

## DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

BR213 SERIES

PHILIPS INTERNATIONAL

56E D ■ 7110826 0041070 723 ■ PHIN

T-11-23

## DUAL BREAKOVER DIODES

A range of monolithic dual bidirectional breakover diodes with  $\pm 12\%$  tolerance of breakover voltage. These diodes feature controlled voltage breakover across and between diodes with good peak current handling capability. Typical applications include transient overvoltage protection across lines and line to earth in telephony equipment, data transmission and remote instrumentation lines.

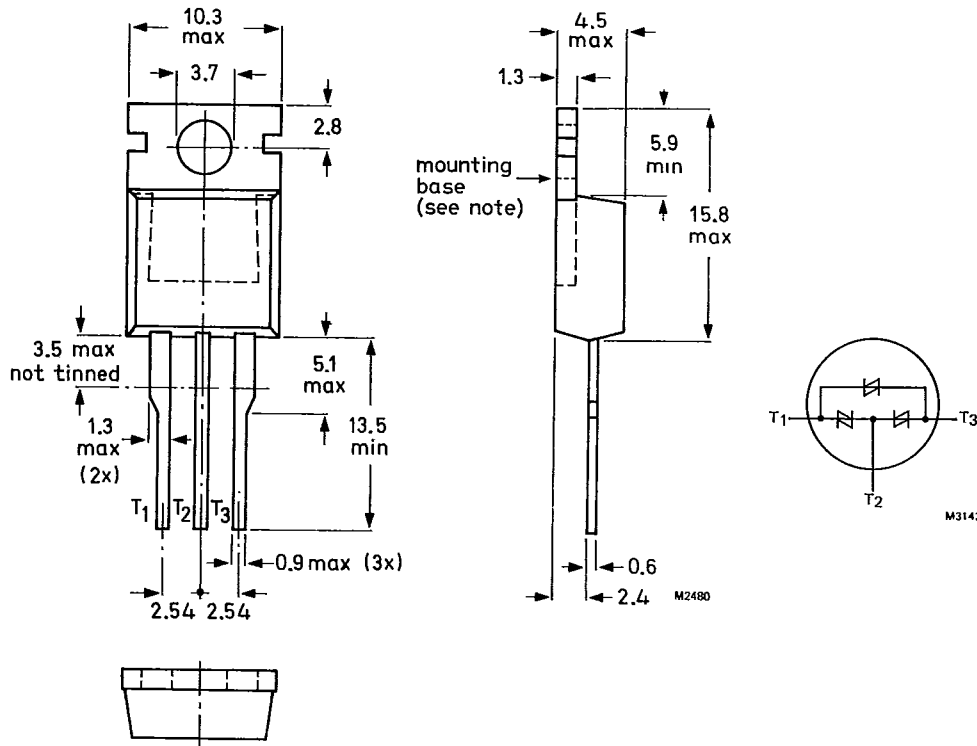
## QUICK REFERENCE DATA

|  |           | BR213 — 100 to 280 |            |    |
|--|-----------|--------------------|------------|----|
| Breakover voltage per line                         | $V(BO)$   | nom.               | 100 to 280 | V  |
| Holding current                                    | $I_H$     | >                  | 150        | mA |
| Transient peak current<br>(10/320 $\mu$ s impulse) | $I_{TSM}$ | max.               | 40         | A  |

## MECHANICAL DATA

Dimensions in mm

Fig.1 TO-220AB



Net mass: 2 g

Note: The exposed metal mounting base is directly connected to terminal T<sub>2</sub>.  
Accessories supplied on request: see data sheet Mounting instructions and accessories for TO-220 envelopes.

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## RATINGS

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

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Voltages (either direction, between any two leads)

|                     |       |   |  |  |
|---------------------|-------|---|--|--|
| Continuous voltages | $V_D$ | BR213 — 100 to 280<br>max. 75% of nom.<br>voltage |  |  |
|---------------------|-------|---|--|--|

## Currents

(Individually for each line to centre lead in either direction)

|  |              |      |     |                        |
|--|--------------|------|-----|------------------------|
| Transient peak current (8/20 $\mu$ s impulse)  | $I_{TSM1}$   | max. | 150 | A                      |
| Transient peak current (10/320 $\mu$ s impulse)<br>equivalent to 10/700 $\mu$ s 1.6 kV voltage<br>impulse (CCITT K17); (see Fig.3) | $I_{TSM2}$   | max. | 40  | A                      |
| Average on-state current (averaged over<br>any 20 ms period); up to $T_{mb} = 75^\circ\text{C}$                                    | $I_{T(AV)}$  | max. | 5   | A                      |
| RMS AC on-state current  | $I_{T(RMS)}$ | max. | 8   | A                      |
| Non-repetitive peak on-state current;<br>$T_j = 100^\circ\text{C}$ prior to surge;<br>$t = 10$ ms; half sinewave                   | $I_{TSM3}$   | max. | 30  | A                      |
| $I^2 t$ for fusing ( $t = 10$ ms)  | $I^2 t$      | max. | 4.5 | $\text{A}^2\text{s}$   |
| Rate of rise of on-state current after<br>$V_{(BO)}$ turn-on ( $t_p = 10$ $\mu$ s)   | $di/dt$      | max. | 50  | $\text{A}/\mu\text{s}$ |

## Power dissipation

|  |           |      |     |   |
|--|-----------|------|-----|---|
| Continuous dissipation;<br>one line dissipating,<br>unidirectional operation,<br>device mounted on infinite heatsink | $P_{tot}$ | max. | 40  | W |
| Peak dissipation; $t = 1$ ms,<br>free-air mounting   | $P_{TM}$  | max. | 400 | W |

## Temperatures

|                                   |           |             |     |                  |
|-----------------------------------|-----------|-------------|-----|------------------|
| Storage temperature               | $T_{stg}$ | -40 to +150 |     | $^\circ\text{C}$ |
| Operating temperature (off-state) | $T_j$     | max.        | 125 | $^\circ\text{C}$ |
| Overload temperature (on-state)   | $T_{vj}$  | max.        | 150 | $^\circ\text{C}$ |

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## CHARACTERISTICS

 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise stated

Each line to centre lead and between lines

Avalanche voltage  $V_{(BR)}$ ; ( $I_{(BR)} = 10\text{mA}$ ), andBreakover voltage  $V_{(BO)}$ ; ( $I \leq I_S$ ):  
(100  $\mu\text{s}$  pulsed)

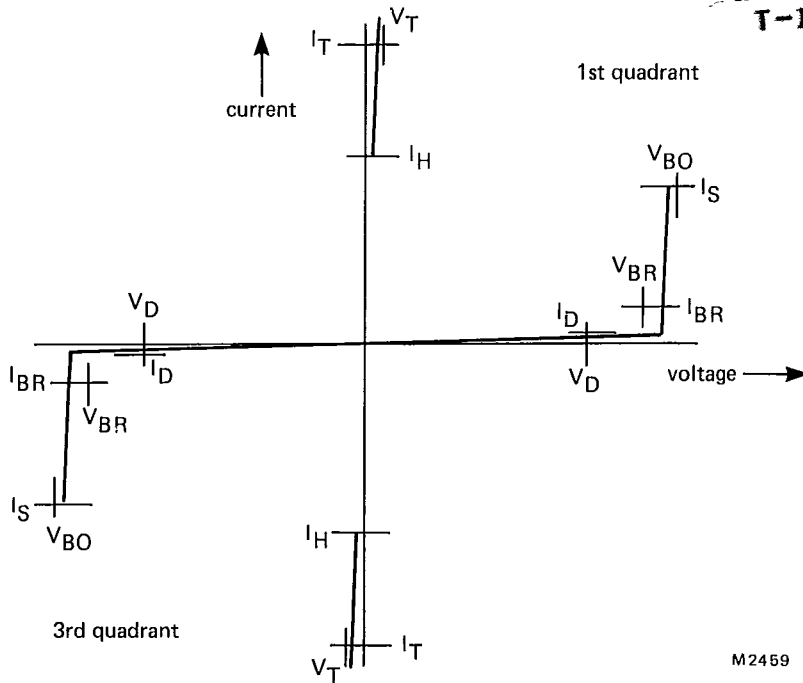
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|  | $V_{(BR)}$<br>min. | $V_{(BO)}$<br>max. | $V_{(BO)}$<br>max.<br>(line-line) | ←                      |
|--|--------------------|--------------------|-----------------------------------|------------------------|
| BR213 -100   | 88                 | 112                | 125                               | V                      |
| -120   | 105                | 135                | 150                               | V                      |
| -140   | 123                | 157                | 175                               | V                      |
| -160   | 140                | 180                | 200                               | V                      |
| -240   | 211                | 269                | 300                               | V ←                    |
| -260   | 228                | 292                | 325                               | V                      |
| -280   | 246                | 314                | 350                               | V                      |
| Temperature coefficient of $V_{(BR)}$  | $S_{(br)}$         | typ.               | +0.1                              | %/K                    |
| Off-state current; $V_D = 85\% V_{(BR)\text{min}}$ (note 4)  |                    |                    |                                   |                        |
| $T_j = 70\text{ }^\circ\text{C}$   | $I_D$              | <                  | 50                                | $\mu\text{A}$          |
| $T_j = 125\text{ }^\circ\text{C}$  | $I_D$              | <                  | 250                               | $\mu\text{A}$          |
| Linear rate of rise of off-state voltage<br>that will not trigger any device;<br>$T_j = 70\text{ }^\circ\text{C}$ ; $V_{DM} = 85\% V_{(BR)\text{min}}$ | $dV_D/dt$          | <                  | 2000                              | $\text{V}/\mu\text{s}$ |
| Off-state capacitance<br>$V_D = 0$ ; $f = 1\text{ kHz to } 1\text{ MHz}$   | $C_j$              | <                  | 300                               | $\text{pF}$            |
| Each line to centre lead only  |                    |                    |                                   |                        |
| Voltages and currents (in either direction)  |                    |                    |                                   |                        |
| On-state voltage (note 1)<br>$I_{TM} = 5\text{ A}$   | $V_{TM}$           | <                  | 2.5                               | V                      |
| Holding current (note 2)   |                    |                    |                                   |                        |
| $T_j = 25\text{ }^\circ\text{C}$   | $I_H$              | >                  | 150                               | $\text{mA}$            |
| $T_j = 70\text{ }^\circ\text{C}$   | $I_H$              | >                  | 100                               | $\text{mA}$            |
| Switching current (note 3)<br>(100 $\mu\text{s}$ pulsed)   | $I_S$              | >                  | 10                                | $\text{mA}$            |
|  | $I_S$              | typ.               | 200                               | $\text{mA}$            |
|  | $I_S$              | <                  | 1000                              | $\text{mA}$            |

## Notes:

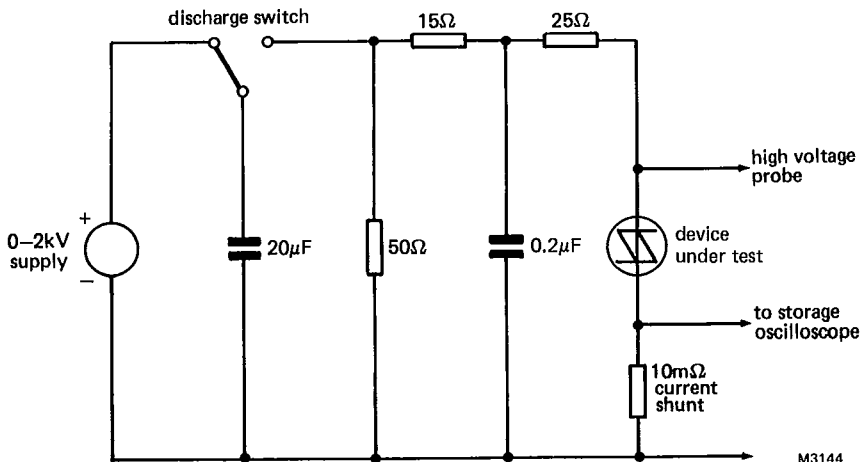
1. Measured under pulsed conditions to avoid excessive dissipation.
2. The minimum current at which the BOD will remain in the on-state.
3. The avalanche current required to switch the BOD to the on-state.
4. I.e., at maximum recommended continuous voltage.

DEVELOPMENT DATA



M2459

Fig.2 Breakover diode characteristics.



M3144

Fig.3 Test circuit for high voltage impulse ( $I_{TSM2}$ )  
(according to CCITT vol IX-Rec. K17).

Notes:

The 10/700  $\mu$ s Impulse Waveform is defined for the voltage across the test fixture when the device under test is replaced with an open circuit. Clearly, once a breakover device has switched on to a low voltage, the current waveform will have a shorter fall-time, since the 15  $\Omega$  + 25  $\Omega$  output impedance becomes effectively in parallel with the 50  $\Omega$ .