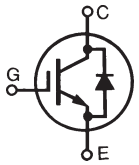
IXYS

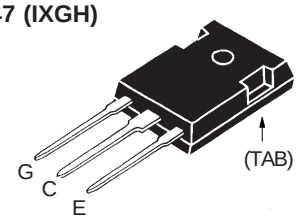
High Voltage IGBT with Diode

IXGH 40N120B2D1
IXGT 40N120B2D1

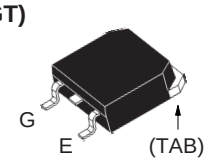
V_{CES} = 1200 V
I_{C25} = 75 A
$V_{CE(sat)}$ ≤ 3.5 V
$t_{fi(typ)}$ = 140 ns



TO-247 (IXGH)



TO-268 (IXGT)



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

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1200	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	1200	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	75	A
I_{C110}	T_C = 100°C	40	A
I_{F110}	T_C = 100°C	30	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE} = 15 V, T_J = 125°C, R_G = 10 Ω Clamped inductive load @0.8 V_{CES}	I_{CM} = 80	A
P_C	T_C = 25°C	360	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque	1.13/10	Nm/lb.in.
T_L	1.6 mm (0.062 in.) from case for 10 s	300	°C
T_{SOLD}	Plastic body for 10 s	260	°C
Weight		5	g

Symbol	Test Conditions		Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
$V_{GE(th)}$	I_C = 250 μA, V_{CE} = V_{GE}		3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}	T=25°C			50	μA
	V_{GE} = 0 V	T=125°C			250	μA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15 V, note 1,			2.9	3.5	V

Features

- International standard packages
- IGBT and anti-parallel FRED for resonant power supplies
  - Induction heating
  - Rice cookers
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
  - soft recovery with low I_{RM}

Advantages

- Saves space (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost

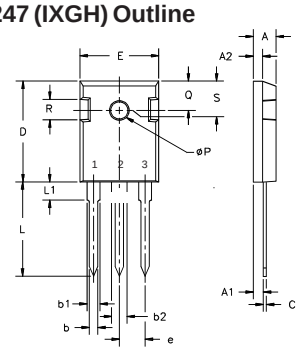
Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
g_{fs}	I_C = 40A; V_{CE} = 10 V, Note 1.	23	37		S
C_{ies}			3360		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		190		pF
C_{res}			63		pF
Q_g			138		nC
Q_{ge}	I_C = 40A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		20		nC
Q_{gc}			48		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		21		ns
t_{ri}	I_C = 40 A; V_{GE} = 15 V		55		ns
$t_{d(off)}$	V_{CE} = 600V; R_G = R_{off} = 2 Ω		290		ns
t_{fi}			140	270	ns
E_{off}			3.0	6.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		21		ns
t_{ri}	I_C = 40A; V_{GE} = 15 V		58		ns
E_{on}	V_{CE} = 600V; R_G = R_{off} = 2 Ω		6.5		mJ
$t_{d(off)}$			350		ns
t_{fi}			420		ns
E_{off}			8.3		mJ
R_{thJC}				0.35	K/W
R_{thCK}		0.15			K/W

Reverse Diode (FRED)

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) Min.	Typ.	Max.	
V_F	I_F = 30 A, V_{GE} = 0 V			3.1	V
	I_F = 30 A, V_{GE} = 0 V, T_J = 125°C			1.8	V
I_{RM}	I_F = 50 A; -di$_F$/dt = 100 A/µs; V_R = 100 V		6.3		A
t_{rr}	V_{GE} = 0 V; T_J = 125°C		200		ns
t_{rr}	I_F = 1 A; -di$_F$/dt = 100 A/µs; V_R = 30 V, V_{GE} = 0 V		40		ns
R_{thJC}				0.9	K/W

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

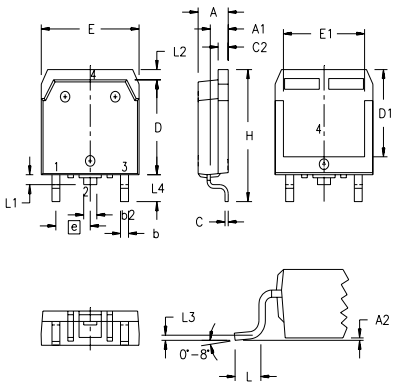
TO-247 (IXGH) Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter Tab - Collector

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
ØP	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 (IXGT) Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter Tab - Collector

SYM	INCHES MIN	MAX	MILLIMETERS MIN	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 @ 25ºC

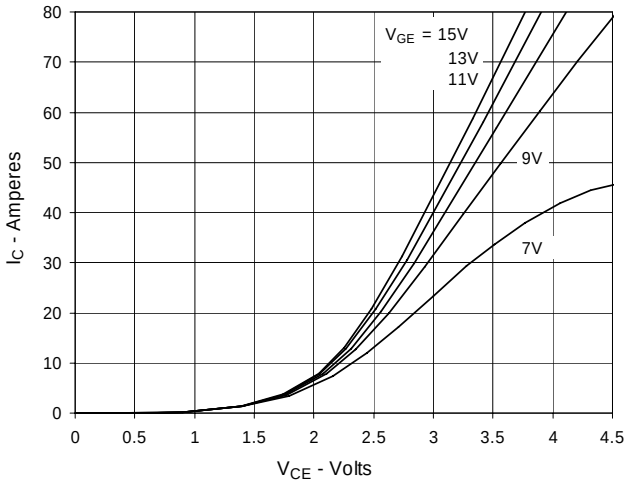


Fig. 2. Exteded Output Characteristics @ 25ºC

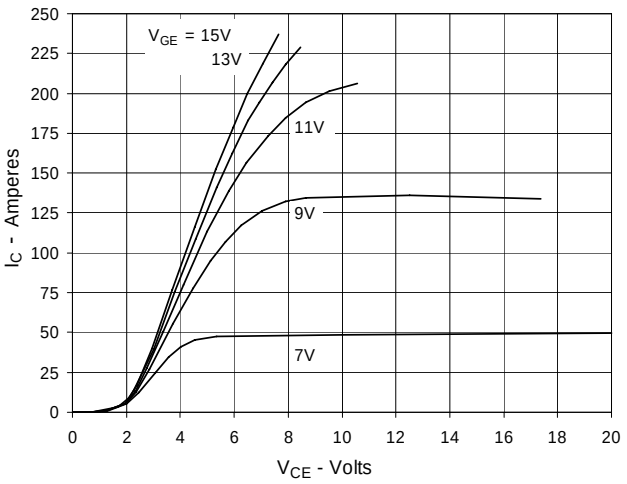


Fig. 3. Output Characteristics @ 125ºC

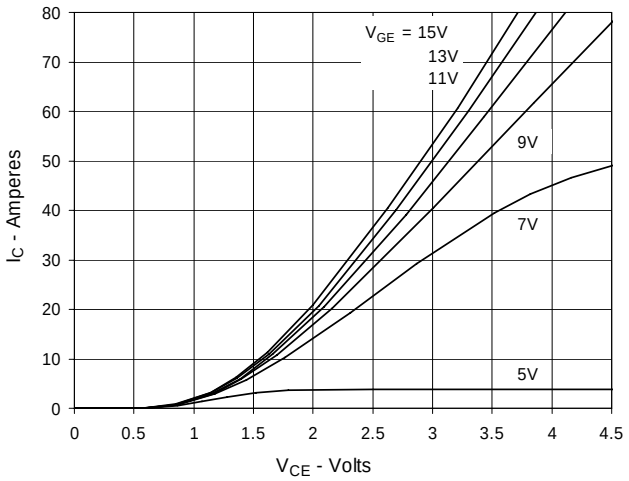


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

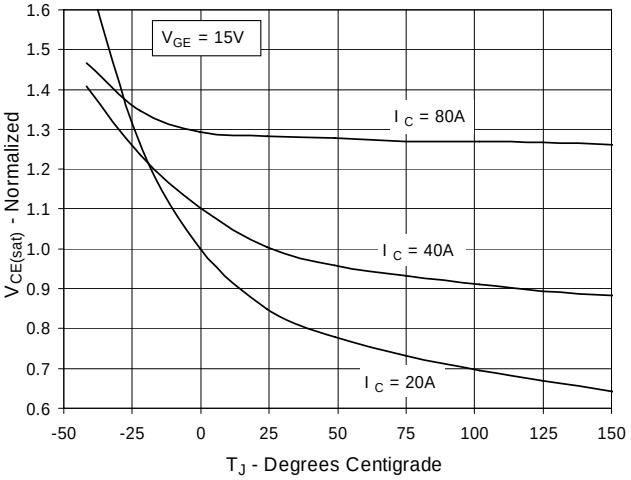


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

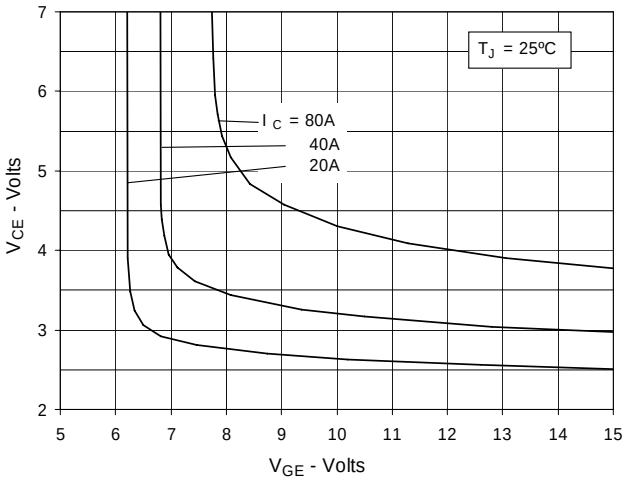


Fig. 6. Input Admittance

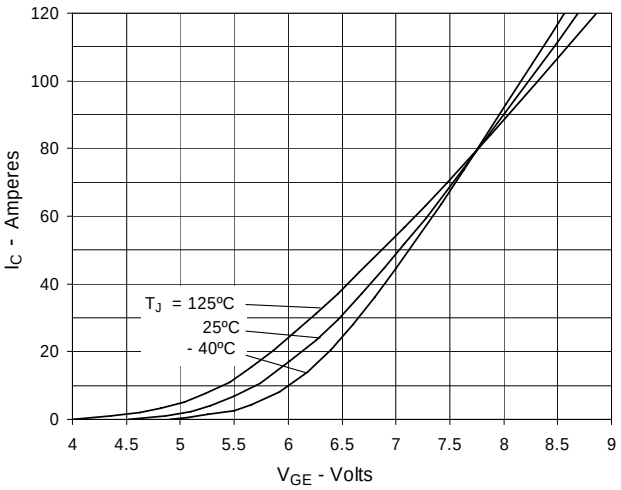


Fig. 7. Transconductance

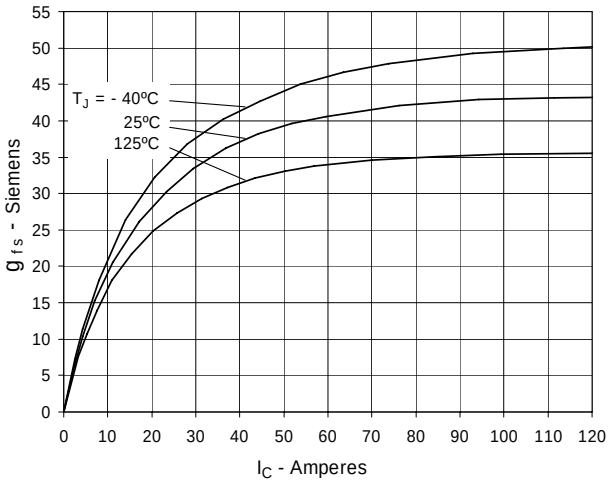


Fig. 8. Inductive Switching Energy Loss vs. Gate Resistance

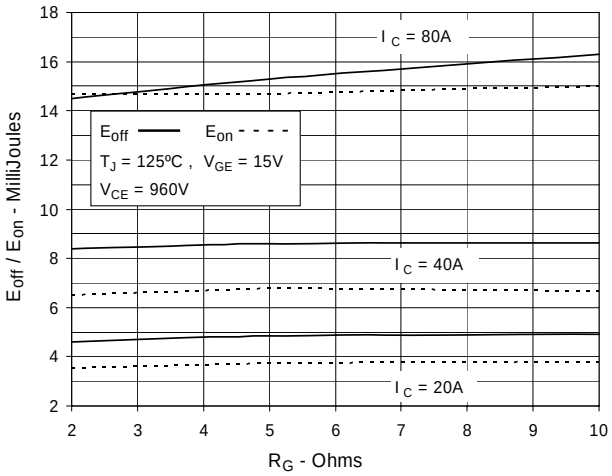


Fig. 9. Inductive Swiching Energy Loss vs. Collector Current

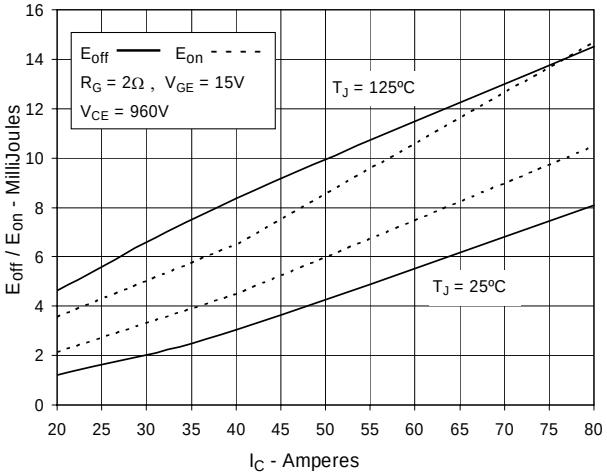


Fig. 10. Inductive Swiching Energy Loss vs. Junction Temperature

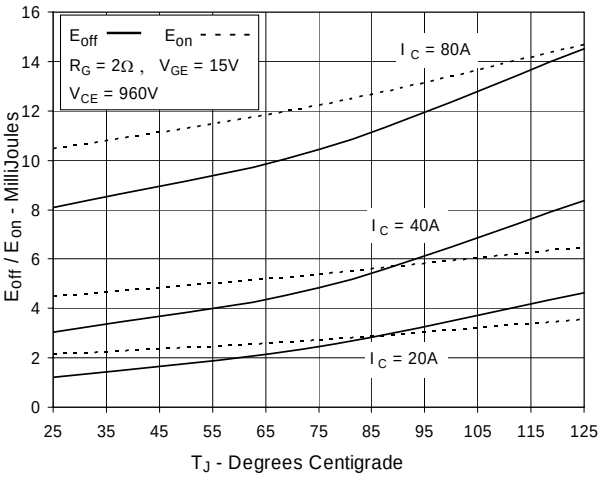


Fig. 11. Inductive Turn-off Switching Times vs. Gate Resistance

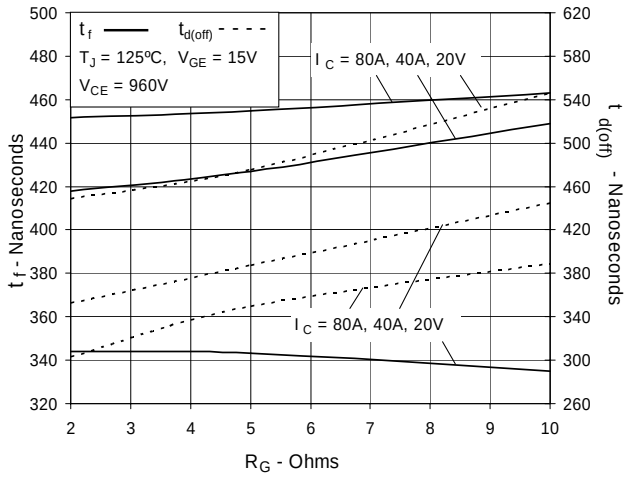


Fig. 12. Inductive Turn-off Switching Times vs. Collector Current

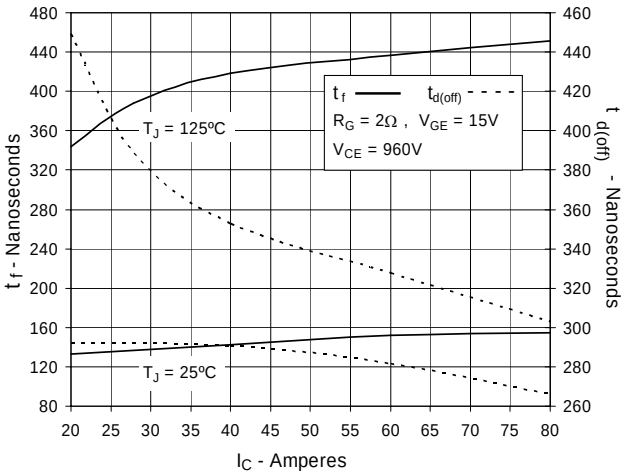


Fig. 13. Inductive Turn-off Switching Times vs. Junction Temperature

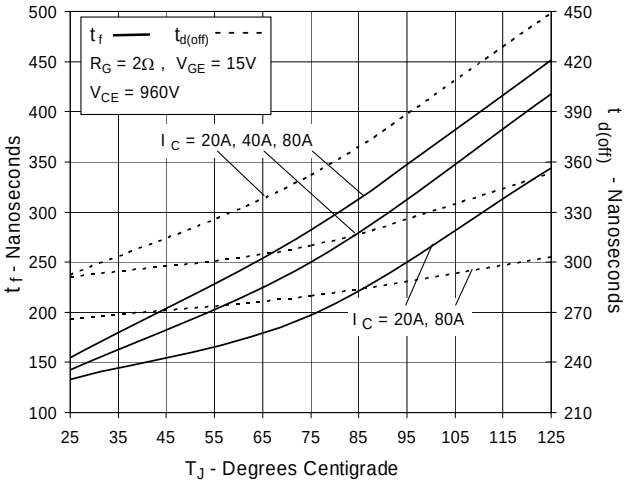


Fig. 14. Inductive Turn-on Switching Times vs. Gate Resistance

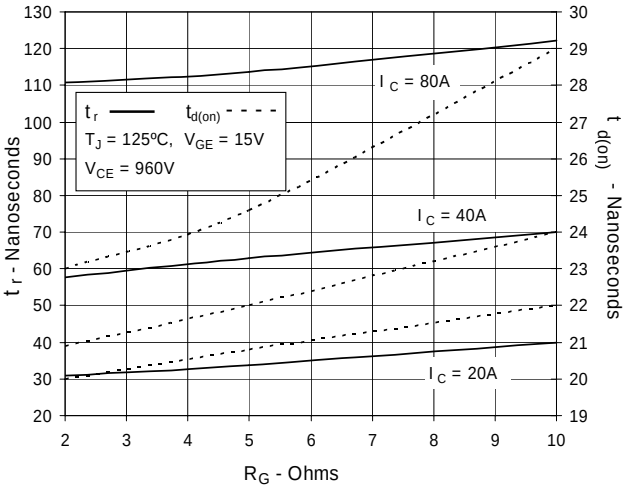


Fig. 15. Inductive Turn-on Switching Times vs. Collector Current

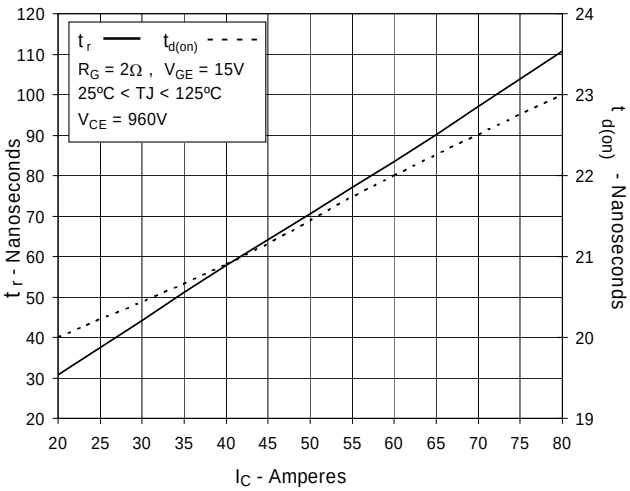


Fig. 16. Inductive Turn-on Switching Times vs. Junction Temperature

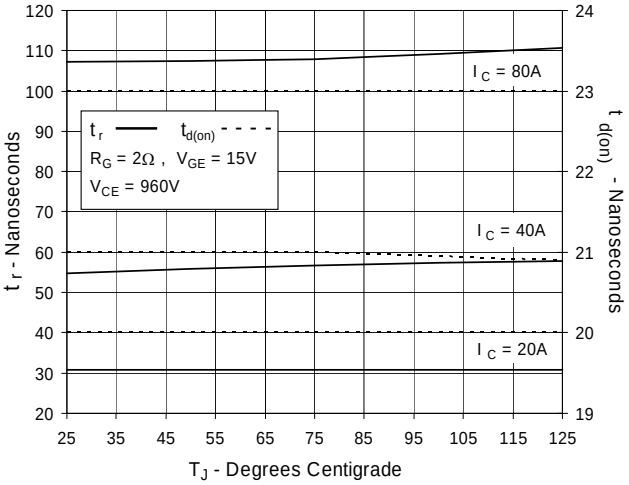


Fig. 17. Gate Charge

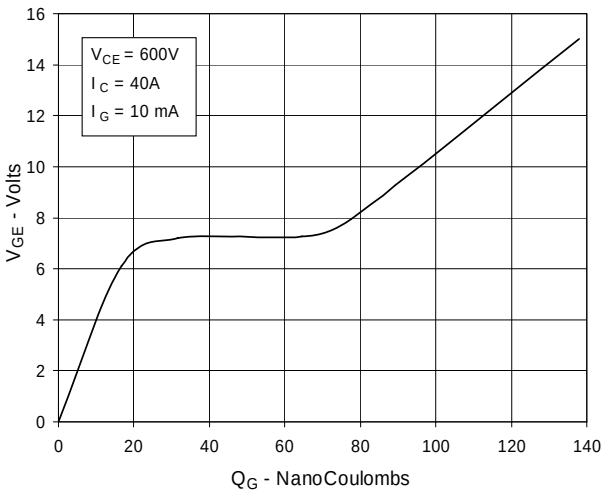


Fig. 18. Capacitance

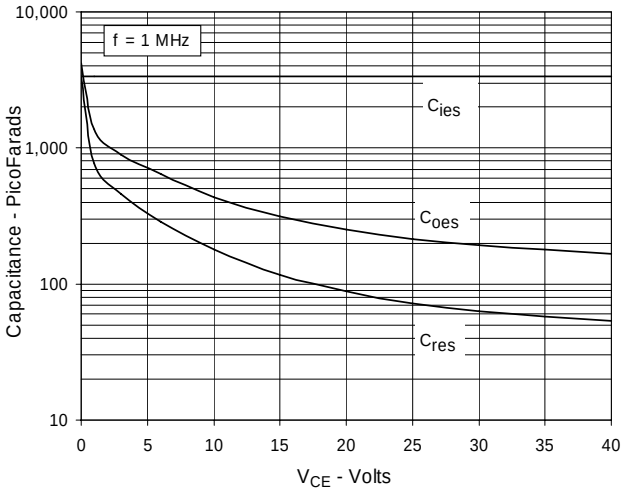


Fig. 19. Reverse-Bias Safe Operating Area

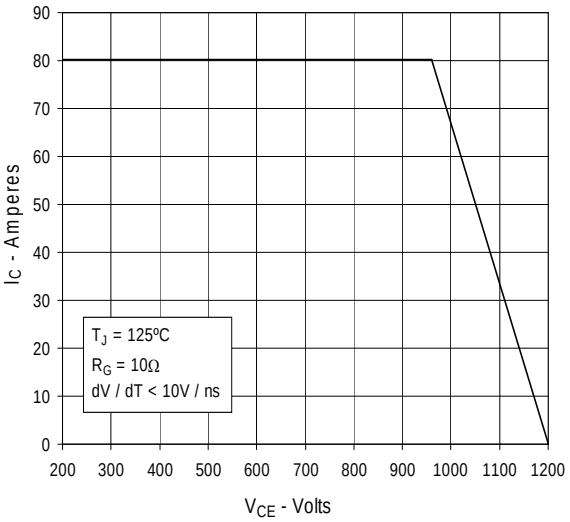
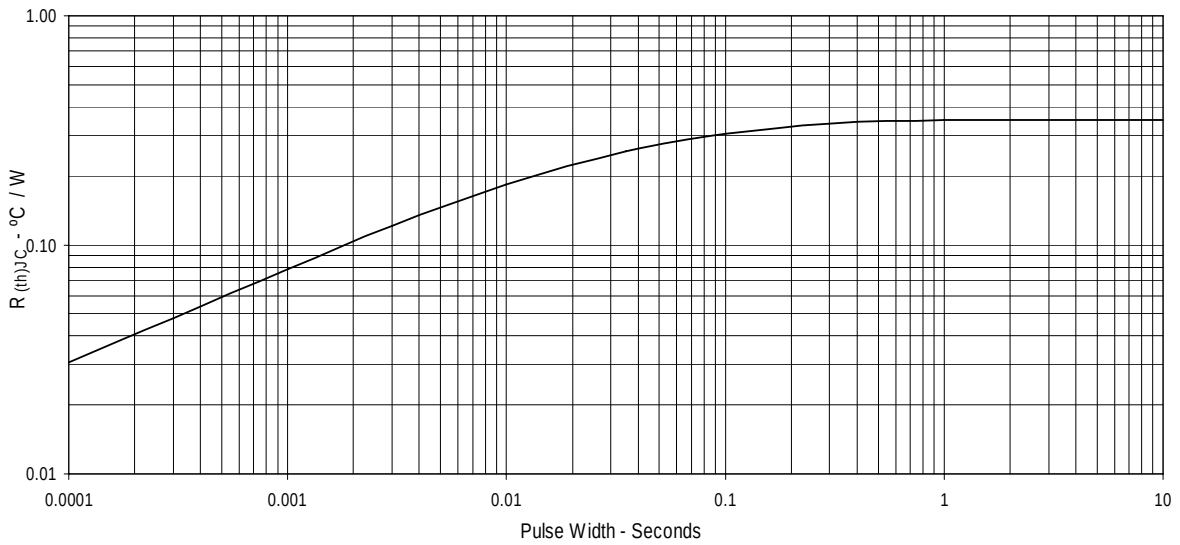


Fig. 20. Maximum Transient Thermal Resistance



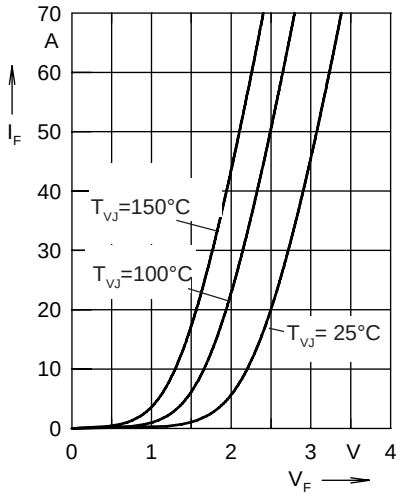


Fig. 1. Forward current I_F versus V_F

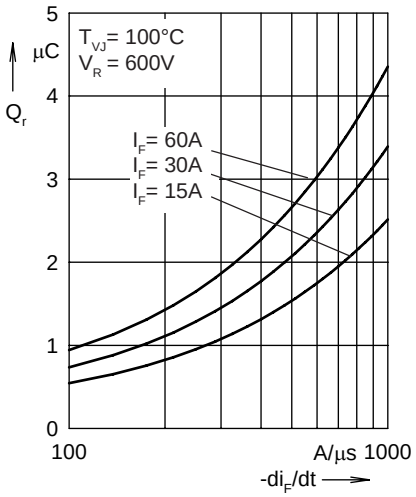


Fig. 2. Reverse recovery charge Q_r versus $-di_F/dt$

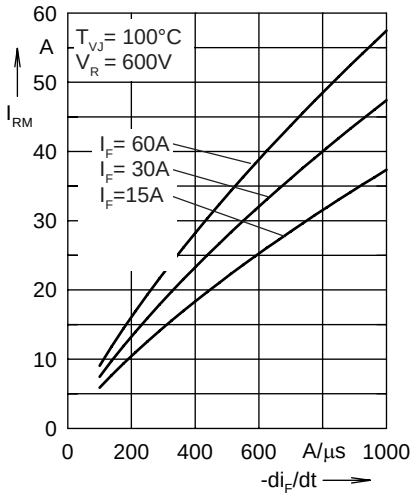


Fig. 3. Peak reverse current I_{RM} versus $-di_F/dt$

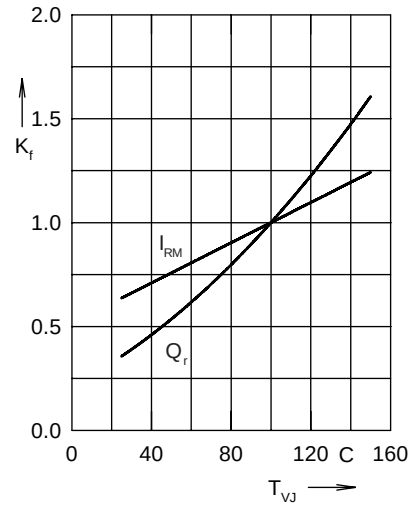


Fig. 4. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

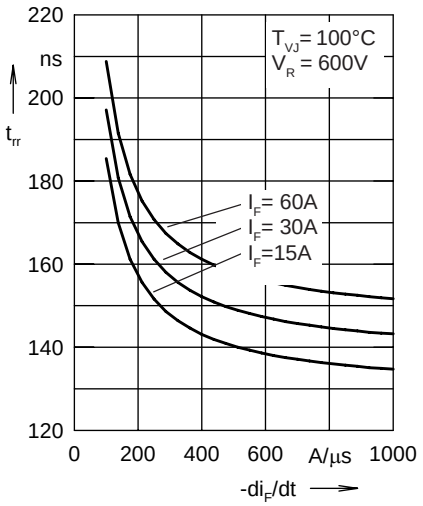


Fig. 5. Recovery time t_{rr} versus $-di_F/dt$

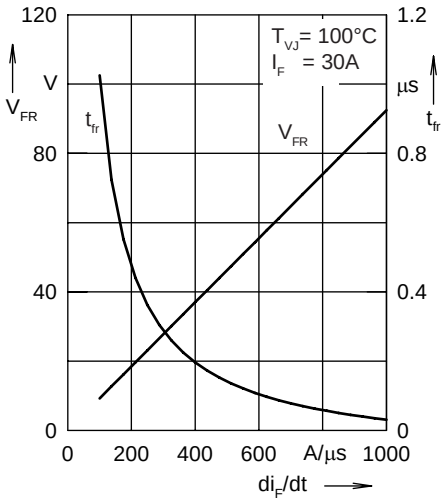


Fig. 6. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

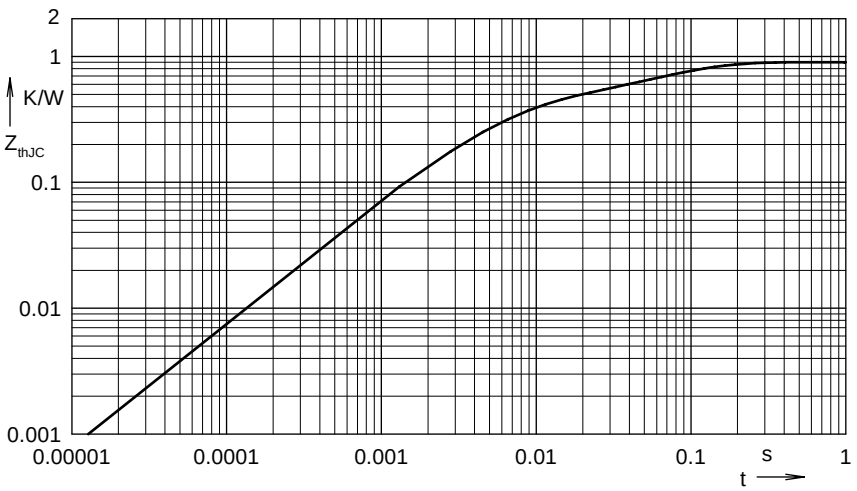


Fig. 7 Transient thermal resistance junction to case

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