# Silicon Dual Diode

# **BYQ30E-200**

200V/16A

# DATASHEET

OEM – Philips

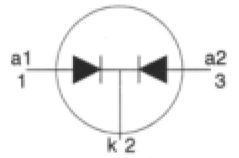
Source: Philips Databook 1999

## Rectifier diodes ultrafast, rugged — BYQ30E, BYQ30EB, BYQ30ED series

### FEATURES

- Low forward volt drop
- Fast switching
- Soft recovery characteristic
- Reverse surge capability
- High thermal cycling performance
- Low thermal resistance

### SYMBOL




### QUICK REFERENCE DATA

$V_R$ = 150 V/ 200 V

$V_F \leq 0.95$ V

$I_{O(AV)}$ = 16 A

$I_{RRM}$ = 0.2 A

$t_{rr} \leq 25$ ns

### GENERAL DESCRIPTION

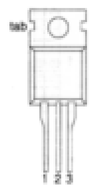
Dual, ultra-fast, epitaxial rectifier diodes intended for use as output rectifiers in high frequency switched mode power supplies.

The BYQ30E series is supplied in the SOT78 conventional leaded package.
The BYQ30EB series is supplied in the SOT404 surface mounting package.
The BYQ30ED series is supplied in the SOT428 surface mounting package.

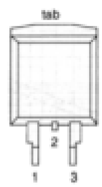
### PINNING

| PIN | DESCRIPTION |
|---|---|
| 1 | anode 1 |
| 2 | cathode [1] |
| 3 | anode 2 |
| tab | cathode |

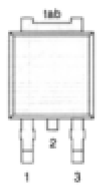
### SOT78 (TO220AB)




### SOT404




### SOT428




### LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134)

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | | UNIT |
|---|---|---|---|---|---|---|
| | | **BYQ30E/ BYQ30EB/ BYQ30ED** | | **-150** | **-200** | |
| $V_{RRM}$ | Peak repetitive reverse voltage | | - | 150 | 200 | V |
| $V_{RWM}$ | Working peak reverse voltage | | - | 150 | 200 | V |
| $V_R$ | Continuous reverse voltage | | - | 150 | 200 | V |
| $I_{O(AV)}$ | Average rectified output current (both diodes conducting) | square wave; $\delta = 0.5$; $T_{mb} \leq 104$ ˚C | - | 16 | | A |
| $I_{FRM}$ | Repetitive peak forward current per diode | square wave; $\delta = 0.5$; $T_{mb} \leq 104$ ˚C | - | 16 | | A |
| $I_{FSM}$ | Non-repetitive peak forward current per diode | t = 10 ms<br>t = 8.3 ms<br>sinusoidal; with reapplied $V_{RRM(max)}$ | -<br>- | 80<br>88 | | A<br>A |
| $I_{RRM}$ | Peak repetitive reverse surge current per diode | $t_p = 2$ µs; $\delta = 0.001$ | - | 0.2 | | A |
| $I_{RSM}$ | Peak non-repetitive reverse surge current per diode | $t_p = 100$ µs | - | 0.2 | | A |
| $T_j$ | Operating junction temperature | | - | 150 | | ˚C |
| $T_{stg}$ | Storage temperature | | - 40 | 150 | | ˚C |

1. It is not possible to make connection to pin 2 of the SOT428 or SOT404 packages.

## ESD LIMITING VALUE

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_C$ | Electrostatic discharge capacitor voltage | Human body model; C = 250 pF; R = 1.5 kΩ | - | 8 | kV |

## THERMAL RESISTANCES

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $R_{th\,j\text{-}mb}$ | Thermal resistance junction to mounting base | per diode | - | - | 3 | K/W |
| | | both diodes | - | - | 2.5 | K/W |
| $R_{th\,j\text{-}a}$ | Thermal resistance junction to ambient | SOT78 package, in free air | - | 60 | - | K/W |
| | | SOT404 and SOT428 packages, pcb mounted, minimum footprint, FR4 board | - | 50 | - | K/W |

## ELECTRICAL CHARACTERISTICS

All characteristics are per diode at $T_j$ = 25 ˚C unless otherwise specified

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| $V_F$ | Forward voltage | $I_F$ = 8 A; $T_j$ = 150˚C | - | 0.84 | 0.95 | V |
| | | $I_F$ = 16 A; $T_j$ = 150˚C | - | 1 | 1.15 | V |
| | | $I_F$ = 16 A | - | 1.12 | 1.25 | V |
| $I_R$ | Reverse current | $V_R = V_{RWM}$ | - | 4 | 30 | µA |
| | | $V_R = V_{RWM}$; $T_j$ = 100˚C | - | 0.3 | 0.6 | mA |
| $Q_{rr}$ | Reverse recovered charge | $I_F$ = 2 A; $V_R \geq 30$ V; $-dI_F/dt$ = 20 A/µs | - | 4 | 11 | nC |
| $t_{rr1}$ | Reverse recovery time | $I_F$ = 1 A; $V_R \geq 30$ V; $-dI_F/dt$ = 100 A/µs | | 20 | 25 | ns |
| $t_{rr2}$ | Reverse recovery time | $I_F$ = 0.5 A to $I_R$ = 1 A; $I_{rec}$ = 0.25 A | - | 12 | 22 | ns |
| $V_{fr}$ | Forward recovery voltage | $I_F$ = 1 A; $dI_F/dt$ = 10 A/µs | - | 1 | - | V |

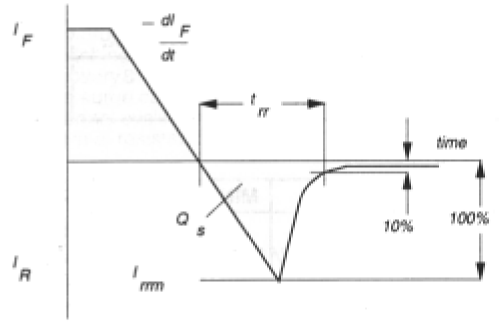



Fig.1. Definition of $t_{rr1}$, $Q_s$ and $I_{rrm}$

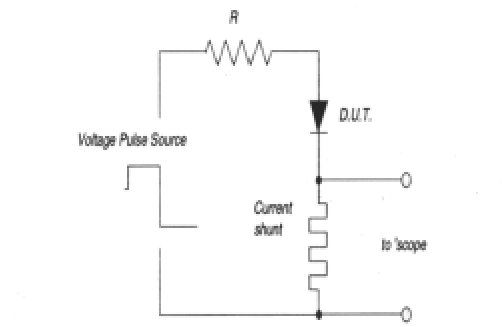



Fig.4. Circuit schematic for $t_{rr2}$

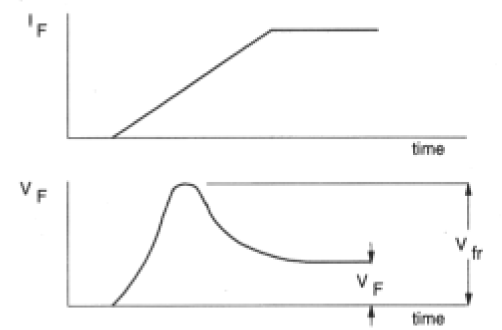



Fig.2. Definition of $V_{fr}$

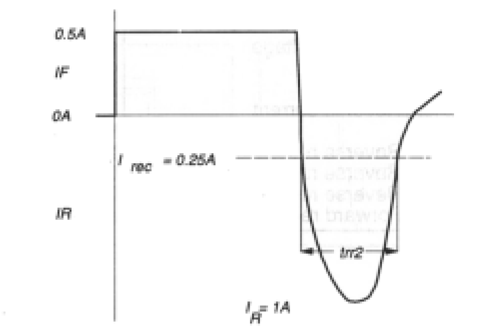



Fig.5. Definition of $t_{rr2}$

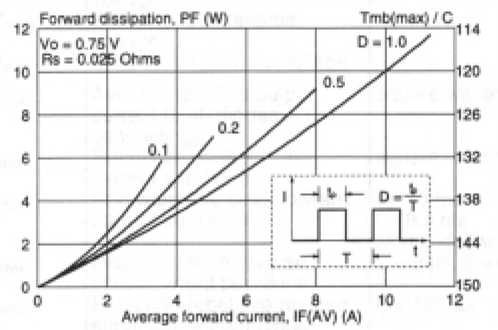



Fig.3. Maximum forward dissipation $P_F = f(I_{F(AV)})$ per diode; square current waveform where $I_{F(AV)} = I_{F(RMS)} \times \sqrt{D}$.

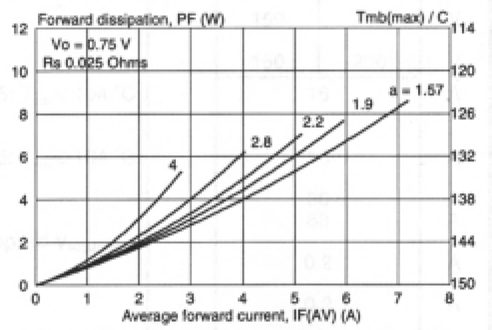



Fig.6. Maximum forward dissipation $P_F = f(I_{F(AV)})$ per diode; sinusoidal current waveform where a = form factor = $I_{F(RMS)} / I_{F(AV)}$.

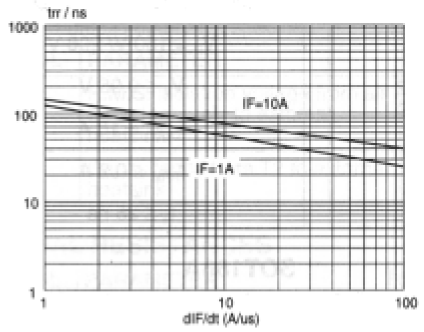



Fig.7. Maximum $t_{rr}$ at $T_j$ = 25 ˚C; per diode

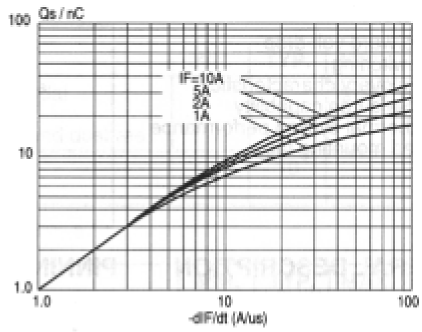



Fig.10. Maximum $Q_s$ at $T_j$ = 25 ˚C; per diode

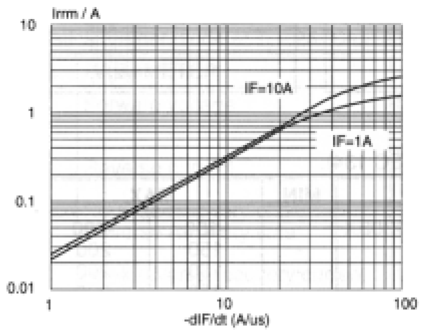



Fig.8. Maximum $I_{rrm}$ at $T_j$ = 25 ˚C; per diode

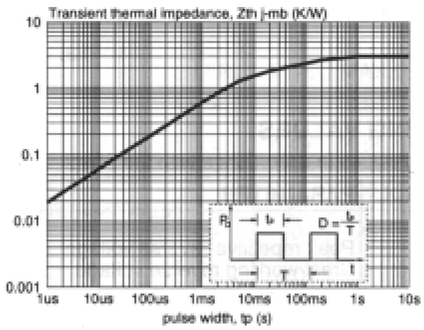



Fig.11. Transient thermal impedance; per diode; $Z_{th\,j\text{-}mb} = f(t_p)$.

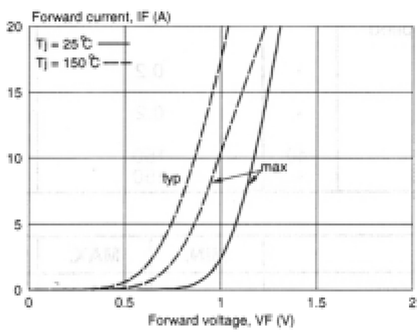



Fig.9. Typical and maximum forward characteristic $I_F = f(V_F)$; parameter $T_j$