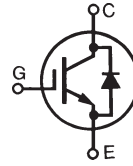


# XPT™ 600V IGBT GenX3™ w/ Diode

## IXXR100N60B3H1

(Electrically Isolated Tab)

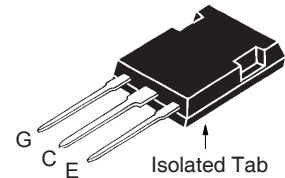
Extreme Light Punch Through  
IGBT for 10-30kHz Switching



$$\begin{aligned} V_{CES} &= 600V \\ I_{C110} &= 68A \\ V_{CE(sat)} &\leq 1.80V \\ t_{fi(typ)} &= 150ns \end{aligned}$$

| Symbol                        | Test Conditions                                                                             | Maximum Ratings                           |                  |
|-------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------|------------------|
| $V_{CES}$                     | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$                                              | 600                                       | V                |
| $V_{CGR}$                     | $T_J = 25^\circ\text{C to } 150^\circ\text{C}, R_{GE} = 1M\Omega$                           | 600                                       | V                |
| $V_{GES}$                     | Continuous                                                                                  | $\pm 20$                                  | V                |
| $V_{GEM}$                     | Transient                                                                                   | $\pm 30$                                  | V                |
| $I_{C25}$                     | $T_C = 25^\circ\text{C (Chip Capability)}$                                                  | 145                                       | A                |
| $I_{C110}$                    | $T_C = 110^\circ\text{C}$                                                                   | 68                                        | A                |
| $I_{F90}$                     | $T_C = 90^\circ\text{C}$                                                                    | 54                                        | A                |
| $I_{CM}$                      | $T_C = 25^\circ\text{C}, 1\text{ms}$                                                        | 440                                       | A                |
| $I_A$                         | $T_C = 25^\circ\text{C}$                                                                    | 50                                        | A                |
| $E_{AS}$                      | $T_C = 25^\circ\text{C}$                                                                    | 600                                       | mJ               |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V, T_{VJ} = 150^\circ\text{C}, R_G = 2\Omega$<br>Clamped Inductive Load         | $I_{CM} = 200$<br>@ $V_{CE} \leq V_{CES}$ | A                |
| $t_{sc}$<br><b>(SCSOA)</b>    | $V_{GE} = 15V, V_{CE} = 360V, T_J = 150^\circ\text{C}$<br>$R_G = 10\Omega$ , Non Repetitive | 10                                        | $\mu\text{s}$    |
| $P_C$                         | $T_C = 25^\circ\text{C}$                                                                    | 400                                       | 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                                                      | 300                                       | $^\circ\text{C}$ |
| $T_{SOLD}$                    | Plastic Body for 10s                                                                        | 260                                       | $^\circ\text{C}$ |
| $V_{ISOL}$                    | 50/60 Hz, 1 Minute                                                                          | 2500                                      | V~               |
| $F_C$                         | Mounting Force                                                                              | 20..120/4.5..27                           | N/lb.            |
| <b>Weight</b>                 |                                                                                             | 5                                         | g                |

ISOPLUS247™



G = Gate      C = Collector  
E = Emitter

### Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Optimized for 10-30kHz Switching
- Square RBSOA
- Avalanche Rated
- Short Circuit Capability
- Anti-Parallel Ultra Fast Diode
- High Current Handling Capability

### Advantages

- High Power Density
- Low Gate Drive Requirement

### Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines

| Symbol        | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |                          |
|---------------|-----------------------------------------------------------------------------|-----------------------|------|--------------------------|
|               |                                                                             | Min.                  | Typ. | Max.                     |
| $BV_{CES}$    | $I_C = 250\mu\text{A}, V_{GE} = 0V$                                         | 600                   |      | V                        |
| $V_{GE(th)}$  | $I_C = 250\mu\text{A}, V_{CE} = V_{GE}$                                     | 3.0                   |      | 5.5 V                    |
| $I_{CES}$     | $V_{CE} = V_{CES}, V_{GE} = 0V$<br>$T_J = 125^\circ\text{C}$                |                       |      | 50 $\mu\text{A}$<br>4 mA |
| $I_{GES}$     | $V_{CE} = 0V, V_{GE} = \pm 20V$                                             |                       |      | $\pm 100$ nA             |
| $V_{CE(sat)}$ | $I_C = 70A, V_{GE} = 15V$ , Note 1<br>$T_J = 150^\circ\text{C}$             | 1.50<br>1.77          |      | V<br>V                   |

## Symbol Test Conditions

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

## Characteristic Values

Min. Typ. Max.

|              |                                                                                                                                         |      |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------|------|------|-------------------------|
| $g_{fs}$     | $I_C = 60\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$                                                                                  | 22   | 40   | S                       |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                              |      | 4860 | pF                      |
| $C_{oes}$    |                                                                                                                                         |      | 475  | pF                      |
| $C_{res}$    |                                                                                                                                         |      | 83   | pF                      |
| $Q_{g(on)}$  | $I_C = 70\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$                                                                     |      | 143  | nC                      |
| $Q_{ge}$     |                                                                                                                                         |      | 37   | nC                      |
| $Q_{gc}$     |                                                                                                                                         |      | 60   | nC                      |
| $t_{d(on)}$  | Inductive load, $T_J = 25^\circ\text{C}$<br>$I_C = 70\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 360\text{V}, R_G = 2\Omega$<br>Note 2  |      | 30   | ns                      |
| $t_{ri}$     |                                                                                                                                         |      | 70   | ns                      |
| $E_{on}$     |                                                                                                                                         |      | 1.9  | mJ                      |
| $t_{d(off)}$ |                                                                                                                                         |      | 120  | ns                      |
| $t_{fi}$     |                                                                                                                                         |      | 150  | ns                      |
| $E_{off}$    |                                                                                                                                         |      | 2.0  | mJ                      |
| $t_{d(on)}$  | Inductive load, $T_J = 150^\circ\text{C}$<br>$I_C = 70\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 360\text{V}, R_G = 2\Omega$<br>Note 2 |      | 32   | ns                      |
| $t_{ri}$     |                                                                                                                                         |      | 60   | ns                      |
| $E_{on}$     |                                                                                                                                         |      | 2.3  | mJ                      |
| $t_{d(off)}$ |                                                                                                                                         |      | 150  | ns                      |
| $t_{fi}$     |                                                                                                                                         |      | 200  | ns                      |
| $E_{off}$    |                                                                                                                                         |      | 2.8  | mJ                      |
| $R_{thJC}$   |                                                                                                                                         | 0.15 |      | 0.31 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                         |      |      | $^\circ\text{C/W}$      |

## Reverse Diode (FRED)

## Symbol Test Conditions

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

## Characteristic Values

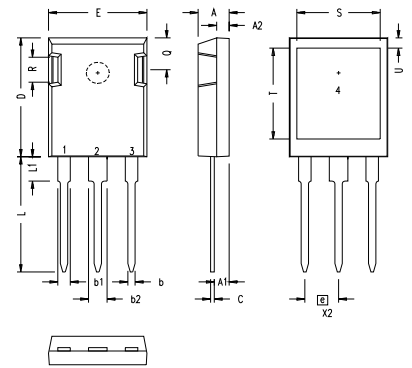
Min. Typ. Max.

|            |                                                                                                    |                           |     |                         |
|------------|----------------------------------------------------------------------------------------------------|---------------------------|-----|-------------------------|
| $V_F$      | $I_F = 60\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$                                              | $T_J = 150^\circ\text{C}$ | 1.6 | 2.5 V                   |
|            |                                                                                                    |                           | 1.4 | 1.8 V                   |
| $I_{RM}$   | $I_F = 60\text{A}, V_{GE} = 0\text{V},$<br>$-di_F/dt = 200\text{A}/\mu\text{s}, V_R = 300\text{V}$ | $T_J = 100^\circ\text{C}$ | 8.3 | A                       |
| $t_{rr}$   |                                                                                                    |                           | 140 | ns                      |
| $R_{thJC}$ |                                                                                                    |                           |     | 0.62 $^\circ\text{C/W}$ |

## Notes:

- Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .
- Switching times & energy losses may increase for higher  $V_{CE}(\text{clamp})$ ,  $T_J$  or  $R_G$ .

## ISOPLUS247 (IXXR) Outline



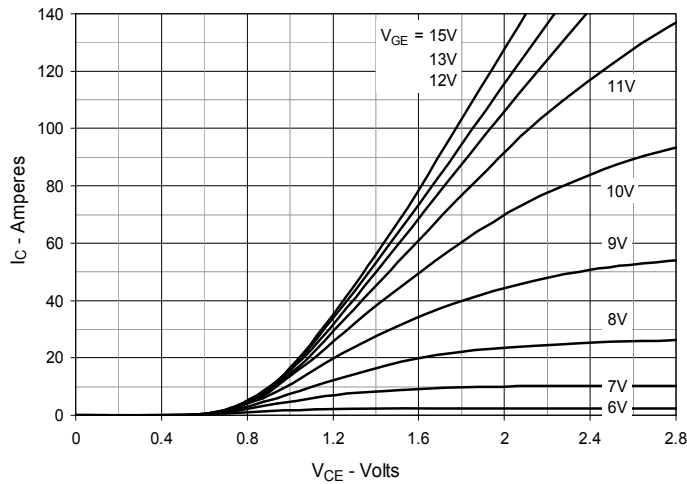
| SYM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .190     | .205 | 4.83        | 5.21  |
| A1  | .090     | .100 | 2.29        | 2.54  |
| A2  | .075     | .085 | 1.91        | 2.16  |
| b   | .045     | .055 | 1.14        | 1.40  |
| b1  | .075     | .084 | 1.91        | 2.13  |
| b2  | .115     | .123 | 2.92        | 3.12  |
| C   | .024     | .031 | 0.61        | 0.80  |
| D   | .819     | .840 | 20.80       | 21.34 |
| E   | .620     | .635 | 15.75       | 16.13 |
| e   | .215 BSC |      | 5.45 BSC    |       |
| L   | .780     | .800 | 19.81       | 20.32 |
| L1  | .150     | .170 | 3.81        | 4.32  |
| Q   | .220     | .244 | 5.59        | 6.20  |
| R   | .170     | .190 | 4.32        | 4.83  |
| S   | .520     | .540 | 13.21       | 13.72 |
| T   | .620     | .640 | 15.75       | 16.26 |
| U   | .065     | .080 | 1.65        | 2.03  |

- 1 - Gate  
2,4 - Collector  
3 - Emiiter

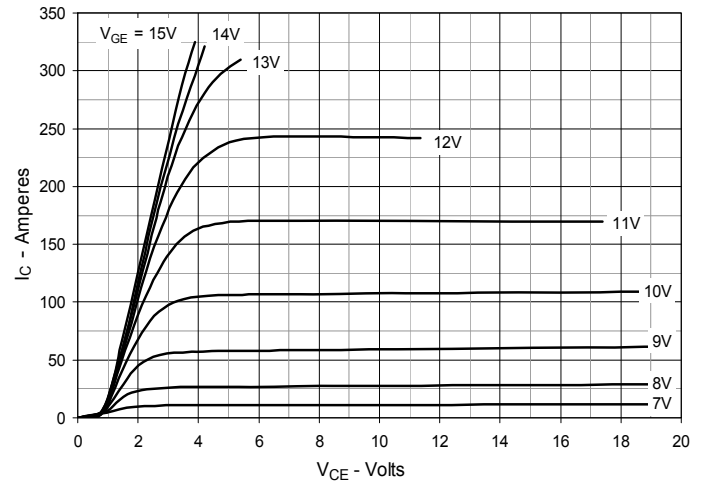
IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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    |             |

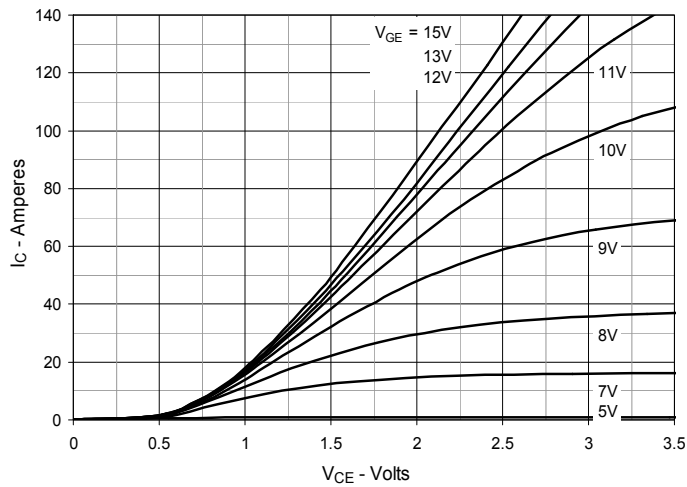
**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$**



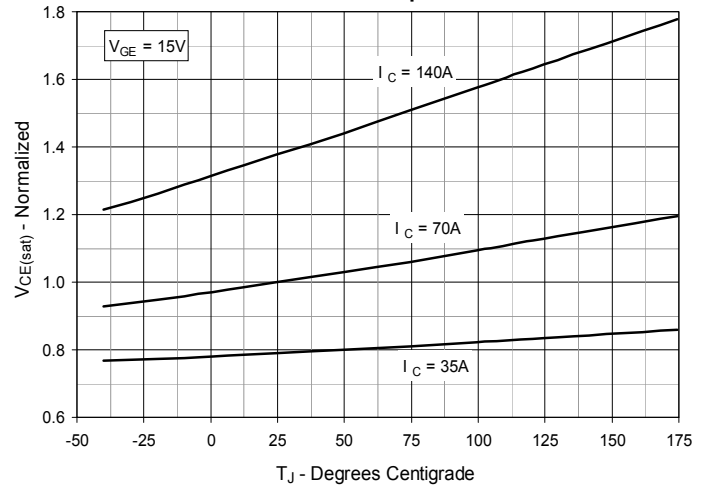
**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$**



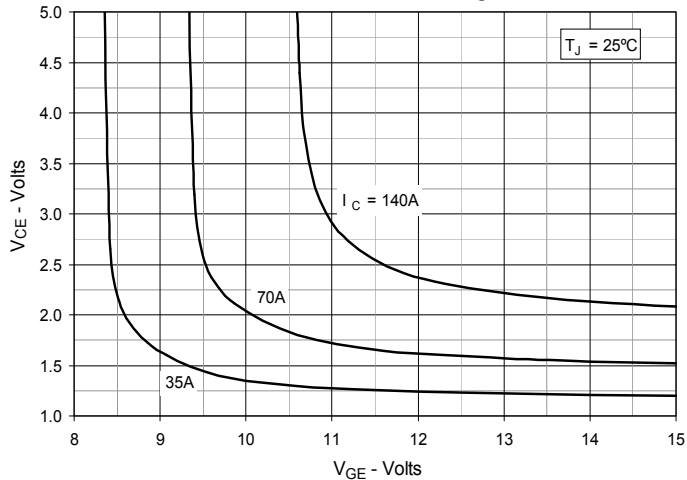
**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$**



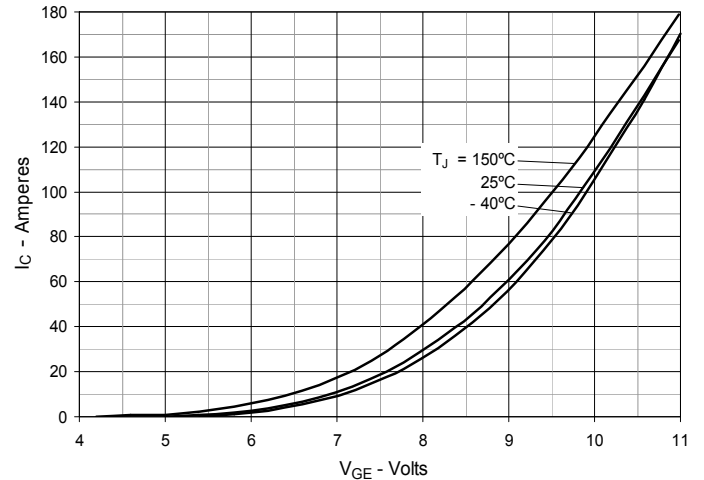
**Fig. 4. Dependence of  $V_{CE(sat)}$  on Junction Temperature**



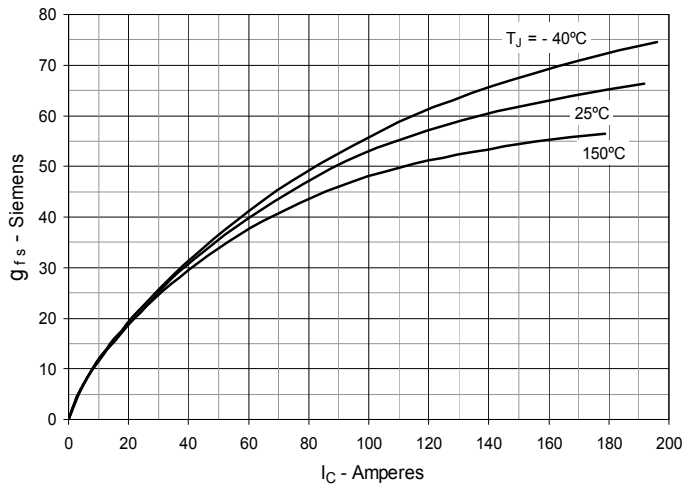
**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**



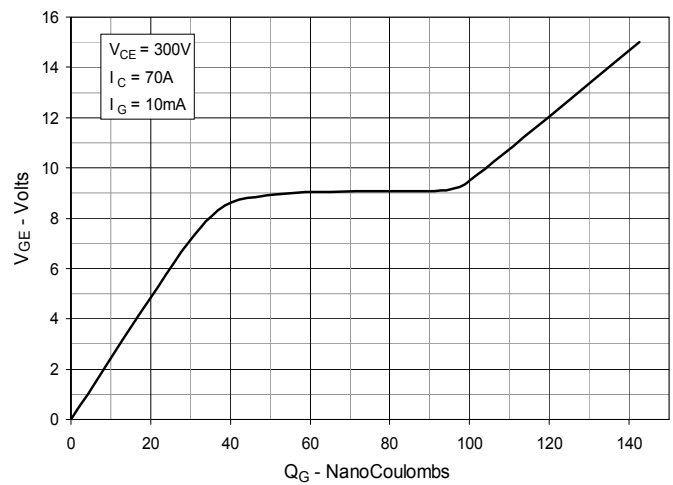
**Fig. 6. Input Admittance**



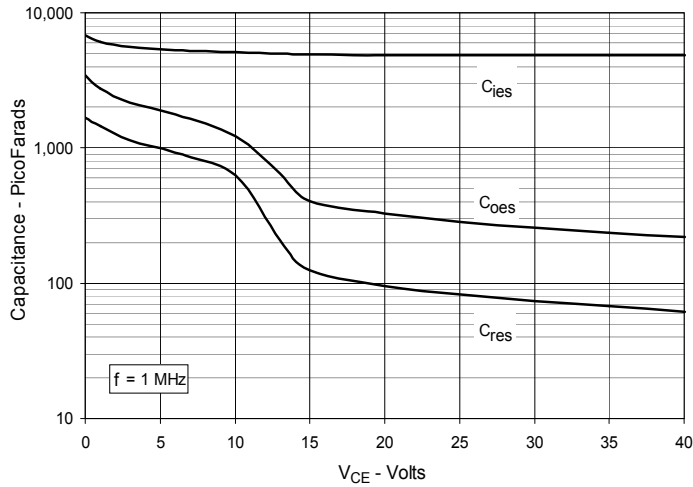
**Fig. 7. Transconductance**



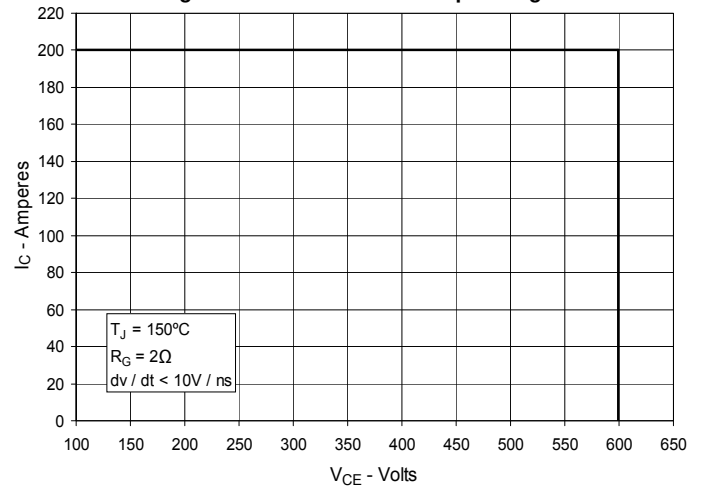
**Fig. 8. Gate Charge**



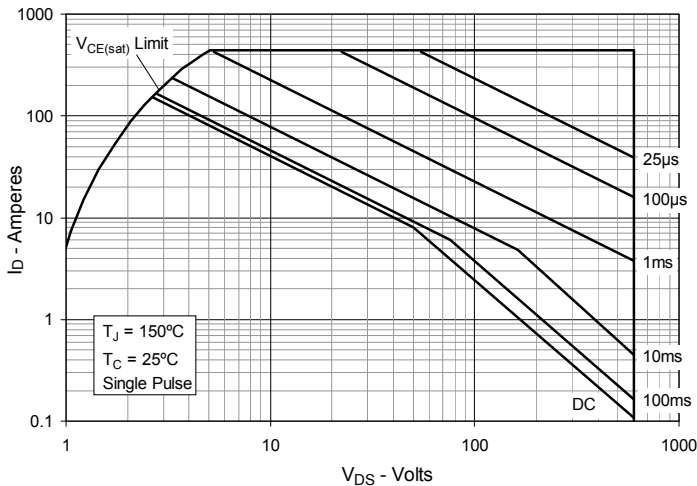
**Fig. 9. Capacitance**



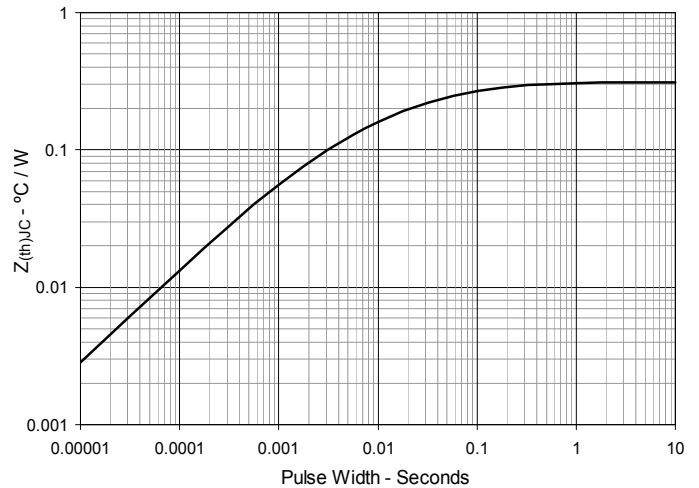
**Fig. 10. Reverse-Bias Safe Operating Area**

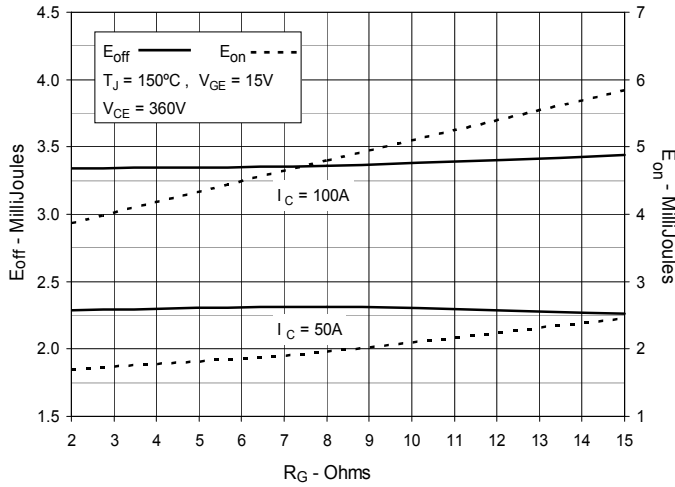
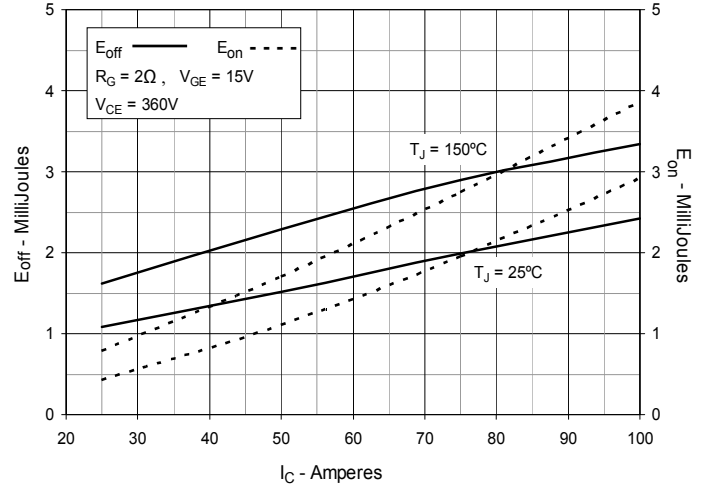
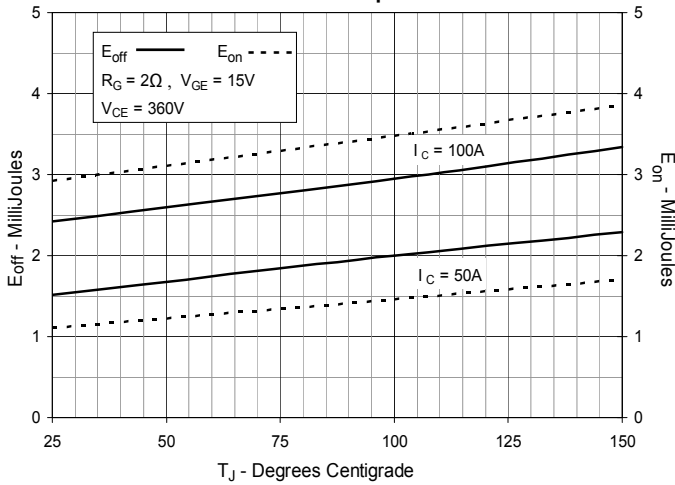
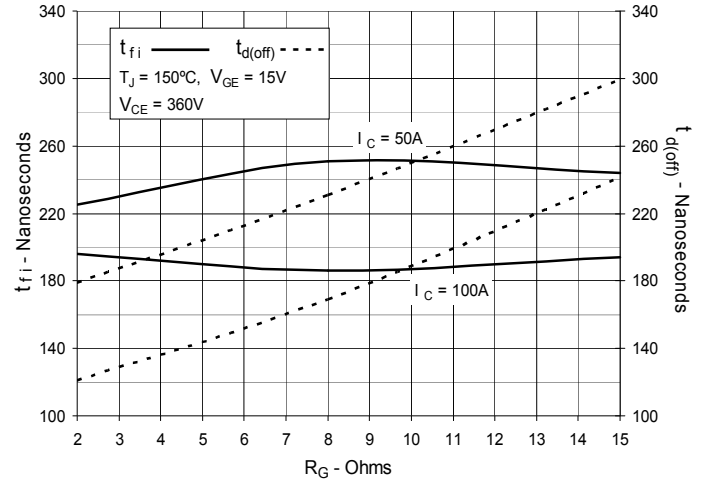
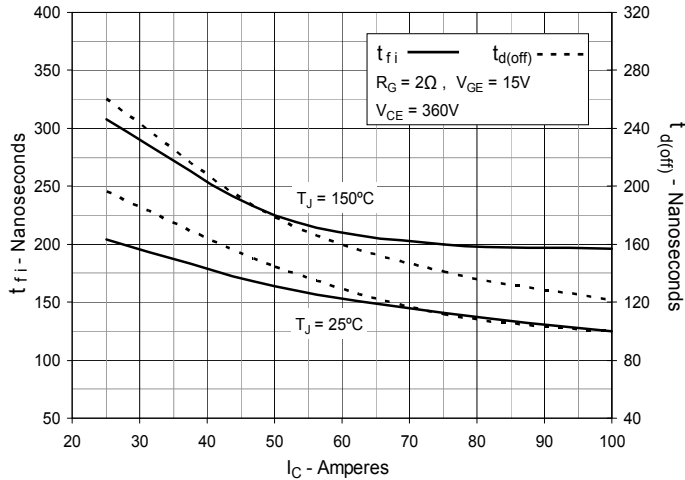
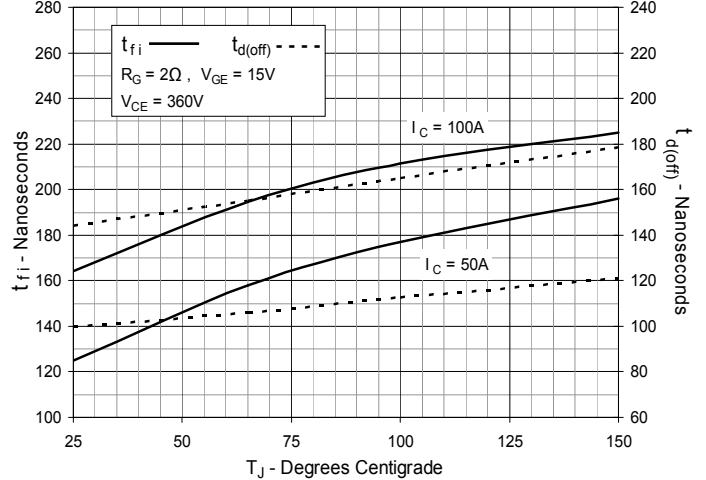


**Fig. 11. Forward-Bias Safe Operating Area**

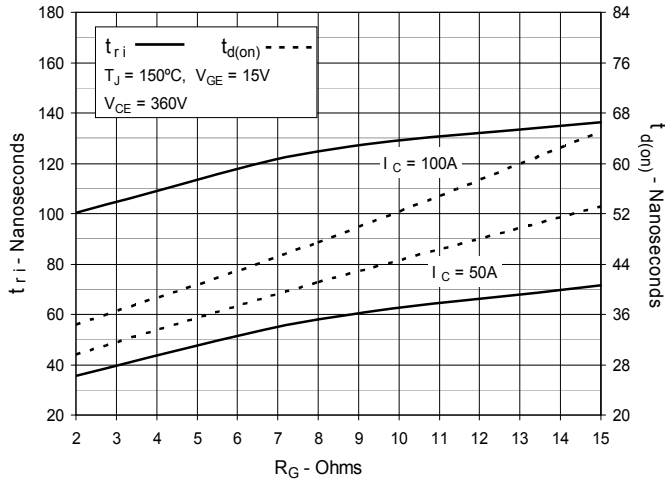


**Fig. 12. Maximum Transient Thermal Impedance**

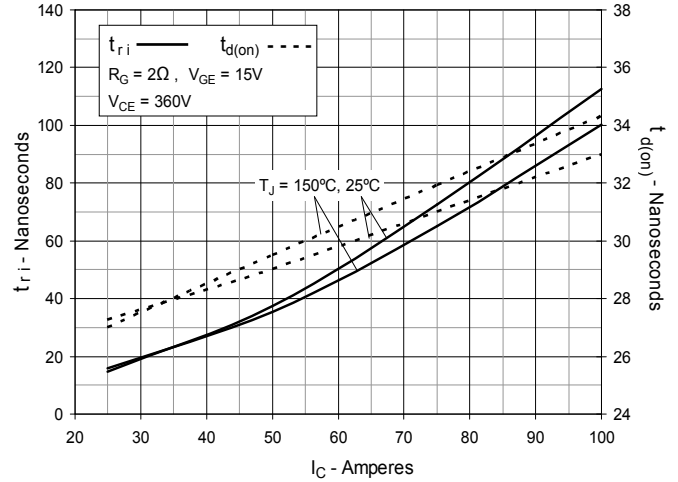


**Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance**

**Fig. 14. Inductive Switching Energy Loss vs. Collector Current**

**Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature**

**Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance**

**Fig. 17. Inductive Turn-off Switching Times vs. Collector Current**

**Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature**


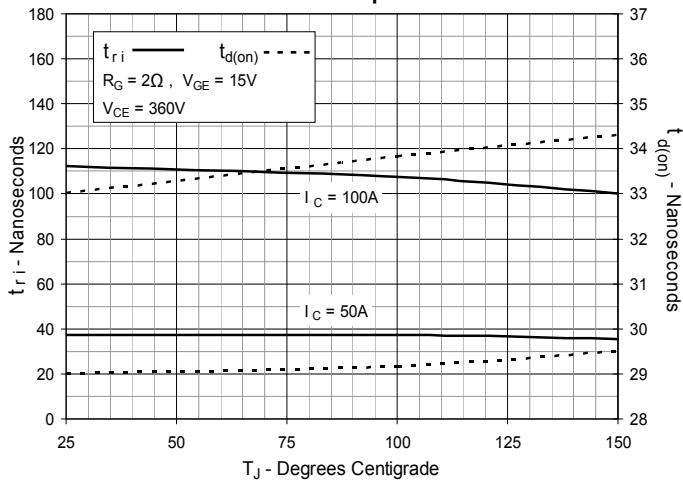
**Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance**

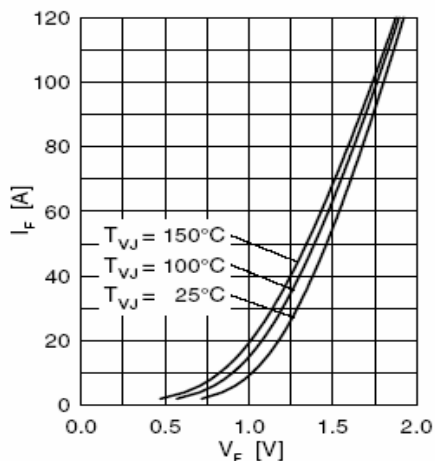
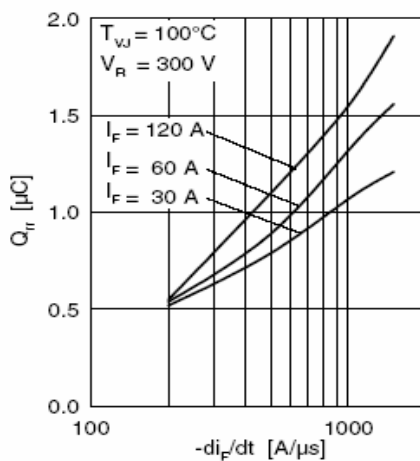
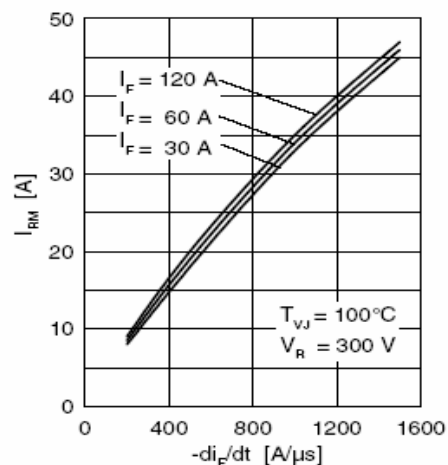
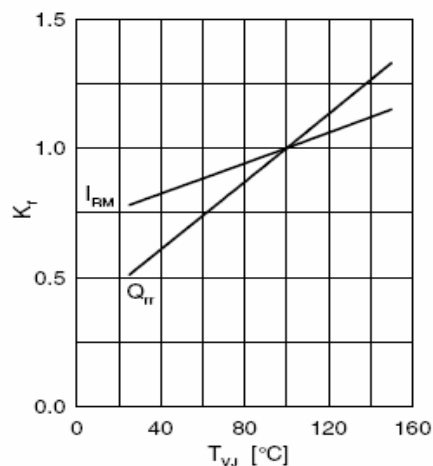
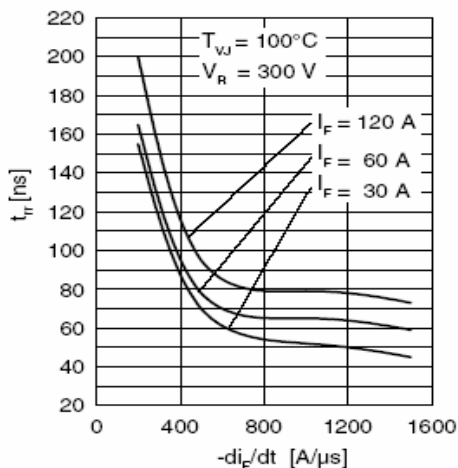
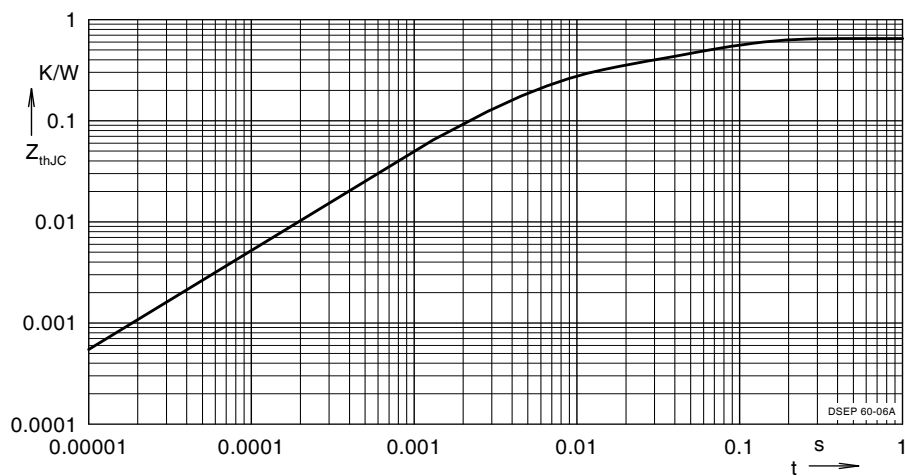


**Fig. 20. Inductive Turn-on Switching Times vs. Collector Current**



**Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature**




**Fig. 22 Forward Current  $I_F$  vs.  $V_F$** 

**Fig. 23 Typ. Reverse Recovery Charge  $Q_{rr}$** 

**Fig. 24 Typ. Peak Reverse Current  $I_{RM}$** 

**Fig. 25 Typ. Dynamic Parameters  $Q_{rr}$ ,  $I_{RM}$** 

**Fig. 26 Typ Recovery Time  $t_{rr}$** 

**Fig. 27. Maximum Transient Thermal Impedance**



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