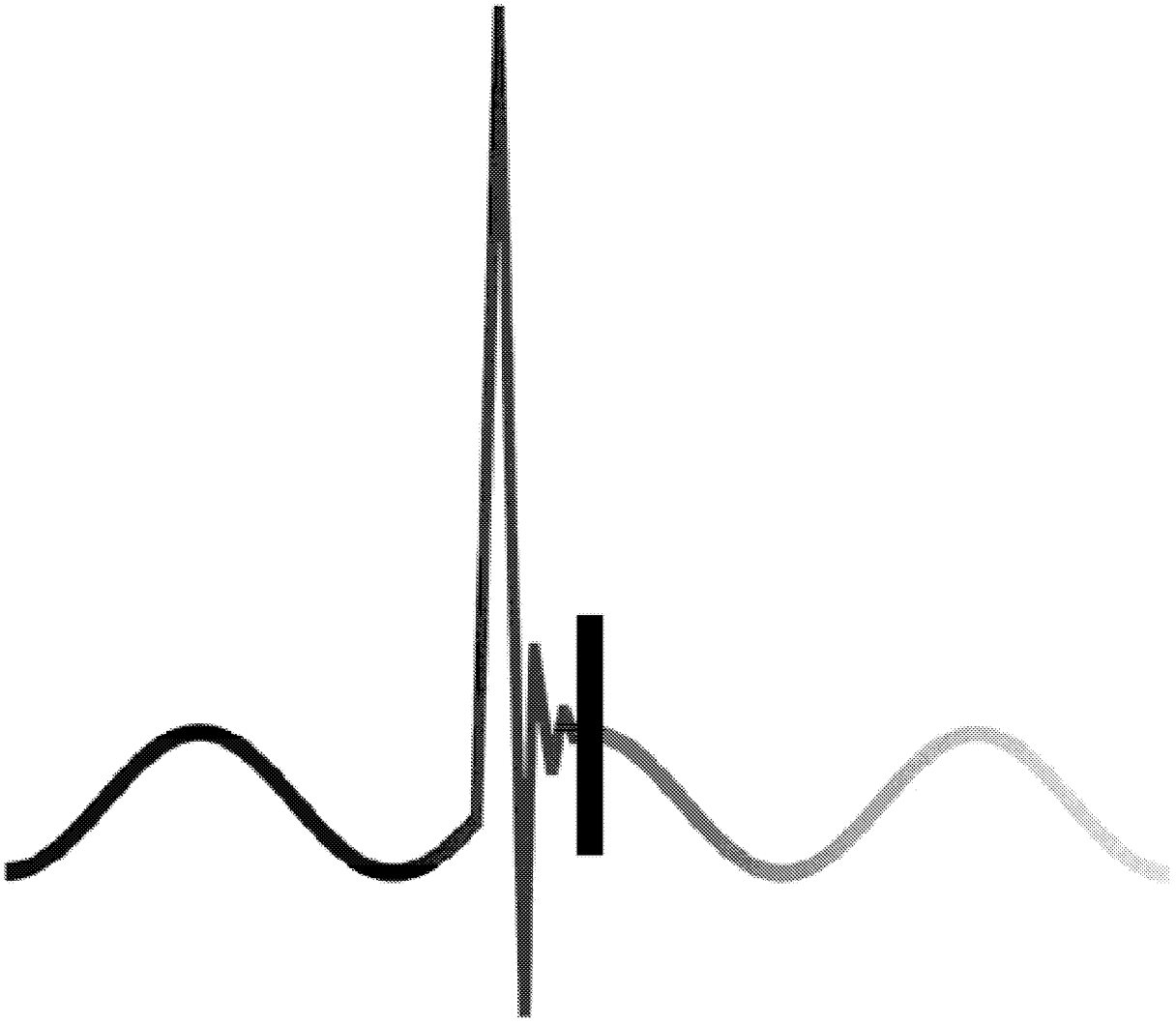
W O R L D P R O D U C T S

MULTILAYER VARISTORS



Protection Products Group

WORLD PRODUCTS INC.

World Products Inc. 19654 8th St. East, Sonoma, CA, USA, 95476 . . Phone: (707) 996-5201 . . Fax: (707) 996-3380

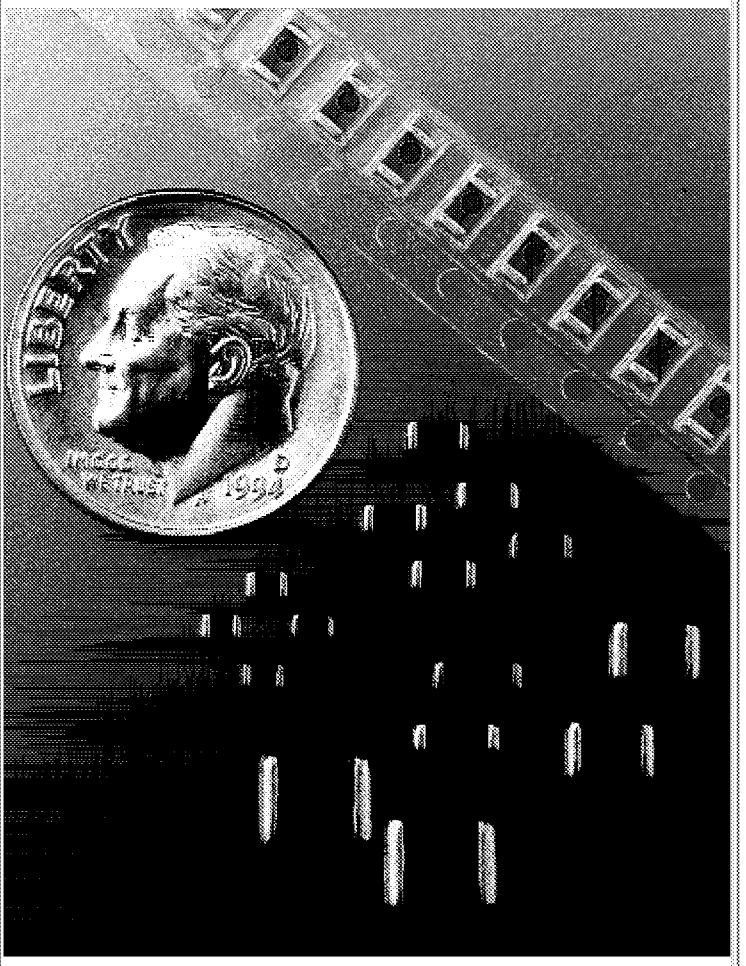
Multilayer Varistors

The Protection Products Group of World Products Inc., specializing in protection products for AC and DC circuits, is proud to feature Ceratech's Multilayer Varistors.

You will see for yourself when you buy Ceratech Multilayer Varistors that you have not only purchased a fine component, but that we will also provide the finest customer service in today's marketplace.

Discover why the first choice in Multilayer Varistors is Ceratech.

Table of Contents



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Multilayer Varistors - General Information

Features

- SMD Type Chip Varistor provides highly reliable surface mount application.
- Wide operating Voltage Range ($V_{W(DC)}$ = 3.5V to 68V)
- Good Clamping ratio
- Low Capacitance

Applications

- Transient Voltage Protection for ICs and Transistors.
- ESD and I/O protection
- Telecommunication Transient Protection
- Replace Surface Mount Zener Diodes

Ordering Information - VA Series

VA	-	A	2012	-	3R5	J	J	T
(1)		(2)	(3)		(4)	(5)	(6)	(7)

(1) Series

(2) Material

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

(4) DC Working voltage
R denotes decimal point.
ie: 3R5 = 3.5

(5) Capacitance Rating
J: Low Capacitance
Blank: Ordinal

(6) Termination
J: Nickel barrier

(7) Packing
B: Bulk pack
T: Tape and Reel - ø178mm (7 inches)
L: Tape and Reel - ø254mm (10 inches)

Ordering Information - VM Array Series and VL Series

VM	-	4	A	3216	-	5R5	E	J	T
(1)		(1A)	(2)	(3)		(4)	(5)	(6)	(7)

(1) Series

(1A) Arrays
2 = 2 Array / 4 = 4 Array

(2) Material

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

(4) DC Working voltage
R denotes decimal point.
ie: 5R5 = 5.5

(5) Capacitance Rating
J: Ordinal
E: Low Capacitance

(6) Termination
J: Nickel barrier

(7) Packing
B: Bulk pack
T: Tape and Reel - ø178mm (7 inches)
L: Tape and Reel - ø254mm (10 inches)

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Multilayer Varistors - General Information - (continued)

Terms and Descriptions

Working DC Voltage (Vw(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. Unlike the zener diode all multilayer varistors have a maximum leakage current of less than 100µA.

Working AC Voltage (Vw(AC))

This is the maximum continuous sinusoidal rms voltage which maybe applied at any temperature up to the maximum operating temperature of the device.

Maximum Surge Current (Is)

This is the maximum peak current which may be applied for an 8/20µs 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 (Ws)

This is the maximum rated transient energy which may be dissipated for a single current pulse at a specified impulse duration (10/1000µs), with the rated DC or RMS voltage applied, without causing device failure.

Leakage (I_L) at Rated DC Voltage

In the nonconducting mode, the device is at a very high impedance (approaching 10^9 ohms) and appears as an almost open circuit in the system. The leakage current drawn at this level is very low (<50µA at ambient temperature) and, unlike the zener diode, the multilayer varistors have the added advantage that, when operated up to its maximum temperature, its leakage current will not increase above 500µA.

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 1mA point and has a specified minimum and maximum voltage listed.

Clamping Voltage (Vc)

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

Capacitance (Cp)

This is the capacitance of the device at a specified frequency (1 MHz) and bias (1 $V_{P.P}$)

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Multilayer Varistors - General Information - (continued)

Application Note

Nickel barrier termination of multilayer varistor

The most difficult problem of multilayer varistor is the termination technique.

Silver electrode can not be used in multilayer varistor due to silver migration between the layers therefore silver palladium or platinum are widely used as electrode materials. In selecting the termination material, it must contain silver, like silver palladium, due to the material compatibility with silver palladium electrode.

The silver portion of this terminal starts to react with the tin-lead in solder when it is on the flow solder process and creates an amalgam condition which makes all the silver content on the electrode drain down to the printed circuit board. Therefore there is not enough material left over on the terminal and one side of the terminal will be lifted due to the other side's pulling force during the flow soldering. This is called Tomb-stone phenomenon.

In order to prevent this amalgam phenomenon, the best method is to block the silver layer on the terminal by nickel and then tin plating for the solder compatibility. This is called **nickel barrier**. Nickel plating on metal oxide varistors is not an easy process. Varistors contain barium oxide and titanium oxide as a junction boundary of potential gradient and barium and titanium dissolves during the acid solution of the electroplating and the varistor becomes degradated.

Ceratech has developed a special electroplating technique for their multilayer varistors which insures that their products have a solid nickel barrier and thus durable solderability. The multilayer varistors from Ceratech use platinum electrodes and then terminate with silver before nickel plating. Tin plating is then deposited on the nickel plated barrier.

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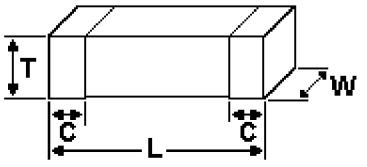
Multilayer Varistors - 1608 Series Specifications

0603 is the U.S. inches equivalent for the 1608 millimeter series.

	Working Voltage		Varistor Voltage (1mA DC)	Maximum Clamping Voltage at 2A (8/20 µs)	Maximum Surge Current (8/20 µs)	Maximum Surge Energy (10/1000 µs)	Capacitance pF(typ.)	
	$V_{W(DC)}$	$V_{W(AC)}$	V_B	V_C	I_S	W_S	C_p	
Part Number	V	V	V	V	A	J	1kHz	1MHz
VA-A1608-3R5	3.5	2.5	3.7 ~ 5.5	14	30	0.1	850	800
VA-A1608-5R5	5.5	4.0	7.1 ~ 9.3	16	30	0.1	670	630
VA-A1608-080	8.0	5.7	9.6 ~ 11.5	24	30	0.1	470	450
VA-A1608-110	11.0	7.8	12.7 ~ 15.5	27	30	0.1	400	375
VA-A1608-140	14.0	10.0	15.9 ~ 20.3	30	30	0.1	360	315
VA-A1608-180	18.0	12.7	21.5 ~ 28.0	40	30	0.1	300	234

1608 Series			**Dimensions**
	mm	Inches	
L	1.60 ± 0.15	0.063 ± 0.006	
W	0.80 ± 0.15	0.031 ± 0.008	
T	0.80 ± 0.15	0.031 ± 0.008	
C(max)	0.50	0.019	



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Multilayer Varistors - 2012 Series Specifications

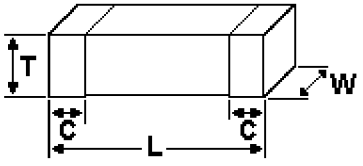
0805 is the U.S. inches equivalent for the 2012 millimeter series.

Part Number	Working Voltage $V_{W(DC)}$ V	Working Voltage $V_{W(AC)}$ V	Varistor Voltage (1mA DC) V_B V	Maximum Clamping Voltage at 5A (8/20 µs) V_C V	Maximum Surge Current (8/20 µs) I_S A	Maximum Surge Energy (10/1000 µs) W_S J	Capacitance pF(typ.) C_p 1kHz	Capacitance pF(typ.) C_p 1MHz
VA-A2012-3R5J	3.5	2.5	3.7 ~ 5.5	14	40	0.1	1800	1600
VA-A2012-3R5					100	0.3	3700	3400
VA-A2012-5R5J	5.5	4.0	7.1 ~ 9.3	16	40	0.1	1600	1450
VA-A2012-5R5					100	0.3	3000	2700
VA-A2012-080J	8.0	5.7	9.6 ~ 12.5	24	40	0.1	900	850
VA-A2012-080					100	0.3	1920	1700
VA-A2012-110J	11.0	7.8	12.7 ~ 15.5	27	40	0.1	760	710
VA-A2012-110					100	0.3	1635	1500
VA-A2012-140J	14.0	10.0	15.9 ~ 20.3	30	40	0.1	700	650
VA-A2012-140					100	0.3	1500	1300
VA-A2012-180J	18.0	12.7	21.5 ~ 28.0	40	30	0.1	570	530
VA-A2012-180					100	0.3	1200	1100
VA-A2012-260J	26.0	18.4	29.0 ~ 38.5	58	30	0.1	430	400
VA-A2012-260					100	0.3	750	700

Surge Energy Rating	**Pulse Current & Waveform**
J : 0.1 Joule	1A 8/20µs
L : 0.3 Joule	1A 8/20µs

2012 Series	mm	Inches
L	2.00 ± 0.2	0.079 ± 0.008
W	1.25 ± 0.2	0.049 ± 0.008
T	1.00 ± 0.2	0.039 ± 0.008
C(max)	0.6	0.024

Dimensions



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Multilayer Varistors - 3216 Series Specifications

1206 is the U.S. inches equivalent for the 3216 millimeter series.

Part Number	Working Voltage $V_{W(DC)}$ V	Working Voltage $V_{W(AC)}$ V	Varistor Voltage (1mA DC) V_B V	Maximum Clamping Voltage at 10A (8/20 µs) V_C V	Maximum Surge Current (8/20 µs) I_S A	Maximum Surge Energy (10/1000 µs) W_S J	Capacitance pF(typ.) C_p 1kHz	Capacitance pF(typ.) C_p 1MHz
VA-A3216-3R5J	3.5	2.5	3.7 ~ 5.5	14	30	0.1	5000	4300
VA-A3216-3R5					150	0.4	8500	8000
VA-A3216-5R5J	5.5	4.0	7.1 ~ 9.3	16	40	0.1	3300	2800
VA-A3216-5R5					150	0.4	5800	5300
VA-A3216-080J	8.0	5.7	9.6 ~ 12.5	24	40	0.1	2800	2200
VA-A3216-080					150	0.4	4500	4100
VA-A3216-110J	11.0	7.8	12.7 ~ 15.5	27	40	0.1	2400	1800
VA-A3216-110					150	0.4	3800	3300
VA-A3216-140J	14.0	10.0	15.9 ~ 20.3	30	40	0.1	2000	1600
VA-A3216-140					150	0.4	3400	3100
VA-A3216-180J	18.0	12.7	21.5 ~ 28.0	40	30	0.1	1800	1300
VA-A3216-180					150	0.4	2600	2400
VA-A3216-260J	26.0	18.4	29.0 ~ 38.5	58	30	0.1	800	900
VA-A3216-260					120	0.4	1900	1800
VA-A3216-330	33.0	23.3	38.0 ~ 45.0	72	120	0.4	1040	950
VA-A3216-420	42.0	30.0	46.0 ~ 56.0	86	100	0.4	600	550
VA-A3216-560	56.0	40.0	58.0 ~ 76.0	110	100	0.4	400	350
VA-A3216-680	68.0	48.1	76.0 ~ 90.0	130	100	0.4	300	260

Surge Energy Rating

J : 0.1 Joule

M : 0.4 Joule

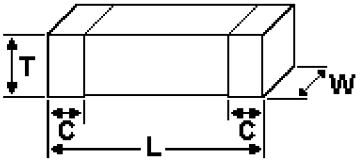
Pulse Current & Waveform

1A 8/20µs

10A 8/20µs

3216 Series	mm	Inches
L	3.2 ± 0.2	0.126 ± 0.008
W	1.6 ± 0.2	0.063 ± 0.008
T	1.3 ± 0.2	0.039 ± 0.008
C(max)	0.7	0.028

Dimensions



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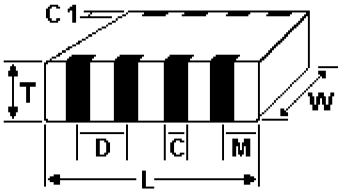
Array Multilayer Varistors - 4 Array / 2 Array Series Specifications

1206 is the U.S. inches equivalent for the 3216 millimeter series.

Part Number	Working Voltage $V_{W(DC)}$ V	Working Voltage $V_{W(AC)}$ V	Varistor Voltage (1mA DC) V_B V	Maximum Clamping Voltage (8/20 µs) V_C V	Maximum Surge Current (8/20 µs) I_S A	Maximum Surge Energy (10/1000 µs) W_S J	Capacitance (at f=1MHz) $C_{p(typ.)}$ pF
4 Array Series							
VM-4A3216-5R5EJ	5.5	4	7.1 ~ 9.3	25	10	0.05	400
VM-4A3216-5R5JJ	5.5	4	7.1 ~ 9.3	16	20	0.1	670
VM-4A3216-090EJ	9	6.4	10.0 ~ 14.0	30	10	0.05	300
VM-4A3216-090JJ	9	6.4	10.0 ~ 14.0	26	30	0.1	470
VM-4A3216-140EJ	14	10.0	15.9 ~ 20.3	40	10	0.05	150
VM-4A3216-140JJ	14	10.0	15.9 ~ 20.3	30	30	0.1	400
VM-4A3216-180EJ	18	12.7	21.5 ~ 28.0	50	10	0.05	75
VM-4A3216-180JJ	18	12.7	21.5 ~ 28.0	40	30	0.1	300
2 Array Series							
VM-2A3216-110EJ	11	7.0	11.0 ~ 15.5	24	7	0.05	75

3216 - 4 Array Series		
	mm	Inches
L	3.20 ± 0.2	0.126 ± 0.008
W	1.60 ± 0.2	0.063 ± 0.008
T	0.80 ± 0.1	0.031 ± 0.004
C	0.40 ± 0.15	0.016 ± 0.006
C1	0.325 ± 0.13	0.013 ± 0.005
D	0.80 ± 0.1	0.031 ± 0.004
M	0.20 ± 0.1	0.008 ± 0.004

Dimensions



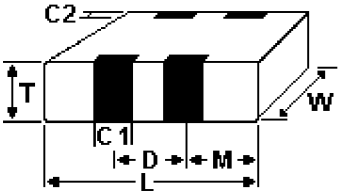
Packaging

3000 pcs - 7" (178mm) reel

7000 pcs - 10" (254mm) reel

3216 - 2 Array Series		
	mm	Inches
L	3.20 ± 0.2	0.126 ± 0.008
W	1.60 ± 0.2	0.063 ± 0.008
T	1.0 Max	0.039 Max
C1	0.84 ± 0.15	0.033 ± 0.006
C2	0.20 ~ 0.45	0.008 ~ 0.018
D	1.96 ± 0.1	0.077 ± 0.004
M	0.625 ± 0.1	0.025 ± 0.004

Dimensions



Packaging

3000 pcs - 7" (178mm) reel

7000 pcs - 10" (254mm) reel

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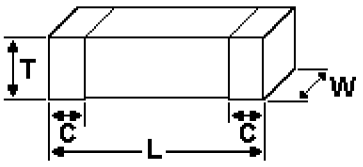
Multilayer Varistors - Very Low Capacitance Series Specifications

0603 is the U.S. inches equivalent for the 1608 millimeter series.
0805 is the U.S. inches equivalent for the 2012 millimeter series.
1206 is the U.S. inches equivalent for the 3216 millimeter series.

	Working Voltage		Varistor Voltage (1mA DC)	Maximum Clamping Voltage (8/20 µs)	Maximum Surge Current (8/20 µs)	Maximum Surge Energy (10/1000 µs)	Capacitance (at f=1MHz)
	$V_{W(DC)}$	$V_{W(AC)}$	V_B	V_C	I_S	W_S	$C_{p(typ.)}$
Part Number	V	V	V	V	A	J	pF
VL-A1608-3R5E	3.5	2.5	3.7 ~ 5.5	25	10	0.05	300
VL-A1608-5R5E	5.5	4.0	7.1 ~ 9.3	30	10	0.05	250
VL-A1608-140E	14.0	10.0	15.9 ~ 20.3	40	10	0.05	150
VL-A1608-180E	18.0	12.7	21.5 ~ 28.0	50	10	0.05	75
VL-A1608-260E	26.0	18.4	29.0 ~ 38.5	70	10	0.05	75
VL-A2012-3R5E	3.5	2.5	3.7 ~ 5.5	25	10	0.05	300
VL-A2012-5R5E	5.5	4.0	7.1 ~ 9.3	30	10	0.05	250
VL-A2012-140E	14.0	10.0	15.9 ~ 20.3	40	10	0.05	200
VL-A2012-180E	18.0	12.7	21.5 ~ 28.0	50	10	0.05	150
VL-A2012-500E	50.0	35.0	57.0 ~ 72.0	150	8	0.02	30
VL-A2012-500J	50.0	35.0	57.0 ~ 72.0	150	10	0.1	90
VL-A3216-140E	14.0	10.0	15.9 ~ 20.3	40	10	0.05	500
VL-A3216-180E	18.0	12.7	21.5 ~ 28.0	50	10	0.06	350

VL Series					Dimensions
Type	L	W	T(max)	C(max)	
VL-A1608	1.6 ± 0.15 (.063 ± .006)	0.8 ± 0.15 (.031 ± .006)	0.95 (.038)	0.5 (.019)	
VL-A2012	2.0 ± 0.2 (.079 ± .008)	1.25 ± 0.2 (.049 ± .008)	1.2 (.047)	0.6 (.024)	
VL-A3216	3.2 ± 0.2 (.126 ± .008)	1.6 ± 0.2 (.063 ± .008)	1.4 (.055)	0.7 (.028)	
mm / (inches)					

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Chip Surge Absorbers - General Information

Features

- SMD Type Chip Surge Absorber provides highly reliable surface mount application.
- Low Capacitance - SA-B = 3pF Max., SA-D = 1pF Max.
- Low Leakage Current
- Fast Response Time

Applications

- Device connection antenna or signal line
- Protection from ESD and burst noise
- Car Audio, Monitor, TV, Display Unit, Modem.
- Replace Spark Gap

Ordering Information

SA	-	B	2012	-	101	-	03	J	T
(1)		(2)	(3)		(4)		(5)	(6)	(7)

(1) Series

(2) Material

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

(4) Working voltage)

(5) Maximum Capacitance (pF)
03: SA-B
01: SA-D

(6) Termination
J: Nickel barrier
P: Silver-palladium

(7) Packing
B: Bulk pack
T: Tape and Reel - ø178mm (7 inches)
L: Tape and Reel - ø254mm (10 inches)

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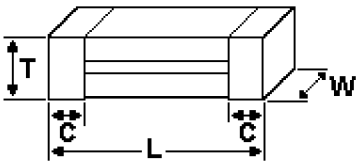
Chip Surge Absorbers - SA-B Series

0805 is the U.S. inches equivalent for the 2012 millimeter series.
1206 is the U.S. inches equivalent for the 3216 millimeter series.

Part Number	Working Voltage		Varistor Voltage (1mA DC)	Maximum Clamping Voltage (1/30ns)	Maximum Surge Current (1/30ns)	Capacitance (at f=1MHz)
	$V_{W(DC)}$	$V_{W(AC)}$	V_B	V_C	I_S	C_p
	V	V	V	V	A	pF
SA-B2012-101-03	100	70	115 ~ 150	300	6	Max. 3pF
SA-B2012-151-03	150	110	173 ~ 216	400	6	Max. 3pF
SA-B2012-201-03	200	140	230 ~ 288	600	5	Max. 3pF
SA-B2012-301-03	300	210	345 ~ 431	700	5	Max. 3pF
SA-B3216-101-03	100	70	115 ~ 150	300	6	Max. 3pF
SA-B3216-151-03	150	110	173 ~ 216	400	6	Max. 3pF
SA-B3216-201-03	200	140	230 ~ 288	600	6	Max. 3pF
SA-B3216-301-03	300	210	345 ~ 431	700	5	Max. 3pF

2012 Series			3216 Series			Dimensions
	mm	Inches		mm	Inches	
L	2.00 ± 0.2	.079 ± .008	L	3.20 ± 0.2	1.126 ± .008	
W	1.25 ± 0.2	.049 ± .008	W	1.60 ± 0.2	.063 ± .008	
T	1.00 ± 0.2	.039 ± .008	T	1.30 ± 0.2	.051 ± .008	
C(max)	0.6	.024	C(max)	0.7	.028	

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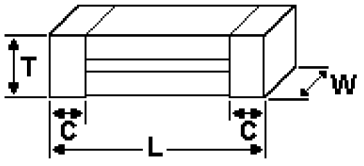
Chip Surge Absorbers - SA-D Series

0805 is the U.S. inches equivalent for the 2012 millimeter series.
1206 is the U.S. inches equivalent for the 3216 millimeter series.

Part Number	Working Voltage $V_{W(DC)}$ V	Working Voltage $V_{W(AC)}$ V	Varistor Voltage (1mA DC) V_B V	Maximum Clamping Voltage (1/30ns) V_C V	Maximum Surge Current (1/30ns) I_S A	Capacitance (at f=1MHz) C_p pF
SA-D2012-101-01	100	70	115 ~ 150	300	4	Max. 1pF
SA-D2012-151-01	150	110	173 ~ 216	400	4	Max. 1pF
SA-D2012-201-01	200	140	230 ~ 288	600	4	Max. 1pF
SA-D2012-251-01	250	180	288 ~ 345	600	4	Max. 1pF
SA-D2012-301-01	300	210	345 ~ 431	700	3	Max. 1pF
SA-D3216-101-01	100	70	115 ~ 150	300	4	Max. 1pF
SA-D3216-151-01	150	110	173 ~ 216	400	4	Max. 1pF
SA-D3216-201-01	200	140	230 ~ 288	600	4	Max. 1pF
SA-D3216-251-01	250	180	288 ~ 345	600	4	Max. 1pF
SA-D3216-301-01	300	210	345 ~ 431	700	3	Max. 1pF

2012 Series			3216 Series			Dimensions
	mm	Inches		mm	Inches	
L	2.00 ± 0.2	.079 ± .008	L	3.20 ± 0.2	1.126 ± .008	
W	1.25 ± 0.2	.049 ± .008	W	1.60 ± 0.2	.063 ± .008	
T	1.00 ± 0.2	.039 ± .008	T	1.30 ± 0.2	.051 ± .008	
C(max)	0.6	.024	C(max)	0.7	.028	



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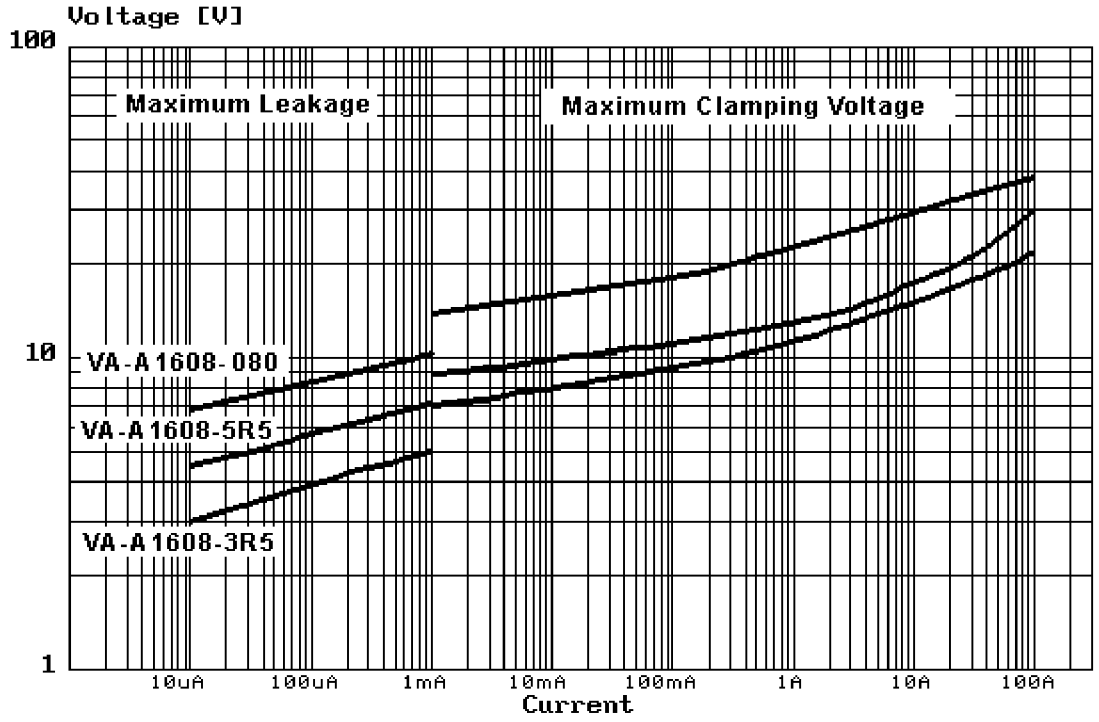
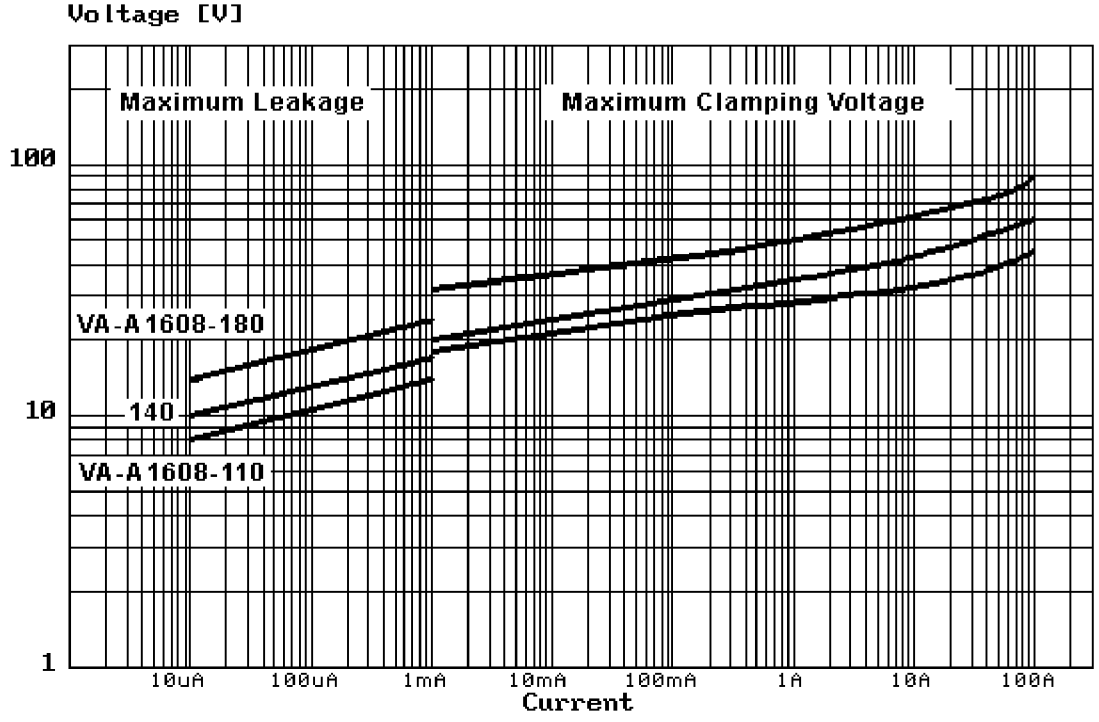
Multilayer Varistors - Chip Surge Absorbers

V - I Characteristic Curves

Multilayer Varistors

1608 Series





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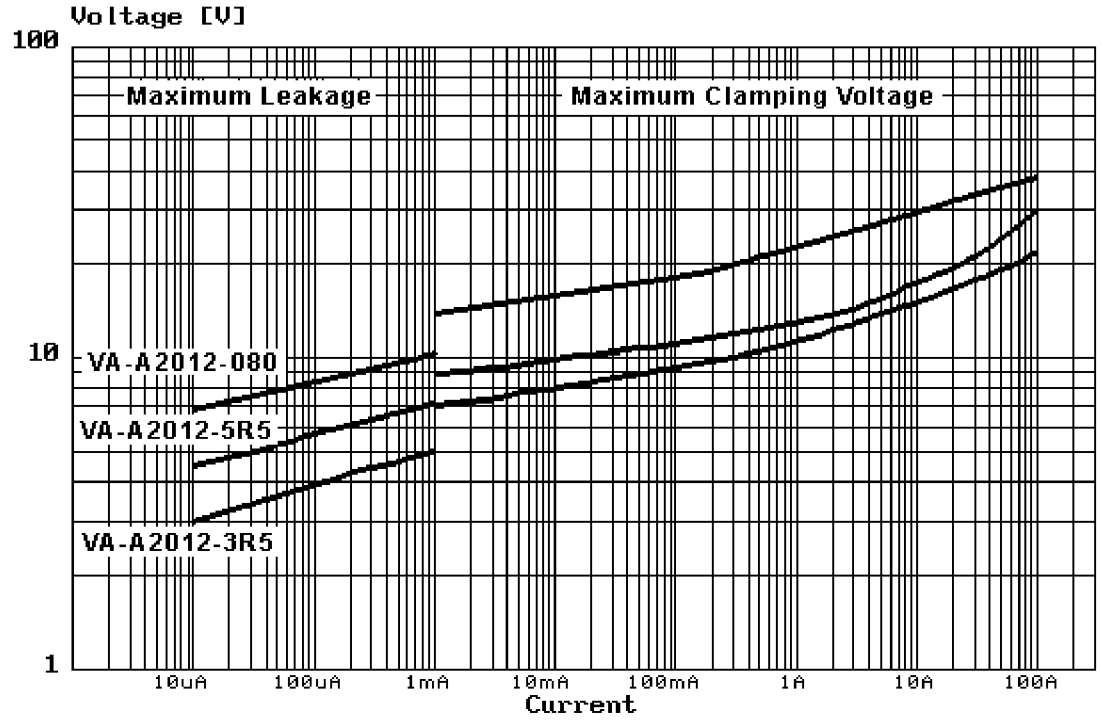
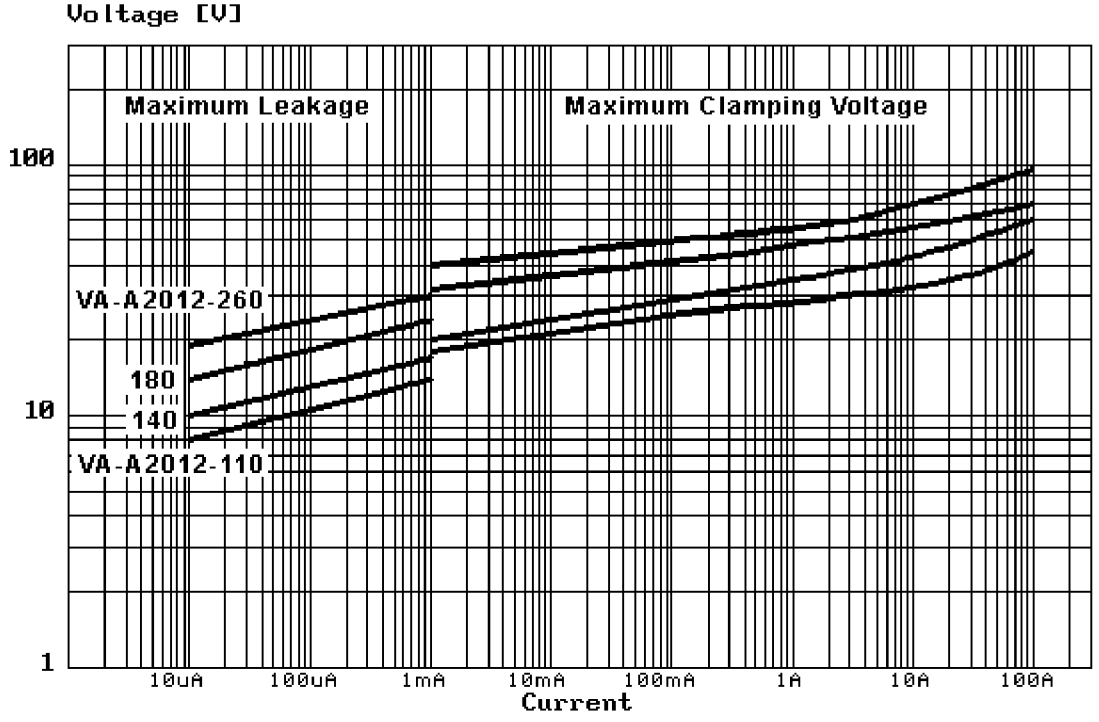
Multilayer Varistors - Chip Surge Absorbers

V - I Characteristic Curves
Multilayer Varistors
2012 Series





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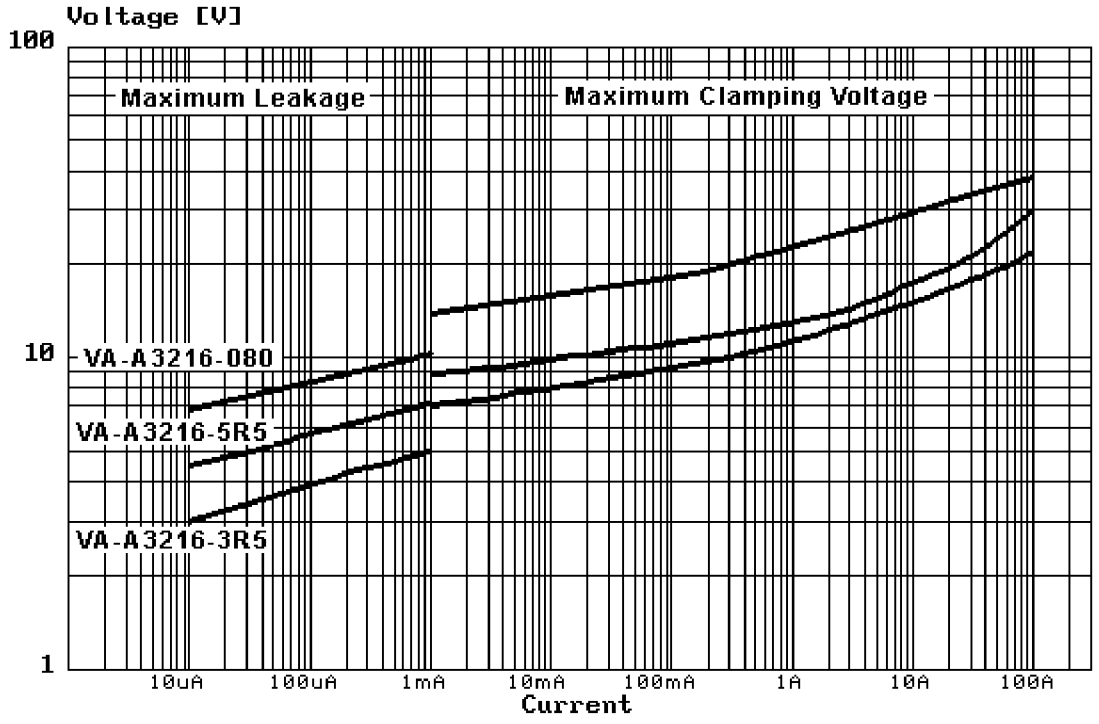
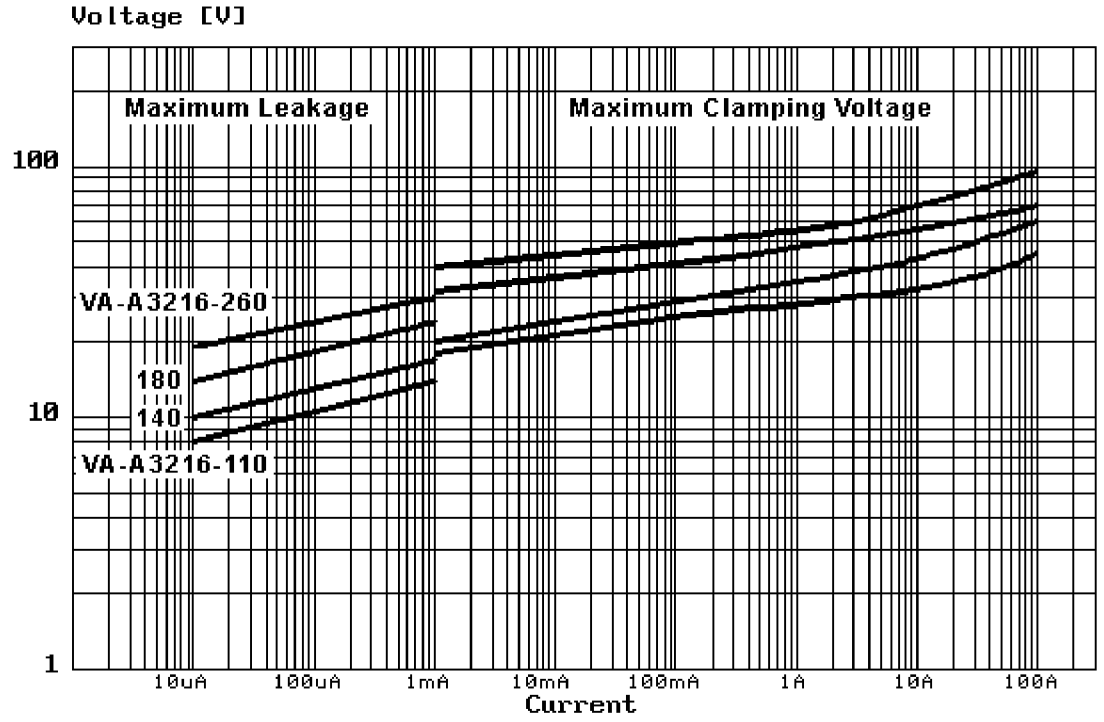
Multilayer Varistors - Chip Surge Absorbers

V - I Characteristic Curves
Multilayer Varistors
3216 Series





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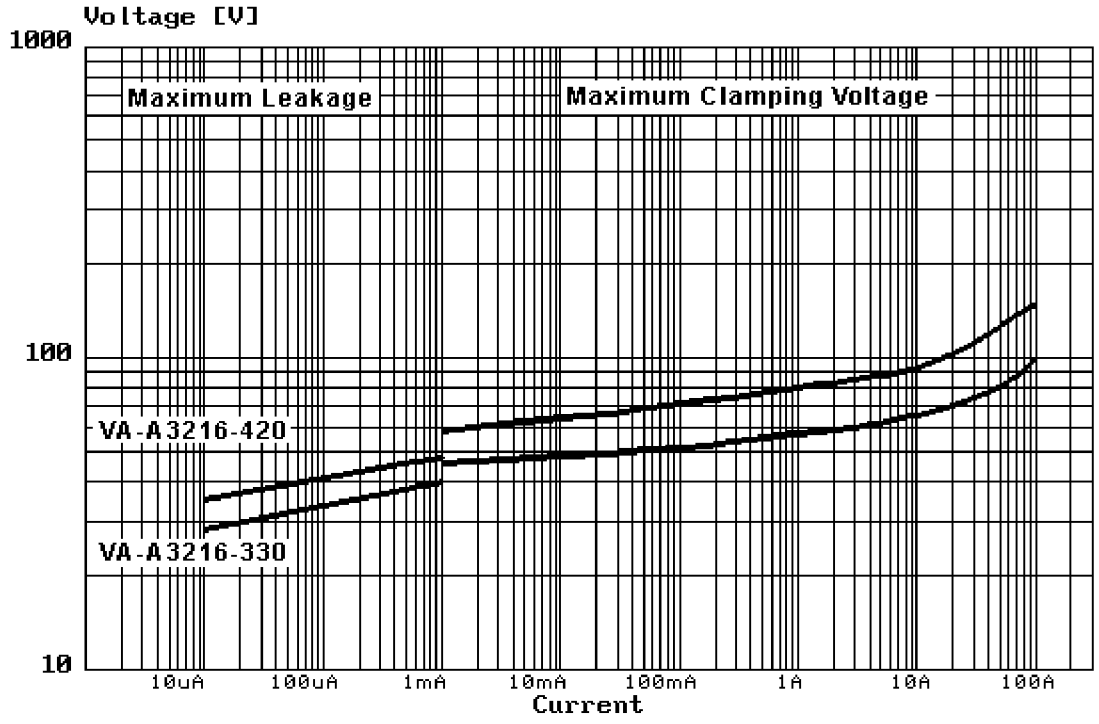
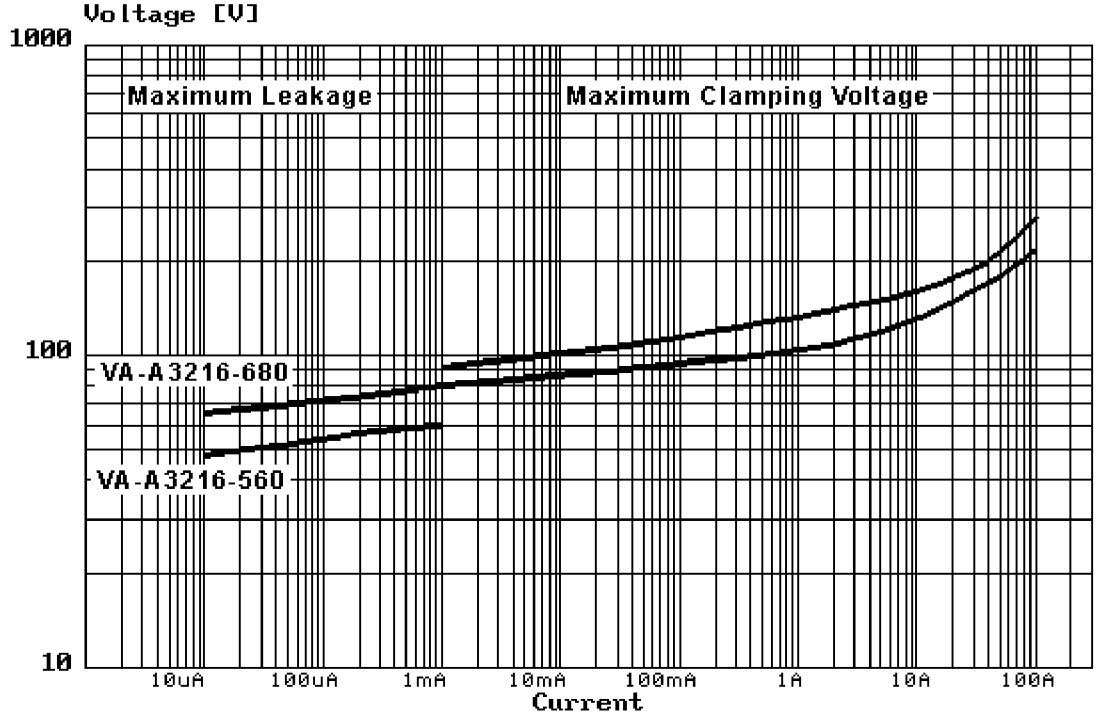
Multilayer Varistors - Chip Surge Absorbers

V - I Characteristic Curves

Multilayer Varistors

3216 Series - (continued)





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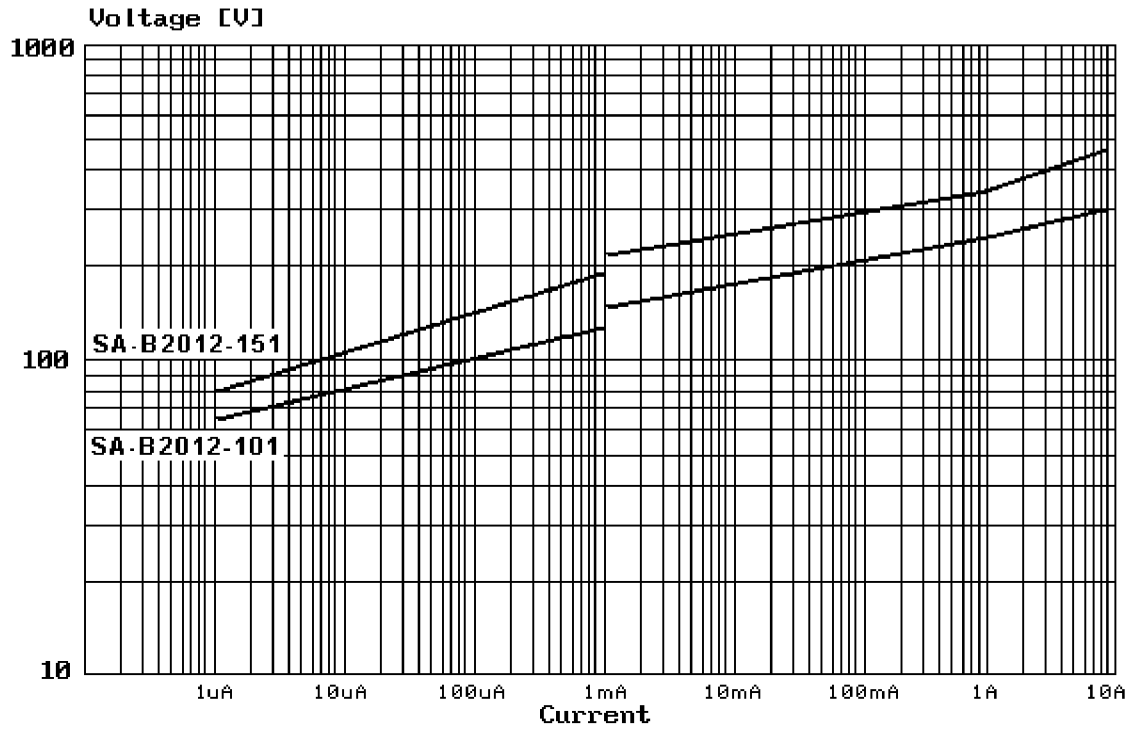
Multilayer Varistors - Chip Surge Absorbers

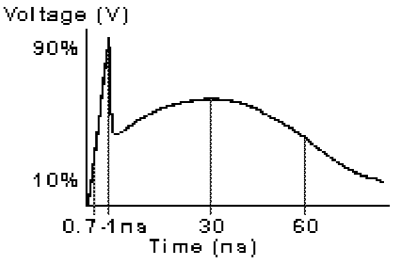
V - I Characteristic Curves

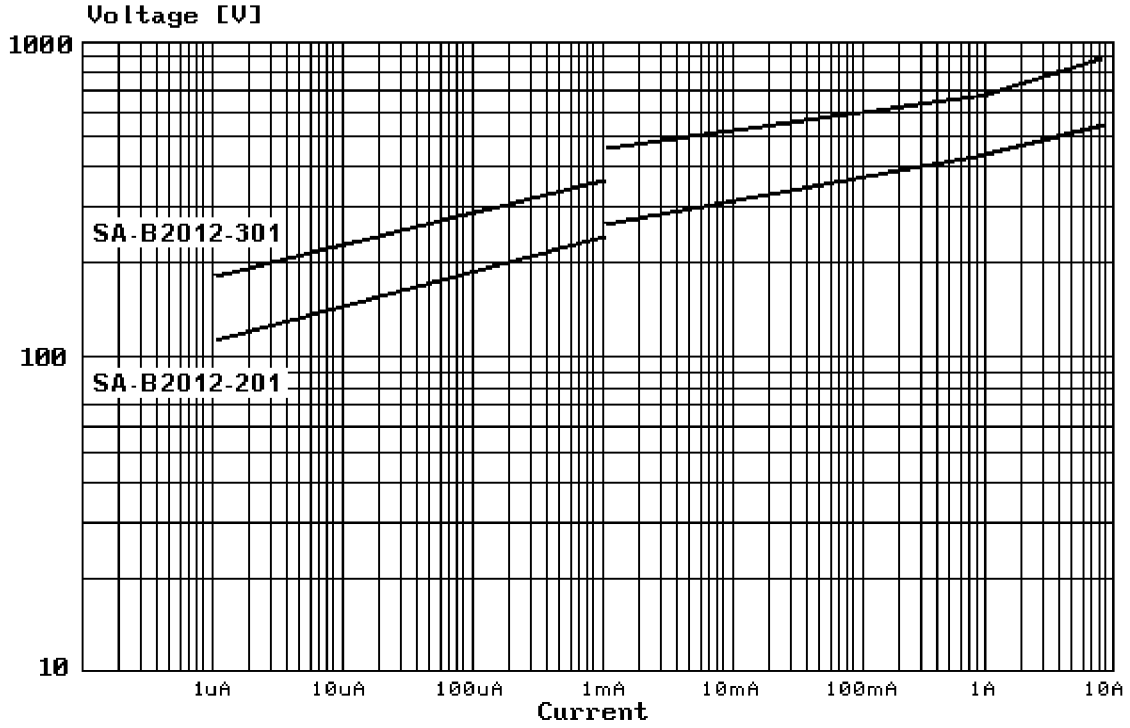
Chip Surge Absorbers

SA-B Series



Test Wave Form





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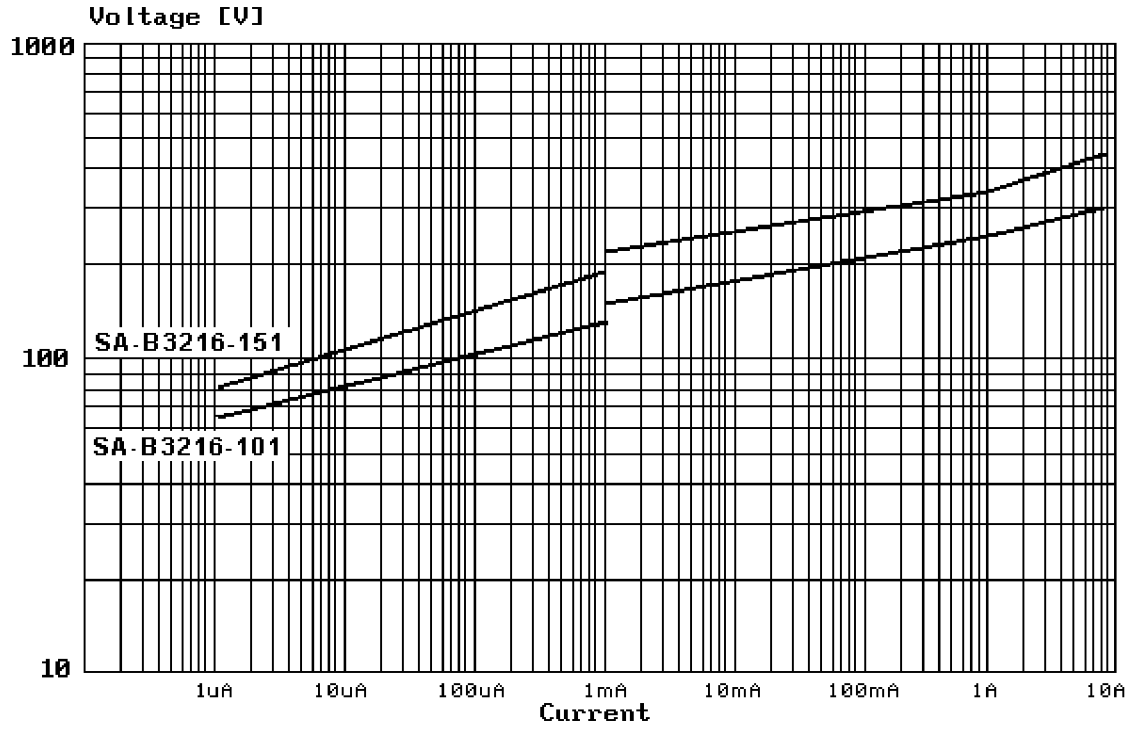
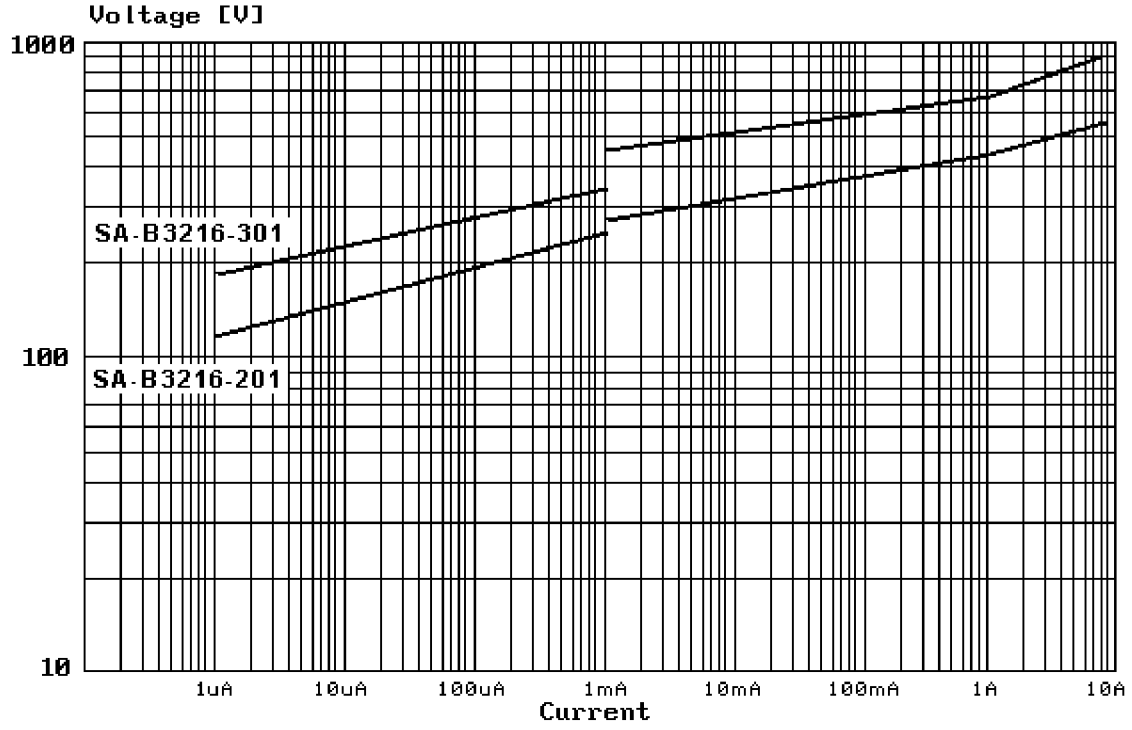
Multilayer Varistors - Chip Surge Absorbers

V - I Characteristic Curves

Chip Surge Absorbers

SA-B Series - (Continued)





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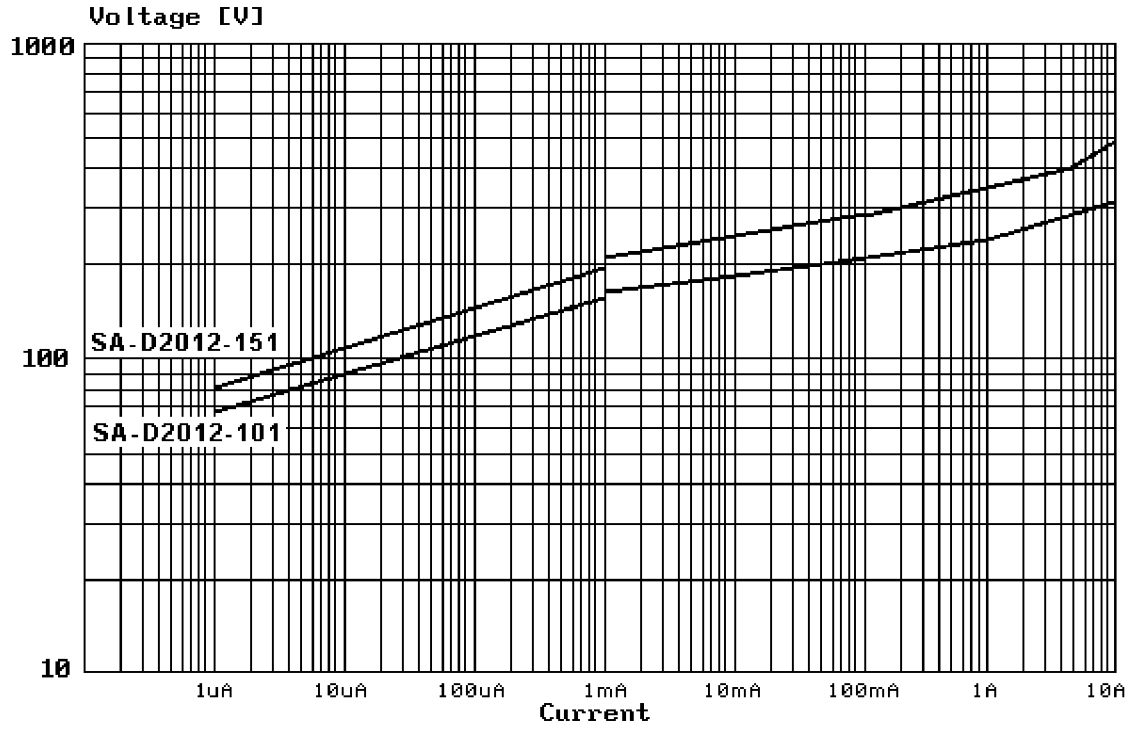
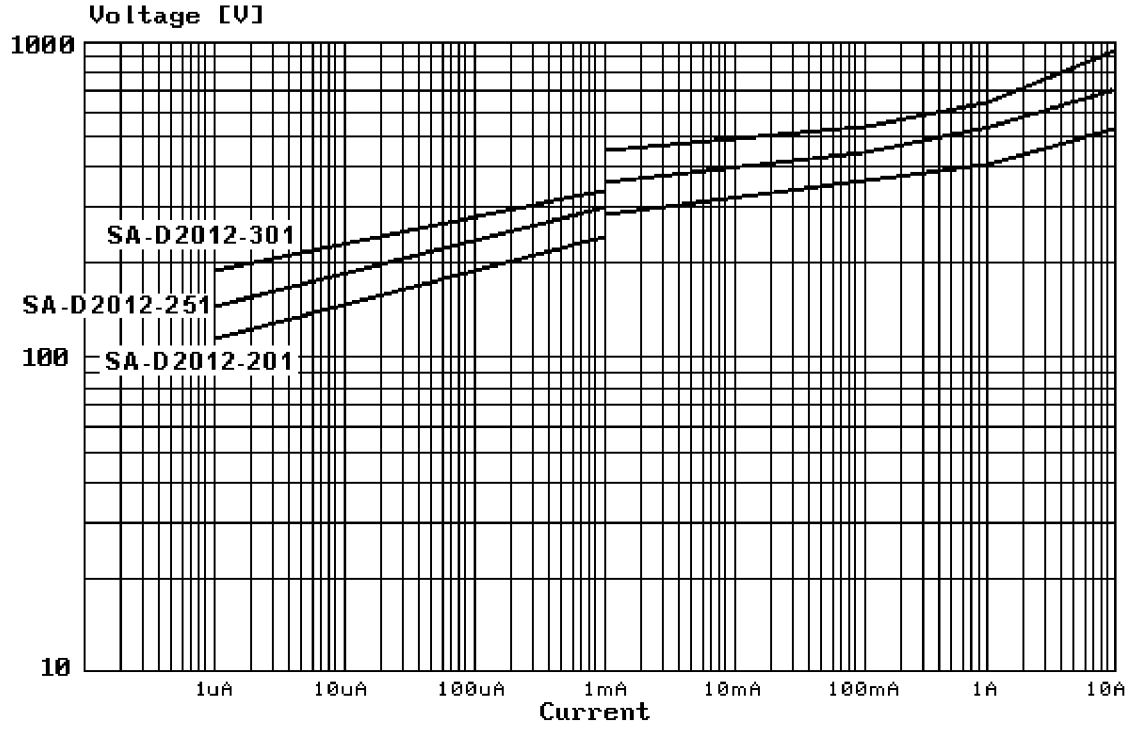
Multilayer Varistors - Chip Surge Absorbers

V - I Characteristic Curves

Chip Surge Absorbers

SA-D Series





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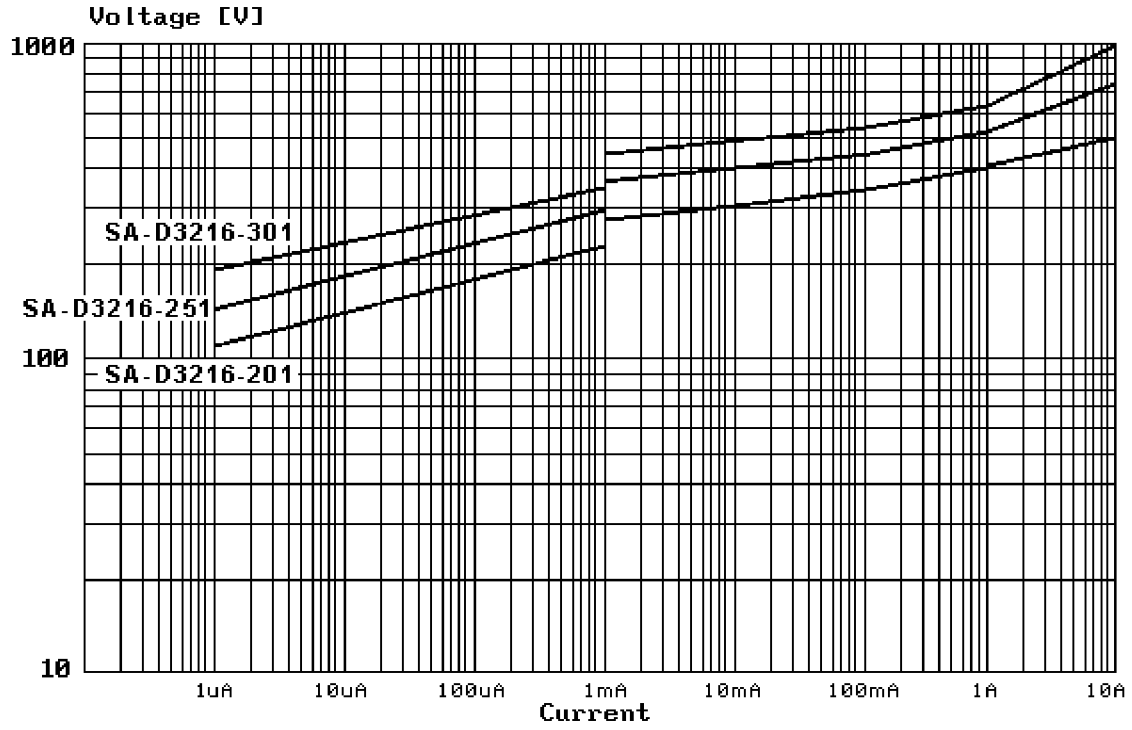
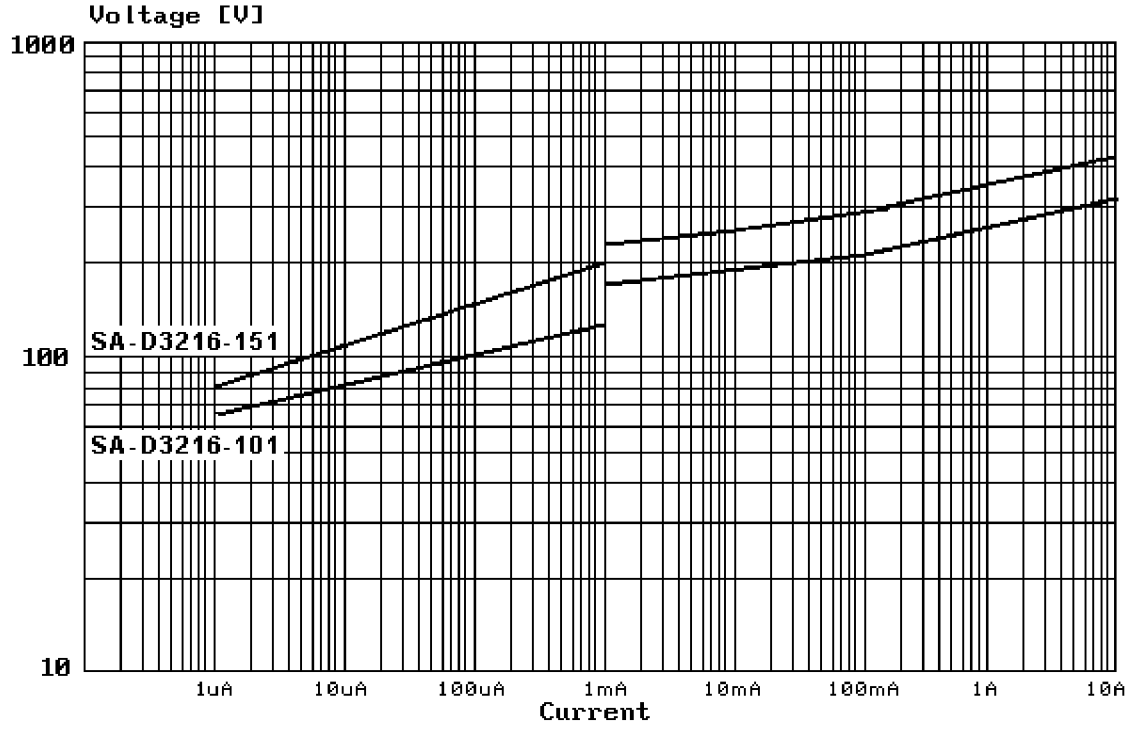
Multilayer Varistors - Chip Surge Absorbers

V - I Characteristic Curves

Chip Surge Absorbers

SA-D Series - (Continued)





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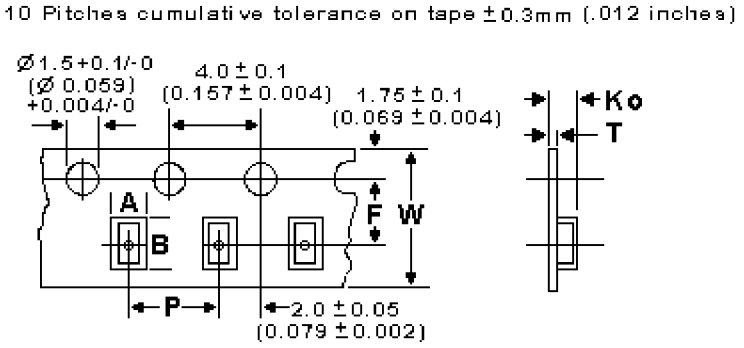
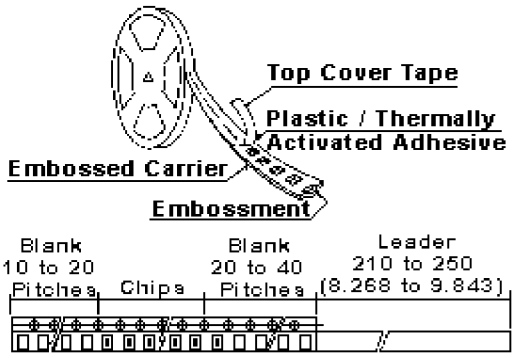
Multilayer Varistors - Tape and Reel Dimensions





Products	Type	A ± 0.1 (.004)	B ± 0.1 (.004)	P ± 0.1 (.004)	Ko ± 0.1 (.004)	T (Max.)	F ± 0.05 (.002)	W ± 0.3 (.012)
Taping Dimensions / 8mm (0.312 inches) wide								
Multilayer Varistors Chip Surge Absorbers	1608	1.00 (.040)	1.80 (.070)	2.00 (.080) 4.00 (.157)	0.95 (.037)	0.3 (.012)	3.5 (.138)	8.00 (.315)
	2012	1.45 (.057)	2.25 (.088)	4.00 (.157)	1.00 (.040)	0.3 (.012)	3.5 (.138)	8.00 (.315)
	3216	1.90 (.075)	3.60 (.142)	4.00 (.157)	1.35 (.053)	0.3 (.012)	3.5 (.138)	8.00 (.315)

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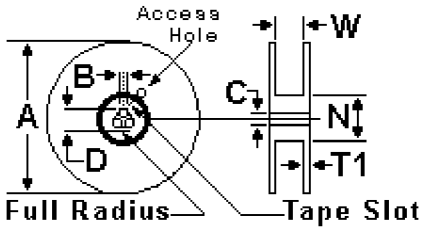
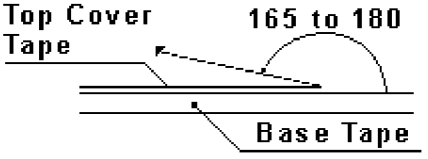
Multilayer Varistors - Tape and Reel Dimensions

Reel Dimensions

	Tolerance ±		Suffix L (10" Reel)		Suffix T (7" Reel)	
	mm	in	mm	in	mm	in
A	2.0	(.0079)	254	(10.0)	178	(7.01)
B	0.8	(.031)	2.0	(.079)	2.0	(.079)
C	0.5	(.020)	13.0	(.512)	13.0	(.512)
D	0.8	(.031)	21.0	(.827)	21.0	(.827)
N	Min	Min	50.0	(1.97)	50.0	(1.97)
T1	Max	Max	< 1.5	< (0.059)	< 1.5	< (0.059)
EIA-481-1 Certified						
Type					W mm (inches)	
1608, 2012, 3216 - 8mm Tape Width					9.0 ± 0.3 (0.354 ± 0.012)	





- The Force for tearing off cover tape is 20 to 70 grams in the arrow direction.

Standard Quantity

Type - mm (in)	Reel Size	P/N Suffix	Pocket Pitch (P)*	Tape Width (W)*	Quantity
1608 - (0603)	7"	T	2 mm	8 mm	8,000
			4 mm		4,000
2012 - (0805)	7"	T	4 mm	8 mm	3,000
	10"	L			7,000
3216 - (1206)	7"	T	4 mm	8 mm	3,000
	10"	L			7,000

* = See Taping Dimensions previous page.

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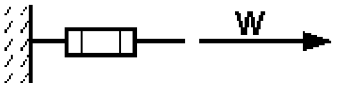
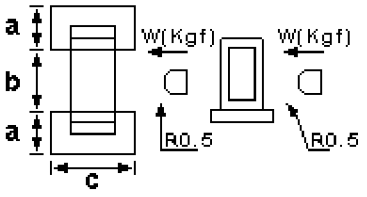
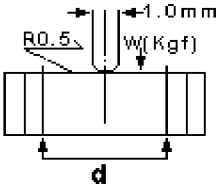
Multilayer Varistors - Chip Surge Absorbers

Reliability and Test Conditions

ITEM		REQUIREMENTS 1608	2012	3216	TEST CONDITIONS	
Operating temp. range		-55°C ~ +125°C			-	
Storage temp. range		-55°C ~ +125°C			-	
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. 3. Varistor voltage : ± within 5%			Preheat Temperature: Preheat time: Solder temperature: Dipping time:	100 to 150°C 1 min. 260 ± 10°C 10 ± 0.5 sec.
Solderability		More than 75% of the terminal electrode shall be covered with new solder.			Preheat Temperature: Preheat Time: Solder Temperature: Dipping Time:	100 to 150°C 1 min. 230 ± 10°C 3 ± 1 sec.
Tensile strength (Terminal strength)		1. The terminal electrode shall not be broken off nor the chip element				
	W	0.5	0.6	1	**W(Kgf) min**	
Flexture strength		1. No mechanical damage.				
	a	1.0	1.0	1.3		
	b	0.8	1.0	1.5		
	c	1.3	1.3	3.0		
	W	1.0	1.2	2.0	**(a, b, c: mm)**	
Bending strength		1. The ferrite shall not be damaged by forces applied on the right.				
	d	1.3	1.3	2.0		
	W	1.0	1.0	2.0	**(d: mm)**	
Drop		1. No mechanical damage. 2. Varistor Voltage : Within ± 5%			Dropped 10 times on a concrete floor from a height of 91cm (35.827 inches.)	
Vibration		1. No mechanical damage. 2. Varistor Voltage : Within ± 5%			Frequency: Amplitude: Direction and time:	10 ~ 55 ~ 10Hz 1.52 mm (.060 inches) X, Y and Z directions for 2 hours.

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Multilayer Varistors - Chip Surge Absorbers

Reliability and Test Conditions

ITEM	REQUIREMENTS 1608	2012	3216	TEST CONDITIONS	
Solvent resistance	1. No mechanical damage. 2. Varistor Voltage : Within ± 5%			Solvent:	Trichoroethane
				Washer:	Ultrasonic washer (100W)
				Washing time:	3 min.
Thermal shock (Temperature cycle)	1. No mechanical damage. 2. Varistor Voltage : Within ± 5%			Temperature:	-40°C, +85°C (-40°F, +185°F)
				Cycle:	30 minutes each, 100 cycles. Measured after being at room temperature for 24 hours.
Heat resistance (High-temp. load)	1. No mechanical damage. 2. Varistor Voltage : Within ± 5%			Temperature:	85 ± 2°C
				Time:	1000 ± 12 hours
				Applied Voltage:	Working Voltage Measured after being at room temperature for 24 hours.
Humidity Loading Test (humidity load)	1. No mechanical damage. 2. Varistor Voltage : Within ± 10%			Temperature:	40 ± 2°C
				Humidity:	90 to 95%RH
				Time:	500 ± 12 hours
				Applied Voltage:	Working Voltage
Humidity resistance	1. No mechanical damage. 2. Varistor Voltage : Within ± 5%			Temperature:	40 ± 2°C
				Humidity:	90 to 95%RH
				Time:	500 ± 12 hours Measured after being at room temperature for 24 hours.
Low temperature resistance	1. No mechanical damage. 2. Varistor Voltage : Within ± 5%			Temperature:	-40 ± 5°C
				Time:	500 ± 12 hours Measured after being at room temperature for 24 hours.