

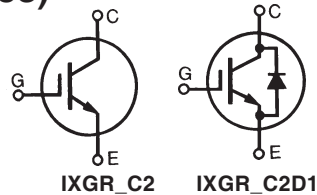
# HiPerFAST™ IGBT ISOPLUS247™

IXGR 60N60C2  
IXGR 60N60C2D1

## Lightspeed 2™ Series (Electrically Isolated Back Surface)

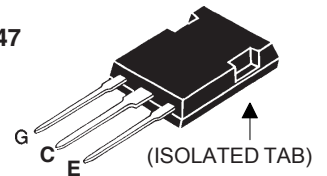
$V_{CES} = 600 \text{ V}$   
 $I_{C25} = 75 \text{ A}$   
 $V_{CE(sat)} = 2.7 \text{ V}$   
 $t_{fi(typ)} = 35 \text{ ns}$

Preliminary Data Sheet



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)	75	A
$I_{C110}$	$T_C = 110^\circ\text{C}$	48	A
$I_{F110}$	$T_C = 110^\circ\text{C}$ (IXGR60N60C2D1)	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
$P_c$	$T_C = 25^\circ\text{C}$	250	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

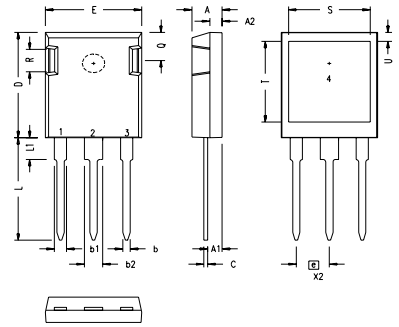
### Advantages

- 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.
$BV_{CES}$	$I_C = 1 \text{ mA}$ , $V_{GE} = 0 \text{ V}$	600		V
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$ , $V_{CE} = V_{GE}$	3.0	5.0	V
$I_{CES}$	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$			$\mu\text{A}$
				GR60N60C2 GR60N60C2D1
			50 650	$\mu\text{A}$
$I_{GES}$	$V_{CE} = 0 \text{ V}$ , $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 50 \text{ A}$ , $V_{GE} = 15 \text{ V}$ Note 1		$T_J = 25^\circ\text{C}$ $T_J = 125^\circ\text{C}$	V
			2.3 2.0	V

Symbol	Test Conditions	Characteristic Values ( $T_J = 25^\circ\text{C}$ , unless otherwise specified)		
		Min.	Typ.	Max.
$g_{fs}$	$I_C = 50\text{ A}$ ; $V_{CE} = 10\text{ V}$ , Note 1	40	55	S
$C_{ies}$	$V_{CE} = 25\text{ V}$ , $V_{GE} = 0\text{ V}$ , $f = 1\text{ MHz}$	60N60C2 60N60C2D1	3900	pF
$C_{oes}$			280	pF
$C_{res}$			97	pF
$Q_g$	$I_C = 50\text{ A}$ , $V_{GE} = 15\text{ V}$ , $V_{CE} = 0.5 V_{CES}$		140	nC
$Q_{ge}$			28	nC
$Q_{gc}$			35	nC
$t_{d(on)}$	<b>Inductive load, <math>T_J = 25^\circ\text{C}</math></b> $I_C = 50\text{ A}$ , $V_{GE} = 15\text{ V}$ $V_{CE} = 400\text{ V}$ , $R_G = R_{off} = 2.0\ \Omega$		18	ns
$t_{ri}$			25	ns
$t_{d(off)}$			95	150 ns
$t_{fi}$			35	ns
$E_{off}$			0.49	0.8 mJ
$t_{d(on)}$			<b>Inductive load, <math>T_J = 125^\circ\text{C}</math></b> $I_C = 50\text{ A}$ , $V_{GE} = 15\text{ V}$ $V_{CE} = 400\text{ V}$ , $R_G = R_{off} = 2.0\ \Omega$	
$t_{ri}$	25	ns		
$E_{on}$	1.6	mJ		
$t_{d(off)}$	130	ns		
$t_{fi}$	80	ns		
$E_{off}$	0.92	mJ		
$R_{thJ-DCB}$	(Note 2)	0.25	K/W	
$R_{thJC}$	(Note 3)	0.50	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
$I_{RM}$	$I_F = 60\text{ A}$ , $V_{GE} = 0\text{ V}$ , $-di_F/dt = 100\text{ A}/\mu\text{s}$ , $T_J = 100^\circ\text{C}$ $V_R = 100\text{ V}$			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

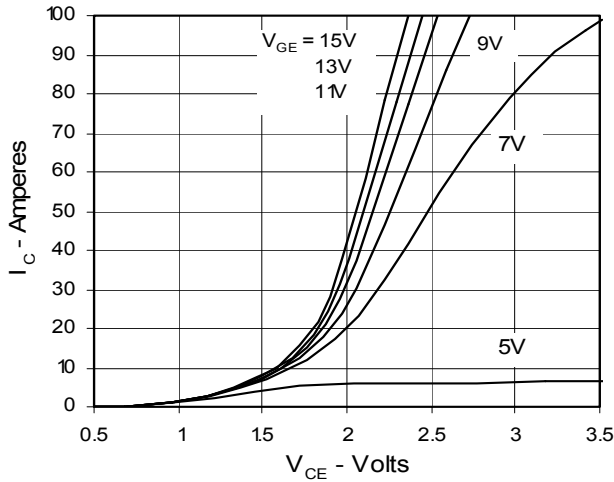
Note 1: Pulse test,  $t \leq 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$

- 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

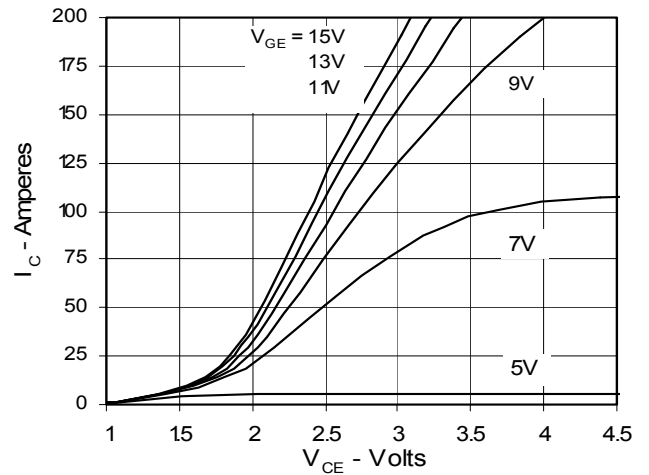
IXYS reserves the right to change limits, test conditions, and dimensions.

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

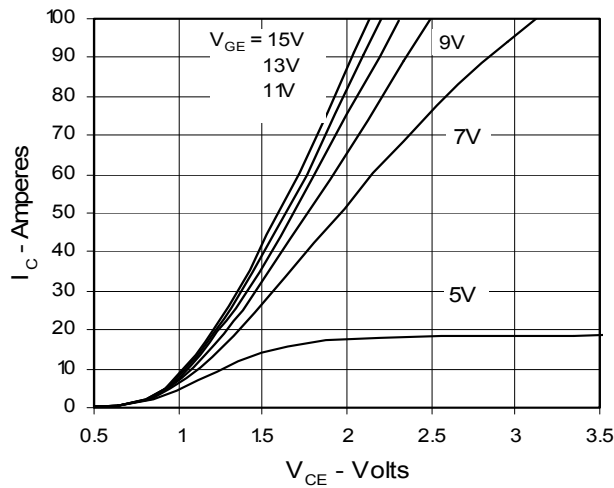
**Fig. 1. Output Characteristics**  
@ 25 Deg. C



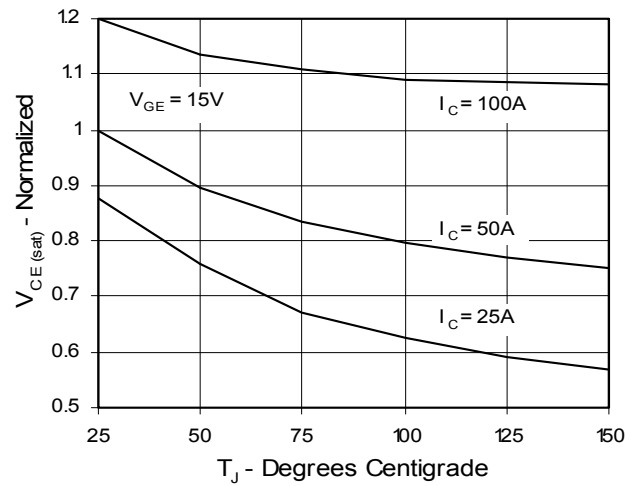
**Fig. 2. Extended Output Characteristics**  
@ 25 deg. C



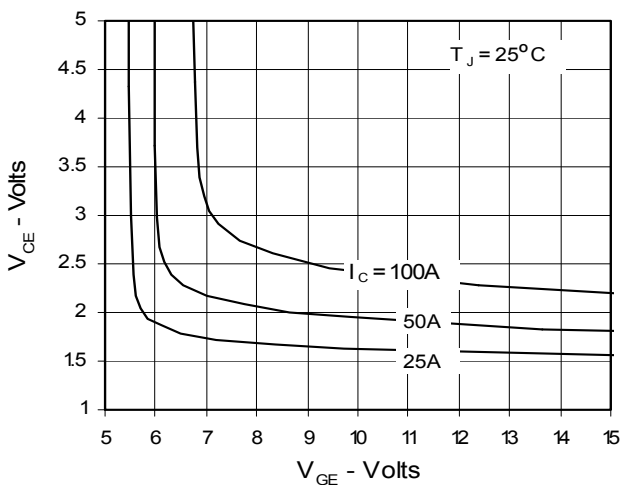
**Fig. 3. Output Characteristics**  
@ 125 Deg. C



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



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



**Fig. 6. Input Admittance**

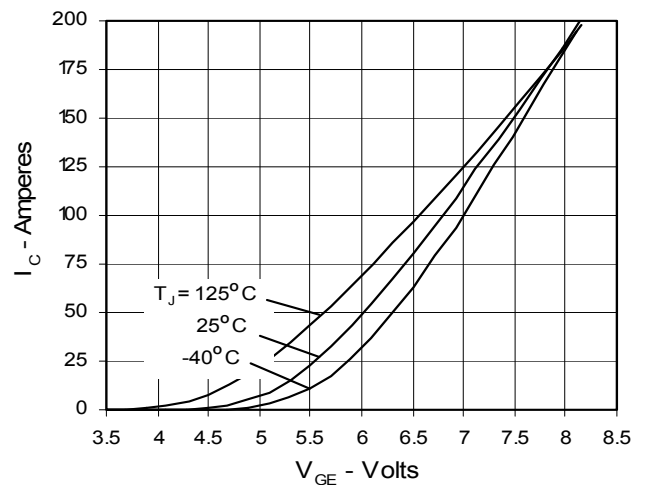


Fig. 7. Transconductance

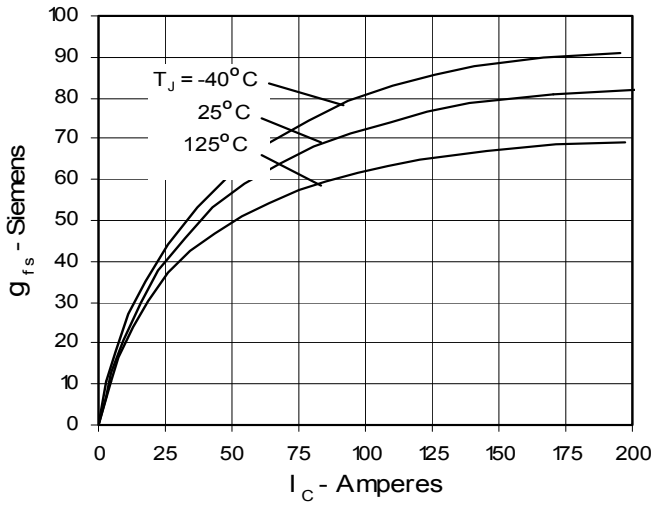


Fig. 8. Dependence of  $E_{off}$  on  $R_G$

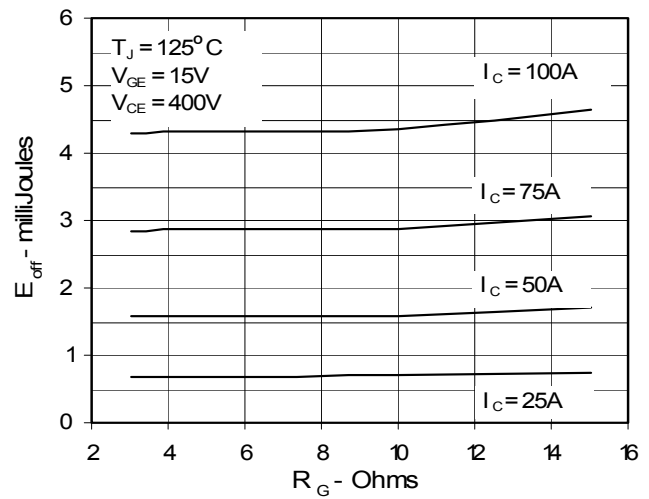


Fig. 9. Dependence of  $E_{off}$  on  $I_C$

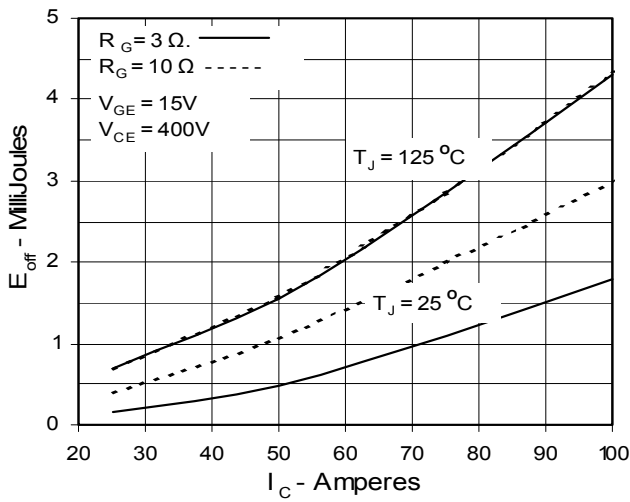


Fig. 10. Dependence of  $E_{off}$  on Temperature

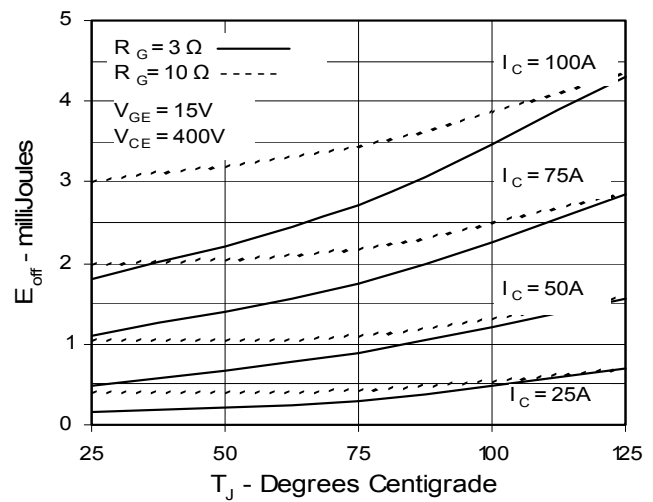


Fig. 11. Gate Charge

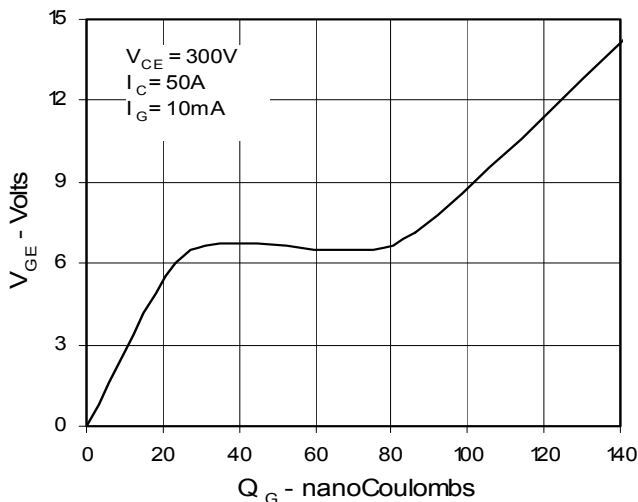


Fig. 12. Capacitance

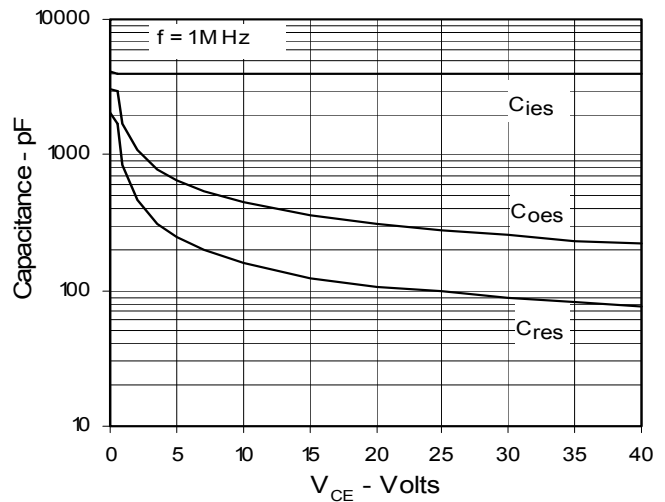
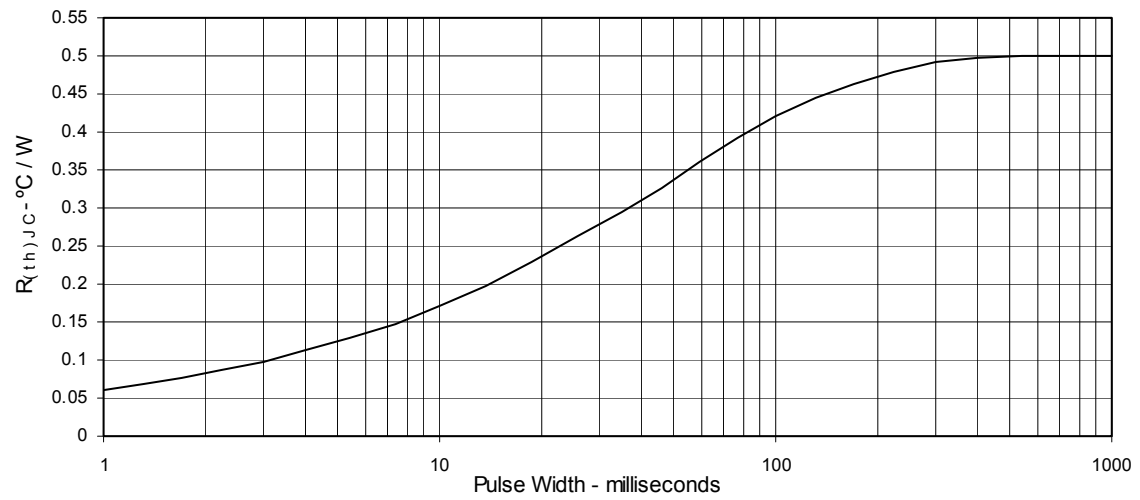


Fig. 13. Maximum Transient Thermal Resistance



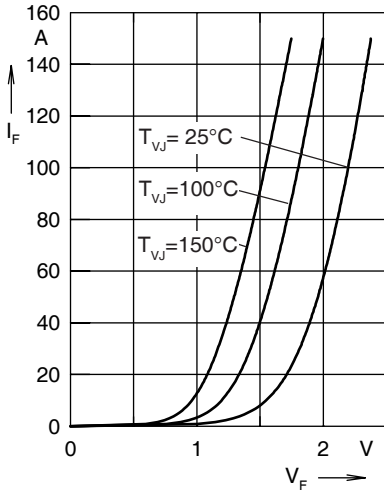


Fig. 14. Forward current  $I_F$  versus  $V_F$

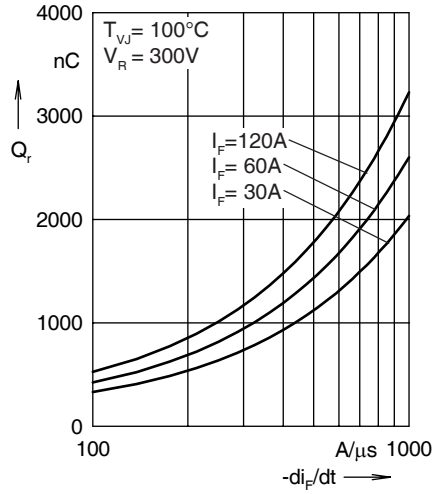


Fig. 15. Reverse recovery charge  $Q_r$  versus  $-di_F/dt$

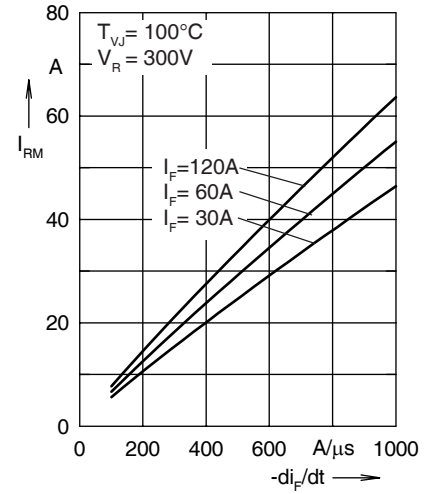


Fig. 16. Peak reverse current  $I_{RM}$  versus  $-di_F/dt$

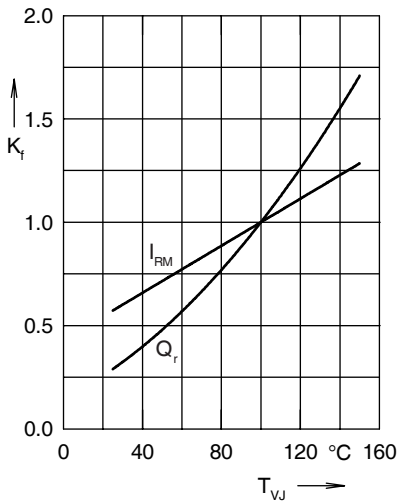


Fig. 17. Dynamic parameters  $Q_r$ ,  $I_{RM}$  versus  $T_{VJ}$

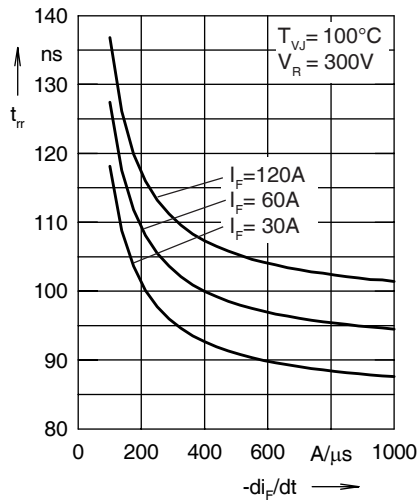


Fig. 18. Recovery time  $t_{rr}$  versus  $-di_F/dt$

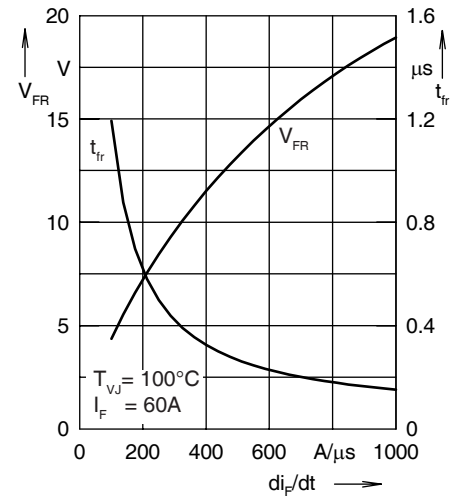


Fig. 19. Peak forward voltage  $V_{FR}$  and  $t_{fr}$  versus  $di_F/dt$

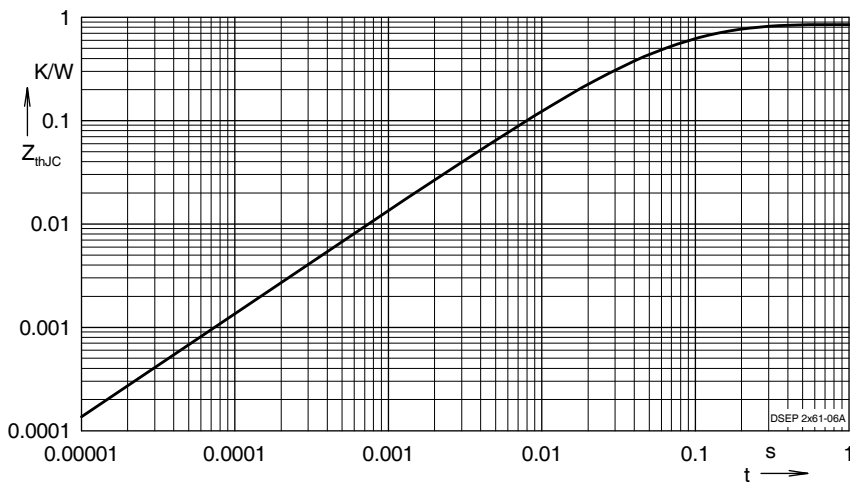


Fig. 20. Transient thermal resistance junction to case

Constants for  $Z_{thJC}$  calculation:

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