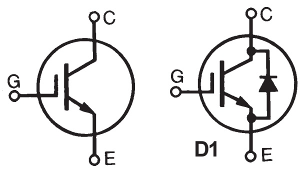
IXYS

High Voltage IGBT with Diode

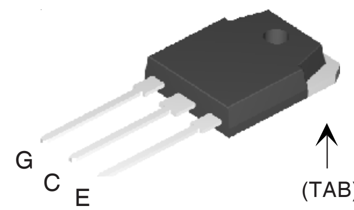
IXGQ 28N120B
IXGQ 28N120BD1

V_{CES}	= 1200	V
I_{C25}	= 50	A
$V_{CE(sat)}$	= 3.5	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	50	A
I_{C110}	T_C = 110°C	28	A
I_{CM}	T_C = 25°C, 1 ms	150	A
SSOA (RBSOA)	V_{GE} = 15 V, T_J = 125°C, R_G = 10 Ω Clamped inductive load	I_{CM} = 60 @0.8 V_{CES}	A
P_C	T_C = 25°C	250	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}

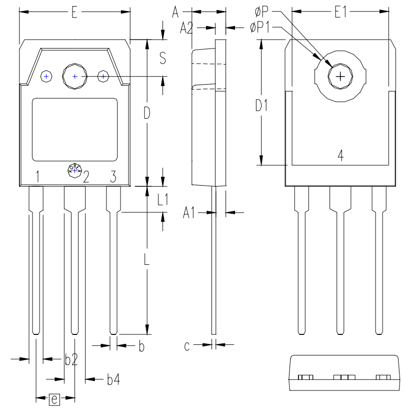
Advantages

- 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	T_J = 25°C	28N120B 28N120BD1		25 50	µA µA
I_{GES}	V_{CE} = 0 V, V_{GE} = ±20 V				±100	nA
$V_{CE(sat)}$	I_C = 28A, V_{GE} = 15 V Note 2	 T=125°C		2.9 2.8	3.5	V

Symbol	Test Conditions	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
g_{fs}	I_C = 28A; V_{CE} = 10 V, Note 2	20	30		S
C_{ies}			2700		pF
C_{oes}	V_{CE} = 25 V, V_{GE} = 0 V, f = 1 MHz; 28N120B		170		pF
	28N120BD1		180		pF
C_{res}			60		pF
Q_g			92		nC
Q_{ge}	I_C = 28A, V_{GE} = 15 V, V_{CE} = 0.5 V_{CES}		17		nC
Q_{gc}			37		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		30		ns
t_{ri}	I_C = 28 A; V_{GE} = 15 V		20		ns
$t_{d(off)}$	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 5 Ω		180	280	ns
t_{fi}	Note 1.		160	320	ns
E_{off}			2.0	5.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		35		ns
t_{ri}	I_C = 28A; V_{GE} = 15 V		28		ns
E_{on}	V_{CE} = 0.8 V_{CES}; R_G = R_{off} = 5 Ω		2.5		mJ
$t_{d(off)}$	Note 1		250		ns
t_{fi}			300		ns
E_{off}			8.0		mJ
R_{thJC}				0.5	K/W
R_{thCK}			0.25		K/W

TO-3P (IXTQ) 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	Characteristic Values (T_J = 25°C, unless otherwise specified) min.	typ.	max.	
I_F	T_C = 90°C			10	A
V_F	I_F = 10 A, V_{GE} = 0 V			2.95	V
	I_F = 10 A, V_{GE} = 0 V, T_J = 125°C			2.0	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 %

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

IXYS MOSFETs and IGBTs are covered by one or more	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	6,583,505
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	6,683,344

Fig. 1. Output Characteristics @ 25 Deg. C

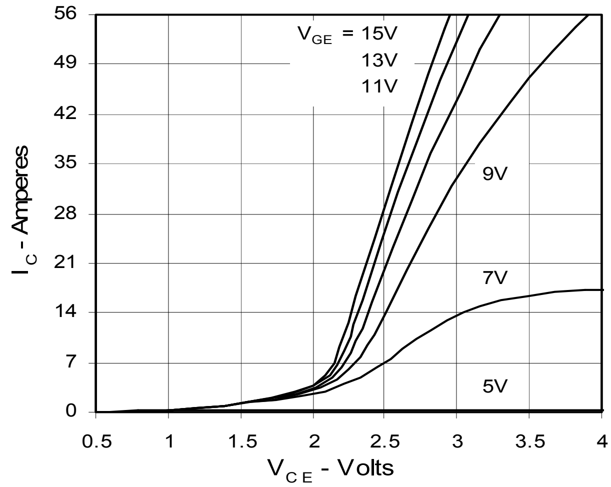


Fig. 2. Extended Output Characteristics @ 25 deg. C

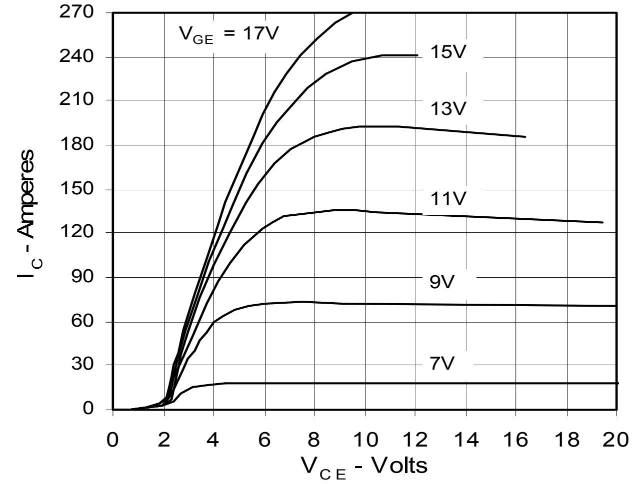


Fig. 3. Output Characteristics @ 125 Deg. C

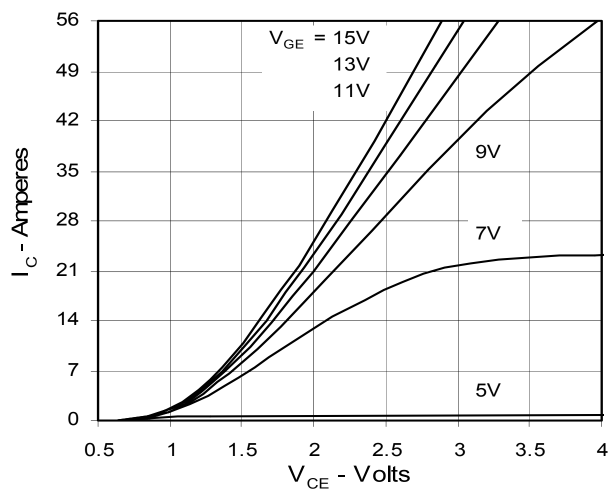


Fig. 4. Dependence of $V_{CE(sat)}$ on Temperature

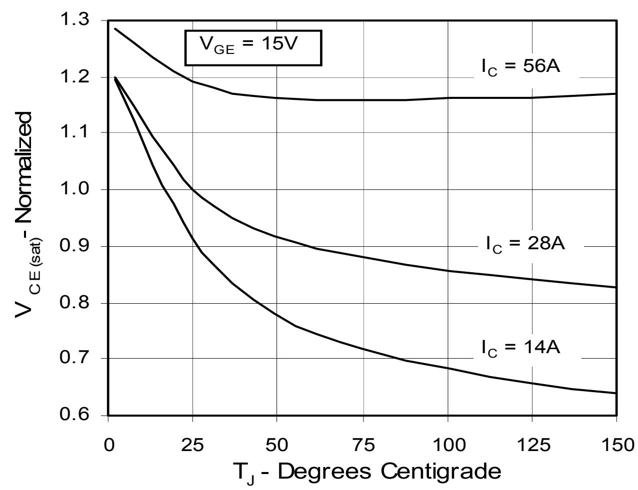


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter voltage

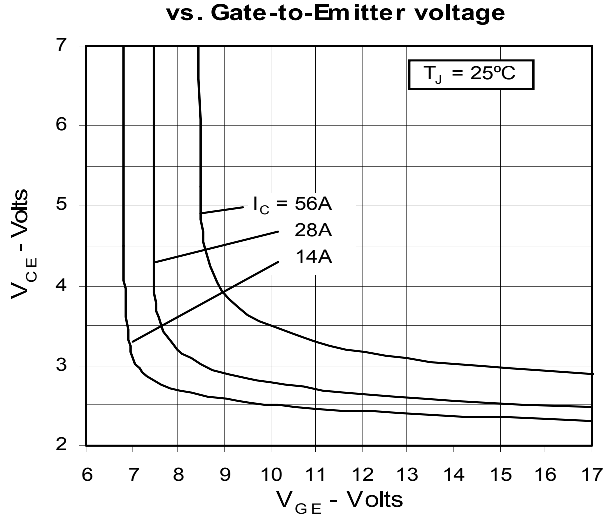


Fig. 6. Input Admittance

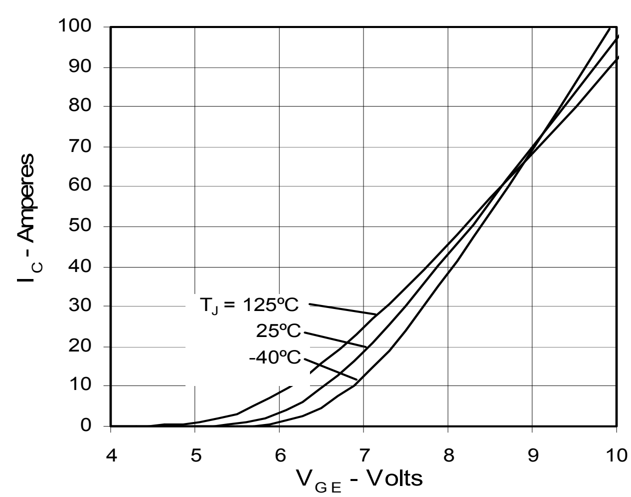


Fig. 7. Transconductance

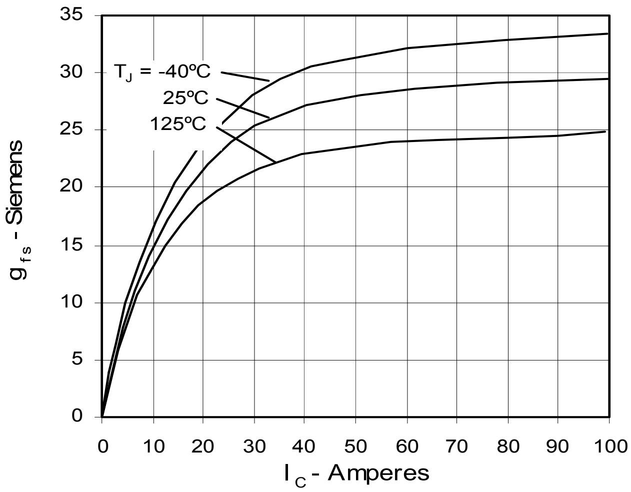


Fig. 8. Dependence of Turn-off Energy Loss on R_G

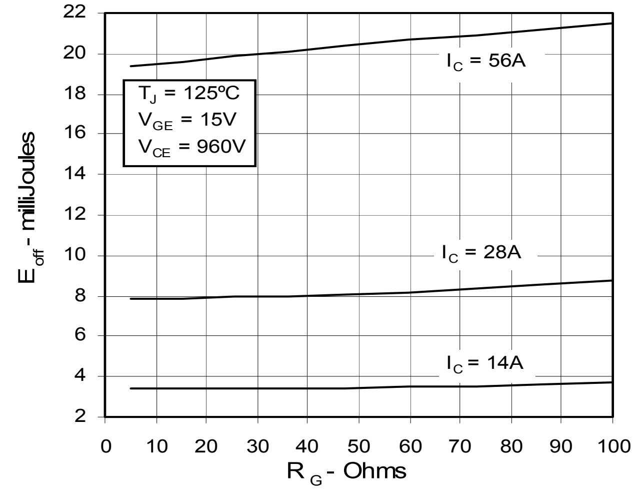


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

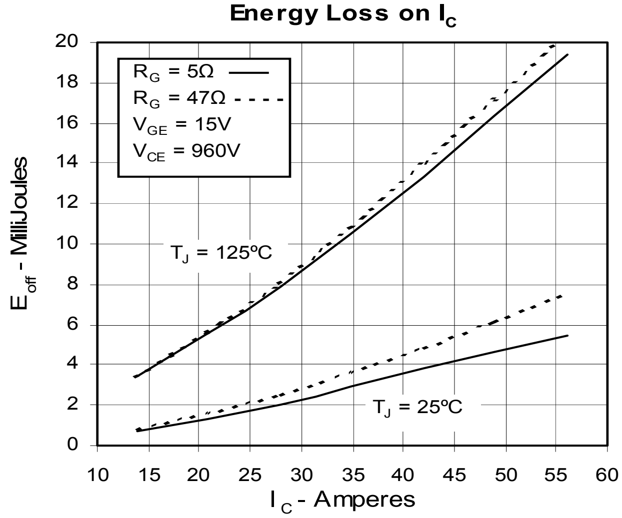


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

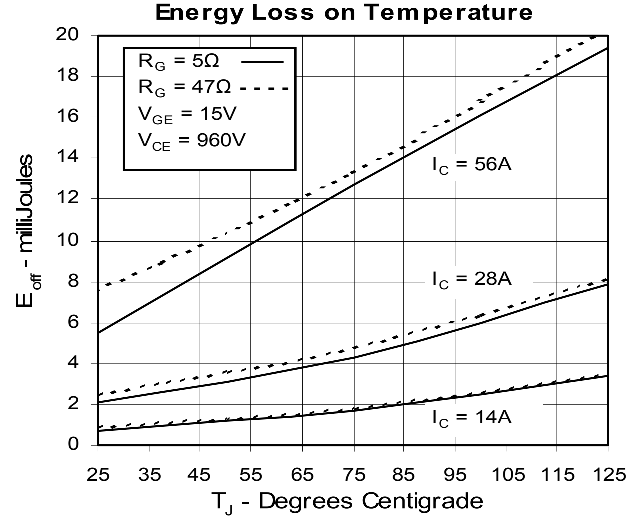


Fig. 11. Dependence of Turn-off Switching Time on R_G

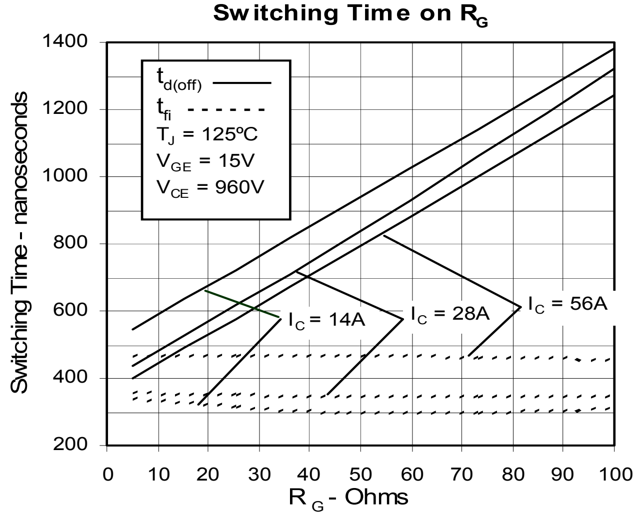
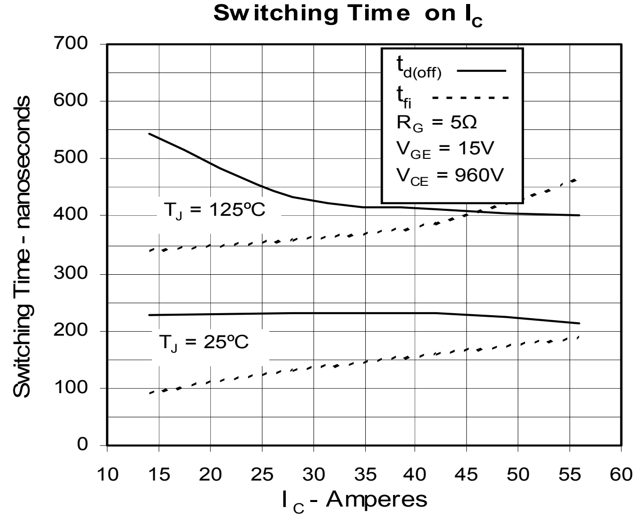


Fig. 12. Dependence of Turn-off Switching Time on I_C



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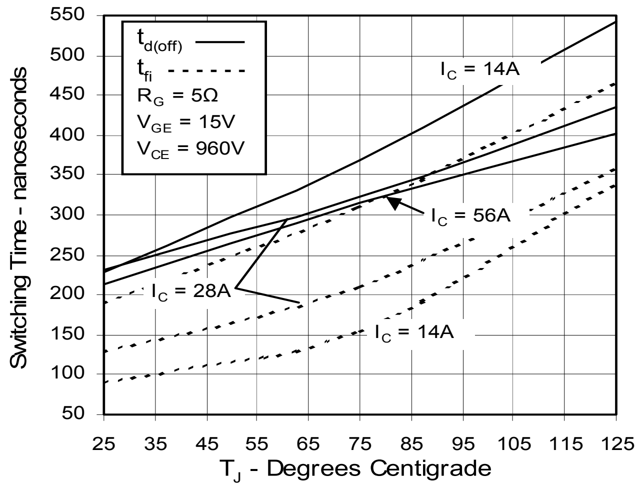

Fig. 13. Dependence of Turn-off Switching Time on Temperature

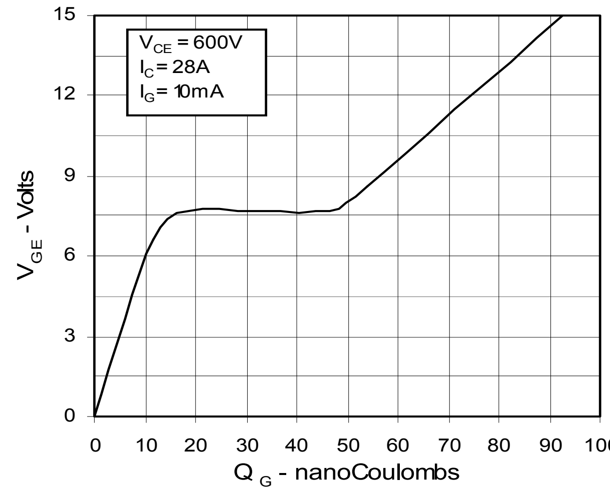

Fig. 14. Gate Charge

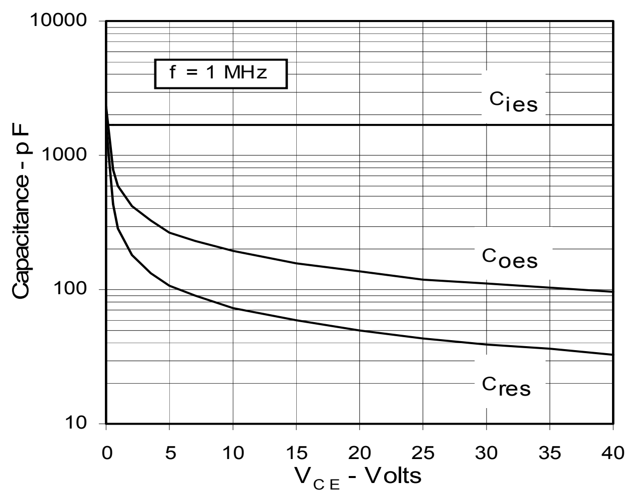

Fig. 15. Capacitance

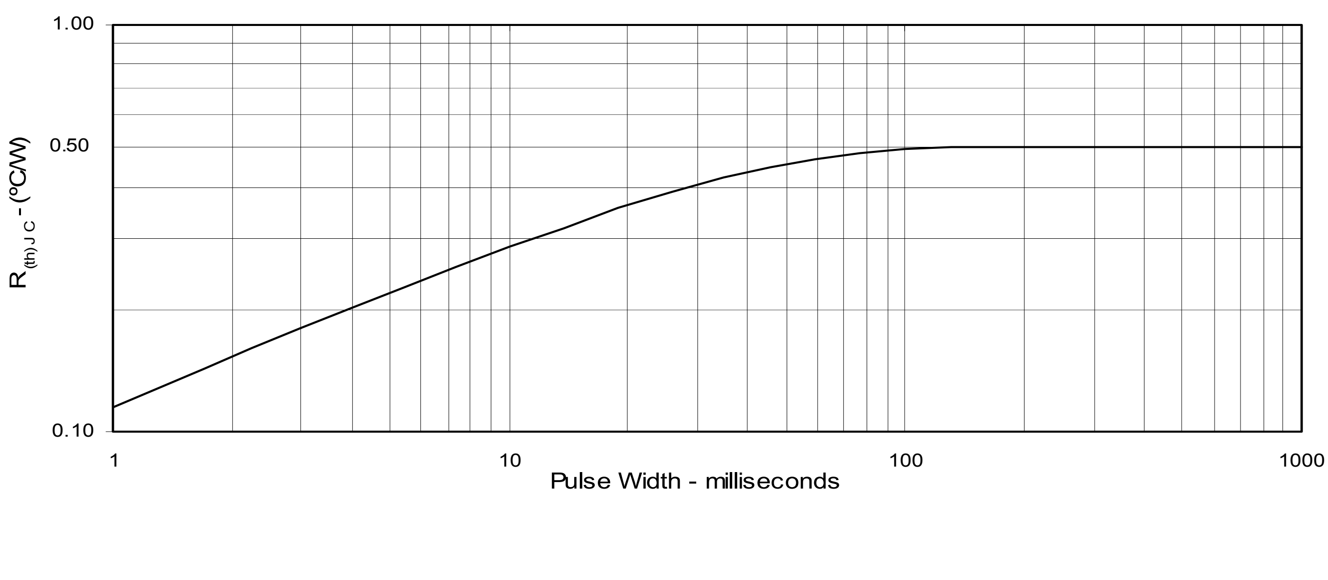

Fig. 16. Maximum Transient Thermal Resistance

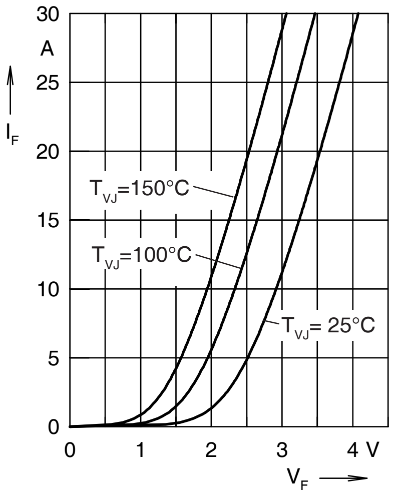

Fig. 17 Forward current I_F versus V_F

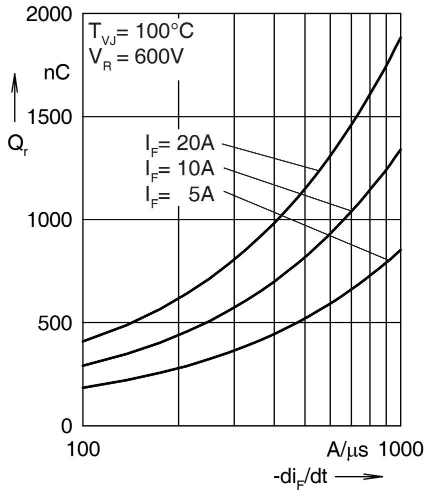

Fig. 18 Reverse recovery charge Q_r versus $-di_F/dt$

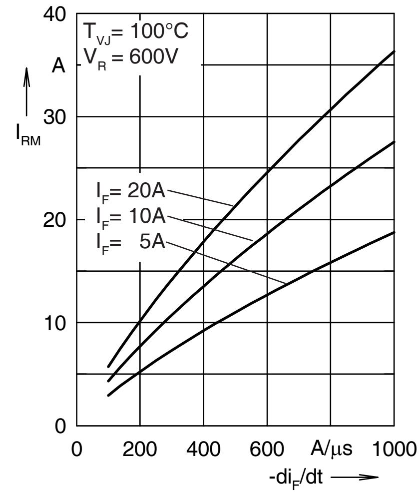

Fig. 19 Peak reverse current I_{RM} versus $-di_F/dt$

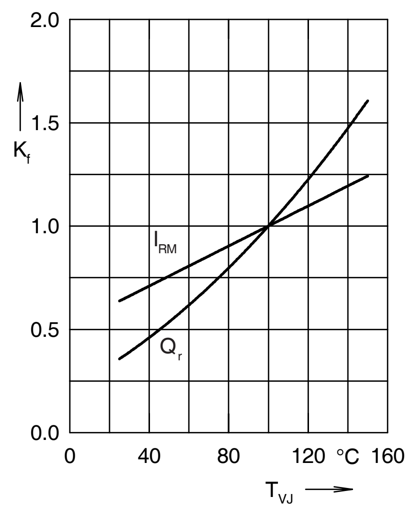

Fig. 20 Dynamic parameters Q_r, I_{RM} versus T_{VJ}

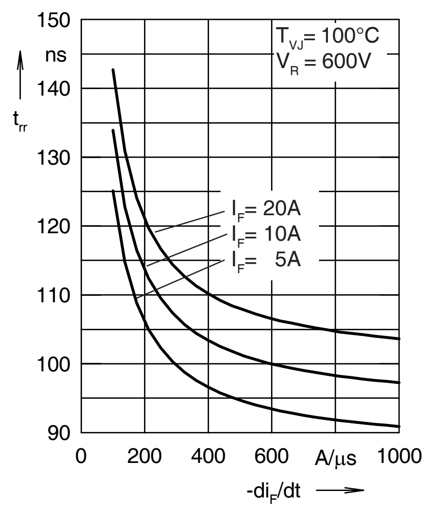

Fig. 21 Recovery time t_{rr} versus $-di_F/dt$

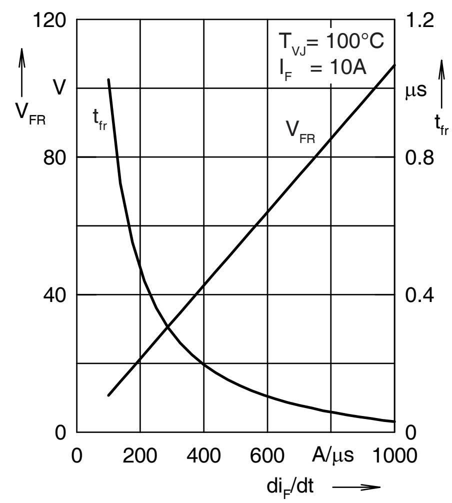

Fig. 22 Peak forward voltage V_{FR} and t_{fr}

versus di_F/dt

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

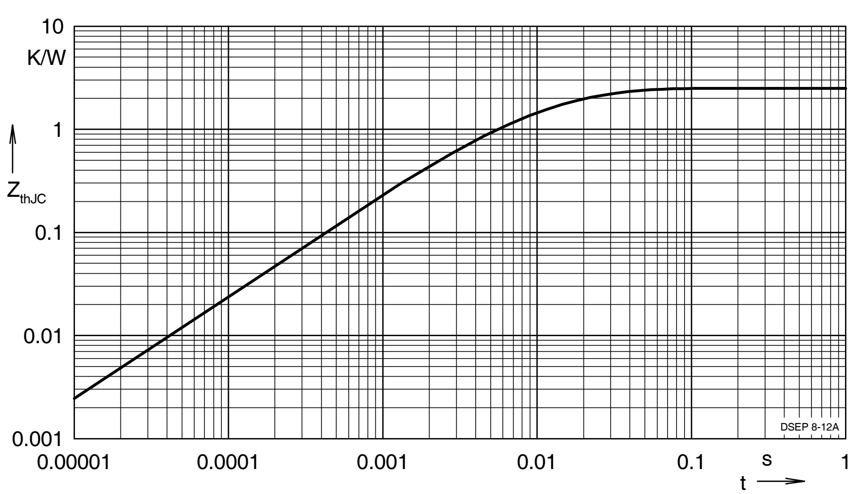

Fig. 23 Transient thermal resistance junction to case

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