IXYS

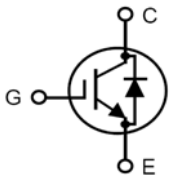
Preliminary Technical Information

900V XPT™ IGBT GenX3™ w/Diode

IXYH24N90C3D1

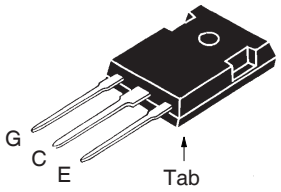
V_{CES} = 900V
I_{C90} = 24A
$V_{CE(sat)}$ ≤ 3.0V
$t_{fi(typ)}$ = 90ns

High-Speed IGBT
for 20-50 kHz Switching



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	900	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	900	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	44	A
I_{C90}	T_C = 90°	24	A
I_{F110}	T_C = 110°C	15	A
I_{CM}	T_C = 25°C, 1ms	105	A
I_A	T_C = 25°C	15	A
E_{AS}	T_C = 25°C	150	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 10Ω Clamped Inductive Load	I_{CM} = 48 @$V_{CE} \leq V_{CES}$	A
P_C	T_C = 25°C	200	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.
Weight		6	g

TO-247



G = Gate C = Collector
E = Emitter Tab = Collector

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Positive Thermal Coefficient of Vce(sat)
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated
- High Current Handling Capability
- International Standard Package

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	950			V
$V_{GE(th)}$	I_C = 250μA, V_{CE} = V_{GE}	3.5		6.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			75	μA
	T_J = 125°C			400	μA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 24A, V_{GE} = 15V, Note 1		2.30	3.00	V
	T_J = 125°C		2.95		V

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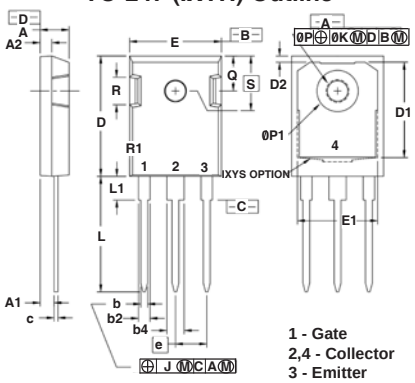
Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 24A, V_{CE} = 10V, Note 1	8	14		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		1190		pF
C_{oes}			64		pF
C_{res}			22		pF
$Q_{g(on)}$	I_C = 24A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		40		nC
Q_{ge}			10		nC
Q_{gc}			18		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		20		ns
t_{ri}	I_C = 24A, V_{GE} = 15V		36		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 10Ω		1.35		mJ
$t_{d(off)}$	Note 2		73		ns
t_{fi}			90		ns
E_{off}			0.40	0.70	mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		22		ns
t_{ri}	I_C = 24A, V_{GE} = 15V		38		ns
E_{on}	V_{CE} = 0.5 • V_{CES}, R_G = 10Ω		2.60		mJ
$t_{d(off)}$	Note 2		85		ns
t_{fi}			130		ns
E_{off}			0.55		mJ
R_{thJC}				0.62	°C/W
R_{thCS}			0.21		°C/W

TO-247 (IXYH) Outline



1 - Gate
2,4 - Collector
3 - Emitter

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.545	.565	13.84	14.35
e	.215 BSC		5.45 BSC	
J	--	.010	--	0.25
K	--	.025	--	0.64
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
øP	.140	.144	3.55	3.65
øP1	.275	.290	6.99	7.37
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.242 BSC		6.15 BSC	

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)		Characteristic Value Min.	Typ.	Max.	
V_F	I_F = 15A, V_{GE} = 0V, Note 1				3.25	V
		T_J = 150°C		2.0		V
I_{RM}	I_F = 15A, V_{GE} = 0V, -di_F/dt = 250A/µs, V_R = 600V	T_J = 100°C		14		A
t_{rr}		T_J = 100°C		340		ns
R_{thJC}					1.6	°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.

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IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: 4,835,592 4,860,072 4,881,106 4,931,844 5,017,508 5,034,796 5,049,961 5,063,307 5,187,117 5,237,481 5,381,025 5,486,715 6,162,665 6,259,123 B1 6,306,728 B1 6,404,065 B1 6,534,343 6,583,505 6,683,344 6,710,405 B2 6,710,463 6,727,585 6,759,692 6,771,478 B2 7,005,734 B2 7,063,975 B2 7,071,537 7,157,338B2

Fig. 1. Output Characteristics @ T_J = 25ºC

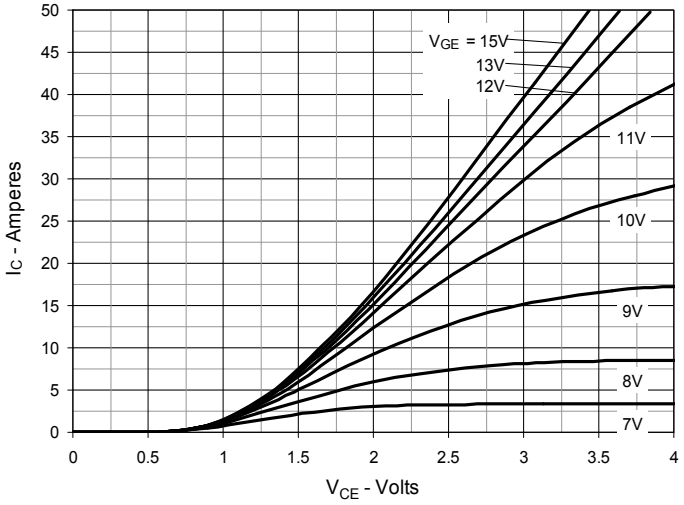

Fig. 2. Extended Output Characteristics @ T_J = 25ºC

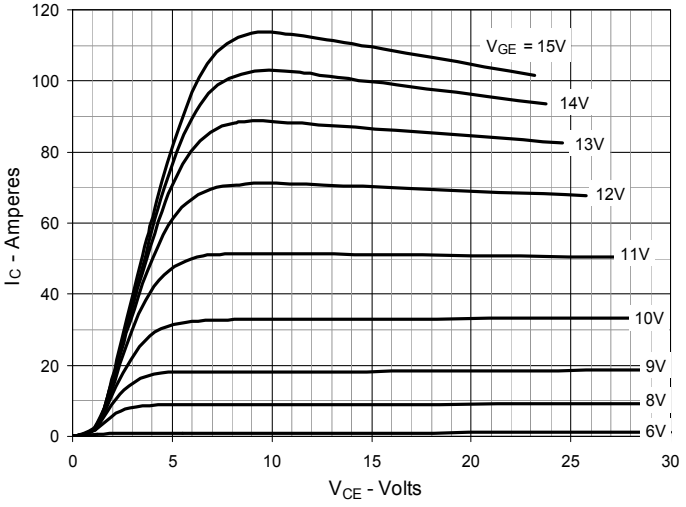

Fig. 3. Output Characteristics @ T_J = 150ºC

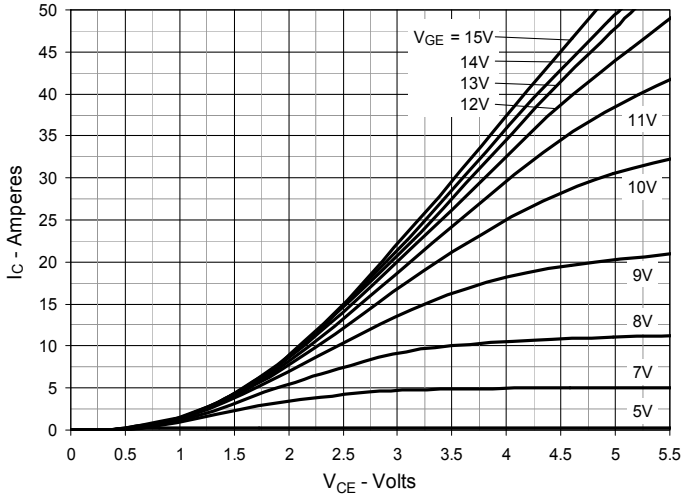

Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

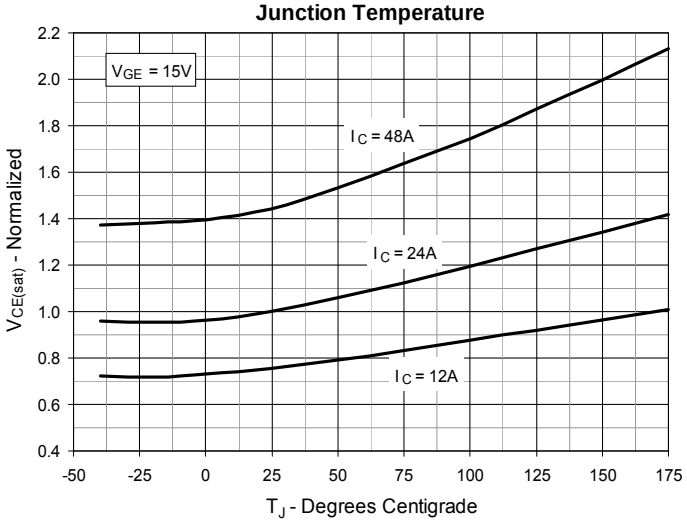

Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

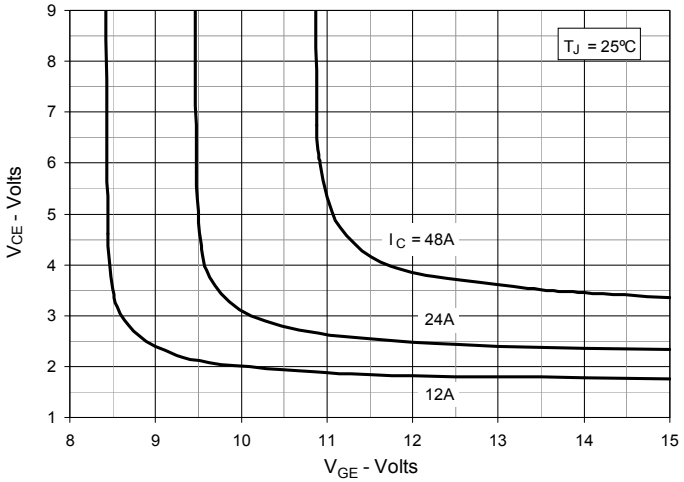

Fig. 6. Input Admittance

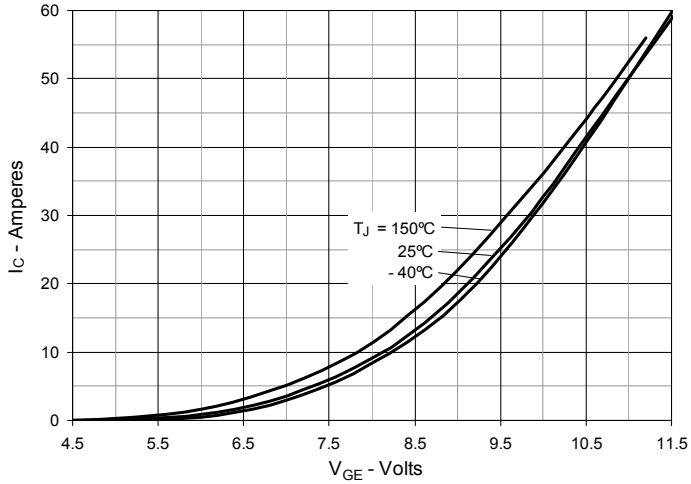

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Fig. 7. Transconductance

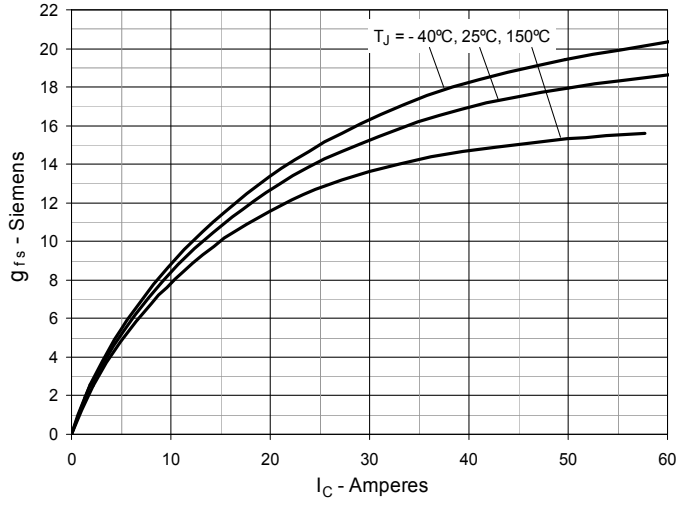


Fig. 8. Gate Charge

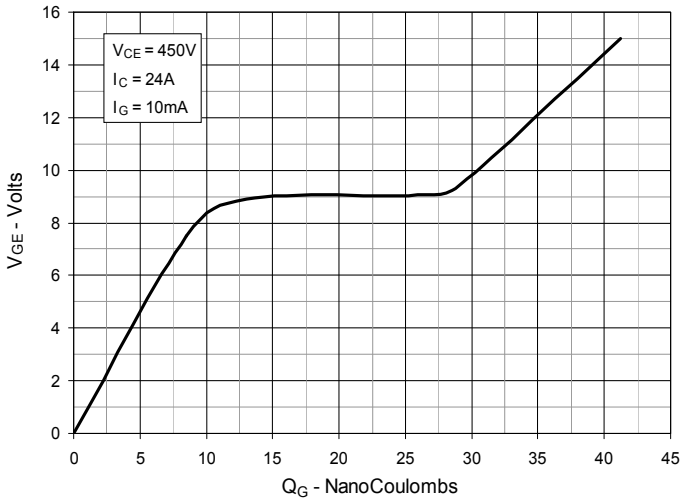


Fig. 9. Capacitance

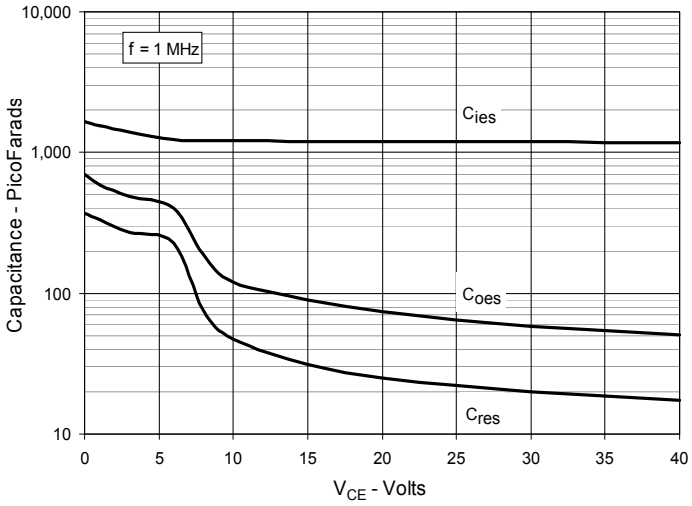


Fig. 10. Reverse-Bias Safe Operating Area

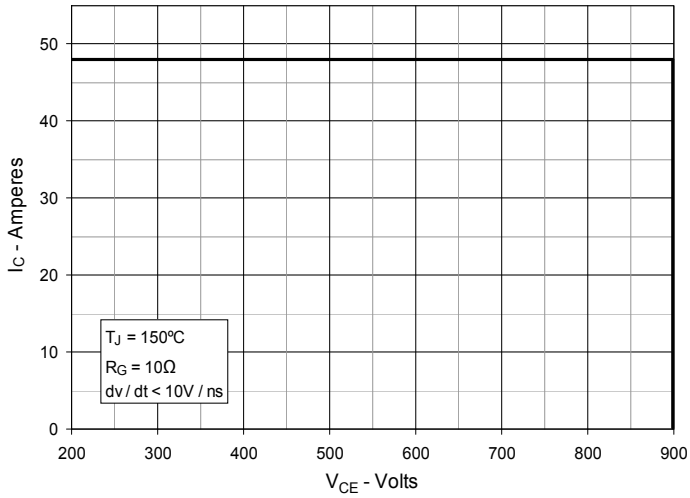
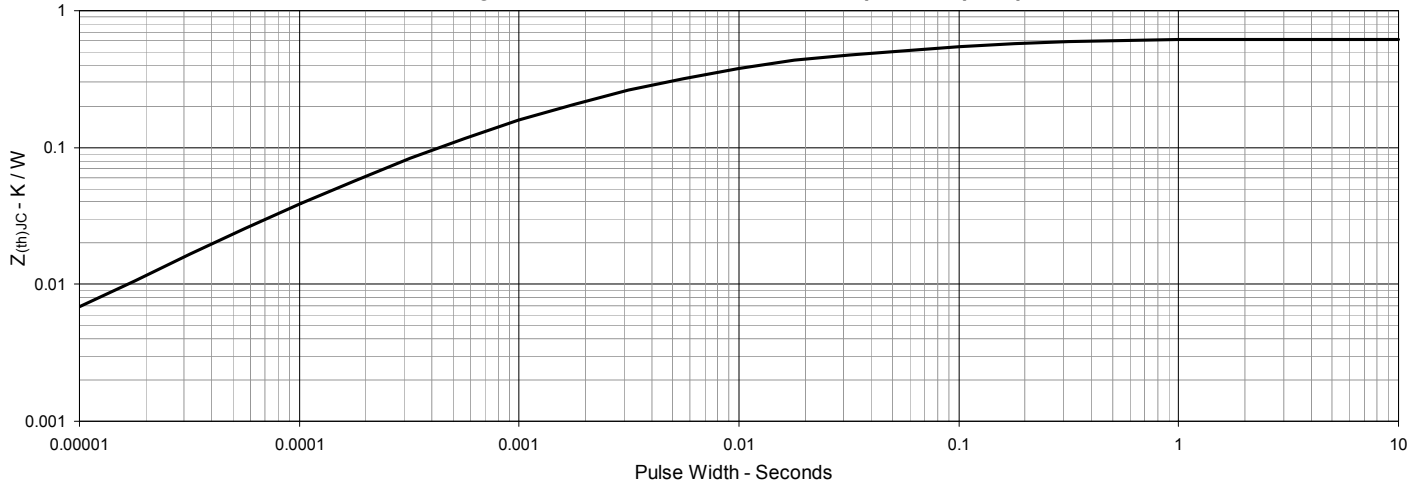


Fig. 11. Maximum Transient Thermal Impedance (IGBT)



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

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

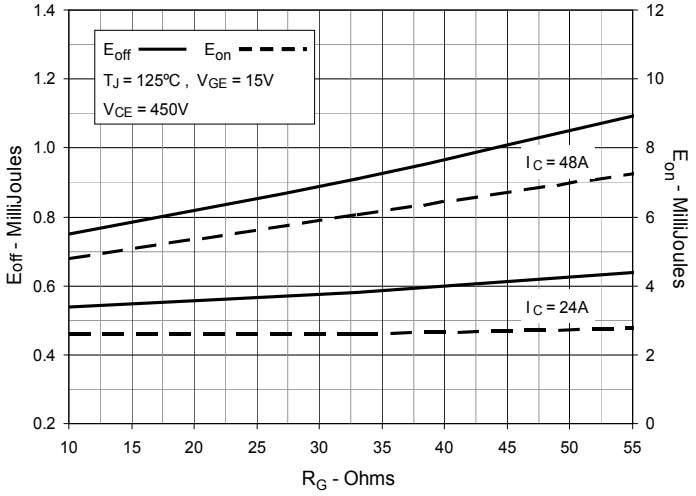


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

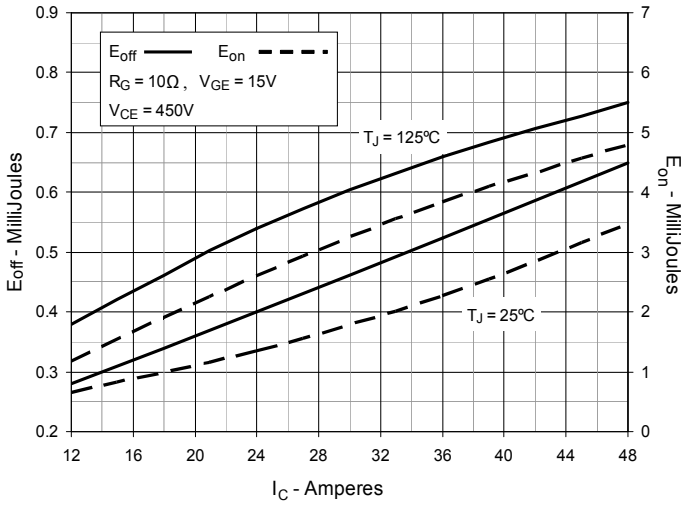


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

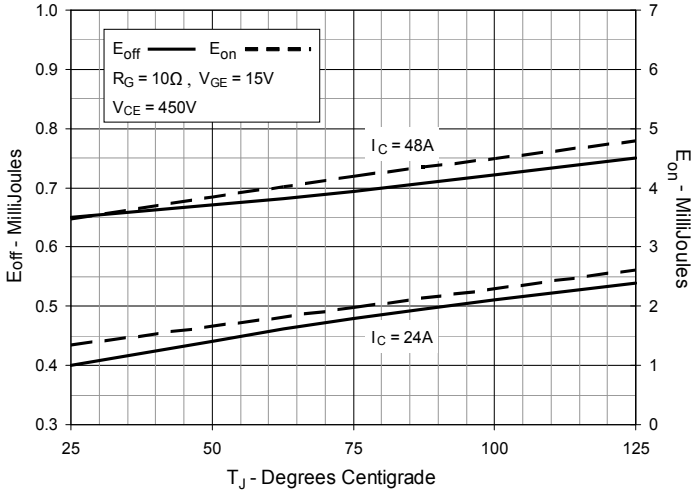


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

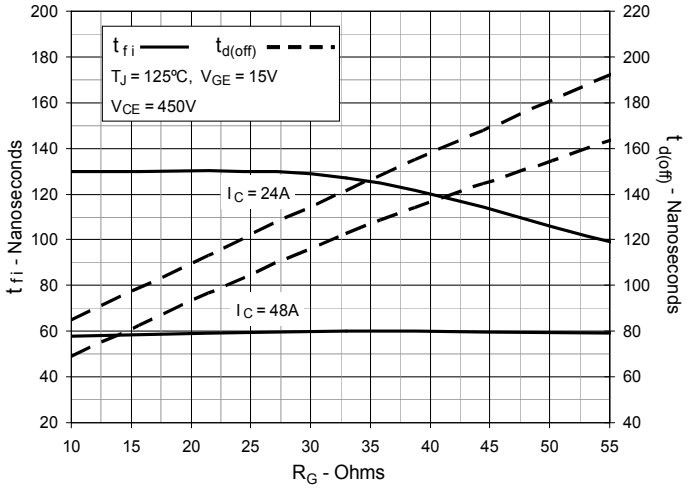


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

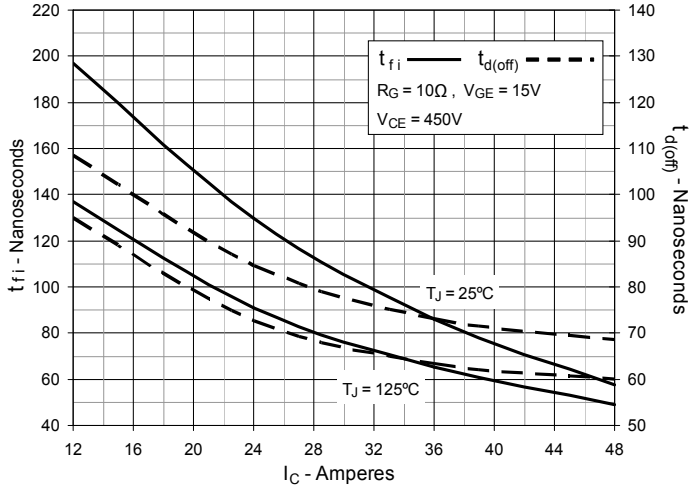


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

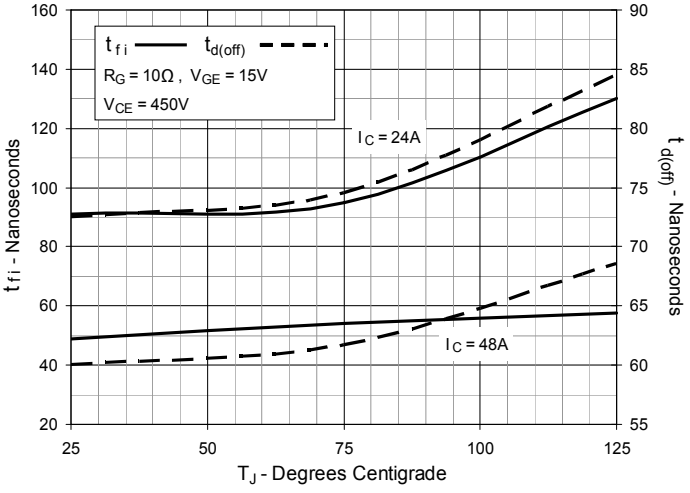


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Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

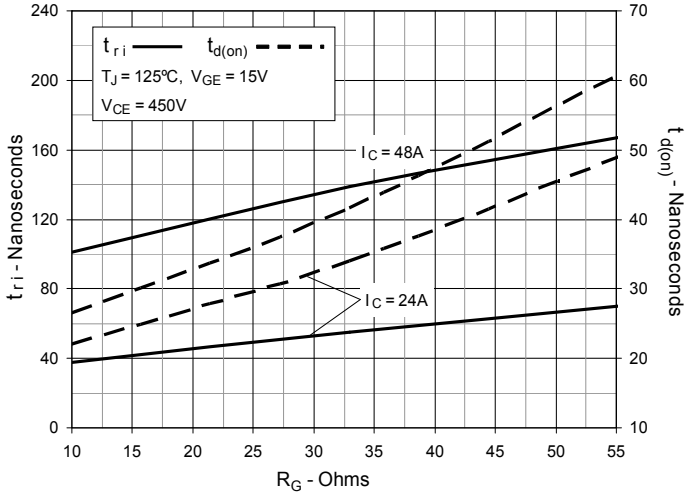


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

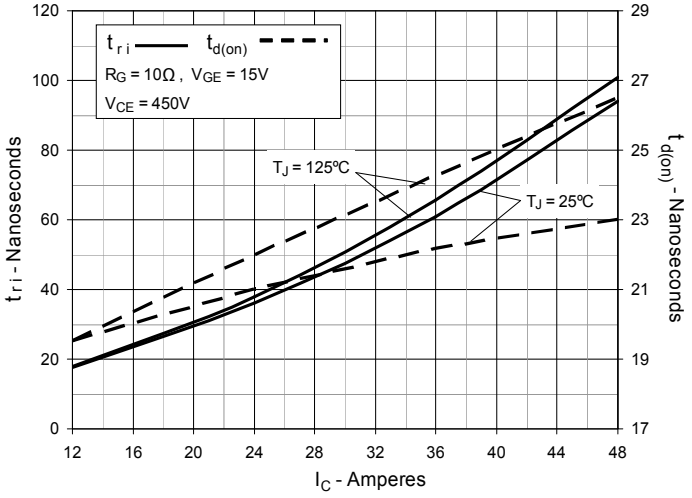
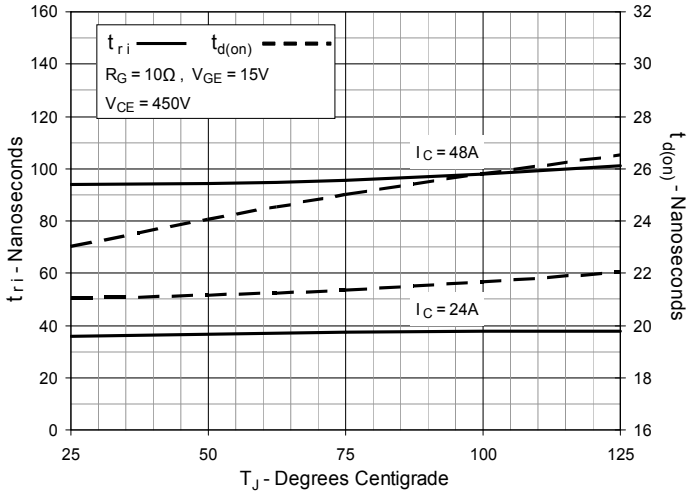


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



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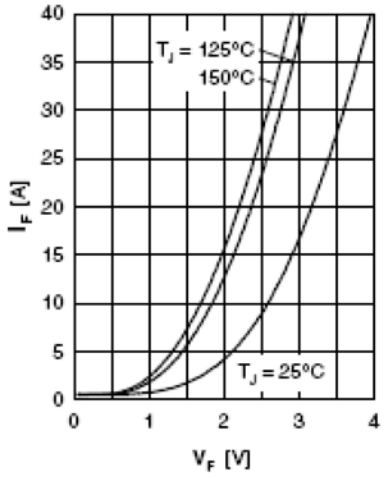

Fig. 21. Typ forward current I_F vs V_F

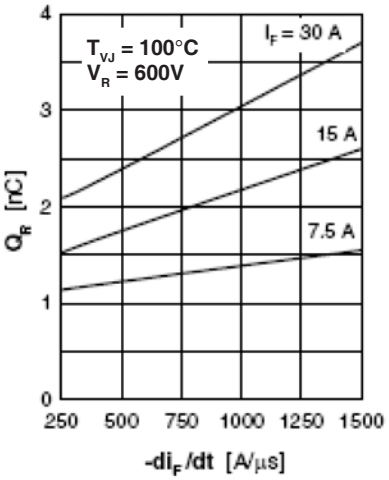

Fig. 22. Typ. reverse recovery charge Q_{rr} versus -di$_F$/dt

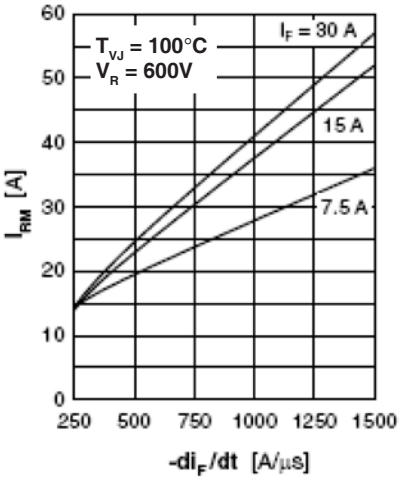

Fig. 23. Typ. peak reverse current I_{RM} versus -di$_F$/dt

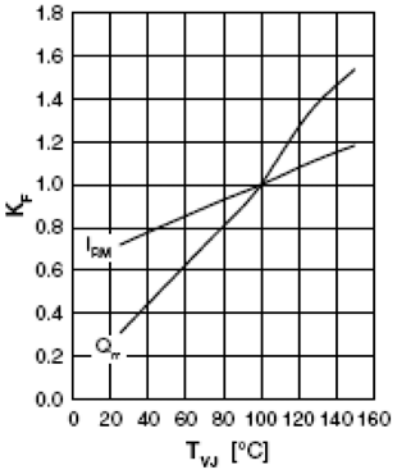

Fig. 24. Dynamic parameters Q_{RR}, I_{RM} versus T_{VJ}

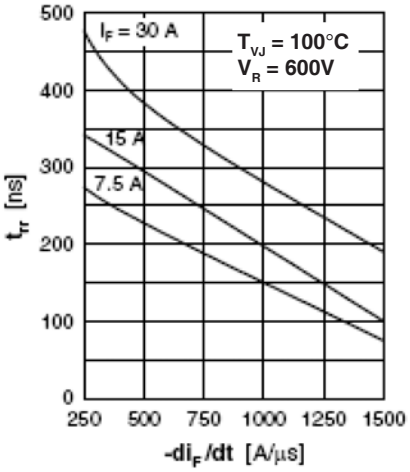

Fig. 25. Typ. recovery time t_{rr} versus -di$_F$/dt

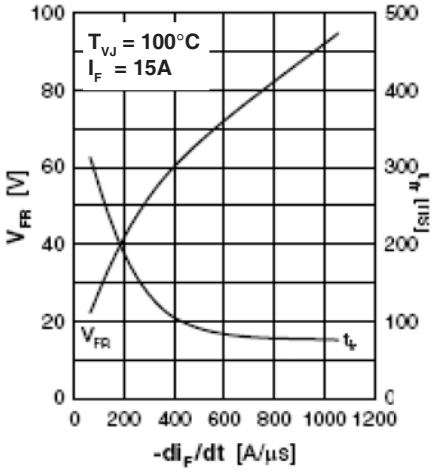

Fig. 26. Typ. peak forward voltage V_{FR} and t_{fr} versus -di$_F$/dt

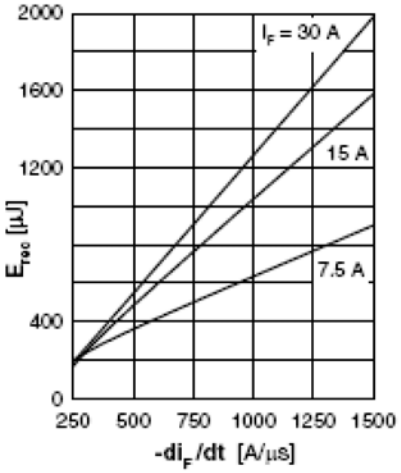

Fig. 27. Typ. recovery energy E_{rec} versus -di$_F$/dt

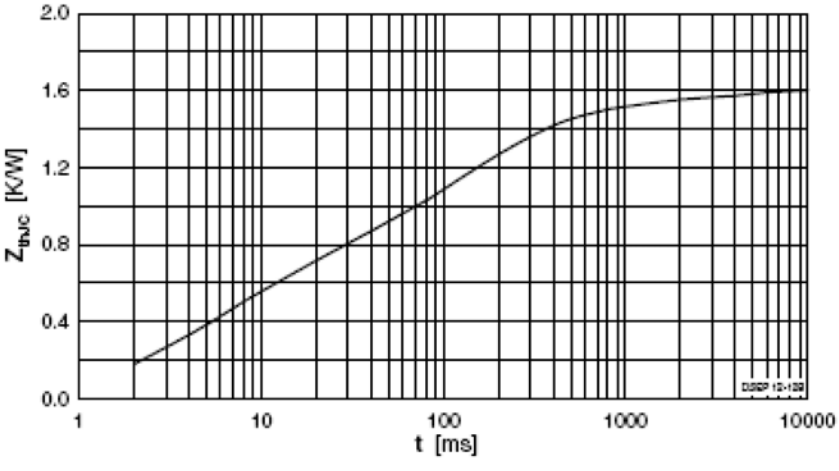

Fig. 28. Maximum transient thermal resistance junction to case

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