CeraDiode

CeraDiodes versus semiconductor diodes

Date: August 2008

1 Difference between the characteristic curves of semiconductor diodes and CeraDiodes

Semiconductor diodes

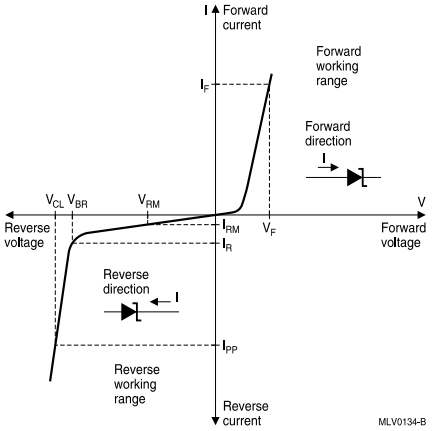

Figure 1: Characteristic curve of semiconductor diodes

CeraDiodes

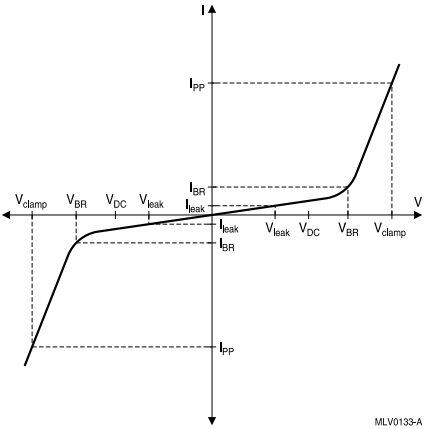

Figure 2: Characteristic curve of CeraDiodes

1.1 Leakage current

@ Semiconductor diode

A semiconductor diode is normally operated in the reverse direction (reverse working range). In normal use the diode has such a huge internal resistance that almost no current can flow through it. As the resistance is not infinite, however, a small current known as the leakage current I_{RM} flows through the diode. This leakage current is specified at a defined voltage V_{RM}.

@ CeraDiode

As the CeraDiode is a bidirectional component it can be used in both forward and reverse directions with no difference. During normal operation the internal resistance of the CeraDiode is so huge that almost no current can flow through it. As the resistance is not infinite, however, a small current known as the leakage current I_{leak} flows through the diode. This current is specified at a defined voltage V_{leak}.

1.2 Maximum operating voltage

@ Semiconductor diode

The voltage V_{RM} resembles the maximum acceptable operating voltage. The current I_{RM} that flows is called the leakage current.

@ CeraDiode

V_{DC} is the maximum operating voltage that can be applied to the CeraDiode. To minimize the leakage current, the maximum applied voltage should be in the V_{leak} range.

1.3 Breakdown voltage

@ Semiconductor diode

If the diode voltage increases, e.g. due to an ESD pulse, the diode breaks down at the breakdown voltage V_{BR}. A current I_R then flows through the diode. The breakdown voltage V_{BR} is specified with a current I_R = 1 mA.

@ CeraDiode

If the diode voltage increases, e.g. due to an ESD pulse, the CeraDiode breaks down at a breakdown voltage V_{BR}. A current I_R then flows through the diode. The breakdown voltage V_{BR} is specified at a current of I_R = 1 mA.

1.4 Clamping voltage

@ Semiconductor diode

The diode restricts the overvoltage, which may be caused by an ESD pulse on the clamping voltage. This is the voltage that would drop across the diode in the event of an overvoltage. To describe the clamping behavior of the diode, the voltage V_{CL} is specified with a current I_{PP} = 1 A. It is designated as the clamping voltage in the glossary.

@ CeraDiode

The diode restricts the overvoltage, which may be caused by an ESD pulse on the clamping voltage. This is the voltage that would drop across the diode in the event of an overvoltage. To describe the clamping behavior of the diode, the voltage V_{clamp} is specified with a current I_{PP} = 1 A. It is designated as the clamping voltage.

1.5 Forward working range

@ Semiconductor diode

As the semiconductor diode is a unidirectional component, it can be used even in forward direction (forward working range). When the diode operates in this range (e.g. for negative overvoltage pulses) it has to be ensured that the current through the diode does not exceed the maximum specified forward current. This current may have to be limited with a series resistor. In this operating range, the diode is characterized by the forward voltage V_F and the current I_F.

@ CeraDiode

Being a bidirectional component, the CeraDiode can be operated forward or reverse biased, forward operation corresponding to reverse operation. There is no forward working range.

1.6 Symbols and terms - CeraDiode versus semiconductor diode

CeraDiode	Semiconductor diode	
C_{max}		Maximum capacitance
C_{typ}		Typical capacitance
I_{BR}	I_R, I_T	(Reverse) current @ breakdown voltage
I_{leak}	I_{RM}	(Reverse) leakage current
I_{PP}	I_{PP}	Current @ clamping voltage
I_{PP}	I_P, I_{PP}	Peak pulse current
P_{PP}	P_{PP}	Peak pulse power
V_{BR}	V_{BR}	(Reverse) breakdown voltage
V_{clamp}	$V_{cl,}$ V_C	Clamping voltage
V_{DC}	V_{RM}, V_{RWM}, V_{WM}, V_{DC}	(Reverse) stand-off voltage, working voltage, operating voltage
V_{leak}	V_{RM}, V_{RWM}, V_{WM}, V_{DC}	(Reverse) voltage @ leakage current
- *)	I_F	Current @ forward voltage
- *)	I_{RM}, $I_{RM,max}$@V_{RM}	(Reverse) current @ maximum reverse stand-off voltage, working voltage, operating voltage
- *)	V_F	Forward voltage

*) Not applicable due to bidirectional characteristics of CeraDiodes