



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

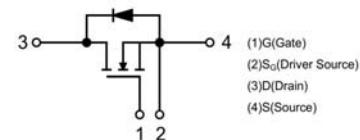
- Reduce switching losses and minimize gate ringing
- Higher system efficiency
- Reduce cooling requirements
- Increase power density
- Increase system switching frequency



SOT-227
Package

Applications

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



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)	$V_{GS\text{max}}$	-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	°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 $T_j = 25$ °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	μA	$V_{DS}=1200V, V_{GS}=0V$ $T_C=25^\circ C$ $T_C=175^\circ C$
Gate-source leakage current	I_{GSS}	-		200	nA	$V_{GS}=18V, V_{DS}=0V$
Drain-source on-state resistance	$R_{DS(on)}$	-	15	22	$m\Omega$	$V_{GS}=18V, I_D=80A, T_J=25^\circ C$ $T_J=175^\circ C$
Transconductance	g_{fs}	-	43	-	S	$V_{DS}=20V, I_D=40A$



Dynamic Characteristic

Input Capacitance	C_{iss}	-	4508	-	pF	$V_{DS} = 1000V$ $V_{GS} = 0V$ $T_J = 25^\circ C$ $V_{AC} = 25mV$ $f = 1MHz$
Output Capacitance	C_{oss}	-	214	-		
Reverse Transfer Capacitance	C_{rss}	-	26	-		
Gate Total Charge	Q_G	-	222	-	nC	$V_{DS} = 800V$ $V_{GS} = 0/18V$ $I_D = 80A$
Gate-Source charge	Q_{gs}	-	46.4	-		
Gate-Drain charge	Q_{gd}	-	77.6	-		
Turn-On Switching Energy	E_{ON}	-	2.29	-	mJ	$V_{DD} = 800V$ $V_{GS} = -4/+18V$ $I_D = 80A$ $R_G = 5\Omega$ $L = 120\mu H$
Turn-Off Switching Energy	E_{OFF}	-	0.63	-		
Turn-on delay time	$t_{d(on)}$	-	49.2	-		
Rise time	t_r	-	14.2	-	ns	
Turn-off delay time	$t_{d(off)}$	-	21.7	-		
Fall time	t_f	-	11.3	-		
Gate resistance	R_G	-	0.9	-	Ω	$V_{AC} = 25mV, f=1MHz$

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 ($T_j = -55^\circ\text{C}$)

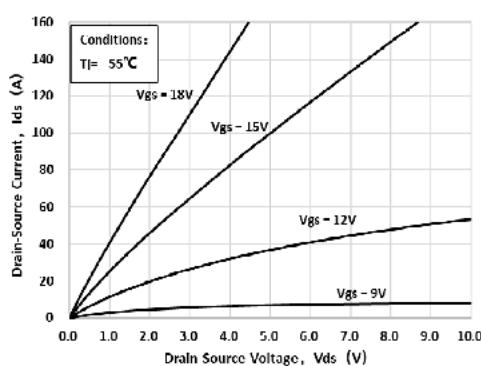


Fig 2. Output Characteristic ($T_j = 25^\circ\text{C}$)

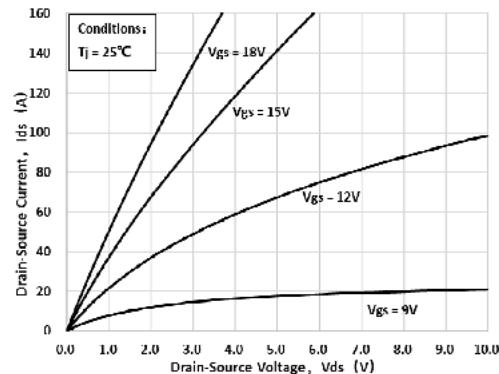


Fig 3. Output Characteristic ($T_j = 175^\circ\text{C}$)

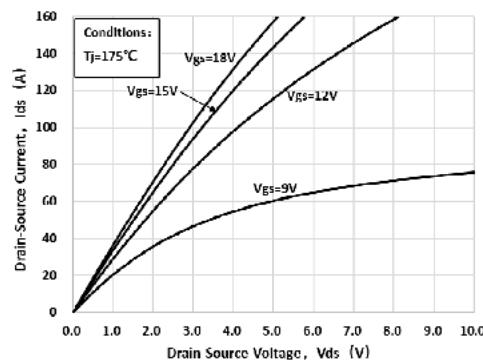


Fig 4: R_{dson} Vs Id_s Characteristic

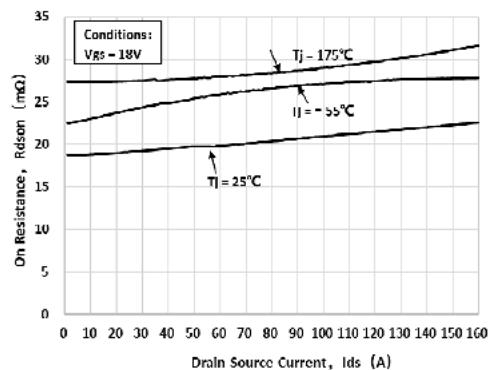


Fig 5: $R_{ds(on)}$ vs. Temperature

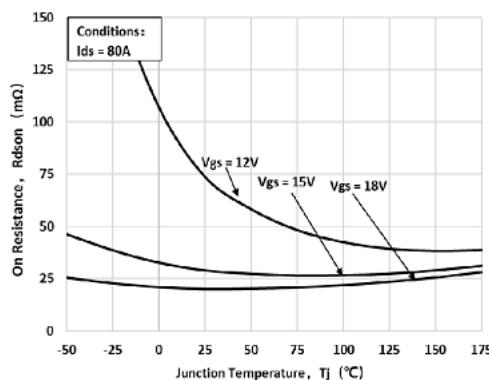


Fig 6: Transfer Characteristic

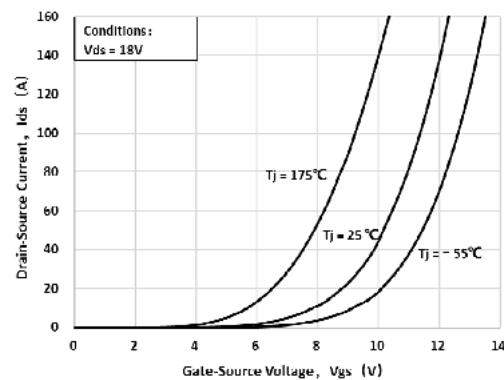




Fig 7: Body-diode Characteristic ($T_J = -55^\circ\text{C}$)

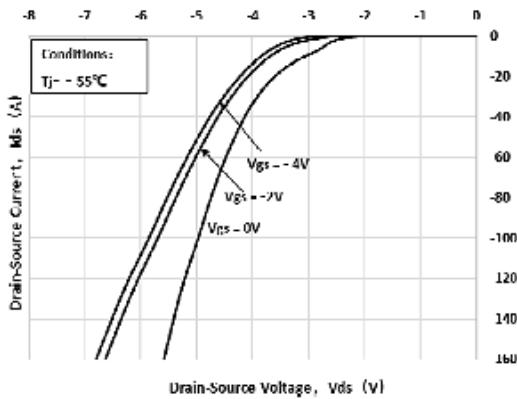


Fig 8: Body-diode Characteristic ($T_J = 25^\circ\text{C}$)

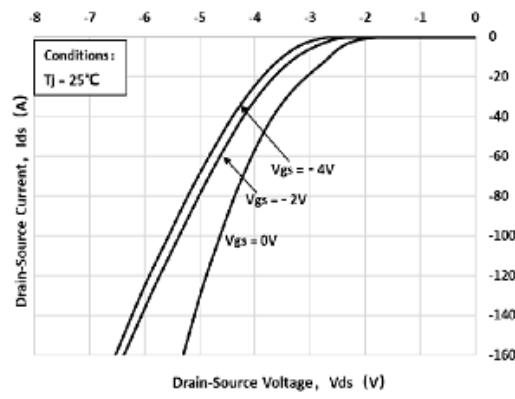


Fig 9: Body-diode Characteristic ($T_J = 175^\circ\text{C}$)

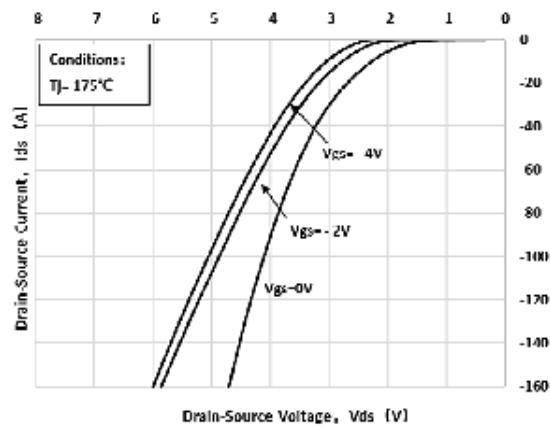


Fig 10: V_{th} Vs T_J Temperature Characteristic

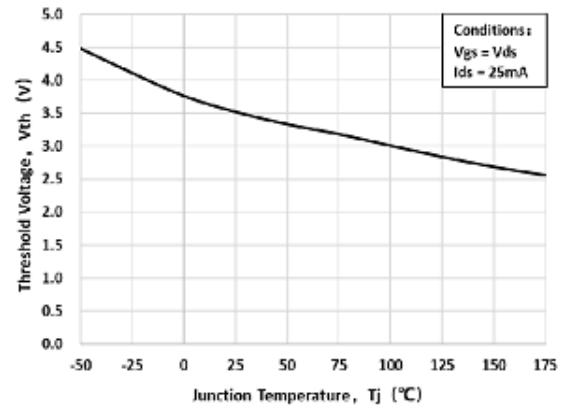


Fig 11: Gate Charge Characteristics

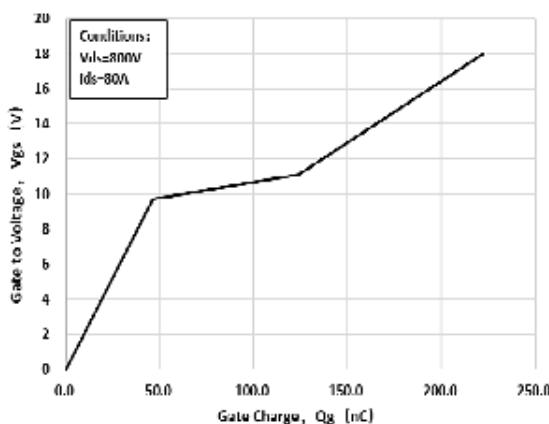


Fig 12: 3rd Quadrant Characteristic ($T_J = -55^\circ\text{C}$)

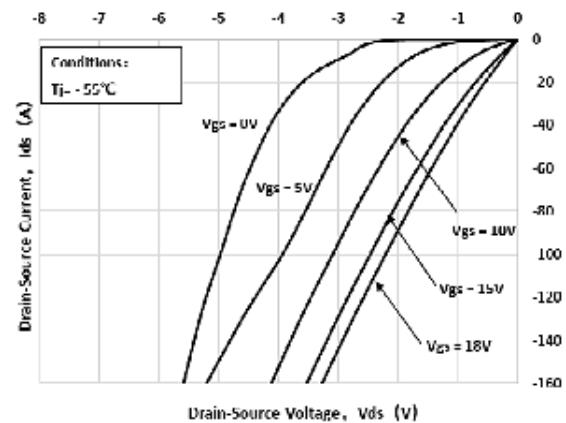




Fig 13: 3rd Quadrant Characteristic($T_J=25^\circ\text{C}$)

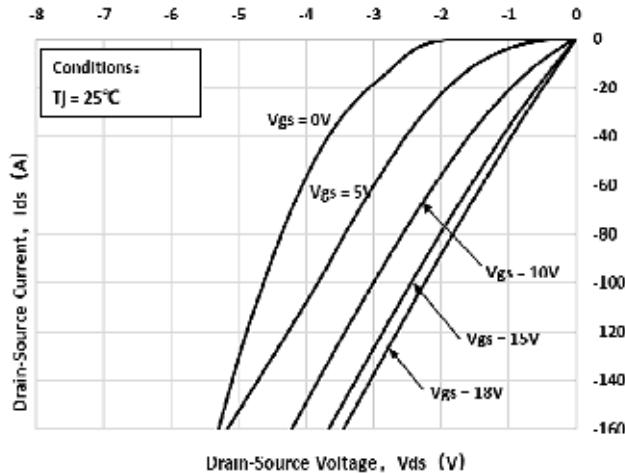


Fig 14: 3rd Quadrant Characteristic($T_J=175^\circ\text{C}$)

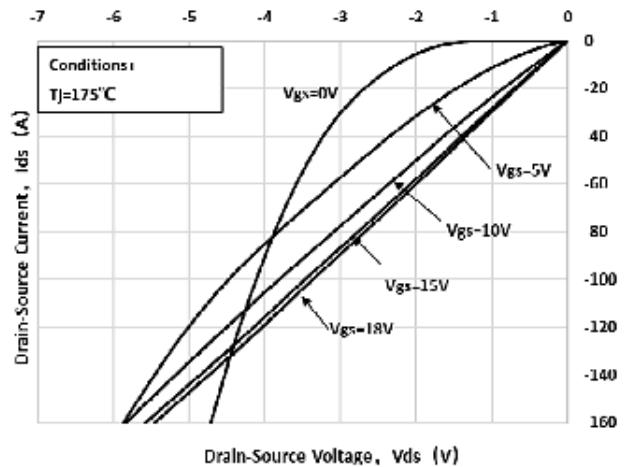


Fig 15: Capacitance Characteristic

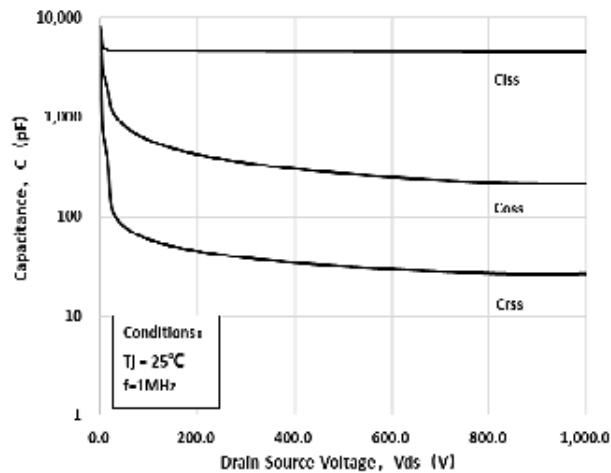
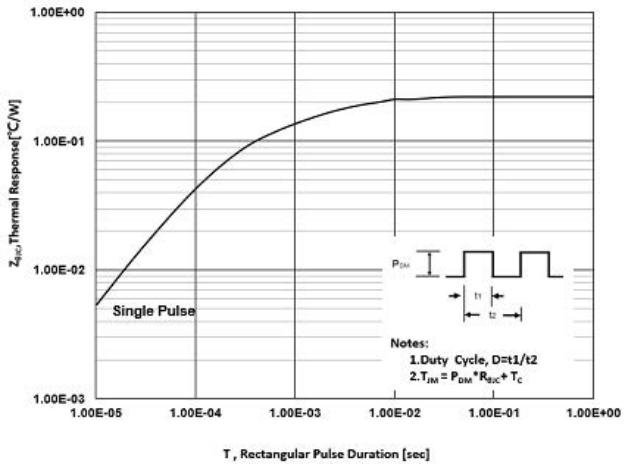


Fig 17: Transient Thermal Impedance





Test Circuit & Waveform

Figure A. Definition of switching times

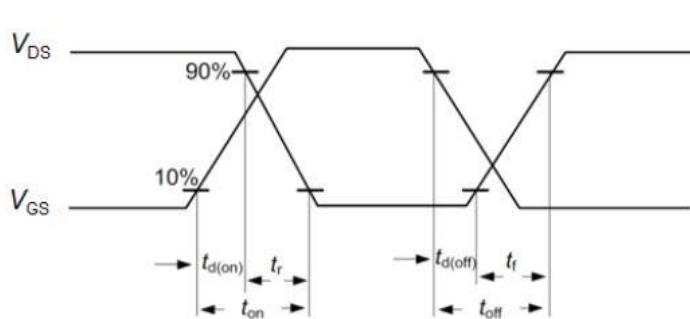


Figure B. Dynamic test circuit

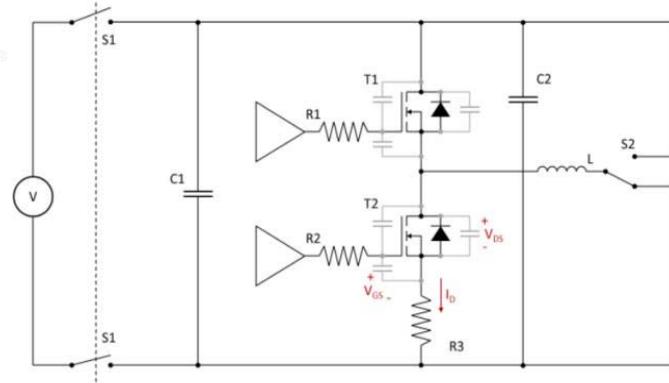


Figure C. Definition of body diodeswitching characteristics

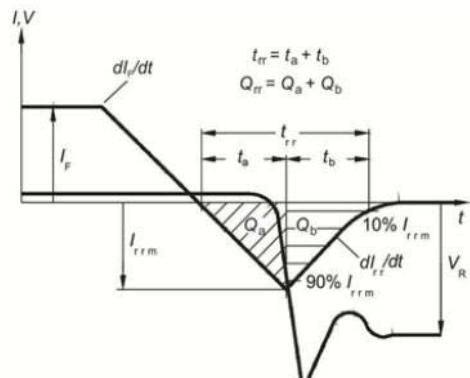
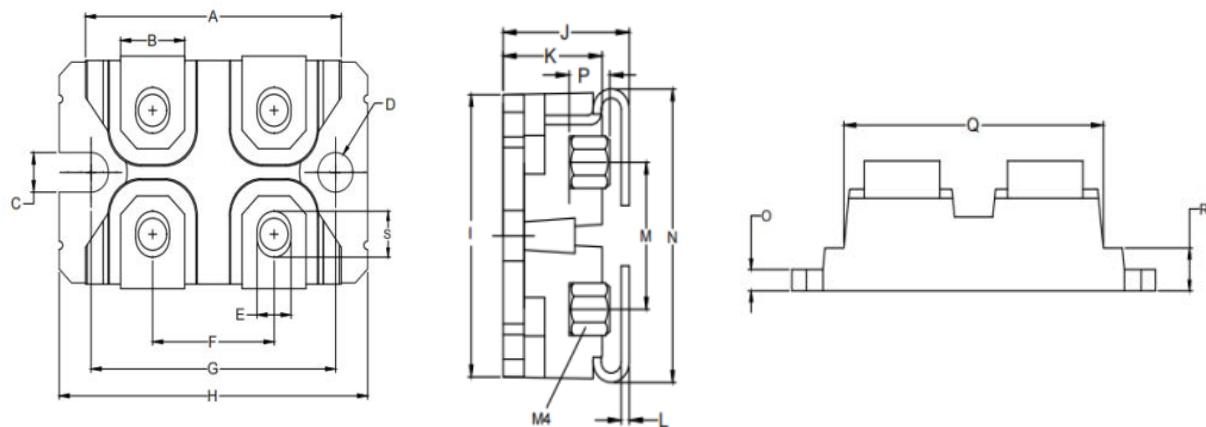


Figure C. Definition of diode switching characteristics



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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