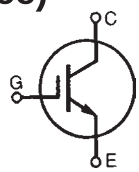
HiPerFAST™ IGBT
ISOPLUS247™

B2-Class High Speed IGBTs
(Electrically Isolated Back Surface)

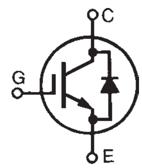
Preliminary Data Sheet

IXGR 50N60B2
IXGR 50N60B2D1

V_{CES}	=	600	V
I_{C25}	=	68	A
$V_{CE(sat)}$	=	2.2	V
$t_{fi(typ)}$	=	65	ns



IXGR_B2

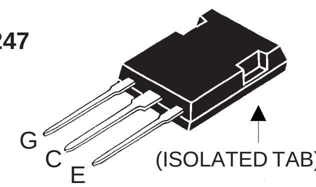


IXGR_B2D1

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)	68	A
I_{C110}	T_C = 110°C	36	A
I_{F110}	T_C = 110°C (50N60B2D1 Diode)	39	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} ≤ 600 V	I_{CM} = 100	A
P_C	T_C = 25°C	200	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
V_{ISOL}	50/60 Hz RMS, t = 1m	2500	V
Weight	5		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	50N60B2 50N60B2D1			50 650	µA µA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 40 A, V_{GE} = 15 V Note 1	 T_J = 125°C		1.8 1.7	2.2	V V

ISOPLUS247
(IXGR)



G = Gate C = Collector
E = Emitter

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

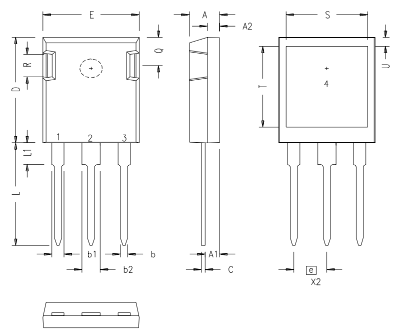
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

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 = 40 A; V_{CE} = 10 V, Note 1		40	55		S
C_{ies}				3500		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz	50N60B2		240		pF
		50N60B2D1		280		pF
C_{res}				50		pF
Q_g				140		nC
Q_{ge}	I_C = 40 A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}			23		nC
Q_{gc}				44		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**			18		ns
t_{ri}	I_C = 40 A, V_{GE} = 15 V			25		ns
$t_{d(off)}$	V_{CE} = 480 V, R_G = R_{off} = 5.0 Ω			190	300	ns
t_{fi}				65		ns
E_{off}				0.55	0.85	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**			18		ns
t_{ri}	I_C = 40 A, V_{GE} = 15 V			25		ns
E_{on}	V_{CE} = 480 V, R_G = R_{off} = 5.0 Ω			0.9		mJ
$t_{d(off)}$				290		ns
t_{fi}				140		ns
E_{off}				1.55		mJ
$R_{thJ-DCB}$	(Note 2)			0.31		K/W
R_{thJC}	(Note 3)				0.62	K/W
R_{thCS}				0.15		K/W

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.

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				2.0	V
		T_J = 150°C			1.39	
I_{RM}	I_F = 60 A, V_{GE} = 0 V, $-di_F/dt$ = 100 A/µ V_R = 100 V	T_J = 100°C			8.3	A
t_{rr}	I_F = 1 A; -di/dt = 200 A/ms; V_R = 30 V			35		ns
R_{thJC}					0.85	K/W

Notes 1: Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %
2: $R_{thJ-DCB}$ is the thermal resistance junction-to-internal side of DCB substrate.
3: R_{thJC} is the thermal resistance junction-to-external side of DCB substrate.

Fig. 1. Output Characteristics @ 25 Deg. C

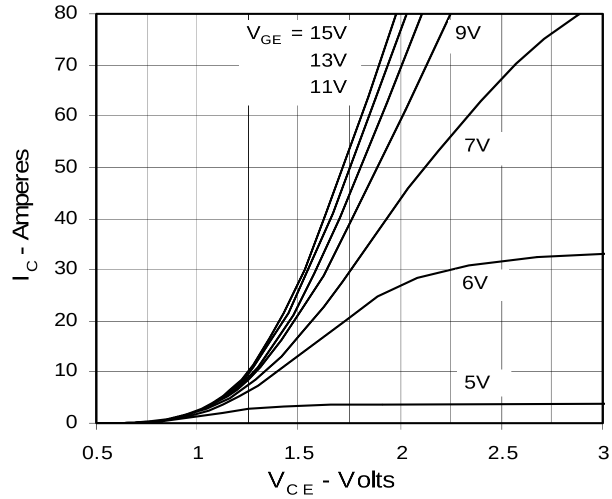


Fig. 2. Extended Output Characteristics @ 25 deg. C

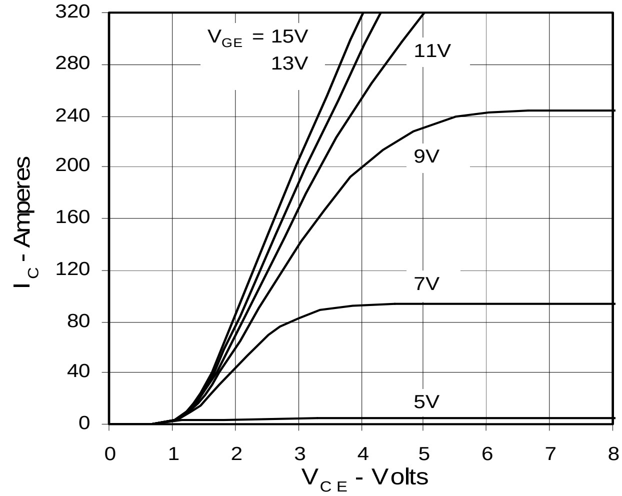


Fig. 3. Output Characteristics @ 125 Deg. C

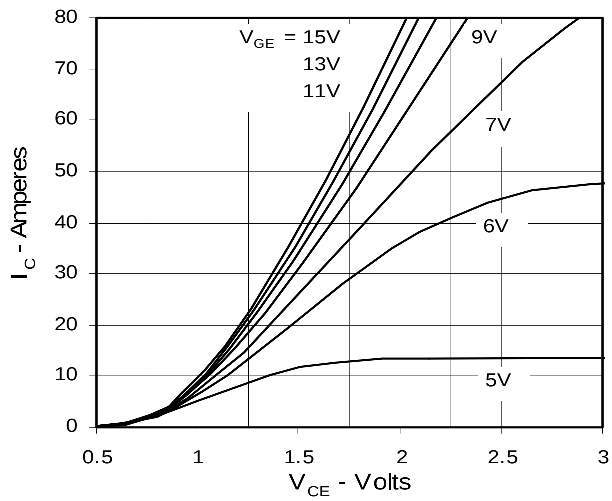


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

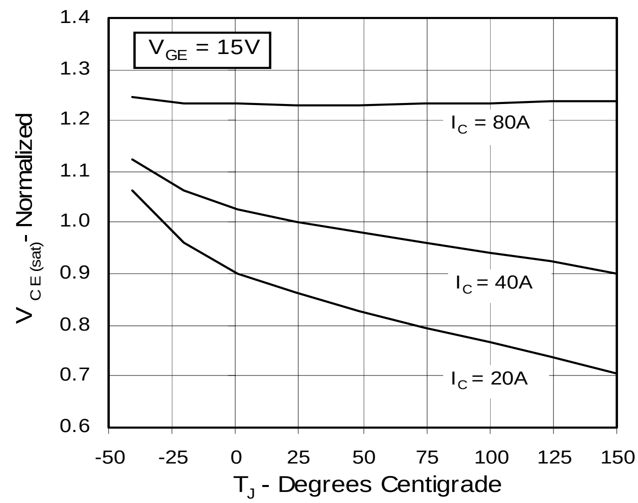


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

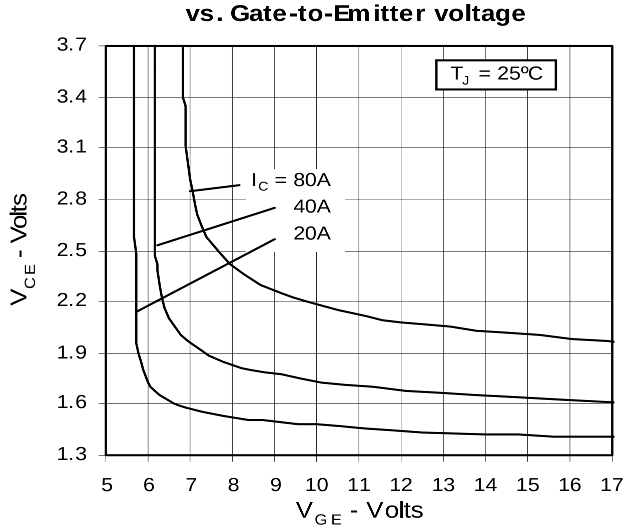


Fig. 6. Input Admittance

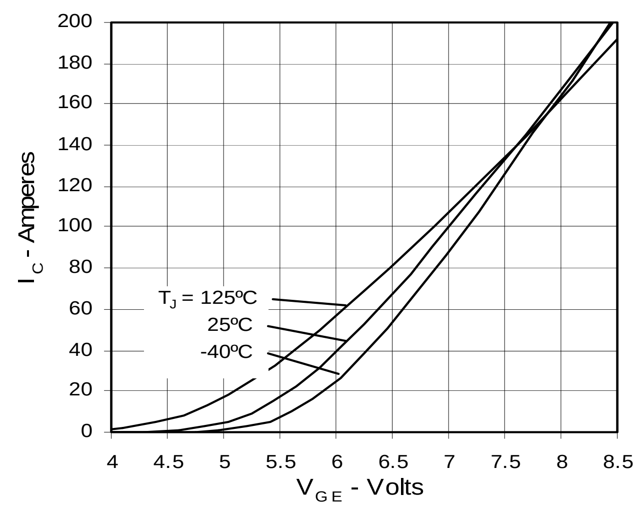


Fig. 7. Transconductance

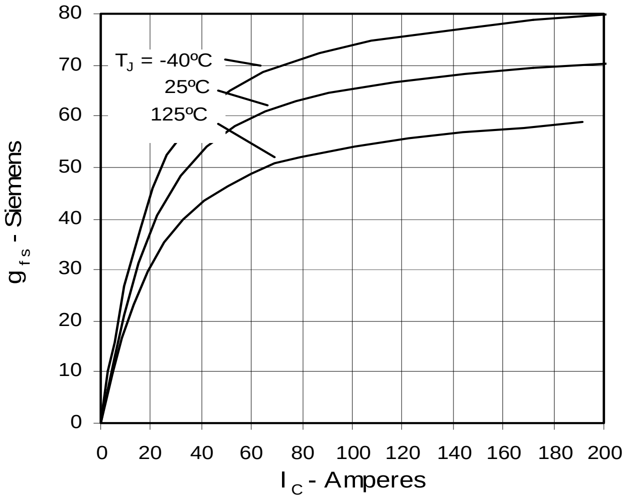


Fig. 8. Dependence of Turn-Off Energy on R_G

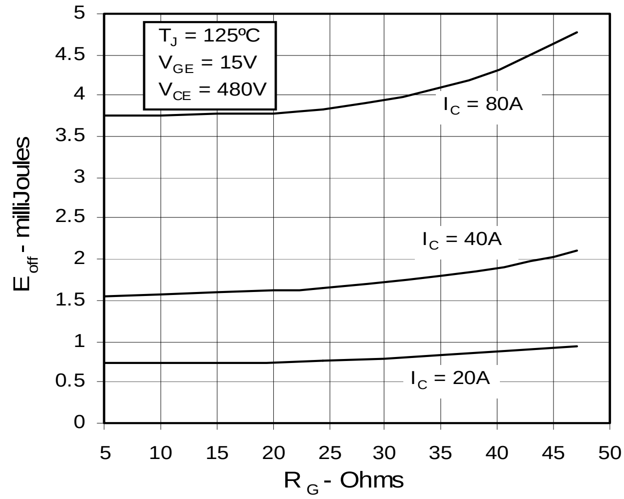


Fig. 9. Dependence of Turn-Off Energy on I_C

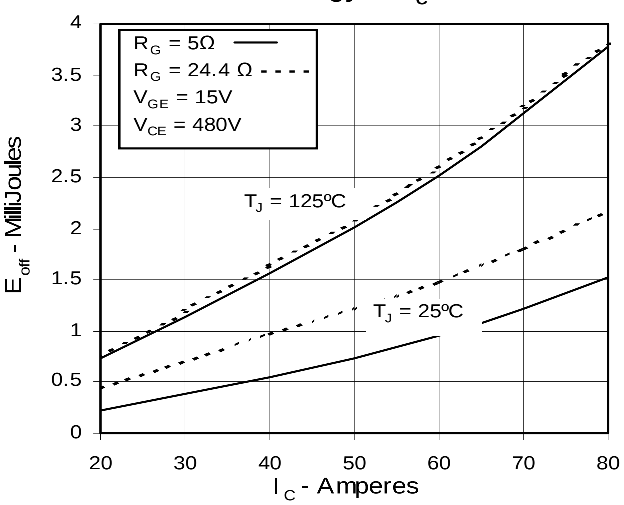


Fig. 10. Dependence of Turn-Off Energy on Temperature

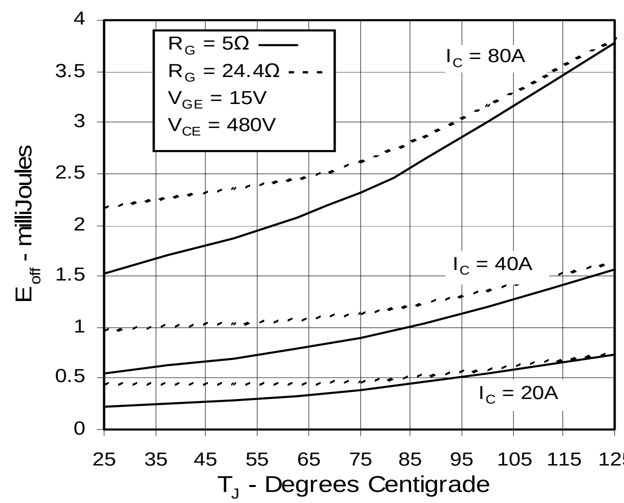


Fig. 11. Dependence of Turn-Off Switching Time on R_G

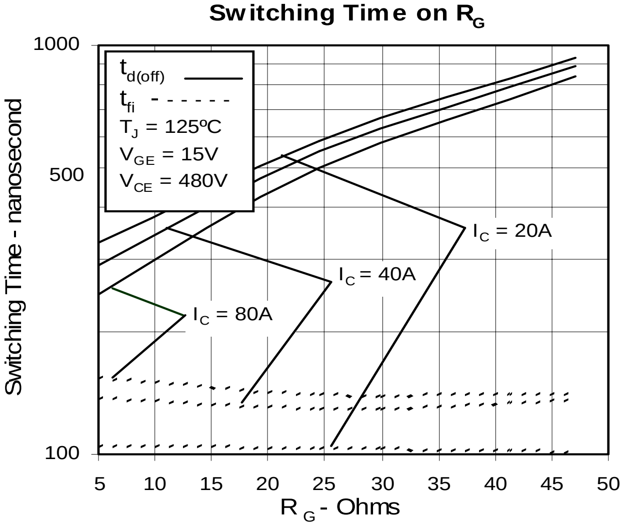
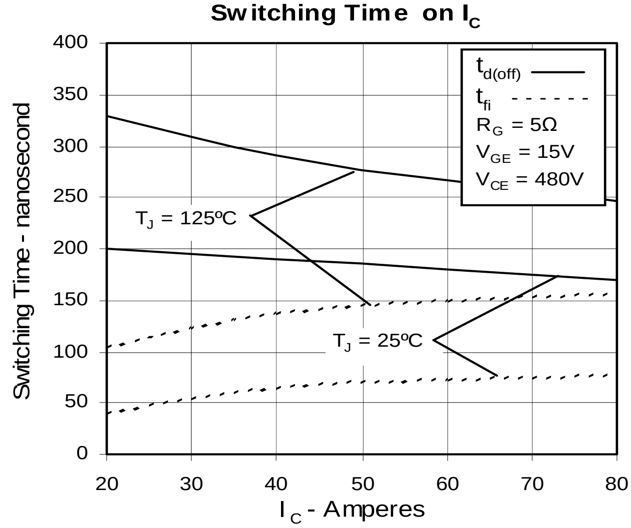


Fig. 12. Dependence of Turn-Off Switching Time on I_C



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

Fig. 13. Dependence of Turn-Off Switching Time on Temperature

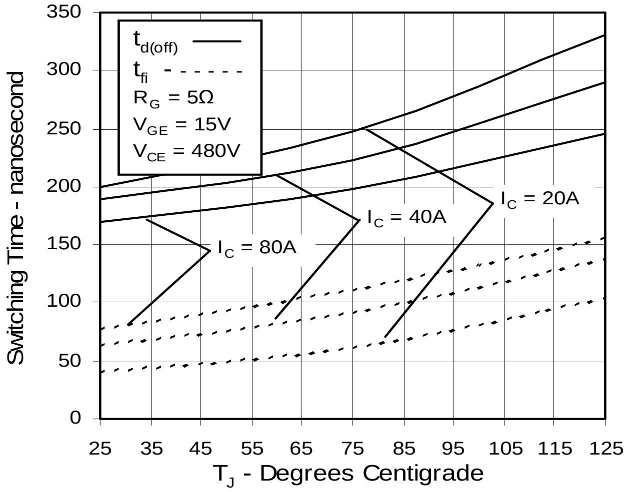


Fig. 14. Reverse-Bias Safe Operating Area

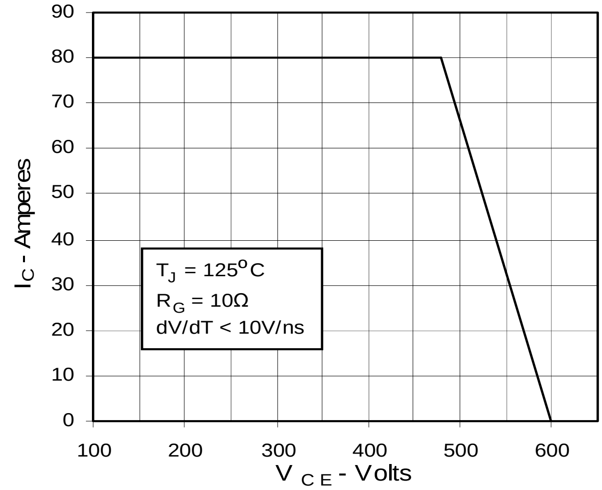


Fig. 15. Gate Charge

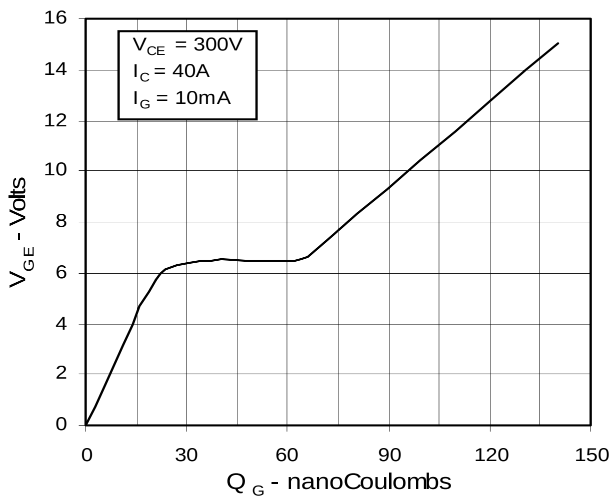


Fig. 16. Capacitance

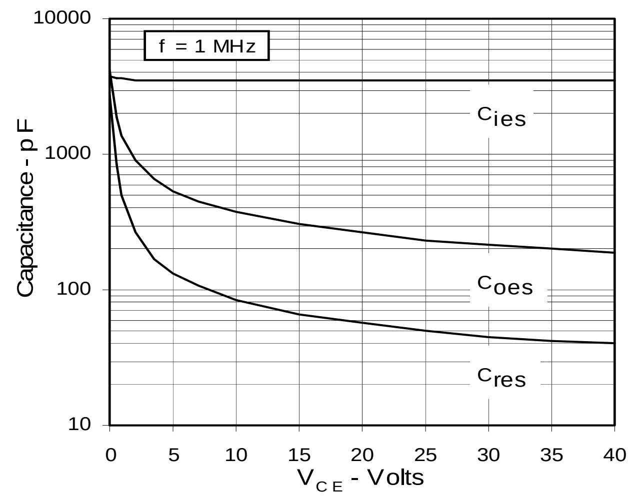
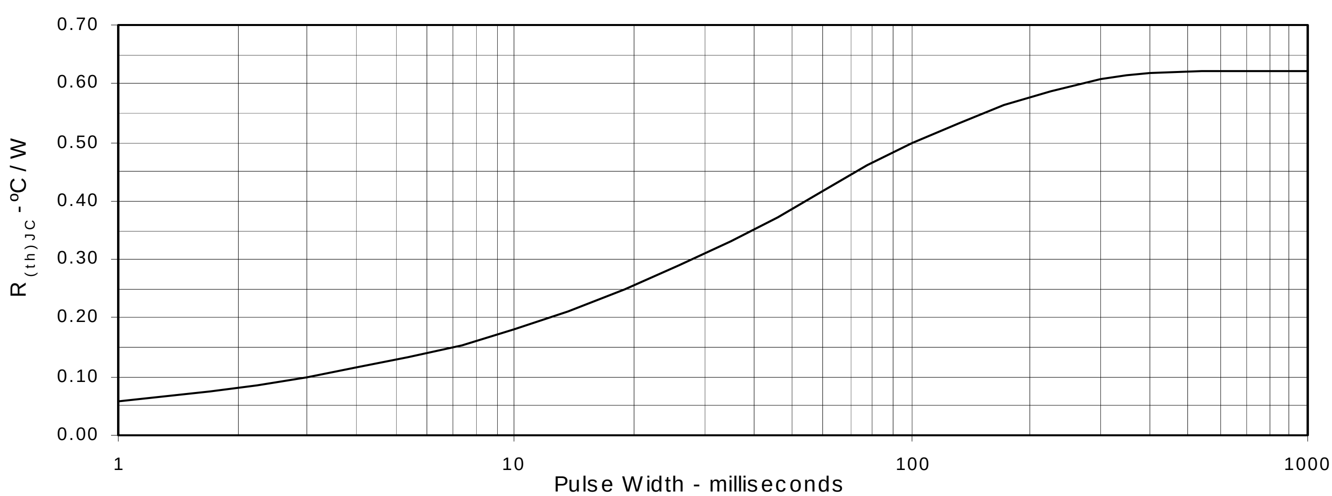


Fig. 17. Maximum Transient Thermal Resistance



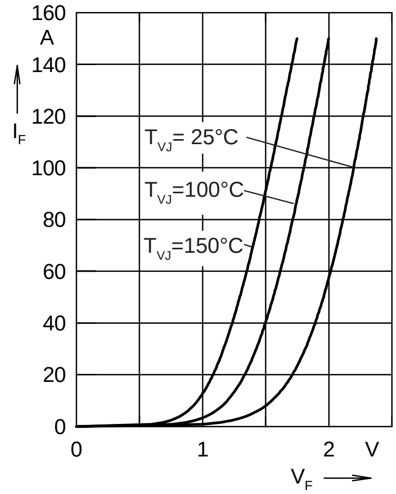


Fig. 18 Forward current I_F versus V_F

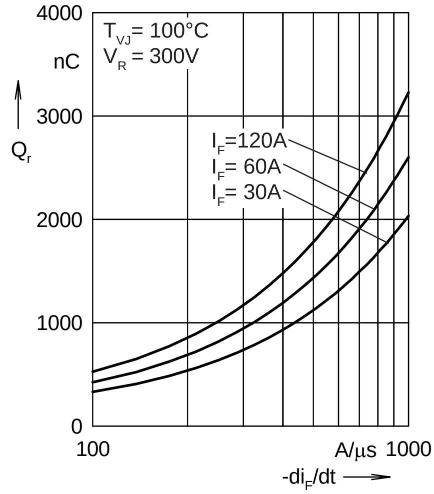


Fig. 19 Reverse recovery charge Q_r versus $-di_F/dt$

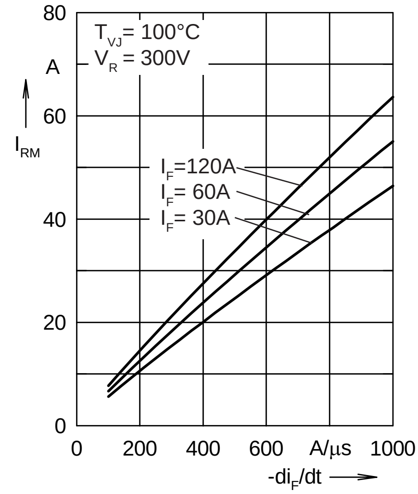


Fig. 20 Peak reverse current I_{RM} versus $-di_F/dt$

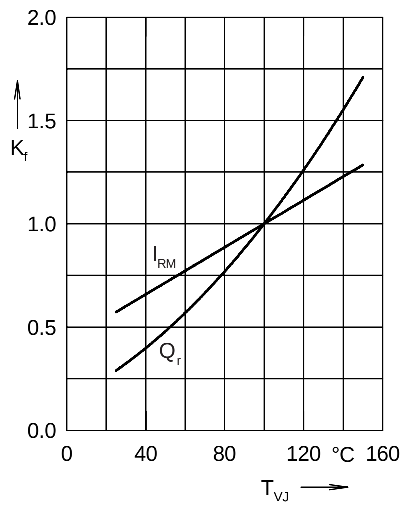


Fig. 21 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

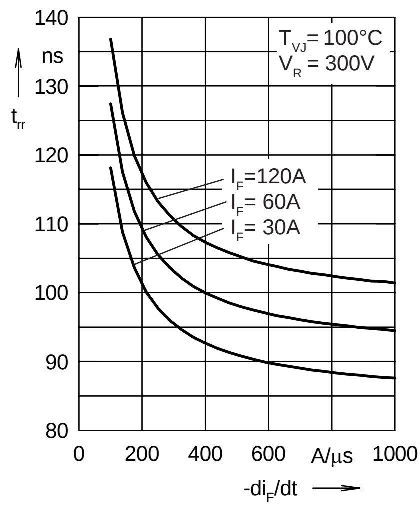


Fig. 22 Recovery time t_{rr} versus $-di_F/dt$

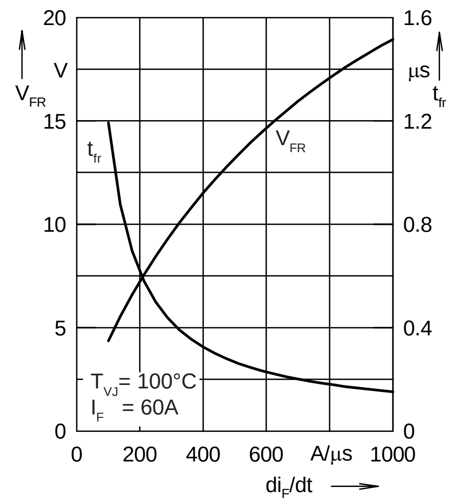


Fig. 23 Peak forward voltage V_{FR} and t_{fr}

versus di_F/dt

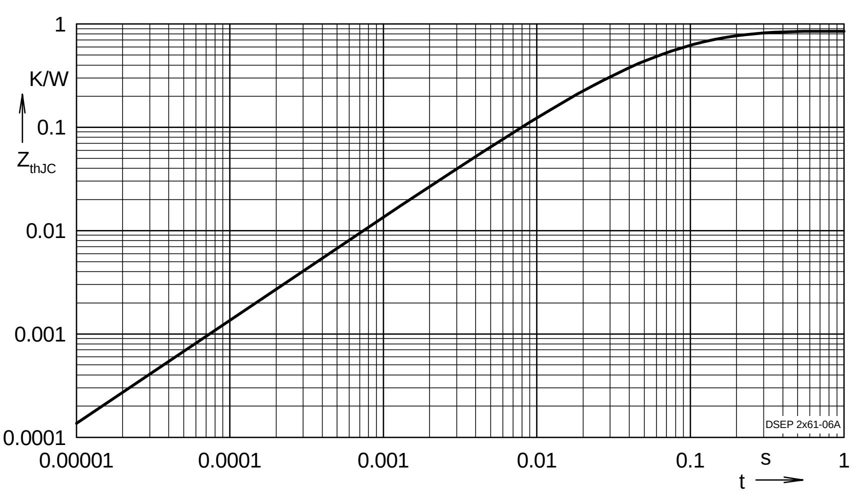


Fig. 24 Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.3073	0.0055
2	0.3533	0.0092
3	0.0887	0.0007
4	0.1008	0.0399