

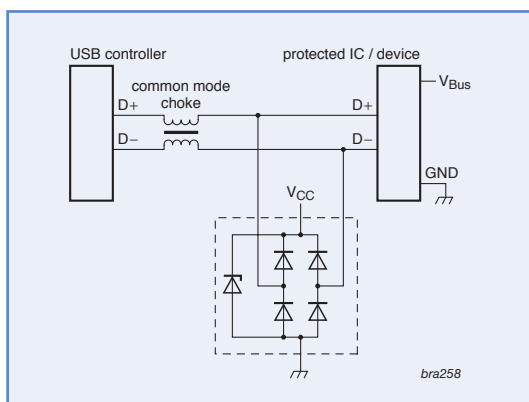


ESD protection
EMI filter
Level shifter and buffer

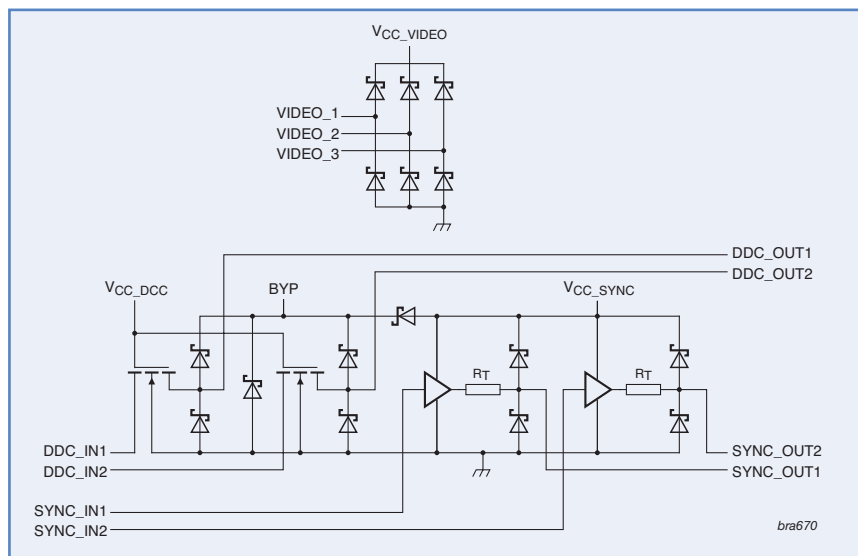
Interface protection products selection guide

Portfolio key features

- ▶ Level shifting, buffering, ESD protection, termination, pull-up resistors, EMI filtering
- ▶ Superior size / performance ratio
- ▶ Fully integrated passive and active components
- ▶ Lowest line capacitance for high-speed interfaces - $C_{line} = 1.0 \text{ pF}$
- ▶ High level ESD protection in compliance with IEC 61000-4-2, level 4
- ▶ Lead-free products



USB2.0 port ESD protection with PRTR5V0U2X



Fully integrated VGA interface supporting highest UXGA resolutions up to 2560 x 1920 pixel at 85 Hz with IP4770/71/72CZ16

ESD protection – very low capacitance < 25 pF 1 to 16 lines

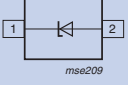
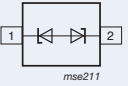
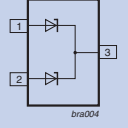
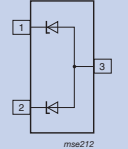
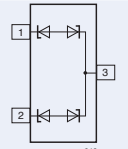
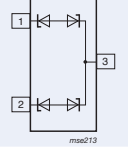
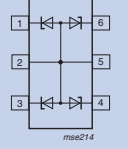
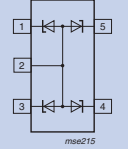
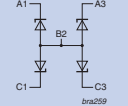
Number of protected lines Uni- directional		I_{RM} max. [μA]	@ V_{RWM} [V]	C_{line} typ. [pF]	P_{PP} * max. [W]	ESD rating** max. [kV]	Configuration	Type	Package
1		2 1 0.05 0.05 0.05	3.3 5 12 15 24	0.6 0.6 0.6 0.6 0.6	80 80 200 200 200	30 30 30 30 23		PESD3V3U1UT PESD5V0U1UT PESD12VU1UT PESD15VU1UT PESD24VU1UT	SOT23
	1	0.1 0.1 0.1	5 5 5	2.9 2.9 2.9	25 25 25	10 10 10		PESD5V0U1BA*** PESD5V0U1BB*** PESD5V0U1BL***	SOD323 (SC-76) SOD523 (SC-79) SOD882
	1	0.05 0.05	15 (diode 1) 24 (diode 2)	13	160	23		PESD1LIN	SOD323 (SC-76)
2	1	0.3 0.025	3.3 5	22 16	30 30	15 15		PESD3V3L2UM PESD5V0L2UM	SOT883 (SC-101)
	2	0.1	5	2.9	25	10		PESD5V0U2BT***	SOT23
	2	0.05 0.01	24 24	11 25	200 230	23 30		PESD1CAN PESD2CAN	SOT23
4	3	0.3 0.025 0.3 0.025 0.3 0.025	3.3 5 3.3 5 3.3 5	22 16 16 12 22 16 15 16	30 30 30 16 30 16 16	20 20 20 10 20 20 10 10		PESD3V3L4UG PESD5V0L4UG PESD3V3V4UG PESD5V0V4UG PESD3V3L4UW PESD5V0L4UW PESD3V3V4UW PESD5V0V4UW	SOT353 (SC-88A) SOT665
	4	0.01	5	16		8		IP4043CX5/LF	5 ball CSP
5	4	0.3 0.25 0.3 0.025	3.3 5 3.3 5	22 16 22 16	25 25 25 25	20 20 20 20		PESD3V3L5UY PESD5V0L5UY PESD3V3L5UV PESD5V0L5UV	SOT363 (SC-88) SOT666
6	5	0.025 0.025	5 5	16 16	35 35	20 20		PESD5V0L6US PESD5V0L6UAS	SOT96-1 (SO8) SOT505-1 (TSSOP8)
	7	0.025	5	7	35	20		PESD5V0L7BS PESD5V0L7BAS	SOT96-1 (SO8) SOT505-1 (TSSOP8)
16	15	0.01	3	15		15		IP4080CX20/LF	WLCSP

*8/20μs surge pulse acc. to IEC61000-4-5

**acc. to IEC61000-4-2 (contact discharge)

***now sampling

ESD protection – standard capacitance 1 to 18 lines

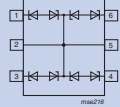
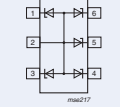
Number of protected lines Uni- directional		I_{RM} max. [μA]	V_{RWM} [V]	C_{line} typ. [pF]	P_{PP}^* max. [W]	ESD rating** max. [kV]	Configuration	Type	Package
1		2	3.3	200	150	30		PESD3V3S1UL	SOD882
		1	5	150	150	30		PESD5V0S1UL	
		0.05	12	38	150	30		PESD12VS1UL	
		0.05	15	32	150	30		PESD15VS1UL	
		0.05	24	23	150	23		PESD24VS1UL	
		2	3.3	207	330	30		PESD3V3S1UB	SOD523 (SC-79)
		1	5	152	260	30		PESD5V0S1UB	
		0.05	12	38	180	30		PESD12VS1UB	
		0.05	15	32	160	30		PESD15VS1UB	
		0.05	24	23	160	23		PESD24VS1UB	
		0.1	5	35	120	30		PESD5V0S1BA	SOD323 (SC-76)
								PESD5V0S1BB	SOD523 (SC-79)
		2	3.3	101	500	30		PESD5V0S1BL	SOD882
		1	5	75	500	30		PESD3V3L1BA	SOD323 (SC-76)
		0.05	12	19	200	30		PESD5V0L1BA	
		0.05	15	16	200	30		PESD12VL1BA	
		0.05	24	11	200	23		PESD15VL1BA	
								PESD24VL1BA	
2	1	2	3.3	207	330	30		PESD3V3S2UAT	SOT23
		1	5	152	260	30		PESD5V0S2UAT	
		0.05	12	38	180	30		PESD12VS2UAT	
		0.05	15	32	160	30		PESD15VS2UAT	
		0.05	24	23	160	23		PESD24VS2UAT	
		3	3.3	200	150	30		PESD3V3S2UQ	SOT663
		0.3	5	150	150	30		PESD5V0S2UQ	
		0.03	12	38	150	30		PESD12VS2UQ	
		0.05	15	32	150	30		PESD15VS2UQ	
		0.05	24	23	150	23		PESD24VS2UQ	
		2	3.3	207	330	30		PESD3V3S2UT	SOT23
		1	5.3	152	260	30		PESD5V2S2UT	
		1	12	38	180	30		PESD12VS2UT	
		1	15	32	160	30		PESD15VS2UT	
		1	24	23	160	23		PESD24VS2UT	
	2	0.1	5	35	120	30		PESD5V0S2BT	SOT23
		2	3.3	101	350	30		PESD3V3L2BT	
		1	5	75	350	30		PESD5V0L2BT	
		0.05	12	19	200	30		PESD12VL2BT	
		0.05	15	16	200	30		PESD15VL2BT	
		0.05	24	11	200	23		PESD24VL2BT	
4		2	3	200		8		BZA456A	SOT457 (SC-74)
		0.7	4	165		8		BZA462A	
		0.075	14	37		8		BZA418A	
		0.1	15	37		8		BZA420A	
		2.2	3.3	215	200	30		PESD3V3S4UD	
		0.15	5	158	200	30		PESD5V0S4UD	
		0.01	12	73	200	30		PESD12VS4UD	
		0.01	15	61	200	30		PESD15VS4UD	
		0.01	24	45	200	23		PESD24VS4UD	
		2	3	200		8		BZA856A	SOT353 (SC-88A)
		0.7	4	165		8		BZA862A	
		0.2	4.3	145		8		BZA868A	
		0.01	15	37		8		BZA820A	
		1	3	107		8		BZA856AL	
		0.5	4	90		8		BZA862AL	
		0.01	4.3	78		8		BZA868AL	
		1	3	107		8		BZA956A	SOT665
		0.5	4	90		8		BZA962A	
		0.01	4.3	78		8		BZA968A	
		0.01	3.3	30		15		IP4042CX5/LF	5 ball CSP

*8/20μs surge pulse acc. to IEC61000-4-5

**acc. to IEC61000-4-2 (contact discharge)

ESD protection – standard capacitance (cont'd)

1 to 18 lines

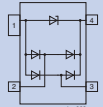
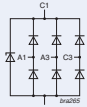
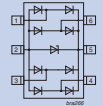
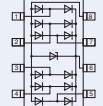
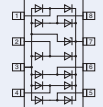
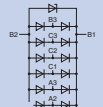
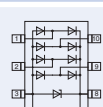
Number of protected lines Uni- directional	Bi- directional	I_{RM} max. [μA]	@ V_{RWM} [V]	C_{line} typ. [pF]	P_{PP} max. [W]	ESD rating** max. [kV]	Configuration	Type	Package
	4	0.01	5	48		15		BZA408B	SOT457 (SC-74)
5	4	2.2 0.15 0.01 0.01 0.01	3.3 5 12 15 24	215 158 73 61 45	200 200 200 200 200	30 30 30 30 23		PESD3V3S5UD PESD5V0S5UD PESD12VS5UD PESD15VS5UD PESD24VS5UD	SOT457 (SC-74)
18	17	1	5.2	100	100	8		BZA100 PESD5V2S18U	SOT163 (SO20) SOT339-1 (SSOP20)

*8/20μs surge pulse acc. to IEC61000-4-5

**acc. to IEC61000-4-2 (contact discharge)

Rail-to-Rail ESD protection – ultra low capacitance < 5 pF

2 to 8 lines

Number of protected lines	I_{RM} max. [μA]	@ V_{RWM} [V]	C_{line} typ. [pF]	ESD rating** max. [kV]	Configuration	Type	Package
2	0.1	3	1	8		PRTR5V0U2X	SOT143
	0.1	3	1.8	12		PRTR5V0U2AX	
3	0.1	3	4	8		IP4059CX5/LF	5 ball CSP
4	0.1	3	1	8		PRTR5V0U4D	SOT457 (SC-74)
6	0.1	3	1	8		PRTR5V0U6S	SOT96-1 (SO8)
	0.1	3	1	8		PRTR5V0U6AS	
7	0.1	3	4	8		IP4067CX9/LF	9 ball CSP
8	0.1	3	1	8		PRTR5V0U8S	SOT552-1 (TSSOP10)

**acc. to IEC61000-4-2 (contact discharge)

EMI filter and ESD protection

Mobile phone applications

Baseband interface	Number of lines	Line small-signal equivalents		Digital interface clock speed	Remark	Type	Package
		R_{line}	C_{line}				
Reverse battery	1	-	240 pF	-	overvoltage and reverse battery protection	IP4085CX5/LF	5 ball CSP
Audio	2	0.9 Ω	290 pF	-	low ohmic speaker (< ~8 Ω)	IP4047CX6/LF	6 ball CSP
	2	10 Ω	200 pF	-	high ohmic speaker (> ~8 Ω)	IP4048CX5/LF	5 ball CSP
	2	68 Ω	110 pF	-	differential microphone	IP4049CX5/LF	5 ball CSP
	2	470 Ω	35 pF	-	differential microphone	IP4055CX5/LF	5 ball CSP
USB	2	33 Ω / 1.5 k Ω	35 pF	~5.5 MHz	fully integrated USB2.0 low / full-speed interface with EMI filter, ESD protection, pull-up resistors and impedance matching on NXP ISP110x, ISP130x, ISP136x	IP4058CX8/LF	8 ball CSP
	2	33 Ω	35 pF	~5.5 MHz	fully integrated USB 1.0 low / full-speed interface with EMI filter, ESD protection and impedance matching on NXP ISP1110	IP4078CX6/LF	6 ball CSP
	2	-	1.4 pF	~1 GHz	USB2.0 high-speed ESD protection on NXP ISP1504/01 HS transceiver	IP4359CX4/LF	4 ball CSP
	3	-	3 pF	~240 MHz	USB2.0 high-speed ESD protection on NXP ISP176x and ISP1504	IP4059CX5/LF	5 ball CSP
Sim card	3	47 Ω / 100 Ω	35 pF	~12 MHz	EMI filter, ESD protection	IP4044CX8/LF	8 ball CSP
	3	47 Ω / 100 Ω	< 20 pF	~20 MHz	EMI filter, ESD protection	IP4064CX8/LF	8 ball CSP
Bottom connector	4	100 Ω	30 pF	~30 MHz	EMI filter, ESD protection	IP4253CZ12-6	12 pin QFN
	6	100 Ω	60 pF	~20 MHz	EMI filter, ESD protection	IP4053CX15/LF	15 ball CSP
	6	100 Ω	30 pF	~40 MHz	EMI filter and ESD protection + 4 single protection diodes	IP4153CX15/LF	15 ball CSP
Memory cards	4	47 Ω / 13 k Ω / 56 k Ω	25 pF	-	MMC ESD protection, pull-up resistors	IP4051CX11/LF	11 ball CSP
	4	50 Ω / 75 k Ω / 7 k Ω	18 pF	~25 MHz	high-speed MMC ESD protection, pull-up resistors	IP4060CX16/LF	16 ball CSP
	7	40 Ω / 50 k Ω / 25 k Ω	18 pF	~20 MHz	(mini) SD/trans flash-card ESD protection, EMI filter, pull-up resistors	IP4052CX20/LF	20 ball CSP
	7	-	5 pF	~24 MHz	memory stick PRO ESD protection	IP4067CX9/LF	9 ball CSP
	9	40 Ω / 50 k Ω / 15 k Ω	20 pF	> 52 MHz	(mini) SD-card/trans flash ESD protection, EMI filter, pull-up resistor	IP4352CX24/LF	24 ball CSP
	9	-	-	> 52 MHz	(mini) SD/SDIO memory cardlevel shifter, can be combined with IP4352CX24/LF	IP4852CX24/LF	25 ball CSP
LCD display	4	100 Ω	30 pF	~30 MHz	EMI filter, ESD protection	IP4253CZ8-4	8 pin QFN
	8	100 Ω	30 pF	~30 MHz	EMI filter, ESD protection	IP4253CZ16-8	16 pin QFN
	8	100 Ω	50 pF	~25 MHz	EMI filter, ESD protection	IP4088CX20/LF*	20 ball CSP
	10	80 Ω	40 pF	~30 MHz	EMI filter, ESD protection	IP4033CX25/LF	25 ball CSP
	10	84 Ω	14 pF	~40 MHz	EMI filter, ESD protection	IP4040CX25/LF	25 ball CSP
	10	200 Ω	50 pF	~20 MHz	EMI filter, ESD protection	IP4041CX25/LF	25 ball CSP
Keypad	10	1 Ω	50 pF	< 1 MHz	EMI filter, ESD protection	IP4035CX24/LF	24 ball CSP
Rail-to-Rail protection	4	-	1pF	~1.5 GHz	ESD protection	PRTR5V0U4Y	SOT363 (SC-88)

*now sampling

Level shifter, buffer and EMI filter with integrated ESD protection

Computing and consumer applications

Interface	Number of lines	Buffer	Level shifter	C _{line}	Resistor	Remark	Type	Package
VGA	7	Yes	Yes	5 pF	55 Ω	sync buffer, DDC level shifter	IP4770CZ16	SSOP16
	7	Yes	Yes	5 pF	65 Ω	sync buffer, DDC level shifter	IP4771CZ16	SSOP16
	7	Yes	Yes	5 pF	10 Ω	sync buffer, DDC level shifter	IP4772CZ16	SSOP16
IEEE1394	4	-	-	5 pF	55 Ω	common mode filter	IP4224CZ6	SOT457 (SC-74)
LVDS	10	-	-	5 pF	100 Ω	100 Ω termination	IP4263CZ14*	SO14 (MS-012)
USB2.0	2	-	-	1 pF	-	ESD protection	PRTR5V0U2X	SOT143
	4	-	-	1 pF	-	ESD protection	IP4220CZ6	SOT457 (SC-74)
	4	-	-	3 pF	-	> 15 kV contact ESD protection with pi-filter	IP4225CZ10	SOT457 (SC-74)
HDMI	4	-	-	1 pF	-	ESD protection	PRTR5V0U4D	SOT457 (SC-74)
	4	-	-	0.7 pF	-	ESD protection	IP4280CZ10	TSSOP10
	8	-	-	1 pF	-	ESD protection	PRTR5V0U8S	TSSOP10
	8	Yes	Yes	0.7 pF	-	level shifter, ESD protection	IP4776CZ38	TSSOP38
	8	Yes	Yes	0.7 pF	-	I ² C buffer, level shifter, ESD protection, back drive protection, CEC buffer	IP4778CZ38*	TSSOP38

* now sampling