

IXYN110N120C4H1

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

Extreme Light Punch Through IGBT for 20–50 kHz Switching



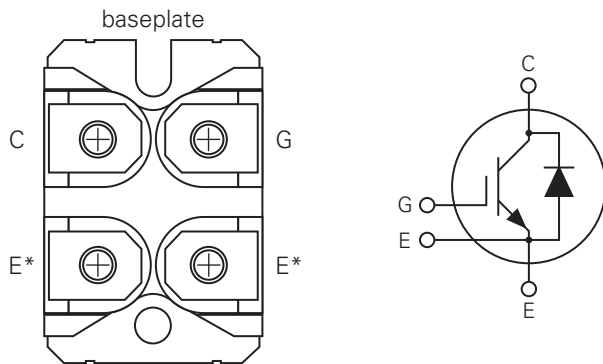
Description:

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

Pinout Diagram (SOT-227B)



G: Gate; **C:** Collector; **E:** Emitter; **baseplate:** Isolated

*Either emitter terminal can be used as Main or Kelvin Emitter

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

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	$T_J = 25^{\circ}\text{C}$ 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	$T_C = 25^{\circ}\text{C}$	210	A
I_{LRMS}	Terminal Current Limit	–	200	A
I_{C110}	Continuous Collector Current	$T_C = 110^{\circ}\text{C}$	110	A
I_{F110}	Diode Forward Current	$T_C = 110^{\circ}\text{C}$	74	A
I_{CM}	Pulsed Collector Current	$T_C = 25^{\circ}\text{C}$, 1 ms	760	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	$V_{GE} = 15\text{ V}$, $T_{VJ} = 150^{\circ}\text{C}$, $R_G = 2\ \Omega$, $I_{CM} = 0.8 \times V_{CES}$	220	A
P_C	Collector Power Dissipation	$T_C = 25^{\circ}\text{C}$	830	W
T_J	Junction Temperature	–	-55 to 175	$^{\circ}\text{C}$
T_{JM}	Maximum Junction Temperature	–	175	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	–	-55 to 175	$^{\circ}\text{C}$
V_{ISOL}	Isolation Voltage	50/60 Hz, $I_{ISOL} \leq 1\text{ mA}$, $t = 1\text{ min}$	2500	V~
		50/60 Hz, $I_{ISOL} \leq 1\text{ mA}$, $t = 1\text{ s}$	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	$^{\circ}\text{C}/\text{W}$
$R_{th, CS}$	Thermal Resistance, case-to-heat sink	–	0.05	–	$^{\circ}\text{C}/\text{W}$

Electrical Characteristics – Static ($T_J = 25^{\circ}\text{C}$ unless otherwise specified)

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

Note 1: Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle, $d \leq 2\%$

Electrical Characteristics – Dynamic ($T_J = 25^\circ\text{C}$ unless otherwise specified)

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

Note 1: Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle, $d \leq 2\%$ **Note 2:** Switching times and energy losses may increase for higher $V_{CE(clamp)}$, T_J , or R_G .**Reverse Sonic Diode (FRD)** ($T_J = 25^\circ\text{C}$ unless otherwise specified)

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

Note 1: Pulse test, $t \leq 300\ \mu\text{s}$, duty cycle, $d \leq 2\%$

Characteristic Curves

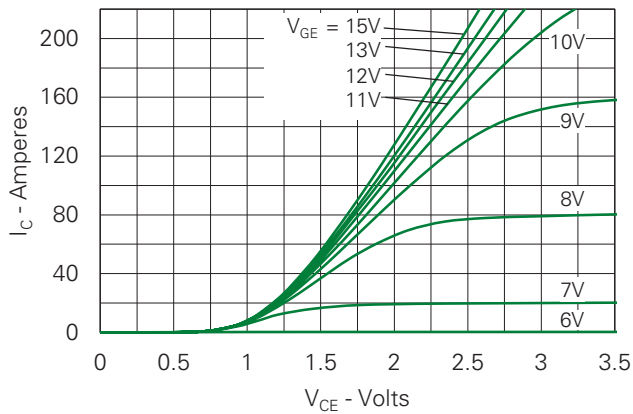
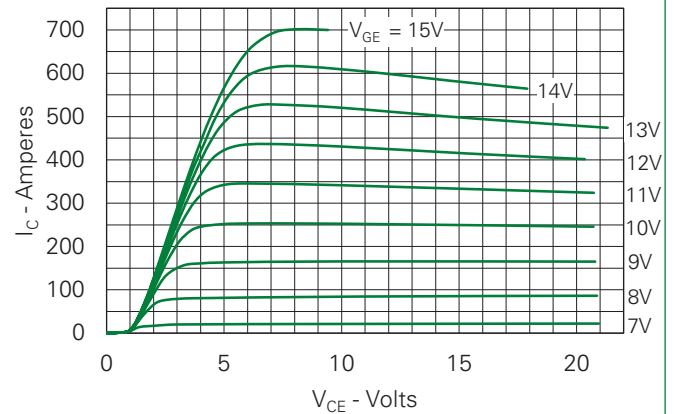
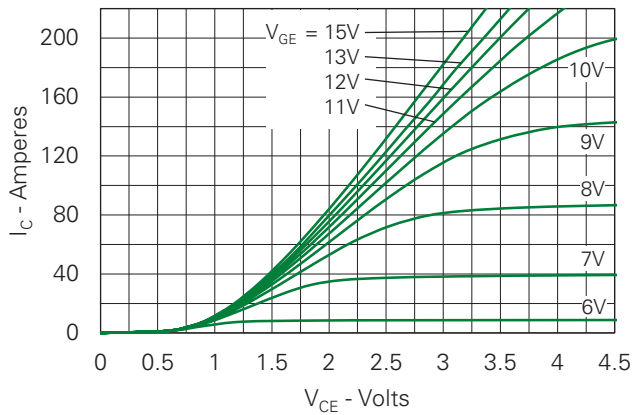
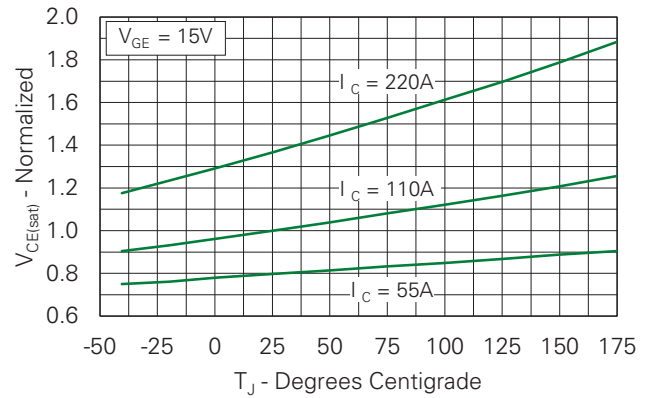
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$ Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$ Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$ Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

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

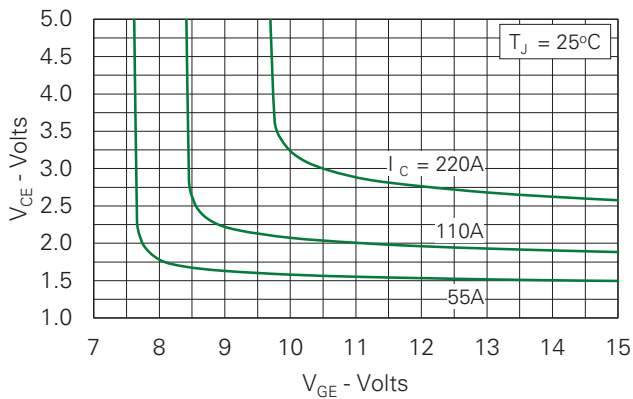


Fig. 6. Input Admittance

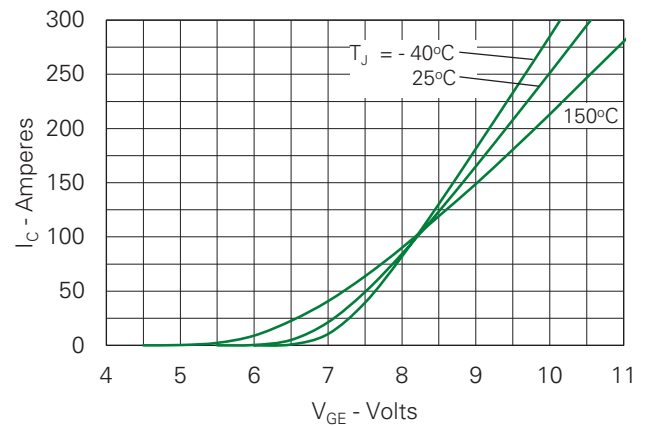


Fig. 7. Transconductance

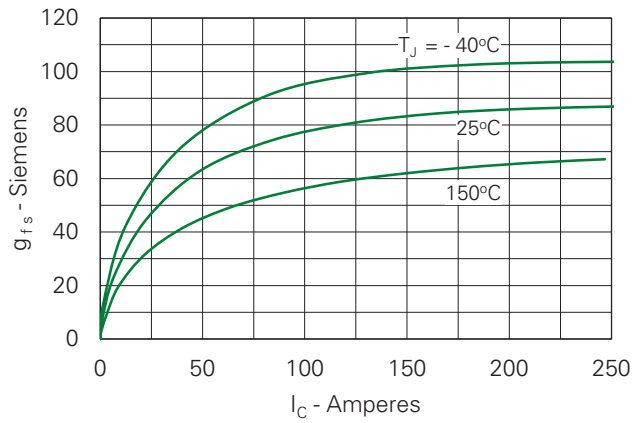


Fig. 8. Gate Charge

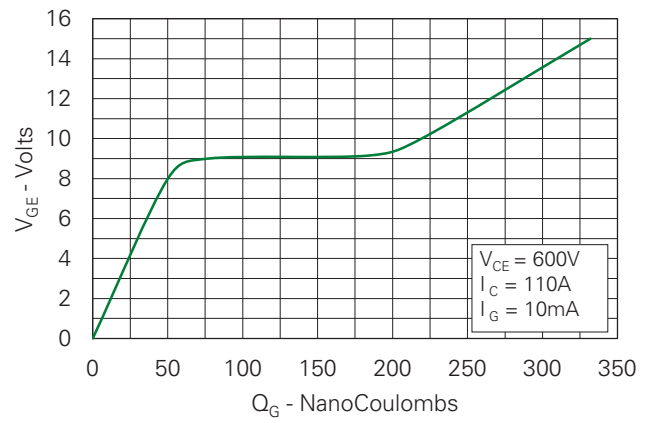


Fig. 9. Capacitance

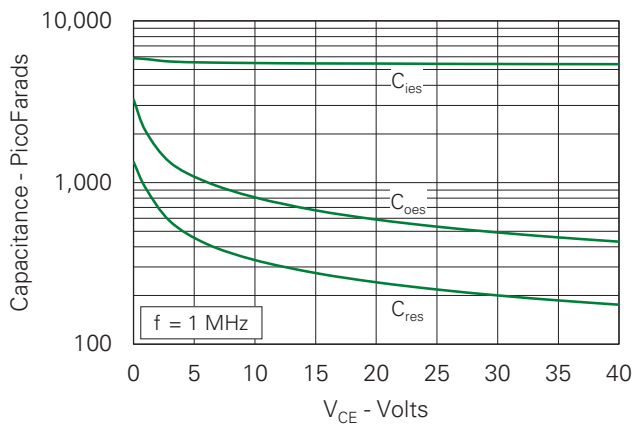


Fig. 10. Reverse-Bias Safe Operating Area

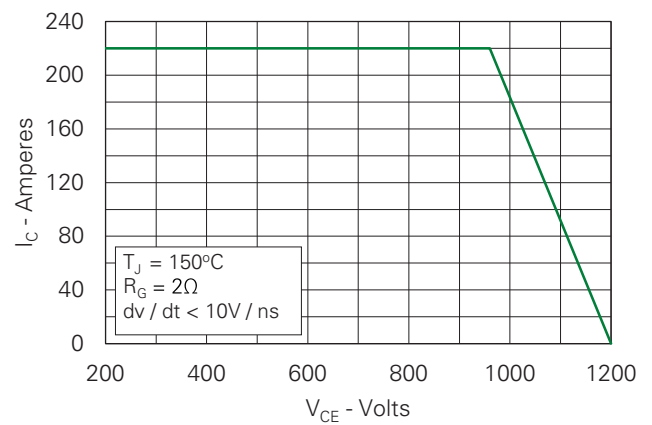


Fig. 11. Maximum Transient Thermal Impedance

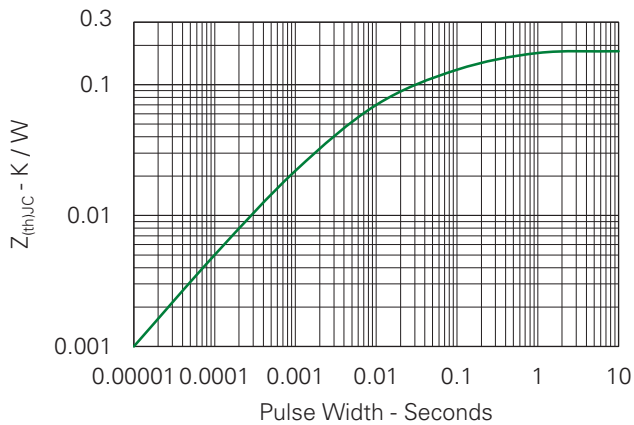


Fig. 12. Inductive Switching Energy Loss vs. Collector Current

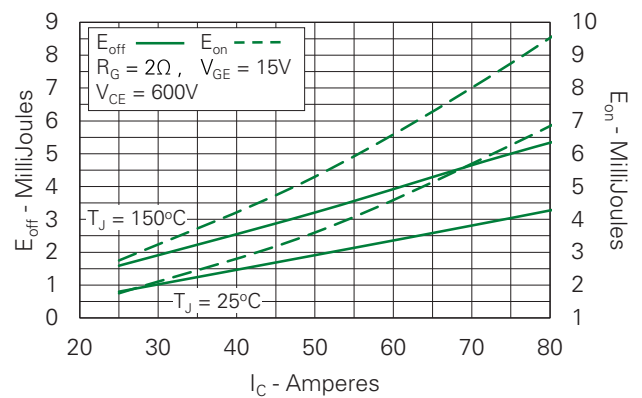


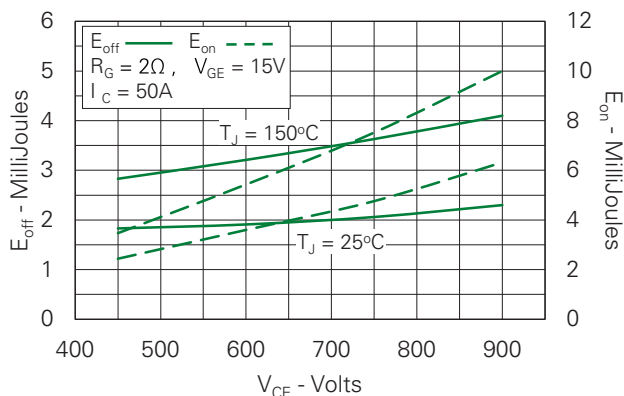
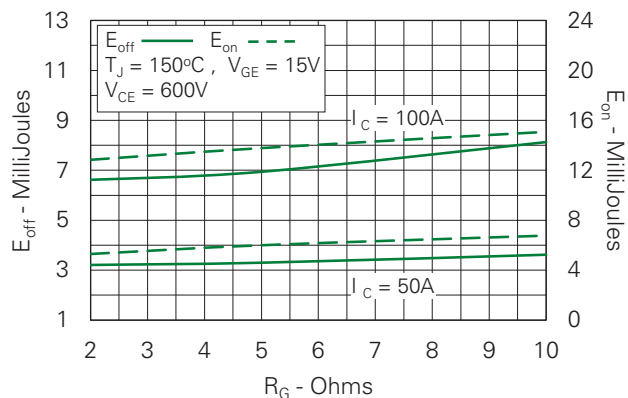
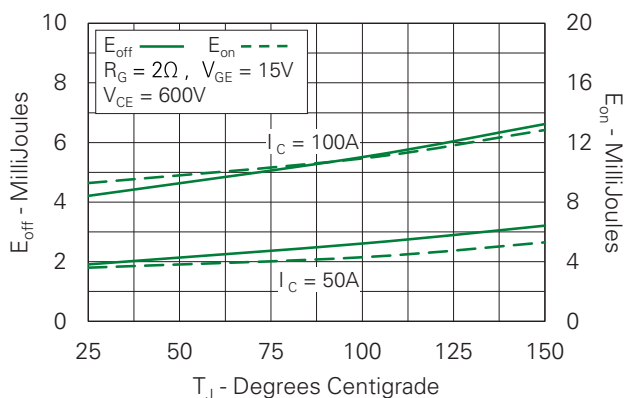
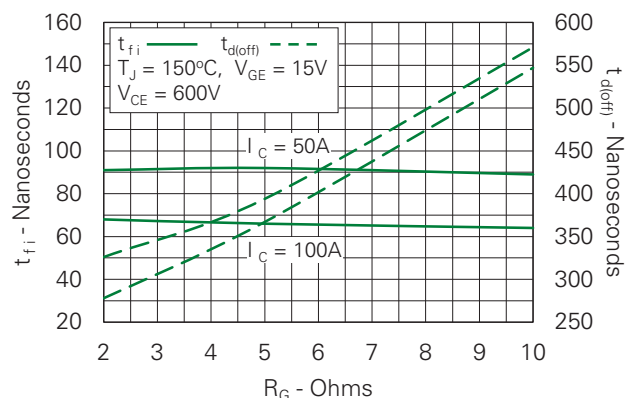
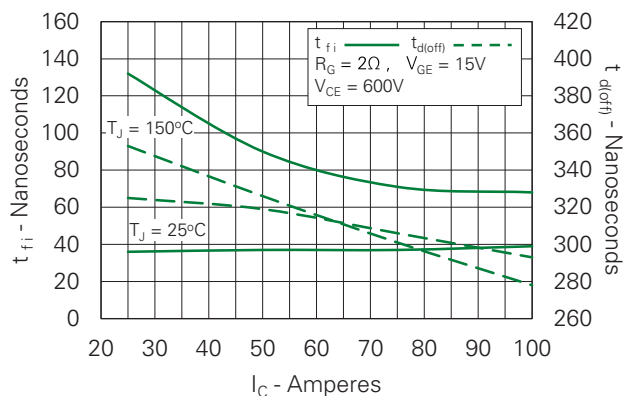
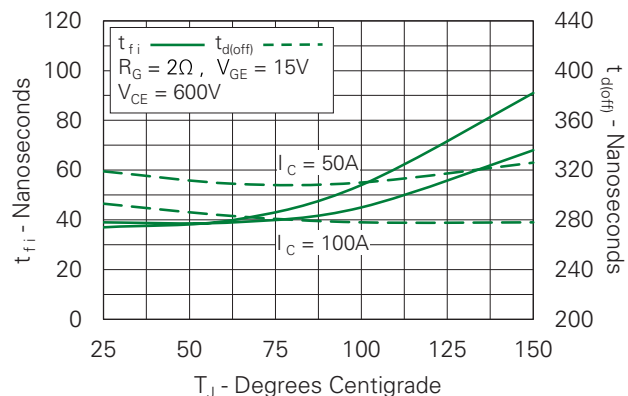
Fig. 13. Inductive Switching Energy Loss vs. Collector-Emitter Voltage**Fig. 14. Inductive Switching Energy Loss vs. Gate Resistance****Fig. 15. Inductive Switching Energy Loss vs. Junction Temperature****Fig. 16. Inductive Turn-off Switching Times vs. Gate Resistance****Fig. 17. Inductive Turn-off Switching Times vs. Collector Current****Fig. 18. Inductive Turn-off Switching Times vs. Junction Temperature**

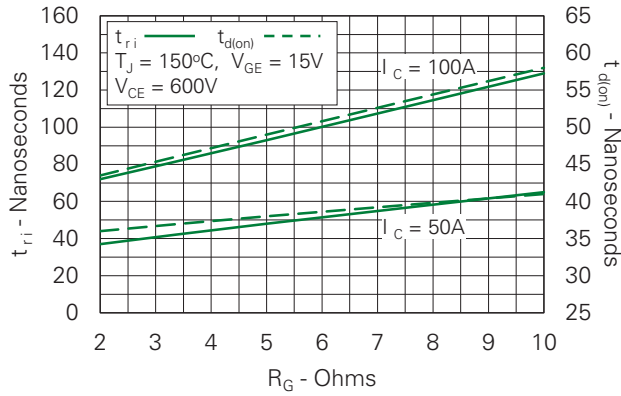
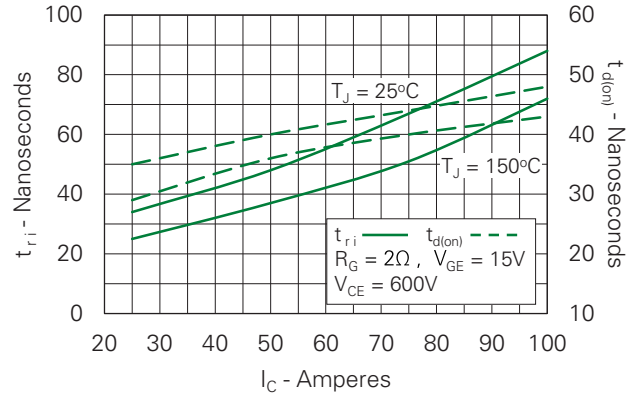
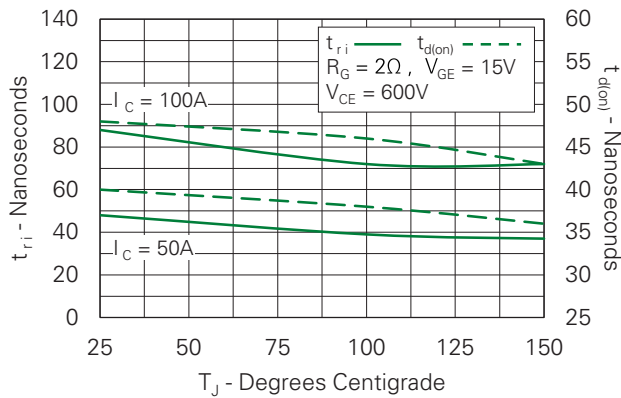
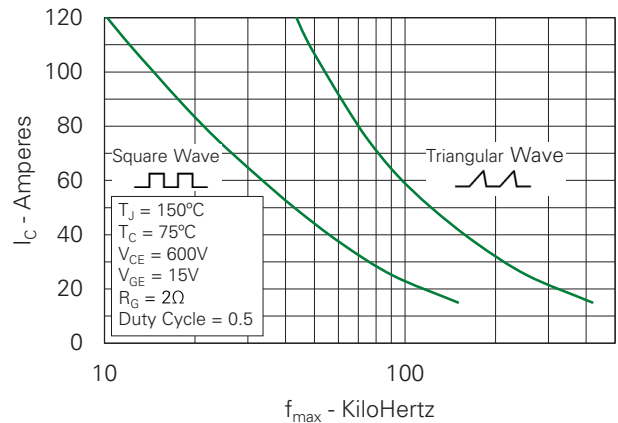
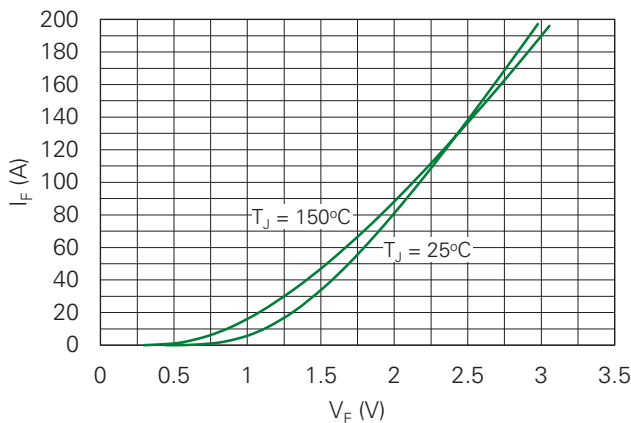
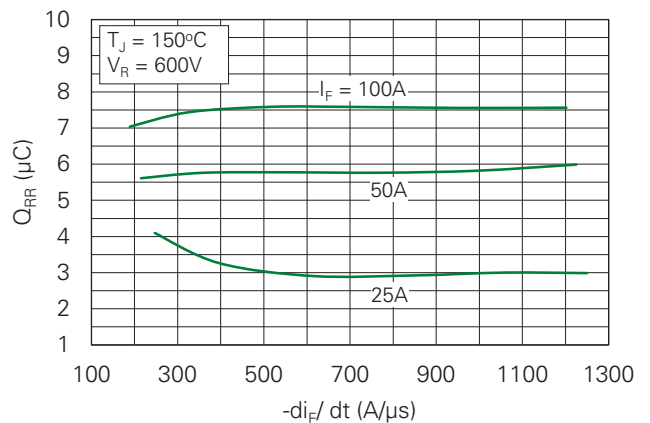
Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance**Fig. 20. Inductive Turn-on Switching Times vs. Collector Current****Fig. 21. Inductive Turn-on Switching Times vs. Junction Temperature****Fig. 22. Maximum Peak Load Current vs. Frequency****Fig. 23. Diode Forward Characteristics****Fig. 24. Reverse Recovery Charge vs. $-di_F/dt$** 

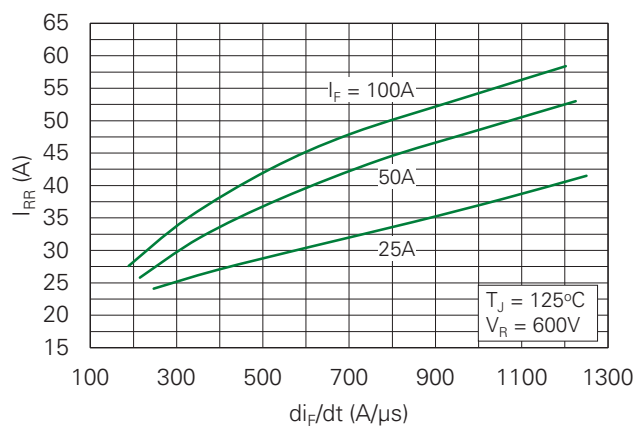
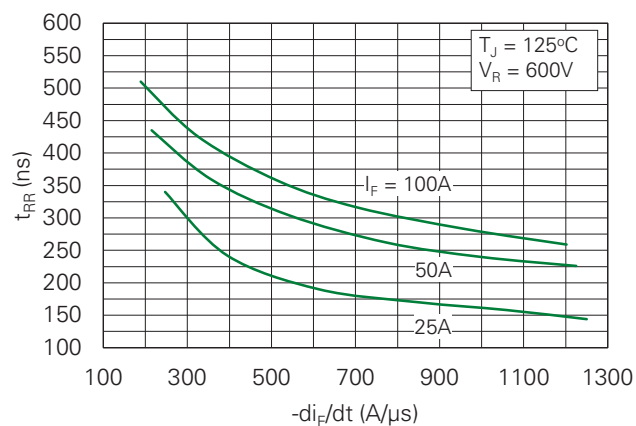
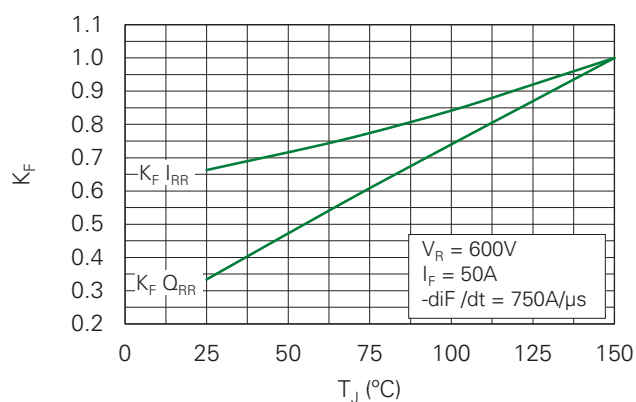
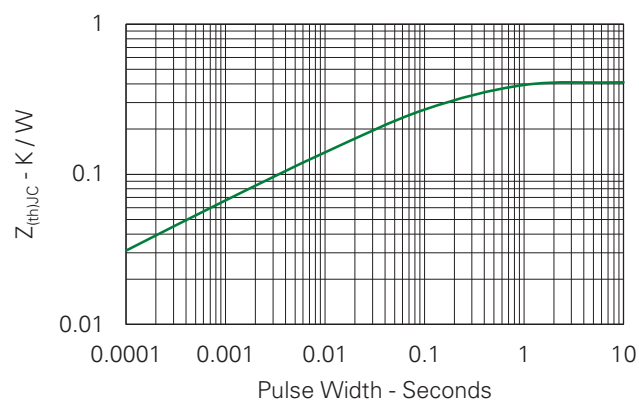
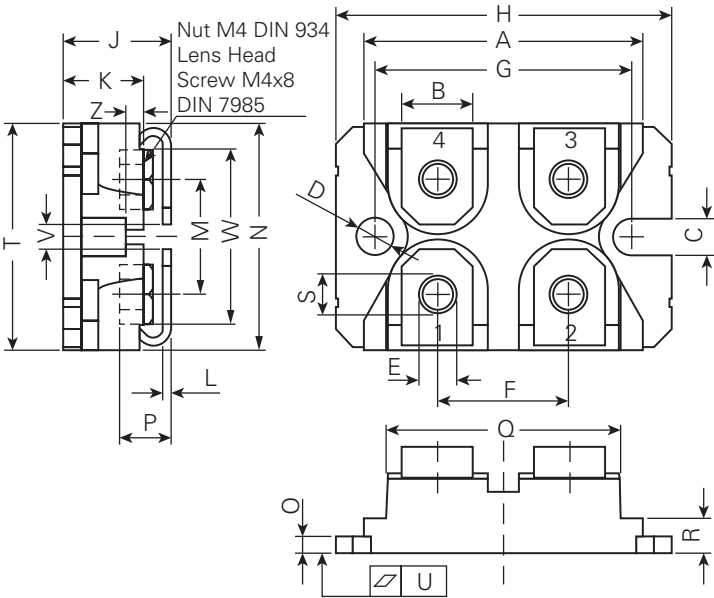
Fig. 25 Reverse Recovery Current vs. $-di_F/dt$ Fig. 26 Reverse Recovery Time vs. $-di_F/dt$ Fig. 27 Dynamic Parameters Q_{RR} , I_{RR} vs. Junction Temperature

Fig. 28 Maximum Transient Thermal Impedance (Diode)



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

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