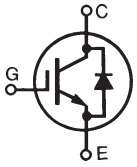
IXYS

HiPerFAST™ IGBT with Diode

IXGH40N60C2D1
IXGT40N60C2D1
IXGJ40N60C2D1

V_{CES} = 600V
I_{C25} = 75A
$V_{CE(SAT)}$ ≤ 2.7V
$t_{fi(typ)}$ = 32ns

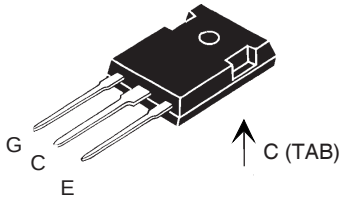
C2-Class High Speed IGBTs



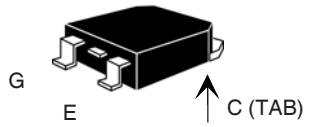
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (limited by leads)	75	A
I_{C110}	T_C = 110°C	40	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE}= 15V, T_{VJ} = 125°C, R_G = 10Ω Clamped inductive load @ V_{CE} ≤ 600V	I_{CM} = 80	A
P_C	T_C = 25°C	300	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum lead temperature for soldering	300	°C
T_{SOLD}	1.6mm (0.062 in.) from case for 10s	260	°C
M_d	Mounting torque (IXGH)	1.13/10	Nm/lb.in
F_C	Mounting force (IXGJ)	20..120/4.5..27	N/lb
Weight	TO-247	6	g
	TO-268 types	5	g

Symbol	Test Conditions	Characteristic Values (T_J = 25°C unless otherwise specified) Min.	Typ.	Max.	
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			200	μA
		T_J = 125°C		3	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 30A, V_{GE} = 15V, Note 1		2.2	2.7	V
		T_J = 125°C	1.7		V

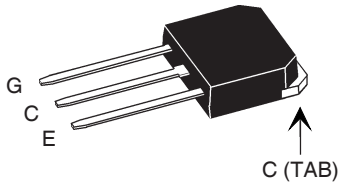
TO-247(IXGH)



TO-268 (D3) (IXGT)



TO-268 Leaded (IXGJ)



G = Gate C = Collector
E = Emitter

Features
- Very high frequency IGBT
- Square RBSOA
- High current handling capability
- MOS Gate turn-on
  - drive simplicity

Applications
- 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
- High power surface mountable packages

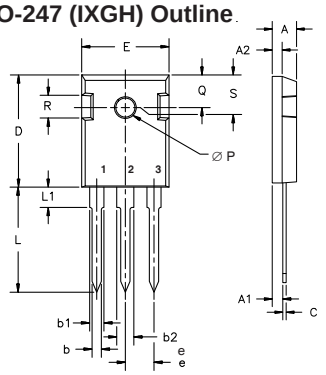
Symbol	Test Conditions (T_J = 25°C unless otherwise specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 30A, V_{CE} = 10V, Note 1	20	36		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1 MHz		2500		pF
C_{oes}			220		pF
C_{res}			54		pF
Q_g	I_C = 30A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		95		nC
Q_{ge}			14		nC
Q_{gc}			36		nC
$t_{d(on)}$	**Inductive load, T_J = 125°C**		18		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		20		ns
$t_{d(off)}$	V_{CE} = 400V, R_G = 3Ω		90	140	ns
t_{fi}			32		ns
E_{off}			0.20	0.37	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		18		ns
t_{ri}	I_C = 30A, V_{GE} = 15V		20		ns
E_{on}	V_{CE} = 400V, R_G = 3Ω		0.6		mJ
$t_{d(off)}$			130		ns
t_{fi}			80	240	ns
E_{off}			0.50		mJ
R_{thJC}				0.42	°C/W
R_{thCK}	(IXGH, IXGJ)		0.25		°C/W

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, Pulse test T_J =150°C			1.6	V
				2.5	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, -di/dt = 100A/μs, V_R = 30V		25		ns
R_{thJC}				0.9	°C/W

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

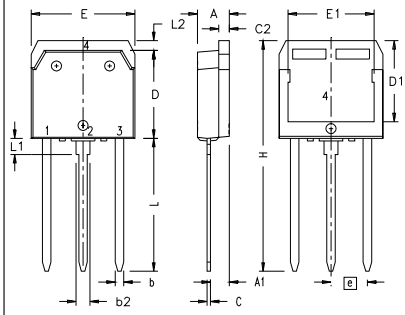
TO-247 (IXGH) Outline

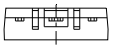


Terminals: 1 - Gate 2 - Drain
3 - Source Tab - Drain

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 Leaded Outline



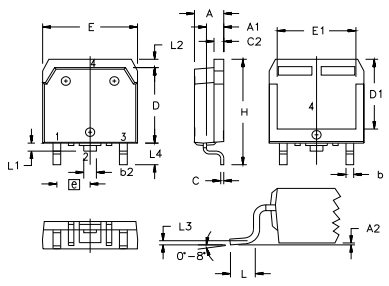


SYM	INCHES MIN	MAX	MILLIMETERS MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	1.365	1.395	34.67	35.43
L	.780	.800	19.81	20.32
L1	.079	.091	2.00	2.30
L2	.039	.045	1.00	1.15

NOTE: ALL METAL AREA ARE SOLDER PLATED.

1 – GATE
2 – DRAIN (COLLECTOR)
3 – SOURCE (EMITTER)
4 – DRAIN (COLLECTOR)

TO-268 Outline



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
@ 25 Deg. C

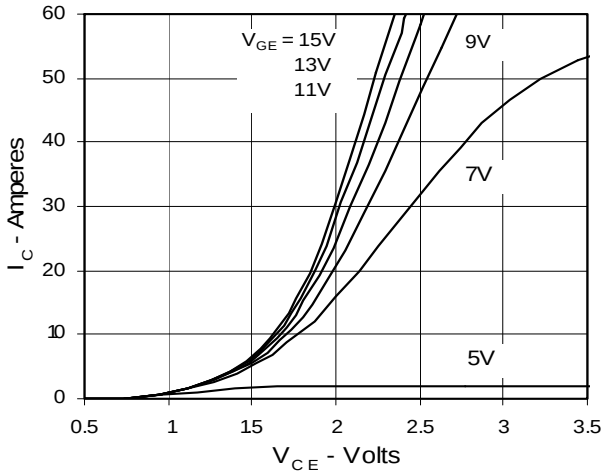


Fig. 2. Extended Output Characteristics
@ 25 deg. C

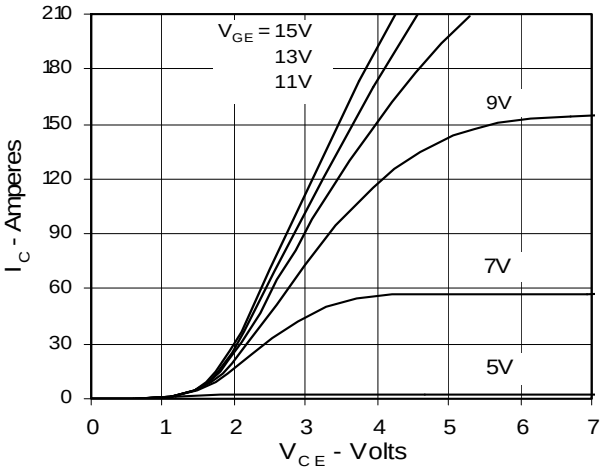


Fig. 3. Output Characteristics
@ 125 Deg. C

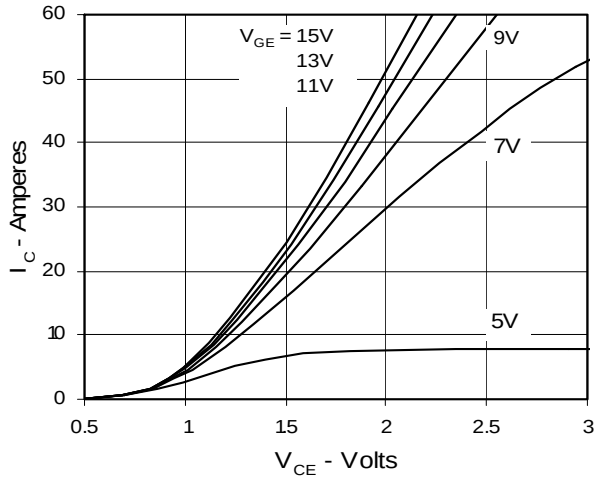


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

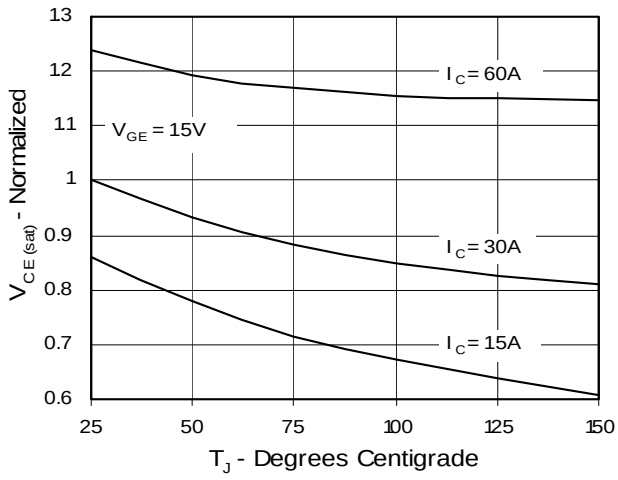


Fig. 5. Collector-to-Emitter Voltage
vs. Gate-to-Emitter voltage

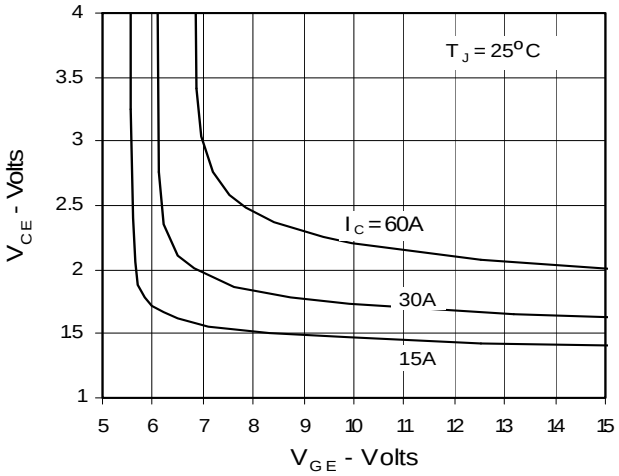


Fig. 6. Input Admittance

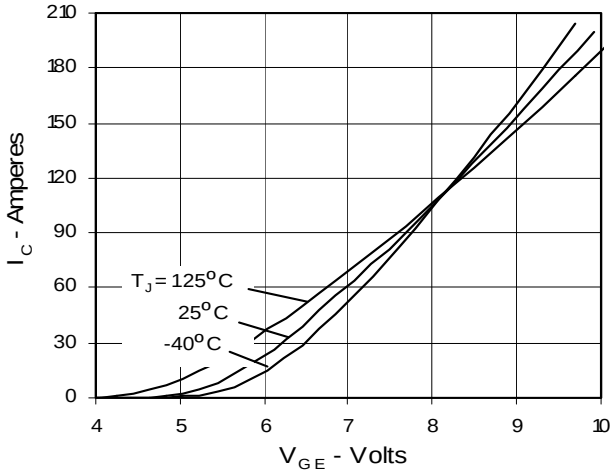


Fig. 7. Transconductance

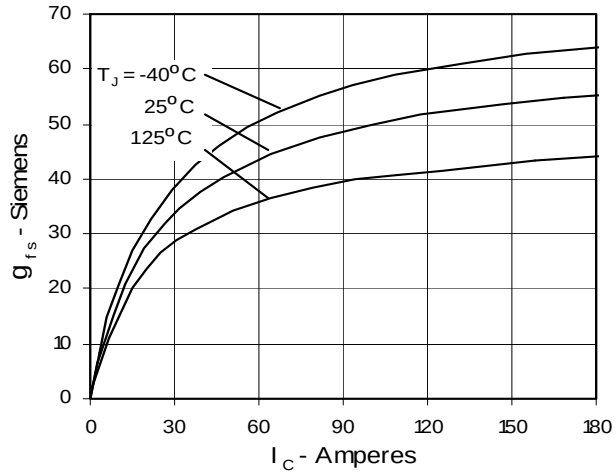


Fig. 8. Dependence of E_{off} on R_G

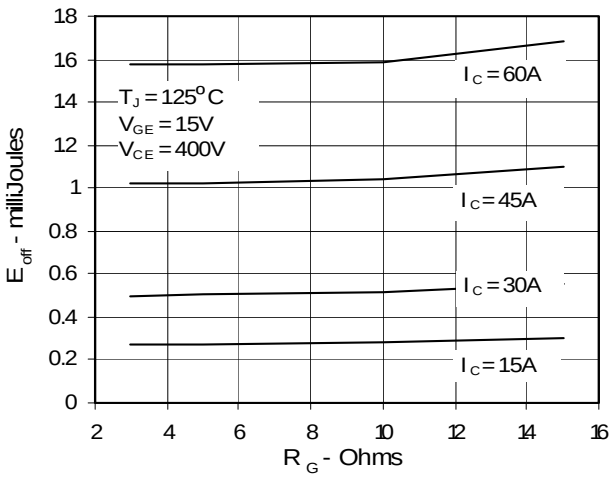


Fig. 9. Dependence of E_{off} on I_C

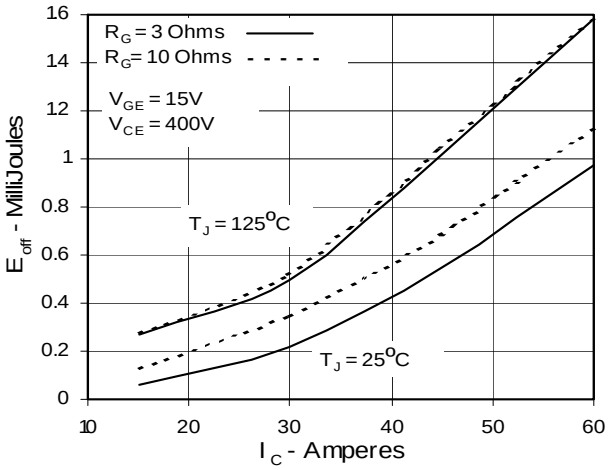


Fig. 10. Dependence of E_{off} on Temperature

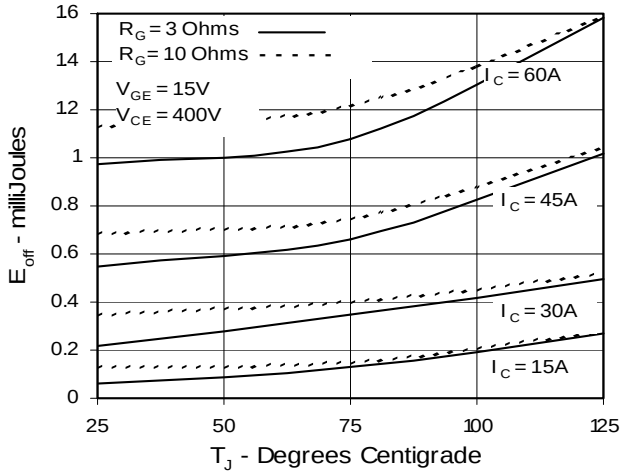


Fig. 11. Gate Charge

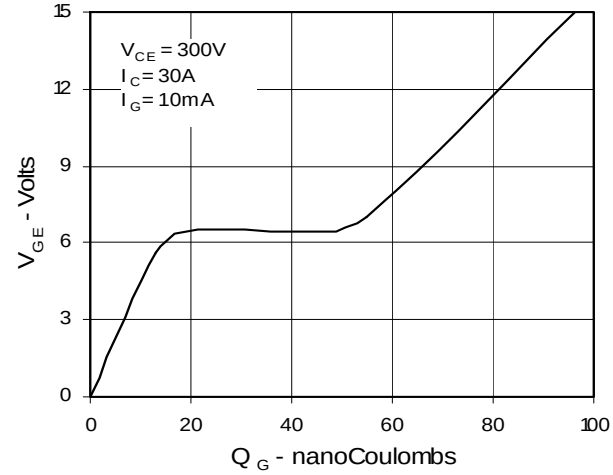


Fig. 12. Capacitance

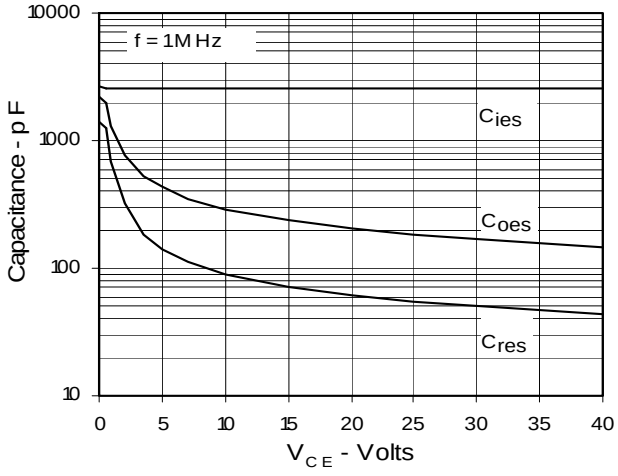
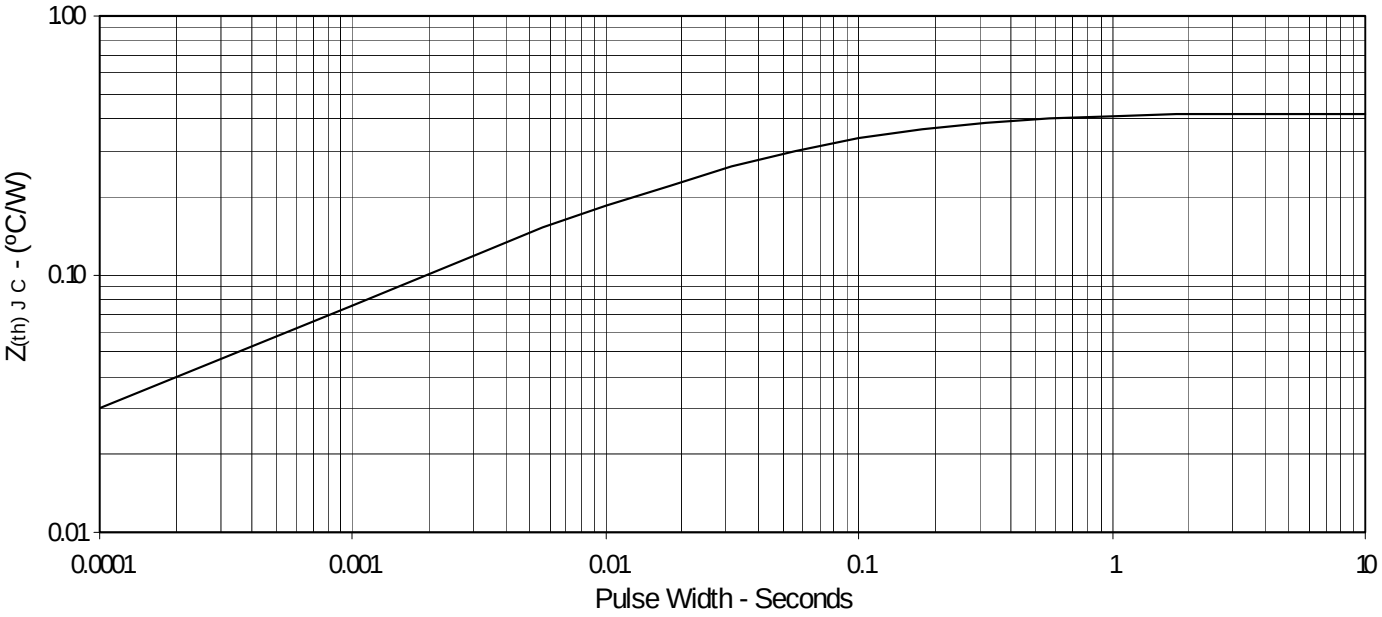


Fig. 13. Maximum Transient Thermal Impedance



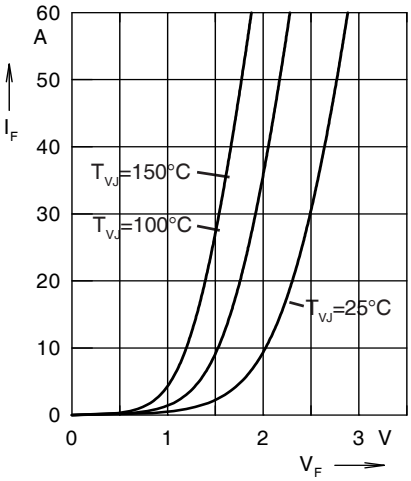


Fig. 14. Forward current I_F versus V_F

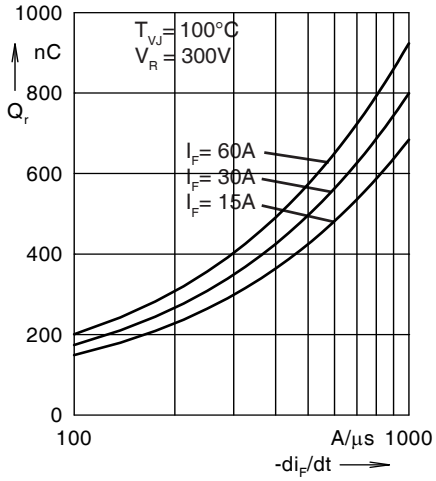


Fig. 15. Reverse recovery charge Q_r versus $-di_F/dt$

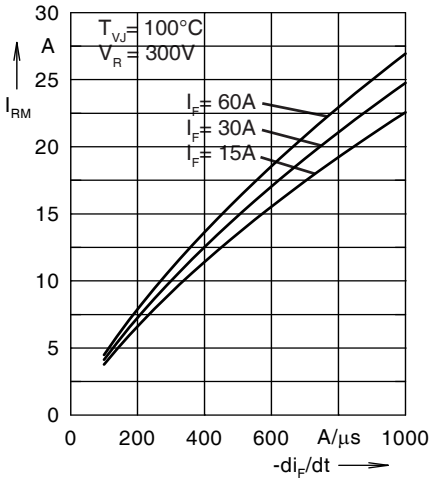


Fig. 16. Peak reverse current I_{RM} versus $-di_F/dt$

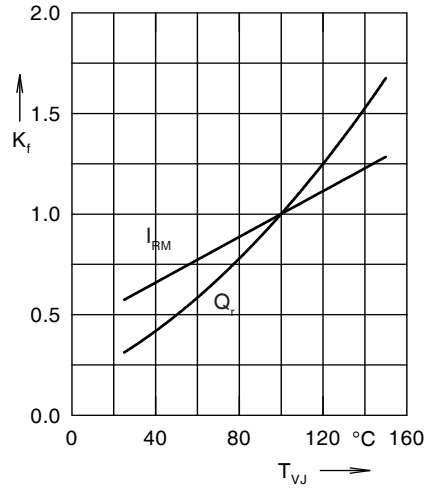


Fig. 17. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

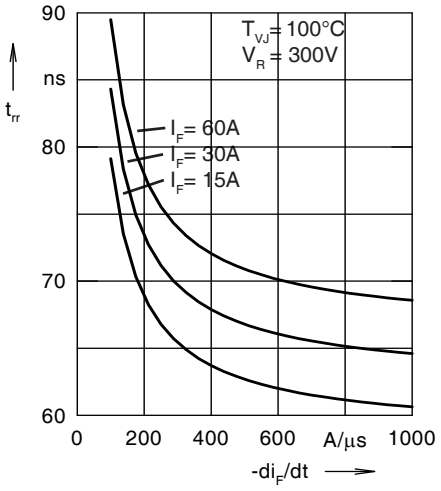


Fig. 18. Recovery time t_{rr} versus $-di_F/dt$

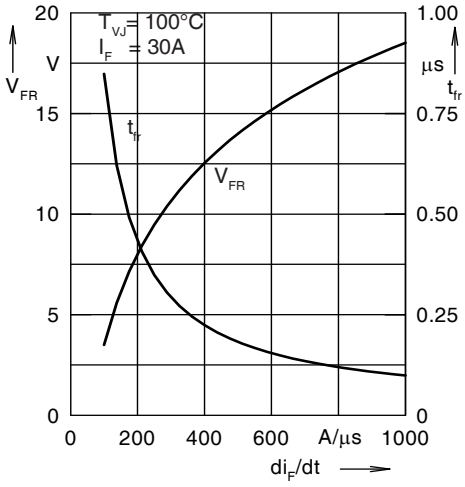


Fig. 19. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

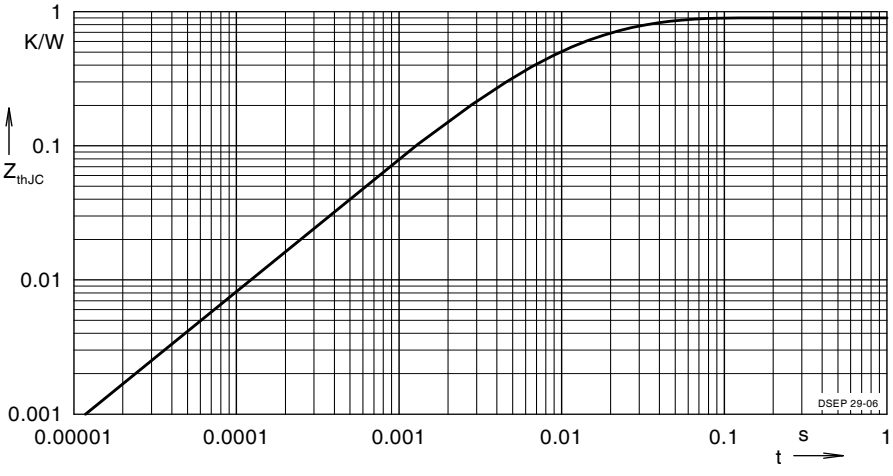


Fig. 20. Transient thermal resistance junction to case

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