



Electronic Parts and Components

# CeraDiodes for ESD protection

## What are CeraDiodes?

1. CeraDiodes are ceramic semiconductor components optimized for **ESD protection** of data-, audio- and video lines (e.g. USB, IEEE 1394, Ethernet, HDMI, and Composite), interfaces, ICs and I/O ports in electronic devices.
2. CeraDiodes are **cost effective alternatives** to semiconductor protection devices such as Zener and TVS diodes and offering additional **technical advantages**.
3. In many cases, CeraDiodes are 1:1 replacements for these semiconductor diodes (fit form function) and offer **additional packages** for specific application requirements.

## What are the benefits for customer applications when using a CeraDiode instead of a semiconductor diode?

A) Cost saving

B) Technical advantages

- 1) Bidirectional protection in a single component
- 2) High ESD stability to IEC 61000-4-2
- 3) No change in ESD protection performance at temperatures up to 85 °C (temperature derating)
- 4) Use of parasitic capacitance for RFI suppression and HF filtering (replacement of additional MLCC)
- 5) Capacitance values from 0.6 pF up to 470 pF
- 6) Ruggedness against surge currents
- 7) Low leakage inductance
- 8) Low leakage current
- 9) Fast response time < 0.5 ns

## Applications

All applications including interfaces such as USB 2.0, IEEE 1394, Ethernet, WLAN, SATA, Bluetooth, Audio, Video, DVI, HDMI, DisplayPort, Memory card, PC card, etc. and requiring ESD protection. Such applications belong to the fields of **consumer** (e.g. TV, DVD, set-top box, game console, DSC, video camera, stereo, car entertainment, navigation system, MP3, etc.), **EDP** (e.g. desktop computer, notebook, printer, PDA, etc.) and **industrial applications**.

## Product range and application matrix

Devices	Case size	EPCOS type	Semiconductor diode package	V <sub>DC, max</sub> [V]	V <sub>eff, min</sub> (1 mA) [V]	V <sub>clamp, max</sub> (1 A) [V]	C <sub>typ</sub> [pF]	C <sub>max</sub> [pF]	Video analog (Scart, Composite, Component, S-Video, VGA)	DVI	HDMI, DisplayPort	Audio analog	Audio digital	USB 1.1 / 2.0	IEEE 1394 (Firewire, DV, i.Link)	Ethernet	Serial port	Parallel port	LCD data line	Disc-drive, hard-disk drive	SATA	Memory card, SIM card	Bluetooth	Analog modem / ISDN	xDSL modem	WLAN	Keyboard, Pushbutton, P.S/2
Single standard	0201	CDS1C05GTA	-	5,6	12	35	22	-				x					x										x
	0402	CDS2C05GTA	SOD-723	5,6	6,4	24	180	-				x					x										x
	0402	CDS2C15GTA	SOD-723	15	20	46	47	-				x		x <sup>1)</sup>	x <sup>1)</sup>												x
	0603	CDS3C05GTA	SOD-523	5,6	6,4	19	470	-				x						x									x
	0603	CDS3C09GTA	SOD-523	9	10	30	220	-				x						x									x
	0603	CDS3C15GTA	SOD-523	15	22	42	160	-				x		x <sup>1)</sup>	x <sup>1)</sup>			x									x
	0603	CDS3C20GTA	SOD-523	22	25	50	56	-				x						x									x
1003	CDS4C12GTA	SOD-323	12	16	42	82	-				x		x <sup>1)</sup>	x <sup>1)</sup>			x									x	
Array standard	0508	CDA4C20GTA	-	22	24	60	33	-				x	x				x										x
	0612	CDA5C20GTA	-	22	25	50	56	-				x	x				x										x
Single high-speed	0201	CDS1C05GTH	-	5,6	21	70	-	10		x			x	x	x	x		x	x	x	x	x	x	x	x	x	x
	0402	CDS2C05HDMI1	SOD-723	5,6	150	-	0,6	0,9			x	x		x	x	x					x						x
	0402	CDS2C15GTH	SOD-723	15	23	66	10	15		x			x	x	x			x	x	x	x	x	x	x	x	x	x
	0402	CDS2C16GTH	SOD-723	16	65	290	2	3		x	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x
	0603	CDS3C05HDMI1	SOD-523	5,6	150	-	0,6	0,9			x	x		x	x	x					x						x
	0603	CDS3C16GTH	SOD-523	16	65	290	3	5		x	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x
	0603	CDS3C30GTH	SOD-523	30	50	120	10	15		x			x	x	x			x	x	x	x	x	x	x	x	x	x
1003	CDS4C16GTH	SOD-323	16	38	146	3	5		x	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x	
Array high-speed	0506	CDA3C05GTH	SOT-666	5,6	120	360	3	5		x			x	x	x	x		x	x	x	x	x	x	x	x	x	x
	0508	CDA4C16GTH	-	16	22	66	10	15		x			x	x	x	x		x	x	x	x	x	x	x	x	x	x
	0612	CDA5C16GTH	-	16	80	350	3	5		x	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x
	1012	CDA6C05GTH	SOT-23 6L	5,6	52	195	7	10		x			x	x	x	x		x	x	x	x	x	x	x	x	x	x

<sup>1)</sup> supply line  
Customer has to test and approve parts for the application.



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### Cross reference list (CeraDiodes 1:1 drop-in equivalents to semiconductor diodes)

Case size	EPCOS type code	Semi-diode package	Semtech	ST Micro	OnSemi	Vishay	Rohm	NXP	Protek
<b>Single standard</b>									
0402	CDS2C05GTA	SOD-723			μESD3.3ST5G				
0402	CDS2C15GTA	SOD-723			μESD5.0ST5G μESD12ST5G				
0603	CDS3C05GTA	SOD-523	SM05 μClamp0501H	ESDA5V3L ESDA6V1L	ESD5Z2.5T1 ESD5Z3.3T1 ESD5Z5.0T1	VESD05A1-02V VESD01-02V VESD03-02V VESD05-02V	RSB6.8S	PESD5V0S1BB PESD3V3S1UB PESD5V0S1UB	
0603	CDS3C09GTA	SOD-523			ESD5Z6.0T1 ESD5Z7.0T1	VESD08-02V			
0603	CDS3C15GTA	SOD-523	SDC15 SM12 SM15 μClamp1201H	ESDA14V2L		VESD12-02V		PESD12VS1UB PESD15VS1UB	
0603	CDS3C20GTA	SOD-523	SM24	ESDA25L		VESD05A1B-02V			RSB6.8S PLW0501H
1003	CDS4C12GTA	SOD-323	SD05C SD12C μClamp3301D		SD05T1 SD12T1			PESD5V0S1BA PESD3V3L1BA PESD5V0L1BA PESD12VL1BA	PSD03C PSD05C PSD08C PSD12C
<b>Single high-speed</b>									
0402	CDS2C15GTH	SOD-723					RSB6.8B		
0603	CDS3C16GTH	SOD-523	SL05 SL12 SL15 SL24						GBLC03C GBLC05C GBLC08C GBLC12C GBLC15C GBLC18C PLW2.8
0603	CDS3C30GTH	SOD-523	SM36 μClamp3301H						ESOT3.3LCC
<b>Array high-speed</b>									
0506	CDA3C05GTH	SOT-666		USBLC6-2P6 DSILC6-4P6					
1012	CDA6C05GTH	SOT-23 6L	SMS3.3 SMS05 SRV05-4 RClamp0504S	ESDA6V1-4BC6 ESDA5V3SC6 ESDA6V1SC6 ESDA14V2SC6 ESDA6V1-5W6 USBLC6-4SC6					PSMS05 PSMS12 ESDA05C-4 ESDA05C-5 ESOT3.3LC-2

**CeraDiodes can even replace many other semiconductor diodes and packages.** We'd likely support you in cross referencing the semiconductor diodes currently used to a corresponding CeraDiodes.

#### Data sheets, data book, samples, sample kit and further information

Please ask your EPCOS contact for CeraDiodes. Or visit the EPCOS homepage [www.epcos.com/ceradiode](http://www.epcos.com/ceradiode). There you find the complete CeraDiodes data book, data sheets, comparisons of characteristic curves between CeraDiodes and semiconductor diodes, technical backgrounds, an application matrix and further application examples. A sample kit and a printed version of the data book are also available.