

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): ± 14 kV (air), ± 12 kV (contact)
 - IEC61000-4-4 (EFT): ± 1.5 kV/ ± 30 A (5/50 ns)
 - IEC61000-4-5 (surge): ± 2 A (8/20 μ 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

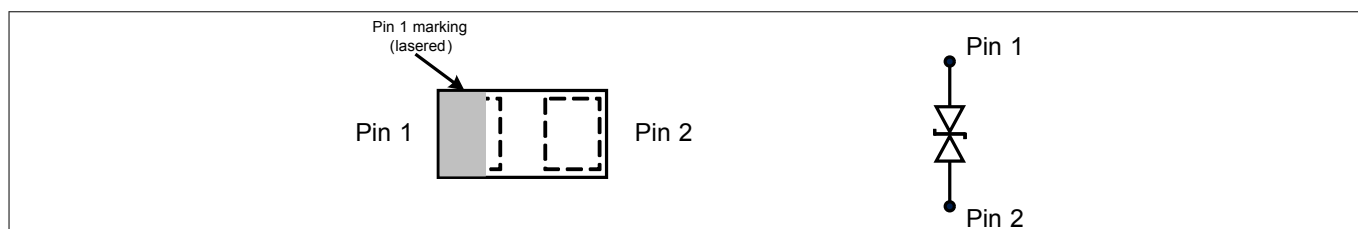


Figure 1 Pin configuration and schematic diagram

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

	Features	1
	Potential applications	1
	Product validation	1
	Device information	1
	Table of contents	2
1	Maximum ratings	3
2	Electrical characteristics	4
3	Typical characteristic diagrams	6
4	Package information	11
4.1	TSSLP-2-4	11
4.2	TSLP-2-20	12
5	References	13
	Revision history	13
	Disclaimer	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 ¹⁾	V_{ESD}	± 14	kV	–
ESD contact discharge ¹⁾		± 12		
Peak pulse power	P_{PK}	30	W	–
Peak pulse current ²⁾	I_{PP}	± 2	A	–
Operating temperature	T_{OP}	-55 to 125	°C	–
Storage temperature	T_{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.

¹ V_{ESD} according to IEC61000-4-2

² Non-repetitive current pulse 8/20 μs 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.

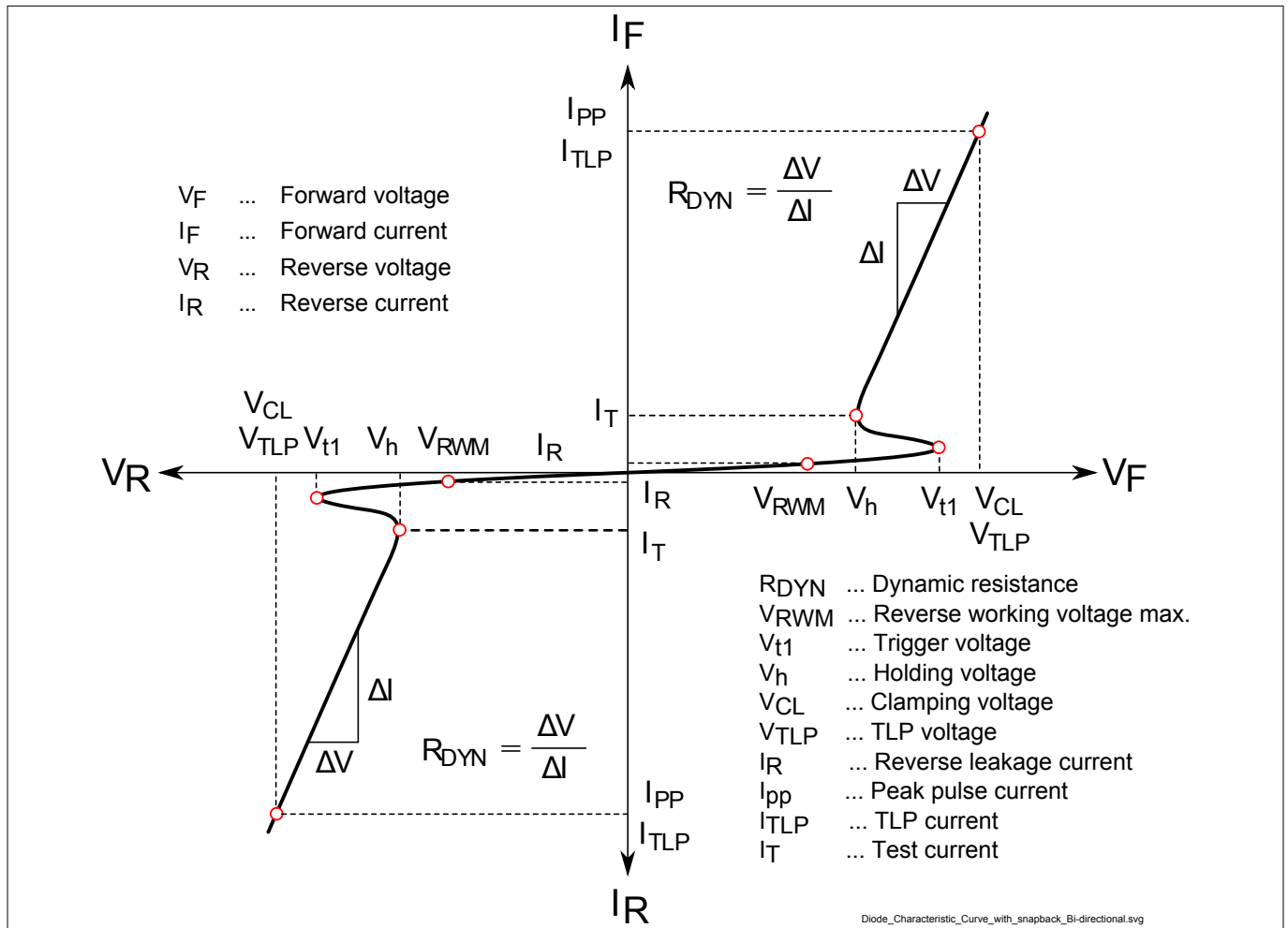


Figure 2 Definitions of electrical characteristics

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 ¹⁾	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
		–	0.4	–		ESD101-B1-02EL

Table 5 ESD and surge characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Clamping voltage ²⁾	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 ³⁾		–	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 ²⁾	R_{DYN}	–	1.5	–	Ω	$t_p = 100 \text{ ns}$
		–				

¹ Verified by design

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

³ Non-repetitive current pulse 8/20 μs 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

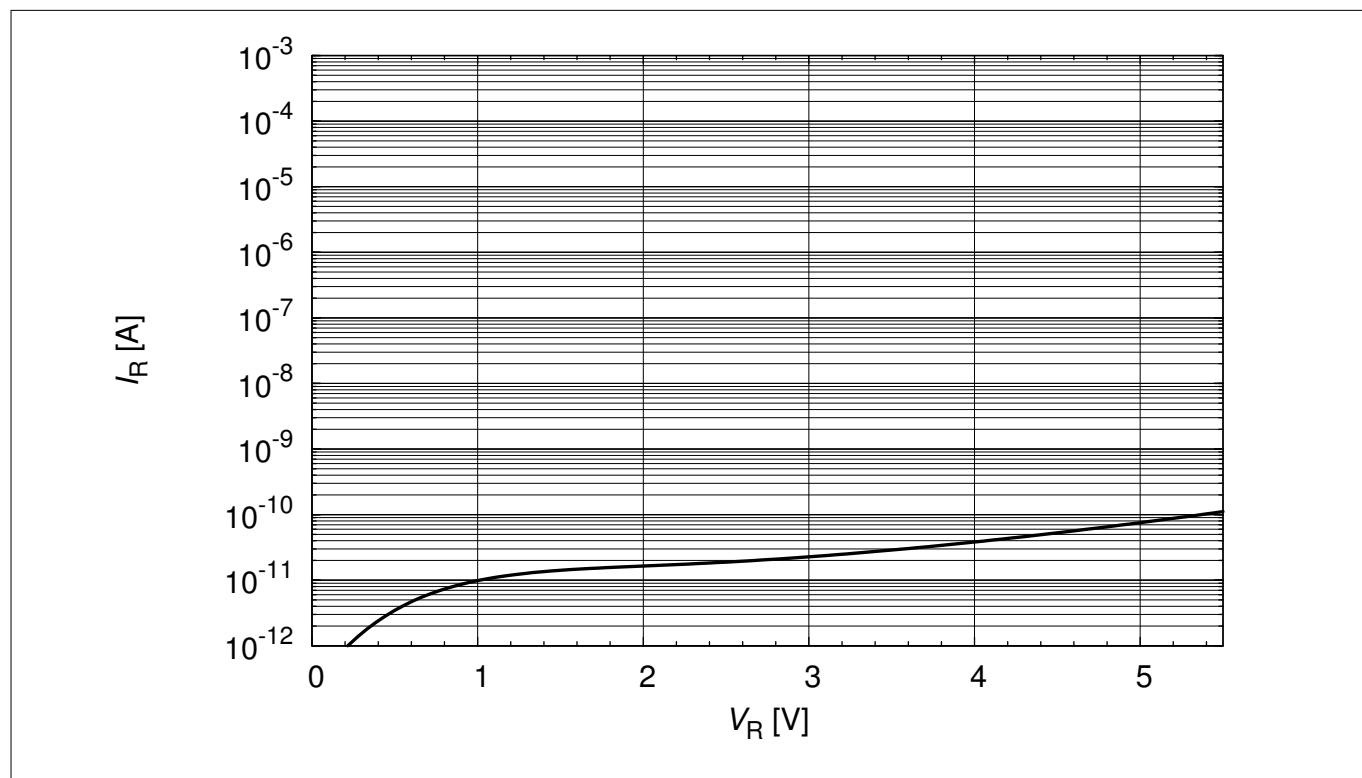


Figure 3 Reverse leakage current: $I_R = f(V_R)$

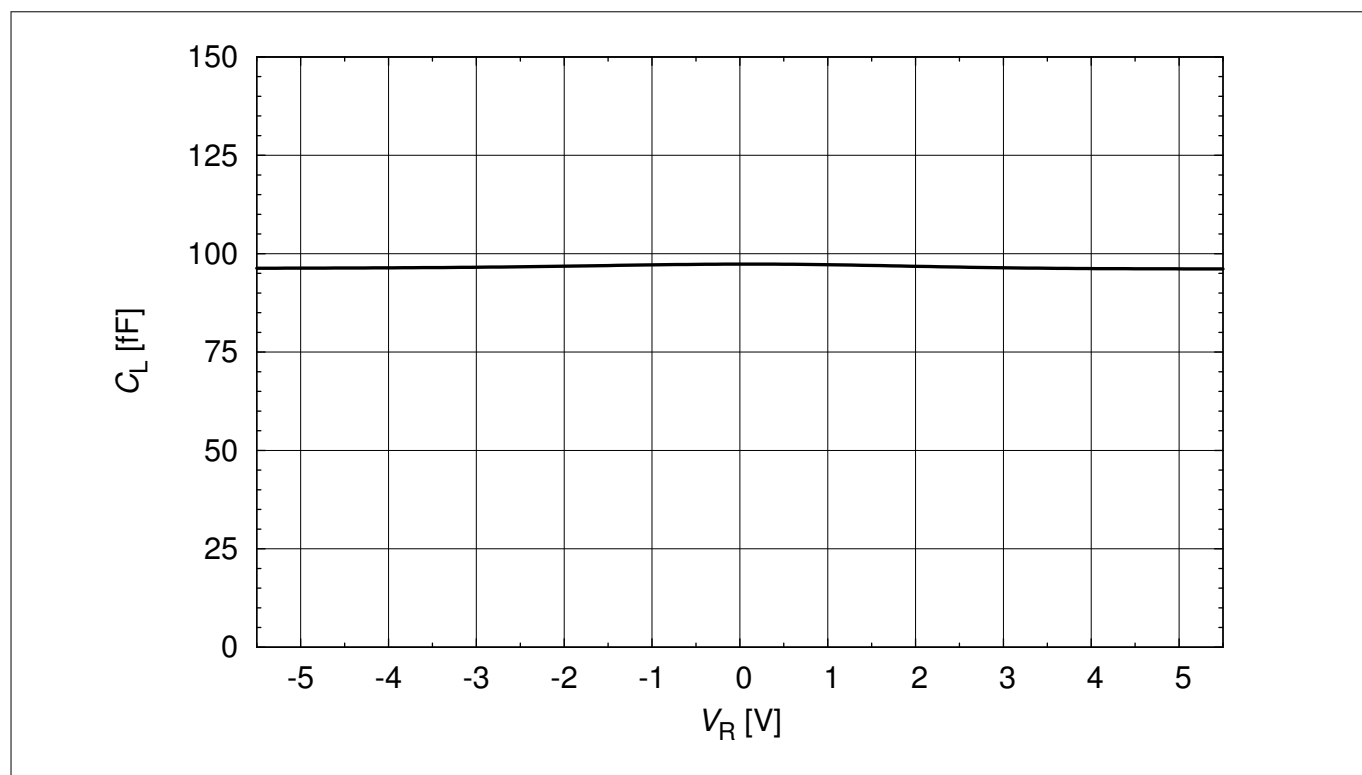


Figure 4 Line capacitance: $C_L = f(V_R)$, $f = 1\text{ GHz}$

Typical characteristic diagrams

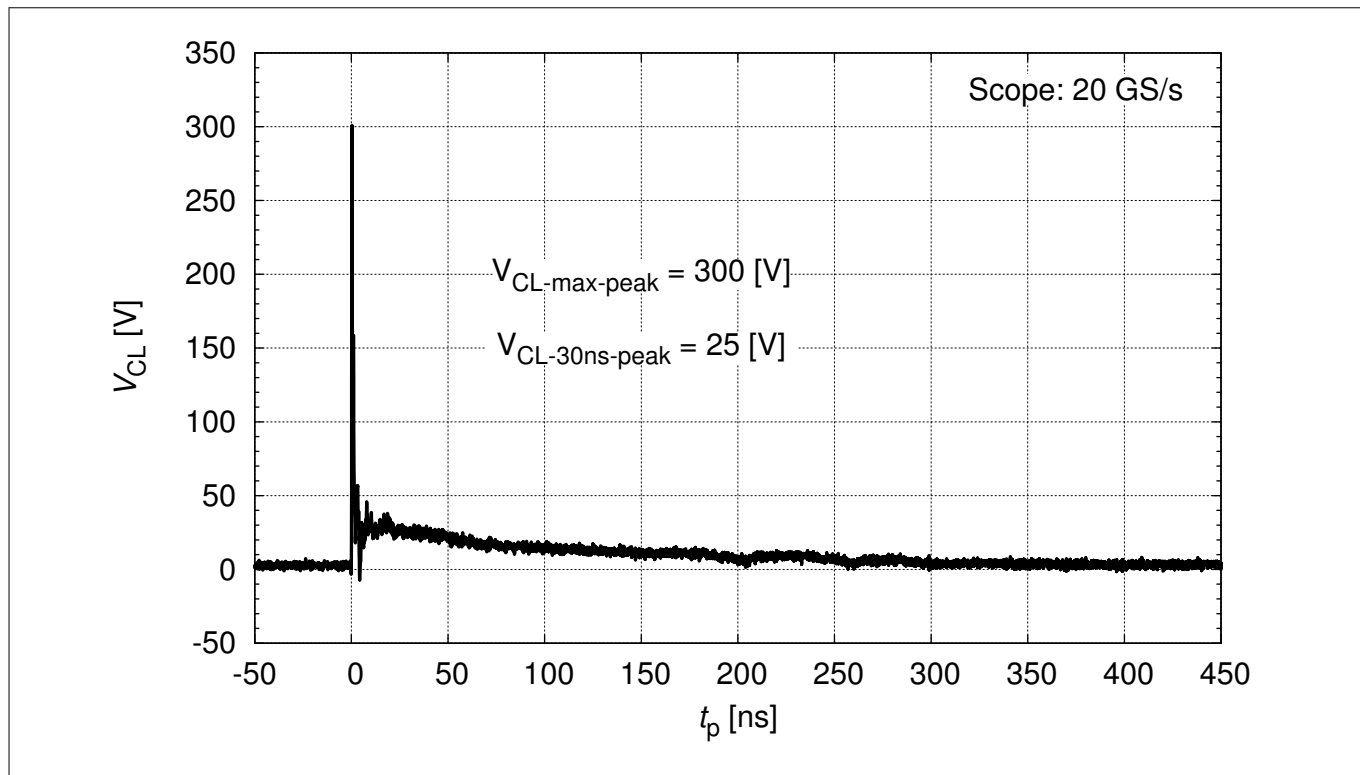


Figure 5 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positive pulse from pin 1 to pin 2

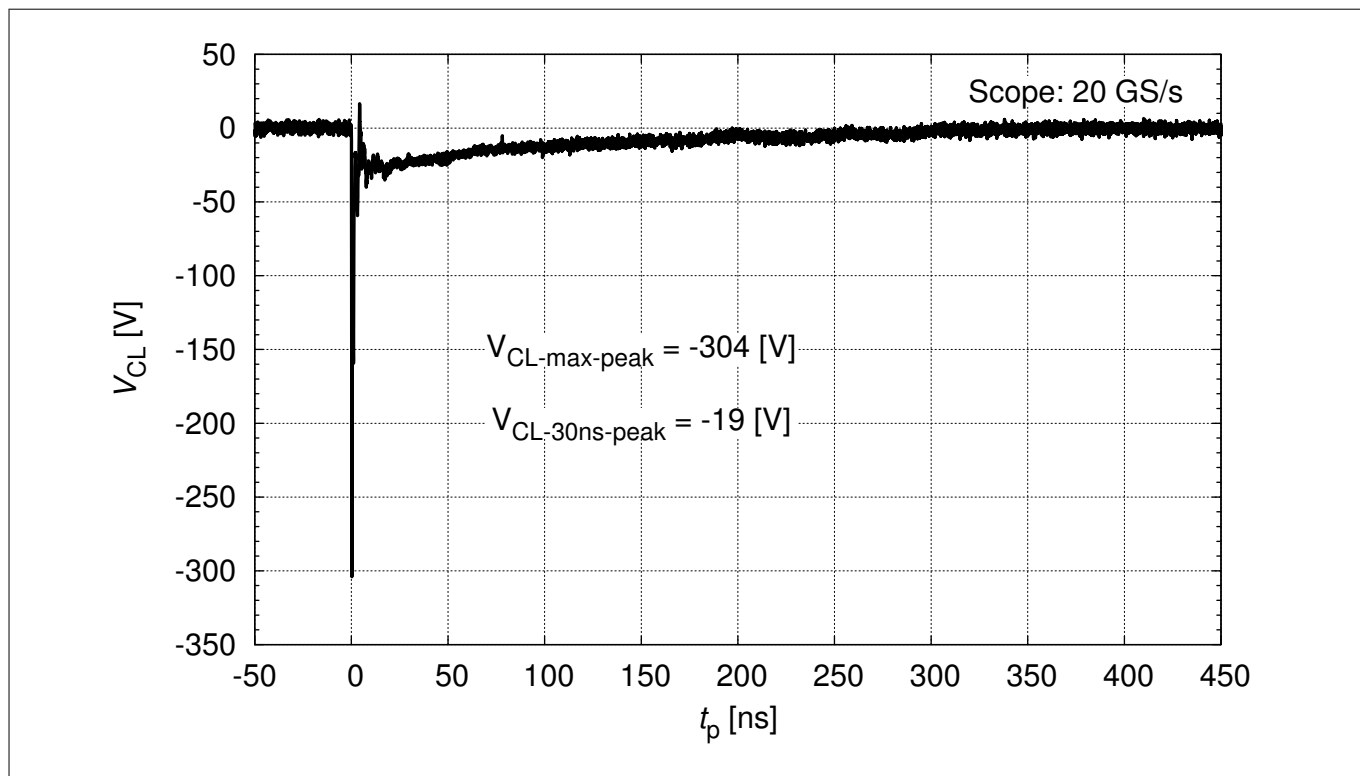


Figure 6 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV negative pulse from pin 1 to pin 2

Typical characteristic diagrams

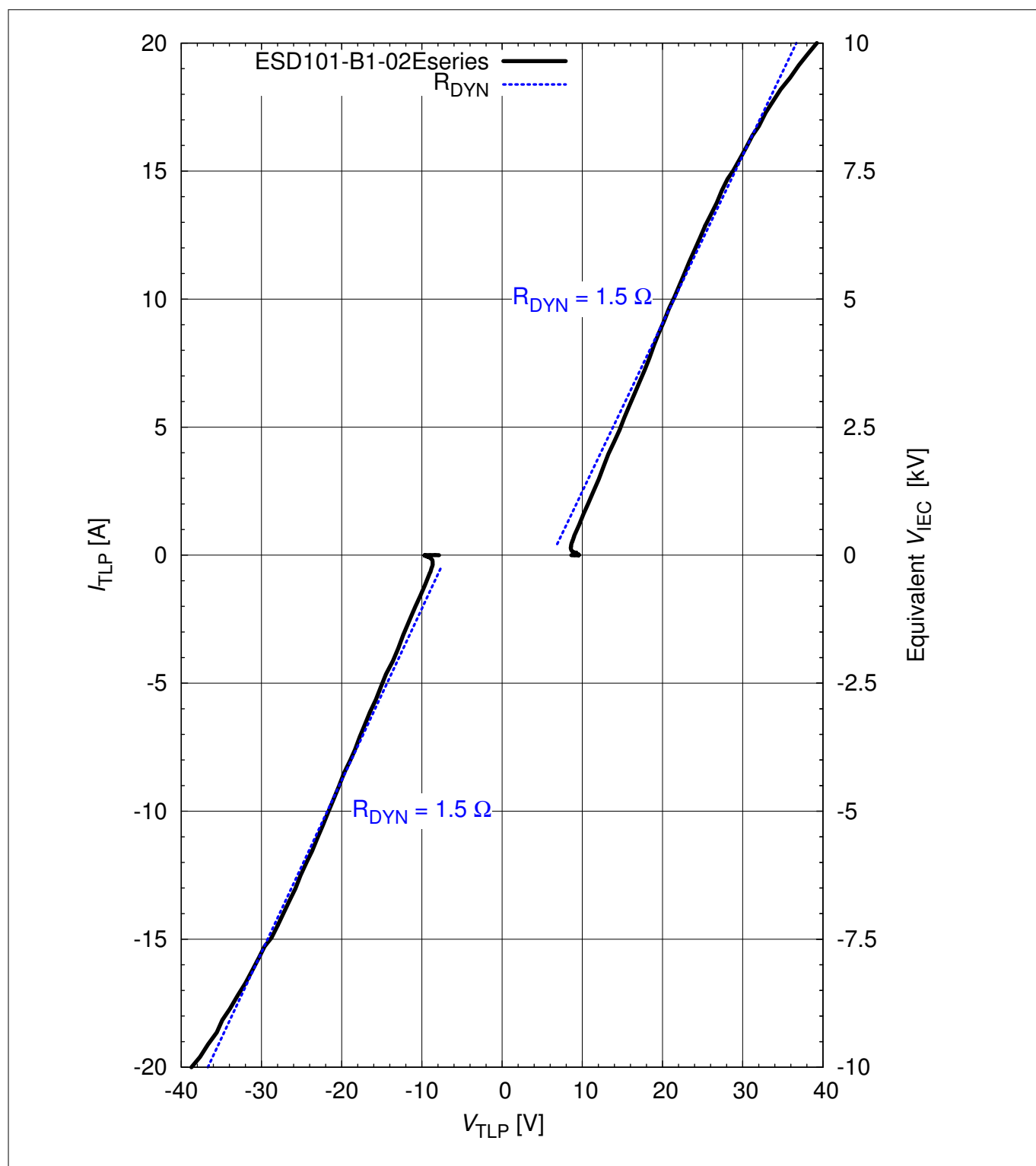


Figure 7 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ [1], pin 1 to pin 2

Typical characteristic diagrams

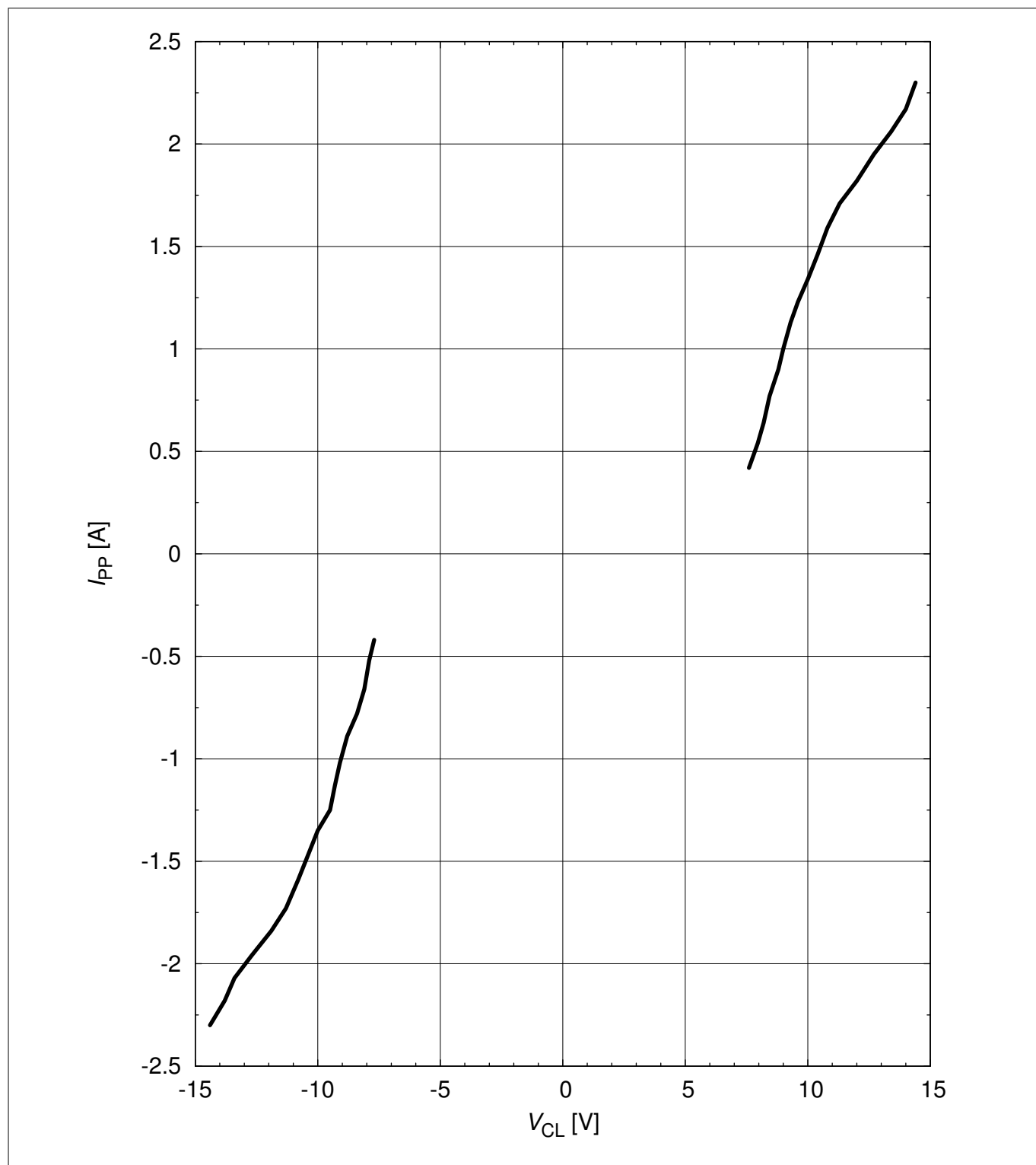


Figure 8 Clamping voltage (Surge): $I_{PP} = f(V_{CL})$ [1], pin 1 to pin 2

Typical characteristic diagrams

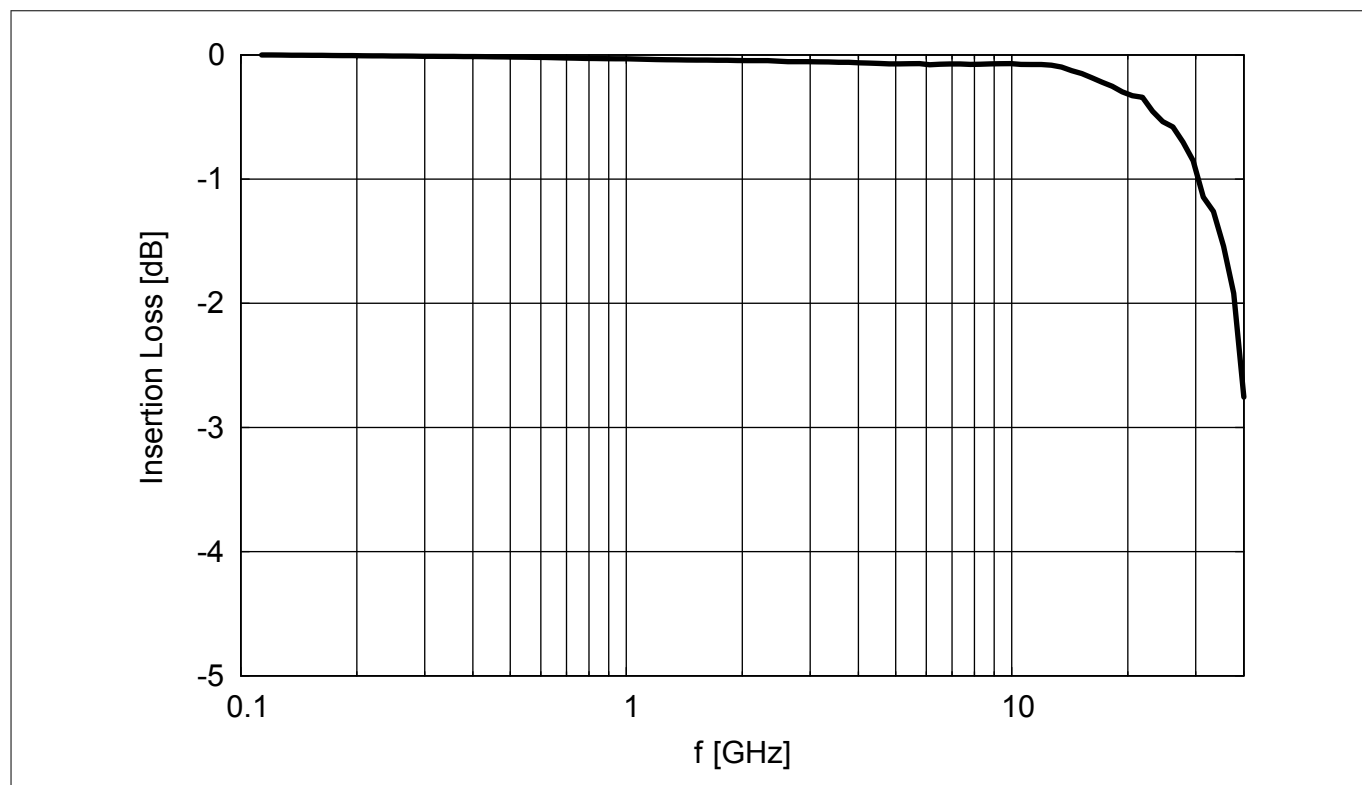


Figure 9 Insertion loss vs. frequency in a 50 Ω system

Package information

4 Package information

4.1 TSSLP-2-4

Note: Dimension in mm

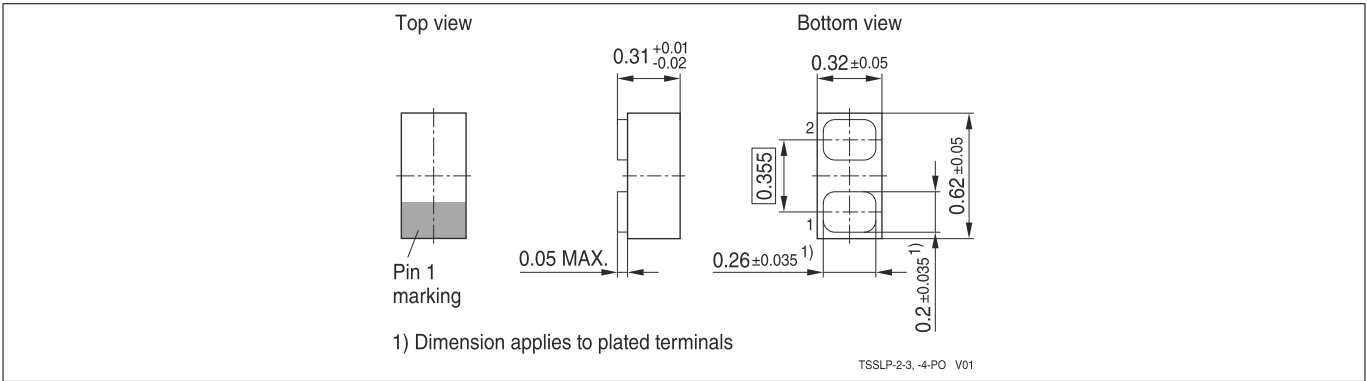


Figure 10 TSSLP-2-4 package outline

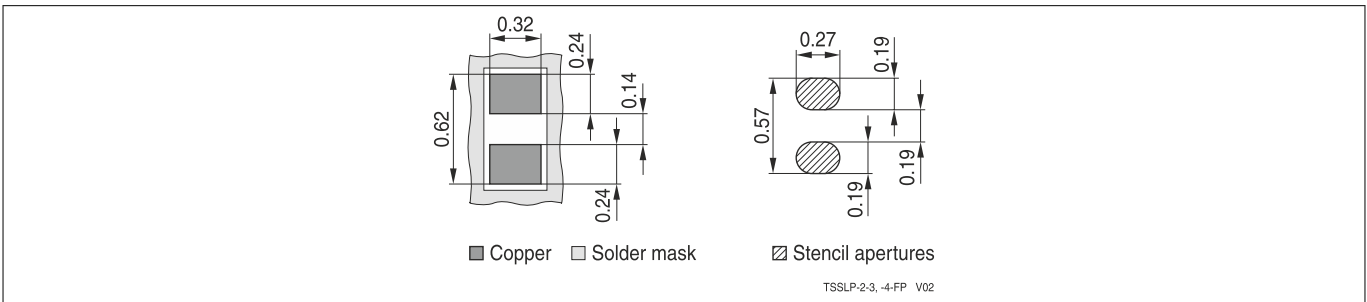


Figure 11 TSSLP-2-4 footprint

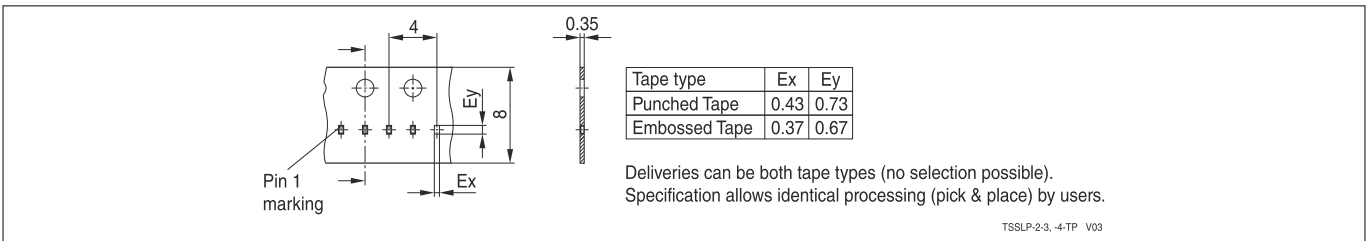


Figure 12 TSSLP-2-4 packing

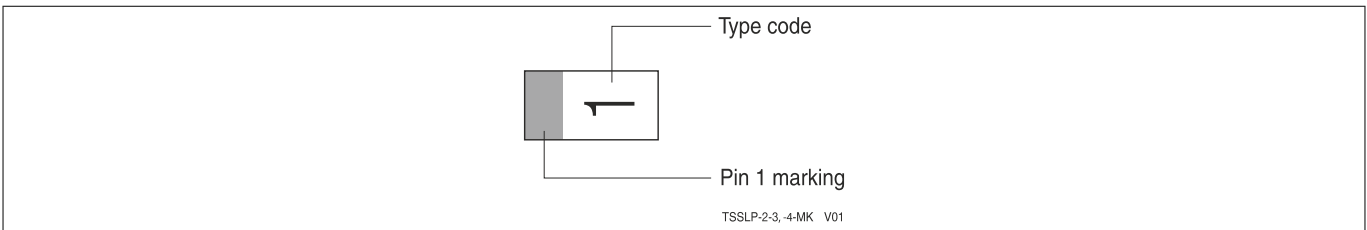


Figure 13 TSSLP-2-4 marking example

Package information

4.2 TSLP-2-20

Note: Dimension in mm

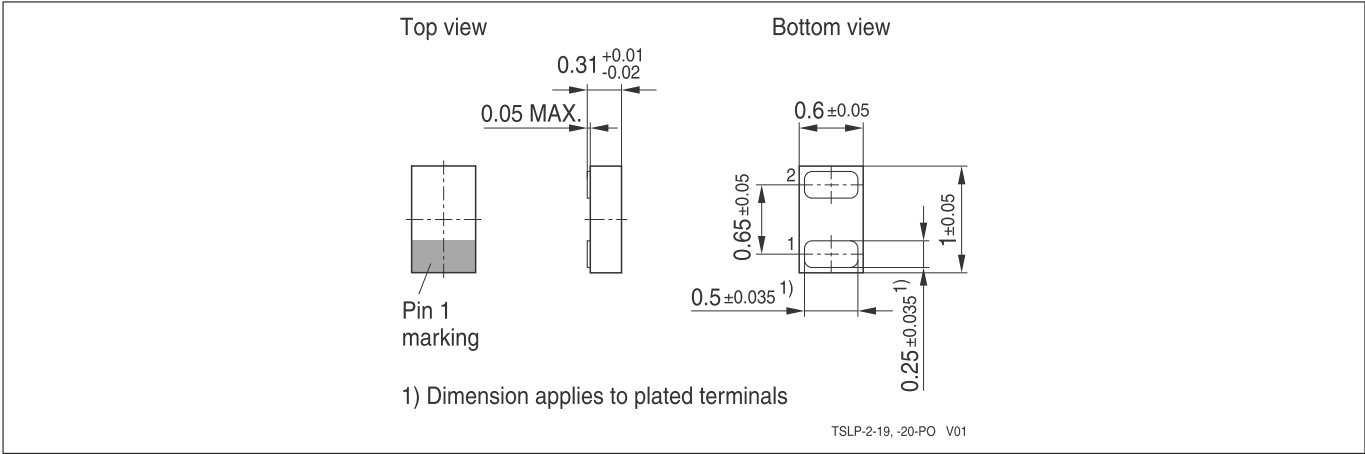


Figure 14 TSLP-2-20 package outline

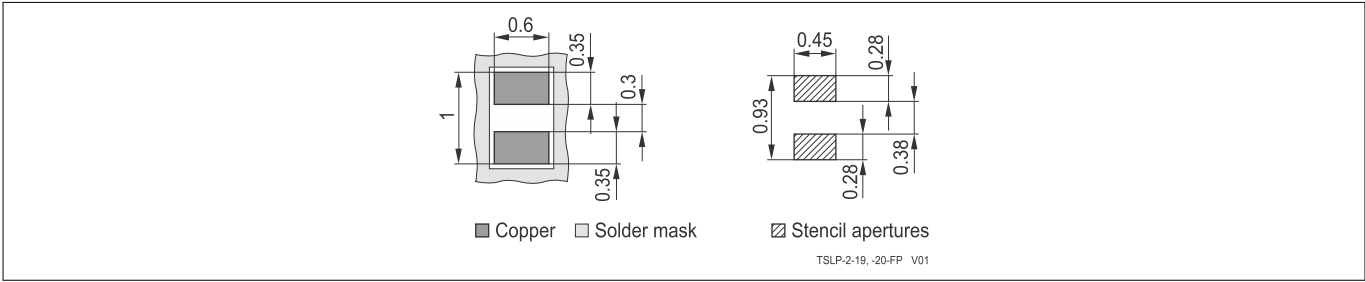


Figure 15 TSLP-2-20 footprint

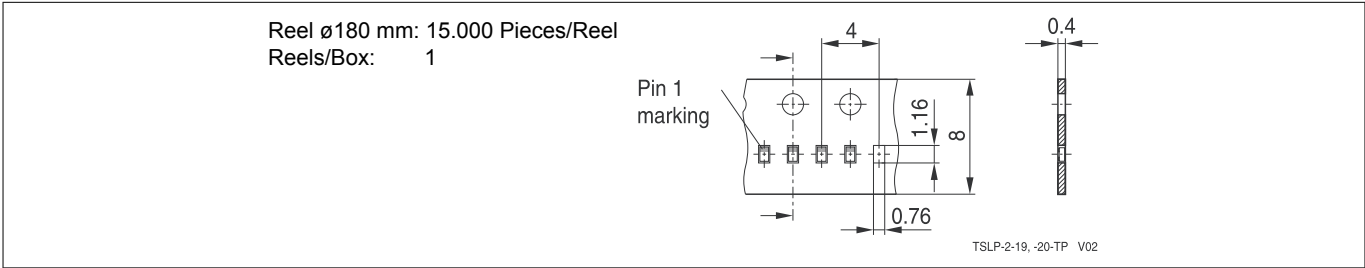


Figure 16 TSLP-2-20 packing

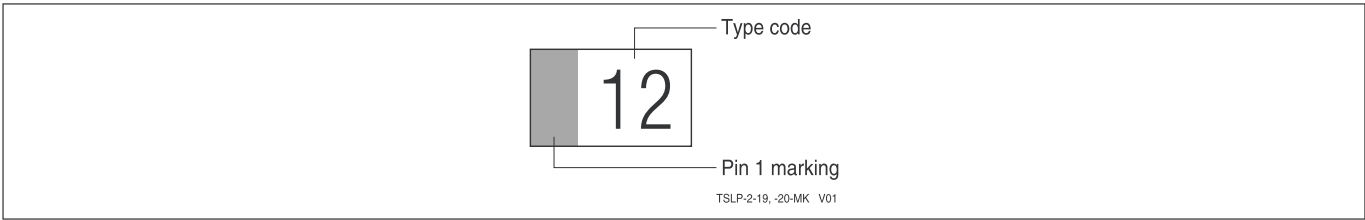


Figure 17 TSLP-2-20 marking example

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

Page or Item	Subjects (major changes since previous revision)
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

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 ("Beschaffenhheitsgarantie").

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