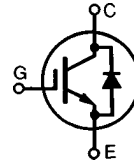


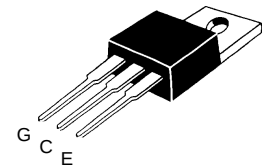
Low $V_{CE(sat)}$ IGBT with Diode Combi Pack

IXGP12N60U1

$$\begin{aligned} V_{CES} &= 600 \text{ V} \\ I_C &= 24 \text{ A} \\ V_{CE(sat)} &= 2.5 \text{ V} \end{aligned}$$



TO-220 AB



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

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

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

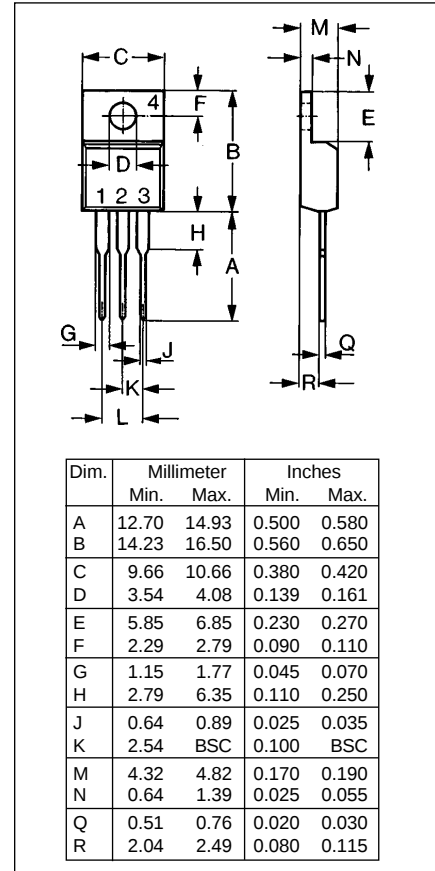
Advantages

- 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 ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
BV_{CES}	$I_C = 750 \mu\text{A}$, $V_{GE} = 0 \text{ V}$	600		V
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$, $V_{GE} = V_{GE}$	2.5		V
I_{CES}	$V_{CE} = 0.8 \cdot V_{CES}$ $V_{GE} = 0 \text{ V}$ $T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$			250 μA 2.5 mA
I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{CE90}$, $V_{GE} = 15 \text{ V}$			2.5 V

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} C _{oes} C _{res}	} V _{CE} = 25 V, V _{GE} = 0 V, f = 1 MHz		750	pF	
			125	pF	
			30	pF	
Q _g Q _{ge} Q _{gc}	} I _C = I _{C90} , V _{GE} = 15 V, V _{CE} = 0.5 V _{CES}		50	70 nC	
			15	25 nC	
			25	45 nC	
t _{d(on)} t _{ri} t _{d(off)} t _{fi} E _{off}	Inductive load, T_J = 25°C I _C = I _{C90} , V _{GE} = 15 V, L = 100 μH V _{CE} = 0.8 • V _{CES} , R _G = R _{off} = 150 Ω Remarks: Switching times may increase for V _{CE} (Clamp) > 0.8 • V _{CES} , higher T _J or increased R _G		100	ns	
				200	ns
				500	700 ns
				300	500 ns
				1.2	2.0 mJ
t _{d(on)} t _{ri} E _{on} t _{d(off)} t _{fi} E _{off}	Inductive load, T_J = 125°C I _C = I _{C90} , V _{GE} = 15 V, L = 100 μH V _{CE} = 0.8 • V _{CES} , R _G = R _{off} = 150 Ω Remarks: Switching times may increase for V _{CE} (Clamp) > 0.8 • V _{CES} , higher T _J or increased R _G		100	ns	
				200	ns
				1	mJ
				600	800 ns
				400	700 ns
				2	mJ
R _{thJC} R _{thCK}			0.25	1.25 K/W K/W	

TO-220 AB Outline



Reverse Diode (FRED)		Characteristic Values (T _J = 25°C, unless otherwise specified)			
Symbol	Test Conditions	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} t _{tr}	I_F = I_{C90}, V_{GE} = 0 V, -di_F/dt = 64 A/μs V_R = 360 V I_F = 1 A; -di/dt = 50 A/μs; V_R = 30 V T_J = 100°C T_J = 25°C		2.5 150 35	A ns 50 ns	
R _{thJC}				2.5 K/W	

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

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,881,106 5,017,508 5,049,961 5,187,117 5,486,715
4,850,072 4,931,844 5,034,796 5,063,307 5,237,481 5,381,025

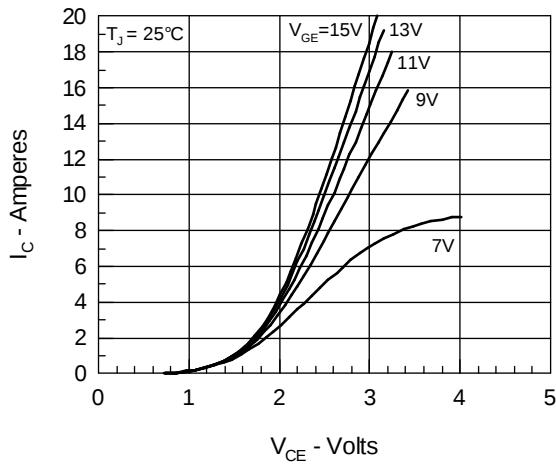
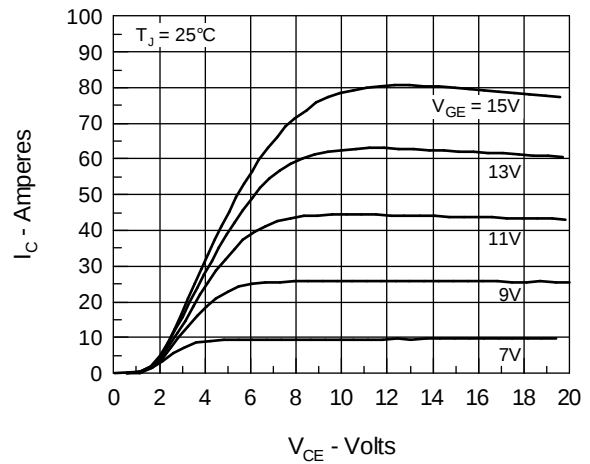
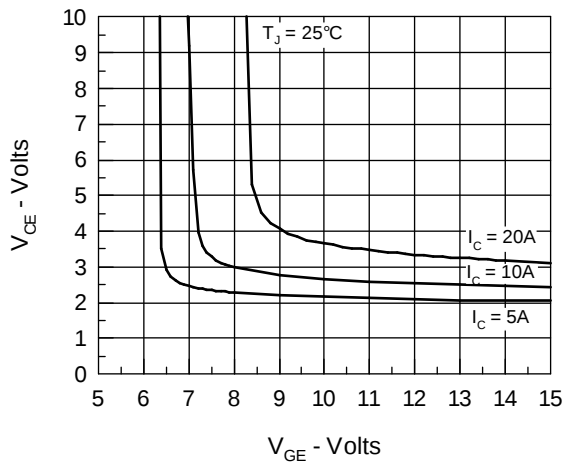
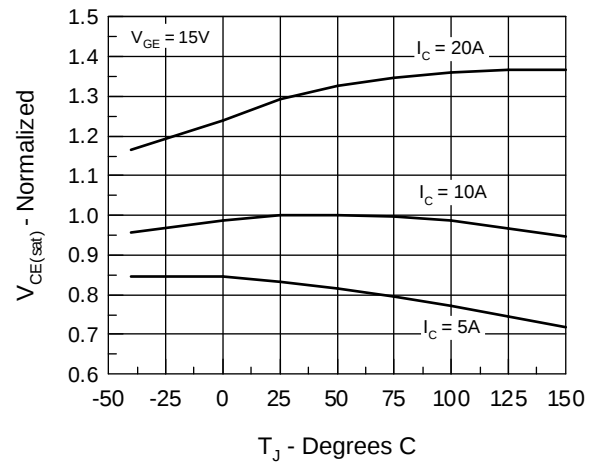
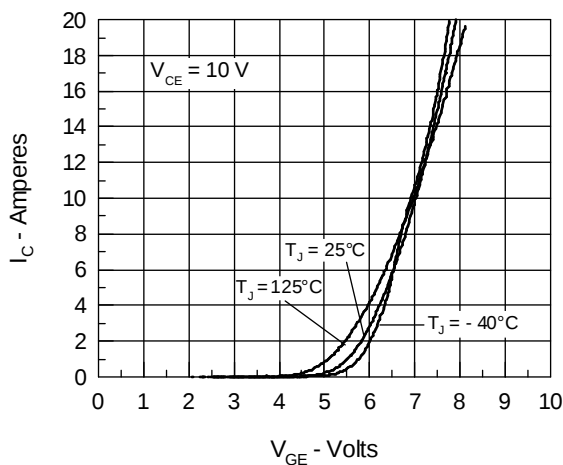
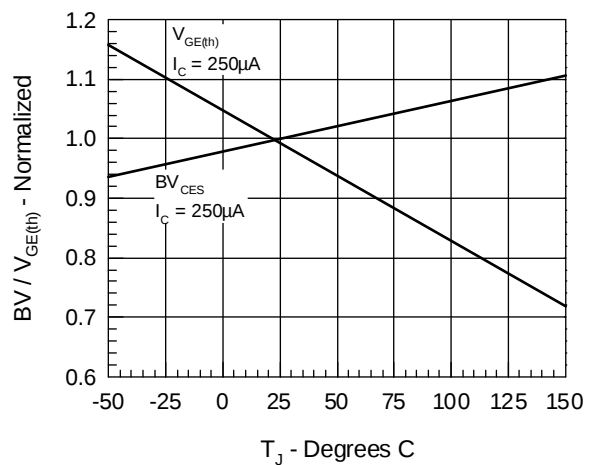
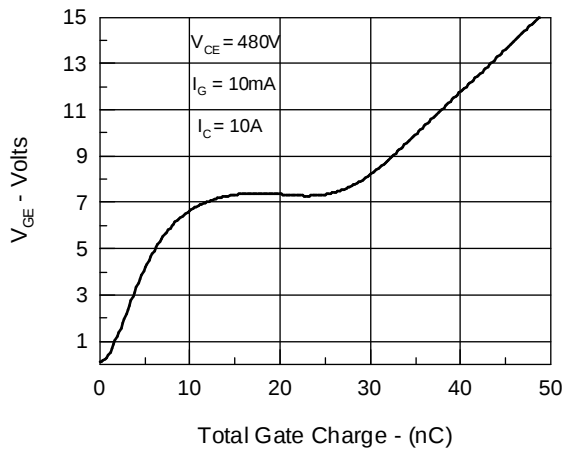
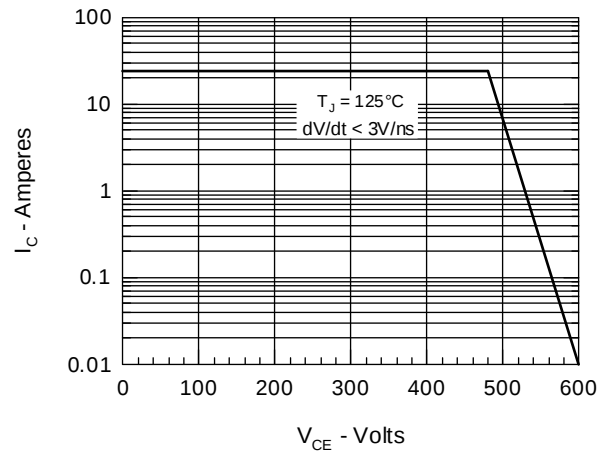
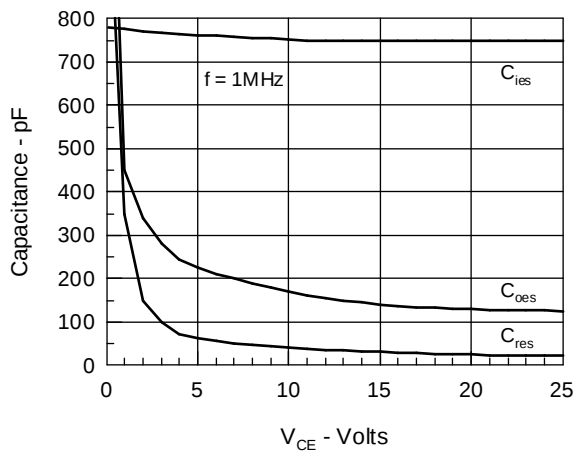
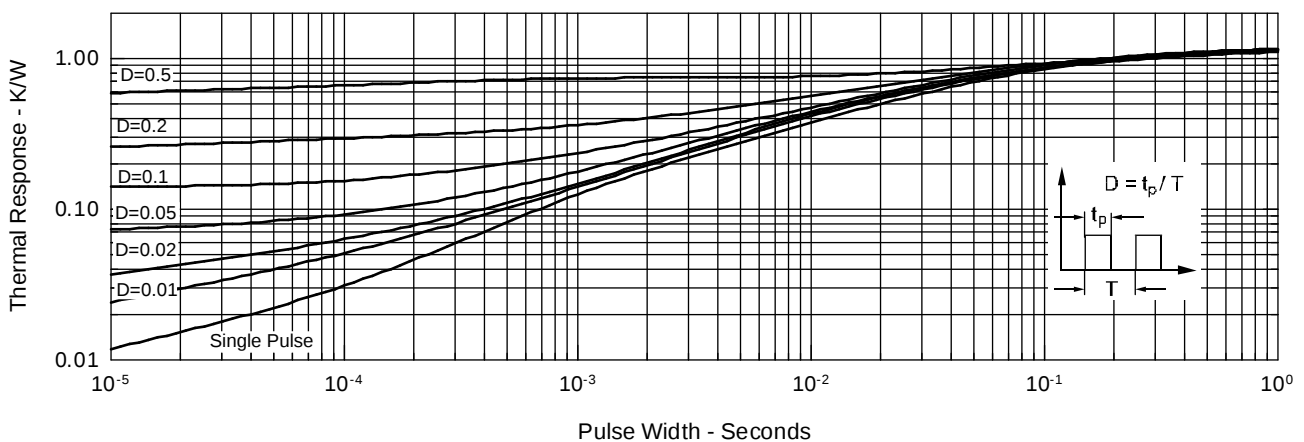
Fig. 1 Saturation Characteristics

Fig. 2 Output Characteristics

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


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4,850,072	4,931,844	5,034,796	5,063,307	5,237,481	5,381,025

Fig.11 Maximum Forward Voltage Drop

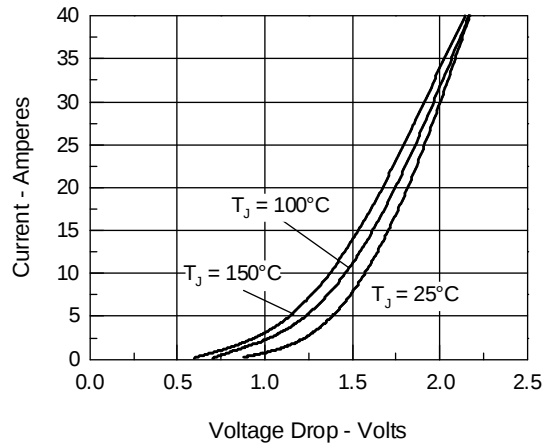


Fig.12 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR}

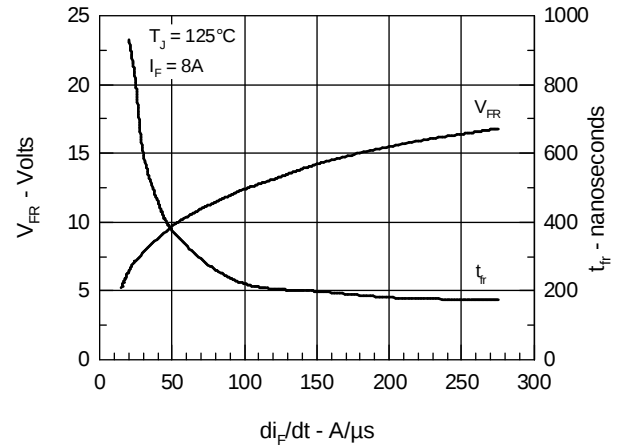


Fig.13 Junction Temperature Dependence of I_{RM} and Q_r

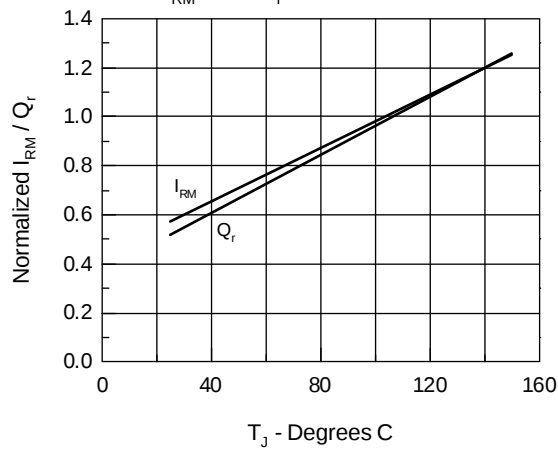


Fig.14 Reverse Recovery Charge

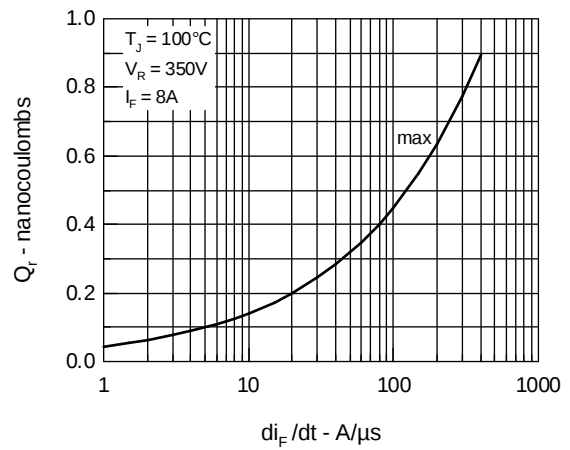


Fig.15 Peak Reverse Recovery Current

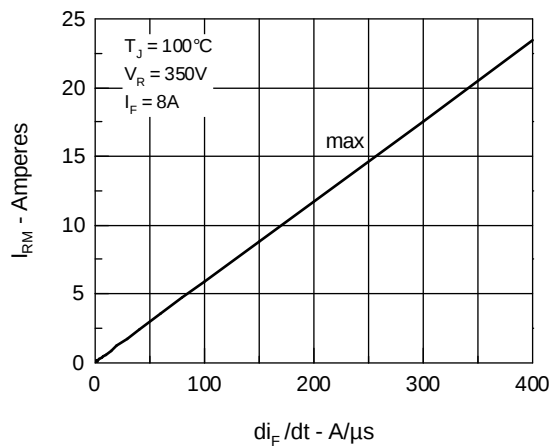


Fig.16 Reverse Recovery Time

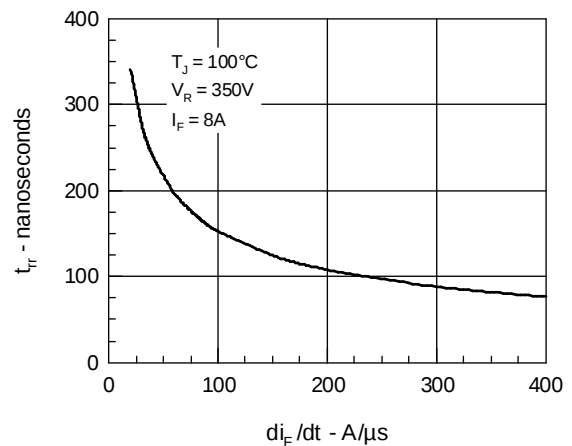


Fig.17 Diode Transient Thermal resistance junction to case

