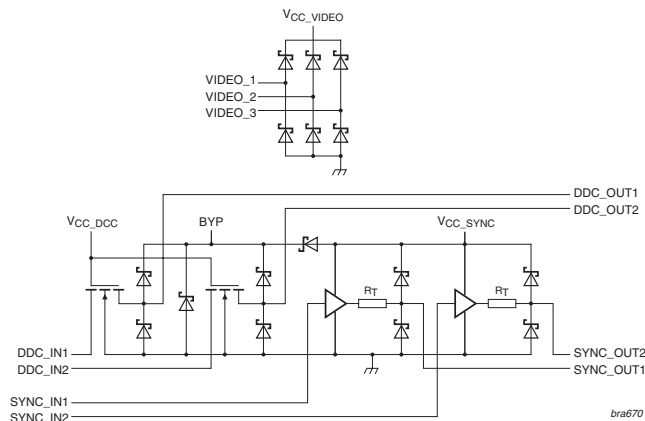


# Interface Protection Products Selection Guide

ESD protection

EMI filter

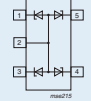
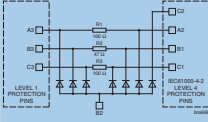
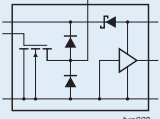
Level shifter and buffer



## Portfolio key features

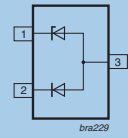
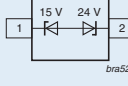
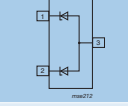
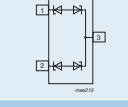
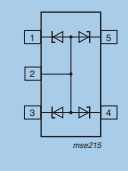
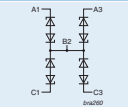
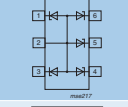
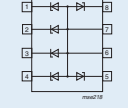
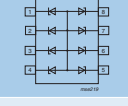
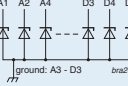
- Level shifting, buffering, ESD protection, termination, pull-up resistors, EMI filtering
- Superior size / performance ratio
- Fully integrated passive and active components
- Lowest line capacitance for high-speed interfaces -  $C_{line} = 1.0 \text{ pF}$
- High level ESD protection in compliance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

## Product overview

| Product group                                                                                   |                                                                             | Example                                                                              | Application |          |              |
|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------|----------|--------------|
|                                                                                                 |                                                                             |                                                                                      | Computing   | Consumer | Mobile phone |
| ESD protection                                                                                  | Very low capacitance < 25 pF<br>1 to 16 lines                               |  | X           | X        | X            |
|                                                                                                 | Standard capacitance<br>1 to 18 lines                                       |  | X           | X        | X            |
|                                                                                                 | Rail-to-Rail ESD protection<br>Ultra low capacitance < 5 pF<br>2 to 8 lines |  | X           | X        | X            |
| EMI filter with integrated ESD protection<br>ESD protection diodes                              |                                                                             |  | X           | X        | X            |
| Level shifter, buffer and<br>EMI filter with integrated ESD protection<br>ESD protection diodes |                                                                             |  | X           | X        |              |

**PHILIPS**

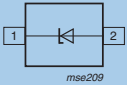
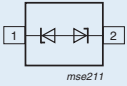
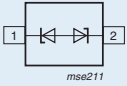
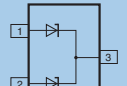
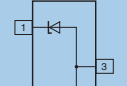
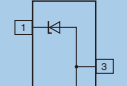
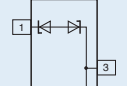
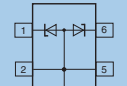
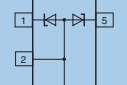
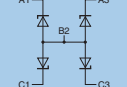
ESD protection – very low capacitance < 25 pF  
1 to 16 lines

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

ESD protection – standard capacitance  
1 to 18 lines

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

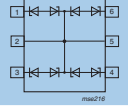
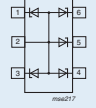
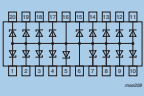
\*8/20μs surge pulse acc. to IEC61000-4-5

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

\*\*\* under development

## ESD protection – standard capacitance (cont'd)

### 1 to 18 lines

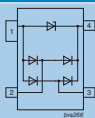
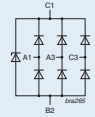
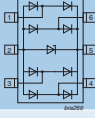
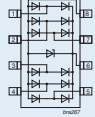
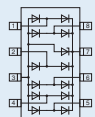
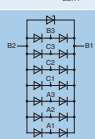
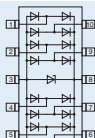
| Number of protected lines<br>Uni-directional |    | $I_{RM}$<br>max.<br>[μA] | @ | $V_{RWM}$<br>[V] | $C_{line}$<br>typ.<br>[pF] | $P_{PP}$ *<br>max.<br>[W] | ESD rating**<br>max.<br>[kV] | Configuration                                                                      | Type        | Package           |
|----------------------------------------------|----|--------------------------|---|------------------|----------------------------|---------------------------|------------------------------|------------------------------------------------------------------------------------|-------------|-------------------|
|                                              | 4  | 0.01                     |   | 5                | 48                         |                           | 15                           |  | BZA408B     | SOT457 (SC-74)    |
| 5                                            | 4  | 2.2                      |   | 3.3              | 215                        | 200                       | 30                           |  | PESD3V3S5UD | SOT457 (SC-74)    |
|                                              |    | 0.15                     |   | 5                | 158                        | 200                       | 30                           |                                                                                    | PESD5V0S5UD |                   |
|                                              |    | 0.01                     |   | 12               | 73                         | 200                       | 30                           |                                                                                    | PESD12VS5UD |                   |
|                                              |    | 0.01                     |   | 15               | 61                         | 200                       | 30                           |                                                                                    | PESD15VS5UD |                   |
|                                              |    | 0.01                     |   | 24               | 45                         | 200                       | 23                           |                                                                                    | PESD24VS5UD |                   |
| 18                                           | 17 | 1                        |   | 5.2              | 100                        | 100                       | 8                            |  | BZA100      | SOT163 (SO20)     |
|                                              |    |                          |   |                  |                            |                           |                              |                                                                                    | PESD5V2S18U | 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 | $I_{RM}$<br>max.<br>[μA] | @ | $V_{RWM}$<br>[V] | $C_{line}$<br>typ.<br>[pF] | ESD rating**<br>max.<br>[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 $\Omega$                                | 290 pF     | -                             | low ohmic speaker (< ~8 $\Omega$ )                                                                                                                                | IP4047CX6/LF   | 6 ball CSP  |
|                    | 2               | 10 $\Omega$                                 | 200 pF     | -                             | high ohmic speaker (> ~8 $\Omega$ )                                                                                                                               | IP4048CX5/LF   | 5 ball CSP  |
|                    | 2               | 68 $\Omega$                                 | 110 pF     | -                             | differential microphone                                                                                                                                           | IP4049CX5/LF   | 5 ball CSP  |
|                    | 2               | 470 $\Omega$                                | 35 pF      | -                             | differential microphone                                                                                                                                           | IP4055CX5/LF   | 5 ball CSP  |
| USB                | 2               | 33 $\Omega$ / 1.5 k $\Omega$                | 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 Philips ISP110x, ISP130x, ISP136x | IP4058CX8/LF   | 8 ball CSP  |
|                    | 2               | 33 $\Omega$                                 | 35 pF      | ~5.5 MHz                      | Fully integrated USB2.0 low / full-speed interface with EMI filter, ESD protection and impedance matching on Philips ISP1110                                      | IP4078CX6/LF   | 6 ball CSP  |
|                    | 3               | -                                           | 3 pF       | ~240 MHz                      | USB2.0 high-speed ESD protection on Philips ISP176x and ISP1504                                                                                                   | IP4059CX5/LF   | 5 ball CSP  |
| Sim card           | 3               | 47 $\Omega$ / 100 $\Omega$                  | 35 pF      | ~12 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4044CX8/LF   | 8 ball CSP  |
|                    | 3               | 47 $\Omega$ / 100 $\Omega$                  | < 20 pF    | ~20 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4064CX8/LF   | 8 ball CSP  |
| Bottom connector   | 6               | 100 $\Omega$                                | 60 pF      | ~20 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4053CX15/LF  | 15 ball CSP |
|                    | 6               | 100 $\Omega$                                | 30 pF      | ~40 MHz                       | EMI filter and ESD protection + 4 single protection diodes                                                                                                        | IP4153CX15/LF  | 15 ball CSP |
| Memory cards       | 4               | 47 $\Omega$ / 13 k $\Omega$ / 56 k $\Omega$ | 25 pF      | -                             | MMC ESD protection, pull-up resistors                                                                                                                             | IP4051CX11/LF  | 11 ball CSP |
|                    | 4               | 50 $\Omega$ / 75 k $\Omega$ / 7 k $\Omega$  | 18 pF      | ~25 MHz                       | High-speed MMC ESD protection, pull-up resistors                                                                                                                  | IP4060CX16/LF  | 16 ball CSP |
|                    | 7               | 40 $\Omega$ / 50 k $\Omega$ / 25 k $\Omega$ | 18 pF      | ~20 MHz                       | SD-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  |
| LCD display        | 8               | 100 $\Omega$                                | 50 pF      | ~25 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4088CX20/LF* | 20 ball CSP |
|                    | 10              | 80 $\Omega$                                 | 40 pF      | ~30 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4033CX25/LF  | 25 ball CSP |
|                    | 10              | 84 $\Omega$                                 | 14 pF      | ~40 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4040CX25/LF  | 25 ball CSP |
|                    | 10              | 200 $\Omega$                                | 50 pF      | ~20 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4041CX25/LF  | 25 ball CSP |
| Keypad             | 10              | 1 $\Omega$                                  | 50 pF      | < 1 MHz                       | EMI filter, ESD protection                                                                                                                                        | IP4035CX24/LF  | 24 ball CSP |

\* under development

# Level shifter, buffer and EMI filter with integrated ESD protection

Computing and consumer applications

| Interface | Number of lines | Sync buffer | Level shifter | C <sub>line</sub> | Resistor               | Remark                            | Type        | Package             |
|-----------|-----------------|-------------|---------------|-------------------|------------------------|-----------------------------------|-------------|---------------------|
| VGA       | 7               | -           | -             | 5 pF              | 75 Ω<br>2.2 KΩ<br>33 Ω | 75 Ω termination,<br>EMI filter   | IP4271CZ20* | TSSOP20<br>(MO-153) |
|           | 7               | -           | -             | 5 pF              | 75 Ω                   | 75 Ω termination,<br>EMI filter   | IP4272CZ20* | TSSOP20<br>(MO-153) |
|           | 7               | -           | -             | 5 pF              | 75 Ω<br>2.2 KΩ<br>33 Ω | 75 Ω termination,<br>EMI filter   | IP4273CZ16* | SO16 (MS-012)       |
|           | 7               | -           | -             | 5 pF              | 75 Ω                   | 75 Ω termination,<br>EMI filter   | IP4274CZ16* | SO16 (MS-012)       |
|           | 7               | Yes         | Yes           | 5 pF              | 55 Ω                   | Sync buffer,<br>DDC level shifter | IP4770CZ16  | SSOP16              |
|           | 7               | Yes         | Yes           | 5 pF              | 65 Ω                   | Sync buffer,<br>DDC level shifter | IP4771CZ16  | SSOP16              |
|           | 7               | Yes         | Yes           | 5 pF              | 10 Ω                   | Sync buffer,<br>DDC level shifter | IP4772CZ16  | SSOP16              |
| IEEE1394  | 4               | -           | -             | 5 pF              | 55 Ω                   | Common<br>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               | -           | -             | 4 pF              | -                      | EMI filter,<br>ESD protection     | IP4225CZ10  | SOT457 (SC-74)      |
| HDMI      | 4               | -           | -             | 1 pF              | -                      | ESD protection                    | PRTR5V0U4D  | SOT457 (SC-74)      |
|           | 8               | -           | -             | 1 pF              | -                      | ESD protection                    | PRTR5V0U8S  | TSSOP10             |
|           | 8               | -           | Yes           | 0.7 pF            | -                      | Level shifter,<br>ESD protection  | IP4776CZ38  | TSSOP38             |

\* under development

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Document order number: 9397 750 15386

Date of release: July 2006

Published in the Netherlands

