Preliminary Technical Information

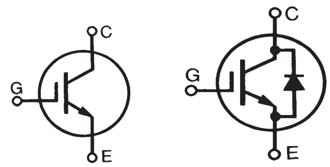
GenX3™ 600V IGBT

IXGR48N60B3
IXGR48N60B3D1

(Electrically isolatred Back Surface)

V_{CES}	=	600V
I_{C25}	=	60A
$V_{CE(sat)}$	≤	2.1V
$t_{fi(typ)}$	=	116ns

Medium speed low Vsat PT
IGBTs 5-40 kHz switching

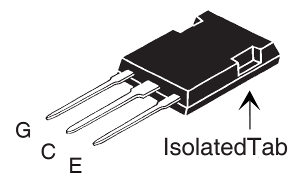


IXGR_B3 IXGR_B3D1

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	27	A
I_{F110}	T_C = 110°C (48N60B3D1)	27	A
I_{CM}	T_C = 25°C, 1ms	280	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 5Ω Clamped inductive load @ ≤ 600V	I_{CM} = 120	A
P_C	T_C = 25°C	150	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
V_{ISOL}	50/60 Hz, RMS t = 1min	2500	V~
	I_{ISOL} ≤ 1mA t = 1s	3000	V~
Weight		5	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		5.0	V
I_{CES}	V_{CE} = V_{CES}	48N60B3			25	µA
	V_{GE} = 0V	48N60B3D1			1.75	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V				±100	nA
$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V, Note 1			1.77	2.1	V
		T_J=125°C		1.74		V

ISOPLUS247™ (IXGR)
E153432



G = Gate E = Emitter
C = Collector

Features

- Silocon chip on Direct-Copper Bond (DCB) substrate
- Isolated mounting surface
- 2500V electrical isolation
- Anti-parallel ultra fast diode
- Square RBSOA

Advantages

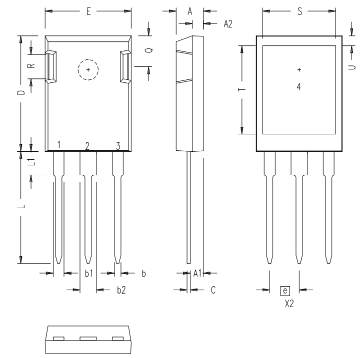
- High power density
- Low gate drive requirement

Applications

- 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		28	46		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz			2980		pF
C_{oes}		48N60B3		170		pF
		48N60B3D1		200		pF
C_{res}				45		pF
Q_g	I_C = 40A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}			115		nC
Q_{ge}				21		nC
Q_{gc}				40		nC
$t_{d(on)}$	**Inductive Load, T_J = 25°C**			22		ns
t_{ri}	I_C = 30A, V_{GE} = 15V			25		ns
E_{on}	V_{CE} = 480V, R_G = 5Ω			0.84		mJ
$t_{d(off)}$				130	200	ns
t_{fi}				116	200	ns
E_{off}				0.66	1.20	mJ
$t_{d(on)}$	**Inductive Load, T_J = 125°C**			19		ns
t_{ri}	I_C = 30A, V_{GE} = 15V			25		ns
E_{on}	V_{CE} = 480V, R_G = 5Ω			1.71		mJ
$t_{d(off)}$				190		ns
t_{fi}				157		ns
E_{off}				1.30		mJ
R_{thJC}					0.83	°C/W
R_{thCS}				0.15		°C/W

ISOPLUS247 (IXGR) Outline



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
b1	.075	.084	1.91	2.13
b2	.115	.123	2.92	3.12
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
E	.620	.635	15.75	16.13
e	.215 BSC		5.45 BSC	
L	.780	.800	19.81	20.32
L1	.150	.170	3.81	4.32
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.520	.540	13.21	13.72
T	.620	.640	15.75	16.26
U	.065	.080	1.65	2.03

1 – GATE
2 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)
4 – NO CONNECTION

NOTE: This drawing will meet all dimensions requirement of JEDEC outline TO-247AD except screw hole.

Reverse Diode (FRED) (D1 Version ONLY)

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
V_F	I_F = 30A, V_{GE} = 0V, Note 1			2.8	V
	T_J = 150°C		1.6		V
I_{RM}	I_F= 30A, V_{GE} = 0V, V_R= 100V -di_F/dt =100A/μs		4		A
t_{rr}	I_F = 1A; -di/dt = 100A/μs, V_R = 30V T_J = 100°C		100		ns
R_{thJC}				1.5	°C/W
R_{thCS}			1.5		°C/W

Note 1: Pulse test, t ≤ 300μs; duty cycle, d ≤ 2%.

PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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Fig. 1. Output Characteristics @ 25ºC

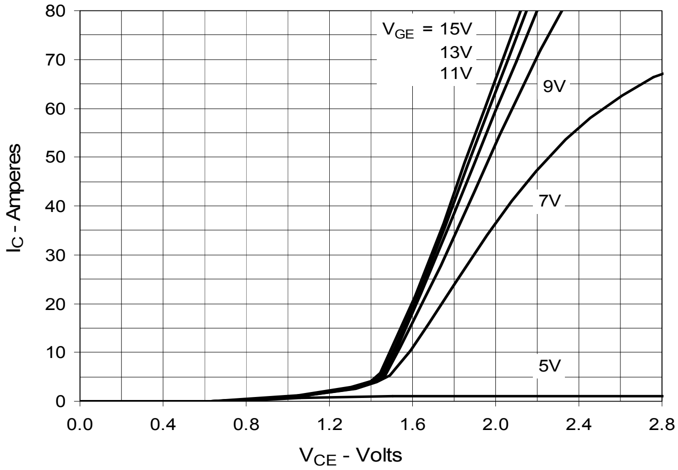


Fig. 2. Extended Output Characteristics @ 25ºC

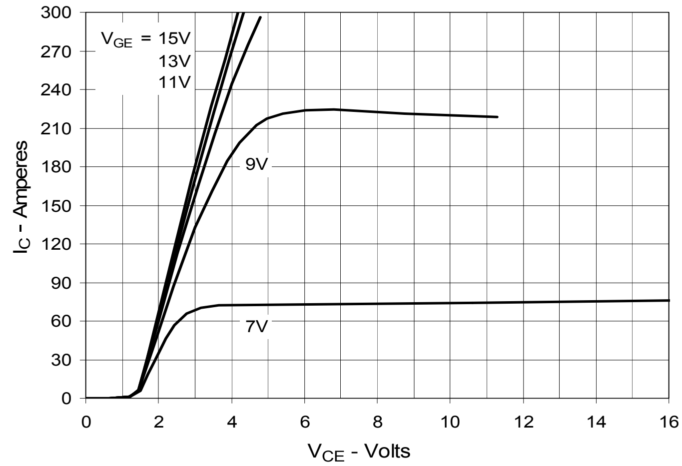


Fig. 3. Output Characteristics @ 125ºC

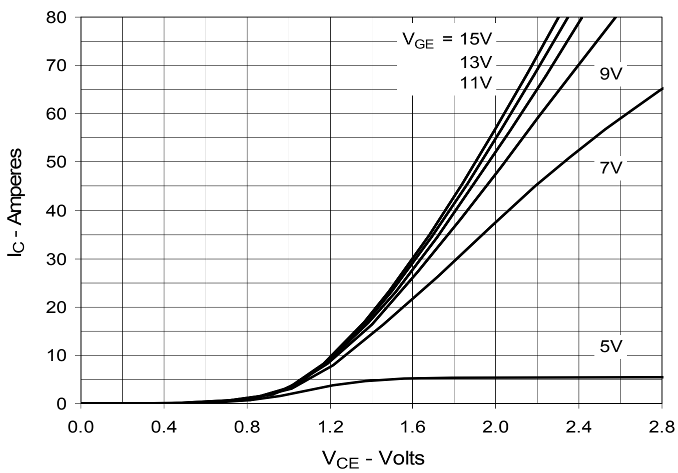


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

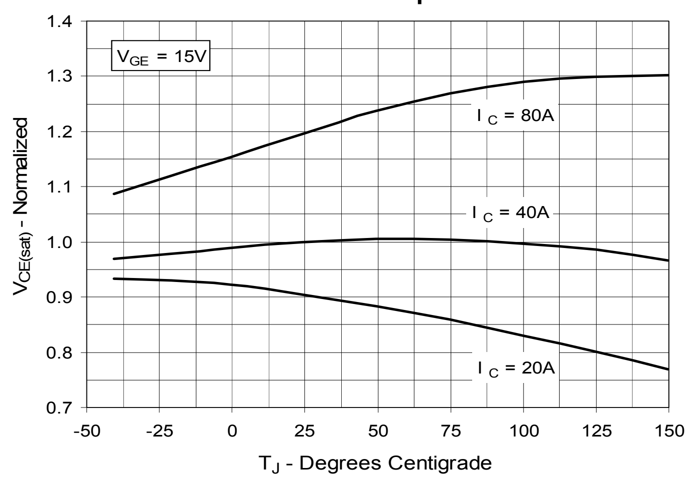


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

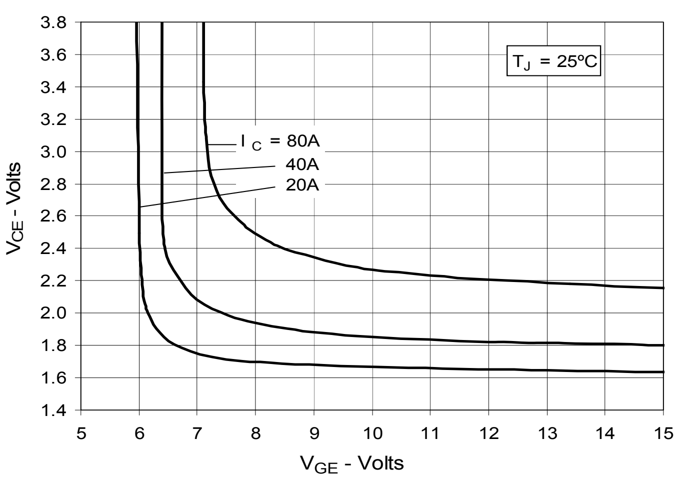


Fig. 6. Input Admittance

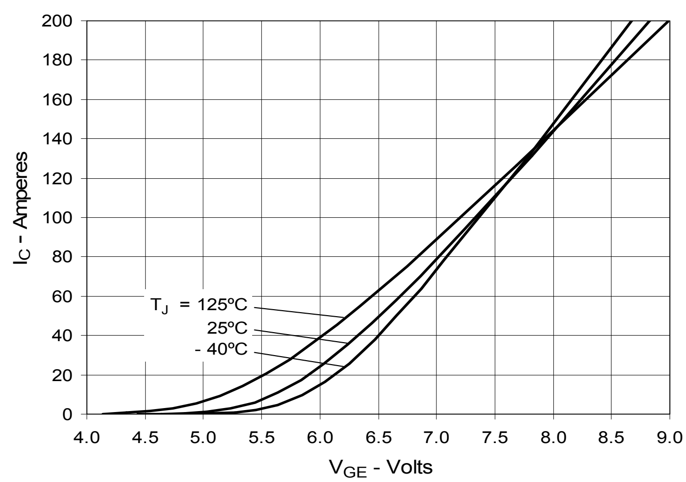


Fig. 7. Transconductance

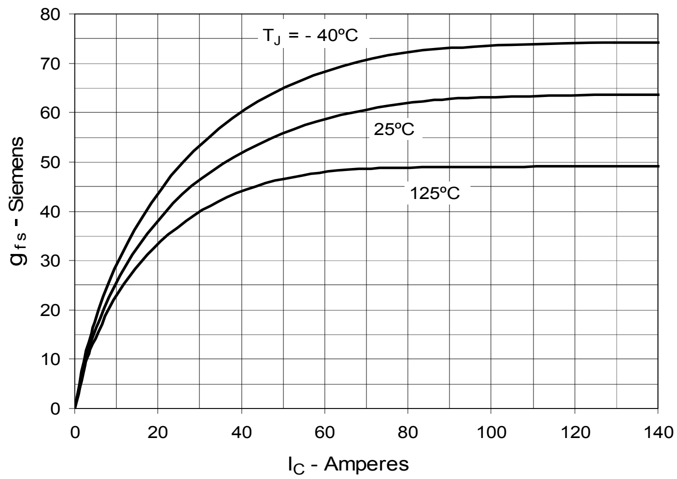


Fig. 8. Gate Charge

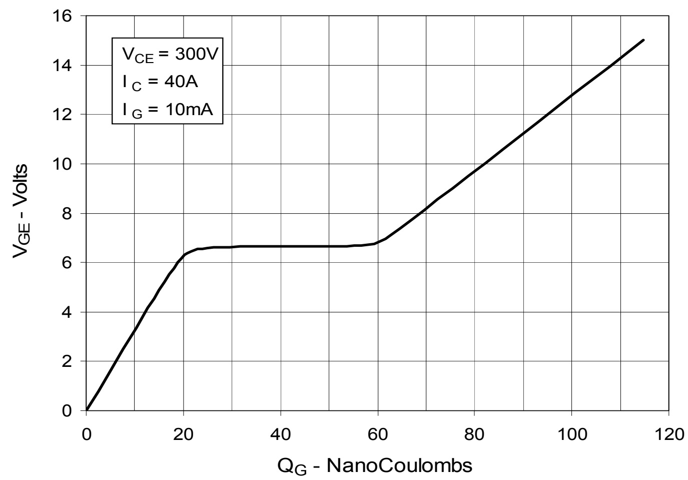


Fig. 9. Capacitance

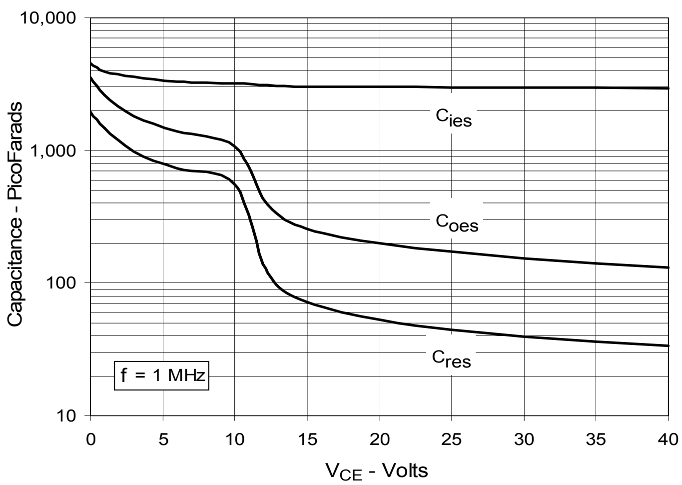


Fig. 10. Reverse-Bias Safe Operating Area

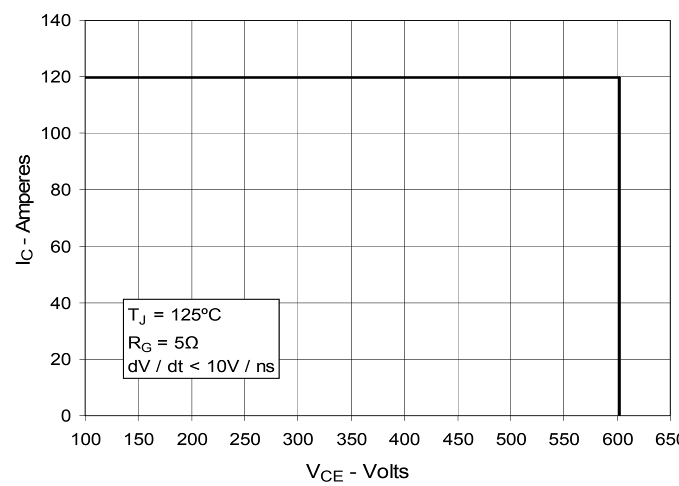
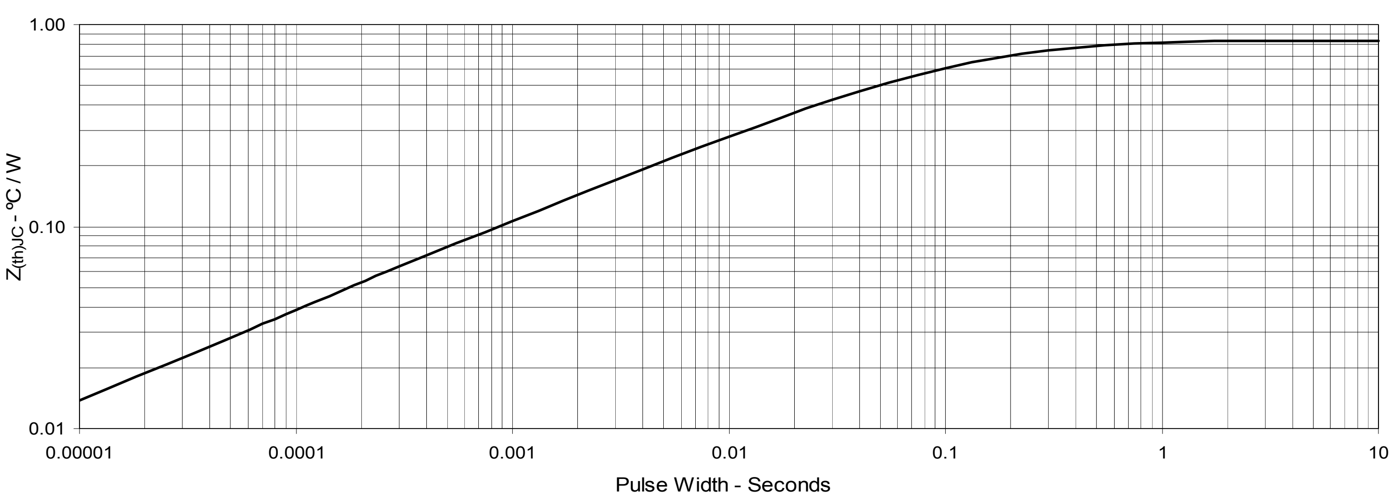


Fig. 11. Maximum Transient Thermal Impedance



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IXYS REF: G_48N60B3D1(56) 05-05-08-A

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

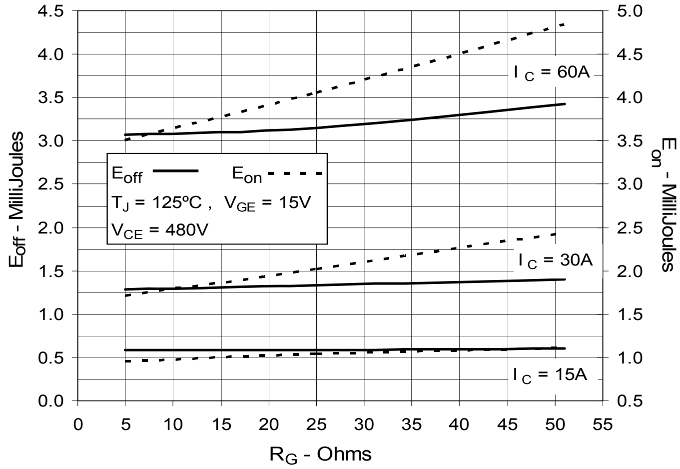


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

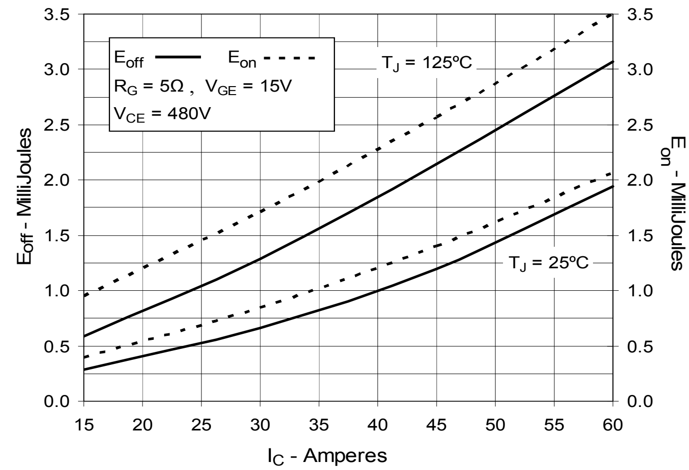


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

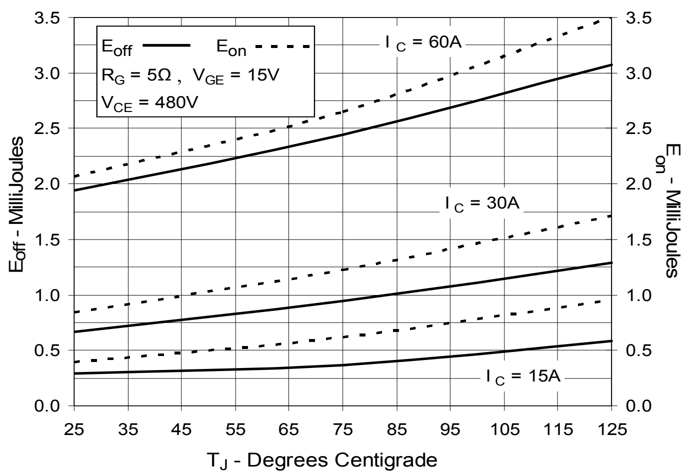


Fig. 15. Inductive Turn-off Switching Times vs. Junction Temperature

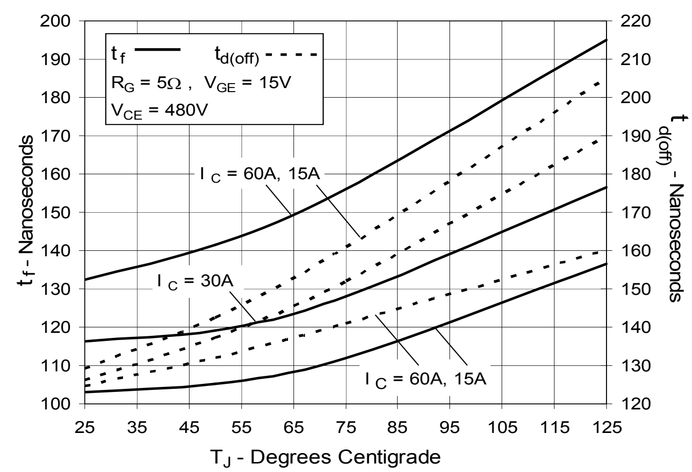


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

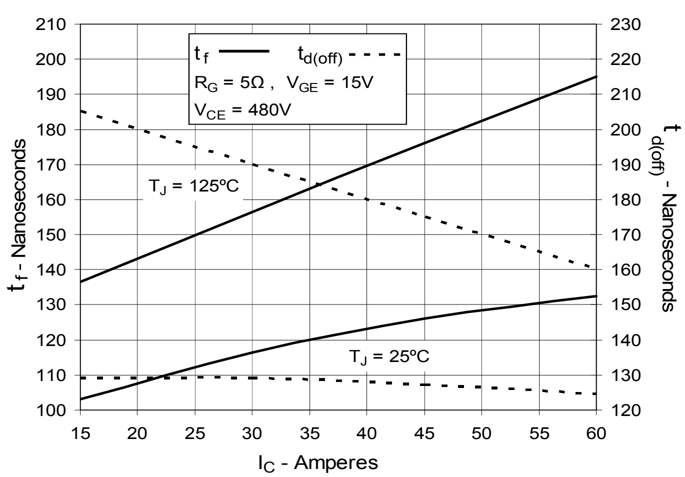


Fig. 17. Inductive Turn-off Switching Times vs. Gate Resistance

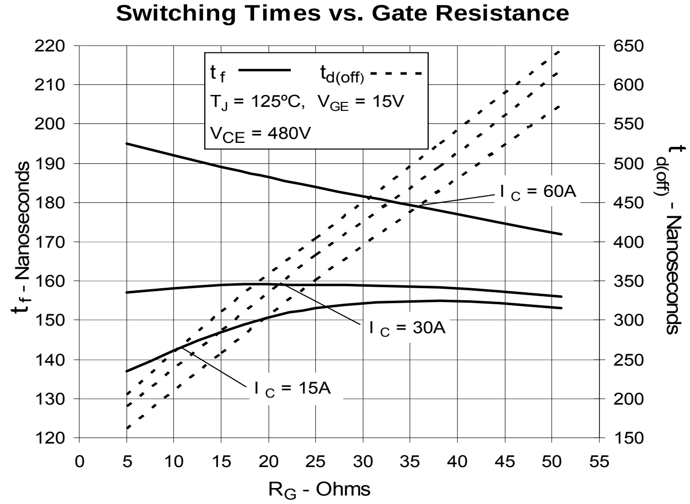


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

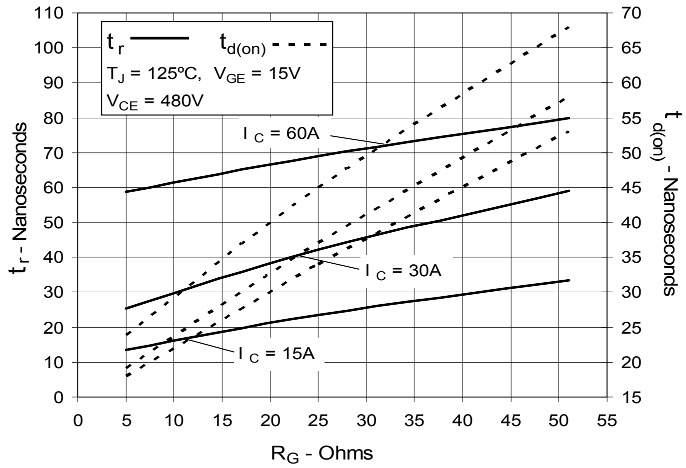


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

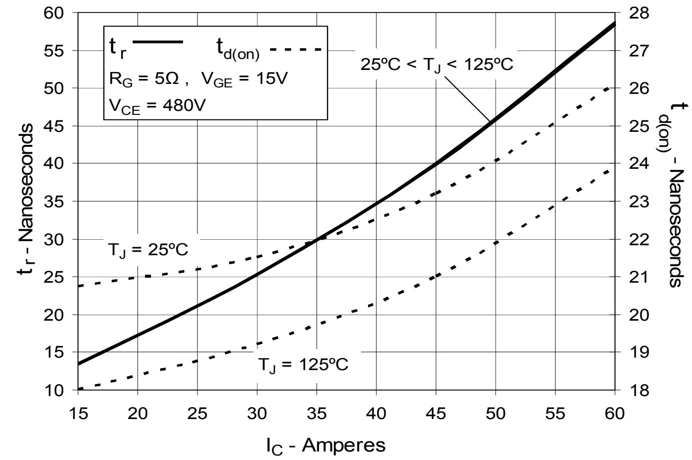
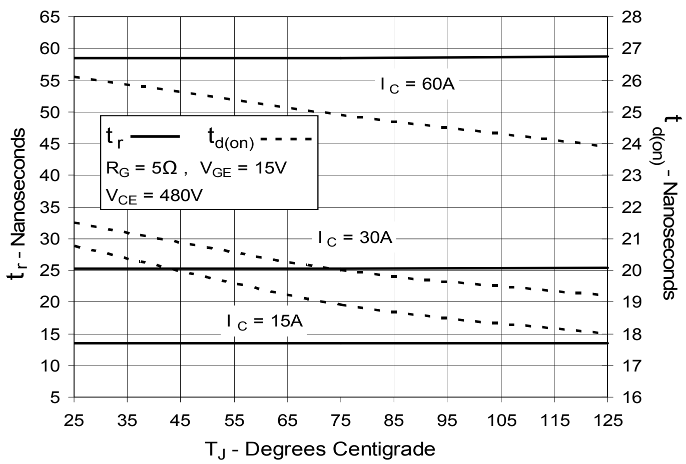


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



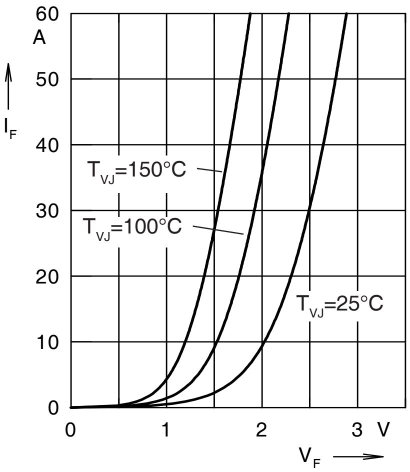


Fig. 21. Forward current I_F versus V_F

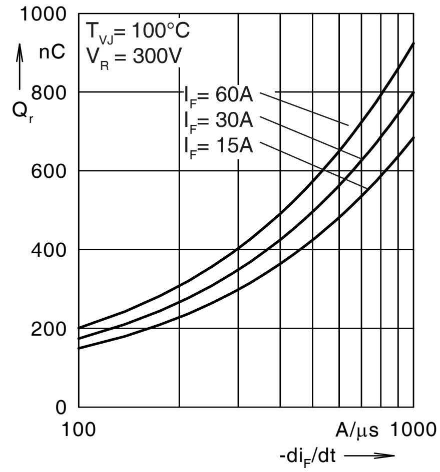


Fig. 22. Reverse recovery charge Q_r versus $-di_F/dt$

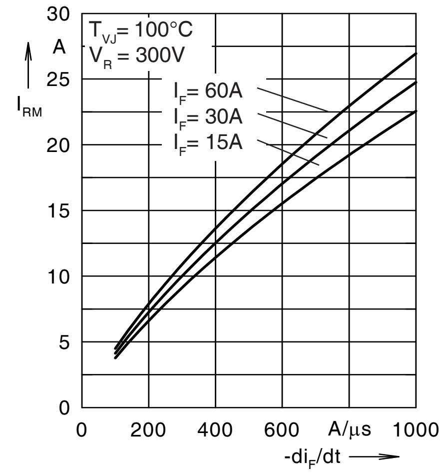


Fig. 23. Peak reverse current I_{RM} versus $-di_F/dt$

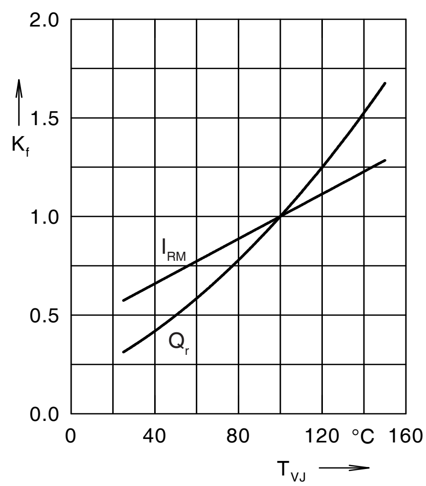


Fig. 24. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

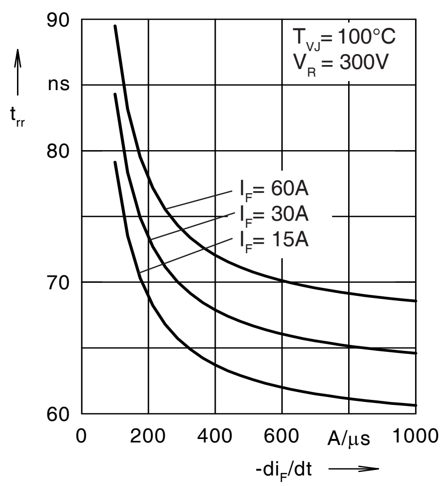


Fig. 25. Recovery time t_{rr} versus $-di_F/dt$

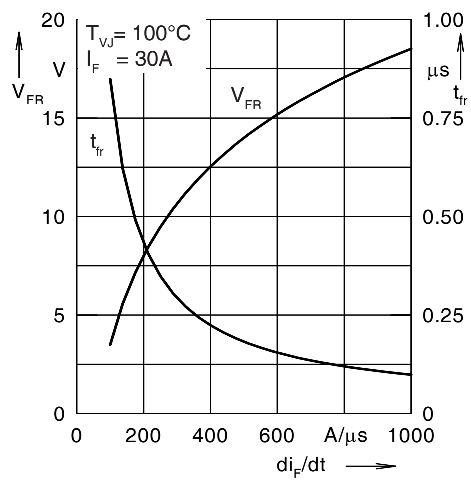


Fig. 26. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

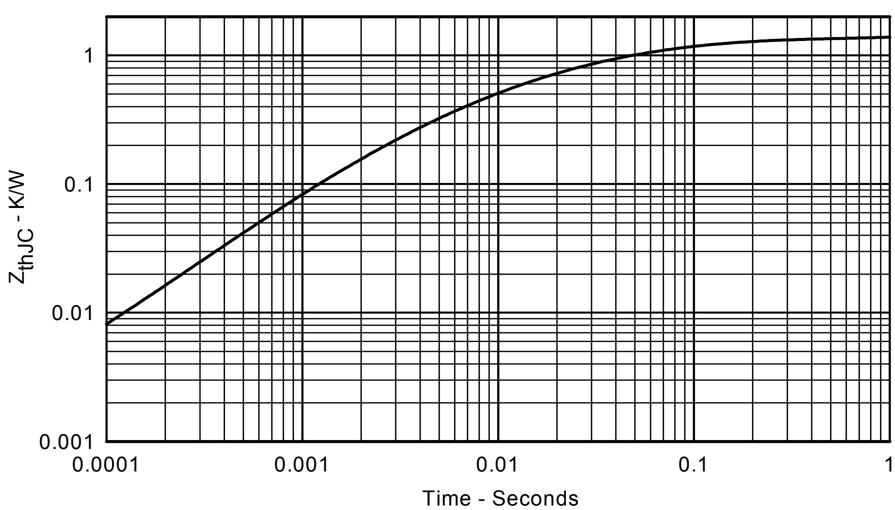


Fig. 27. Transient thermal resistance junction to case