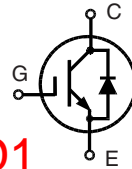
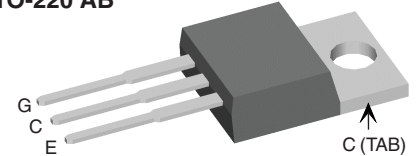


# High Voltage IGBT with optional Diode

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

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>	$V_{GE} = \pm 15 \text{ V}, T_J = 125^\circ\text{C}, R_G = 22 \Omega$ Clamped inductive load, $L = 30 \mu\text{H}$	$I_{CM} = 60$ $V_{CEK} < V_{CES}$	A
<b><math>t_{SC}</math> (SCSOA)</b>	$V_{GE} = \pm 15 \text{ V}, V_{CE} = 600 \text{ V}, T_J = 125^\circ\text{C}$ $R_G = 22 \Omega$ , non repetitive	10	$\mu\text{s}$
<b><math>P_C</math></b>	$T_C = 25^\circ\text{C}$	IGBT	140 W
		Diode	50 W
<b><math>T_J</math></b>		-55 ... +150	$^\circ\text{C}$
<b><math>T_{stg}</math></b>		-40 ... +150	$^\circ\text{C}$
	Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s	300	$^\circ\text{C}$
<b><math>M_d</math></b>	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

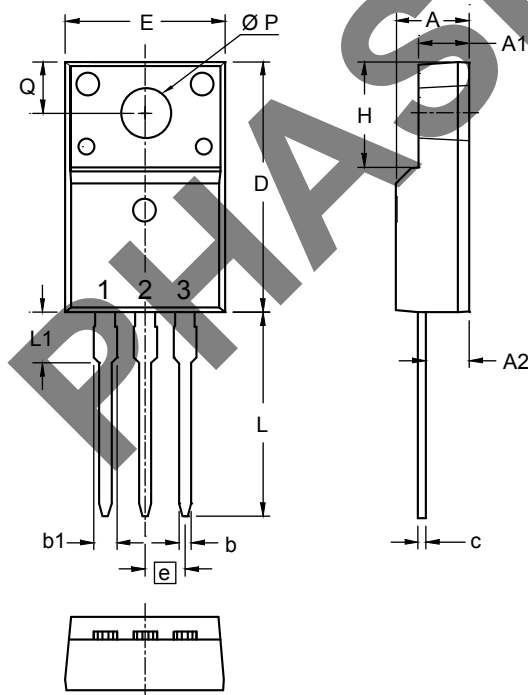
Symbol	Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		min.	typ.	max.
$V_{(BR)CES}$	$V_{GE} = 0 \text{ V}$	600		V
$V_{GE(th)}$	$I_C = 0.4 \text{ mA}, V_{CE} = V_{GE}$	3		5 V
$I_{CES}$	$V_{CE} = V_{CES}$	$T_J = 25^\circ\text{C}$		0.1 mA
		$T_J = 125^\circ\text{C}$	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

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

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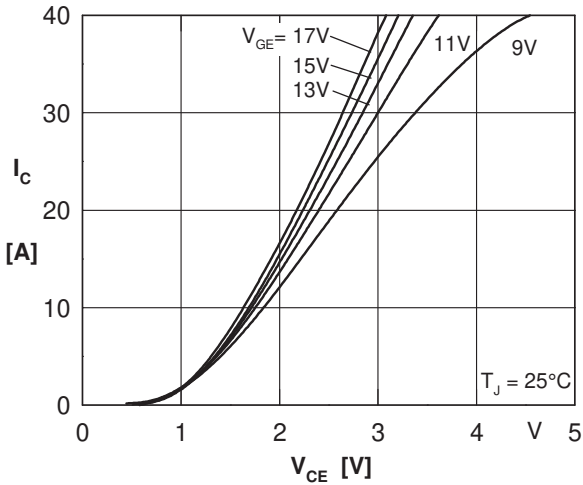
Symbol	Conditions	Characteristic Values		
		(T <sub>J</sub> = 25°C, unless otherwise specified)		
		min.	typ.	max.
C <sub>ies</sub>	V <sub>CE</sub> = 25 V, V <sub>GE</sub> = 0 V, f = 1 MHz		800	pF
C <sub>oes</sub>			85	pF
C <sub>res</sub>			50	pF
Q <sub>g</sub>	I <sub>C</sub> = 20 A, V <sub>GE</sub> = 15 V, V <sub>CE</sub> = 480 V		70	nC
t <sub>d(on)</sub>	Inductive load, T <sub>J</sub> = 125°C I <sub>C</sub> = 20 A, V <sub>GE</sub> = ±15 V, V <sub>CE</sub> = 300 V, R <sub>G</sub> = 22 Ω		25	ns
t <sub>r</sub>			30	ns
t <sub>d(off)</sub>			260	ns
t <sub>f</sub>			55	ns
E <sub>on</sub>			0.9	mJ
E <sub>off</sub>			0.4	mJ
R <sub>thJC</sub>	Package with heatsink compound	0.5		0.9 K/W
R <sub>thCH</sub>				K/W
R <sub>thCK</sub>	Package with heatsink compound		0.25	K/W

Reverse Diode (FRED) [D1 version only]		Characteristic Values		
		(T <sub>J</sub> = 25°C, unless otherwise specified)		
Symbol	Conditions	min.	typ.	max.
V <sub>F</sub>	I <sub>F</sub> = 20 A, V <sub>GE</sub> = 0 V		2.1	2.4 V
	I <sub>F</sub> = 20 A, V <sub>GE</sub> = 0 V, T <sub>J</sub> = 125°C		1.6	V
I <sub>F</sub>	T <sub>C</sub> = 25°C			25 A
	T <sub>C</sub> = 90°C			15 A
I <sub>RM</sub>	I <sub>F</sub> = 10 A, -di <sub>F</sub> /dt = 400 A/μs, V <sub>R</sub> = 300 V		11	A
t <sub>rr</sub>	V <sub>GE</sub> = 0 V, T <sub>J</sub> = 125°C		80	ns
t <sub>rr</sub>	I <sub>F</sub> = 1 A, -di <sub>F</sub> /dt = 100 A/μs, V <sub>R</sub> = 30 V, V <sub>GE</sub> = 0 V		40	ns
R <sub>thJC</sub>				2.5 K/W

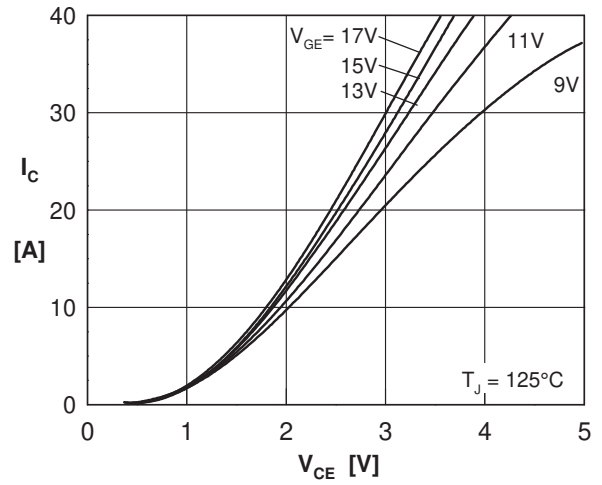


TO-220 AB Outline

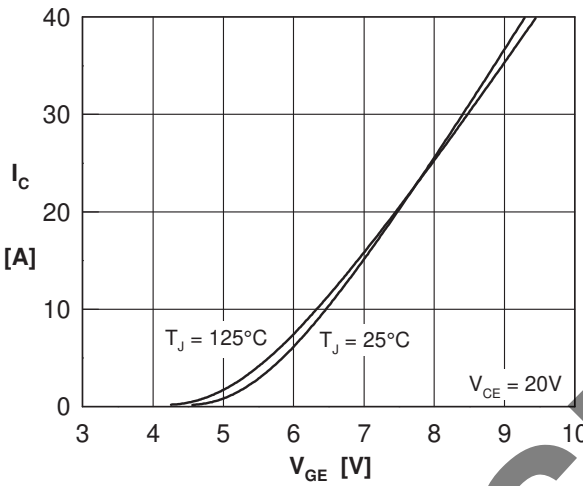
Dim.	Millimeters		Inches	
	min	max	min	max
A	4.50	4.90	0.177	0.193
A1	2.34	2.74	0.092	0.108
A2	2.56	2.96	0.101	0.117
b	0.70	0.90	0.028	0.035
c	0.45	0.60	0.018	0.024
D	15.67	16.07	0.617	0.633
E	9.96	10.36	0.392	0.408
e	2.54 BSC		0.100 BSC	
H	6.48	6.88	0.255	0.271
L	12.68	13.28	0.499	0.523
L1	3.03	3.43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



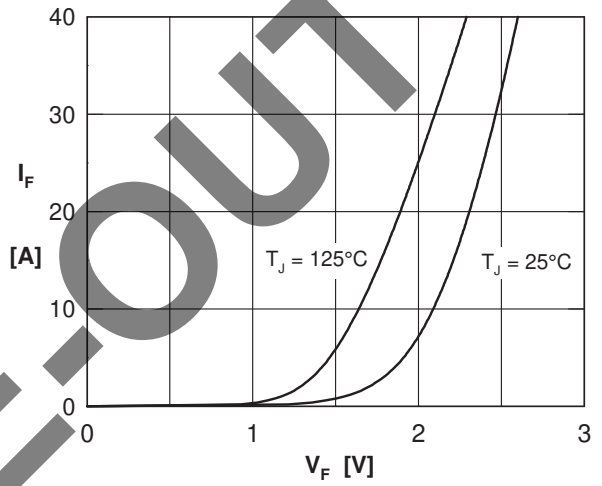
**Fig. 1 Typ. output characteristics**



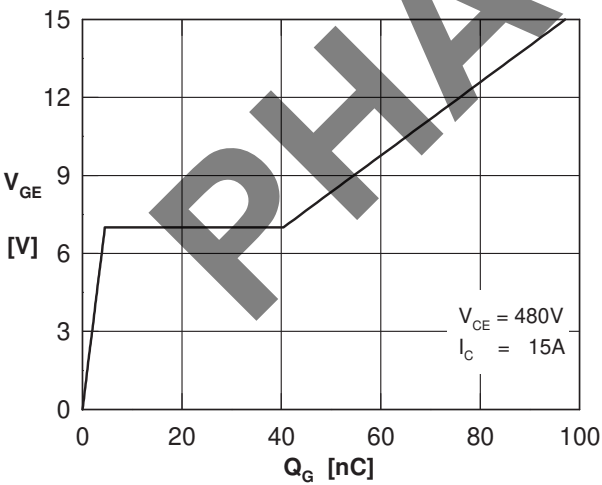
**Fig. 2 Typ. output characteristics**



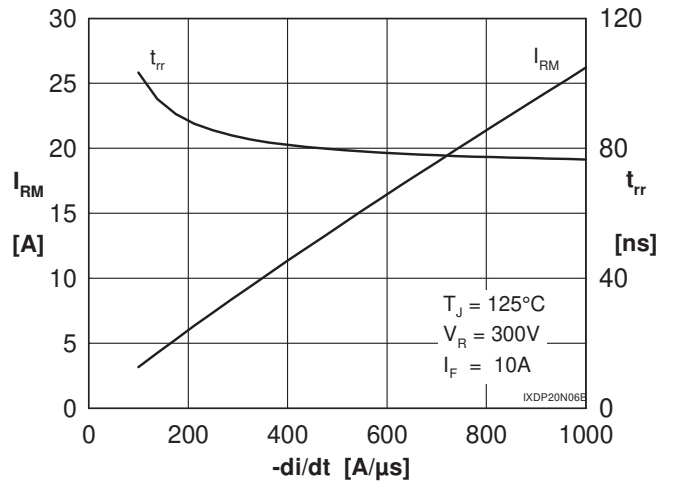
**Fig. 3 Typ. transfer characteristics**



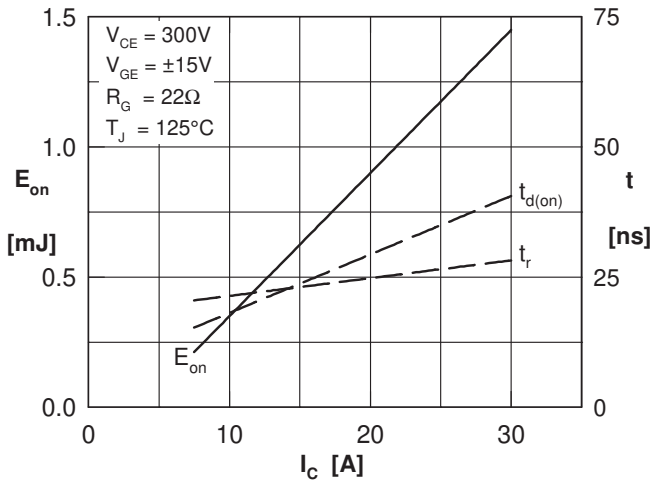
**Fig. 4 Typ. forward characteristics of free wheeling diode**



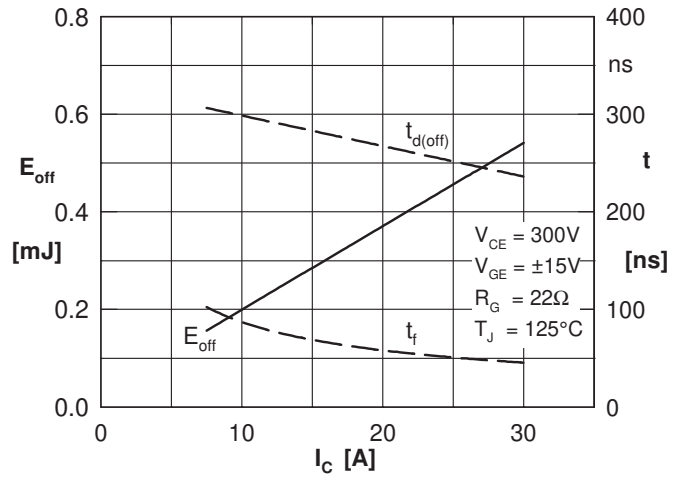
**Fig. 5 Typ. turn on gate charge**



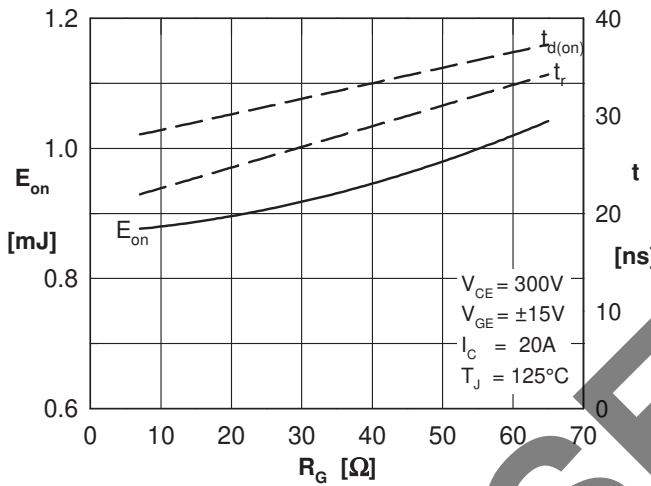
**Fig. 6 Typ. turn off characteristics of free wheeling diode**



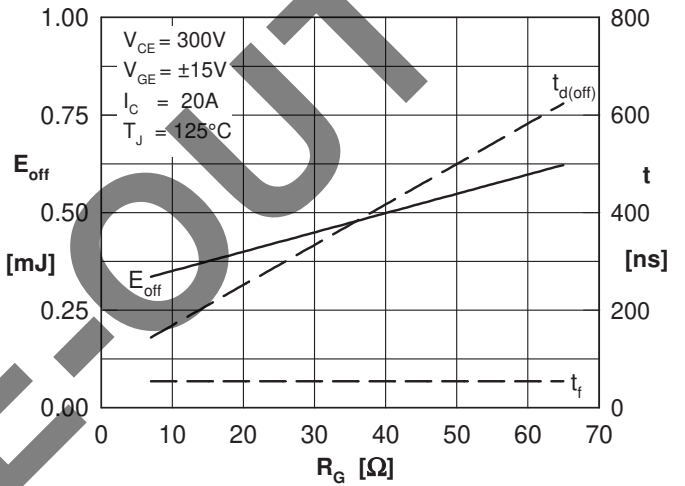
**Fig. 7** Typ. turn on energy and switching times versus collector current



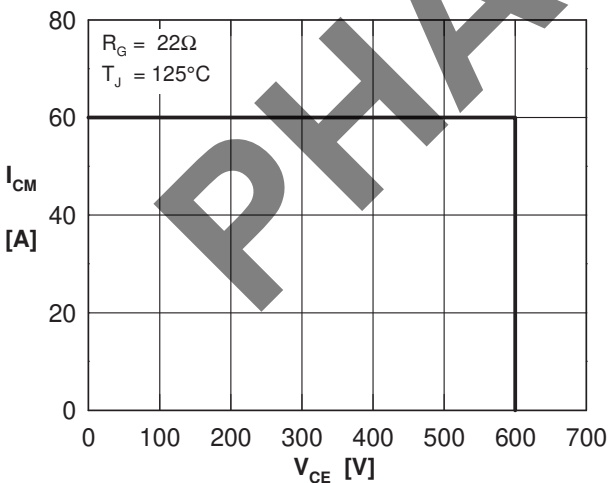
**Fig. 8** Typ. turn off energy and switching times versus collector current



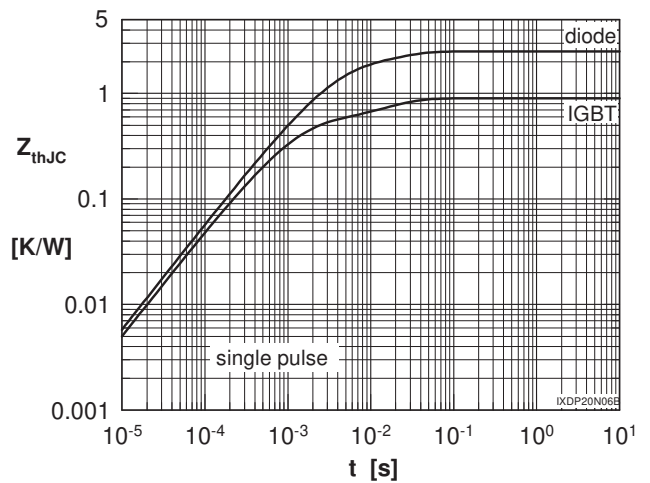
**Fig. 9** Typ. turn on energy and switching times versus gate resistor



**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