IXYS

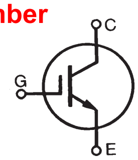
GenX3™ 600V IGBTs

IXGA30N60C3
IXGP30N60C3*
IXGH30N60C3

V_{CES} = 600V
I_{C110} = 30A
$V_{CE(sat)}$ ≤ 3.0V
$t_{fi(typ)}$ = 47ns

High-Speed PT IGBTs for 40-100kHz Switching

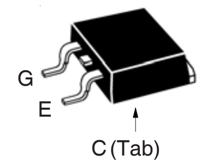
*Obsolete Part Number



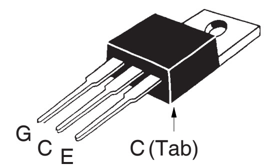
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_C = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C	60	A
I_{C110}	T_C = 110°C	30	A
I_{CM}	T_C = 25°C, 1ms	150	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 5Ω Clamped Inductive Load	I_{CM} = 60 @ ≤ V_{CES}	A
P_C	T_C = 25°C	220	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	1.6mm (0.062 in.) from Case for 10s	300	°C
T_{SOLD}	Plastic Body for 10 seconds	260	°C
M_d	Mounting Torque (TO-220 & TO-247)	1.13/10	Nm/lb.in.
Weight	TO-220 TO-263 TO-263	2.5 3.0 3.0	g g g

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.
BV_{CES}	I_C = 250μA, V_{GE} = 0V	600		V
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	3.0		5.5 V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			15 μA
	T_J = 125°C			300 μA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V			±100 nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15V, Note 1		2.6	3.0 V
	T_J = 125°C		1.8	V

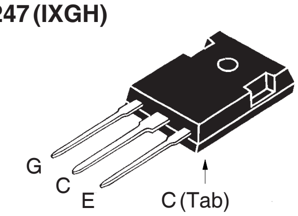
TO-263 AA (IXGA)



TO-220AB (IXGP)



TO-247 (IXGH)



G = Gate D = Collector
S = Emitter Tab = Collector

Features

- Optimized for Low Switching Losses
- Square RBSOA
- International Standard Packages

Advantages

- High Power Density
- Low Gate Drive Requirement

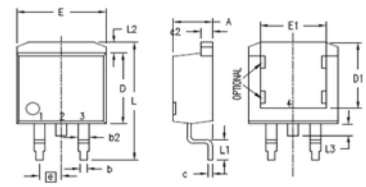
Applications

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

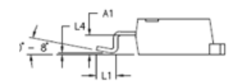
Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 20A, V_{CE} = 10V, Note 1	9	16		S
C_{ies}			915		pF
C_{oes}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		78		pF
C_{res}			32		pF
Q_g			38		nC
Q_{ge}	I_C = 20A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		8		nC
Q_{gc}			17		nC
$t_{d(on)}$	**Inductive Load, T_J = 25°C**		16		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		26		ns
E_{on}	V_{CE} = 300V, R_G = 5Ω		0.27		mJ
$t_{d(off)}$	Note 2		42	75	ns
t_{fi}			47		ns
E_{off}			0.09	0.18	mJ
$t_{d(on)}$	**Inductive Load, T_J = 125°C**		17		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		28		ns
E_{on}	V_{CE} = 300V, R_G = 5Ω		0.44		mJ
$t_{d(off)}$	Note 2		70		ns
t_{fi}			90		ns
E_{off}			0.33		mJ
R_{thJC}				0.56	°C/W
R_{thCS}	TO-220		0.50		°C/W
	TO-247		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-263 Outline

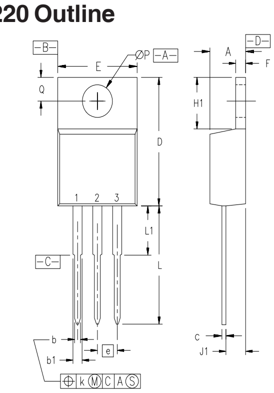


1 = Gate
2 = Collector
3 = Emitter
4 = Collector



SYM	INCHES MIN	MAX	MILLIMETERS MIN	MAX
A	.160	.190	4.06	4.83
A1	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b2	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c2	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D1	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E1	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	14.61	15.88
L1	.090	.110	2.29	2.79
L2	.040	.055	1.02	1.40
L3	.050	.070	1.27	1.78
L4	0	.005	0	0.13

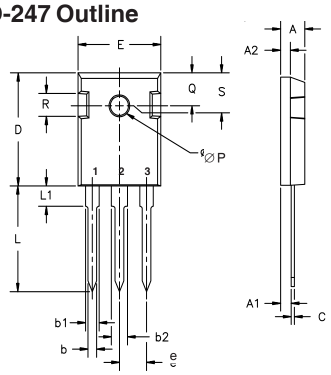
TO-220 Outline



1 = Gate 2 = Collector
3 = Emitter

SYM	INCHES MIN	MAX	MILLIMETERS MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
∅P	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

TO-247 Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter

Dim.	Millimeter Min.	Max.	Inches 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
∅P	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	

Fig. 1. Output Characteristics @ T_J = 25ºC

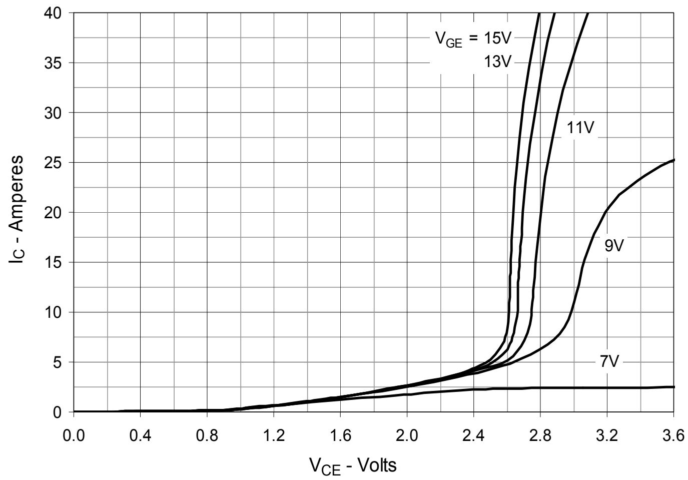


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

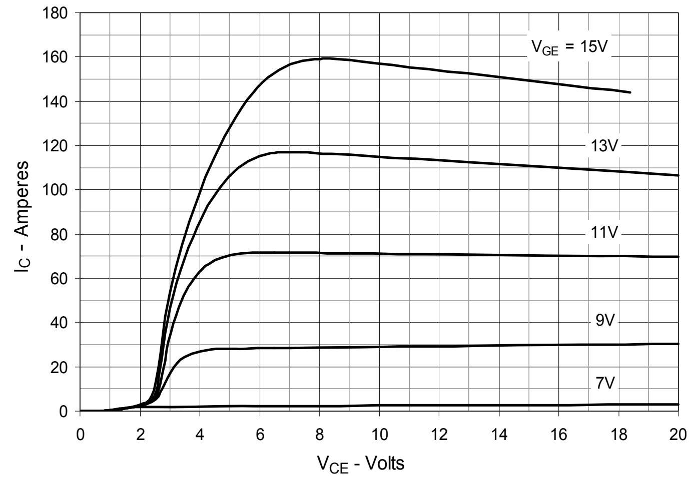


Fig. 3. Output Characteristics @ T_J = 125ºC

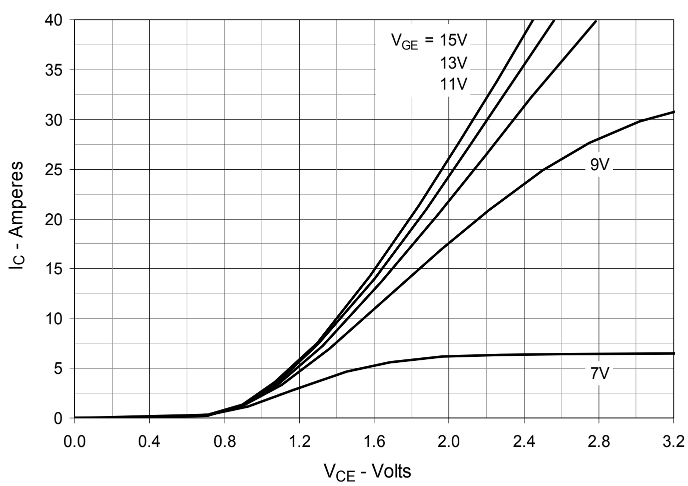


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

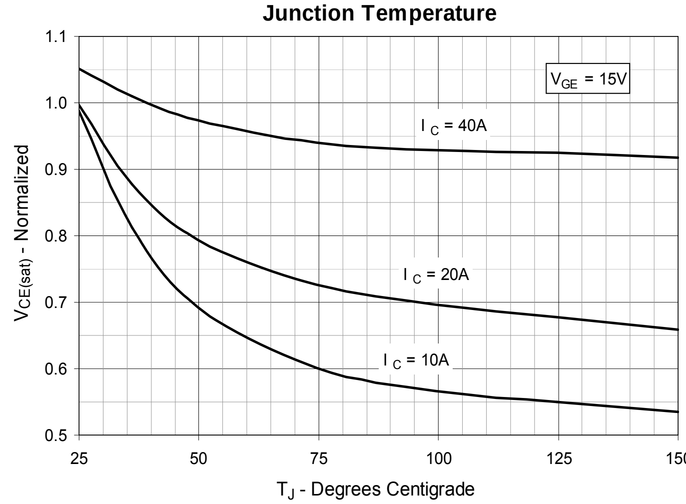


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

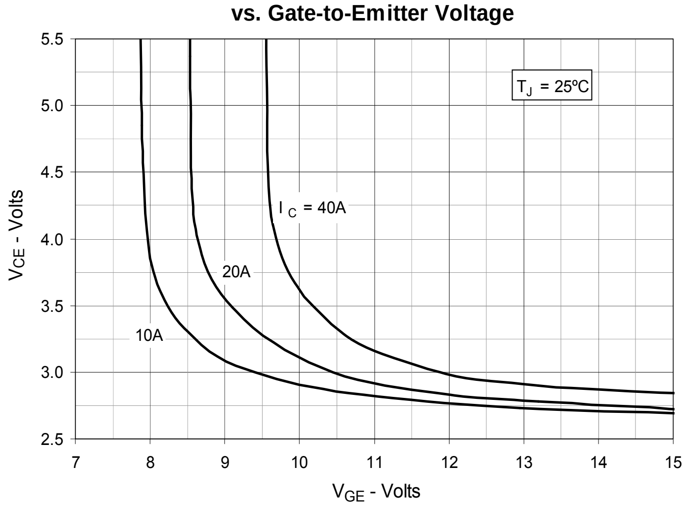


Fig. 6. Input Admittance

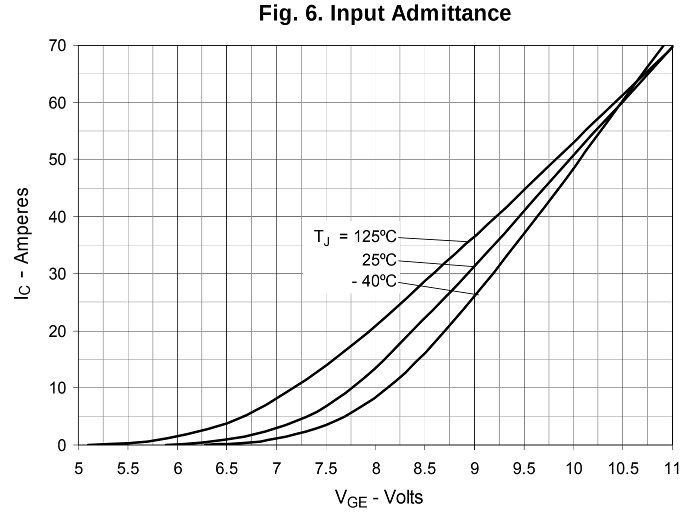


Fig. 7. Transconductance

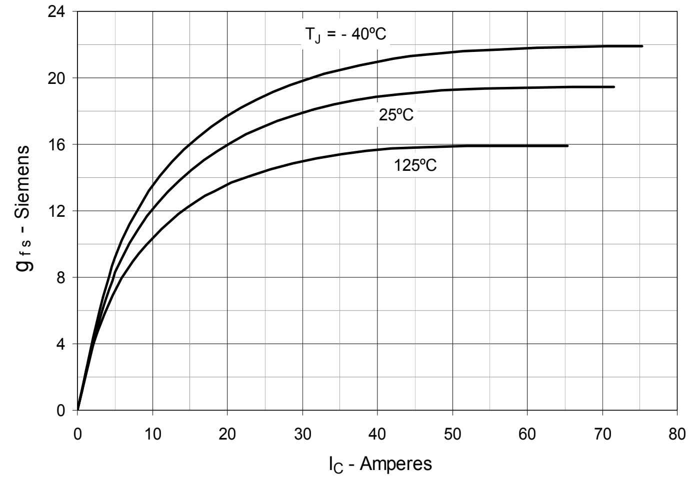


Fig. 8. Gate Charge

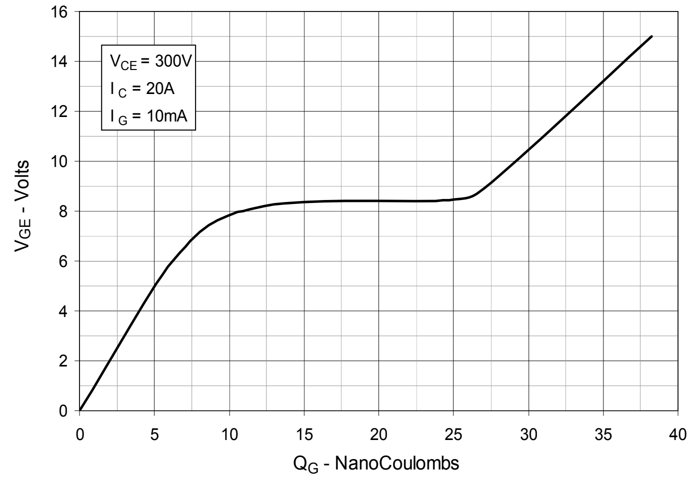


Fig. 9. Capacitance

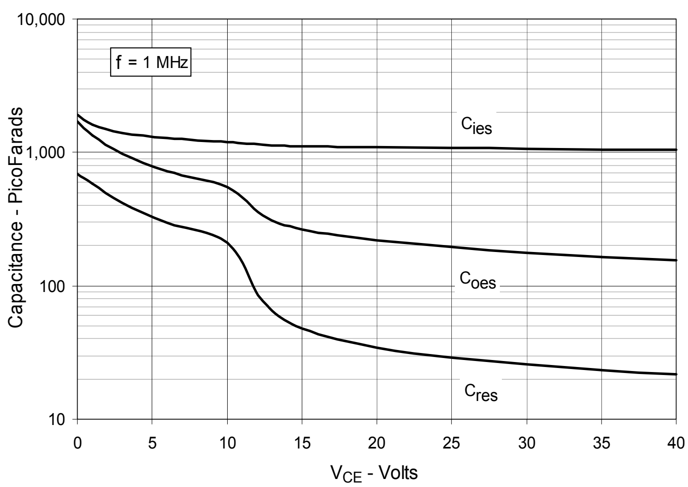


Fig. 10. Reverse-Bias Safe Operating Area

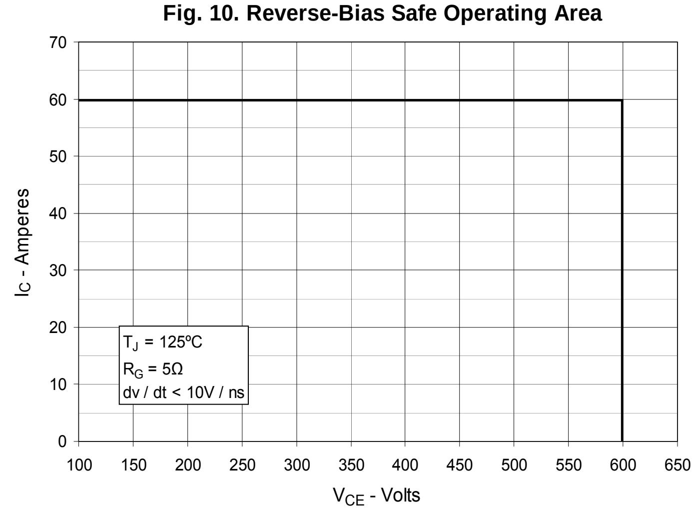


Fig. 11. Maximum Transient Thermal Impedance for IGBT

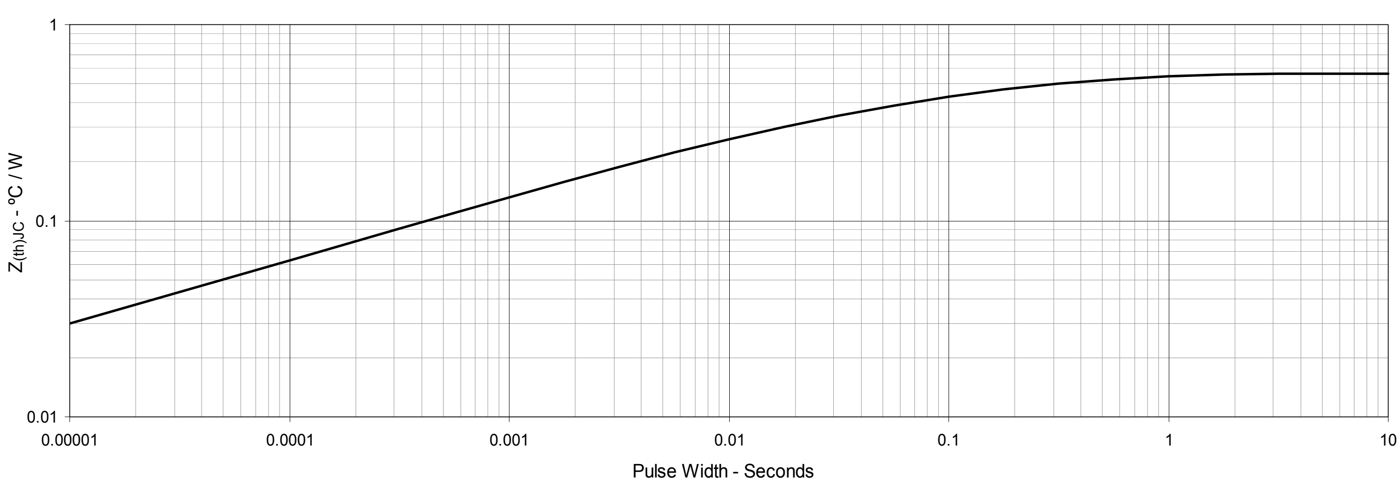


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

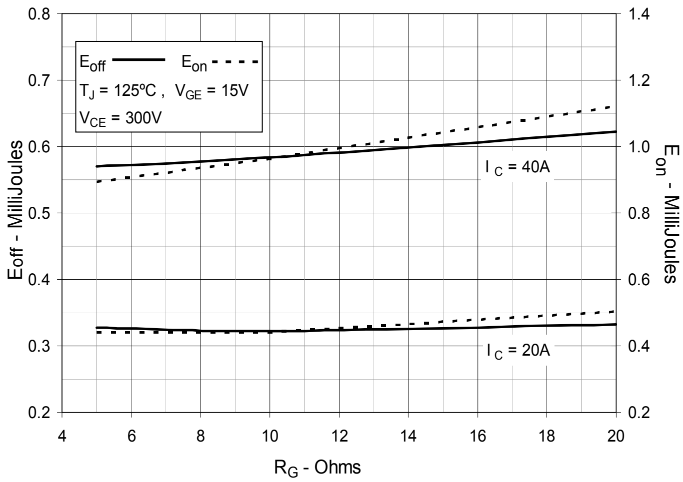


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

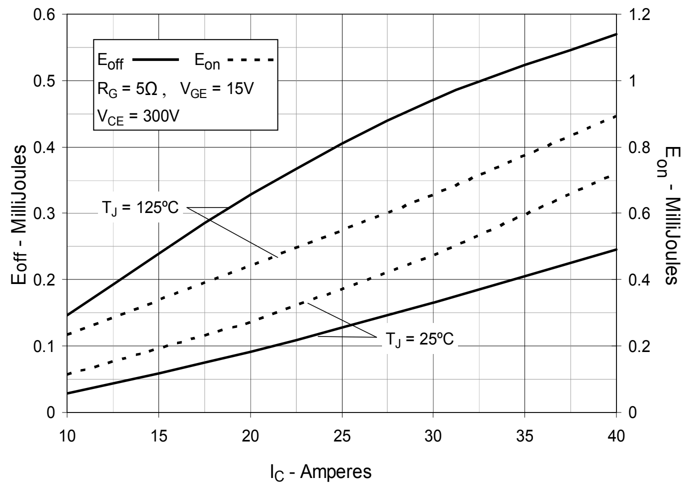


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

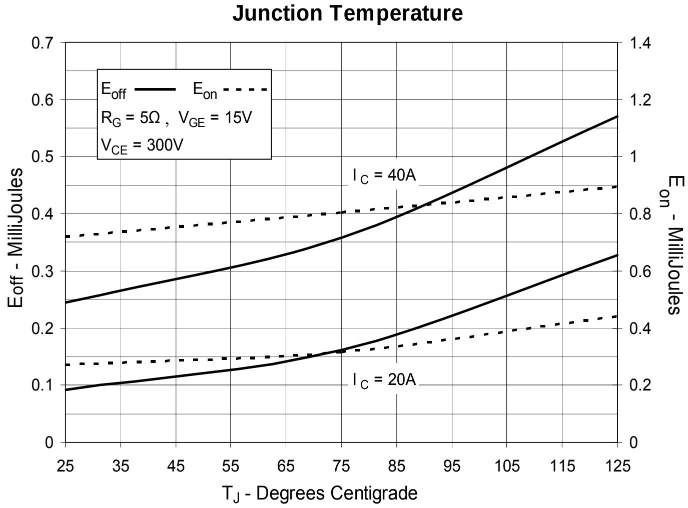


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

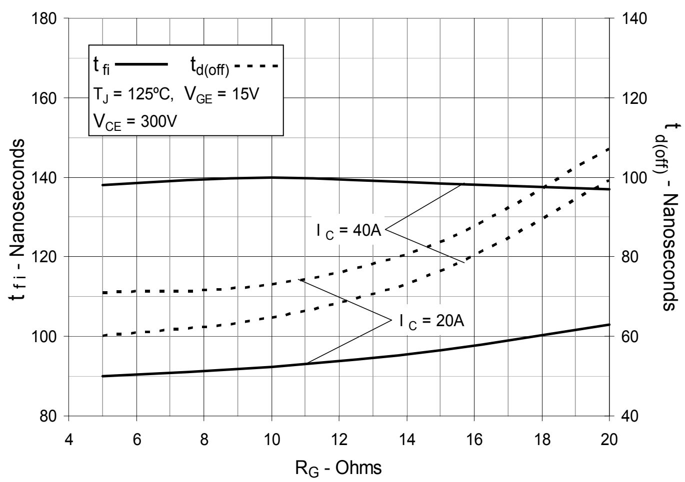


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

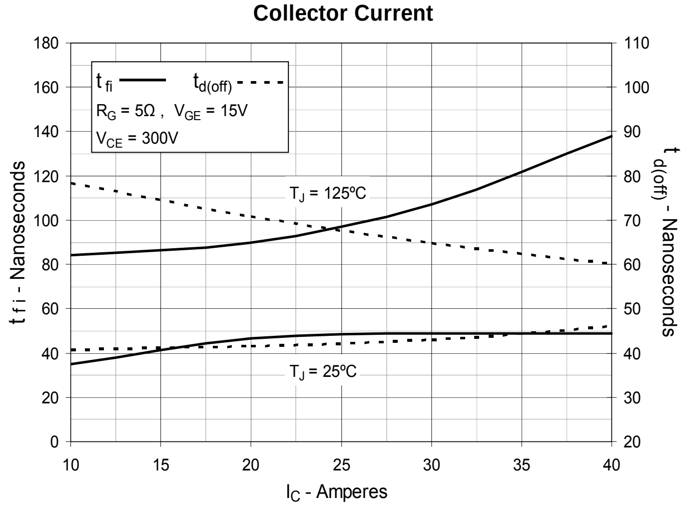
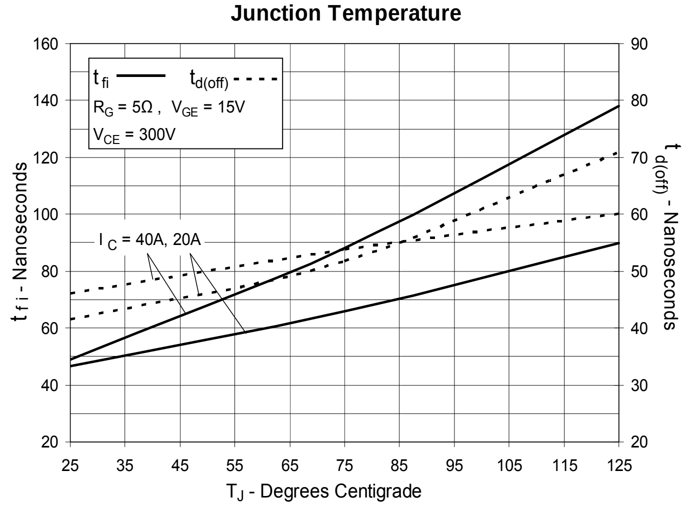


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature



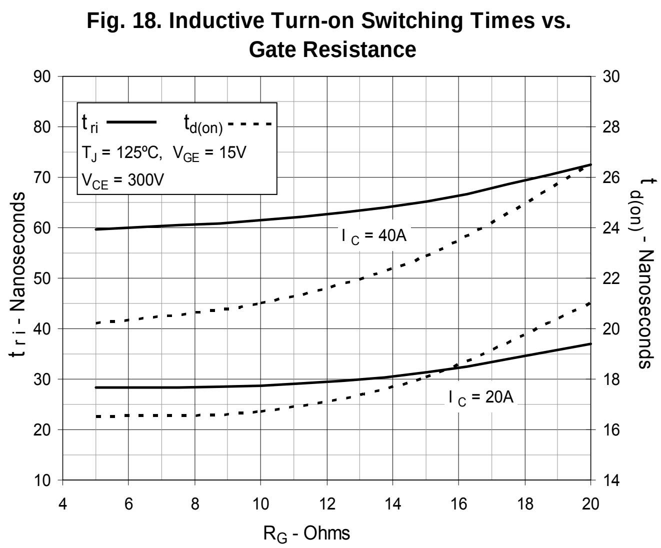


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance
t ri
t d(on)
T J = 125ºC, V GE = 15V
V CE = 300V
I C = 40A
I C = 20A
t r i - Nanoseconds
t d(on) - Nanoseconds
R G - Ohms
90
80
70
60
50
40
30
20
10
30
28
26
24
22
20
18
16
14
4
6
8
10
12
14
16
18
20

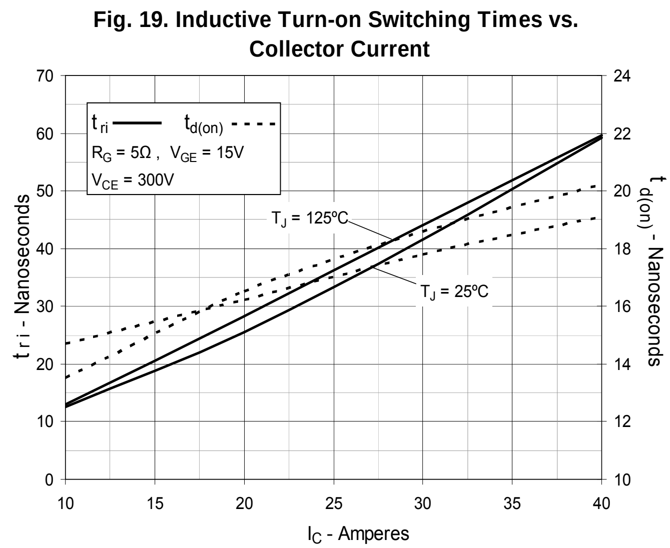


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current
t ri
t d(on)
R G = 5Ω , V GE = 15V
V CE = 300V
T J = 125ºC
T J = 25ºC
t r i - Nanoseconds
t d(on) - Nanoseconds
I C - Amperes
70
60
50
40
30
20
10
0
24
22
20
18
16
14
12
10
10
15
20
25
30
35
40

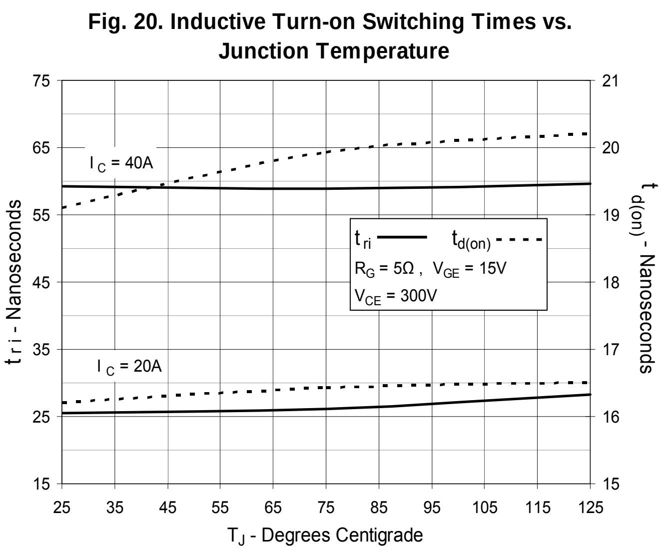


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature
t ri
t d(on)
R G = 5Ω , V GE = 15V
V CE = 300V
I C = 40A
I C = 20A
t r i - Nanoseconds
t d(on) - Nanoseconds
T J - Degrees Centigrade
75
65
55
45
35
25
15
21
20
19
18
17
16
15
25
35
45
55
65
75
85
95
105
115
125