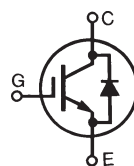


XPT™ 650V IGBT GenX4™ w/ Sonic Diode

IXXH80N65B4H1



Extreme Light Punch Through
IGBT for 5-30 kHz Switching

$$\begin{aligned} V_{CES} &= 650V \\ I_{C110} &= 80A \\ V_{CE(sat)} &\leq 2.1V \\ t_{fi(typ)} &= 52ns \end{aligned}$$

Symbol	Test Conditions	Maximum Ratings	
V_{CES}	$T_J = 25^\circ\text{C to } 175^\circ\text{C}$	650	V
V_{CGR}	$T_J = 25^\circ\text{C to } 175^\circ\text{C}, R_{GE} = 1M\Omega$	650	V
V_{GES}	Continuous	± 20	V
V_{GEM}	Transient	± 30	V
I_{C25}	$T_C = 25^\circ\text{C (Chip Capability)}$	160	A
I_{C110}	$T_C = 110^\circ\text{C}$	80	A
I_{F110}	$T_C = 110^\circ\text{C}$	62	A
I_{CM}	$T_C = 25^\circ\text{C}, 1\text{ms}$	430	A
SSOA (RBSOA)	$V_{GE} = 15V, T_{VJ} = 150^\circ\text{C}, R_G = 3\Omega$ Clamped Inductive Load	$I_{CM} = 160$ $@ V_{CE} \leq V_{CES}$	A
t_{sc} (SCSOA)	$V_{GE} = 15V, V_{CE} = 360V, T_J = 150^\circ\text{C}$ $R_G = 82\Omega, \text{Non Repetitive}$	10	μs
P_C	$T_C = 25^\circ\text{C}$	625	W
T_J		-55 ... +175	$^\circ\text{C}$
T_{JM}		175	$^\circ\text{C}$
T_{stg}		-55 ... +175	$^\circ\text{C}$
T_L	Maximum Lead Temperature for Soldering	300	$^\circ\text{C}$
T_{SOLD}	1.6 mm (0.062in.) from Case for 10s	260	$^\circ\text{C}$
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 5-30kHz Switching
- Square RBSOA
- Anti-Parallel Sonic Diode
- Short Circuit Capability
- International Standard Package

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

Symbol	Test Conditions ($T_J = 25^\circ\text{C}$, Unless Otherwise Specified)	Characteristic Values		
		Min.	Typ.	Max.
BV_{CES}	$I_C = 250\mu\text{A}, V_{GE} = 0V$	650		V
$V_{GE(th)}$	$I_C = 250\mu\text{A}, V_{CE} = V_{GE}$	4.0		6.5 V
I_{CES}	$V_{CE} = V_{CES}, V_{GE} = 0V$ $T_J = 150^\circ\text{C}$			50 μA 4 mA
I_{GES}	$V_{CE} = 0V, V_{GE} = \pm 20V$			± 100 nA
$V_{CE(sat)}$	$I_C = 80A, V_{GE} = 15V, \text{Note 1}$ $T_J = 150^\circ\text{C}$		1.65 2.00	2.10 V V

Symbol Test Conditions

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

Characteristic Values

		Min.	Typ.	Max.
g_{fs}	$I_C = 60\text{A}, V_{CE} = 10\text{V}, \text{Note 1}$	25	42	S
C_{ies}	$V_{CE} = 25\text{V}, V_{GE} = 0\text{V}, f = 1\text{MHz}$		3860	pF
C_{oes}			395	pF
C_{res}			58	pF
$Q_{g(on)}$	$I_C = 80\text{A}, V_{GE} = 15\text{V}, V_{CE} = 0.5 \cdot V_{CES}$		120	nC
Q_{ge}			32	nC
Q_{gc}			46	nC
$t_{d(on)}$	Inductive load, $T_J = 25^\circ\text{C}$ $I_C = 80\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2		26	ns
t_{ri}			103	ns
E_{on}			4.0	mJ
$t_{d(off)}$			122	ns
t_{fi}			52	ns
E_{off}			2.1	mJ
$t_{d(on)}$	Inductive load, $T_J = 150^\circ\text{C}$ $I_C = 80\text{A}, V_{GE} = 15\text{V}$ $V_{CE} = 400\text{V}, R_G = 3\Omega$ Note 2		23	ns
t_{ri}			100	ns
E_{on}			5.2	mJ
$t_{d(off)}$			145	ns
t_{fi}			102	ns
E_{off}			3.1	mJ
R_{thJC}			0.21	0.24°C/W
R_{thCS}				$^\circ\text{C/W}$

Reverse Sonic Diode (FRD)

Symbol Test Conditions

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

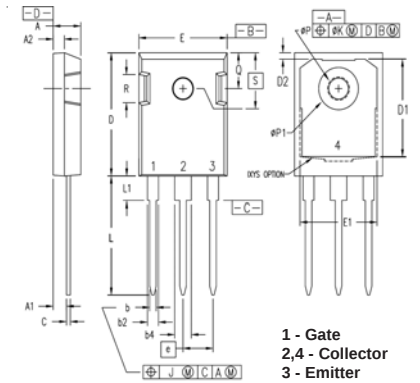
Characteristic Values

		Min.	Typ.	Max.
V_F	$I_F = 50\text{A}, V_{GE} = 0\text{V}, \text{Note 1}$			2.5 V
I_{RM}	$I_F = 50\text{A}, V_{GE} = 0\text{V}, -di_F/dt = 900\text{A}/\mu\text{s},$ $V_R = 300\text{V}$	$T_J = 150^\circ\text{C}$	1.8	V
t_{rr}		$T_J = 150^\circ\text{C}$ $T_J = 150^\circ\text{C}$	45 150	A ns
R_{thJC}				0.45°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 .

TO-247 (IXXH) Outline



SYM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.045	.055	1.14	1.40
b2	.075	.087	1.91	2.20
b4	.115	.126	2.92	3.20
C	.024	.031	0.61	0.80
D	.819	.840	20.80	21.34
D1	.650	.690	16.51	17.53
D2	.035	.050	0.89	1.27
E	.620	.635	15.75	16.13
E1	.545	.565	13.84	14.35
e	.215 BSC		5.45 BSC	
J	--	.010	--	0.25
K	--	.025	--	0.64
L	.780	.810	19.81	20.57
L1	.150	.170	3.81	4.32
L1	.140	.144	3.55	3.65
øP1	.275	.290	6.99	7.37
Q	.220	.244	5.59	6.20
R	.170	.190	4.32	4.83
S	.242 BSC		6.15 BSC	

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	

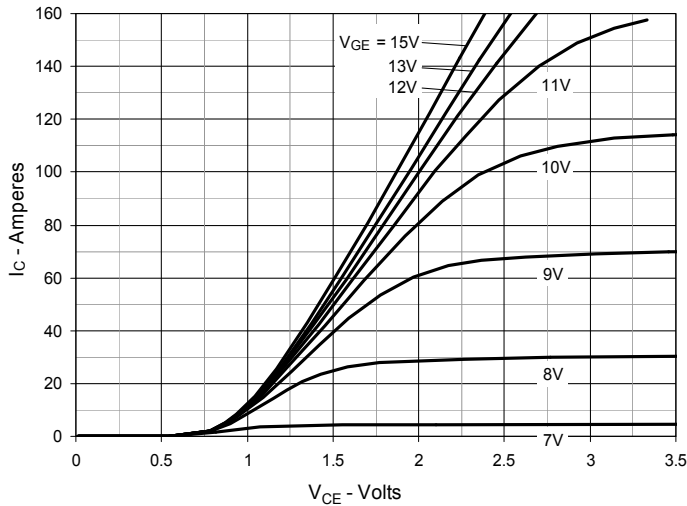
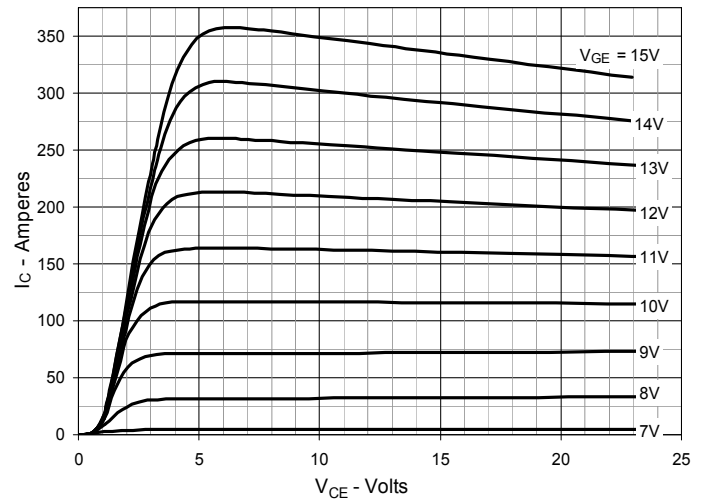
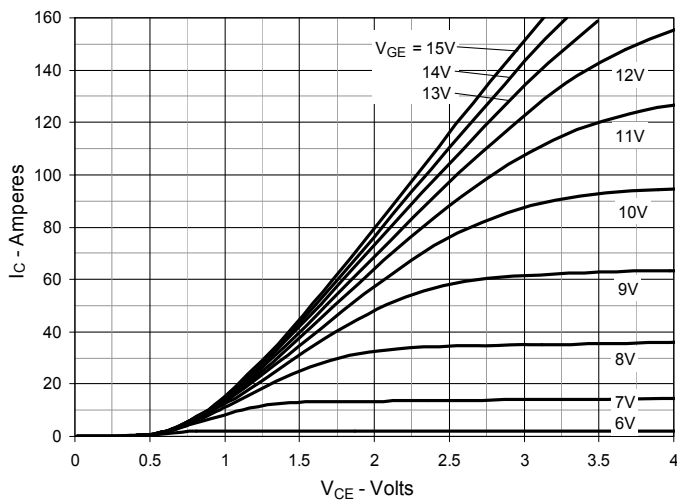
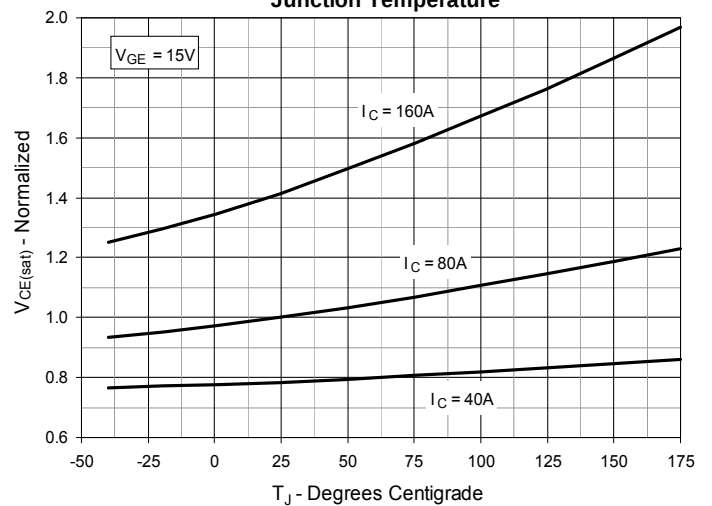
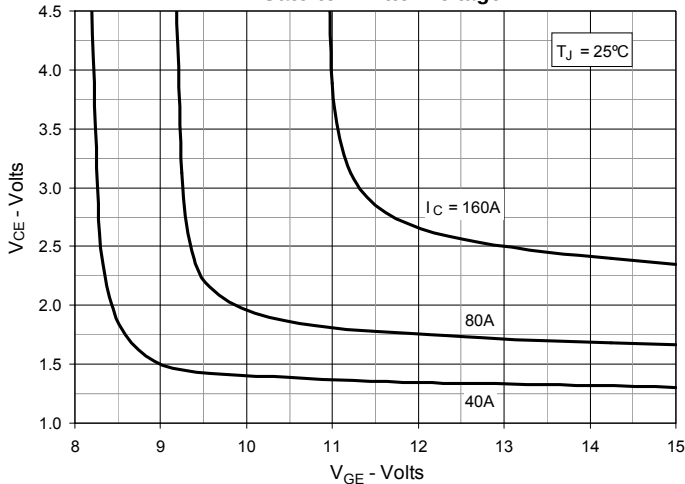
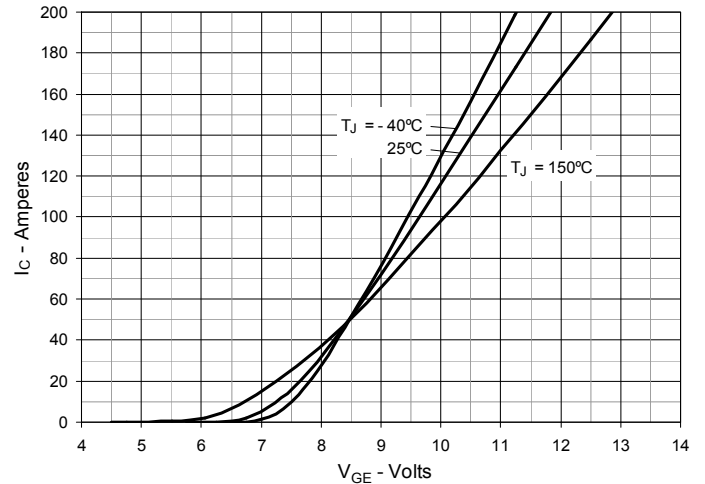
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$

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


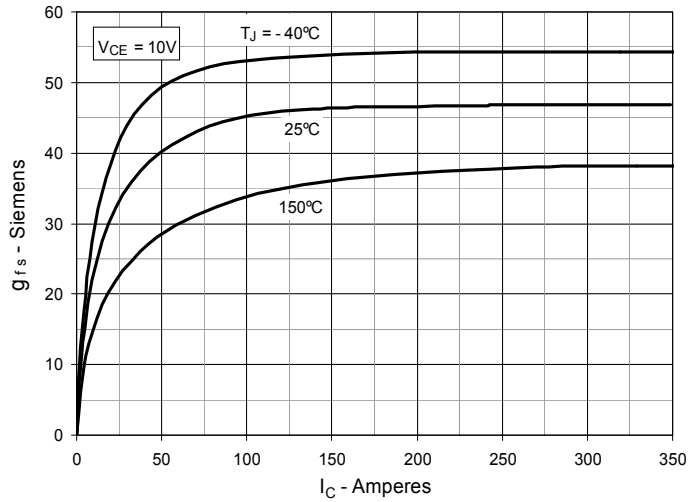
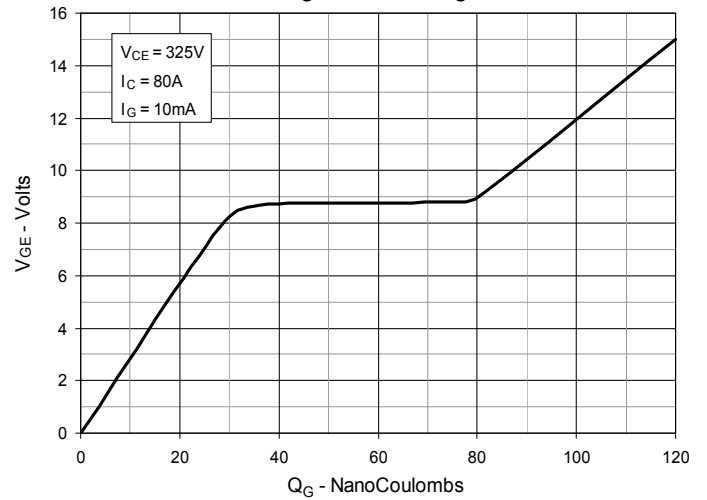
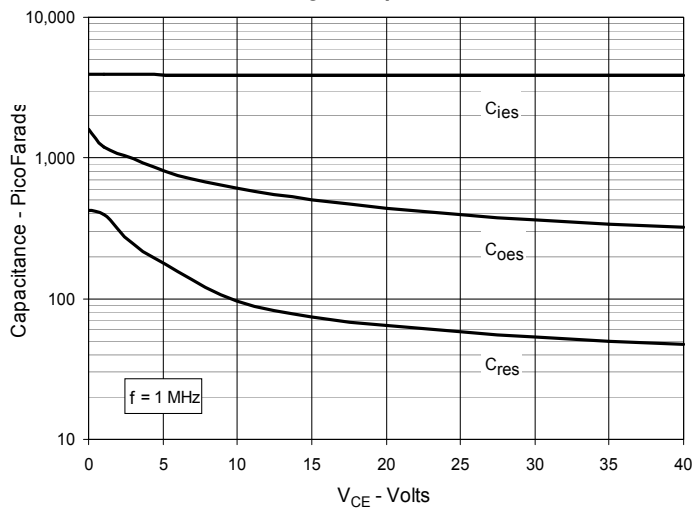
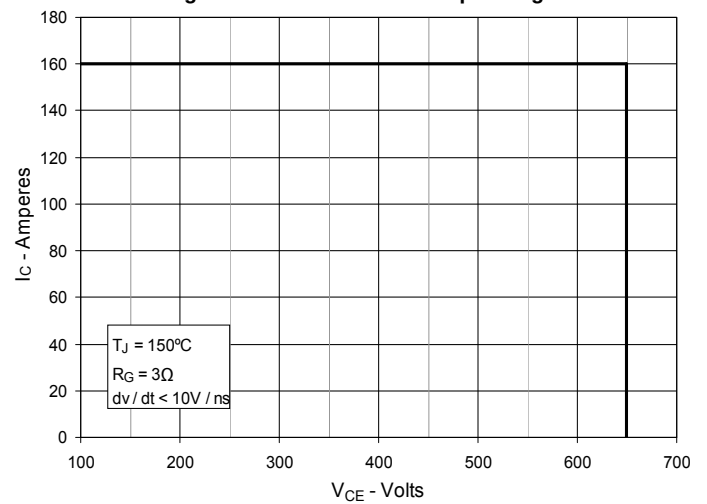
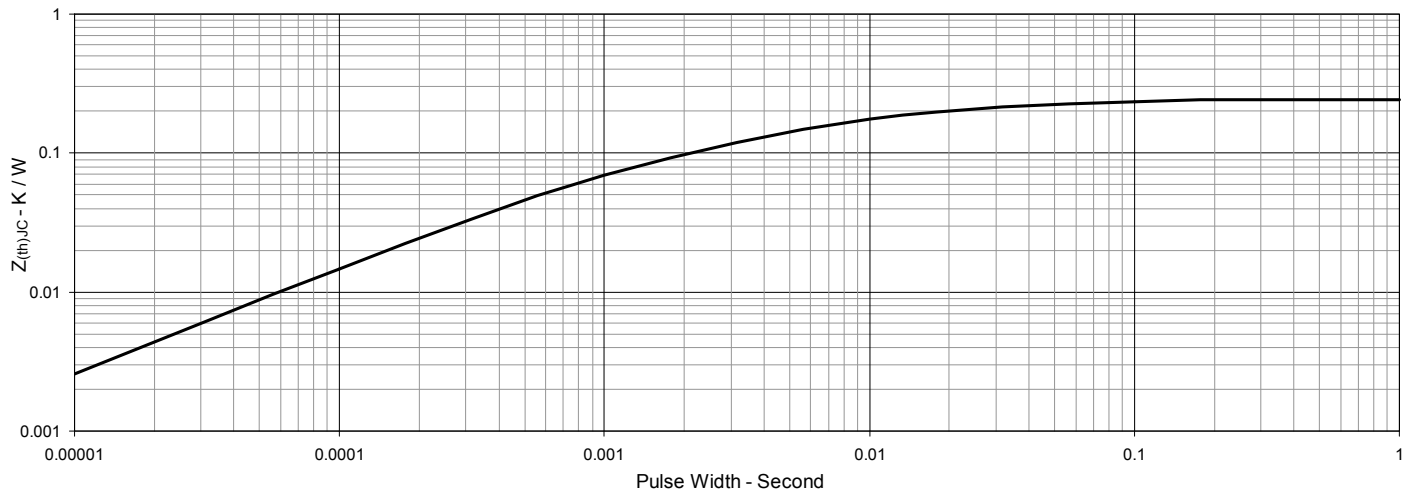
Fig. 7. Transconductance

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

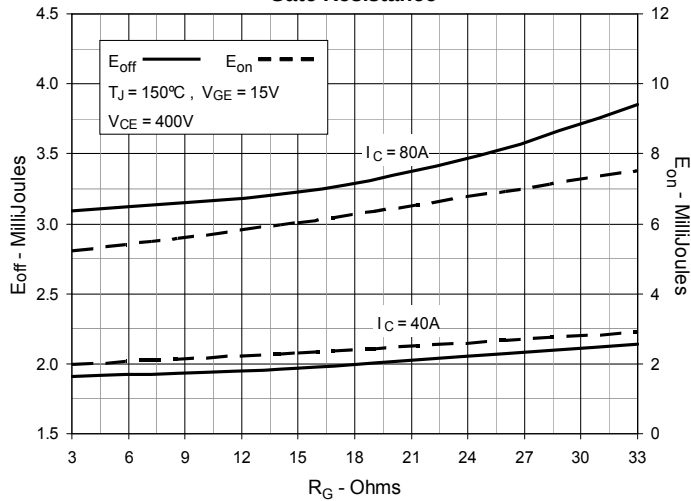


Fig. 13. Inductive Switching Energy Loss vs. Collector Current

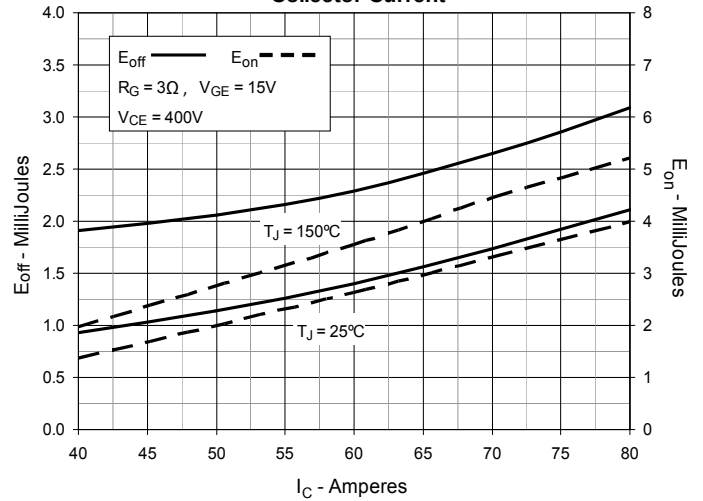


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

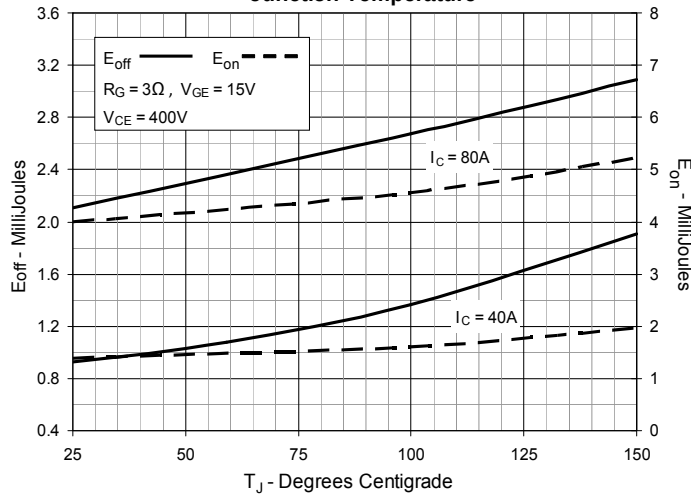


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

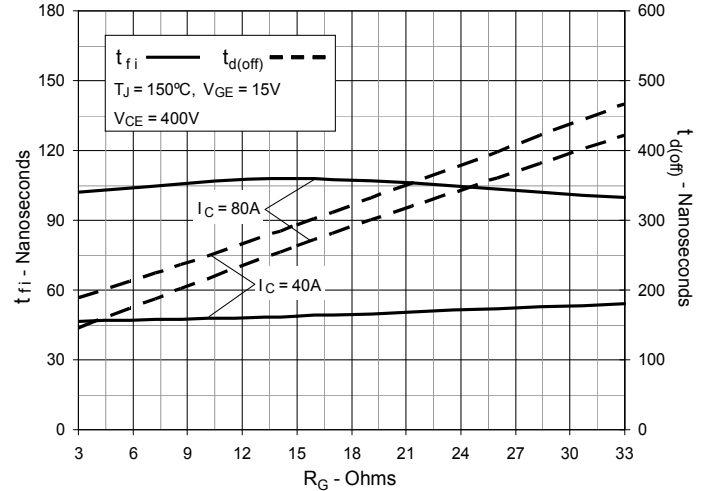


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

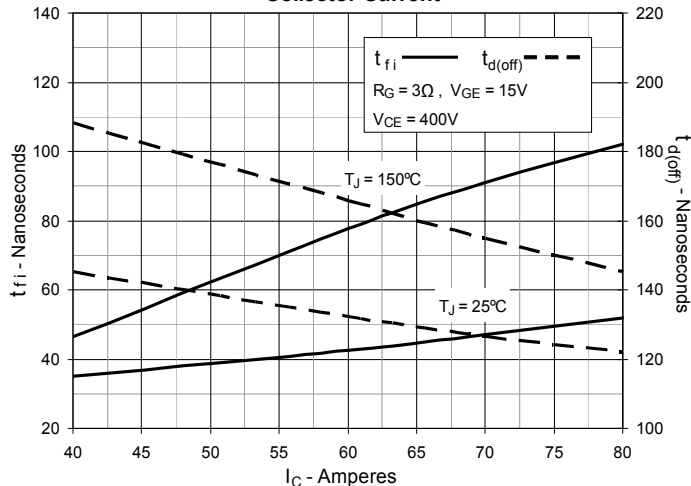


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

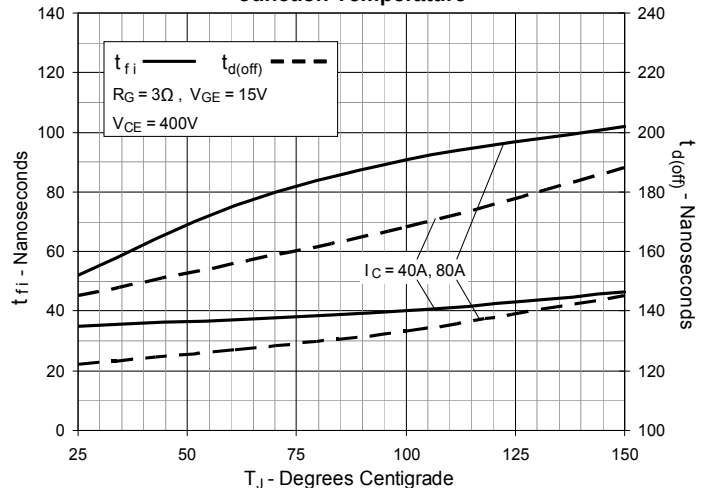


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

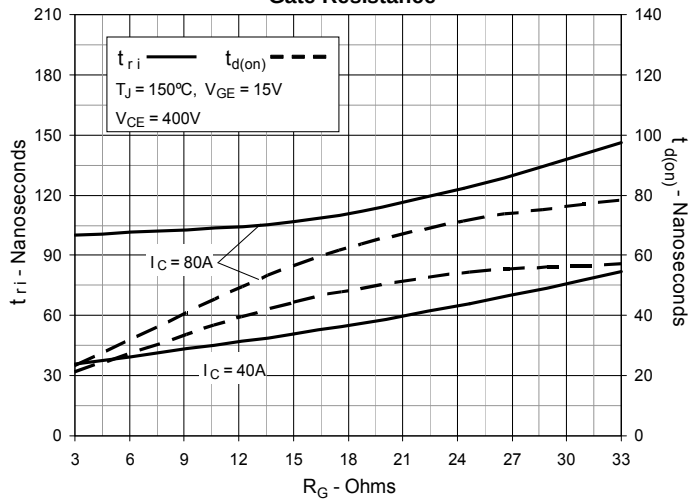


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

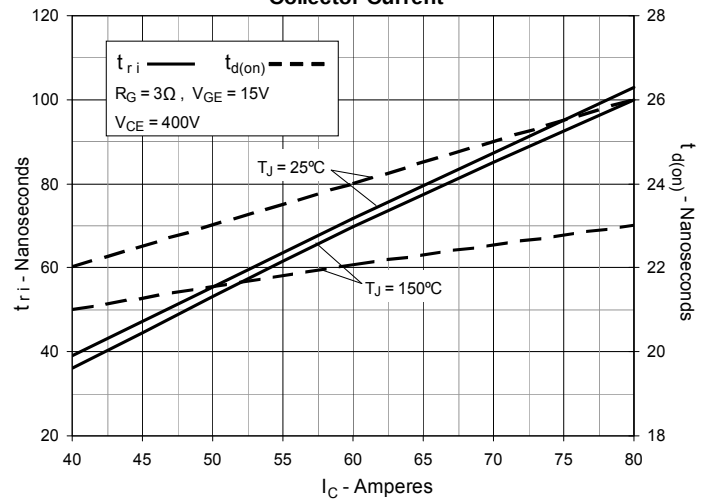


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

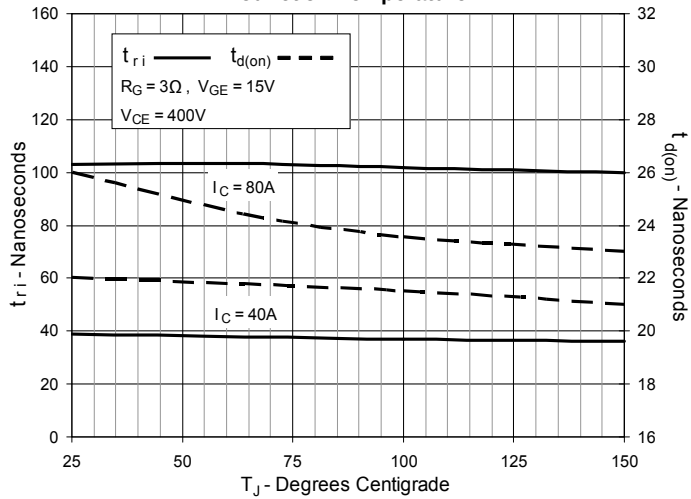


Fig. 21. Typ. Forward characteristics

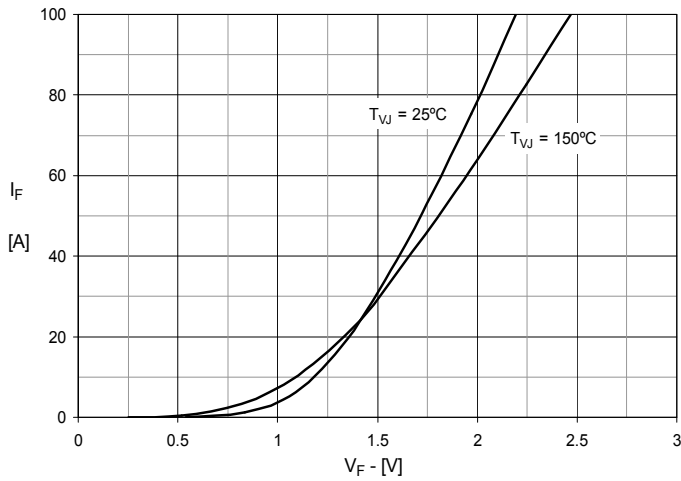


Fig. 22. Typ. Reverse Recovery Charge Q_{rr} vs. $-di_F/dt$

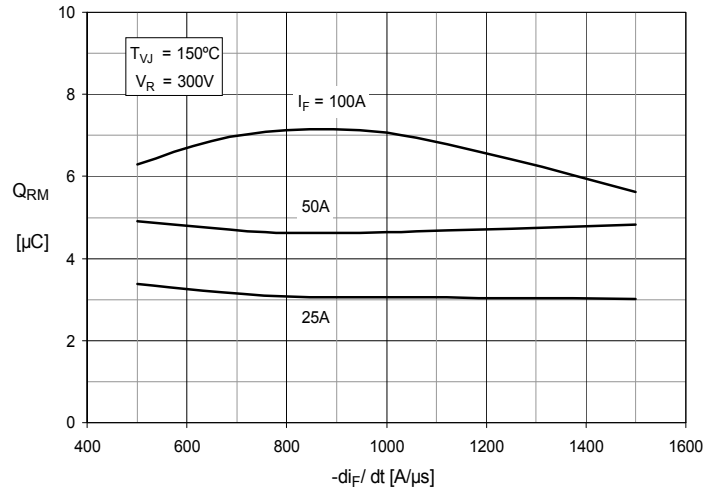


Fig. 23. Typ. Peak Reverse Current I_{RM} vs. $-di_F/dt$

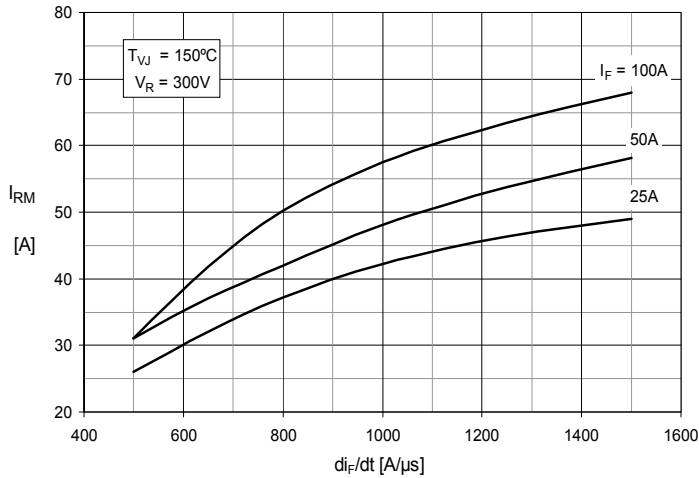


Fig. 24. Typ. Recovery Time t_{rr} vs. $-di_F/dt$

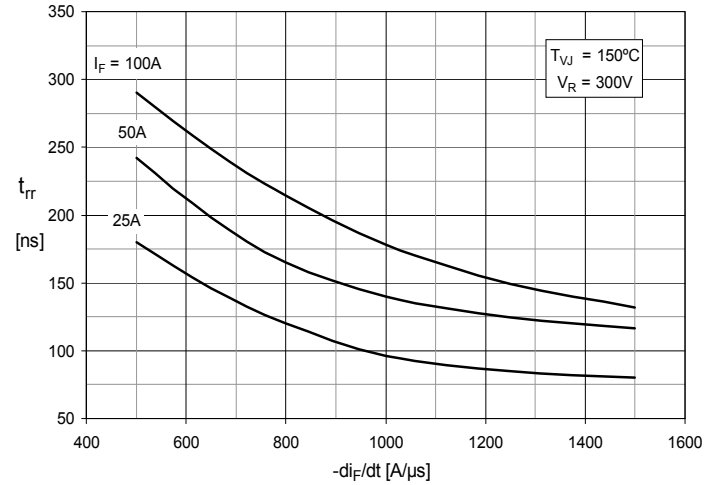


Fig. 25. Typ. Recovery Energy E_{rec} vs. $-di_F/dt$

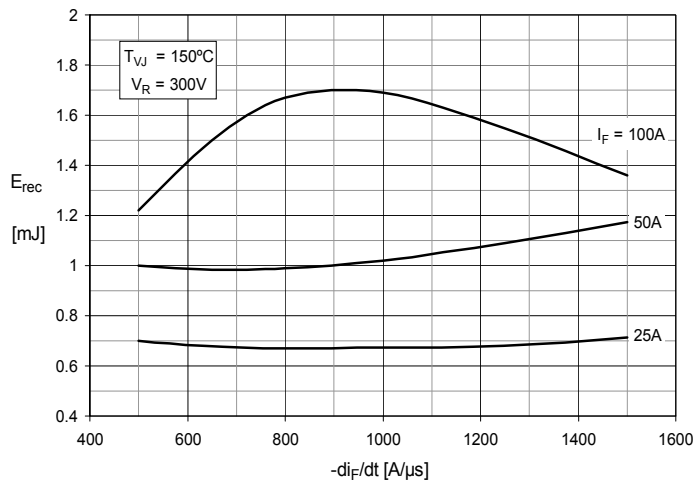
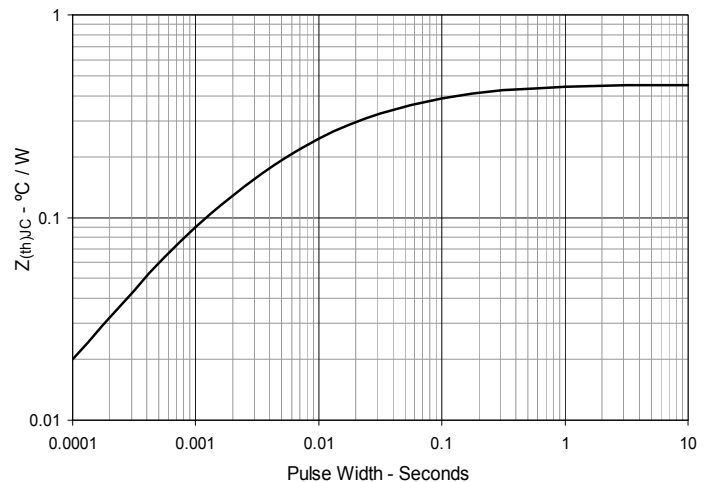


Fig. 26. Maximum Transient Thermal Impedance





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