QS65SCM65D2P

Silicon Carbide (SiC)

MOSFET – SiC,

31mohm, 650V, M2

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Features

- Fast Switching with Low EMI/RFI
- Simple to Drive and Easy to Parallel
- Low Gate Charge Minimize Switching Loss
- Short Circuit Withstand Rated
- Improved Efficiency

Key Values

PARAMETER	VALUE	UNIT
$V_{(BR)DSS}$	650	V
$R_{DS(ON)}$ MAX	55 @ 20V	$m\Omega$
I_D MAX	65	A
E_{ON}	0.19	mJ
E_{OFF}	0.10	mJ
$V_{GS(TH)}$	3.0~5.0	V

Applications

- SMPS (Switching Mode Power Supplies)
- Solar Inverters
- UPS (Uninterruptable Power Supplies)
- Energy Storage

Part Number

QS65SCM65D2P

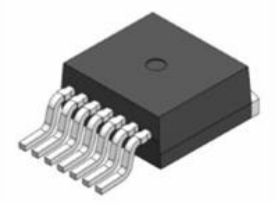
Package

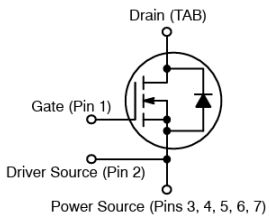
D2PAK-7L

Marking

Q

Package





N–CHANNEL MOSFET

ROHS Compliant
REACH Compliant

Ver 1.0

MAXIMUM RATINGS (TJ = 25°C unless otherwise noted)

Parameter			Symbol	Value	Unit
Drain – to-Source Voltage			V_{DSS}	650	V
Gate – to – Source Voltage			V_{GS}	-10 /$+25$	V
Recommended Operation Value of gate – Source Voltage		$T_C < 175℃$	V_{GSOP}	-5 /$+20$	V
Continuous Drain current	Steady state	$T_C = 25℃$	I_D	65	A
Power Dissipation			P_D	294	W
Continuous Drain current	Steady state	$T_C = 100℃$	I_D	46	A
Pulsed Drain Current		$T_C = 25℃$	I_{DM}	162	A
Operating Junction and Storage Temperature			T_J, T_{stg}	$-55\ TO$ $+ 175$	℃
Source Current			I_S	145	A
Single Pulse Drain to Source Avalanche Energy (I_L=12A_{pk}, L = 1mH (From Packaging)			EA_S	72	mJ

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, then device functionality should not be assumed, damage may occur and reliability may be affected.

THERMAL CHARACTERISTICS

Parameter	Symbol	Max	Unit
Junction-to-case – Steady State	$R_{\theta JC}$	0.51	°C/W
Junction-to-Ambient Steady State	$R_{\theta JA}$	40	°C/W

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain – to – Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V, I_D = 1mA$	650	–	–	V
Drain – to – Source breakdown voltage temperature coefficient	$V_{(BR)DSS}/T_J$	$I_D = 20mA\ refer\ to\ 25°C$	–	0.13	–	V/°C
Zero gate voltage drain current	$I_{GSS}+$	$V_{GS} = +20V, V_{DS} = 0V$	–	–	100	nA
Gate – to – Source Leakage Current	$I_{GSS}-$	$V_{GS} = -10V, V_{DS} = 0V$	–	–	−100	μA
ON CHARACTERISTICS						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS} = V_{DS},\ I_D = 8mA$	3.0	–	5.0	V
Recommended Gate Voltage	V_{GOP}		−5	–	+18	V
Drain-to-Source On Resistance	$R_{DS(ON)}$	$V_{GS} = 20V, I_D = 25A,$	–	55	70	$m\Omega$
		$V_{GS} = 18V, I_D = 25A$	–	71	–	
		$V_{GS} = 20V, I_D = 25A$ $T_J = 175°C$	–	48	–	
CHARGES, CAPACITANCES & GATE RESISTANCE						
Input capacitance	C_{ISS}	$V_{GS} = 0, V_{DS} = 400V,$ $f = 1MHz$	–	1946	–	pF
Output capacitance	C_{OSS}		–	182	–	
Reverse transfer capacitance	C_{RSS}		–	7.6	–	
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS} = -5/18, V_{DS} = 520V,$ $I_{DS} = 25A$	–	105	–	nC
Gate-to-Source Charge	Q_{GS}		–	29	–	
Gate-to-Drain Charge	Q_{GD}		–	33	–	
Gate-Resistance	R_G	$f = 1MHz$	–	8.6	–	Ω

SWITCHING CHARACTERISTICS						
Turn-on delay time	$t_{d(on)}$	$V_{GS} = -3.5/18, V_{DS} = 400V,$ $I_D = 25A, R_G = 2.0\Omega$ $inductive\ load$	–	21	–	ns
Rise time	t_r		–	17	–	
Turn-Off delay time	$t_{d(off)}$		–	27	–	
Fall time	t_f		–	15	–	
Turn-On Switching loss	E_{ON}		–	0.19	–	μJ
Turn-Off Switching loss	E_{OFF}		–	0.10	–	
Total Switching Loss	E_{TOT}		–	80	–	
SOURCE-DRAIN DIODE CHARACTERISTICS						
Continuous Source-Drain Diode Forward Current	I_{SD}	$Maximum\ Ratings$	–	–	65	A
Forward Diode Voltage	V_{SD}	$V_{GS} = 0V$ $I_S = 25A$	–	4.2	–	V
Reverse Recovery Time	t_{RR}	$V_{GS} = 0V, I_F = 25A,$ $\frac{d_i}{d_t} = 1000A/\mu S$	–	19	–	ns
Reverse Recovery Charge	Q_{RR}		–	61	–	nC
Peak Reverse Recovery Current	I_{mm}		–	4.8	–	A

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Figure 1: Typical Output Characteristics

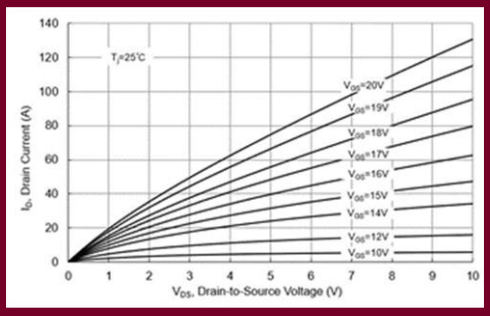

Figure 2: Typical Output Characteristics

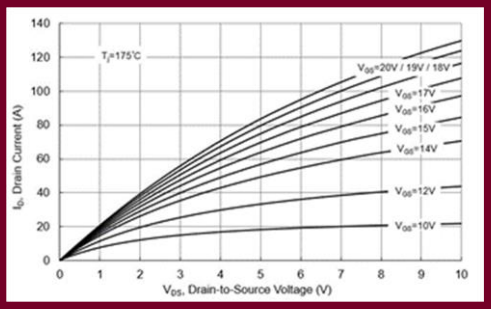

Figure 3: Typical Drain-to-Source ON resistance vs. Gate Voltage

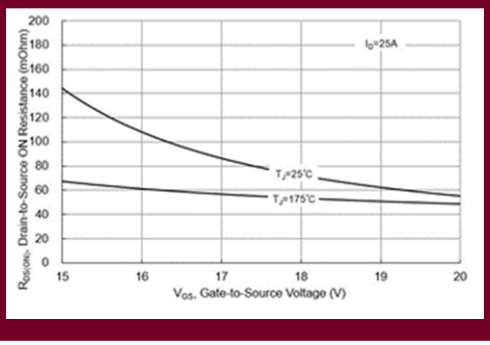

Figure 4: Typical Transfer Characteristics

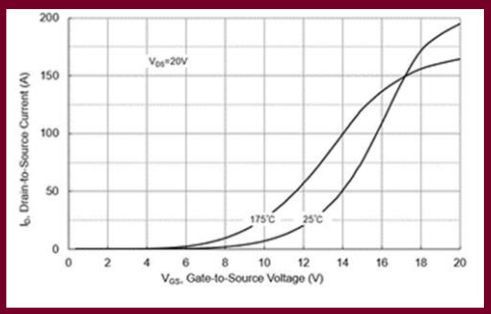

Figure 5: Typical Drain-to-Source ON Resistance

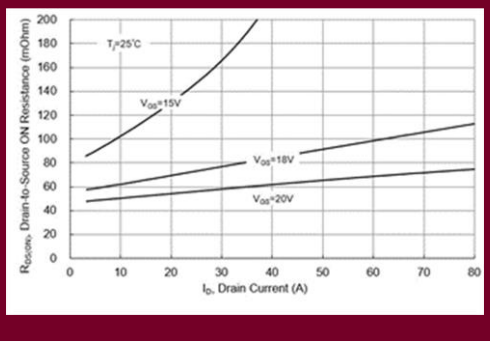

Figure 6: Typical Drain-to-Source ON Resistance

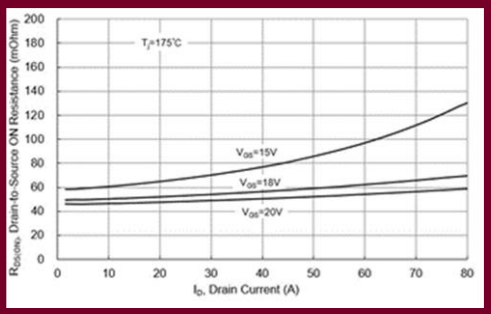

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Figure 7: Typical Body Diode Characteristics

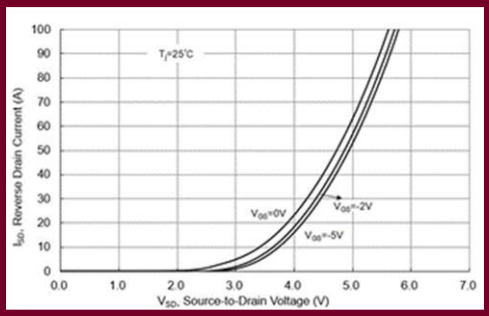

Figure 8: Typical Body Diode Characteristics

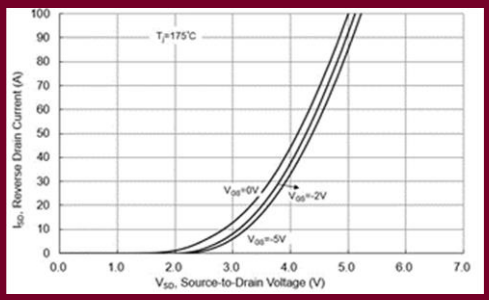

Figure 9: 3rd Quadrant Characteristics

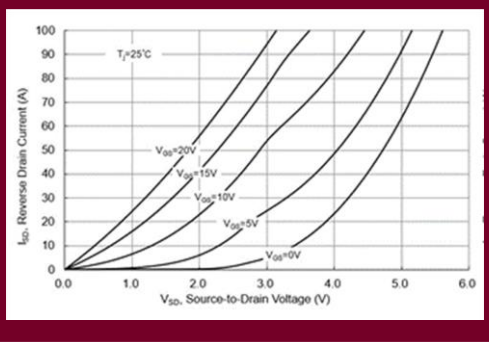

Figure 10: 3rd Quadrant Characteristics

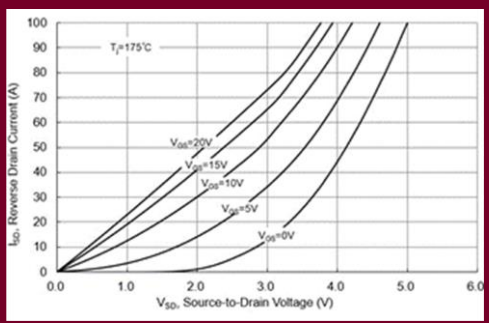

Figure 11: Typical Drain-to-Source On-resistance vs Junction Temperature

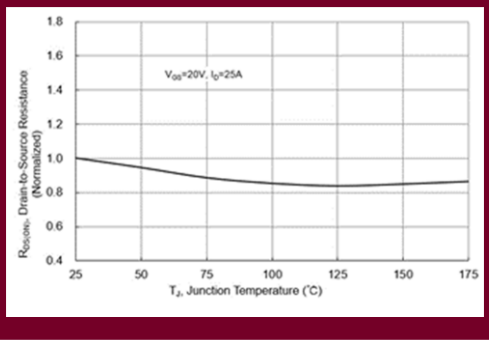

Figure 12: Typical Breakdown Voltage vs. Junction Temperature

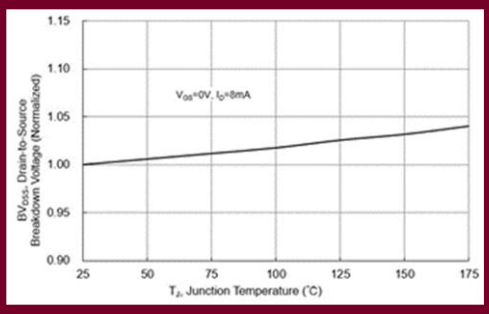

Figure 13: Typical Threshold Voltage vs, Junction Temperature

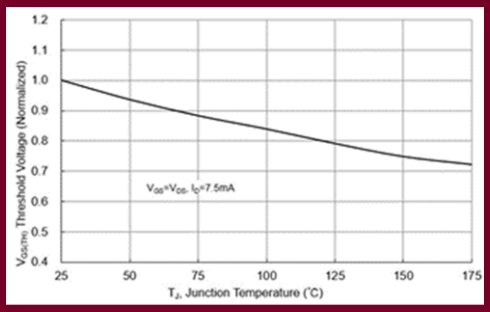

Figure 14: Typical Capacitance vs. Drain-to-Source Voltage

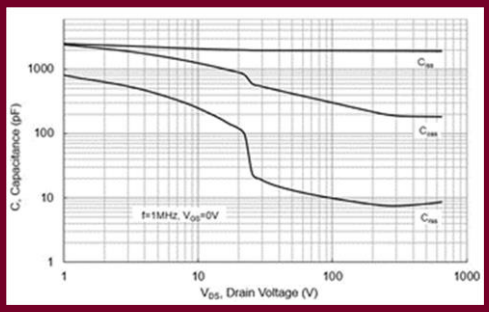

Figure 15: Typical Gate Charge vs. Gate-to-Source Voltage

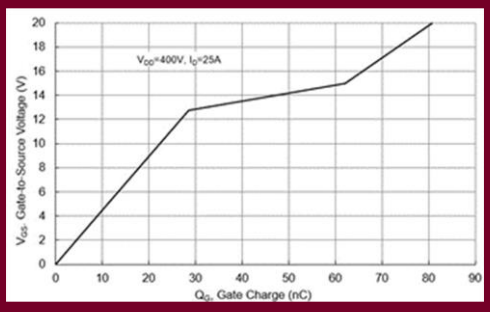

Figure 16: Switching Times vs R_G

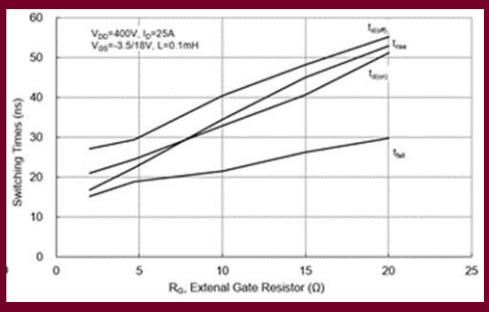

Figure 17: Switching Loss vs R_G

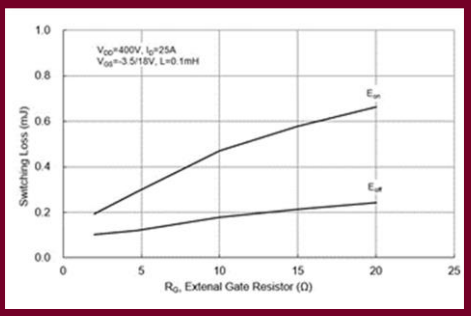

Figure 18: Switching Loss vs. Drain Current

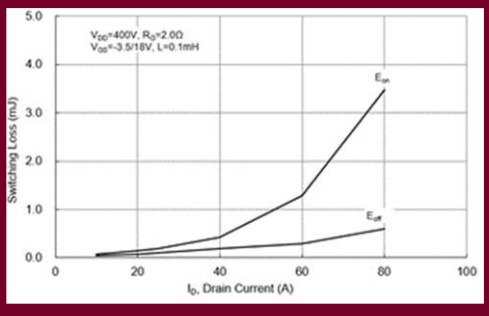

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Figure 19: Thermal Impedance Junction-to-Case

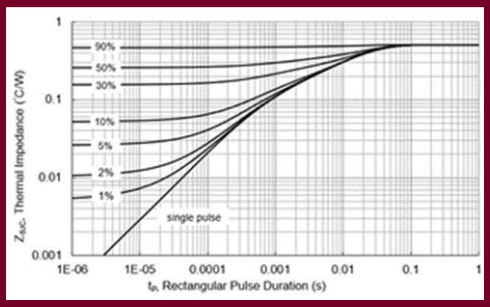


Figure 20: Maximum Peak Current Capability

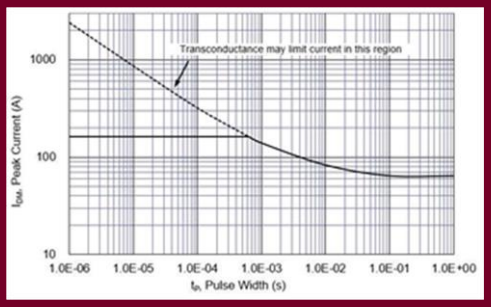


Figure 21: Maximum Power Dissipation vs. Case Temperature

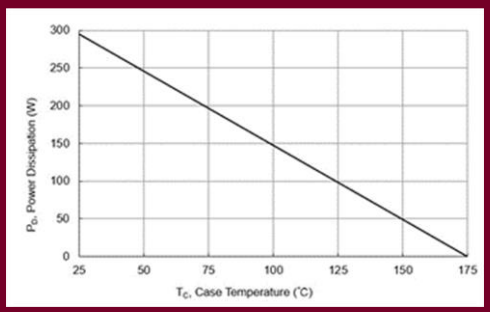


Figure 22: Maximum Continuous Drain Current vs. Case Temperature

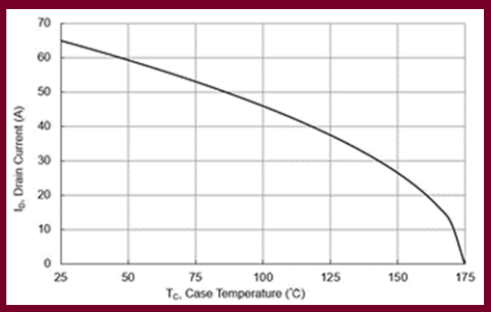
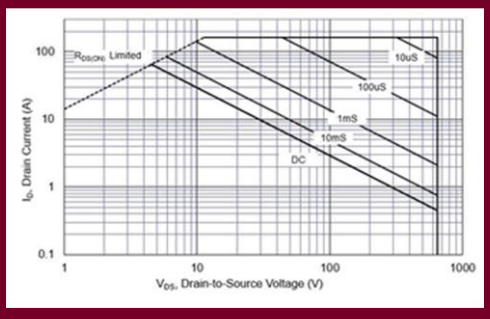
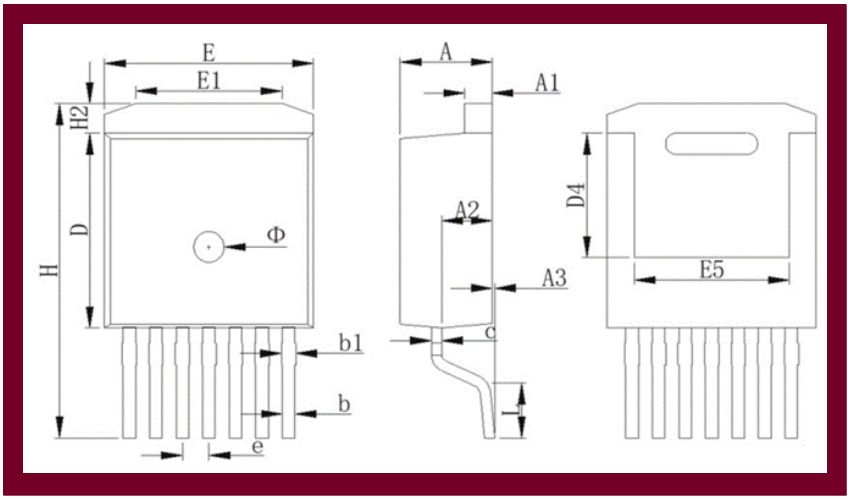


Figure 23: Maximum Forward Safe Operation Area





Symbol	MIN(mm)	MAX(mm)
A	4.300	4.560
A1	1.200	1.400
A2	2.450	2.750
A3	0.000	0.250
b	0.500	0.700
b1	0.600	0.900
c	0.450	0.600
D	8.930	9.230
D4	4.650	4.950
E	10.080	10.280
E1	6.500	7.500
E5	6.820	7.620
e	2.40	
H	15.000	16.000
H2	0.980	1.420
L	1.900	2.500
L1	6.480	7.080
Θ	1.400	1.600

Disclaimer:

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