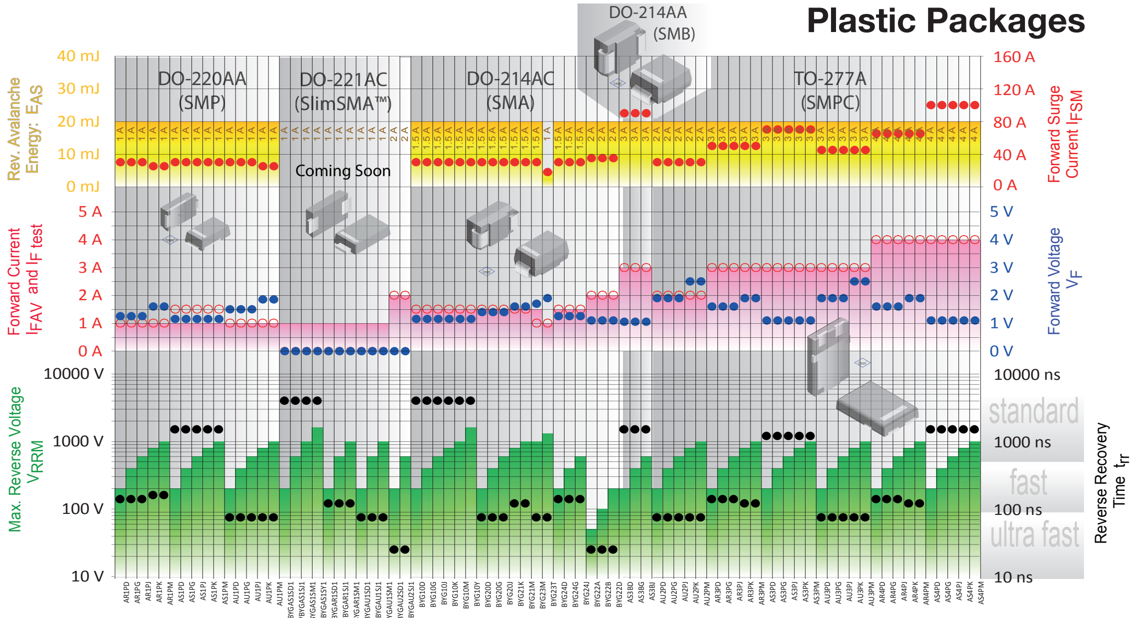
AVALANCHE RECTIFIERS

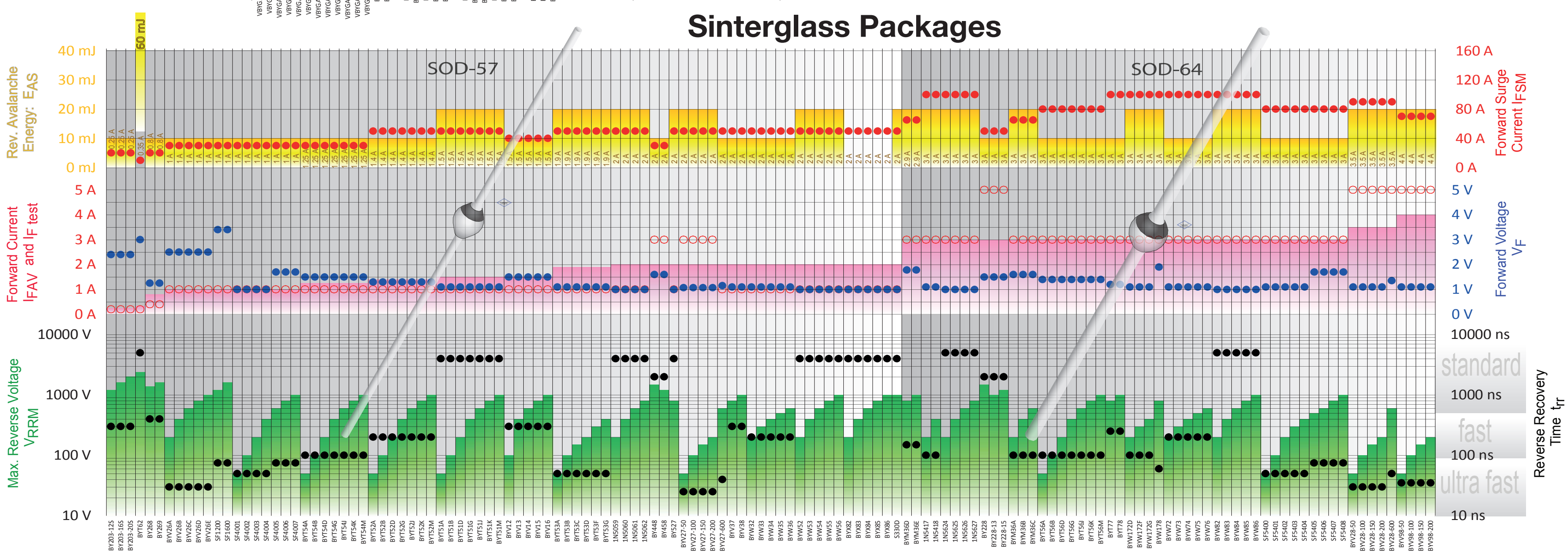
Rectifiers With Specified Reverse Avalanche Capability

Avalanche rectifiers are primarily used as "current valves," which conduct the current in one direction and block it in the other. But for short transient voltage spikes, this type of rectifier can also be driven in reverse avalanche breakdown mode in order to avoid a further increase of the applied voltage. In avalanche breakdown mode, the diode becomes conductive again and clamps the transient voltage at a non-critical level.

Plastic Packages



Sinterglass Packages



Legend

- Red dot = Forward surge current I_{FSM}
- Blue dot = Forward voltage V_F
- Red circle = V_F test current I_{test}
- Black dot = Reverse recovery time t_{rr}
- Yellow bar (1.0 A) = Rev. avalanche energy: E_{AS} tested with (e.g.) I_R = 1.0 A
- Pink bar = Average forward current I_{AV}
- Green bar = Max. reverse voltage V_{RRM}

For technical questions contact Avalanche@vishay.com
Web: http://www.vishay.com/diodes/rectifiers/

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Datasheet Parameters

V_R	Applied reverse voltage
V_{RRM}	Maximum repetitive peak reverse voltage
$V_{(BR)R}$	Reverse avalanche breakdown voltage
I_R	Reverse (leakage) current
I_F	Forward current
V_F	Forward voltage
I_{FAV}	Average forward current
I_{FSM}	Forward surge maximum current
t_{rr}	Reverse recovery time
E_{AS} (E_R)	Avalanche surge or reverse energy

Fig. 1 shows the reverse avalanche energy when using the rectifier (device under test = DUT) in the reverse direction as a freewheeling diode at an inductive load. When the inductance (L) is switched off, the current (I_L) through the inductance (L) will keep on flowing through the DUT until the stored energy

$$E_{AS} = 0.5 \times L \times I^2$$

is dissipated within the rectifier (DUT). The reverse current (I_R) at the beginning will be the same as the current that was flowing through the inductance (I_L) just before the switch was opened (see Fig. 2).

Depending on the avalanche clamping voltage (V_C) of the DUT, the current ($I_L = I_R$) decreases accordingly (see Fig. 2).

$$dI_L/dt = V_C / L$$

The reverse energy capability depends on the reverse current and the junction temperature prior to the avalanche test.

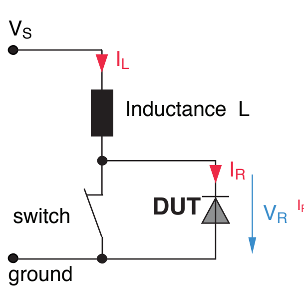


Figure 1. Avalanche energy test circuit

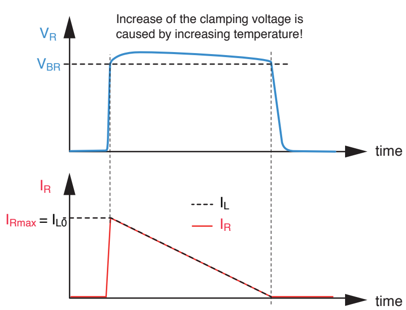
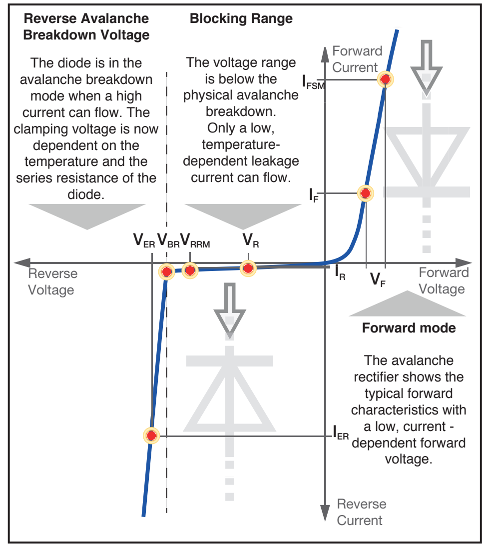
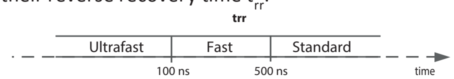


Figure 2. Typical reverse clamping voltage and reverse current during a reverse energy test



t_{rr} = Reverse Recovery Time

Avalanche rectifiers are also classified in groups depending on their reverse recovery time t_{rr}:



This "t_{rr}" is the time needed to discharge the charged depletion zone of the diode before it can block the current again.

For the t_{rr} measurement (e.g.: I_F = 0.5 A, I_R = 1.0 A, I_R = 0.25 A), the diode is being "charged" with a forward current of I_F = 0.5 A. Then a reverse voltage is applied so that the peak reverse current is I_R = 1.0 A. The reverse recovery time is the time until the reverse current has reached I_R = 0.25 A. (see Fig. 4)

Q_{rr} is the total amount of charge as integral to the discharge current versus time.

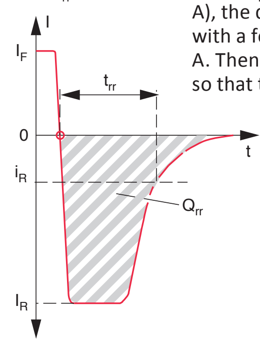
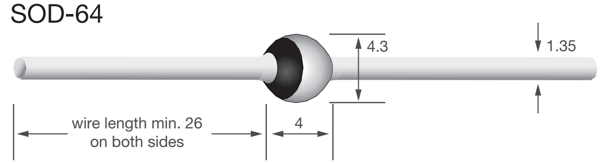


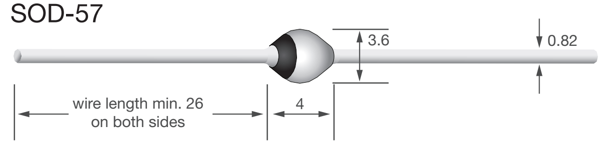
Figure 4. Definition of the reverse recovery time

Package Dimensions (in millimeters)

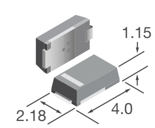
SOD-64



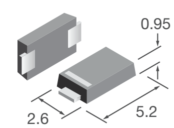
SOD-57



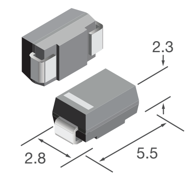
DO-220AA (SMP)



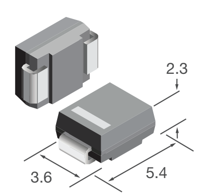
DO-221AC (SlimSMA™)



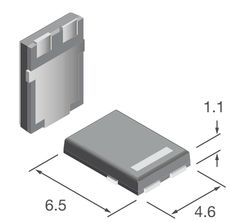
DO-214AC (SMA)



DO-214AA (SMBJ)



TO-277A (SMPC)



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