

# ESD101-B1-02 Series

## Protection device

TVS (transient voltage suppressor)

Bi-directional, 5.5 V, 0.1 pF, 0201, 0402, RoHS and halogen free compliant

## Features

- ESD/transient protection of high speed data lines according to:
  - IEC61000-4-2 (ESD):  $\pm 14$  kV (air),  $\pm 12$  kV (contact)
  - IEC61000-4-4 (EFT):  $\pm 1.5$  kV/ $\pm 30$  A (5/50 ns)
  - IEC61000-4-5 (surge):  $\pm 2$  A (8/20  $\mu$ s)
- Bi-directional working voltage up to:  $V_{RWM} = \pm 5.5$  V
- Extremely low capacitance  $C_L = 0.1$  pF (typical) at  $f = 1$  GHz
- Clamping voltage:  $V_{CL} = 30$  V (typical) at  $I_{TLP} = 16$  A with  $R_{DYN} = 1.5 \Omega$  (typical)
- Very low reverse current:  $I_R < 0.1$  nA
- Small form factor SMD sizes 0201 and 0402 low profile
- Bi-directional and symmetric I/V characteristics for optimized design/assembly



## Potential applications

Tailored for ESD protection of capacitance-susceptible application like:

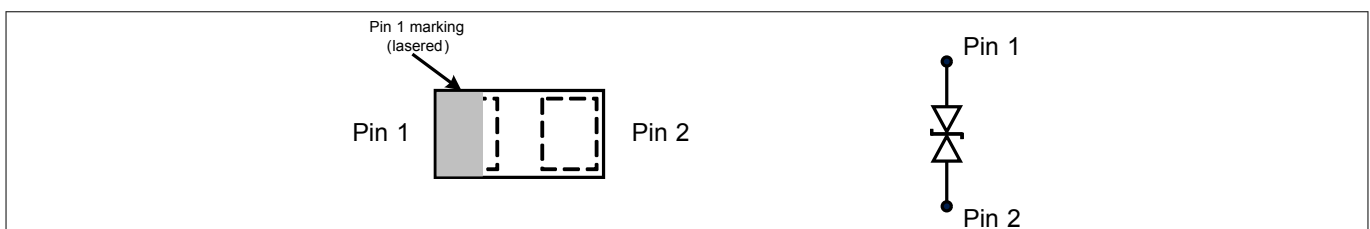
- Super high speed interface
- RF antenna

For further application information please refer to application note AN327 [3].

## Product validation

Qualified for industrial applications according to the relevant tests of JEDEC47/20/22

## Device information



**Figure 1** Pin configuration and schematic diagram

**Table 1** Part information

Type	Package	Configuration	Marking code
ESD101-B1-02ELS	TSSLP-2-4	1 line, bi-directional	<u>R</u>
ESD101-B1-02EL	TSLP-2-20	1 line, bi-directional	R

## Table of contents

	<b>Features</b> .....	1
	<b>Potential applications</b> .....	1
	<b>Product validation</b> .....	1
	<b>Device information</b> .....	1
	<b>Table of contents</b> .....	2
<b>1</b>	<b>Maximum ratings</b> .....	3
<b>2</b>	<b>Electrical characteristics</b> .....	4
<b>3</b>	<b>Typical characteristic diagrams</b> .....	6
<b>4</b>	<b>Package information</b> .....	11
4.1	TSSLP-2-4 .....	11
4.2	TSLP-2-20 .....	12
<b>5</b>	<b>References</b> .....	13
	<b>Revision history</b> .....	13
	<b>Disclaimer</b> .....	14

---

Maximum ratings

## 1 Maximum ratings

Note:  $T_A = 25\text{ °C}$ , unless otherwise specified

**Table 2** Maximum ratings

Parameter	Symbol	Values	Unit	Note or test condition
ESD air discharge <sup>1)</sup>	$V_{\text{ESD}}$	$\pm 14$	kV	–
ESD contact discharge <sup>1)</sup>		$\pm 12$		
Peak pulse power	$P_{\text{PK}}$	30	W	–
Peak pulse current <sup>2)</sup>	$I_{\text{PP}}$	$\pm 2$	A	–
Operating temperature	$T_{\text{OP}}$	-55 to 125	°C	–
Storage temperature	$T_{\text{stg}}$	-65 to 150	°C	–

**Attention:** Stresses above the maximum 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 component.

---

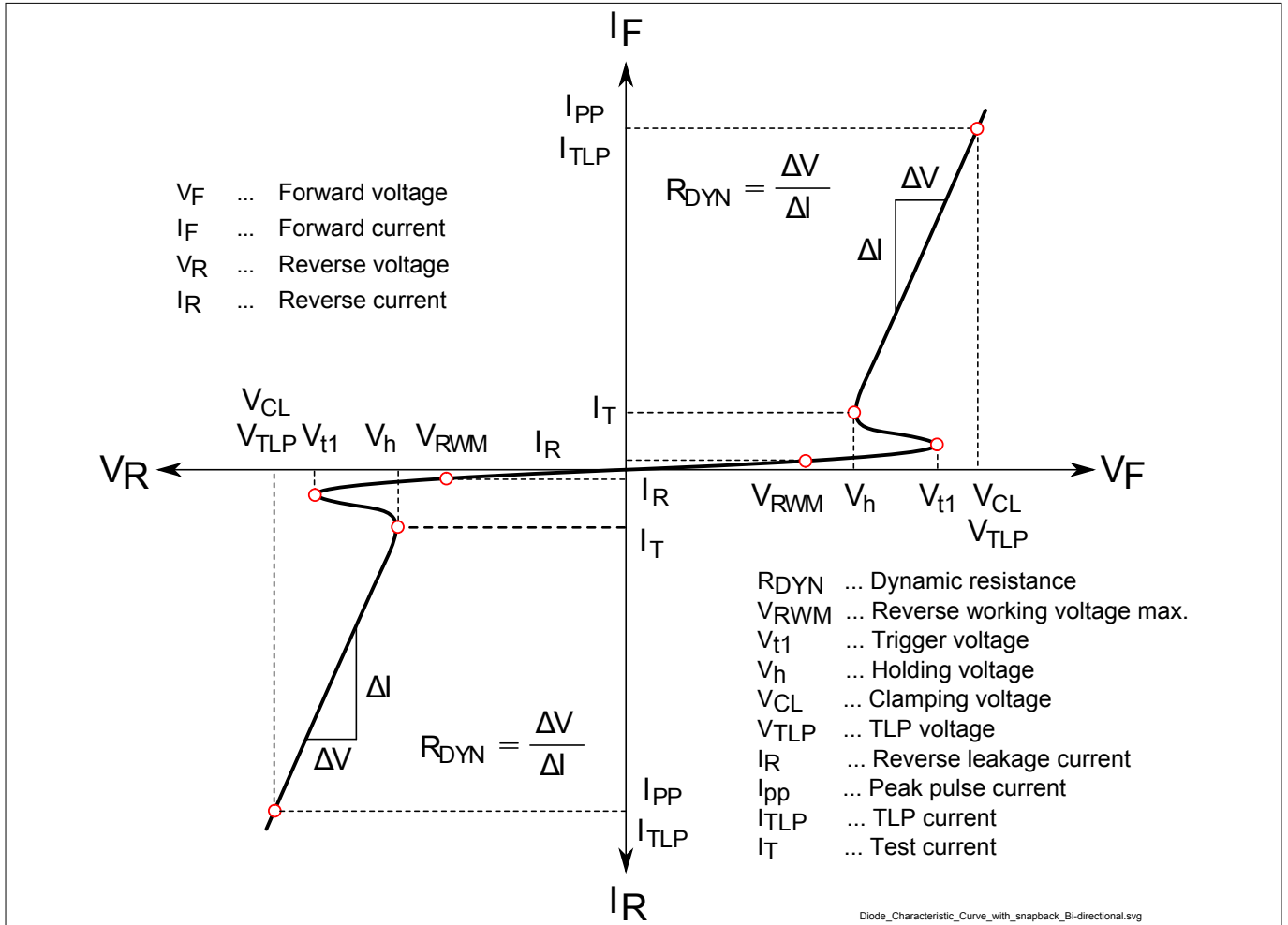
<sup>1</sup>  $V_{\text{ESD}}$  according to IEC61000-4-2

<sup>2</sup> Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform according to IEC61000-4-5

**Electrical characteristics**

**2 Electrical characteristics**

Note:  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified.  
 Device is electrically symmetrical.



**Figure 2** Definitions of electrical characteristics

**Electrical characteristics**

**Table 3 DC characteristics**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Reverse current	$I_{RWM}$	-5.5	-	5.5	V	
Trigger voltage <sup>1)</sup>	$V_{t1}$	6.1	-	-		
Holding voltage	$V_h$	6.1	7.3	8.2		$I_T = 1 \text{ mA}$
		6.1	7.0	7.9		$I_T = 10 \text{ mA}$
Reverse leakage current	$I_R$	-	<0.1	20	nA	$V_R = 5.5 \text{ V}$

**Table 4 AC characteristics**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Line capacitance	$C_L$	-	-	0.2	pF	$V_R = 0 \text{ V}, f = 1 \text{ MHz}$
		-	0.1	-		$V_R = 0 \text{ V}, f = 1 \text{ GHz}$
Serie inductance	$L_S$	-	0.2	-	nH	ESD101-B1-02ELS ESD101-B1-02EL
		-	0.4	-		

**Table 5 ESD and surge characteristics**

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Clamping voltage <sup>2)</sup>	$V_{CL}$	-	18	-	V	$I_{TLP} = 8 \text{ A}, t_p = 100 \text{ ns}$
		-	30	-		$I_{TLP} = 16 \text{ A}, t_p = 100 \text{ ns}$
Clamping voltage <sup>3)</sup>		-	9	-		$I_{PP} = 1 \text{ A}, t_p = 8/20 \mu\text{s}$
		-	13	-		$I_{PP} = 2 \text{ A}, t_p = 8/20 \mu\text{s}$
Dynamic resistance <sup>2)</sup>	$R_{DYN}$	-	1.5	-	$\Omega$	$t_p = 100 \text{ ns}$

<sup>1</sup> Verified by design

<sup>2</sup> Please refer to application note AN210 [1], TLP parameters:  $Z_0 = 50 \Omega$ ,  $t_p = 100 \text{ ns}$ ,  $t_r = 300 \text{ ps}$

<sup>3</sup> Non-repetitive current pulse 8/20 $\mu\text{s}$  exponential decay waveform according to IEC61000-4-5

Typical characteristic diagrams

### 3 Typical characteristic diagrams

Note:  $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified

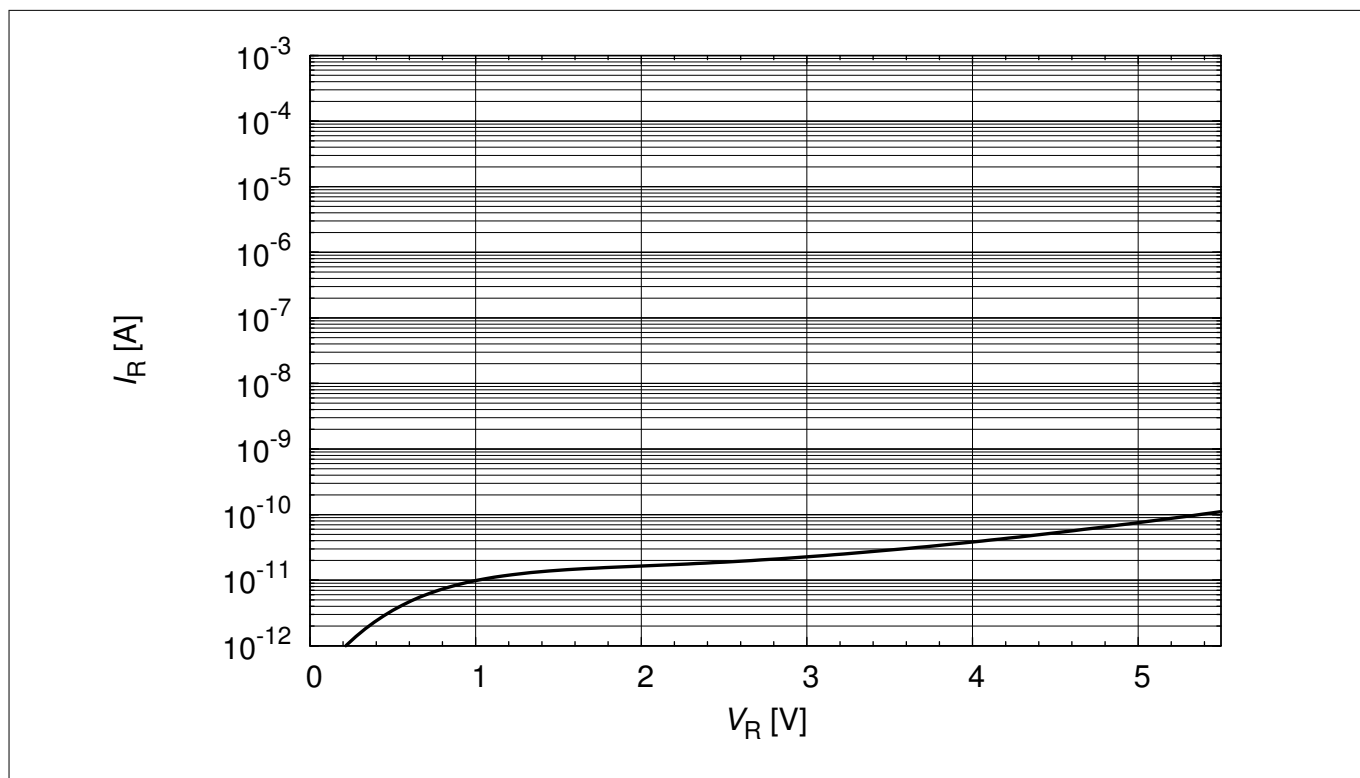


Figure 3 Reverse leakage current:  $I_R = f(V_R)$

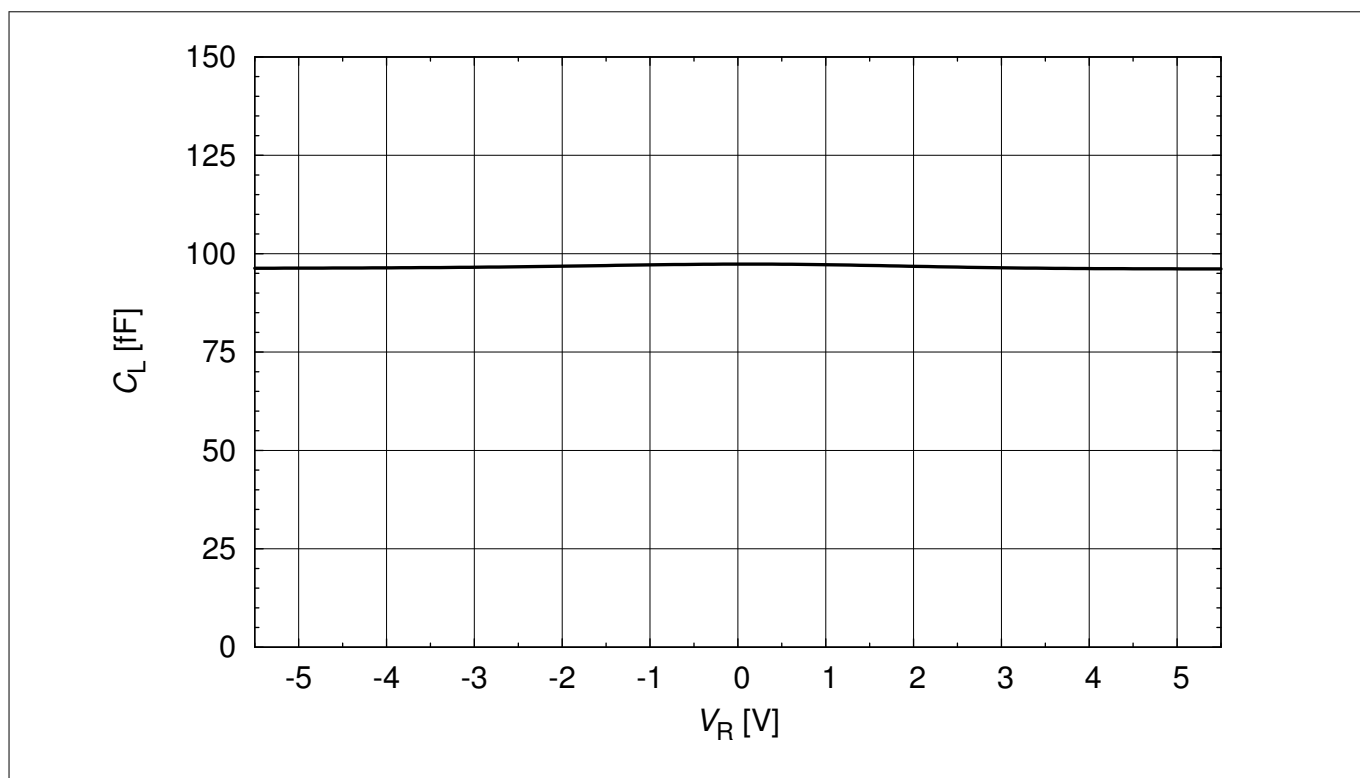


Figure 4 Line capacitance:  $C_L = f(V_R)$ ,  $f = 1\text{ GHz}$

Typical characteristic diagrams

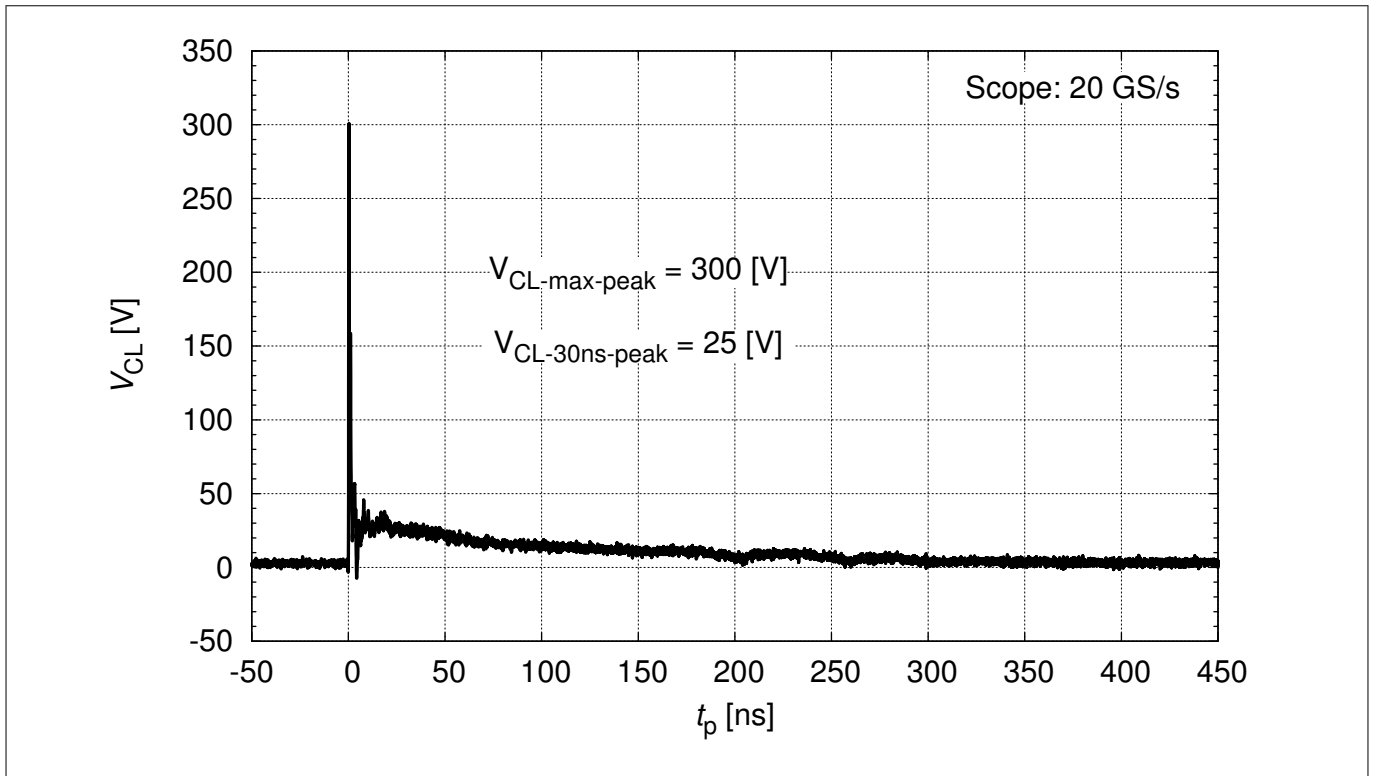


Figure 5 Clamping voltage (ESD):  $V_{CL} = f(t)$ , 8 kV positive pulse from pin 1 to pin 2

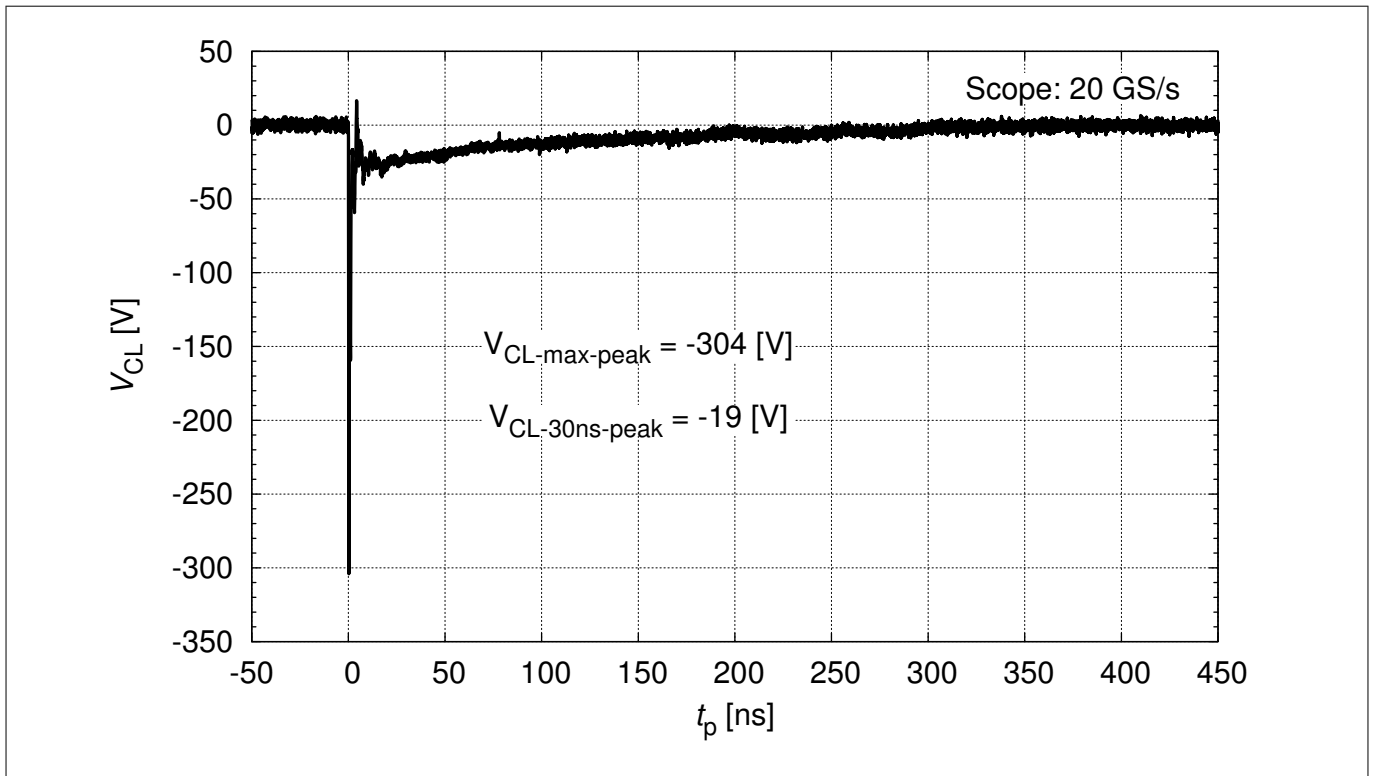
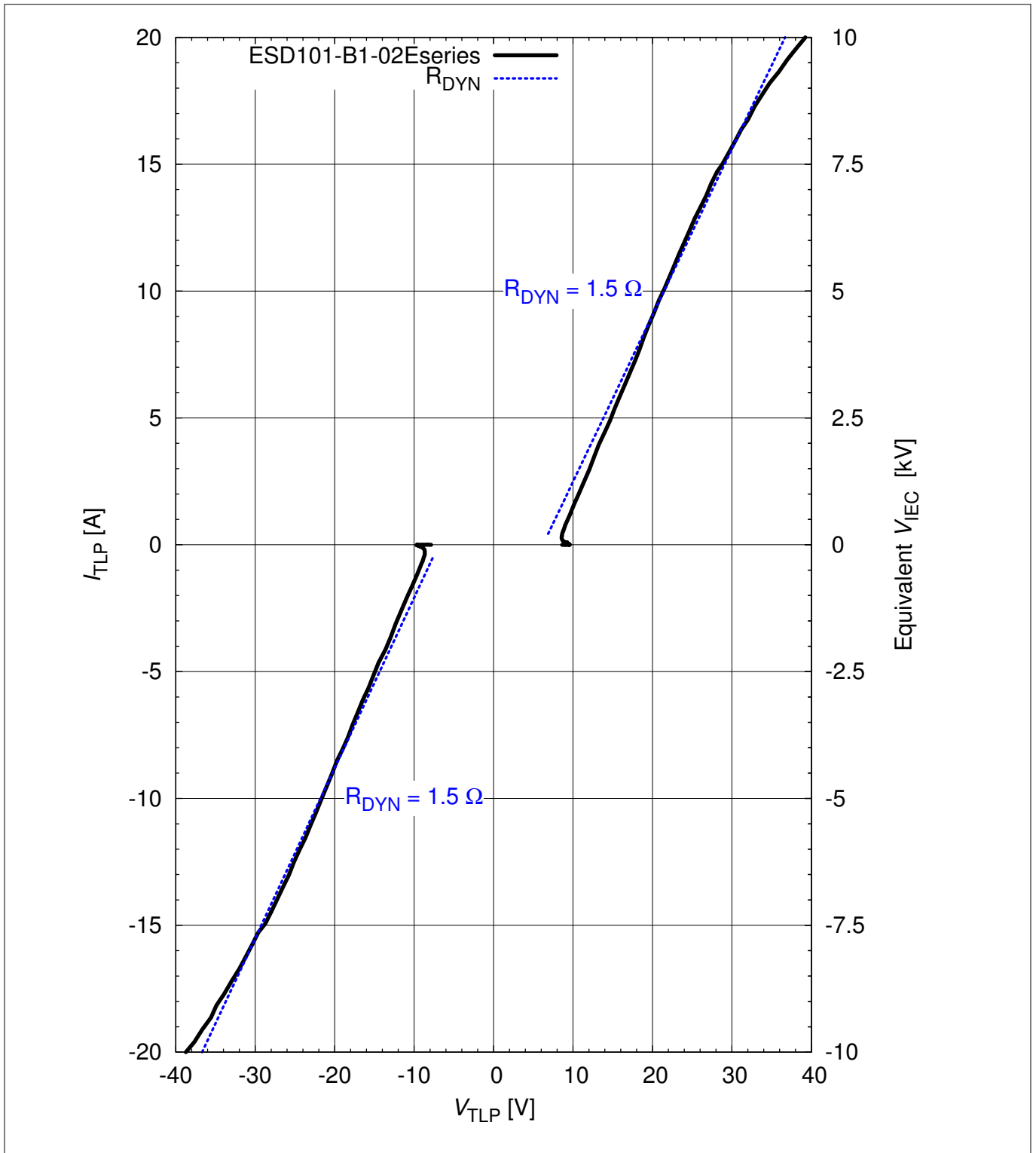


Figure 6 Clamping voltage (ESD):  $V_{CL} = f(t)$ , 8 kV negative pulse from pin 1 to pin 2

**Typical characteristic diagrams**



**Figure 7 Clamping voltage (TLP):  $I_{TLP} = f(V_{TLP})$  [1], pin 1 to pin 2**



Typical characteristic diagrams

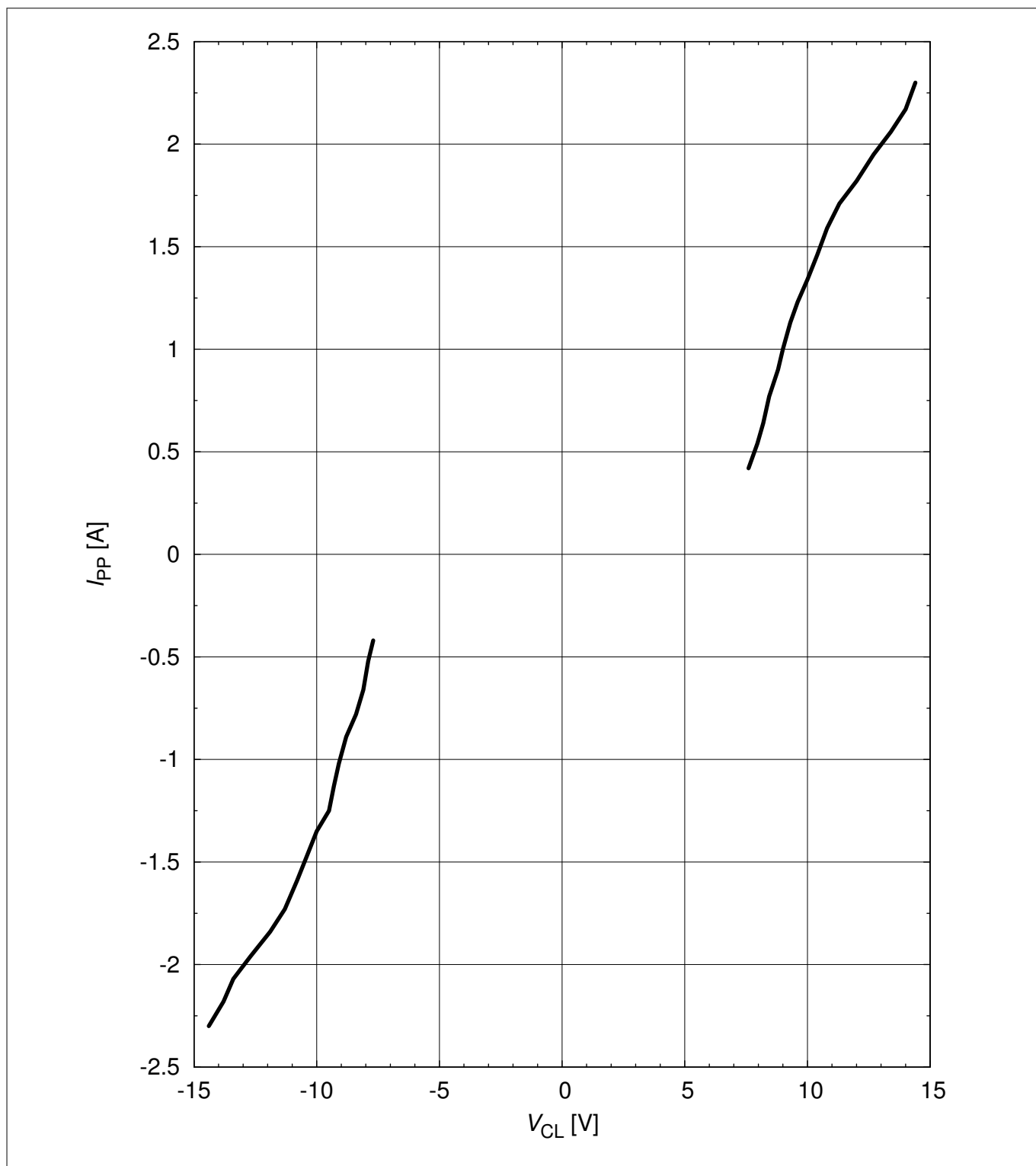


Figure 8 Clamping voltage (Surge):  $I_{PP} = f(V_{CL})$  [1], pin 1 to pin 2

Typical characteristic diagrams

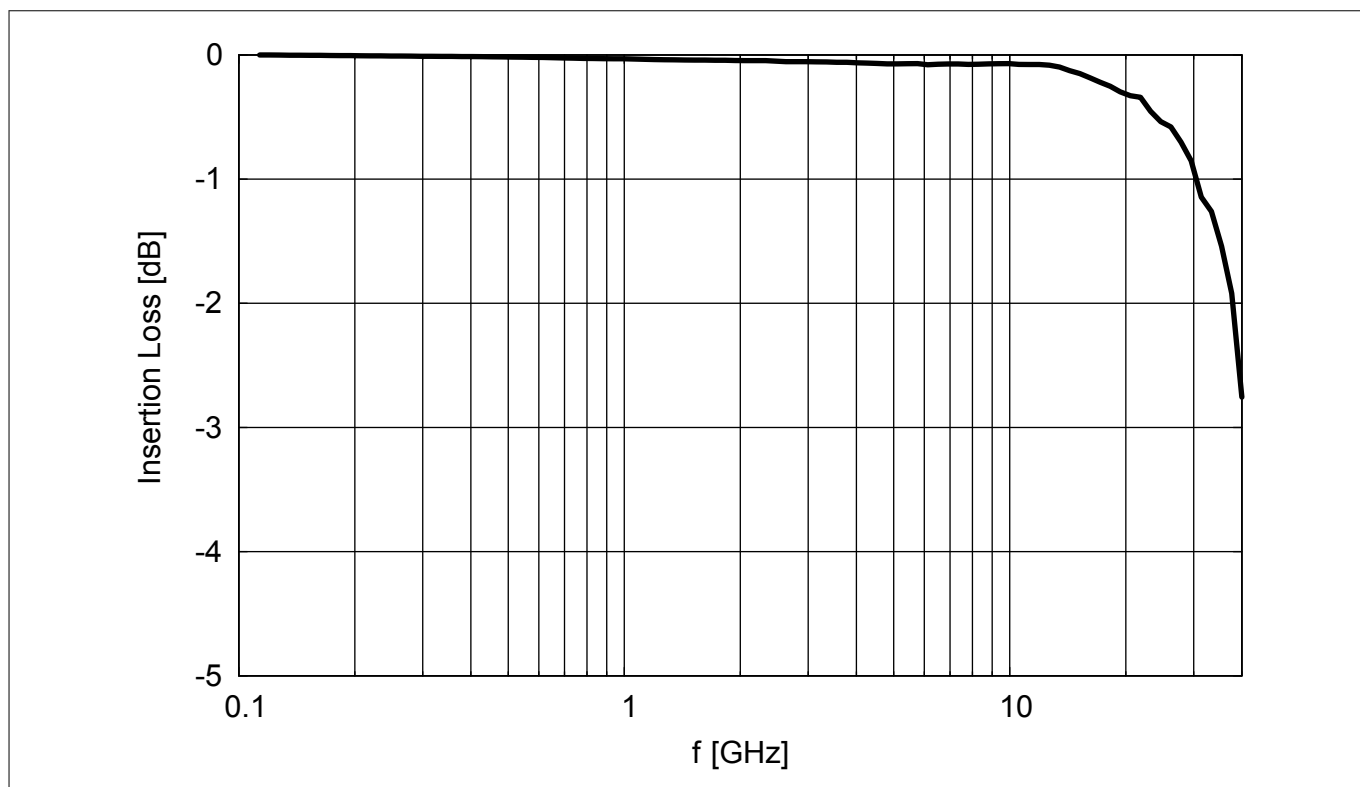


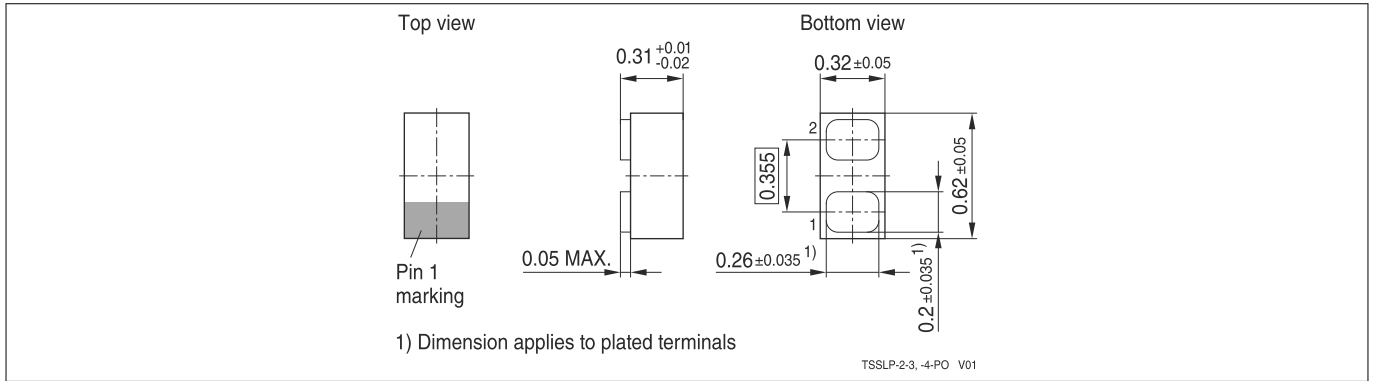
Figure 9 Insertion loss vs. frequency in a 50 Ω system

**Package information**

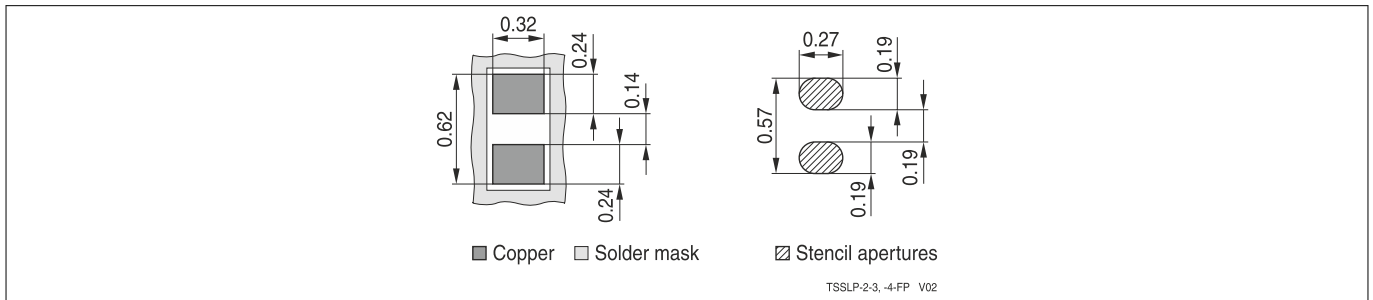
**4 Package information**

**4.1 TSSLP-2-4**

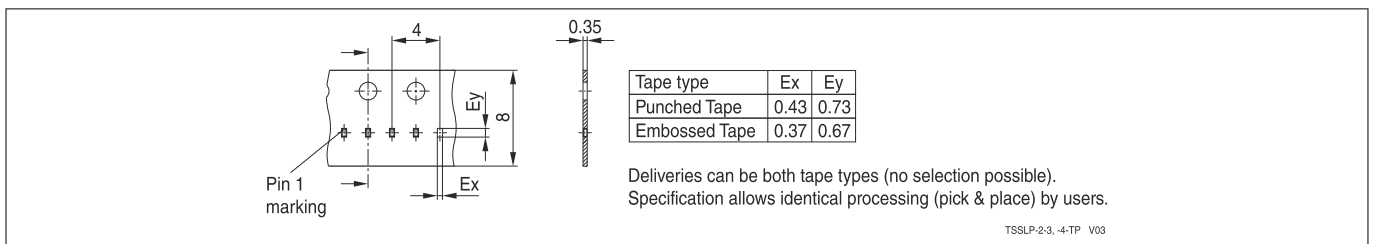
Note: Dimension in mm



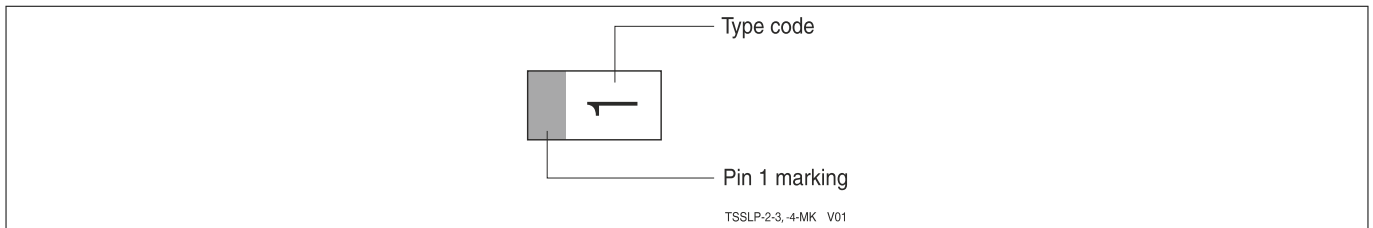
**Figure 10 TSSLP-2-4 package outline**



**Figure 11 TSSLP-2-4 footprint**



**Figure 12 TSSLP-2-4 packing**

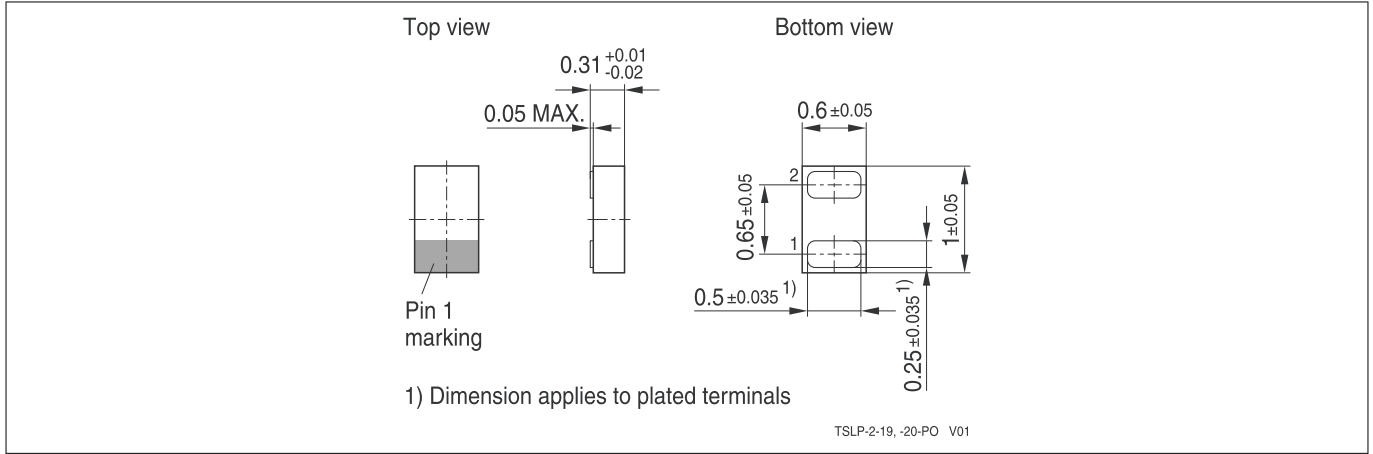


**Figure 13 TSSLP-2-4 marking example**

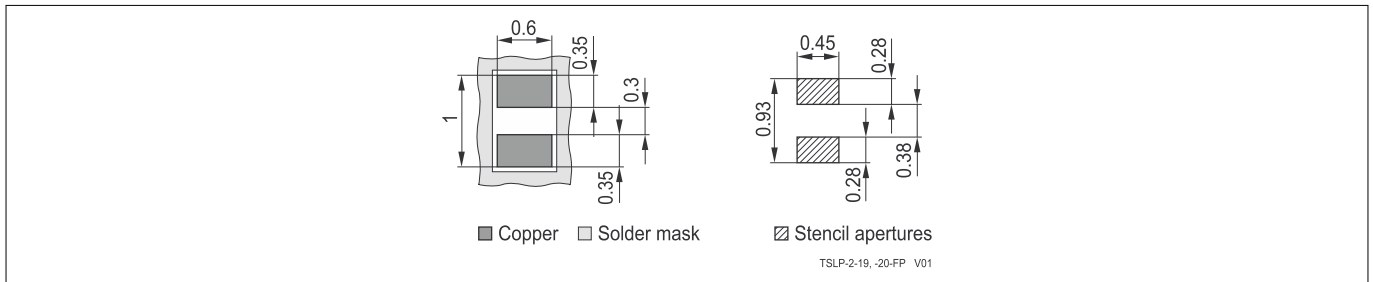
**Package information**

**4.2 TSLP-2-20**

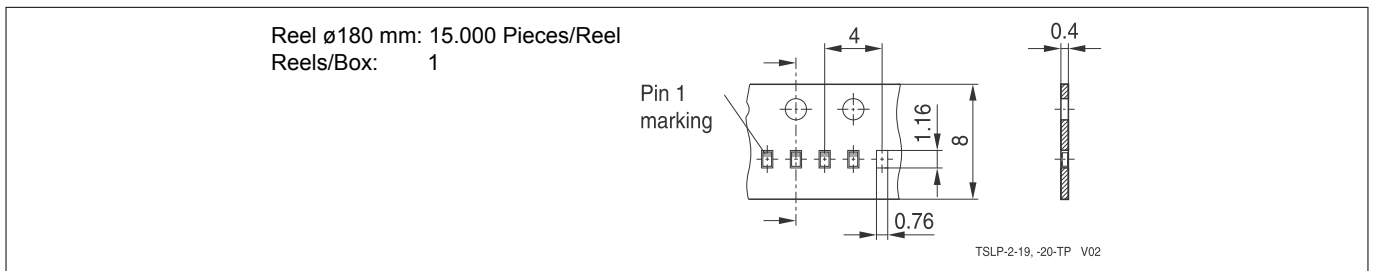
Note: Dimension in mm



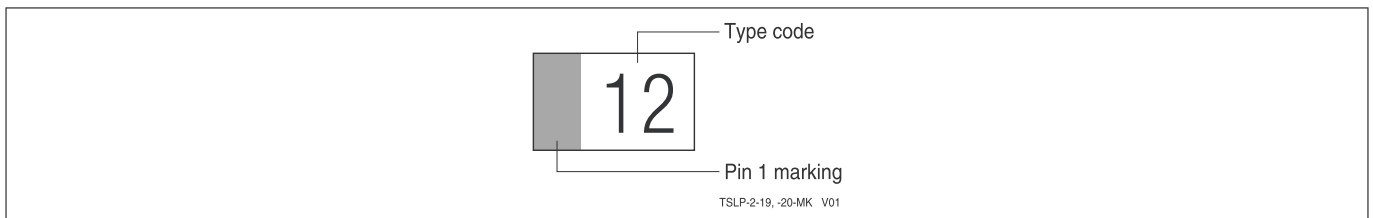
**Figure 14 TSLP-2-20 package outline**



**Figure 15 TSLP-2-20 footprint**



**Figure 16 TSLP-2-20 packing**



**Figure 17 TSLP-2-20 marking example**

---

**References**

## **5                   References**

- [1] Infineon AG - **Application Note AN210**: Effective ESD protection design at system level using VF-TLP characterization methodology
- [2] Infineon AG - **Recommendations for PCB Assembly of Infineon TSLP/TSSLP/TSNP Packages**
- [3] Infineon AG - **Application Note AN327**: ESD101-B1/ESD103-B1, Bi-directional Ultra Low Capacitance Transient Voltage Suppression Diodes for High Power RD Applications

## **Revision history**

---

**Revision history: Rev. 1.3. 2015-07-13**

<b>Page or Item</b>	<b>Subjects (major changes since previous revision)</b>
Revision 1.4, 2017-10-27	
All	Datasheet layout changed
	Table 3 updated

## Trademarks

All referenced product or service names and trademarks are the property of their respective owners.

**Edition 2017-10-26**

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

**© 2017 Infineon Technologies AG**  
**All Rights Reserved.**

**Do you have a question about any**  
**aspect of this document?**  
**Email: [erratum@infineon.com](mailto:erratum@infineon.com)**

**Document reference**  
**IFX-bvo1508924672557**

## IMPORTANT NOTICE

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics ("Beschaffheitsgarantie").

With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, 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.

In addition, any information given in this document is subject to customer's compliance with its obligations stated in this document and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Infineon Technologies in customer's applications.

The data contained in this document is exclusively intended for technically trained staff. It is the responsibility of customer's technical departments to evaluate the suitability of the product for the intended application and the completeness of the product information given in this document with respect to such application.

## WARNINGS

Due to technical requirements products may contain dangerous substances. For information on the types in question please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by Infineon Technologies in a written document signed by authorized representatives of Infineon Technologies, Infineon Technologies' products may not be used in any applications where a failure of the product or any consequences of the use thereof can reasonably be expected to result in personal injury



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.