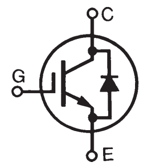
IXYS

High Voltage IGBT with Diode

IXGH 20N120BD1
IXGT 20N120BD1

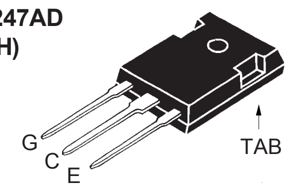
V_{CES}	=	1200	V
I_{C25}	=	40	A
$V_{CE(sat)}$	=	3.4	V
$t_{fi(typ)}$	=	160	ns

Preliminary Data Sheet

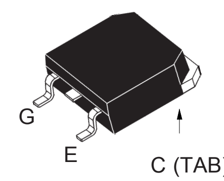


Symbol	Test Conditions		Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C		1200	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ		1200	V
V_{GES}	Continuous		±20	V
V_{GEM}	Transient		±30	V
I_{C25}	T_C = 25°C		40	A
I_{C110}	T_C = 110°C		20	A
I_{CM}	T_C = 25°C, 1 ms		100	A
SSOA (RBSOA)	V_{GE} = 15 V, T_J = 125°C, R_G = 10 Ω Clamped inductive load		I_{CM} = 80 @0.8 V_{CES}	A
P_C	T_C = 25°C		190	W
T_J			-55 ... +150	°C
T_{JM}			150	°C
T_{stg}			-55 ... +150	°C
M_d	Mounting torque	(TO-247)	1.13/10 Nm/lb.in.	
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s			300	°C
Maximum tab temperature soldering SMD devices for 10s			260	°C
Weight		TO-247AD/TO-268	6/4	g

TO-247AD (IXGH)



TO-268 (IXGT)



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

Features

- International standard packages: JEDEC TO-247AD & TO-268
- IGBT and anti-parallel FRED for resonant power supplies
  - Induction heating
  - Rice cookers
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
  - soft recovery with low I_{RM}

Advantages

- Saves space (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 1 µA, V_{GE} = 0 V		1200			V
$V_{GE(th)}$	I_C = 250 µA, V_{CE} = V_{GE}		2.5		5.0	V
I_{CES}	V_{CE} = V_{CES}	T_J = 25°C			150	µA
	V_{GE} = 0 V	T_J = 125°C		50		µA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15 V			2.9	3.4	V
	Note 2	T_J=125°C		2.8		V

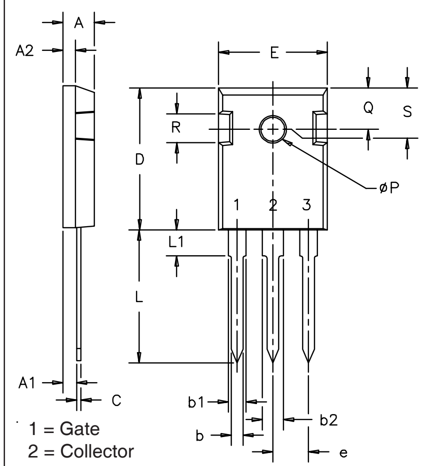
Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	I_C = 20A; V_{CE} = 10 V, Note 2.	12	18		S
C_{ies}			1700		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		105		pF
C_{res}			39		pF
Q_g			72		nC
Q_{ge}	I_C = 20A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		12		nC
Q_{gc}			27		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		25		ns
t_{ri}	I_C = 20 A; V_{GE} = 15 V		15		ns
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 10 Ω		150	280	ns
t_{fi}	Note 1.		160	320	ns
E_{off}			2.1	3.5	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		25		ns
t_{ri}	I_C = 20A; V_{GE} = 15 V		18		ns
E_{on}	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 10 Ω		1.9		mJ
$t_{d(off)}$	Note 1		270		ns
t_{fi}			360		ns
E_{off}			3.5		mJ
R_{thJC}				0.65	K/W
R_{thCK}	(TO-247)		0.25		K/W

Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
V_F	I_F = 10 A, V_{GE} = 0 V			3.3	V
I_F	T_C = 90°C			10	A
I_{RM}	I_F = 10 A; $-di_F/dt$ = 400 A/µs, V_R = 600 V		14		A
t_{rr}	V_{GE} = 0 V; T_J = 125°C		120		ns
t_{rr}	I_F = 1 A; $-di_F/dt$ = 100 A/µs; V_R = 30 V, V_{GE} = 0 V		40		ns
R_{thJC}				2.5	K/W

Notes:
1. Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G.
2. Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %

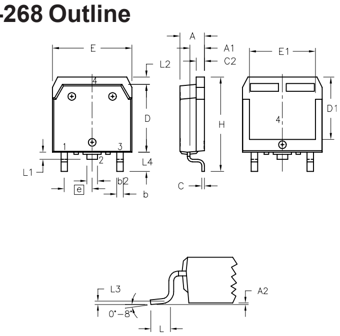
TO-247 AD Outline



1 = Gate
2 = Collector
3 = Emitter
Tab = Collector

SYM	INCHES MIN	MAX	MILLIMETERS MIN	MAX
A	.185	.209	4.7	5.3
A_1	.087	.102	2.2	2.54
A_2	.059	.098	2.2	2.6
b	.040	.055	1.0	1.4
b_1	.065	.084	1.65	2.13
b_2	.113	.123	2.87	3.12
C	.016	.031	.4	.8
D	.819	.845	20.80	21.46
E	.610	.640	15.75	16.26
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1		.177		4.50
øP	.140	.144	3.55	3.65
Q	.212	.244	5.4	6.2
R	.170	.216	4.32	5.49
S	.242 BSC		6.15 BSC	

TO-268 Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.9	5.1	.193	.201
A_1	2.7	2.9	.106	.114
A_2	.02	.25	.001	.010
b	1.15	1.45	.045	.057
b_2	1.9	2.1	.75	.83
C	.4	.65	.016	.026
D	13.80	14.00	.543	.551
E	15.85	16.05	.624	.632
E_1	13.3	13.6	.524	.535
e	5.45 BSC		.215 BSC	
H	18.70	19.10	.736	.752
L	2.40	2.70	.094	.106
L1	1.20	1.40	.047	.055
L2	1.00	1.15	.039	.045
L3	0.25 BSC		.010 BSC	
L4	3.80	4.10	.150	.161

Fig. 1. Output Characteristics @ 25 Deg. C

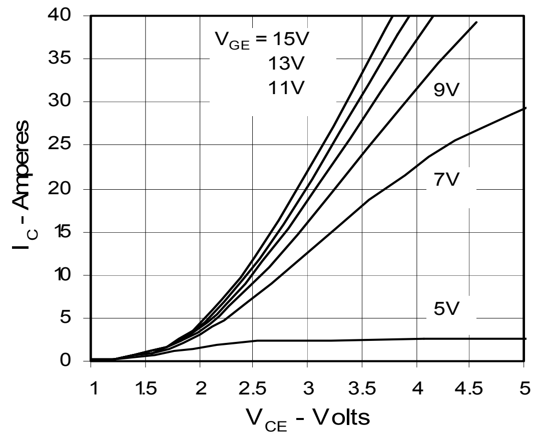


Fig. 2. Extended Output Characteristics @ 25 deg. C

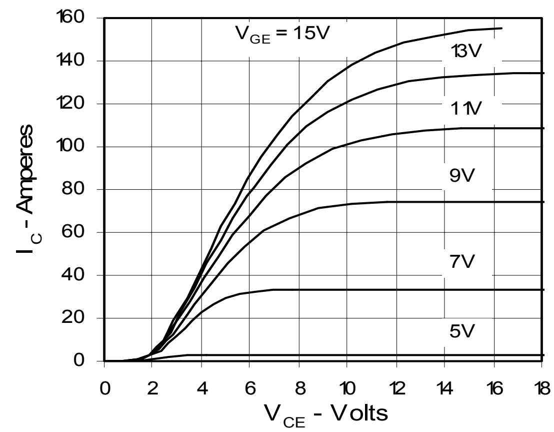


Fig. 3. Output Characteristics @ 125 Deg. C

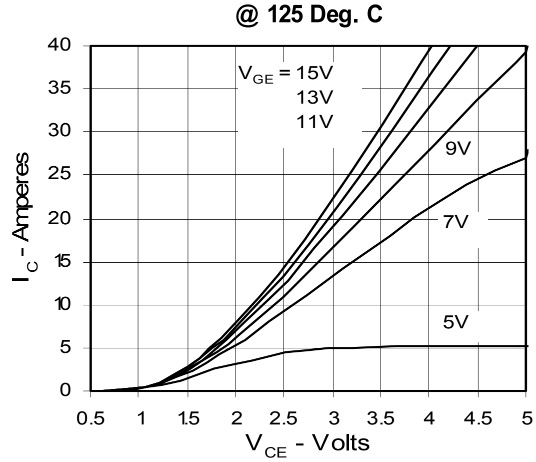


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

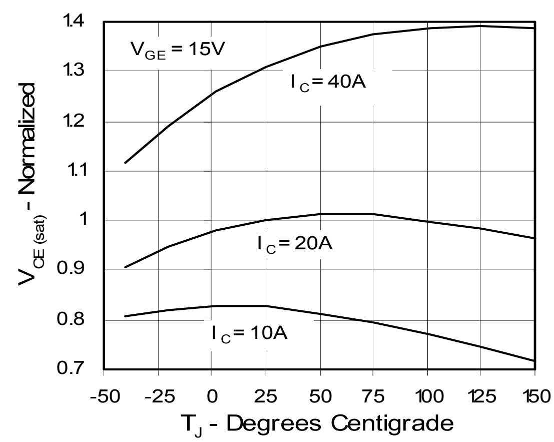


Fig. 5. Input Admittance

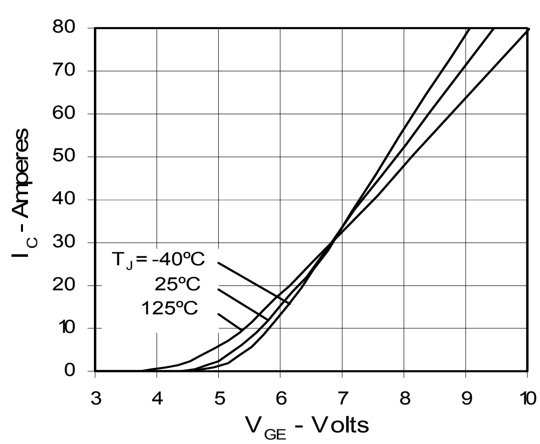


Fig. 6. Transconductance

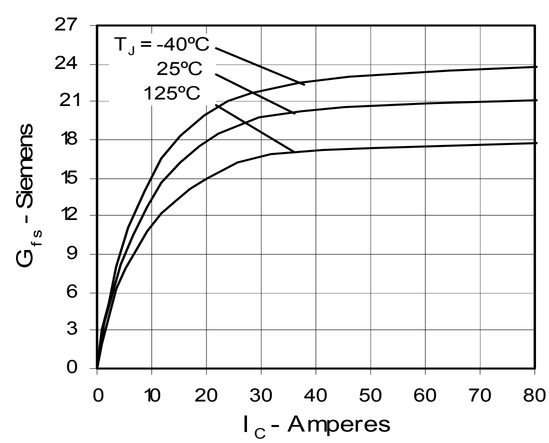


Fig. 7. Dependence of E_{off} on R_G

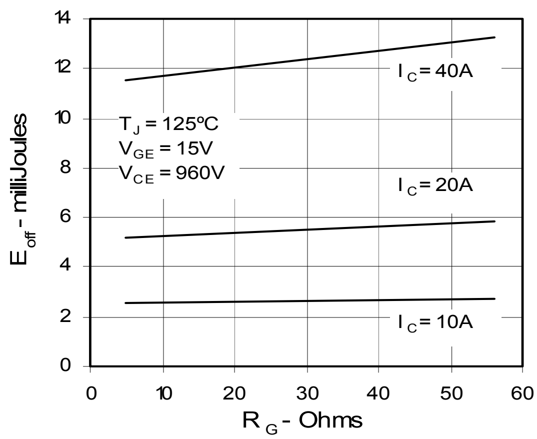


Fig. 8. Dependence of E_{off} on I_C

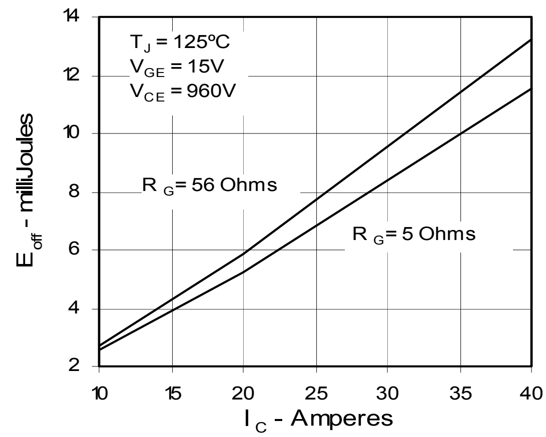


Fig. 9. Dependence of E_{off} on Temperature

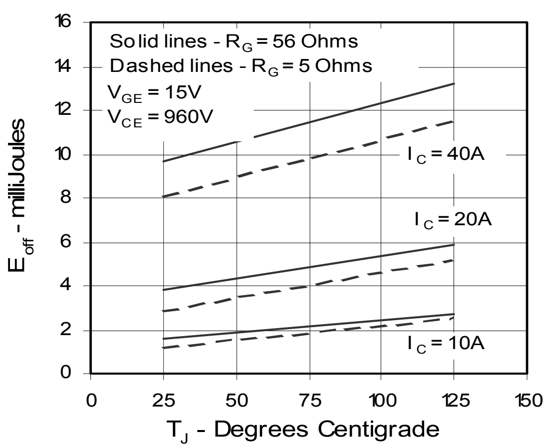


Fig. 10. Gate Charge

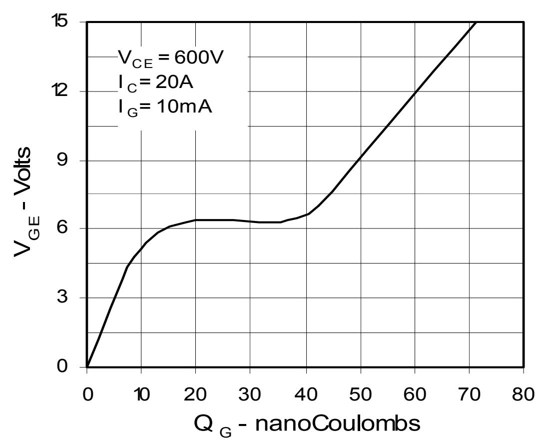


Fig. 11. Reverse-Bias Safe Operating Area

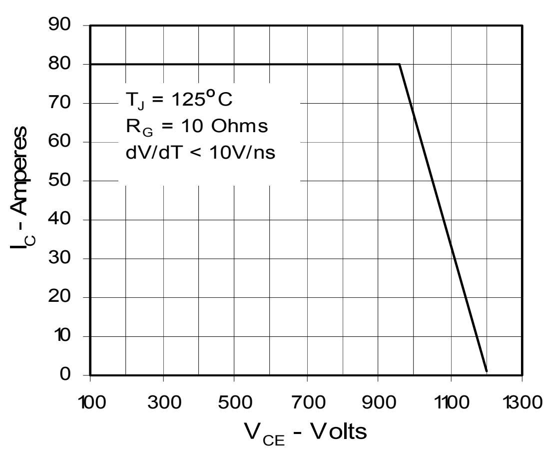
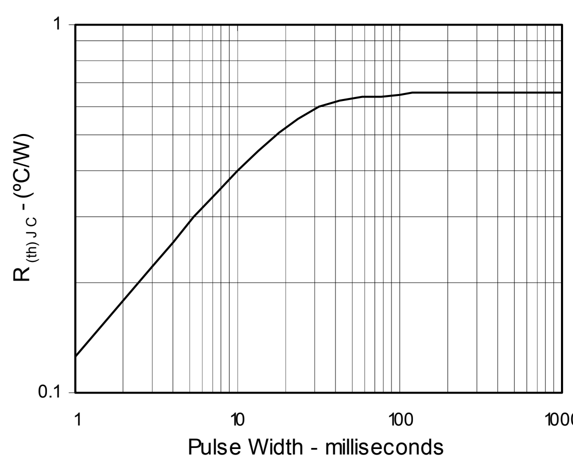


Fig. 12. Maximum Transient Thermal Resistance



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

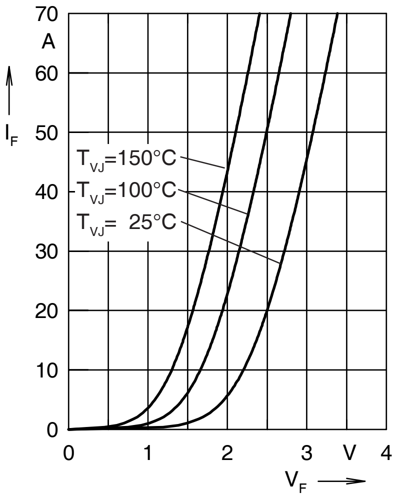


Fig. 13. Forward current I_F versus V_F

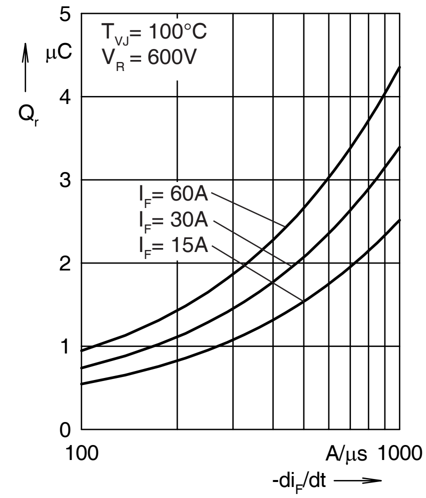


Fig. 14. Reverse recovery charge Q_r versus $-di_F/dt$

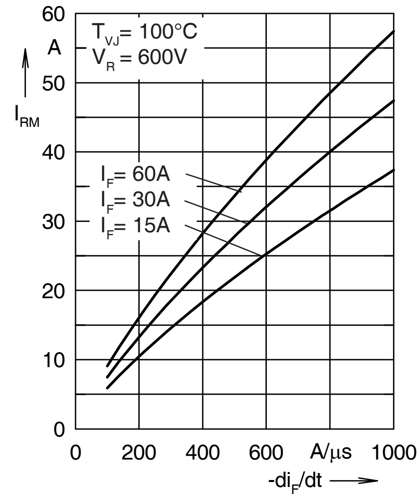


Fig. 15. Peak reverse current I_{RM} versus $-di_F/dt$

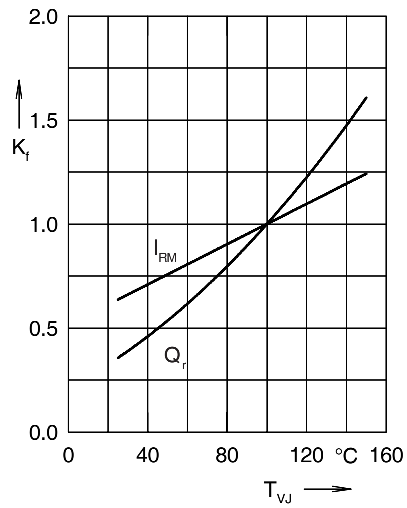


Fig. 16. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

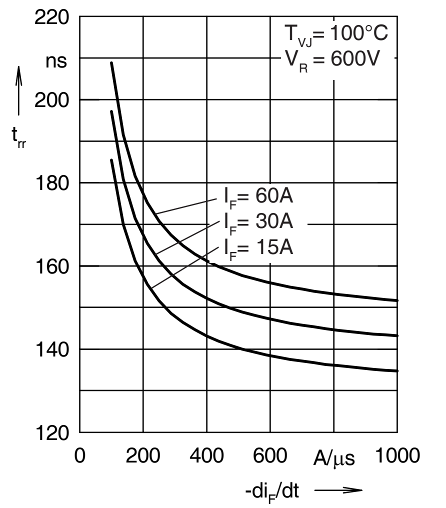


Fig. 17. Recovery time t_{rr} versus $-di_F/dt$

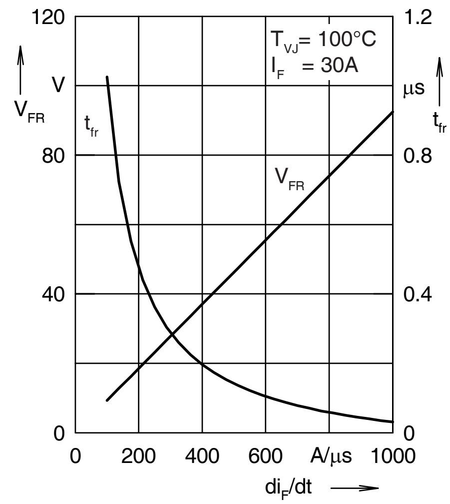


Fig. 18. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

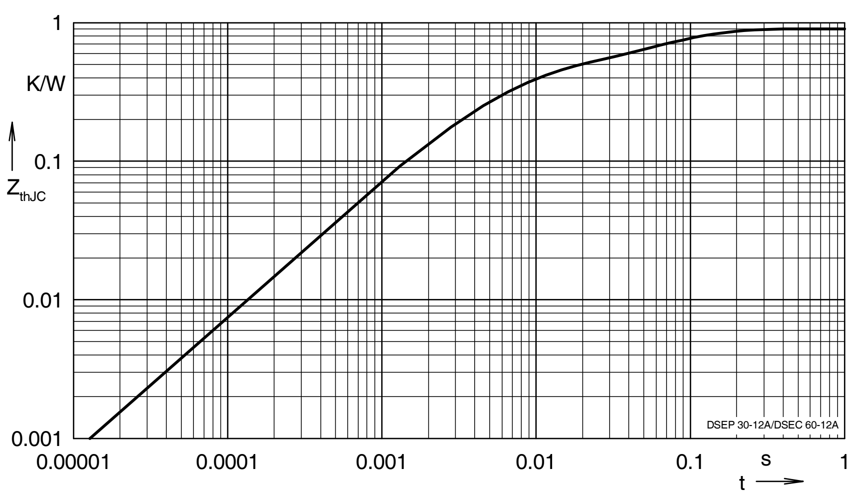


Fig. 19. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0397