

HiPerFAST™ IGBT with Fast Diode

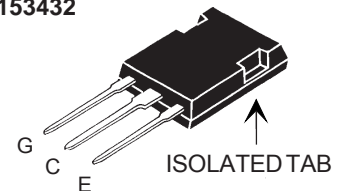
IXGR 50N90B2D1

B2-Class High Speed IGBT with Fast Diode

(Electrically Isolated Back Surface)


$$\begin{aligned} V_{CES} &= 900 \text{ V} \\ I_{C25} &= 40 \text{ A} \\ V_{CE(sat)} &= 2.9 \text{ V} \\ t_{fi typ} &= 200 \text{ ns} \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C}$ to 150°C	900	V
V_{CGR}	$T_J = 25^\circ\text{C}$ to 150°C ; $R_{GE} = 1 \text{ M}\Omega$	900	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	40	A
I_{C110}	$T_C = 110^\circ\text{C}$ (IGBT)	19	A
I_{F110}	$T_C = 110^\circ\text{C}$ (diode)	22	A
I_{CM}	$T_C = 25^\circ\text{C}$, 1 ms	200	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}$, $T_{VJ} = 125^\circ\text{C}$, $R_G = 10 \Omega$ Clamped inductive load @ $\leq 720 \text{ V}$	$I_{CM} = 100$	A
P_C	$T_C = 25^\circ\text{C}$	100	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, $t = 1 \text{ ms}$	2500	V
F_C	Mounting force (PLUS247)	20..120 / 4.5..25	N/lb
Weight		ISOPLUS247 5	g

ISOPLUS247 (IXGR)
E153432


G = Gate C = Collector
E = Emitter TAB = Collector

Features

- Electrically isolated tab
- International standard package outline
- High current handling capability
- MOS Gate turn-on
- Drive simplicity
- Rugged NPT structure
- UL recognized
- Molding epoxies meet UL 94 V-0 flammability classification

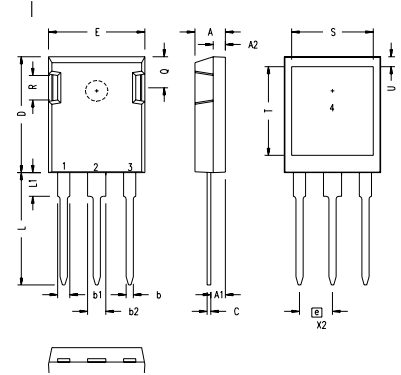
Applications

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

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$ unless otherwise specified)	Characteristic Values		
		Min.	Typ.	Max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$, $V_{CE} = V_{GE}$	3.0		5.0 V
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$ $T_J = 150^\circ\text{C}$			50 μA 1 mA
I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_T$, $V_{GE} = 15 \text{ V}$, Note 1, 2 $T_J = 125^\circ\text{C}$		2.2	2.9 V

Symbol	Test Conditions	Characteristic Values		
		Min.	Typ.	Max.
g_{fs}	$I_C = I_T; V_{CE} = 10 \text{ V, Note 1, 2}$	25	40	S
C_{ies}	$V_{CE} = 25 \text{ V, } V_{GE} = 0 \text{ V, } f = 1 \text{ MHz}$		2500	pF
C_{oes}			180	pF
C_{res}			75	pF
Q_g	$I_C = I_T, V_{GE} = 15 \text{ V, } V_{CE} = 0.5 V_{CES}$		135	nC
Q_{ge}			23	nC
Q_{gc}			50	nC
$t_{d(on)}$	Inductive load		20	ns
t_{ri}	$I_C = I_T, V_{GE} = 15 \text{ V}$		28	ns
$t_{d(off)}$	$V_{CE} = 720 \text{ V, } R_G = R_{off} = 5 \Omega$	350	500	ns
t_{fi}	Note 2	200		ns
E_{off}		4.7	7.5	mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$		20	ns
t_{ri}	$I_C = I_T, V_{GE} = 15 \text{ V}$		28	ns
E_{on}	$V_{CE} = 720 \text{ V, } R_G = R_{off} = 5 \Omega,$		1.5	mJ
$t_{d(off)}$	Note 2	400		ns
t_{fi}		420		ns
E_{off}		8.7		mJ
R_{thJC}				1.25 K/W
R_{thCH}		0.21		K/W

ISOPLUS247 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.

Diode

Symbol	Conditions	Characteristic Values		
		Min.	Typ.	Max.
V_F	$I_F = 30 \text{ A; Note 1}$ $T_{VJ} = 150^\circ\text{C}$	2.5	2.75	V
I_{RM}	$I_F = I_T, di_F/dt = -100 \text{ A}/\mu\text{s; } T_{VJ} = 100^\circ\text{C}$ $V_R = 100 \text{ V; } V_{GE} = 0 \text{ V}$	5.5	11.5	A
t_{rr}		200		ns
R_{thJC}	with heat transfer paste			1.1 K/W
R_{thCH}		0.25		K/W

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

Note 2: Test Current $I_T = 50 \text{ A}$

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

IXYS MOSFETs and IGBTs are covered by 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
 one or more of the following U.S. patents: 4,850,072 5,017,508 5,063,307 5,381,025 6,259,123 B1 6,534,343 6,710,405B2 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 6771478 B2

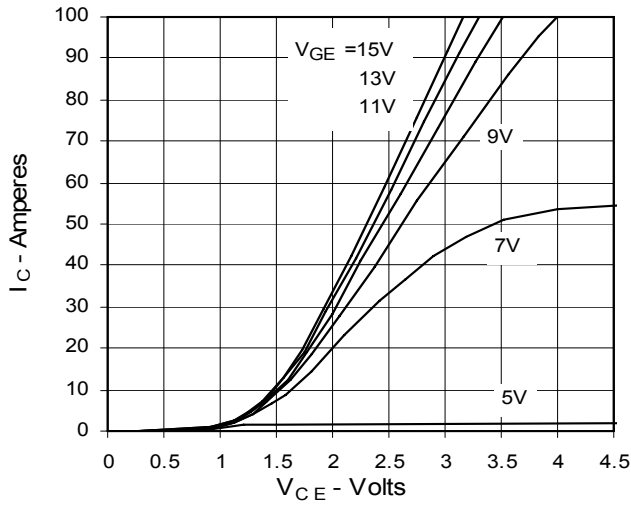
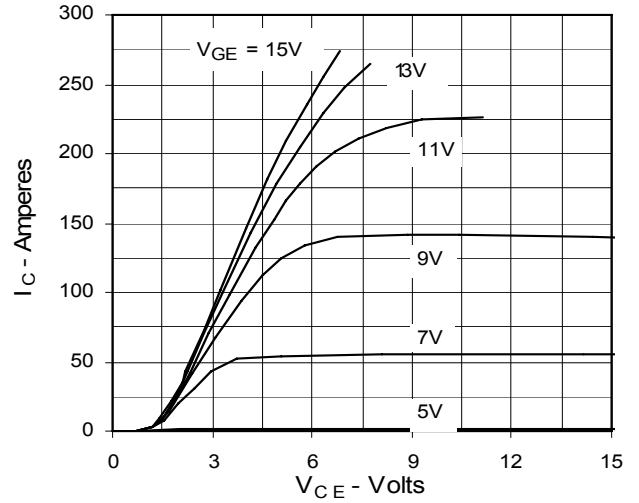
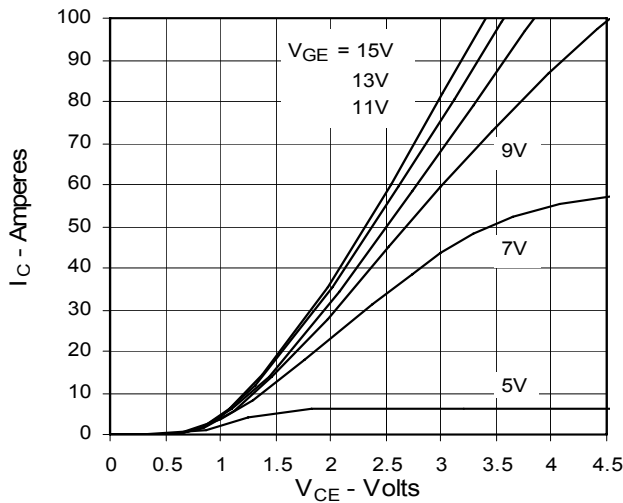
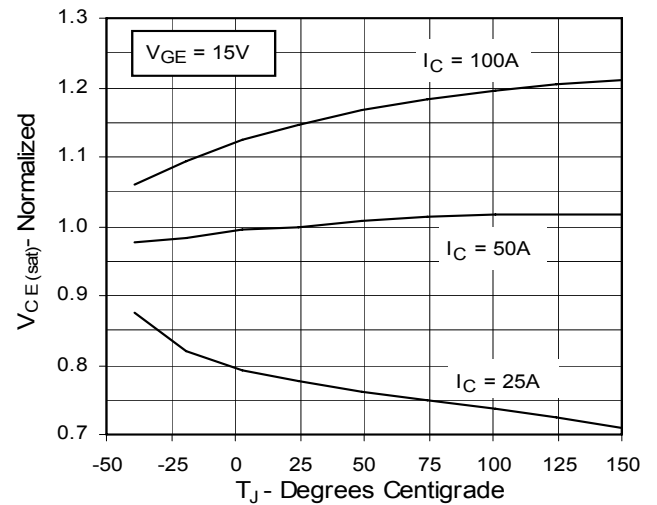
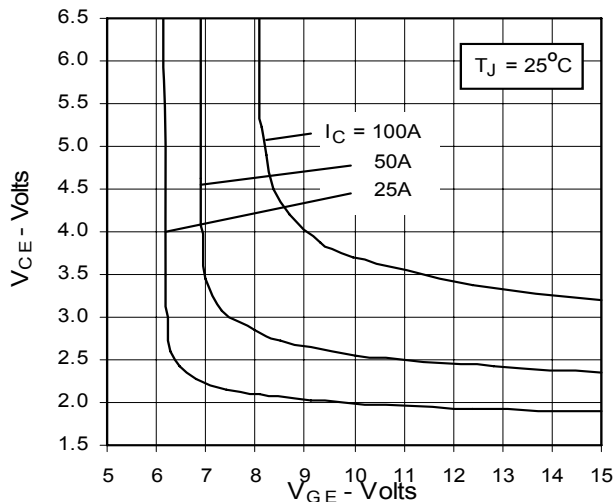
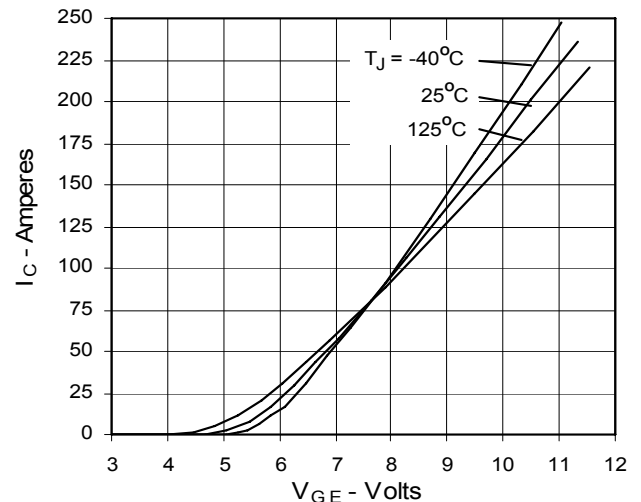
Fig. 1. Output Characteristics
@ 25 °C

Fig. 2. Extended Output Characteristics
@ 25 °C

Fig. 3. Output Characteristics
@ 125 °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


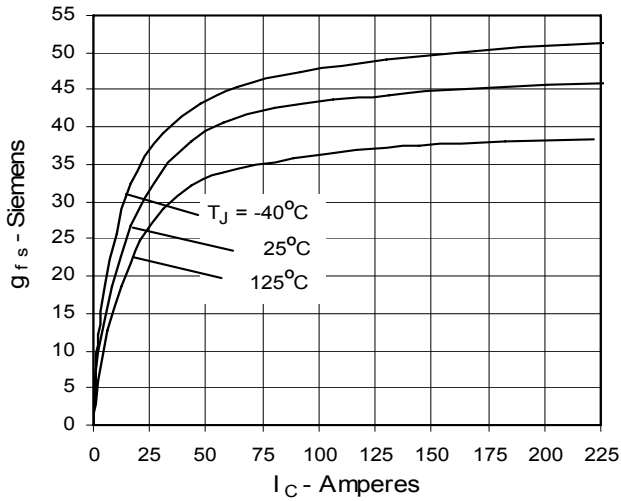
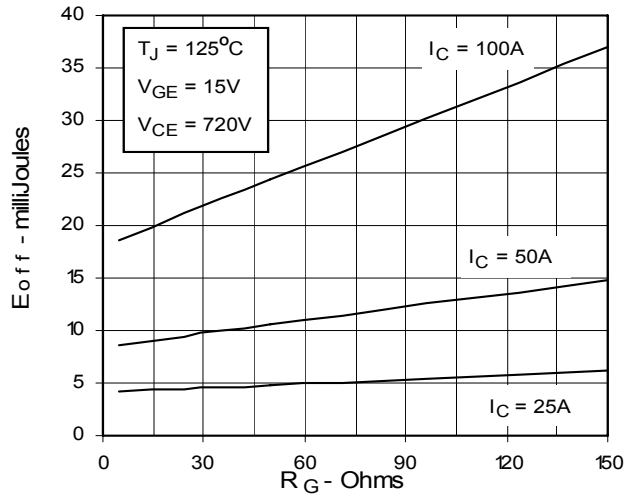
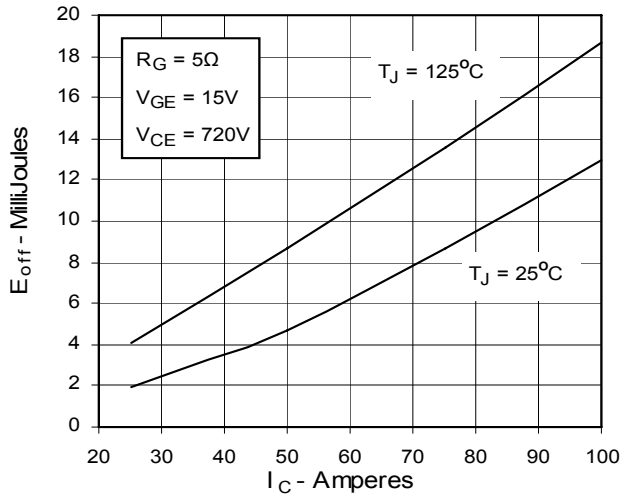
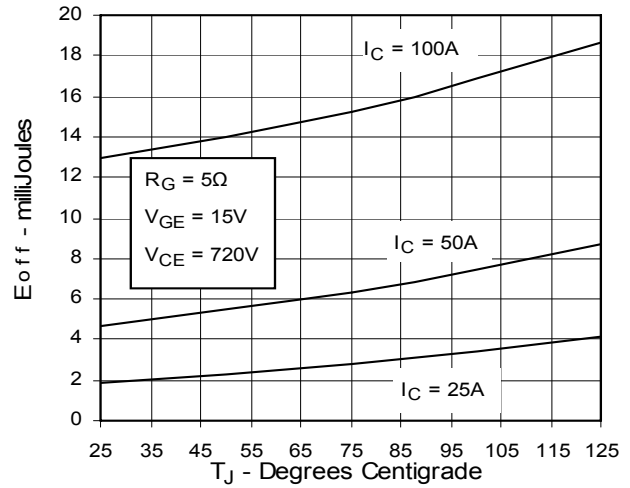
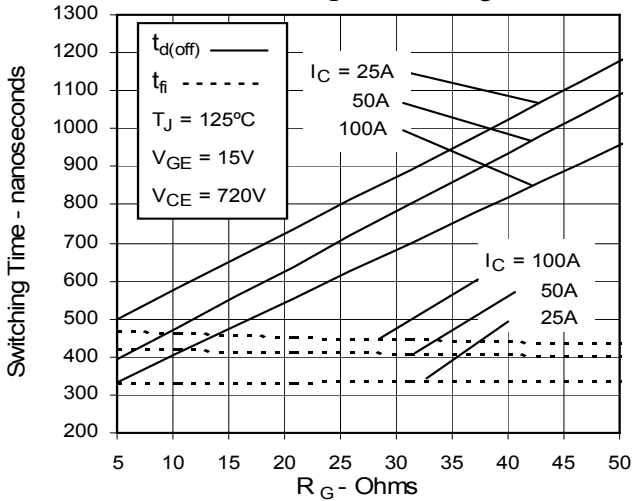
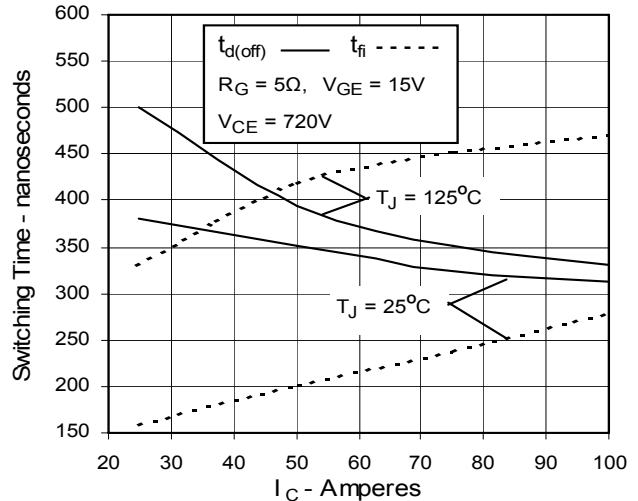
Fig. 7. Transconductance

Fig. 8. Dependence of Turn-off Energy Loss on R_G

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

Fig. 10. Dependence of Turn-off Energy Loss on Temperature

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

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


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

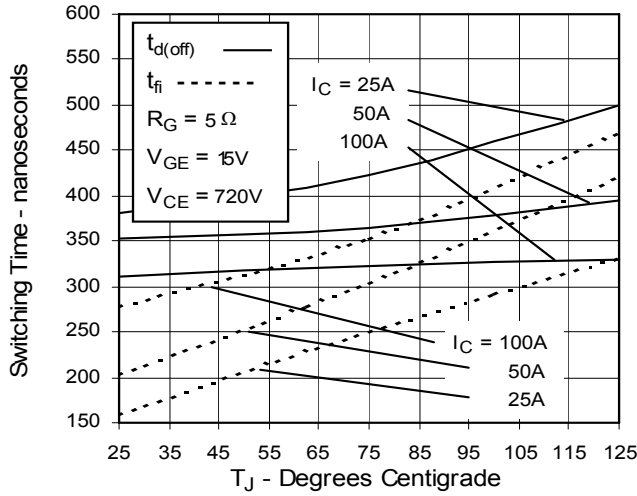


Fig. 14. Gate Charge

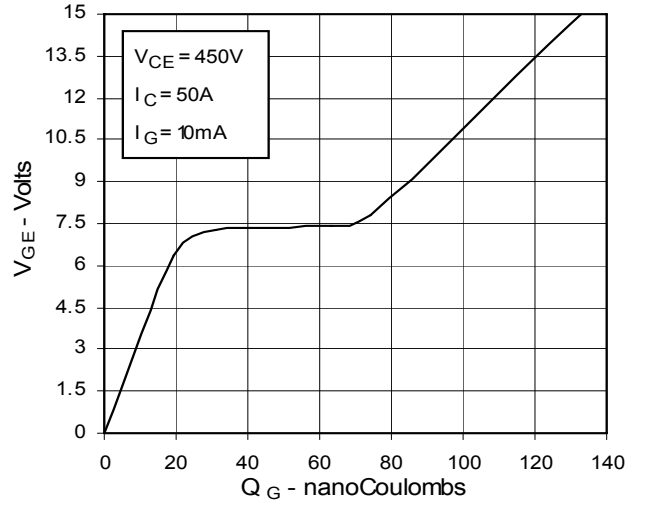


Fig. 15. Capacitance

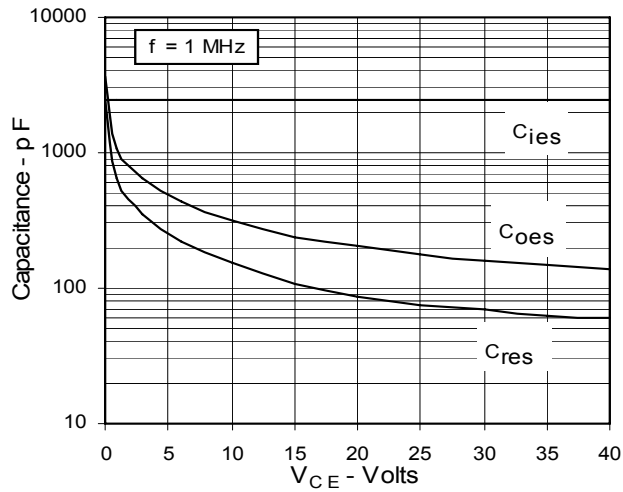


Fig. 16. Reverse-Bias Safe Operating Area

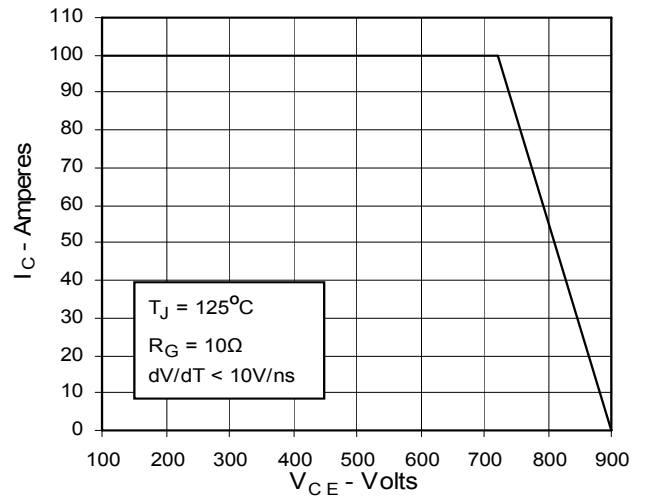
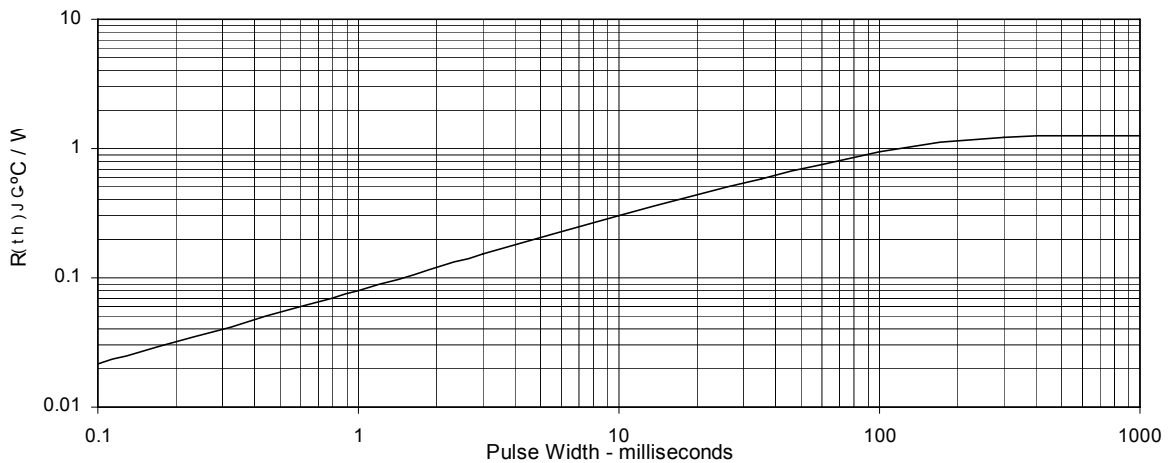


Fig. 17. Maximum Transient Thermal Resistance



Diode Curves

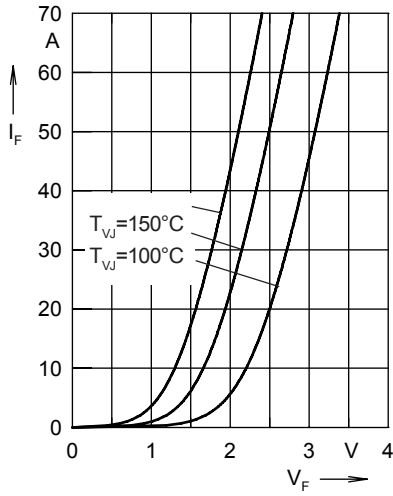


Fig. 18. Forward current I_F versus V_F

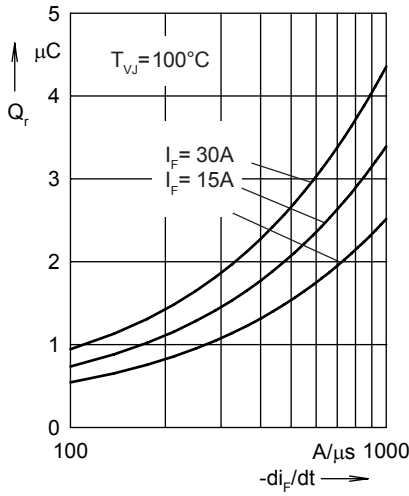


Fig. 19. Reverse recovery charge Q_r

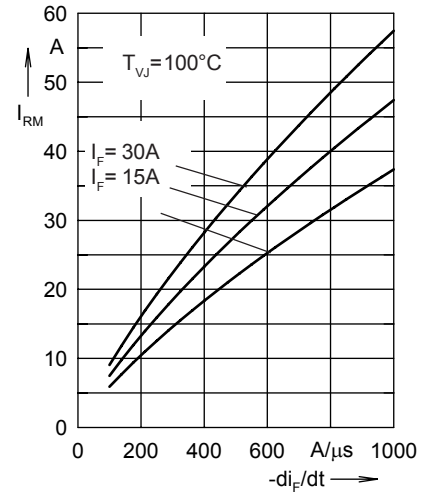


Fig. 20. Peak reverse current I_{RM}

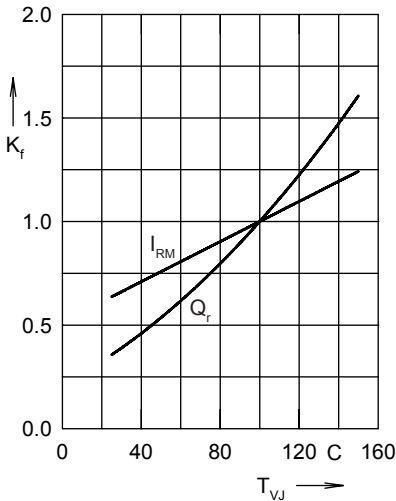


Fig. 21. Dynamic parameters Q_r, I_{RM}

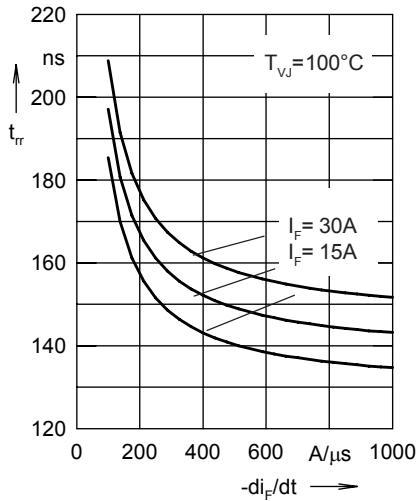


Fig. 22. Recovery time t_{tr} versus $-di_F/dt$

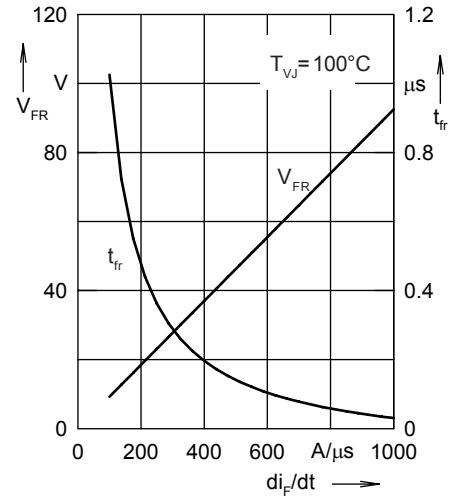


Fig. 23. Peak forward voltage V_{FR} and t_{tr}

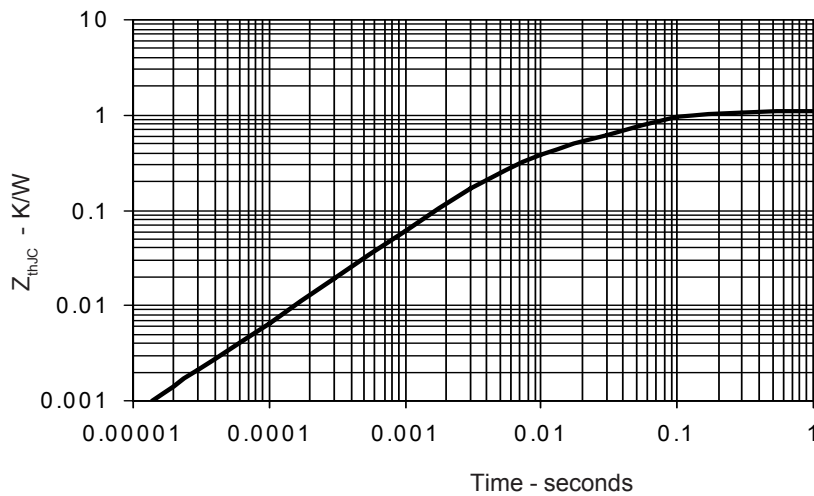


Fig. 24. Transient thermal resistance junction to case