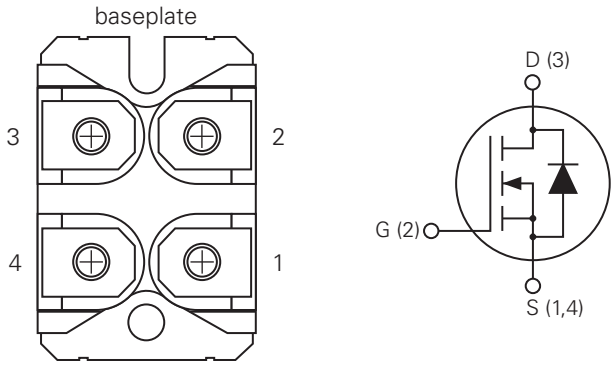
IXTN500N20X4

200 V, 1.99 mΩ, 500 A X4-Class Power MOSFET

N-Channel Enhancement Mode, Avalanche Rated

Pinout Diagram (SOT-227B, miniBLOC™)



3: Drain; **2:** Gate; **1, 4:** Source, **baseplate:** Isolated

Features

- Low $R_{DS(on)}$ and high current capability
- Low gate charge Q_g
- Compact design with high power density

Benefits

- Minimized parallel connection effort with decreased part count
- Simplified driver reduces design effort
- Cost-efficient solution with ease of assembly

SOT-227B Package

- Aluminum nitride ceramic-based isolated package improves thermal resistance and power handling capability
- Compact discrete package with electrically isolated baseplate
- Isolation voltage 2500 V AC (RMS), 1 minute
- Low internal lead inductance with higher safety overvoltage margin
- Screw-mounted discrete package enabling rugged and stable mounting

Applications:

- DC load switch
- Battery and fuel cell based energy storage systems
- Industrial and process power supplies
- Telecom and data center power supplies
- Battery formation
- Robotics and servo controls

Product Summary

Characteristic	Value	Unit
V_{DSS}	200	V
I_{D25}	500	A
$R_{DS(on)}$	≤1.99	mΩ

Revised: XZ 07/05/2024

Maximum Ratings

Symbol	Characteristic	Conditions	Value	Unit
V_{DSS}	Drain-Source Voltage	T_{vj} = 25 °C to 175 °C	200	V
V_{GSS}	Gate-Source Voltage	Continuous	±20	V
V_{GSM}		Transient	±30	
I_{D25}	Drain Current	T_c = 25 °C	500	A
I_{DM}		T_c = 25 °C, Pulse Width Limited by $T_{vj(max)}$	1300	
$I_{L(RMS)}$	Terminal Current Limit	–	200	A
I_A	Avalanche Current	T_c = 25 °C	250	A
E_{AS}	Avalanche Energy	T_c = 25 °C	5	J
dv/dt	Reverse Diode dv/dt	$I_S \le I_{DM}$, $V_{DD} \le V_{DSS}$, $T_{vj} \le 150$ °C	50	V/ns
P_D	Power Dissipation	T_c = 25 °C	1150	W
T_{vj}	Virtual Junction Temperature Range	–	−55 to +175	°C
$T_{vj(max)}$	Maximum Virtual Junction Temperature	–	175	
T_{stg}	Storage Temperature Range	–	−55 to +175	
V_{ISOL}	Isolation Voltage	50/60 Hz, $I_{ISOL} \le$ 1 mA, t = 1 min	2500	V~
		50/60 Hz, $I_{ISOL} \le$ 1 mA, t = 1 s	3000	
M_d	Mounting Torque	–	1.5/13	Nm/lb.in
	Terminal Connection Torque	–	1.3/11.5	Nm/lb.in
W	Weight	–	30	g

Thermal Characteristics

Symbol	Characteristic	Value			Unit
		Min.	Typ.	Max.	
$R_{th, JC}$	Thermal Resistance, Junction-to-Case	–	–	0.13	K/W
$R_{th, CS}$	Thermal Resistance, Case-to-Sink	–	0.05	–	K/W

Electrical Characteristics – Static (T_{vj} = 25 °C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
BV_{DSS}	Drain-Source Breakdown Voltage	I_D = 1 mA, V_{GS} = 0 V	200	–	–	V
$V_{GS(th)}$	Gate Threshold Voltage	I_D = 250 µA, $V_{GS} = V_{DS}$	2.5	–	4.5	V
I_{GSS}	Gate-Source Leakage Current	V_{DS} = 0 V, V_{GS} = ±20 V	–	–	±200	nA
I_{DSS}	Drain-Source Leakage Current	$V_{DS} = V_{DSS}$, V_{GS} = 0 V	–	–	25	µA
		$V_{DS} = V_{DSS}$, V_{GS} = 0 V, T_{vj} = 150 °C	–	–	3	mA
$R_{DS(on)}$	Drain-Source On-Resistance[1]	V_{GS} = 10 V, I_D = 100 A	–	–	1.99	mΩ

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2 %

Electrical Characteristics – Dynamic (T_{vj} = 25 °C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
g_{fs}	Transconductance[1]	V_{DS} = 10 V, I_D = 60 A	150	200	–	S
R_{Gi}	Gate Input Resistance	–	–	0.85	–	Ω
C_{iss}	Input Capacitance	V_{GS} = 0 V, V_{DS} = 25 V, f = 1 MHz	–	41.5	–	nF
C_{oss}	Output Capacitance		–	4.4	–	nF
C_{rss}	Reverse Transfer Capacitance		–	23	–	pF
$C_{o(er)}$	Effective Output Capacitance – Energy Related	V_{GS} = 0 V, V_{DS} = 0.8 x V_{DSS}	–	2.33	–	nF
$C_{o(tr)}$	Effective Output Capacitance – Time Related		–	10.10	–	
$Q_{g(on)}$	Total Gate Charge	V_{GS} = 10 V, V_{DS} = 0.5 x V_{DSS}, I_D = 0.5 x I_{D25}	–	535	–	nC
Q_{gs}	Gate-Source Charge		–	220	–	
Q_{gd}	Gate-Drain Charge		–	110	–	
$t_{d(on)}$	Turn-on Delay Time	**Resistive Switching** V_{GS} = 10 V, V_{DS} = 0.5 x V_{DSS}, I_D = 0.5 x I_{D25}, $R_{G(ext)}$ = 1 Ω	–	75	–	ns
t_r	Rise Time		–	46	–	
$t_{d(off)}$	Turn-off Delay Time		–	160	–	
t_f	Fall Time		–	14	–	

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%

Source-Drain Diode Characteristics (T_{vj} = 25 °C unless otherwise specified)

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
I_S	Continuous Diode Forward Current	V_{GS} = 0 V	–	–	500	A
I_{SM}	Diode Pulse Current	Repetitive, Pusle Width Limited by $T_{vj(max)}$	–	–	2000	A
V_{SD}	Diode Forward Voltage[1]	I_F = 100 A, V_{GS} = 0 V	–	–	1.4	V
t_{rr}	Reverse Recovery Time	I_F = 200 A, –di/dt = 200 A/µs, V_R = 100 V, V_{GS} = 0 V	–	250	–	ns
Q_{rr}	Reverse Recovery Charge		–	2.8	–	µC
I_{rrm}	Reverse Recovery Current		–	28	–	A

Note 1: Pulse test, t ≤ 300 µs, duty cycle, d ≤ 2%

Characteristic Curves

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

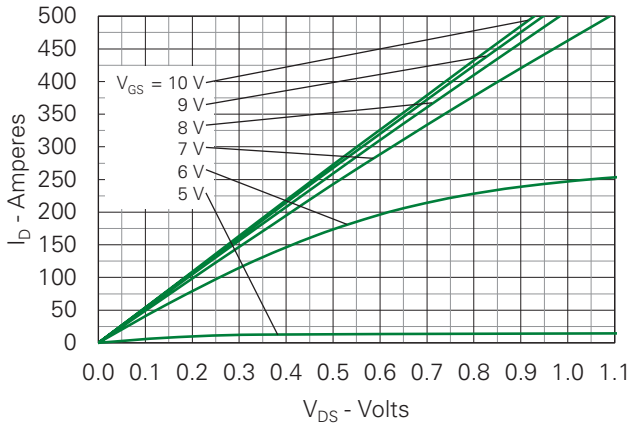


Fig. 2. Extended Output Characteristics @ T_{vj} = 25 ºC

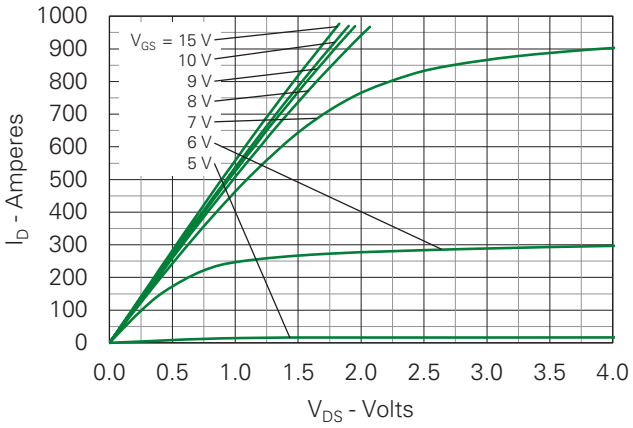


Fig. 3. Output Characteristics @ T_{vj} = 150 ºC

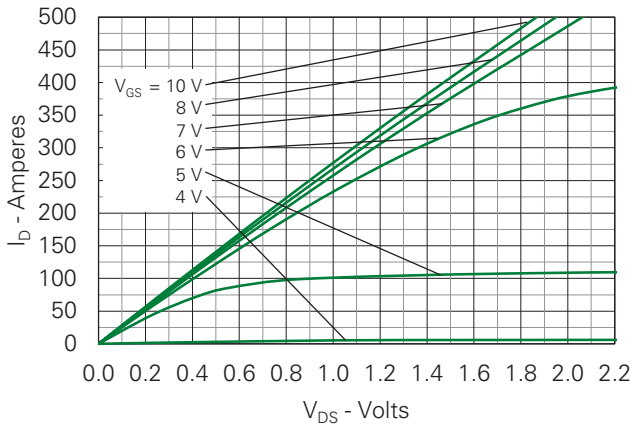


Fig. 4. $R_{DS(on)}$ Normalized to I_D = 250 A Value vs. Junction Temperature

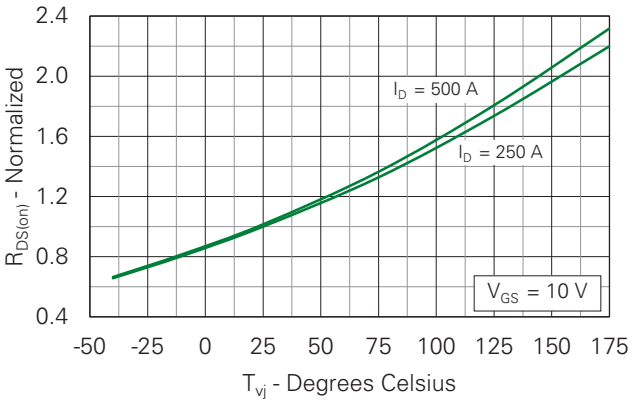


Fig. 5. $R_{DS(on)}$ Normalized to I_D = 250 A vs. Drain Current

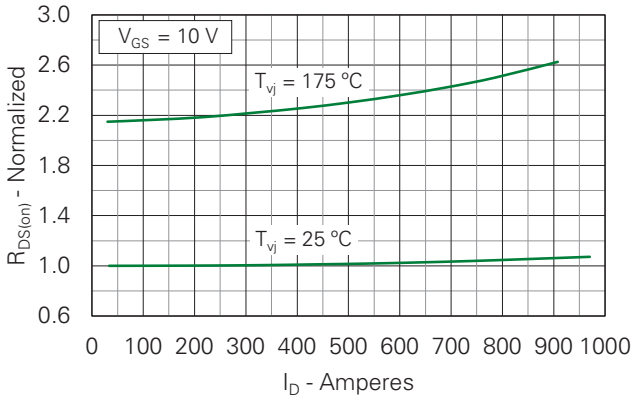


Fig. 6. Normalized Breakdown & Threshold Voltages vs. Junction Temperature

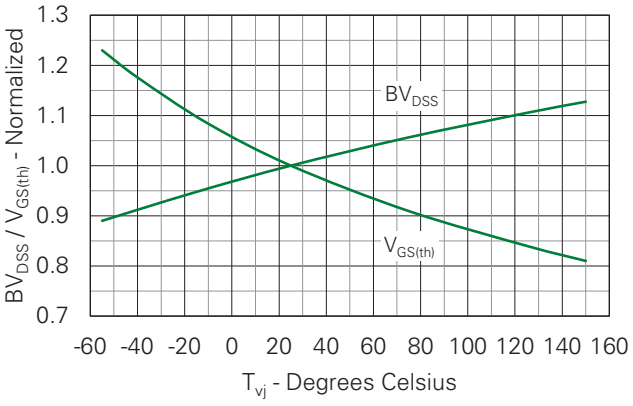


Fig. 7. Drain Current vs. Case Temperature

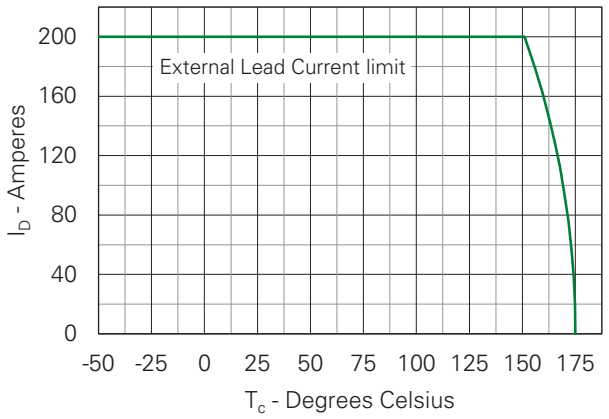


Fig. 8. Input Admittance

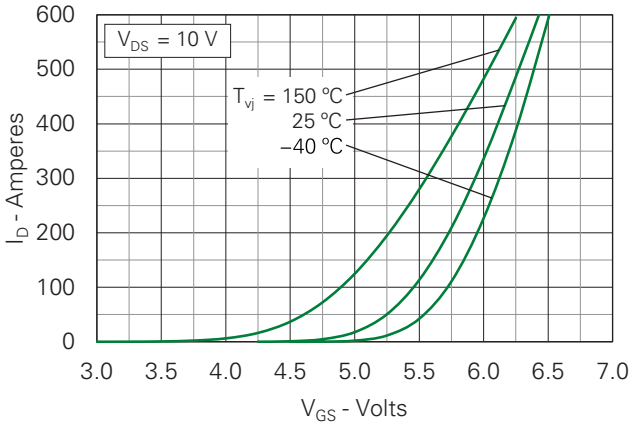


Fig. 9. Transconductance

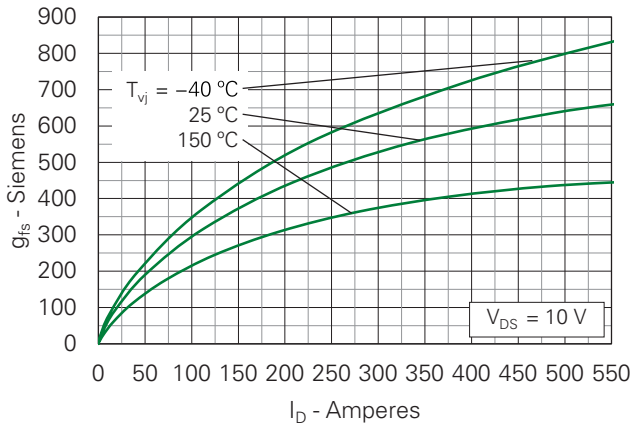


Fig. 10. Forward Voltage Drop of Intrinsic Diode

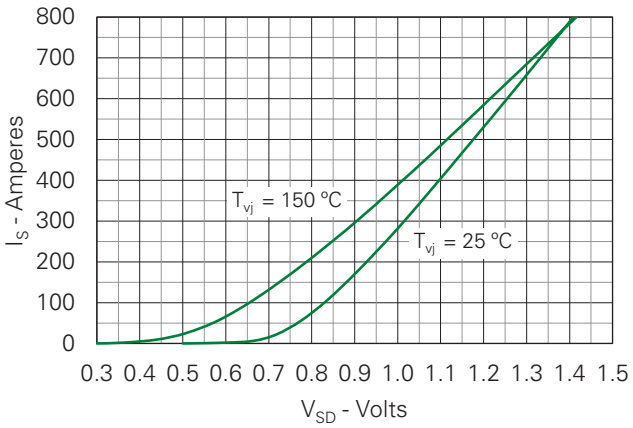


Fig. 11. Gate Charge

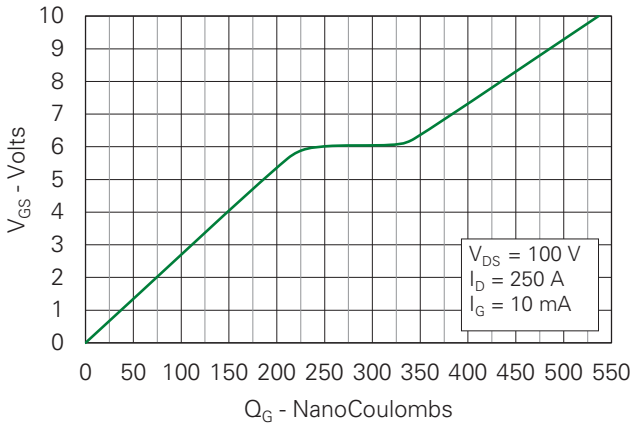


Fig. 12. Capacitance

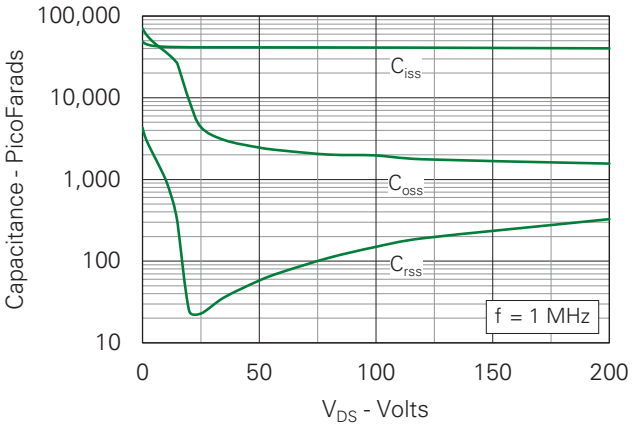


Fig. 13. Output Capacitance Stored Energy

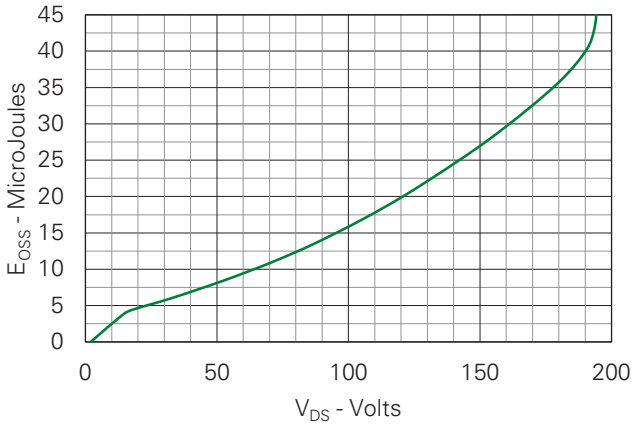


Fig. 14. Forward-Bias Safe Operating Area

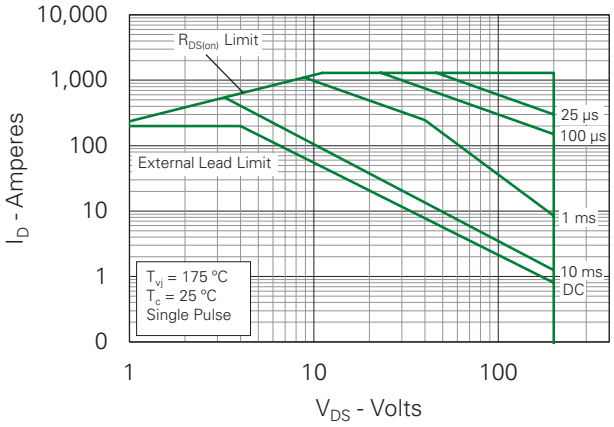
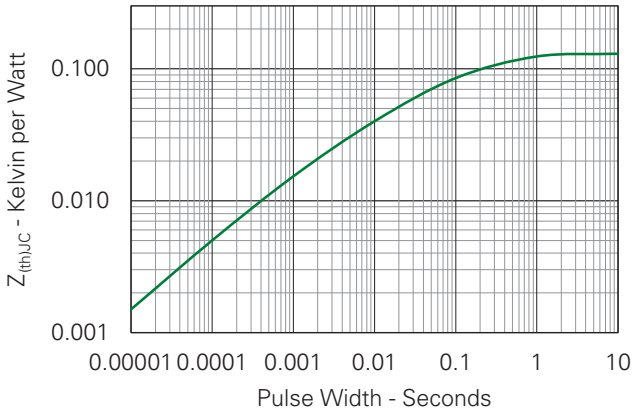
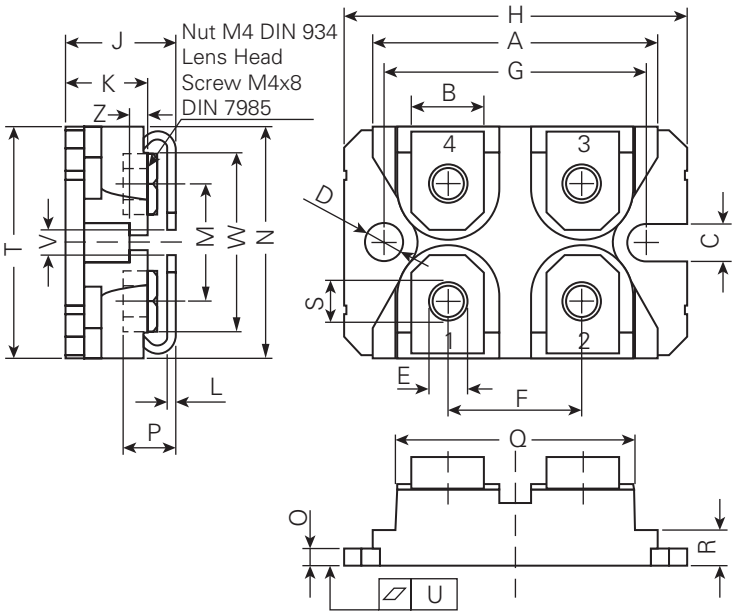


Fig. 15. Maximum Transient Thermal Impedance



Part Outline Drawing (SOT-227B, miniBLOC™)



Symbol	Inches		Millimeters	
	Min.	Max.	Min.	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	0.167	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	.098	0.106	2.50	2.70