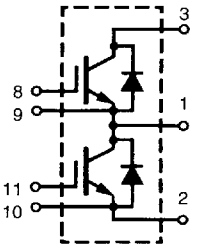
IXYS

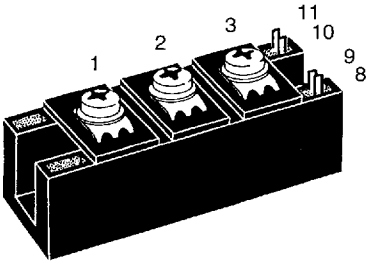
# IGBT Module
## Half-Bridge Configuration

**VII75-12G3**

$I_{C(DC)}$ = 75 A
$V_{CES}$ = 1200 V
$V_{CE(sat)}$ = 2.9 V

High Short Circuit
SOA Capability




| Symbol | Test Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 1200 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C; $R_{GE}$ = 1 MΩ | 1200 | V |
| $V_{GES}$ | Continuous | ±20 | V |
| $V_{GEM}$ | Transient | ±30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 75 | A |
| $I_{C100}$ | $T_C$ = 100°C | 56 | A |
| $I_{CM}$ | $T_C$ = 25°C, $t_P$ = 1 ms | 150 | A |
| $t_{SC}$ (SCSOA) | $V_{GE}$ = 15 V, $V_{CE}$ = 0.6 • $V_{CES}$, $T_J$ = 125°C<br>$R_G$ = 11 Ω, non repetitive | 10 | µs |
| RBSOA | $V_{GE}$ = 15 V, $T_J$ = 125°C, $R_G$ = 11 Ω<br>Clamped inductive load, L = 100 µH | $I_{CM}$ = 150<br>@ 0.8 $V_{CES}$ | A |
| $P_{tot}$ | $T_C$ = 25°C | 400 | W |
| $T_J$ | | -40 ... +150 | °C |
| $T_{Smax}$ | | 110 | °C |
| $T_{stg}$ | | -40 ... +125 | °C |
| $V_{ISOL}$ | 50/60 Hz, RMS t = 1 min<br>$I_{ISOL}$ ≤ 1 mA t = 1 s<br>Insulating material: $Al_2O_3$ | 3000<br>3600 | V~<br>V~ |
| $M_d$ | Mounting torque (M5) | 2.25 - 2.75<br>20 - 25 | Nm<br>lb.in. |
| | Terminal connection torque (M5) | 2.50 - 3.70<br>22 - 33 | Nm<br>lb.in. |
| $d_S$ | Creepage distance on surface | 12.7 | mm |
| $d_A$ | Strike distance through air | 9.6 | mm |
| a | Max. allowable acceleration | 50 | m/s² |
| Weight | Typical, including screws | 0.13<br>4.60 | kg<br>oz. |

### Features

- International standard package
- Package with DCB ceramic base plate
- Isolation voltage 3600 V~
- MOS-input (voltage controlled)
- Low saturation voltage
- High short circuit capability
- No latch-up
- Ultra fast free wheeling diode
- Low conduction and commutation losses
- Recommended pulse frequency up to 5 kHz
- UL-registered E 72873

### Applications

- AC motor speed control
- DC servo and robot drives
- Uninterruptible power systems (UPS)
- Switch-mode and resonant-mode power supplies
- Induction heating
- DC choppers

### Advantages

- Space and weight savings
- Simple mounting with two screws
- Reduced protection circuits
- High $V_{GE(th)}$ for good noise immunity

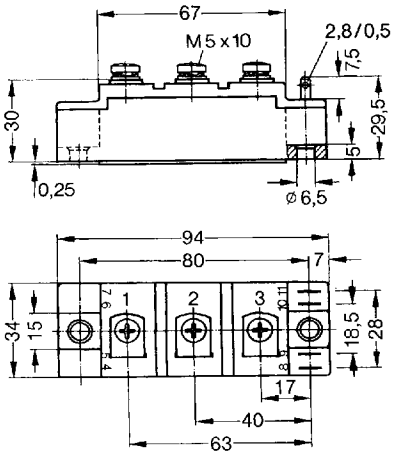
Data according to a single IGBT/FRED unless otherwise stated.
IXYS reserves the right to change limits, test conditions and dimensions.

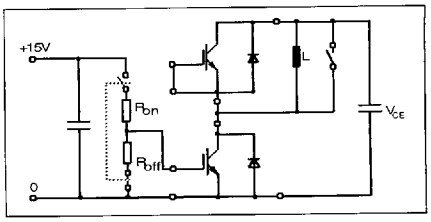
| Symbol | Test Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $V_{(BR)CES}$ | $I_C$ = 5 mA, $V_{GE}$ = 0 V | 1200 | | | V |
| $V_{GE(th)}$ | $I_C$ = 20 mA, $V_{CE}$ = $V_{GE}$ | 5 | | 8 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$ $T_J$ = 25°C<br>$V_{CE}$ = 0.8 • $V_{CES}$ $T_J$ = 125°C | | | 5<br>18 | mA<br>mA |
| $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = ±20 V | | | ±500 | nA |
| $V_{CE(sat)}$ | $I_C$ = 75 A, $V_{GE}$ = 15 V | | 2.9 | 3.3 | V |
| $C_{ies}$ | $V_{CE}$ = 25 V, $V_{GE}$ = 0 V, f = 1 MHz | | 9 | | nF |
| $C_{oes}$ | | | 1 | | nF |
| $C_{res}$ | | | 0.18 | | nF |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 125°C** | | 300 | | ns |
| $t_{rv}$ | | | 200 | | ns |
| $t_{d(off)}$ | $I_C$ = 75 A, $V_{GE}$ = 15 V | | 300 | | ns |
| $t_{fi}$ | $V_{CE}$ = 600 V, $R_{on}$ = 3.9 Ω, $R_{off}$ = 11 Ω | | 1600 | | ns |
| $E_{on}$ | Remarks: Switching times may increase for | | 12 | 15 | mJ |
| $E_{off}$ | $V_{CE}$ > 600 V, $T_J$ > 125°C or increased $R_G$ | | 22 | 28 | mJ |
| $R_{thJC}$ | for calculation of $P_{tot}$ | | | 0.31 | K/W |
| $R_{thJS}$ | with heat transfer paste | | | 0.41 | K/W |

**Reverse Diode (FRED)**

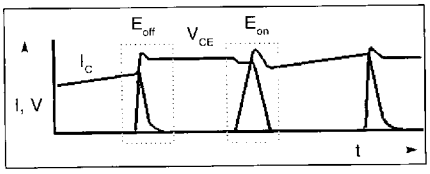
| | | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 75 A, $V_{GE}$ = 0 V | | 1.8 | 1.9 | V |
| $I_F$ | $T_C$ = 25°C<br>$T_C$ = 100°C | | | 75<br>54 | A<br>A |
| $I_{RM}$ | $I_F$ = 75 A, $V_{GE}$ = 0 V, -$di_F/dt$ = 600 A/µs | | | 87 | A |
| $t_{rr}$ | $T_J$ = 125°C, $V_R$ = 600 V | | 200 | | ns |
| $R_{thJC}$ | | | | 0.62 | K/W |
| $R_{thJS}$ | with heat transfer paste | | | 0.90 | K/W |

**Dimensions in mm (1 mm = 0.0394")**

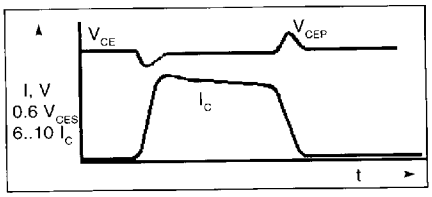


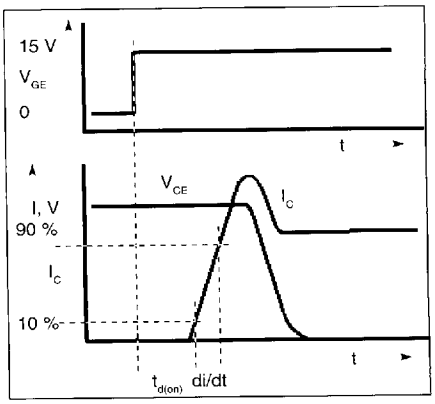

Test circuit for $E_{on}$, $E_{off}$, SCSOA and RBSOA
$R_{on}$ = 3.9 Ω L = 100 µH
$R_{off}$ = 11 Ω for RBSOA, $E_{off}$



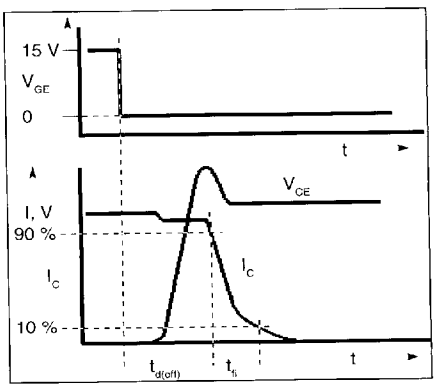

Typical V/I waveforms for inductive load




SCSOA conditions $V_{CE}$ = 0.6 $V_{CES}$,
$V_{CEP}$ < $V_{CES}$, $T_J$ = 125°C




Turn-on waveforms $E_{on}$




Turn-off waveforms $E_{off}$ RBSOA

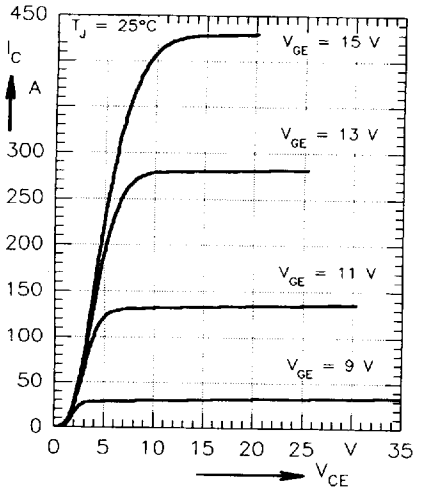



Fig. 1 Typ. output characteristics

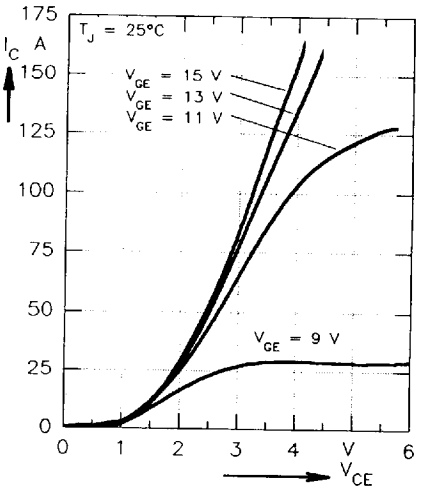



Fig. 2 Typ. output characteristics

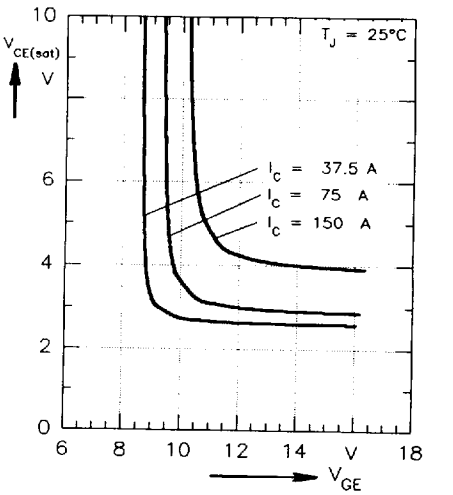



Fig. 3 Typ. on-state characteristics

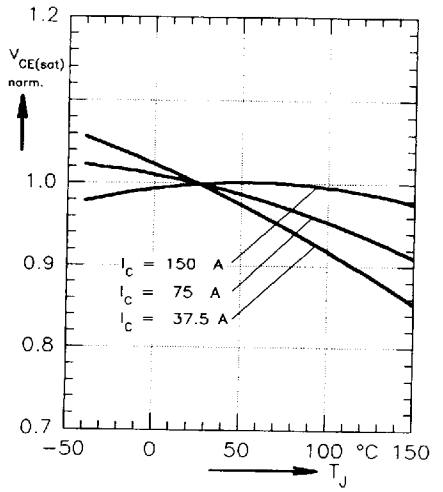



Fig. 4 Typ. temperature dependence of normalized $V_{CE(sat)}$

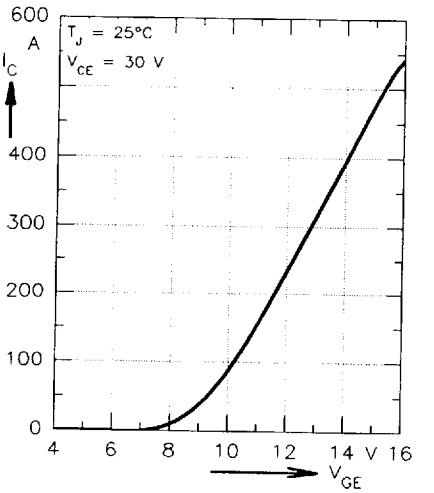



Fig. 5 Typ. transfer characteristics

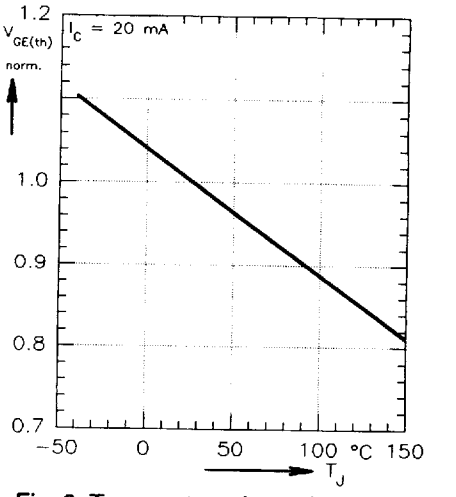



Fig. 6 Temperature dependence of normalized $V_{GE(th)}$

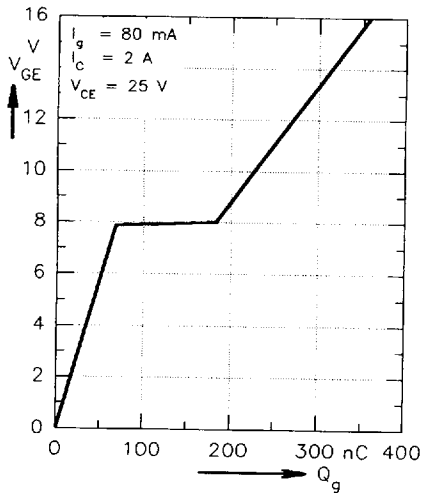



Fig. 7 Typ. turn-on gate charge characteristics

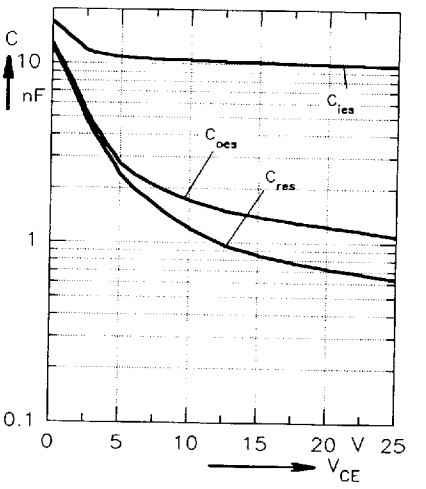



Fig. 8 Typ. capacitances

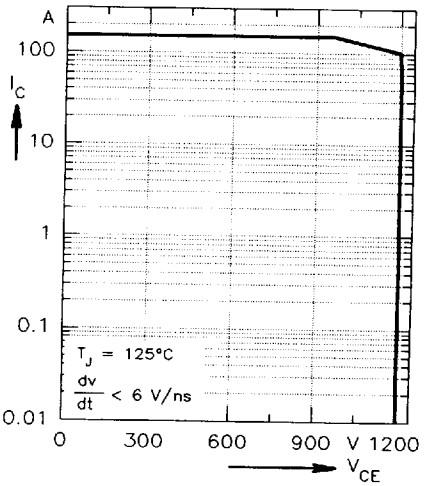



Fig. 9 Reverse biased SOA

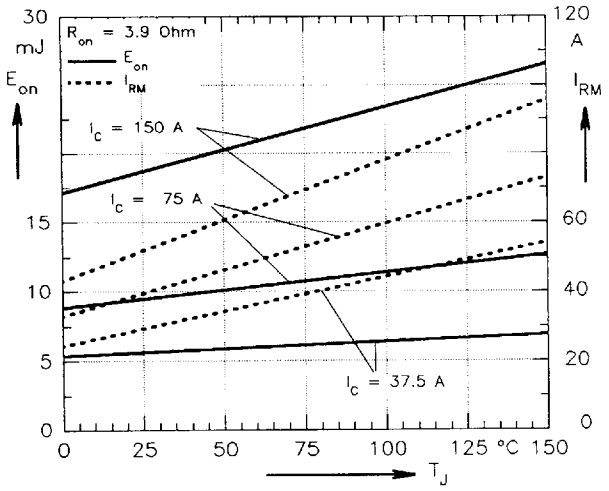



Fig. 10 Typ. turn-on energy per pulse

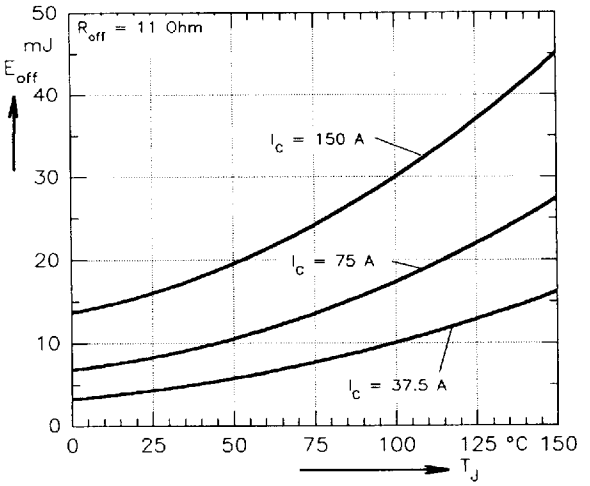



Fig. 11 Typ. turn-off energy per pulse

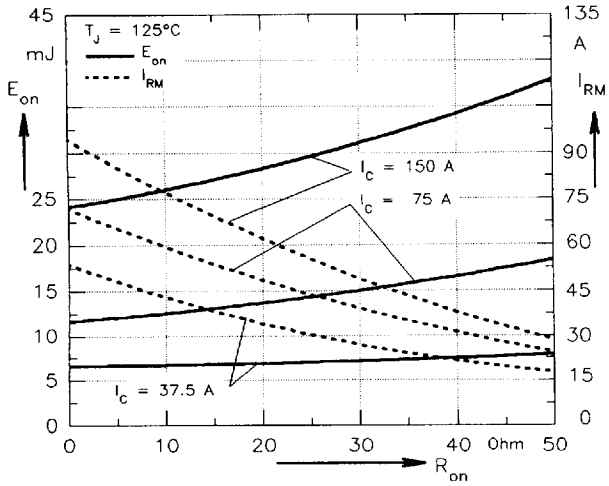



Fig. 12 Typ. turn-on energy per pulse

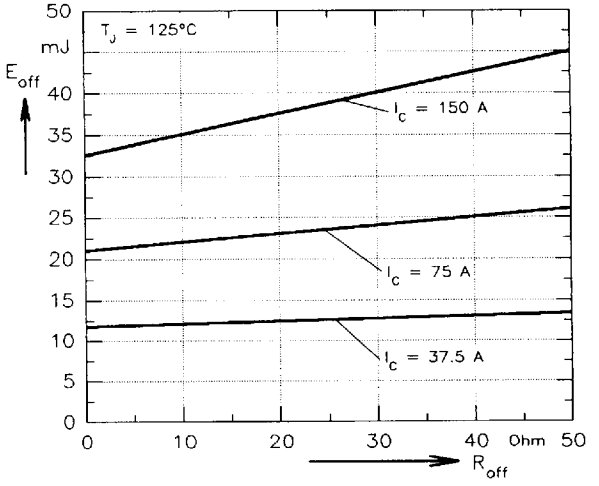



Fig. 13 Typ. turn-off energy per pulse

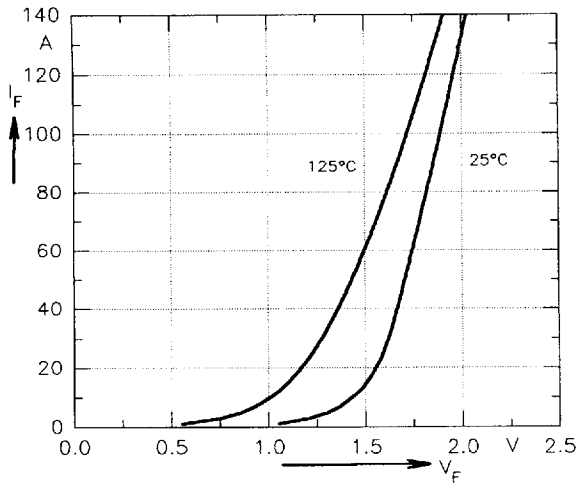



Fig. 14 Typ. forward characteristic of reverse diode

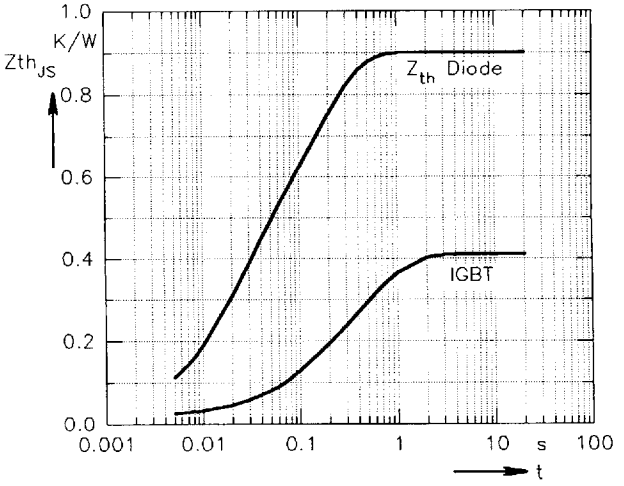



Fig. 15 Transient thermal resistance junction to heatsink of IGBT and Diode (per leg)