QS1200SCM436: 1200V N-Channel SiC MOSFET

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Features

- High Operating Temperature 175°C
- Low On-Resistance RDS (on) 0.04Ω
- Fast Switching Speed and Low EMI
- High Peak Current Ratings
- Low Total Gate Charge 60nC 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}	1200	V
$R_{DS(ON),typ}$ $(20V)$	80	mΩ
$V_{GS(TH),typ}$	2.8	V
E_{ON}	325	µJ
E_{OFF}	219	µJ
I_D $(at\ 25℃)$	36	A

Part Number

QS1200SCM46

Package

TO247-4L

Marking

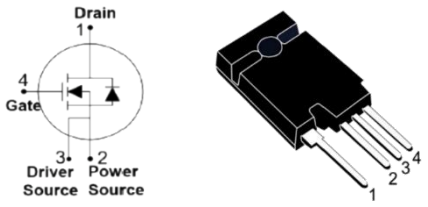
Q

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}	1200	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	36.0	A
Continuous Drain Current at $\boldsymbol{T_c = 100}$℃		25.0	
Pulsed Drain Current at $\boldsymbol{VGS = 10V^2}$	I_{DM}	90	
Single Pulse Avalanche Energy $(\boldsymbol{V_{DD} = 50V, V_{GS} = 15V, R_G = 25\Omega, L = 1mH})$	E_{AS}	171	mJ
Power Dissipation	P_D	198	W
Derating Factor above 25°C		1.30	℃/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	$R_{\theta JC}$	0.76	℃/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}	$V_{GS} = 0V, I_D = 100\mu A$	1200	–	–	V
Drain-to-Source Leakage Current	I_{DSS}	$V_{DS} = 1200V, V_{GS} = 0V$	–	–	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]	$R_{DS(ON)}$	$V_{GS} = 20V, I_D = 20A$	–	80	100.0	$m\Omega$
		$V_{GS} = 20V, I_D = 20A, T_J = 150°C$	–	121	–	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 5mA$	1.8	2.8	3.8	V
Dynamic Characteristics (Essentially independent of operating temperature)						
Input Capacitance	C_{iss}	$V_{GS} = 0V$ $V_{DS} = 800V$ $f = 1MHz$	–	1001	–	pF
Reverse Transfer Capacitance	C_{rss}		–	7.2	–	
Output Capacitance	C_{oss}		–	60	–	
Gate Series Resistance	R_g	$f = 1MHz$	–	5.6	–	Ω
Total Gate Charge	Q_g	$V_{DD} = 600V$ $I_D = 20A$ $V_{GS} = -\frac{5}{20V}$	–	60	–	nC
Gate-to-Source Charge	Q_{gs}		–	16	–	
Gate-to-Drain (Miller) Charge	Q_{gd}		–	23	–	
Resistive Switching Characteristics (Essentially independent of operating temperature)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 800V$ $I_D = 20A$ $V_{GS} = -\frac{5}{20V}$ $R_G = 4.7\Omega$ $L = 500\mu H$	–	11	–	nS
Rise Time	t_{rise}		–	37	–	
Turn-off Delay Time	$t_{d(off)}$		–	24	–	
Fall Time	t_{fall}		–	9.8	–	
Turn-On Switching Energy	E_{ON}		–	325	–	mJ
Turn-Off Switching Energy	E_{OFF}		–	219	–	
Source-Drain Body Diode Characteristics ($T_J = 25°C$ unless otherwise specified)						
Continuous Source Current	I_{SD}	$Maximum\ Ratings$	–	–	36	A
Diode Forward Voltage	V_{SD}	$I_S = 0.5A, V_{GS} = 0V$	–	2.6	–	V
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V$ $I_F = 20A$ $\frac{di}{dt} = 800A/\mu s$	–	20	–	nS
Reverse Recovery Charge	Q_{rr}		–	39	–	nC
Peak Reverse Recovery Charge	I_{mm}		–	2.8	–	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: Maximum effective Thermal impedance, junction - to - Case

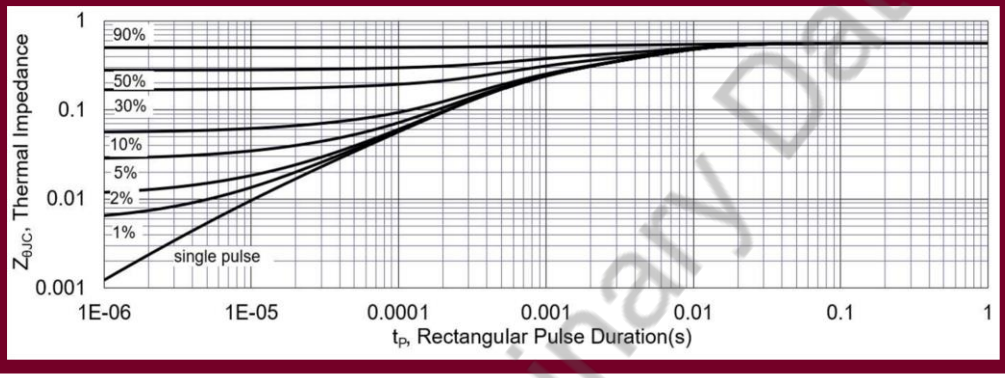


Figure 2: Maximum Power Dissipation vs Case Temperature

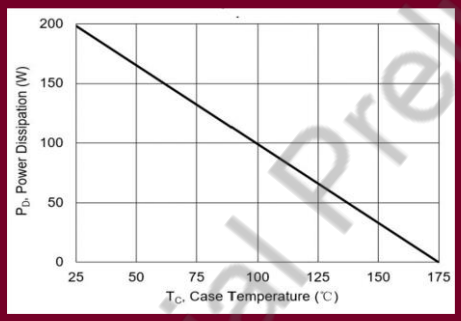


Figure 3: Maximum Continuous Drain Current vs Case Temperature

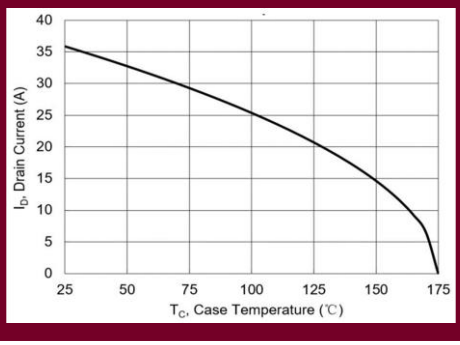


Figure 4: Typical Output Characteristics

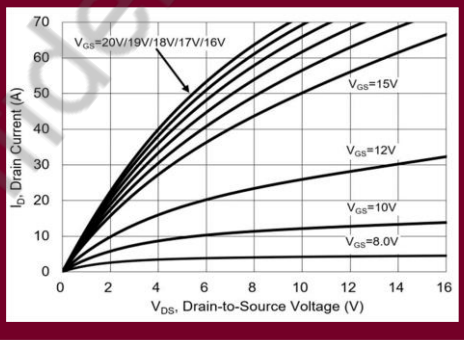


Figure 5: Typical Drain-to-Source ON Resistance vs Gate Voltage

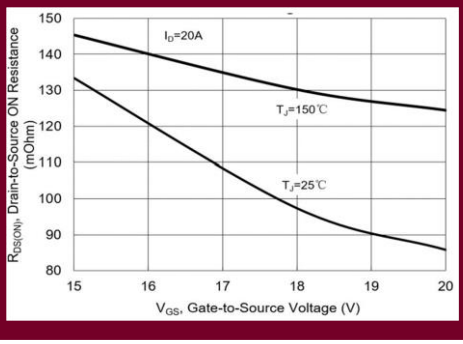


Figure 6: Maximum Peak Current Capability

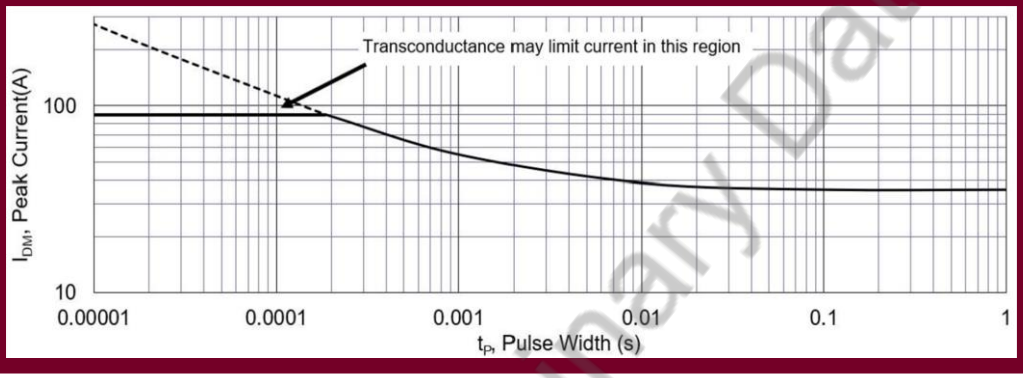


Figure 7: Typical Transfer Characteristics

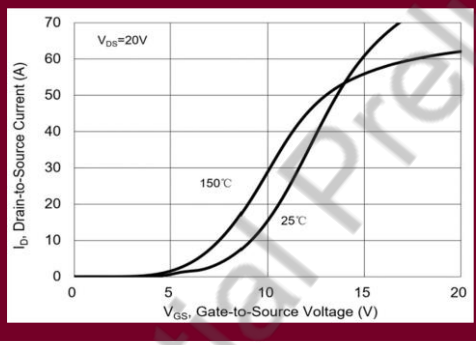


Figure 8: Typical Drain to Source ON Resistance

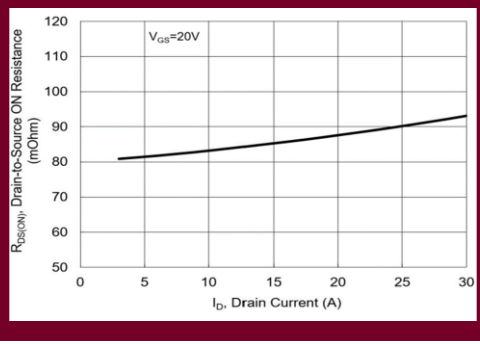


Figure 9: Typical Drain to Source ON Resistance vs Junction Temperature

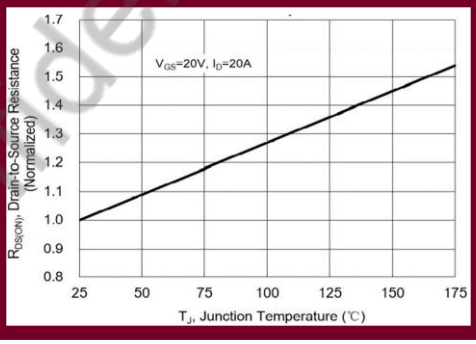


Figure 10: Typical Breakdown Voltage vs. Junction Temperature

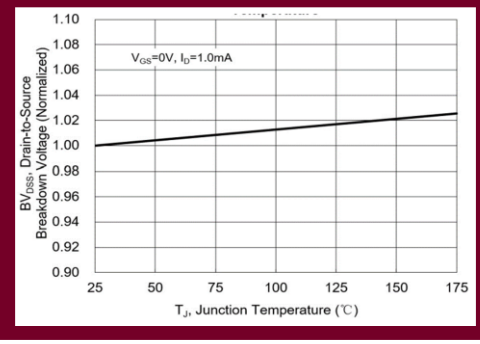


Figure 11: Typical Threshold Voltage vs. Junction Temperature

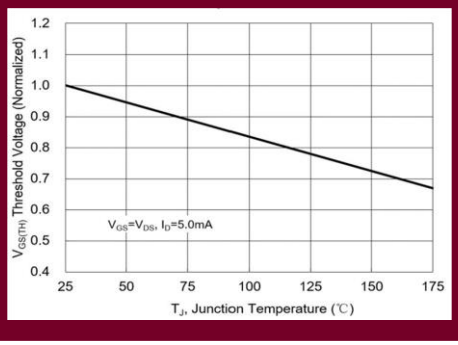


Figure 12: Typical Capacitance vs. Drain-to-Source Voltage

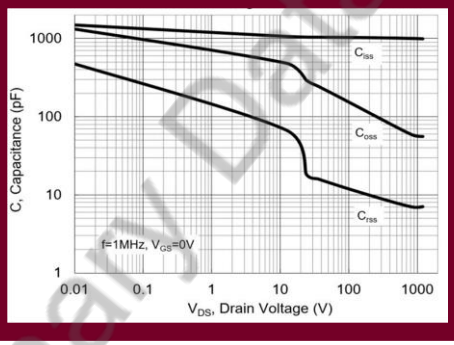


Figure 13: Maximum Forward Safe Operating Area

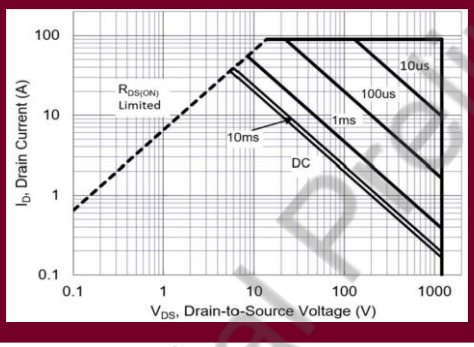
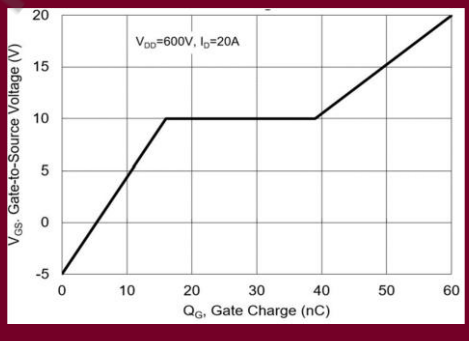


Figure 14: Typical Gate Charge vs. Gate to Source Voltage



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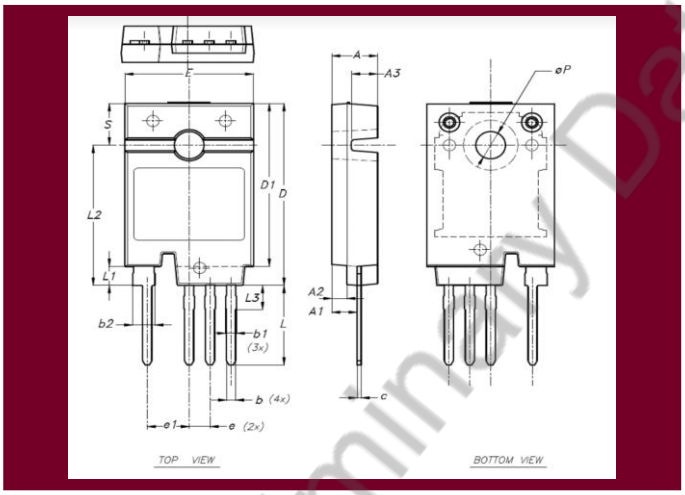

DIM	MIN(mm)	MAX(mm)	NOM(mm)
A	5.50	5.80	5.65
A1	2.85	3.25	3.15
A2			1.92
A3			3.18
B	0.95	1.30	1.10
B1	1.10	1.50	
B2	2.50	2.90	
C	0.40	0.80	
D	23.85	24.15	24
D1			21.50
E	15.45	15.75	15.60
E1			2.54
L			5.08
L1	10.20	10.80	
L2	2.20	2.80	2.50
L3			18.50
oP			3
S	3.55	3.65	
			5.50

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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