

TVS3V3L4U

Protection device

TVS (transient voltage suppressor)

Bi/uni-directional, 3.3 V, 2 pF, RoHS and halogen free compliant

Feature list

- 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): ± 20 A (8/20 μ s)
- Reverse working voltage up to: $V_{RWM} = 3.3$ V
- Low leakage current: $I_R < 50$ nA
- Low capacitance: $C_L = 2$ pF (typical, I/O to GND), 1 pF (typical, I/O to I/O)
- Low clamping voltage: $V_{CL} = 7.7$ V (typical) at $I_{pp} = 20$ A (8/20 μ s)
- Pb-free (RoHS compliant) and halogen free package



Potential applications

- 10/100/1000 Ethernet
- 4 lines uni-directional (pin 1, 3, 4, 6 to GND)
- 2 lines bi-directional (pin 2 n.c.)

Product validation

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

Device information

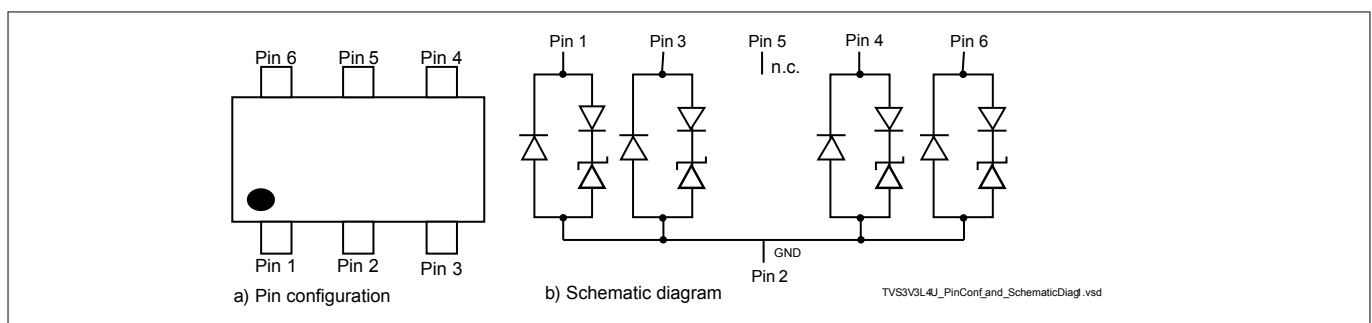


Figure 1 Pin configuration and schematic diagram

Table 1 Part information

Type	Package	Configuration	Marking code
TVS3V3L4U	SC74-6-2	4-lines uni-directional or 2-lines bi-directional	E1s

Table of contents

	Feature list	1
	Potential applications	1
	Product validation	1
	Device information	1
	Table of contents	2
1	Maximum ratings	3
2	Electrical characteristics	4
3	Typical characteristic diagrams	6
4	Package information	12
4.1	SC74-6-2 package	12
5	References	13
	Revision history	13
	Disclaimer	14

Maximum ratings

1 Maximum ratings

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

Table 2 Maximum ratings

Parameter	Symbol	Values		Unit	Note or test condition
		Min.	Max.		
ESD discharge ¹⁾	V_{ESD}	-30	30	kV	air
		-30	30		contact
Peak pulse current	I_{pp}	-20	20	A	$t_p = 8/20\ \mu\text{s}$ ²⁾
Peak pulse power	P_{PK}	-	154	W	$t_p = 8/20\ \mu\text{s}$ ²⁾
		-	1044		$t_p = 100\ \text{ns}$ ³⁾
Operating temperature	T_{OP}	-55	125	°C	-
Storage temperature	T_{stg}	-55	150		-

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 V_{ESD} according to IEC61000-4-2

² I_{pp} according to IEC61000-4-5. P_{PK} is calculated by $I_{pp} \times V_{CL}$

³ Please refer to AN210 [1]. P_{PK} is calculated by $I_{TLP} \times V_{CL}$

Electrical characteristics

2 Electrical characteristics

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

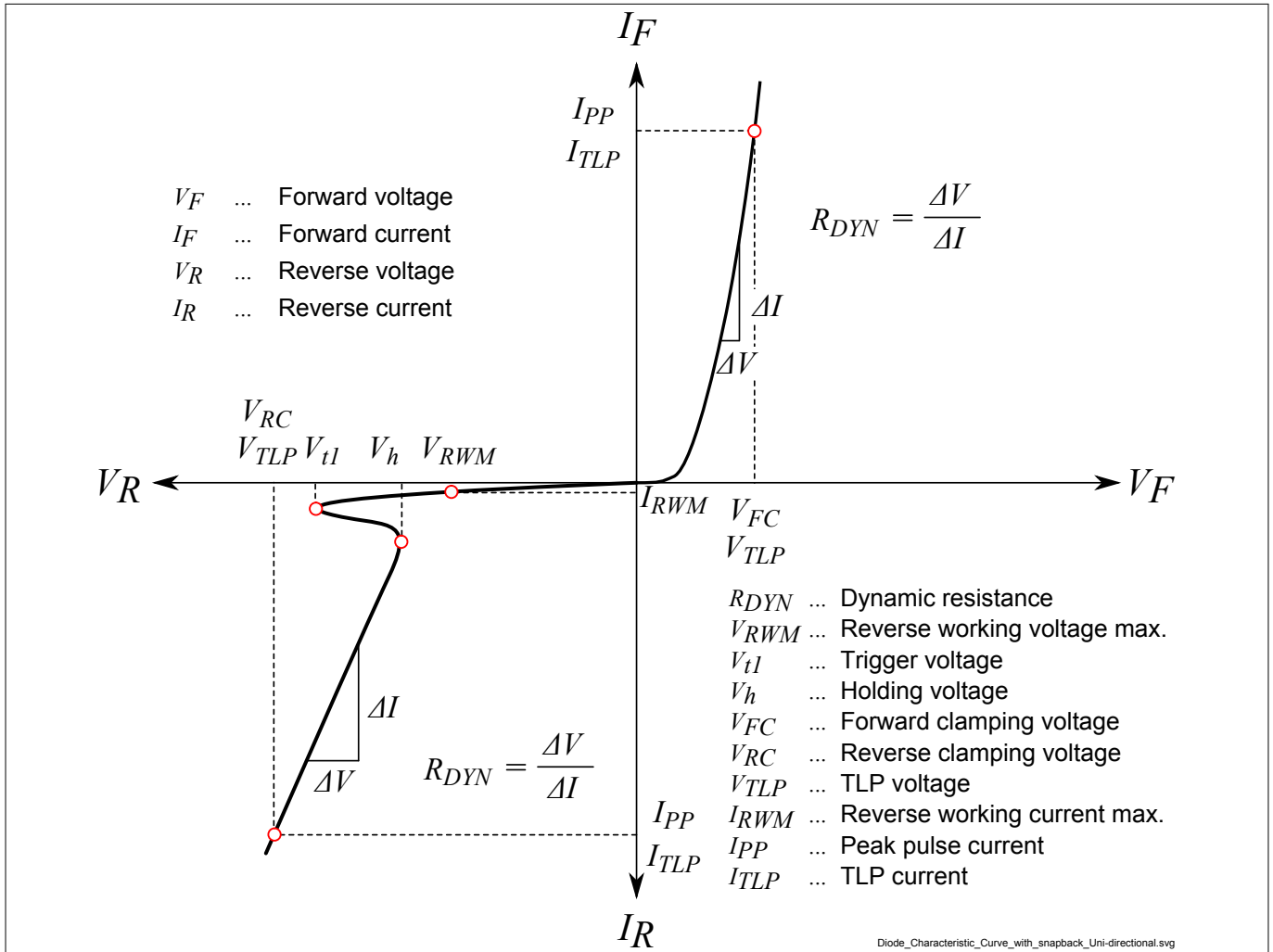


Figure 2 Definitions of electrical characteristics

Electrical characteristics

Table 3 DC characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Reverse working voltage	V_{RWM}	–	–	3.3	V	–
Reverse current	I_R	–	–	50	nA	$V_R = 3.3$ V

Table 4 RF characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Line capacitance	C_L	–	2	3	pF	I/O to GND, $V_R = 0$ V, $f = 1$ MHz
		–	1	–		I/O to I/O, $V_R = 0$ V, $f = 1$ MHz

Table 5 ESD characteristics

Parameter	Symbol	Values			Unit	Note or test condition
		Min.	Typ.	Max.		
Reverse clamping voltage ¹⁾	V_{CL}	–	4.2	–	V	I/O to GND, $t_p = 8/20$ μ s, $I_{PP} = 1$ A
		–	4.9	–		I/O to GND, $t_p = 8/20$ μ s, $I_{PP} = 5$ A
		–	5.8	–		I/O to GND, $t_p = 8/20$ μ s, $I_{PP} = 10$ A
		–	6.7	–		I/O to GND, $t_p = 8/20$ μ s, $I_{PP} = 15$ A
		–	7.7	–		I/O to GND, $t_p = 8/20$ μ s, $I_{PP} = 20$ A
Reverse clamping voltage ²⁾		–	5.8	–		I/O to GND, $t_p = 100$ ns, $I_{PP} = 16$ A
Forward clamping voltage ¹⁾	V_{FC}	–	1.1	–		GND to I/O, $t_p = 8/20$ μ s, $I_{PP} = 1$ A
		–	4	–		GND to I/O, $t_p = 8/20$ μ s, $I_{PP} = 20$ A
Forward clamping voltage ²⁾		–	3.1	–		GND to I/O, $t_p = 100$ ns, $I_{PP} = 16$ A
Dynamic resistance ¹⁾	R_{DYN}	–	0.15	–	Ω	I/O to GND, $t_p = 8/20$ μ s
Dynamic resistance ²⁾		–	0.09	–		I/O to GND, $t_p = 100$ ns

¹⁾ I_{PP} according to IEC61000-4-5

²⁾ Please refer to application note AN210 [1], TLP parameters: $Z_0 = 50$ Ω , $t_p = 100$ ns, $t_r = 300$ ps, averaging window: $t_1 = 30$ ns to $t_2 = 60$ ns, extraction of dynamic resistance using least squares fit of TLP characteristics between $I_{PP1} = 10$ A and $I_{PP2} = 40$ A

Typical characteristic diagrams

3 Typical characteristic diagrams

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

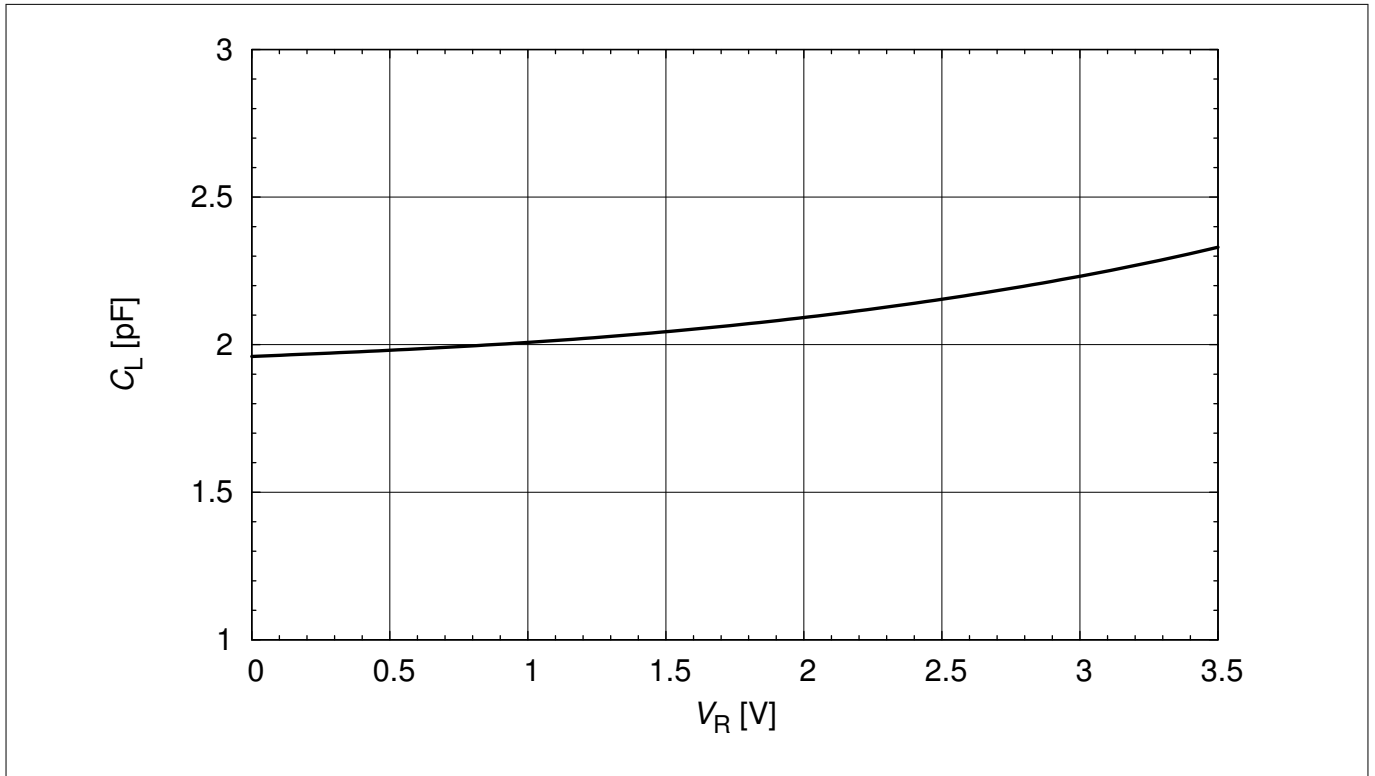


Figure 3 Line capacitance: $C_L = f(V_R)$

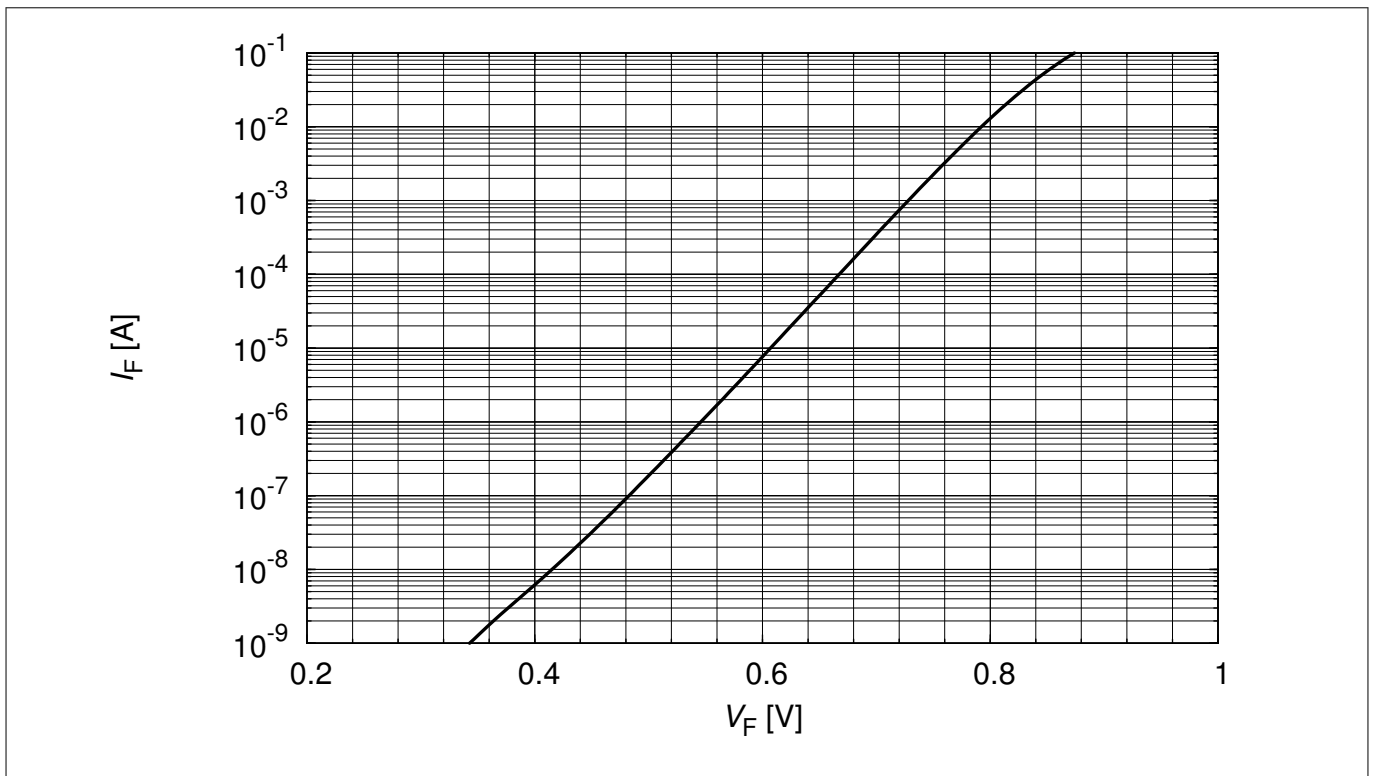


Figure 4 Forward characteristic: $I_F = f(V_F)$

Typical characteristic diagrams

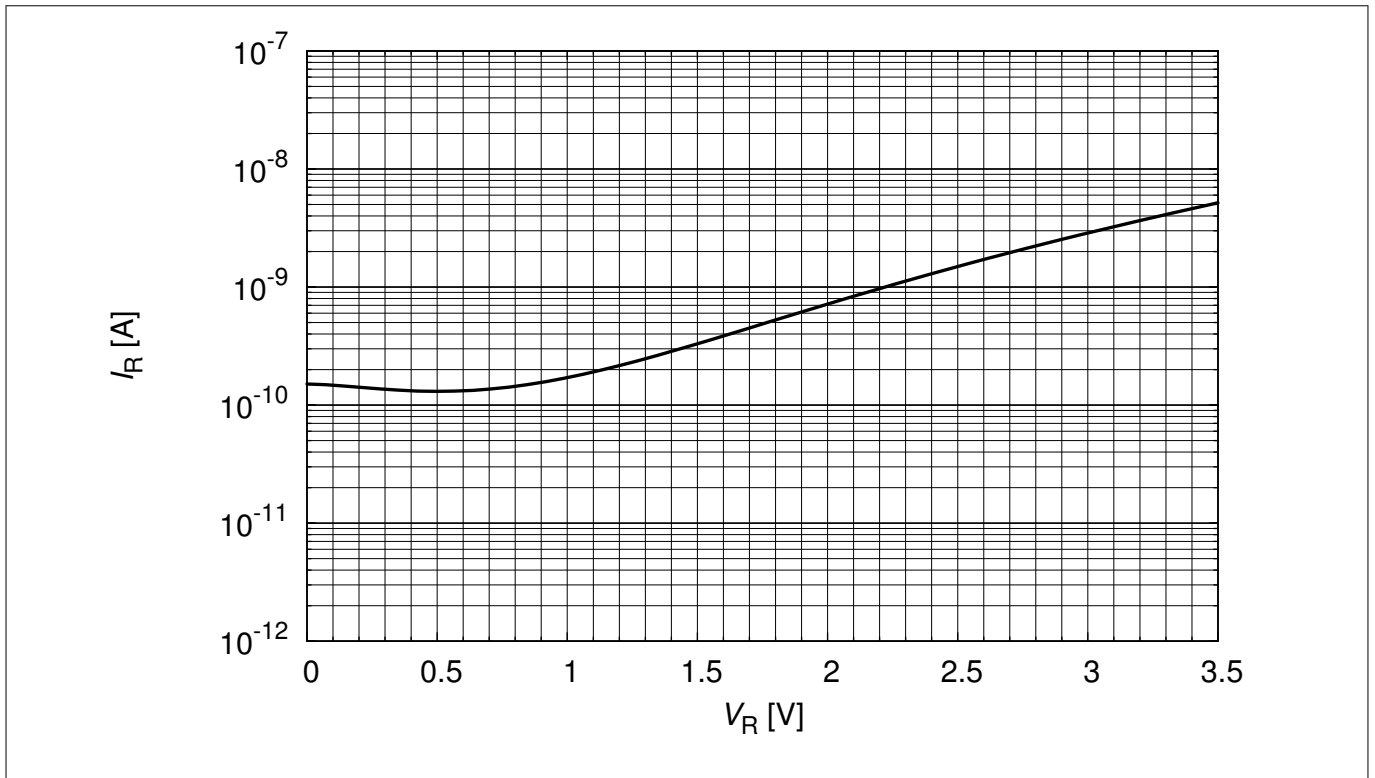


Figure 5 Reverse current: $I_R = f(V_R)$

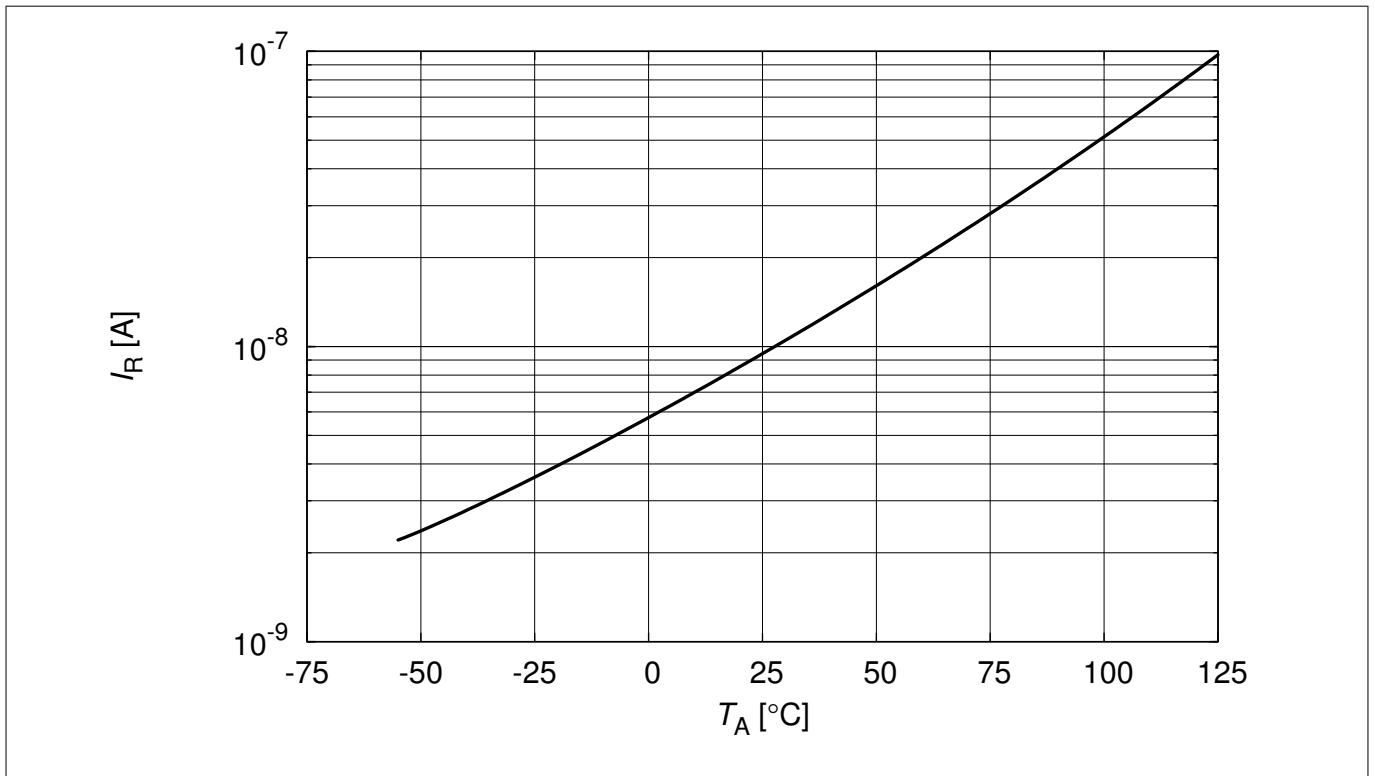


Figure 6 Reverse current: $I_R = f(T_A)$, $V_R = 3.3$ V

Typical characteristic diagrams

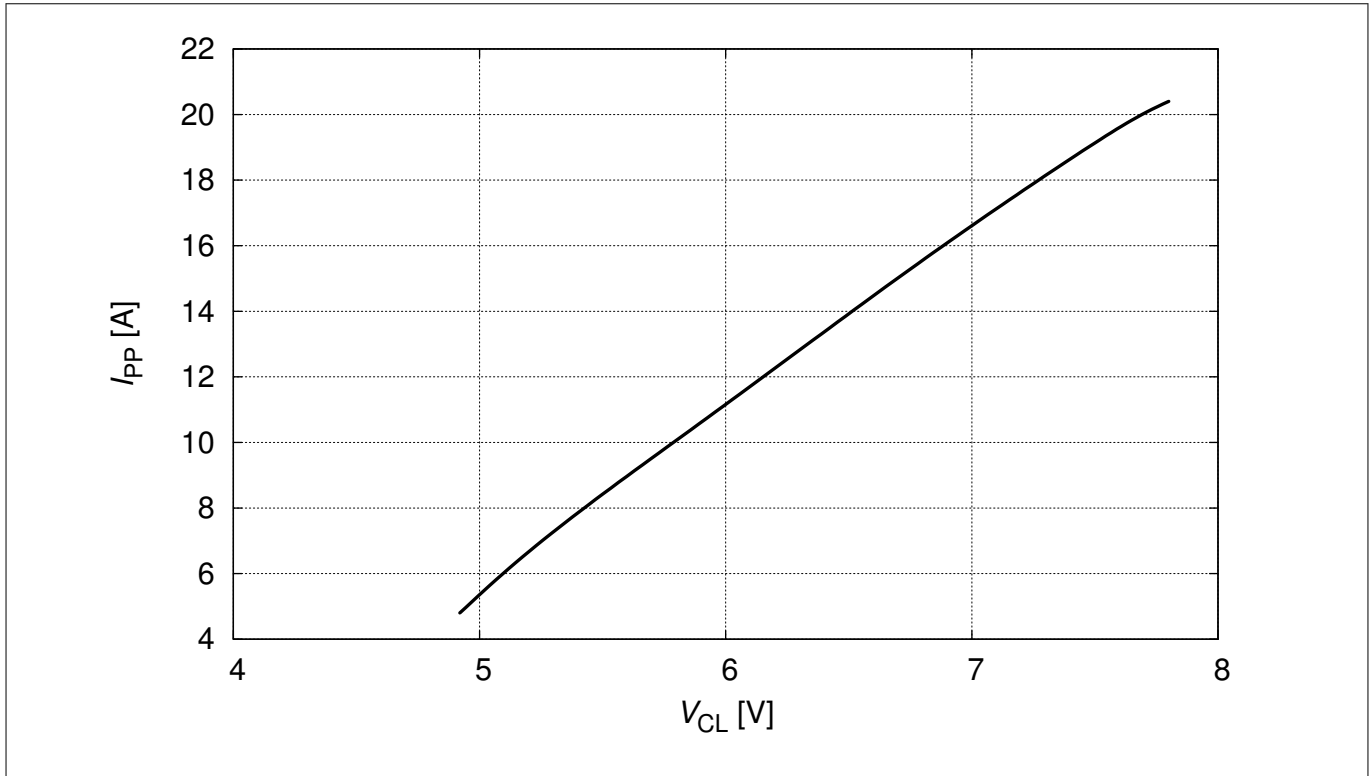


Figure 7 Pulse reverse current versus clamping voltage: $I_{PP} = f(V_{CL})$, according to IEC61000-4-5

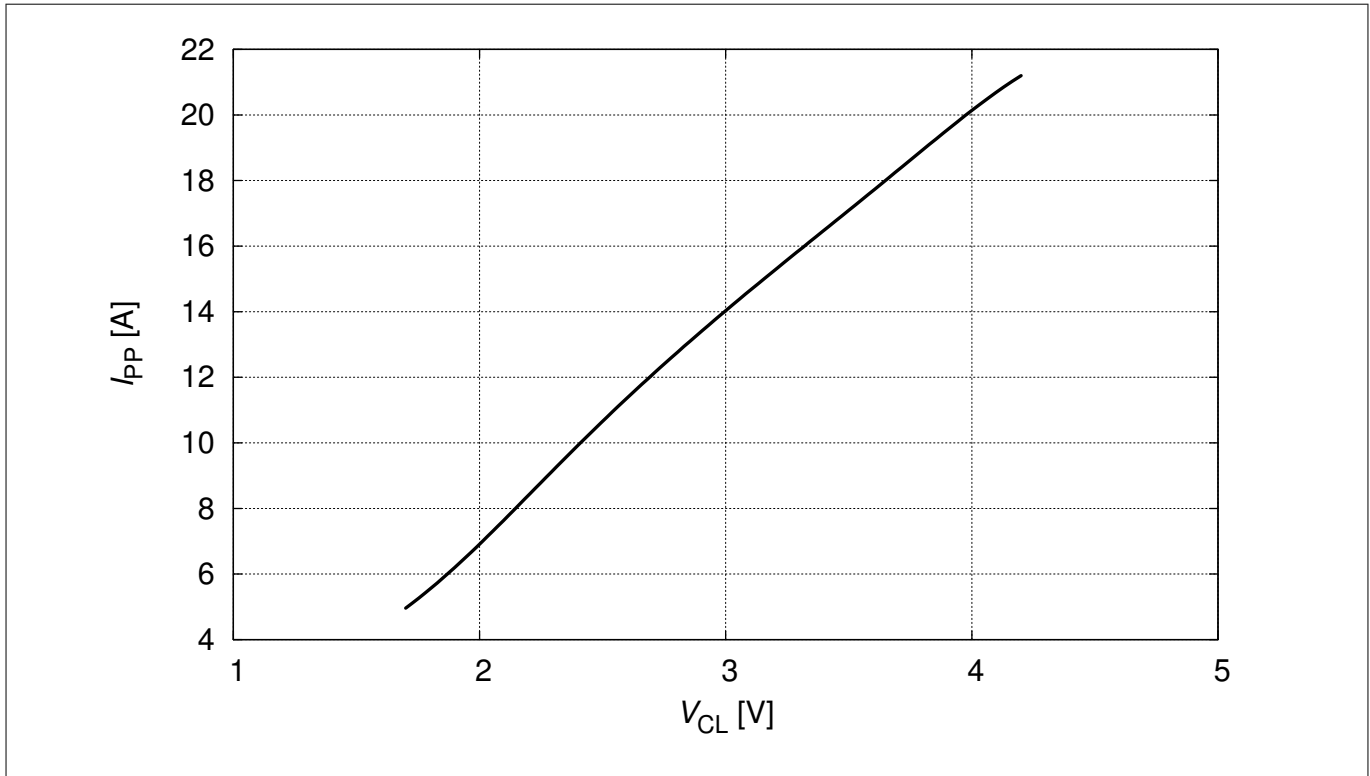


Figure 8 Pulse forward current versus clamping voltage: $I_{PP} = f(V_{CL})$, according to IEC61000-4-5

Typical characteristic diagrams

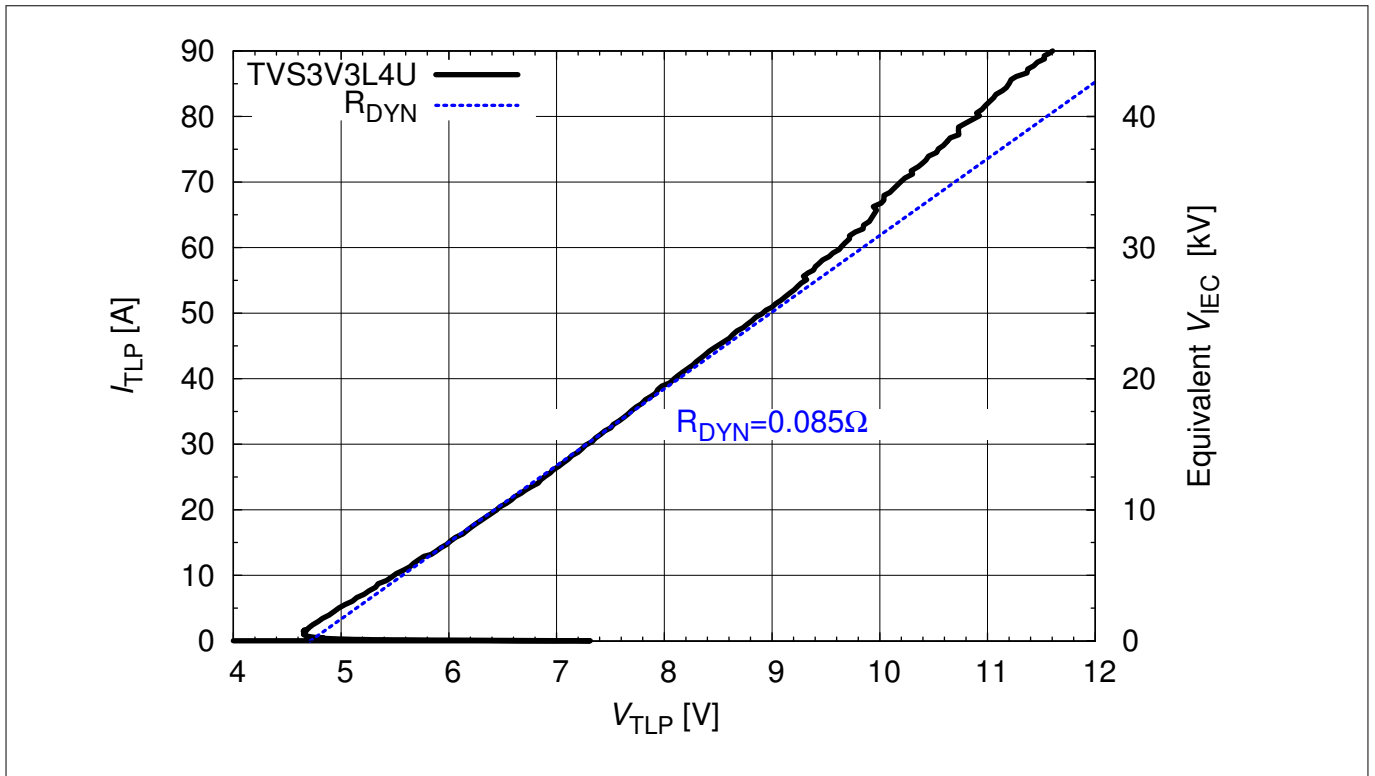


Figure 9 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$, reverse pulse [1]

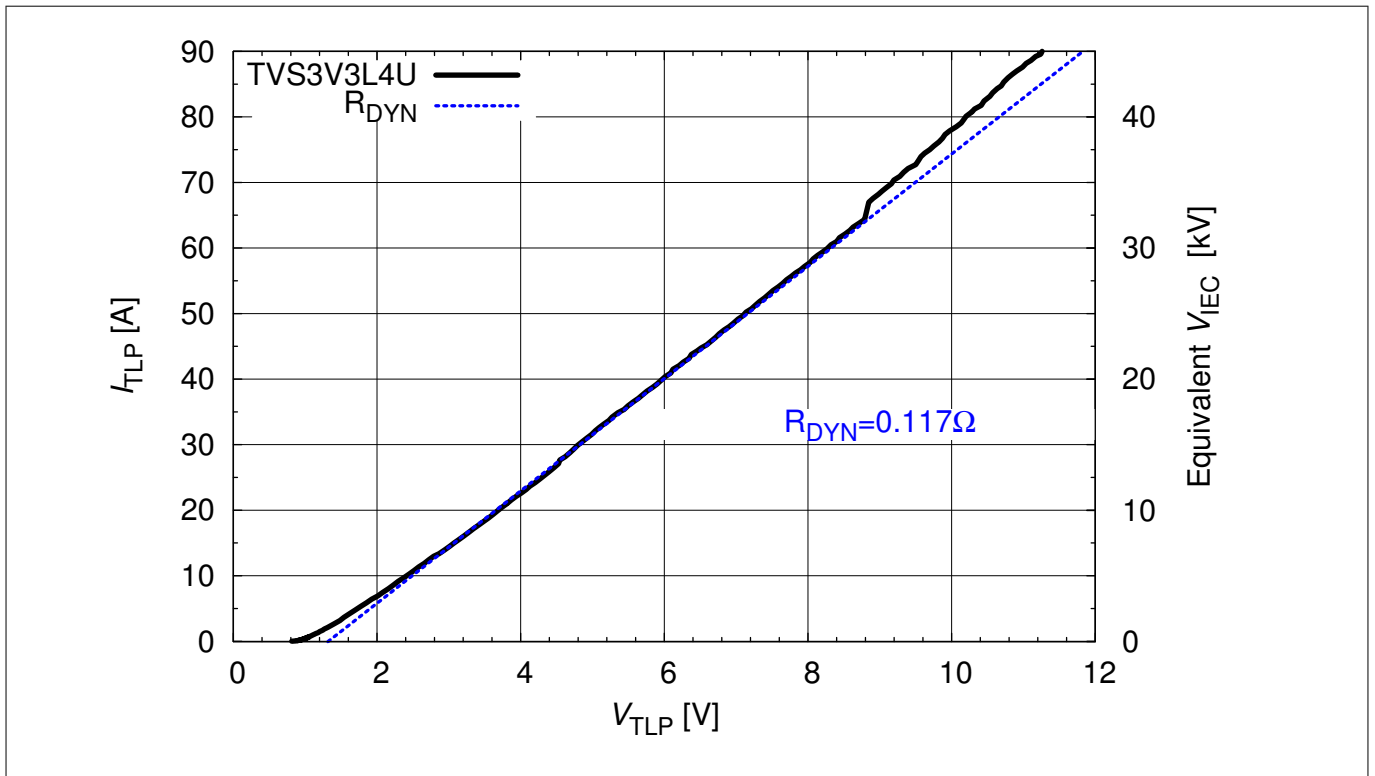


Figure 10 Clamping voltage (TLP): $I_{TLP} = f(V_{TLP})$, forward pulse [1]

Typical characteristic diagrams

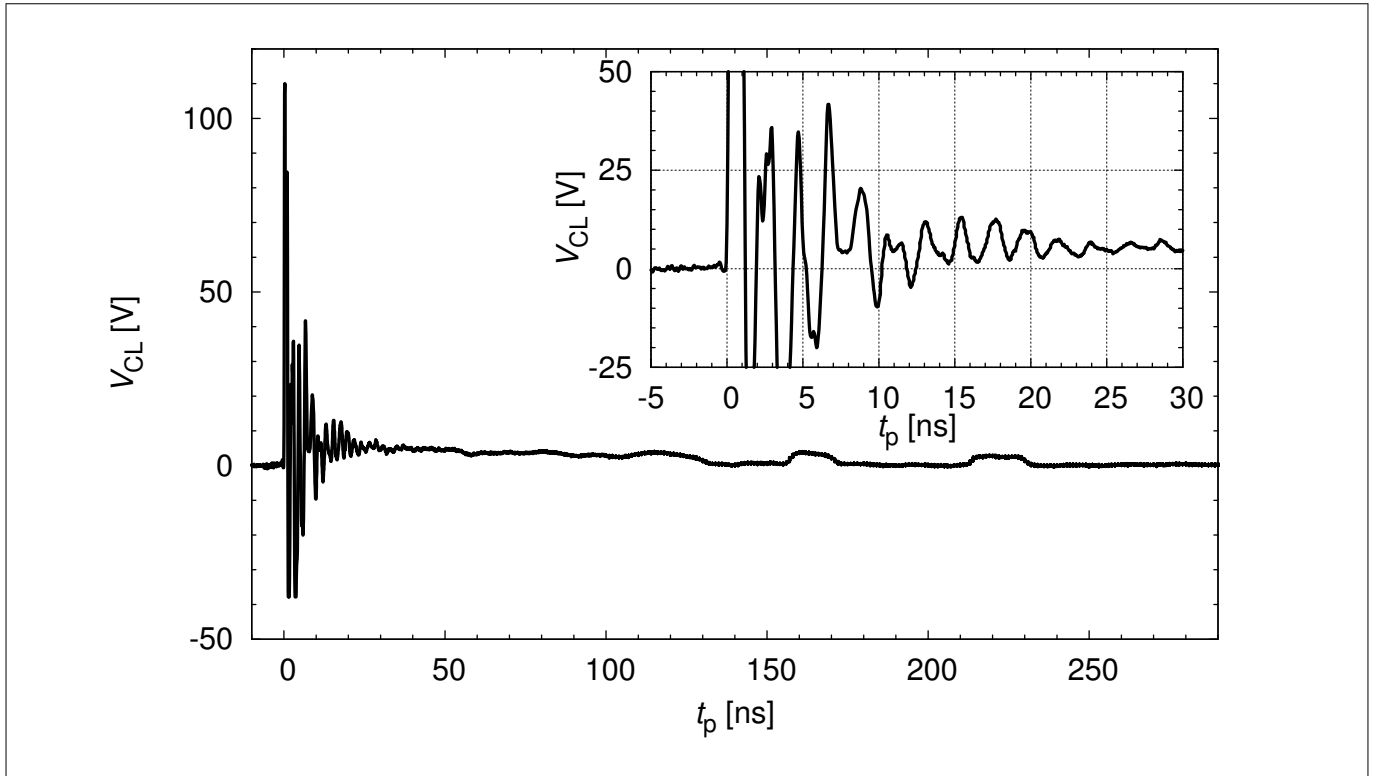


Figure 11 Clamping voltage (ESD): $V_{CL} = f(t)$, 8 kV positive pulse according to IEC61000-4-2

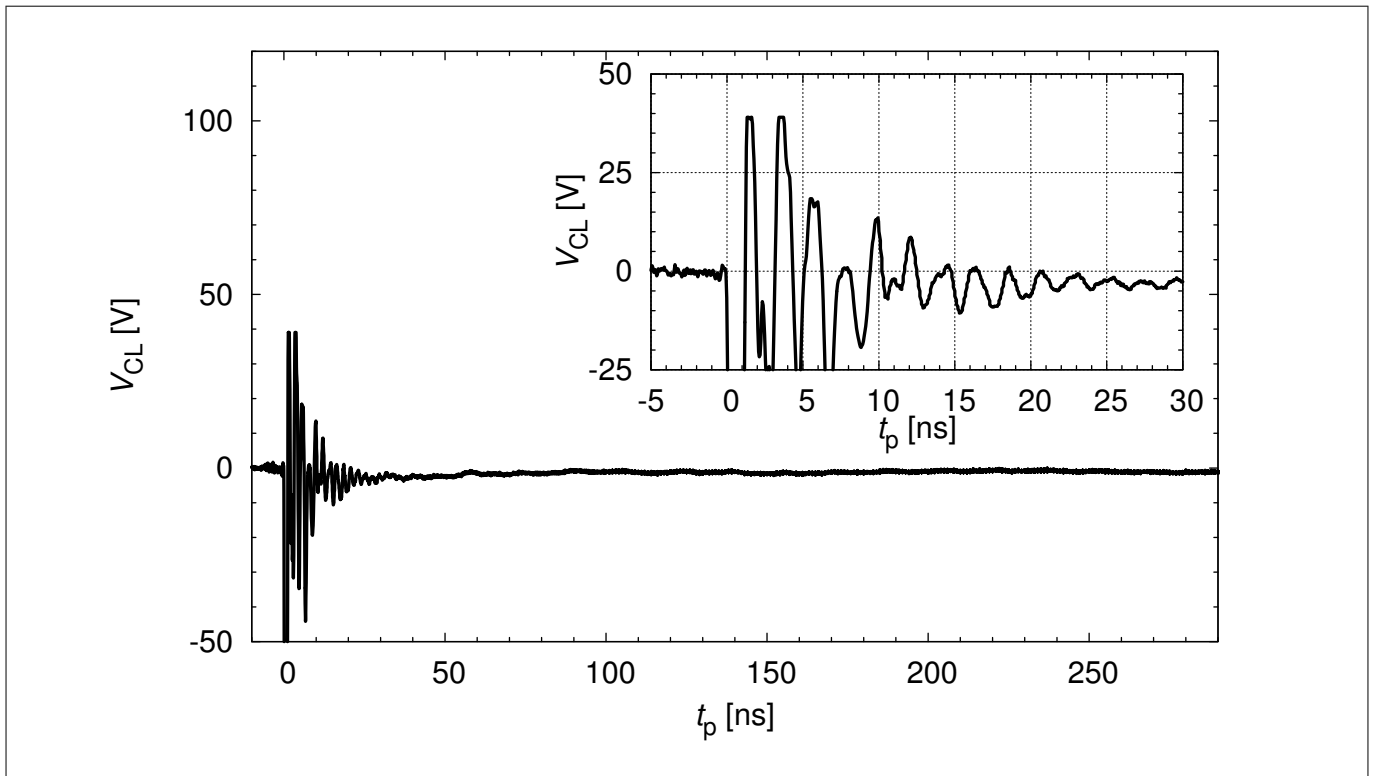


Figure 12 Clamping voltage (ESD): $V_{CL} = f(t)$, -8 kV negative pulse according to IEC61000-4-2

Typical characteristic diagrams

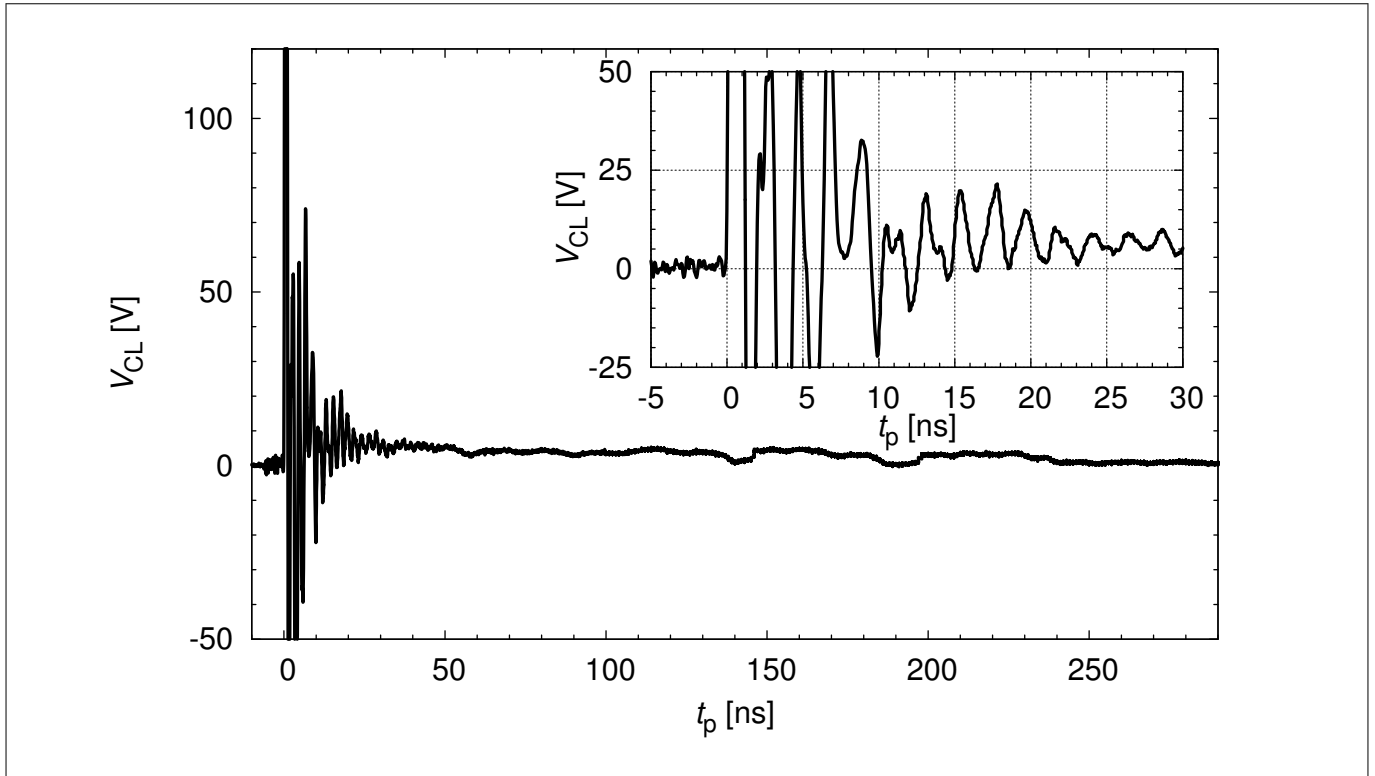


Figure 13 Clamping voltage (ESD): $V_{CL} = f(t)$, +15 kV positive pulse according to IEC61000-4-2

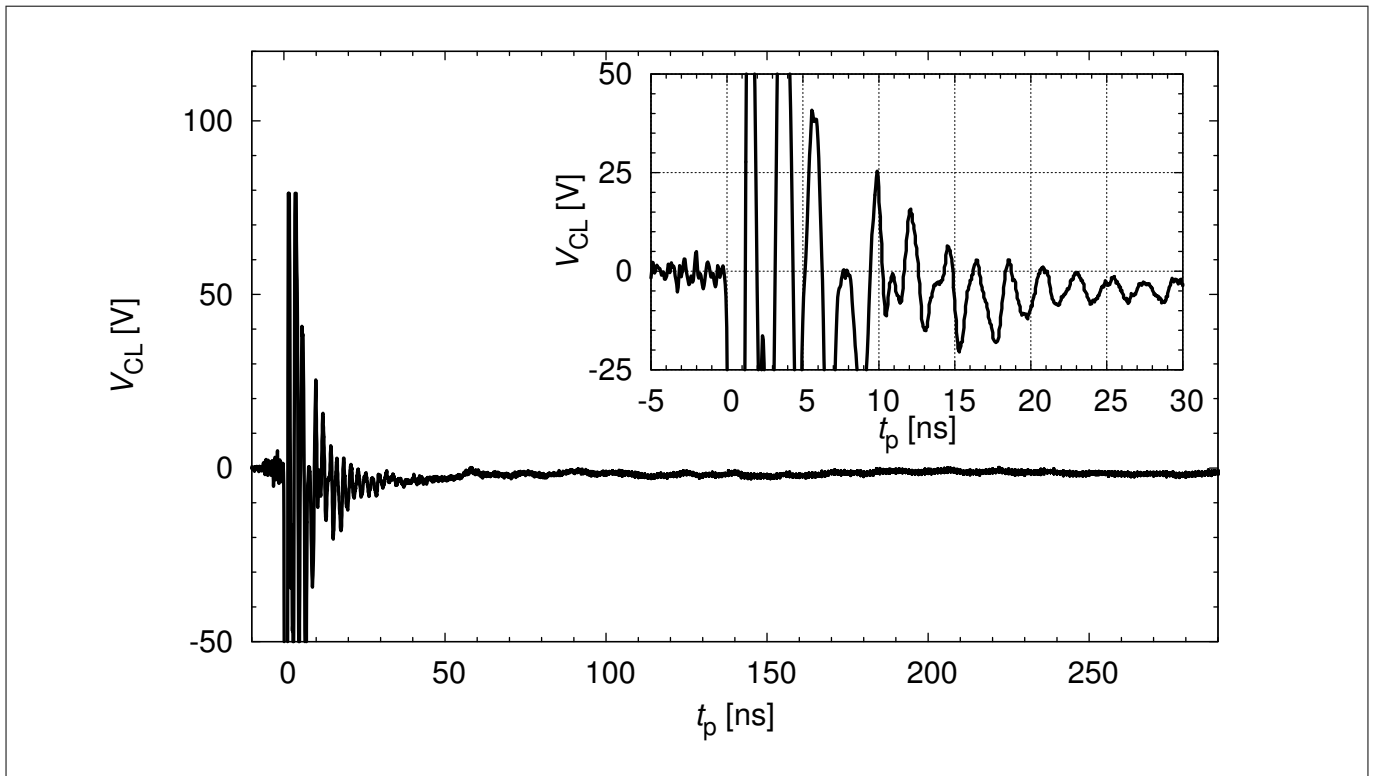


Figure 14 Clamping voltage (ESD): $V_{CL} = f(t)$, -15 kV negative pulse according to IEC61000-4-2

Package information

4 Package information

Note: Dimensions in mm.

4.1 SC74-6-2 package

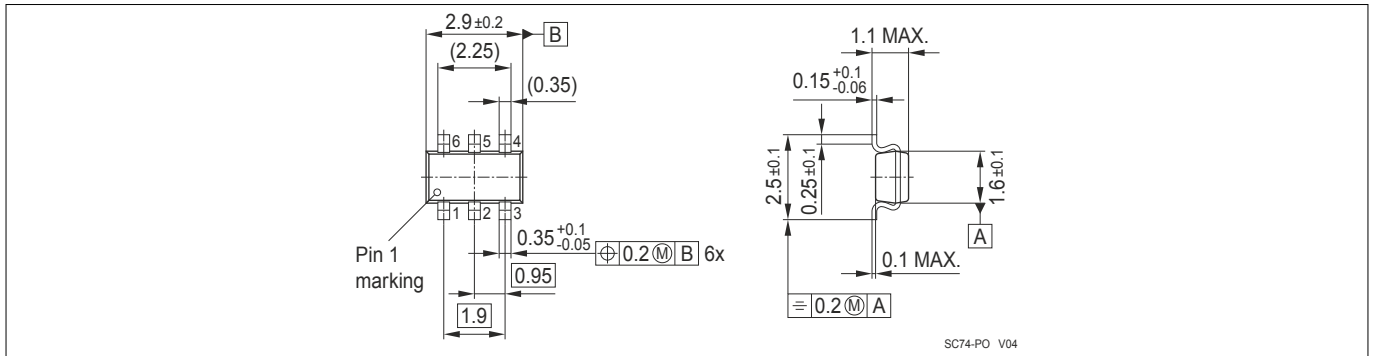


Figure 15 SC74-6-2 package outline

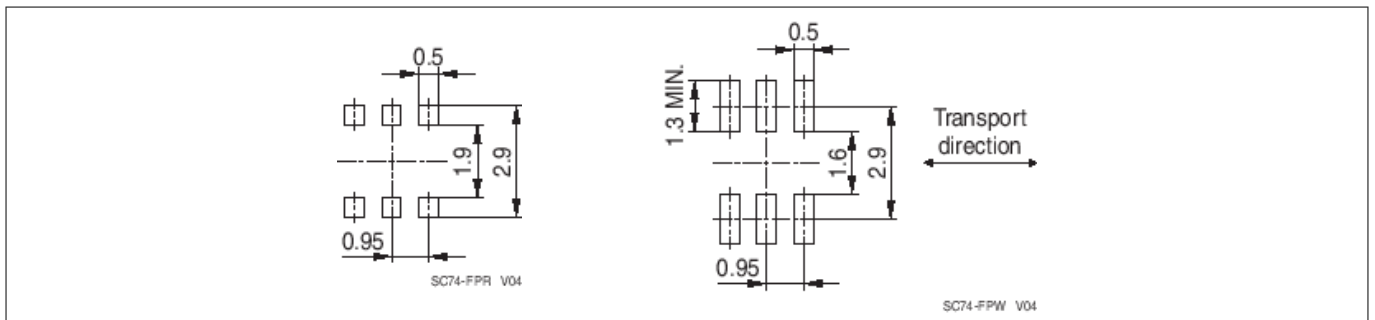


Figure 16 SC74-6-2 footprint

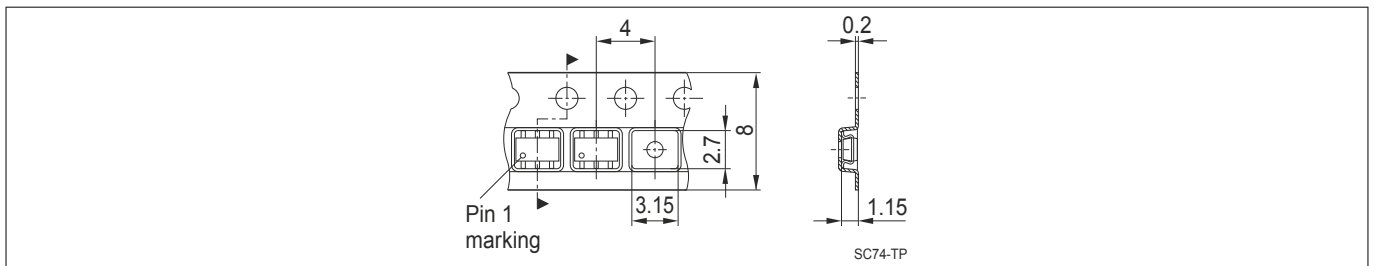


Figure 17 SC74-6-2 packing

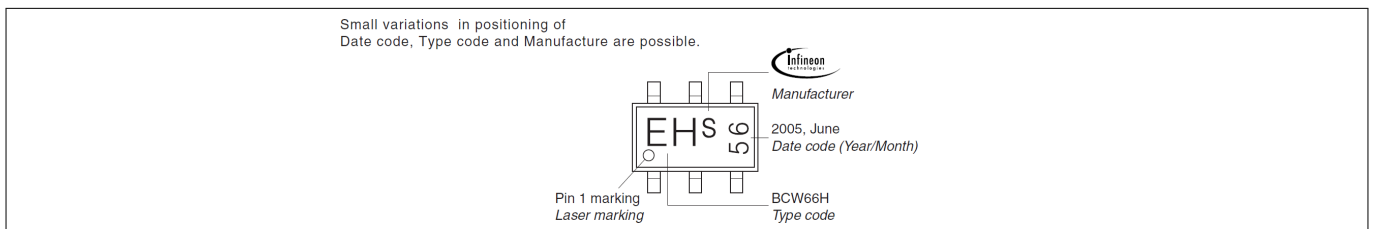


Figure 18 SC74-6-2 marking example (marking code see [Device information](#))

References

5 References

- [1] Infineon AG - **Application Note AN210**: Effective ESD protection design at system level using VF-TLP characterization methodology

Revision history

Revision history: Rev. 2.4. 2013-02-06

Page or Item	Subjects (major changes since previous revision)
Revision 2.5, 2018-02-16	
All	Data sheet layout changed, editorial changes, references updated

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Edition 2018-02-16

Published by

Infineon Technologies AG

81726 Munich, Germany

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Document reference

IFX-rza1515758558601

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