IXFN75N120SK

1200 V, 21 mΩ, 75 A SiC Power MOSFET

E72873

Features & Benefits:

- Latest Generation SiC MOSFET with Low $R_{DS(on)}$
- Ideal for High Frequency Switching Applications
- Compatible with 15 V Gate Drive Voltage
- Real Kelvin Source Connection

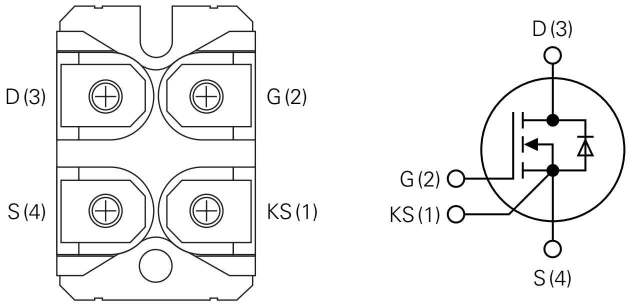
Applications:

- Solar Inverters
- DC/DC Converters
- Motor Drives
- Switch Mode Power Supplies
- UPS
- Battery Chargers
- Induction Heating

Package:

- Isolation Voltage: 2500 V AC
- RoHS Compliant
- Epoxy Meets UL 94V-0
- Baseplate with Aluminum Nitride Isolation

Pinout Diagram (SOT-227B miniBLOC)



D: Drain; **G:** Gate; **S:** Source; **KS:** Kelvin Source; **Backside:** Isolated

Product Summary

Characteristic	Value	Unit
I_{D25}	75	A
V_{DSS}	1200	V
$R_{DS(on)typ}$	21	mΩ

MOSFET

Symbol	Characteristic	Conditions		Value Min.	Value Typ.	Value Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS} = 0 V, I_D=100 µA, T_{VJ} = 25 °C		1200	–	–	V
V_{GS}	Gate-Source Voltage	Continuous	T_{VJ} = 25 °C	−4	–	15	V
		Transient		−8	–	19	V
I_{D25}	Continuous Drain Current	V_{GS} = 15 V	T_C = 25 °C	–	–	75	A
I_{D80}			T_C = 80 °C	–	–	60	
I_{D100}			T_C = 100 °C	–	–	53	
$R_{DS(on)}$	Static Drain-Source on Resistance	I_D = 50 A, V_{GS} = 15 V	T_{VJ} = 25 °C	–	21	27	mΩ
			T_{VJ} = 150 °C	–	32	–	
$V_{GS(th)}$	Gate Threshold Voltage	I_D = 18 mA, V_{GS} = V_{DS}	T_{VJ} = 25 °C	1.8	2.5	3.6	V
			T_{VJ} = 150 °C	–	2.2	–	
I_{DSS}	Drain-Source Leakage Current	V_{DS} = 1200 V, V_{GS} = 0 V	T_{VJ} = 25 °C	–	1	25	µA
I_{GSS}	Gate-Source Leakage Current	V_{DS} = 0 V, V_{GS} = 15 V	T_{VJ} = 25 °C	–	–	250	nA
$R_{G(int)}$	Internal Gate Resistance	f = 1 MHz, V_{AC} = 25 mV, ESR of C_{iss}		–	3.3	–	Ω
$T_{VJ,op}$	Virtual Junction Temperature	–		−40	–	150	°C
$T_{VJ,max}$	Maximum virtual Junction Temperature	–		–	–	175	°C
C_{iss}	Input Capacitance	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz	T_{VJ} = 25 °C	–	4820	–	pF
C_{oss}	Output Capacitance			–	180	–	pF
C_{rss}	Reverse Transfer Capacitance			–	12	–	pF
Q_g	Total Gate Charge	V_{DS} = 800 V, I_D = 50 A, V_{GS} = −4 / 15 V	T_{VJ} = 25 °C	–	158	–	nC
Q_{gs}	Gate-Source Charge			–	50	–	nC
Q_{gd}	Gate-Drain Charge			–	39	–	nC
$t_{d(on)}$	Turn-on Delay Time	**Inductive Switching** V_{DS} = 800 V, V_{GS} = −4 / 15 V, I_D = 50 A, $R_{G(ext)}$ = 5 Ω, Free Wheeling Diode: Body Diode	T_{VJ} = 25 °C	–	27	–	ns
			T_{VJ} = 150 °C	–	24	–	
t_r	Current Rise Time		T_{VJ} = 25 °C	–	47	–	ns
			T_{VJ} = 150 °C	–	46	–	
$t_{d(off)}$	Turn-off Delay Time		T_{VJ} = 25 °C	–	76	–	ns
			T_{VJ} = 150 °C	–	89	–	
t_f	Current Fall Time		T_{VJ} = 25 °C	–	17	–	ns
			T_{VJ} = 150 °C	–	18	–	
E_{on}	Turn-on Energy per Pulse		T_{VJ} = 25 °C	–	1321	–	µJ
			T_{VJ} = 150 °C	–	1714	–	
E_{off}	Turn-off Energy per Pulse		T_{VJ} = 25 °C	–	423	–	µJ
			T_{VJ} = 150 °C	–	469	–	
E_{rec}	Reverse Recovery Losses at Turn-off		T_{VJ} = 25 °C	–	95	–	µJ
			T_{VJ} = 150 °C	–	299	–	

Thermal Characteristics

Symbol	Characteristic	Conditions	Value Min.	Value Typ.	Value Max.	Unit
$R_{th,JC}$	Thermal Resistance, junction-to-case	T_{VJ} = 125 °C	–	–	0.57	K/W
$R_{th,JH}$	Thermal Resistance, junction-to-heatsink	With heatsink compound λ = 0.67 W/mK	–	0.64	–	K/W

Source-Drain Diode

Symbol	Characteristic	Conditions		Value Min.	Value Typ.	Value Max.	Unit
V_{SD}	Forward Voltage Drop	I_F = 30 A; V_{GS} = –4 V	T_{VJ} = 25 °C	–	4.5	–	V
			T_{VJ} = 150 °C	–	4.0	–	V
t_{rr}	Reverse Recovery Time	V_{GS} = –4 V; I_F = 50 A; V_R = 800 V MOSFET Gate Drive: V_{GS} = –4 / 15 V; $R_{G(ext)}$ = 5 Ω	T_{VJ} = 25 °C	–	21	–	ns
			T_{VJ} = 150 °C	–	30	–	
Q_{rm}	Reverse Recovery Charge (Intrinsic Diode)		T_{VJ} = 25 °C	–	404	–	nC
			T_{VJ} = 150 °C	–	1055	–	
I_{rm}	Max. Reverse Recovery Current		T_{VJ} = 25 °C	–	32	–	A
			T_{VJ} = 150 °C	–	50	–	
dI_F/dt	Current Slew Rate		T_{VJ} = 25 °C	–	2925	–	A/µs
			T_{VJ} = 150 °C	–	3214	–	

Note: When using SiC Body Diode the maximum recommended V_{GS} = –4V

Package SOT-227B (miniBLOC)

Symbol	Characteristic	Conditions		Value Min.	Value Typ.	Value Max.	Unit
I_{RMS}	RMS Current	Per Terminal		–	–	100	A
T_{stg}	Storage Temperature	–		–40	–	150	°C
T_{op}	Operation Temperature	–		–40	–	150	°C
M_D	Mounting Torque[1]	Screws to Heatsink		–	–	1.5	Nm
		Terminal Connection Screws		–	–	1.3	Nm
V_{ISOL}	Isolation Voltage	I_{ISOL} ≤ 1 mA; 50/60 Hz, 1 sec.		3000	–	–	V
		I_{ISOL} ≤ 1 mA; 50/60 Hz, 1 minute		2500	–	–	V
$d_{Spp/App}$ $d_{Spb/Apb}$	Clearance Distance Through Air	Terminal to Terminal	Between Pin 1 to 2 Between Pin 3 to 4	7.1	–	–	mm
			Between Pin 2 to 3 Between Pin 4 to 1	3.2	–	–	mm
	Creepage Distance on Surface	Terminal to Terminal (With Nut)	Between Pin 1 to 2 Between Pin 3 to 4	9.6	–	–	mm
			Between Pin 2 to 3 Between Pin 4 to 1	10.5	–	–	mm
	Clearance Distance Through Air	Terminal to Backside Plane	For All Terminals	8.6	–	–	mm
	Creepage Distance on Surface	Terminal to Backside Tab		10.5	–	–	
W	Weight	–		–	30	–	g

1) For further information see application note "Handling and Mounting Littelfuse miniBLOC - SOT227B"

Characteristic Curves

Fig. 1. Typical Transfer Characteristics

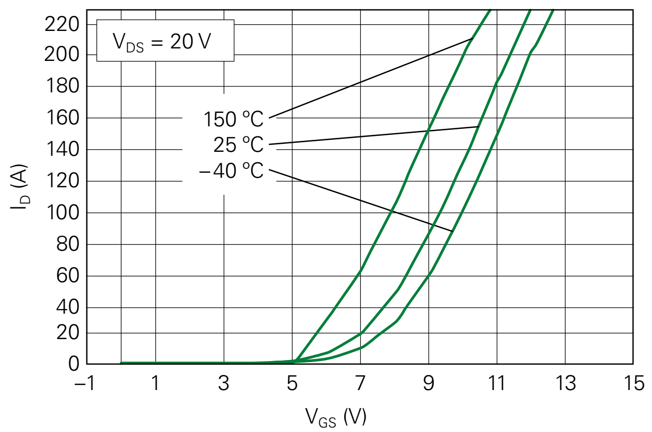


Fig. 2. Typical Forward Transconductance

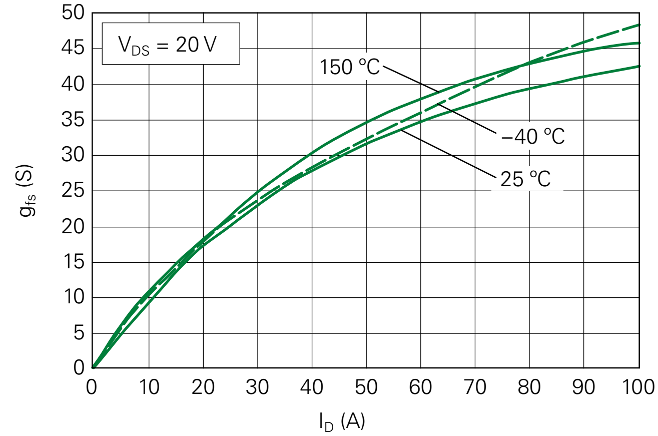


Fig. 3. Normalized Breakdown Voltage and Threshold Voltage vs. Junction Temperature

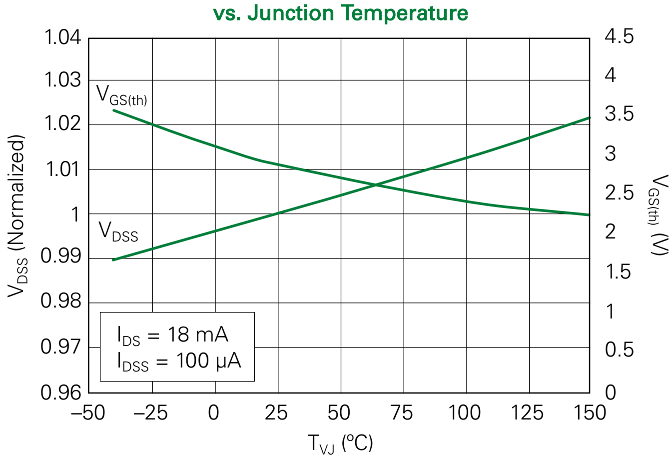


Fig. 4. Typical Output Characteristics (T_{VJ} = –40 °C)

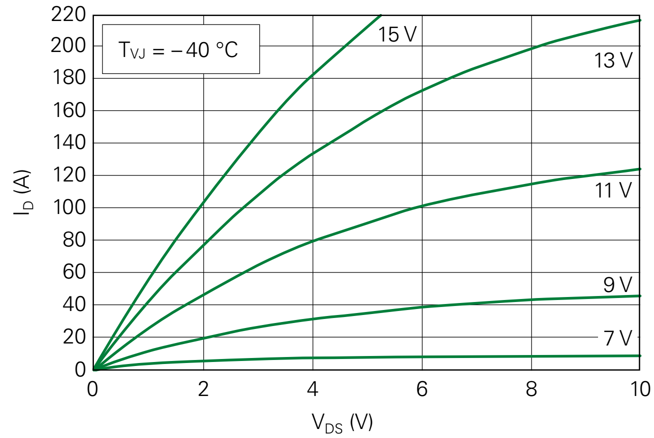


Fig. 5. Typical Output Characteristics (T_{VJ} = 25 °C)

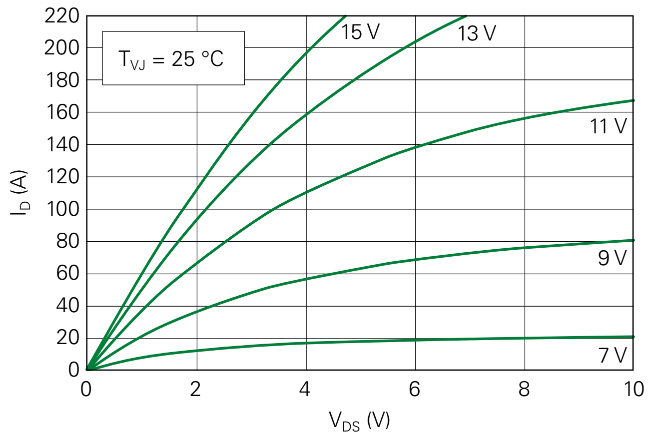
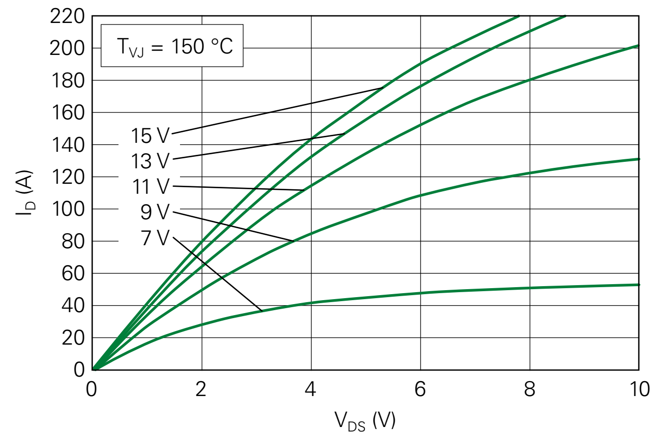


Fig. 6. Typical Output Characteristics (T_{VJ}= 150 °C)



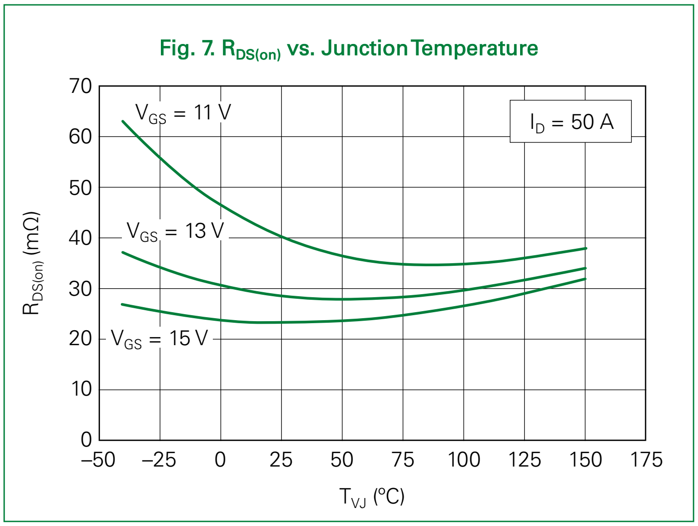


Fig. 7. $R_{DS(on)}$ vs. Junction Temperature
V_{GS} = 11 V
V_{GS} = 13 V
V_{GS} = 15 V
I_D = 50 A
$R_{DS(on)}$ (mΩ)
T_{VJ} (ºC)
70 60 50 40 30 20 10 0
–50 –25 0 25 50 75 100 125 150 175

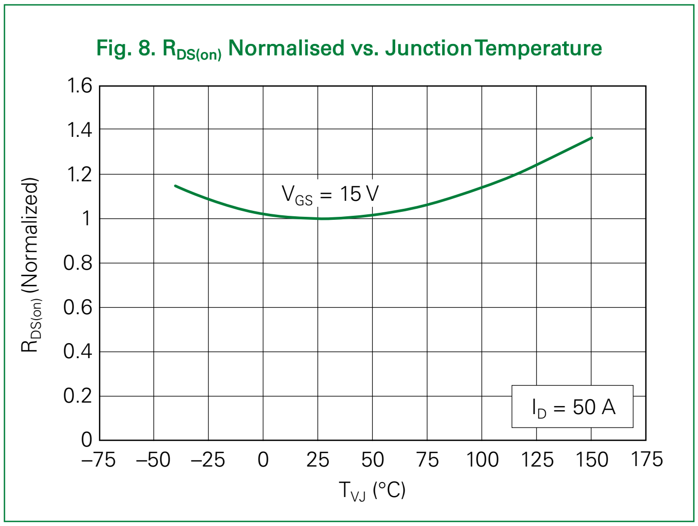


Fig. 8. $R_{DS(on)}$ Normalised vs. Junction Temperature
V_{GS} = 15 V
I_D = 50 A
$R_{DS(on)}$ (Normalized)
T_{VJ} (ºC)
1.6 1.4 1.2 1 0.8 0.6 0.4 0.2 0
–75 –50 –25 0 25 50 75 100 125 150 175

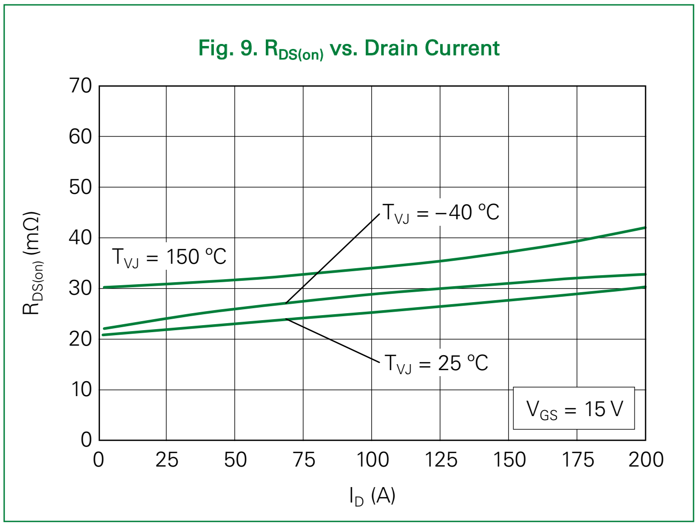


Fig. 9. $R_{DS(on)}$ vs. Drain Current
T_{VJ} = –40 °C
T_{VJ} = 150 °C
T_{VJ} = 25 °C
V_{GS} = 15 V
$R_{DS(on)}$ (mΩ)
I_D (A)
70 60 50 40 30 20 10 0
0 25 50 75 100 125 150 175 200

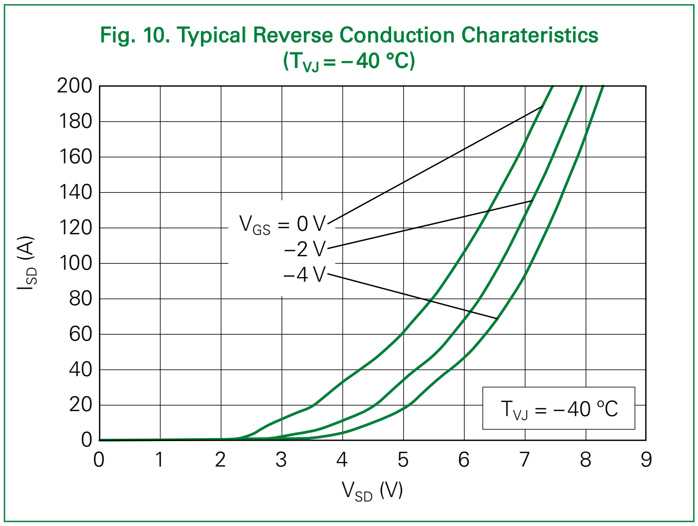


Fig. 10. Typical Reverse Conduction Charateristics
(T_{VJ} = –40 °C)
V_{GS} = 0 V
–2 V
–4 V
T_{VJ} = –40 °C
I_{SD} (A)
V_{SD} (V)
200 180 160 140 120 100 80 60 40 20 0
0 1 2 3 4 5 6 7 8 9

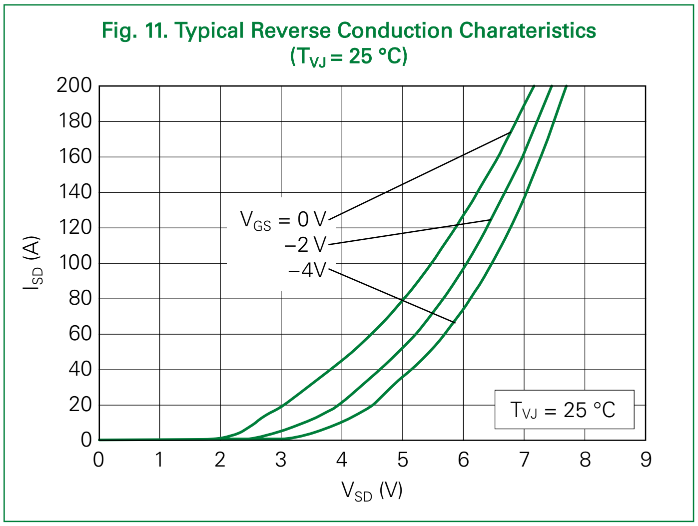


Fig. 11. Typical Reverse Conduction Charateristics
(T_{VJ} = 25 °C)
V_{GS} = 0 V
–2 V
–4V
T_{VJ} = 25 °C
I_{SD} (A)
V_{SD} (V)
200 180 160 140 120 100 80 60 40 20 0
0 1 2 3 4 5 6 7 8 9

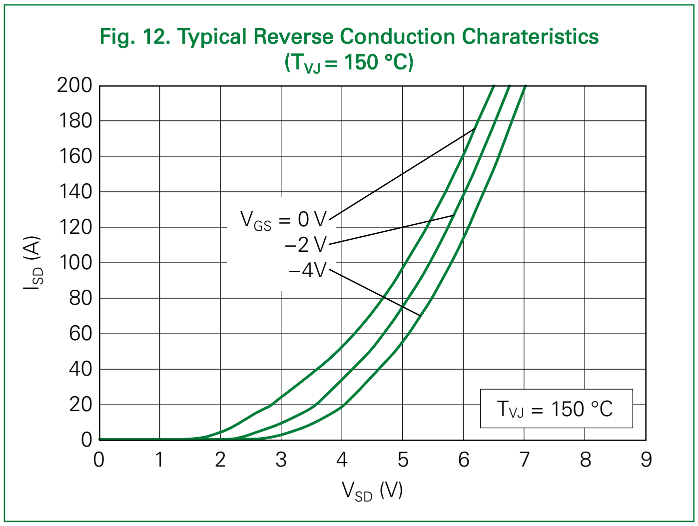


Fig. 12. Typical Reverse Conduction Charateristics
(T_{VJ} = 150 °C)
V_{GS} = 0 V
–2 V
–4V
T_{VJ} = 150 °C
I_{SD} (A)
V_{SD} (V)
200 180 160 140 120 100 80 60 40 20 0
0 1 2 3 4 5 6 7 8 9

Fig. 13. Typical Junction Capacitances

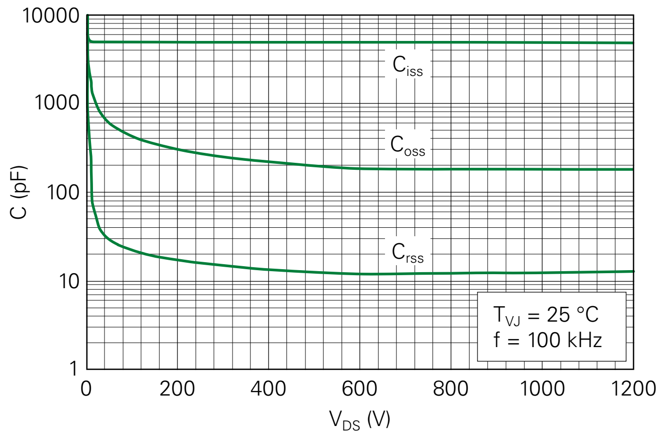


Fig. 14. Power Dissipation vs. Case Temperature

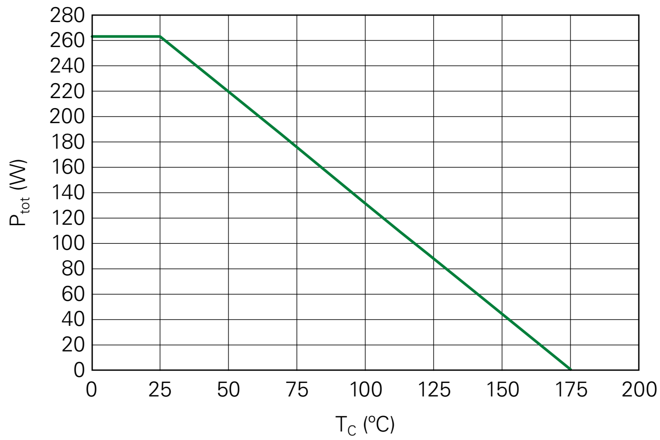


Fig. 15. Drain Current vs. Case Temperature

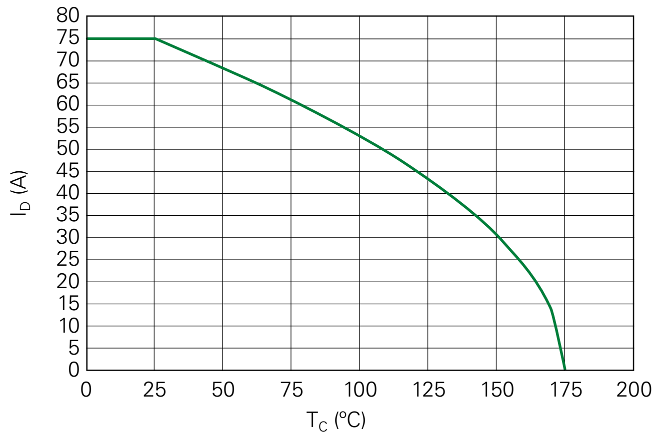


Fig. 16. Typical Switching Energy vs. Drain Current

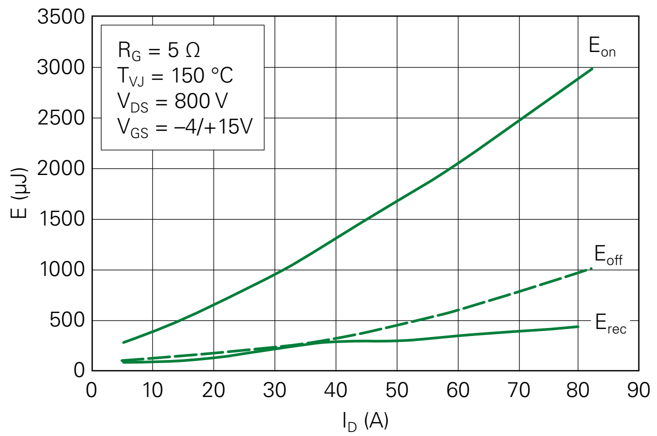


Fig. 17. Typical Switching Energy vs. Junction Temperature

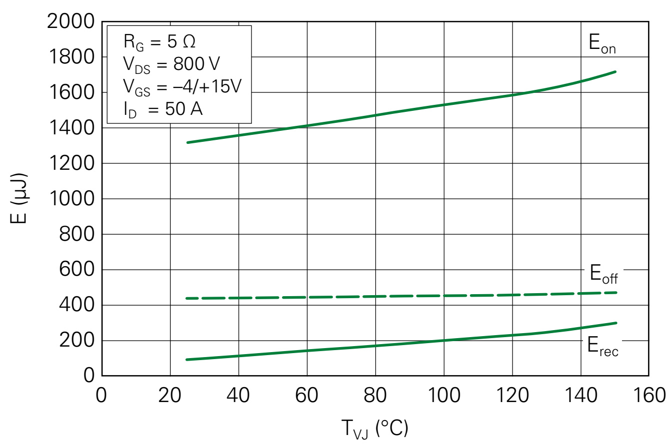


Fig. 18. Typical Switching Energy vs. External Gate Resisitor

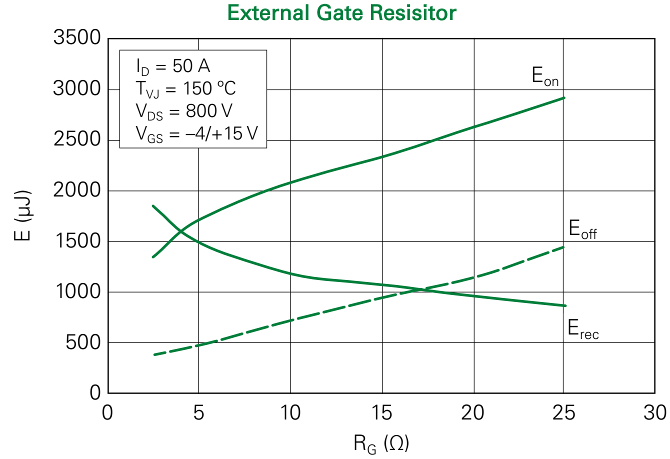


Fig. 19. Typical Switching Time vs. External Gate Resistor

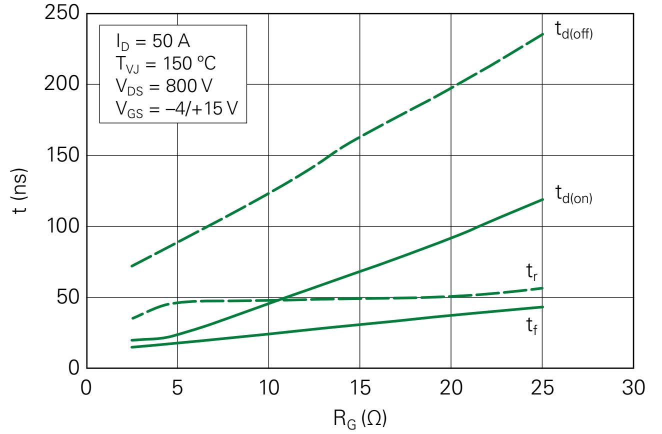


Fig. 20. Typical Turn on Gate Charge Trendline

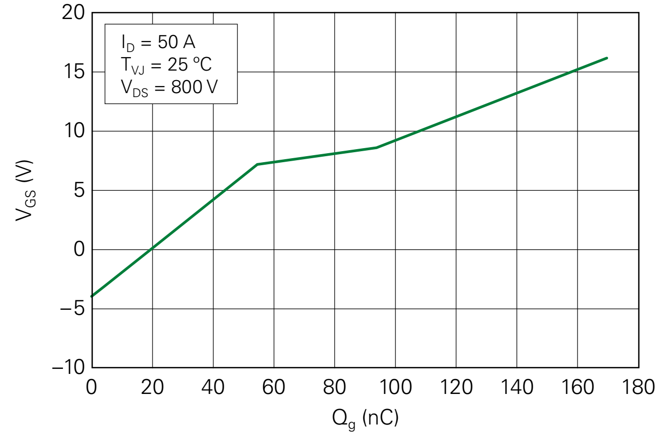
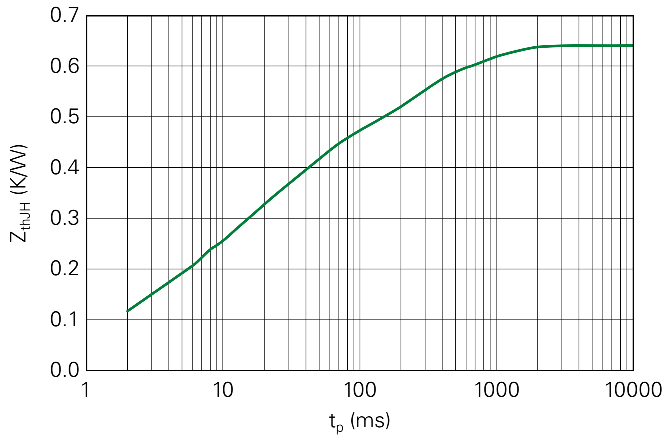
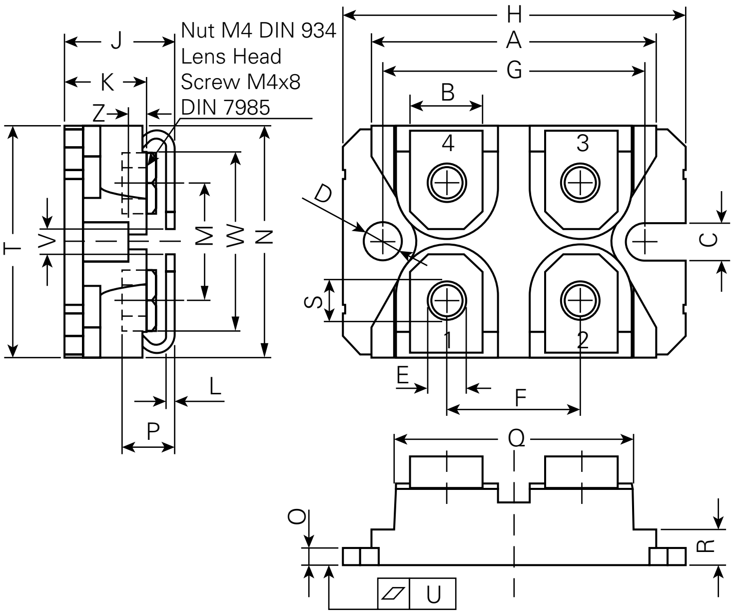


Fig. 21. Typical Transient Thermal Impedance

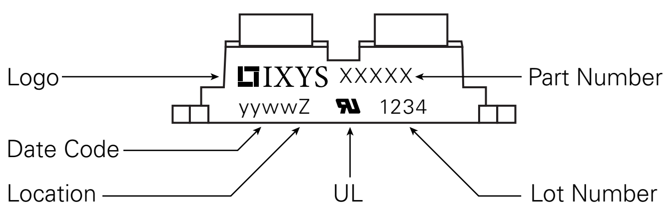


Part Outline Drawing (SOT-227B miniBLOC)



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

Part Number and Marking



Ordering Information

Ordering	Part Number	Marking on Product	Delivering Mode	Base Quantity	Ordering Code
Standard	IXFN75N120SK	IXFN75N120SK	Tube	10	IXFN75N120SK