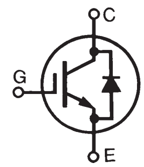
IXYS **Advance Technical Information**

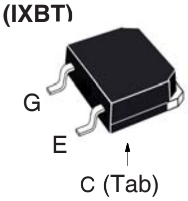
High Voltage, High Gain BIMOSFET™ Monolithic Bipolar MOS Transistor

IXBT20N360HV
IXBH20N360HV

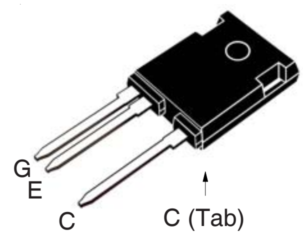
V_{CES} = 3600V
I_{C110} = 20A
$V_{CE(sat)}$ ≤ 3.4V



TO-268HV (IXBT)



TO-247HV (IXBH)



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

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	3600	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	3600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C	70	A
I_{C110}	T_C = 110°C	20	A
I_{CM}	T_C = 25°C, 1ms	220	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 10Ω Clamped Inductive Load	I_{CM} = 160 V_{CES} ≤ 1500	A V
T_{SC} **(SCSOA)**	V_{GE} = 15V, T_J = 125°C, R_G = 52Ω, V_{CE} = 1500V, Non-Repetitive	10	µs
P_C	T_C = 25°C	430	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}	Plastic Body for 10s	260	°C
M_d	Mounting Torque (TO-247HV)	1.13/10	Nm/lb.in
Weight	TO-268HV TO-247HV	4 6	g g

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250µA, V_{GE} = 0V	3600			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 T_J = 125°C			25 500	µA µA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V			±100	nA
$V_{CE(sat)}$	I_C = 20A, V_{GE} = 15V, Note 1 T_J = 125°C		2.9 3.6	3.4	V V

Features

- High Voltage Packages
- High Blocking Voltage
- High Peak Current Capability
- Low Saturation Voltage

Advantages

- Low Gate Drive Requirement
- High Power Density

Applications

- Switch-Mode and Resonant-Mode Power Supplies
- Uninterruptible Power Supplies (UPS)
- Laser Generators
- Capacitor Discharge Circuits
- AC Switches

IXYS

IXBT20N360HV
IXBH20N360HV

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	10	17		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		2045		pF
C_{oes}			110		pF
C_{res}			50		pF
$Q_{g(on)}$	I_C = 20A, V_{GE} = 15V, V_{CE} = 1000V		110		nC
Q_{ge}			13		nC
Q_{gc}			43		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		18		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		14		ns
E_{on}	V_{CE} = 1500V, R_G = 10Ω		15.50		mJ
$t_{d(off)}$	Note 2		238		ns
t_{fi}			206		ns
E_{off}			4.30		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		20		ns
t_{ri}	I_C = 20A, V_{GE} = 15V		22		ns
E_{on}	V_{CE} = 1500V, R_G = 10Ω		16.10		mJ
$t_{d(off)}$	Note 2		247		ns
t_{fi}			216		ns
E_{off}			4.15		mJ
$t_{d(on)}$	**Resistive load, T_J = 25°C**		30		ns
t_r	I_C = 20A, V_{GE} = 15V		325		ns
$t_{d(off)}$	V_{CE} = 960V, R_G = 10Ω		165		ns
t_f			1045		ns
$t_{d(on)}$	**Resistive load, T_J = 125°C**		32		ns
t_r	I_C = 20A, V_{GE} = 15V		890		ns
$t_{d(off)}$	V_{CE} = 960V, R_G = 10Ω		185		ns
t_f			1100		ns
R_{thJC}				0.29	°C/W
R_{thCS}	TO-247HV		0.21		°C/W

Reverse Diode

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max	
V_F	I_F = 20A, V_{GE} = 0V, Note 1			3.5	V
t_{rr}	I_F = 10A, V_{GE} = 0V, $-di_F/dt$ = 100A/μs		1.7		μs
I_{RM}	V_R = 100V, V_{GE} = 0V		35		A
Q_{RM}			30		μC

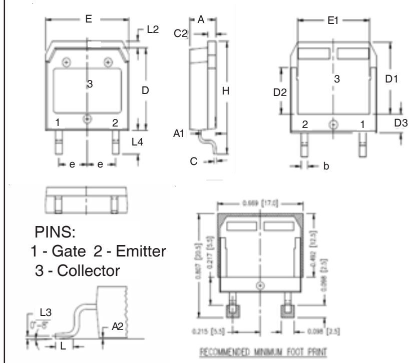
Note: 1. Pulse test, t ≤ 300μs, duty cycle, d ≤ 2%.
2. Switching times & energy losses may increase for higher V_{CE}(clamp), T_J or R_G.

ADVANCE 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.

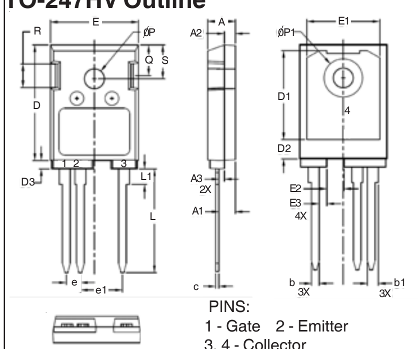
TO-268HV Outline



PINS:
1 - Gate 2 - Emitter
3 - Collector

SYM	INCHES MIN	INCHES MAX	MILLIMETER MIN	MILLIMETER MAX
A	.193	.201	4.90	5.10
A1	.106	.114	2.70	2.90
A2	.001	.010	0.02	0.25
b	.045	.057	1.15	1.45
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.465	.476	11.80	12.10
D2	.295	.307	7.50	7.80
D3	.114	.126	2.90	3.20
E	.624	.632	15.85	16.05
E1	.524	.535	13.30	13.60
e	.215 BSC		5.45 BSC	
H	.736	.752	18.70	19.10
L	.067	.079	1.70	2.00
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

TO-247HV Outline



PINS:
1 - Gate 2 - Emitter
3, 4 - Collector

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS MAX
A	.193	.201	4.90	5.10
A1	.114	.122	2.90	3.10
A2	.075	.083	1.90	2.10
A3	.035	.043	0.90	1.10
b	.053	.059	1.35	1.50
b1	.075	.083	1.90	2.10
c	.022	.030	0.55	0.75
D	.819	.843	20.80	21.40
D1	.638	.646	16.20	16.40
D2	.134	.146	3.40	3.70
D3	.055	.063	1.40	1.60
E	.622	.638	15.80	16.20
E1	.520	.528	13.20	13.40
E2	.118	.126	3.00	3.20
E3	.051	.059	1.30	1.50
e	.100 BSC		2.54 BSC	
e1	.300 BSC		7.62 BSC	
L	.732	.748	18.60	19.00
L1	.106	.118	2.70	3.00
øP	.138	.142	3.50	3.60
øP1	.272	.280	6.90	7.10
Q	.216	.224	5.50	5.70
R	.165	.169	4.20	4.30
S	.240	.248	6.10	6.30

Fig. 1. Output Characteristics @ T_J = 25ºC

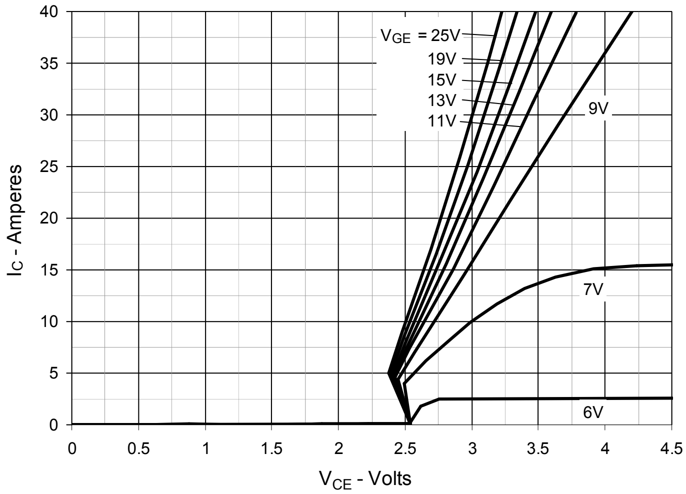


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

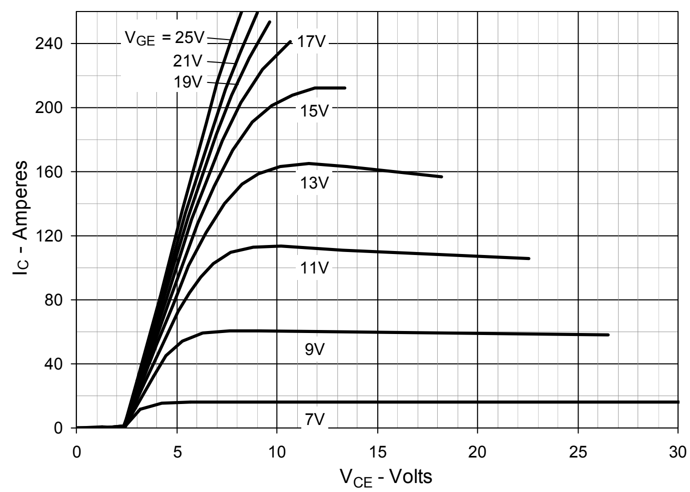


Fig. 3. Output Characteristics @ T_J = 125ºC

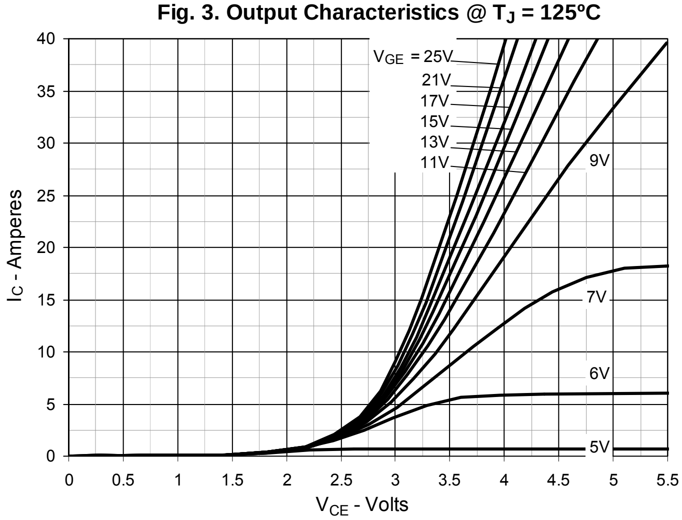


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

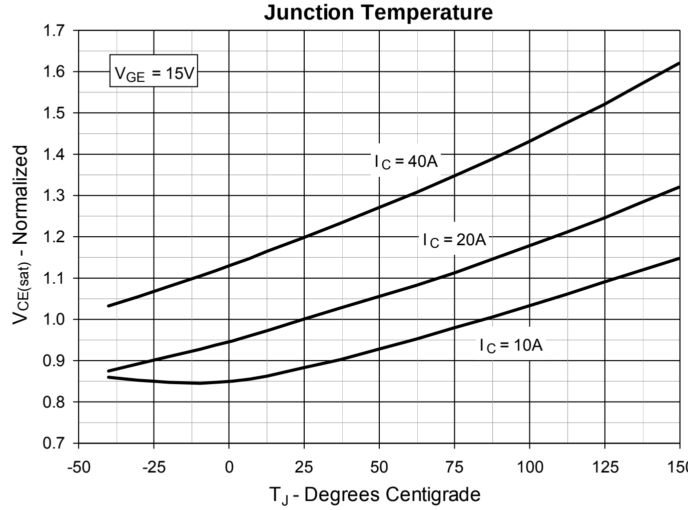


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

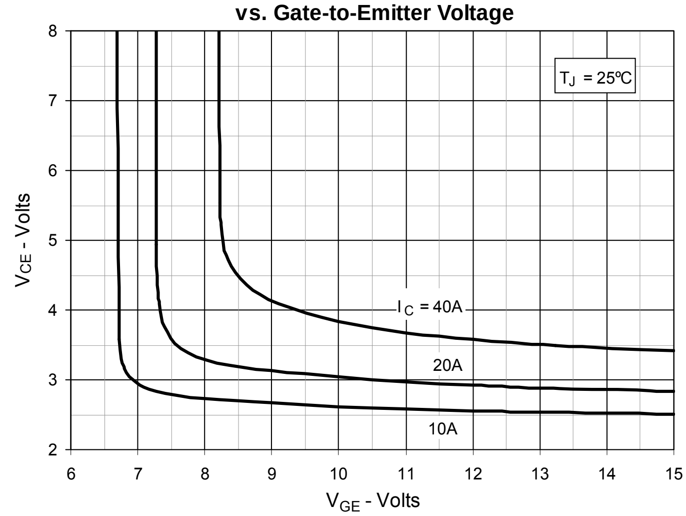


Fig. 6. Input Admittance

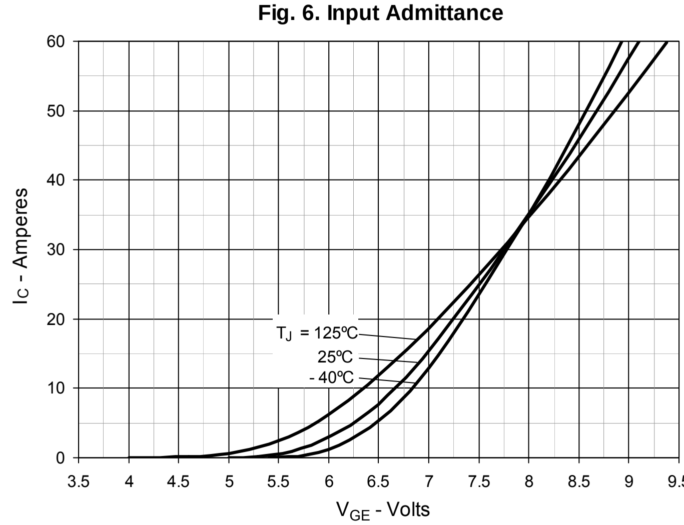


Fig. 7. Transconductance

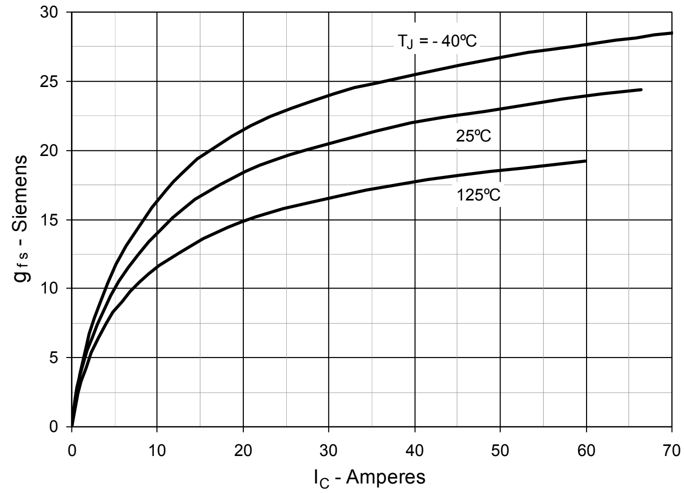


Fig. 8. Gate Charge

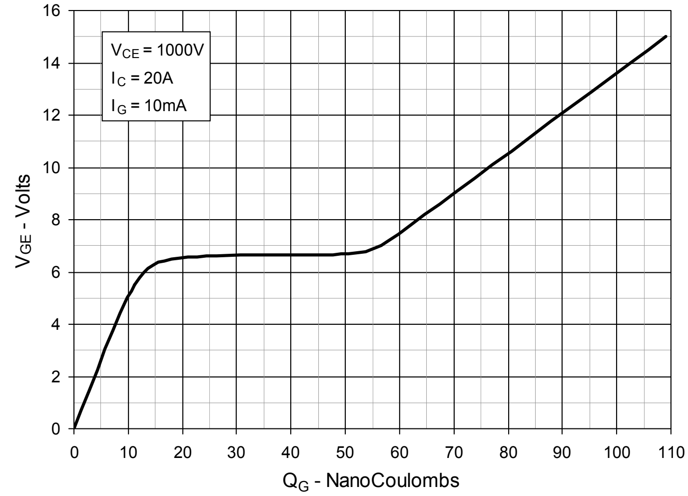


Fig. 9. Forward Voltage Drop of Intrinsic Diode

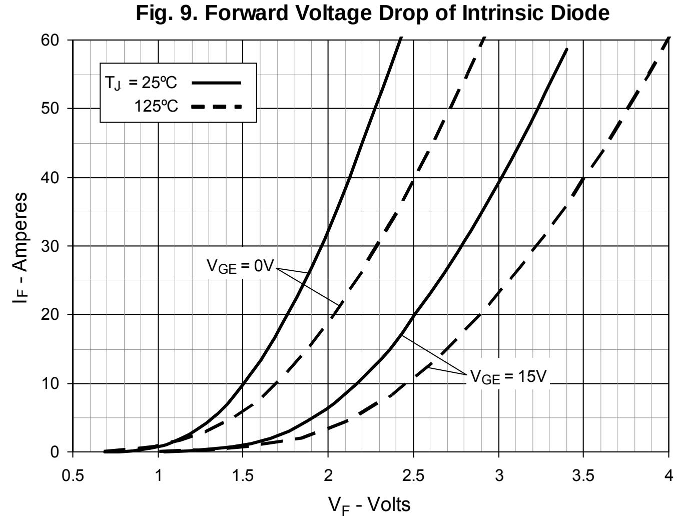


Fig. 10. Capacitance

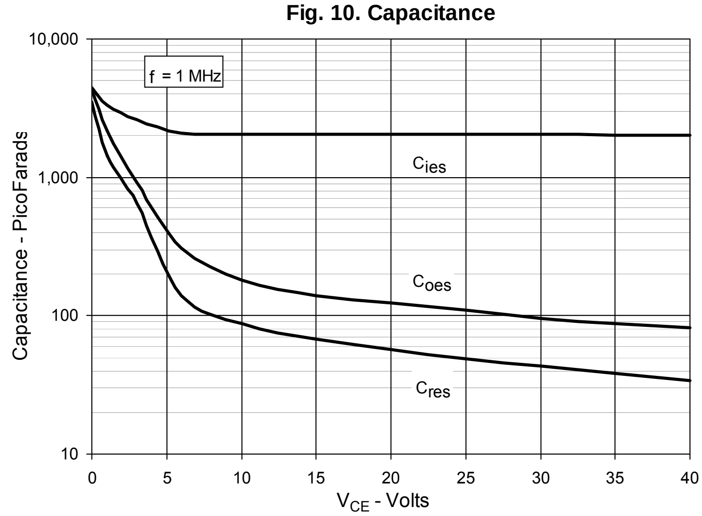


Fig. 11. Reverse-Bias Safe Operating Area

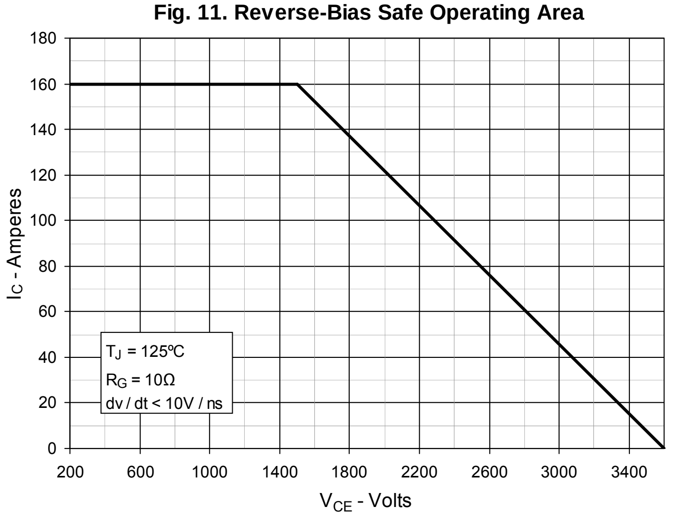


Fig. 12. Maximum Transient Thermal Impedance

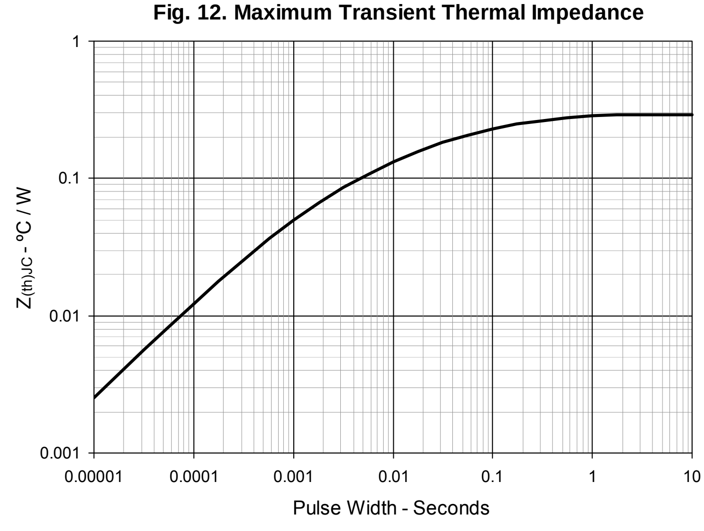


Fig. 13. Forward-Bias Safe Operating Area @ T_C = 25ºC

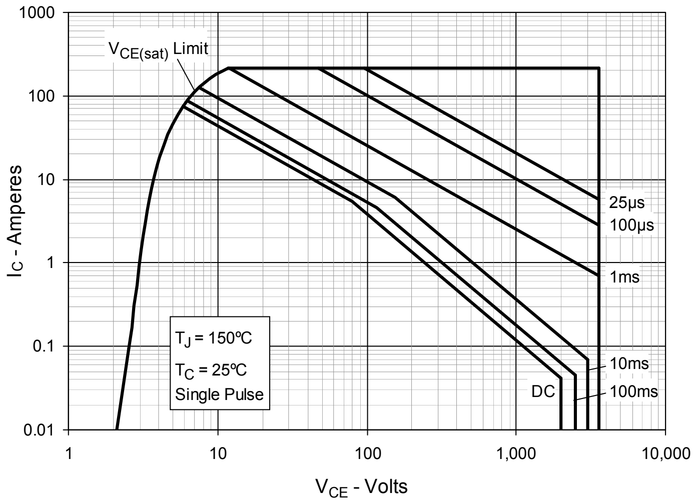


Fig. 14. Forward-Bias Safe Operating Area @ T_C = 75ºC

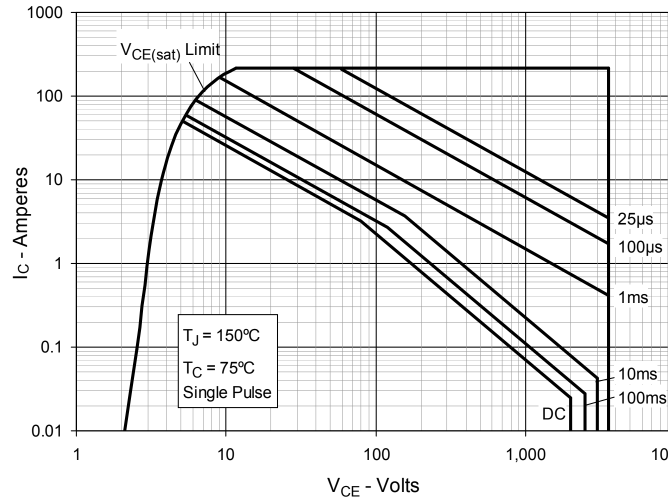


Fig. 15. Inductive Switching Energy Loss vs. Gate Resistance

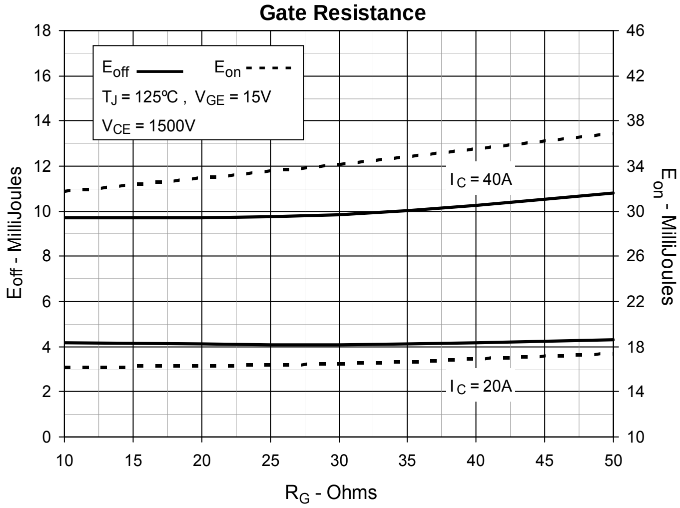


Fig. 16. Inductive Switching Energy Loss vs. Collector Current

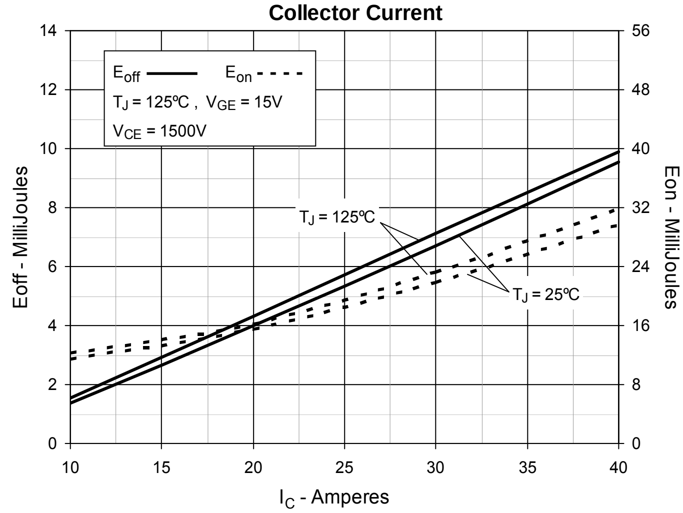


Fig. 17. Inductive Switching Energy Loss vs. Junction Temperature

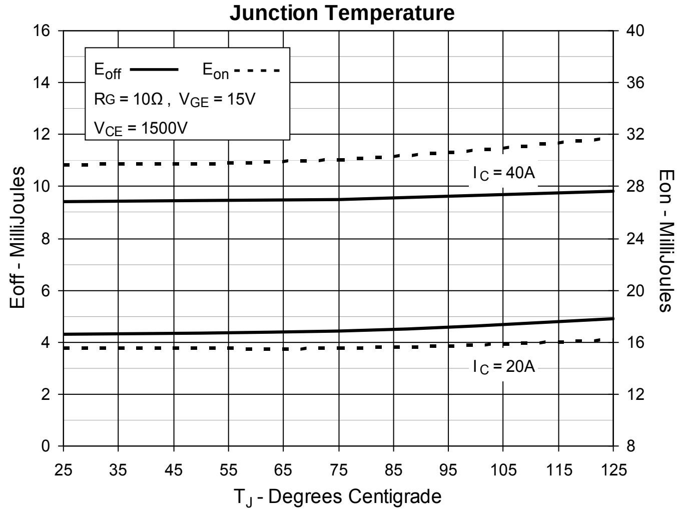


Fig. 18. Inductive Turn-off Switching Times vs. Gate Resistance

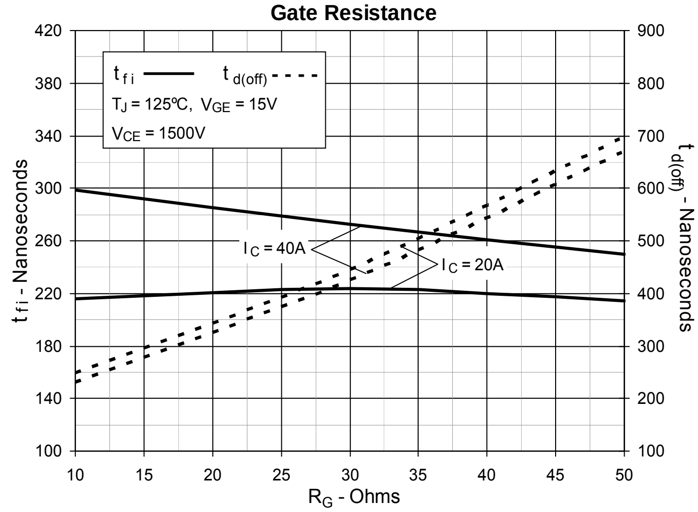


Fig. 19. Inductive Turn-off Switching Times vs. Collector Current

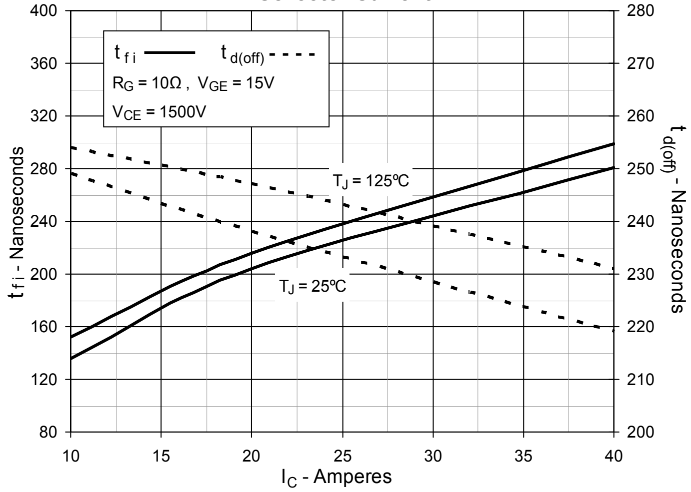


Fig. 20. Inductive Turn-off Switching Times vs. Junction Temperature

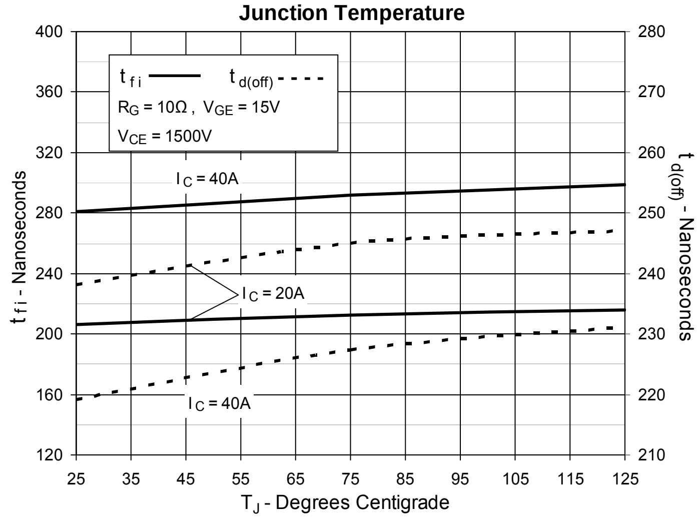


Fig. 21. Inductive Turn-on Switching Times vs. Gate Resistance

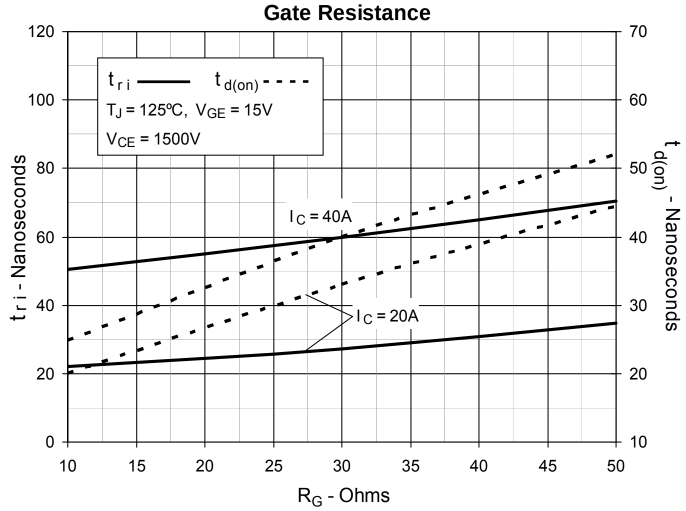


Fig. 22. Inductive Turn-on Switching Times vs. Collector Current

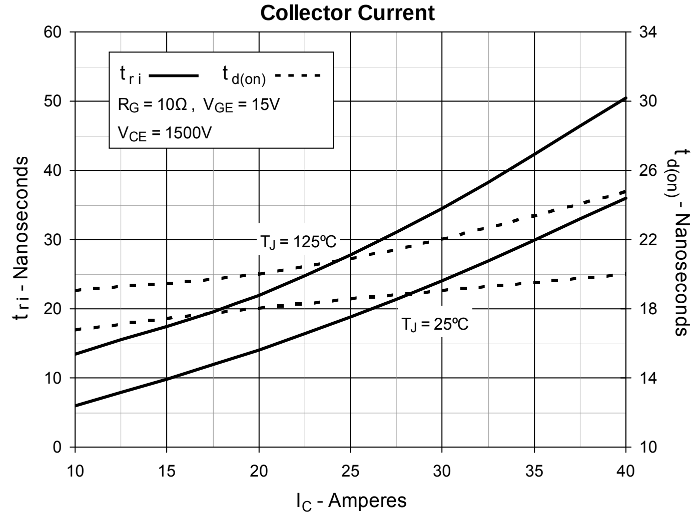


Fig. 23. Inductive Turn-on Switching Times vs. Junction Temperature