QS1700SMC8: 1700V N-Channel SiC MOSFET

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Features

- High Operating Temperature 175°C
- Low On-Resistance RDS (on) 0.8Ω
- Fast Switching Speed and Low EMI
- High Peak Current Ratings
- Low Total Gate Charge 16nC for Low Switching Losses
- Improved Power Density: The combination of high voltage, fast switching, and low losses.
- Reduced System Size and Weight

Key Values

PARAMETER	VALUE	UNIT
BV_{DSS}	1700	V
$R_{DS(ON),typ}$ $(20V)$	800	mΩ
$V_{GS(TH),typ}$	2.0~4.0	V
E_{ON}	37	μJ
E_{OFF}	25	μJ
I_D $(at\ 25℃)$	7.5	A

Part Number

QS1700SMC8

Package

TO247

Marking

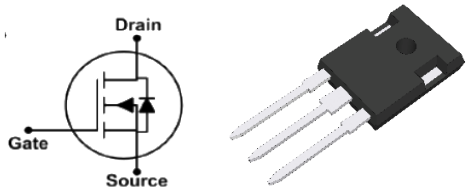
Q

Applications

SiC MOSFETs are well-suited for applications where high-power density, high-frequency operation, and improved efficiency are critical. Their characteristics make them a preferred choice in a variety of modern electronic systems.

- Electric Vehicles
- Solar Inverters
- Uninterruptible Power Supplies (UPS)
- Switched-Mode Power Supplies (SMPS)
- Industrial Motor Drives
- Renewable Energy Systems
- High-Frequency Power Converters
- Grid-Tied Energy Storage Systems

Package



ROHS Compliant
REACH Compliant

Ver 1.0

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ABSOLUTE MAXIMUM RATINGS (Ta = 25°C Unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DSS}	1700	V
Maximum Gate-to-Source Voltage	V_{GSmax}	$-10 \sim +25$	
Recommended operations values of gate to source voltage	$V_{GSop(DC)}$	$-5.0 \sim +20$	
Recommended operations values of gate to source voltage (f>1Hz)	$V_{GSop(AC)}$	$-5.0 \sim +20$	
Continuous Drain Current	I_D	7.5	A
Continuous Drain Current at $\boldsymbol{T_c = 100}$℃		5.2	
Pulsed Drain Current at $\boldsymbol{VGS = 10V}$ [2]	I_{DM}	18	
Single Pulse Avalanche Energy ($\boldsymbol{V_{DD} = 50V, V_{GS} = 15V, R_G = 25\Omega, L = 1mH}$)	E_{AS}	18	mJ
Power Dissipation	P_D	88	W
Derating Factor above 25°C		0.59	℃/W
Soldering Temperature, Distance of 1.6mm from case for 10 seconds	T_L	300	℃
Operating and Storage Temperature Range	T_J, T_{STG}	$-55\ to\ 175$	
Caution: Stresses greater than those listed in the Absolute Maximum Ratings may cause permanent damage to devices.			
Thermal Characteristics			
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.7	℃/W
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	40	

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ELECTRICAL CHARACTERISTICS (Ta = 25°C Unless otherwise specified)

Parameter	Symbol	Test Conditions	Value			Unit
			Min	Typ	Max	
OFF Characteristics ($T_J = 25$°C unless otherwise specified)						
Drain-to-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0V, I_D = 100\mu A$	1700	–	–	V
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS} = 1700V, V_{GS} = 0V$	–	–	100	μA
Gate-to-Source Leakage Current	I_{Gss+}	$V_{DS} = 0V, V_{GS} = 20V$	–	–	100	nA
Gate-to-Source Leakage Current	I_{Gss-}	$V_{DS} = 0V, V_{GS} = -10V$	–	–	−100	nA
ON Characteristics ($T_J = 25$°C unless otherwise specified)						
Static Drain-to-Source On Resistance [3]	$R_{DS(ON)}$	$V_{GS} = 20V, I_D = 2A$	–	0.8	1.0	Ω
		$V_{GS} = 20V, I_D = 2A, T_J = 150$°C	–	1.2	–	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 5\mu A$	2.0	–	4.0	V
Dynamic Characteristics (Essentially independent of operating temperature)						
Input Capacitance	C_{iss}	$V_{GS} = 0V$ $V_{DS} = 1000V$ $f = 1MHz$	–	142	–	pF
Reverse Transfer Capacitance	C_{rss}		–	2.6	–	
Output Capacitance	C_{oss}		–	12	–	
Gate Series Resistance	R_g	$f = 1MHz$	–	48	–	Ω
Total Gate Charge	Q_g	$V_{DD} = 1200V$ $I_D = 2A$ $V_{GS} = -\frac{5}{20V}$	–	16	–	nC
Gate-to-Source Charge	Q_{gs}		–	1.8	–	
Gate-to-Drain (Miller) Charge	Q_{gd}		–	12	–	
Resistive Switching Characteristics (Essentially independent of operating temperature)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 1200V$ $I_D = 2A$ $V_{GS} = -\frac{3.5}{18V}$ $R_G = 2.0\Omega$ $L = 0.1mH$	–	12	–	nS
Rise Time	t_{rise}		–	35	–	
Turn-off Delay Time	$t_{d(off)}$		–	9	–	
Fall Time	t_{fall}		–	43	–	
Turn-On Switching Energy	E_{ON}		–	37	–	μJ
Turn-Off Switching Energy	E_{OFF}		–	25	–	
Source-Drain Body Diode Characteristics ($T_J = 25$°C unless otherwise specified)						
Continuous Source Current	I_{SD}	$Maximum\ Ratings$	–	–	7.5	A
Diode Forward Voltage	V_{SD}	$I_S = 20A, V_{GS} = 0V$	–	3.7	–	V
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V$ $I_F = 20A$ $\frac{di}{dt} = 800A/\mu s$	–	–	–	nS
Reverse Recovery Charge	Q_{rr}		–	–	–	nC
Peak Reverse Recovery Charge	I_{mm}		–	–	–	A

- TJ=25°C to 175°C

- Repetitive rating, pulse width limited by maximum junction temperature

-Pulse width≤380μs; duty cycle≤2%

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Figure 1: Typical Output Characteristics at Tj = 25°C

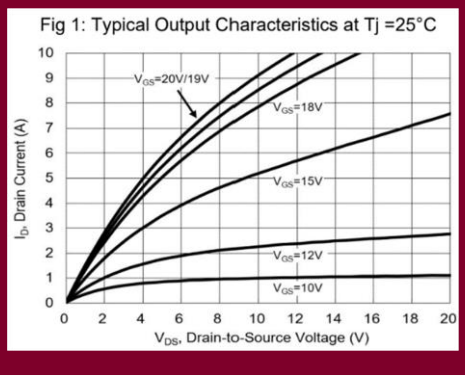

Figure 2: Typical Output Characteristics at Tj = 150°C

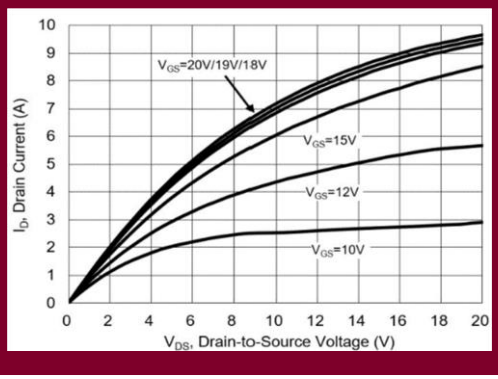

Figure 3: Typical Drain-to-Source ON Resistance vs. Gate Voltage

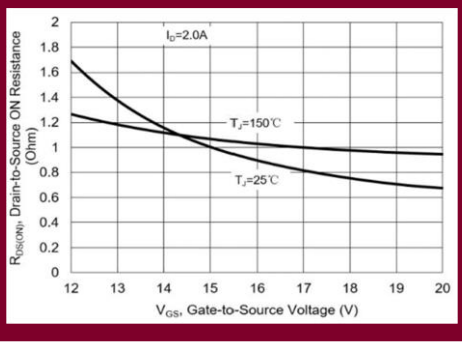

Figure 4: Typical Transfer Characteristics

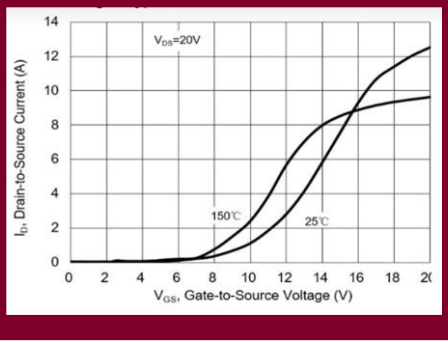

Figure 5: Typical Drain-to-Source ON Resistance at Tj = 25°C

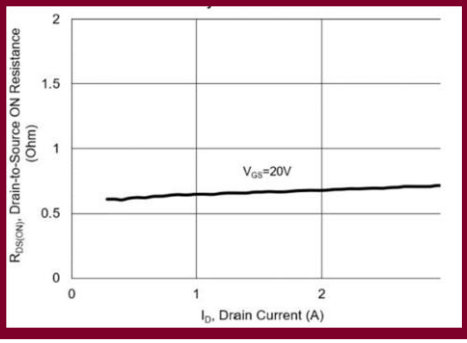

Figure 6: Typical Drain-to-Source ON Resistance at Tj = 150°C

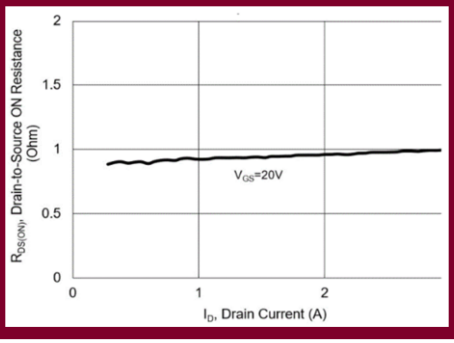

Figure 7: Typical Body Diode Characteristics at Tj = 25°C

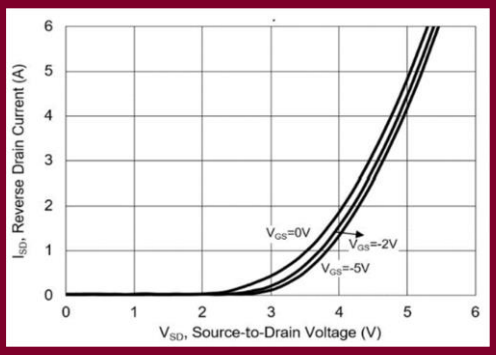

Figure 8: Typical Body Diode Characteristics at Tj=150°C

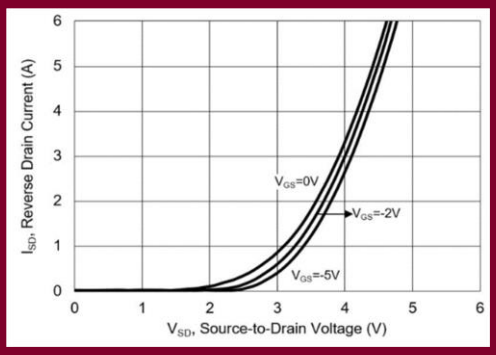

Figure 9: 3rd Quadrant Characteristics at Tj = 25°C

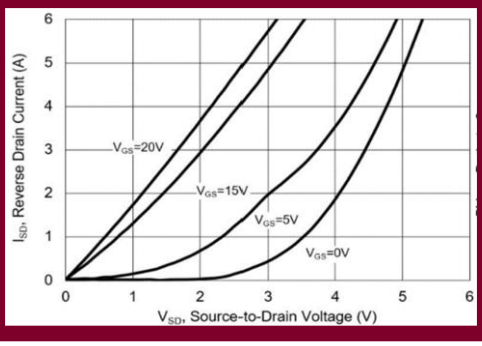

Figure 10: 3rd Quadrant Characteristics at Tj=150°C

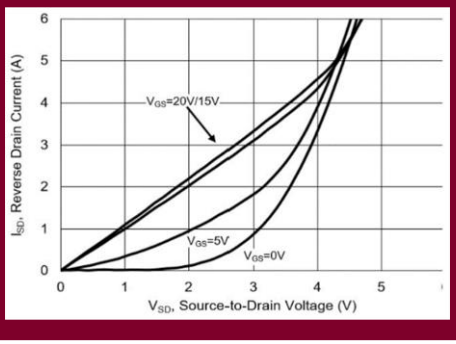

Figure 11: Typical Drain-to-Source ON Resistance vs Junction Temperature

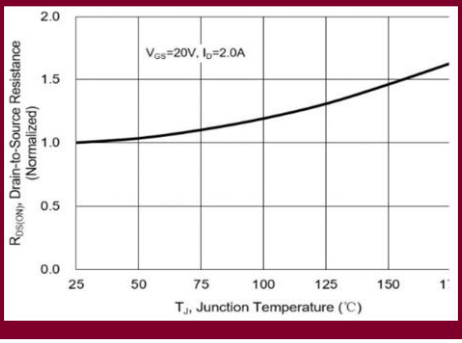

Figure 12: Typical Breakdown Voltage vs. Junction Temperature

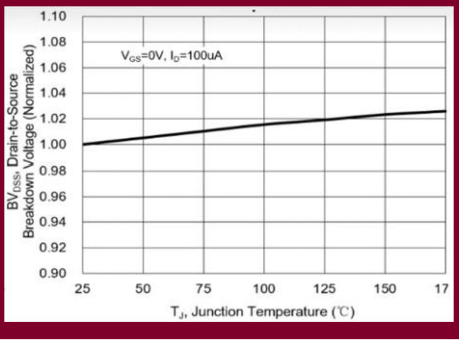

Figure 13: Typical Threshold Voltage vs. Junction Temperature

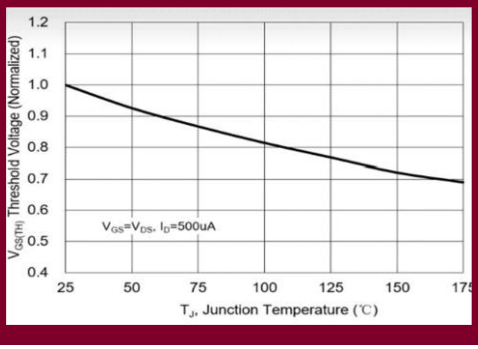

Figure 14: Thermal Impedance Junction to Case

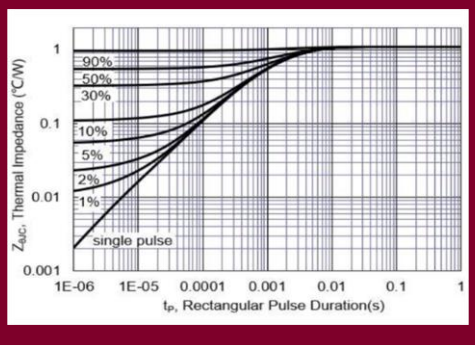

Figure 15: Typical Capacitance vs. Drain-to-Source Voltage

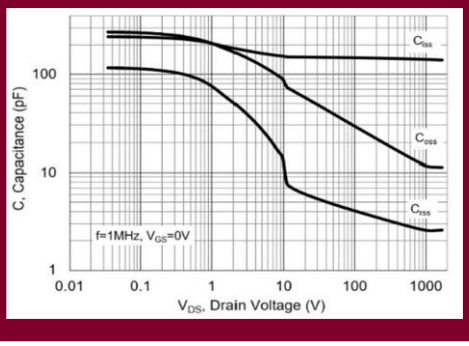

Figure 16: Maximum Peak Current Capability

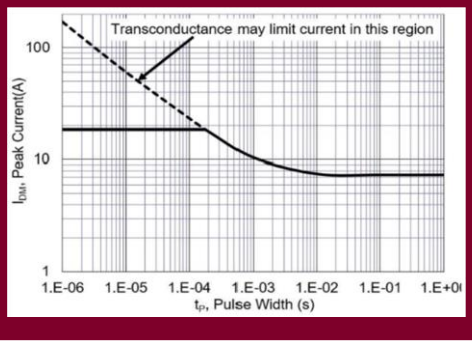

Figure 17: Typical Gate charge vs. Gate to Source voltage

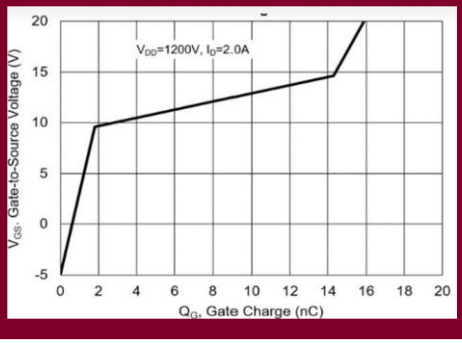

Figure 18: Maximum Power Dissipation vs Case Temperature

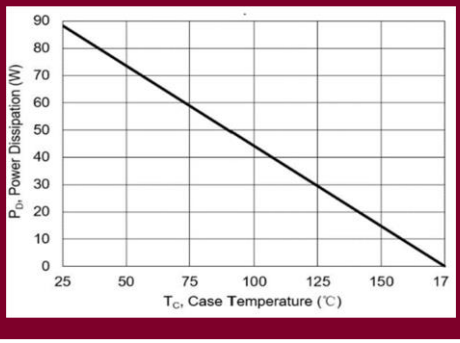

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Figure 19: Maximum Continuous Drain current vs Case Temperature

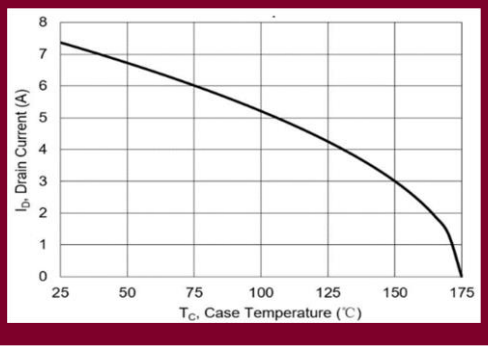
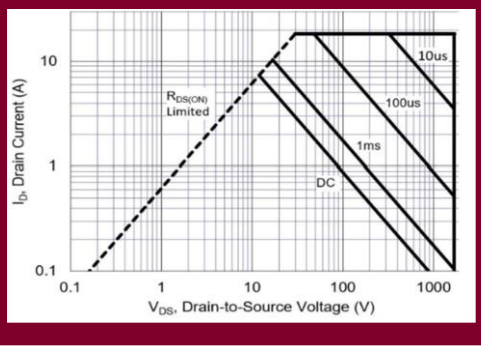
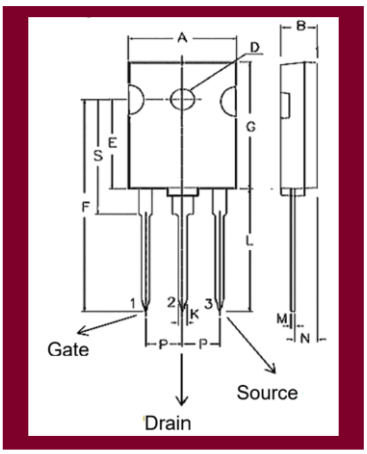


Figure 20: Maximum Forward Safe Operating Area





DIM	MIN	MAX
A	15.20	15.80
B	4.90	5.10
D	3.90	4.10
E	14.20	14.80
F	28.20	30.50
G	19.50	19.80
K	1.00	1.30
L	14.10	17.50
M	0.40	0.60
N	2.50	2.75
P	5.21	5.72
S	18.25	19.25

Pin configuration:

1. Gate
2. Drain
3. Source

Disclaimer:

The products described in this datasheet are intended for general-purpose applications, and their specifications and performance characteristics have been established under standard operating conditions. They are not specifically designed or authorized for use in life-critical or life-support systems. Life-critical systems are those in which the failure of a semiconductor device could lead to loss of life, severe injury, or severe damage to property.

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