IXYS

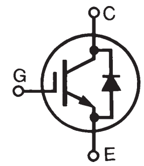
GenX3™ 600V IGBTs w/ Diode

IXGH30N60C3D1
IXGT30N60C3D1*

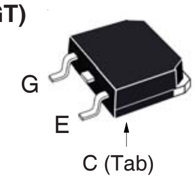
*Obsolete Part Number

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

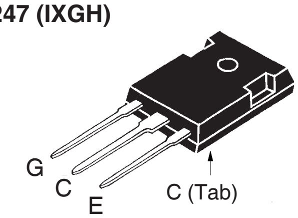
High-Speed PT IGBTs for 40-100 kHz Switching



TO-268 (IXGT)



TO-247 (IXGH)



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

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_{F110}	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-247)	1.13/10	Nm/lb.in.
Weight	TO-268	4	g
	TO-247	6	g

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	3.0		5.5	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			75	μA
	T_J = 125°C			1	mA
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

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- 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

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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	30		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		915		pF
C_{oes}			78		pF
C_{res}			32		pF
Q_g	I_C = 20A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		38		nC
Q_{ge}			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-247		0.21		°C/W

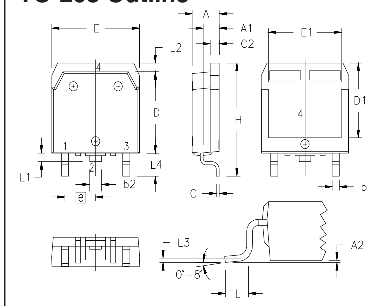
Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 30A, V_{GE} = 0V, Note 1			2.7	V
	T_J = 150°C		1.6		V
I_{RM}	I_F = 30A, V_{GE} = 0V, $-di_F/dt$ = 100A/μs, T_J = 100°C			4	A
t_{rr}	V_R = 100V, T_J = 100°C		100		ns
	I_F = 1A, -di/dt = 100A/μs, V_R = 30V		25		ns
R_{thJC}				0.9	°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.

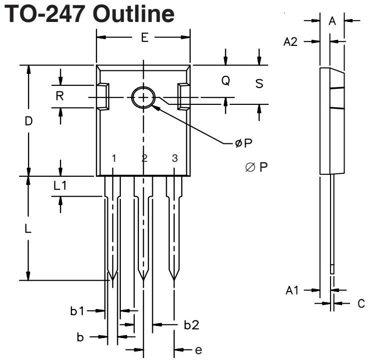
TO-268 Outline



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

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

TO-247 Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter

Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches 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	

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

IXYS MOSFETs and IGBTs are covered by one or moreof the following U.S. patents: 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 7,005,734 B2 7,157,338B2 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 7,063,975 B2 4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6,771,478 B2 7,071,537

Fig. 1. Output Characteristics @ T_J = 25ºC

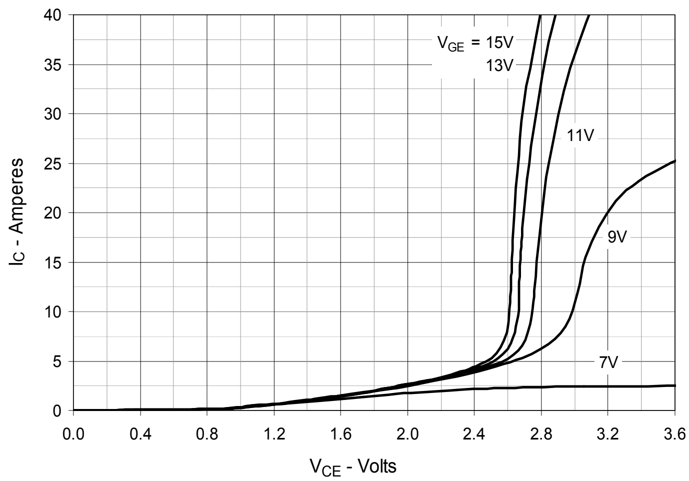


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

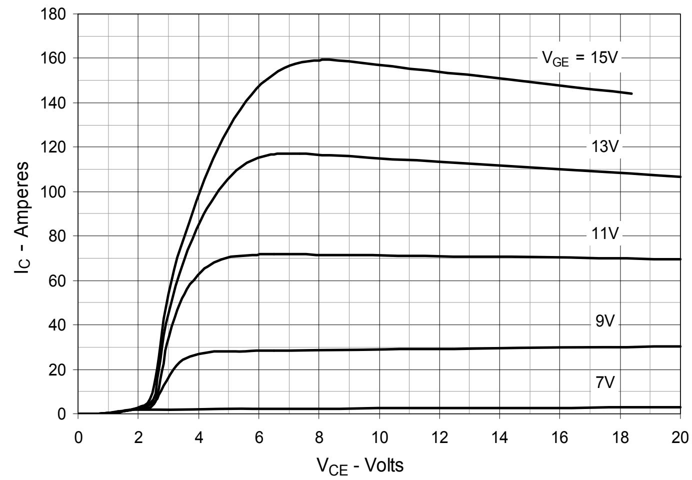


Fig. 3. Output Characteristics @ T_J = 125ºC

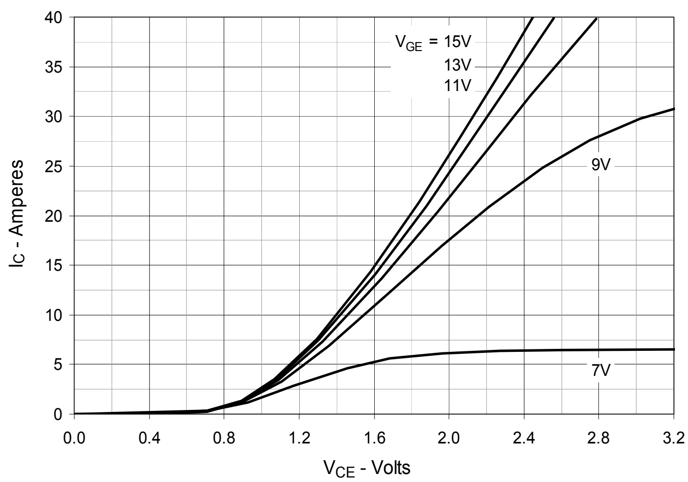


Fig. 4. Dependence of $V_{CE(sat)}$ on JunctionTemperature

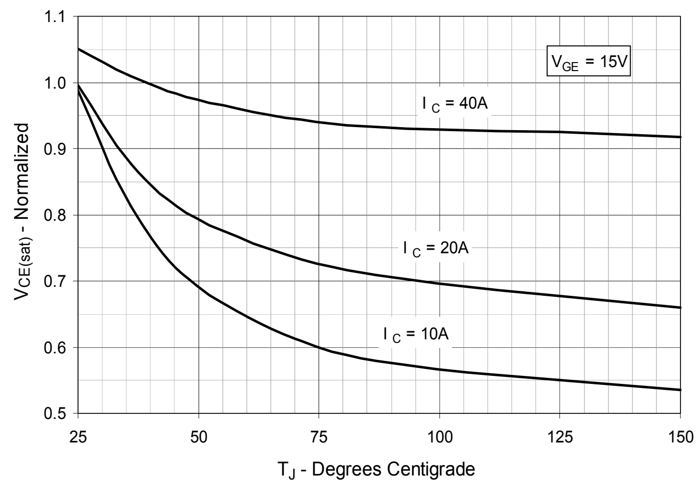


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

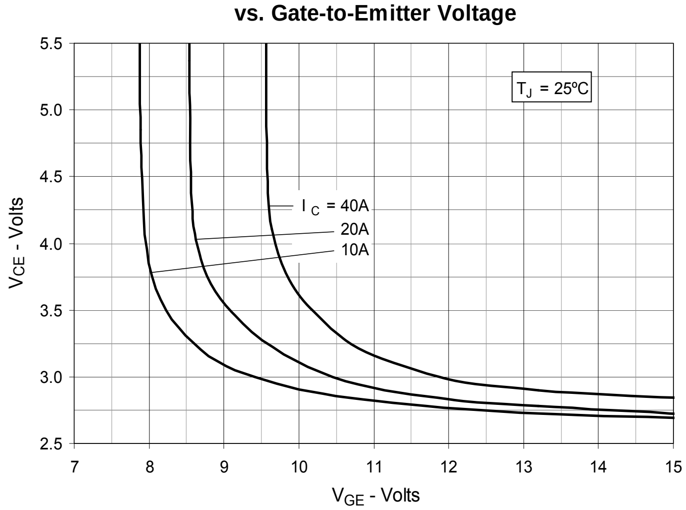
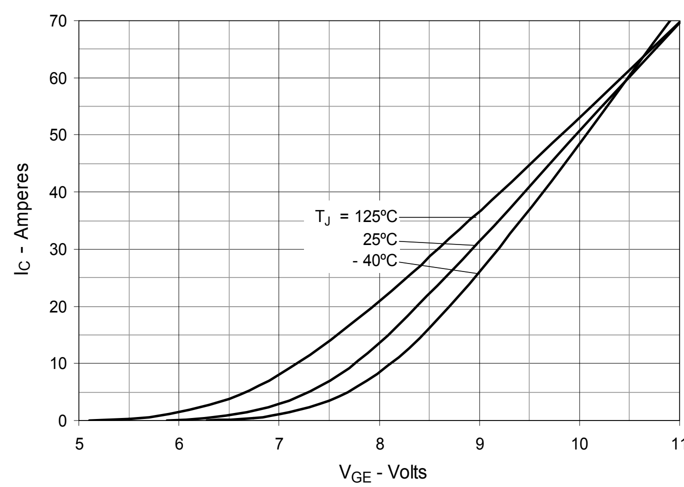


Fig. 6. Input Admittance



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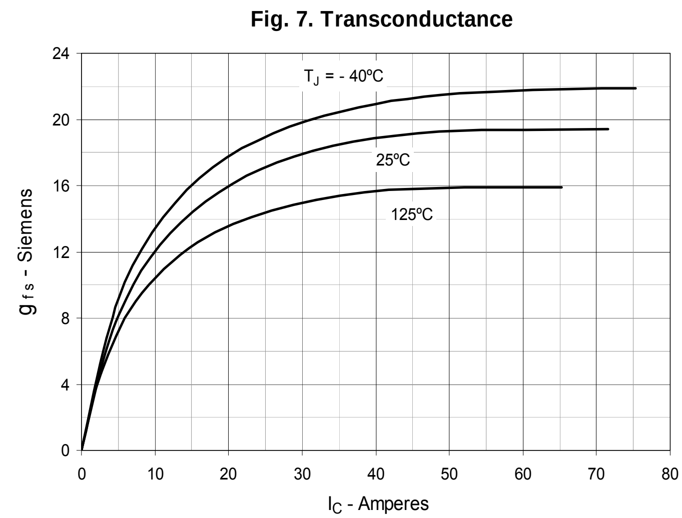
Fig. 7. Transconductance
TJ = - 40ºC
25ºC
125ºC
g f s - Siemens
IC - Amperes
0
4
8
12
16
20
24
0
10
20
30
40
50
60
70
80

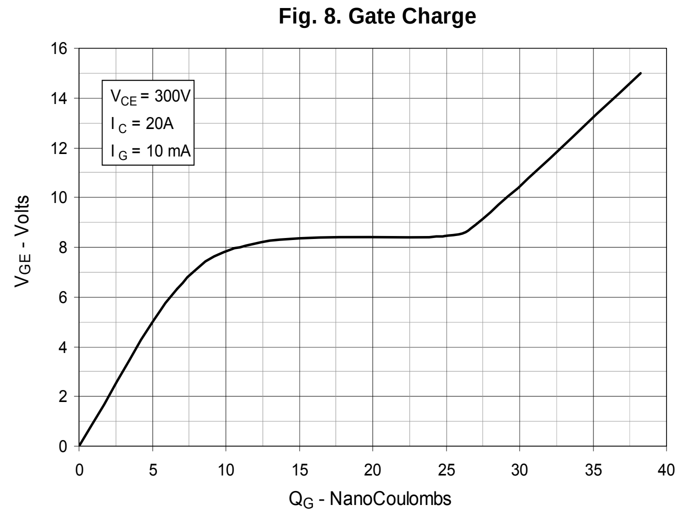
Fig. 8. Gate Charge
VCE = 300V
I C = 20A
I G = 10 mA
VGE - Volts
QG - NanoCoulombs
0
2
4
6
8
10
12
14
16
0
5
10
15
20
25
30
35
40

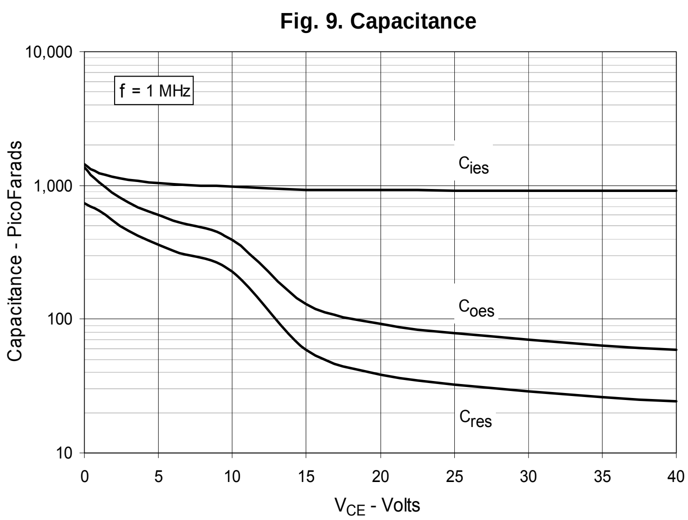
Fig. 9. Capacitance
f = 1 MHz
Cies
Coes
Cres
Capacitance - PicoFarads
VCE - Volts
10
100
1,000
10,000
0
5
10
15
20
25
30
35
40

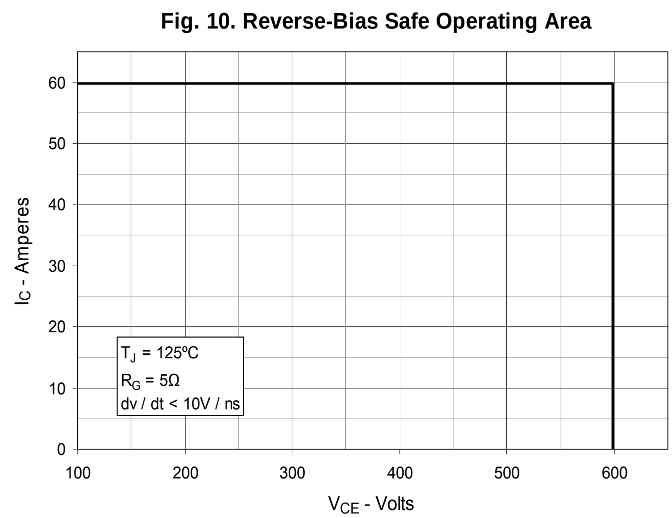
Fig. 10. Reverse-Bias Safe Operating Area
TJ = 125ºC
RG = 5Ω
dv / dt < 10V / ns
IC - Amperes
VCE - Volts
0
10
20
30
40
50
60
100
200
300
400
500
600

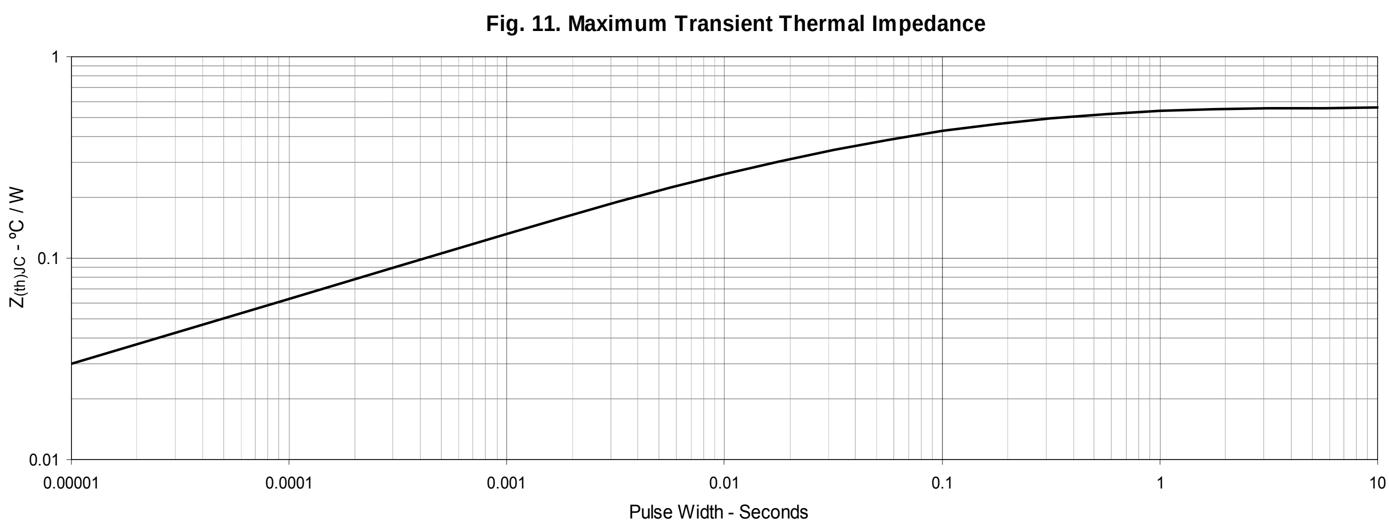
Fig. 11. Maximum Transient Thermal Impedance
Z(th)JC - ºC / W
Pulse Width - Seconds
0.01
0.1
1
0.00001
0.0001
0.001
0.01
0.1
1
10

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

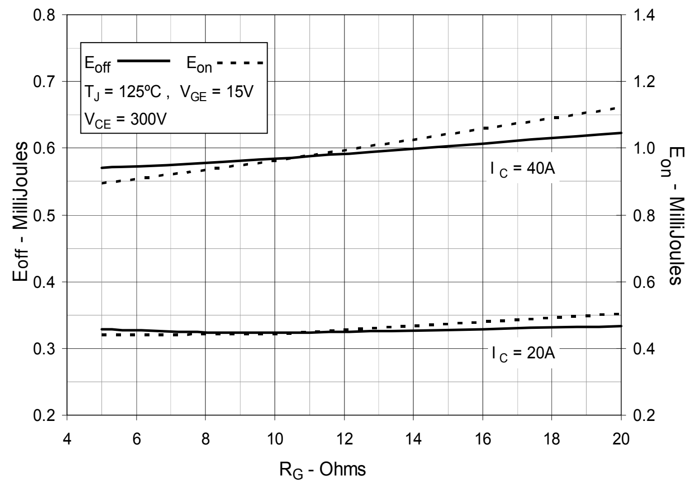

Fig. 13. Inductive Switching Energy Loss vs. Collector Current

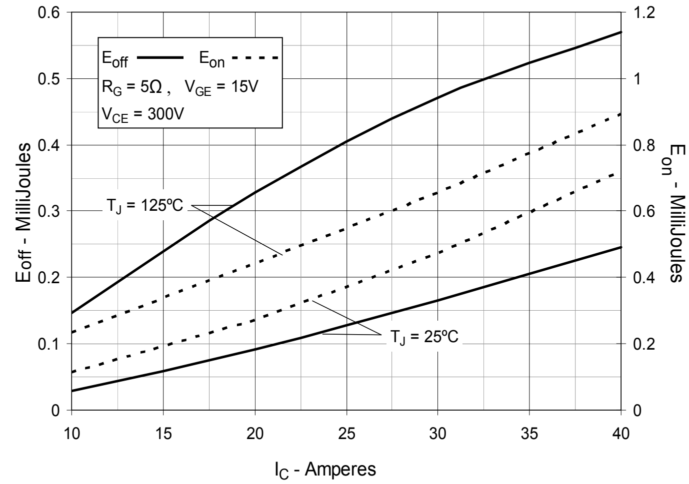

Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

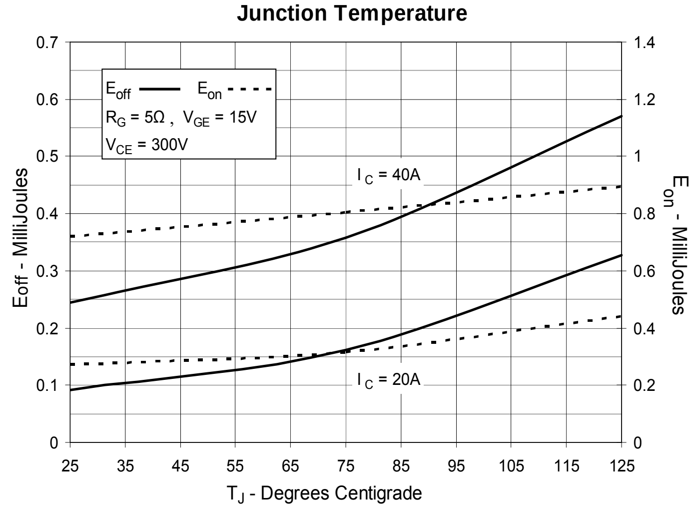

Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

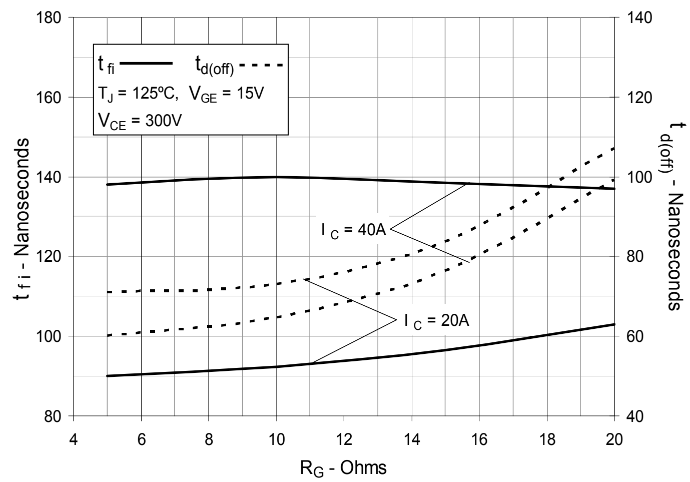

Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

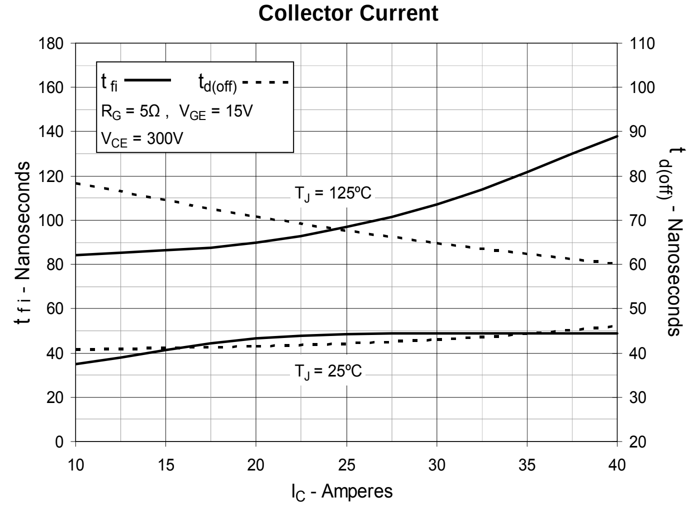

Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

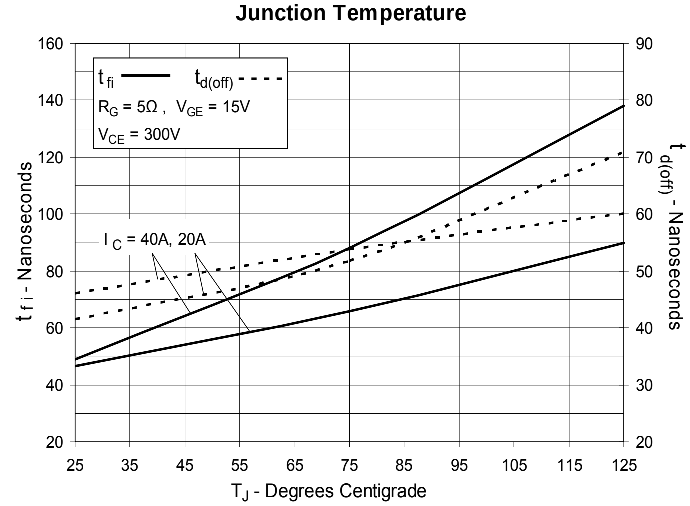

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Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

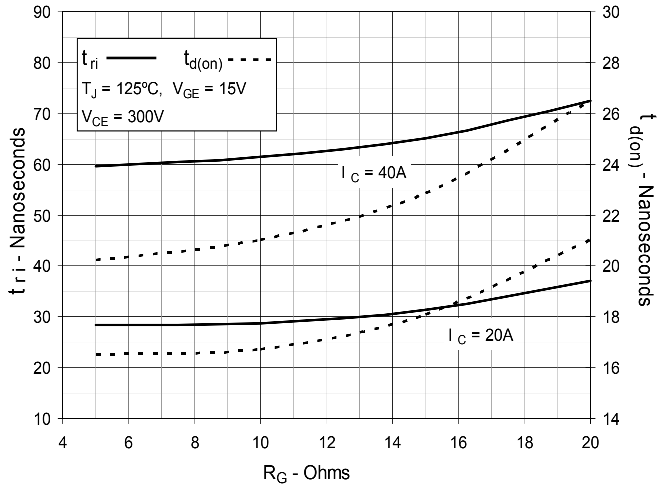


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

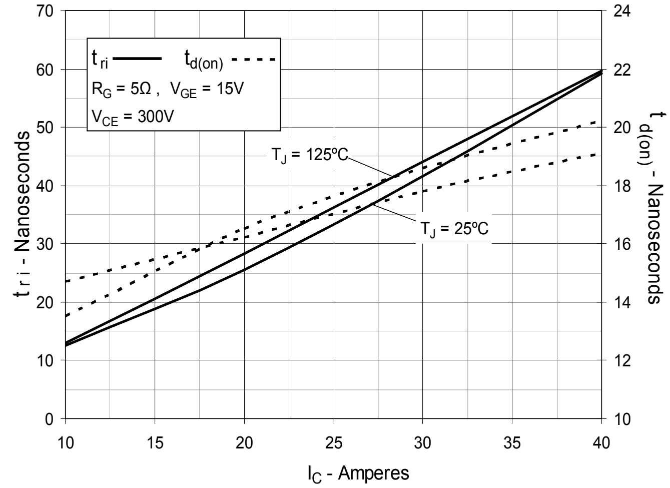
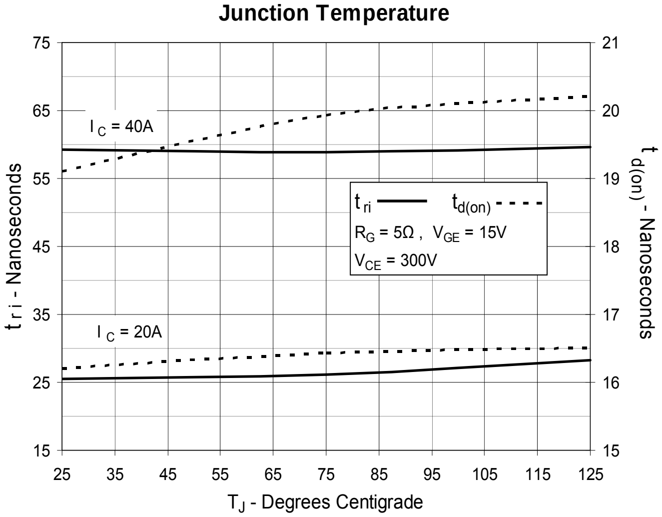


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



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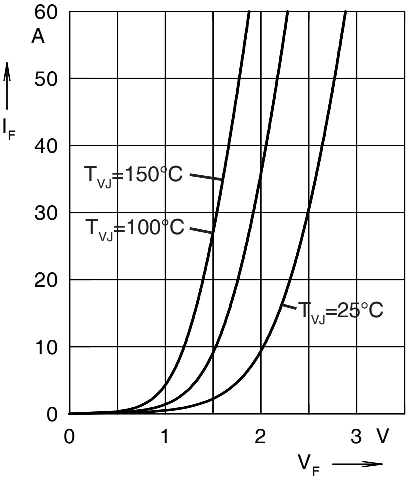

Fig. 21. Forward current I_F versus V_F

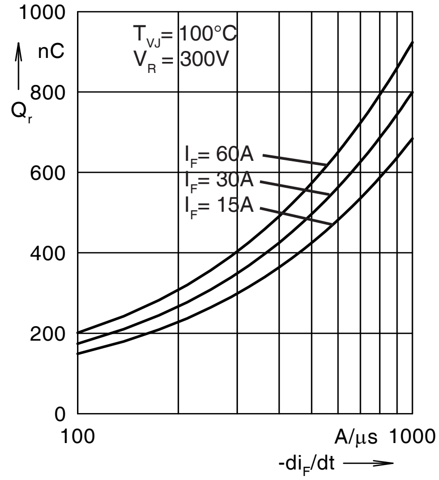

Fig. 22. Reverse recovery charge Q_r versus $-di_F/dt$

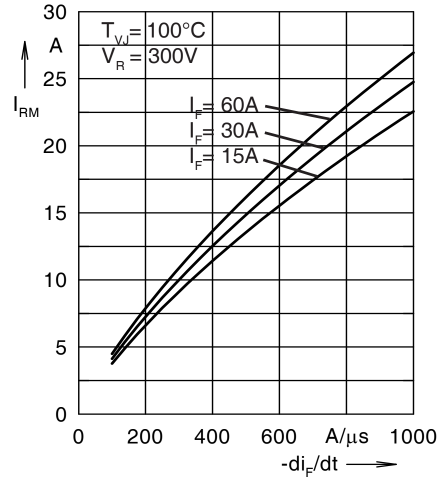

Fig. 23. Peak reverse current I_{RM} versus $-di_F/dt$

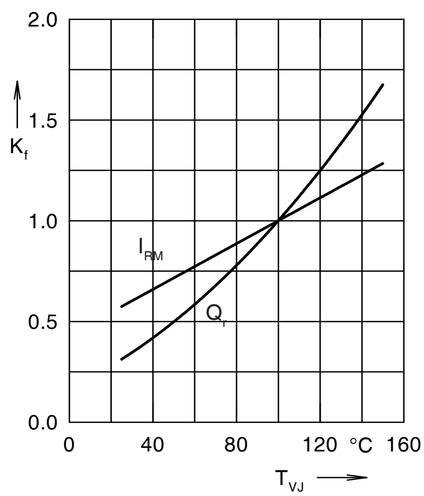

Fig. 24. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

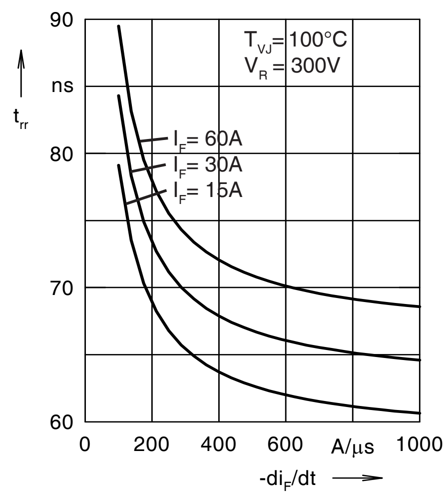

Fig. 25. Recovery time t_{rr} versus $-di_F/dt$

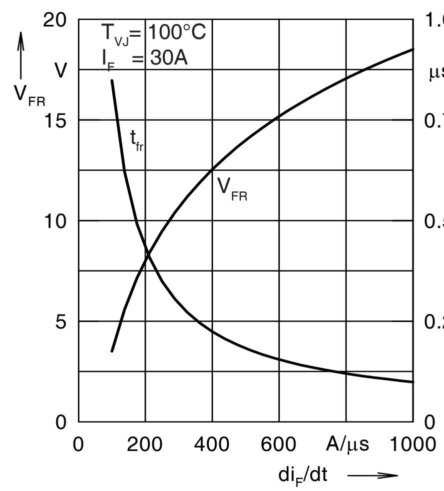

Fig. 26. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

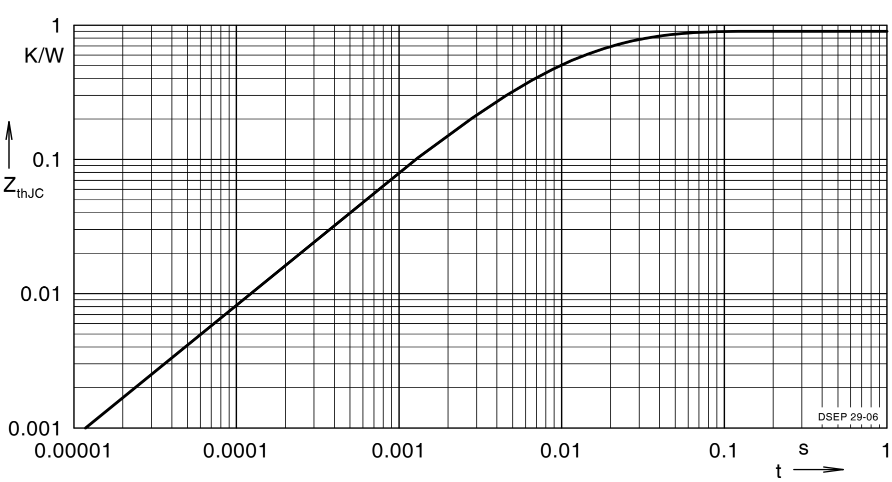

Fig. 27. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.502	0.0052
2	0.193	0.0003
3	0.205	0.0162

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