

IXYN220N65A5

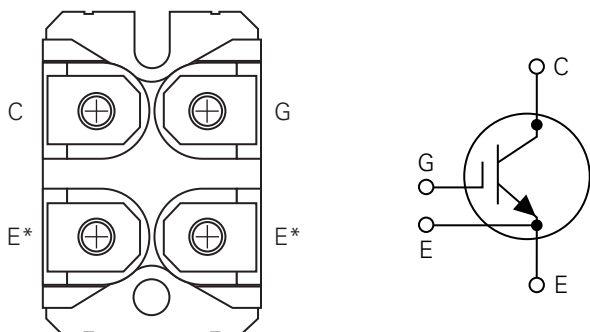
650 V, 220 A Gen5 XPT™ IGBT

Extreme Light Punch Through IGBT for up to 5 kHz Switching

 E153432



Pinout Diagram (SOT-227B, miniBLOC)



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

*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}	220	A
$V_{CE(sat)}$	1.35	V
$t_{fi(typ)}$	225	ns

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{CES}	Collector-Emitter Voltage	$T_J = 25\text{ }^{\circ}\text{C}$ to $175\text{ }^{\circ}\text{C}$	650	V
V_{CGR}	Collector-Gate Voltage	$T_J = 25\text{ }^{\circ}\text{C}$ to $175\text{ }^{\circ}\text{C}$, $R_{GE} = 1\text{ M}\Omega$	650	V
V_{GES}	Gate-Emitter Voltage	Continuous	± 20	V
V_{GEM}	Transient Gate-Emitter Voltage	Transient	± 30	V
I_{C25}	Continuous Collector Current	$T_C = 25\text{ }^{\circ}\text{C}$ (Chip Capability)	510	A
I_{LRMS}	Terminal Current Limit	–	200	A
I_{C110}	Continuous Collector Current	$T_C = 110\text{ }^{\circ}\text{C}$	220	A
I_{CM}	Pulsed Collector Current	$T_C = 25\text{ }^{\circ}\text{C}$, 1 ms	1180	A
SSOA (RBSOA)	Switching Safe Operating Area (Reverse Biased Safe Operating Area)	$V_{GE} = 15\text{ V}$, $T_{VJ} = 150\text{ }^{\circ}\text{C}$, $R_G = 3\text{ }\Omega$, Clamped Inductive Load, $I_{CM} = V_{CE} \leq V_{CES}$	300	A
P_C	Collector Power Dissipation	$T_C = 25\text{ }^{\circ}\text{C}$	1200	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	–	–	0.125	$^{\circ}\text{C}/\text{W}$
$R_{th, CS}$	Thermal Resistance, Case-to-Heat Sink	–	0.05	–	$^{\circ}\text{C}/\text{W}$

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

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{CES}	Collector-Emitter Breakdown Voltage	$I_C = 250\text{ }\mu\text{A}$, $V_{GE} = 0\text{ V}$	650	–	–	V
$V_{GE(th)}$	Gate-Emitter Threshold Voltage	$I_C = 4\text{ mA}$, $V_{CE} = V_{GE}$	3.8	–	5.8	V
I_{GES}	Gate-Emitter Leakage Current	$V_{CE} = 0\text{ V}$, $V_{GE} = \pm 20\text{ V}$	–	–	± 200	nA
I_{CES}	Zero Gate Voltage Collector Current	$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$	–	–	25	μA
		$V_{CE} = V_{CES}$, $V_{GE} = 0\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$	–	–	2	mA
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ¹	$I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$	–	1.15	1.35	V
		$I_C = 100\text{ A}$, $V_{GE} = 15\text{ V}$, $T_J = 150\text{ }^{\circ}\text{C}$	–	1.15	–	V

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

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

Symbol	Characteristic	Conditions		Value			Unit	
				Min.	Typ.	Max.		
g_{fs}	Transconductance ¹	$I_C = 60\text{ A}, V_{CE} = 10\text{ V}$		72	120	–	S	
C_{ies}	Input Capacitance	$V_{GE} = 25\text{ V}, V_{CE} = 0\text{ V}, f = 1\text{ MHz}$		–	11.7	–	pF	
C_{oes}	Output Capacitance			–	570	–		
C_{res}	Reverse Transfer Capacitance			–	440	–		
$Q_{g(on)}$	Total Gate Charge	$V_{GE} = 15\text{ V}, V_{CE} = 0.5 \times V_{CES},$ $I_C = 220\text{ A}$		–	750	–	nC	
Q_{ge}	Gate-Emitter Charge			–	86	–		
Q_{gc}	Gate-Collector Charge			–	377	–		
$t_{d(on)}$	Turn-on Delay Time ²	Inductive Load, $V_{GE} = 15\text{ V}, V_{CE} = 300\text{ V},$ $I_C = 100\text{ A}, R_{G(EXT)} = 1\text{ }\Omega$	$T_J = 25\text{ }^{\circ}\text{C}$	–	64	–	ns	
			$T_J = 150\text{ }^{\circ}\text{C}$	–	50	–		
t_{ri}	Turn-on Rise Time ²		$T_J = 25\text{ }^{\circ}\text{C}$	–	78	–	ns	
			$T_J = 150\text{ }^{\circ}\text{C}$	–	70	–		
E_{on}	Turn-on Energy ²		$T_J = 25\text{ }^{\circ}\text{C}$	–	1.30	–	mJ	
			$T_J = 150\text{ }^{\circ}\text{C}$	–	2.75	–		
$t_{d(off)}$	Turn-off Delay Time ²		$T_J = 25\text{ }^{\circ}\text{C}$	–	540	–	ns	
			$T_J = 150\text{ }^{\circ}\text{C}$	–	480	–		
t_{fi}	Turn-off Fall Time ²		$T_J = 25\text{ }^{\circ}\text{C}$	–	225	–	ns	
			$T_J = 150\text{ }^{\circ}\text{C}$	–	385	–		
E_{off}	Turn-off Energy ²		$T_J = 25\text{ }^{\circ}\text{C}$	–	7.95	–	mJ	
			$T_J = 150\text{ }^{\circ}\text{C}$	–	10.35	–		

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

Characteristic Curves

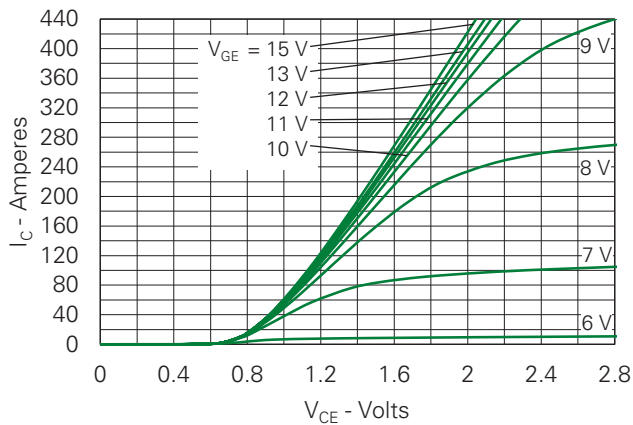
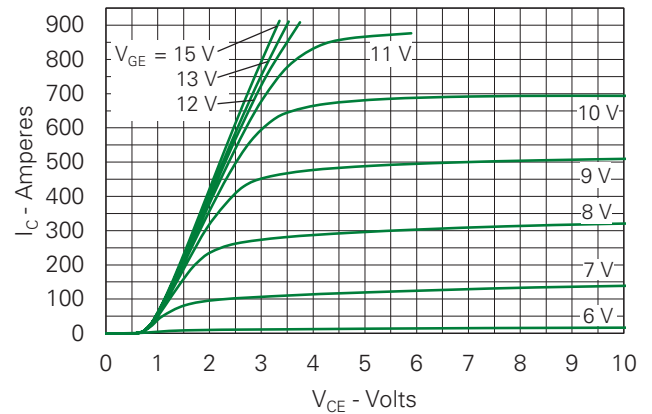
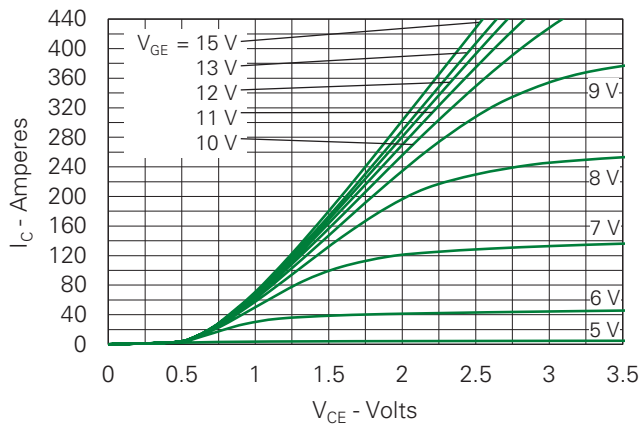
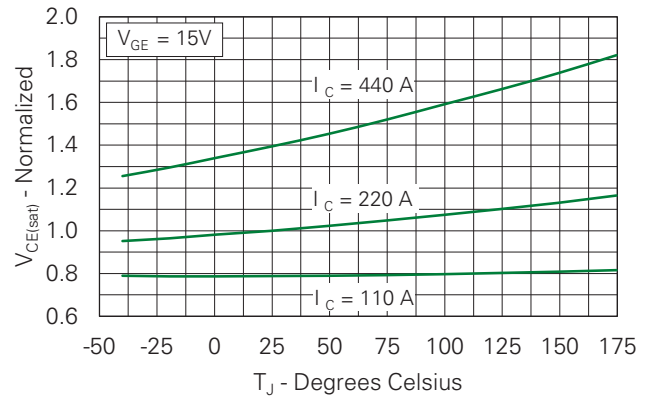
Fig. 1. Output Characteristics @ $T_J = 25^\circ\text{C}$ Fig. 2. Extended Output Characteristics @ $T_J = 25^\circ\text{C}$ Fig. 3. Output Characteristics @ $T_J = 150^\circ\text{C}$ Fig. 4. Dependence of $V_{CE(sat)}$ on Junction Temperature

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

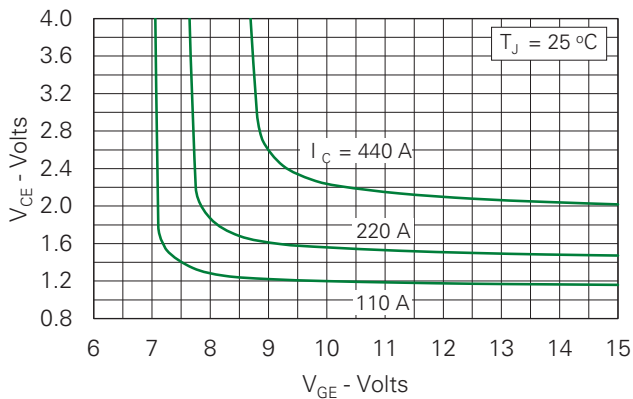


Fig. 6. Input Admittance

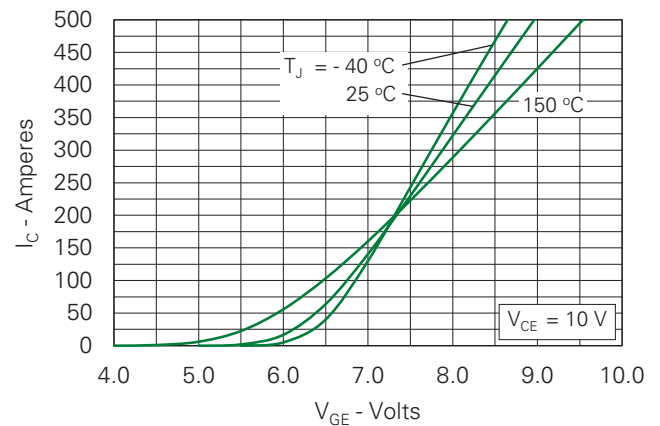


Fig. 7. Transconductance

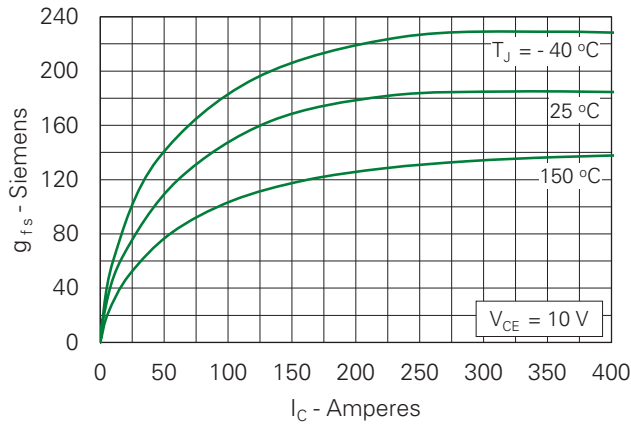


Fig. 8. Gate Charge

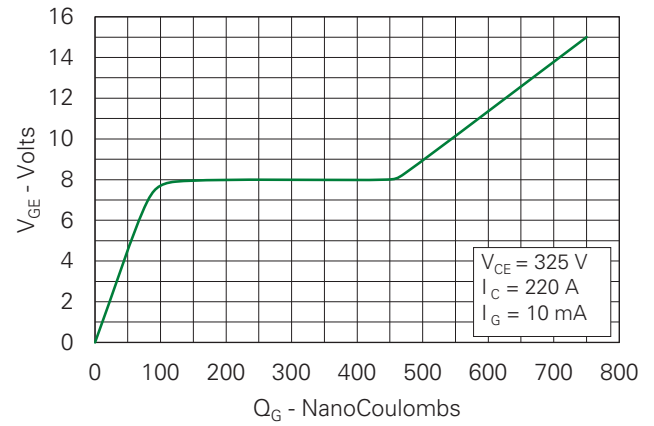


Fig. 9. Capacitance

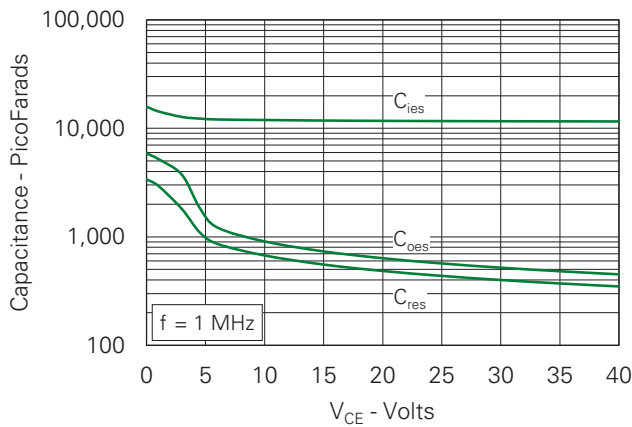


Fig. 10. Reverse-Bias Safe Operating Area

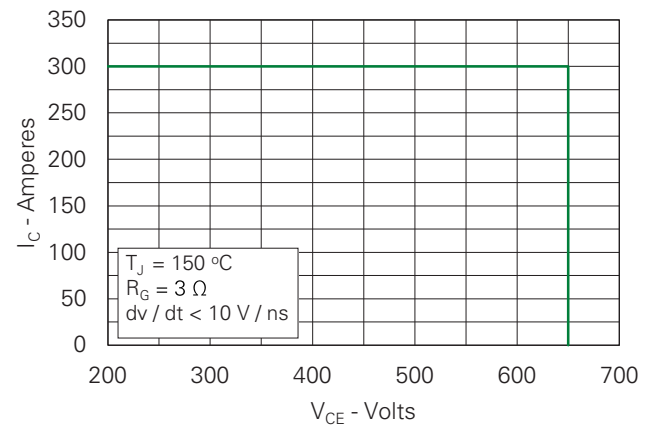


Fig. 11. Maximum Transient Thermal Impedance

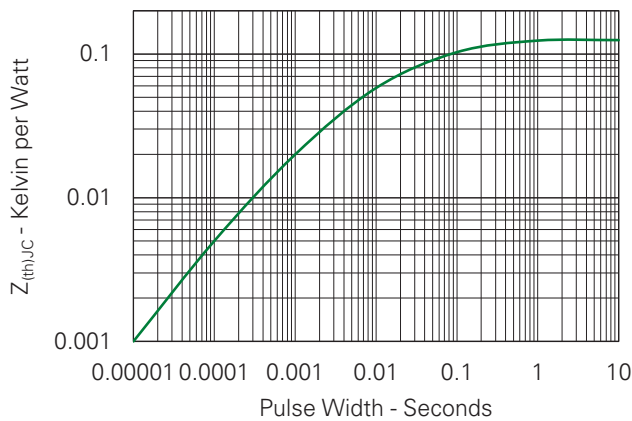


Fig. 12. Inductive Switching Energy Loss vs. Gate Resistance

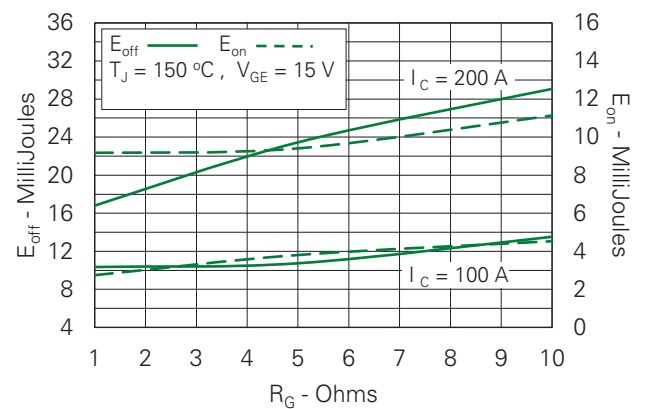


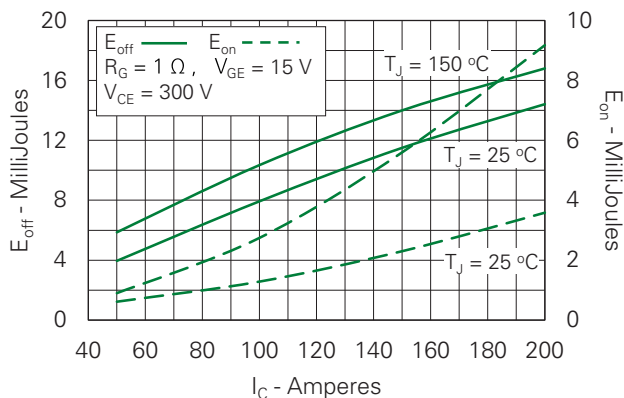
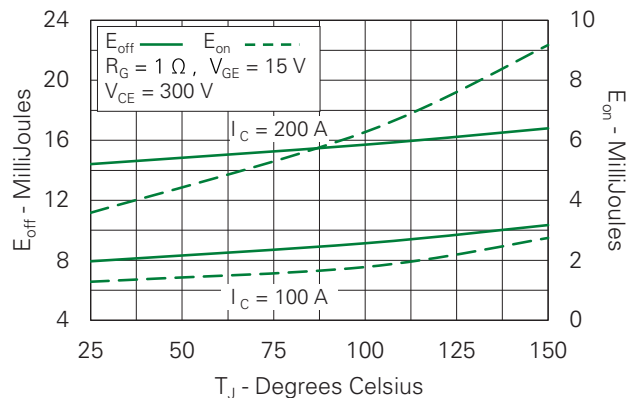
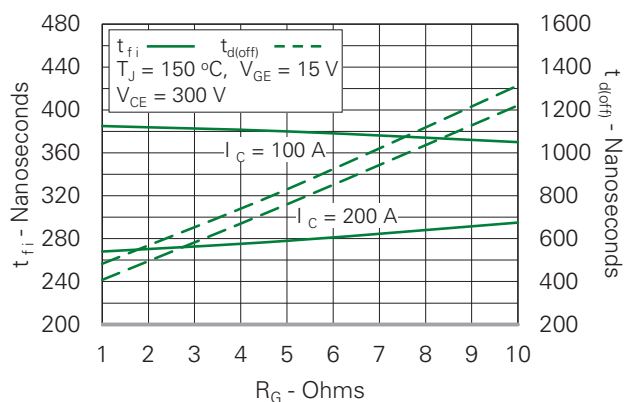
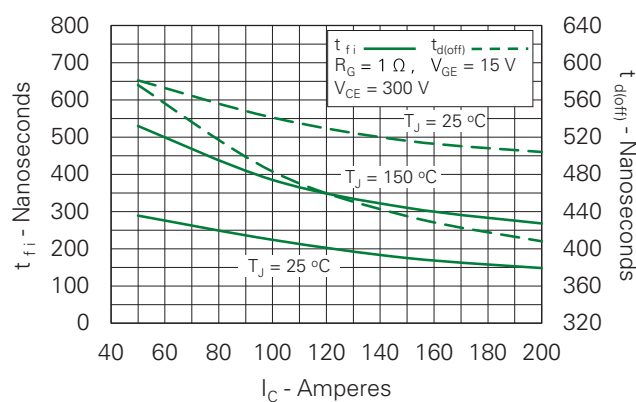
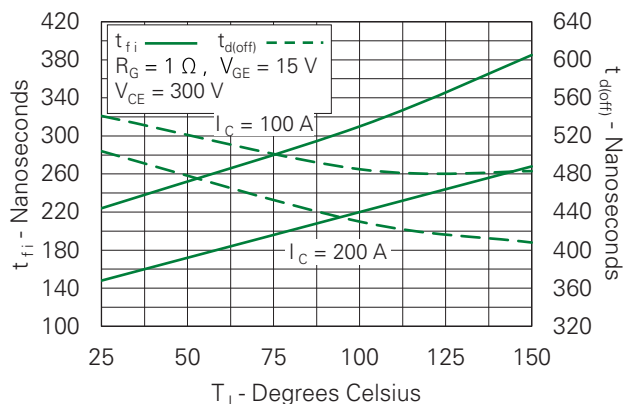
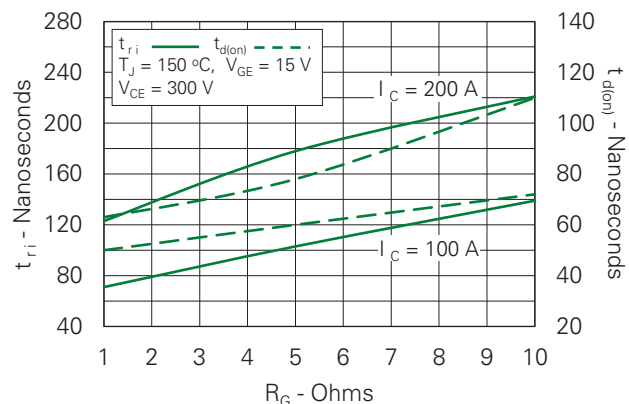
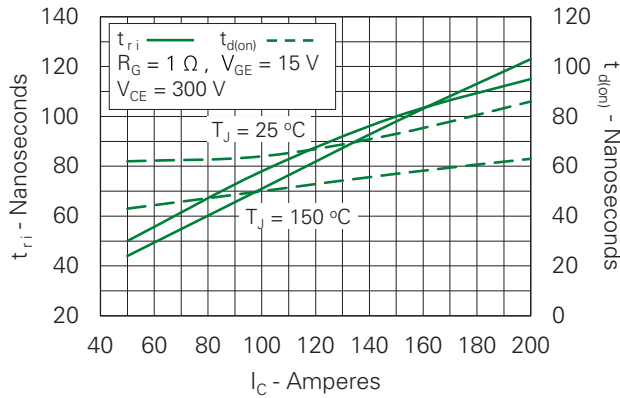
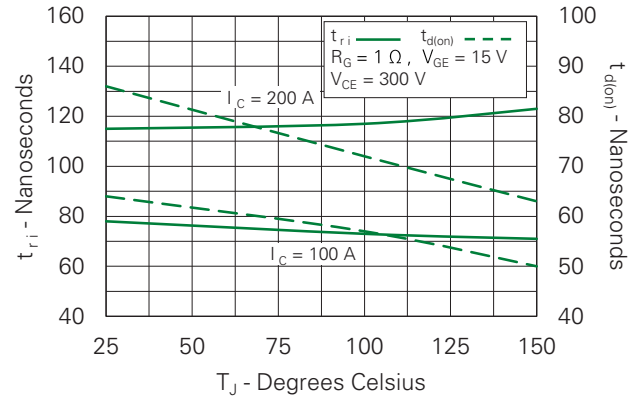
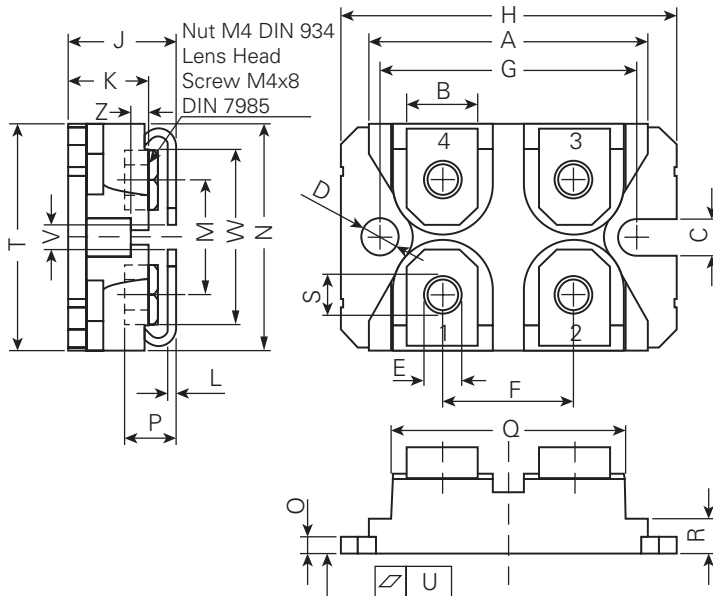
Fig. 13. Inductive Switching Energy Loss vs. Collector Current**Fig. 14. Inductive Switching Energy Loss vs. Junction Temperature****Fig. 15. Inductive Turn-off Switching Times vs. Gate Resistance****Fig. 16. Inductive Turn-off Switching Times vs. Collector Current****Fig. 17. Inductive Turn-off Switching 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****Part Outline Drawing** (SOT-227B, miniBLOC)

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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