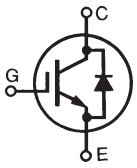
IXYS

Preliminary Technical Information

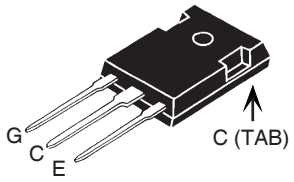
# High Voltage IGBTs w/Diode

# IXGH24N170AH1
# IXGT24N170AH1

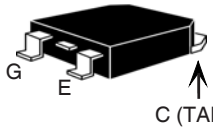
$V_{CES}$ = 1700V
$I_{C25}$ = 24A
$V_{CE(sat)}$ ≤ 6.0V
$t_{fi(typ)}$ = 40ns




**TO-247 (IXGH)**




**TO-268 (IXGT)**




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

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_C$ = 25°C to 150°C | 1700 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C, $R_{GE}$ = 1MΩ | 1700 | V |
| $V_{GES}$ | Continuous | ± 20 | V |
| $V_{GEM}$ | Transient | ± 30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 24 | A |
| $I_{C90}$ | $T_C$ = 90°C | 16 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 75 | A |
| SSOA (RBSOA) | $V_{GE}$ = 15V, $T_{VJ}$ = 125°C, $R_G$ = 10Ω<br>Clamped Inductive Load | $I_{CM}$ = 50<br>0.8 • $V_{CES}$ | A<br>V |
| $t_{SC}$ | $T_J$ = 125°C, $V_{CE}$ = 1200V, $V_{GE}$ = 15V, $R_G$ = 22Ω | 10 | µs |
| $P_C$ | $T_C$ = 25°C | 250 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | 1.6mm (0.062 in.) from Case for 10s | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10 seconds | 260 | °C |
| $M_d$ | Mounting Torque (TO-247) | 1.13/10 | Nm/lb.in. |
| Weight | TO-247 | 6 | g |
| | TO-268 | 4 | g |

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{CES}$ | $I_C$ = 250µA, $V_{GE}$ = 0V | 1700 | | | V |
| $V_{GE(th)}$ | $I_C$ = 250µA, $V_{CE}$ = $V_{GE}$ | 3.0 | | 5.0 | V |
| $I_{CES}$ | $V_{CE}$ = 0.8 • $V_{CES}$, $V_{GE}$ = 0V | | | 100 | µA |
| | $T_J$ = 125°C | | | 1.5 | mA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ± 20V | | | ±100 | nA |
| $V_{CE(sat)}$ | $I_C$ = 16A, $V_{GE}$ = 15V, Note 1 | | 4.5 | 6.0 | V |
| | $T_J$ = 125°C | | 4.8 | | V |

**Features**

- Optimized for Low Conduction and Switching Losses
- Anti-Parallel Ultra Fast Diode
- International Standard Packages

**Advantages**

- High Power Density
- Low Gate Drive Requirement

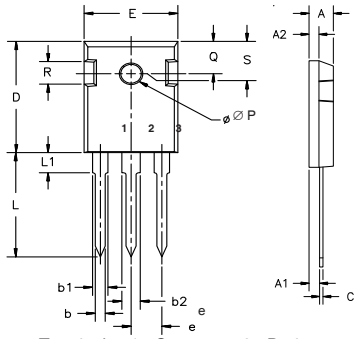
**Applications**

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

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| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 24A, $V_{CE}$ = 10V, Note 2 | 13 | 22 | | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 2860 | | pF |
| $C_{oes}$ | | | 198 | | pF |
| $C_{res}$ | | | 58 | | pF |
| $Q_g$ | $I_C$ = 16A, $V_{GE}$ = 15V, $V_{CE}$ = 0.5 • $V_{CES}$ | | 140 | | nC |
| $Q_{ge}$ | | | 18 | | nC |
| $Q_{gc}$ | | | 60 | | nC |
| $t_{d(on)}$ | **Inductive Load, $T_J$ = 25°C** | | 21 | | ns |
| $t_{ri}$ | $I_C$ = 24A, $V_{GE}$ = 15V | | 36 | | ns |
| $E_{on}$ | $V_{CE}$ = 0.5 • $V_{CES}$, $R_G$ = 10Ω | | 2.97 | | mJ |
| $t_{d(off)}$ | Note 1 | | 336 | | ns |
| $t_{fi}$ | | | 40 | 80 | ns |
| $E_{off}$ | | | 0.79 | 1.50 | mJ |
| $t_{d(on)}$ | **Inductive Load, $T_J$ = 125°C** | | 23 | | ns |
| $t_{ri}$ | $I_C$ = 24A, $V_{GE}$ = 15V | | 31 | | ns |
| $E_{on}$ | $V_{CE}$ = 0.5 • $V_{CES}$, $R_G$ = 10Ω | | 3.60 | | mJ |
| $t_{d(off)}$ | Note 1 | | 360 | | ns |
| $t_{fi}$ | | | 96 | | ns |
| $E_{off}$ | | | 1.47 | | mJ |
| $R_{thJC}$ | | | | 0.50 | °C/W |
| $R_{thCK}$ | (TO-247) | | 0.21 | | °C/W |

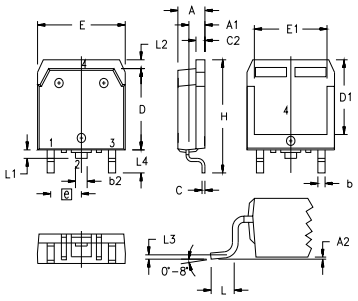
**TO-247 (IXGH) Outline**




Terminals: 1 - Gate 2 - Drain
3 - Source Tab - Drain

| Dim. | Millimeter Min. | Max. | Inches Min. | Max. |
|---|---|---|---|---|
| A | 4.7 | 5.3 | .185 | .209 |
| $A_1$ | 2.2 | 2.54 | .087 | .102 |
| $A_2$ | 2.2 | 2.6 | .059 | .098 |
| b | 1.0 | 1.4 | .040 | .055 |
| $b_1$ | 1.65 | 2.13 | .065 | .084 |
| $b_2$ | 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-268 (IXGT) Outline**




| SYM | INCHES MIN | MAX | MILLIMETERS 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 |
| b2 | .075 | .083 | 1.90 | 2.10 |
| C | .016 | .026 | 0.40 | 0.65 |
| C2 | .057 | .063 | 1.45 | 1.60 |
| D | .543 | .551 | 13.80 | 14.00 |
| D1 | .488 | .500 | 12.40 | 12.70 |
| E | .624 | .632 | 15.85 | 16.05 |
| E1 | .524 | .535 | 13.30 | 13.60 |
| e | .215 BSC | | 5.45 BSC | |
| H | .736 | .752 | 18.70 | 19.10 |
| L | .094 | .106 | 2.40 | 2.70 |
| L1 | .047 | .055 | 1.20 | 1.40 |
| L2 | .039 | .045 | 1.00 | 1.15 |
| L3 | .010 BSC | | 0.25 BSC | |
| L4 | .150 | .161 | 3.80 | 4.10 |

**Reverse Diode (FRED)**

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 20A, $V_{GE}$ = 0V | | 2.5 | 2.95 | V |
| | $T_J$ = 125°C | | 2.5 | | V |
| $I_{RM}$ | $I_F$ = 20A, -$di_F$/dt = 150A/µs, | | 15 | | A |
| $t_{rr}$ | | | 80 | | ns |
| $I_{RM}$ | $V_R$ = 1200V, $V_{GE}$ = 0V $T_J$ = 125°C | | 20 | | A |
| $t_{rr}$ | | | 200 | | ns |
| $R_{thJC}$ | | | | 0.9 | °C/W |

Notes:
1. Switching times may increase for $V_{CE}$ (Clamp) > 0.5 • $V_{CES}$, higher $T_J$ or increased $R_G$.
2. Pulse Test, t ≤ 300µs; Duty Cycle, d ≤ 2%.

**PRELIMINARY TECHNICAL INFORMATION**

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. 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 4,850,072 4,881,106 4,931,844 5,017,508 5,034,796 5,049,961 5,063,307 5,187,117 5,237,481 5,381,025 5,486,715 6,162,665 6,259,123 B1 6,306,728 B1 6,404,065 B1 6,534,343 6,583,505 6,683,344 6,710,405 B2 6,710,463 6,727,585 6,759,692 6,771,478 B2 7,005,734 B2 7,063,975 B2 7,071,537 7,157,338B2

**Fig. 1. Output Characteristics @ 25ºC**

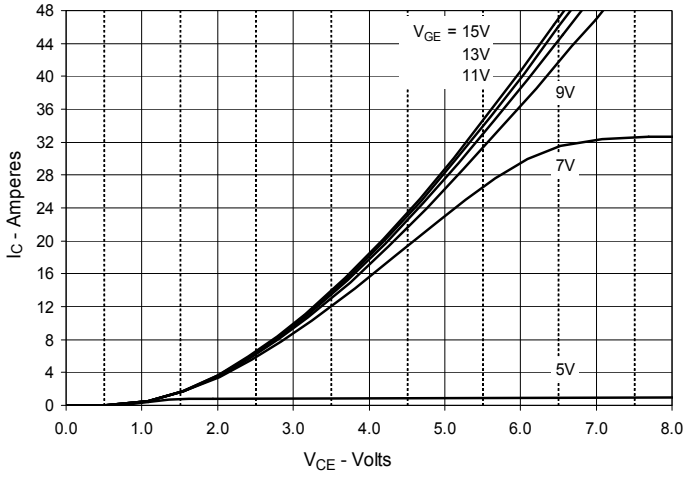



**Fig. 2. Extended Output Characteristics @ 25ºC**

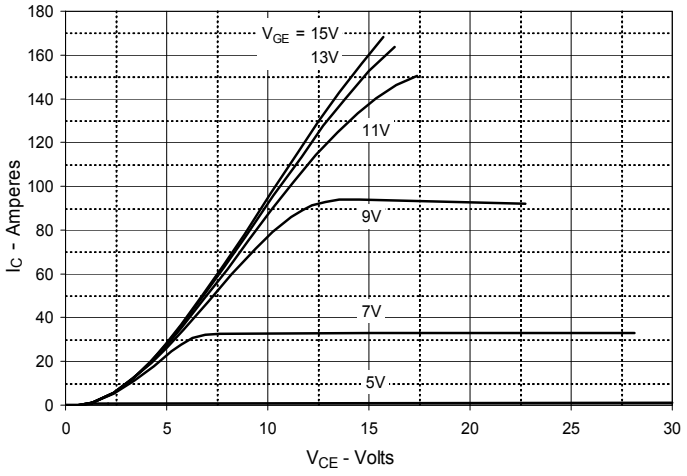



**Fig. 3. Output Characteristics @ 125ºC**

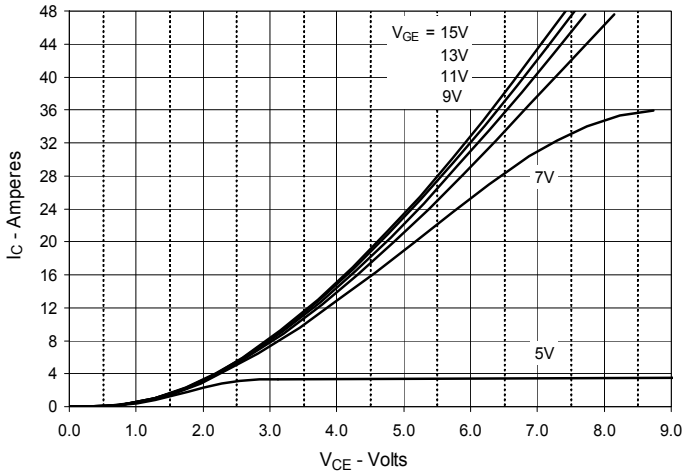



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

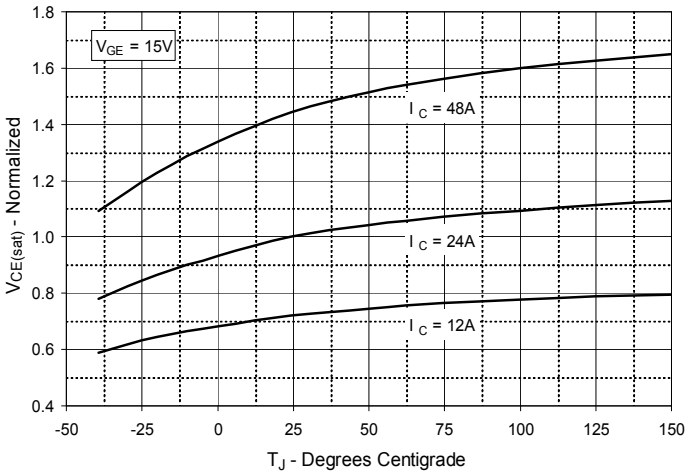



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

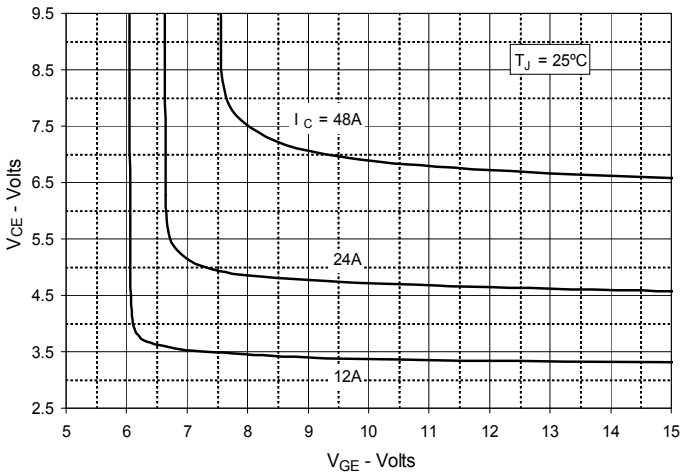
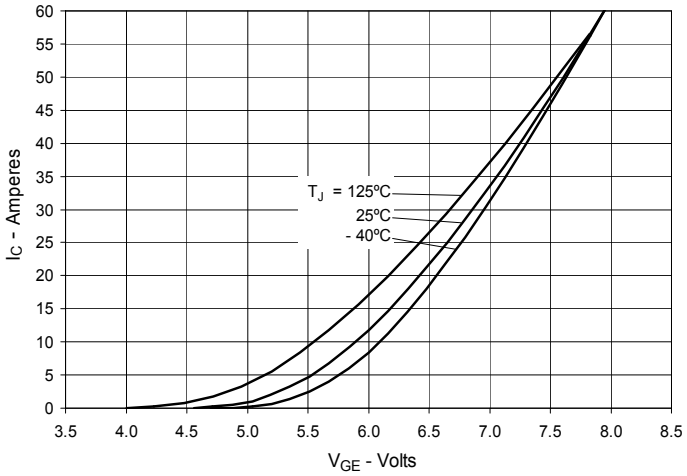



**Fig. 6. Input Admittance**




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**Fig. 7. Transconductance**

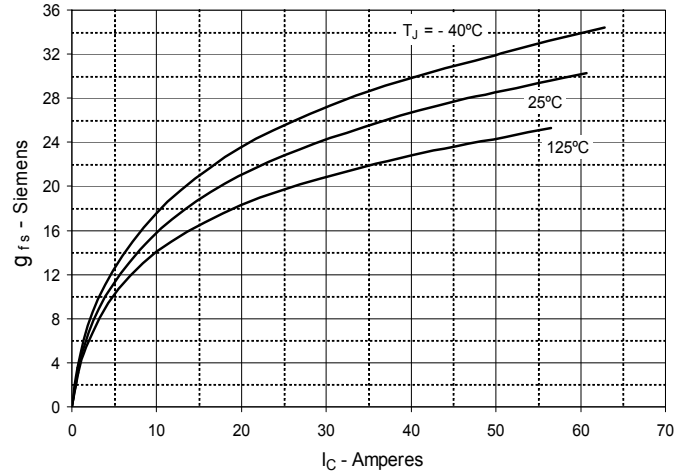



**Fig. 8. Gate Charge**

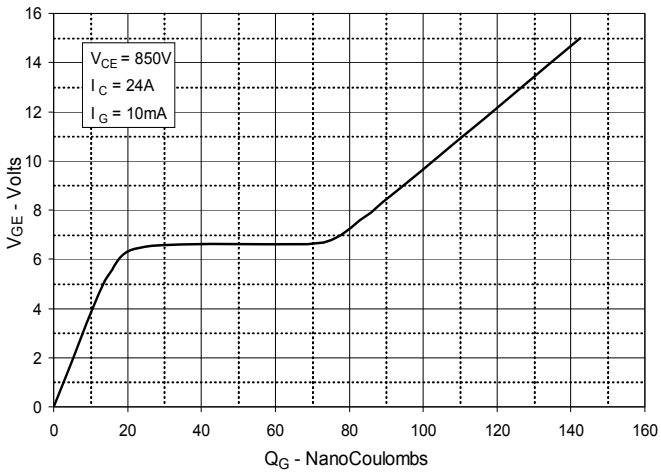



**Fig. 9. Capacitance**

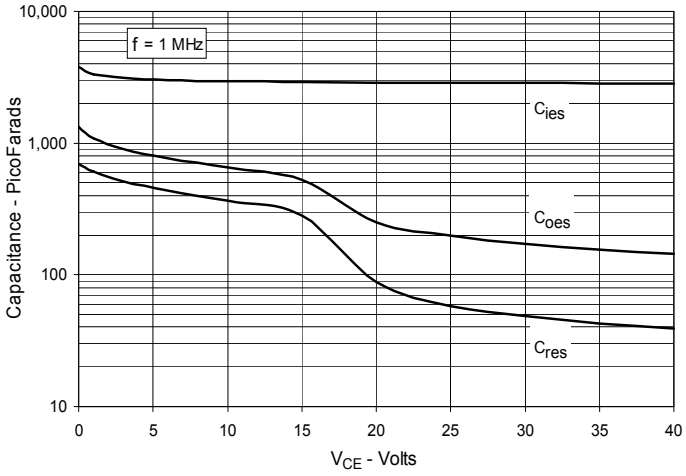



**Fig. 10. Reverse-Bias Safe Operating Area**

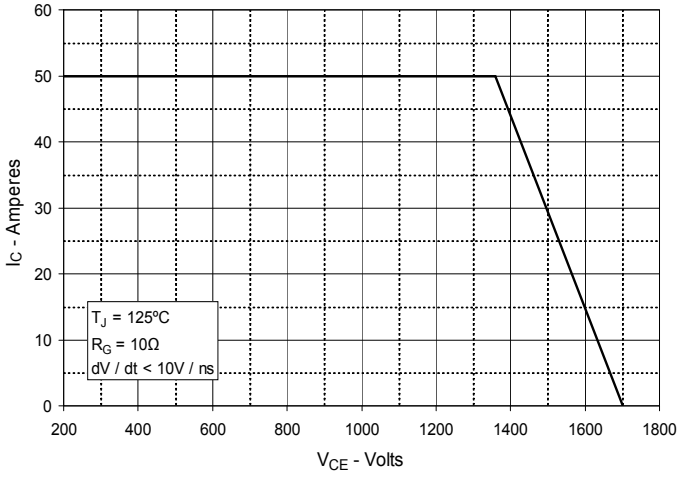
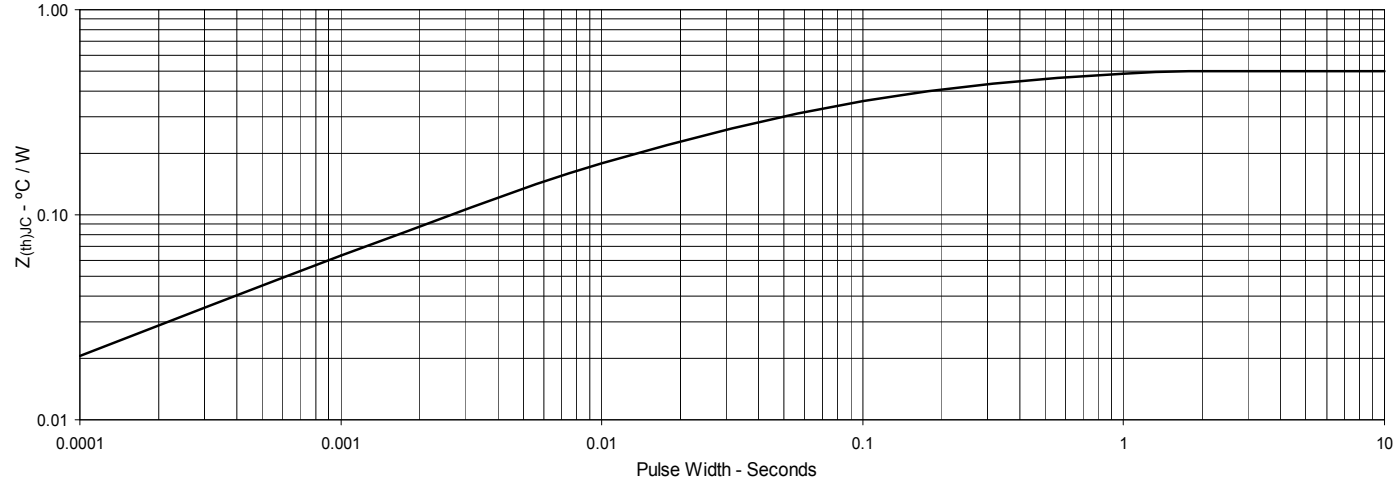



**Fig. 11. Maximum Transient Thermal Impedance**




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