ESD5V3L1B_02LS

SPICE3 Model Documentation

Technical Report

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RF and Protection Devices

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Contents

1 Model Description 5

2 Model Performance 6

3 Model Code 11

Revision History

ESD5V3L1B_02LS

Revision History: October 7, 2011, Rev. 1.0

Previous Version:

Page	Subjects (major changes since last revision)
All	Creation of document.

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Last Trademarks Update 2009-10-19

1 Model Description

To account for the forward and reverse dynamic resistance, R1 and R2 have been introduced. They are controlled by the ideal diodes D1 and D2. D3 and D4 are used to adjust leakage current and breakdown voltage. L1 is the inductance of the bond wire. Snap back behaviour is not modeled. Breakdown voltage is adjusted to the DC measurement. Hence the simulated TLP characteristic has an offset.

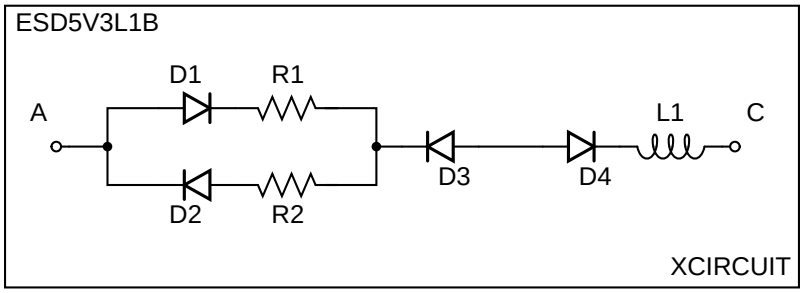

Figure 1: Subcircuit of ESD diode

2 Model Performance

The results of parameter extraction are shown in this chapter. Red boxes indicate measurement data. Blue lines indicate simulated data.

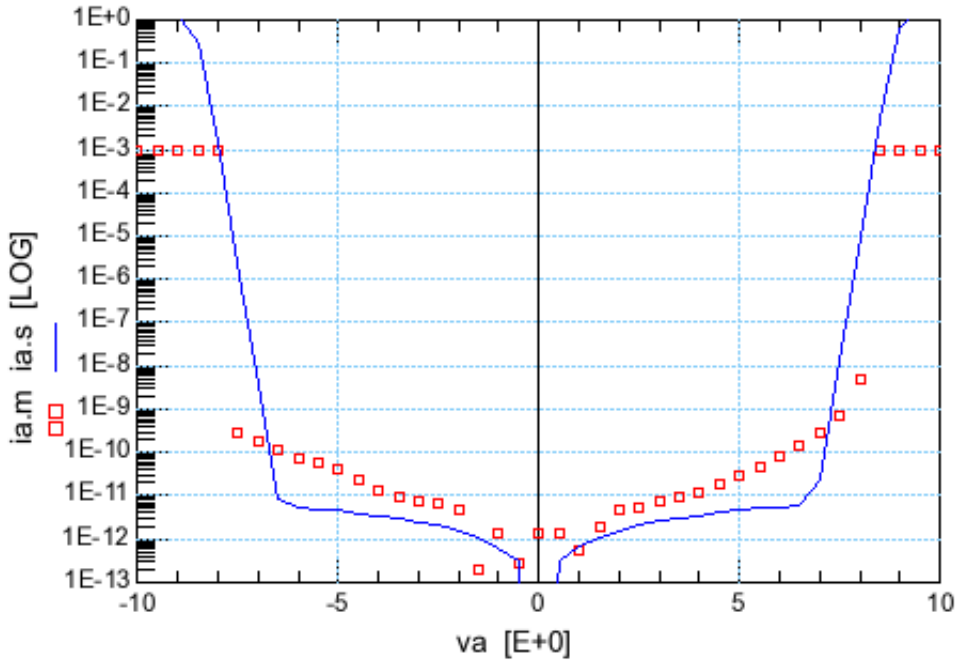

Figure 2: Leakage current

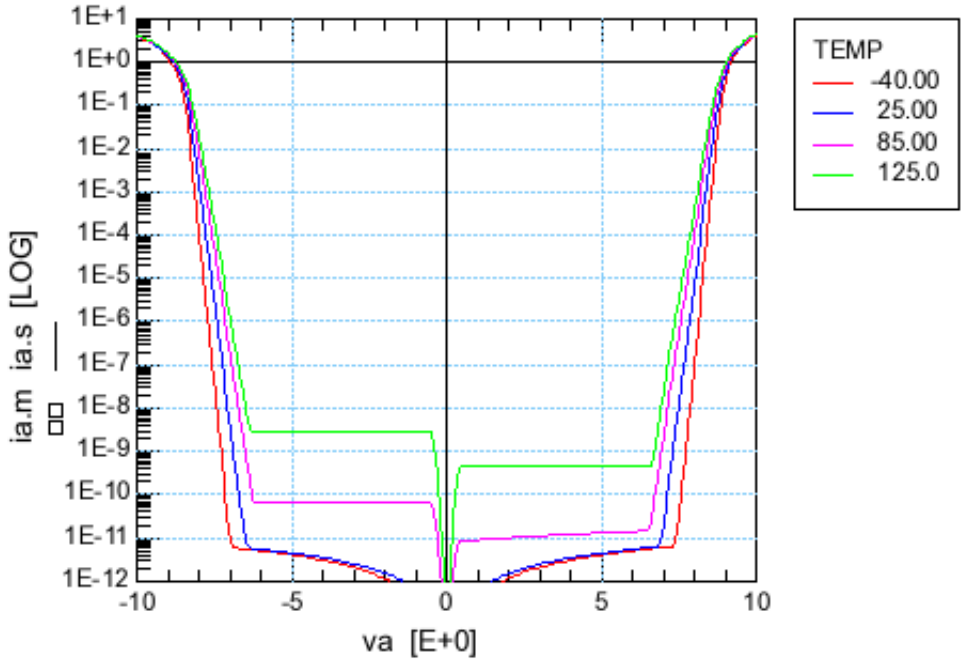

Figure 3: Leakage current

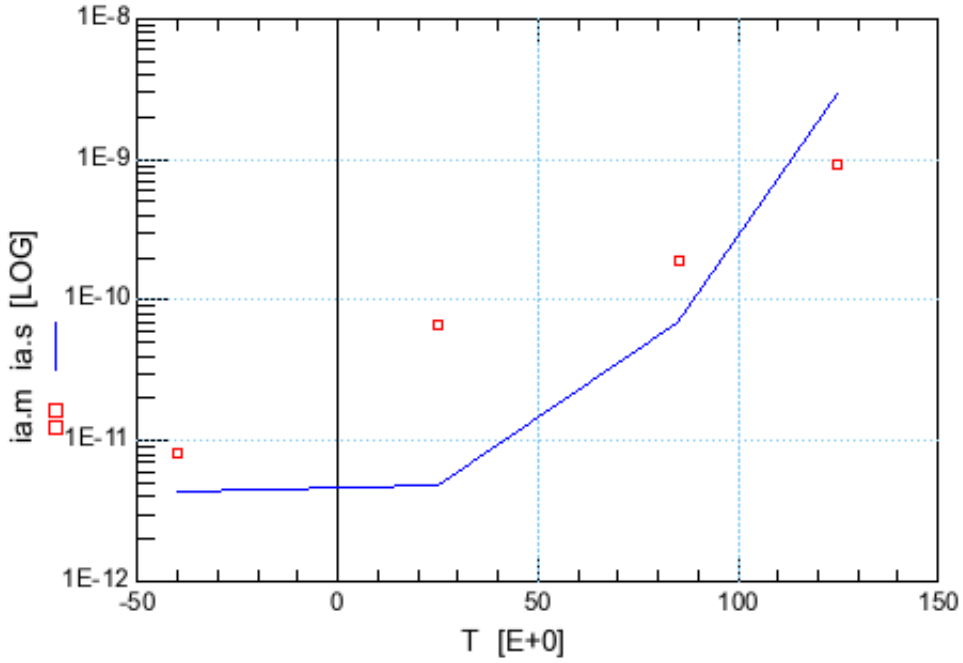

Figure 4: Leakage current vs. temperature at -5.3V at PIN1

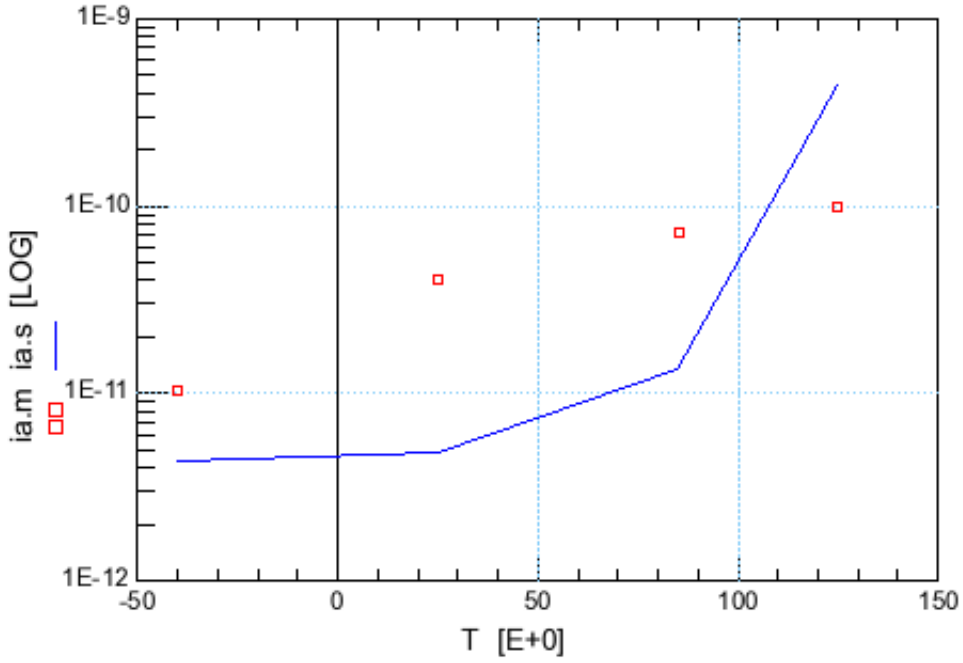

Figure 5: Leakage current vs. temperature at +5.3V at PIN1

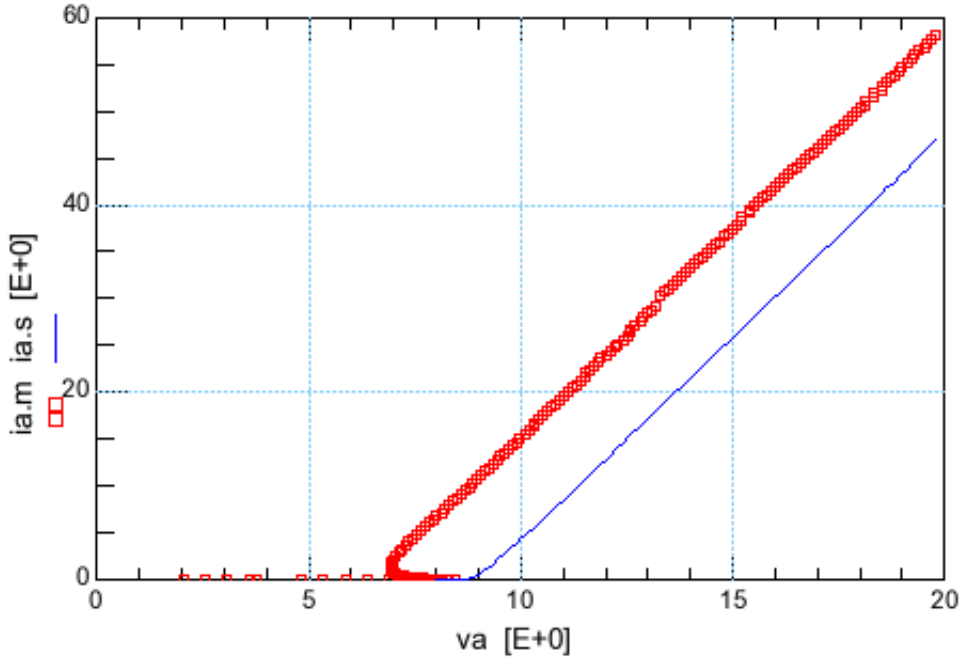

Figure 6: Forward TLP characteristics

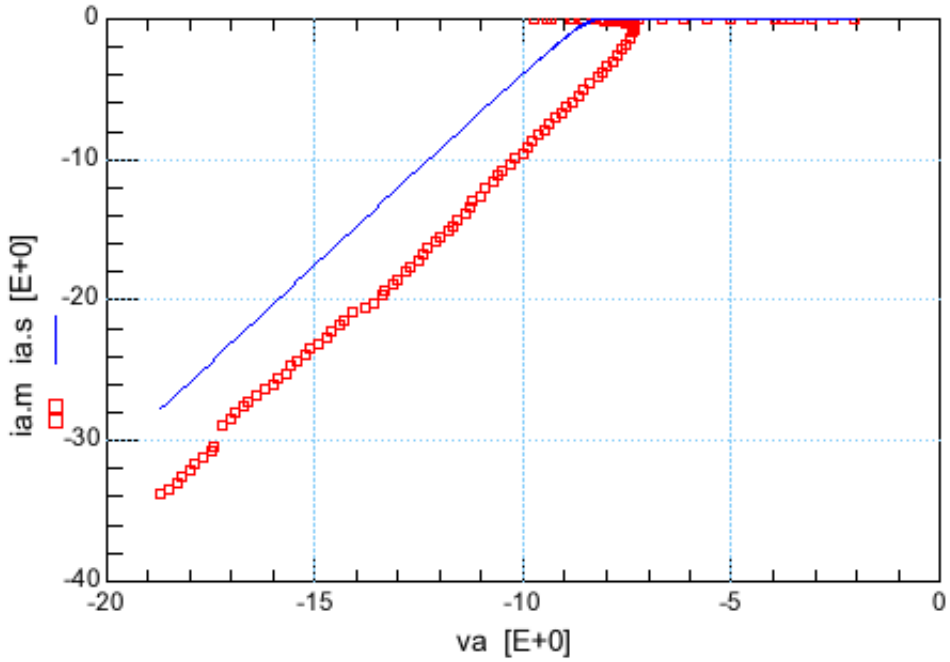

Figure 7: Reverse TLP characteristics

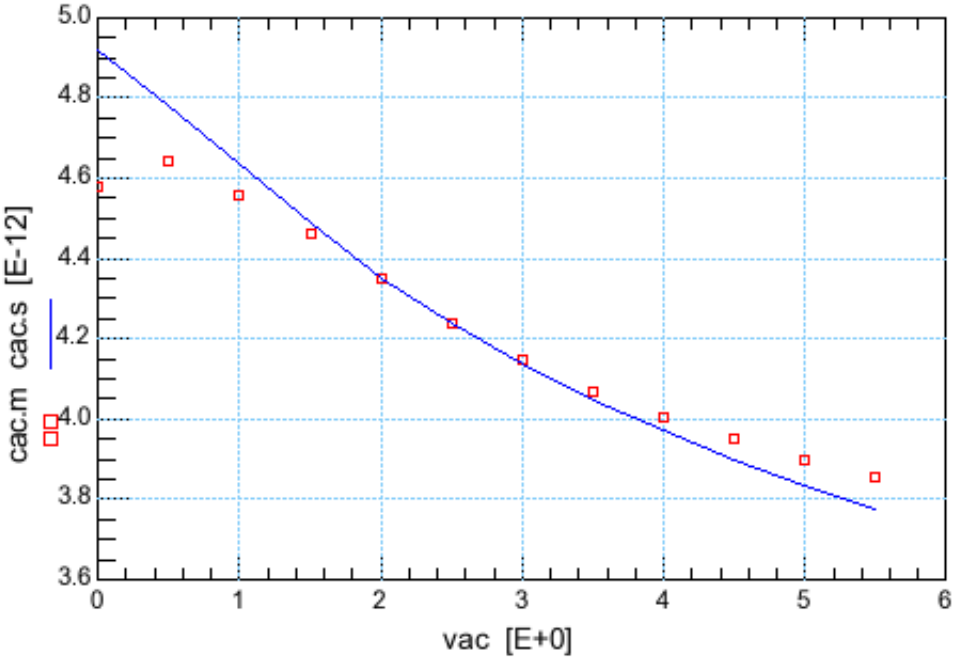

Figure 8: CV curve

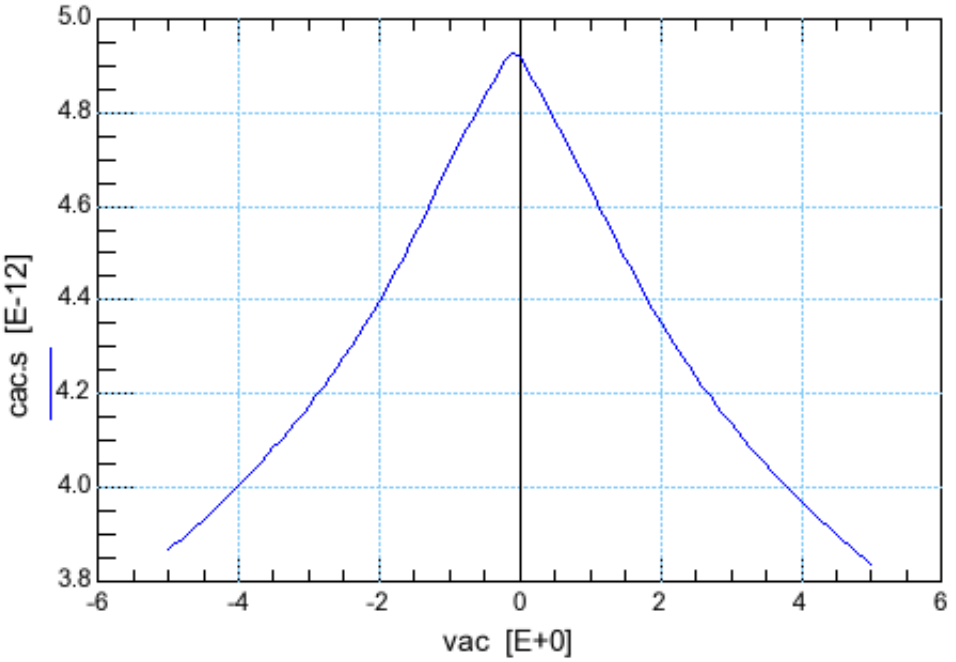

Figure 9: CV curve for positive and negative voltages

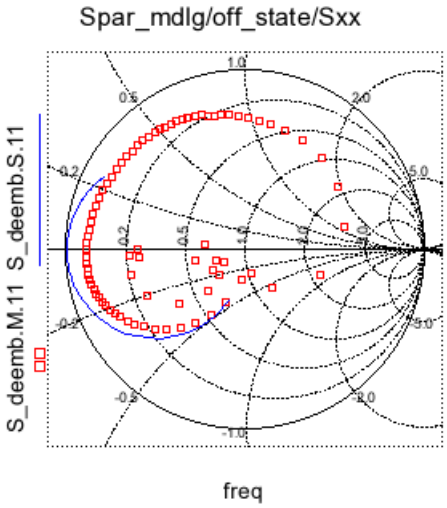

Figure 10: S11, VC=0V (VC=voltage at cathode)

3 Model Code

```
.SUBCKT ESD5V3L1B_02LS 1 2
X1     1   12  resistor_switch_ESD5V3L1B
X2     12  13  diode_subckt_ESD5V3L1B
L1 13 2 2E-10
.ENDS
.SUBCKT resistor_switch_ESD5V3L1B 1 2
.MODEL D1 D
+ IS = 1E-18
+ RS = 0
+ N = 1
+ TT = 1E-10
+ CJO = 1
+ VJ = 0.7
+ M = 0.3
+ EG = 1.11
+ XTI = 3
+ KF = 0
+ AF = 1
+ FC = 0.5
+ BV = 100
+ IBV = 0.001
+ TNOM = 27
D1 1 12
+ D1
R1 12 2 0.226
D2 21 1
+ D1
R2 21 2 0.358
.ENDS
.SUBCKT diode_subckt_ESD5V3L1B 1  2
.MODEL D3 D
+ IS = 4.446E-15
+ RS = 0
+ N = 1
+ TT = 1E-10
+ CJO = 9.835E-12
+ VJ = 1.2
+ M = 0.3
+ EG = 1.12
+ XTI = 3
+ KF = 0
+ AF = 1
+ FC = 0.5
+ BV = 6.86
+ IBV = 0.001
+ TNOM = 27
.MODEL D4 D
+ IS = 4.406E-14
+ RS = 0
+ N = 1
+ TT = 1E-10
+ CJO = 9.835E-12
+ VJ = 1.2
+ M = 0.3
+ EG = 1.06
+ XTI = 3.648
+ KF = 0
+ AF = 1
+ FC = 0.5
```

```
+ BV = 6.4
+ IBV = 0.001
+ TNOM = 27
D3 12 1
+ D3
D4 12 2
+ D4
.ENDS
```

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