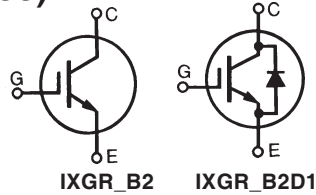


# HiPerFAST™ IGBT ISOPLUS247™

IXGR 50N60B2  
IXGR 50N60B2D1

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

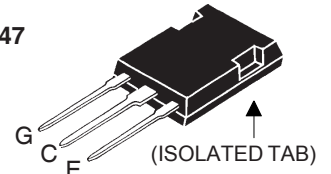
Preliminary Data Sheet



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

Symbol	Test Conditions	Maximum Ratings	
$V_{CES}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$	600	V
$V_{CGR}$	$T_J = 25^\circ\text{C}$ to $150^\circ\text{C}$ ; $R_{GE} = 1 \text{ M}\Omega$	600	V
$V_{GES}$	Continuous	$\pm 20$	V
$V_{GEM}$	Transient	$\pm 30$	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
<b>SSOA</b> <b>(RBSOA)</b>	$V_{GE} = 15 \text{ V}$ , $T_{VJ} = 125^\circ\text{C}$ , $R_G = 10 \Omega$ 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
<b>Weight</b>	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      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

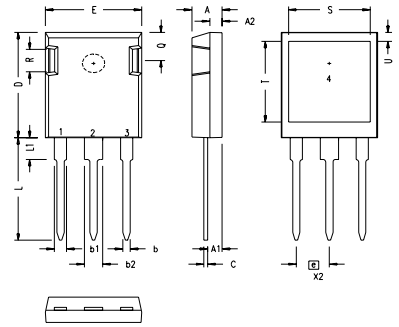
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

### Advantages

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

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$ , $V_{CE} = V_{GE}$	3.0		5.0
$I_{CES}$	$V_{CE} = V_{CES}$	50N60B2		50 $\mu\text{A}$
	$V_{GE} = 0 \text{ V}$	50N60B2D1		650 $\mu\text{A}$
$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 40 \text{ A}$ , $V_{GE} = 15 \text{ V}$ Note 1	$T_J = 125^\circ\text{C}$	1.8	2.2
			1.7	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	
$C_{ies}$	$V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$		3500	pF	
$C_{oes}$		50N60B2	240	pF	
$C_{res}$		50N60B2D1	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	
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 40\text{ A}$ , $V_{GE} = 15\text{ V}$ $V_{CE} = 480\text{ V}$ , $R_G = R_{off} = 5.0\ \Omega$		18	ns	
$t_{ri}$			25	ns	
$t_{d(off)}$			190	300	ns
$t_{fi}$			65		ns
$E_{off}$			0.55	0.85	mJ
$t_{d(on)}$	<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 40\text{ A}$ , $V_{GE} = 15\text{ V}$ $V_{CE} = 480\text{ V}$ , $R_G = R_{off} = 5.0\ \Omega$		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	K/W	
$R_{thJC}$	(Note 3)		0.62	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
$t_{rr}$	$I_F = 1\text{ A}$ ; $-di/dt = 200\text{ A}/\text{ms}$ ; $V_R = 30\text{ V}$		35	ns
$R_{thJC}$				0.85 K/W

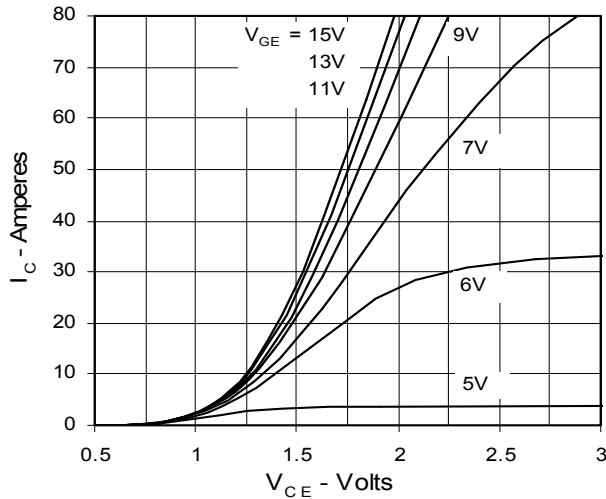
Notes 1: Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$

- 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.

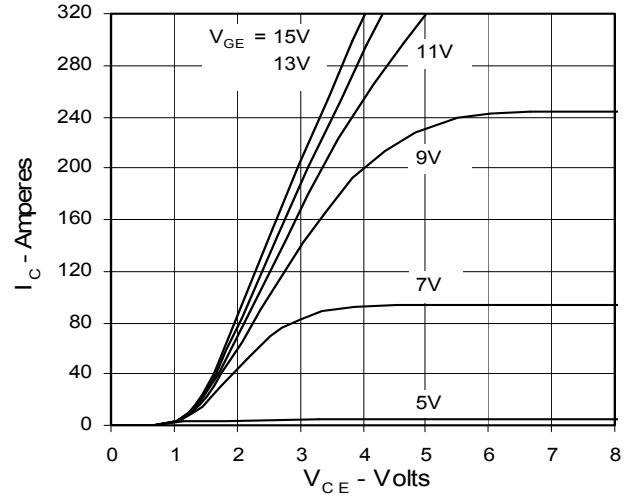
IXYS reserves the right to change limits, test conditions, and dimensions.

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

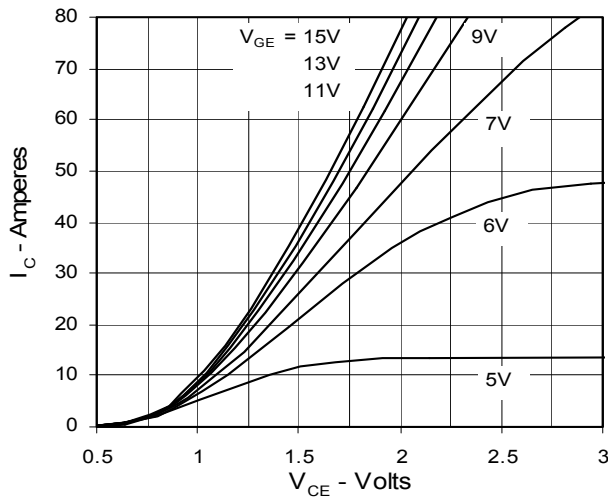
**Fig. 1. Output Characteristics  
@ 25 Deg. C**



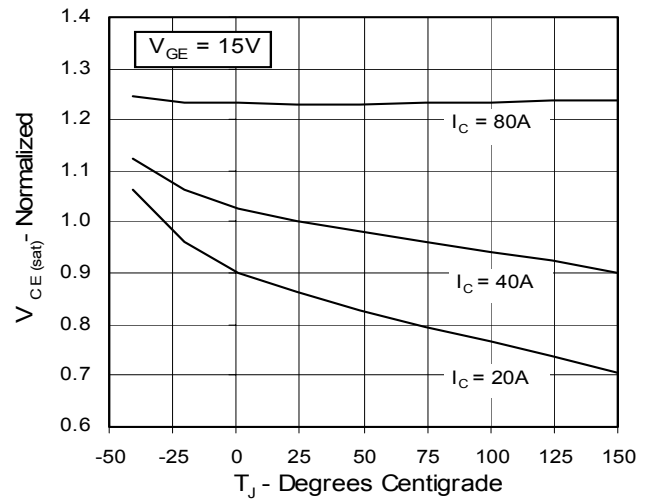
**Fig. 2. Extended Output Characteristics  
@ 25 deg. C**



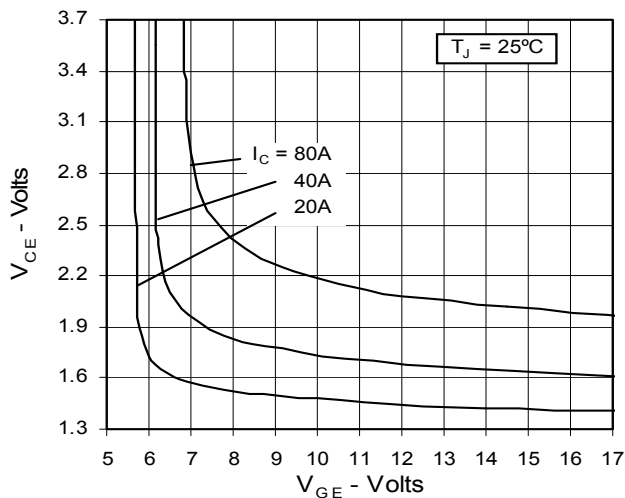
**Fig. 3. Output Characteristics  
@ 125 Deg. C**



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



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



**Fig. 6. Input Admittance**

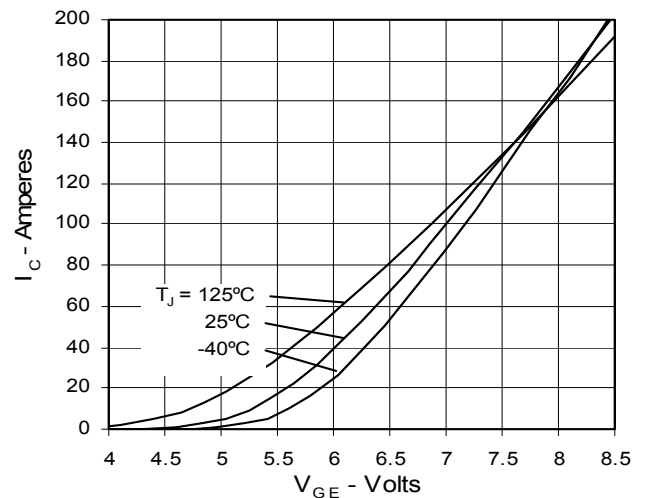


Fig. 7. Transconductance

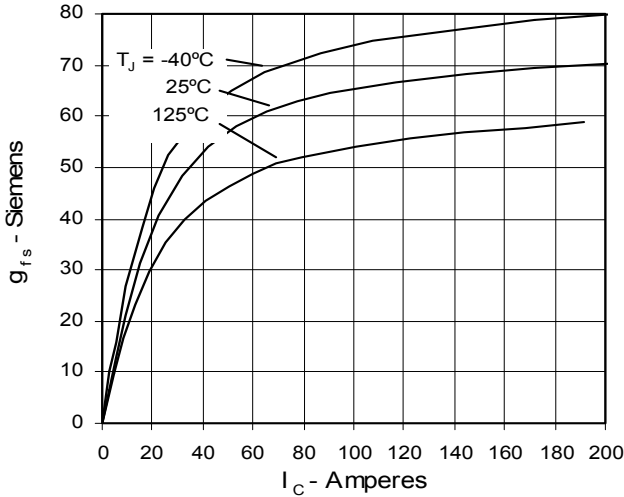


Fig. 8. Dependence of Turn-Off Energy on  $R_G$

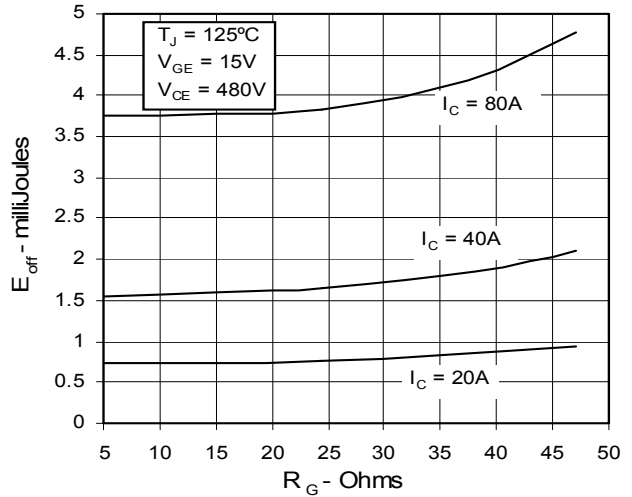


Fig. 9. Dependence of Turn-Off Energy on  $I_C$

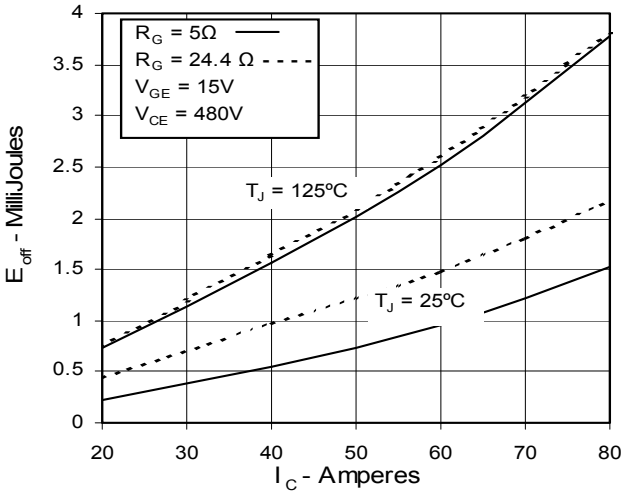


Fig. 10. Dependence of Turn-Off Energy on Temperature

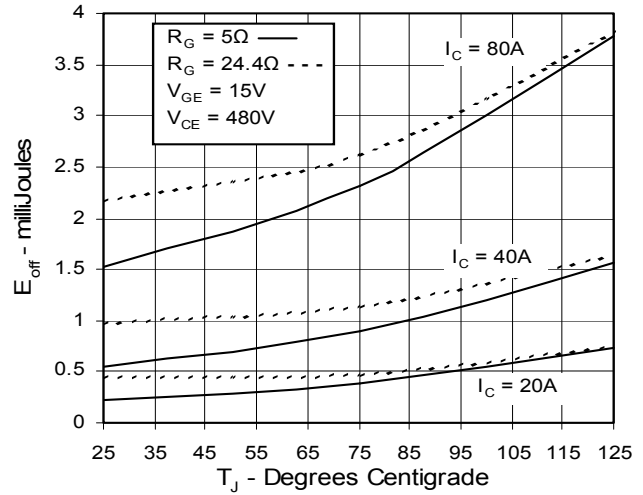


Fig. 11. Dependence of Turn-Off Switching Time on  $R_G$

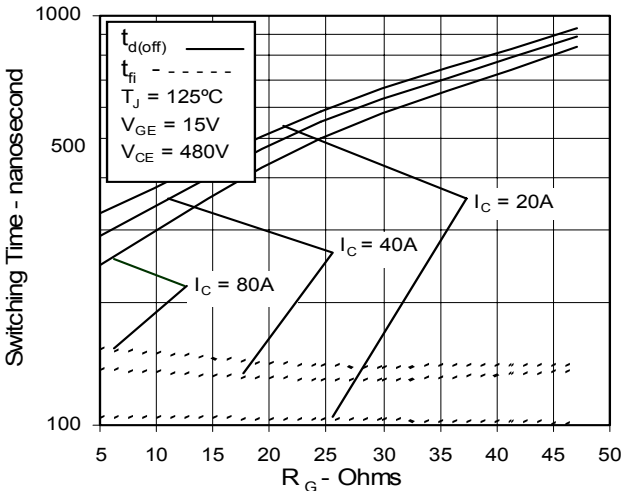
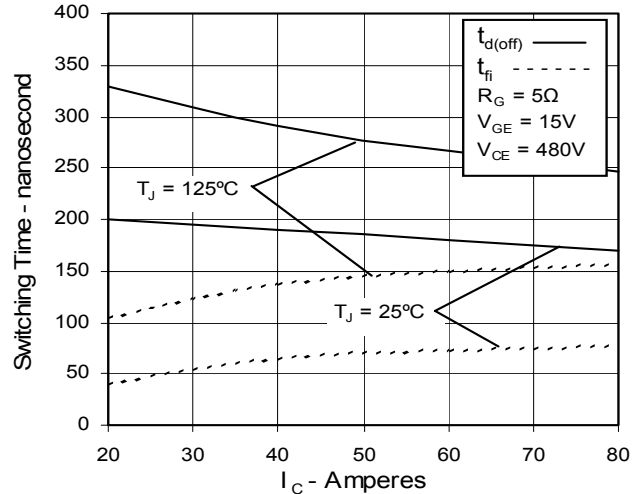
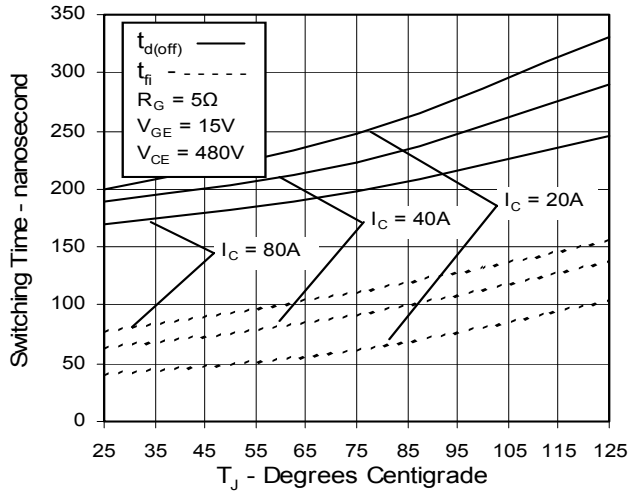


Fig. 12. Dependence of Turn-Off Switching Time on  $I_C$

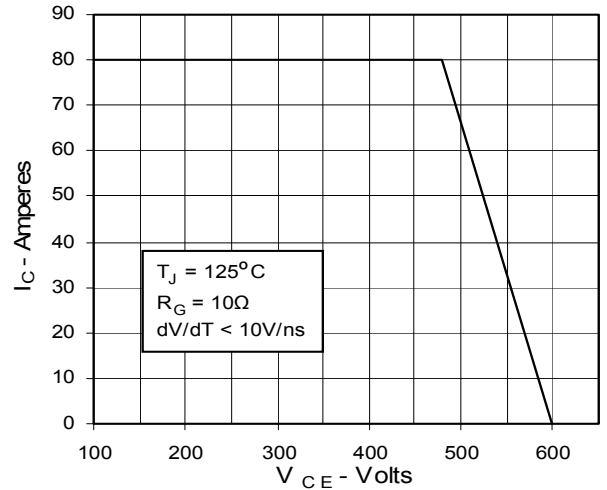


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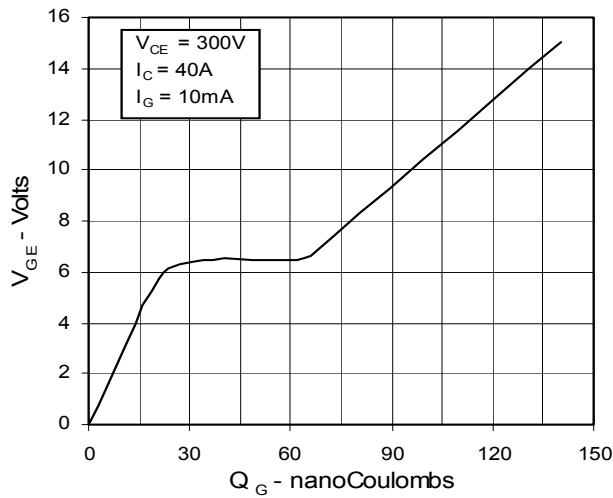
**Fig. 13. Dependence of Turn-Off Switching Time on Temperature**



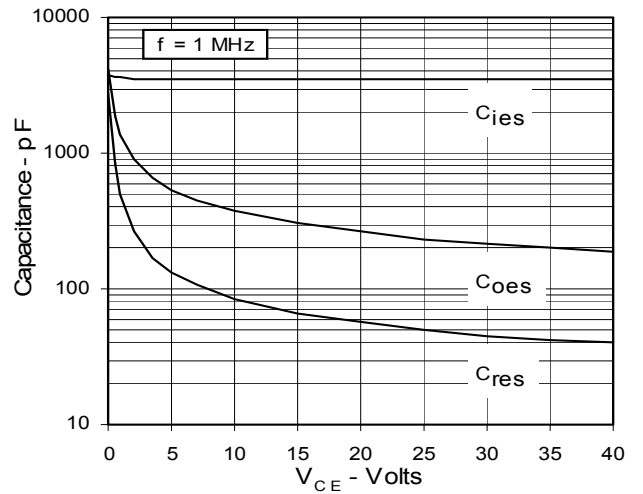
**Fig. 14. Reverse-Bias Safe Operating Area**



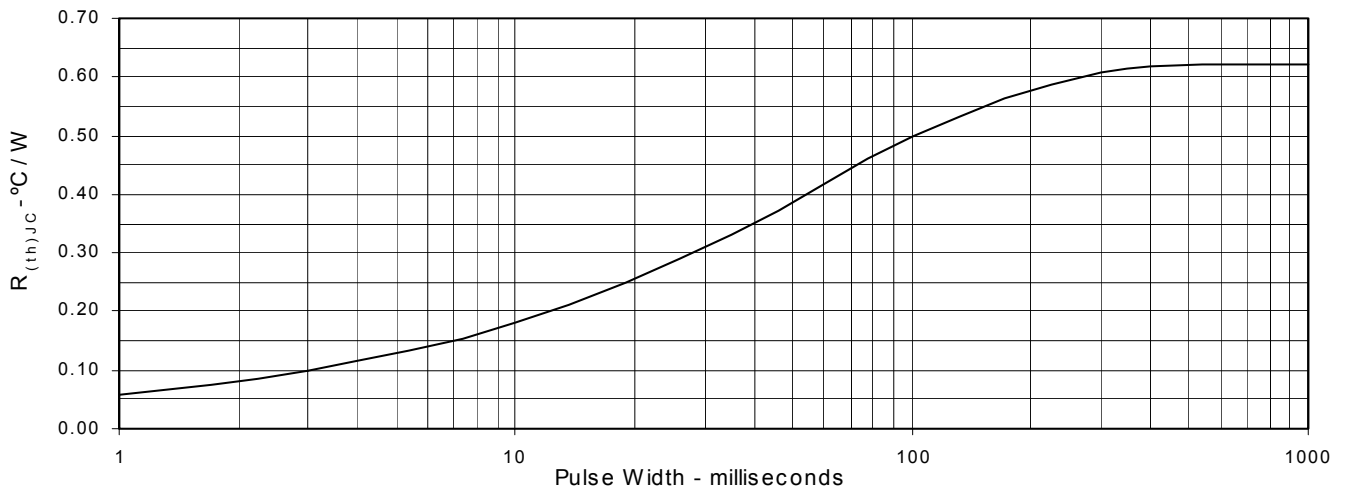
**Fig. 15. Gate Charge**



**Fig. 16. Capacitance**



**Fig. 17. Maximum Transient Thermal Resistance**



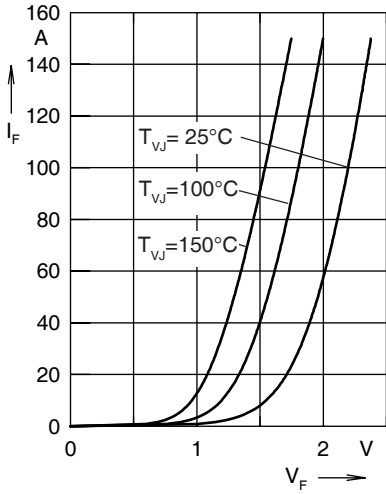


Fig. 18 Forward current  $I_F$  versus  $V_F$

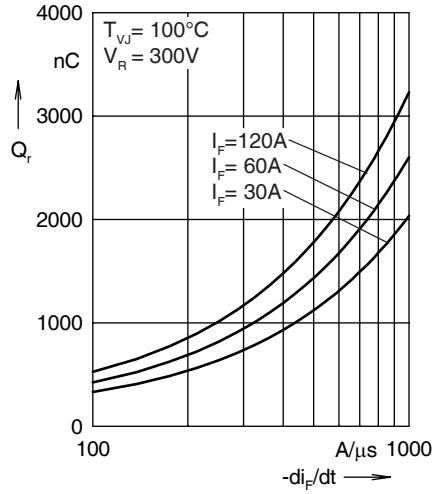


Fig. 19 Reverse recovery charge  $Q_r$  versus  $-di_F/dt$

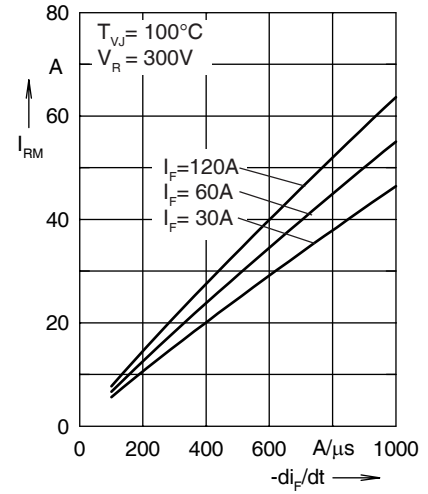


Fig. 20 Peak reverse current  $I_{RM}$  versus  $-di_F/dt$

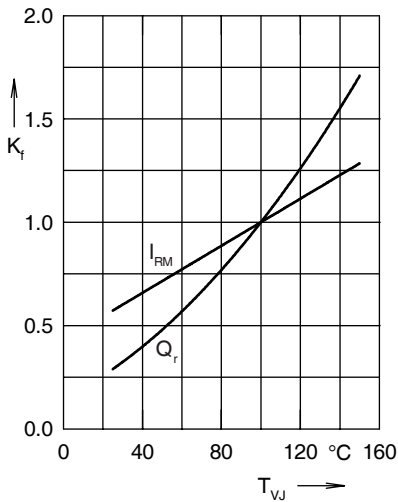


Fig. 21 Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

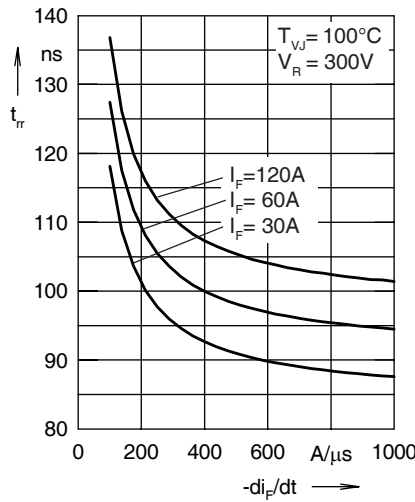


Fig. 22 Recovery time  $t_{rr}$  versus  $-di_F/dt$

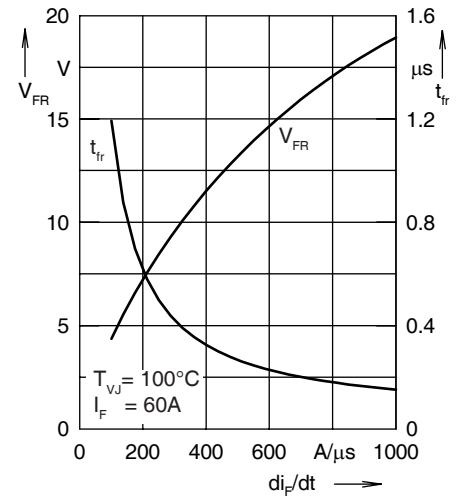


Fig. 23 Peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

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

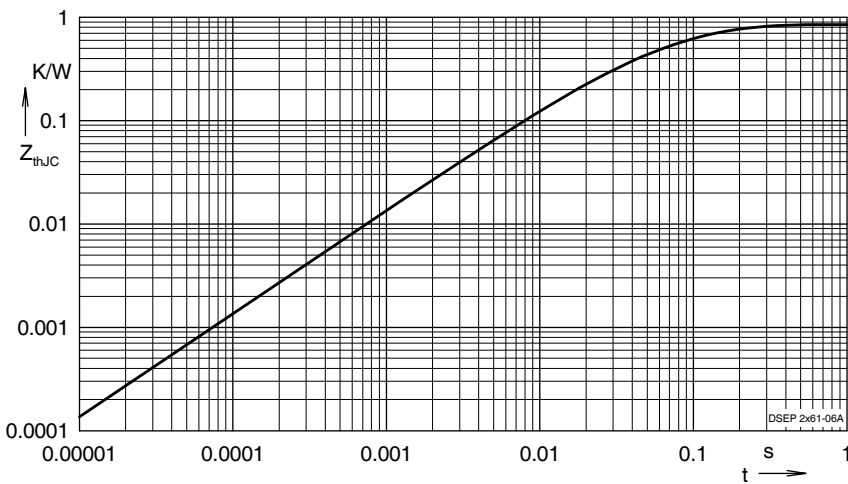


Fig. 24 Transient thermal resistance junction to case

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