

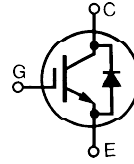
# High Voltage, High Gain BiMOSFET™ Monolithic Bipolar MOS Transistor

## IXBA12N300HV IXBT12N300HV

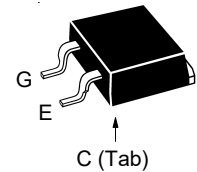
$$V_{CES} = 3000V$$

$$I_{C110} = 12A$$

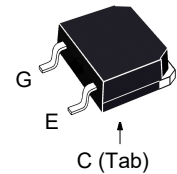
$$V_{CE(sat)} \leq 3.2V$$



TO-263HV  
(IXBA..HV)



TO-268HV  
(IXBT..HV)



G = Gate  
E = Emitter

C = Collector  
Tab = Collector

| Symbol                        | Test Conditions                                                                      | Maximum Ratings       |            |
|-------------------------------|--------------------------------------------------------------------------------------|-----------------------|------------|
| $V_{CES}$                     | $T_J = 25^\circ C$ to $150^\circ C$                                                  | 3000                  | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$                            | 3000                  | V          |
| $V_{GES}$                     | Continuous                                                                           | $\pm 20$              | V          |
| $V_{GEM}$                     | Transient                                                                            | $\pm 30$              | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$                                                                   | 30                    | A          |
| $I_{C110}$                    | $T_C = 110^\circ C$                                                                  | 12                    | A          |
| $I_{CM}$                      | $T_C = 25^\circ C$ , 1ms                                                             | 100                   | A          |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 30\Omega$<br>Clamped Inductive Load | $I_{CM} = 98$<br>1500 | A<br>V     |
| $P_c$                         | $T_C = 25^\circ C$                                                                   | 160                   | W          |
| $T_J$                         |                                                                                      | -55 ... +150          | $^\circ C$ |
| $T_{JM}$                      |                                                                                      | 150                   | $^\circ C$ |
| $T_{stg}$                     |                                                                                      | -55 ... +150          | $^\circ C$ |
| $T_{SOLD}$                    | Plastic Body for 10s                                                                 | 260                   | $^\circ C$ |
| <b>Weight</b>                 | TO-263HV                                                                             | 2.5                   | g          |
|                               | TO-268HV                                                                             | 4.0                   | g          |

### Features

- High Voltage Package
- High Blocking Voltage
- Anti-Parallel Diode
- Low Conduction Losses

### Advantages

- Low Gate Drive Requirement
- High Power Density

### Applications:

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

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values |      |                    |
|---------------|---------------------------------------------------------------------|-----------------------|------|--------------------|
|               |                                                                     | Min.                  | Typ. | Max.               |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                    | 3000                  |      | V                  |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                | 3.0                   |      | 5.0 V              |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$ |                       |      | 25 $\mu A$<br>1 mA |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                                  |                       |      | $\pm 100$ nA       |
| $V_{CE(sat)}$ | $I_C = 12A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$        | 2.8                   | 3.2  | V                  |
|               |                                                                     | 3.5                   |      | V                  |

## Symbol Test Conditions

(T<sub>J</sub> = 25°C Unless Otherwise Specified)

## Characteristic Values

|                           |                                                                                                                                                         | Min. | Typ. | Max. |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| <b>g<sub>fs</sub></b>     | I <sub>C</sub> = 12A, V <sub>CE</sub> = 10V, Note 1                                                                                                     | 6.5  | 10.8 | S    |
| <b>C<sub>ies</sub></b>    | V <sub>CE</sub> = 25V, V <sub>GE</sub> = 0V, f = 1MHz                                                                                                   |      | 1290 | pF   |
| <b>C<sub>oes</sub></b>    |                                                                                                                                                         |      | 56   | pF   |
| <b>C<sub>res</sub></b>    |                                                                                                                                                         |      | 19   | pF   |
| <b>Q<sub>g(on)</sub></b>  | I <sub>C</sub> = 12A, V <sub>GE</sub> = 15V, V <sub>CE</sub> = 1000V                                                                                    |      | 62   | nC   |
| <b>Q<sub>ge</sub></b>     |                                                                                                                                                         |      | 13   | nC   |
| <b>Q<sub>gc</sub></b>     |                                                                                                                                                         |      | 8.5  | nC   |
| <b>t<sub>d(on)</sub></b>  | <b>Resistive Switching Times, T<sub>J</sub> = 25°C</b><br>I <sub>C</sub> = 12A, V <sub>GE</sub> = 15V<br>V <sub>CE</sub> = 1250V, R <sub>G</sub> = 10Ω  |      | 64   | ns   |
| <b>t<sub>r</sub></b>      |                                                                                                                                                         |      | 140  | ns   |
| <b>t<sub>d(off)</sub></b> |                                                                                                                                                         |      | 180  | ns   |
| <b>t<sub>f</sub></b>      |                                                                                                                                                         |      | 540  | ns   |
| <b>t<sub>d(on)</sub></b>  | <b>Resistive Switching Times, T<sub>J</sub> = 125°C</b><br>I <sub>C</sub> = 12A, V <sub>GE</sub> = 15V<br>V <sub>CE</sub> = 1250V, R <sub>G</sub> = 10Ω |      | 65   | ns   |
| <b>t<sub>r</sub></b>      |                                                                                                                                                         |      | 395  | ns   |
| <b>t<sub>d(off)</sub></b> |                                                                                                                                                         |      | 175  | ns   |
| <b>t<sub>f</sub></b>      |                                                                                                                                                         |      | 530  | ns   |
| <b>R<sub>thJC</sub></b>   |                                                                                                                                                         |      | 0.78 | °C/W |

## Reverse Diode

## Symbol Test Conditions

(T<sub>J</sub> = 25°C Unless Otherwise Specified)

## Characteristic Values

|                       |                                                                           | Min. | Typ. | Max.  |
|-----------------------|---------------------------------------------------------------------------|------|------|-------|
| <b>V<sub>F</sub></b>  | I <sub>F</sub> = 12A, V <sub>GE</sub> = 0V                                |      |      | 2.1 V |
| <b>t<sub>rr</sub></b> | I <sub>F</sub> = 6A, V <sub>GE</sub> = 0V, -di <sub>F</sub> /dt = 100A/μs |      | 1.4  | μs    |
| <b>I<sub>RM</sub></b> |                                                                           |      | 21   | A     |

Note 1: Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.

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 | 7,157,338B2 |
| 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 @  $T_J = 25^\circ\text{C}$

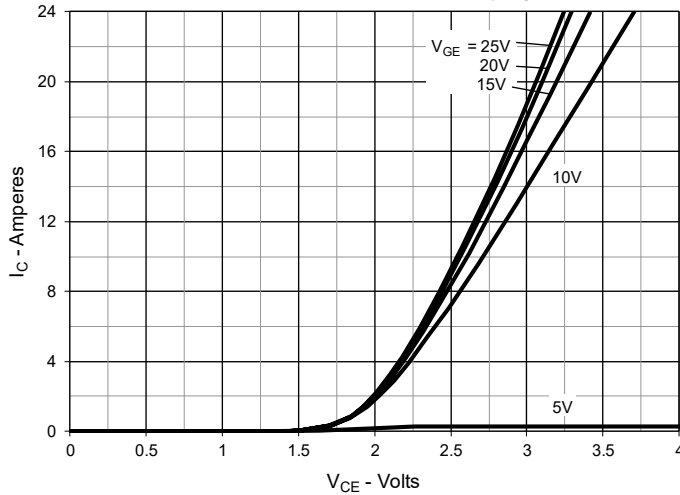


Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$

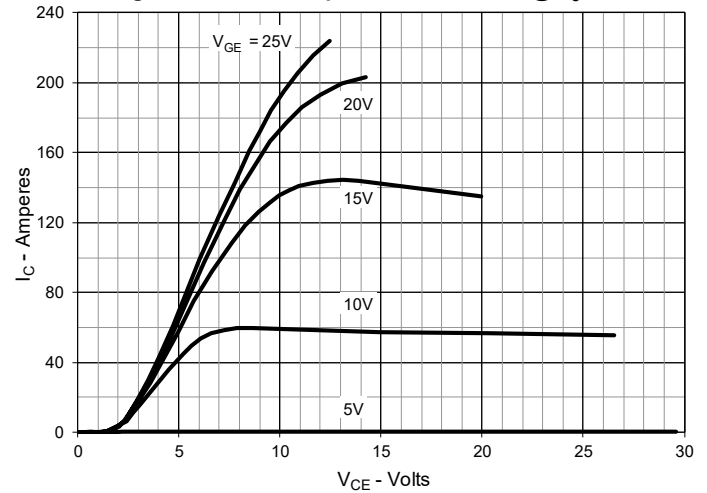


Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$

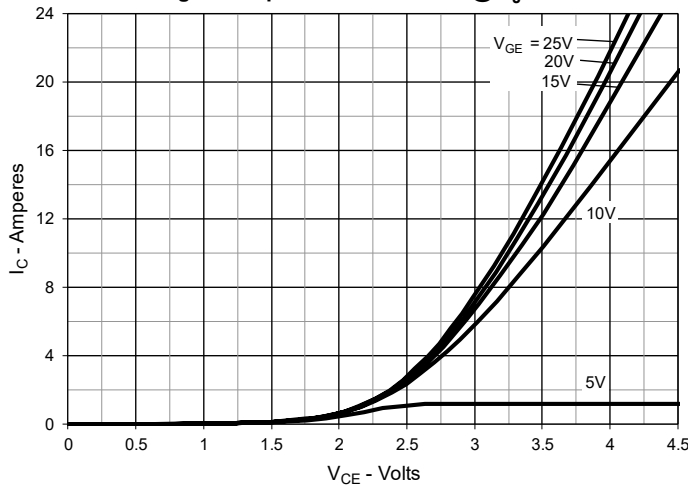


Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature

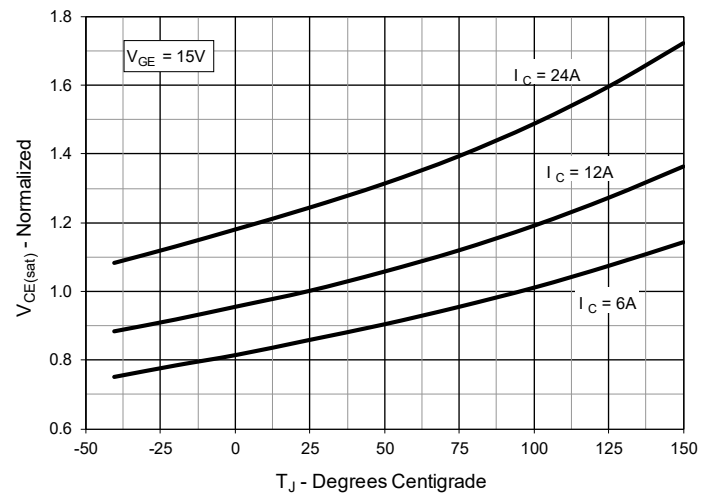


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

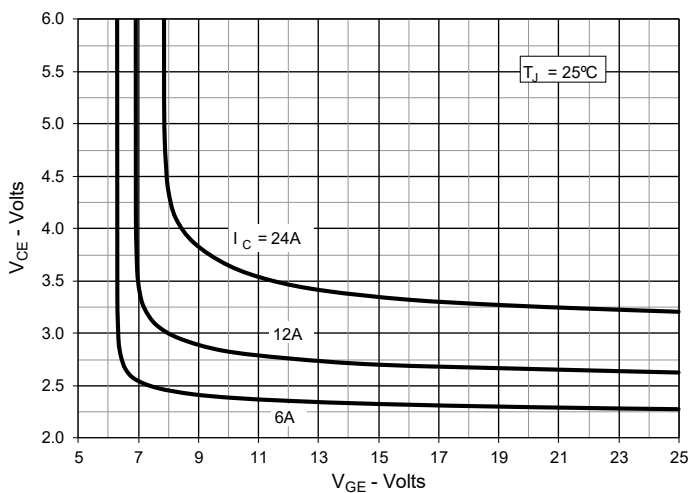


Fig. 6. Input Admittance

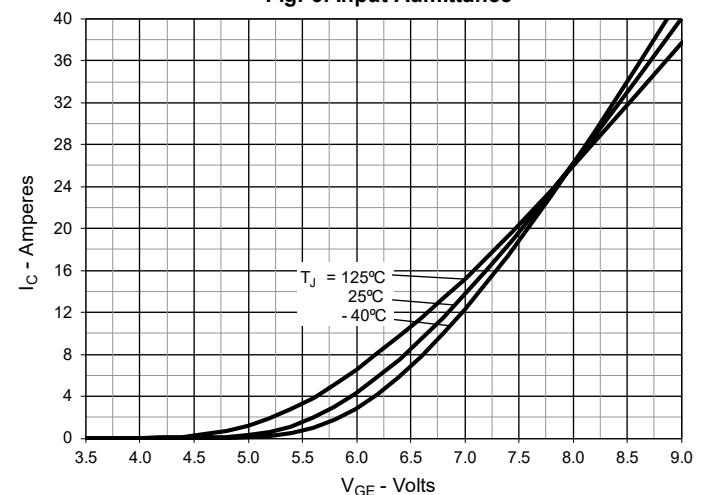


Fig. 7. Transconductance

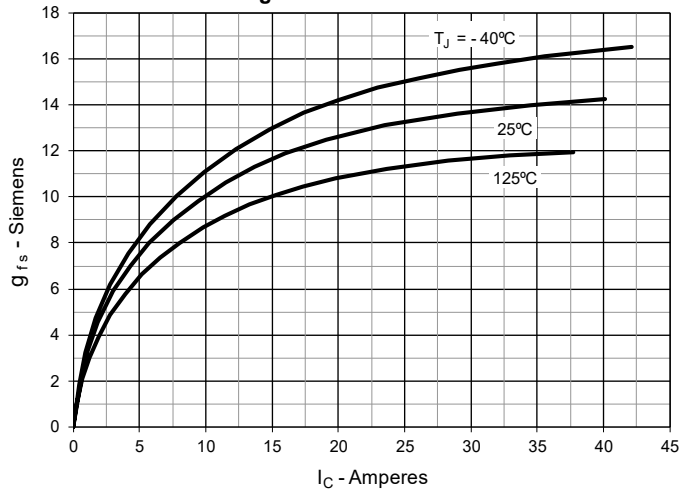


Fig. 8. Forward Voltage Drop of Intrinsic Diode

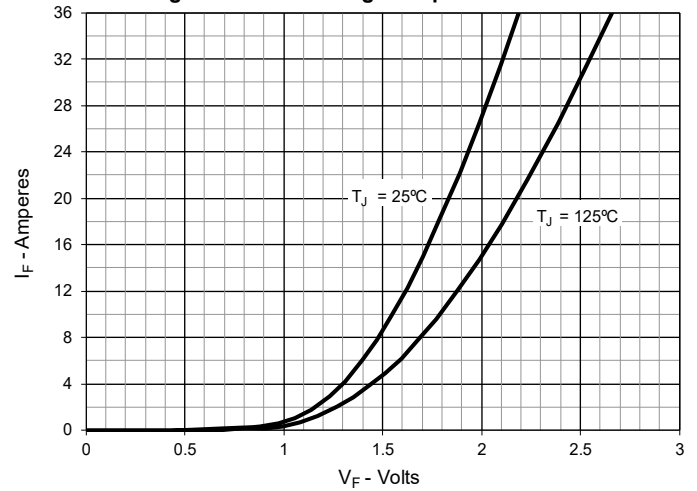


Fig. 9. Gate Charge

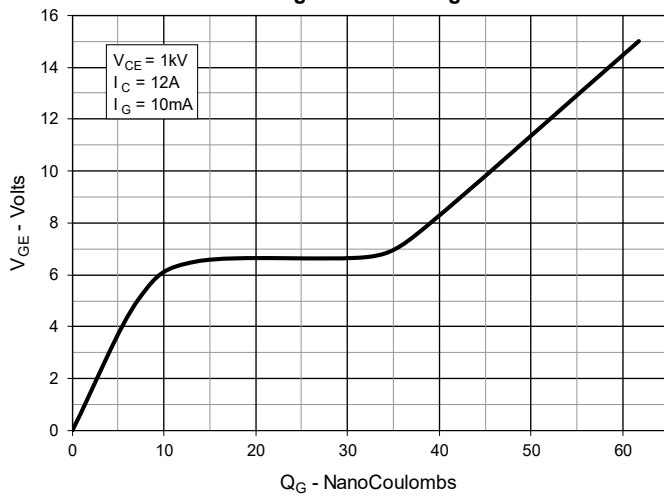


Fig. 10. Capacitance

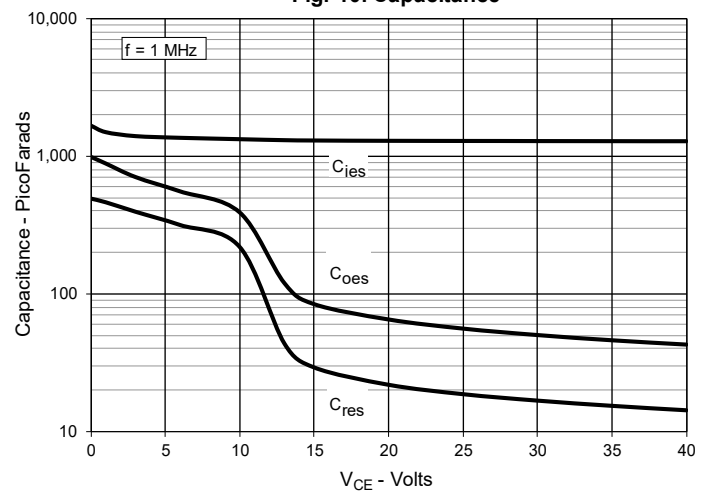


Fig. 11. Reverse-Bias Safe Operating Area

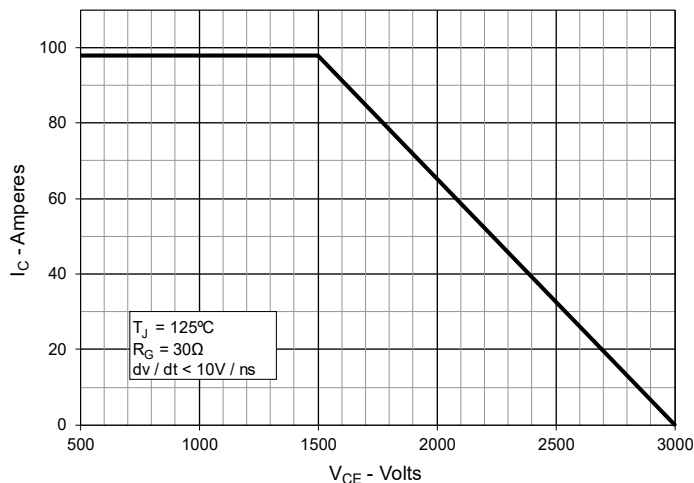


Fig. 12. Maximum Transient Thermal Impedance

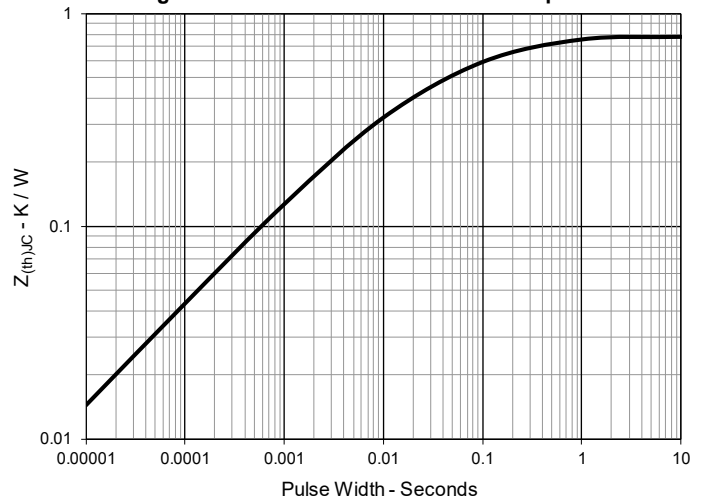


Fig. 15. Resistive Turn-on Rise Time vs. Junction Temperature

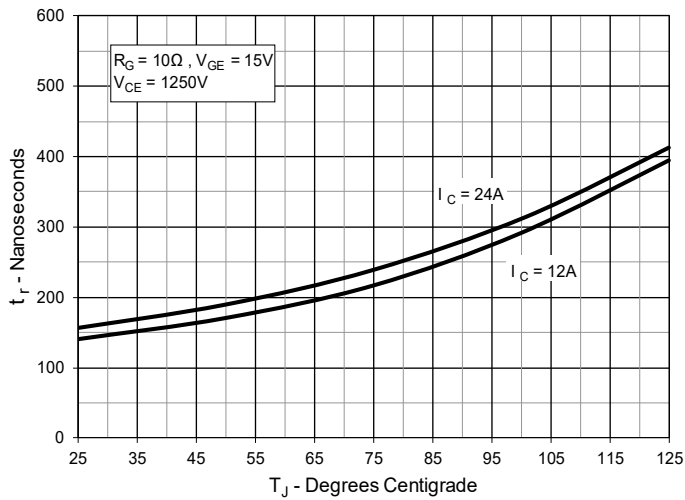


Fig. 16. Resistive Turn-on Rise Time vs. Collector Current

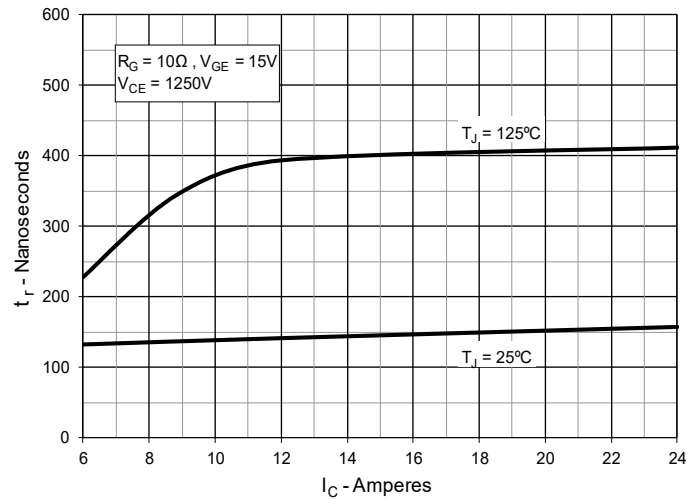


Fig. 17. Resistive Turn-on Switching Times vs. Gate Resistance

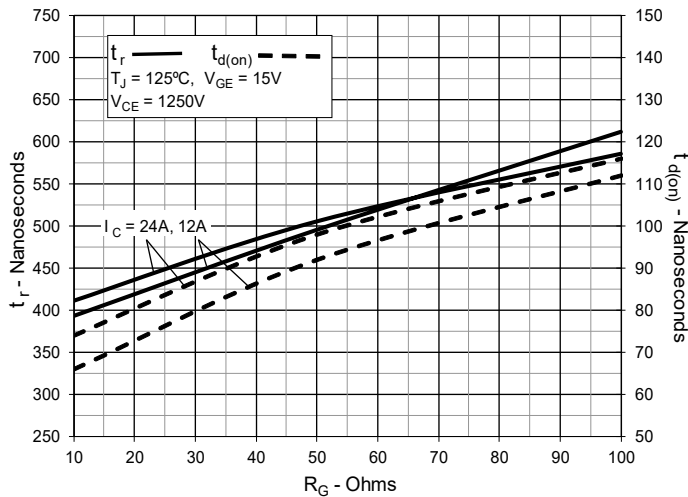


Fig. 18. Resistive Turn-off Switching Times vs. Junction Temperature

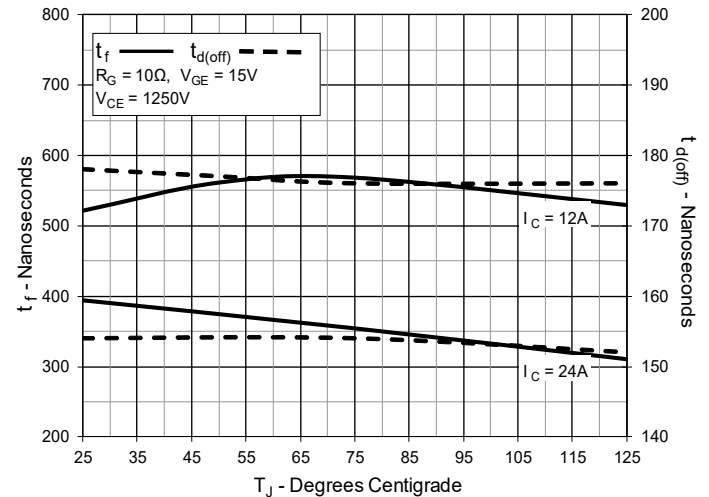


Fig. 19. Resistive Turn-off Switching Times vs. Collector Current

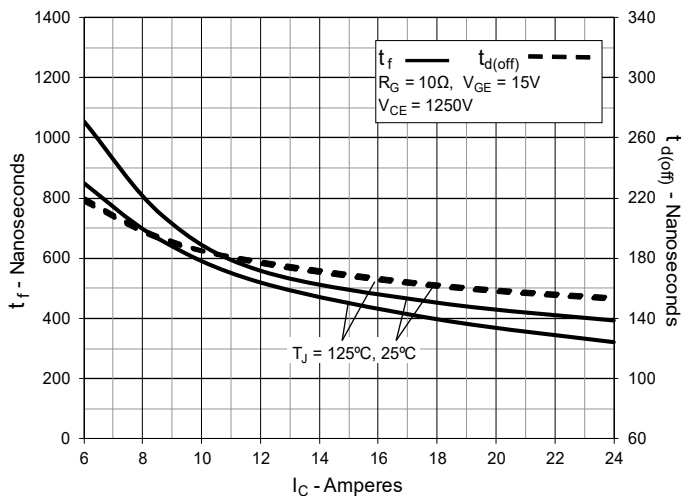


Fig. 20. Resistive Turn-off Switching Times vs. Gate Resistance

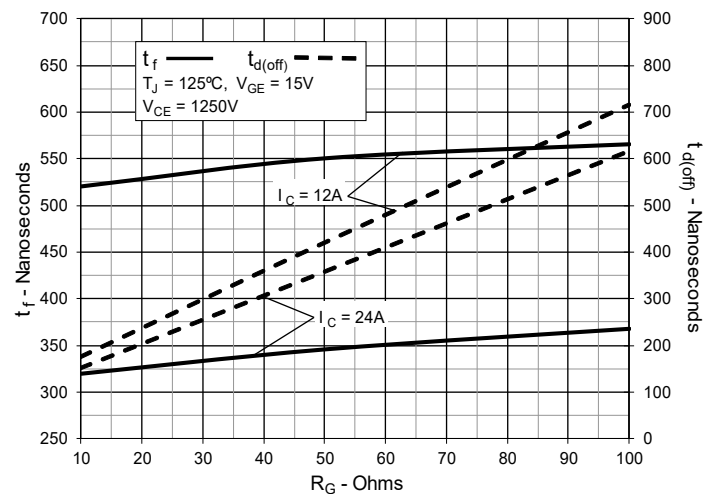


Fig. 13. Forward-Bias Safe Operating Area  
@  $T_C = 25^\circ\text{C}$

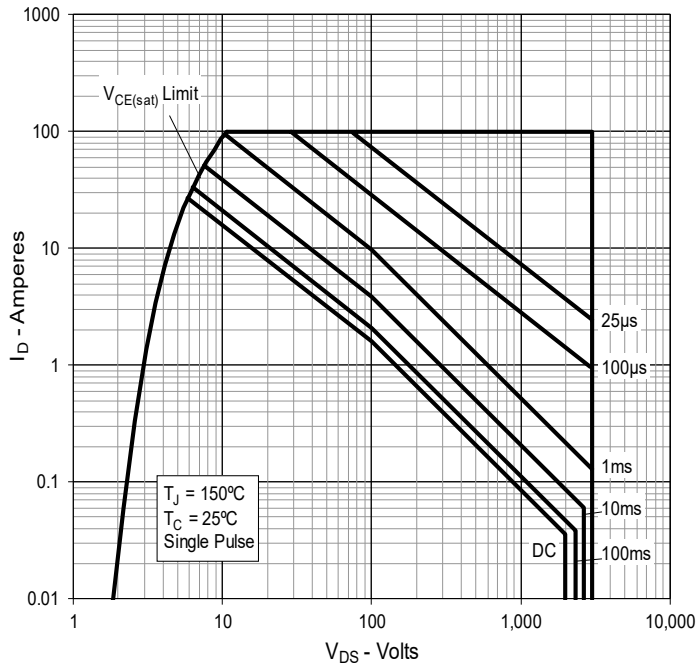
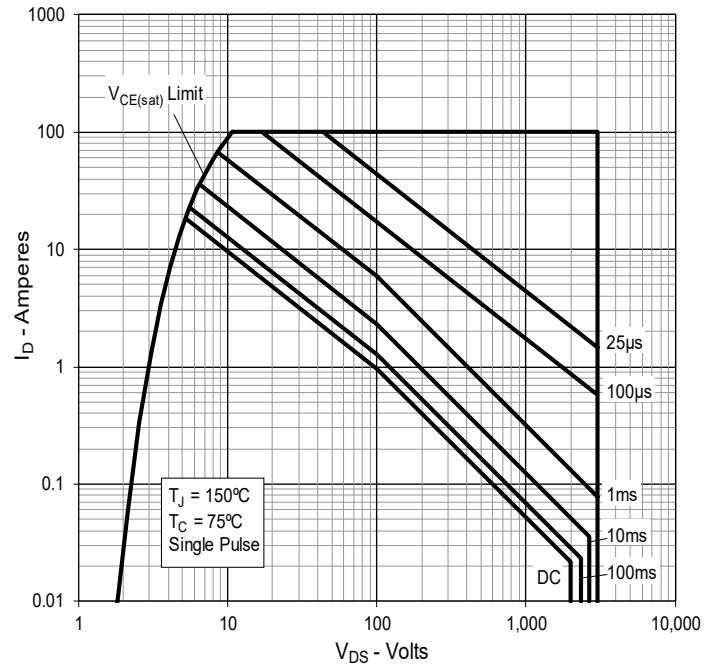
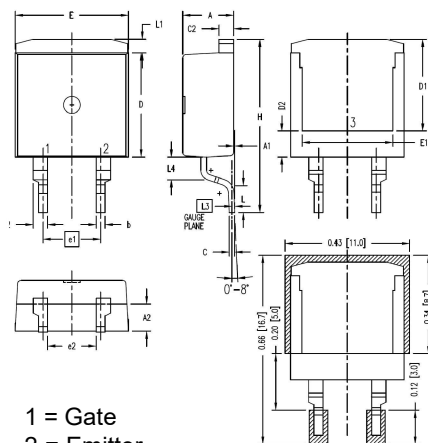


Fig. 14. Forward-Bias Safe Operating Area  
@  $T_C = 75^\circ\text{C}$



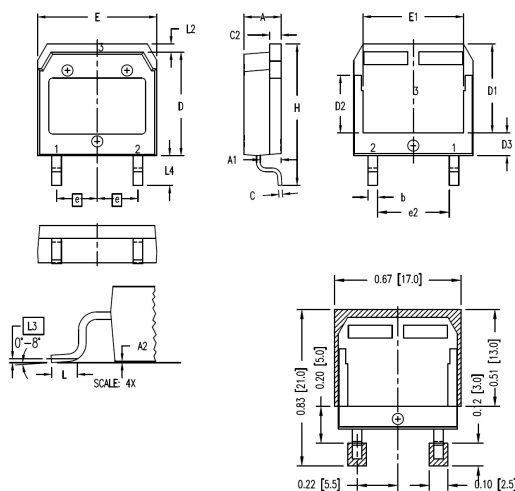
### TO-263HV Outline



- 1 = Gate  
2 = Emitter  
3 = Collector

| SYM  | INCHES   |      | MILLIMETER |       |
|------|----------|------|------------|-------|
|      | MIN      | MAX  | MIN        | MAX   |
| A    | .170     | .185 | 4.30       | 4.70  |
| A1   | .000     | .008 | 0.00       | 0.20  |
| A2   | .091     | .098 | 2.30       | 2.50  |
| b    | .028     | .035 | 0.70       | 0.90  |
| b2   | .046     | .054 | 1.18       | 1.38  |
| C    | .018     | .024 | 0.45       | 0.60  |
| C2   | .049     | .055 | 1.25       | 1.40  |
| D    | .354     | .370 | 9.00       | 9.40  |
| D1   | .311     | .327 | 7.90       | 8.30  |
| D2   | .083     | .098 | 2.10       | 2.50  |
| E    | .386     | .402 | 9.80       | 10.20 |
| E1   | .307     | .323 | 7.80       | 8.20  |
| e1   | .200 BSC |      | 5.08 BSC   |       |
| (e2) | .163     | .174 | 4.13       | 4.43  |
| H    | .591     | .614 | 15.00      | 15.60 |
| L    | .079     | .102 | 2.00       | 2.60  |
| L1   | .039     | .055 | 1.00       | 1.40  |
| L3   | .010 BSC |      | 0.254 BSC  |       |
| (L4) | .071     | .087 | 1.80       | 2.20  |

### TO-268HV Outline



- 1 - Gate  
2 - Emitter  
3 - Collector

| SYM  | INCHES   |      | MILLIMETER |       |
|------|----------|------|------------|-------|
|      | MIN      | MAX  | MIN        | MAX   |
| A    | .193     | .201 | 4.90       | 5.10  |
| A1   | .106     | .114 | 2.70       | 2.90  |
| A2   | .001     | .010 | 0.02       | 0.25  |
| b    | .045     | .057 | 1.15       | 1.45  |
| C    | .016     | .026 | 0.40       | 0.65  |
| C2   | .057     | .063 | 1.45       | 1.60  |
| D    | .543     | .551 | 13.80      | 14.00 |
| D1   | .465     | .476 | 11.80      | 12.10 |
| D2   | .295     | .307 | 7.50       | 7.80  |
| D3   | .114     | .126 | 2.90       | 3.20  |
| E    | .624     | .632 | 15.85      | 16.05 |
| E1   | .524     | .535 | 13.30      | 13.60 |
| e    | .215 BSC |      | 5.45 BSC   |       |
| (e2) | .374     | .386 | 9.50       | 9.80  |
| H    | .736     | .752 | 18.70      | 19.10 |
| L    | .067     | .079 | 1.70       | 2.00  |
| L2   | .039     | .045 | 1.00       | 1.15  |
| L3   | .010 BSC |      | 0.25 BSC   |       |
| L4   | .150     | .161 | 3.80       | 4.10  |