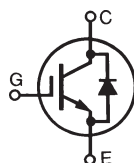


### High Voltage, BiMOSFET™ Monolithic Bipolar MOS Transistor

## IXBT42N300HV IXBH42N300HV

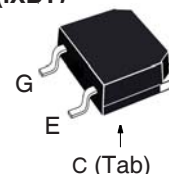


$$V_{CES} = 3000V$$

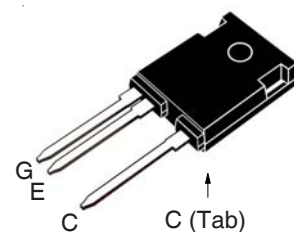
$$I_{C110} = 42A$$

$$V_{CE(sat)} \leq 3.0V$$

TO-268HV (IXBT)



TO-247HV (IXBH)



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

| Symbol                                       | Test Conditions                                                                                | Maximum Ratings       |            |
|----------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------|------------|
| $V_{CES}$                                    | $T_C = 25^\circ C$ 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                                                                                     | $\pm 25$              | V          |
| $V_{GEM}$                                    | Transient                                                                                      | $\pm 35$              | V          |
| $I_{C25}$                                    | $T_C = 25^\circ C$                                                                             | 104                   | A          |
| $I_{C110}$                                   | $T_C = 110^\circ C$                                                                            | 42                    | A          |
| $I_{CM}$                                     | $T_C = 25^\circ C$ , 1ms                                                                       | 400                   | A          |
| <b>SSOA</b><br><b>(RBSOA)</b>                | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 20\Omega$<br>Clamped Inductive Load           | $I_{CM} = 84$<br>1500 | A<br>V     |
| <b><math>T_{SC}</math></b><br><b>(SCSOA)</b> | $V_{GE} = 15V$ , $T_J = 125^\circ C$ ,<br>$R_G = 82\Omega$ , $V_{CE} = 1500V$ , Non-Repetitive | 10                    | $\mu s$    |
| $P_C$                                        | $T_C = 25^\circ C$                                                                             | 500                   | W          |
| $T_J$                                        |                                                                                                | -55 ... +150          | $^\circ C$ |
| $T_{JM}$                                     |                                                                                                | 150                   | $^\circ C$ |
| $T_{stg}$                                    |                                                                                                | -55 ... +150          | $^\circ C$ |
| $T_L$                                        | 1.6mm (0.062 in.) from Case for 10s                                                            | 300                   | $^\circ C$ |
| $T_{SOLD}$                                   | Plastic Body for 10 seconds                                                                    | 260                   | $^\circ C$ |
| $M_d$                                        | Mounting Torque (TO-247HV)                                                                     | 1.13/10               | Nm/lb.in   |
| <b>Weight</b>                                | TO-268HV                                                                                       | 4                     | g          |
|                                              | TO-247HV                                                                                       | 6                     | g          |

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ Unless Otherwise Specified) | Characteristic Values |            |                       |
|---------------|---------------------------------------------------------------------|-----------------------|------------|-----------------------|
|               |                                                                     | Min.                  | Typ.       | Max.                  |
| $BV_{CES}$    | $I_C = 1mA$ , $V_{GE} = 0V$                                         | 3000                  |            | V                     |
| $V_{GE(th)}$  | $I_C = 1mA$ , $V_{CE} = V_{GE}$                                     | 3.0                   |            | 5.0 V                 |
| $I_{CES}$     | $V_{CE} = 0.8 \cdot V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 125^\circ C$ |                       | 250        | 50 $\mu A$<br>$\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 25V$                                  |                       |            | $\pm 200$ nA          |
| $V_{CE(sat)}$ | $I_C = 42A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$        |                       | 2.5<br>3.1 | 3.0 V<br>V            |

### Features

- High Voltage Package
- High Blocking Voltage
- High Peak Current Capability
- Low Saturation Voltage
- FBSOA
- SCSOA

### Advantages

- Low Gate Drive Requirement
- High Power Density

### Applications

- Laser Generators
- Capacitor Discharge Circuits
- AC Switches
- Protection Circuits

## Symbol Test Conditions

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

## Characteristic Values

Min. Typ. Max.

|              |                                                                                                                                                              |    |      |                        |
|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|----|------|------------------------|
| $g_{fs}$     | $I_C = 42\text{A}, V_{CE} = 10\text{V}$ , Note 1                                                                                                             | 28 | 45   | S                      |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                                                   |    | 4780 | pF                     |
| $C_{oes}$    |                                                                                                                                                              |    | 170  | pF                     |
| $C_{res}$    |                                                                                                                                                              |    | 56   | pF                     |
| $R_{Gi}$     | Gate Input Resistance                                                                                                                                        |    | 3.0  | $\Omega$               |
| $Q_g$        | $I_C = 42\text{A}, V_{GE} = 15\text{V}, V_{CE} = 1000\text{V}$                                                                                               |    | 200  | nC                     |
| $Q_{ge}$     |                                                                                                                                                              |    | 28   | nC                     |
| $Q_{gc}$     |                                                                                                                                                              |    | 75   | nC                     |
| $t_{d(on)}$  | <b>Resistive Switching Times, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 42\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 1500\text{V}, R_G = 20\Omega$  |    | 72   | ns                     |
| $t_r$        |                                                                                                                                                              |    | 330  | ns                     |
| $t_{d(off)}$ |                                                                                                                                                              |    | 445  | ns                     |
| $t_f$        |                                                                                                                                                              |    | 610  | ns                     |
| $t_{d(on)}$  | <b>Resistive Switching Times, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 42\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 1500\text{V}, R_G = 20\Omega$ |    | 72   | ns                     |
| $t_r$        |                                                                                                                                                              |    | 580  | ns                     |
| $t_{d(off)}$ |                                                                                                                                                              |    | 460  | ns                     |
| $t_f$        |                                                                                                                                                              |    | 490  | ns                     |
| $R_{thJC}$   | TO-247HV                                                                                                                                                     |    | 0.21 | $0.25^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                              |    |      | $^\circ\text{C/W}$     |

## Reverse Diode

## Symbol Test Conditions

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

## Characteristic Values

Min. Typ. Max

|          |                                                                                                                       |  |     |               |
|----------|-----------------------------------------------------------------------------------------------------------------------|--|-----|---------------|
| $V_F$    | $I_F = 42\text{A}, V_{GE} = 0\text{V}$ , Note 1                                                                       |  | 2.5 | V             |
| $t_{rr}$ | $I_F = 21\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 100\text{A}/\mu\text{s}$<br>$V_R = 100\text{V}, V_{GE} = 0\text{V}$ |  | 1.7 | $\mu\text{s}$ |
| $I_{RM}$ |                                                                                                                       |  | 43  | A             |

Note 1. Pulse test,  $t < 300\mu\text{s}$ , duty cycle,  $d < 2\%$ .

## PRELIMINARY TECHNICAL INFORMATION

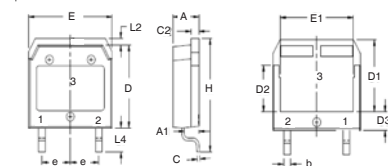
The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

IXYS 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    |             |

## TO-268HV Outline

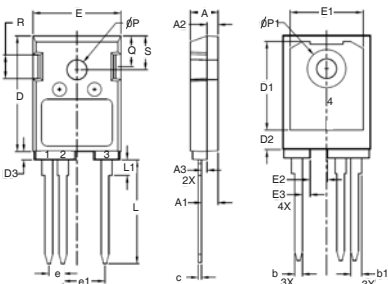


PINS:  
1 - Gate 2 - Emitter  
3 - Collector



| 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 |
| E2  | .215   | BSC  | 5.45       | BSC   |
| 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  |

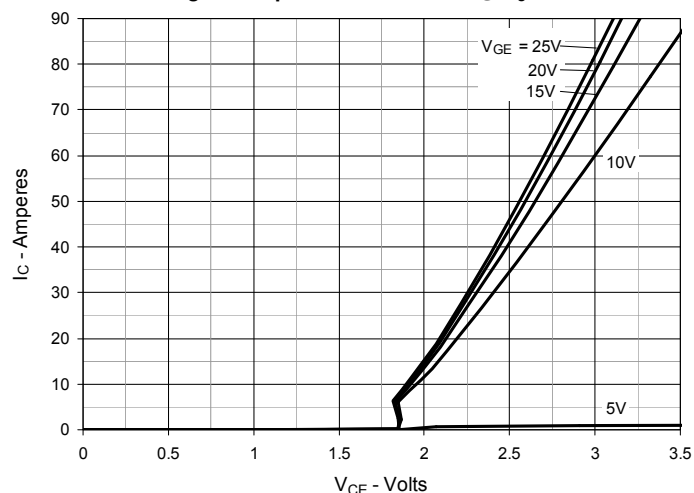
## TO-247HV Outline



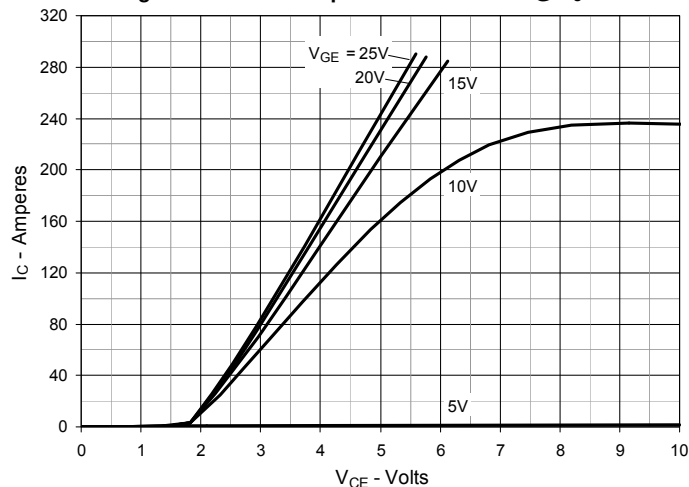
PINS:  
1 - Gate 2 - Emitter  
3, 4 - Collector

| SYM | INCHES |      | MILLIMETERS |       |
|-----|--------|------|-------------|-------|
|     | MIN    | MAX  | MIN         | MAX   |
| A   | .193   | .201 | 4.90        | 5.10  |
| A1  | .114   | .122 | 2.90        | 3.10  |
| A2  | .075   | .083 | 1.90        | 2.10  |
| A3  | .035   | .043 | 0.90        | 1.10  |
| b   | .053   | .059 | 1.35        | 1.50  |
| b1  | .075   | .083 | 1.90        | 2.10  |
| c   | .022   | .030 | 0.55        | 0.75  |
| D   | .819   | .843 | 20.80       | 21.40 |
| D1  | .638   | .646 | 16.20       | 16.40 |
| D2  | .134   | .146 | 3.40        | 3.70  |
| D3  | .055   | .063 | 1.40        | 1.60  |
| E   | .622   | .638 | 15.80       | 16.20 |
| E1  | .520   | .528 | 13.20       | 13.40 |
| E2  | .118   | .126 | 3.00        | 3.20  |
| E3  | .051   | .059 | 1.30        | 1.50  |
| e   | .100   | BSC  | 2.54        | BSC   |
| e1  | .300   | BSC  | 7.62        | BSC   |
| L   | .732   | .748 | 18.60       | 19.00 |
| L1  | .106   | .118 | 2.70        | 3.00  |
| øP  | .138   | .142 | 3.50        | 3.60  |
| øP1 | .272   | .280 | 6.90        | 7.10  |
| Q   | .216   | .224 | 5.50        | 5.70  |
| R   | .165   | .169 | 4.20        | 4.30  |
| S   | .240   | .248 | 6.10        | 6.30  |

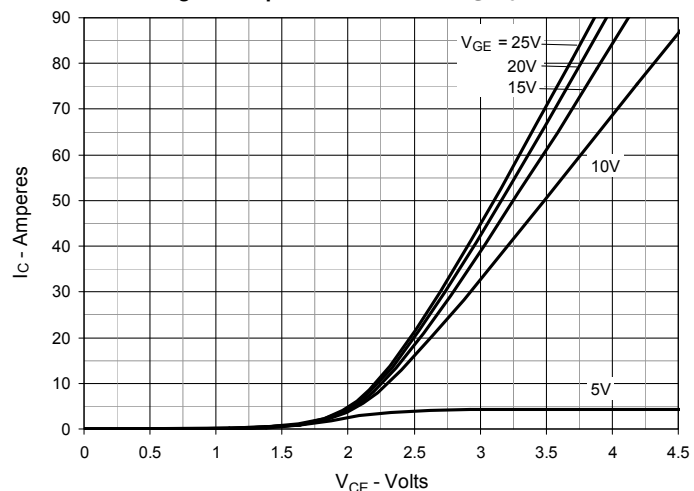
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



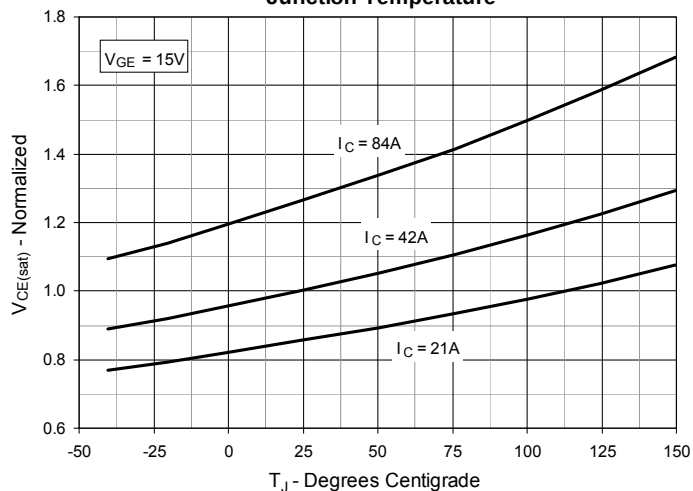
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



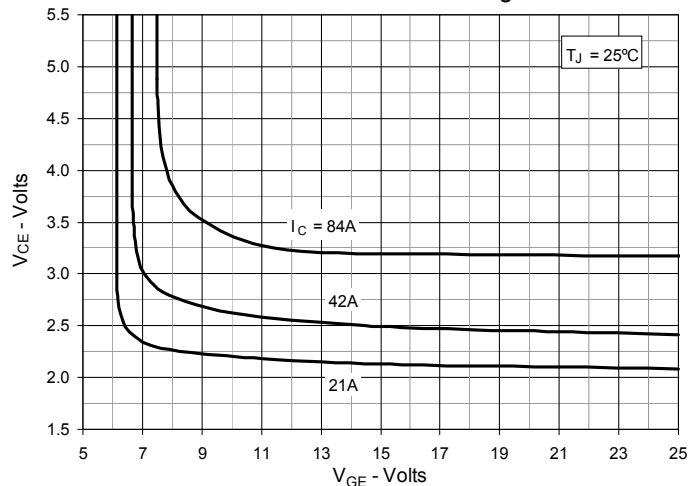
**Fig. 3. Output Characteristics @  $T_J = 125^\circ\text{C}$**



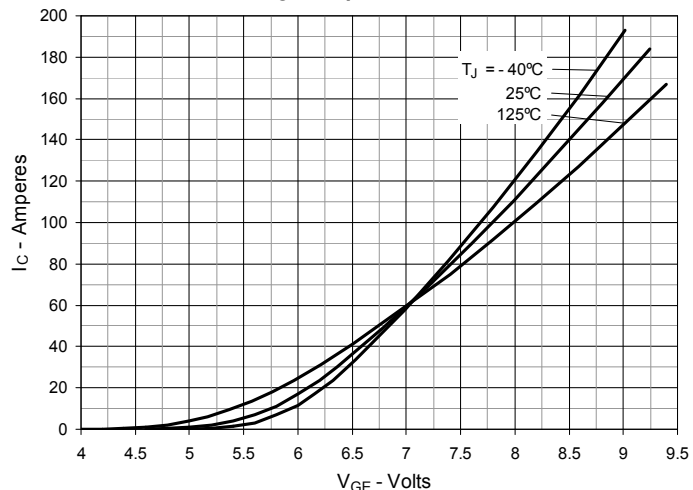
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



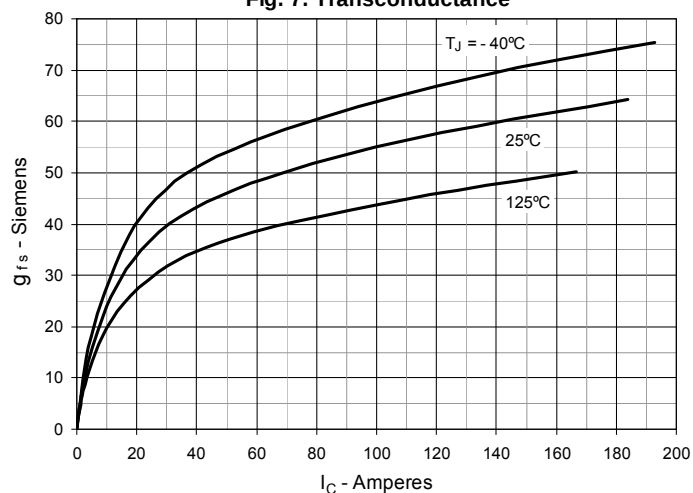
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



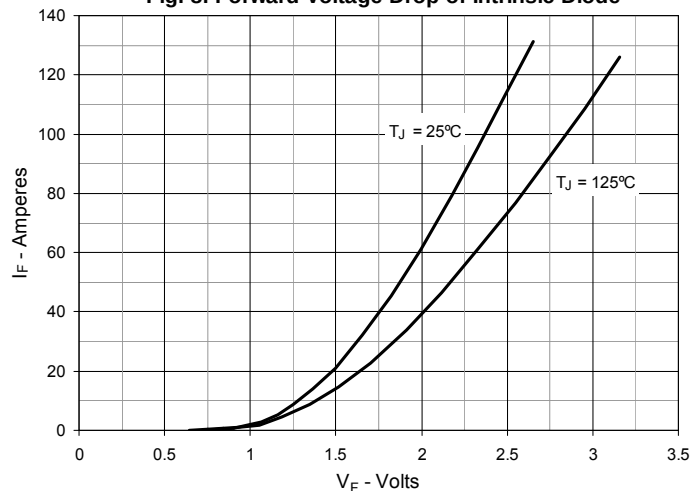
**Fig. 6. Input Admittance**



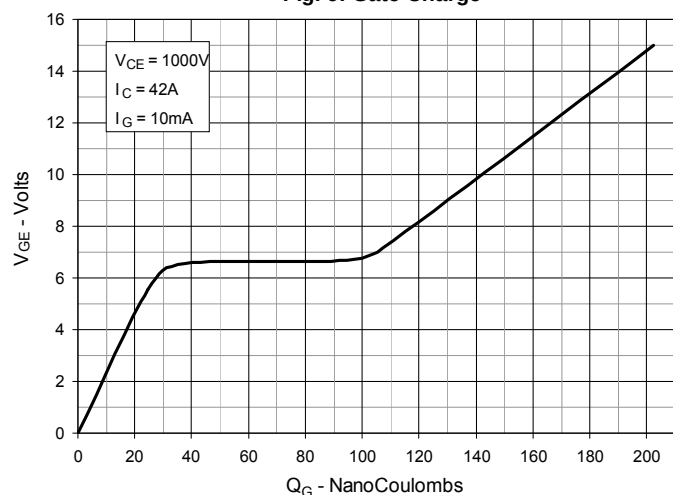
**Fig. 7. Transconductance**



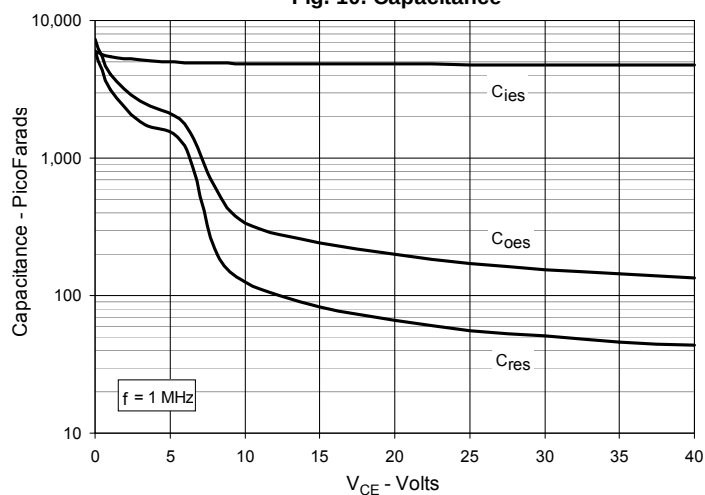
**Fig. 8. Forward Voltage Drop of Intrinsic Diode**



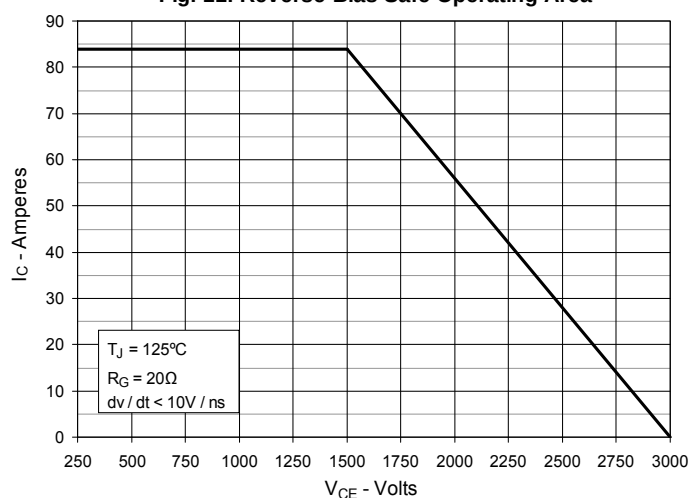
**Fig. 9. Gate Charge**



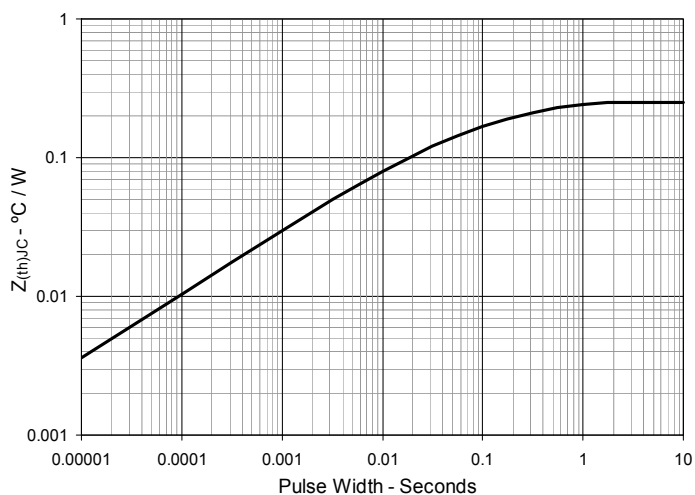
**Fig. 10. Capacitance**

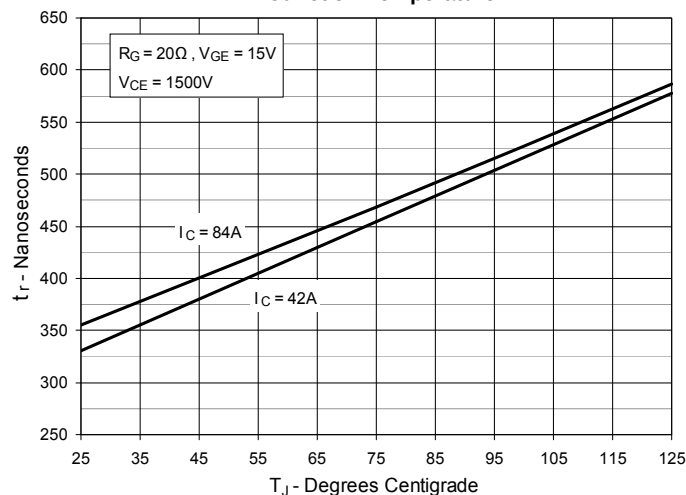
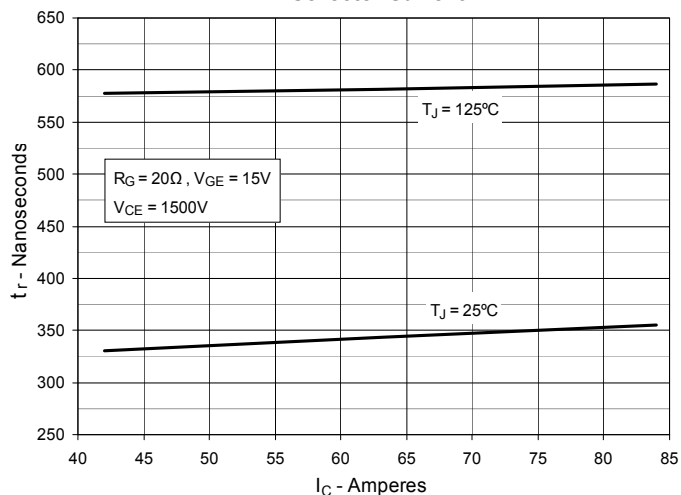
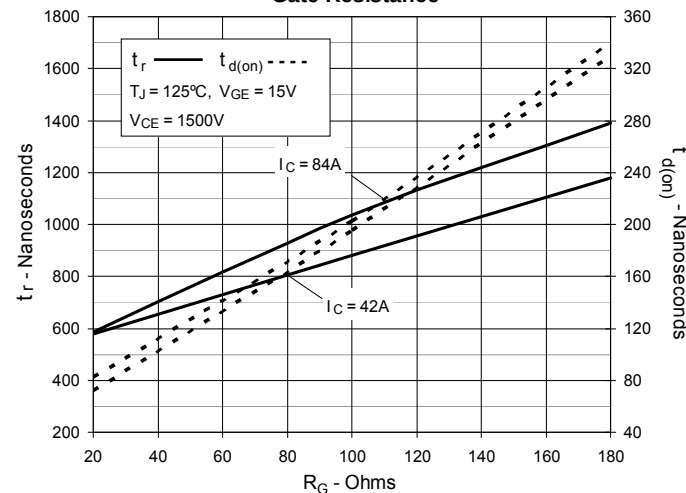
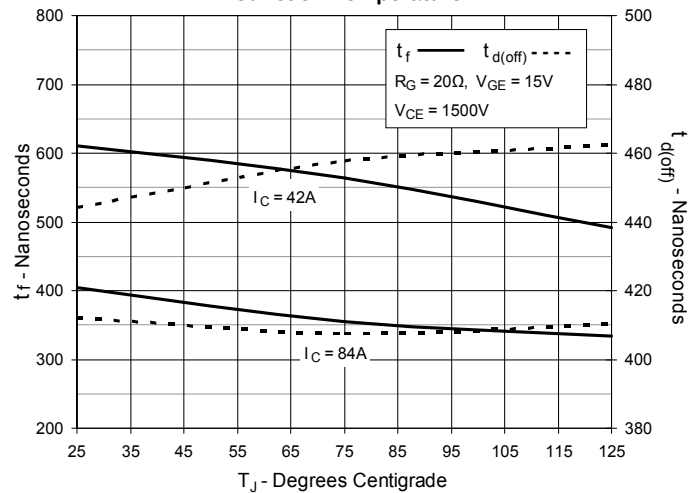
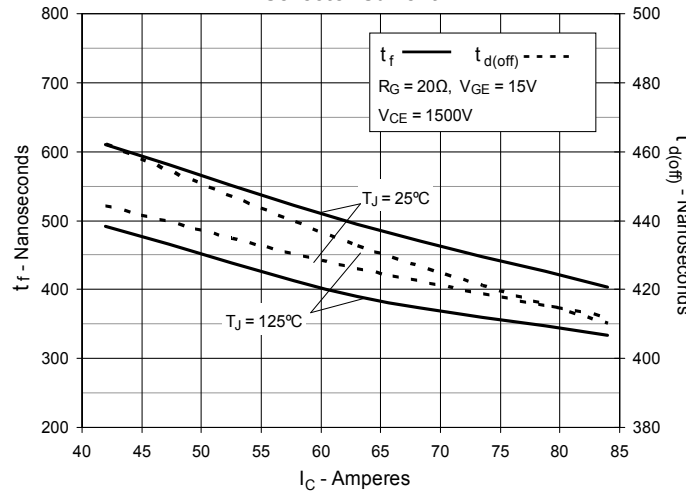
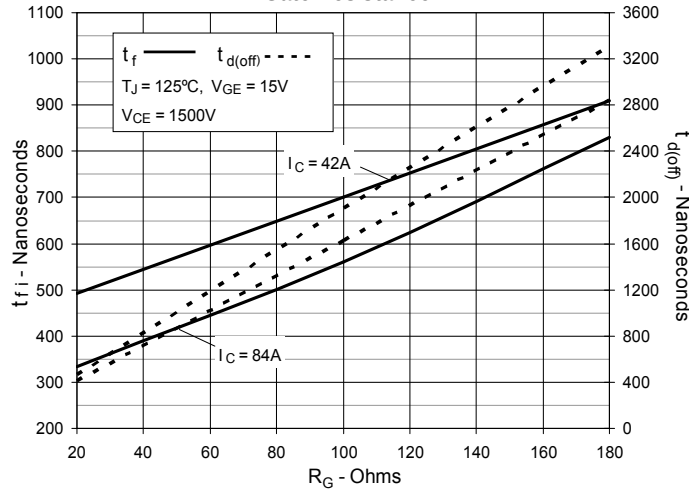


**Fig. 11. Reverse-Bias Safe Operating Area**

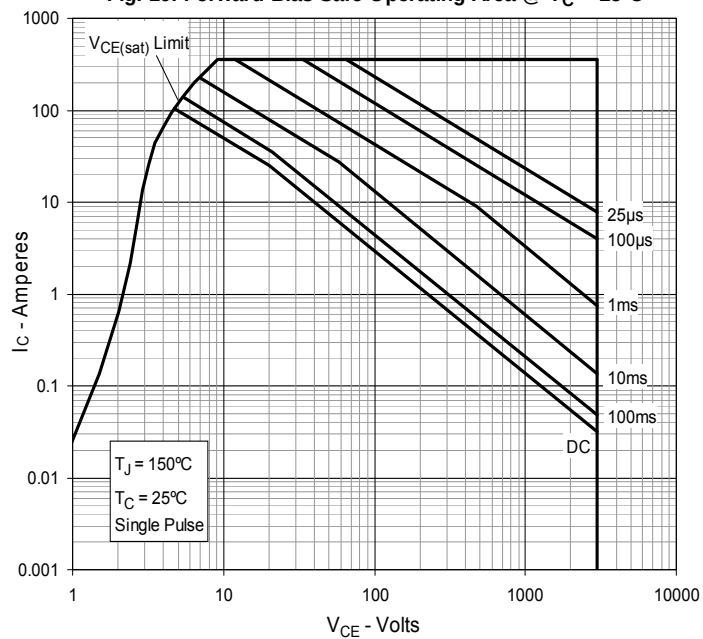


**Fig. 12. Maximum Transient Thermal Impedance**

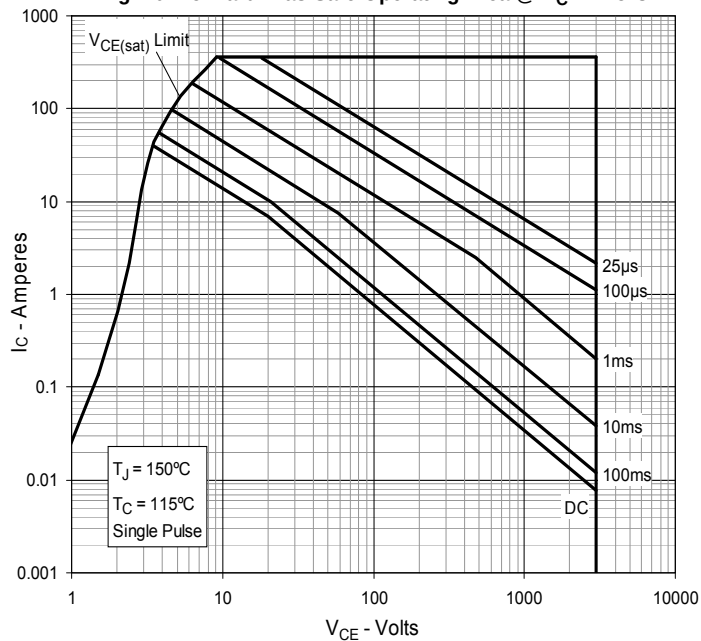


**Fig. 13. Resistive Turn-on Rise Time vs. Junction Temperature**

**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 @  $T_C = 115^\circ\text{C}$**





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