

Protection Device

TVS (Transient Voltage Suppressor)

ESD205-B1 Series

Bi-directional, 5.5 V, 5 pF, 0201, 0402, RoHS and Halogen Free compliant

ESD205-B1-02ELS
ESD205-B1-02EL

Data Sheet

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Final

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1 Product Overview

1.1 Features

- ESD / transient protection of signal lines in low voltage applications according to:
 - IEC61000-4-2 (ESD): ± 20 kV (air / contact)
 - IEC61000-4-4 (EFT): ± 2.5 kV / ± 50 A (5/50 ns)
 - IEC61000-4-5 (Surge): ± 2.5 A (8/20 μ s)
- Bi-directional, working voltage up to $V_{RWM} = \pm 5.5$ V
- Low capacitance: $C_L = 5$ pF (typical)
- Low clamping voltage: $V_{CL} = +10 / -12$ V (typical) at $I_{TLP} = 16$ A
- Very low reverse current: $I_R < 1$ nA (typical)
- Pb-free (RoHS compliant) and halogen free package



1.2 Application Examples

- Keypad, touchpad, buttons, convenience keys
- LCD displays, Camera, audio lines, mobile communication, Consumer products (E-Book, MP3, DVD, DSC...)
- Notebooks tablets and desktop computers and their peripherals

1.3 Product Description



Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Ordering Information

| Type | Package | Configuration | Marking code |
|-----------------|-----------|------------------------|--------------|
| ESD205-B1-02ELS | TSSLP-2-3 | 1 line, bi-directional | |
| ESD205-B1-02EL | TSLP-2-19 | 1 line, bi-directional | |

2 Maximum Ratings

Table 2-1 Maximum Ratings at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | Unit |
|-------------------------------------|-----------|------------|------------------|
| ESD air discharge ¹⁾ | V_{ESD} | ± 20 | kV |
| ESD contact discharge ¹⁾ | | ± 20 | |
| Peak pulse power ²⁾ | P_{PK} | 30 | W |
| Peak pulse current ²⁾ | I_{PP} | ± 2.5 | A |
| Operating temperature range | T_{OP} | -55 to 125 | $^\circ\text{C}$ |
| Storage temperature | T_{stg} | -65 to 150 | $^\circ\text{C}$ |

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

2) Non-repetitive current pulse 8/20 μs 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 $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

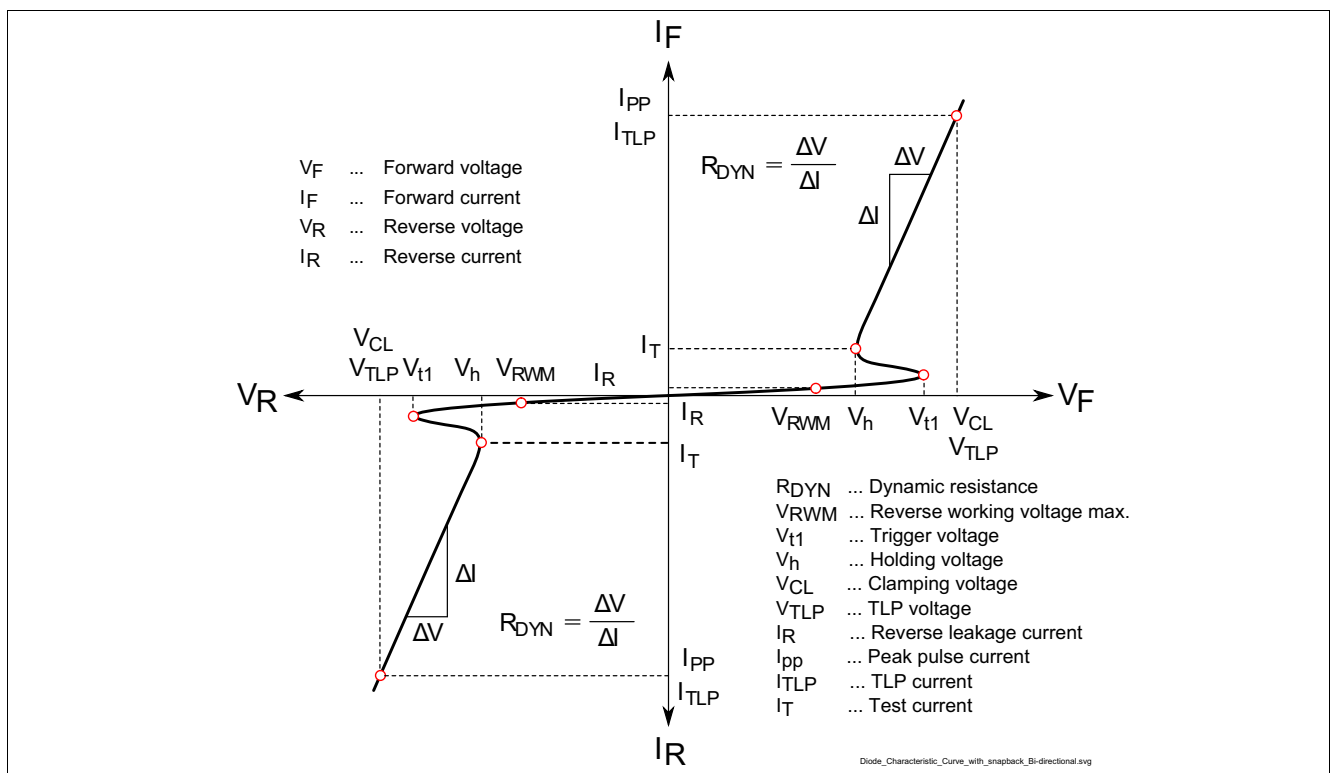


Figure 3-1 Definitions of electrical characteristics

Electrical Characteristics at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified
Table 3-1 DC Characteristics at $T_A = 25\text{ }^\circ\text{C}$, unless otherwise specified

| Parameter | Symbol | Values | | | Unit | Note / Test Condition |
|-------------------------|-----------|--------|------|------|------|-----------------------|
| | | Min. | Typ. | Max. | | |
| Reverse working voltage | V_{RWM} | -5.5 | – | 5.5 | V | |
| Trigger voltage | V_{t1} | 6 | – | – | V | |
| Holding voltage | V_h | 6 | 8 | 10 | V | $I_T = 1\text{ mA}$ |
| Reverse current | I_R | – | <1 | 100 | nA | $V_R = 5.5\text{ V}$ |

Table 3-2 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 | 4 – | 5 5 | 7 – | pF | $V_R = 0\text{ V}, f = 1\text{ MHz}$ $V_R = 0\text{ V}, f = 1\text{ GHz}$ |
| Series inductance | L_S | – – | 0.2 0.4 | – – | nH | ESD205-B1-02ELS ESD205-B1-02EL |

Table 3-3 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 ¹⁾ | V_{CL} | – | 10 | – | V | $I_{TLP} = 16\text{ A}, t_p = 100\text{ ns}$ from Pin 1 to Pin 2 |
| | | – | 13 | – | | $I_{TLP} = 30\text{ A}, t_p = 100\text{ ns}$ from Pin 1 to Pin 2 |
| | | – | 12 | – | | $I_{TLP} = 16\text{ A}, t_p = 100\text{ ns}$ from Pin 2 to Pin 1 |
| | | – | 17 | – | | $I_{TLP} = 30\text{ A}, t_p = 100\text{ ns}$ from Pin 2 to Pin 1 |
| Clamping voltage ²⁾ | V_{CL} | – | 8 | – | V | $I_{PP} = 1\text{ A}, t_p = 8/20\text{ }\mu\text{s}$ from Pin 1 to Pin 2 |
| | | – | 8.5 | – | | $I_{PP} = 2.5\text{ A}, t_p = 8/20\text{ }\mu\text{s}$ from Pin 1 to Pin 2 |
| | | – | 8 | – | | $I_{PP} = 1\text{ A}, t_p = 8/20\text{ }\mu\text{s}$ from Pin 2 to Pin 1 |
| | | – | 9 | – | | $I_{PP} = 2.5\text{ A}, t_p = 8/20\text{ }\mu\text{s}$ from Pin 2 to Pin 1 |
| Dynamic resistance ¹⁾ | R_{DYN} | – | 0.2 | – | Ω | Pin 1 to Pin 2 |
| | | – | 0.3 | – | Ω | Pin 2 to Pin 1 |

1) Please refer to Application Note AN210[1]. TLP parameter: $Z_0 = 50\text{ }\Omega$, $t_p = 100\text{ ns}$, $t_r = 300\text{ ps}$.

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

4 Typical Characteristics Diagrams

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

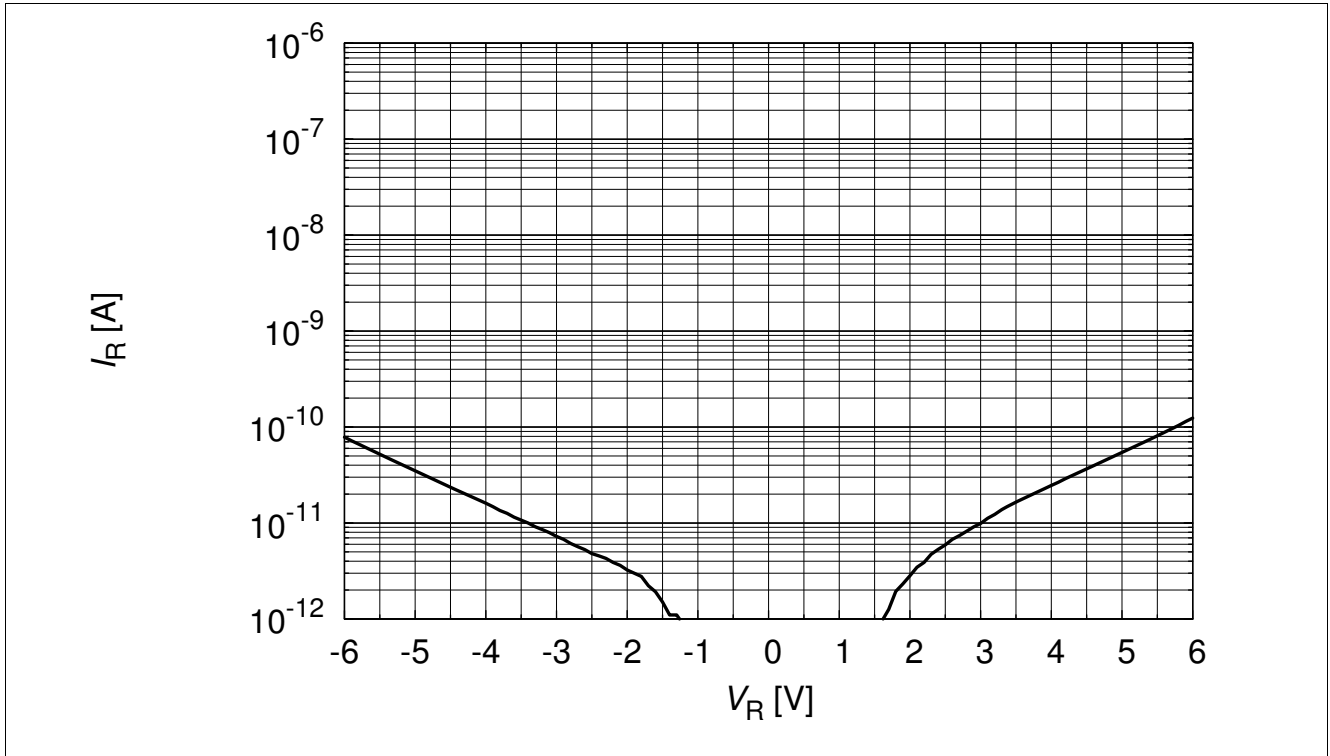


Figure 4-1 Reverse leakage current: $I_R = f(V_R)$

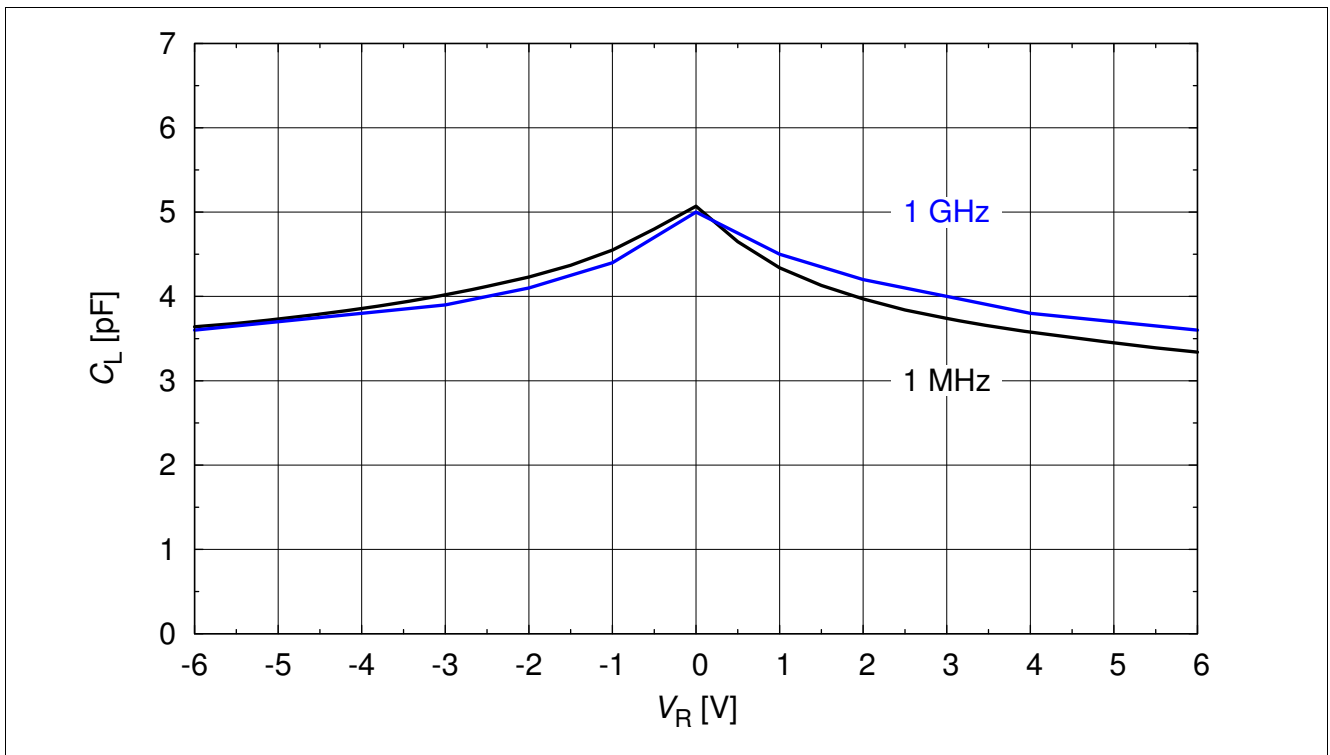


Figure 4-2 Line capacitance: $C_L = f(V_R)$

Typical Characteristics Diagrams

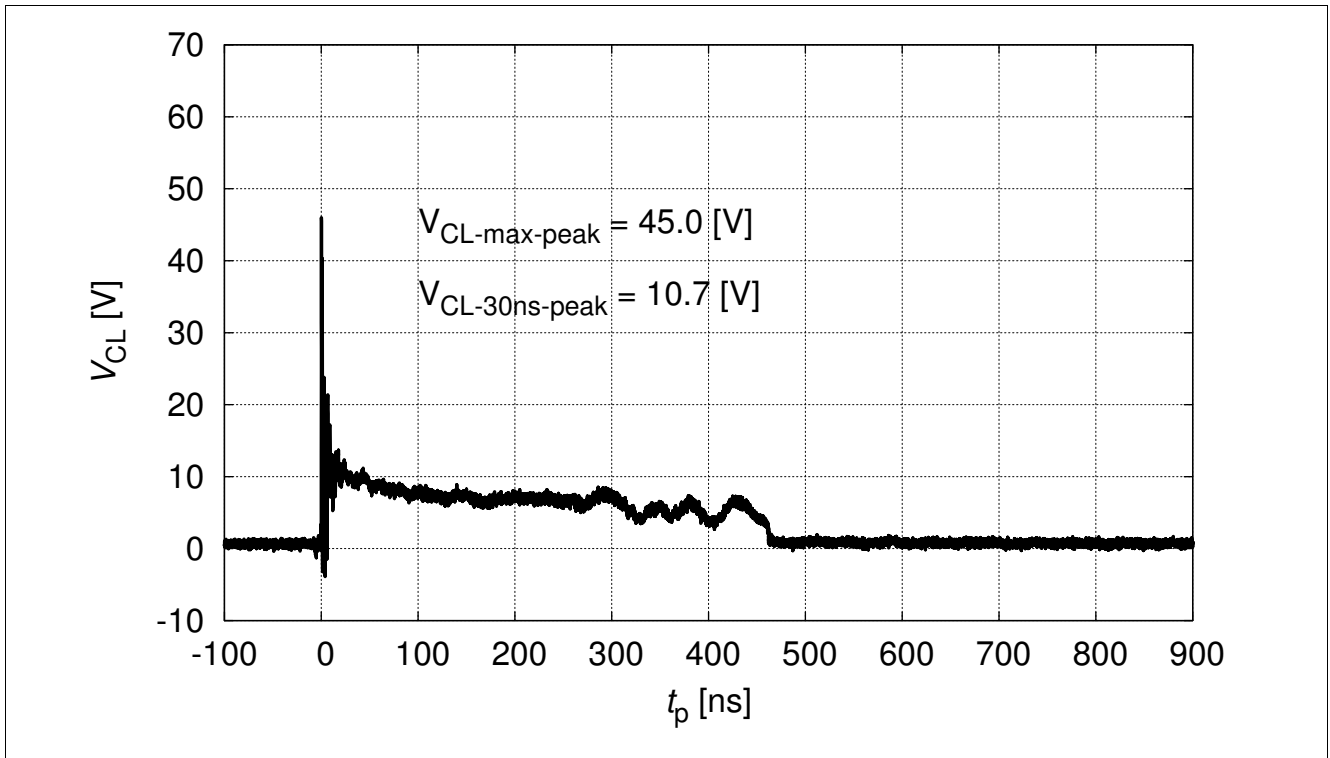


Figure 4-3 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positive pulse from pin 1 to pin 2

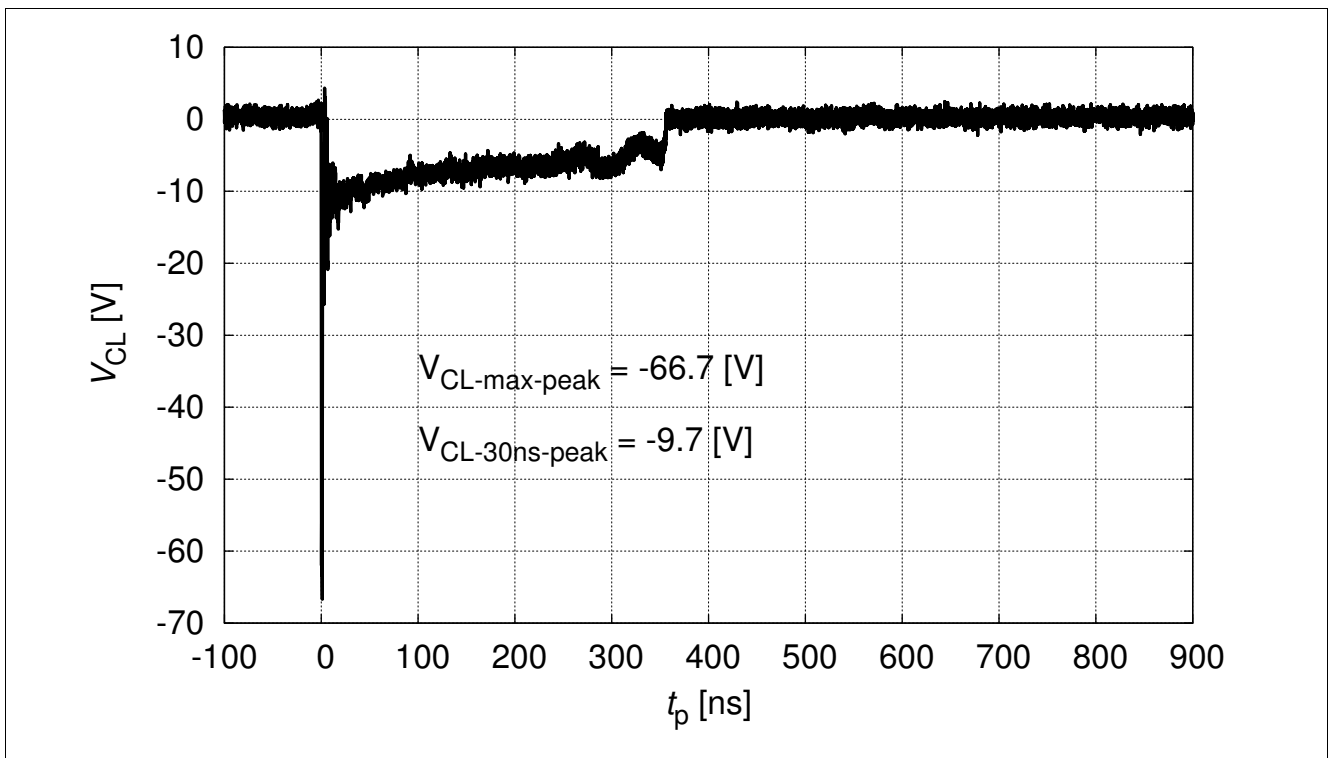


Figure 4-4 Clamping voltage (ESD) $V_{CL} = f(t)$, 8 kV negative pulse from pin 1 to pin 2

Typical Characteristics Diagrams

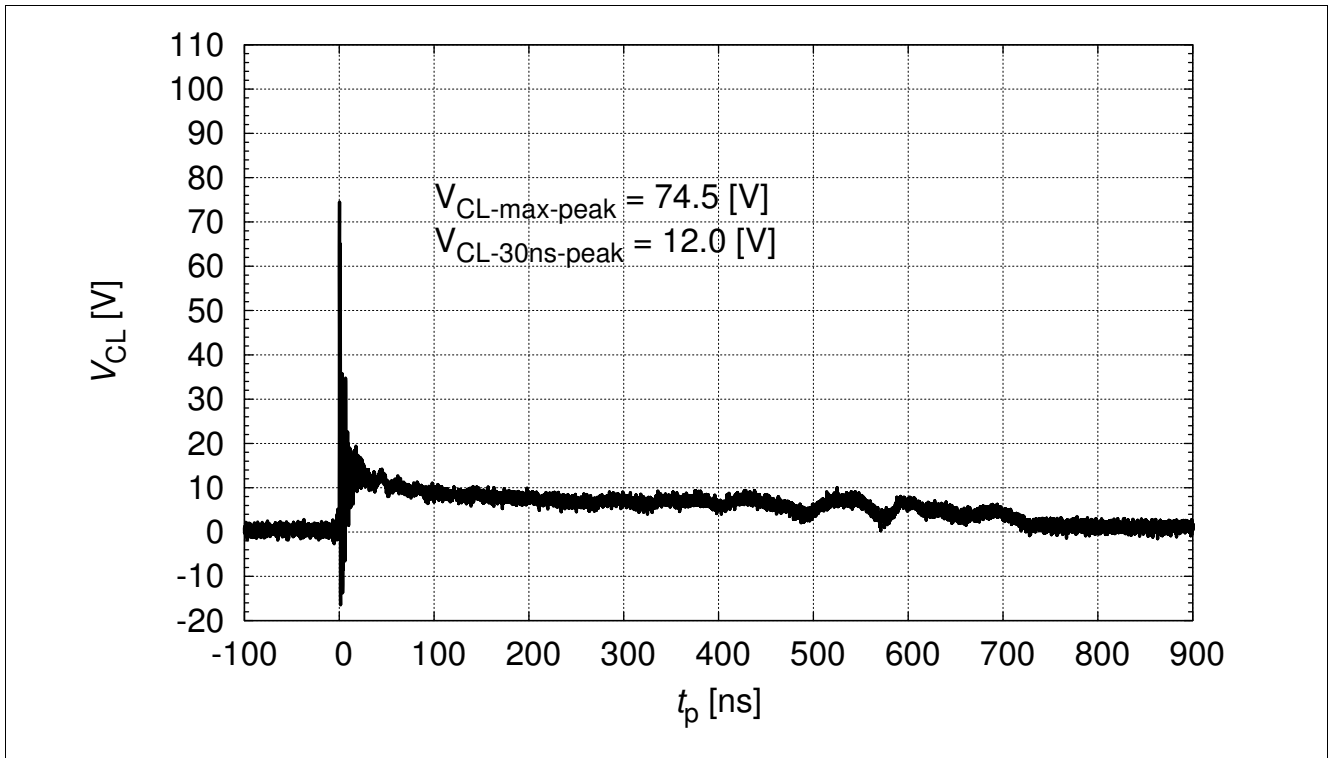


Figure 4-5 Clamping voltage (ESD) $V_{CL} = f(t)$, 15 kV positive pulse from pin 1 to pin 2

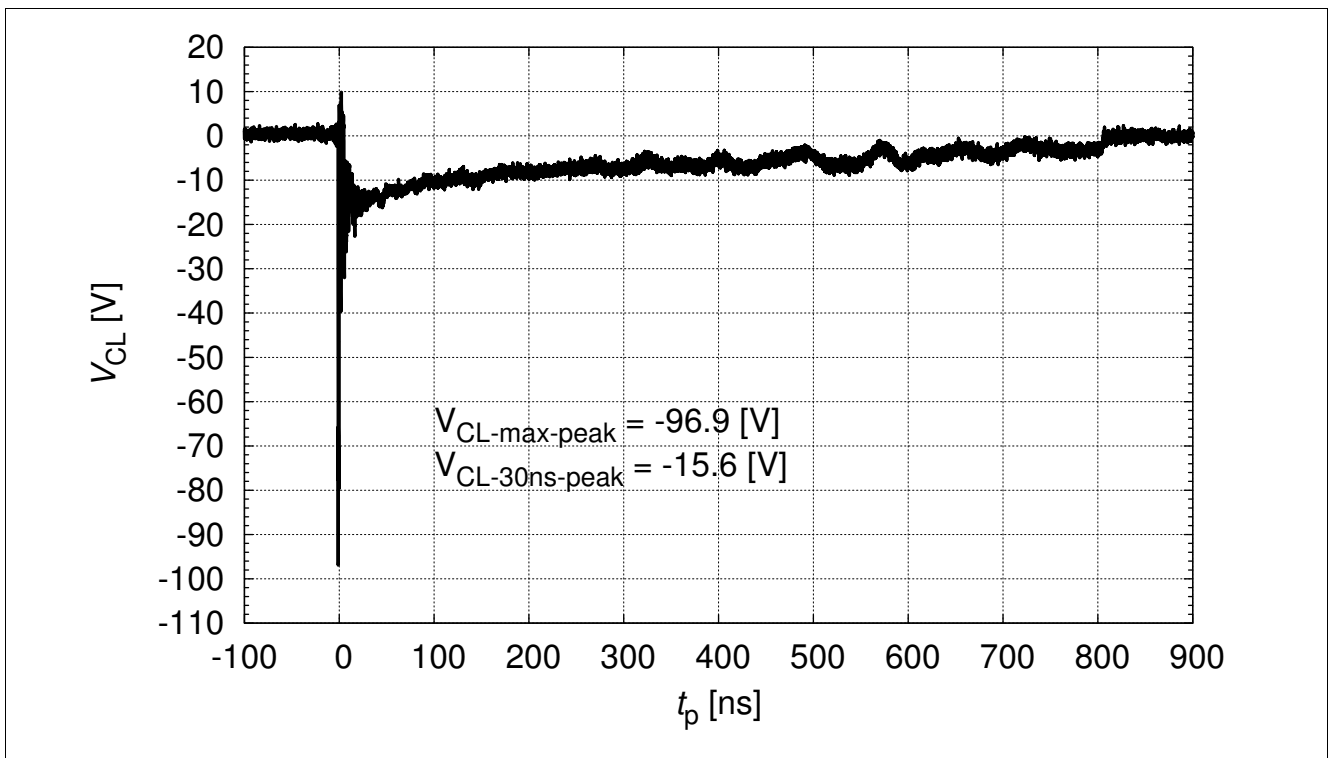


Figure 4-6 Clamping voltage (ESD) $V_{CL} = f(t)$, 15 kV negative pulse from pin 1 to pin 2

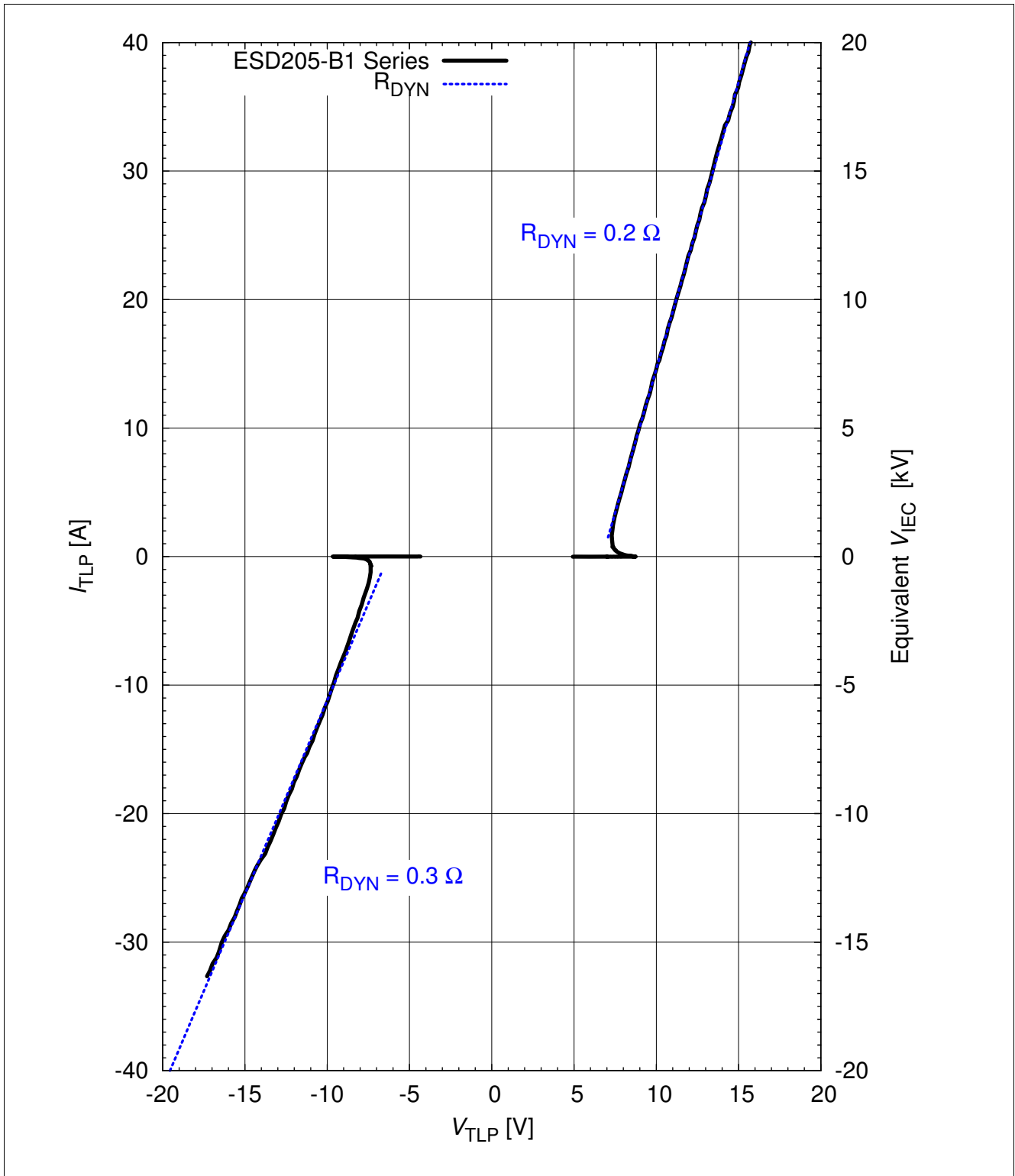


Figure 4-7 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ [1], pin 1 to pin 2

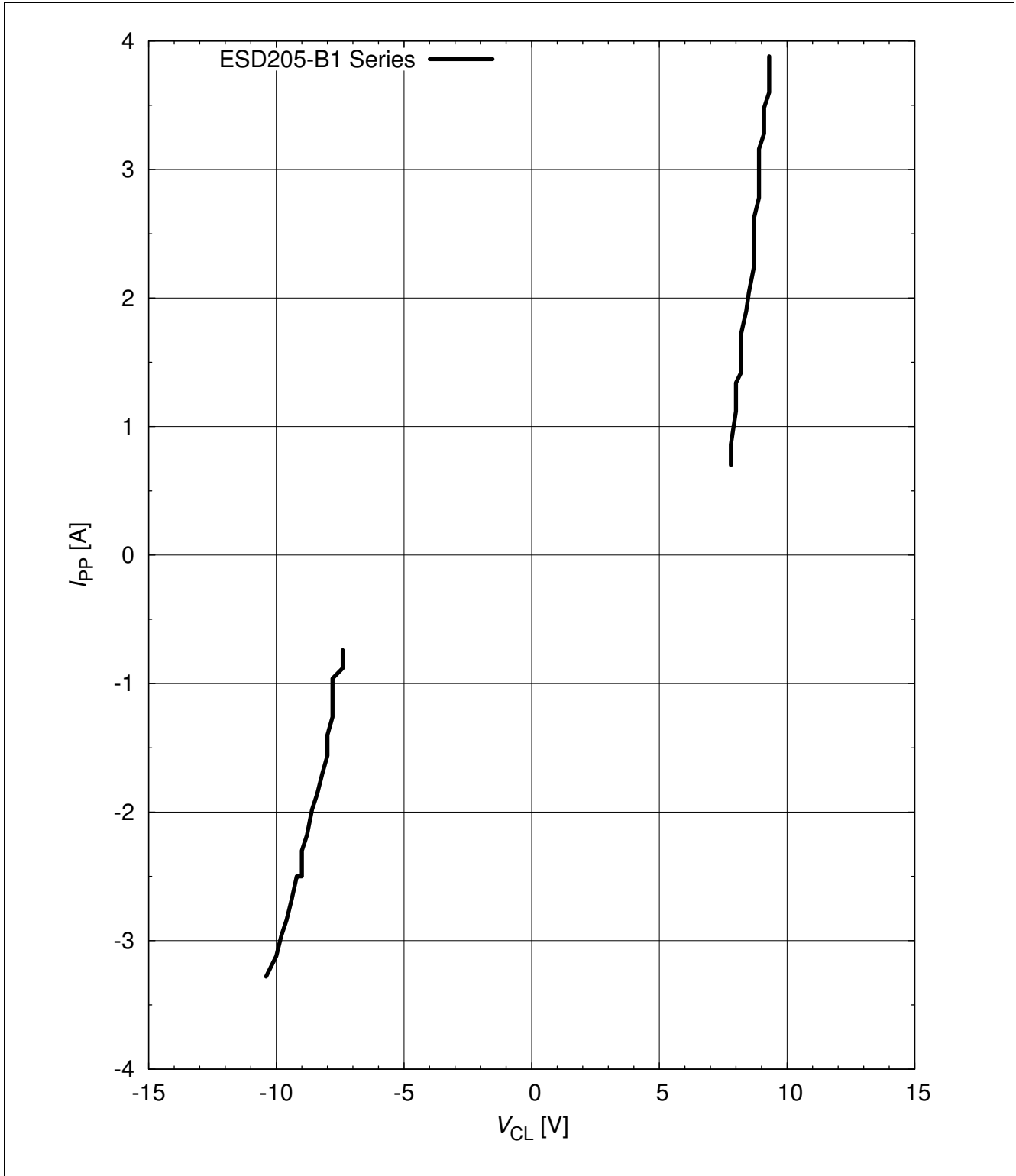


Figure 4-8 Clamping voltage (Surge): $I_{PP} = f(V_{CL})$ [1], pin 1 to pin 2

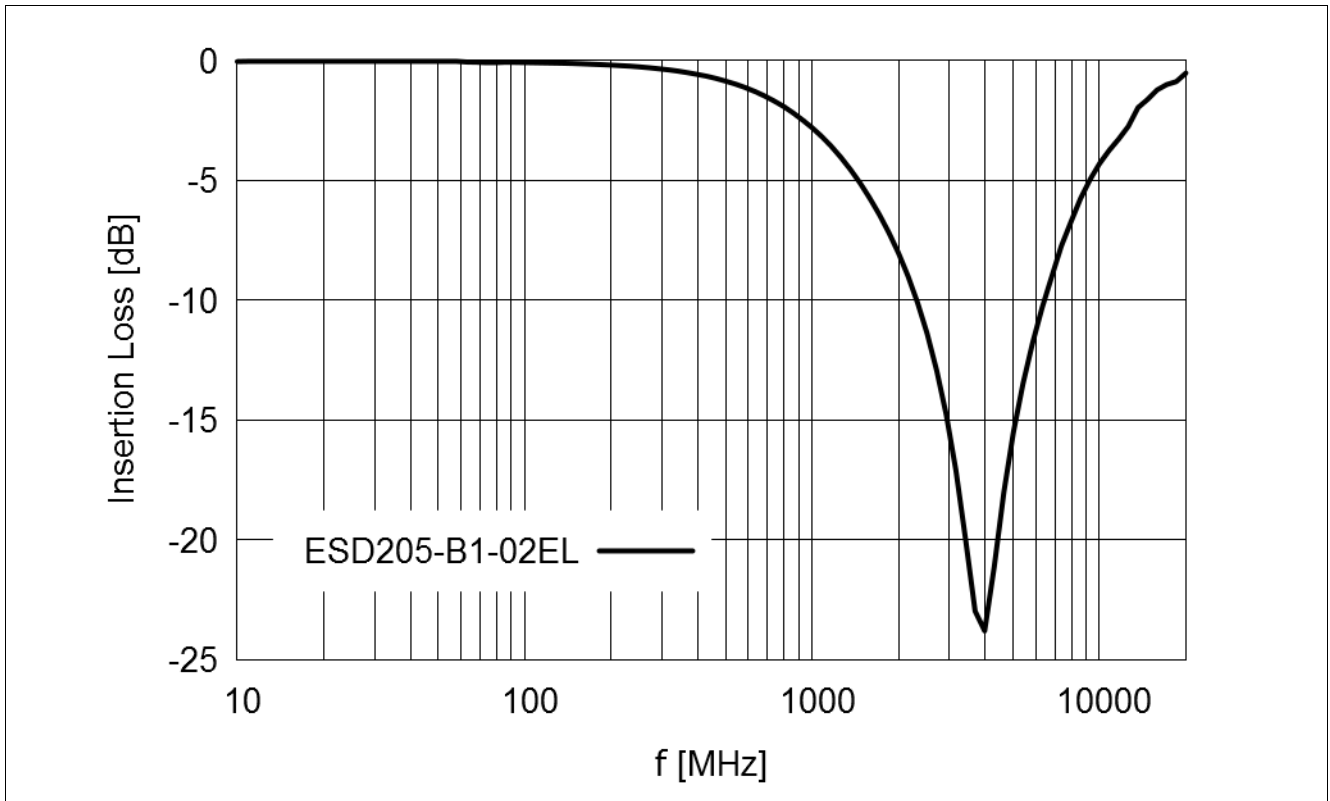


Figure 4-9 Insertion loss vs. frequency in a 50 Ω system

5 Package Information

5.1 TSSLP-2-3

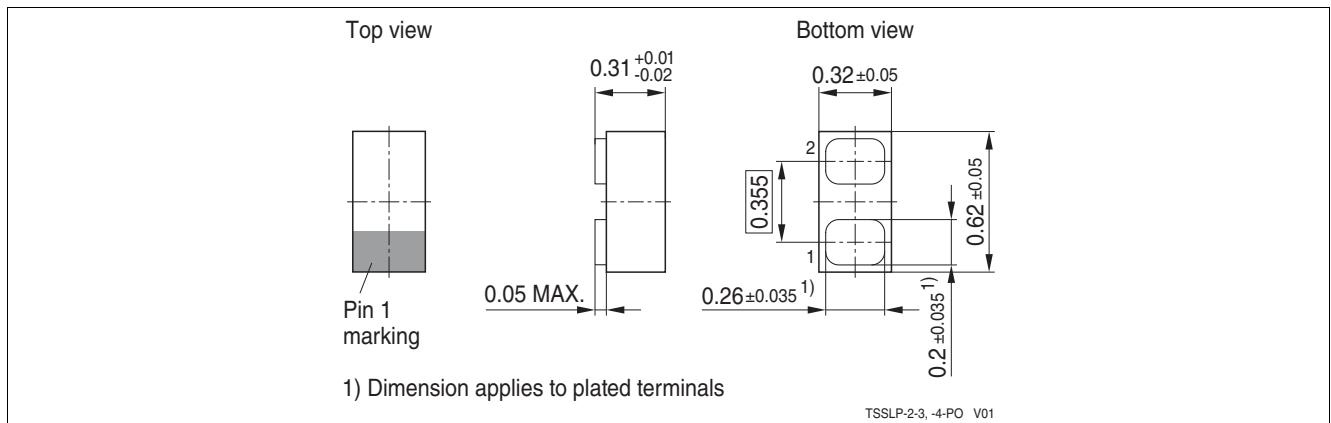


Figure 5-1 TSSLP-2-3 Package outline

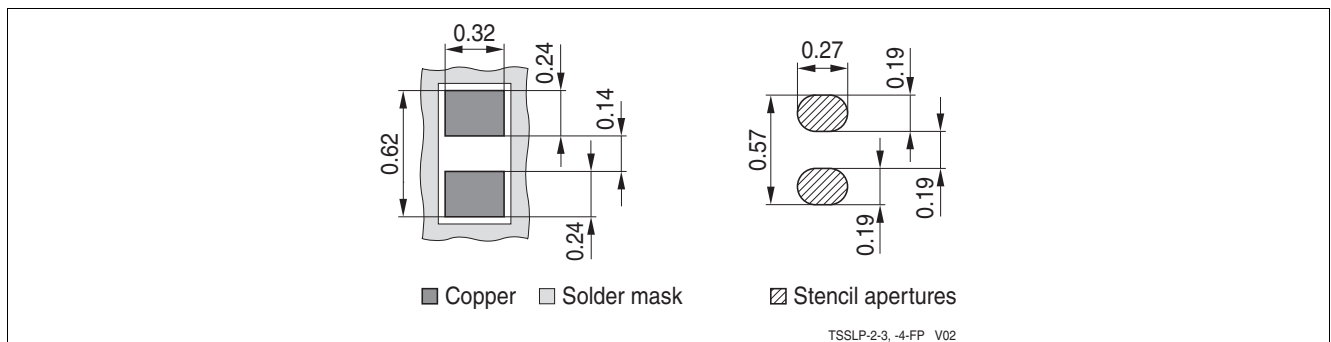


Figure 5-2 TSSLP-2-3 Footprint

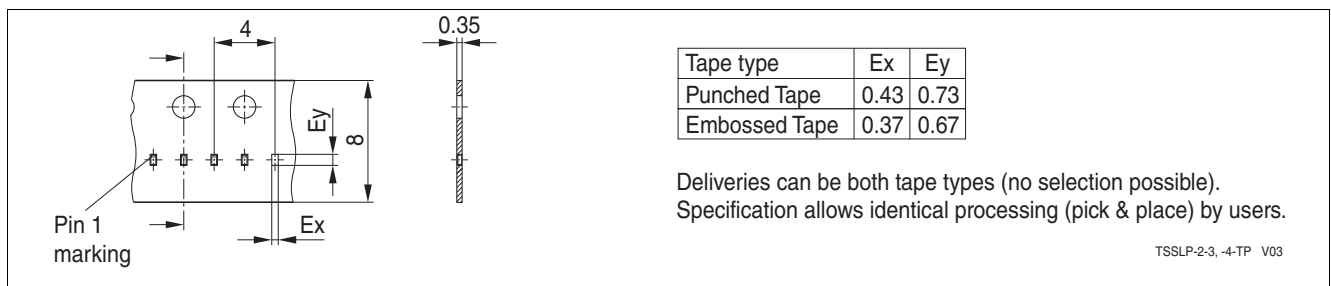


Figure 5-3 TSSLP-2-3 Packing

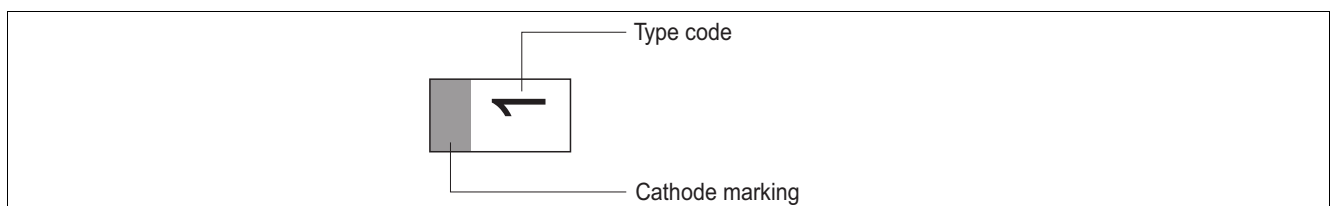


Figure 5-4 TSSLP-2-3 Marking example, Type code see: [Table 1-1 "Ordering Information" on Page 3](#)

5.2 TSLP-2-19

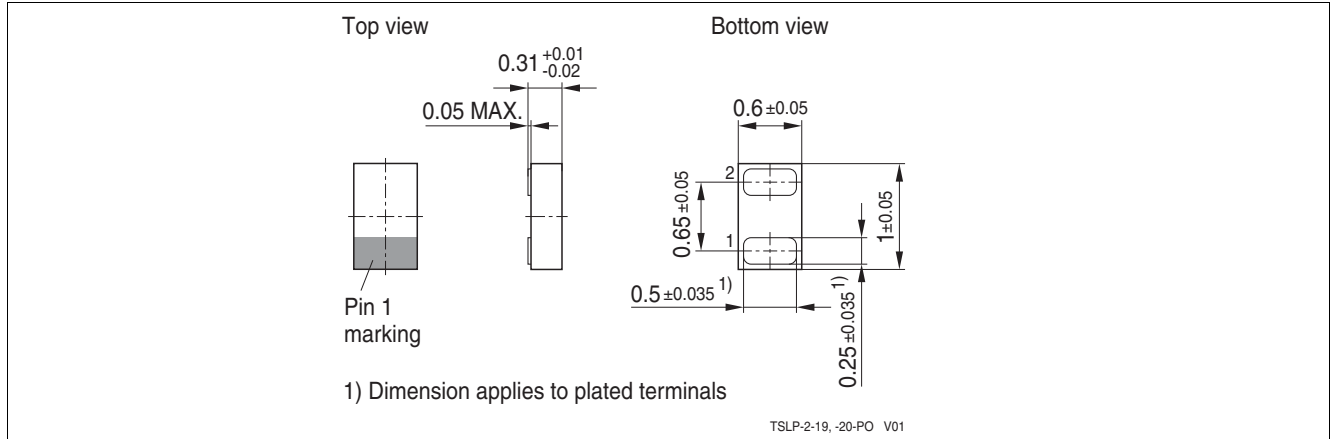


Figure 5-5 TSLP-2-19 Package outline

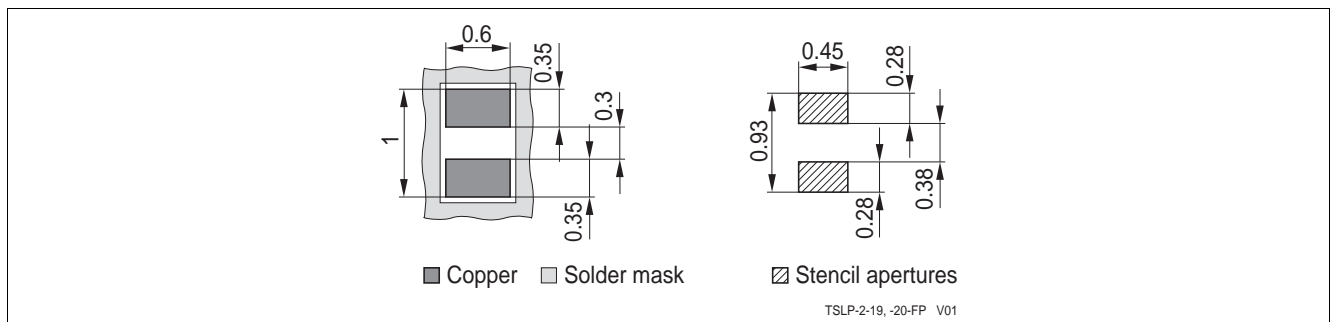


Figure 5-6 TSLP-2-19 Footprint

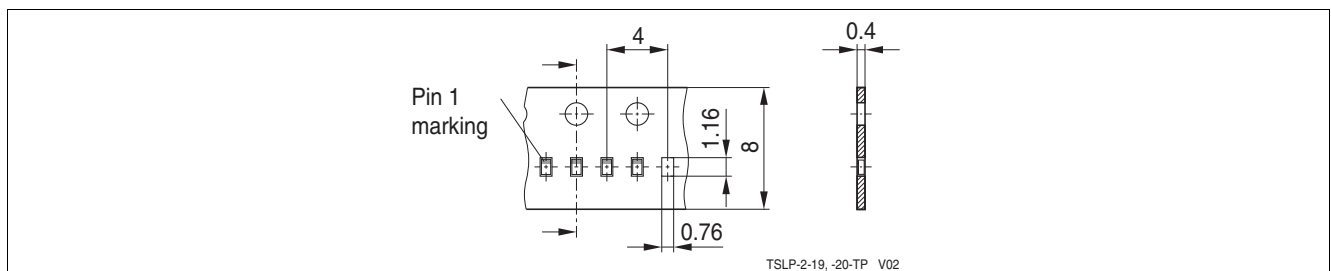


Figure 5-7 TSLP-2-19 Packing

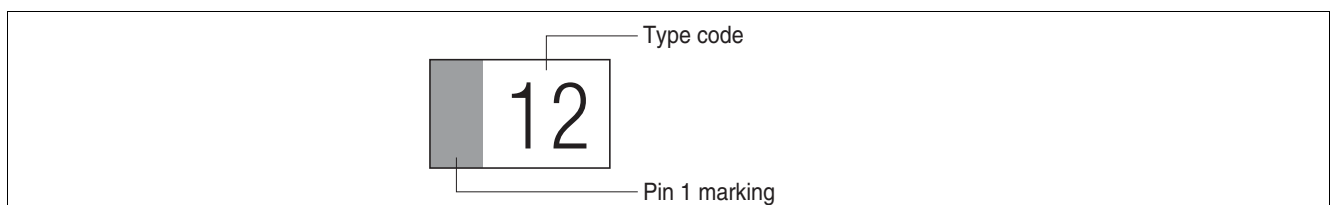


Figure 5-8 TSLP-2-19 Marking example, Type code see: [Table 1-1 "Ordering Information" on Page 3](#)

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: Revision 1.3, 2013-03-08

| Page or Item | Subjects (major changes since previous revision) |
|---------------------------------|--------------------------------------------------|
| Revision 1.4, 2014-05-14 | |
| All | New type ESD205-B1-02EL inserted |
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| | |
| | |

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