

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

Edition 2013-05-17

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

**© 2013 Infineon Technologies AG
All Rights Reserved.**

Legal Disclaimer

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. With respect to any examples or hints given herein, any typical values stated herein and/or any information regarding the application of the device, Infineon Technologies hereby disclaims any and all warranties and liabilities of any kind, including without limitation, warranties of non-infringement of intellectual property rights of any third party.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest Infineon Technologies Office (www.infineon.com).

Warnings

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact the nearest Infineon Technologies Office.

Infineon Technologies components may be used in life-support devices or systems only with the express written approval of Infineon Technologies, if a failure of such components can reasonably be expected to cause the failure of that life-support device or system or to affect the safety or effectiveness of that device or system. Life support devices or systems are intended to be implanted in the human body or to support and/or maintain and sustain and/or protect human life. If they fail, it is reasonable to assume that the health of the user or other persons may be endangered.

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 |
| | |
| | |
| | |

Trademarks of Infineon Technologies AG

AURIX™, BlueMoon™, COMNEON™, C166™, CROSSAVE™, CanPAK™, CIPOST™, CoolMOS™, CoolSET™, CORECONTROL™, DAVE™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPACK™, EconoPIM™, EiceDRIVER™, EUPEC™, FCOS™, HITFET™, HybridPACK™, ISOFACE™, I²RF™, IsoPACK™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OmniTune™, OptiMOS™, ORIGA™, PROFET™, PRO-SIL™, PRIMARION™, PrimePACK™, RASIC™, ReverSave™, SatRIC™, SIEGET™, SINDRION™, SMARTi™, SmartLEWIS™, TEMPFET™, thinQ!™, TriCore™, TRENCHSTOP™, X-GOLD™, XMM™, X-PMU™, XPOSSYS™.

Other Trademarks

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, PRIMECELL™, REALVIEW™, THUMB™ of ARM Limited, UK. AUTOSAR™ is licensed by AUTOSAR development partnership. Bluetooth™ of Bluetooth SIG Inc. CAT-iq™ of DECT Forum. COLOSSUS™, FirstGPS™ of Trimble Navigation Ltd. EMV™ of EMVCo, LLC (Visa Holdings Inc.). EPCOS™ of Epcos AG. FLEXGO™ of Microsoft Corporation. FlexRay™ is licensed by FlexRay Consortium. HYPERTERMINAL™ of Hilgraeve Incorporated. IEC™ of Commission Electrotechnique Internationale. IrDA™ of Infrared Data Association Corporation. ISO™ of INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. MATLAB™ of MathWorks, Inc. MAXIM™ of Maxim Integrated Products, Inc. MICROTEC™, NUCLEUS™ of Mentor Graphics Corporation. Mifare™ of NXP. MIPI™ of MIPI Alliance, Inc. MIPS™ of MIPS Technologies, Inc., USA. muRata™ of MURATA MANUFACTURING CO., MICROWAVE OFFICE™ (MWO) of Applied Wave Research Inc., OmniVision™ of OmniVision Technologies, Inc. Openwave™ Openwave Systems Inc. RED HAT™ Red Hat, Inc. RFMD™ RF Micro Devices, Inc. SIRIUS™ of Sirius Sattelite Radio Inc. SOLARIS™ of Sun Microsystems, Inc. SPANSION™ of Spansion LLC Ltd. Symbian™ of Symbian Software Limited. TAIYO YUDEN™ of Taiyo Yuden Co. TEAKLITE™ of CEVA, Inc. TEKTRONIX™ of Tektronix Inc. TOKO™ of TOKO KABUSHIKI KAISHA TA. UNIX™ of X/Open Company Limited. VERILOG™, PALLADIUM™ of Cadence Design Systems, Inc. VLYNQ™ of Texas Instruments Incorporated. VXWORKS™, WIND RIVER™ of WIND RIVER SYSTEMS, INC. ZETEX™ of Diodes Zetex Limited.

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) : ± 20 kV (air) and ± 18 kV (contact)
 - IEC61000-4-4 (EFT) : ± 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

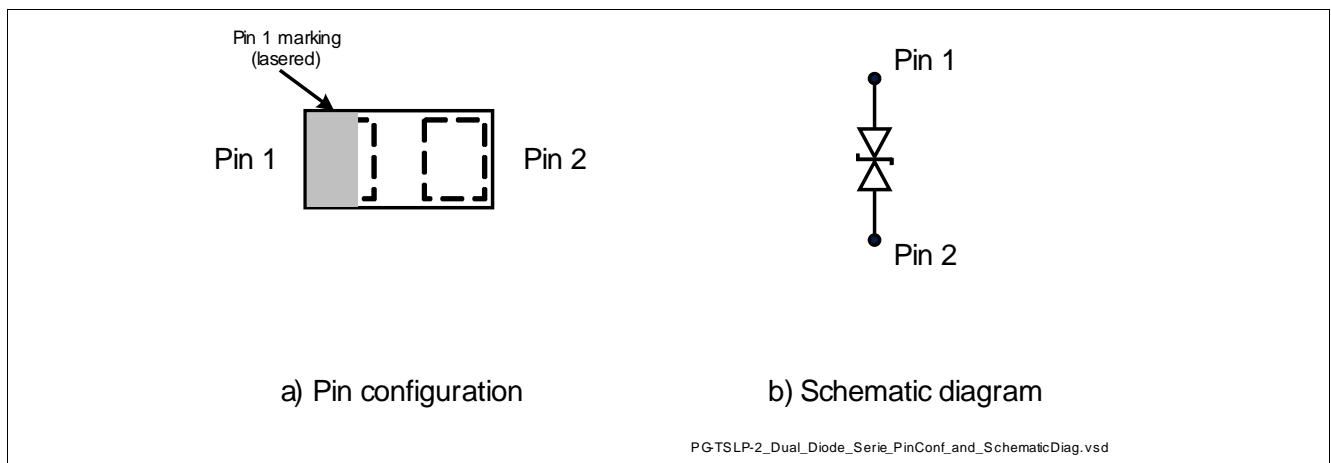


Figure 1 a) Pin Configuration and b) Schematic Diagram

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 ¹⁾ | 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 ¹⁾ | V_{ESD} | -20 | – | 20 | kV |
| ESD contact discharge ¹⁾ | V_{ESD} | -18 | – | 18 | kV |
| Peak pulse current ($t_p = 8/20\ \mu\text{s}$) ²⁾ | 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

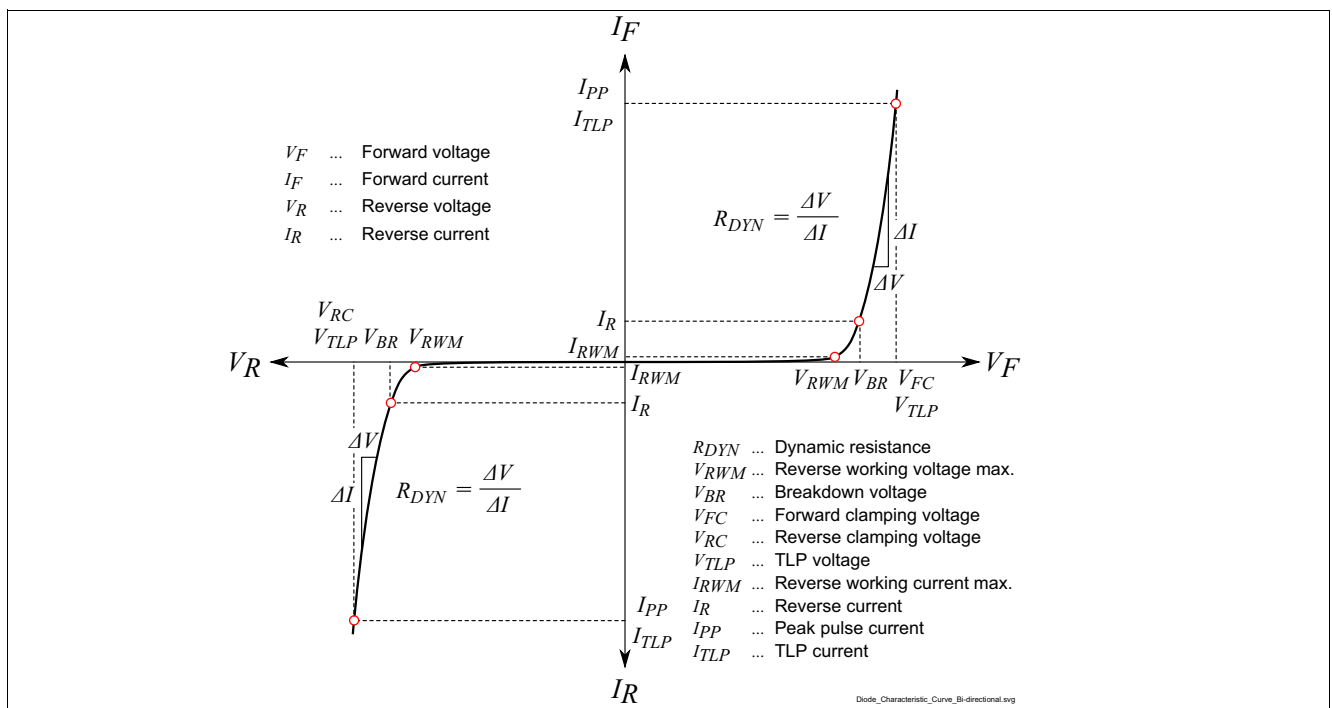


Figure 2 Definitions of electrical characteristics

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 | $I_R = 1\text{ mA}$, from Pin1 to Pin2 |
| Breakdown voltage | V_{BR} | 14.5 | 17 | 20 | V | $I_R = 1\text{ mA}$, 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 | $V_R = 0\text{ V}$, $f = 1\text{ MHz}$, I/O to GND |
| Serie inductance | L_S | – | 0.2 | – | nH | ESD204-B1-02ELS 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 ¹⁾ | V_{CL} | – | 17 | 22 | V | $I_{PP} = 1\text{ A}$ from Pin1 to Pin2 |
| | V_{CL} | – | 23 | 28 | V | $I_{PP} = 1\text{ A}$ 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

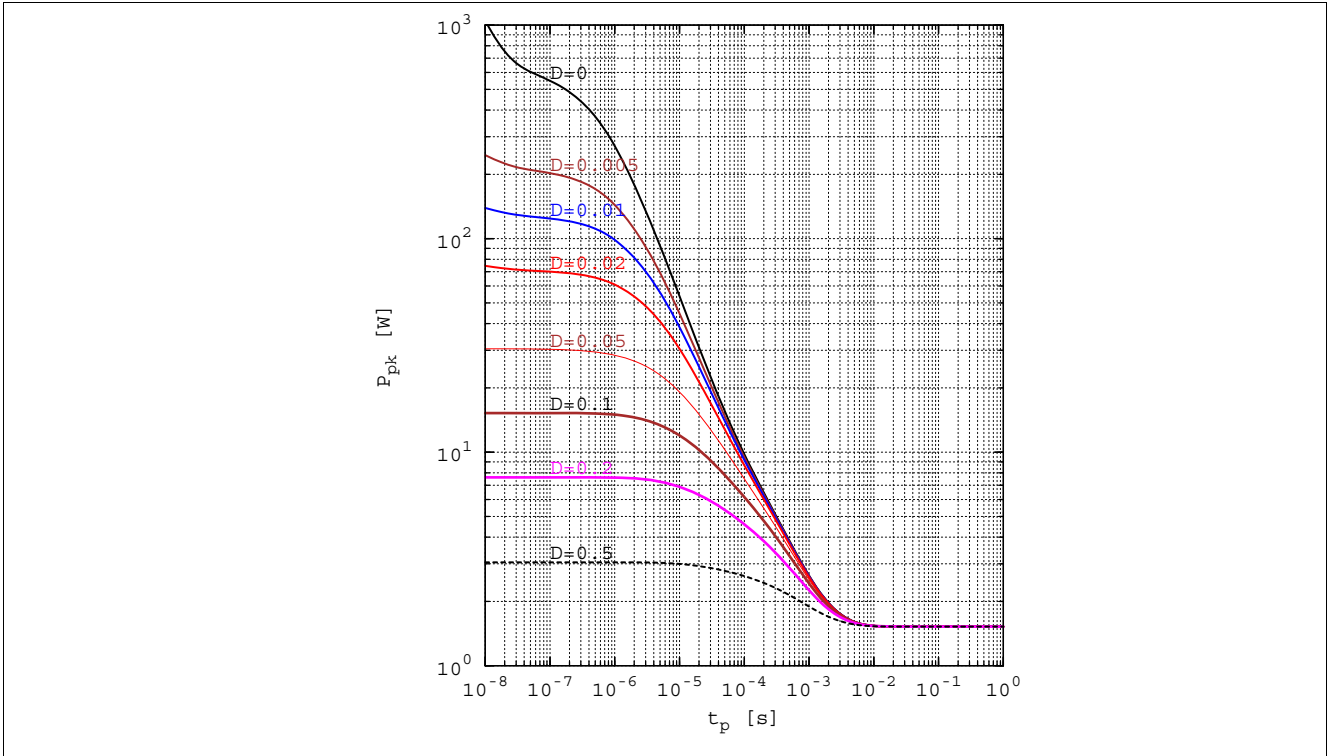


Figure 3 Non-repetitive peak pulse power: $P_{pk} = f(t_p)$

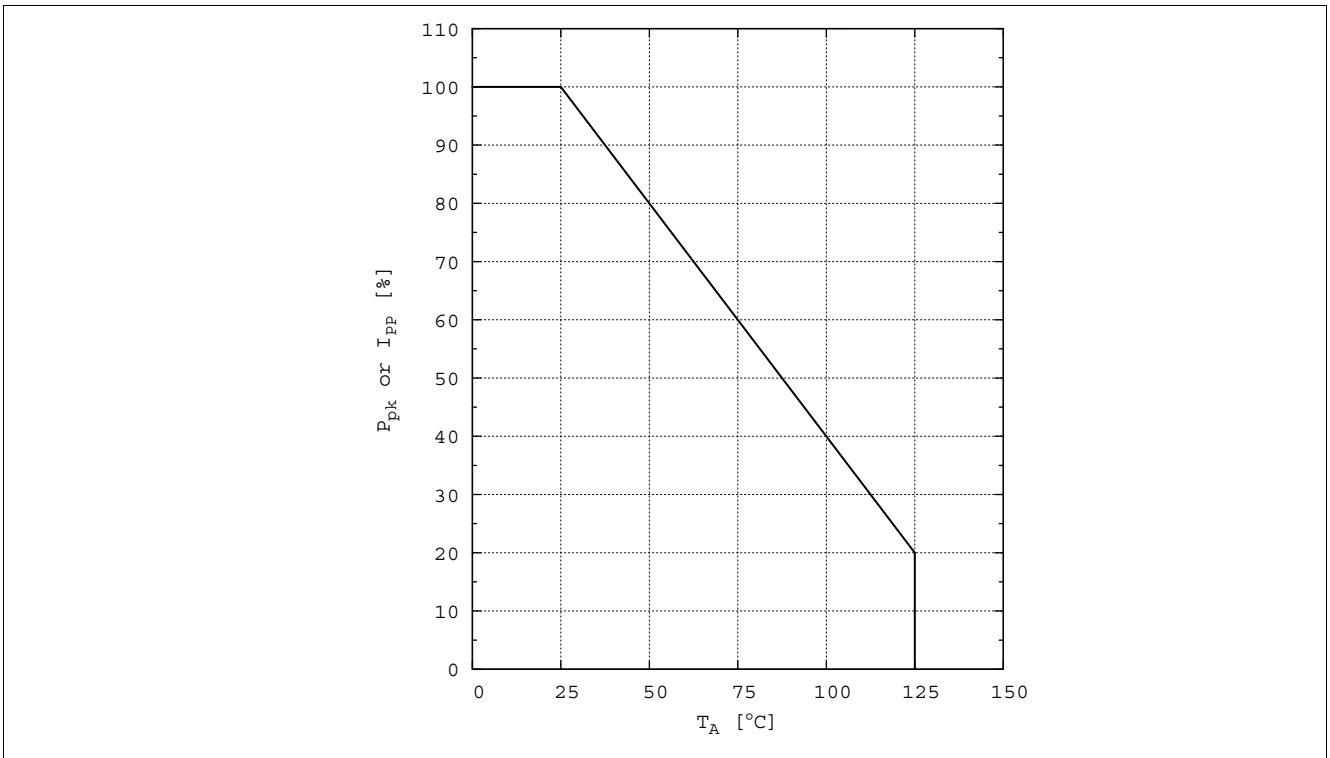


Figure 4 Power derating curve: $P_{pk} = f(T_A)$

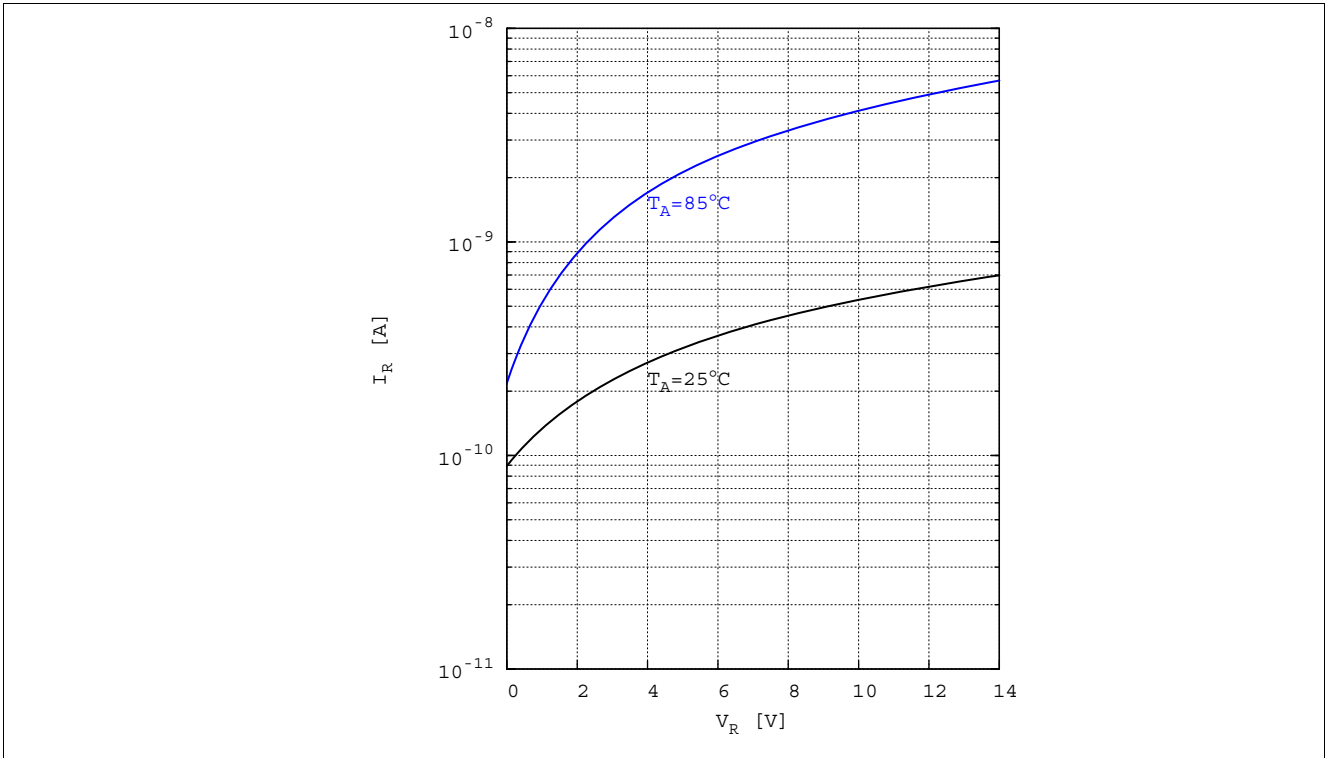


Figure 5 Reverse characteristic, $I_R = (V_R)$, $T_A =$ parameter

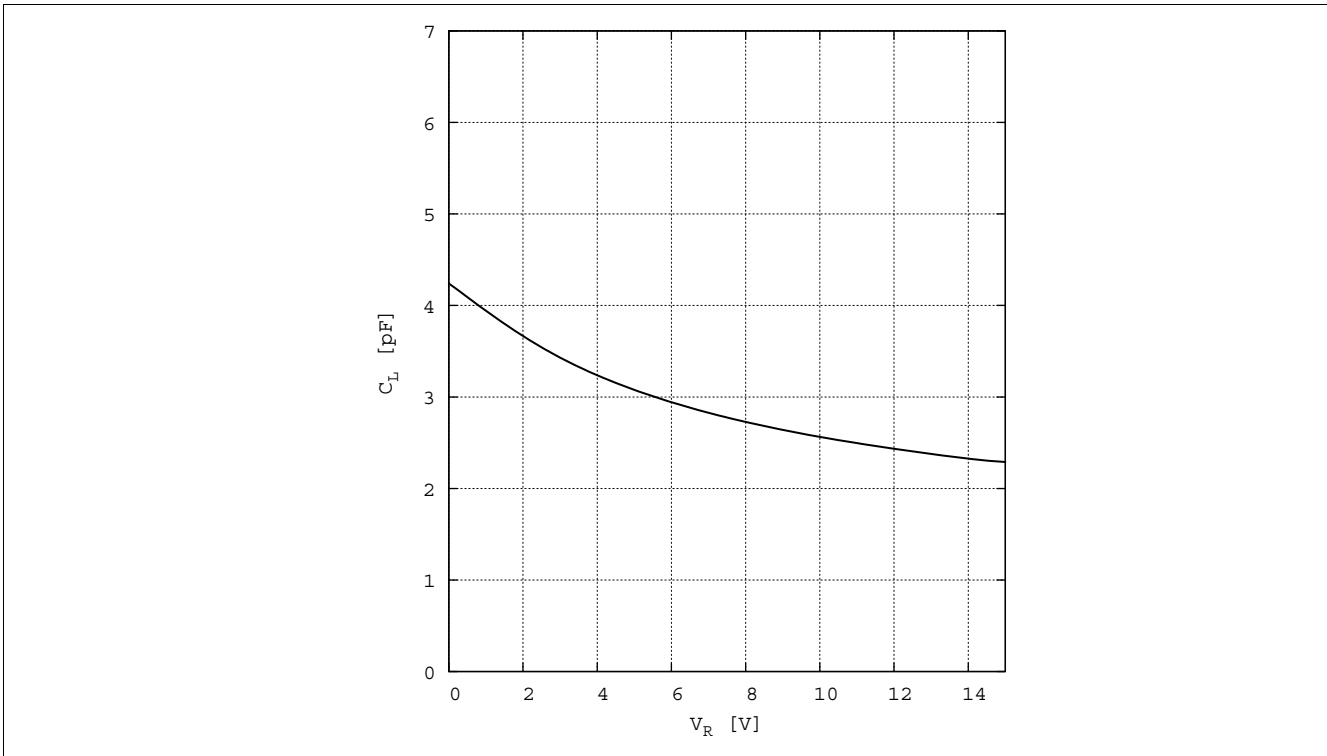


Figure 6 Line capacitance $C_L = f(V_R)$

3 Application Information

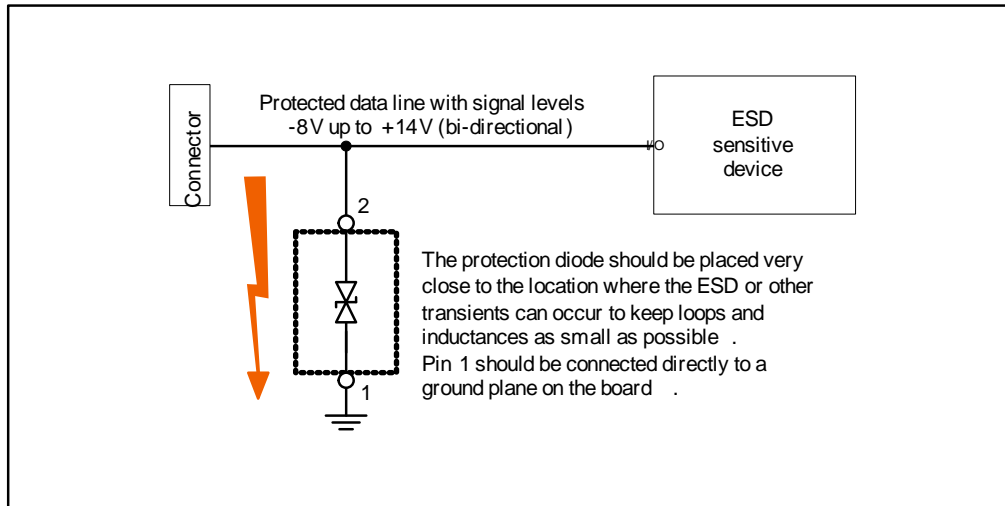


Figure 7 1 Line, bi-directional protection with ESD diode

4 Package Information

4.1 TSSLP-2-3

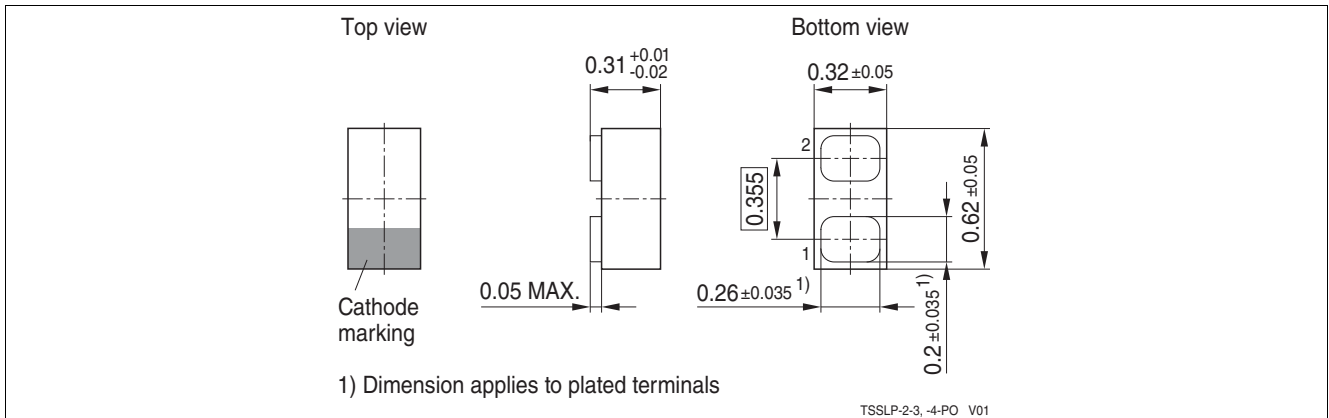


Figure 8 TSSLP-2-3: Package Overview

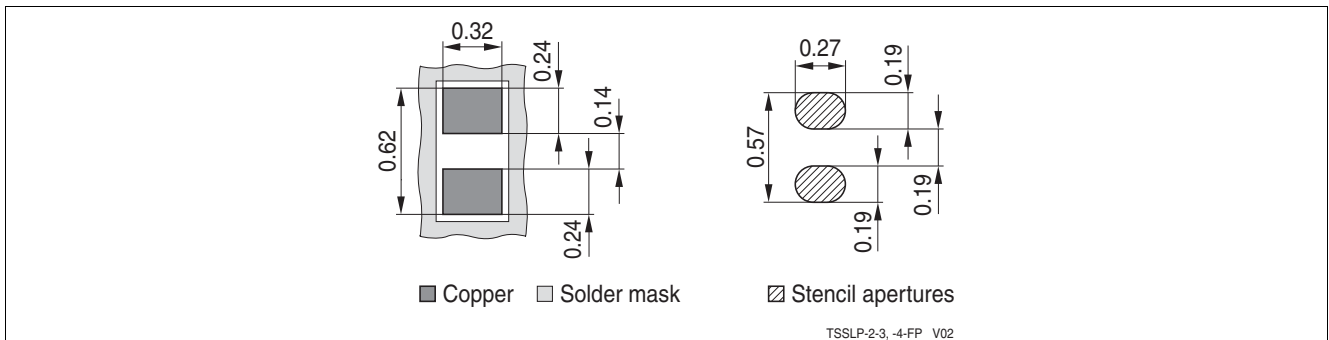


Figure 9 TSSLP-2-3 Footprint

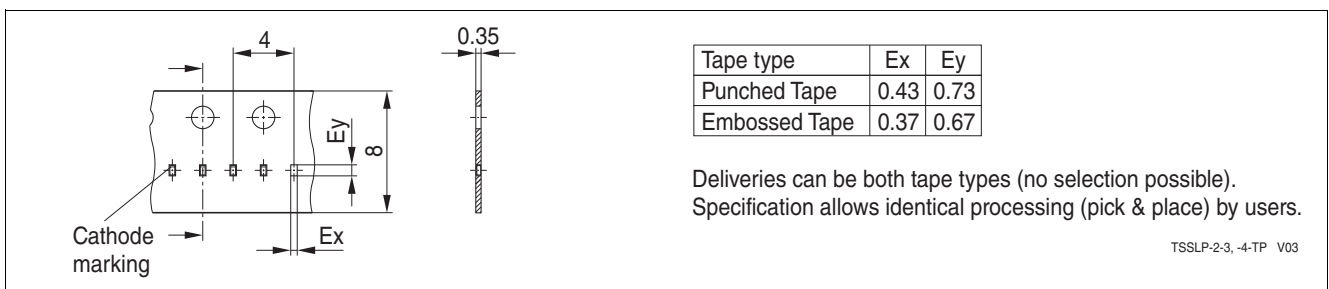


Figure 10 TSSLP-2-3: Packing

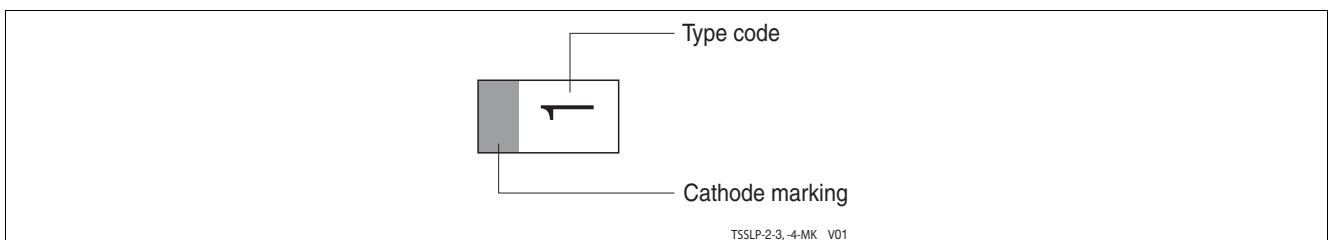


Figure 11 TSSLP-2-3: Marking (example)

4.2 TSLP-2-19

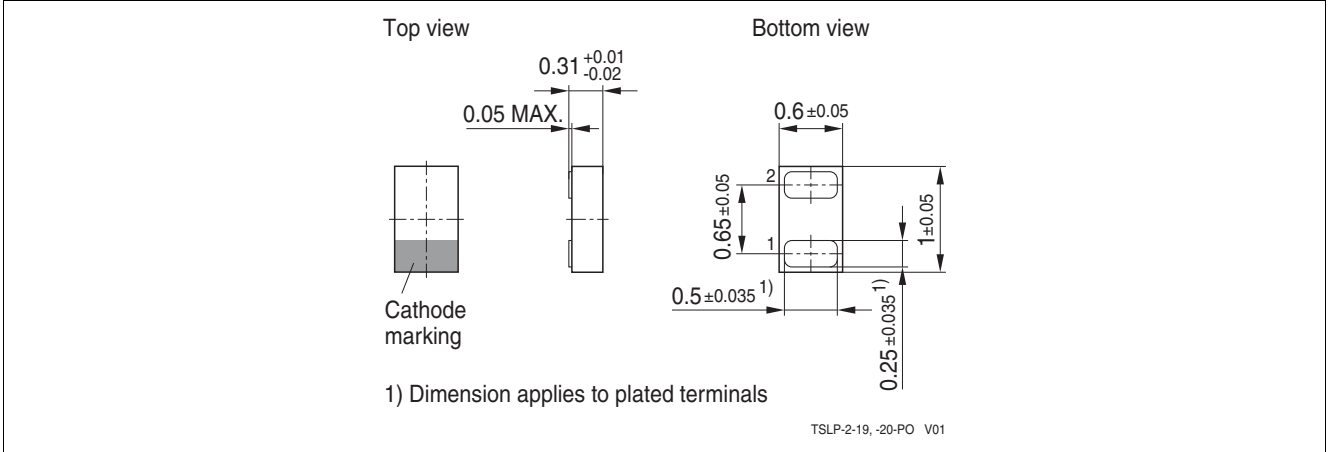


Figure 12 TSLP-2-19: Package Overview

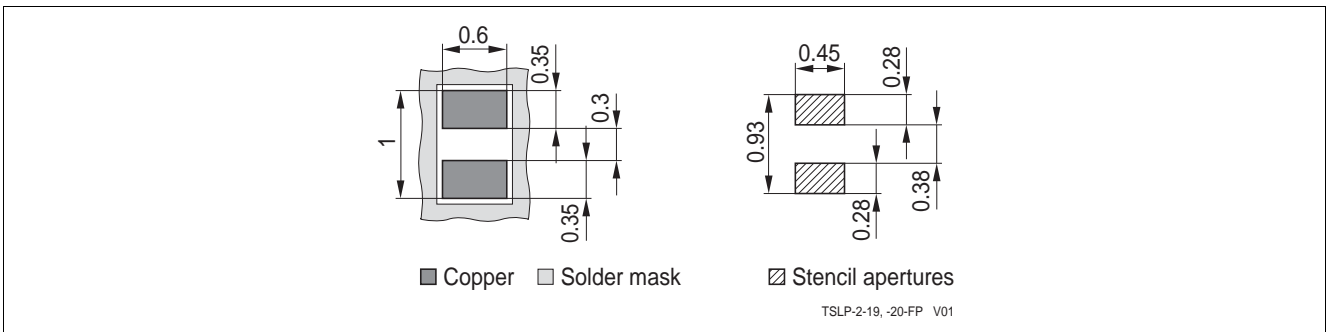


Figure 13 TSLP-2-19: Footprint

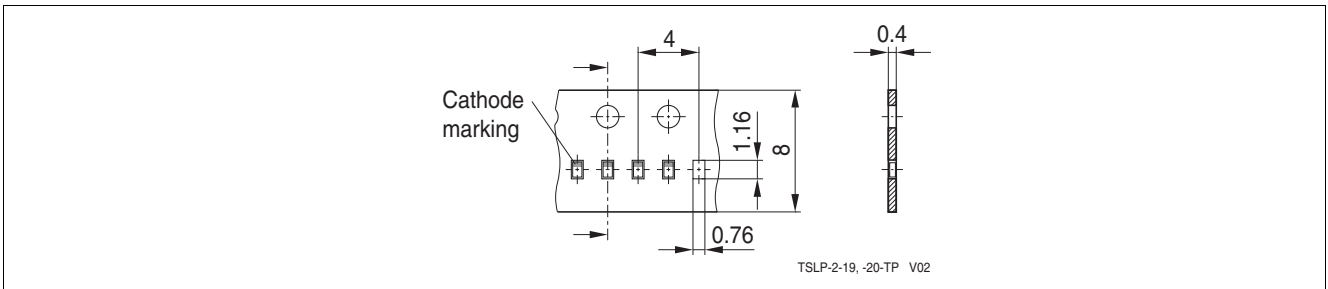


Figure 14 TSLP-2-19: Packing

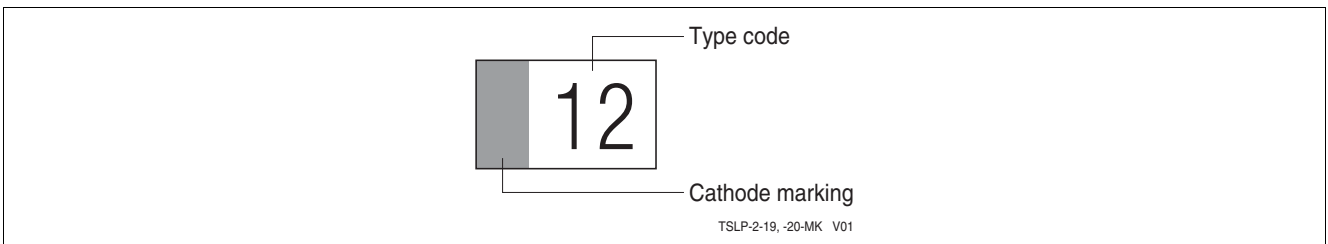


Figure 15 TSLP-2-19: Marking (example)

www.infineon.com

Published by Infineon Technologies AG