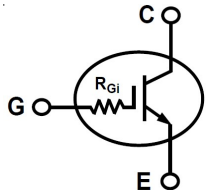
IXYS

# High Voltage XPT™ IGBT

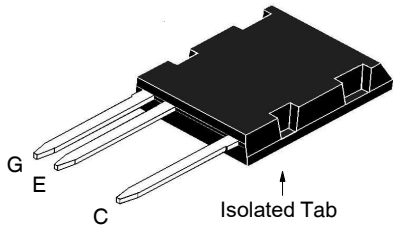
# IXYL60N450

$V_{CES}$ = 4500V
$I_{C110}$ = 38A
$V_{CE(sat)}$ ≤ 3.30V

**(Electrically Isolated Tab)**




**ISOPLUS i5-Pak™**




G = Gate E = Emitter
C = Collector

| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 4500 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C, $R_{GE}$ = 1MΩ | 4500 | V |
| $V_{GES}$ | Continuous | ±20 | V |
| $V_{GEM}$ | Transient | ±30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 90 | A |
| $I_{C110}$ | $T_C$ = 110°C | 38 | A |
| $I_{CM}$ | $T_C$ = 25°C, 1ms | 680 | A |
| SSOA (RBSOA) | $V_{GE}$ = 15V, $T_{VJ}$ = 125°C, $R_G$ = 4.7Ω<br>Clamped Inductive Load | $I_{CM}$ = 120<br>1500 | A<br>V |
| $P_C$ | $T_C$ = 25°C | 417 | W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{JM}$ | | 150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $T_L$ | Maximum Lead Temperature for Soldering | 300 | °C |
| $T_{SOLD}$ | Plastic Body for 10s | 260 | °C |
| $F_C$ | Mounting Force | 40..120 / 9..27 | N/lb |
| $V_{ISOL}$ | 50/60 Hz, RM, t = 1min | 4000 | V~ |
| Weight | | 8 | g |

| Symbol | Test Conditions ($T_J$ = 25°C, Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. | |
|---|---|---|---|---|---|
| $BV_{CES}$ | $I_C$ = 250μA, $V_{GE}$ = 0V | 4500 | | | V |
| $V_{GE(th)}$ | $I_C$ = 250μA, $V_{CE}$ = $V_{GE}$ | 3.0 | | 5.0 | V |
| $I_{CES}$ | $V_{CE}$ = 4000V, $V_{GE}$ = 0V | | | 25 | μA |
| | Note 1, $T_J$ = 90°C | | 75 | | μA |
| $I_{GES}$ | $V_{CE}$ = 0V, $V_{GE}$ = ±20V | | | ±300 | nA |
| $V_{CE(sat)}$ | $I_C$ = 60A, $V_{GE}$ = 15V, Note 1 | | 2.64 | 3.30 | V |
| | $T_J$ = 125°C | | 3.46 | | V |

## Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 4000V~ Electrical Isolation
- High Blocking Voltage
- High Peak Current Capability
- Low Saturation Voltage

## Advantages

- Low Gate Drive Requirement
- High Power Density

## Applications

- Switch-Mode and Resonant-Mode Power Supplies
- Uninterruptible Power Supplies (UPS)
- Laser Generators
- Capacitor Discharge Circuits
- AC Switches

| Symbol | Test Conditions ($T_J$ = 25°C Unless Otherwise Specified) | Characteristic Values Min. | Typ. | Max. |
|---|---|---|---|---|
| $g_{fs}$ | $I_C$ = 60A, $V_{CE}$ = 10V, Note 1 | 32 | 54 | S |
| $C_{ies}$ | $V_{CE}$ = 25V, $V_{GE}$ = 0V, f = 1MHz | | 7530 | pF |
| $C_{oes}$ | | | 270 | pF |
| $C_{res}$ | | | 115 | pF |
| $R_{Gi}$ | Integrated Gate Input Resistance | | 5.0 | Ω |
| $Q_{g(on)}$ | $I_C$ = 60A, $V_{GE}$ = 15V, $V_{CE}$ = 1000V | | 366 | nC |
| $Q_{ge}$ | | | 48 | nC |
| $Q_{gc}$ | | | 138 | nC |
| $t_{d(on)}$ | **Resistive Switching Times, $T_J$ = 25°C** | | 55 | ns |
| $t_r$ | $I_C$ = 60A, $V_{GE}$ = 15V | | 450 | ns |
| $t_{d(off)}$ | $V_{CE}$ = 960V, $R_G$ = 4.7Ω | | 450 | ns |
| $t_f$ | | | 1360 | ns |
| $t_{d(on)}$ | **Resistive Switching Times, $T_J$ = 125°C** | | 60 | ns |
| $t_r$ | $I_C$ = 60A, $V_{GE}$ = 15V | | 664 | ns |
| $t_{d(off)}$ | $V_{CE}$ = 960V, $R_G$ = 4.7Ω | | 510 | ns |
| $t_f$ | | | 1070 | ns |
| $R_{thJC}$ | | | | 0.30 °C/W |
| $R_{thCS}$ | | | 0.15 | °C/W |

Notes:

1. Pulse test, t < 300μs, duty cycle, d < 2%.
2. Device must be heatsunk for high-temperature leakage current measurements to avoid thermal runaway.

**Fig. 1. Output Characteristics @ $T_J$ = 25ºC**

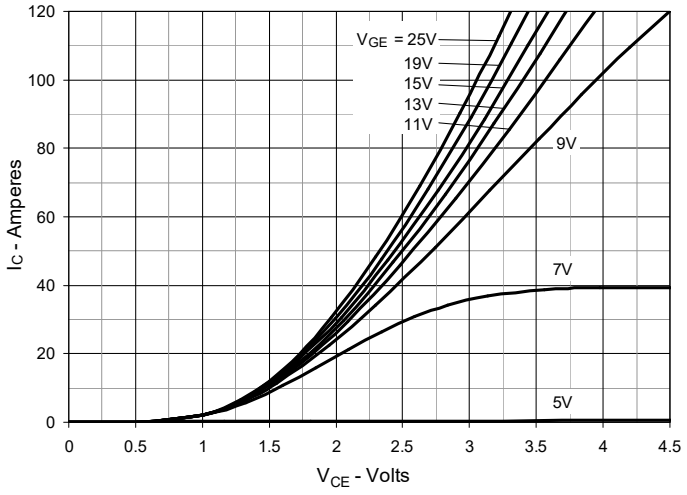



**Fig. 2. Extended Output Characteristics @ $T_J$ = 25ºC**

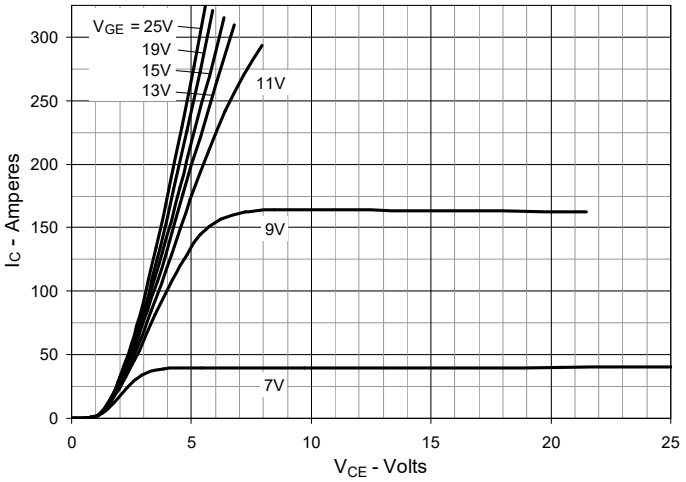



**Fig. 3. Output Characteristics @ $T_J$ = 125ºC**

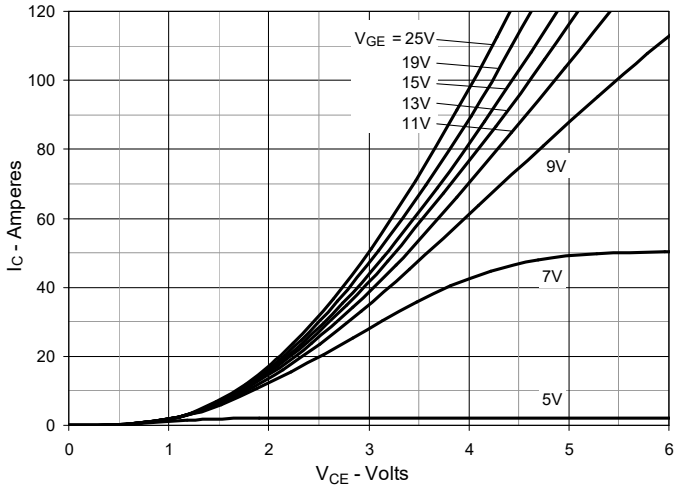



**Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature**

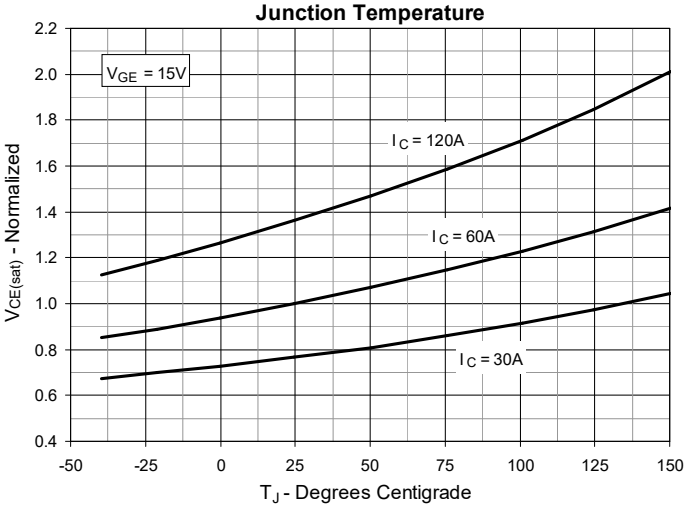



**Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage**

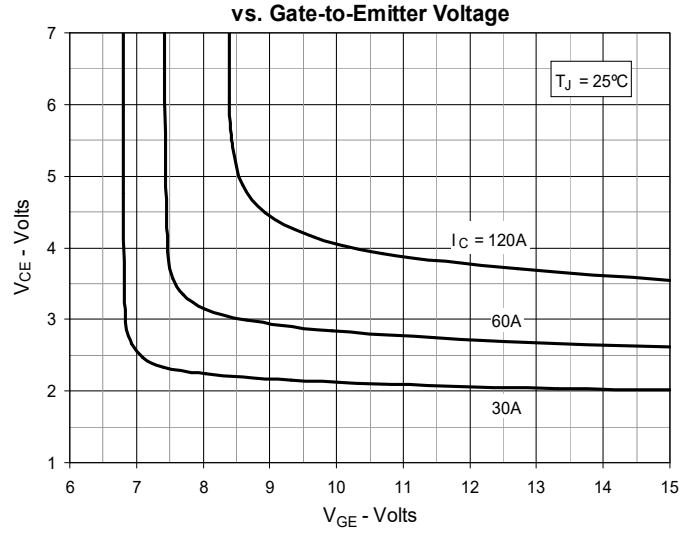



**Fig. 6. Input Admittance**

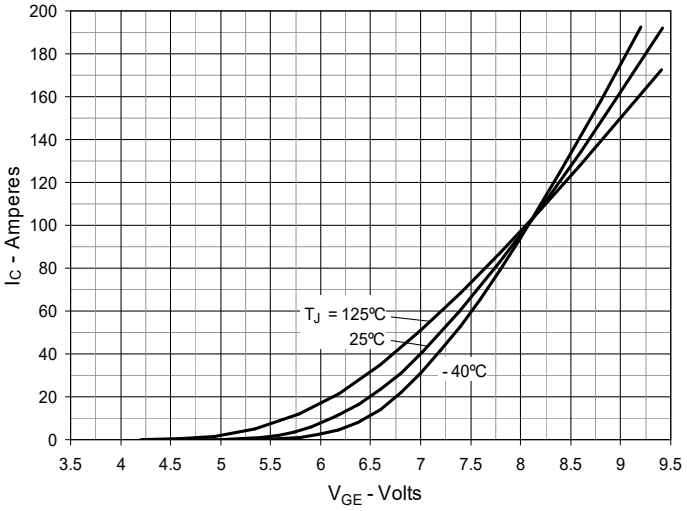


**Fig. 7. Transconductance**

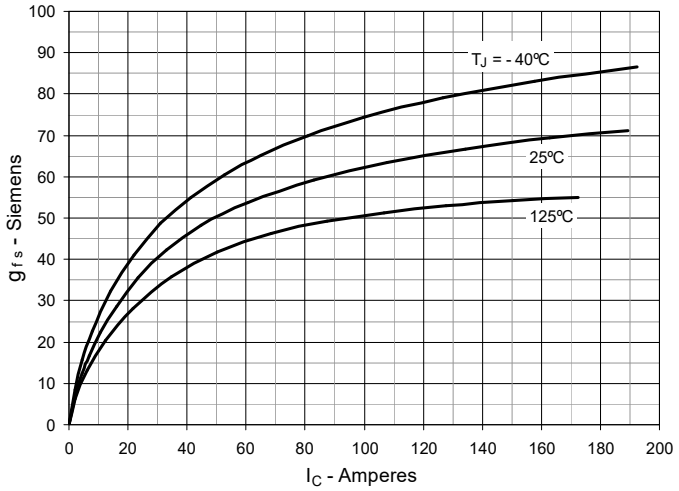



**Fig. 8. Gate Charge**

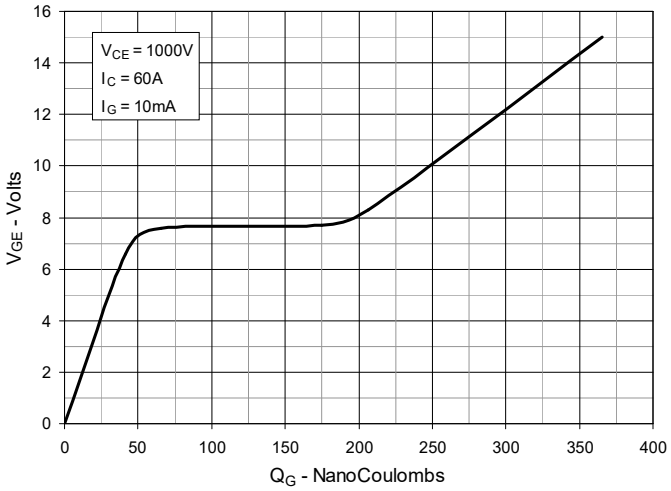



**Fig. 9. Capacitance**

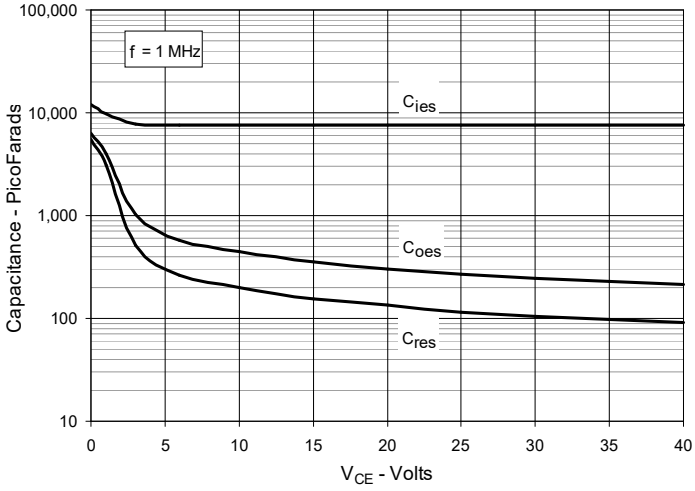



**Fig. 10. Reverse-Bias Safe Operating Area**

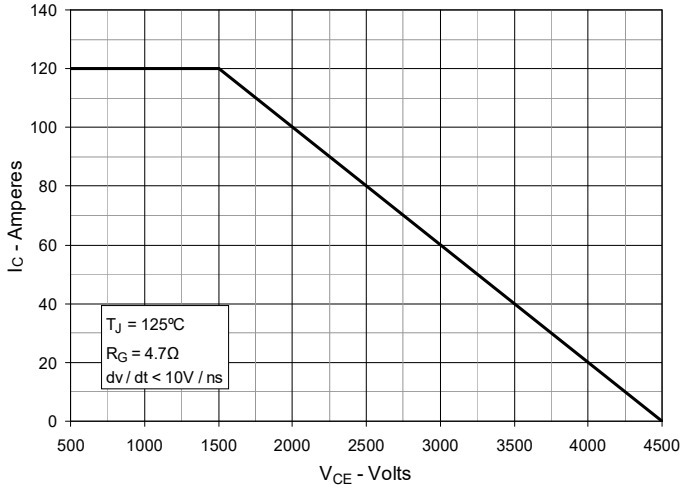
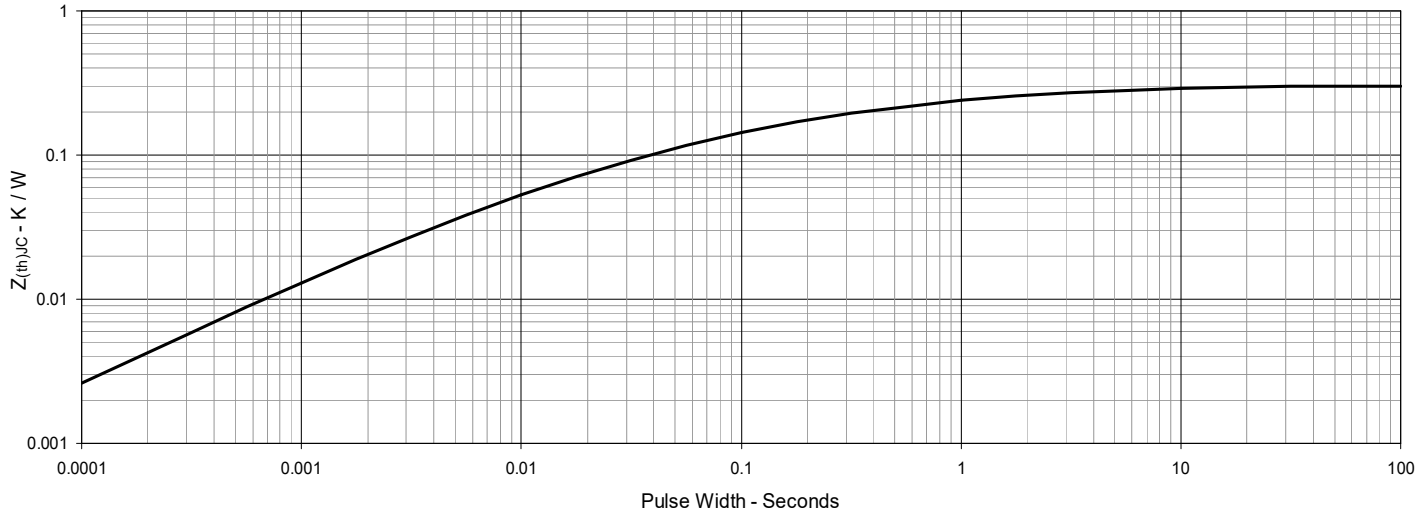
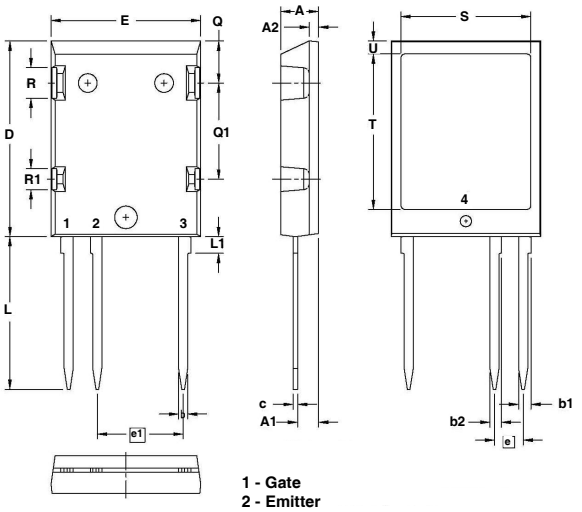



**Fig. 11. Maximum Transient Thermal Impedance**




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

**ISOPLUS i5-Pak™ (IXYL) Outline**




1 - Gate
2 - Emitter
3 - Collector
4 - Electrically Isolated 3,600V to pins

| SYM | INCHES | | MILLIMETERS | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | .190 | .205 | 4.83 | 5.21 |
| A1 | .102 | .118 | 2.59 | 3.00 |
| A2 | .046 | .055 | 1.17 | 1.40 |
| b | .045 | .055 | 1.14 | 1.40 |
| b1 | .063 | .072 | 1.60 | 1.83 |
| b2 | .058 | .068 | 1.47 | 1.73 |
| c | .020 | .029 | 0.51 | 0.74 |
| D | 1.020 | 1.040 | 25.91 | 26.42 |
| E | .770 | .799 | 19.56 | 20.29 |
| e | .150 BSC | | 3.81 BSC | |
| e1 | .450 BSC | | 11.43 BSC | |
| L | .780 | .820 | 19.81 | 20.83 |
| L1 | .080 | .102 | 2.03 | 2.59 |
| Q | .210 | .235 | 5.33 | 5.97 |
| Q1 | .490 | .513 | 12.45 | 13.03 |
| R | .150 | .180 | 3.81 | 4.57 |
| R1 | .100 | .130 | 2.54 | 3.30 |
| S | .668 | .690 | 16.97 | 17.53 |
| T | .801 | .821 | 20.34 | 20.85 |
| U | .065 | .080 | 1.65 | 2.03 |