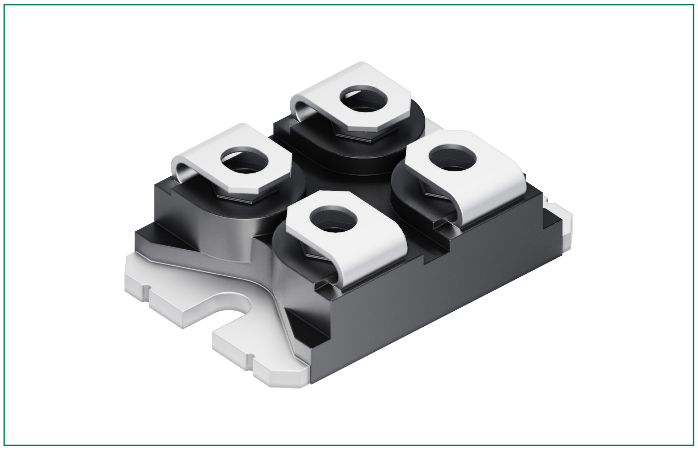
IXYN180N65A5

650 V, 180 A Gen5 XPT™ IGBT

Extreme Light Punch Through IGBT for up to 5 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 conduction losses, and low gate drive requirements.

Features & Benefits:

- Optimized for Low Conduction Losses
- High Surge Current Capability
- Square RBSOA
- International Standard Package
- Low Gate Charge Q_G
- Low Gate Drive Requirement

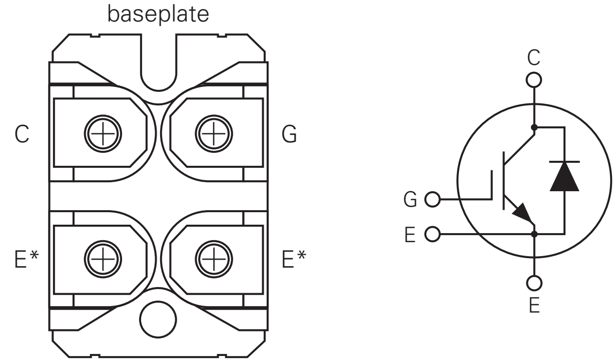
Applications:

- Power Inverters
- UPS
- PFC Circuits
- Battery Chargers
- Welding Machines
- Lamp Ballasts
- Inrush Current Protection Circuits

Product Summary

Characteristic	Value	Unit
V_{CES}	650	V
I_{C110}	180	A
$V_{CE(sat)}$	≤ 1.35	V
$t_{fi(typ)}$	225	ns

Pinout Diagram (SOT-227B)



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

Maximum Ratings (T_{vj} = 25°C unless otherwise specified)

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	T_{vj} = 25°C to 175°C	650	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	340	A
I_{LRM}	Lead Current Limit	–	200	A
I_{C110}	Continuous Collector Current	T_C = 110°C	180	A
I_{CM}	Pulsed Collector Current	T_C = 25°C, 1 ms	1100	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} @ $V_{CE} \leq V_{CES}$	360	A
P_C	Collector Power Dissipation	T_C = 25°C	940	W
T_{vj}	Virtual 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, $I_{ISOL} \leq$ 1 mA, t = 1 min	2500	V
		50/60 Hz, $I_{ISOL} \leq$ 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	–	–	0.16	°C/W
$R_{th, CS}$	Thermal Resistance, case-to-heat sink	–	0.05	–	°C/W

Electrical Characteristics – Static (T_{vj} = 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	650	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 250 μA, $V_{CE} = V_{GE}$	3.7	–	5.8	V
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = V_{CES}$, V_{GE} = 0 V	–	–	25	μA
		$V_{CE} = V_{CES}$, V_{GE} = 0 V, T_{vj} = 125°C	–	–	1.5	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 = 100 A, V_{GE} = 15 V	–	1.20	1.35	V
		I_C = 100 A, V_{GE} = 15 V, T_{vj} = 150°C	–	1.25	–	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 Min.	Value Typ.	Value Max.	Unit
g_{fs}	Transconductance[1]	I_C = 60 A, V_{CE} = 10 V		63	105	–	S
R_{Gi}	Gate Input Resistance	–		–	1.15	–	Ω
C_{ies}	Input Capacitance	V_{CE} = 25 V, V_{GE} = 0 V, f = 1MHz		–	8640	–	pF
C_{oes}	Output Capacitance			–	790	–	
C_{res}	Reverse Transfer Capacitance			–	360	–	
$Q_{g(on)}$	Total Gate Charge	I_C = 180 A, V_{GE} = 15 V, V_{CE} = 0.5 x V_{CES}		–	654	–	nC
Q_{ge}	Gate-Emitter Charge			–	63	–	
Q_{gc}	Gate-Collector Charge			–	345	–	
$t_{d(on)}$	Turn-on Delay Time[2]	Inductive Load, V_{GE} = 15 V, V_{CE} = 300 V, I_C = 100 A, $R_{G(ext)}$ = 2 Ω	T_{vj} = 25°C	–	74	–	ns
			T_{vj} = 150°C	–	52	–	
t_{ri}	Turn-on Rise Time[2]		T_{vj} = 25°C	–	70	–	ns
			T_{vj} = 150°C	–	75	–	
E_{on}	Turn-on Energy[2]		T_{vj} = 25°C	–	0.85	–	mJ
			T_{vj} = 150°C	–	1.94	–	
$t_{d(off)}$	Turn-off Delay Time[2]		T_{vj} = 25°C	–	500	–	ns
			T_{vj} = 150°C	–	415	–	
t_{fi}	Turn-off Fall Time[2]		T_{vj} = 25°C	–	115	–	ns
			T_{vj} = 150°C	–	225	–	
E_{off}	Turn-off Energy[2]		T_{vj} = 25°C	–	4.40	–	mJ
			T_{vj} = 150°C	–	6.10	–	

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_{vj}, or R_G.

Characteristic Curves

Fig. 1. Output Characteristics @ T_{vj} = 25°C

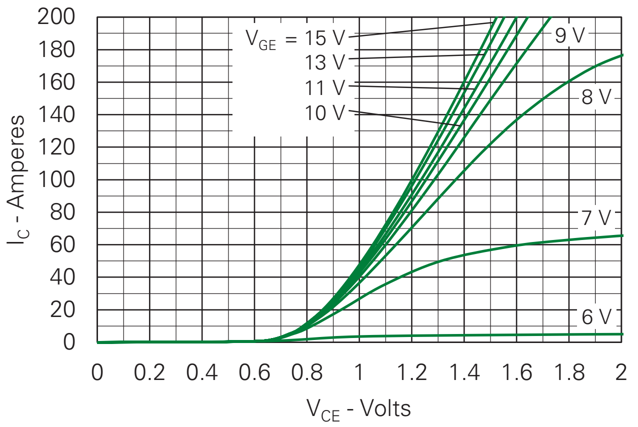


Fig. 2. Extended Output Characteristics @ T_{vj} = 25°C

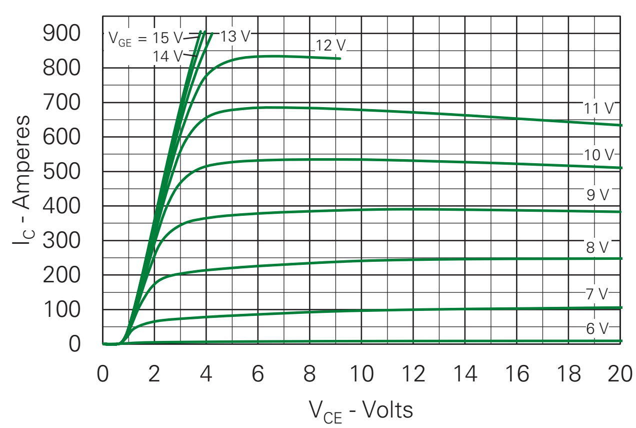


Fig. 3. Output Characteristics @ T_{vj} = 150°C

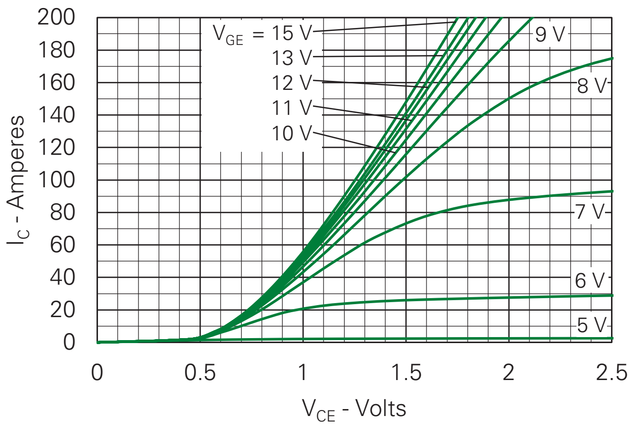


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

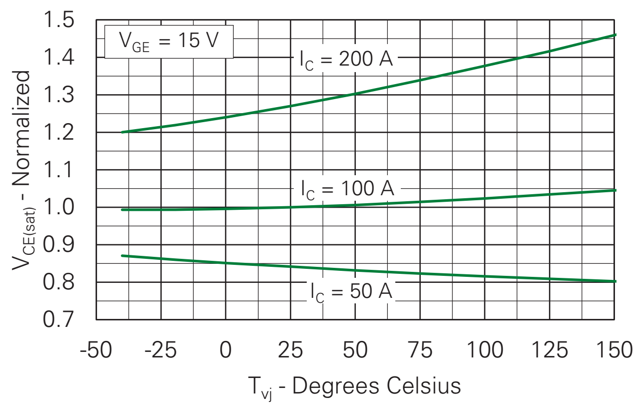


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

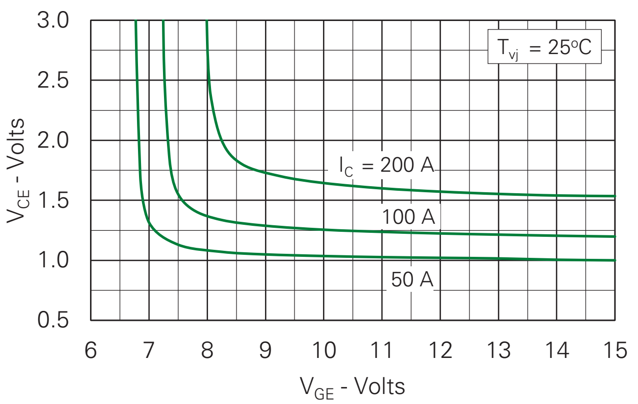


Fig. 6. Input Admittance

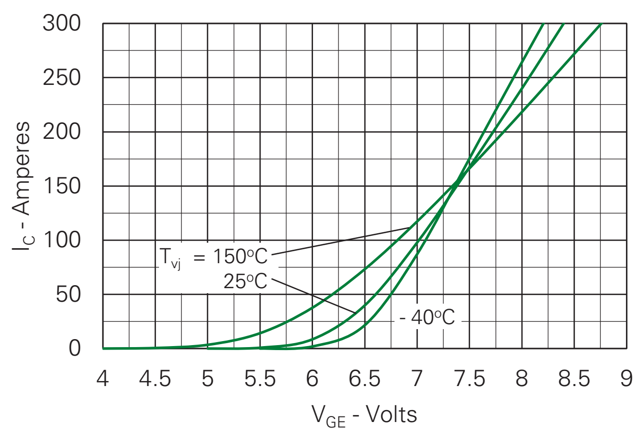


Fig. 7. Transconductance

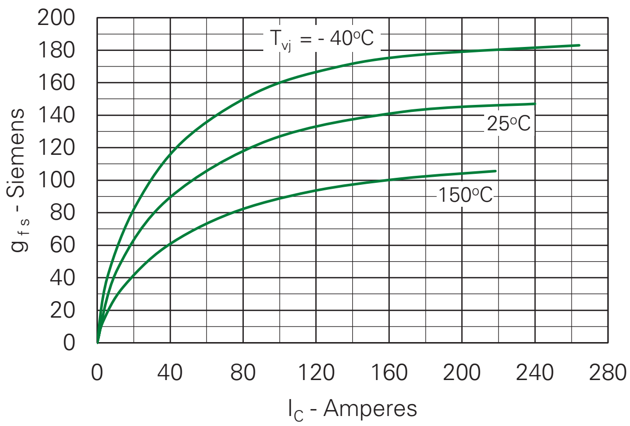


Fig. 8. Gate Charge

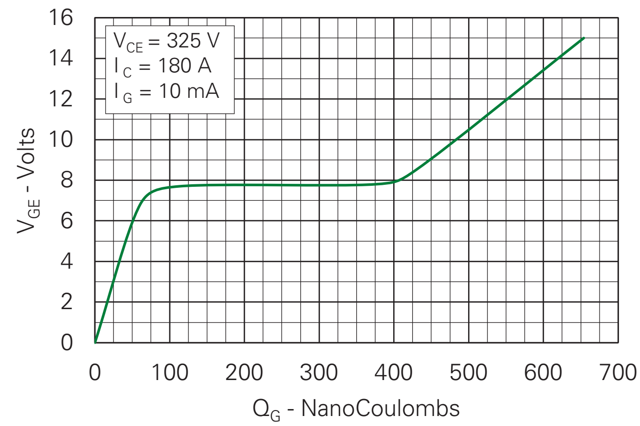


Fig. 9. Capacitance

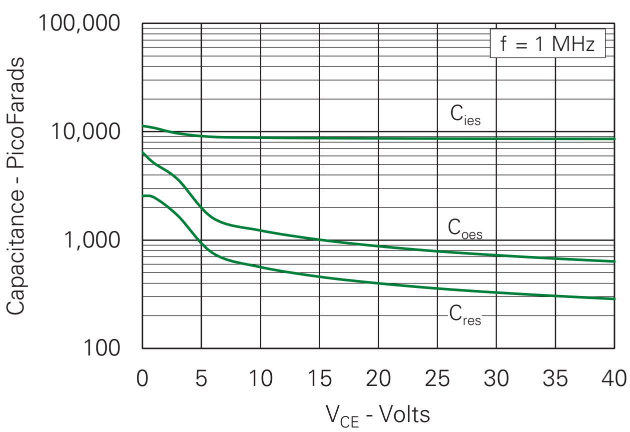


Fig. 10. Reverse-Bias Safe Operating Area

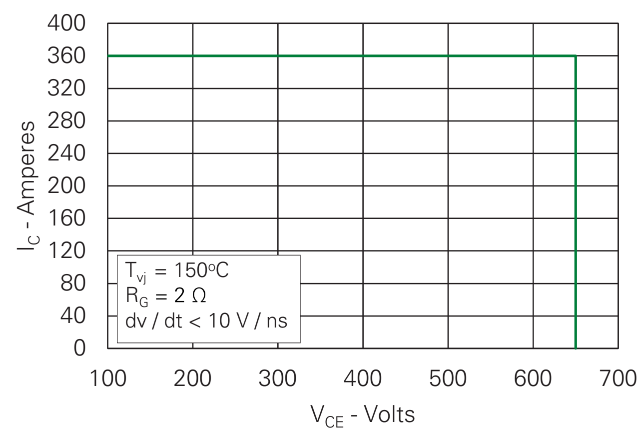


Fig. 11. Maximum Transient Thermal Impedance

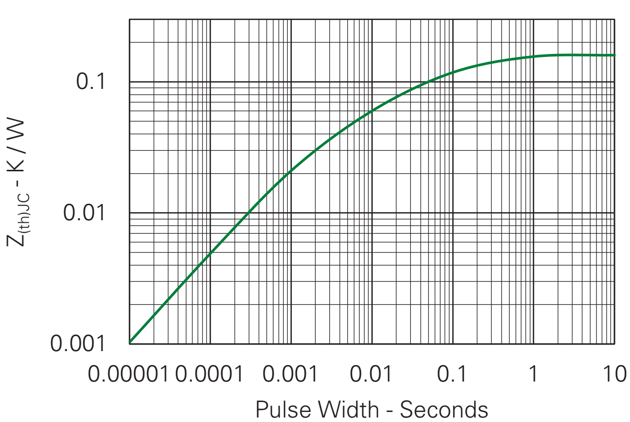
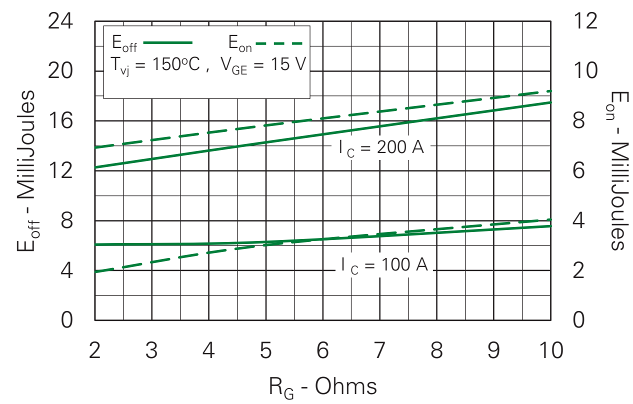


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance



Characteristic Curves

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

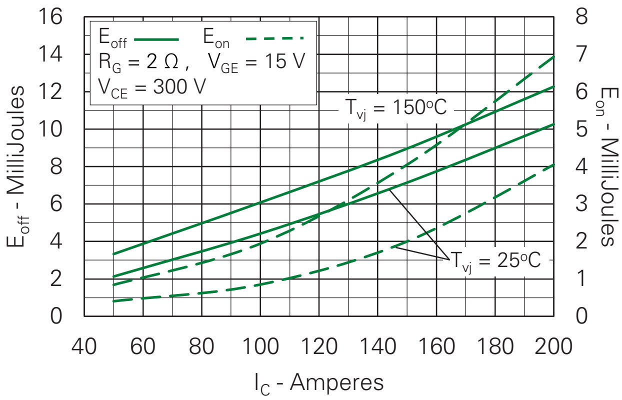


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

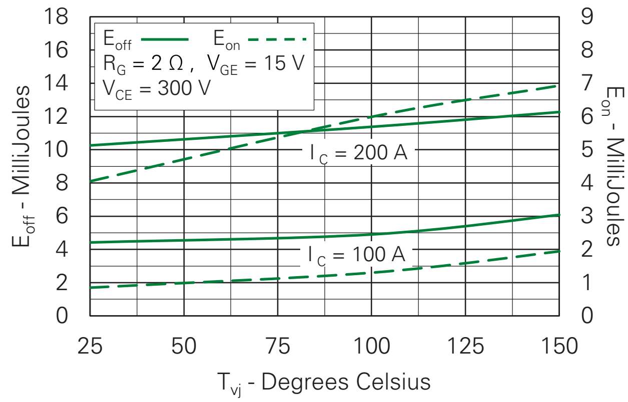


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

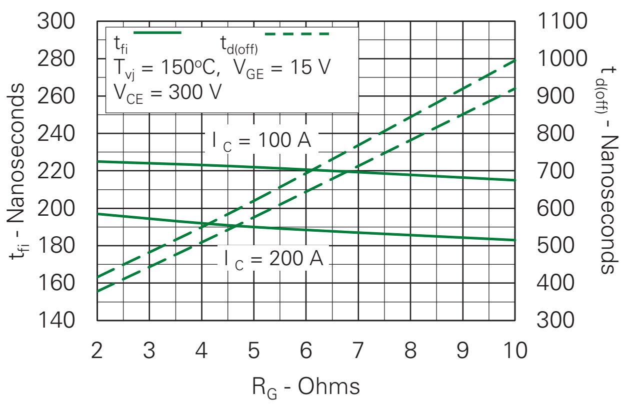


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

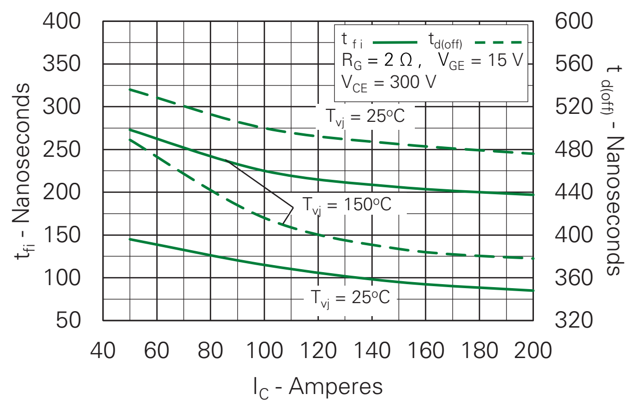


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

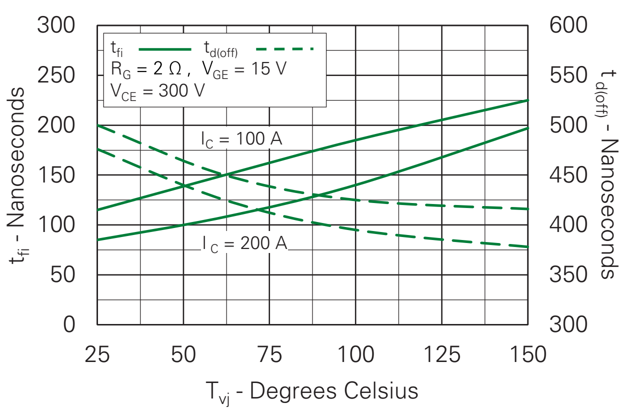


Fig. 18. Inductive Turn-on Switching Times vs. Collector Current

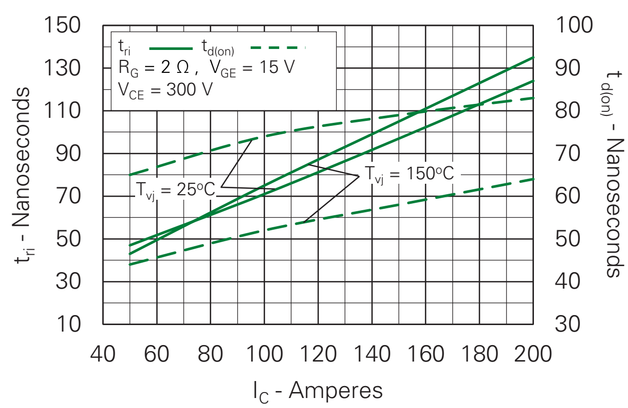


Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance

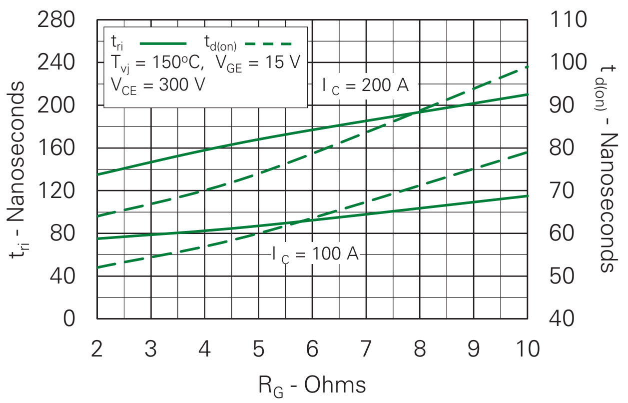


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

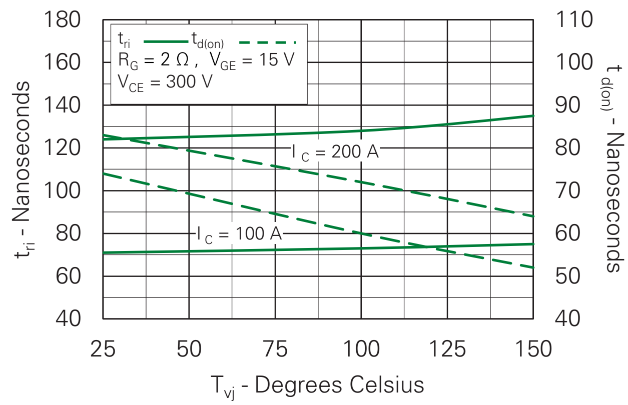


Fig. 21. Maximum Peak Load Current vs. Frequency

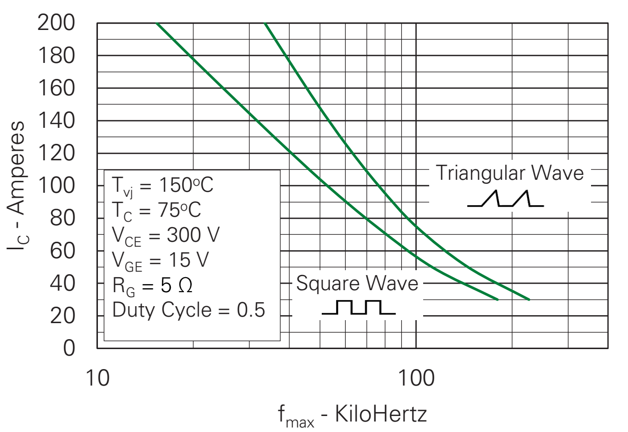


Fig. 22. Diode Forward Characteristics

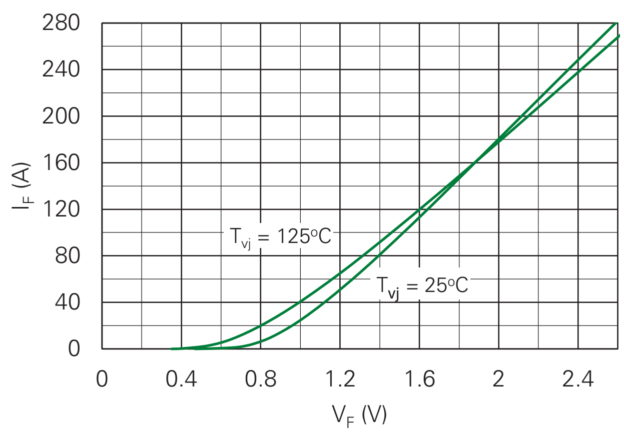


Fig. 23. Reverse Recovery Charge vs. -di_F/dt

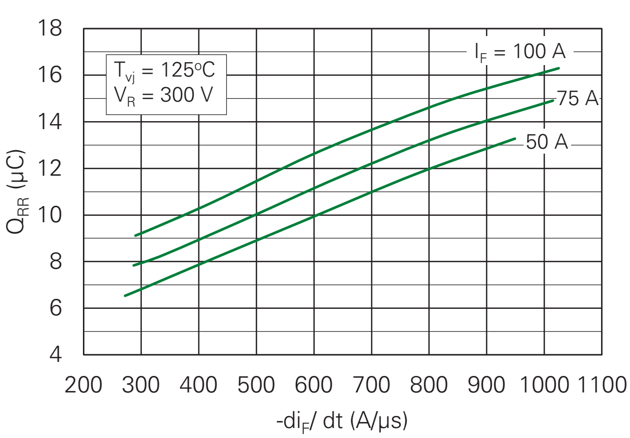


Fig. 24. Reverse Recovery Current vs. -di_F/dt

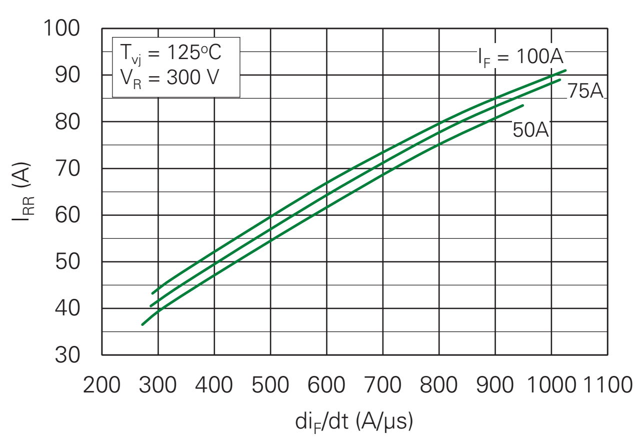


Fig. 25. Reverse Recovery Time vs. $-di_F/dt$

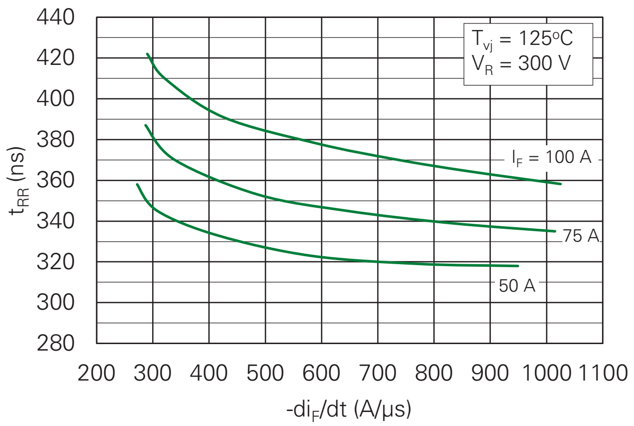


Fig. 26. Dynamic Parameters Q_{RR}, I_{RR} vs. Junction Temperature

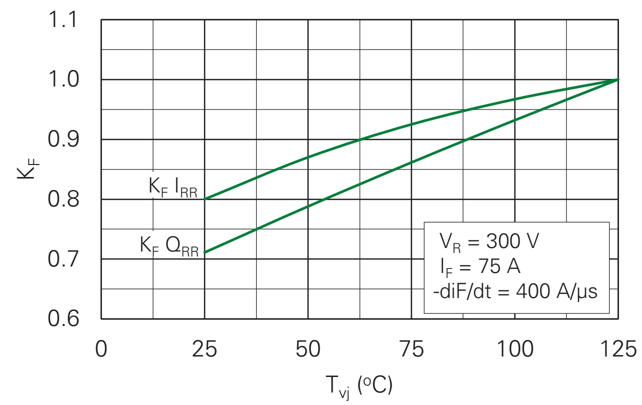
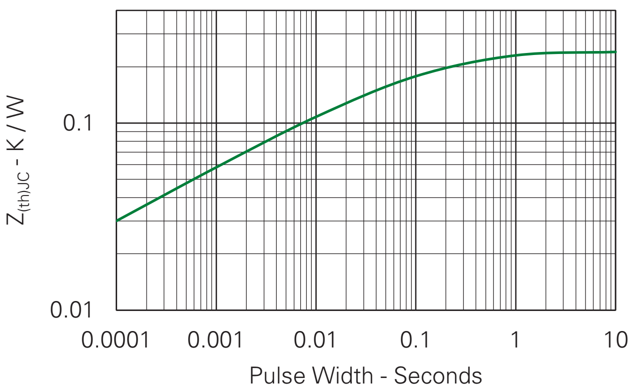
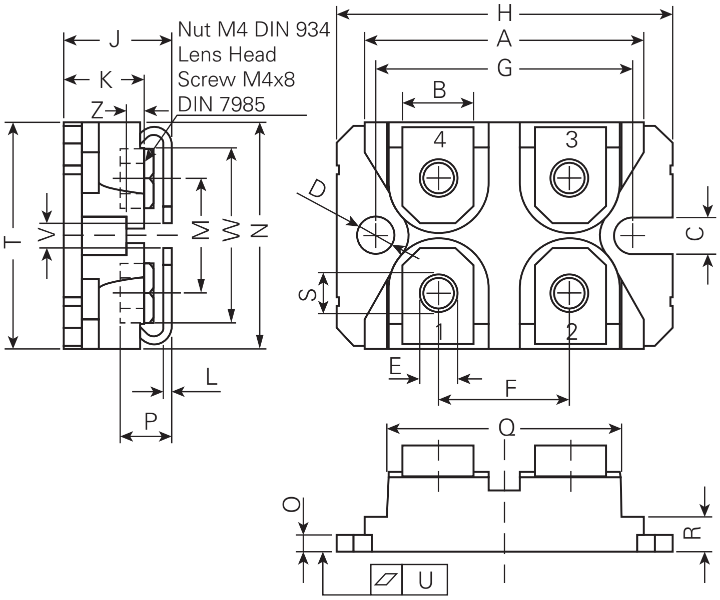


Fig. 27. Maximum Transient Thermal Impedance (Diode)



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

REVISION HISTORY		
01/18/2024	XZ	▪ Create first draft.