IXYS

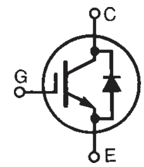
Advance Technical Information

HiPerFAST™ IGBT with Fast Diode

B2-Class High Speed IGBTs with Ultrafast Diode

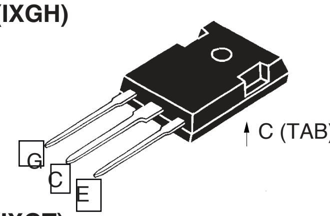
IXGH 32N90B2D1
IXGT 32N90B2D1

V_{CES} = 900 V
I_{C25} = 64 A
$V_{CE(sat)}$ = 2.7 V
$t_{fi\,typ}$ = 150 ns

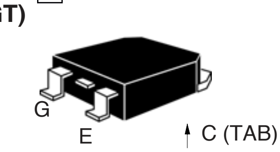


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	900	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MW	900	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	64	A
I_{C110}	T_C = 110°C	32	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE}= 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load: V_{CL} < 600V	I_{CM} = 64	A
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C
M_d	Mounting torque (TO-247)	1.13/10	Nm/lb.in.
Weight	TO-247	6	g
	TO-268	4	g

TO-247 (IXGH)



TO-268 (IXGT)



G = Gate
E = Emitter
C = Collector
TAB = Collector

Features
- High frequency IGBT
- High current handling capability
- MOS Gate turn-on
  - drive simplicity

Applications
- PFC circuits
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

Advantages
- High power density
- Very fast switching speeds for high frequency applications

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)		Characteristic Values min.	typ.	max.	
$V_{GE(th)}$	I_C = 250 mA, V_{CE} = V_{GE}		3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}				300	µA
	V_{GE} = 0 V	T_J = 150°C			1.5	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ± 20 V				± 100	nA
$V_{CE(sat)}$	I_C = I_{C110}, V_{GE} = 15 V			2.2	2.7	V
		T_J = 125°C		2.1		V

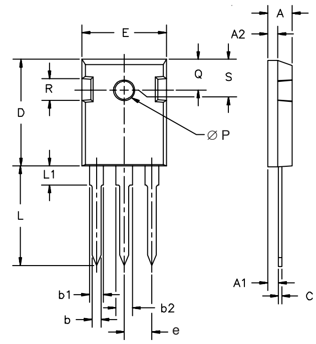
Symbol	Test Conditions (T$_J$ = 25°C unless otherwise specified)	Min.	Typ.	Max.	
g_{fs}	I_C = I_{C110}, V_{CE} = 10 V Pulse test, t < 300 µs, duty cycle < 2 %	18	28		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		1790		pF
C_{oes}			146		pF
C_{res}			49		pF
Q_g	I_C = I_{C110}, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		89		nC
Q_{ge}			15		nC
Q_{gc}			34		nC
$t_{d(on)}$	**Inductive load, T$_J$ = 25°C** I_C = I_{C110}, V_{GE} = 15 V V_{CE} = 720 V, R_G = R_{off} = 5 Ω		20		ns
t_{ri}			22		ns
$t_{d(off)}$			260	400	ns
t_{fi}			150		ns
E_{off}			2.2	4.5	mJ
$t_{d(on)}$	**Inductive load, T$_J$ = 125°C** I_C = I_{C110} A, V_{GE} = 15 V V_{CE} = 720 V, R_G = R_{off} = 5 Ω		20		ns
t_{ri}			22		ns
E_{on}			3.8		mJ
$t_{d(off)}$			360		ns
t_{fi}			330		ns
E_{off}			5.75		mJ
R_{thJC}				0.42	K/W
R_{thCS}	(TO-247)		0.25		K/W

Ultrafast Diode

Symbol	Conditions	Maximum Ratings	
I_{F110}	T_C = 110°C	27	A

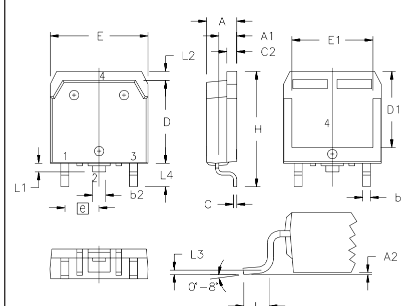
Symbol	Conditions (T$_J$ = 25°C unless otherwise specified)	Min.	Typ.	Max.	
V_F	I_F = 30 A;			2.75	V
	T_{VJ} = 125°C		1.9		V
I_{RM}	I_F = 50 A; di_F/dt = -100 A/µs; T_{VJ} = 100°C V_R = 100 V; V_{GE} = 0 V		5.5	11.4	A
t_{rr}			190		ns
R_{thJC}				0.9	K/W
R_{thCS}			0.25		K/W

TO-247 AD Outline



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	

TO-268 Outline



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

Fig. 1. Output Characteristics @ 25 ºC

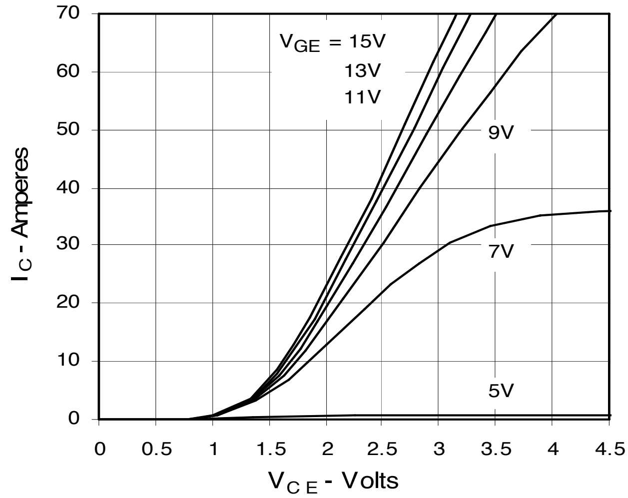


Fig. 2. Extended Output Characteristics @ 25 ºC

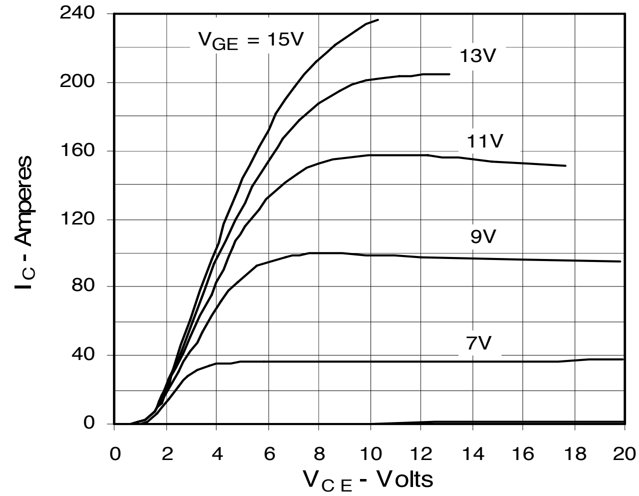


Fig. 3. Output Characteristics @ 125 ºC

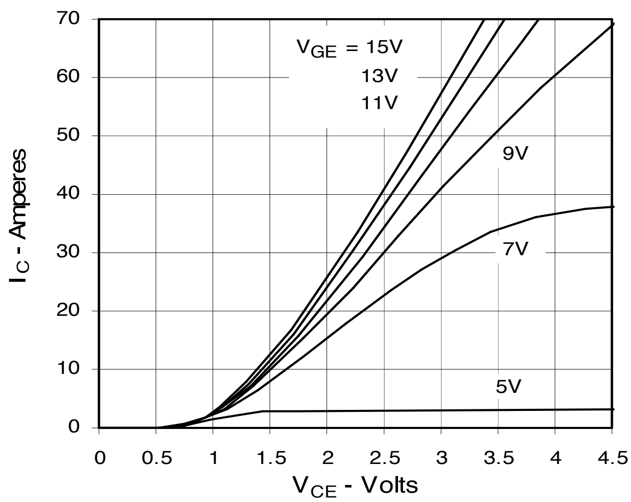


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

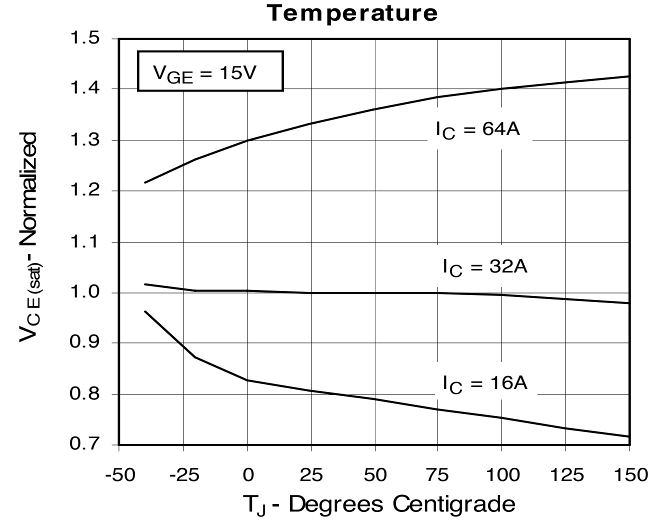


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

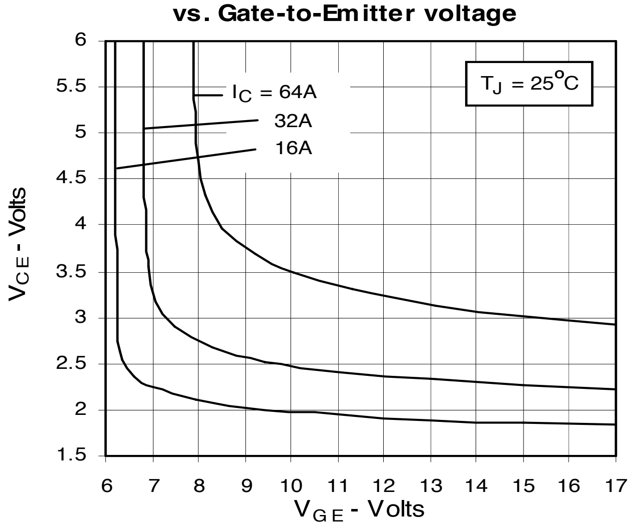


Fig. 6. Input Admittance

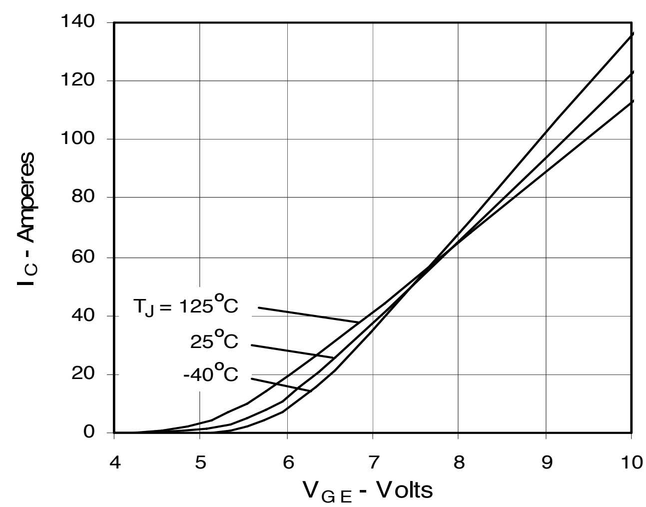


Fig. 7. Transconductance

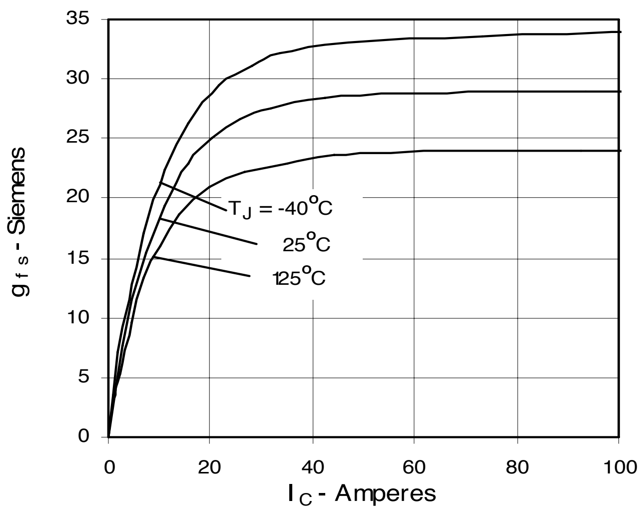


Fig. 8. Gate Charge

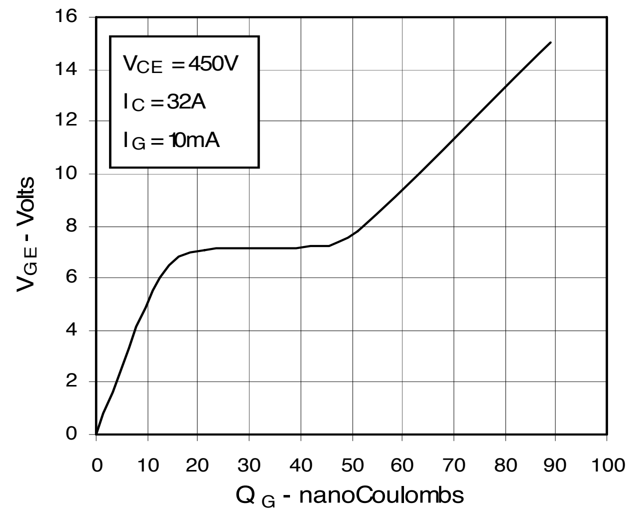


Fig. 9. Capacitance

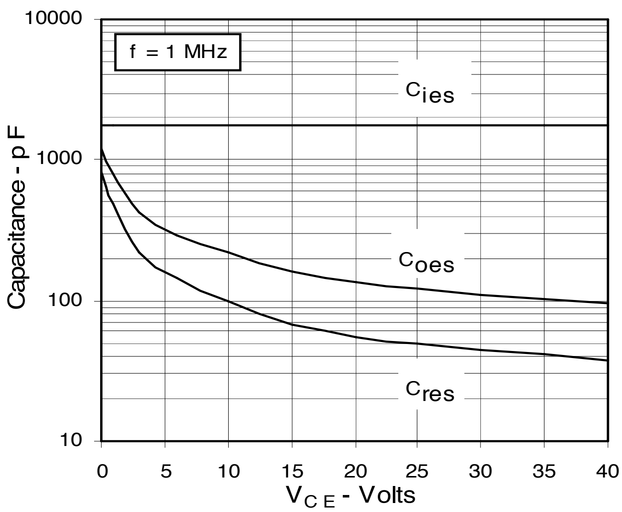


Fig. 10. Reverse-Bias Safe Operating Area

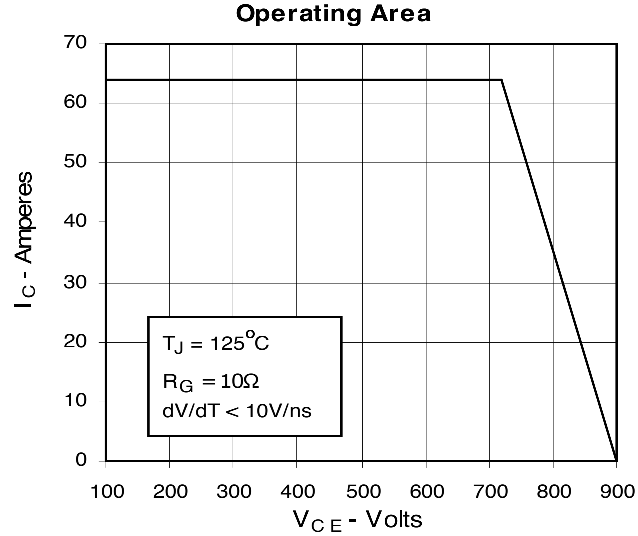


Fig. 11. Maximum Transient Thermal Resistance

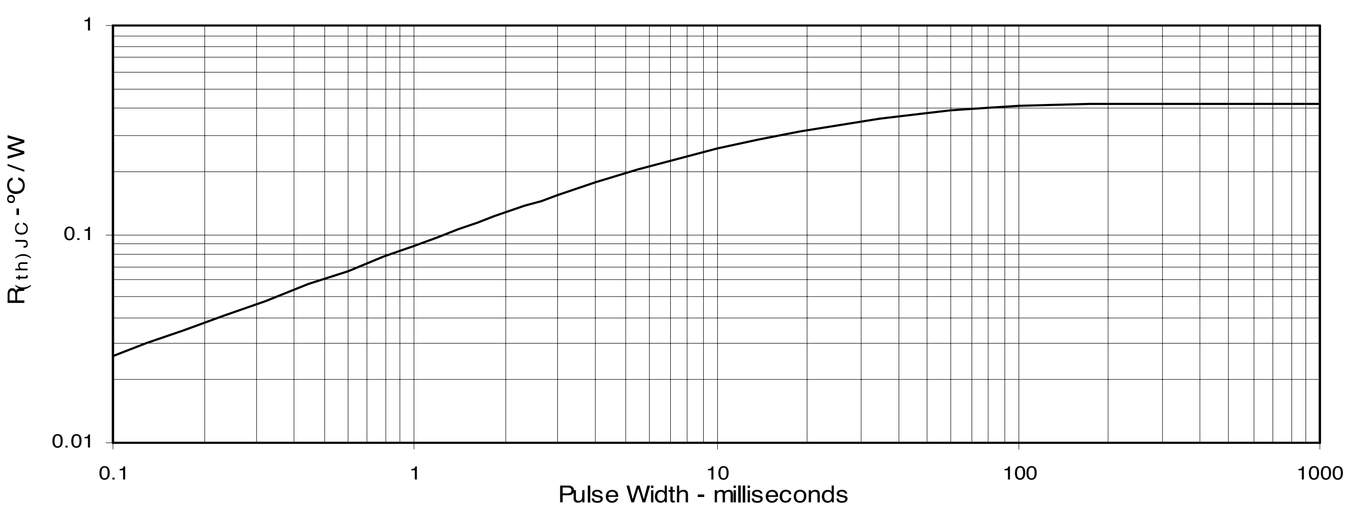


Fig. 12. Dependence of Turn-off Energy Loss on Gate Resistance

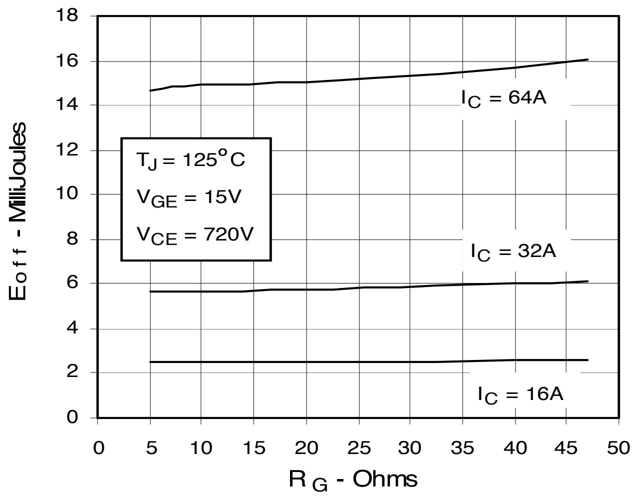


Fig. 13. Dependence of Turn-on Energy Loss on Gate Resistance

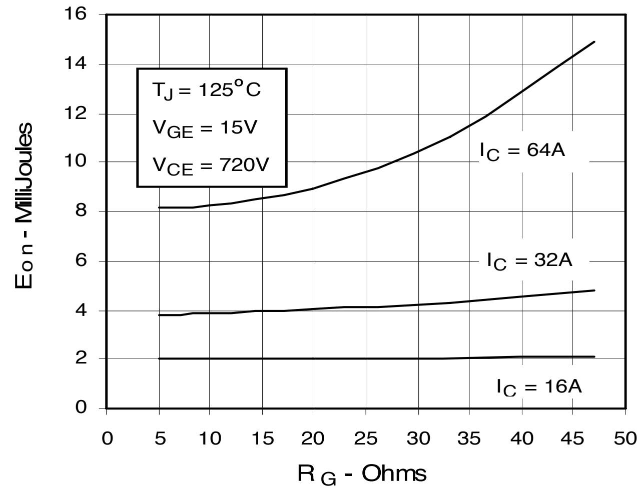


Fig. 14. Dependence of Turn-off Energy Loss on Collector Current

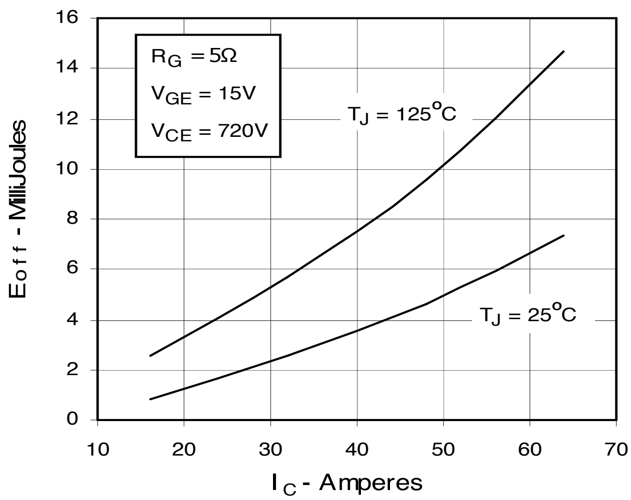


Fig. 15. Dependence of Turn-on Energy Loss on Collector Current

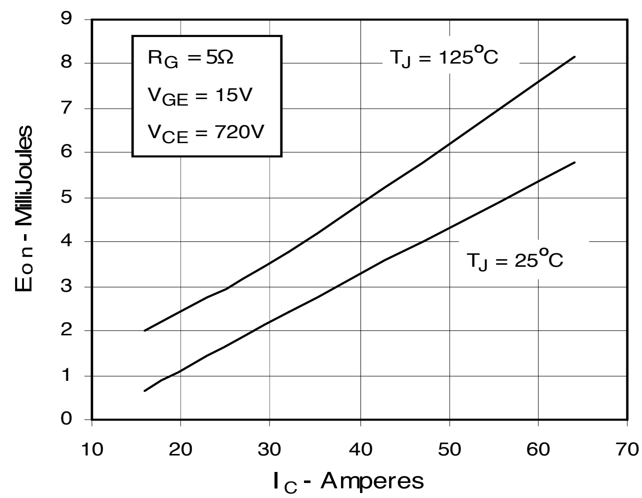


Fig. 16. Dependence of Turn-off Energy Loss on Temperature

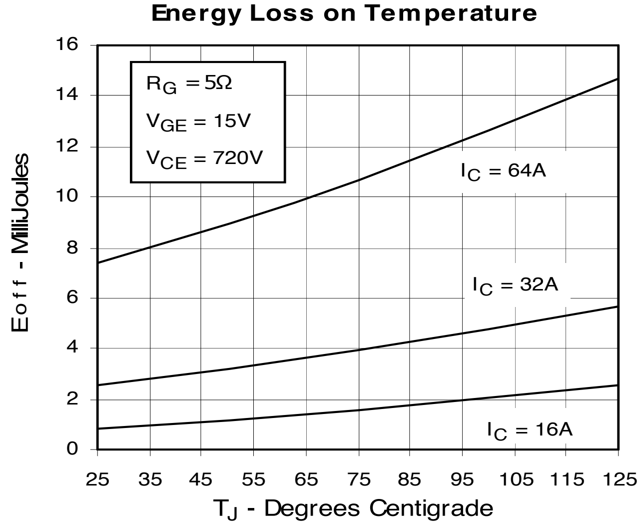


Fig. 17. Dependence of Turn-on Energy Loss on Temperature

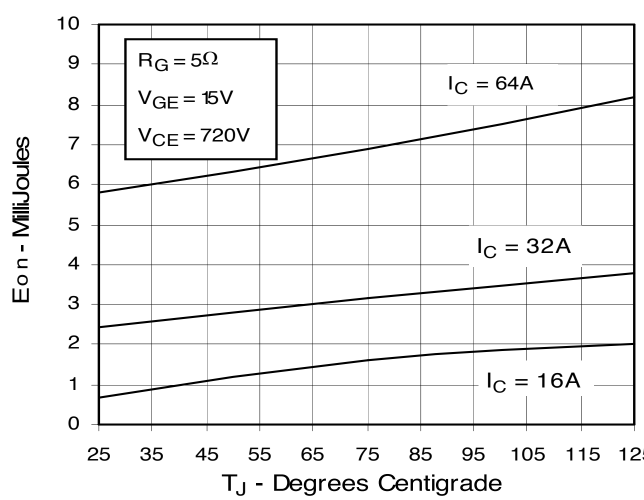


Fig. 18. Dependence of Turn-off Switching Time on Gate Resistance

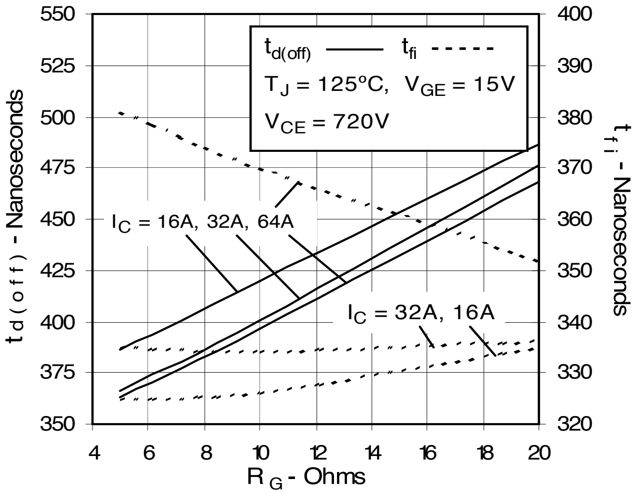


Fig. 19. Dependence of Turn-on Switching Time on Gate Resistance

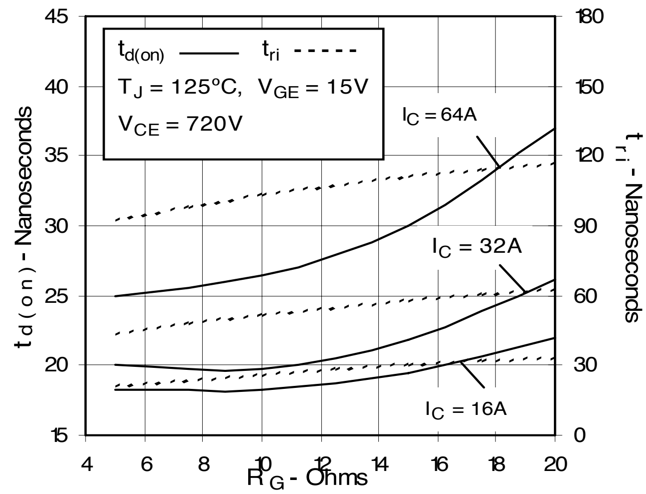


Fig. 20. Dependence of Turn-off Switching Time on Collector Current

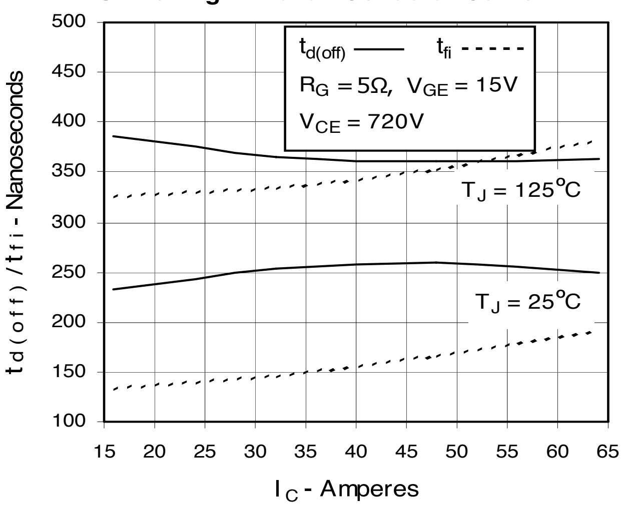


Fig. 21. Dependence of Turn-on Switching Time on Collector Current

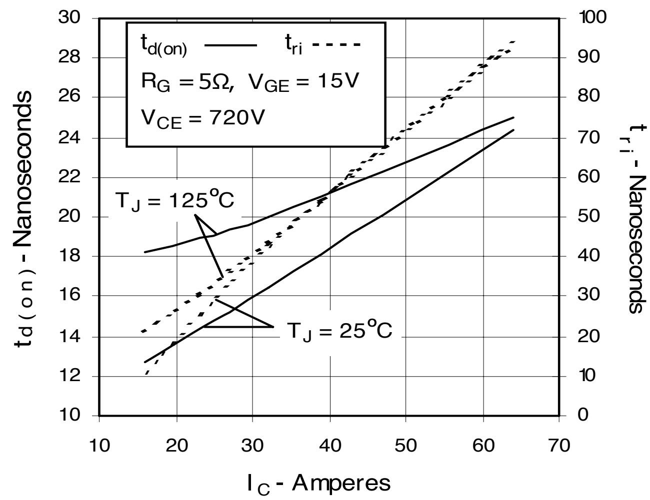


Fig. 22. Dependence of Turn-off Switching Time on Temperature

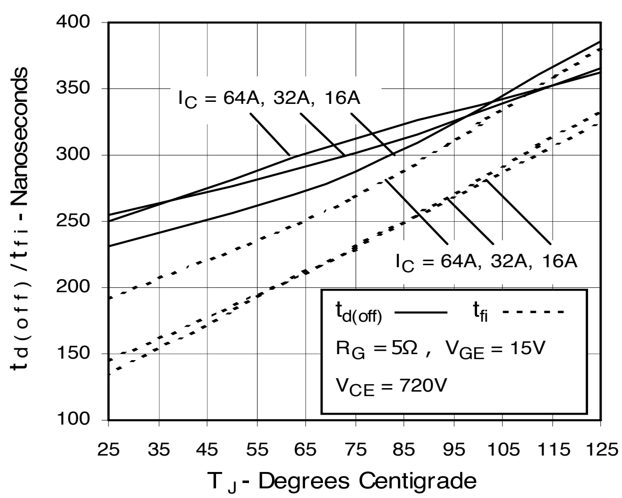
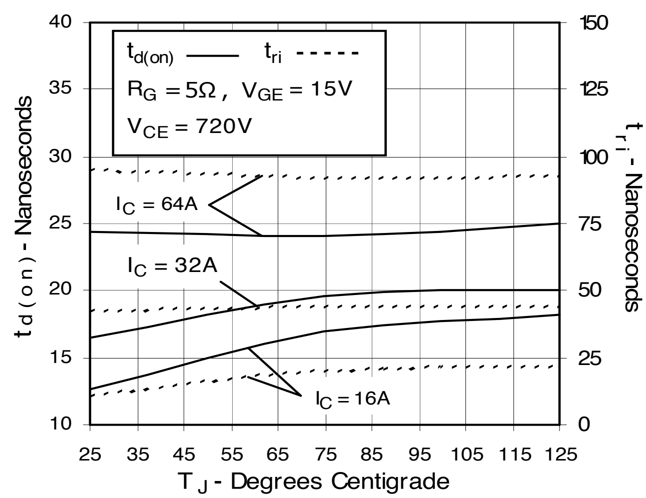


Fig. 23. Dependence of Turn-on Switching Time on Temperature



Ultrafast Diode Charateristic Curves

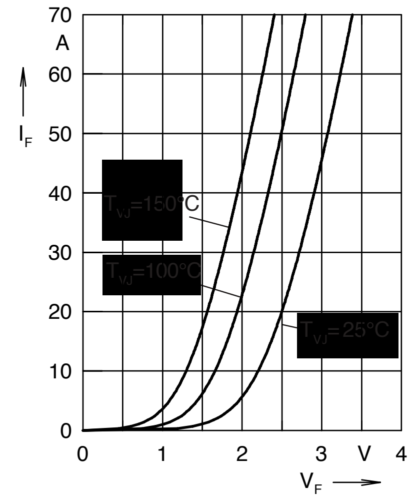


Fig. 24. Forward current I_F versus V_F

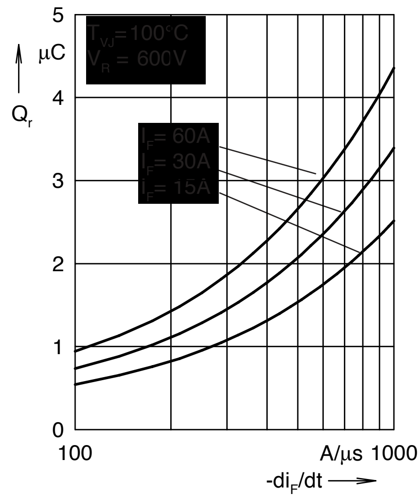


Fig. 25. Reverse recovery charge Q_r versus $-di_F/dt$

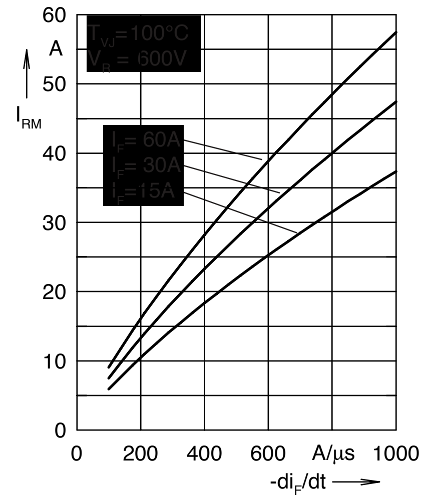


Fig. 26. Peak reverse current I_{RM} versus $-di_F/dt$

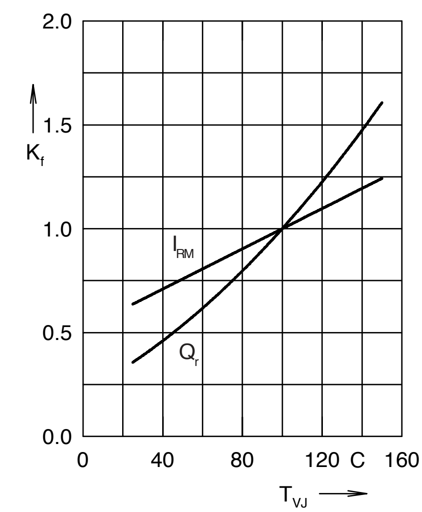


Fig. 27. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

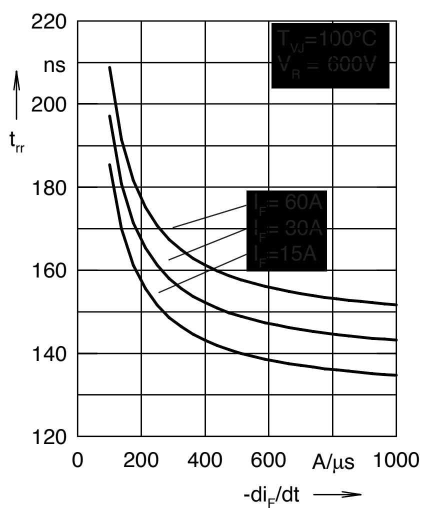


Fig. 28. Recovery time t_{rr} versus $-di_F/dt$

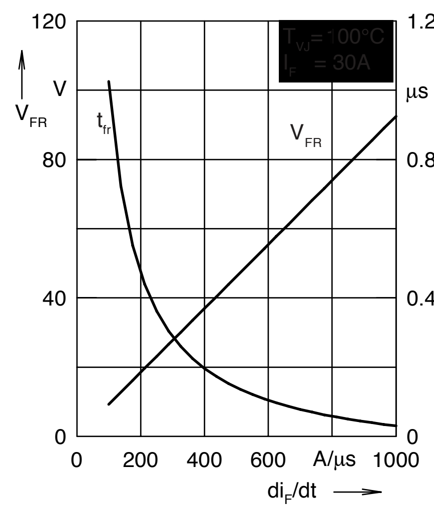


Fig. 29. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

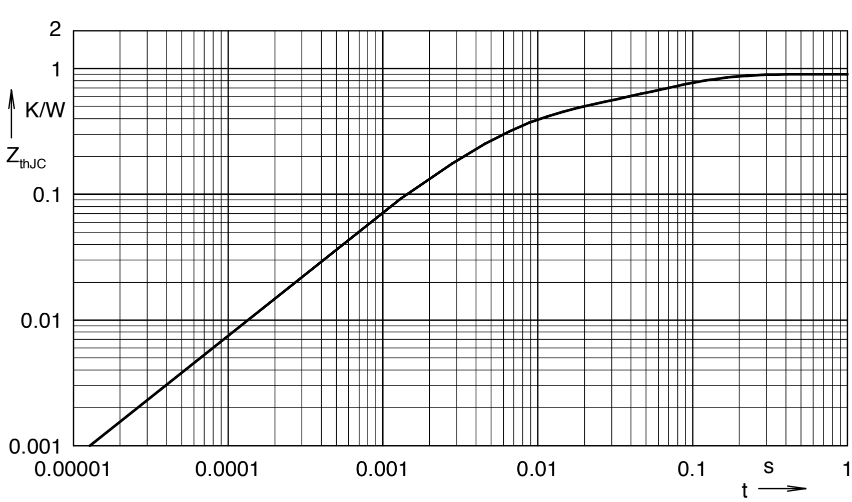


Fig. 30. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0397

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