

# 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](http://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)
<b>Revision 1.2, 2013-05-17</b>	
	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™, I<sup>2</sup>RF™, 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) :  $\pm 20$  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

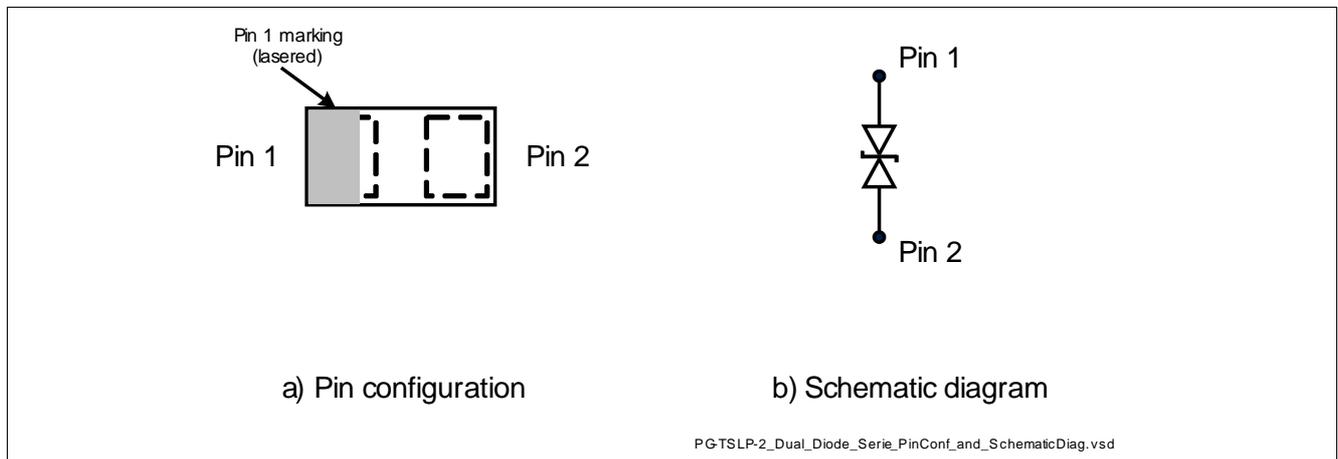


Figure 1 a) Pin Configuration and b) Schematic Diagram

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

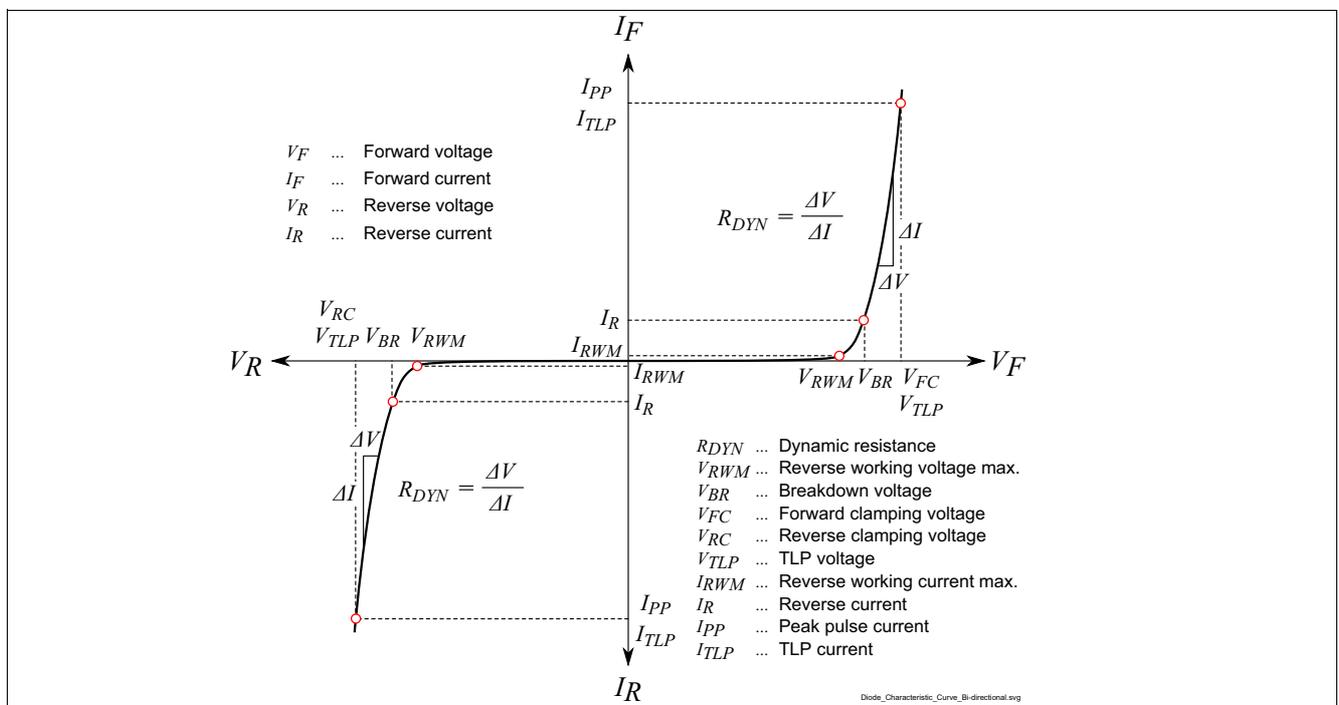
Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
ESD air discharge <sup>1)</sup>	$V_{ESD}$	-20	–	20	kV
ESD contact discharge <sup>1)</sup>	$V_{ESD}$	-18	–	18	kV
Peak pulse current ( $t_p = 8/20\ \mu\text{s}$ ) <sup>2)</sup>	$I_{PP}$	-1	–	1	A
Operating temperature	$T_{OP}$	-55	–	150	°C
Storage temperature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

**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 <sup>1)</sup>	$V_{CL}$	–	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

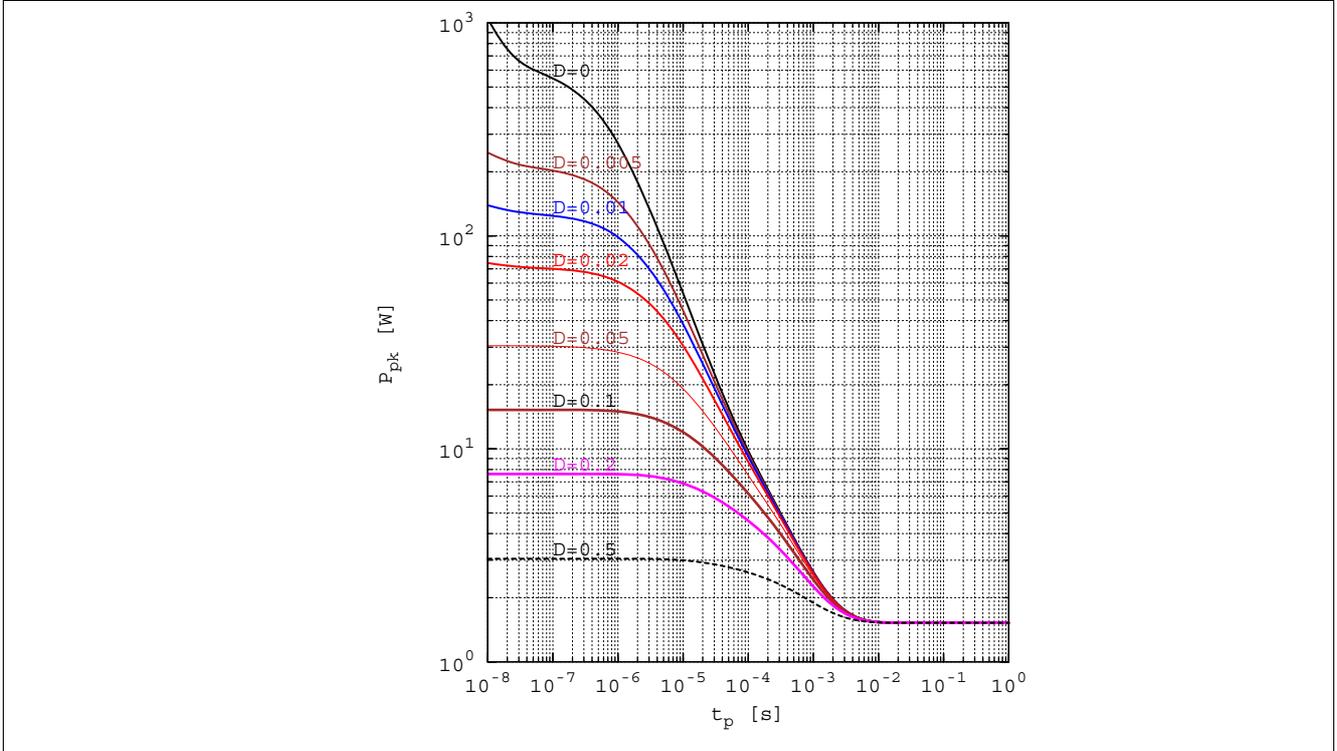


Figure 3 Non-repetitive peak pulse power:  $P_{pk} = f(t_p)$

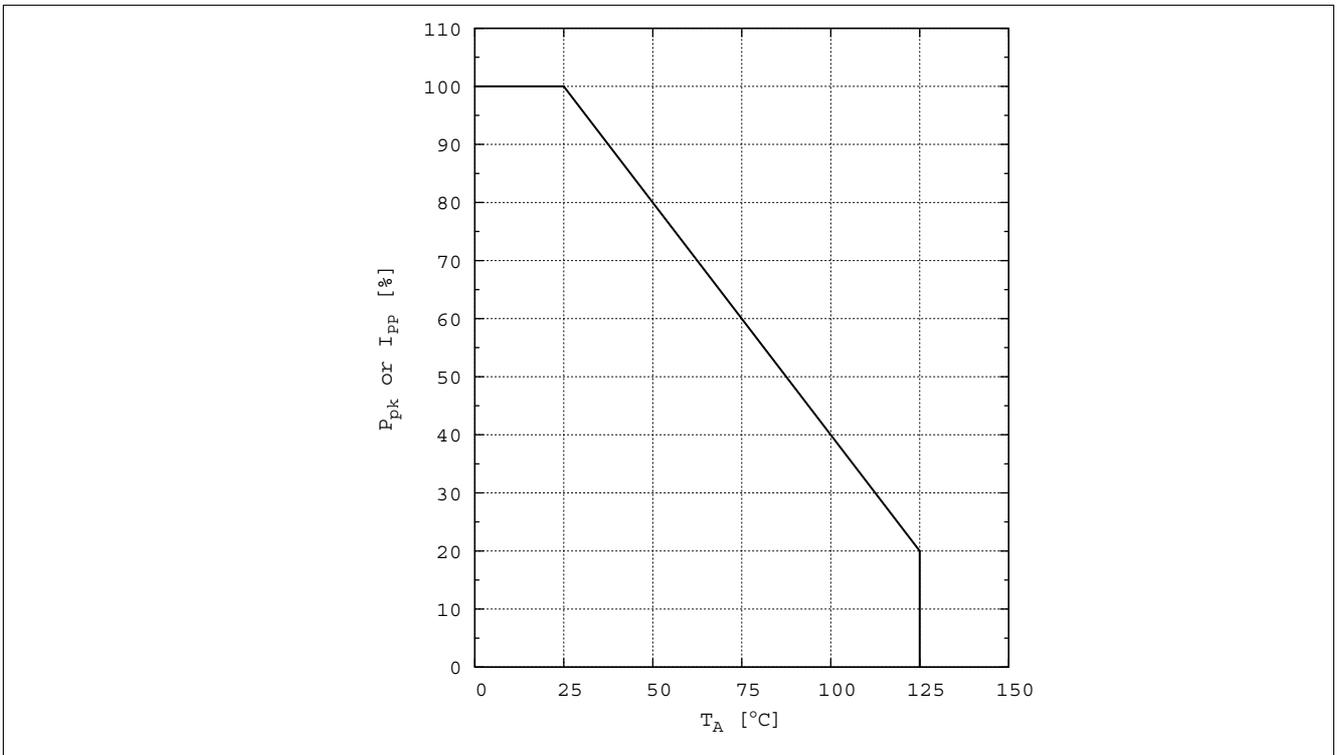


Figure 4 Power derating curve:  $P_{pk} = f(T_A)$

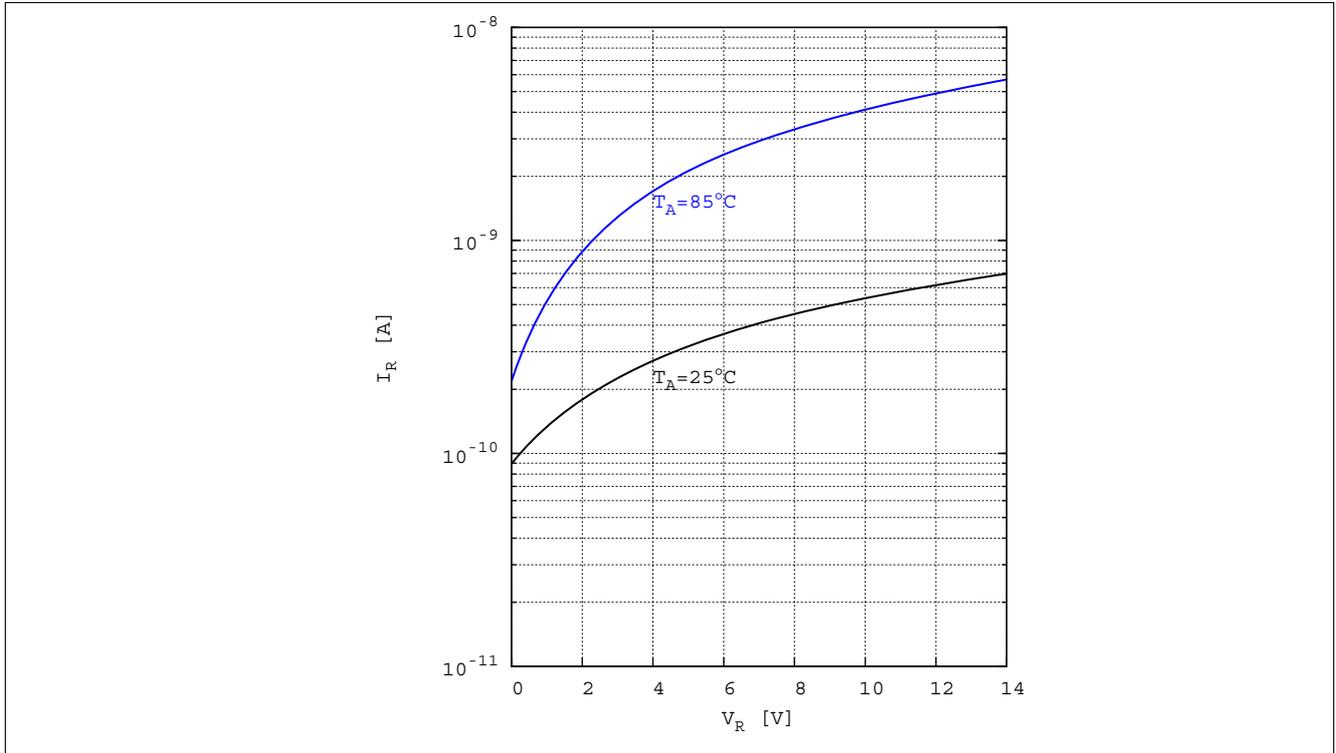


Figure 5 Reverse characteristic,  $I_R = (V_R)$ ,  $T_A =$  parameter

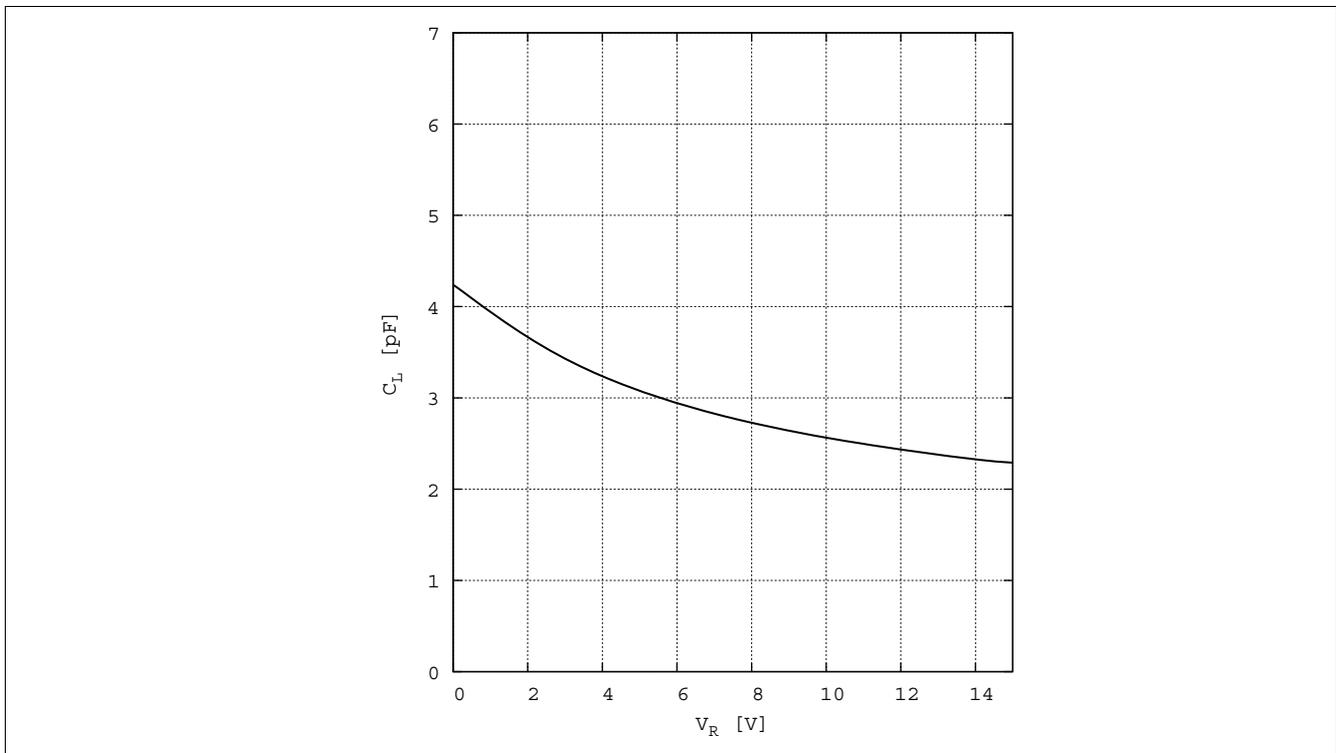


Figure 6 Line capacitance  $C_L = f(V_R)$

### 3 Application Information

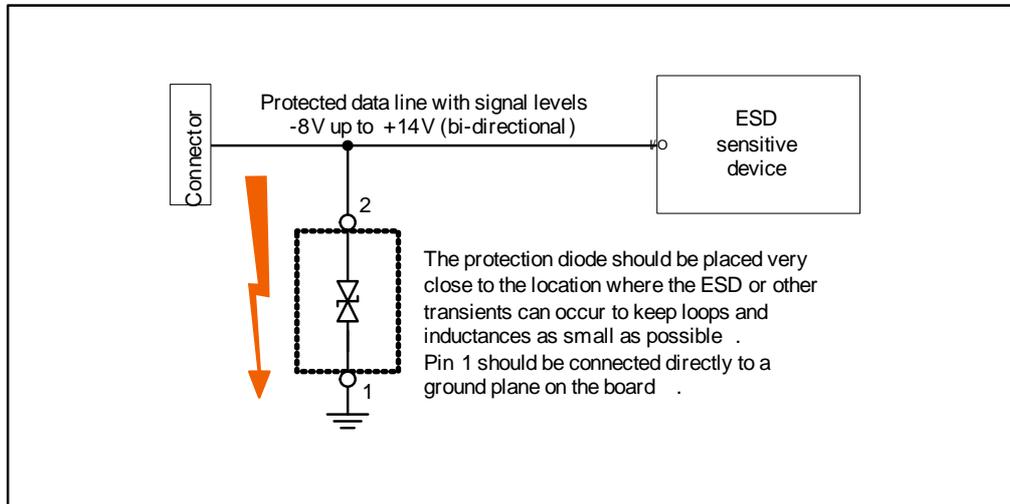


Figure 7 1 Line, bi-directional protection with ESD diode

## 4 Package Information

### 4.1 TSSLP-2-3

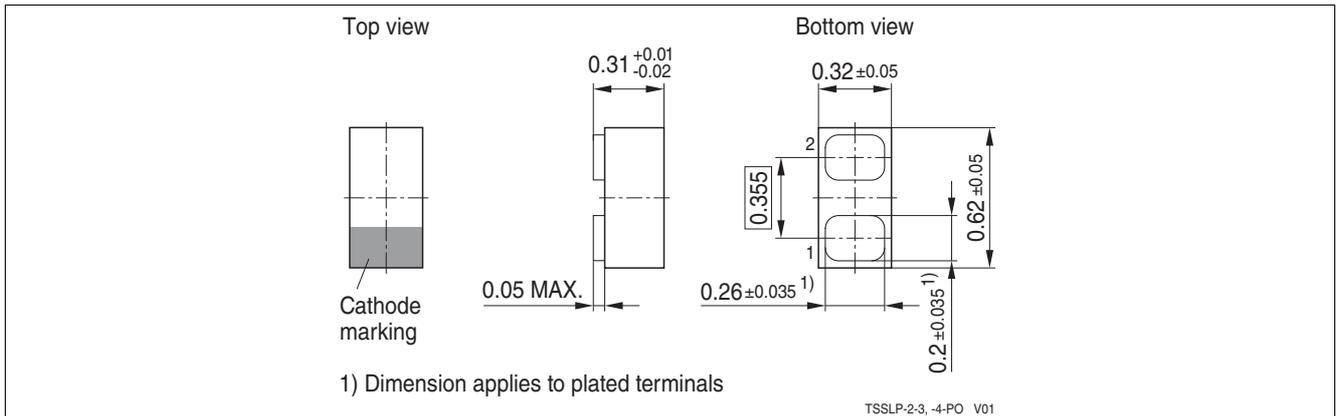


Figure 8 TSSLP-2-3: Package Overview

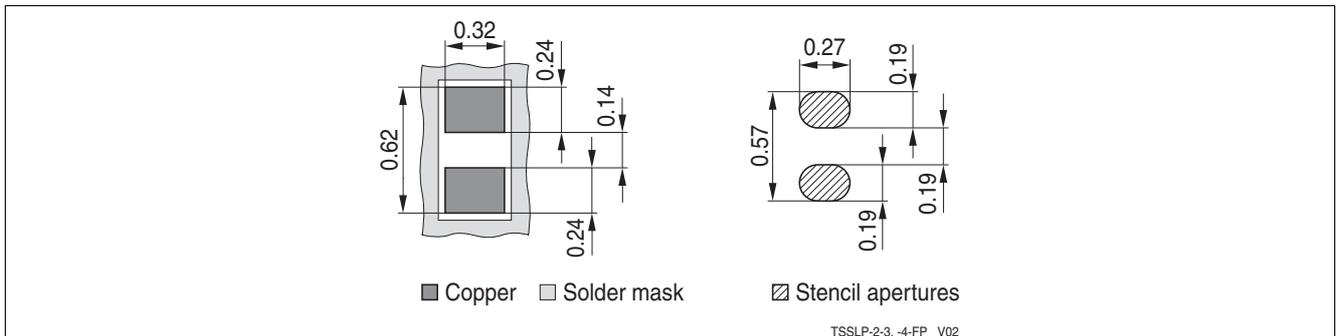


Figure 9 TSSLP-2-3 Footprint

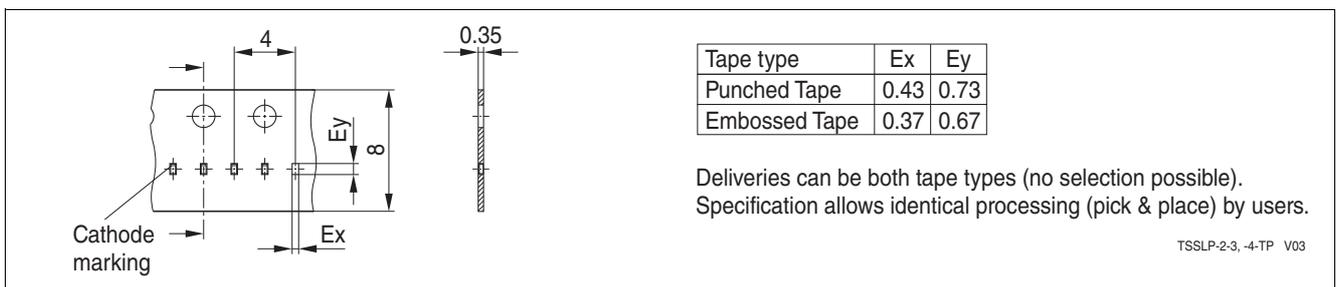


Figure 10 TSSLP-2-3: Packing

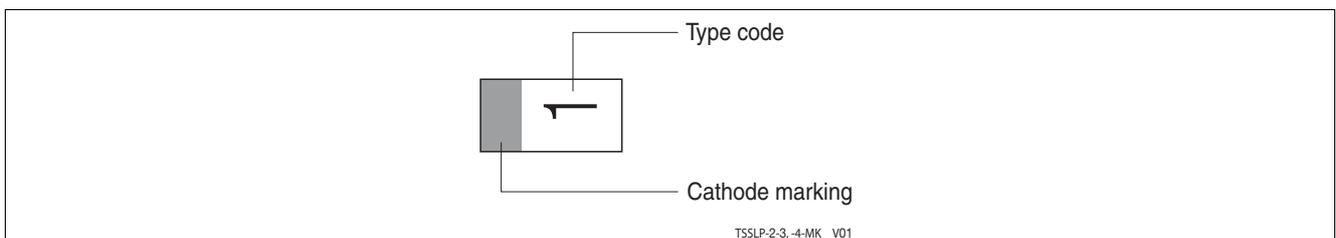


Figure 11 TSSLP-2-3: Marking (example)

4.2 TSLP-2-19

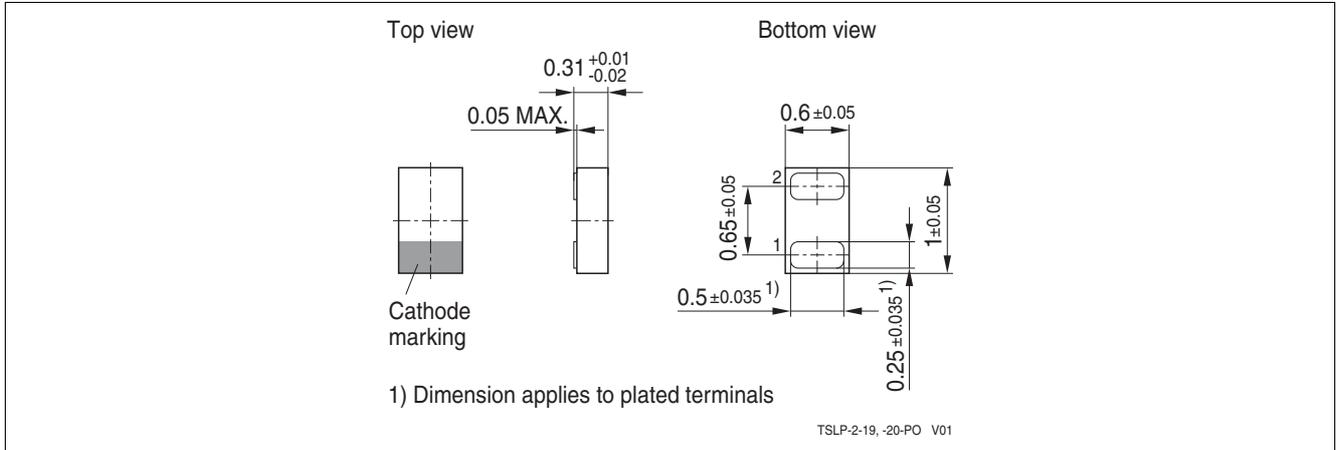


Figure 12 TSLP-2-19: Package Overview

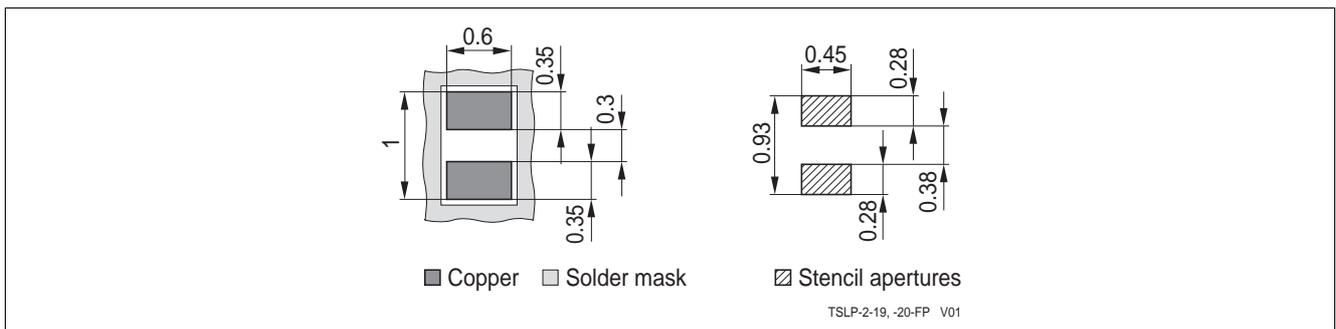


Figure 13 TSLP-2-19: Footprint

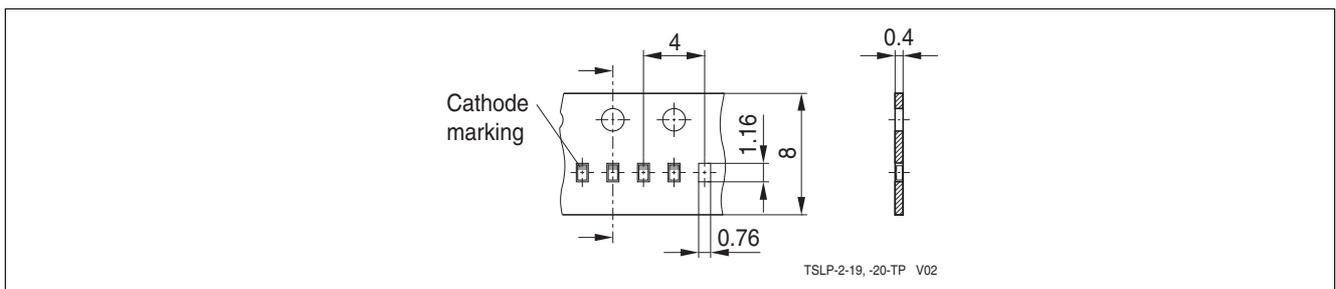


Figure 14 TSLP-2-19: Packing

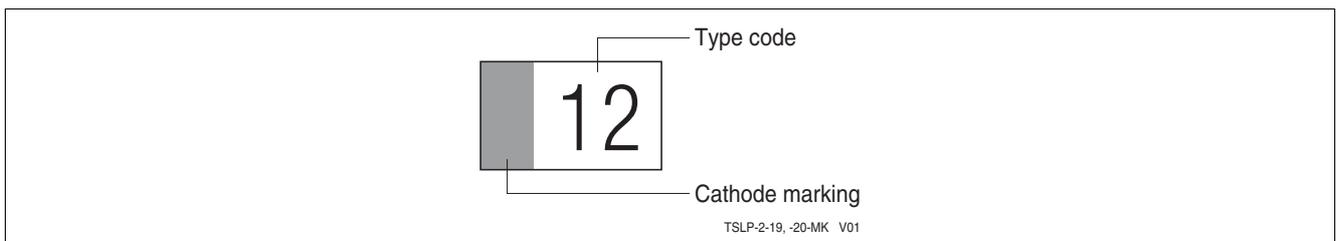


Figure 15 TSLP-2-19: Marking (example)

[www.infineon.com](http://www.infineon.com)

Published by Infineon Technologies AG

## Данный компонент на территории Российской Федерации

### Вы можете приобрести в компании MosChip.

Для оперативного оформления запроса Вам необходимо перейти по данной ссылке:

<http://moschip.ru/get-element>

Вы можете разместить у нас заказ для любого Вашего проекта, будь то серийное производство или разработка единичного прибора.

В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

moschip.ru\_4

moschip.ru\_6

moschip.ru\_9