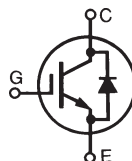


1200V XPT™ IGBT GenX3™ w/ Diode

IXYH40N120C3D1

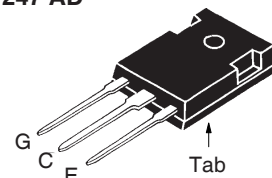
High-Speed IGBT
for 20-50 kHz Switching



$$\begin{aligned} V_{CES} &= 1200V \\ I_{C90} &= 40A \\ V_{CE(sat)} &\leq 4.0V \\ t_{fi(typ)} &= 38ns \end{aligned}$$

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}	$T_C = 25^\circ C$ (Chip Capability)	64	A
I_{C90}	$T_C = 90^\circ C$	40	A
I_{F110}	$T_C = 110^\circ C$	25	A
I_{CM}	$T_C = 25^\circ C$, 1ms	105	A
I_A	$T_C = 25^\circ C$	20	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	$I_{CM} = 80$ @ $V_{CE} \leq V_{CES}$	A
P_C	$T_C = 25^\circ C$	480	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
- High Current Handling Capability
- 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}	$V_{CE} = V_{CES}$, $V_{GE} = 0V$ $T_J = 125^\circ C$			50 μA 500 μA
I_{GES}	$V_{CE} = 0V$, $V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 40A$, $V_{GE} = 15V$, Note 1 $T_J = 125^\circ C$		4.8	4.0 V V

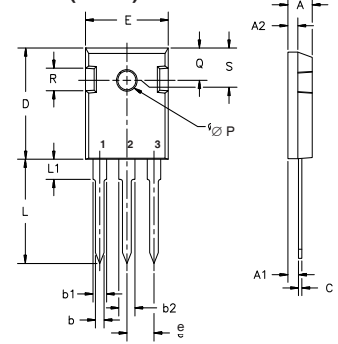
Symbol Test Conditions

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

Characteristic Values

Symbol	Test Conditions	Min.	Typ.	Max.
g_{fs}	$I_C = 40\text{A}$, $V_{CE} = 10\text{V}$, Note 1	12	20	S
C_{ies}	$V_{CE} = 25\text{V}$, $V_{GE} = 0\text{V}$, $f = 1\text{MHz}$		1880	pF
C_{oes}			225	pF
C_{res}			40	pF
$Q_{g(on)}$	$I_C = 40\text{A}$, $V_{GE} = 15\text{V}$, $V_{CE} = 0.5 \cdot V_{CES}$		85	nC
Q_{ge}			14	nC
Q_{gc}			38	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = 40\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 0.5 \cdot V_{CES}$, $R_G = 10\Omega$ Note 2		24	ns
t_{ri}			60	ns
E_{on}			3.90	mJ
$t_{d(off)}$			125	ns
t_{fi}			38	ns
E_{off}			0.66	mJ
$t_{d(on)}$	Inductive load, $T_J = 125^\circ\text{C}$ $I_C = 40\text{A}$, $V_{GE} = 15\text{V}$ $V_{CE} = 0.5 \cdot V_{CES}$, $R_G = 10\Omega$ Note 2		27	ns
t_{ri}			72	ns
E_{on}			8.20	mJ
$t_{d(off)}$			140	ns
t_{fi}			38	ns
E_{off}			0.70	mJ
R_{thJC}				0.26 $^\circ\text{C/W}$
R_{thCS}			0.21	$^\circ\text{C/W}$

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}	$I_F = 30\text{A}$, $V_{GE} = 0\text{V}$, $-di_F/dt = 100\text{A}/\mu\text{s}$, $T_J = 100^\circ\text{C}$ $V_R = 600\text{V}$, $T_J = 100^\circ\text{C}$		195	9 A
t_{rr}				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 $V_{CE}(\text{clamp})$, 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 @ $T_J = 25^\circ\text{C}$

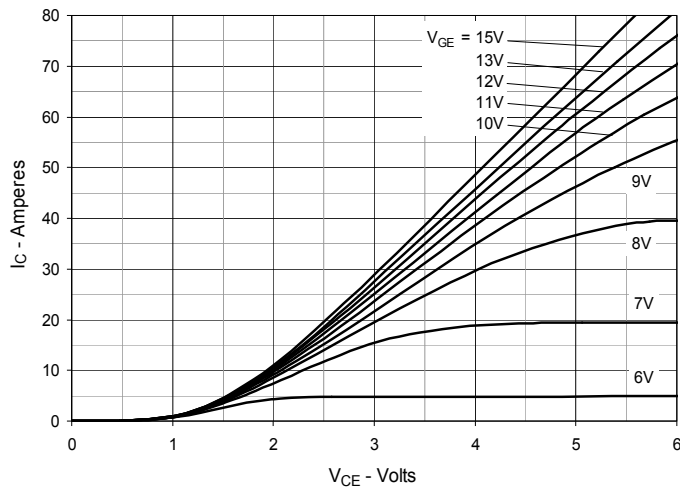


Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$

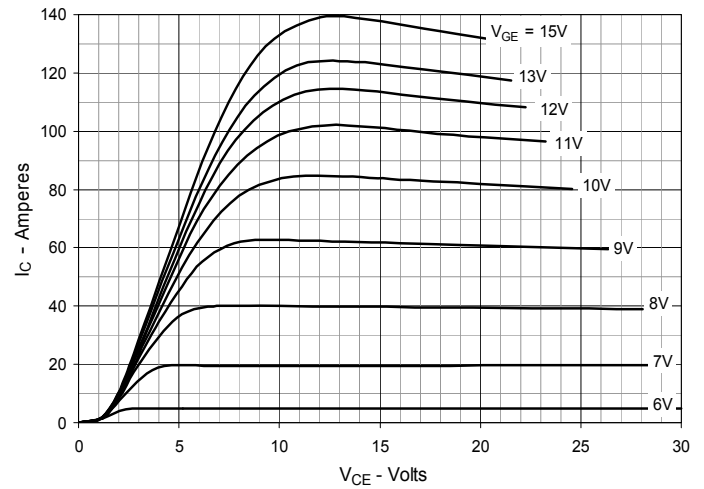


Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$

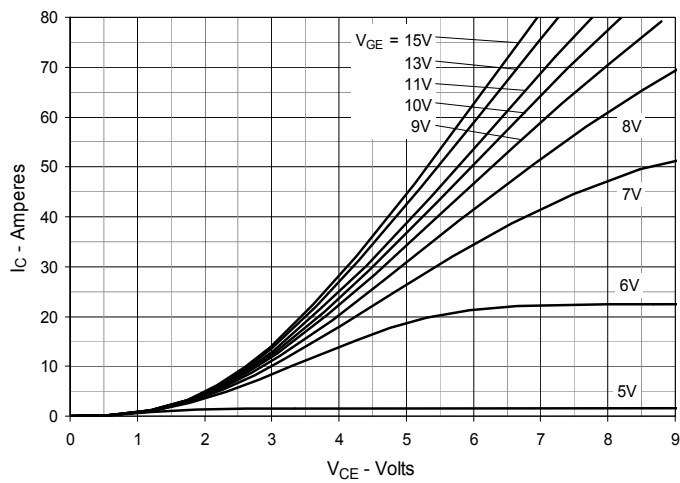


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

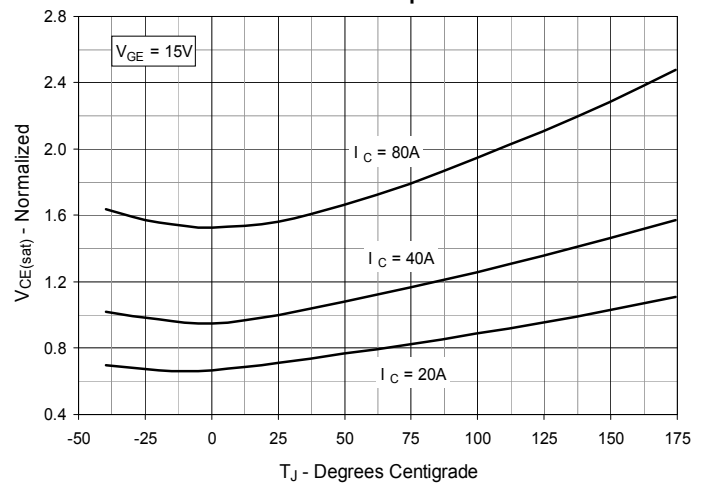


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

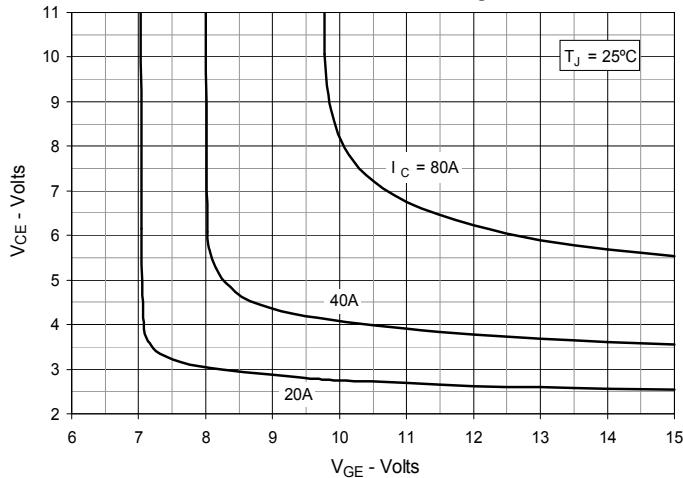


Fig. 6. Input Admittance

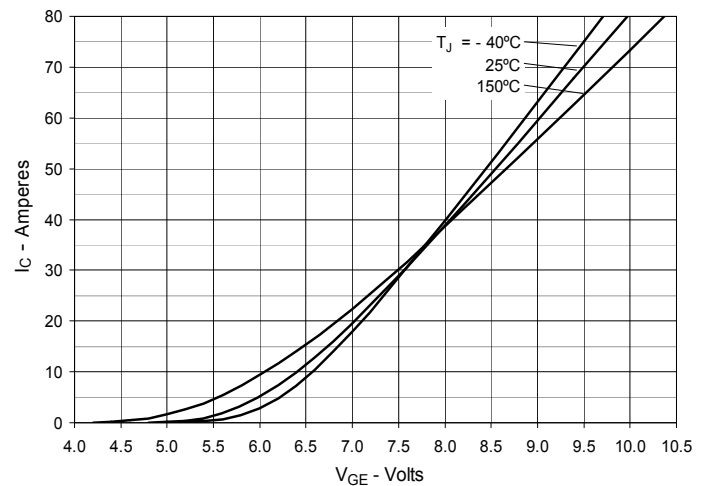


Fig. 7. Transconductance

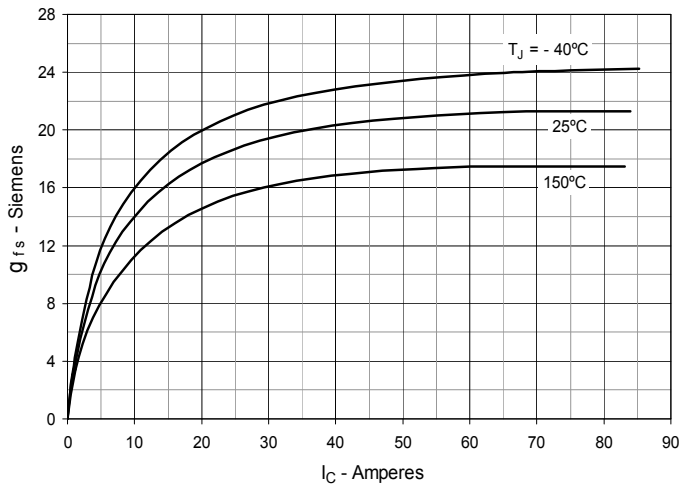


Fig. 8. Gate Charge

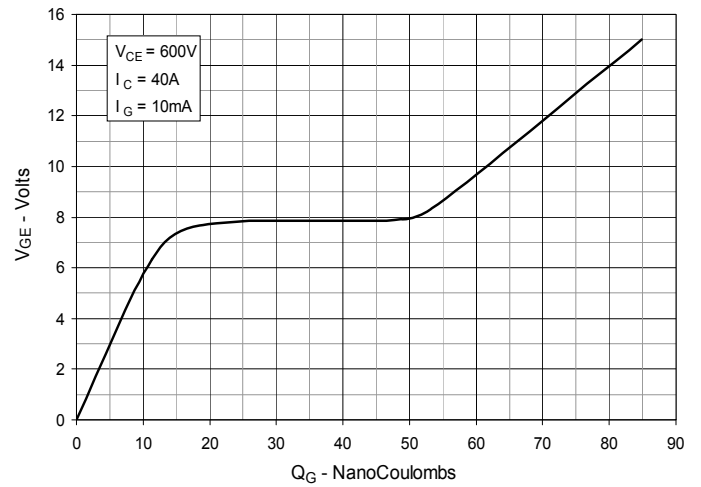


Fig. 9. Capacitance

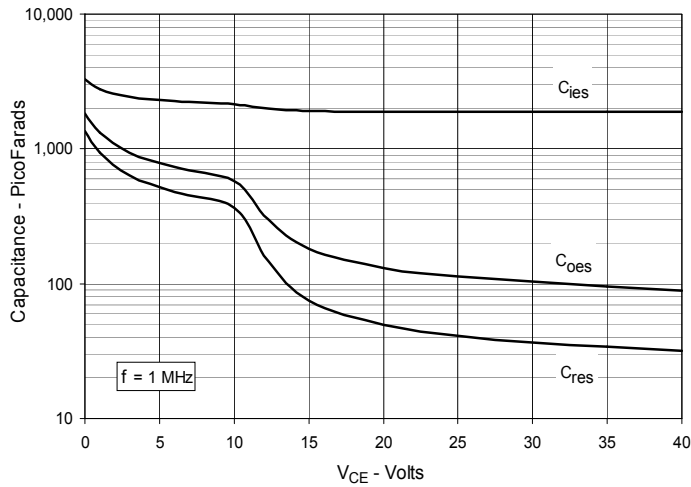


Fig. 10. Reverse-Bias Safe Operating Area

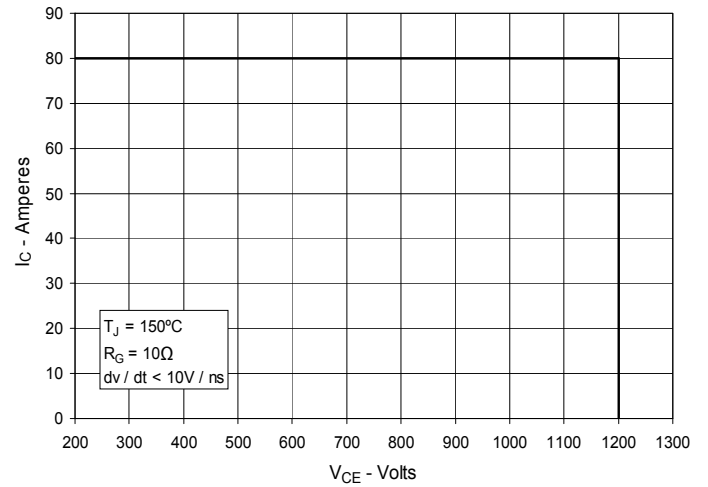


Fig. 11. Maximum Transient Thermal Impedance

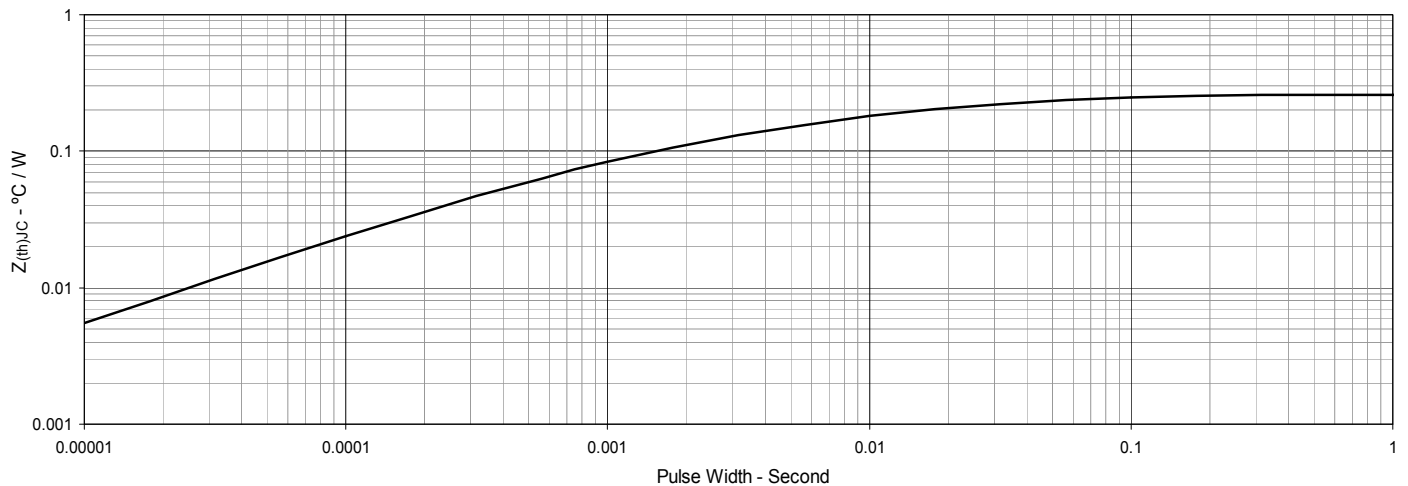


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

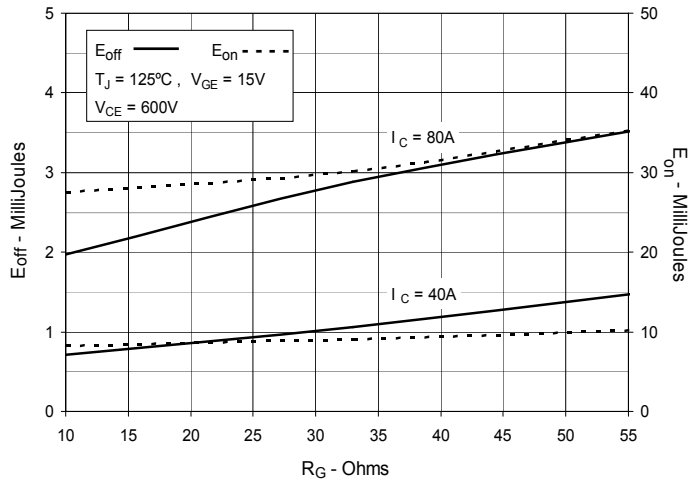


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

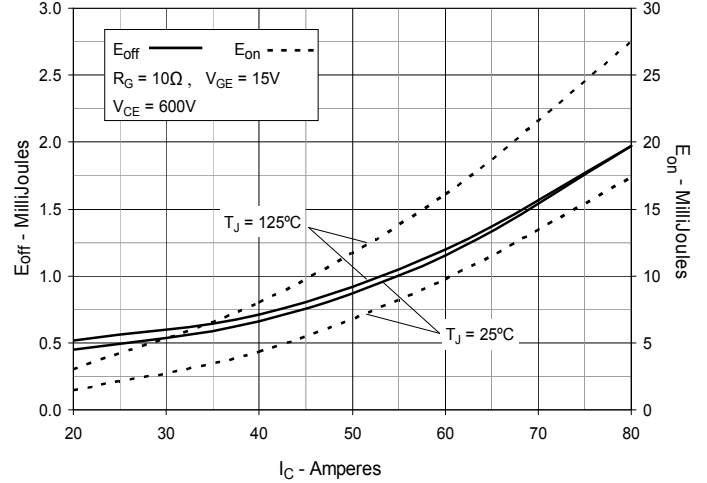


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

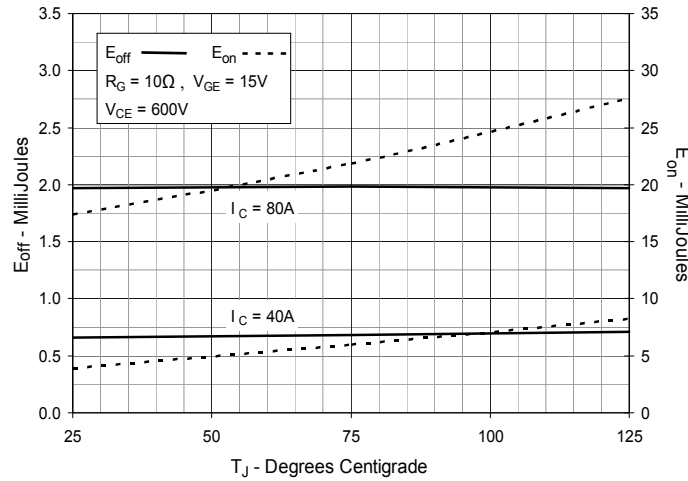


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

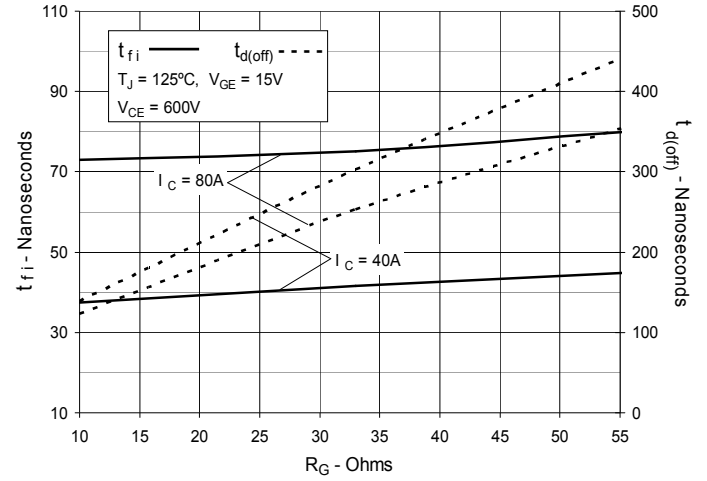


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

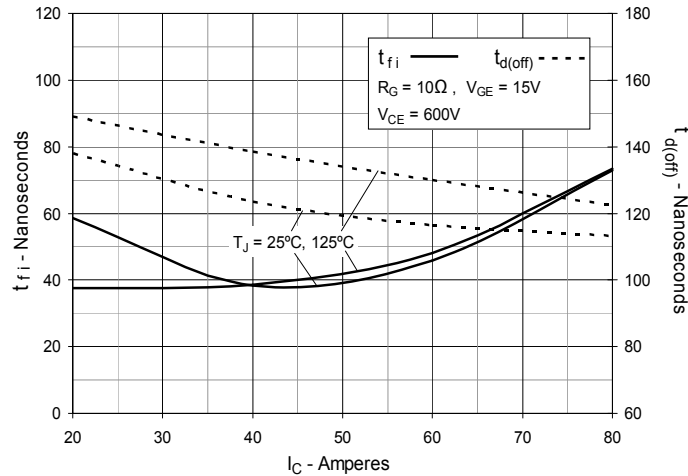


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

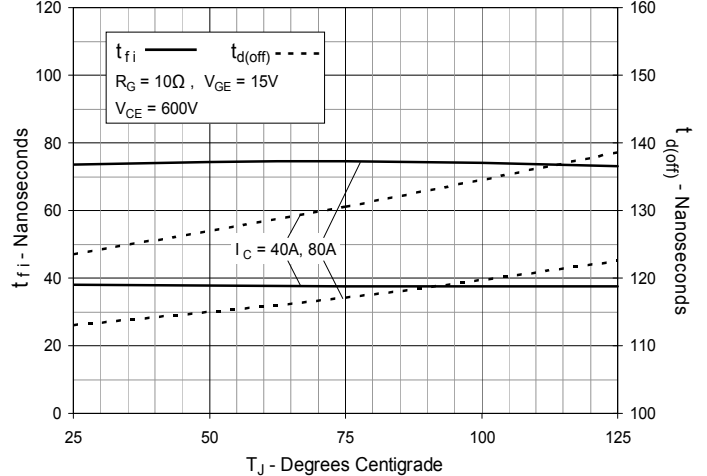


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

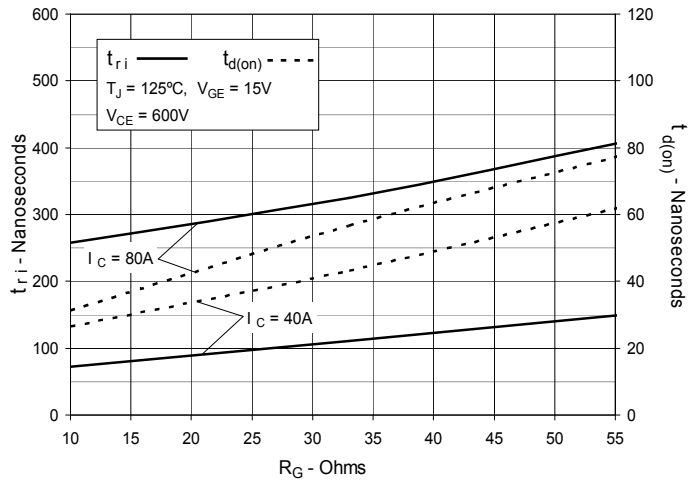


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

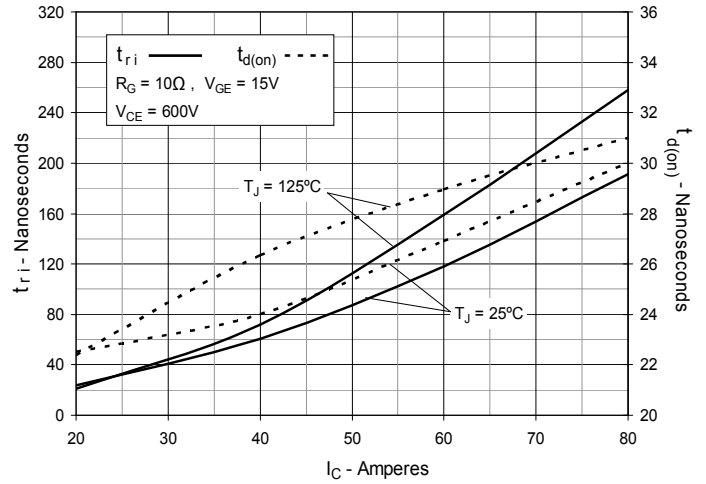


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

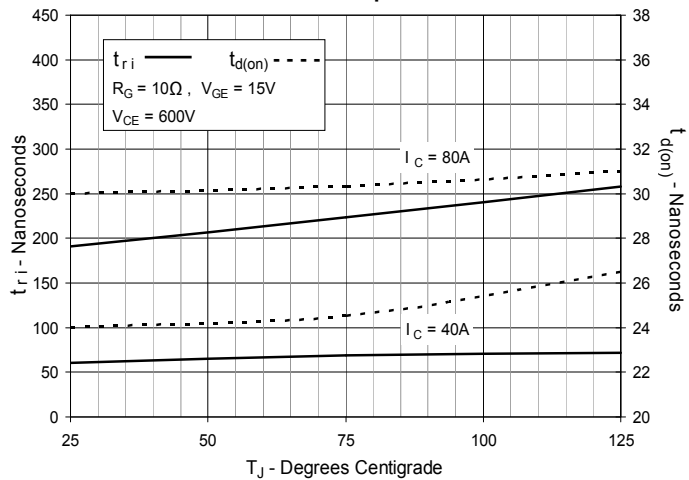


Fig. 21. Maximum Transient Thermal Impedance (Diode)

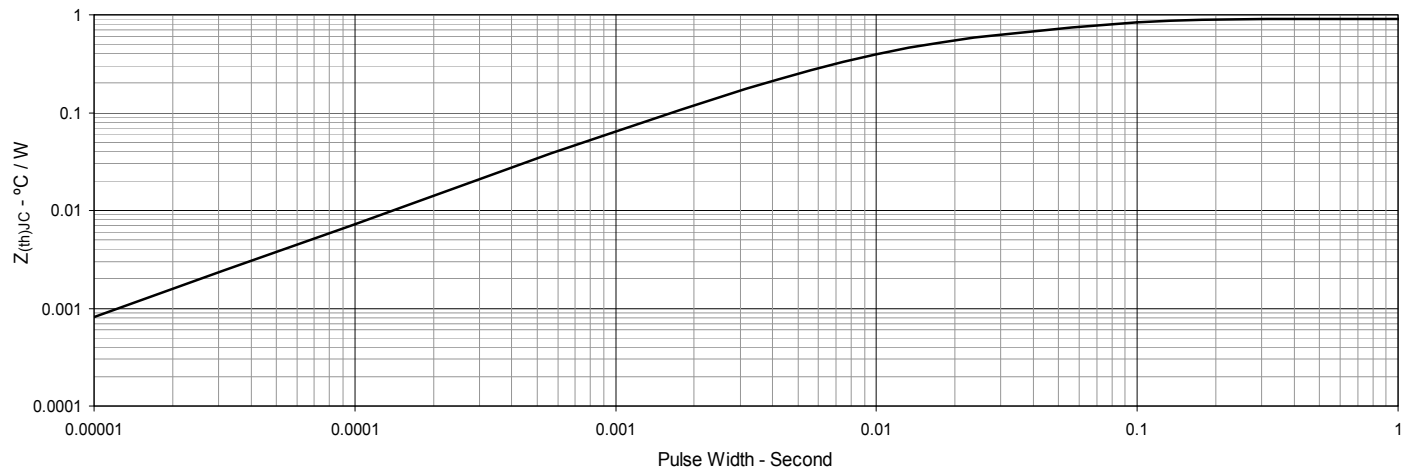
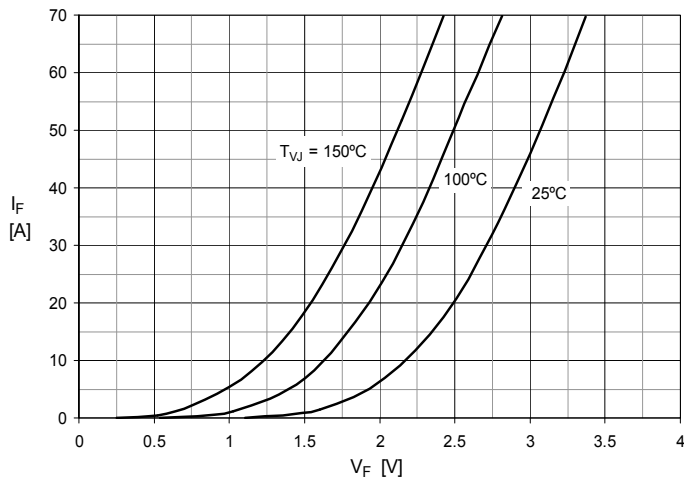
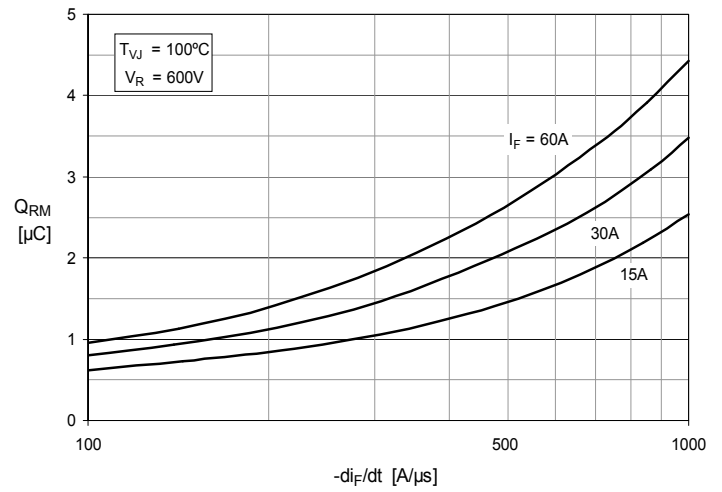
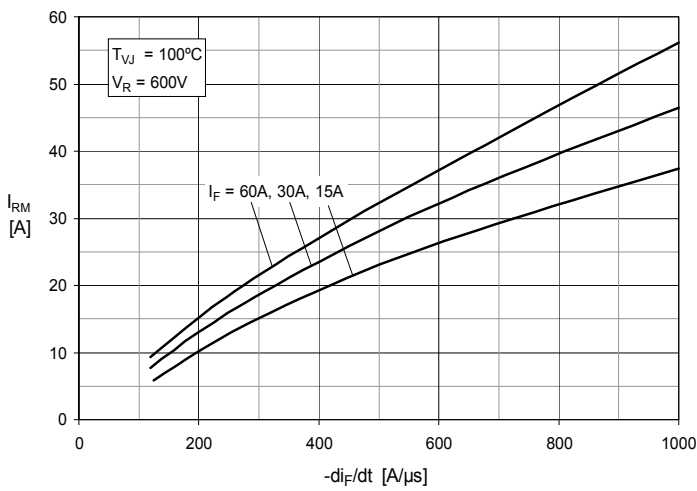
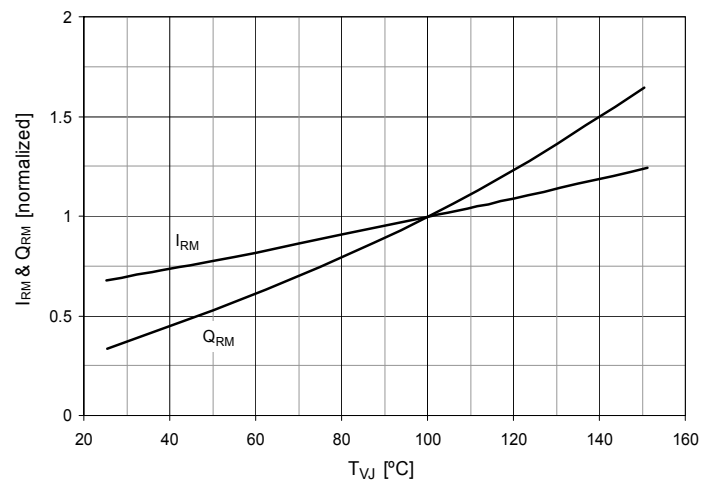
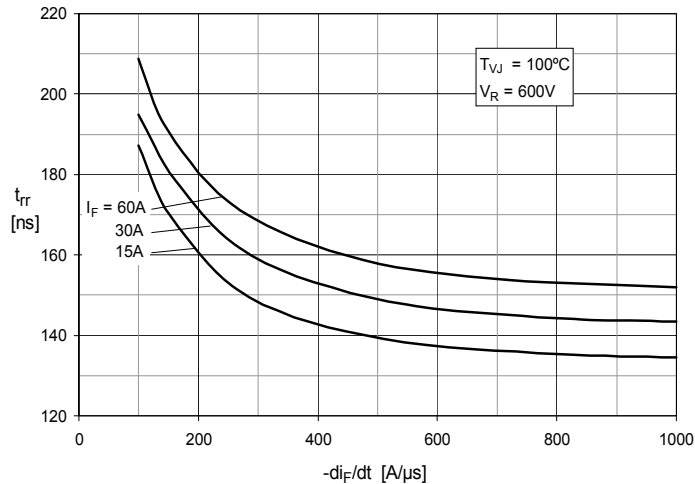


Fig. 22. Forward Current I_F vs V_F

Fig. 23. Reverse Recovery Charge Q_{RM} vs. $-di_F/dt$

Fig. 24. Peak Reverse Current I_{RM} vs. $-di_F/dt$

Fig. 25. Dynamic Parameters Q_{RM} , I_{RM} vs. T_{VJ}

Fig. 26. Recovery Time t_{rr} vs. $-di_F/dt$

Fig. 27. Peak Forward Voltage V_{FR} , t_{rr} vs $-di_F/dt$
