IXYS

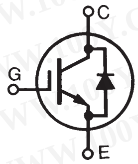
Preliminary Technical Information

1200V XPT™ IGBT GenX3™ w/ Diode

IXYJ20N120C3D1

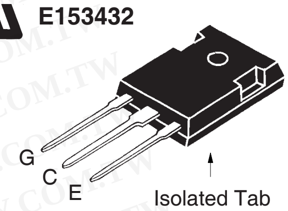
(Electrically Isolated Tab)

High-Speed IGBT
for 20-50 kHz Switching



V_{CES} = 1200V
I_{C110} = 9A
$V_{CE(sat)}$ ≤ 4.0V
$t_{fi(typ)}$ = 108ns

ISO TO-247™
E153432



G = Gate C = Collector
E = Emitter

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} = 1MΩ	1200	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	21	A
I_{C110}	T_C = 110°C	9	A
I_{F110}	T_C = 110°C	19	A
I_{CM}	T_C = 25°C, 1ms	84	A
I_A	T_C = 25°C	10	A
E_{AS}	T_C = 25°C	400	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 10Ω Clamped Inductive Load	I_{CM} = 40 @ $V_{CE} \le V_{CES}$	A
P_C	T_C = 25°C	105	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
M_d	Mounting Torque	1.13/10	Nm/lb.in.
V_{ISOL}	50/60 Hz, RM, t = 1min	2500	V~
Weight		5	g

Features

- Optimized for Low Switching Losses
- Silicon Chip on Direct-Copper Bond (DCB) Substrate
- Isolated Mounting Surface
- 2500V~ Electrical Isolation
- Square RBSOA
- Positive Thermal Coefficient of Vce(sat)
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated

Advantages

- High Power Density
- Low Gate Drive Requirement

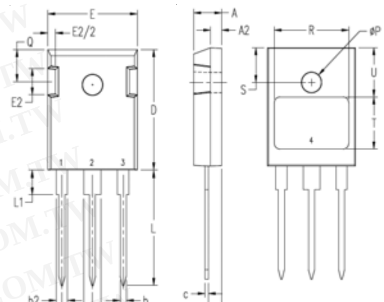
Applications

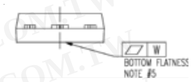
- High Frequency Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250µA, V_{GE} = 0V	1200			V
$V_{GE(th)}$	I_C = 250µA, V_{CE} = V_{GE}	3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			25	µA
	T_J = 125°C			350	µA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15V, Note 1			4.0	V
	T_J = 150°C		4.0		V

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Min.	Typ.	Max.	
g_{fs}	I_C = 20A, V_{CE} = 10V, Note 1	7.0	11.5		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1130		pF
C_{oes}			70		pF
C_{res}			24		pF
$Q_{g(on)}$	I_C = 20A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		53		nC
Q_{ge}			9		nC
Q_{gc}			22		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		20		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		29		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 10Ω		1.3		mJ
$t_{d(off)}$	Note 2		90		ns
t_{fi}			108		ns
E_{off}			0.5	1.0	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		20		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		40		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 10Ω		3.7		mJ
$t_{d(off)}$	Note 2		115		ns
t_{fi}			105		ns
E_{off}			0.7		mJ
R_{thJC}				1.19	°C/W
R_{thCS}			0.15		°C/W

ISO TO-247 (IXYJ) OUTLINE





PINS:
1 = Gate
2 = Drain
3 = Source
4 = Isolated

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.087	.100	2.21	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.085	1.91	2.16
b4	.115	.126	2.92	3.20
c	.023	.033	0.58	0.84
D	.820	.840	20.83	21.34
E	.620	.635	15.75	16.13
E2	.175	.195	4.44	4.95
e	.215 BSC		5.45 BSC	
L	.780	.810	19.81	20.57
L1	.160	.177	4.06	4.50
Q	.220	.240	5.59	6.10
R	.520	.540	13.21	13.72
S	.242 BSC		6.15 BSC	
T	.355	.375	9.02	9.53
U	.345	.370	8.76	9.40
øP	.140	.144	3.55	3.66
W	.000	.004	0.00	0.10

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)		Min.	Typ.	Max.	
V_F	I_F = 30A, V_{GE} = 0V, Note 1				3.00	V
		T_J = 150°C		1.75		V
I_{RM}	I_F = 30A, V_{GE} = 0V, $-di_F/dt$ = 100A/μs,	T_J = 100°C			9	A
t_{rr}	V_R = 600V	T_J = 100°C		195		ns
R_{thJC}					1.10	°C/W

Notes:

1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE}(clamp), T_J or R_G.

PRELIMANARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from a subjective evaluation of the design, based upon prior knowledge and experience, and constitute a "considered reflection" of the anticipated result. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

Fig. 1. Output Characteristics @ T_J = 25ºC

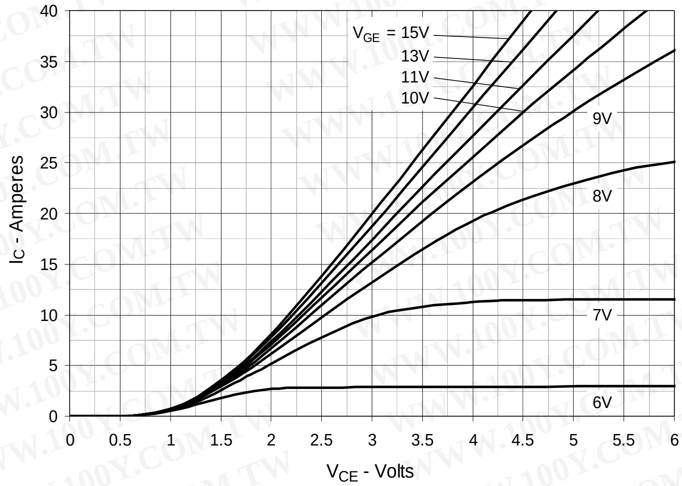


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

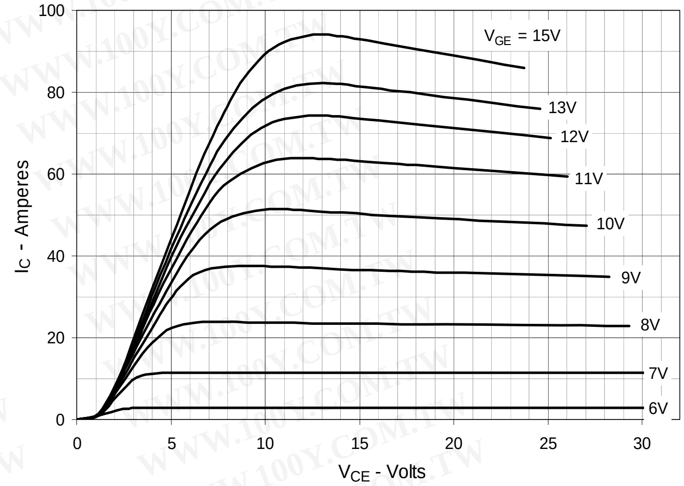


Fig. 3. Output Characteristics @ T_J = 150ºC

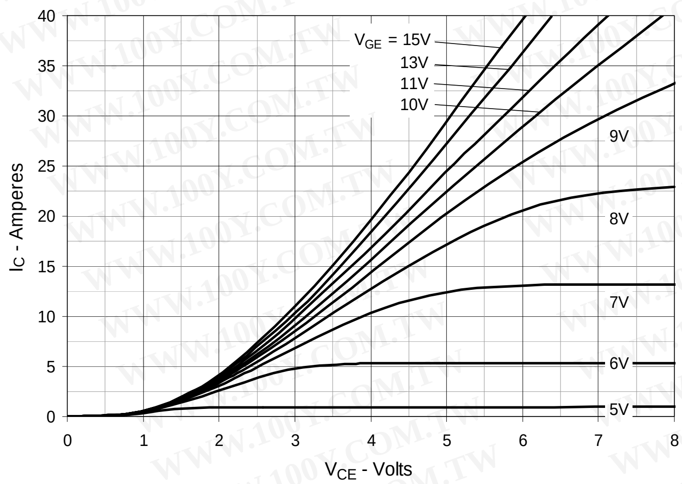


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

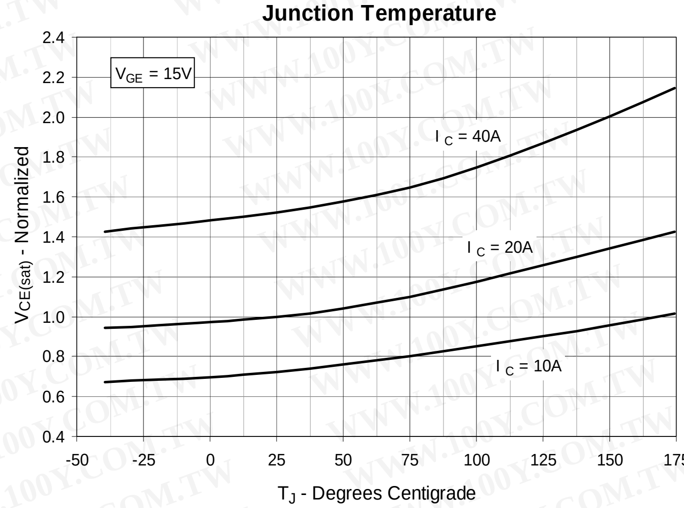


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

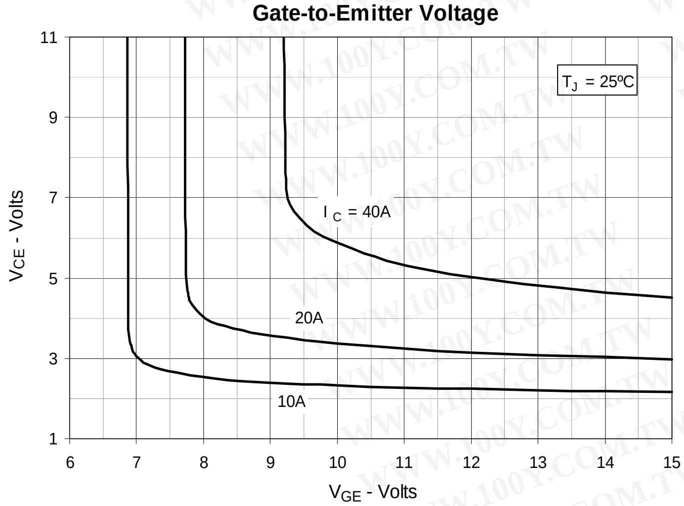


Fig. 6. Input Admittance

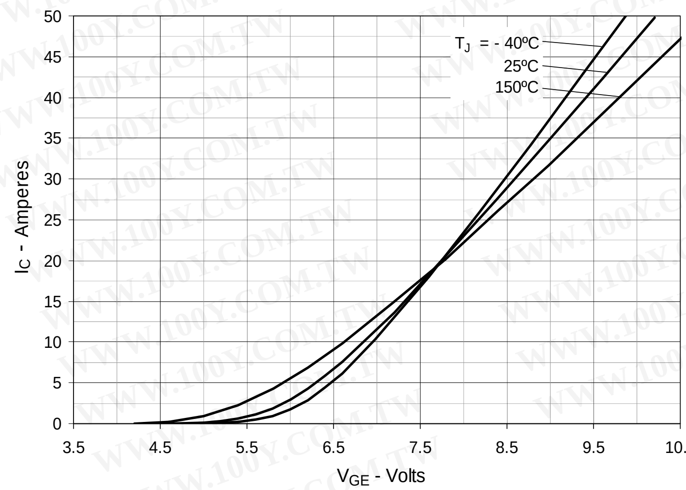


Fig. 7. Transconductance

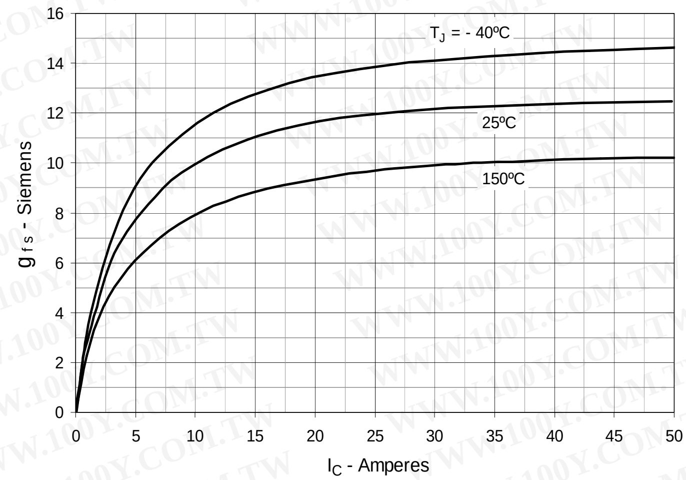


Fig. 8. Gate Charge

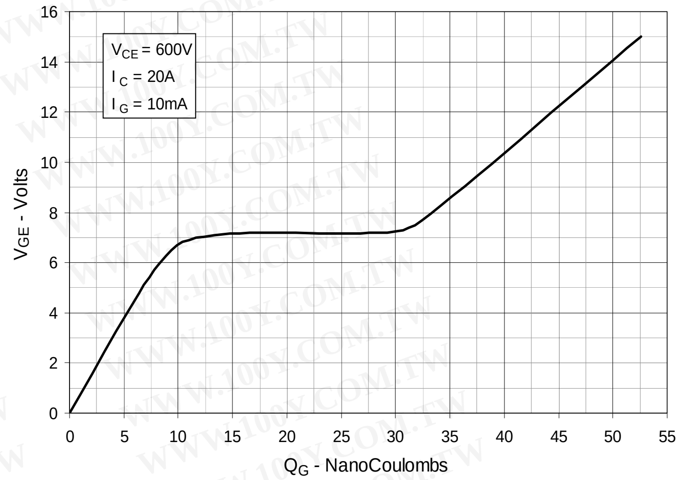


Fig. 9. Capacitance

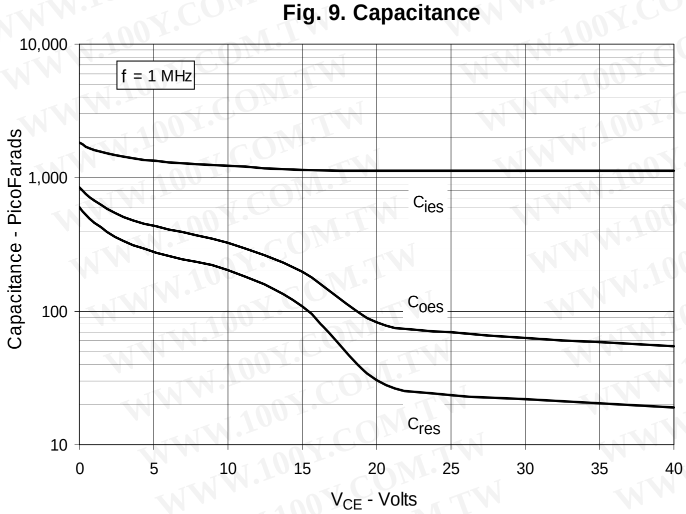


Fig. 10. Reverse-Bias Safe Operating Area

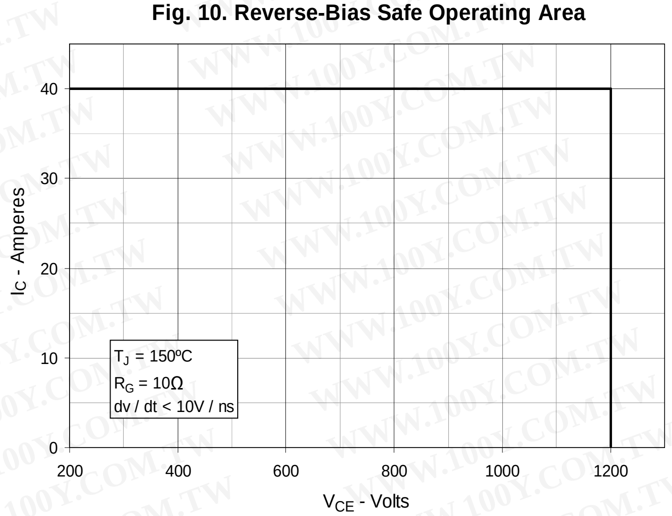
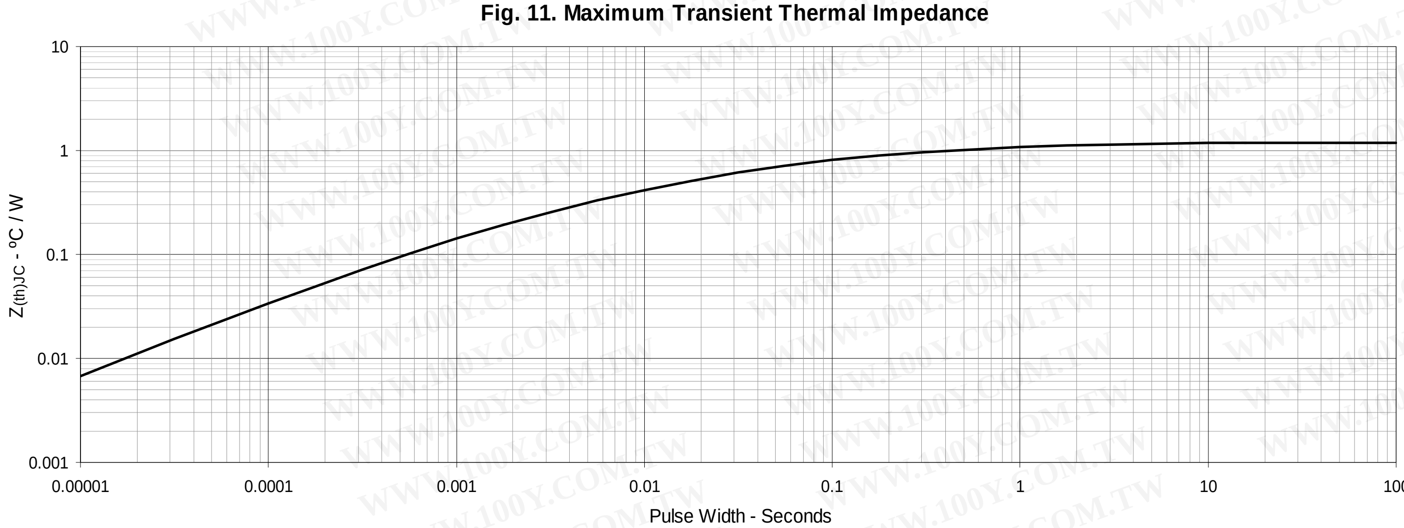


Fig. 11. Maximum Transient Thermal Impedance



IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

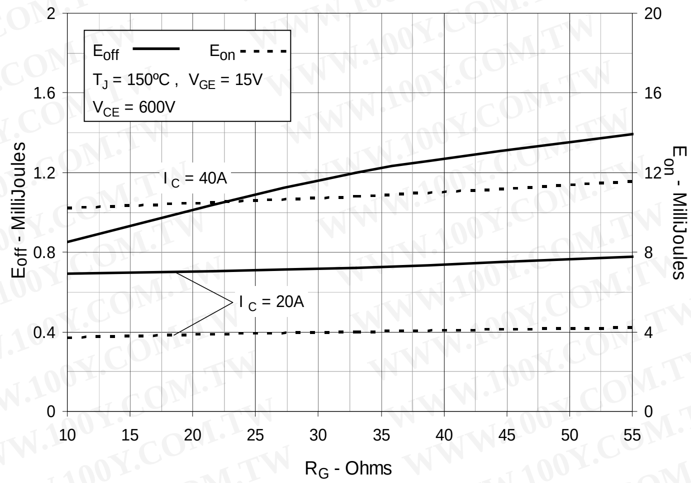


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

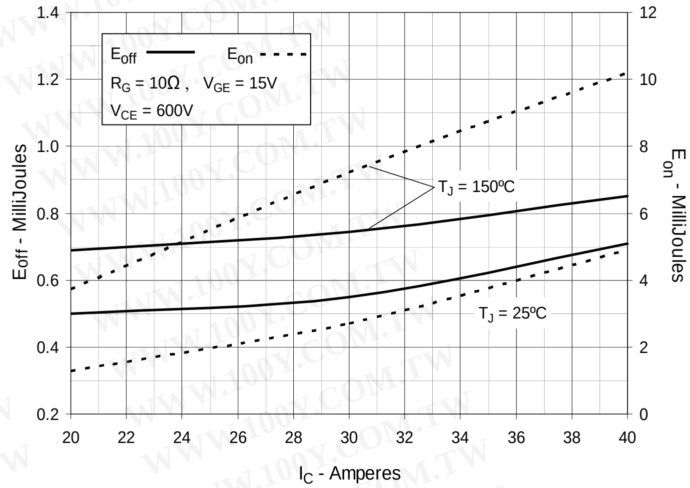


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

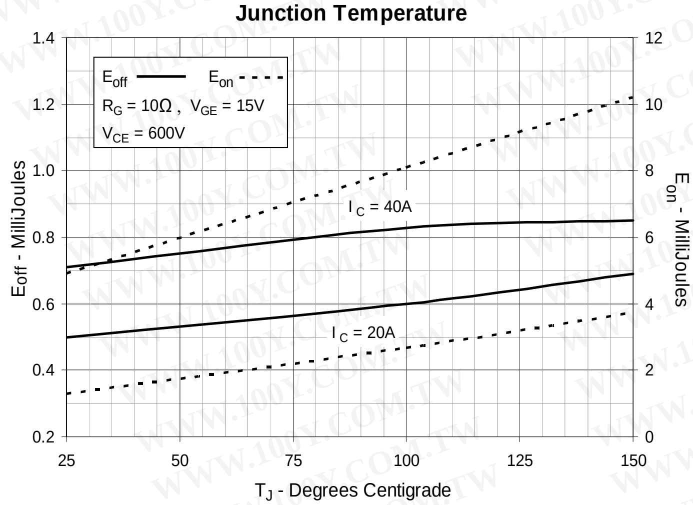


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

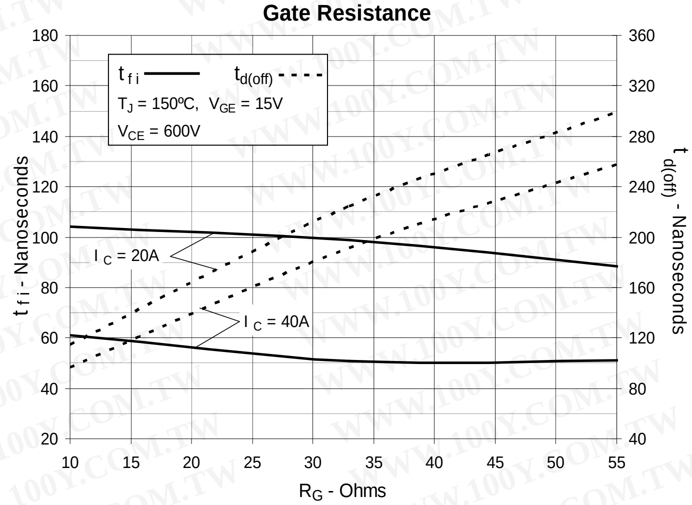


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

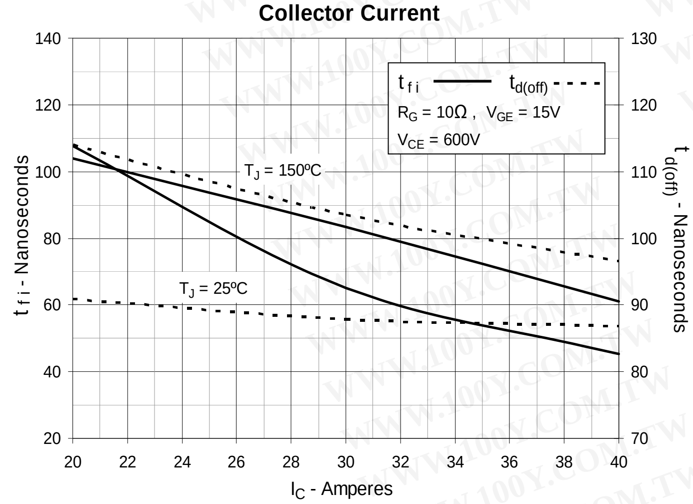


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

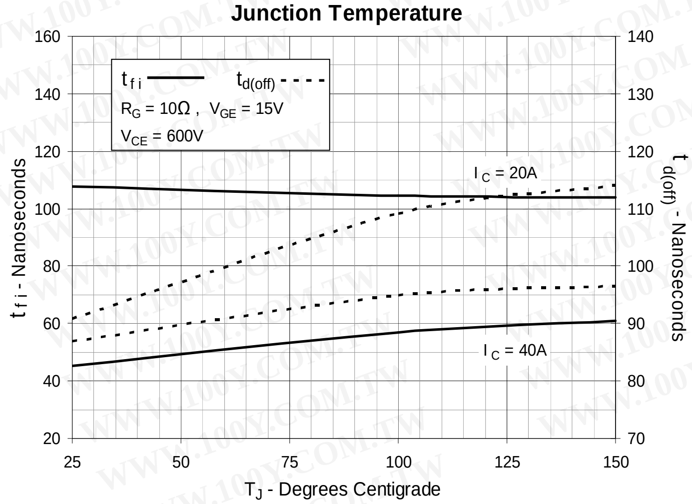


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

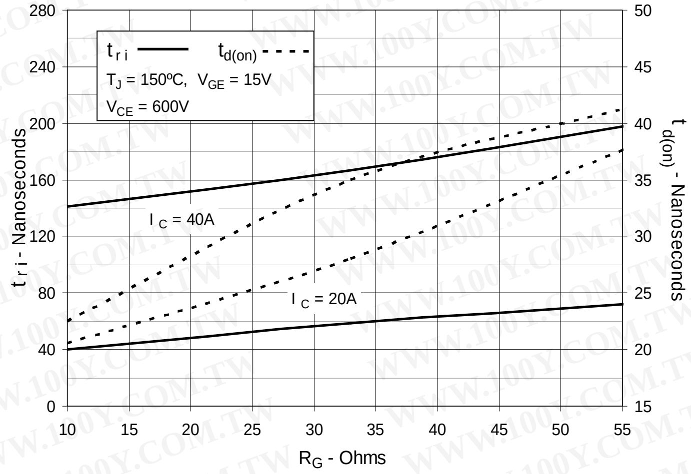


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

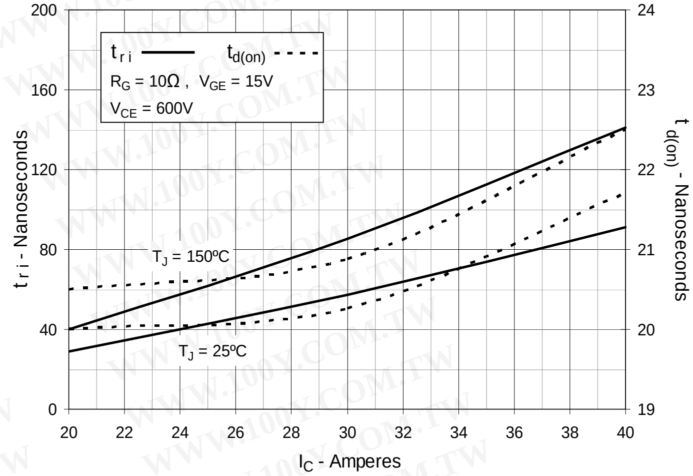


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

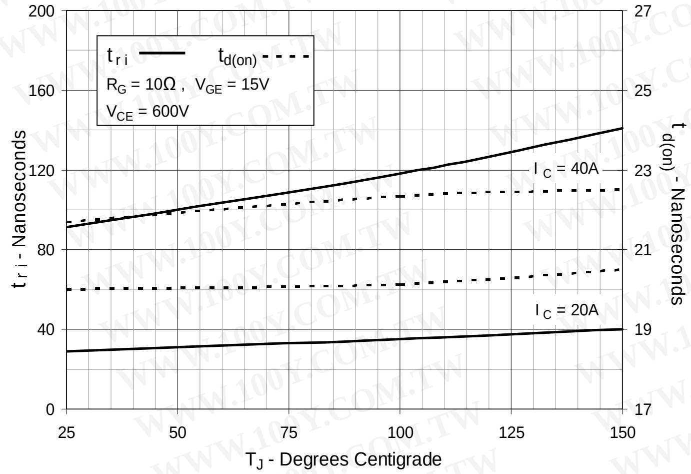


Fig. 21. Maximum Transient Thermal Impedance (Diode)

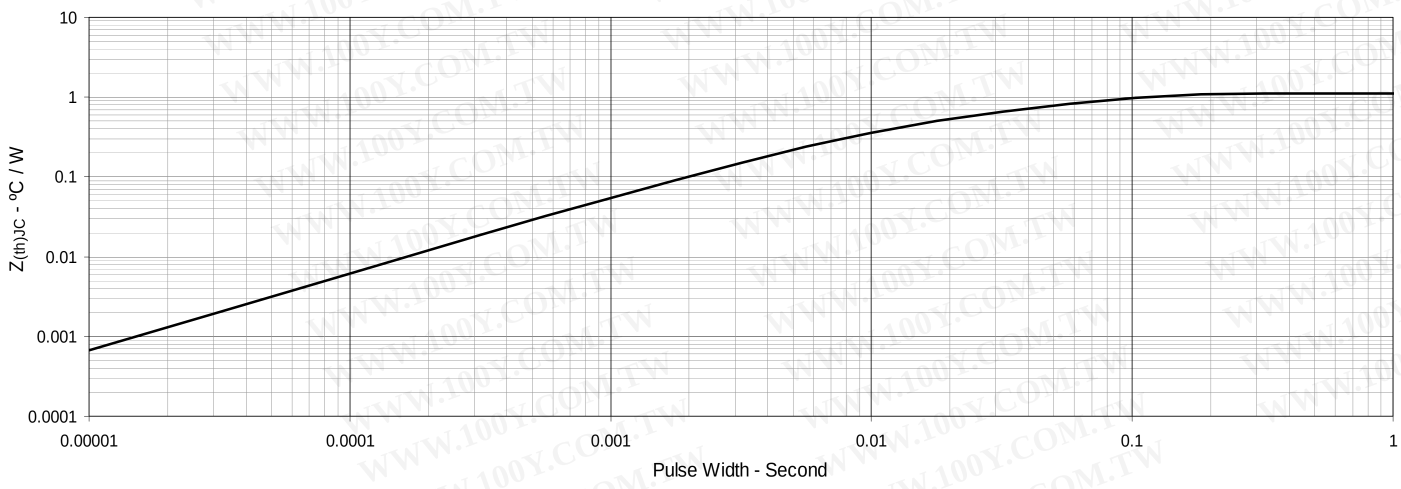


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Fig. 22. Forward Current I_F vs V_F

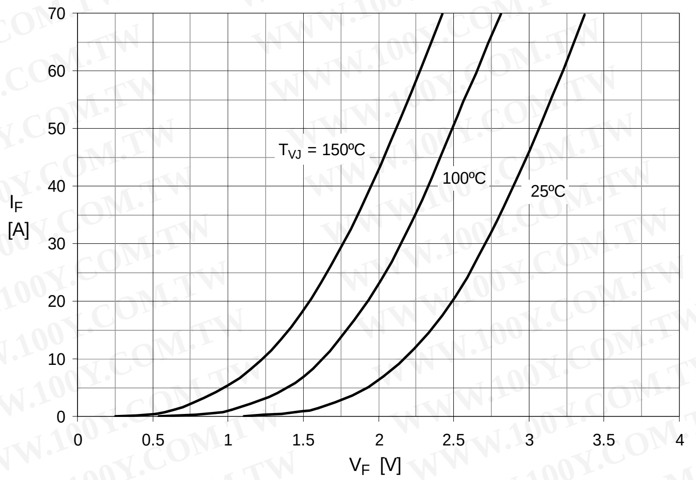

Fig. 23. Reverse Recovery Charge Q_{RM} vs. $-di_F/dt$

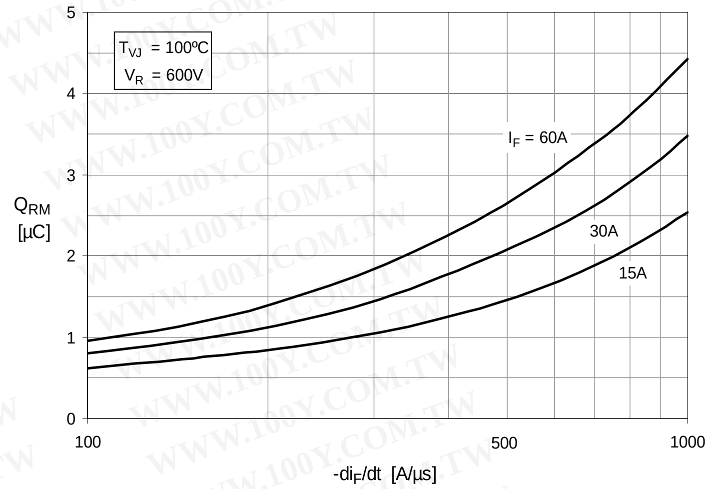

Fig. 24. Peak Reverse Current I_{RM} vs. $-di_F/dt$

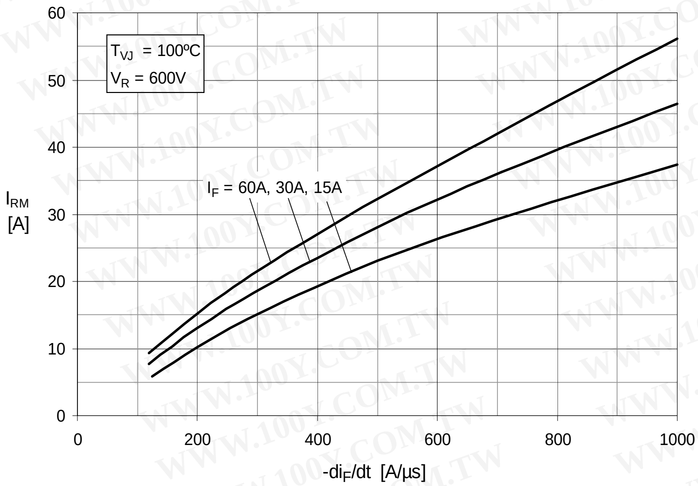

Fig. 25. Dynamic Parameters Q_{RM}, I_{RM} vs. T_{VJ}

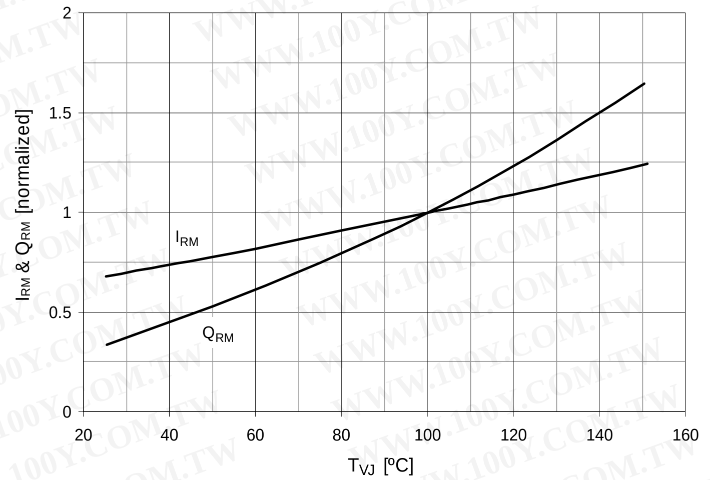

Fig. 26. Recovery Time t_{rr} vs. $-di_F/dt$

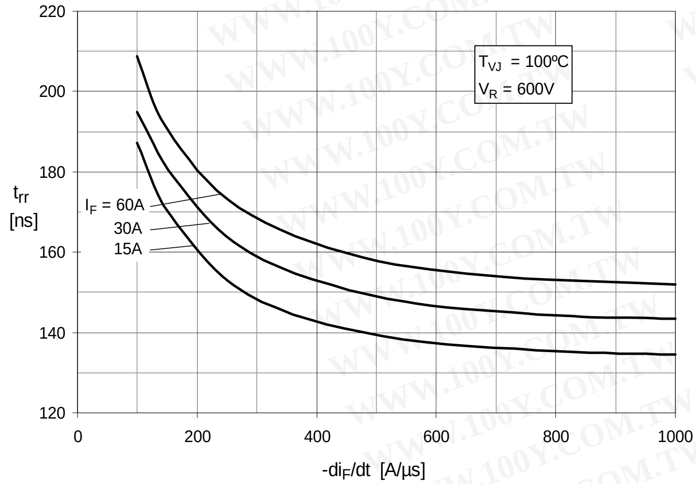

Fig. 27. Peak Forward Voltage V_{FR}, trr vs $-di_F/dt$