IXYS

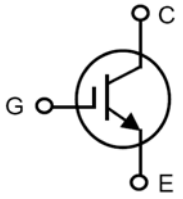
Preliminary Technical Information

XPT™ 650V IGBT GenX3™

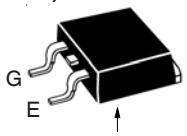
IXYA20N65C3
IXYH20N65C3

V_{CES} = 650V
I_{C110} = 20A
$V_{CE(sat)}$ ≤ 2.50V
$t_{fi(typ)}$ = 28ns

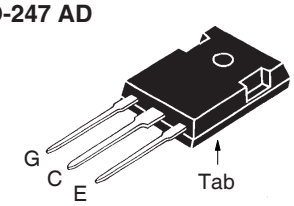
Extreme Light Punch Through
IGBT for 20-60 kHz Switching



TO-263 AA (IXYA)



TO-247 AD



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

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	50	A
I_{C110}	T_C = 110°C	20	A
I_{CM}	T_C = 25°C, 1ms	105	A
I_A	T_C = 25°C	10	A
E_{AS}	T_C = 25°C	200	mJ
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 20Ω Clamped Inductive Load	I_{CM} = 40 $V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	V_{GE} = 15V, V_{CE} = 360V, T_J = 150°C R_G = 82Ω, Non Repetitive	10	μs
P_C	T_C = 25°C	230	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
M_d	Mounting Torque	1.13/10	Nm/lb.in
Weight	TO-263	2.5	g
	TO-247	6.0	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			150	μA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15V, Note 1		2.27	2.50	V
	T_J = 150°C		2.44		V

Features

- Optimized for 20-60kHz Switching
- Square RBSOA
- Avalanche Rated
- Short Circuit Capability
- International Standard Packages

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 = 20A, V_{CE} = 10V, Note 1	7	12		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		822		pF
C_{oes}			52		pF
C_{res}			19		pF
$Q_{g(on)}$	I_C = 20A, V_{GE} = 15V, V_{CE} = 0.5 • V_{CES}		30		nC
Q_{ge}			6		nC
Q_{gc}			15		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		19		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		34		ns
E_{on}	V_{CE} = 400V, R_G = 20Ω		0.43		mJ
$t_{d(off)}$	Note 2		80		ns
t_{fi}			28		ns
E_{off}			0.35	0.65	mJ
$t_{d(on)}$	**Inductive load, T_J = 150°C**		18		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		33		ns
E_{on}	V_{CE} = 400V, R_G = 20Ω		0.70		mJ
$t_{d(off)}$	Note 2		96		ns
t_{fi}			36		ns
E_{off}			0.40		mJ
R_{thJC}				0.65	°C/W
R_{thCS}	TO-247		0.21		°C/W

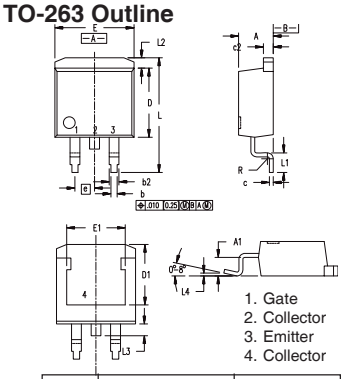
Notes:

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.

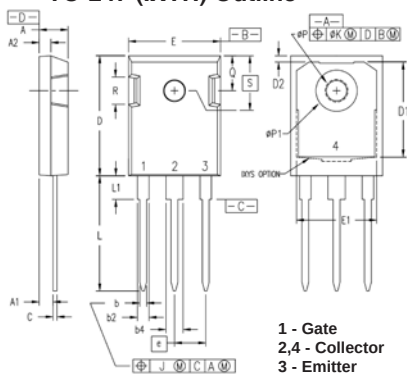
TO-263 Outline



1. Gate
2. Collector
3. Emitter
4. Collector

Dim.	Millimeter Min.	Max.	Inches Min.	Max.
A	4.06	4.83	.160	.190
b	0.51	0.99	.020	.039
b2	1.14	1.40	.045	.055
c	0.40	0.74	.016	.029
c2	1.14	1.40	.045	.055
D	8.64	9.65	.340	.380
D1	8.00	8.89	.280	.320
E	9.65	10.41	.380	.405
E1	6.22	8.13	.270	.320
e	2.54	BSC	.100	BSC
L	14.61	15.88	.575	.625
L1	2.29	2.79	.090	.110
L2	1.02	1.40	.040	.055
L3	1.27	1.78	.050	.070
L4	0	0.13	0	.005

TO-247 (IXYH) Outline



1 - Gate
2,4 - Collector
3 - Emitter

Dim.	Millimeter min	max	Inches min	max
A	4.70	5.30	0.185	0.209
A1	2.21	2.59	0.087	0.102
A2	1.50	2.49	0.059	0.098
b	0.99	1.40	0.039	0.055
b2	1.65	2.39	0.065	0.094
b4	2.59	3.43	0.102	0.135
c	0.38	0.89	0.015	0.035
D	20.79	21.45	0.819	0.845
D1	13.07	-	0.515	-
D2	0.51	1.35	0.020	0.053
E	15.48	16.24	0.610	0.640
E1	13.45	-	0.53	-
E2	4.31	5.48	0.170	0.216
e	5.45 BSC		0.215 BSC	
L	19.80	20.30	0.078	0.800
L1	-	4.49	-	0.177
Ø P	3.55	3.65	0.140	0.144
Ø P1	-	7.39	-	0.290
Q	5.38	6.19	0.212	0.244
S	6.14 BSC		0.242 BSC	

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 = 25ºC

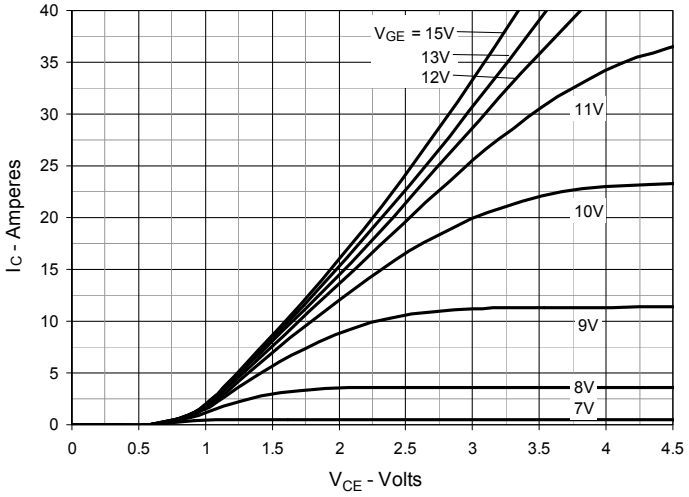


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

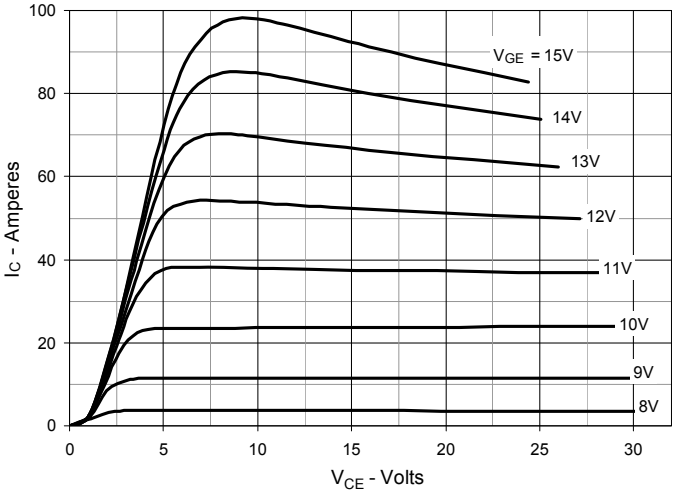


Fig. 3. Output Characteristics @ T_J = 150ºC

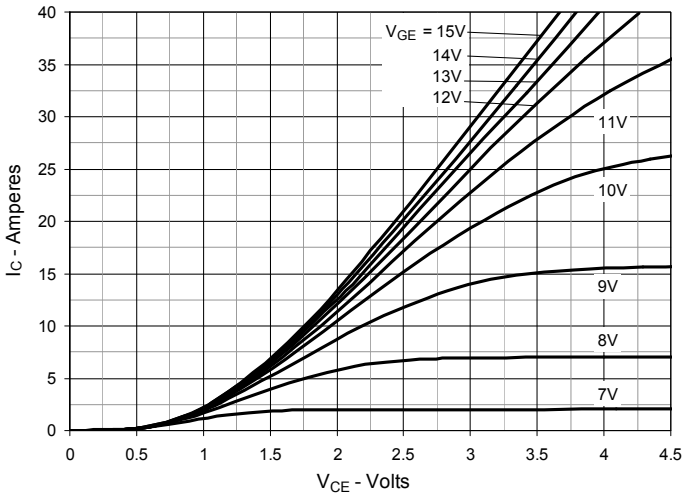


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

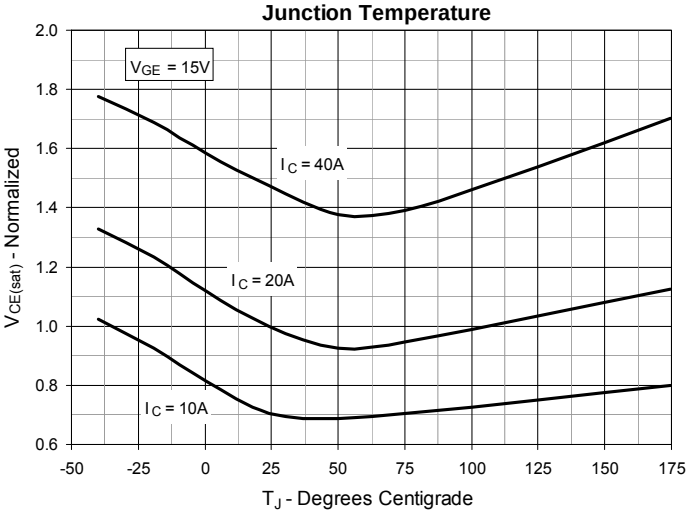


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

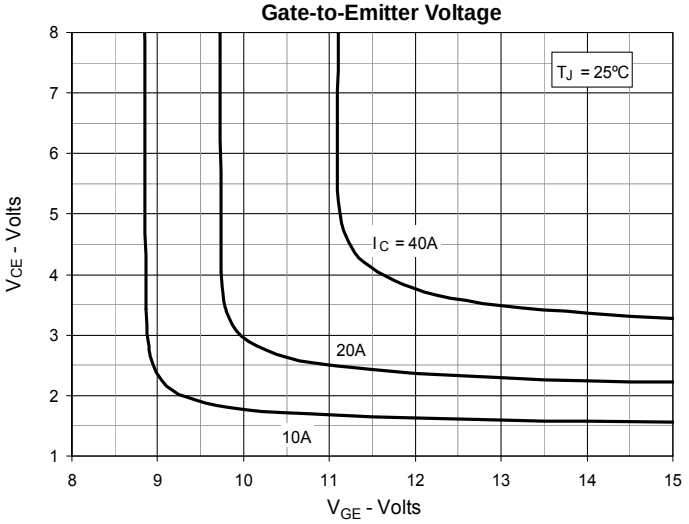
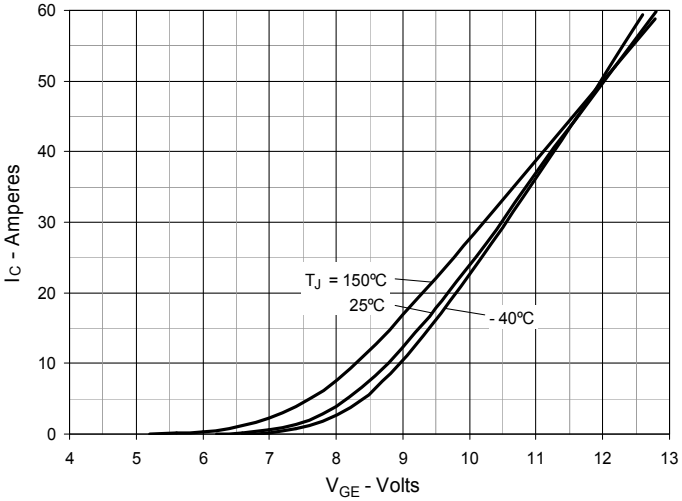


Fig. 6. Input Admittance



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Fig. 7. Transconductance

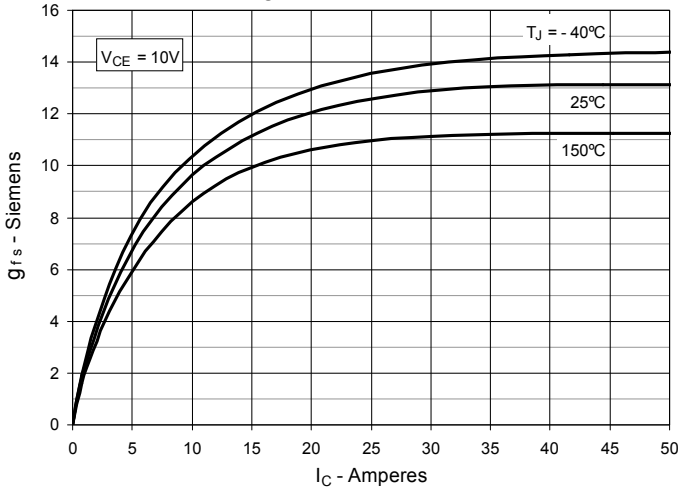


Fig. 8. Gate Charge

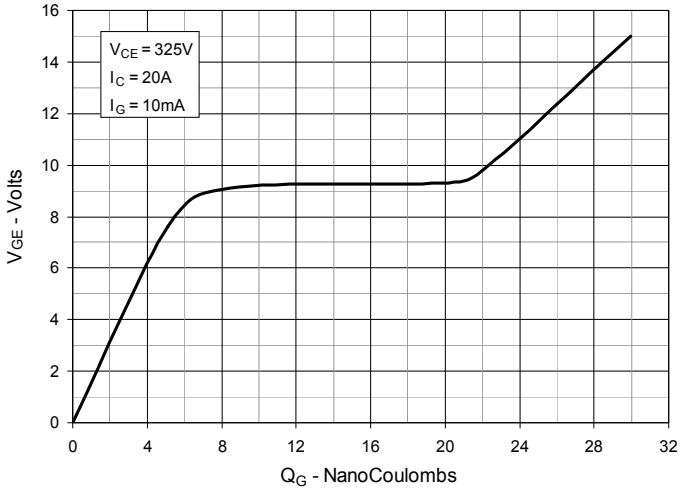


Fig. 9. Capacitance

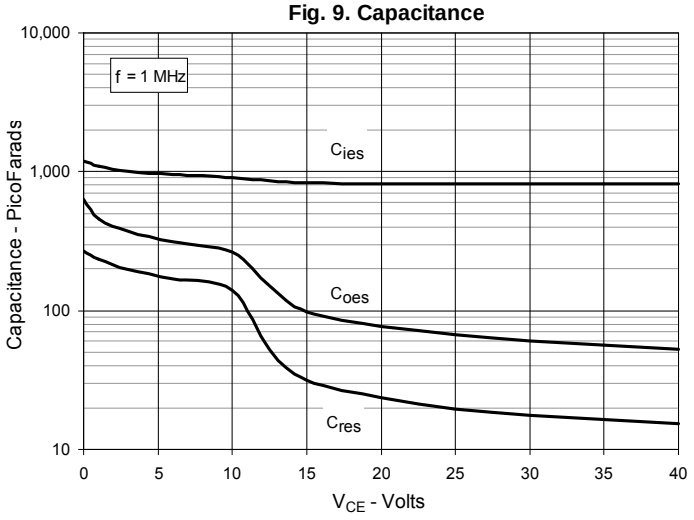


Fig. 10. Reverse-Bias Safe Operating Area

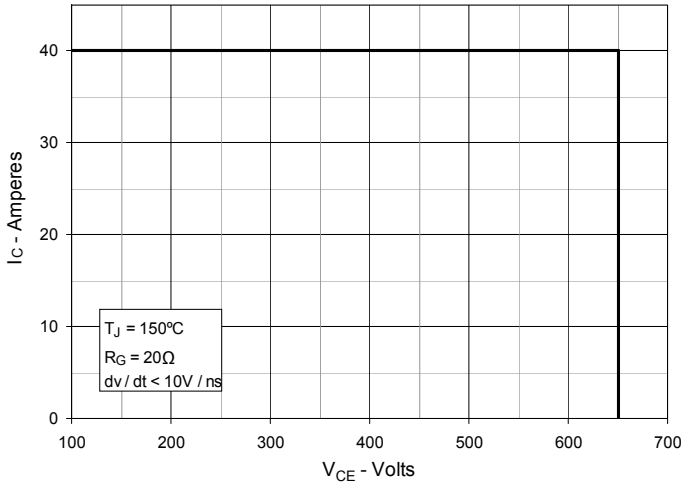


Fig. 11. Forward-Bias Safe Operating Area

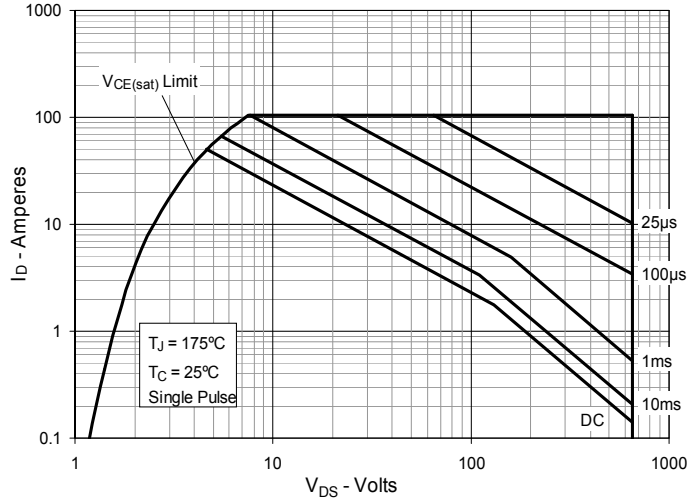
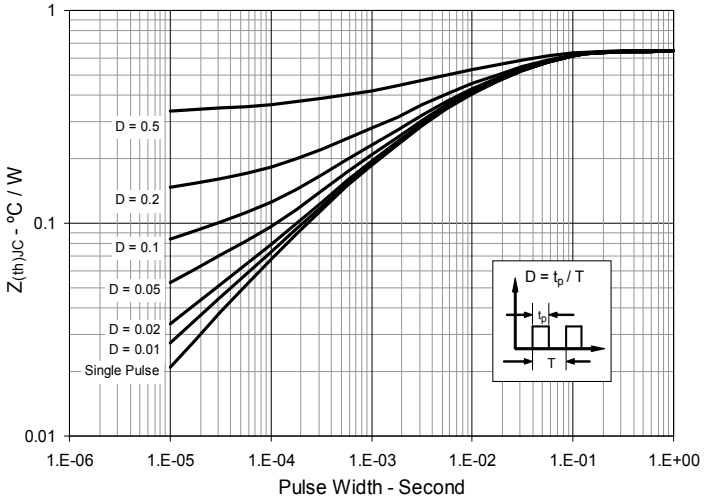


Fig. 12. Maximum Transient Thermal Impedance (IGBT)



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

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

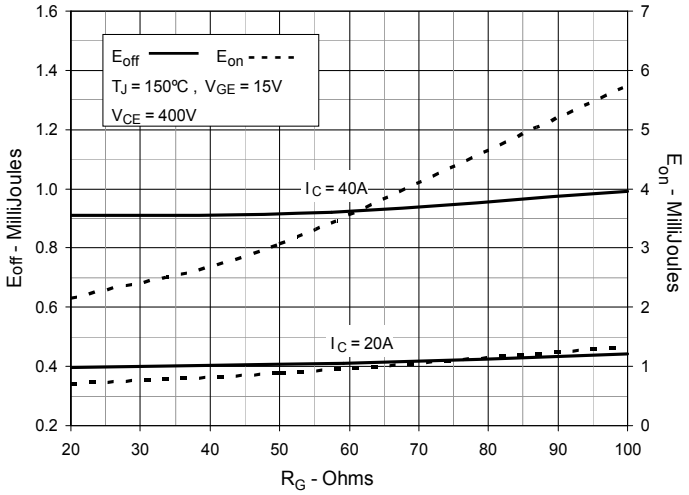


Fig. 14. Inductive Switching Energy Loss vs. Collector Current

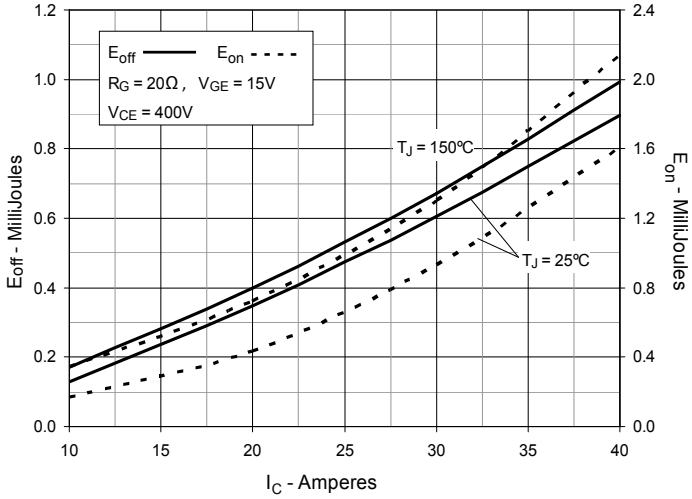


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

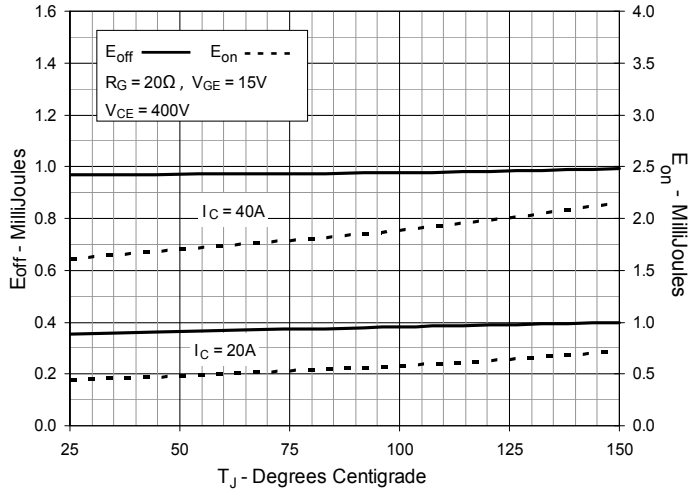


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

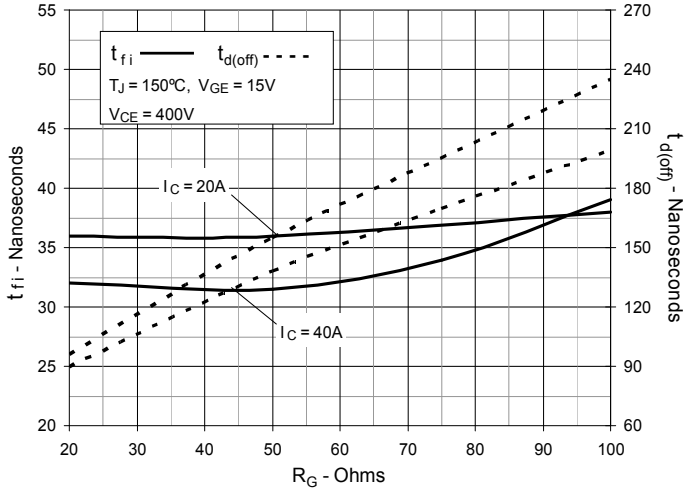


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

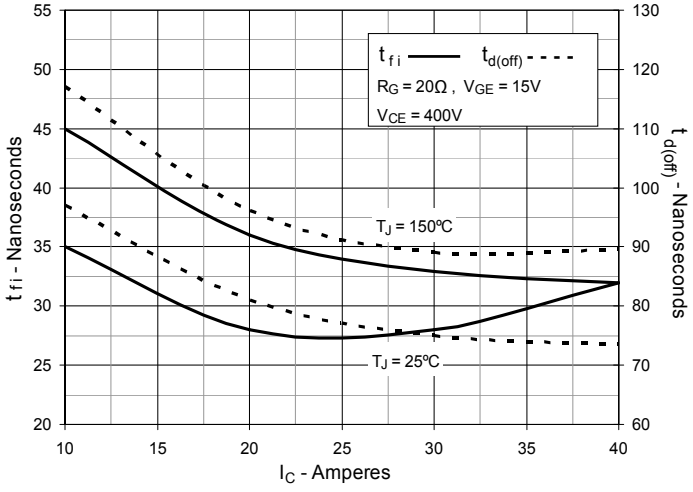
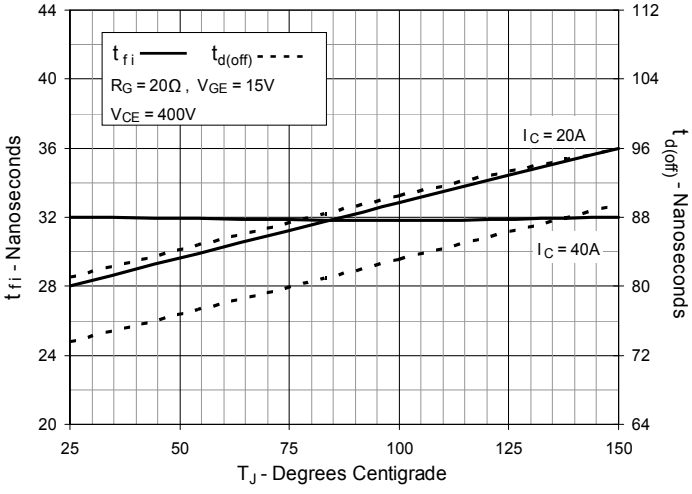


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature



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

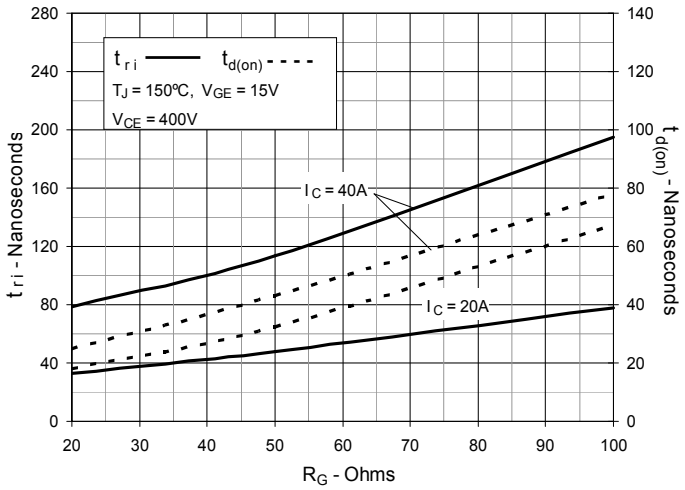


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

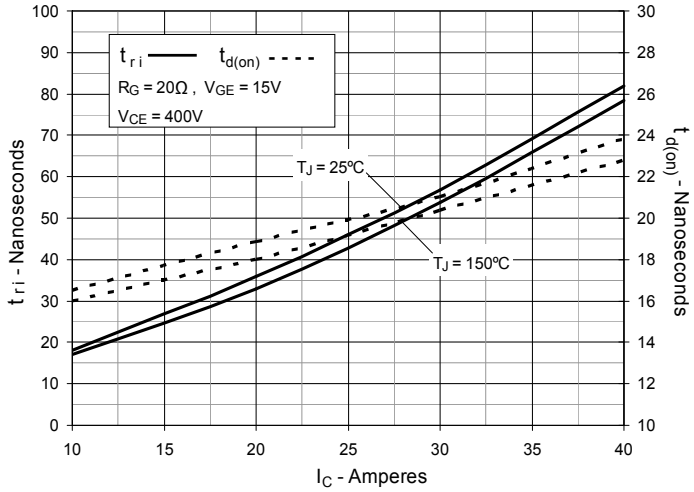


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature

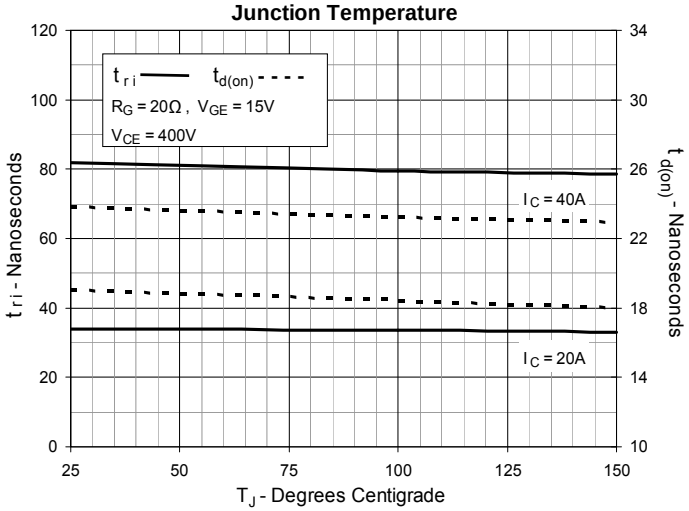
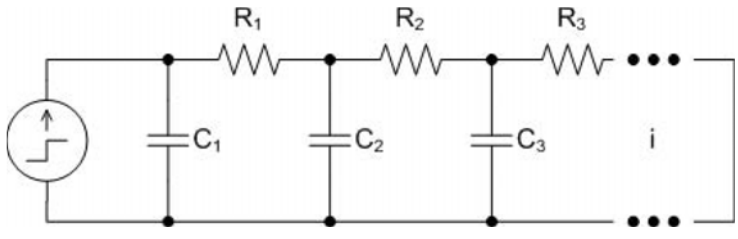


Fig. 22. Cauer Thermal Network



i	Ri (°C/W)	Ci (J/°C)
1	0.170320	0.0017715
2	0.136990	0.0166820
3	0.090011	0.0391660

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



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