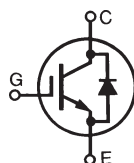


## XPT™ 650V IGBT GenX3™ w/ Diode

## IXYK100N65B3D1 IXYX100N65B3D1

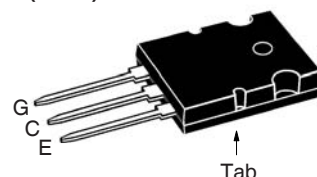
Extreme Light Punch Through  
IGBT for 10-30kHz Switching



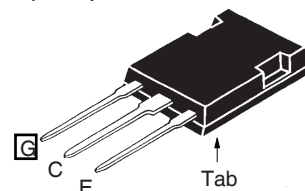
$$\begin{aligned} V_{CES} &= 650V \\ I_{C110} &= 100A \\ V_{CE(sat)} &\leq 1.85V \\ t_{fi(typ)} &= 73ns \end{aligned}$$

| Symbol                        | Test Conditions                                                                             | Maximum Ratings                           |            |
|-------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------|------------|
| $V_{CES}$                     | $T_J = 25^\circ C$ to $175^\circ C$                                                         | 650                                       | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $175^\circ C$ , $R_{GE} = 1M\Omega$                                   | 650                                       | V          |
| $V_{GES}$                     | Continuous                                                                                  | $\pm 20$                                  | V          |
| $V_{GEM}$                     | Transient                                                                                   | $\pm 30$                                  | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$ (Chip Capability)                                                        | 225                                       | A          |
| $I_{LRMS}$                    | Terminal Current Limit                                                                      | 160                                       | A          |
| $I_{C110}$                    | $T_C = 110^\circ C$                                                                         | 100                                       | A          |
| $I_{F110}$                    | $T_C = 110^\circ C$                                                                         | 67                                        | A          |
| $I_{CM}$                      | $T_C = 25^\circ C$ , 1ms                                                                    | 460                                       | A          |
| $I_A$                         | $T_C = 25^\circ C$                                                                          | 50                                        | A          |
| $E_{AS}$                      | $T_C = 25^\circ C$                                                                          | 600                                       | mJ         |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 150^\circ C$ , $R_G = 3\Omega$<br>Clamped Inductive Load         | $I_{CM} = 200$<br>$@ V_{CE} \leq V_{CES}$ | A          |
| $t_{sc}$<br><b>(SCSOA)</b>    | $V_{GE} = 15V$ , $V_{CE} = 360V$ , $T_J = 150^\circ C$<br>$R_G = 10\Omega$ , Non Repetitive | 8                                         | $\mu s$    |
| $P_C$                         | $T_C = 25^\circ C$                                                                          | 830                                       | W          |
| $T_J$                         |                                                                                             | -55 ... +175                              | $^\circ C$ |
| $T_{JM}$                      |                                                                                             | 175                                       | $^\circ C$ |
| $T_{stg}$                     |                                                                                             | -55 ... +175                              | $^\circ C$ |
| $T_L$                         | Maximum Lead Temperature for Soldering                                                      | 300                                       | $^\circ C$ |
| $T_{SOLD}$                    | 1.6 mm (0.062in.) from Case for 10s                                                         | 260                                       | $^\circ C$ |
| $M_d$                         | Mounting Torque (TO-264)                                                                    | 1.13/10                                   | Nm/lb.in   |
| $F_C$                         | Mounting Force (PLUS247)                                                                    | 20..120 / 4.5..27                         | N/lb       |
| <b>Weight</b>                 | TO-264                                                                                      | 10                                        | g          |
|                               | PLUS247                                                                                     | 6                                         | g          |

TO-264 (IXYK)



PLUS247 (IXYX)



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

### Features

- International Standard Packages
- 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
- Lamp Ballasts

| Symbol        | Test Conditions<br>( $T_J = 25^\circ C$ , Unless Otherwise Specified) | Characteristic Values |      |                    |
|---------------|-----------------------------------------------------------------------|-----------------------|------|--------------------|
|               |                                                                       | Min.                  | Typ. | Max.               |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                                      | 650                   |      | V                  |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                                  | 3.5                   |      | 6.0 V              |
| $I_{CES}$     | $V_{CE} = V_{CES}$ , $V_{GE} = 0V$<br>$T_J = 150^\circ C$             |                       |      | 50 $\mu A$<br>3 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>$T_J = 150^\circ C$          | 1.53<br>1.77          |      | V<br>V             |

### Symbol Test Conditions

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

### Characteristic Values

|              |                                                                                                                                                           | Min. | Typ. | Max.                    |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|-------------------------|
| $g_{fs}$     | $I_C = 60\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$                                                                                                    | 30   | 55   | S                       |
| $C_{ies}$    | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$                                                                                                |      | 4740 | pF                      |
| $C_{oes}$    |                                                                                                                                                           |      | 470  | pF                      |
| $C_{res}$    |                                                                                                                                                           |      | 103  | pF                      |
| $Q_{g(on)}$  | $I_C = 100\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$                                                                                      |      | 168  | nC                      |
| $Q_{ge}$     |                                                                                                                                                           |      | 30   | nC                      |
| $Q_{gc}$     |                                                                                                                                                           |      | 78   | nC                      |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b><br>$I_C = 50\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 400\text{V}, R_G = 3\Omega$<br>Note 2  |      | 29   | ns                      |
| $t_{ri}$     |                                                                                                                                                           |      | 37   | ns                      |
| $E_{on}$     |                                                                                                                                                           |      | 1.27 | mJ                      |
| $t_{d(off)}$ |                                                                                                                                                           |      | 150  | ns                      |
| $t_{fi}$     |                                                                                                                                                           |      | 73   | ns                      |
| $E_{off}$    |                                                                                                                                                           |      | 1.37 | mJ                      |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 150^\circ\text{C}</math></b><br>$I_C = 50\text{A}, V_{GE} = 15\text{V}$<br>$V_{CE} = 400\text{V}, R_G = 3\Omega$<br>Note 2 |      | 28   | ns                      |
| $t_{ri}$     |                                                                                                                                                           |      | 37   | ns                      |
| $E_{on}$     |                                                                                                                                                           |      | 2.35 | mJ                      |
| $t_{d(off)}$ |                                                                                                                                                           |      | 198  | ns                      |
| $t_{fi}$     |                                                                                                                                                           |      | 160  | ns                      |
| $E_{off}$    |                                                                                                                                                           |      | 2.16 | mJ                      |
| $R_{thJC}$   |                                                                                                                                                           |      |      | 0.18 $^\circ\text{C/W}$ |
| $R_{thCS}$   |                                                                                                                                                           |      | 0.15 | $^\circ\text{C/W}$      |

### Reverse Diode (FRED)

### Symbol Test Conditions

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

### Characteristic Values

|            |                                                                                                                              | Min. | Typ.       | Max.                    |
|------------|------------------------------------------------------------------------------------------------------------------------------|------|------------|-------------------------|
| $V_F$      | $I_F = 100\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$<br>$T_J = 150^\circ\text{C}$                                          |      | 1.7<br>1.4 | V<br>V                  |
| $I_{RM}$   | $I_F = 100\text{A}, V_{GE} = 0\text{V}, T_J = 150^\circ\text{C},$<br>$-di_F/dt = 700\text{A}/\mu\text{s}, V_R = 400\text{V}$ |      | 45         | A                       |
| $t_{rr}$   |                                                                                                                              |      | 156        | ns                      |
| $R_{thJC}$ |                                                                                                                              |      |            | 0.36 $^\circ\text{C/W}$ |

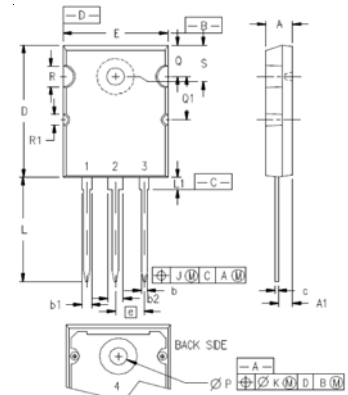
### Notes:

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

### ADVANCE 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.

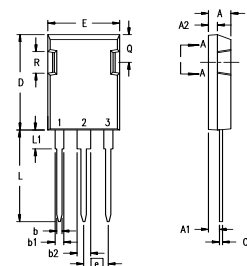
### TO-264 Outline



Terminals: 1 = Gate  
2,4 = Collector  
3 = Emitter

| SYM | 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  |
| 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

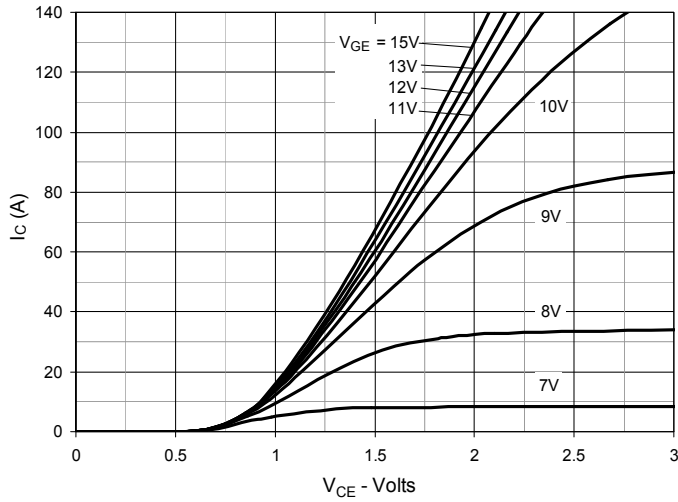
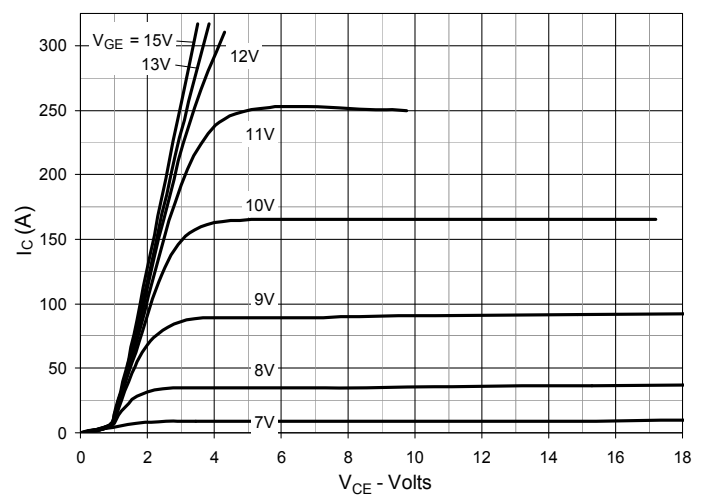
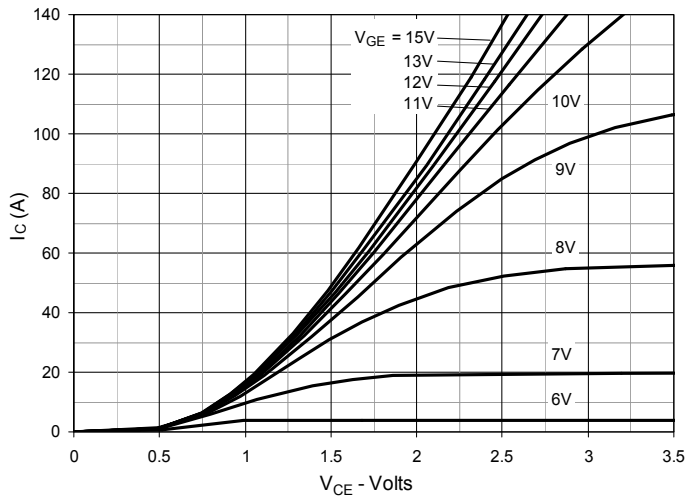
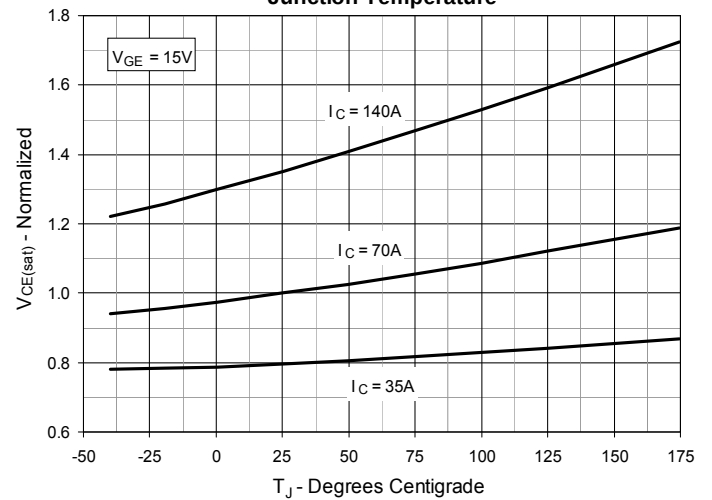
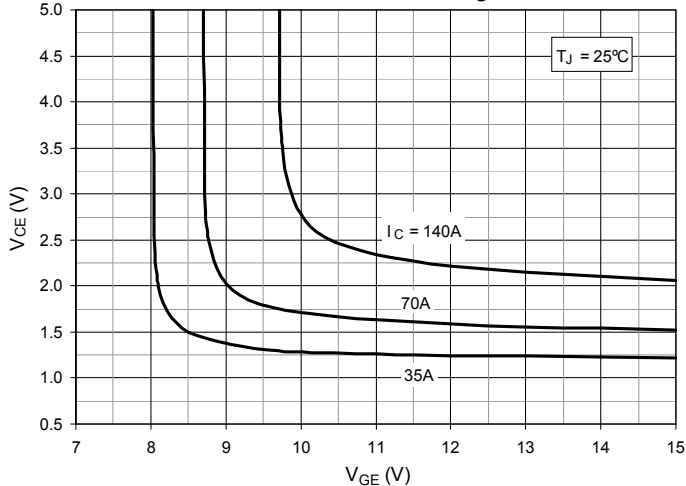
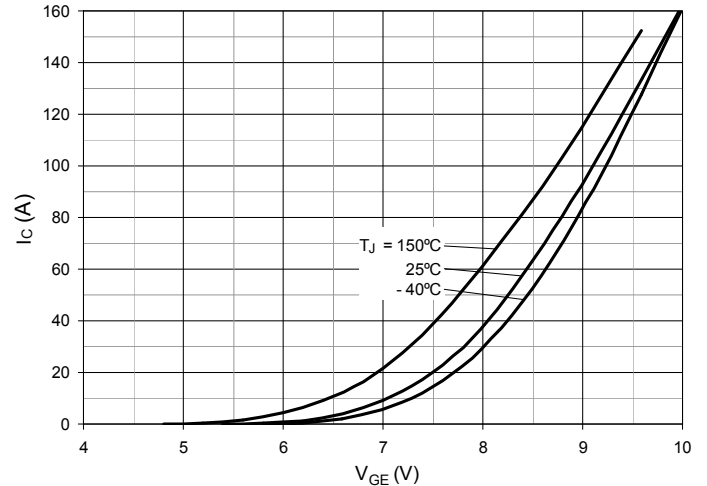


Terminals: 1 - Gate  
2 - Collector  
3 - Emitter

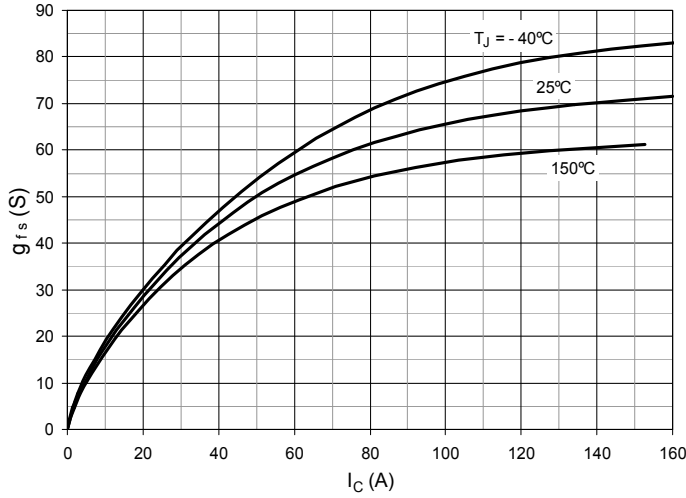
| Dim. | Millimeter |       | Inches |      |
|------|------------|-------|--------|------|
|      | Min.       | Max.  | Min.   | Max. |
| A    | 4.83       | 5.21  | .190   | .205 |
| A1   | 2.29       | 2.54  | .090   | .100 |
| A2   | 1.91       | 2.16  | .075   | .085 |
| b    | 1.14       | 1.40  | .045   | .055 |
| b1   | 1.91       | 2.13  | .075   | .084 |
| b2   | 2.92       | 3.12  | .115   | .123 |
| C    | 0.61       | 0.80  | .024   | .031 |
| D    | 20.80      | 21.34 | .819   | .840 |
| E    | 15.75      | 16.13 | .620   | .635 |
| e    | 5.45       | 5.45  | .215   | .215 |
| L    | 19.81      | 20.32 | .780   | .800 |
| L1   | 3.81       | 4.32  | .150   | .170 |
| Q    | 5.59       | 6.20  | .220   | .244 |
| R    | 4.32       | 4.83  | .170   | .190 |

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

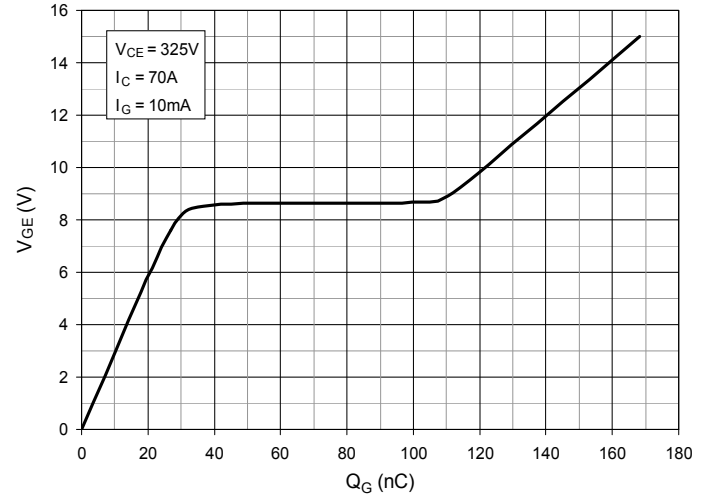
|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| 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**


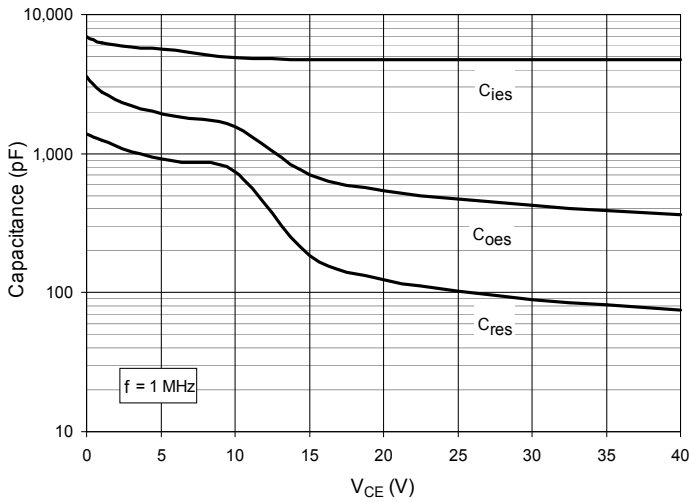
**Fig. 7. Transconductance**



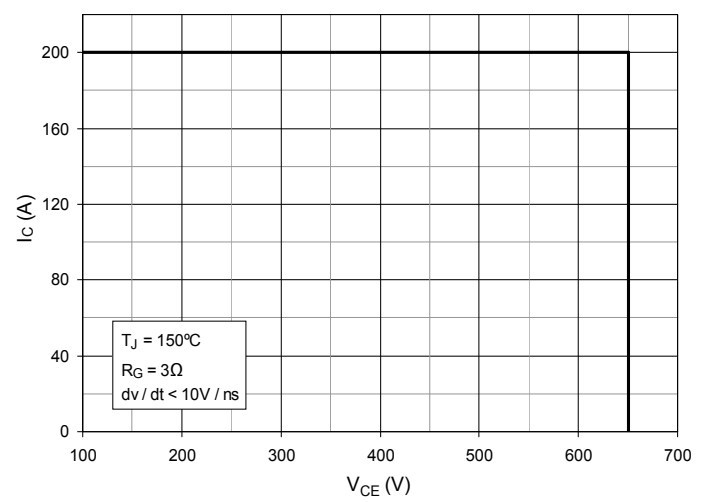
**Fig. 8. Gate Charge**



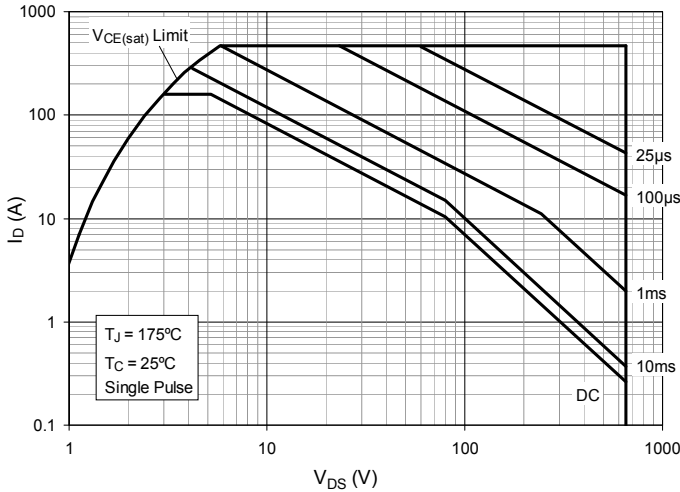
**Fig. 9. Capacitance**



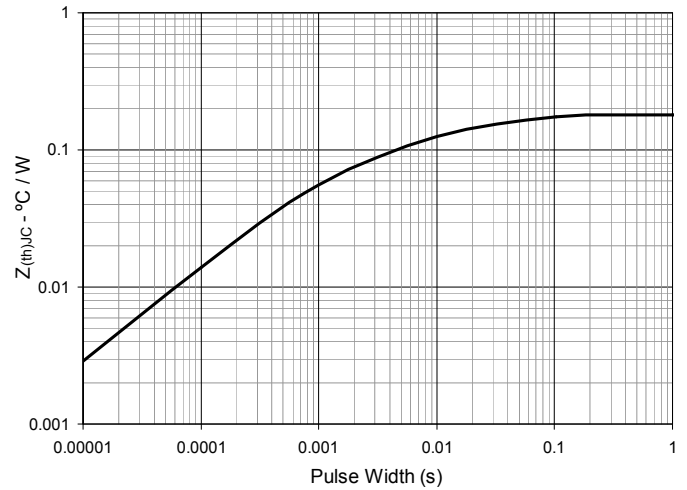
**Fig. 10. Reverse-Bias Safe Operating Area**



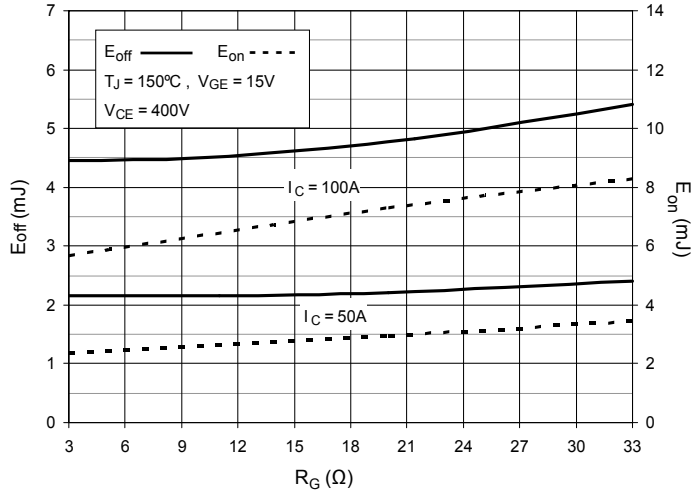
**Fig. 11. Forward-Bias Safe Operating Area**



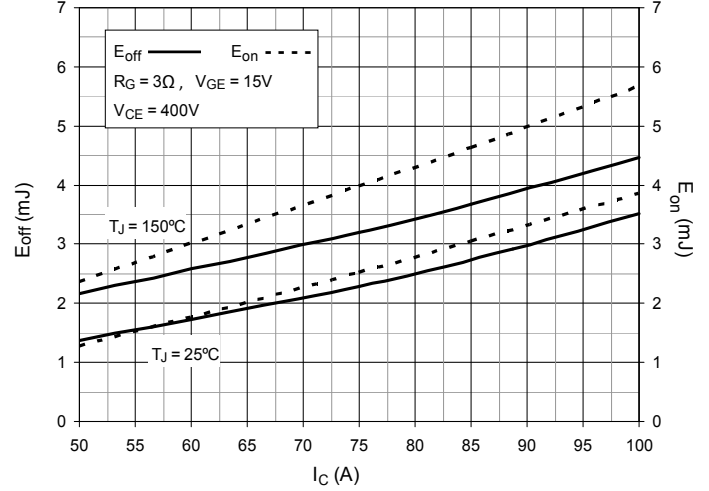
**Fig. 12. Maximum Transient Thermal Impedance (IGBT)**



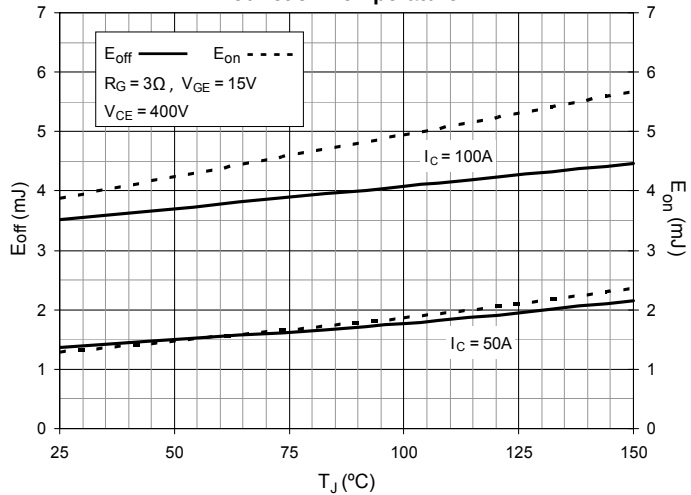
**Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance**



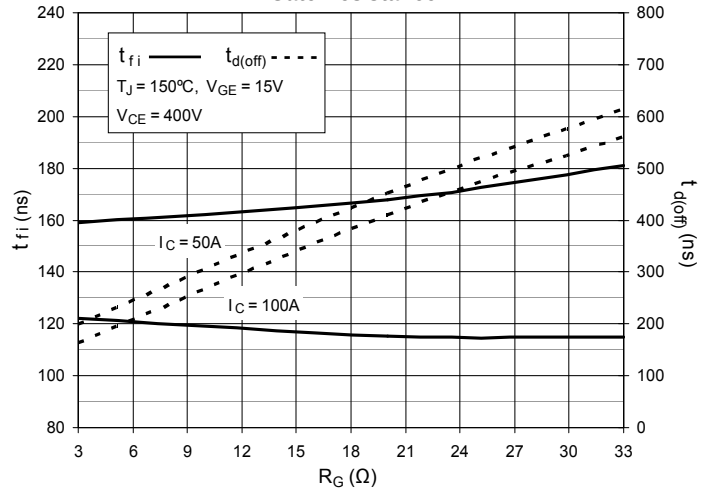
**Fig. 14. Inductive Switching Energy Loss vs. Collector Current**



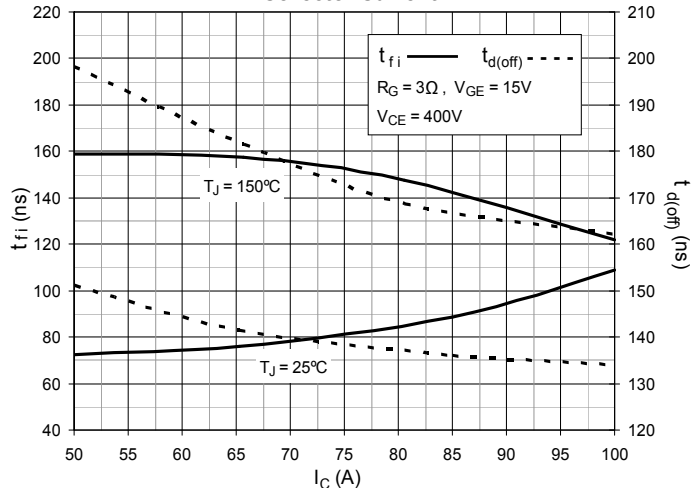
**Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature**



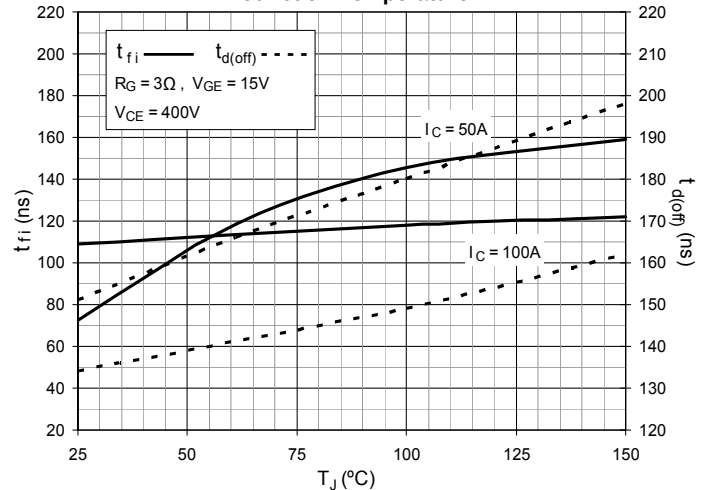
**Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance**



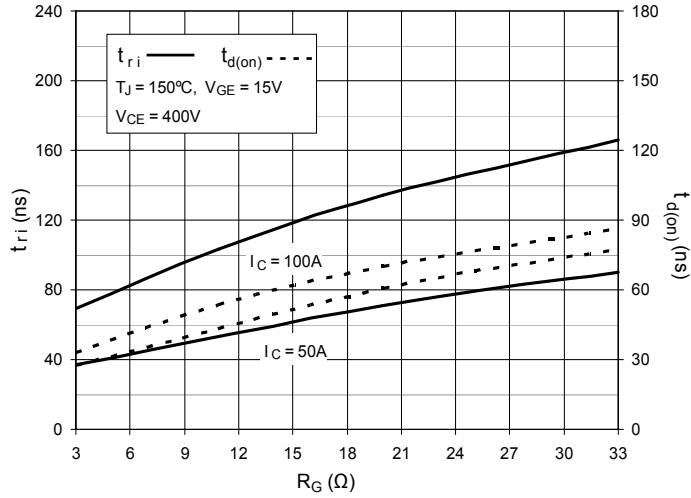
**Fig. 17. Inductive Turn-off Switching Times vs. Collector Current**



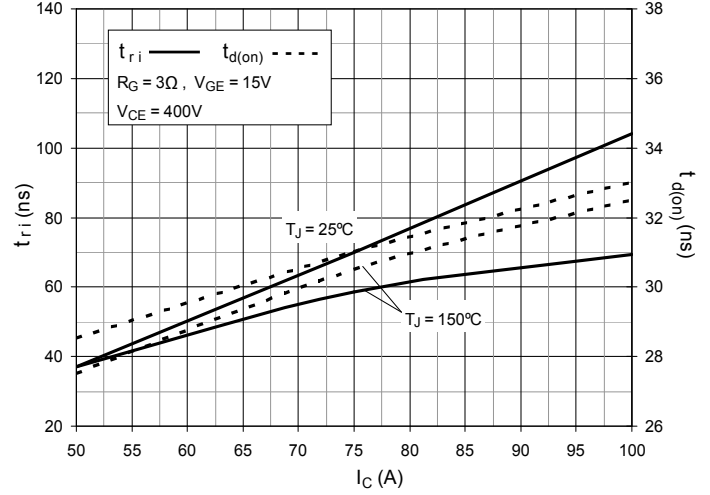
**Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature**



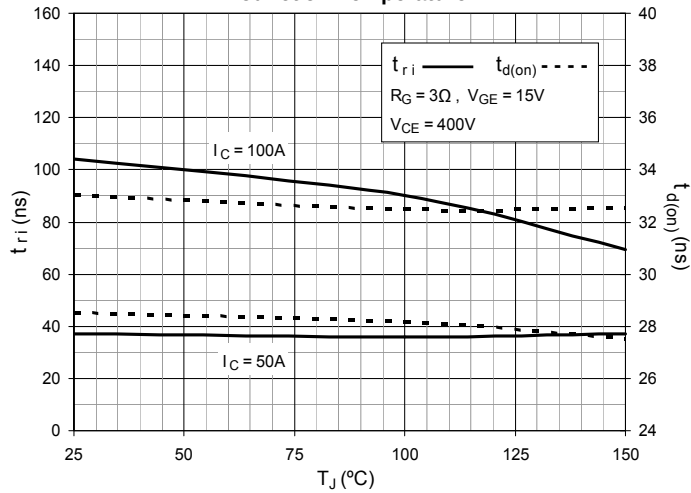
**Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance**



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



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



**Fig. 22. Maximum Peak Load Current vs. Frequency**

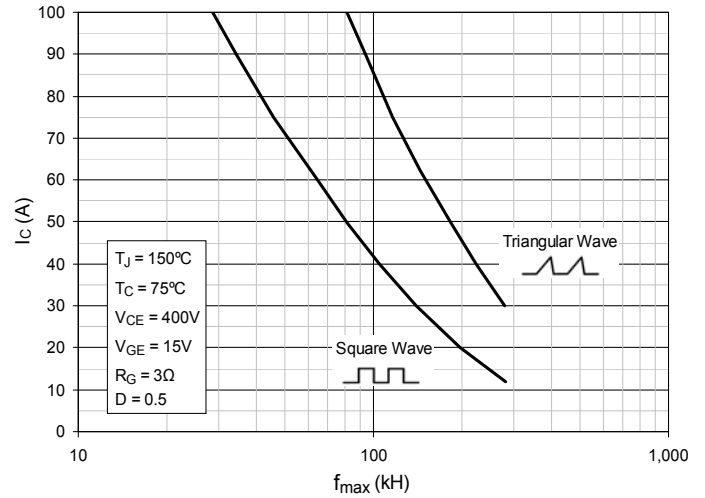


Fig. 23. Diode Forward Characteristics

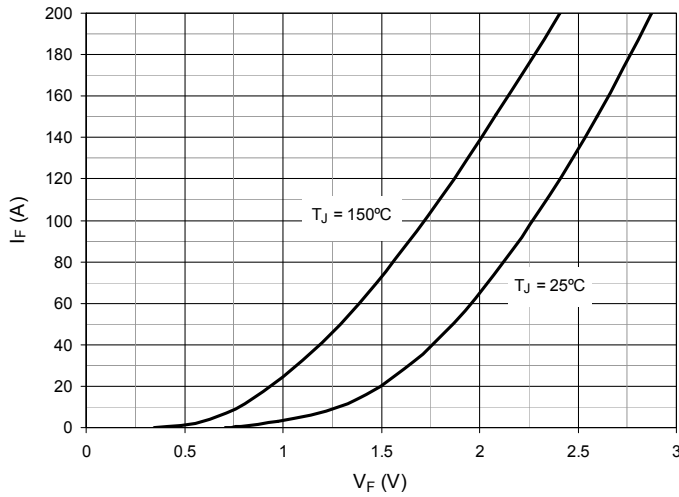


Fig. 24. Reverse Recovery Charge vs.  $-di_F/dt$

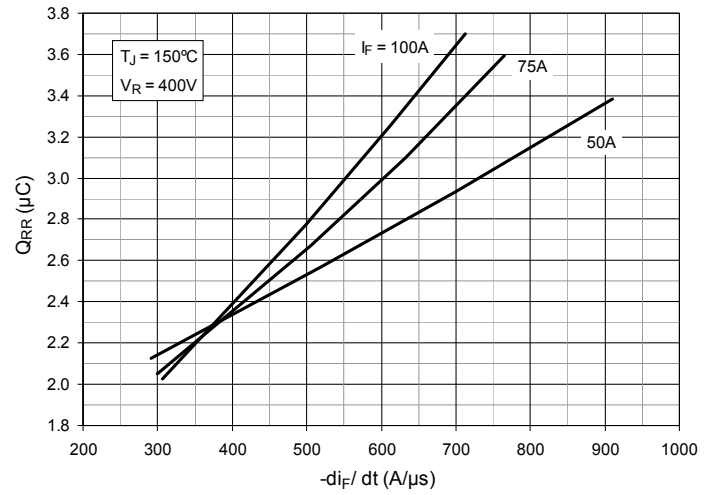


Fig. 25. Reverse Recovery Current vs.  $-di_F/dt$

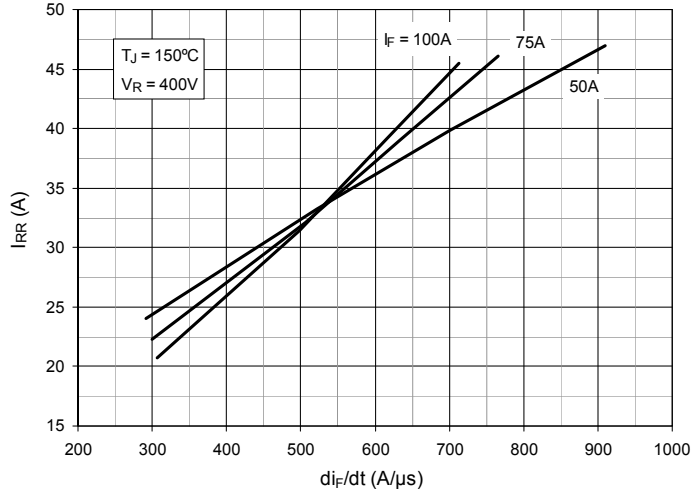


Fig. 26. Reverse Recovery Time vs.  $-di_F/dt$

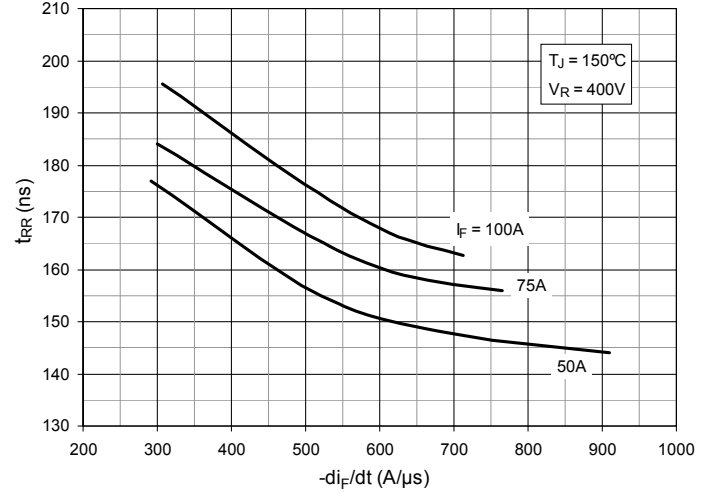


Fig. 27. Dynamic Parameters  $Q_{RR}$ ,  $I_{RR}$  vs. Junction Temperature

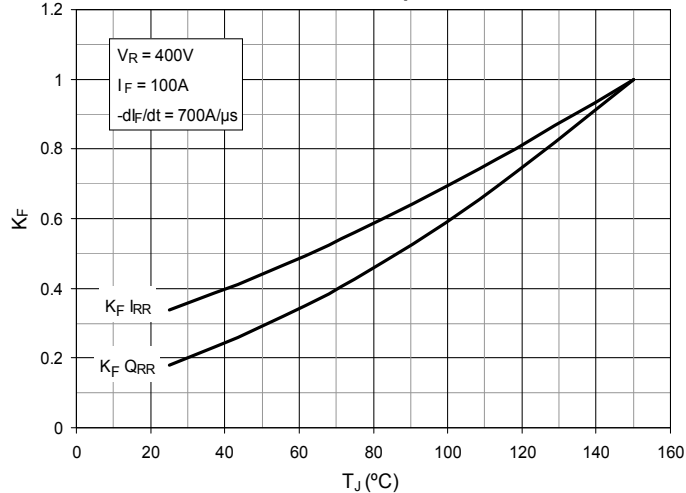


Fig. 28. Maximum Transient Thermal Impedance (Diode)

