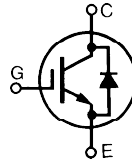


# High Voltage, High Gain BiMOSFET™

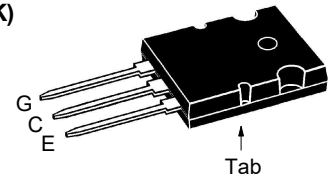
## IXBK55N300 IXBX55N300

### Monolithic Bipolar MOS Transistor

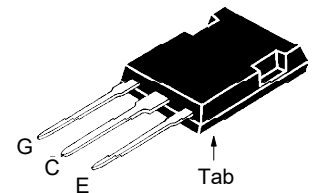


$$\begin{aligned} V_{CES} &= 3000V \\ I_{C110} &= 55A \\ V_{CE(sat)} &\leq 3.2V \end{aligned}$$

TO-264  
(IXBK)



PLUS247  
(IXBX)



G = Gate                      E = Emitter  
C = Collector                Tab = Collector

| Symbol              | Test Conditions                                                                                                    | Maximum Ratings |                  |
|---------------------|--------------------------------------------------------------------------------------------------------------------|-----------------|------------------|
| $V_{CES}$           | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$                                                                    | 3000            | V                |
| $V_{CGR}$           | $T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ , $R_{GE} = 1\text{M}\Omega$                                       | 3000            | V                |
| $V_{GES}$           | Continuous                                                                                                         | $\pm 25$        | V                |
| $V_{GEM}$           | Transient                                                                                                          | $\pm 35$        | V                |
| $I_{C25}$           | $T_C = 25^\circ\text{C}$ (Chip Capability)                                                                         | 130             | A                |
| $I_{C110}$          | $T_C = 110^\circ\text{C}$                                                                                          | 55              | A                |
| $I_{CM}$            | $T_C = 25^\circ\text{C}$ , 1ms                                                                                     | 600             | A                |
| SSOA                | $V_{GE} = 15\text{V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 2\Omega$                                             | $I_{CM} = 110$  | A                |
| (RBSOA)             | Clamped Inductive Load                                                                                             | 1500            | V                |
| $T_{SC}$<br>(SCSOA) | $V_{GE} = 15\text{V}$ , $T_J = 125^\circ\text{C}$ ,<br>$R_G = 10\Omega$ , $V_{CE} = 1250\text{V}$ , Non-Repetitive | 10              | $\mu\text{s}$    |
| $P_C$               | $T_C = 25^\circ\text{C}$                                                                                           | 625             | W                |
| $T_J$               |                                                                                                                    | -55 ... +150    | $^\circ\text{C}$ |
| $T_{JM}$            |                                                                                                                    | 150             | $^\circ\text{C}$ |
| $T_{stg}$           |                                                                                                                    | -55 ... +150    | $^\circ\text{C}$ |
| $T_L$               | Maximum Lead Temperature for Soldering<br>1.6 mm (0.062 in.) from Case for 10                                      | 300             | $^\circ\text{C}$ |
| $M_d$               | Mounting Torque (TO-264)                                                                                           | 1.13/10         | Nm/lb.in         |
| $F_C$               | Mounting Force (PLUS247)                                                                                           | 20..120/4.5..27 | N/lb             |
| Weight              | TO-264                                                                                                             | 10              | g                |
|                     | PLUS247                                                                                                            | 6               | g                |

| Symbol        | Test Conditions                                          | Characteristic Values |      |                          |
|---------------|----------------------------------------------------------|-----------------------|------|--------------------------|
|               | ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Min.                  | Typ. | Max.                     |
| $BV_{CES}$    | $I_C = 1\text{mA}$ , $V_{GE} = 0\text{V}$                | 3000                  |      |                          |
| $V_{GE(th)}$  | $I_C = 4\text{mA}$ , $V_{CE} = V_{GE}$                   | 3.0                   |      | 5.0                      |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0\text{V}$                |                       |      | 50 $\mu\text{A}$<br>3 mA |
|               | $T_J = 125^\circ\text{C}$                                |                       |      |                          |
| $I_{GES}$     | $V_{CE} = 0\text{V}$ , $V_{GE} = \pm 25\text{V}$         |                       |      | $\pm 200$ nA             |
| $V_{CE(sat)}$ | $I_C = 55\text{A}$ , $V_{GE} = 15\text{V}$ , Note 1      | 2.7                   | 3.2  | V                        |
|               | $T_J = 125^\circ\text{C}$                                | 3.3                   |      | V                        |

### Features

- High Blocking Voltage
- International Standard Packages
- Low Conduction Losses
- High Current Handling Capability
- MOS Gate Turn-On  
- Drive Simplicity

### Advantages

- Easy to Mount
- Space Savings
- High Power Density

### Applications

- Uninterruptible Power Supplies (UPS)
- Switch-Mode and Resonant-Mode Power Supplies
- Capacitor Discharge Circuits
- Laser Generators

**Symbol Test Conditions**

( $T_J = 25^\circ\text{C}$  Unless Otherwise Specified)

**Characteristic Values**
**Min.      Typ.      Max.**

|              |                                                                                                                                                              |    |      |                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----|------|------------------------|
| $g_{fs}$     | $I_C = 55\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$                                                                                                       | 32 | 50   | S                      |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                                                   |    | 7300 | pF                     |
| $C_{oes}$    |                                                                                                                                                              |    | 275  | pF                     |
| $C_{res}$    |                                                                                                                                                              |    | 83   | pF                     |
| $Q_g$        | $I_C = 55\text{A}, V_{GE} = 15\text{V}, V_{CE} = 1000\text{V}$                                                                                               |    | 335  | nC                     |
| $Q_{ge}$     |                                                                                                                                                              |    | 47   | nC                     |
| $Q_{gc}$     |                                                                                                                                                              |    | 130  | nC                     |
| $t_{d(on)}$  | <b>Resistive Switching Times, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 110\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 1250\text{V}, R_G = 2\Omega$  |    | 54   | ns                     |
| $t_r$        |                                                                                                                                                              |    | 307  | ns                     |
| $t_{d(off)}$ |                                                                                                                                                              |    | 230  | ns                     |
| $t_f$        |                                                                                                                                                              |    | 268  | ns                     |
| $t_{d(on)}$  | <b>Resistive Switching Times, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 110\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 1250\text{V}, R_G = 2\Omega$ |    | 52   | ns                     |
| $t_r$        |                                                                                                                                                              |    | 585  | ns                     |
| $t_{d(off)}$ |                                                                                                                                                              |    | 215  | ns                     |
| $t_f$        |                                                                                                                                                              |    | 260  | ns                     |
| $R_{thJC}$   |                                                                                                                                                              |    | 0.15 | $0.20^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                              |    |      | $^\circ\text{C/W}$     |

**Reverse Diode**
**Symbol Test Conditions**

( $T_J = 25^\circ\text{C}$  Unless Otherwise Specified)

**Characteristic Values**
**Min.      Typ.      Max**

|          |                                                                                                                       |  |     |               |
|----------|-----------------------------------------------------------------------------------------------------------------------|--|-----|---------------|
| $V_F$    | $I_F = 55\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$                                                                 |  | 2.5 | V             |
| $t_{rr}$ | $I_F = 28\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GE} = 0\text{V}$ |  | 1.9 | $\mu\text{s}$ |
| $I_{RM}$ |                                                                                                                       |  | 54  | A             |

Note 1: Pulse Test,  $t \leq 300\mu\text{s}$ , Duty Cycle,  $d \leq 2\%$ .

Additional provisions for lead-to-lead isolation are required at  $V_{CE} > 1250\text{V}$ .

Littelfuse reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

|           |           |           |           |              |              |              |              |              |              |
|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|
| 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665    | 6,404,065 B1 | 6,683,344    | 6,727,585    | 7,005,734 B2 | 7,157,338 B2 |
| 4,860,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 6,759,692    | 7,063,975 B2 |              |
| 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505    | 6,710,463    | 6,771,478 B2 | 7,071,537    |              |

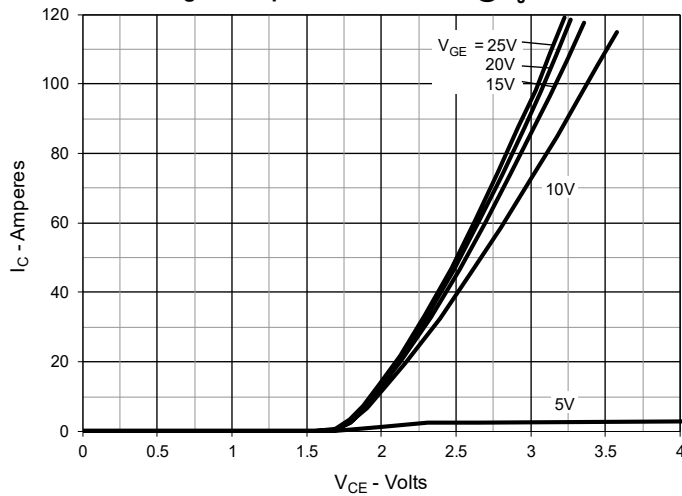
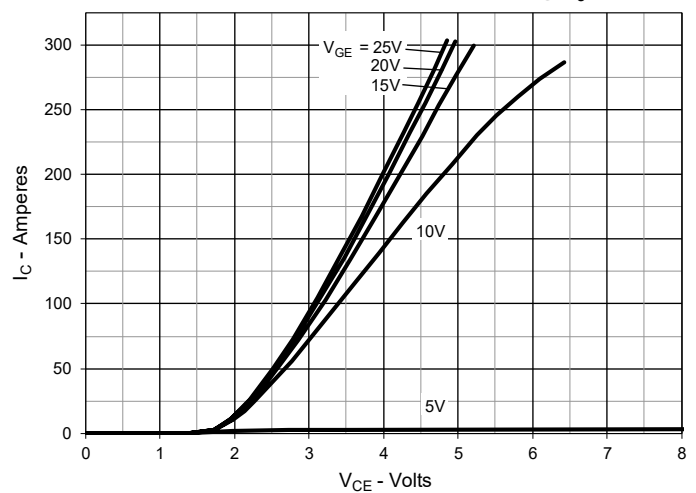
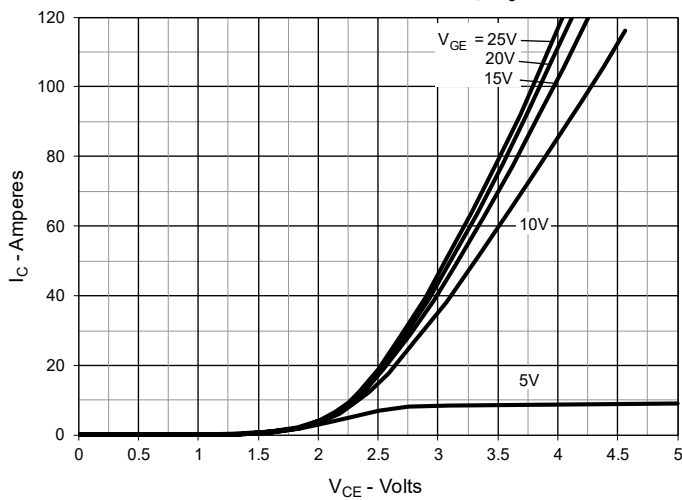
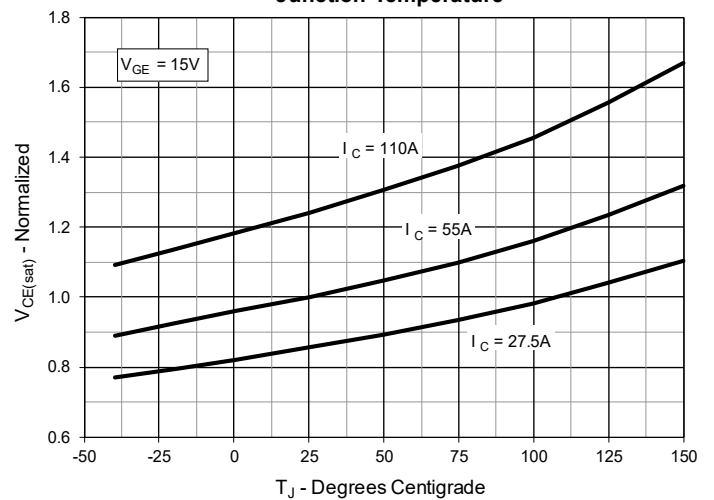
Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$ 

Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$ 

Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$ 

Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

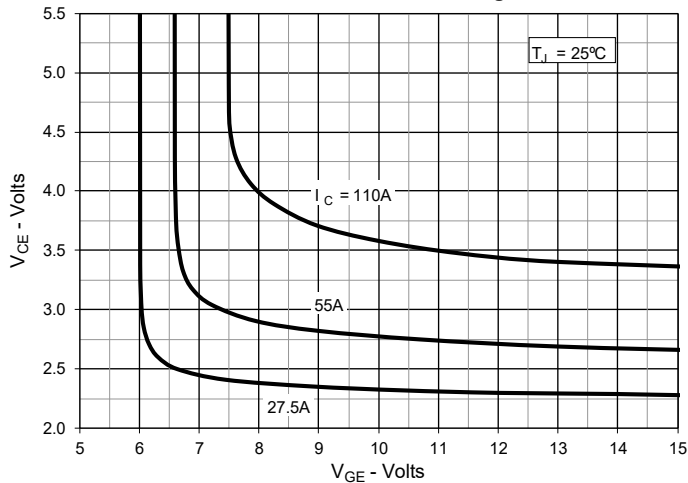


Fig. 6. Input Admittance

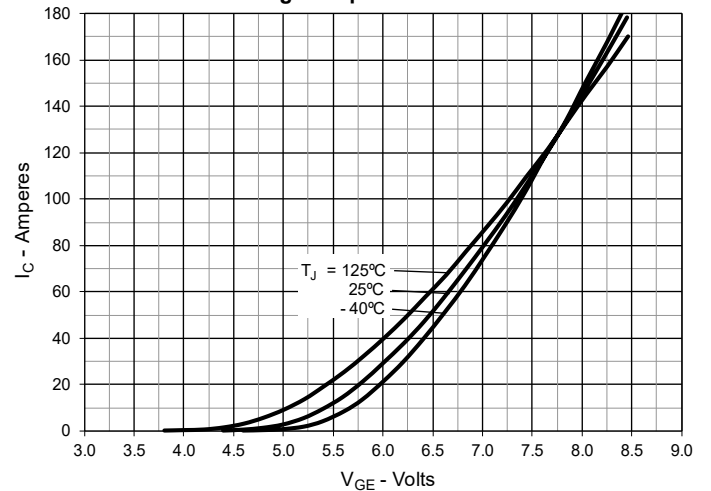


Fig. 7. Transconductance

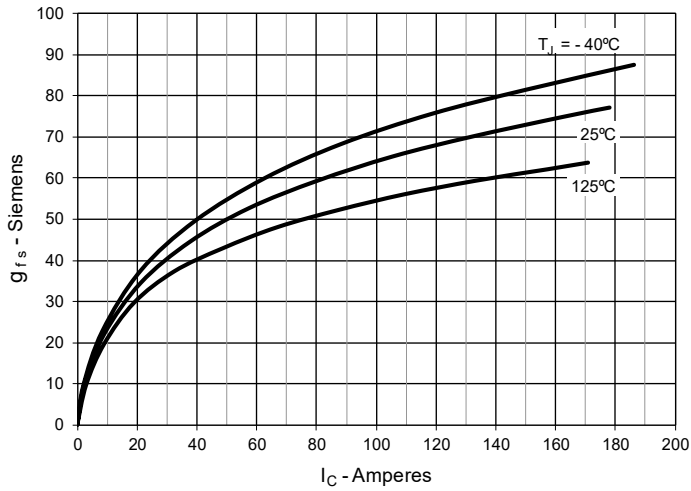


Fig. 8. Forward Voltage Drop of Intrinsic Diode

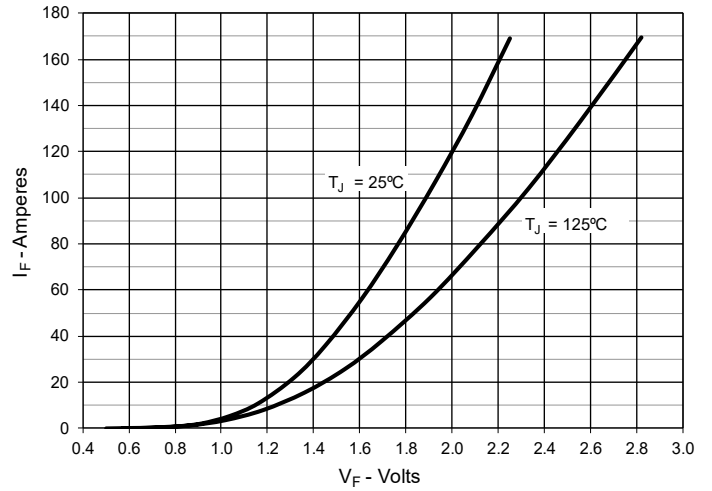


Fig. 9. Gate Charge

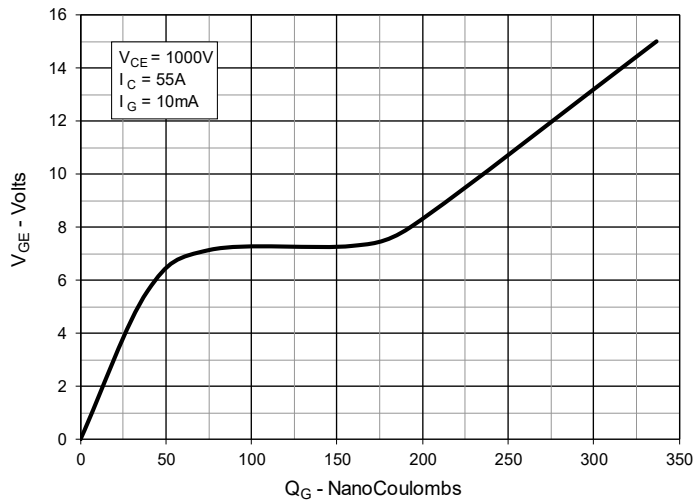


Fig. 10. Capacitance

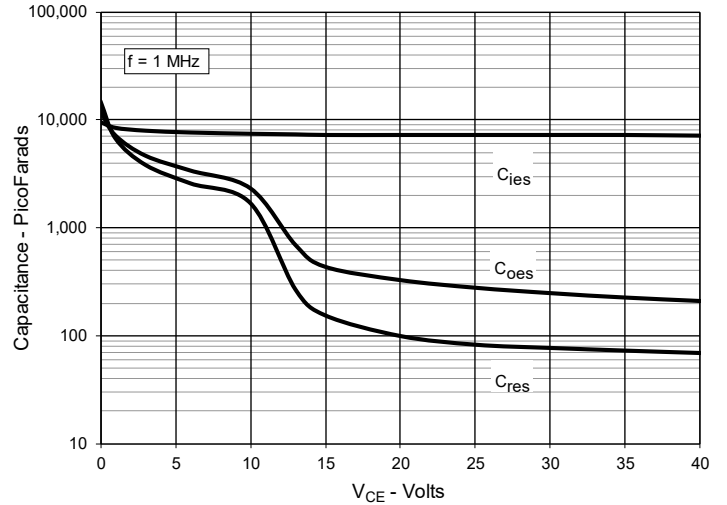


Fig. 11. Reverse-Bias Safe Operating Area

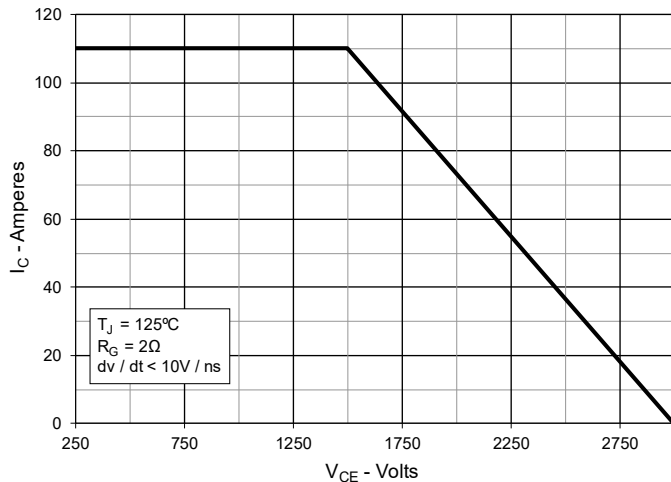


Fig. 12. Maximum Transient Thermal Impedance

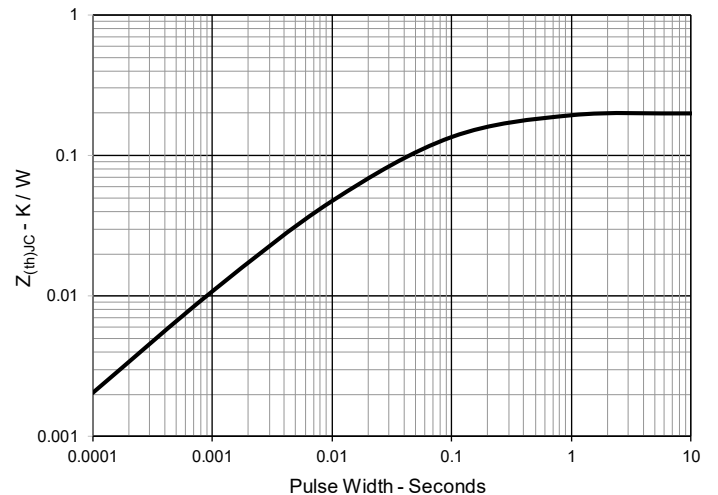


Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature

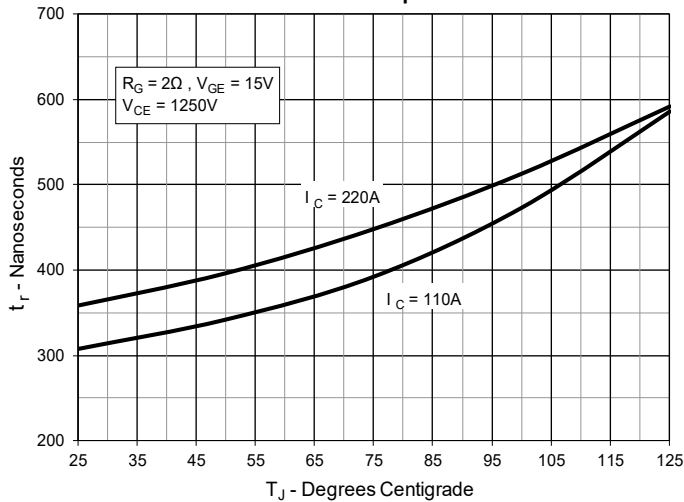


Fig. 14. Resistive Turn-on Rise Time vs. Collector Current

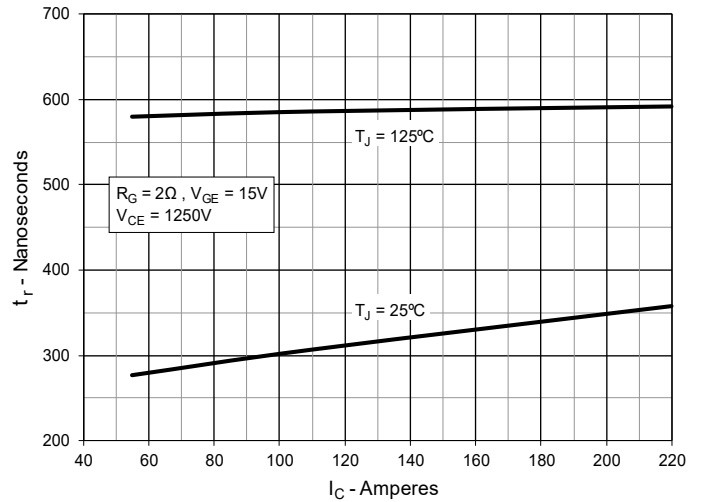


Fig. 15. Resistive Turn-on Switching Times vs. Gate Resistance

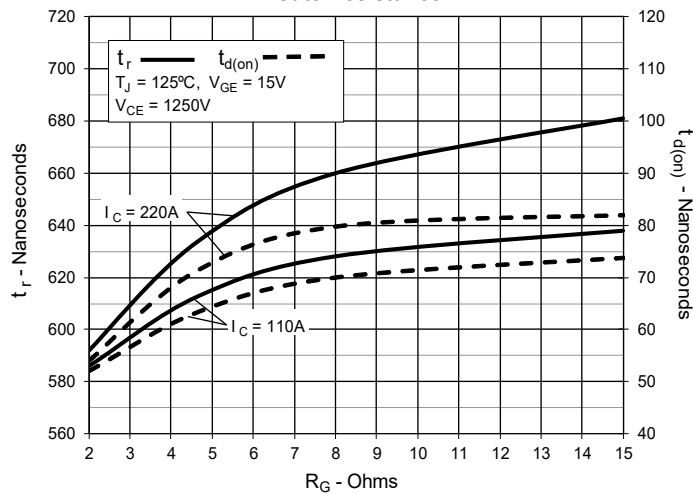


Fig. 16. Resistive Turn-off Switching Times vs. Junction Temperature

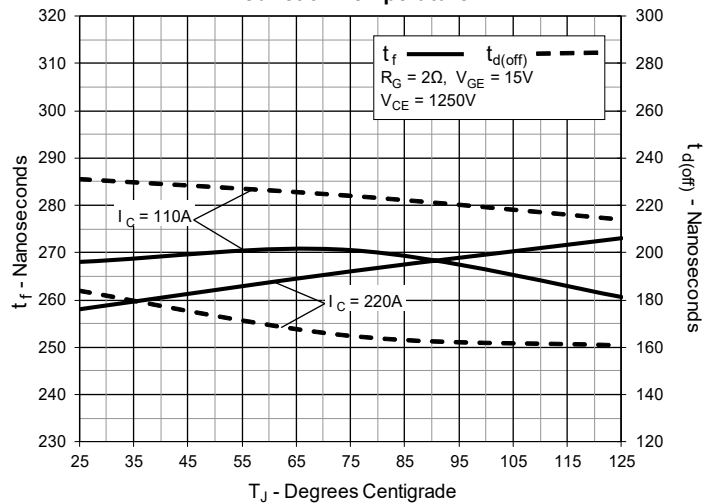


Fig. 17. Resistive Turn-off Switching Times vs. Collector Current

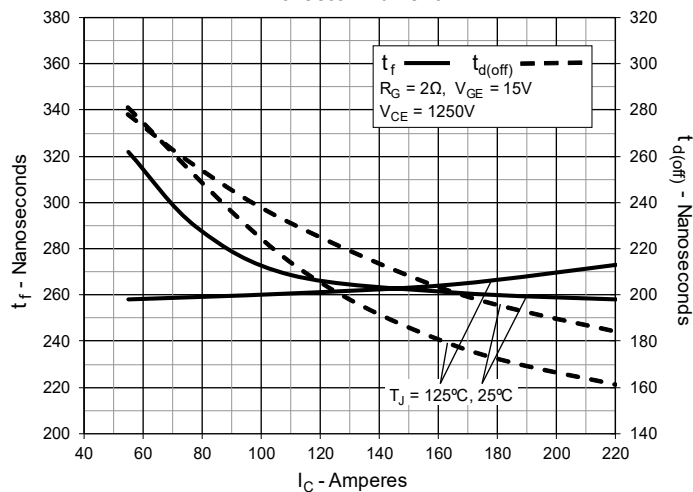


Fig. 18. Resistive Turn-off Switching Times vs. Gate Resistance

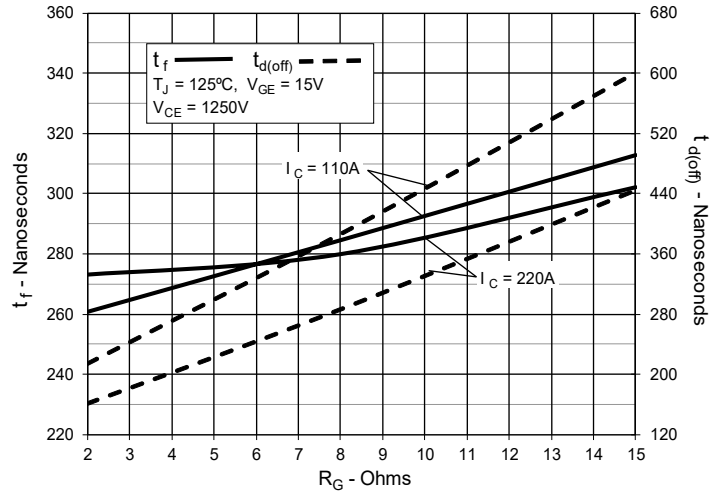


Fig. 19. Forward-Bias Safe Operating Area  
@  $T_C = 25^\circ\text{C}$

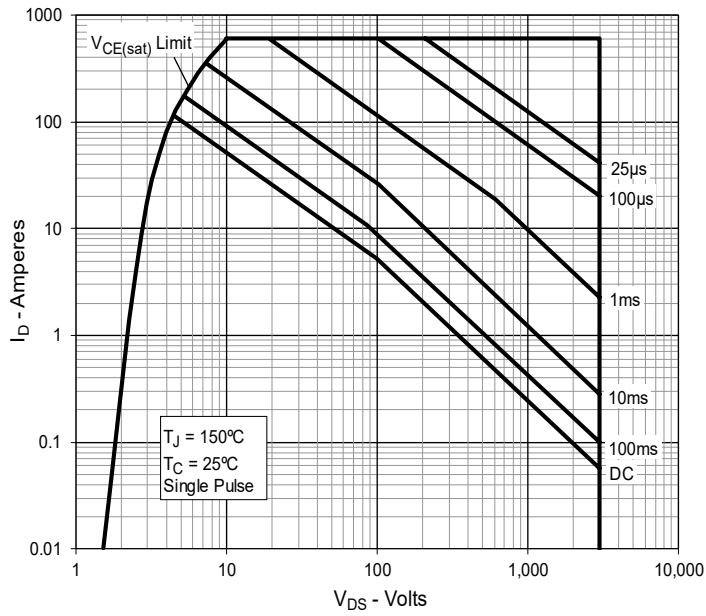
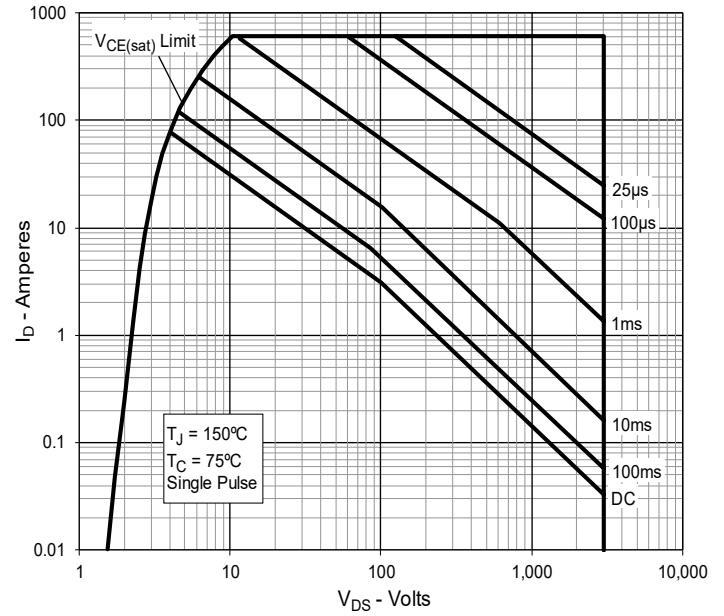
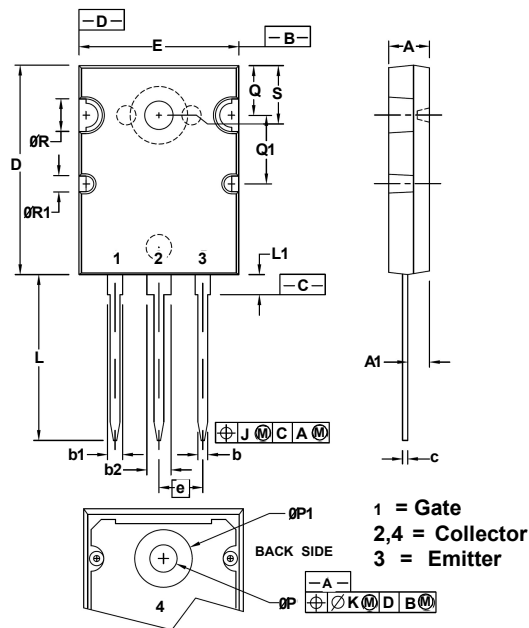
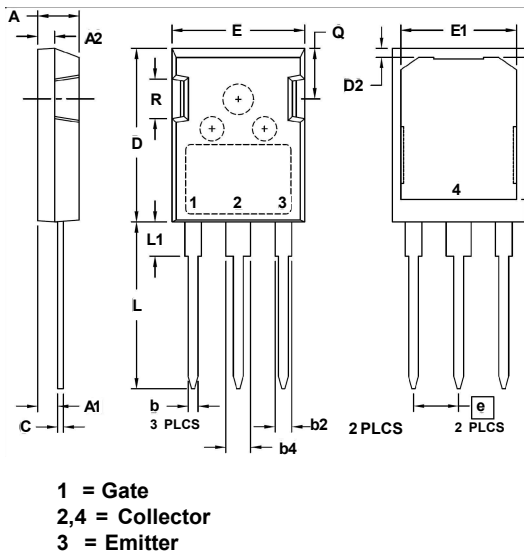


Fig. 20. Forward-Bias Safe Operating Area  
@  $T_C = 75^\circ\text{C}$



**TO-264 Outline**


| SYMBOL | INCHES   |       | MILLIMETERS |       |
|--------|----------|-------|-------------|-------|
|        | MIN      | MAX   | MIN         | MAX   |
| A      | .185     | .209  | 4.70        | 5.31  |
| A1     | .102     | .118  | 2.59        | 3.00  |
| b      | .037     | .055  | 0.94        | 1.40  |
| b1     | .087     | .102  | 2.21        | 2.59  |
| b2     | .110     | .126  | 2.79        | 3.20  |
| c      | .017     | .029  | 0.43        | 0.74  |
| D      | 1.007    | 1.047 | 25.58       | 26.59 |
| E      | .760     | .799  | 19.30       | 20.29 |
| e      | .215 BSC |       | 5.46 BSC    |       |
| J      | .000     | .010  | 0.00        | 0.25  |
| K      | .000     | .010  | 0.00        | 0.25  |
| L      | .779     | .842  | 19.79       | 21.39 |
| L1     | .087     | .102  | 2.21        | 2.59  |
| øP     | .122     | .138  | 3.10        | 3.51  |
| øP1    | .270     | .290  | 6.86        | 7.37  |
| Q      | .240     | .256  | 6.10        | 6.50  |
| Q1     | .330     | .346  | 8.38        | 8.79  |
| øR     | .155     | .187  | 3.94        | 4.75  |
| øR1    | .085     | .093  | 2.16        | 2.36  |
| S      | .243     | .253  | 6.17        | 6.43  |

**PLUS247™ Outline**


| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .055 | 1.14        | 1.40  |
| b2  | .075     | .087 | 1.91        | 2.20  |
| b4  | .115     | .126 | 2.92        | 3.20  |
| C   | .024     | .031 | 0.61        | 0.80  |
| D   | .819     | .840 | 20.80       | 21.34 |
| D1  | .650     | .690 | 16.51       | 17.53 |
| D2  | .035     | .050 | 0.89        | 1.27  |
| E   | .620     | .635 | 15.75       | 16.13 |
| E1  | .520     | .560 | 13.08       | 14.22 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .810 | 19.81       | 20.57 |
| L1  | .150     | .170 | 3.81        | 4.32  |
| Q   | .220     | .244 | 5.59        | 6.20  |
| R   | .170     | .190 | 4.32        | 4.83  |

