

# TVS Diodes

Transient Voltage Suppressor Diodes

## ESD204-B1-02 Series

Bi-directional Low Capacitance TVS Diode

ESD204-B1-02ELS  
ESD204-B1-02EL

## Data Sheet

Revision 1.2, 2013-05-17  
Final

Power Management & Multimarket

**Edition 2013-05-17**

**Published by  
Infineon Technologies AG  
81726 Munich, Germany**

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**Revision History: Rev. 1.1, 2013-02-06**

| Page or Item | Subjects (major changes since previous revision) |
|--------------|--------------------------------------------------|
|--------------|--------------------------------------------------|

**Revision 1.2, 2013-05-17**

|  |                                  |
|--|----------------------------------|
|  | New type ESD204-B1-02EL inserted |
|  |                                  |
|  |                                  |
|  |                                  |

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Last Trademarks Update 2010-06-09

# 1 Bi-directional Low Capacitance TVS Diode

## 1.1 Features

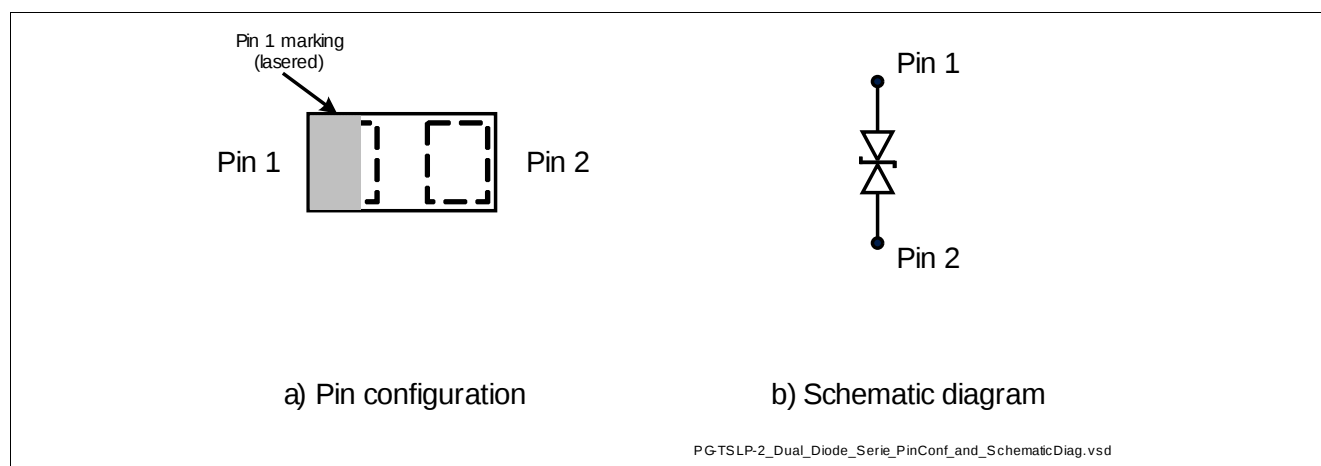
- ESD / Transient protection of data lines in 3.3 / 5 / 12 V applications according to :
  - IEC61000-4-2 (ESD) :  $\pm 20$  kV (air) and  $\pm 18$  kV (contact)
  - IEC61000-4-4 (EFT) :  $\pm 40$  A (5/50ns)
- Maximum working voltage:  $V_{RWM} = -8 / +14$  V
- Very low reverse current:  $I_R < 1$  nA (typical)
- Low capacitance  $C_L = 4$  pF I/O to GND (typical)



## 1.2 Application Examples

- Keypad, touchpad, buttons, convenience keys
- LCD displays, Camera, audio lines, mobile communication, Consumer products (E-Book, MP3, DVD, DSC, ...)
- Notebooks tablets and desktop computers and their peripherals

## 1.3 Product Description



**Figure 1** a) Pin Configuration and b) Schematic Diagram

**Table 1** Ordering information

| Type                         | Package   | Configuration          | Marking code |
|------------------------------|-----------|------------------------|--------------|
| ESD204-B1-02ELS              | TSSLP-2-3 | 1 line, bi-directional | <u>D</u>     |
| ESD204-B1-02EL <sup>1)</sup> | TSLP-2-19 | 1 line, bi-directional | RR           |

1) Product not available yet, target data

## 2 Characteristics

**Table 2** Maximum Rating at  $T_A = 25\text{ °C}$ , unless otherwise specified

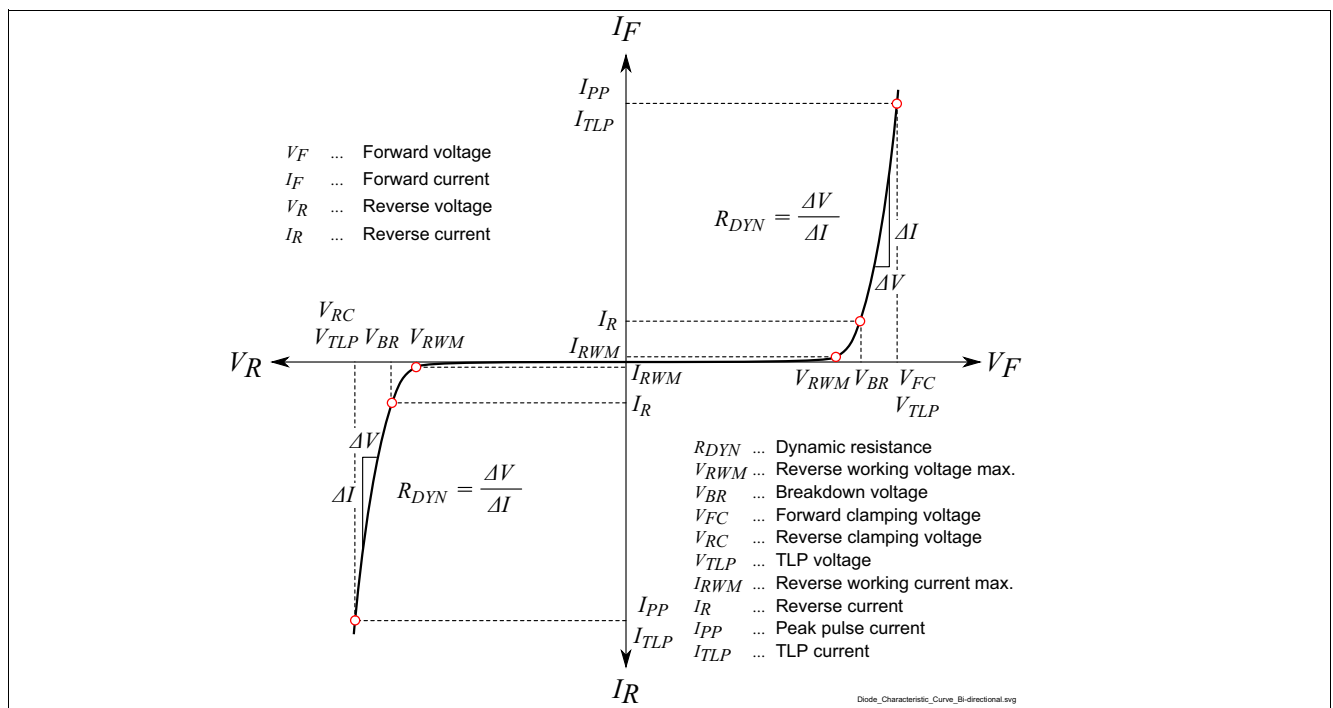
| Parameter                                                            | Symbol    | Values |      |      | Unit |
|----------------------------------------------------------------------|-----------|--------|------|------|------|
|                                                                      |           | Min.   | Typ. | Max. |      |
| ESD air discharge <sup>1)</sup>                                      | $V_{ESD}$ | -20    | –    | 20   | kV   |
| ESD contact discharge <sup>1)</sup>                                  | $V_{ESD}$ | -18    | –    | 18   | kV   |
| Peak pulse current ( $t_p = 8/20\text{ }\mu\text{s}$ ) <sup>2)</sup> | $I_{PP}$  | -1     | –    | 1    | A    |
| Operating temperature                                                | $T_{OP}$  | -55    | –    | 150  | °C   |
| Storage temperature                                                  | $T_{stg}$ | -65    | –    | 150  | °C   |

1)  $V_{ESD}$  according to IEC61000-4-2

2)  $I_{PP}$  according to IEC61000-4-5

**Attention:** Stresses above the max. values listed here may cause permanent damage to the device. Exposure to absolute maximum rating conditions for extended periods may affect device reliability. Maximum ratings are absolute ratings; exceeding only one of these values may cause irreversible damage to the integrated circuit.

### 2.1 Electrical Characteristics at $T_A = 25\text{ °C}$ , unless otherwise specified



**Figure 2** Definitions of electrical characteristics

## Characteristics

**Table 3** DC characteristics at  $T_A = 25\text{ °C}$ , unless otherwise specified

| Parameter               | Symbol    | Values |      |      | Unit | Note / Test Condition                      |
|-------------------------|-----------|--------|------|------|------|--------------------------------------------|
|                         |           | Min.   | Typ. | Max. |      |                                            |
| Reverse working voltage | $V_{RWM}$ | -8     | –    | 14   | V    | from Pin2 to Pin1                          |
| Breakdown voltage       | $V_{BR}$  | 8.5    | 11   | 14   | V    | $I_R = 1\text{ mA}$ ,<br>from Pin1 to Pin2 |
| Breakdown voltage       | $V_{BR}$  | 14.5   | 17   | 20   | V    | $I_R = 1\text{ mA}$ ,<br>from Pin2 to Pin1 |
| Reverse current         | $I_R$     | –      | <1   | 50   | nA   | $V_R = 3.3\text{ V}$                       |

**Table 4** RF characteristics at  $T_A = 25\text{ °C}$ , unless otherwise specified

| Parameter        | Symbol | Values |      |      | Unit | Note / Test Condition                                   |
|------------------|--------|--------|------|------|------|---------------------------------------------------------|
|                  |        | Min.   | Typ. | Max. |      |                                                         |
| Line capacitance | $C_L$  | –      | 4    | 7    | pF   | $V_R = 0\text{ V}$ , $f = 1\text{ MHz}$ ,<br>I/O to GND |
| Serie inductance | $L_S$  | –      | 0.2  | –    | nH   | ESD204-B1-02ELS<br>ESD204-B1-02EL                       |
|                  |        | –      | 0.4  | –    |      |                                                         |

**Table 5** ESD characteristics at  $T_A = 25\text{ °C}$ , unless otherwise specified

| Parameter                      | Symbol   | Values |      |      | Unit | Note / Test Condition                      |
|--------------------------------|----------|--------|------|------|------|--------------------------------------------|
|                                |          | Min.   | Typ. | Max. |      |                                            |
| Clamping voltage <sup>1)</sup> | $V_{CL}$ | –      | 17   | 22   | V    | $I_{PP} = 1\text{ A}$<br>from Pin1 to Pin2 |
|                                | $V_{CL}$ | –      | 23   | 28   | V    | $I_{PP} = 1\text{ A}$<br>from Pin2 to Pin1 |

1) According to IEC61000-4-5 ( $t_p : 8 / 20\text{ }\mu\text{s}$ )

## 2.2 Typical Performance characteristics at $T_A = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

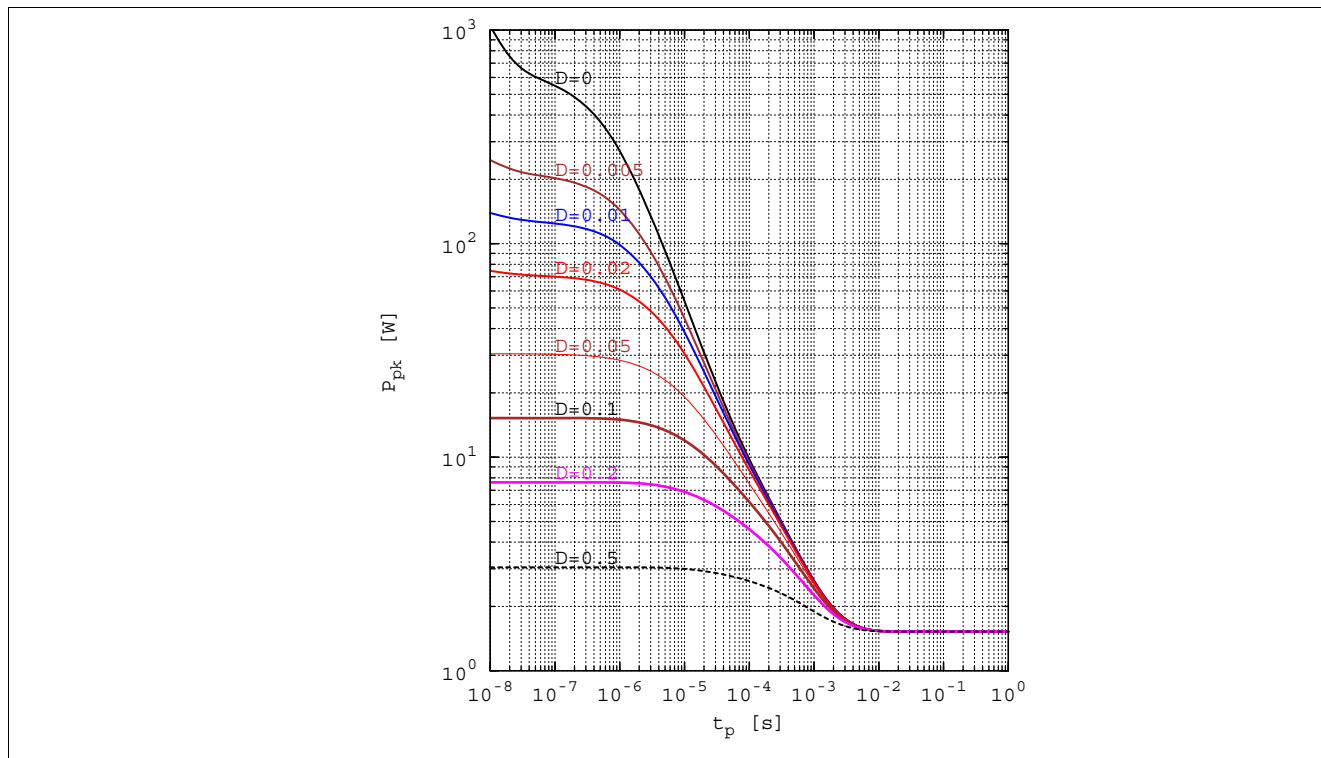


Figure 3 Non-repetitive peak pulse power:  $P_{pk} = f(t_p)$

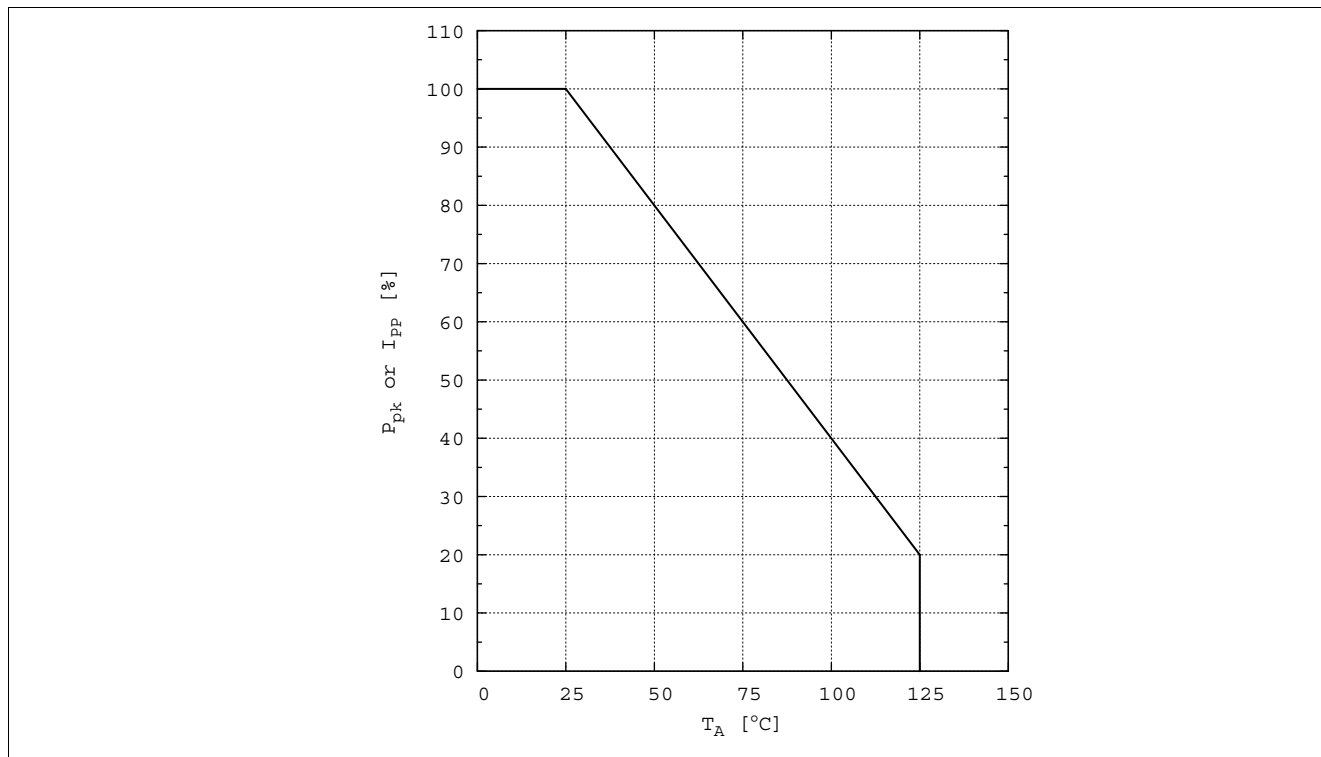


Figure 4 Power derating curve:  $P_{pk} = f(T_A)$

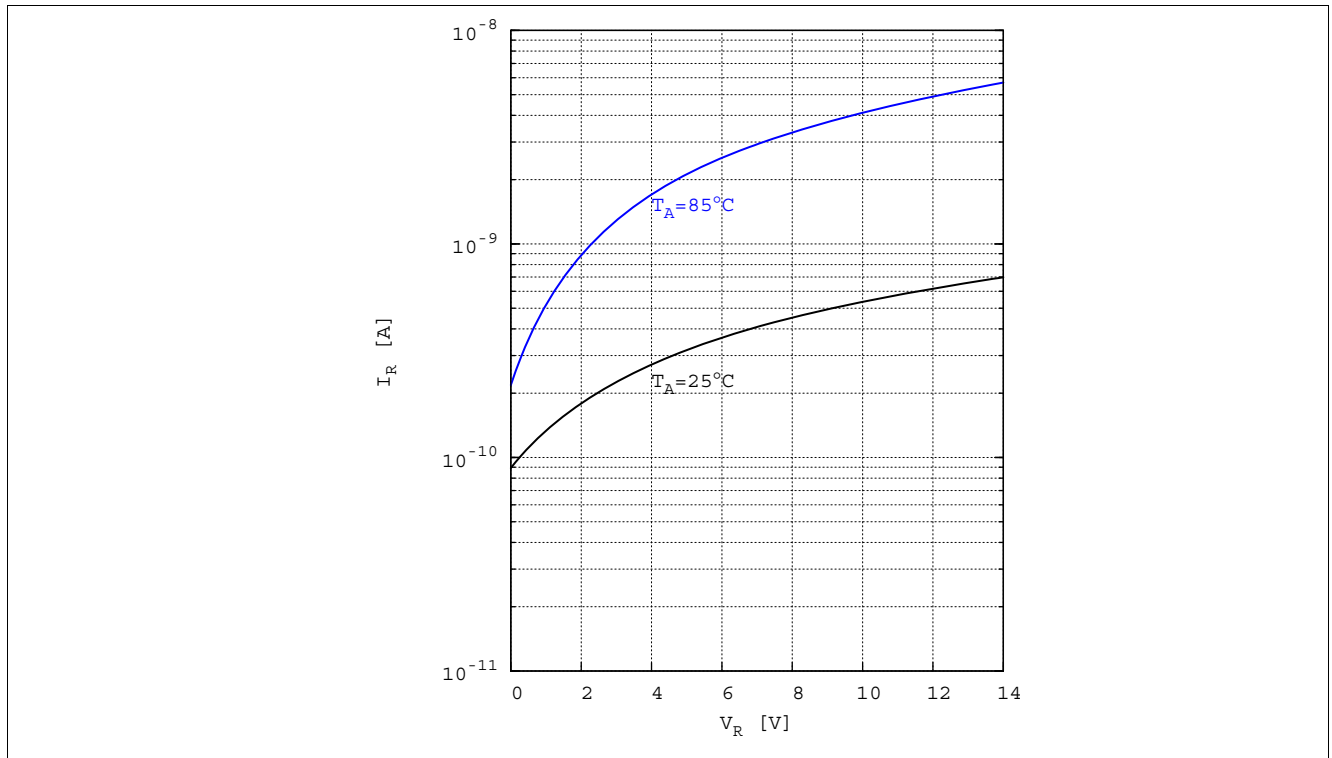


Figure 5 Reverse characteristic,  $I_R = (V_R)$ ,  $T_A$  = parameter

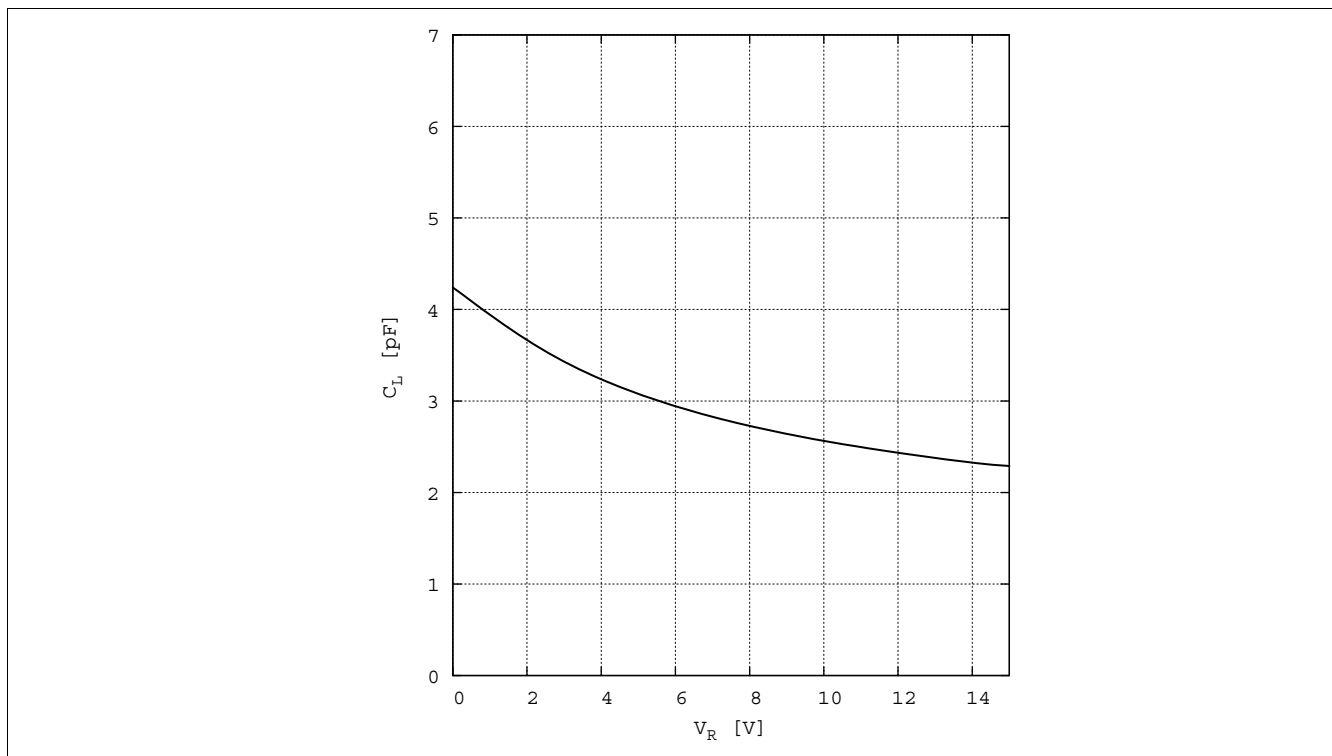
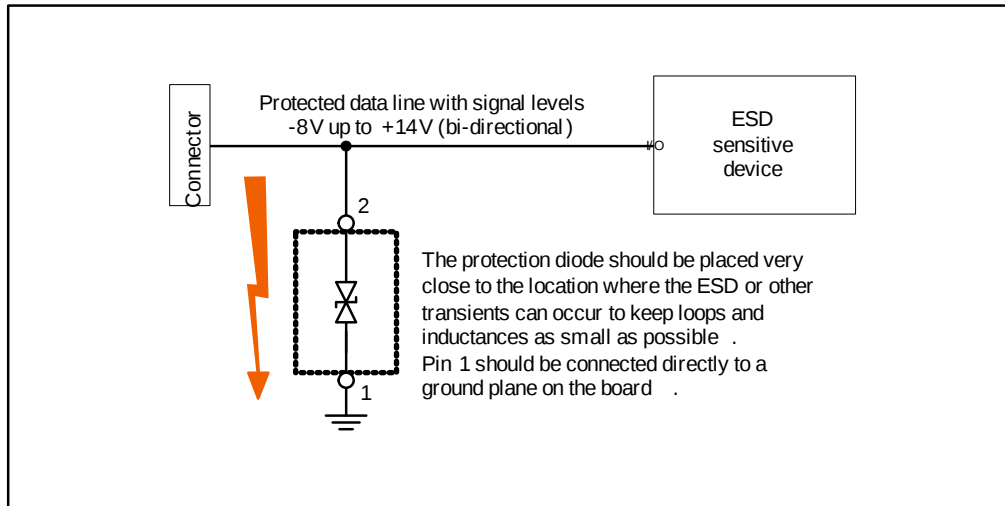


Figure 6 Line capacitance  $C_L = f(V_R)$

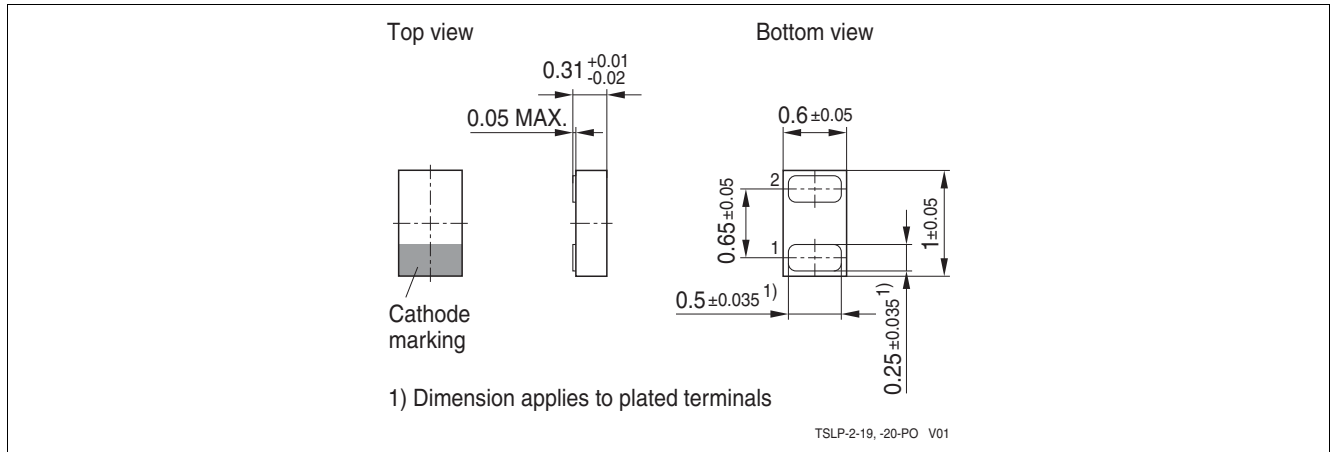
### 3 Application Information



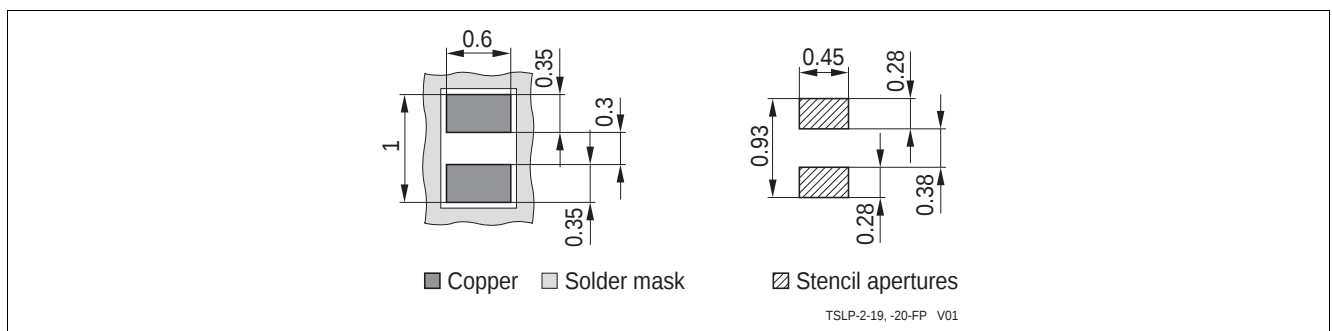
**Figure 7 1 Line, bi-directional protection with ESD diode**



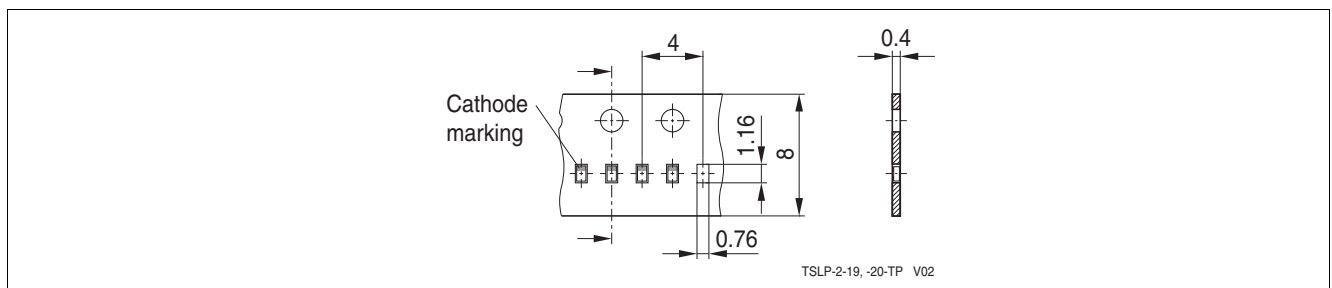
## 4.2 TSLP-2-19



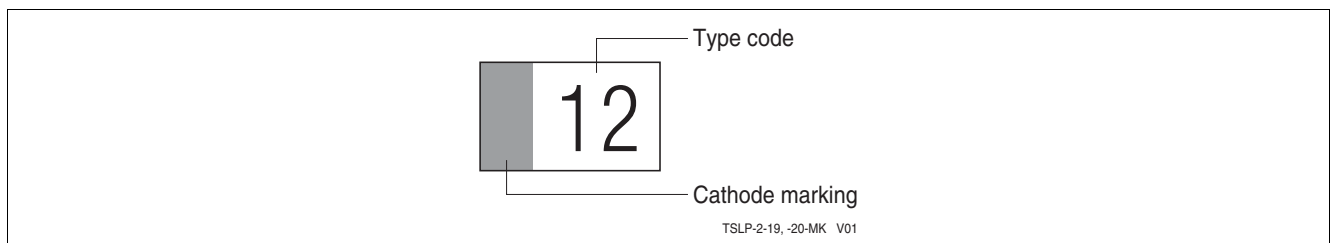
**Figure 12 TSLP-2-19: Package Overview**



**Figure 13 TSLP-2-19: Footprint**



**Figure 14 TSLP-2-19: Packing**



**Figure 15 TSLP-2-19: Marking (example)**

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