# BD239, BD239A, BD239B, BD239C

**ELECTRICAL CHARACTERISTICS** *at Case Temperature ($T_C$) = 25°C*

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | | | | LIMITS | | | | | | | | UNITS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | VOLTAGE V dc | | CURRENT A dc | | BD239 | | BD239A | | BD239B | | BD239C | | |
| | | $V_{CE}$ | $V_{BE}$ | $I_C$ | $I_B$ | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | MIN. | MAX. | |
| Collector Cutoff Current: With base open | $I_{CEO}$ | 30 | | | 0 | – | 0.3 | – | 0.3 | – | – | – | – | mA |
| | | 60 | | | 0 | – | – | – | – | – | 0.3 | – | 0.3 | |
| With base-to-emitter junction short-circuited | $I_{CES}$ | 45 | 0 | | | – | 0.2 | – | – | – | – | – | – | |
| | | 60 | 0 | | | – | – | – | 0.2 | – | – | – | – | |
| | | 80 | 0 | | | – | – | – | – | – | 0.2 | – | – | |
| | | 100 | 0 | | | – | – | – | – | – | – | – | 0.2 | |
| Emitter Cutoff Current | $I_{EBO}$ | | –5 | 0 | | – | 1 | – | 1 | – | 1 | – | 1 | mA |
| Collector-to-Emitter Breakdown Voltage: With base open | $V_{BR(CEO)}$ | | | 0.03[a] | 0 | 45 | – | 60 | – | 80 | – | 100 | – | V |
| DC Forward-Current Transfer Ratio | $h_{FE}$ | 4 | | 0.2[a] | | 40 | – | 40 | – | 40 | – | 40 | – | |
| | | 4 | | 1[a] | | 15 | – | 15 | – | 15 | – | 15 | – | |
| Base-to-Emitter Voltage | $V_{BE}$ | 4 | | 1[a] | | – | 1.3 | – | 1.3 | – | 1.3 | – | 1.3 | V |
| Collector-to-Emitter Saturation Voltage | $V_{CE(sat)}$ | | | 1[a] | 0.2 | – | 0.7 | – | 0.7 | – | 0.7 | – | 0.7 | V |
| Common-Emitter Small-Signal Short-Circuit Forward-Current Transfer Ratio (f = 1 kHz) | $h_{fe}$ | 10 | | 0.2 | | 20 | – | 20 | – | 20 | – | 20 | – | |
| Magnitude of Common Emitter Small-Signal Short-Circuit Forward-Current Transfer Ratio (f = 1 MHz) | $\lvert h_{fe} \rvert$ | 10 | | 0.2 | | 3 | – | 3 | – | 3 | – | 3 | – | |
| Thermal Resistance: Junction-to-Case | $R_{\theta JC}$ | | | | | – | 4.17 | – | 4.17 | – | 4.17 | – | 4.17 | °C/W |
| Junction-to-Ambient | $R_{\theta JA}$ | | | | | – | 62.5 | – | 62.5 | – | 62.5 | – | 62.5 | |

[a]Pulsed: Pulse duration = 300 μs, duty factor = 2%.

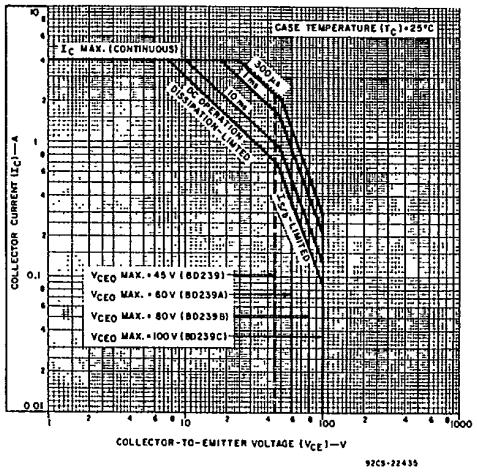


*Fig. 1— Maximum safe operating areas for all types.*

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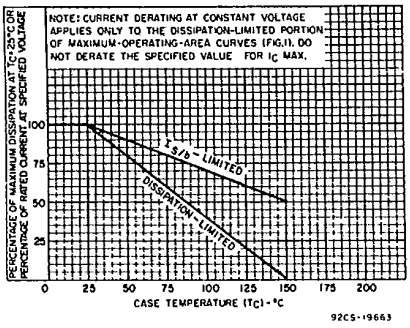


*Fig. 2– Derating curves for all types.*

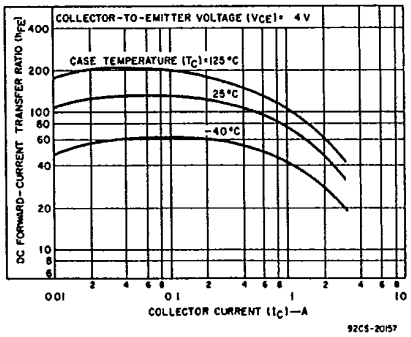


*Fig. 3 — Typical dc beta characteristics for all types.*