

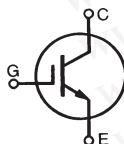
## GenX3™ 600V IGBT

High Speed PT IGBTs for  
40-100kHz switching

**IXGA48N60C3**

**IXGH48N60C3**

**IXGP48N60C3**



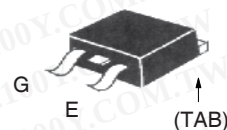
$$V_{CES} = 600V$$

$$I_{C110} = 48A$$

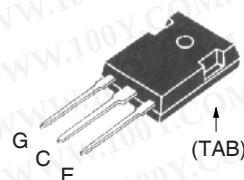
$$V_{CE(sat)} \leq 2.5V$$

$$t_{fi(typ)} = 38ns$$

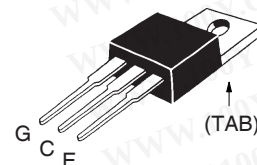
TO-263 (IXGA)



TO-247 (IXGH)



TO-220 (IXGP)



G = Gate      C = Collector  
E = Emitter    TAB = Collector

| Symbol                        | Test Conditions                                                                                   | Maximum Ratings |            |
|-------------------------------|---------------------------------------------------------------------------------------------------|-----------------|------------|
| $V_{CES}$                     | $T_C = 25^\circ C$ to $150^\circ C$                                                               | 600             | V          |
| $V_{CGR}$                     | $T_J = 25^\circ C$ to $150^\circ C$ , $R_{GE} = 1M\Omega$                                         | 600             | V          |
| $V_{GES}$                     | Continuous                                                                                        | $\pm 20$        | V          |
| $V_{GEM}$                     | Transient                                                                                         | $\pm 30$        | V          |
| $I_{C25}$                     | $T_C = 25^\circ C$ ( Limited by Leads)                                                            | 75              | A          |
| $I_{C110}$                    | $T_C = 110^\circ C$                                                                               | 48              | A          |
| $I_{CM}$                      | $T_C = 25^\circ C$ , 1ms                                                                          | 250             | A          |
| $I_A$                         | $T_C = 25^\circ C$                                                                                | 30              | A          |
| $E_{AS}$                      | $T_C = 25^\circ C$                                                                                | 300             | mJ         |
| <b>SSOA</b><br><b>(RBSOA)</b> | $V_{GE} = 15V$ , $T_{VJ} = 125^\circ C$ , $R_G = 3\Omega$<br>Clamped Inductive Load @ $\leq 600V$ | $I_{CM} = 100$  | A          |
| $P_C$                         | $T_C = 25^\circ C$                                                                                | 300             | 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-247&TO-220)                                                                   | 1.13/10         | Nm/lb.in.  |
| <b>Weight</b>                 | TO-247                                                                                            | 6.0             | g          |
|                               | TO-220                                                                                            | 3.0             | g          |
|                               | TO-263                                                                                            | 2.5             | g          |

| Symbol        | Test Conditions                                              | Characteristic Values |      |                           |
|---------------|--------------------------------------------------------------|-----------------------|------|---------------------------|
|               |                                                              | Min.                  | Typ. | Max.                      |
| $BV_{CES}$    | $I_C = 250\mu A$ , $V_{GE} = 0V$                             | 600                   |      | V                         |
| $V_{GE(th)}$  | $I_C = 250\mu A$ , $V_{CE} = V_{GE}$                         | 3.0                   |      | 5.5 V                     |
| $I_{CES}$     | $V_{CE} = V_{CES}$<br>$V_{GE} = 0V$ $T_J = 125^\circ C$      |                       |      | 25 $\mu A$<br>250 $\mu A$ |
| $I_{GES}$     | $V_{CE} = 0V$ , $V_{GE} = \pm 20V$                           |                       |      | $\pm 100$ nA              |
| $V_{CE(sat)}$ | $I_C = 30A$ , $V_{GE} = 15V$ , Note 1<br>$T_J = 125^\circ C$ | 2.3<br>1.8            |      | 2.5 V<br>V                |

### Features

- Optimized for Low Switching Losses
- Square RBSOA
- Avalanche Rated
- Fast Switching
- International Standard Packages

### Advantages

- High Power Density
- Low Gate Drive Requirement

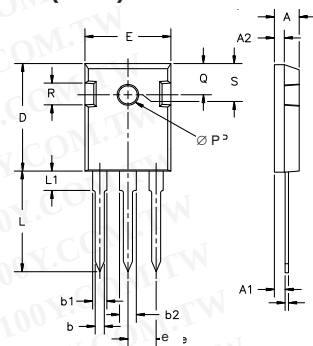
### Applications

- High Frequency Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

| Symbol                                                |   | Test Conditions                                                     |  | Characteristic Values |      |                         |
|-------------------------------------------------------|---|---------------------------------------------------------------------|--|-----------------------|------|-------------------------|
| $(T_J = 25^\circ\text{C Unless Otherwise Specified})$ |   |                                                                     |  | Min.                  | Typ. | Max.                    |
| $g_{fs}$                                              |   | $I_C = 30\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$              |  | 20                    | 30   | S                       |
| $C_{ies}$                                             | } | $V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$          |  |                       | 1960 | pF                      |
| $C_{oes}$                                             |   |                                                                     |  |                       | 207  | pF                      |
| $C_{res}$                                             |   |                                                                     |  |                       | 66   | pF                      |
| $Q_g$                                                 | } | $I_C = 30\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$ |  |                       | 77   | nC                      |
| $Q_{ge}$                                              |   |                                                                     |  |                       | 16   | nC                      |
| $Q_{gc}$                                              |   |                                                                     |  |                       | 32   | nC                      |
| $t_{d(on)}$                                           | } | <b>Inductive Load, <math>T_J = 25^\circ\text{C}</math></b>          |  |                       | 19   | ns                      |
| $t_{ri}$                                              |   |                                                                     |  |                       | 26   | ns                      |
| $E_{on}$                                              |   |                                                                     |  |                       | 0.41 | mJ                      |
| $t_{d(off)}$                                          |   |                                                                     |  |                       | 60   | ns                      |
| $t_{fi}$                                              |   |                                                                     |  |                       | 38   | ns                      |
| $E_{off}$                                             |   |                                                                     |  |                       | 0.23 | mJ                      |
| $t_{d(on)}$                                           | } | <b>Inductive Load, <math>T_J = 125^\circ\text{C}</math></b>         |  |                       | 19   | ns                      |
| $t_{ri}$                                              |   |                                                                     |  |                       | 26   | ns                      |
| $E_{on}$                                              |   |                                                                     |  |                       | 0.65 | mJ                      |
| $t_{d(off)}$                                          |   |                                                                     |  |                       | 92   | ns                      |
| $t_{fi}$                                              |   |                                                                     |  |                       | 95   | ns                      |
| $E_{off}$                                             |   |                                                                     |  |                       | 0.57 | mJ                      |
| $R_{thJC}$                                            |   |                                                                     |  |                       |      | 0.42 $^\circ\text{C/W}$ |
| $R_{thCS}$                                            |   | (TO-247)                                                            |  |                       | 0.21 | $^\circ\text{C/W}$      |
|                                                       |   | (TO-220)                                                            |  |                       | 0.50 | $^\circ\text{C/W}$      |

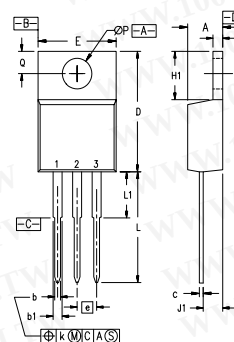
Note 1: Pulse Test,  $t \leq 300\mu\text{s}$ ; Duty Cycle,  $d \leq 2\%$ .

### TO-247 (IXGH) Outline



| Dim.           | Millimeter |       | Inches |       |
|----------------|------------|-------|--------|-------|
|                | Min.       | Max.  | Min.   | Max.  |
| A              | 4.7        | 5.3   | .185   | .209  |
| A <sub>1</sub> | 2.2        | 2.54  | .087   | .102  |
| A <sub>2</sub> | 2.2        | 2.6   | .059   | .098  |
| b              | 1.0        | 1.4   | .040   | .055  |
| b <sub>1</sub> | 1.65       | 2.13  | .065   | .084  |
| b <sub>2</sub> | 2.87       | 3.12  | .113   | .123  |
| C              | .4         | .8    | .016   | .031  |
| D              | 20.80      | 21.46 | .819   | .845  |
| E              | 15.75      | 16.26 | .610   | .640  |
| e              | 5.20       | 5.72  | 0.205  | 0.225 |
| L              | 19.81      | 20.32 | .780   | .800  |
| L1             |            | 4.50  |        | .177  |
| ØP             | 3.55       | 3.65  | .140   | .144  |
| Q              | 5.89       | 6.40  | 0.232  | 0.252 |
| R              | 4.32       | 5.49  | .170   | .216  |
| S              | 6.15       | BSC   | .242   | BSC   |

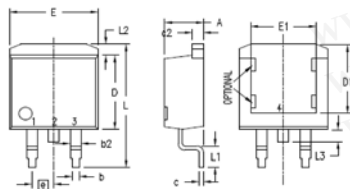
### TO-220 (IXGP) Outline



Pins: 1 - Gate 2 - Drain  
3 - Source 4 - Drain

| SYM            | INCHES   |      | MILLIMETERS |       |
|----------------|----------|------|-------------|-------|
|                | MIN      | MAX  | MIN         | MAX   |
| A              | .170     | .190 | 4.32        | 4.83  |
| b              | .025     | .040 | 0.64        | 1.02  |
| b <sub>1</sub> | .045     | .065 | 1.15        | 1.65  |
| c              | .014     | .022 | 0.35        | 0.56  |
| D              | .580     | .630 | 14.73       | 16.00 |
| E              | .390     | .420 | 9.91        | 10.66 |
| e              | .100 BSC |      | 2.54 BSC    |       |
| F              | .045     | .055 | 1.14        | 1.40  |
| H1             | .230     | .270 | 5.85        | 6.85  |
| J1             | .090     | .110 | 2.29        | 2.79  |
| k              | 0        | .015 | 0           | 0.38  |
| L              | .500     | .550 | 12.70       | 13.97 |
| L1             | .110     | .230 | 2.79        | 5.84  |
| ØP             | .139     | .161 | 3.53        | 4.08  |
| Q              | .100     | .125 | 2.54        | 3.18  |

### TO-263 (IXGA) Outline



1. GATE (COLLECTOR)
2. DRAIN (COLLECTOR)
3. SOURCE (EMITTER)
4. DRAIN (COLLECTOR) BOTTOM SIDE

| SYM            | INCHES   |      | MILLIMETERS |       |
|----------------|----------|------|-------------|-------|
|                | MIN      | MAX  | MIN         | MAX   |
| A              | .160     | .190 | 4.06        | 4.83  |
| A <sub>1</sub> | .080     | .110 | 2.03        | 2.79  |
| b              | .020     | .039 | 0.51        | 0.99  |
| b <sub>2</sub> | .045     | .055 | 1.14        | 1.40  |
| c              | .016     | .029 | 0.40        | 0.74  |
| c <sub>2</sub> | .045     | .055 | 1.14        | 1.40  |
| D              | .340     | .380 | 8.64        | 9.65  |
| D <sub>1</sub> | .315     | .350 | 8.00        | 8.89  |
| E              | .380     | .410 | 9.65        | 10.41 |
| E <sub>1</sub> | .245     | .320 | 6.22        | 8.13  |
| e              | .100 BSC |      | 2.54 BSC    |       |
| L              | .575     | .625 | 14.61       | 15.88 |
| L <sub>1</sub> | .090     | .110 | 2.29        | 2.79  |
| L <sub>2</sub> | .040     | .055 | 1.02        | 1.40  |
| L <sub>3</sub> | .050     | .070 | 1.27        | 1.78  |
| L <sub>4</sub> | 0        | .005 | 0           | 0.13  |

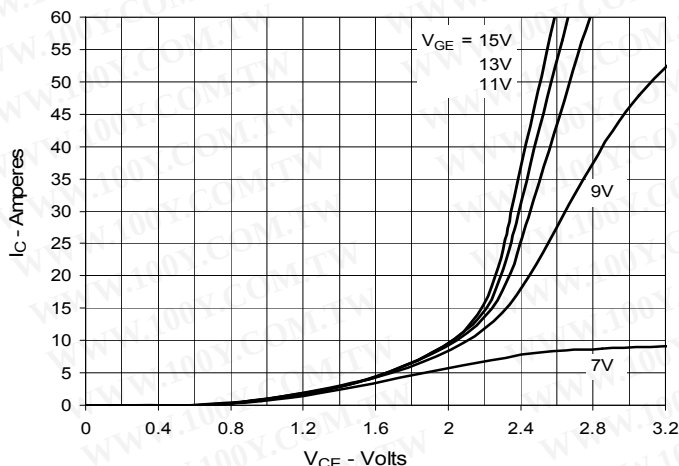
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勝特力电子(上海) 86-21-34970699  
勝特力电子(深圳) 86-755-83298787

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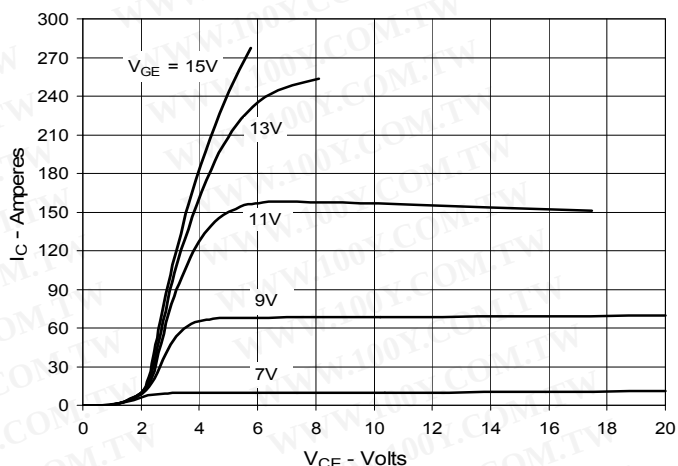
IXYS reserves the right to change limits, test conditions and dimensions.

IXYS MOSFETs and IGBTs are covered 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  
by one or more of the following U.S. patents: 4,850,072 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

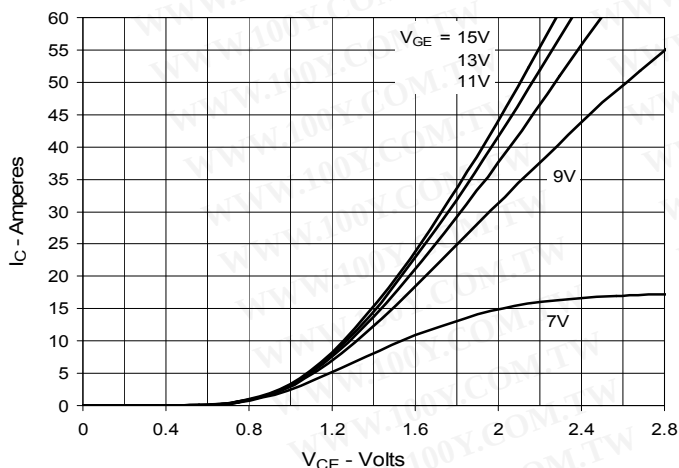
**Fig. 1. Output Characteristics**  
@ 25°C



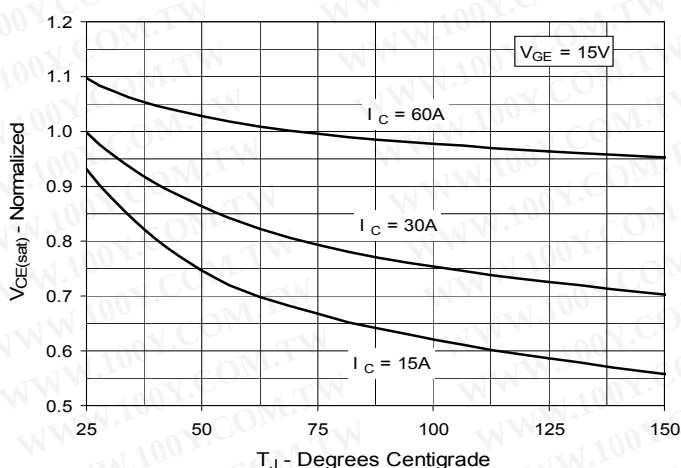
**Fig. 2. Extended Output Characteristics**  
@ 25°C



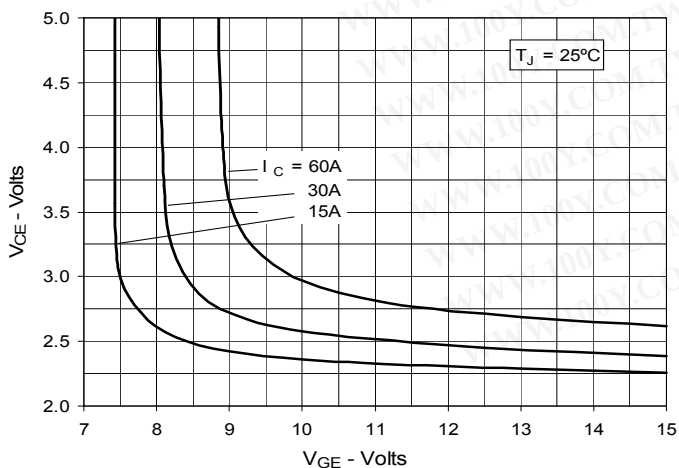
**Fig. 3. Output Characteristics**  
@ 125°C



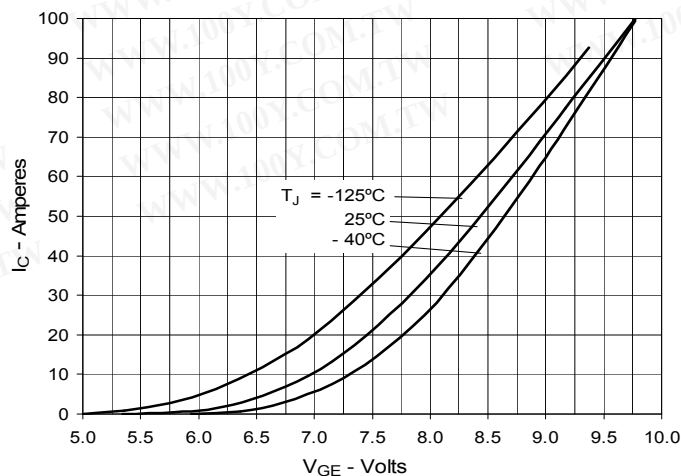
**Fig. 4. Dependence of VCE(sat) on**  
Junction Temperature



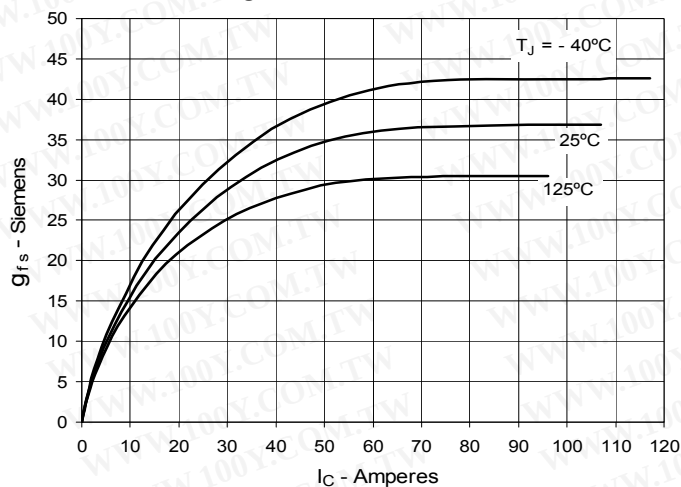
**Fig. 5. Collector-to-Emitter Voltage**  
vs. Gate-to-Emitter Voltage



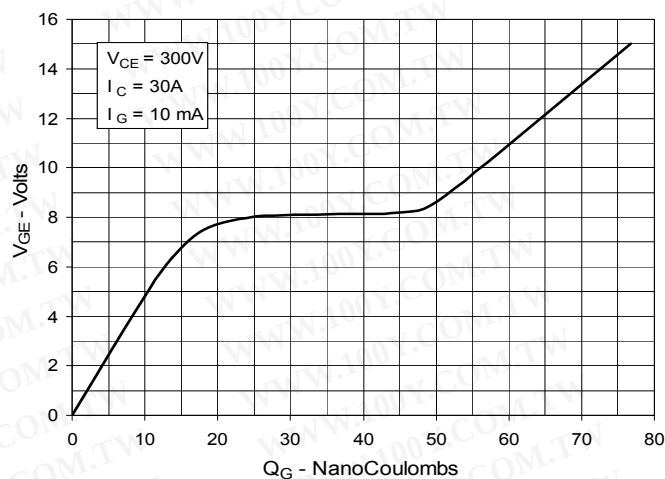
**Fig. 6. Input Admittance**



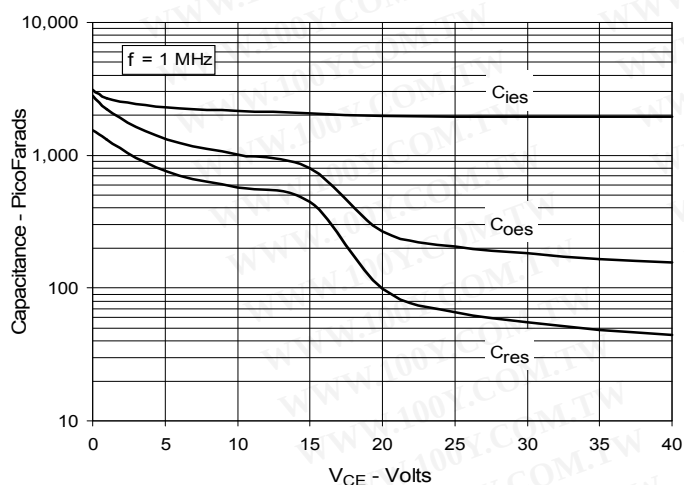
**Fig. 7. Transconductance**



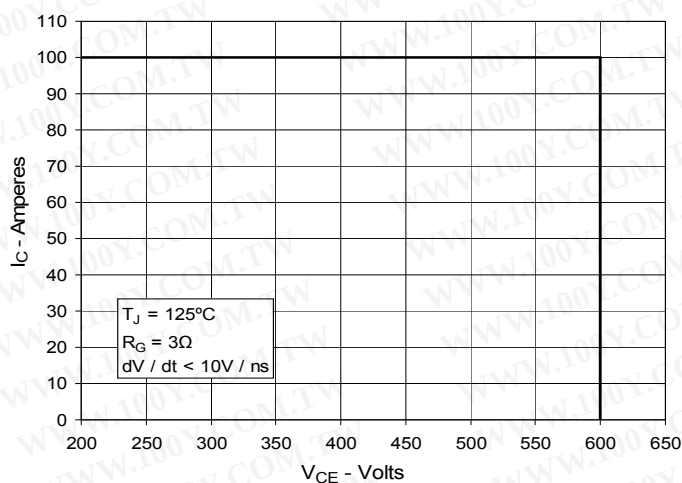
**Fig. 8. Gate Charge**



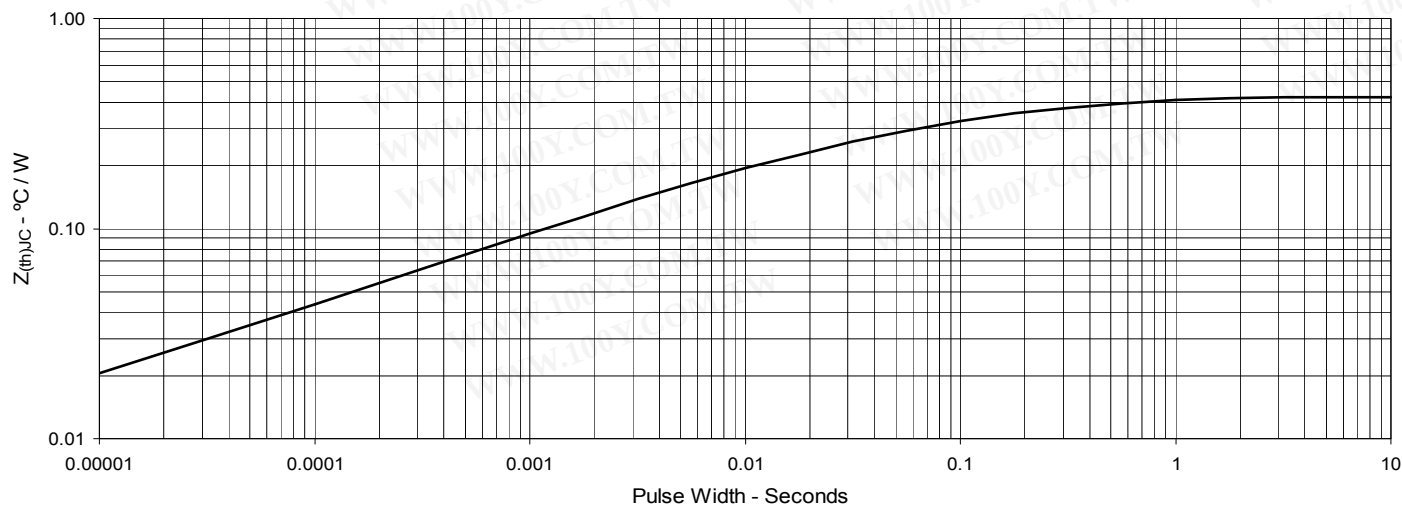
**Fig. 9. Capacitance**



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

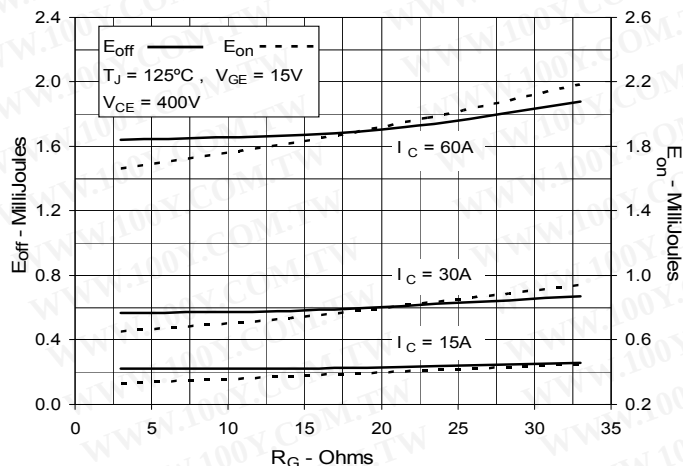


**Fig. 11. Maximum Transient Thermal Impedance**

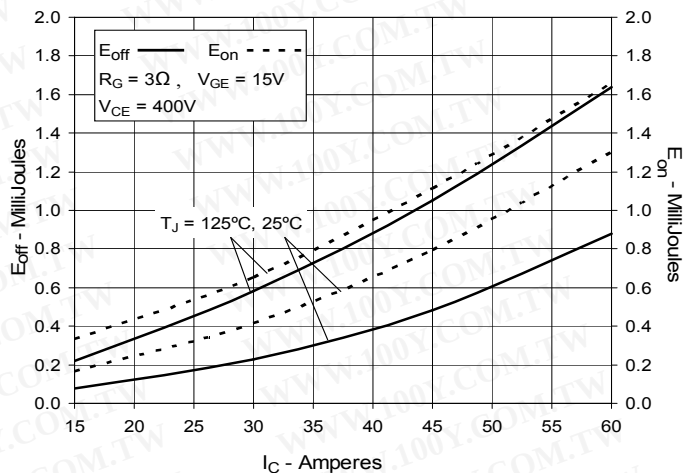




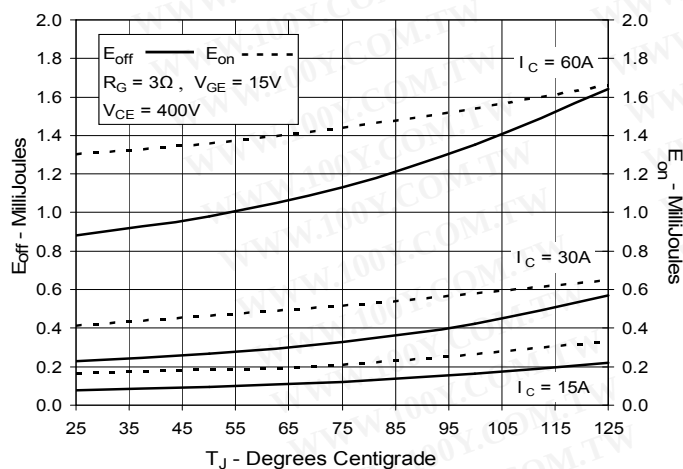
**Fig. 12. Inductive Switching  
Energy Loss vs. Gate Resistance**



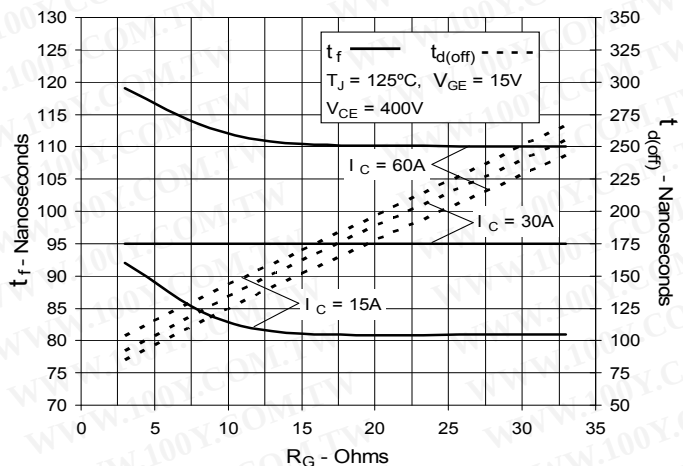
**Fig. 13. Inductive Switching  
Energy Loss vs. Collector Current**



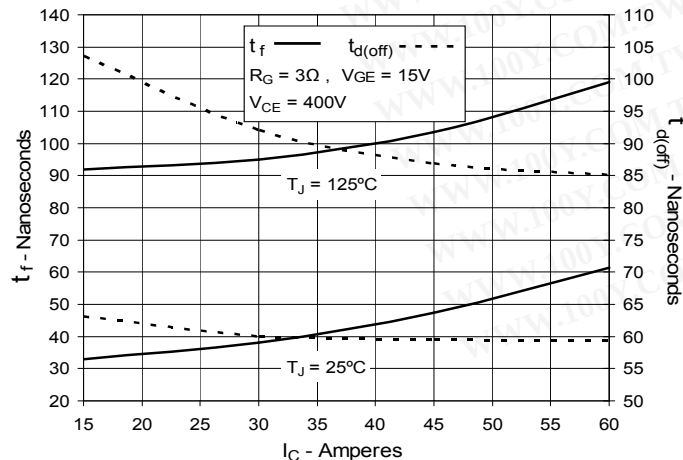
**Fig. 14. Inductive Switching  
Energy Loss vs. Junction Temperature**



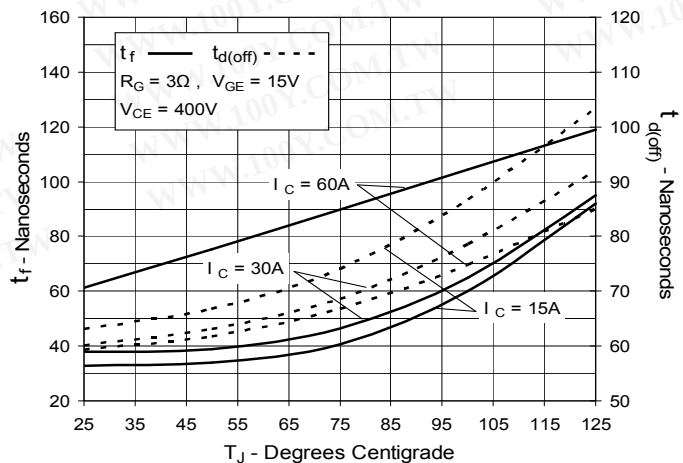
**Fig. 15. Inductive Turn-off  
Switching Times vs. Gate Resistance**

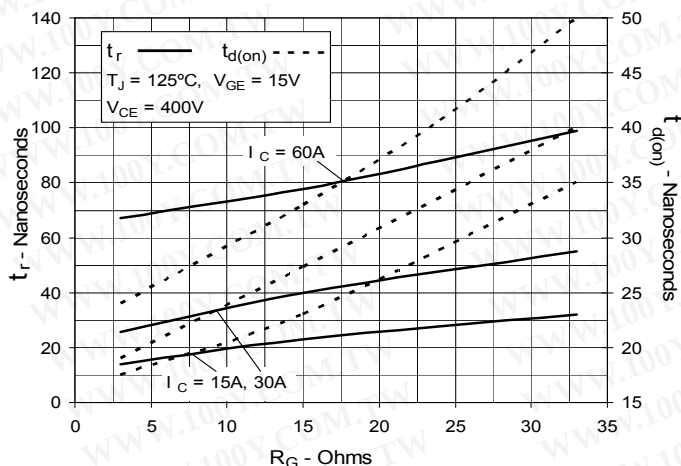
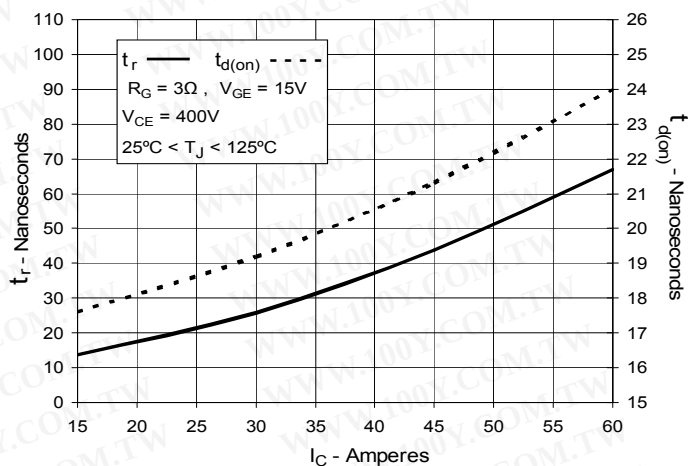
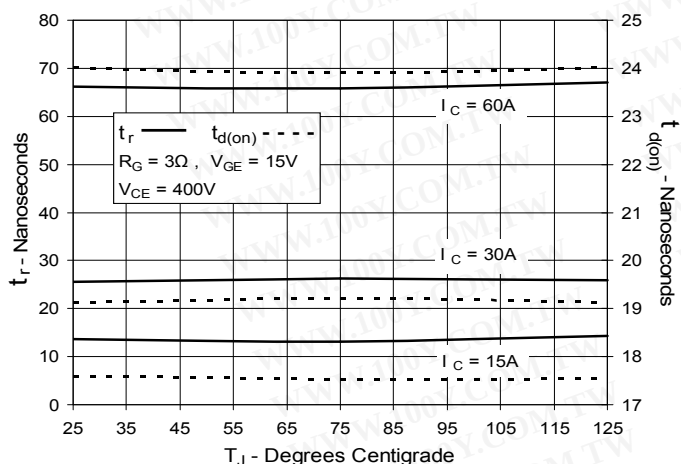


**Fig. 16. Inductive Turn-off  
Switching Times vs. Collector Current**



**Fig. 17. Inductive Turn-off  
Switching Times vs. Junction Temperature**



**Fig. 18. Inductive Turn-on  
Switching Times vs. Gate Resistance**

**Fig. 19. Inductive Turn-on  
Switching Times vs. Collector Current**

**Fig. 20. Inductive Turn-on  
Switching Times vs. Junction Temperature**


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