

ESD129-B1-W01005

Protection Devices

TVS (Transient Voltage Suppressor)

Bi-directional, 18 V (AC), 13 V (DC), 0.3 pF, 01005, RoHS and Halogen Free compliant

Feature list

- ESD / transient protection of high speed data lines according to:
 - IEC61000-4-2 (ESD): ± 15 kV (air / contact discharge)
 - IEC61000-4-4 (EFT): ± 2 kV / ± 40 A (5/50 ns)
 - IEC61000-4-5 (Surge): ± 2 A (8/20 μ s)
- Bi-directional working voltage up to: $V_{RWM} = \pm 18$ V (AC), ± 13 V (DC)
- Line capacitance: $C_L = 0.3$ pF (typical) at $f = 1$ MHz
- Clamping voltage: $V_{CL} = 32$ V (typical) at $I_{TLP} = 16$ A with $R_{DYN} = 0.82 \Omega$ (typical)
- Very low reverse current: $I_R < 1$ nA (typical)
- Small form factor SMD size 01005 and low profile (0.43 mm x 0.23 mm x 0.15 mm); for further package information please refer to application note AN392 [\[3\]](#)
- Bi-directional, symmetric I/V characteristic for optimized design and assembly, recommendations for PCB assembly see [\[2\]](#)



Potential applications

- ESD protection of RF signal lines in Near Field Communication (NFC) applications [\[4\]](#)

Product validation

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

Device information

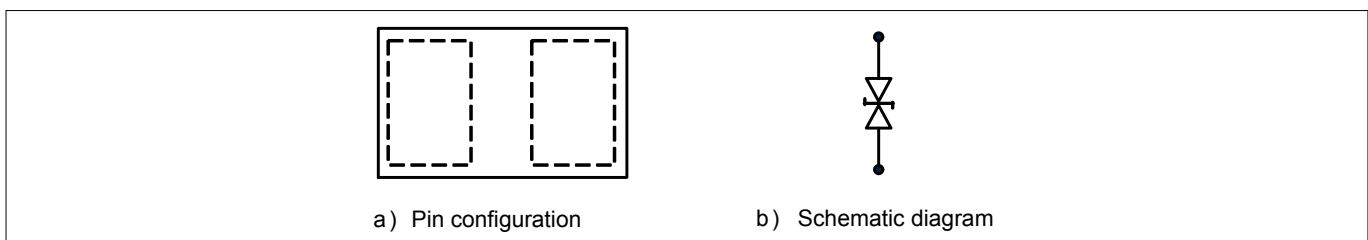


Figure 1 Pin configuration and schematic diagram

Table 1 Part information

| Type | Package | Configuration | Marking code |
|------------------|---------|------------------------|-----------------|
| ESD129-B1-W01005 | WLL-2-2 | 1 line, bi-directional | K ¹⁾ |

¹⁾ The device has no marking on the device top. The marking code is on pad side.

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Maximum ratings

1 Maximum ratings

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

Table 2 Maximum ratings

| Parameter | Symbol | Values | Unit |
|----------------------------------|---------------------|---------------------------|------|
| Reverse working voltage | V_{RWM} | $\pm 18^{1)} \pm 13^{2)}$ | V |
| ESD discharge ³⁾ | V_{ESD} (contact) | ± 15 | kV |
| | V_{ESD} (air) | ± 15 | |
| Peak pulse power ⁴⁾ | P_{PK} | 53 | W |
| Peak pulse current ⁴⁾ | I_{PP} | ± 2 | A |
| Operating temperature range | 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 For RF peak voltage (NFC)

² For DC voltage

³ V_{ESD} according to IEC61000-4-2 ($R = 330\ \Omega$, $C = 150\text{ pF}$ discharge network)

⁴ Stress pulse: 8/20 μ s current 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.

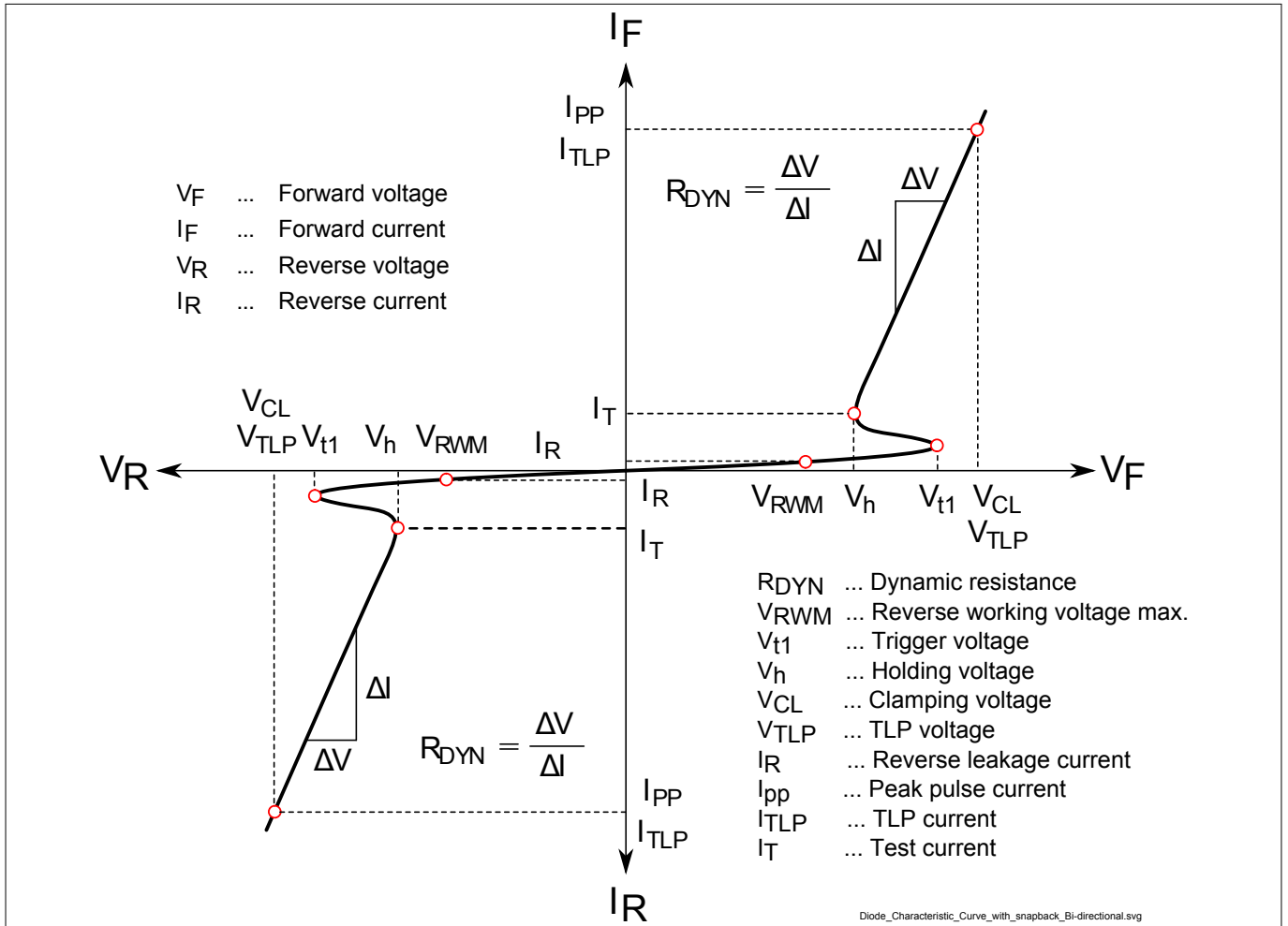


Figure 2 Definitions of electrical characteristics

Electrical characteristics

Table 3 DC characteristics

| Parameter | Symbol | Values | | | Unit | Note or test condition |
|-------------------------------|----------|--------|------|------|------|------------------------|
| | | Min. | Typ. | Max. | | |
| Trigger Voltage ¹⁾ | V_{t1} | 19 | 22 | 25 | V | – |
| Holding voltage | V_h | 13 | 16 | 19 | V | $I_T = 1 \text{ mA}$ |
| Reverse current | I_R | – | <1 | 30 | nA | $V_R = 18 \text{ V}$ |

Table 4 AC characteristics

| Parameter | Symbol | Values | | | Unit | Note or test condition |
|------------------|--------|--------|------|------|------|--|
| | | Min. | Typ. | Max. | | |
| Line capacitance | C_L | 0.15 | 0.3 | 0.5 | pF | $V_R = 0 \text{ V}, f = 1 \text{ MHz}$ |
| | | – | 0.22 | – | | $V_R = 0 \text{ V}, f = 1 \text{ GHz}$ |

Table 5 ESD and Surge characteristics

| Parameter | Symbol | Values | | | Unit | Note or test condition |
|----------------------------------|-----------|--------|------|------|----------|--|
| | | Min. | Typ. | Max. | | |
| Clamping voltage ²⁾ | V_{CL} | – | 32 | – | V | $I_{TLP} = 16 \text{ A}, t_p = 100 \text{ ns}$ |
| Clamping voltage ³⁾ | | – | 17.5 | – | | $I_{PP} = 1 \text{ A}, t_p = 8/20 \mu\text{s}$ |
| Dynamic resistance ²⁾ | R_{DYN} | – | 0.82 | – | Ω | $t_p = 100 \text{ ns}$ |

¹ Verified by design

² Please refer to Application Note AN210 [1]. TLP parameters: $Z_0 = 50 \Omega$, $t_p = 100 \text{ ns}$, $t_r = 0.6 \text{ ns}$.

³ Stress pulse: 8/20 μs current waveform according to IEC61000-4-5

Typical characteristic diagrams

3 Typical characteristic diagrams

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

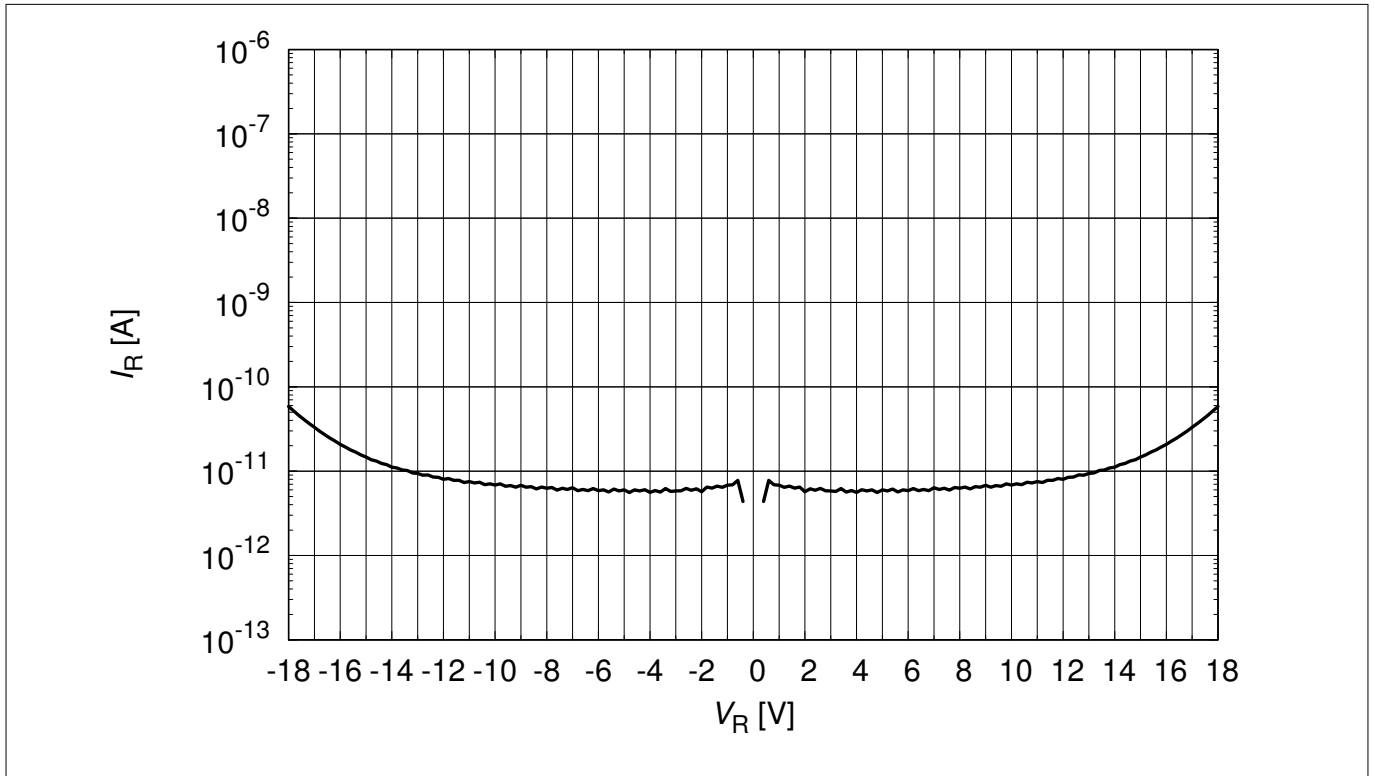


Figure 3 Reverse leakage current: $I_R = f(V_R)$

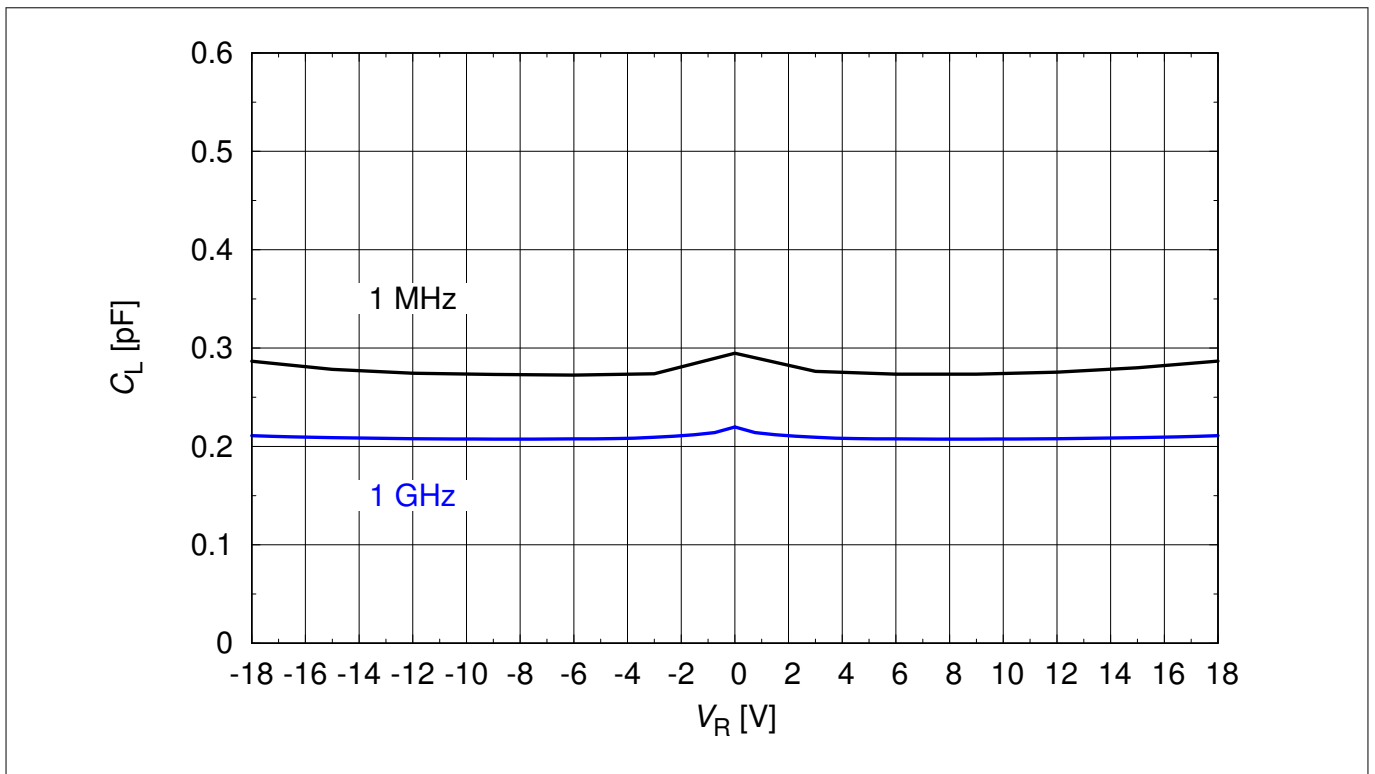


Figure 4 Line capacitance: $C_L = f(V_R)$, $f = 1\text{ MHz}, 1\text{ GHz}$

Typical characteristic diagrams

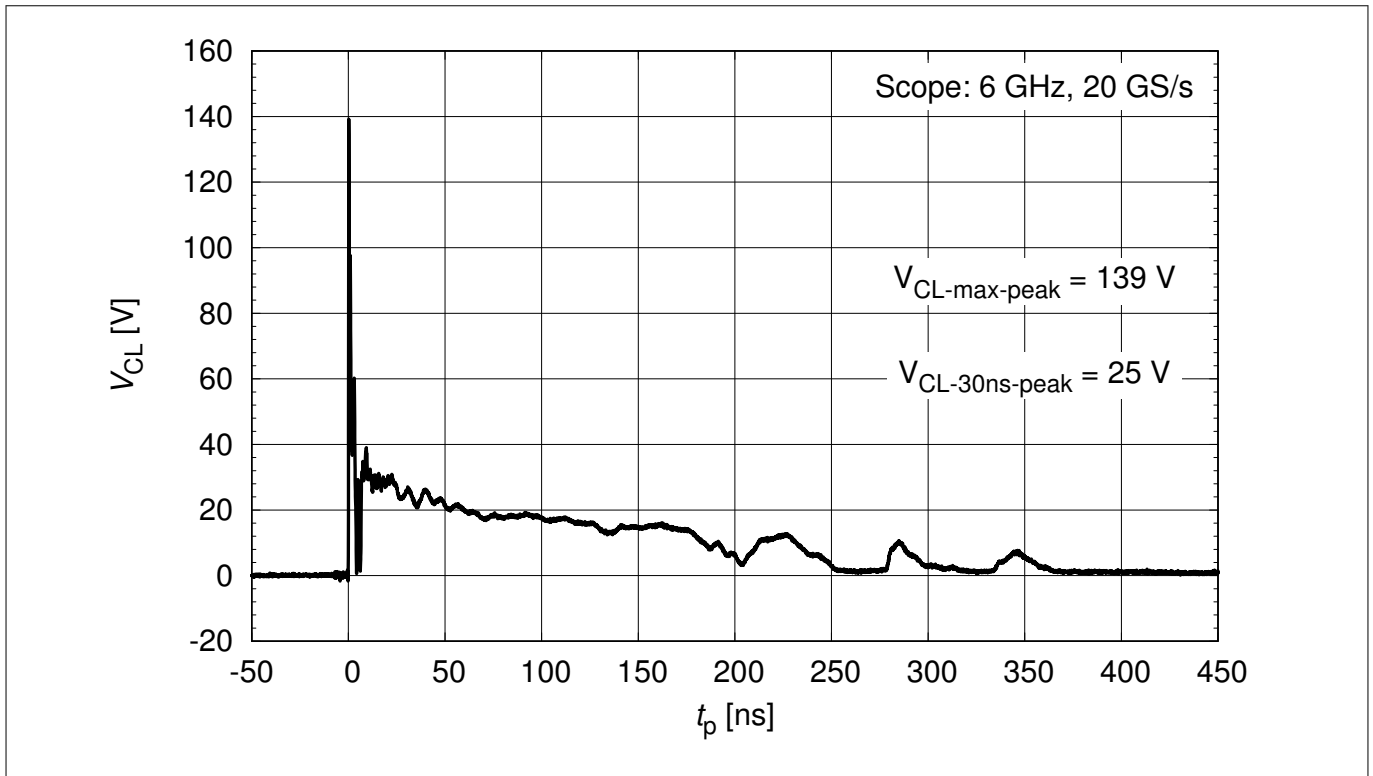


Figure 5 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positive pulse (according to IEC 61000-4-2)

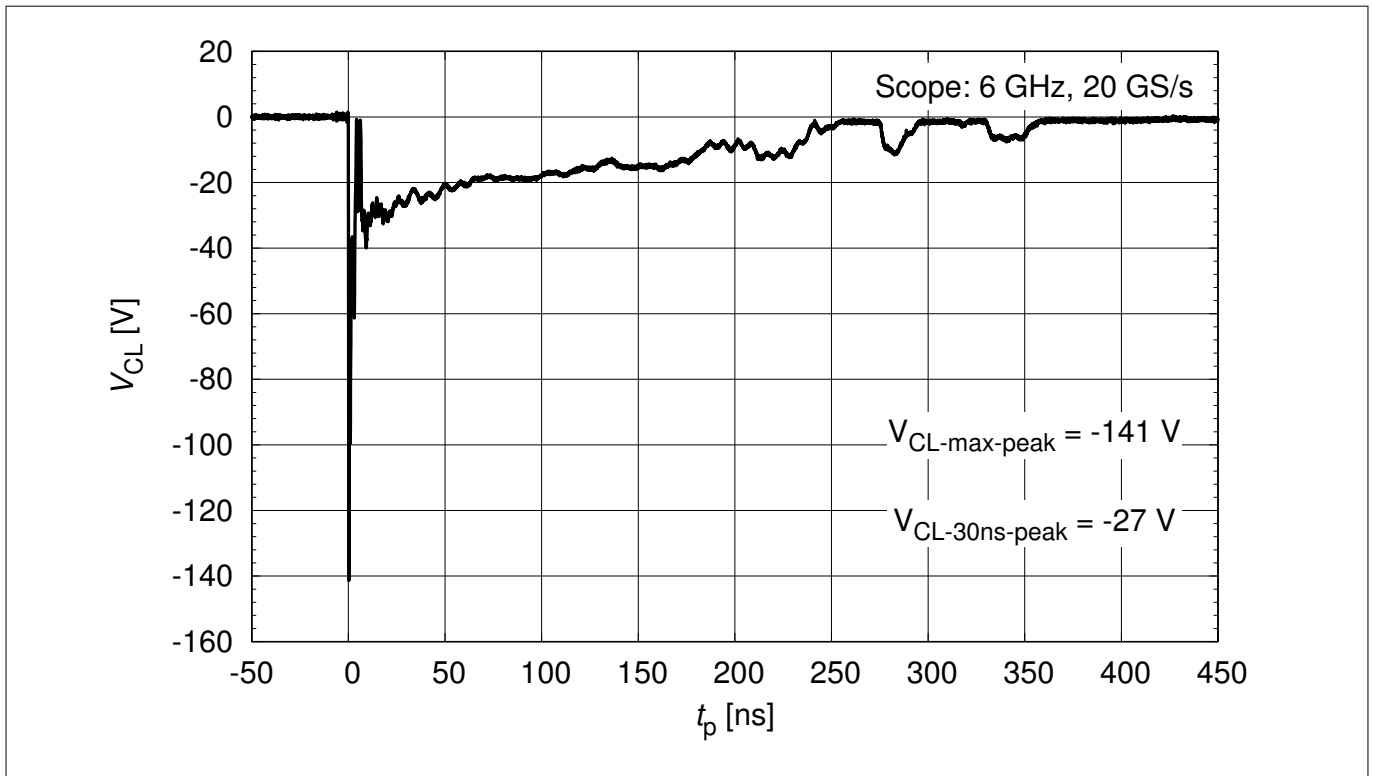


Figure 6 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV negative pulse (according to IEC 61000-4-2)

Typical characteristic diagrams

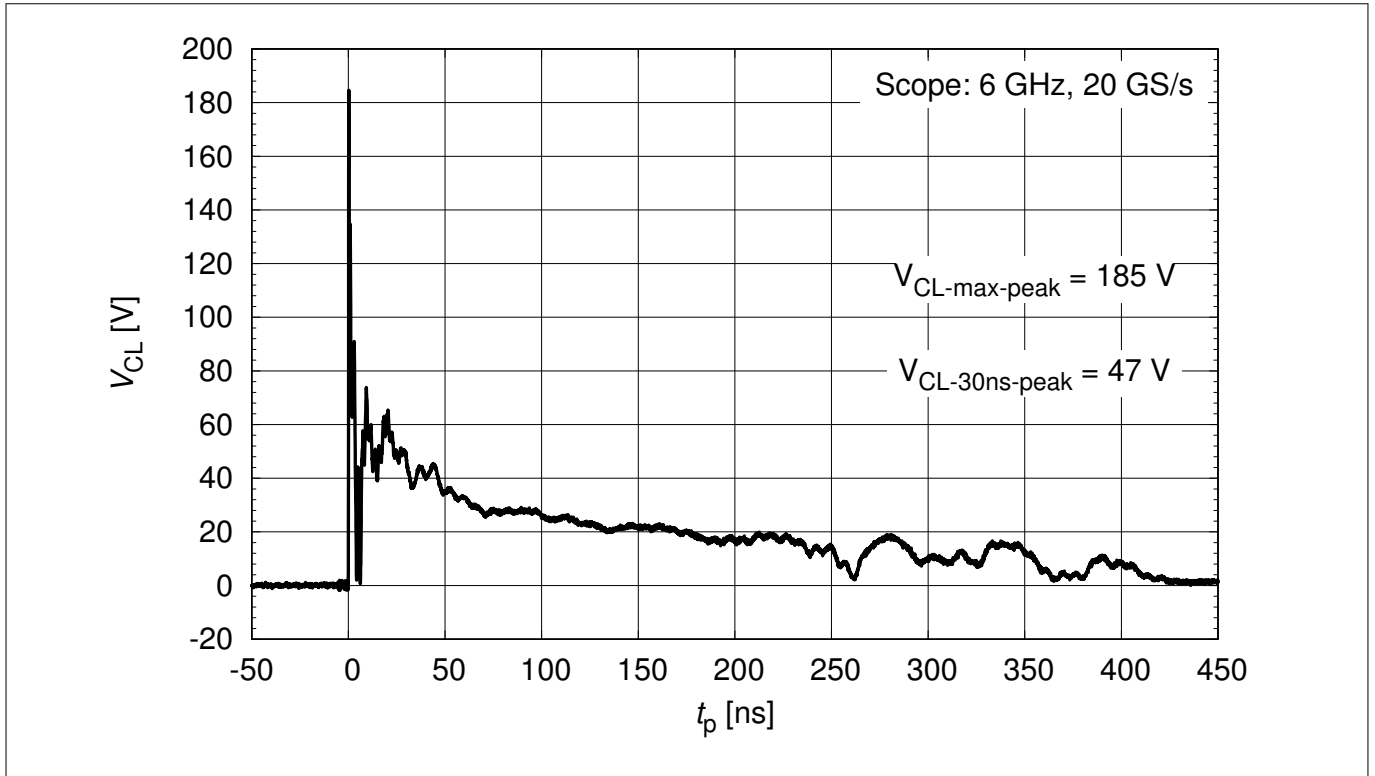


Figure 7 Clamping voltage (ESD): $V_{CL} = f(t)$, 15 kV positive pulse (according to IEC 61000-4-2)

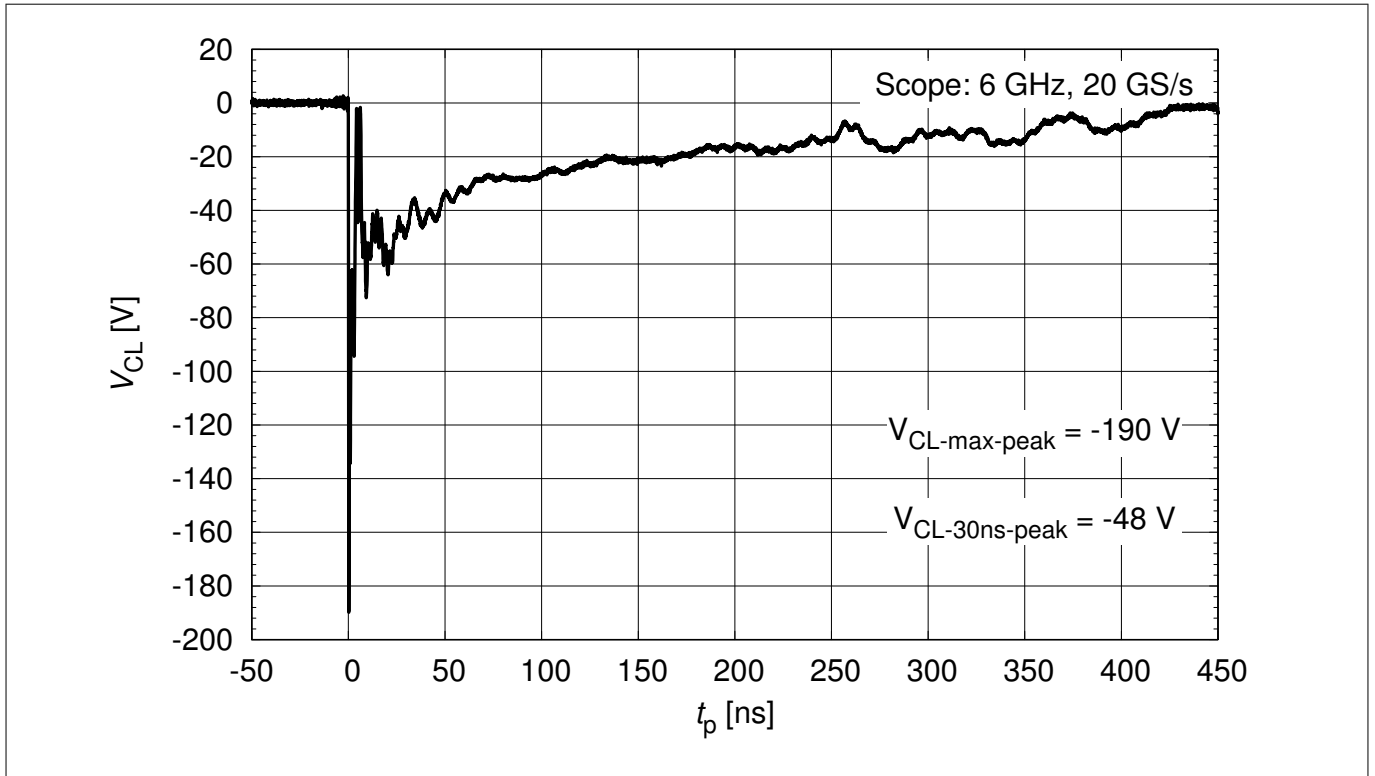


Figure 8 Clamping voltage (ESD): $V_{CL} = f(t)$, 15 kV negative pulse (according to IEC 61000-4-2)

Typical characteristic diagrams

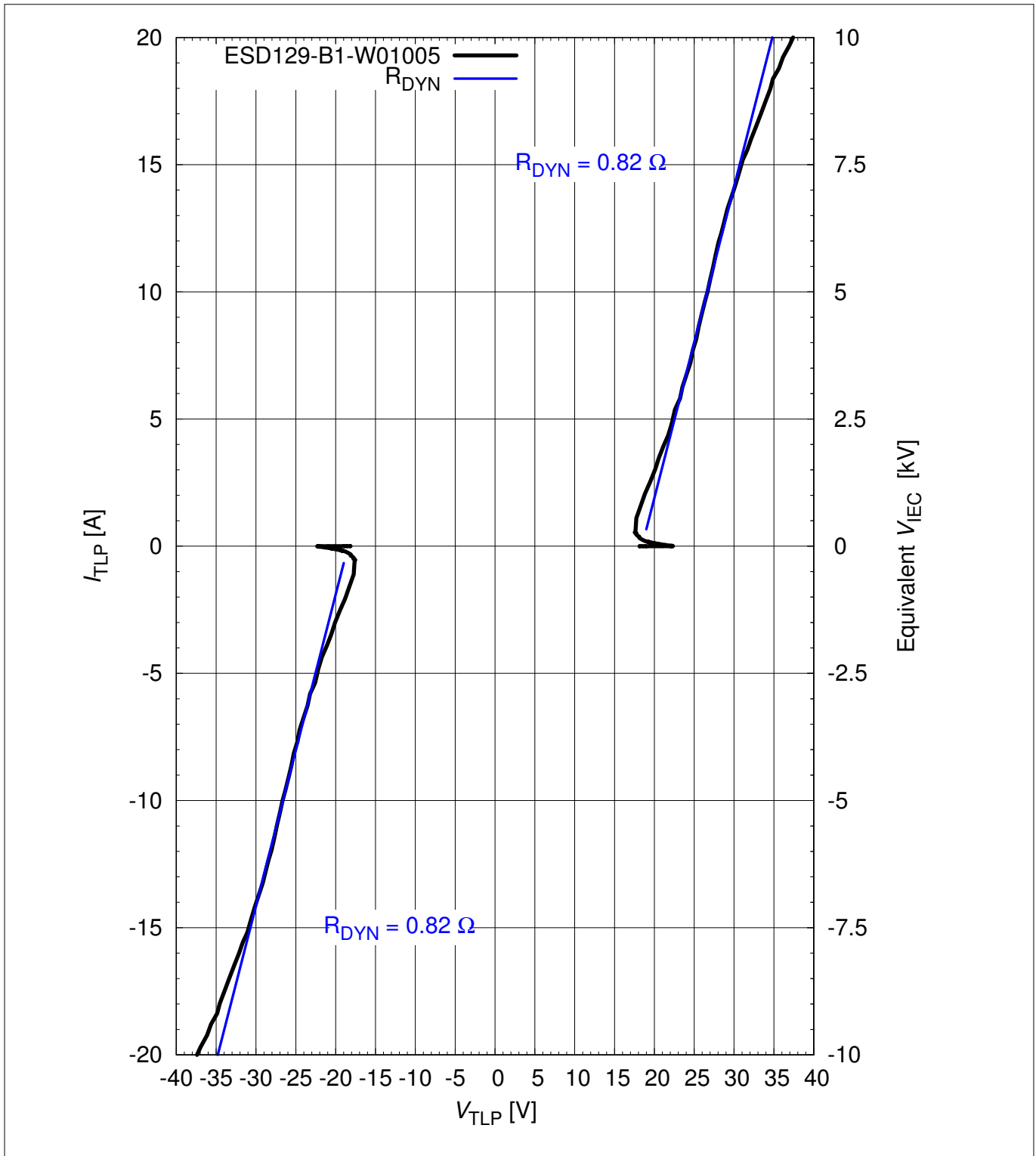


Figure 9 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$ [1]

Typical characteristic diagrams

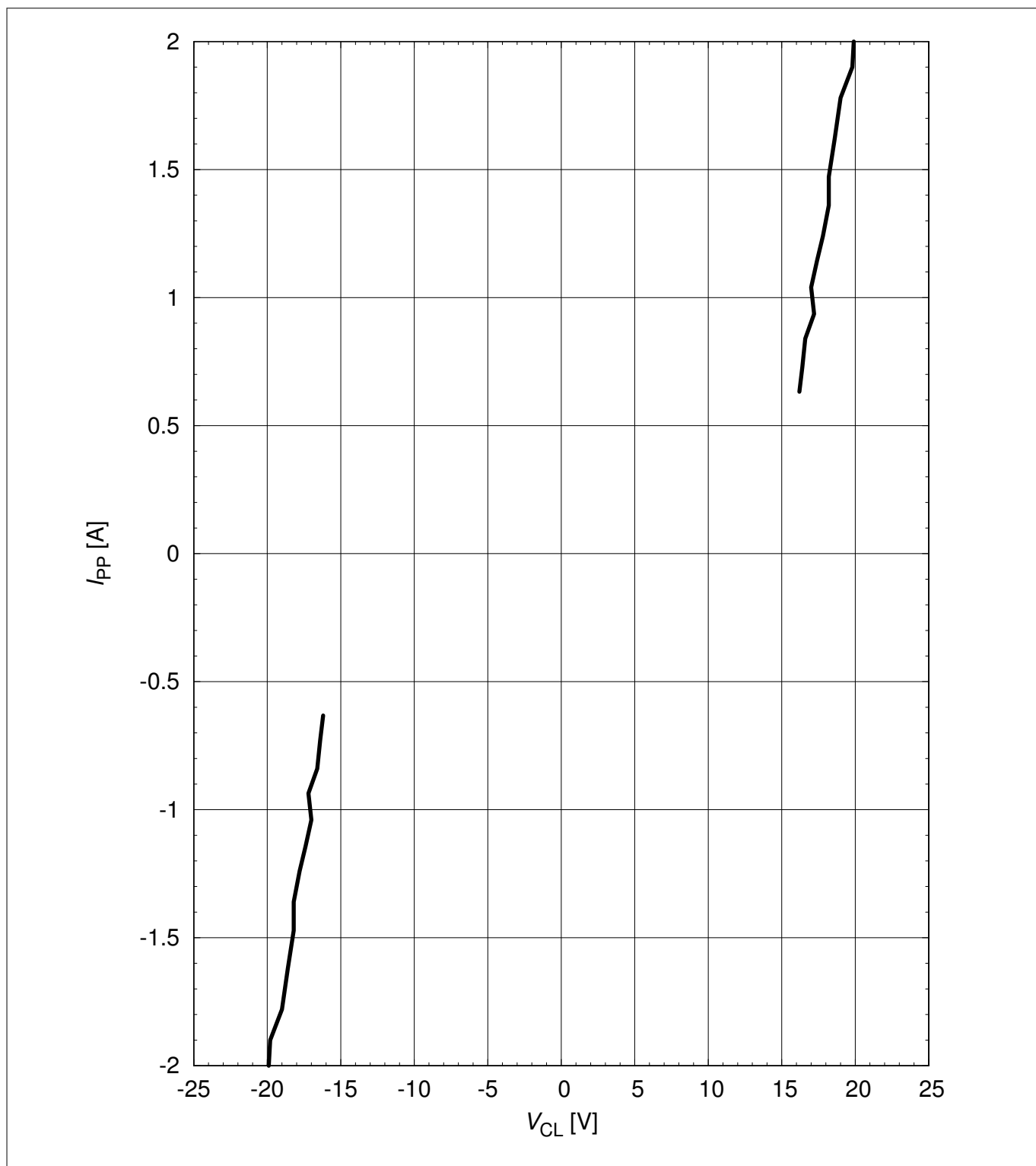


Figure 10 Clamping voltage (Surge): $I_{PP} = f(V_{CL})$ according to IEC 61000-4-5 [1]

Typical characteristic diagrams

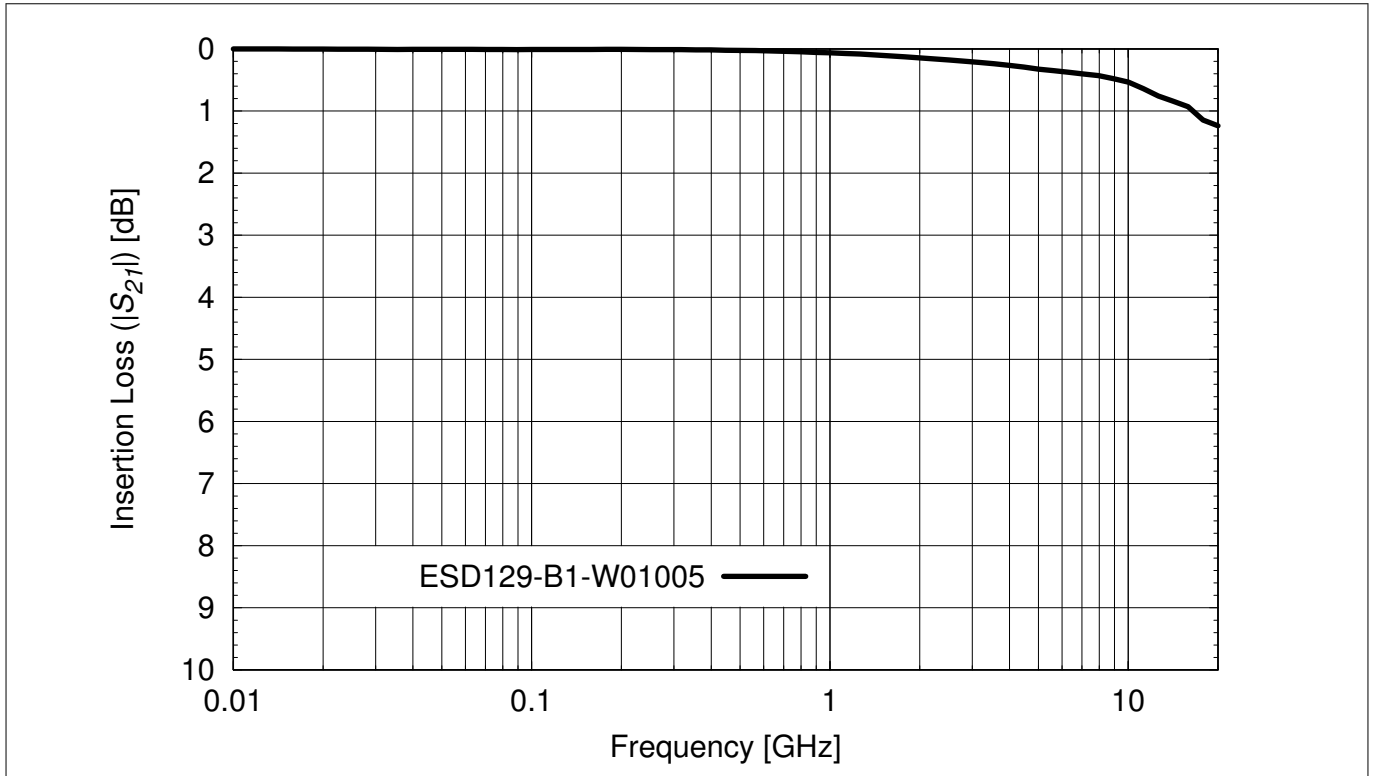


Figure 11 Insertion loss versus frequency in a 50 Ω system

4 Application information

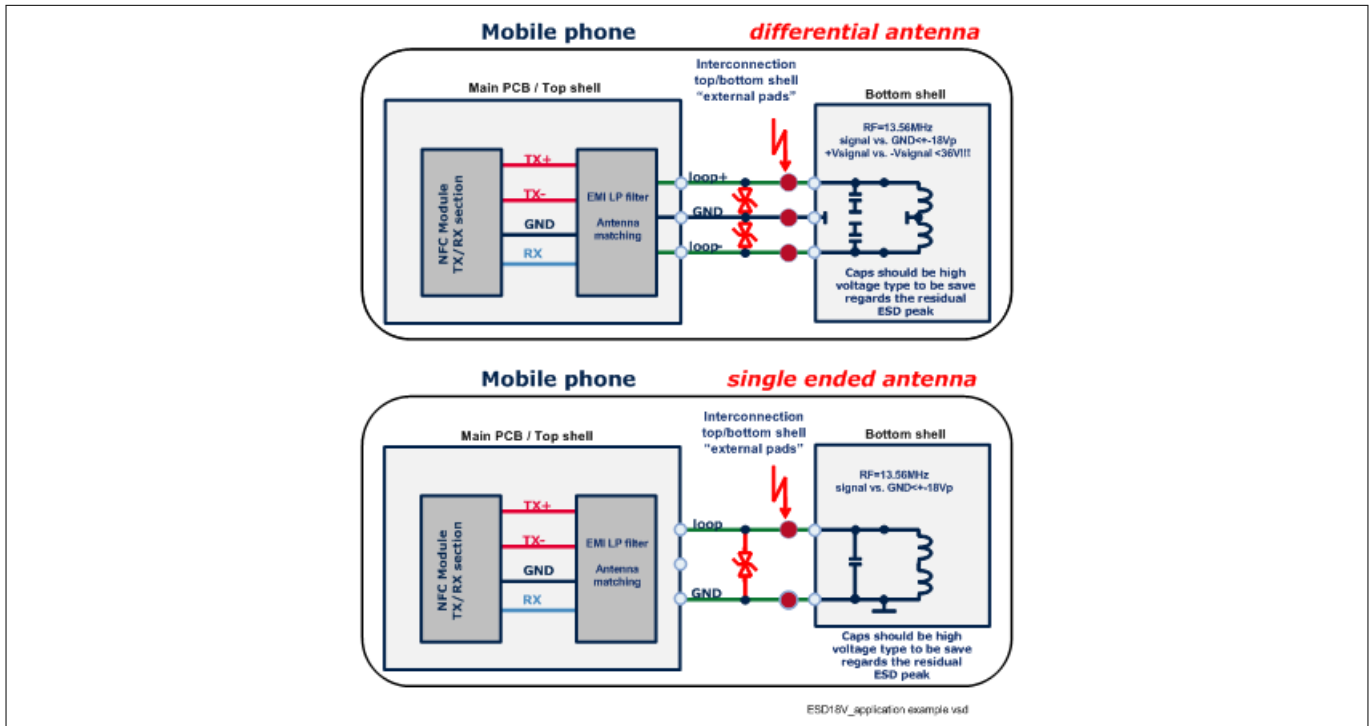


Figure 12 Bi-directional ESD/transient protection for NFC front end [4]

Package information

5 Package information

5.1 WLL-2-2 package

Note: Dimensions in mm

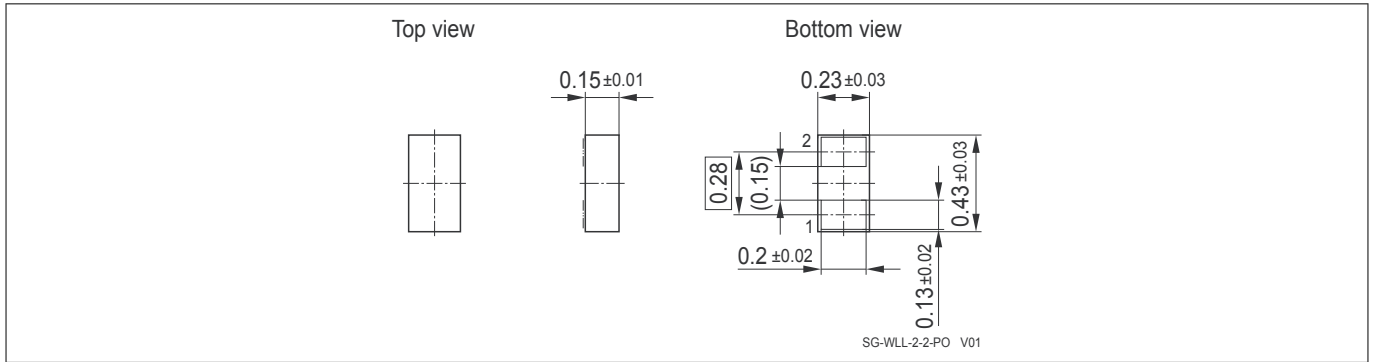


Figure 13 WLL-2-2 package outline

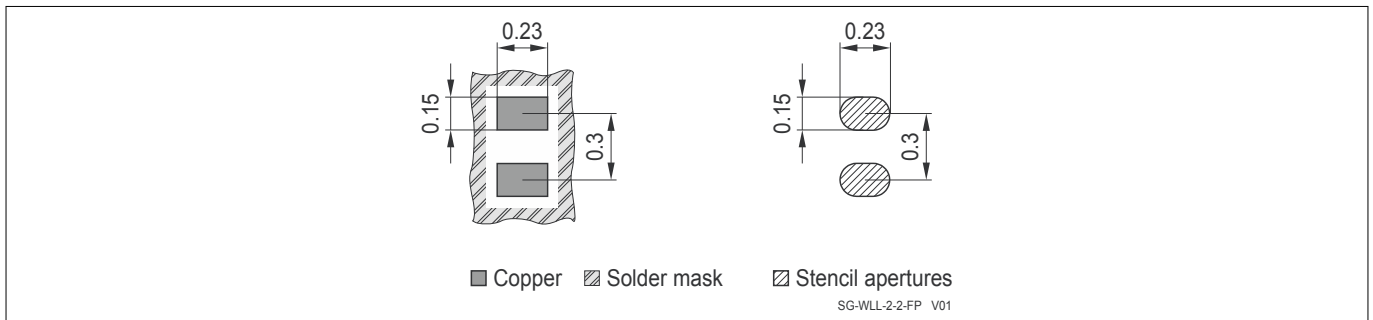


Figure 14 WLL-2-2 footprint

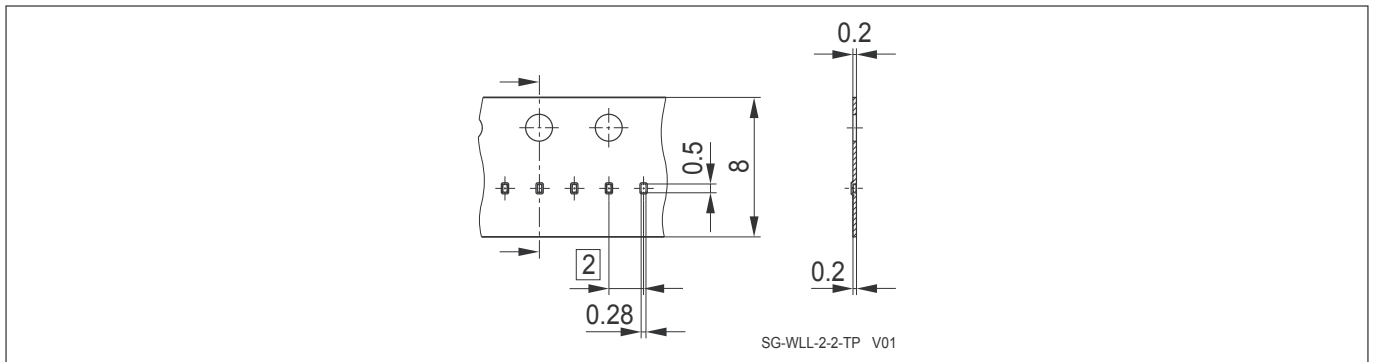


Figure 15 WLL-2-2 packing

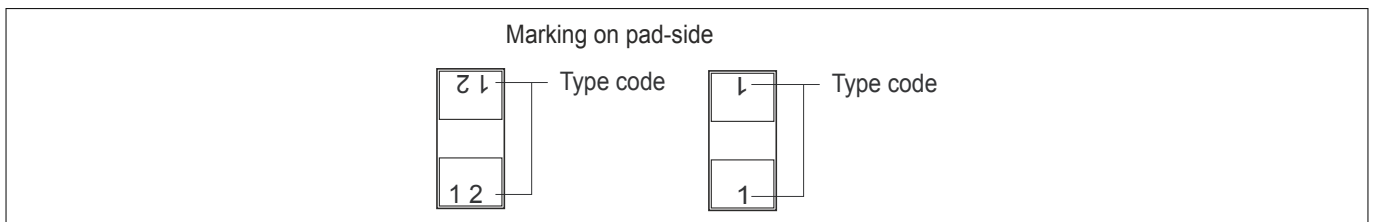


Figure 16 WLL-2-2 marking example (see [Device information](#))

References

6 References

- [1] Infineon AG - **Application Note AN210**: Effective ESD Protection design at System Level Using VF-TLP Characterization Methodology
- [2] Infineon AG - Recommendation for Printed Circuit Board Assembly of Infineon WLL Packages
http://www.infineon.com/Packageinformation_WLL
- [3] Infineon AG - **Application Note AN392**: TVS Diodes in ChipScalePackage reduce size and save cost
- [4] Infineon AG - **Application Note AN244**: ESD Protection in Chip Size Package (CSP) tailored for the NFC Frontend

Revision history

Revision history: Rev.1.1, 2017-10-27

| Page or Item | Subjects (major changes since previous revision) |
|--------------------------|---|
| Revision 1.2, 2018-08-01 | |
| | Chapter ´Application information´ added |
| | Table 3,4 updated |
| | Minor editorial changes |
| | |

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