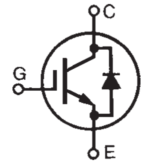
IXYS

Preliminary Technical Information

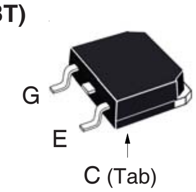
High Voltage, High Gain BIMOSFET™ Monolithic Bipolar MOS Transistor

IXBT42N170A
IXBH42N170A

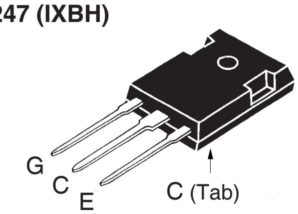
V_{CES} = 1700V
I_{C90} = 21A
$V_{CE(sat)}$ ≤ 6.0V
t_{fi} = 20ns



TO-268 (IXBT)



TO-247 (IXBH)



G = Gate C = Collector
E = Emiiter Tab = Collector

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_C = 25°C to 150°C	1700	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	1700	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	T_C = 25°C	42	A
I_{C90}	T_C = 90°C	21	A
I_{CM}	T_C = 25°C, 1ms	265	A
SSOA (RBSOA)	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 10Ω Clamped Inductive Load	I_{CM} = 84 1360	A V
T_{SC} (SCSOA)	V_{GE} = 15 V, V_{CES} = 1200V, T_J = 125°C R_G = 10Ω, non repetitive	10	µs
P_C	T_C = 25°C	357	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	1.6mm (0.062 in.) from Case for 10s	300	°C
T_{SOLD}	Plastic Body for 10 seconds	260	°C
M_d	Mounting Torque (TO-247)	1.13/10	Nm/lb.in.
Weight	TO-268	4	g
	TO-247	6	g

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250µA, V_{GE} = 0V	1700			V
$V_{GE(th)}$	I_C = 750µA, V_{CE} = V_{GE}	2.5		5.5	V
I_{CES}	V_{CE} = 0.8 • V_{CES}, V_{GE} = 0V			50	µA
	T_J = 125°C			1.5	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ± 20V			±100	nA
$V_{CE(sat)}$	I_C = I_{C90}, V_{GE} = 15V, Note 1		5.2	6.0	V
	T_J = 125°C		5.3		V

Features

- High Blocking Voltage
- International Standard Packages
- Anti-Parallel Diode
- Low Conduction Losses

Advantages

- Low Gate Drive Requirement
- High Power Density

Applications

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

Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Min.	Typ.	Max.	
g_{fs}	$I_C = I_{C90}$, V_{CE} = 10V, Note 1	14	23		S
C_{ies}	V_{CE} = 25V, V_{GE} = 0V, f = 1MHz		3920		pF
C_{oes}			275		pF
C_{res}			107		pF
$Q_{g(on)}$	$I_C = I_{C90}$, V_{GE} = 15V, $V_{CE} = 0.5 \bullet V_{CES}$		188		nC
Q_{ge}			23		nC
Q_{gc}			80		nC
$t_{d(on)}$	**Inductive load, T_J = 25°C**		19		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15V		17		ns
E_{on}	$V_{CE} = 0.5 \bullet V_{CES}$, $R_G = 1\Omega$		3.43		mJ
$t_{d(off)}$	Diode Type = DH40-18A		200		ns
t_{fi}	Note 2		20		ns
E_{off}			0.43		mJ
$t_{d(on)}$	**Inductive load, T_J = 125°C**		19		ns
t_{ri}	$I_C = I_{C90}$, V_{GE} = 15V		14		ns
E_{on}	$V_{CE} = 0.5 \bullet V_{CES}$, $R_G = 1\Omega$		5.40		mJ
$t_{d(off)}$	Diode Type = DH40-18A		226		ns
t_{fi}	Note 2		82		ns
E_{off}			0.83		mJ
R_{thJC}				0.35	°C/W
R_{thCS}	TO-247		0.21		°C/W

Reverse Diode

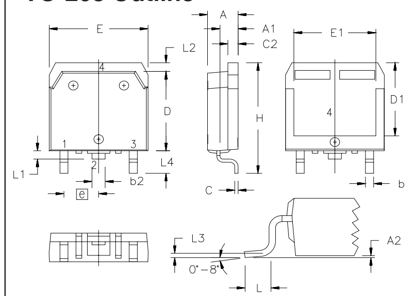
Symbol	Test Conditions (T_J = 25°C Unless Otherwise Specified)	Min.	Typ.	Max.	
V_F	$I_F = I_{C90}$, V_{GE} = 0V			5.0	V
t_{rr}	I_F = 25A, V_{GE} = 0V, $-di_F/dt$ = 50A/µs		330		ns
I_{RM}	V_R = 100V, V_{GE} = 0V		15		A

Note 1: Pulse test, t ≤ 300µs, duty cycle, d ≤ 2%.

PRELIMINARY TECHNICAL INFORMATION

The product presented herein is under development. The Technical Specifications offered are derived from data gathered during objective characterizations of preliminary engineering lots; but also may yet contain some information supplied during a pre-production design evaluation. IXYS reserves the right to change limits, test conditions, and dimensions without notice.

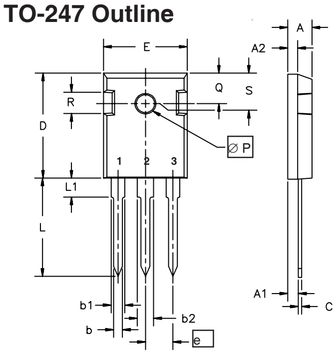
TO-268 Outline



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

SYM	INCHES MIN	INCHES MAX	MILLIMETERS MIN	MILLIMETERS 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
b2	.075	.083	1.90	2.10
C	.016	.026	0.40	0.65
C2	.057	.063	1.45	1.60
D	.543	.551	13.80	14.00
D1	.488	.500	12.40	12.70
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	.094	.106	2.40	2.70
L1	.047	.055	1.20	1.40
L2	.039	.045	1.00	1.15
L3	.010 BSC		0.25 BSC	
L4	.150	.161	3.80	4.10

TO-247 Outline



Terminals: 1 - Gate, 2 - Collector, 3 - Emitter

Dim.	Millimeter Min.	Millimeter Max.	Inches Min.	Inches Max.
A	4.7	5.3	.185	.209
A_1	2.2	2.54	.087	.102
A_2	2.2	2.6	.059	.098
b	1.0	1.4	.040	.055
b_1	1.65	2.13	.065	.084
b_2	2.87	3.12	.113	.123
C	.4	.8	.016	.031
D	20.80	21.46	.819	.845
E	15.75	16.26	.610	.640
e	5.20	5.72	0.205	0.225
L	19.81	20.32	.780	.800
L1		4.50		.177
∅P	3.55	3.65	.140	.144
Q	5.89	6.40	0.232	0.252
R	4.32	5.49	.170	.216
S	6.15 BSC		242 BSC	

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

Fig. 1. Output Characteristics @ T_J = 25ºC

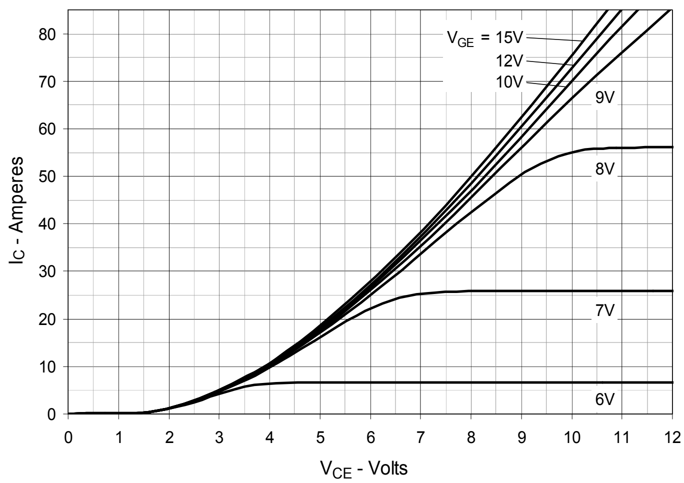


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

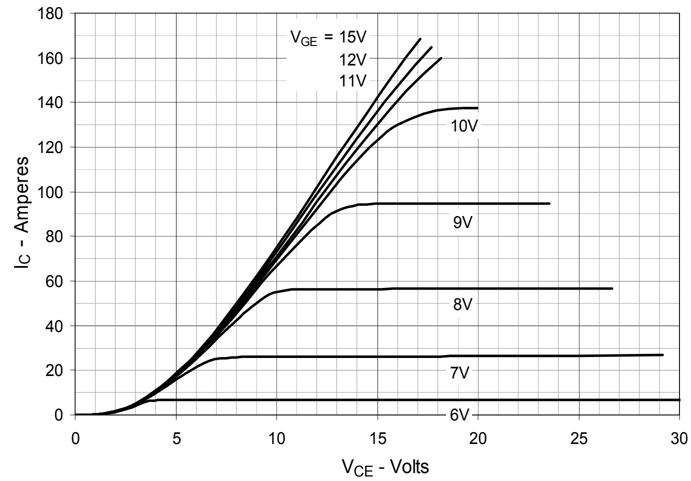


Fig. 3. Output Characteristics @ T_J = 125ºC

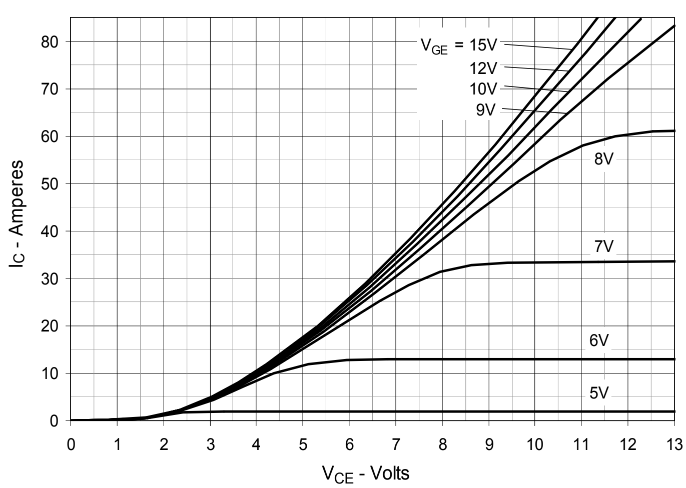


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

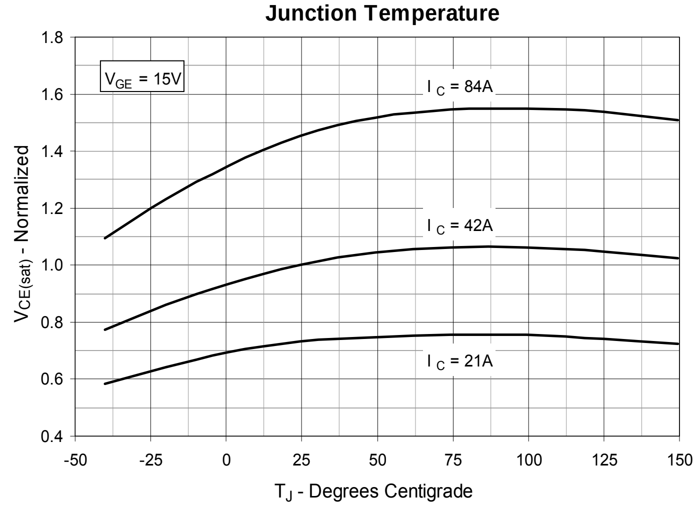


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

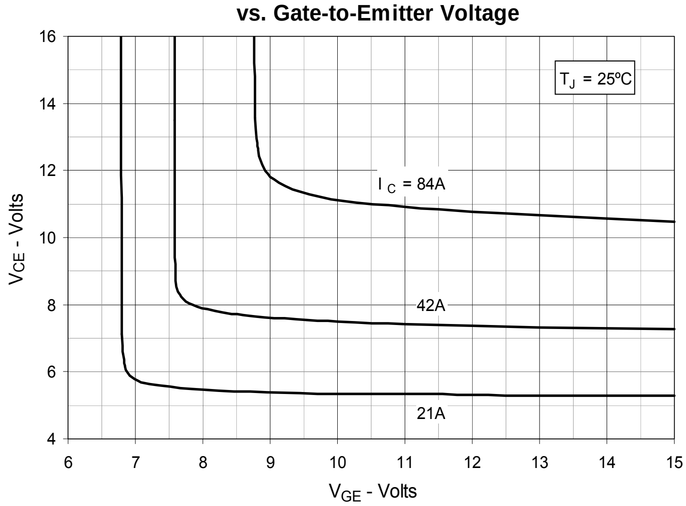


Fig. 6. Input Admittance

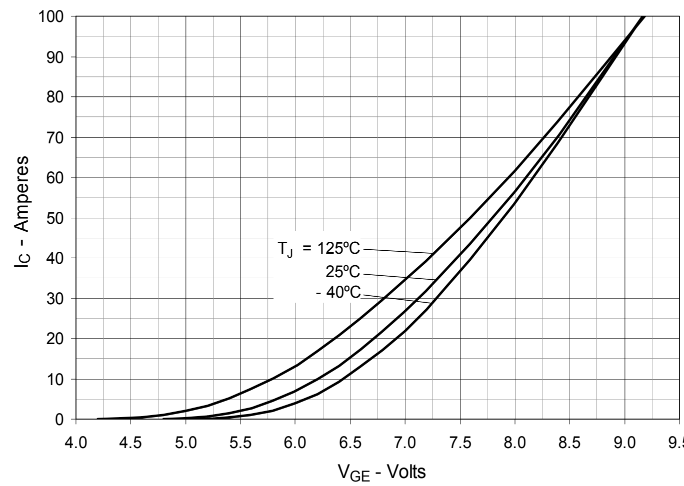


Fig. 7. Transconductance

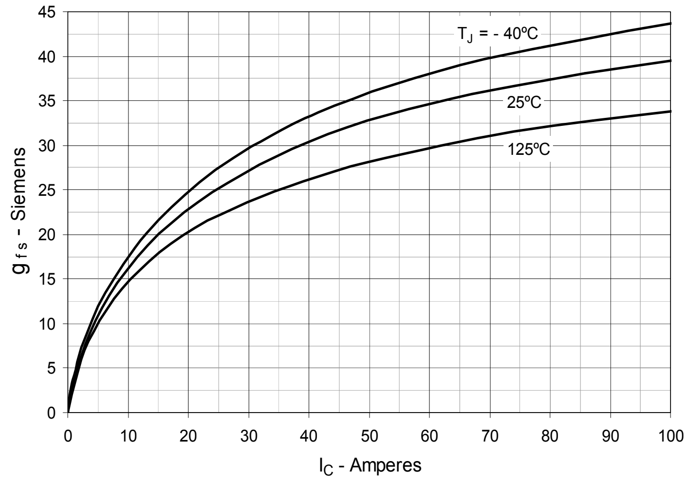


Fig. 8. Gate Charge

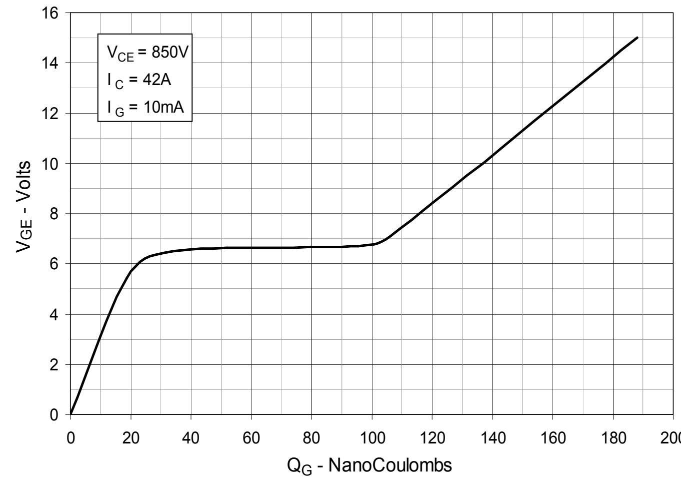


Fig. 9. Forward Voltage Drop of Intrinsic Diode

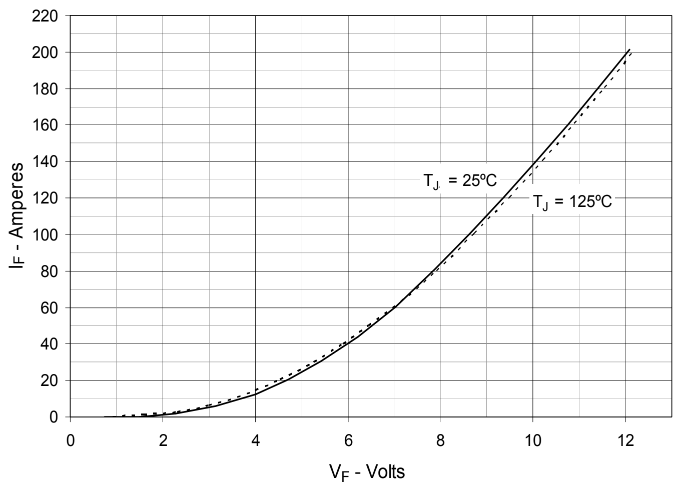


Fig. 10. Capacitance

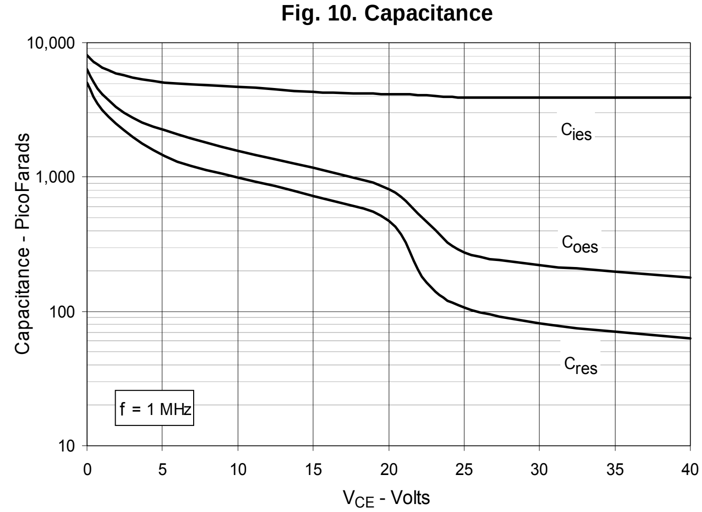


Fig. 11. Reverse-Bias Safe Operating Area

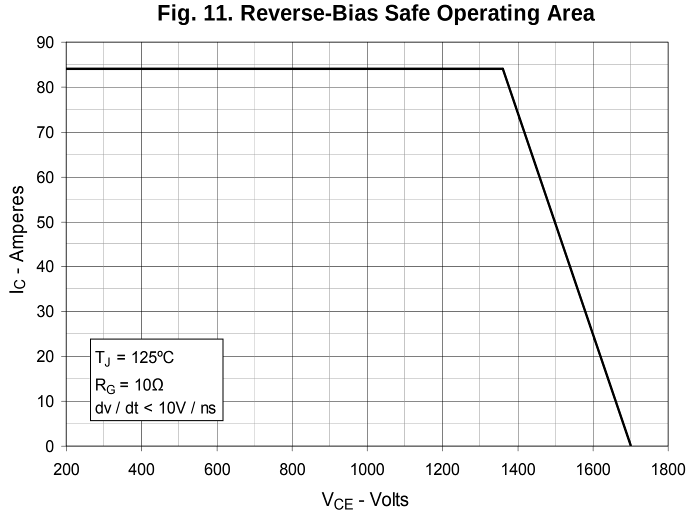


Fig. 12. Maximum Transient Thermal Impedance

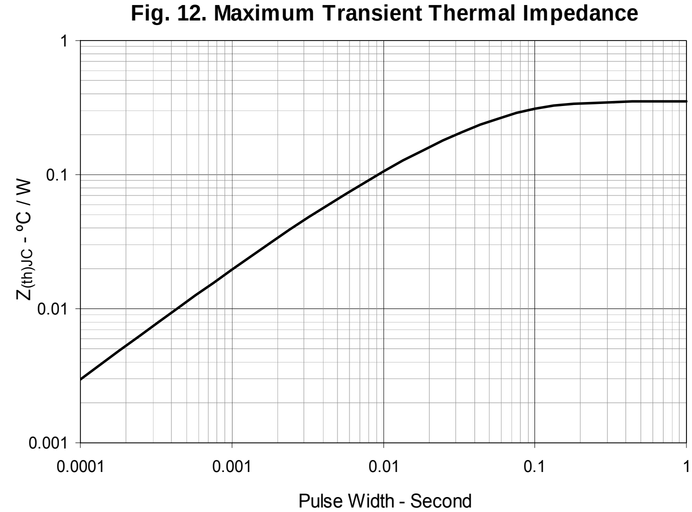


Fig. 13. Forward-Bias Safe Operating Area @ T_C = 25ºC

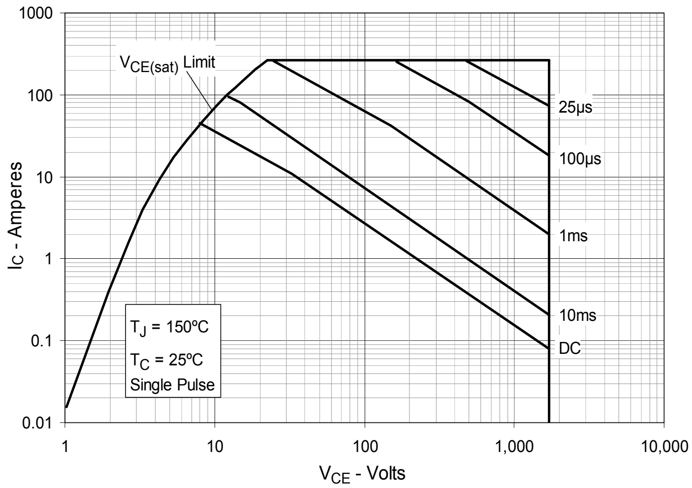


Fig. 14. Forward-Bias Safe Operating Area @ T_C = 75ºC

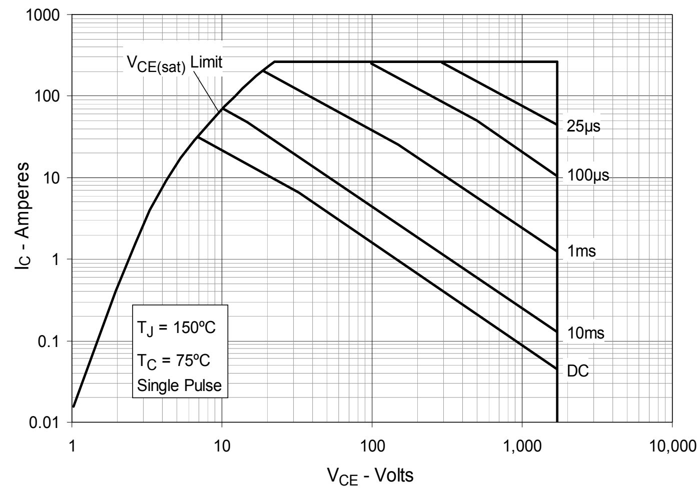


Fig. 15. Inductive Switching Energy Loss vs. Gate Resistance

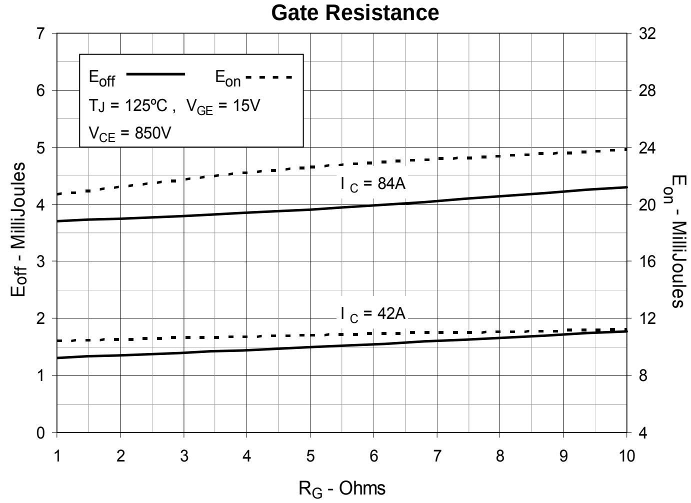


Fig. 16. Inductive Switching Energy Loss vs. Collector Current

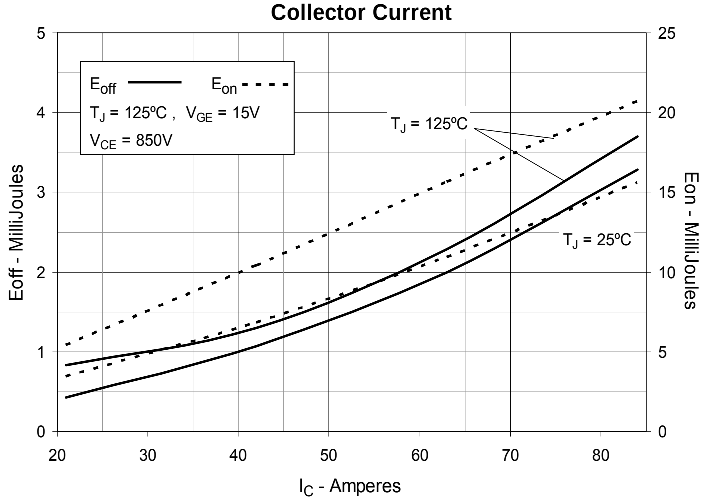


Fig. 17. Inductive Switching Energy Loss vs. Junction Temperature

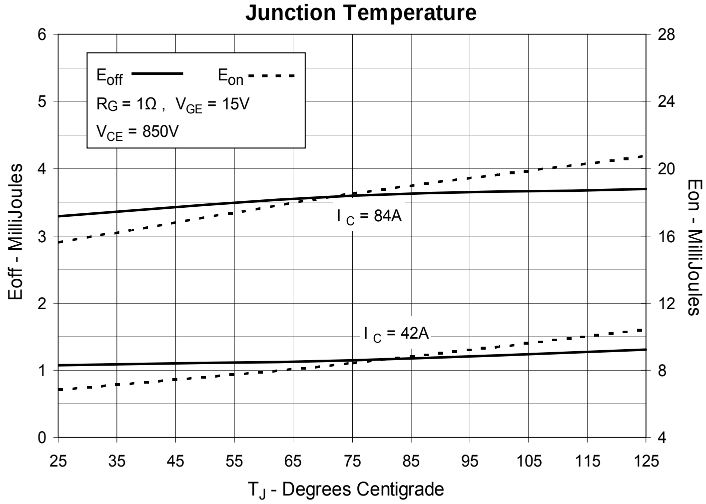
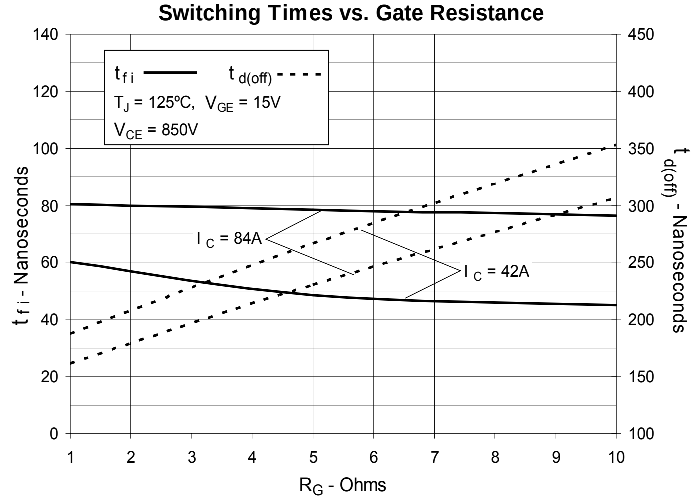


Fig. 18. Inductive Turn-off Switching Times vs. Gate Resistance



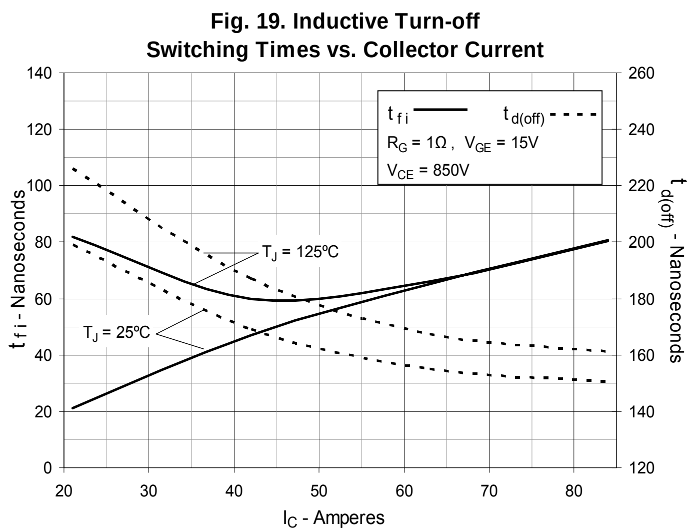


Fig. 19. Inductive Turn-off
Switching Times vs. Collector Current
t f i
t d(off)
RG = 1Ω , VGE = 15V
VCE = 850V
TJ = 125ºC
TJ = 25ºC
t f i - Nanoseconds
t d(off) - Nanoseconds
IC - Amperes

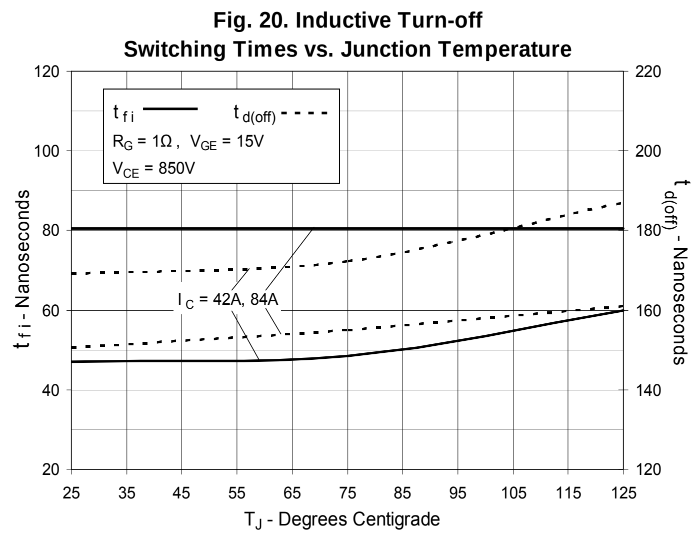


Fig. 20. Inductive Turn-off
Switching Times vs. Junction Temperature
t f i
t d(off)
RG = 1Ω , VGE = 15V
VCE = 850V
I C = 42A, 84A
t f i - Nanoseconds
t d(off) - Nanoseconds
TJ - Degrees Centigrade

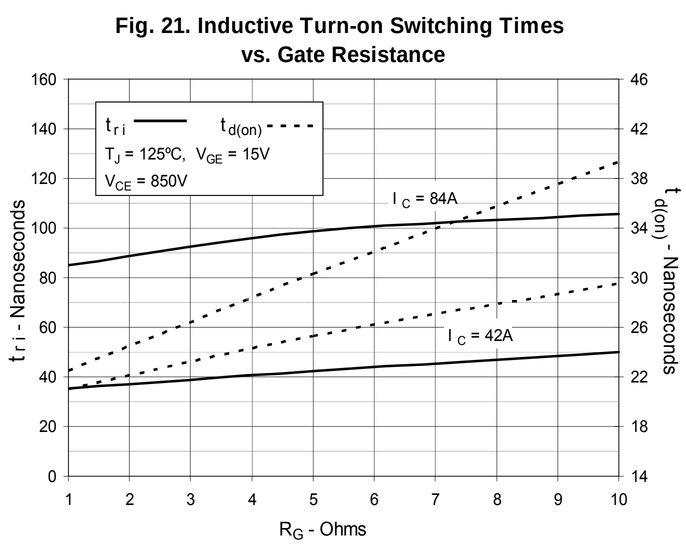


Fig. 21. Inductive Turn-on Switching Times
vs. Gate Resistance
t r i
t d(on)
TJ = 125ºC, VGE = 15V
VCE = 850V
I C = 84A
I C = 42A
t r i - Nanoseconds
t d(on) - Nanoseconds
RG - Ohms

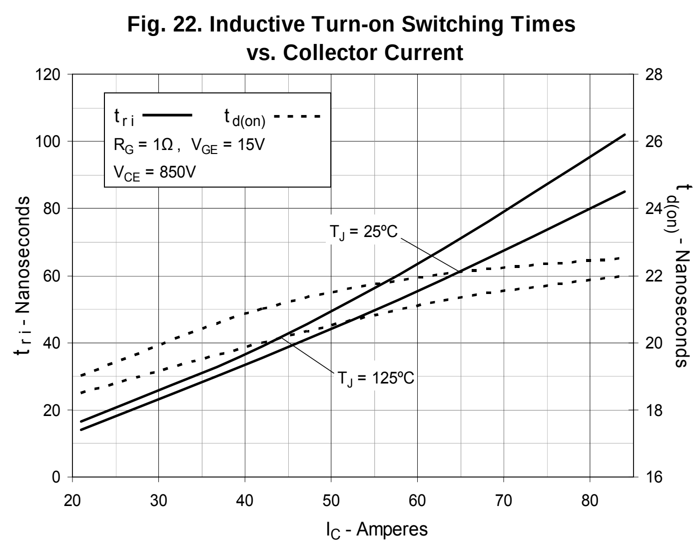


Fig. 22. Inductive Turn-on Switching Times
vs. Collector Current
t r i
t d(on)
RG = 1Ω , VGE = 15V
VCE = 850V
TJ = 25ºC
TJ = 125ºC
t r i - Nanoseconds
t d(on) - Nanoseconds
IC - Amperes

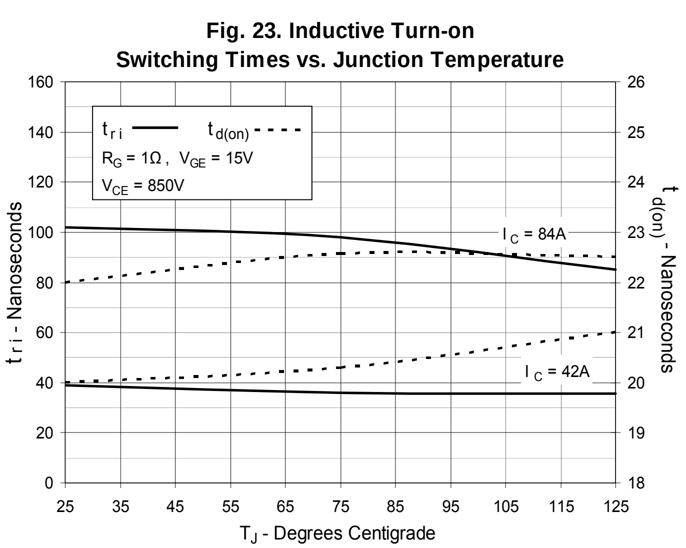


Fig. 23. Inductive Turn-on
Switching Times vs. Junction Temperature
t r i
t d(on)
RG = 1Ω , VGE = 15V
VCE = 850V
I C = 84A
I C = 42A
t r i - Nanoseconds
t d(on) - Nanoseconds
TJ - Degrees Centigrade