IXYS

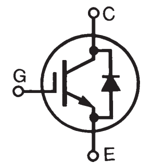
HiPerFAST™ IGBT with Fast Diode

B2-Class High Speed IGBT with Fast Diode

Preliminary Data Sheet

IXGH 50N90B2D1
IXGK 50N90B2D1
IXGX 50N90B2D1

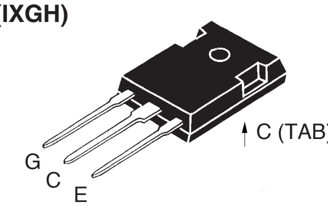
V_{CES} = 900 V
I_{C25} = 75 A
$V_{CE(sat)}$ = 2.7 V
$t_{fi\,typ}$ = 200 ns



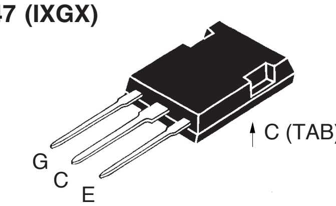
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	900	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	900	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C (limited by leads)	75	A
I_{C110}	T_C = 110°C	50	A
I_{CM}	T_C = 25°C, 1 ms	200	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load @ ≤ 600V	I_{CM} = 100	A
P_C	T_C = 25°C	400	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°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

Symbol	Test Conditions (T_J = 25°C unless otherwise specified)		Characteristic Values min.	typ.	max.	
$V_{GE(th)}$	I_C = 250 µA, V_{CE} = V_{GE}		3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}				50	µA
	V_{GE} = 0 V	T_J = 150°C			1	mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ± 20 V				± 100	nA
$V_{CE(sat)}$	I_C = I_{C110}, V_{GE} = 15 V, Note 1			2.2	2.7	V
		T_J = 125°C				V

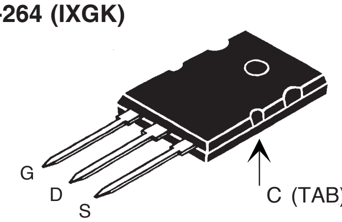
TO-247 (IXGH)



PLUS247 (IXGX)



TO-264 (IXGK)



G = Gate C = Collector
E = Emitter 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°C unless otherwise specified)	Characteristic Values min.	typ.	max.	
g_{fs}	$I_C = I_{C110}$; V_{CE} = 10 V, Note 1	25	40		S
C_{ies}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		2500		pF
C_{oes}			205		pF
C_{res}			75		pF
Q_g	$I_C = I_{C110}$, V_{GE} = 15 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}	$I_C = I_{C110}$, V_{GE} = 15 V		28		ns
$t_{d(off)}$	V_{CE} = 720 V, $R_G = R_{off}$ = 5 Ω		350	500	ns
t_{fi}			200		ns
E_{off}			4.7	7.5	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		20		ns
t_{ri}	$I_C = I_{C110}$, V_{GE} = 15 V		28		ns
E_{on}	V_{CE} = 720 V, $R_G = R_{off}$ = 5 Ω		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°C	30	A

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

Note 1: Pulse test, t ≤ 300 μs, duty cycle ≤ 2 %

Fig. 1. Output Characteristics @ 25 ºC

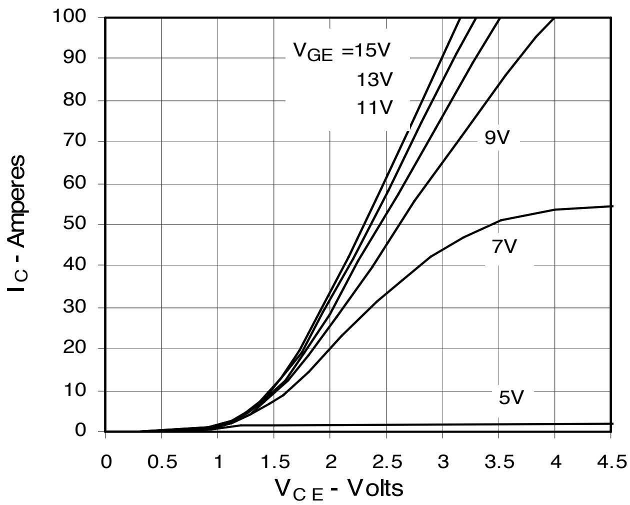


Fig. 2. Extended Output Characteristics @ 25 ºC

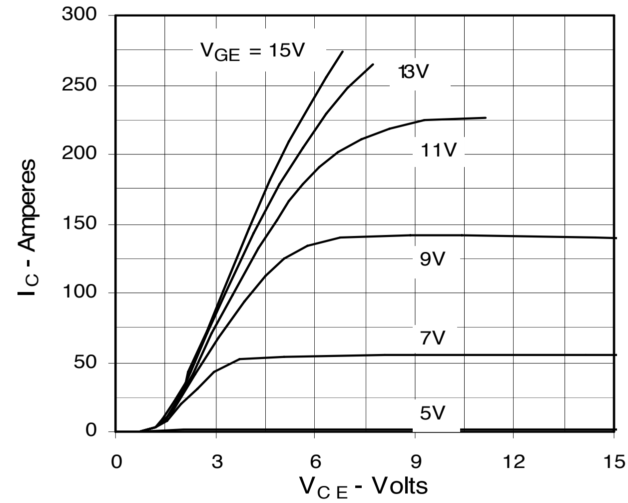


Fig. 3. Output Characteristics @ 125 ºC

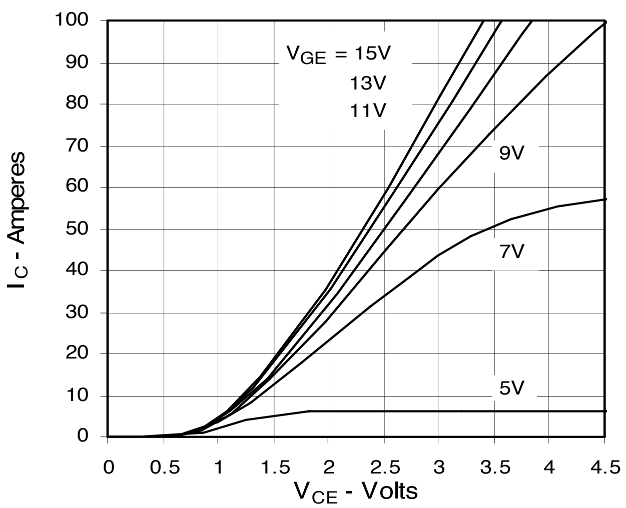


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

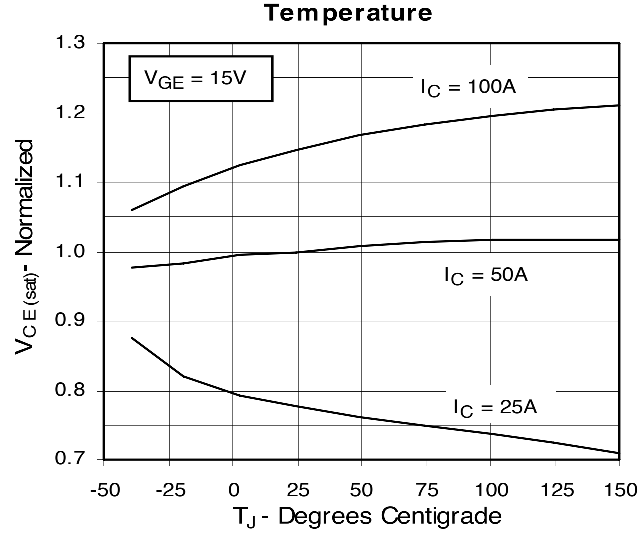


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

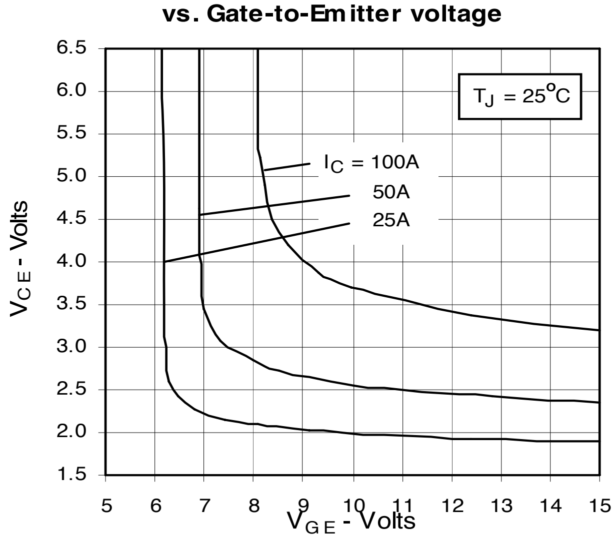


Fig. 6. Input Admittance

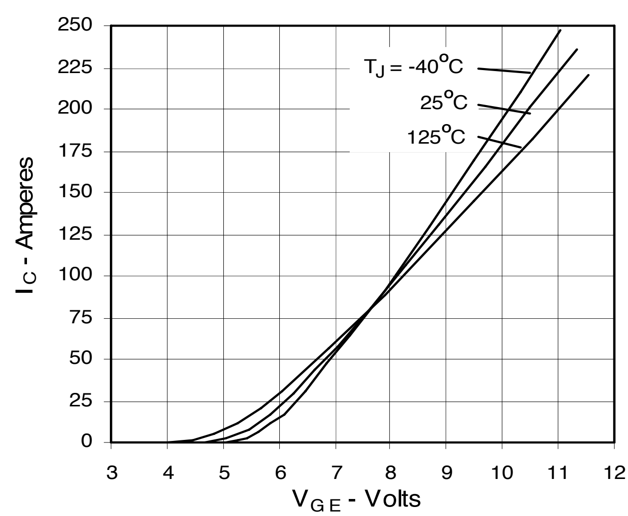


Fig. 7. Transconductance

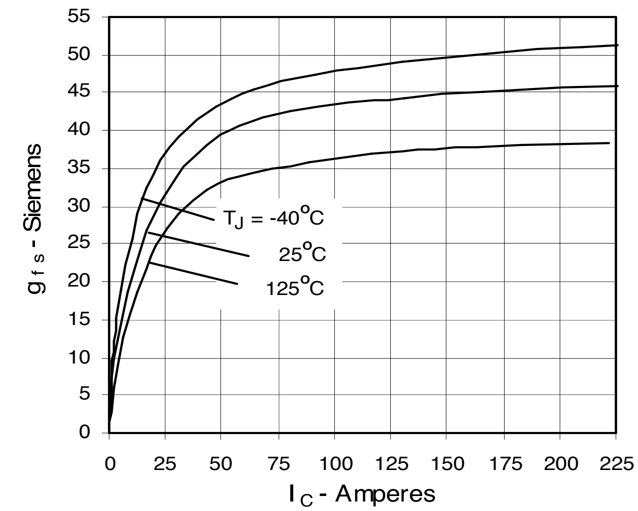


Fig. 8. Dependence of Turn-off Energy Loss on R_G

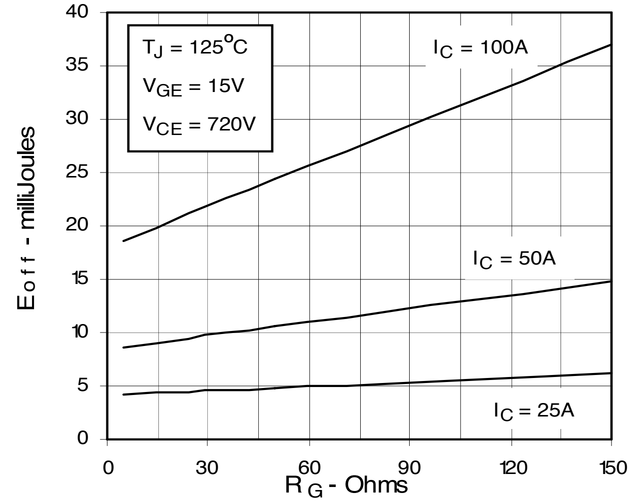


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

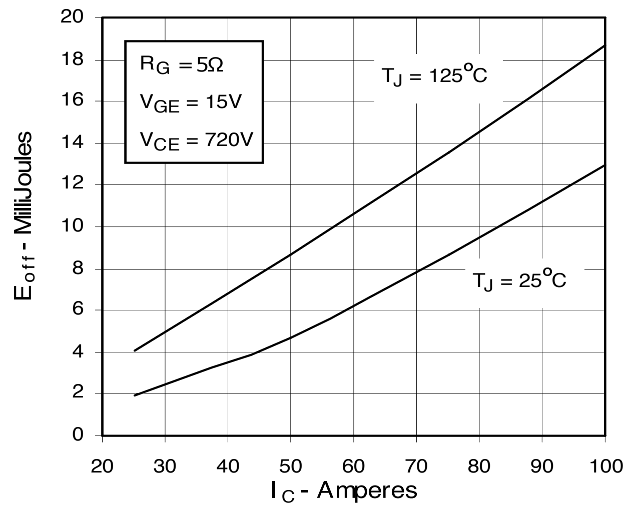


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

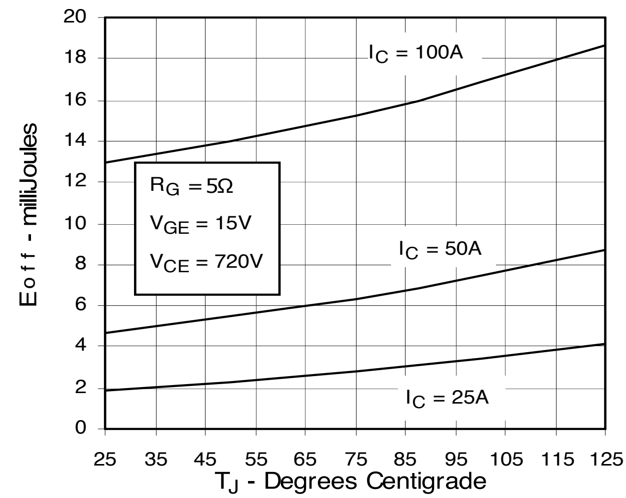


Fig. 11. Dependence of Turn-off Switching Time on R_G

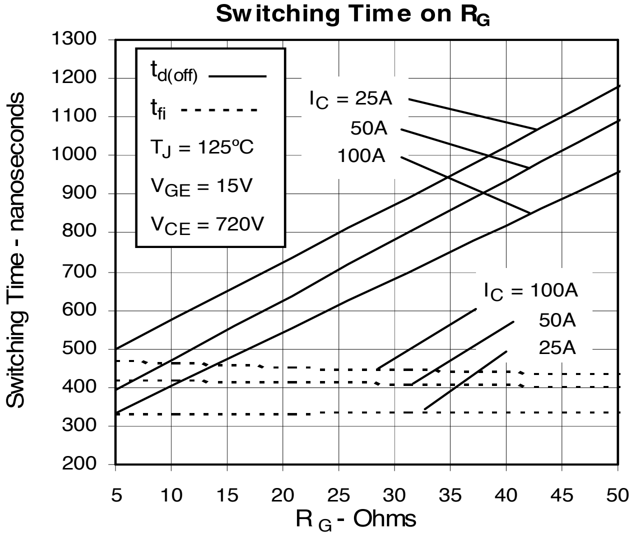


Fig. 12. Dependence of Turn-off Switching Time on I_C

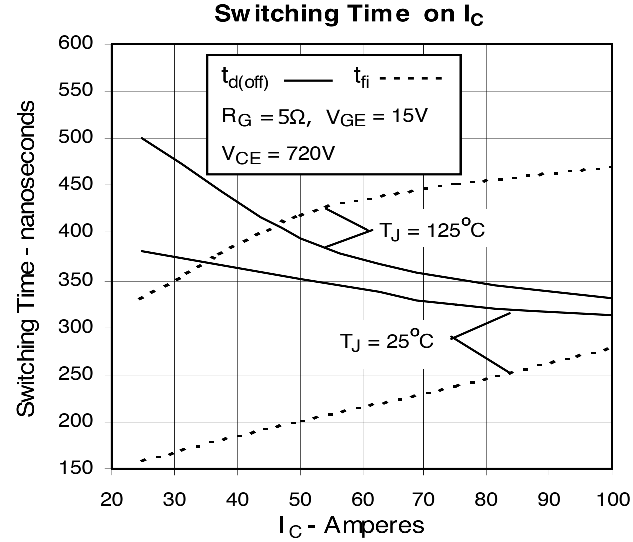


Fig. 13. Dependence of Turn-off Switching Time on Temperature

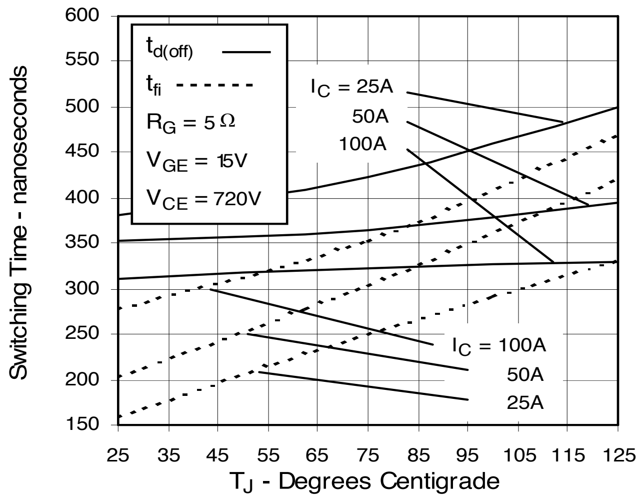


Fig. 14. Gate Charge

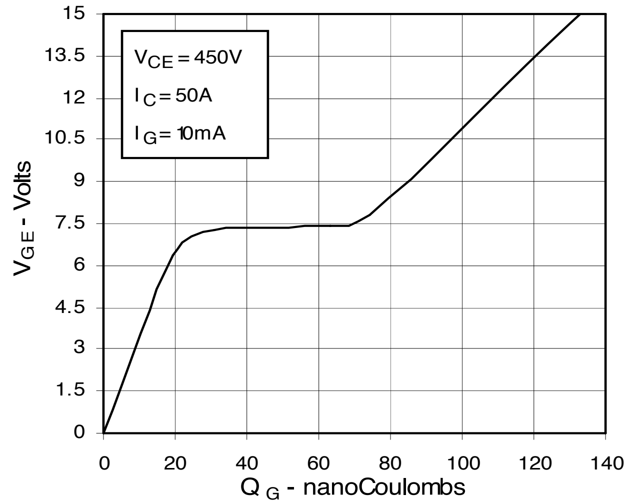


Fig. 15. Capacitance

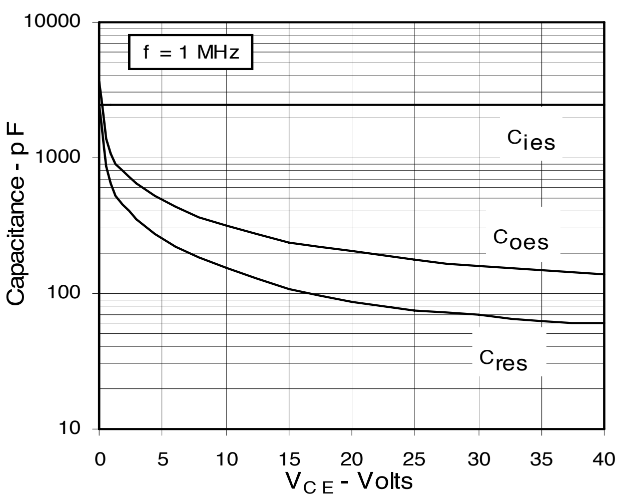


Fig. 16. Reverse-Bias Safe Operating Area

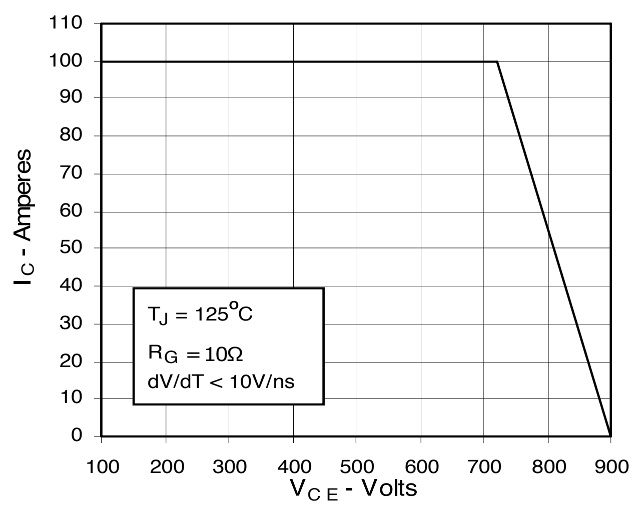
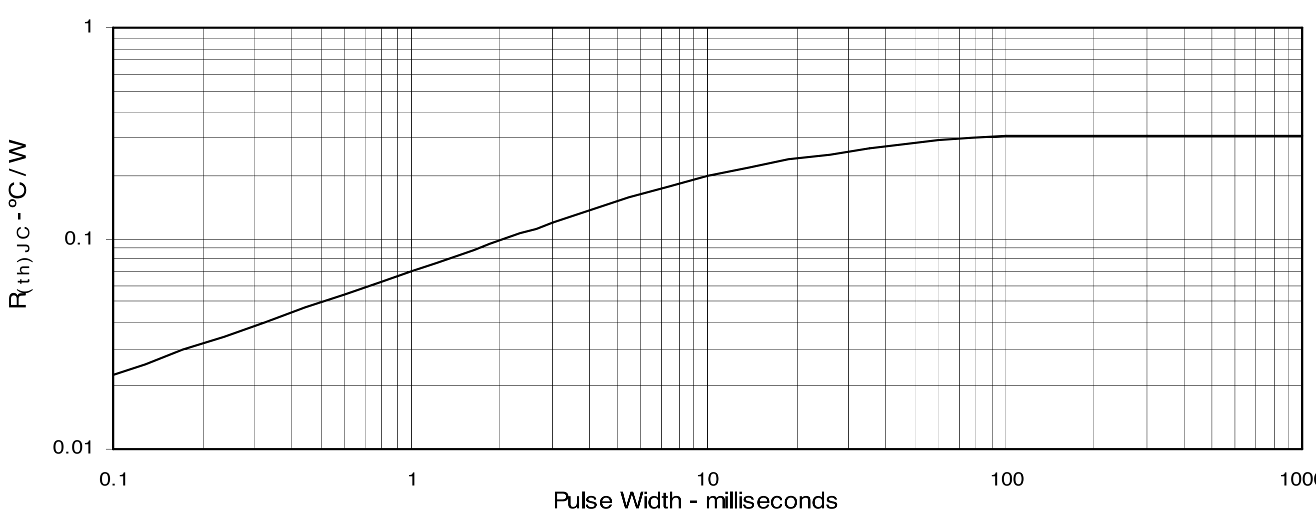


Fig. 17. Maximum Transient Thermal Resistance



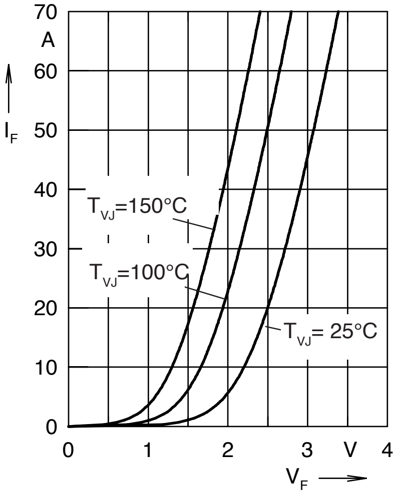


Fig. 18. Forward current I_F versus V_F

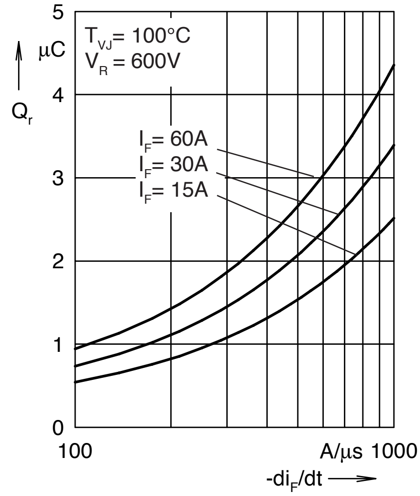


Fig. 19. Reverse recovery charge Q_r versus $-di_F/dt$

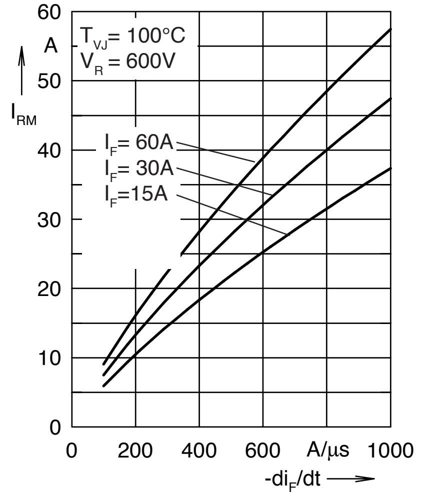


Fig. 20. Peak reverse current I_{RM} versus $-di_F/dt$

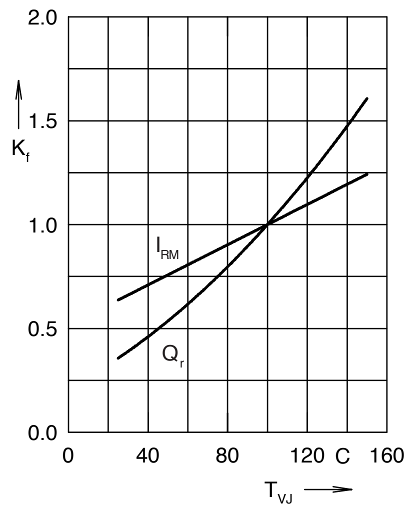


Fig. 21. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

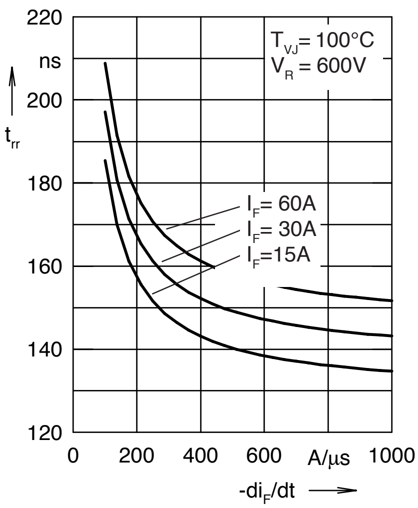


Fig. 22. Recovery time t_{rr} versus $-di_F/dt$

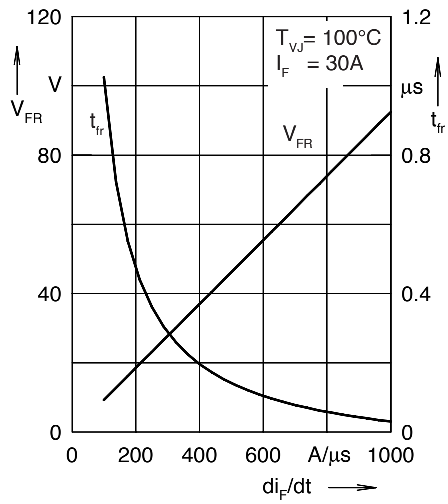


Fig. 23. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

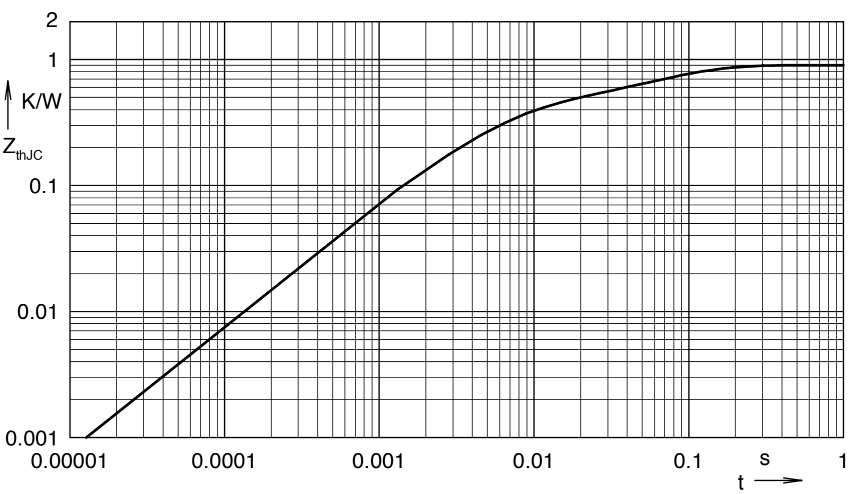


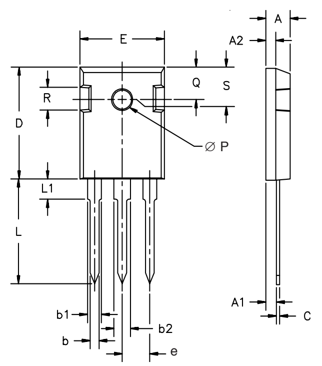
Fig. 24 Transient thermal resistance junction to case

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

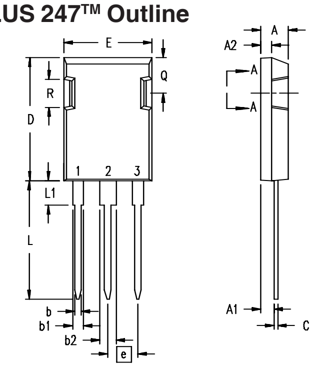
TO-247 AD Outline



Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches 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
∅P	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	

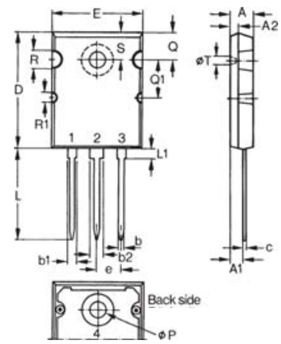
Terminals:
1 - Gate
2 - Drain (Collector)
3 - Source (Emitter)
4 - Drain (Collector)

PLUS 247™ Outline



Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches 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 Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.82	5.13	.190	.202
A1	2.54	2.89	.100	.114
A2	2.00	2.10	.079	.083
b	1.12	1.42	.044	.056
b1	2.39	2.69	.094	.106
b2	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.