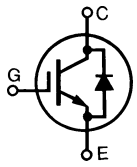
IXYS

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

Combi Pack

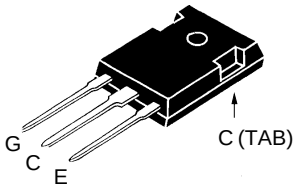
	V_{CES}	I_{C25}	$V_{CE(sat)}$
IXGH 12N100U1	1000 V	24 A	3.5 V
IXGH 12N100AU1	1000 V	24 A	4.0 V



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1000	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	1000	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} = 24 @ 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	1.13/10	Nm/lb.in.
Weight		6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

Symbol (T_J = 25°C, unless otherwise specified)	Test Conditions		Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 3 mA, V_{GE} = 0 V		1000			V
	BV_{CES} temperature coefficient			0.072		%/K
$V_{GE(th)}$	I_C = 500 µA, V_{GE} = V_{GE}		2.5		5.5	V
	$V_{GE(th)}$ temperature coefficient			-0.192		%/K
I_{CES}	V_{CE} = 0.8, V_{CES}	T_J = 25°C			300	µA
	V_{GE} = 0 V	T_J = 125°C			5	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = I_{CE90}, V_{GE} = 15	12N100U1			3.5	V
		12N100AU1			4.0	V

TO-247AD



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

Features

- International standard packages JEDEC TO-247
- IGBT with antiparallel FRED in one package
- HDMOS™ process
- Low $V_{CE(sat)}$
  - for minimum on-state conduction losses
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
  - soft recovery with low I_{RM}

Applications

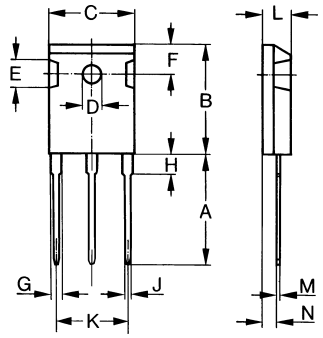
- DC choppers
- AC motor speed control
- DC servo and robot drives
- Uninterruptible power supplies (UPS)
- Switch-mode and resonant-mode power supplies

Advantages

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

Symbol	Test Conditions (T_J = 25°C, unless otherwise specified)		Characteristic Values Min.	Typ.	Max.	
g_{fs}	$I_C = I_{C90}$; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %		6	10		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1MHz			750		pF
C_{oes}				120		pF
C_{res}				30		pF
Q_g	$I_C = I_{C90}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}			65	90	nC
Q_{ge}				8	20	nC
Q_{gc}				24	45	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**			100		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 300 µH			200		ns
$t_{d(off)}$	V_{CE} = 800 V, $R_G = R_{off}$ = 120 Ω			850	1000	ns
t_{fi}	Remarks: Switching times may	12N100U1		800	1000	ns
	increase for V_{CE} (Clamp) > 0.8 V_{CES},	12N100AU1		500	700	ns
E_{off}	higher T_J or increased R_G	12N100U1		2.5		mJ
		12N100AU1		1.5	3.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**			100		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15 V, L = 300 µH			200		ns
$E_{(on)}$	V_{CE} = 800 V, $R_G = R_{off}$ = 120 Ω			1.1		mJ
$t_{d(off)}$	Remarks: Switching times may			900		ns
t_{fi}	increase for V_{CE} (Clamp) > 0.8 V_{CES},	12N100U1		1250		ns
	higher T_J or increased R_G	12N100AU1		950		ns
E_{off}		12N100U1		3.5		mJ
		12N100AU1		2.2		mJ
R_{thJC}					1.25	K/W
R_{thCK}				0.25		K/W

TO-247 AD (IXGH) Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	19.81	20.32	0.780	0.800
B	20.80	21.46	0.819	0.845
C	15.75	16.26	0.610	0.640
D	3.55	3.65	0.140	0.144
E	4.32	5.49	0.170	0.216
F	5.4	6.2	0.212	0.244
G	1.65	2.13	0.065	0.084
H	-	4.5	-	0.177
J	1.0	1.4	0.040	0.055
K	10.8	11.0	0.426	0.433
L	4.7	5.3	0.185	0.209
M	0.4	0.8	0.016	0.031
N	1.5	2.49	0.087	0.102

Reverse Diode (FRED) **Characteristic Values**
(T_J = 25°C, unless otherwise specified)

Symbol	Test Conditions		Min.	Typ.	Max.	
V_F	I_F =8A, V_{GE} = 0 V, Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %				2.75	V
I_{RM}	$I_F = I_{C90}$, V_{GE} = 0 V, -di_F/dt = 100 A/µs			6.5		A
t_{rr}	V_R = 540 V	T_J = 125°C		120		ns
	I_F = 1 A, -di/dt = 50 A/µs, V_R = 30 V	T_J = 25°C		50	60	ns
R_{thJC}					2.5	K/W

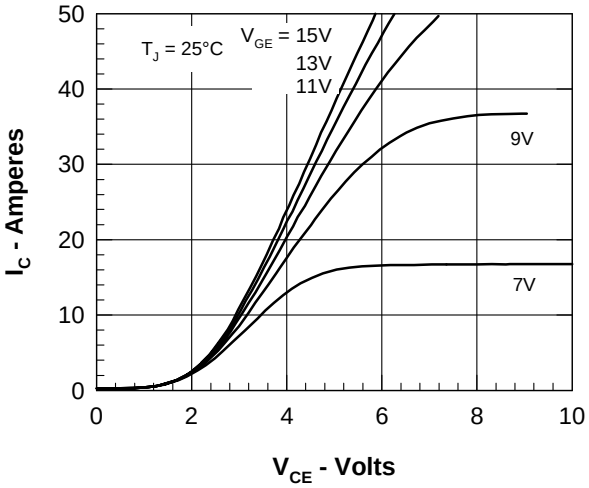


Figure 1. Saturation Voltage Characteristics

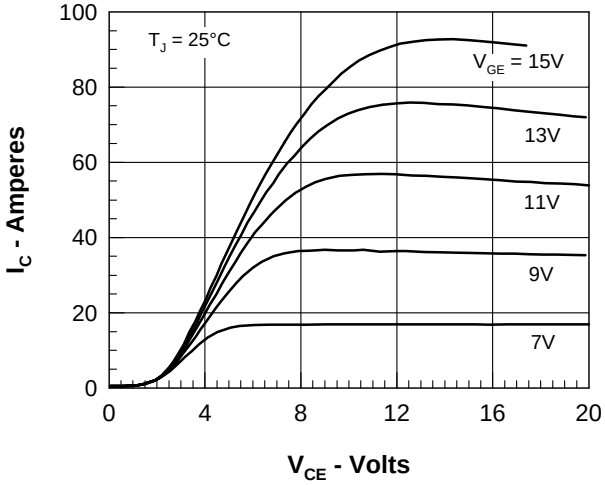


Figure 2. Extended Output Characteristics

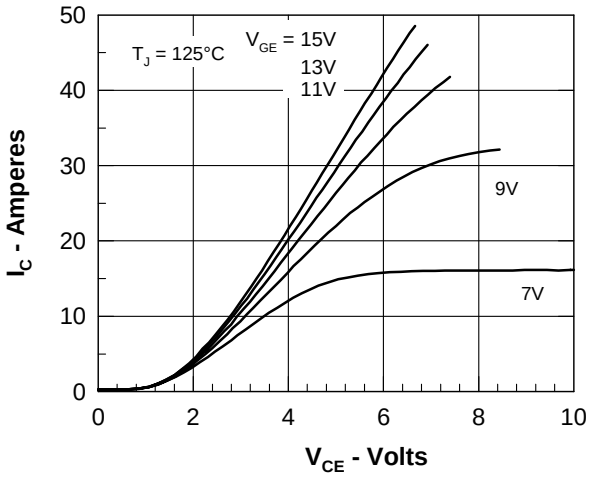


Figure 3. Saturation Voltage Characteristics

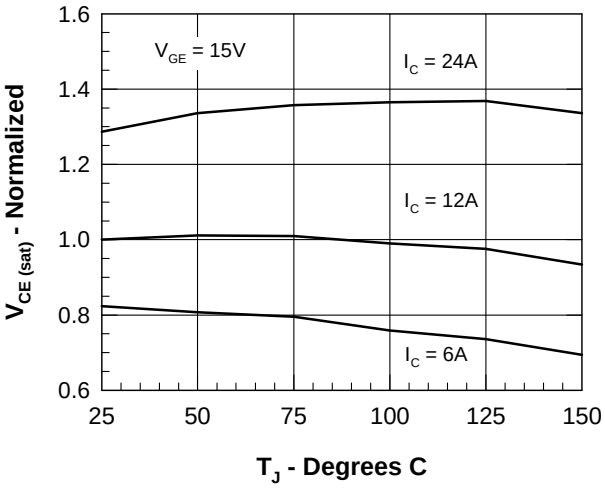


Figure 4. Temperature Dependence of $V_{CE(sat)}$

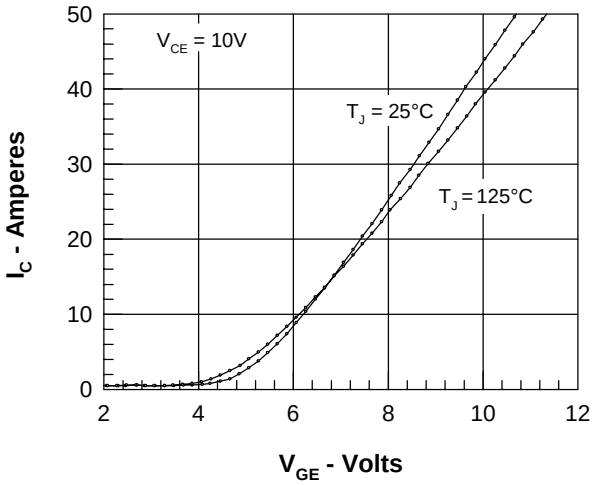


Figure 5. Admittance Curves

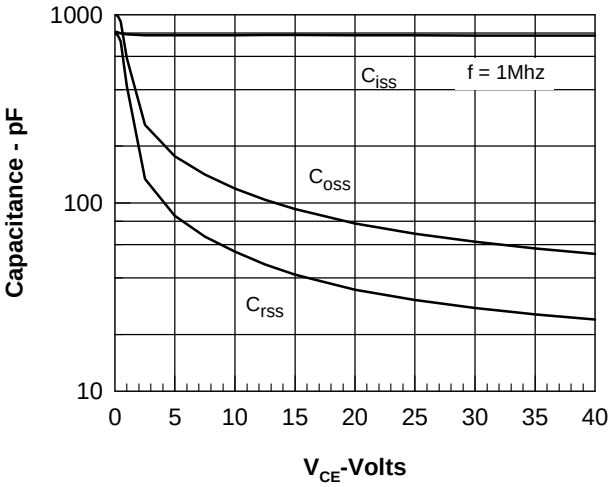


Figure 6. Capacitance Curves

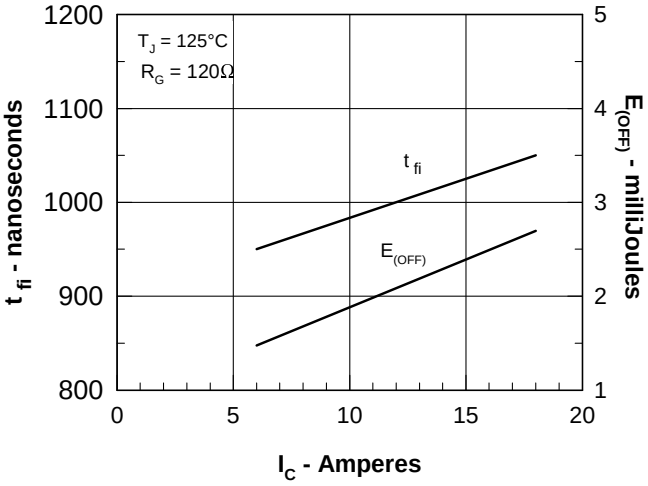


Figure 7. Dependence of tfi and E_{OFF} on I_C.

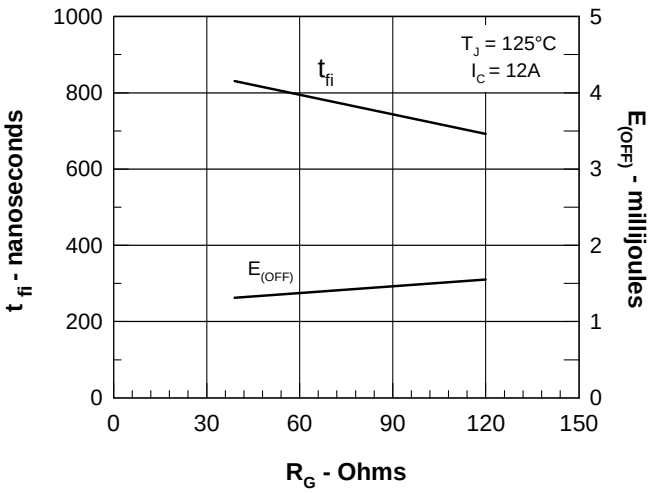


Figure 8. Dependence of tfi and E_{OFF} on R_G.

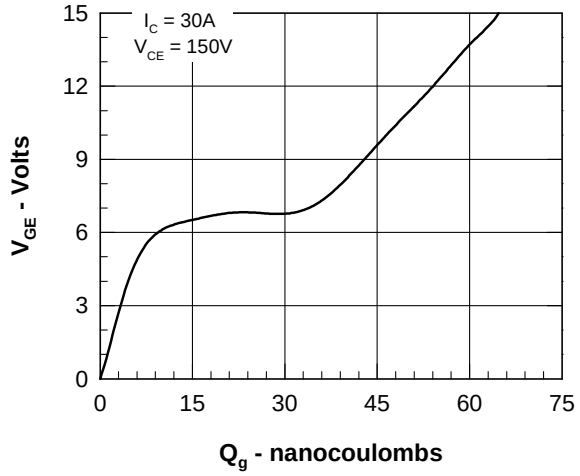


Figure 9. Gate Charge

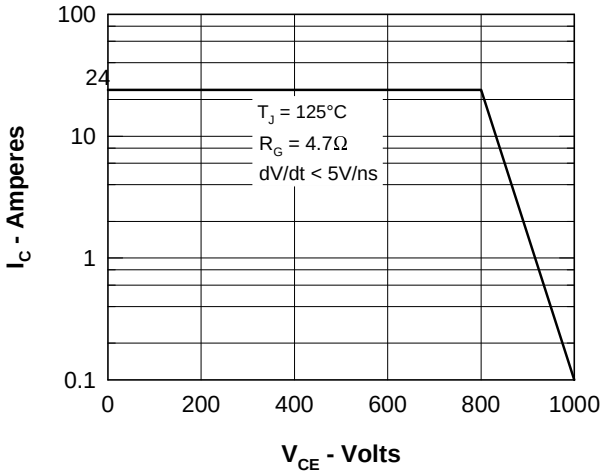


Figure 10. Turn-off Safe Operating Area

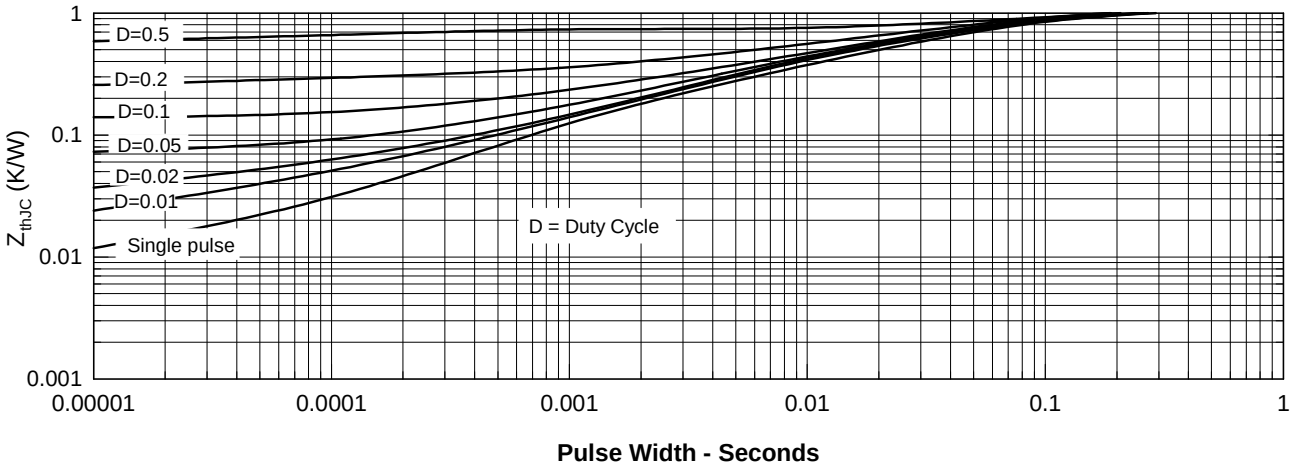


Figure 11. Transient Thermal Resistance

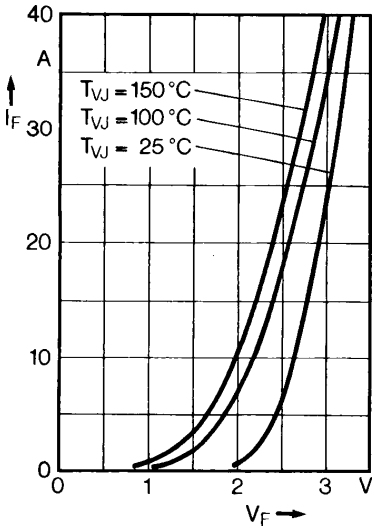


Fig. 12. Forward current versus voltage drop.

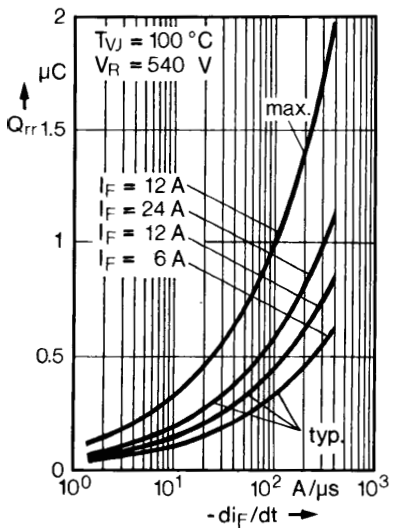


Fig. 13. Recovery charge versus $-di_F/dt$.

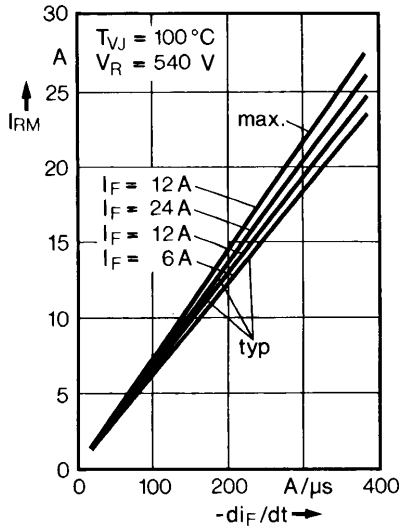


Fig. 14. Peak reverse current versus $-di_F/dt$.

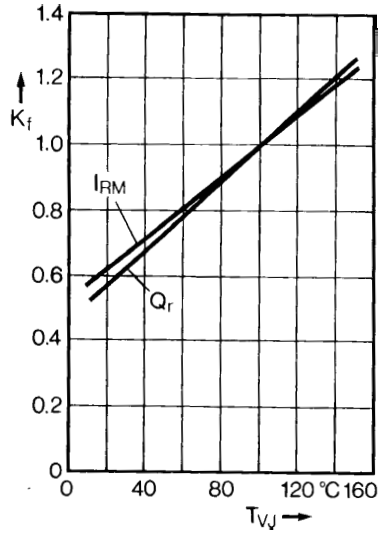


Fig. 15. Dynamic parameters versus junction temperature.

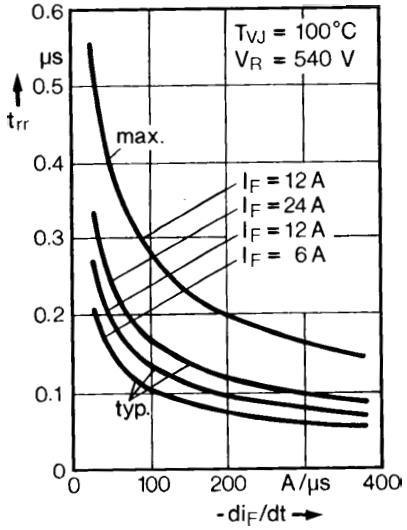


Fig. 16. Reverse recovery time . versus $-di_F/dt$

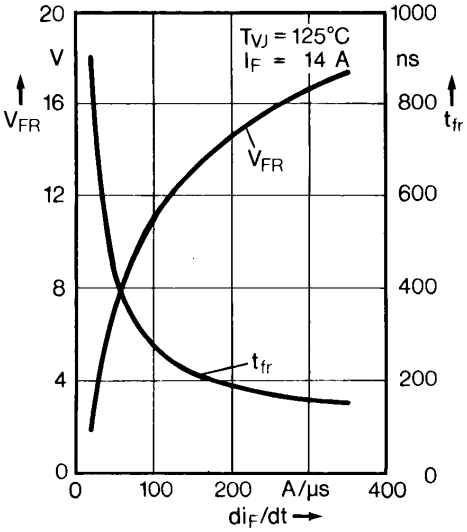


Fig. 17. Forward voltage recovery and time versus $-di_F/dt$.

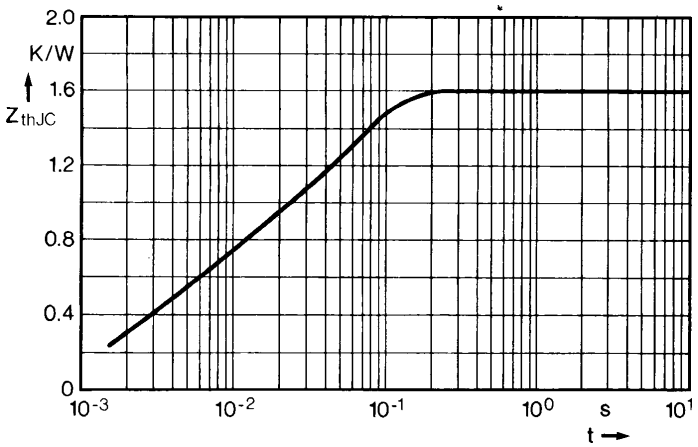


Fig. 18. Transient thermal impedance junction to case.