

# TVS Diode

Transient Voltage Suppressor Diodes

## ESD206-B1-02 Series

Ultra Low Clamping Bi-directional ESD / Transient / Surge Protection Diode

ESD206-B1-02ELS  
ESD206-B1-02EL

## Data Sheet

Revision 1.5, 2013-12-19  
Final

**Revision History, Rev 1.4, 2013-11-26**

Page or Item	Subjects (major changes since previous revision)
<b>Revision 1.5, 2013-12-19</b>	
5	Update of Table 2-2)

**Trademarks of Infineon Technologies AG**

AURIX™, BlueMoon™, C166™, CanPAK™, CIPOS™, CIPURSE™, COMNEON™, EconoPACK™, CoolMOS™, CoolSET™, CORECONTROL™, CROSSAVE™, DAVE™, EasyPIM™, EconoBRIDGE™, EconoDUAL™, EconoPIM™, EiceDRIVER™, eupec™, FCOS™, HITFET™, HybridPACK™, I<sup>2</sup>RF™, ISOFACE™, IsoPACK™, MIPAQ™, ModSTACK™, my-d™, NovalithIC™, OmniTune™, OptiMOS™, ORIGA™, PRIMARION™, PrimePACK™, PrimeSTACK™, PRO-SIL™, PROFET™, RASIC™, ReverSave™, SatRIC™, SIEGET™, SINDRION™, SIPMOS™, SMARTi™, SmartLEWIS™, SOLID FLASH™, TEMPFET™, thinQ!™, TRENCHSTOP™, TriCore™, X-GOLD™, X-PMU™, XMM™, XPOSYS™.

**Other Trademarks**

Advance Design System™ (ADS) of Agilent Technologies, AMBA™, ARM™, MULTI-ICE™, KEIL™, PRIMECELL™, REALVIEW™, THUMB™, μVision™ of ARM Limited, UK. AUTOSAR™ is licensed by AUTOSAR development partnership. Bluetooth™ of Bluetooth SIG Inc. CAT-ig™ 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 Satellite 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 2010-10-26

# 1 Ultra Low Clamping Bi-directional ESD / Transient / Surge Protection Diode

## 1.1 Features

- ESD/Transient/Surge protection of one data /  $V_{bus}$  line exceeding standard:
  - IEC61000-4-2 (ESD):  $\pm 30$  kV (air/contact discharge)
  - IEC61000-4-4 (EFT):  $\pm 50$  A (5/50 ns)
  - IEC61000-4-5 (surge):  $\pm 6$  A (8/20  $\mu$ s)
- Medium capacitance:  $C_L = 12$  pF (typ.)
- Bi-directional symmetrical working voltage:  $-5.5$  V to  $+5.5$  V
- Low leakage current
- Very low ESD clamping voltage:  $8$  V (typ.)
- Very low dynamic resistance:  $0.13 \Omega$  (typ.)
- Pb-free (RoHS compliant) and halogen free package



## 1.2 Application Examples

- Audio Line, Speaker, Headset, Microphone Protection
- Human Interface Devices (Keyboard, Touchpad, Buttons)

## 1.3 Product Description

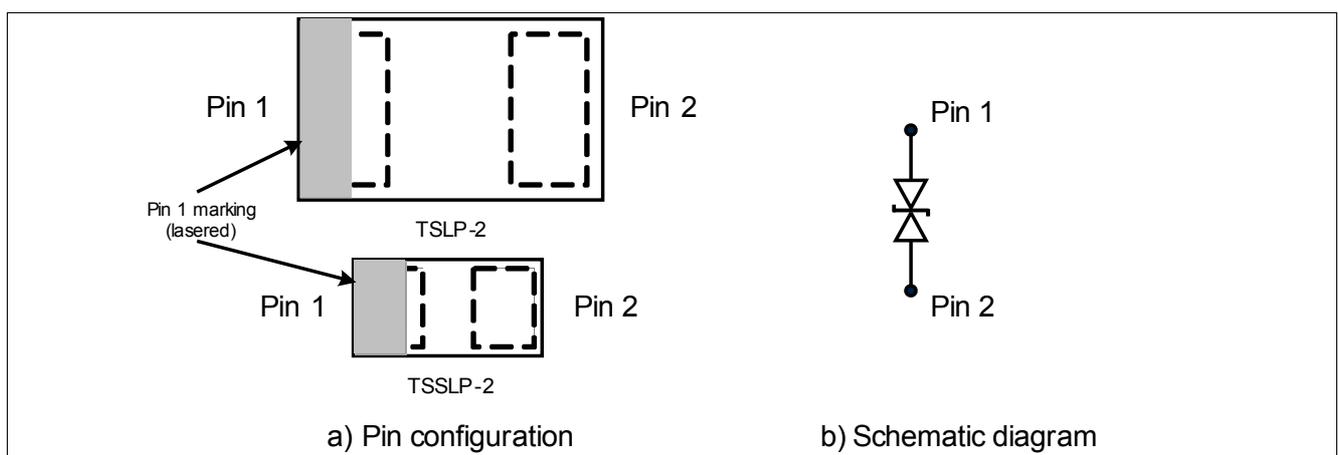


Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Ordering Information

Type	Package	Configuration	Marking code
ESD206-B1-02ELS	TSSLP-2-3	1 line, bi-directional	r
ESD206-B1-02EL	TSLP-2-19	1 line, bi-directional	A3



**Table 2-2 DC Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified<sup>1)</sup>**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse working voltage	$V_{RWM}$	-	-	5.5	V	
Reverse current	$I_R$	-	-	50	nA	$V_R = 5.5\text{ V}$
Trigger voltage	$V_{t1}$	6.1	-	-	V	
Holding voltage	$V_h$	6.1	8	9.5	V	$I_R = 10\text{ mA}$

1) Device is electrically symmetrical

**Table 2-3 AC Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance	$C_L$	-	12	20	pF	$V_R = 0\text{ V}, f = 1\text{ MHz}$

**Table 2-4 ESD and Surge Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified**

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage <sup>1)</sup> Pin 1 to GND	$V_{CL}$	-	8	-	V	$I_{TLP} = 16\text{ A}$
		-	10.8	-		$I_{TLP} = 30\text{ A}$
Clamping voltage <sup>1)</sup> GND to Pin1			8.5			$I_{TLP} = 16\text{ A}$
			12.5			$I_{TLP} = 30\text{ A}$
Clamping voltage <sup>2)</sup>		-	7.5	-		$I_{PP} = 1\text{ A}, t_p = 8/20\text{ }\mu\text{s}$
		-	9.6	-		$I_{PP} = 6\text{ A}, t_p = 8/20\text{ }\mu\text{s}$
Dynamic resistance <sup>1)</sup>	$R_{DYN}$	-	0.13	-	$\Omega$	Pin 1 to GND
			0.16			GND to Pin 1

1) ANSI/ESD STM5.5.1 - Electrostatic Discharge Sensitive Testing using Transmission Line Pulse (TLP) Model. TLP conditions:  $Z_0 = 50\text{ }\Omega$ ,  $t_p = 100\text{ ns}$ ,  $t_r = 0.6\text{ ns}$ ,  $I_{TLP}$  and  $V_{TLP}$  averaging window:  $t_1 = 30\text{ ns}$  to  $t_2 = 60\text{ ns}$ , extraction of dynamic resistance using least squares fit of TLP characteristic between  $I_{TLP1} = 10\text{ A}$  and  $I_{TLP2} = 40\text{ A}$ . Please refer to Application Note AN210[1].

2)  $I_{PP}$  according to IEC61000-4-5 ( $t_p = 8/20\text{ }\mu\text{s}$ )

Typical Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

### 3 Typical Characteristics at $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

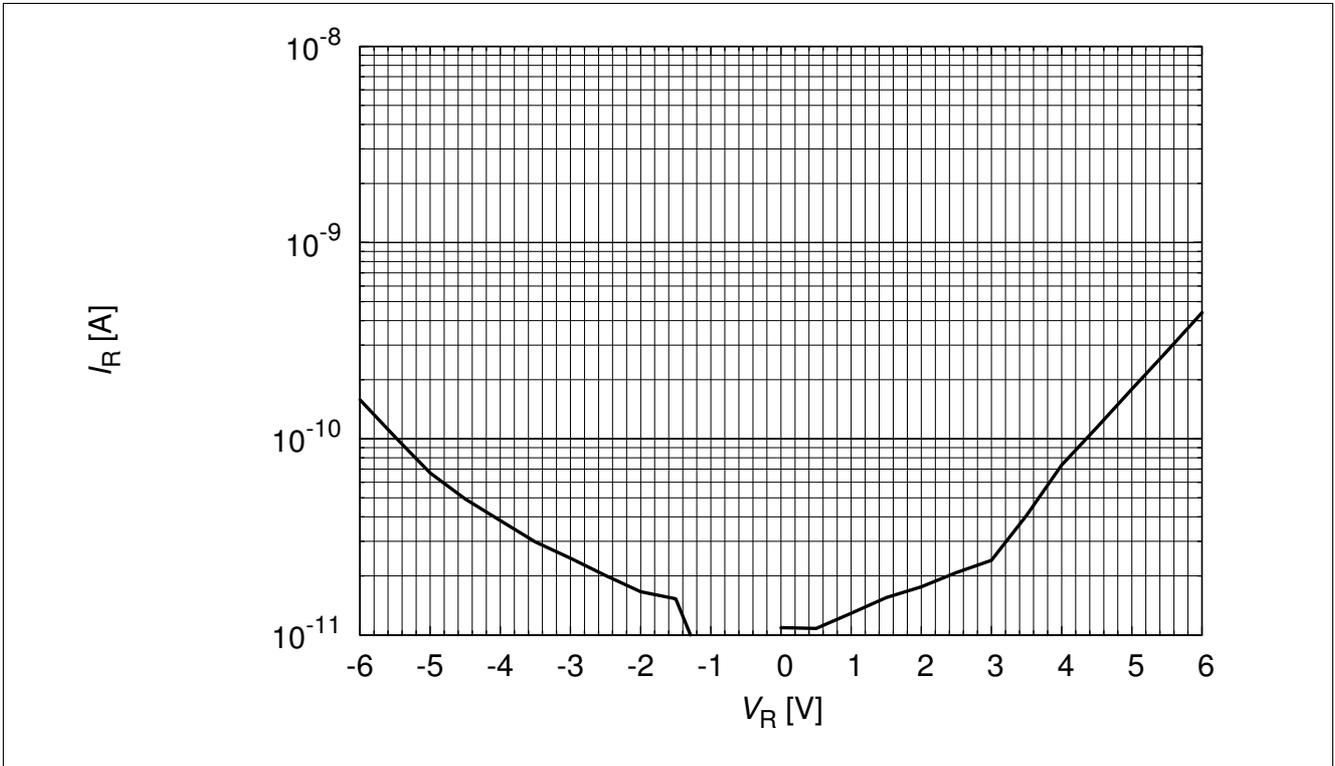


Figure 3-1 Reverse current:  $I_R = f(V_R)$

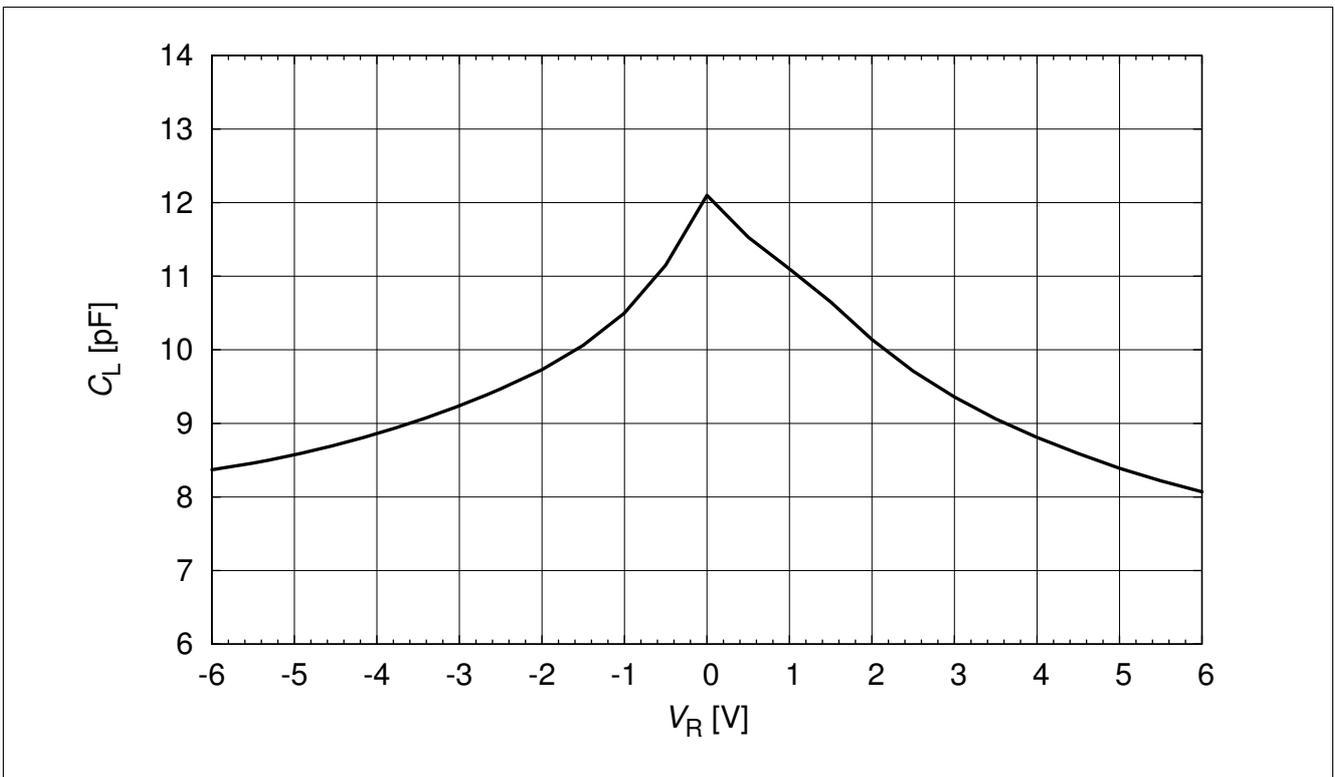
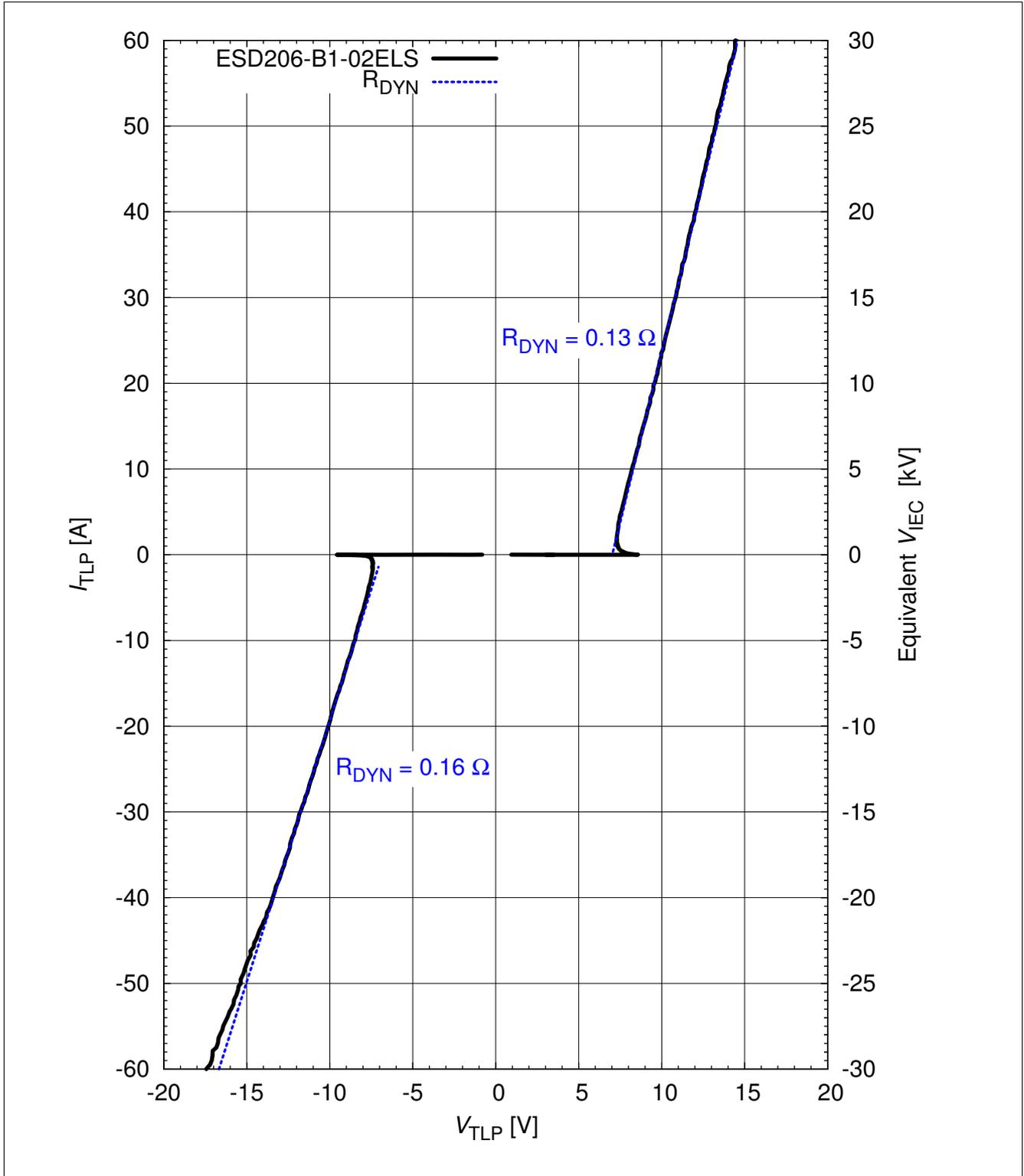


Figure 3-2 Line capacitance:  $C_L = f(V_R), f = 1\text{ MHz}$

Typical Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified



**Figure 3-3 Clamping voltage (TLP):  $I_{TLP} = f(V_{TLP})$  according ANSI/ESD STM5.5.1 - Electrostatic Discharge Sensitivity Testing using Transmission Line Pulse (TLP) Model. TLP conditions:  $Z_0 = 50\ \Omega$ ,  $t_p = 100\ \text{ns}$ ,  $t_r = 0.6\ \text{ns}$ ,  $I_{TLP}$  and  $V_{TLP}$  averaging window:  $t_1 = \text{ns}$  to  $t_2 = 60\ \text{ns}$ , extraction of dynamic resistance using squares fit to TLP characteristics between  $I_{TLP1} = 10\ \text{A}$  and  $I_{TLP2} = 40\ \text{A}$ . Please refer to Application Note AN210 [1]**

Typical Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

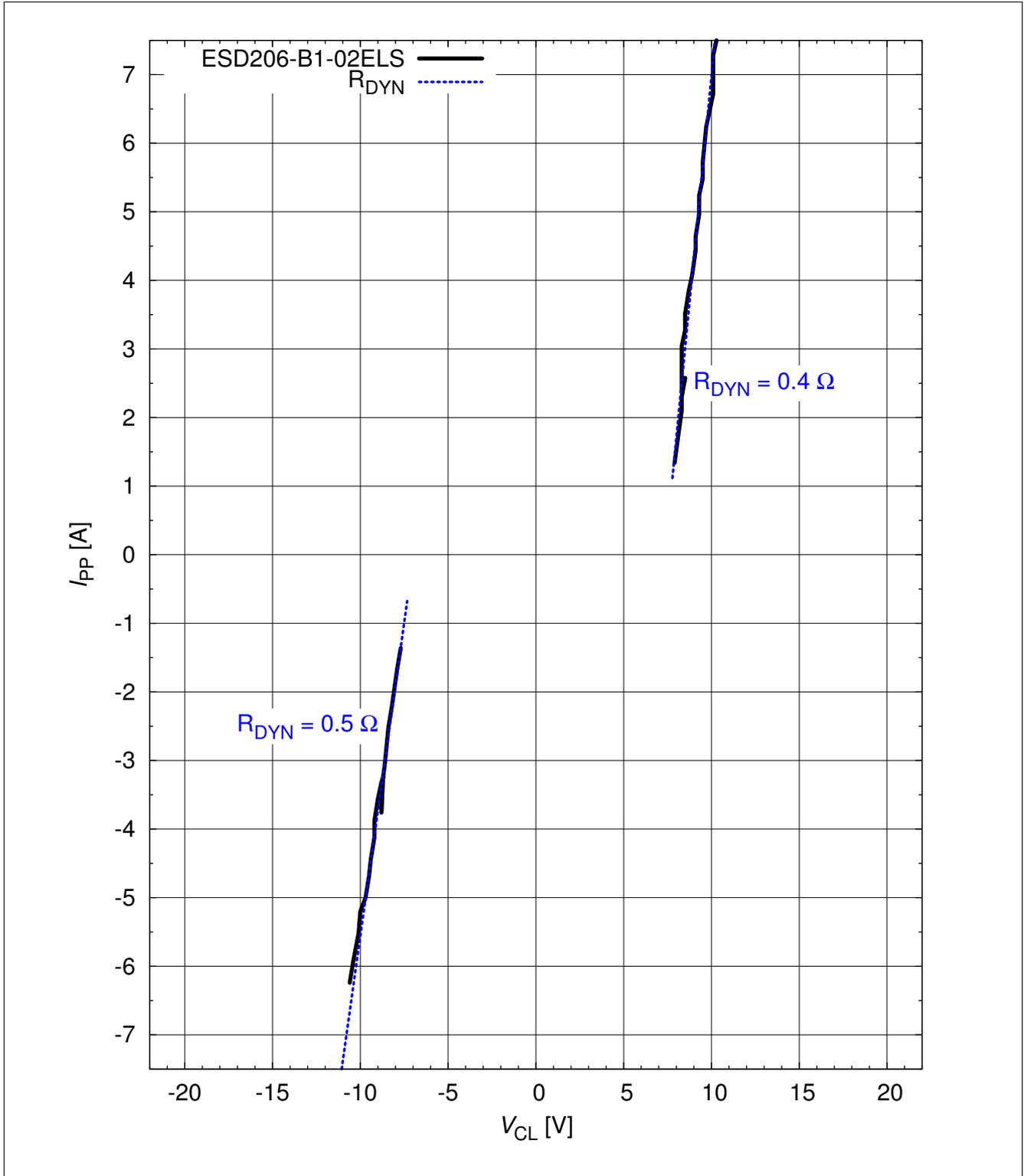


Figure 3-4 Pulse current (IEC61000-4-5) versus clamping voltage:  $I_{PP} = f(V_{CL})$

Typical Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

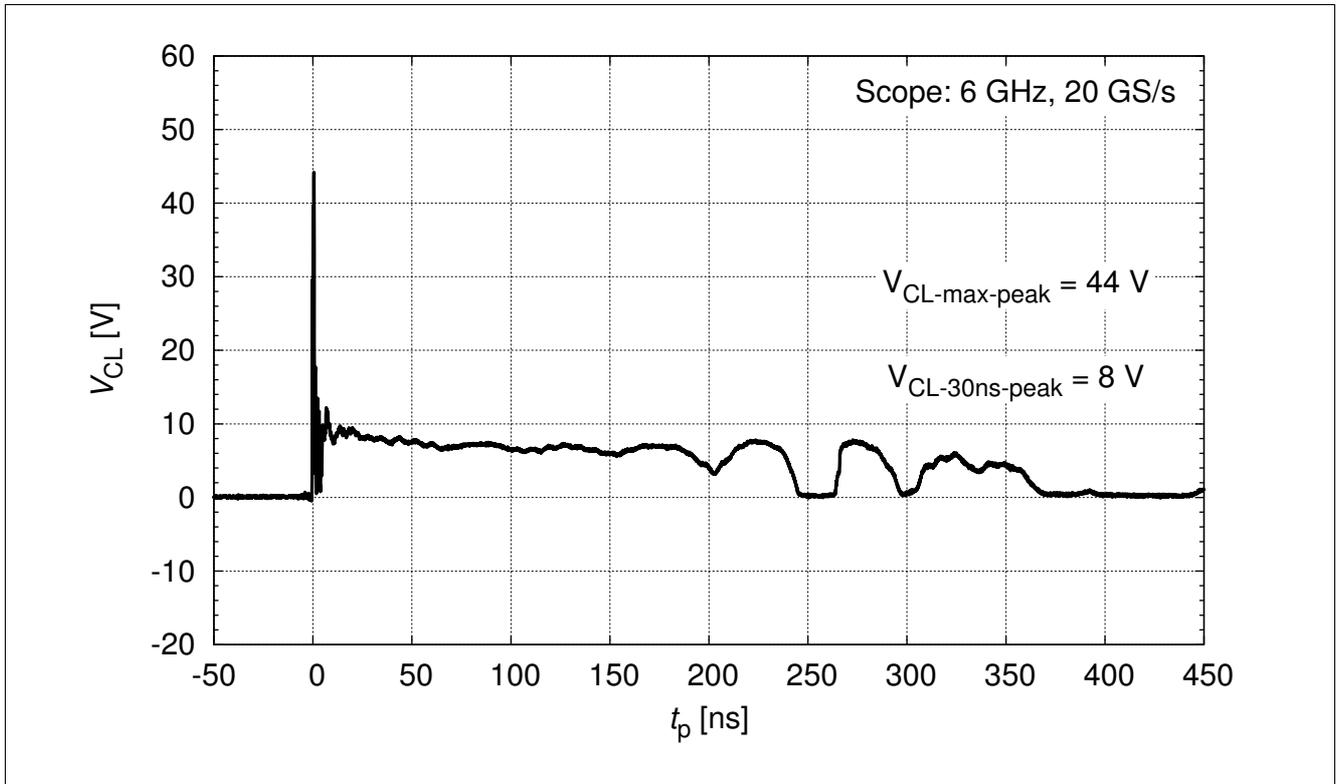


Figure 3-5 IEC61000-4-2 :  $V_{CL} = f(t)$ , 8 kV positive pulse from pin 1 to pin 2

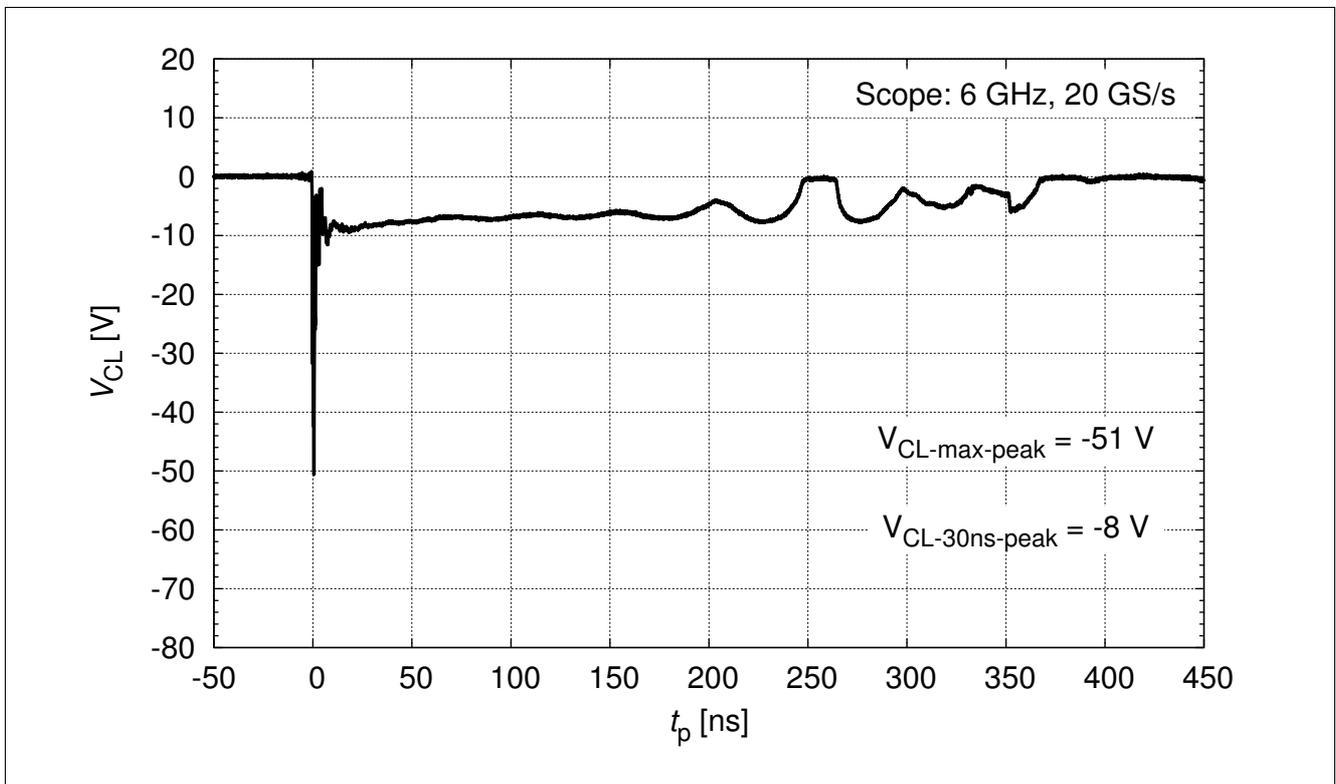


Figure 3-6 IEC61000-4-2 :  $V_{CL} = f(t)$ , 8 kV negative pulse from pin 1 to pin 2

Typical Characteristics at  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

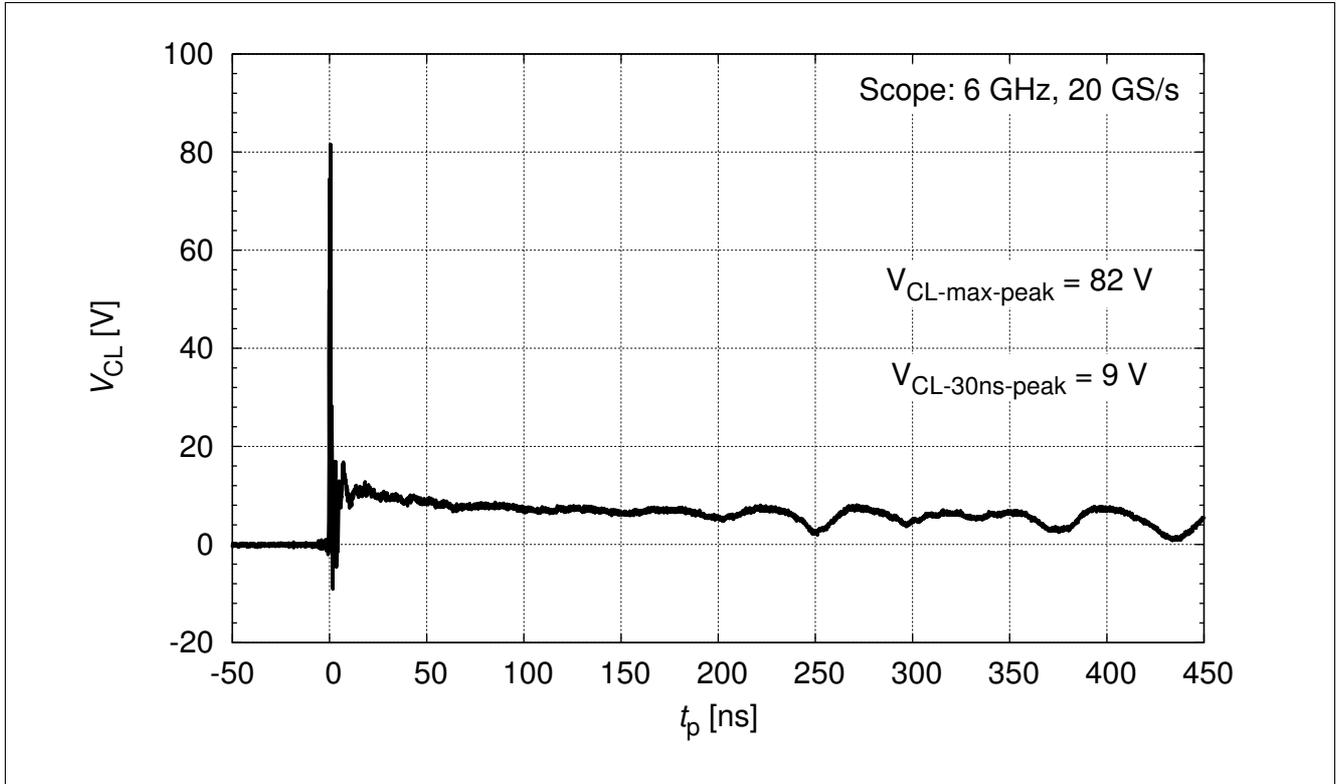


Figure 3-7 IEC61000-4-2 :  $V_{CL} = f(t)$ , 15 kV positive pulse from pin 1 to pin 2

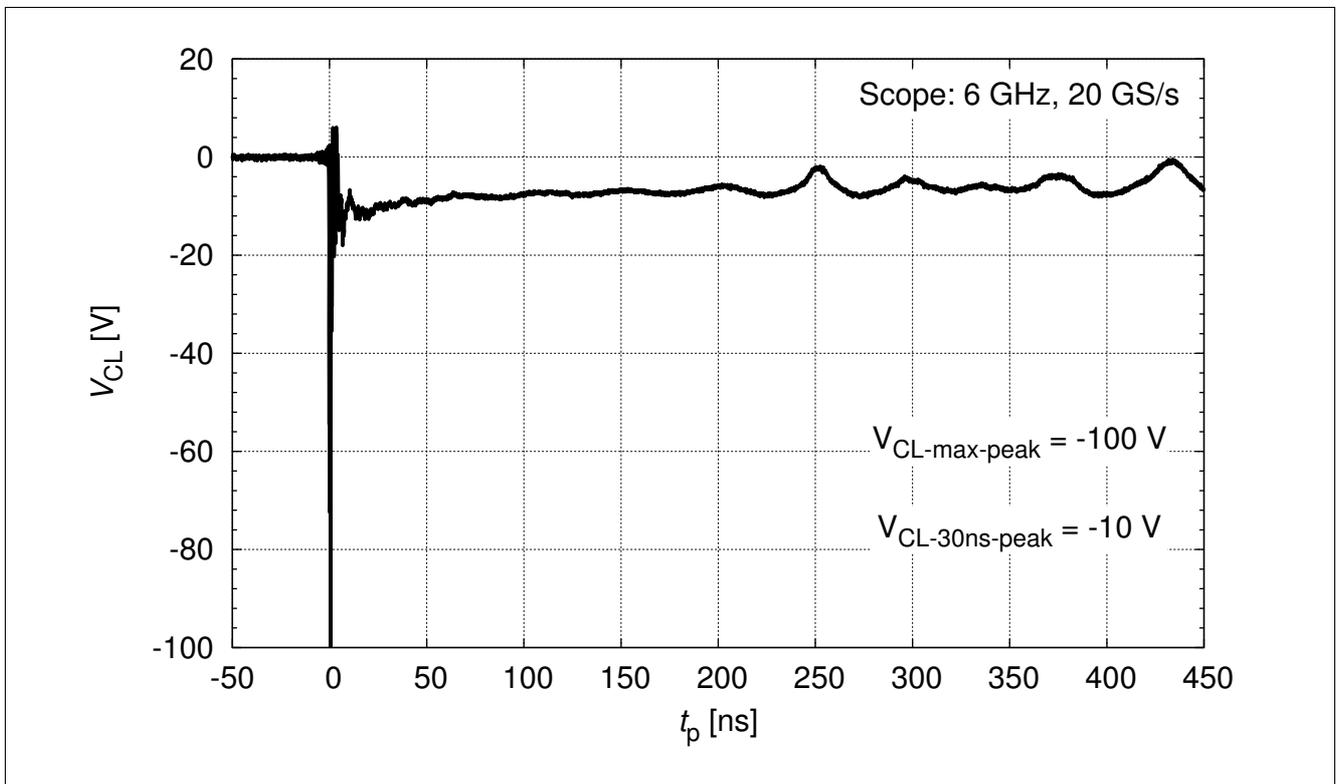


Figure 3-8 IEC61000-4-2 :  $V_{CL} = f(t)$ , 15 kV negative pulse from pin 1 to pin 2

## 4 Package Information

### 4.1 TSSLP-2-3

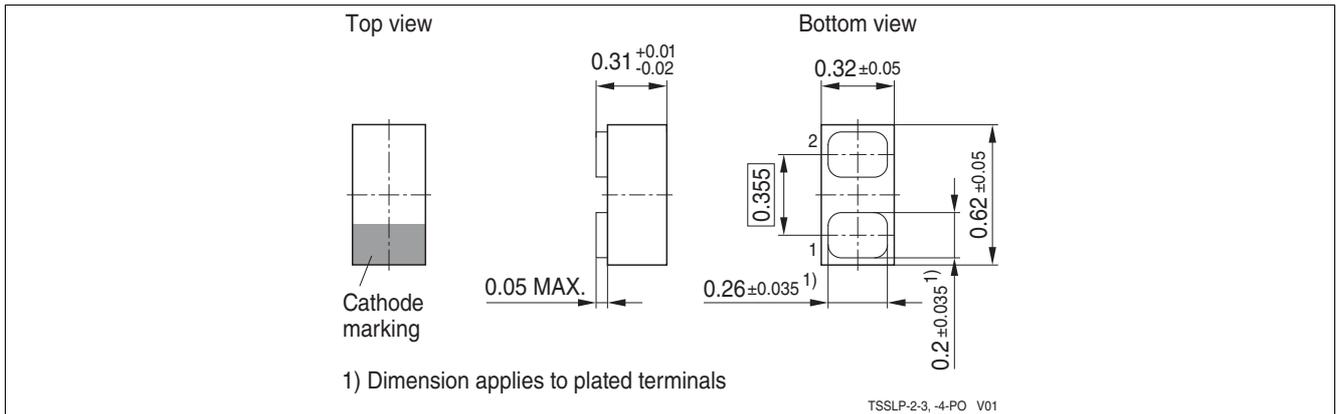


Figure 4-1 TSSLP-2-3: Package outline (dimension in mm)

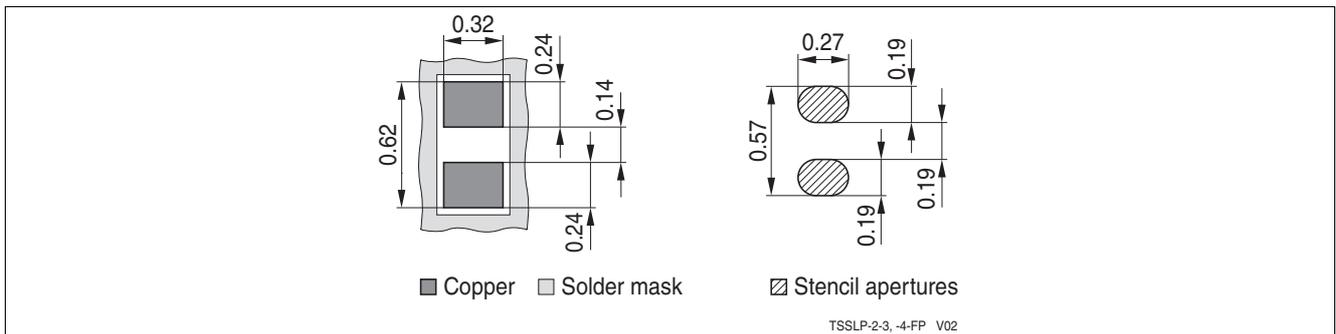


Figure 4-2 TSSLP-2-3: Footprint (dimension in mm)

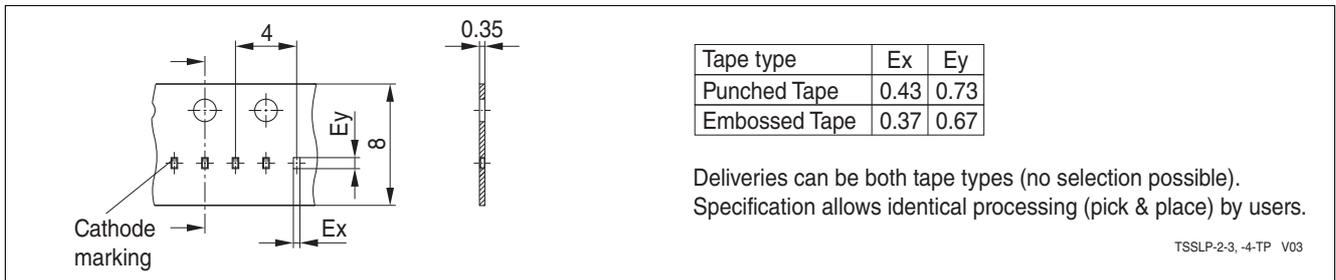


Figure 4-3 TSSLP-2-3: Tape and reel (dimension in mm)

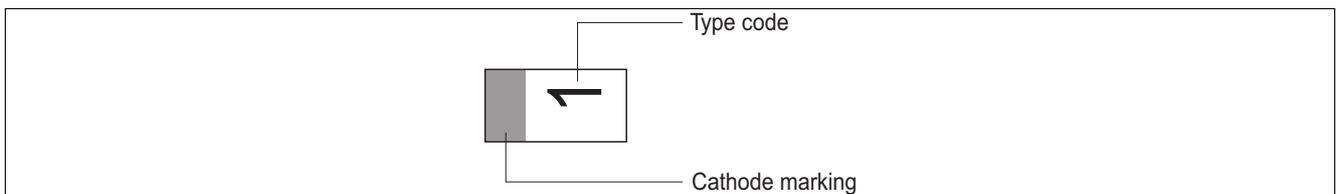


Figure 4-4 TSSLP-2-3: Marking example

4.2 TSLP-2-19

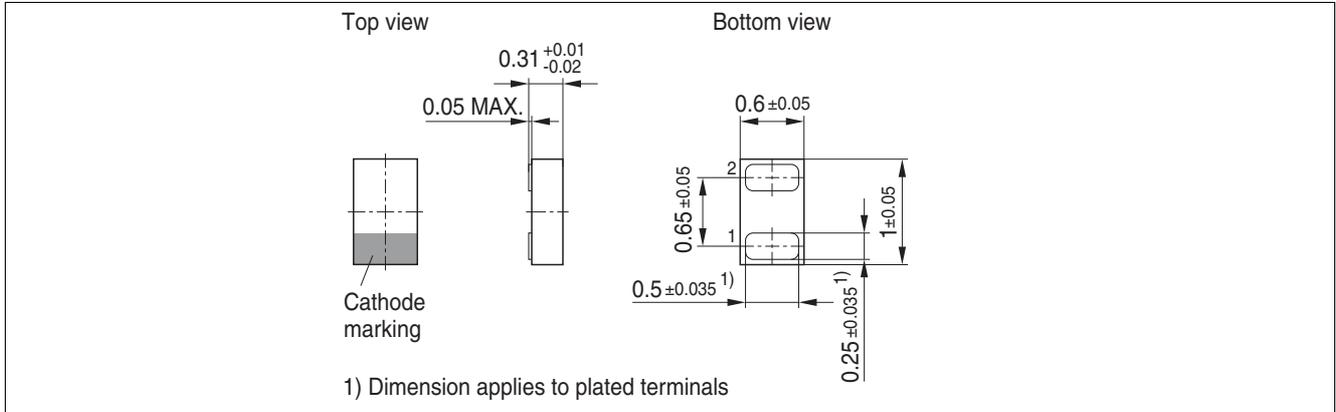


Figure 4-5 TSLP-2-19: Package outline (dimension in mm)

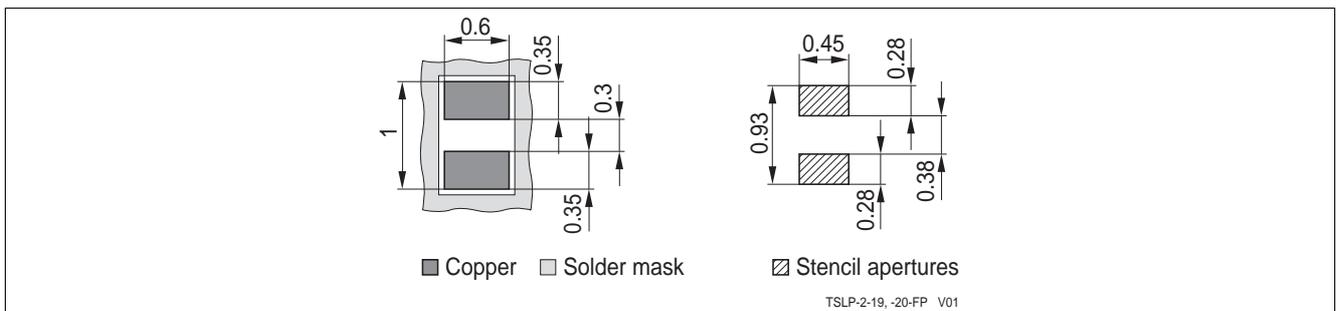


Figure 4-6 TSLP-2-19: Footprint (dimension in mm)

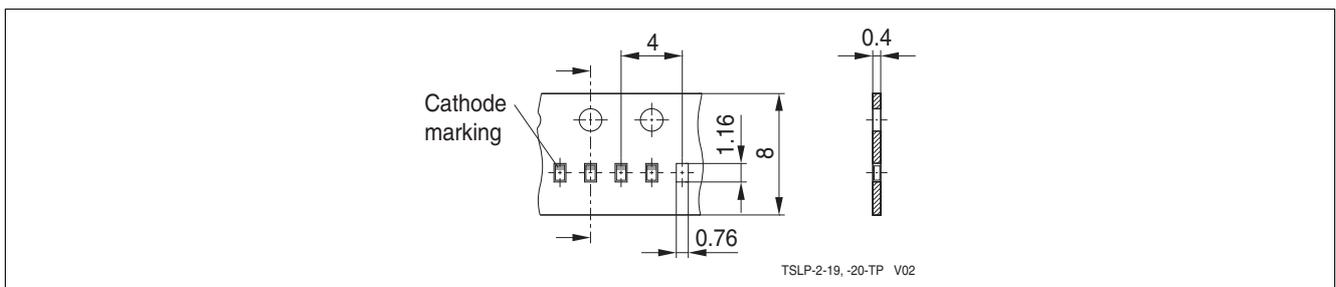


Figure 4-7 TSLP-2-19: Tape and reel (dimension in mm)

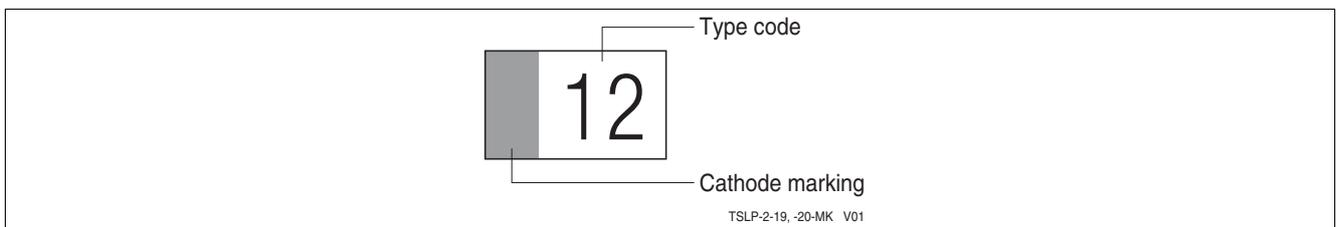


Figure 4-8 TSLP-2-19: Marking example

**References**

- [1] Infineon AG - **Application Note AN210**: Effective ESD Protection design at System Level Using VF-TLP Characterization Methodology

[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