

XPT IGBT

$V_{CES} = 1200V$

$I_{C25} = 58A$

$V_{CE(sat)} = 1.8V$

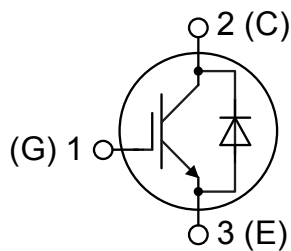
Copack

Part number

IXA33IF1200HB



Backside: collector

**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 μ sec.
 - very low gate charge
 - low EMI
 - square RBSOA @ 3x I_c
- Thin wafer technology combined with the XPT design results in a competitive low $V_{CE(sat)}$
- 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: TO-247

- Industry standard outline
- RoHS compliant
- Epoxy meets UL 94V-0

| IGBT | | | | Ratings | | | |
|---------------|--|--|-------------------------|---------|----------|---------|--|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit | |
| V_{CES} | collector emitter voltage | $T_{VJ} = 25^{\circ}C$ | | | 1200 | V | |
| V_{GES} | max. DC gate voltage | | | | ± 20 | V | |
| V_{GEM} | max. transient gate emitter voltage | | | | ± 30 | V | |
| I_{C25} | collector current | $T_C = 25^{\circ}C$ | | | 58 | A | |
| I_{C80} | | $T_C = 80^{\circ}C$ | | | 34 | A | |
| P_{tot} | total power dissipation | $T_C = 25^{\circ}C$ | | | 250 | W | |
| $V_{CE(sat)}$ | collector emitter saturation voltage | $I_C = 25A; V_{GE} = 15V$ | | 1.8 | 2.1 | V | |
| | | | | 2.1 | | V | |
| $V_{GE(th)}$ | gate emitter threshold voltage | $I_C = 1mA; V_{CE} = V_{CE}$ | 5.4 | 5.9 | 6.5 | V | |
| I_{CES} | collector emitter leakage current | $V_{CE} = V_{CES}; V_{GE} = 0V$ | | | 0.1 | mA | |
| | | | | 0.1 | | mA | |
| I_{GES} | gate emitter leakage current | $V_{GE} = \pm 20V$ | | | 500 | nA | |
| $Q_{G(on)}$ | total gate charge | $V_{CE} = 600V; V_{GE} = 15V; I_C = 25A$ | | 76 | | nC | |
| $t_{d(on)}$ | turn-on delay time | inductive load $V_{CE} = 600V; I_C = 25A$ $V_{GE} = \pm 15V; R_G = 39\Omega$ | $T_{VJ} = 125^{\circ}C$ | 70 | | ns | |
| t_r | current rise time | | | 40 | | ns | |
| $t_{d(off)}$ | turn-off delay time | | | 250 | | ns | |
| t_f | current fall time | | | 100 | | ns | |
| E_{on} | turn-on energy per pulse | | | 2.5 | | mJ | |
| E_{off} | turn-off energy per pulse | | | 3 | | mJ | |
| RBSOA | reverse bias safe operating area | $V_{GE} = \pm 15V; R_G = 39\Omega$ | $T_{VJ} = 125^{\circ}C$ | | | | |
| I_{CM} | | $V_{CEmax} = 1200V$ | | | 75 | A | |
| SCSOA | short circuit safe operating area | $V_{CEmax} = 900V$ | $T_{VJ} = 125^{\circ}C$ | | | | |
| t_{sc} | short circuit duration | $V_{CE} = 900V; V_{GE} = \pm 15V$ | | | 10 | μs | |
| I_{sc} | short circuit current | $R_G = 39\Omega; \text{non-repetitive}$ | | 100 | | A | |
| R_{thJC} | thermal resistance junction to case | | | | 0.5 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | 0.25 | | K/W | |
| Diode | | | | | | | |
| V_{RRM} | max. repetitive reverse voltage | | $T_{VJ} = 25^{\circ}C$ | | 1200 | V | |
| I_{F25} | forward current | | $T_C = 25^{\circ}C$ | | 60 | A | |
| I_{F80} | | | $T_C = 80^{\circ}C$ | | 33 | A | |
| V_F | forward voltage | $I_F = 30A$ | $T_{VJ} = 25^{\circ}C$ | | 2.20 | V | |
| | | | $T_{VJ} = 125^{\circ}C$ | 1.95 | | V | |
| I_R | reverse current | $V_R = V_{RRM}$ | $T_{VJ} = 25^{\circ}C$ | | * | mA | |
| | * not applicable, see Ices value above | | $T_{VJ} = 125^{\circ}C$ | * | | mA | |
| Q_{rr} | reverse recovery charge | $V_R = 600V$ $-di_F/dt = -600A/\mu s$ $I_F = 30A; V_{GE} = 0V$ | $T_{VJ} = 125^{\circ}C$ | 3.5 | | μC | |
| I_{RM} | max. reverse recovery current | | | 30 | | A | |
| t_{rr} | reverse recovery time | | | 350 | | ns | |
| E_{rec} | reverse recovery energy | | | 0.9 | | mJ | |
| R_{thJC} | thermal resistance junction to case | | | | 0.7 | K/W | |
| R_{thCH} | thermal resistance case to heatsink | | | 0.25 | | K/W | |

| Package TO-247 | | | Ratings | | | |
|----------------|------------------------------|--------------|---------|------|------|------|
| Symbol | Definition | Conditions | min. | typ. | max. | Unit |
| I_{RMS} | RMS current | per terminal | | | 70 | A |
| T_{VJ} | virtual junction temperature | | -40 | | 150 | °C |
| T_{op} | operation temperature | | -40 | | 125 | °C |
| T_{stg} | storage temperature | | -40 | | 150 | °C |
| Weight | | | | 6 | | g |
| M_D | mounting torque | | 0.8 | | 1.2 | Nm |
| F_C | mounting force with clip | | 20 | | 120 | N |

Product Marking

Part number

I = IGBT
 X = XPT IGBT
 A = Gen 1 / std
 33 = Current Rating [A]
 IF = Copack
 1200 = Reverse Voltage [V]
 HB = TO-247AD (3)

| Ordering | Part Number | Marking on Product | Delivery Mode | Quantity | Code No. |
|----------|---------------|--------------------|---------------|----------|----------|
| Standard | IXA33IF1200HB | IXA33IF1200HB | Tube | 30 | 508562 |

Equivalent Circuits for Simulation
** on die level*
 $T_{VJ} = 150\text{ °C}$

 $V_{0\max}$ threshold voltage

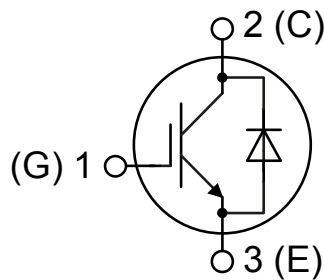
 $R_{0\max}$ slope resistance *

| | IGBT | Diode | |
|-------------|------|-------|----|
| $V_{0\max}$ | 1.1 | 1.25 | V |
| $R_{0\max}$ | 55 | 28.3 | mΩ |

Outlines TO-247



| Sym. | Inches | | Millimeter | |
|------|-----------|-------|------------|-------|
| | min. | max. | min. | max. |
| A | 0.185 | 0.209 | 4.70 | 5.30 |
| A1 | 0.087 | 0.102 | 2.21 | 2.59 |
| A2 | 0.059 | 0.098 | 1.50 | 2.49 |
| D | 0.819 | 0.845 | 20.79 | 21.45 |
| E | 0.610 | 0.640 | 15.48 | 16.24 |
| E2 | 0.170 | 0.216 | 4.31 | 5.48 |
| e | 0.215 BSC | | 5.46 BSC | |
| L | 0.780 | 0.800 | 19.80 | 20.30 |
| L1 | - | 0.177 | - | 4.49 |
| Ø P | 0.140 | 0.144 | 3.55 | 3.65 |
| Q | 0.212 | 0.244 | 5.38 | 6.19 |
| S | 0.242 BSC | | 6.14 BSC | |
| b | 0.039 | 0.055 | 0.99 | 1.40 |
| b2 | 0.065 | 0.094 | 1.65 | 2.39 |
| b4 | 0.102 | 0.135 | 2.59 | 3.43 |
| c | 0.015 | 0.035 | 0.38 | 0.89 |
| D1 | 0.515 | - | 13.07 | - |
| D2 | 0.020 | 0.053 | 0.51 | 1.35 |
| E1 | 0.530 | - | 13.45 | - |
| Ø P1 | - | 0.29 | - | 7.39 |



IGBT

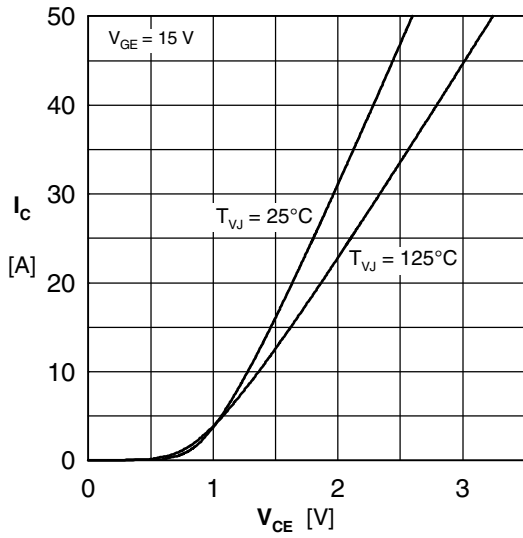


Fig. 1 Typ. output characteristics

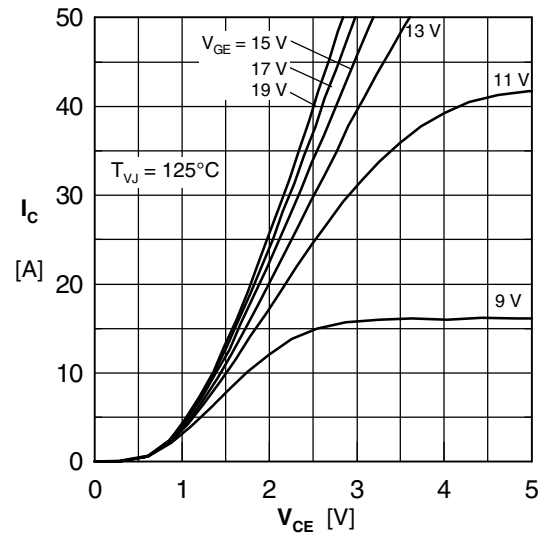


Fig. 2 Typ. output characteristics

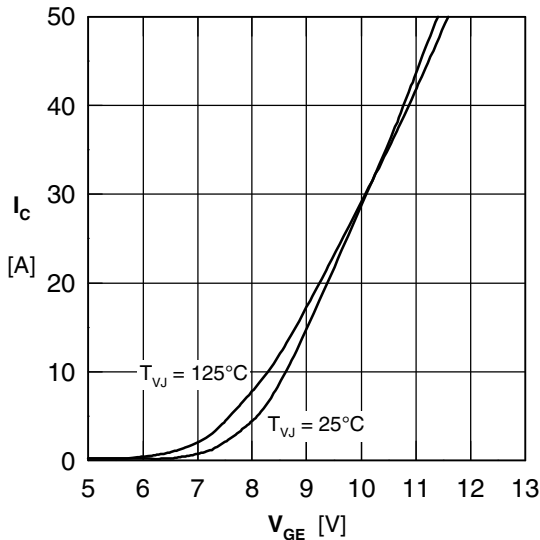


Fig. 3 Typ. transfer characteristics

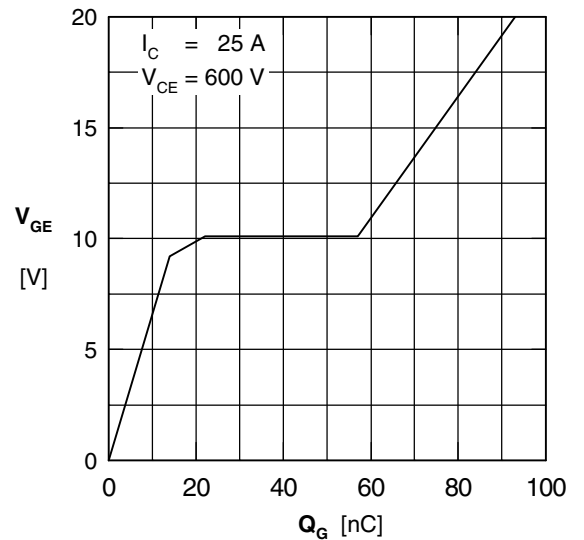


Fig. 4 Typ. turn-on gate charge

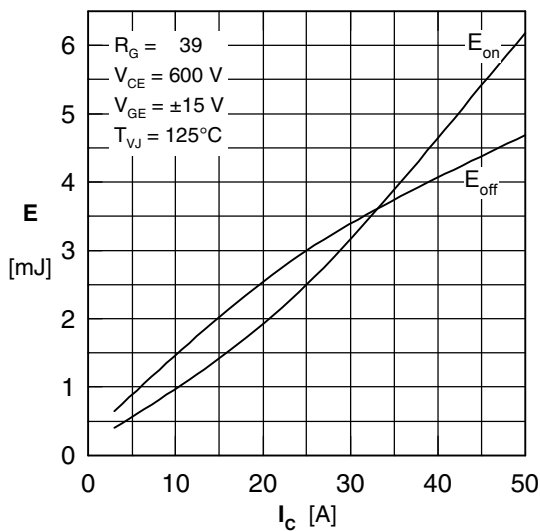


Fig. 5 Typ. switching energy vs. collector current

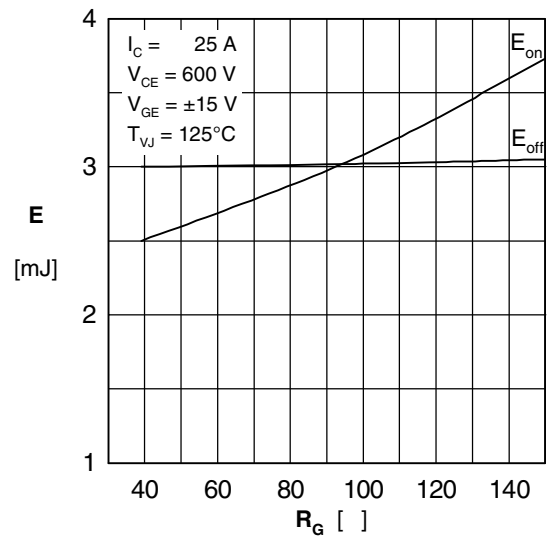


Fig. 6 Typ. switching energy vs. gate resistance

Diode

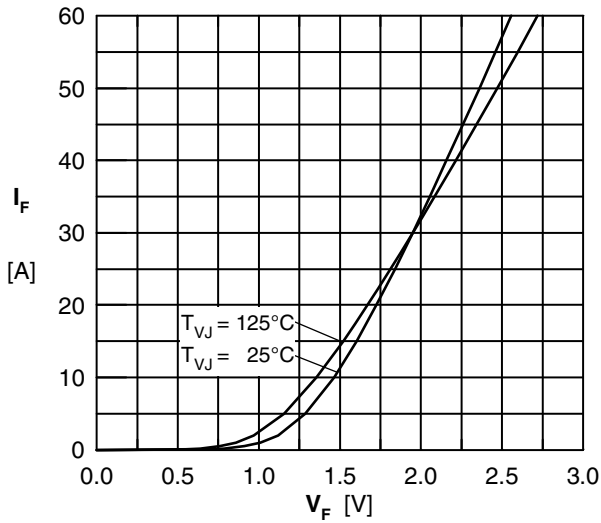


Fig. 7 Typ. Forward current versus V_F

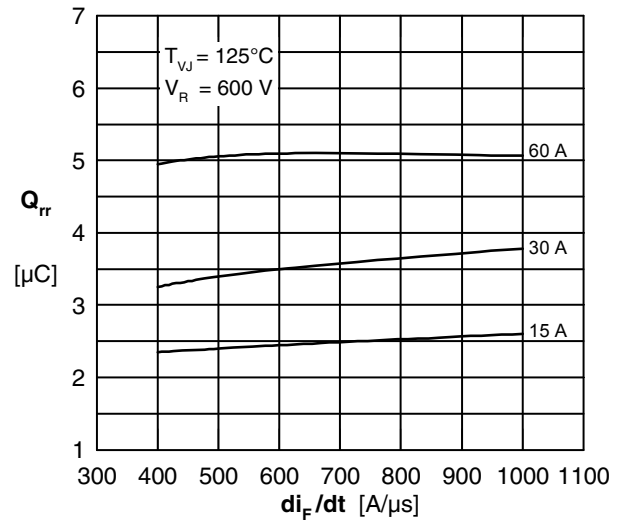


Fig. 8 Typ. reverse recov. charge Q_{rr} vs. di/dt

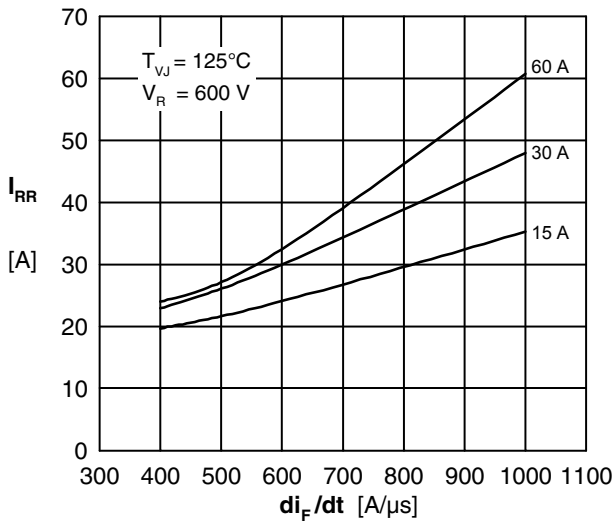


Fig. 9 Typ. peak reverse current I_{RM} vs. di/dt

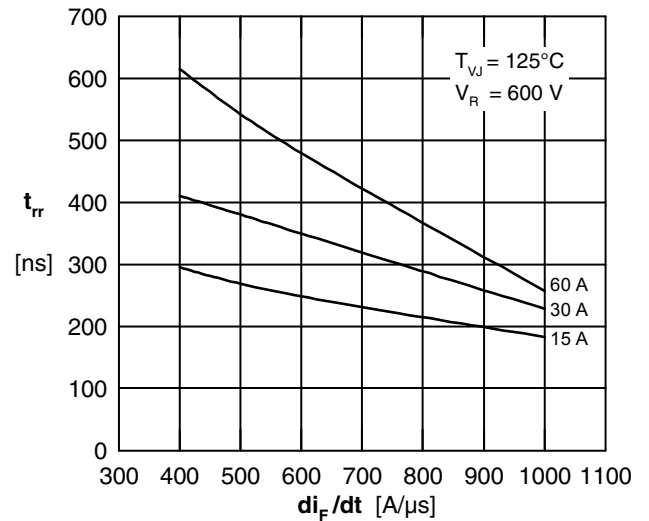


Fig. 10 Typ. recovery time t_{rr} versus di/dt

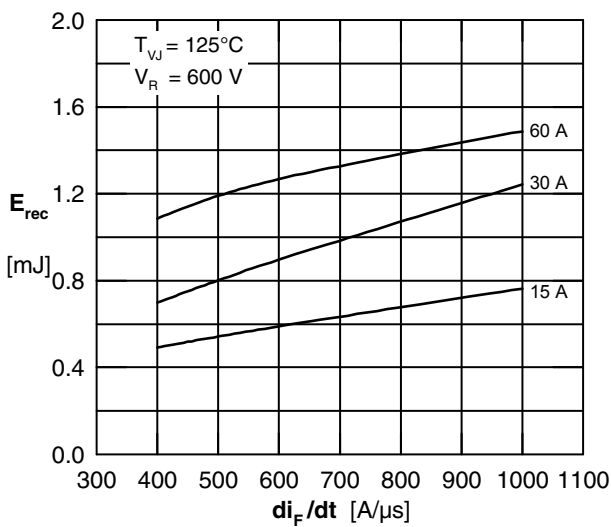


Fig. 11 Typ. recovery energy E_{rec} versus di/dt

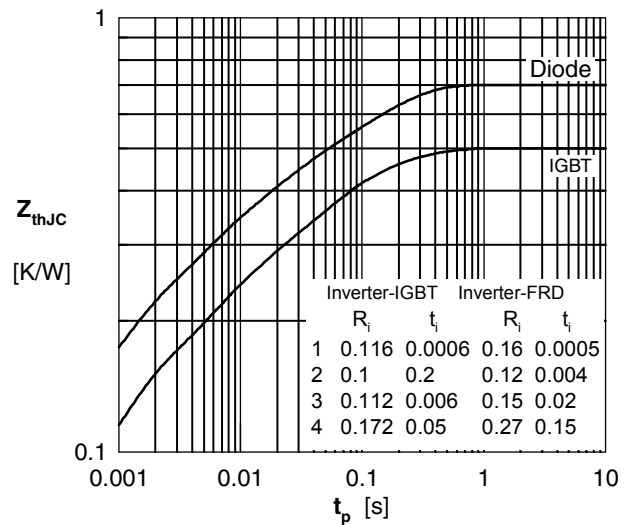


Fig. 12 Typ. transient thermal impedance



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