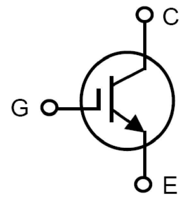
IXYS

1200V XPT™ IGBT GenX4™

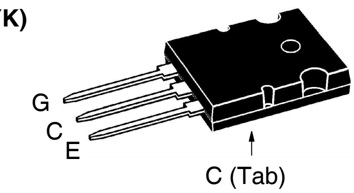
IXYK140N120A4

V_{CES} = 1200V
I_{C110} = 140A
$V_{CE(sat)}$ ≤ 1.70V
$t_{fi(typ)}$ = 320ns

Ultra Low-Vsat IGBT for up to 5kHz Switching



TO-264 (IXYK)



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

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 175°C	1200	V
V_{CGR}	T_J = 25°C to 175°C, R_{GE} = 1MΩ	1200	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C= 25°C (Chip Capability)	480	A
I_{LRMS}	Terminal Current Limit	160	A
I_{C110}	T_C= 110°C	140	A
I_{CM}	T_C = 25°C, 1ms	1200	A
SSOA	V_{GE} = 15V, T_{VJ} = 125°C, R_G = 2Ω	I_{CM} = 280	A
(RBSOA)	Clamped Inductive Load	0.8 • V_{CES}	V
P_C	T_C = 25°C	1500	W
T_J		-55 ... +175	°C
T_{JM}		175	°C
T_{stg}		-55 ... +175	°C
T_L	Maximum Lead Temperature for Soldering 1.6 mm (0.062 in.) from Case for 10s	300	°C
M_d	Mounting Torque	1.13/10	Nm/lb.in
Weight		10	g

Features

- Optimized for Low Conduction Losses
- Positive Thermal Coefficient of Vce(sat)
- International Standard Package

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

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

Symbol	Test Conditions (T_J = 25°C, Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
BV_{CES}	I_C = 250μA, V_{GE} = 0V	1200			V
$V_{GE(th)}$	I_C = 4mA, V_{CE} = V_{GE}	4.5		6.5	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			25	μA
	T_J = 125°C			5	mA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±200	nA
$V_{CE(sat)}$	I_C = I_{C110}, V_{GE} = 15V, Note 1		1.34	1.70	V
	T_J = 150°C		1.50		V

Symbol	Test Conditions ($T_J = 25°C$ Unless Otherwise Specified)	Characteristic Values Min.	Typ.	Max.	
g_{fs}	$I_C = 60A$, $V_{CE} = 10V$, Note 1	60	100		S
C_{ies}	$V_{CE} = 25V$, $V_{GE} = 0V$, f = 1MHz		8300		pF
C_{oes}			470		pF
C_{res}			300		pF
$Q_{g(on)}$	$I_C = I_{C110}$, $V_{GE} = 15V$, $V_{CE} = 0.5 \bullet V_{CES}$		420		nC
Q_{ge}			68		nC
Q_{gc}			210		nC
$t_{d(on)}$	**Inductive load, $T_J = 25°C$**		52		ns
t_{ri}	$I_C = 70A$, $V_{GE} = 15V$		47		ns
E_{on}	$V_{CE} = 0.5 \bullet V_{CES}$, $R_G = 1.5\Omega$		4.9		mJ
$t_{d(off)}$	Note 2		590		ns
t_{fi}			320		ns
E_{off}			12.0		mJ
$t_{d(on)}$	**Inductive load, $T_J = 150°C$**		44		ns
t_{ri}	$I_C = 70A$, $V_{GE} = 15V$		42		ns
E_{on}	$V_{CE} = 0.5 \bullet V_{CES}$, $R_G = 1.5\Omega$		7.4		mJ
$t_{d(off)}$	Note 2		710		ns
t_{fi}			530		ns
E_{off}			20.0		mJ
R_{thJC}				0.10	°C/W
R_{thCS}			0.15		°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.

Fig. 1. Output Characteristics @ T_J = 25°C

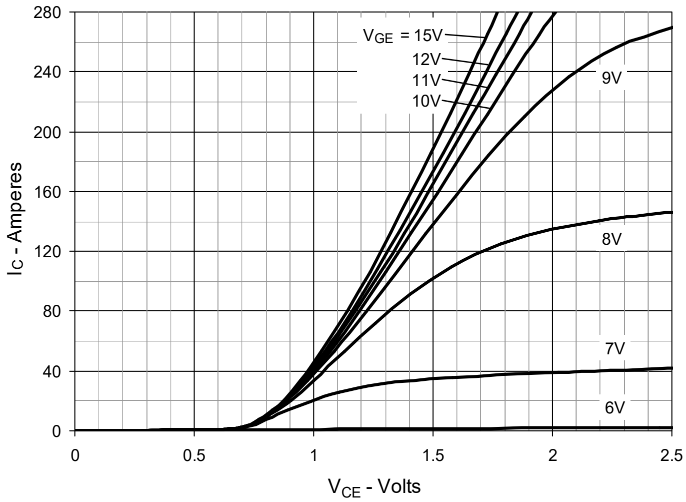


Fig. 2. Extended Output Characteristics @ T_J = 25°C

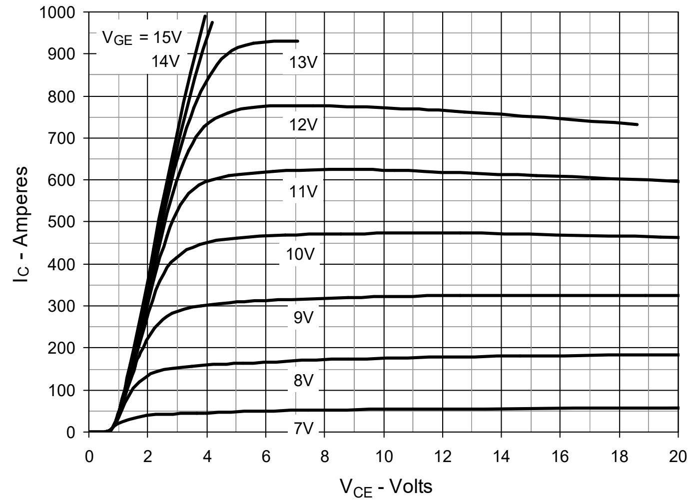


Fig. 3. Output Characteristics @ T_J = 150°C

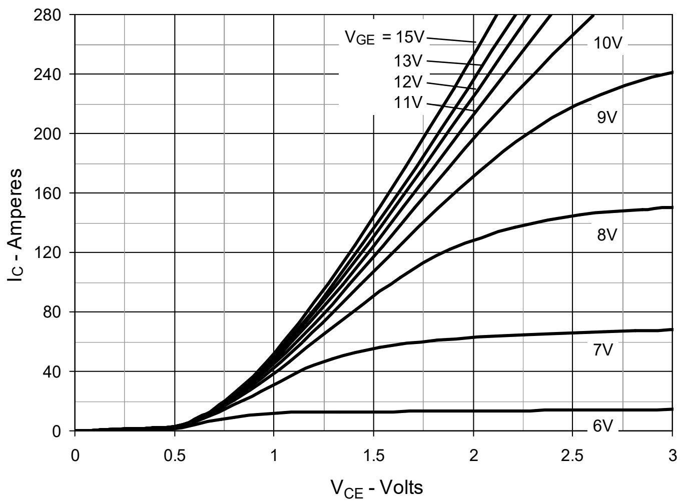


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

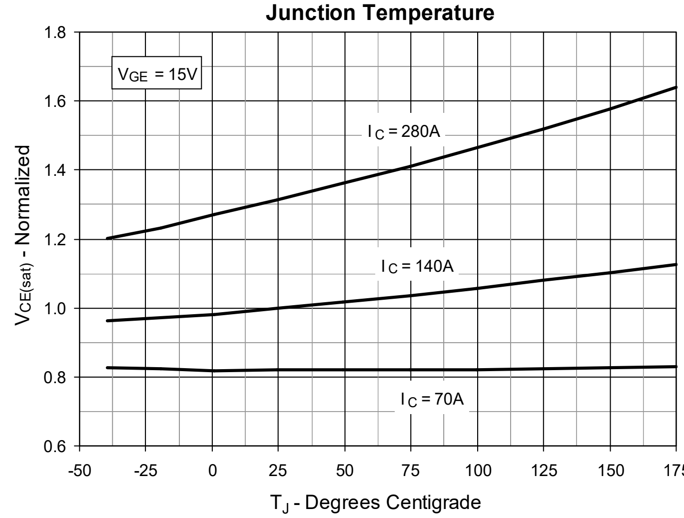


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

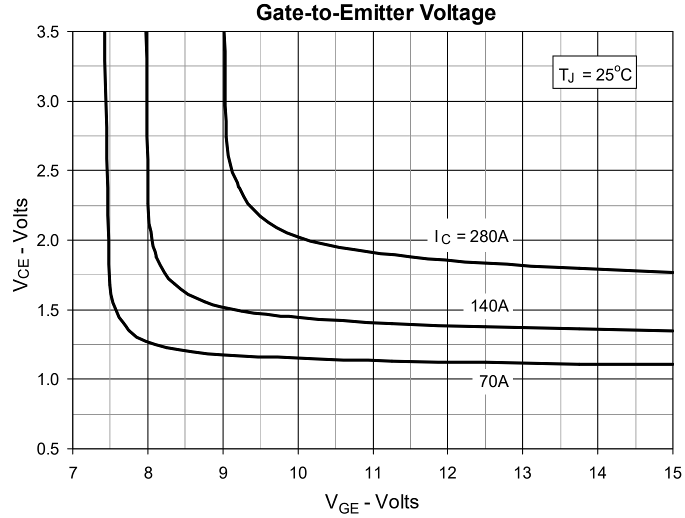
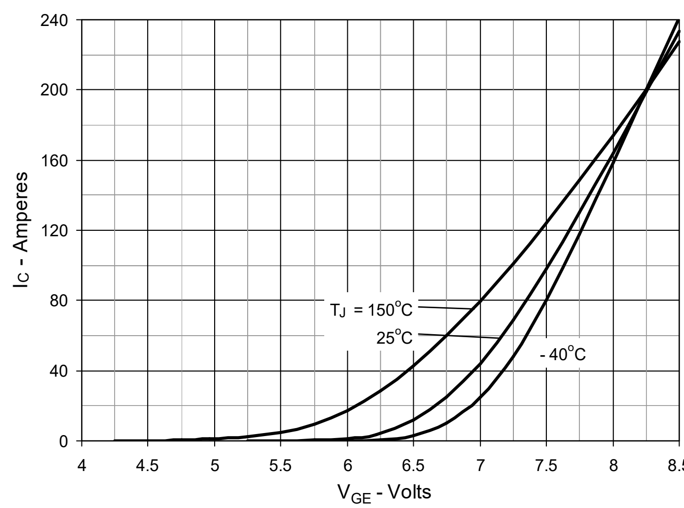


Fig. 6. Input Admittance



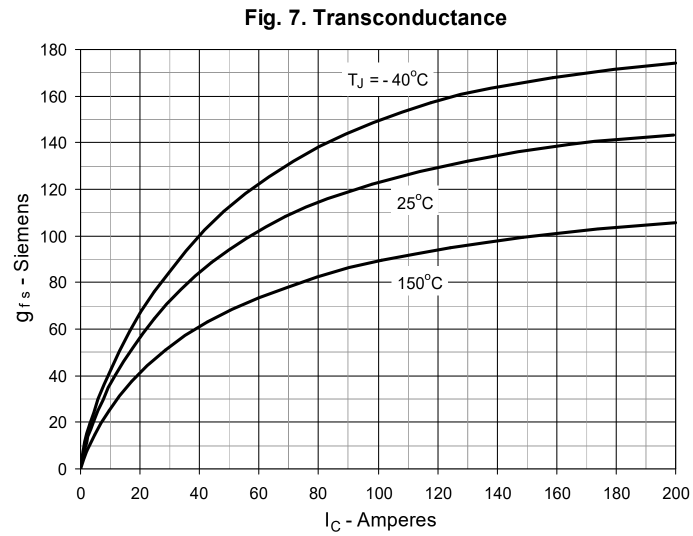


Fig. 7. Transconductance
T_J = - 40°C
25°C
150°C
g_{fs} - Siemens
I_C - Amperes

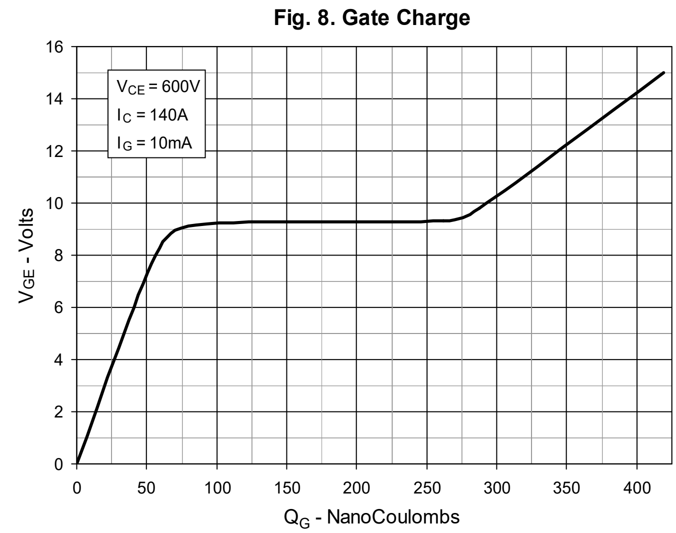


Fig. 8. Gate Charge
V_{CE} = 600V
I_C = 140A
I_G = 10mA
V_{GE} - Volts
Q_G - NanoCoulombs

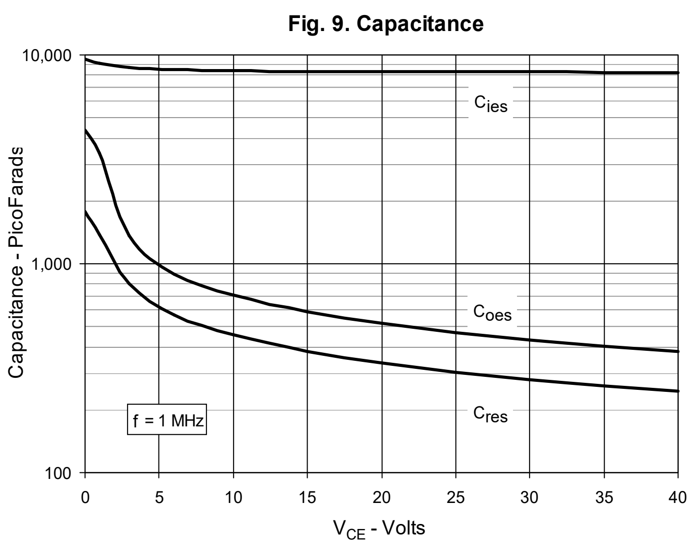


Fig. 9. Capacitance
C_{ies}
C_{oes}
C_{res}
f = 1 MHz
Capacitance - PicoFarads
V_{CE} - Volts

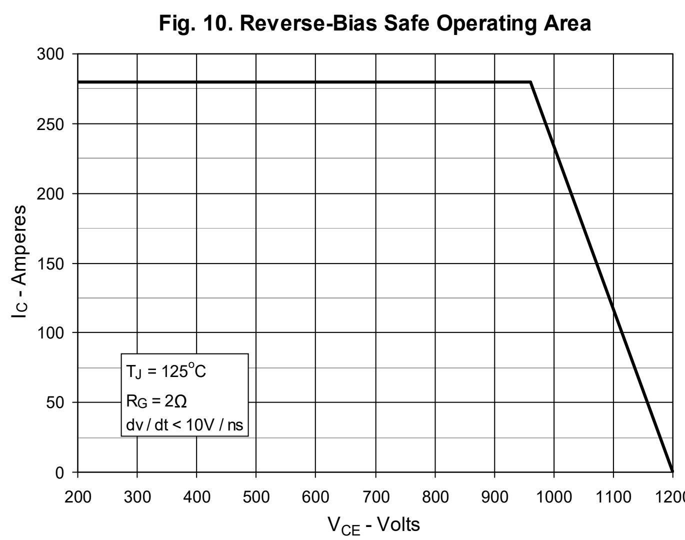


Fig. 10. Reverse-Bias Safe Operating Area
T_J = 125°C
R_G = 2Ω
dv / dt < 10V / ns
I_C - Amperes
V_{CE} - Volts

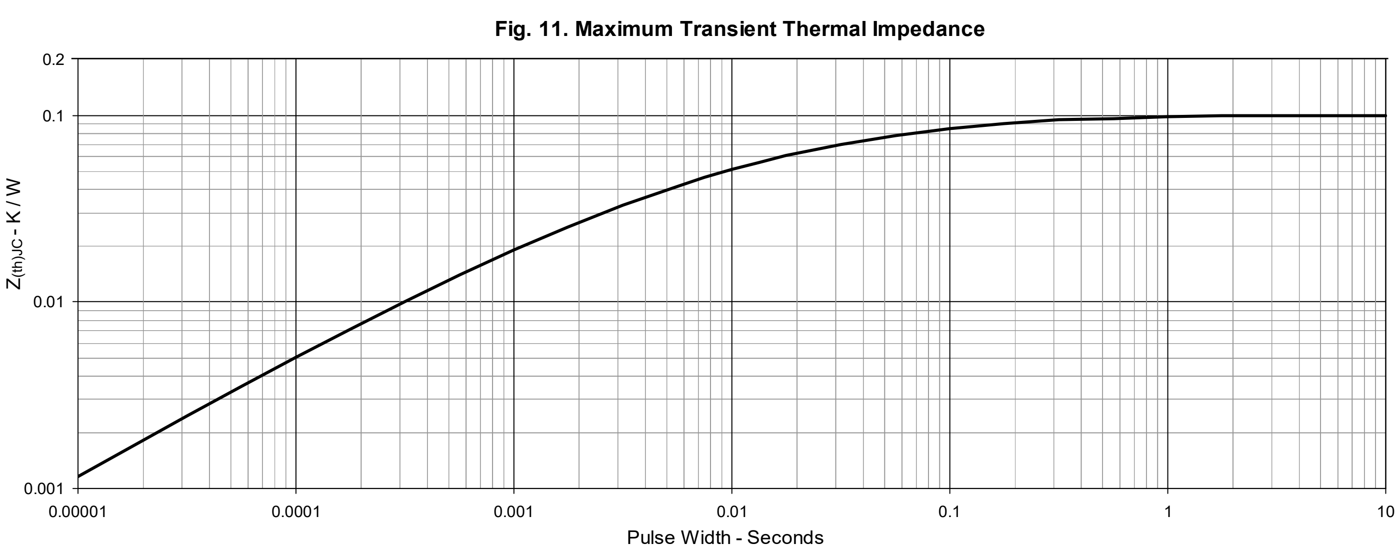


Fig. 11. Maximum Transient Thermal Impedance
$Z_{(th)JC}$ - K / W
Pulse Width - Seconds

Fig. 12. Inductive Switching Energy Loss vs. Collector Current

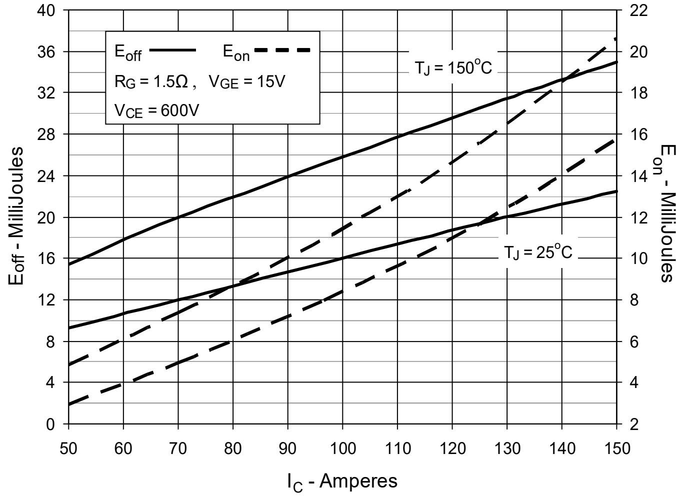


Fig. 13. Inductive Switching Energy Loss vs. Collector-Emitter Voltage

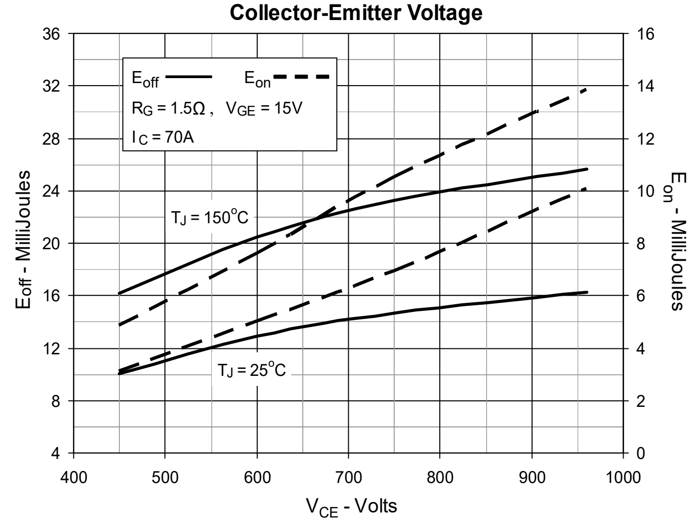


Fig. 14. Inductive Switching Energy Loss vs. Gate Resistance

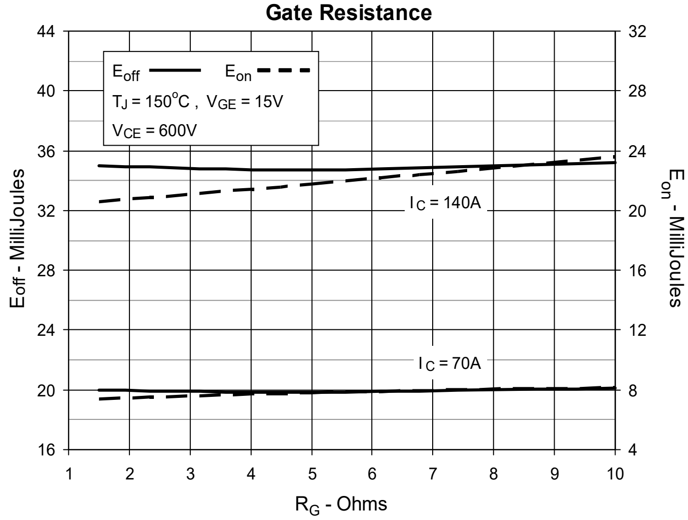


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

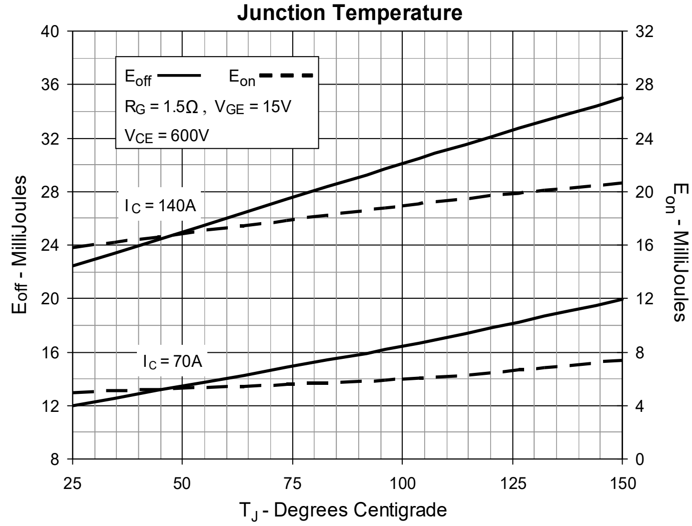


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

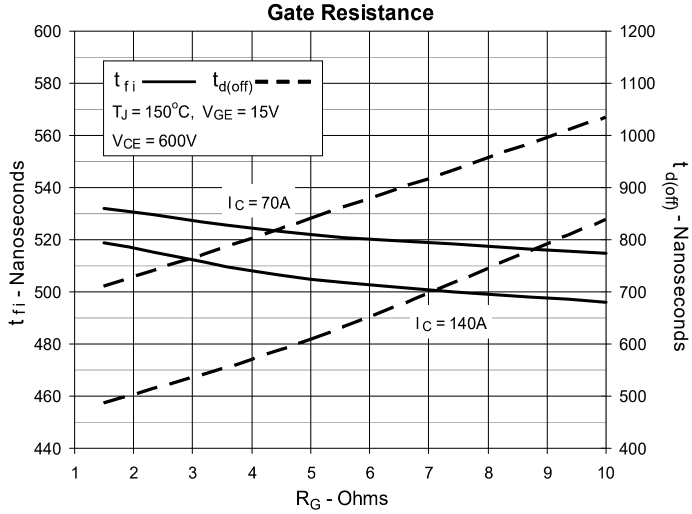


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

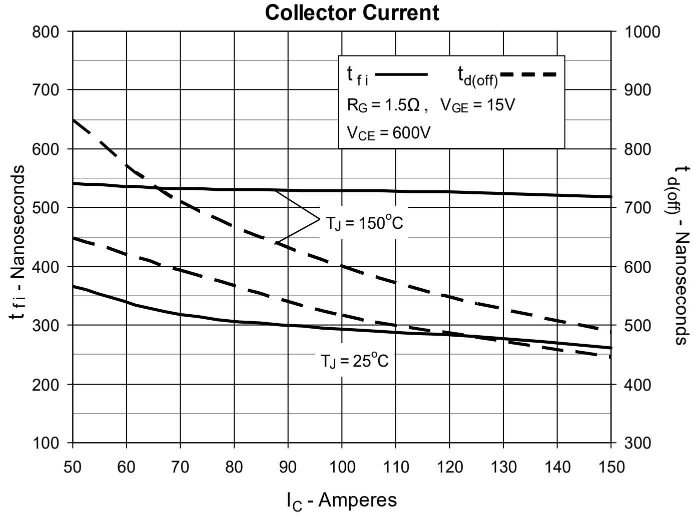


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

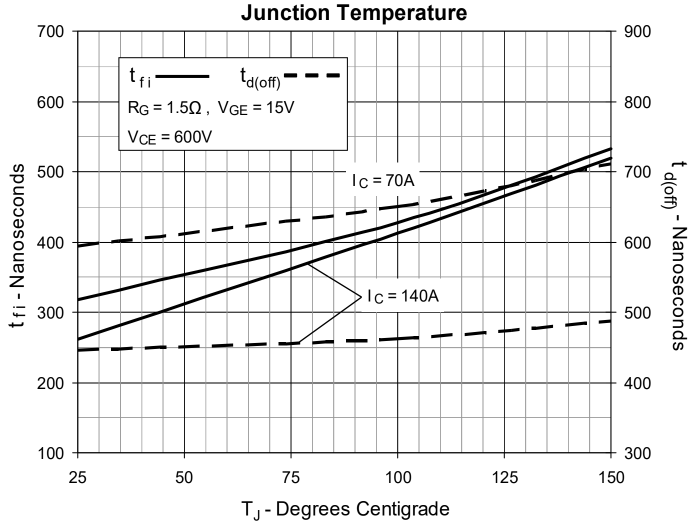


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

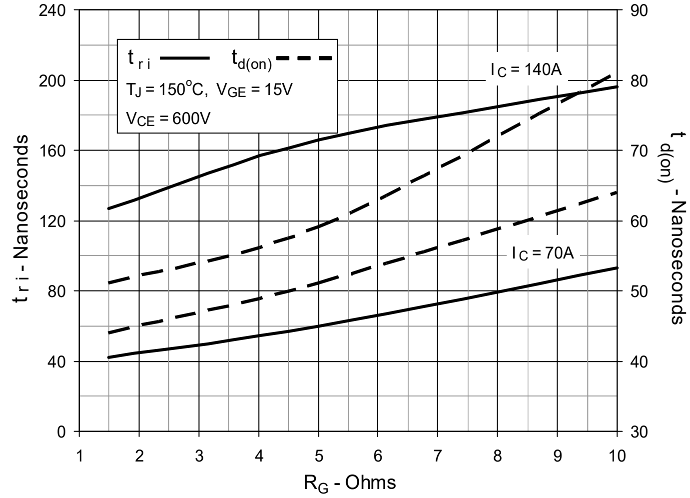


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

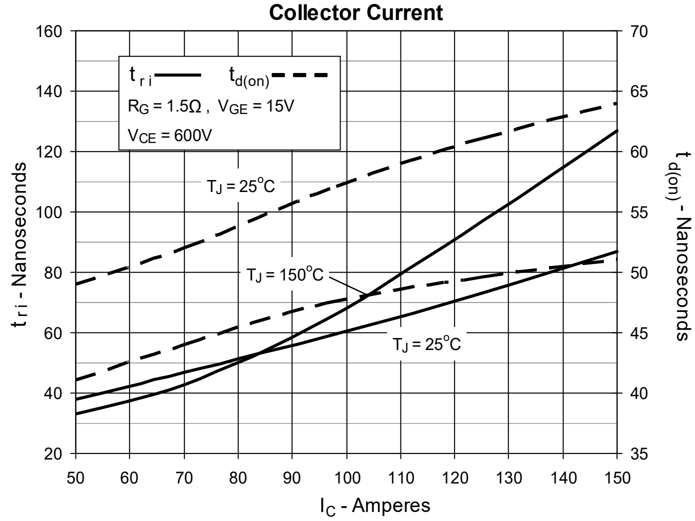
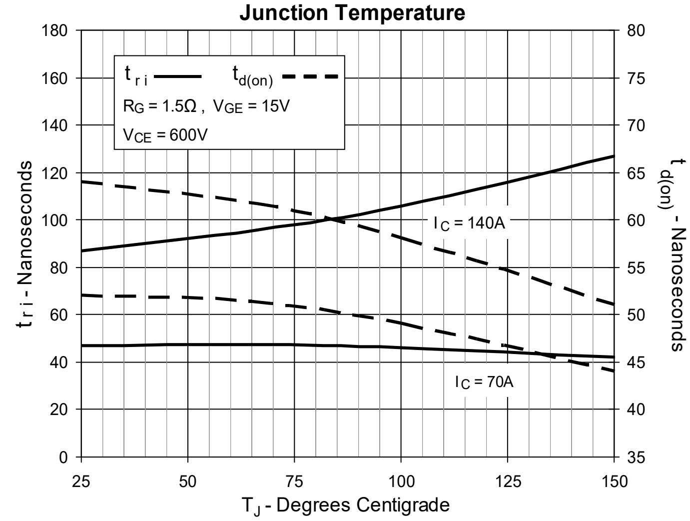
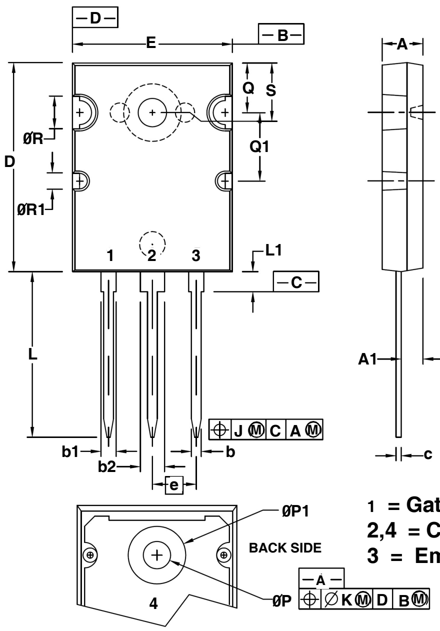


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature



TO-264 Outline



1 = Gate
2,4 = Collector
3 = Emitter

SYMBOL	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.185	.209	4.70	5.31
A1	.102	.118	2.59	3.00
b	.037	.055	0.94	1.40
b1	.087	.102	2.21	2.59
b2	.110	.126	2.79	3.20
c	.017	.029	0.43	0.74
D	1.007	1.047	25.58	26.59
E	.760	.799	19.30	20.29
e	.215BSC		5.46 BSC	
J	.000	.010	0.00	0.25
K	.000	.010	0.00	0.25
L	.779	.842	19.79	21.39
L1	.087	.102	2.21	2.59
ØP	.122	.138	3.10	3.51
ØP1	.270	.290	6.86	7.37
Q	.240	.256	6.10	6.50
Q1	.330	.346	8.38	8.79
ØR	.155	.187	3.94	4.75
ØR1	.085	.093	2.16	2.36
S	.243	.253	6.17	6.43