

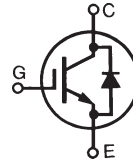
HiPerFAST™ IGBT with Fast Diode

B2-Class High Speed IGBT with Fast Diode

Preliminary Data Sheet

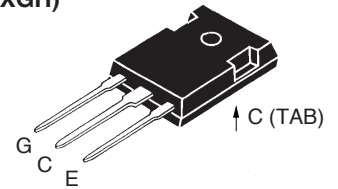
IXGH 50N90B2D1
IXGK 50N90B2D1
IXGX 50N90B2D1

$V_{CES} = 900 \text{ V}$
 $I_{C25} = 75 \text{ A}$
 $V_{CE(sat)} = 2.7 \text{ V}$
 $t_{fi typ} = 200 \text{ ns}$

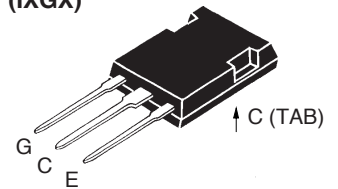


Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	900	V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	900	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$ (limited by leads)	75	A
I_{C110}	$T_C = 110^\circ\text{C}$	50	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 @ $\leq 600 \text{ V}$	$I_{CM} = 100$	A
P_C	$T_C = 25^\circ\text{C}$	400	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	$^\circ\text{C}$
M_d	Mounting torque (TO-247, TO-264)	1.13/10Nm/lb.in.	
F_C	Mounting force (PLUS247)	20..120 / 4.5..25	N/lb
Weight	TO-247	6	g
	TO-264	10	g
	PLUS247	6	g

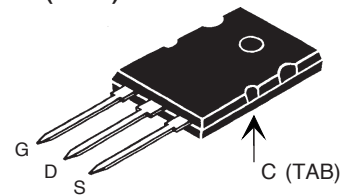
TO-247 (IXGH)



PLUS247 (IXGX)



TO-264 (IXGK)



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

Features

- High frequency IGBT
- High current handling capability
- MOS Gate turn-on
- drive simplicity

Applications

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

Advantages

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

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}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = I_{C110}, V_{GE} = 15 \text{ V}, \text{Note 1}$ $T_J = 125^\circ\text{C}$	2.2	2.7	V V

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$ unless otherwise specified)	Characteristic Values		
		min.	typ.	max.
g_{fs}	$I_C = I_{C110}; V_{CE} = 10\text{ V, Note 1}$	25	40	S
C_{ies}	$V_{CE} = 25\text{ V, } V_{GE} = 0\text{ V, } f = 1\text{ MHz}$		2500	pF
C_{oes}			205	pF
C_{res}			75	pF
Q_g	$I_C = I_{C110}, V_{GE} = 15\text{ V, } V_{CE} = 0.5 V_{CES}$		135	nC
Q_{ge}			23	nC
Q_{gc}			50	nC
$t_{d(on)}$	Inductive load $I_C = I_{C110}, V_{GE} = 15\text{ V}$ $V_{CE} = 720\text{ V, } R_G = R_{off} = 5\ \Omega$		20	ns
t_{ri}			28	ns
$t_{d(off)}$			350	500 ns
t_{fi}			200	ns
E_{off}			4.7	7.5 mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = I_{C110}, V_{GE} = 15\text{ V}$ $V_{CE} = 720\text{ V, } R_G = R_{off} = 5\ \Omega$		20	ns
t_{ri}			28	ns
E_{on}			1.5	mJ
$t_{d(off)}$			400	ns
t_{fi}			420	ns
E_{off}			8.7	mJ
R_{thJC}				0.31 K/W
R_{thCH}		0.21		K/W

Diode

Symbol	Conditions	Maximum Ratings	
I_{F25}	$T_C = 115^\circ\text{C}$	30	A

Symbol	Conditions ($T_J = 25^\circ\text{C}$ unless otherwise specified)	Characteristic Values		
		min.	typ.	max.
V_F	$I_F = 30\text{ A; Note 1}$ $T_{VJ} = 150^\circ\text{C}$		2.5 1.8	2.75 V V
I_{RM} t_{rr}	$I_F = 10\text{ A; } di_F/dt = -100\text{ A}/\mu\text{s; } T_{VJ} = 100^\circ\text{C}$ $V_R = 100\text{ V; } V_{GE} = 0\text{ V}$		5.5 200	11.5 A ns
R_{thJC} R_{thCH}	with heat transfer paste		0.25	0.9 K/W K/W

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

Fig. 1. Output Characteristics
@ 25 °C

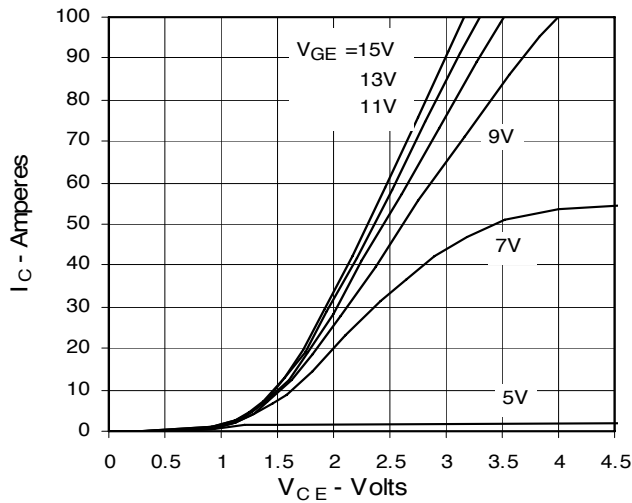


Fig. 2. Extended Output Characteristics
@ 25 °C

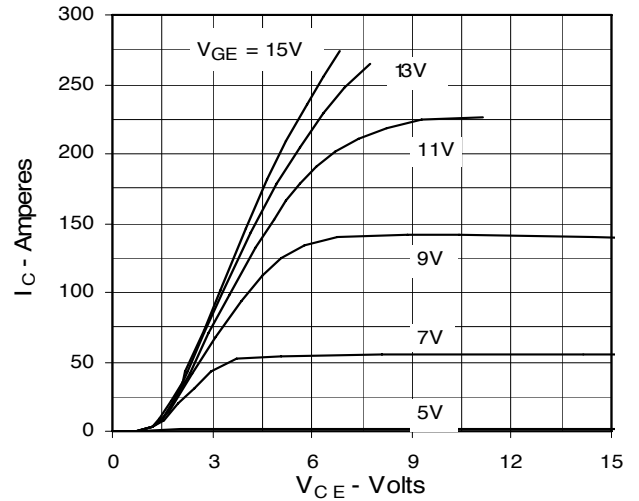


Fig. 3. Output Characteristics
@ 125 °C

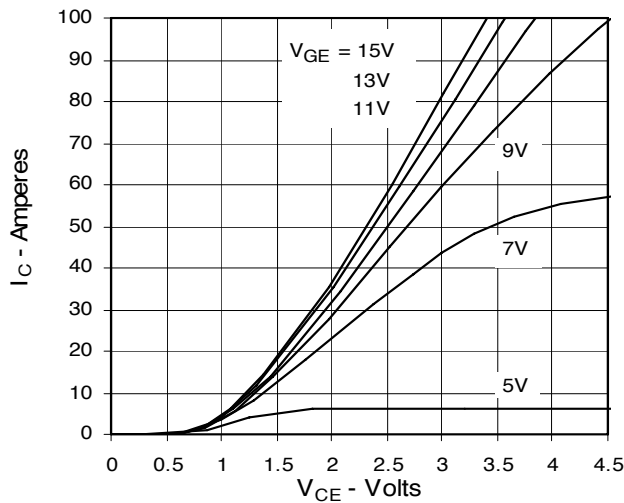


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

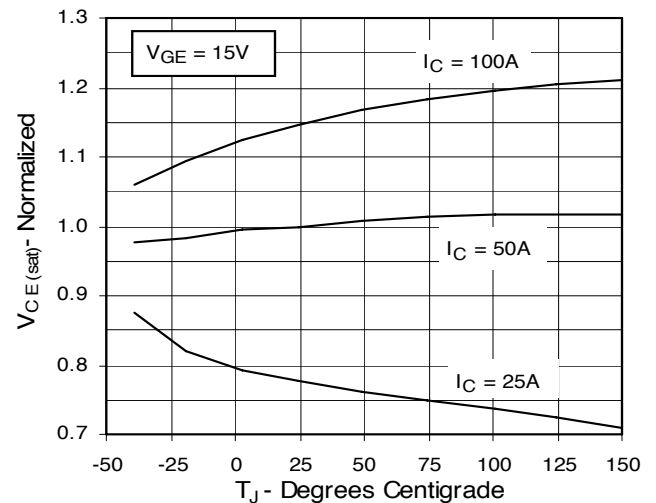


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

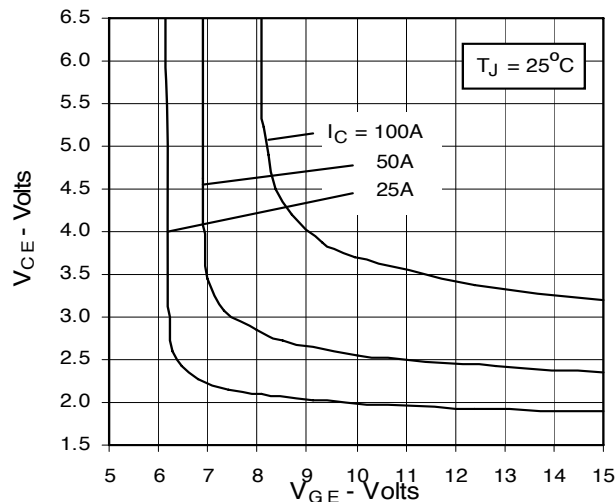


Fig. 6. Input Admittance

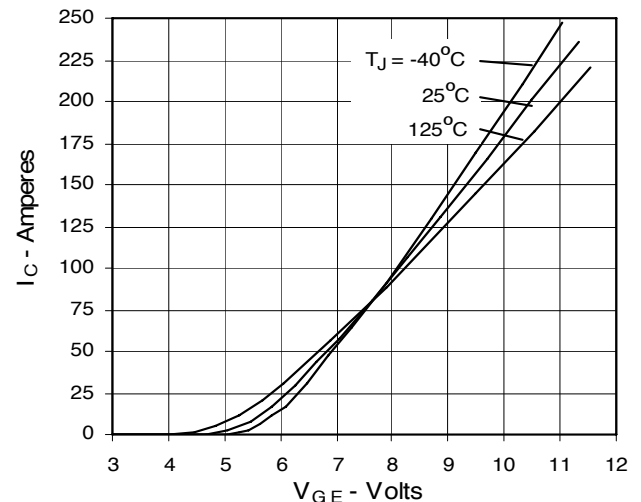


Fig. 7. Transconductance

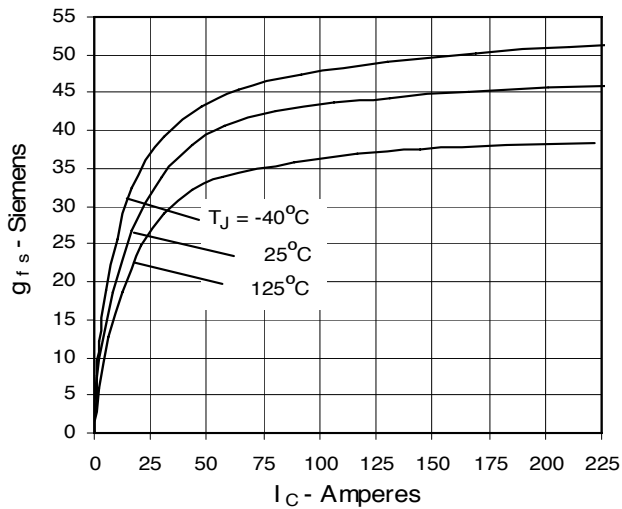


Fig. 8. Dependence of Turn-off Energy Loss on R_G

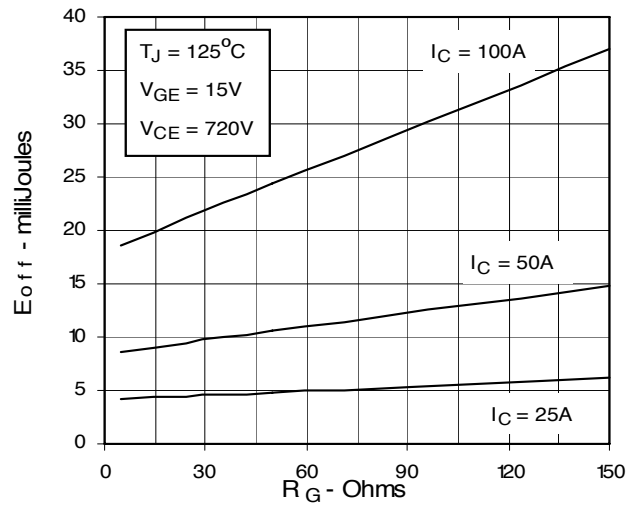


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

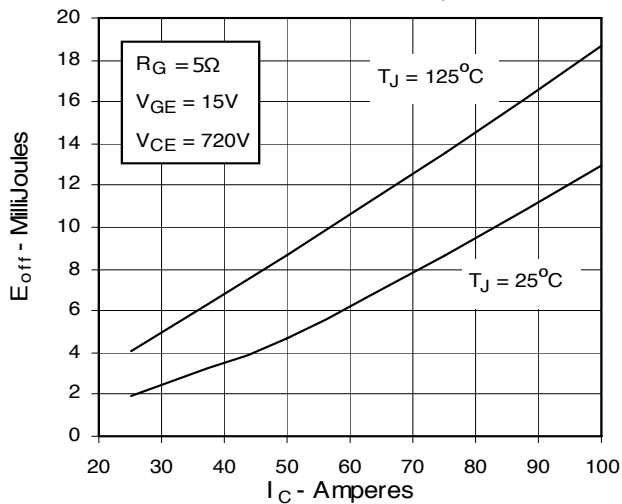


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

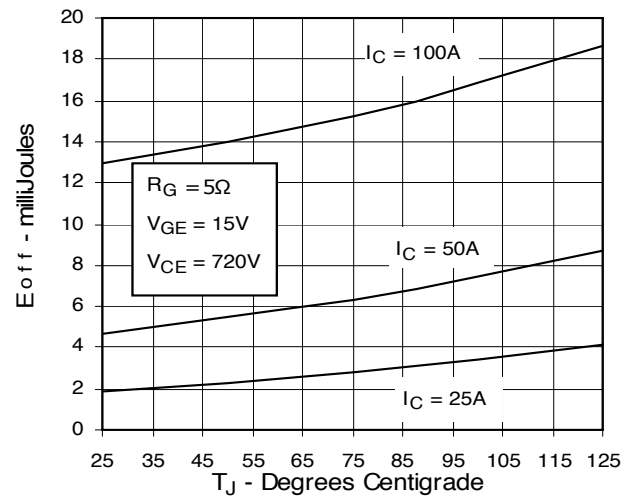


Fig. 11. Dependence of Turn-off Switching Time on R_G

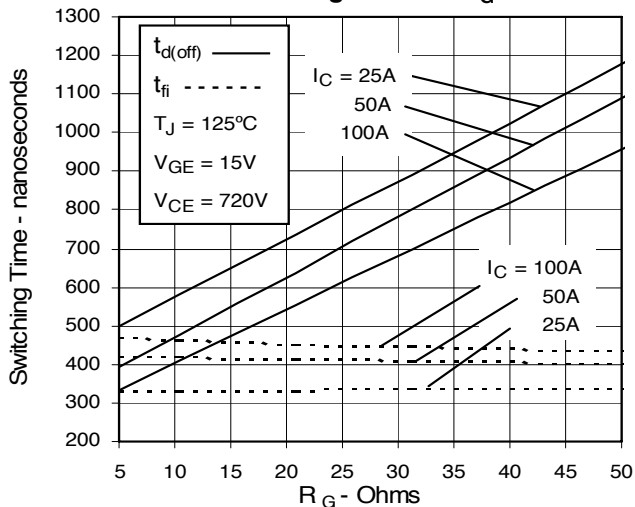


Fig. 12. Dependence of Turn-off Switching Time on I_C

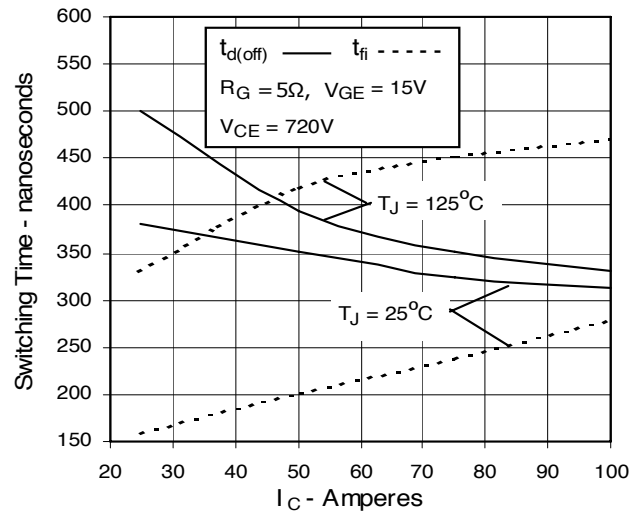


Fig. 13. Dependence of Turn-off Switching Time on Temperature

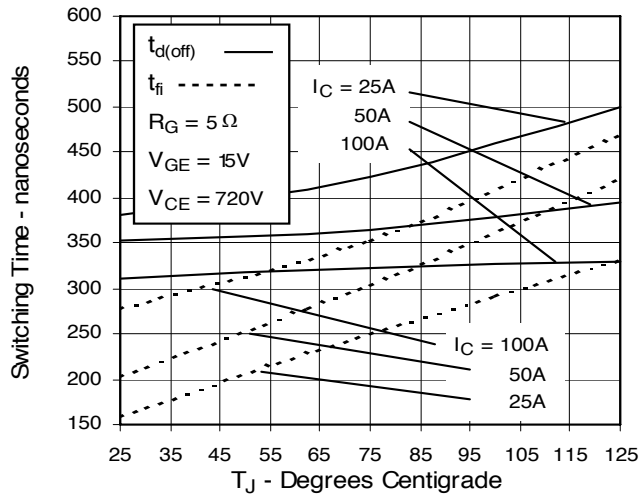


Fig. 14. Gate Charge

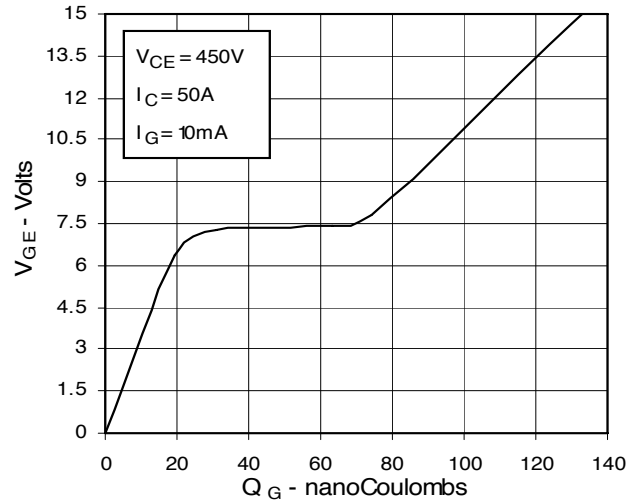


Fig. 15. Capacitance

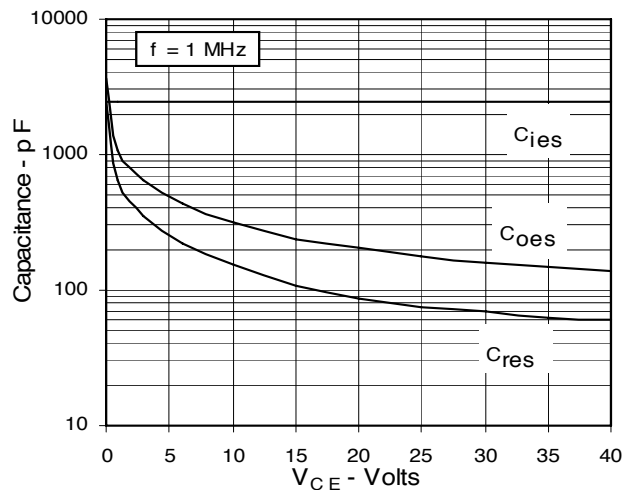


Fig. 16. Reverse-Bias Safe Operating Area

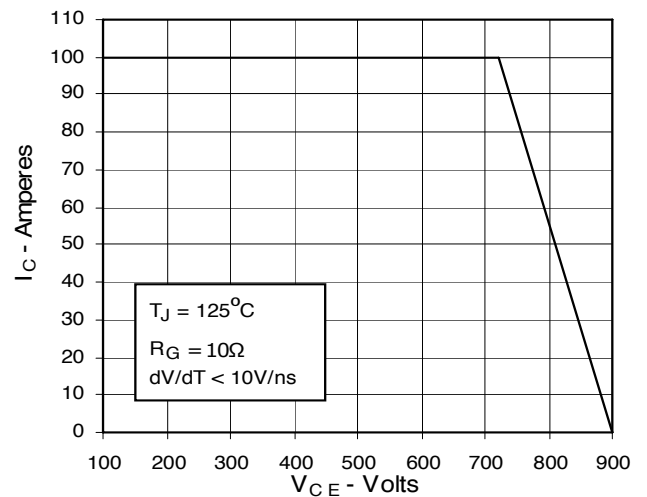
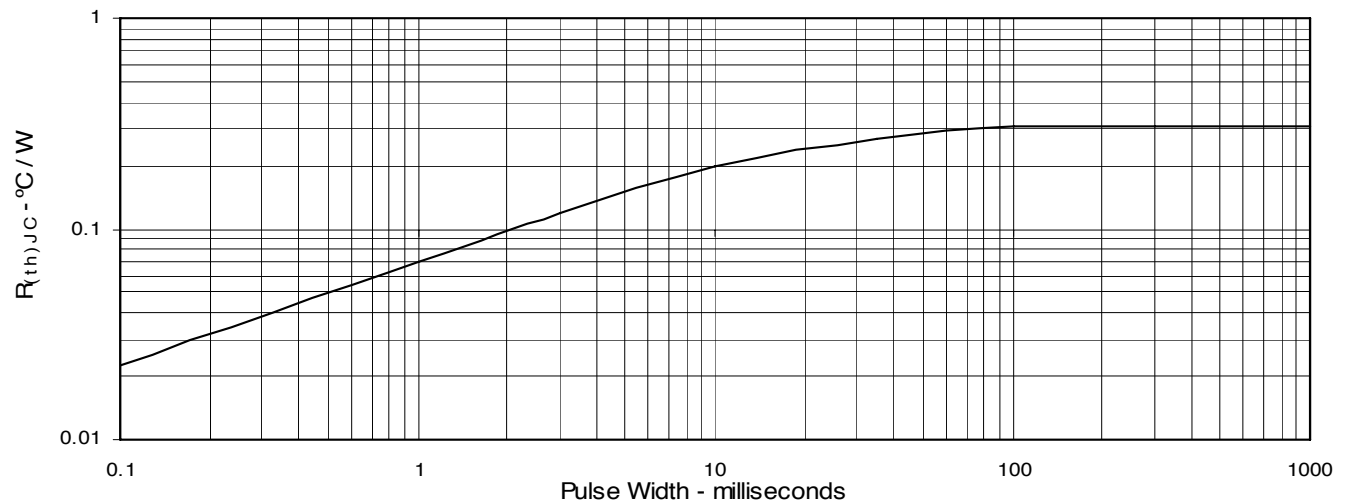


Fig. 17. Maximum Transient Thermal Resistance



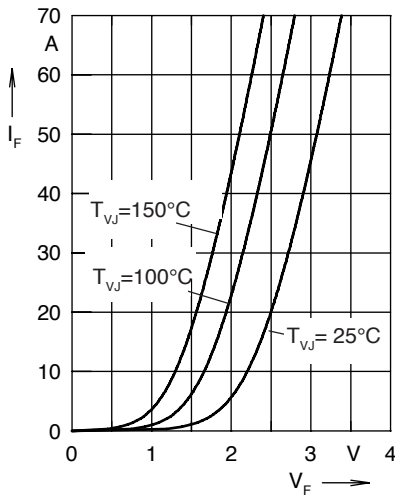


Fig. 18. Forward current I_F versus V_F

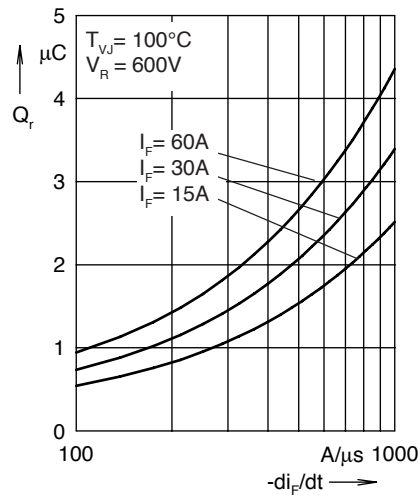


Fig. 19. Reverse recovery charge Q_r versus $-di_F/dt$

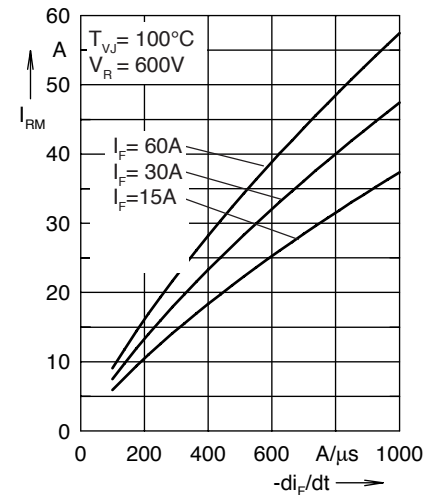


Fig. 20. Peak reverse current I_{RM} versus $-di_F/dt$

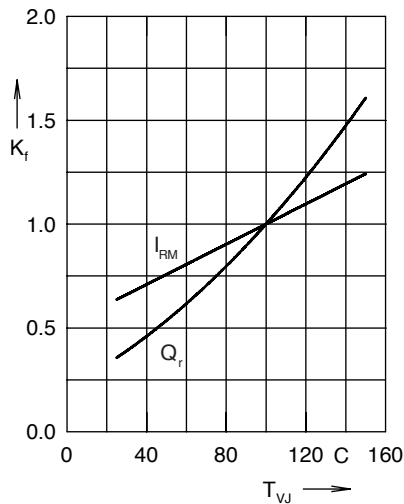


Fig. 21. Dynamic parameters Q_r , I_{RM} versus T_{VJ}

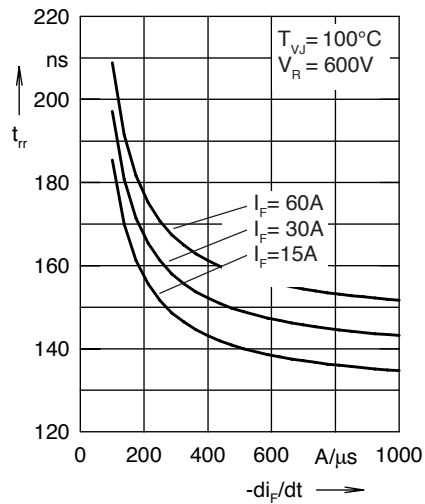


Fig. 22. Recovery time t_{rr} versus $-di_F/dt$

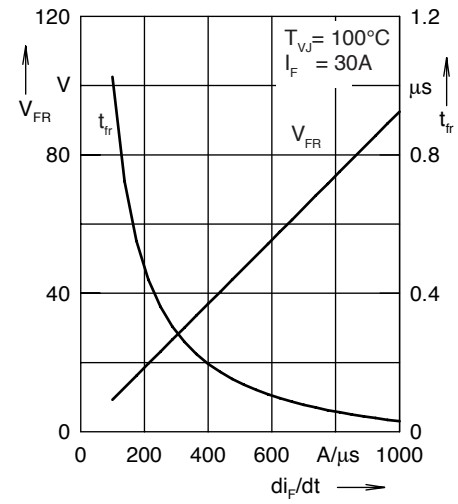


Fig. 23. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

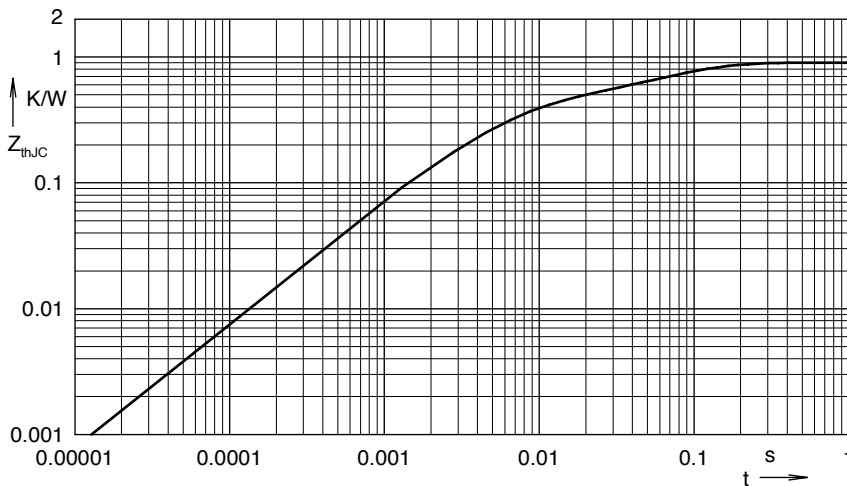


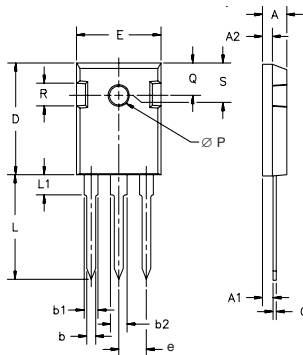
Fig. 24. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.465	0.0052
2	0.179	0.0003
3	0.256	0.0397

Package Outlines

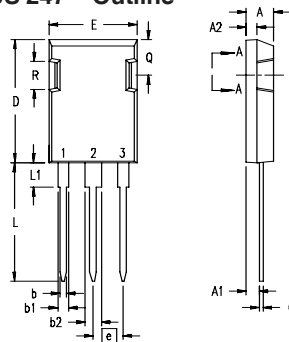
TO-247 AD Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.7	5.3	.185	.209
A ₁	2.2	2.54	.087	.102
A ₂	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b ₁	1.65	2.13	.065	.084
b ₂	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
ØP	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15	BSC	.242	BSC

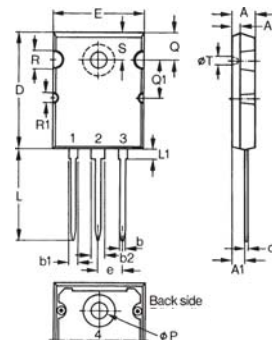
Terminals: 1 - Gate
2 - Drain (Collector)
3 - Source (Emitter)
4 - Drain (Collector)

PLUS 247™ Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.83	5.21	.190	.205
A ₁	2.29	2.54	.090	.100
A ₂	1.91	2.16	.075	.085
b	1.14	1.40	.045	.055
b ₁	1.91	2.13	.075	.084
b ₂	2.92	3.12	.115	.123
C	0.61	0.80	.024	.031
D	20.80	21.34	.819	.840
E	15.75	16.13	.620	.635
e	5.45	BSC	.215	BSC
L	19.81	20.32	.780	.800
L1	3.81	4.32	.150	.170
Q	5.59	6.20	.220	0.244
R	4.32	4.83	.170	.190

TO-264 AA Outline



Dim.	Millimeter		Inches	
	Min.	Max.	Min.	Max.
A	4.82	5.13	.190	.202
A ₁	2.54	2.89	.100	.114
A ₂	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b ₁	2.39	2.69	.094	.106
b ₂	2.90	3.09	.114	.122
c	0.53	0.83	.021	.033
D	25.91	26.16	1.020	1.030
E	19.81	19.96	.780	.786
e	5.46	BSC	.215	BSC
J	0.00	0.25	.000	.010
K	0.00	0.25	.000	.010
L	20.32	20.83	.800	.820
L1	2.29	2.59	.090	.102
P	3.17	3.66	.125	.144
Q	6.07	6.27	.239	.247
Q1	8.38	8.69	.330	.342
R	3.81	4.32	.150	.170
R1	1.78	2.29	.070	.090
S	6.04	6.30	.238	.248
T	1.57	1.83	.062	.072

PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a subjective pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

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