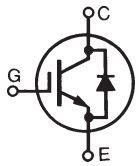
IXYS

GenX3™ 600V IGBT with Diode

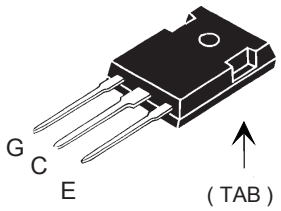
IXGH48N60C3D1

V_{CES} = 600V
I_{C110} = 48A
$V_{CE(sat)}$ ≤ 2.5V
$t_{fi(typ)}$ = 38ns

High speed PT IGBT for 40-100kHz Switching



TO-247



G = Gate C = Collector
E = Emitter TAB = 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 (Limited by Leads)	75	A
I_{C110}	T_C = 110°C	48	A
I_{D110}	T_C = 110°C	30	A
I_{CM}	T_C = 25°C, 1ms	250	A
I_A	T_C = 25°C	30	A
E_{AS}	T_C = 25°C	300	mJ
SSOA	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 3Ω	I_{CM} = 100	A
(RBSOA)	Clamped Inductive Load	@V_{CE} ≤ 600	V
P_C	T_C = 25°C	300	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
F_C	Mounting Torque	1.13/10	Nm/lb.in
Weight		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}			300	μA
	V_{GE} = 0V T_J = 125°C			1.75	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 30A, V_{GE} = 15V, Note 1		2.3	2.5	V
	T_J = 125°C		1.8		V

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- Fast Switching
- Avalanche Rated
- International Standard Package

Advantages

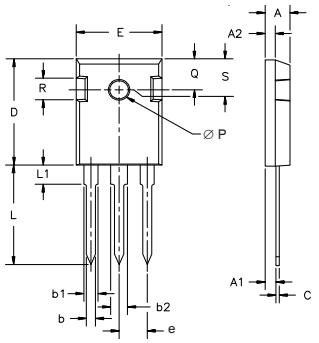
- High Power Density
- Low Gate Drive Requirement

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 = 30A, V_{CE} = 10V, Note 1	20	30		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1960		pF
C_{oes}			202		pF
C_{res}			66		pF
Q_g	I_C = 30A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		77		nC
Q_{ge}			16		nC
Q_{gc}			32		nC
$t_{d(on)}$	**Inductive Load, T_J = 25°C**		19		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		26		ns
E_{on}	V_{CE} = 400V, R_G = 3Ω		0.41		mJ
$t_{d(off)}$			60	100	ns
t_{fi}			38		ns
E_{off}			0.23	0.42	mJ
$t_{d(on)}$	**Inductive Load, T_J = 125°C**		19		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		26		ns
E_{on}	V_{CE} = 400V, R_G = 3Ω		0.65		mJ
$t_{d(off)}$			92		ns
t_{fi}			95		ns
E_{off}			0.57		mJ
R_{thJC}				0.42	°C/W
R_{thCS}			0.21		°C/W

TO-247 AD Outline



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

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, V_{GE} = 0V, -di_F/dt = 100A/µs, V_R = 30V		25		ns
R_{thJC}				0.9	°C/W

Note 1: Pulse Test, t ≤ 300µs, Duty Cycle, d ≤ 2%.

Fig. 1. Output Characteristics @ 25ºC

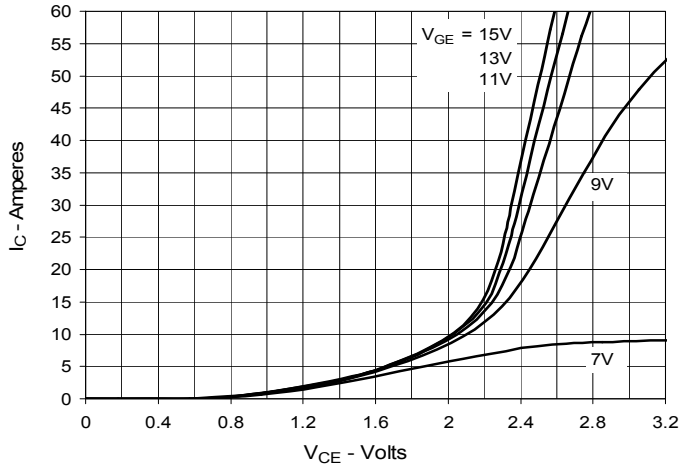


Fig. 2. Extended Output Characteristics @ 25ºC

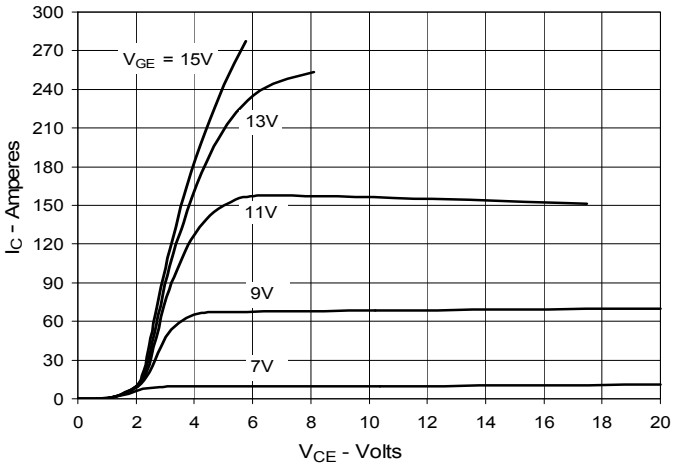


Fig. 3. Output Characteristics @ 125ºC

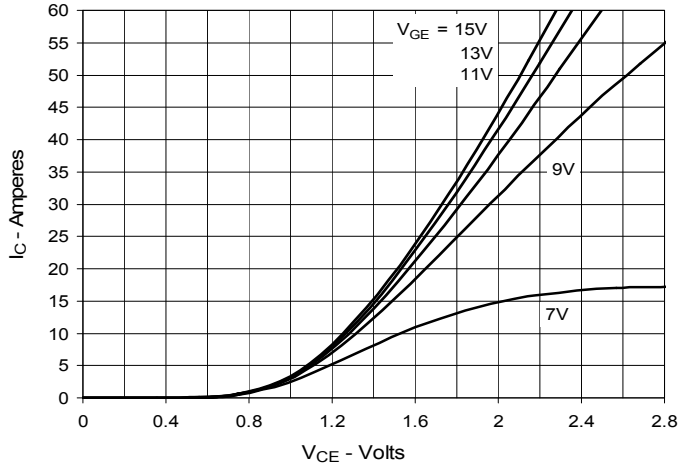


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

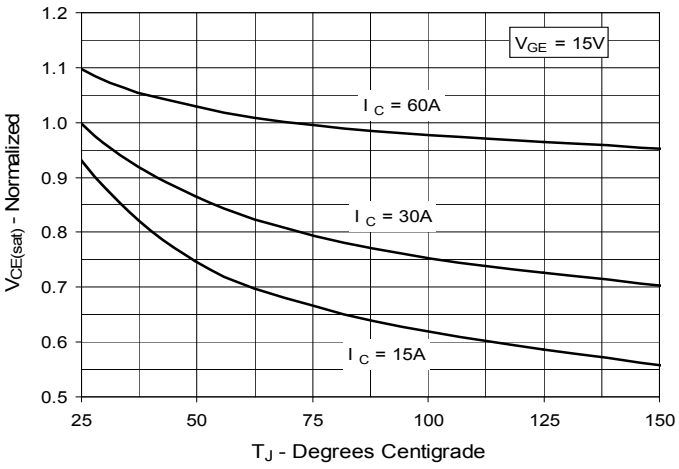


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

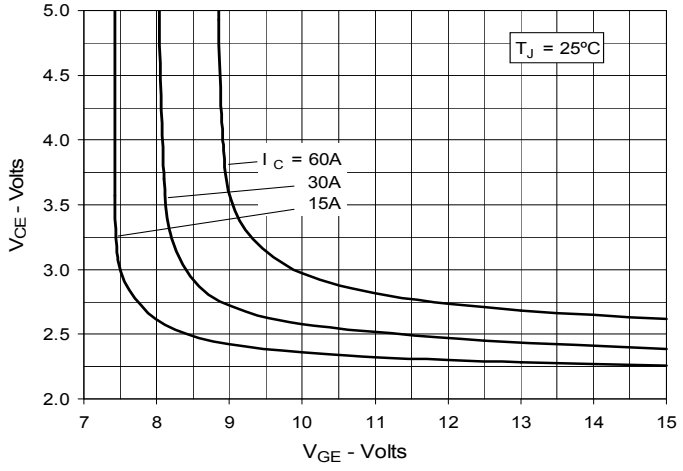


Fig. 6. Input Admittance

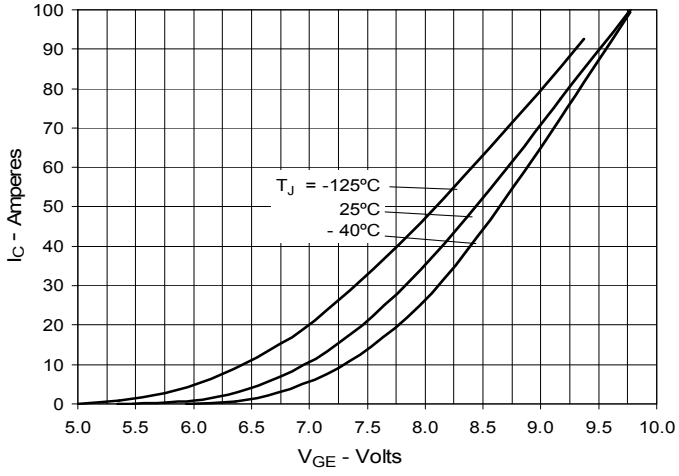


Fig. 7. Transconductance

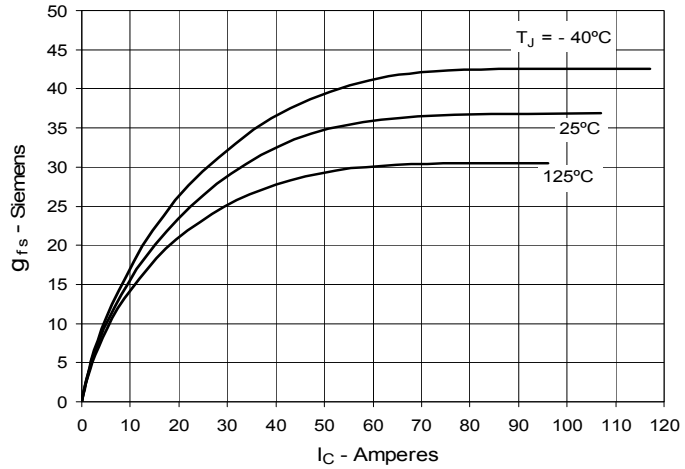


Fig. 8. Gate Charge

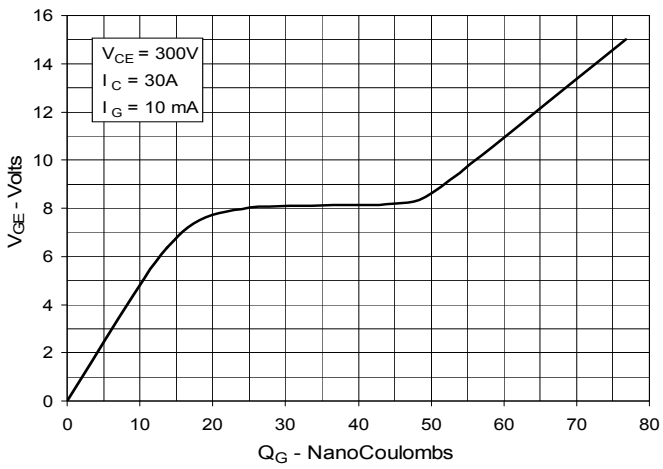


Fig. 9. Capacitance

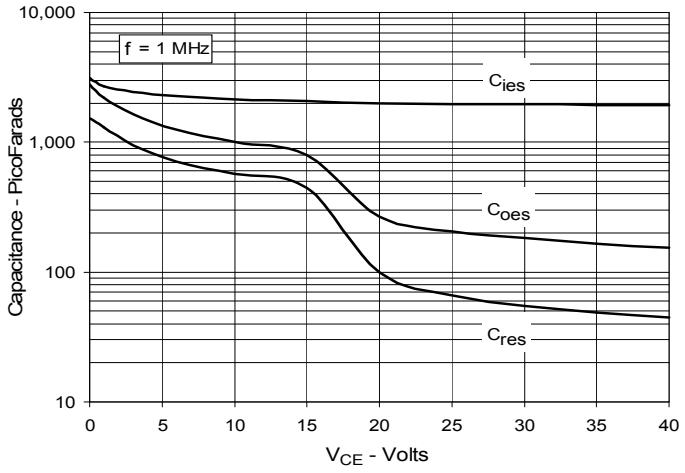


Fig. 10. Reverse-Bias Safe Operating Area

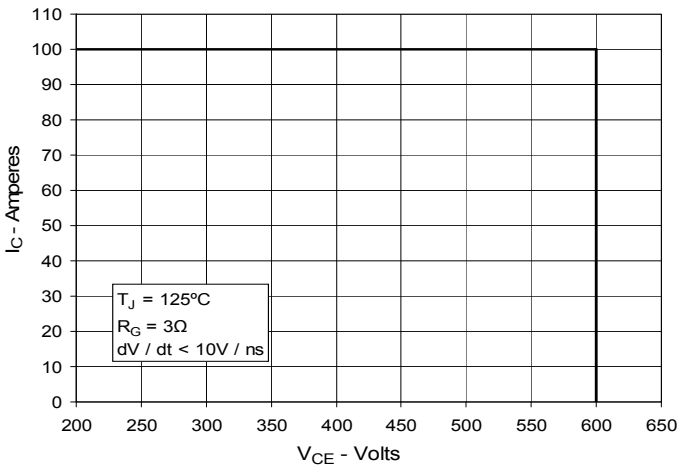


Fig. 11. Maximum Transient Thermal Impedance

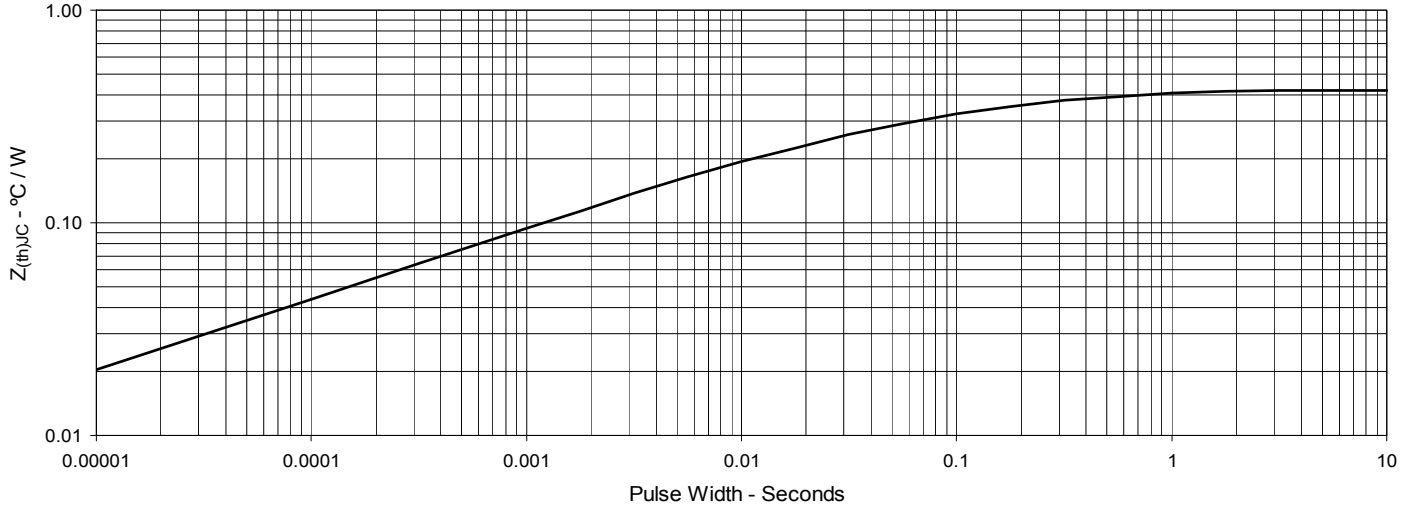


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

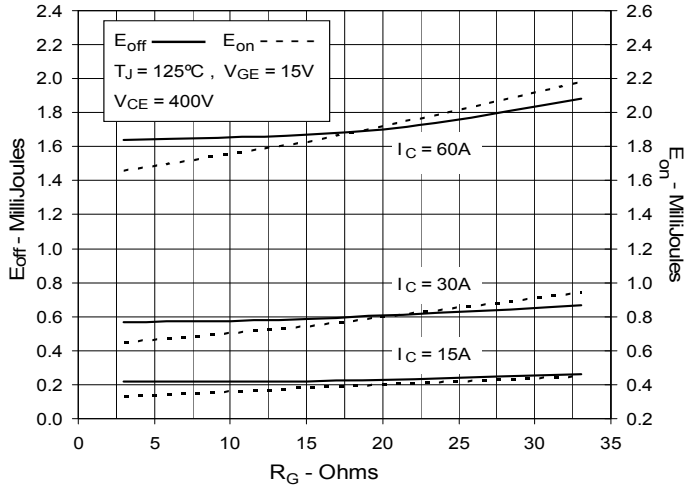


Fig. 13. Inductive Swiching Energy Loss vs. Collector Current

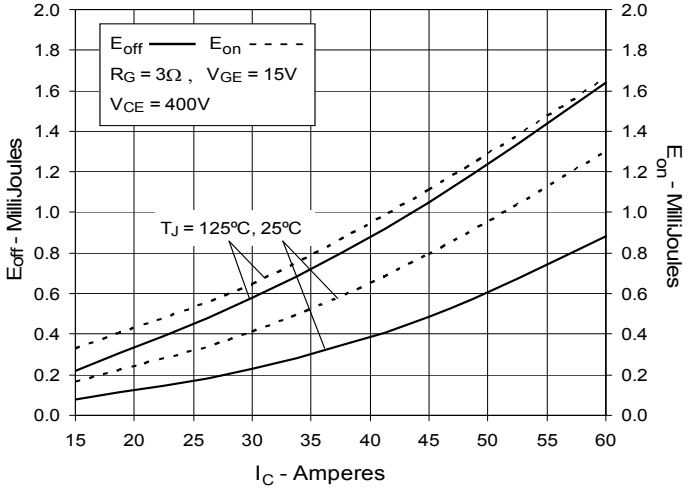


Fig. 14. Inductive Swiching Energy Loss vs. Junction Temperature

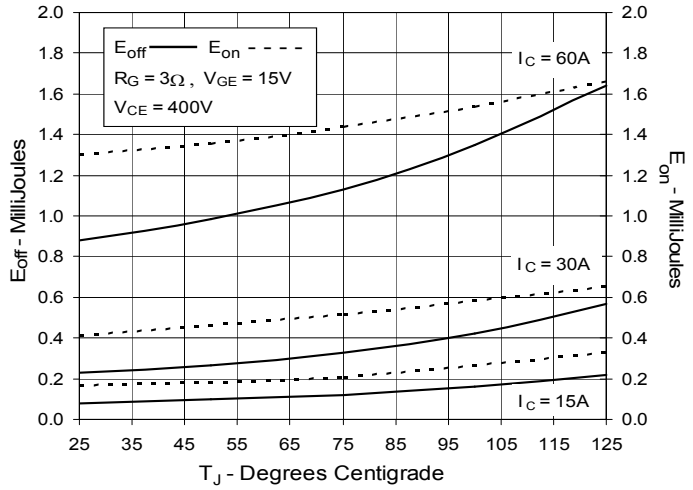


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

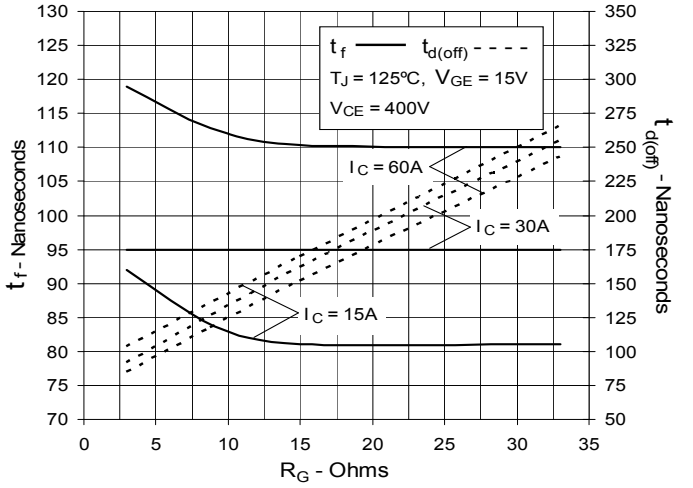


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

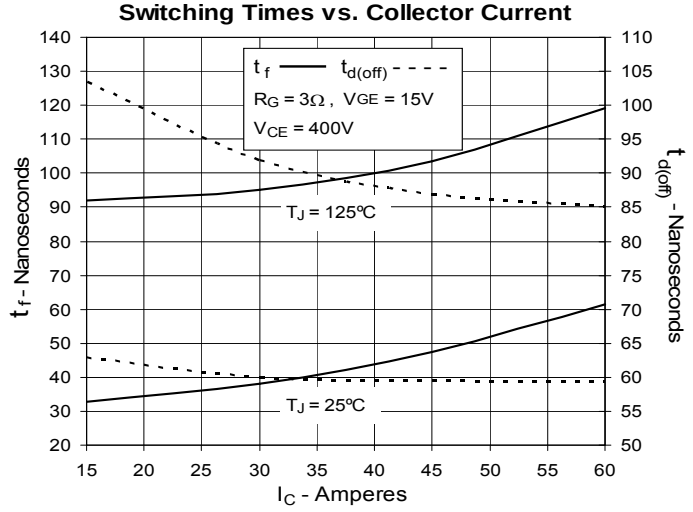


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

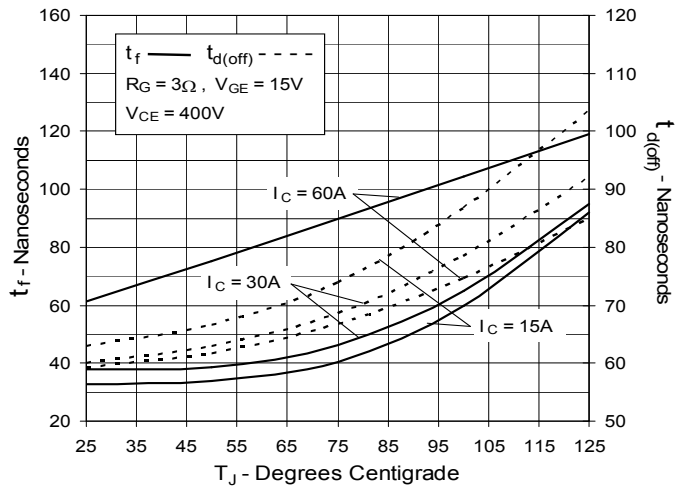


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

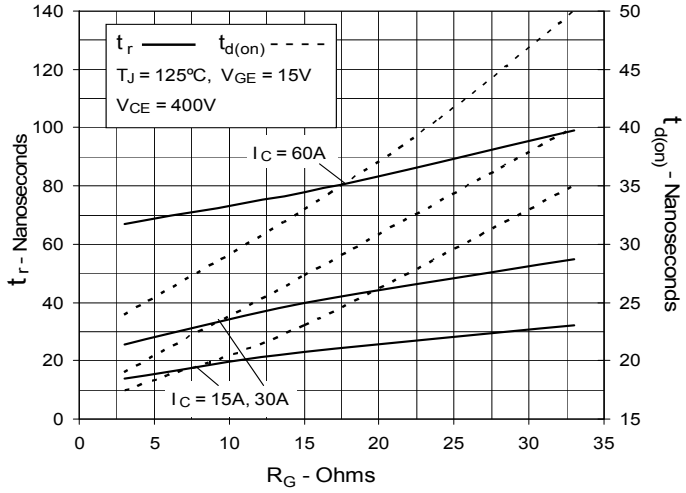


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

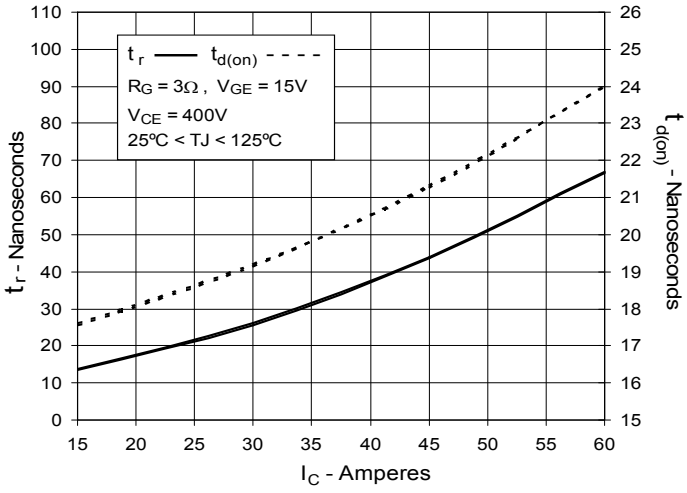
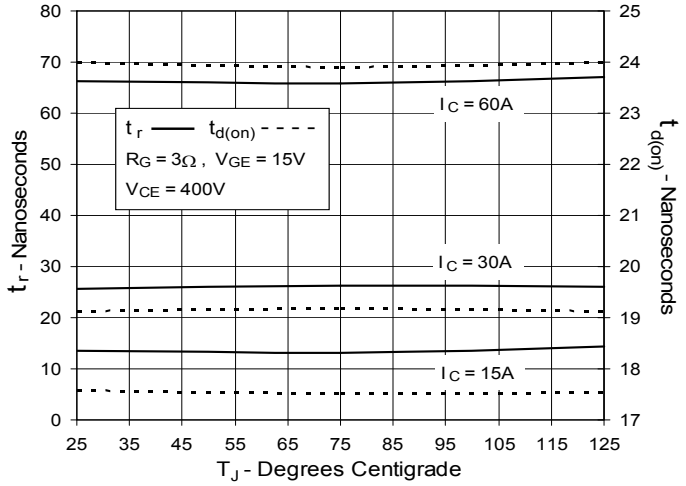


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



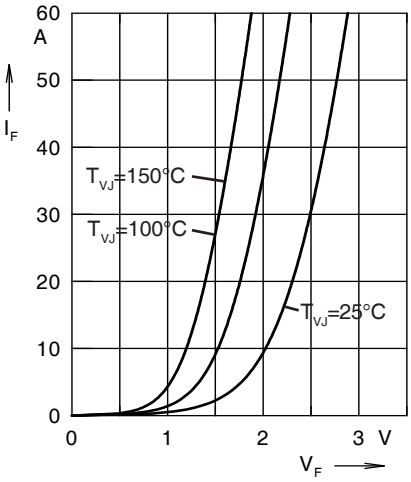


Fig. 21. Forward current I_F versus V_F

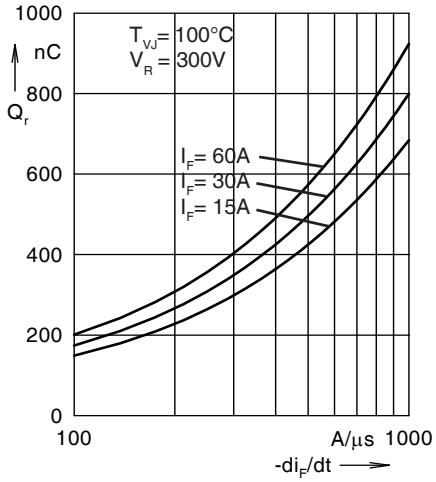


Fig. 22. Reverse recovery charge Q_r versus -di_F/dt

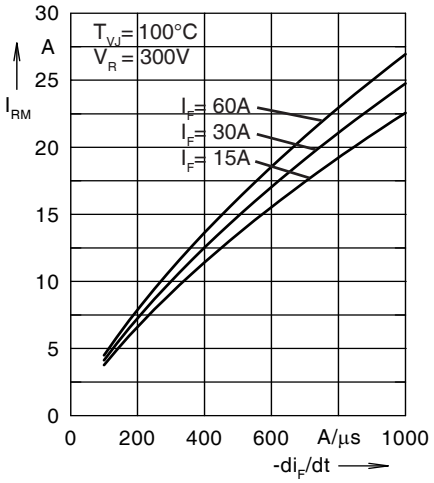


Fig. 23. Peak reverse current I_{RM} versus -di_F/dt

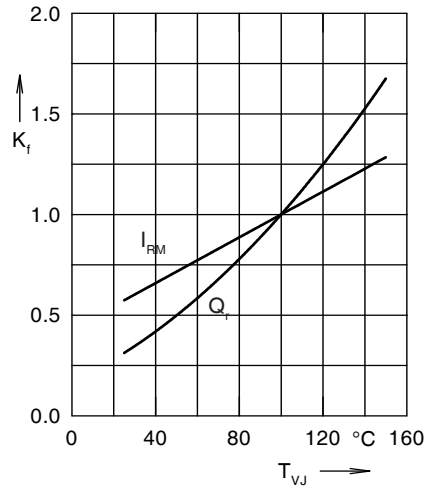


Fig. 24. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

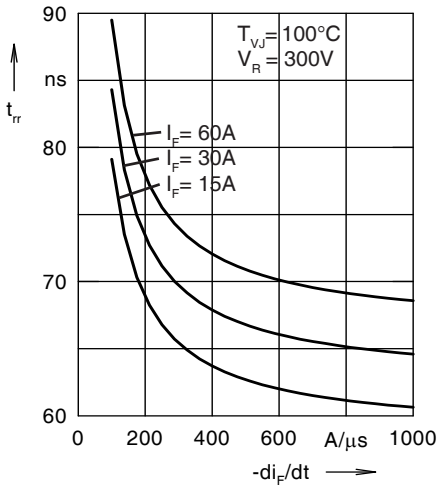


Fig. 25. Recovery time t_{rr} versus -di_F/dt

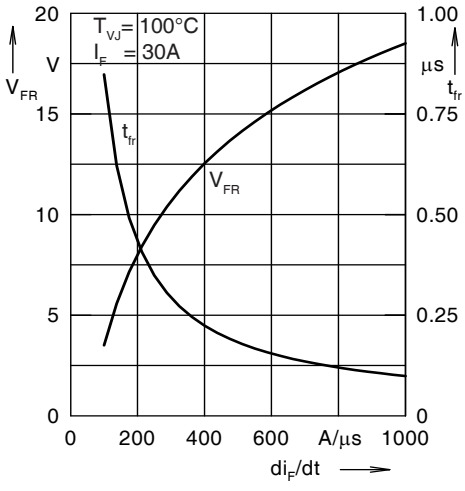


Fig. 26. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

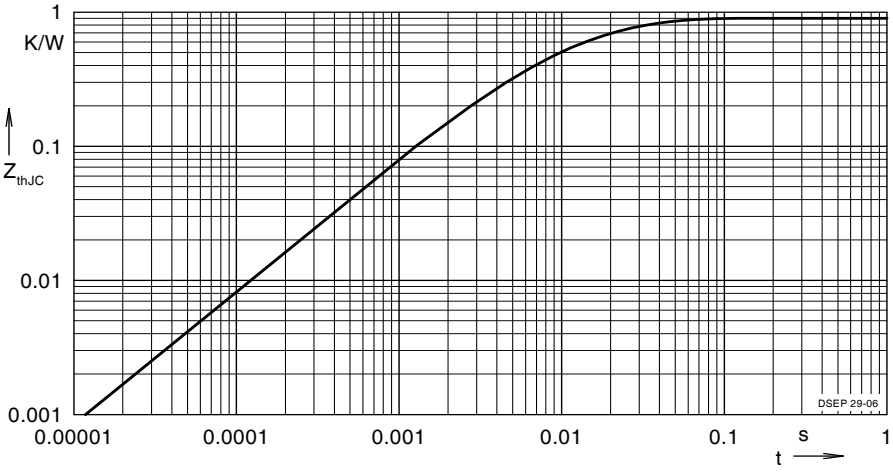


Fig. 27. Transient thermal resistance junction to case

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