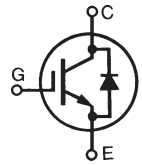
IXYS

HiPerFAST™ IGBT with Diode

C2-Class High Speed IGBTs

IXGK 60N60C2D1
IXGX 60N60C2D1

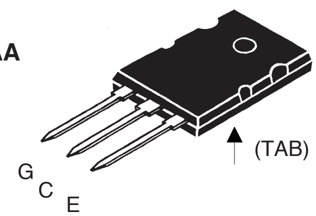
V_{CES}	= 600	V
I_{C25}	= 75	A
$V_{CE(sat)}$	= 2.5	V
$t_{fi(typ)}$	= 35	ns



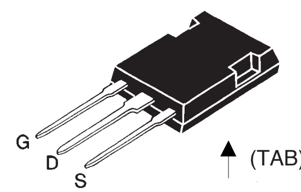
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	600	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	600	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (limited by leads)	75	A
I_{C110}	T_C = 110°C	60	A
I_{F110}	T_C = 110°C	48	A
I_{CM}	T_C = 25°C, 1 ms	300	A
SSOA (RBSOA)	V_{GE} = 15 V, T_{VJ} = 125°C, R_G = 10 Ω Clamped inductive load @ $V_{CE} \leq$ 600 V	I_{CM} = 100	A
P_C	T_C = 25°C	480	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque, TO-264	1.13/10	Nm/lb.in.
Weight	TO-264	10	g
	PLUS247	6	g
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C

Symbol	Test Conditions		Characteristic Values (T_J = 25°C unless otherwise specified) 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} V_{GE} = 0 V	T_J = 25°C T_J = 125°C			650 5	μA mA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 50 A, V_{GE} = 15 V Note 1	T_J = 25°C T_J = 125°C		2.1 1.8	2.5	V V

TO-264 AA (IXGK)



PLUS247 (IXGX)



G = Gate C = Collector
E = Emitter Tab = Collector

Features

- Very high frequency IGBT and anti-parallel FRED in one package
- Square RBSOA
- High current handling capability
- MOS Gate turn-on for drive simplicity
- Fast Recovery Epitaxial Diode (FRED) with soft recovery and low I_{RM}

Applications

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

Advantages

- Space savings (two devices in one package)
- Easy to mount with 1 screw

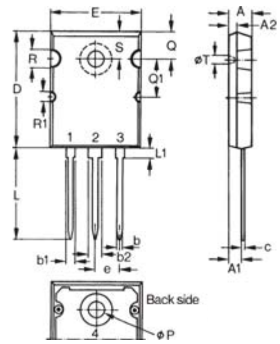
Symbol	Test Conditions (Characteristic Values; $T_J = 25°C$ unless otherwise specified)	Min.	Typ.	Max.	
g_{fs}	I_C = 50 A; V_{CE} = 10 V, Note 1	40	58		S
C_{ies}			3900		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz		280		pF
C_{res}			97		pF
Q_g			146		nC
Q_{ge}	I_C = 50 A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		28		nC
Q_{gc}			50		nC
$t_{d(on)}$			18		ns
E_{on}			0.4		mJ
t_{ri}	**Inductive load, T_J = 25°C**		25		ns
$t_{d(off)}$	I_C = 50 A, V_{GE} = 15 V		95	150	ns
t_{fi}	V_{CE} = 400 V, R_G = R_{off} = 2.0 Ω		35		ns
E_{off}			0.48	0.8	mJ
$t_{d(on)}$			18		ns
t_{ri}			25		ns
E_{on}	**Inductive load, T_J = 125°C**		0.9		mJ
$t_{d(off)}$	I_C = 50 A, V_{GE} = 15 V		130		ns
t_{fi}	V_{CE} = 400 V, R_G = R_{off} = 2.0 Ω		80		ns
E_{off}			1.2		mJ
R_{thJC}				0.26	K/W
R_{thCK}			0.15		K/W

Reverse Diode (FRED)

Symbol	Test Conditions (Characteristic Values; $T_J = 25°C$, unless otherwise specified)	min.	typ.	max.	
V_F	I_F = 60 A, V_{GE} = 0 V, Note 1			2.1	V
	T_J = 150°C			1.4	
I_{RM}	I_F = 60 A, V_{GE} = 0 V, -di_F/dt = 100 A/µ T_J = 100°C, V_R = 100 V			8.3	A
t_{rr}	I_F = 1 A; -di/dt = 200 A/ms; V_R = 30 V		35		ns
R_{thJC}				0.65	K/W

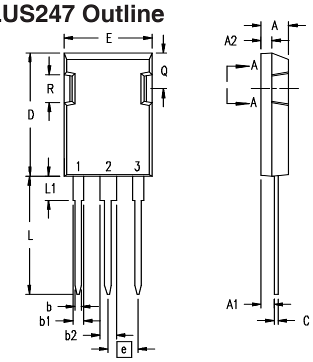
Note 1: Pulse test, t ≤ 300 µs, duty cycle ≤ 2 %

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

PLUS247 Outline



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

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

Fig. 1. Output Characteristics @ 25ºC

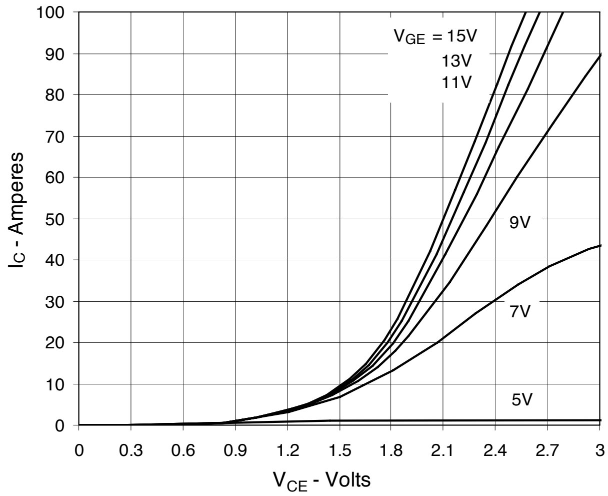


Fig. 2. Exteded Output Characteristics @ 25ºC

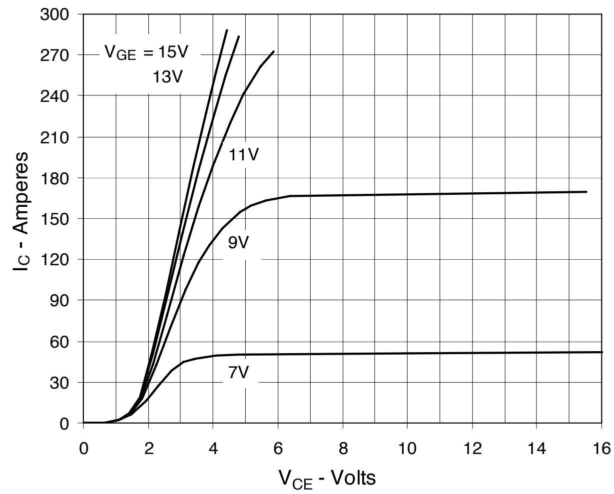


Fig. 3. Output Characteristics @ 125ºC

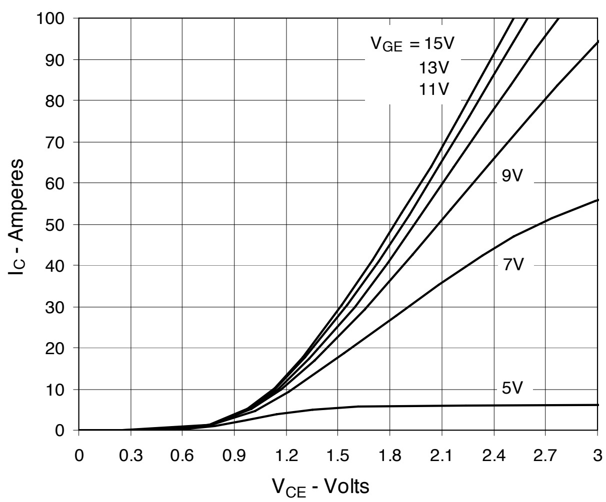


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

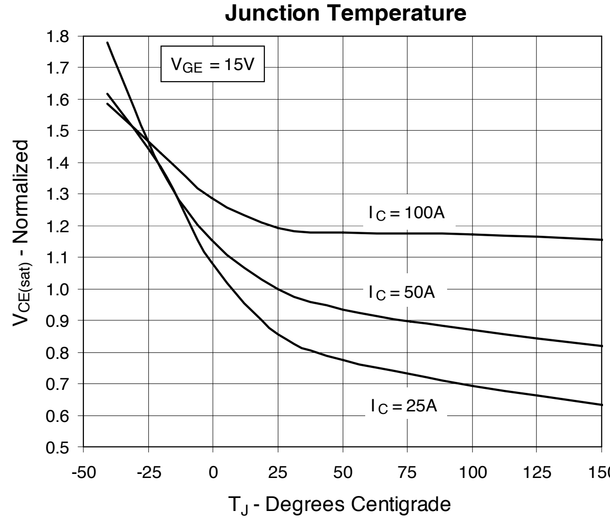


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

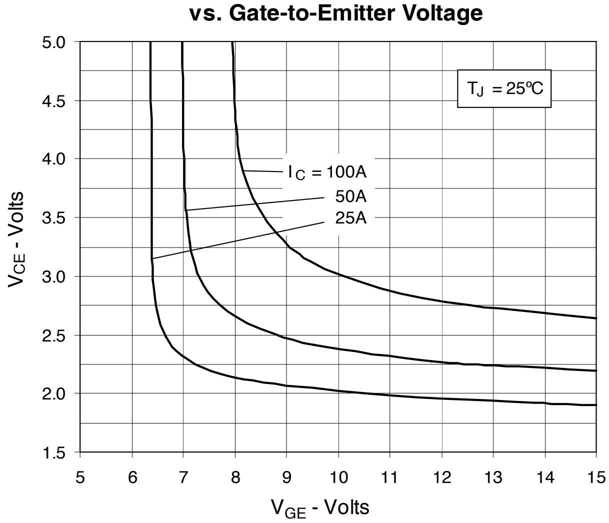


Fig. 6. Input Admittance

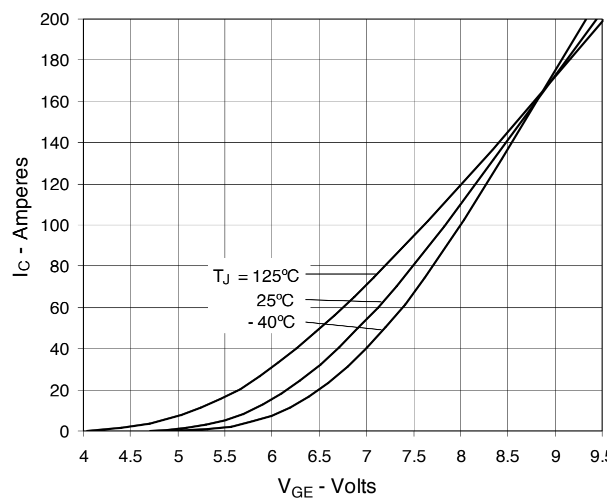


Fig. 7. Transconductance

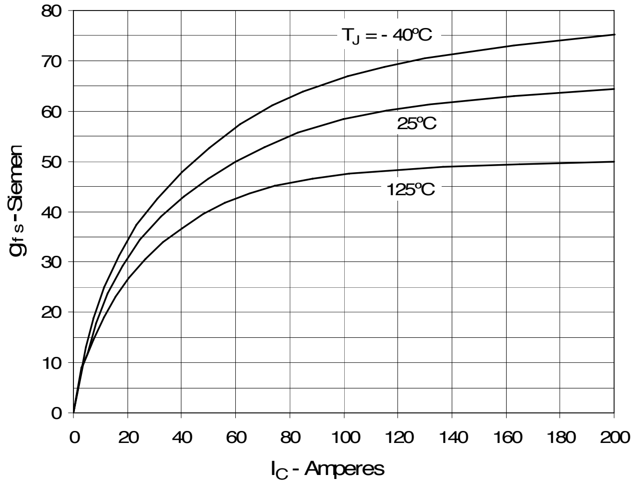


Fig. 8. Inductive Switching Energy Loss vs. Gate Resistance

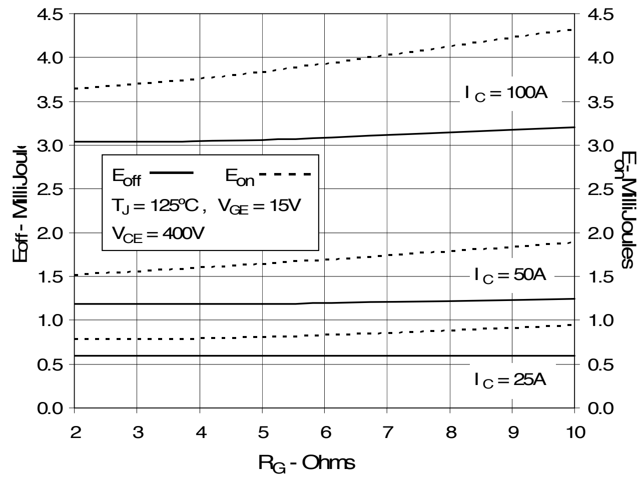


Fig. 9. Inductive Swiching Energy Loss vs. Collector Current

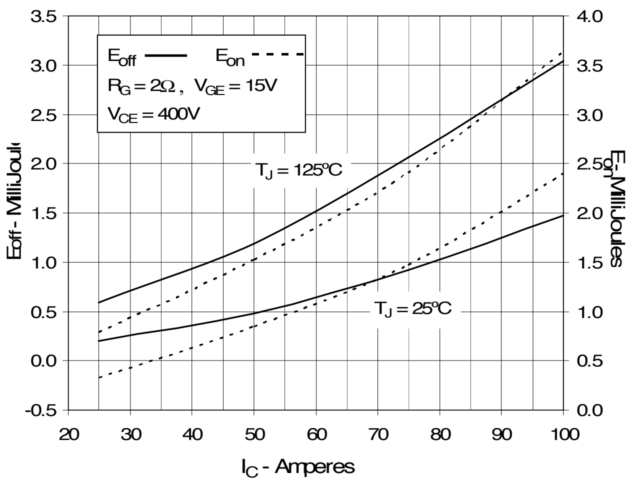


Fig. 10. Inductive Swiching Energy Loss vs. Junction Temperature

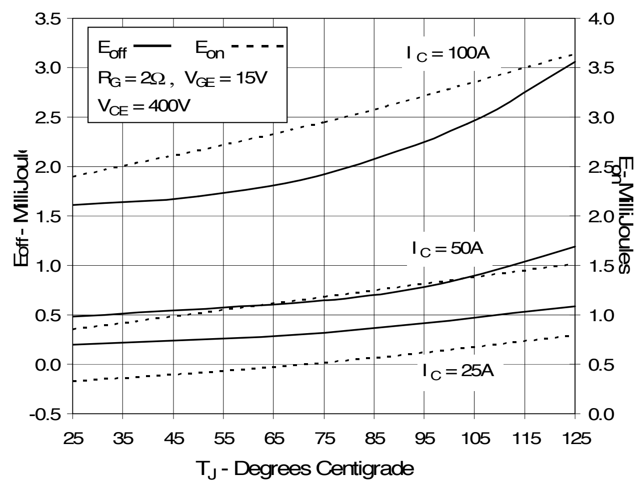


Fig. 11. Inductive Turn-off Switching Times vs. Gate Resistance

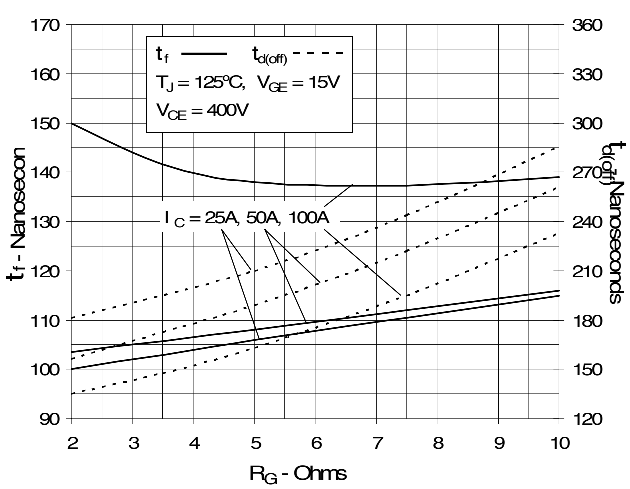


Fig. 12. Inductive Turn-off Switching Times vs. Collector Current

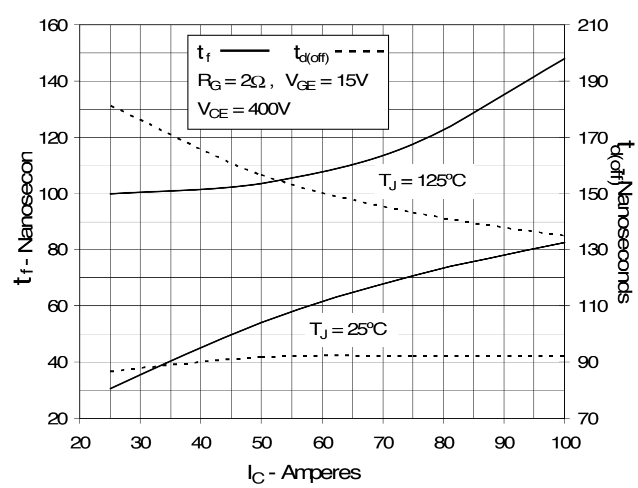


Fig. 13. Inductive Turn-off Switching Times vs. Junction Temperature

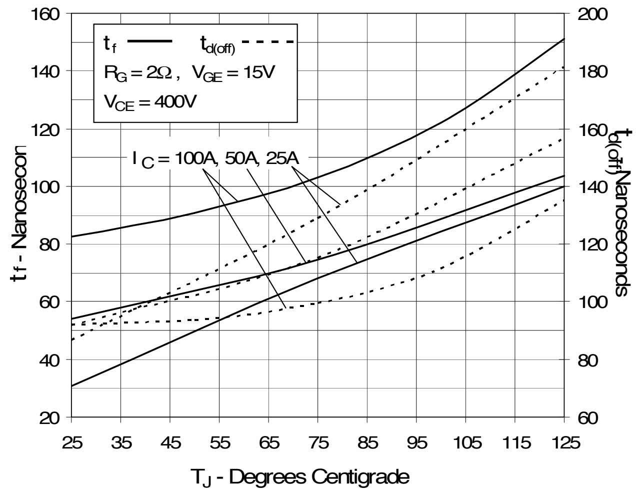


Fig. 14. Inductive Turn-on Switching Times vs. Gate Resistance

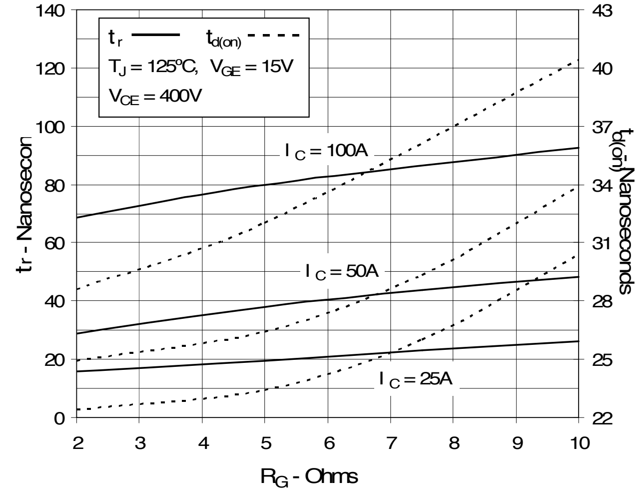


Fig. 15. Inductive Turn-on Switching Times vs. Collector Current

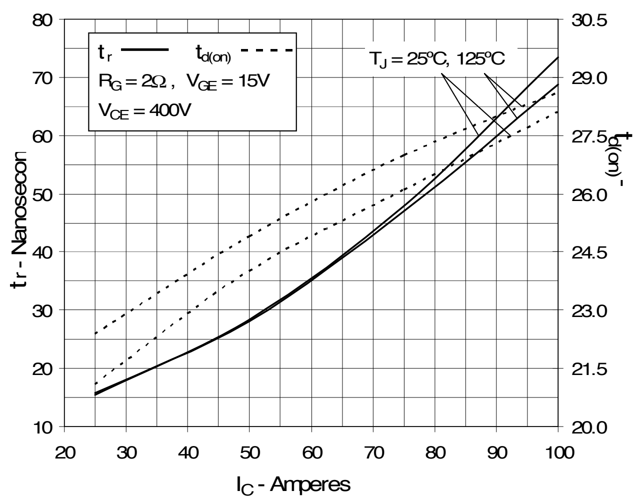


Fig. 16. Inductive Turn-on Switching Times vs. Junction Temperature

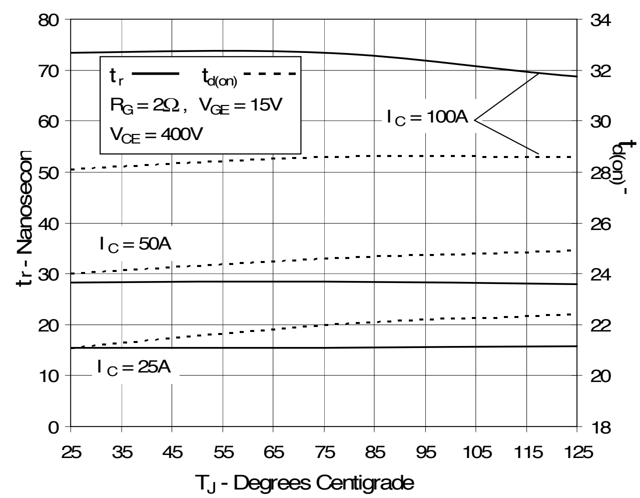


Fig. 17. Gate Charge

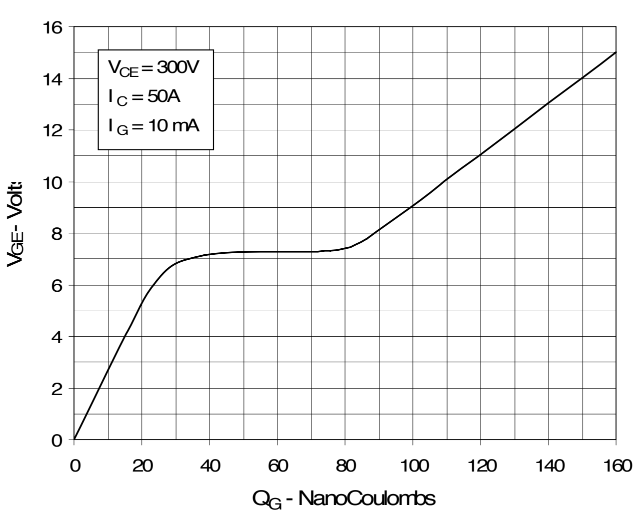


Fig. 18. Capacitance

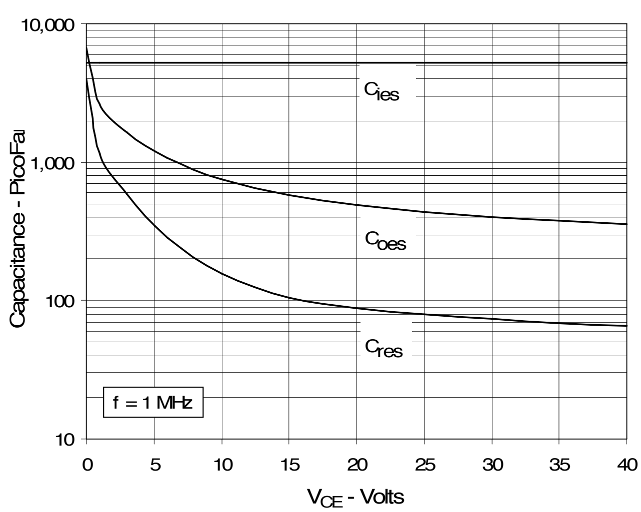


Fig. 19. Reverse-Bias Safe Operating Area

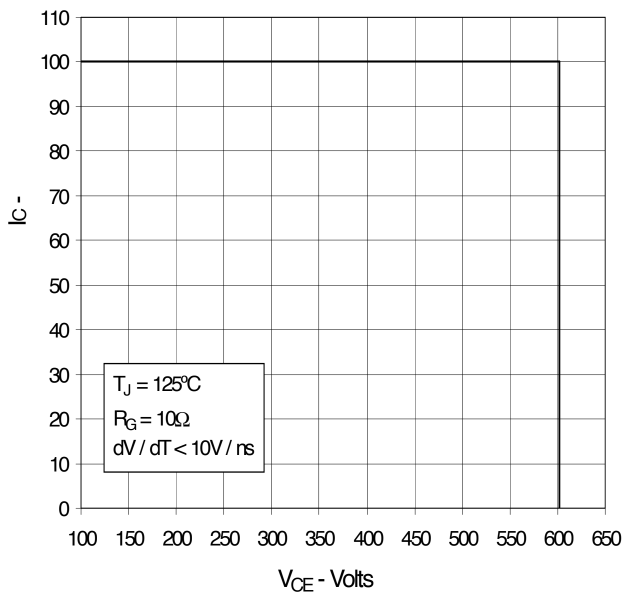
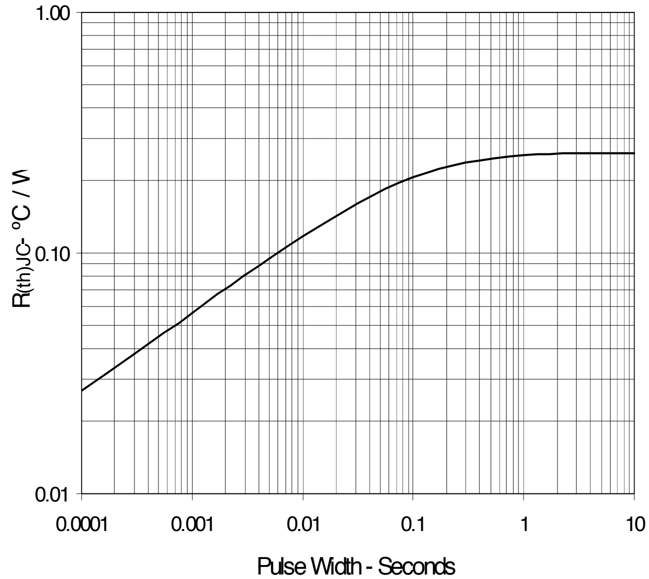


Fig. 20. Maximum Transient Thermal Resistance



Diode's Curves

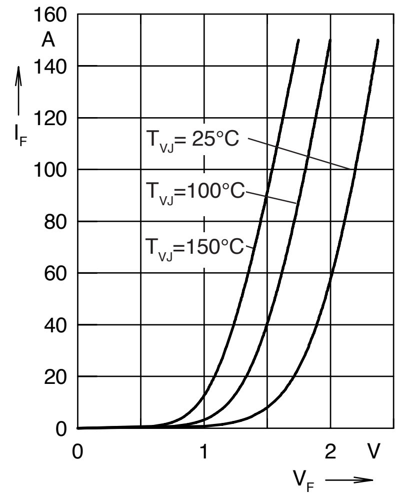


Fig. 21. Forward current I_F versus V_F

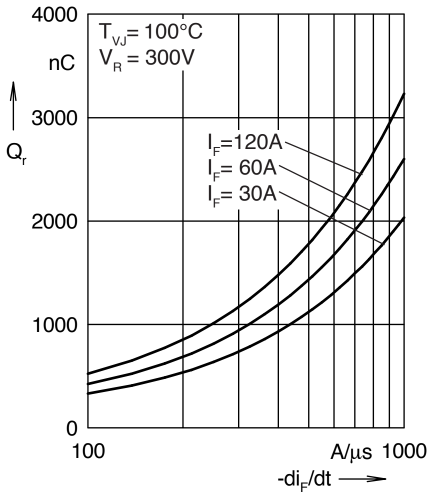


Fig. 22. Reverse recovery charge Q_r versus $-di_F/dt$

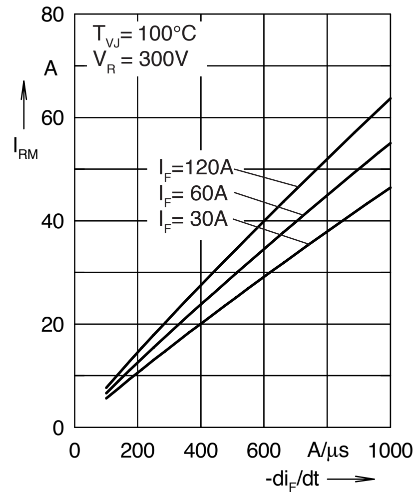


Fig. 23. Peak reverse current I_{RM} versus $-di_F/dt$

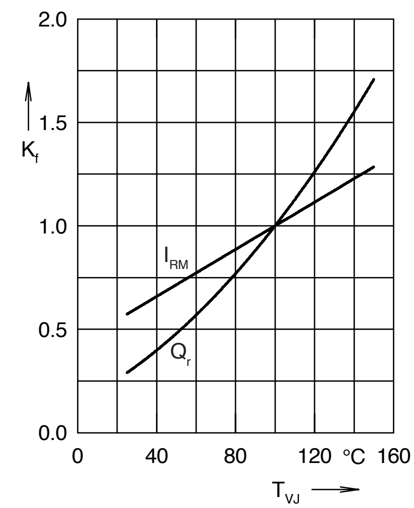


Fig. 24. Dynamic parameters Q_r, I_{RM} versus T_{VJ}

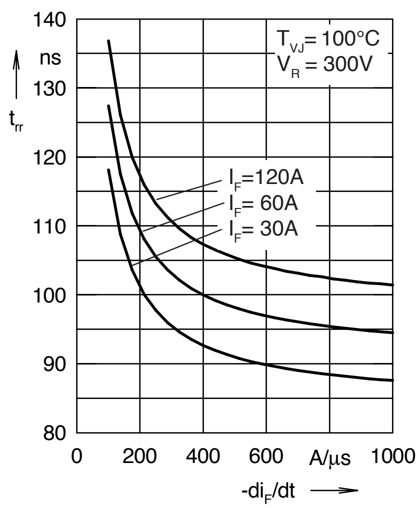


Fig. 25. Recovery time t_{rr} versus $-di_F/dt$

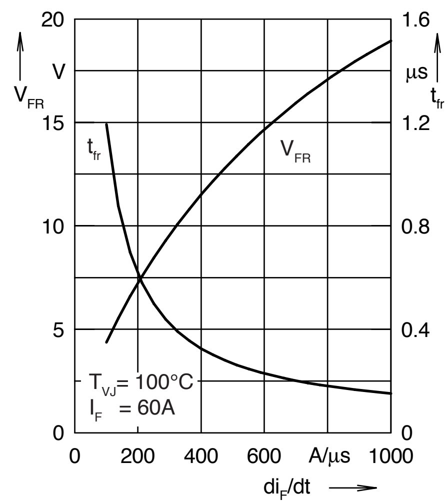


Fig. 26. Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

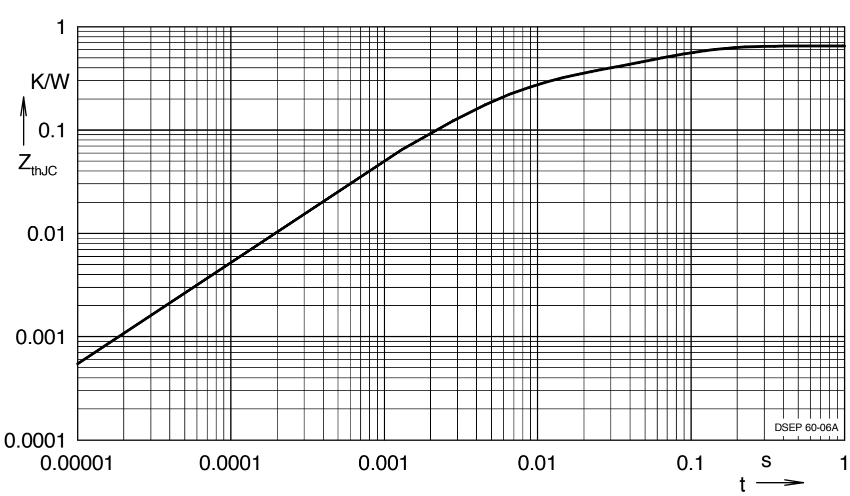


Fig. 27. Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	0.324	0.0052
2	0.125	0.0003
3	0.201	0.0385

Note: Fig. 15 through Fig. 20 show typical values