IXYS

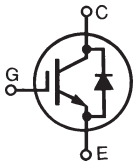
Preliminary Technical Information

High Voltage Co-Pack IGBT

Avalanche Rated

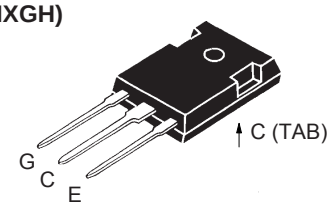
IXGH28N140B3H1
IXGK28N140B3H1
IXGX28N140B3H1

V_{CES} = 1400 V
I_{C25} = 60 A
$V_{CE(sat)}$ ≤ 3.6 V

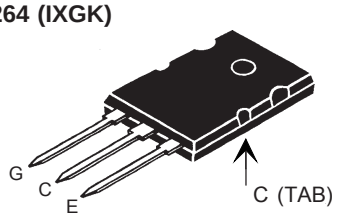


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1400	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	1400	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C (limited by leads)	60	A
I_{C110}	T_C = 110°C (IGBT)	28	A
I_{F110}	T_C = 110°C (Diode)	15	A
I_{CM}	T_C = 25°C, 1 ms	150	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load @1400V	I_{CM} = 120	A
I_{AS}	T_C = 25°C	28	A
E_{AS}		360	mJ
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	1.6 mm (0.062 in.) from case for 10 s	300	°C
T_{SOLD}	Plastic body for 10 seconds	260	°C
M_d	Mounting torque (TO-247, TO-264)	1.13/10	Nm/lb.in.
F_C	Mounting force (PLUS247)	20..120 / 4.5..25	N/lb
Weight	TO-247 & PLUS247 TO-264	6 10	g g

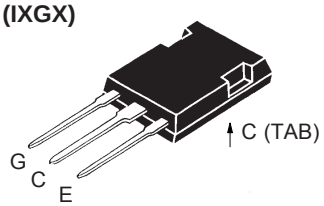
TO-247 (IXGH)



TO-264 (IXGK)



PLUS247 (IXGX)



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

Symbol (T_J = 25°C unless otherwise specified)	Test Conditions	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250 μA	1400			V
$V_{GE(th)}$	I_C = 250 μA, V_{CE} = V_{GE}	3.0		5.0	V
I_{CES}	V_{CE} = V_{CES} V_{GE} = 0 V T_J = 125°C			50 1	μA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ± 20 V			± 100	nA
$V_{CE(sat)}$	I_C = I_{C110}, V_{GE} = 15 V, Note 1 T_J = 125°C		3.0 3.05	3.6	V V

Features
- High frequency IGBT
- High current handling capability
- MOS Gate turn-on
  - drive simplicity

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

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	$I_C = I_{C110}$; V_{CE} = 10 V, Note 1	12	19		S
C_{ies}			2060		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		160		pF
C_{res}			60		pF
Q_g			88		nC
Q_{ge}	$I_C = I_{C110}$, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		12		nC
Q_{gc}			38		nC
$t_{d(on)}$			16		ns
t_{ri}	**Inductive load**		36		ns
E_{on}	$I_C = I_{C110}$, V_{GE} = 15 V		3.6		mJ
$t_{d(off)}$	V_{CE} = 960 V, $R_G = R_{off}$ = 5 Ω		190	400	ns
t_{fi}			360		ns
E_{off}			3.9	6.5	mJ
$t_{d(on)}$			16		ns
t_{ri}	**Inductive load, T_J = 125°C**		50		ns
E_{on}	$I_C = I_{C110}$, V_{GE} = 15 V		7.3		mJ
$t_{d(off)}$	V_{CE} = 960 V, $R_G = R_{off}$ = 5 Ω		215		ns
t_{fi}			700		ns
E_{off}			6.5		mJ
R_{thJC}				0.42	°C/W
R_{thCS}	TO-247		0.21		°C/W
	TO-264 & PLUS247		0.15		°C/W

Diode

Symbol	Conditions (T_J = 25°C unless otherwise specified)	Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 20 A; Note 1			3.0	V
	T_{VJ} = 150°C		2.65		V
I_{RM}	I_F = 20 A; di_F/dt = -200 A/µs; T_{VJ} = 125 °C		18.5		A
t_{rr}	V_R = 1200 V; V_{GE} = 0 V		350		ns
R_{thJC}				0.9	°C/W

Note 1: Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %

PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

Fig. 1. Output Characteristics @ 25ºC

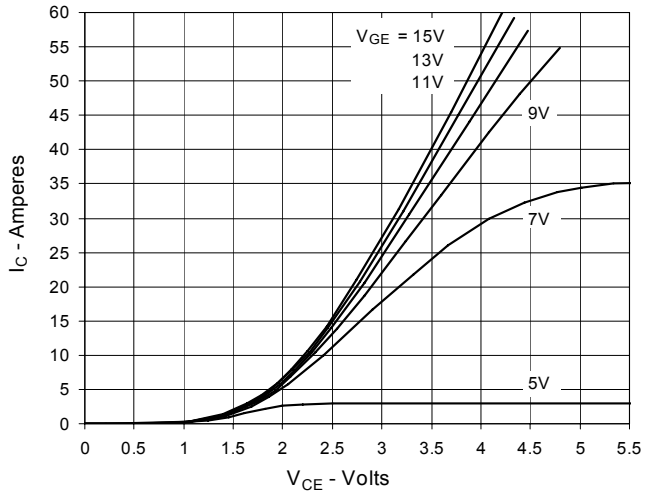


Fig. 2. Exteded Output Characteristics @ 25ºC

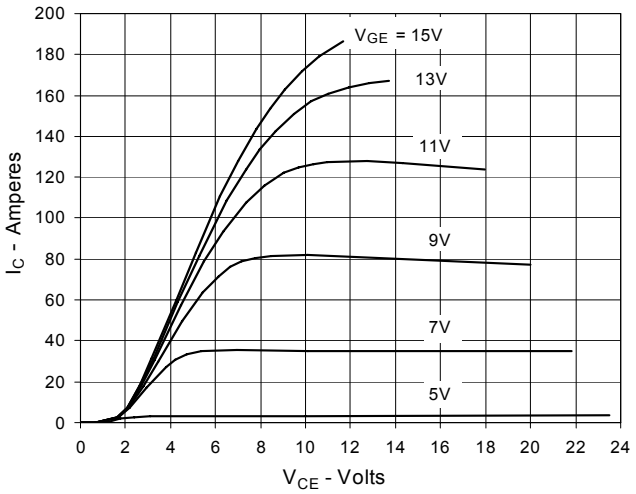


Fig. 3. Output Characteristics @ 125ºC

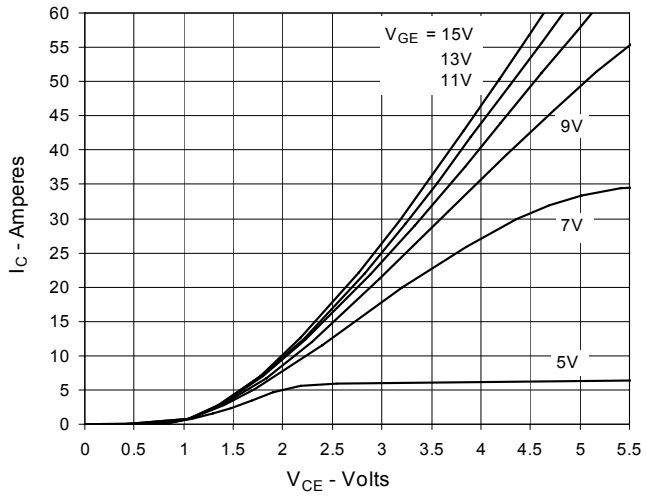


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

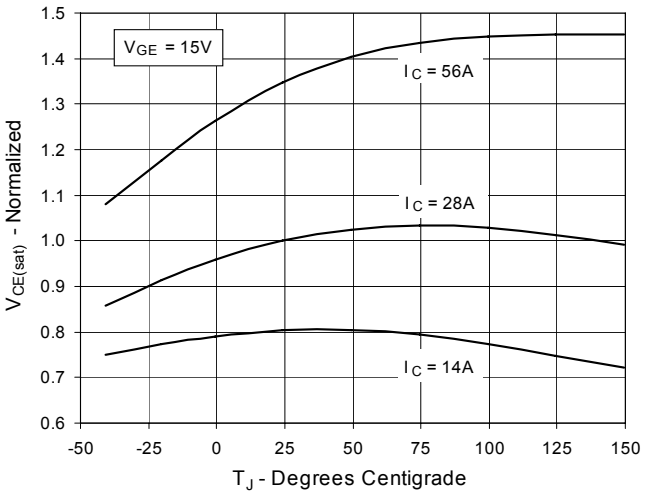


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

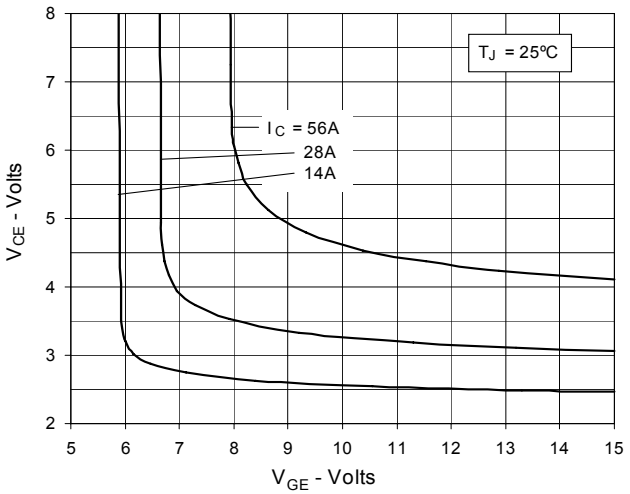


Fig. 6. Input Admittance

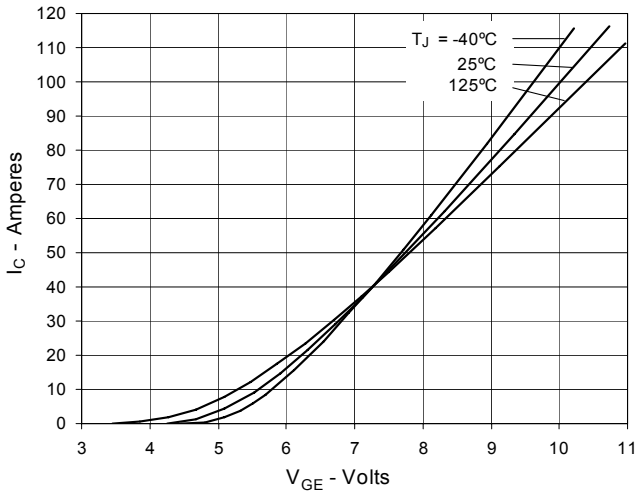


Fig. 7. Transconductance

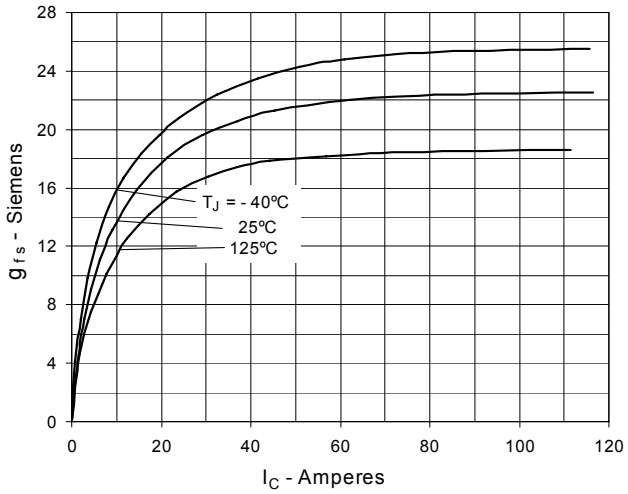


Fig. 8. Gate Charge

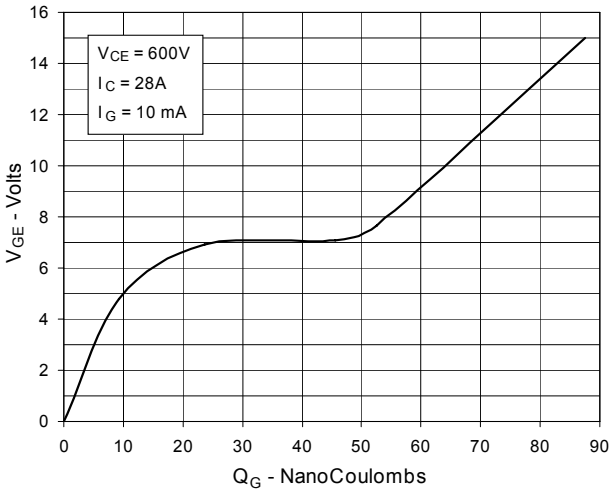


Fig. 9. Capacitance

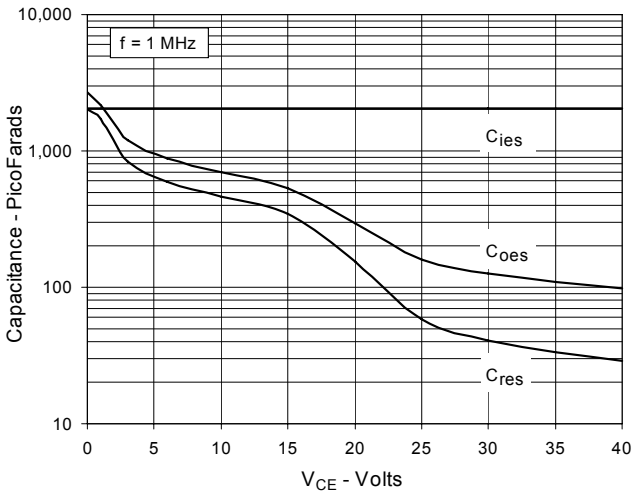


Fig. 10. Reverse-Bias Safe Operating Area

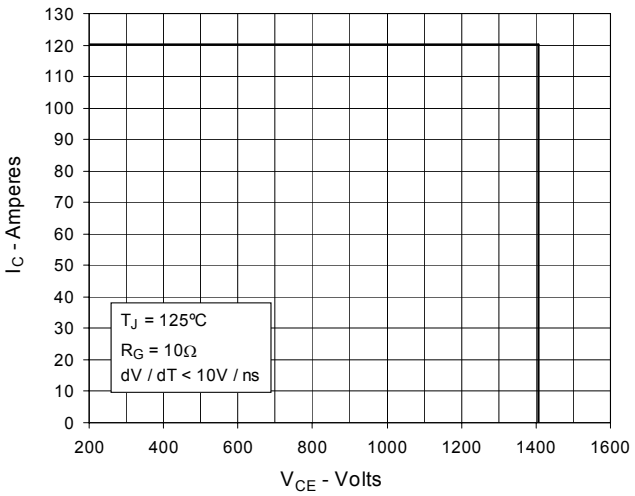


Fig. 11. Maximum Transient Thermal Resistance

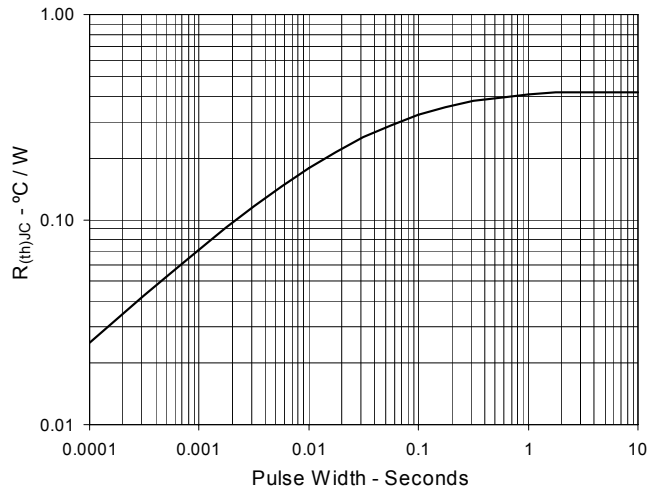


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

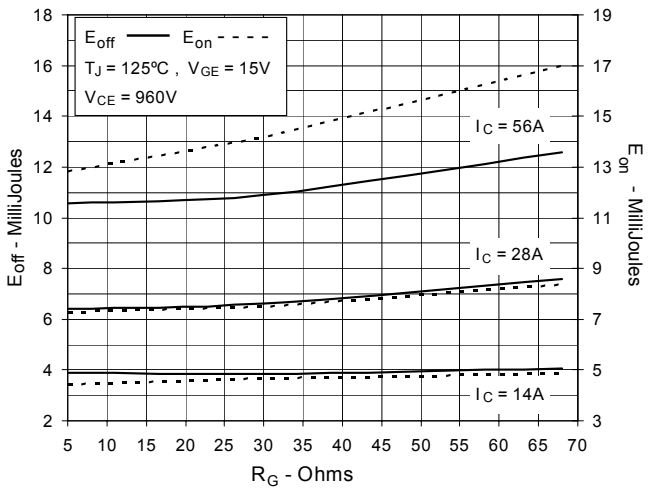


Fig. 13. Inductive Swiching Energy Loss vs. Collector Current

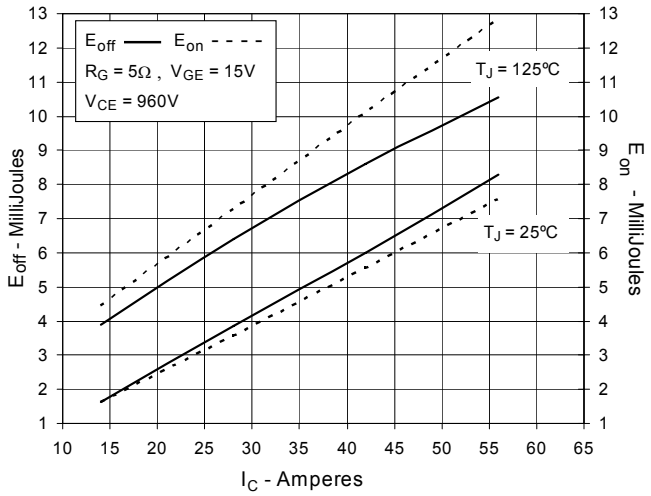


Fig. 14. Inductive Swiching Energy Loss vs. Junction Temperature

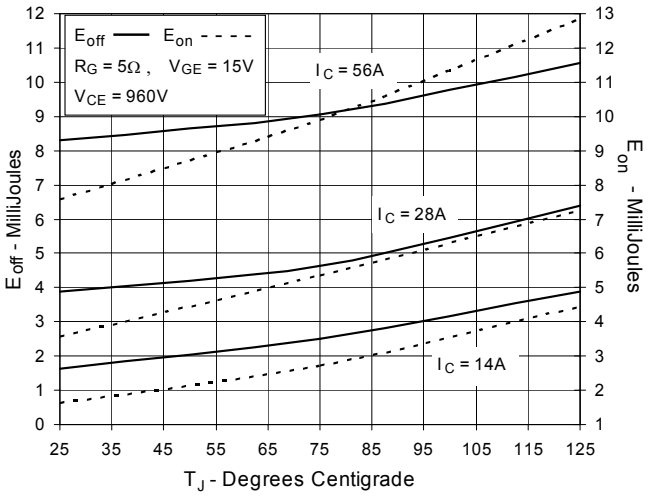


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

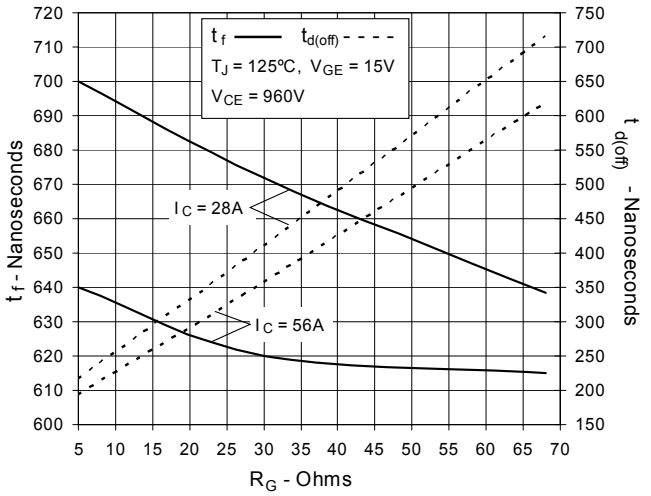


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

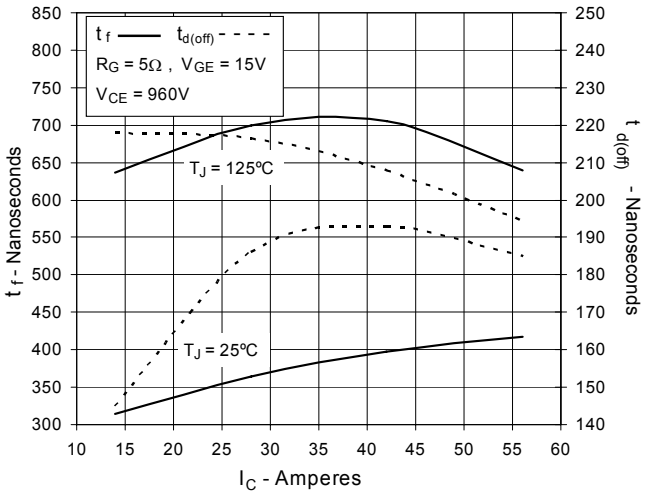


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

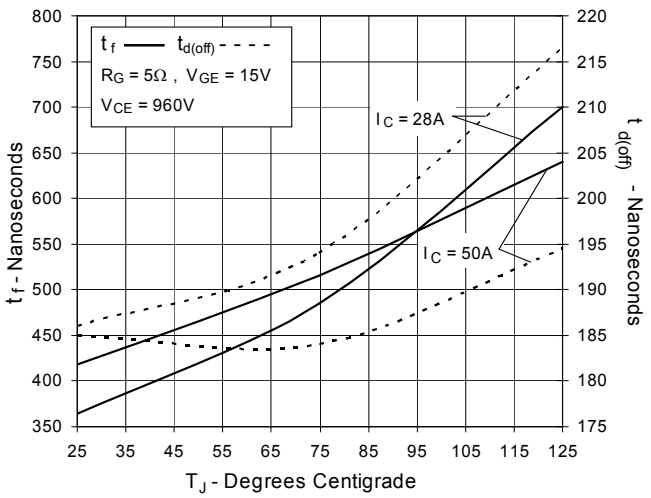


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

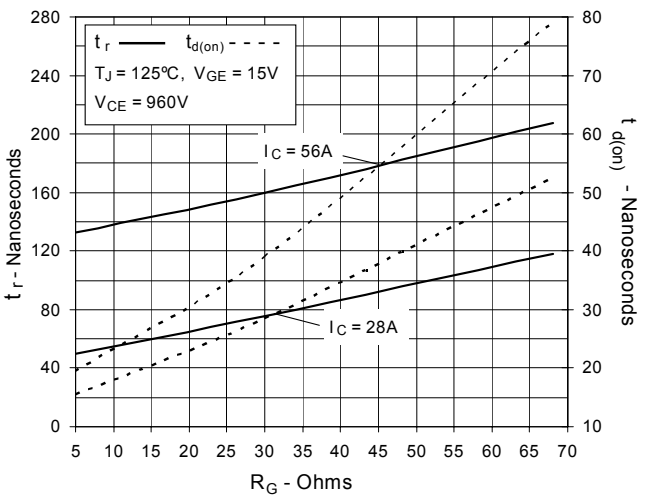


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

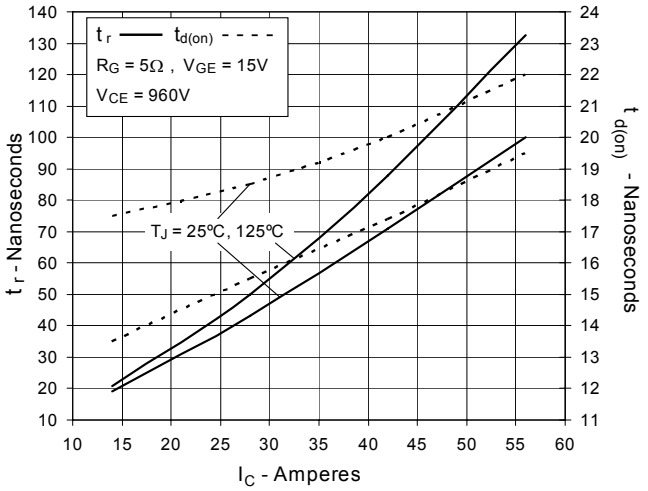
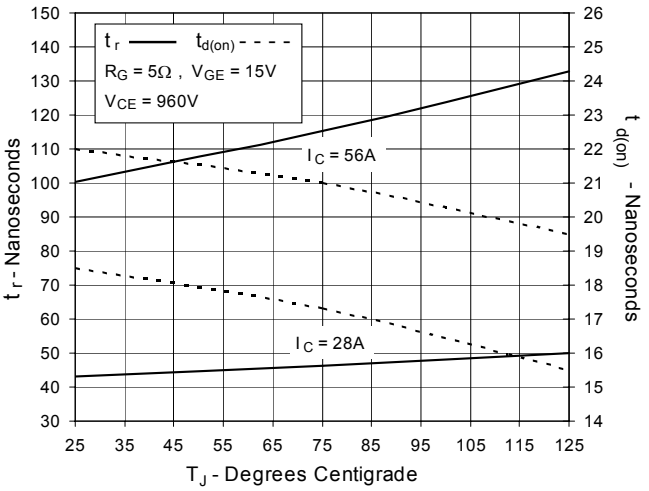


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



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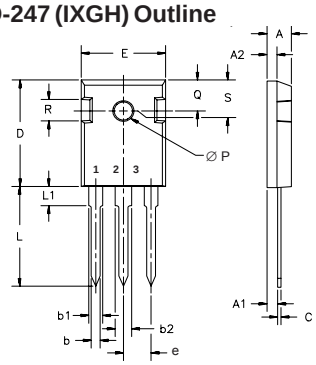
Package Outlines

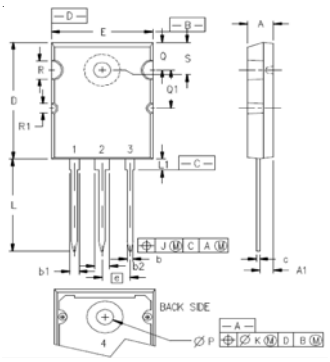
TO-247 (IXGH) Outline



Terminals: 1 - Gate 2 - Drain
3 - Source Tab - Drain

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.7	5.3	.185	.209
A_1	2.2	2.54	.087	.102
A_2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b_1	1.65	2.13	.065	.084
b_2	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
ØP	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15 BSC		242 BSC	

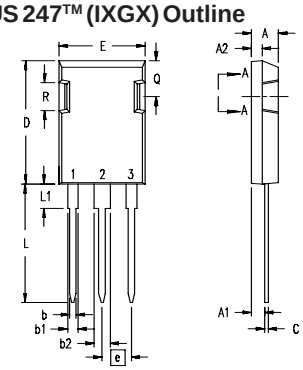
TO-264 (IXGK) Outline



1 – GATE
2, 4 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.209	4.70	5.31
A1	.102	.118	2.59	3.00
b	.037	.055	0.94	1.40
b1	.087	.102	2.21	2.59
b2	.110	.126	2.79	3.20
c	.017	.029	0.43	0.74
D	1.007	1.047	25.58	26.59
E	.760	.799	19.30	20.29
e	.215BSC		5.46 BSC	
J	.000	.010	0.00	0.25
K	.000	.010	0.00	0.25
L	.779	.842	19.79	21.39
L1	.087	.102	2.21	2.59
ØP	.122	.138	3.10	3.51
Q	.240	.256	6.10	6.50
Q1	.330	.346	8.38	8.79
ØR	.155	.187	3.94	4.75
ØR1	.085	.093	2.16	2.36
S	.243	.253	6.17	6.43

PLUS 247™ (IXGX) Outline



Terminals: 1 - Gate
2 - Drain (Collector)
3 - Source (Emitter)
4 - Drain (Collector)

Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A_1	2.29	2.54	.090	.100
A_2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b_1	1.91	2.13	.075	.084
b_2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	0.244
R	4.32	4.83	.170	.190