

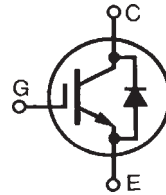
HiPerFAST™ IGBT

IXGH 40N60B2D1

IXGT 40N60B2D1

Optimized for 10-25 KHz hard switching and up to 150 KHz resonant switching

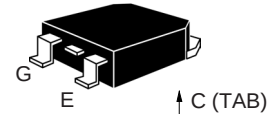
Preliminary Data Sheet



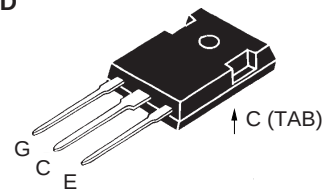
$$\begin{aligned} V_{CES} &= 600 \text{ V} \\ I_{C25} &= 75 \text{ A} \\ V_{CE(sat)} &< 1.7 \text{ V} \\ t_{fi typ} &= 82 \text{ ns} \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C}$ to 150°C	600	V
V_{CGR}	$T_J = 25^\circ\text{C}$ to 150°C ; $R_{GE} = 1 \text{ M}\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$ (limited by leads)	75	A
I_{C110}	$T_C = 110^\circ\text{C}$	40	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 @ $\leq 600 \text{ V}$	$I_{CM} = 80$	A
P_C	$T_C = 25^\circ\text{C}$	300	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 (M3)	1.13/10 Nm/lb.in.	
Weight	TO-247 AD	6	g
	TO-268 SMD	4	g

TO-268
(IXGT)



TO-247 AD
(IXGH)



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

Features

- Medium frequency IGBT
- Square RBSOA
- 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

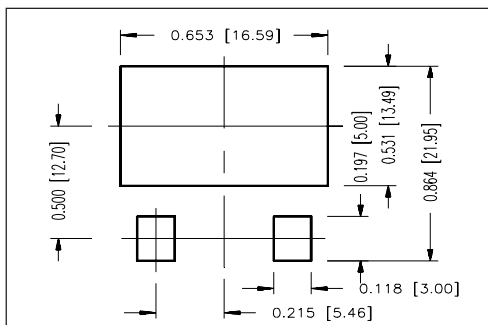
Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}$, $V_{CE} = V_{GE}$	3.0		5.0 V
I_{CES}	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$			50 μA 1 mA
I_{GES}	$V_{CE} = 0 \text{ V}$, $V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 30 \text{ A}$, $V_{GE} = 15 \text{ V}$			1.7 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		2560	pF
C_{oes}			210	pF
C_{res}			54	pF
Q_g	} I _C = 30 A, V _{GE} = 15 V, V _{CE} = 300 V		100	nC
Q_{ge}			15	nC
Q_{gc}			36	nC
t_{d(on)}	} Inductive load, T_j = 25°C		18	ns
t_{ri}			20	ns
t_{d(off)}		I _C = 30 A, V _{GE} = 15 V V _{CE} = 400 V, R _G = 3.3 Ω	130	200 ns
t_{fi}			82	150 ns
E_{off}			0.4	0.8 mJ
t_{d(on)}	} Inductive load, T_j = 125°C		18	ns
t_{ri}			20	ns
E_{on}		I _C = 30 A, V _{GE} = 15 V	0.3	mJ
t_{d(off)}		V _{CE} = 400 V, R _G = 3.3 Ω	240	ns
t_{fi}			150	ns
E_{off}			1.10	mJ
R_{thJC}	(TO-247)			0.42 K/W
R_{thCK}			0.25	K/W

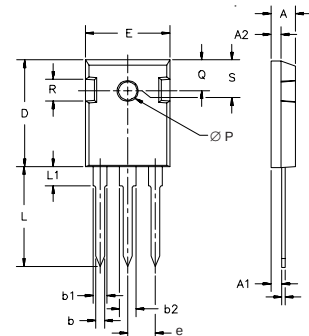
Reverse Diode (FRED)

Reverse Diode (FRED)		Characteristic Values (T _j = 25°C, unless otherwise specified)		
Symbol	Test Conditions	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		1.6 V 2.5 V
I _{RM} t _{rr}	} I_F = 30 A, V_{GE} = 0 V, -di_F/dt = 100 A/μs, T_j = 100°C V_R = 100 V I_F = 1 A; -di/dt = 100 A/μs; V_R = 30 V	T _j = 100°C T _j = 100°C	100 25	4 A ns ns
R _{thJC}				0.9 K/W

Min. Recommended Footprint

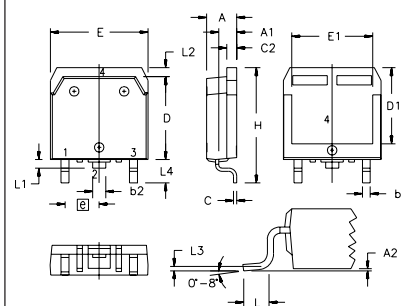


TO-247 AD Outline



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

TO-268 Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

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	4,881,106	5,017,508	5,049,961	5,187,117	5,486,715	6,306,728B1	6,259,123B1	6,306,728B1
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

Fig. 1. Output Characteristics
@ 25 Deg. C

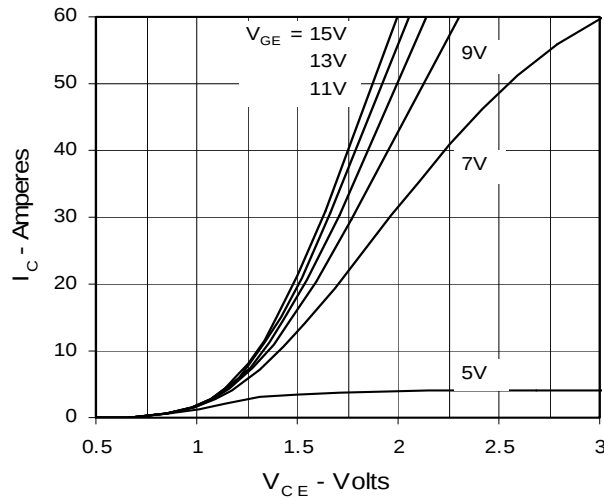


Fig. 2. Extended Output Characteristics
@ 25 deg. C

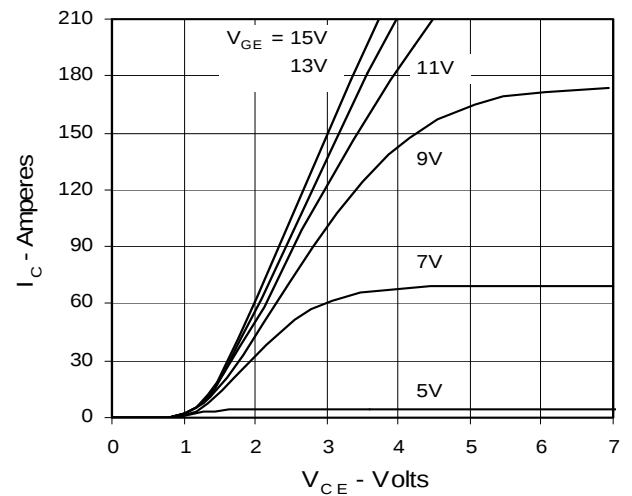


Fig. 3. Output Characteristics
@ 125 Deg. C

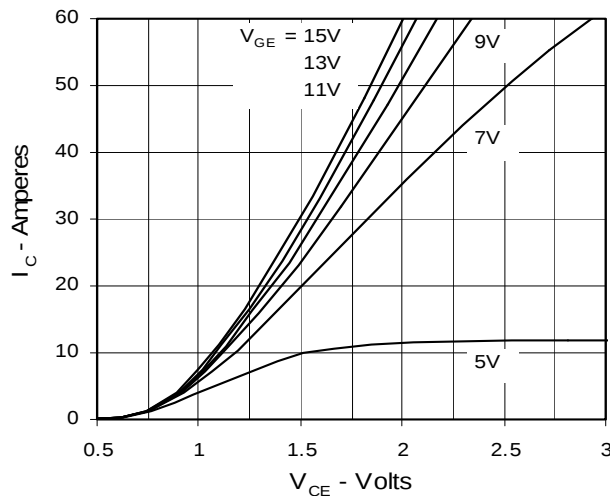


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

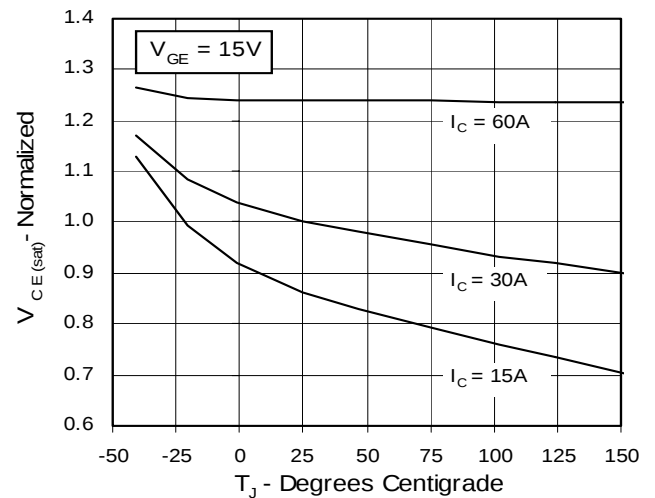


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

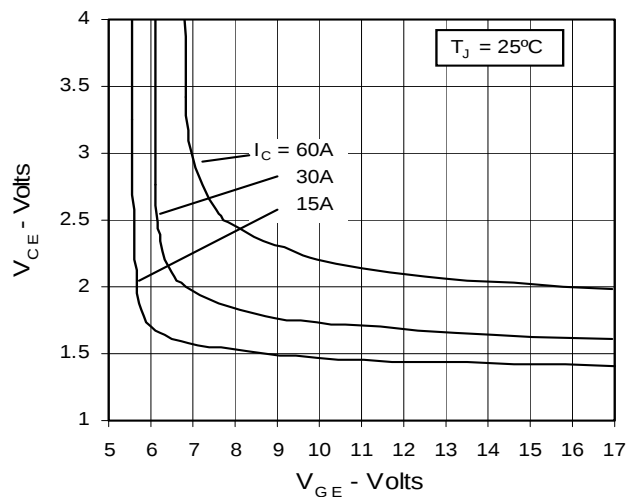


Fig. 6. Input Admittance

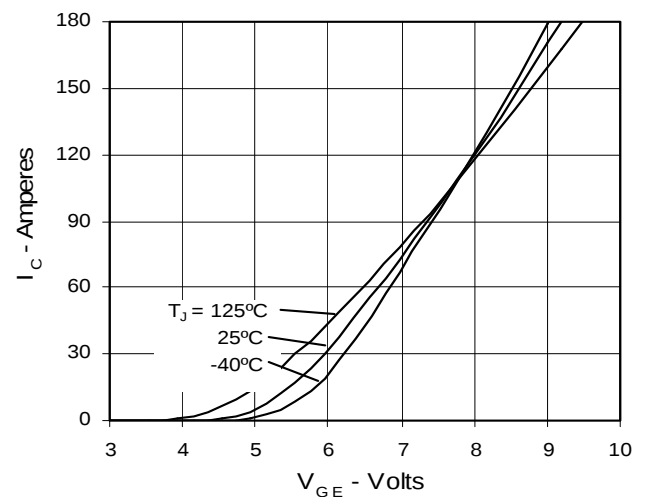


Fig. 7. Transconductance

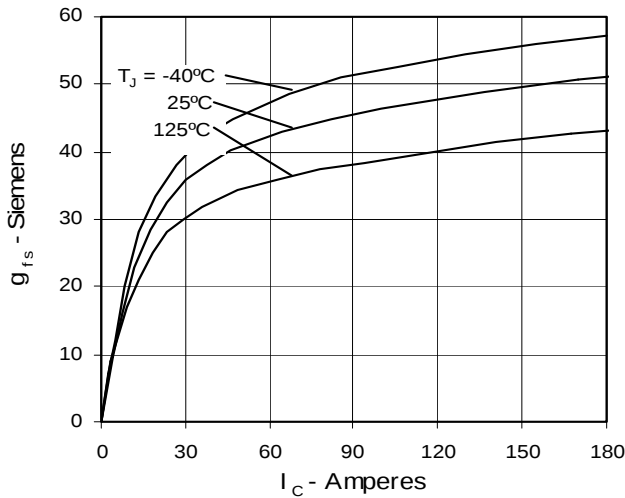


Fig. 8. Dependence of Turn-Off Energy on R_G

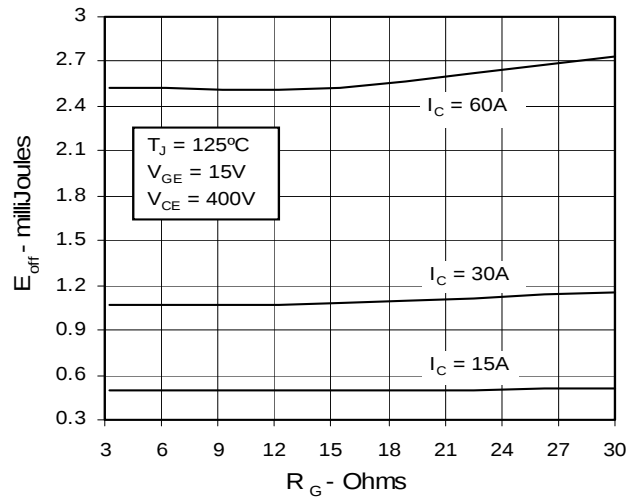


Fig. 9. Dependence of Turn-Off Energy on I_C

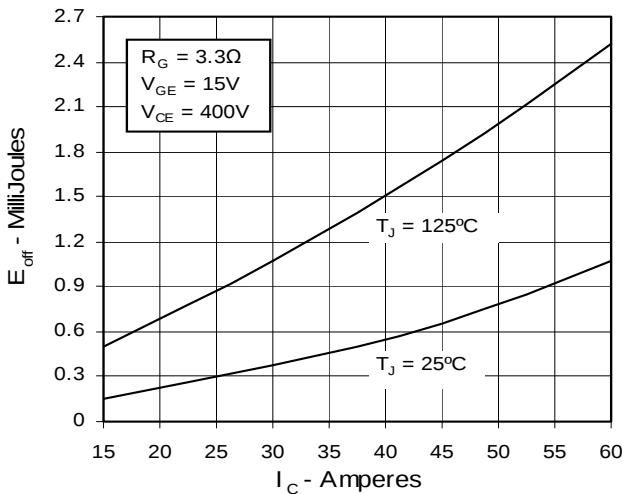


Fig. 10. Dependence of Turn-Off Energy on Temperature

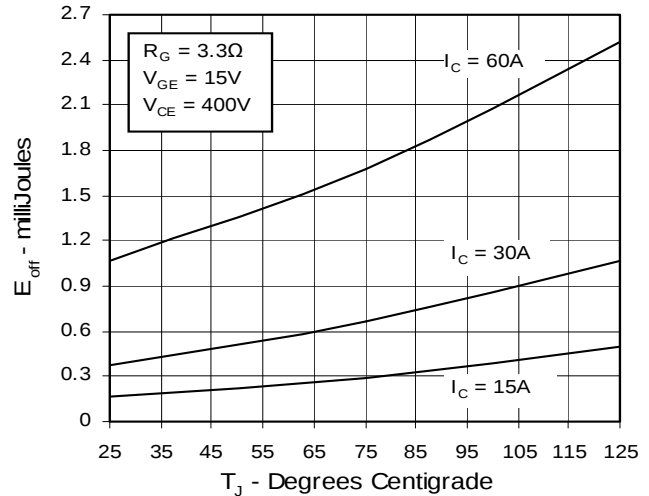


Fig. 11. Dependence of Turn-Off Switching Time on R_G

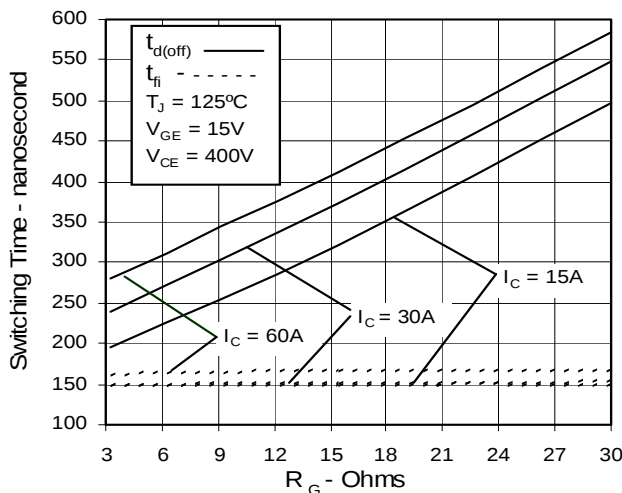
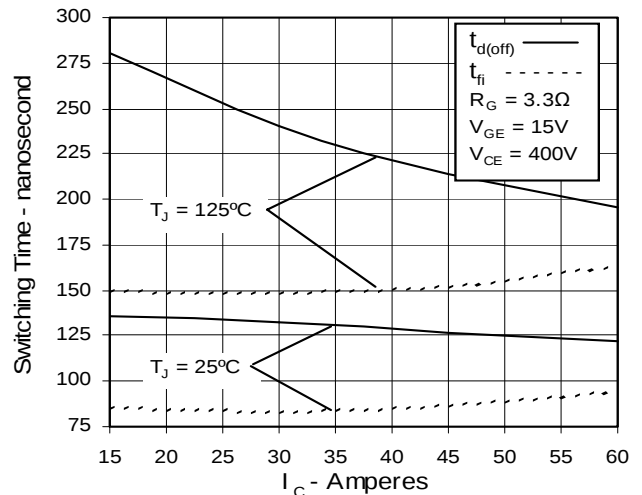


Fig. 12. Dependence of Turn-Off Switching Time on I_C



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

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

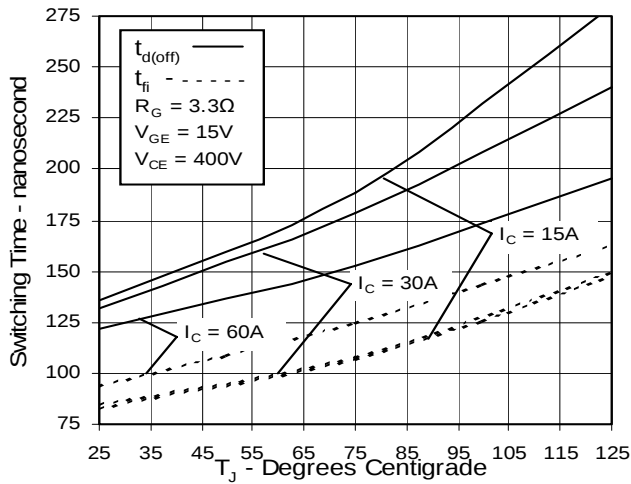


Fig. 14. Gate Charge

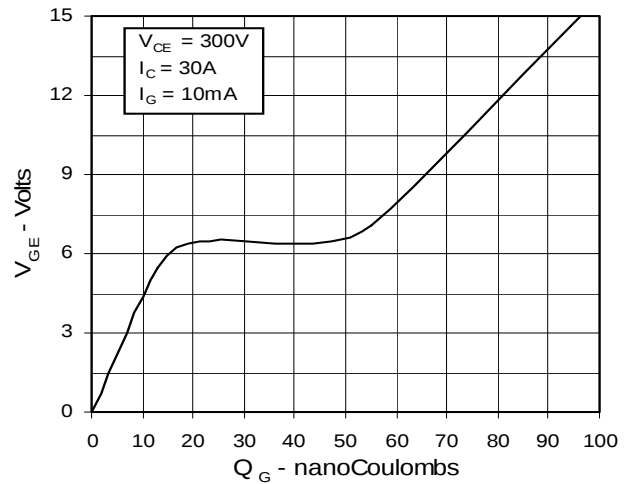


Fig. 15. Capacitance

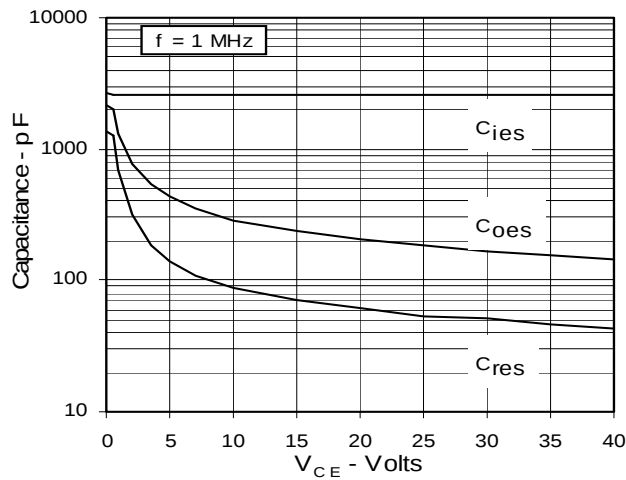
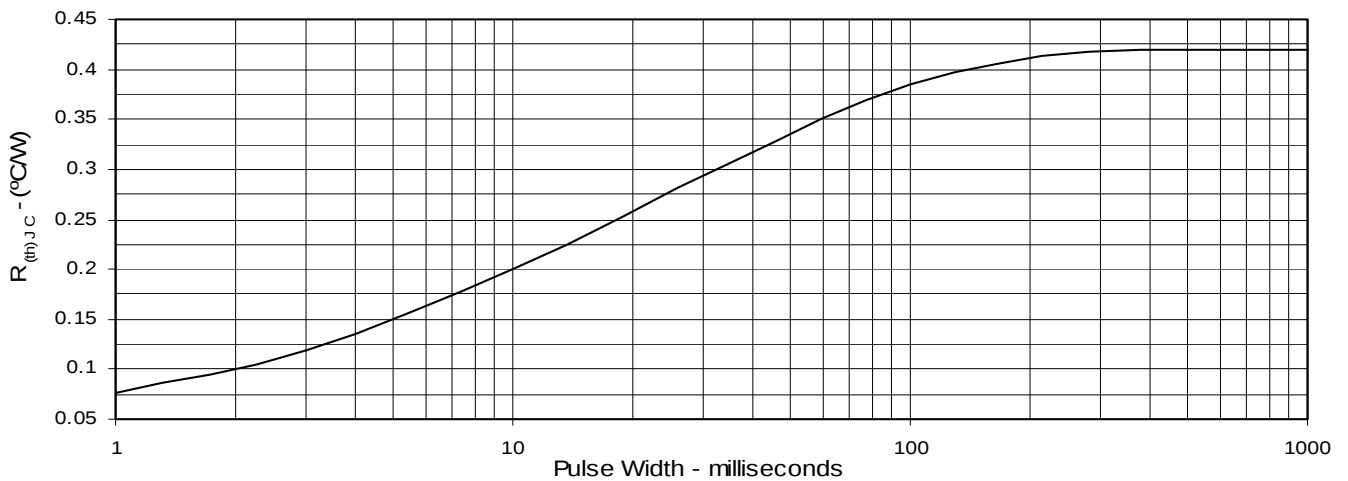


Fig. 16. Maximum Transient Thermal Resistance



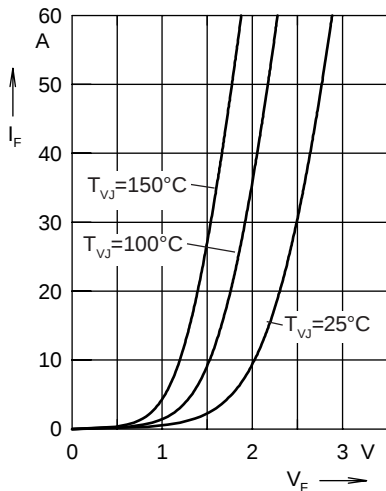


Fig. 17. Forward current I_F versus V_F

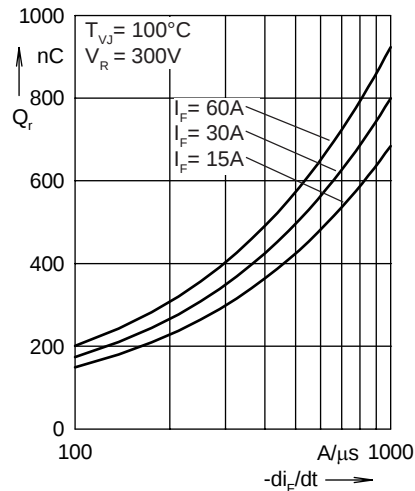


Fig. 18. Reverse recovery charge Q_r versus $-di_F/dt$

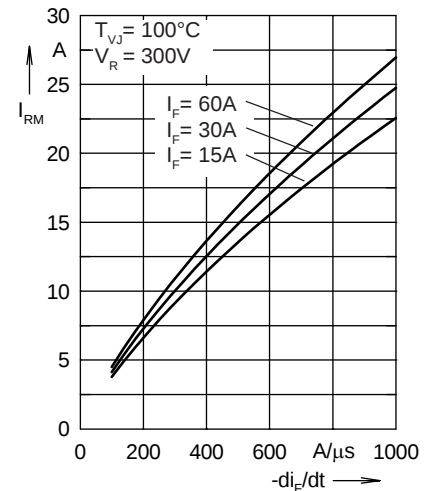


Fig. 19. Peak reverse current I_{RM} versus $-di_F/dt$

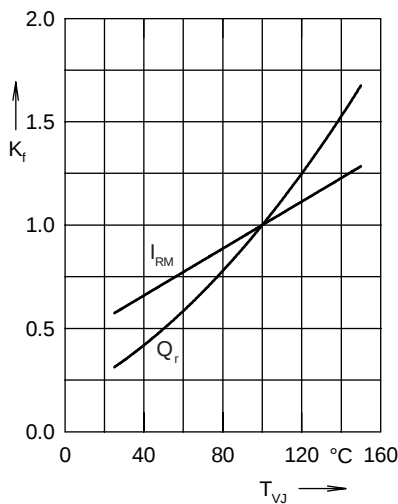


Fig. 20. Dynamic parameters Q_r , I_{RM} versus T_{VJ}

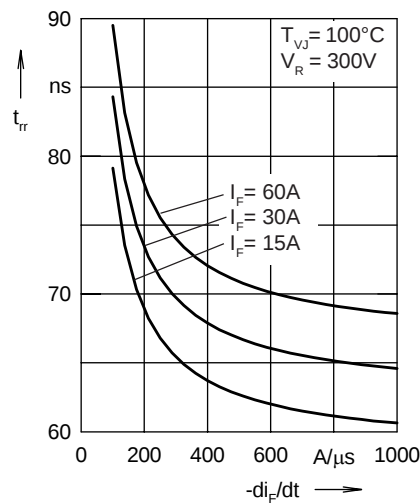


Fig. 21. Recovery time t_{rr} versus $-di_F/dt$

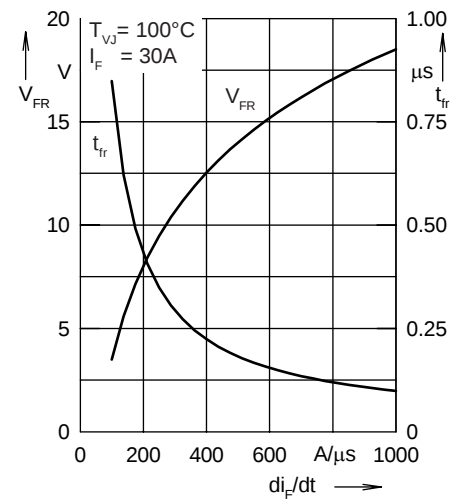


Fig. 22. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

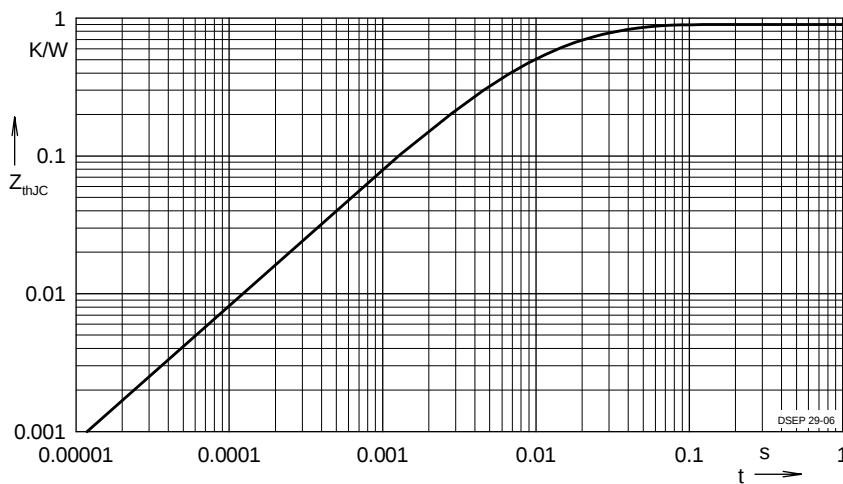


Fig. 23. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.502	0.0052
2	0.193	0.0003
3	0.205	0.0162

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