IXYN200N65B5

650 V, 200 A Gen5 XPT™ IGBT

Extreme Light Punch Through IGBT for 5–30 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, optimization for medium switching applications and very high power density.

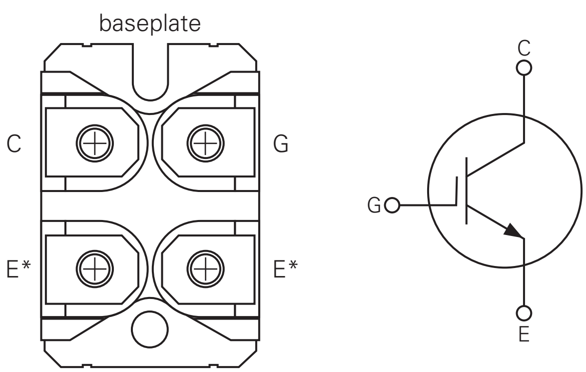
Features & Benefits:

- Optimized for 5–30 kHz Switching
- Positive Thermal Coefficient of $V_{CE(sat)}$
- Square RBSOA
- International Standard Package
- High Power Density
- Low Gate Drive Requirement

Applications:

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

Pinout Diagram (SOT-227B)



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

Product Summary

Characteristic	Value	Unit
V_{CES}	650	V
I_{C110}	200	A
$V_{CE(sat)}$	1.45	V
$t_{fi(typ)}$	65	ns

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	T_J = 25°C to 175°C	650	V
V_{GES}	Gate-Emitter Voltage	Continuous	±20	V
V_{GEM}	Transient Gate-Emitter Voltage	Transient, < 1 ms	±30	V
I_{C25}	Continuous Collector Current	T_C = 25°C	390	A
I_{LRMS}	Terminal Current Limit	–	200	A
I_{C110}	Continuous Collector Current	T_C = 110°C	200	A
I_{CM}	Pulsed Collector Current	T_C = 25°C, 1 ms	1130	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	V_{GE} = 15 V, T_{VJ} = 150°C, R_G = 3 Ω, Clamped Inductive Load, I_{CM} @ $V_{CE} \leq V_{CES}$	300	A
P_C	Collector Power Dissipation	T_C = 25°C	1200	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, $I_{ISOL} \leq$ 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	–	1.5/11.5	
W	Weight	–	30	g

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th, JC}$	Thermal Resistance, junction-to-case	–	–	0.125	°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	650	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	I_C = 4 mA, $V_{CE} = V_{GE}$	3.7	–	5.8	V
I_{GES}	Gate-Emitter Leakage Current	V_{CE} = 0 V, V_{GE} = ±20 V	–	–	±300	nA
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_J = 150°C	–	–	2	mA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage[1]	I_C = 100 A, V_{GE} = 15 V	–	1.20	1.45	V
		I_C = 100 A, V_{GE} = 15 V, T_J = 150°C	–	1.25	–	

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		70	120	–	S
C_{ies}	Input Capacitance	V_{GE} = 25 V, V_{GE} = 0 V, f = 1MHz		–	11.7	–	nF
C_{oes}	Output Capacitance			–	570	–	pF
C_{res}	Reverse Transfer Capacitance			–	430	–	
$Q_{g(on)}$	Total Gate Charge	V_{GE} = 15 V, V_{CE} = 0.5 x $V_{CES,}$ I_C = 200 A		–	790	–	nC
Q_{ge}	Gate-Emitter Charge			–	82	–	
Q_{gc}	Gate-Collector Charge			–	376	–	
$t_{d(on)}$	Turn-on Delay Time[2]	Inductive Load, V_{GE} = 15 V, V_{CE} = 300 V, I_C = 100 A, $R_{G(ext)}$ = 1 Ω	T_J = 25°C	–	77	–	ns
			T_J = 150°C	–	60	–	
t_{ri}	Turn-on Rise Time[2]		T_J = 25°C	–	70	–	ns
			T_J = 150°C	–	65	–	
E_{on}	Turn-on Energy[2]		T_J = 25°C	–	0.60	–	mJ
			T_J = 150°C	–	1.40	–	
$t_{d(off)}$	Turn-off Delay Time[2]		T_J = 25°C	–	470	–	ns
			T_J = 150°C	–	380	–	
t_{fi}	Turn-off Fall Time[2]		T_J = 25°C	–	65	–	ns
			T_J = 150°C	–	110	–	
E_{off}	Turn-off Energy[2]		T_J = 25°C	–	3.40	–	mJ
			T_J = 150°C	–	4.50	–	

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.

Characteristic Curves

Fig. 1. Output Characteristics @ T_J = 25ºC

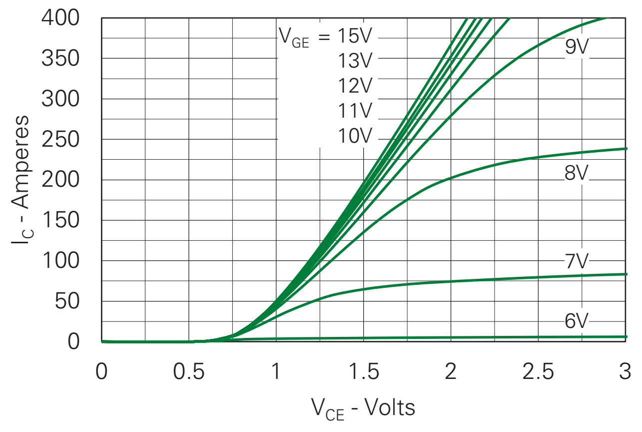


Fig. 2. Extended Output Characteristics @ T_J = 25ºC

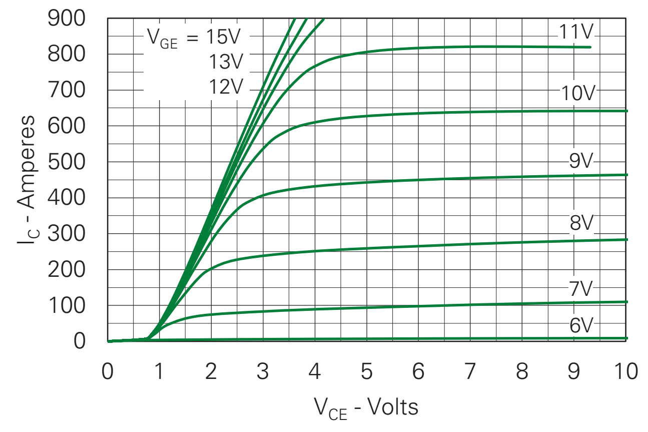


Fig. 3. Output Characteristics @ T_J = 150ºC

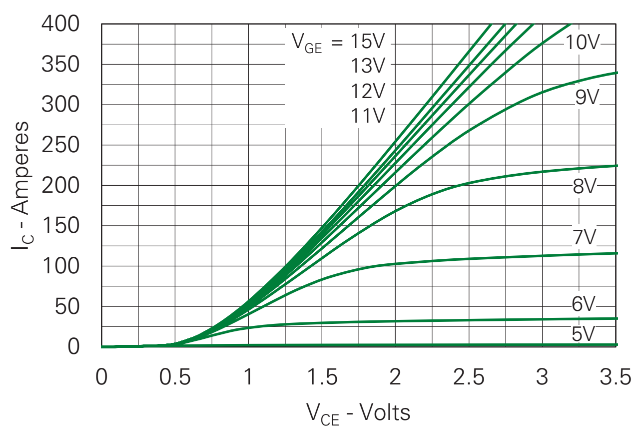


Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

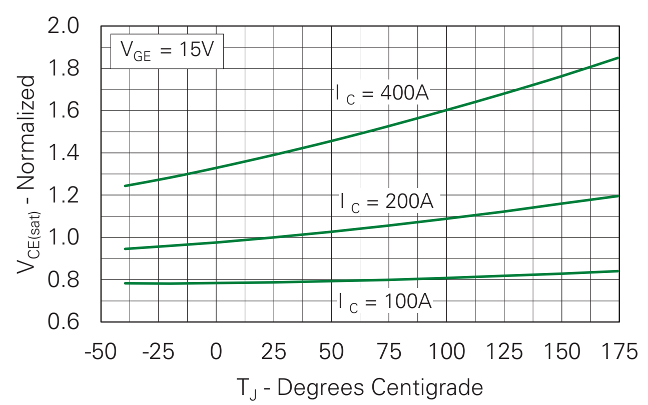


Fig. 5. Collector-to-Emitter Voltage vs. Gate-to-Emitter Voltage

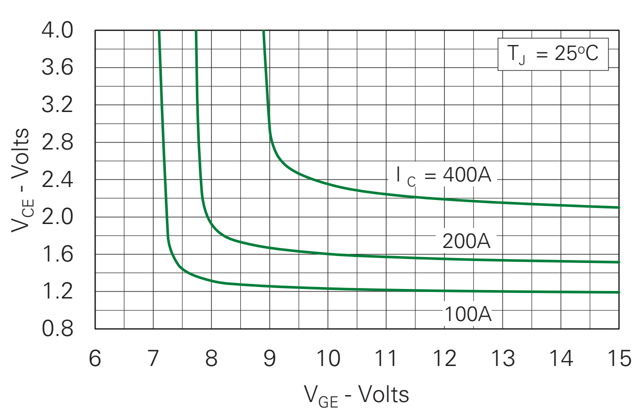
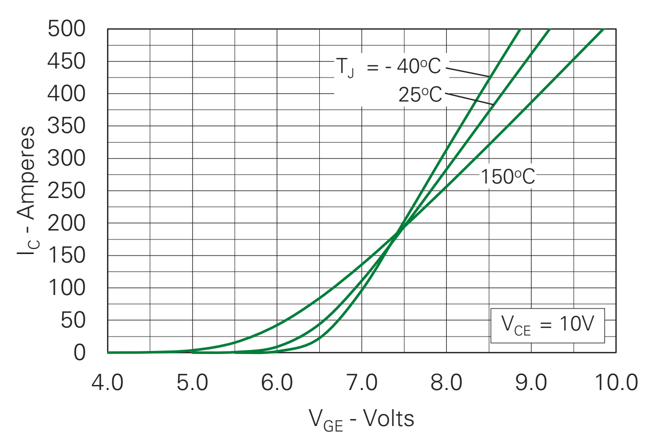


Fig. 6. Input Admittance



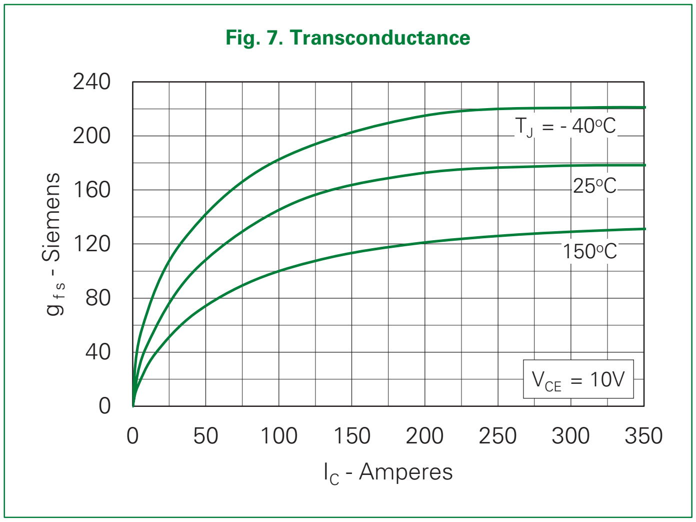


Fig. 7. Transconductance
g f s - Siemens
I C - Amperes
T J = - 40ºC
25ºC
150ºC
V CE = 10V

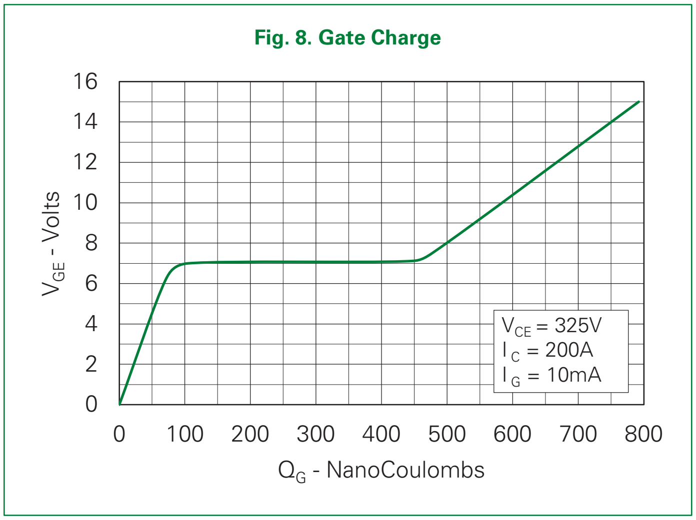


Fig. 8. Gate Charge
V GE - Volts
Q G - NanoCoulombs
V CE = 325V
I C = 200A
I G = 10mA

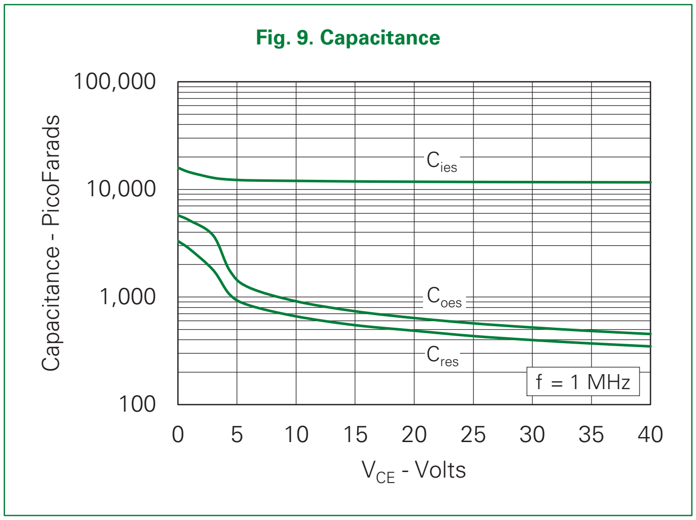


Fig. 9. Capacitance
Capacitance - PicoFarads
V CE - Volts
C ies
C oes
C res
f = 1 MHz

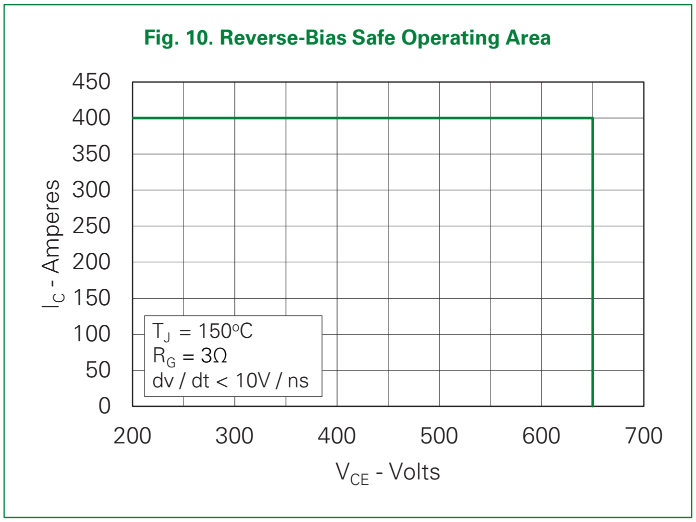


Fig. 10. Reverse-Bias Safe Operating Area
I C - Amperes
V CE - Volts
T J = 150ºC
R G = 3Ω
dv / dt < 10V / ns

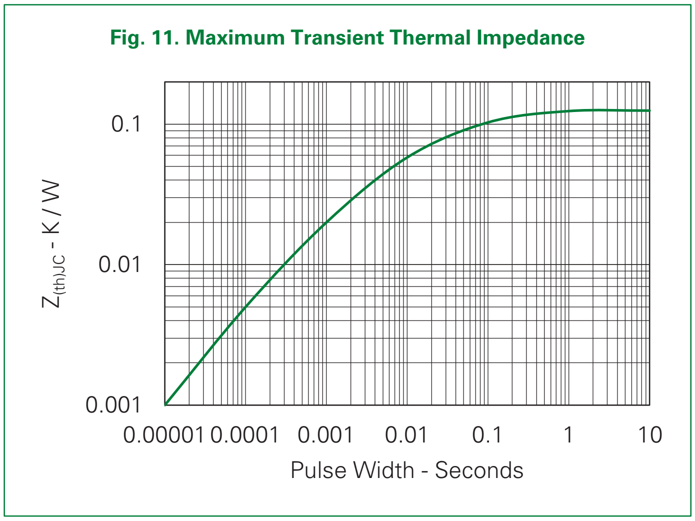


Fig. 11. Maximum Transient Thermal Impedance
Z (th)JC - K / W
Pulse Width - Seconds

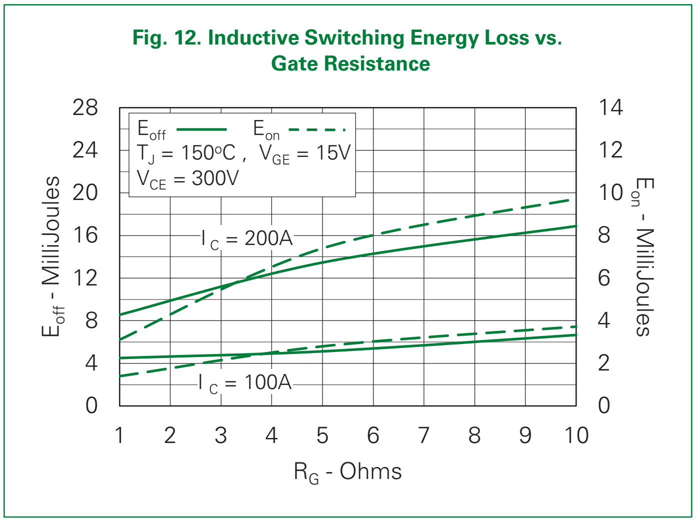


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance
E off - MilliJoules
E on - MilliJoules
R G - Ohms
E off
E on
T J = 150ºC , V GE = 15V
V CE = 300V
I C = 200A
I C = 100A

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

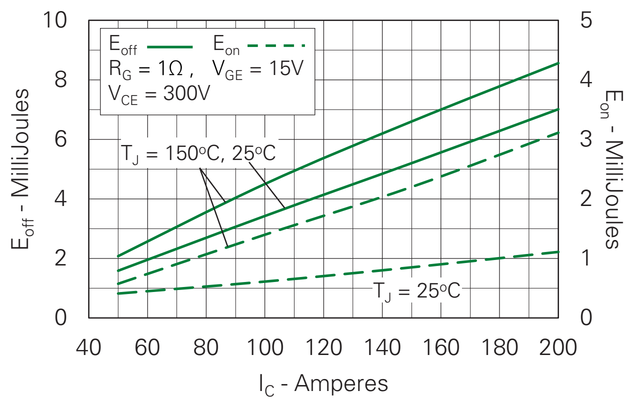


Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature

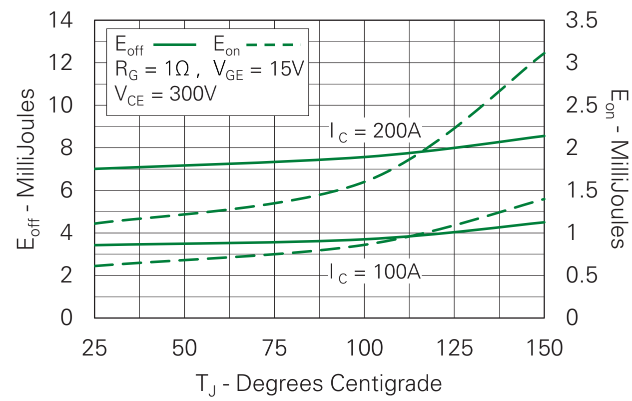


Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance

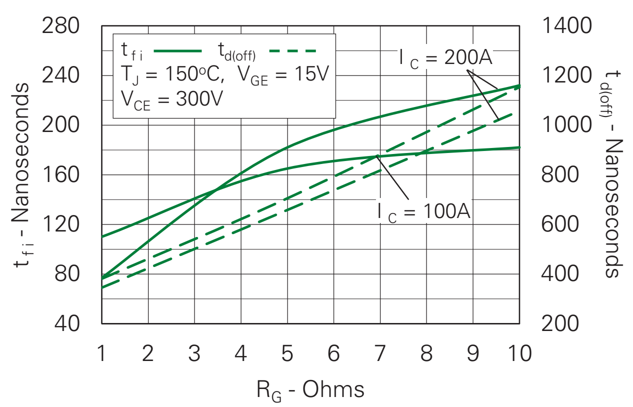


Fig. 16. Inductive Turn-off Switching Times vs. Collector Current

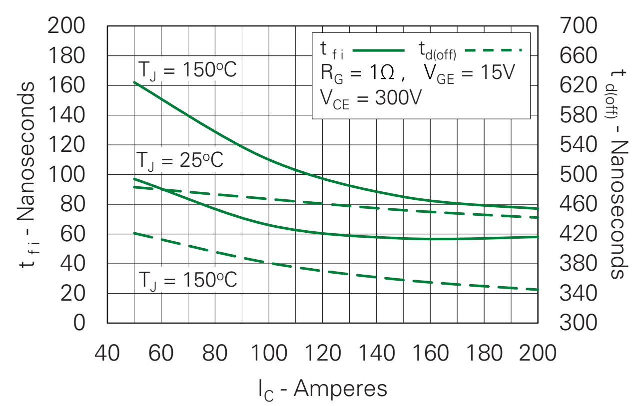


Fig. 17. Inductive Turn-off Switching Times vs. Junction Temperature

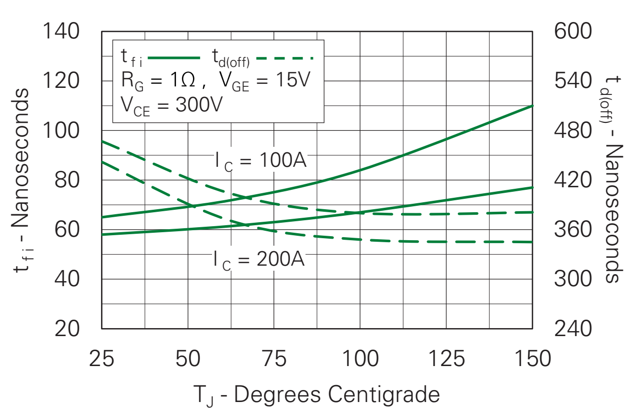


Fig. 18. Inductive Turn-on Switching Times vs. Gate Resistance

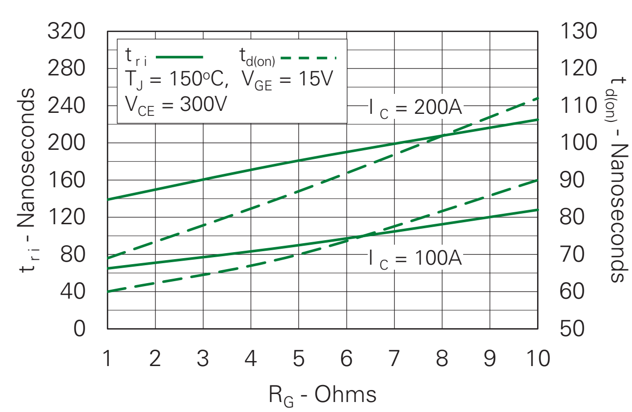


Fig. 19. Inductive Turn-on Switching Times vs. Collector Current

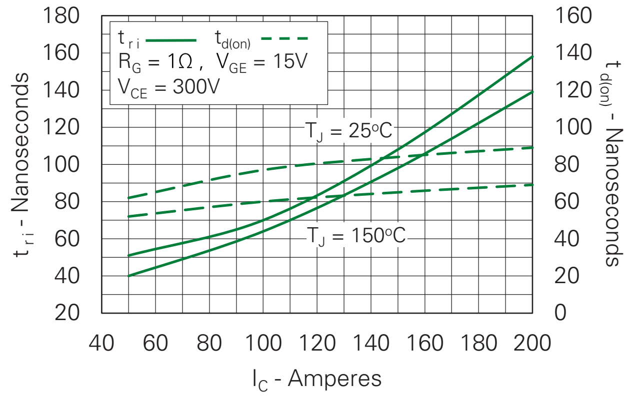


Fig. 20. Inductive Turn-on Switching Times vs. Junction Temperature

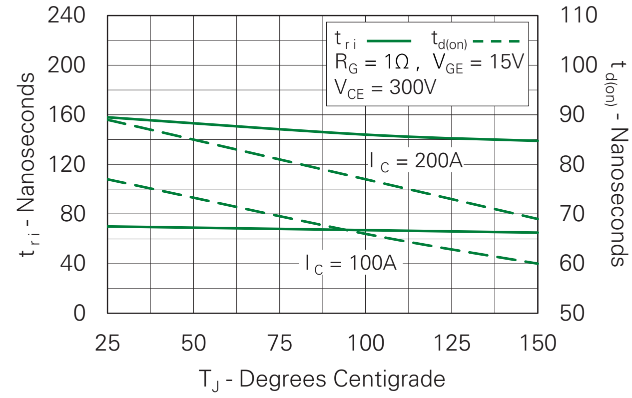
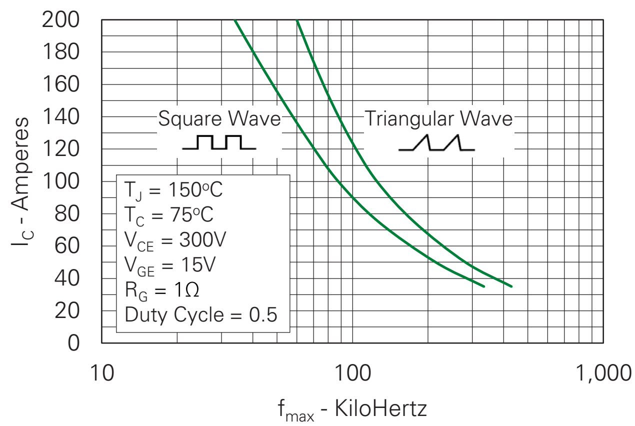
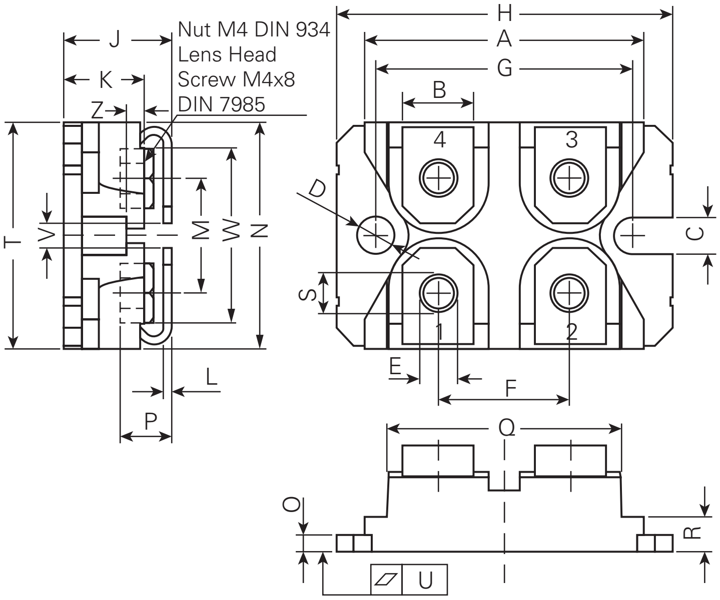


Fig. 21. Maximum Peak Load Current vs. Frequency



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