

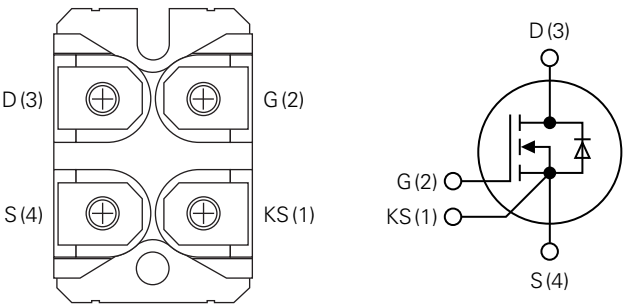
IXFN55N120SK

1200 V, 32 mΩ, 54 A SiC Power MOSFET

 E72873



Pinout Diagram (SOT-227B miniBLOC)



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

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

Product Summary

Characteristic	Value	Unit
I_{D25}	54	A
V_{DSS}	1200	V
$R_{DS(on)typ}$	32	mΩ

MOSFET

Symbol	Characteristic	Conditions		Value			Unit	
				Min.	Typ.	Max.		
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} = 0 V, I _D =19 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	–	–	54	A	
I _{D80}			T _C = 80 °C	–	–	43		
I _{D100}			T _C = 100 °C	–	–	38		
R _{DS(on)}	Static Drain-Source on Resistance	I _D = 40 A, V _{GS} = 15 V	T _{VJ} = 25 °C	–	32	42	mΩ	
			T _{VJ} = 150 °C	–	53	–		
V _{GS(th)}	Gate Threshold Voltage	I _D = 12 mA, V _{GS} = V _{DS}	T _{VJ} = 25 °C	1.8	2.5	3.6	V	
			T _{VJ} = 150 °C	–	2.1	–		
I _{DSS}	Drain-Source Leakage Current	V _{DS} = 1200 V, V _{GS} = 0 V	T _{VJ} = 25 °C	–	1	20	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}		–	1.7	–	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	–	3360	–	pF	
C _{oss}	Output Capacitance			–	130	–	pF	
C _{rss}	Reverse Transfer Capacitance			–	8	–	pF	
Q _g	Total Gate Charge	V _{DS} = 800 V, I _D = 40 A, V _{GS} = –4 / 15 V	T _{VJ} = 25 °C	–	107	–	nC	
Q _{gs}	Gate-Source Charge			–	37	–	nC	
Q _{gd}	Gate-Drain Charge			–	33	–	nC	
t _{d(on)}	Turn-on Delay Time	Inductive Switching V _{DS} = 800 V, V _{GS} = –4 / 15 V, I _D = 40 A, R _{G,ext} = 5 Ω, Free Wheeling Diode: Body Diode	T _{VJ} = 25 °C	–	24	–	ns	
			T _{VJ} = 150 °C	–	22	–		
t _r	Current Rise Time		T _{VJ} = 25°C	–	23	–	ns	
			T _{VJ} = 150°C	–	27	–		
t _{d(off)}	Turn-off Delay Time		T _{VJ} = 25 °C	–	41	–	ns	
			T _{VJ} = 150 °C	–	46	–		
t _f	Current Fall Time		T _{VJ} = 25 °C	–	11	–	ns	
			T _{VJ} = 150 °C	–	16	–		
E _{on}	Turn-on Energy per Pulse		T _{VJ} = 25 °C	–	562	–	μJ	
			T _{VJ} = 150 °C	–	813	–		
E _{off}	Turn-off Energy per Pulse		T _{VJ} = 25 °C	–	162	–	μJ	
			T _{VJ} = 150 °C	–	166	–		
E _{rec}	Reverse Recovery Losses at Turn-off		T _{VJ} = 25 °C	–	110	–	μJ	
			T _{VJ} = 150 °C	–	372	–		

Thermal Characteristics

Symbol	Characteristic	Conditions	Value			Unit
			Min.	Typ.	Max.	
$R_{th,JC}$	Thermal Resistance, Junction-to-Case	$T_{VJ} = 125\text{ }^\circ\text{C}$	–	–	0.71	K/W
$R_{th,JH}$	Thermal Resistance, Junction-to-Heatsink	With heatsink compound $\lambda = 0.67\text{ W/mK}$	–	0.79	–	K/W

Source-Drain Diode

Symbol	Characteristic	Conditions		Value			Unit	
				Min.	Typ.	Max.		
V _{SD}	Forward Voltage Drop	I _F = 20 A; V _{GS} = −4 V	T _{VJ} = 25 °C	–	4.6	–	V	
			T _{VJ} = 150 °C	–	4.2	–	V	
t _{rr}	Reverse Recovery Time	V _{GS} = −4 V; I _F = 40 A; V _R = 800 V MOSFET Gate Drive: V _{GS} = −4 / +15 V; R _G = 5 Ω	T _{VJ} = 25 °C	–	15	–	ns	
			T _{VJ} = 150 °C	–	20	–		
Q _{rm}	Reverse Recovery Charge (Intrinsic Diode)		T _{VJ} = 25 °C	–	337	–	μC	
			T _{VJ} = 150 °C	–	721	–		
I _{rm}	Max. Reverse Recovery Current		T _{VJ} = 25 °C	–	39	–	A	
			T _{VJ} = 150 °C	–	65	–		
dI _F /dt	Current Slew Rate		T _{VJ} = 25 °C	–	5257	–	A/μs	
			T _{VJ} = 150 °C	–	5758	–		

Note: When using SiC Body Diode the maximum recommended $V_{GS} = -4\text{V}$

Package SOT-227B (miniBLOC)

Symbol	Characteristic	Conditions		Value			Unit
				Min.	Typ.	Max.	
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	7.1	–	–	mm
			Between Pin 3 to 4				
			Between Pin 2 to 3	3.2	–	–	mm
			Between Pin 4 to 1				
	Creepage Distance on Surface	Terminal to Terminal (With Nut)	Between Pin 1 to 2	9.6	–	–	mm
			Between Pin 3 to 4				
			Between Pin 2 to 3	10.5	–	–	mm
			Between Pin 4 to 1				
	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

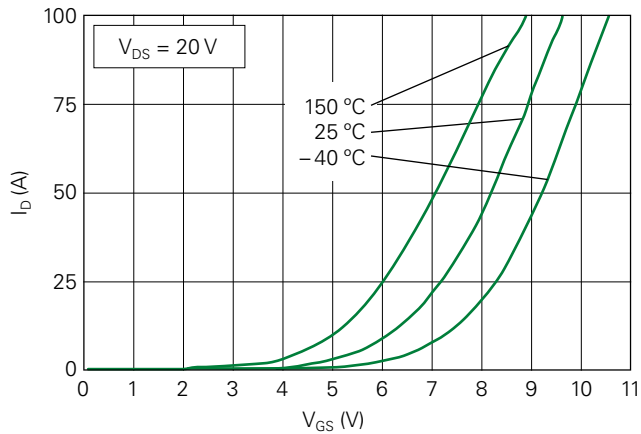


Fig. 2. Typical Forward Transconductance

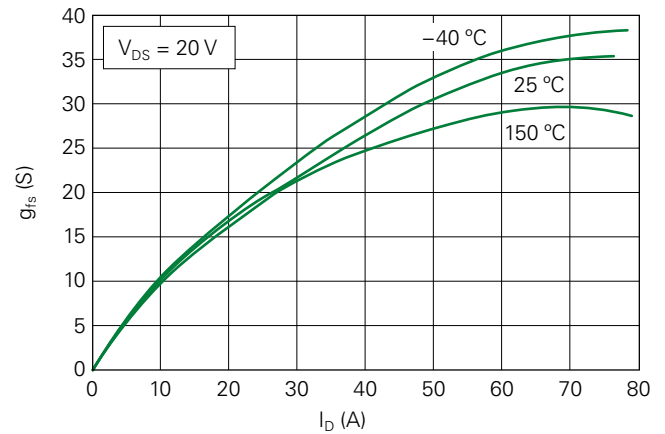


Fig. 3. Normalized Breakdown Voltage and Threshold Voltage vs. Junction Temperature

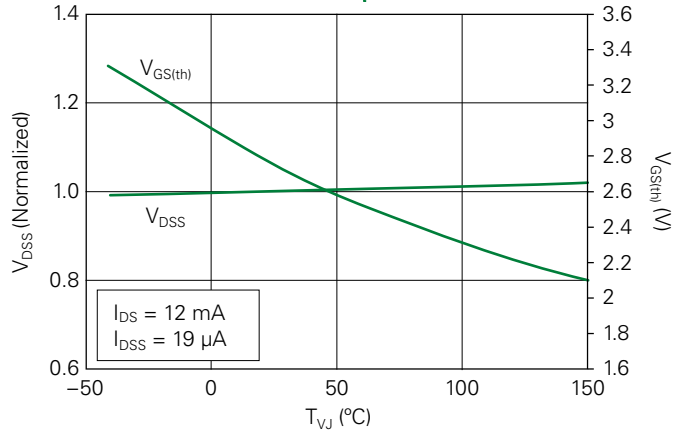
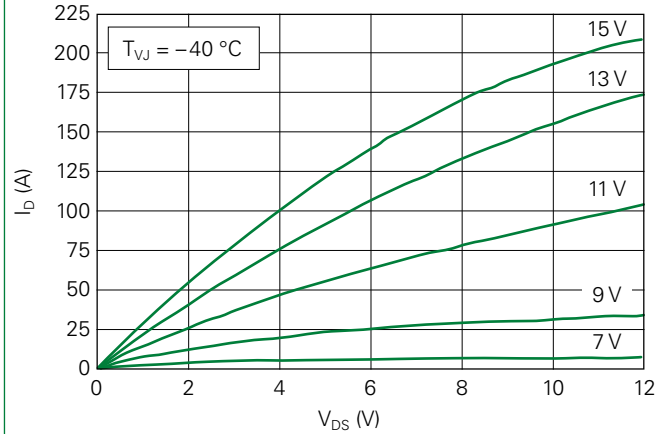
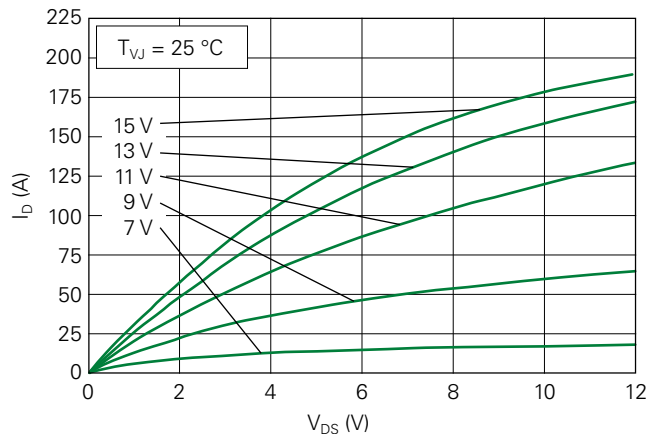
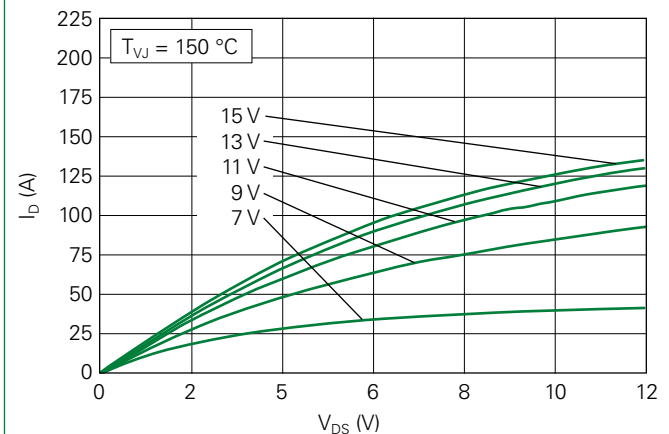
Fig. 4. Typical Output Characteristics ($T_{VJ} = -40^\circ\text{C}$)Fig. 5. Typical Output Characteristics ($T_{VJ} = 25^\circ\text{C}$)Fig. 6. Typical Output Characteristics ($T_{VJ} = 150^\circ\text{C}$)

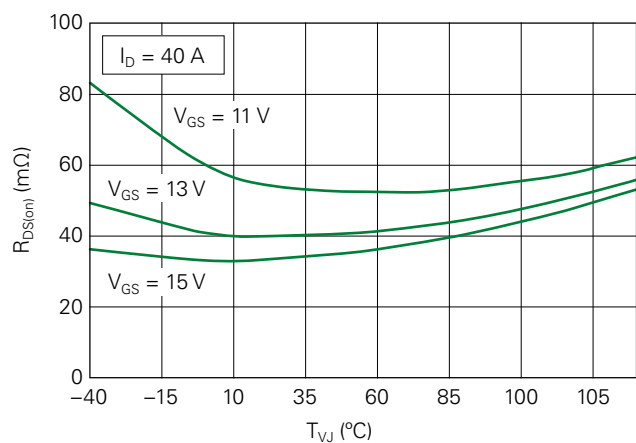
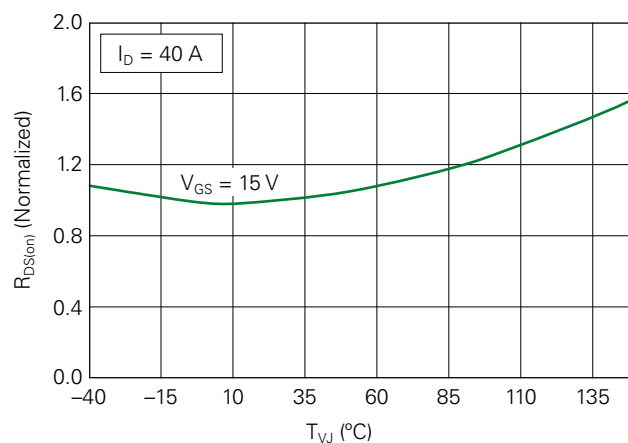
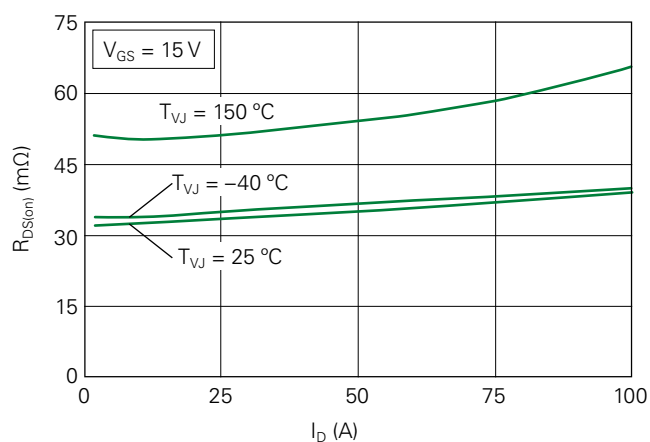
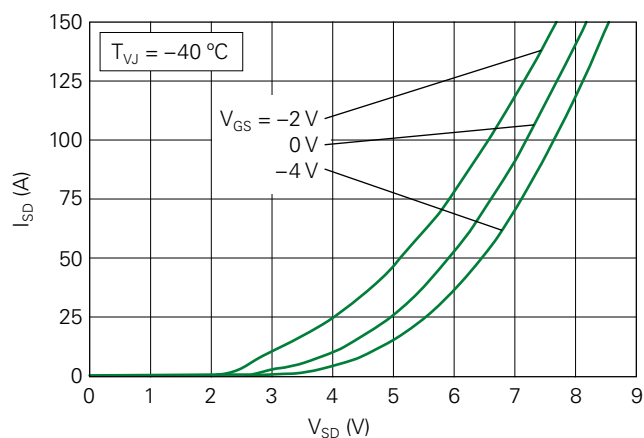
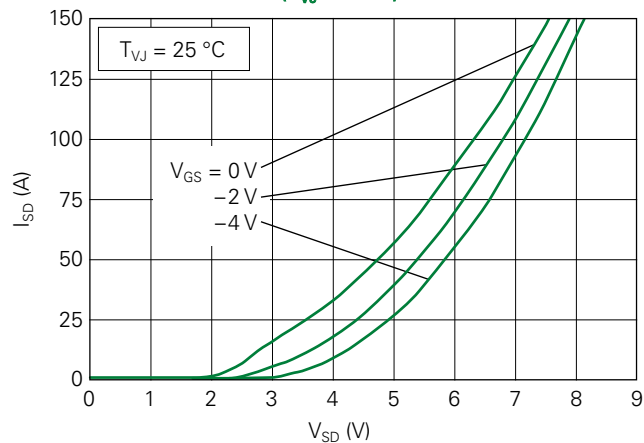
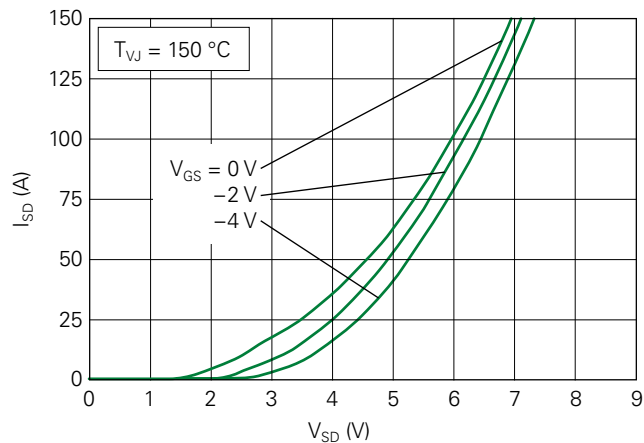
Fig. 7. $R_{DS(on)}$ vs. Junction TemperatureFig. 8. $R_{DS(on)}$ Normalised vs. Junction TemperatureFig. 9. $R_{DS(on)}$ vs. Drain CurrentFig. 10. Typical Reverse Conduction Characteristics ($T_{VJ} = -40^{\circ}$ C)Fig. 11. Typical Reverse Conduction Characteristics ($T_{VJ} = 25^{\circ}$ C)Fig. 12. Typical Reverse Conduction Characteristics ($T_{VJ} = 150^{\circ}$ C)

Fig. 13. Typical Junction Capacitances

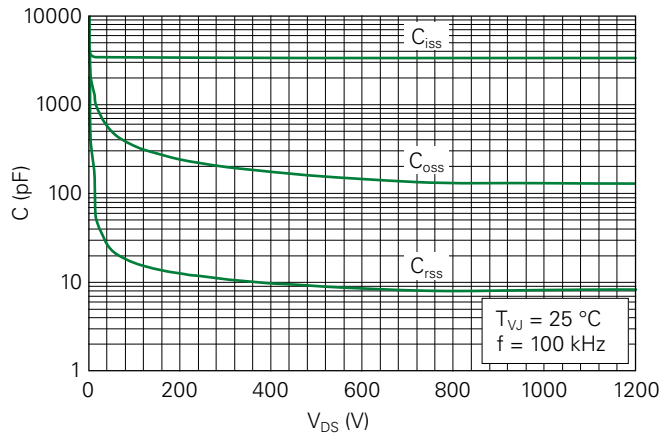


Fig. 14. Power Dissipation vs. Case Temperature

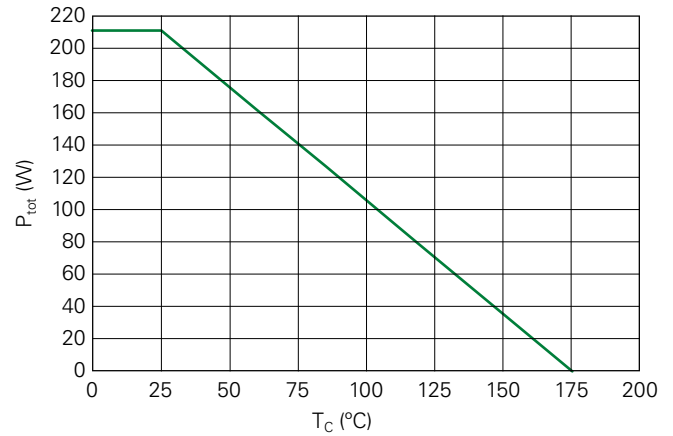


Fig. 15. Drain Current vs. Case Temperature

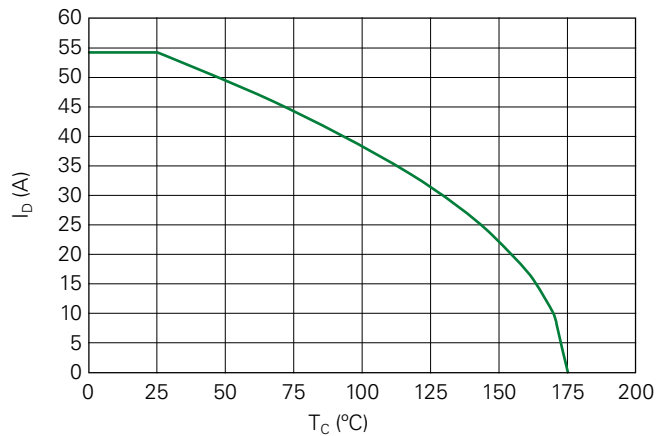


Fig. 16. Typical Switching Energy vs. Drain Current

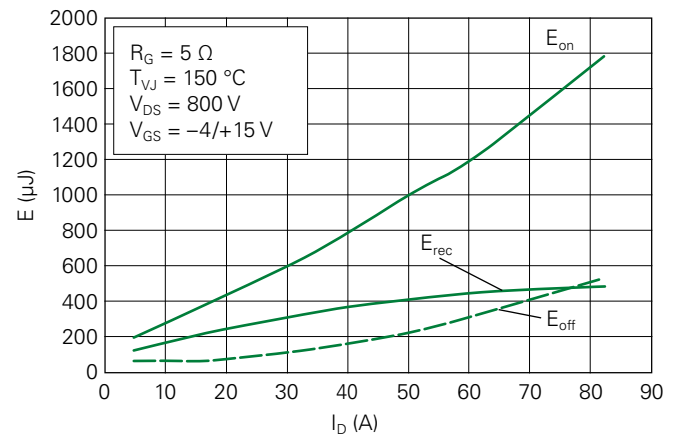


Fig. 17. Typical Switching Energy vs. Junction Temperature

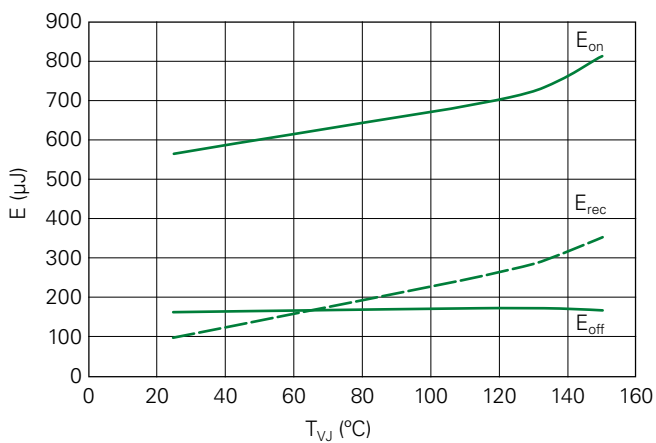


Fig. 18. Typical Switching Energy vs. External Gate Resistor

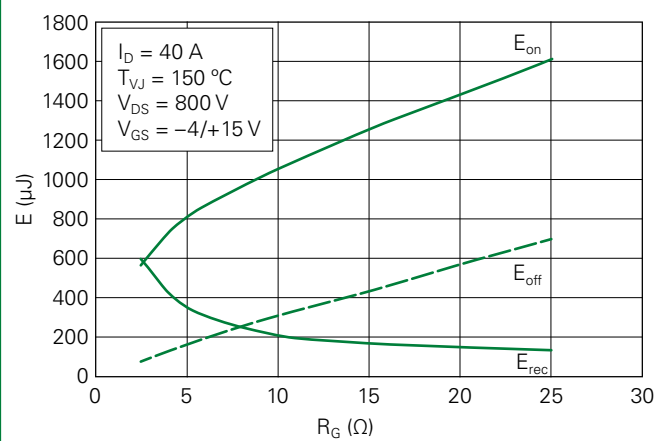


Fig. 19. Typical Switching Time vs. External Gate Resistor

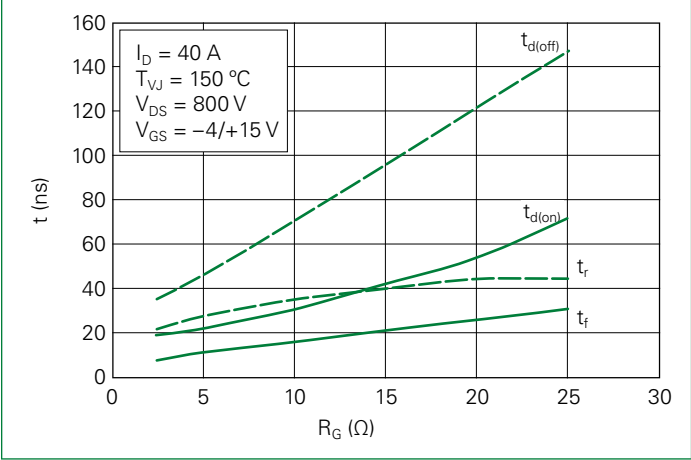


Fig. 20. Typical Turn on Gate Charge Trendline

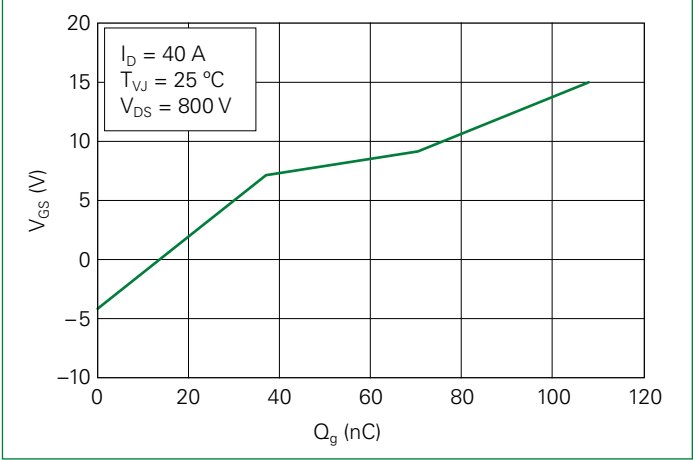
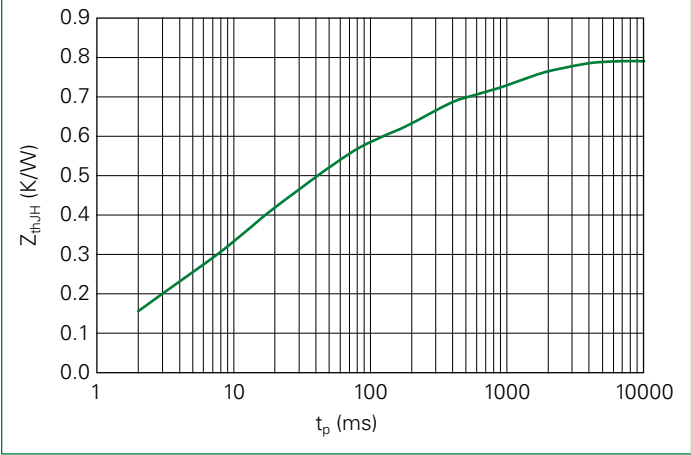
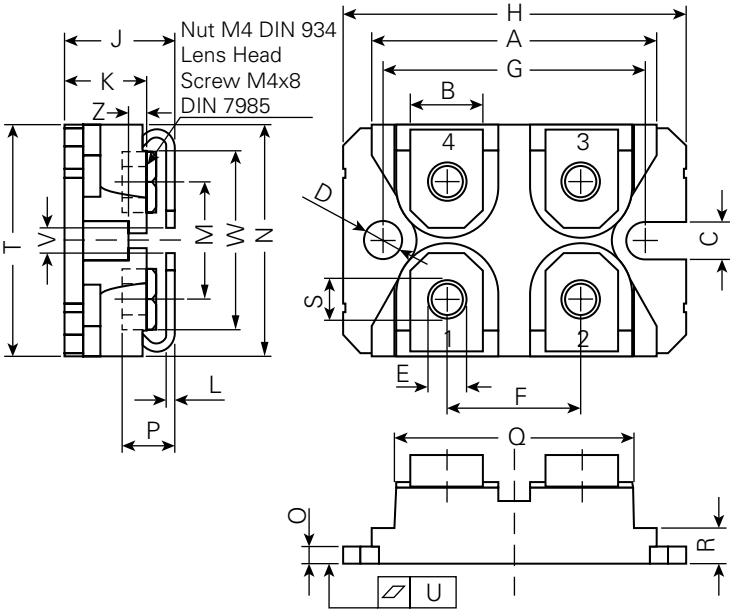


Fig. 21. Typical Transient Thermal Impedance

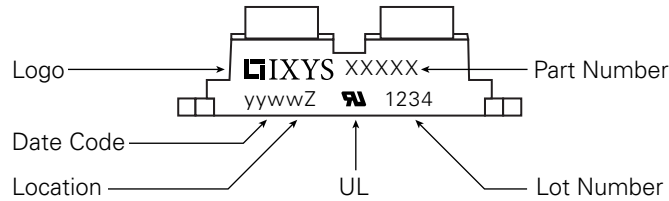


Part Outline Drawing (SOT-227B miniBLOC)



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	IXFN55N120SK	IXFN55N120SK	Tube	10	IXFN55N120SK

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