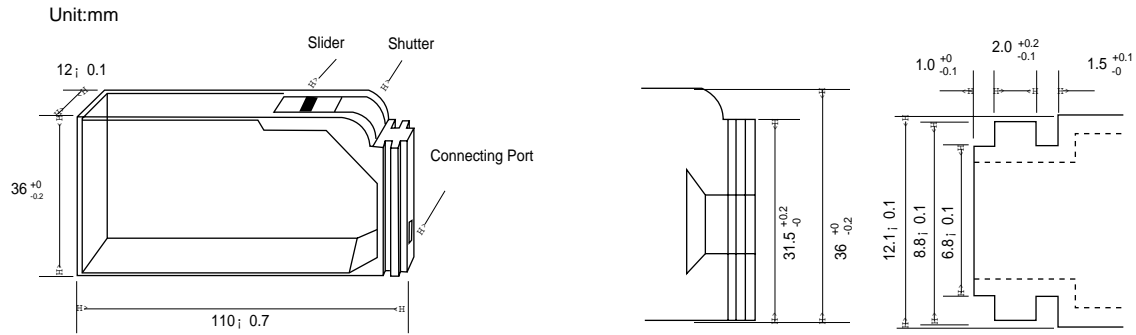
unit:mm



unit ; mm

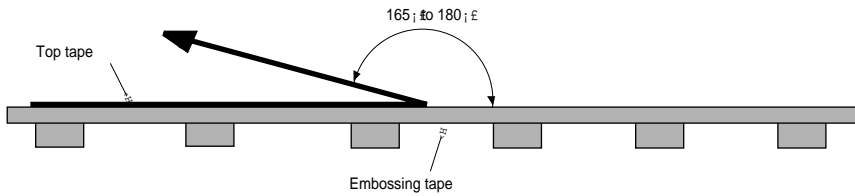
PRODUCT	Type	A <sub>i</sub> 0.1	B <sub>i</sub> 0.1	P <sub>i</sub> 0.1	Ko <sub>i</sub> 0.1	T(max.)
CHIP BEADS CHIP FEEDTHRU	4516	1.90	4.90	4.0	1.00	0.3
	4516	1.90	4.90	4.0	1.35	0.3
	4532	3.60	4.90	8.0	1.40	0.3
	5750	5.20	6.10	8.0	2.05	0.3

## § 1005 BULK CASSETTE DIMENSION



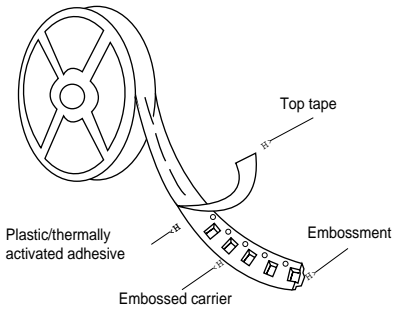
## § TOP TAPE STRENGTH

⌋ The force for tearing off top tape is 20 to 70 grams in the arrow direction.

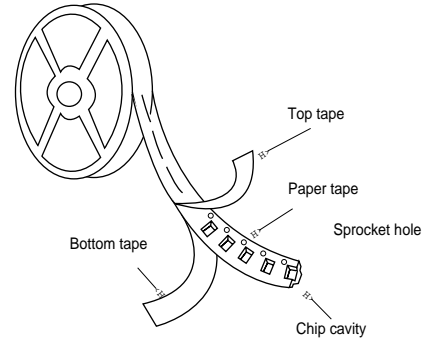


## § TAPING MATERIAL

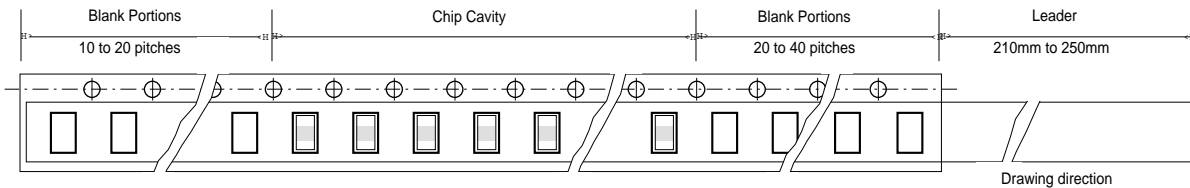
⌋ Embossed Tape



⌋ Paper Tape



## § LEADER AND BLANK PORTION

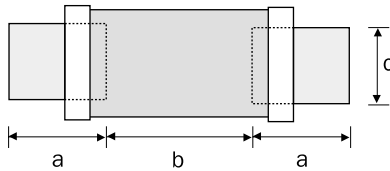


⌋ The pitch holes shift within  $\pm 0.3\text{mm}$  for cumulative 10 pitches.

# LAND PATTERN DESIGN

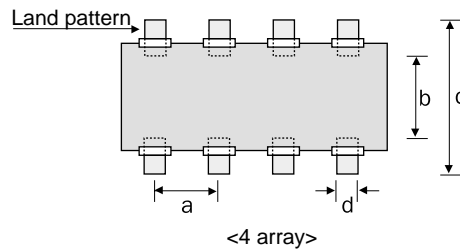
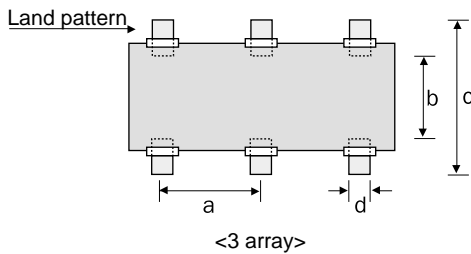
## BEAD, INDUCTOR, VARISTOR, SURGE ABSORBER

unit ; mm



SIZE	a	b	c
0603	0.22	0.25	0.32
1005	0.7	0.4	0.5
1608	1.0	0.6	0.8
2012	1.0	1.0	1.0
3216	1.1	2.2	1.4
4516	1.5	3.0	1.4
4532	1.8	3.0	3.0
5750	2.0	4.0	5.8

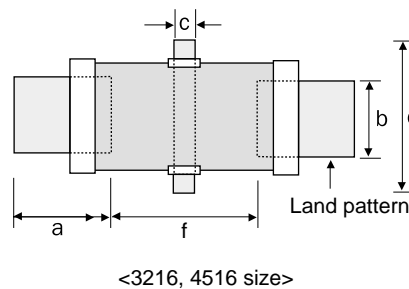
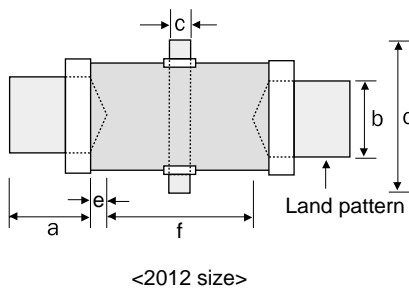
## ARRAY



unit ; mm

SIZE	array	a	b	c	d
3216	3 array	1.0	0.8	3.0	0.5
3216	4 array	0.8	0.8	3.0	0.4

## EMI SUPPRESSION FILTER, LC FILTER, FEEDTHRU CAPACITOR



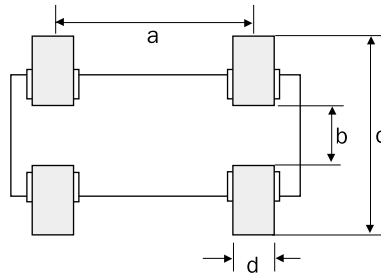
unit ; mm

SIZE	a	b	c	d	e	f
2012	1.0	1.0	0.4	2.0	0.1	1.4
3216	1.1	1.4	0.6	2.4	-	2.4
4516	1.5	1.4	0.8	2.4	-	3.4



# LAND PATTERN DESIGN

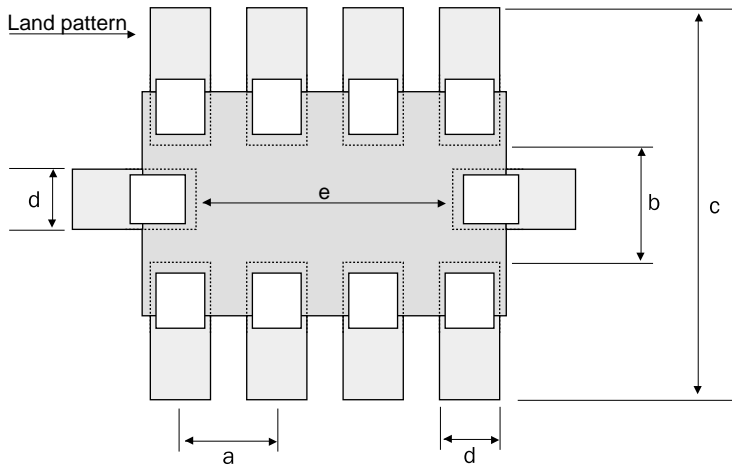
## COMMON MODE FILTER, VARISTOR ARRAY



unit ; mm

SIZE	POLE(Array)	a	b	c	d
2012	2 POLE	1.20	0.60	2.60	0.40
2012	2 Array	0.76	0.38	2.16	0.46
3216	2 POLE	2.10	0.80	3.00	0.60
3216	2 Array	1.96	0.76	2.54	0.90

## EMI FILTER ARRAY

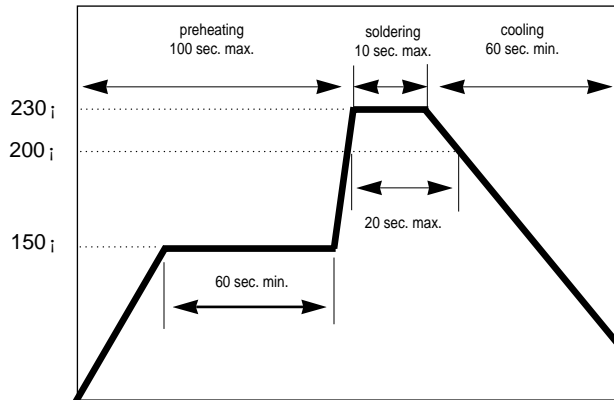


unit ; mm

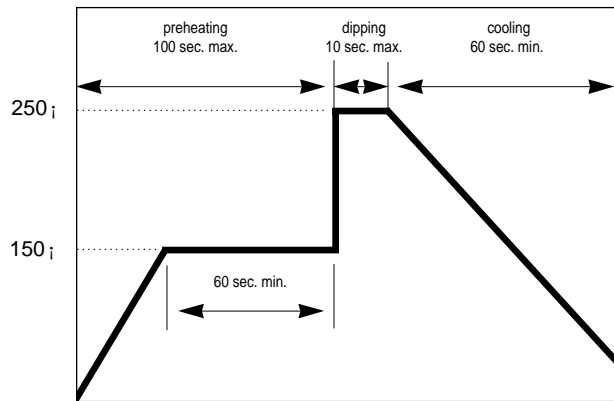
SIZE	POLE(Array)	a	b	c	d	e
3216	4 Array	0.8	0.8	3.0	0.4	2.4

# SOLDERING PROFILE

## REFLOW SOLERING PROFILE



## FLOW SOLDERING PROFILE



## MANUAL SOLDERING

