Protection Device

TVS (Transient Voltage Suppressor)

ESD114-U1-02 Series

Uni-directional, 5.3 V, 0.4 pF, 0402, 0201, RoHS and Halogen Free compliant

ESD114-U1-02ELS
ESD114-U1-02EL

Data Sheet

Revision 1.0, 2014-10-30
Final

Power Management & Multimarket

Edition 2014-10-30

Published by
Infineon Technologies AG
81726 Munich, Germany

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1 Product Overview

1.1 Features

- ESD / Transient protection of high speed data lines exceeding
  - **IEC61000-4-2 (ESD): ±20 kV (contact)**
  - **IEC61000-4-4 (EFT): ±2 kV / ±40 A (5/50 ns)**
  - **IEC61000-4-5 (surge): ±3 A (8/20 µs)**
- Maximum working voltage: V_{RWM} **= ±5.3 V**
- Ultra low capacitance: C_L **= 0.4 pF (typical)**
- Very low clamping voltage V_{CL} **= +20 / -15 V (typical) at** I_{TLP} **= 16 A**
- Low dynamic resistance R_{DYN} **= 0.5 Ω (typical)**
- Very small form factor down to 0.62 x 0.32 x 0.31 mm^3
- Pb-free (RoHS compliant) and halogen free package

1.2 Application Examples

- USB 2.0, Mobile HDMI Link, MDDI, MIPI, etc.
- HDMI, DisplayPort, DVI, Ethernet, Firewire, S-ATA

1.3 Product Description

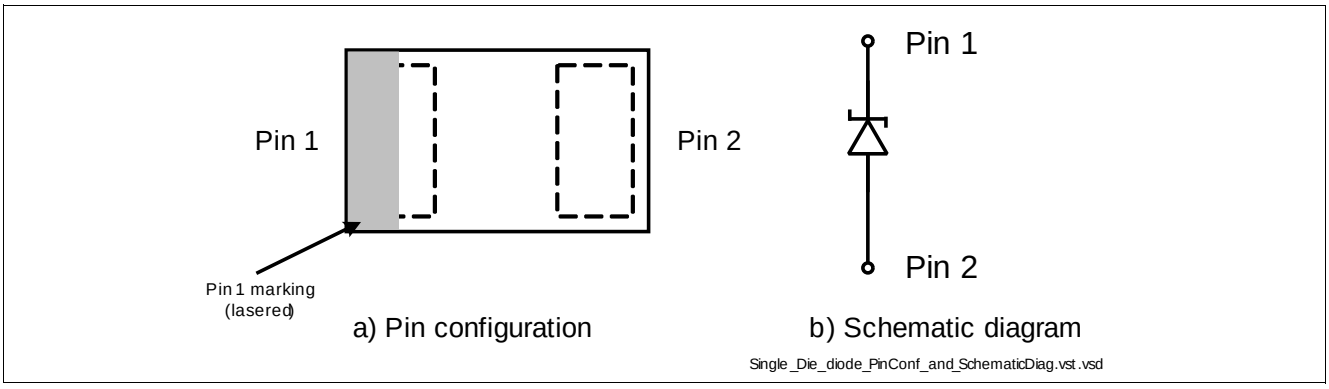

Figure 1 Pin Configuration and Schematic Diagram

Table 1 Ordering Information

Type	Package	Configuration	Marking code
ESD114-U1-02ELS	TSSLP-2-3	1 line, uni-directional	K
ESD114-U1-02EL	TSLP-2-19	1 line, uni-directional	K

2 Maximum Ratings

Table 2 Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values	Unit
ESD contact discharge[1)]	V_{ESD}	±20	kV
Peak pulse current (t_p = 8/20 µs)[2)]	I_{PP}	±3	A
Operating temperature range	T_{OP}	-55 to 125	°C
Storage temperature	T_{stg}	-65 to 150	°C

1) V_{ESD} according to IEC61000-4-2

2) Non-repetitive current pulse 8/20µs exponential decay waveform 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.

3 Electrical Characteristics at T_A = 25 °C, unless otherwise specified

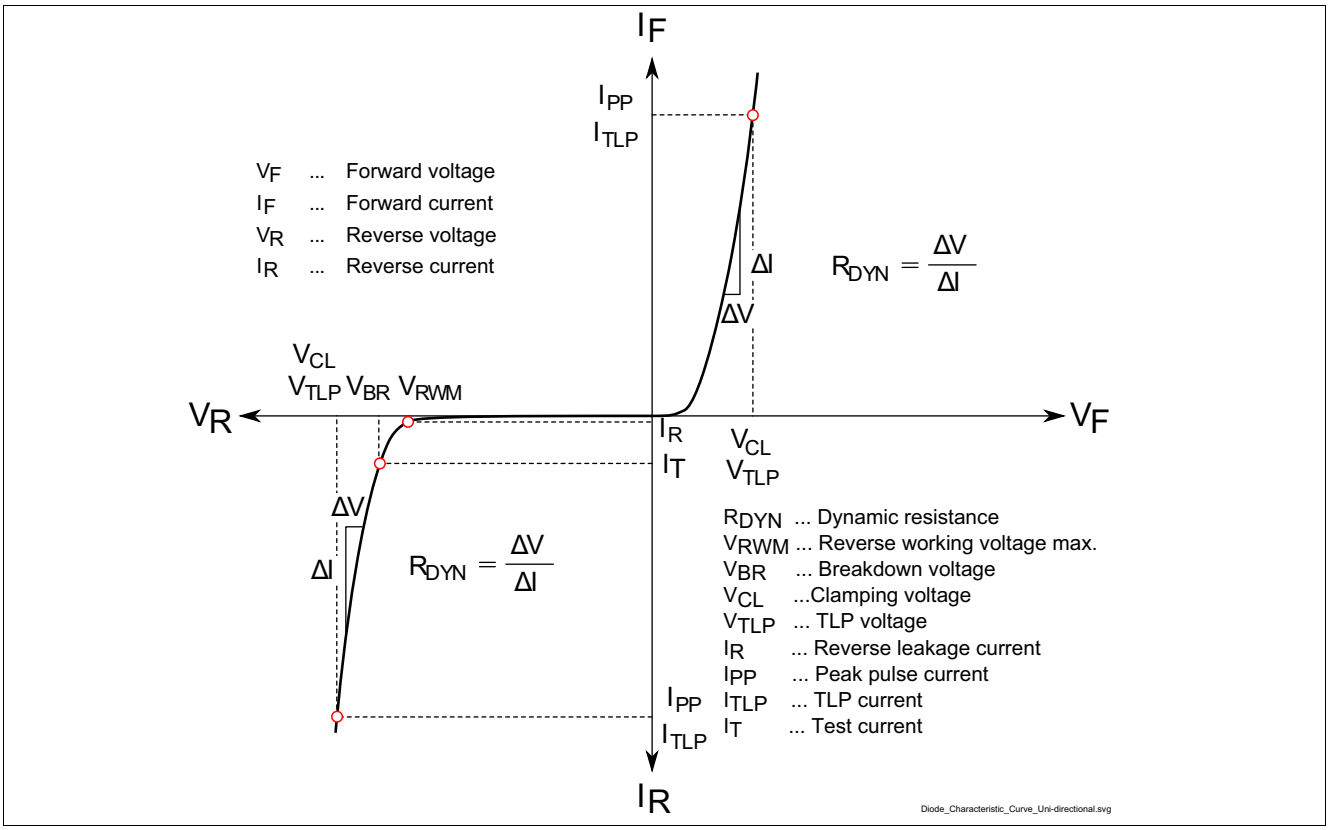

Figure 2 Definitions of Electrical Characteristics

Table 3 DC Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Reverse working voltage	V_{RWM}	–	–	5.3	V	Pin 1 to Pin 2
Breakdown voltage	V_{BR}	6	–	–	V	I_{BR} = 1 mA, from Pin 1 to Pin 2
Reverse current	I_R	–	<10	100	nA	V_R = 5.3 V, from Pin 1 to Pin 2

Table 4 RF Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Line capacitance[1)]	C_L	–	0.4	0.6	pF	V_R = 0 V, f = 1 MHz
Serie inductance	L_S	–	0.2	–	nH	ESD114-U1-02ELS
		–	0.4	–	nH	ESD114-U1-02EL

1) Total capacitance line to ground

Table 5 ESD Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage	V_{CL}	–	10	–	V	I_{TLP} = 1 A, from Pin 1 to Pin 2
		–	20	–		I_{TLP} = 16 A, from Pin 1 to Pin 2
		–	28	–		I_{TLP} = 30 A, from Pin 1 to Pin 2
		–	3	–		I_{TLP} = 1 A, from Pin 2 to Pin 1
		–	15	–		I_{TLP} = 16 A, from Pin 2 to Pin 1
		–	21	–		I_{TLP} = 30 A, from Pin 2 to Pin 1
Dynamic resistance[1)]	R_{DYN}	–	0.56	–	V	Pin 1 to Pin 2
		–	0.43	–	V	Pin 2 to Pin 1

1) Please refer to Application Note AN210[1]. TLP parameter: Z_0 = 50 Ω, t_p = 100ns, t_r = 300ps, averaging window: t_1 = 30 ns to t_2 = 60 ns, extraction of dynamic resistance using least squares fit of TLP charactertistics between I_{PP1} = 10 A and I_{PP2} = 40 A.

4 Typical Characteristics Diagrams

Typical characteristics diagrams at T_A = 25°C, unless otherwise specified

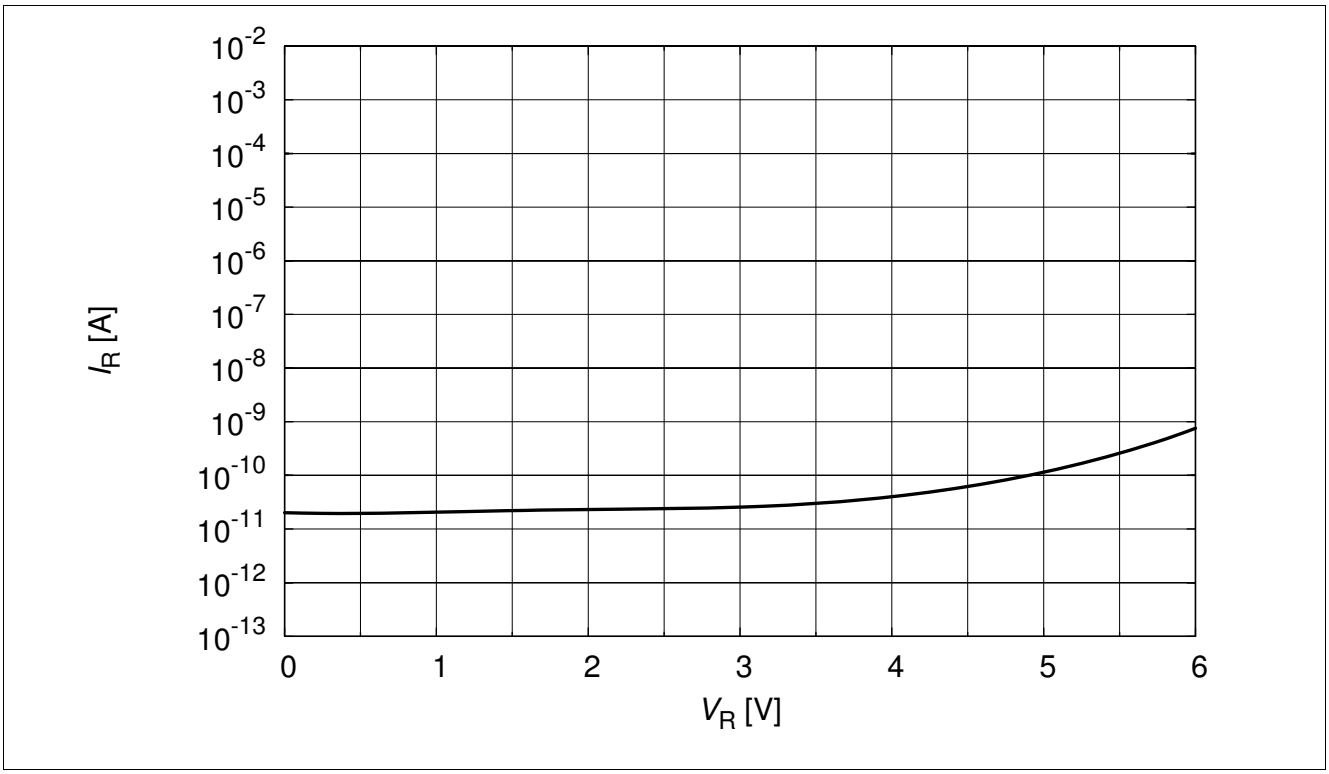

Figure 3 Reverse leakage current: $I_R = f(V_R)$

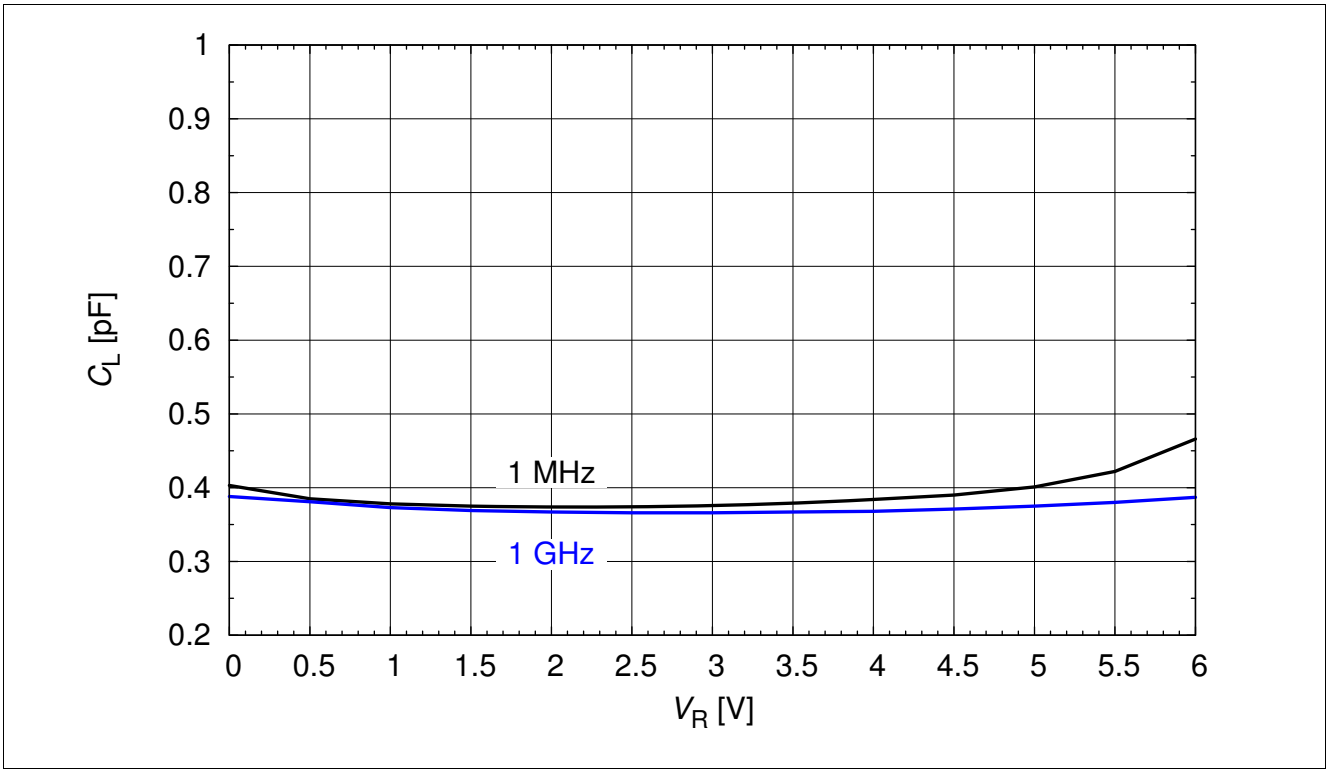

Figure 4 Line capacitance: $C_L = f(V_R)$

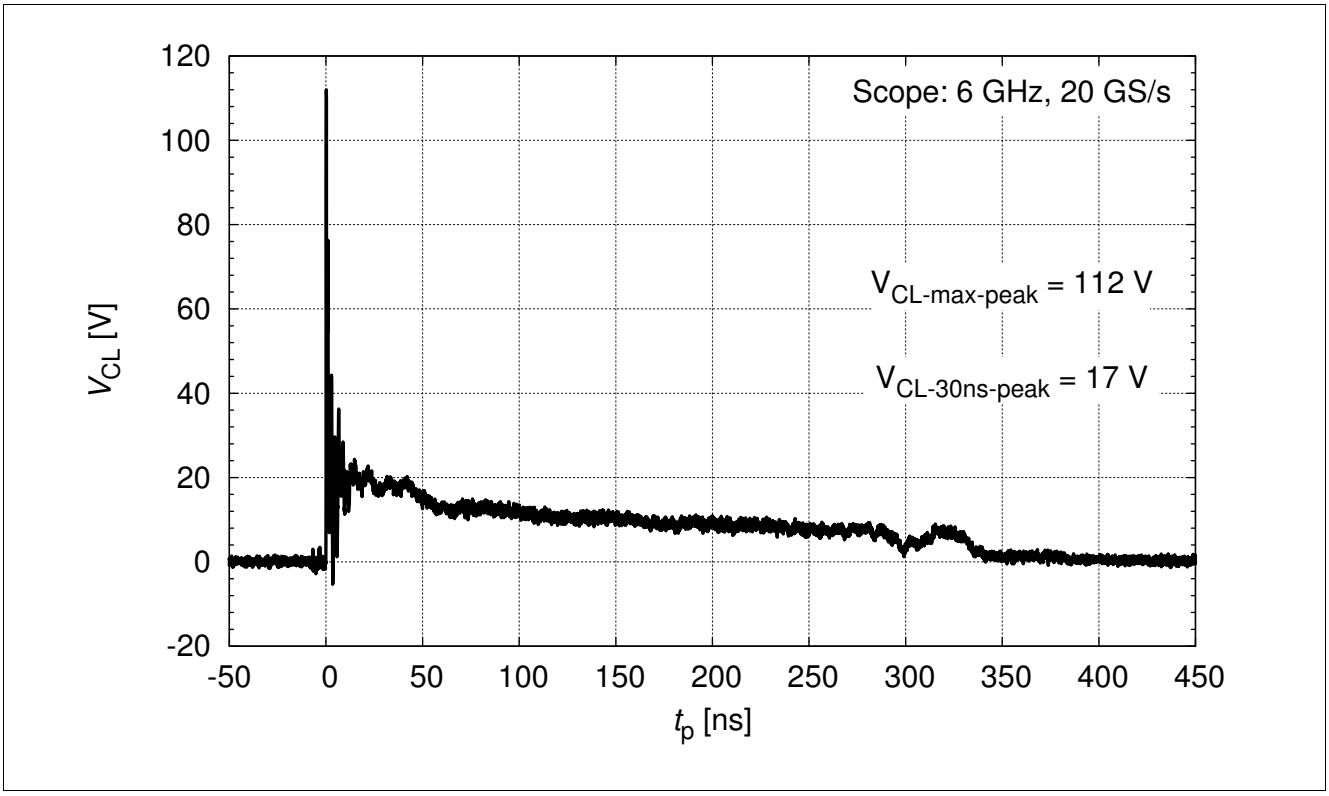

Figure 5 IEC61000-4-2 : $V_{CL} = f(t)$, 8 kV positive pulse from pin 1 to pin 2

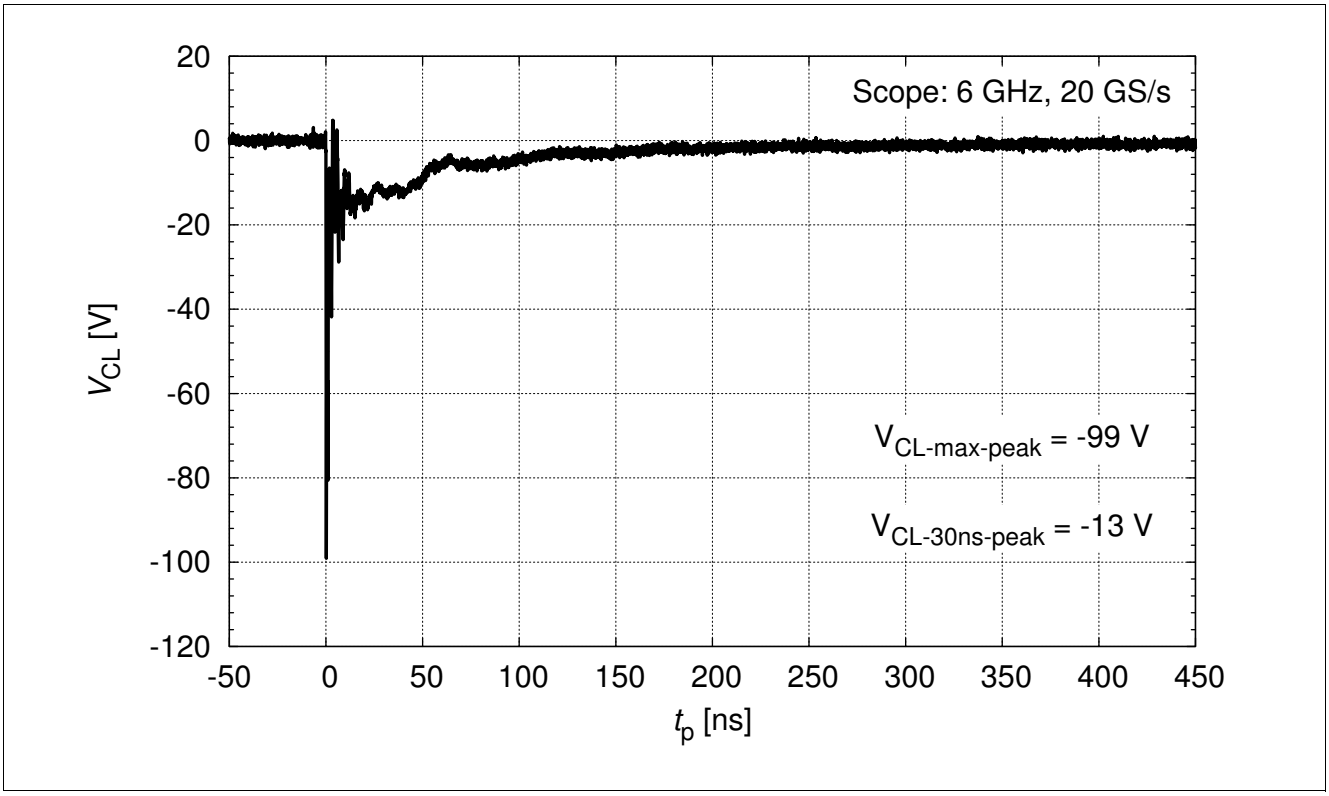

Figure 6 IEC61000-4-2 : $V_{CL} = f(t)$, 8 kV negative pulse from pin 1 to pin 2

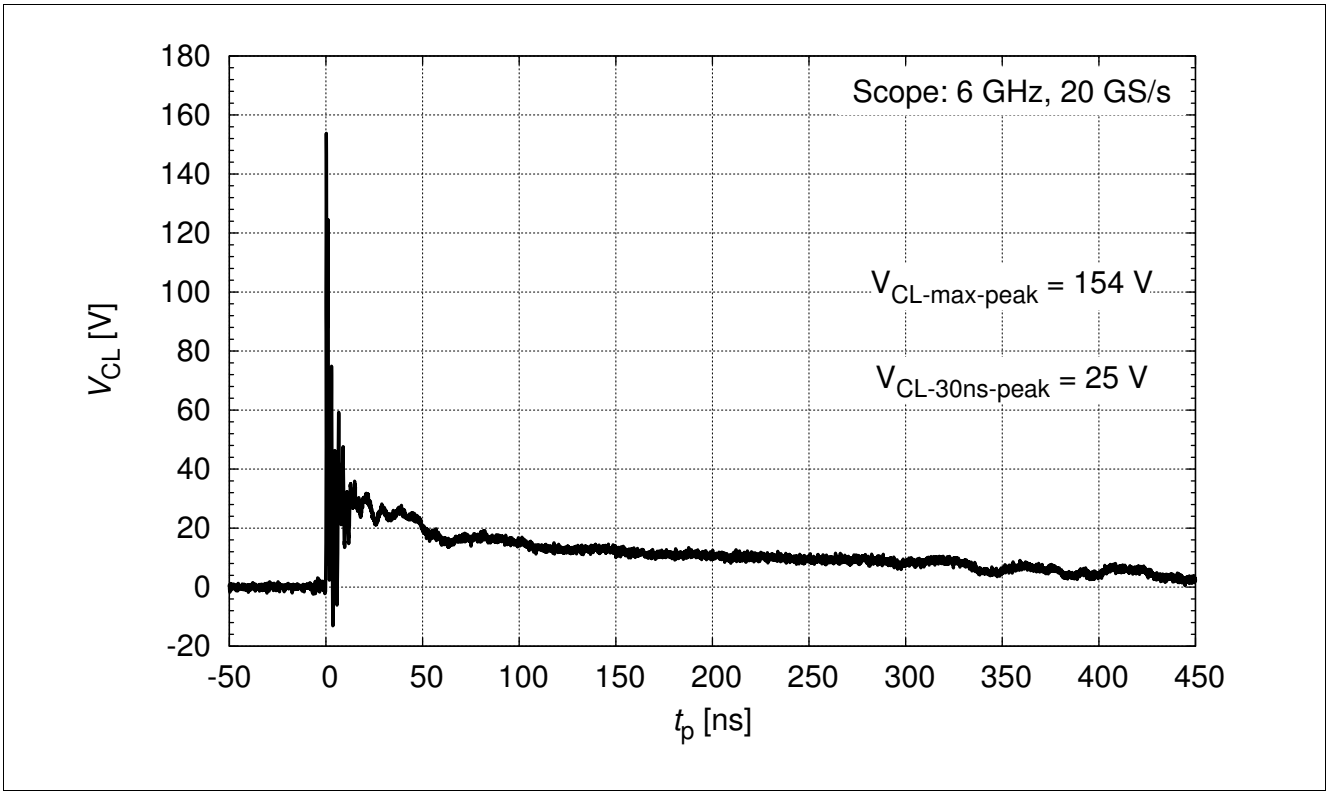

Figure 7 IEC61000-4-2 : $V_{CL} = f(t)$, 15 kV positive pulse from pin 1 to pin 2

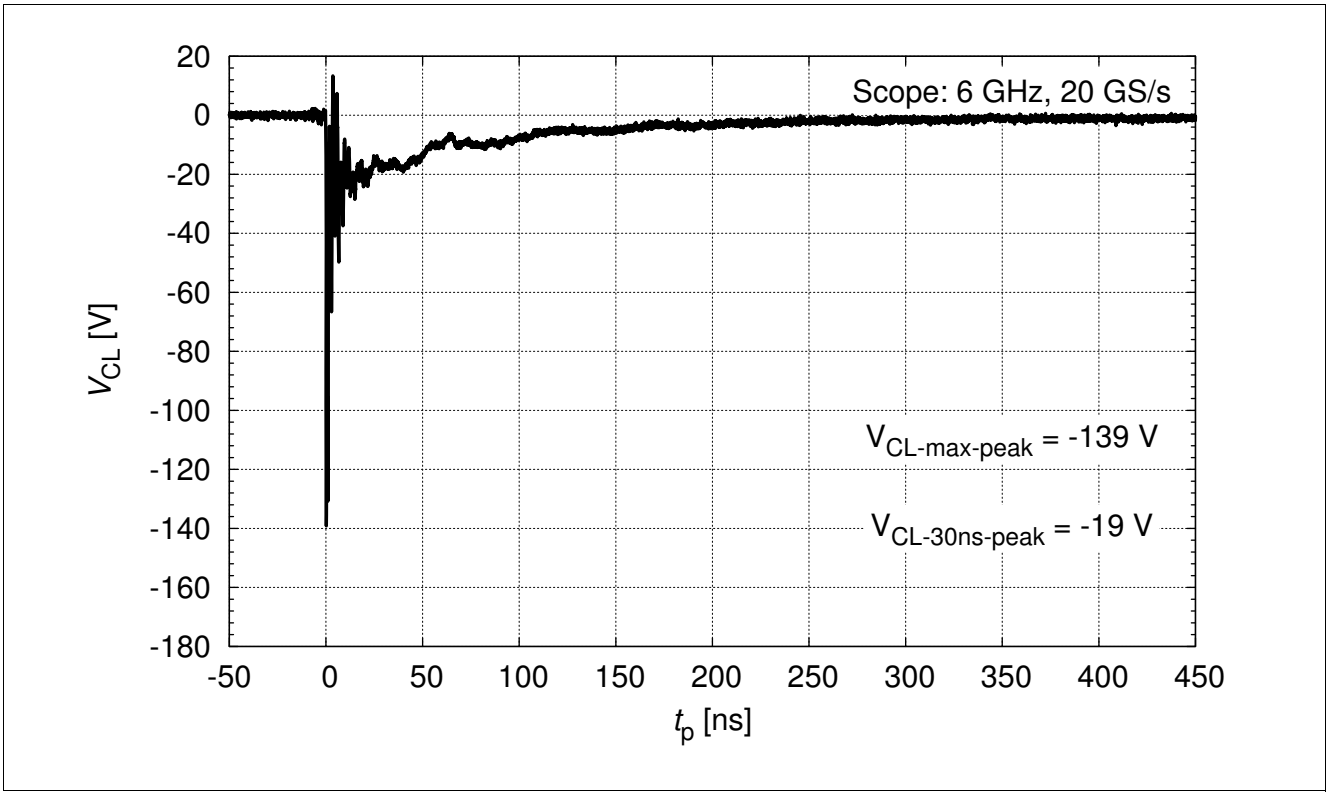

Figure 8 IEC61000-4-2 : $V_{CL} = f(t)$, 15 kV negative pulse from pin 1 to pin 2

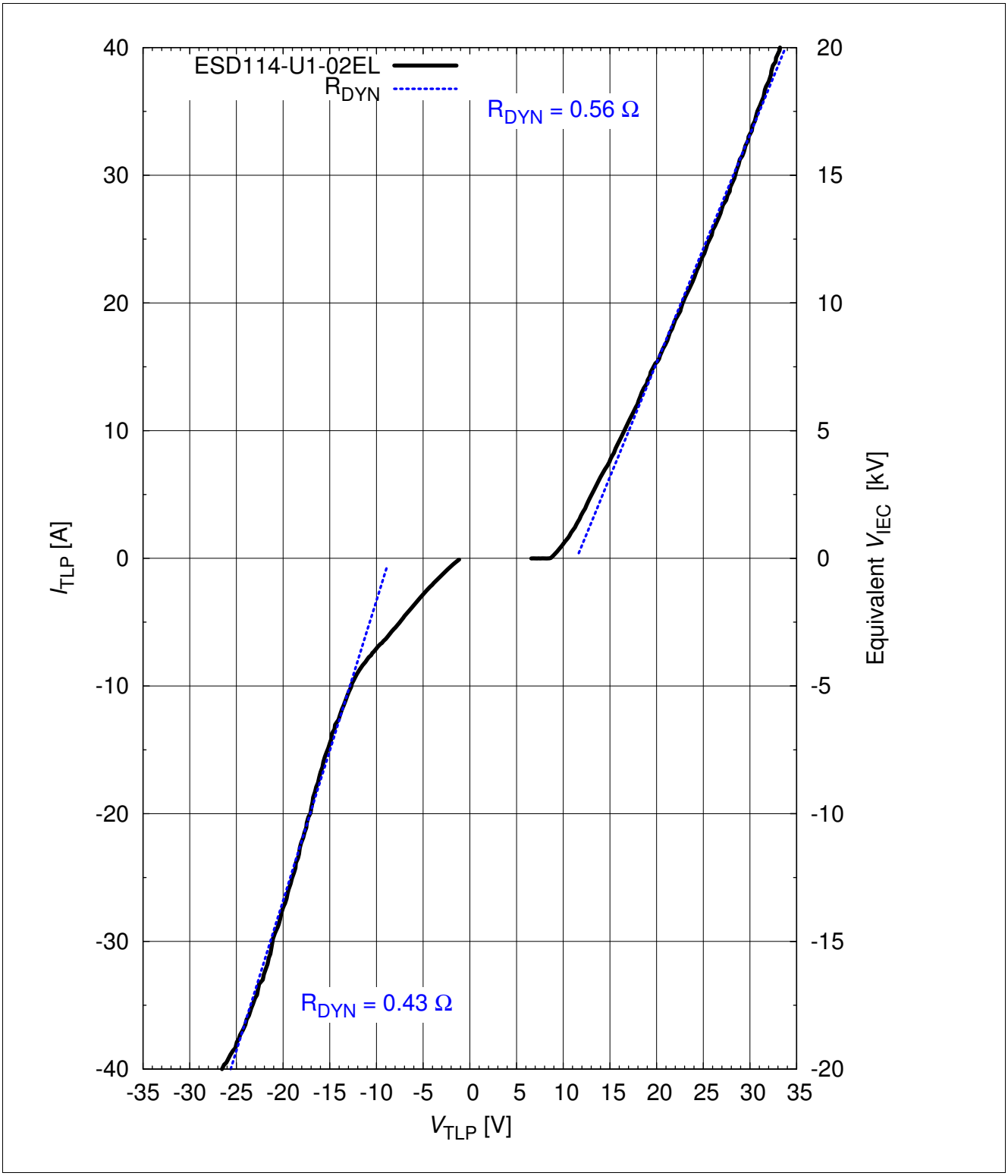

Figure 9 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ [1], pin 1 to pin 2

5 Package Information

5.1 TSSLP-2-3 (mm)[3]

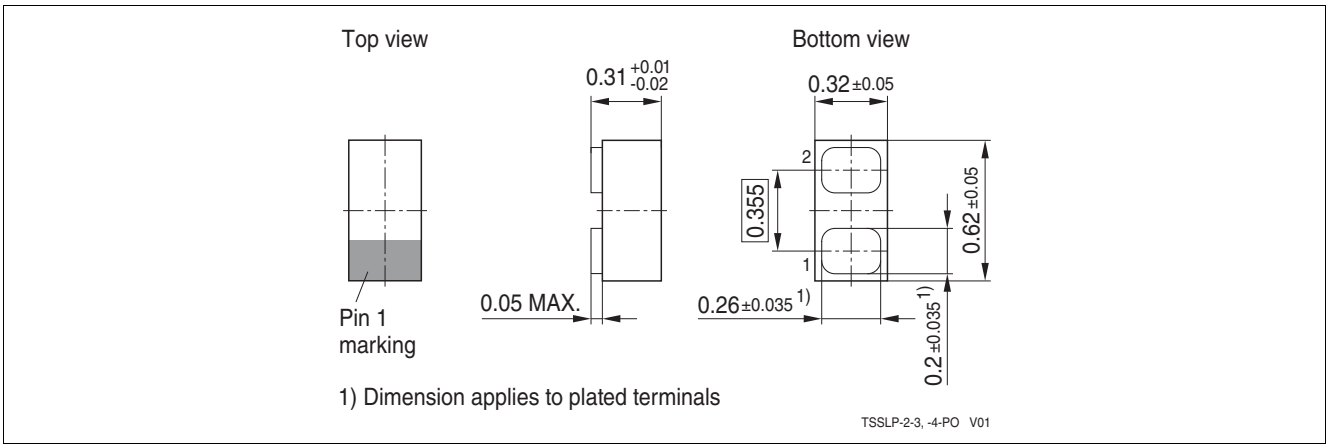

Figure 10 TSSLP-2-3: Package overview

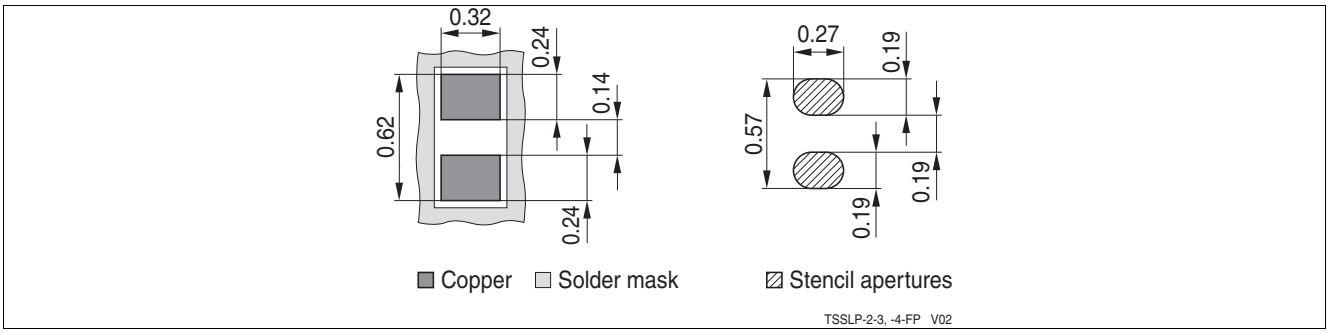

Figure 11 TSSLP-2-3 Footprint

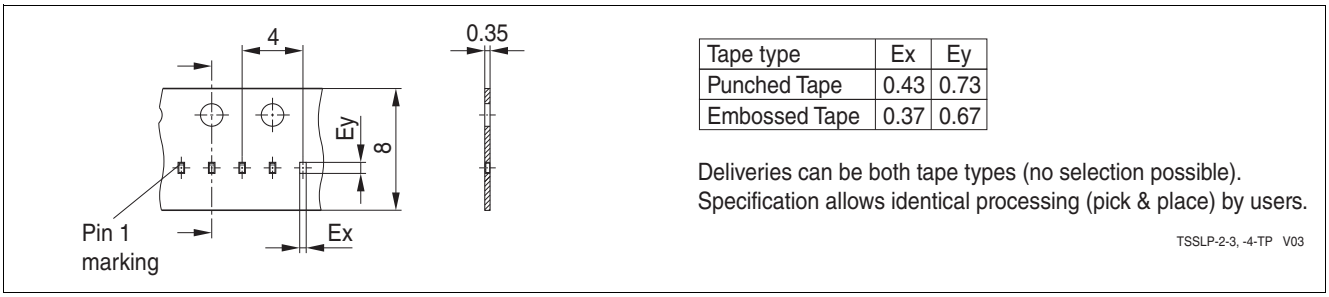

Figure 12 TSSLP-2-3: Packing

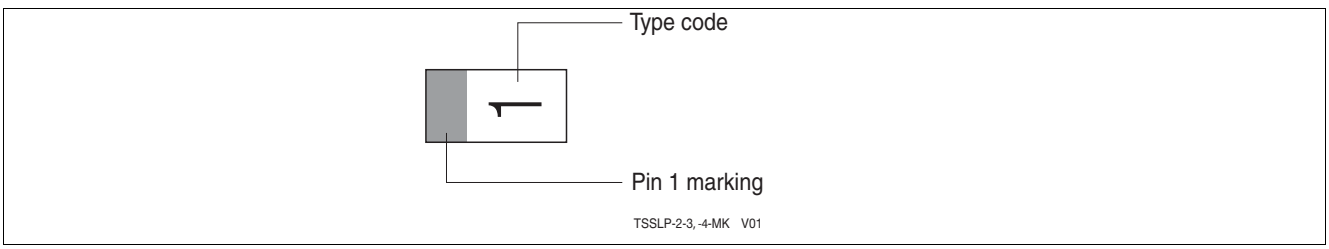

Figure 13 TSSLP-2-3: Marking (example)

5.2 TSLP-2-19 (mm)[3]

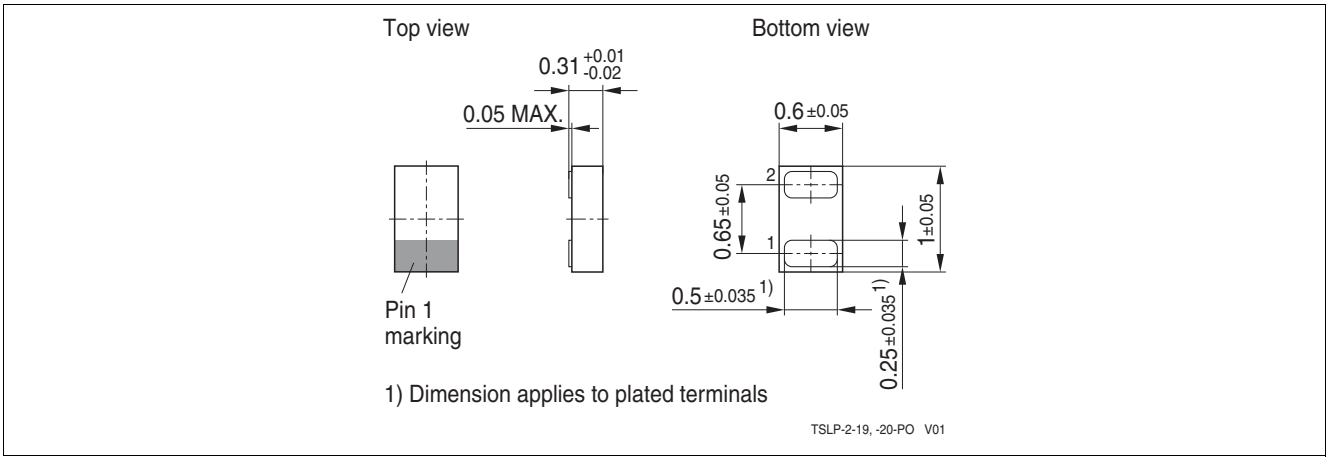

Figure 14 TSLP-2-19: Package Overview

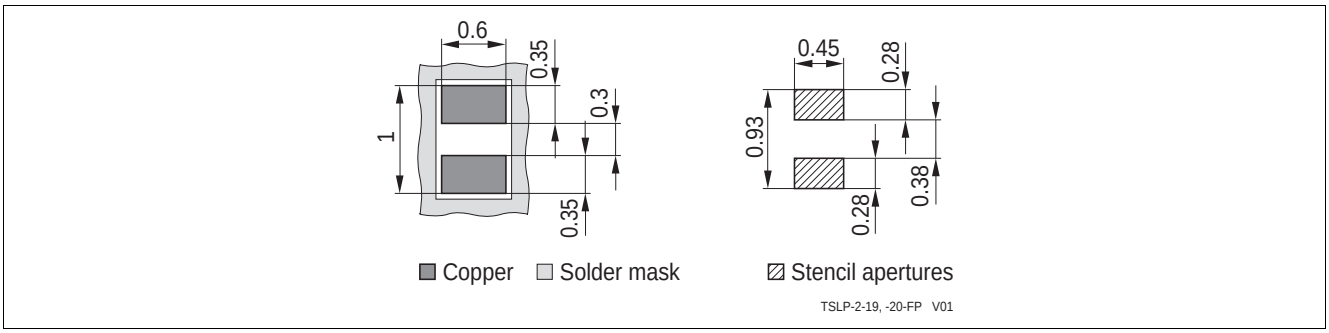

Figure 15 TSLP-2-19: Footprint

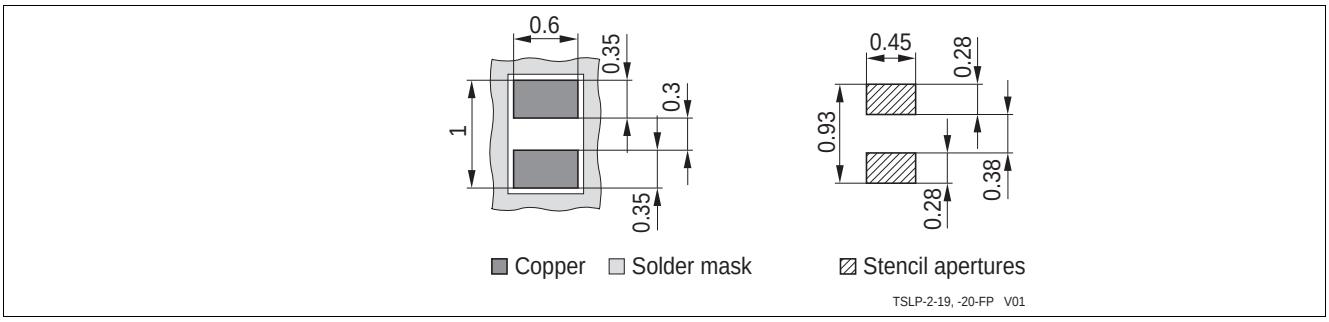

Figure 16 TSLP-2-19: Packing

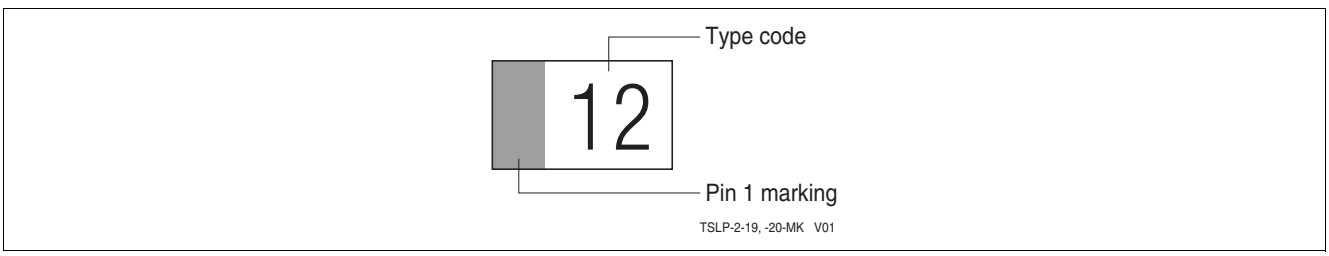

Figure 17 TSLP-2-19: Marking (example)

References

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

[2] Infineon AG - **Application Note AN140**: ESD Protection for Digital High-Speed Interfaces (HDMI, FireWire, ...) using ESD5V3U1U)

[3] Infineon AG - Recommendations for PCB Assembly of Infineon TSLP and TSSLP Package

Revision History: Rev.09, 2014-06-20	
Page or Item	**Subjects (major changes since previous revision)**
Revision 1.0, 2014-10-30	
All	Status change to Final

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