

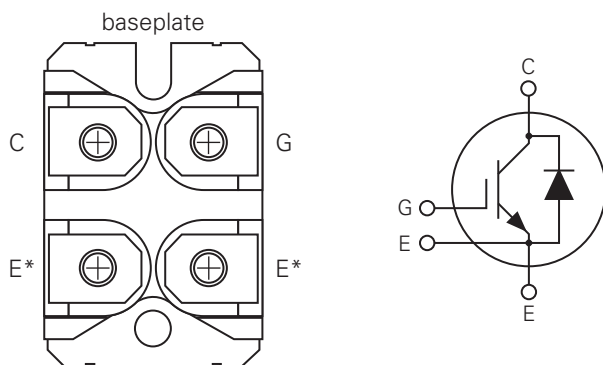
IXYN180N65A5

650 V, 180 A Gen5 XPT™ IGBT

Extreme Light Punch Through IGBT for up to 5 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 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

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} ≤ 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} ≤ 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	–	–	0.16	°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 ($T_J = 25^\circ\text{C}$ unless otherwise specified)

Symbol	Characteristic	Conditions		Value			Unit		
				Min.	Typ.	Max.			
g_{fs}	Transconductance ¹	$I_C = 60\text{ A}, V_{CE} = 10\text{ V}$		63	105	–	S		
R_{Gi}	Gate Input Resistance	–		–	1.15	–	Ω		
C_{ies}	Input Capacitance	$V_{CE} = 25\text{ V}, V_{GE} = 0\text{ V}, f = 1\text{ MHz}$		–	8640	–	pF		
C_{oes}	Output Capacitance			–	790	–			
C_{res}	Reverse Transfer Capacitance			–	360	–			
$Q_{g(on)}$	Total Gate Charge	$I_C = 180\text{ A}, V_{GE} = 15\text{ V}, V_{CE} = 0.5 \times V_{CES}$		–	654	–	nC		
Q_{ge}	Gate-Emitter Charge			–	63	–			
Q_{gc}	Gate-Collector Charge			–	345	–			
$t_{d(on)}$	Turn-on Delay Time ²	Inductive Load, $V_{GE} = 15\text{ V},$ $V_{CE} = 300\text{ V},$ $I_C = 100\text{ A},$ $R_{G(ext)} = 2\ \Omega$	$T_{vj} = 25^\circ\text{C}$	–	74	–	ns		
			$T_{vj} = 150^\circ\text{C}$	–	52	–			
t_{ri}	Turn-on Rise Time ²			$T_{vj} = 25^\circ\text{C}$	–	70	–	ns	
				$T_{vj} = 150^\circ\text{C}$	–	75	–		
E_{on}	Turn-on Energy ²			$T_{vj} = 25^\circ\text{C}$	–	0.85	–	mJ	
				$T_{vj} = 150^\circ\text{C}$	–	1.94	–		
$t_{d(off)}$	Turn-off Delay Time ²			$T_{vj} = 25^\circ\text{C}$	–	500	–	ns	
				$T_{vj} = 150^\circ\text{C}$	–	415	–		
t_{fi}	Turn-off Fall Time ²			$T_{vj} = 25^\circ\text{C}$	–	115	–	ns	
				$T_{vj} = 150^\circ\text{C}$	–	225	–		
E_{off}	Turn-off Energy ²			$T_{vj} = 25^\circ\text{C}$	–	4.40	–	mJ	
				$T_{vj} = 150^\circ\text{C}$	–	6.10	–		

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_{vj} , or R_G .

Characteristic Curves

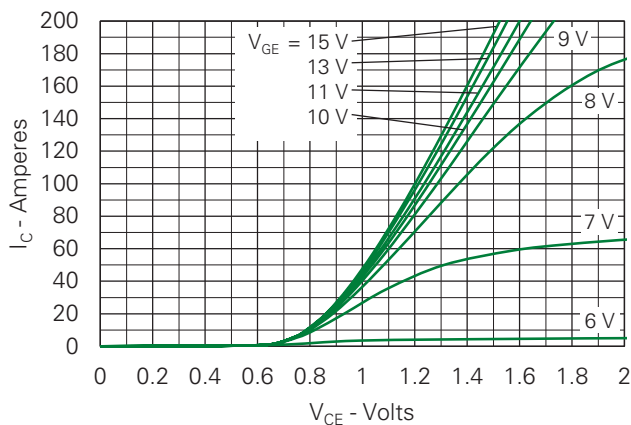
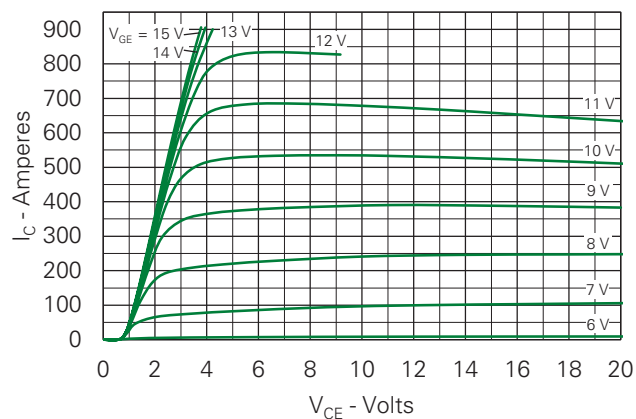
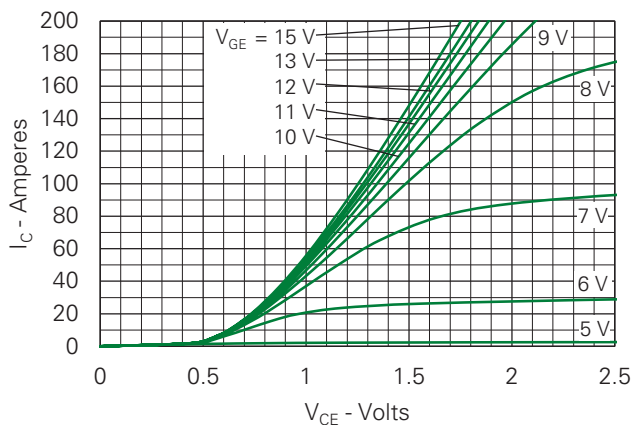
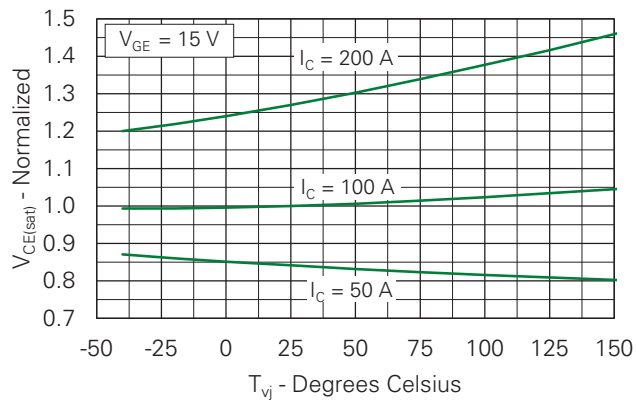
Fig. 1. Output Characteristics @ $T_{vj} = 25^{\circ}\text{C}$ Fig. 2. Extended Output Characteristics @ $T_{vj} = 25^{\circ}\text{C}$ Fig. 3. Output Characteristics @ $T_{vj} = 150^{\circ}\text{C}$ Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

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

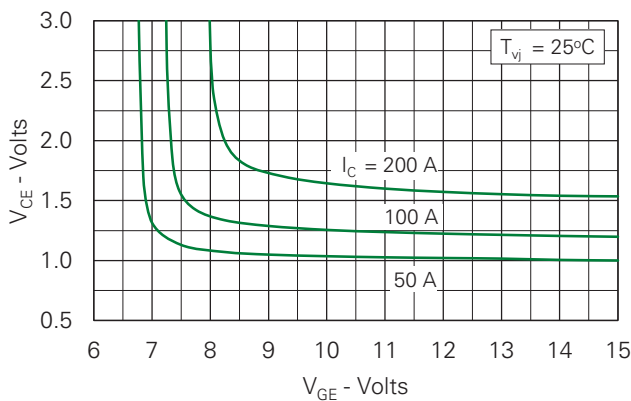


Fig. 6. Input Admittance

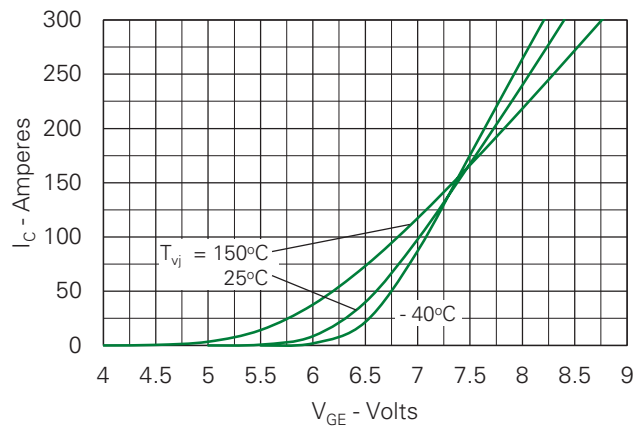


Fig. 7. Transconductance

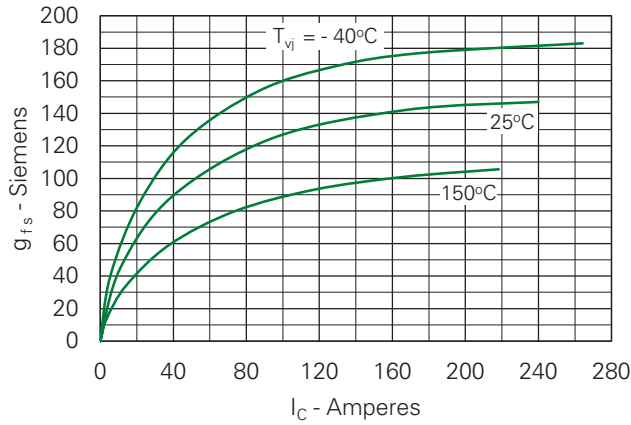


Fig. 8. Gate Charge

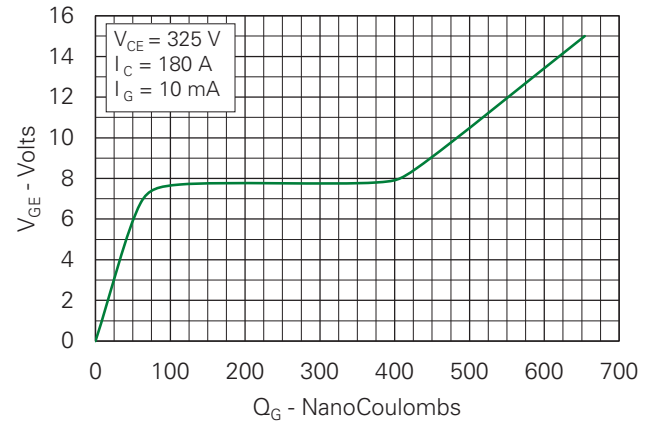


Fig. 9. Capacitance

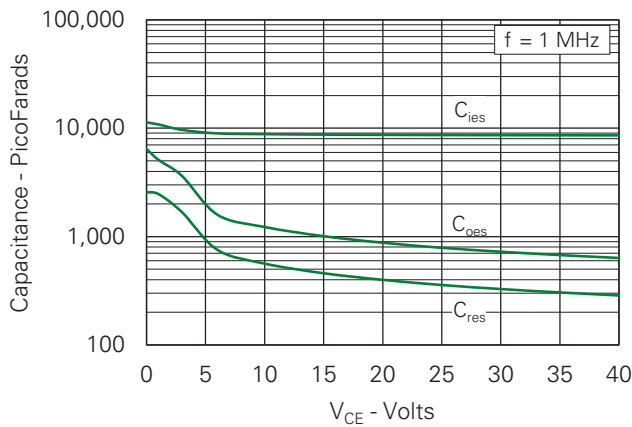


Fig. 10. Reverse-Bias Safe Operating Area

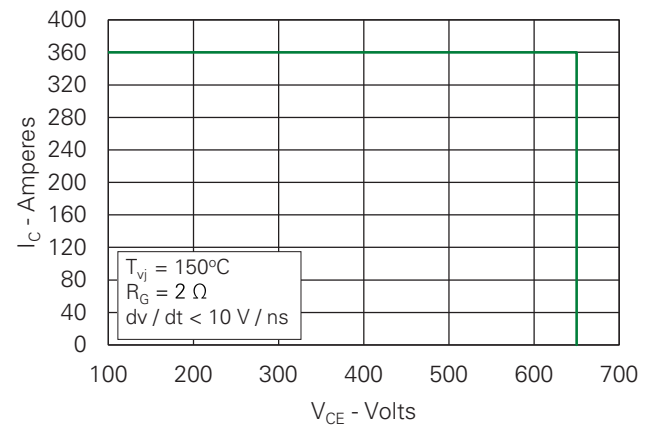


Fig. 11. Maximum Transient Thermal Impedance

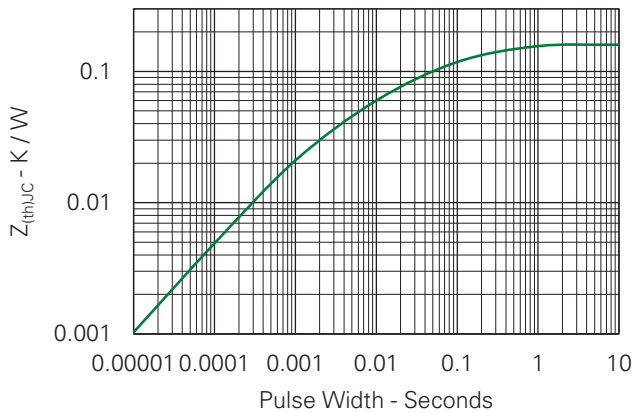
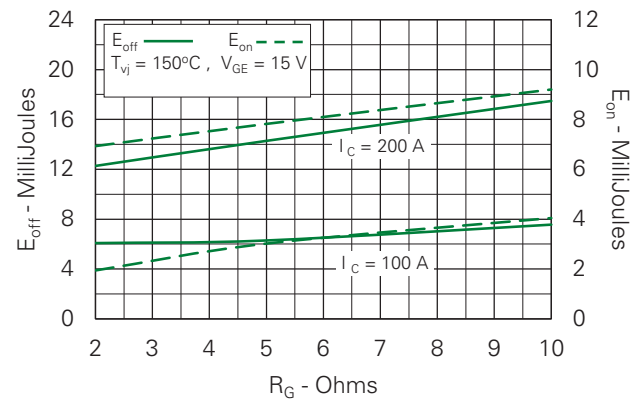


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance



Characteristic Curves

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

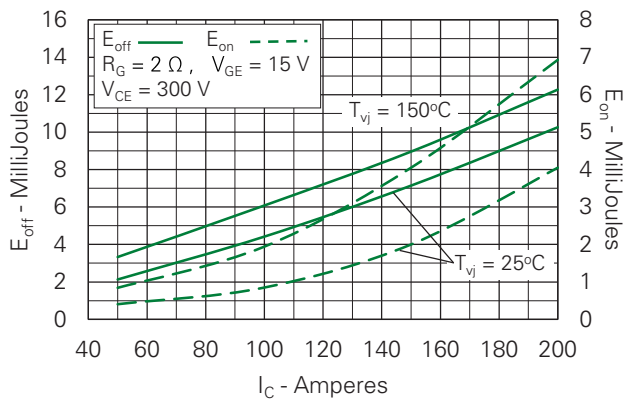


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

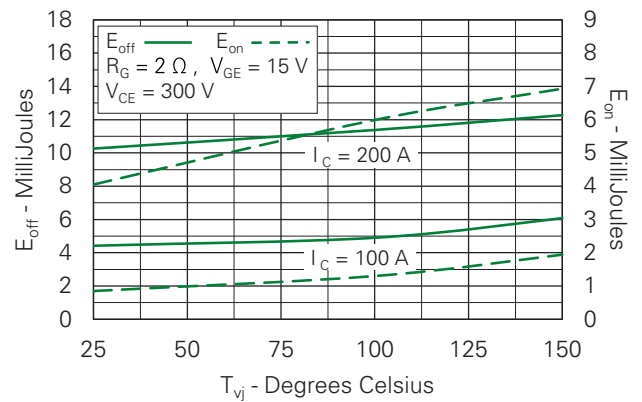


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

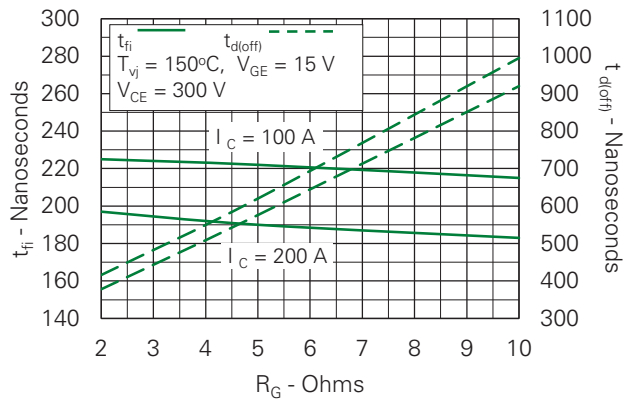


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

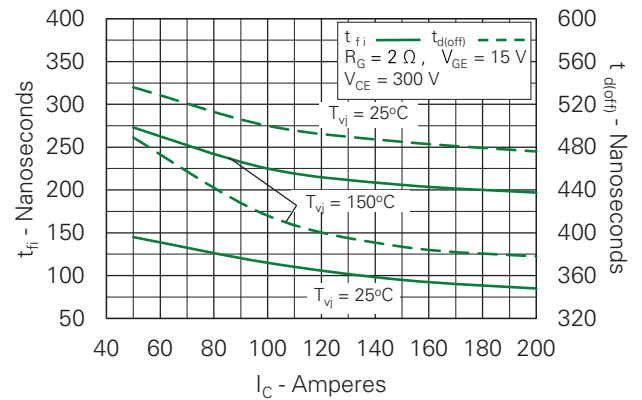


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

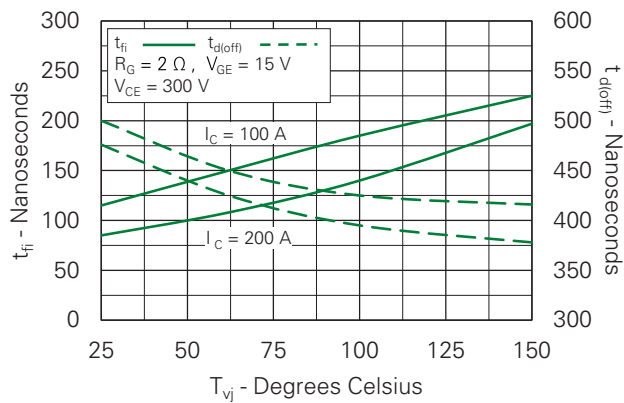


Fig. 18. Inductive Turn-on Switching Times vs. Collector Current

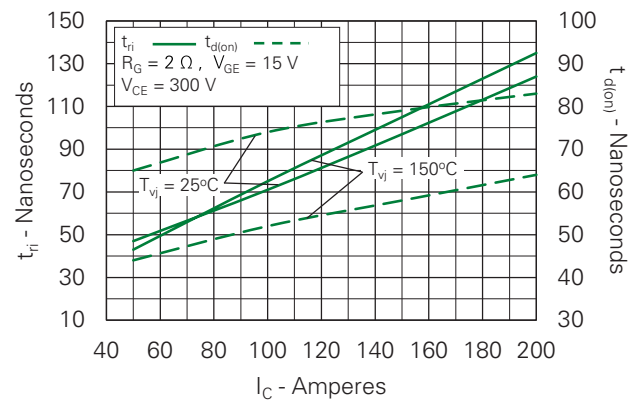


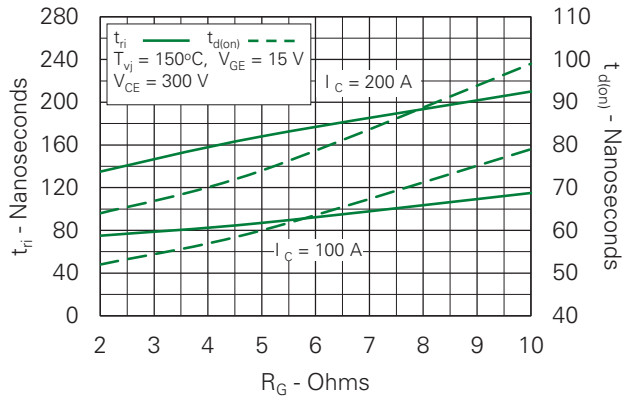
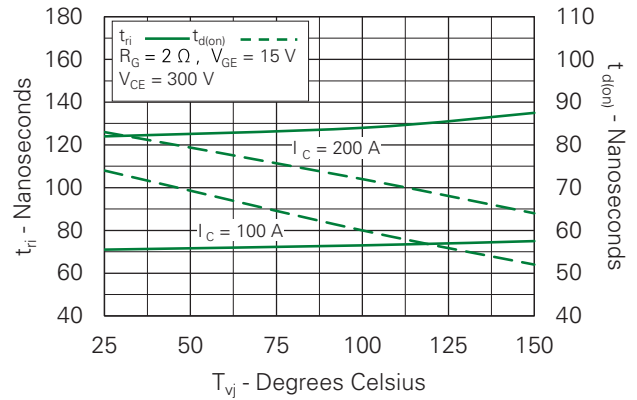
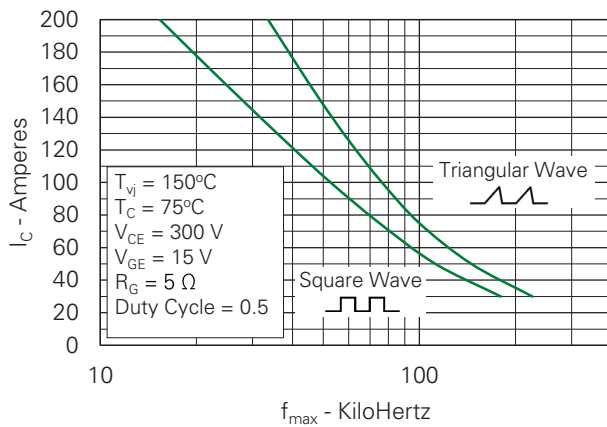
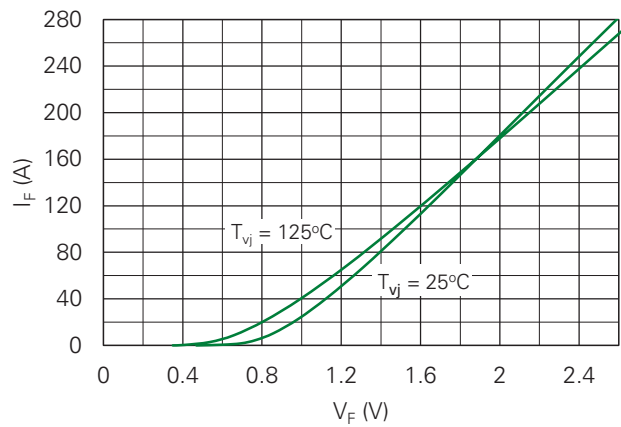
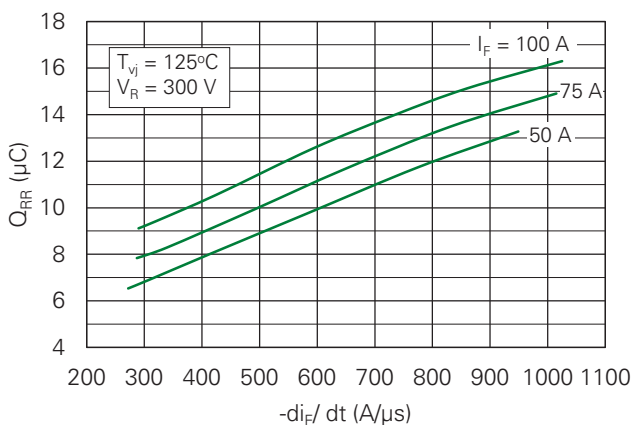
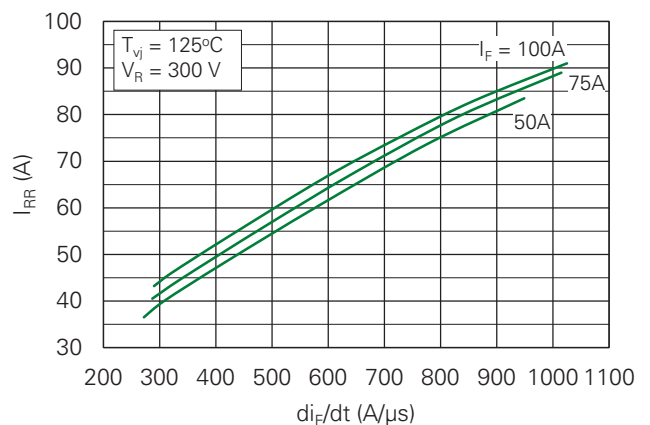
Fig. 19. Inductive Turn-on Switching Times vs. Gate Resistance**Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature****Fig. 21. Maximum Peak Load Current vs. Frequency****Fig. 22. Diode Forward Characteristics****Fig. 23. Reverse Recovery Charge vs. $-di_F/dt$** **Fig. 24. Reverse Recovery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

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

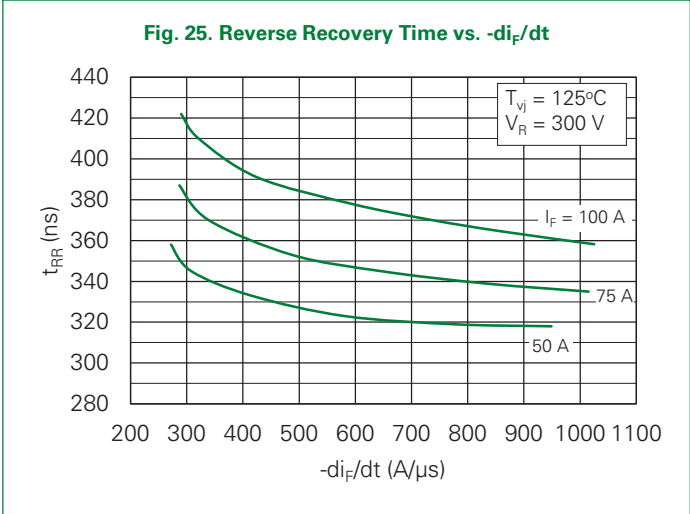


Fig. 26. Dynamic Parameters Q_{RR} , I_{RR} vs. Junction Temperature

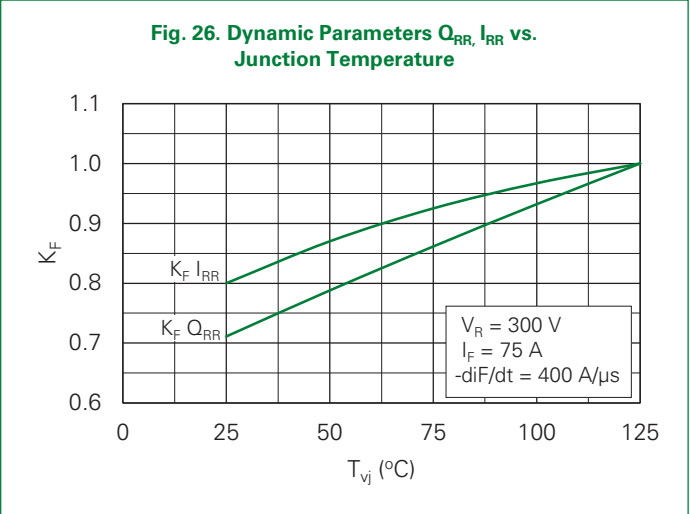
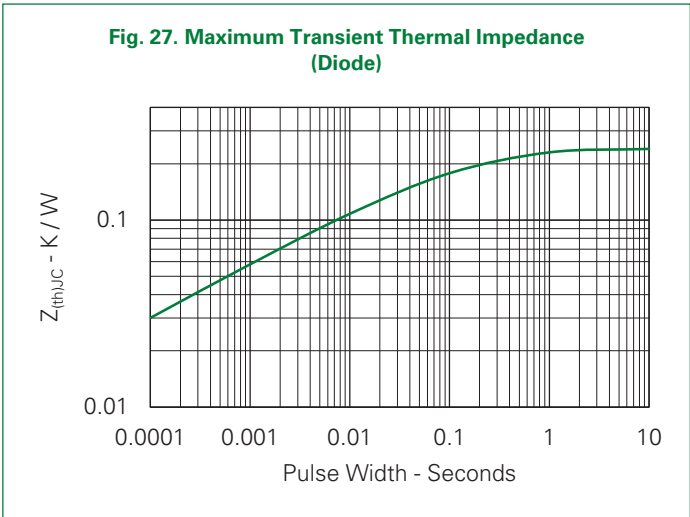
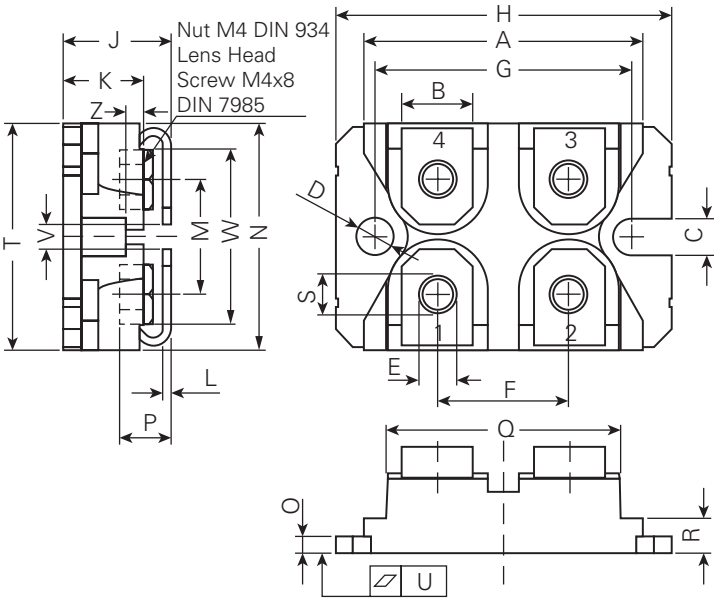


Fig. 27. Maximum Transient Thermal Impedance (Diode)



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

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Part of:

