IXYS

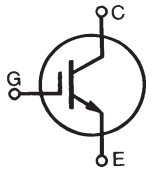
Advance Technical Information

XPT™ 650V GenX4™

IXXH140N65B4

V_{CES} = 650V
I_{C110} = 140A
$V_{CE(sat)}$ ≤ 1.90V
$t_{fi(typ)}$ = 44ns

Extreme Light Punch Through
IGBT for 10-30kHz Switching



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	140	A
I_{CM}	T_C = 25°C, 1ms	840	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 4.7Ω Clamped Inductive Load	I_{CM} = 240 $V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	V_{GE} = 15V, V_{CE} = 400V, T_J = 150°C R_G = 10Ω, Non Repetitive	10	μs
P_C	T_C = 25°C	1200	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

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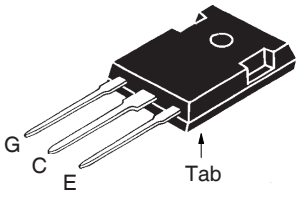


G = Gate E = Emitter
C = Collector Tab = Collector

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}	4.0		6.5	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			10	μA
	T_J = 150°C			1	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 120A, V_{GE} = 15V, Note 1		1.55	1.90	V
	T_J = 150°C		1.76		V

Features

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

Advantages

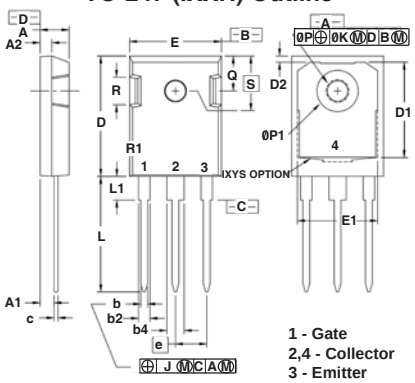
- High Power Density
- Low Gate Drive Requirement

Applications

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

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	40	70	S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		8000	pF
C_{oes}			378	pF
C_{res}			107	pF
$Q_{g(on)}$	I_C = 140A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		250	nC
Q_{ge}			70	nC
Q_{gc}			90	nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		54	ns
t_{ri}	I_C = 100A, V_{GE} = 15V		105	ns
E_{on}	V_{CE} = 400V, R_G = 4.7Ω		5.75	mJ
$t_{d(off)}$	Note 2		270	ns
t_{fi}			44	ns
E_{off}			2.67	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		43	ns
t_{ri}	I_C = 100A, V_{GE} = 15V		85	ns
E_{on}	V_{CE} = 400V, R_G = 4.7Ω		6.80	mJ
$t_{d(off)}$	Note 2		240	ns
t_{fi}			100	ns
E_{off}			3.90	mJ
R_{thJC}				0.125 °C/W
R_{thCS}			0.21	°C/W

TO-247 (IXXH) 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	

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.

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

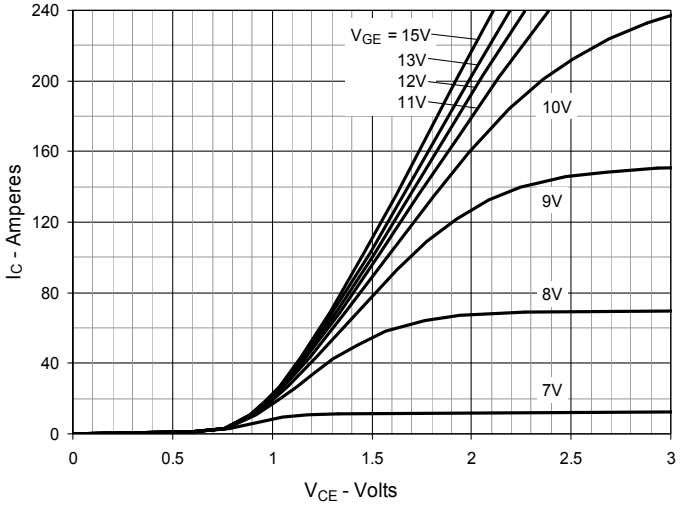


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

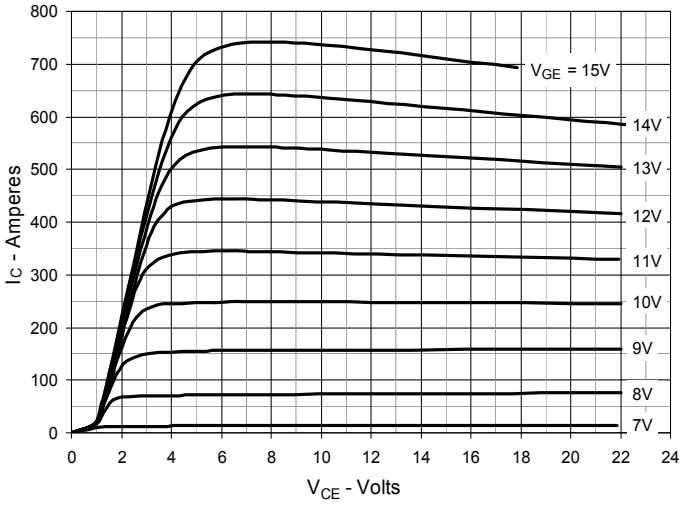


Fig. 3. Output Characteristics @ T_J = 150ºC

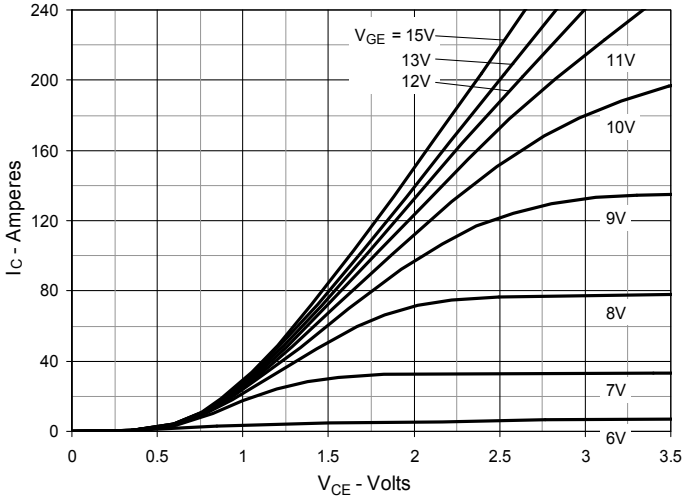


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

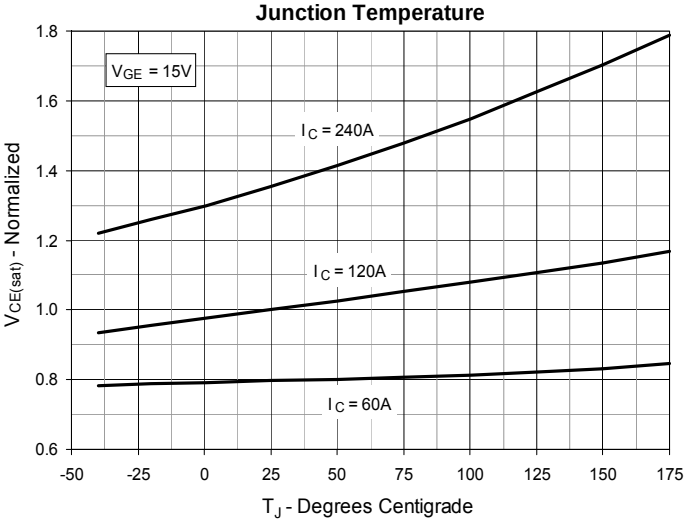


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

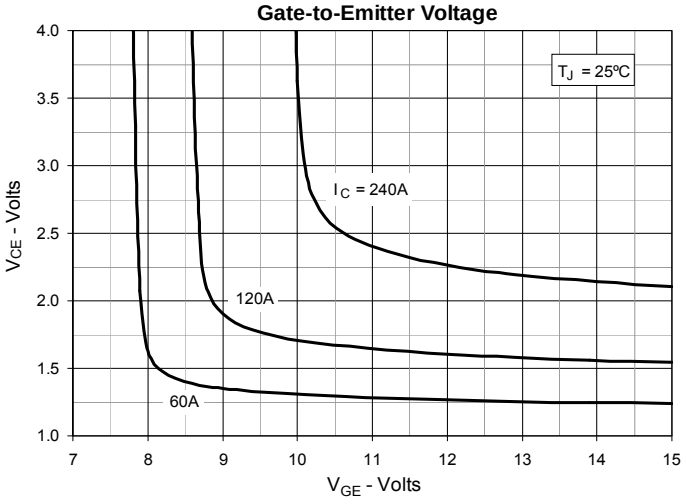


Fig. 6. Input Admittance

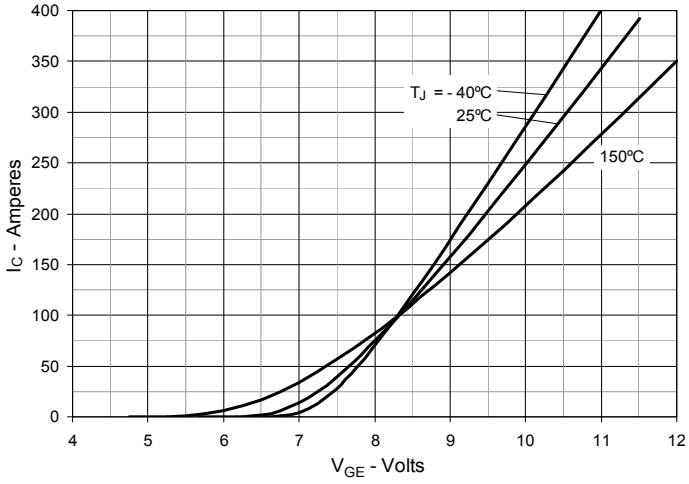


Fig. 7. Transconductance

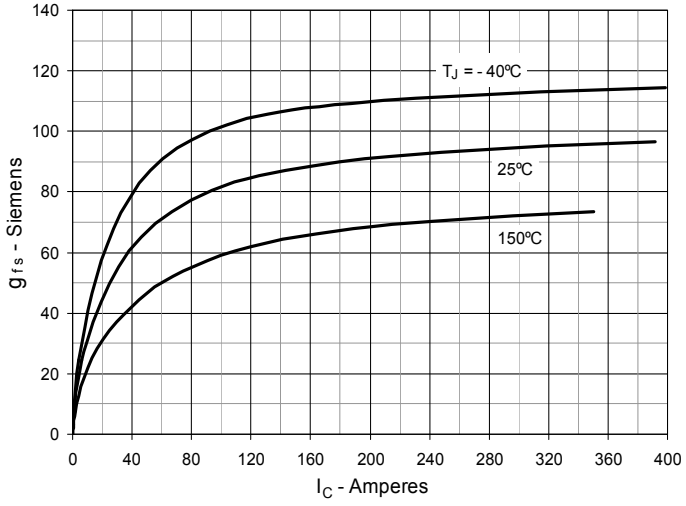


Fig. 8. Gate Charge

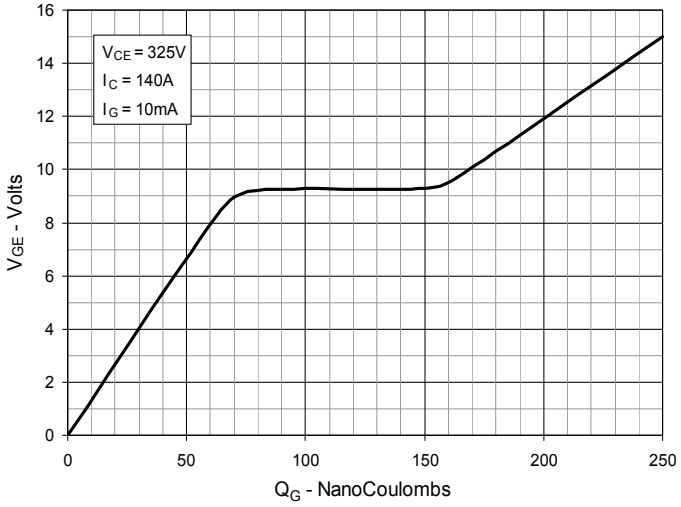


Fig. 9. Capacitance

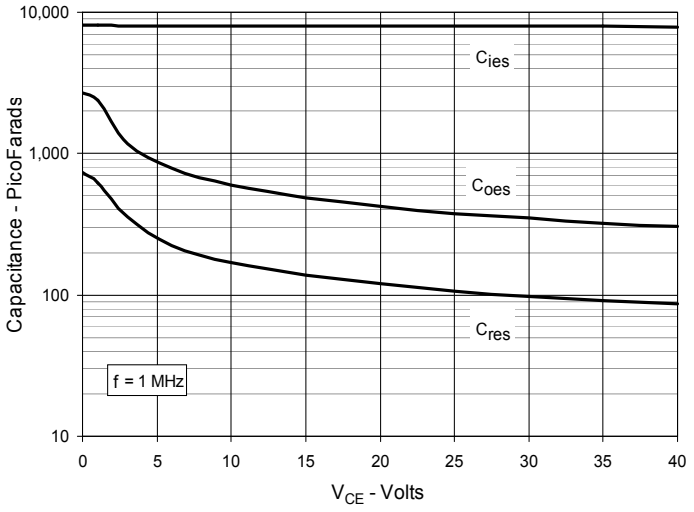


Fig. 10. Reverse-Bias Safe Operating Area

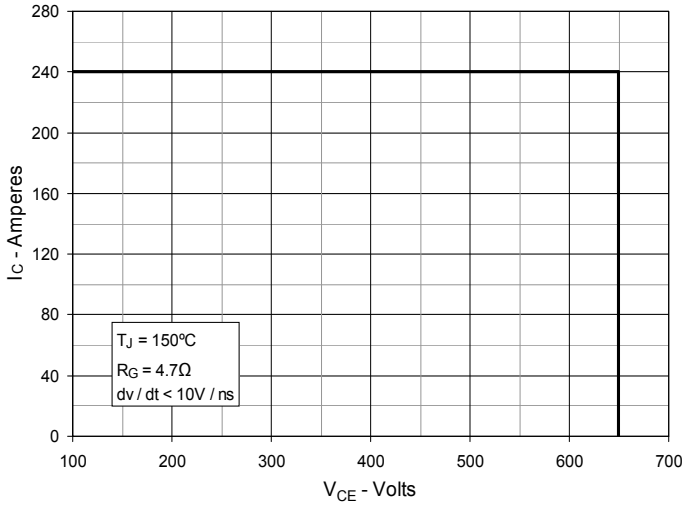


Fig. 11. Forward-Bias Safe Operating Area

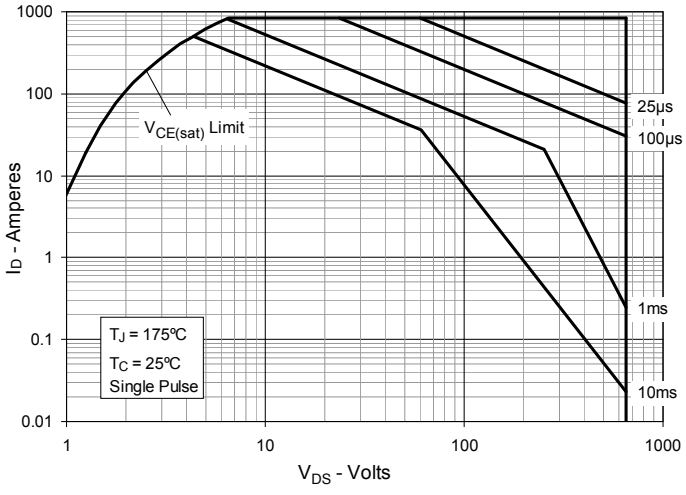


Fig. 12. Maximum Transient Thermal Impedance (IGBT)

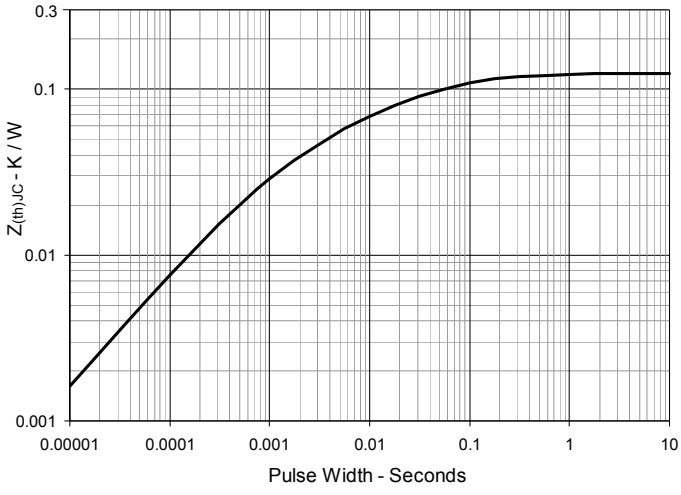


Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

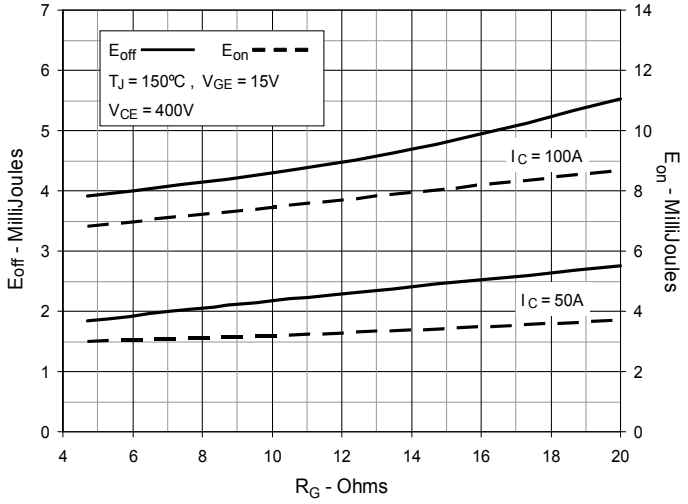


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

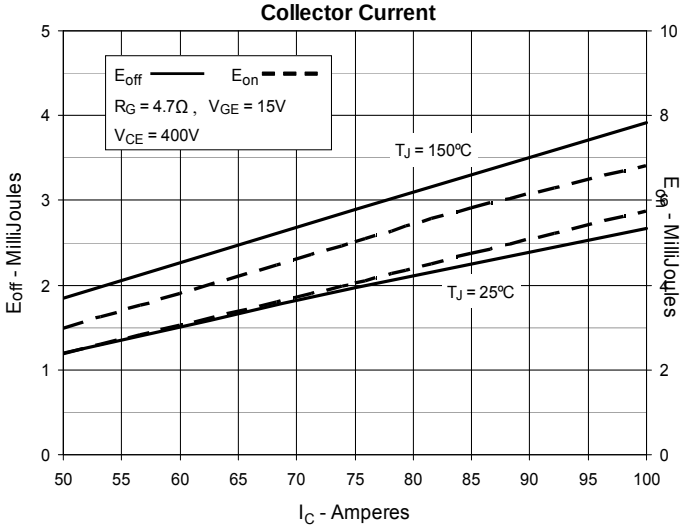


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

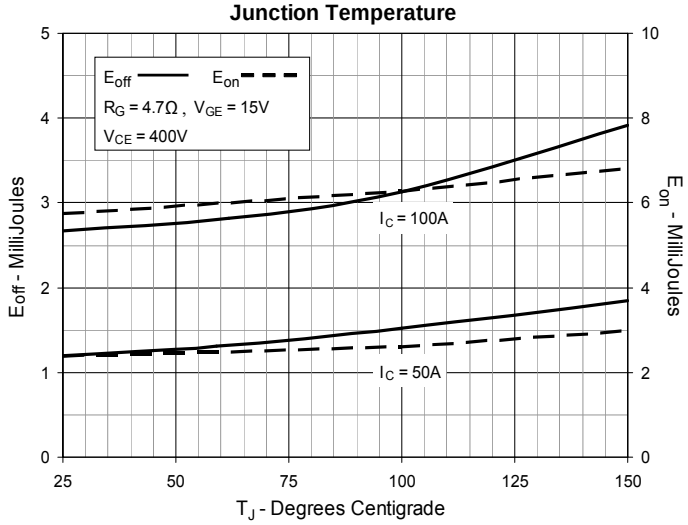


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

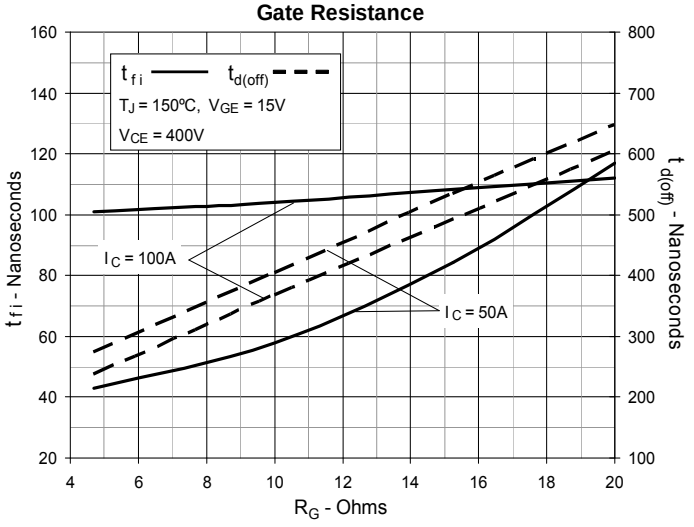


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

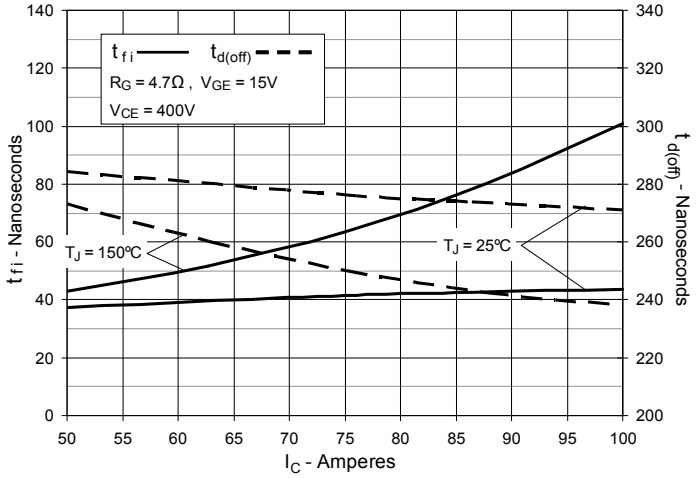


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

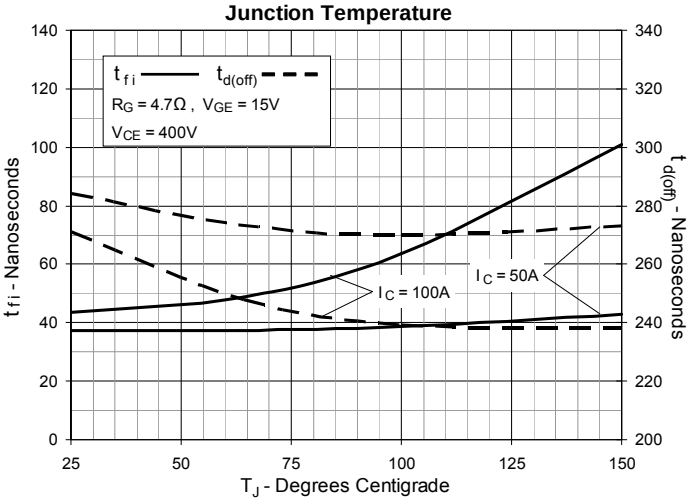


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

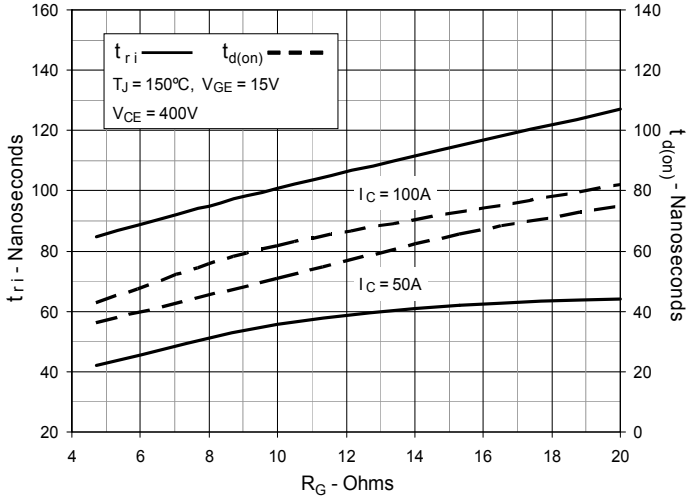


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

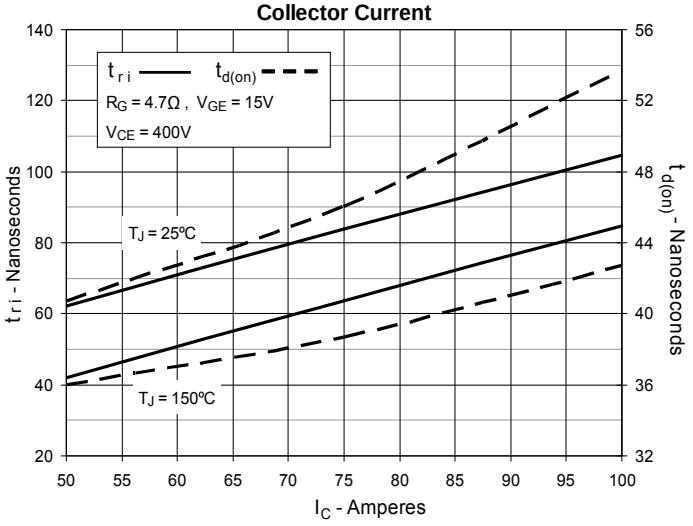


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature