

HiPerFAST™ IGBT

ISOPLUS247™

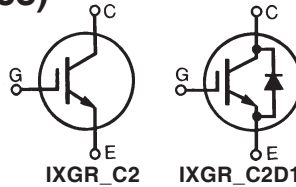
C2-Class High Speed IGBTs

(Electrically Isolated Back Surface)

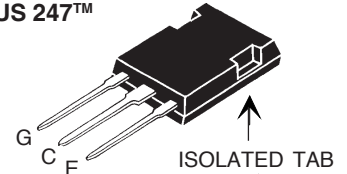
IXGR 40N60C2
IXGR 40N60C2D1

$V_{CES} = 600 \text{ V}$
 $I_{C25} = 56 \text{ A}$
 $V_{CE(SAT)} = 2.7 \text{ V}$
 $t_{fi(typ)} = 32 \text{ ns}$

Preliminary Data Sheet



ISOPLUS 247™ (IXGR)



G = Gate C = Collector
E = Emitter

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	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	56	A
I_{C110}	$T_C = 110^\circ\text{C}$	26	A
I_{D110}	$T_C = 110^\circ\text{C}$ (40N60C2D1)	27	A
I_{CM}	$T_C = 25^\circ\text{C}, 1 \text{ ms}$	200	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}, T_{VJ} = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load @ $V_{CE} \leq 600 \text{ V}$	$I_{CM} = 80$	A
P_C	$T_C = 25^\circ\text{C}$	170	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
Maximum Lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	$^\circ\text{C}$
V_{ISOL}	50/60 Hz, RMS, $t = 1 \text{ minute}, I_{ISOL} < 1 \text{ mA}$	2500	V~
F_C	Mounting force	20..120/4.5..25	N/lb.
Weight		4	g

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

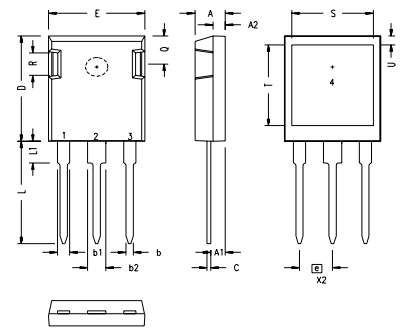
- Uninterruptible power supplies (UPS)
- Switched-mode and resonant-mode power supplies
- AC motor speed control
- DC servo and robot drives
- DC choppers

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}	$I_C = 250 \mu\text{A}, V_{GE} = 0 \text{ V}$	600		V
$V_{GE(th)}$	$I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$	3.0		V
I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0 \text{ V}$			40N60C2: 50 μA 40N60C2/D1: 100 μA
I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 30 \text{ A}, V_{GE} = 15 \text{ V}$		$T_J = 25^\circ\text{C}: 2.2$ $T_J = 125^\circ\text{C}: 2.0$	2.7 V

Symbol	Test Conditions	Characteristic Values		
		(T _J = 25°C unless otherwise specified)		
		min.	typ.	max.
g_{fs}	I _C = 30 A; V _{CE} = 10 V, Pulse test, t ≤ 300 μs, duty cycle ≤ 2 %	20	36	S
C_{ies}	V _{CE} = 25 V, V _{GE} = 0 V, f = 1 MHz	40N60C2 40N60C2D1	2500	pF
C_{oes}			180	pF
C_{res}			220	pF
Q_g	I _C = 30 A, V _{GE} = 15 V, V _{CE} = 0.5 V _{CES}	95	nC	
Q_{ge}		14	nC	
Q_{gc}		36	nC	
t_{d(on)}	Inductive load, T_J = 25°C I _C = 30 A, V _{GE} = 15 V V _{CE} = 400 V, R _G = R _{off} = 3 Ω	18	ns	
t_{ri}		20	ns	
t_{d(off)}		90	140 ns	
t_{fi}		32	ns	
E_{off}		0.20	0.37 mJ	
t_{d(on)}	Inductive load, T_J = 125°C I _C = 30 A, V _{GE} = 15 V V _{CE} = 400 V, R _G = R _{off} = 3 Ω	18	ns	
t_{ri}		20	ns	
E_{on}		40N60C2 40N60C2D1	0.3	mJ
t_{d(off)}		130	ns	
t_{fi}		80	240 ns	
E_{off}	0.50	mJ		
R_{thJ-DCB}	(Note 1)	0.26	K/W	
R_{thJC}	(Note 2)		0.74 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°C unless otherwise specified)		
		min.	typ.	max.
V_F	I _F = 30 A, V _{GE} = 0 V, Pulse test t ≤ 300 μs, duty cycle d ≤ 2 %	T _J = 150°C T _J = 25°C		1.6 V 2.5 V
I_{RM}	I _F = 30 A, V _{GE} = 0 V, -di _F /dt = 100 A/μs, T _J = 100°C V _R = 100 V		100	4 A
t_{rr}			25	ns
t_{rr}		I _F = 1 A; -di/dt = 100 A/μs; V _R = 30 V		
R_{thJC}				1.5 K/W
R_{thCS}		0.15		K/W

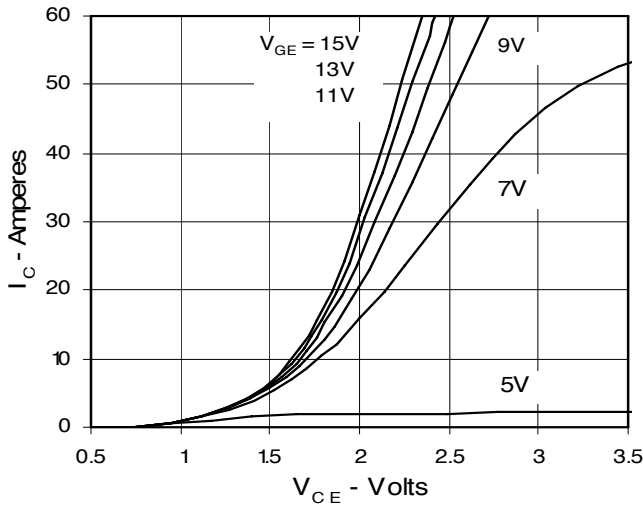
Notes:

- R_{thJ-DCB} is the thermal resistance junction-to-internal side of DCB substrate
- R_{thJC} is the thermal resistance junction-to-external side of DCB substrate

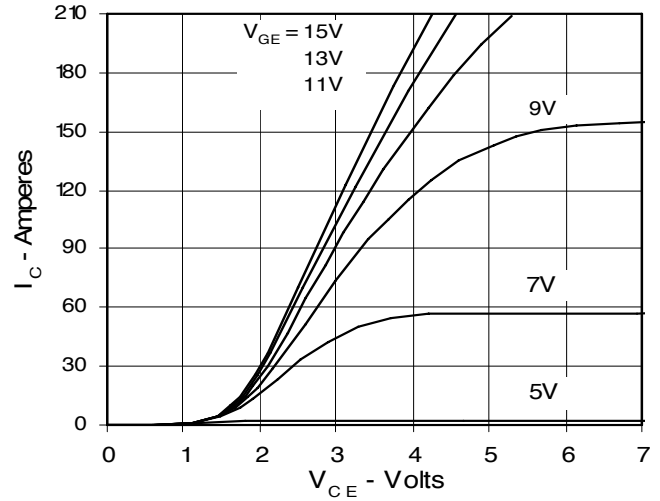
IXYS reserves the right to change limits, test conditions, and dimensions.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	4,835,592	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	6,771,478 B2

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



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



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

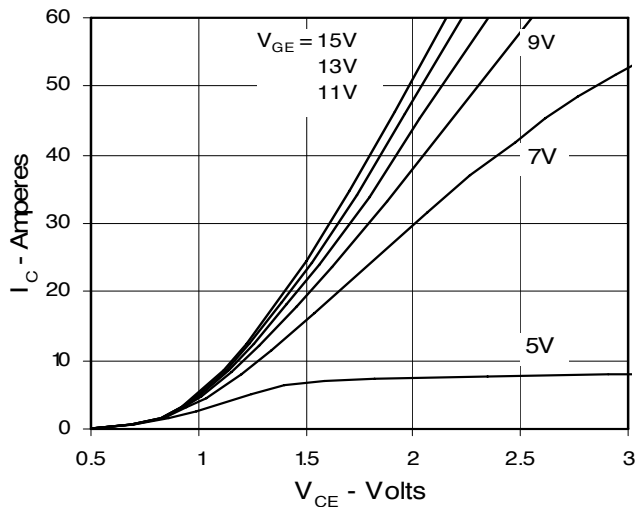
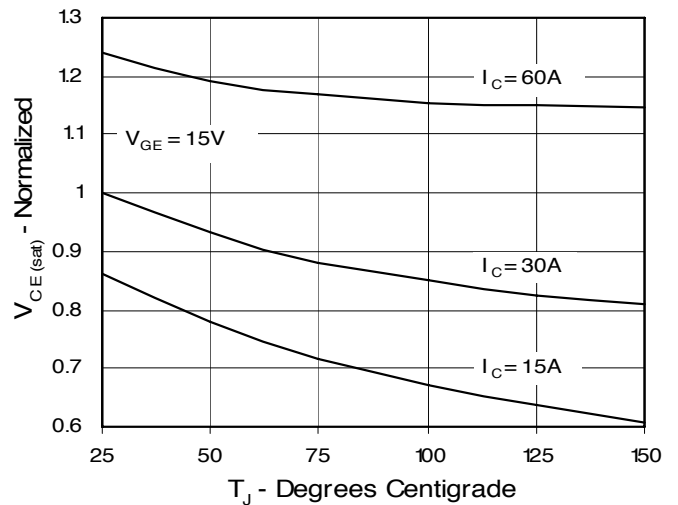


Fig. 4. Temperature Dependence of $V_{CE(sat)}$



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

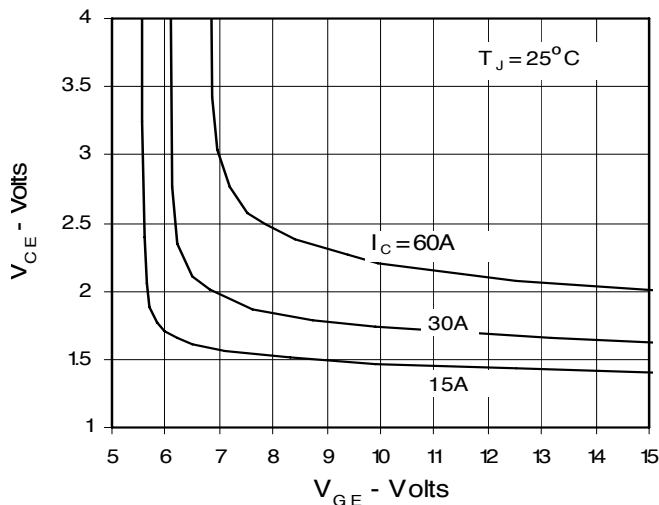


Fig. 6. Input Admittance

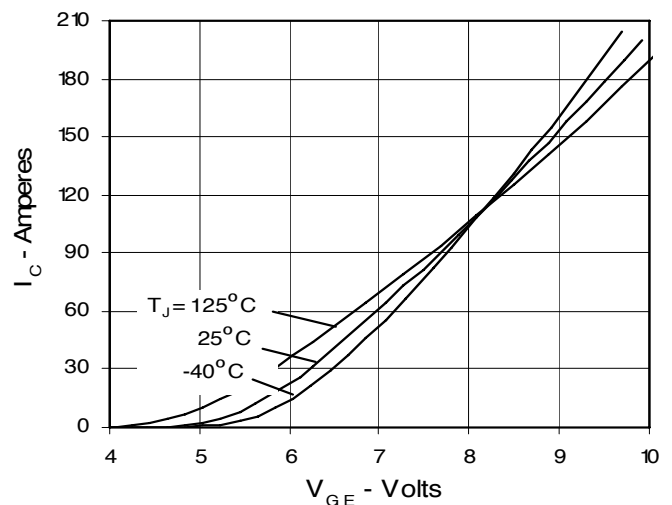


Fig. 7. Transconductance

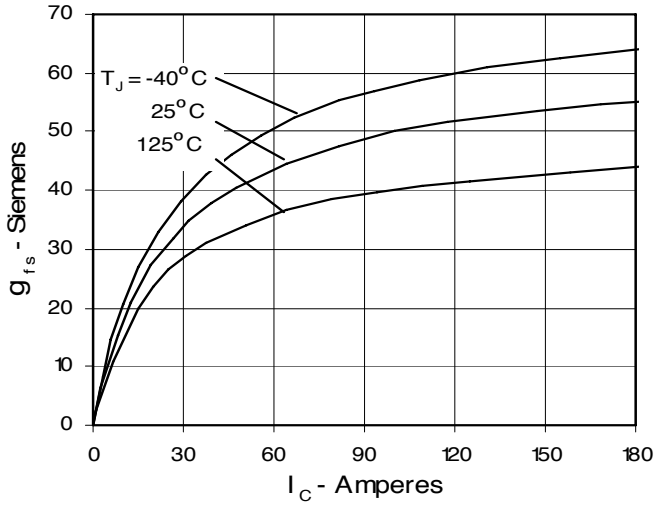


Fig. 8. Dependence of E_{off} on R_G

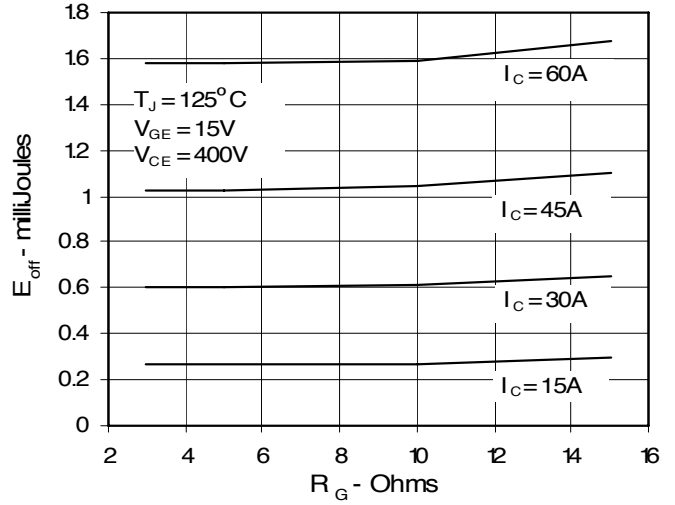


Fig. 9. Dependence of E_{off} on I_C

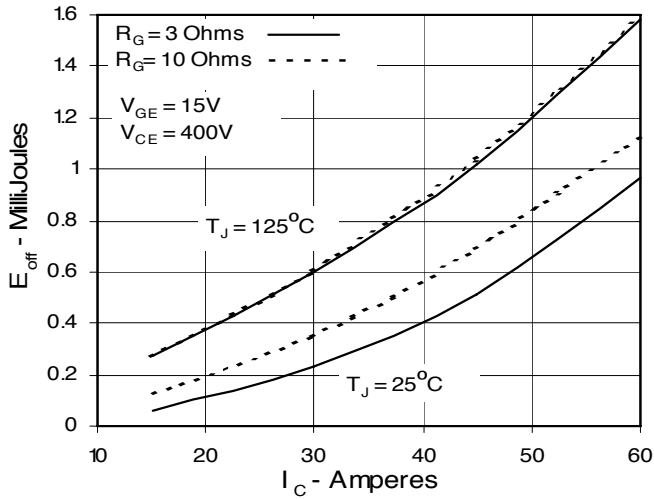


Fig. 10. Dependence of E_{off} on Temperature

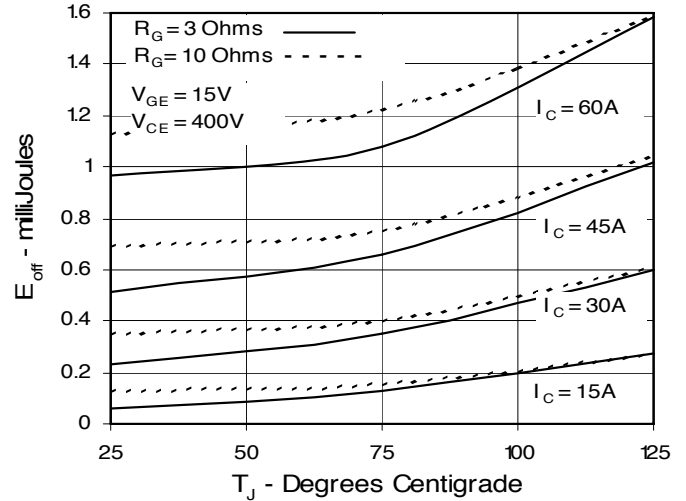


Fig. 11. Gate Charge

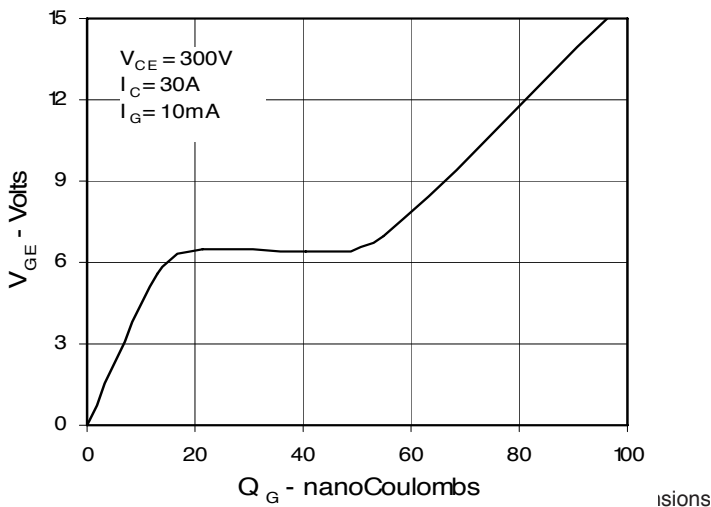


Fig. 12. Capacitance

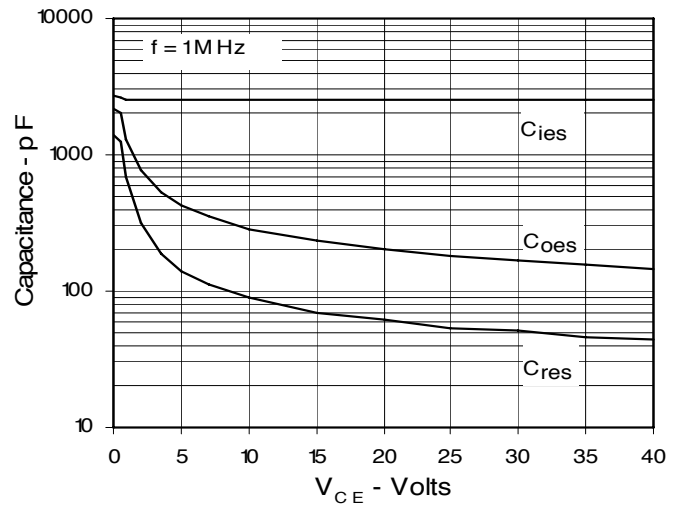
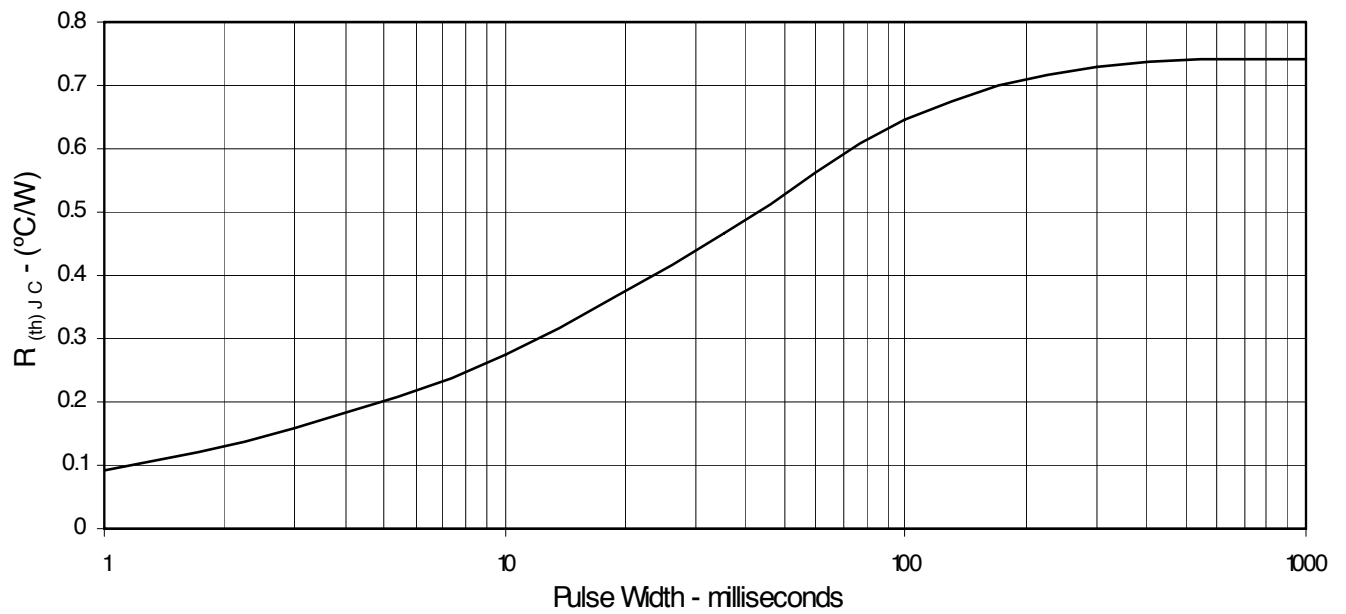


Fig. 13. Maximum Transient Thermal Resistance



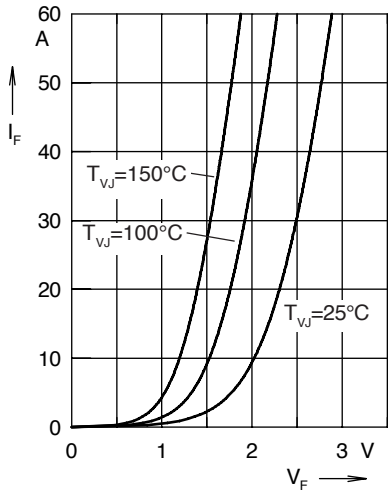


Fig. 14. Forward current I_F versus V_F

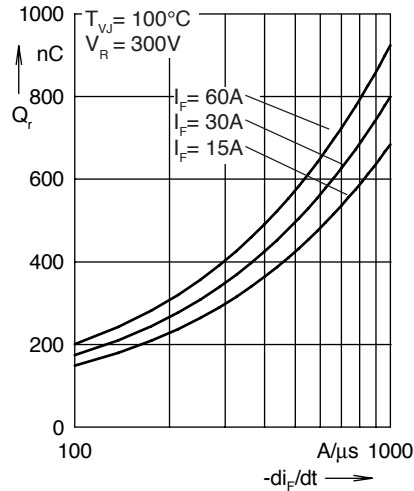


Fig. 15. Reverse recovery charge Q_r versus $-di_F/dt$

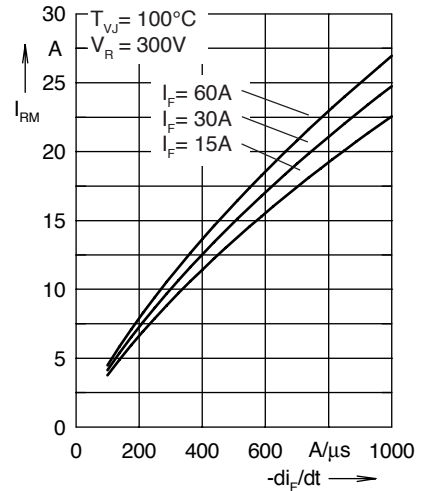


Fig. 16. Peak reverse current I_{RM} versus $-di_F/dt$

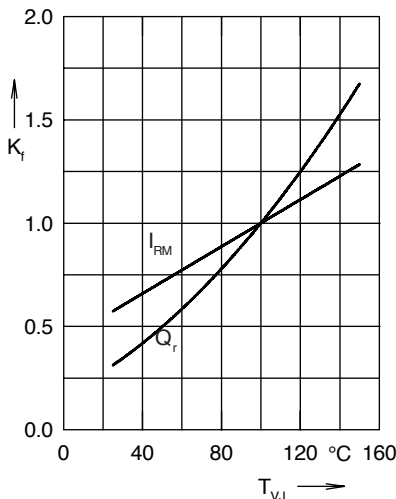


Fig. 17. Dynamic parameters Q_r , I_{RM} versus T_{VJ}

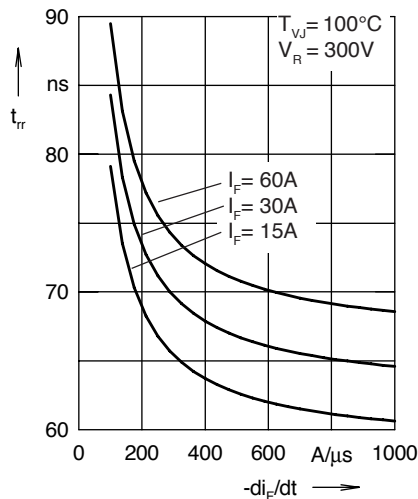


Fig. 18. Recovery time t_{rr} versus $-di_F/dt$

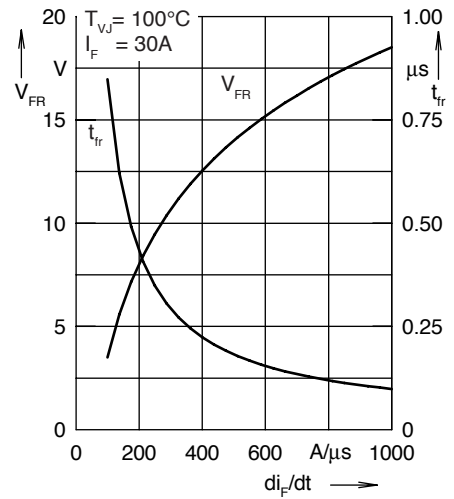


Fig. 19. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

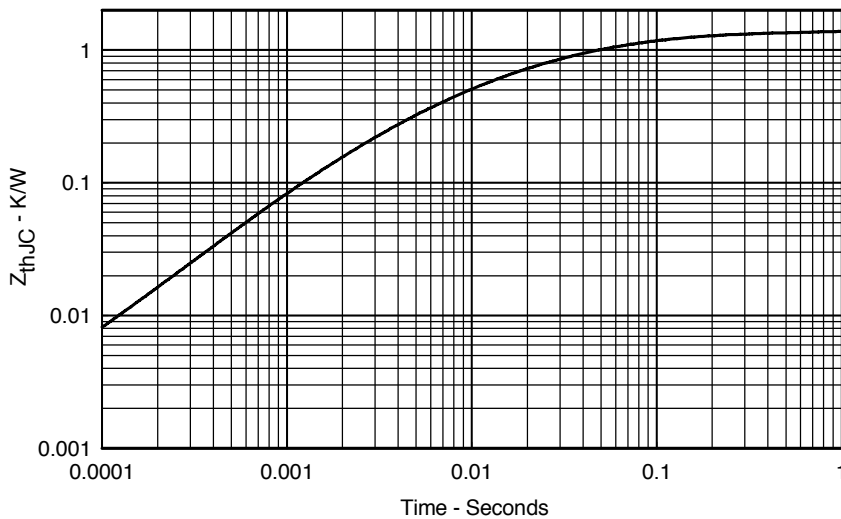


Fig. 20. Transient thermal resistance junction to case