

Attracting Tomorrow



# CeraDiode devices for reliable ESD protection

Ceramic Transient Voltage Suppressors (CTVS)

**TDK Electronics AG**  
Piezo & Protection Devices Business Group  
Multilayer Business Division  
Munich, Germany  
November 2023



# Single & array devices

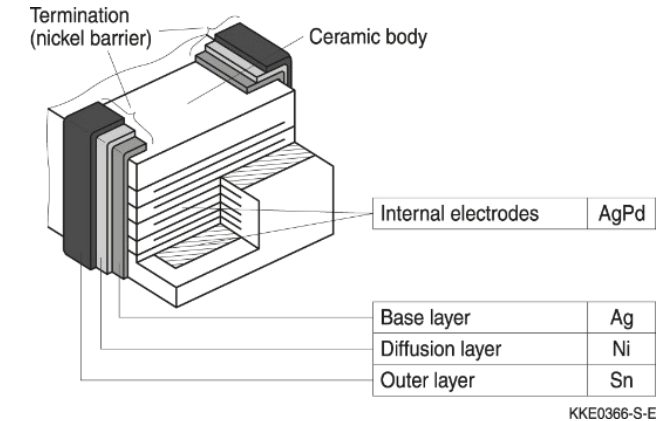
Due to the ongoing miniaturization, today's electronic devices are more and more sensitive to electrostatic discharges (ESD).

Therefore, reliable protection components become absolutely necessary to safeguard your valuable electronics against the impact of ESD.

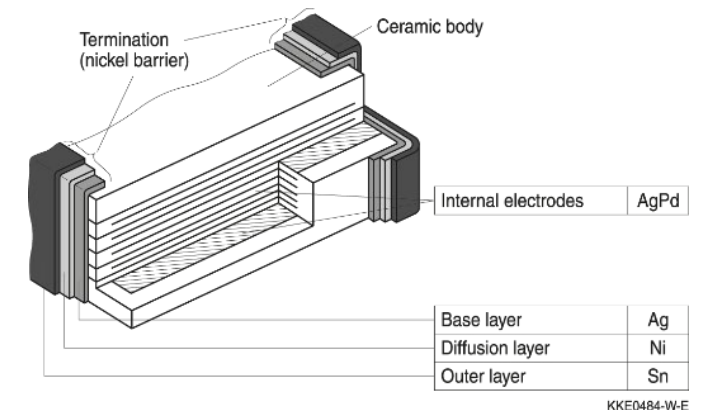
CeraDiode devices are ceramic semiconductors optimized specifically for high performance in ESD applications. They have a non-linear voltage/current characteristic for effectively suppressing extremely fast voltage transients and offer superior parametric stability over the complete operating range of  $-40$  to  $+85$  °C.

CeraDiode devices are bi-directional devices. A single CeraDiode connected from signal/data line to ground routes both positive and negative ESD transitions safely to the ground plane. This technique eliminates the need to route ESD charge into the power plane, possibly damaging nearby integrated circuits.

## Single device



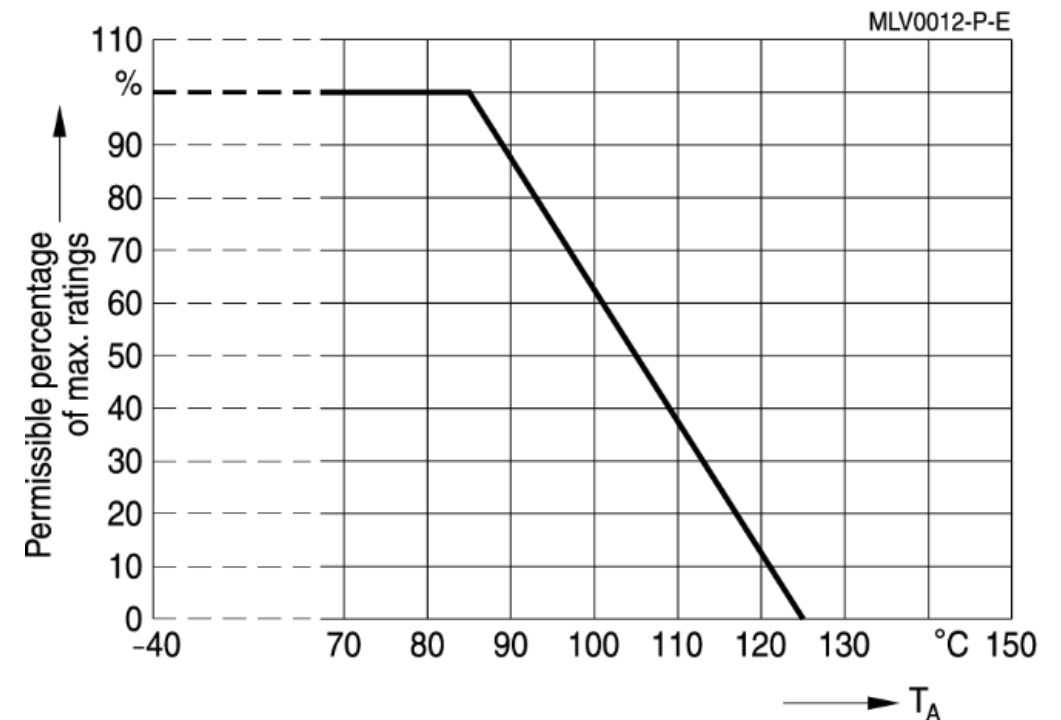
## Array device



# Features & benefits

- Bidirectional protection in a single component
- High ESD stability to IEC 61000-4-2, Level 4 up to  $\pm 1000$  pulses
- No change of ESD protection performance at temperatures up to  $+85\text{ }^\circ\text{C}$  (temperature derating)
- Use of parasitic capacitance for RFI suppression and RF filtering (replacement of additional MLCC)
- Small packages down to EIA case size 0201
- Capacitance values 0.6 up to 470 pF
- Combined ESD/EMI protection with EIA case size 0405 audio filter array
- EIA case size 0201 series with low clamping voltage (CDS1C05GTA1, CDS1C05GTH1, CDS1C05GTH2)
- Surge current capability
- Low parasitic inductance
- Low leakage current
- Fast response time  $<0.5\text{ ns}$

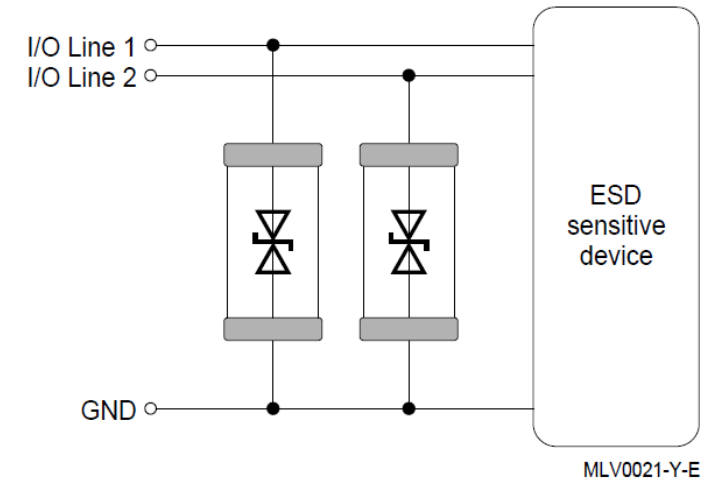
## Typical characteristics



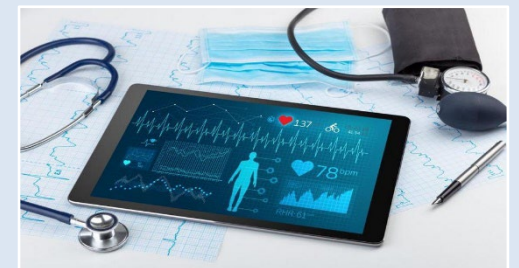
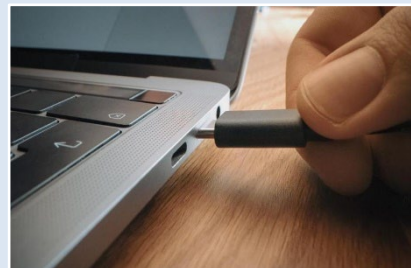
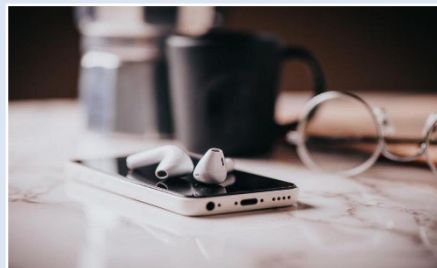
# Main applications

- EDP products (e.g. desktop and notebook computers)
- Peripherals (e.g. printers, memory cards, etc.)
- Portable handheld products and wearables
- Interfaces, data lines, power lines and audio lines
- High-speed interfaces
- Network communication devices
- Smartphones
- Consumer electronics
- Industrial applications
- LED modules

## Application example



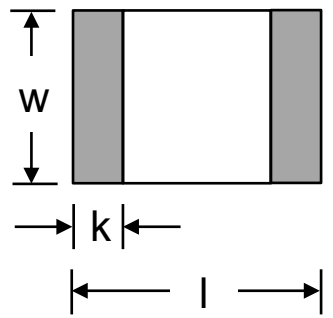
**Note:** Protection of I/O lines with single CeraDiodes



# Ordering codes & dimensions (mm)

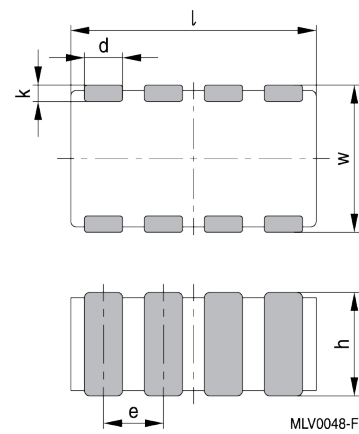
<b>B72590</b>	<b>D</b>	<b>0050</b>	<b>A0</b>	<b>60</b>																																													
<b>Type, case sizes and devices</b> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 5px;"> <thead> <tr> <th style="font-size: 8px;">Chip size (inch/mm)</th> <th style="font-size: 8px;">Device</th> <th style="font-size: 8px;">Ordering code</th> </tr> </thead> <tbody> <tr><td>0201/0603</td><td>Single</td><td>B72440...</td></tr> <tr><td>0402/1005</td><td>Single</td><td>B72590...</td></tr> <tr><td>0603/1608</td><td>Single</td><td>B72500...</td></tr> <tr><td>1003/2508</td><td>Single</td><td>B72570...</td></tr> <tr><td>0506/1216</td><td>Array</td><td>B72755...</td></tr> <tr><td>0508/1220</td><td>Array</td><td>B72714...</td></tr> <tr><td>0612/1632</td><td>Array</td><td>B72724...</td></tr> <tr><td>1012/2532</td><td>Array</td><td>B72735...</td></tr> </tbody> </table>					Chip size (inch/mm)	Device	Ordering code	0201/0603	Single	B72440...	0402/1005	Single	B72590...	0603/1608	Single	B72500...	1003/2508	Single	B72570...	0506/1216	Array	B72755...	0508/1220	Array	B72714...	0612/1632	Array	B72724...	1012/2532	Array	B72735...																		
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<b>Type</b> A0 ≙ Standard B0 ≙ LED H0 ≙ High-speed H1 ≙ Capacitance value <1 pF H2 ≙ Capacitance value <1 pF																																																	
<b>Packaging codes</b> 60 ≙ cardboard tape, 180 mm reel 62 ≙ blister tape, 180 -mm reel 70 ≙ cardboard tape, 330 mm reel 72 ≙ blister tape, 330 mm reel																																																	

**Single devices**



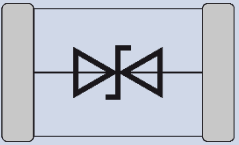
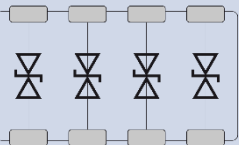
Case size	(inch) (mm)	0201 0603		0402 1005		0603 1608		1003 2508	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
l		0.57	0.63	0.85	1.15	1.45	1.75	2.34	2.74
w		0.27	0.33	0.4	0.6	0.7	0.9	0.7	0.9
h		0.27	0.33	0.4	0.6	0.7	0.9	0.7	0.9
k		0.1	0.2	0.1	0.3	0.1	0.4	0.13	0.75

**Array devices**



Case size	(inch) (mm)	0506 1216		0508 1220		0612 1632		1012 2532	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
l		1.50	1.70	1.8	2.2	3.0	3.4	2.90	3.50
w		1.20	1.40	1.05	1.45	1.45	1.75	2.25	2.75
h		-	0.6	-	0.9	-	0.9	-	1.2
d		0.2	0.4	0.2	0.4	0.25	0.55	0.35	0.65
e		0.4	0.6	0.4	0.6	0.61	0.91	0.8	1.1
k		-	0.35	-	0.35	-	0.35	-	0.45

# Series (1)

Electrical specifications and ordering codes								
EIA case size	Ordering code	TDK type	Device schematic	$V_{DC}$	$V_{BR, min}$ @ 1 mA	$V_{clamp, max}$ @ 1 A, 8/20 $\mu$ s	$I_{pp, max}$ @ 8/20 $\mu$ s	$C_{typ}$
				[V]	[V]	[V]	[V]	[pF]
<b>Single standard <sup>1)</sup></b>								
0402	B72590D0050A060	CDS2C05GTA		5.6	6.4	24	10	180
0603	B72500D0050A060	CDS3C05GTA		5.6	6.4	19	30	470
1003	B72570D0120A060	CDS4C12GTA		12	16	46	20	82
<b>Array standard <sup>2)</sup></b>								
0612	B72724D0200A062	CDA5C20GTA		22	25	50	30	56

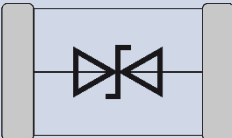
<sup>1)</sup> Lines to protect: 1

<sup>2)</sup> Lines to protect: 4

<sup>3)</sup> Lines to protect: 2 or 4 data + 1 supply

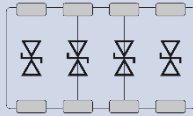
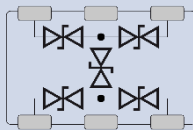
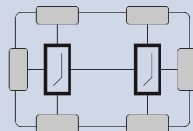
<sup>4)</sup> Lines to protect: 2

# Series (2)

Electrical specifications and ordering codes								
EIA case size	Ordering code	TDK type	Device schematic	$V_{DC}$	$V_{BR, min}$ @ 1 mA	$V_{clamp, max}$ @ 1 A, 8/20 $\mu$ s	$I_{pp, max}$ @ 8/20 $\mu$ s	$C_{typ}$
				[V]	[V]	[V]	[V]	[pF]
Single high-speed <sup>1)</sup>								
0201	B72440D0050H060	CDS1C05GTH		5.6	21	70	-	6
0201	B72440C0050H260	CDS1C05GTH2		5.5	20	66	-	3
0402	B72590D0050H260	CDS2C05HDMI2		5.6	90	-	-	0.6
0402	B72590D0160H060	CDS2C16GTH		16	65	290	-	2
0603	B72500D0050H160	CDS3C05HDMI1		5.6	150	-	-	0.6
0603	B72500D0160H060	CDS3C16GTH		16	65	290	-	3
0603	B72500D0300H060	CDS3C30GTH		30	50	120	-	10
1003	B72570D0160H060	CDS4C16GTH		16	38	146	-	3

<sup>1)</sup> Lines to protect: 1  
<sup>2)</sup> Lines to protect: 4  
<sup>3)</sup> Lines to protect: 2 or 4 data + 1 supply  
<sup>4)</sup> Lines to protect: 2

# Series (3)

Electrical specifications and ordering codes								
EIA case size	Ordering code	TDK type	Device schematic	$V_{DC}$ [V]	$V_{BR, min}$ @ 1 mA [V]	$V_{clamp, max}$ @ 1 A, 8/20 $\mu$ s [V]	$I_{pp, max}$ @ 8/20 $\mu$ s [V]	$C_{typ}$ [pF]
<b>Array high-speed</b>								
0508	B72714D0160H060 <sup>2)</sup>	CDA4C16GTH		16	22	66	-	10
0612	B72724D0160H062 <sup>2)</sup>	CDA5C16GTH		16	80	350	-	3
1012	B72735D0050H062 <sup>3)</sup>	CDA6C05GTH		5.6	52	195	-	7
<b>ESD/EMI audio filter array <sup>4)</sup></b>								
0405	B72862F1050S160	CA04F2FT5 AUD010G		5.6	8	30	-	270

<sup>1)</sup> Lines to protect: 1

<sup>2)</sup> Lines to protect: 4

<sup>3)</sup> Lines to protect: 2 or 4 data + 1 supply

<sup>4)</sup> Lines to protect: 2



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