

Multilayer Varistors [MLCV] for ESD noise



EZJZ series , 0402/0603/2array
EZJP series , 0402
EZJS series , 0603/0805

Ceramic Division
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Panasonic Electronic Devices Co., Ltd.

Multilayer Varistors for ESD noise

➤ What's Varistor ?

Variable Resistor

"Varistor" is an abbreviation of "Variable Resistor", and it is a non-linear resistor or a voltage dependent resistor. It is electronic parts playing a role which the "Varistor" uses this characteristic with the semiconductor ceramics that resistance value changes by the voltage to impress, and protect electronics from the abnormal voltage such as thunder surge or the static electricity.

[V-I characteristics of MLCV]

Varistor

[Equivalent circuit of MLCV]

ZD: monopolar 2pcs.
Capacitor 1pc.
3pcs. → 1pc.

➤ ESD measure by the Varistor

ESD → Varistor voltage → Breakdown voltage of IC → IC

SW ON

MLCV does not give a necessary signal bad influence and works when ESD invaded it. It control abnormal voltage in lower than breakdown voltage of the IC and protect an IC!

➤ MLCV v.s. Zener Diode [ZD]

a) The equal above-mentioned ESD clamping effect

ESD test condition :
IEC61000-4-2 [150pF, 330 / Contact discharge / 8kV]

EZJP0V080GA
[0402/8V/100pFmax.]

Zener diode
[6.8V/30pFtyp.]

b) The reduction of the mounting area [Small and space-saving]

Part Type	Original Dimensions (mm)	Reduced Dimensions (mm)	Area Ratio
SOD-323	2.5 x 1.2	1.0 x 0.5	16%
SOD-523	1.6 x 0.8	1.0 x 0.5	39%
SC-89	1.6 x 1.6	1.0 x 0.5	19%

[Unit:mm]

c) Reduction of the part mark, cost reduction, appointed date of delivery shortening etc.

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MLCV product Lineups

Product Lineups



EZJZ series

ZnO based **bismuth (Bi) system** multilayer chip varistor. Besides small capacitance, excellent ESD suppression of high speed signal line and RF antenna.

Low voltage Type [General circuit]

• 0402,0603 / V_{1mA} : 12 ~ 65V / C_{1MHz} : 20 ~ 330pFmax.

Low Capacitance Type [High speed signal line]

• 0402,0603 / V_{1mA} : 50 ~ 170V / C_{1MHz} : 1 ~ 3pFmax.

2 Array Type

• 0504 2array / V_{1mA} : 12 ~ 80V / C_{1MHz} : 3 ~ 220pFmax.



EZJP series

Zinkoxyd (ZnO) based **praseodmium (Pr) system** multilayer chip varistor. Besides low Varistor voltage, excellent ESD suppression of low voltage circuit.

Low Voltage Type [General circuit]

• 0402 / V_{1mA} : 8V / C_{1MHz} : 27 ~ 680pFmax.



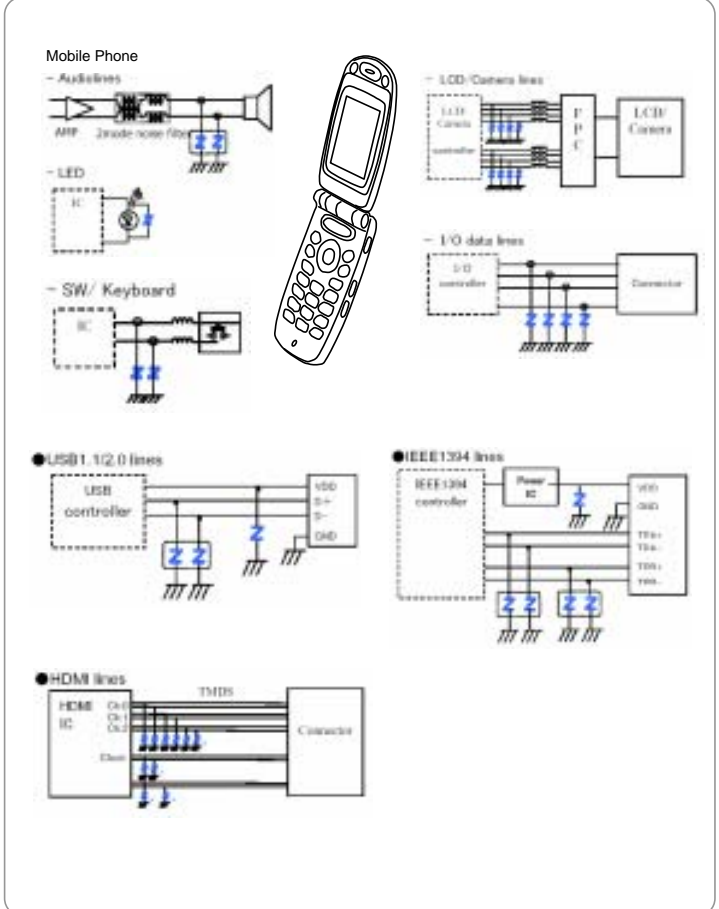
EZJS series

Strontium titanate (SrTiO₃) based multilayer chip varistor. Besides large capacitance, excellent ESD suppression with absorption and suppression of high voltage and high frequency noise of ESD, etc.

• 0603,0805 / V_{1mA} : 12 ~ 50V / C_{1MHz} : 1800 ~ 22000pF typ.



Applications



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Feature of MLCV

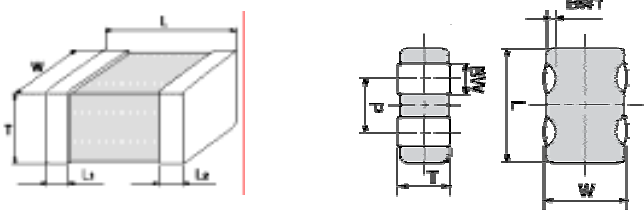
➤ Feature

- Excellent ESD suppression due to advanced material technology
- Meets IEC61000-4-2, Level 4 standard
- Can replace 2 Zener Diodes and 1 Capacitor
- Low capacitance versions for DC voltage lines of high speed busses
- Ultra low capacitance for signal lines of high speed busses
- Ideal usage for USB 2.0, IEEE1394, and HDMI high speed data busses
- RoHS compliant

➤ Recommended Applications

Applications	Series	Circuit				
		DC	1k	1M	1G [Hz]	
Mobile Phone, DSC, PC, PDA, HDD, TV(PDP/LCD), DVD, DVC, Audio, Game etc.	EZJZ EZJP	Ultra low capacitance [Cap.: 3pF or less]	[Bar chart showing high performance across all frequencies]			DC to GHz: Antenna, RF circuit, LVDS, USB, IEEE1394, HDMI etc.
		Low capacitance [Cap.: 20 to 680pF]	[Bar chart showing high performance across all frequencies]			DC to millions of Hz: PWR, SW, Audio terminals, LCD, RS232C, etc.
PWR, Photoelectric sensors, SSR, Motors, Pressure sensors, Proximity switches	EZJS	High capacitance [Cap.: 1800 to 22000pF]	[Bar chart showing high performance across all frequencies]			DC to thousands of Hz: PWR, SW, Audio terminals, etc.

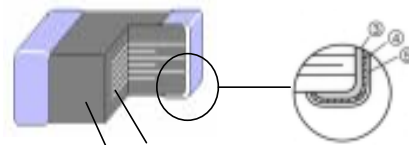
➤ Dimensions



(Unit: mm)

Series	Size	L	W	T	L1, L2	BW	BW1	P
EZJZ, EZJP series	0402	1.00 ± 0.05	0.50 ± 0.05	0.50 ± 0.05	0.2 ± 0.1	-	-	-
	0603	1.6 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.3 ± 0.2	-	-	-
	0504/2array	1.37 ± 0.15	1.0 ± 0.1	0.6 ± ^{0.06} / _{0.10}	-	0.36 ± 0.10	0.2 ± 0.1	0.64 ± 0.10
EZJS series	0603	1.6 ± 0.15	0.8 ± 0.1	0.8 ± 0.1	0.3 ± 0.2	-	-	-
	0805	2.0 ± 0.2	1.25 ± 0.20	0.8 ± ^{0.2} / _{1.25 ± 0.20}	0.5 ± 0.25	-	-	-

➤ Construction



No.	Material
	Semiconductive Ceramics [ZnO, SrTiO ₃]
	Internal electrode
	Substrate electrode
	Intermediate electrode [Ni]
	External electrode [Sn]

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EZJZ series / Low Capacitance Type

➤ Feature

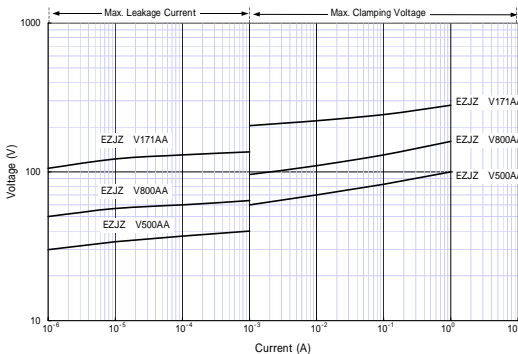
- Multilayer monolithic ceramic construction for high speed signal lines
- Ideal usage for USB 2.0, IEEE1394, and HDMI high speed data busses
Capacitance : 0.8 ~ 2.1 pF typ.

➤ Recommended Applications

Mobile phone	Antenna circuit, External IF
DSC, DVC	USB2.0, IEEE1394
PC, PDA	USB2.0, IEEE1394, LAN1000BASE
TV, DVD	USB2.0, IEEE1394, HDMI
Game console	Controller, External IF

➤ Characteristics

< Voltage v.s. Current >

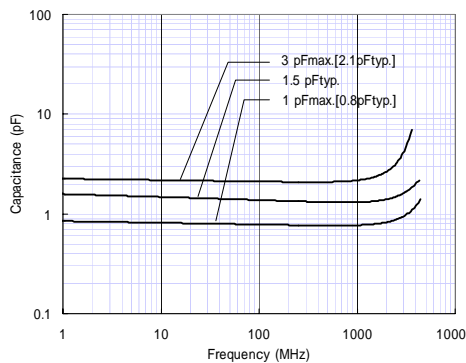


➤ Ratings and Characteristics

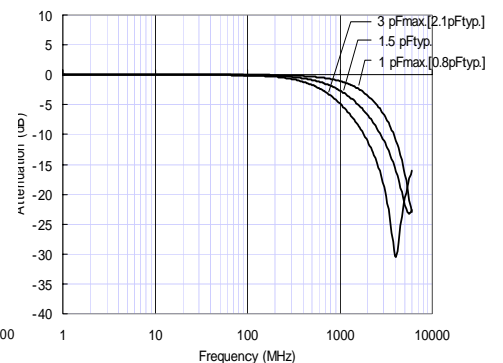
Size	P/N	Maximum Allowable vol. DC [V]	Nominal Varistor vol. at 1mA [V]	Capacitance [pF] at 1MHz	Maximum ESD at IEC61000-4-2
0402	EZJZ0V80010	10	80	1max. [0.8typ.]	Contact discharge : 8kV
	EZJZ0V80015D	5	80	1.5 ± 0.5	
	EZJZ0V500AA	5	50	3max. [2.1typ.]	
	EZJZ0V800AA	18	80	3max. [2.1typ.]	
	EZJZ0V171AA	18	170	3max. [2.1typ.]	
0603	EZJZ1V80010	10	80	1max. [0.8typ.]	
	EZJZ1V500AA	5	50	3max. [2.1typ.]	
	EZJZ1V800AA	18	80	3max. [2.1typ.]	
	EZJZ1V171AA	18	170	3max. [2.1typ.]	

Operating Temperature: -40 ~ 85
Recommend soldering method : Reflow soldering

< Frequency v.s. Capacitance >



< Frequency v.s. Attenuation >



EZJZ series / Low Voltage Type

➤ Feature

Multilayer monolithic ceramic construction for use protecting DC voltage lines or signal lines

- Varistor voltage : 12 to 65V [at 1mA]
- Capacitance : 15 to 250pFtyp. [at 1MHz]

➤ Recommended Applications

Mobile Phone	SW, LCD, LED, Audio terminal, Battery pack, Memory card, External IF
DSC, DVC	SW, LCD, LED, USB
PC, PDA	SW, LCD, LED, USB
TV, DVD	Audio, Video terminal
Audio	Audio terminal, Microphone, Receiver
Game	Controller, External IF

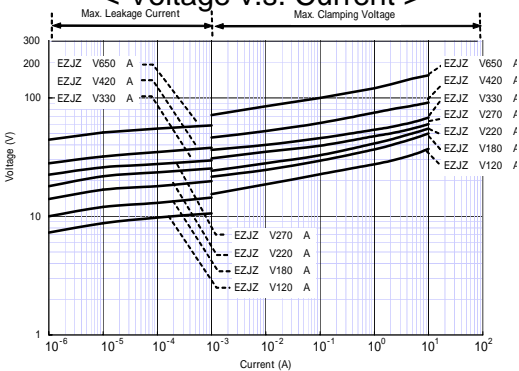
Operating Temperature : -40 ~ 85
 Recommend soldering method : Reflow soldering

➤ Recommended Applications

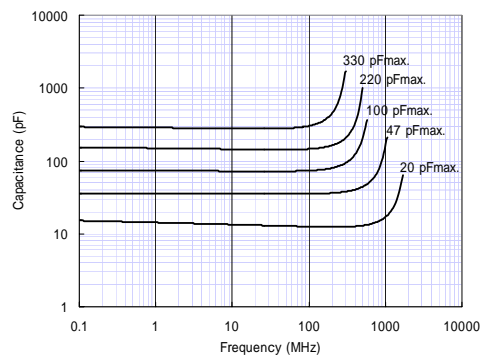
Size	P/N	Maximum Allowable DC [V]	Nominal Varistor voltage at 1mA [V]	Capacitance [pF] [typ.]		Maximum peak current at 8/20us, 2 times [A]	Maximum ESD at IEC61000-4-2
				at 1MHz	at 1kHz		
0402	EZJZ0V120JA	6.7	12	220max. [150typ.]	175typ.	10	Contact discharge: 8kV
	EZJZ0V180HA	11	18	150max. [120typ.]	140typ.	10	
	EZJZ0V220HA	13	22	150max. [100typ.]	116typ.	10	
	EZJZ0V270EA	16	27	47max. [33typ.]	37typ.	10	
	EZJZ0V270RA	16	27	20max. [15typ.]	16.5typ.	3	
	EZJZ0V420WA	30	42	56max. [40typ.]	45typ.	10	
0603	EZJZ0V650DA	40	65	27max. [22typ.]	33typ.	5	
	EZJZ1V120KA	6.7	12	330max. [250typ.]	290typ.	20	
	EZJZ1V180JA	11	18	220max. [180typ.]	210typ.	20	
	EZJZ1V220JA	13	22	220max. [160typ.]	185typ.	20	
	EZJZ1V270GA	16	27	100max. [85typ.]	100typ.	20	
	EZJZ1V270EA	16	27	47max. [33typ.]	37typ.	20	
	EZJZ1V270RA	16	27	20max. [15typ.]	16.5typ.	5	
	EZJZ1V330GA	26	33	100max. [85typ.]	100typ.	20	
	EZJZ1V420FA	30	42	68max. [55typ.]	63typ.	15	
	EZJZ1V650DA	40	65	27max. [22typ.]	33typ.	5	

➤ Characteristics

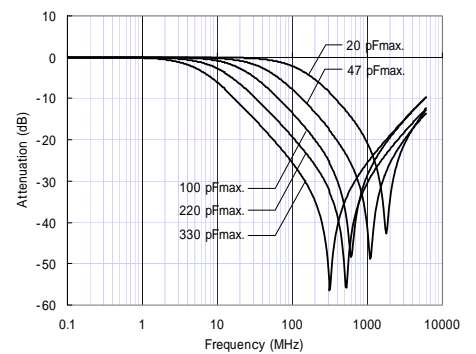
< Voltage v.s. Current >



< Frequency v.s. Capacitance >



< Frequency v.s. Attenuation >



EZJP series / Low Voltage Type



➤ Feature

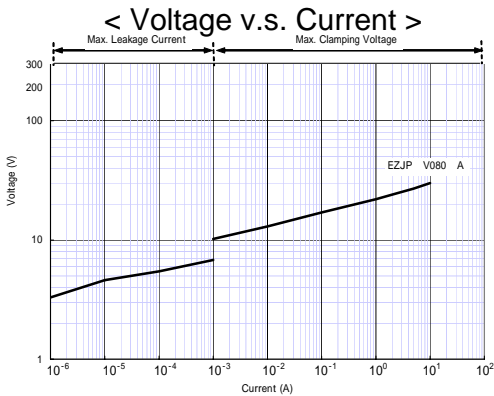
Multilayer monolithic ceramic construction for use protecting DC voltage lines or signal lines

- Varistor voltage : 8 V [at 1mA]
- Capacitance : 22 to 420pFtyp. [at 1MHz]

➤ Recommended Applications

Mobile Phone	SW, LCD, LED, Audio terminal, Battery pack, Memory card, External IF
DSC, DVC	SW, LCD, LED, USB
PC, PDA	SW, LCD, LED, USB
TV, DVD	Audio, Video terminal
Audio	Audio terminal, Microphone, Receiver
Game	Controller, External IF

➤ Characteristics

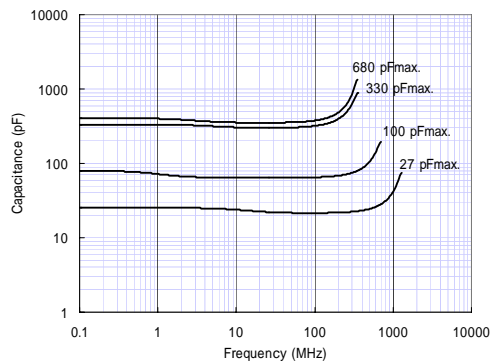


➤ Recommended Applications

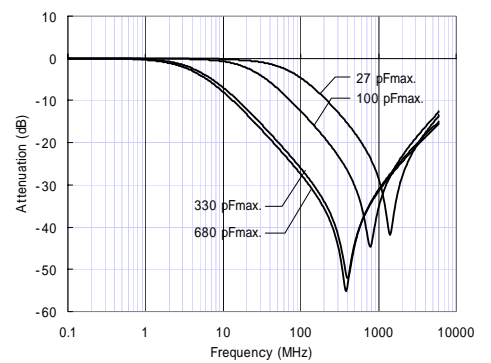
Size	P/N	Maximum Allowable voltage DC [V]	Nominal Varistor voltage at 1mA [V]	Capacitance [pF] [typ.]		Maximum peak current at 8/20us, 2 times [A]	Maximum ESD at IEC61000-4-2
				at 1MHz	at 1kHz		
1005	EZJP0V080MA	5.6	8	680max. [420typ.]	650typ.	20	Contact discharge: 8kV
	EZJP0V080KA	5.6	8	330max. [290typ.]	480typ.	15	
	EZJP0V080GA	5.6	8	100max. [65typ.]	100typ.	3	
	EZJP0V080DA	5.6	8	27max. [22typ.]	33typ.	1	

Operating Temperature : -40 ~ 85
 Recommend soldering method : Reflow soldering

< Frequency v.s. Capacitance >



< Frequency v.s. Attenuation >



EZJZ series / 2 Array Type

➤ Feature

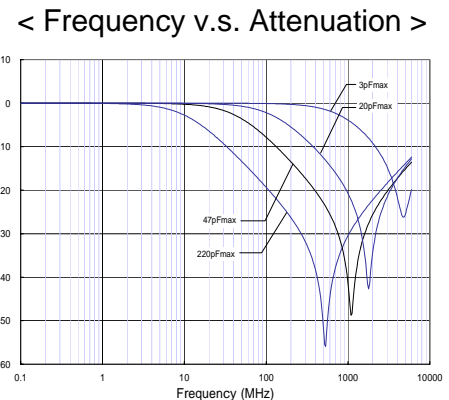
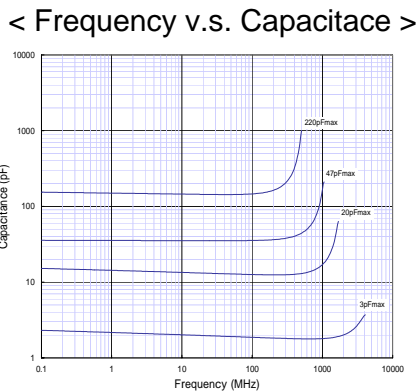
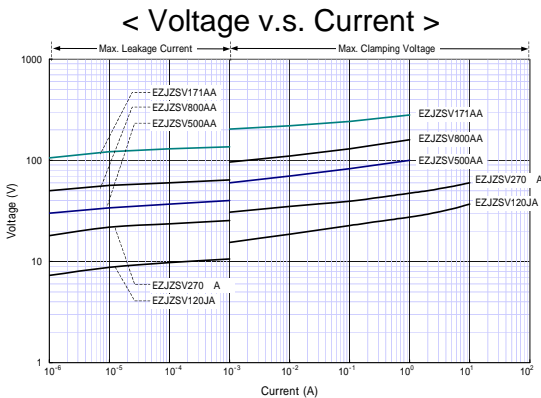
- Excellent ESD suppression due to advanced material technology
- Meets IEC61000-4-2, Level 4 standard
- Can replace 2 Zener Diodes and 1 Capacitor
- 2 Array per package for multiple
- Ultra low capacitance for signal lines of high speed busses
- Ideal usage for USB 2.0, IEEE1394, and HDMI high speed data busses
- RoHS compliant

➤ Recommended Applications

P/N	Maximum Allowable voltage DC [V]	Nominal Varistor voltage at 1mA [V]	Capacitance [pF] [typ.]		Maximum peak current at 8/20us.2 times [A]	Maximum ESD at IEC61000-4-2
			at 1MHz	at 1kHz		
EZJZSV120JA	6.7	12	220 max. [150typ.]	175typ.	10	Contact discharge: 8kV
EZJZSV270EA	16	27	47 max. [33typ.]	37typ.	10	
EZJZSV270RA	16	27	20 max. [15typ.]	16.5typ.	3	
EZJZSV270DA	16	27	27 ± 10% / ± 20%	30typ.	5	
EZJZSV270PA	16	27	33 ± 10% / ± 20%	37typ.	5	
EZJZSV270SA	16	27	39 ± 10% / ± 20%	43typ.	5	
EZJZSV270TA	16	27	43 ± 10% / ± 20%	47typ.	5	
EZJZSV270EA	16	27	47 ± 10% / ± 20%	52typ.	5	
EZJZSV500AA	5	50	3 max. [2.1typ.]	-	-	
EZJZSV800AA	18	80	3 max. [2.1typ.]	-	-	
EZJZSV171AA	18	170	3 max. [2.1typ.]	-	-	

Operating Temperature: -40 ~ 85
 : Capacitance Tolerance Code K: ± 10%, M: ± 20%
 Avoid flow soldering

➤ Characteristics



EZJS series / High Capacitance Type

➤ Feature

- Excellent ESD suppression due to advanced material technology
- Meets IEC61000-4-2, Special Level 30kV standard
- Can replace 2 Zener Diodes and 1 Capacitor
- RoHS compliant

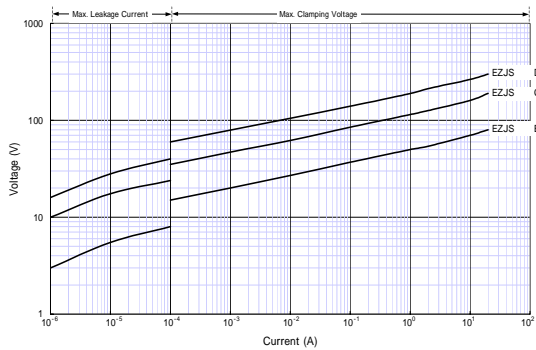
➤ Recommended Applications

Size	P/N	Maximum Allowable voltage DC [V]	Nominal Varistor voltage at 1mA [V]	Capacitance at 1kHz [pF]	Maximum ESD at IEC61000-4-2
0603	EZJS1VB822	6	12	8200 typ.	Contact discharge: 30kV
	EZJS1VC392	18	30	3900 typ.	
	EZJS1VD182	30	50	1800 typ.	
0805	EZJS2VB223	6	12	22000 typ.	
	EZJS2YC822	18	30	8200 typ.	
	EZJS2YD472	30	50	4700 typ.	

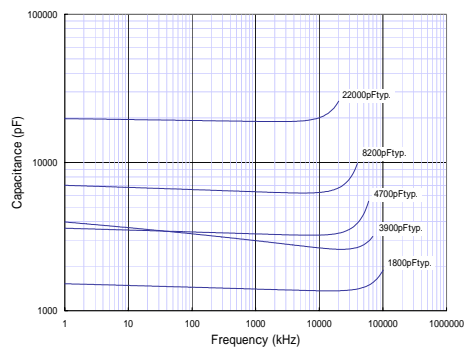
Operating Temperature : -40 ~ 85
Avoid flow soldering

➤ Characteristics

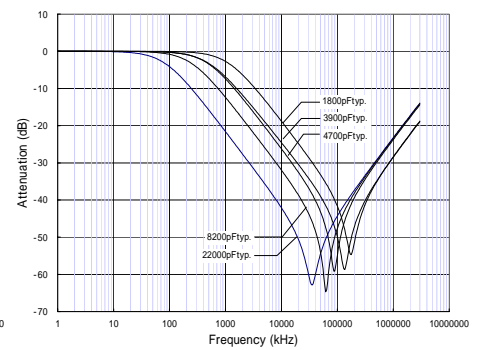
< Voltage v.s. Current >



< Frequency v.s. Capacitance >



< Frequency v.s. Attenuation >



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