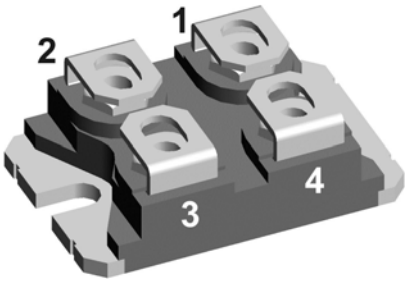
# XPT IGBT

$V_{CES}$ = 1200V
$I_{C25}$ = 88A
$V_{CE(sat)}$ = 1.8V

Copack

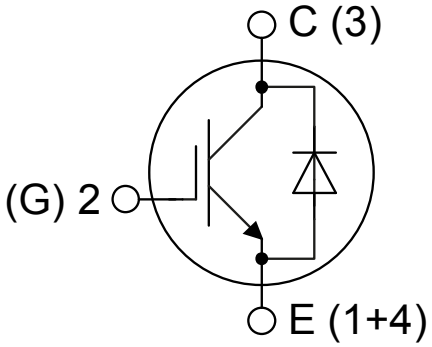
**Part number**

IXA60IF1200NA




Backside: isolated

E72873




**Features / Advantages:**

- Easy paralleling due to the positive temperature coefficient of the on-state voltage
- Rugged XPT design (Xtreme light Punch Through) results in:
  - short circuit rated for 10 µsec.
  - very low gate charge
  - low EMI
  - square RBSOA @ 3x Ic
- Thin wafer technology combined with the XPT design results in a competitive low VCE(sat)
- SONIC™ diode
  - fast and soft reverse recovery
  - low operating forward voltage

**Applications:**

- AC motor drives
- Solar inverter
- Medical equipment
- Uninterruptible power supply
- Air-conditioning systems
- Welding equipment
- Switched-mode and resonant-mode power supplies
- Inductive heating, cookers
- Pumps, Fans

**Package:** SOT-227B (minibloc)

- Isolation Voltage: 3000 V~
- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0
- Base plate: Copper internally DCB isolated
- Advanced power cycling
- Either emitter terminal can be used as main or Kelvin emitter

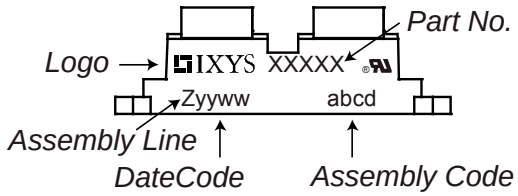
| IGBT | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| $V_{CES}$ | *collector emitter voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $V_{GES}$ | *max. DC gate voltage* | | | | | ±20 | V |
| $V_{GEM}$ | *max. transient gate emitter voltage* | | | | | ±30 | V |
| $I_{C25}$ | *collector current* | | $T_C$ = 25°C | | | 88 | A |
| $I_{C80}$ | | | $T_C$ = 80°C | | | 56 | A |
| $P_{tot}$ | *total power dissipation* | | $T_C$ = 25°C | | | 290 | W |
| $V_{CE(sat)}$ | *collector emitter saturation voltage* | $I_C$ = 50A; $V_{GE}$ = 15 V | $T_{VJ}$ = 25°C | | 1.8 | 2.1 | V |
| | | | $T_{VJ}$ = 125°C | | 2.1 | | V |
| $V_{GE(th)}$ | *gate emitter threshold voltage* | $I_C$ = 2mA; $V_{GE}$ = $V_{CE}$ | $T_{VJ}$ = 25°C | 5.4 | 5.9 | 6.5 | V |
| $I_{CES}$ | *collector emitter leakage current* | $V_{CE}$ = $V_{CES}$; $V_{GE}$ = 0 V | $T_{VJ}$ = 25°C | | | 0.1 | mA |
| | | | $T_{VJ}$ = 125°C | | 0.1 | | mA |
| $I_{GES}$ | *gate emitter leakage current* | $V_{GE}$ = ±20 V | | | | 500 | nA |
| $Q_{G(on)}$ | *total gate charge* | $V_{CE}$ = 600 V; $V_{GE}$ = 15 V; $I_C$ = 50 A | | | 190 | | nC |
| $t_{d(on)}$ | *turn-on delay time* | | | | 70 | | ns |
| $t_r$ | *current rise time* | | | | 40 | | ns |
| $t_{d(off)}$ | *turn-off delay time* | inductive load | $T_{VJ}$ = 125°C | | 250 | | ns |
| $t_f$ | *current fall time* | $V_{CE}$ = 600 V; $I_C$ = 50 A | | | 100 | | ns |
| $E_{on}$ | *turn-on energy per pulse* | $V_{GE}$ = ±15 V; $R_G$ = 15 Ω | | | 4.5 | | mJ |
| $E_{off}$ | *turn-off energy per pulse* | | | | 5.5 | | mJ |
| RBSOA | *reverse bias safe operating area* | $V_{GE}$ = ±15 V; $R_G$ = 15 Ω | $T_{VJ}$ = 125°C | | | | |
| $I_{CM}$ | | $V_{CEmax}$ = 1200 V | | | | 150 | A |
| SCSOA | *short circuit safe operating area* | $V_{CEmax}$ = 1200 V | | | | | |
| $t_{SC}$ | *short circuit duration* | $V_{CE}$ = 900 V; $V_{GE}$ = ±15 V | $T_{VJ}$ = 125°C | | | 10 | µs |
| $I_{SC}$ | *short circuit current* | $R_G$ = 15 Ω; non-repetitive | | | 200 | | A |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0.43 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.10 | | K/W |

| Diode | | | | | | | |
|---|---|---|---|---|---|---|---|
| $V_{RRM}$ | *max. repetitive reverse voltage* | | $T_{VJ}$ = 25°C | | | 1200 | V |
| $I_{F25}$ | *forward current* | | $T_C$ = 25°C | | | 85 | A |
| $I_{F80}$ | | | $T_C$ = 80°C | | | 51 | A |
| $V_F$ | *forward voltage* | $I_F$ = 60A | $T_{VJ}$ = 25°C | | | 2.20 | V |
| | | | $T_{VJ}$ = 125°C | | 1.95 | | V |
| $I_R$ | *reverse current* | $V_R$ = $V_{RRM}$ | $T_{VJ}$ = 25°C | | | * | mA |
| | * not applicable, see Ices at IGBT | | $T_{VJ}$ = 125°C | | * | | mA |
| $Q_{rr}$ | *reverse recovery charge* | $V_R$ = 600 V | | | 8 | | µC |
| $I_{RM}$ | *max. reverse recovery current* | -$di_F$/dt = E+03 A/µs | $T_{VJ}$ = 125°C | | 60 | | A |
| $t_{rr}$ | *reverse recovery time* | $I_F$ = 60A; $V_{GE}$ = 0 V | | | 350 | | ns |
| $E_{rec}$ | *reverse recovery energy* | | | | 2.5 | | mJ |
| $R_{thJC}$ | *thermal resistance junction to case* | | | | | 0.6 | K/W |
| $R_{thCH}$ | *thermal resistance case to heatsink* | | | | 0.10 | | K/W |

| Package SOT-227B (minibloc) | | | | Ratings | | | |
|---|---|---|---|---|---|---|---|
| Symbol | Definition | Conditions | | min. | typ. | max. | Unit |
| $I_{RMS}$ | *RMS current* | per terminal [1] | | | | 150 | A |
| $T_{VJ}$ | *virtual junction temperature* | | | -40 | | 150 | °C |
| $T_{op}$ | *operation temperature* | | | -40 | | 125 | °C |
| $T_{stg}$ | *storage temperature* | | | -40 | | 150 | °C |
| Weight | | | | | 30 | | g |
| $M_D$ | *mounting torque* | | | 1.1 | | 1.5 | Nm |
| $M_T$ | *terminal torque* | | | 1.1 | | 1.5 | Nm |
| $d_{Spp/App}$ | *creepage distance on surface \| striking distance through air* | *terminal to terminal* | 10.5 | 3.2 | | | mm |
| $d_{Spb/Apb}$ | | *terminal to backside* | 8.6 | 6.8 | | | mm |
| $V_{ISOL}$ | *isolation voltage* | t = 1 second | 50/60 Hz, RMS; $I_{ISOL}$ ≤ 1 mA | 3000 | | | V |
| | | t = 1 minute | | 2500 | | | V |

[1] $I_{RMS}$ is typically limited by the pin-to-chip resistance (1); or by the current capability of the chip (2). In case of (1) and a product with multiple pins for one chip-potential, the current capability can be increased by connecting the pins as one contact.

## Product Marking




## Part description

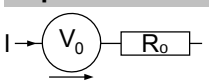
I = IGBT
X = XPT IGBT
A = Gen 1 / std
60 = Current Rating [A]
IF = Copack
1200 = Reverse Voltage [V]
NA = SOT-227B (minibloc)

| Ordering | Ordering Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|---|---|---|---|---|---|
| Standard | IXA60IF1200NA | IXA60IF1200NA | Tube | 10 | 508765 |

| Similar Part | Package | Voltage class |
|---|---|---|
| IXA70I1200NA | SOT-227B (minibloc) | 1200 |

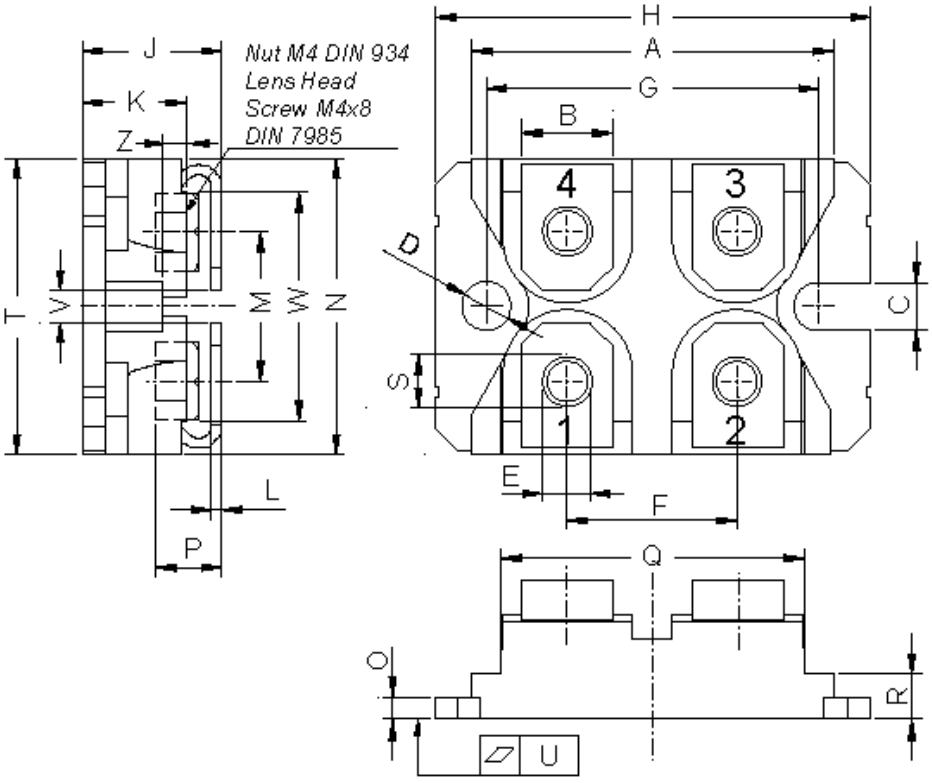
## Equivalent Circuits for Simulation

** on die level* $T_{VJ}$ = 150 °C

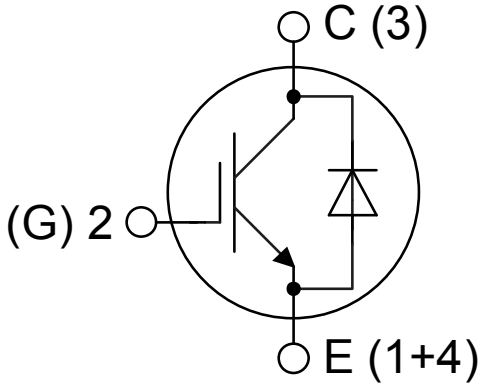



| | | IGBT | Diode | |
|---|---|---|---|---|
| $V_{0\,max}$ | *threshold voltage* | 1.1 | 1.25 | V |
| $R_{0\,max}$ | *slope resistance ** | 28 | 14.2 | mΩ |

## Outlines SOT-227B (minibloc)




| Dim. | Millimeter | | Inches | |
|---|---|---|---|---|
| | min | max | min | max |
| A | 31.50 | 31.88 | 1.240 | 1.255 |
| B | 7.80 | 8.20 | 0.307 | 0.323 |
| C | 4.09 | 4.29 | 0.161 | 0.169 |
| D | 4.09 | 4.29 | 0.161 | 0.169 |
| E | 4.09 | 4.29 | 0.161 | 0.169 |
| F | 14.91 | 15.11 | 0.587 | 0.595 |
| G | 30.12 | 30.30 | 1.186 | 1.193 |
| H | 37.80 | 38.23 | 1.488 | 1.505 |
| J | 11.68 | 12.22 | 0.460 | 0.481 |
| K | 8.92 | 9.60 | 0.351 | 0.378 |
| L | 0.74 | 0.84 | 0.029 | 0.033 |
| M | 12.50 | 13.10 | 0.492 | 0.516 |
| N | 25.15 | 25.42 | 0.990 | 1.001 |
| O | 1.95 | 2.13 | 0.077 | 0.084 |
| P | 4.95 | 6.20 | 0.195 | 0.244 |
| Q | 26.54 | 26.90 | 1.045 | 1.059 |
| R | 3.94 | 4.42 | 0.155 | 0.167 |
| S | 4.55 | 4.85 | 0.179 | 0.191 |
| T | 24.59 | 25.25 | 0.968 | 0.994 |
| U | -0.05 | 0.10 | -0.002 | 0.004 |
| V | 3.20 | 5.50 | 0.126 | 0.217 |
| W | 19.81 | 21.08 | 0.780 | 0.830 |
| Z | 2.50 | 2.70 | 0.098 | 0.106 |



## IGBT

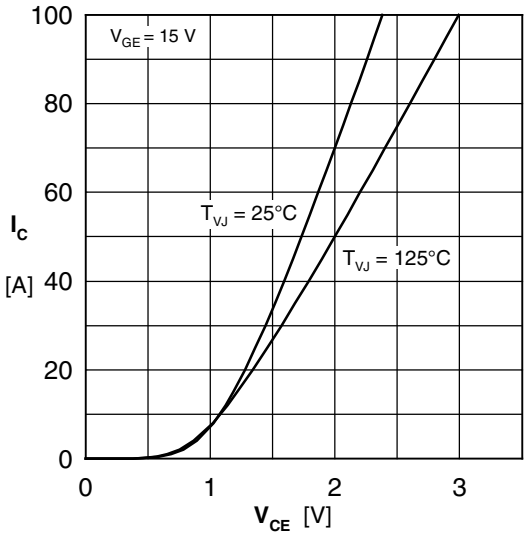



Fig. 1 Typ. output characteristics

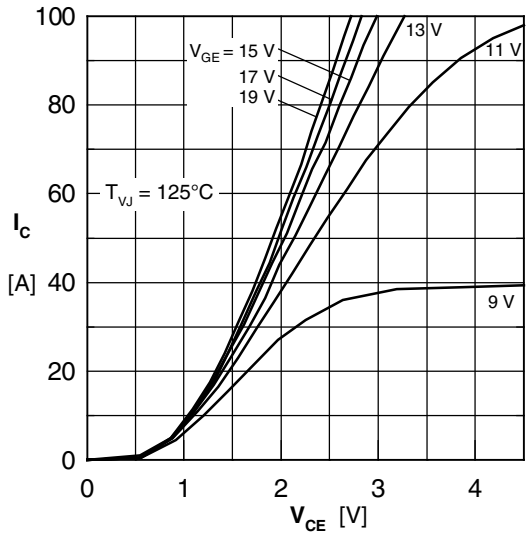



Fig. 2 Typ. output characteristics

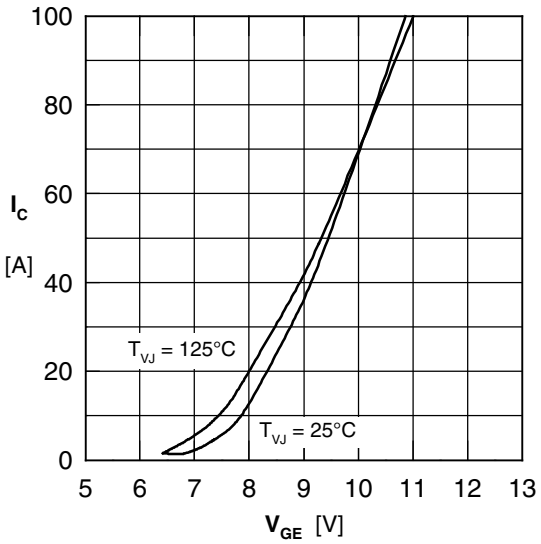



Fig. 3 Typ. tranfer characteristics

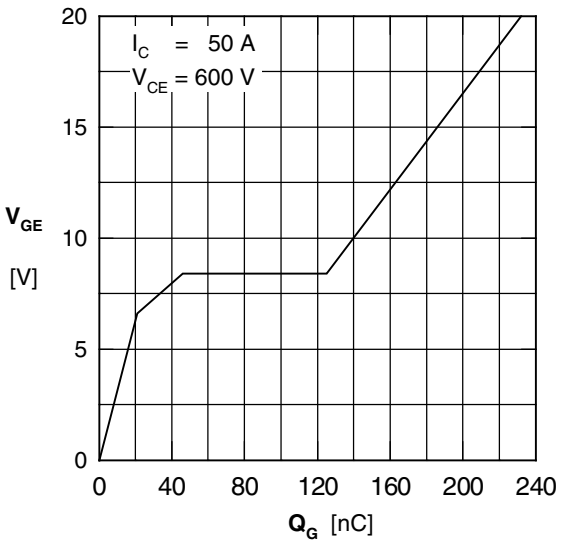



Fig. 4 Typ. turn-on gate charge

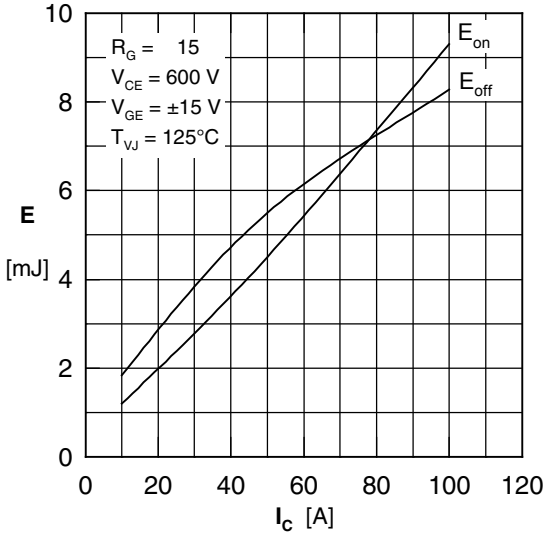



Fig. 5 Typ. switching energy vs. collector current

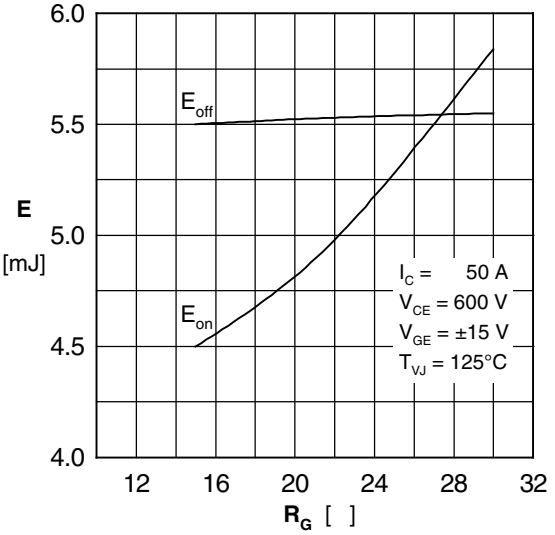



Fig. 6 Typ. switching energy vs. gate resistance