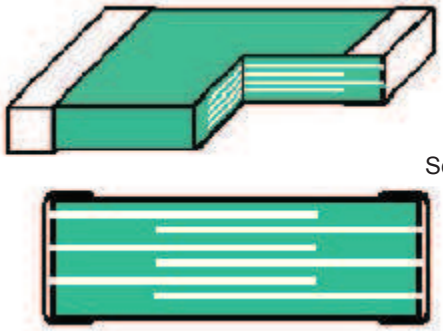
Introduction fo FPV Series Multilayer Chip Varistor

Multilayer Chip Varistors (MLV) are Transient Voltage Suppressors (TVS) which manufactured from semiconducting ceramics by the highly advanced multilayer formation technologies, which can offer rugged protection, excellent transient energy absorption and internal heat dissipation. The devices are leadless chip form, eliminating lead inductance and guaranteeing a faster speed of response time of less than 0.5ns, which makes them fast enough to ensure reliable protection against ESD pulse and other specific transient events. These transient suppression devices are significantly smaller footprints and lower profiles than traditional zener diodes or radial MOVs.

Multilayer Formation Technologies



Section of the chip

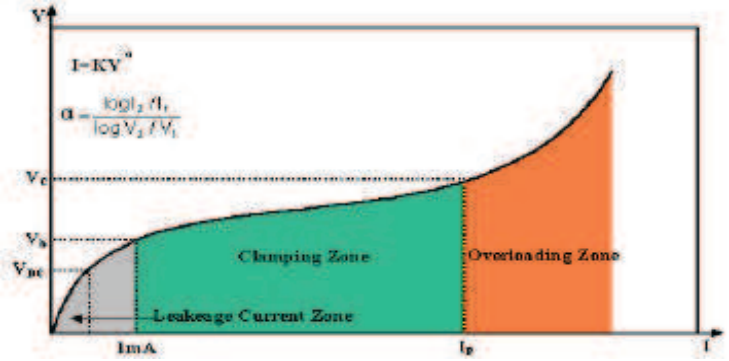
Features

- Multilayer Ceramic Construction Technology
- Leadless 1005[0402], 1608[0603], 2012[0805], 3216[1206], 3225[1210], 4532[1812], 8063[3225] and 1080[4032] Chip Size
- -55ºC to +125ºC Operating Temperature Range
- Operating Voltage Range Vw(DC) =3.3V to 615V
- Inherent Bi-directional Clamping
- Suitable for ESD Protection
- Very Low Leakage Current
- Low Inductance, Fast Response (Response time<0.5ns)
- Excellent Temperature Coefficient
- Good Solderability (The electrode termination is selectable in plated and silver /palladium/platinum.)

Information for Designer

Voltage Dependent Characteristic

Transient Voltage Suppressors (Varistors) are voltage-dependent electrical resistors with symmetrical V/I characteristic. Their resistance value decrease with increasing voltage, thus "short-circuiting" further rises in overvoltage.



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.

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 (Peak Current I_P)

This is the maximum peak current, which may be applied for an 8/20μ 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 (Es)

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

leakage (I_L) at Rated DC Voltage

In the no conducting mode, the device is at a very high impedance (approaching 10^9ohms) and appears as an almost open circuit in the system. The leakage current drawn at this level is very low (<50μ A 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 500μ A.

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.

Clamping Voltage (Vc)

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

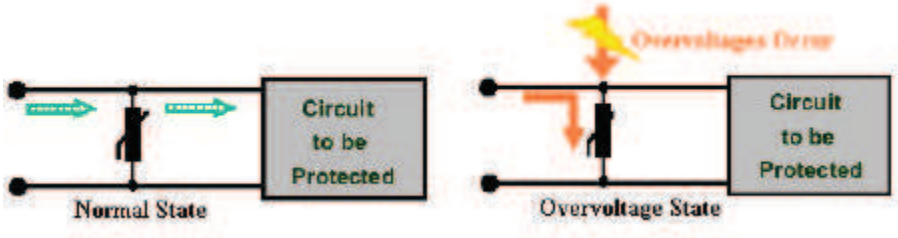
Capacitance (Cp)

This is the capacitance of the device at a specified frequency 1MHz and bias 0.5V

Application

The Prevention of Overvoltage

When the voltage increases above the threshold of MLV, the suppressor will draws a rapidly increasing current, and then the overvoltage is considerably attenuated away from the protection of the equipments should be supplemented by including specific components that will raise the withstand capabilities to the required level. Varistors provide protection against all kind of overvoltage and prevent electronic equipment from being damaged by transient events.



Specific Application

- Suppression of Inductive Switching or Other Transient Events Such as EFT and Surge Voltage at the Circuit Board Level.
- Protection of Components and Circuits Sensitive to ESD Transients Occurring on Power supplies, Control and Signal Lines.
- Provides On-Board Transient Voltage Protection for ICs, CMOS and MOSFET.
- Replace Larger Surface Mount TVS Zeners in Many Applications
- Used to Help Achieve Electromagnetic Compliance of End Products

Part Number Identification

Multilayer Chip Varistor

FPV	160808	G	3R3	P	M	T
①	②	③	④	⑤	⑥	⑦

① Product Code

FPV	Multilayer Chip Varistor

② Dimensions (L×W×T) (mm)

100505	1.0×0.5×0.5
160808	1.6×0.8×0.8
201209	2.0×1.2×0.9
321611	3.2×1.6×1.1
322513	3.2×2.5×1.3
453215	4.5×1.6×1.6
453225	4.5×3.2×2.5
8063	8.0×6.3
1080	10.2×8.0

③ Product Series

E	High energy absorb type
G	Genera type
S	High speed type

④ Working DC Voltage

3R3	3.3V
250	24V

⑤ Termination

P	Plated
S	Non-plated Pt/Pd/Ag

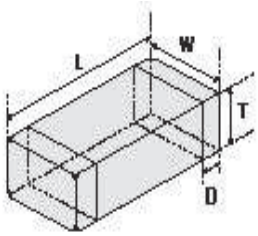
⑥ Tolerance

K	±10%
L	±15%
M	±20%

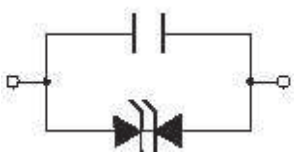
⑦ Packaging Style

T	Tape & Reel
B	Bulk

Shape And Dimensions & Equivalent circuit



Equivalent circuit



unit: mm(inch)

Part No.	L	W	T	D
100505 (0402)	1.0±0.15 (0.040±0.006)	0.5±0.15 (0.020±0.006)	0.5±0.15 (0.020±0.006)	0.25±0.10 (0.010±0.004)
160808 (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.8±0.2 (0.031±0.008)	0.3±0.2 (0.01±0.008)
201209 (0805)	2.0±0.2 (0.079±0.008)	1.2±0.2 (0.047±0.008)	0.9±0.2 (0.035±0.008)	0.5±0.3 (0.020±0.012)
201212 (0805)	2.0±0.2 (0.079±0.008)	1.2±0.2 (0.047±0.008)	1.2±0.2 (0.047±0.008)	0.5±0.3 (0.020±0.012)
321611 (1206)	3.2±0.2 (0.126±0.008)	1.6±0.2 (0.063±0.008)	1.1±0.2 (0.043±0.008)	0.5±0.3 (0.020±0.012)
321609 (1206)	3.2±0.2 (0.126±0.008)	1.6±0.2 (0.063±0.008)	0.9±0.2 (0.035±0.008)	0.5±0.3 (0.020±0.012)
322513 (1210)	3.2±0.2 (0.126±0.008)	2.5±0.2 (0.098±0.008)	1.3±0.2 (0.051±0.008)	0.5±0.3 (0.020±0.012)
451616 (1806)	4.5±0.2 (0.186±0.008)	1.6±0.2 (0.063±0.008)	1.6±0.2 (0.063±0.008)	0.5±0.3 (0.020±0.012)
453225 (1812)	4.5±0.2 (0.180±0.008)	3.2±0.2 (0.126±0.008)	2.5±0.2 (0.100±0.008)	0.5±0.3 (0.020±0.012)
8063	8.0±0.3 (0.3±0.012)	6.3±0.3 (0.250±0.012)	1.0~2.5 (0.050~0.100)	0.7±0.3 (0.028±0.012)
1080	10.2±0.3 (0.100±0.012)	8.0±0.3 (0.320±0.012)	1.0~2.5 (0.050~0.100)	0.7±0.3 (0.028±0.012)

Multilayer Chip Varistor Array

CAV	3216-4	G	3R3	P	M	T
①	②	③	④	⑤	⑥	⑦

①

Product Code	
CVA	Multilayer Chip Varistor Aarry

②

Dimensions (L×W×T) (mm)	
3216	3.2×1.6×0.9
2010	2.0×1.0×0.5

③

Product Series	
S	High Speed type
G	Genera type

④

Working DC Voltage	
3R3	3.3V
250	24V

⑤

Termination	
P	Plated
S	Non-plated Pt/Pd/Ag

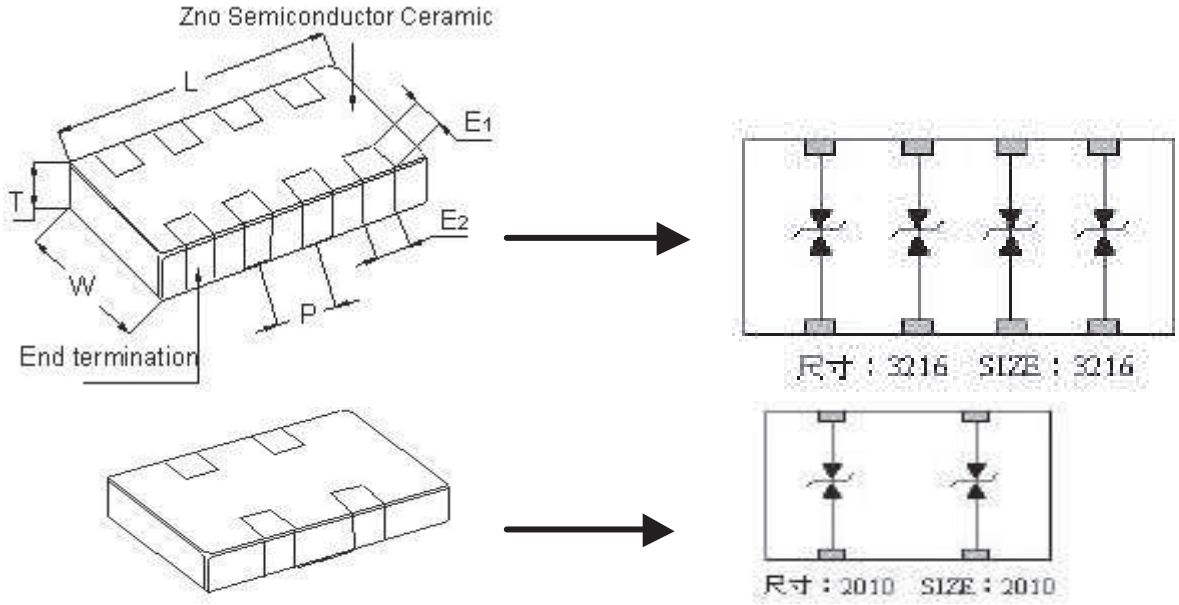
⑥

Tolerance	
K	±10%
L	±15%
M	±20%

⑦

Packaging Style	
T	Tape & Reel
B	Bulk

Shape And Dimensions & Equivalent circuit



unit：mm(inch)

Part No.	L	W	T	E_1	E_2	D
2010 (0804)	2.0±0.15 (0.079±0.008)	1.0±0.15 (0.039±0.006)	0.5±0.1 (0.035±0.008)	0.20+0.15/-0.1 (0.010+0.006/-0.004)	2.0±0.15 (0.079±0.006)	2.0±0.15 (0.079±0.006)
3216 (1206)	3.2±0.2 (0.126±0.008)	1.6±0.2 (0.063±0.008)	0.9±0.1 (0.035±0.008)	0.35±0.2 (0.014±0.008)	0.3±0.2 (0.012±0.008)	0.8±0.1 (0.031±0.004)

Specification

Multilayer Chip Varistor General Series

General Series is a major series of FPV Mulitlayer Chip Varistors (MLV), which can provide widely working voltage, high reliability and suppress varies transient event

- Protection from transient voltage noise in all kinds of IC
- Protection from ESD, EFT and surge in power I/O port
- Replacement of zener diode

1005 (0402) TYPE

1005 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV100505G3R3□M□	3.3	2.5	5	±20%	10	0.05	20	450
FPV100505G5R6□M□	5.6	4	8	±20%	15.5	0.05	20	360
FPV100505G8R0□M□	8	5.7	12	±20%	20	0.05	20	300
FPV100505G9R0□L□	9	6.4	13	±15%	20	0.05	20	230
FPV100505G110□L□	11	7.8	16	±15%	25	0.05	20	180
FPV100505G120□L□	12	8.5	18	±15%	25	0.05	20	150
FPV100505G140□L□	14	10	20	±15%	30	0.05	20	120
FPV100505G160□K□	16	11.3	22	±10%	35	0.05	20	100
FPV100505G180□K□	18	12.7	25	±10%	40	0.05	20	90

1608 (0603) TYPE

1608 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV160808G3R3□M□	3.3	2.5	5	±20%	10	0.1	30	1230
FPV160808G5R6□M□	5.6	4	8	±20%	15.5	0.1	30	825
FPV160808G8R0□M□	8	5.7	12	±20%	20	0.1	30	600
FPV160808G9R0□L□	9	6.4	13	±15%	20	0.1	30	550
FPV160808G110□L□	11	7.8	16	±15%	25	0.1	30	500
FPV160808G120□L□	12	8.5	18	±15%	25	0.1	30	480
FPV160808G140□L□	14	10	20	±15%	30	0.1	30	430
FPV160808G160□K□	16	11.3	22	±10%	35	0.1	30	300
FPV160808G180□K□	18	12.7	25	±10%	40	0.1	30	230
FPV160808G220□K□	22	15.6	30	±10%	50	0.1	30	180
FPV160808G240□K□	24	17	33	±10%	54	0.1	30	170
FPV160808G260□K□	26	18.4	36	±10%	58	0.1	30	160
FPV160808G300□K□	30	21.2	42	±10%	65	0.1	30	150

2012 (0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV2012□G3R3□M□	3.3	2.5	5	±20%	10	0.1	40	930
FPV2012□G5R6□M□	5.6	4	8	±20%	15.5	0.1	40	860
FPV2012□G8R0□M□	8	5.7	12	±20%	20	0.1	40	620
FPV2012□G9R0□L□	9	6.4	13	±15%	20	0.1	40	580
FPV2012□G110□L□	11	7.8	16	±15%	25	0.1	35	500
FPV2012□G120□L□	12	8.5	18	±15%	25	0.1	35	450
FPV2012□G140□L□	14	10	20	±15%	30	0.1	35	400
FPV2012□G160□K□	16	11.3	22	±10%	35	0.1	35	300
FPV2012□G180□K□	18	12.7	25	±10%	40	0.1	35	280
FPV2012□G220□K□	22	15.6	30	±10%	50	0.1	35	220
FPV2012□G240□K□	24	17	33	±10%	54	0.1	35	180
FPV2012□G260□K□	26	18.4	36	±10%	58	0.1	35	110
FPV2012□G300□K□	30	21.2	42	±10%	65	0.1	35	80

3216 (1206) TYPE

3216 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV3216□G3R3□M□	3.3	2.5	5	±20%	10	0.1	40	1500
FPV3216□G5R6□M□	5.6	4	8	±20%	15.5	0.1	40	870
FPV3216□G8R0□M□	8	5.7	12	±20%	20	0.1	40	650
FPV3216□G9R0□L□	9	6.4	13	±15%	20	0.1	40	630
FPV3216□G110□L□	11	7.8	16	±15%	25	0.1	35	600
FPV3216□G120□L□	12	8.5	18	±15%	25	0.1	35	560
FPV3216□G140□L□	14	10	20	±15%	30	0.1	35	500
FPV3216□G160□K□	16	11.3	22	±10%	35	0.1	35	450
FPV3216□G180□K□	18	12.7	25	±10%	40	0.1	35	400
FPV3216□G220□K□	22	15.6	30	±10%	50	0.1	35	300
FPV3216□G240□K□	24	17	33	±10%	54	0.1	35	270
FPV3216□G260□K□	26	18.4	36	±10%	58	0.1	35	250
FPV3216□G300□K□	30	21.2	42	±10%	65	0.1	35	225
FPV3216□G330□K□	33	23.3	45	±10%	72	0.1	35	200
FPV3216□G380□K□	38	27	51	±10%	77	0.1	35	150
FPV3216□G420□K□	42	30	56	±10%	86	0.1	35	120
FPV3216□G480□K□	48	34	62	±10%	100	0.1	35	90
FPV3216□G560□K□	56	40	72	±10%	110	0.1	35	80
FPV3216□G600□K□	60	45	76	±10%	120	0.1	35	70
FPV3216□G680□K□	68	48	86	±10%	130	0.1	35	60

Multlayer Chip Varistor High Energy Absorb Series

High Energy Absorb Series is design to absorb the high energy transient voltage in circuit, which provide high rate current, highly energy absorb ability and fast response speed

Application

- Suppression of Inductive Switching or Other Transient Events Such as EFT and Surge Voltage at the Circuit Board Level.
- Protection of Components and Circuits Sensitive to ESD Transients Occurring on Power supplies, Control and Signal Lines.
- Provides On-Board Transient Voltage Protection for ICs, CMOS and MOSFET.
- Replace Larger Surface Mount TVS Zeners in Many Applications

2012 (0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV2012□E3R3□M□	3.3	2.5	5	±20%	14	0.3	120	4000
FPV2012□E5R6□M□	5.6	4	8	±20%	16	0.3	120	2400
FPV2012□E8R0□M□	8	5.7	12	±20%	24	0.3	120	1700
FPV2012□E9R0□L□	9	6.4	13	±15%	25	0.3	120	1500
FPV2012□E110□L□	11	7.8	16	±15%	27	0.3	120	1000
FPV2012□E120□L□	12	8.5	18	±15%	28	0.3	120	920
FPV2012□E140□L□	14	10	20	±15%	30	0.3	120	820
FPV2012□E160□K□	16	11.3	22	±10%	35	0.3	120	600
FPV2012□E180□K□	18	12.7	25	±10%	40	0.3	100	500
FPV2012□E220□K□	22	15.6	30	±10%	47	0.3	100	350
FPV2012□E240□K□	24	17	33	±10%	50	0.3	100	270
FPV2012□E260□K□	26	18.4	36	±10%	54	0.3	100	190
FPV2012□E300□K□	30	21.2	42	±10%	65	0.3	100	150

3216(1206) TYPE

3216 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV3216□E3R3□M□	3.3	2.5	5	±20%	14	0.4	150	3800
FPV3216□E5R6□M□	5.6	4	8	±20%	16	0.4	150	2300
FPV3216□E8R0□M□	8	5.7	12	±20%	24	0.4	150	1800
FPV3216□E9R0□L□	9	6.4	13	±15%	25	0.4	150	1700
FPV3216□E110□L□	11	7.8	16	±15%	27	0.4	150	1300
FPV3216□E120□L□	12	8.5	18	±15%	28	0.4	150	1200
FPV3216□E140□L□	14	10	20	±15%	30	0.4	150	900
FPV3216□E160□K□	16	11.3	22	±10%	35	0.4	150	780
FPV3216□E180□K□	18	12.7	25	±10%	40	0.4	150	635
FPV3216□E220□K□	22	15.6	30	±10%	47	0.4	150	550
FPV3216□E240□K□	24	17	33	±10%	50	0.4	150	500
FPV3216□E260□K□	26	18.4	36	±10%	54	0.4	120	450
FPV3216□E300□K□	30	21.2	42	±10%	65	0.4	120	400
FPV3216□E330□K□	33	23.3	45	±10%	72	0.4	120	350
FPV3216□E380□K□	38	27	51	±10%	77	0.4	120	300
FPV3216□E420□K□	42	30	56	±10%	86	0.4	120	250
FPV3216□E480□K□	48	34	62	±10%	100	0.4	120	185
FPV3216□E560□K□	56	40	72	±10%	110	0.4	120	165
FPV3216□E600□K□	60	45	76	±10%	120	0.4	120	150
FPV3216□E680□K□	68	48	86	±10%	130	0.4	120	135

3225(1210) TYPE

3225 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV3225□E180□K□	18	12.7	25	±10%	38	1.5	300	2400
FPV3225□E220□K□	22	15.6	30	±10%	47	1.5	300	2150
FPV3225□E240□K□	24	17	33	±10%	50	1.5	300	1980
FPV3225□E260□K□	26	18.4	36	±10%	54	1.5	280	1800
FPV3225□E300□K□	30	21.2	42	±10%	65	1.5	280	1860
FPV3225□E330□K□	33	23.3	45	±10%	70	1.5	280	1600
FPV3225□E380□K□	38	27	51	±10%	77	1.5	280	1300
FPV3225□E420□K□	42	30	56	±10%	90	1.5	280	1000
FPV3225□E480□K□	48	34	62	±10%	100	1.5	280	510
FPV3225□E560□K□	56	40	72	±10%	110	1.5	250	450
FPV3225□E600□K□	60	45	76	±10%	120	1.5	250	420
FPV3225□E680□K□	68	48	86	±10%	135	1.5	250	360

4532(1812) TYPE

4532 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV453215E180□K□	18	12.7	25	±10%	38	2.5	500	4500
FPV453215E220□K□	22	15.6	30	±10%	47	2.5	500	4000
FPV453215E240□K□	24	17	33	±10%	50	2.5	500	3500
FPV453215E260□K□	26	18.4	36	±10%	54	2.5	500	3000
FPV453215E300□K□	30	21.2	42	±10%	65	2.5	500	2500
FPV453215E330□K□	33	23.3	45	±10%	70	2.5	500	2200
FPV453215E380□K□	38	27	51	±10%	77	2.5	500	2000
FPV453215E420□K□	42	30	56	±10%	90	2.5	500	1800
FPV453215E480□K□	48	34	62	±10%	100	2.5	500	1500
FPV453215E560□K□	56	40	72	±10%	110	2.5	500	1000
FPV453215E600□K□	60	45	76	±10%	120	2.5	500	750
FPV453215E680□K□	68	48	86	±10%	135	2.5	500	500

8063(3225) TYPE

8063 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV8063E14□K□	14	11	18	±10%	36@1A	0.3	100	1750
FPV8063E18□K□	18	14	22	±10%	43@1A	0.4	100	1450
FPV8063E22□K□	22	17	27	±10%	53@1A	0.5	100	1200
FPV8063E26□K□	26	20	33	±10%	65@1A	0.6	100	980
FPV8063E31□K□	31	25	39	±10%	77@1A	0.7	100	850
FPV8063E38□K□	38	30	47	±10%	93@1A	0.9	100	720
FPV8063E45□K□	45	35	56	±10%	110@1A	1.1	100	620
FPV8063E56□K□	56	40	68	±10%	135@1A	1.3	100	520
FPV8063E65□K□	65	50	82	±10%	135@5A	1.8	400	300
FPV8063E85□K□	85	60	100	±10%	165@5A	2.2	400	250
FPV8063E100□K□	100	75	120	±10%	200@5A	2.5	400	210
FPV8063E125□K□	125	95	150	±10%	250@5A	3.4	400	135
FPV8063E150□K□	150	115	180	±10%	300@5A	3.6	400	110

8063 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV8063E170□K□	170	130	205	±10%	340@5A	4.2	400	100
FPV8063E180□K□	180	140	220	±10%	360@5A	4.5	400	95
FPV8063E200□K□	200	150	240	±10%	395@5A	4.9	400	90
FPV8063E225□K□	225	175	270	±10%	455@5A	5.6	400	75
FPV8063E300□K□	300	230	360	±10%	595@5A	7.2	400	60
FPV8063E320□K□	320	250	390	±10%	650@5A	8.2	400	55
FPV8063E350□K□	350	275	430	±10%	710@5A	8.6	400	50
FPV8063E385□K□	385	300	470	±10%	775@5A	9.6	400	45

1080(4032) TYPE

1080 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV1080E14□K□	14	11	18	±10%	36@2.5	0.8	250	2750
FPV1080E18□K□	18	14	22	±10%	43@2.5	0.9	250	2300
FPV1080E22□K□	22	17	27	±10%	53@2.5	1.1	250	1900
FPV1080E26□K□	26	20	33	±10%	65@2.5	1.3	250	1600
FPV1080E31□K□	31	25	39	±10%	77@2.5	1.6	250	1400
FPV1080E38□K□	38	30	47	±10%	93@2.5	2.0	250	1200
FPV1080E45□K□	45	35	56	±10%	110@2.5	2.5	250	1050
FPV1080E56□K□	56	40	68	±10%	135@2.5	3.0	250	900
FPV1080E65□K□	65	50	82	±10%	135@10A	4.2	1200	530
FPV1080E85□K□	85	60	100	±10%	165@10A	4.8	1200	480
FPV1080E100□K□	100	75	120	±10%	200@10A	5.9	1200	430
FPV1080E125□K□	125	95	150	±10%	250@10A	7.6	1200	260
FPV1080E150□K□	150	115	180	±10%	300@10A	8.4	1200	220
FPV1080E170□K□	170	130	205	±10%	340@10A	9.5	1200	200
FPV1080E180□K□	180	140	220	±10%	360@10A	10.0	1200	180
FPV1080E200□K□	200	150	240	±10%	395@10A	11.0	1200	170
FPV1080E225□K□	225	175	270	±10%	455@10A	13.0	1200	150
FPV1080E300□K□	300	230	360	±10%	595@10A	17.0	1200	115
FPV1080E320□K□	320	250	390	±10%	650@10A	19.0	1200	105
FPV1080E350□K□	350	275	430	±10%	710@10A	21.0	1200	95
FPV1080E385□K□	385	300	470	±10%	775@10A	23.0	1200	90
FPV1080E615□K□	615	460	750	±10%	1240@10A	36.0	1200	55

Remark: The working DC voltage of 8063 and 1080 part number are identified as: 18------18V 225-----225V

Multilayer Chip Varistor High Speed Series

The Multilayer High-Speed Series is a very low capacitance extension to the FPV family of Transient Voltage Suppressor available in 1005,1608 and 2012 surface mount chip.

The High Speed series provides protection from ESD and EFT in high speed data-line and other high frequency applications.

- Data, Diagnostic I/O Ports
- Universal Serial Bus (USB)
- Video & Audio Ports
- Portable/Hand-Held Products
- Mobile Communications/Cellular Phones
- Computer/DSP Products
- Industrial Instruments Including Medical

1005(0402) TYPE

1005 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV100505S3R3□M□	3.3	2.5	5	±20%	10	0.05	20	70
FPV100505S5R6□M□	5.6	4	8	±20%	15.5	0.05	20	45
FPV100505S8R0□M□	8	5.7	12	±20%	20	0.05	20	30
FPV100505S9R0□L□	9	6.4	13	±15%	20	0.05	20	26
FPV100505S110□L□	11	7.8	16	±15%	25	0.05	20	24
FPV100505S120□L□	12	8.5	18	±15%	25	0.05	20	20
FPV100505S140□L□	14	10	20	±15%	30	0.05	20	18
FPV100505S160□K□	16	11.3	22	±10%	35	0.05	20	15
FPV100505S180□K□	18	12.7	25	±10%	40	0.05	20	15

1608(0603) TYPE

1608 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV2012□S3R3□M□	3.3	2.5	5	±20%	10	0.05	20	220
FPV2012□S5R6□M□	5.6	4	8	±20%	15.5	0.05	20	140
FPV2012□S8R0□M□	8	5.7	12	±20%	20	0.05	20	100
FPV2012□S9R0□L□	9	6.4	13	±15%	20	0.05	20	90
FPV2012□S110□L□	11	7.8	16	±15%	25	0.05	20	70
FPV2012□S120□L□	12	8.5	18	±15%	25	0.05	20	60
FPV2012□S140□L□	14	10	20	±15%	30	0.05	20	55
FPV2012□S160□K□	16	11.3	22	±10%	35	0.05	20	50
FPV2012□S180□K□	18	12.7	25	±10%	40	0.05	20	45
FPV2012□S220□K□	22	15.6	30	±10%	50	0.05	20	40
FPV2012□S240□K□	24	17	33	±10%	54	0.05	20	35
FPV2012□S260□K□	26	18.4	36	±10%	58	0.05	20	30
FPV2012□S300□K□	30	21.2	42	±10%	65	0.05	20	25

2012(0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
FPV2012□S3R3□M□	3.3	2.5	5	±20%	10	0.05	20	220
FPV2012□S5R6□M□	5.6	4	8	±20%	15.5	0.05	20	140
FPV2012□S8R0□M□	8	5.7	12	±20%	20	0.05	20	100
FPV2012□S9R0□L□	9	6.4	13	±15%	20	0.05	20	90
FPV2012□S110□L□	11	7.8	16	±15%	25	0.05	20	70
FPV2012□S120□L□	12	8.5	18	±15%	25	0.05	20	60
FPV2012□S140□L□	14	10	20	±15%	30	0.05	20	55
FPV2012□S160□K□	16	11.3	22	±10%	35	0.05	20	50
FPV2012□S180□K□	18	12.7	25	±10%	40	0.05	20	45
FPV2012□S220□K□	22	15.6	30	±10%	50	0.05	20	40
FPV2012□S240□K□	24	17	33	±10%	54	0.05	20	35
FPV2012□S260□K□	26	18.4	36	±10%	58	0.05	20	30
FPV2012□S300□K□	30	21.2	42	±10%	65	0.05	20	25

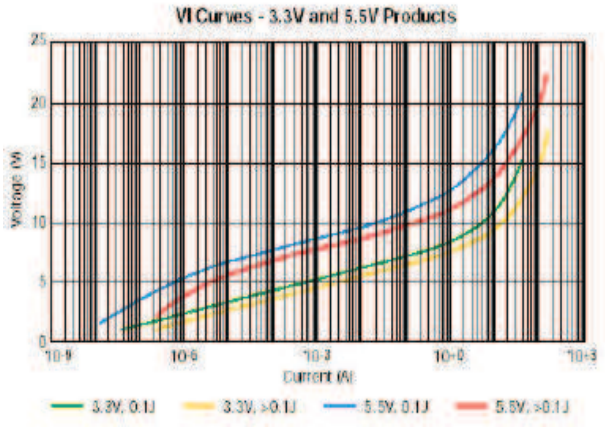
Multilayer Chip Varistor Array Electrical Characteristics Per Element

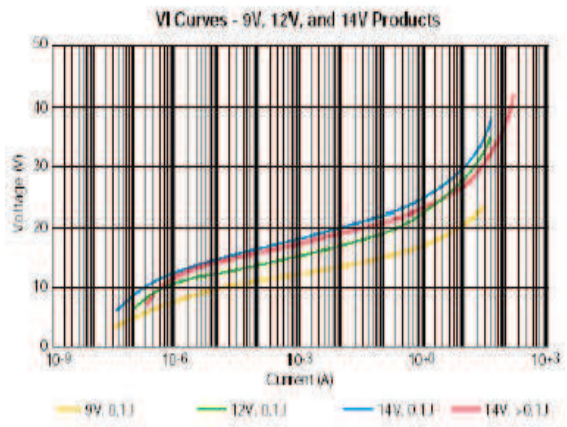
- Reduced component placement costs.
- Downsize PCB.
- Use in multiple lines for transient voltage suppression.

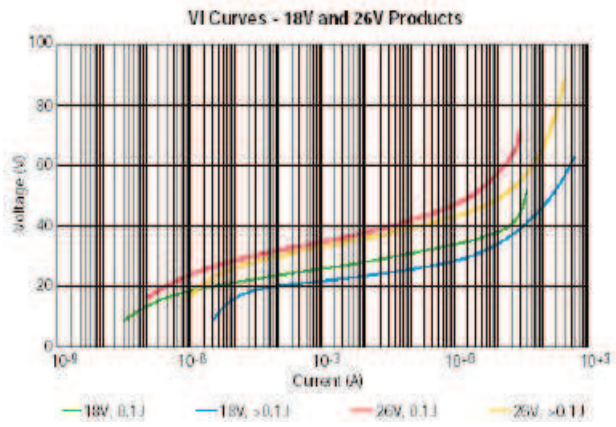
PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μs 1A	Energy Absorb 10/1000 μs	Peak Current 8/20 μs	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Volts	pF
CVA2010-2G5R6□M□	5.6	4	8	±20%	15.5	0.1	30	825
CVA2010-2G9R0□L□	9	6.4	12	±15%	20	0.1	30	550
CVA2010-2G140□L□	14	10	18	±15%	30	0.1	30	425
CVA2010-2G180□L□	18	12.7	24	±15%	40	0.1	30	225
CVA2010-2S180□L□	≤18	≤12.7	N/A		40	0.05	20	<75
CVA3216-4G5R6□M□	5.6	4	8	±20%	15.5	0.1	30	825
CVA3216-4G9R0□L□	9	6.4	12	±15%	20	0.1	30	550
CVA3216-4G140□L□	14	10	18	±15%	30	0.1	30	425
CVA3216-4G180□L□	18	12.7	24	±15%	40	0.1	30	225
CVA3216-4S180□L□	≤18	≤12.7	N/A		40	0.05	20	<75

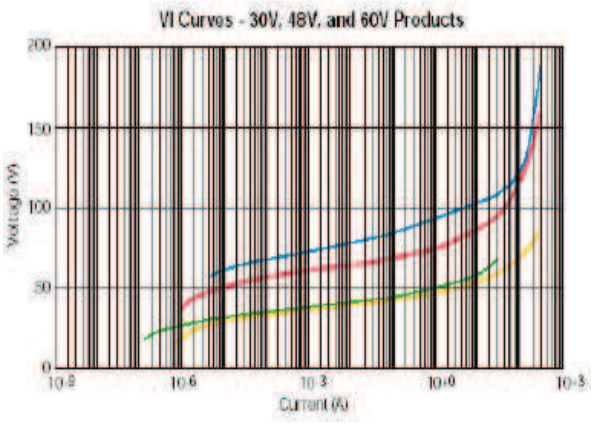
Characteristics

一、I-V curves

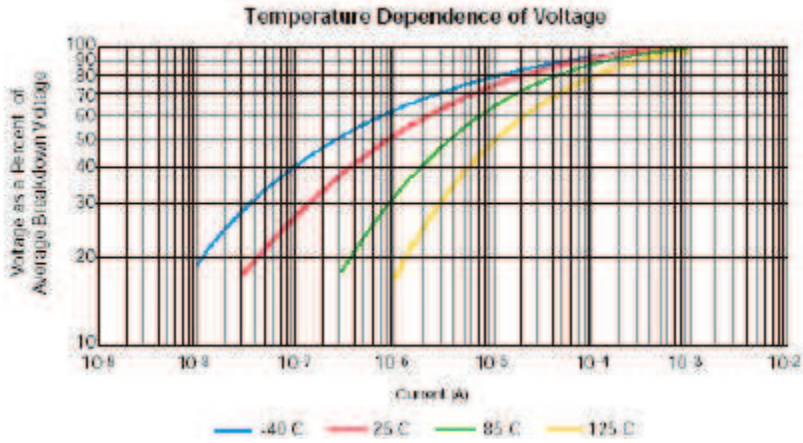




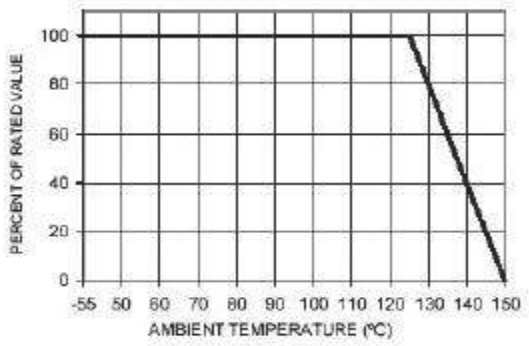


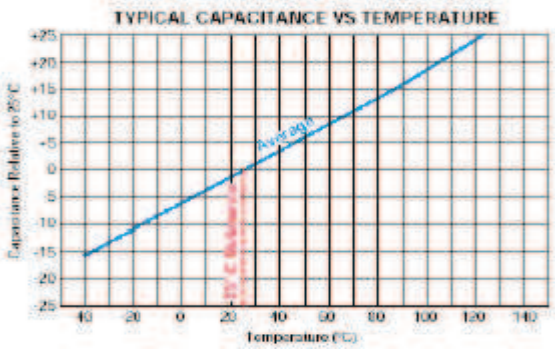


二、VB Vs. Temperature

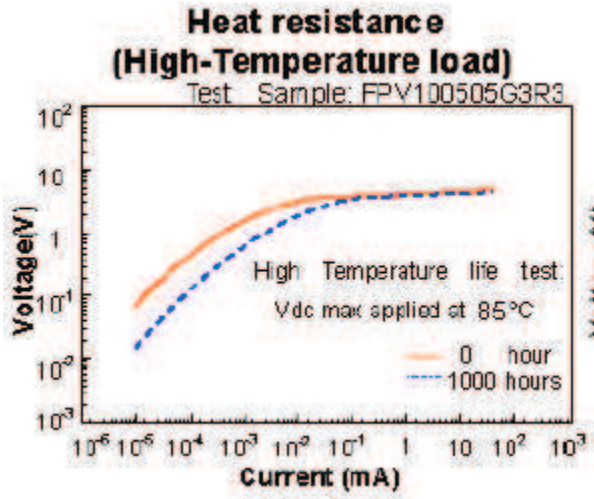


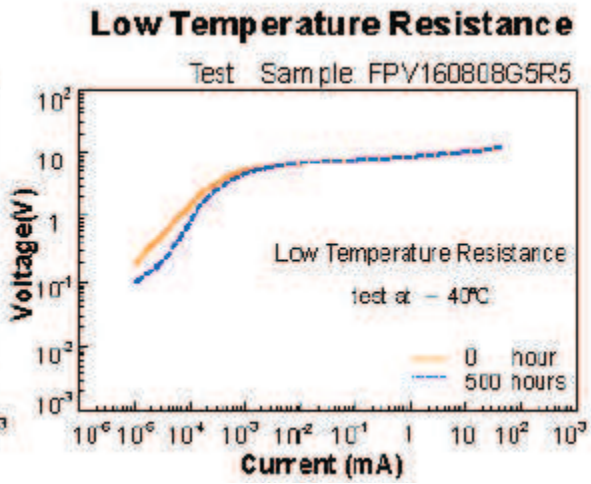
三、Energy and Capacitance Vs. Temperature

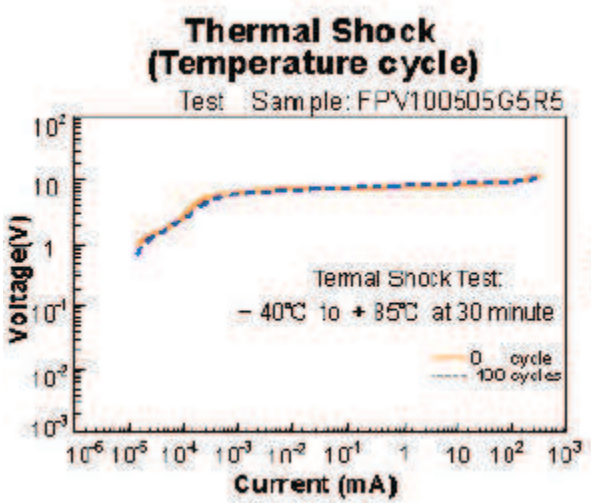


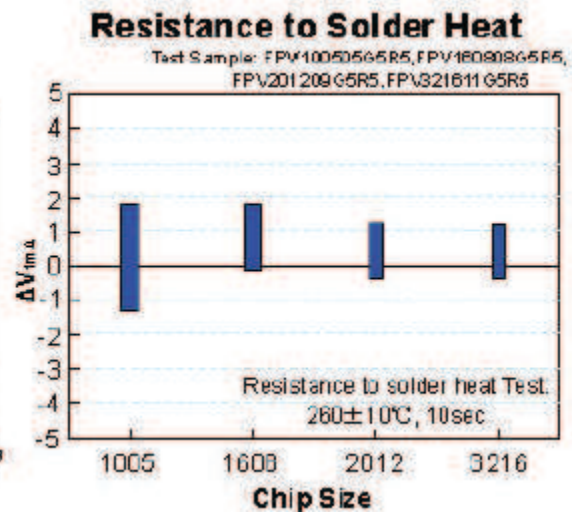


四、Reliability Test Data

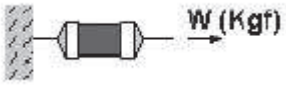


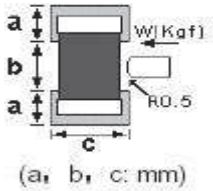


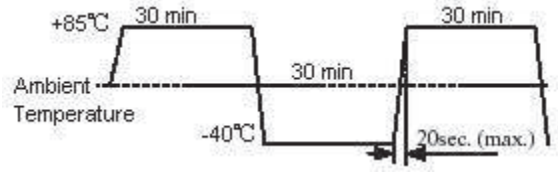


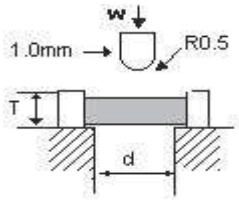


Reliability And Test Conditions

<table>
<tr><th rowspan="2">Type</th><th rowspan="2">Item</th><th colspan="4">Specified value</th><th rowspan="2">Test methods</th></tr>
<tr><th>1005</th><th>1608</th><th>2012</th><th>3216</th></tr>
<tr><td>1</td><td>Operating temperature range</td><td colspan="4">-55 to +125℃</td><td>-</td></tr>
<tr><td>2</td><td>Storage temperature range</td><td colspan="4">-55 to +125℃</td><td>-</td></tr>
<tr><td>3</td><td>Solderability</td><td colspan="4">At least 90% of terminal electrode is covered by new solder</td><td>Solder temperature: 230±10℃
Duration:3±1S
Preheating temperature: 100 to 150℃
Preheating time: 60S
Flux: immersion into methanol solution with colophony for 3 to 5 sec.</td></tr>
<tr><td>4</td><td>Resistance to soldering</td><td colspan="4">No damage such as crucks should be caused in chip element.
At least 75% of terminal electrode is covered by new solder
Varistor voltage change within ±10%</td><td>Solder temperature: 260±5℃
Duration: 10±0.5S
Preheating temperature: 100 to 150℃
Preheating time: 60S
Flux: immersion into methanol solution with colophony for 3 to 5 sec.</td></tr>
<tr><td rowspan="2">5</td><td rowspan="2">Terminal Strength</td><td colspan="4">The terminal electrode shall not be broken off nor the chip element.</td><td rowspan="2"> 

W (Kgf) min</td></tr>
<tr><td>W</td><td>0.4</td><td>0.5</td><td>0.6</td><td>1</td></tr>
<tr><td rowspan="5">6</td><td rowspan="5">Flextrue strength</td><td colspan="4">No mechanical damage.</td><td rowspan="5"> 

(a, b, c: mm)</td></tr>
<tr><td>A</td><td>0.45</td><td>1.0</td><td>1.0</td><td>1.3</td></tr>
<tr><td>B</td><td>0.5</td><td>0.8</td><td>1.0</td><td>1.5</td></tr>
<tr><td>C</td><td>0.5</td><td>1.3</td><td>1.3</td><td>3.0</td></tr>
<tr><td>D</td><td>0.8</td><td>1.0</td><td>1.2</td><td>2.0</td></tr>
<tr><td>7</td><td>Drop</td><td colspan="4">1、 No mechanical damage.
2、 Varistor voltage change within ±5%</td><td>Dropped 10 times on a concrete floor from a height of 1m.</td></tr>
<tr><td>8</td><td>Thermal shock</td><td colspan="4">1、 No mechanical damage.
2、Varistor voltage change within ±5%</td><td>Temperature: -40℃ for 30±3min
+85℃ for 30±3min
Transforming interval :max 20 sec
Number of cycles: 32
 
</td></tr>
<tr><td>9</td><td>Loading at low temperature</td><td colspan="4">1、 No mechanical damage.
2、 Varistor voltage change within ±5%.</td><td>Temperature: -40±2℃
Duration: 500 hrs</td></tr>
<tr><td>10</td><td>Loading at high temperature</td><td colspan="4">1、 No mechanical damage.
2、 Varistor voltage change within ±5%.</td><td>Temperature: 85±2℃
Duration: 1000±12hrs
Applied voltage: Working voltage</td></tr>
<tr><td>11</td><td>Loading under Damp Heat</td><td colspan="4">1、 No mechanical damage.
2、 Varistor voltage change within ±5%.</td><td>Temperature: 55±2℃
Duration: 500±12hrs
Humidity: 90 to 95%RH
Applied voltage: Working voltage</td></tr>
</table>

Type	Item	Specified value				Test methods
		1005	1608	2012	3216	
12	Humidity resistance	1、 No mechanical damage. 2、 Varistor voltage change within ±5%.				Temperature: 55±2℃ Duration: 500±12hrs Humidity: 90 to 95%RH
13	Vibration	1、 No mechanical damage. 2、 Varistor voltage change within ±5%.				Amplitude: 1.5mm Directions: 2hrs each in X Y Z direction Frequency range: 10 to 55 to 10Hz (min)
14	Resistance to pressure of substrate	The body shall not be damaged by forces applied on the right.				
		d	1.3	1.3	1.3	2.0
		w	1.0	2.0	3.0	4.0
15	Solvent resistance	1、No mechanical damage. 2、Varistor voltage change within ±5%.				Solvent : Trichoroethane Washer : ultrasonic washer Wash time : 3min

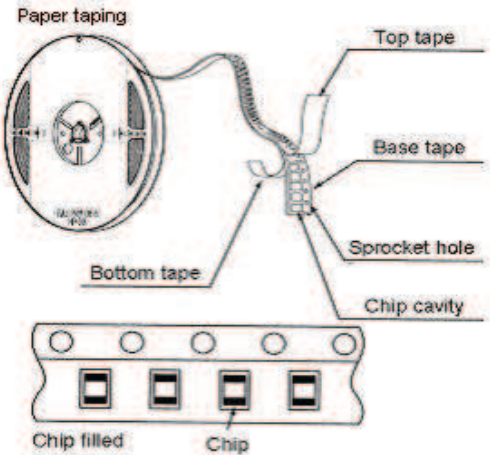
Note: When there are questions concerning, measurement shall be made after 24±2hrs of recovery under the standard condition.

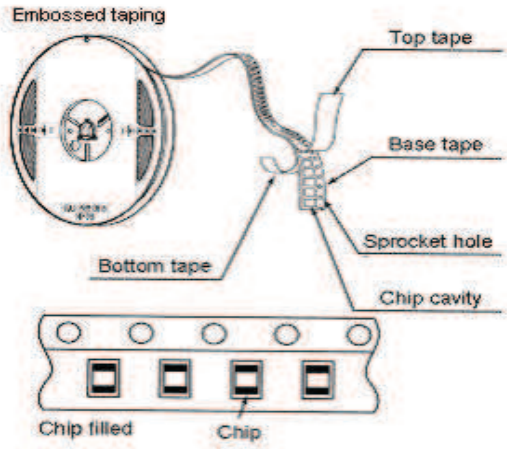
Packaging

STANDAE QUANTITY

TYPE	100505	160808	201209	321611	322513	451616	453215
Quantity(PCS)	10000	4000	4000	3000	3000	5000	3000

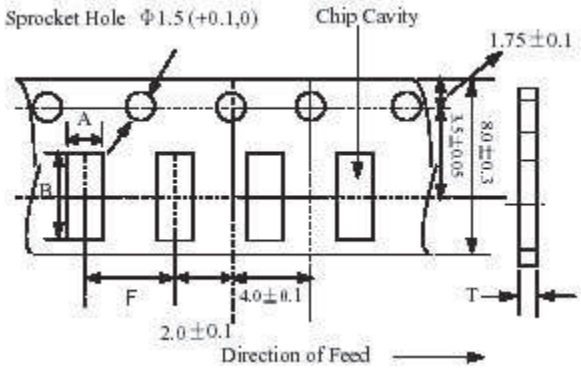
TAPING DRAWINGS





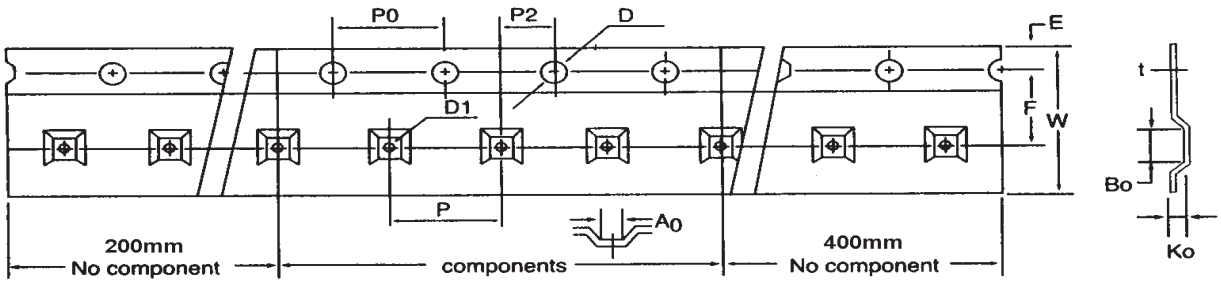
TAPING DIMENSIONS (UNIT: mm)

Paper tape



Part NO.	A	B	F	T
100505	0.65±0.1	1.15±0.1	2.0±0.05	0.8max
160808	1.0±0.2	1.8±0.2	4.0±0.2	1.1max
201209	1.5±0.2	2.3±0.2	4.0±0.2	1.1max

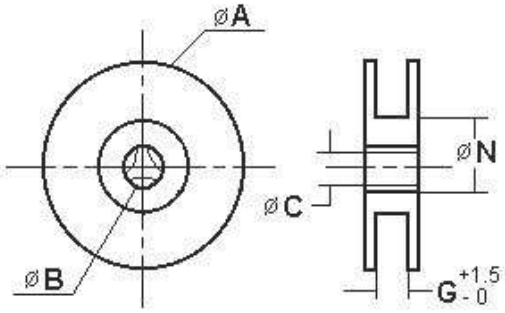
Embossed tape



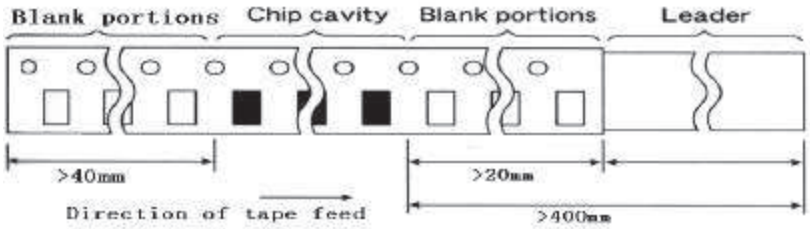
	4532	4516	3225	3216	2012
W	12.0+/-0.2	12.0+/-0.2	8.1+/-0.2	8.1+/-0.2	8.1+/-0.2
P	8.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10
E	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10
F	5.50+/-0.10	5.50+/-0.10	3.50+/-0.10	3.50+/-0.10	3.50+/-0.10
D	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05
D1	$1.50^{+0.25}_{-0}$	$1.50^{+0.25}_{-0}$	$1.50^{+0.25}_{-0}$	$1.50^{+0.25}_{-0}$	$1.50^{+0.25}_{-0}$
P_0	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10
$P_0$10	40.0+/-0.20	40.0+/-0.20	40.0+/-0.20	40.0+/-0.20	40.0+/-0.20
P2	2.0+/-0.05	2.0+/-0.05	2.0+/-0.05	2.0+/-0.05	2.0+/-0.05
A_0	3.66+/-0.10	1.93+/-0.10	2.80+/-0.10	1.90+/-0.10	1.52+/-0.10
B_0	4.95+/-0.10	4.95+/-0.10	3.50+/-0.10	3.51+/-0.10	2.41+/-0.10
t	0.23+/-0.10	0.23+/-0.10	0.23+/-0.10	0.23+/-0.10	0.23+/-0.10

REEL DIMENSIONS (UNIT : mm)

	A	B	C	N	G
CF-8	178 ±2.0	22.0 ±2.0	12.5 ±1.5	67 ±2.0	8
CF-12	330 ±2.0	22.0 ±2.0	12.5 ±1.5	110 ±2.0	12



LEADER AND BLANK PORTION



PEELING OFF FORCE : 0.05 to 0.7N in the direction show below.