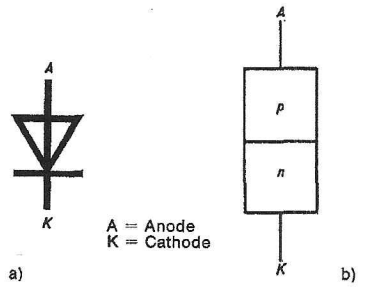
Technical Data

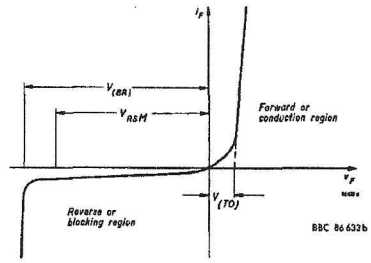
BBC BROWN BOVERI

Silicon-Semiconductor Components

Printed order nr.
D GHS 30392 E

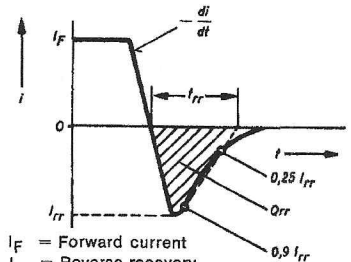
Rectifier-Diodes





c)
i_F = Forward current
v_F = Forward voltage drop
$V_{(TO)}$ = Threshold voltage
$V_{(BR)}$ = Break down voltage
V_{RSM} = Non repetitive peak reverse voltage

Figure 1: Diode
a) Symbol, switch sign
b) schematical constitution
c) V_F - i_F characteristic



I_F = Forward current
I_{rr} = Reverse recovery current, peak value
t_{rr} = Reverse recovery time
Q_{rr} = Reverse recovered charge
$\frac{di}{dt}$ = Rate of rise of forward current

Figure 2: Current wave form during commutation of the diode from conduction state to the blocking state. (DIN 41 781 page 10)

Diodes are electric devices which conduct current in one direction i.e. offer a low resistance, while blocking i.e. offering a high resistance, in the reverse direction. Silicon, proving especially efficient in the higher power range, is preferrably employed for the production of semiconductor diodes.

Fig. 1 c shows the characteristic of a semiconductor diode in forward and reverse direction.

In the standard range (type code DS . .) the reverse voltage must not exceed even temporarily the non repetitive reverse voltage V_{RSM}.

Avalanche diodes of the DSA range may temporarily be exposed to voltages of the order of the break down voltage $V_{(BR)}$.

Standard-type diodes are as a rule employed in circuits with line voltage supply (50–60 Hz). For use at higher frequencies (nearly off 1000 Hz) the dynamical properties during turn-on and turn-off should be taken into consideration.

Fast recovery diodes of the DSD range have good dynamical properties. The criterion of the "quickness" of a diode is the reverse recovery time t_{rr} indicated as time interval between the turn-off of the forward current and the instant a certain value of the reverse voltage is reached (see Fig. 2).

On changing over from the conducting to the non-conducting state the charge carrier quantity stored in the junction give rise to an excessive inverse current, the so-called recovery reverse current I_{rr}, immediately after passage of the current through zero. After the reverse recovery time has elapsed the reverse current is interrupted and finally decays to the steady state value of the inverse current. This phenomenon is known as hole storage effect and the integration of the current-time-area in reverse direction eventually gives the reverse recovered charge Q_{rr}.

Fast diodes featuring lower Q_{rr} and t_{rr} values than standard-type diodes, their reverse power losses is lower, which again results in a higher efficiency.

Type code of Brown Boveri diodes

Example: DS A I 35–14 A

DS	Silicon diode (standard)
A	Avalanche type
D	Fast recovery type
I	Inverse polarity (cathode stud mounted)
35	Current rating in ampere
-14	Voltage class (14 ≙ 1400 V)
A	Modification

Glossary of terms and symbols

Terms and symbols largely correspond to the international recommendations ( )

V_{RRM} = Repetitive peak reverse voltage, instantaneous value
I_{FRMS} = Maximum permissible forward current, RMS value
I_{FAVM} = Mean forward current, 40 to 1000 Hz of one halfsine wave at ϑ_{amb} = 45° C, convection cooling and R_{thJA}, resp. ϑ_{case} = 100° C and R_{thJC}
I_{FSM} = Peak one cycle surge forward current, 10 ms, starting temperature $\vartheta_{(VJ)max}$
$\int i^2dt$ = I^2t for fusing
I_R = Maximum reverse current at $\vartheta_{(VJ)max}$ and V_{RRM}
v_F = Forward voltage drop, maximum value at rated I_F
P_{RSM} = Maximum reverse power surge for avalanche diodes at $\vartheta_{(VJ)max}$ and 10 μs pulse width
$\vartheta_{(VJ)}$ = Virtual junction temperature
$\vartheta_{(VJ)max}$ = Maximum junction temperature
ϑ_{amb} = Ambient temperature
ϑ_{case} = Case temperature
R_{thJC} = Thermal resistance junction to case
R_{thJA} = Thermal resistance junction to ambient
t_{rr} = Reverse recovery time at 25° C
Q_{rr} = Reverse recovered charge at 25° C