

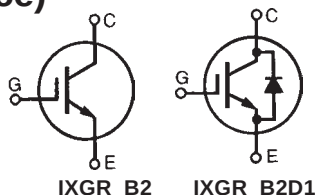
HiPerFAST™ IGBT ISOPLUS247™

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

Preliminary Data Sheet

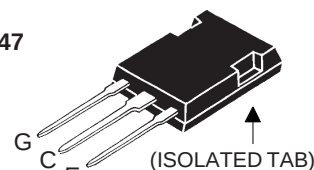
IXGR 50N60B2
IXGR 50N60B2D1

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



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C}$ to 150°C	600	V
V_{CGR}	$T_J = 25^\circ\text{C}$ to 150°C ; $R_{GE} = 1 \text{ M}\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$ (limited by leads)	68	A
I_{C110}	$T_C = 110^\circ\text{C}$	36	A
I_{F110}	$T_C = 110^\circ\text{C}$ (50N60B2D1 Diode)	39	A
I_{CM}	$T_C = 25^\circ\text{C}$, 1 ms	300	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 10 \Omega$ Clamped inductive load @ $V_{CE} \leq 600 \text{ V}$	$I_{CM} = 100$	A
P_C	$T_C = 25^\circ\text{C}$	200	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
V_{ISOL}	50/60 Hz RMS, $t = 1 \text{ m}$	2500	V
Weight	5	g	
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$

ISOPLUS247
(IXGR)



G = Gate
E = Emitter
C = Collector

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

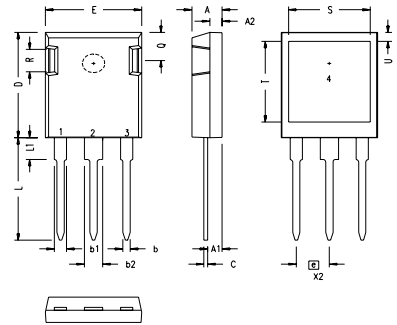
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

Advantages

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

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$, $V_{CE} = V_{GE}$	3.0		5.0
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$	50N60B2 50N60B2D1		50 650
I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = \pm 20 \text{ V}$			± 100
$V_{CE(sat)}$	$I_C = 40 \text{ A}$, $V_{GE} = 15 \text{ V}$ Note 1		1.8 1.7	2.2 V

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		Min.	Typ.	Max.
g_{fs}	$I_C = 40\text{ A}$; $V_{CE} = 10\text{ V}$, Note 1	40	55	S
C_{ies}	$V_{CE} = 25\text{ V}$, $V_{GE} = 0\text{ V}$, $f = 1\text{ MHz}$	50N60B2 50N60B2D1	3500	pF
C_{oes}			240	pF
C_{res}			280	pF
			50	pF
Q_g	$I_C = 40\text{ A}$, $V_{GE} = 15\text{ V}$, $V_{CE} = 0.5 V_{CES}$		140	nC
Q_{ge}			23	nC
Q_{gc}			44	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = 40\text{ A}$, $V_{GE} = 15\text{ V}$ $V_{CE} = 480\text{ V}$, $R_G = R_{off} = 5.0\ \Omega$		18	ns
t_{ri}			25	ns
$t_{d(off)}$			190	ns
t_{fi}			65	ns
E_{off}			0.55	0.85 mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = 40\text{ A}$, $V_{GE} = 15\text{ V}$ $V_{CE} = 480\text{ V}$, $R_G = R_{off} = 5.0\ \Omega$		18	ns
t_{ri}			25	ns
E_{on}			0.9	mJ
$t_{d(off)}$			290	ns
t_{fi}			140	ns
E_{off}			1.55	mJ
$R_{thJ-DCB}$	(Note 2)	0.31	0.62	K/W
R_{thJC}	(Note 3)			K/W
R_{thCS}				0.15 K/W

ISOPLUS 247 Outline


SYM	INCHES		MILLIMETERS	
	MIN	MAX	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.

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
V_F	$I_F = 60\text{ A}$, $V_{GE} = 0\text{ V}$, Note 1 $T_J = 150^\circ\text{C}$			2.0 V 1.39
I_{RM}	$I_F = 60\text{ A}$, $V_{GE} = 0\text{ V}$, $-di_F/dt = 100\text{ A}/\mu$ $V_R = 100\text{ V}$ $T_J = 100^\circ\text{C}$			8.3 A
t_{rr}	$I_F = 1\text{ A}$; $-di_F/dt = 200\text{ A}/\text{ms}$; $V_R = 30\text{ V}$		35	ns
R_{thJC}				0.85 K/W

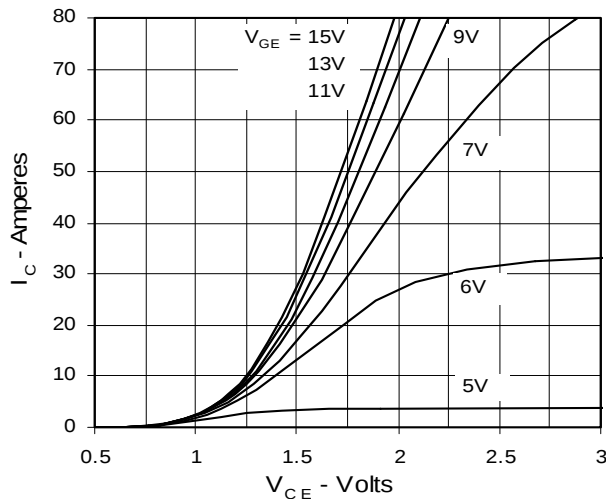
Notes 1: Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $\leq 2\%$

- 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.

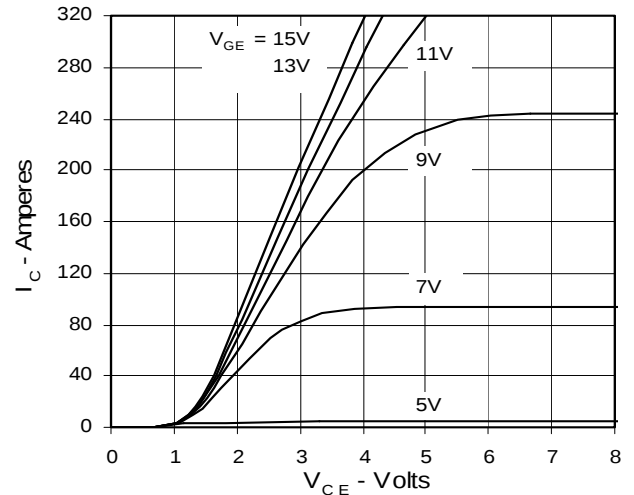
IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,850,072	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
	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

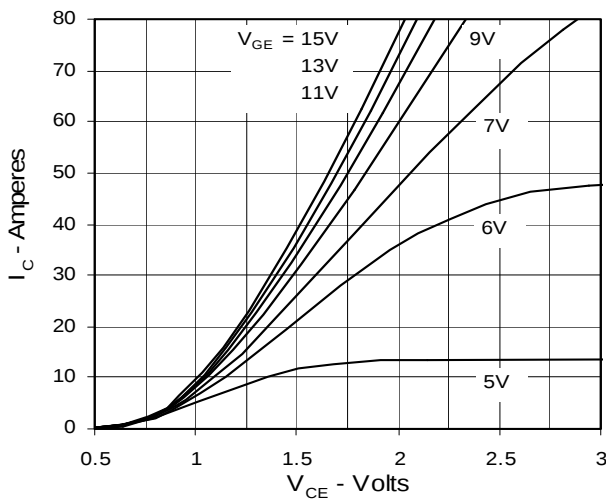
**Fig. 1. Output Characteristics
@ 25 Deg. C**



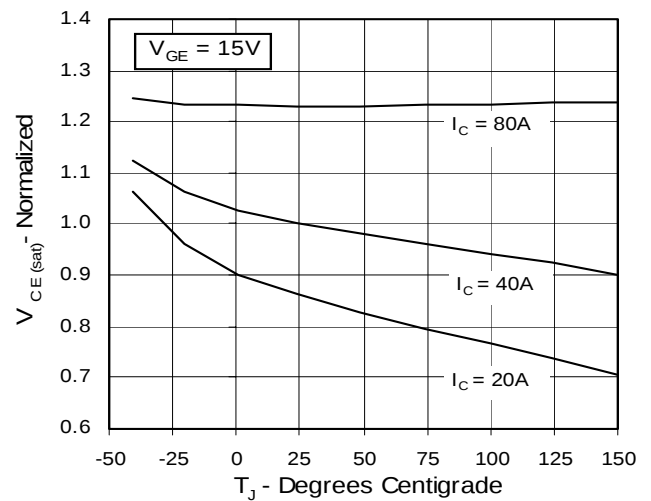
**Fig. 2. Extended Output Characteristics
@ 25 deg. C**



**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**

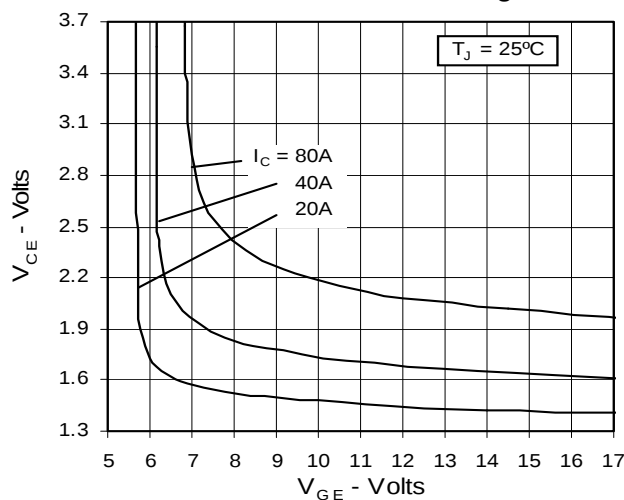


Fig. 6. Input Admittance

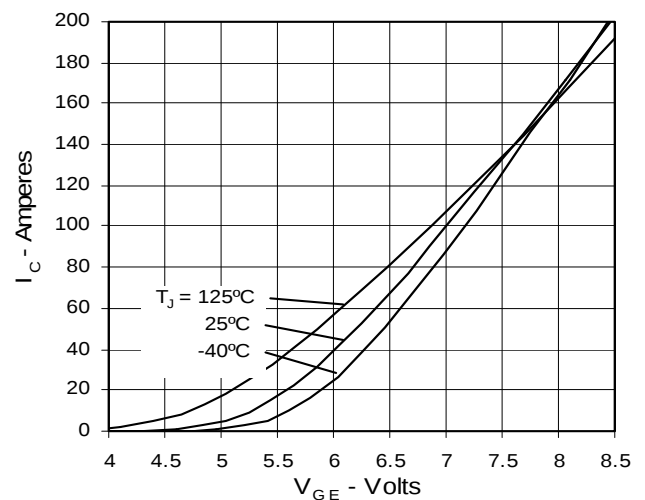


Fig. 7. Transconductance

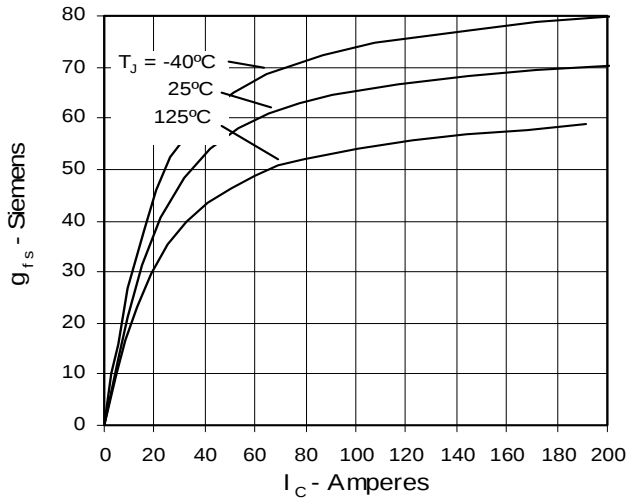


Fig. 8. Dependence of Turn-Off Energy on R_G

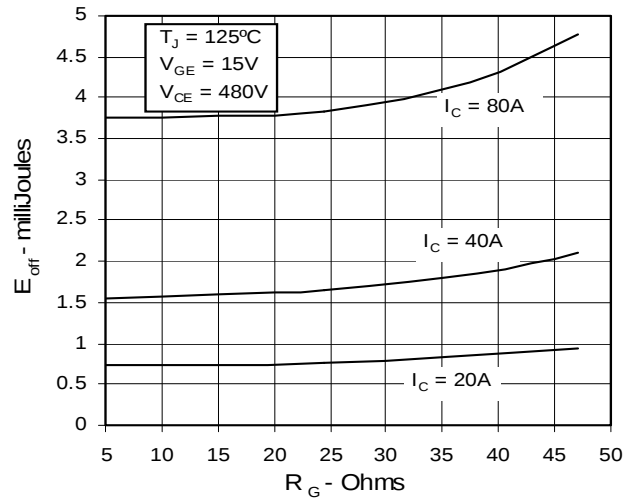


Fig. 9. Dependence of Turn-Off Energy on I_C

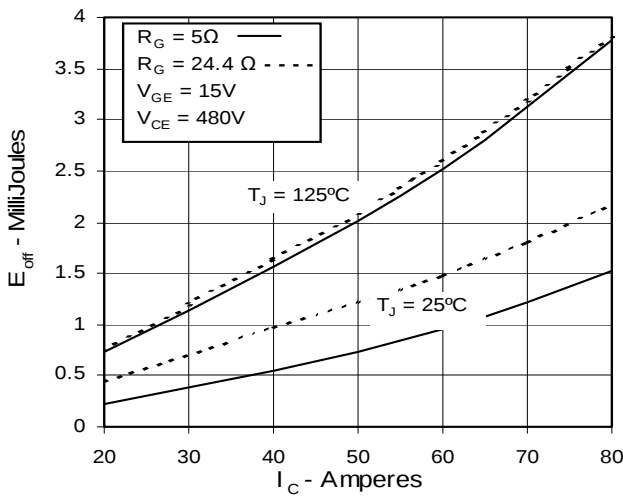


Fig. 10. Dependence of Turn-Off Energy on Temperature

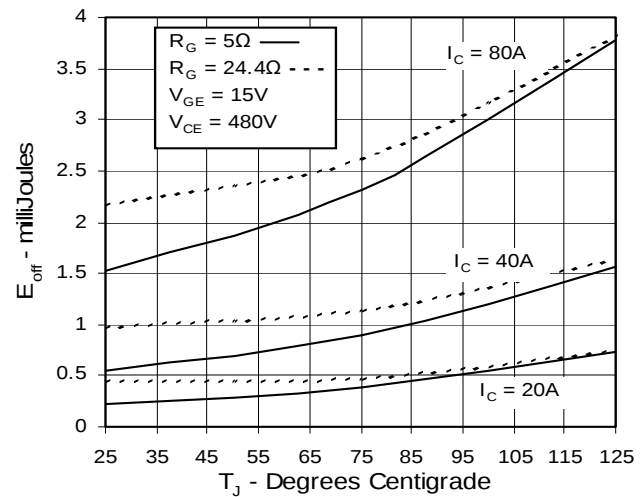


Fig. 11. Dependence of Turn-Off Switching Time on R_G

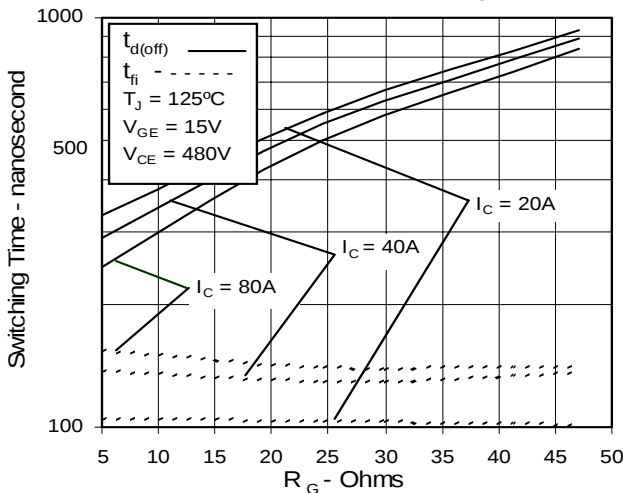
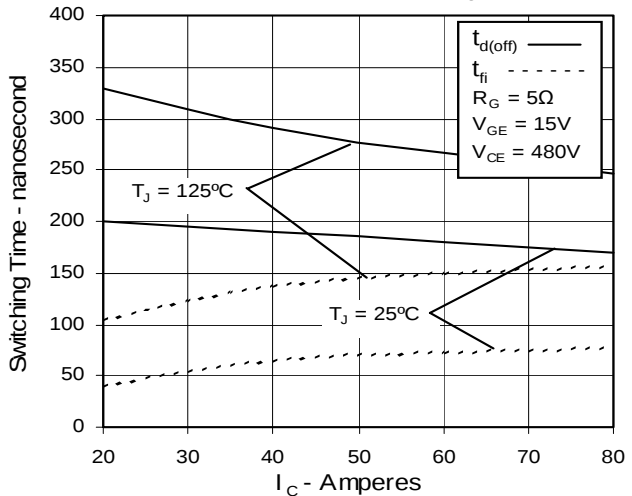


Fig. 12. Dependence of Turn-Off Switching Time on I_C



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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

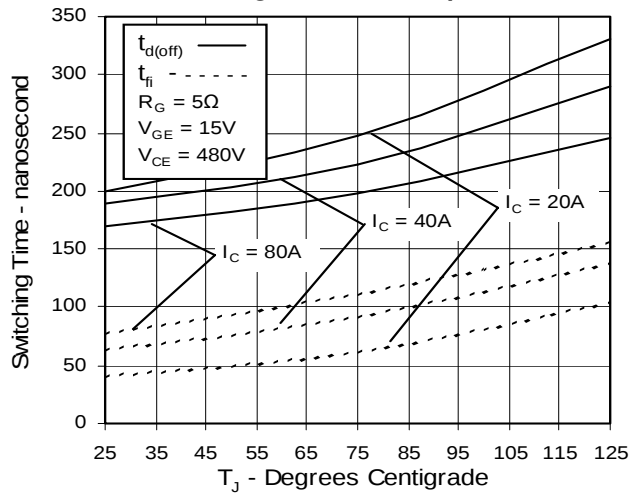


Fig. 14. Reverse-Bias Safe Operating Area

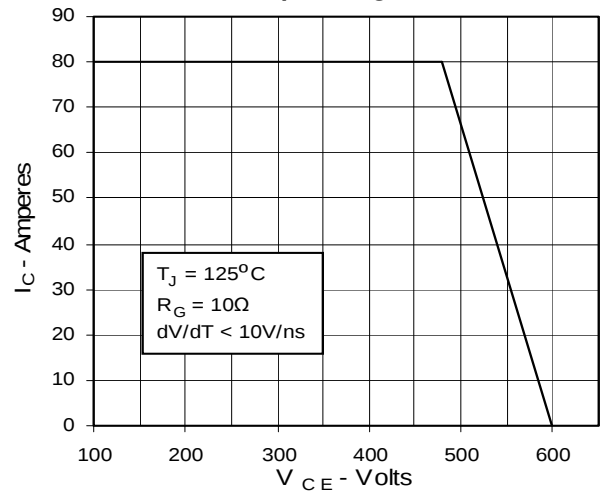


Fig. 15. Gate Charge

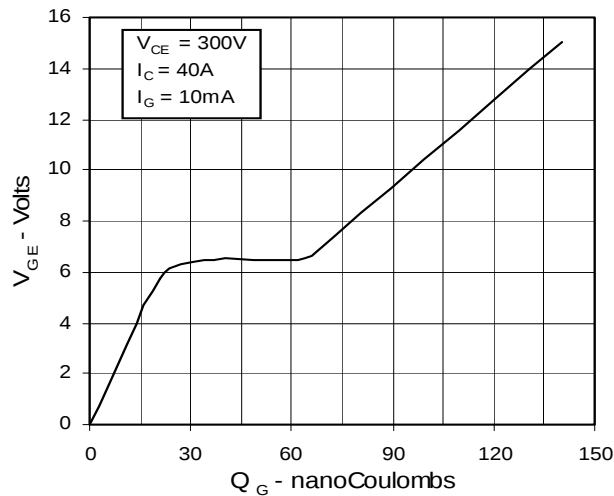


Fig. 16. Capacitance

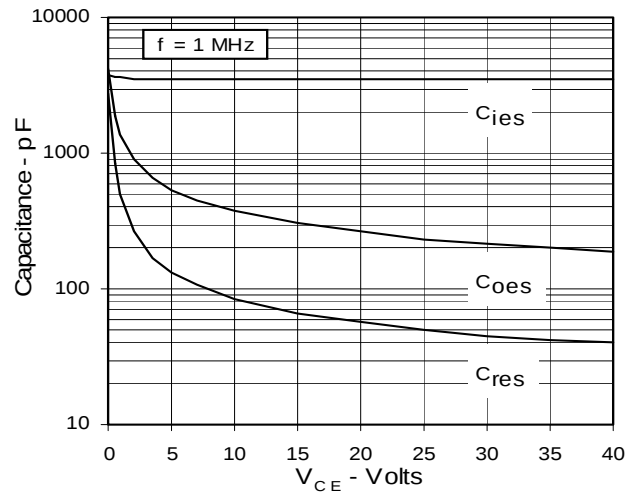
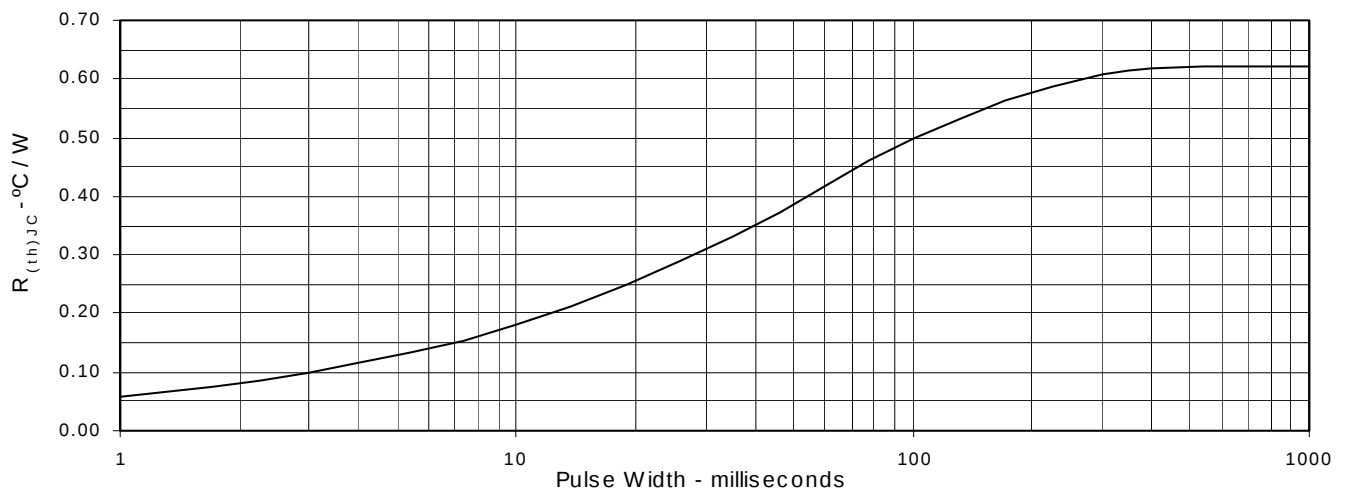


Fig. 17. Maximum Transient Thermal Resistance



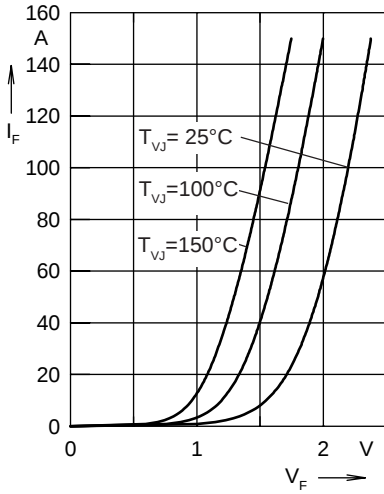


Fig. 18 Forward current I_F versus V_F

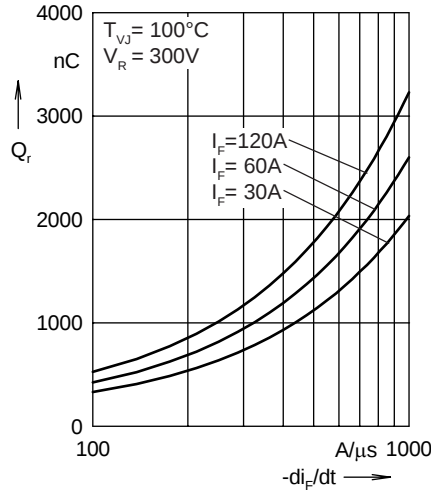


Fig. 19 Reverse recovery charge Q_r versus $-di_F/dt$

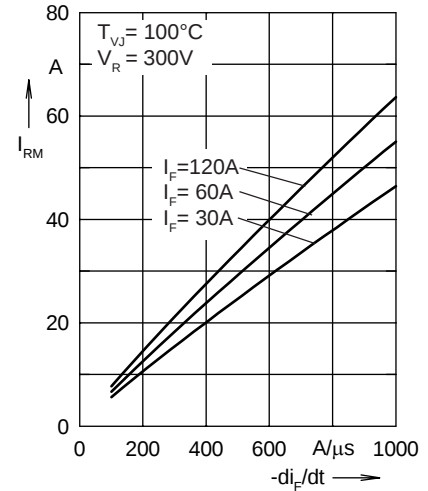


Fig. 20 Peak reverse current I_{RM} versus $-di_F/dt$

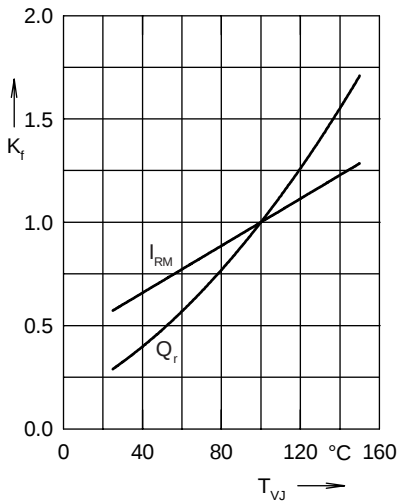


Fig. 21 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

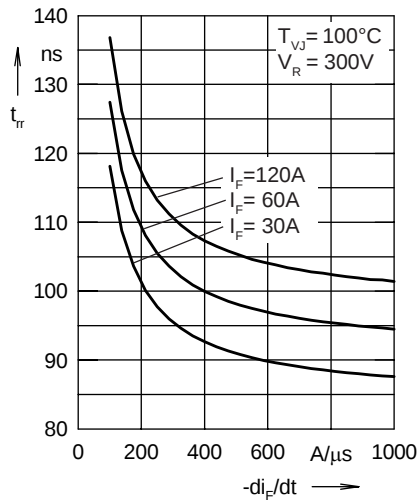


Fig. 22 Recovery time t_{rr} versus $-di_F/dt$

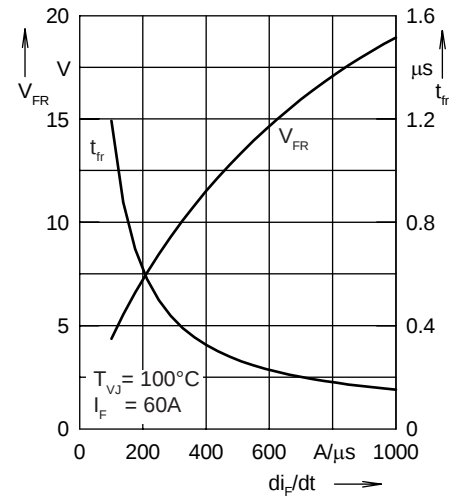


Fig. 23 Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

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

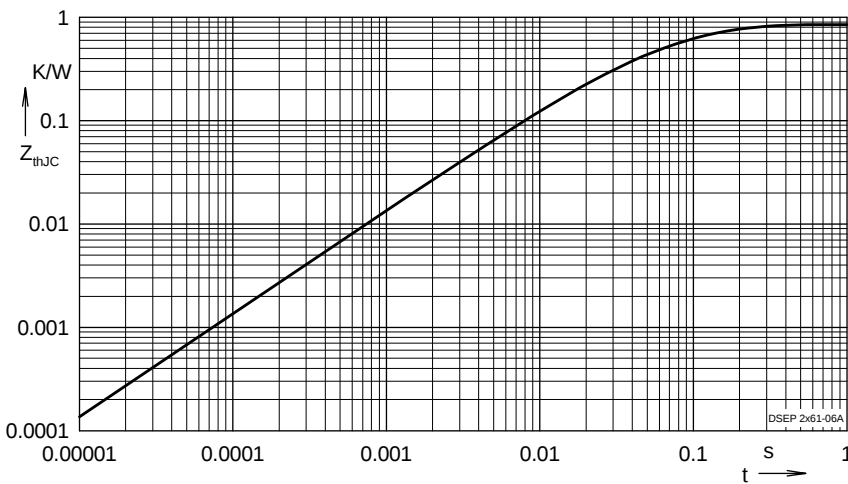


Fig. 24 Transient thermal resistance junction to case

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