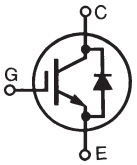
IXYS

HiPerFAST™ IGBT with Diode

C2-Class High Speed IGBTs

IXGK 60N60C2D1
IXGX 60N60C2D1

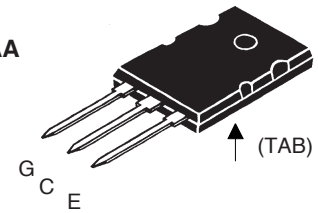
V_{CES} = 600 V
I_{C25} = 75 A
$V_{CE(sat)}$ = 2.5 V
$t_{fi(typ)}$ = 35 ns



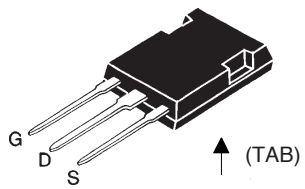
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (limited by leads)	75	A
I_{C110}	T_C = 110°C	60	A
I_{F110}	T_C = 110°C	48	A
I_{CM}	T_C = 25°C, 1 ms	300	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load @ $V_{CE} \le 600$ V	I_{CM} = 100	A
P_C	T_C = 25°C	480	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque, TO-264	1.13/10	Nm/lb.in.
Weight	TO-264	10	g
	PLUS247	6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

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}	$V_{CE} = V_{CES}$ V_{GE} = 0 V	T_J = 25°C T_J = 125°C			650 5	μA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 50 A, V_{GE} = 15 V Note 1	T_J = 25°C T_J = 125°C		2.1 1.8	2.5	V V

TO-264 AA (IXGK)



PLUS247 (IXGX)



G = Gate C = Collector
E = Emitter Tab = Collector

Features

- Very high frequency IGBT and anti-parallel FRED in one package
- Square RBSOA
- High current handling capability
- MOS Gate turn-on for drive simplicity
- Fast Recovery Epitaxial Diode (FRED) with soft recovery and low I_{RM}

Applications

- Switch-mode and resonant-mode power supplies
- Uninterruptible power supplies (UPS)
- DC choppers
- AC motor speed control
- DC servo and robot drives

Advantages

- Space savings (two devices in one package)
- Easy to mount with 1 screw

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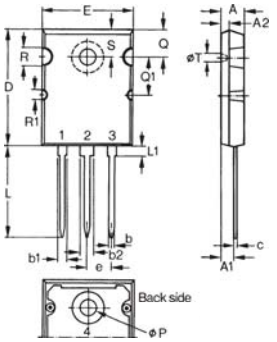
Symbol	Test Conditions	Characteristic Values (T_J = 25°C unless otherwise specified) Min.	Typ.	Max.	
g_{fs}	I_C = 50 A; V_{CE} = 10 V, Note 1	40	58		S
C_{ies}			3900		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		280		pF
C_{res}			97		pF
Q_g			146		nC
Q_{ge}	I_C = 50 A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		28		nC
Q_{gc}			50		nC
$t_{d(on)}$			18		ns
t_{ri}	**Inductive load, T_J = 25°C**		25		ns
$t_{d(off)}$	I_C = 50 A, V_{GE} = 15 V		95	150	ns
t_{fi}	V_{CE} = 400 V, R_G = R_{off} = 2.0 Ω		35		ns
E_{off}			0.48	0.8	mJ
$t_{d(on)}$			18		ns
t_{ri}	**Inductive load, T_J = 125°C**		25		ns
E_{on}	I_C = 50 A, V_{GE} = 15 V		0.9		mJ
$t_{d(off)}$	V_{CE} = 400 V, R_G = R_{off} = 2.0 Ω		130		ns
t_{fi}			80		ns
E_{off}			1.2		mJ
R_{thJC}				0.26	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 = 60 A, V_{GE} = 0 V, Note 1 T_J = 150°C			2.1 1.4	V
I_{RM}	I_F = 60 A, V_{GE} = 0 V, -di_F/dt = 100 A/μ T_J = 100°C V_R = 100 V			8.3	A
t_{rr}	I_F = 1 A; -di/dt = 200 A/ms; V_R = 30 V		35		ns
R_{thJC}				0.65	K/W

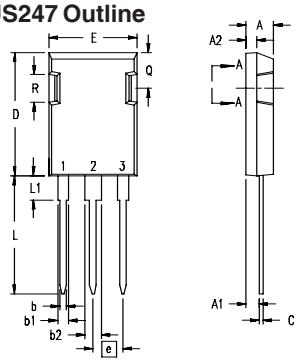
Note 1: Pulse test, t ≤ 300 μs, duty cycle ≤ 2 %

TO-264 AA Outline



Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46 BSC		.215 BSC	
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

PLUS247 Outline



Terminals: 1 - Gate
2 - Drain (Collector)
3 - Source (Emitter)
4 - Drain (Collector)

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.83	5.21	.190	.205
A_1	2.29	2.54	.090	.100
A_2	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b_1	1.91	2.13	.075	.084
b_2	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45 BSC		.215 BSC	
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	0.244
R	4.32	4.83	.170	.190

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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

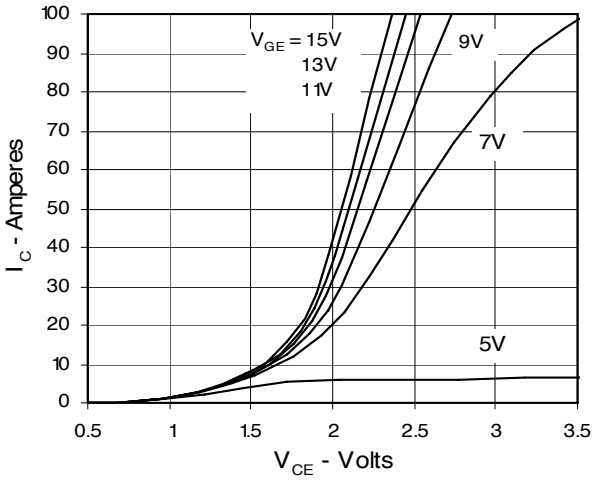

Fig. 2. Extended Output Characteristics @ 25 deg. C

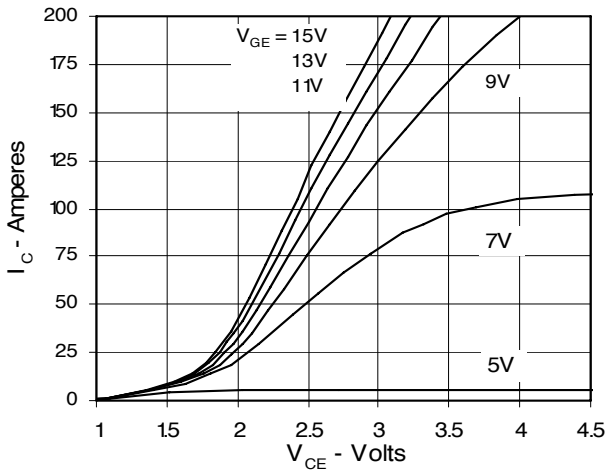

Fig. 3. Output Characteristics @ 125 Deg. C

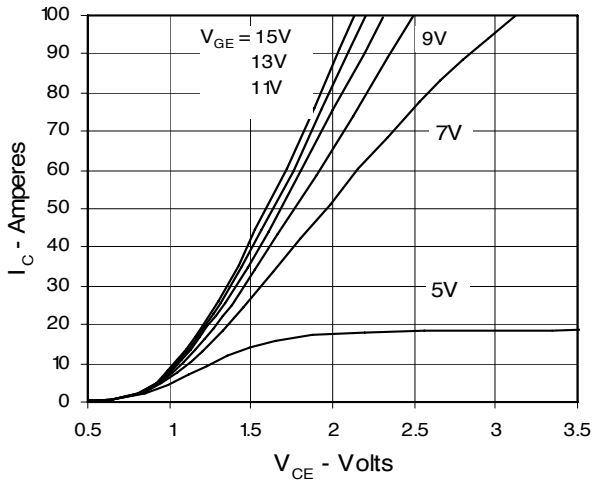

Fig. 4. Temperature Dependence of $V_{CE(sat)}$

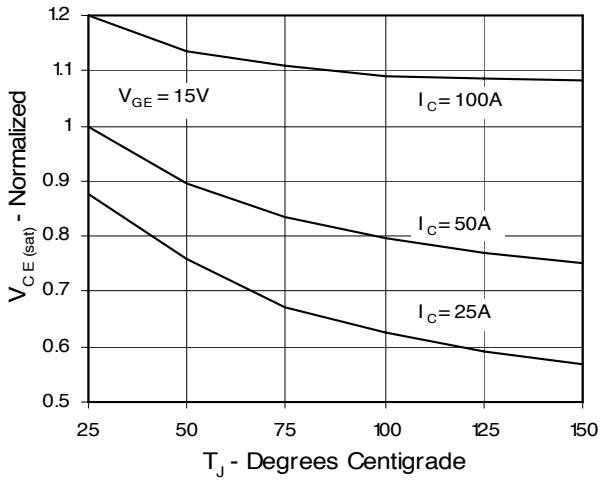

Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

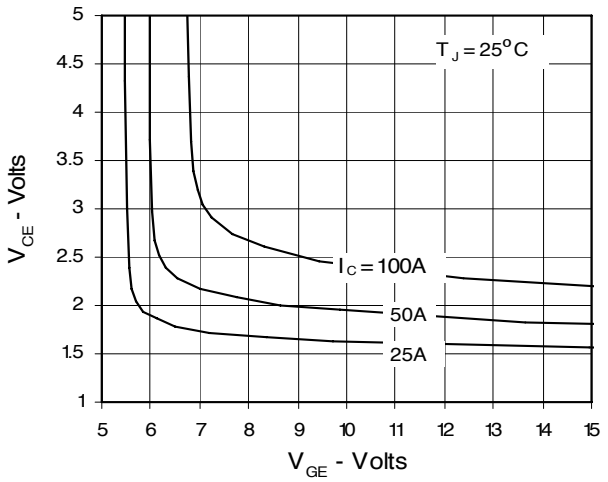

Fig. 6. Input Admittance

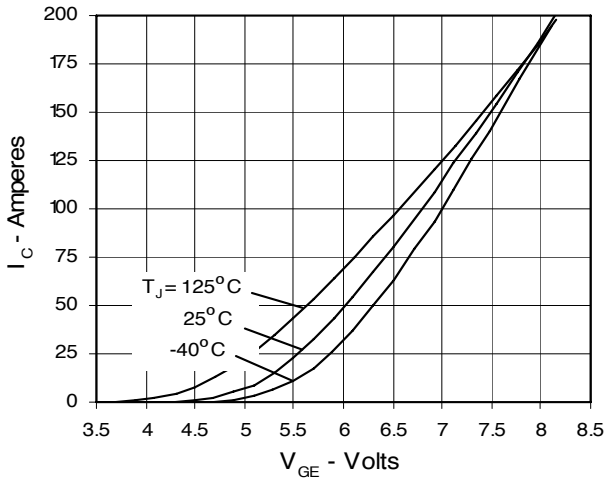

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Fig. 7. Transconductance

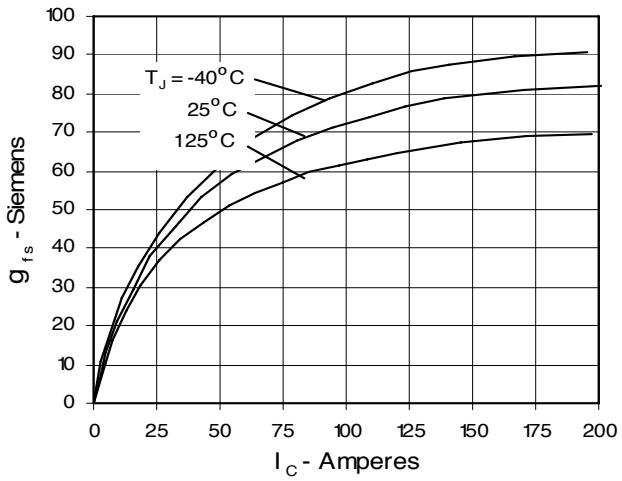

Fig. 8. Dependence of E_{off} on R_G

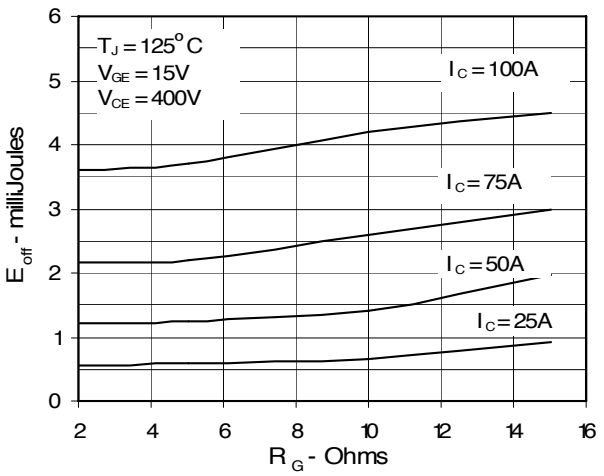

Fig. 9. Dependence of E_{off} on I_C

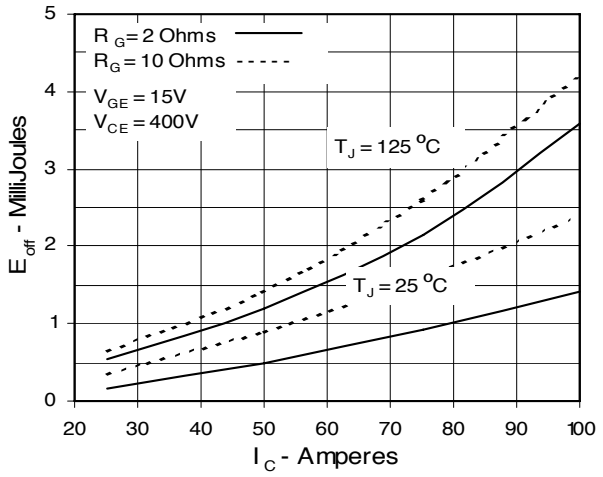

Fig. 10. Dependence of E_{off} on Temperature

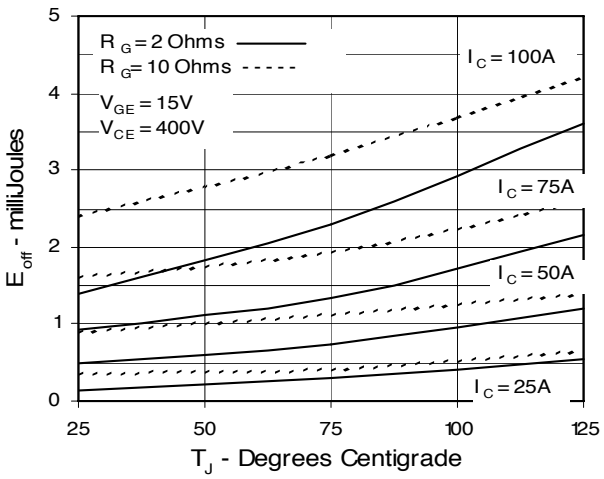

Fig. 11. Gate Charge

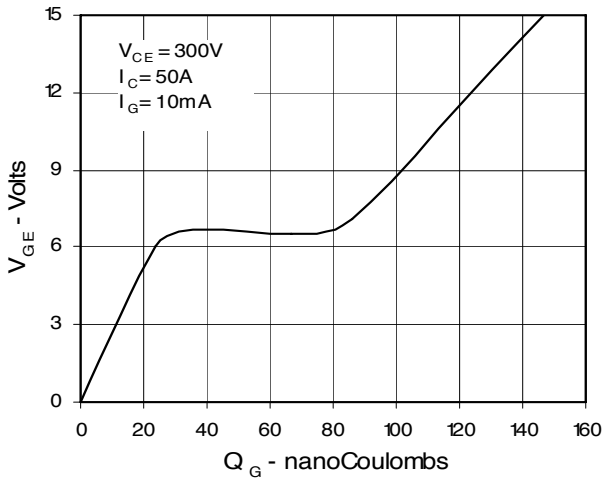

Fig. 12. Capacitance

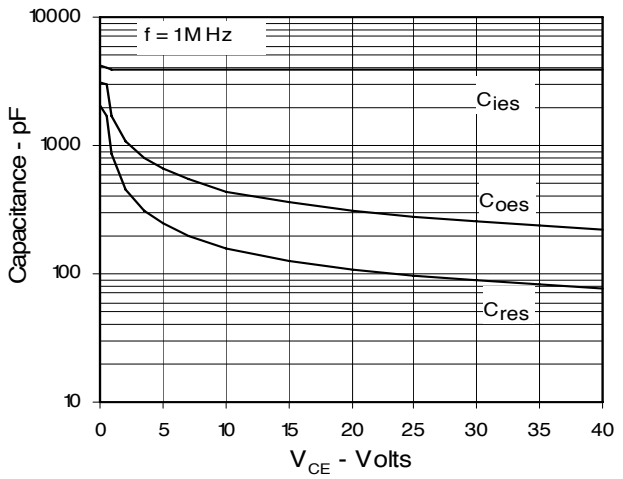

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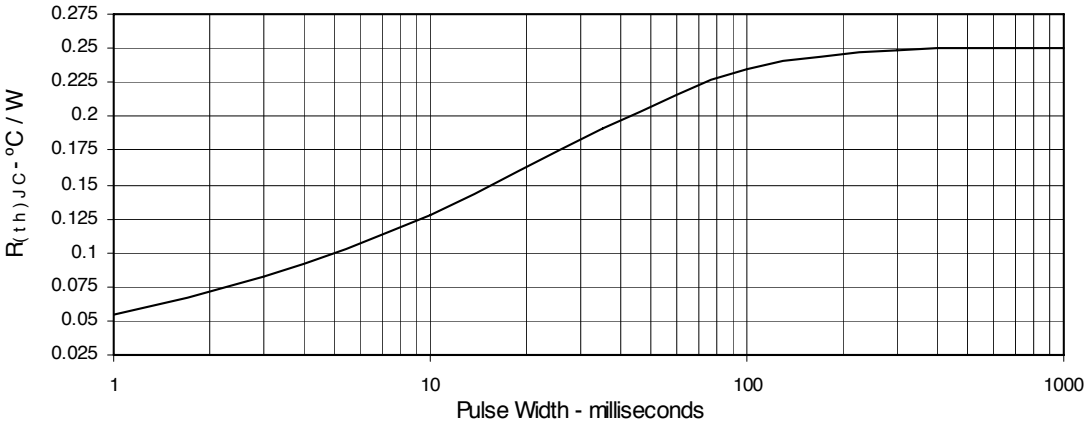
Fig. 13. Maximum Transient Thermal Resistance



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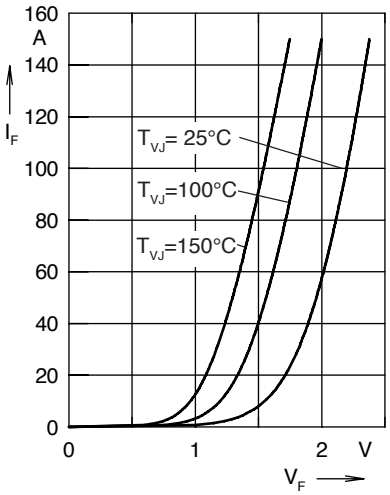

Fig. 14. Forward current I_F versus V_F

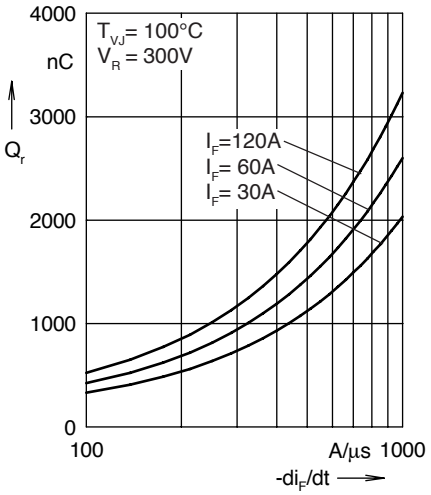

Fig. 15. Reverse recovery charge Q_r versus $-di_F/dt$

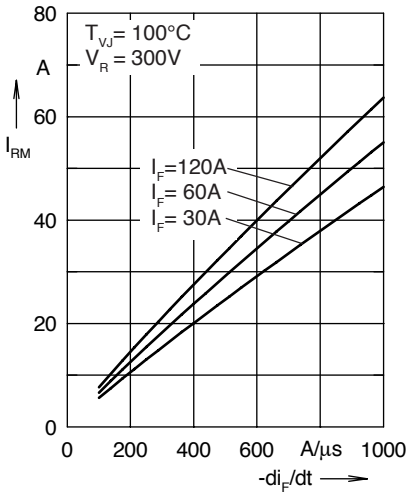

Fig. 16. Peak reverse current I_{RM} versus $-di_F/dt$

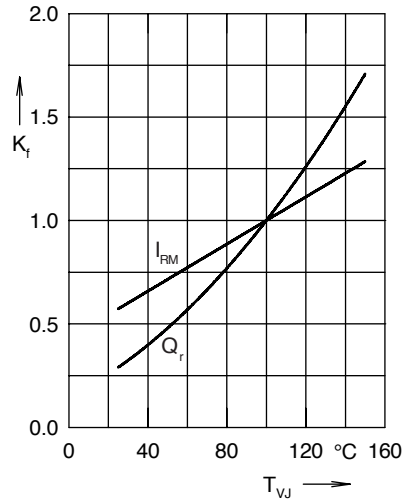

Fig. 17. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

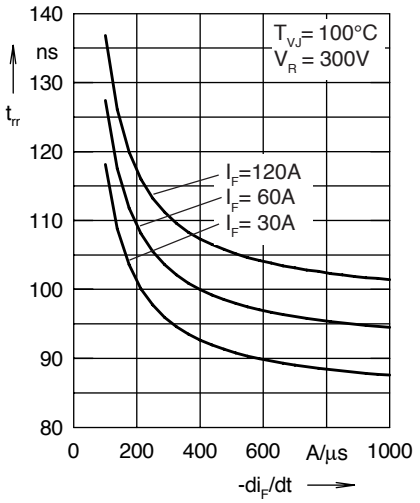

Fig. 18. Recovery time t_{rr} versus $-di_F/dt$

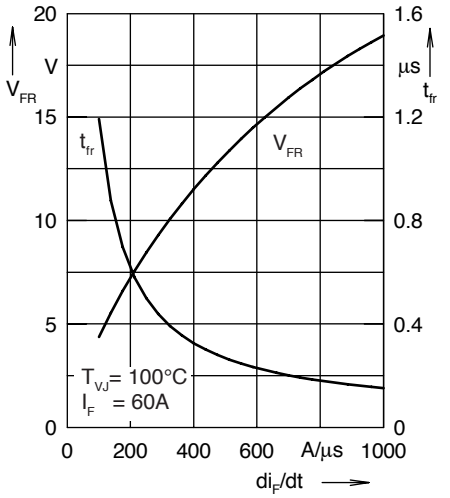

Fig. 19. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

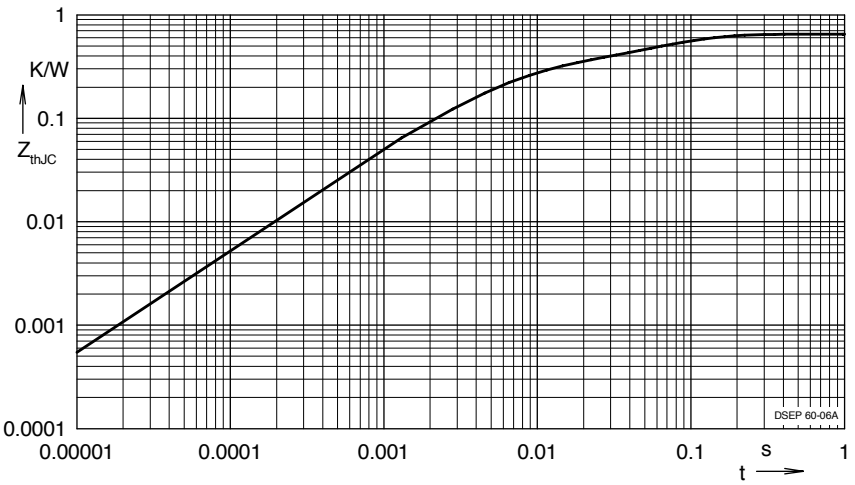

Fig. 20. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.324	0.0052
2	0.125	0.0003
3	0.201	0.0385

Note: Fig. 15 through Fig. 20 show typical values

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