# Protection Device

TVS (Transient Voltage Suppressor)

# ESD218-B1 Series

Bi-directional, 24 V, 3 pF, 0201, 0402, RoHS and Halogen Free compliant

ESD218-B1-02ELS
ESD218-B1-02EL

## Data Sheet

Revision 1.1, 2015-01-13
Final

Power Management & Multimarket

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# 1 Product Overview

## 1.1 Features

- ESD / transient protection according to:
  - **IEC61000-4-2 (ESD): ±20 kV (air), ±18 kV (contact)**
  - **IEC61000-4-4 (EFT): ±2 kV / 40 A (5/50 ns)**
  - **IEC61000-4-5 (Surge): ±1.5 A (8/20 µs)**
- Bi-directional, working voltage up to $V_{RWM}$ **= ±24 V**
- Low capacitance: $C_L$ **= 3 pF (typical)**
- Low clamping voltage: $V_{CL}$ **= 51 V (typical) at** $I_{TLP}$ **= 16 A**
- Very low reverse current. $I_R$ **= < 1nA (typical)**
- Pb-free (RoHS compliant) and halogen free package

## 1.2 Application Examples

- ESD protection of USB-battery charger interface
- LCD Backlight protection
- NFC antenna protection
- Protection of high speed bus rated up to ±24 V

## 1.3 Product Description

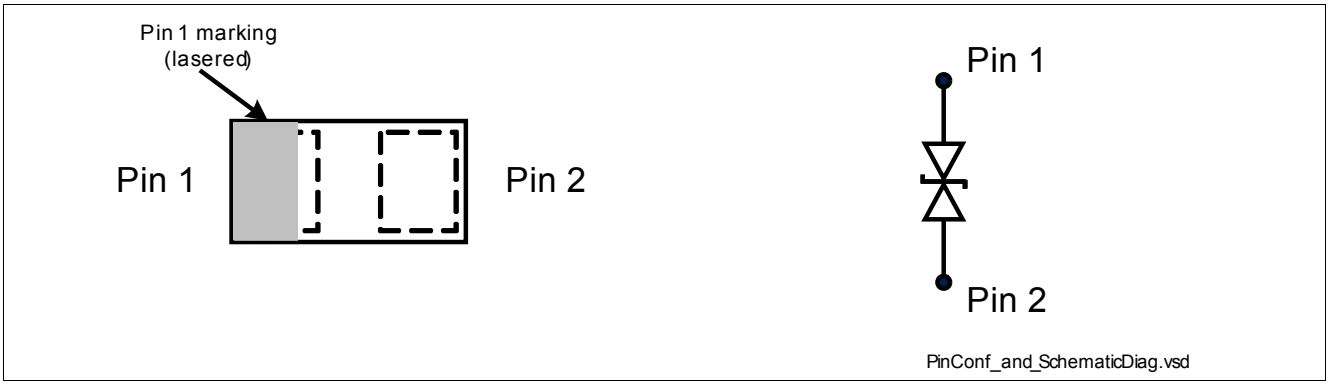



**Figure 1-1 Pin Configuration and Schematic Diagram**

**Table 1-1 Part Information**

| Type | Package | Configuration | Marking code |
|---|---|---|---|
| ESD218-B1-02ELS | TSSLP-2-4 | 1 line, bi-directional | 4 |
| ESD218-B1-02EL | TSLP-2-20 | 1 line, bi-directional | AA |

# 2 Maximum Ratings

**Table 2-1 Maximum Ratings** at $T_A$ = 25 °C, unless otherwise specified [1)]

| Parameter | Symbol | Values | Unit |
|---|---|---|---|
| ESD air discharge[2)]<br>ESD contact discharge[2)] | $V_{ESD}$ | ±20<br>±18 | kV |
| Peak pulse power[3)] | $P_{PK}$ | 67 | W |
| Peak pulse current[3)] | $I_{PP}$ | ±1.5 | A |
| Operating temperature range | $T_{OP}$ | -55 to 150 | °C |
| Storage temperature | $T_{stg}$ | -65 to 150 | °C |

1) Device is electrically symmetrical

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

3) 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

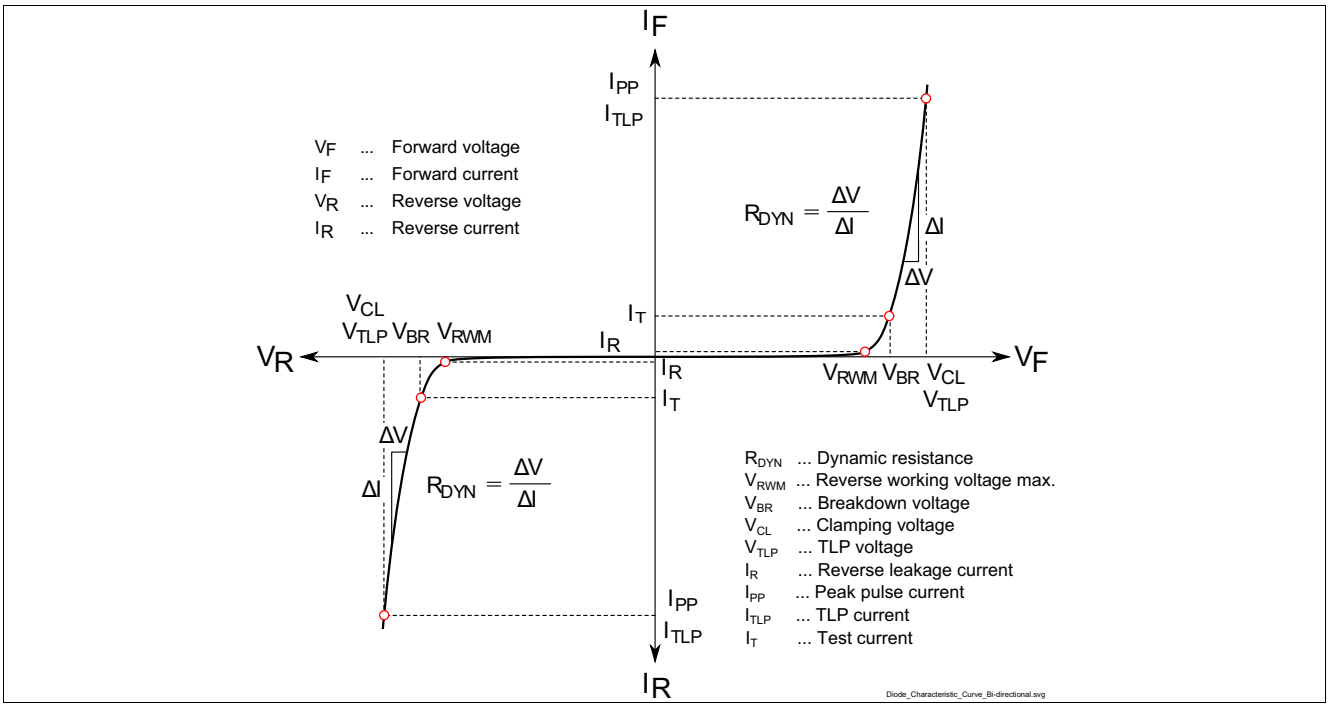



**Figure 3-1 Definitions of electrical characteristics**

**Table 3-1 DC Characteristics** at $T_A$ = 25 °C, unless otherwise specified [1)]

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Reverse working voltage | $V_{RWM}$ | -24 | – | 24 | V | |
| Breakdown voltage | $V_{BR}$ | 24.3 | 25.5 | 30 | V | $I_T$ = 1 mA |
| Reverse leakage current | $I_R$ | – | <1 | 50 | nA | $V_R$ = 24 V |

1) Device is electrically symmetrical

**Table 3-2 AC Characteristics** at $T_A$ = 25 °C, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Line capacitance | $C_L$ | –<br>– | 3<br>3 | 3.5<br>3.5 | pF | $V_R$ = 0 V, $f$ = 1 MHz<br>$V_R$ = 0 V, $f$ = 1 GHz |
| Series inductance | $L_S$ | –<br>– | 0.2<br>0.4 | –<br>– | nH | ESD218-B1-02ELS<br>ESD218-B1-02EL |

**Table 3-3 ESD and Surge Characteristics** at $T_A$ = 25 °C, unless otherwise specified [1)]

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|---|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | | |
| Clamping voltage[2)] | $V_{CL}$ | – | 51 | 55.5 | V | $I_{TLP}$ = 16 A, $t_p$ = 100 ns |
| | | – | 66 | 70.5 | | $I_{TLP}$ = 30 A, $t_p$ = 100 ns |
| Clamping voltage[3)] | | – | 37 | 41.5 | | $I_{PP}$ = 1 A, $t_p$ = 8/20 µs |
| | | | 40 | 44.5 | | $I_{PP}$ = 1.5 A, $t_p$ = 8/20 µs |
| Dynamic resistance[2)] | $R_{DYN}$ | – | 0.9 | – | Ω | $t_p$ = 100 ns |

1) Device is electrically symmetrical

2) Please refer to Application Note AN210[1]. TLP parameter: $Z_0$ = 50 Ω , $t_p$ = 100ns, $t_r$ = 300ps.

3) Non-repetitive current pulse 8/20µs exponential decay waveform according to IEC61000-4-5

# 4 Typical Characteristics Diagrams

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

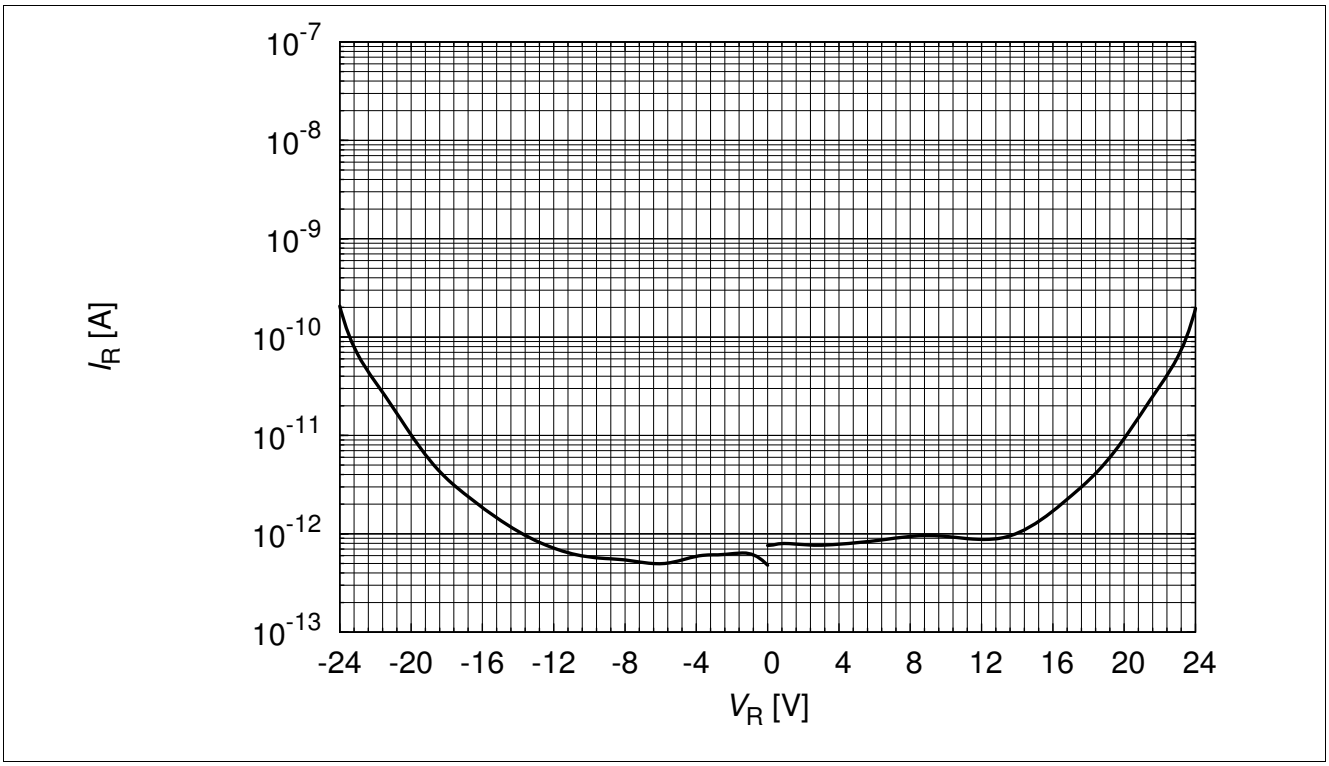



**Figure 4-1 Reverse leakage current: $I_R = f(V_R)$**

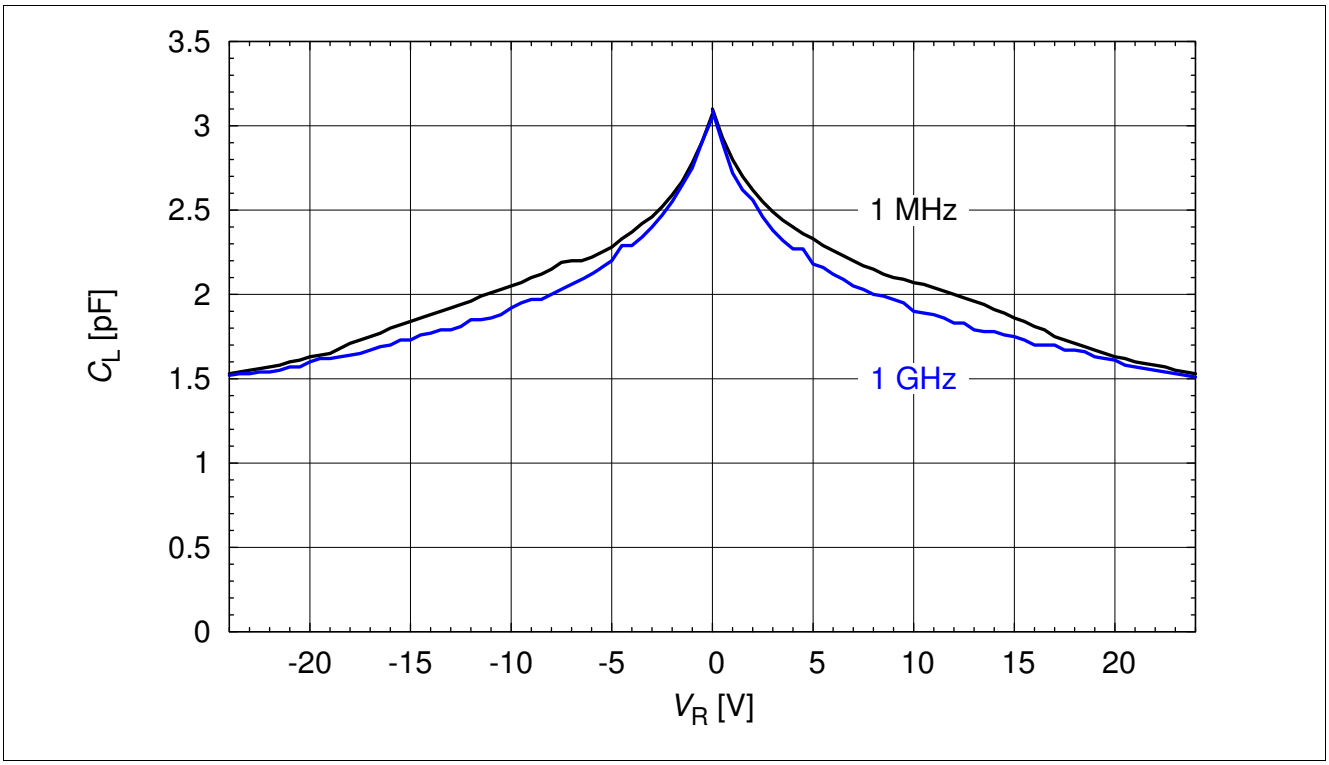



**Figure 4-2 Line capacitance: $C_L = f(V_R)$**

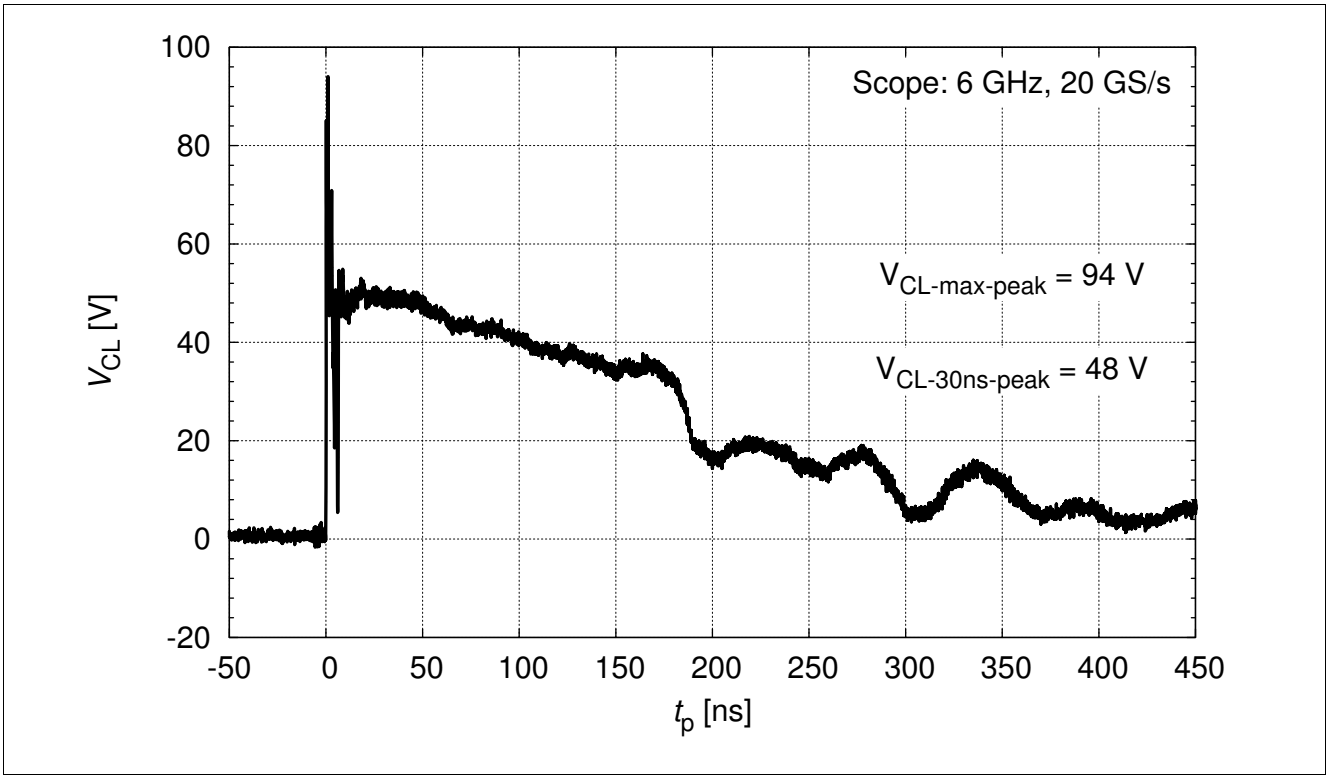



**Figure 4-3 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positive pulse from pin 1 to pin 2**

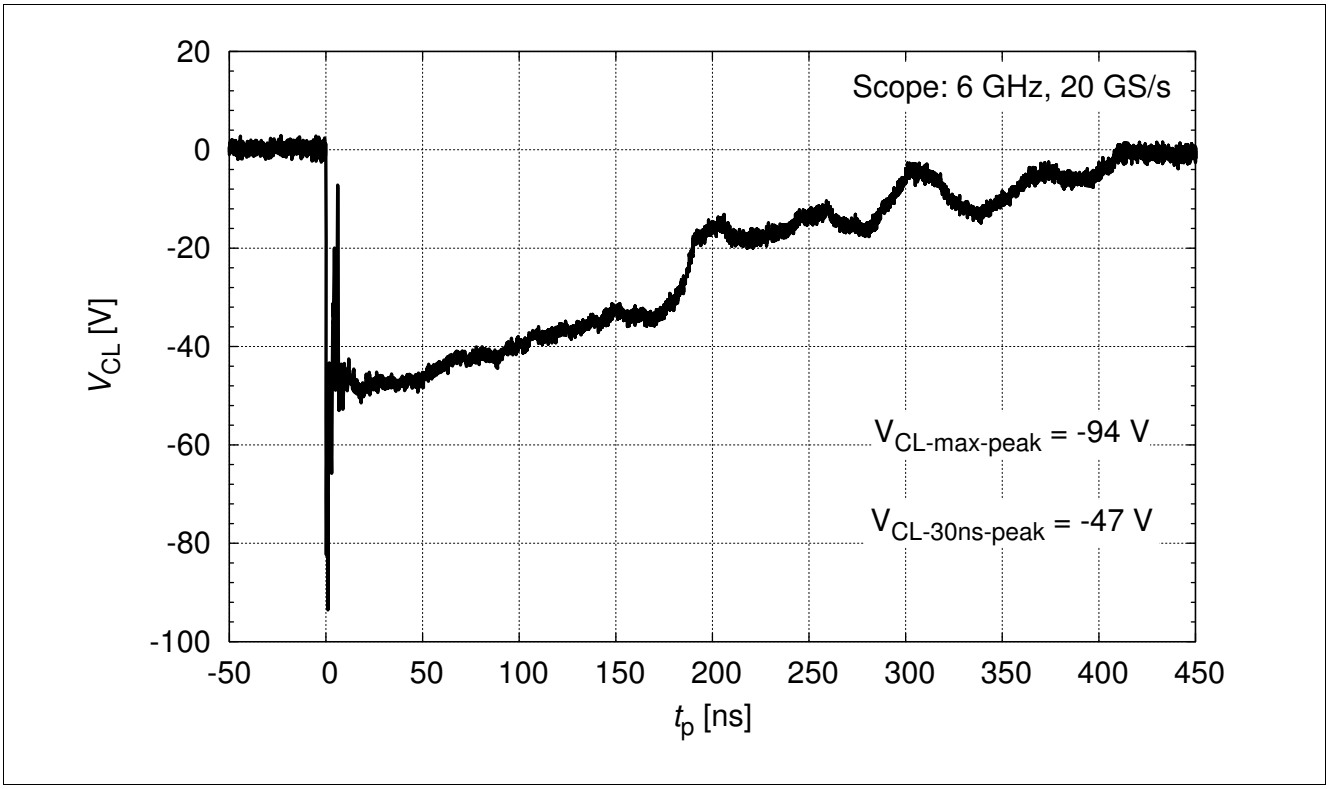



**Figure 4-4 Clamping voltage (ESD) $V_{CL} = f(t)$, 8 kV negative pulse from pin 1 to pin 2**

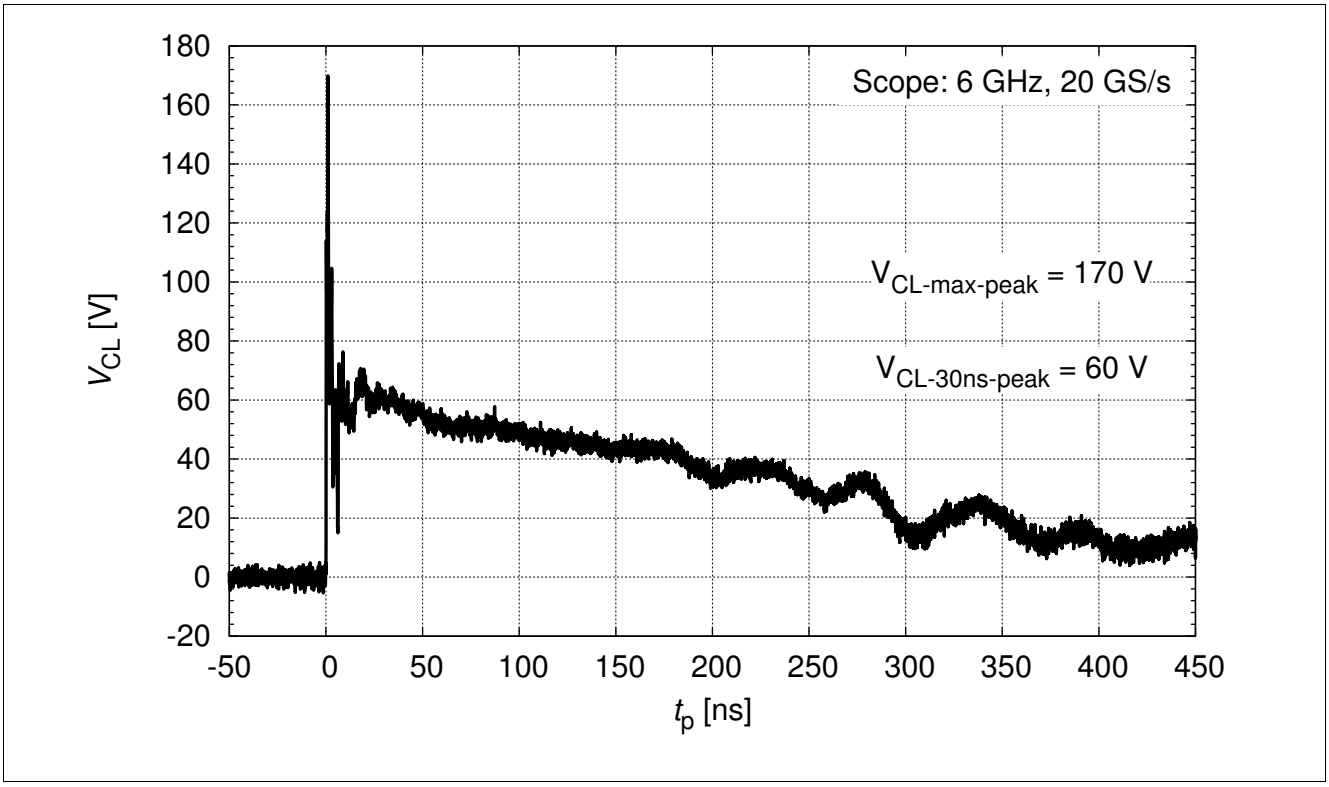



**Figure 4-5 Clamping voltage (ESD) $V_{CL} = f(t)$, 15 kV positive pulse from pin 1 to pin 2**

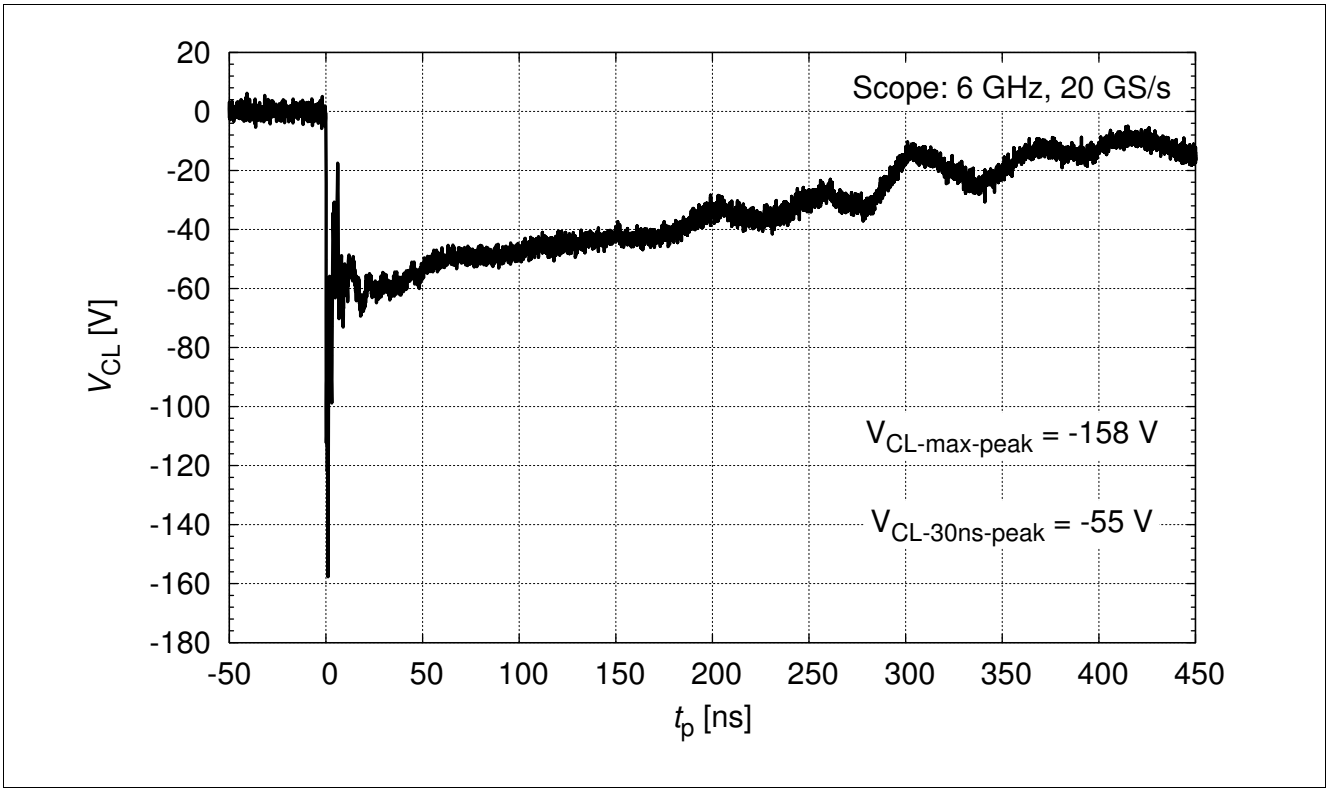



**Figure 4-6 Clamping voltage (ESD) $V_{CL} = f(t)$, 15 kV negative pulse from pin 1 to pin 2**

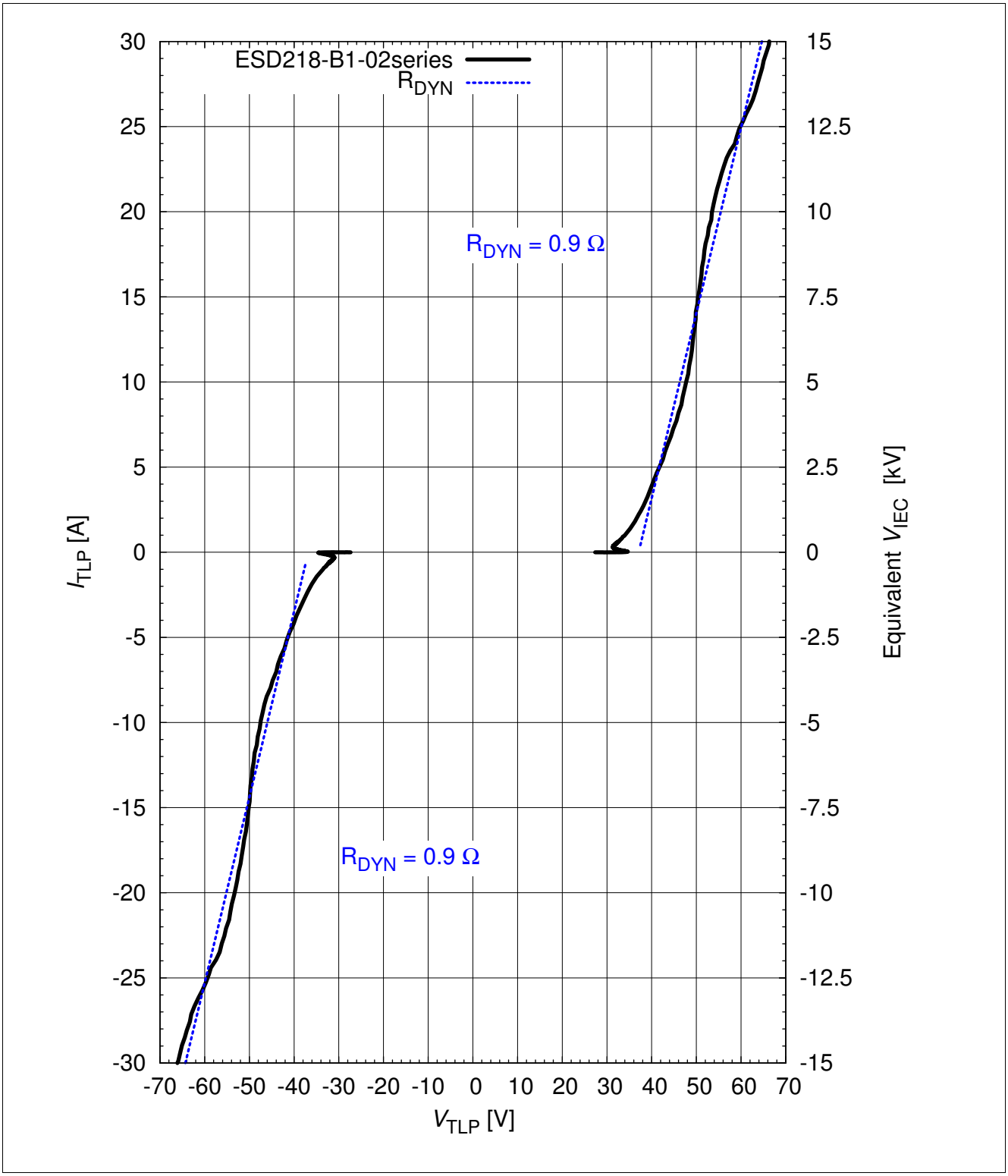



**Figure 4-7 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$[1], pin 2 to pin 1**

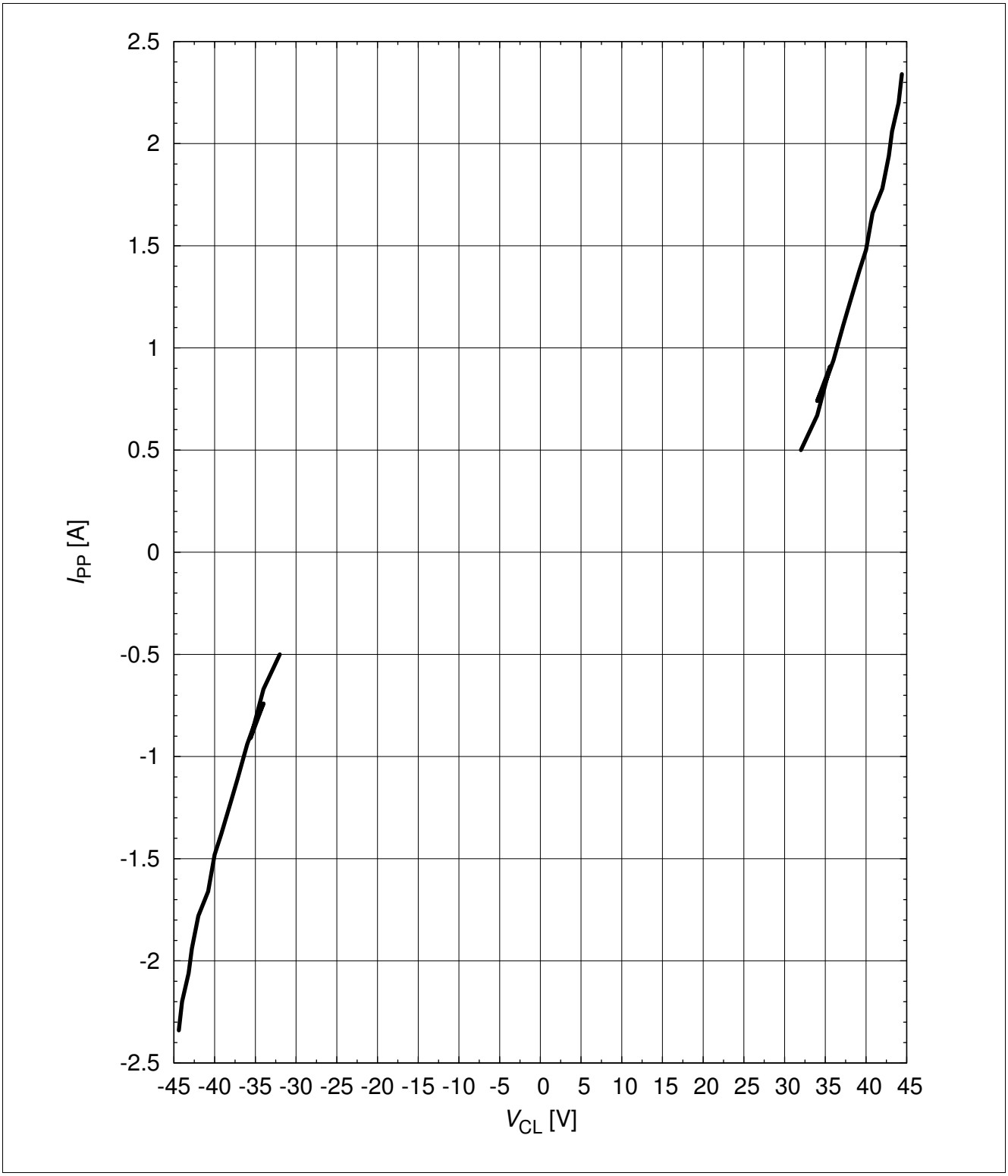



**Figure 4-8 Clamping voltage(Surge): $I_{PP} = f(V_{CL})$[1]**

# 5 Package Information

## 5.1 TSSLP-2-4

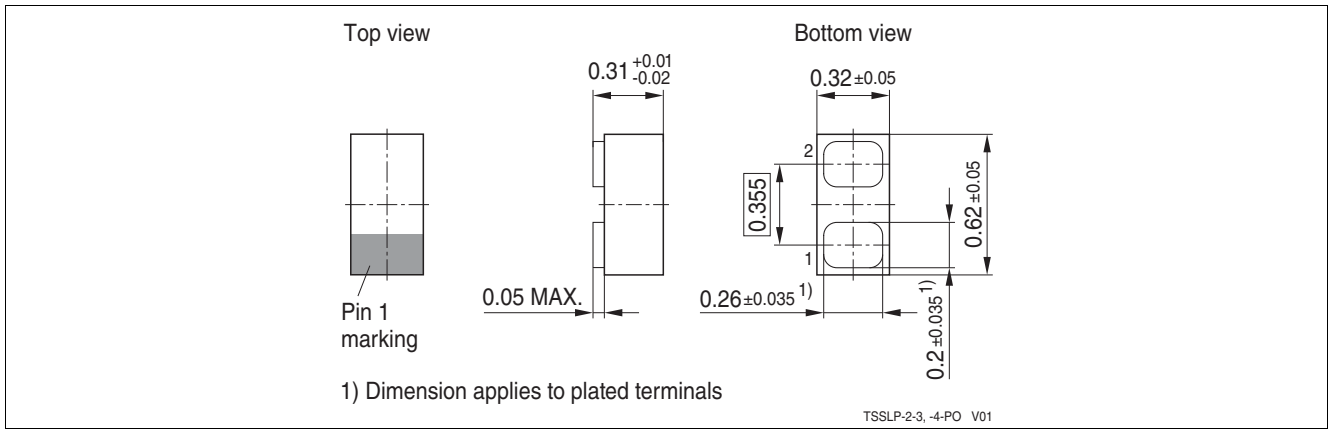



**Figure 5-1 TSSLP-2-4 Package outline**

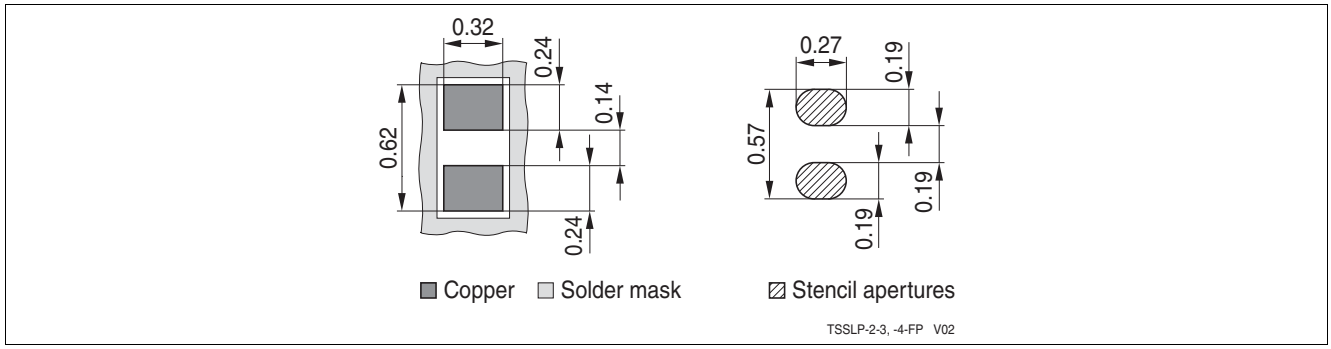



**Figure 5-2 TSSLP-2-4 Footprint**

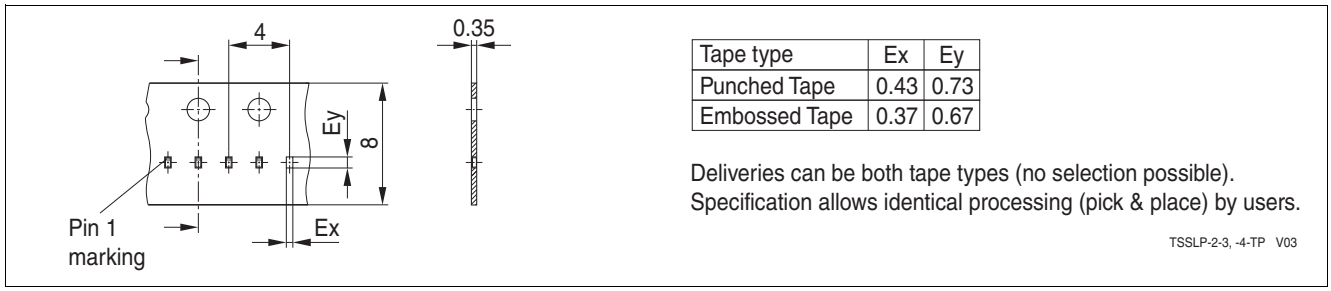



**Figure 5-3 TSSLP-2-4 Packing**

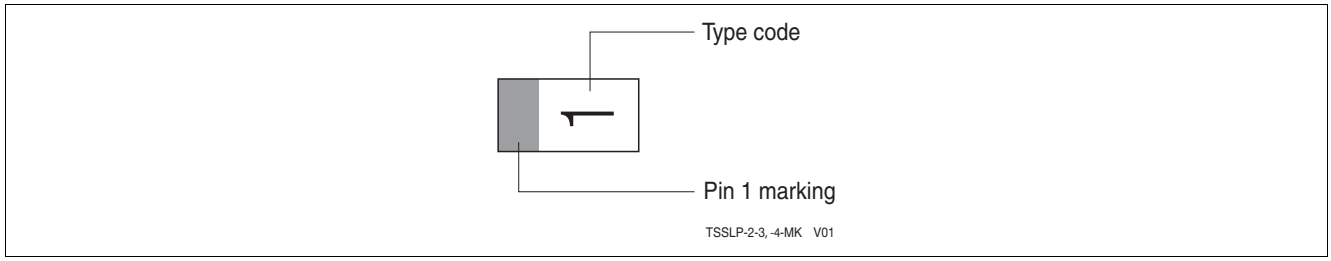



**Figure 5-4 TSSLP-2-4 Marking example, Type code see: Table 1-1 “Part Information” on Page 3**

## 5.2 TSLP-2-20

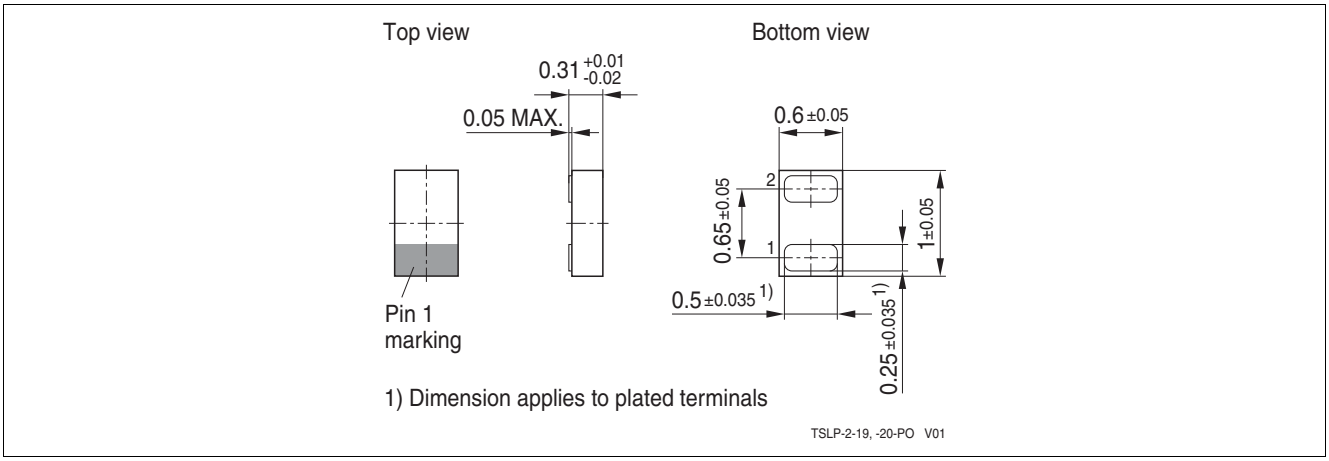



**Figure 5-5 TSLP-2-20 Package outline**

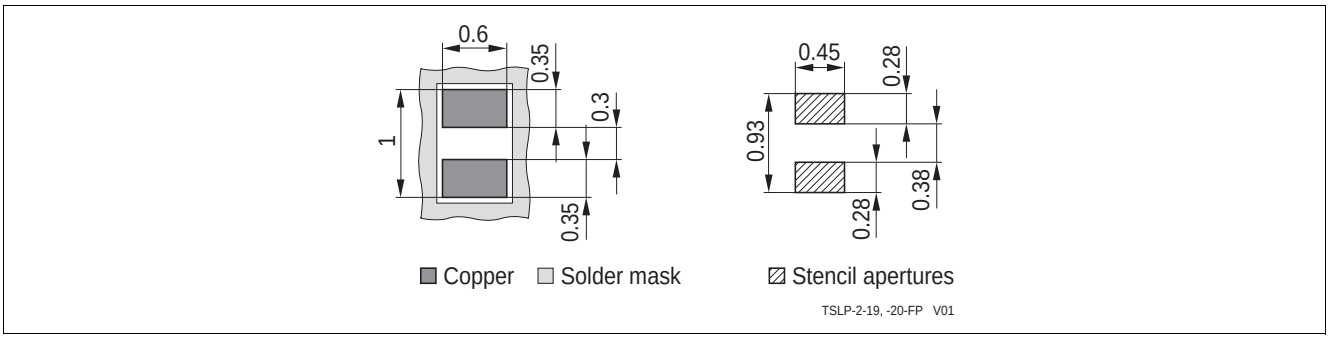



**Figure 5-6 TSLP-2-20 Footprint**

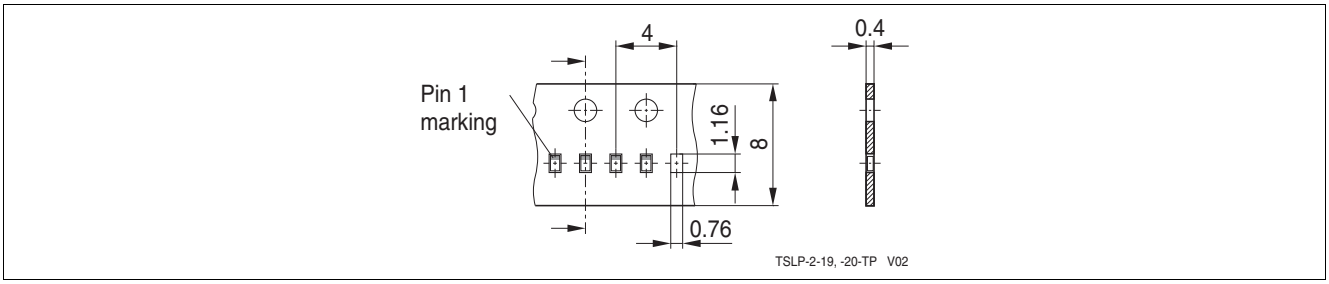



**Figure 5-7 TSLP-2-20 Packing**

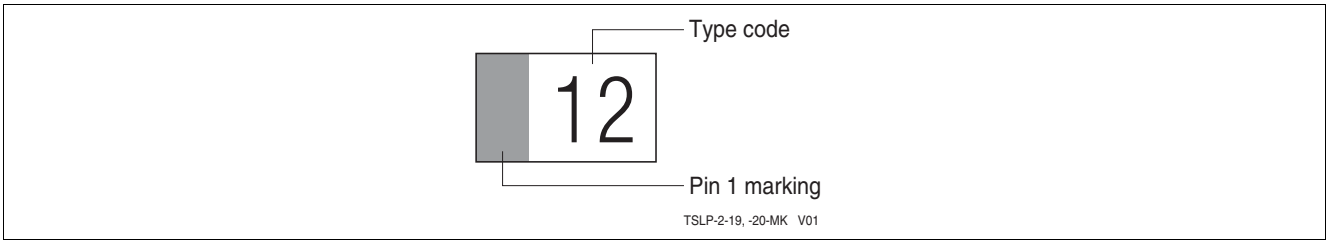



**Figure 5-8 TSLP-2-20 Marking example, Type code see: Table 1-1 “Part Information” on Page 3**

# 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 and TSSLP Packages

| Revision History: Rev. 1.0, 2014-04-08 | |
|---|---|
| **Page or Item** | **Subjects (major changes since previous revision)** |
| **Revision 1.1, 2015-01-13** | |
| 11 | Correction of Footprint drawing |
| | |
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