IXYS

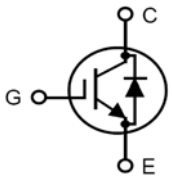
Preliminary Technical Information

XPT™ 650V IGBT GenX3™ w/Diode

IXYP10N65C3D1M

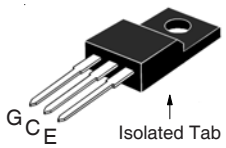
(Electrically Isolated Tab)

Extreme Light Punch Through
IGBT for 20-60kHz Switching



V_{CES} = 650V
I_{C110} = 7A
$V_{CE(sat)}$ ≤ 2.6V
$t_{fi(typ)}$ = 23ns

OVERMOLDED TO-220



G = Gate C = Collector
E = Emitter

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 175°C	650	V
V_{CGR}	T_J = 25°C to 175°C, R_{GE} = 1MΩ	650	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C	15	A
I_{C110}	T_C = 110°C	7	A
I_{F110}	T_C = 110°C	13	A
I_{CM}	T_C = 25°C, 1ms	50	A
I_A	T_C = 25°C	5	A
E_{AS}	T_C = 25°C	100	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 50Ω Clamped Inductive Load	I_{CM} = 20 @ $V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	V_{GE} = 15V, V_{CE} = 360V, T_J = 150°C R_G = 150Ω, Non Repetitive	8	μs
P_C	T_C = 25°C	53	W
T_J		-55 ... +175	°C
T_{JM}		175	°C
T_{stg}		-55 ... +175	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
V_{ISOL}	50/60 Hz, 1 Minute	2500	V~
M_d	Mounting Torque	1.13 / 10	Nm/lb.in
Weight		2.5	g

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250μA, V_{GE} = 0V	650			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			10	μA
	T_J = 150°C			400	μA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 10A, V_{GE} = 15V, Note 1		2.27	2.60	V
	T_J = 150°C		2.54		V

Features

- Optimized for 20-60kHz Switching
- Plastic Overmolded Tab for Electrical Isolation
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Fast Diode
- Short Circuit Capability
- 2500V~ Electrical Isolation
- International Standard Package

Advantages

- High Power Density
- Extremely Rugged
- Low Gate Drive Requirement

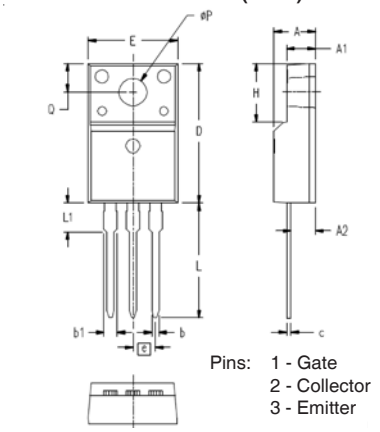
Applications

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

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Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	I_C = 10A, V_{CE} = 10V, Note 1	3.8	6.2		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		423		pF
C_{oes}			42		pF
C_{res}			10		pF
$Q_{g(on)}$	I_C = 10A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		18		nC
Q_{ge}			4		nC
Q_{gc}			8		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		20		ns
t_{ri}	I_C = 10A, V_{GE} = 15V		26		ns
E_{on}	V_{CE} = 400V, R_G = 50Ω		0.24		mJ
$t_{d(off)}$	Note 2		77		ns
t_{fi}			23		ns
E_{off}			0.11	0.17	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		17		ns
t_{ri}	I_C = 10A, V_{GE} = 15V		27		ns
E_{on}	V_{CE} = 400V, R_G = 50Ω		0.44		mJ
$t_{d(off)}$	Note 2		90		ns
t_{fi}			38		ns
E_{off}			0.15		mJ
R_{thJC}				2.83	°C/W
R_{thCS}			0.50		°C/W

OVERMOLDED TO-220 (IXYP) Outline



Pins: 1 - Gate
2 - Collector
3 - Emitter

Dim.	Millimeters min	Millimeters max	Inches min	Inches max
A	4.50	4.90	0.177	0.193
A1	2.34	2.74	0.092	0.108
A2	2.56	2.96	0.101	0.117
b	0.70	0.90	0.028	0.035
b1	1.27	1.47	0.050	0.058
c	0.45	0.60	0.018	0.024
D	15.67	16.07	0.617	0.633
E	9.96	10.36	0.392	0.408
e	2.54 BSC		0.100 BSC	
H	6.48	6.88	0.255	0.271
L	12.68	13.28	0.499	0.523
L1	3.03	3.43	0.119	0.135
Ø P	3.08	3.28	0.121	0.129
Q	3.20	3.40	0.126	0.134

Reverse Diode (FRED)

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
V_F	I_F = 10A, V_{GE} = 0V, Note 1			3.0	V
	T_J = 125°C		1.7		V
I_{RM}	I_F = 12A, V_{GE} = 0V,		2.5		A
t_{rr}	$-di_F/dt$ = 100A/µs, V_R = 100V, T_J = 125°C		110		ns
t_{rr}	I_F = 1A, V_{GE} = 0V, $-di_F/dt$ = 100A/µs, V_R = 30V		30		ns
R_{thJC}				4.0	°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.

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 4,860,072 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 = 25°C

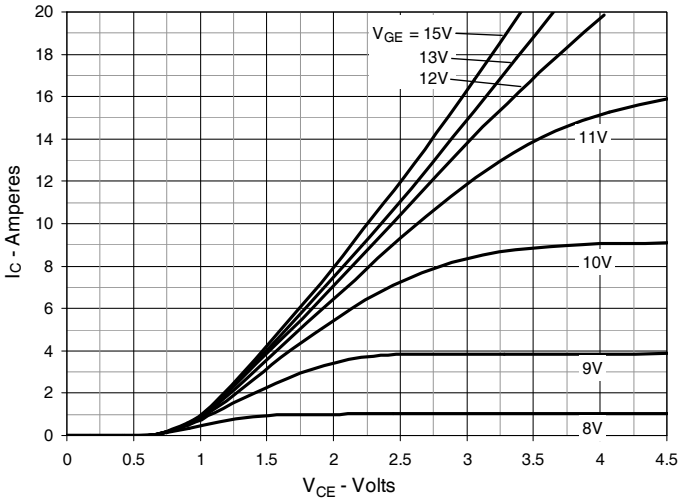


Fig. 2. Extended Output Characteristics @ T_J = 25°C

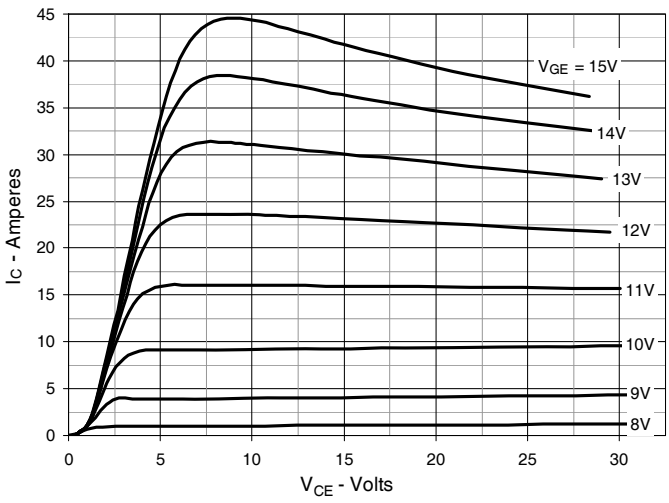


Fig. 3. Output Characteristics @ T_J = 150°C

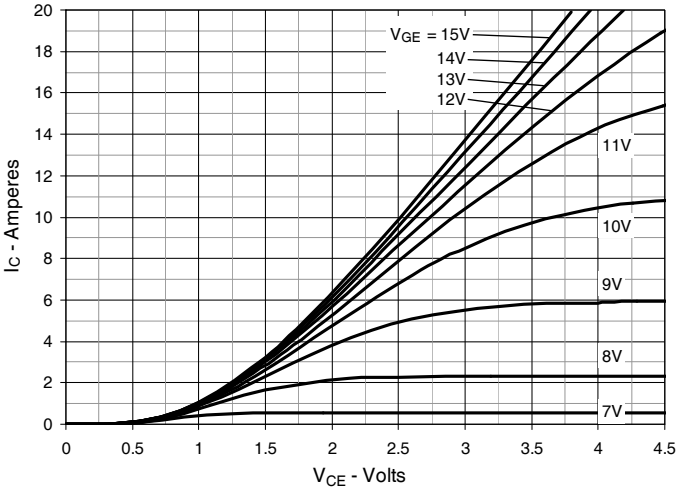


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

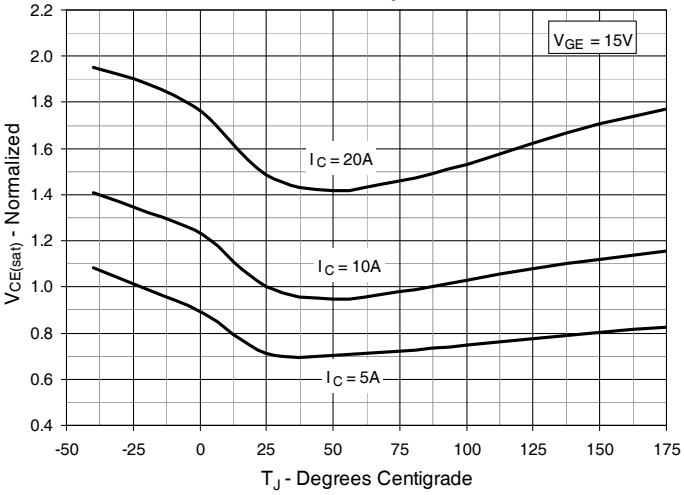


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

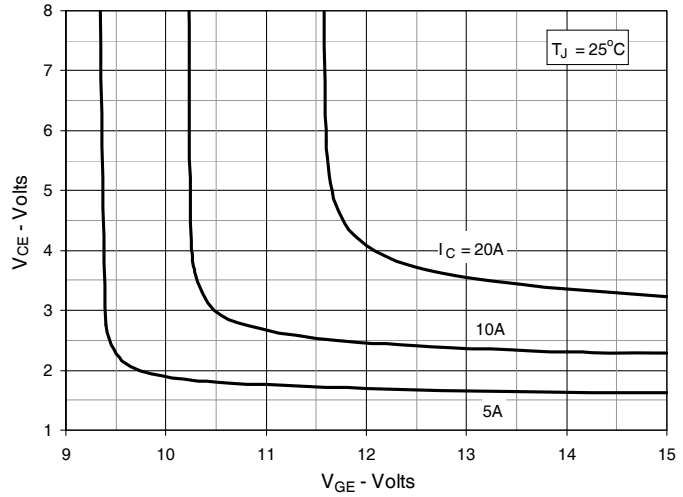
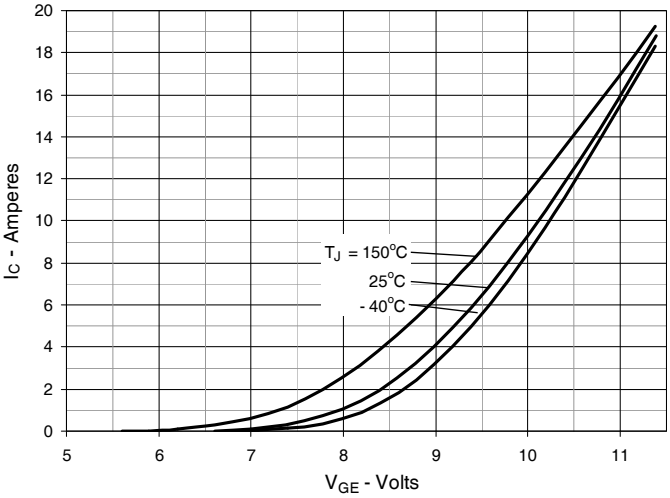


Fig. 6. Input Admittance



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Fig. 7. Transconductance

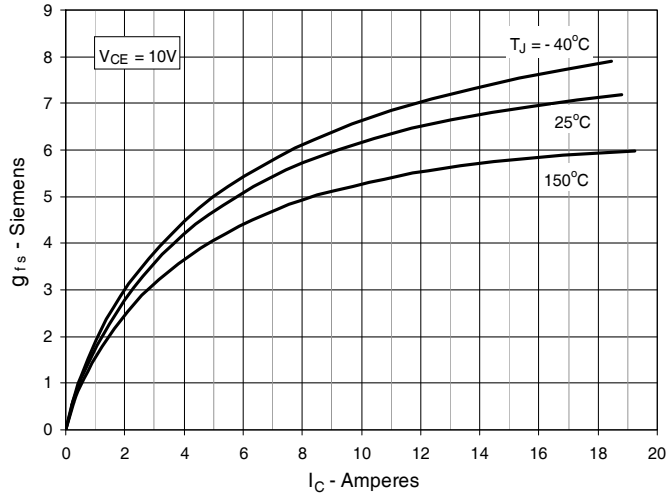


Fig. 8. Gate Charge

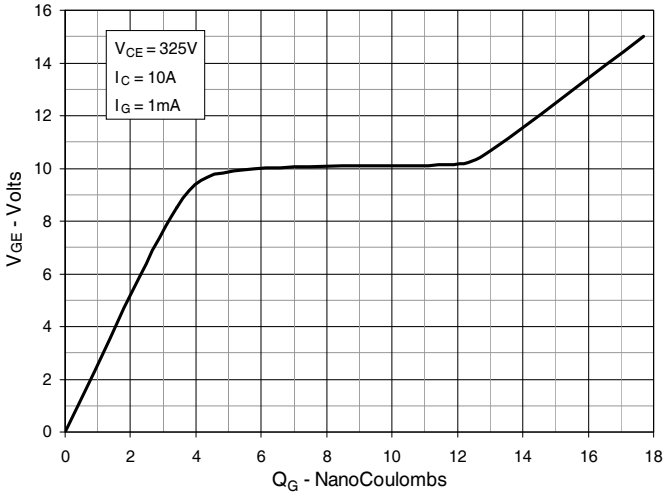


Fig. 9. Capacitance

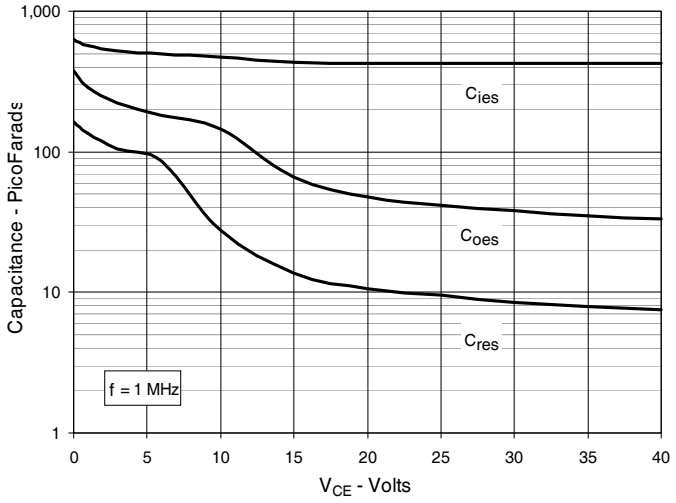


Fig. 10. Reverse-Bias Safe Operating Area

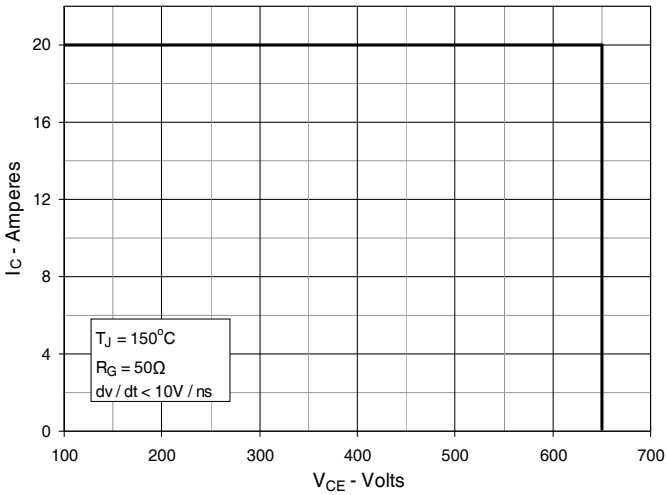


Fig. 11. Forward-Bias Safe Operating Area

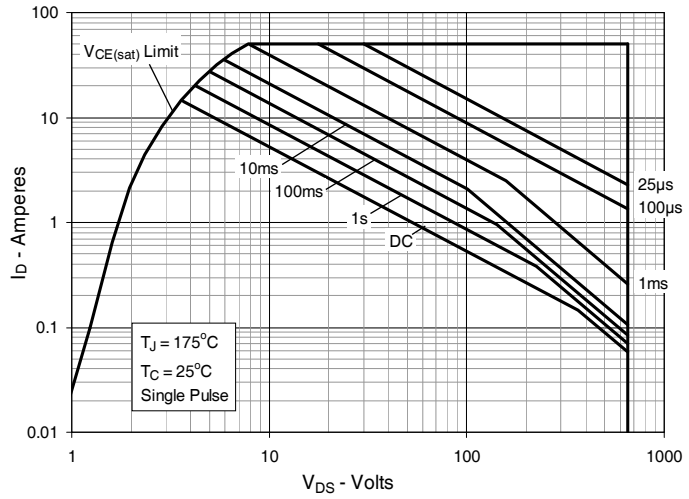
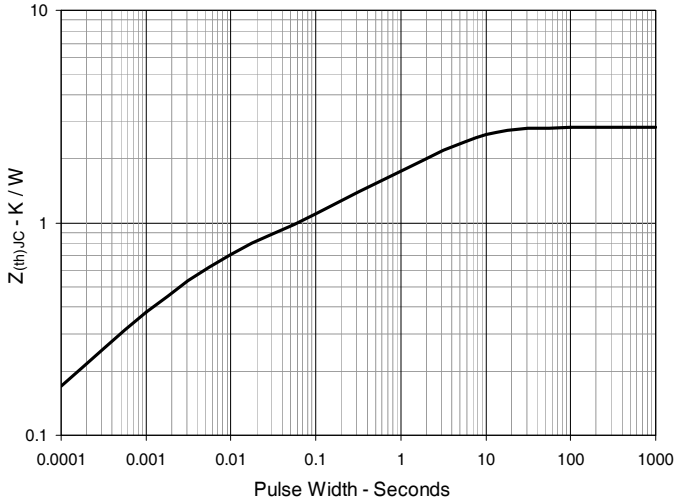


Fig. 12. Maximum Transient Thermal Impedance (IGBT)



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

Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

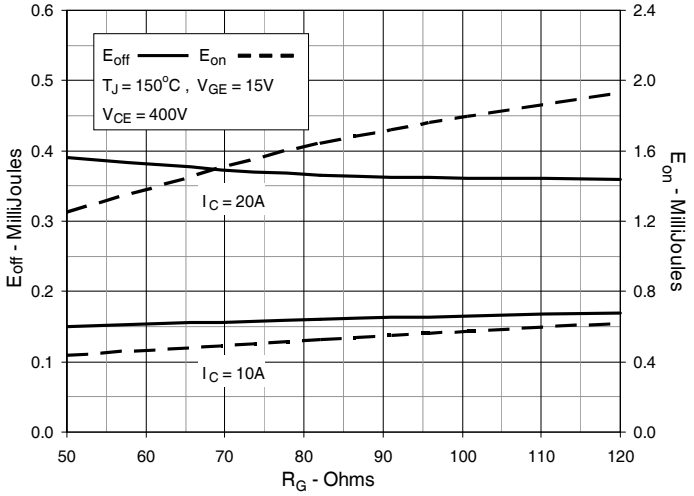


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

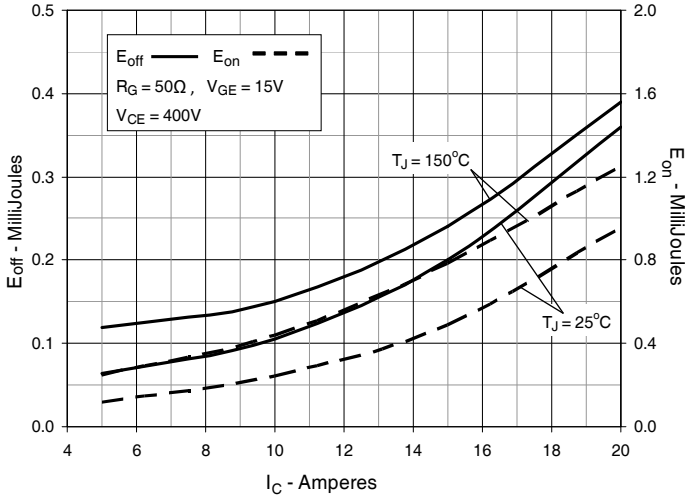


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

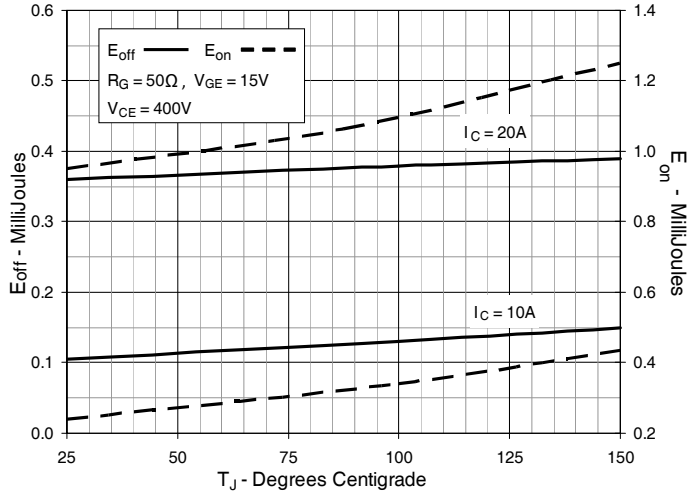


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

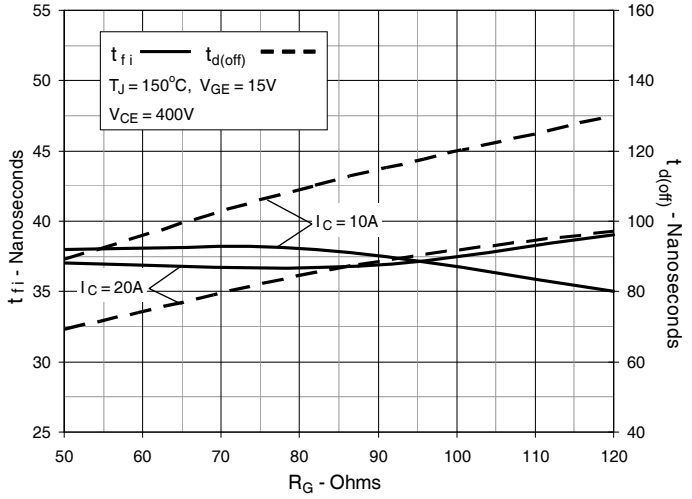


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

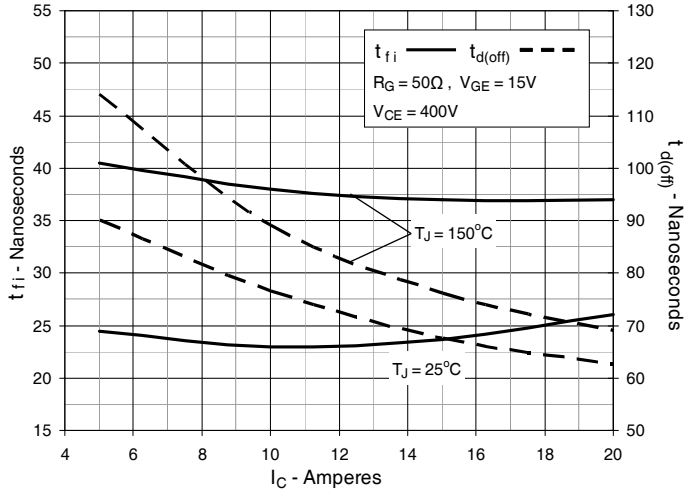
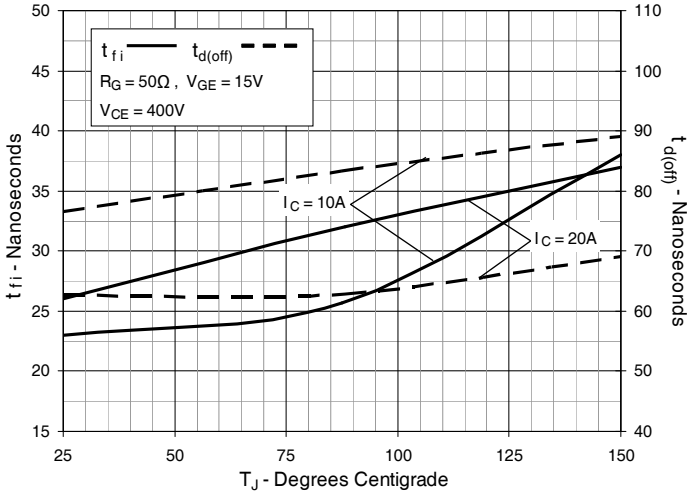


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature



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Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

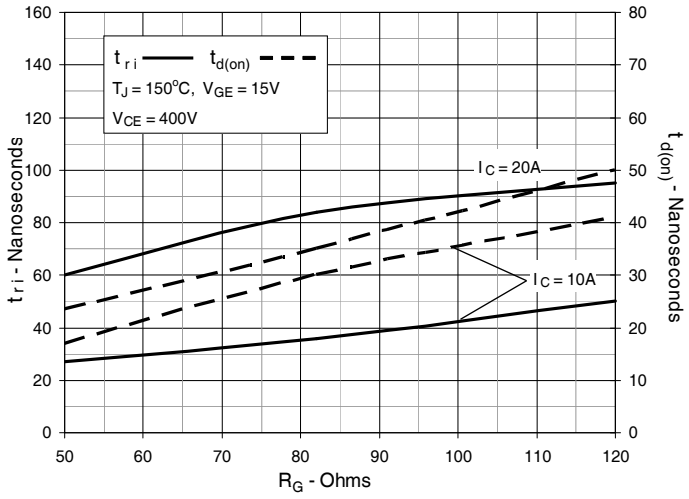


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

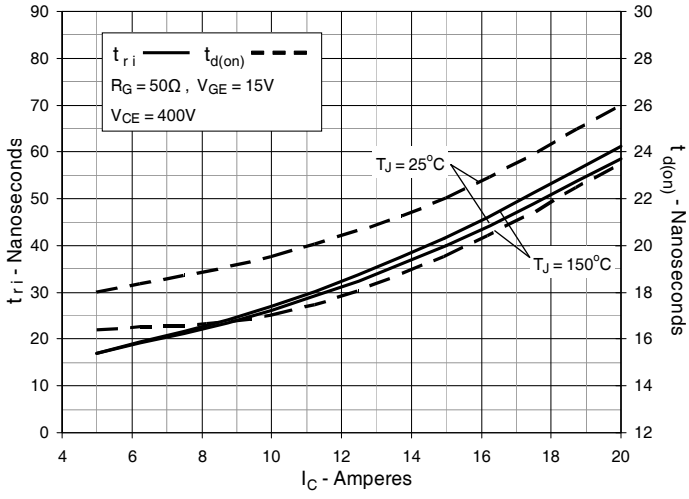


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature

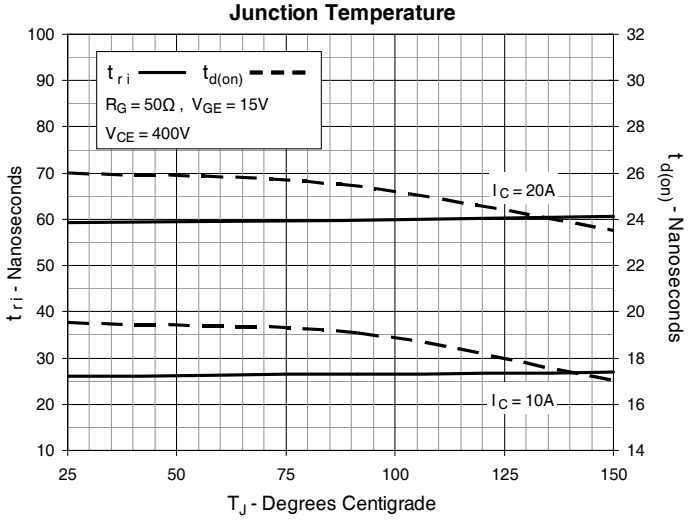
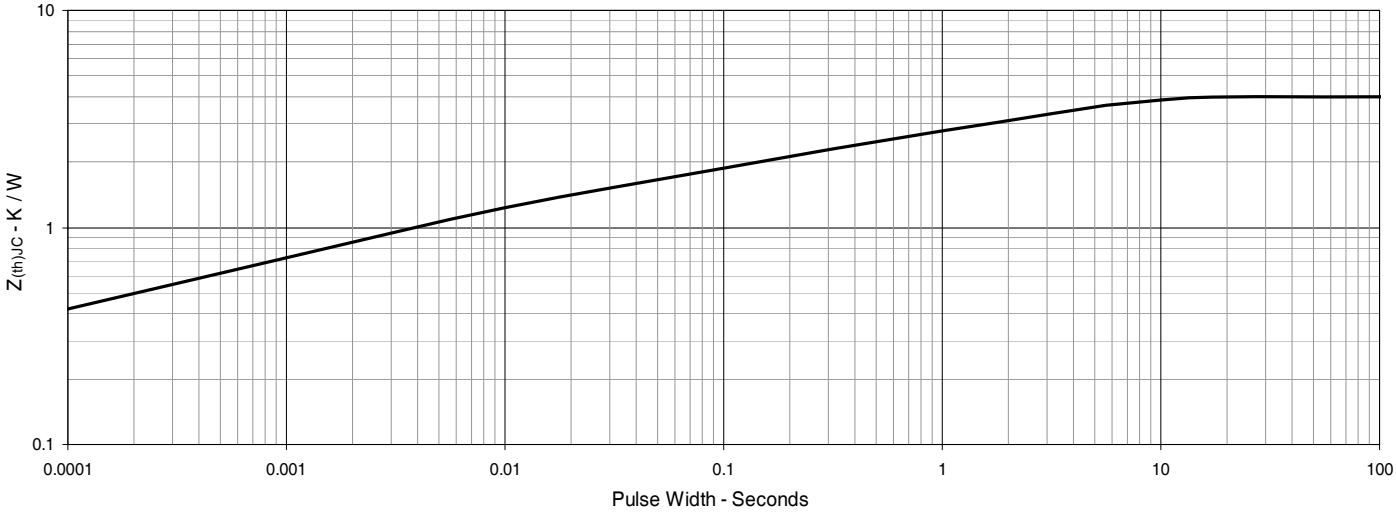


Fig. 22. Maximum Transient Thermal Impedance (DIODE)



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