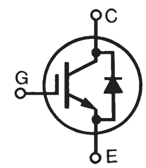
GenX3™ 1400V IGBTs w/ Diode

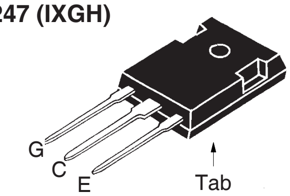
IXGH28N140B3H1
IXGX28N140B3H1
IXGK28N140B3H1

V_{CES} = 1400V
I_{C110} = 28A
$V_{CE(sat)}$ ≤ 3.60V

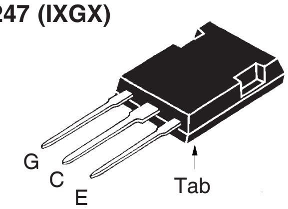
Avalanche Rated



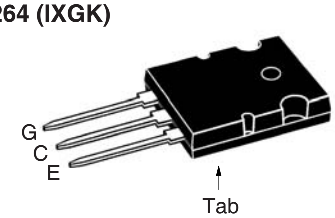
TO-247 (IXGH)



PLUS247 (IXGX)



TO-264 (IXGK)



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

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} = 1MΩ	1400	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	28	A
I_{F110}	T_C = 110°C	15	A
I_{CM}	T_C = 25°C, 1ms	150	A
I_A	T_C = 25°C	28	A
E_{AS}	T_C = 25°C	360	mJ
SSOA (RBSOA)	V_{GE}= 15V, T_{VJ} = 125°C, R_G = 5Ω Clamped Inductive Load	I_{CM} = 120 @ V_{CES} < V_{CE}	A
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062 in.) from Case for 10	260	°C
M_d	Mounting Torque (IXGH & IXGK)	1.13/10	Nm/lb.in.
F_C	Mounting Force (IXGX)	20..120/4.5..27	N/lb.
Weight	TO-247 & PLUS247	6	g
	TO-264	10	g

Symbol	Test Conditions	Characteristic Values			
(T_J = 25°C, Unless Otherwise Specified)		Min.	Typ.	Max.	
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			50	μA
	Note 2, T_J = 125°C			1	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = I_{C110}, V_{GE} = 15V, Note 1		3.00	3.60	V
	T_J = 125°C		3.05		

Features

- Optimized for Low Conduction and Switching Losses
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Ultra Fast Diode
- High Current Handling Capability

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

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

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max.	
g_{fs}	$I_C = I_{C110}$, V_{CE} = 10V, Note 1	12	19		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1 MHz		1830		pF
C_{oes}			163		pF
C_{res}			46		pF
$Q_{g(on)}$	$I_C = I_{C110}$, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		88		nC
Q_{ge}			12		nC
Q_{gc}			38		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		16		ns
t_{ri}	$I_C = I_{C110}$, V_{GE} = 15V		36		ns
E_{on}	V_{CE} = 960V, R_G = 5Ω		3.6		mJ
$t_{d(off)}$	Note 3		190	400	ns
t_{fi}			360		ns
E_{off}			3.9	6.5	J
$t_{d(on)}$	**Inductive load, T_J = 125°C**		16		ns
t_{ri}	$I_C = I_{C110}$, V_{GE} = 15V		50		ns
E_{on}	V_{CE} = 960V, R_G = 5Ω		7.3		mJ
$t_{d(off)}$	Note 3		215		ns
t_{fi}			700		ns
E_{off}			6.5		mJ
R_{thJC}				0.42	°C/W
R_{thCs}			0.21		°C/W
			0.15		°C/W

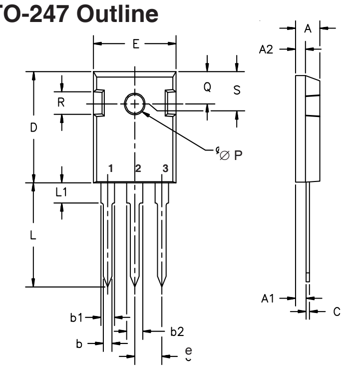
Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max.	
V_F	I_F = 20A, V_{GE} = 0V, Note 1			3.0	V
	T_J = 150°C		2.65		V
t_{rr}	I_F = 20A, V_{GE} = 0V, $-di_F/dt$ = -200A/μs,		350		ns
I_{RM}	V_R = 1200V, T_J = 125°C		18.5		A
R_{thJC}				0.90	°C/W

Notes:

1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Part must be heatsunk for high-temp Ices measurement.
3. Switching times & energy losses may increase for higher V_{CE}(Clamp), T_J or R_G.

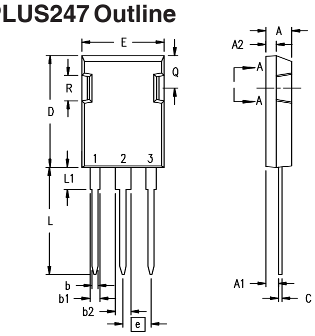
TO-247 Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitted

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	

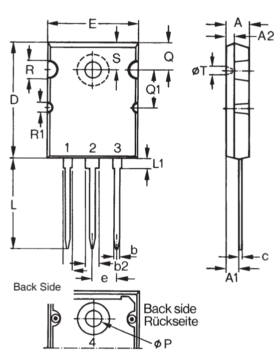
PLUS247 Outline



Terminals: 1 - Gate
2 - Collector
3 - Emitter

Dim.	Millimeter Min.	Max.	Inches 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

TO-264 AA Outline



Terminals: 1 = Gate
2,4 = Collector
3 = Emitter

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

Fig. 1. Output Characteristics @ T_J = 25ºC

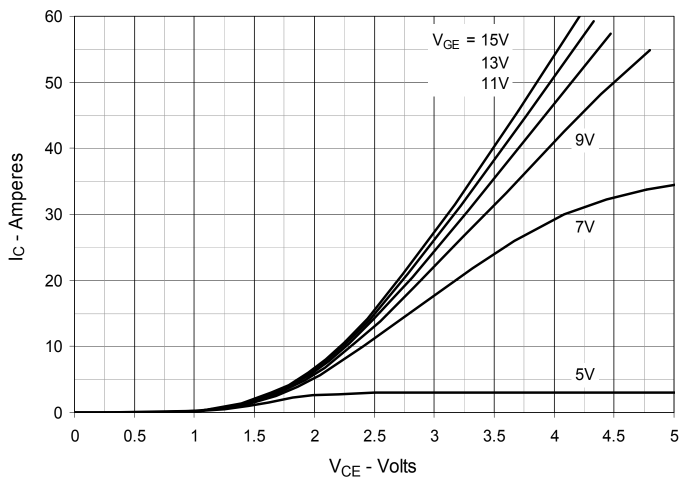


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

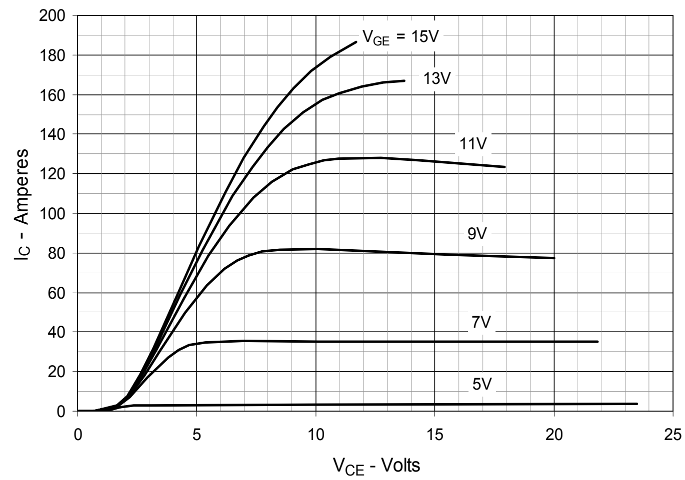


Fig. 3. Output Characteristics @ T_J = 125ºC

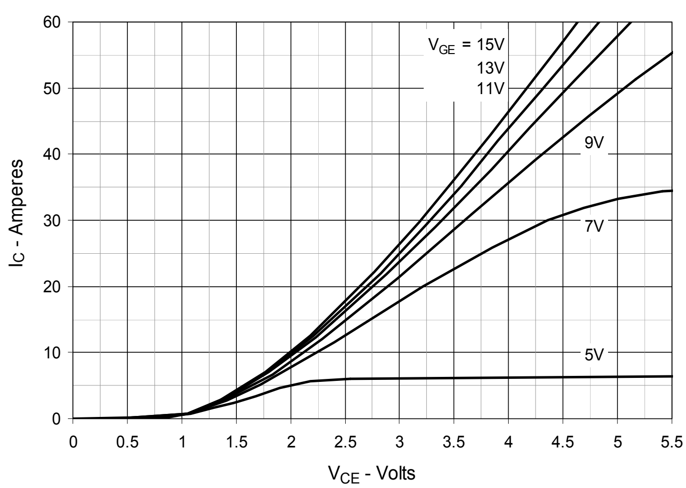


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

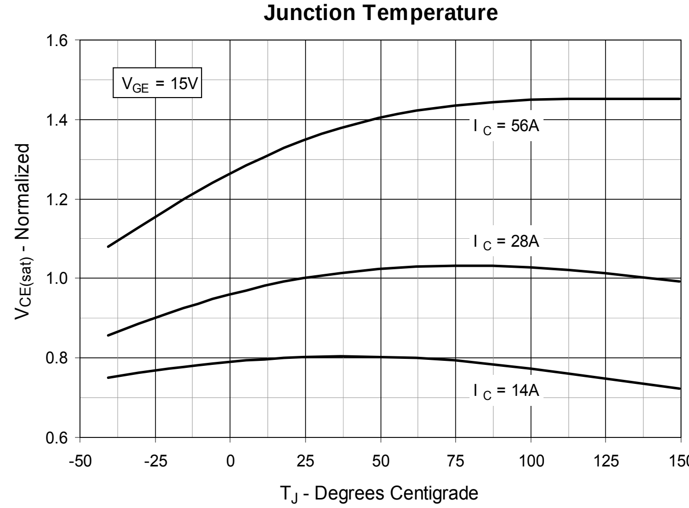


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

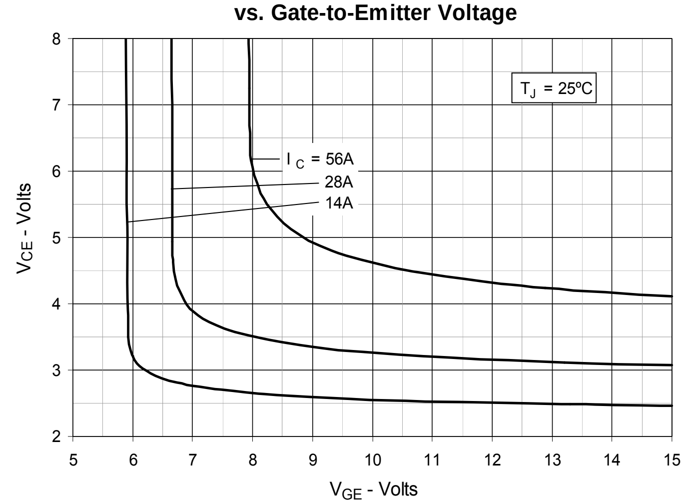


Fig. 6. Input Admittance

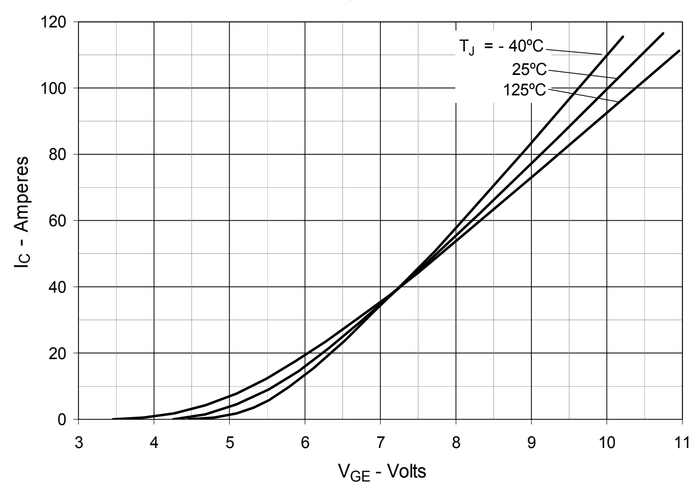


Fig. 7. Transconductance

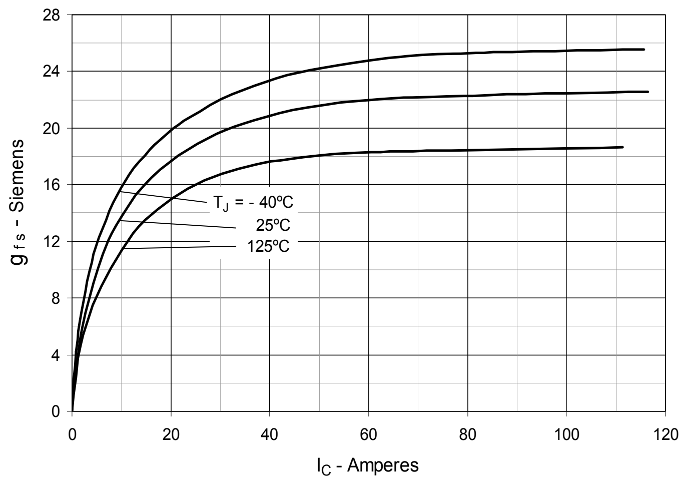


Fig. 8. Gate Charge

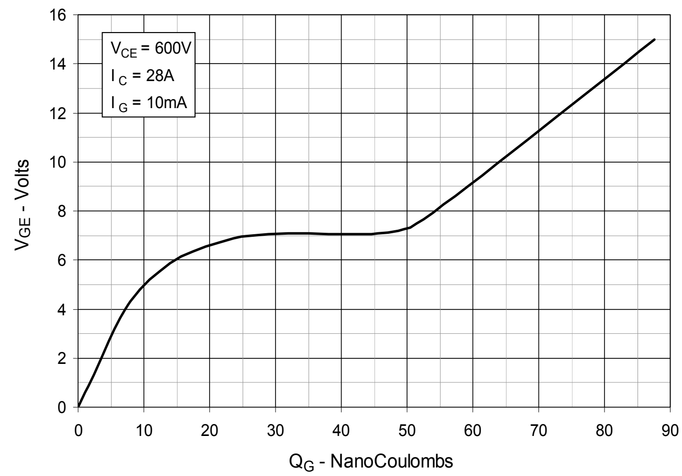


Fig. 9. Capacitance

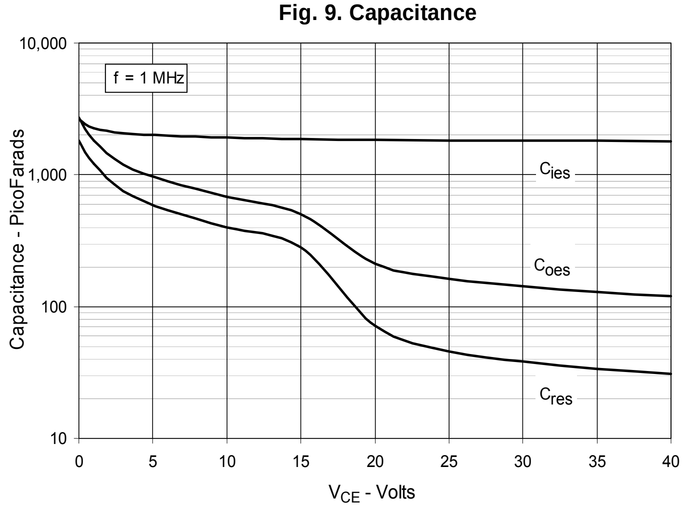


Fig. 10. Reverse-Bias Safe Operating Area

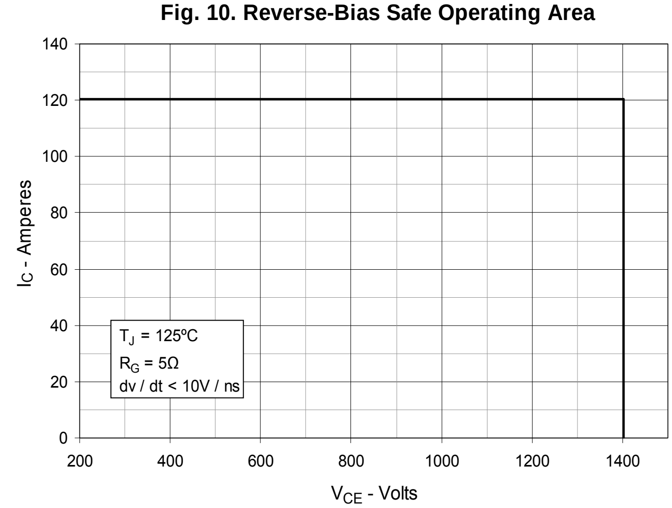


Fig. 11. Maximum Transient Thermal Impedance

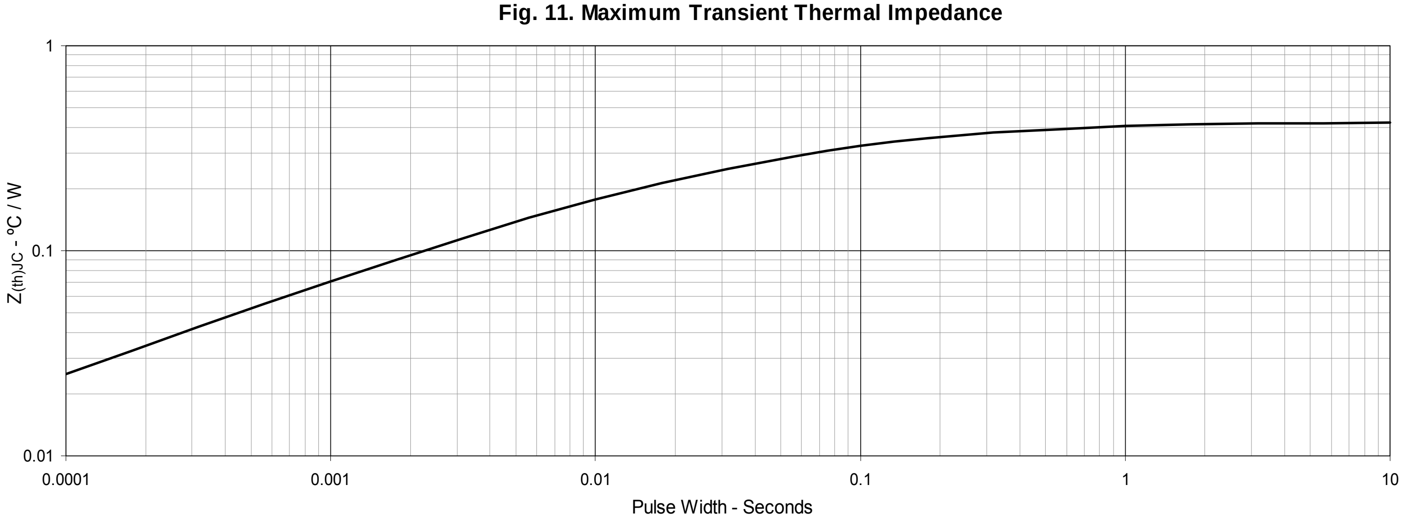


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

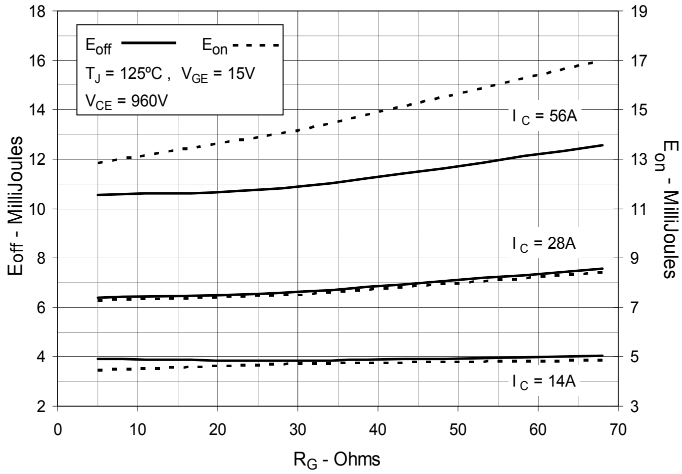


Fig. 13. Inductive Swiching Energy Loss vs. Collector Current

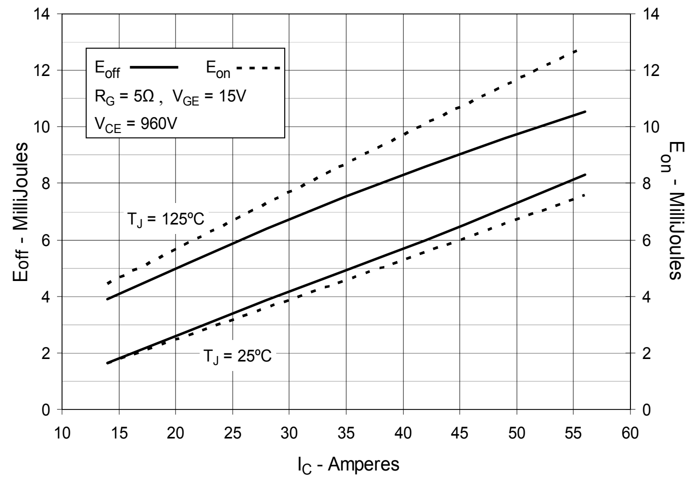


Fig. 14. Inductive Swiching Energy Loss vs. Junction Temperature

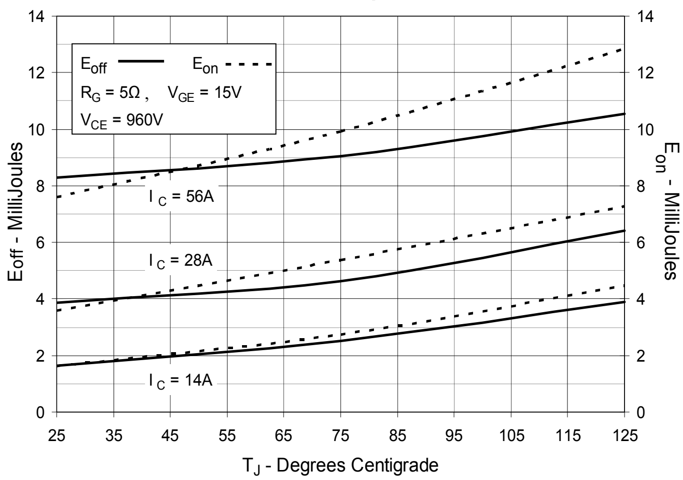


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

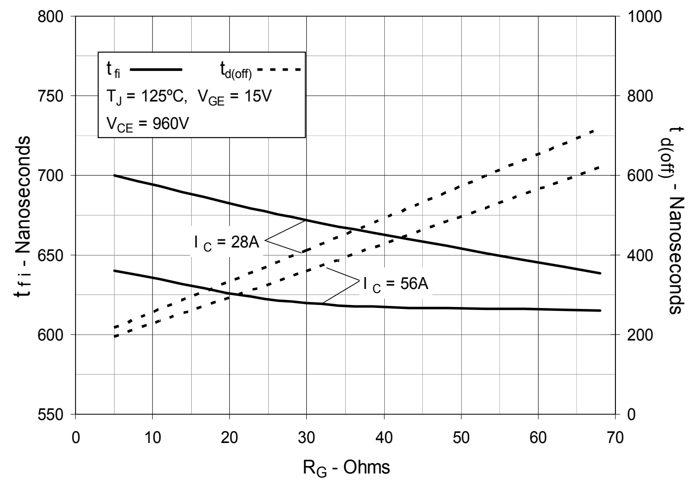


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

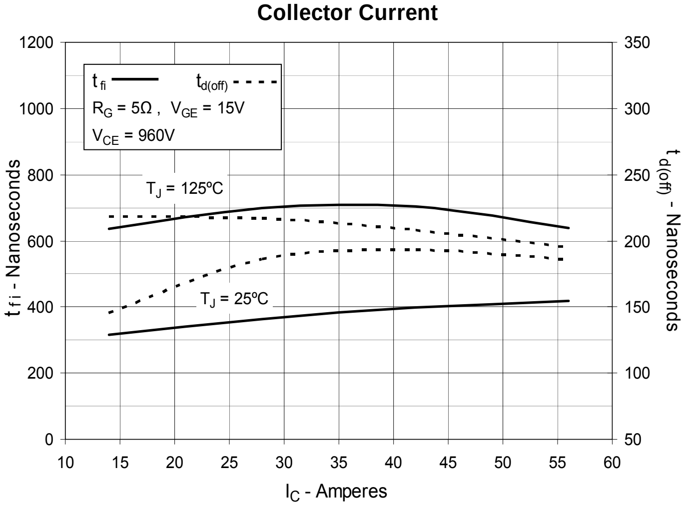


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

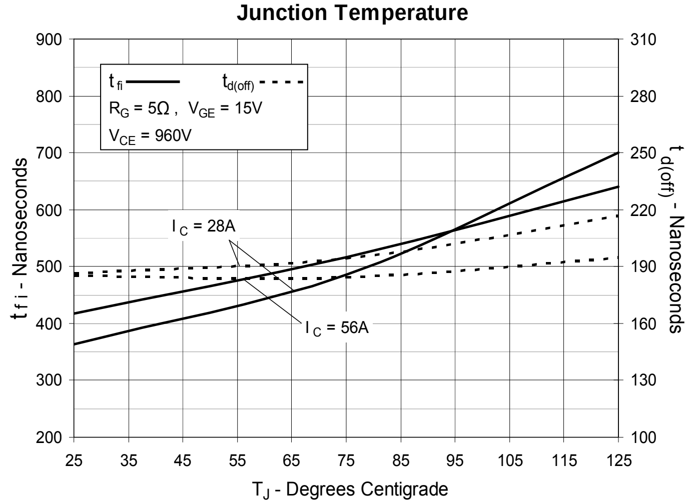


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

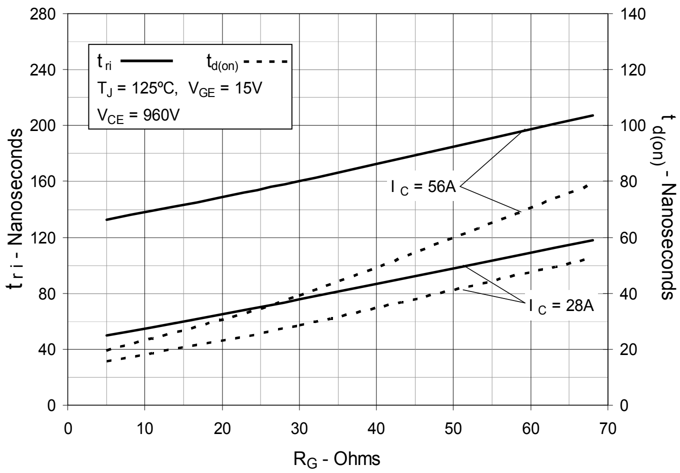


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

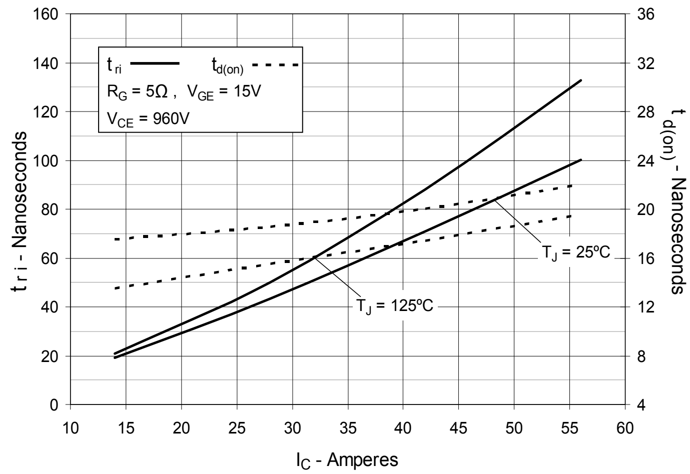


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature