H2M120F140

Silicon Carbide MOSFET
N-CHANNEL ENHANCEMENT MODE

Product Summary

V_{DS}	1200V
$I_{D(@25^{\circ}C)}$	20A*
$R_{DS(on)}$	140mΩ

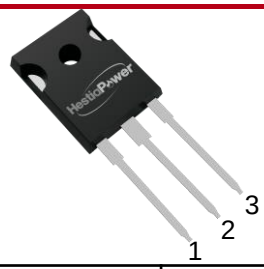
RoHS COMPLIANT

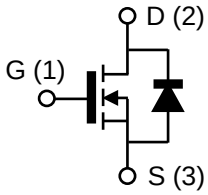
Halogen-Free F Cl Br I

Features

- Low On-Resistance and High Current Density
- Low Capacitance for High Frequency Operation
- Ultra-high Avalanche Ruggedness
- Positive Temperature Coefficient Device
- RoHS Compliant and Halogen Free

Circuit Diagram





Part Number	Package	Marking
H2M120F140	TO-247-3L	H2M120F140

Benefits

- Higher System Efficiency
- Increase Parallel Device Convenience
- Capable of 175˚C High T_j Application
- Allow High Frequency Operation
- Realize Compact and Lightweight Systems

Description

The H2M120F140 1200V, 140mΩ silicon carbide power MOSFET is an N-channel enhancement mode device. Exploiting the outstanding wide bandgap material properties, this device shows high current density and great switching behavior. Thanks for the excellent thermal conductivity and many advantages of SiC, this device significantly improved in thermal capability and temperature independent switching behavior.

Applications

- Switching Mode Power Supply
- DC/DC Converters, UPS, and PFC
- EV Charging Station
- Motor Drives
- Power Inverters
- Solar/Wind Renewable Energy

Absolute Maximum Ratings (T_c = 25˚C unless otherwise specified)

Parameter	Symbol	Test Conditions	Value	Unit
Drain – Source Voltage	$V_{DS, max}$	V_{GS}=0V, I_{DS}=100μA	1200	V
Continuous Drain Current	I_D	V_{GS}=20V, T_C=25°C	20*	A
		V_{GS}=20V, T_C=110°C	15*	
Pulse Drain Current	$I_{D, pulse}$	t_{PW}	46*	
Power Dissipation	P_D	T_C=25°C	128*	W
Recommend Gate Source Voltage	$V_{GS, op}$	Static, recommended DC operating values	-5 to 20	V
Maximum Gate Source Voltage	$V_{GS, max}$	Transient operating limit (AC f > 1Hz, duty cycle < 1%)	-10 to 25	
Junction & Storage Temperature	T_j , T_{stg}		-55 to 175	°C
Soldering Temperature	T_L		260	
Mounting Torque	M_D	M3 or 6-32 screw	1.0	Nm

Thermal Resistance

Parameter	Symbol	Min.	Typ.	Max.	Unit
Thermal Resistance, Junction to Case (with TO-247)	$R_{\theta,JC}$		0.67*		˚C/W

Electrical Characteristics (T_c = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Drain-Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_{DS}=100μA	1200			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{DS}=10V, I_{DS}=20mA	1.5	3*	4.5	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{DS}=1200V, V_{GS}=0V		<1	50	μA
		V_{DS}=1200V, V_{GS}=0V T_j=175°C		10*		
Gate-Source Leakage Current	I_{GSS}	V_{GS}=20V, V_{DS}=0V			250	nA
Drain-Source On-State Resistance	$R_{DS(on)}$	V_{GS}=20V, I_{DS}=15A		140*	180*	mΩ
		V_{GS}=20V, I_{DS}=15A, T_j=175°C		240*		
Transconductance	g_{fs}	V_{DS}=9.8V, I_{DS}=15A		6.5*		S
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=800V f =1MHz, V_{AC}=25mV		1511*		pF
Output Capacitance	C_{oss}			49*		
Reverse Transfer Capacitance	C_{rss}			7*		
Effective Output Capacitance, Energy Related	$C_{o(er)}$	V_{GS}=0V, V_{DS}=0 to 800V		115*		
Effective Output Capacitance, Time Related	$C_{o(tr)}$	I_D=const., V_{GS}=0V, V_{DS}=0 to 800V		83.4*		
Turn On Delay Time	$t_{d(on)}$	V_{DS}=800V, V_{GS}=-5/+20V, I_D=20A, R_L=40Ω, $R_{G(ext)}$= 2.7 Ω		28*		ns
Rise Time	t_r			64*		
Turn Off Delay Time	$t_{d(off)}$			60*		
Fall Time	t_f			26.4*		
C_{oss} Stored Energy	E_{oss}	V_{GS}=0V, V_{DS}=800V f =1MHz, V_{AC}=25mV		19*		μJ
Turn-on Switching Energy	E_{on}	V_{DS}=800V, V_{GS}=-5/+20V, I_D=15A, $R_{G(ext)}$= 2.7 Ω		194*		
Turn-off Switching Energy	E_{off}			33*		
Internal Gate Resistance	$R_{G(int.)}$	f =1MHz, V_{AC}=25mV		1.2*		Ω

Built-in SiC Diode Characteristics (T_c = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Typ.	Unit
Inverse Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{SD}=2.8A	3*	V
Continuous Diode Forward Current	I_S	V_{GS}=0V, T_C=25°C	26*	A
Reverse Recovery Time	t_{rr}	V_{GS}=0V, I_{SD}=9A, V_{DS}=400V, di/dt=300A/μs	50*	ns
Reverse Recovery Charge	Q_{rr}		81*	nC
Peak Reverse Recovery Current	I_{rrm}		3.2*	A

*By estimation

Gate Charge Characteristics (T_c = 25°C unless otherwise specified)

Parameter	Symbol	Test Conditions	Value	Unit
Gate to Source Charge	Q_{GS}	V_{DS}=800V, V_{GS}=-5/+20V, I_D=9A	57*	nC
Gate to Drain Charge	Q_{GD}		23*	
Total Gate Charge	Q_G		131*	
Gate plateau voltage	V_{pl}		9.9*	V

Typical Device Performance

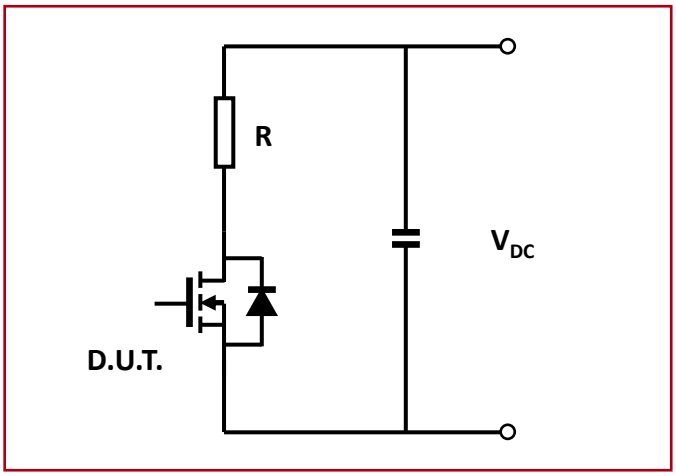


Fig.01 Schematic of Resistive Switching

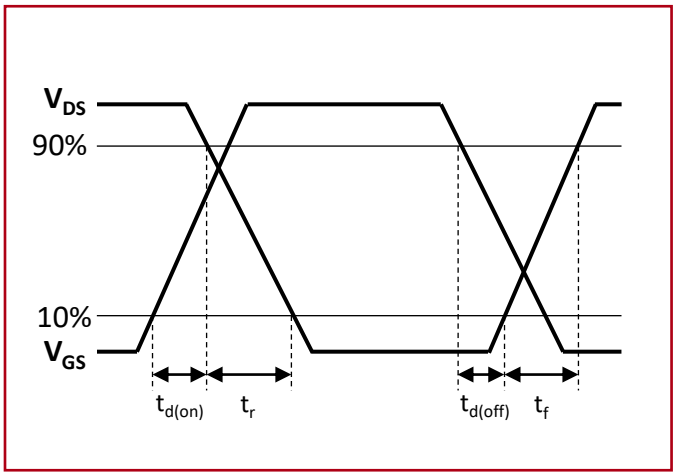


Fig.02 Switching Times Definition

Naming Rule

H2 M 120 F 140

Generation
H2 = 2nd Gen Discrete

Device Type
M = MOSFET J = JMOS
S = JBS diode

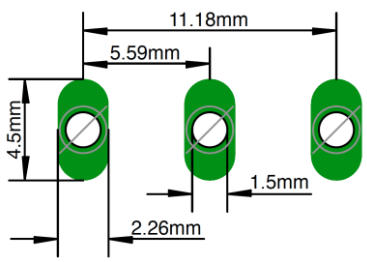
Breakdown Voltage
065 = 650V 170 = 1700V
120 = 1200V 330 = 3300V

Package
F = TO-247-3L B = TO-220-3L
T = TO-263-2L N = Bare Die

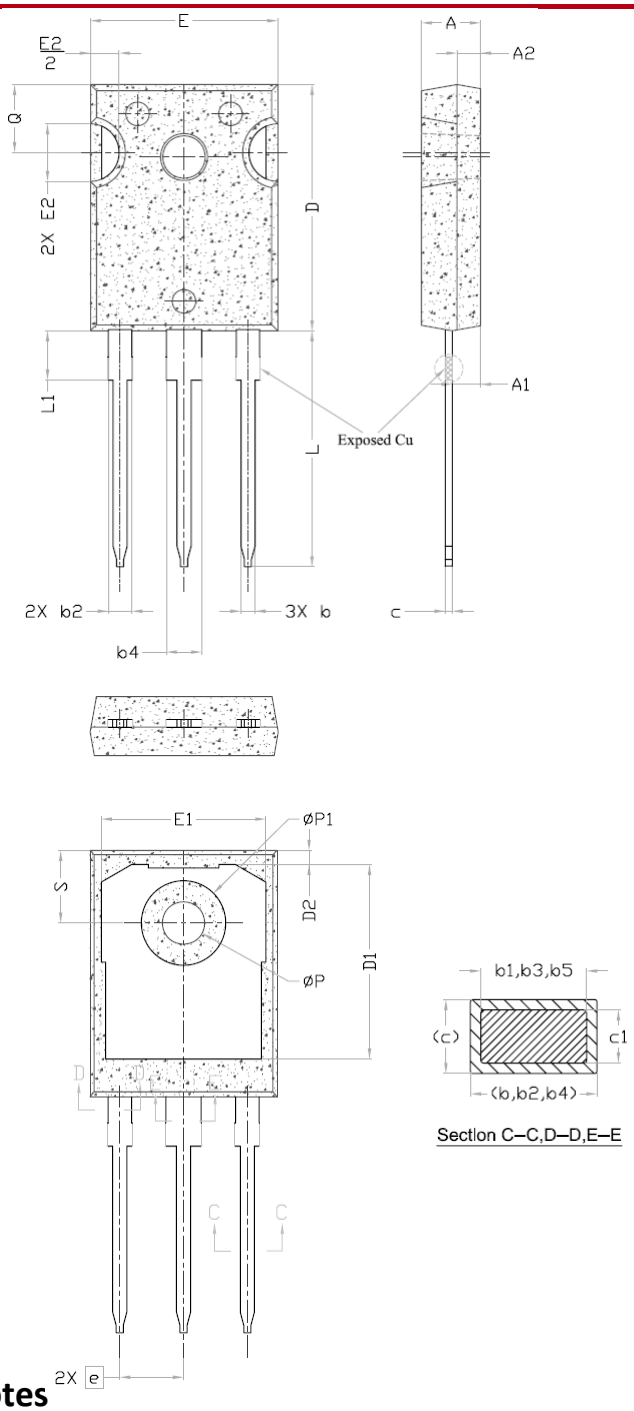
Typical On-Resistance
020 = 20mΩ 040 = 40mΩ 100 = 100mΩ
140 = 140mΩ

Recommended Solder Pad Layout

TO-247-3L



Package Dimensions



SYMBOL	DIMENSIONS			Note
	Min.	Typ.	Max.	
A	4.83	5.02	5.21	
A1	2.29	2.41	2.55	
A2	1.50	2.00	2.49	
b	1.12	1.20	1.33	
b1	1.12	1.20	1.28	
b2	1.91	2.00	2.39	6
b3	1.91	2.00	2.34	
b4	2.87	3.00	3.22	6, 8
b5	2.87	3.00	3.18	
c	0.55	0.60	0.69	6
c1	0.55	0.60	0.65	
D	20.80	20.95	21.10	4
D1	16.25	16.55	17.65	5
D2	0.51	1.19	1.35	
E	15.75	15.94	16.13	4
E1	13.46	14.02	14.16	5
E2	4.32	4.91	5.49	3
e	5.44 BSC			
L	19.81	20.07	20.32	
L1	4.10	4.19	4.40	6
ϕP	3.56	3.61	3.65	7
ϕP1	7.19 REF.			
Q	5.39	5.79	6.20	
S	6.04	6.17	6.30	

Note:
1. Package Reference: JEDEC TO247, Variation AD.
2. All Dimensions Are In mm.
3. Slot Required, Notch May Be Rounded
4. Dimension D & E Do Not Include Mold Flash. Mold Flash Shall Not Exceed 0.127mm Pre Side. These Dimensions Are Measured At The Outermost Extreme Of The Plastic Body.
5. Thermal Pad Contour Optional Within Dimension D1 & E1.
6. Lead Finish Uncontrolled In L1.
7. ØP To Have A Maximum Draft Angle Of 1.5° To The Top Of The Part With A Maximum Hole Diameter Of 3.91mm.
8. Dimension "b2" And "b4" Does Not Include Dambar Protrusion. Allowable Dambar Protrusion Shall Be 0.10mm Total In Excess Of "b2" And "b4" Dimension At Maximum Material Condition.

Notes

- The information provided herein is subject to change without notice.
- For other information that does not show on this datasheet, please contact us for inquiry.