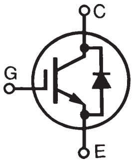
IXYS

1200V XPT™ IGBT GenX3™ w/ Diode

IXYH40N120B3D1

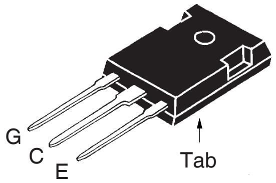
V_{CES} = 1200V
I_{C110} = 40A
$V_{CE(sat)} \leq$ 2.9V
$t_{fi(typ)}$ = 183ns

Extreme Light Punch Through
IGBT for 5-30 kHz Switching



Symbol	Test Conditions	Maximum Ratings	
V_{CES}	T_J = 25°C to 150°C	1200	V
V_{CGR}	T_J = 25°C to 150°C, R_{GE} = 1MΩ	1200	V
V_{GES}	Continuous	±20	V
V_{GEM}	Transient	±30	V
I_{C25}	T_C = 25°C (Chip Capability)	86	A
I_{C110}	T_C = 110°C	40	A
I_{F110}	T_C = 110°C	25	A
I_{CM}	T_C = 25°C, 1ms	180	A
I_A	T_C = 25°C	20	A
E_{AS}	T_C = 25°C	400	mJ
SSOA **(RBSOA)**	V_{GE} = 15V, T_{VJ} = 150°C, R_G = 10Ω Clamped Inductive Load	I_{CM} = 80 @$V_{CE} \leq V_{CES}$	A
P_C	T_C = 25°C	480	W
T_J		-55 ... +150	°C
T_{JM}		150	°C
T_{stg}		-55 ... +150	°C
T_L	Maximum Lead Temperature for Soldering	300	°C
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	°C
M_d	Mounting Torque	1.13/10	Nm/lb.in.
Weight		6	g

TO-247 AD



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

Features

- Optimized for 5-30kHZ Switching
- Square RBSOA
- Positive Thermal Coefficient of Vce(sat)
- Anti-Parallel Ultra Fast Diode
- Avalanche Rated
- International Standard Package

Advantages

- High Power Density
- Low Gate Drive Requirement

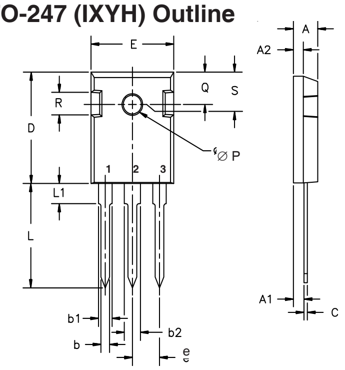
Applications

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

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 = 250µA, V_{CE} = V_{GE}	3.0		5.0	V
I_{CES}	V_{CE} = V_{CES}, V_{GE} = 0V			50	µA
	T_J = 125°C			500	µA
I_{GES}	V_{CE} = 0V, V_{GE} = ±20V			±100	nA
$V_{CE(sat)}$	I_C = 40A, V_{GE} = 15V, Note 1		2.4	2.9	V
	T_J = 150°C		3.1		V

Symbol	Test Conditions ($T_J = 25°C$ Unless Otherwise Specified)	Characteristic Values Min.	 Typ.	 Max.	
g_{fs}	$I_C = 40A$, $V_{CE} = 10V$, Note 1	13	22		S
C_{ies}	$V_{CE} = 25V$, $V_{GE} = 0V$, f = 1MHz		1690		pF
C_{oes}			157		pF
C_{res}			47		pF
$Q_{g(on)}$	$I_C = 40A$, $V_{GE} = 15V$, $V_{CE} = 0.5 \bullet V_{CES}$		87		nC
Q_{ge}			12		nC
Q_{gc}			38		nC
$t_{d(on)}$	**Inductive load, $T_J = 25°C$** $I_C = 40A$, $V_{GE} = 15V$ $V_{CE} = 0.5 \bullet V_{CES}$, $R_G = 10\Omega$ Note 2		22		ns
t_{ri}			50		ns
E_{on}			2.70		mJ
$t_{d(off)}$			177		ns
t_{fi}			183		ns
E_{off}			1.60	3.00	mJ
$t_{d(on)}$	**Inductive load, $T_J = 125°C$** $I_C = 40A$, $V_{GE} = 15V$ $V_{CE} = 0.5 \bullet V_{CES}$, $R_G = 10\Omega$ Note 2		24		ns
t_{ri}			60		ns
E_{on}			5.25		mJ
$t_{d(off)}$			205		ns
t_{fi}			206		ns
E_{off}			2.05		mJ
R_{thJC}				0.26	°C/W
R_{thCS}			0.21		°C/W

TO-247 (IXYH) Outline



Terminals: 1 - Gate 2 - Collector
3 - Emitter

Dim.	Millimeter Min.	 Max.	Inches 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
∅P	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)

($T_J = 25°C$, Unless Otherwise Specified)

Symbol	Test Conditions		Characteristic Value Min.	 Typ.	 Max.	
V_F	$I_F = 30A, V_{GE} = 0V$, Note 1				3.0	V
		$T_J = 150°C$		1.6		V
I_{RM}	$I_F = 30A, V_{GE} = 0V$, $-di_F/dt = 100A/\mu s$,	$T_J = 100°C$			4	A
t_{rr}	$V_R = 300V$	$T_J = 100°C$		100		ns
R_{thJC}					0.9	°C/W

Notes:

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

Fig. 1. Output Characteristics @ T_J = 25ºC

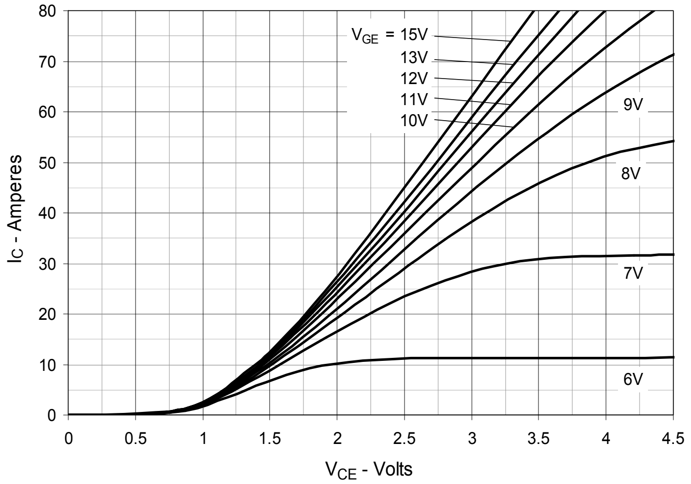


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

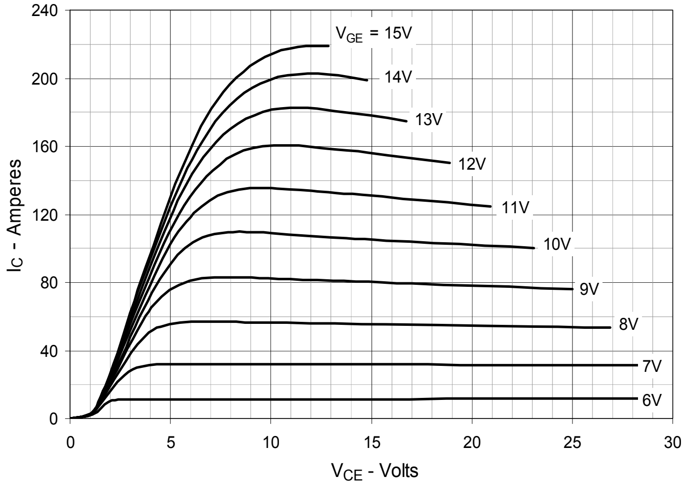


Fig. 3. Output Characteristics @ T_J = 150ºC

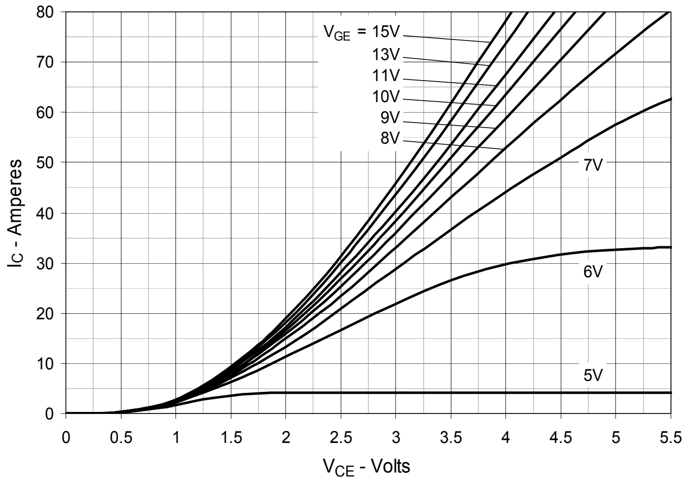


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

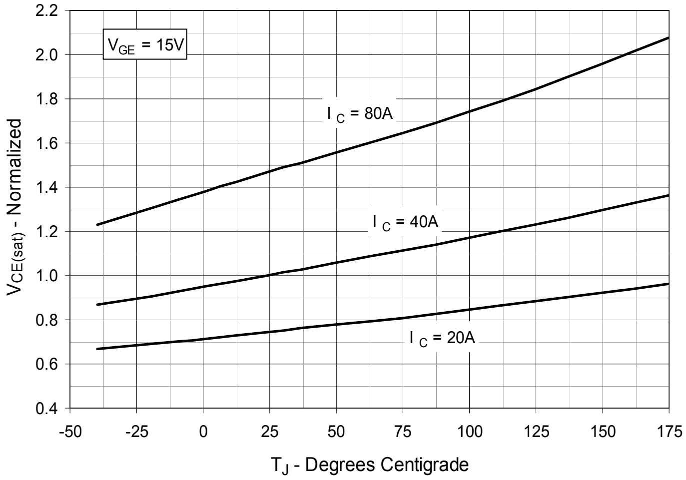


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

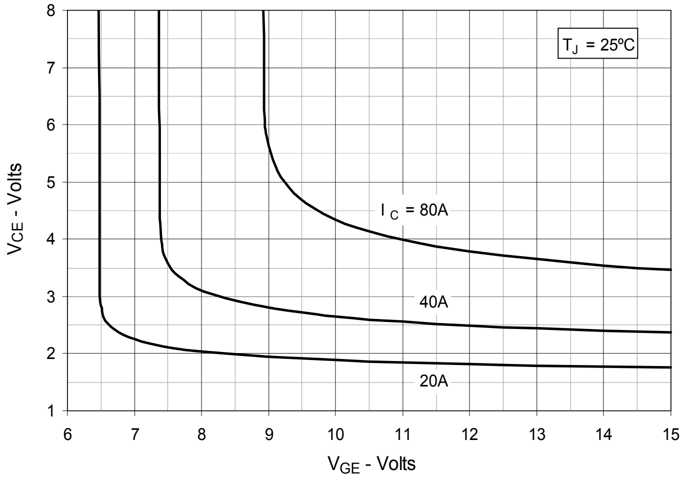


Fig. 6. Input Admittance

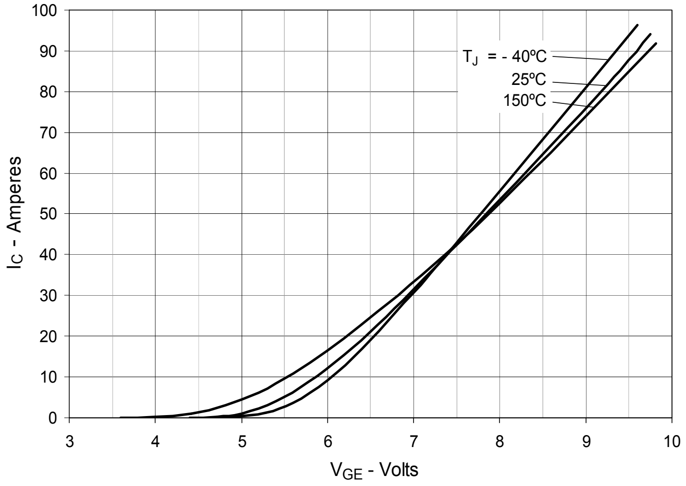


Fig. 7. Transconductance

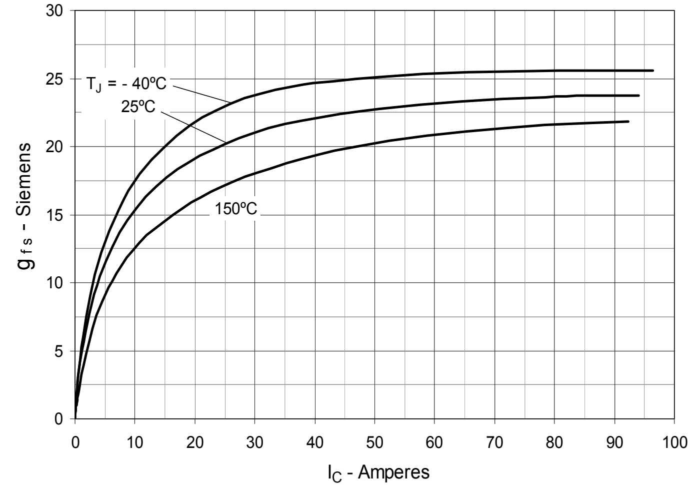


Fig. 8. Gate Charge

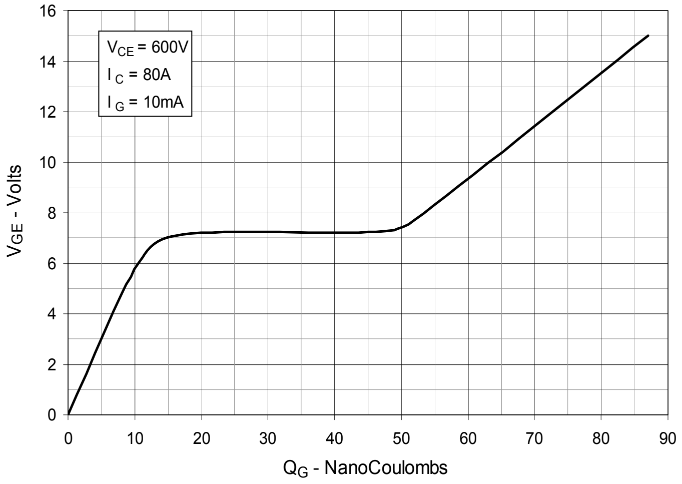


Fig. 9. Capacitance

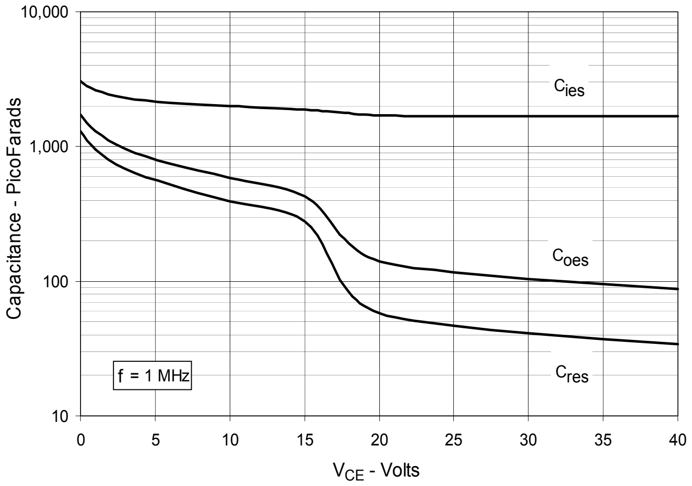


Fig. 10. Reverse-Bias Safe Operating Area

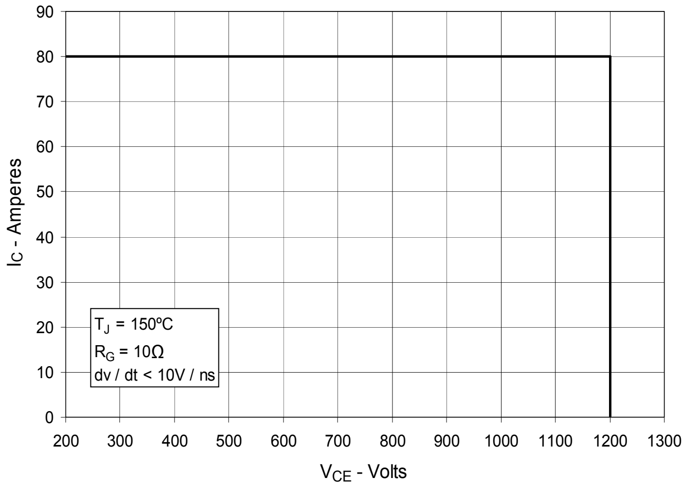


Fig. 11. Maximum Transient Thermal Impedance

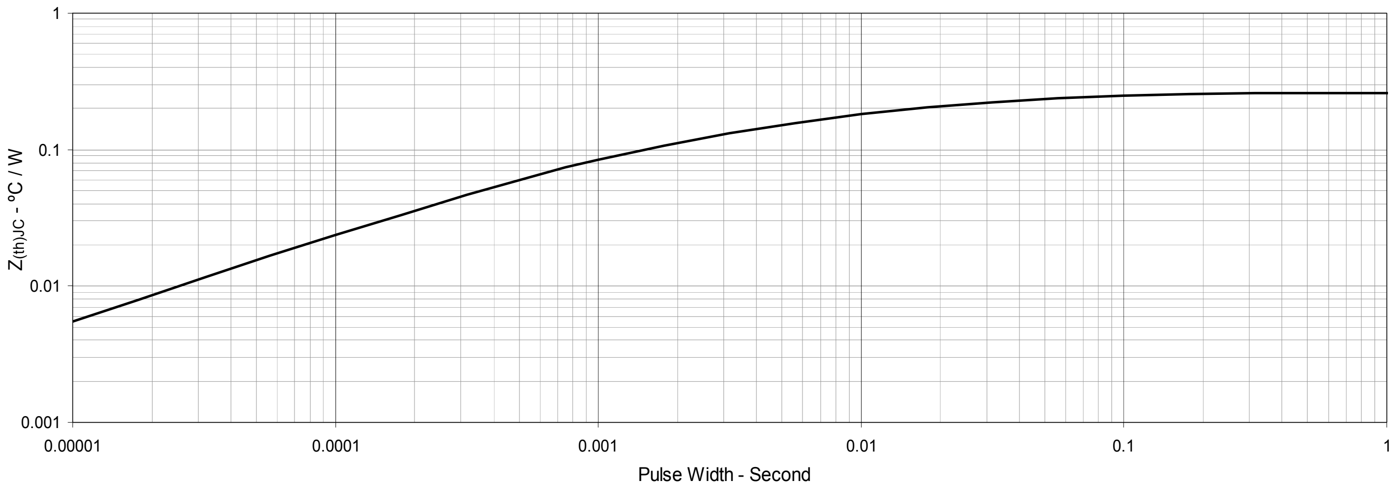


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

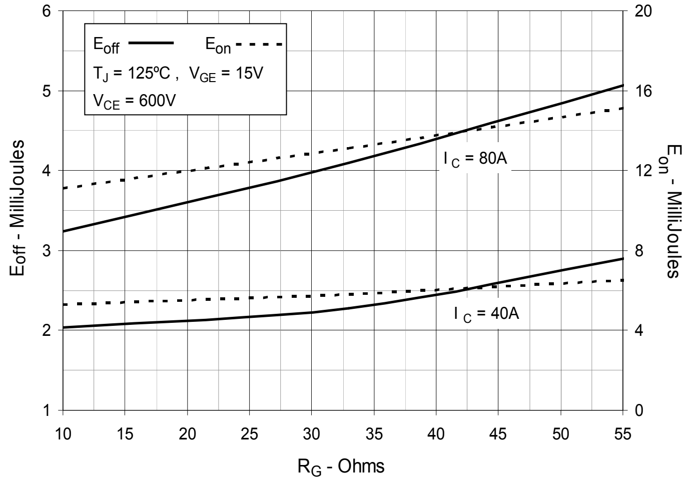


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

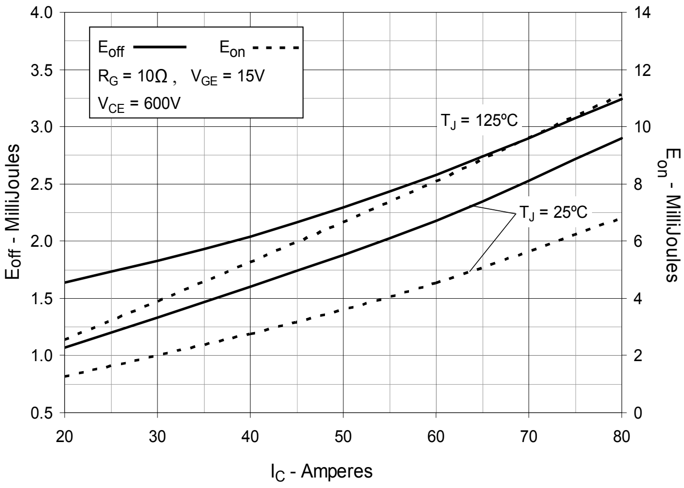


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

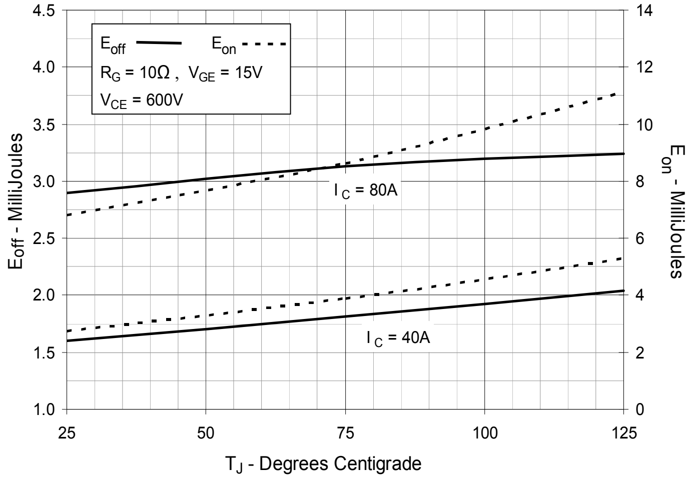


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

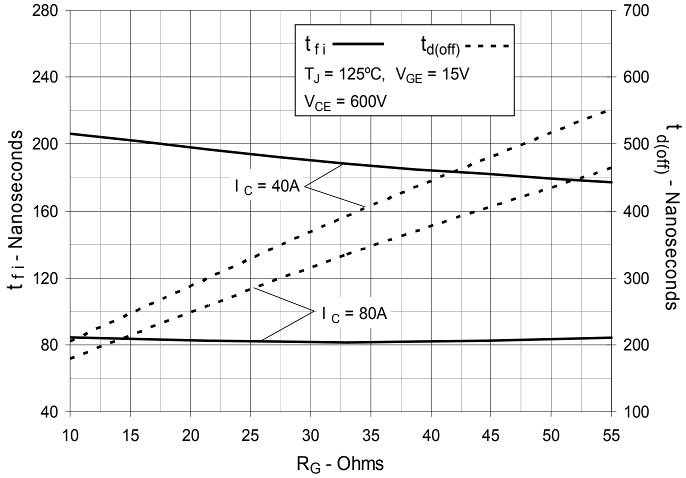


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

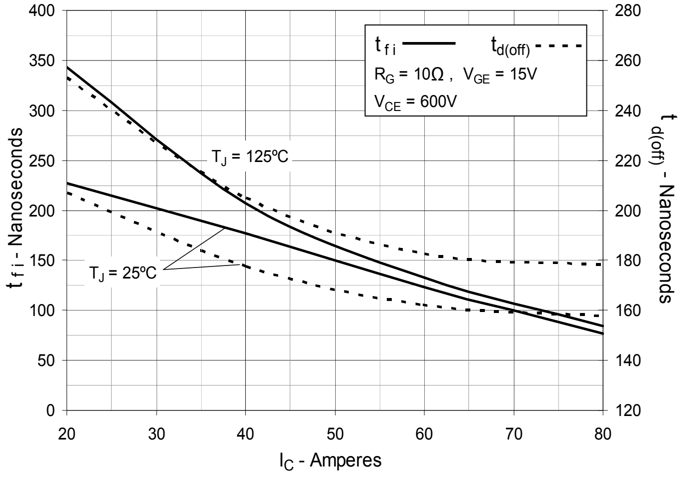


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

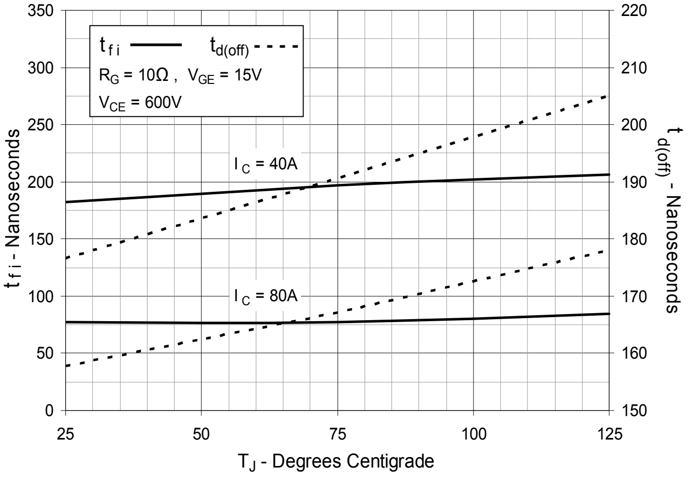


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

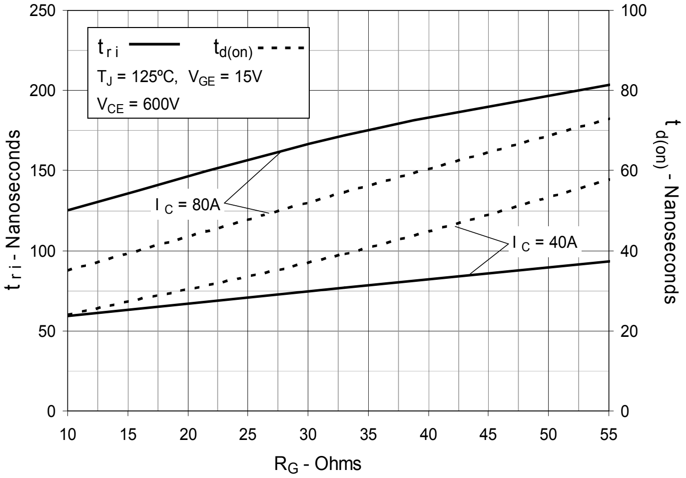


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

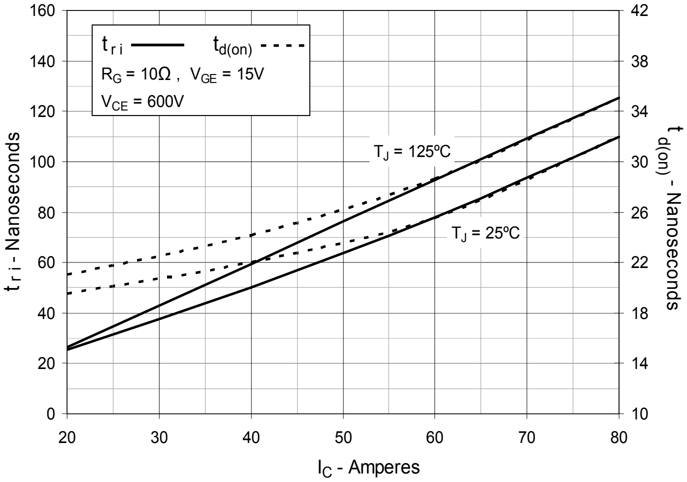
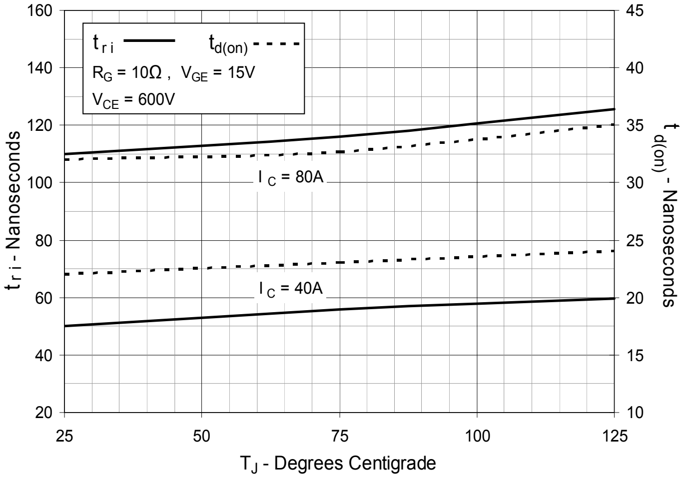


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature



IXYS REF: IXY_40N120B3(4A-C91) 11-10-11

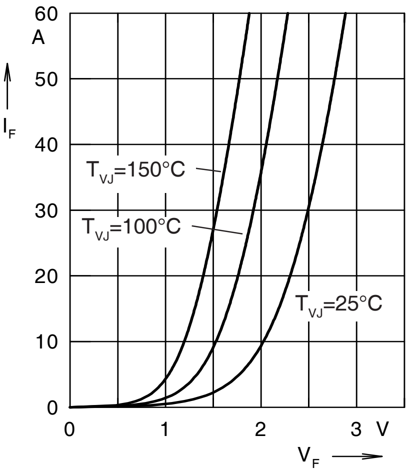


Fig. 21. Forward Current I_F Versus V_F

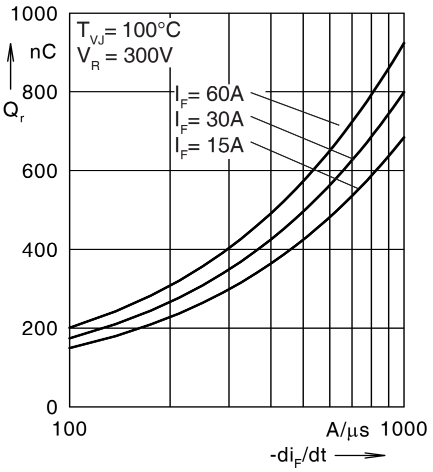


Fig. 22. Reverse Recovery Charge Q_r Versus $-di_F/dt$

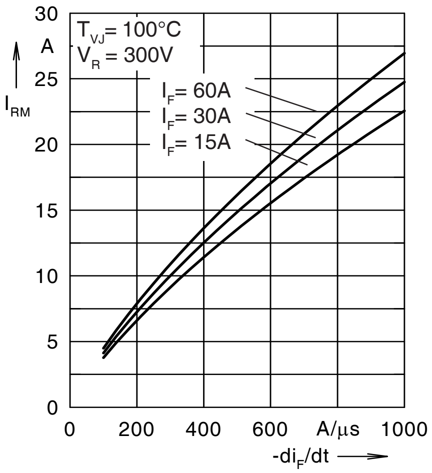


Fig. 23. Peak Reverse Current I_{RM} Versus $-di_F/dt$

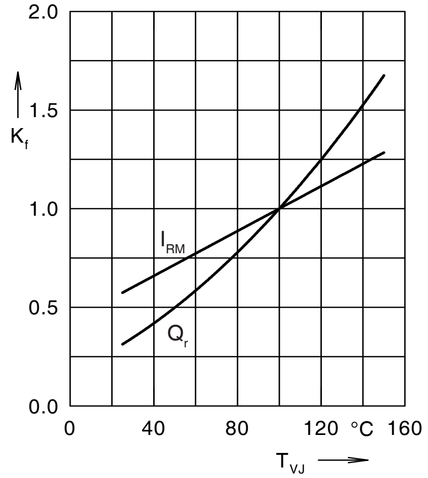


Fig. 24. Dynamic Parameters Q_r, I_{RM} Versus T_{VJ}

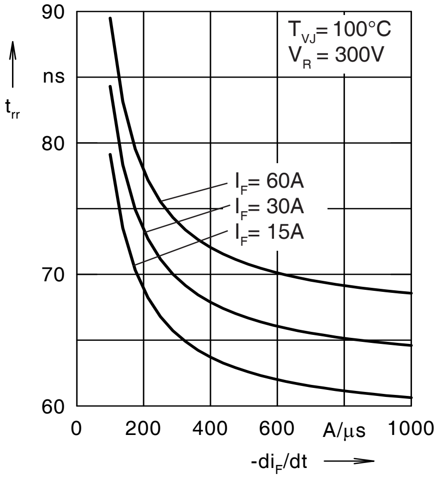


Fig. 25. Recovery Time t_{rr} Versus $-di_F/dt$

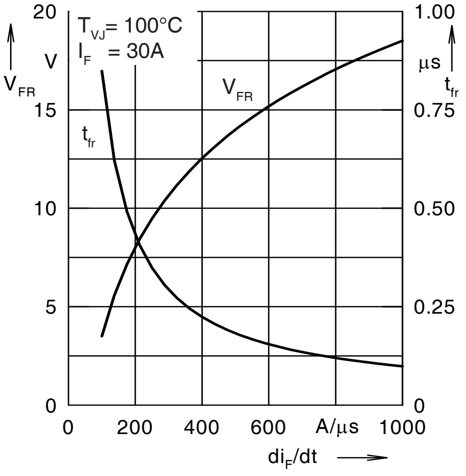


Fig. 26. Peak Forward Voltage V_{FR} and t_{fr} Versus di_F/dt

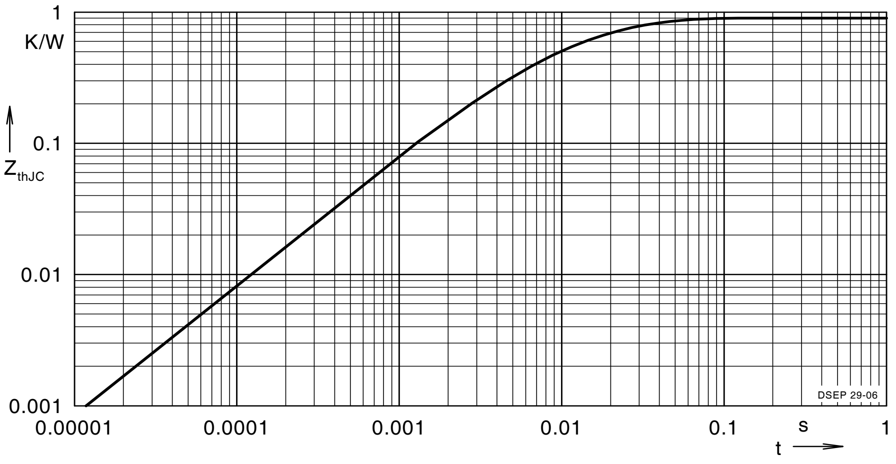


Fig. 27. Transient Thermal Resistance Junction to Case