IXYS

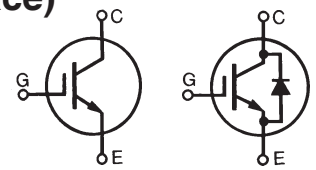
HiPerFAST™ IGBT
ISOPLUS247™

IXGR 40N60C2
IXGR 40N60C2D1

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

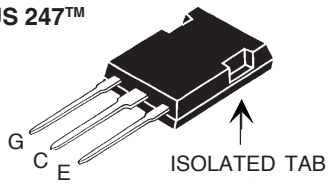
C2-Class High Speed IGBTs
(Electrically Isolated Back Surface)

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 @ $V_{CE} \le 600$ 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}	$V_{CE} = V_{CES}$	40N60C2			50	μA
	V_{GE} = 0 V	40N60C2/D1			100	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		2.2	2.7	V
		T_J = 125°C		2.0		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

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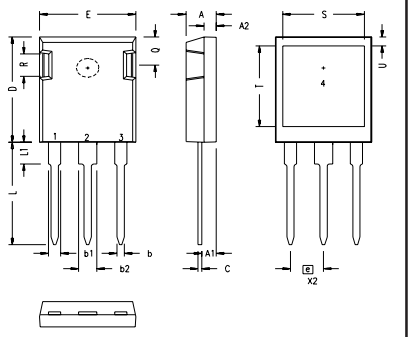
Symbol	Test Conditions		Characteristic Values (T_J = 25°C unless otherwise specified) min.	typ.	max.	
g_{fs}	I_C = 30 A; V_{CE} = 10 V, Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %		20	36		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz			2500		pF
C_{oes}		40N60C2		180		pF
		40N60C2D1		220		pF
C_{res}				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**			18		ns
t_{ri}	I_C = 30 A, V_{GE} = 15 V			20		ns
$t_{d(off)}$	V_{CE} = 400 V, R_G = R_{off} = 3 Ω			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 = 30 A, V_{GE} = 15 V			20		ns
E_{on}	V_{CE} = 400 V, R_G = R_{off} = 3 Ω	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				4	A
t_{rr}	V_R = 100 V			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	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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.

IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,931,844 5,049,961 5,237,481 6,162,665 6,404,065 B1 6,683,344 6,727,585 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405 B2 6,759,692 4,881,106 5,034,796 5,187,117 5,486,715 6,306,728 B1 6,583,505 6,710,463 6771478 B2

Fig. 1. Output Characteristics @ 25 Deg. C

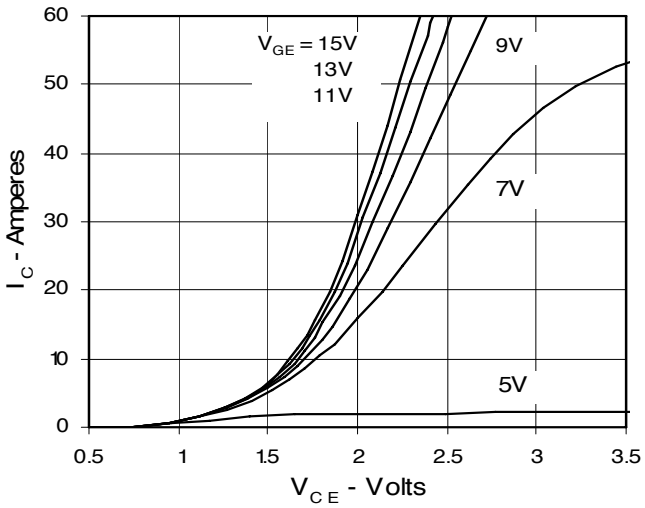


Fig. 2. Extended Output Characteristics @ 25 deg. C

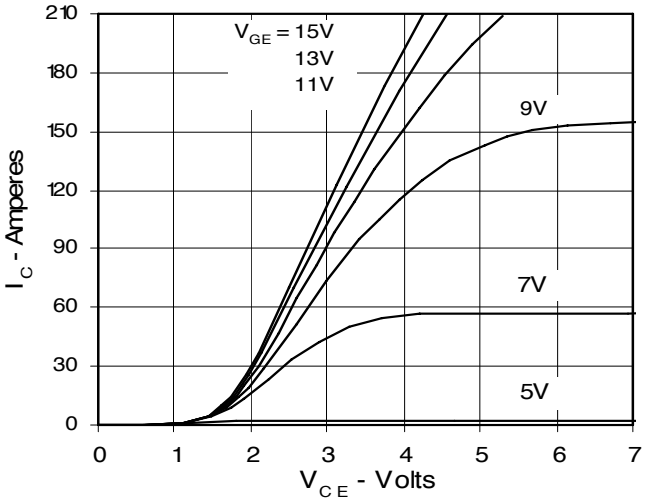


Fig. 3. Output Characteristics @ 125 Deg. C

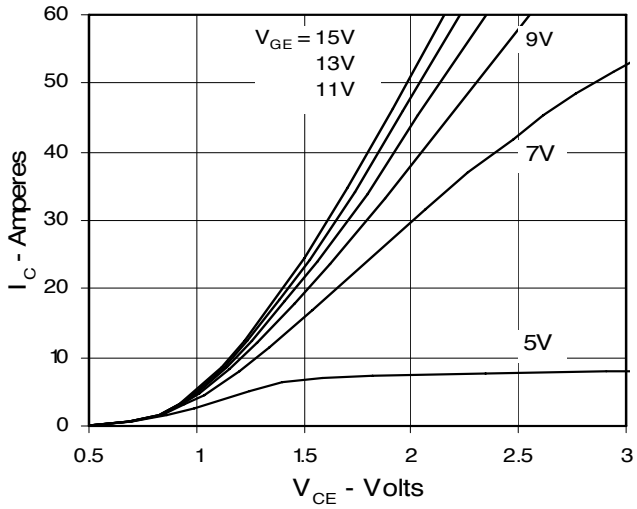


Fig. 4. Temperature Dependence of $V_{CE(sat)}$

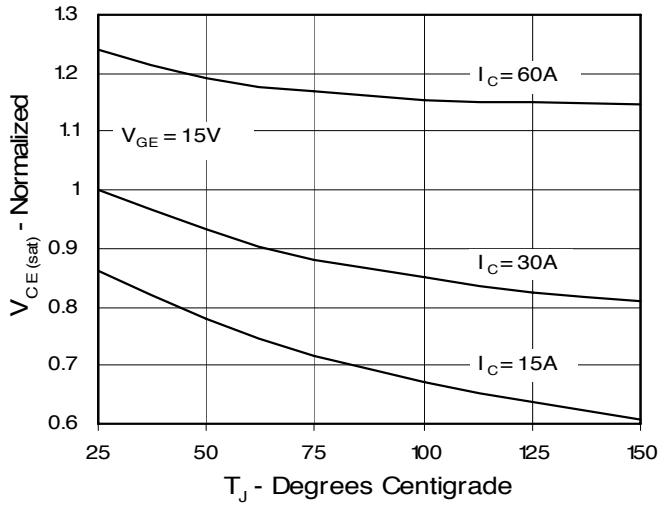


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emiiter voltage

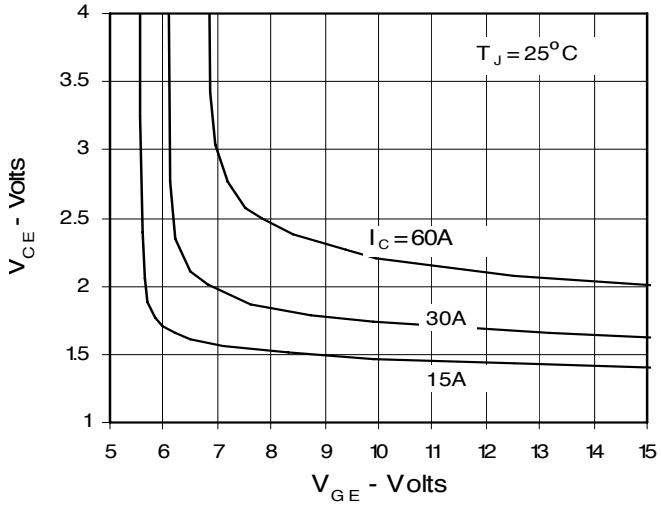
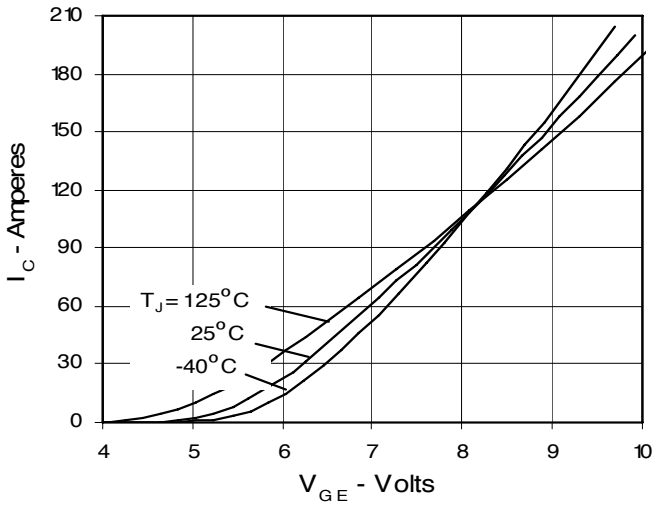


Fig. 6. Input Admittance



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Fig. 7. Transconductance

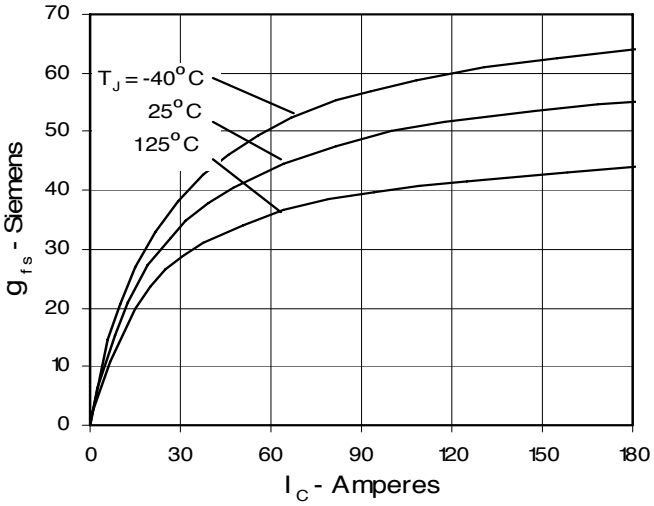


Fig. 8. Dependence of E_{off} on R_G

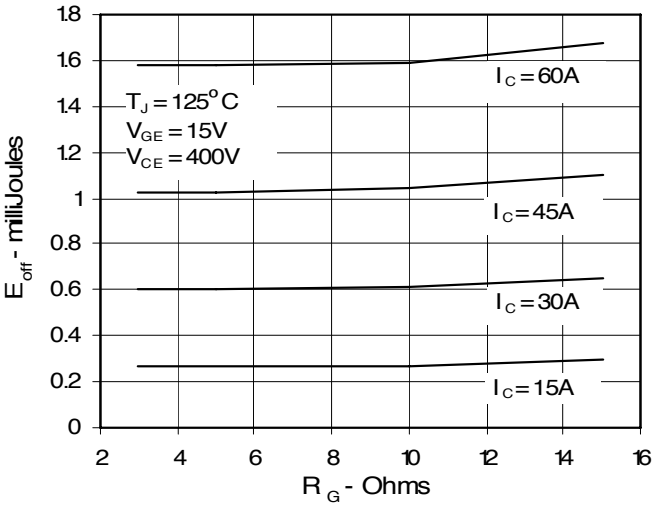


Fig. 9. Dependence of E_{off} on I_c

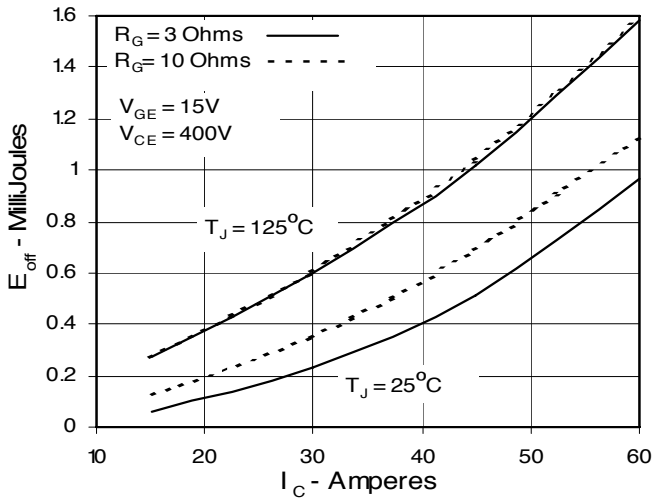


Fig. 10. Dependence of E_{off} on Temperature

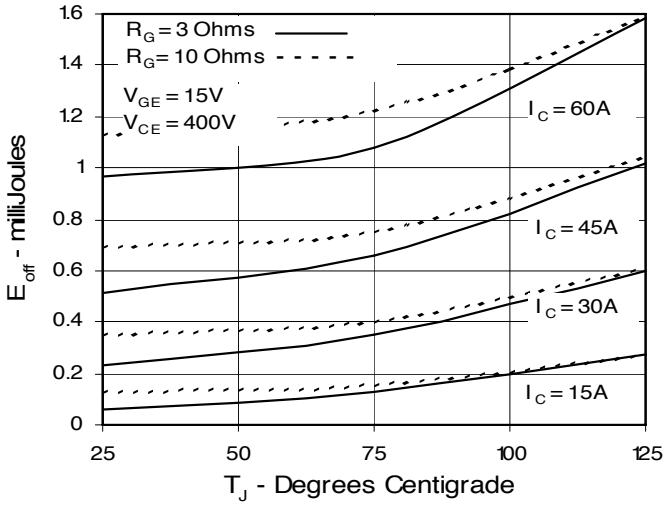


Fig. 11. Gate Charge

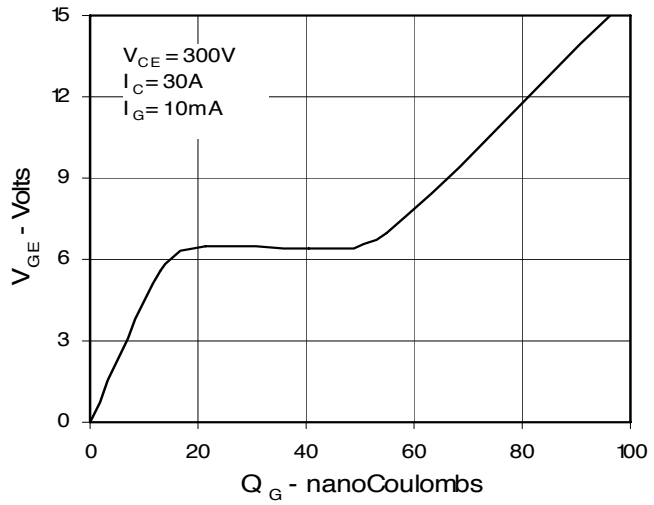


Fig. 12. Capacitance

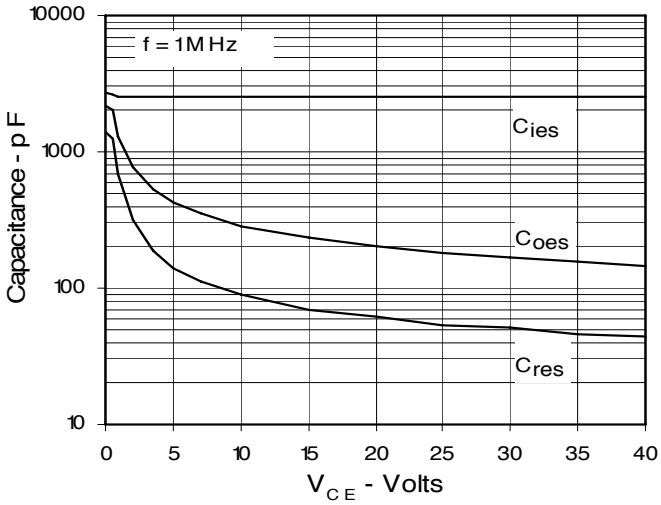
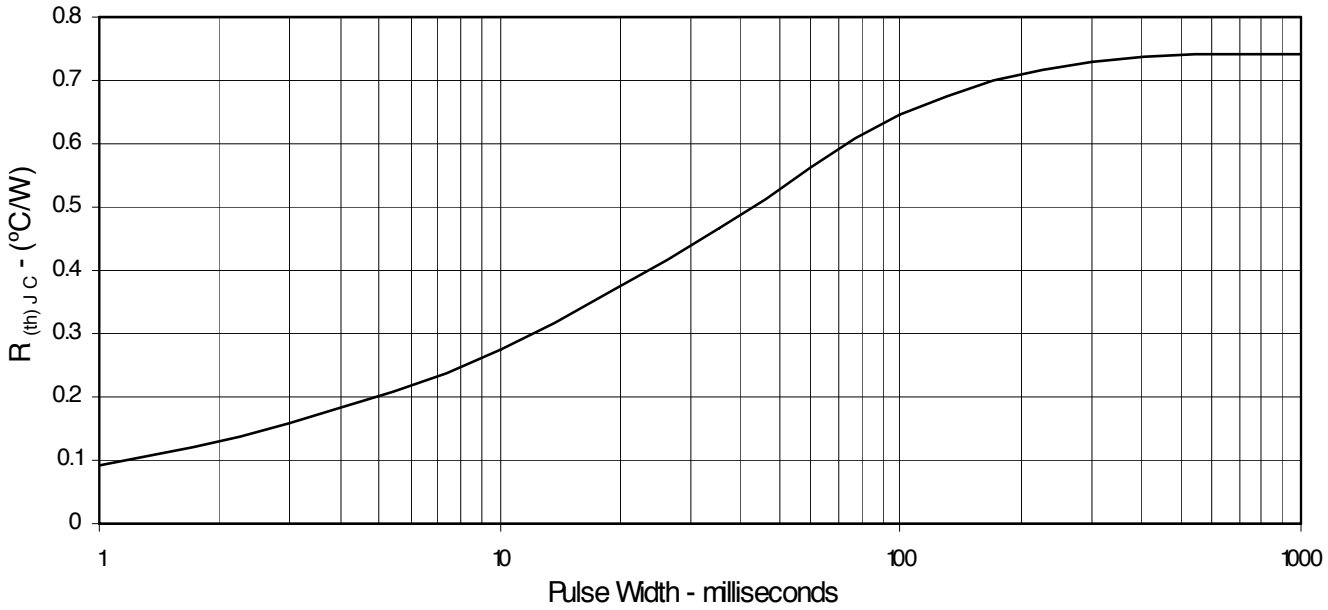


Fig. 13. Maximum Transient Thermal Resistance



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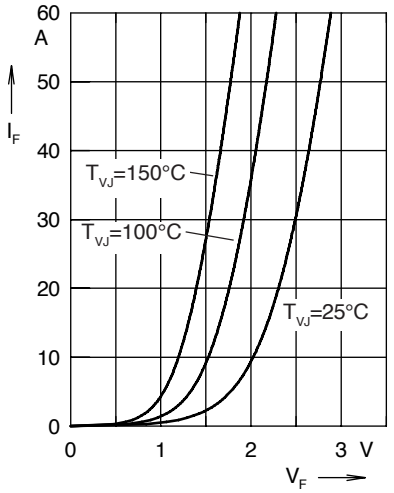


Fig. 14. Forward current I_F versus V_F

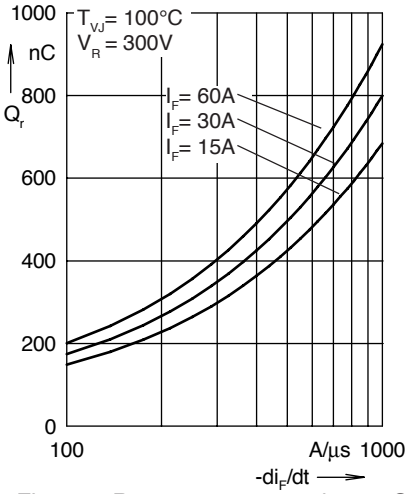


Fig. 15. Reverse recovery charge Q_r versus $-di_F/dt$

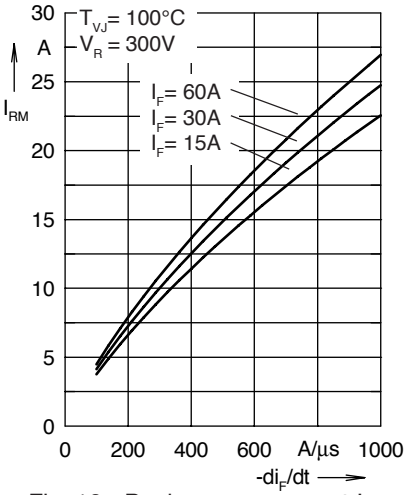


Fig. 16. Peak reverse current I_{RM} versus $-di_F/dt$

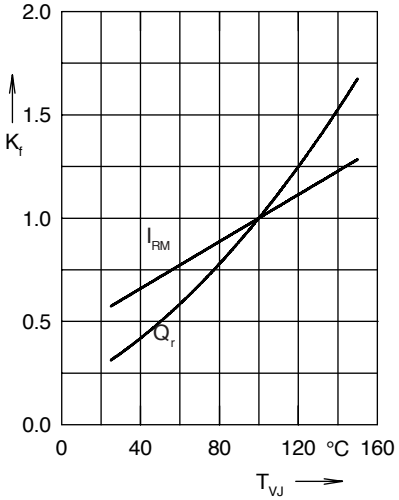


Fig. 17. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

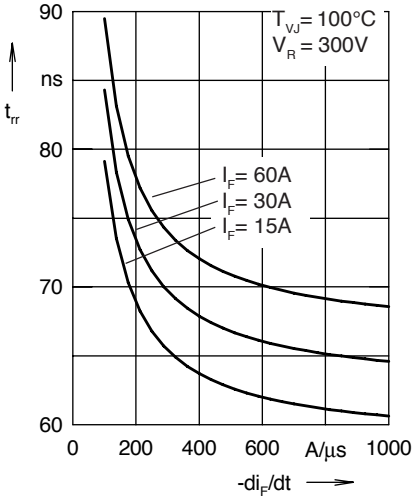


Fig. 18. Recovery time t_{rr} versus $-di_F/dt$

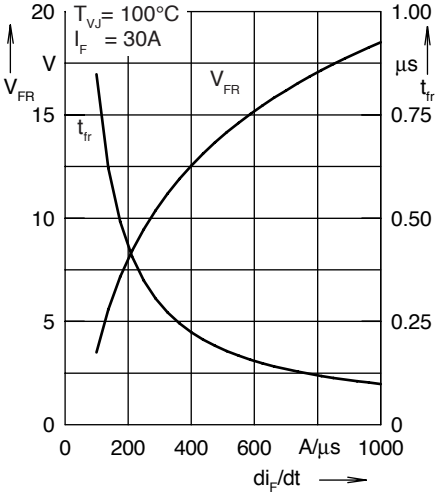


Fig. 19. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

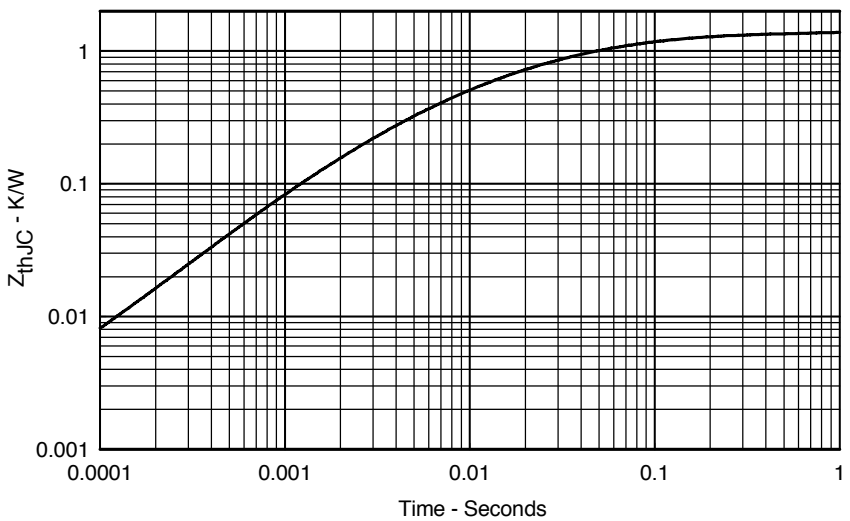


Fig. 20. Transient thermal resistance junction to case

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