

Product Summary

V_{DS}	1200 V
$I_D (T_C=25^\circ\text{C})$	44 A
$R_{DS(on)}$	80 mΩ@$V_{GS}=20\text{V}$

Features

- Low On-Resistance with High Blocking Voltage
- Low Capacitance
- Avalanche Ruggedness
- Halogen Free, Rohs Compliant

Benefits

- High Frequency Operation
- Enabling Higher Switching Frequency
- Increased Power Density
- Reduction of Heat Sink Requirements

Applications

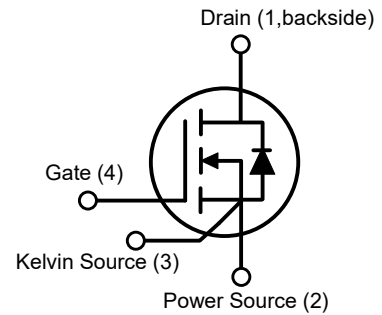
- Switch Mode Power Supplies (SMPS)
- Power Inverter & Solar Inverter
- Motor Drivers & EV Charging Station
- DC/DC Converter

Package Pin Definitions

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

Package Parameters

Part Number	Marking	Package
B1M080120HK	B1M080120HK	TO-247-4

Package: TO-247-4


Maximum Ratings

Symbol	Parameter	Test conditions	Value	Unit
V_{DSmax}	Drain-Source Voltage	$V_{GS}=0V, I_D=100\mu A$	1200	V
V_{GSmax}	Gate-Source Voltage		-10/25	
V_{GSop}	Recommend Gate-Source Voltage		-5/20	V
I_D	Continuous Drain Current	$V_{GS}=20V, T_C=25^\circ C$	44	A
		$V_{GS}=20V, T_C=100^\circ C$	27	A
$I_{D,pulse}$	Pulsed Drain Current	Pulse with t_p limited by T_{jmax}	80	A
P_{tot}	Power Dissipation	$T_C=25^\circ C, T_j=150^\circ C$	241	W
T_j	Operating Junction Temperature		-55~150	$^\circ C$
T_{stg}	Storage Temperature		-55~150	$^\circ C$
M_d	TO-247 mounting torque	M3 Screw	0.7	N·m

Electrical Characteristics (Defined at $T_j=25^\circ C$ unless otherwise specified)
Static Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=100mA$	1200			V
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=5mA$	2.0	2.7	3.5	V
		$V_{GS}=V_{DS}, I_D=5mA, T_j=150^\circ C$		1.9		
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=20V, V_{DS}=0V$			250	nA
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=1200V, V_{GS}=0V$		0.2	45	μA
		$V_{DS}=1200V, V_{GS}=0V, T_j=150^\circ C$		1	200	
$R_{DS(on)}$	Drain-Source On-State Resistance	$V_{GS}=20V, I_D=20A$		80	98	m Ω
		$V_{GS}=20V, I_D=20A, T_j=150^\circ C$		103		
g_{fs}	Transconductance	$V_{DS}=20V, I_D=20A$		8		S

Thermal Characteristics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(jc)}$	Thermal Resistance from Junction to Case		0.52		K/W

AC Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
C_{iss}	Input Capacitance	$V_{GS}=0V, V_{DS}=800V$ $f=1MHz, V_{AC}=25mV$		2128		pF
C_{oss}	Output Capacitance			104		pF
C_{rss}	Reverse Transfer Capacitance			15		pF
$R_{G(int)}$	Internal Gate Resistance	$f=1MHz, V_{AC}=25mV$		1.48		Ω

Gate Charge Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
Q_{GS}	Gate to Source Charge	$V_{DS}=800V$ $I_D=20A$ $V_{GS}=-5/+20V$		56		nC
Q_{GD}	Gate to Drain Charge			66		nC
Q_G	Total Gate Charge			149		nC

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	$V_{DC}=800V, V_{GS}=-5/20V$ $I_D=20A, R_{G(ext)}=2.2\Omega$ $L_\sigma=60nH$ Inductive Load Eon includes diode reverse recovery		10		ns
t_r	Rise Time			23		ns
$t_{d(off)}$	Turn-Off Delay Time			19		ns
t_f	Fall Time			11		ns
E_{on}	Turn-On Energy			227		μJ
E_{off}	Turn-Off Energy			71		μJ

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	$V_{GS}=-5V, I_{SD}=10A$		5		V
t_{rr}	Reverse Recovery Time	$V_{DC}=800V, I_{SD}=20A$ $-di_F/dt=3000A/\mu s$		19		ns
Q_{rr}	Reverse Recovery Charge			295		nC
I_{rrm}	Peak Reverse Recovery Current			26		A

Typical Performance

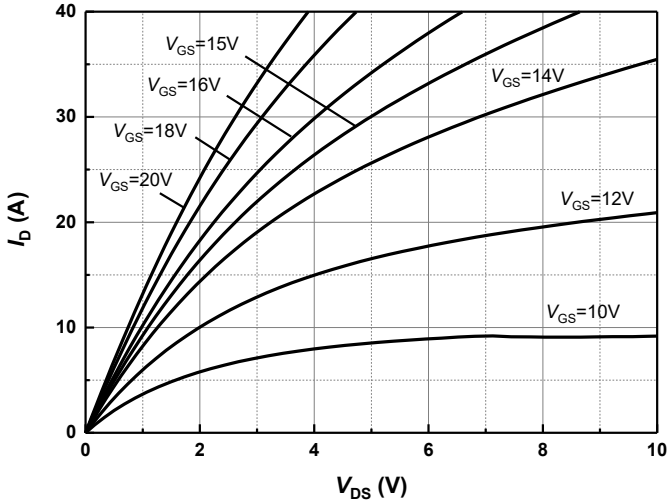


Figure 1 Typical Forward Output Characteristics at $T_j=25^\circ\text{C}$

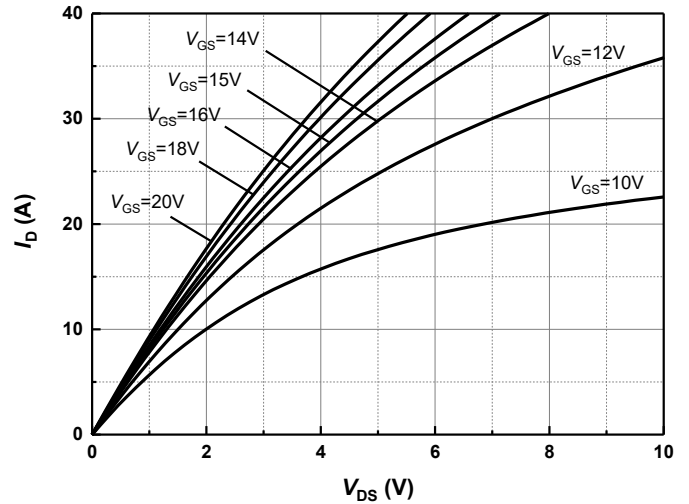


Figure 2 Typical Forward Output Characteristics at $T_j=150^\circ\text{C}$

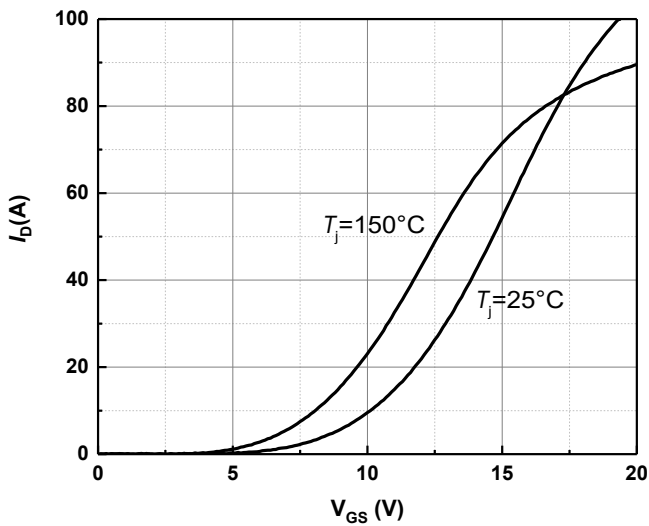


Figure 3 Transfer Characteristics for Various Temperature

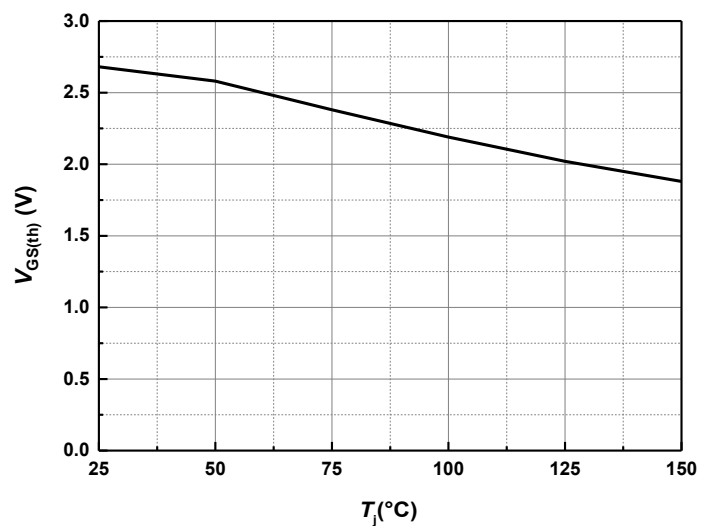


Figure 4 Threshold Voltage for Various Temperature

Typical Performance

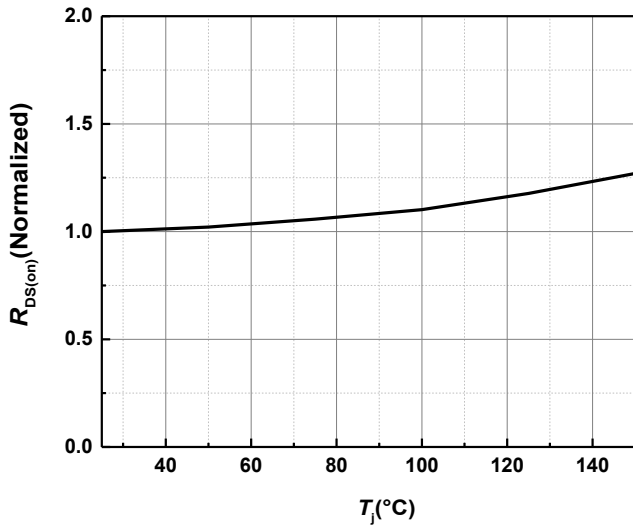


Figure 5 Normalized On-Resistance for Various Temperature

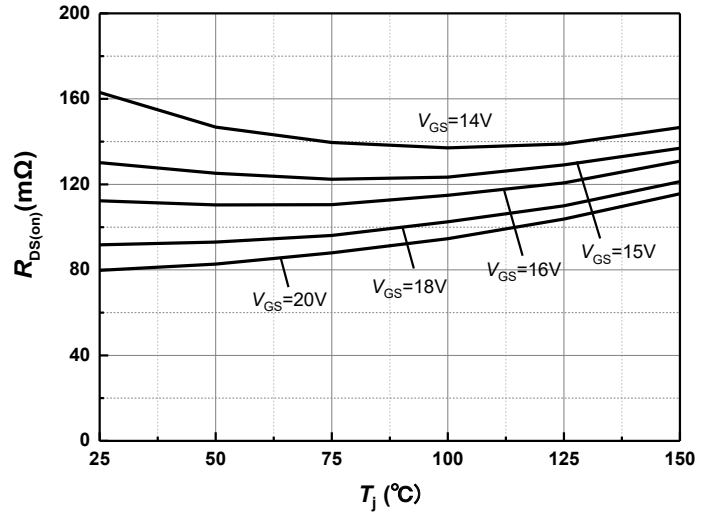


Figure 6 On-Resistance vs. Temperature for Various Gate Voltage

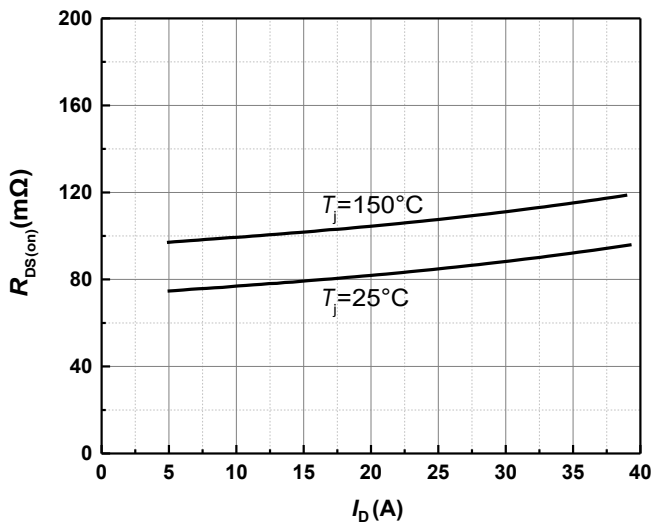


Figure 7 On-Resistance vs. Drain Current for Various Temperature

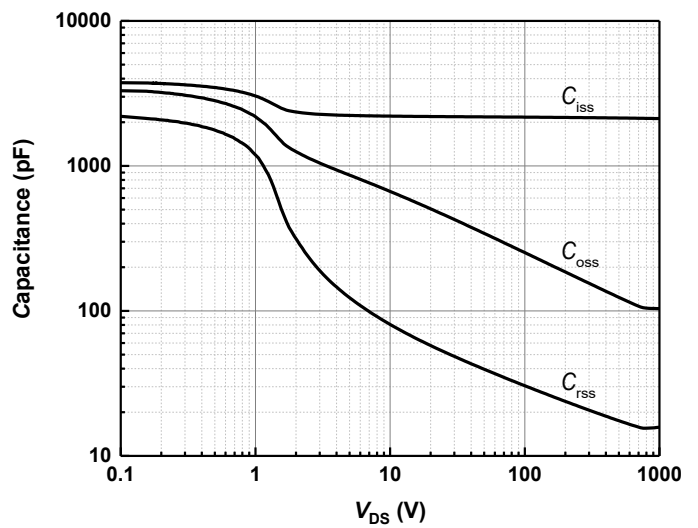


Figure 8 Capacitance vs. Drain-Source Voltage (0 - 1000V)

Typical Performance

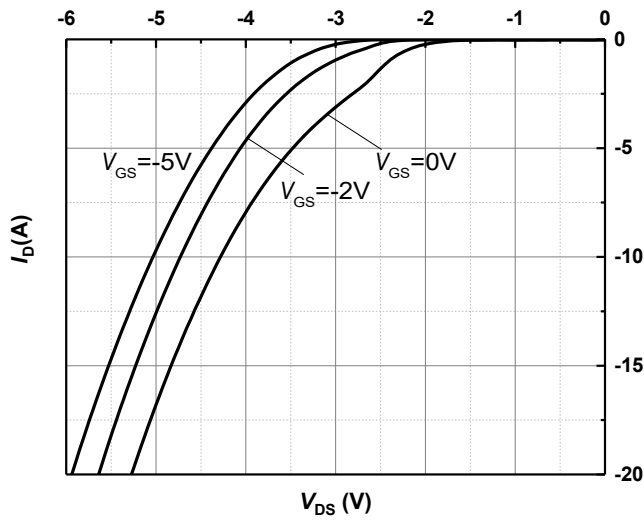


Figure 9 Body Diode Characteristics at $T_j=25\text{ }^\circ\text{C}$

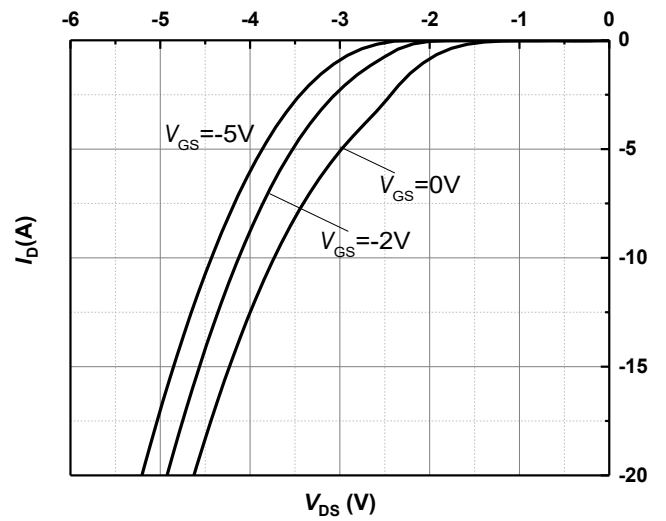


Figure 10 Body Diode Characteristics at $T_j=150\text{ }^\circ\text{C}$

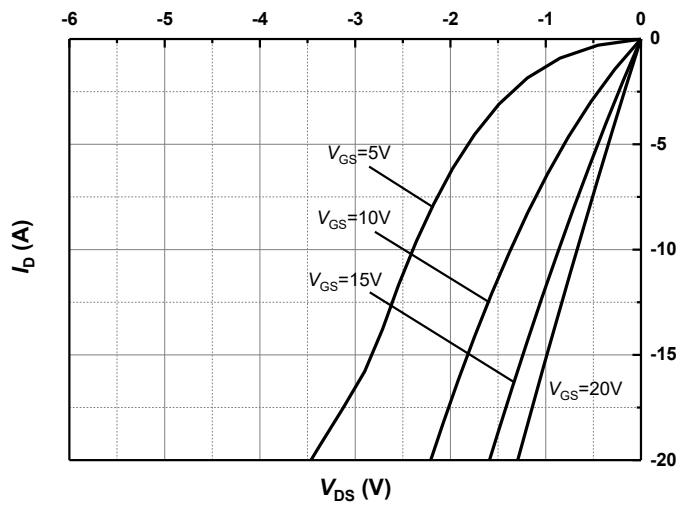


Figure 11 3rd Quadrant Characteristics at $T_j=25\text{ }^\circ\text{C}$

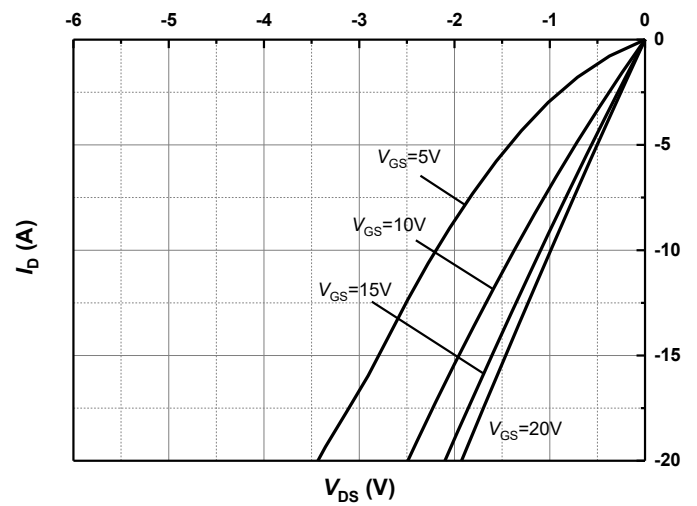


Figure 12 3rd Quadrant Characteristics at $T_j=150\text{ }^\circ\text{C}$

Typical Performance

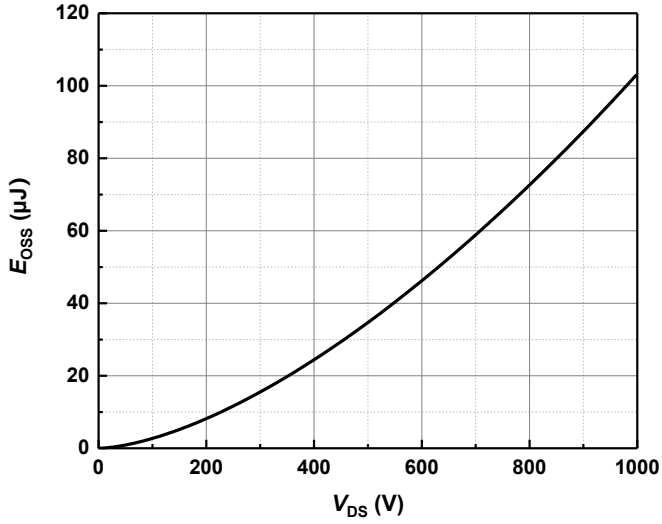


Figure 13 Output Capacitor stored Energy

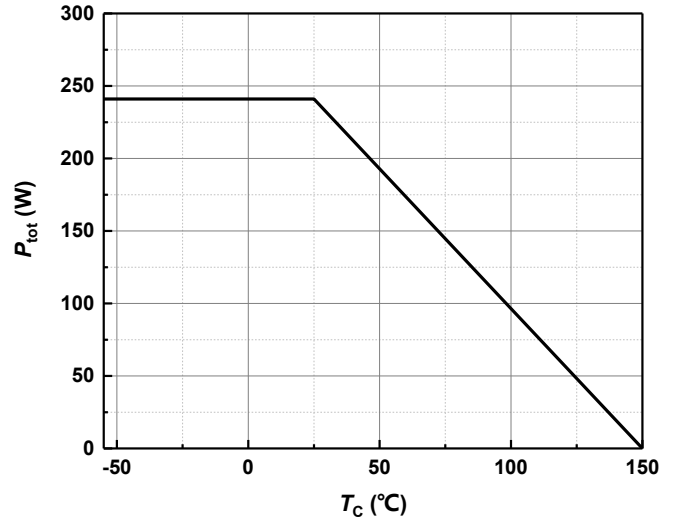


Figure 14 Maximum Power Dissipation Derating vs. Case Temperature

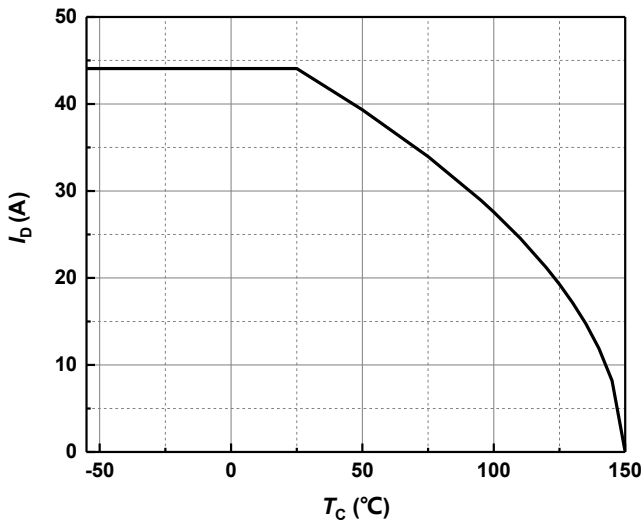


Figure 15 Continuous Drain Current Derating vs. Case Temperature

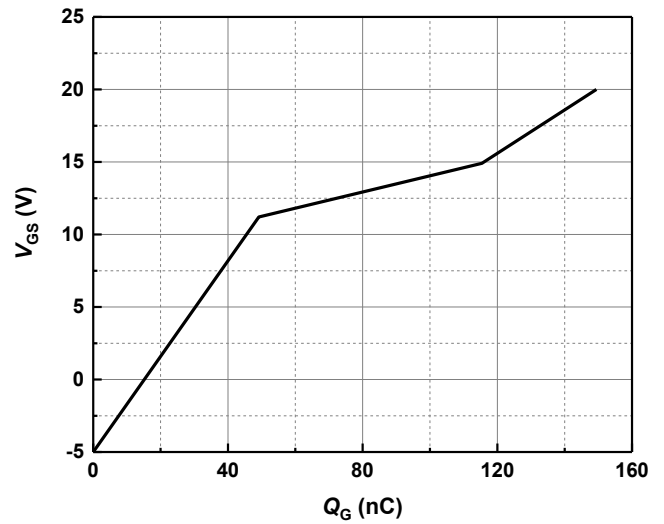


Figure 16 Gate Charge Characteristics

Typical Performance

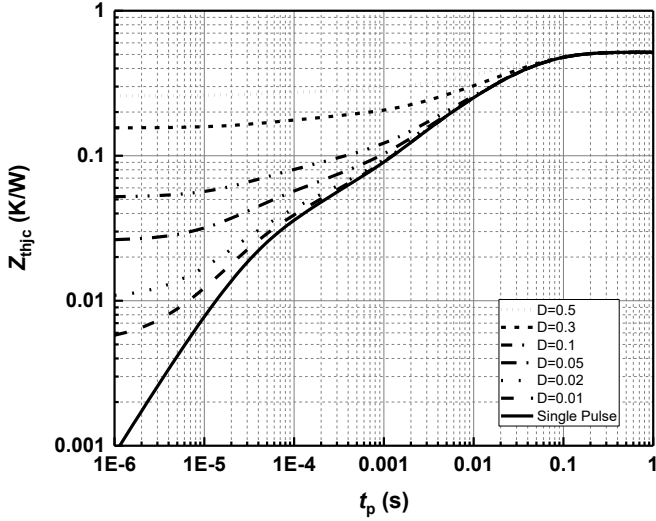


Figure 17 Transient Thermal Impedance (Junction - Case)

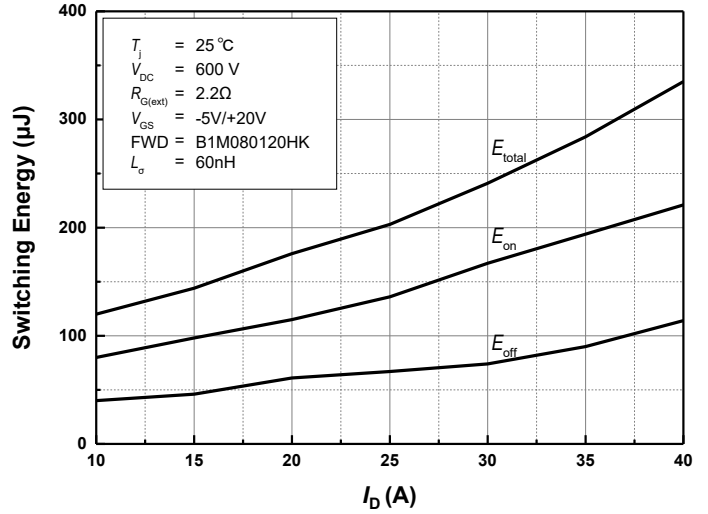


Figure 18 Clamped Inductive Switching Energy vs. Drain Current

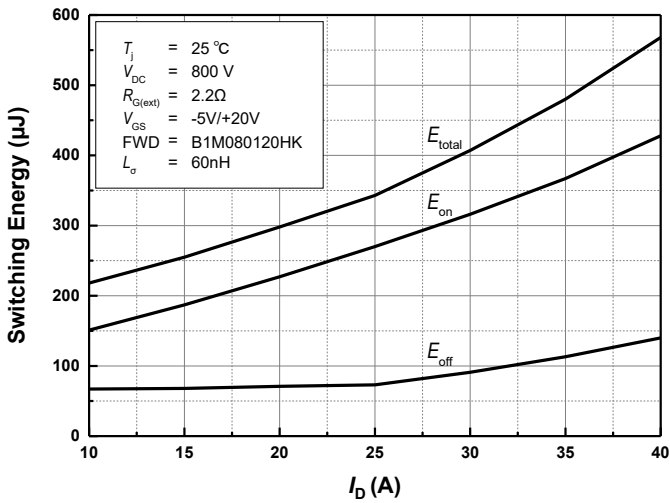


Figure 19 Clamped Inductive Switching Energy vs. Drain Current

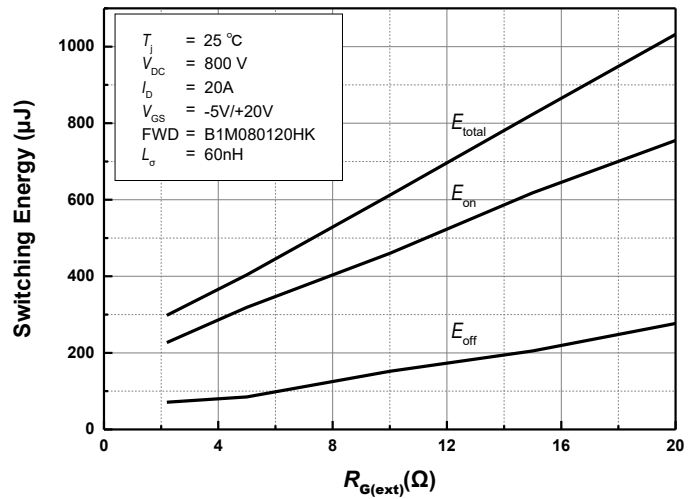


Figure 20 Clamped Inductive Switching Energy vs. External Gate Resistance

Typical Performance

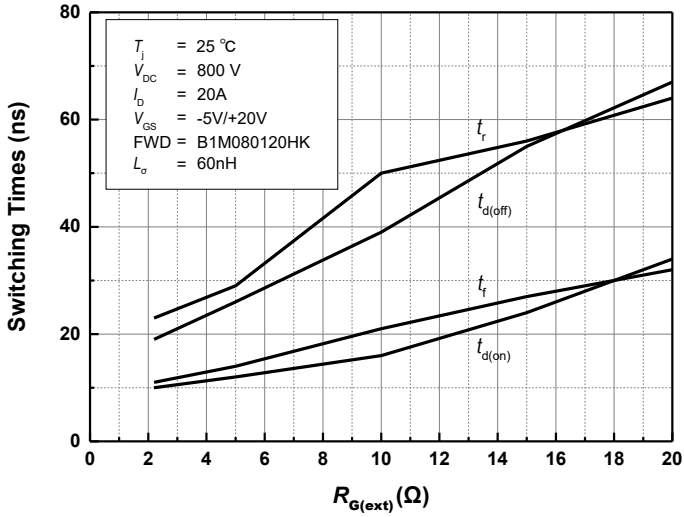


Figure 21 Clamped Inductive Switching Time vs. External Gate Resistance

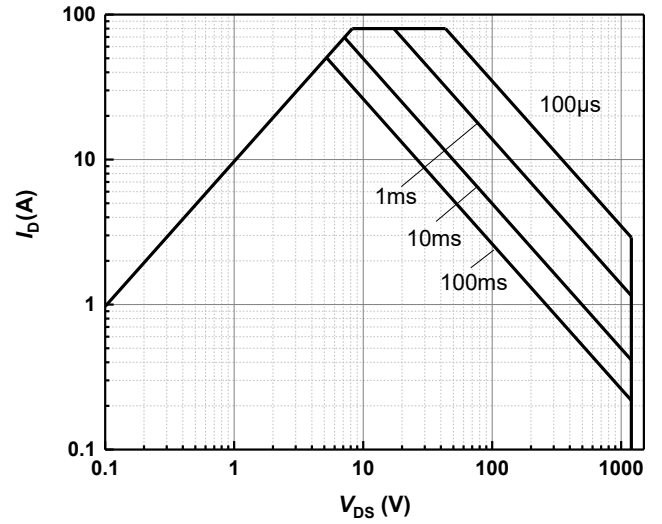
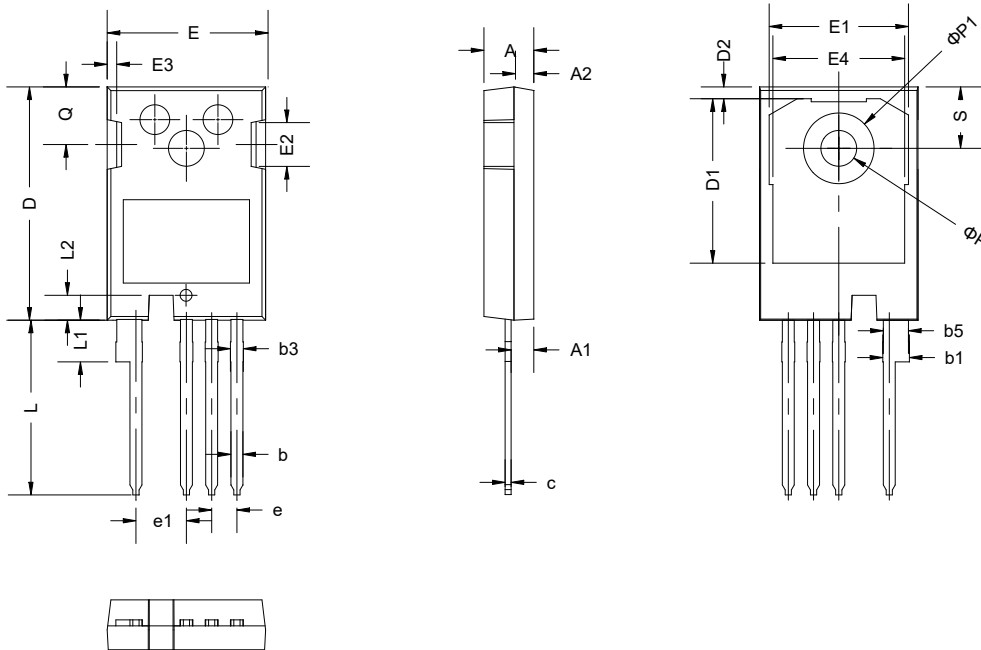


Figure 22 Safe Operating Area

Package Dimensions


SYMBOL	mm		
	MIN	NOM	MAX
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b	1.07	1.20	1.33
b1	2.39	2.67	2.84
b3	1.07	1.30	1.60
b5	2.39	2.53	2.69
c	0.55	0.60	0.68
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
φ P	3.51	3.61	3.65
φ P1	7.19 REF		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

Revision History

Document Version	Date of Release	Description of Changes
Rev 0.0	2020-04-19	Release of the preliminary datasheet.
Rev 0.1	2020-10-30	Characteristics update.
Rev 0.2	2020-12-23	Reverse Diode Characteristics update.
Rev 0.3	2022-05-10	Characteristics update.

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