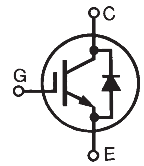
IXYS

Preliminary Technical Information

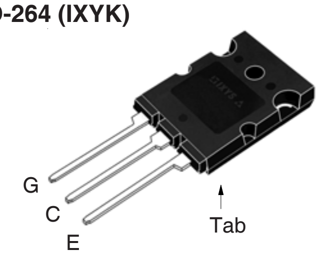
High Voltage XPT™ IGBT w/ Diode

IXYK30N170CV1
IXYX30N170CV1

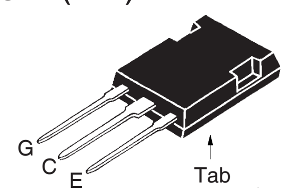
V_{CES} = 1700V
I_{C110} = 30A
$V_{CE(sat)}$ ≤ 4.0V
$t_{fi(typ)}$ = 95ns



TO-264 (IXYK)



PLUS247 (IXYX)



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

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 175°C	1700	V
V_{CGR}	T_J = 25°C to 175°C, R_{GE} = 1MΩ	1700	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	100	A
I_{C110}	T_C = 110°C	30	A
I_{F110}	T_C = 110°C	38	A
I_{CM}	T_C = 25°C, 1ms	250	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 2.7Ω Clamped Inductive Load	I_{CM} = 120 1360	A V
P_C	T_C = 25°C	937	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 (TO-264)	1.13/10	Nm/lb.in
F_C	Mounting Force (PLUS247)	20..120 /4.5..27	N/lb
Weight	TO-264 PLUS247	10 6	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	1700			V
$V_{GE(th)}$	I_C = 250µA, V_{CE} = V_{GE}	3.0		5.0	V
I_{CES}	V_{CE} = 0.8 • V_{CES}, V_{GE} = 0V			25	µA
	T_J = 125°C			4	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 30A, V_{GE} = 15V, Note 1		3.5	4.0	V
	T_J = 150°C		4.6		V

Features

- International Standard Packages
- High Voltage Package
- High Blocking Voltage
- Low Saturation Voltage

Advantages

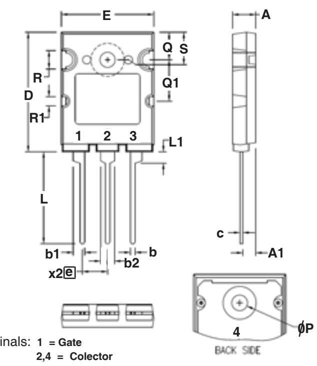
- Low Gate Drive Requirement
- High Power Density

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- Uninterruptible Power Supplies (UPS)
- Laser Generators
- Capacitor Discharge Circuits
- AC Switches

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Min.	Typ.	Max.	
g_{fs}	I_C = 30A, V_{CE} = 10V, Note 1	17	28		S
R_{Gi}	Gate Input Resistance		2.8		Ω
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		3100		pF
C_{oes}			210		pF
C_{res}			55		pF
$Q_{g(on)}$	I_C = 30A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		150		nC
Q_{ge}			15		nC
Q_{gc}			65		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		16		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		33		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 2.7Ω		3.6		mJ
$t_{d(off)}$	Note 2		143		ns
t_{fi}			95		ns
E_{off}			1.8		mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		16		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		33		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 2.7Ω		5.5		mJ
$t_{d(off)}$	Note 2		193		ns
t_{fi}			134		ns
E_{off}			3.5		mJ
R_{thJC}				0.16	°C/W
R_{thCS}			0.15		°C/W

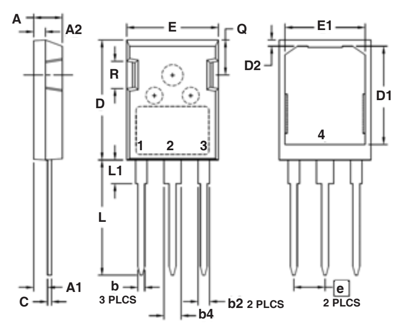
TO-264 Outline



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

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.185	.209	4.70	5.30
A1	.102	.118	2.60	3.00
b	.035	.049	0.90	1.25
b1	.091	.106	2.30	2.70
b2	.110	.126	2.80	3.20
c	.020	.033	0.50	0.85
D	1.012	1.035	25.70	26.30
E	.776	.799	19.70	20.30
e	.215BSC		5.46 BSC	
L	.768	.807	19.50	20.50
L1	.091	.106	2.30	2.70
øP	.122	.138	3.10	3.50
Q	.228	.244	5.80	6.20
Q1	.346	.362	8.80	9.20
øR	.150	.165	3.80	4.20
øR1	.071	.087	1.80	2.20
S	.228	.244	5.80	6.20

PLUS 247™ Outline



Terminals: 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	.520	.560	13.08	14.22
e	.215 BSC		5.45 BSC	
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Min.	Typ.	Max.	
V_F	I_F = 30A, V_{GE} = 0V, Note 1			3.5	V
	T_J = 150°C		3.7		V
I_{RM}	I_F = 30A, V_{GE} = 0V, $-di_F/dt$ = 500A/μs,		32		A
t_{rr}	V_R = 1200V, T_J = 150°C		175		ns
R_{thJC}				0.36	°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.

PRELIMINARY 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 @ $T_J = 25^oC$

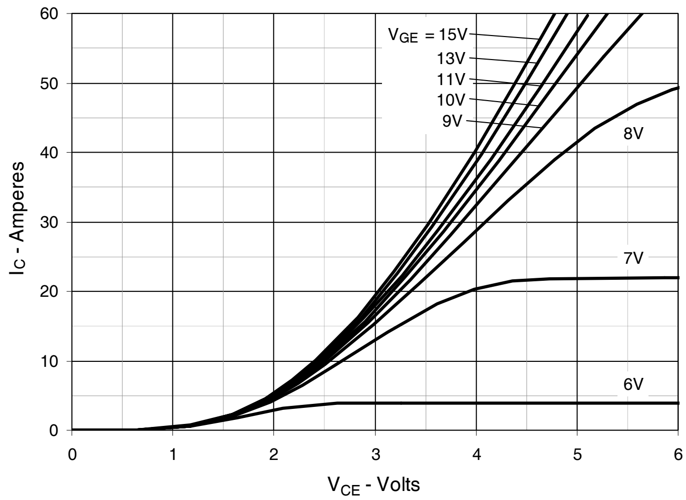


Fig. 2. Extended Output Characteristics @ $T_J = 25^oC$

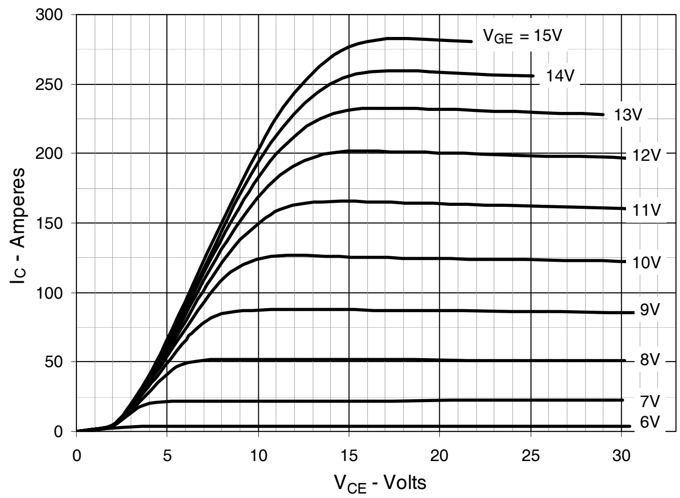


Fig. 3. Output Characteristics @ $T_J = 150^oC$

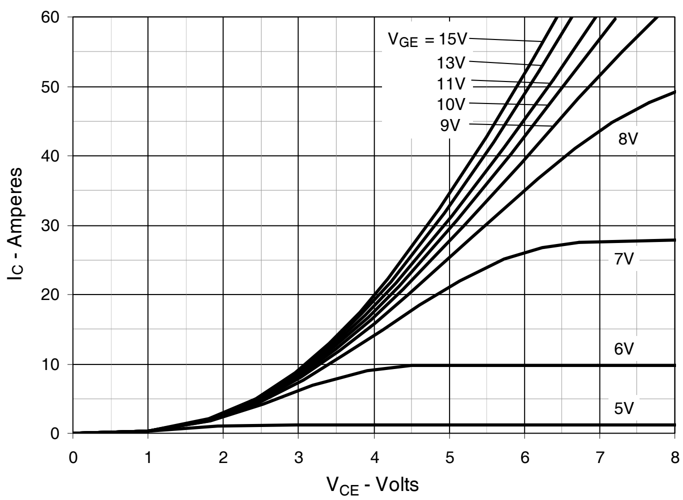


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

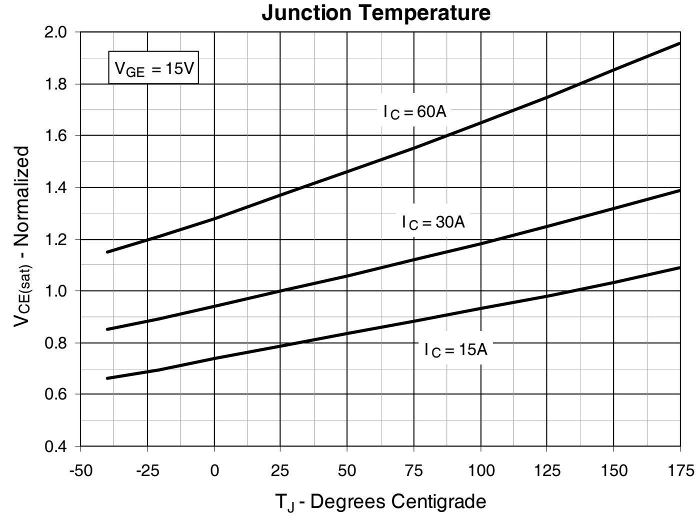


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

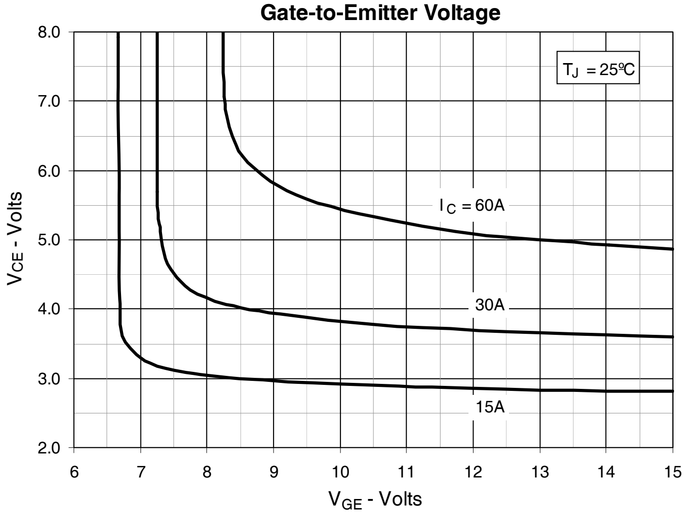


Fig. 6. Input Admittance

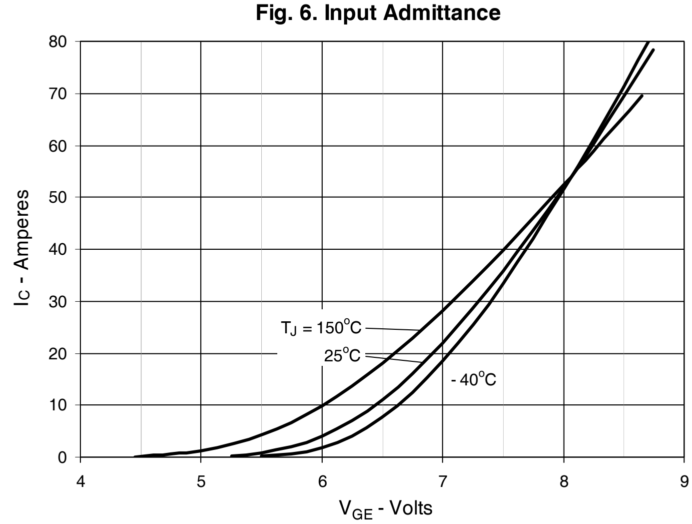


Fig. 7. Transconductance

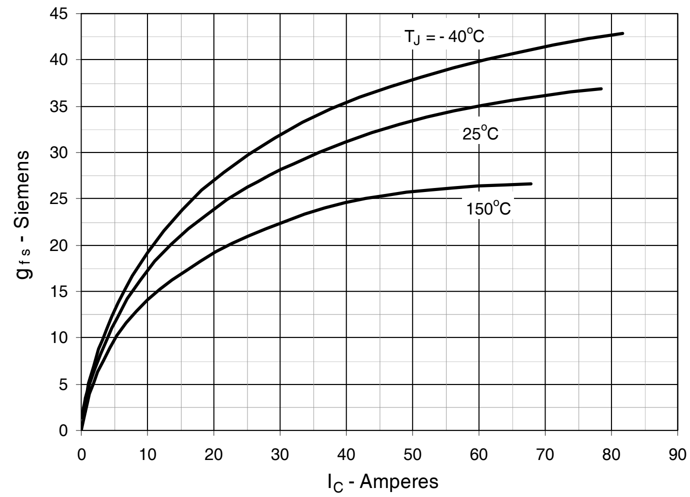


Fig. 8. Gate Charge

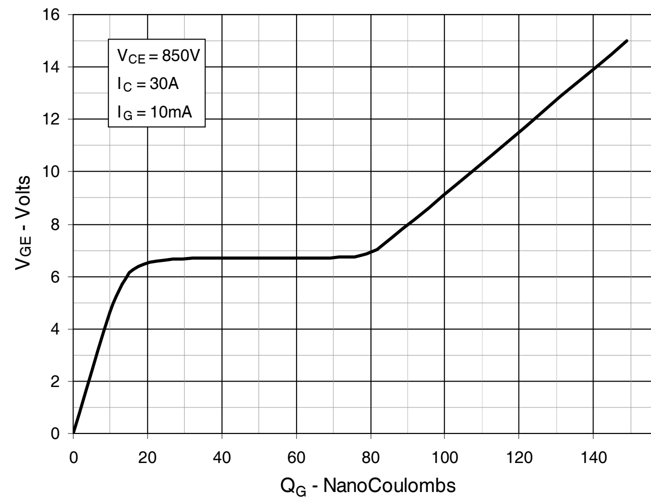


Fig. 9. Capacitance

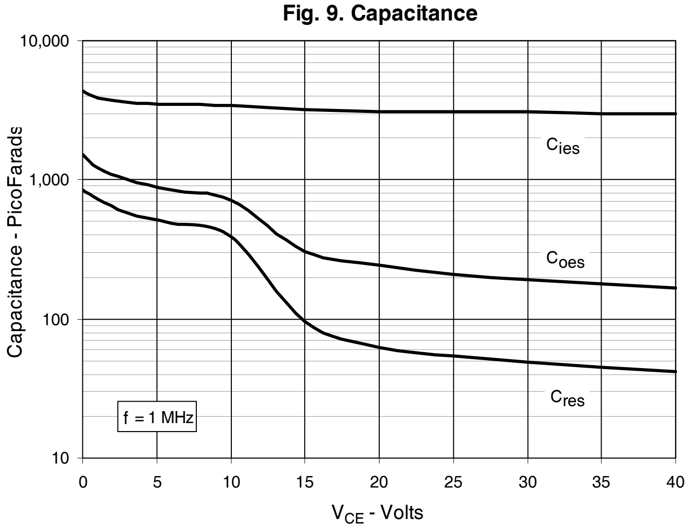


Fig. 10. Reverse-Bias Safe Operating Area

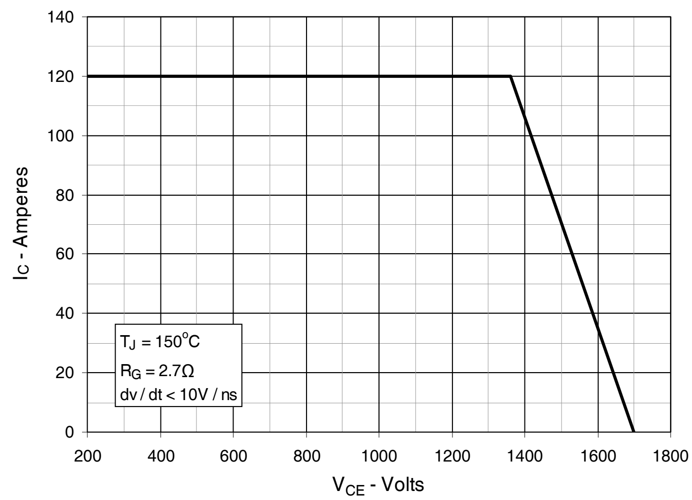


Fig. 11. Maximum Transient Thermal Impedance (IGBT)

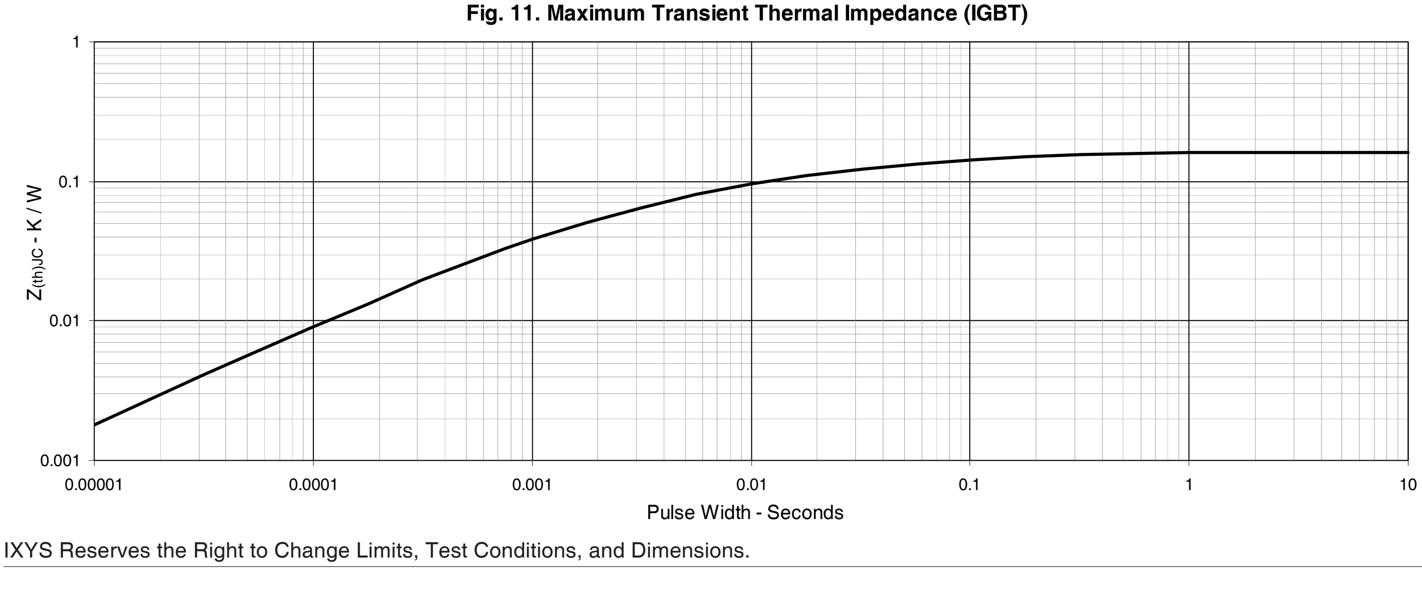


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

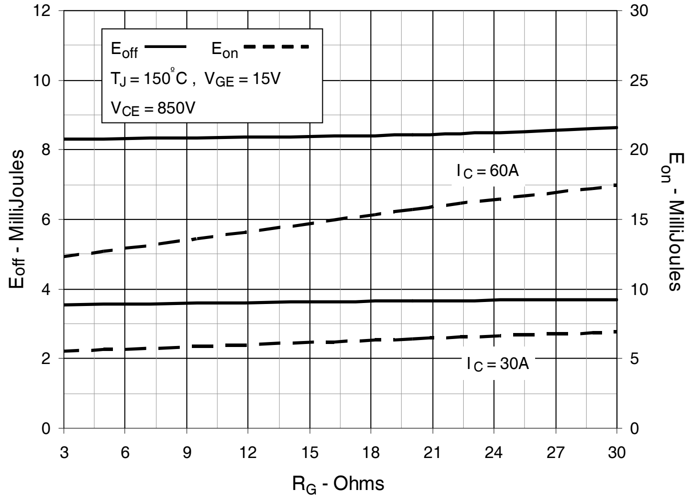


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

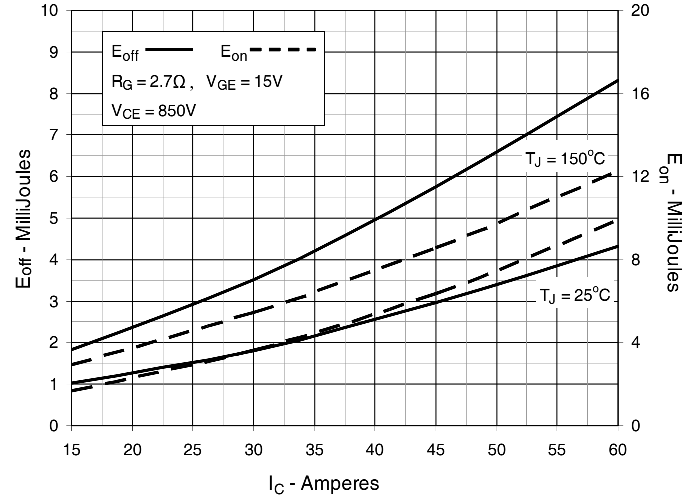


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

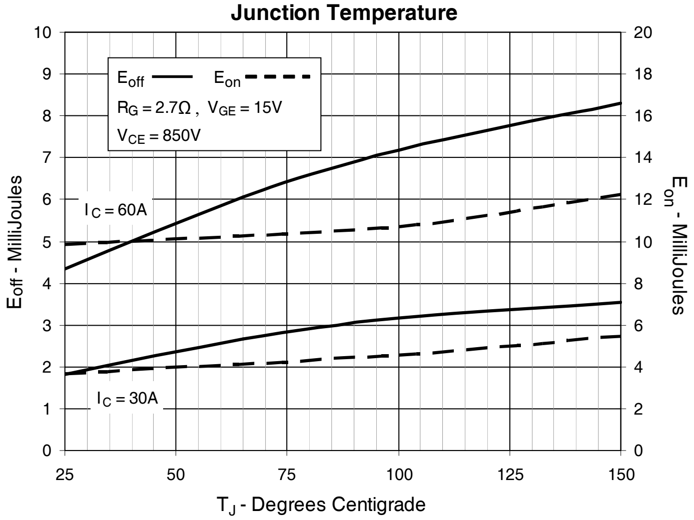


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

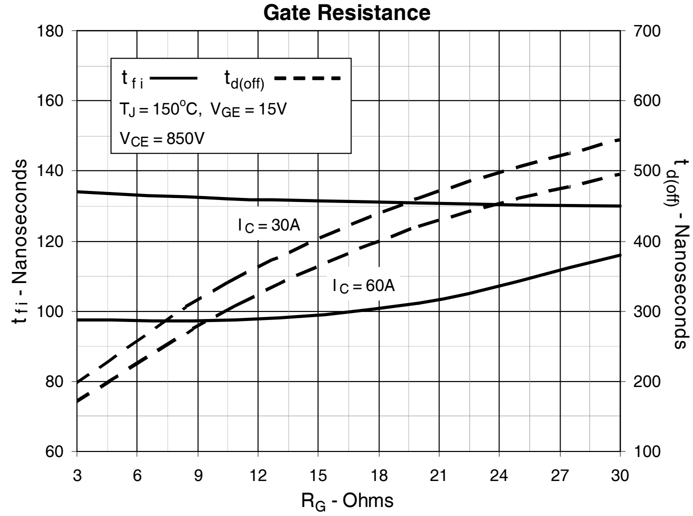


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

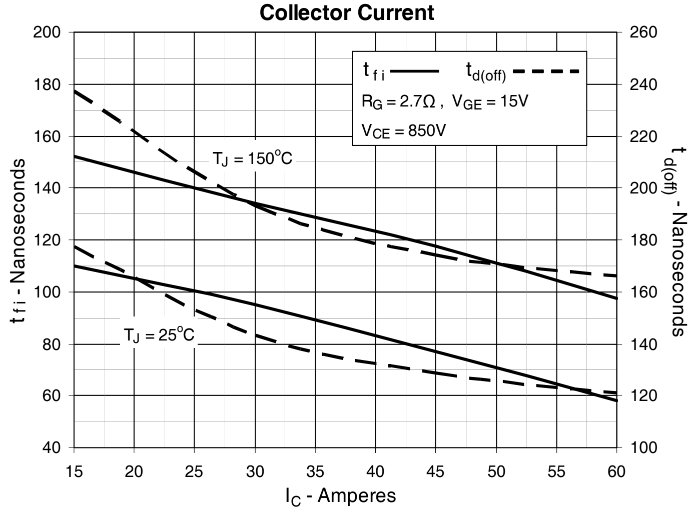
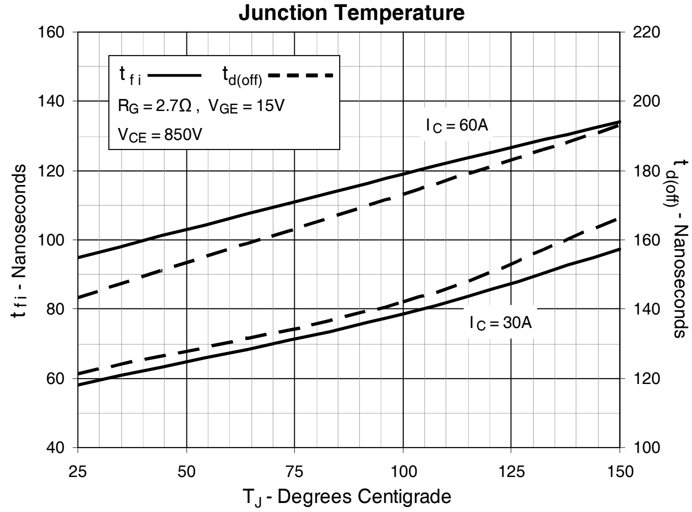


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature



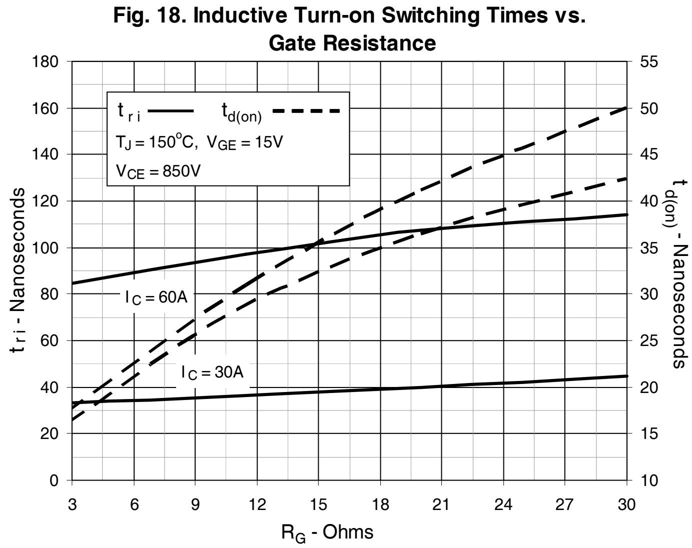


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance
t r i
t d(on)
T J = 150°C, V GE = 15V
V CE = 850V
I C = 60A
I C = 30A
t r i - Nanoseconds
t d(on) - Nanoseconds
R G - Ohms
180
160
140
120
100
80
60
40
20
0
55
50
45
40
35
30
25
20
15
10
3
6
9
12
15
18
21
24
27
30

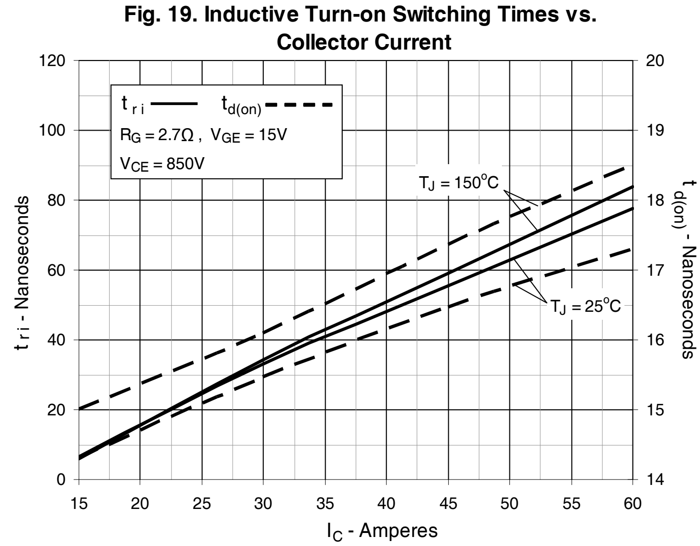


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current
t r i
t d(on)
R G = 2.7Ω , V GE = 15V
V CE = 850V
T J = 150°C
T J = 25°C
t r i - Nanoseconds
t d(on) - Nanoseconds
I C - Amperes
120
100
80
60
40
20
0
20
19
18
17
16
15
14
15
20
25
30
35
40
45
50
55
60

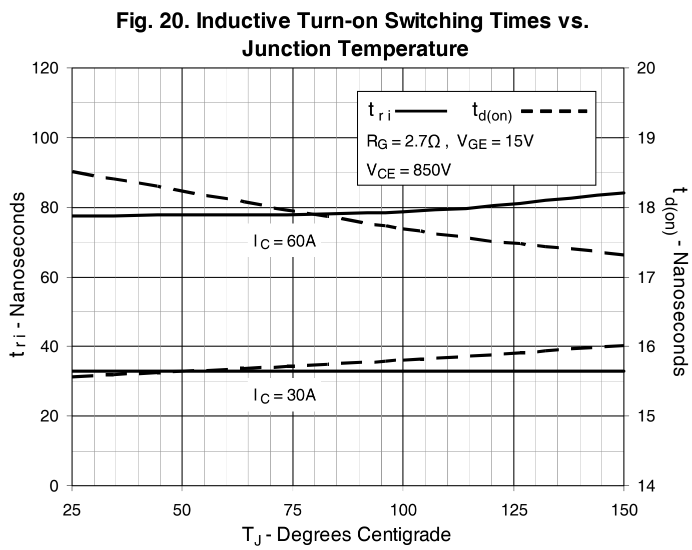


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature
t r i
t d(on)
R G = 2.7Ω , V GE = 15V
V CE = 850V
I C = 60A
I C = 30A
t r i - Nanoseconds
t d(on) - Nanoseconds
T J - Degrees Centigrade
120
100
80
60
40
20
0
20
19
18
17
16
15
14
25
50
75
100
125
150

Fig. 21. Diode Forward Characteristics

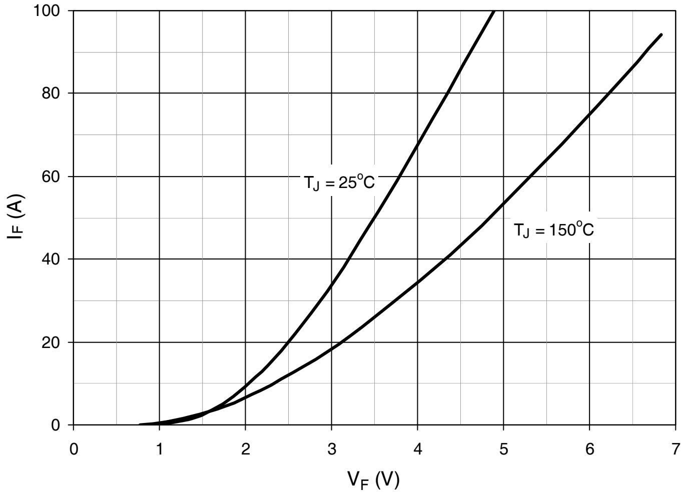


Fig. 22. Reverse Recovery Charge vs. -di$_F$/dt

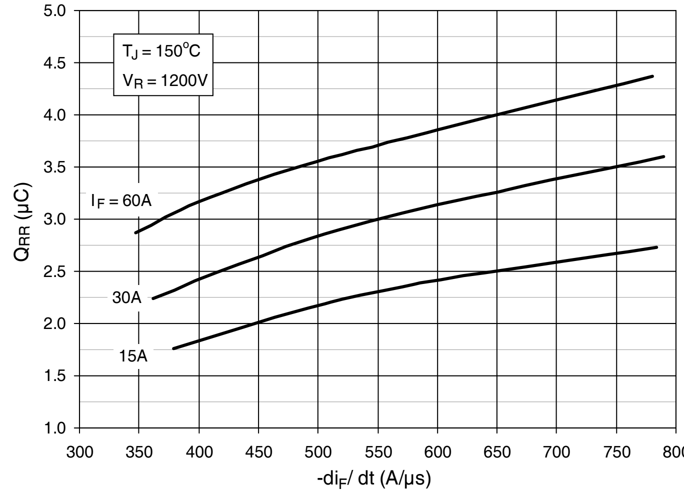


Fig. 23. Reverse Recovery Current vs. -di$_F$/dt

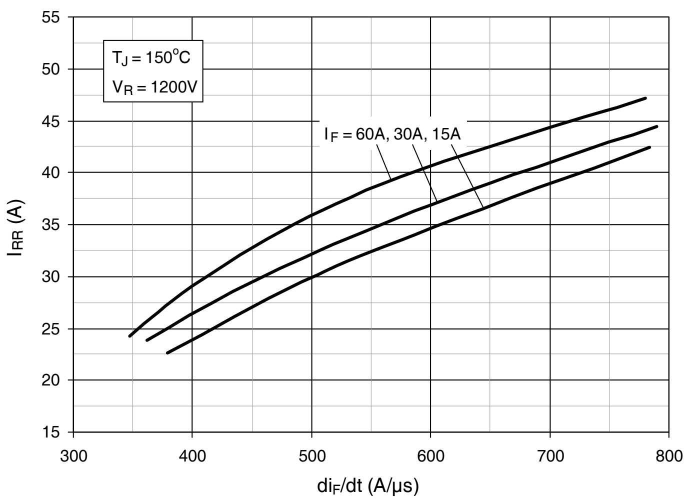


Fig. 24. Reverse Recovery Time vs. -di$_F$/dt

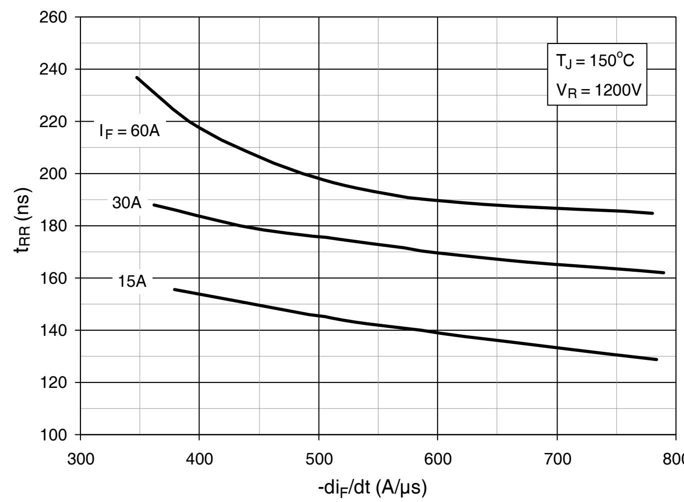


Fig. 25. Dynamic Parameters Q_{RR}, I_{RR} vs. Junction Temperature

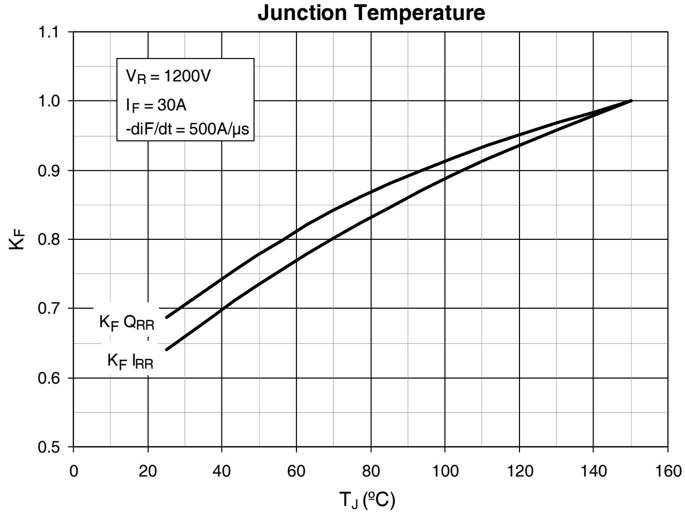


Fig. 26. Maximum Transient Thermal Impedance (Diode)