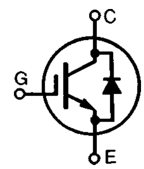
Preliminary data

Low $V_{CE(sat)}$ IGBT with Diode

Combi Pack

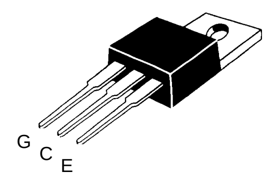
IXGP12N60U1

V_{CES}	=	600 V
I_C	=	24 A
$V_{CE(sat)}$	=	2.5 V



Symbol	Test 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} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	24	A
I_{C90}	T_C = 90°C	12	A
I_{CM}	T_C = 25°C, 1 ms	48	A
SSOA (RBSOA)	V_{GE}= 15 V, T_{VJ} = 125°C, R_G = 150 Ω Clamped inductive load, L = 300 µH	I_{CM} = 20 @ 0.8 V_{CES}	A
P_C	T_C = 25°C	100	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque with screw M3 Mounting torque with screw M3.5	0.45/4 0.55/5	Nm/lb.in. Nm/lb.in.
Weight		4	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

TO-220 AB



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

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 750 µA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 250 µA, V_{GE} = V_{GE}		2.5		5.5	V
I_{CES}	V_{CE} = 0.8 • V_{CES} V_{GE} = 0 V	T_J = 25°C T_J = 125°C			250 2.5	µA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{CE90}, V_{GE} = 15 V				2.5	V

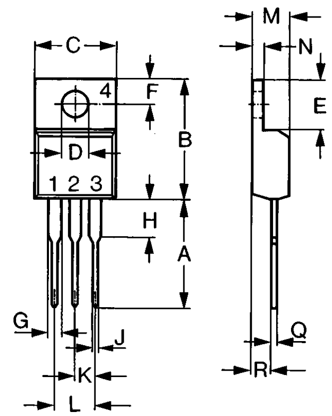
Features
- International standard package JEDEC TO-220 AB
- IGBT with antiparallel FRED in one package
- 2nd generation HDMOS™ process
- Low $V_{CE(sat)}$
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Epitaxial Diode FRED)
  - soft recovery with low I_{RM}

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

Advantages
- Easy to mount with 1 screw
- Space savings (two devices in one package)
- Reduces assembly time and cost
- High power density

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	$I_C = I_{C90}$; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %	4	8		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		750		pF
C_{oes}			125		pF
C_{res}			30		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		50	70	nC
Q_{ge}			15	25	nC
Q_{gc}			25	45	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		100		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH		200		ns
$t_{d(off)}$	V_{CE} = 0.8 • V_{CES}, $R_G = R_{off}$ = 150 Ω		500	700	ns
t_{fi}	Remarks: Switching times may increase		300	500	ns
E_{off}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G		1.2	2.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		100		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 100 µH		200		ns
E_{on}	V_{CE} = 0.8 • V_{CES}, $R_G = R_{off}$ = 150 Ω		1		mJ
$t_{d(off)}$	Remarks: Switching times may increase		600	800	ns
t_{fi}	for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or		400	700	ns
E_{off}	increased R_G		2		mJ
R_{thJC}				1.25	K/W
R_{thCK}			0.25		K/W

TO-220 AB Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	12.70	14.93	0.500	0.580
B	14.23	16.50	0.560	0.650
C	9.66	10.66	0.380	0.420
D	3.54	4.08	0.139	0.161
E	5.85	6.85	0.230	0.270
F	2.29	2.79	0.090	0.110
G	1.15	1.77	0.045	0.070
H	2.79	6.35	0.110	0.250
J	0.64	0.89	0.025	0.035
K	2.54	BSC	0.100	BSC
M	4.32	4.82	0.170	0.190
N	0.64	1.39	0.025	0.055
Q	0.51	0.76	0.020	0.030
R	2.04	2.49	0.080	0.115

Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	$I_F = I_{C90}$, V_{GE} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %			1.75	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 64 A/µs		2.5		A
t_{rr}	V_R = 360 V, T_J = 100°C		150		ns
	I_F = 1 A; -di/dt = 50 A/µs; V_R = 30 V, T_J = 25°C		35	50	ns
R_{thJC}				2.5	K/W

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

Fig. 1 Saturation Characteristics

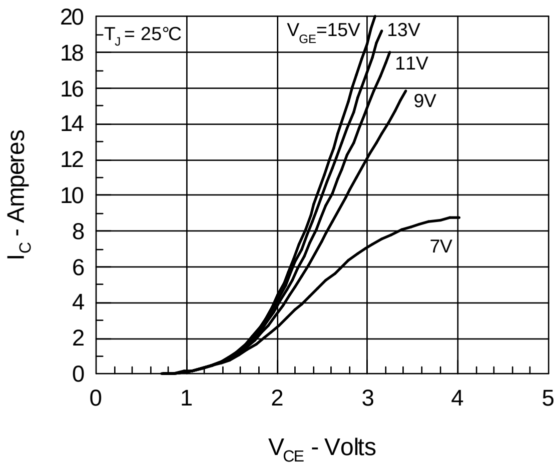


Fig. 2 Output Characterstics

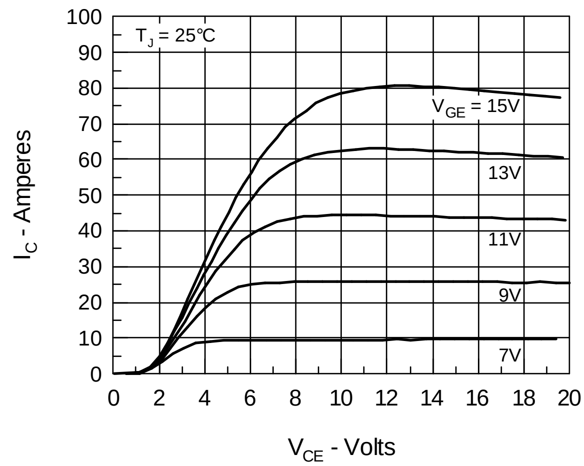


Fig. 3 Collector-Emitter Voltage vs. Gate-Emitter Voltage

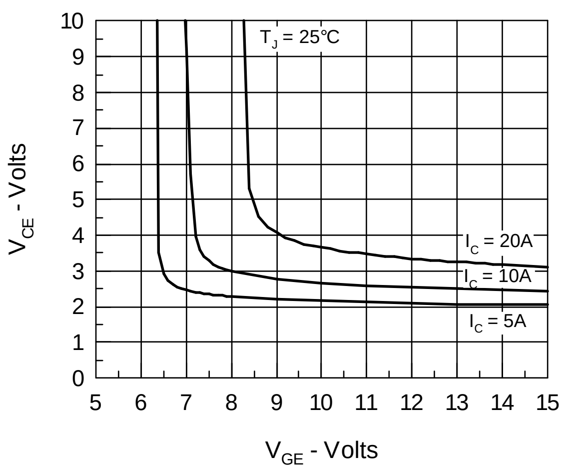


Fig. 4 Temperature Dependence of Output Saturation Voltage

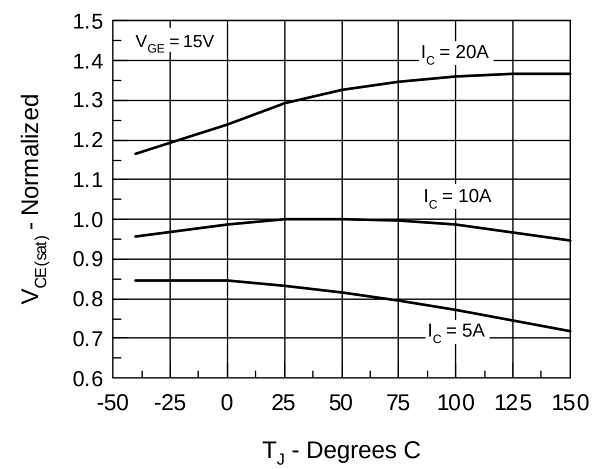


Fig. 5 Input Admittance

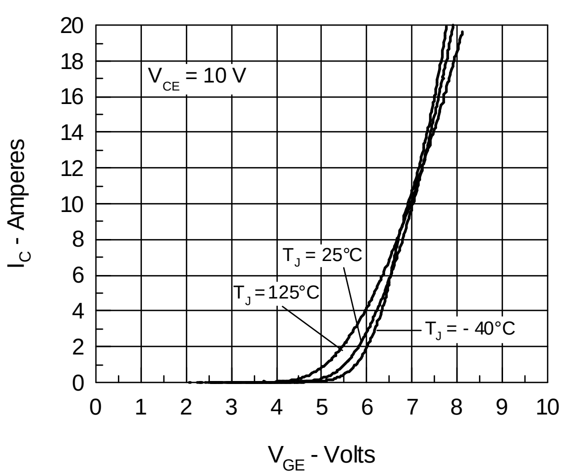


Fig. 6 Temperature Dependence of Breakdown and Threshold Voltage

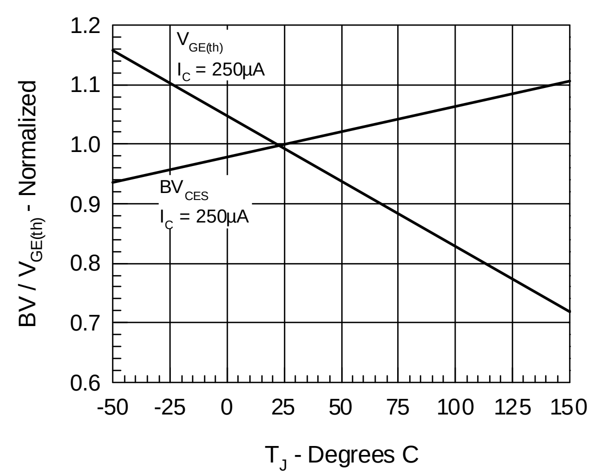


Fig.7 Gate Charge

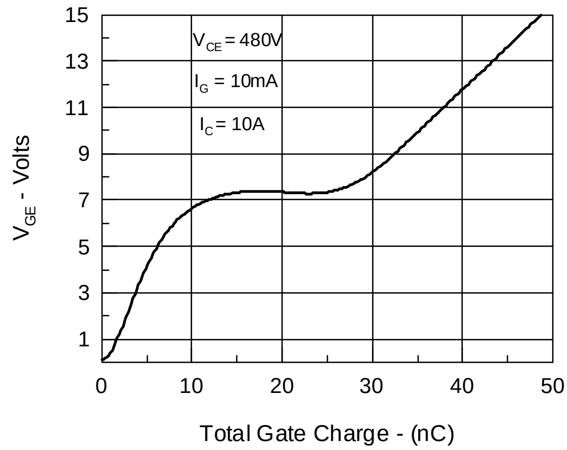


Fig.8 Turn-Off Safe Operating Area

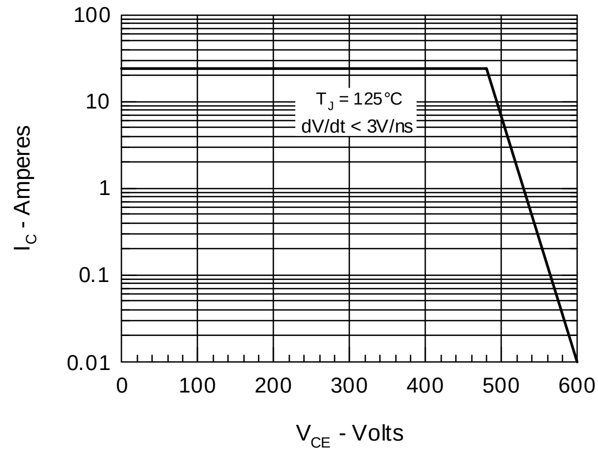


Fig.9 Capacitance Curves

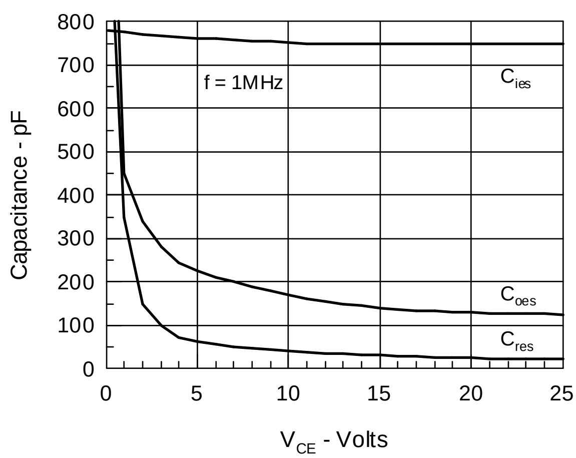


Fig.10 Transient Thermal Impedance

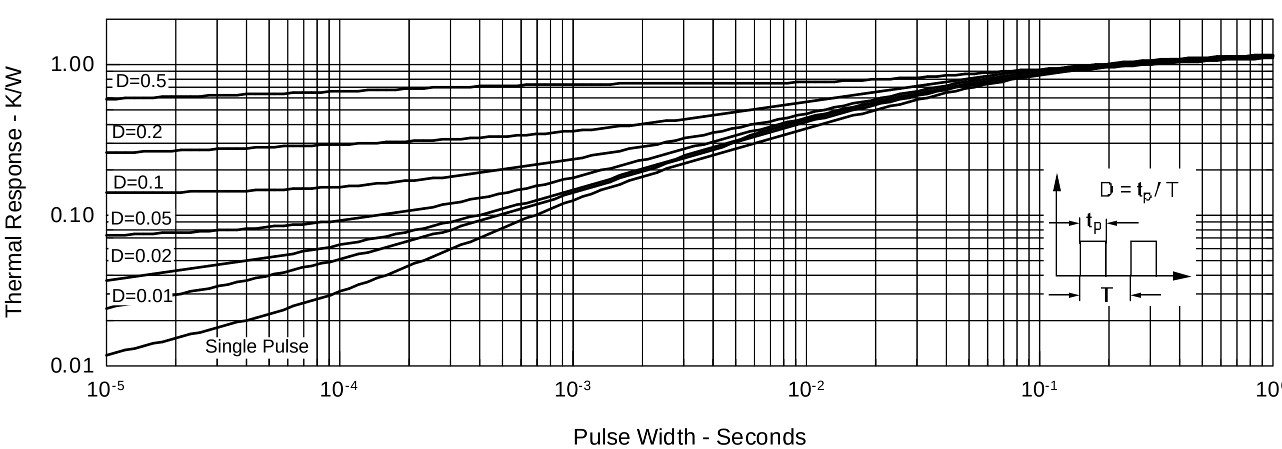


Fig.11 Maximum Forward Voltage Drop

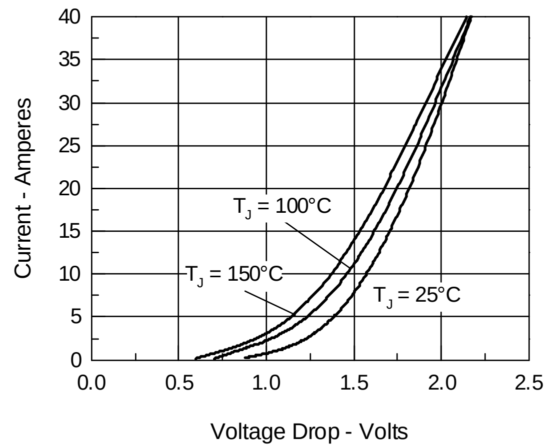


Fig.12 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

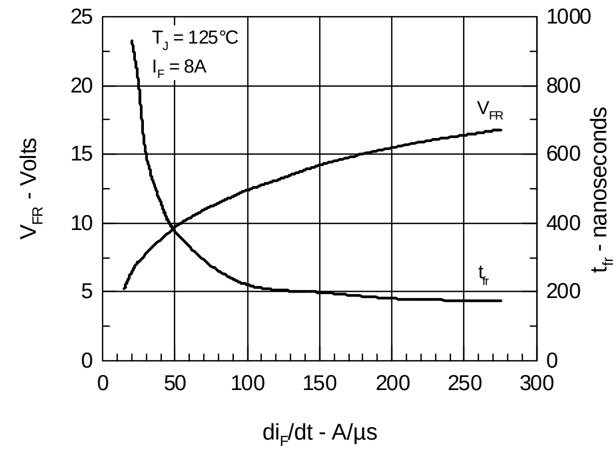


Fig.13 Junction Temperature Dependence off I_{RM} and Q_r

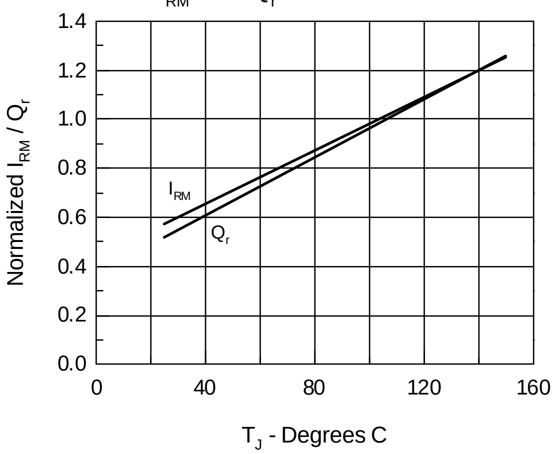


Fig.14 Reverse Recovery Charge

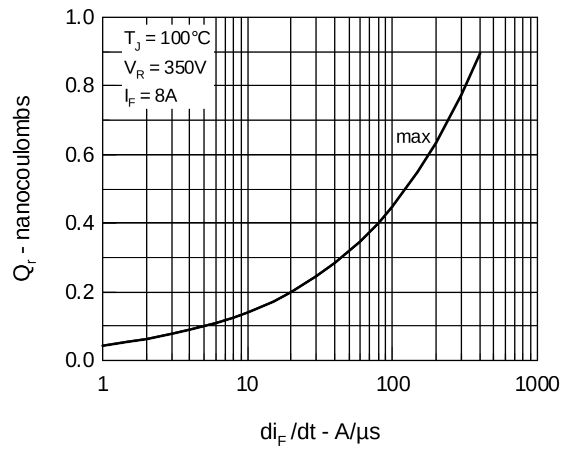


Fig.15 Peak Reverse Recovery Current

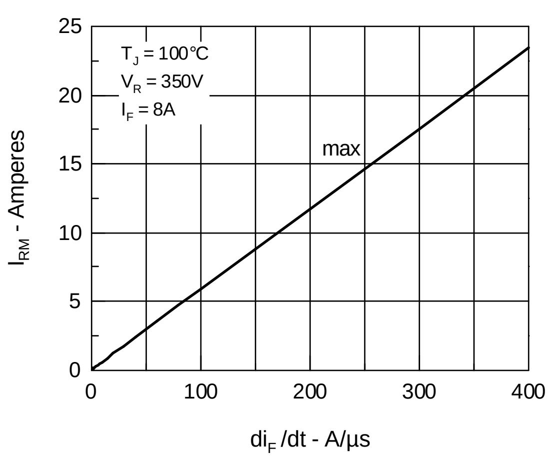


Fig.16 Reverse Recovery Time

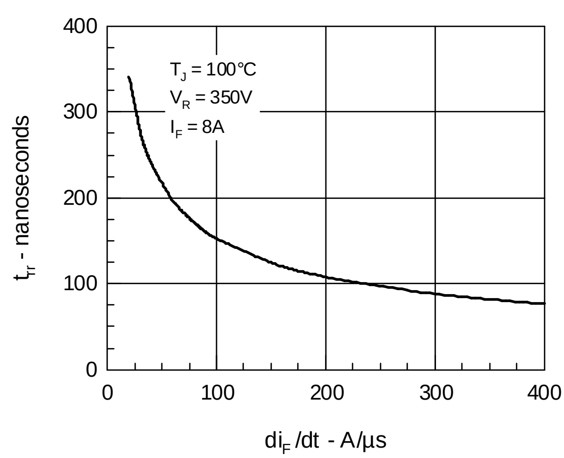


Fig.17 Diode Transient Thermal resistance junction to case