

## 650V Planar SiC Power MOSFET

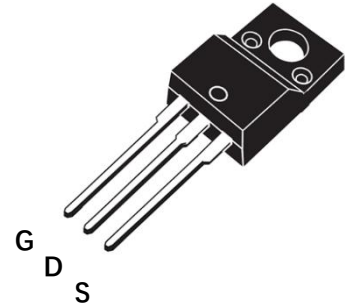
Parameter	Value	Unit
$V_{DS}$	650	V
$R_{DS(on\_typ.)}$ $V_{GS}=15V$	180	m $\Omega$
$I_D$	15	A

### 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

### Benefits

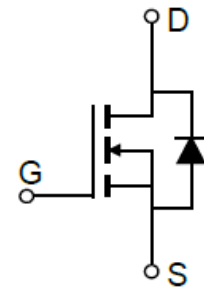
- Reduced Switching Losses
- Increased System Switching Frequency
- Increased Power Density
- Reduction of Heat Sink Requirements
- Reduced EMI



TO-220F-3L TopView

### Application

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



Schematic Diagram

### Package parameters

Part Number	Marking	Package	Packaging Method
GSA180R065MC	GSA180R065MC	TO-220F-3L	Tube

## Maximum ratings at $T_j=25^\circ\text{C}$ , Unless otherwise specified

Parameter	Symbol	Test Condition	Value	Unit
Drain to Source Voltage	$V_{DS}$	$V_{GS} = 0V, I_D = 100\mu\text{A}$	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	$I_D$	$V_{GS}=15V, T_C=25^\circ\text{C}$	15	A
		$V_{GS}=15V, T_C=100^\circ\text{C}$	10	
Pulsed Drain Current	$I_{DM}$	$V_{GS}=15V, T_C=25^\circ\text{C}$	30	A
Power Dissipation	$P_{tot}$	$T_C=25^\circ\text{C}, T_j=175^\circ\text{C}$	42	W
Operating and Storage Temperature	$T_j, T_{stg}$		-55 to +175	$^\circ\text{C}$

## Thermal Characteristics

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Thermal Resistance from Junction to Case	$R_{th(j-c)}$	-	3.6	-	$^\circ\text{C}/\text{W}$

## Electrical Characteristics

### Static Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Drain to Source Breakdown Voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=500\mu\text{A}$	650			V
Gate Threshold Voltage	$V_{GS(th)}$	$V_{GS} = V_{DS}, I_D=3.5\text{mA}$	2.7		4.5	V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=650V, T_j=25^\circ\text{C}$			10	$\mu\text{A}$
Gate to Source Leakage Current	$I_{GSS}$	$V_{GS}=18V, V_{DS}=0V$			250	nA
Drain to Source on Resistance	$R_{DS(on)}$	$V_{GS}=15V, I_D=8.5\text{A}$		180	240	m $\Omega$
		$V_{GS}=15V, I_D=8.5\text{A}, T_j=175^\circ\text{C}$		160		
		$V_{GS}=18V, I_D=8.5\text{A}$		120		
		$V_{GS}=18V, I_D=8.5\text{A}, T_j=175^\circ\text{C}$		130		

## Dynamic Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Input Capacitance	$C_{iss}$	$V_{GS}=0V, V_{DS}=500V, f=1MHz,$ $T_j=25^\circ C$		491		pF
Output Capacitance	$C_{oss}$			39		
Reverse Transfer Capacitance	$C_{rss}$			4.2		
Total Gate Charge	$Q_g$	$V_{GS}=0/15V, V_{DS}=500V, I_D=8.5A,$ $T_j=25^\circ C$		28.6		nC
Gate-Source Charge	$Q_{gs}$			13.8		
Gate-Drain Charge	$Q_{gd}$			8.3		
Gate Resistance	$R_g$	$V_{AC}=25mV, f=1MHz$		3.3		$\Omega$

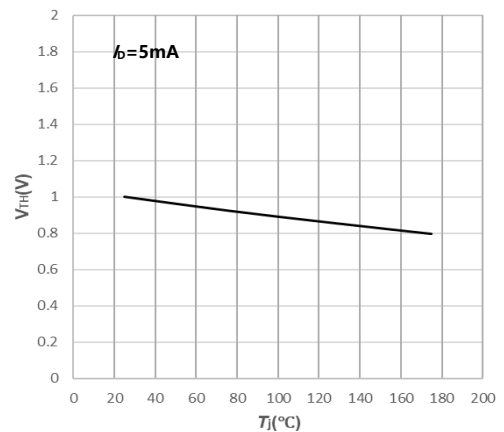
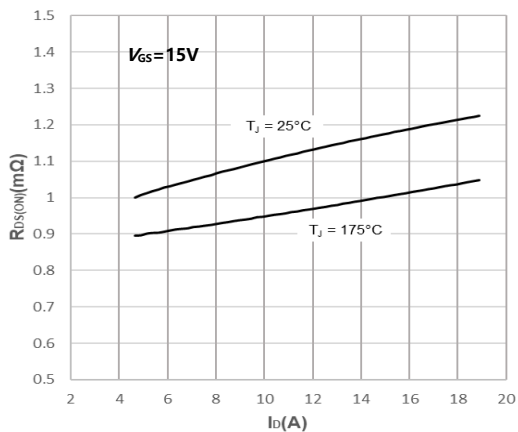
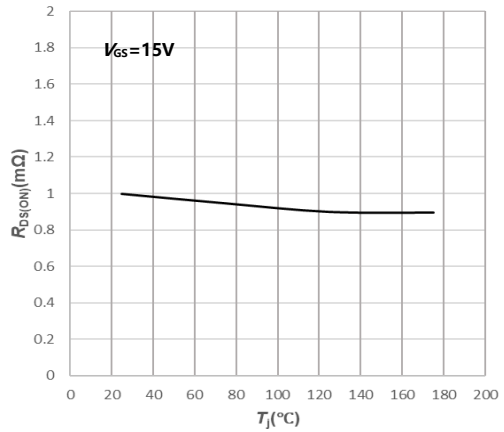
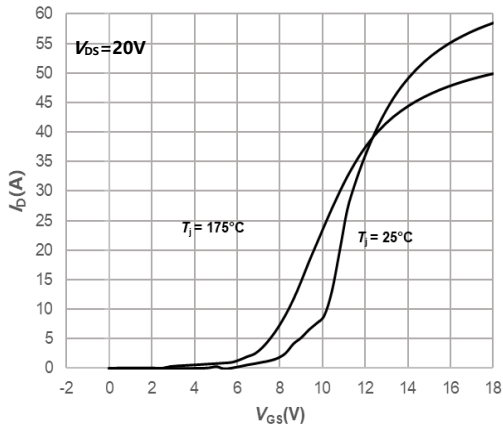
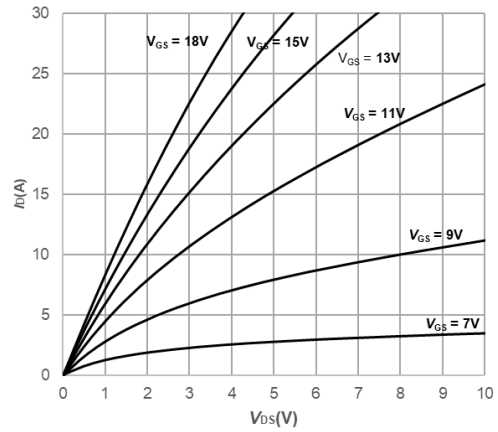
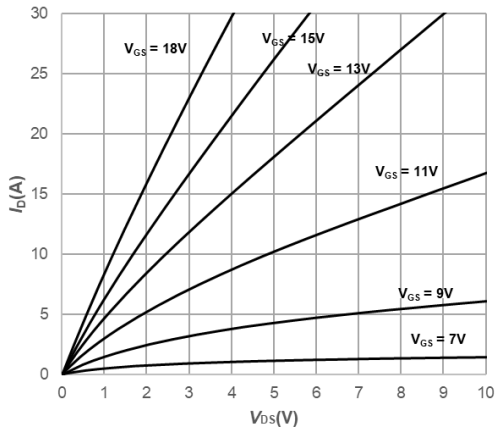
## Switching Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Turn-On Delay Time	$t_{d(on)}$	$V_{GS}=0/15V, V_{DD}=500V,$ $I_D=8.5A, R_g=10\Omega$		16		ns
Rise Time	$t_r$			55		
Turn-Off Delay Time	$t_{d(off)}$			34		
Fall Time	$t_f$			71		

## Reverse Diode Characteristics

Parameter	Symbol	Test Condition	Value			Unit
			Min.	Typ.	Max.	
Diode Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=5A, T_j=25^\circ C$	-	3.4		V
Continuous Diode Forward Current	$I_S$	$V_{GS}=0V, T_j=25^\circ C$		15		A
Reverse Recovery Time	$t_{rr}$	$V_{GS}=0V, I_{SD}=8.5A,$ $V_R=500V, di/dt=530A/us, T_j=25^\circ C$		17.6		ns
Reverse Recovery Charge	$Q_{rr}$			43		nC
Peak Reverse Recovery Current	$I_{rrm}$			4.2		A

## Typical Performance



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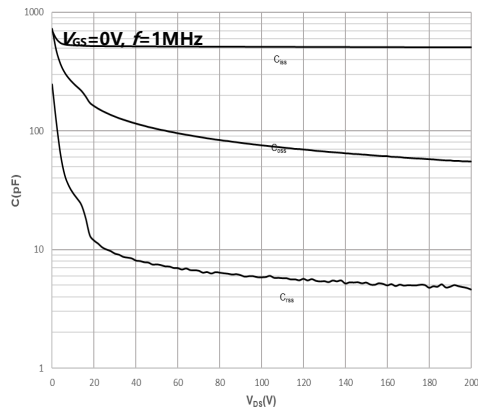


Fig7. Capacitances vs. Drain-Source Voltage (0-200V)

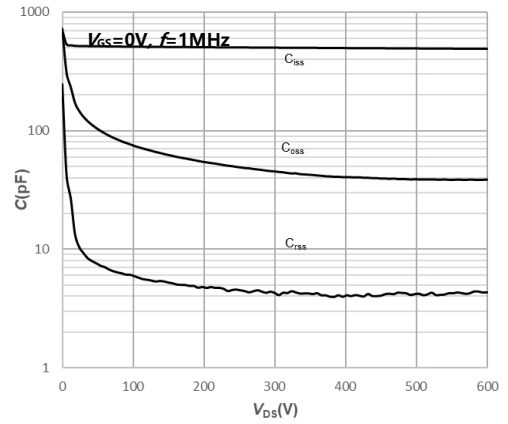


Fig8. Capacitances vs. Drain-Source Voltage (0-600V)

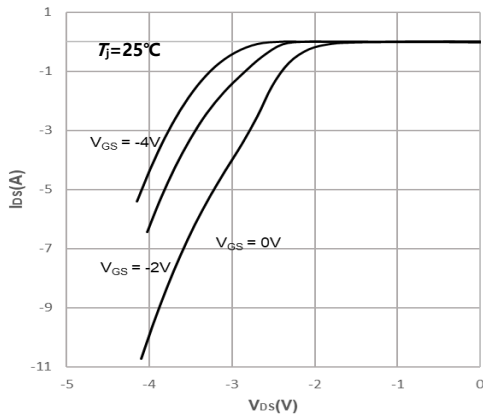
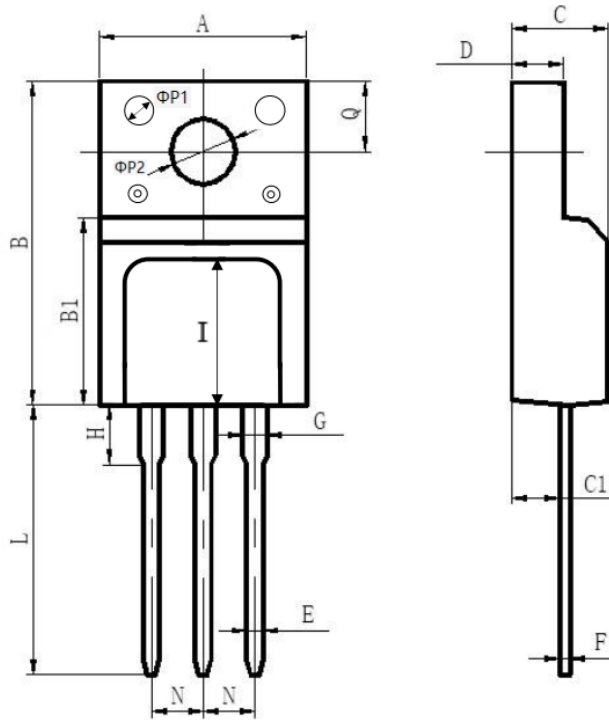


Fig9. Body Diode Characteristics

# GSA180R065MC

## TO-220F-3L Package Dimensions



Ref.	Dimensions(mm)	
	MIN	MAX
A	9.70	10.30
B	15.50	16.10
B1	8.99	9.39
C	4.40	4.80
C1	2.15	2.55
D	2.44	2.64
E	0.70	0.90
F	0.40	0.60
G	1.12	1.42
H	3.40	3.80
I	7.40	7.60
L	12.6	13.6
N	2.34	2.74
Q	3.15	3.55
ΦP1	1.40	1.60
ΦP2	3.00	3.30

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## Reversion History

Rev.	Date	Change Description
1.0	2025-06-15	Form the initial version
1.1	2025-08-20	Update electrical parameter