IXYS

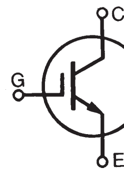
Advance Technical Information

XPT™ 650V IGBT GenX3™

IXYH120N65B3

V_{CES} = 650V
I_{C110} = 120A
$V_{CE(sat)}$ ≤ 1.90V
$t_{fi(typ)}$ = 107ns

Extreme Light Punch Through
IGBT for 10-30kHz Switching



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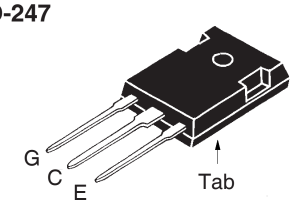


G = Gate C = Collector
E = Emitter Tab = Collector

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 175°C	650	V
V_{CGR}	T_J = 25°C to 175°C, R_{GE} = 1MΩ	650	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (Chip Capability)	340	A
I_{LRMS}	Terminal Current Limit	160	A
I_{C110}	T_C = 110°C	120	A
I_{CM}	T_C = 25°C, 1ms	760	A
I_A	T_C = 25°C	60	A
E_{AS}	T_C = 25°C	1	J
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 2Ω Clamped Inductive Load	I_{CM} = 240 $V_{CE} \le V_{CES}$	A
t_{sc} **(SCSOA)**	V_{GE} = 15V, V_{CE} = 400V, T_J = 150°C R_G = 82Ω, Non Repetitive	8	µs
P_C	T_C = 25°C	1360	W
T_J		-55 ... +175	°C
T_{JM}		175	°C
T_{stg}		-55 ... +175	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
M_d	Mounting Torque	1.13/10	Nm/lb.in
Weight		6	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250µA, V_{GE} = 0V	650			V
$V_{GE(th)}$	I_C = 250µA, V_{CE} = V_{GE}	3.5		6.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			25	µA
	T_J = 150°C			1	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 100A, V_{GE} = 15V, Note 1		1.55	1.90	V
	T_J = 150°C		1.77		V

Features

- Optimized for 10-30kHz Switching
- Square RBSOA
- Avalanche Rated
- Short Circuit Capability
- High Current Handling Capability
- International Standard Package

Advantages

- High Power Density
- Low Gate Drive Requirement

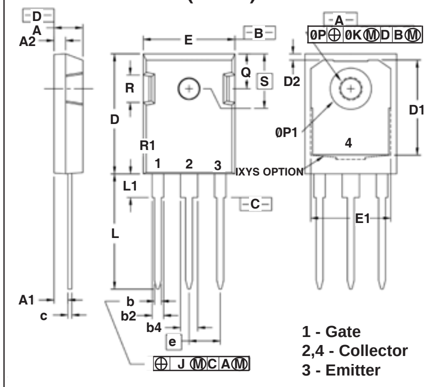
Applications

- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 60A, V_{CE} = 10V, Note 1	35	58		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		6900		pF
C_{oes}			393		pF
C_{res}			146		pF
$Q_{g(on)}$	I_C = 120A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		250		nC
Q_{ge}			52		nC
Q_{gc}			110		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		30		ns
t_{ri}	I_C = 50A, V_{GE} = 15V		28		ns
E_{on}	V_{CE} = 400V, R_G = 2Ω		1.34		mJ
$t_{d(off)}$	Note 2		168		ns
t_{fi}			107		ns
E_{off}			1.50		mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		30		ns
t_{ri}	I_C = 50A, V_{GE} = 15V		30		ns
E_{on}	V_{CE} = 400V, R_G = 2Ω		2.60		mJ
$t_{d(off)}$	Note 2		226		ns
t_{fi}			196		ns
E_{off}			2.20		mJ
R_{thJC}				0.11	°C/W
R_{thCS}			0.21		°C/W

Notes:
1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE}(clamp), T_J or R_G.

TO-247 (IXYH) Outline



Dim.	Millimeter min	Millimeter max	Inches min	Inches max
A	4.70	5.30	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
b4	2.59	3.43	0.102	0.135
c	0.38	0.89	0.015	0.035
D	20.79	21.45	0.819	0.845
D1	13.07	-	0.515	-
D2	0.51	1.35	0.020	0.053
E	15.48	16.24	0.610	0.640
E1	13.45	-	0.53	-
E2	4.31	5.48	0.170	0.216
e	5.45 BSC		0.215 BSC	
L	19.80	20.30	0.078	0.800
L1	-	4.49	-	0.177
Ø P	3.55	3.65	0.140	0.144
Ø P1	-	7.39	-	0.290
Q	5.38	6.19	0.212	0.244
S	6.14 BSC		0.242 BSC	

ADVANCE TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

Fig. 1. Output Characteristics @ T_J = 25ºC

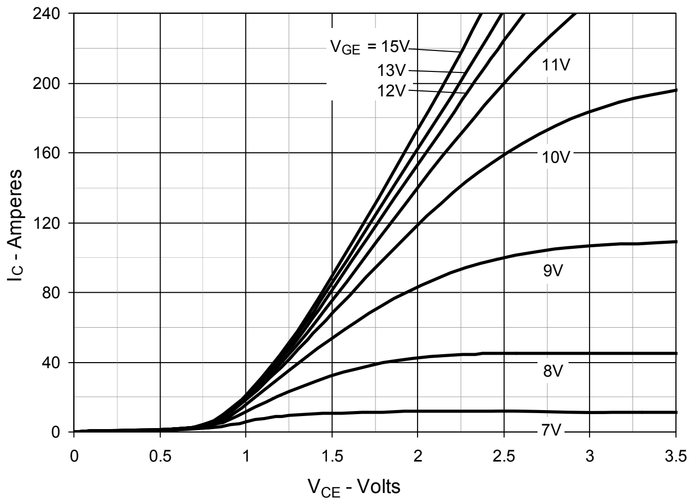


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

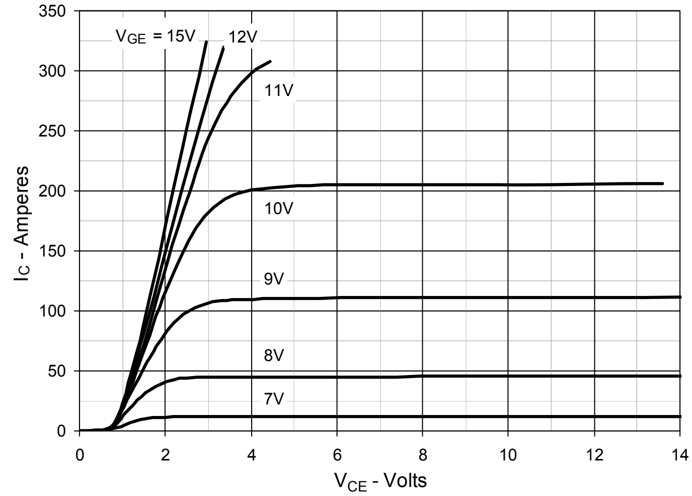


Fig. 3. Output Characteristics @ T_J = 150ºC

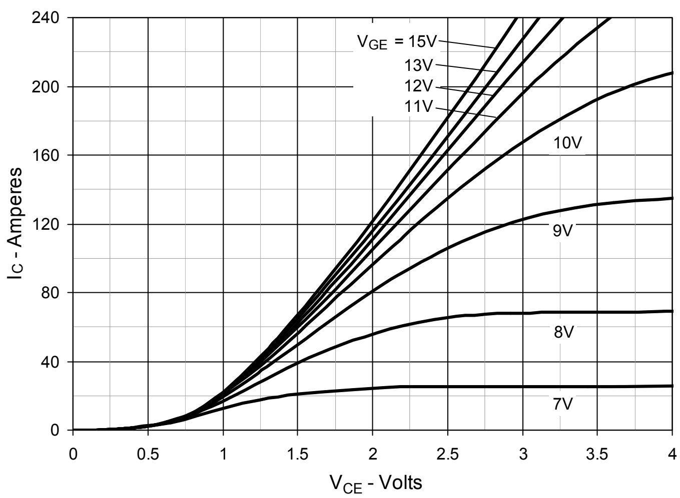


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

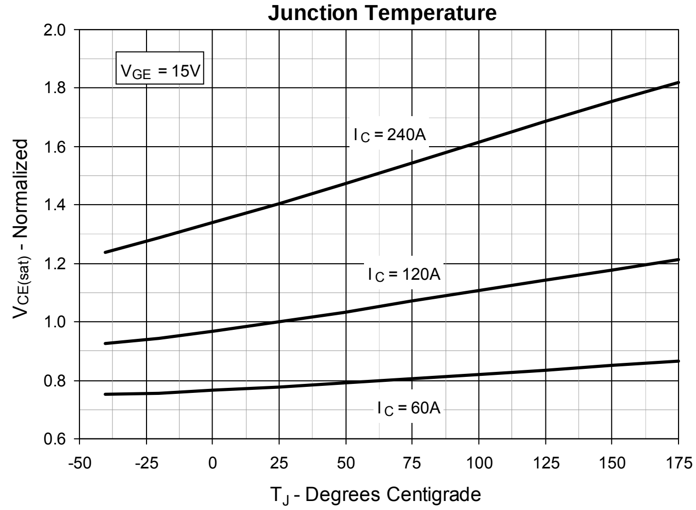


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

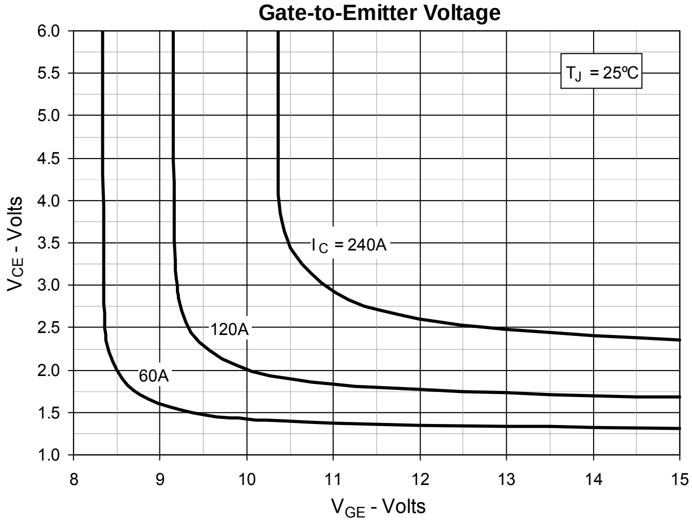
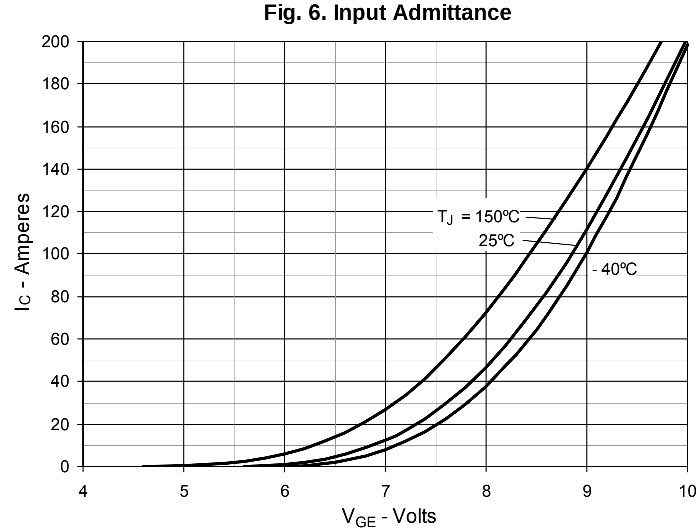
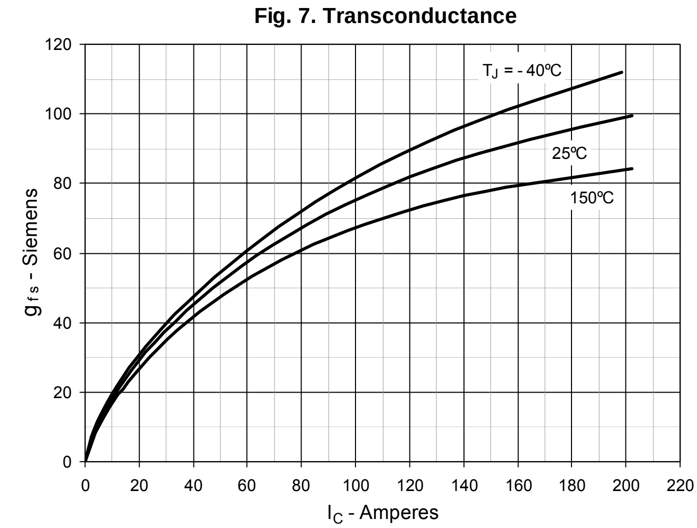
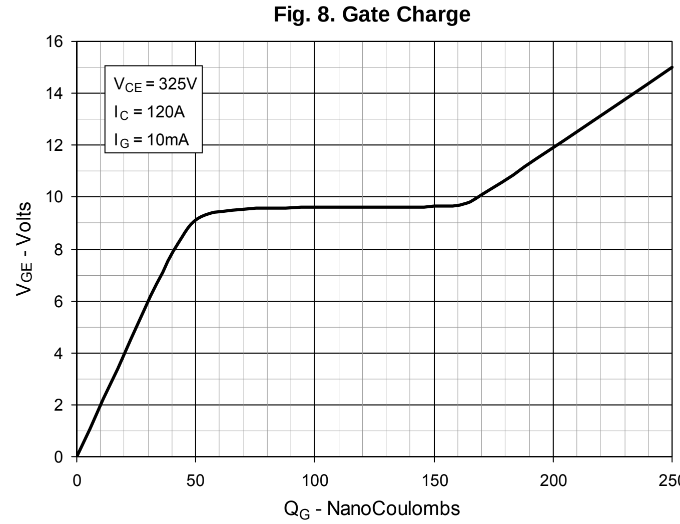
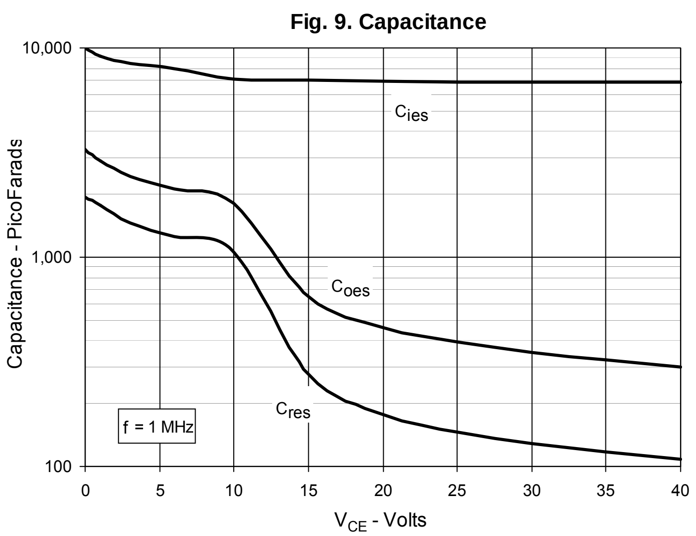


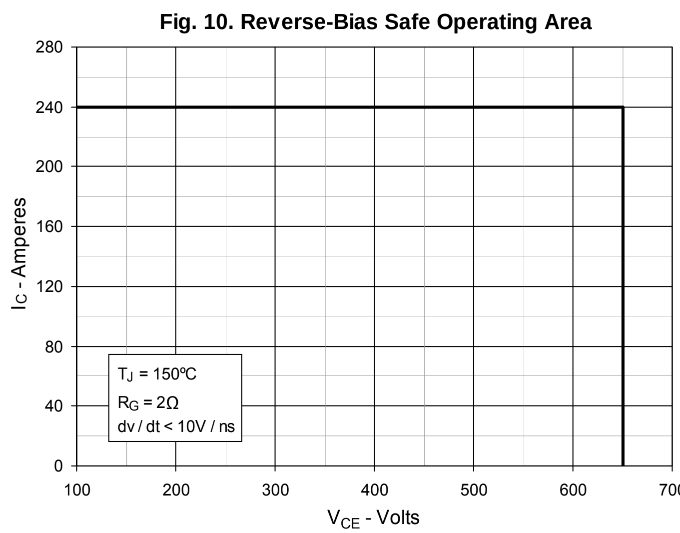
Fig. 6. Input Admittance

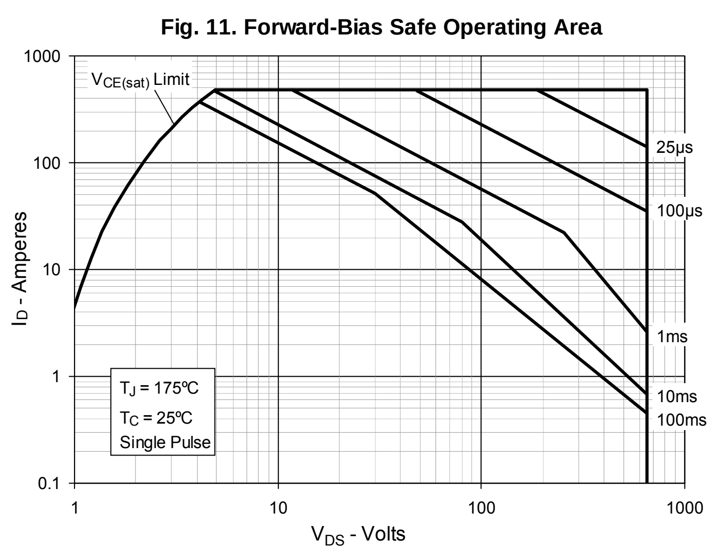


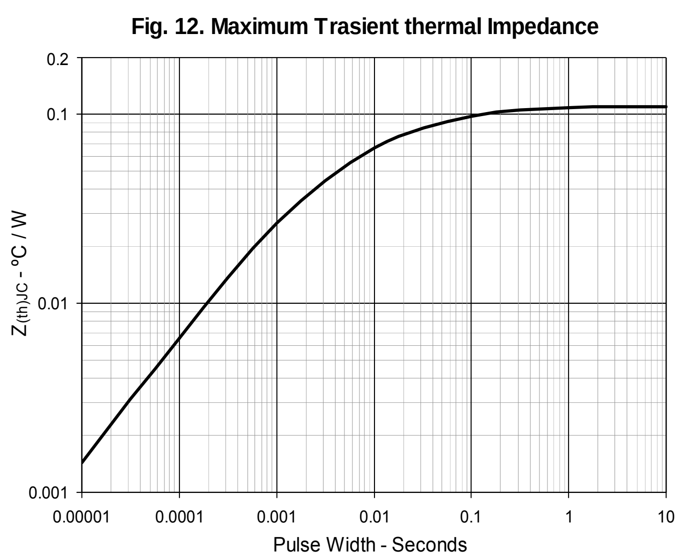












IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

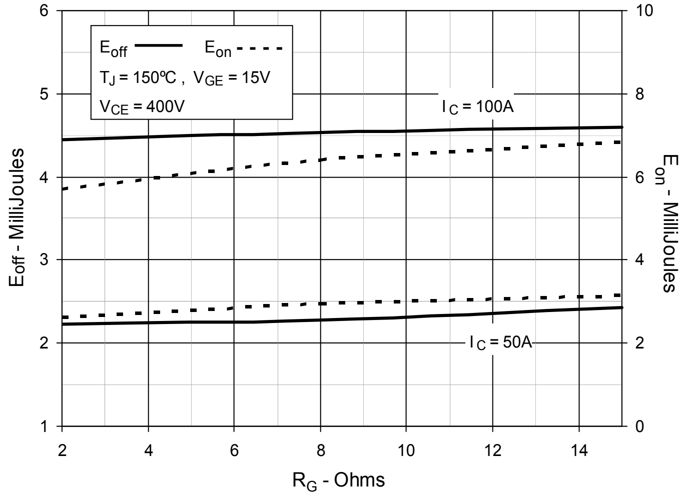


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

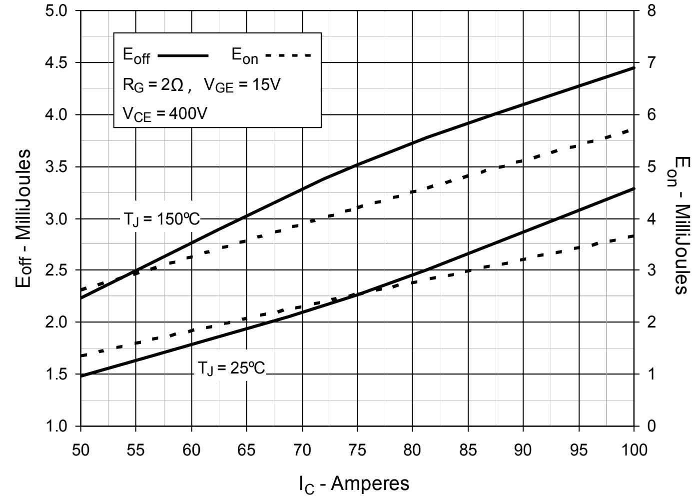


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

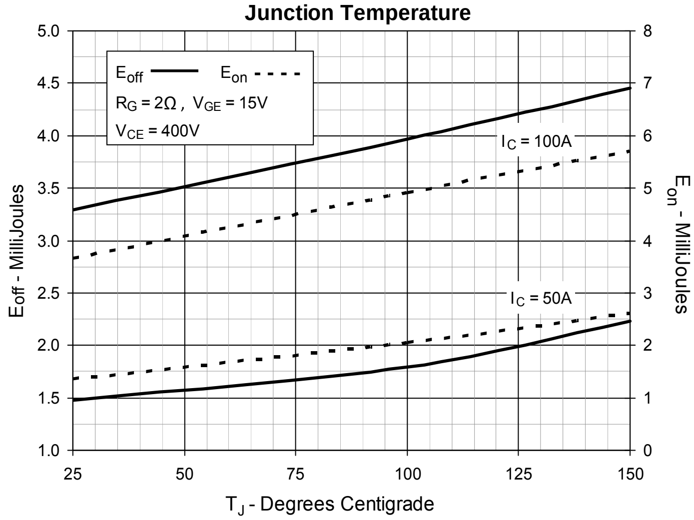


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

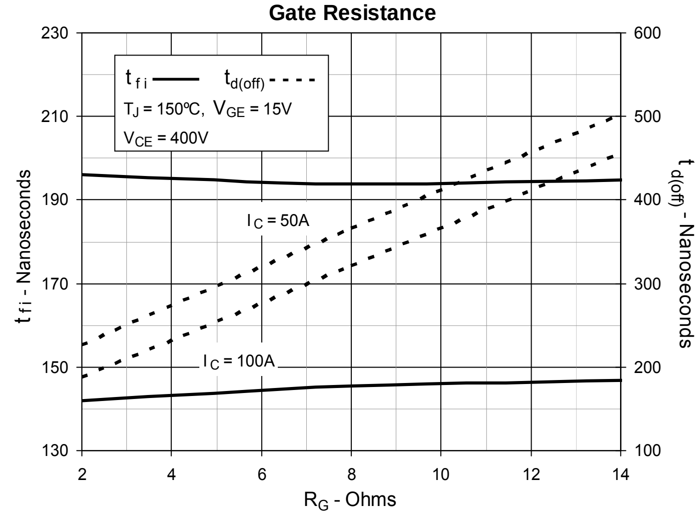


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

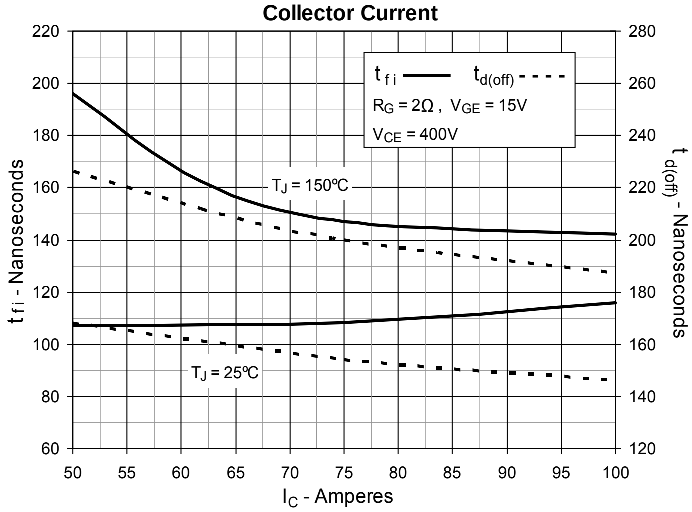
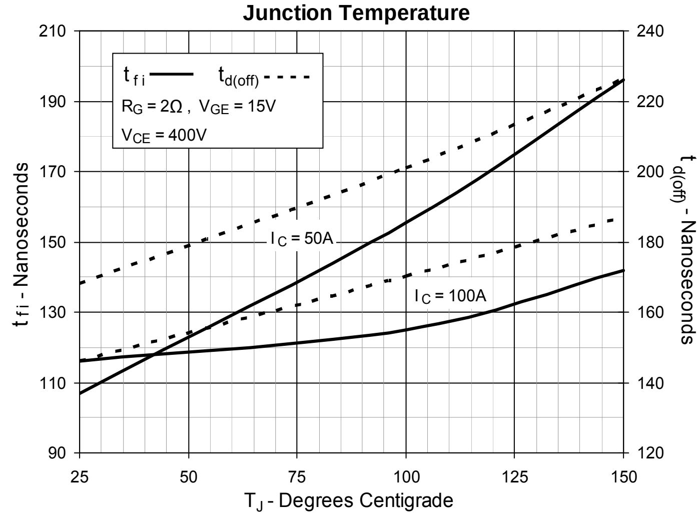


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature



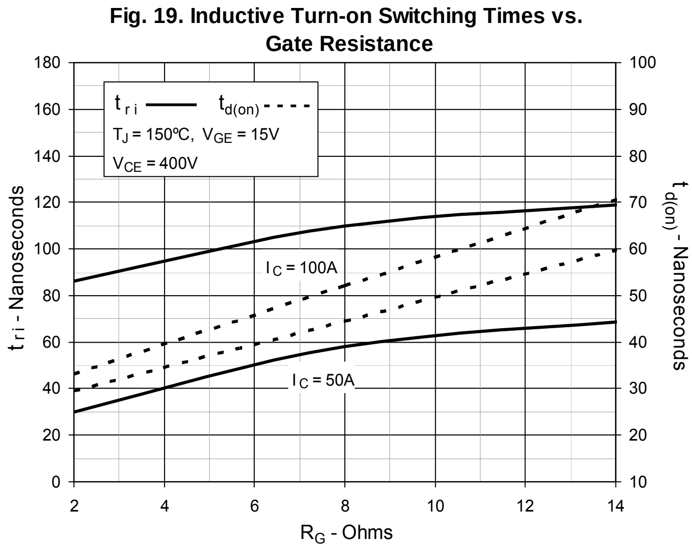


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance
t r i
t d(on)
T J = 150ºC, V GE = 15V
V CE = 400V
I C = 100A
I C = 50A
t r i - Nanoseconds
t d(on) - Nanoseconds
R G - Ohms

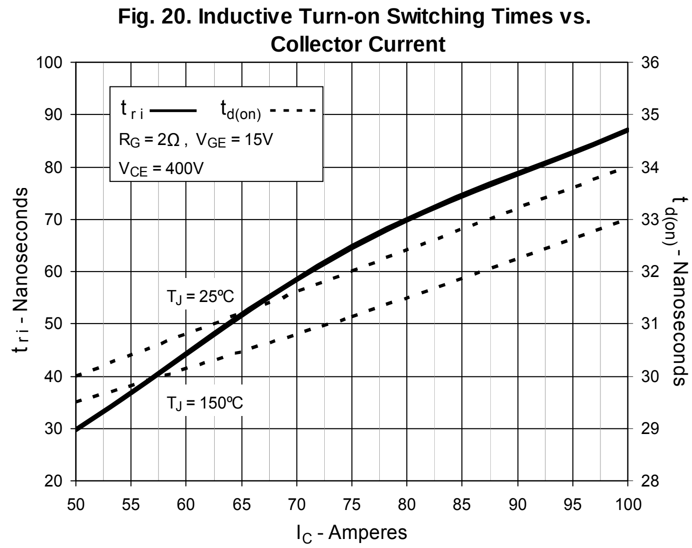


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current
t r i
t d(on)
R G = 2Ω , V GE = 15V
V CE = 400V
T J = 25ºC
T J = 150ºC
t r i - Nanoseconds
t d(on) - Nanoseconds
I C - Amperes

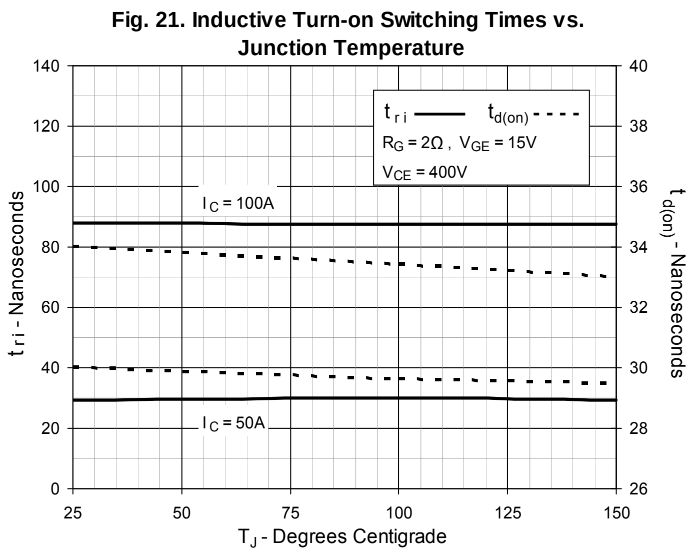


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature
t r i
t d(on)
R G = 2Ω , V GE = 15V
V CE = 400V
I C = 100A
I C = 50A
t r i - Nanoseconds
t d(on) - Nanoseconds
T J - Degrees Centigrade

IXYS

Preliminary Technical Information

XPT™ 650V IGBT GenX3™

IXYH120N65B3

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$V_{CE(sat)}$ ≤ 1.90V
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Extreme Light Punch Through
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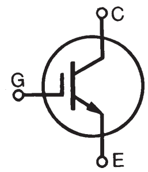

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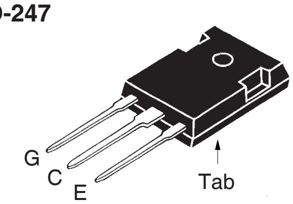

G = Gate   C = Collector
E = Emitter   Tab = Collector

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I_{CM}	T_C = 25°C, 1ms	770	A
I_A	T_C = 25°C	60	A
E_{AS}	T_C = 25°C	1	J
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P_C	T_C = 25°C	1360	W
T_J		-55 ... +175	°C
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I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			25	µA
	T_J = 150°C			1	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 100A, V_{GE} = 15V, Note 1		1.55	1.90	V
	T_J = 150°C		1.77		V

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t_{fi}			107		ns
E_{off}			1.50		mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		30		ns
t_{ri}	I_C = 50A, V_{GE} = 15V		30		ns
E_{on}	V_{CE} = 400V, R_G = 2Ω		2.60		mJ
$t_{d(off)}$	Note 2		226		ns
t_{fi}			196		ns
E_{off}			2.20		mJ
R_{thJC}				0.11	°C/W
R_{thCS}			0.21		°C/W

Notes:

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PRELIMINARY TECHNICAL INFORMATION

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Fig. 1. Output Characteristics @ T_J = 25°C

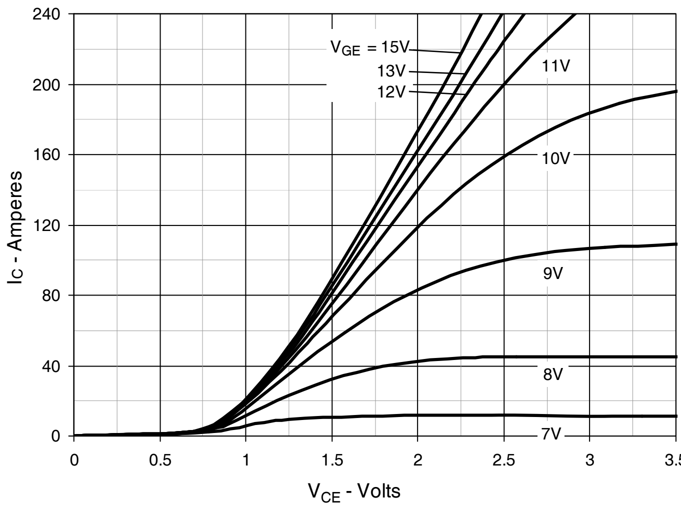


Fig. 2. Extended Output Characteristics @ T_J = 25°C

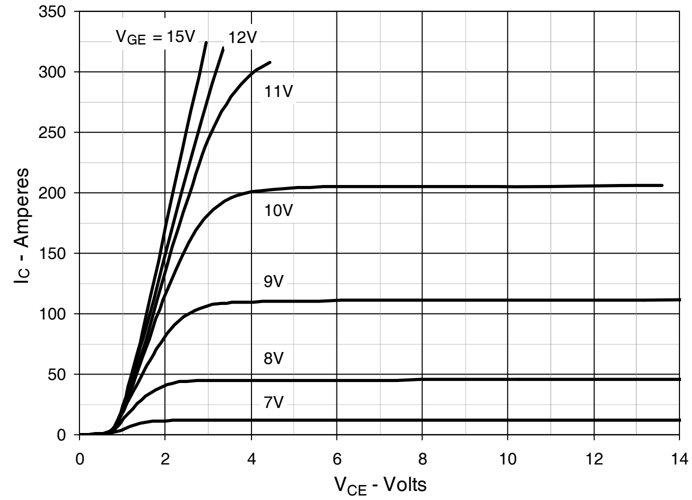


Fig. 3. Output Characteristics @ T_J = 150°C

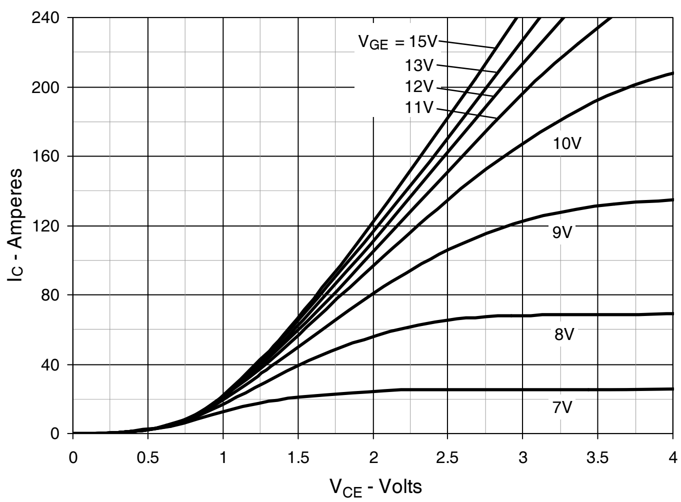


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

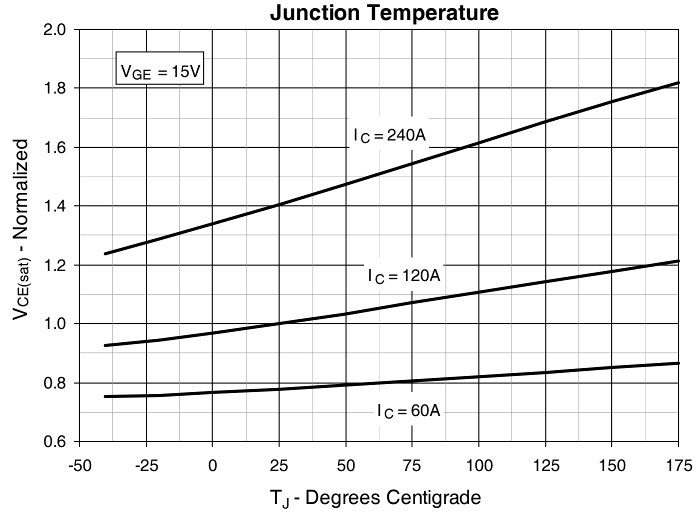


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

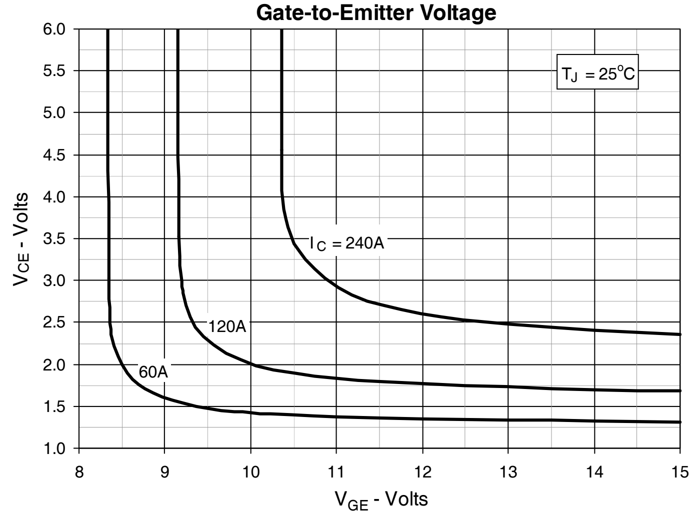


Fig. 6. Input Admittance

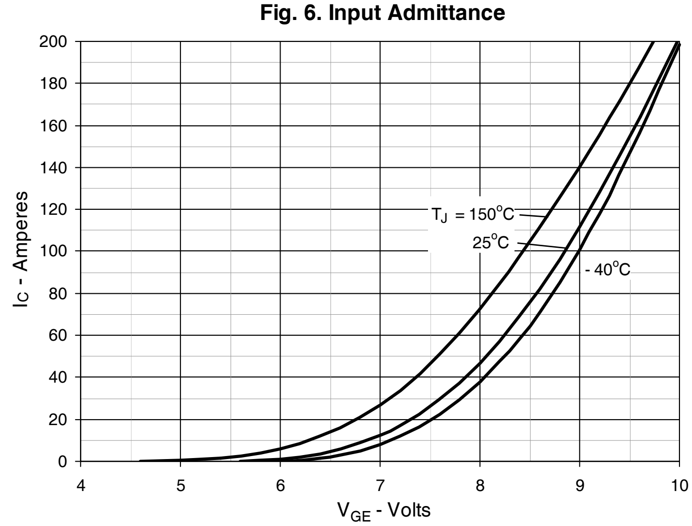


Fig. 7. Transconductance

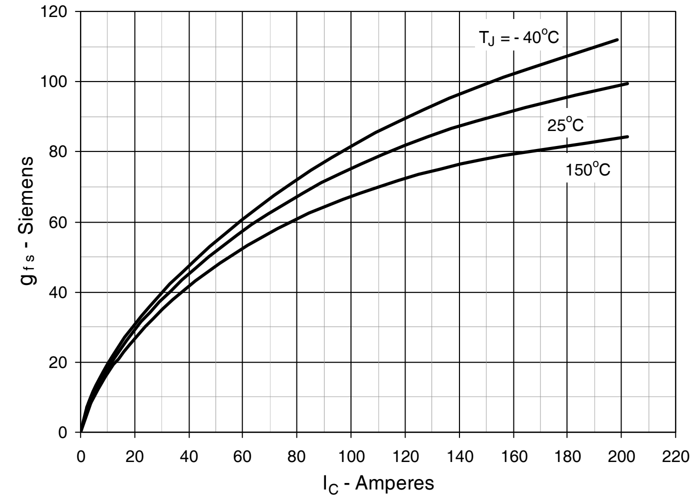


Fig. 8. Gate Charge

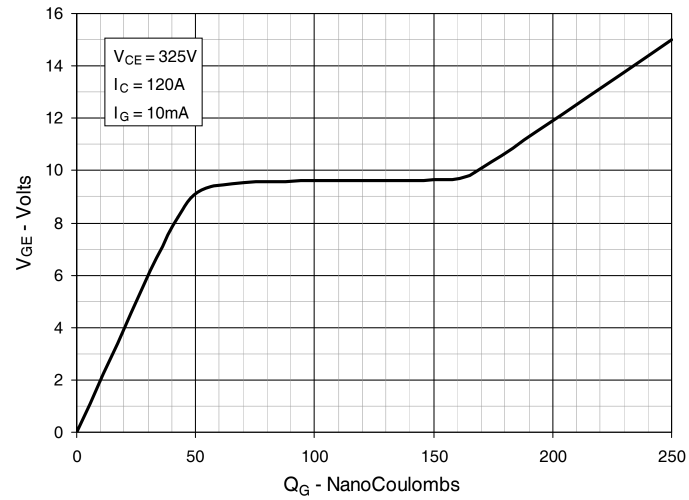


Fig. 9. Capacitance

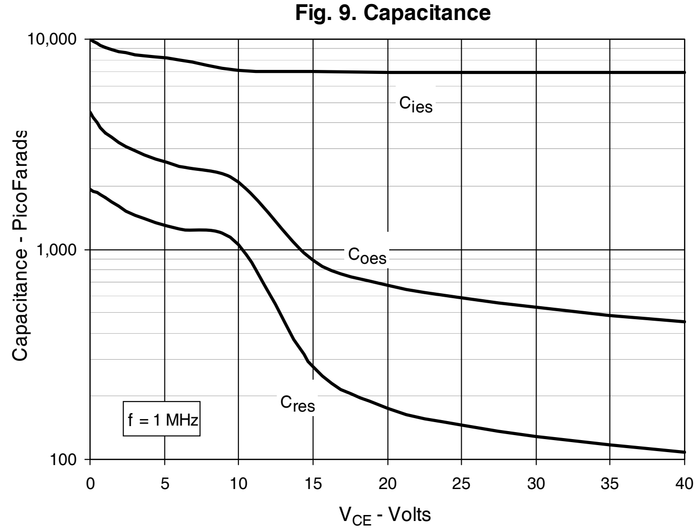


Fig. 10. Reverse-Bias Safe Operating Area

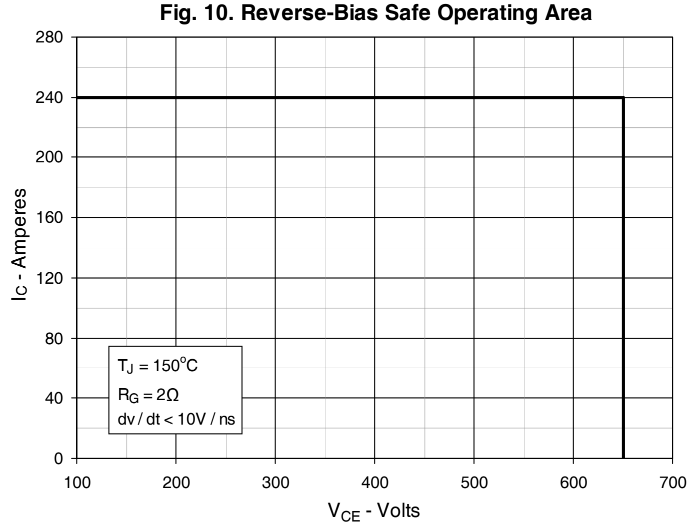


Fig. 11. Forward-Bias Safe Operating Area

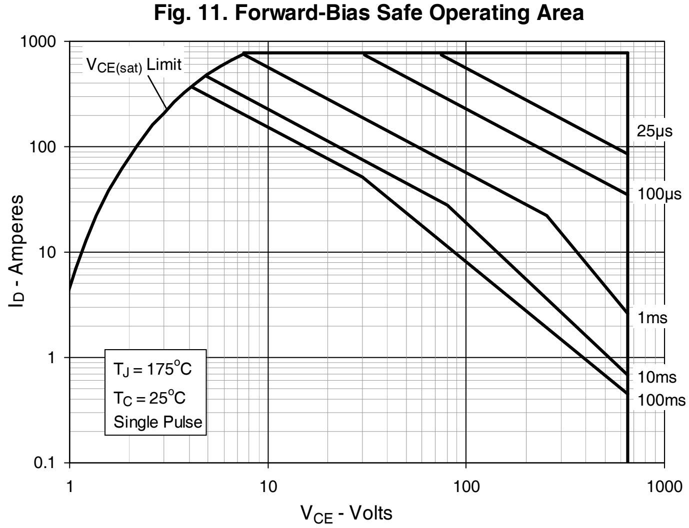


Fig. 12. Maximum Trasient Thermal Impedance

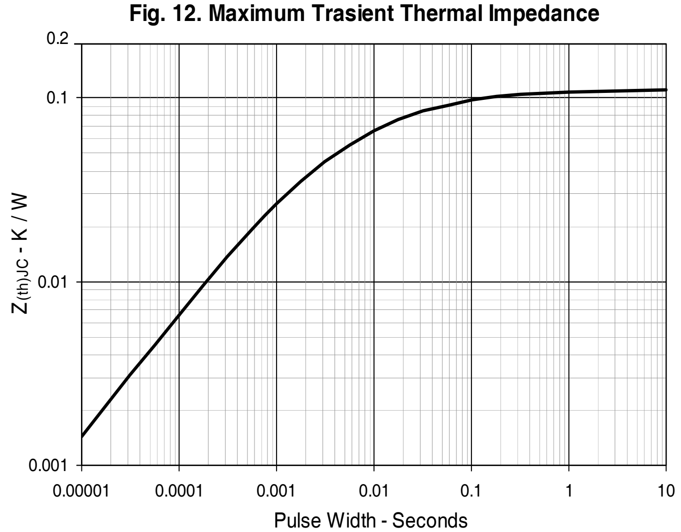


Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

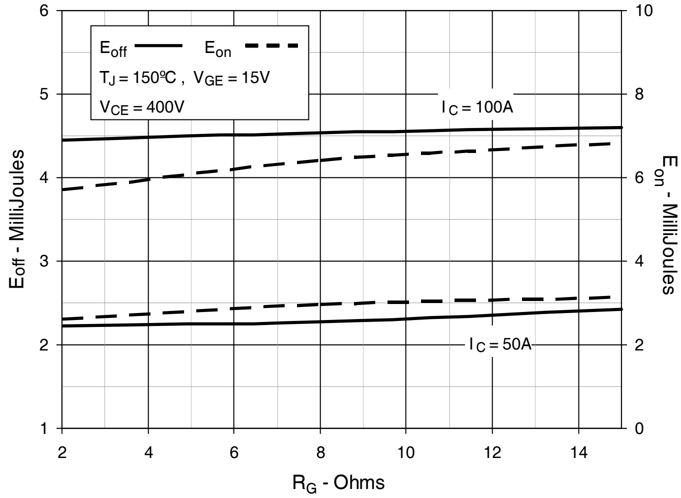


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

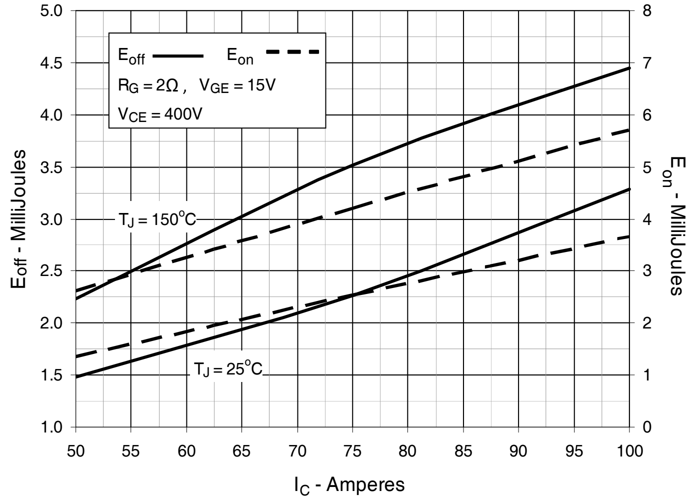


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

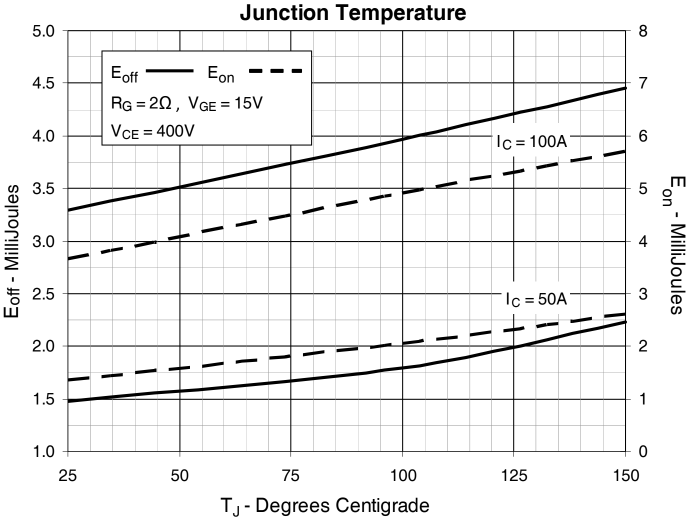


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

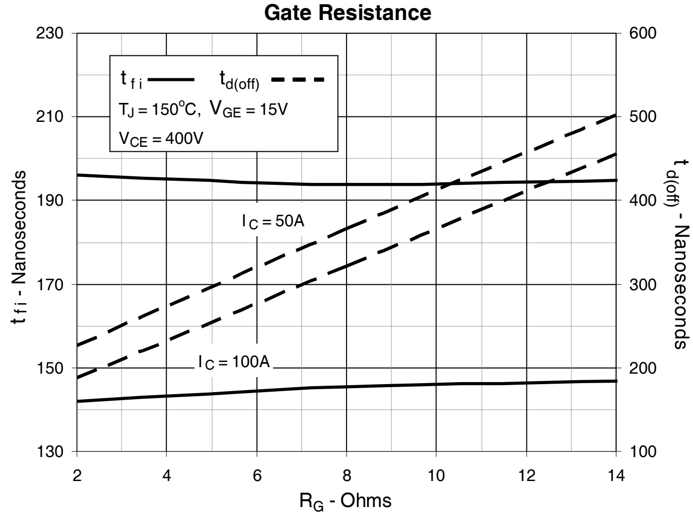


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

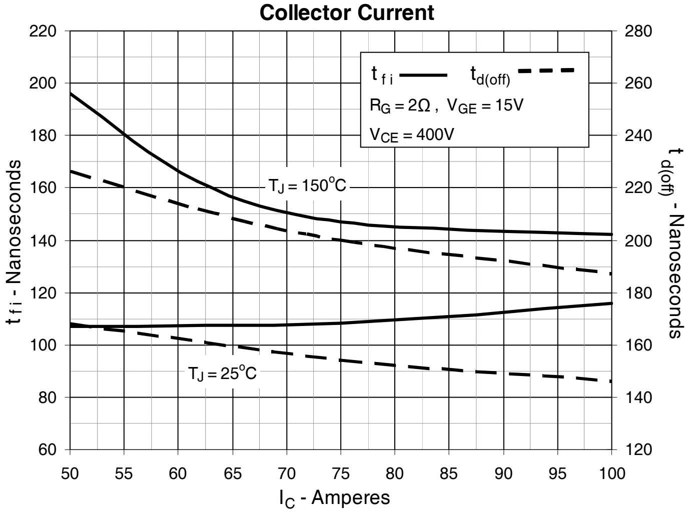


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

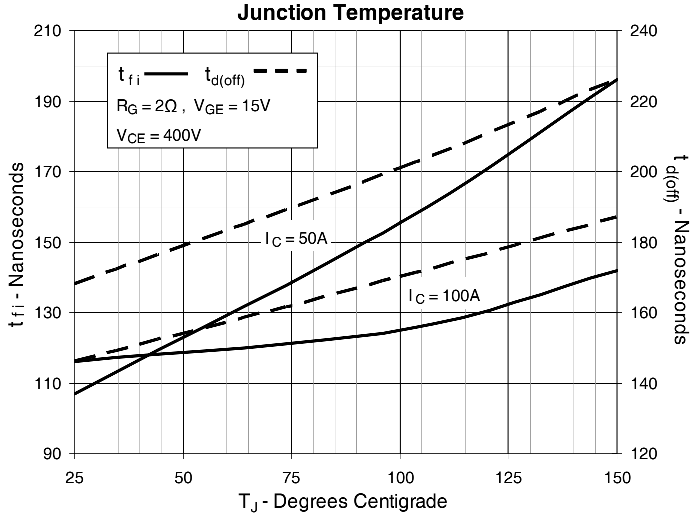


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

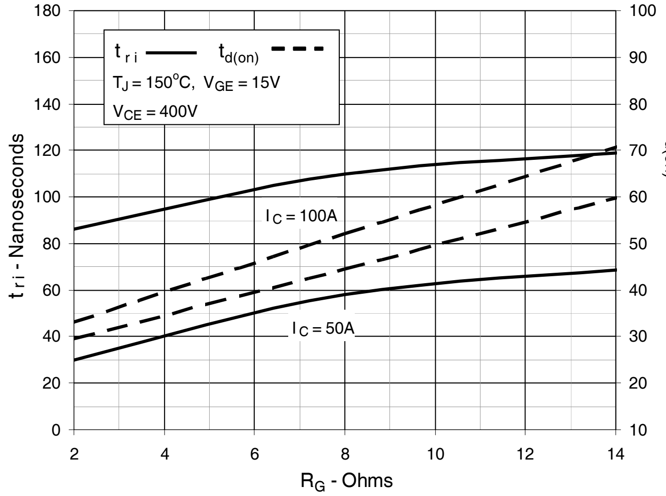


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

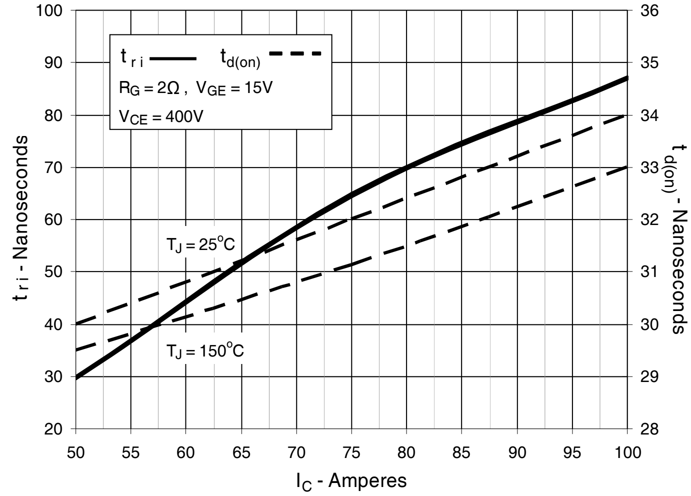
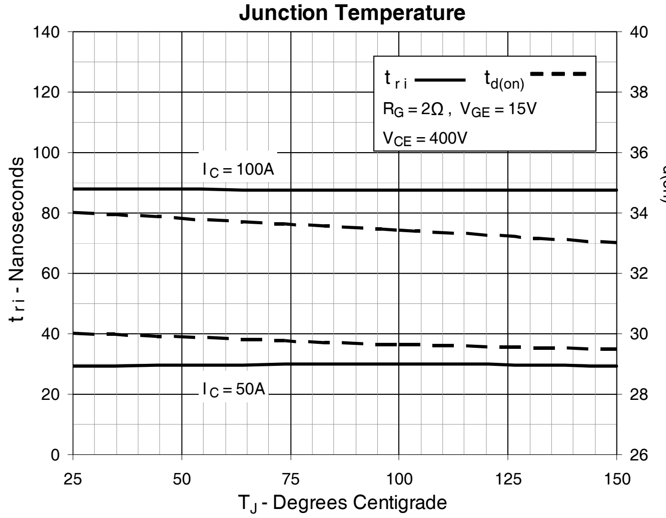
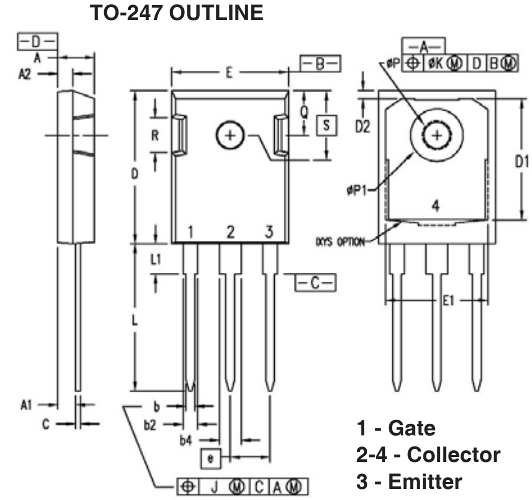


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature



TO-247 OUTLINE



1 - Gate
2-4 - Collector
3 - Emitter

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.545	.565	13.84	14.35
e	.215 BSC		5.45 BSC	
J	--	.010	--	0.25
K	--	.025	--	0.64
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
øP	.140	.144	3.55	3.65
øP1	.275	.290	6.99	7.37
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.242 BSC		6.15 BSC	

NOTE: This drawing will meet all dimensions requirement of JEDEC outlines TO-247 AD (R-PSIP-F3)

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.