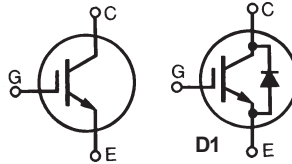


High Voltage IGBT with Diode

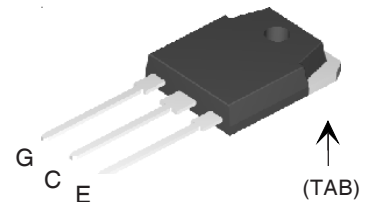
IXGQ 28N120B IXGQ 28N120BD1



$V_{CES} = 1200 \text{ V}$
 $I_{C25} = 50 \text{ A}$
 $V_{CE(sat)} = 3.5 \text{ V}$
 $t_{fi(typ)} = 160 \text{ ns}$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}$	1200	V
V_{CGR}	$T_J = 25^\circ\text{C to } 150^\circ\text{C}; R_{GE} = 1 \text{ M}\Omega$	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C}$	50	A
I_{C110}	$T_C = 110^\circ\text{C}$	28	A
I_{CM}	$T_C = 25^\circ\text{C}, 1 \text{ ms}$	150	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}, T_J = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load	$I_{CM} = 60$ @ $0.8 V_{CES}$	A
P_C	$T_C = 25^\circ\text{C}$	250	W
T_J		-55 ... +150	$^\circ\text{C}$
T_{JM}		150	$^\circ\text{C}$
T_{stg}		-55 ... +150	$^\circ\text{C}$
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	$^\circ\text{C}$
Weight		6	g

TO-3P (IXGQ)



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

Features

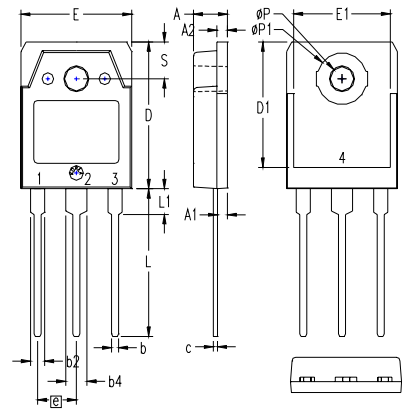
- International standard package
- IGBT and anti-parallel FRED for resonant power supplies
 - Induction heating
 - Rice cookers
- MOS Gate turn-on
 - drive simplicity
- Fast Recovery Epitaxial Diode (FRED)
 - soft recovery with low I_{RM}

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 ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
$V_{GE(th)}$	$I_C = 250 \mu\text{A}, V_{CE} = V_{GE}$	2.5		5.0 V
I_{CES}	$V_{CE} = V_{CES}, T_J = 25^\circ\text{C}$ $V_{GE} = 0 \text{ V}$		28N120B 28N120BD1	25 μA 50 μA
I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 28 \text{ A}, V_{GE} = 15 \text{ V}$ Note 2			2.9 2.8 V

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

TO-3P (IXTQ) Outline


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

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	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
ϕP	.126	.134	3.20	3.40
$\phi P1$.272	.280	6.90	7.10
S	.193	.201	4.90	5.10

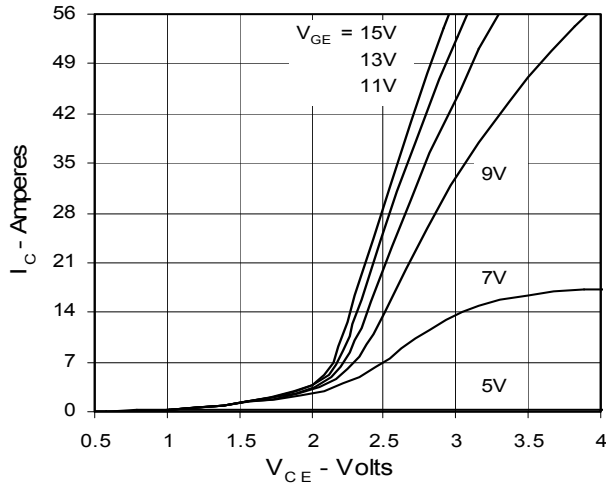
All metal area are tin plated.

Symbol	Test Conditions	Characteristic Values ($T_J = 25^\circ\text{C}$, unless otherwise specified)		
		min.	typ.	max.
I_F	$T_C = 90^\circ\text{C}$			10 A
V_F	$I_F = 10\text{A}, V_{GE} = 0\text{V}$			2.95 V
	$I_F = 10\text{A}, V_{GE} = 0\text{V}, T_J = 125^\circ\text{C}$			2.0 V
I_{RM}	$I_F = 10\text{A}; -di_F/dt = 400\text{A}/\mu\text{s}, V_R = 600\text{V}$		14	A
t_{rr}	$V_{GE} = 0\text{V}; T_J = 125^\circ\text{C}$		120	ns
t_{rr}	$I_F = 1\text{A}; -di_F/dt = 100\text{A}/\mu\text{s}; V_R = 30\text{V}, V_{GE} = 0\text{V}$		40	ns
R_{thJC}				2.5 K/W

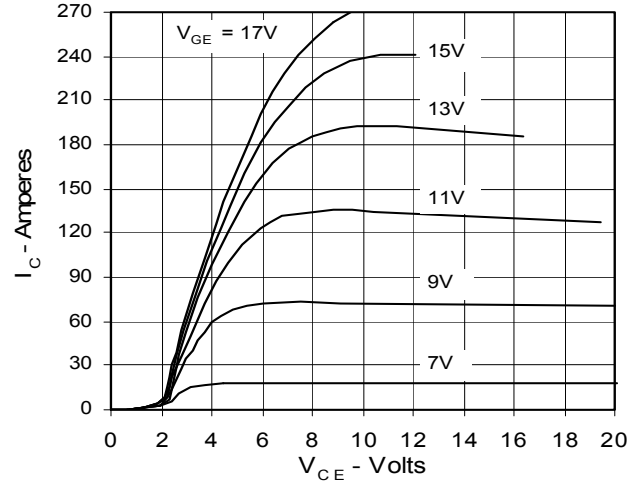
- Notes:
- Switching times may increase for $V_{CE}(\text{Clamp}) > 0.8 \cdot V_{CES}$, higher T_J or increased R_G .
 - Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle $d \leq 2\%$

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

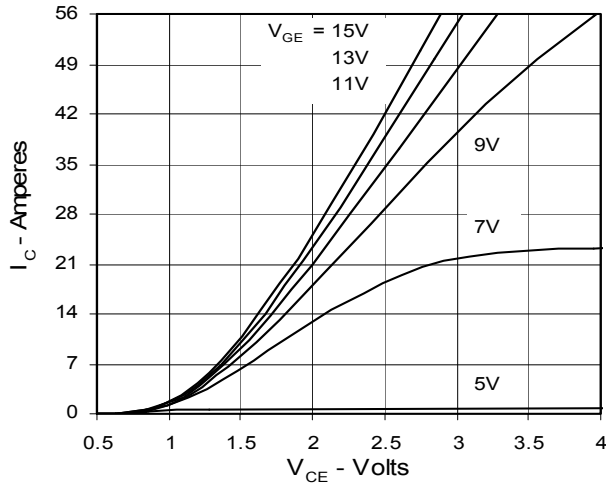
**Fig. 1. Output Characteristics
@ 25 Deg. C**



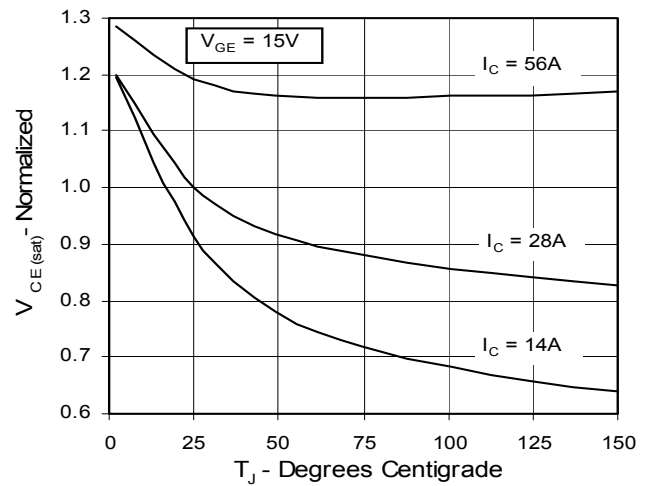
**Fig. 2. Extended Output Characteristics
@ 25 deg. C**



**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**

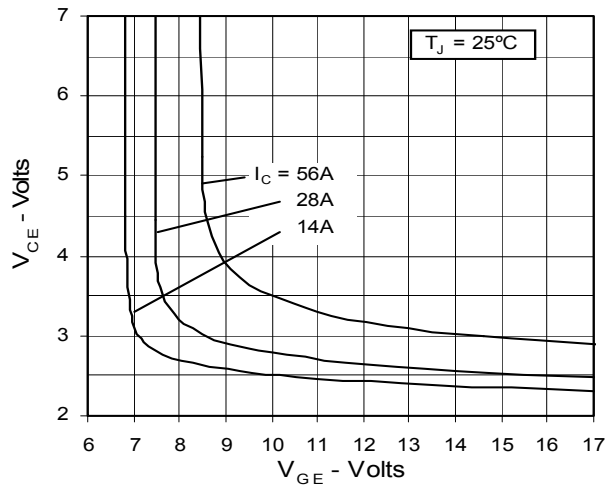


Fig. 6. Input Admittance

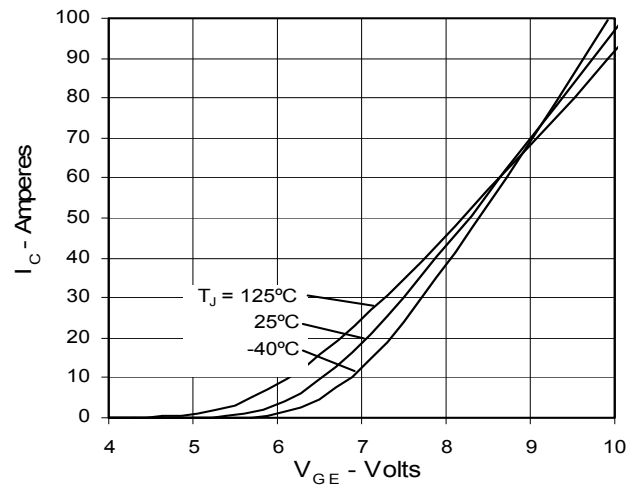


Fig. 7. Transconductance

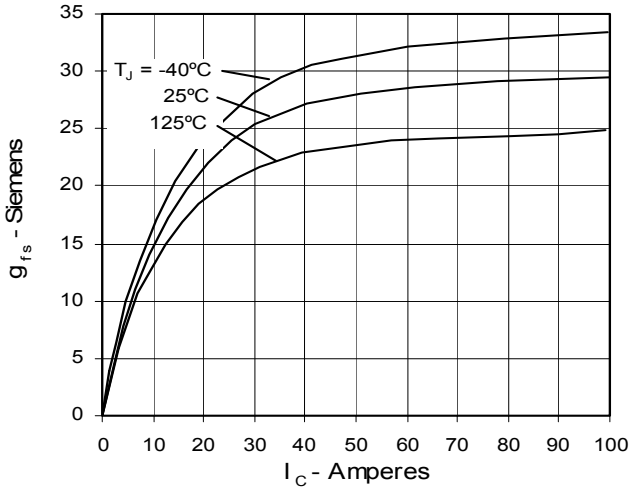


Fig. 8. Dependence of Turn-off Energy Loss on R_G

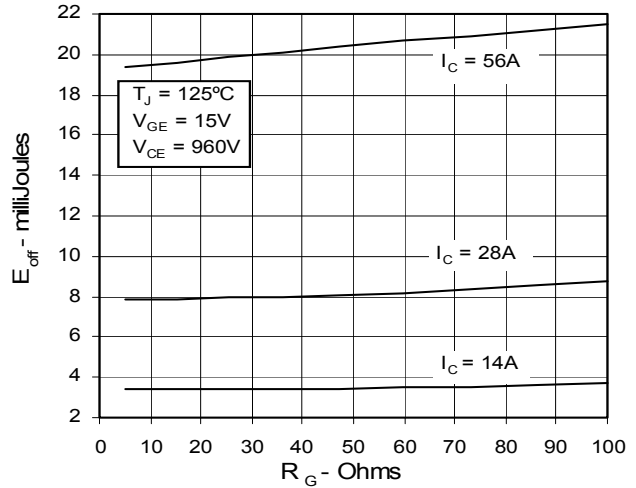


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

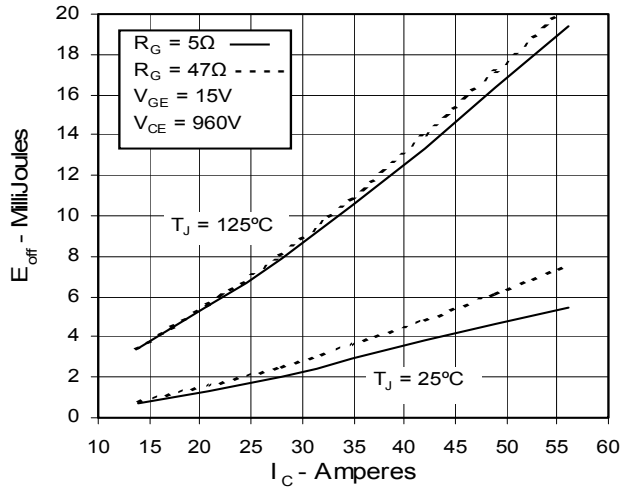


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

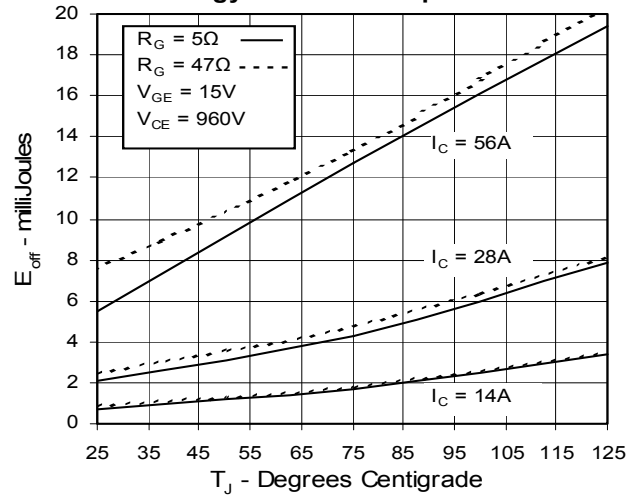


Fig. 11. Dependence of Turn-off Switching Time on R_G

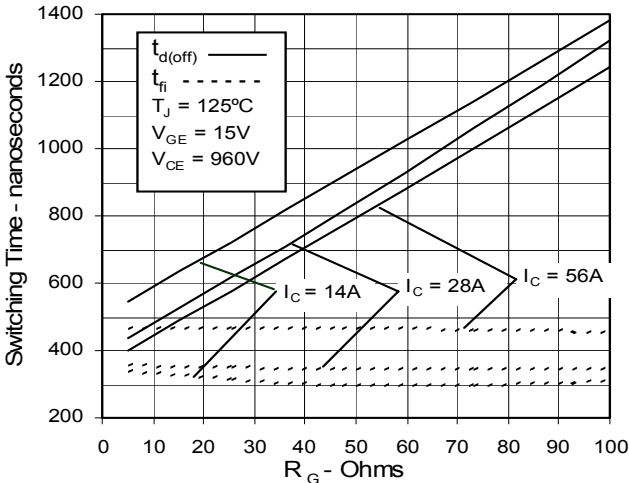
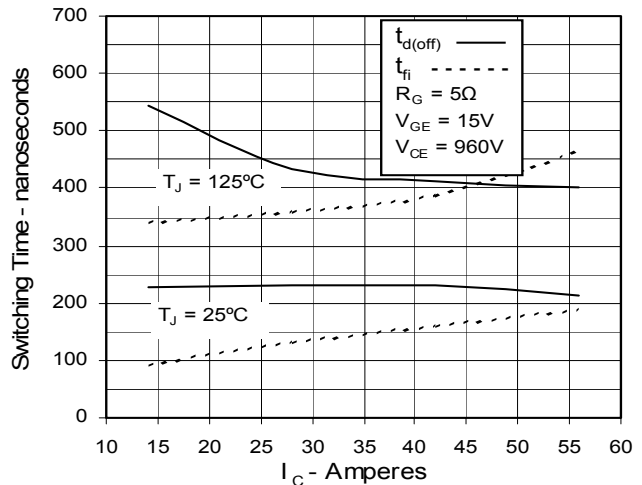


Fig. 12. Dependence of Turn-off Switching Time on I_C



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:

4,850,072	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
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. 13. Dependence of Turn-off Switching Time on Temperature

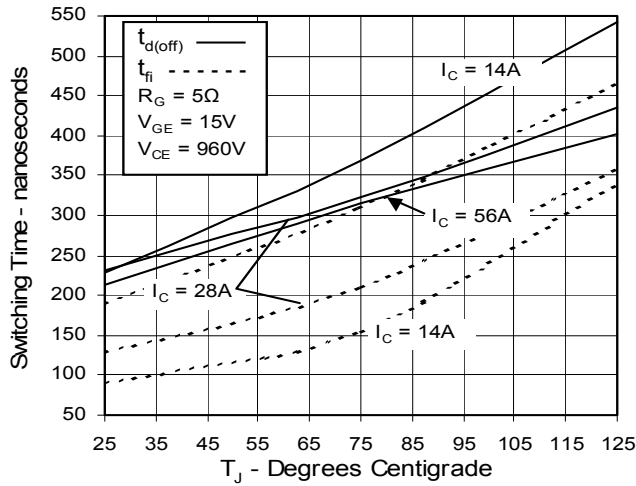


Fig. 14. Gate Charge

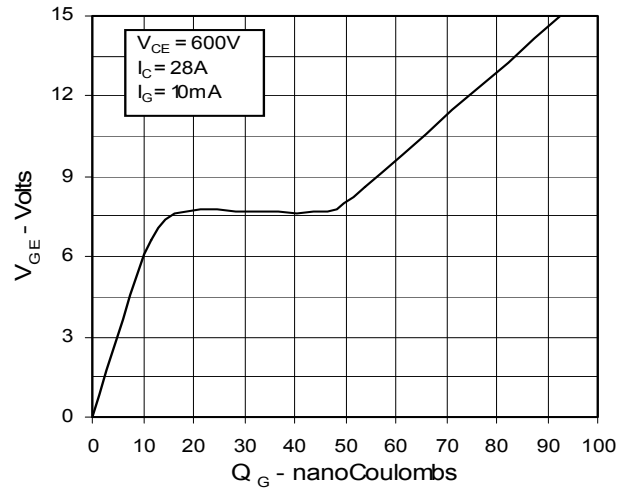


Fig. 15. Capacitance

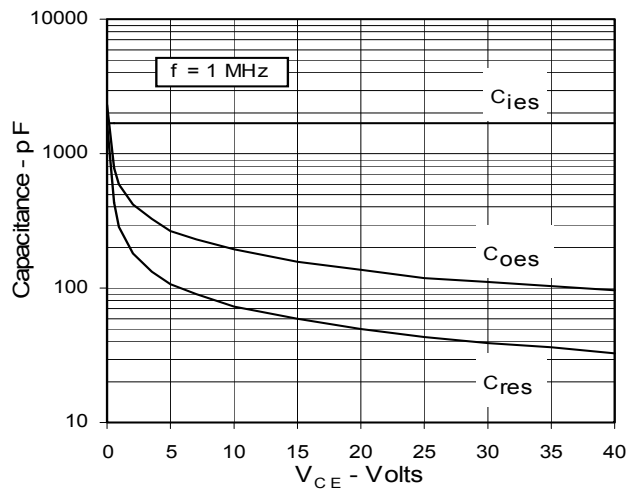
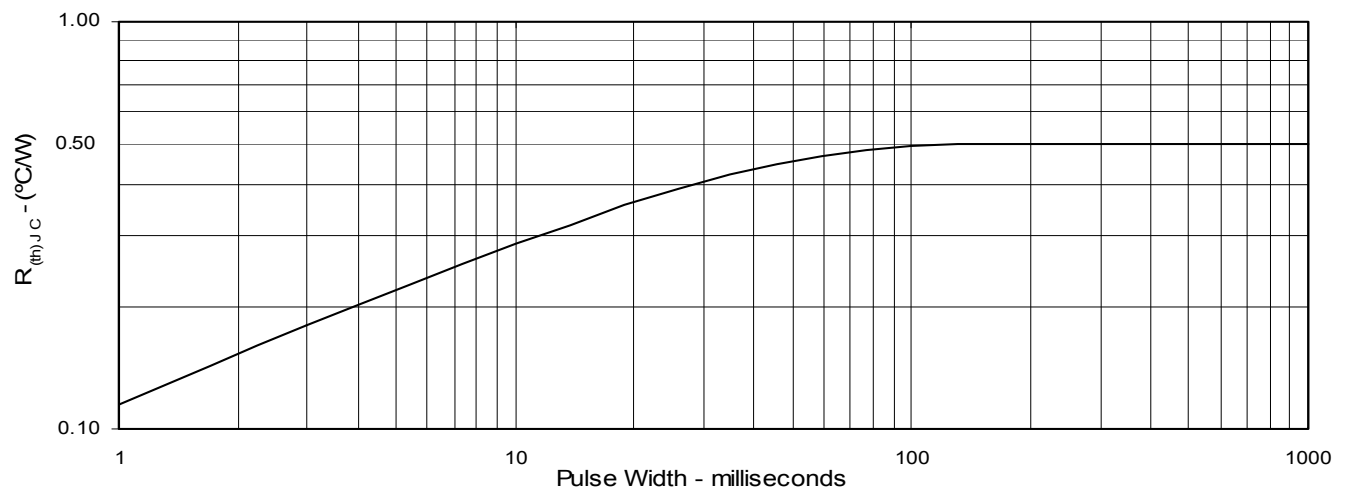


Fig. 16. Maximum Transient Thermal Resistance



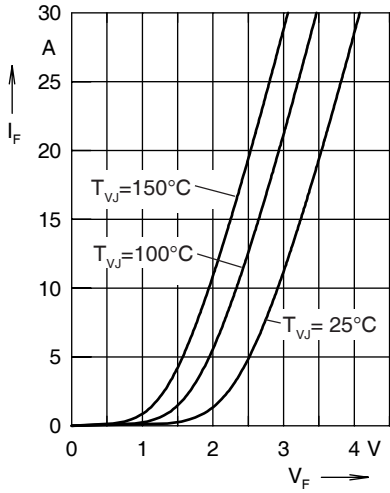


Fig. 17 Forward current I_F versus V_F

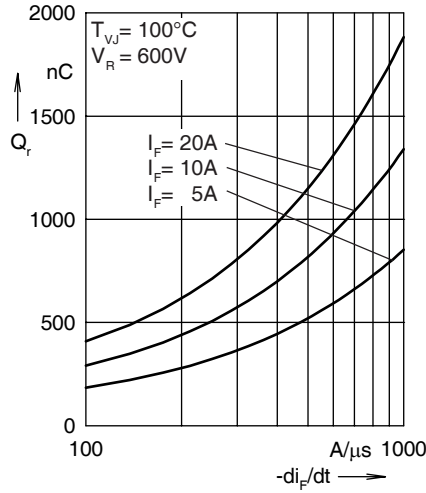


Fig. 18 Reverse recovery charge Q_r versus $-di_F/dt$

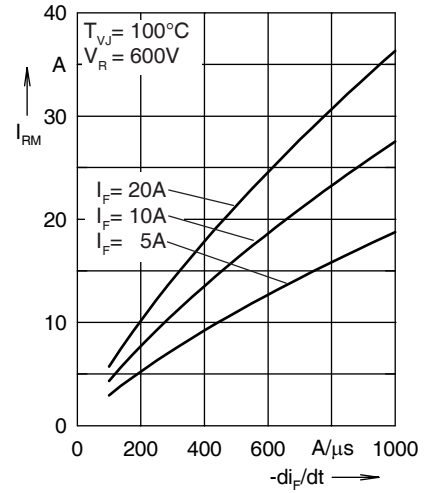


Fig. 19 Peak reverse current I_{RM} versus $-di_F/dt$

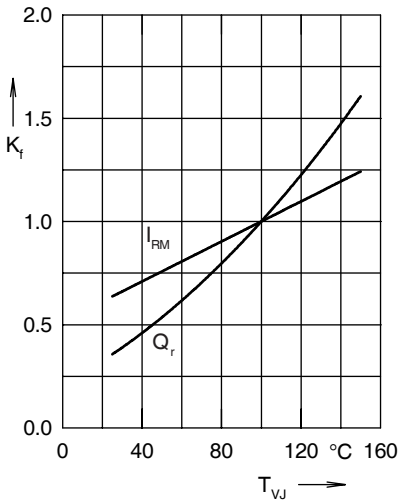


Fig. 20 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

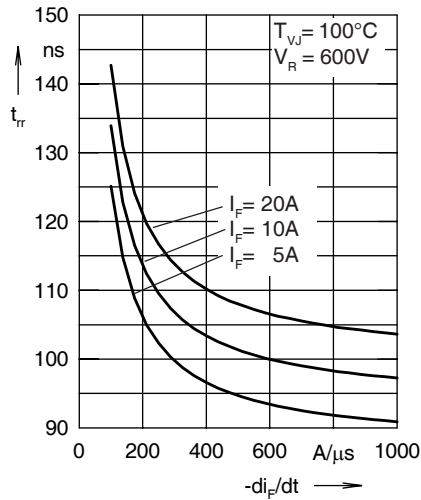


Fig. 21 Recovery time t_{tr} versus $-di_F/dt$

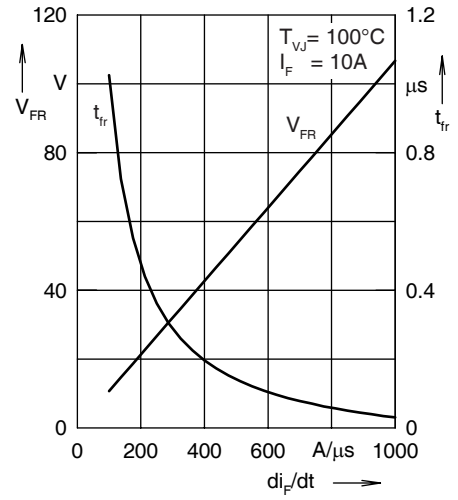


Fig. 22 Peak forward voltage V_{FR} and t_{tr} versus di_F/dt

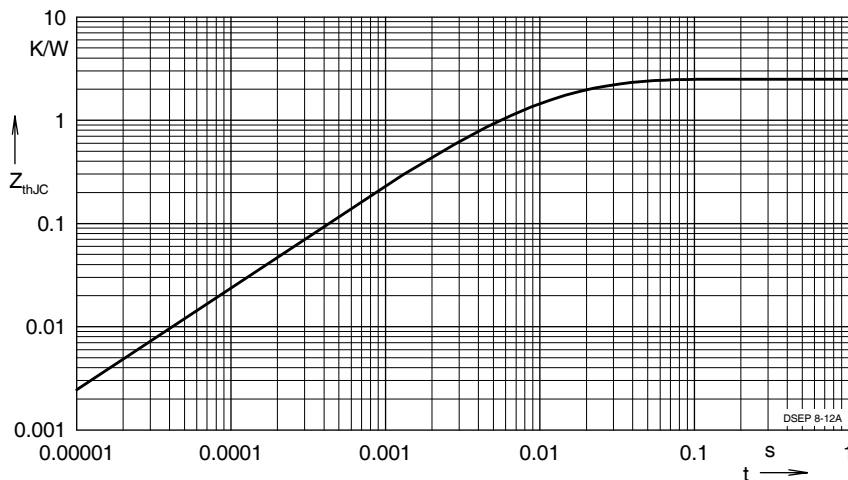


Fig. 23 Transient thermal resistance junction to case

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

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IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:

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
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