



**THE DATASHEET OF
IXGR48N60C3D1**

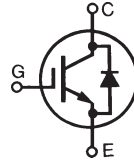


GenX3™ 600V IGBT with Diode

IXGR48N60C3D1

(Electrically Isolated Back Surface)

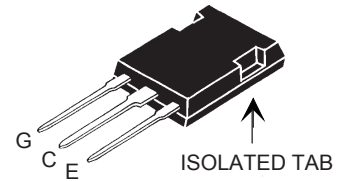
High Speed PT IGBTs for
40-100kHz Switching



$V_{CES} = 600V$
 $I_{C25} = 56A$
 $V_{CE(sat)} \leq 2.7V$
 $t_{fi(typ)} = 38ns$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ C$ to $150^\circ C$	600	V
V_{CGR}	$T_J = 25^\circ C$ to $150^\circ C$, $R_{GE} = 1M\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ C$	56	A
I_{C110}	$T_C = 110^\circ C$	26	A
I_{D110}	$T_C = 110^\circ C$	27	A
I_{CM}	$T_C = 25^\circ C$, 1ms	230	A
I_A	$T_C = 25^\circ C$	30	A
E_{AS}	$T_C = 25^\circ C$	300	mJ
SSOA (RBSOA)	$V_{GE} = 15V$, $T_{VJ} = 125^\circ C$, $R_G = 3\Omega$ Clamped Inductive Load	$I_{CM} = 100$ @ $V_{CE} \leq 600$	A V
P_C	$T_C = 25^\circ C$	125	W
T_J		-55 ... +150	$^\circ C$
T_{JM}		150	$^\circ C$
T_{stg}		-55 ... +150	$^\circ C$
T_L	1.6mm (0.062 in.) from Case for 10s	300	$^\circ C$
T_{SOLD}	Plastic Body for 10 Seconds	260	$^\circ C$
V_{ISOL}	50/60 Hz RMS, $t = 1min$	2500	V~
F_C	Mounting Force	20..120 / 4.5..27	N/lb.
Weight		5	g

ISOPLUS 247™



G = Gate C = Collector
E = Emitter

Features

- Silicon Chip on Direct-Copper Bond (DCB) Substrate
 - UL Recognized Package
 - Isolated Mounting Surface
 - 2500V Electrical Isolation
- Avalanche Rated
- Square RBSOA
- Anti-Parallel Ultra Fast Diode
- Fast Switching
- International Standard Package

Advantages

- High Power Density
- Low Gate Drive Requirement

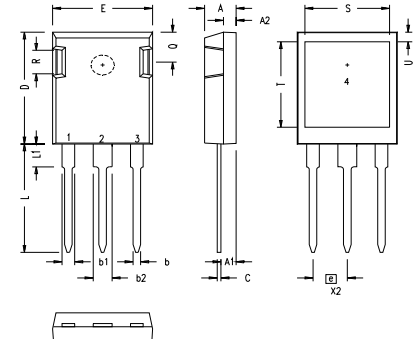
Applications

- High Frequency Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ C$, Unless Otherwise Specified)		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250\mu A$, $V_{CE} = V_{GE}$	3.0		5.5 V
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0V$ $T_J = 125^\circ C$			300 μA 1.75 mA
I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 30A$, $V_{GE} = 15V$, Note 1 $T_J = 125^\circ C$		2.3 1.8	2.7 V V

Symbol	Test Conditions	Characteristic Values		
		(T _J = 25°C, Unless Otherwise Specified)		
		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}			220	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 I _C = 30A, V _{GE} = 15V V _{CE} = 400V, R _G = 3Ω		19	ns
t_{ri}			26	ns
E_{on}			0.41	mJ
t_{d(off)}			60	100 ns
t_{fi}			38	ns
E_{off}			0.23	0.55 mJ
t_{d(on)}	Inductive Load, T _J = 125°C I _C = 30A, V _{GE} = 15V V _{CE} = 400V, R _G = 3Ω		19	ns
t_{ri}			26	ns
E_{on}			0.65	mJ
t_{d(off)}			92	ns
t_{fi}			95	ns
E_{off}			0.57	mJ
R_{thJC}			1.0	°C/W
R_{thCS}		0.15		°C/W

ISOPLUS247 (IXGR) Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	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.

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	T _J = 25°C		2.7 V
I_{RM}	I _F = 30A, V _{GE} = 0V, -di _F /dt = 100A/μs, V _R = 100V	T _J = 100°C		4 A
t_{rr}		T _J = 100°C	100	
	I _F = 1A, -di/dt = 100A/μs; V _R = 30V		25	ns
R_{thJC}				1.5 °C/W

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

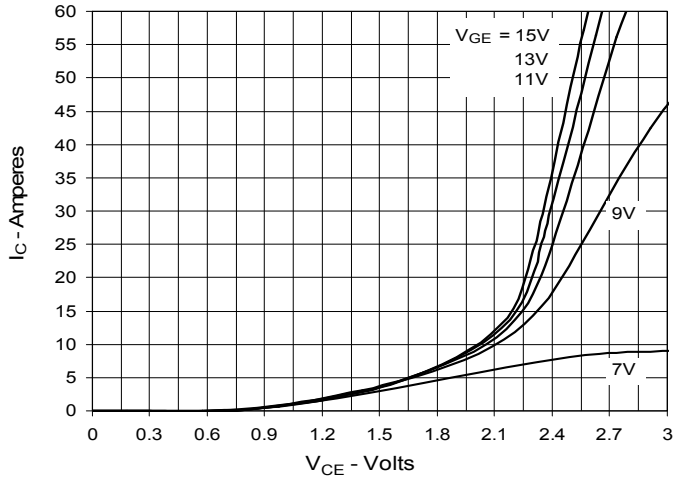
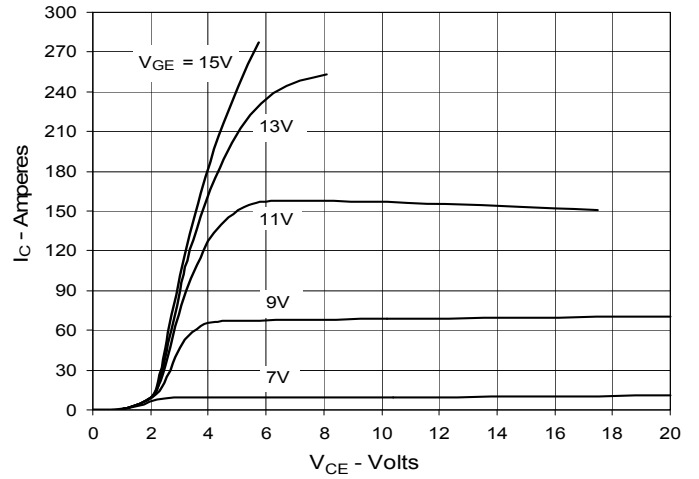
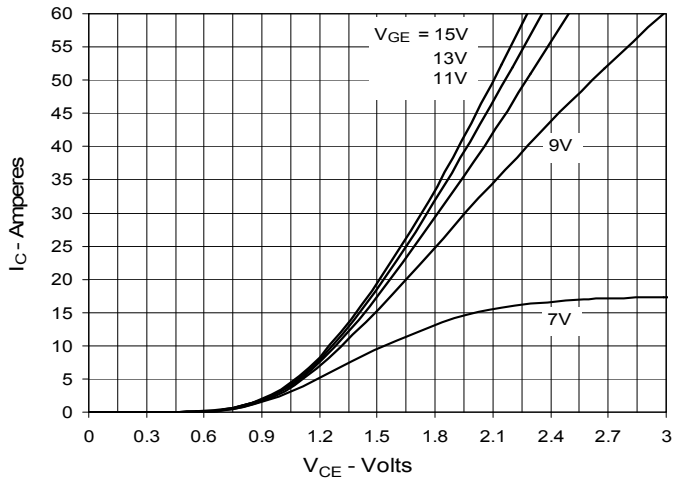
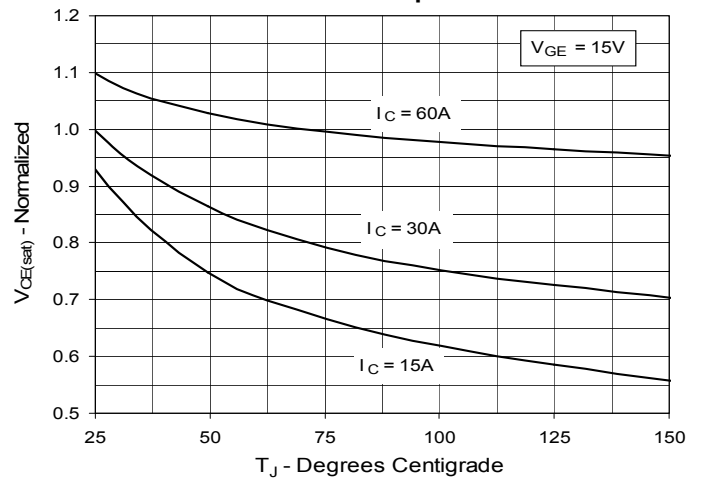
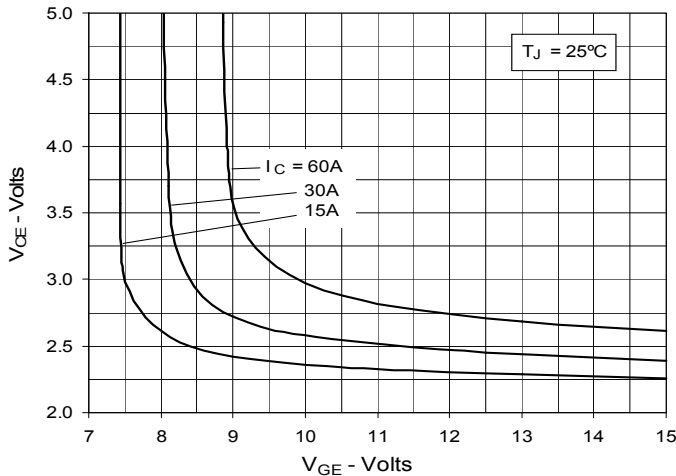
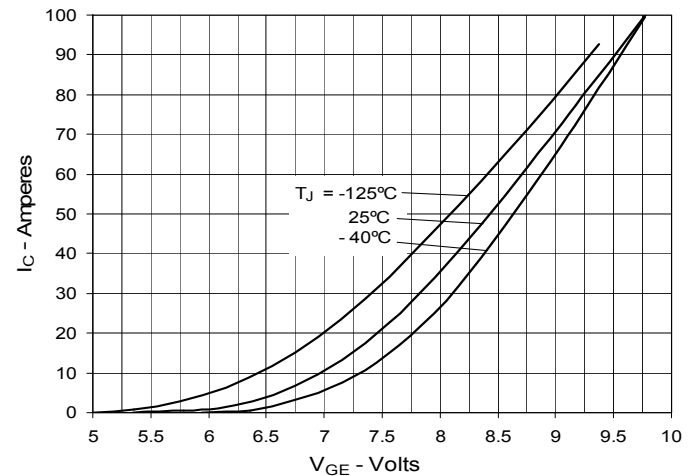
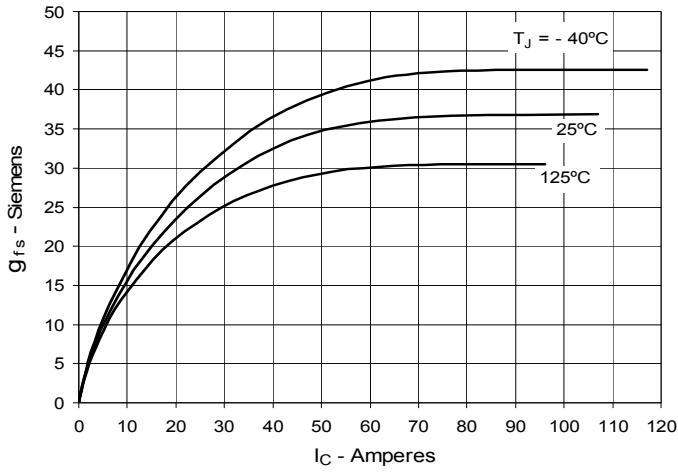
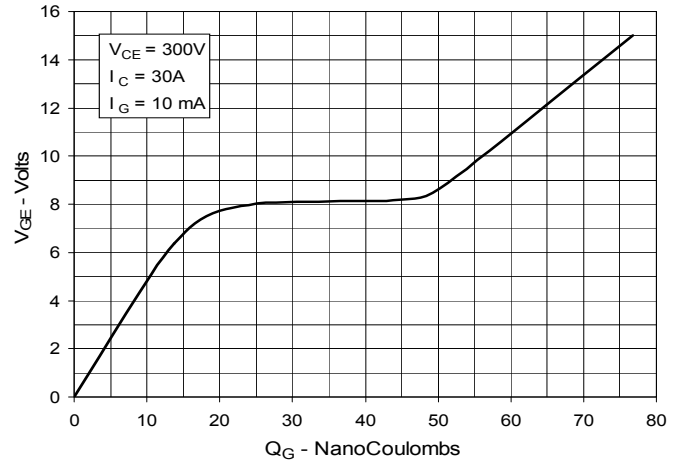
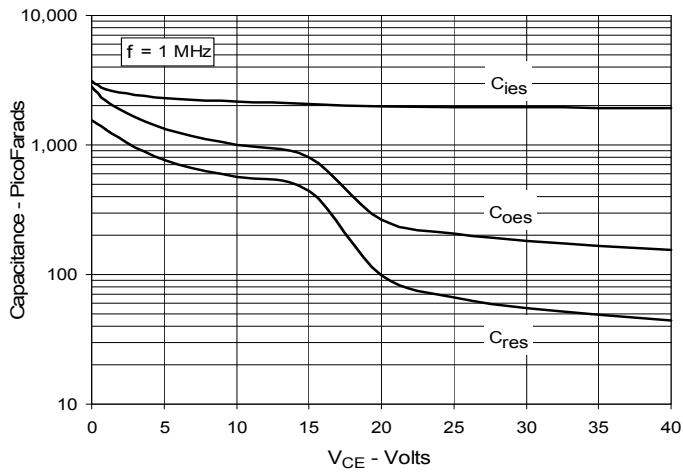
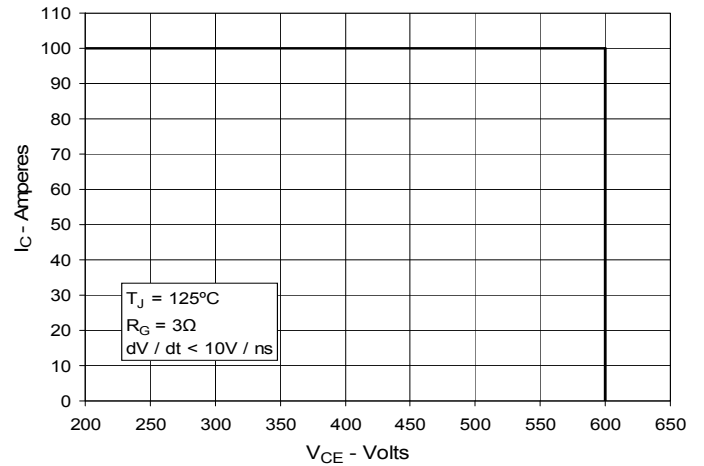
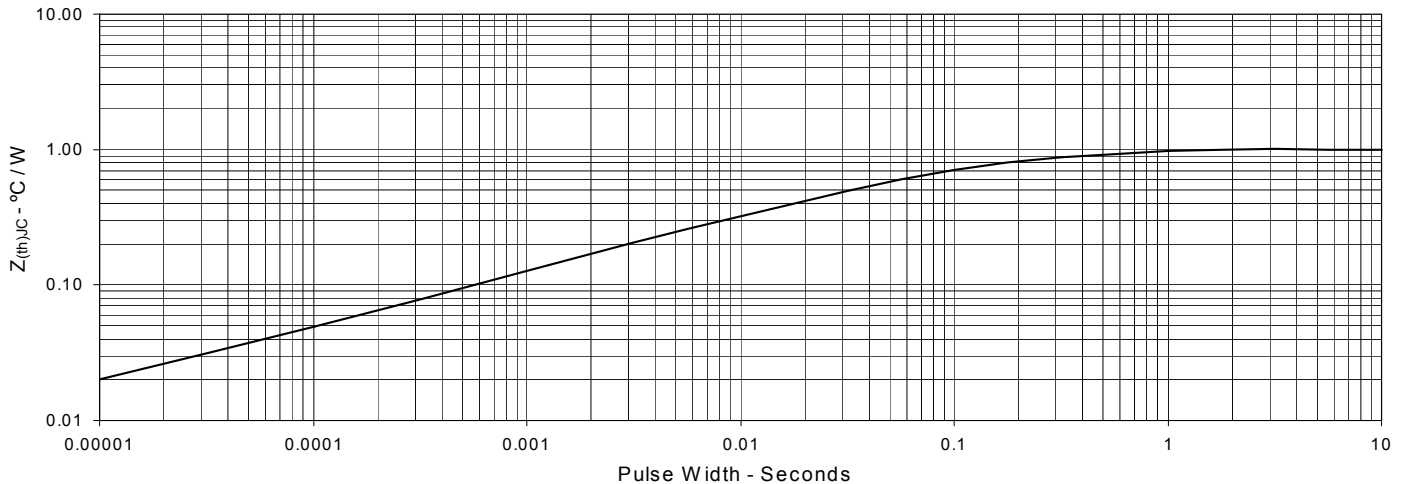
**Fig. 1. Output Characteristics
@ 25°C**

**Fig. 2. Extended Output Characteristics
@ 25°C**

**Fig. 3. Output Characteristics
@ 125°C**

**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


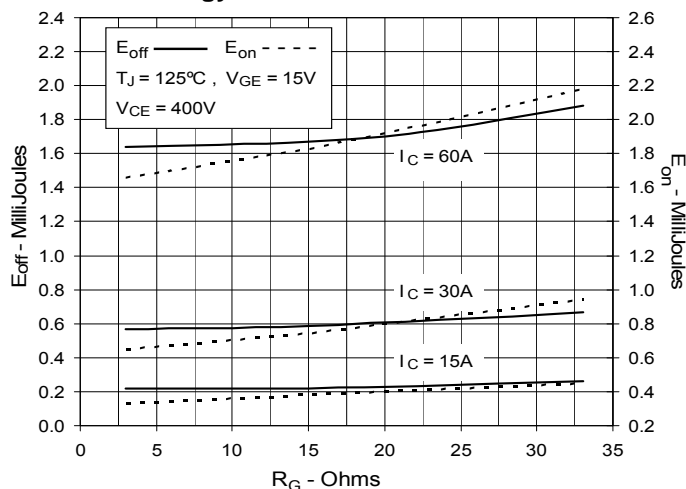
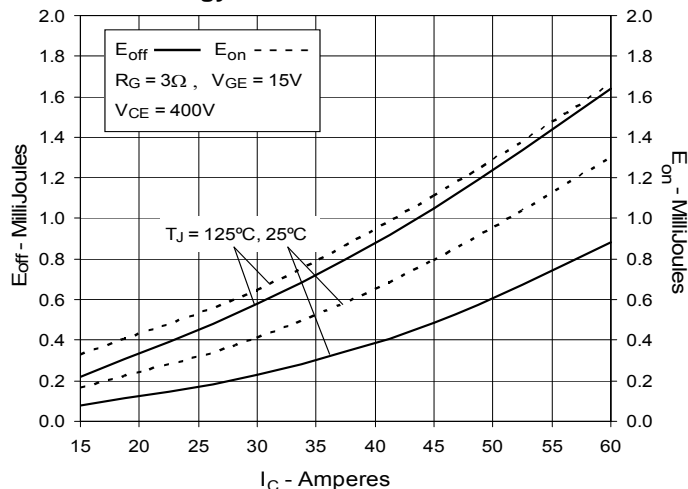
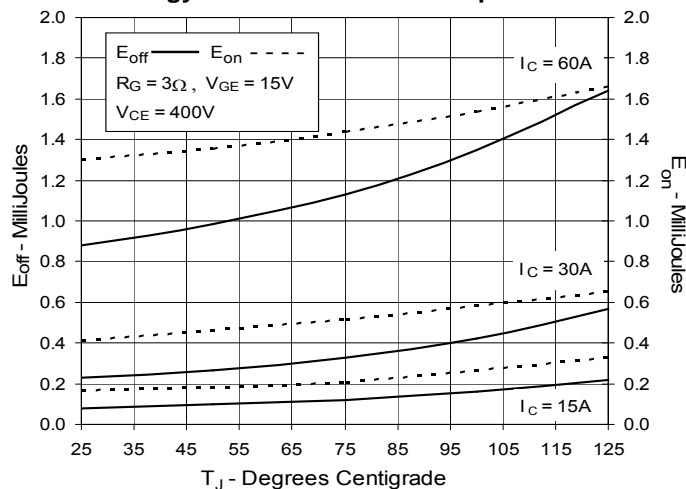
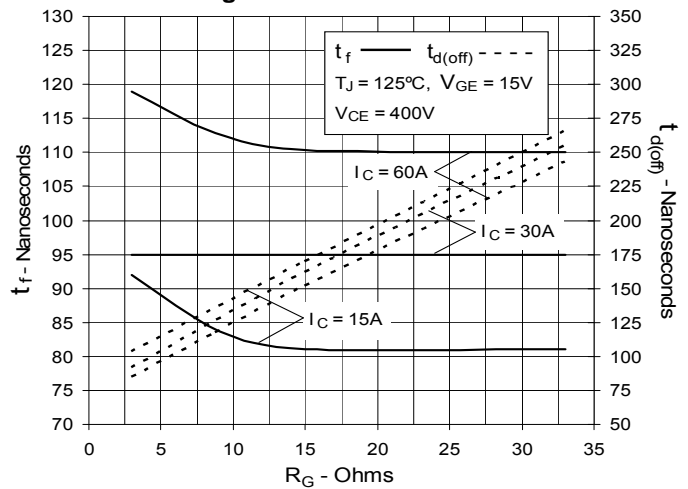
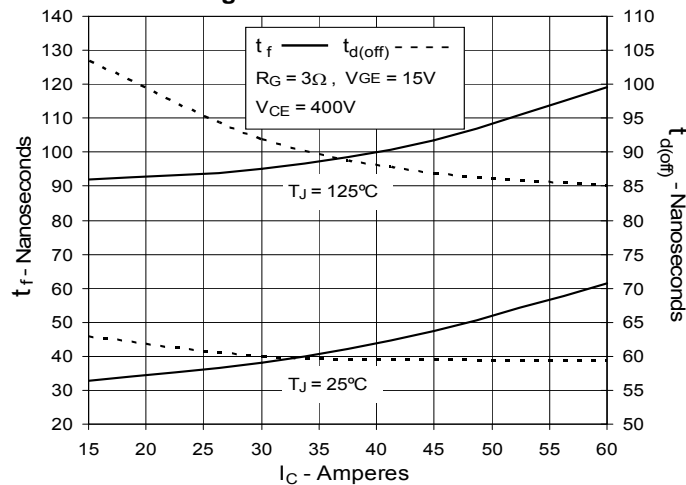
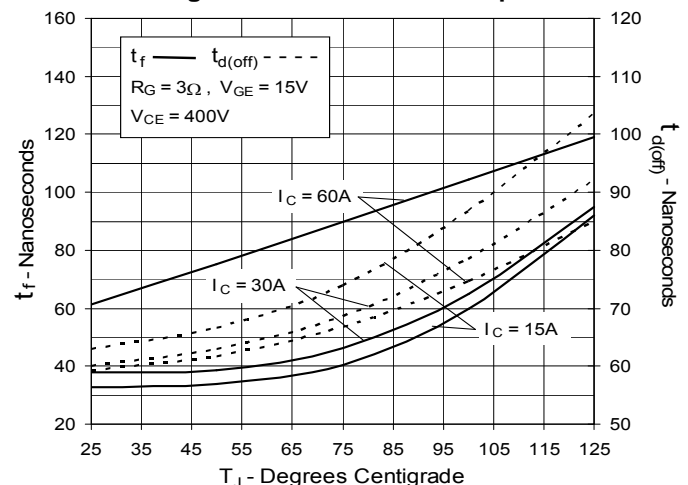
**Fig. 12. Inductive Switching
Energy Loss vs. Gate Resistance**

**Fig. 13. Inductive 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

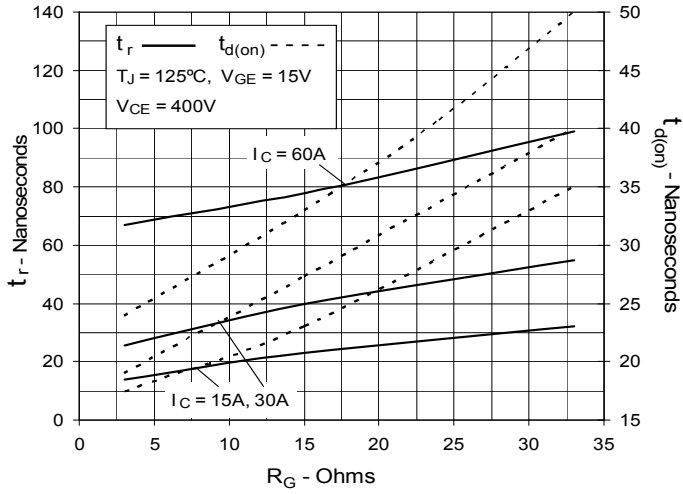


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

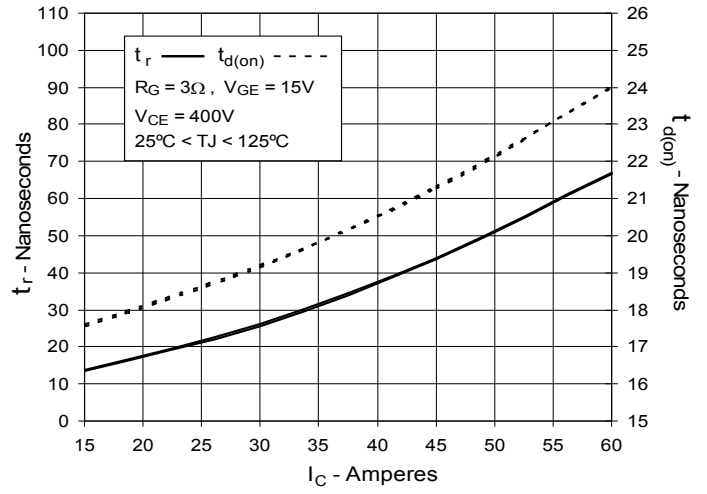
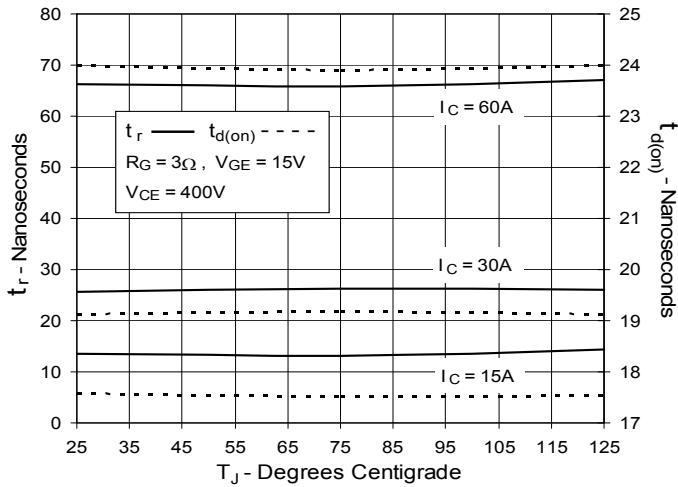


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



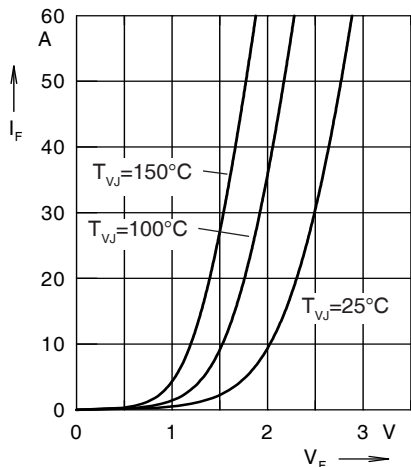


Fig. 21. Forward current I_F versus V_F

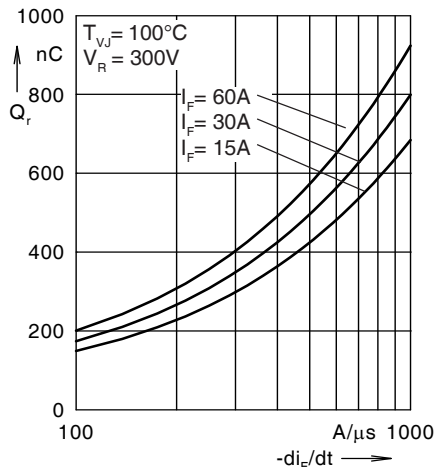


Fig. 22. Reverse recovery charge Q_r versus $-di_F/dt$

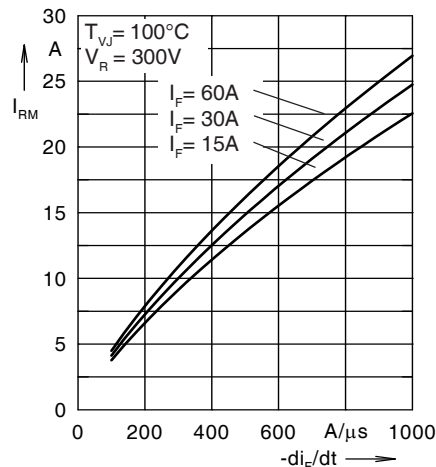


Fig. 23. Peak reverse current I_{RM} versus $-di_F/dt$

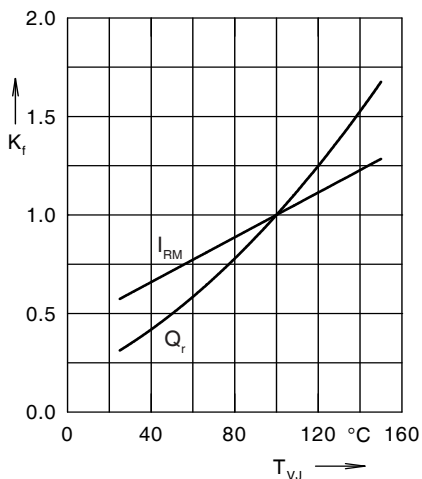


Fig. 24. Dynamic parameters Q_r , I_{RM} versus T_{VJ}

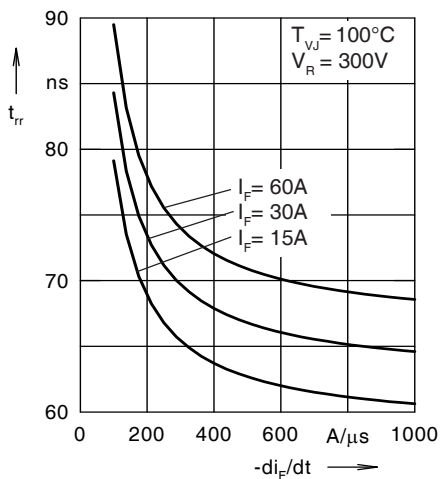


Fig. 25. Recovery time t_{rr} versus $-di_F/dt$

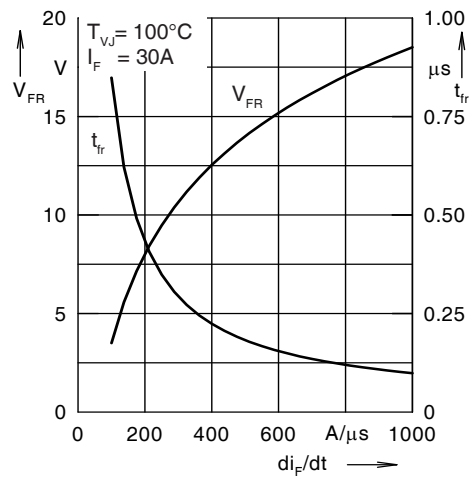


Fig. 26. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

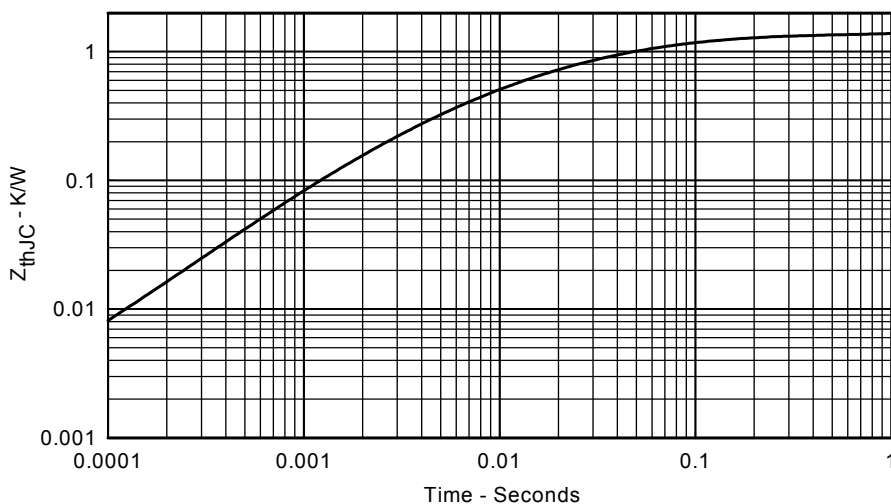


Fig. 27. Transient thermal resistance junction to case



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