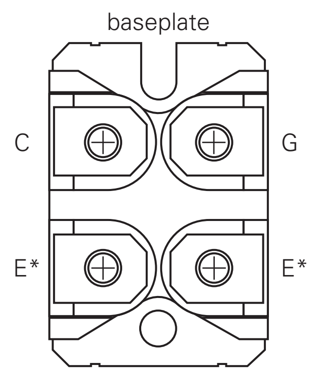
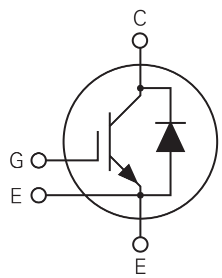
IXYN110N120C4H1

1200V, 110A XPT™ Gen4 IGBT with Sonic Diode

Extreme Light Punch Through IGBT for 20–50 kHz Switching

Pinout Diagram (SOT-227B)





G: Gate; **C:** Collector; **E:** Emitter; **baseplate:** Isolated
*Either emitter terminal can be used as Main or Kelvin Emitter

Description:

Developed using our proprietary XPT™ thin-wafer technology and state-of-the-art Trench IGBT process, these devices feature reduced thermal resistance, low energy losses, fast switching, low tail current, and high current densities.

Features & Benefits:

- Optimized for 20–50 kHz Switching
- miniBLOC, with Aluminum Nitride Isolation
- 2500V~ Isolation Voltage
- High Surge Current Capability
- Positive Thermal Coefficient of $V_{CE(sat)}$
- International Standard Package
- Low Gate Charge Q_G
- Anti-Parallel Sonic Diode

Applications:

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

Product Summary

Characteristic	Value	Unit
V_{CES}	1200	V
I_{C110}	110	A
$V_{CE(sat)}$	2.40	V
$t_{fi(typ)}$	37	ns

Revised: XZ 03/21/2023

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	T_J = 25°C to 175°C	1200	V
V_{GES}	Gate-Emitter Voltage	Continuous	±20	V
V_{GEM}	Transient Gate-Emitter Voltage	Transient	±30	V
I_{C25}	Continuous Collector Current	T_C = 25°C	210	A
I_{LRMS}	Terminal Current Limit	–	200	A
I_{C110}	Continuous Collector Current	T_C = 110°C	110	A
I_{F110}	Diode Forward Current	T_C = 110°C	74	A
I_{CM}	Pulsed Collector Current	T_C = 25°C, 1 ms	760	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	V_{GE} = 15 V, T_{VJ} = 150°C, R_G = 2 Ω, I_{CM} = 0.8 x V_{CES}	220	A
P_C	Collector Power Dissipation	T_C = 25°C	830	W
T_J	Junction Temperature	–	-55 to 175	°C
T_{JM}	Maximum Junction Temperature	–	175	°C
T_{stg}	Storage Temperature	–	-55 to 175	°C
V_{ISOL}	Isolation Voltage	50/60 Hz, I_{ISOL} ≤ 1 mA, t = 1 min	2500	V~
		50/60 Hz, I_{ISOL} ≤ 1 mA, t = 1 s	3000	
M_d	Mounting Torque	–	1.5 / 13	Nm/lb.in
	Terminal Connection Torque	–	1.3 / 11.5	
W	Weight	–	30	g

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th, JC}$	Thermal Resistance, junction-to-case	–	–	0.18	°C/W
$R_{th, CS}$	Thermal Resistance, case-to-heat sink	–	0.05	–	°C/W

Electrical Characteristics – Static (T_J = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-Emitter Breakdown Voltage	I_C = 250 µA, V_{GE} = 0 V	1200	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 3 mA, V_{CE} = V_{GE}	4.5	–	6.5	V
I_{CES}	Zero Gate Voltage Collector Current	V_{CE} = V_{CES}, V_{GE} = 0 V	–	–	50	µA
		V_{CE} = V_{CES}, V_{GE} = 0 V, T_J = 150°C	–	–	7	mA
I_{GES}	Gate-Emitter Leakage Current	V_{CE} = 0 V, V_{GE} = ±20 V	–	–	±100	nA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage[1]	I_C = I_{C110}, V_{GE} = 15 V	–	1.90	2.40	V
		I_C = I_{C110}, V_{GE} = 15 V, T_J = 150°C	–	2.27	–	V

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%

Electrical Characteristics – Dynamic (T_J = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions		Value			Unit
				Min.	Typ.	Max.	
g_{fs}	Transconductance[1]	I_C = 60 A, V_{CE} = 10 V		40	68	–	S
C_{ies}	Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 1MHz		–	5420	–	pF
C_{oes}	Output Capacitance			–	495	–	
C_{res}	Reverse Transfer Capacitance			–	220	–	
$Q_{g(on)}$	Total Gate Charge	$I_C = I_{C110}$, V_{GE} = 15 V, V_{CE} = 0.5 x V_{CES}		–	330	–	nC
Q_{ge}	Gate-Emitter Charge			–	55	–	
Q_{gc}	Gate-Collector Charge			–	138	–	
$t_{d(on)}$	Turn-on Delay Time[2]	Inductive Load, V_{GE} = 15 V, V_{CE} = 0.5 x V_{CES}, I_C = 50 A, $R_{G(ext)}$ = 2 Ω	T_J = 25°C	–	40	–	ns
			T_J = 150°C	–	36	–	
t_{ri}	Turn-on Rise Time[2]		T_J = 25°C	–	48	–	ns
			T_J = 150°C	–	37	–	
E_{on}	Turn-on Energy[2]		T_J = 25°C	–	3.6	–	mJ
			T_J = 150°C	–	5.3	–	
$t_{d(off)}$	Turn-off Delay Time[2]		T_J = 25°C	–	320	–	ns
			T_J = 150°C	–	326	–	
t_{fi}	Turn-off Fall Time[2]		T_J = 25°C	–	37	–	ns
			T_J = 150°C	–	90	–	
E_{off}	Turn-off Energy[2]		T_J = 25°C	–	1.9	–	mJ
			T_J = 150°C	–	3.2	–	

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%
Note 2: Switching times and energy losses may increase for higher $V_{CE(clamp)}$, T_J, or R_G.

Reverse Sonic Diode (FRD) (T_J = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
V_F	Diode Forward Voltage[1]	I_F = 100 A, V_{GE} = 0 V	–	2.20	2.70	V
		I_F = 75 A, V_{GE} = 0 V, T_J = 150°C	–	2.15	–	
I_{RM}	Reverse Recovery Current	I_F = 50 A, V_{GE} = 0 V, T_J = 150°C -di$_F$/dt= 750 A/µs, V_R = 600 V	–	43	–	A
t_{rr}	Reverse Recovery Time		–	270	–	ns
$R_{th, JC}$	Thermal Resistance, junction-to-case	–	–	–	0.41	°C/W

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%

Characteristic Curves

Fig. 1. Output Characteristics @ T_J = 25ºC

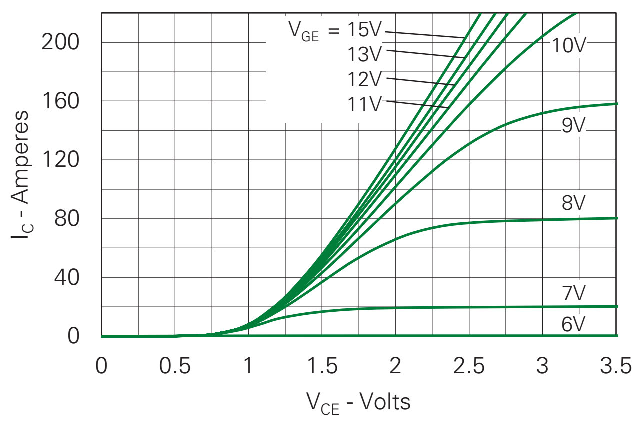


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

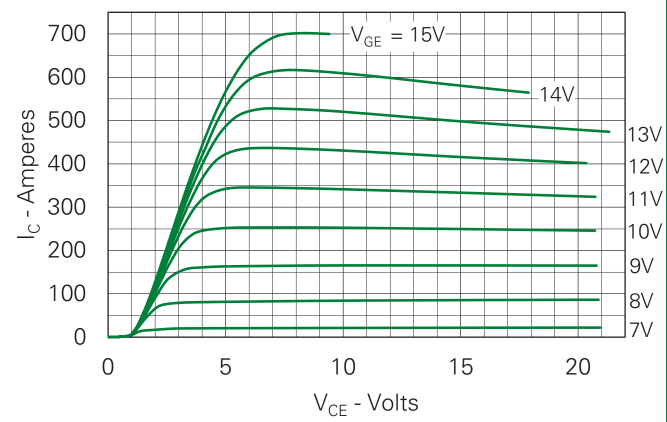


Fig. 3. Output Characteristics @ T_J = 150ºC

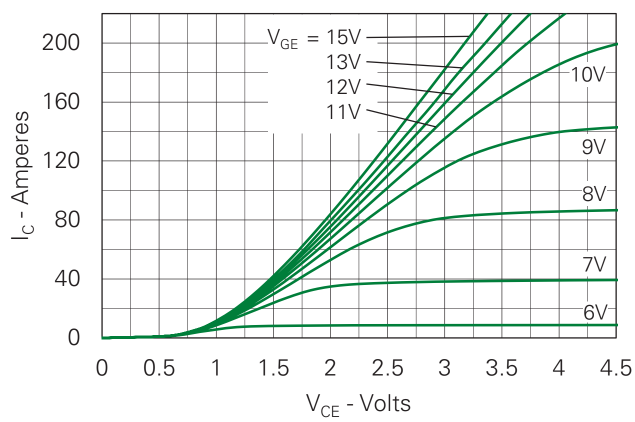


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

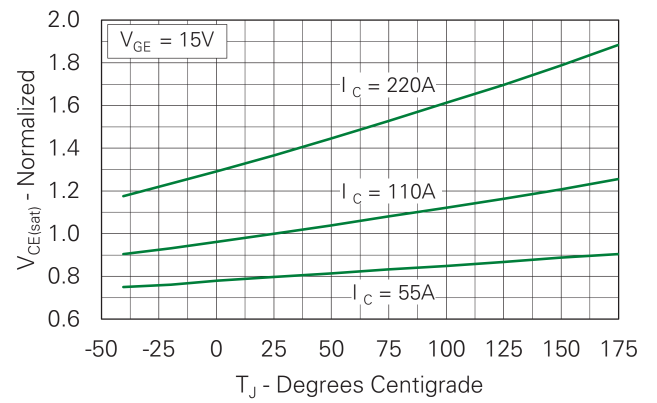


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

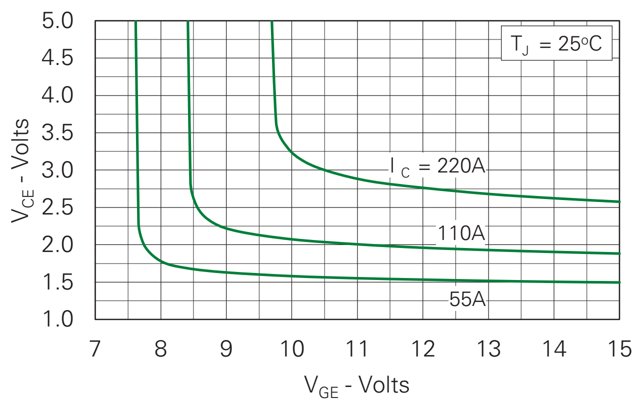


Fig. 6. Input Admittance

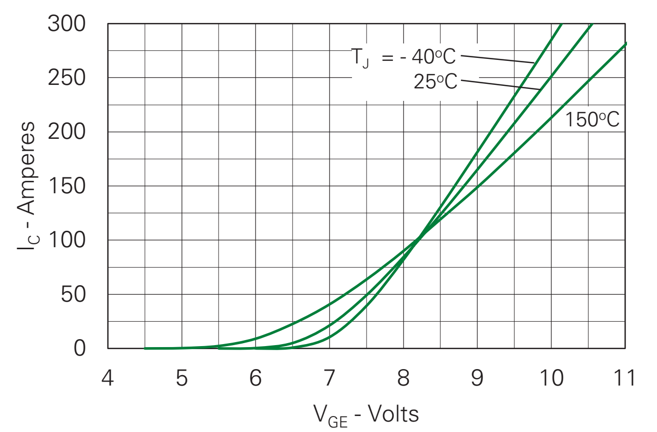


Fig. 7. Transconductance

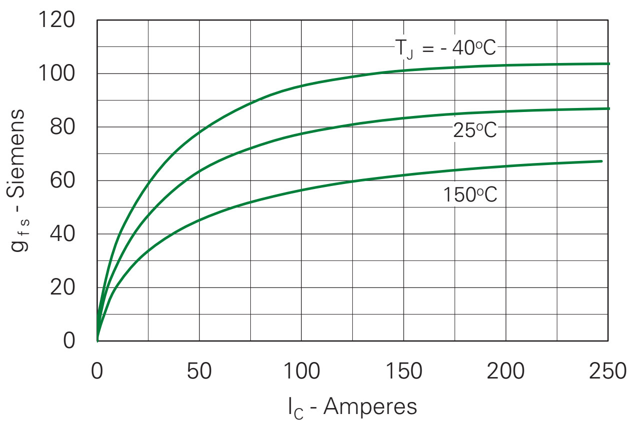


Fig. 8. Gate Charge

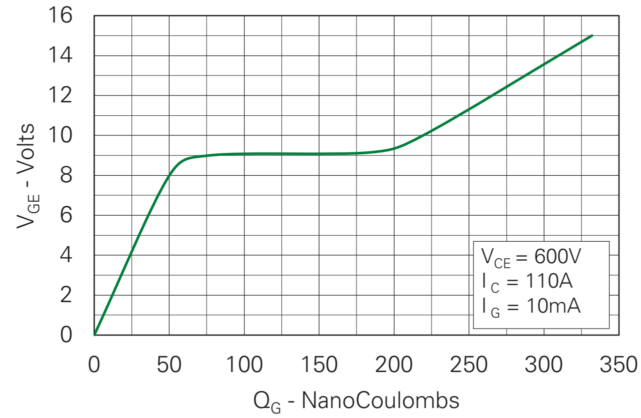


Fig. 9. Capacitance

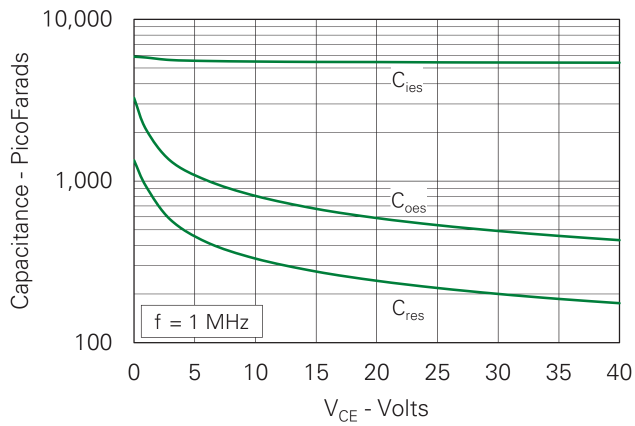


Fig. 10. Reverse-Bias Safe Operating Area

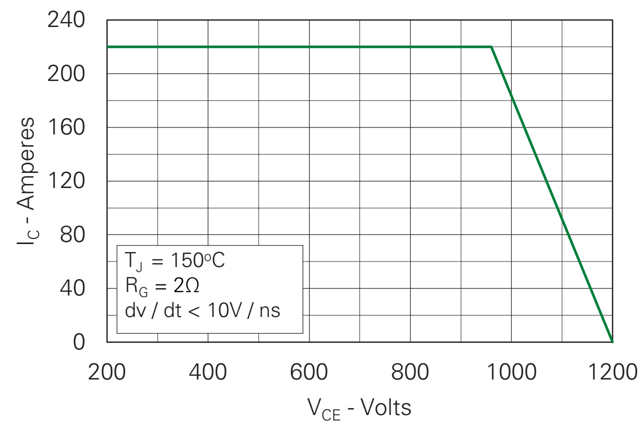


Fig. 11. Maximum Transient Thermal Impedance

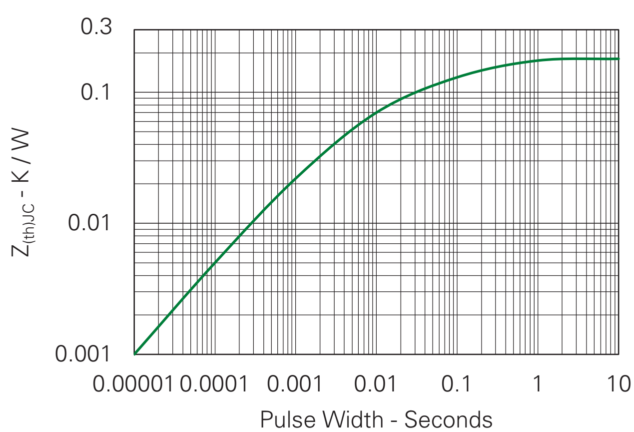


Fig. 12. Inductive Switching Energy Loss vs. Collector Current

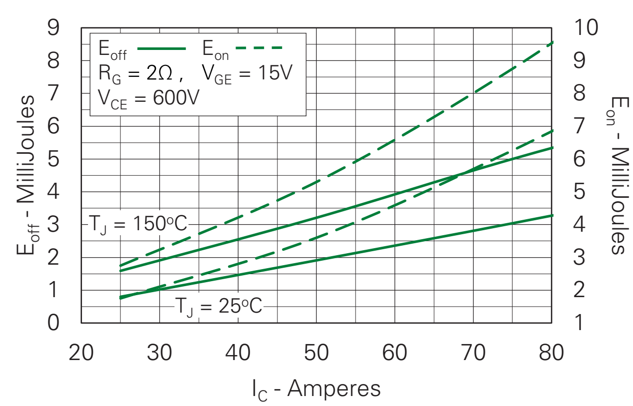


Fig. 13. Inductive Switching Energy Loss vs. Collector-Emitter Voltage

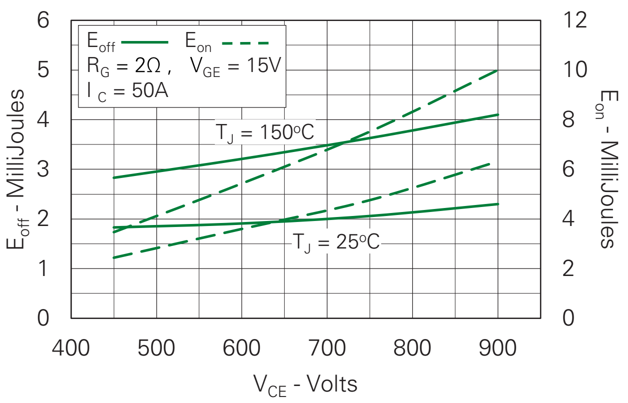


Fig. 14. Inductive Switching Energy Loss vs. Gate Resistance

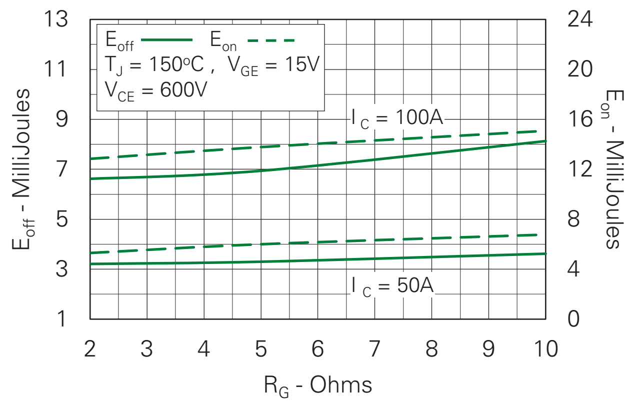


Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature

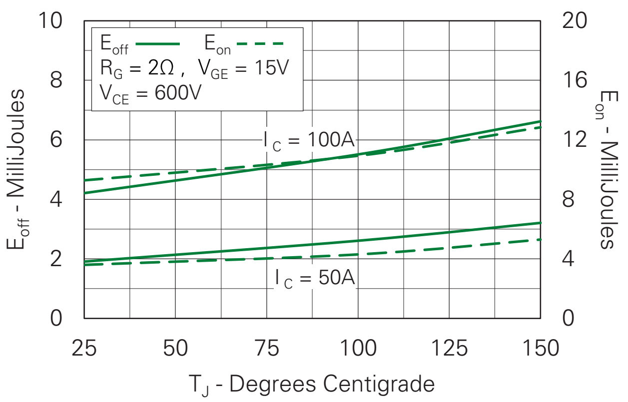


Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance

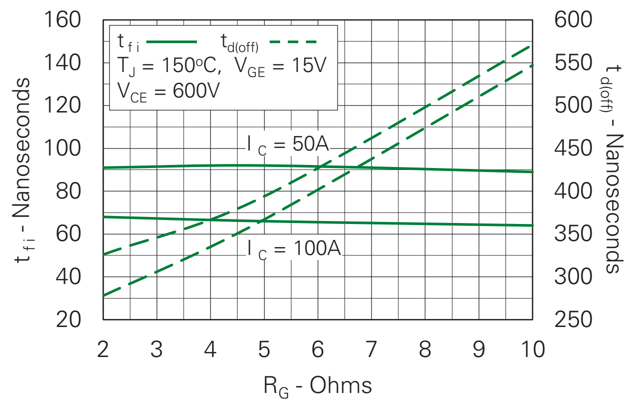


Fig. 17. Inductive Turn-off Switching Times vs. Collector Current

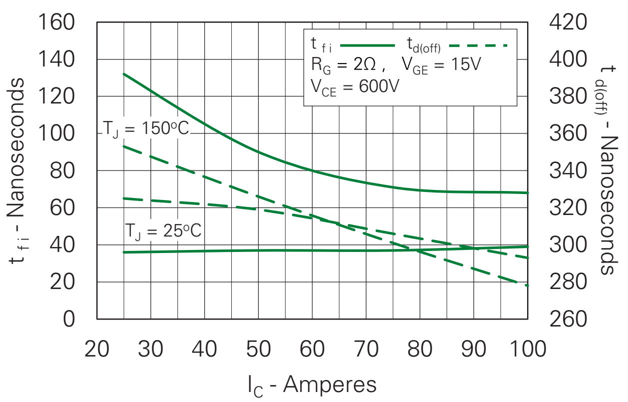


Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature

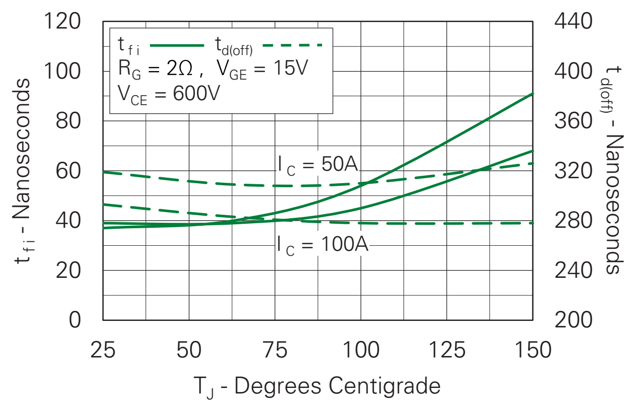


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

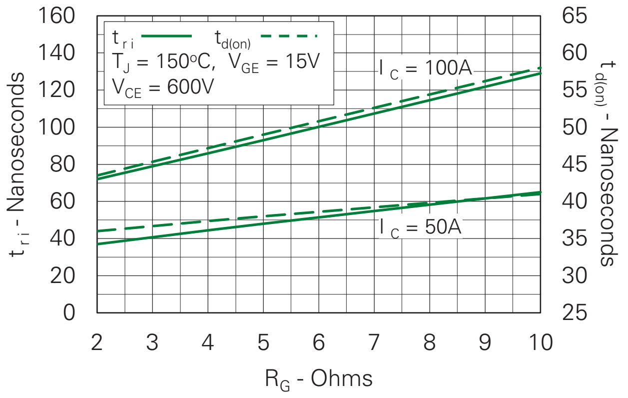


Fig. 20. Inductive Turn-on Switching Times vs. Collector Current

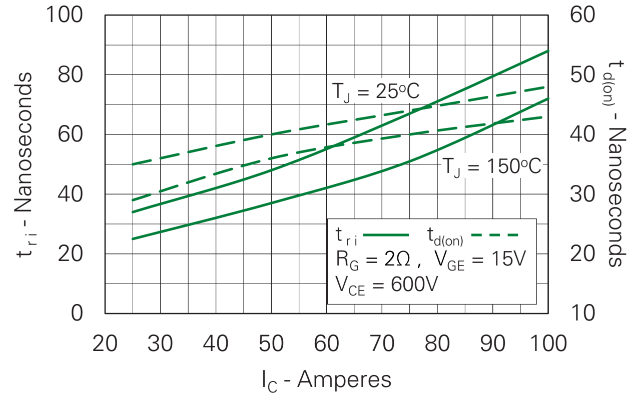


Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature

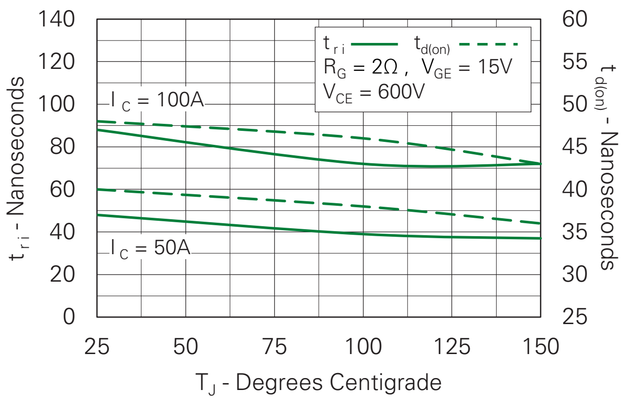


Fig. 22. Maximum Peak Load Current vs. Frequency

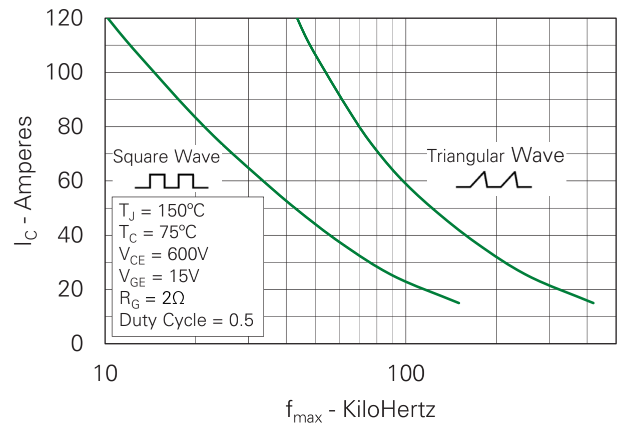


Fig. 23. Diode Forward Characteristics

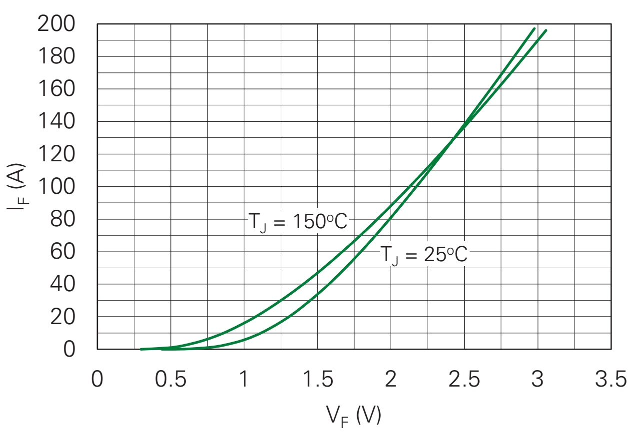
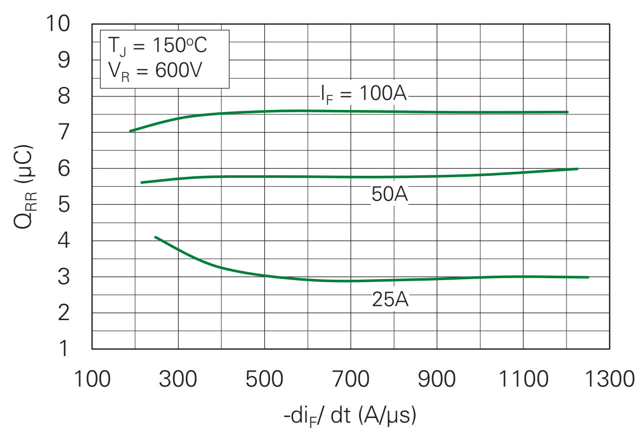


Fig. 24. Reverse Recovery Charge vs. -diF/dt



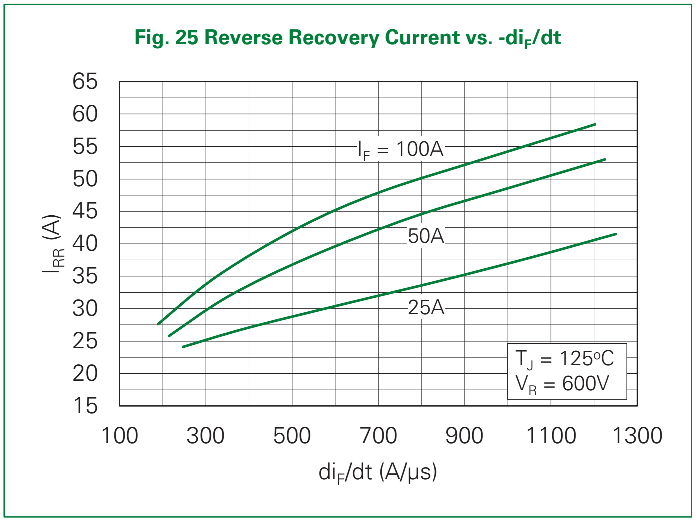


Fig. 25 Reverse Recovery Current vs. -di$_F$/dt
I_{RR} (A)
I_F = 100A
50A
25A
T_J = 125°C
V_R = 600V
di$_F$/dt (A/μs)

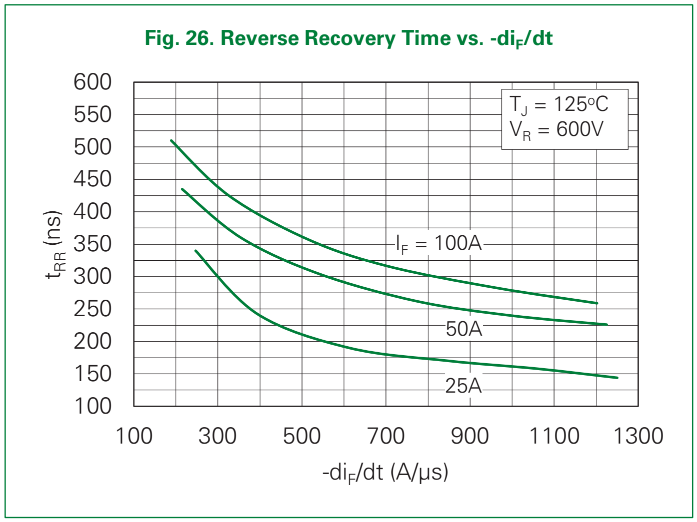


Fig. 26. Reverse Recovery Time vs. -di$_F$/dt
t_{RR} (ns)
T_J = 125°C
V_R = 600V
I_F = 100A
50A
25A
-di$_F$/dt (A/μs)

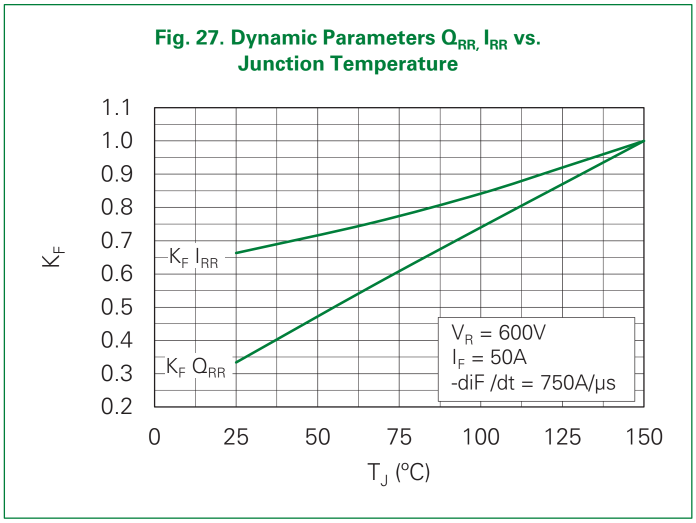


Fig. 27. Dynamic Parameters Q_{RR}, I_{RR} vs. Junction Temperature
K_F
K_F I_{RR}
K_F Q_{RR}
V_R = 600V
I_F = 50A
-diF /dt = 750A/μs
T_J (°C)

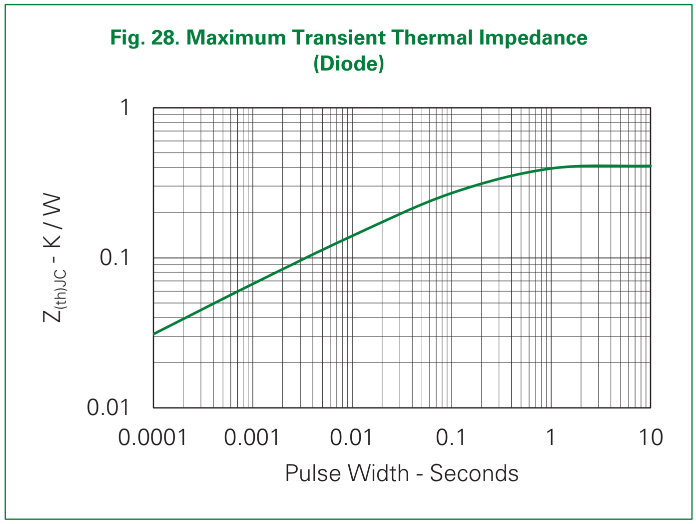
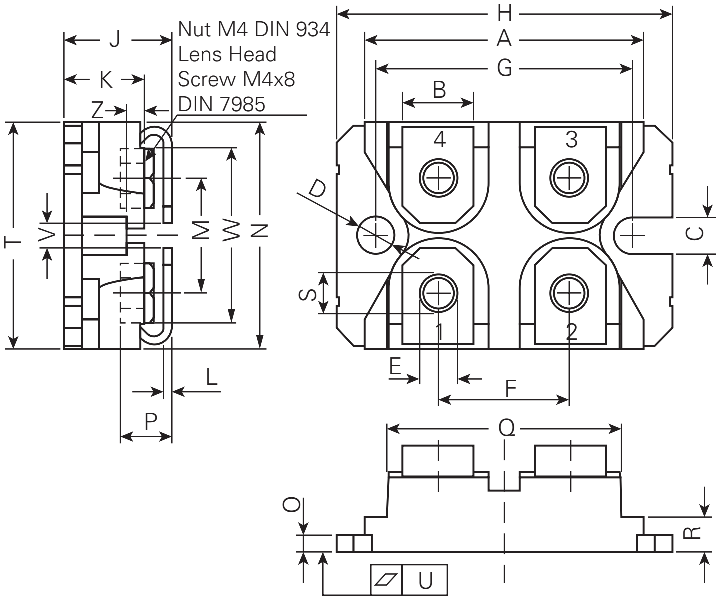


Fig. 28. Maximum Transient Thermal Impedance (Diode)
$Z_{(th)JC}$ - K / W
Pulse Width - Seconds

Part Outline Drawing (SOT-227B)



Symbol	Inches			Millimeters		
	Min.	**Typical**	**Max.**	**Min.**	**Typical**	**Max**
A	1.240	–	1.255	31.50	–	31.88
B	0.307	–	0.323	7.80	–	8.20
C	0.161	–	0.169	4.09	–	4.29
D	0.161	–	0.169	4.09	–	4.29
E	0.161	–	0.169	4.09	–	4.29
F	0.587	–	0.595	14.91	–	15.11
G	1.186	–	1.193	30.12	–	30.30
H	1.488	–	1.505	37.80	–	38.23
J	0.460	–	0.481	11.68	–	12.22
K	0.351	–	0.378	8.92	–	9.60
L	0.029	–	0.033	0.74	–	0.84
M	0.492	–	0.516	12.50	–	13.10
N	0.990	–	1.001	25.15	–	25.42
O	0.077	–	0.084	1.95	–	2.13
P	0.195	–	0.244	4.95	–	6.20
Q	1.045	–	1.059	26.54	–	26.90
R	0.155	–	0.174	3.94	–	4.42
S	0.179	–	0.191	4.55	–	4.85
T	0.968	–	0.994	24.59	–	25.25
U	-0.002	–	0.004	-0.05	–	0.10
V	0.126	–	0.217	3.20	–	5.50
W	0.780	–	0.830	19.81	–	21.08
Z	0.098	–	0.106	2.50	–	2.70