Protection Device

TVS (Transient Voltage Suppressor)

ESD311-U1-02N

Uni-directional, 15 V, 210 pF, 0603, RoHS and Halogen Free compliant

ESD311-U1-02N

Data Sheet

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Final

Power Management & Multimarket

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1 Product Overview

1.1 Features

- ESD / Transient / Surge protection according to:
  - **IEC61000-4-2 (ESD): ±30 kV (air / contact discharge)**
  - **IEC61000-4-4 (EFT): ±4 kV / ±80 A (5/50 ns)**
  - **IEC61000-4-5 (surge): ±28 A (8/20 µs)**
- Uni-directional working voltage up to V_{RWM} **= 15 V**
- Low capacitance: C_L **= 210 pF (typical)**
- Low clamping voltage V_{CL} **= 29 V (typical) at** I_{PP} **= 28 A**
- Low reverse current. I_R **< 1 nA (typical)**
- Small and flat-profile SMD plastic package: 1.6 mm x 0.8 mm x 0.375 mm.
- Pb-free (RoHS compliant) and halogen free package

1.2 Application Examples

- Surge protection of USB V_{BUS} lines in mobile devices

1.3 Product Description

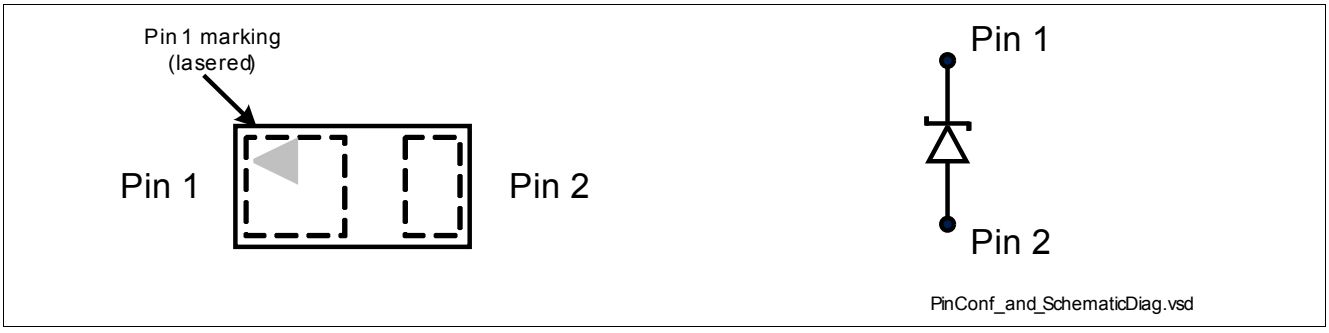


Figure 1-1 Pin Configuration and Schematic Diagram (in mm)

Table 1-1 Part Information

Type	Package	Configuration	Marking code
ESD311-U1-02N	TSNP-2-2	uni-directional	A

2 Maximum Ratings

Table 2-1 Maximum Ratings at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values	Unit
ESD air / contact discharge[1)]	V_{ESD}	±30	kV
Peak pulse power[2)]	P_{PK}	800	W
Peak pulse current[2)]	I_{PP}	28	A
Operating temperature range	T_{OP}	-40 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

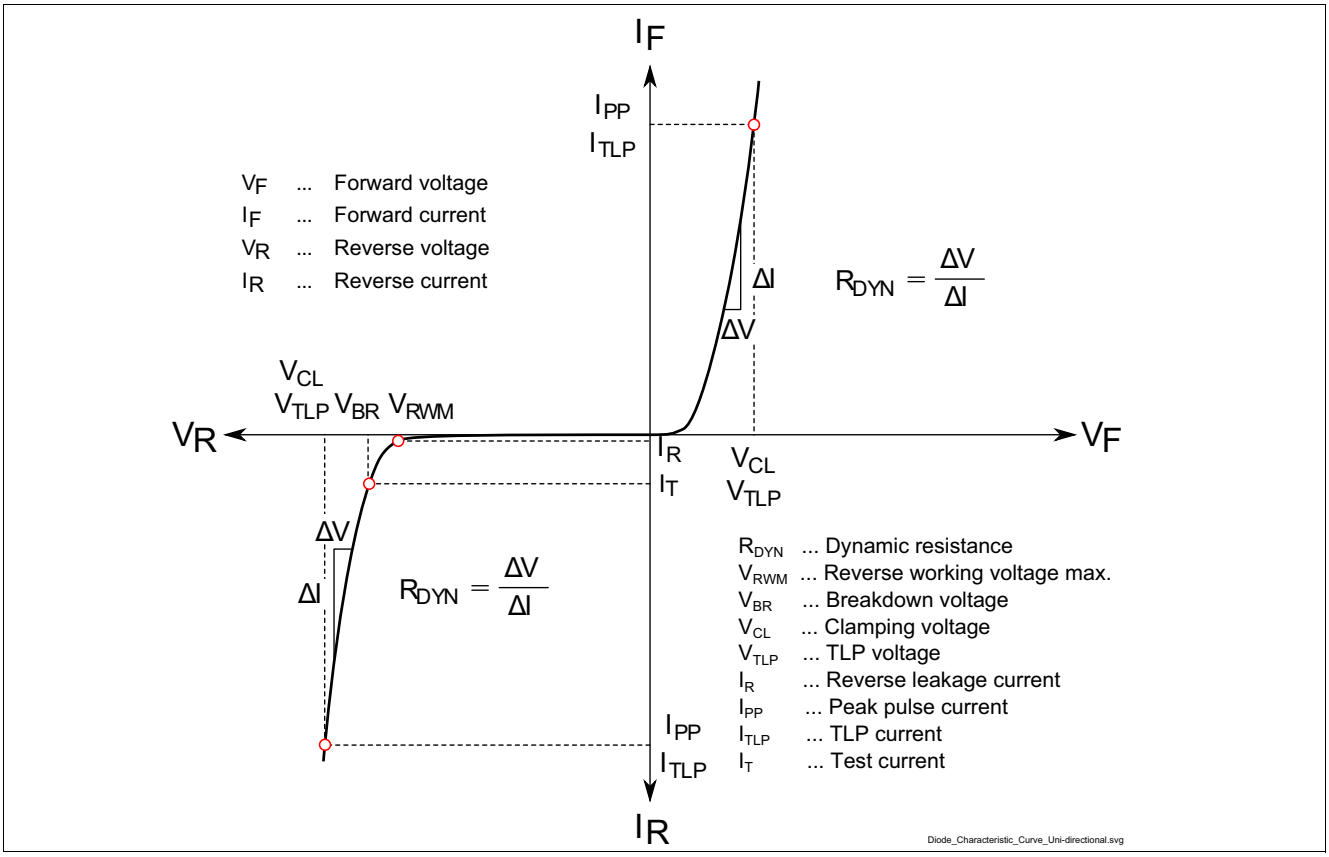


Figure 3-1 Definitions of electrical characteristics

Table 3-1 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}	–	–	15	V	
Breakdown voltage	V_{BR}	16	17	–	V	I_T = 1 mA
Reverse current	I_R	–	<1	100	nA	V_R = 15V

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	–	210	290	pF	V_R = 0 V, f = 1 MHz

Table 3-3 ESD and Surge Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage[1)]	V_{CL}	–	22	26.5	V	I_{TLP} = 16 A, t_p = 100 ns
		–	23	28		I_{TLP} = 30 A, t_p = 100 ns
Clamping voltage[2)]		–	21	25.5		I_{PP} = 1 A, t_p = 8/20 µs
		–	29	35		I_{PP} = 28 A, t_p = 8/20 µs
Dynamic resistance[1)]	R_{DYN}	–	0.07	–	Ω	t_p = 100 ns

1) Please refer to Application Note AN210[1]. TLP parameter: Z_0 = 50 Ω , t_p = 100 ns, t_r = 600 ps.

2) 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

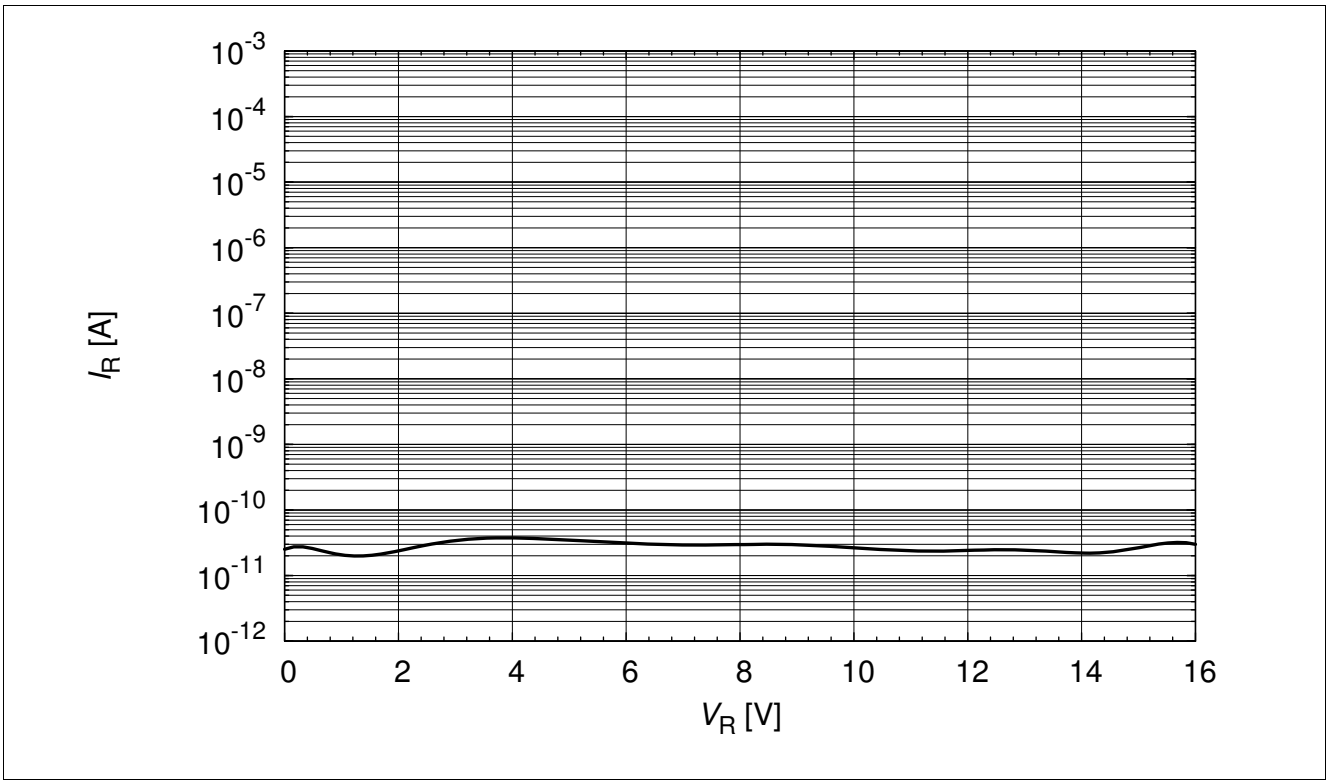


Figure 4-1 Reverse leakage current: $I_R = f(V_R)$

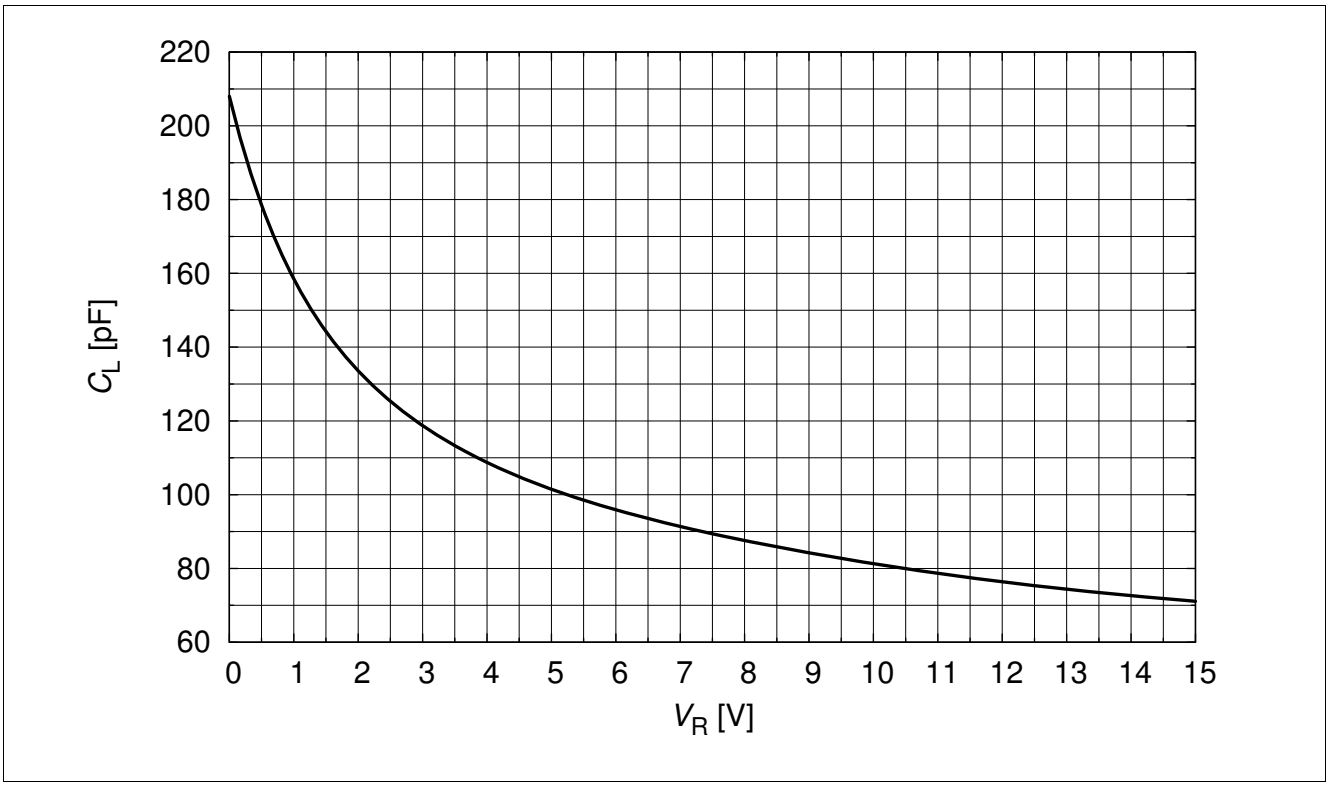


Figure 4-2 Line capacitance: $C_L = f(V_R)$

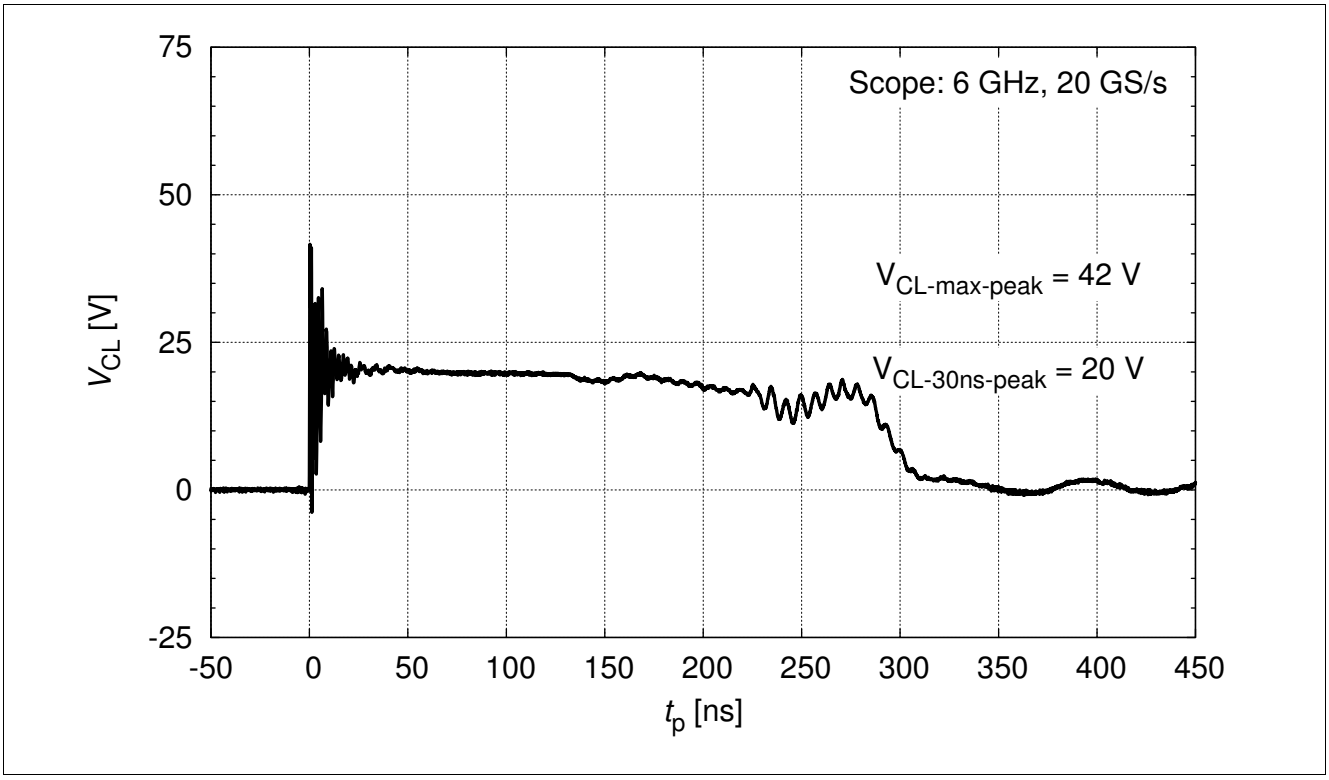


Figure 4-3 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positive pulse from pin 1 to pin 2

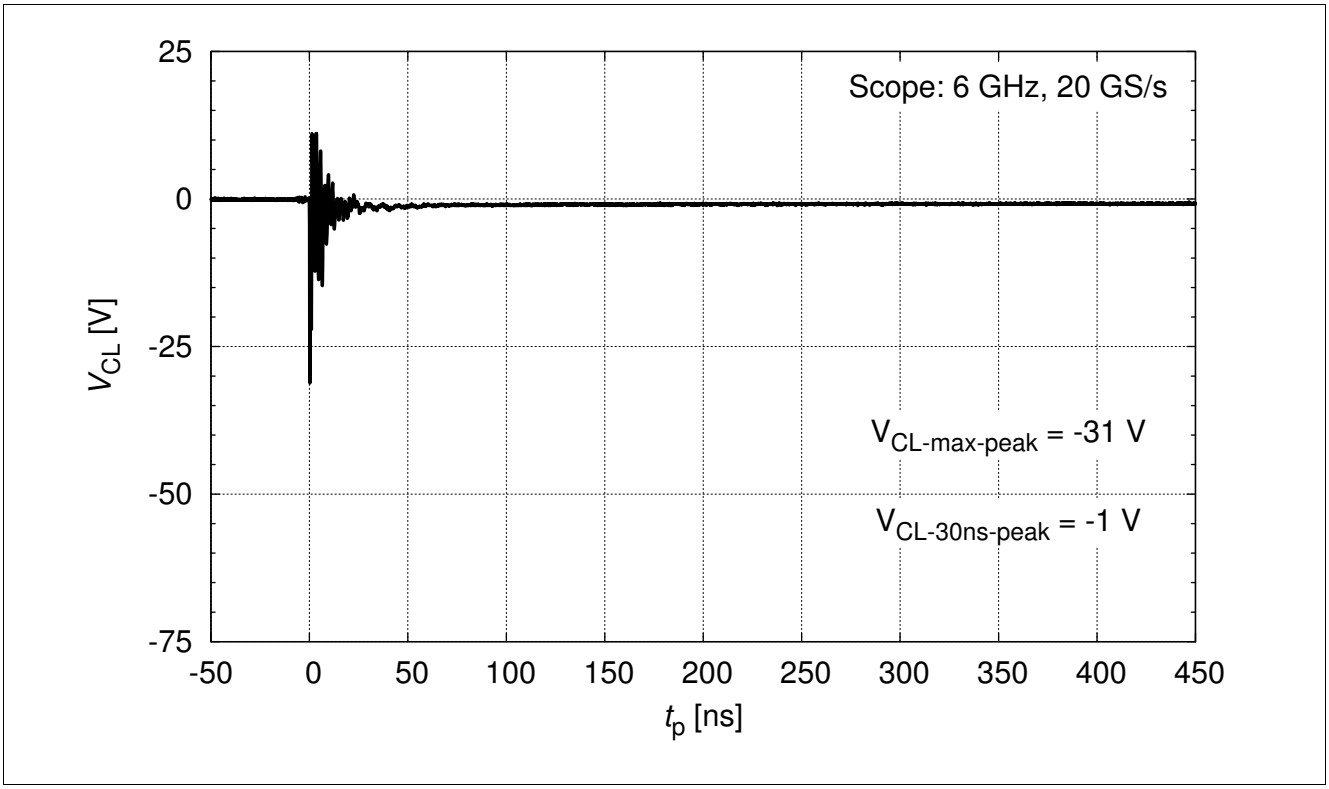


Figure 4-4 Clamping voltage (ESD) $V_{CL} = f(t)$, 8 kV negative pulse from pin 1 to pin 2

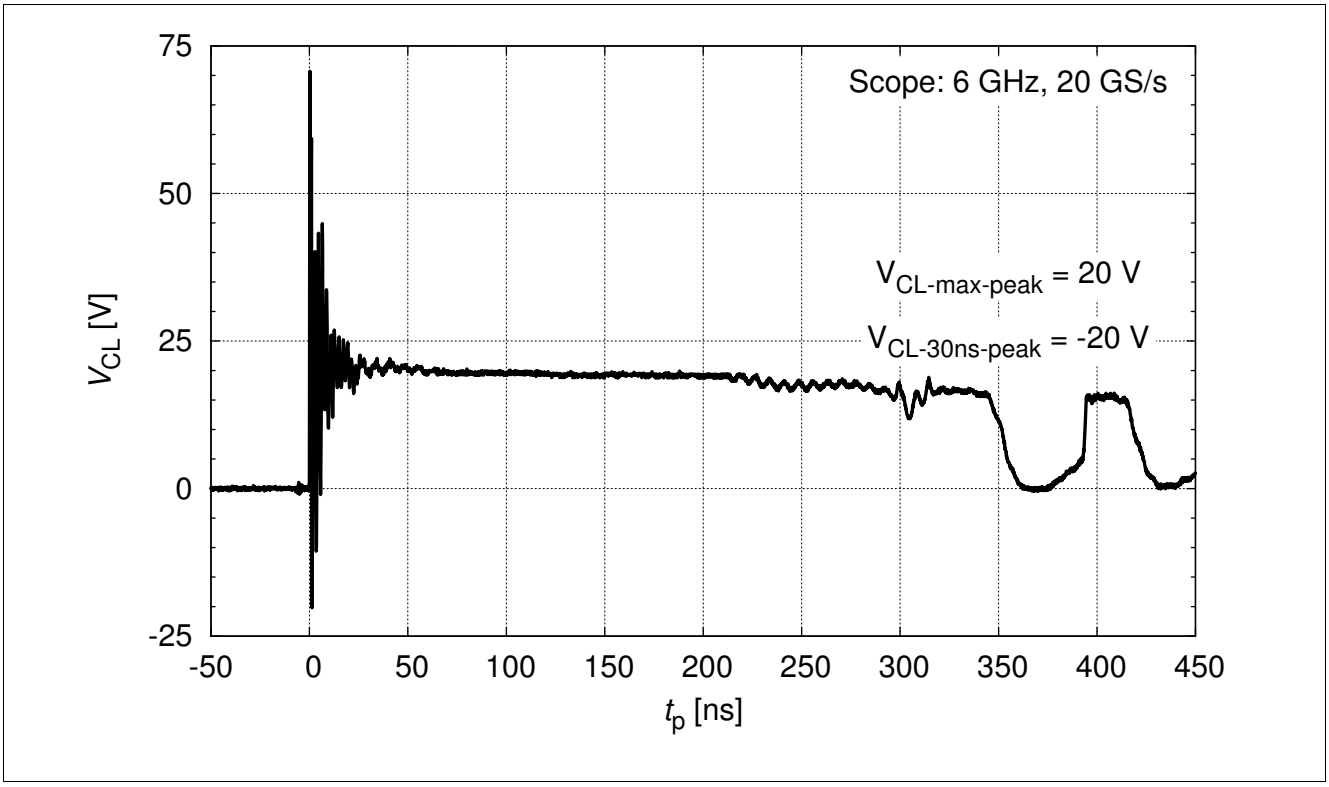


Figure 4-5 Clamping voltage (ESD) $V_{CL} = f(t)$, 15 kV positive pulse from pin 1 to pin 2

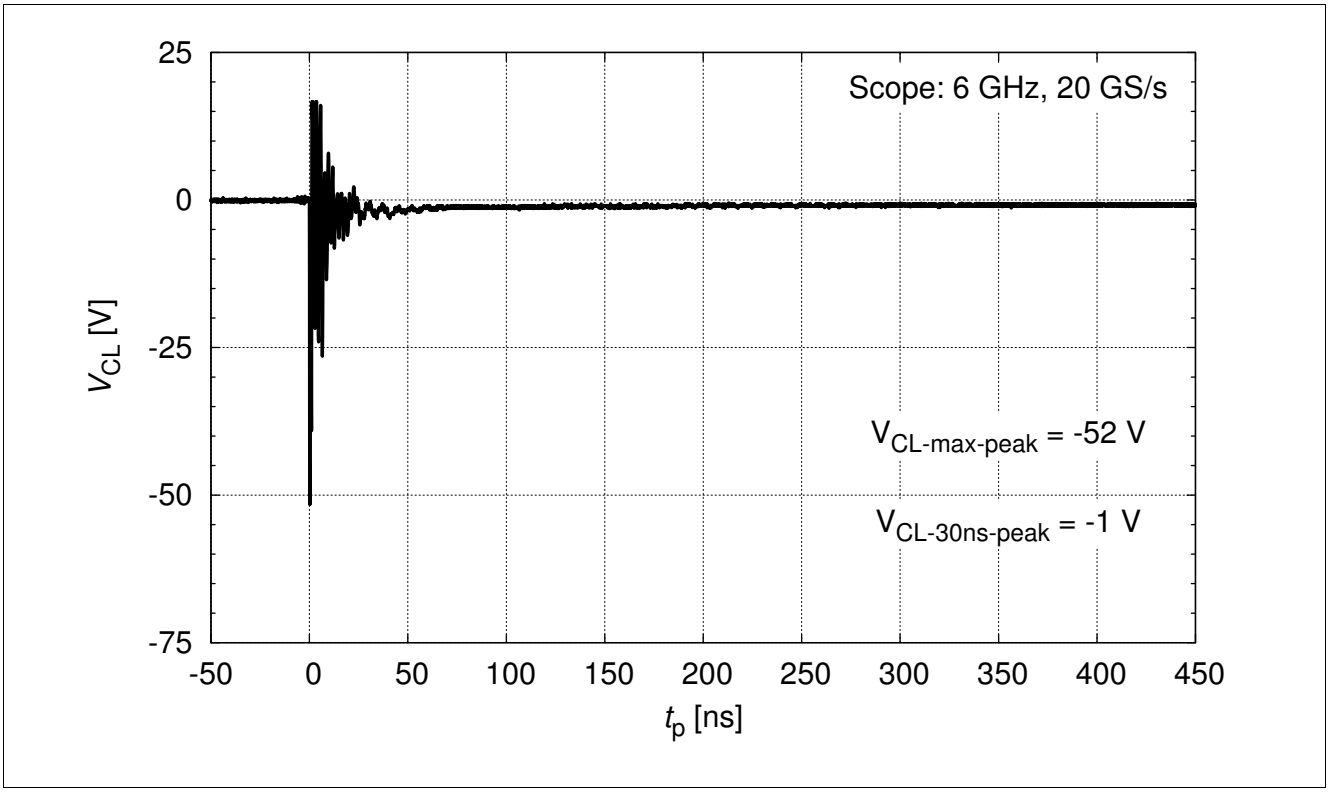


Figure 4-6 Clamping voltage (ESD) $V_{CL} = f(t)$, 15 kV negative pulse from pin 1 to pin 2

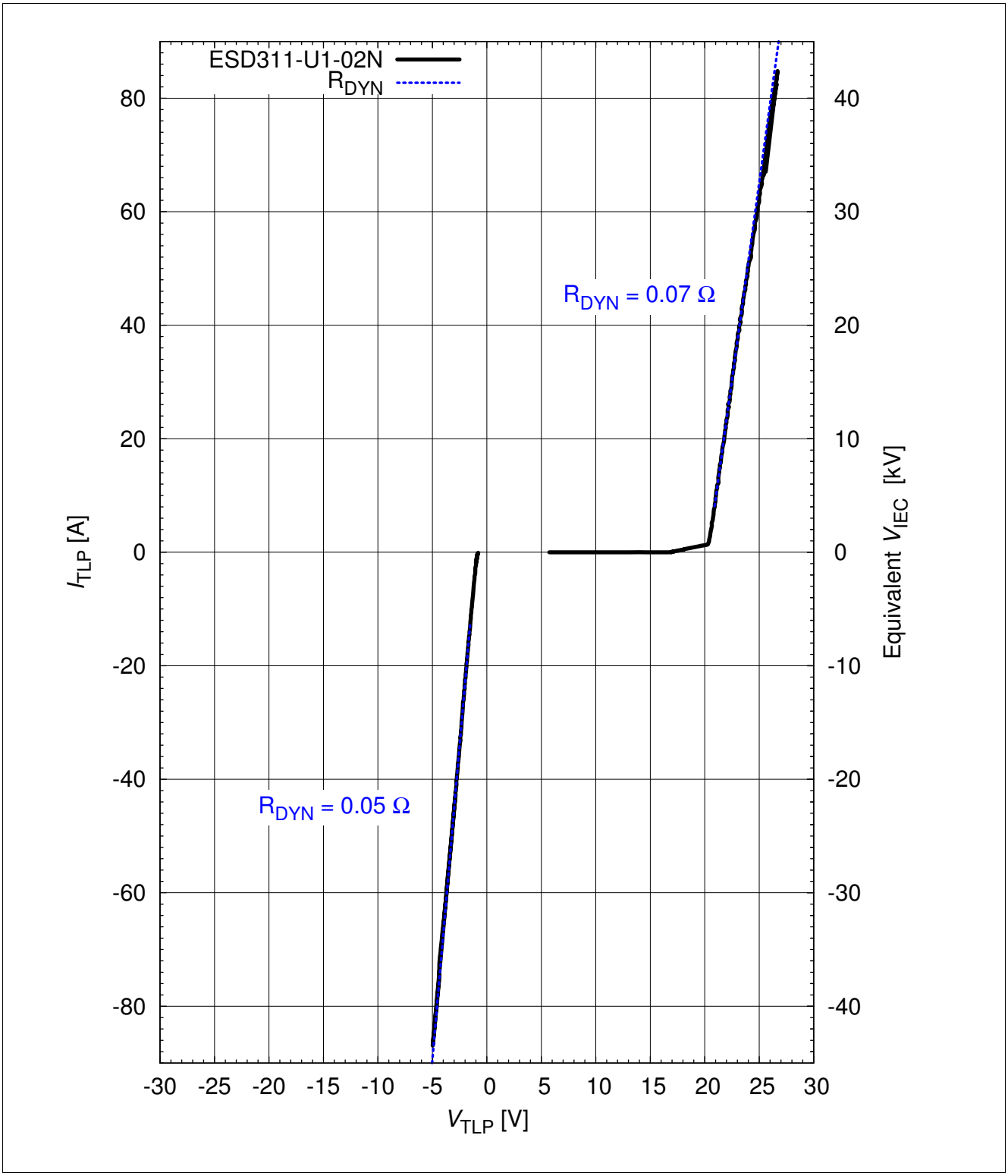


Figure 4-7 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$[1], pin 1 to pin 2

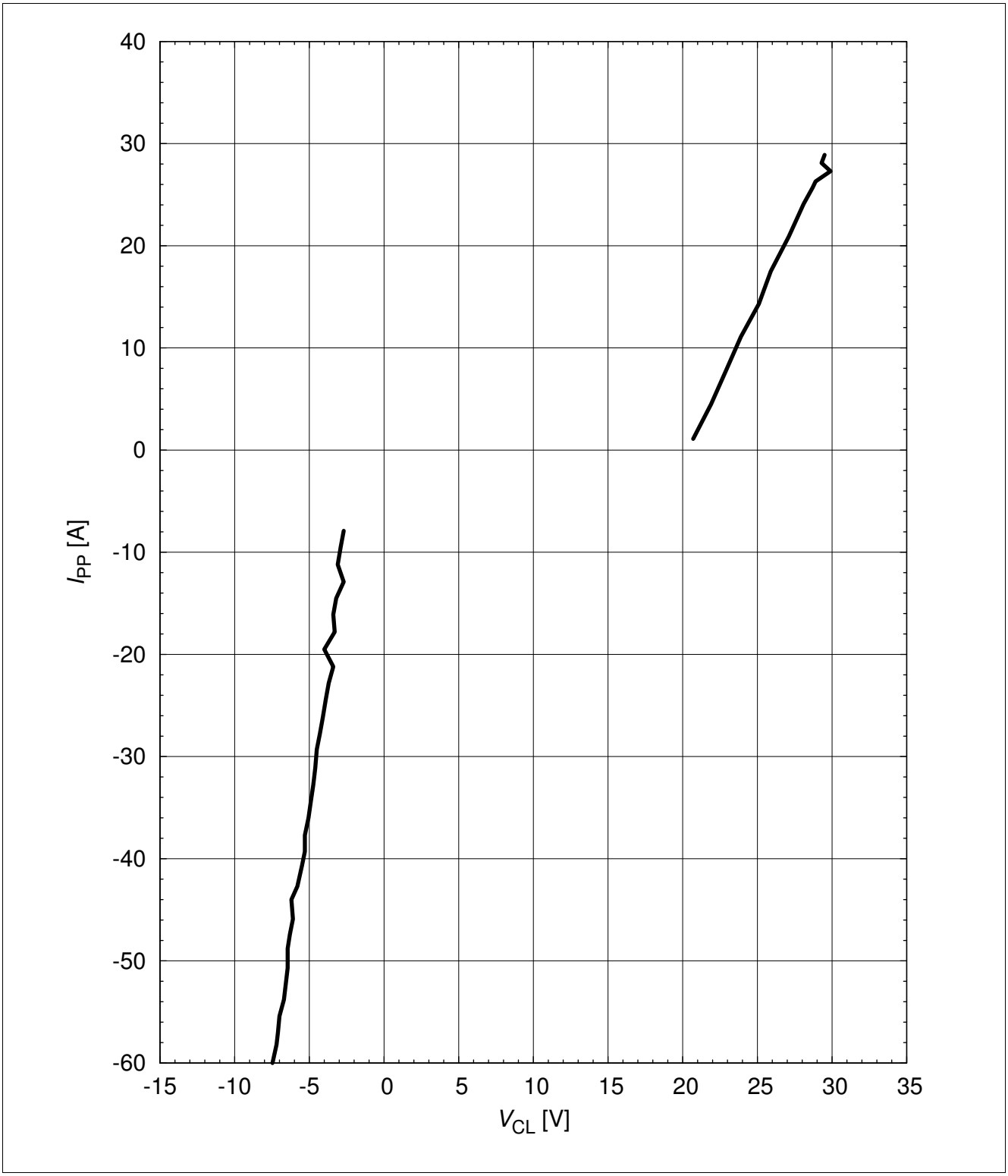


Figure 4-8 Pulse current (Surge): $I_{PP} = f(V_{CL})$[1], pin 1 to pin 2

5 Package Information

5.1 TSNP-2-2

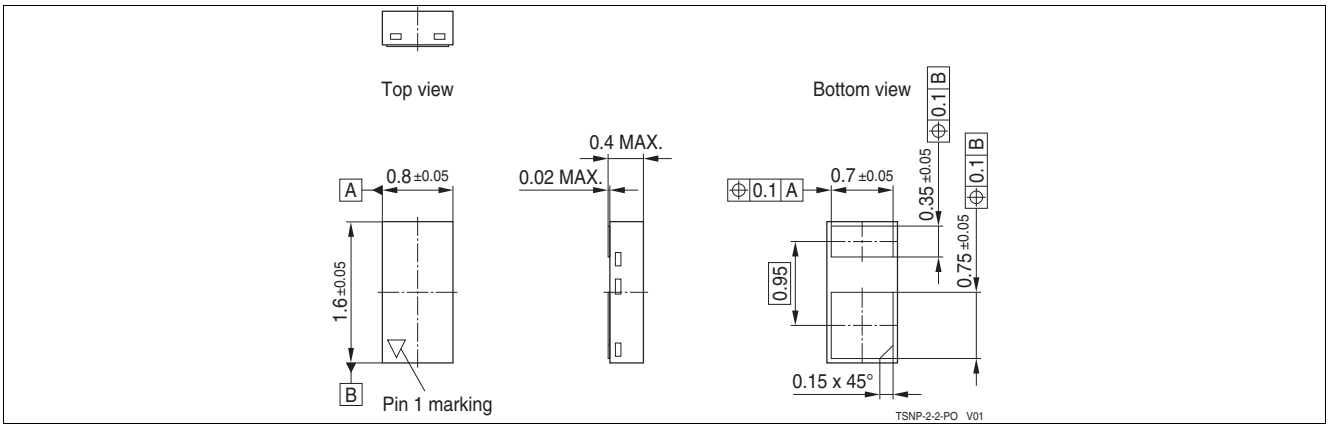


Figure 5-1 TSNP-2-2: Package outline

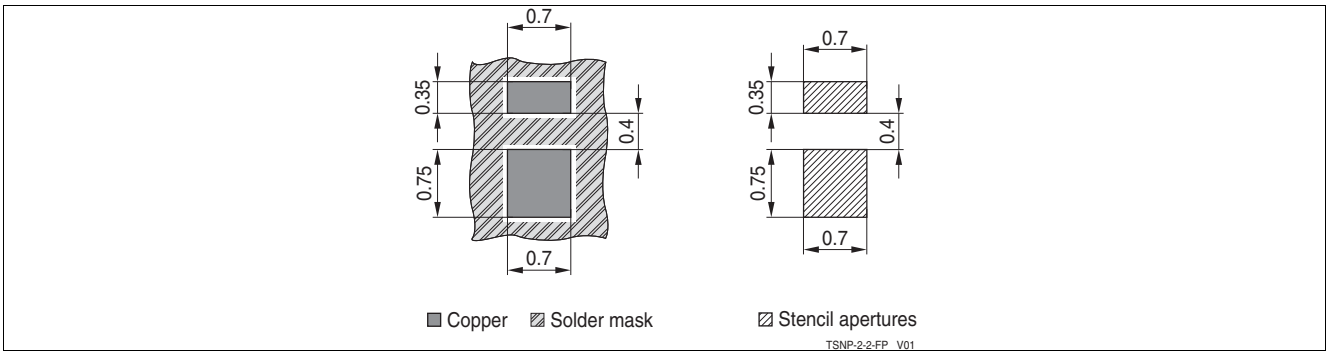


Figure 5-2 TSNP-2-2: Footprint

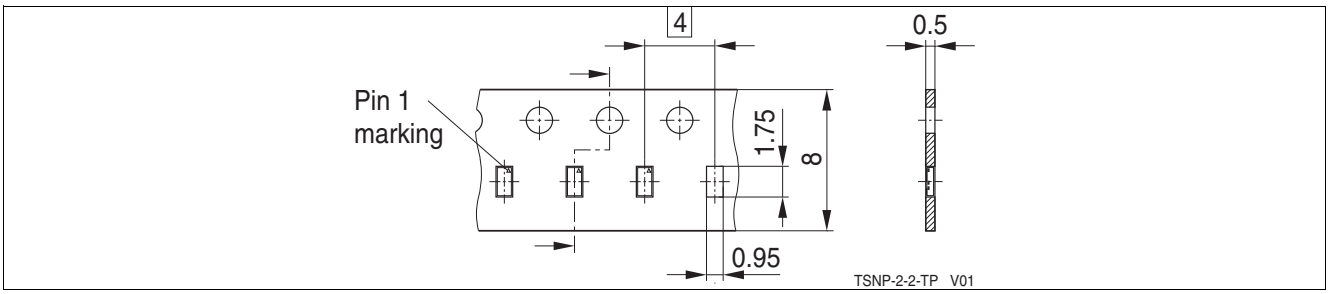


Figure 5-3 TSNP-2-2: Packing

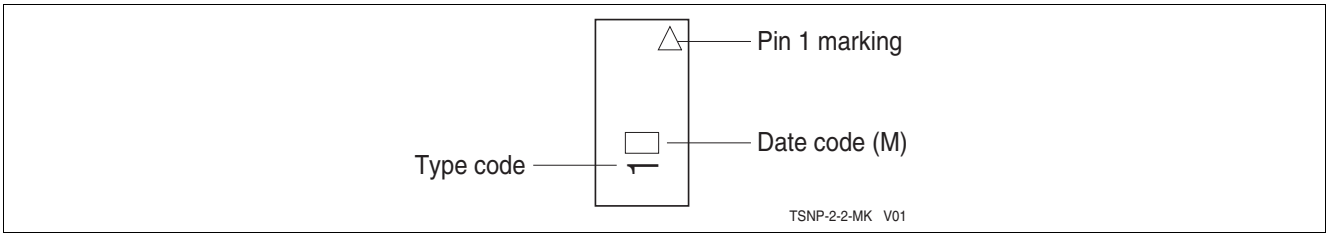


Figure 5-4 TSNP-2-2: Marking example, Type code see: Table 1-1 “Part Information” on Page 3

Revision History: Rev. 0.9.1, 2014-05-20	
Page or Item	**Subjects (major changes since previous revision)**
Revision 1.0, 2014-05-28	
All	Status change to final

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