

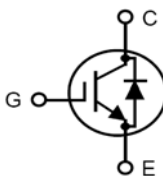
XPT™ 650V IGBT

GenX3™ w/Diode

IXYP15N65C3D1M

(Electrically Isolated Tab)

Extreme Light Punch Through
IGBT for 20-60kHz Switching



$$V_{CES} = 650V$$

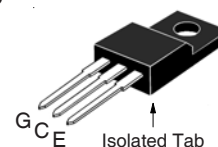
$$I_{C110} = 9A$$

$$V_{CE(sat)} \leq 2.5V$$

$$t_{fi(typ)} = 28ns$$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^{\circ}C$ to $175^{\circ}C$	650	V
V_{CGR}	$T_J = 25^{\circ}C$ to $175^{\circ}C$, $R_{GE} = 1M\Omega$	650	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^{\circ}C$	18	A
I_{C110}	$T_C = 110^{\circ}C$	9	A
I_{F110}	$T_C = 110^{\circ}C$	13	A
I_{CM}	$T_C = 25^{\circ}C$, 1ms	80	A
I_A	$T_C = 25^{\circ}C$	5	A
E_{AS}	$T_C = 25^{\circ}C$	100	mJ
SSOA (RBSOA)	$V_{GE} = 15V$, $T_{VJ} = 150^{\circ}C$, $R_G = 20\Omega$ Clamped Inductive Load	$I_{CM} = 30$ $@ V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	$V_{GE} = 15V$, $V_{CE} = 360V$, $T_J = 150^{\circ}C$ $R_G = 82\Omega$, Non Repetitive	8	μs
P_C	$T_C = 25^{\circ}C$	57	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	$^{\circ}C$
V_{ISOL}	50/60 Hz, 1 Minute	2500	V~
M_d	Mounting Torque	1.13 / 10	Nm/lb.in
Weight		2.5	g

OVERMOLDED TO-220



G = Gate C = Collector
E = Emitter

Features

- Optimized for 20-60kHz Switching
- Plastic Overmolded Tab for Electrical Isolation
- Square RBSOA
- Avalanche Rated
- Anti-Parallel Fast Diode
- 2500V~ Electrical Isolation
- Short Circuit Capability

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

Symbol	Test Conditions ($T_J = 25^{\circ}C$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 250\mu A$, $V_{GE} = 0V$	650		V
$V_{GE(th)}$	$I_C = 250\mu A$, $V_{CE} = V_{GE}$	3.5		6.0 V
I_{CES}	$V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 150^{\circ}C$			10 μA 400 μA
I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 15A$, $V_{GE} = 15V$, Note 1 $T_J = 150^{\circ}C$		1.96 2.45	V V

Symbol Test Conditions

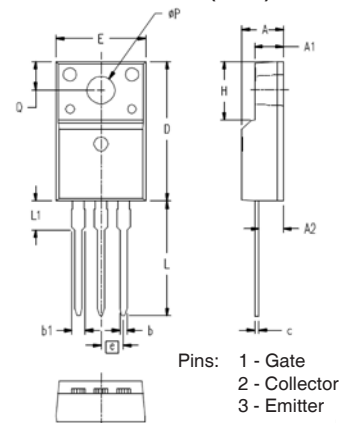
(T_J = 25°C Unless Otherwise Specified)

Characteristic Values

Min. Typ. Max.

g_{fs}	I _C = 15A, V _{CE} = 10V, Note 1	5.0	8.5	S
C_{ies}	V _{CE} = 25V, V _{GE} = 0V, f = 1MHz		583	pF
C_{oes}			52	pF
C_{res}			13	pF
Q_{g(on)}	I _C = 15A, V _{GE} = 15V, V _{CE} = 0.5 • V _{CES}		19	nC
Q_{ge}			4	nC
Q_{gc}			10	nC
t_{d(on)}	Inductive load, T _J = 25°C I _C = 15A, V _{GE} = 15V V _{CE} = 400V, R _G = 20Ω Note 2		15	ns
t_{ri}			20	ns
E_{on}			0.27	mJ
t_{d(off)}			68	ns
t_{fi}			28	ns
E_{off}			0.23	mJ
t_{d(on)}	Inductive load, T _J = 150°C I _C = 15A, V _{GE} = 15V V _{CE} = 400V, R _G = 20Ω Note 2		15	ns
t_{ri}			21	ns
E_{on}			0.53	mJ
t_{d(off)}			80	ns
t_{fi}			42	ns
E_{off}			0.24	mJ
R_{thJC}			2.63	°C/W

OVERMOLDED TO-220 (IXYP) Outline



Dim.	Millimeters		Inches	
	min	max	min	max
A	4.50	4.90	0.177	0.193
A1	2.34	2.74	0.092	0.108
A2	2.56	2.96	0.101	0.117
b	0.70	0.90	0.028	0.035
b1	1.27	1.47	0.050	0.058
c	0.45	0.60	0.018	0.024
D	15.67	16.07	0.617	0.633
E	9.96	10.36	0.392	0.408
e	2.54 BSC		0.100 BSC	
H	6.48	6.88	0.255	0.271
L	12.68	13.28	0.499	0.523
L1	3.03	3.43	0.119	0.135
ØP	3.08	3.28	0.121	0.129
Q	3.20	3.40	0.126	0.134

Reverse Diode (FRED)

Symbol Test Conditions

(T_J = 25°C, Unless Otherwise Specified)

Characteristic Values

Min. Typ. Max.

V_F	I_F = 10A, V_{GE} = 0V, Note 1 T_J = 125°C	1.7	3.0	V V
I_{RM}	I_F = 12A, V_{GE} = 0V, -di_F/dt = 100A/μs, V_R = 100V, T_J = 125°C	2.5		A
t_{rr}		110		ns
t_{rr}	I_F = 1A, V_{GE} = 0V, -di_F/dt = 100A/μs, V_R = 30V	30		ns
R_{thJC}			4.0	°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.

PRELIMINARY 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.

IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents:	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
	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	

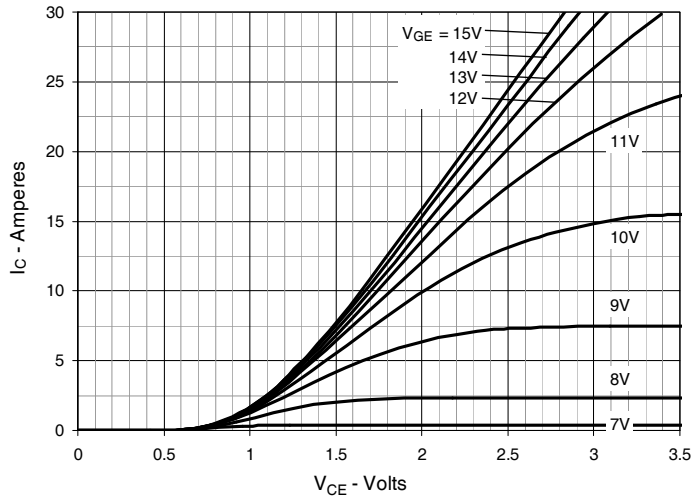
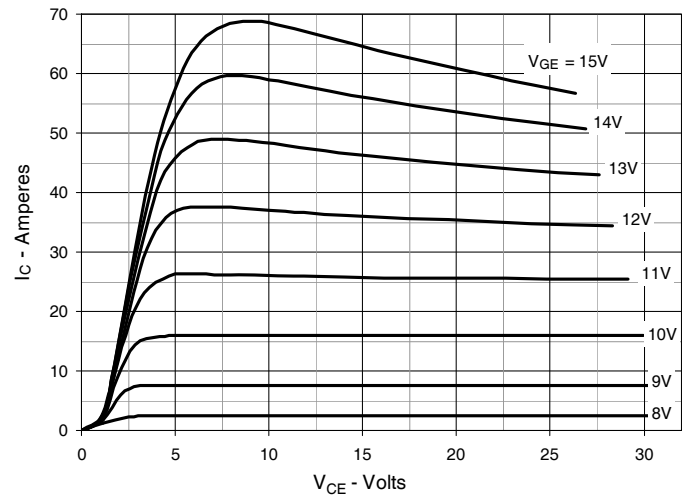
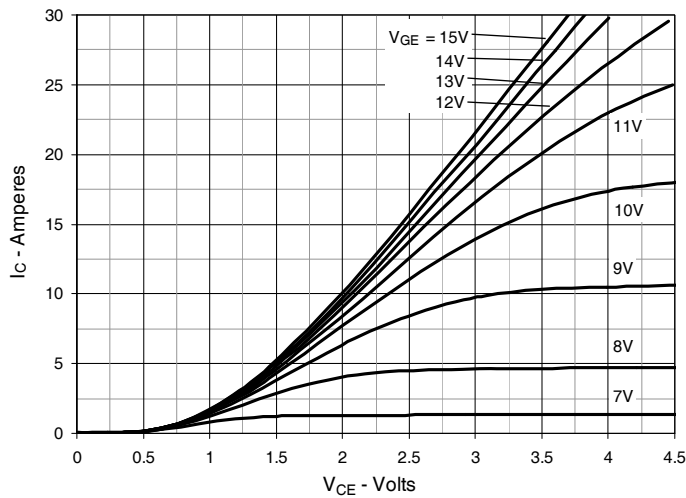
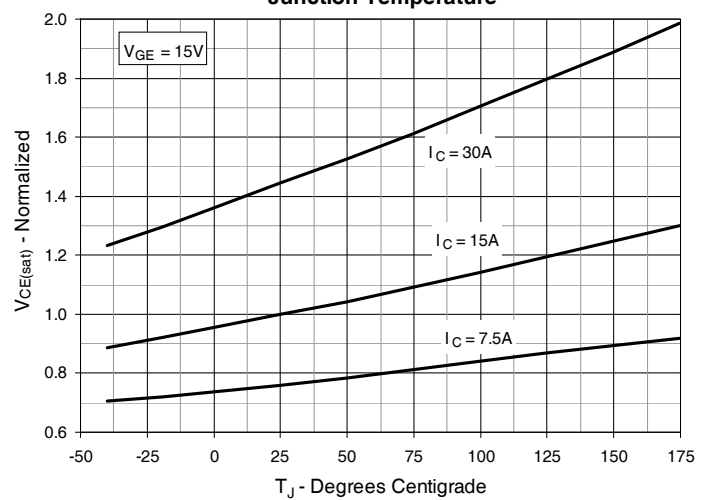
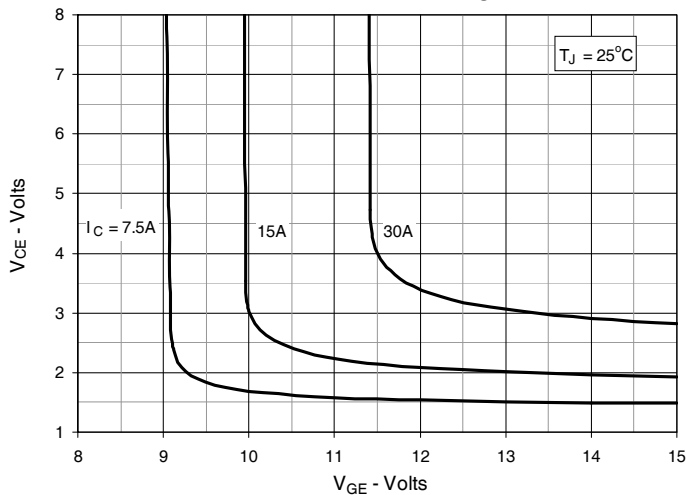
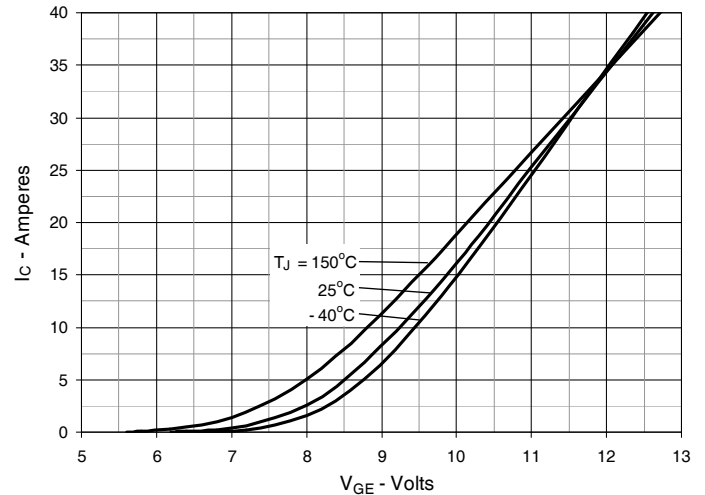
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

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


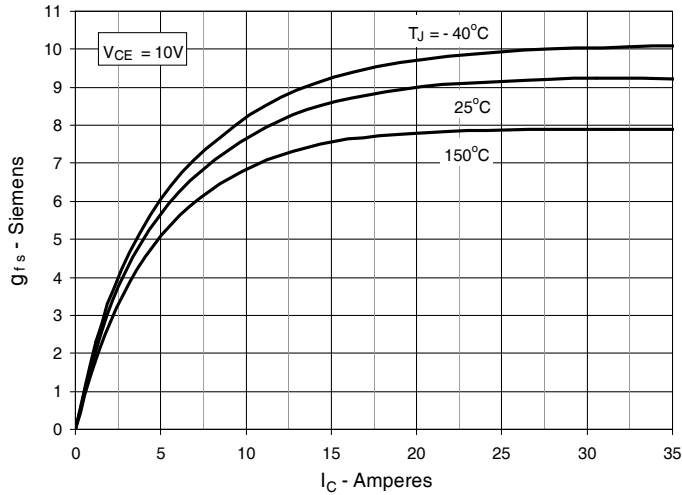
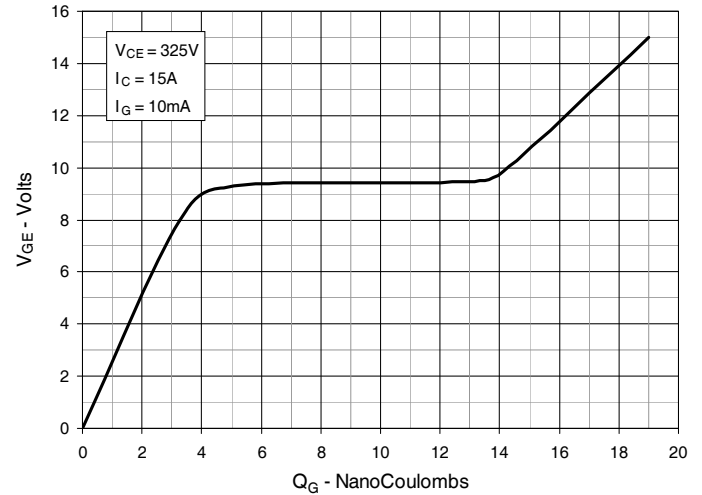
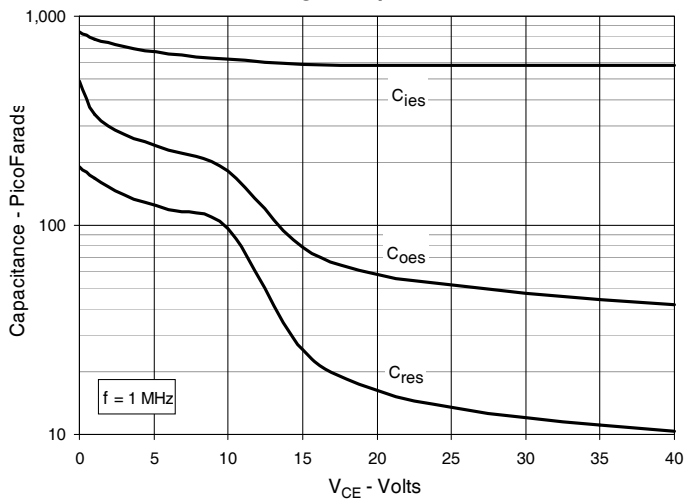
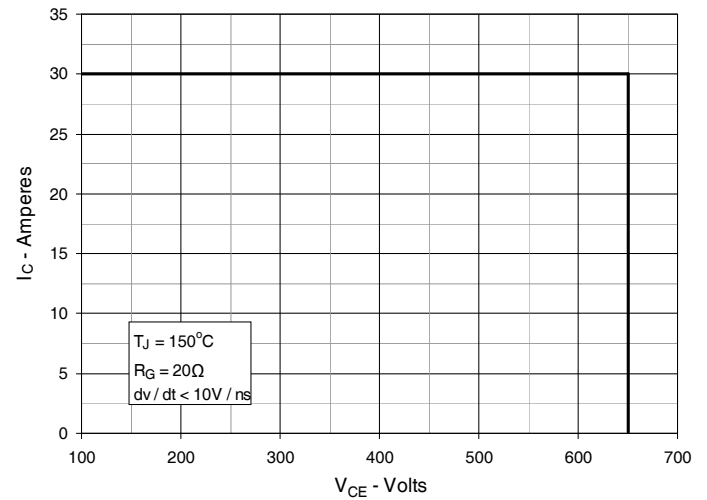
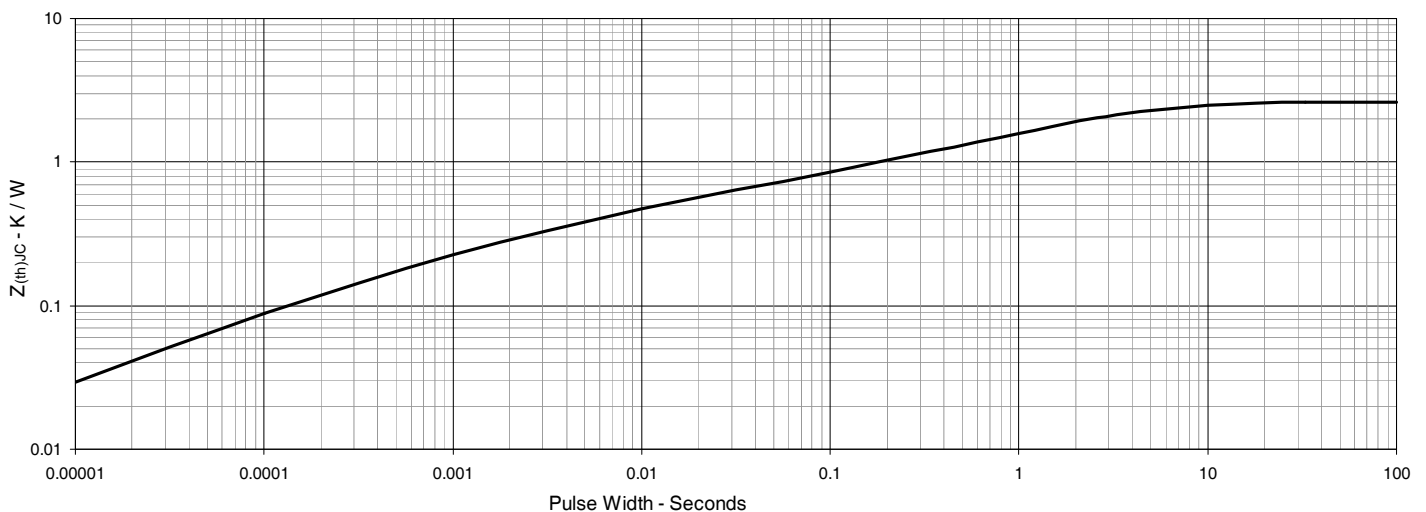
Fig. 7. Transconductance

Fig. 8. Gate Charge

Fig. 9. Capacitance

Fig. 10. Reverse-Bias Safe Operating Area

Fig. 11. Maximum Transient Thermal Impedance (IGBT)


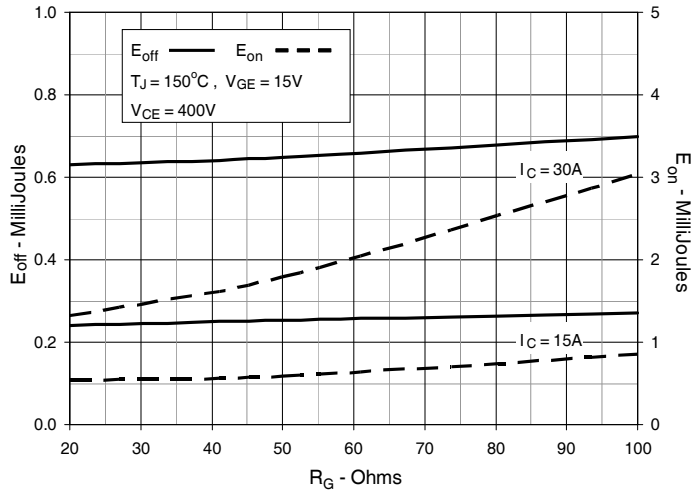
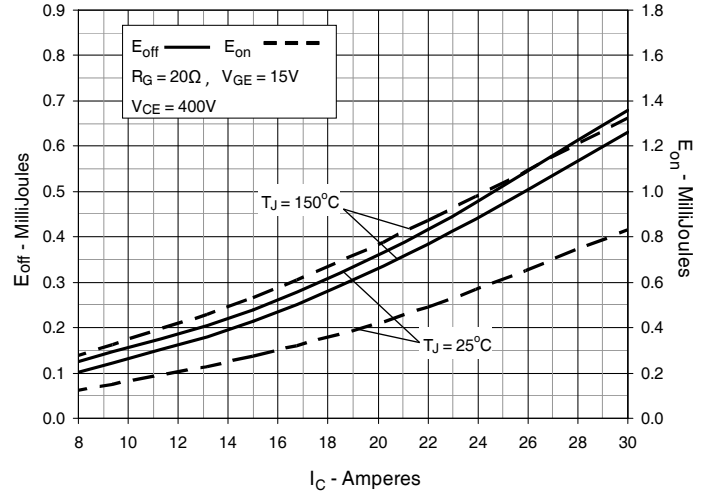
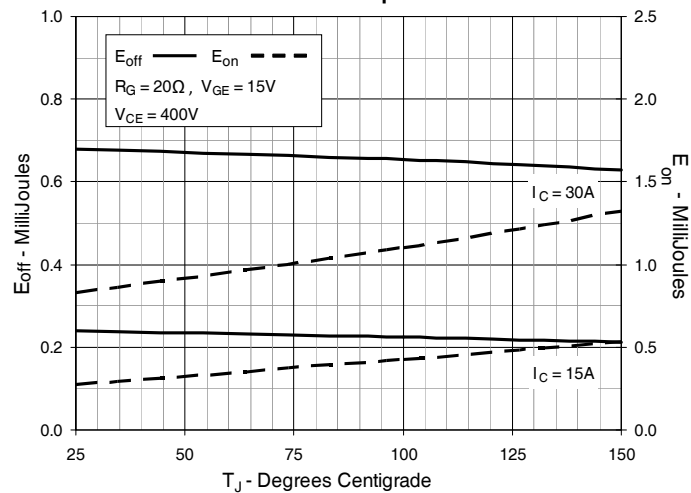
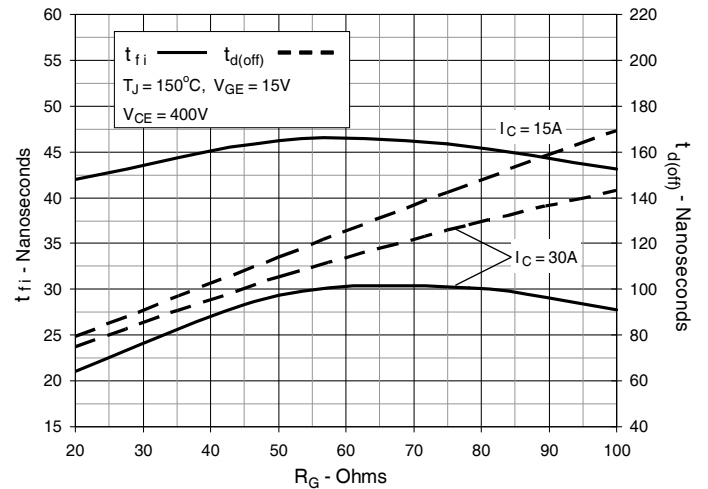
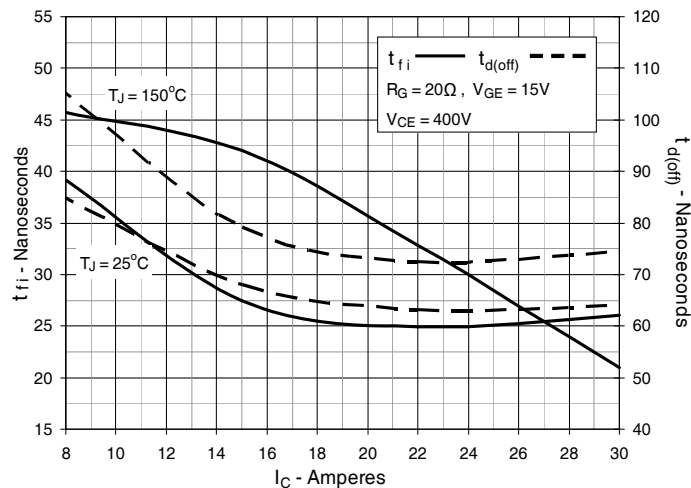
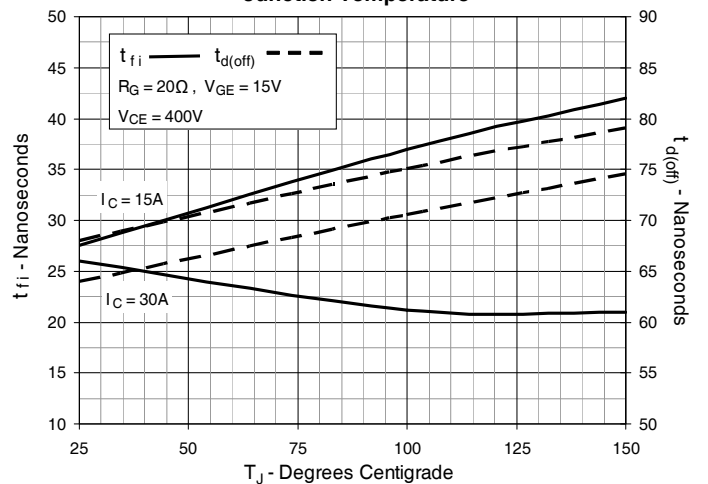
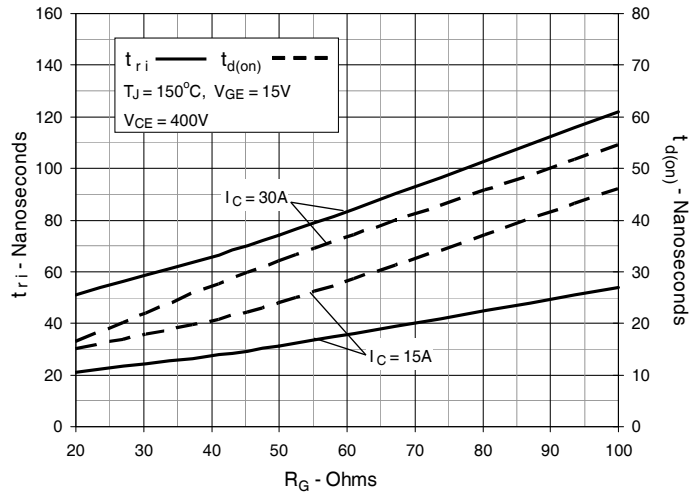
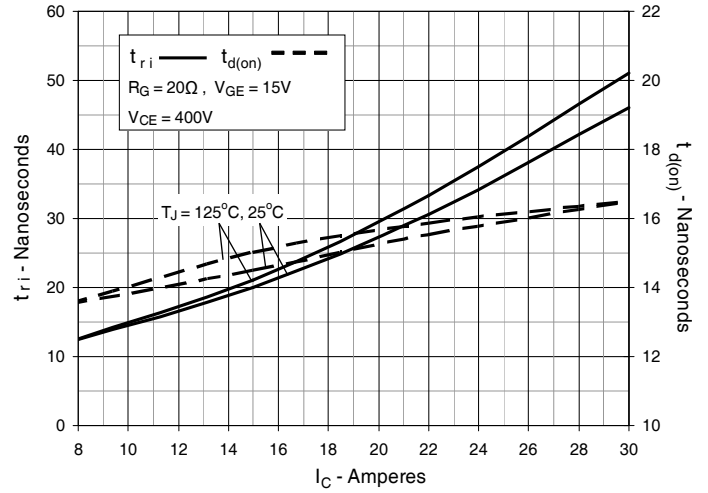
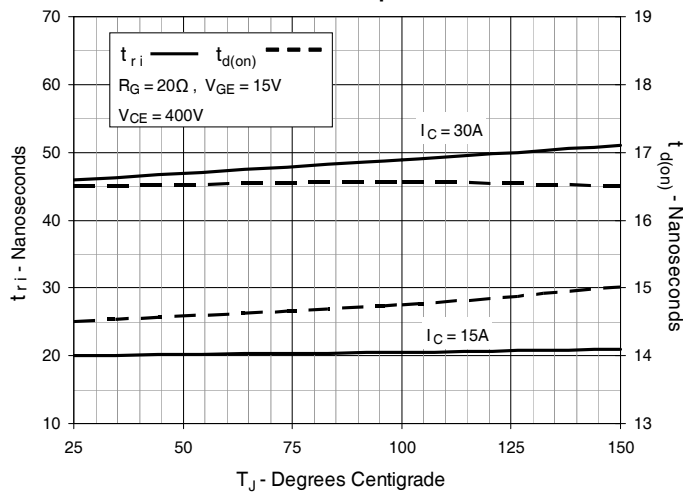
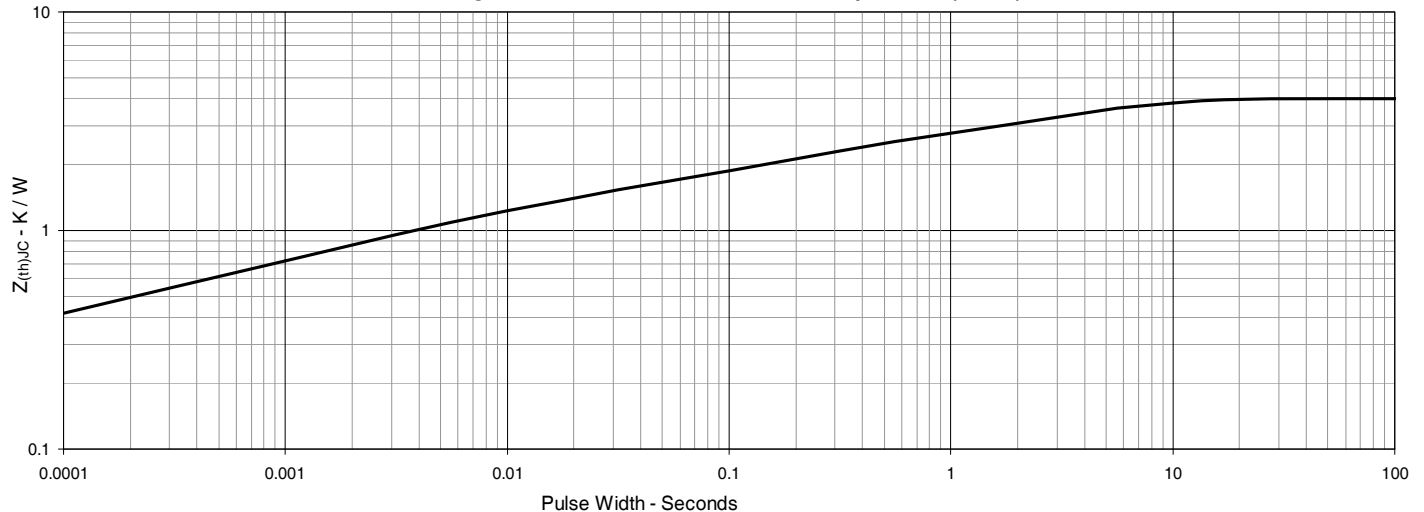
Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

Fig. 13. Inductive Switching Energy Loss vs. Collector Current

Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature


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

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

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

Fig. 21. Maximum Transient Thermal Impedance (Diode)


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