TVS Diodes

Transient Voltage Suppressor Diodes

ESD112-B1-02 Series

Bi-directional Ultra-low Capacitance ESD / Transient Protection Diode

ESD112-B1-02ELS
ESD112-B1-02EL

Data Sheet

Rev. 1.3, 2013-11-27
Final

Power Management & Multimarket

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Rev. 1.3, 2013-11-27: Final Data Sheet	
	ESD112-B1-02EL Status change to final

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Last Trademarks Update 2010-10-26

1 Bi-directional Ultra-low Capacitance ESD / Transient Protection Diode

1.1 Features

- ESD / transient protection of RF signal lines according to:
  - **IEC61000-4-2 (ESD): ±20 kV (air/contact)**
  - **IEC61000-4-4 (EFT): ±40 A (5/50 ns)**
  - **IEC61000-4-5 (surge): ±3 A (8/20 µs)**
- Maximum working voltage: V_{RWM} ±5.3 V
- Extremely low capacitance: C_L **= 0.2 pF (typical)**
- Low clamping voltage: V_{CL} = 29 V (typical) at I_{PP} = 16 A
- Very low reverse current I_R < 1 nA typ.
- 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

- ESD protection of sensitive RF signal lines, Bluetooth Class 2, Automated Meter Reading
- RF antenna protection, frontend module, GPS, mobile TV, FM radio, UWB

1.3 Product Description

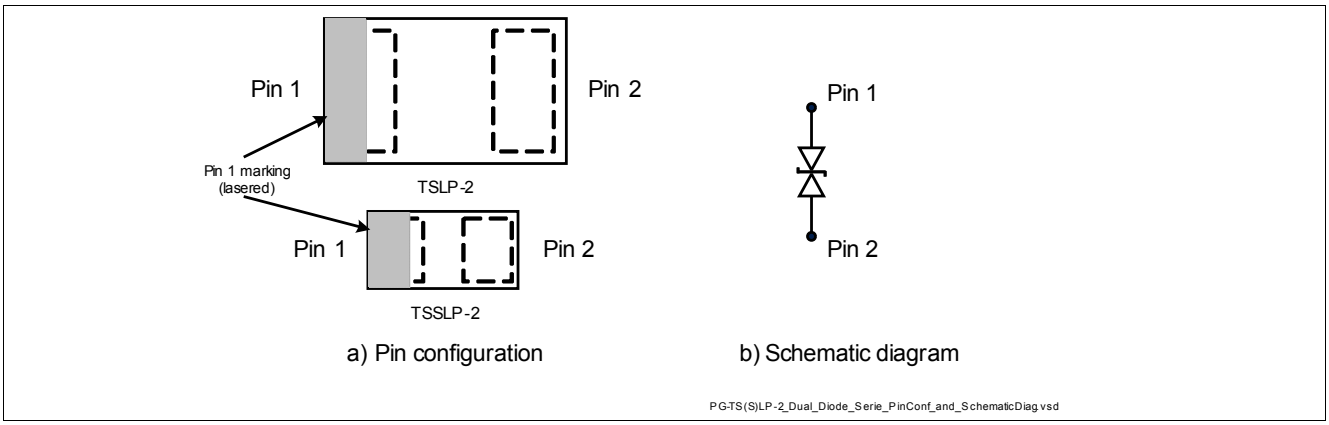


Figure 1-1 Pin Configuration and Schematic Diagram

Table 1-1 Ordering Information

Type	Package	Configuration	Marking code
ESD112-B1-02ELS	TSSLP-2-4	1 line, bi-directional	T
ESD112-B1-02EL	TSLP-2-20	1 line, bi-directional	TE

2 Characteristics

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

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

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

2) I_{PP} 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.

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

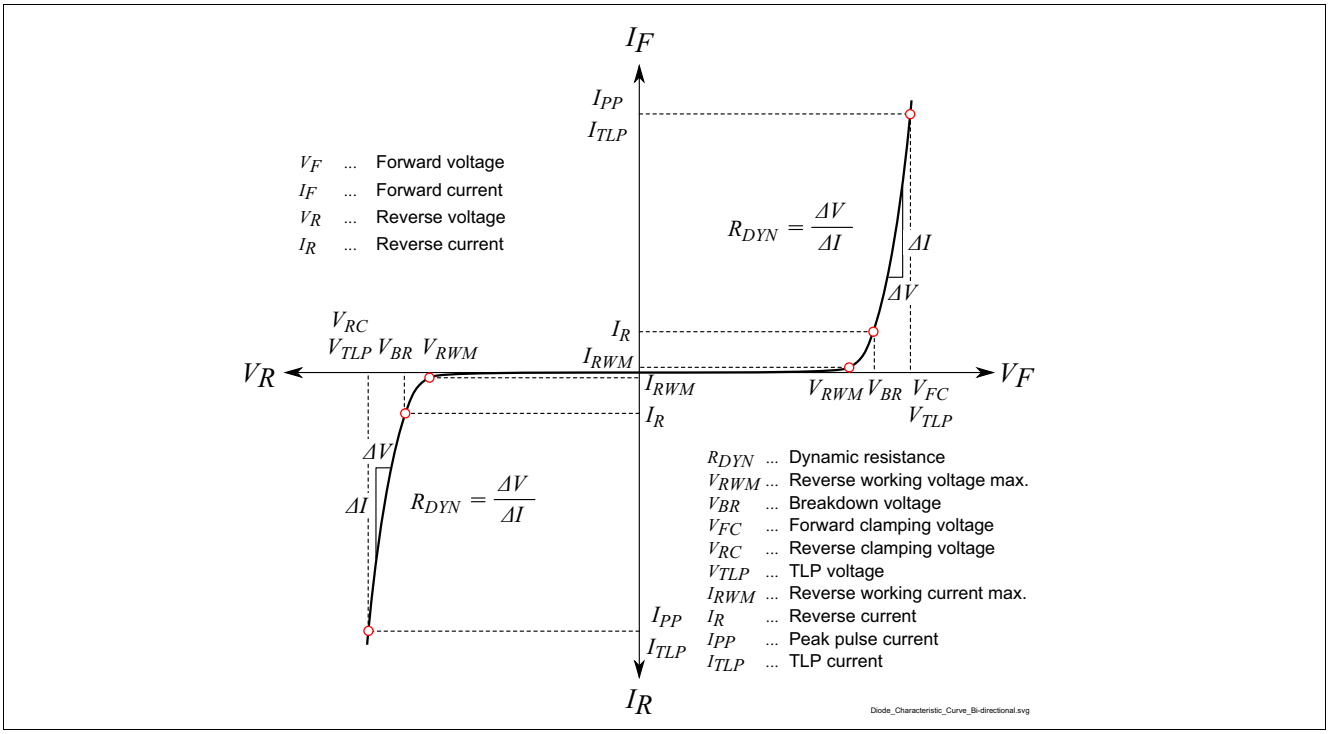


Figure 2-1 Definitions of electrical characteristics

Table 2-2 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	–	5.3	V	
Breakdown voltage	V_{BR}	7	–	–	V	I_R = 1 mA, from pin 1 to pin 2, from pin 2 to pin 1
Reverse current	I_R	–	<1	50	nA	V_R = 5.3 V

Table 2-3 RF Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode capacitance	C_L	–	0.23	0.4	pF	V_R = 0 V, f = 1 MHz
		–	0.2	0.4		V_R = 0 V, f = 1 GHz
Series inductance	L_S	–	0.2	–	nH	ESD112-B1-02ELS
		–	0.4	–		ESD112-B1-02EL

Table 2-4 ESD Characteristics at T_A = 25 °C, unless otherwise specified

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Clamping voltage[2)]	V_{CL}	–	29	–	V	I_{TLP} = 16 A
		–	44	–		I_{TLP} = 30 A
Clamping voltage[1)]		–	11	17		I_{PP} = 1 A
		–	15	21		I_{PP} = 3 A
Dynamic resistance[2)]	R_{DYN}	–	1	–	Ω	

1) I_{PP} according to IEC61000-4-5 (t_p = 8/20 µs)

2) Please refer to Application Note AN210 [4]. 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_{TLP1} = 10 A and I_{TLP2} = 40 A.

2.2 Typical Characteristics at T_A = 25 °C, unless otherwise specified

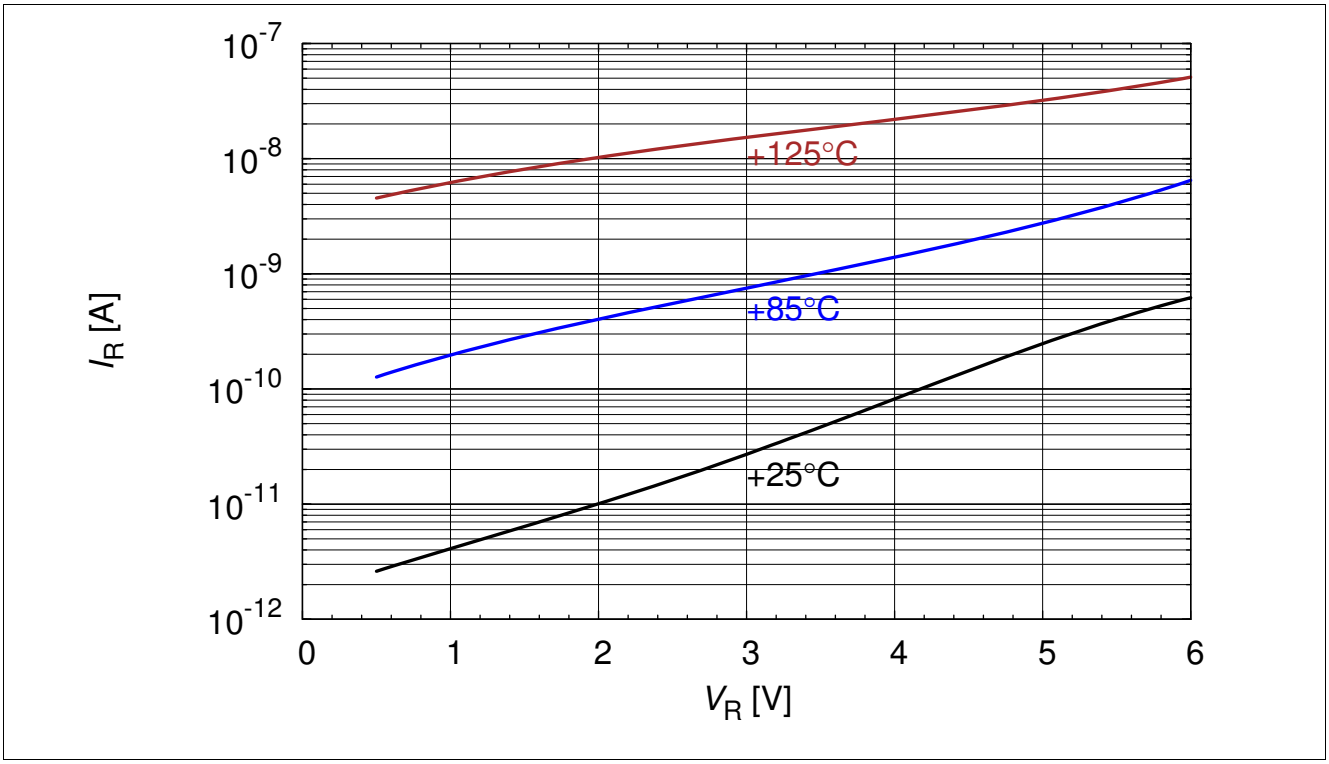


Figure 2-2 Reverse current: $I_R = f(V_R)$, T_A = parameter

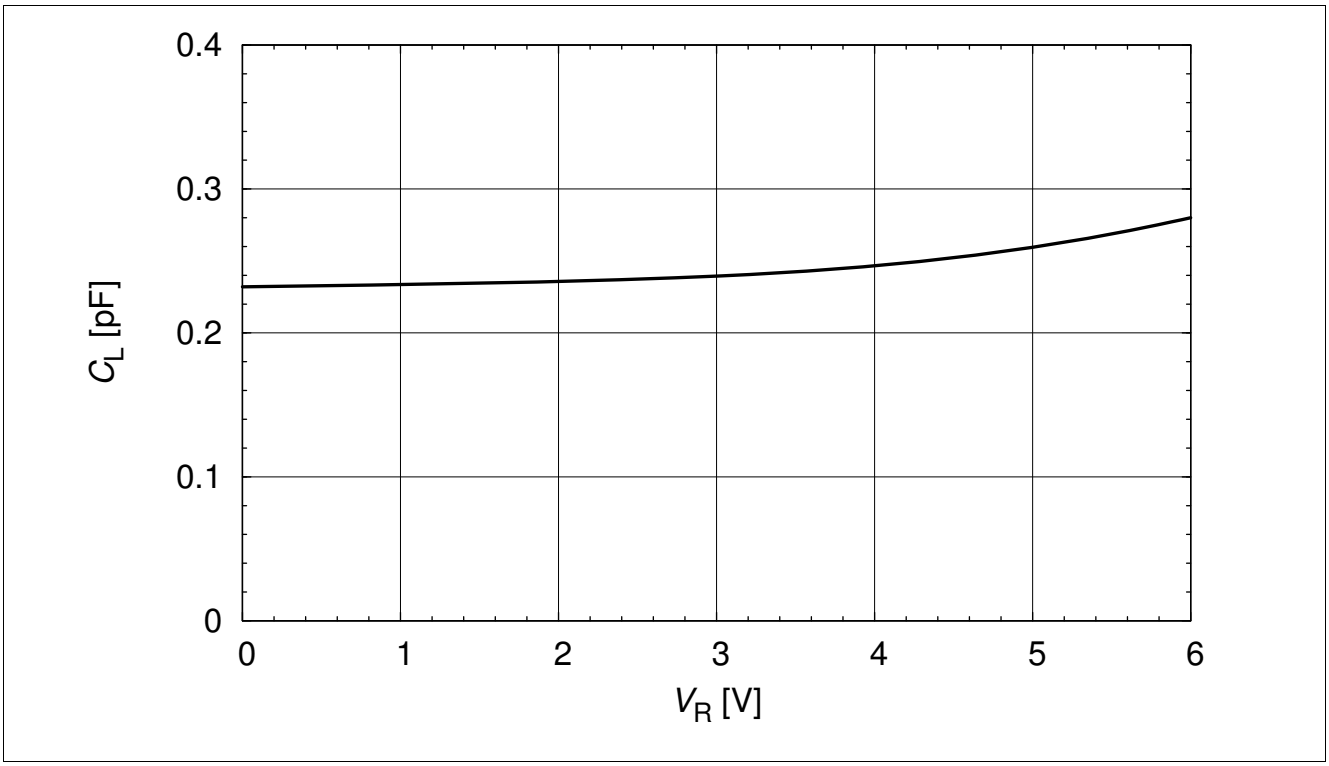


Figure 2-3 Line capacitance: $C_L = f(V_R)$, f = 1 MHz

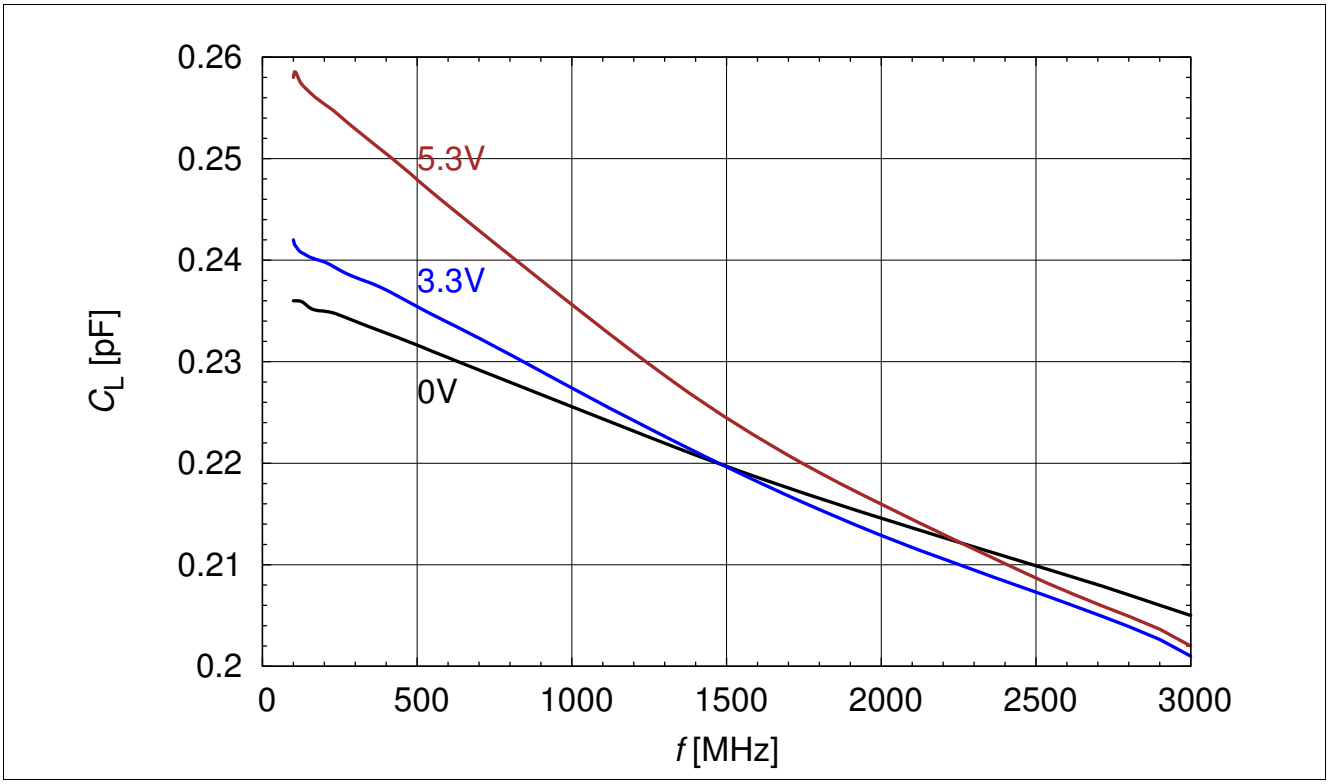


Figure 2-4 Line capacitance: $C_L = f(f)$, V_R = parameter

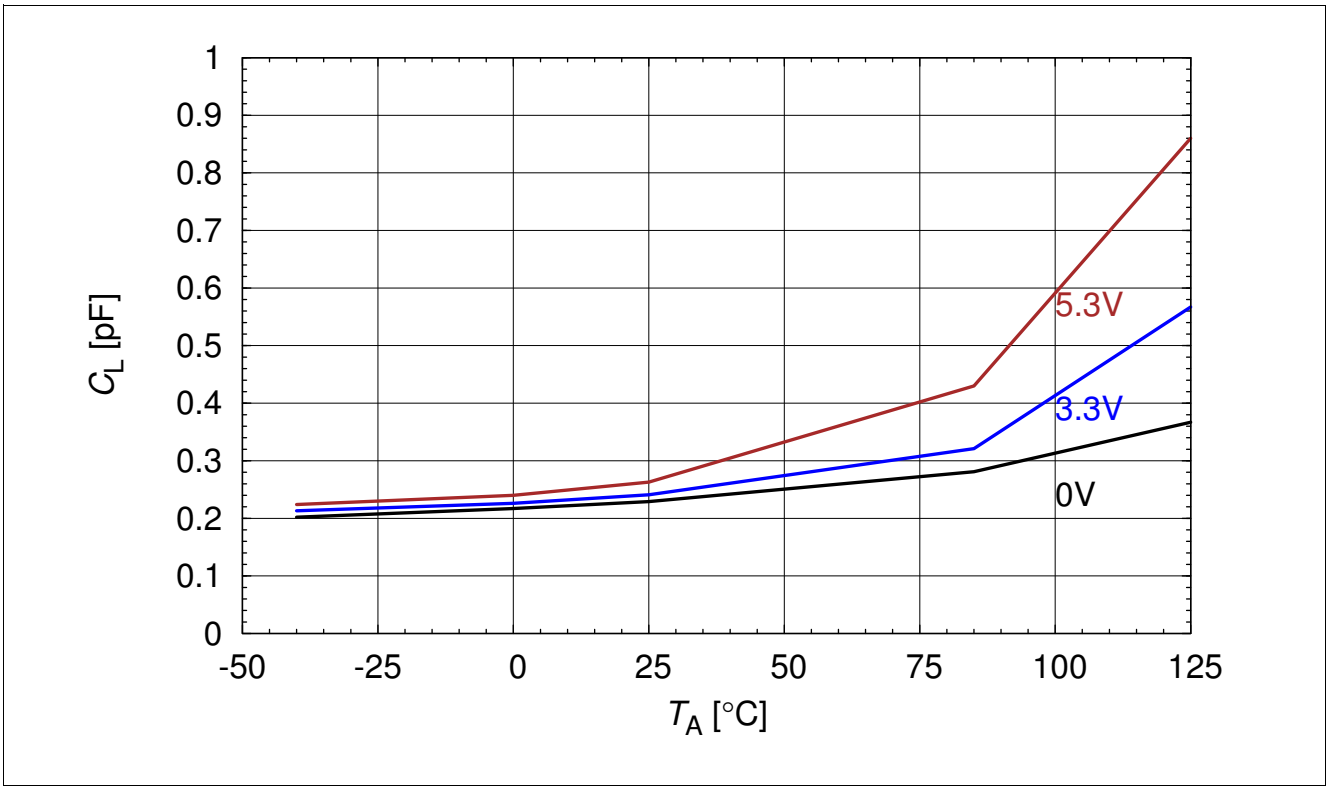


Figure 2-5 Line capacitance: $C_L = f(T_A)$, V_R = parameter

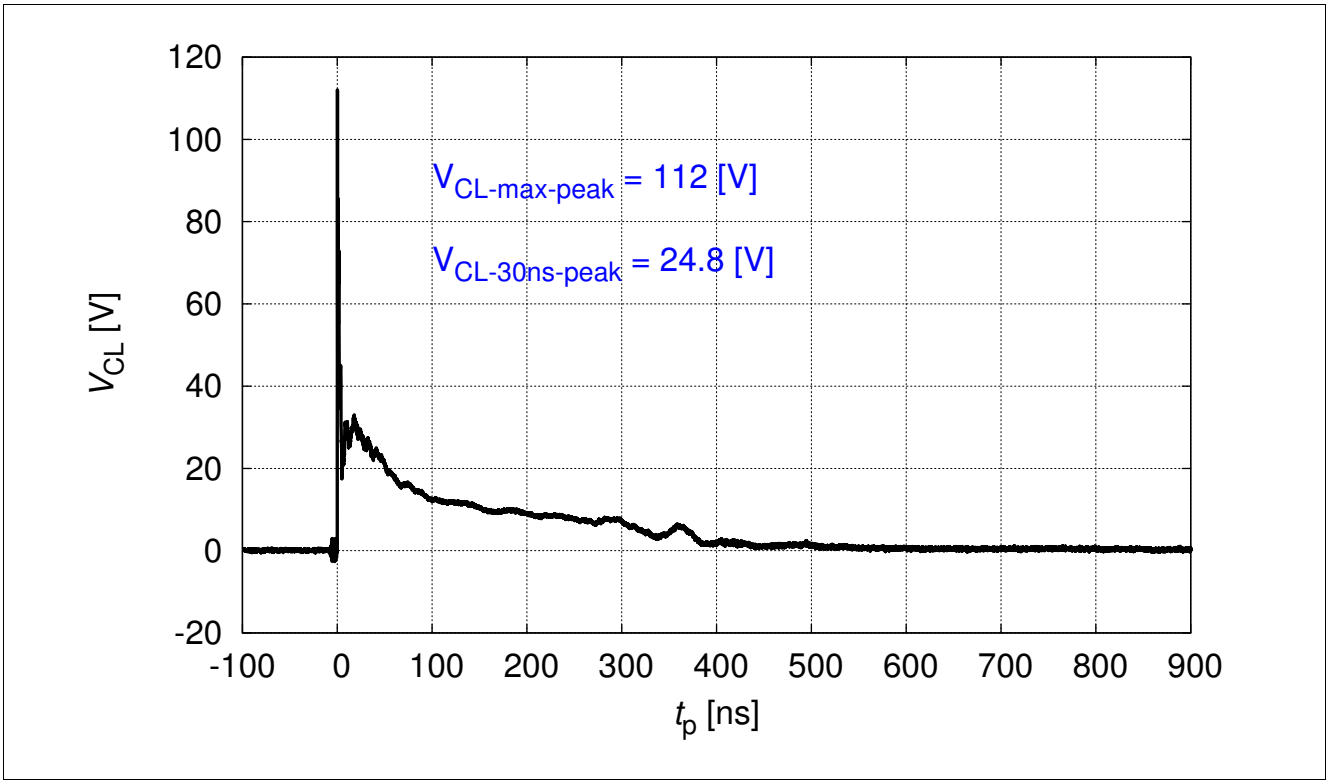


Figure 2-6 IEC61000-4-2 V_{CL} = *f*(*t*), 8 kV positiv pulse from pin 1 to pin 2

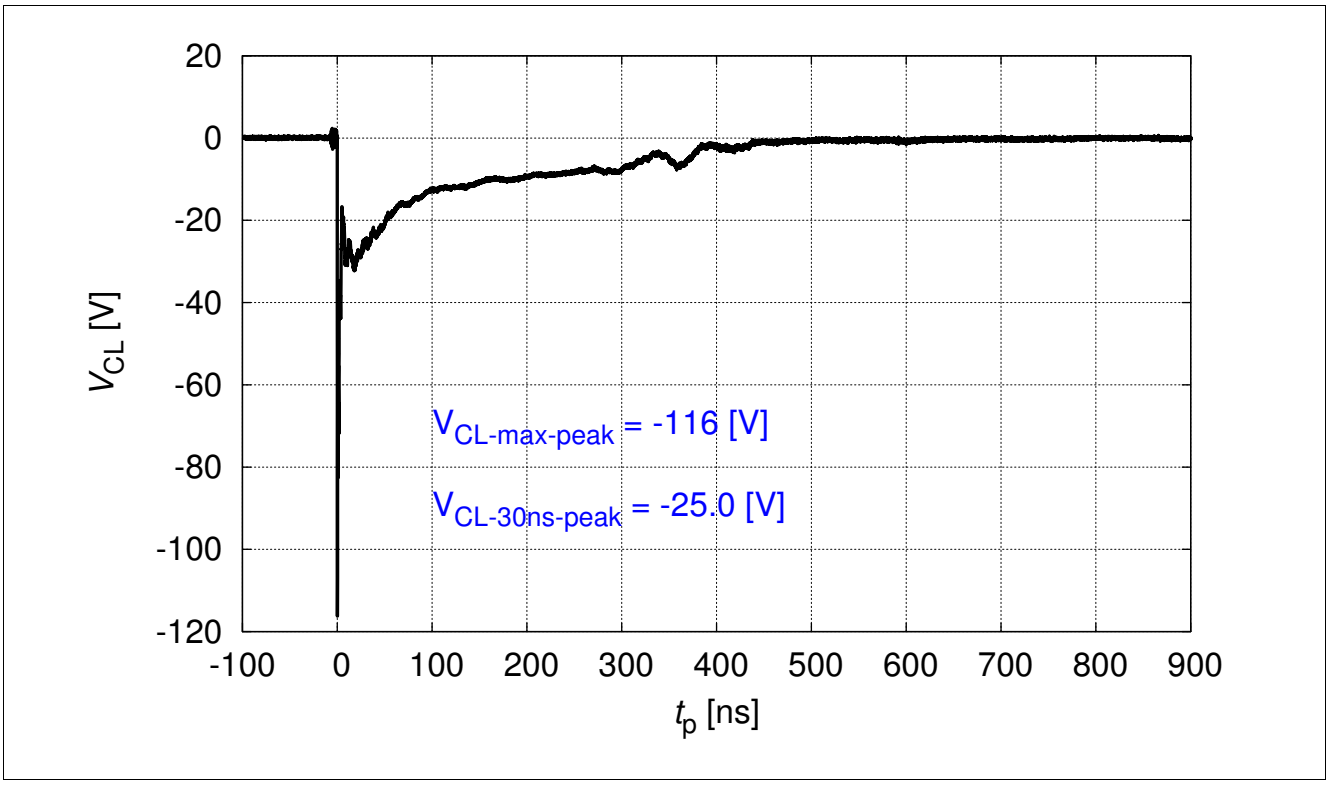


Figure 2-7 IEC61000-4-2 V_{CL} = *f*(*t*), 8 kV negativ pulse from pin 1 to pin 2

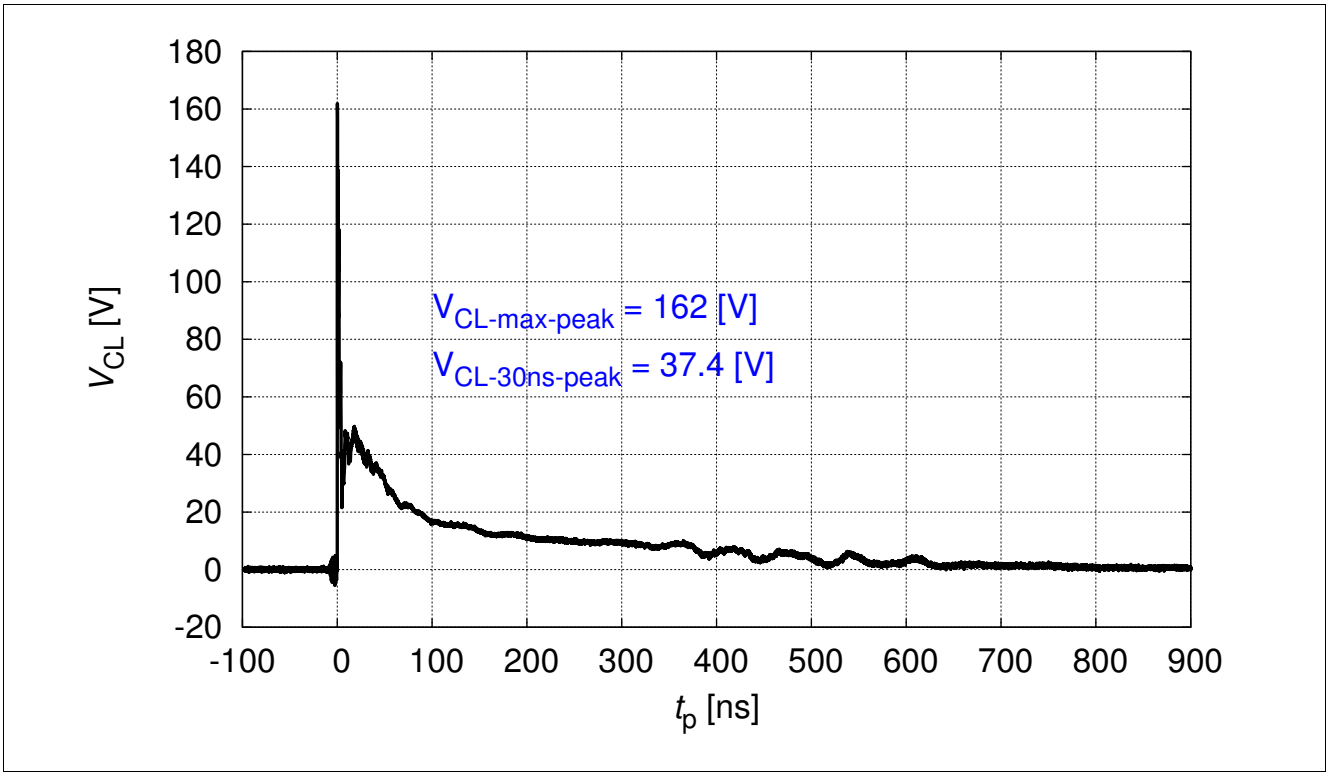


Figure 2-8 IEC61000-4-2 V_{CL} = $f(t)$, 15 kV positiv pulse from pin 1 to pin 2

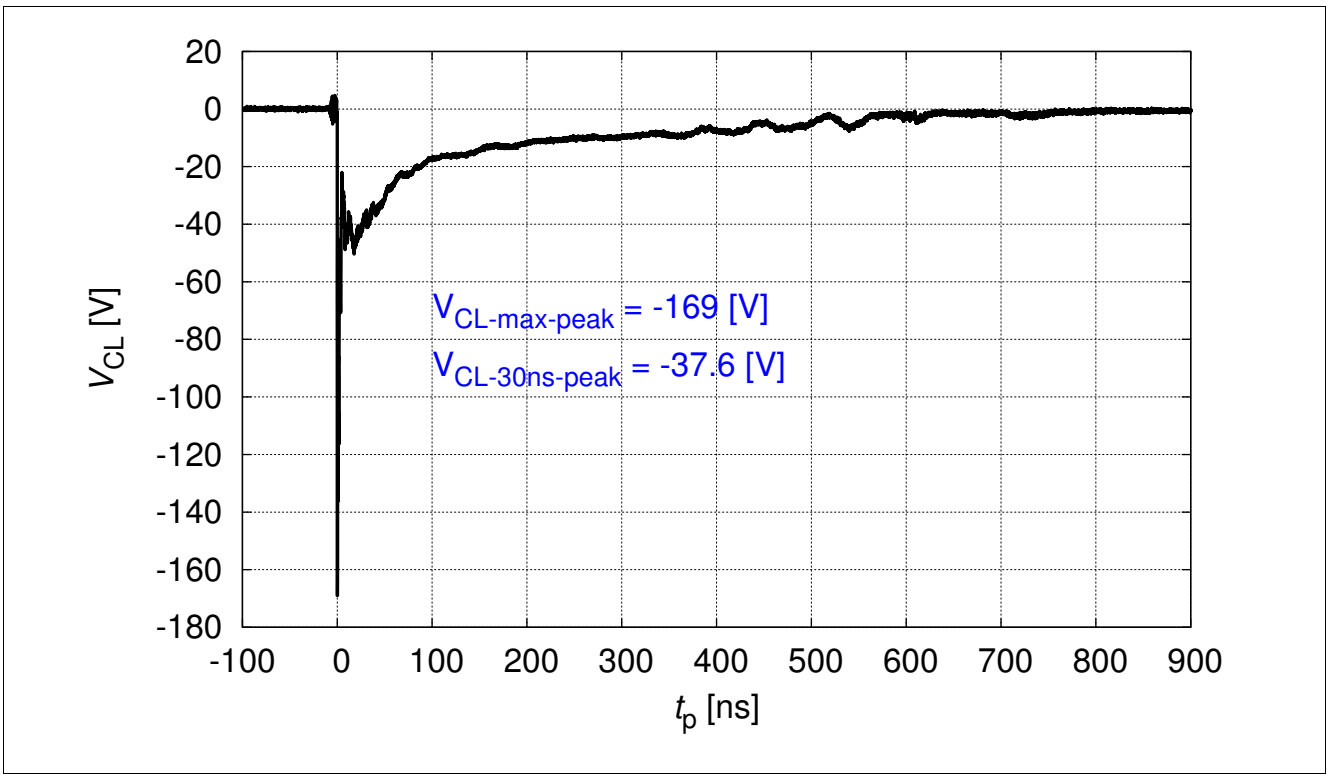


Figure 2-9 IEC61000-4-2 V_{CL} = $f(t)$, 15 kV negativ pulse from pin 1 to pin 2

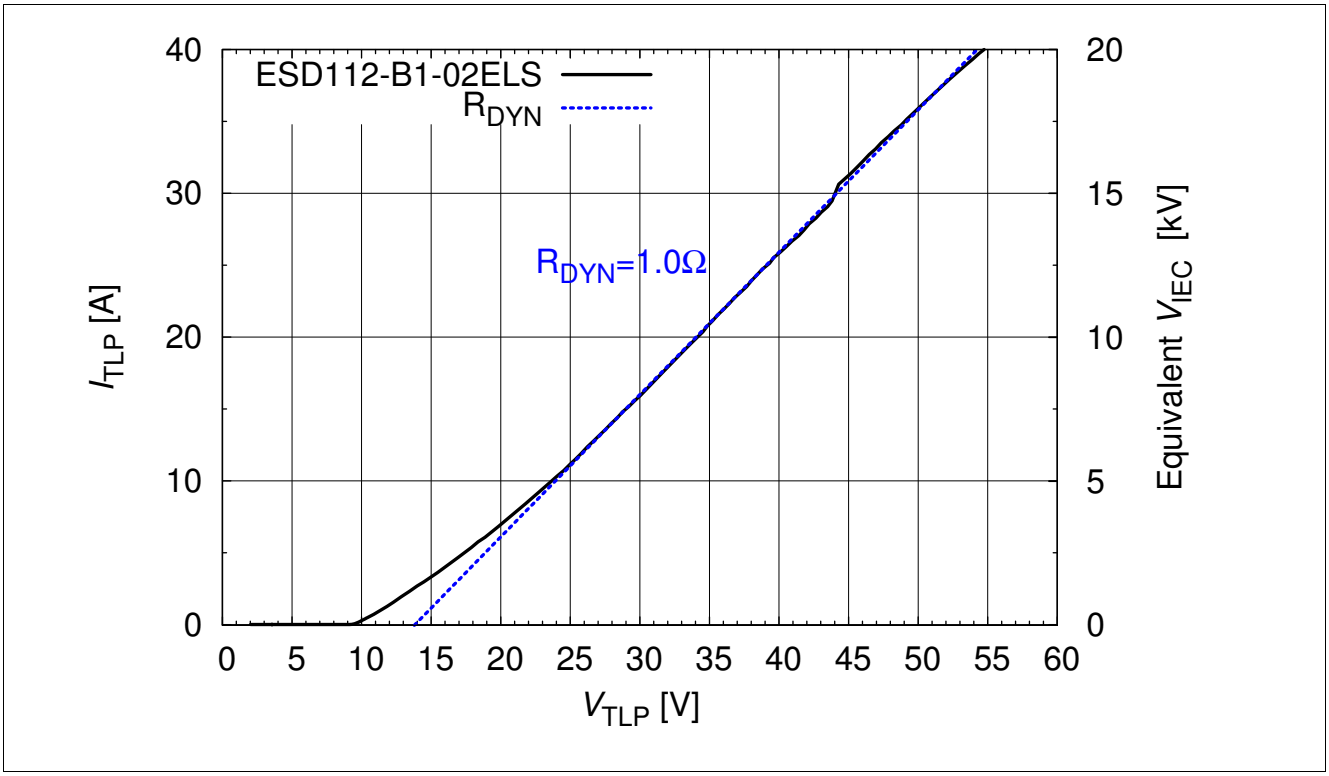


Figure 2-10 Clamping voltage : $I_{TLP} = f(V_{TLP})$ [4]

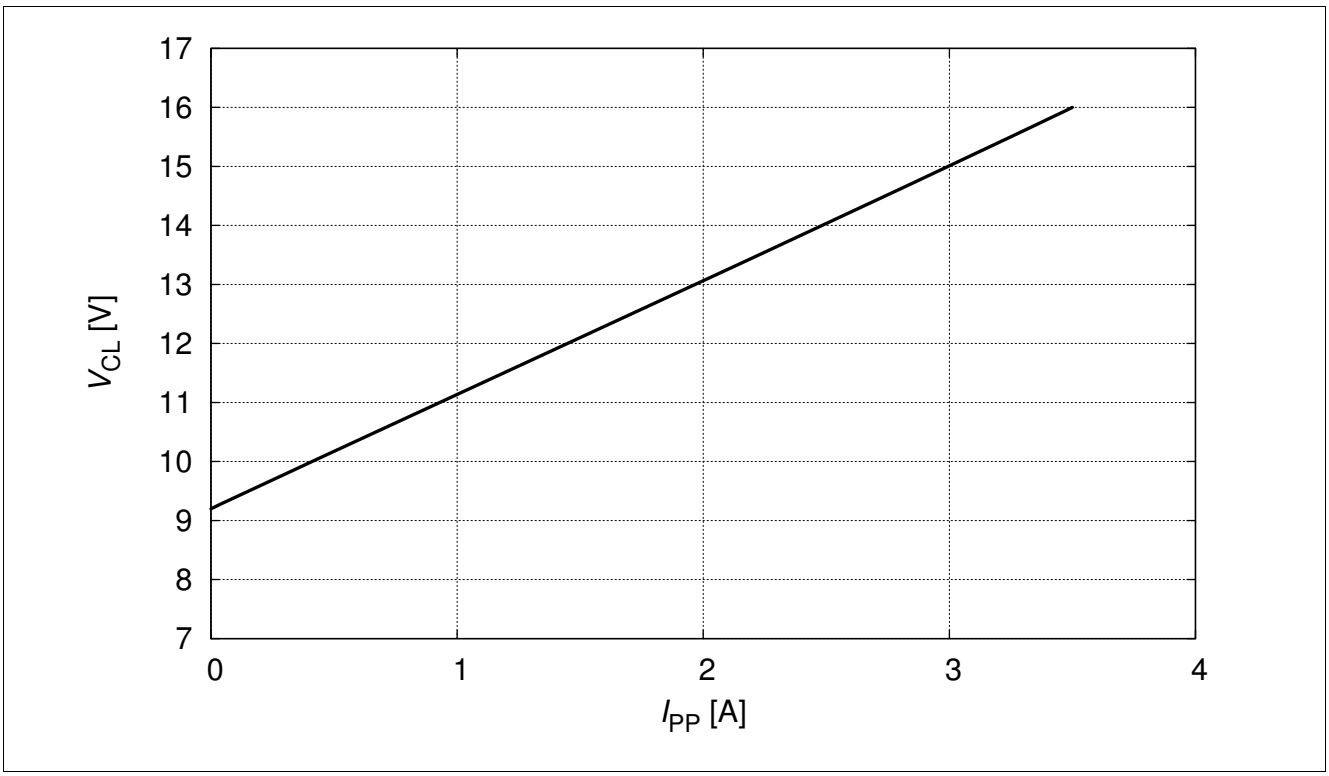


Figure 2-11 Clampine voltage: $V_{CL} = f(I_{PP})$, t_p = 8/20 µs

3 Application Information

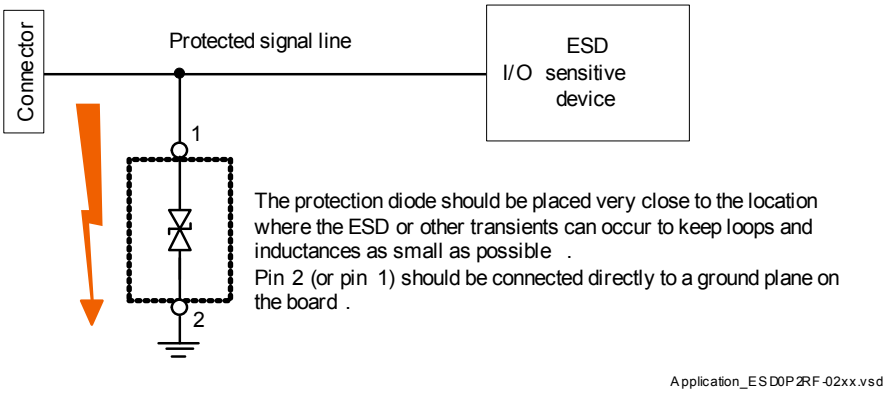


Figure 3-1 Single line, bi-directional ESD / Transient protection [1], [2]

4 Package Information

4.1 TSSLP-2-4 (mm) [5]

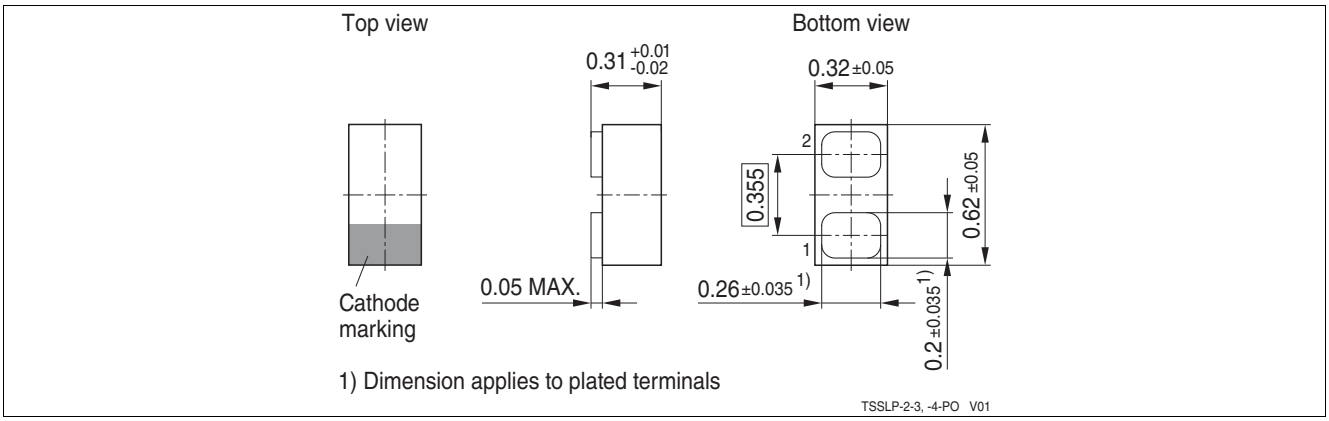


Figure 4-1 TSSLP-2-4 Package overview

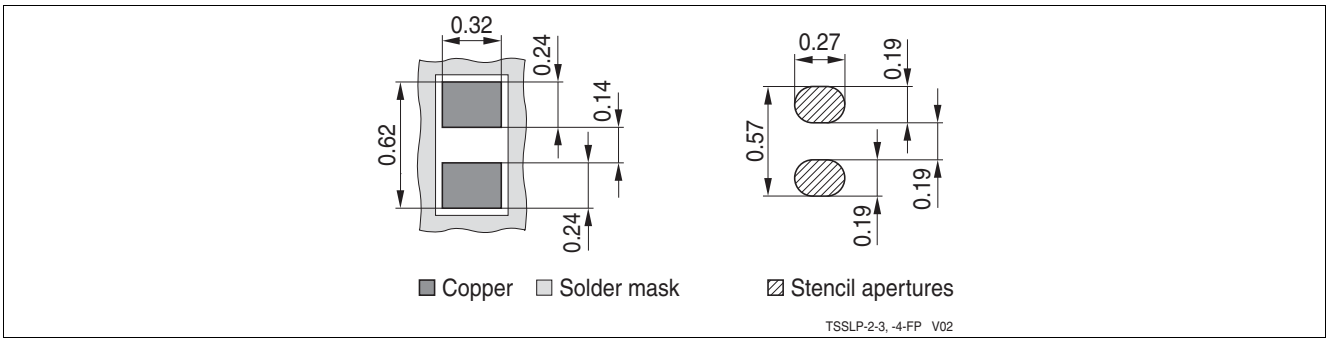


Figure 4-2 TSSLP-2-4: Footprint

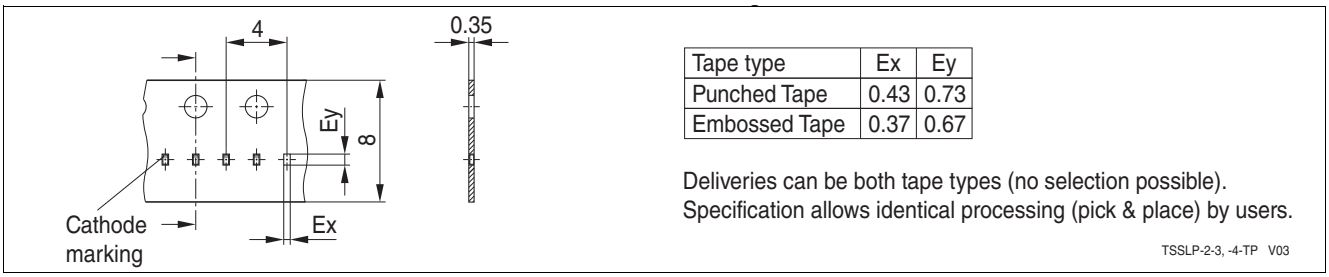


Figure 4-3 TSSLP-2-4: Packing

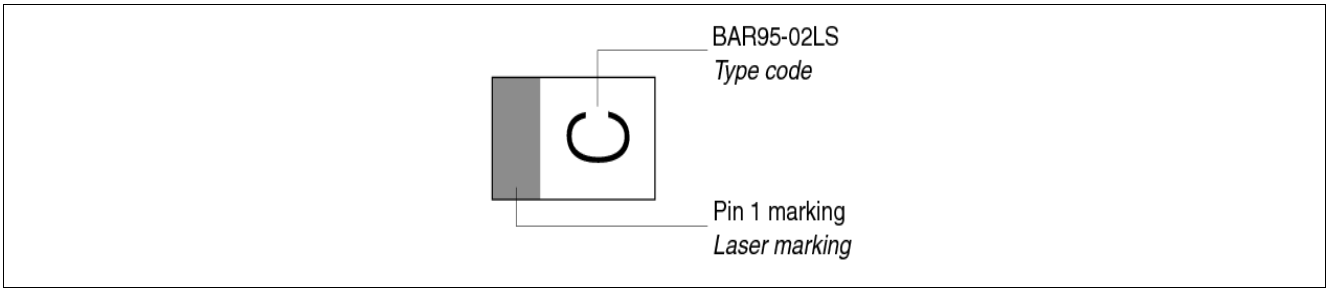


Figure 4-4 TSSLP-2-4: Marking (example)

4.2 TSLP-2-20 (mm) [5]

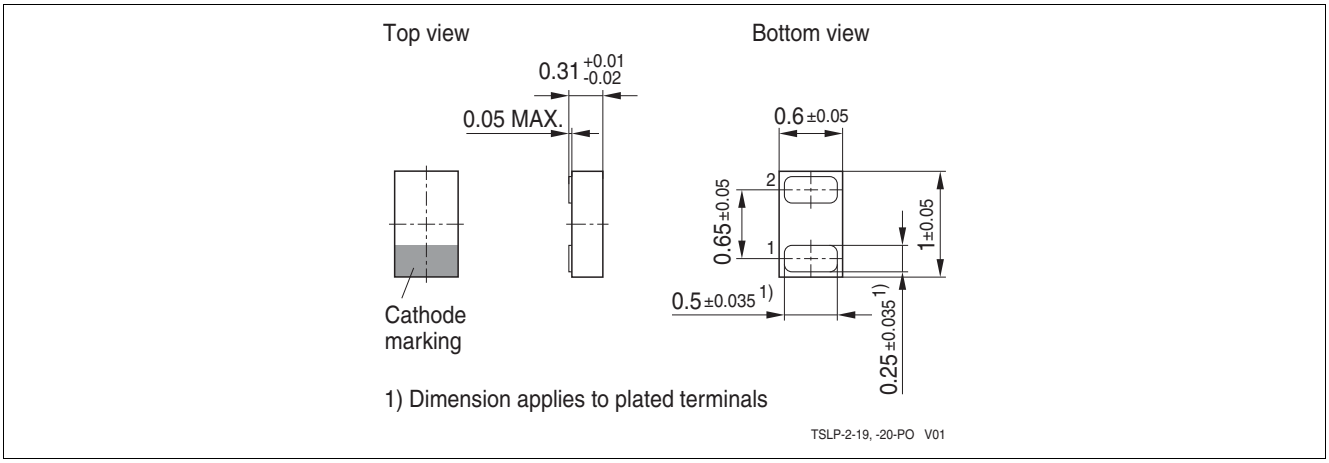


Figure 4-5 TSLP-2-20: Package overview

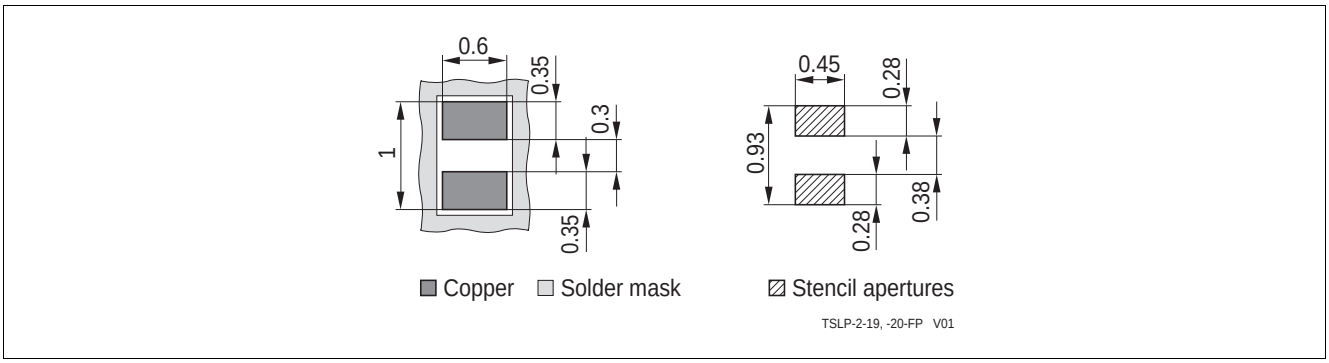


Figure 4-6 TSLP-2-20: Footprint

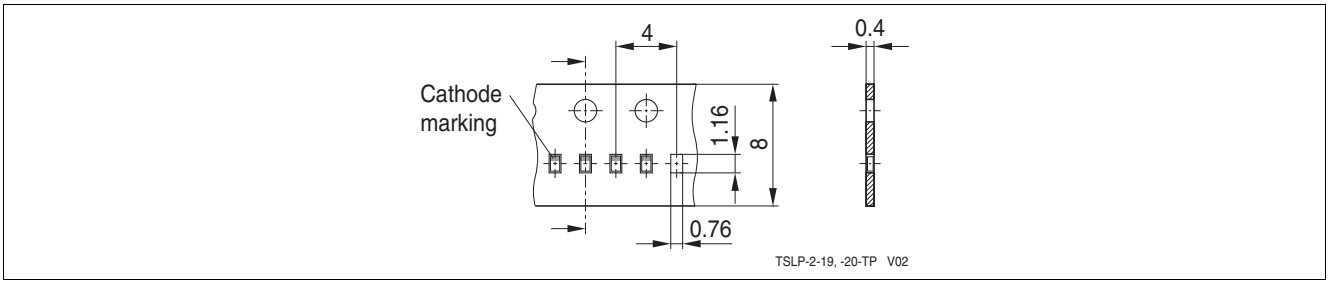


Figure 4-7 TSLP-2-20: Packing

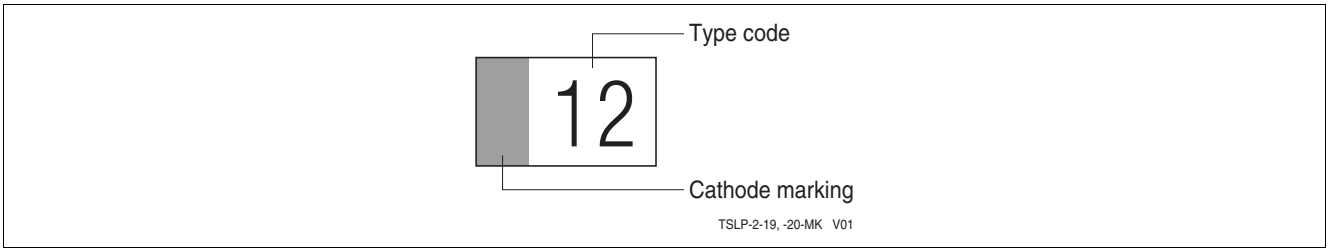


Figure 4-8 TSLP-2-20: Marking (example)

References

[1] Infineon AG - **Application Note AN167**: ESD Protection for Broadband LNA BGA728L7 for Portable and Mobile TV Applications

[2] Infineon AG - **Application Note AN178**: ESD Protection for RF Antennas using Infineon ESD0P4RFL and ESD0P2RF-xx

[3] Infineon AG - **Application Note AN200**: Low Cost FM Radio LNA using BFR340F for Mobile Phone Applications

[4] Infineon AG - **Application Note AN210**: Effective ESD Protection Design at System Level using VF-TLP Characterization Methodology

[5] Infineon AG - Recommendations for PCB Assembly of Infineon TSLP and TSSLP Packages

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