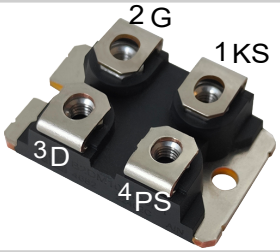
B2M030120N

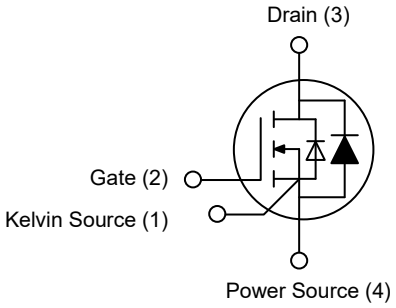
SiC MOSFET with Embeded SiC SBD

Product Summary

V_{DS}	1200 V
I_D (T_C=25°C)	66 A
$R_{DS(on).typ}$	30 mΩ@V_{GS}=18V

Package: SOT-227





Features

- Embeded SiC SBD as free-wheeling diode
- High Blocking Voltage with low On-Resistance
- High speed switching with low capacitances
- Easy to parallel and simple to mount
- E_{on} decreases as T_j rises
- Base plate with AIN ceramic isolation
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

Benefits

- Higher Frequency operation
- Higher system efficiency
- Increased power Density
- Reduction of Heat Sink Requirements

Applications

- Switch Mode Power Supplies (SMPS)
- Power Inverter & Solar Inverter
- Motor Drivers & EV Charging Station
- High Voltage DC/DC Converter
- UPS
- Induction heating and Welding

Package Pin Definitions

- Pin1 - Kelvin Source
- Pin2 - Gate
- Pin3 - Drain
- Pin4 - Power Source

Package Parameters

Part Number	Marking	Package
B2M030120N	B2M030120N	SOT-227

Maximum Ratings

Symbol	Parameter	Test conditions	Value	Unit
V_{DSmax}	Drain-Source Voltage	V_{GS}=0V, I_D=100μA	1200	V
V_{GSmax}	Gate-Source Voltage		-10/25	V
V_{GSop}	Recommended Gate-Source Voltage		-4/18	V
I_D	Continuous Drain Current	V_{GS}=18V, T_C=25°C	66	A
		V_{GS}=18V, T_C=100°C	47	A
$I_{D,pulse}$	Pulsed Drain Current	Pulse with t_p limited by T_{jmax}	151	A
P_{tot}	Power Dissipation	T_C=25°C, T_j=175°C	223	W
T_j	Operating Junction Temperature		-40~175	°C
T_{stg}	Storage Temperature		-40~175	°C

Electrical Characteristics (Defined at T_j=25°C unless otherwise specified)
Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	V_{GS}=0V, I_D=1mA	1200			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS}, I_D=13mA	3.0	4.3	5.0	V
		V_{GS}=V_{DS}, I_D=13mA, T_j=175°C		3.0		
I_{GSS}	Gate-Source Leakage Current	V_{GS}=18V, V_{DS}=0V			100	nA
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=1200V, V_{GS}=0V		1	50	μA
		V_{DS}=1200V, V_{GS}=0V, T_j=175°C		20		
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=18V, I_D=50A		30		mΩ
		V_{GS}=18V, I_D=50A, T_j=175°C		50		
		V_{GS}=15V, I_D=50A		45		
g_{fs}	Transconductance	V_{DS}=10V, I_D=50A		21		S

Thermal Characteritics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$R_{th(jc)}$	Thermal Resistance from Junction to Case			0.67		K/W

Package Chracteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
M_d	Mounting torque	M4-0.7 screws			1.5	N/m
M_{dt}	Terminal connection torque	M4-0.7 screws			1.3	N/m
W_t	Package weight			29		g
	Internal isolation	Basic insulation		AlN		
V_{ISOL}	Isolation voltage	I_{ISOL}<1mA, RMS, 50Hz,1min	2500			V
d_{Ctt}	Creepage Distance on Surface	Terminal to Terminal	10.4			mm
d_{Ctb}		Terminal to Backside	9.6			mm
d_{Stt}	Clearance Distance Through Air	Terminal to Terminal	4.4			mm
d_{Stb}		Terminal to Backside	8.4			mm

AC Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	V_{GS}=0V, V_{DS}=800V f=100kHz, V_{AC}=25mV		2925		pF
C_{oss}	Output Capacitance			160		pF
C_{rss}	Reverse Transfer Capacitance			7		pF
E_{oss}	C_{oss} stored energy			61		μJ
$C_{O(ER)}$	Effective Output Capacitance, Energy Related	V_{GS}=0V, 0V < V_{DS} < 800V		197		pF
$C_{O(TR)}$	Effective Output Capacitance, Time Related	V_{GS}=0V, 0V < V_{DS} < 800V		290		pF
$R_{G(int)}$	Internal Gate Resistance	f=1MHz, V_{AC}=25mV		2.7		Ω

Gate Charge Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
Q_{GS}	Gate to Source Charge	V_{DS} = 800V I_D = 50A V_{GS} = -4/+18V		40		nC
Q_{GD}	Gate to Drain Charge			18		nC
Q_G	Total Gate Charge			86		nC

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	V_{DC}=800V, V_{GS}=-4/18V I_D=50A, $R_{G(ext)}$=5.1Ω L_σ=90nH, T_j=25°C diode: body diode at V_{GS}=-4V Inductive Load Eon includes diode reverse recovery		21		ns
t_r	Rise Time			32		ns
$t_{d(off)}$	Turn-Off Delay Time			25		ns
t_f	Fall Time			11		ns
E_{on}	Turn-On Energy (FWD=Body Diode)			650		uJ
E_{off}	Turn-Off Energy (FWD=Body Diode)			220		uJ
$t_{d(on)}$	Turn-On Delay Time	V_{DC}=800V, V_{GS}=-4/18V I_D=50A, $R_{G(ext)}$=5.1Ω L_σ=90nH, T_j=175°C diode: body diode at V_{GS}=-4V Inductive Load Eon includes diode reverse recovery		19		ns
t_r	Rise Time			27		ns
$t_{d(off)}$	Turn-Off Delay Time			31		ns
t_f	Fall Time			11		ns
E_{on}	Turn-On Energy (FWD=Body Diode)			500		uJ
E_{off}	Turn-Off Energy (FWD=Body Diode)			250		uJ

Embeded SiC SBD free-wheeling diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	V_{GS}=-4V, I_{SD}=25A, T_j=25°C		1.6		V
		V_{GS}=-4V, I_{SD}=25A, T_j=175°C		2.3		
I_{SD}	Continuous Diode Forward Current	V_{GS}=-4V, T_C=25°C		81		A
$I_{SD,pulse}$	Pulsed Diode Current	V_{GS}=-4V, pulse width t_p limited by T_{jmax}		210		A
t_{rr}	Reverse Recovery Time	V_{GS}=-4V, V_{DC}=800V, I_{SD}=50A -di$_F$/dt=2300A/µs T_j=25°C		16		ns
Q_C	Junction charge			216		nC
I_{rrm}	Peak Reverse Recovery Current			21		A
t_{rr}	Reverse Recovery Time	V_{GS}=-4V, V_{DC}=800V, I_{SD}=50A -di$_F$/dt=2700A/µs T_j=175°C		16		ns
Q_C	Junction charge			237		nC
I_{rrm}	Peak Reverse Recovery Current			24		A

Typical Performance

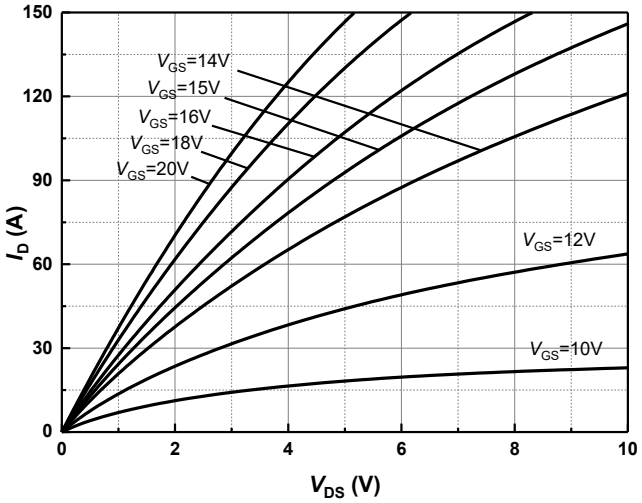


Figure 1 Typical Forward Output Characteristics at T_j=25°C

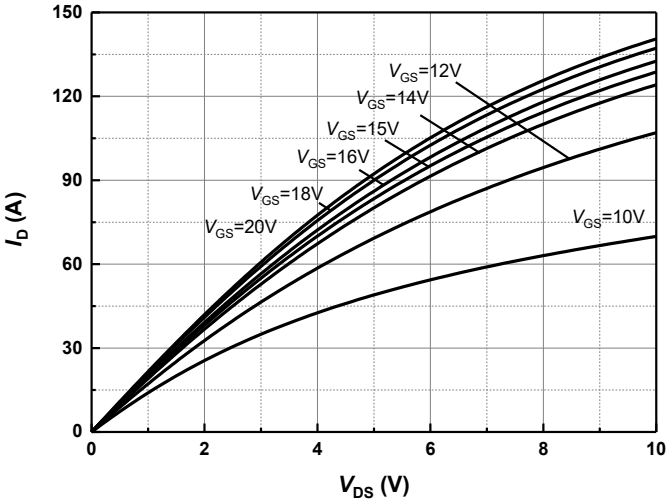


Figure 2 Typical Forward Output Characteristics at T_j=175°C

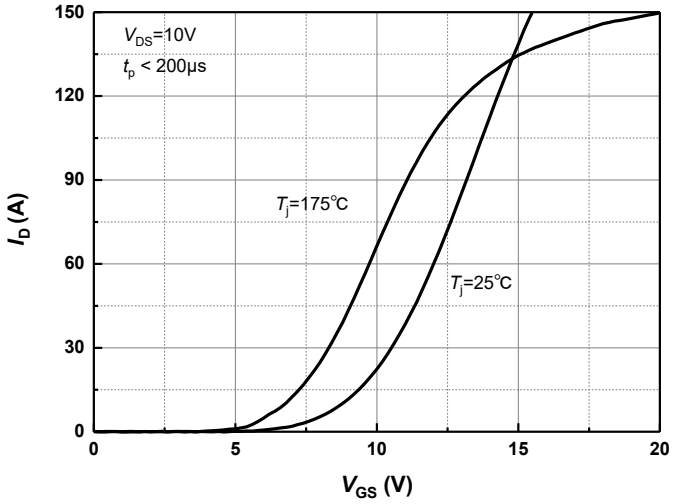


Figure 3 Transfer Characteristics for Various Temperature

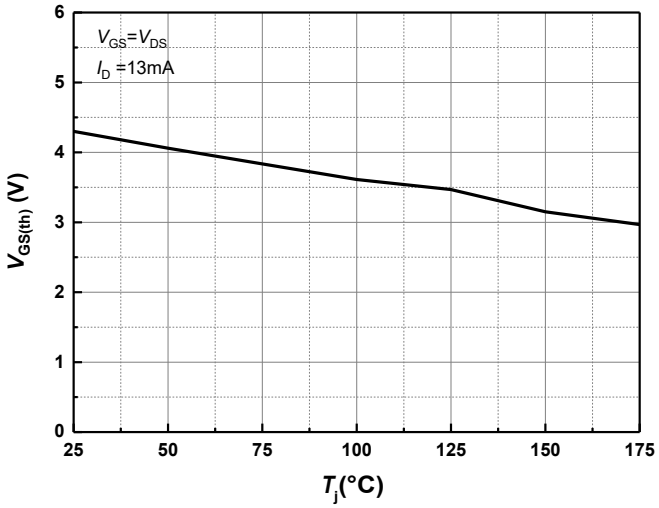


Figure 4 Threshold Voltage for Various Temperature

Typical Performance

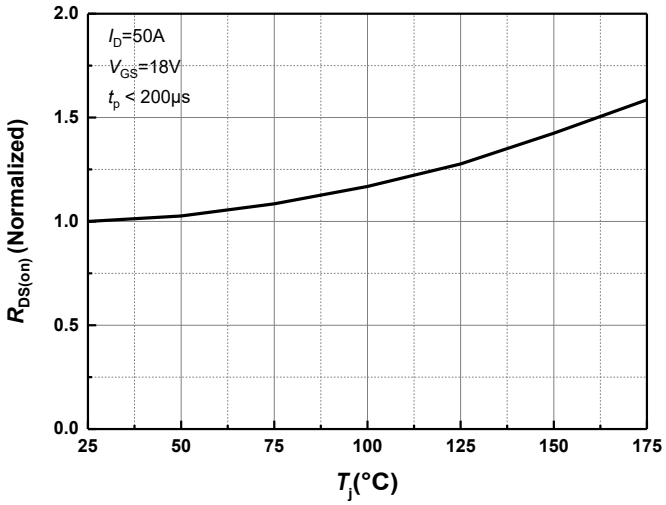


Figure 5 Normalized On-Resistance for Various Temperature

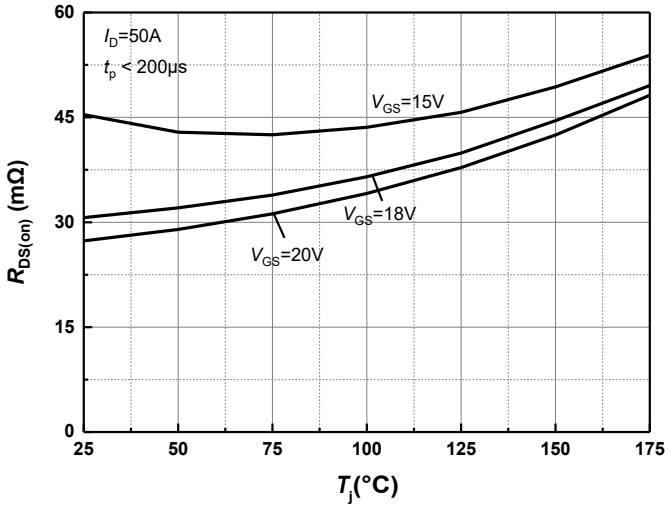


Figure 6 On-Resistance vs. Temperature for Various Gate-Source Voltage

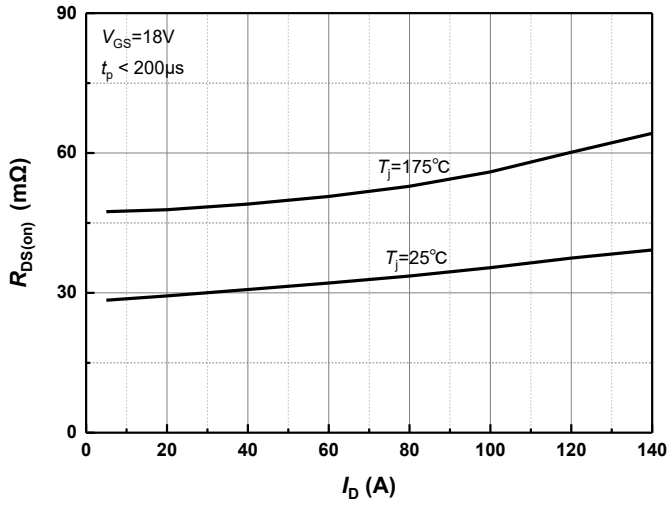


Figure 7 On-Resistance vs. Drain Current for Various Temperature

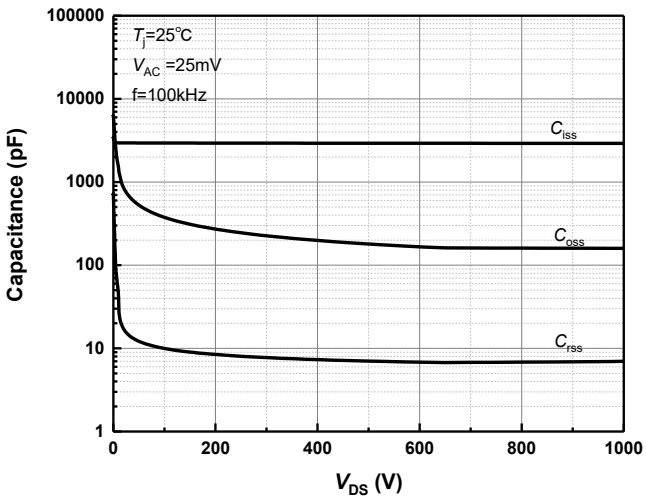


Figure 8 Capacitance vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

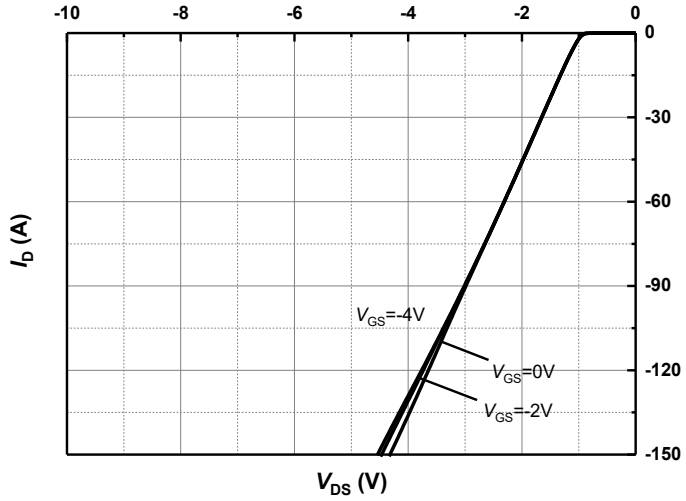


Figure 9 Embeded SiC SBD Characteristics at T_j=25°C

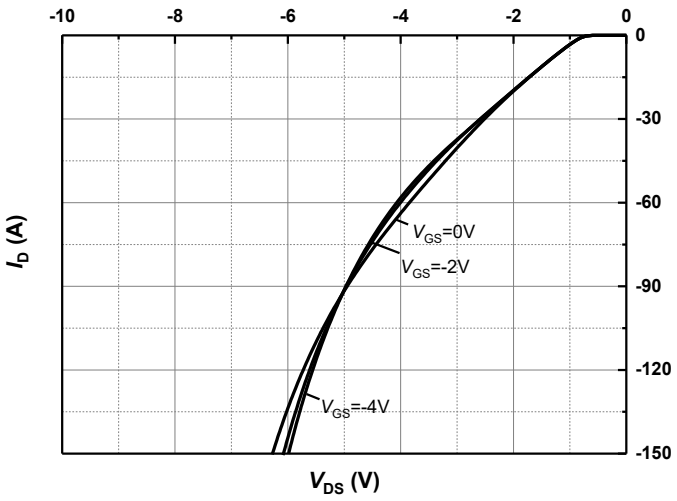


Figure 10 Embeded SiC SBD Characteristics at T_j=175°C

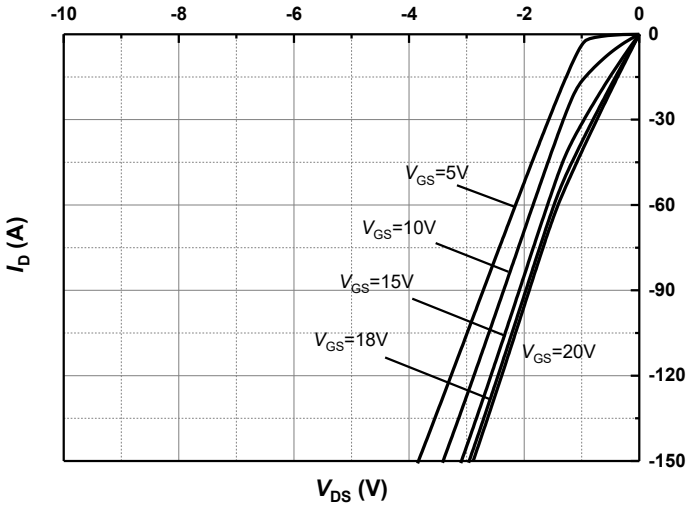


Figure 11 3rd Quadrant Characteristics at T_j=25°C

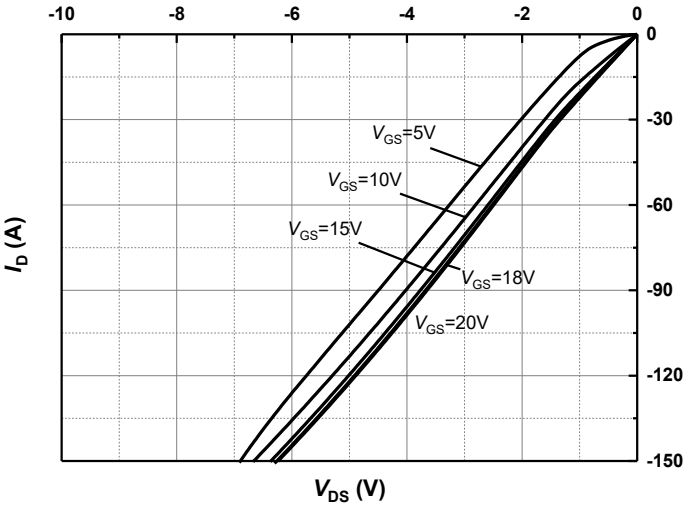


Figure 12 3rd Quadrant Characteristics at T_j=175°C

Typical Performance

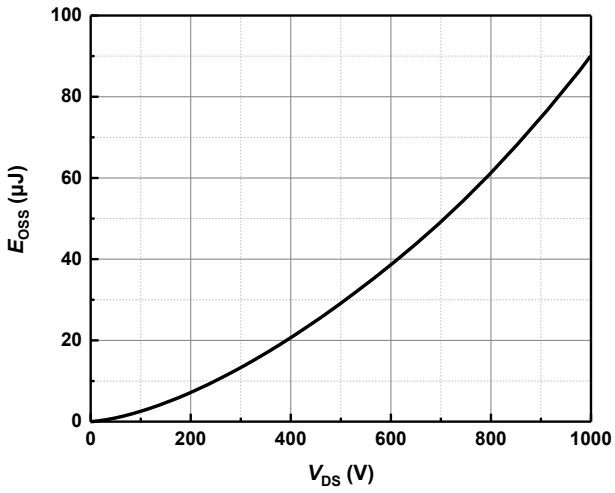


Figure 13 Output Capacitor stored Energy

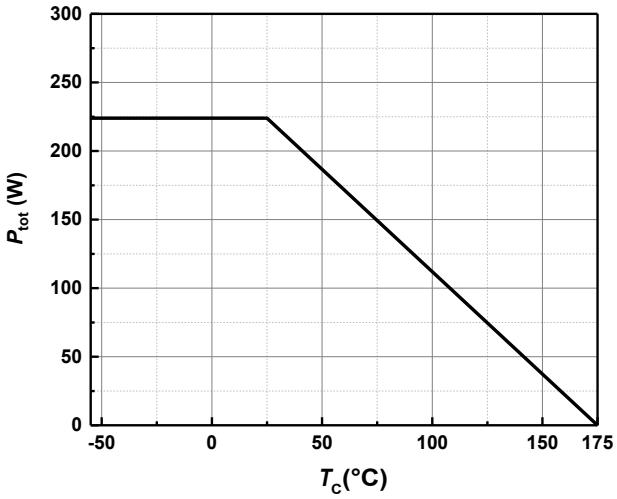


Figure 14 Maximum Power Dissipation Derating vs. Case Temperature

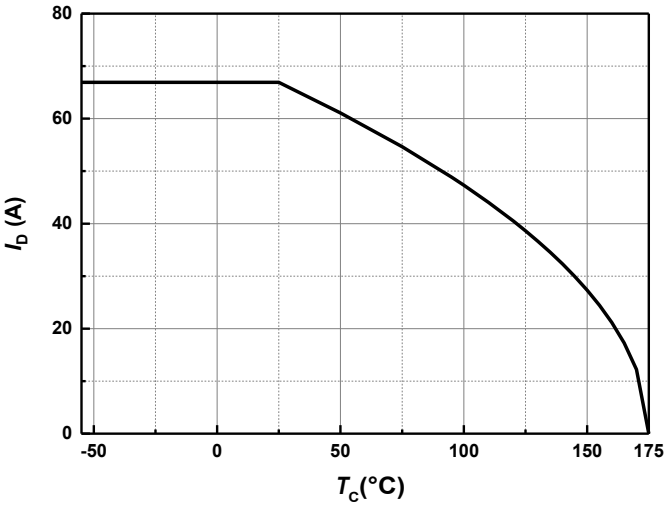


Figure 15 Continuous Drain Current Derating vs. Case Temperature

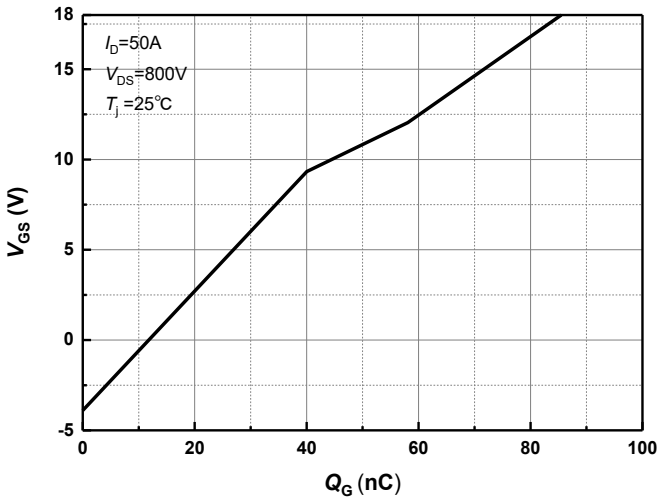


Figure 16 Gate Charge Characteristics

Typical Performance

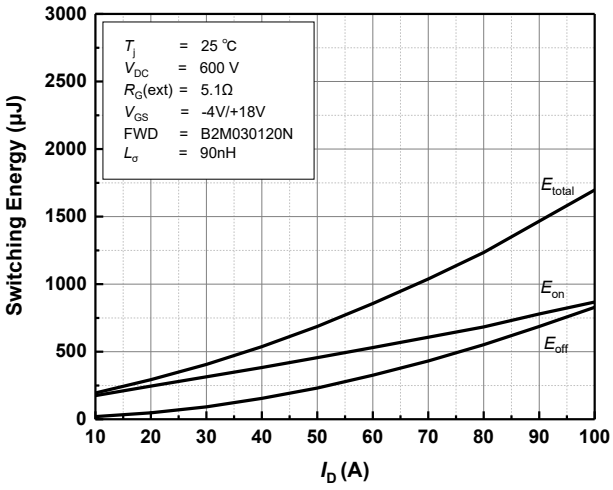


Figure 17 Clamped Inductive Switching Energy vs. Drain Current (V_{DC}= 600V) at T_j=25°C

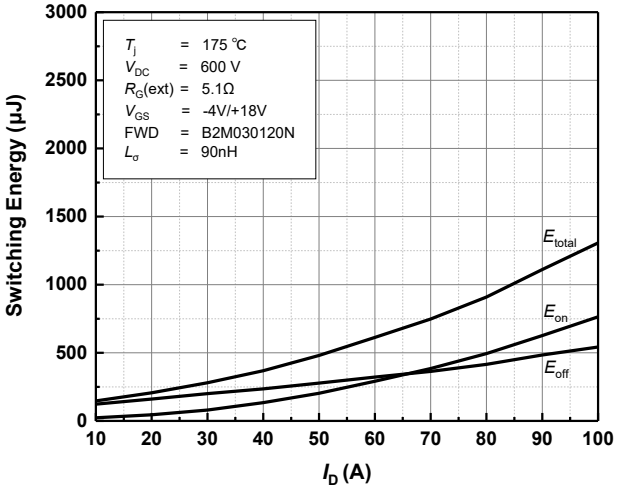


Figure 18 Clamped Inductive Switching Energy vs. Drain Current (V_{DC}= 600V) at T_j=175°C

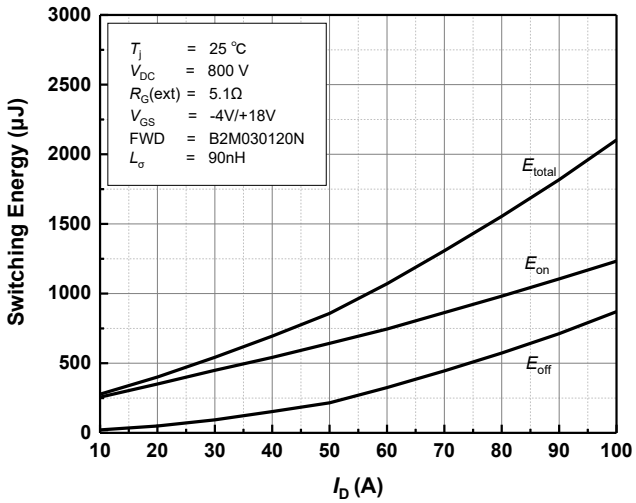


Figure 19 Clamped Inductive Switching Energy vs. Drain Current (V_{DC}= 800V) at T_j=25°C

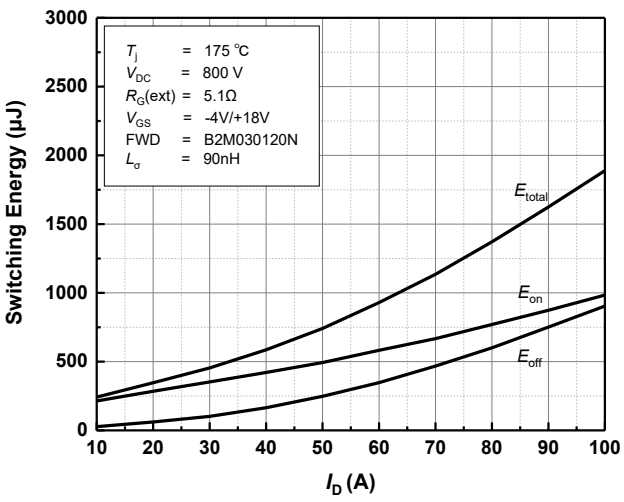


Figure 20 Clamped Inductive Switching Energy vs. Drain Current (V_{DC}= 800V) at T_j=175°C

Typical Performance

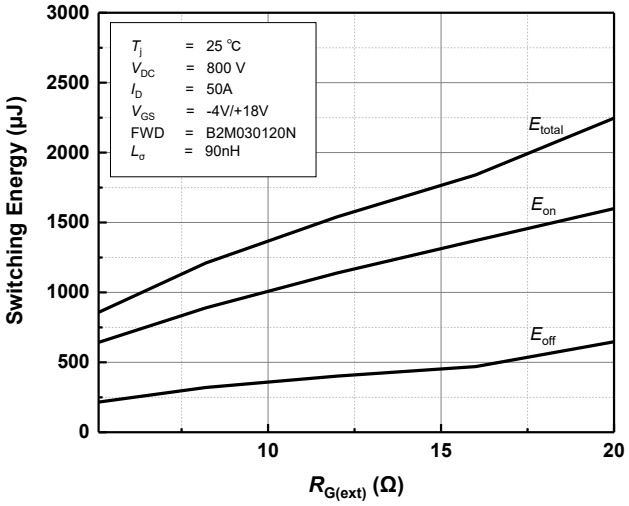


Figure 21 Clamped Inductive Switching Energy vs. External Gate Resistance at T_j=25°C

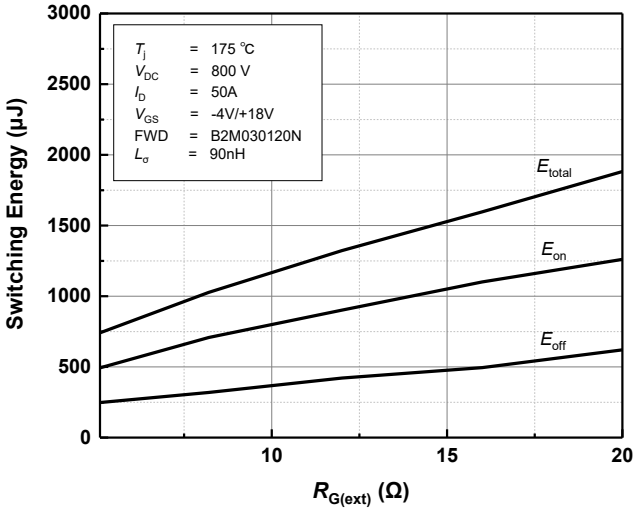


Figure 22 Clamped Inductive Switching Energy vs. External Gate Resistance at T_j=175°C

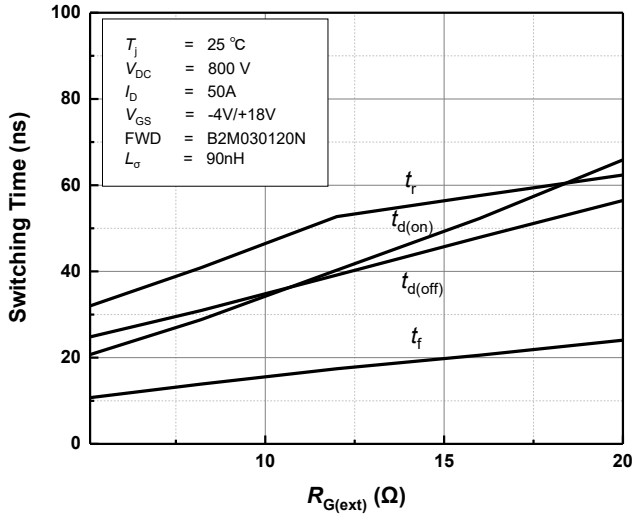


Figure 23 Clamped Inductive Switching Time vs. External Gate Resistance at T_j=25°C

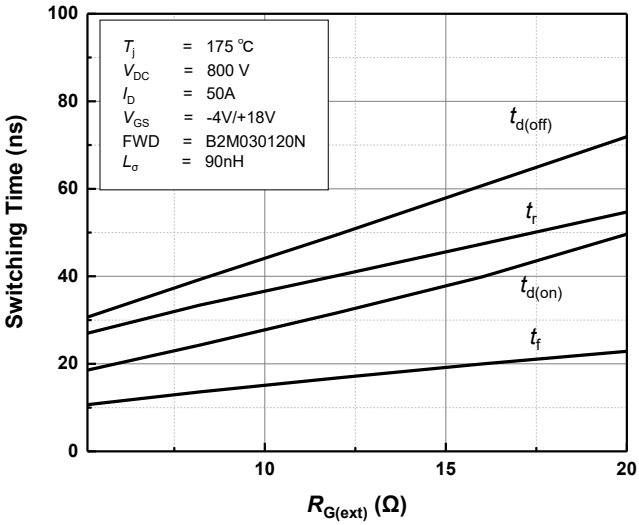


Figure 24 Clamped Inductive Switching Time vs. External Gate Resistance at T_j=175°C

Typical Performance

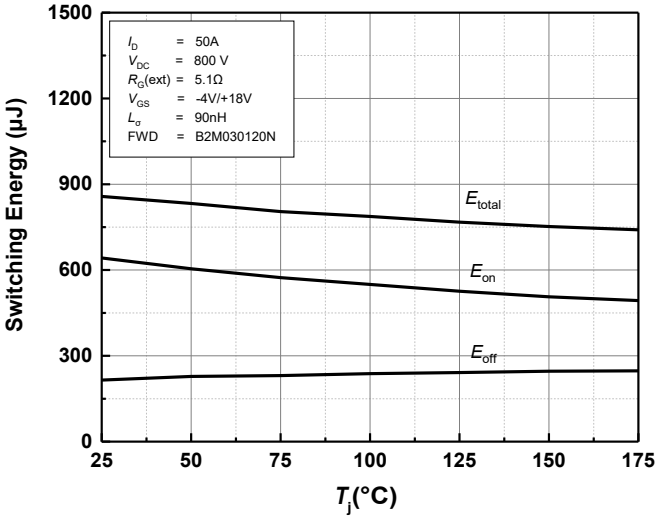


Figure 25 Clamped Inductive Switching Energy vs. Temperature

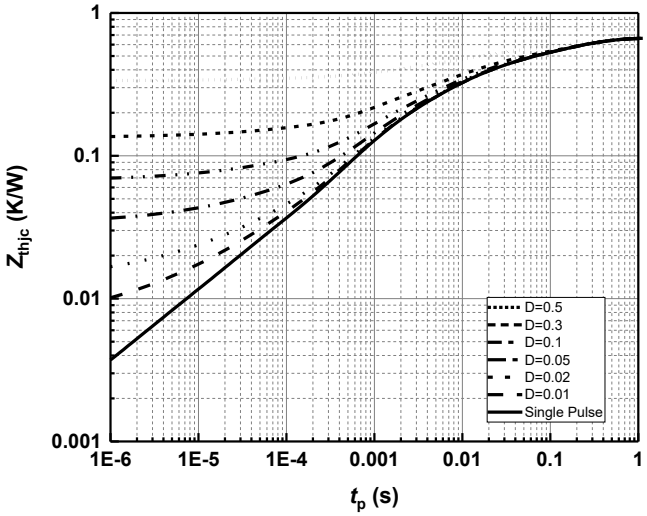


Figure 26 Transient Thermal Impedance (Junction - Case)

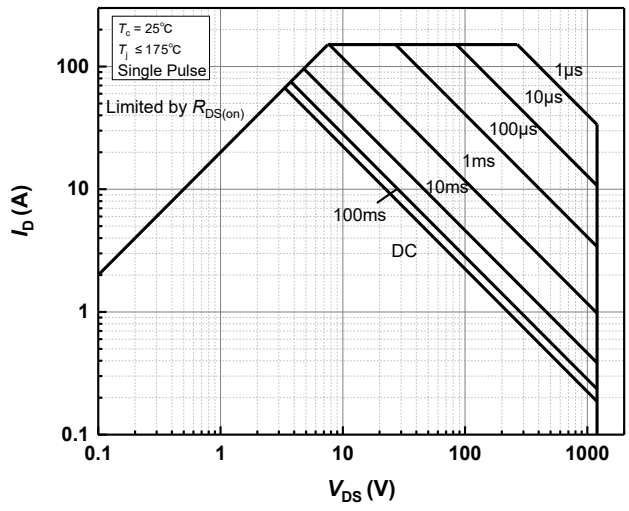
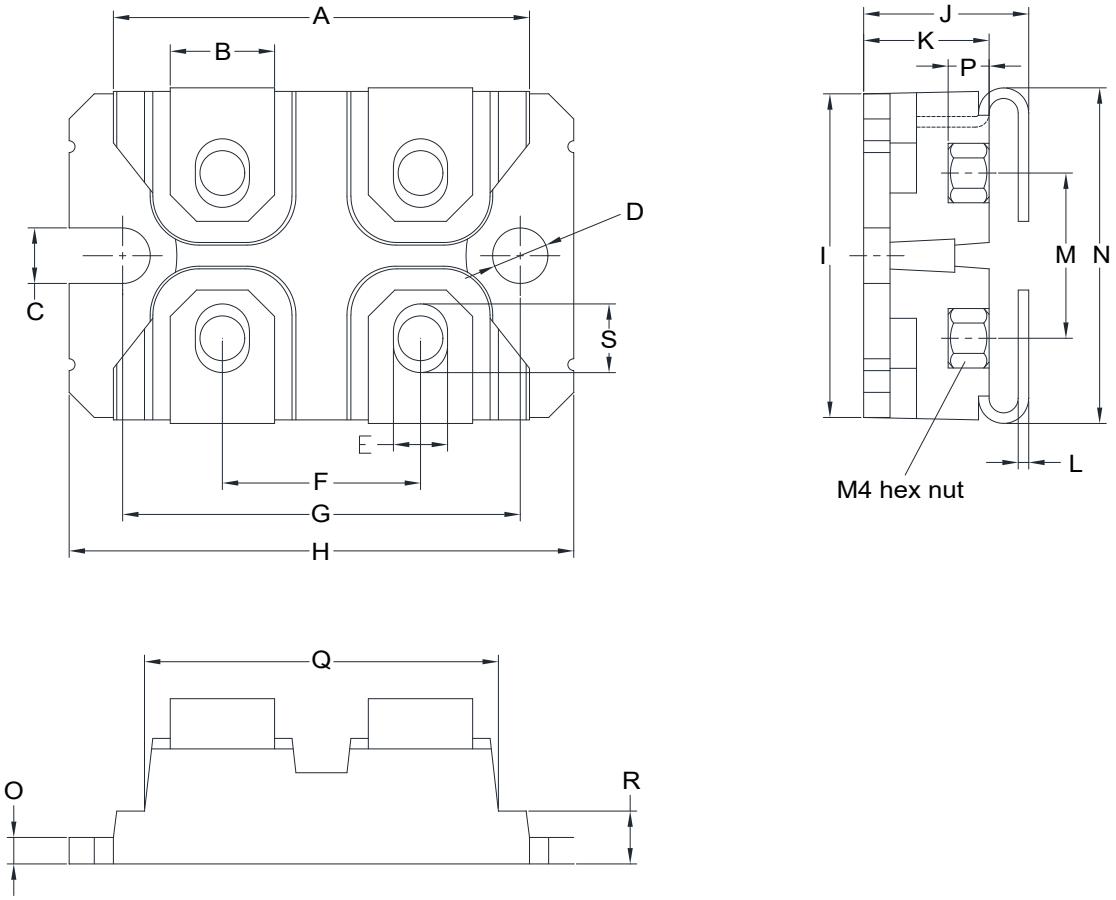


Figure 27 Forward Biased Safe Operating Area

Package Dimensions



Items	mm	
	MIN	MAX
A	31.40	31.90
B	7.70	8.30
C	4.10	4.40
D	4.10	4.40
E	4.00	4.40
F	14.80	15.20
G	29.80	30.20
H	37.8	38.40
I	23.60	24.3
J	11.60	12.20
K	9.30	9.70
L	0.70	0.90
M	12.40	12.90
N	24.20	25.80
O	1.90	2.10
P	3.40	4.00
Q	26.60	27.00
R	3.80	4.40
S	4.50	5.20

Revision History

Document Version	Date of Release	Description of Changes
Rev. 0.0	2024-10-16	Draft datasheet created.
Rev. 0.1	2025-07-09	Fig 27 update.
Rev. 0.2	2025-08-28	POD update.
Rev. 0.3	2025-11-18	POD data update.

Information

For further information on technology, delivery terms and conditions and prices, please contact the nearest BASiC Semiconductor Office.

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