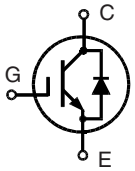
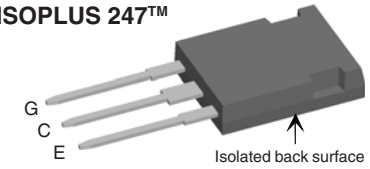
# IGBT with optional Diode

High Speed,
Low Saturation Voltage

$V_{CES}$ = 600 V
$I_{C25}$ = 38 A
$V_{CE(sat)\ typ}$ = 2.2 V




**ISOPLUS 247™**




G = Gate, E = Emitter
C = Collector , TAB = Collector

| Symbol | Conditions | Maximum Ratings | |
|---|---|---|---|
| $V_{CES}$ | $T_J$ = 25°C to 150°C | 600 | V |
| $V_{CGR}$ | $T_J$ = 25°C to 150°C; $R_{GE}$ = 20 kΩ | 600 | V |
| $V_{GES}$ | Continuous | ±20 | V |
| $V_{GEM}$ | Transient | ±30 | V |
| $I_{C25}$ | $T_C$ = 25°C | 38 | A |
| $I_{C90}$ | $T_C$ = 90°C | 24 | A |
| $I_{CM}$ | $T_C$ = 90°C, $t_p$ =1 ms | 48 | A |
| RBSOA | $V_{GE}$= ±15 V, $T_J$ = 125°C, $R_G$ = 10 Ω<br>Clamped inductive load, L = 30 µH | $I_{CM}$ = 110<br>$V_{CEK} < V_{CES}$ | A |
| $t_{SC}$ (SCSOA) | $V_{GE}$= ±15 V, $V_{CE}$ = 600 V, $T_J$ = 125°C<br>$R_G$ = 10 Ω, non repetitive | 10 | µs |
| $P_C$ | $T_C$ = 25°C IGBT<br>Diode | 125<br>50 | W<br>W |
| $T_J$ | | -55 ... +150 | °C |
| $T_{stg}$ | | -55 ... +150 | °C |
| $V_{ISOL}$ | 50/60 Hz RMS; $I_{ISOL} \leq$ 1 mA | 2500 | V~ |
| $F_C$ | mounting force with clip | 20...120 | N |
| Weight | typical | 6 | g |

| Symbol | Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $V_{(BR)CES}$ | $V_{GE}$ = 0 V | 600 | | | V |
| $V_{GE(th)}$ | $I_C$ = 0.7 mA, $V_{CE}$ = $V_{GE}$ | 3 | | 5 | V |
| $I_{CES}$ | $V_{CE}$ = $V_{CES}$ $T_J$ = 25°C<br>$T_J$ = 125°C | | <br>1 | 0.1 | mA<br>mA |
| $I_{GES}$ | $V_{CE}$ = 0 V, $V_{GE}$ = ±20 V | | | ± 500 | nA |
| $V_{CE(sat)}$ | $I_C$ = 35 A, $V_{GE}$ = 15 V | | 2.2 | 2.7 | V |

### Features

- NPT IGBT technology
- low switching losses
- low tail current
- no latch up
- short circuit capability
- positive temperature coefficient for easy paralleling
- MOS input, voltage controlled
- optional ultra fast diode
- Epoxy meets UL 94V-0
- Isolated and UL registered E153432

### Advantages

- DCB Isolated mounting tab
- Meets TO-247AD package Outline
- Package for clip or spring mounting
- Space savings
- High power density

### Typical Applications

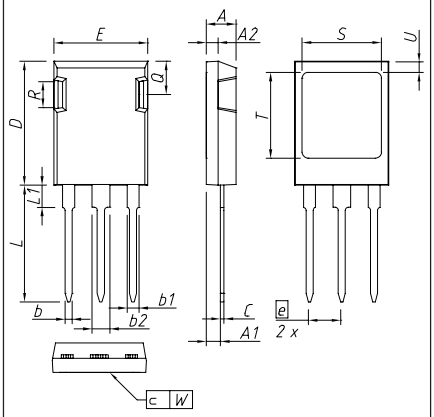
- AC motor speed control
- DC servo and robot drives
- DC choppers
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

| Symbol | Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $C_{ies}$ | $V_{CE}$ = 25 V, $V_{GE}$ = 0 V, f = 1 MHz | | 1600 | | pF |
| $C_{oes}$ | | | 150 | | pF |
| $C_{res}$ | | | 90 | | pF |
| $Q_g$ | $I_C$ = 35 A, $V_{GE}$ = 15 V, $V_{CE}$ = 480V | | 140 | | nC |
| $t_{d(on)}$ | **Inductive load, $T_J$ = 125°C** $I_C$ = 35 A, $V_{GE}$ = ±15 V, $V_{CE}$ = 300 V, $R_G$ = 10 Ω | | 30 | | ns |
| $t_r$ | | | 45 | | ns |
| $t_{d(off)}$ | | | 320 | | ns |
| $t_f$ | | | 70 | | ns |
| $E_{on}$ | | | 1.6 | | mJ |
| $E_{off}$ | | | 0.8 | | mJ |
| $R_{thJC}$ | | | | 1 | K/W |
| $R_{thCH}$ | Package with heatsink compound | | 0.25 | | K/W |

**Reverse Diode (FRED)** [D1 version only]

| Symbol | Conditions | Characteristic Values ($T_J$ = 25°C, unless otherwise specified) min. | typ. | max. | |
|---|---|---|---|---|---|
| $V_F$ | $I_F$ = 35 A, $V_{GE}$ = 0 V | | 2.1 | 2.3 | V |
| | $I_F$ = 35 A, $V_{GE}$ = 0 V, $T_J$ = 125°C | | 1.6 | | V |
| $I_F$ | $T_C$ = 25°C | | | 35 | A |
| | $T_C$ = 90°C | | | 18 | A |
| $I_{RM}$ | $I_F$ = 15 A, -$di_F$/dt = 400 A/µs, $V_R$ = 300 V | | 13 | | A |
| $t_{rr}$ | $V_{GE}$ = 0 V, $T_J$ = 125°C | | 90 | | ns |
| $t_{rr}$ | $I_F$ = 1 A, -$di_F$/dt = 100 A/µs, $V_R$ = 30 V, $V_{GE}$ = 0 V | | 40 | | ns |
| $R_{thJC}$ | | | | 2.3 | K/W |

**ISOPLUS247™ OUTLINE**




| DIM. | MILLIMETER MIN | MILLIMETER MAX | INCHES MIN | INCHES MAX |
|---|---|---|---|---|
| A | 4,83 | 5,21 | 0,190 | 0,205 |
| A1 | 2,29 | 2,54 | 0,090 | 0,100 |
| A2 | 1,91 | 2,16 | 0,075 | 0,085 |
| b | 1,14 | 1,40 | 0,045 | 0,055 |
| b1 | 1,91 | 2,15 | 0,075 | 0,085 |
| b2 | 2,92 | 3,20 | 0,115 | 0,126 |
| C | 0,61 | 0,83 | 0,024 | 0,033 |
| D | 20,80 | 21,34 | 0,819 | 0,840 |
| E | 15,75 | 16,13 | 0,620 | 0,635 |
| e | 5,45 BSC | | 0,215 BSC | |
| L | 19,81 | 20,60 | 0,780 | 0,811 |
| L1 | 3,81 | 4,38 | 0,150 | 0,172 |
| Q | 5,59 | 6,20 | 0,220 | 0,244 |
| R | 4,32 | 4,85 | 0,170 | 0,191 |
| S | 13,21 | 13,72 | 0,520 | 0,540 |
| T | 15,75 | 16,26 | 0,620 | 0,640 |
| U | 1,65 | 2,03 | 0,065 | 0,080 |
| W | - | 0,10 | - | 0,004 |

The convex bow of substrate is typ. < 0.04 mm over plastic surface level of device bottom side
This drawing will meet all dimensions requirement of JEDEC outline TO-247 AD except screw hole and except Lmax.

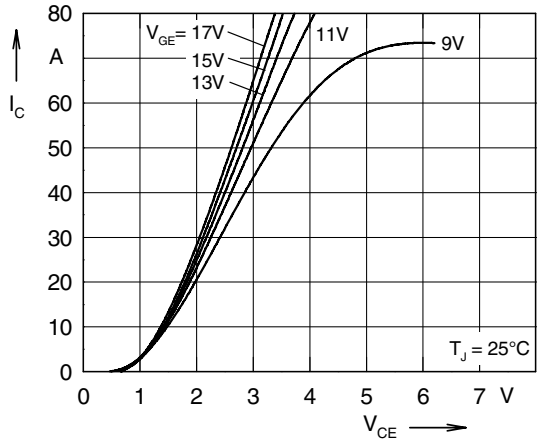



Fig. 1 Typ. output characteristics

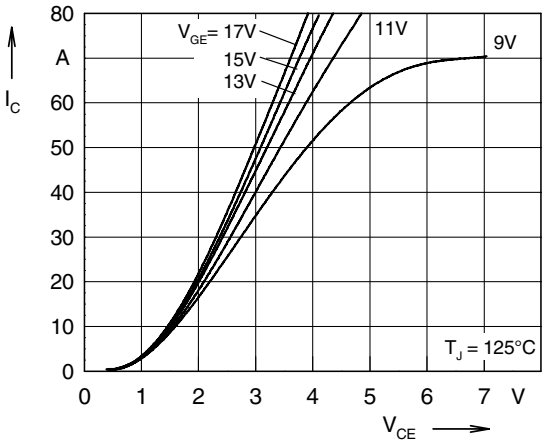



Fig. 2 Typ. output characteristics

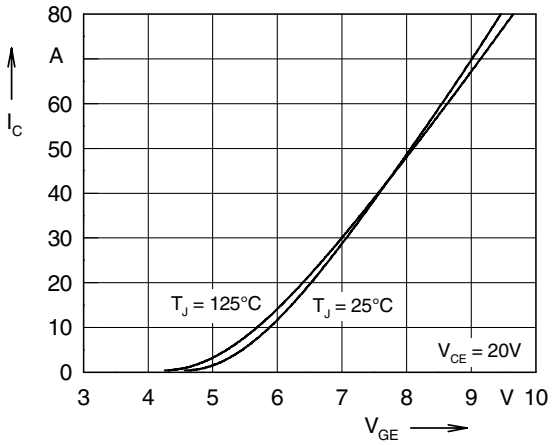



Fig. 3 Typ. transfer characteristics

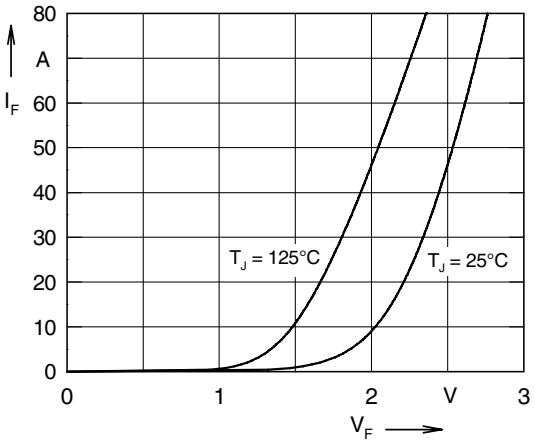



Fig. 4 Typ. forward characteristics of free wheeling diode

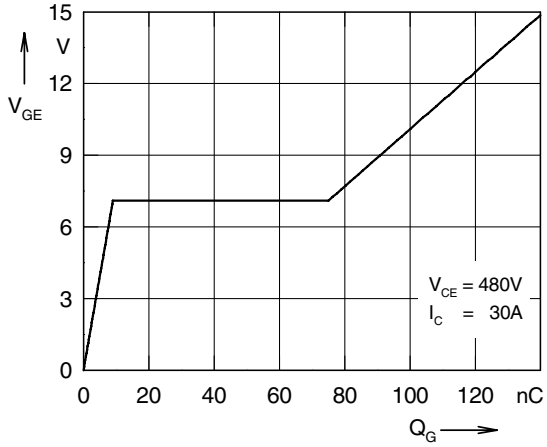



Fig. 5 Typ. turn on gate charge

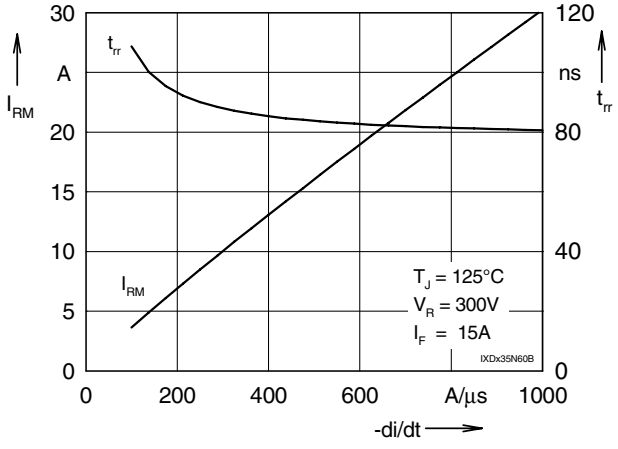



Fig. 6 Typ. turn off characteristics of free wheeling diode

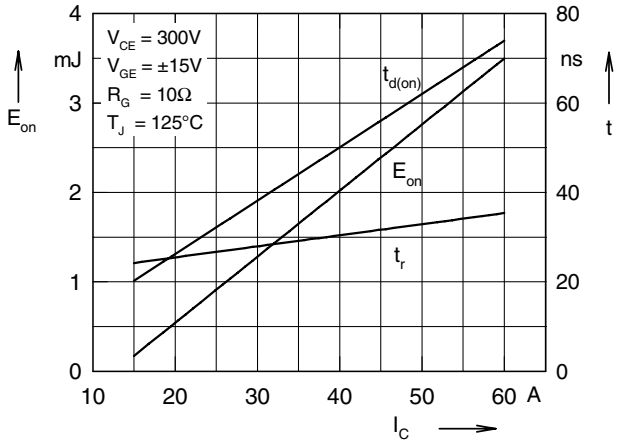



Fig. 7 Typ. turn on energy and switching times versus collector current

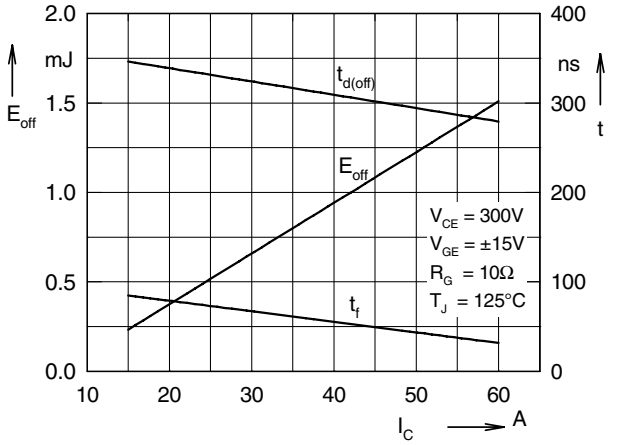



Fig. 8 Typ. turn off energy and switching times versus collector current

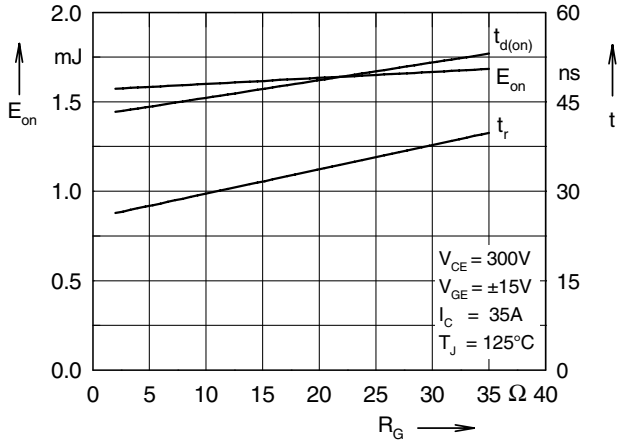



Fig. 9 Typ. turn on energy and switching times versus gate resistor

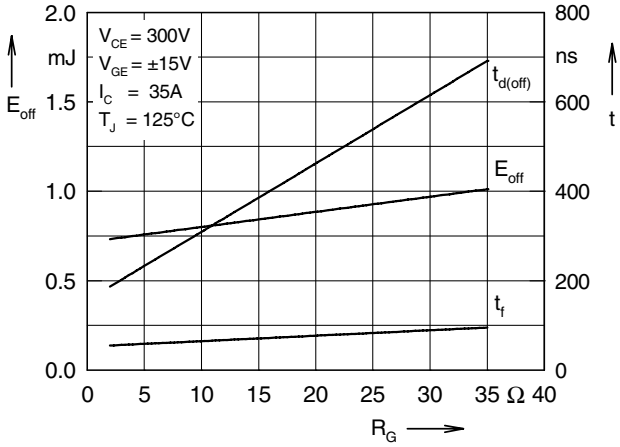



Fig.10 Typ. turn off energy and switching times versus gate resistor

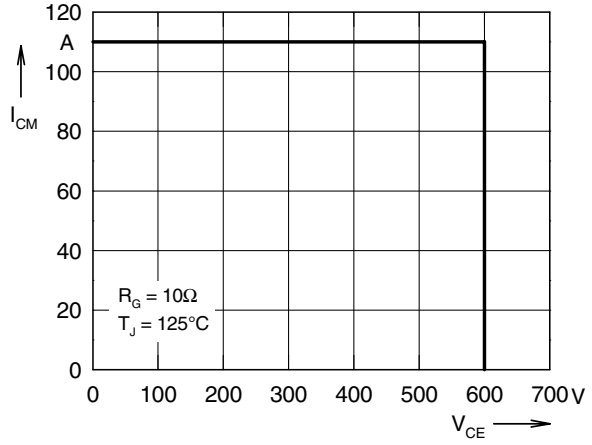



Fig. 11 Reverse biased safe operating area RBSOA

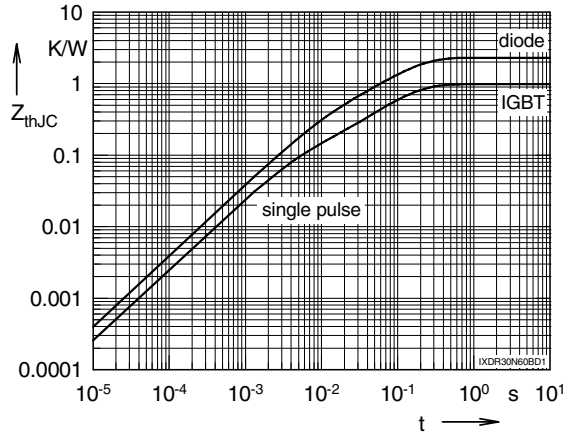



Fig. 12 Typ. transient thermal impedance