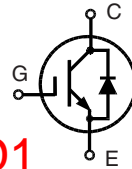
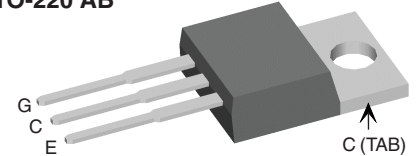


# High Voltage IGBT with optional Diode

$V_{CES} = 600\text{ V}$   
 $I_{C25} = 32\text{ A}$   
 $V_{CE(sat) typ} = 2.2\text{ V}$

High Speed,  
Low Saturation Voltage

Replacements:  
IXYP15N65C3D1 / IXXP12N65B4D1


**TO-220 AB**


G = Gate,  
C = Collector ,

E = Emitter  
TAB = Collector

| Symbol                                 | Conditions   | Maximum Ratings                      |                  |
|--|--|--------------------------------------|------------------|
| $V_{CES}$                              | $T_J = 25^\circ\text{C to } 150^\circ\text{C}$   | 600                                  | V                |
| $V_{CGR}$                              | $T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 20\text{ k}\Omega$   | 600                                  | V                |
| $V_{GES}$                              | Continuous   | $\pm 20$                             | V                |
| $V_{GEM}$                              | Transient  | $\pm 30$                             | V                |
| $I_{C25}$                              | $T_C = 25^\circ\text{C}$   | 32                                   | A                |
| $I_{C90}$                              | $T_C = 90^\circ\text{C}$   | 20                                   | A                |
| $I_{CM}$                               | $T_C = 90^\circ\text{C}, t_p = 1\text{ ms}$  | 40                                   | A                |
| <b>RBSOA</b>                           | $V_{GE} = \pm 15\text{ V}, T_J = 125^\circ\text{C}, R_G = 22\ \Omega$<br>Clamped inductive load, $L = 30\ \mu\text{H}$ | $I_{CM} = 60$<br>$V_{CEK} < V_{CES}$ | A                |
| <b><math>t_{SC}</math><br/>(SCSOA)</b> | $V_{GE} = \pm 15\text{ V}, V_{CE} = 600\text{ V}, T_J = 125^\circ\text{C}$<br>$R_G = 22\ \Omega$ , non repetitive      | 10                                   | $\mu\text{s}$    |
| $P_C$                                  | $T_C = 25^\circ\text{C}$   | IGBT                                 | 140 W            |
|  |  | Diode                                | 50 W             |
| $T_J$                                  |  | -55 ... +150                         | $^\circ\text{C}$ |
| $T_{stg}$                              |  | -40 ... +150                         | $^\circ\text{C}$ |
|  | Maximum lead temperature for soldering<br>1.6 mm (0.062 in.) from case for 10 s  | 300                                  | $^\circ\text{C}$ |
| $M_d$                                  | Mounting torque  | 0.4 - 0.6                            | Nm               |
| <b>Weight</b>                          |  | 2                                    | g                |

**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
- International standard package

**Advantages**

- Space savings
- High power density

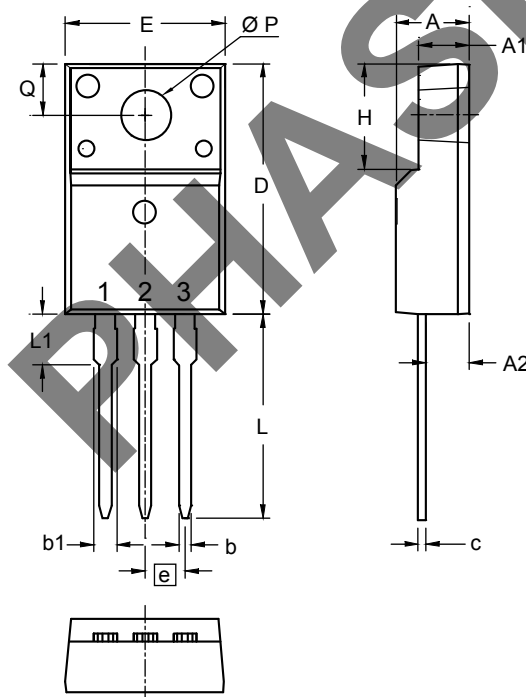
**Typical Applications**

- 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<br>( $T_J = 25^\circ\text{C}$ , unless otherwise specified) |      |                     |
|---------------|---|---|------|---------------------|
|               |   | min.  | typ. | max.                |
| $V_{(BR)CES}$ | $V_{GE} = 0\text{ V}$                           | 600   |      | V                   |
| $V_{GE(th)}$  | $I_C = 0.4\text{ mA}, V_{CE} = V_{GE}$          | 3   |      | 5 V                 |
| $I_{CES}$     | $V_{CE} = V_{CES}$                              | $T_J = 25^\circ\text{C}$  |      | 0.1 mA              |
|               |   | $T_J = 125^\circ\text{C}$   | 0.7  | mA                  |
| $I_{GES}$     | $V_{CE} = 0\text{ V}, V_{GE} = \pm 20\text{ V}$ |   |      | $\pm 500\text{ nA}$ |
| $V_{CE(sat)}$ | $I_C = 20\text{ A}, V_{GE} = 15\text{ V}$       |   | 2.2  | 2.8 V               |

| Symbol       | Conditions   | Characteristic Values  |      |         |
|--------------|--|--|------|---------|
|              |  | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |         |
|              |  | min.   | typ. | max.    |
| $C_{ies}$    | $V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$  |  | 800  | pF      |
| $C_{oes}$    |  |  | 85   | pF      |
| $C_{res}$    |  |  | 50   | pF      |
| $Q_g$        | $I_C = 20\text{ A}, V_{GE} = 15\text{ V}, V_{CE} = 480\text{ V}$   |  | 70   | nC      |
| $t_{d(on)}$  | <b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b><br>$I_C = 20\text{ A}, V_{GE} = \pm 15\text{ V},$<br>$V_{CE} = 300\text{ V}, R_G = 22\ \Omega$ |  | 25   | ns      |
| $t_r$        |  |  | 30   | ns      |
| $t_{d(off)}$ |  |  | 260  | ns      |
| $t_f$        |  |  | 55   | ns      |
| $E_{on}$     |  |  | 0.9  | mJ      |
| $E_{off}$    |  |  | 0.4  | mJ      |
| $R_{thJC}$   | Package with heatsink compound   | 0.5  |      | 0.9 K/W |
| $R_{thCH}$   |  |  |      | K/W     |
| $R_{thCK}$   | Package with heatsink compound   |  | 0.25 | K/W     |

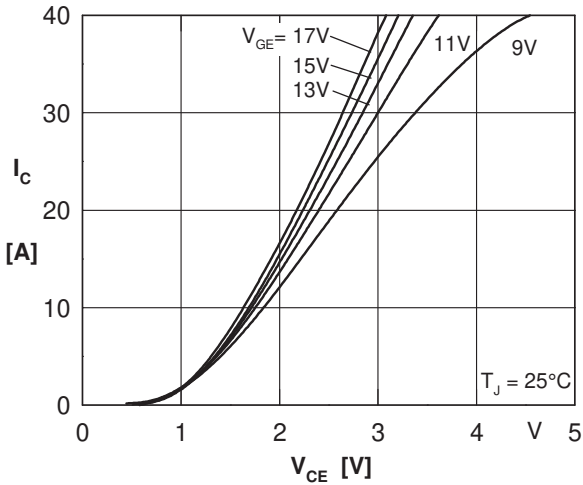
| Reverse Diode (FRED) [D1 version only] |   | Characteristic Values  |      |         |
|--|---|--|------|---------|
|  |   | $(T_J = 25^\circ\text{C}, \text{ unless otherwise specified})$ |      |         |
| Symbol                                 | Conditions  | min.   | typ. | max.    |
| $V_F$                                  | $I_F = 20\text{ A}, V_{GE} = 0\text{ V}$  |  | 2.1  | 2.4 V   |
|  | $I_F = 20\text{ A}, V_{GE} = 0\text{ V}, T_J = 125^\circ\text{C}$                               |  | 1.6  | V       |
| $I_F$                                  | $T_C = 25^\circ\text{C}$  |  |      | 25 A    |
|  | $T_C = 90^\circ\text{C}$  |  |      | 15 A    |
| $I_{RM}$                               | $I_F = 10\text{ A}, -di_F/dt = 400\text{ A}/\mu\text{s}, V_R = 300\text{ V}$                    |  | 11   | A       |
| $t_{rr}$                               | $V_{GE} = 0\text{ V}, T_J = 125^\circ\text{C}$  |  | 80   | ns      |
| $t_{rr}$                               | $I_F = 1\text{ A}, -di_F/dt = 100\text{ A}/\mu\text{s}, V_R = 30\text{ V}, V_{GE} = 0\text{ V}$ |  | 40   | ns      |
| $R_{thJC}$                             |   |  |      | 2.5 K/W |


**TO-220 AB Outline**

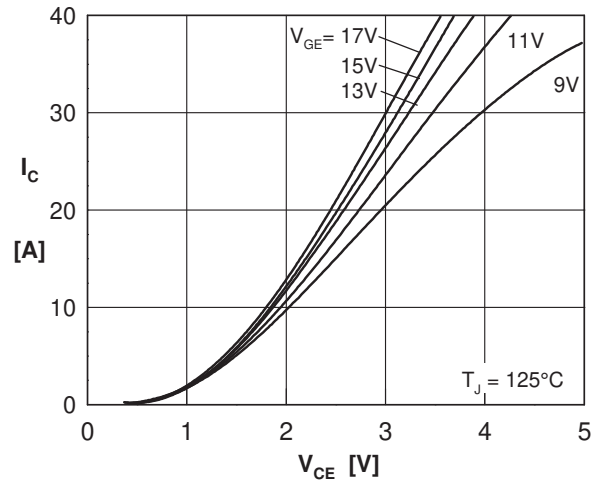
| Dim. | Millimeters |       | Inches    |       |
|------|-------------|-------|-----------|-------|
|      | min         | max   | min       | max   |
| A    | 4.50        | 4.90  | 0.177     | 0.193 |
| A1   | 2.34        | 2.74  | 0.092     | 0.108 |
| A2   | 2.56        | 2.96  | 0.101     | 0.117 |
| b    | 0.70        | 0.90  | 0.028     | 0.035 |
| c    | 0.45        | 0.60  | 0.018     | 0.024 |
| D    | 15.67       | 16.07 | 0.617     | 0.633 |
| E    | 9.96        | 10.36 | 0.392     | 0.408 |
| e    | 2.54 BSC    |       | 0.100 BSC |       |
| H    | 6.48        | 6.88  | 0.255     | 0.271 |
| L    | 12.68       | 13.28 | 0.499     | 0.523 |
| L1   | 3.03        | 3.43  | 0.119     | 0.135 |
| ØP   | 3.08        | 3.28  | 0.121     | 0.129 |
| Q    | 3.20        | 3.40  | 0.126     | 0.134 |

IXYS reserves the right to change limits, test conditions and dimensions.

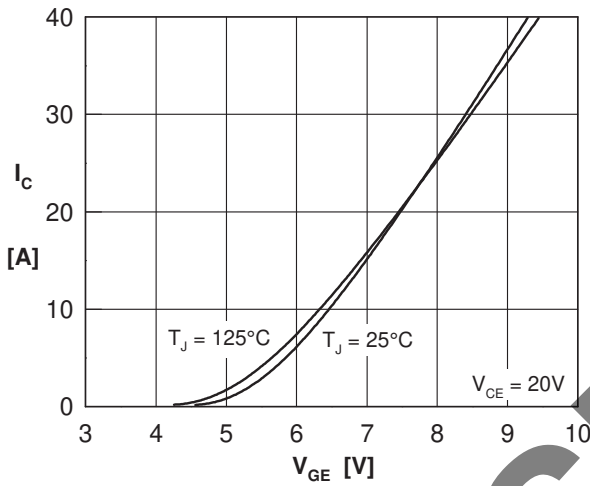
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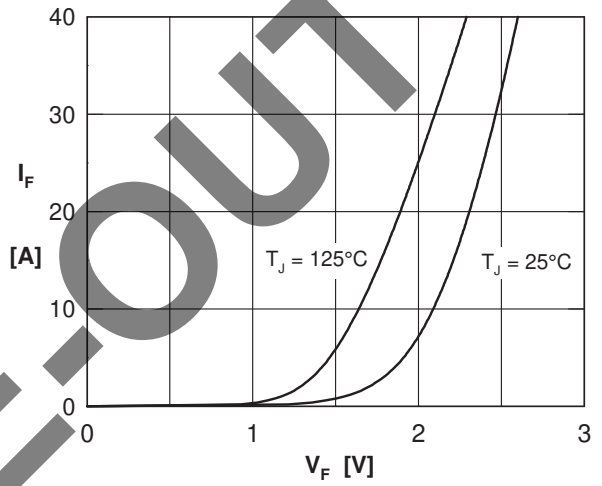
**Fig. 1 Typ. output characteristics**



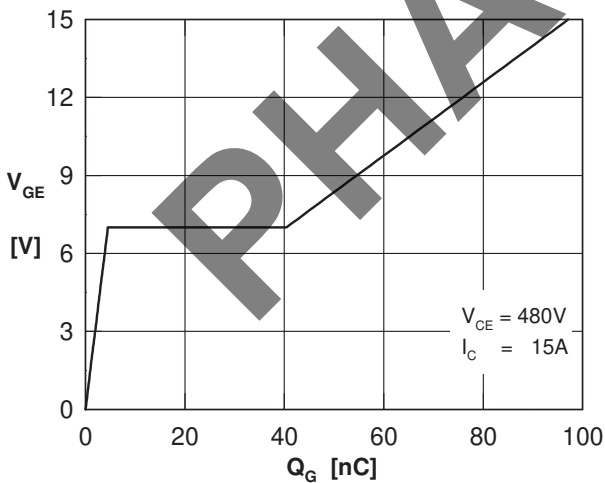
**Fig. 2 Typ. output characteristics**



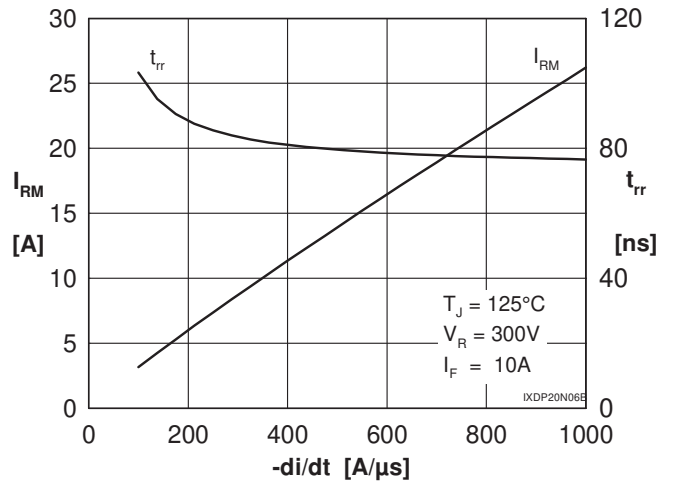
**Fig. 3 Typ. transfer characteristics**



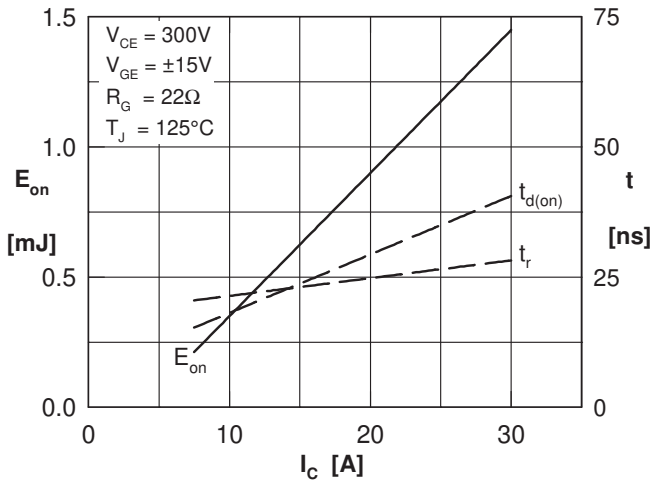
**Fig. 4 Typ. forward characteristics of free wheeling diode**



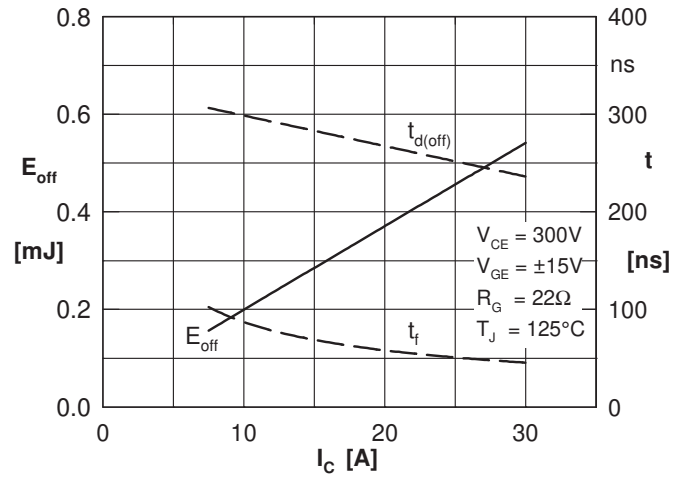
**Fig. 5 Typ. turn on gate charge**



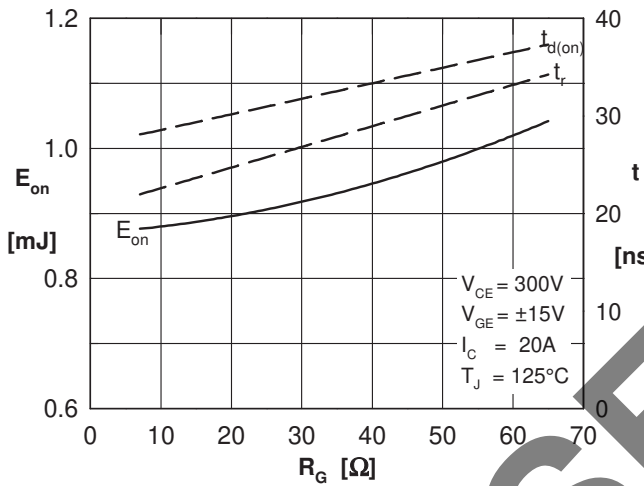
**Fig. 6 Typ. turn off characteristics of free wheeling diode**



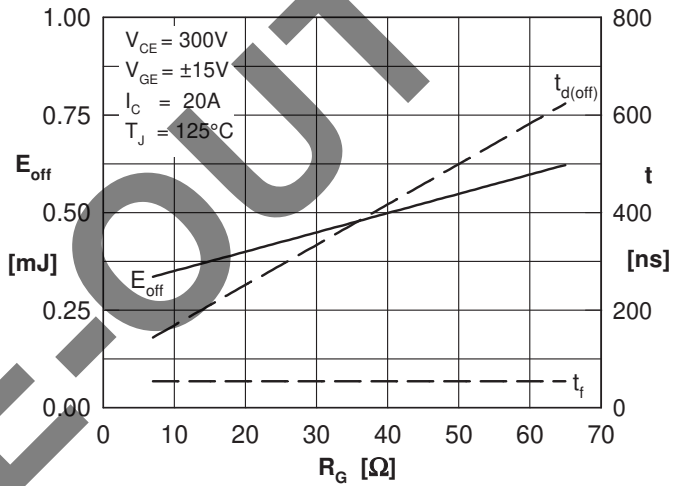
**Fig. 7** Typ. turn on energy and switching times versus collector current



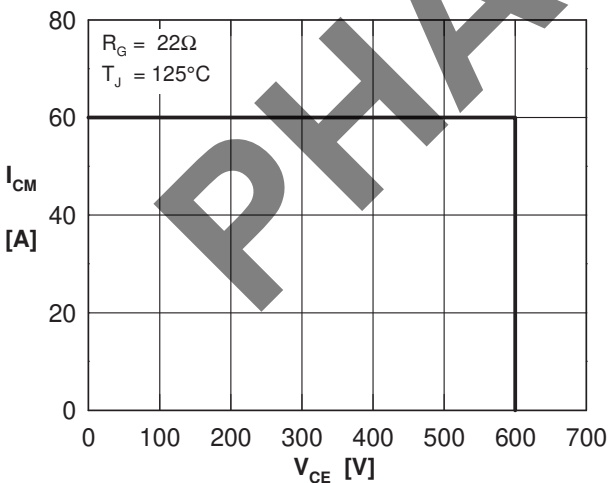
**Fig. 8** Typ. turn off energy and switching times versus collector current



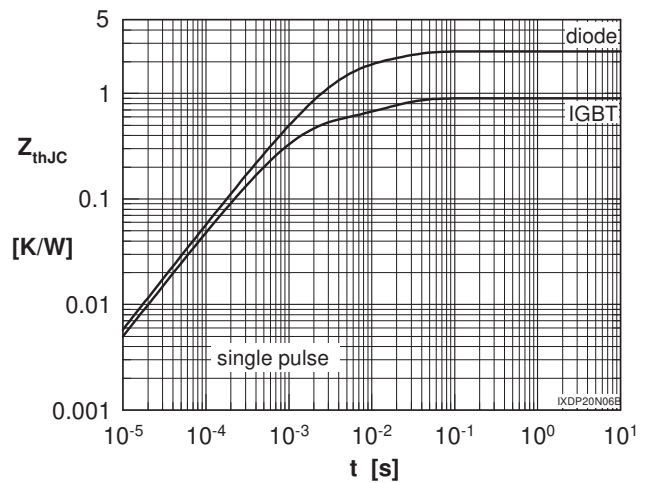
**Fig. 9** Typ. turn on energy and switching times versus gate resistor



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



**Fig. 5** Typ. turn on gate charge



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