

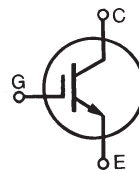
XPT™ 600V IGBTs

GenX3™

IXXA50N60B3
IXXP50N60B3
IXXH50N60B3

$V_{CES} = 600V$
 $I_{C110} = 50A$
 $V_{CE(sat)} \leq 1.80V$

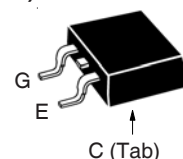
Extreme Light Punch Through
 IGBT for 5-30 kHz Switching



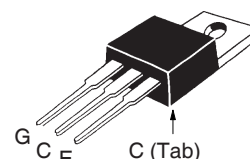
Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ C$ to $175^\circ C$	600	V
V_{CGR}	$T_J = 25^\circ C$ to $175^\circ C$, $R_{GE} = 1M\Omega$	600	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ C$	120	A
I_{C110}	$T_C = 110^\circ C$	50	A
I_{CM}	$T_C = 25^\circ C$, 1ms	200	A
I_A	$T_C = 25^\circ C$	25	A
E_{AS}	$T_C = 25^\circ C$	200	mJ
SSOA (RBSOA)	$V_{GE} = 15V$, $T_{VJ} = 150^\circ C$, $R_G = 5\Omega$ Clamped Inductive Load	$I_{CM} = 100$ $@V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	$V_{GE} = 15V$, $V_{CE} = 360V$, $T_J = 150^\circ C$ $R_G = 22\Omega$, Non Repetitive	10	μs
P_C	$T_C = 25^\circ C$	600	W
T_J		-55 ... +175	$^\circ C$
T_{JM}		175	$^\circ C$
T_{stg}		-55 ... +175	$^\circ C$
T_L	Maximum Lead Temperature for Soldering	300	$^\circ C$
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
F_C	Mounting Force (TO-263)	10..65 / 2.2..14.6	N/lb.
M_d	Mounting Torque (TO-220 & TO-247)	1.13 / 10	Nm/lb.in.
Weight	TO-263	2.5	g
	TO-220	3.0	g
	TO-247	6.0	g

Symbol	Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 250\mu A$, $V_{GE} = 0V$	600		V
$V_{GE(th)}$	$I_C = 250\mu A$, $V_{CE} = V_{GE}$	3.5		6.0 V
I_{CES}	$V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 150^\circ C$			25 μA 2 mA
I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 36A$, $V_{GE} = 15V$, Note 1 $T_J = 150^\circ C$	1.55 1.80	1.80	V V

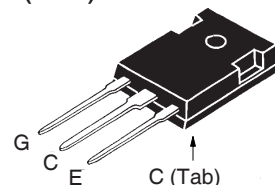
TO-263 (IXXA)



TO-220 (IXXP)



TO-247 (IXXH)



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

Features

- Optimized for 5-30kHz Switching
- Square RBSOA
- Avalanche Capability
- Short Circuit Capability
- International Standard Packages

Advantages

- High Power Density
- 175°C Rated
- Extremely Rugged
- Low Gate Drive Requirement
- Easy to Parallel

Applications

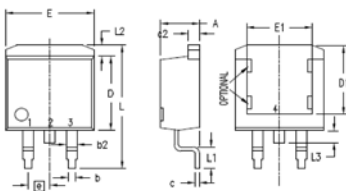
- Power Inverters
- UPS
- Motor Drives
- SMPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts

Symbol Test Conditions
 $(T_J = 25^\circ\text{C Unless Otherwise Specified})$
Characteristic Values

		Min.	Typ.	Max.
g_{fs}	$I_C = 36\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$	12	19	S
C_{ies}	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		2230	pF
C_{oes}			195	pF
C_{res}			44	pF
$Q_{g(on)}$	$I_C = 36\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		70	nC
Q_{ge}			16	nC
Q_{gc}			29	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = 36\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 360\text{V}, R_G = 5\Omega$ Note 2		27	ns
t_{ri}			40	ns
E_{on}			0.67	mJ
$t_{d(off)}$			100	ns
t_{fi}			135	ns
E_{off}			0.74	mJ
$t_{d(on)}$	Inductive load, $T_J = 150^\circ\text{C}$ $I_C = 36\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 360\text{V}, R_G = 5\Omega$ Note 2		30	ns
t_{ri}			45	ns
E_{on}			1.40	mJ
$t_{d(off)}$			130	ns
t_{fi}			190	ns
E_{off}			1.20	mJ
R_{thJC}				0.25 $^\circ\text{C/W}$
R_{thCS}	TO-247		0.21	$^\circ\text{C/W}$
	TO-220		0.50	$^\circ\text{C/W}$

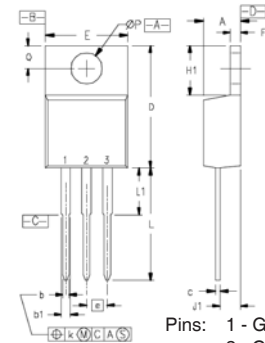
Notes:

1. Pulse test, $t \leq 300\mu\text{s}$, duty cycle, $d \leq 2\%$.
2. Switching times & energy losses may increase for higher $V_{CE}(\text{clamp})$, T_J or R_G .

TO-263 Outline


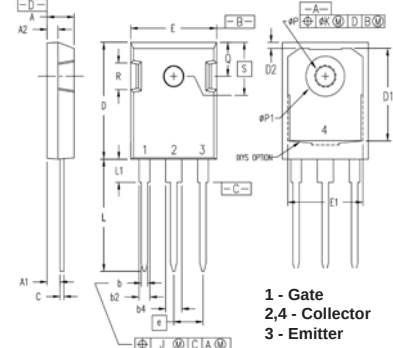
1 = Gate
2,4 = Collector
3 = Emitter

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.160	.190	4.06	4.83
A1	.080	.110	2.03	2.79
b	.020	.039	0.51	0.99
b2	.045	.055	1.14	1.40
c	.016	.029	0.40	0.74
c2	.045	.055	1.14	1.40
D	.340	.380	8.64	9.65
D1	.315	.350	8.00	8.89
E	.380	.410	9.65	10.41
E1	.245	.320	6.22	8.13
e	.100 BSC		2.54 BSC	
L	.575	.625	14.61	15.88
L1	.090	.110	2.29	2.79
L2	.040	.055	1.02	1.40
L3	.050	.070	1.27	1.78
L4	0	.005	0	0.13

TO-220 Outline


Pins: 1 - Gate
2 - Collector
3 - Emitter

SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.170	.190	4.32	4.83
b	.025	.040	0.64	1.02
b1	.045	.065	1.15	1.65
c	.014	.022	0.35	0.56
D	.580	.630	14.73	16.00
E	.390	.420	9.91	10.66
e	.100 BSC		2.54 BSC	
F	.045	.055	1.14	1.40
H1	.230	.270	5.85	6.85
J1	.090	.110	2.29	2.79
k	0	.015	0	0.38
L	.500	.550	12.70	13.97
L1	.110	.230	2.79	5.84
ØP	.139	.161	3.53	4.08
Q	.100	.125	2.54	3.18

TO-247 Outline


1 - Gate
2,4 - Collector
3 - Emitter

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

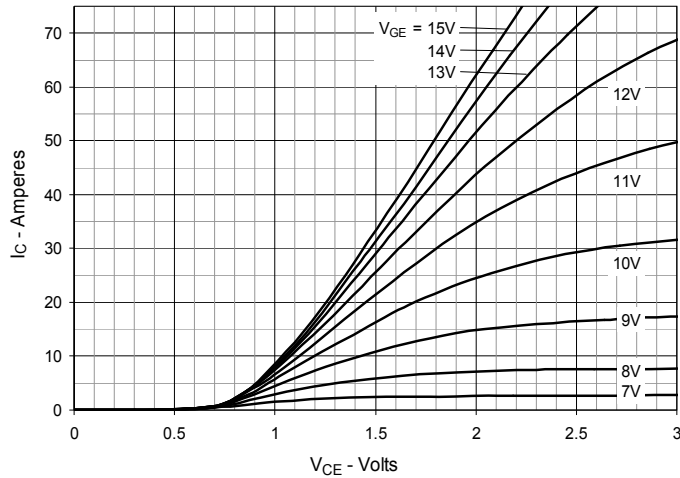
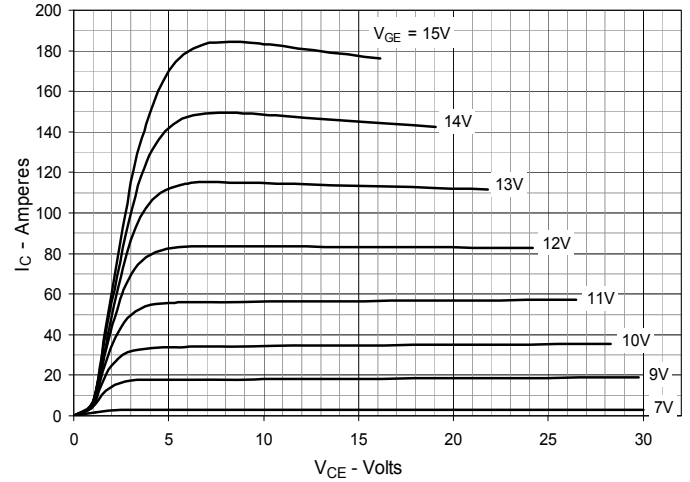
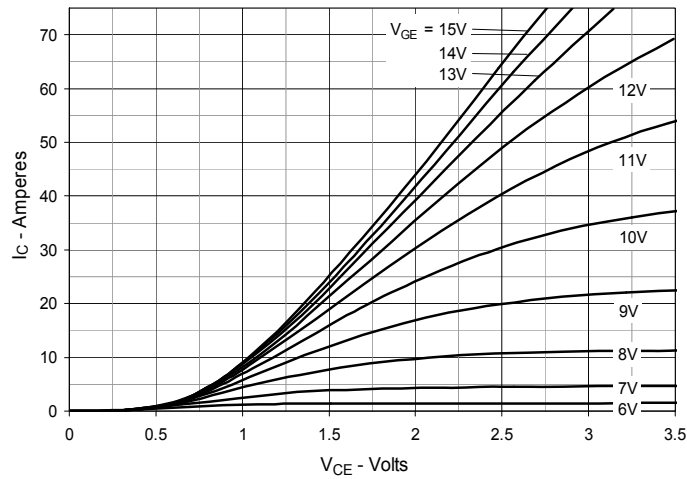
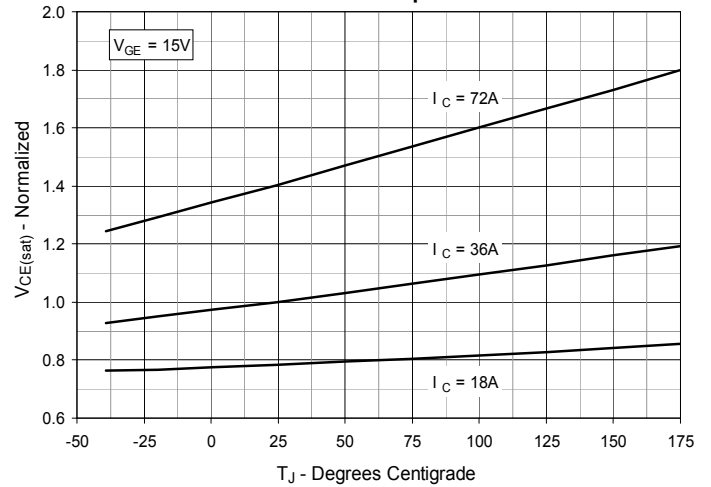
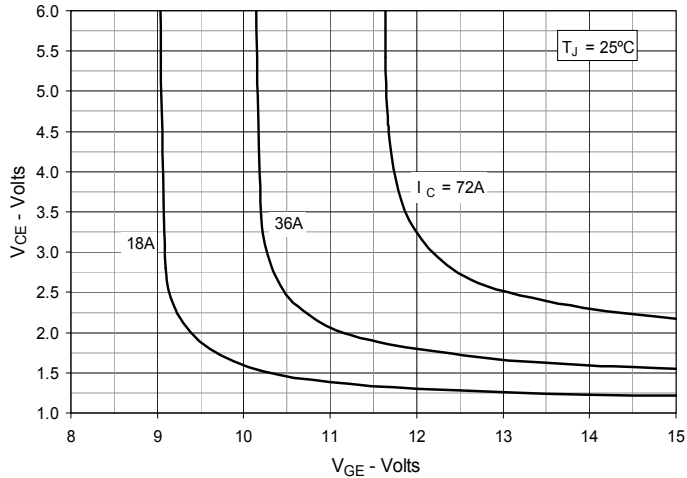
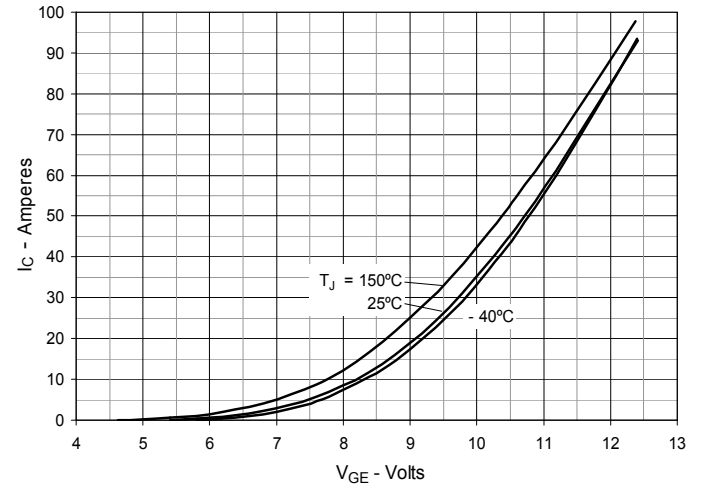
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$

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


Fig. 7. Transconductance

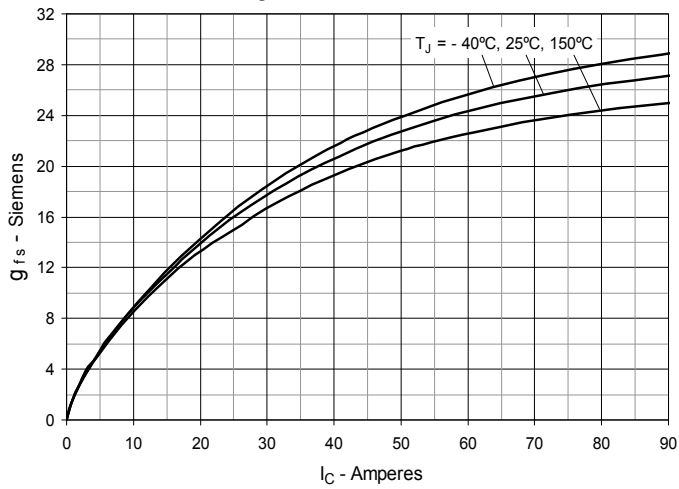


Fig. 8. Gate Charge

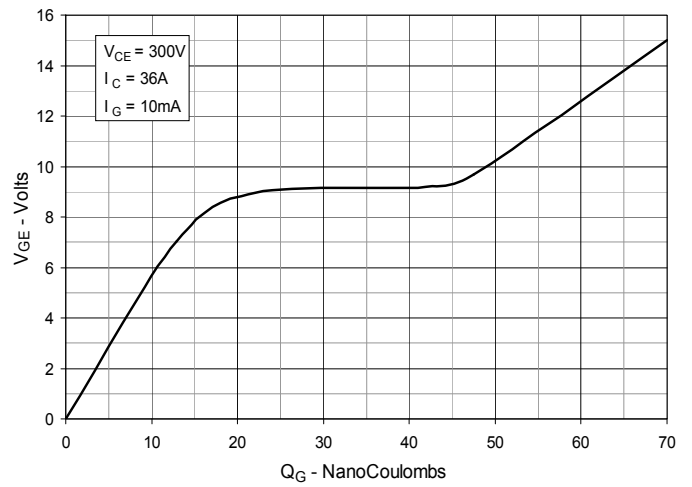


Fig. 9. Capacitance

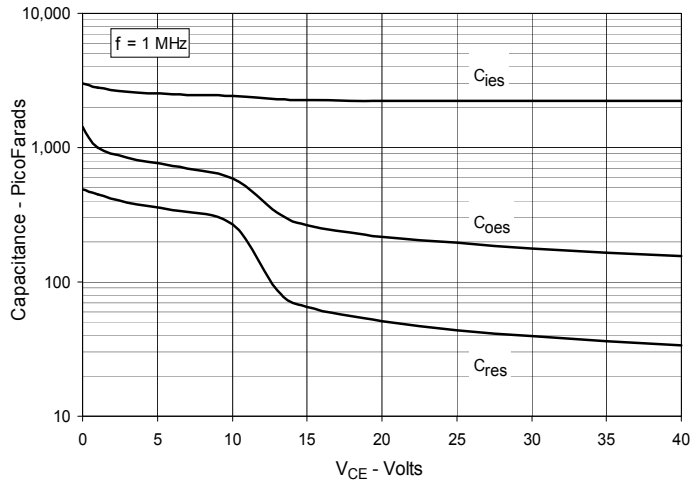


Fig. 10. Reverse-Bias Safe Operating Area

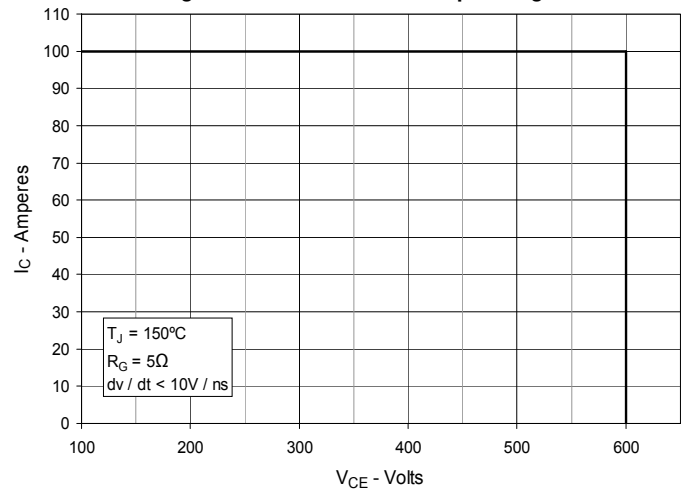


Fig. 11. Forward-Bias Safe Operating Area

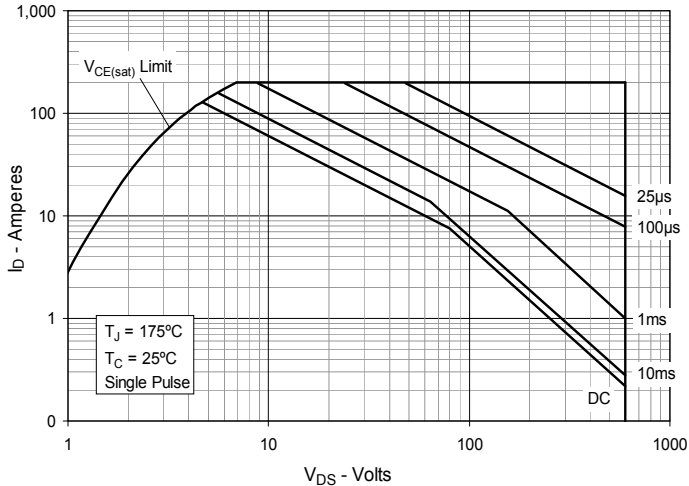


Fig. 12. Maximum Transient Thermal Impedance

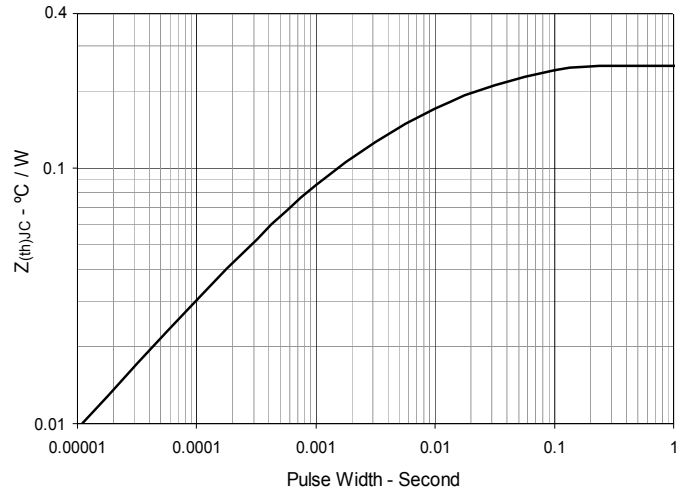


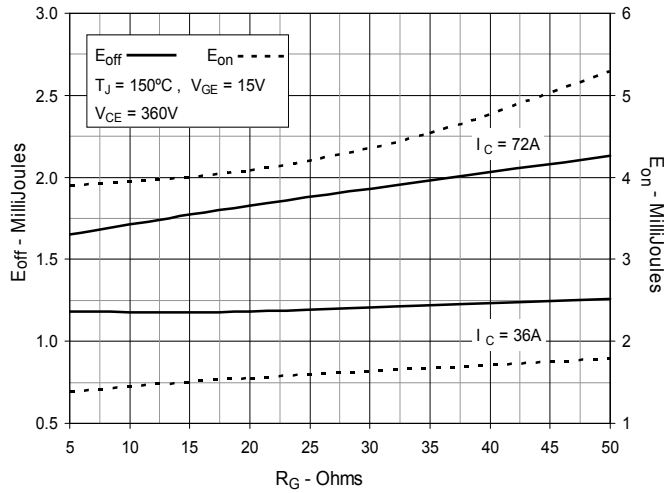
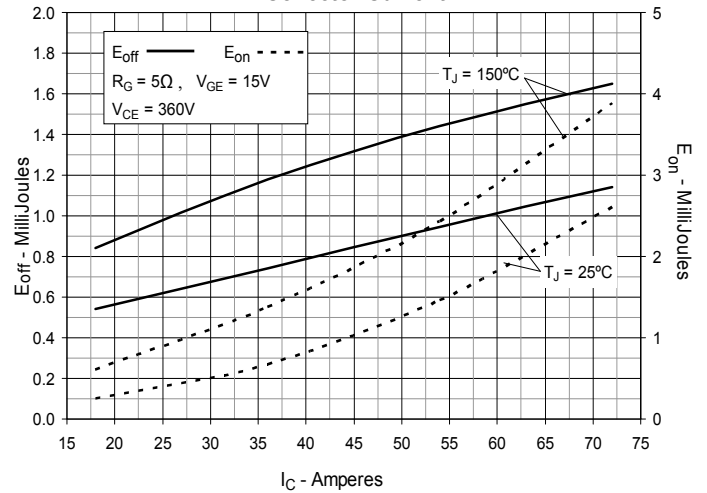
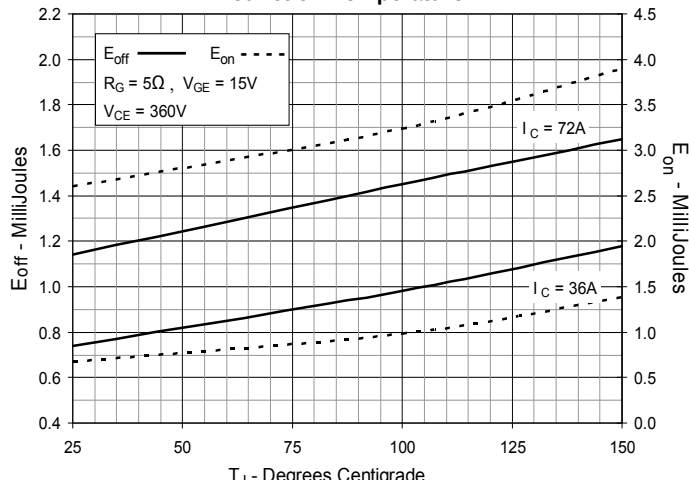
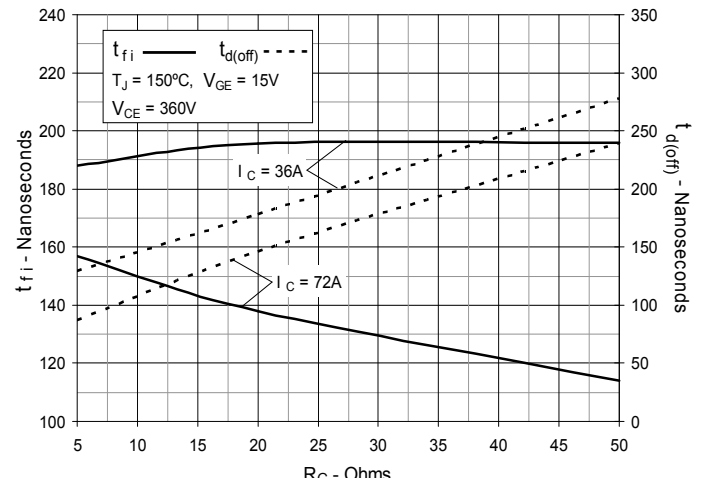
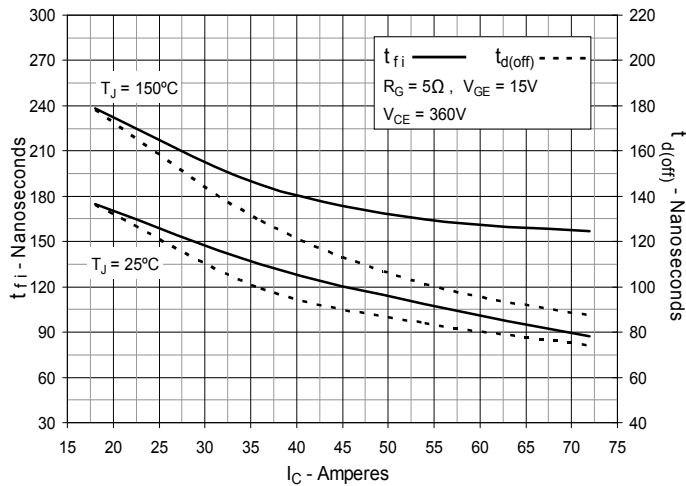
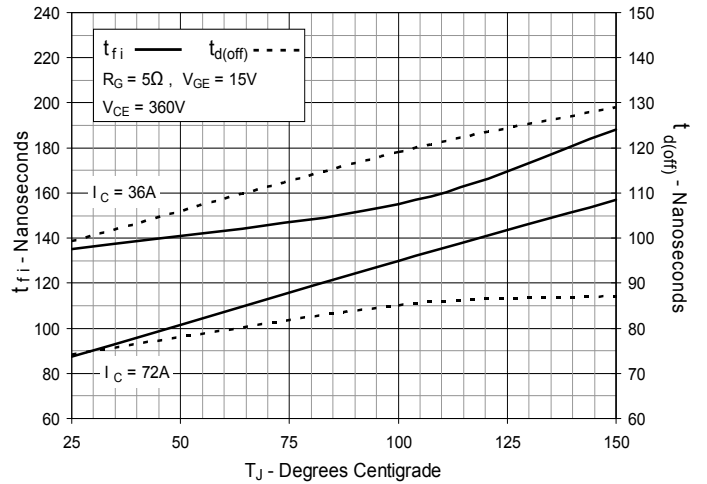
Fig. 13. Inductive Switching Energy Loss vs. Gate Resistance

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


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

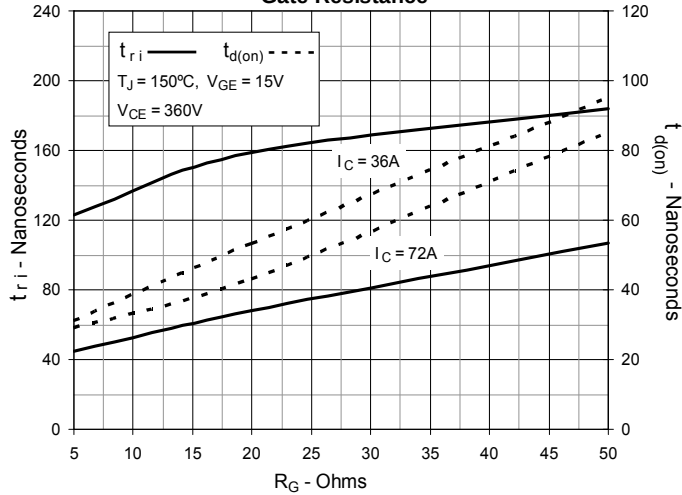


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

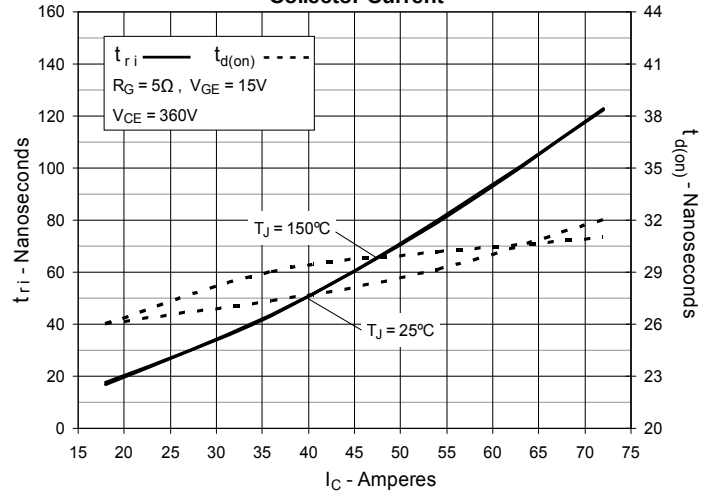
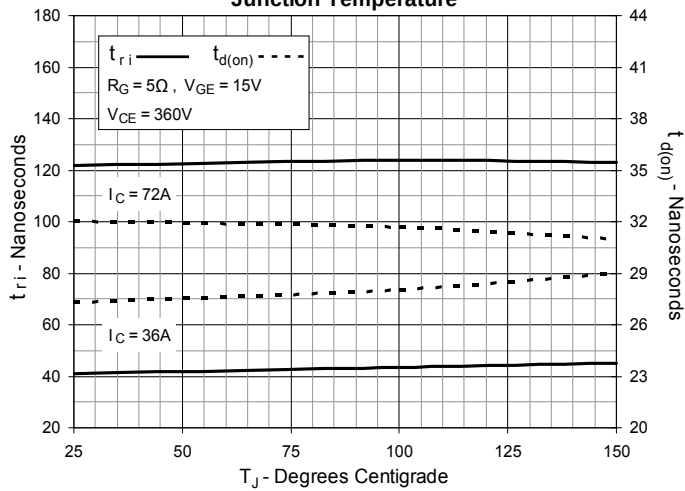


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature





Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.