



## Features

- 3rd generation SiC MOSFET technology
- Optimized package with separate driver source pin
- High blocking voltage with low on-resistance
- High-speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery ( $Q_{rr}$ )
- Halogen free, RoHS compliant

## Benefits

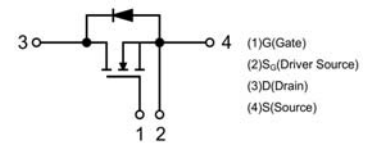
- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency

## Applications

- Renewable energy
- EV battery chargers
- High voltage DC/DC converters
- Switch Mode Power Supplies



SOT-227  
Package



Ordering Part Number	Package	Marking
HC1M15120S	SOT-227	HC1M15120S

## Maximum Ratings ( $T_C = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	1200	V
Continuous drain current $T_C = 25^\circ\text{C}$ , $V_{GS} = 18\text{V}$ $T_C = 100^\circ\text{C}$ , $V_{GS} = 18\text{V}$	$I_D$	125 90	A
Pulsed drain current ( $T_C = 25^\circ\text{C}$ , $t_p$ limited by $T_{jmax}$ )	$I_{D \text{ pulse}}$	250	A
Gate-Source voltage	$V_{GS}$	-4/+18	V
Gate-Source voltage (Absolute maximum values)	$V_{GSmax}$	-8/+22	V
Power dissipation ( $T_C = 25^\circ\text{C}$ )	$P_{tot}$	681	W
Operating junction and storage temperature	$T_j$ , $T_{stg}$	-40...+175	$^\circ\text{C}$

●Example of acceptable  $V_{GS}$  waveform





### Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal resistance, junction – case. Max	$R_{thJC}$	0.22	°C/W

### Electrical Characteristic (at $T_j = 25^\circ\text{C}$ , unless otherwise specified)

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		

### Static Characteristic

Drain-source breakdown voltage	$BV_{DSS}$	1200	-	-	V	$V_{GS}=0V, I_D=250\mu A$
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	$V_{DS}=V_{GS}, I_D=25mA$
Zero gate voltage drain current	$I_{DSS}$	-	1	50	$\mu A$	$V_{DS}=1200V, V_{GS}=0$ $V T_C=25^\circ C$
		-	10	-		$T_C=175^\circ C$
Gate-source leakage current	$I_{GSS}$	-		200	nA	$V_{GS}=18V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	15	22	m $\Omega$	$V_{GS}=18V,$ $I_D=80A, T_J=25^\circ C$
		-	29	-		$T_J=175^\circ C$
Transconductance	$g_{fs}$	-	43	-	S	$V_{DS}=20V, I_D=40A$



### Dynamic Characteristic

Input Capacitance	C <sub>iss</sub>	-	4508	-	pF	V <sub>DS</sub> = 1000V V <sub>GS</sub> = 0V T <sub>J</sub> = 25°C V <sub>AC</sub> = 25mV f = 1MHz
Output Capacitance	C <sub>oss</sub>	-	214	-		
Reverse Transfer Capacitance	C <sub>rss</sub>	-	26	-		
Gate Total Charge	Q <sub>G</sub>	-	222	-	nC	V <sub>DS</sub> = 800V V <sub>GS</sub> = 0/18V I <sub>D</sub> = 80A
Gate-Source charge	Q <sub>gs</sub>	-	46.4	-		
Gate-Drain charge	Q <sub>gd</sub>	-	77.6	-		
Turn-On Switching Energy	E <sub>ON</sub>	-	2.29	-	mJ	V <sub>DD</sub> = 800V V <sub>GS</sub> = -4/+18V I <sub>D</sub> =80A R <sub>G</sub> = 5Ω L = 120uH
Turn-Off Switching Energy	E <sub>OFF</sub>	-	0.63	-		
Turn-on delay time	t <sub>d(on)</sub>	-	49.2	-	ns	
Rise time	t <sub>r</sub>	-	14.2	-		
Turn-off delay time	t <sub>d(off)</sub>	-	21.7	-		
Fall time	t <sub>f</sub>	-	11.3	-		
Gate resistance	R <sub>G</sub>	-	0.9	-	Ω	V <sub>AC</sub> = 25mV, f=1MHz

### Body Diode Characteristic

Parameter	Symbol	Value			Unit	Test Condition
		min.	typ.	max.		
Body Diode Forward Voltage	$V_{SD}$		4.4		V	$V_{GS} = -4V, I_{SD} = 40A,$ $T_J = 25^{\circ}C$
			3.9			$V_{GS} = -4V, I_{SD} = 40A,$ $T_J = 175^{\circ}C$
Body Diode Reverse Recovery Time	$t_{rr}$	-	29.6	-	ns	$V_R = 800V$ $I_D = 80A$ $di/dt = 1000A/\mu S$ $T_J = 25^{\circ}C$
Body Diode Reverse Recovery Charge	$Q_{rr}$	-	272	-	nC	



## Typical Performance Characteristics

Fig 1. Output Characteristic ( $T_J = -55^\circ\text{C}$ )

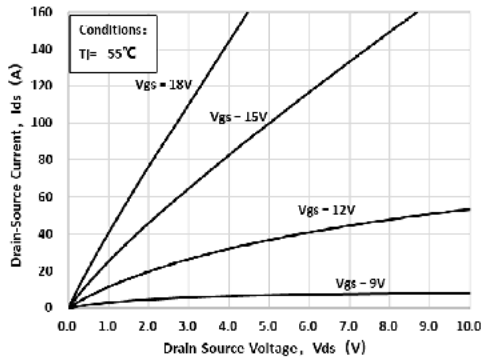


Fig 2. Output Characteristic ( $T_J = 25^\circ\text{C}$ )

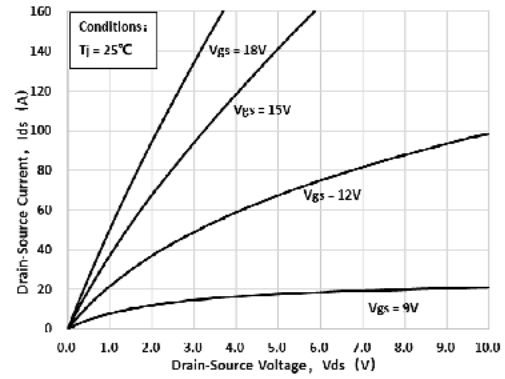


Fig 3. Output Characteristic ( $T_J = 175^\circ\text{C}$ )

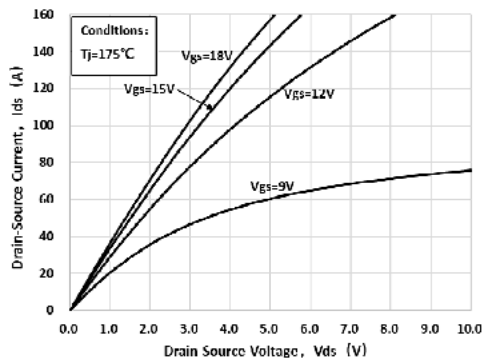


Fig 4:  $R_{DS(on)}$  Vs  $I_{DS}$  Characteristic

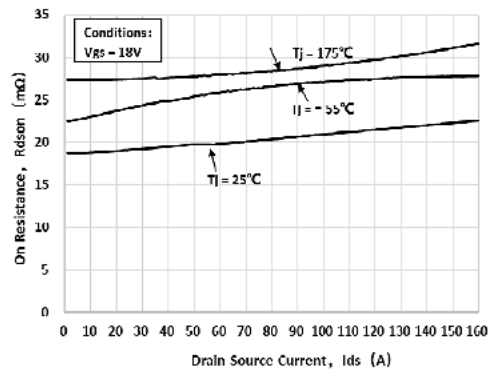


Fig 5:  $R_{DS(on)}$  vs. Temperature

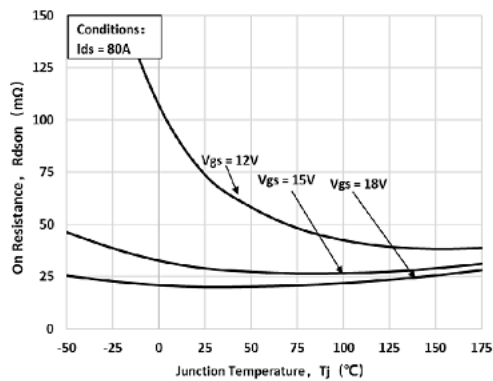


Fig 6: Transfer Characteristic

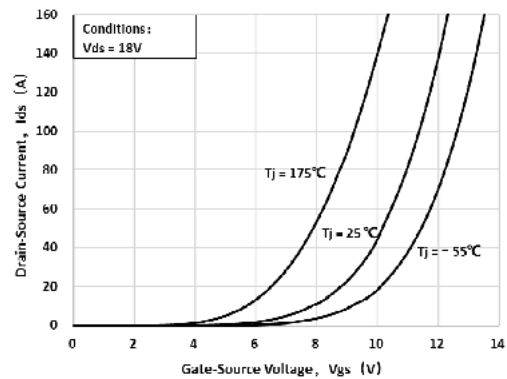




Fig 7: Body-diode Characteristic ( $T_J = -55^\circ\text{C}$ )

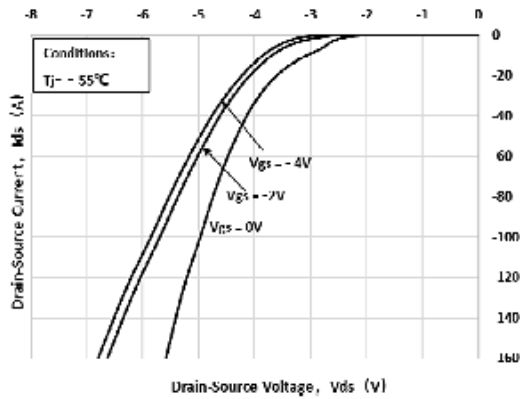


Fig 8: Body-diode Characteristic ( $T_J = 25^\circ\text{C}$ )

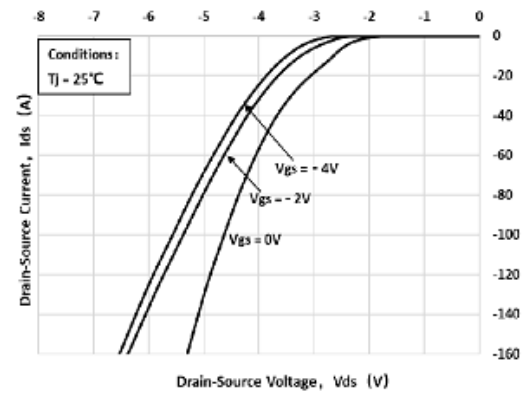


Fig 9: Body-diode Characteristic ( $T_J = 175^\circ\text{C}$ )

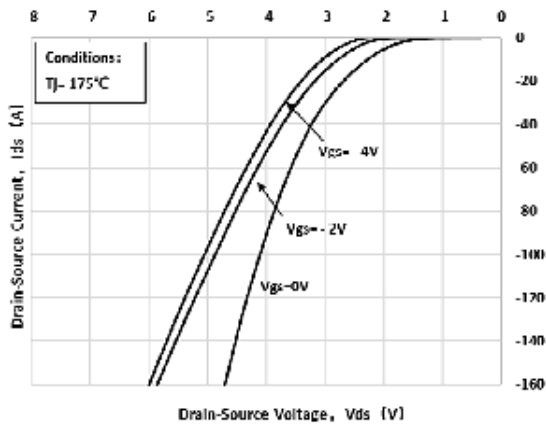


Fig 10:  $V_{TH}$  Vs  $T_J$  Temperature Characteristic

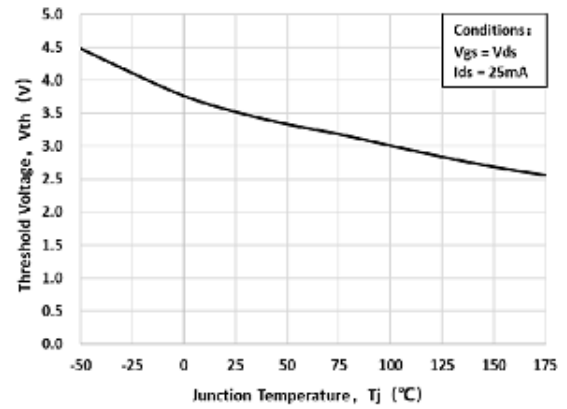


Fig 11: Gate Charge Characteristics

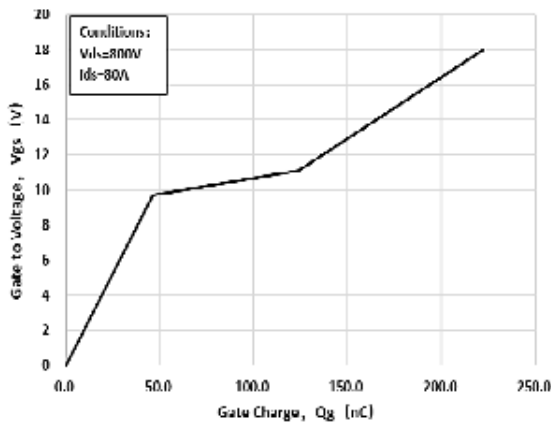


Fig 12: 3rd Quadrant Characteristic ( $T_J = -55^\circ\text{C}$ )

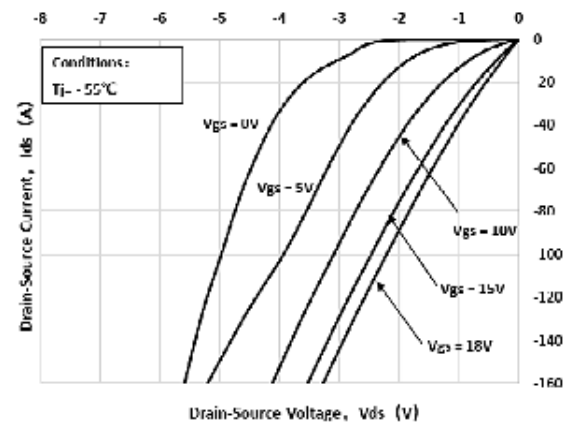




Fig 13: 3rd Quadrant Characteristic( $T_J=25^{\circ}\text{C}$ )

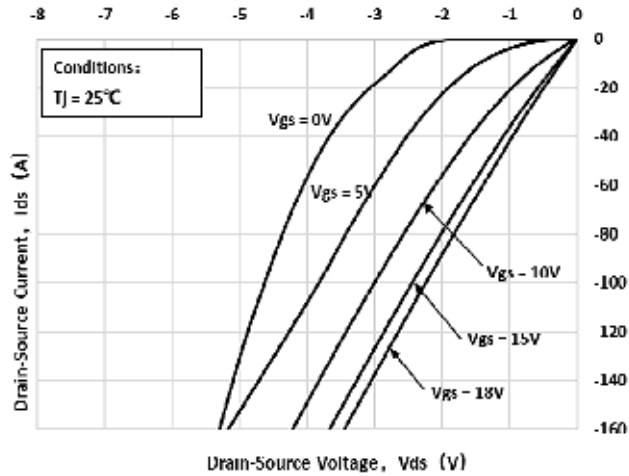


Fig 14: 3rd Quadrant Characteristic( $T_J=175^{\circ}\text{C}$ )

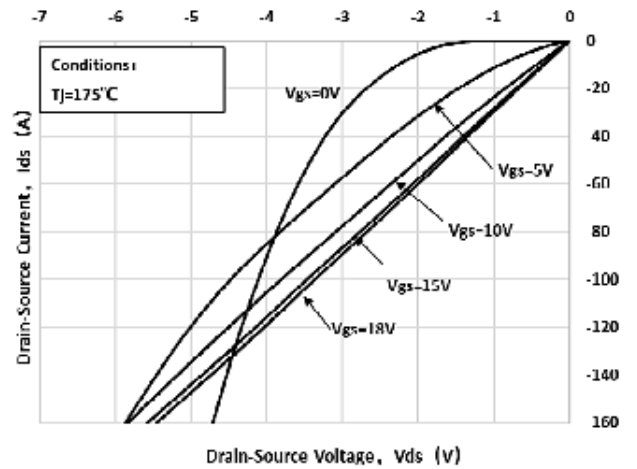


Fig 15: Capacitance Characteristic

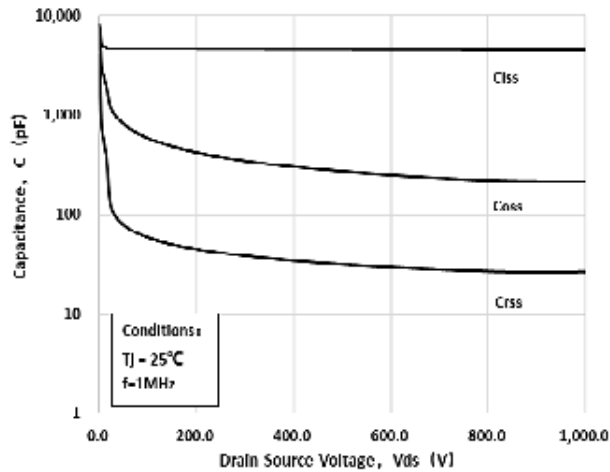
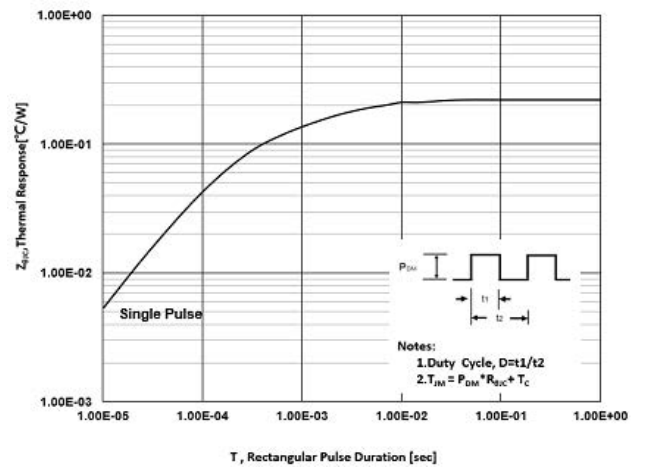


Fig 17: Transient Thermal Impedance





## Test Circuit & Waveform

Figure A. Definition of switching times

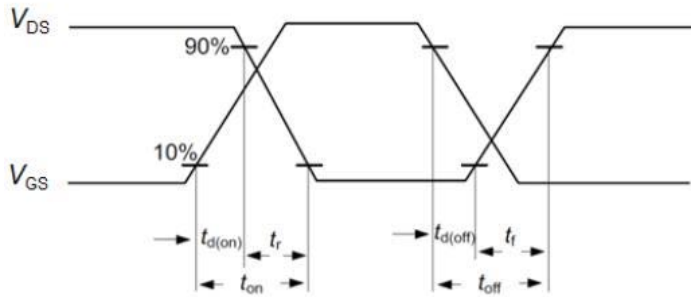


Figure B. Dynamic test circuit

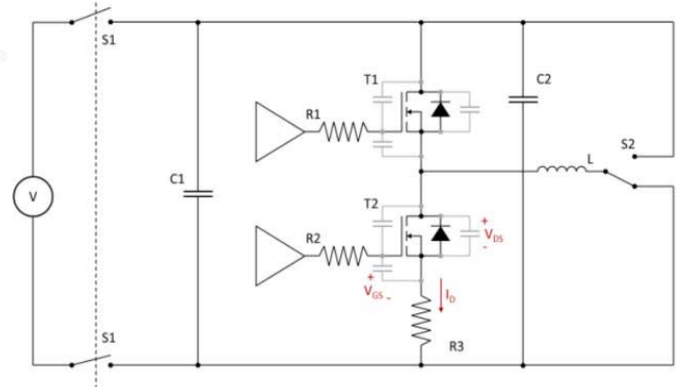


Figure C. Definition of body diodeswitching characteristics

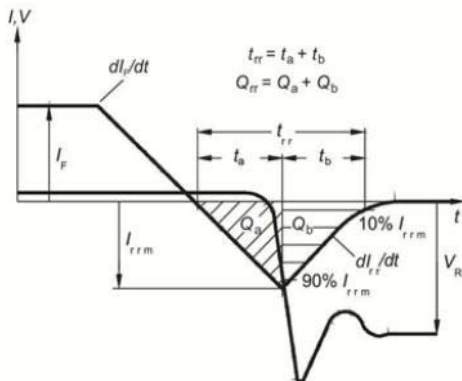


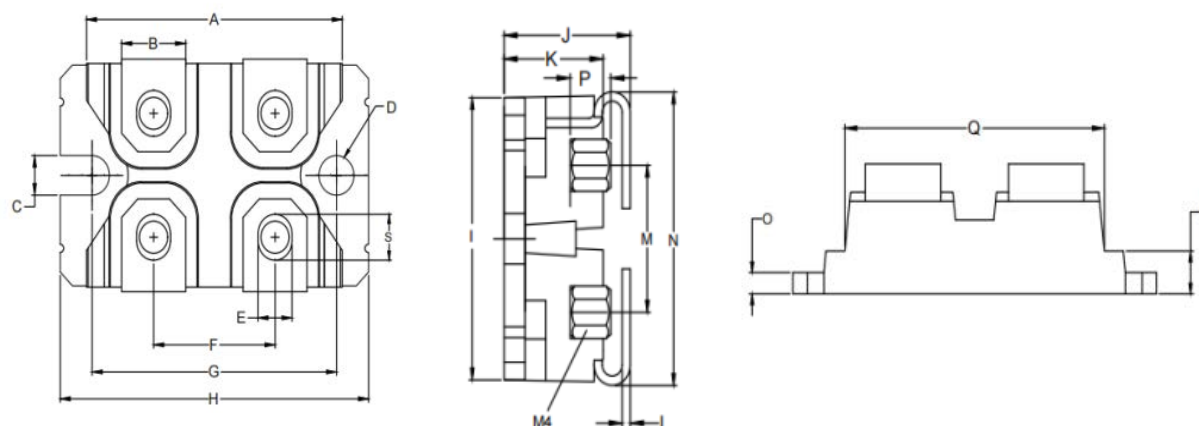
Figure C. Definition of diode switching characteristics



## Package

## Dimensions

Package SOT-227



DiM	Millimeter	
	Min	Max
A	31.40	31.60
B	7.70	8.10
C	4.20	4.40
D	4.20	4.40
E	4.10	4.30
F	14.90	15.10
G	30.10	30.20
H	38.00	38.40
I	23.80	24.20
J	12.20	12.70
K	9.40	9.60
L	0.75	0.85
M	12.40	12.80
N	24.50	25.40
O	1.90	2.10
P	3.10	3.95
Q	26.60	27.00
R	3.80	4.20
S	5.10	5.40





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