

B2M011120HK

1200V ▲ 11mΩ ▲ 115A ▲ 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



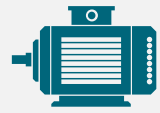




Item ($T_c = 25^\circ\text{C}$, unless otherwise noted)		Characteristics
Operating Temperature Range	T_J	-55°C to $+150^\circ\text{C}$
Storage Temperature Range	T_S	-55°C to $+150^\circ\text{C}$
Drain-Source Voltage	$V_{DS\text{ MAX}}$	1200V
Continuous Drain Current	I_D	115A
Drain-Source On-State Resistance ^{Note 1}	$R_{DS(ON)TYP}$	11mΩ
Reverse Transfer Capacitance ^{Note 2}	C_{RSS}	6pF
Power Dissipation	P_D	290W

Notes

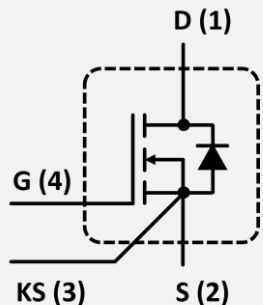
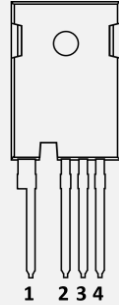
1: $V_{GS} = 18\text{V}$, $I_D = 68\text{A}$

2: $V_{DS} = 800\text{V}$, $V_{GS} = 0\text{V}$, $f = 1\text{kHz}$, $V_{AC} = 25\text{mV}$

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 2 3 4	D S KS G	Drain Source Kelvin Source Gate

ABSOLUT MAXIMUM RATINGS ▲ $T_C = 25^\circ\text{C}$, unless otherwise noted

Item	Condition	Symbol		Unit
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_{DS} = 100\mu A$	$V_{DS\ MAX}$	1200	V
Continuous Drain Current	$V_{GS} = 18V, T_C = 25^\circ\text{C}$	I_D	115	A
Continuous Drain Current	$V_{GS} = 18V, T_C = 100^\circ\text{C}$	I_D	72	A
Pulse Drain Current	Pulse with t_p limited by $T_{J\ MAX}$	$I_{D, pulse}$	305	A
Power Dissipation	$T_C = 25^\circ\text{C}$	P_D	290	W
Gate Source Voltage		$V_{GS, MAX}$	-2/+21	V
Recommended Gate Source Voltage		$V_{GS, op}$	0/+18	V
Operating Junction Temperature		T_J	-55 to +150	$^\circ\text{C}$
Storage Temperature Range		T_{STG}	-55 to +150	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ▲ $T_J = 25^\circ\text{C}$, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 30mA$	$V_{(BR)DSS}$	1200			V
Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_D = 36.4mA$	$V_{GS(th)}$		3.7		V
Gate-Source Threshold Voltage	$V_{GS} = V_{DS}, I_{DS} = 36.4mA, T_J = 150^\circ\text{C}$	$V_{GS(th)}$		3		V
Zero Gate Voltage Drain Current	$V_{DS} = 1200V, V_{GS} = 0V$	I_{DSS}		1	80	μA
Zero Gate Voltage Drain Current	$V_{DS} = 1200V, V_{GS} = 0V, T_J = 150^\circ\text{C}$	I_{DSS}		10		μA
Gate-Source Leakage Current	$V_{GS} = 18V, V_{DS} = 0V$	I_{GSS}			250	nA
Drain-Source On-State Resistance	$V_{GS} = 18V, I_D = 68A$	$R_{DS(ON)}$		11		m Ω
Drain-Source On-State Resistance	$V_{GS} = 18V, I_D = 68A, T_J = 150^\circ\text{C}$	$R_{DS(ON)}$		24		m Ω

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Dynamic Characteristics						
Input Capacitance	$V_{DS} = 800V, V_{GS} = 0V, f = 1kHz, V_{AC} = 25mV$	C_{ISS}		7670		pF
Output Capacitance	$V_{DS} = 800V, V_{GS} = 0V, f = 1kHz, V_{AC} = 25mV$	C_{OSS}		203		pF
Reverse Transfer Capacitance	$V_{DS} = 800V, V_{GS} = 0V, f = 1kHz, V_{AC} = 25mV$	C_{RSS}		6		pF
Internal Gate Resistance	$f = 1MHz, V_{AC} = 25mV$	$R_{G(INT.)}$		4.5		Ω
Turn-On Delay Time	$V_{DS} = 800V, V_{GS} = 0/+18V, I_D = 68A, R_{G(ext)} = 0\Omega, \text{Inductive Load}$	$t_{D(ON)}$		25		ns
Rise Time	$V_{DS} = 800V, V_{GS} = 0/+18V, I_D = 68A, R_{G(ext)} = 0\Omega, \text{Inductive Load}$	t_R		40		ns
Turn-Off Delay Time	$V_{DS} = 800V, V_{GS} = 0/+18V, I_D = 68A, R_{G(ext)} = 0\Omega, \text{Inductive Load}$	$t_{D(OFF)}$		110		ns
Fall Time	$V_{DS} = 800V, V_{GS} = 0/+18V, I_D = 68A, R_{G(ext)} = 0\Omega, \text{Inductive Load}$	t_F		16		ns
Turn-on Switching Energy	$V_{DS} = 800V, V_{GS} = 0/+18V, I_D = 68A, R_{G(ext)} = 0\Omega, \text{Inductive Load}$	E_{ON}		1206		μJ
Turn-off Switching Energy	$V_{DS} = 800V, V_{GS} = 0/+18V, I_D = 68A, R_{G(ext)} = 0\Omega, \text{Inductive Load}$	E_{OFF}		454		μJ

BUILT-IN SiC DIODE CHARACTERISTICS ▲ $T_J = 25^\circ\text{C}$, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Source-Drain Diode						
Inverse Diode Forward Voltage	$V_{GS} = 0\text{V}, I_{SD} = 68\text{A}$	V_{SD}		3.5		V
Reverse Recovery Time	$V_{GS} = 0\text{V}, I_{SD} = 68\text{A}, V_{DS} = 800\text{V}, -di/dt = -4000\text{A}/\mu\text{s}$	t_{RR}		25		ns
Reverse Recovery Charge	$V_{GS} = 0\text{V}, I_{SD} = 68\text{A}, V_{DS} = 800\text{V}, -di/dt = -4000\text{A}/\mu\text{s}$	Q_{RR}		500		nC
Peak Reverse Recovery Current	$V_{GS} = 0\text{V}, I_{SD} = 68\text{A}, V_{DS} = 800\text{V}, -di/dt = -4000\text{A}/\mu\text{s}$	I_{RRM}		43		A

GATE CHARGE CHARACTERISTICS ▲ $T_J = 25^\circ\text{C}$, unless otherwise noted

Item	Condition	Symbol	Min.	Typ.	Max.	Unit
Gate to Source Charge	$V_{DS} = 800\text{V}, V_{GS} = 0/+18\text{V}, I_D = 68\text{A}$	Q_{GS}		56		nC
Gate to Drain Charge	$V_{DS} = 800\text{V}, V_{GS} = 0/+18\text{V}, I_D = 68\text{A}$	Q_{GD}		72		nC
Total Gate Charge	$V_{DS} = 800\text{V}, V_{GS} = 0/+18\text{V}, I_D = 68\text{A}$	Q_G		270		nC

THERMAL RESISTANCE PERFORMANCE

Item	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$		0.43		K/W

REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 1 • Forward Output Characteristics I_{DS} vs. V_{DS} ,
 $T_J = 25^\circ\text{C}$

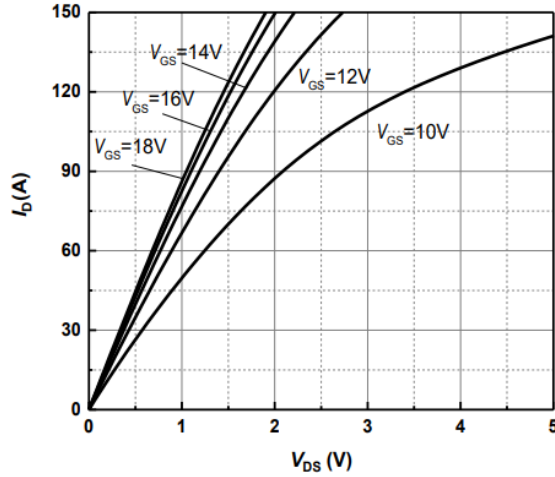


Fig. 2 • Forward Output Characteristics I_{DS} vs. V_{DS} ,
 $T_J = 150^\circ\text{C}$

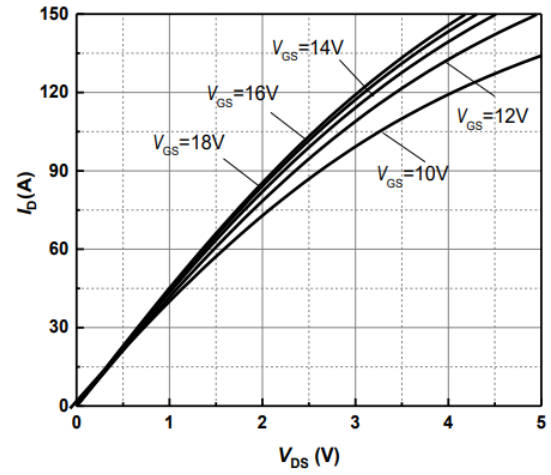


Fig. 3 • Transfer Characteristics for various Temperature T_J

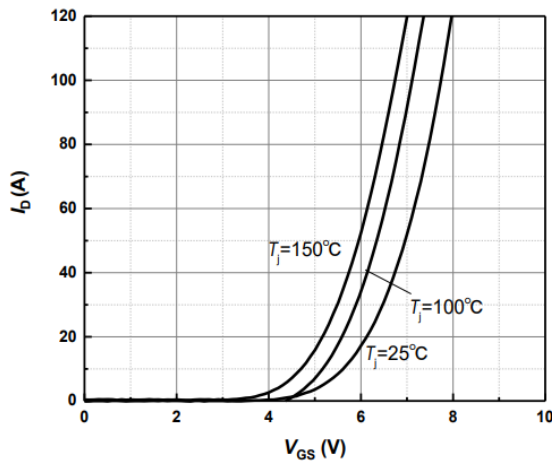


Fig. 4 • Threshold Voltage for various Temperature T_J

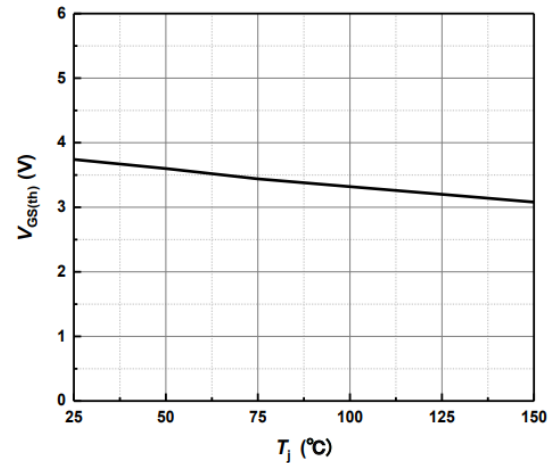


Fig. 5 • Normalized On-Resistance R_{ON} for various
Temperature T_J

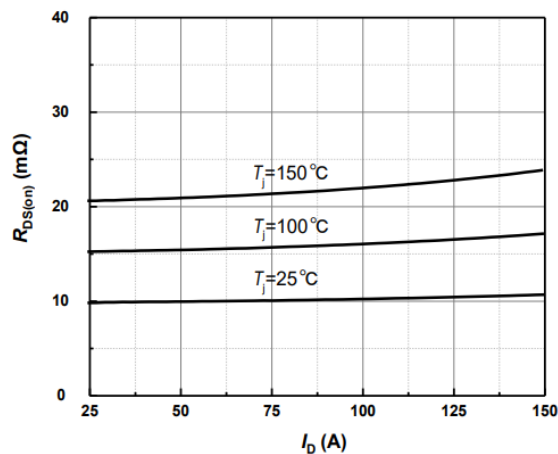
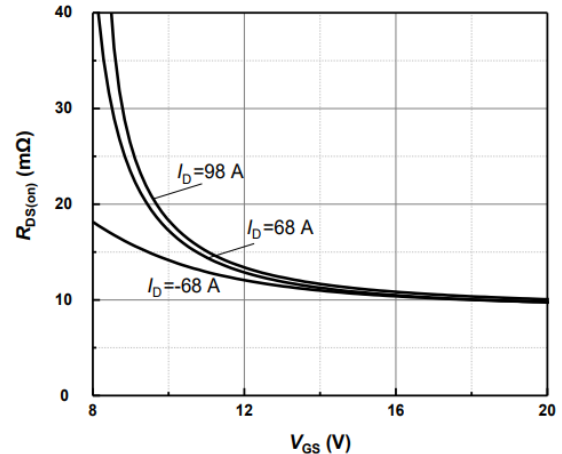


Fig. 6 • On-Resistance R_{ON} vs. Gate-Source Voltage V_{GS}
for various Drain Current I_D



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 7 • Normalized Drain-Source Breakdown Voltage vs. Junction Temperature T_J

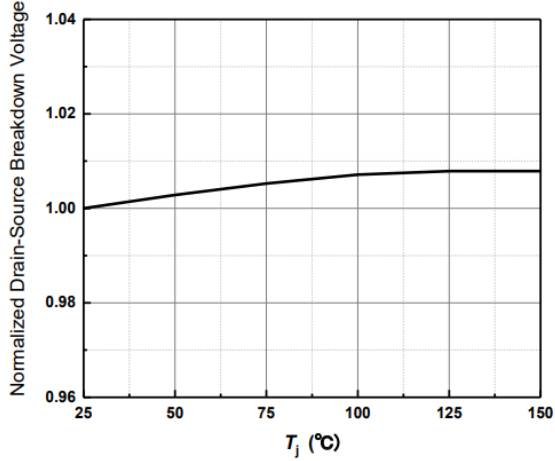


Fig. 8 • Capacitances vs. Drain to Source Voltage V_{DS} (0 to 1000V)

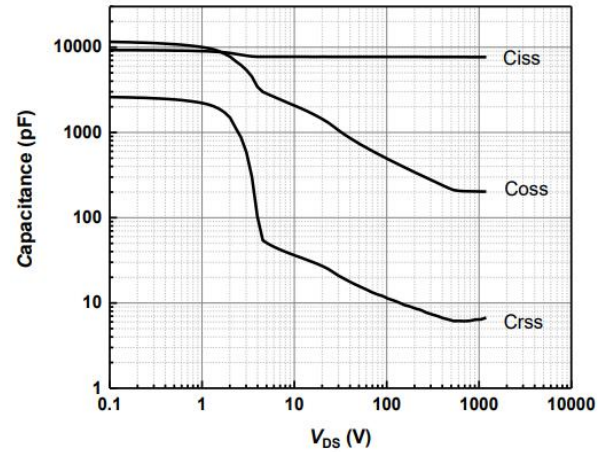


Fig. 9 • 3rd Quadrant Characteristics at $T_J = 25^\circ\text{C}$

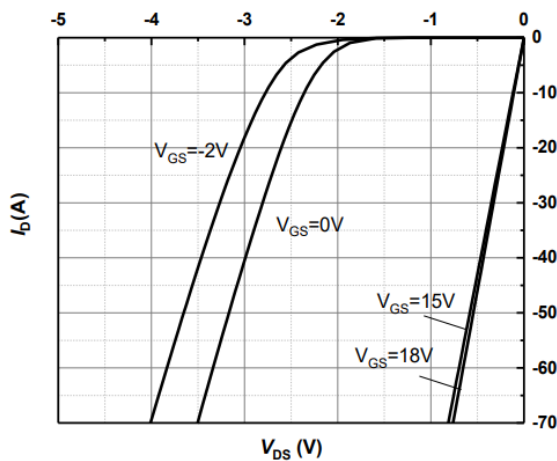


Fig. 10 • 3rd Quadrant Characteristics at $T_J = 150^\circ\text{C}$

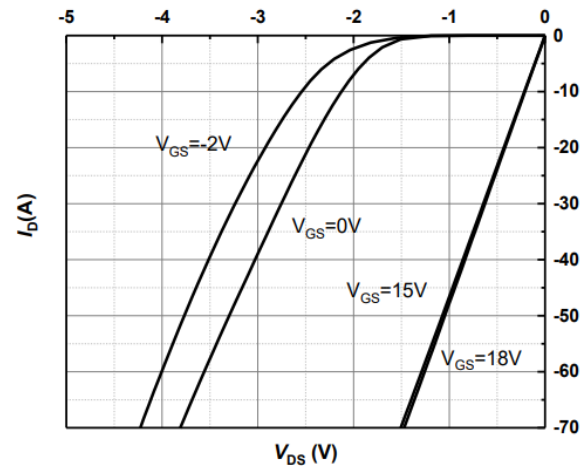


Fig. 11 • Gate Charge Characteristics

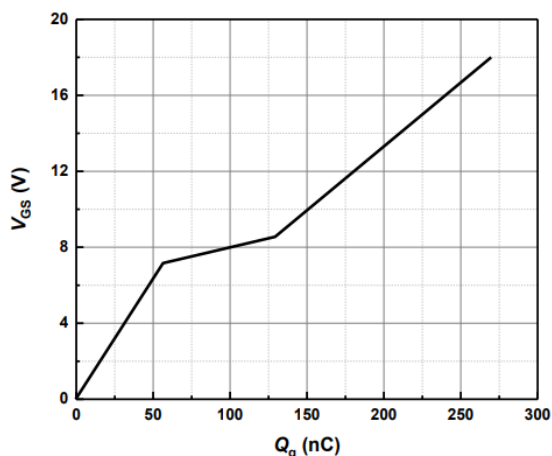
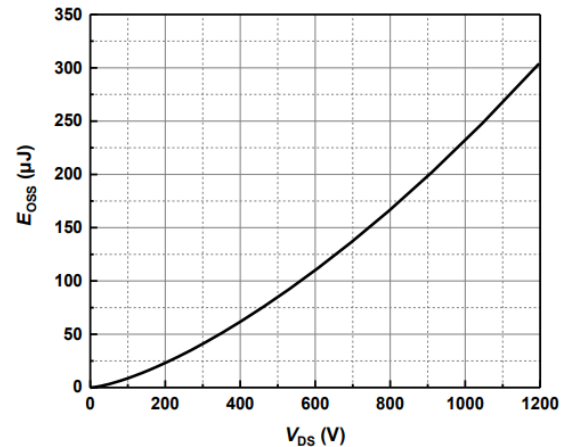


Fig. 12 • C_{oss} Stored Energy E_{oss} vs. Drain-Source Voltage V_{DS}



REFERENCE DATA ▲ TYPICAL DEVICE PERFORMANCE

Fig. 13 • Continuous Drain Current Derating I_D vs. Case Temperature T_c

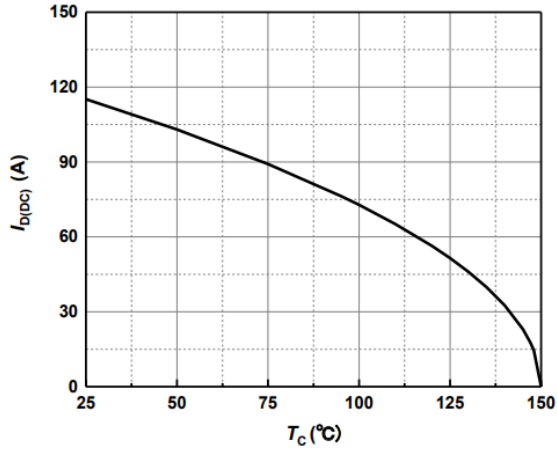


Fig. 14 • Body Diode Forward Voltage V_{SD} vs. Gate-Source Voltage V_{GS} for Various Junction Temperature T_j

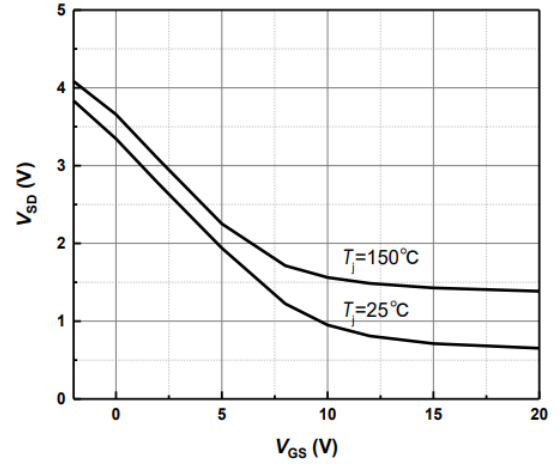


Fig. 15 • Safe Operating Area

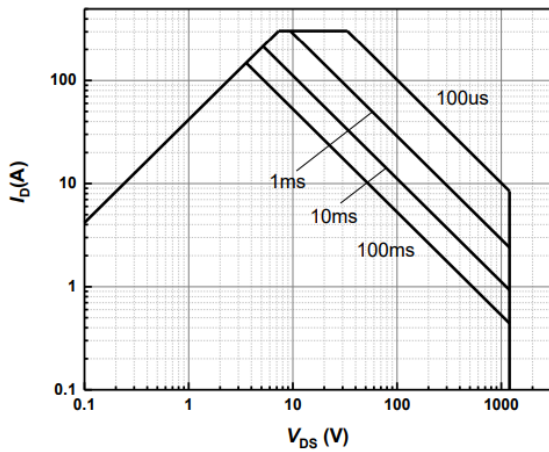
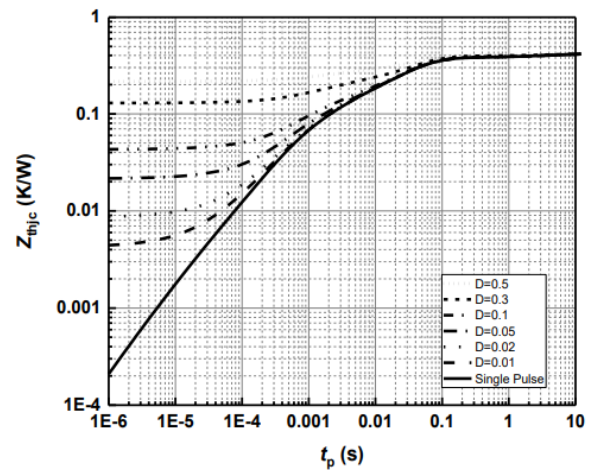
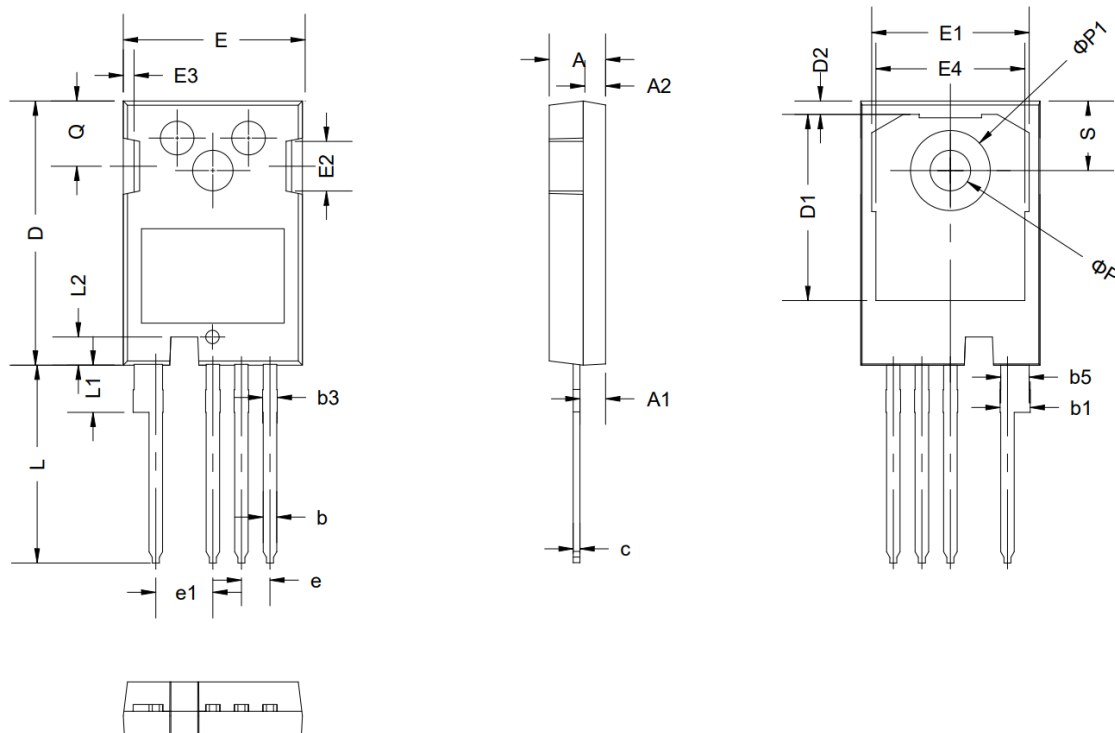


Fig. 16 • Transient Thermal Impedance (Junction – Case)



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

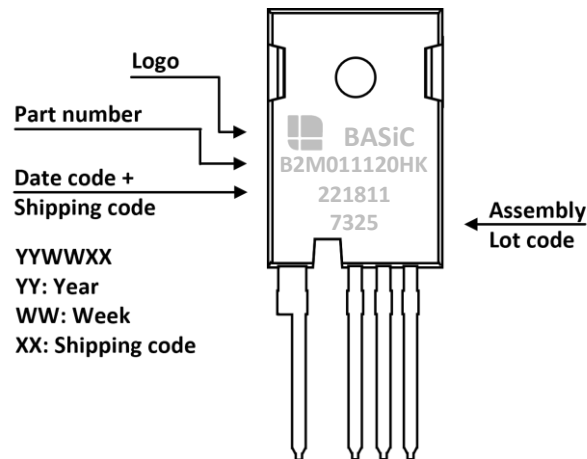
Sym	Millimeters (Min.)	Millimeters (Typ.)	Millimeters (Max.)
E2	3.68	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ØP	3.51	3.61	3.65
ØP1	7.19 REF		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

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

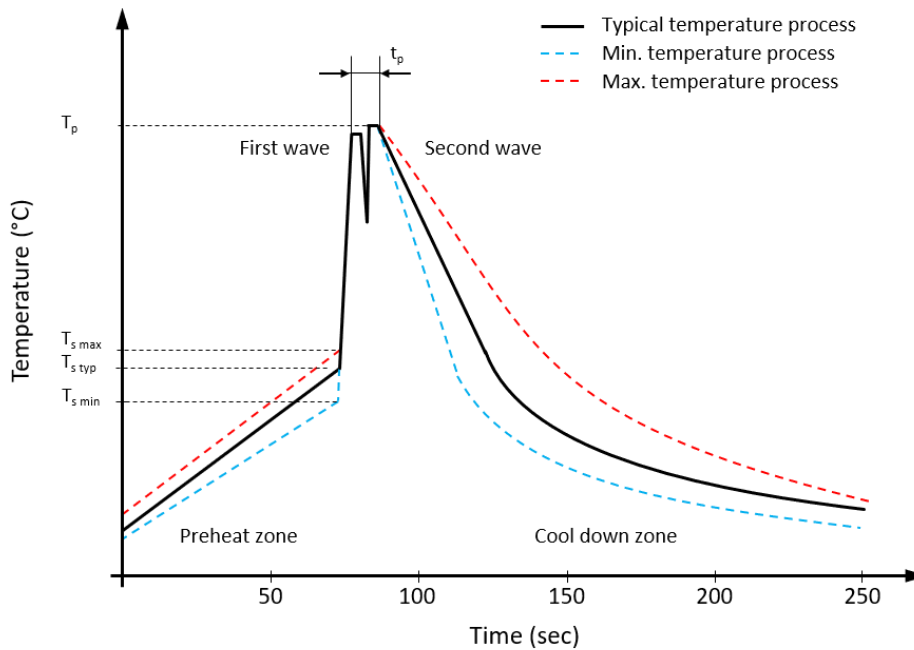
ORDERING INFORMATION

Part Number	Package	Packing	Tube Qty.	Inner Box Qty.	Outer Box Qty.
B2M011120HK	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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