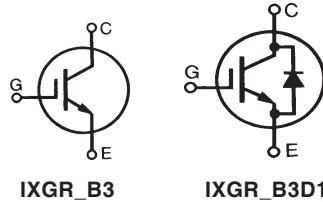


GenX3™ 600V IGBTs
(Electrically Isolated Back Surface)

 Medium-Speed Low-V_{sat} PT IGBTs 5-40 kHz Switching

**IXGR48N60B3
IXGR48N60B3D1**


$$V_{CES} = 600V$$

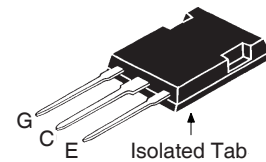
$$I_{C25} = 60A$$

$$V_{CE(sat)} \leq 2.1V$$

$$t_{fi(typ)} = 116ns$$

 ISOPLUS247™
 E153432

| 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 | ± 20 | V |
| V_{GEM} | Transient | ± 30 | V |
| I_{C25} | $T_C = 25^\circ C$ | 60 | A |
| I_{C110} | $T_C = 110^\circ C$ | 27 | A |
| I_{F110} | $T_C = 110^\circ C$ (48N60B3D1) | 27 | A |
| I_{CM} | $T_C = 25^\circ C$, 1ms | 280 | A |
| SSOA | $V_{GE} = 15V$, $T_{VJ} = 125^\circ C$, $R_G = 5\Omega$ | $I_{CM} = 120$ | A |
| (RBSOA) | Clamped Inductive Load | @ $\leq V_{CE}$ | |
| P_C | $T_C = 25^\circ C$ | 150 | 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 | $^\circ C$ |
| F_C | Mounting Force | 20..120 / 4.5..27 | N/lb. |
| V_{ISOL} | 50/60 Hz, RM, t = 1min | 2500 | V~ |
| Weight | | 5 | g |


 G = Gate E = Emitter
 C = Collector

Features

- Silocon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- Optimized for Low Conduction and Switching Losses
- 2500V~ Electrical Isolation
- Anti-Parallel Ultra Fast Diode
- Square RBSOA

Advantages

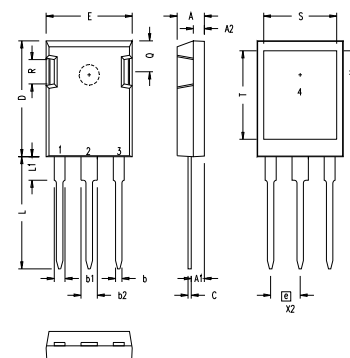
- High Power Density
- Low Gate Drive Requirement

Applications

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

| Symbol | Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified) | 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} | $V_{CE} = V_{CES}$, $V_{GE} = 0V$ | 48N60B3 | | 25 μA |
| | | 48N60B3D1 | | 1.75 mA |
| I_{GES} | $V_{CE} = 0V$, $V_{GE} = \pm 20V$ | | | ± 100 nA |
| $V_{CE(sat)}$ | $I_C = 40A$, $V_{GE} = 15V$, Note 1 $T_J = 125^\circ C$ | | 1.77 | 2.1 V |
| | | | 1.74 | V |

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|--------------|---|-----------------------|-----------|--------------------|
| | | Min. | Typ. | Max. |
| g_{fs} | $I_C = 30\text{A}$, $V_{CE} = 10\text{V}$, Note 1 | 20 | 30 | S |
| C_{ies} | $V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$ | 48N60B3 | 2980 | pF |
| C_{oes} | | | 170 | pF |
| C_{res} | | | 48N60B3D1 | 200 |
| Q_g | $I_C = 40\text{A}$, $V_{GE} = 15\text{V}$, $V_{CE} = 0.5 \cdot V_{CES}$ | | 115 | nC |
| Q_{ge} | | | 21 | nC |
| Q_{gc} | | | 40 | nC |
| $t_{d(on)}$ | Inductive Load, $T_J = 25^\circ\text{C}$ $I_C = 30\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$, $R_G = 5\Omega$ Note 2 | | 22 | ns |
| t_{ri} | | | 25 | ns |
| E_{on} | | | 0.84 | mJ |
| $t_{d(off)}$ | | | 130 | 200 ns |
| t_{fi} | | | 116 | 200 ns |
| E_{off} | | | 0.66 | 1.20 mJ |
| $t_{d(on)}$ | Inductive Load, $T_J = 125^\circ\text{C}$ $I_C = 30\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 480\text{V}$, $R_G = 5\Omega$ Note 2 | | 19 | ns |
| t_{ri} | | | 25 | ns |
| E_{on} | | | 1.71 | mJ |
| $t_{d(off)}$ | | | 190 | ns |
| t_{fi} | | | 157 | ns |
| E_{off} | | | 1.30 | mJ |
| R_{thJC} | | | 0.83 | $^\circ\text{C/W}$ |
| R_{thCS} | | | 0.15 | $^\circ\text{C/W}$ |

ISOPLUS247 (IXGR) 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 - DRAIN (COLLECTOR)
- 3 - SOURCE (EMITTER)
- 4 - NO CONNECTION

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

Reverse Diode (FRED) (D1 Version ONLY)

| Symbol | Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified) | Characteristic Values | | |
|------------|---|---------------------------|------|------------------------|
| | | Min. | Typ. | Max. |
| V_F | $I_F = 30\text{A}$, $V_{GE} = 0\text{V}$, Note 1 | | | 2.8 V |
| | | $T_J = 150^\circ\text{C}$ | 1.6 | V |
| I_{RM} | $I_F = 30\text{A}$, $V_{GE} = 0\text{V}$, $V_R = 100\text{V}$ $-di_F/dt = 100\text{A}/\mu\text{s}$ | | 4 | A |
| t_{rr} | $I_F = 1\text{A}$, $-di/dt = 100\text{A}/\mu\text{s}$, $V_R = 30\text{V}$ $T_J = 100^\circ\text{C}$ | | 100 | ns |
| R_{thJC} | | | | 1.5 $^\circ\text{C/W}$ |
| R_{thCS} | | | 1.5 | $^\circ\text{C/W}$ |

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 .

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 | 4,931,844 | 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 |
| | 4,850,072 | 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 | |

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