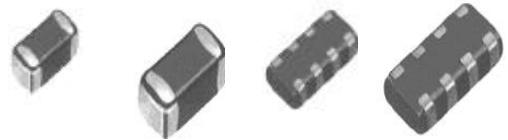


片式压敏电阻器 (MLV) Introduction fo FPV Series Multilayer Chip Varistor

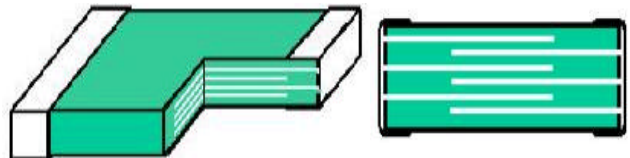


Multilayer Chip Varistors (MLV) are Transient Voltage Suppressors (TVS) which manufactured from semiconducting ceramics by the highly advanced multilayer formation technologies, which can offer rugged protection, excellent transient energy absorption and internal heat dissipation. The devices are leadless 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.

多层片式压敏电阻器 (MLV) 是一种浪涌电压抑制器。它是采用先进的叠层片式化技术制造的半导体陶瓷元件, 它能为被保护元件 (电路) 提供强有力的保护, 同时具有优良的浪涌能量吸收能力及内部散热能力。该元件是一种无引线的片式结构, 其寄生电感非常小、响应速度非常快 (响应时间<0.5ns), 因此它具有优良的ESD及各种浪涌噪声的抑制能力。与传统的齐纳二极管和圆片压敏电阻器相似, 具有体积小、重量轻、响应速度快的特点。



Multilayer Formation Technologies



Section of the chip

特征 Features

- Multilayer Ceramic Construction Technology
叠层片式陶瓷结构
- Leadless 1005[0402], 1608[0603], 2012[0805], 3216[1206], 3225[1210], 4532[1812], 8063[3225] and 1080[4032]
Chip Size
无引线, 产品尺寸1005[0402]、1608[0603]、2012[0805]、3216[1206]、3225[1210]、4532[1812]、8063[3225]和 1080[4032]
- -55°C to +125°C Operating Temperature Range
温度范围: - 55 ~ + 125
- Operating Voltage Range $V_w(\text{DC}) = 3.3\text{V to } 615\text{V}$
工作电压范围 $V_{w(\text{dc})} = 3.3 \sim 615\text{V}$
- Inherent Bi-directional Clamping
具有双向限制特性
- Suitable for ESD Protection
适合ESD保护
- Very Low Leakage Current
漏电流非常小
- Low Inductance, Fast Response (Response time<0.5ns)
寄生电感小、响应速度快 (响应时间<0.5ns)
- Excellent Temperature Coefficient
优良的温度系数
- Good Solderability (The electrode termination is selectable in plated and silver /palladium/platinum.)
良好的焊接性能 (端电极为三层电镀或银/钯/铂合金)

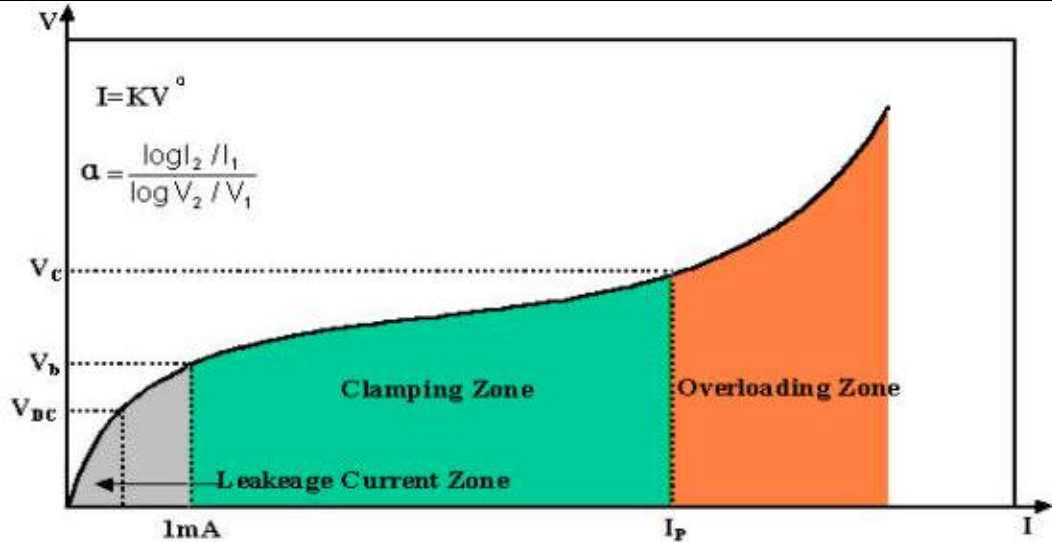
设计信息 Information for Designer

Voltage Dependent Characteristic 压敏特性

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.

叠层片式压敏电阻器是一种对电压敏感的电容器, 具有对称的伏安特性, 其阻值随着电压上升呈非线性下降, 当电压在一定范围内进一步上升时, 这种“短路”现象更加剧烈。



术语解释 Terms and Descriptions

Working DC Voltage (Vw(DC)) 直流工作电压

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.

在规定的条件下，保证压敏电阻器正常工作所允许连续施加的最大直流电压值，它作为测量漏电流的参考点，在此电压通常小于元件的压敏电压。

Working AC Voltage (Vw(AC)) 交流工作电压

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

在规定的条件下，保证压敏电阻器正常工作所允许连续施加的最大交流电压值。

Maximum Surge Current (Peak Current Ip) 最大浪涌电流

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.

在规定的脉冲波形（8/20μs）和相应的电压下，保证压敏电阻器正常工作所允许施加最大电流。这个脉冲可以施加在元件任意一端。

Maximum Surge Energy (Es) 最大的浪涌能量（能量耐量Es）

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.

在单个规定的脉冲波形（10/1000μs）下，保证压敏电阻器正常工作时，其所能承受的最大的脉冲能量。

leakage (IL) at Rated DC Voltage 漏电流 (IL)

In the no conducting mode, the device is at a very high impedance (approaching 10⁹ohms) 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.

在非传导模式下，该元件具有非常高的阻抗（接近10⁹Ω）在系统中呈开路状态，此时漏电流非常低（室温下<50μA），与齐纳二极管不同，叠层片式压敏电阻器具有低漏电流特性，在最高工作温度下，漏电流不超过500μA。

Varistor Voltage (Vb(DC)) 压敏电压

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.

该电压是压敏电阻器从开路状态进入导通状态的电压值，标称压敏电压通常为 1mA 直流电流所对应的电压。

Clamping Voltage (Vc) 限制电压

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

在规定脉冲波形（8/20μs）和电流下，元件两端产生的峰值电压，需要指出的是峰值电压和峰值电流的产生在时间上不一定一致。

Capacitance (Cp) 电容量

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

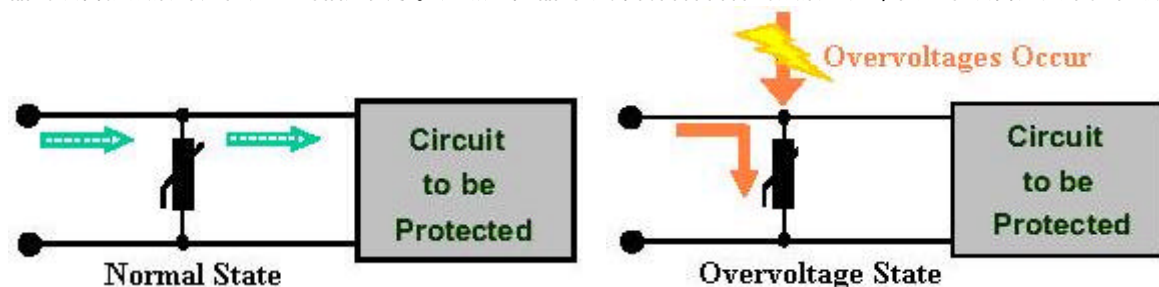
这是元件在规定频率（1MHz）和偏置电压（0.5V）下的电容量。

应用 Application

The Prevention of Overvoltage 防止过电压

When the voltage increases above the threshold of MLV, the suppressor will draw 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.

当施加的电压升高到压敏电压时，压敏电阻器的电流急剧上升，被保护设备的浪涌电压迅速减小，从而使装有压敏电阻器的设备抗浪涌噪声能力达到相应要求。压敏电阻器可以抑制各种各样的浪涌电压，使电子设备免受干扰和破坏



Specific Application 具体应用

- Suppression of Inductive Switching or Other Transient Events Such as EFT and Surge Voltage at the Circuit Board Level. 抑制各种感性负载切换或各种瞬间噪声在电路板中产生的EFT和浪涌电压。
- Protection of Components and Circuits Sensitive to ESD Transients Occurring on Power supplies, Control and Signal Lines. 保护元件和电路，防止在电源供应、控制和信号线产生的ESD。
- Provides On-Board Transient Voltage Protection for ICs, CMOS and MOSFET. 为IC、CMOS和MOSFET提供在线过压保护。
- Replace Larger Surface Mount TVS Zeners in Many Applications 在许多领域中可替换较大的表面贴装TVS齐纳二极管。
- Used to Help Achieve Electromagnetic Compliance of End Products 用于协助各种终端产品实现电磁兼容性。

产品规格型号的表示方法 Part Number Identification

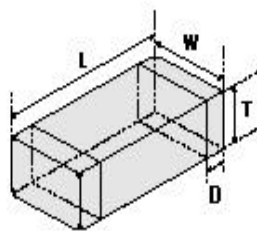
Multilayer Chip Varistor 片式压敏电阻器

FPV	160808	G	3R3	P	M	T
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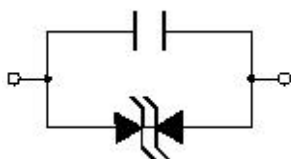
产品代号 Product Code		规格尺寸(L × W × T) (mm) Dimensions		产品系列 Product Series		直流工作电 压 Working DC Voltage		端头 Termina- tion		误差 Tolerance		包装方式 Packaging Style		
FPV	叠层片式 压敏电阻 器 Multilayer Chip Varistor	100505	1.0×0.5×0.5	E	高耐能型 High energy absorb type	-	3R3	3.3V	P	Plated	K	±10%	T	Tap e & Reel
		160808	1.6×0.8×0.8				L	±15%						
		201209	2.0×1.2×0.9				M	±20%						
		321611	3.2×1.6×1.1	S	通用型 General type		240	24V	S	Non-plated Pt/Pd/Ag			B	Bulk
		322513	3.2×2.5×1.3											
		453215	4.5×1.6×1.6											
		453225	4.5×3.2×2.5	G	高速型 High speed type									
		8063	8.0×6.3											
		1080	10.2×8.0											

外形尺寸及等效电路 Shape And Dimensions & Equivalent circuit

unit : mm(inch)



Equivalent circuit



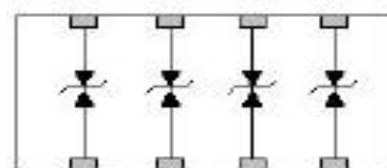
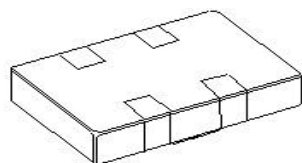
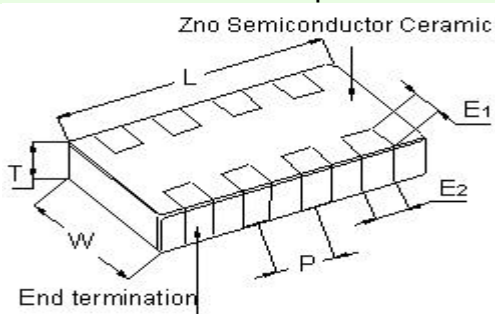
Part No.	L	W	T	D
100505 (0402)	1.0 ± 0.15 (0.040 ± 0.006)	0.5 ± 0.15 (0.020 ± 0.006)	0.5 ± 0.15 (0.020 ± 0.006)	0.25 ± 0.10 (0.010 ± 0.004)
160808 (0603)	1.6 ± 0.2 (0.063 ± 0.008)	0.8 ± 0.2 (0.031 ± 0.008)	0.8 ± 0.2 (0.031 ± 0.008)	0.3 ± 0.2 (0.01 ± 0.008)
201209 (0805)	2.0 ± 0.2 (0.079 ± 0.008)	1.2 ± 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)

片式压敏电阻排 Multilayer Chip Varistor Array

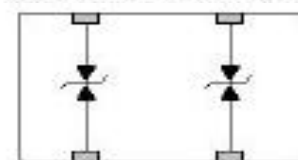
CAV 3216-4 G 3R3 P M T

产品代号 Product Code		规格尺寸(L × W × T) (mm) Dimensions		产品系列 Product Series		直流工作电压 Working DC Voltage		端头		误差 Tolerance		包装方式 Packaging Style	
CVA	Multilayer Chip Varistor Array	3216	3.2 × 1.6 × 0.9	S	高速型 High Speed type	3R3	3.3V	P	Plated	K	±10%	T	Tape & Reel
		2010	2.0 × 1.0 × 0.5			180	18V			L	±15%		
				G	通用型 General type			S	Non-plated Pt/Pd/Ag	M	±20%		

外形尺寸及等效电路 Shape And Dimensions & Equivalent circuit



尺寸 : 3216 SIZE : 3216



尺寸 : 2010 SIZE : 2010

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)

性能参数 Specification

Multilayer Chip Varistor General Series 片式压敏电阻器通用系列

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

通用系列是 FPV 片式压敏电阻器中主要的一种，其工作电压宽、可靠性高，应用非常广泛：

- Protection from transient voltage noise in all kinds of IC 为各种IC提供浪涌电压保护
- Protection from ESD, EFT and surge in power I/O port 为电源I/O接口提供ESD、EFT及浪涌保护
- Replacement of zener diode 替代齐纳二极管

1005 (0402) TYPE

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

1608 (0603) TYPE

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

2012 (0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V _B	Δ V _B	Volts	Joules	Amps	pF
FPV2012□G3R3□M□	3.3	2.5	5	$\pm 20\%$	10	0.1	40	930
FPV2012□G5R6□L□	5.6	4	8	$\pm 15\%$	15.5	0.1	40	860
FPV2012□G8R0□L□	8	5.7	12	$\pm 15\%$	20	0.1	40	620
FPV2012□G9R0□L□	9	6.4	13	$\pm 15\%$	20	0.1	40	580
FPV2012□G110□L□	11	7.8	16	$\pm 15\%$	25	0.1	35	500
FPV2012□G120□L□	12	8.5	18	$\pm 15\%$	25	0.1	35	450
FPV2012□G140□K□	14	10	20	$\pm 10\%$	30	0.1	35	400

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Amps	pF
FPV2012□G160□K□	16	11.3	22	$\pm 10\%$	35	0.1	35	300
FPV2012□G180□K□	18	12.7	25	$\pm 10\%$	40	0.1	35	280
FPV2012□G220□K□	22	15.6	30	$\pm 10\%$	50	0.1	35	220
FPV2012□G240□K□	24	17	33	$\pm 10\%$	54	0.1	35	180
FPV2012□G260□K□	26	18.4	36	$\pm 10\%$	58	0.1	35	110
FPV2012□G300□K□	30	21.2	42	$\pm 10\%$	65	0.1	35	80

3216 (1206) TYPE

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

Multilayer Chip Varistor High Energy Absorb Series 片式压敏电阻器高耐能系列

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

高耐能系列专为吸收电路中存在的能量较大的瞬态电压噪声而设计的，其通流量大，吸收功率大、响应速度快。

Application 应用

- Suppression of Inductive Switching or Other Transient Events Such as EFT and Surge Voltage at the Circuit Board Level.
抑制各种感性负载切换或各种瞬间噪声在电路板中产生的EFT和浪涌电压。
- Protection of Components and Circuits Sensitive to ESD Transients Occurring on Power supplies, Control and Signal Lines.
保护元件和电路，防止在电源供应、控制和信号线产生的ESD。
- Provides On-Board Transient Voltage Protection for ICs, CMOS and MOSFET.
为IC、CMOS和MOSFET提供在线过压保护。
- Replace Larger Surface Mount TVS Zeners in Many Applications
在许多领域中可替换较大的表面贴装TVS齐纳二极管。

2012 (0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V _B	Δ V _B	Volts	Joules	Amps	pF
FPV2012□E3R3□M□	3.3	2.5	5	± 20%	14	0.3	120	4000
FPV2012□E5R6□L□	5.6	4	8	± 15%	16	0.3	120	2400
FPV2012□E8R0□L□	8	5.7	12	± 15%	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□K□	14	10	20	± 10%	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 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V _B	Δ V _B	Volts	Joules	Amps	pF
FPV3216□E3R3□M□	3.3	2.5	5	± 20%	14	0.4	150	3800
FPV3216□E5R6□L□	5.6	4	8	± 15%	16	0.4	150	2300
FPV3216□E8R0□L□	8	5.7	12	± 15%	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□K□	14	10	20	± 10%	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

3216 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V _B	Δ V _B	Volts	Joules	Amps	pF
FPV3216□E330□K□	33	23.3	45	$\pm 10\%$	72	0.4	120	350
FPV3216□E380□K□	38	27	51	$\pm 10\%$	77	0.4	120	300
FPV3216□E420□K□	42	30	56	$\pm 10\%$	86	0.4	120	250
FPV3216□E480□K□	48	34	62	$\pm 10\%$	100	0.4	120	185
FPV3216□E560□K□	56	40	72	$\pm 10\%$	110	0.4	120	165
FPV3216□E600□K□	60	45	76	$\pm 10\%$	120	0.4	120	150
FPV3216□E680□K□	68	48	86	$\pm 10\%$	130	0.4	120	135

3225(1210) TYPE

3225 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 2.5A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V _B	Δ V _B	Volts	Joules	Amps	pF
FPV3225□E180□K□	18	12.7	25	$\pm 10\%$	38	1.5	300	2400
FPV3225□E220□K□	22	15.6	30	$\pm 10\%$	47	1.5	300	2150
FPV3225□E240□K□	24	17	33	$\pm 10\%$	50	1.5	300	1980
FPV3225□E260□K□	26	18.4	36	$\pm 10\%$	54	1.5	280	1800
FPV3225□E300□K□	30	21.2	42	$\pm 10\%$	65	1.5	280	1860
FPV3225□E330□K□	33	23.3	45	$\pm 10\%$	70	1.5	280	1600
FPV3225□E380□K□	38	27	51	$\pm 10\%$	77	1.5	280	1300
FPV3225□E420□K□	42	30	56	$\pm 10\%$	90	1.5	280	1000
FPV3225□E480□K□	48	34	62	$\pm 10\%$	100	1.5	280	510
FPV3225□E560□K□	56	40	72	$\pm 10\%$	110	1.5	250	450
FPV3225□E600□K□	60	45	76	$\pm 10\%$	120	1.5	250	420
FPV3225□E680□K□	68	48	86	$\pm 10\%$	135	1.5	250	360

4532(1812) TYPE

4532 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 5A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V _B	Δ V _B	Volts	Joules	Amps	pF
FPV453215E180□K□	18	12.7	25	$\pm 10\%$	38	2.5	500	4500
FPV453215E220□K□	22	15.6	30	$\pm 10\%$	47	2.5	500	4000
FPV453215E240□K□	24	17	33	$\pm 10\%$	50	2.5	500	3500
FPV453215E260□K□	26	18.4	36	$\pm 10\%$	54	2.5	500	3000
FPV453215E300□K□	30	21.2	42	$\pm 10\%$	65	2.5	500	2500
FPV453215E330□K□	33	23.3	45	$\pm 10\%$	70	2.5	500	2200
FPV453215E380□K□	38	27	51	$\pm 10\%$	77	2.5	500	2000
FPV453215E420□K□	42	30	56	$\pm 10\%$	90	2.5	500	1800
FPV453215E480□K□	48	34	62	$\pm 10\%$	100	2.5	500	1500
FPV453215E560□K□	56	40	72	$\pm 10\%$	110	2.5	500	1000
FPV453215E600□K□	60	45	76	$\pm 10\%$	120	2.5	500	750
FPV453215E680□K□	68	48	86	$\pm 10\%$	135	2.5	500	500

8063(3225) TYPE

8063 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Amps	pF
FPV8063E14□K□	14	11	18	$\pm 10\%$	36@1A	0.3	100	1750
FPV8063E18□K□	18	14	22	$\pm 10\%$	43@1A	0.4	100	1450
FPV8063E22□K□	22	17	27	$\pm 10\%$	53@1A	0.5	100	1200
FPV8063E26□K□	26	20	33	$\pm 10\%$	65@1A	0.6	100	980
FPV8063E31□K□	31	25	39	$\pm 10\%$	77@1A	0.7	100	850
FPV8063E38□K□	38	30	47	$\pm 10\%$	93@1A	0.9	100	720
FPV8063E45□K□	45	35	56	$\pm 10\%$	110@1A	1.1	100	620
FPV8063E56□K□	56	40	68	$\pm 10\%$	135@1A	1.3	100	520
FPV8063E65□K□	65	50	82	$\pm 10\%$	135@5A	1.8	400	300
FPV8063E85□K□	85	60	100	$\pm 10\%$	165@5A	2.2	400	250
FPV8063E100□K□	100	75	120	$\pm 10\%$	200@5A	2.5	400	210
FPV8063E125□K□	125	95	150	$\pm 10\%$	250@5A	3.4	400	135
FPV8063E150□K□	150	115	180	$\pm 10\%$	300@5A	3.6	400	110
FPV8063E170□K□	170	130	205	$\pm 10\%$	340@5A	4.2	400	100
FPV8063E180□K□	180	140	220	$\pm 10\%$	360@5A	4.5	400	95
FPV8063E200□K□	200	150	240	$\pm 10\%$	395@5A	4.9	400	90
FPV8063E225□K□	225	175	270	$\pm 10\%$	455@5A	5.6	400	75
FPV8063E300□K□	300	230	360	$\pm 10\%$	595@5A	7.2	400	60
FPV8063E320□K□	320	250	390	$\pm 10\%$	650@5A	8.2	400	55
FPV8063E350□K□	350	275	430	$\pm 10\%$	710@5A	8.6	400	50
FPV8063E385□K□	385	300	470	$\pm 10\%$	775@5A	9.6	400	45

1080(4032) TYPE

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

片式压敏电阻器高速系列

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.

高速系列片式压敏电阻器是FPV电压保护元件中的一族，其容量非常低反应速度非常快。

高速系列产品为高速数据线和其它高频领域提供ESD和EFT保护

- Data, Diagnostic I/O Ports 数据、诊断I/O接口
- Universal Serial Bus (USB) 通用串行总线 (USB)
- Video & Audio Ports 视频和音频接口
- Portable/Hand-Held Products 便携式手提设备
- Mobile Communications/Cellular Phones 移动通信/蜂窝电话
- Computer/DSP Products 计算机/DSP产品
- Industrial Instruments Including Medical 工业及医学仪器

1005(0402) TYPE

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

1608(0603) TYPE

1608 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Amps	pF
FPV160808S3R3□M□	3.3	2.5	5	$\pm 20\%$	10	0.05	20	180
FPV160808S5R6□L□	5.6	4	8	$\pm 15\%$	16	0.05	20	110
FPV160808S8R0□L□	8	5.7	12	$\pm 15\%$	20	0.05	20	80
FPV160808S9R0□L□	9	6.4	13	$\pm 15\%$	20	0.05	20	70
FPV160808S110□L□	11	7.8	16	$\pm 15\%$	25	0.05	20	60
FPV160808S120□L□	12	8.5	18	$\pm 15\%$	25	0.05	20	55
FPV160808S140□K□	14	10	20	$\pm 10\%$	30	0.05	20	50
FPV160808S160□K□	16	11.3	22	$\pm 10\%$	35	0.05	20	45
FPV160808S180□K□	18	12.7	25	$\pm 10\%$	40	0.05	20	40
FPV160808S220□K□	22	15.6	30	$\pm 10\%$	50	0.05	20	30
FPV160808S240□K□	24	17	33	$\pm 10\%$	54	0.05	20	25
FPV160808S260□K□	26	18.4	36	$\pm 10\%$	58	0.05	20	25
FPV160808S300□K□	30	21.2	42	$\pm 10\%$	65	0.05	20	20

2012(0805) TYPE

2012 PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Amps	pF
FPV201209S3R3□M□	3.3	2.5	5	$\pm 20\%$	10	0.05	20	220
FPV201209S5R6□L□	5.6	4	8	$\pm 15\%$	15.5	0.05	20	140
FPV201209S8R0□L□	8	5.7	12	$\pm 15\%$	20	0.05	20	100
FPV201209S9R0□L□	9	6.4	13	$\pm 15\%$	20	0.05	20	90
FPV201209S110□L□	11	7.8	16	$\pm 15\%$	25	0.05	20	70
FPV201209S120□L□	12	8.5	18	$\pm 15\%$	25	0.05	20	60
FPV201209S140□K□	14	10	20	$\pm 10\%$	30	0.05	20	55
FPV201209S160□K□	16	11.3	22	$\pm 10\%$	35	0.05	20	50
FPV201209S180□K□	18	12.7	25	$\pm 10\%$	40	0.05	20	45
FPV201209S220□K□	22	15.6	30	$\pm 10\%$	50	0.05	20	40
FPV201209S240□K□	24	17	33	$\pm 10\%$	54	0.05	20	35
FPV201209S260□K□	26	18.4	36	$\pm 10\%$	58	0.05	20	30
FPV201209S300□K□	30	21.2	42	$\pm 10\%$	65	0.05	20	25

Multilayer Chip Varistor Array Electrical Characteristics Per Element

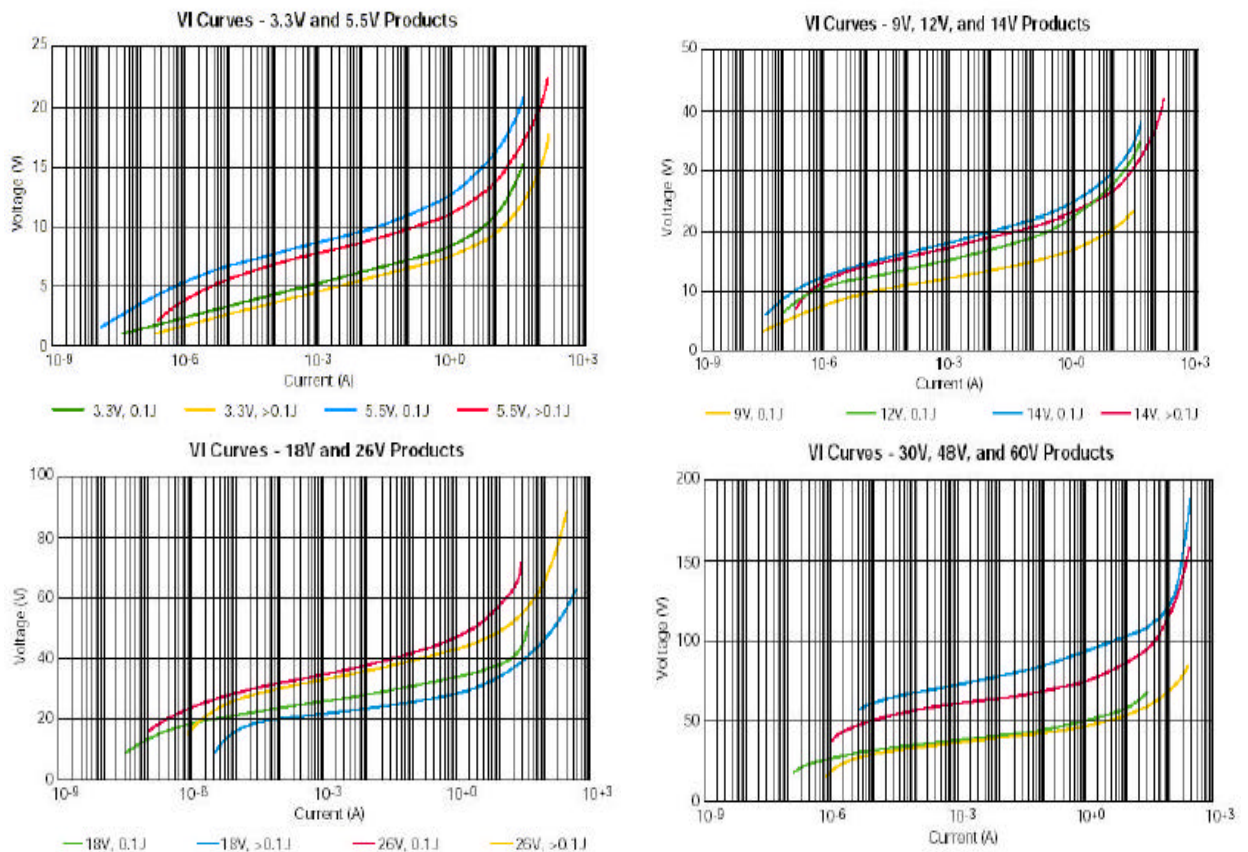
片式压敏电阻排单片电性能

- Reduced component placement costs. 所占空间更小，
- Downsize PCB. 减少PCB板面积，
- Use in multiple lines for transient voltage suppression. 用于多线浪涌电压抑制。

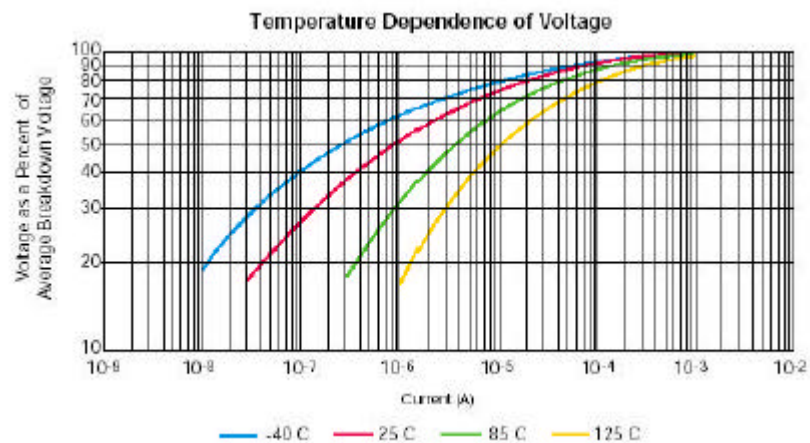
PART Number	Working voltage		Varistor voltage @1mA DC		Maximum Clamping Voltage 8/20 μ s 1A	Energy Absorb 10/1000 μ s	Peak Current 8/20 μ s	Typical Capacitance @1MHz
	DC	AC						
	Volts	Volts	V_B	ΔV_B	Volts	Joules	Amps	pF
CVA2010-2G5R6□M□	5.6	4	8	$\pm 20\%$	15.5	0.1	30	825
CVA2010-2G9R0□L□	9	6.4	12	$\pm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

电气性能 Characteristics

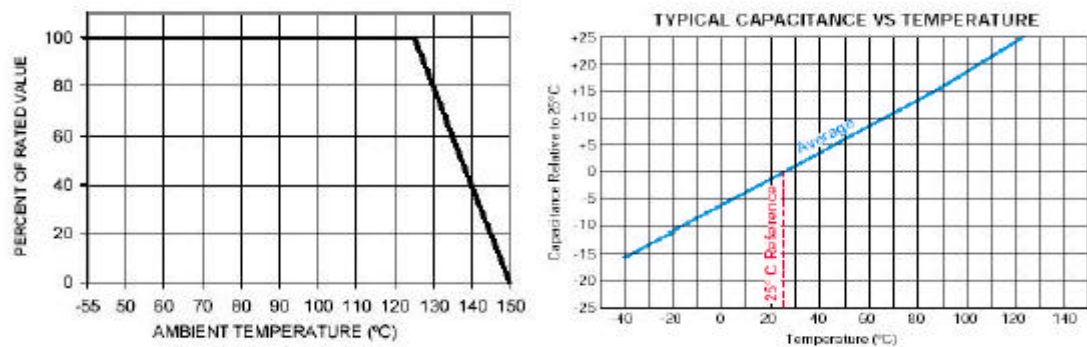
一、I-V curves



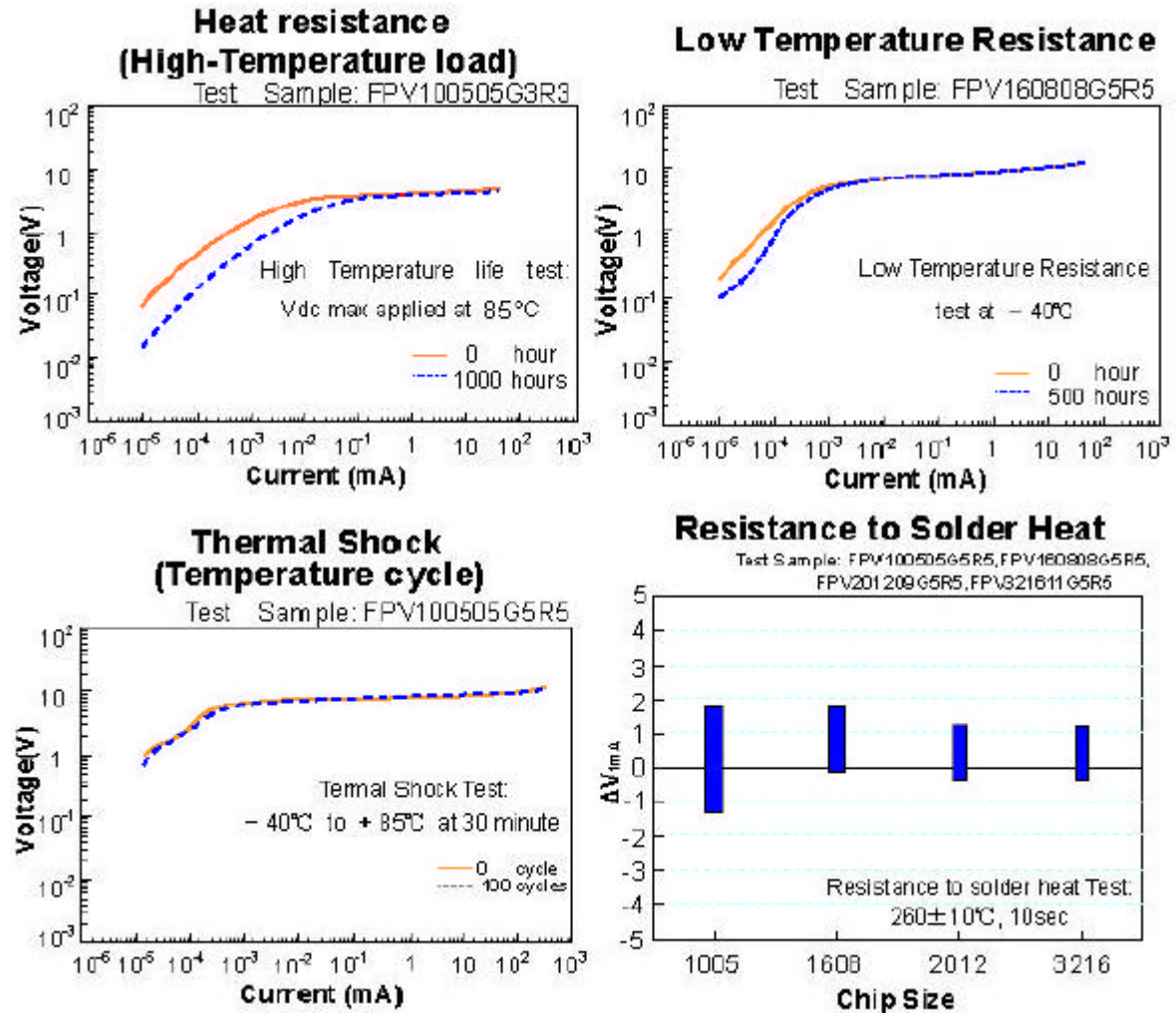
二、VB Vs. Temperature



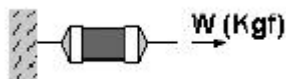
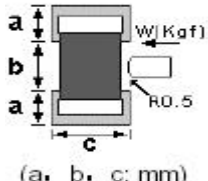
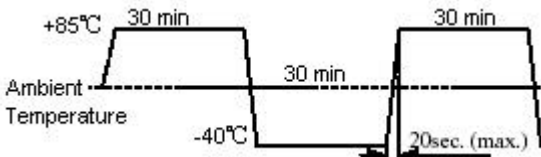
三、Energy and Capacitance Vs. Temperature

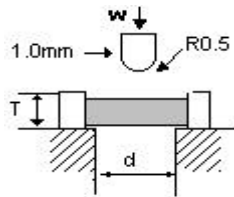


四、Reliability Test Data



可靠性测试 Reliability And Test Conditions

Type	Item	Specified value				Test methods	
		1005	1608	2012	3216		
1	Operating temperature range	-55 to +125				-	
2	Storage temperature range	-55 to +125				-	
3	Solderability	At least 90% of terminal electrode is covered by new solder				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.	
4	Resistance to soldering	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%				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.	
5	Terminal Strength	The terminal electrode shall not be broken off nor the chip element.				 W (Kgf) min	
		W	0.4	0.5	0.6		1
6	Flextrue strength	No mechanical damage.				 (a, b, c: mm)	
		A	0.45	1.0	1.0		1.3
		B	0.5	0.8	1.0		1.5
		C	0.5	1.3	1.3		3.0
		D	0.8	1.0	1.2		2.0
7	Drop	1、 No mechanical damage. 2、 Varistor voltage change within ± 5%				Dropped 10 times on a concrete floor from a height of 1m.	
8	Thermal shock	1、 No mechanical damage. 2、 Varistor voltage change within ± 5%				Temperature: -40 for 30 ± 3min +85 for 30 ± 3min Transforming interval :max 20 sec Number of cycles: 32 	
9	Loading at low temperature	1、 No mechanical damage. 2、 Varistor voltage change within ± 5%.				Temperature: -40 ± 2 Duration: 500 hrs	
10	Loading at high temperature	1、 No mechanical damage. 2、 Varistor voltage change within ± 5%.				Temperature: 85 ± 2 Duration: 1000 ± 12hrs Applied voltage: Working voltage	
11	Loading under Damp Heat	1、 No mechanical damage. 2、 Varistor voltage change within ± 5%.				Temperature: 55 ± 2 Duration: 500 ± 12hrs Humidity: 90 to 95%RH Applied voltage: Working voltage	
12	Humidity resistance	1、 No mechanical damage. 2、 Varistor voltage change within ± 5%.				Temperature: 55 ± 2 Duration: 500 ± 12hrs Humidity: 90 to 95%RH	

Type	Item	Specified value				Test methods
		1005	1608	2012	3216	
13	Vibration	1、 No mechanical damage. 2、 Varistor voltage change within $\pm 5\%$.				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 $\pm 5\%$.				Solvent : Trichoroethane Washer : ultrasonic washer Wash time : 3min

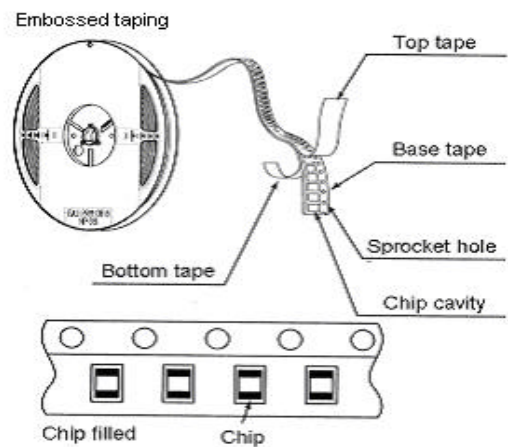
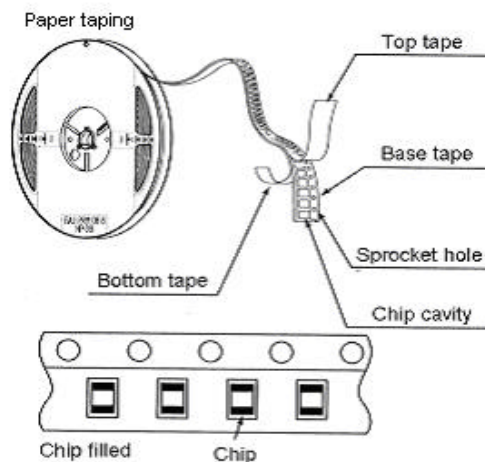
Note: When there are questions concerning, measurement shall be made after 24 ± 2 hrs of recovery under the standard condition.

包装 Packaging

STANDAE QUANTITY

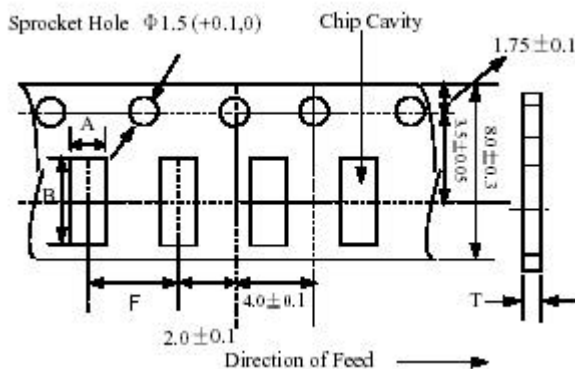
TYPE	100505	160808	201209	321611	322513	451616	453215
Quantity(PCS)	10000	4000	4000	3000	3000	5000	3000

TAPING DRAWINGS



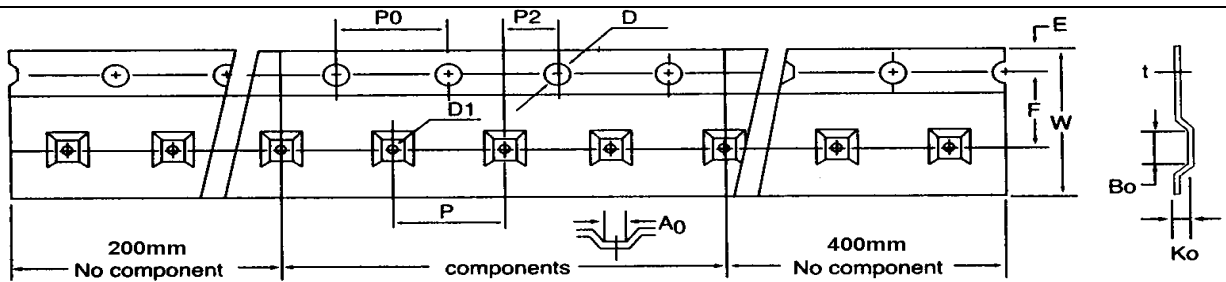
TAPING DIMENSIONS (UNIT: mm)

Paper tape



Embossed tape

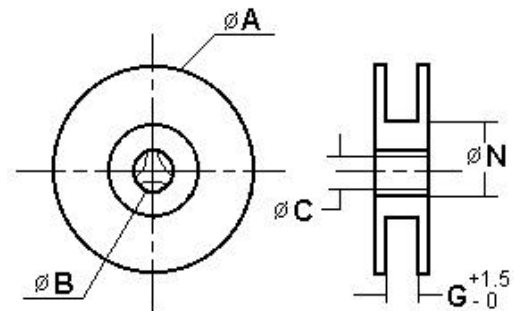
Part NO.	A	B	F	T
100505	0.65 ± 0.1	1.15 ± 0.1	2.0 ± 0.05	0.8max
160808	1.0 ± 0.2	1.8 ± 0.2	4.0 ± 0.2	1.1max
201209	1.5 ± 0.2	2.3 ± 0.2	4.0 ± 0.2	1.1max



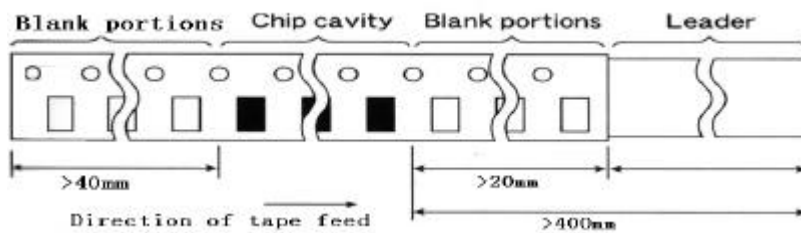
	4532	4516	3225	3216	2012
W	12.0+/-0.2	12.0+/-0.2	8.1+/-0.2	8.1+/-0.2	8.1+/-0.2
P	8.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10	4.0+/-0.10
E	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10	1.75+/-0.10
F	5.50+/-0.10	5.50+/-0.10	3.50+/-0.10	3.50+/-0.10	3.50+/-0.10
D	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	1.55+/-0.05	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 ₀₁₀	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.