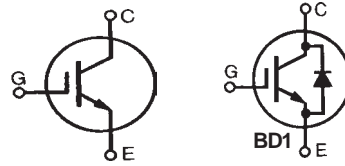


High Voltage IGBT with Diode

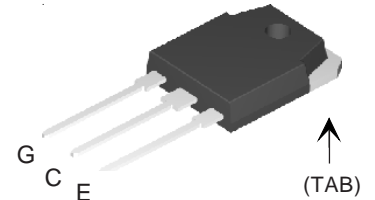
IXGQ 20N120B IXGQ 20N120BD1



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

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}	$T_C = 25^\circ\text{C}$	40	A
I_{C110}	$T_C = 110^\circ\text{C}$	20	A
I_{CM}	$T_C = 25^\circ\text{C}, 1 \text{ ms}$	100	A
SSOA (RBSOA)	$V_{GE} = 15 \text{ V}, T_J = 125^\circ\text{C}, R_G = 10 \Omega$ Clamped inductive load	$I_{CM} = 40$ @ $0.8 V_{CES}$	A
P_C	$T_C = 25^\circ\text{C}$	190	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

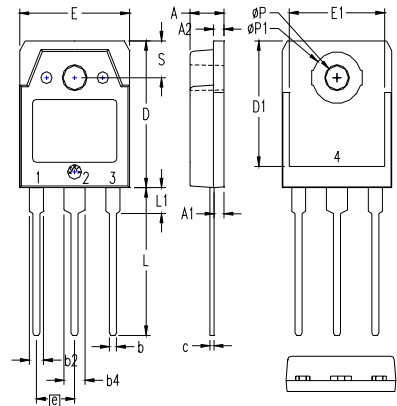
- International standard package
- IGBT and anti-parallel FRED for resonant power supplies
 - Induction heating
 - Rice cookers
- MOS Gate turn-on
 - drive simplicity
- Fast Recovery Expitaxial Diode (FRED)
 - soft recovery with low I_{RM}

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 ($T_J = 25^\circ\text{C}$, 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}	$V_{CE} = V_{CES}$ $V_{GE} = 0 \text{ V}$			20N120B: 25 μA 20N120BD1: 50 μA
I_{GES}	$V_{CE} = 0 \text{ V}, V_{GE} = \pm 20 \text{ V}$			$\pm 100 \text{ nA}$
$V_{CE(sat)}$	$I_C = 20 \text{ A}, V_{GE} = 15 \text{ V}$ Note 2		2.9 2.8	3.4 V V

Symbol	Test Conditions	Characteristic Values		
		(T _J = 25°C, unless otherwise specified)		
		min.	typ.	max.
g_{fs}	I _C = 20A; V _{CE} = 10 V, Note 2.	12	16	S
C_{ies}			1700	pF
			70	pF
C_{oes}	V _{CE} = 25 V, V _{GE} = 0 V, f = 1 MHz	20N120B	80	pF
C_{res}		20N120BD1	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		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
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.

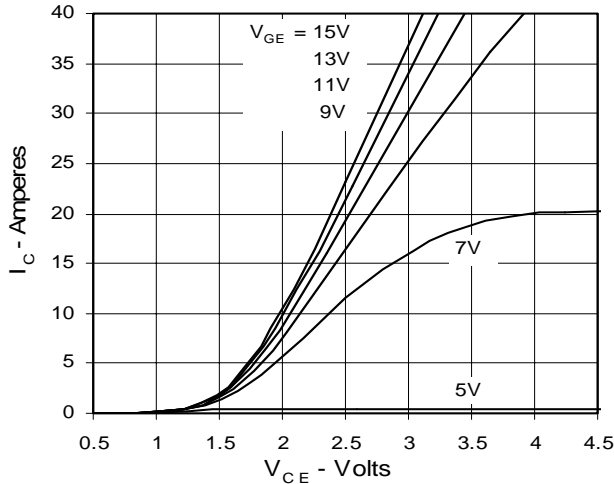
Reverse Diode (FRED)

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			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

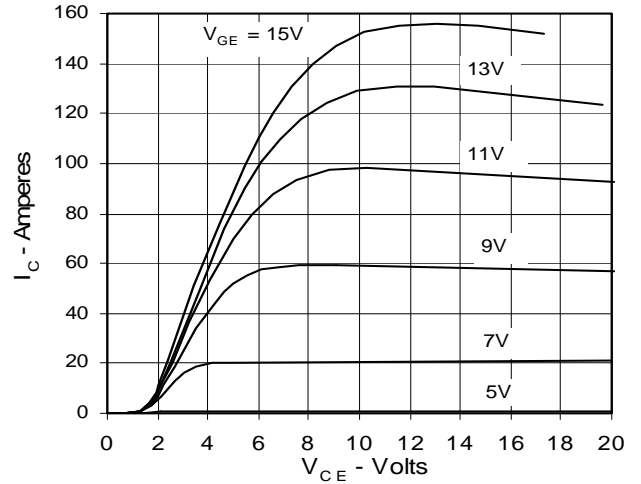
- Notes:
- Switching times may increase for V_{CE} (Clamp) > 0.8 • V_{CES}, higher T_J or increased R_G.
 - Pulse test, t ≤ 300 μs, duty cycle d ≤ 2 %

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

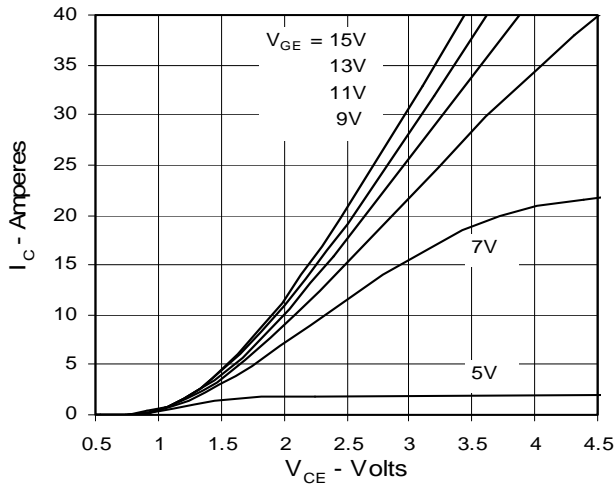
**Fig. 1. Output Characteristics
@ 25 Deg. C**



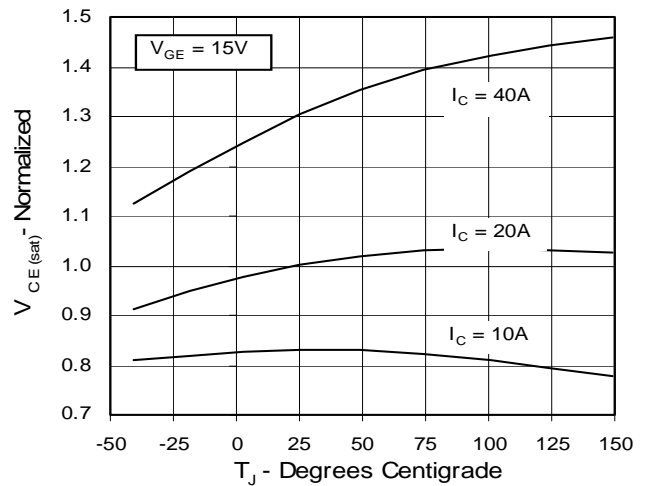
**Fig. 2. Extended Output Characteristics
@ 25 deg. C**



**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**

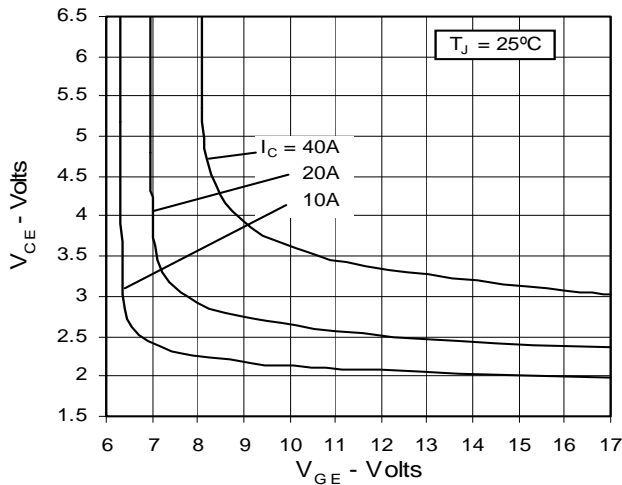


Fig. 6. Input Admittance

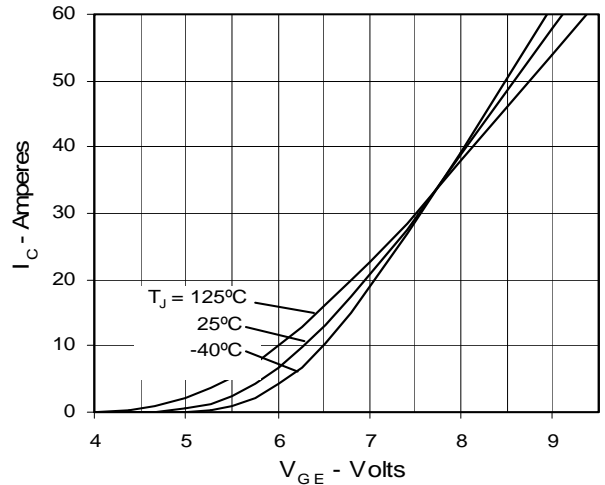


Fig. 7. Transconductance

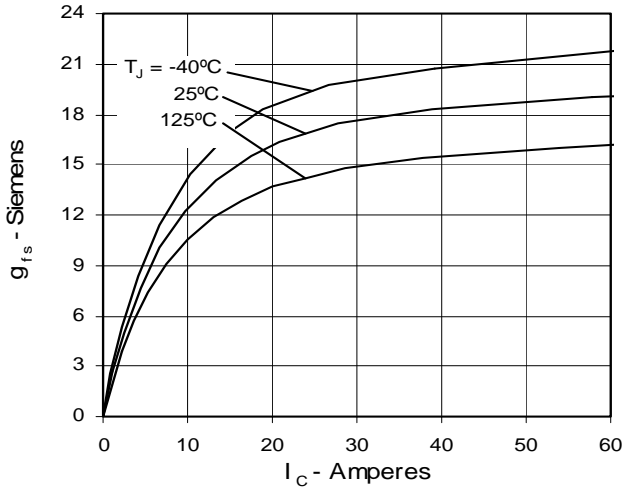


Fig. 8. Dependence of Turn-off Energy Loss on R_G

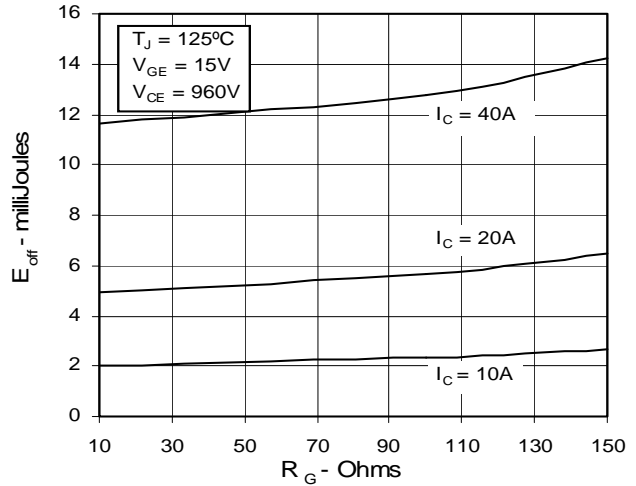


Fig. 9. Dependence of Turn-Off Energy Loss on I_C

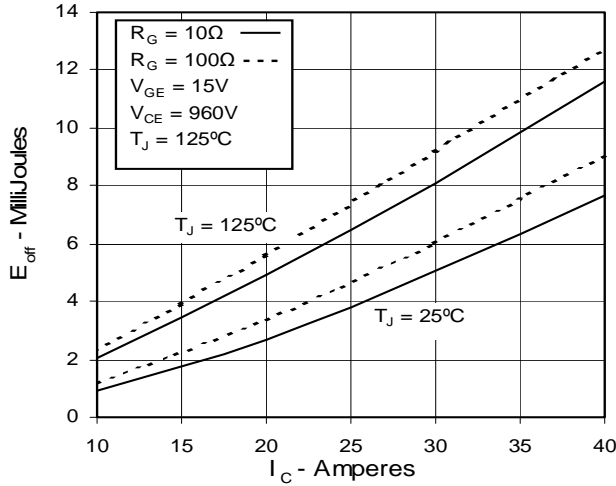


Fig. 10. Dependence of Turn-off Energy Loss on Temperature

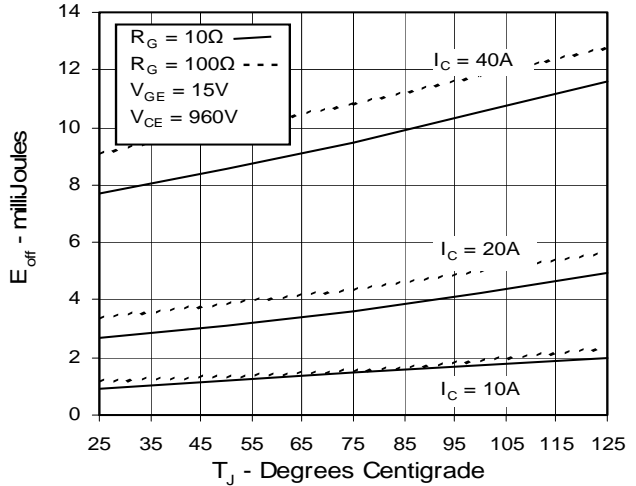


Fig. 11. Dependence of Turn-off Switching Time on R_G

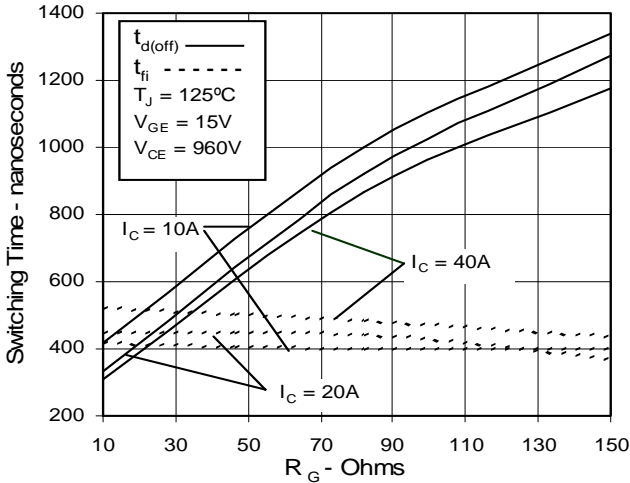
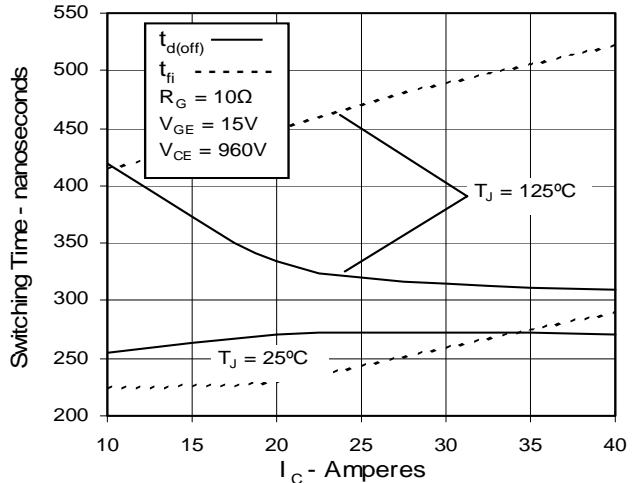


Fig. 12. Dependence of Turn-off Switching Time on I_C



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:

4,835,592 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. 13. Dependence of Turn-off Switching Time on Temperature

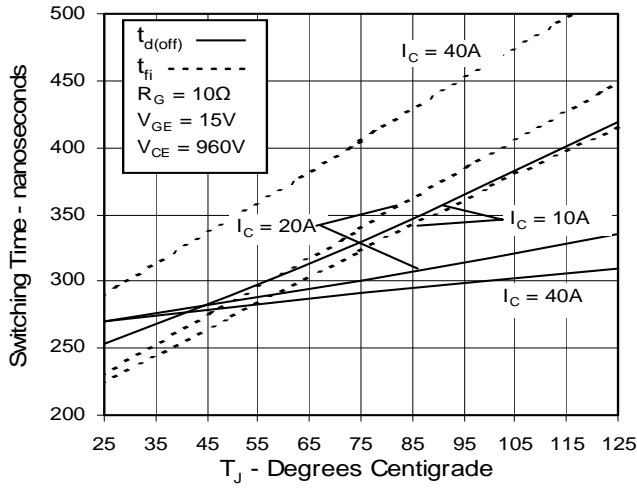


Fig. 14. Gate Charge

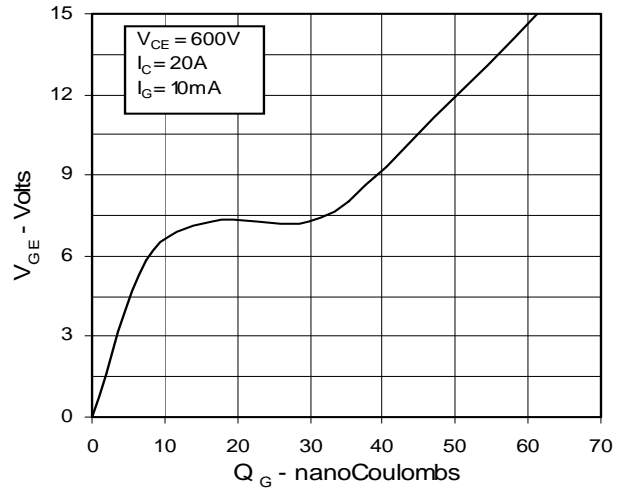


Fig. 15. Capacitance

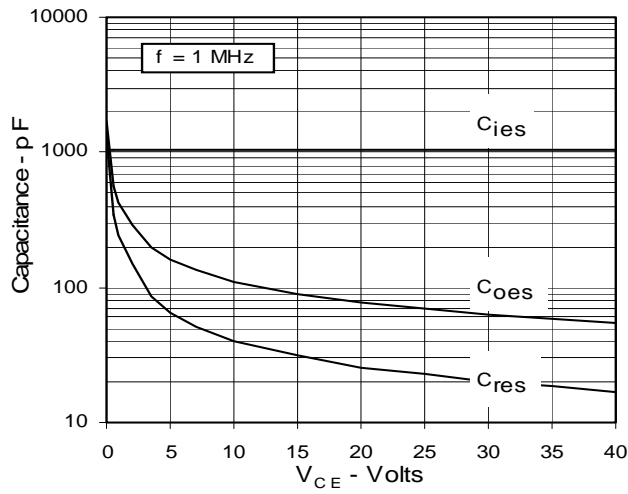
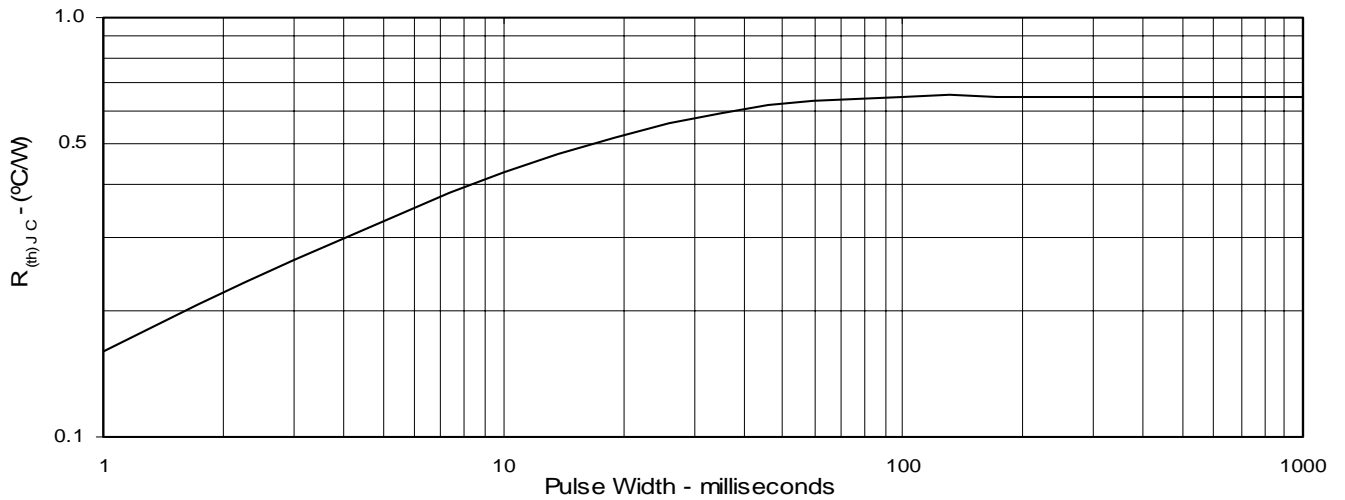


Fig. 16. Maximum Transient Thermal Resistance



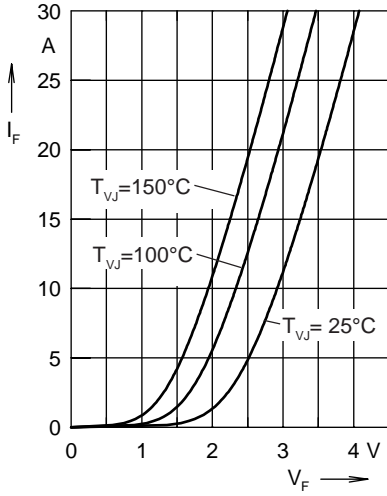


Fig. 17 Forward current I_F versus V_F

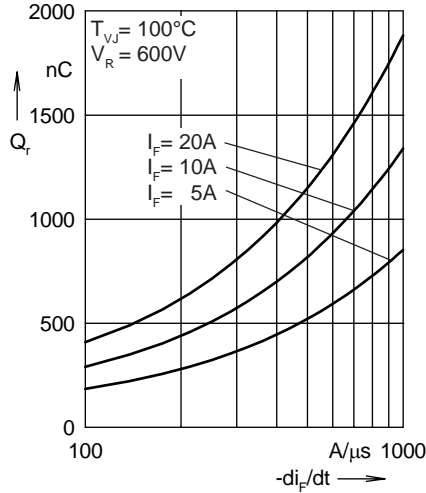


Fig. 18 Reverse recovery charge Q_r versus $-di_F/dt$

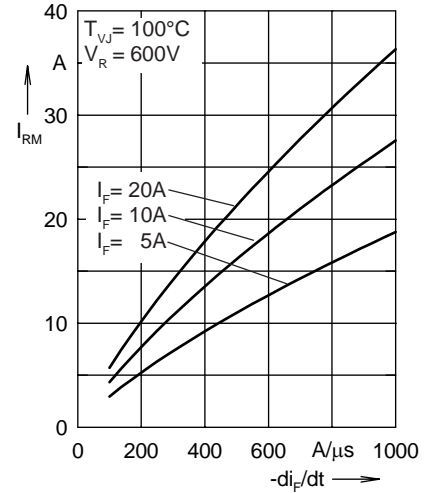


Fig. 19 Peak reverse current I_{RM} versus $-di_F/dt$

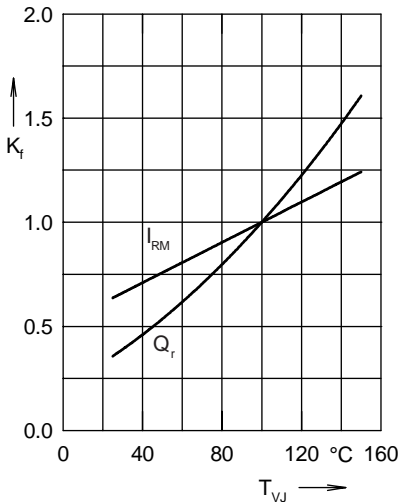


Fig. 20 Dynamic parameters Q_r , I_{RM} versus T_{VJ}

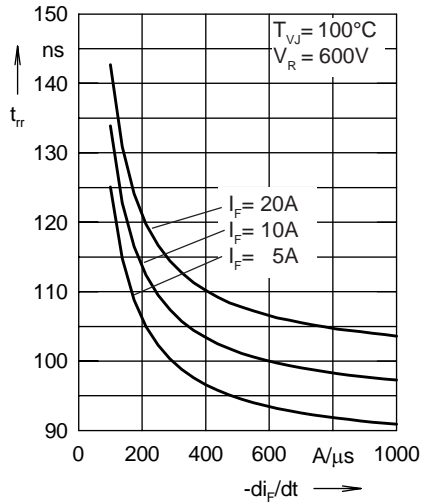


Fig. 21 Recovery time t_{rr} versus $-di_F/dt$

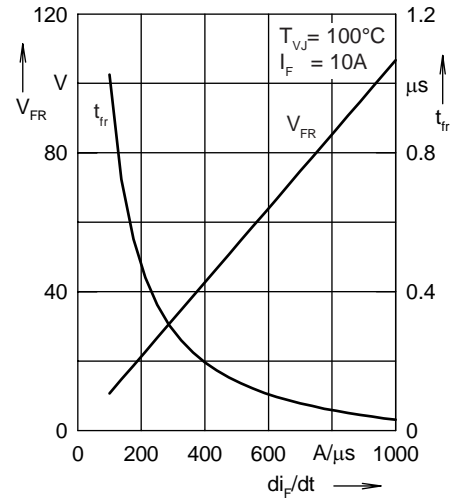


Fig. 22 Peak forward voltage V_{FR} and t_{rr} versus di_F/dt

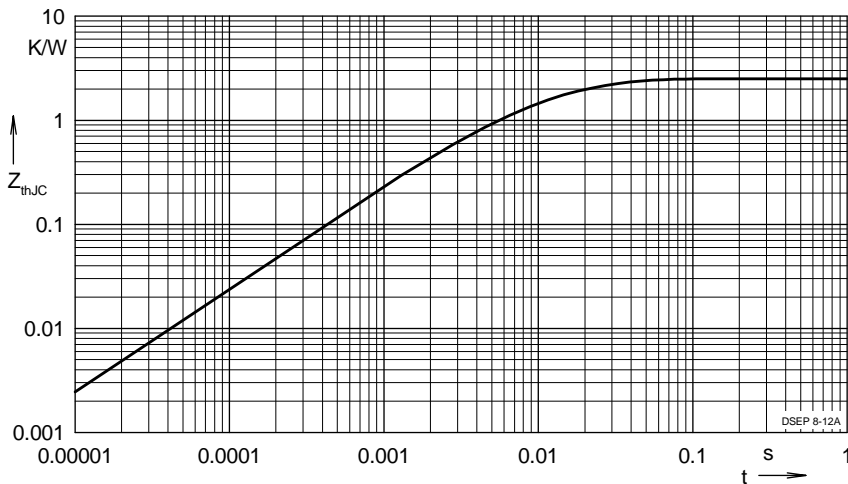


Fig. 23 Transient thermal resistance junction to case

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

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



Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.