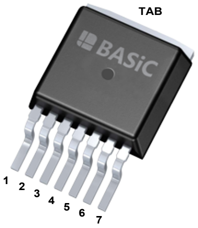
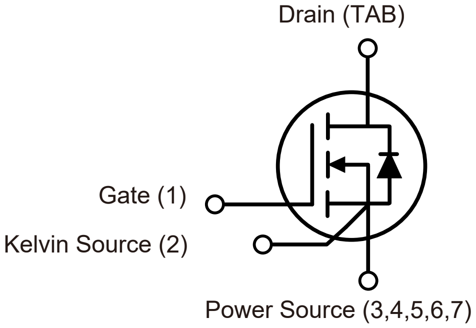
Product Summary

V_{DS}	**1200 V**
I_D (T_C=25°C)	**63 A**
$R_{DS(on).typ}$	**40 mΩ@V_{GS}=18V**

Package: TO-263-7





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

- TAB - Drain
- Pin1 - Gate
- Pin2 - Kelvin Source
- Pin3,4,5,6,7 - Power Source

Package Parameters

Part Number	Marking	Package
B3M040120R	B3M040120R	TO-263-7

Maximum Ratings

Symbol	Parameter	Test conditions	Value	Unit
V_{DSmax}	Drain-Source Voltage	V_{GS}=0V, I_D=100μA	1200	V
$V_{GSmax}{}^{1)}$	Gate-Source Voltage		-10/22	V
V_{GSop}	Recommend Gate-Source Voltage		-5/18	V
I_D	Continuous Drain Current	V_{GS}=18V, T_C=25°C	63	A
		V_{GS}=18V, T_C=100°C	44	A
$I_{D,pulse}$	Pulsed Drain Current	Pulse with t_p limited by T_{jmax}	108	A
P_{tot}	Power Dissipation	T_C=25°C, T_j=175°C	300	W
T_j	Operating Junction Temperature		-55~175	°C
T_{stg}	Storage Temperature		-55~175	°C

1) Note: When using MOSFET Body Diode V_{GSmax}=-4/22V

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=100μA	1200			V
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS}, I_D=10mA	2.3	2.7	3.5	V
		V_{GS}=V_{DS}, I_D=10mA, T_j=175°C		1.9		
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		10	200	
$R_{DS(on)}$	Drain-Source On-State Resistance	V_{GS}=18V, I_D=40A		40	55	mΩ
		V_{GS}=18V, I_D=40A,T_j=175°C		75		
		V_{GS}=15V, I_D=40A		50		
g_{fs}	Transconductance	V_{DS}=10V, I_D=40A		16		S

Thermal Characteritics

Symbol	Parameter	Value			Unit
		Min.	Typ.	Max.	
$R_{th(jc)}$	Thermal Resistance from Junction to Case		0.50	0.70	K/W

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		1870		pF
C_{oss}	Output Capacitance			82		pF
C_{rss}	Reverse Transfer Capacitance			6		pF
E_{oss}	C_{oss} stored energy			33		μJ
$C_{O(ER)}$	Effective Output Capacitance, Energy Related	V_{GS}=0V, 0V < V_{DS} < 800V		105		pF
$C_{O(TR)}$	Effective Output Capacitance, Time Related	V_{GS}=0V, 0V < V_{DS} < 800V		157		pF
$R_{G(int)}$	Internal Gate Resistance	f=1MHz, V_{AC}=25mV		1.3		Ω

Gate Charge Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
Q_{GS}	Gate to Source Charge	V_{DS}=800V I_D =40A V_{GS}=-5/+18V		28		nC
Q_{GD}	Gate to Drain Charge			43		nC
Q_G	Total Gate Charge			87		nC

Switching Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$t_{d(on)}$	Turn-On Delay Time	V_{DC}=800V, V_{GS}=-5/18V I_D=40A, $R_{G(ext)}$=8.2Ω L_σ=50nH, T_j=25°C diode: body diode at V_{GS}=-5V Inductive Load Eon includes diode reverse recovery		11		ns
t_r	Rise Time			34		ns
$t_{d(off)}$	Turn-Off Delay Time			34		ns
t_f	Fall Time			10		ns
E_{on}	Turn-On Energy (FWD=Body Diode)			675		μJ
E_{off}	Turn-Off Energy (FWD=Body Diode)			185		μJ
E_{on}	Turn-On Energy (FWD=SiC SBD)	V_{DC}=800V, V_{GS}=-5/18V I_D=40A, $R_{G(ext)}$=8.2Ω L_σ=50nH, T_j=25°C FWD 2): B3D20120H		600		μJ
E_{off}	Turn-Off Energy (FWD=SiC SBD)			190		μJ
$t_{d(on)}$	Turn-On Delay Time	V_{DC}=800V, V_{GS}=-5/18V I_D=40A, $R_{G(ext)}$=8.2Ω L_σ=50nH, T_j=175°C diode: body diode at V_{GS}=-5V Inductive Load Eon includes diode reverse recovery		9		ns
t_r	Rise Time			31		ns
$t_{d(off)}$	Turn-Off Delay Time			41		ns
t_f	Fall Time			9		ns
E_{on}	Turn-On Energy (FWD=Body Diode)			885		μJ
E_{off}	Turn-Off Energy (FWD=Body Diode)			190		μJ
E_{on}	Turn-On Energy (FWD=SiC SBD)	V_{DC}=800V, V_{GS}=-5/18V I_D=40A, $R_{G(ext)}$=8.2Ω L_σ=50nH, T_j=175°C FWD 2): B3D20120H		450		μJ
E_{off}	Turn-Off Energy (FWD=SiC SBD)			190		μJ

2) Note: FWD: Freewheeling diode

Reverse Diode Characteristics

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
V_{SD}	Diode Forward Voltage	V_{GS}=-5V, I_{SD}=20A, T_j=25°C		5.2		V
		V_{GS}=-5V, I_{SD}=20A, T_j=175°C		4.5		
I_S	Continuous Diode Forward Current	V_{GS}=-5V, T_C=25°C		45		A
$I_{S,pulse}$	Pulse Diode Current	V_{GS}=-5V, pulse width t_p limited by T_{jmax}		93		A
t_{rr}	Reverse Recovery Time	V_{GS}=-5V, V_{DC}=800V, I_{SD}=40A -di$_F$/dt=2800A/μs T_j=25°C		16		ns
Q_{rr}	Reverse Recovery Charge			187		nC
I_{rrm}	Peak Reverse Recovery Current			20		A
t_{rr}	Reverse Recovery Time	V_{GS}=-5V, V_{DC}=800V, I_{SD}=40A -di$_F$/dt=3600A/μs T_j=175°C		29		ns
Q_{rr}	Reverse Recovery Charge			910		nC
I_{rrm}	Peak Reverse Recovery Current			45		A

Typical Performance

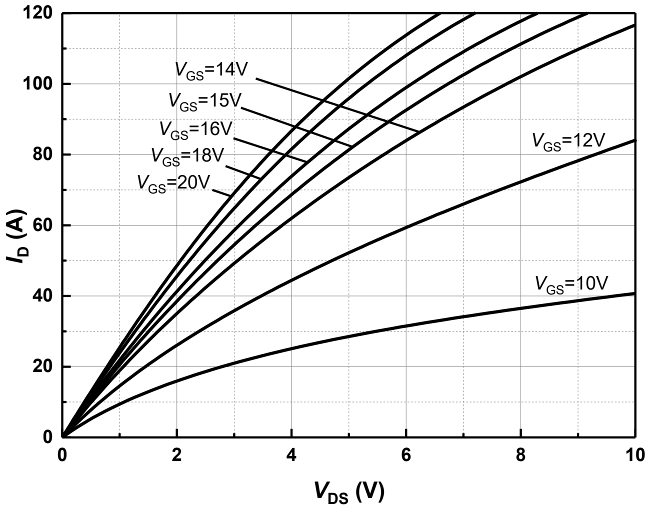


Figure 1 Typical Forward Output Characteristics at T_j=25°C

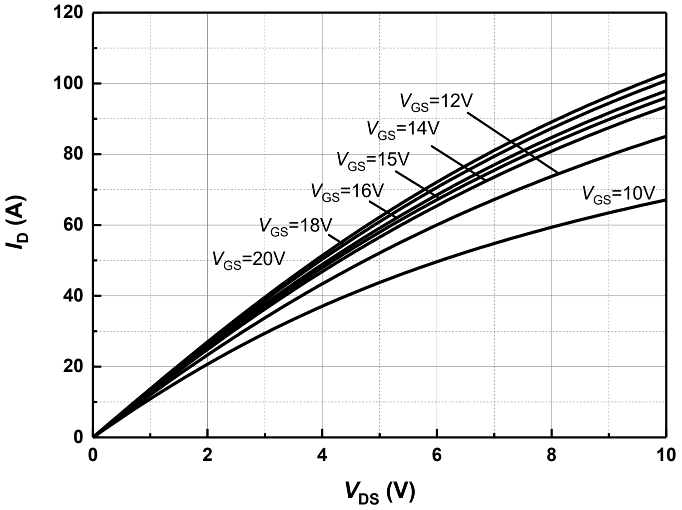


Figure 2 Typical Forward Output Characteristicsat T_j=175°C

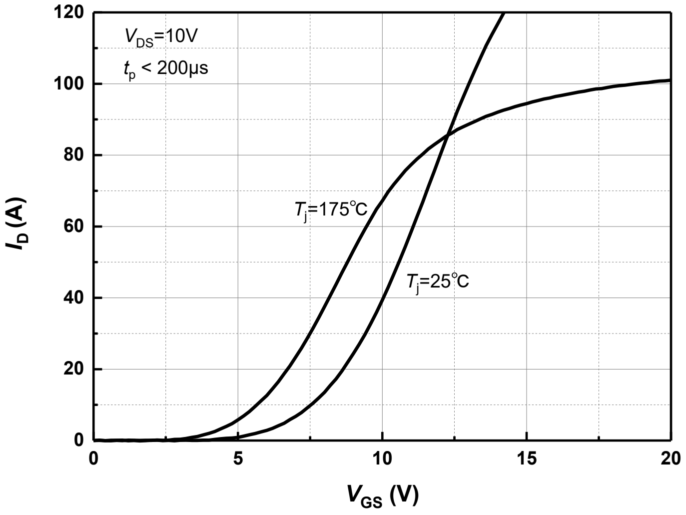


Figure 3 Transfer Characteristics for Various Temperature

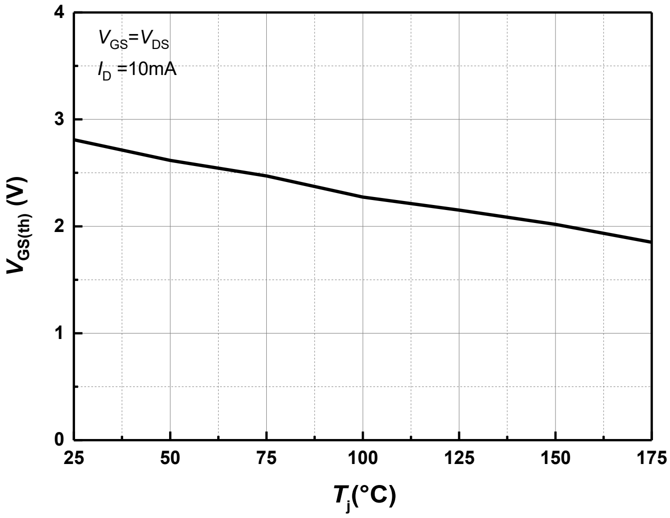


Figure 4 Threshold Voltage for Various Temperature

Typical Performance

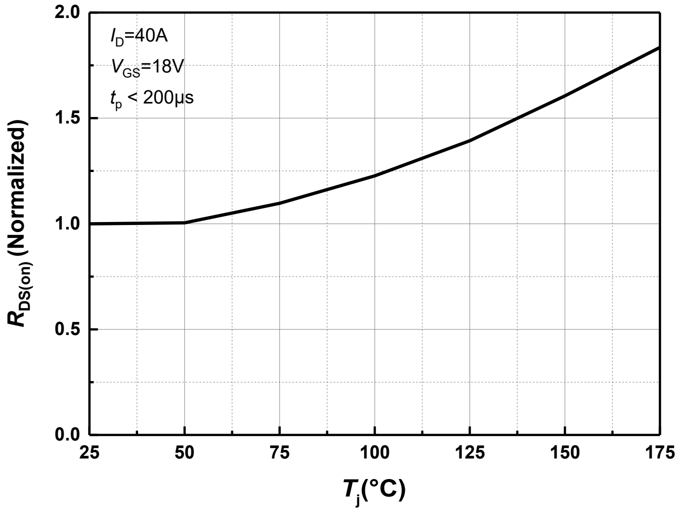


Figure 5 Normalized On-Resistance for Various Temperature

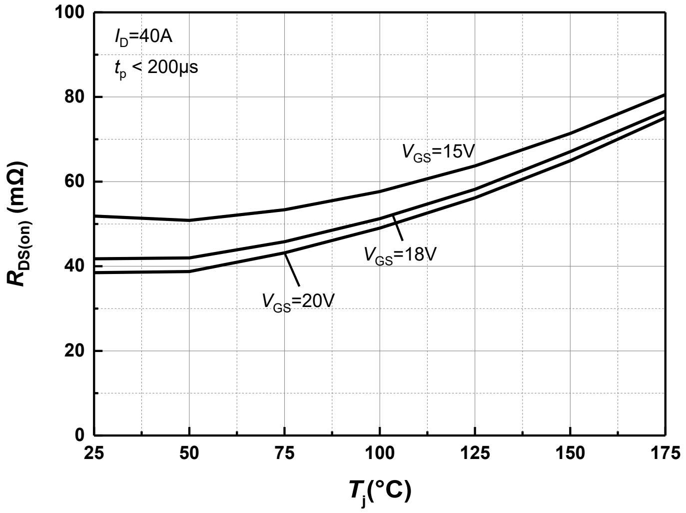


Figure 6 On-Resistance vs. Temperature for Various Gate-Source Voltage

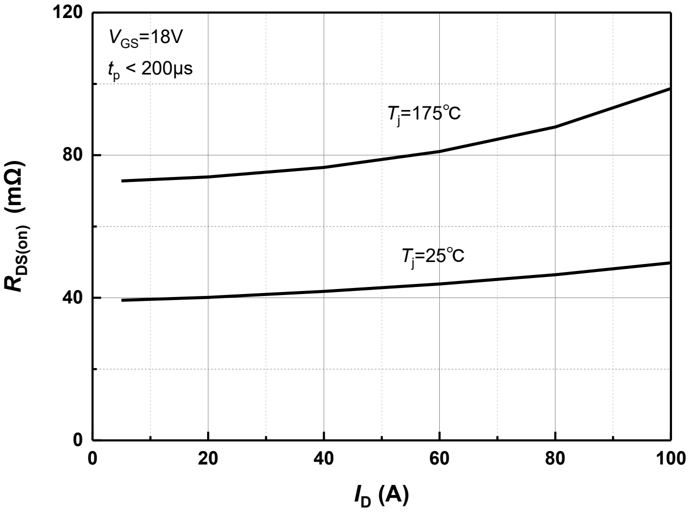


Figure 7 On-Resistance vs. Drain Current for Various Temperature

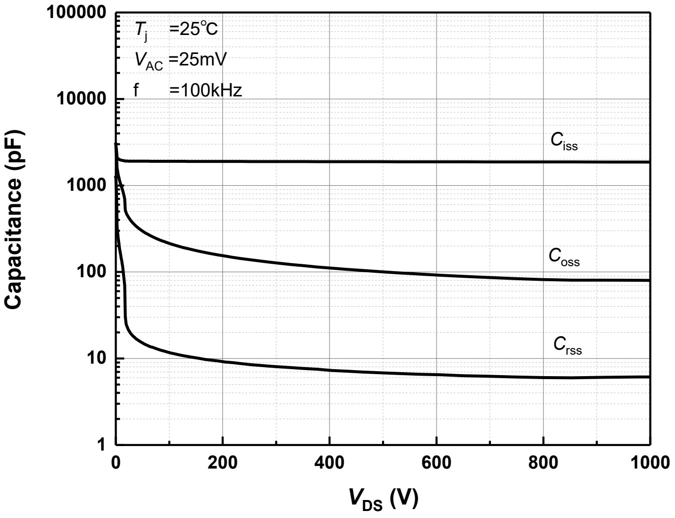
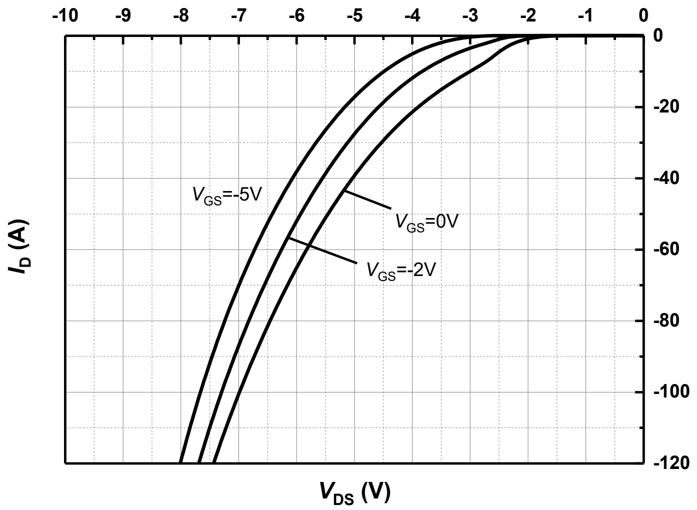


Figure 8 Capacitance vs. Drain-Source Voltage (0 - 1000V)

Typical Performance



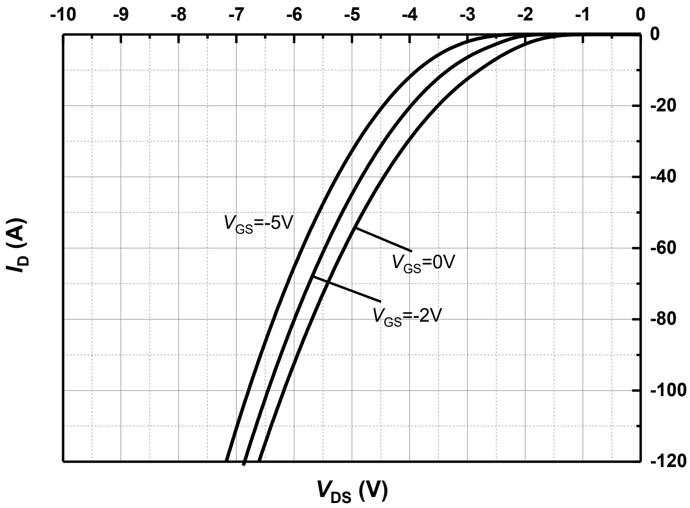
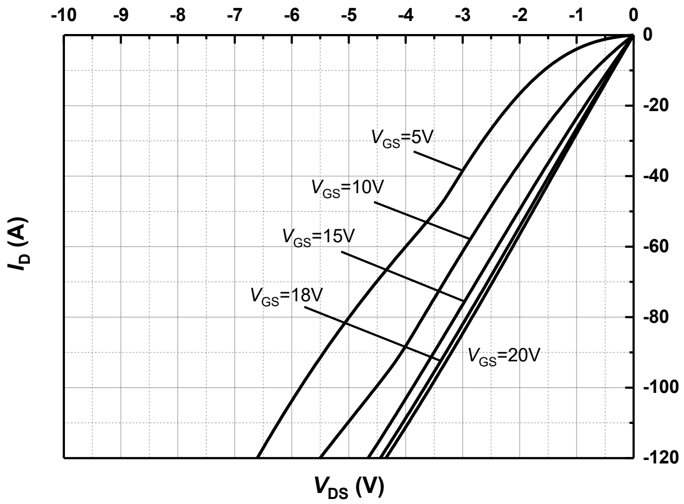


Figure 9 Body Diode Characteristics at T_j=25°C

Figure 10 Body Diode Characteristics at T_j=175°C



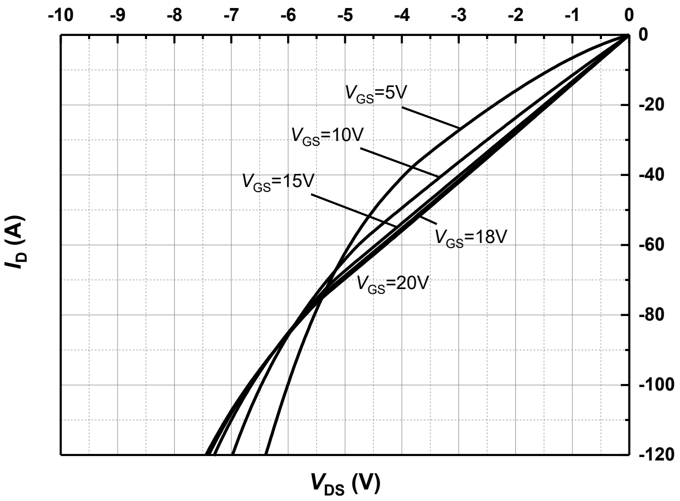


Figure 11 3rd Quadrant Characteristics at T_j=25°C

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

Typical Performance

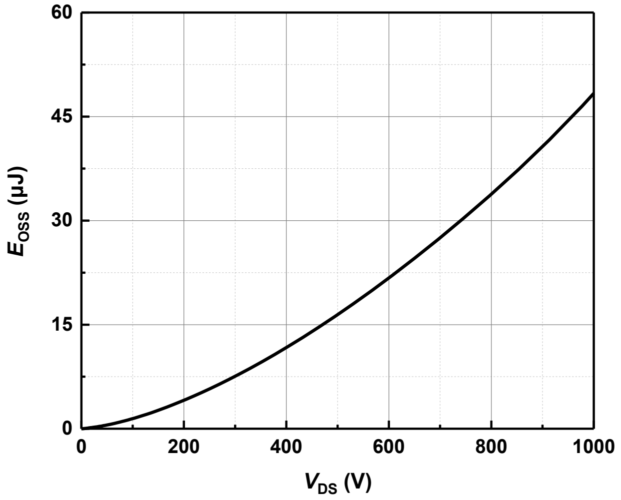


Figure 13 Output Capacitor stored Energy

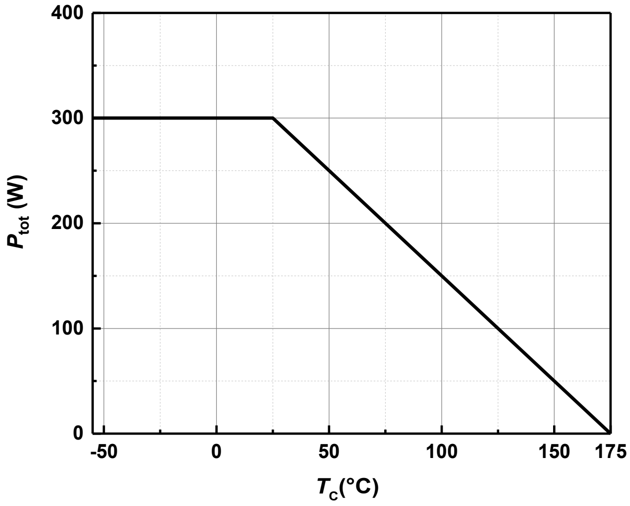


Figure 14 Maximum Power Dissipation Derating vs. Case Temperature

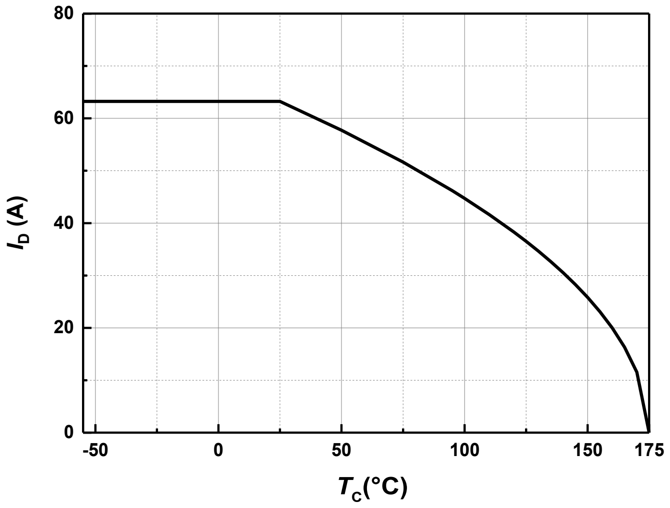


Figure 15 Continuous Drain Current Derating vs. Case Temperature

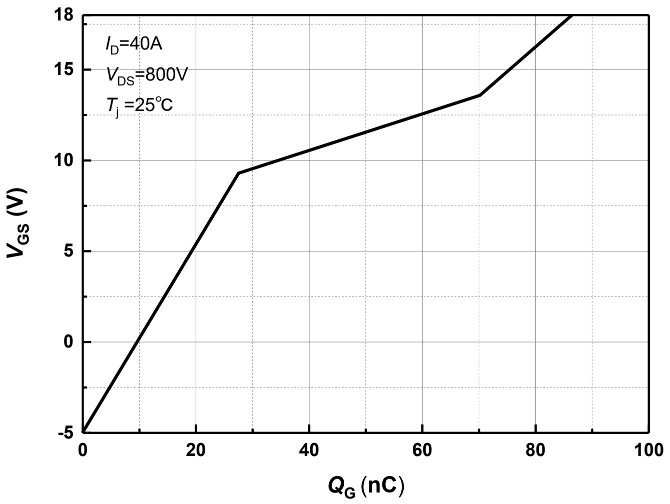
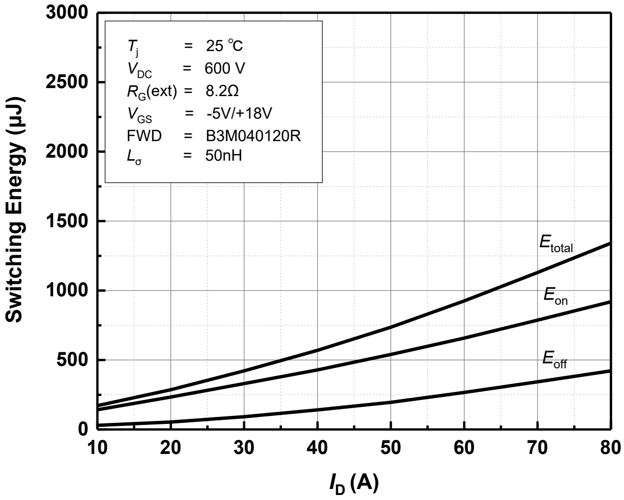


Figure 16 Gate Charge Characteristics

Typical Performance



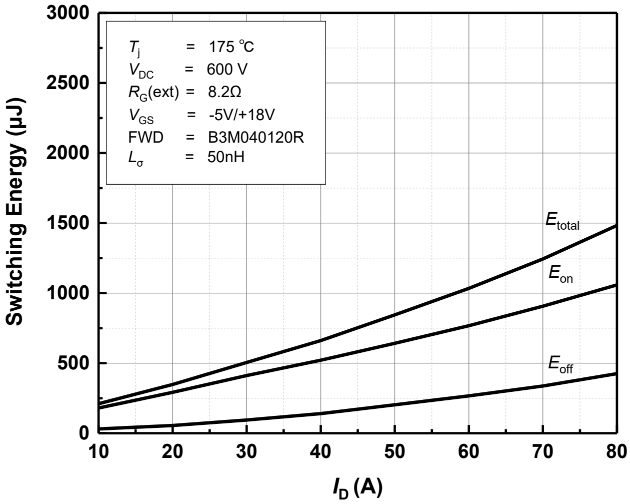
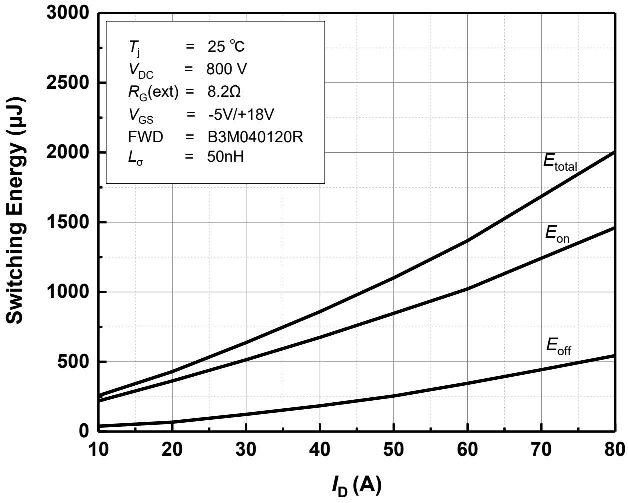


Figure 17 Clamped Inductive Switching Energy vs. Drain Current (V_{DC}= 600V) at T_j=25°C

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



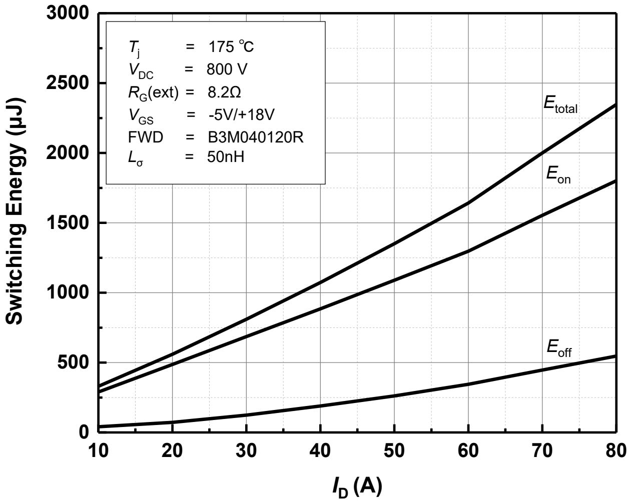


Figure 19 Clamped Inductive Switching Energy vs. Drain Current (V_{DC}= 800V) at T_j=25°C

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

Typical Performance

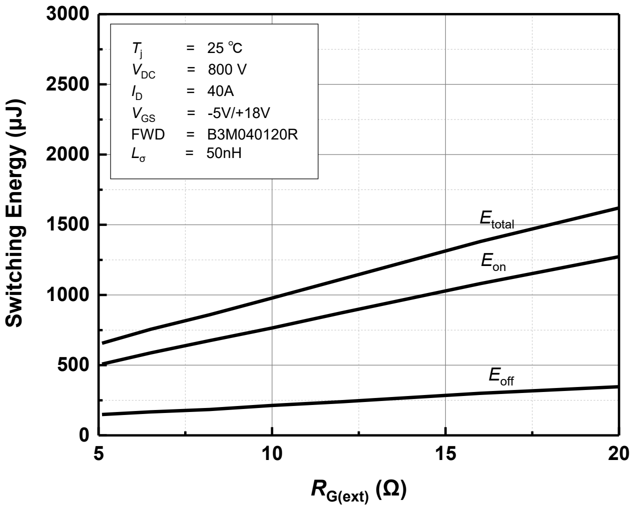


Figure 21 **Clamped Inductive Switching Energy vs. External Gate Resistance at T_j=25°C**

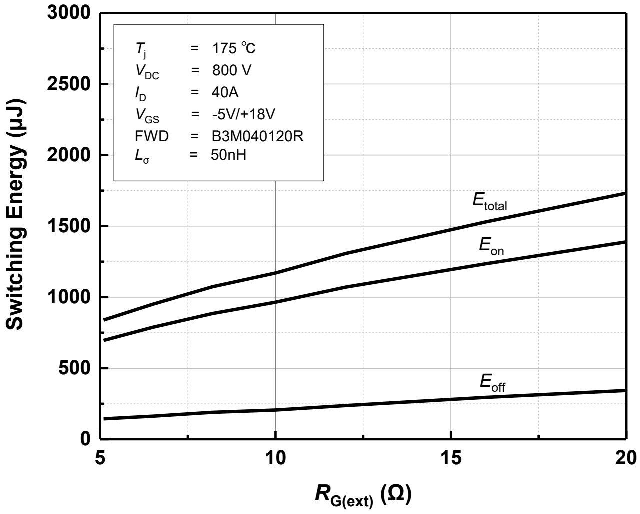


Figure 22 **Clamped Inductive Switching Time vs. External Gate Resistance at T_j=175°C**

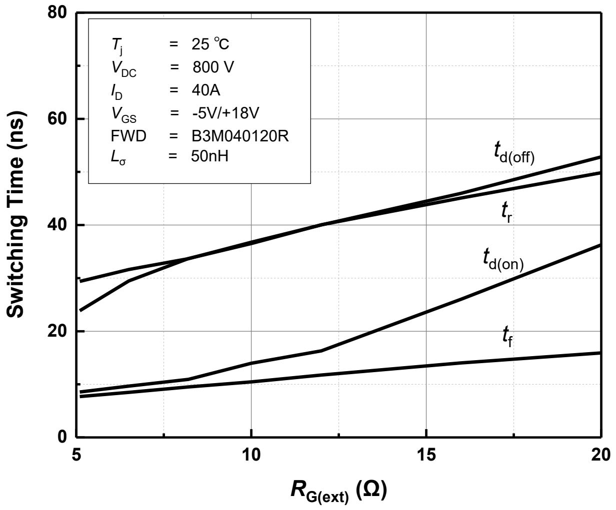


Figure 23 **Clamped Inductive Switching Time vs. External Gate Resistance at T_j=25°C**

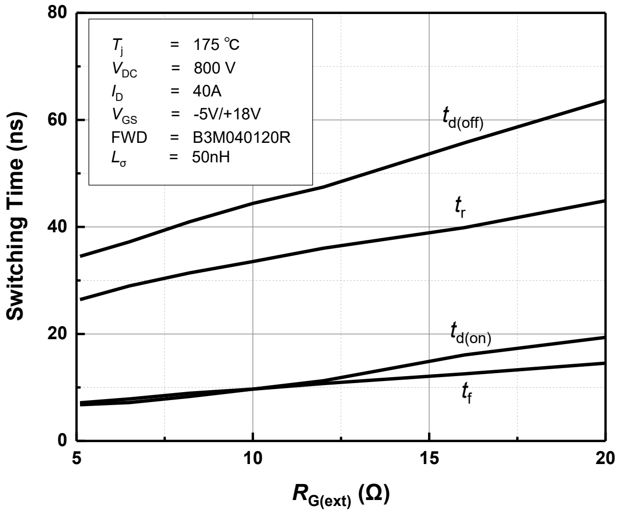


Figure 24 **Clamped Inductive Switching Time vs. External Gate Resistance at T_j=175°C**

Typical Performance

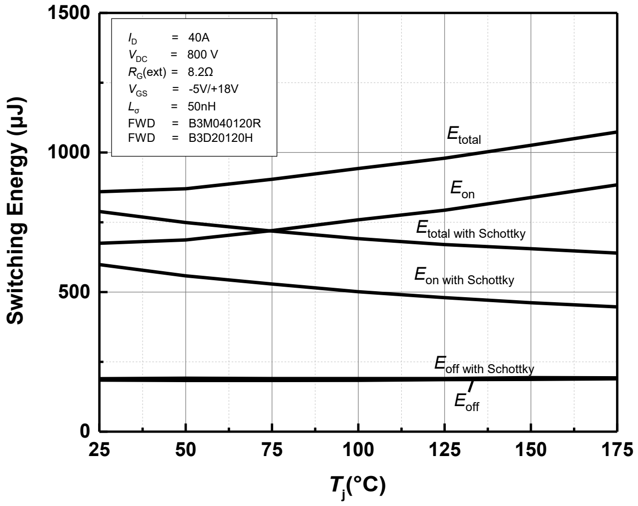


Figure 25 Clamped Inductive Switching Energy vs. Temperature

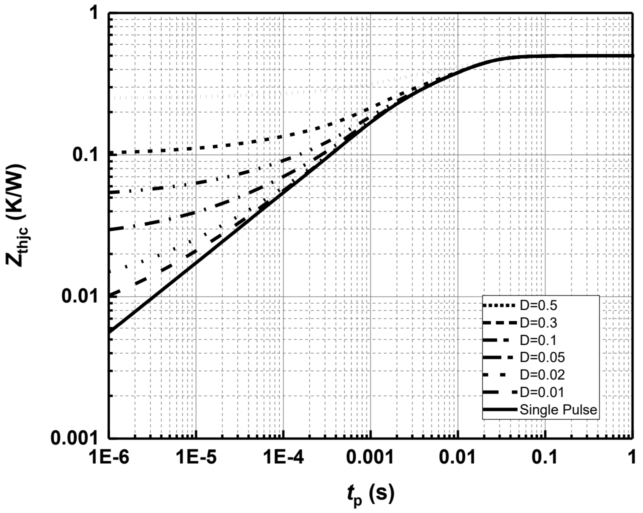


Figure 26 Transient Thermal Impedance (Junction - Case)

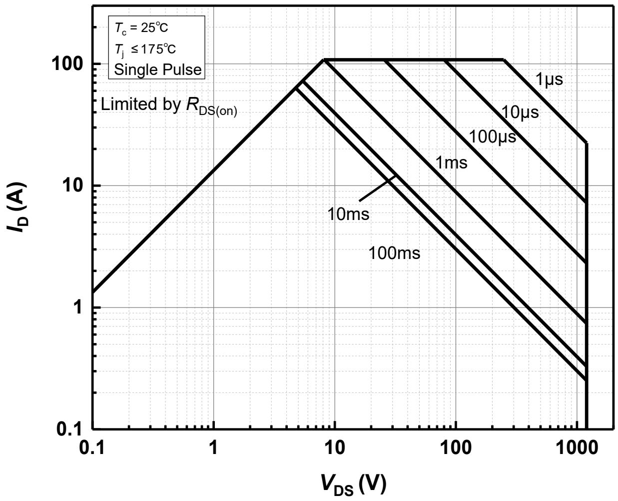
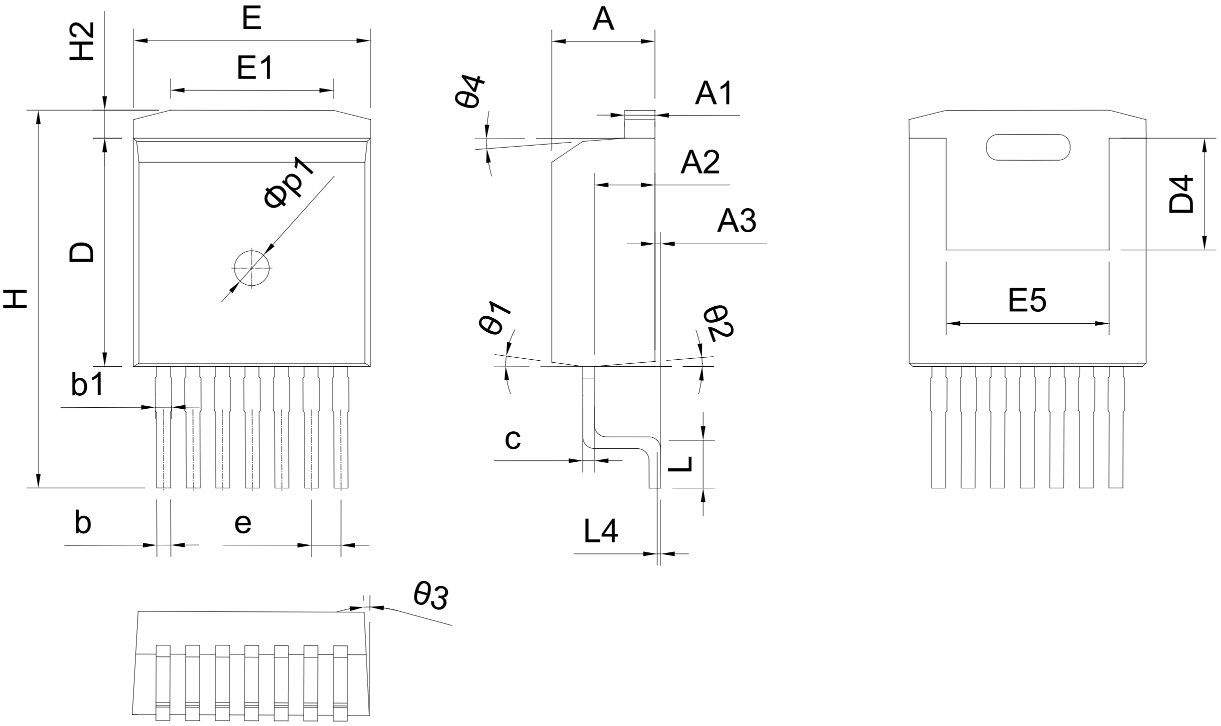


Figure 27 Forward Biased Safe Operating Area

Package Dimensions



SYMBOL	mm		
	MIN	NOM	MAX
A	4.30	4.43	4.56
A1	1.20	1.30	1.40
A2	2.45	2.60	2.75
A3	0.00	0.13	0.25
b	0.50	0.60	0.70
b1	0.60	0.70	0.90
c	0.45	0.50	0.60
D	8.93	9.08	9.23
D4	4.65	4.80	4.95
E	10.08	10.18	10.28
E1	6.50	7.00	7.50
E5	6.82	7.22	7.62
e	1.27 BSC		
H	15.00	15.50	16.00
H2	0.98	1.20	1.42
L	1.90	2.20	2.50
L4	0.25 BSC		
φ p1	1.40	1.50	1.60
θ1	3°	5°	7°
θ2	3°	5°	7°
θ3	3°	5°	7°
θ4	3°	5°	7°

Revision History

Document Version	Date of Release	Description of Changes
Rev. 0.0	2025-05-28	Draft datasheet created.

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Information

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

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