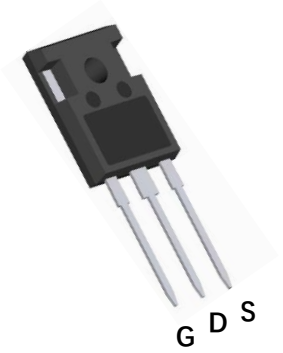
650V Planar SiC Power MOSFET

Parameter		Value	Unit
V_{DS}		650	V
$R_{DS(on)\_typ.}$	V_{GS}=15V	90	mΩ
I_D		36	A

Features

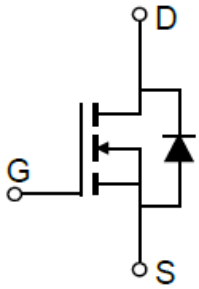
- Wide Bandgap SiC MOSFET Technology
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed Switching
- Low Reverse Recovery (Qrr)
- Robust against Parasitic Turn on Even 0V Turn off Gate Voltage



TO-247-3L TopView

Benefits

- Reduced Switching Losses
- Increased System Switching Frequency
- Increased Power Density
- Reduction of Heat Sink Requirements
- Reduced EMI



Schematic Diagram

Application

- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power Applications

Package parameters

Part Number	Marking	Package	Packaging Method
GSW90R065MC	GSW90R065MC	TO-247-3L	TUBE

Maximum ratings at T_j=25℃, Unless otherwise specified

Parameter	Symbol	Test Condition	Value	Unit
Drain to Source Voltage	V_{DS}	V_{GS} = 0V, I_D = 100μA	650	V
Gate to Source Voltage	V_{GS}	Absolute maximum values	-10/+22	V
Recommended Operation Voltage of Gate to Source	V_{GSop}	Recommended operational values	0/+18	V
Continuous Drain Current	I_D	V_{GS}=15V, T_C=25℃	36	A
		V_{GS}=15V, T_C=100℃	27	
Pulsed Drain Current	I_{DM}	V_{GS}=15V, T_C=25℃	72	A
Power Dissipation	P_{tot}	T_C=25℃, T_j=175℃	136	W
Operating and Storage Temperature	T_j, T_{stg}		-55 to +175	℃

Thermal Characteristics

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Thermal Resistance from Junction to Case	$R_{th(j-c)}$	-	1.1	-	℃/W

Electrical Characteristics

Static Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS}=0V, I_D=500μA	650			V
Gate Threshold Voltage	$V_{GS(th)}$	V_{GS}= V_{DS}, I_D=7.5mA	2.7		4.5	V
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS}=0V, V_{DS}=650V, T_j=25℃			10	μA
Gate to Source Leakage Current	I_{GSS}	V_{GS}=18V, V_{DS}=0V			250	nA
Drain to Source on Resistance	$R_{DS(on)}$	V_{GS}=15V, I_D=17A		90	120	mΩ
		V_{GS}=15V, I_D=17A, T_j=175℃		77		
		V_{GS}=18V, I_D=17A		63		
		V_{GS}=18V, I_D=17A, T_j=175℃		65		

Dynamic Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Input Capacitance	C_{iss}	V_{GS}=0V, V_{DS}=500V, f=100KHz, T_j=25℃		1040		pF
Output Capacitance	C_{oss}			96		
Reverse Transfer Capacitance	C_{rss}			9		
Total Gate Charge	Q_g	V_{GS}=0/15V, V_{DS}=500V, I_D=17A, T_j=25℃		41		nC
Gate-Source Charge	Q_{gs}			10		
Gate-Drain Charge	Q_{gd}			16		
Gate Resistance	R_g	V_{AC}=25mV, f=100KHz		3.0		Ω

Switching Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Turn-On Delay Time	$t_{d(on)}$	V_{GS}=0/15V, V_{DD}=500V, I_D=17A, R_g=2Ω		19		ns
Rise Time	t_r			115		
Turn-Off Delay Time	$t_{d(off)}$			31		
Fall Time	t_f			34		

Reverse Diode Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_{SD}=8.5A, T_j=25℃		3.5		V
Continuous Diode Forward Current	I_S	V_{GS}=0V, T_j=25℃		36		A
Reverse Recovery Time	t_{rr}	V_{GS} = 0V, I_{SD}=17A, V_R=500V, di/dt=550A/us, T_j=25℃		17.8		ns
Reverse Recovery Charge	Q_{rr}			63		nC
Peak Reverse Recovery Current	I_{rrm}			4.9		A

Typical Performance

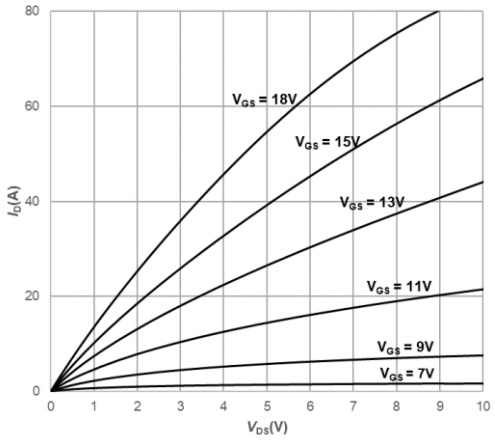


Fig1. Output Characteristics T_j=25℃

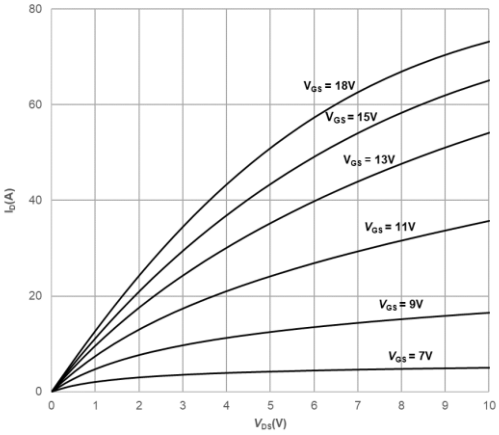


Fig2. Output Characteristics T_j=175℃

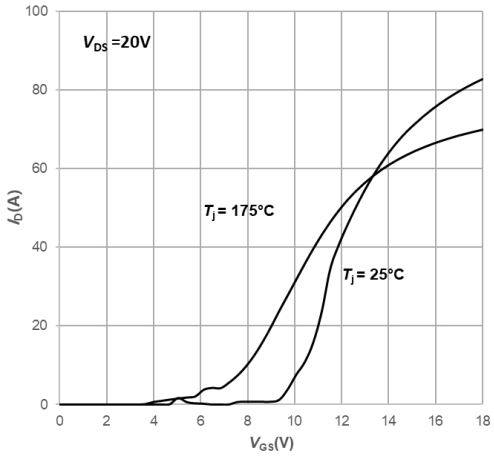


Fig3. Typical Transfer Characteristics

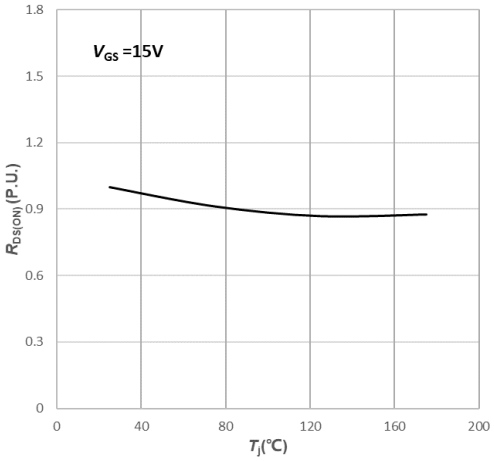


Fig4. Normalized On-Resistance vs. Temperature

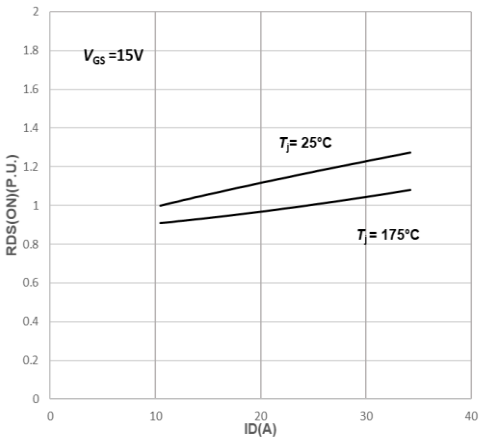


Fig5. Normalized On-Resistance vs. Drain Current For Various Temperatures

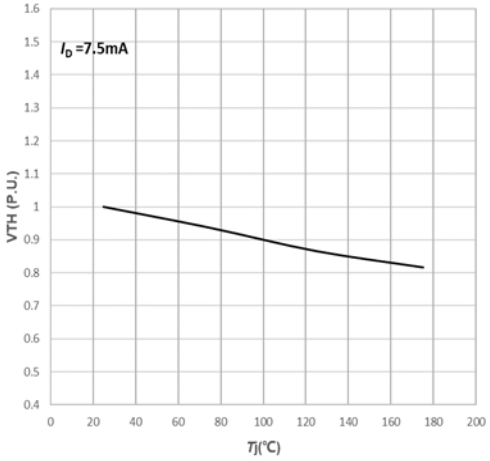


Fig6. Normalized Threshold Voltage vs. Temperature

Typical Performance

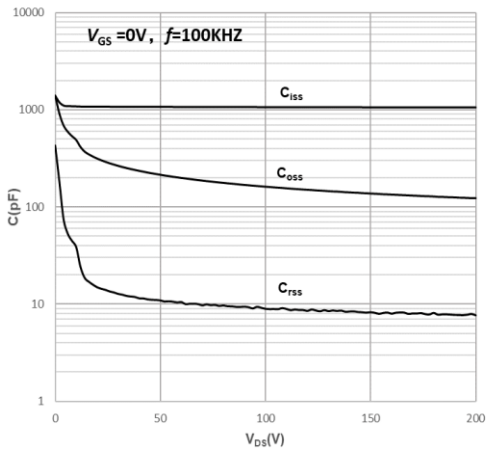


Fig7. Capacitances vs. Drain-Source Voltage (0-200V)

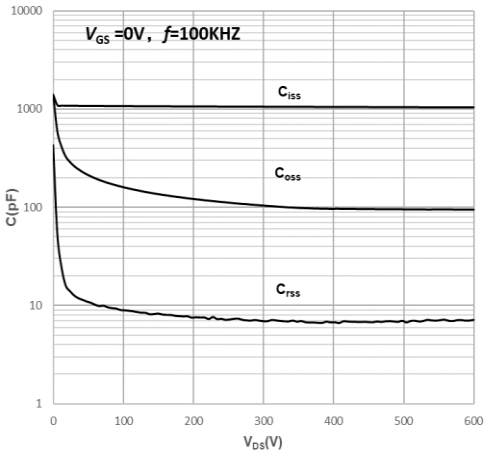


Fig8. Capacitances vs. Drain-Source Voltage (0-600V)

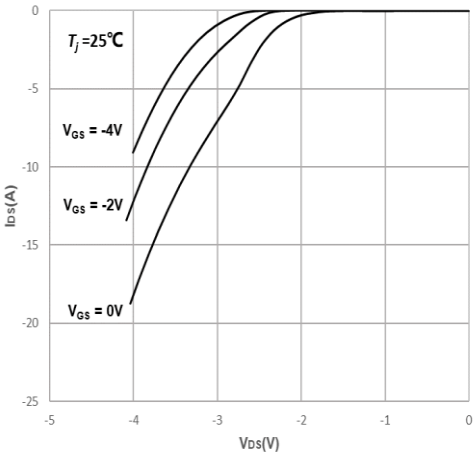
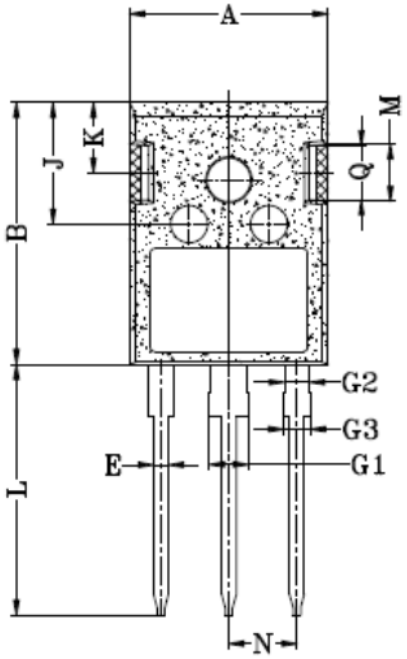
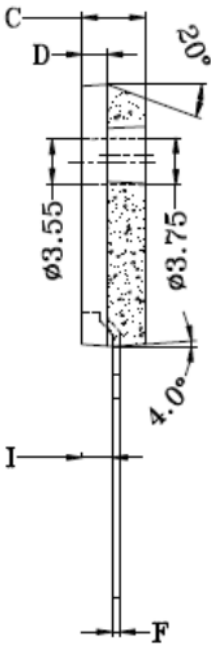


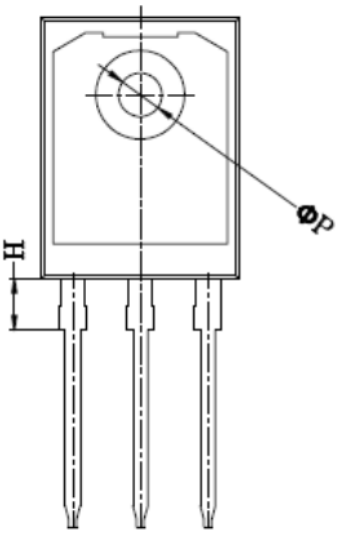
Fig9. Body Diode Characteristics

TO-247-3L Package Dimensions





Symbol	Dimensions in Millimeter	
	MIN	MAX
A	15.70	15.90
B	20.90	21.10
C	4.90	5.10
D	1.90	2.10
E	1.10	1.30
F	0.50	0.70
G1	3.00	3.20
G2	1.85	2.15
G3	2.00	2.20
H	4.00	4.30
I	2.30	2.50
J	9.65	9.85
K	5.54	5.74
L	19.80	20.20
M	4.5	4.7
N	5.286	5.586
ϕ P	3.40	3.60
Q	4.232	4.432



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Reversion History

Rev.	Date	Change Description
1.0	2025-08-12	Form the initial version