IXYS

Preliminary Technical Information

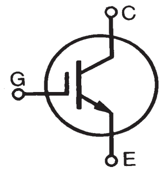
GenX3™ 600V IGBT

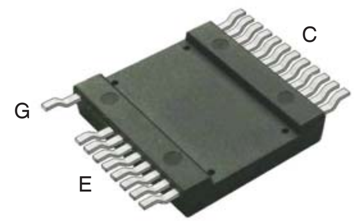
MMIX1G320N60B3

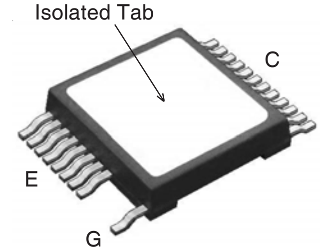
V_{CES} = 600V
I_{C25} = 400A
$V_{CE(sat)}$ ≤ 1.50V

(Electrically Isolated Tab)

Medium-Speed Low-Vsat PT IGBT for 5-40 kHz Switching







G = Gate E = Emitter
C = Collector

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	400	A
I_{C110}	T_C = 110°C	180	A
I_{CM}	T_C = 25°C, 1ms	1000	A
SSOA (RBSOA)	V_{GE}= 15V, T_{VJ} = 125°C, R_G = 1Ω Clamped Inductive Load	I_{CM} = 320 $V_{CE} \le V_{CES}$	A V
P_C	T_C = 25°C	1000	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L T_{SOLD}	Maximum Lead Temperature for Soldering 1.6 mm (0.062 in.) from Case for 10	300 260	°C °C
V_{ISOL}	50/60Hz, 1 minute	2500	V~
F_C	Mounting Force	50..200/11..45	N/lb.
Weight		8	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 1mA, V_{GE} = 0V	600			V
$V_{GE(th)}$	I_C = 4mA, $V_{CE} = V_{GE}$	3.0		5.0	V
I_{CES}	$V_{CE} = V_{CES}$, V_{GE} = 0V			75	μA
	T_J = 125°C			2	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V			±400	nA
$V_{CE(sat)}$	I_C = 100A, V_{GE} = 15V, Note 1		1.20	1.50	V
	I_C = 320A		1.67		V

Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Optimized for Low Conduction and Switching Losses
- Very High Current Capability
- Square RBSOA

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

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

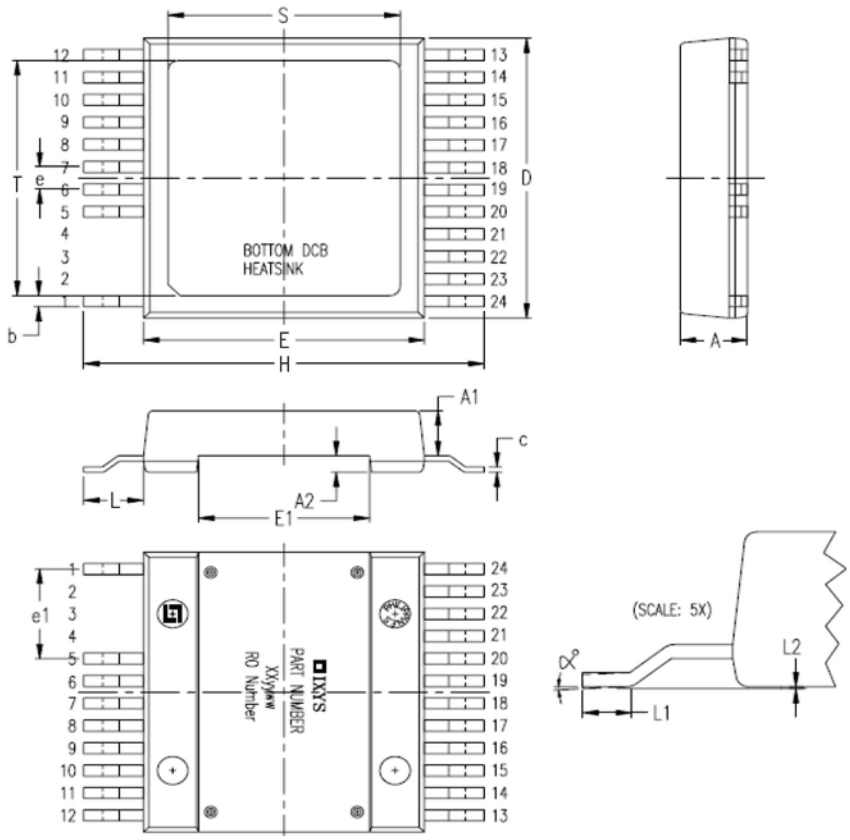
Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 60A, V_{CE} = 10V, Note 1	75	130		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		18		nF
C_{oes}			960		pF
C_{res}			130		pF
Q_g	I_C = 320A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		585		nC
Q_{ge}			105		nC
Q_{gc}			215		nC
$t_{d(on)}$	**Inductive Load, T_J = 25°C**		44		ns
t_{ri}	I_C = 100A, V_{GE} = 15V		66		ns
E_{on}	V_{CE} = 0.8 • V_{CES}, R_G = 1Ω		2.7		mJ
$t_{d(off)}$			250		ns
t_{fi}			165		ns
E_{off}			3.5	5.0	mJ
$t_{d(on)}$	**Inductive Load, T_J = 125°C**		40		ns
t_{ri}	I_C = 100A, V_{GE} = 15V		67		ns
E_{on}	V_{CE} = 0.8 • V_{CES}, R_G = 1Ω		3.5		mJ
$t_{d(off)}$			330		ns
t_{fi}			265		ns
E_{off}			5.4		mJ
R_{thJC}				0.125	°C/W
R_{thCS}			0.05		°C/W

Note 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 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.

Package Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.209	.224	5.30	5.70
A1	.154	.161	3.90	4.10
A2	.055	.063	1.40	1.60
b	.035	.045	0.90	1.15
c	.018	.026	0.45	0.65
D	.976	.994	24.80	25.25
E	.898	.915	22.80	23.25
E1	.543	.559	13.80	14.20
e	.079 BSC		2.00 BSC	
e1	.315 BSC		8.00 BSC	
H	1.272	1.311	32.30	33.30
L	.181	.209	4.60	5.30
L1	.051	.067	1.30	1.70
L2	.000	.006	0.00	0.15
S	.736	.760	18.70	19.30
T	.815	.839	20.70	21.30
α	0	4°	0	4°

PIN: **1 = Gate**
5-12 = Emitter
13-24 = Collector

Fig. 1. Output Characteristics @ T_J = 25ºC

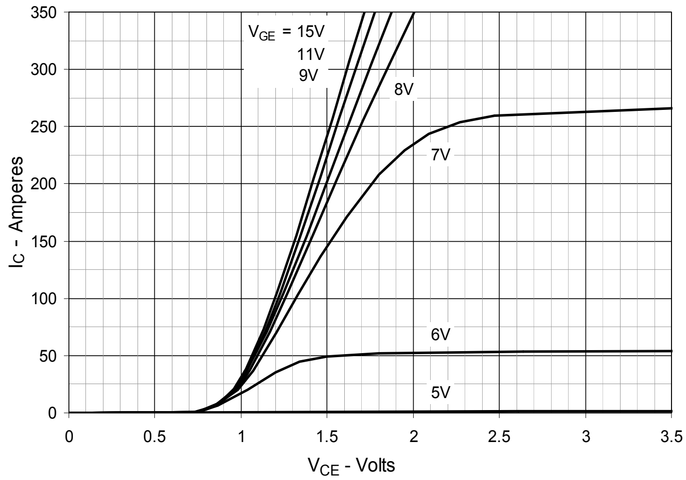


Fig. 2. Output Characteristics @ T_J = 125ºC

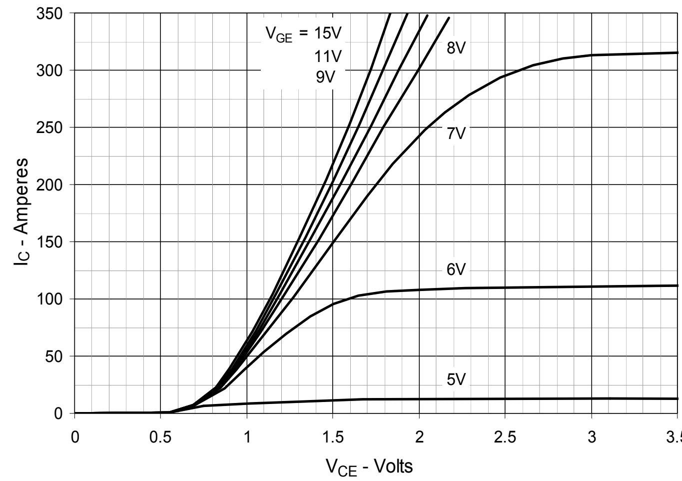


Fig. 3. Dependence of $V_{CE(sat)}$ on Junction Temperature

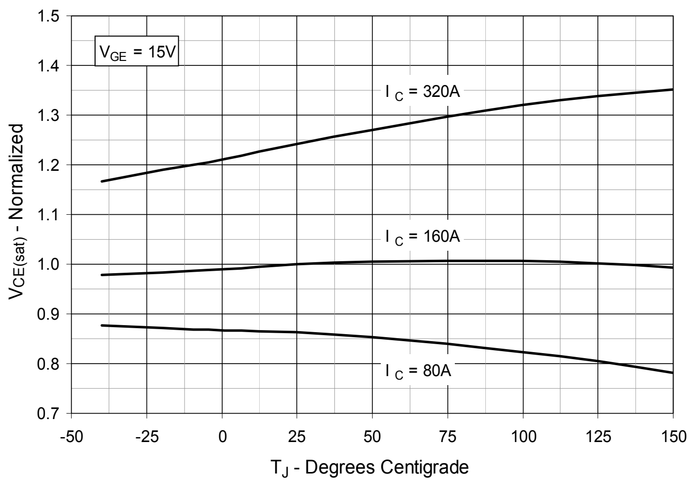


Fig. 4. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

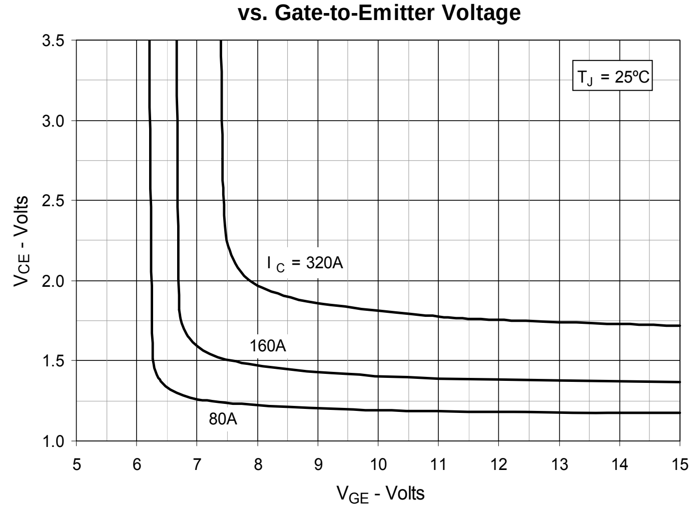


Fig. 5. Input Admittance

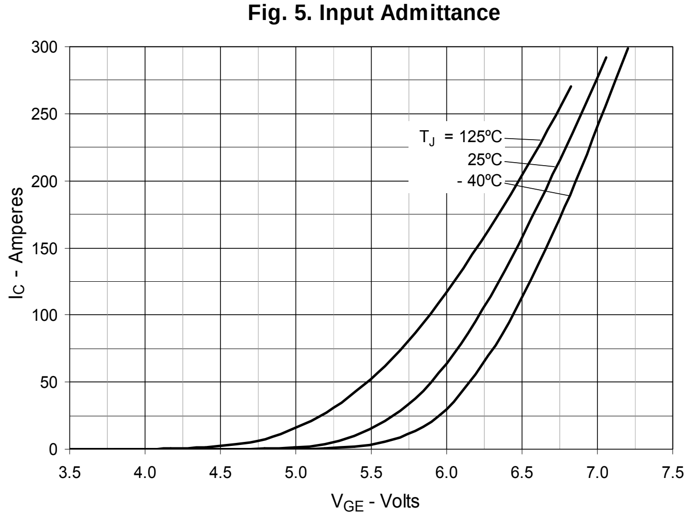
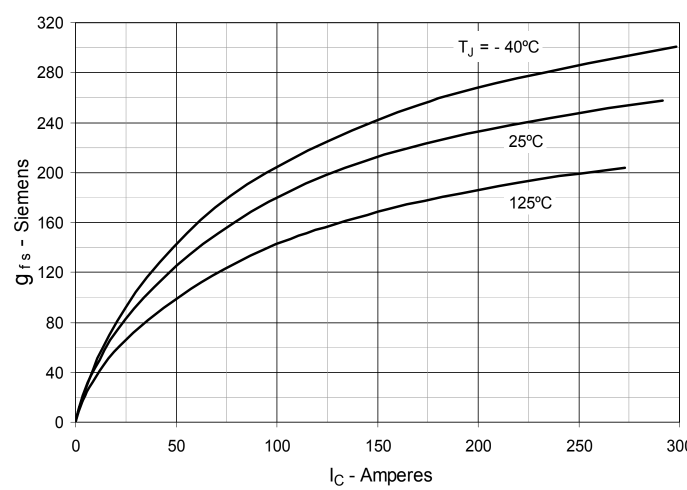


Fig. 6. Transconductance



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

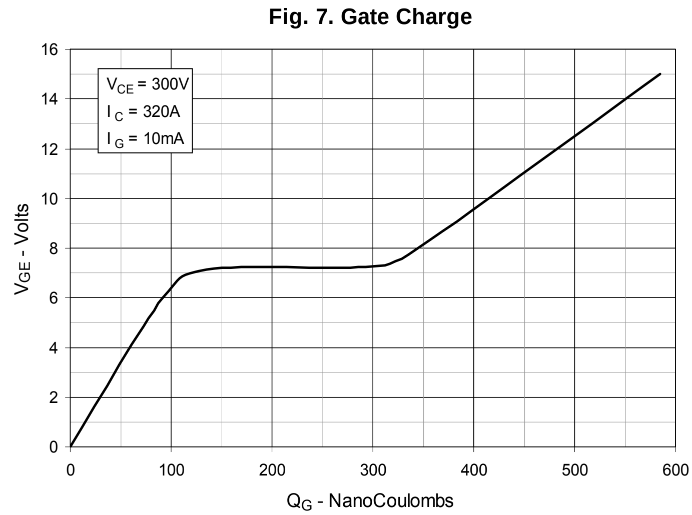


Fig. 7. Gate Charge
VCE = 300V
I C = 320A
I G = 10mA
VGE - Volts
QG - NanoCoulombs
0
2
4
6
8
10
12
14
16
0
100
200
300
400
500
600

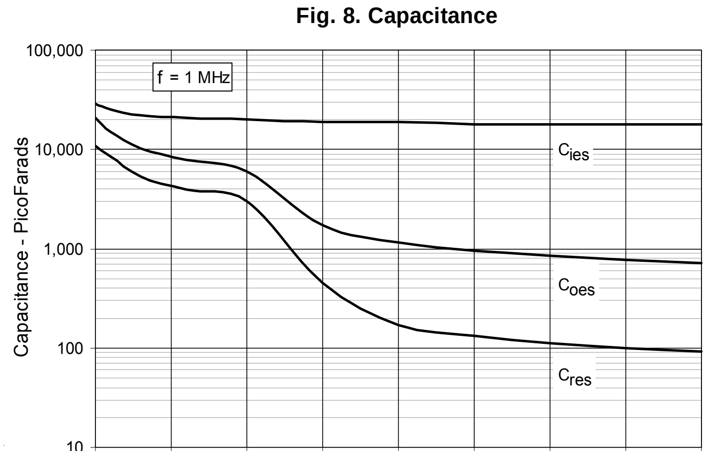


Fig. 8. Capacitance
f = 1 MHz
Cies
Coes
Cres
Capacitance - PicoFarads
100,000
10,000
1,000
100
10

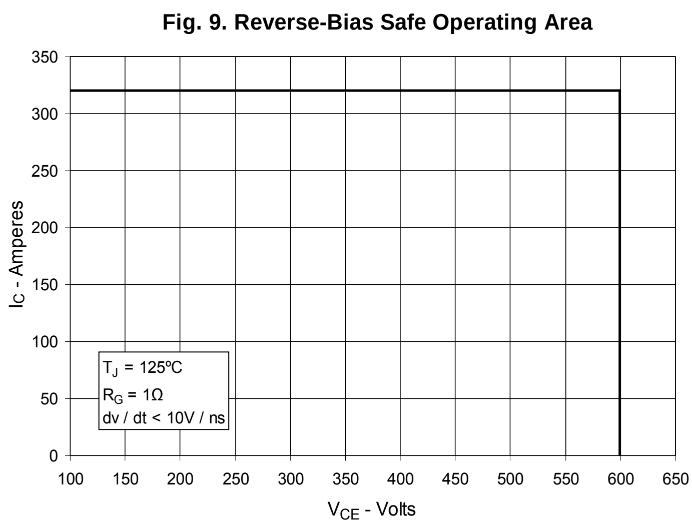


Fig. 9. Reverse-Bias Safe Operating Area
TJ = 125ºC
RG = 1Ω
dv / dt < 10V / ns
IC - Amperes
VCE - Volts
0
50
100
150
200
250
300
350
100
150
200
250
300
350
400
450
500
550
600
650

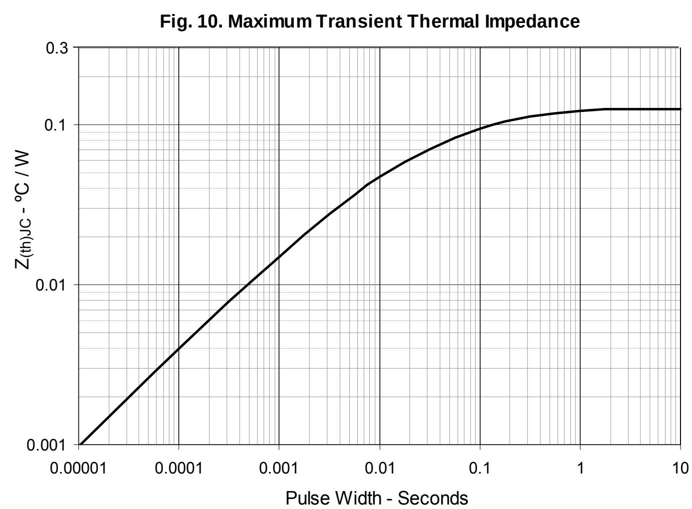


Fig. 10. Maximum Transient Thermal Impedance
Z(th)JC - ºC / W
Pulse Width - Seconds
0.3
0.1
0.01
0.001
0.00001
0.0001
0.001
0.01
0.1
1
10

Fig. 11. Inductive Switching Energy Loss vs. Gate Resistance

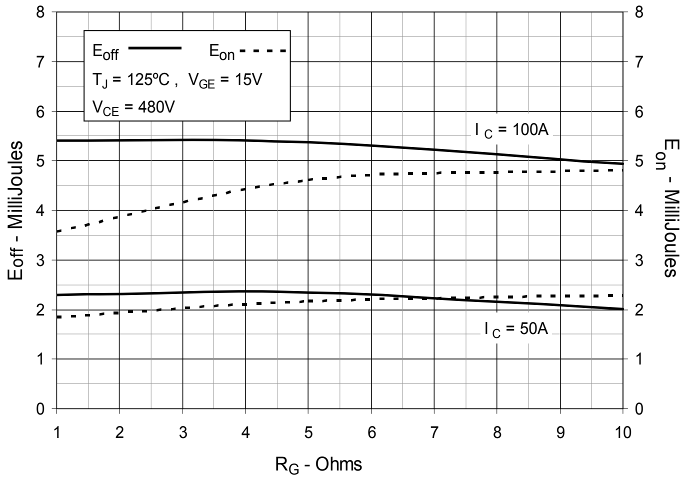


Fig. 12. Inductive Switching Energy Loss vs. Collector Current

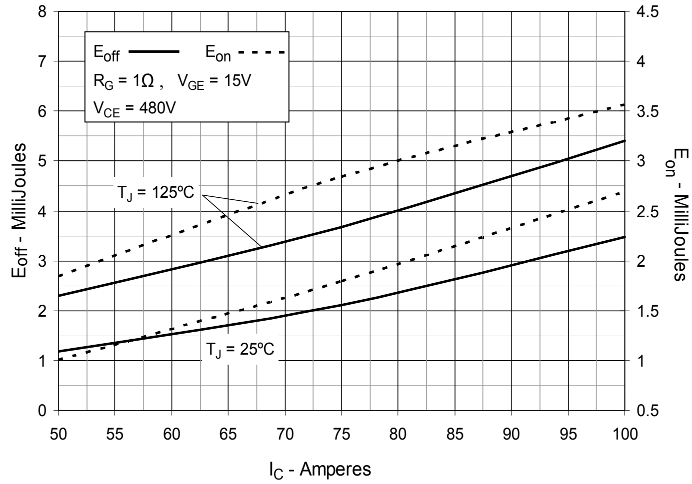


Fig. 13. Inductive Switching Energy Loss vs. Junction Temperature

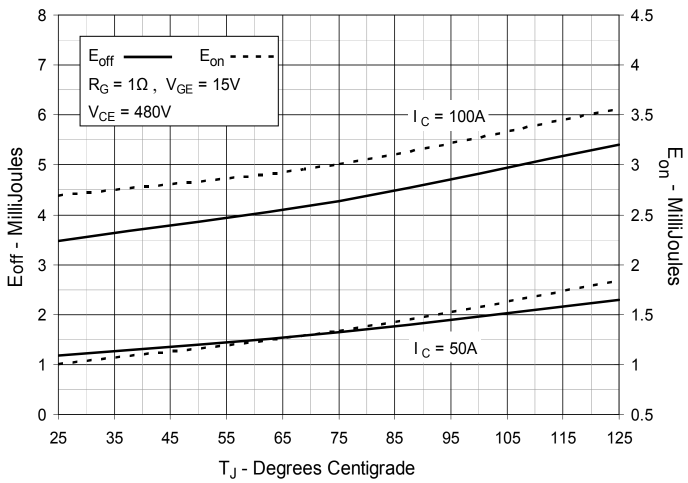


Fig. 14. Inductive Turn-off Switching Times vs. Gate Resistance

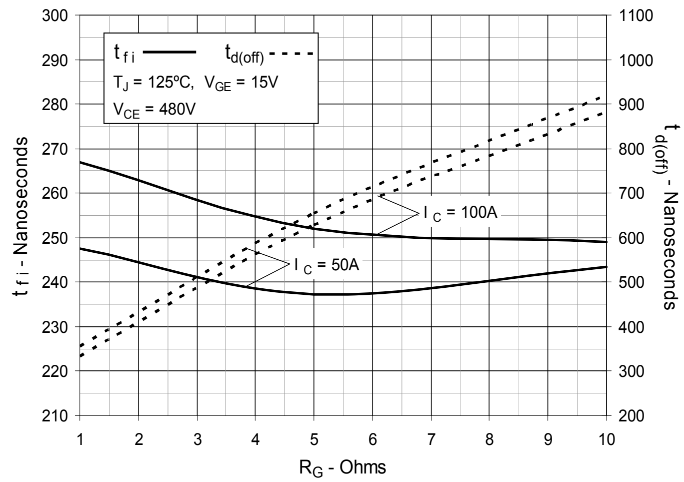


Fig. 15. Inductive Turn-off Switching Times vs. Collector Current

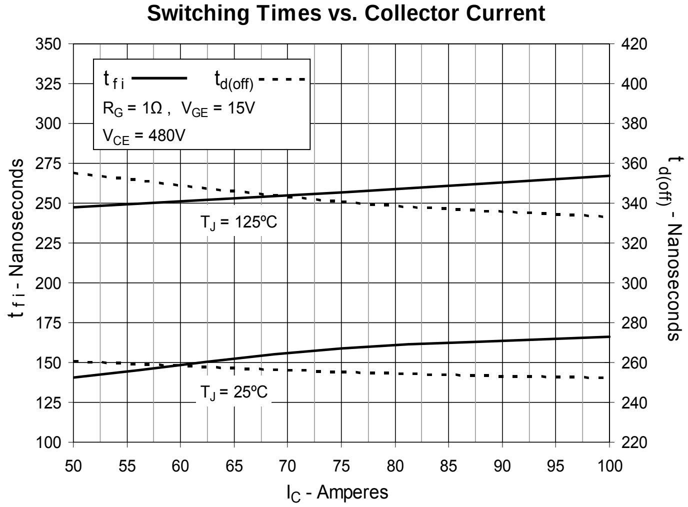


Fig. 16. Inductive Turn-off Switching Times vs. Junction Temperature

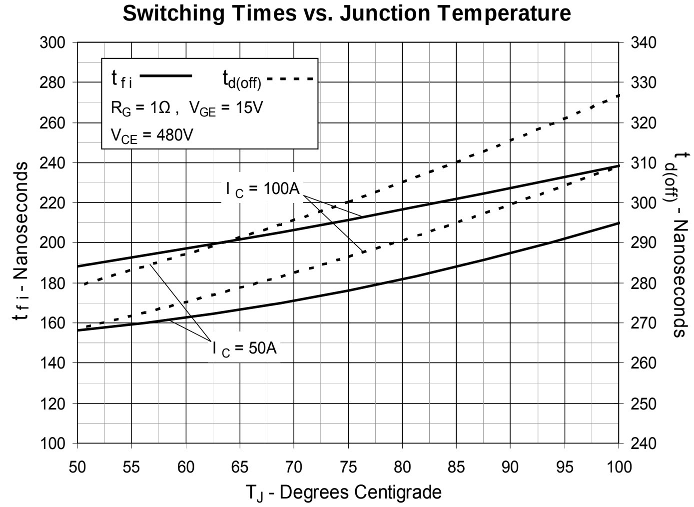


Fig. 17. Inductive Turn-on Switching Times vs. Gate Resistance

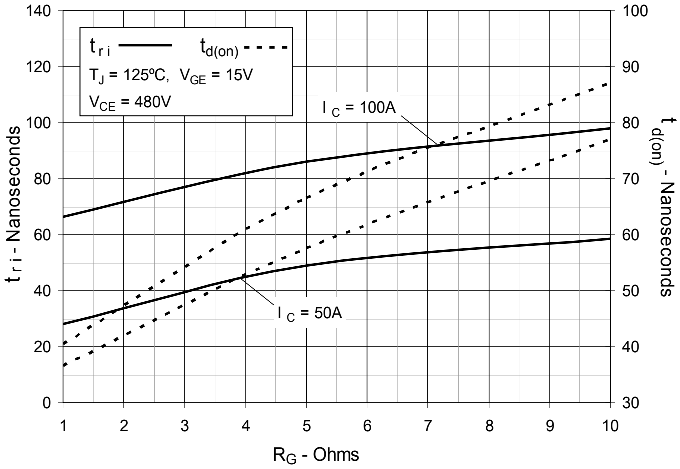


Fig. 18. Inductive Turn-on Switching Times vs. Collector Current

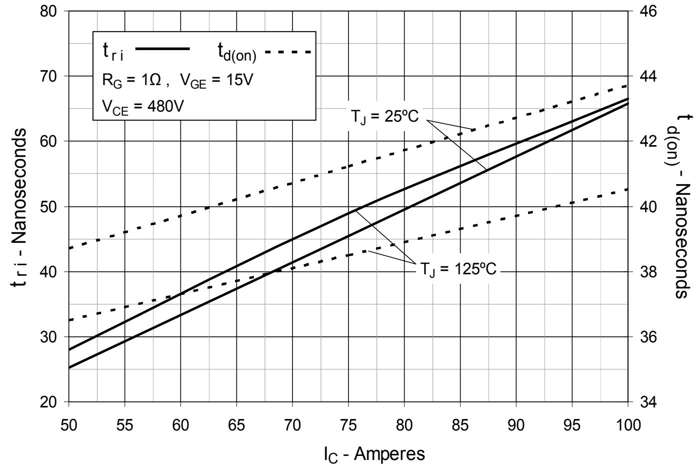


Fig. 19. Inductive Turn-on Switching Times vs. Junction Temperature