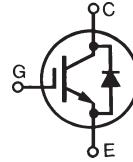


1200V XPT™ IGBT GenX3™ w/ Diode

IXYH20N120C3D1

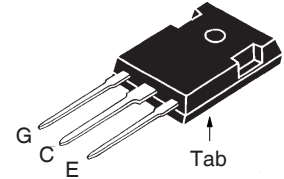
High-Speed IGBT
for 20-50 kHz Switching



$$\begin{aligned} V_{CES} &= 1200V \\ I_{C110} &= 17A \\ V_{CE(sat)} &\leq 3.4V \\ t_{fi(typ)} &= 108ns \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ C$ to $150^\circ C$	1200	V
V_{CGR}	$T_J = 25^\circ C$ to $150^\circ C$, $R_{GE} = 1M\Omega$	1200	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ C$	36	A
I_{C110}	$T_C = 110^\circ C$	17	A
I_{F110}	$T_C = 110^\circ C$	20	A
I_{CM}	$T_C = 25^\circ C$, 1ms	88	A
I_A	$T_C = 25^\circ C$	10	A
E_{AS}	$T_C = 25^\circ C$	400	mJ
SSOA (RBSOA)	$V_{GE} = 15V$, $T_{VJ} = 150^\circ C$, $R_G = 10\Omega$ Clamped Inductive Load	$I_{CM} = 40$ $@ V_{CE} \leq V_{CES}$	A
P_C	$T_C = 25^\circ C$	230	W
T_J		-55 ... +150	$^\circ C$
T_{JM}		150	$^\circ C$
T_{stg}		-55 ... +150	$^\circ C$
T_L	Maximum Lead Temperature for Soldering	300	$^\circ C$
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	$^\circ C$
M_d	Mounting Torque	1.13/10	Nm/lb.in.
Weight		6	g

TO-247 AD



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

Features

- Optimized for Low Switching Losses
- Square RBSOA
- Positive Thermal Coefficient of $V_{ce(sat)}$
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated
- International Standard Package

Advantages

- High Power Density
- Low Gate Drive Requirement

Applications

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

Symbol	Test Conditions ($T_J = 25^\circ C$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 250\mu A$, $V_{GE} = 0V$	1200		V
$V_{GE(th)}$	$I_C = 250\mu A$, $V_{CE} = V_{GE}$	3.0		5.0 V
I_{CES}	$V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 125^\circ C$			25 μA 350 μA
I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 20A$, $V_{GE} = 15V$, Note 1 $T_J = 150^\circ C$		4.0	3.4 V V

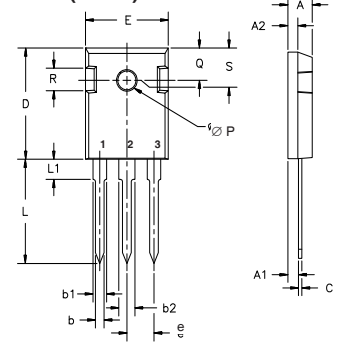
Symbol Test Conditions

($T_J = 25^\circ\text{C}$ Unless Otherwise Specified)

Characteristic Values

Symbol	Test Conditions	Min.	Typ.	Max.
g_{fs}	$I_C = 20\text{A}$, $V_{CE} = 10\text{V}$, Note 1	7.0	11.5	S
C_{ies}	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		1110	pF
C_{oes}			120	pF
C_{res}			27	pF
$Q_{g(on)}$	$I_C = 20\text{A}$, $V_{GE} = 15\text{V}$, $V_{CE} = 0.5 \cdot V_{CES}$		53	nC
Q_{ge}			9	nC
Q_{gc}			22	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = 20\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 0.5 \cdot V_{CES}$, $R_G = 10\Omega$ Note 2		20	ns
t_{ri}			29	ns
E_{on}			1.3	mJ
$t_{d(off)}$			90	ns
t_{fi}			108	ns
E_{off}			0.5	mJ
$t_{d(on)}$	Inductive load, $T_J = 150^\circ\text{C}$ $I_C = 20\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 0.5 \cdot V_{CES}$, $R_G = 10\Omega$ Note 2		20	ns
t_{ri}			40	ns
E_{on}			3.7	mJ
$t_{d(off)}$			115	ns
t_{fi}			105	ns
E_{off}			0.7	mJ
R_{thJC}			0.21	0.54°C/W
R_{thCS}				$^\circ\text{C/W}$

TO-247 (IXYH) Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter

Dim.	Millimeter	Inches
	Min. Max.	Min. 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
ØP	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

Reverse Diode (FRED)

($T_J = 25^\circ\text{C}$, Unless Otherwise Specified)

Symbol	Test Conditions	Min.	Typ.	Max.
V_F	$I_F = 30\text{A}$, $V_{GE} = 0\text{V}$, Note 1 $T_J = 150^\circ\text{C}$		1.75	3.00 V
I_{RM}	$I_F = 30\text{A}$, $V_{GE} = 0\text{V}$, $-di_F/dt = 100\text{A}/\mu\text{s}$, $T_J = 100^\circ\text{C}$ $V_R = 600\text{V}$ $T_J = 100^\circ\text{C}$			9 A
t_{rr}			195	ns
R_{thJC}				0.90 $^\circ\text{C/W}$

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} (clamp), T_J or R_G .

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	

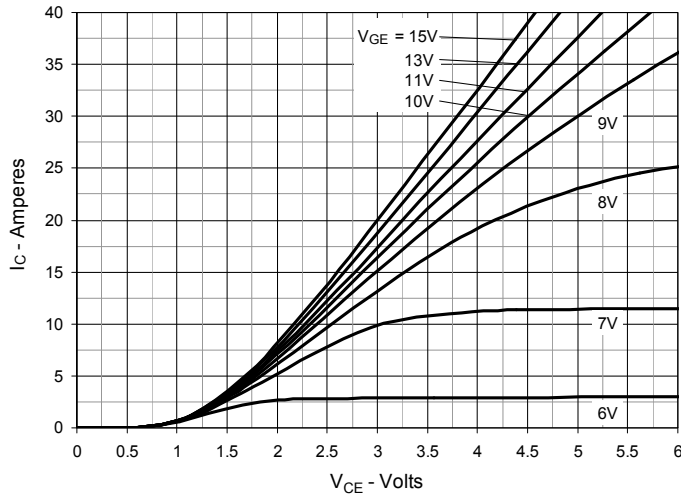
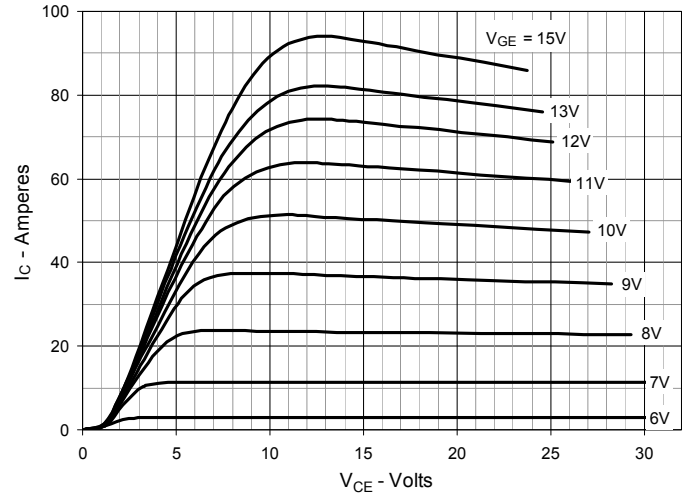
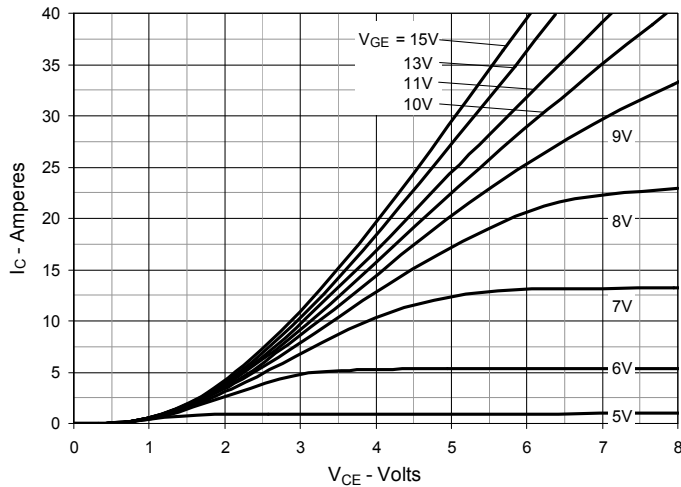
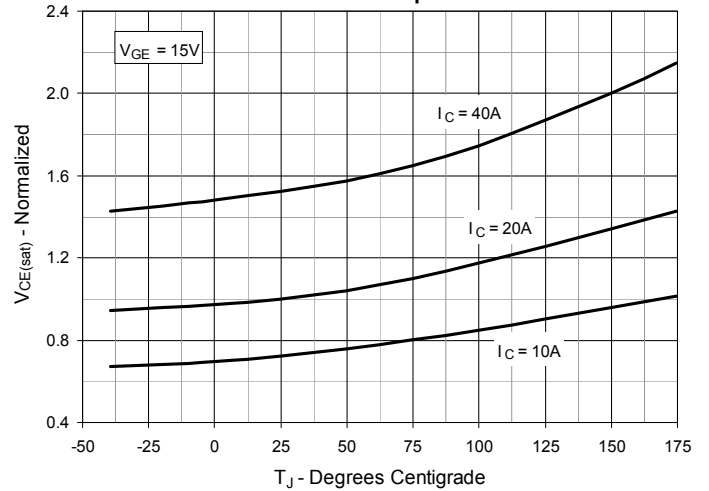
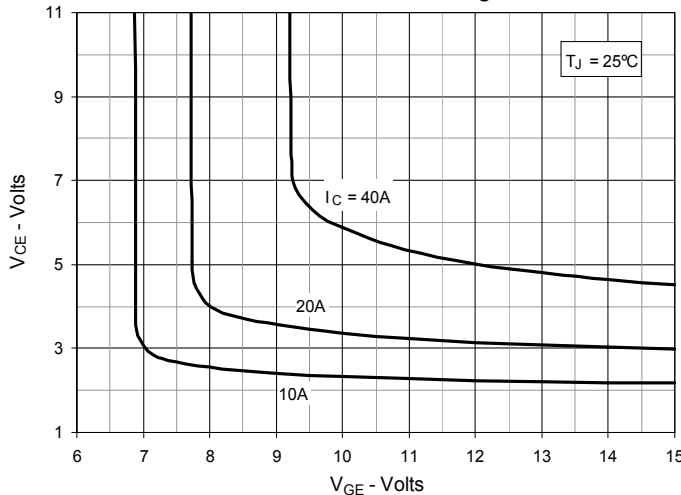
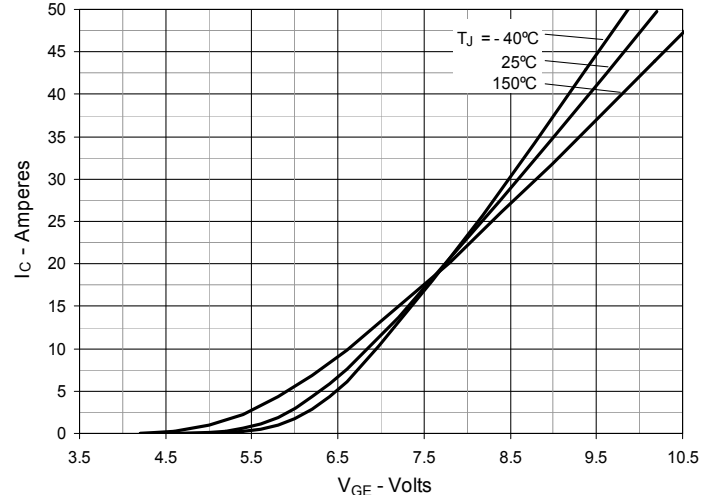
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

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

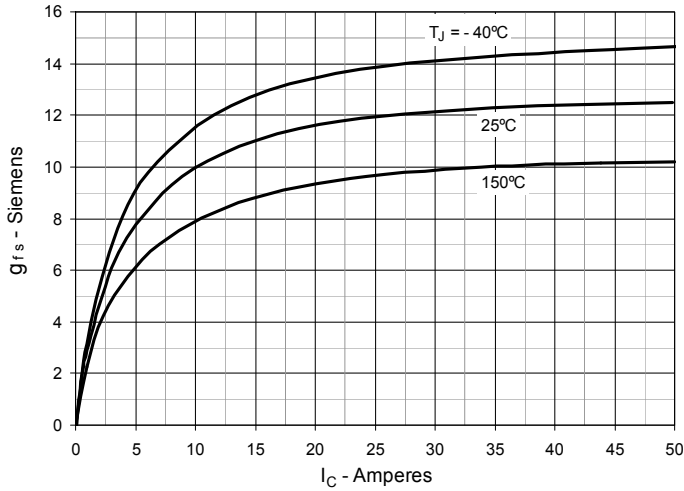


Fig. 8. Gate Charge

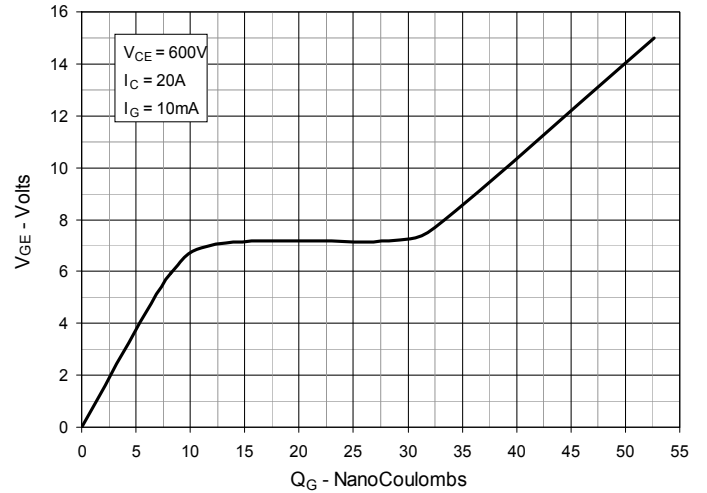


Fig. 9. Capacitance

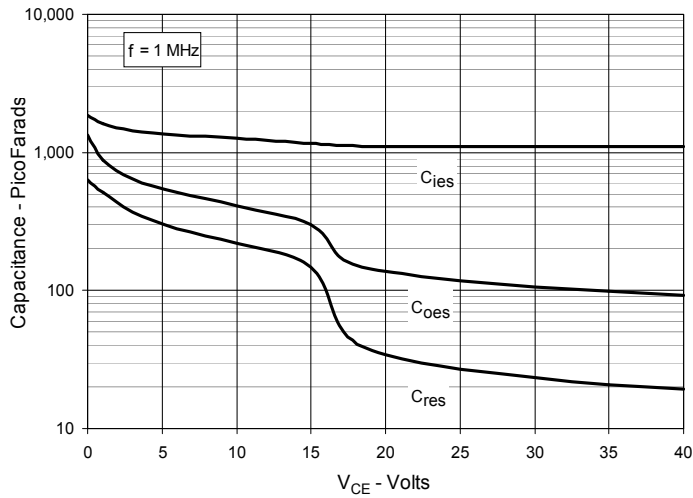


Fig. 10. Reverse-Bias Safe Operating Area

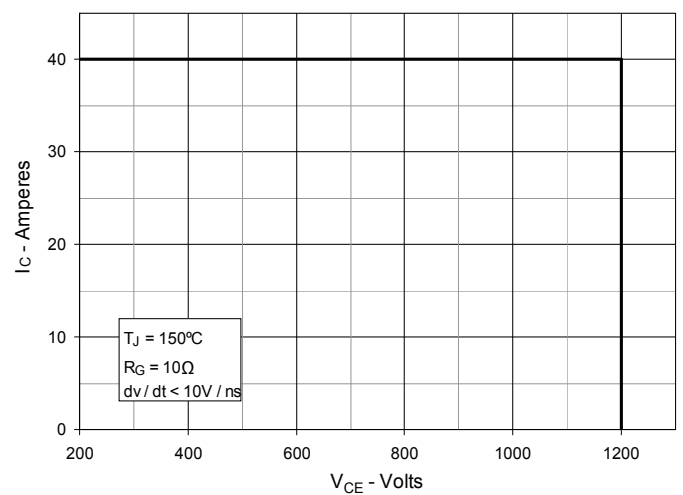


Fig. 11. Maximum Transient Thermal Impedance (IGBT)

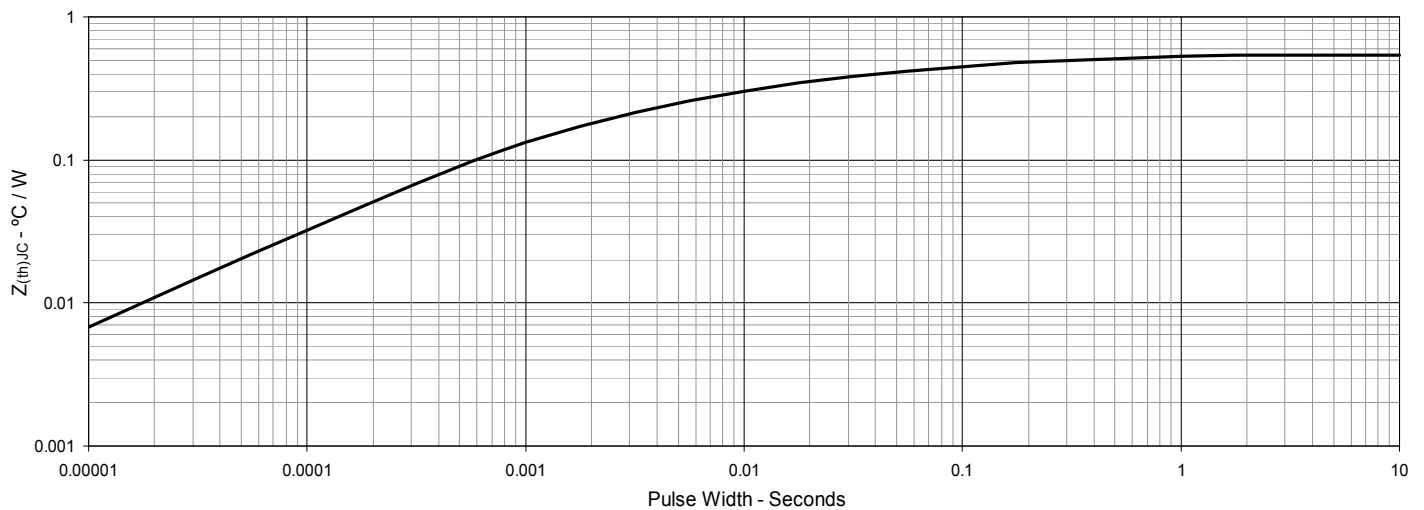


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

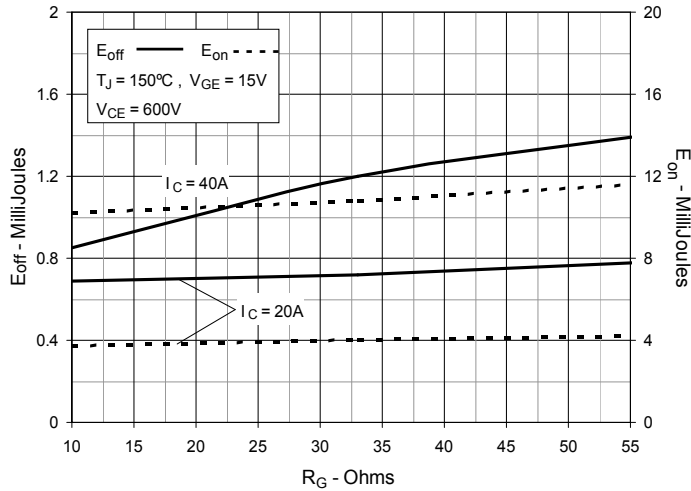


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

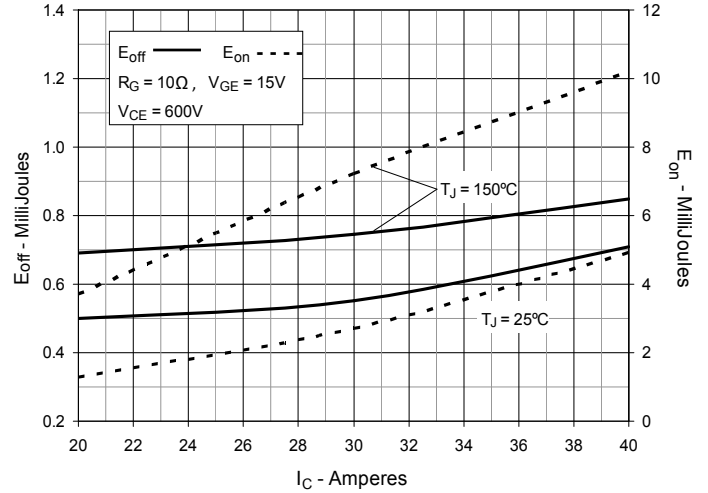


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

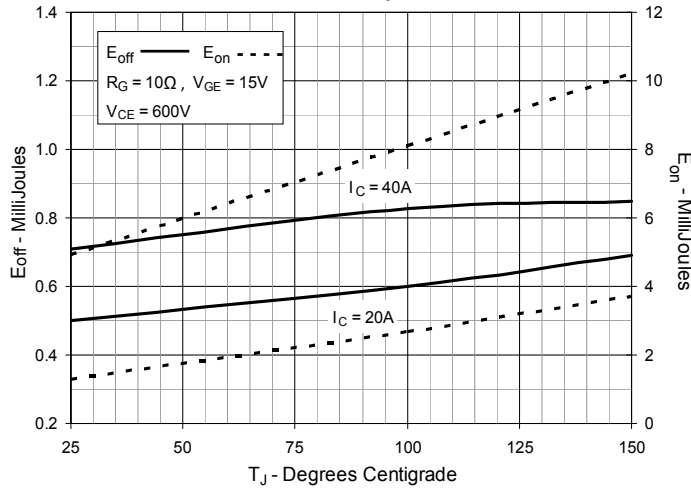


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

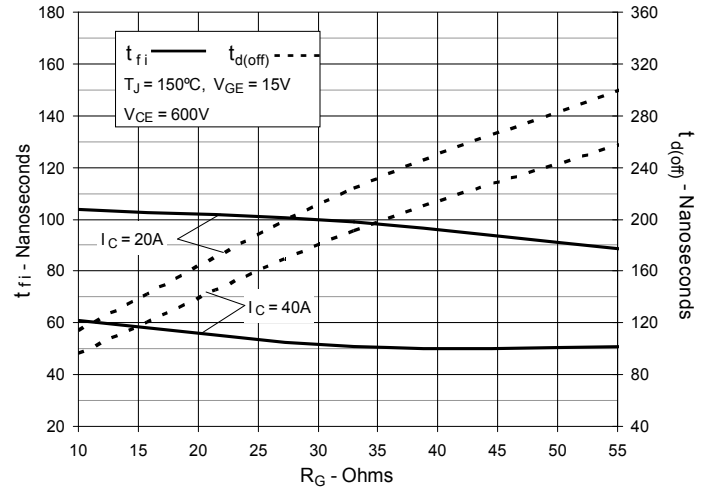


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

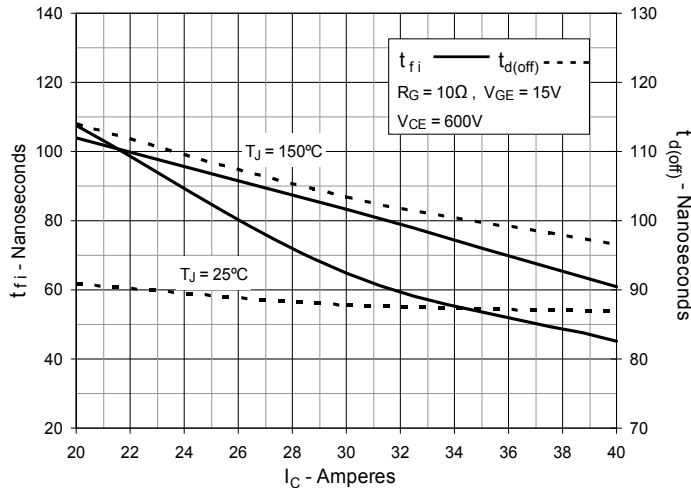


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

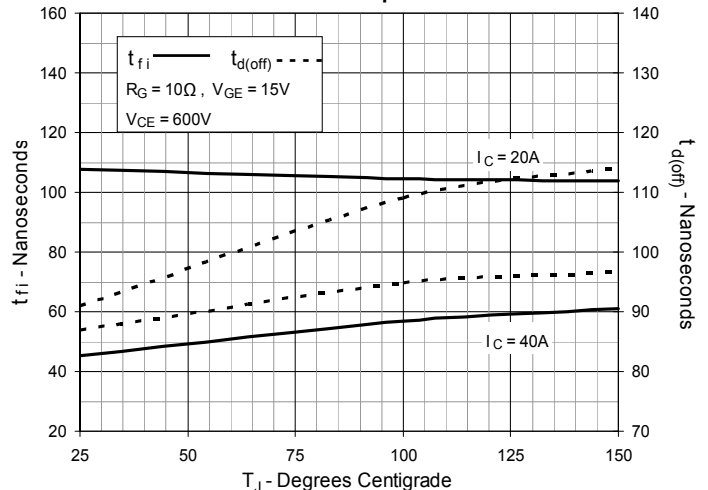


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

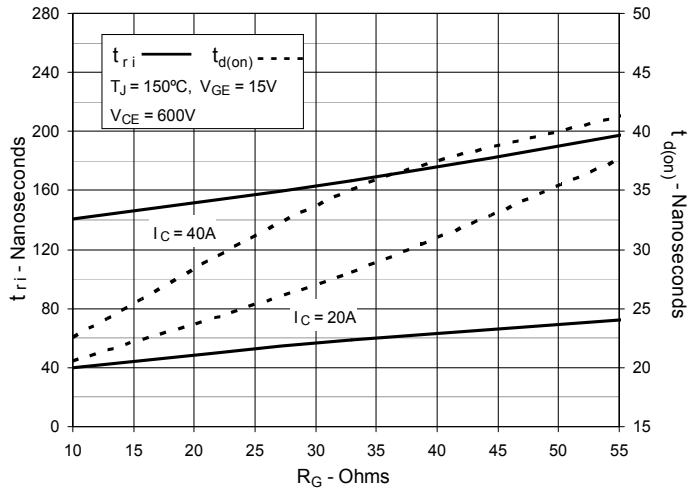


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

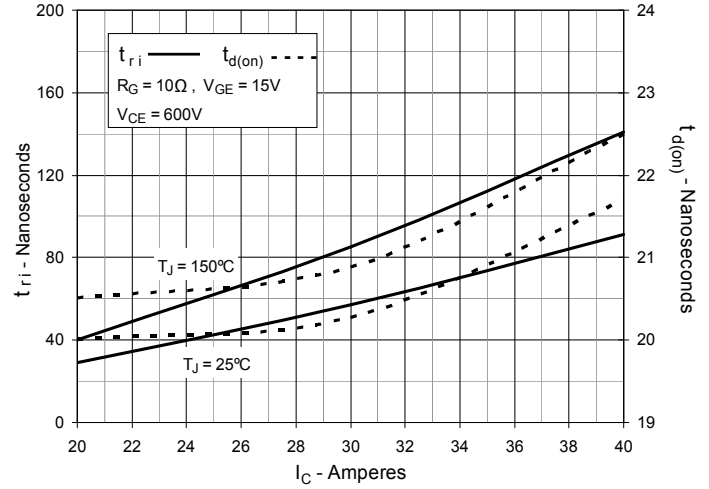


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

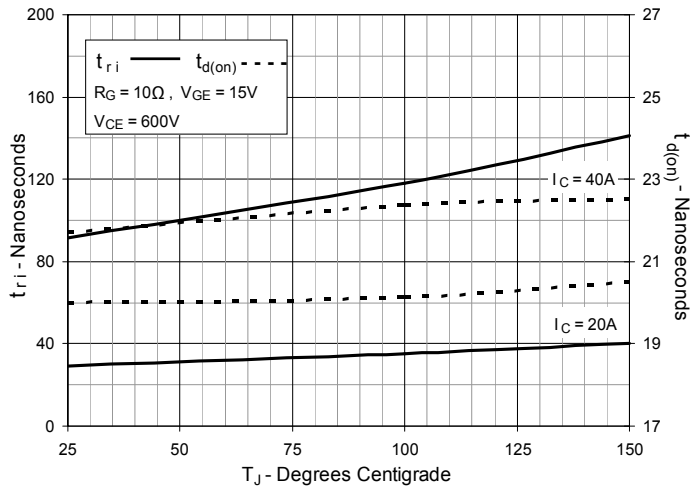


Fig. 21. Maximum Peak Load Current vs. Frequency

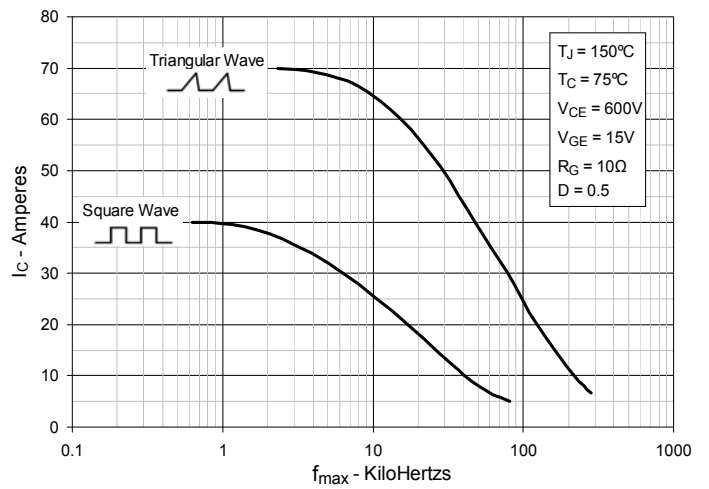


Fig. 22. Maximum Transient Thermal Impedance (Diode)

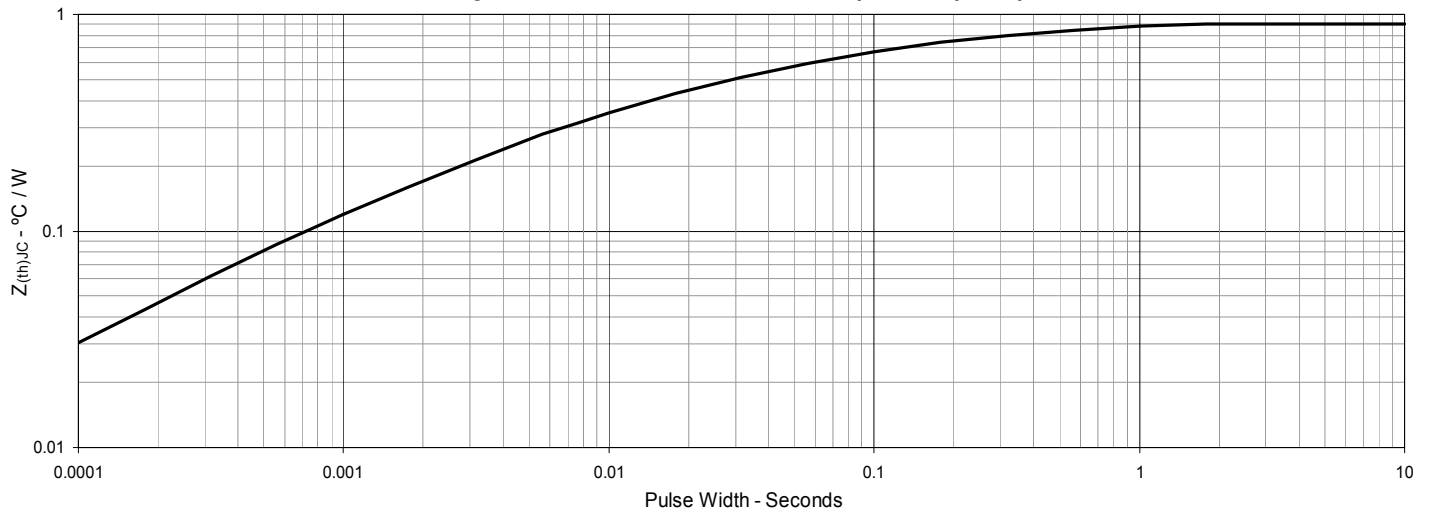
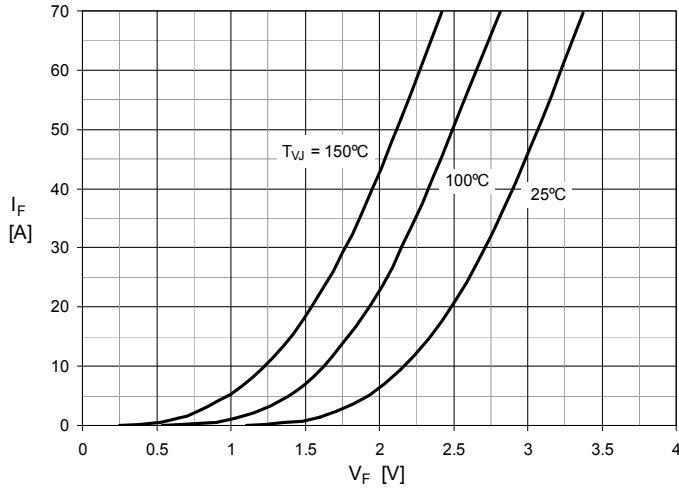
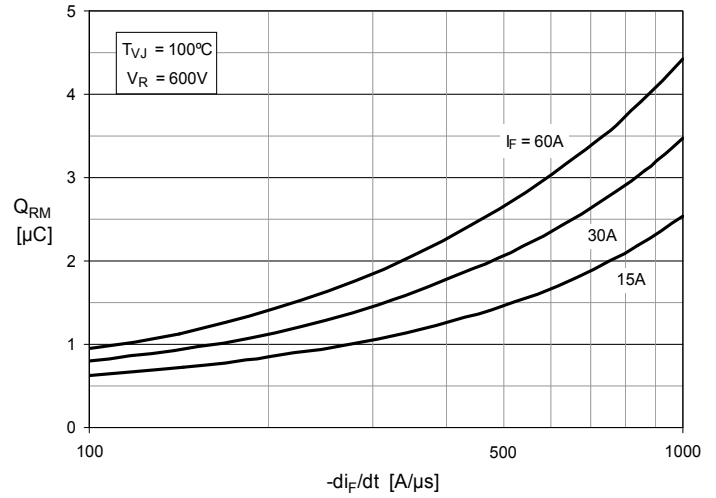
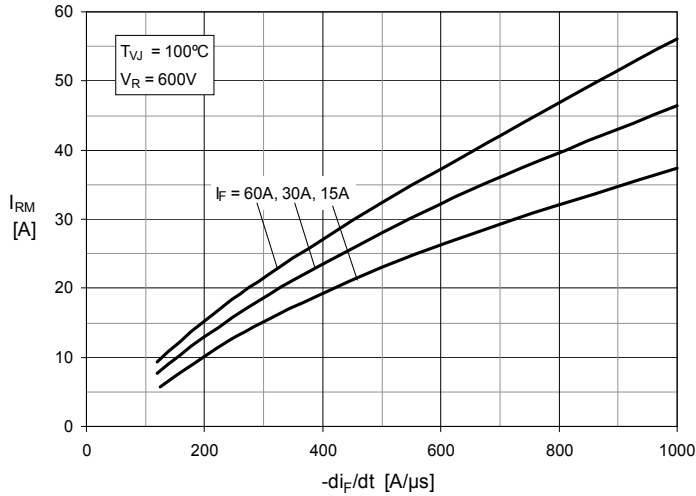
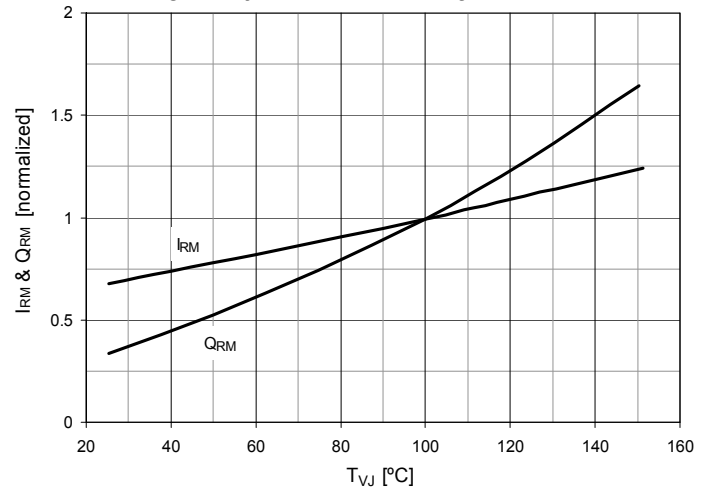
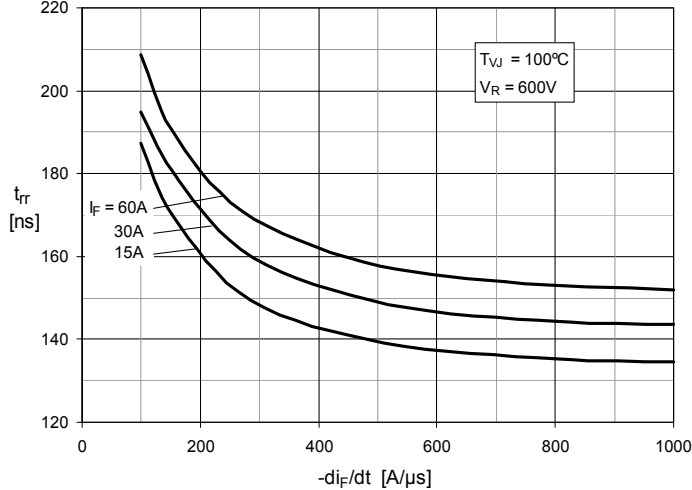


Fig. 23. Forward Current I_F vs V_F

Fig. 24. Reverse Recovery Charge Q_{RM} vs. $-di_F/dt$

Fig. 25. Peak Reverse Current I_{RM} vs. $-di_F/dt$

Fig. 26. Dynamic Parameters Q_{RM} , I_{RM} vs. T_{VJ}

Fig. 27. Recovery Time t_{rr} vs. $-di_F/dt$

Fig. 28. Peak Forward Voltage V_{FR} , t_{rr} vs $-di_F/dt$
