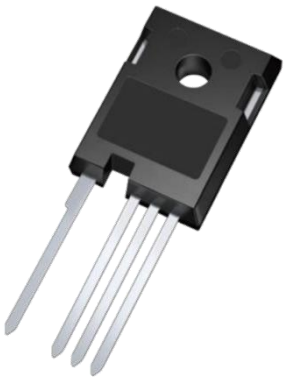


B1M080120HK

1200V ▲ 80mΩ ▲ 44A ▲ SIC MOSFET

SILICON CARBIDE SiC MOSFET ▲ THT type
N-channel enhancement mode
Low on-resistance and capacitance
TO-247-4L package with Kelvin Source connection
Avalanche ruggedness
Elimination of voltage drops over the source inductance

SPECIFICATION

Item (T_C = 25°C, unless otherwise noted)		Characteristics
Operating Temperature Range	T_J	-55°C to +150°C
Storage Temperature Range	T_S	-55°C to +150°C
Drain-Source Voltage	$V_{DS\ MAX}$	1200V
Continuous Drain Current	I_D	44A
Drain-Source On-State Resistance Note 1	$R_{DS(ON)TYP}$	80mΩ
Reverse Transfer Capacitance Note 2	C_{RSS}	15pF
Power Dissipation	P_D	241W

Notes

1: V_{GS} = 20V, I_D = 20A

2: V_{DS} = 800V, V_{GS} = 0V, f = 1MHz, V_{AC} = 25mV

APPLICATIONS

EV Charging	Industrial Inverters	Motors & Drives	Power Factor Correction	Renewable Energy	SMPS	UPS

PIN DESCRIPTION

Circuit Diagram	Outline ▪ Front View	Pin No.	Symbol	Description
		1	D	Drain
		2	S	Source
		3	KS	Kelvin Source
		4	G	Gate

ABSOLUT MAXIMUM RATINGS ▲ T_C = 25°C, unless otherwise noted

Item	Condition	Symbol		Unit
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_{DS} = 100μA	$V_{DS\ MAX}$	1200	V
Continuous Drain Current	V_{GS} = 20V, T_C = 25°C	I_D	44	A
Continuous Drain Current	V_{GS} = 20V, T_C = 100°C	I_D	27	A
Pulse Drain Current	Pulse with t_p limited by $T_{J\ MAX}$	$I_{D,\ pulse}$	80	A
Power Dissipation	T_C = 25°C	P_D	241	W
Gate Source Voltage		$V_{GS,\ MAX}$	-10/+25	V
Recommended Gate Source Voltage		$V_{GS,\ op}$	-5/+20	V
Operating Junction Temperature		T_J	-55 to +150	°C
Storage Temperature Range		T_{STG}	-55 to +150	°C

ELECTRICAL CHARACTERISTICS ▲ T_J = 25°C, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	V_{GS} = 0V, I_D = 100μA	$V_{(BR)DSS}$	1200			V
Gate-Source Threshold Voltage	V_{GS} = V_{DS}, I_D = 5mA	$V_{GS(th)}$		3		V
Gate-Source Threshold Voltage	V_{GS} = V_{DS}, I_{DS} = 5mA, T_J = 150°C	$V_{GS(th)}$		2.3		V
Zero Gate Voltage Drain Current	V_{DS} = 1200V, V_{GS} = 0V	I_{DSS}		0.2	45	μA
Zero Gate Voltage Drain Current	V_{DS} = 1200V, V_{GS} = 0V, T_J = 150°C	I_{DSS}		1	200	μA
Gate-Source Leakage Current	V_{GS} = 20V, V_{DS} = 0V	I_{GSS}			250	nA
Drain-Source On-State Resistance	V_{GS} = 20V, I_D = 20A	$R_{DS(ON)}$		80		mΩ
Drain-Source On-State Resistance	V_{GS} = 20V, I_D = 20A, T_J = 150°C	$R_{DS(ON)}$		103		mΩ

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Dynamic Characteristics						
Input Capacitance	V_{DS} = 800V, V_{GS} = 0V, f = 1MHz, V_{AC} = 25mV	C_{ISS}		2128		pF
Output Capacitance	V_{DS} = 800V, V_{GS} = 0V, f = 1MHz, V_{AC} = 25mV	C_{OSS}		104		pF
Reverse Transfer Capacitance	V_{DS} = 800V, V_{GS} = 0V, f = 1MHz, V_{AC} = 25mV	C_{RSS}		15		pF
Internal Gate Resistance	f = 1MHz, V_{AC} = 25mV	$R_{G(INT.)}$		1.48		Ω
Turn-On Delay Time	V_{DS} = 800V, V_{GS} = -5/+20V, I_{DS} = 20A, $R_{G(ext)}$ = 2.2Ω, Inductive Load	$t_{D(ON)}$		15		ns
Rise Time	V_{DS} = 800V, V_{GS} = -5/+20V, I_{DS} = 20A, $R_{G(ext)}$ = 2.2Ω, Inductive Load	t_R		26		ns
Turn-Off Delay Time	V_{DS} = 800V, V_{GS} = -5/+20V, I_{DS} = 20A, $R_{G(ext)}$ = 2.2Ω, Inductive Load	$t_{D(OFF)}$		42		ns
Fall Time	V_{DS} = 800V, V_{GS} = -5/+20V, I_{DS} = 20A, $R_{G(ext)}$ = 2.2Ω, Inductive Load	t_F		15		ns
Turn-on Switching Energy	V_{DS} = 800V, V_{GS} = -5/+20V, I_{DS} = 20A, $R_{G(ext)}$ = 2.2Ω, Inductive Load	E_{ON}		163		μJ
Turn-off Switching Energy	V_{DS} = 800V, V_{GS} = -5/+20V, I_{DS} = 20A, $R_{G(ext)}$ = 2.2Ω, Inductive Load	E_{OFF}		77		μJ

BUILT-IN SiC DIODE CHARACTERISTICS ▲ T_J = 25°C, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Source-Drain Diode						
Inverse Diode Forward Voltage	V_{GS} = -5V, I_{SD} = 10A	V_{SD}		5		V
Reverse Recovery Time	V_{GS} = -5V, I_{SD} = 20A, V_{DS} = 800V, di/dt = 2100A/µs	t_{RR}		27		ns
Reverse Recovery Charge	V_{GS} = -5V, I_{SD} = 20A, V_{DS} = 800V, di/dt = 2100A/µs	Q_{RR}		433		nC
Peak Reverse Recovery Current	V_{GS} = -5V, I_{SD} = 20A, V_{DS} = 800V, di/dt = 2100A/µs	I_{RRM}		25		A

GATE CHARGE CHARACTERISTICS ▲ T_J = 25°C, unless otherwise noted

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

THERMAL RESISTANCE PERFORMANCE

Item	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction to Case	$R_{\theta,JC}$		0.518		K/W

REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 1 ▪ Forward Output Characteristics I_{DS} vs. V_{DS}, T_C = 25°C

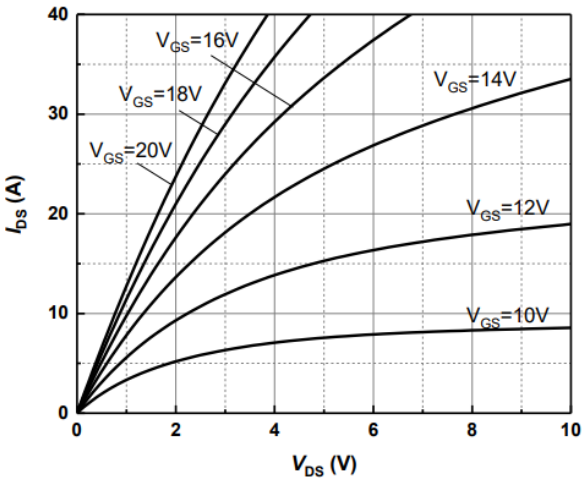


Fig. 2 ▪ Forward Output Characteristics I_{DS} vs. V_{DS}, T_C = 150°C

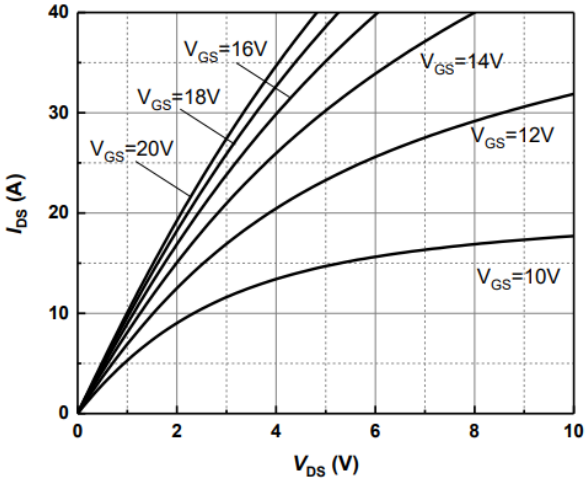


Fig. 3 ▪ Transfer Characteristics for various Temperature T_C

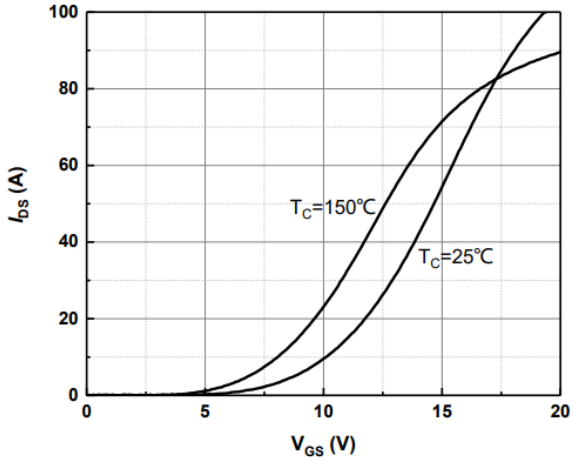


Fig. 4 ▪ Threshold Voltage for various Temperature T_C

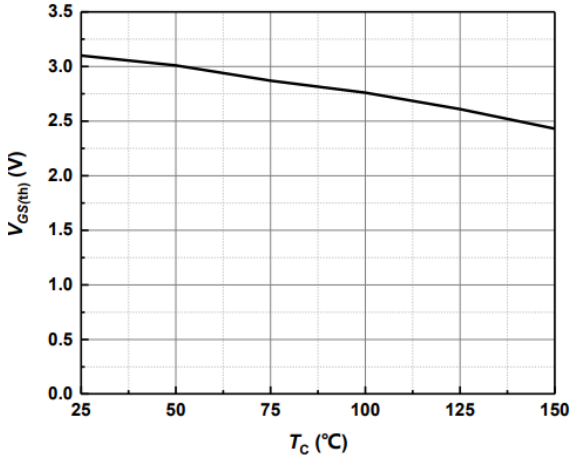


Fig. 5 ▪ Normalized On-Resistance R_{ON} for various Temperature T_C

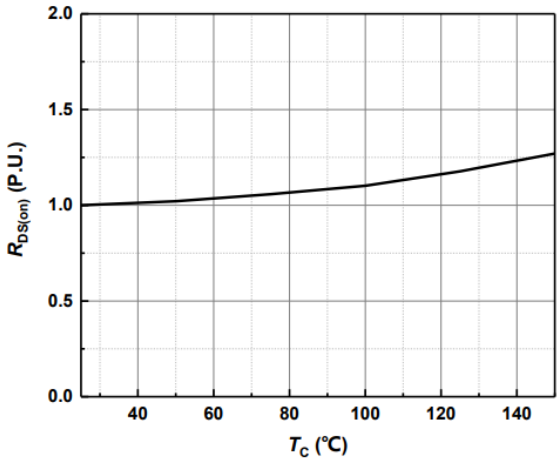
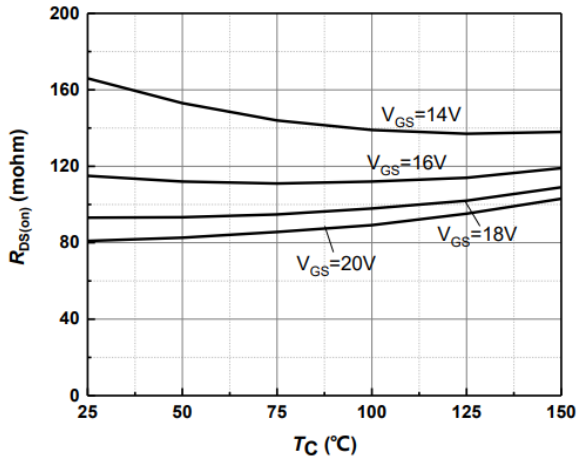


Fig. 6 ▪ On-Resistance R_{ON} vs. Case Temperature T_C for various Gate Voltage V_{GS}



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 7 ▪ On-Resistance R_{ON} vs. Drain Current I_{DS} for various Temperature T_C

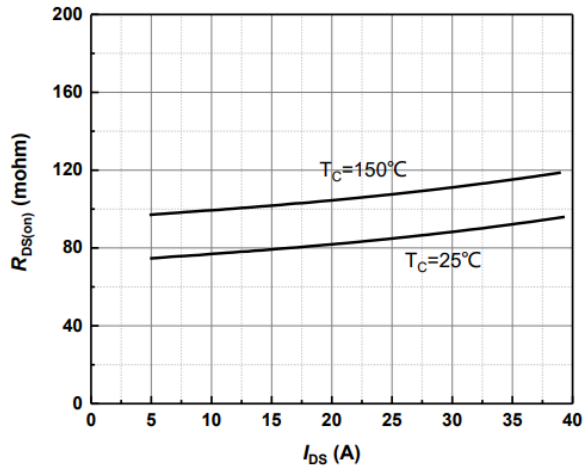


Fig. 8 ▪ Capacitances vs. Drain to Source Voltage V_{DS} (0 to 1000V)

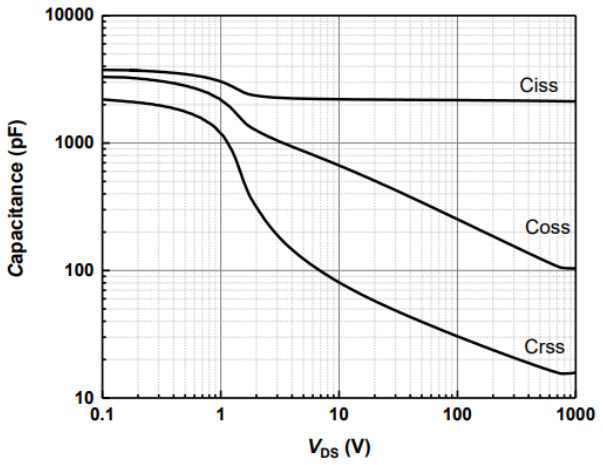


Fig. 9 ▪ Body Diode Characteristics at T_C = 25°C

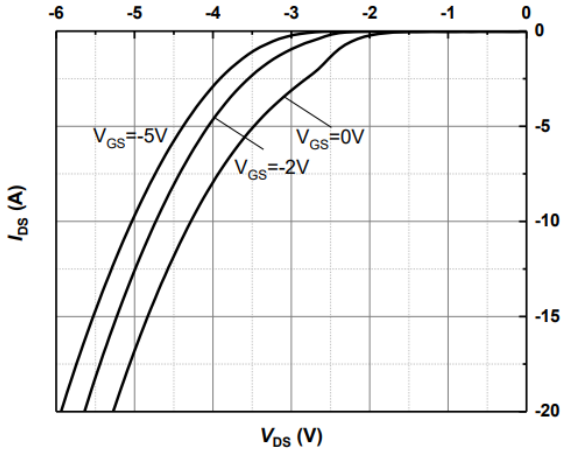


Fig. 10 ▪ Body Diode Characteristics at T_C = 150°C

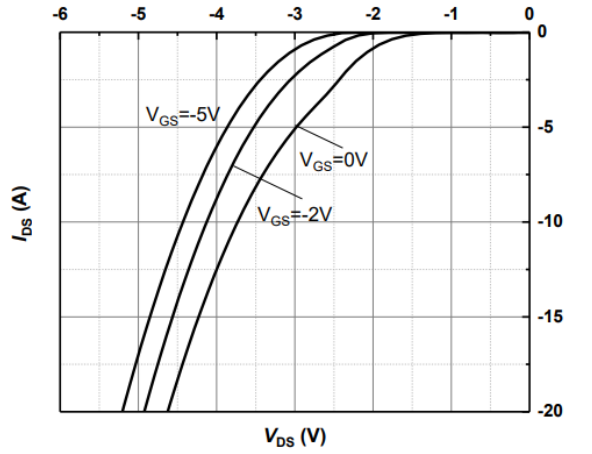


Fig. 11 ▪ 3rd Quadrant Characteristics at T_C = 25°C

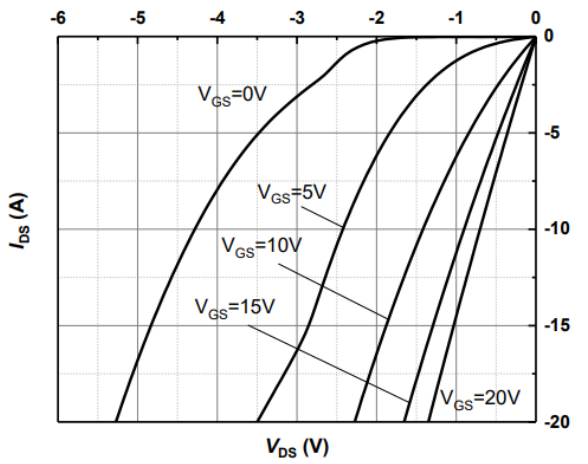
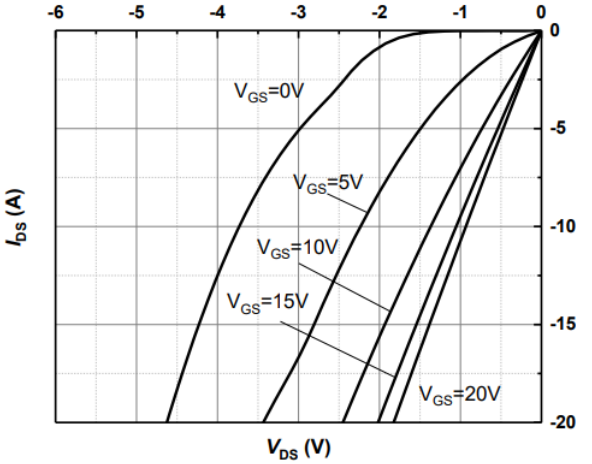


Fig. 12 ▪ 3rd Quadrant Characteristics at T_C = 150°C



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 13 ▪ Output Capacitor Stored Energy

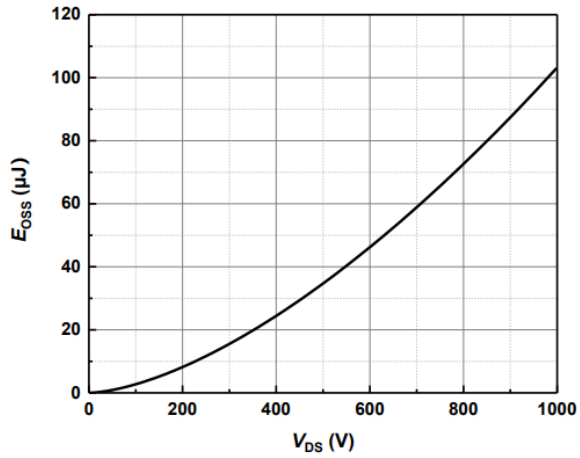


Fig. 14 ▪ Maximum Power Dissipation P_D Derating vs. Case Temperature T_C

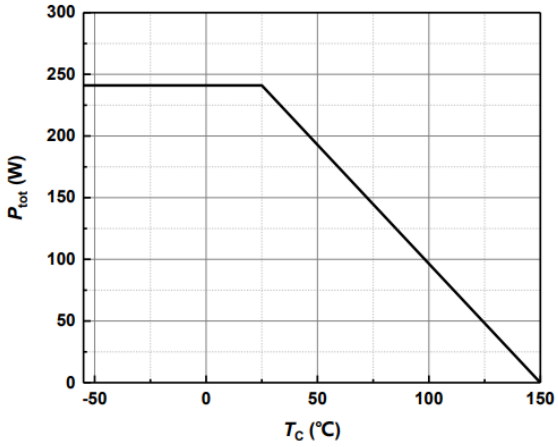


Fig. 15 ▪ Continuous Drain Current Derating I_{DS} vs. Case Temperature T_C

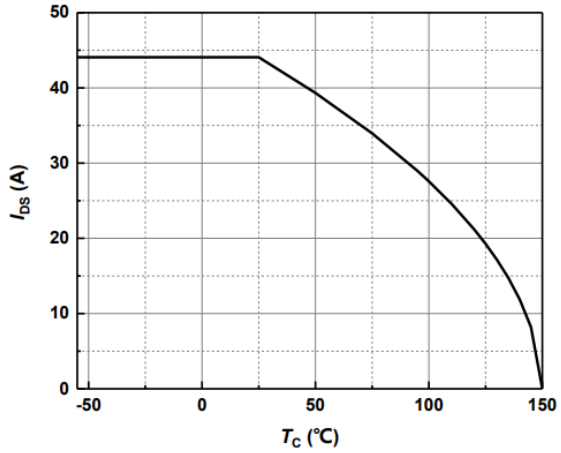


Fig. 16 ▪ Gate Charge Characteristics

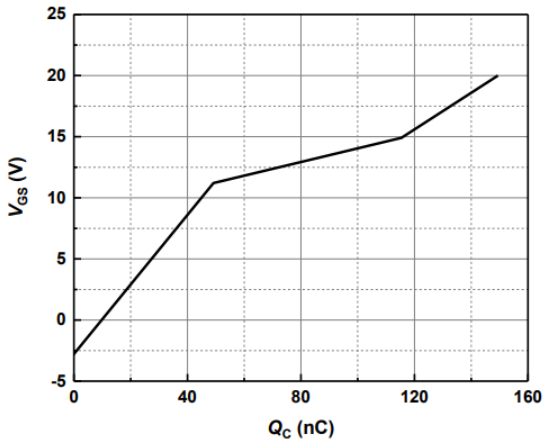


Fig. 17 ▪ Transient Thermal Impedance (Junction – Case)

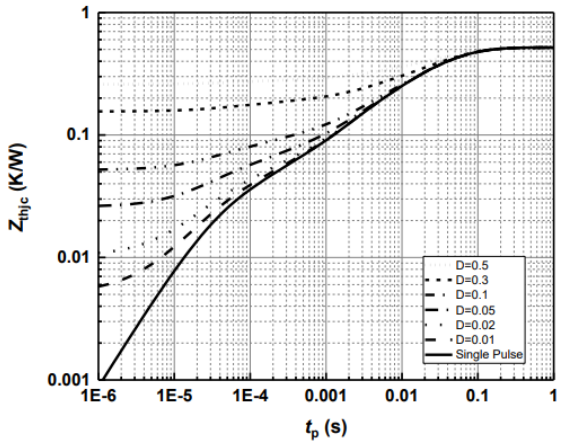
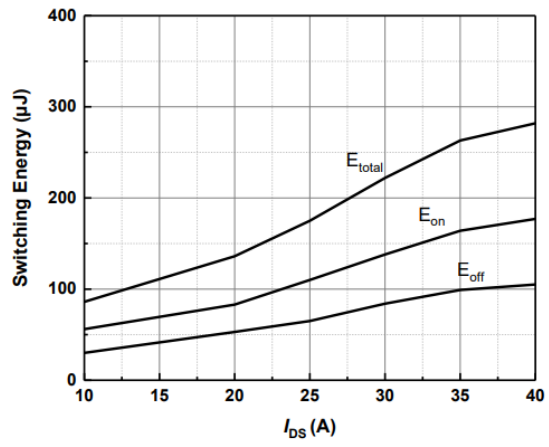


Fig. 18 ▪ Clamped Inductive Switching Energy vs. Drain Current (V_{DS} = 600V)



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 19 ▪ Clamped Inductive Switching Energy vs. Drain Current (V_{DS} = 800V)

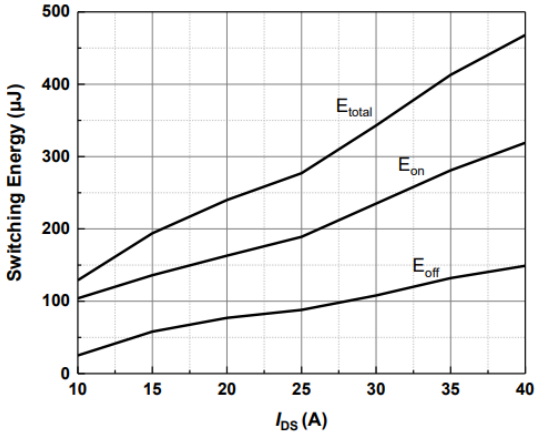


Fig. 20 ▪ Clamped Inductive Switching Energy vs. External Gate Resistor

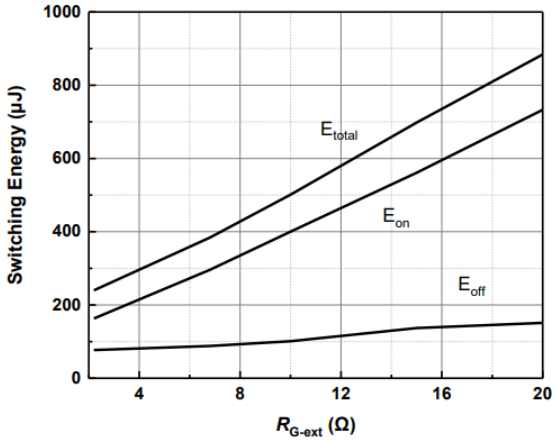


Fig. 21 ▪ Clamped Inductive Switching Time vs. External Gate Resistor

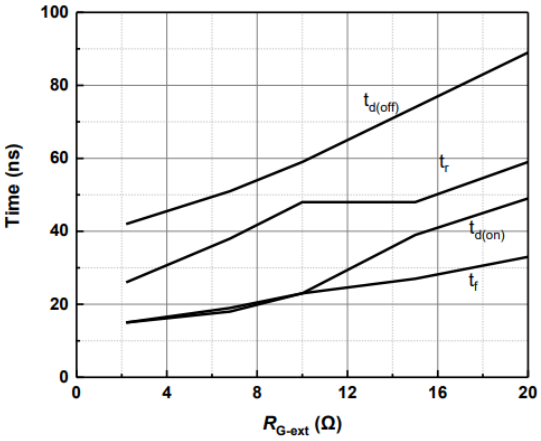
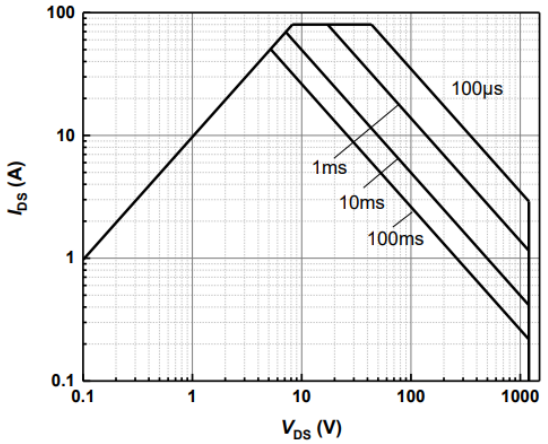
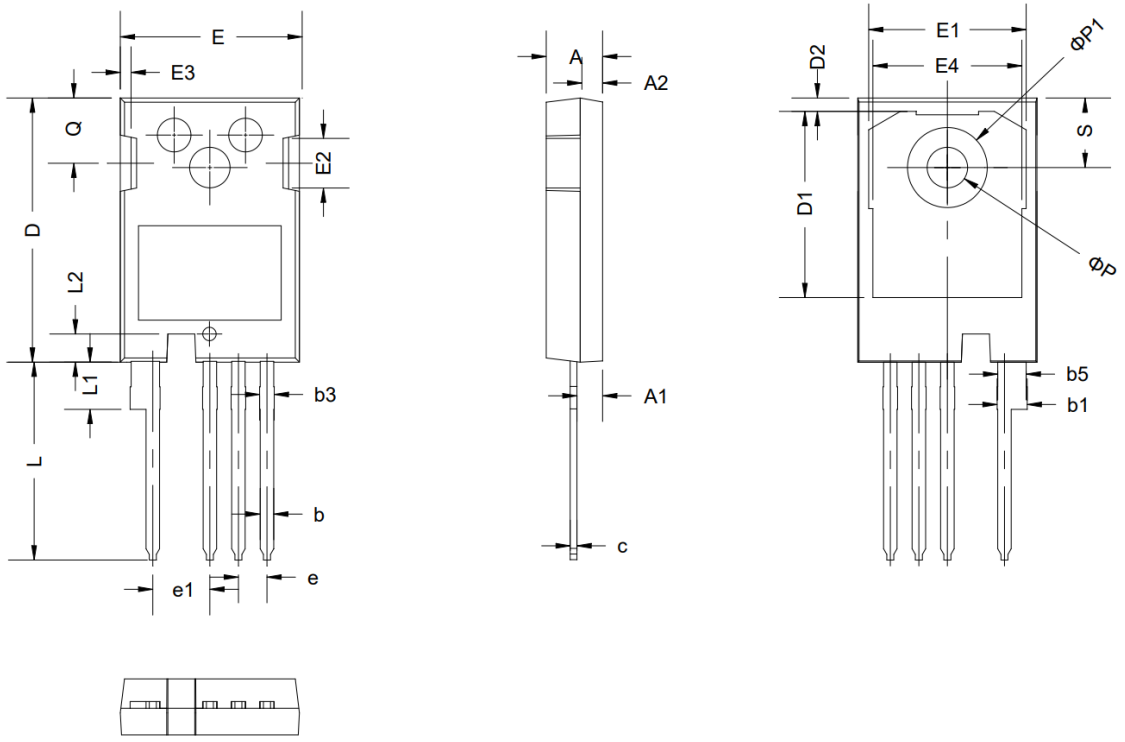


Fig. 22 ▪ Safe Operationg Area



PACKAGE OUTLINE



Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (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

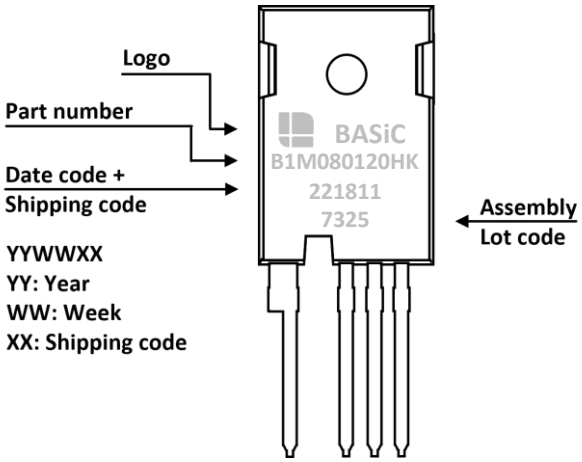
Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e		2.54 BSC	
e1		5.08 BSC	
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ØP	3.51	3.61	3.65
ØP1		7.19 REF	
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

TO-247-4L package ▲ Epoxy meets UL94-V0

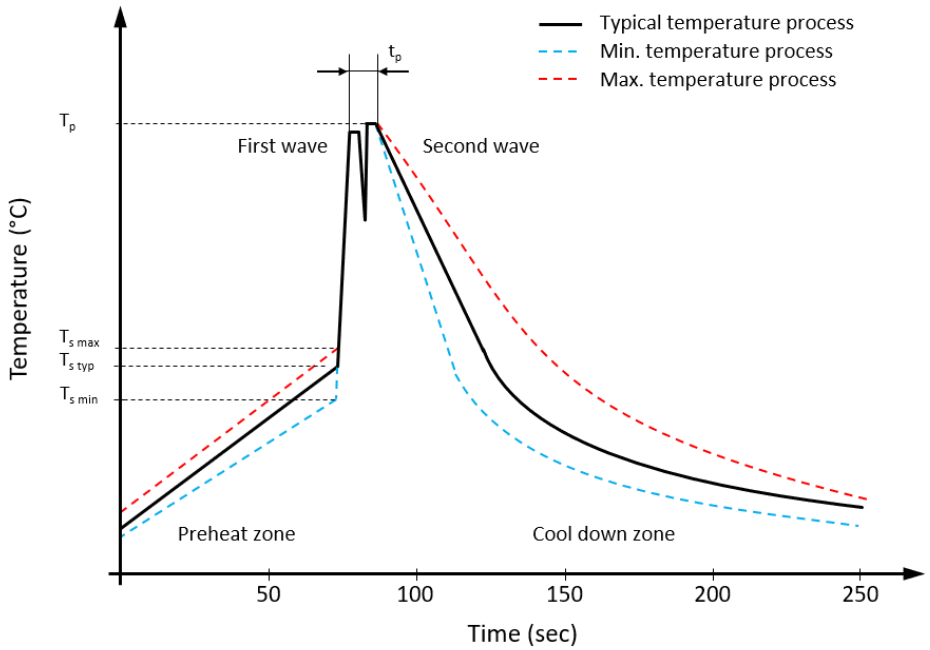
ORDERING INFORMATION

Part Number	Package	Packing	Tube Qty.	Inner Box Qty.	Outer Box Qty.
B1M080120HK	TO-247-4L	Tube	30pcs	300pcs	1,800pcs

PART MARKING



RECOMMENDED WAVE SOLDERING PROFILE ▲ THT PACKAGE



Classification wave soldering profile ▲ Refer to EN 61760-1: 2006

Profile Features		Value ▲ Sn-Pb Assembly	Value ▲ Pb-free Assembly
Preheat temperature min.	$T_{s\,min}$	100 °C	100 °C
Preheat temperature typical	$T_{s\,typ}$	120 °C	120 °C
Preheat temperature max.	$T_{s\,max}$	130 °C	130 °C
Preheat time t_s from $T_{s\,min}$ to $T_{s\,max}$	t_s	70 seconds	70 seconds
Peak temperature	T_p	235 °C to 260 °C	245 °C to 260 °C
Time of actual peak temperature	t_p	Max. 10 seconds Max. 5 second each wave	Max. 10 seconds Max. 5 second each wave
Ramp-down date min.		~ 2 °C/second	~ 2 °C/second
Ramp-down rate typical		~ 3.5 °C/second	~ 3.5 °C/second
Ramp-down rate max.		~ 5 °C/second	~ 5 °C/second
Time 25°C to 25°C		4 minutes	4 minutes

REVISION TABLE

Revision	Date	Status	Notes
001	30/09/2022	Initial release	Initial publication

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It is subject to the user's duty of care to design and validate his products in such a way that appropriate measures are taken, such as protective circuits or redundant systems to ensure the safety standards required in the application.

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