THE DATASHEET OF

IXGR40N60C2D1

IXYS

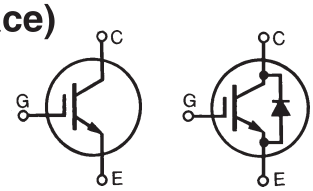
HiPerFAST™ IGBT ISOPLUS247™

C2-Class High Speed IGBTs (Electrically Isolated Back Surface)

IXGR 40N60C2
IXGR 40N60C2D1

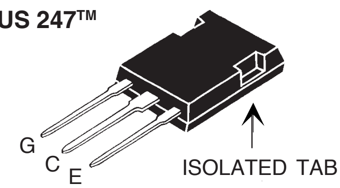
V_{CES} = 600 V
I_{C25} = 56 A
$V_{CE(SAT)}$ = 2.7 V
$t_{fi(typ}$ = 32 ns

Preliminary Data Sheet



IXGR_C2   IXGR_C2D1

ISOPLUS 247™ (IXGR)



G = Gate   C = Collector
E = Emitter

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} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	56	A
I_{C110}	T_C = 110°C	26	A
I_{D110}	T_C = 110°C (40N60C2D1)	27	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_{CE} ≤ 600 V	I_{CM} = 80	A
P_C	T_C = 25°C	170	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
V_{ISOL}	50/60 Hz, RMS, t = 1 minute, I_{ISOL} < 1 mA	2500	V~
F_C	Mounting force	20..120/4.5..25	N/lb.
Weight		4	g

Symbol	Test Conditions		Characteristic Values (T_J = 25°C unless otherwise specified) min.	typ.	max.	
BV_{CES}	I_C = 250µA, V_{GE} = 0 V		600			V
$V_{GE(th)}$	I_C = 250 µA, V_{CE} = V_{GE}		3.0		5.0	V
I_{CES}	V_{CE} = V_{CES} V_{GE} = 0 V	40N60C2 40N60C2/D1			50 100	µA µA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 30 A, V_{GE} = 15 V	T_J = 25°C T_J = 125°C		2.2 2.0	2.7	V V

Features

- DCB Isolated mounting tab
- Meets TO-247AD package Outline
- High current handling capability
- Latest generation HDMOS™ process
- 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

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

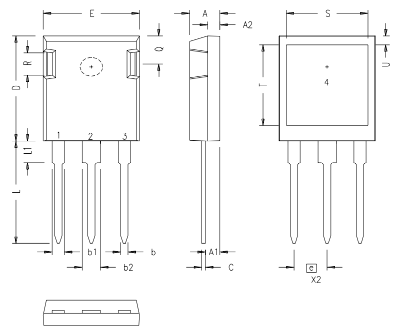
Symbol	Test Conditions	Characteristic Values (T_J = 25°C unless otherwise specified) min.	typ.	max.	
g_{fs}	I_C = 30 A; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %	20	36		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		2500		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz; 40N60C2		180		pF
	40N60C2D1		220		pF
C_{res}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		54		pF
Q_g	I_C = 30 A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		95		nC
Q_{ge}			14		nC
Q_{gc}			36		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**; I_C = 30 A, V_{GE} = 15 V; V_{CE} = 400 V, R_G = R_{off} = 3 Ω		18		ns
t_{ri}			20		ns
$t_{d(off)}$			90	140	ns
t_{fi}			32		ns
E_{off}			0.20	0.37	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**; I_C = 30 A, V_{GE} = 15 V; V_{CE} = 400 V, R_G = R_{off} = 3 Ω		18		ns
t_{ri}			20		ns
E_{on}	40N60C2		0.3		mJ
	40N60C2D1		0.6		mJ
$t_{d(off)}$			130		ns
t_{fi}			80	240	ns
E_{off}			0.50		mJ
$R_{thJ-DCB}$	(Note 1)		0.26		K/W
R_{thJC}	(Note 2)			0.74	K/W
R_{thCS}			0.15		K/W

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 = 30 A, V_{GE} = 0 V, Pulse test; T_J = 150°C			1.6	V
	t ≤ 300 µs, duty cycle d ≤ 2 %; T_J = 25°C			2.5	V
I_{RM}	I_F = 30 A, V_{GE} = 0 V, -di_F/dt = 100 A/µs, T_J = 100°C; V_R = 100 V			4	A
t_{rr}			100		ns
t_{rr}	I_F = 1 A; -di/dt = 100 A/µs; V_R = 30 V		25		ns
R_{thJC}				1.5	K/W
R_{thCS}			0.15		K/W

Notes:
1. $R_{thJ-DCB}$ is the thermal resistance junction-to-internal side of DCB substrate
2. R_{thJC} is the thermal resistance junction-to-external side of DCB substrate

ISOPLUS 247 Outline



SYM	INCHES MIN	MAX	MILLIMETERS 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.

Fig. 1. Output Characteristics @ 25 Deg. C

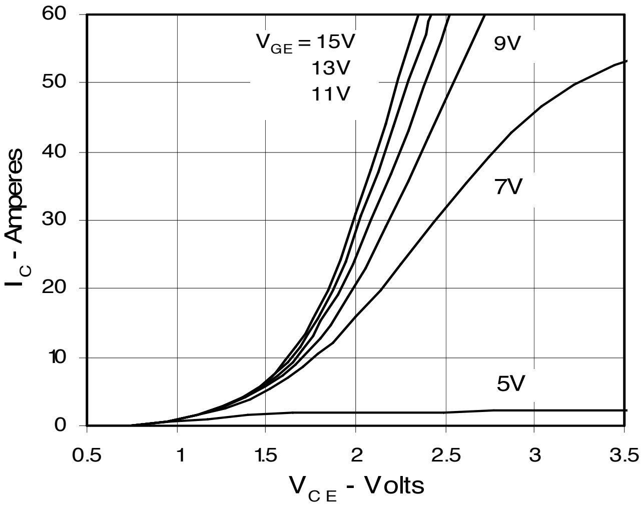


Fig. 2. Extended Output Characteristics @ 25 deg. C

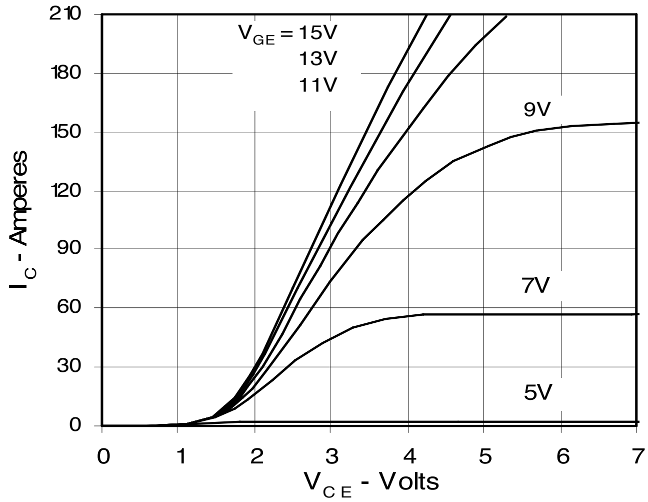


Fig. 3. Output Characteristics @ 125 Deg. C

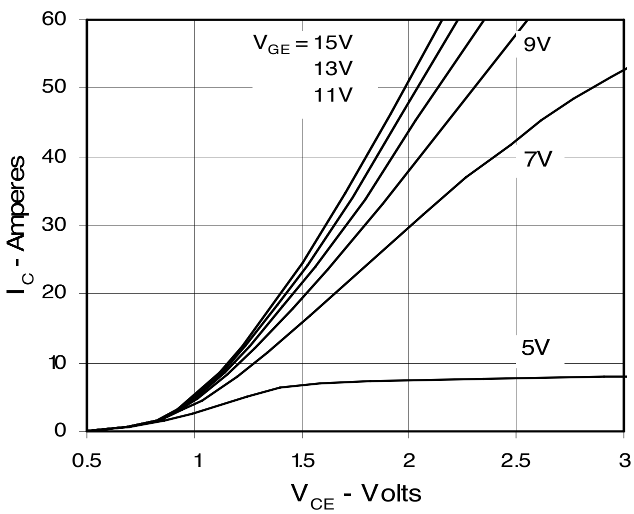


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

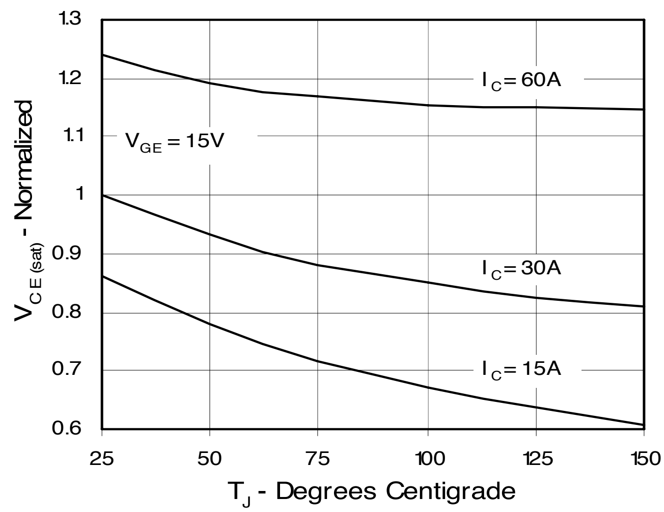


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emiiter voltage

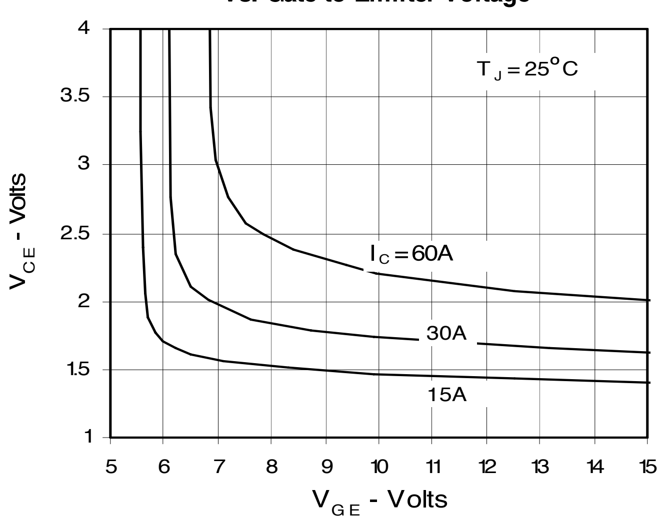


Fig. 6. Input Admittance

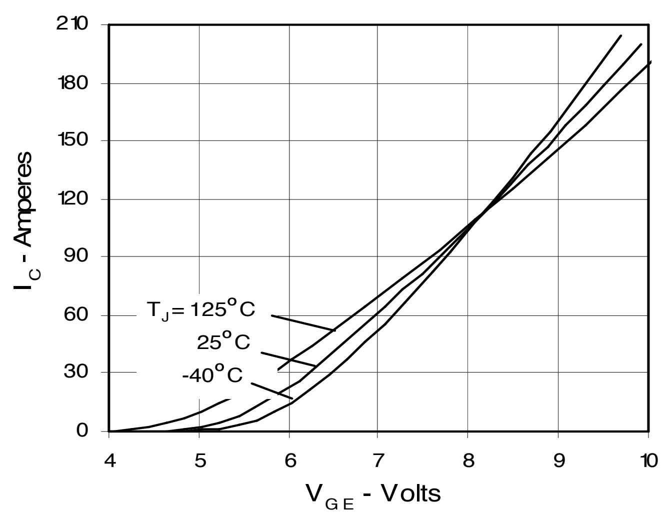


Fig. 7. Transconductance

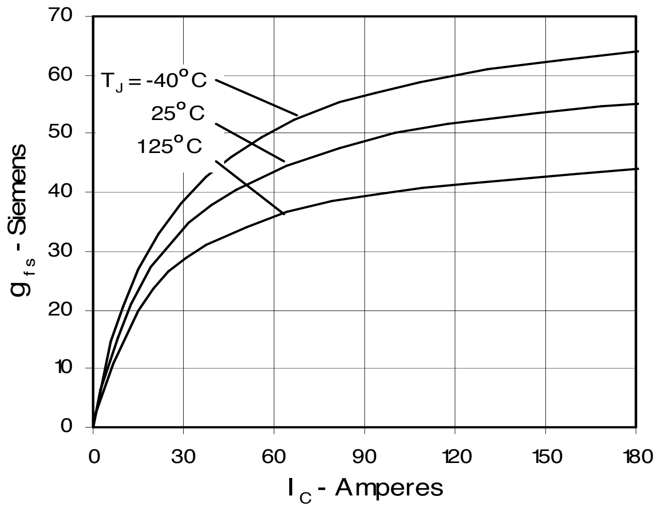


Fig. 8. Dependence of E_{off} on R_G

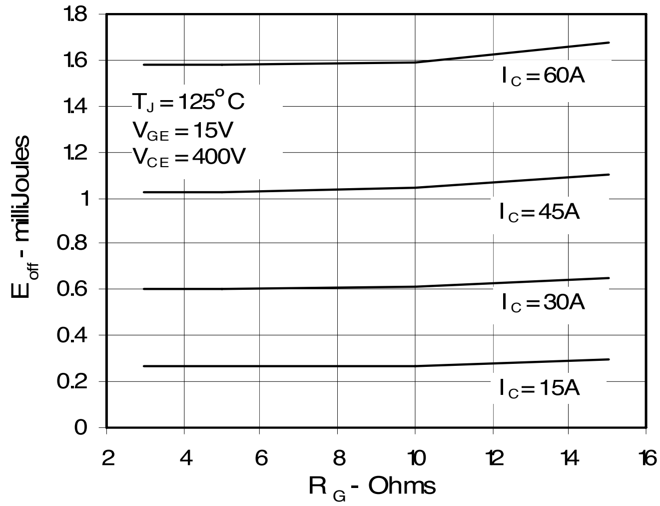


Fig. 9. Dependence of E_{off} on I_c

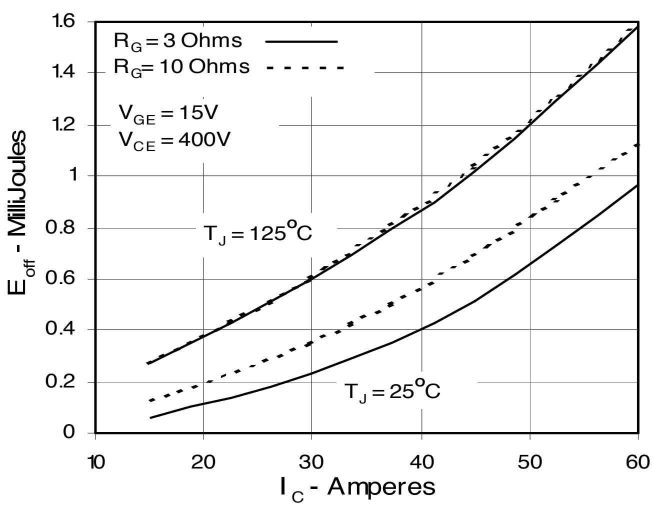


Fig. 10. Dependence of E_{off} on Temperature

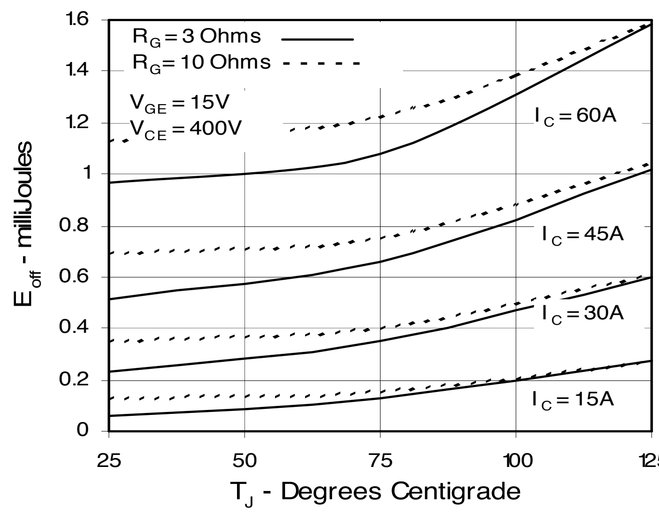


Fig. 11. Gate Charge

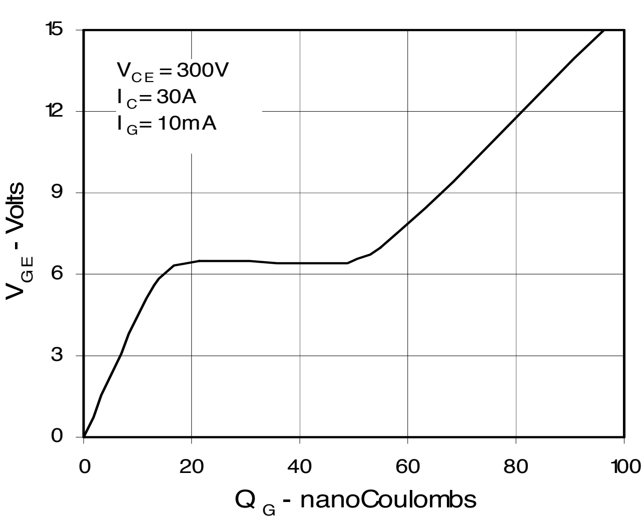


Fig. 12. Capacitance

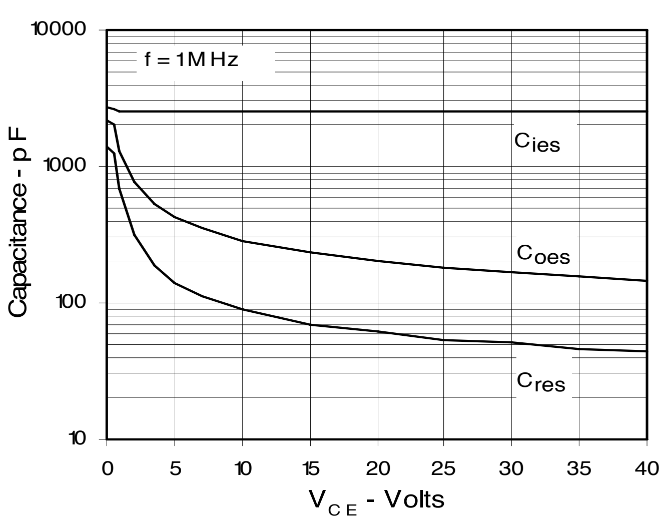


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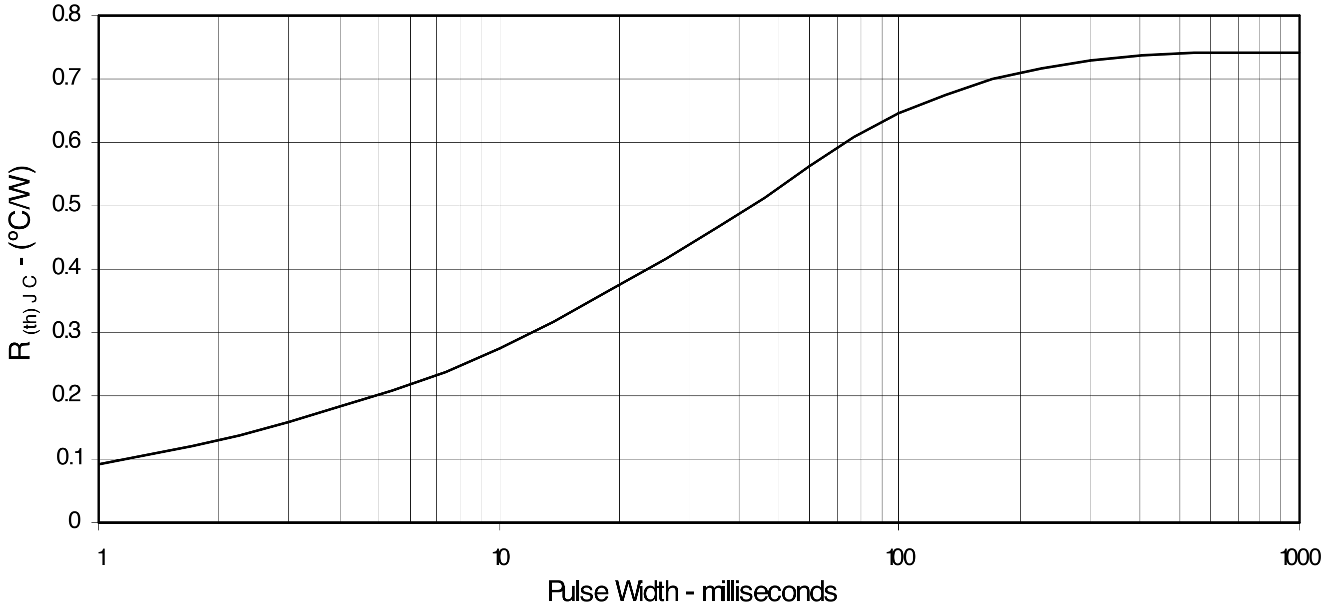
Fig. 13. Maximum Transient Thermal Resistance



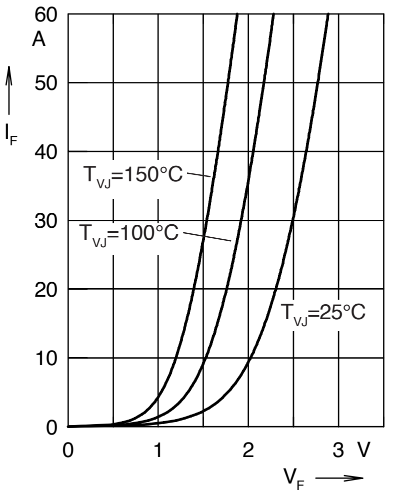


Fig. 14. Forward current I_F versus V_F

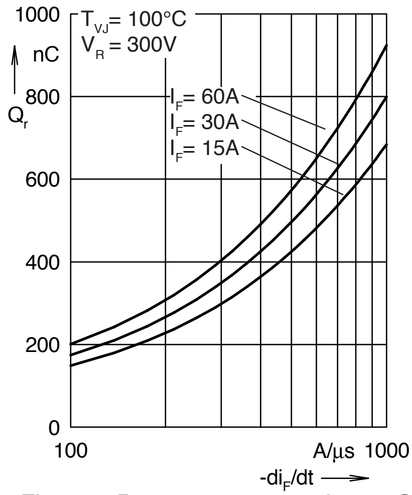


Fig. 15. Reverse recovery charge Q_r versus $-di_F/dt$

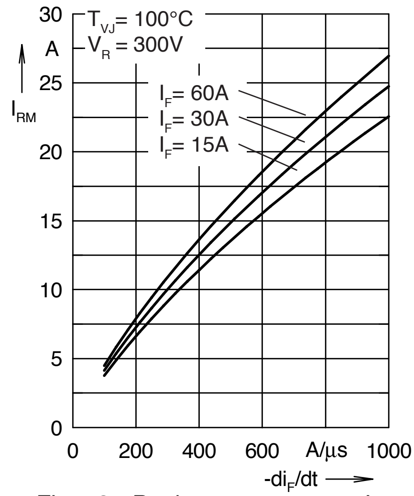


Fig. 16. Peak reverse current I_{RM} versus $-di_F/dt$

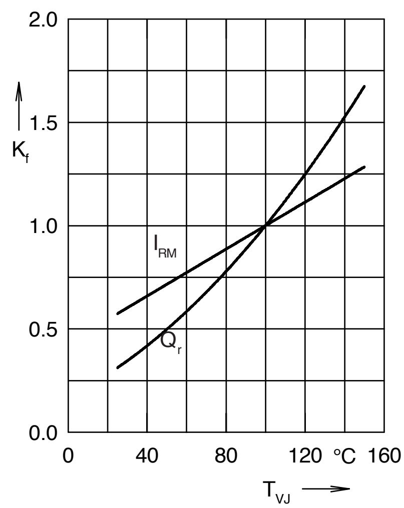


Fig. 17. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

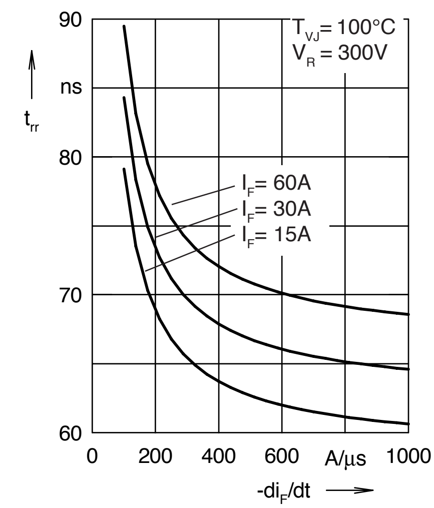


Fig. 18. Recovery time t_{rr} versus $-di_F/dt$

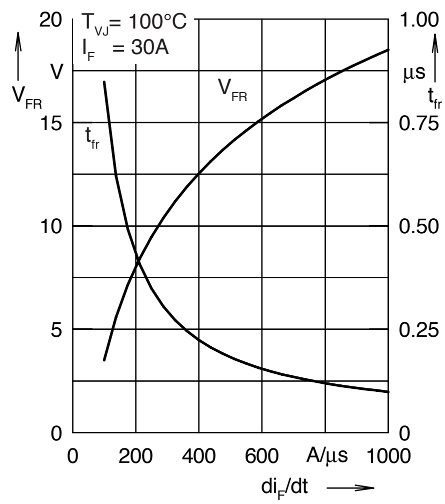


Fig. 19. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

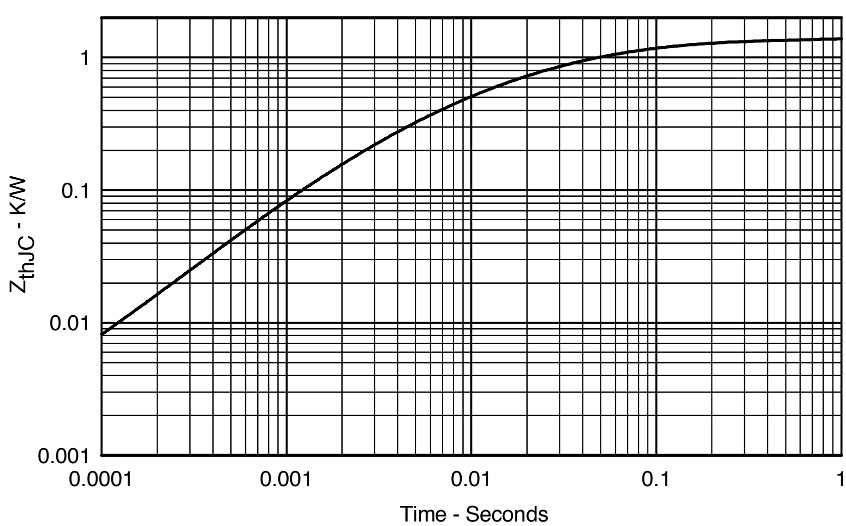


Fig. 20. Transient thermal resistance junction to case