QS1200SCM466: 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 132nC for Low Switching Losses
- Improved Power Density: The combination of high voltage, fast switching, and low losses.
- Reduced System Size and Weight

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

Key Values

PARAMETER	VALUE	UNIT
BV_{DSS}	1200	V
$R_{DS(ON),typ}$ $(20V)$	40	mΩ
$V_{GS(TH),typ}$	2.0~4.0	V
E_{ON}	1.2	mJ
E_{OFF}	0.54	mJ
I_D $(at\ 25℃)$	66	A

Part Number

QS1200SCM466

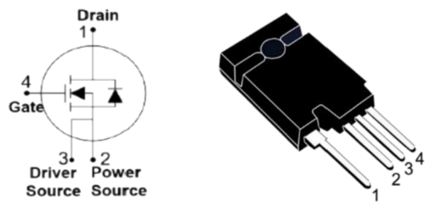
Package

TO247-4L

Marking

Q

Package



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	66.0	A
Continuous Drain Current at $T_c = 100$°C		47.0	
Pulsed Drain Current at $VGS = 10V^2$	I_{DM}	164	
Single Pulse Avalanche Energy ($V_{DD} = 50V, V_{GS} = 15V, R_G = 25\Omega, L = 1mH$)	E_{AS}	288	mJ
Power Dissipation	P_D	333	W
Derating Factor above 25°C		2.20	$°C/W$
Soldering Temperature, Distance of 1.6mm from case for 10 seconds	T_L	300	°C
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_{8JC}	0.45	$°C/W$
Thermal Resistance, Junction-to-Ambient	R_{8JA}	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]	$R_{DS(ON)}$	$V_{GS} = 20V, I_D = 40A$	–	40	50	$m\Omega$
		$V_{GS} = 20V, I_D = 40A, T_J = 150°C$	–	55	–	
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS}, I_D = 10mA$	2.0	–	4.0	V
Dynamic Characteristics (Essentially independent of operating temperature)						
Input Capacitance	C_{iss}	$V_{GS} = 0V$, $V_{DS} = 800V$, $f = 1MHz$	–	2027	–	pF
Reverse Transfer Capacitance	C_{rss}		–	11	–	
Output Capacitance	C_{oss}		–	115	–	
Gate Series Resistance	R_g	$f = 1MHz$	–	3.2	–	Ω
Total Gate Charge	Q_g	$V_{DD} = 800V$, $I_D = 40A$, $V_{GS} = -\frac{5}{20V}$	–	132	–	nC
Gate-to-Source Charge	Q_{gs}		–	25	–	
Gate-to-Drain (Miller) Charge	Q_{gd}		–	61	–	
Resistive Switching Characteristics (Essentially independent of operating temperature)						
Turn-on Delay Time	$t_{d(on)}$	$V_{DD} = 800V$, $I_D = 40A$, $V_{GS} = -\frac{3.5}{18V}$, $R_G = 2.0\Omega$, $L = 1mH$	–	11	–	nS
Rise Time	t_{rise}		–	31	–	
Turn-off Delay Time	$t_{d(off)}$		–	33	–	
Fall Time	t_{fall}		–	27	–	
Turn-On Switching Energy	E_{ON}		–	1.2	–	mJ
Turn-Off Switching Energy	E_{OFF}		–	0.54	–	
Source-Drain Body Diode Characteristics ($T_J = 25°C$ unless otherwise specified)						
Continuous Source Current	I_{SD}	$Maximum\ Ratings$	–	–	66	A
Diode Forward Voltage	V_{SD}	$I_S = 20A, V_{GS} = 0V$	–	4.2	–	V
Reverse Recovery Time	t_{rr}	$V_{GS} = 0V$, $I_F = 40A$, $\frac{di}{dt} = 1000A/\mu s$	–	46	–	nS
Reverse Recovery Charge	Q_{rr}		–	278	–	nC
Peak Reverse Recovery Charge	I_{rrm}		–	9.3	–	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

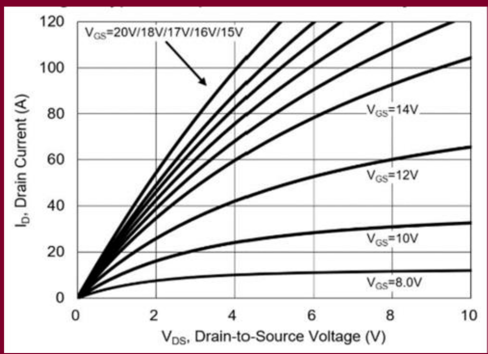

Figure 2: Typical Output Characteristics at Tj = 150°C

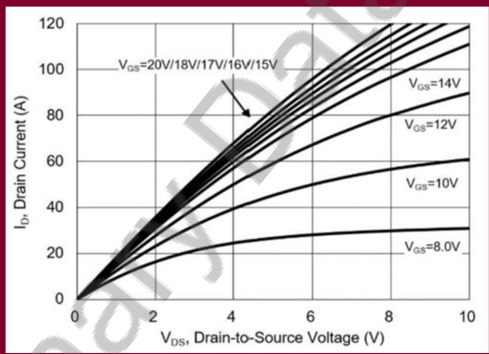

Figure 3: Typical Drain-to-Source ON Resistance vs. Gate Voltage

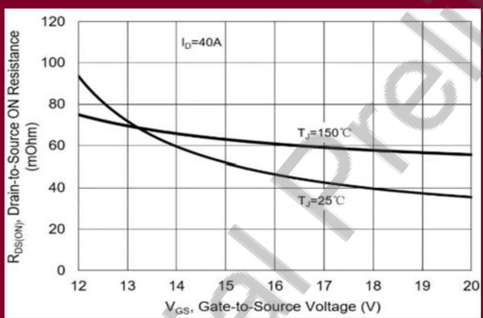

Figure 4: Typical Transfer Characteristics

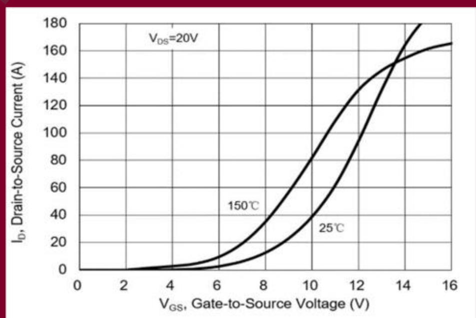

Figure 5: Typical Drain-to-Source ON Resistance at Tj = 25°C

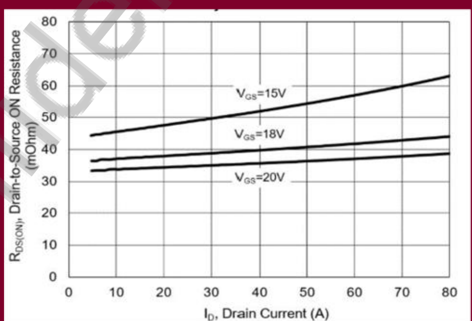

Figure 6: Typical Drain-to-Source ON Resistance at Tj = 150°C

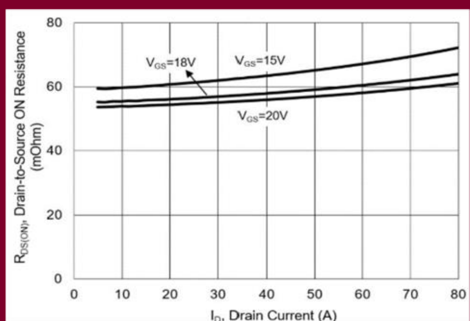

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Figure 7: Typical Body Diode Characteristics at Tj = 25°C

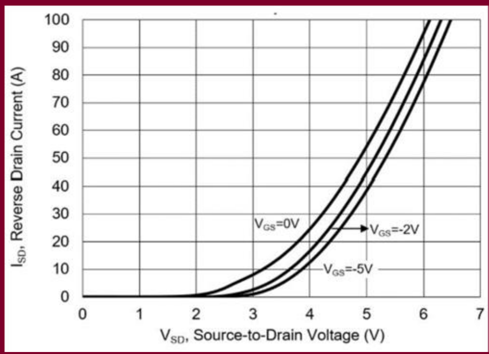

Figure 8: Typical Body Diode Characteristics at Tj=150°C

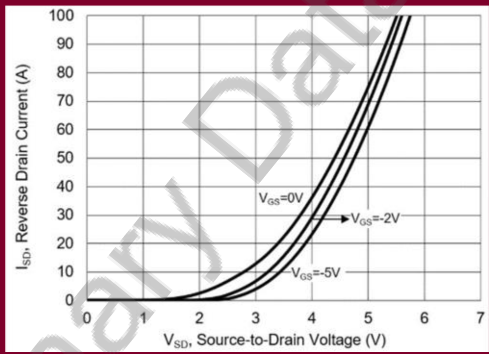

Figure 9: 3rd Quadrant Characteristics at Tj = 25°C

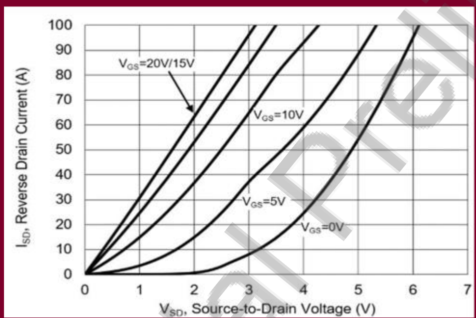

Figure 10: 3rd Quadrant Characteristics at Tj=150°C

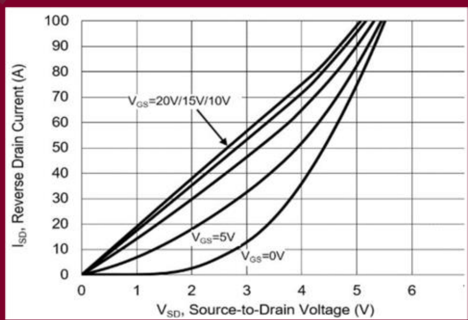

Figure 11: Typical Drain-to-Source ON Resistance vs Junction Temperature

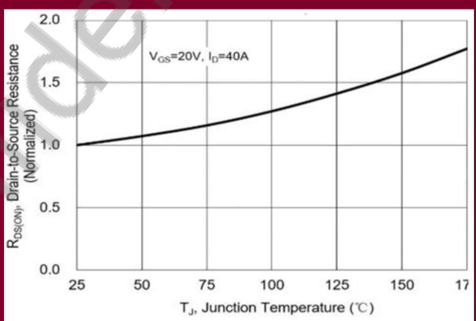

Figure 12: Typical Breakdown Voltage vs. Junction Temperature

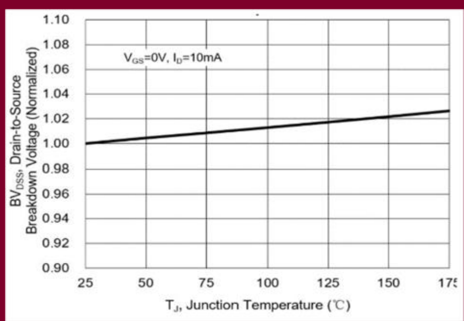

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Figure 13: Typical Threshold Voltage vs. Junction Temperature

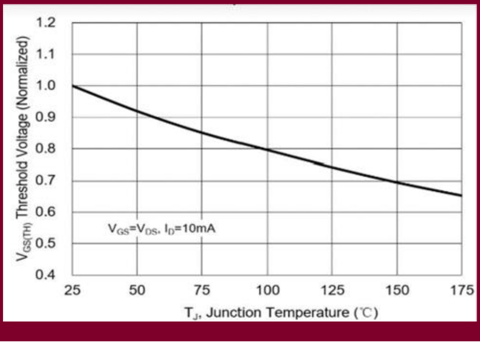

Figure 14: Thermal Impedance Junction to Case

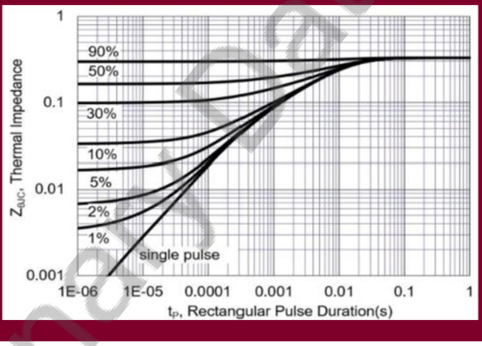

Figure 15: Typical Capacitance vs. Drain-to-Source Voltage

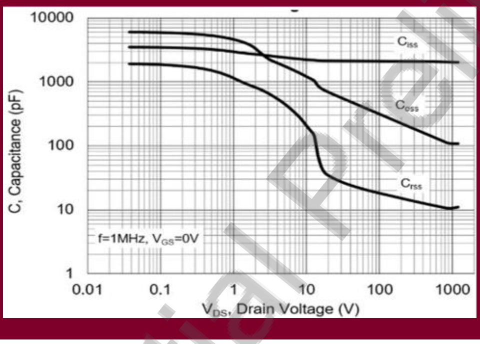

Figure 16: Maximum Peak Current Capability

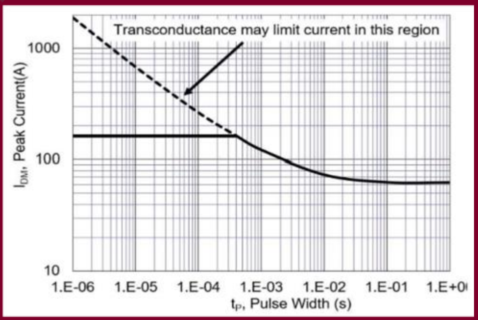

Figure 17: Typical Gate charge vs. Gate to Source voltage

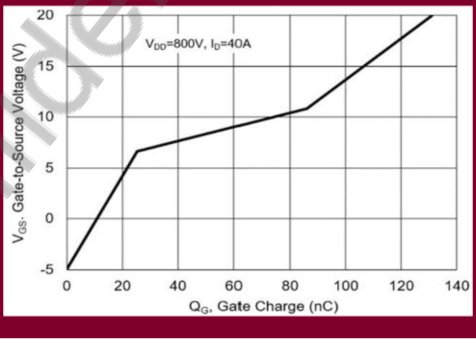

Figure 18: Maximum Power Dissipation vs Case Temperature

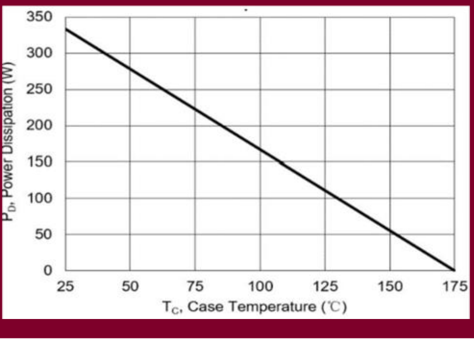

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Figure 19: Switching Time vs Rg

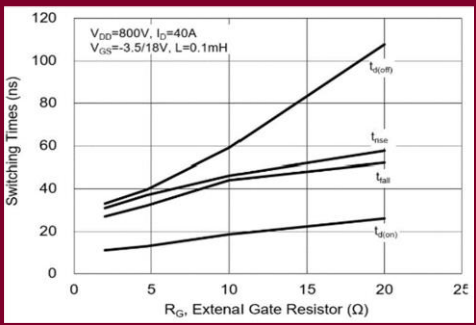


Figure 20: Switching Loss vs Rg

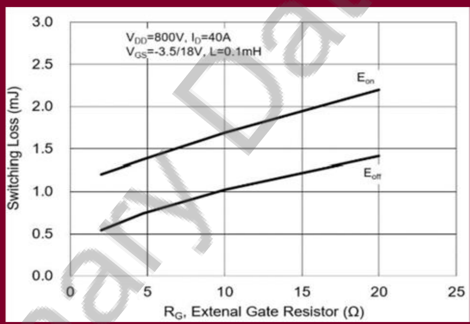


Figure 21: Switching Loss vs Drain Current

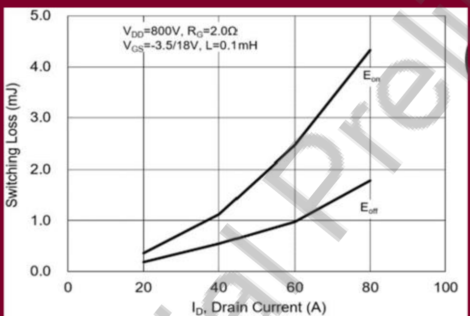


Figure 22: Switching Loss vs Drain Current

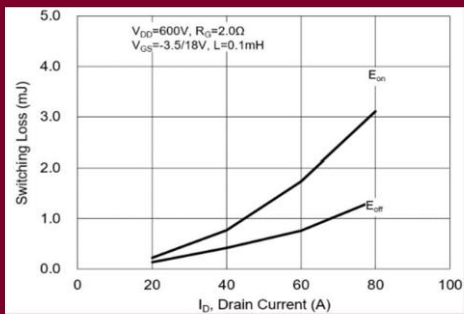


Figure 23: Typical Gate charge vs. Gate to Source voltage

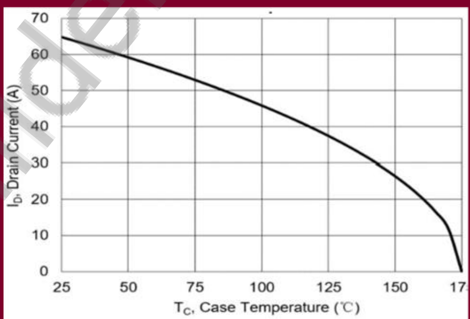
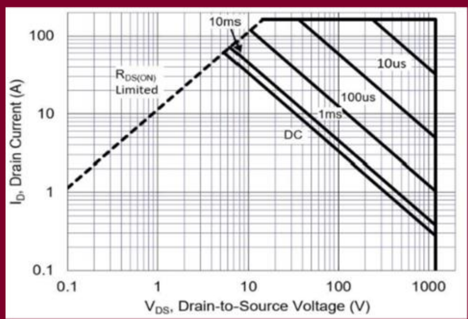


Figure 24: Maximum Power Dissipation vs Case Temperature



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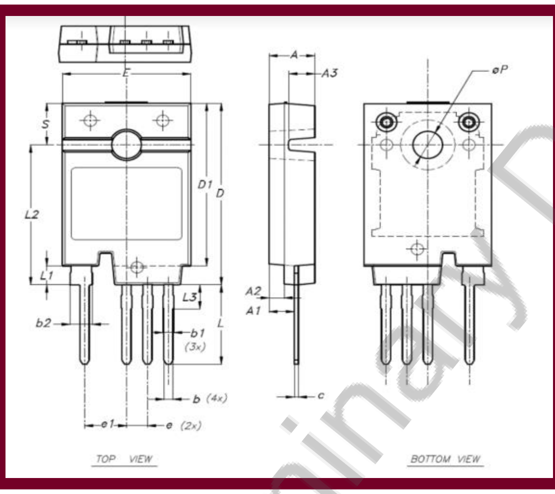

DIM	MIN(mm)	MAX(mm)	NOM(mm)
A	5.50	5.80	5.65
A1	2.85	3.25	3.15
A2			1.92
A3			3.18
B	0.95	1.30	1.10
B1	1.10	1.50	
B2	2.50	2.90	
C	0.40	0.80	
D	23.85	24.15	24
D1			21.50
E	15.45	15.75	15.60
E1			2.54
L			5.08
L1	10.20	10.80	
L2	2.20	2.80	2.50
L3			18.50
oP			3
S	3.55	3.65	
			5.50

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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