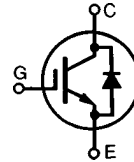


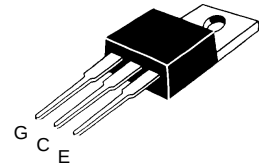
Low $V_{CE(sat)}$ IGBT with Diode Combi Pack

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		$-55 \dots +150$	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		$-55 \dots +150$	$^\circ\text{C}$
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

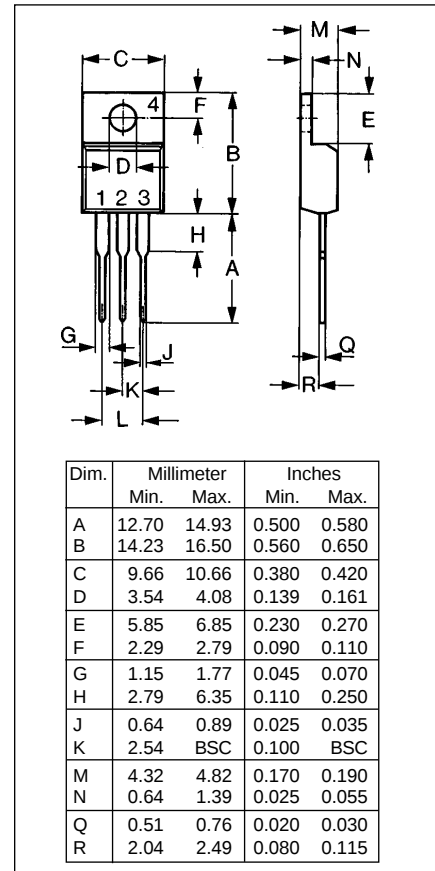
Advantages

- 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		750 125 30	pF pF pF		
Q _g Q _{ge} Q _{gc}		} I _C = I _{C90} , V _{GE} = 15 V, V _{CE} = 0.5 V _{CES}	50 15 25	70 25 45	nC nC 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		100 200 500 300 1.2		ns ns ns ns 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	100 200 1 600 400 2		ns ns mJ ns ns 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 T _j = 100°C I _F = 1 A; -di/dt = 50 A/μs; V _R = 30 V T _j = 25°C		2.5	A
			150	ns
			35	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

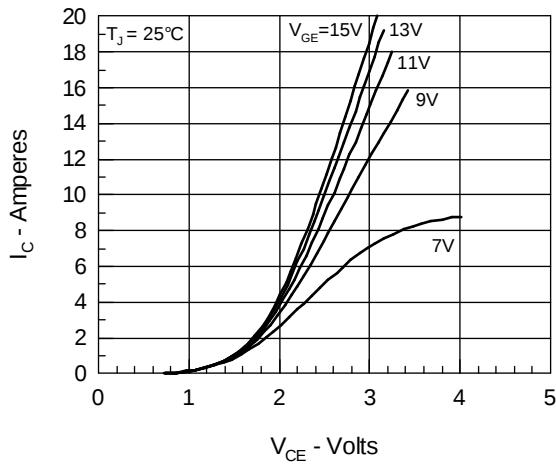
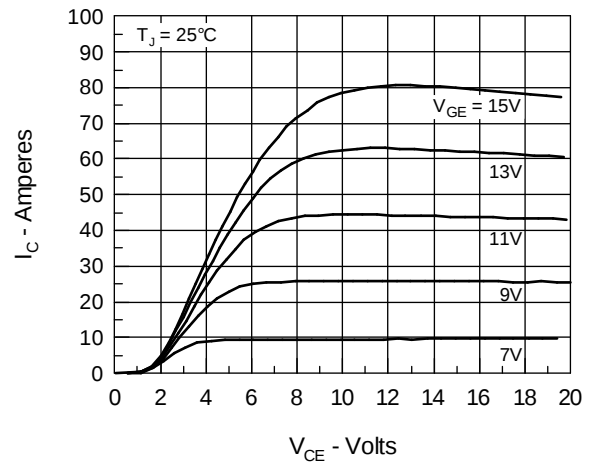
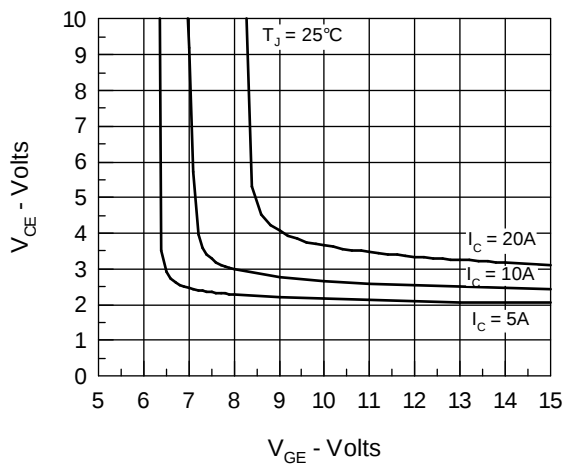
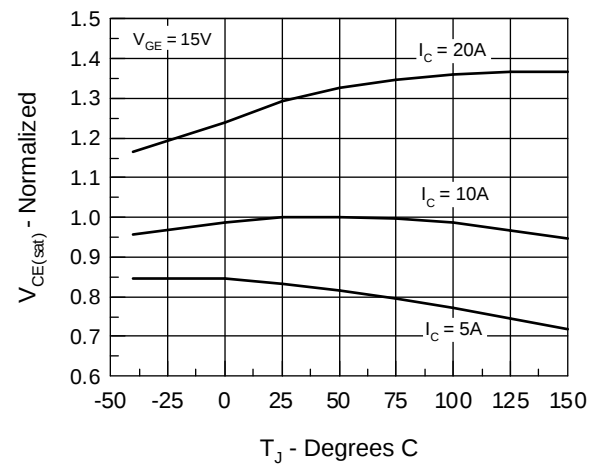
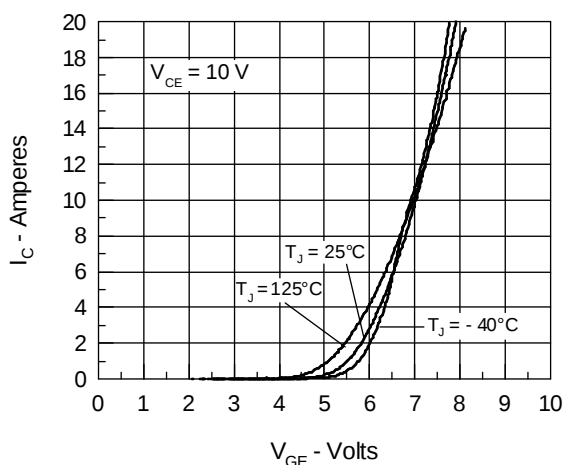
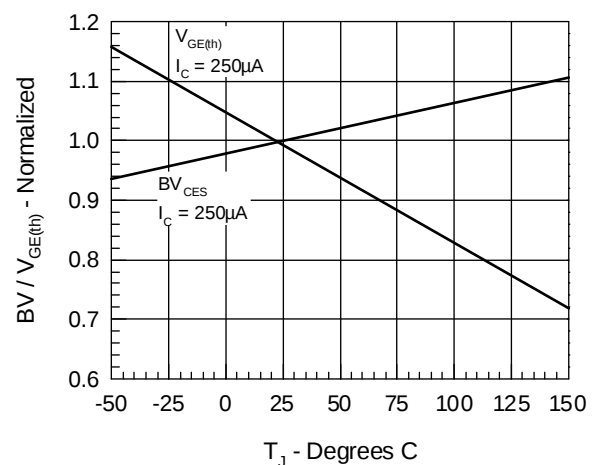
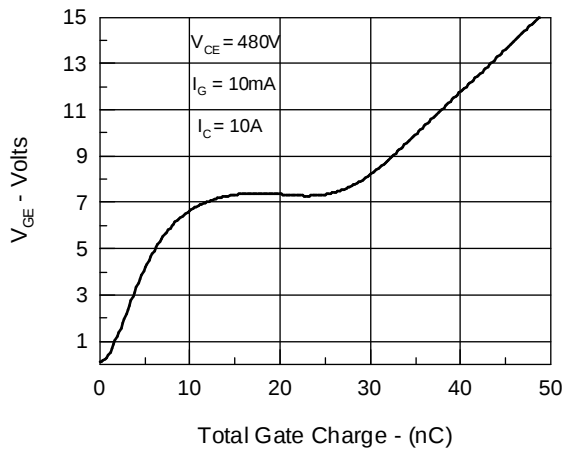
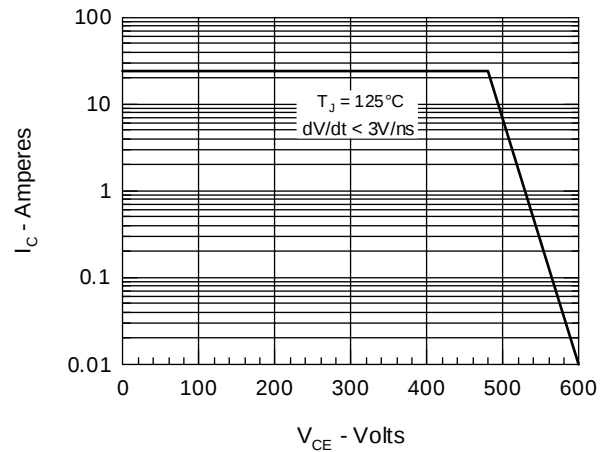
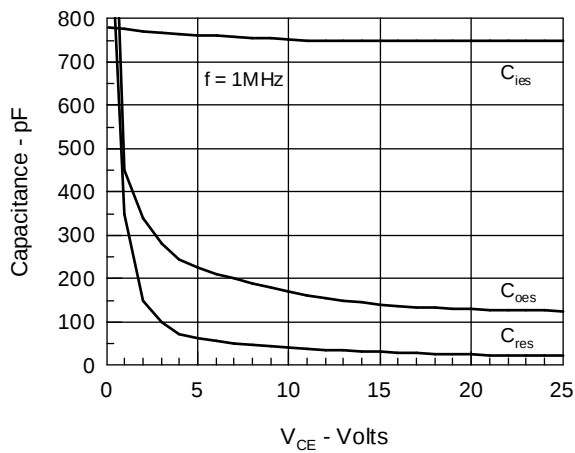
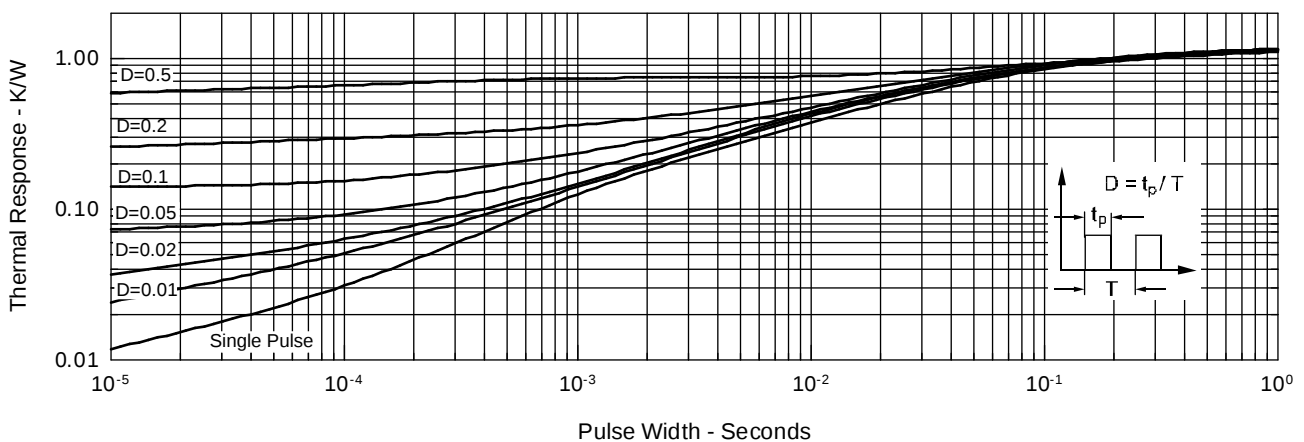
Fig. 1 Saturation Characteristics

Fig. 2 Output Characteristics

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


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.11 Maximum Forward Voltage Drop

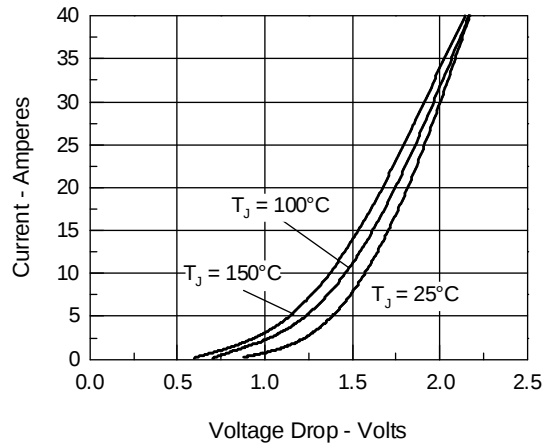
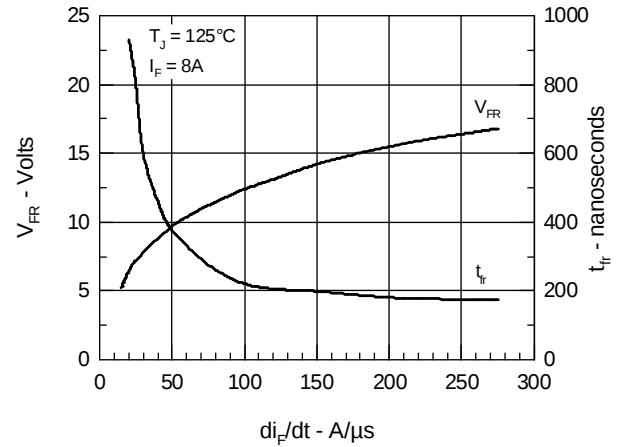
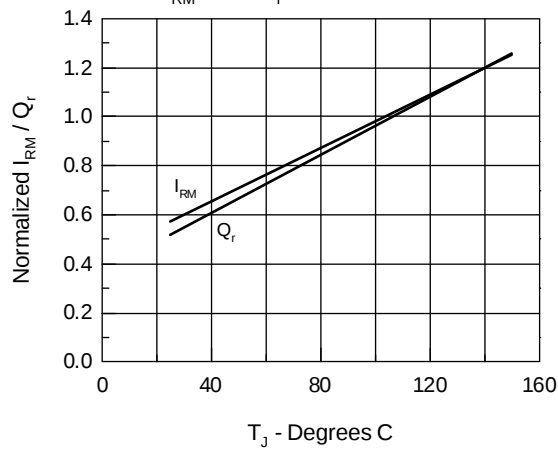
Fig.12 Peak Forward Voltage V_{FR} and Forward Recovery Time t_{FR} Fig.13 Junction Temperature Dependence of I_{RM} and Q_r 

Fig.14 Reverse Recovery Charge

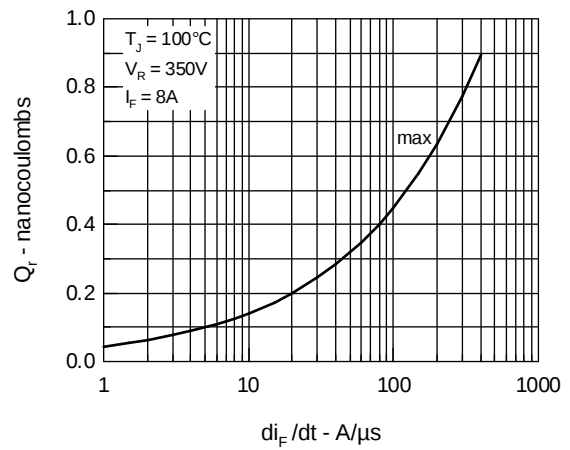


Fig.15 Peak Reverse Recovery Current

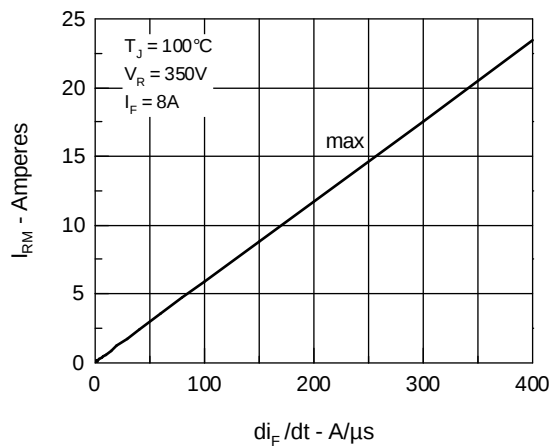


Fig.16 Reverse Recovery Time

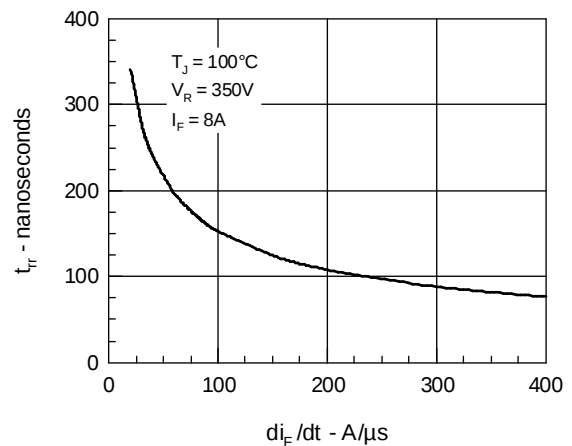


Fig.17 Diode Transient Thermal resistance junction to case

