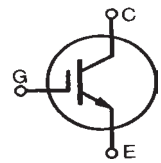
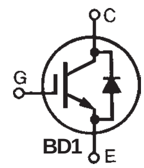
IXYS

High Voltage IGBT with Diode

IXGQ 20N120B
IXGQ 20N120BD1

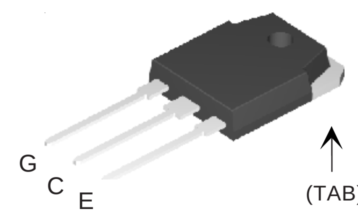
V_{CES} = 1200 V
I_{C25} = 40 A
$V_{CE(sat)}$ = 3.4 V
$t_{fi(typ)}$ = 160 ns





Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1200	V
V_{CGR}	T_J = 25°C to 150°C; R_{GE} = 1 MΩ	1200	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	40	A
I_{C110}	T_C = 110°C	20	A
I_{CM}	T_C = 25°C, 1 ms	100	A
SSOA (RBSOA)	V_{GE} = 15 V, T_J = 125°C, R_G = 10 Ω Clamped inductive load	I_{CM} = 40 @0.8 V_{CES}	A
P_C	T_C = 25°C	190	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
M_d	Mounting torque	1.13/10 Nm/lb.in.	
Maximum lead temperature for soldering 1.6 mm (0.062 in.) from case for 10 s		300	°C
Weight		6	g

TO-3P (IXGQ)



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

Features

- International standard package
- IGBT and anti-parallel FRED for resonant power supplies
  - Induction heating
  - Rice cookers
- MOS Gate turn-on
  - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
  - soft recovery with low I_{RM}

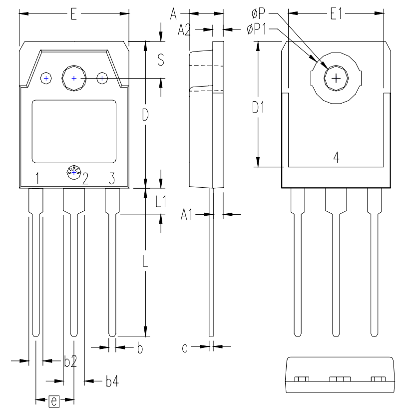
Advantages

- Saves space (two devices in one package)
- Easy to mount with 1 screw (isolated mounting screw hole)
- Reduces assembly time and cost

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}		2.5		5.0	V
I_{CES}	V_{CE} = V_{CES} V_{GE} = 0 V	20N120B 20N120BD1			25 50	µA µA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15 V Note 2	 T_J=125°C		2.9 2.8	3.4	V V

Symbol	Test Conditions	min.	typ.	max.	
	Characteristic Values (T_J = 25°C, unless otherwise specified)				
g_{fs}	I_C = 20A; V_{CE} = 10 V, Note 2.	12	16		S
C_{ies}			1700		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz — 20N120B		70		pF
	20N120BD1		80		pF
C_{res}			23		pF
Q_g			62		nC
Q_{ge}	I_C = 20A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		9		nC
Q_{gc}			24		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		20		ns
t_{ri}	I_C = 20 A; V_{GE} = 15 V		14		ns
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 10 Ω		270	380	ns
t_{fi}	Note 1.		160	320	ns
E_{off}			2.1	3.5	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		25		ns
t_{ri}	I_C = 20A; V_{GE} = 15 V		18		ns
E_{on}	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 10 Ω		1.4		mJ
$t_{d(off)}$	Note 1		270		ns
t_{fi}			360		ns
E_{off}			4.5		mJ
R_{thJC}				0.65	K/W
R_{thCK}	(TO-247)		0.25		K/W

TO-3P (IXGQ) Outline



1 - GATE
2 - DRAIN (COLLECTOR)
3 - SOURCE (EMITTER)
4 - DRAIN (COLLECTOR)

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.185	.193	4.70	4.90
A1	.051	.059	1.30	1.50
A2	.057	.065	1.45	1.65
b	.035	.045	0.90	1.15
b2	.075	.087	1.90	2.20
b4	.114	.126	2.90	3.20
c	.022	.031	0.55	0.80
D	.780	.791	19.80	20.10
D1	.665	.677	16.90	17.20
E	.610	.622	15.50	15.80
E1	.531	.539	13.50	13.70
e	.215 BSC		5.45 BSC	
L	.779	.795	19.80	20.20
L1	.134	.142	3.40	3.60
øP	.126	.134	3.20	3.40
øP1	.272	.280	6.90	7.10
S	.193	.201	4.90	5.10

All metal area are tin plated.

Reverse Diode (FRED)

Symbol	Test Conditions	min.	typ.	max.	
	Characteristic Values (T_J = 25°C, unless otherwise specified)				
I_F	T_C = 90°C			10	A
V_F	I_F = 10 A, V_{GE} = 0 V			3.3	V
I_{RM}	I_F = 10 A; $-di_F/dt$ = 400 A/µs, V_R = 600 V		14		A
t_{rr}	V_{GE} = 0 V; T_J = 125°C		120		ns
t_{rr}	I_F = 1 A; $-di_F/dt$ = 100 A/µs; V_R = 30 V, V_{GE} = 0 V		40		ns
R_{thJC}				2.5	K/W

Notes:
1. Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G.
2. Pulse test, t ≤ 300 µs, duty cycle d ≤ 2 %

Fig. 1. Output Characteristics @ 25 Deg. C

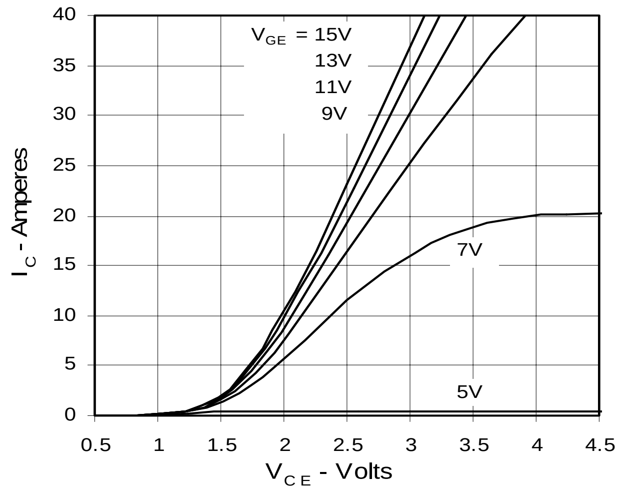


Fig. 2. Extended Output Characteristics @ 25 deg. C

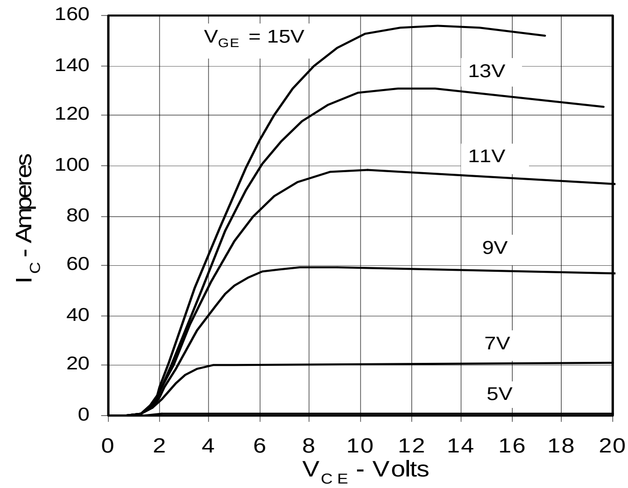


Fig. 3. Output Characteristics @ 125 Deg. C

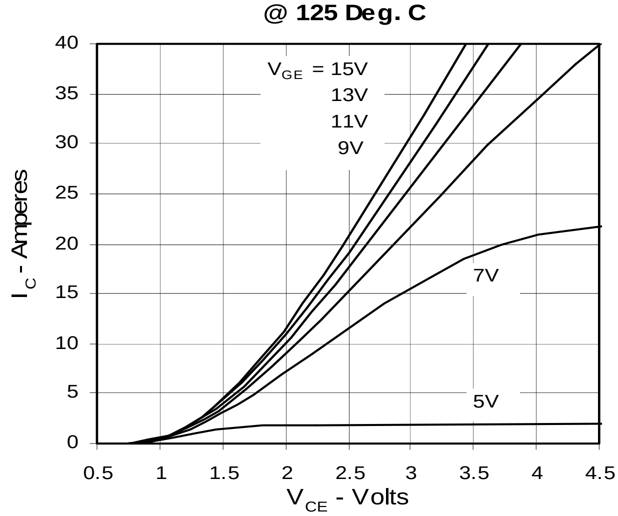


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

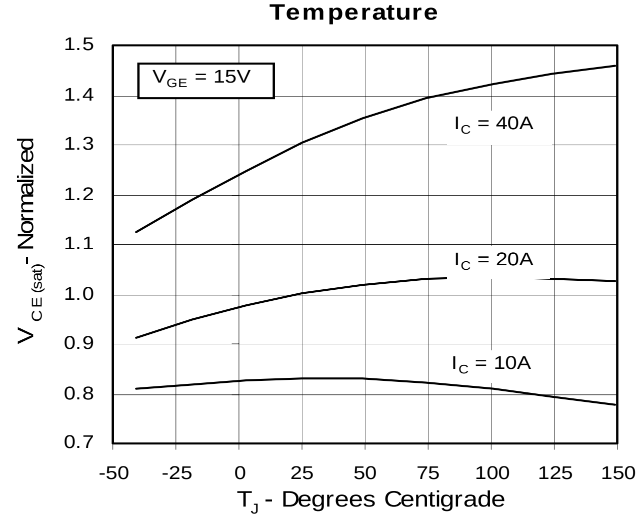


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emiiter voltage

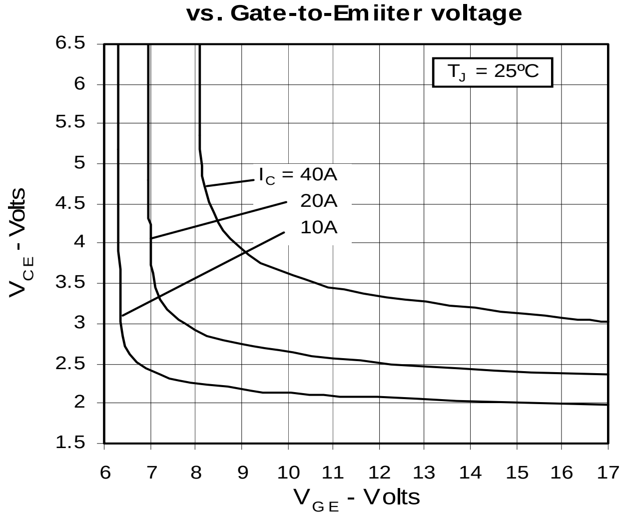


Fig. 6. Input Admittance

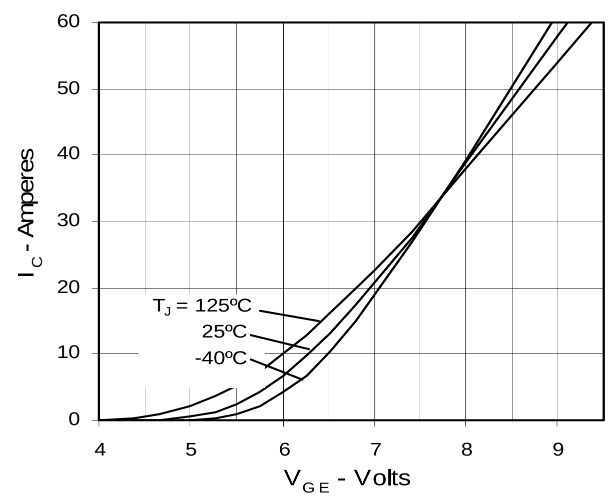


Fig. 7. Transconductance

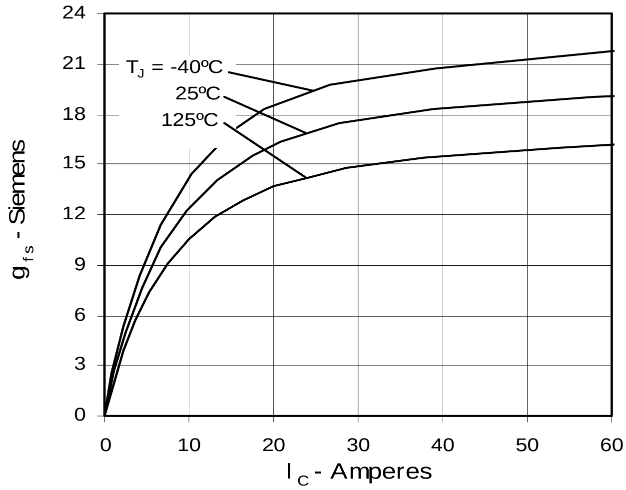


Fig. 8. Dependence of Turn-off Energy Loss on R_G

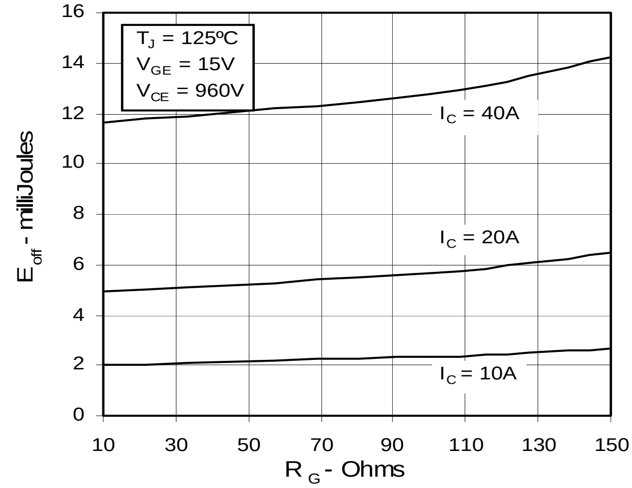


Fig. 9. Dependence of Turn-Off Energy Loss on I_c

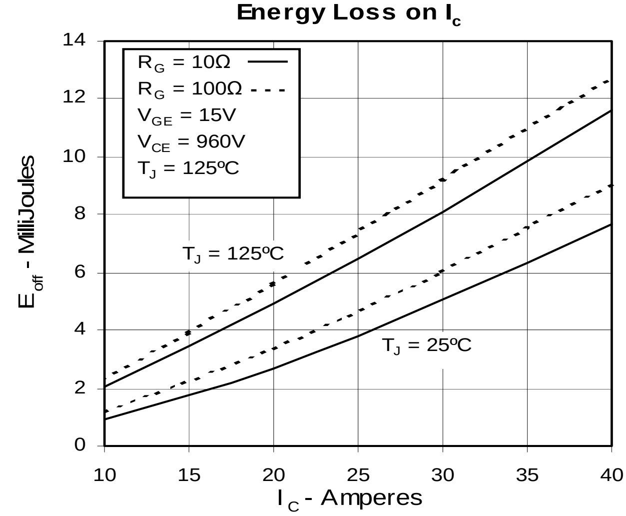


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

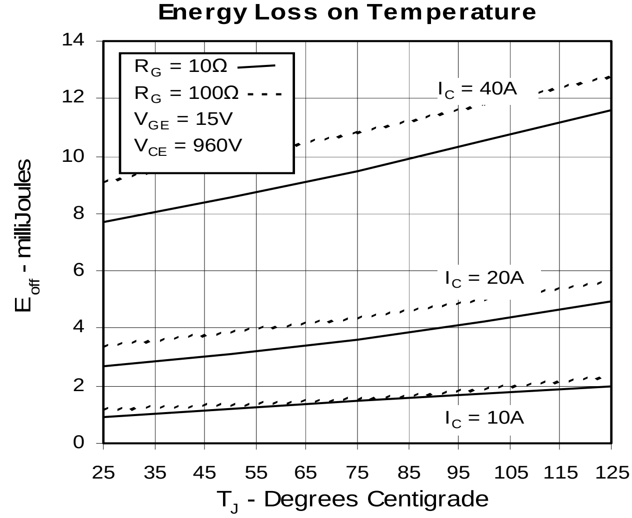


Fig. 11. Dependence of Turn-off Switching Time on R_G

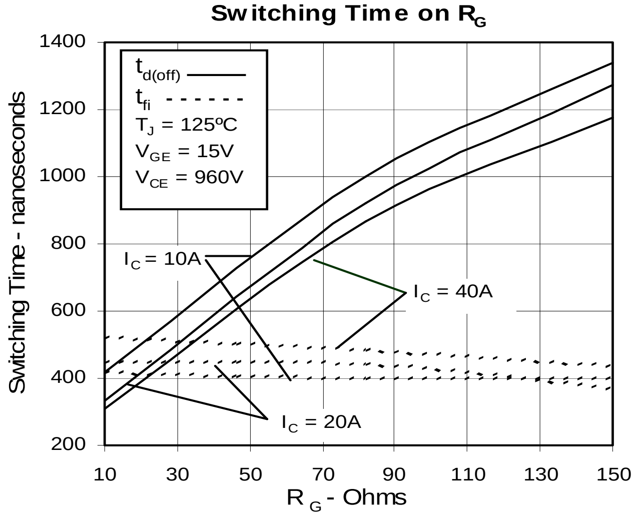


Fig. 12. Dependence of Turn-off Switching Time on I_c

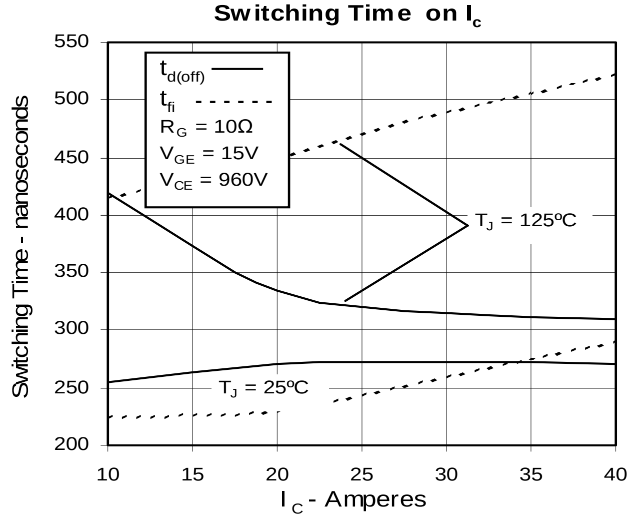


Fig. 13. Dependence of Turn-off Switching Time on Temperature

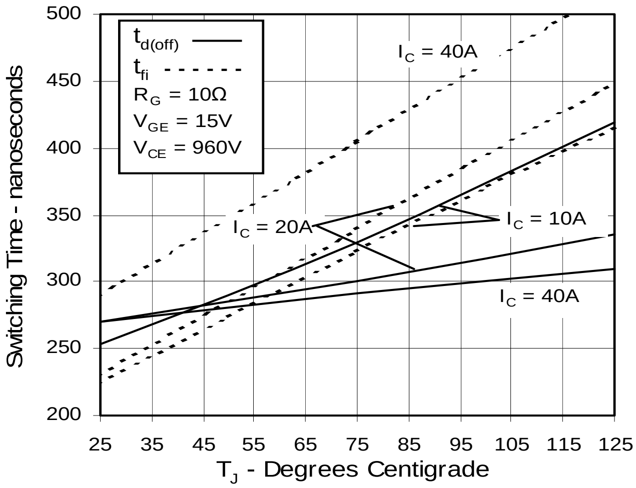


Fig. 14. Gate Charge

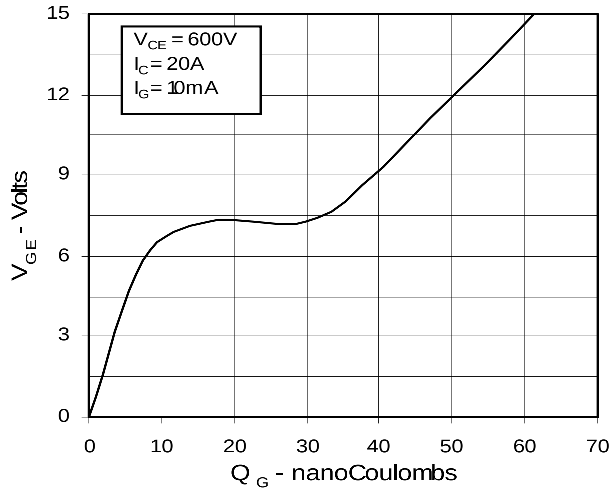


Fig. 15. Capacitance

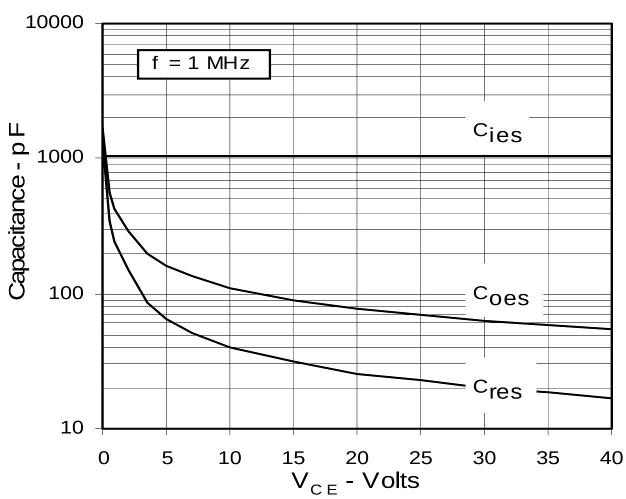
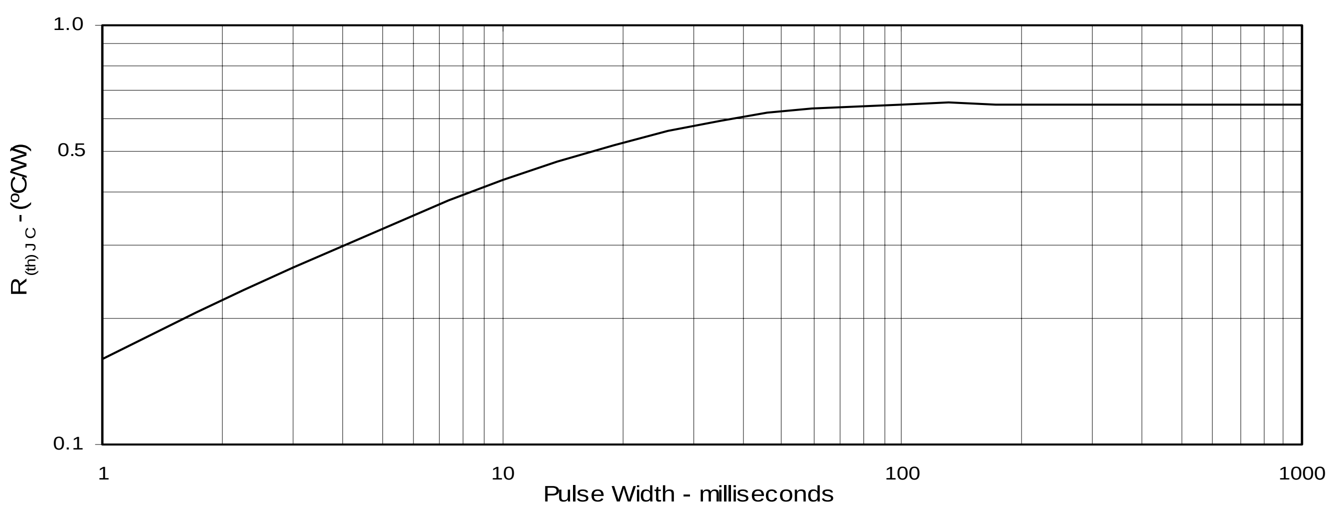


Fig. 16. Maximum Transient Thermal Resistance



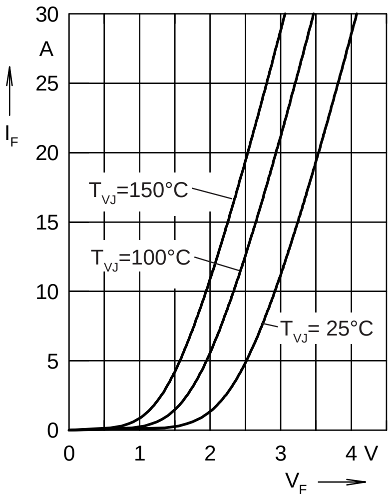


Fig. 17 Forward current I_F versus V_F

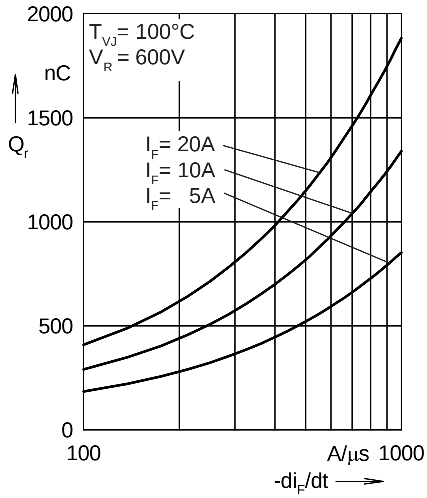


Fig. 18 Reverse recovery charge Q_r versus $-di_F/dt$

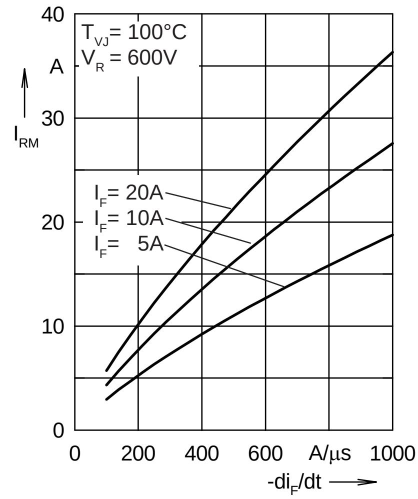


Fig. 19 Peak reverse current I_{RM} versus $-di_F/dt$

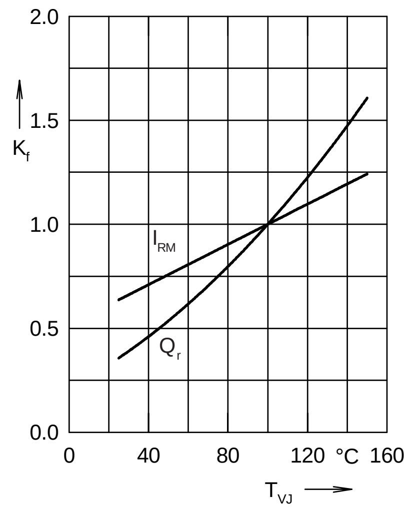


Fig. 20 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

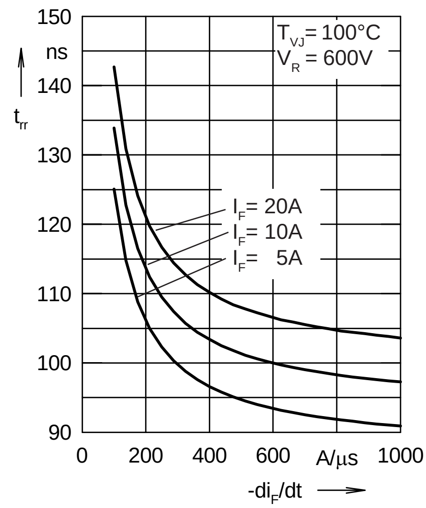


Fig. 21 Recovery time t_{rr} versus $-di_F/dt$

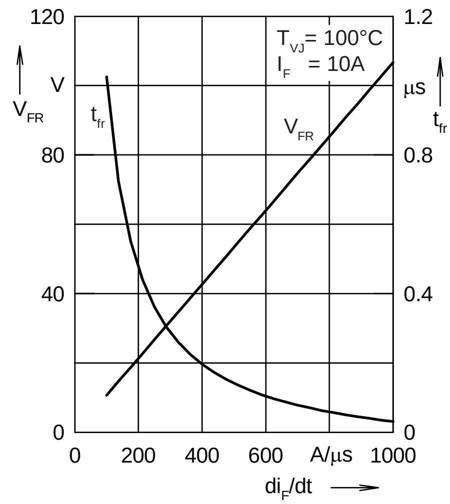


Fig. 22 Peak forward voltage V_{FR} and t_{fr} versus di_F/dt

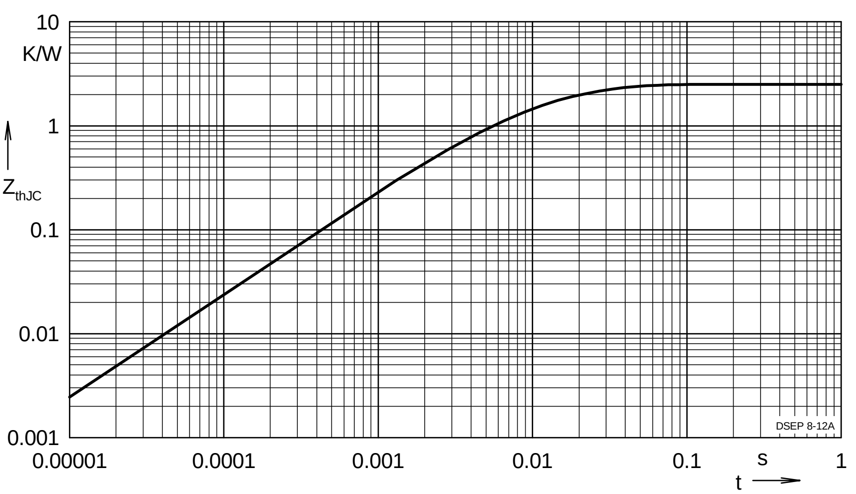


Fig. 23 Transient thermal resistance junction to case

Constants for Z_{thJC} calculation:

i	R_{thi} (K/W)	t_i (s)
1	1.449	0.0052
2	0.558	0.0003
3	0.493	0.017