

Silicon Carbide Power MOSFET 1200V N-Channel MOS
■ Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications

■ Features

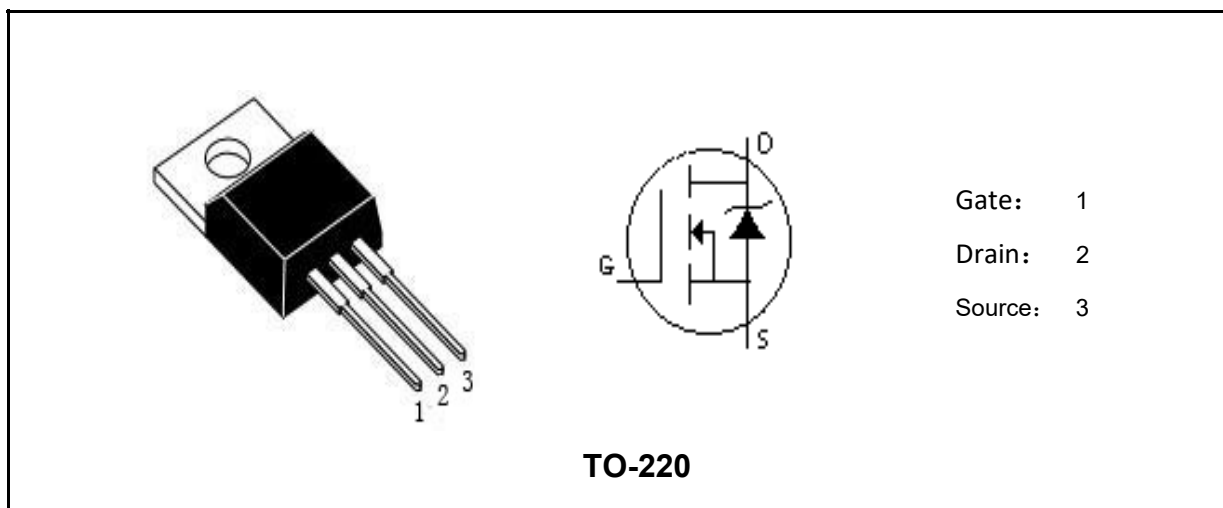
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

■ Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

■ Product Summary

V_{DS}	1200	V
I_D	28	A
$R_{DS(ON)}$, Typ@20V	80	m Ω
Q_g	85	nC



Marking	Package	Packaging	Min. package quantity
MC3C080R120	TO-220	Tube	1000



■ Absolute Maximum Ratings (Tc=25°C unless otherwise noted)

Parameter	Symbol	Ratings	Unit
Drain-Source Voltage	V_{DS}	1200	V
Gate-Source Voltage	V_{GS}	- 10/+25	V
Recommended operational values	V_{GSop}	- 5/+20	V
Continuous Drain Current Tc=25°C (Note 1)	I_D	28	A
Continuous Drain Current Tc=100°C (Note 1)		20	A
Drain Current-Pulsed (Note 1)	I_{DM}	70	A
Total Dissipation	P_D	156	W
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	-55~150	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.

■ Thermal Characteristics

Parameter	Symbol	Max	Unit
Maximum Junction-to-Case	$R_{\theta JC}$	0.8	°C/W
Maximum Junction-to-Ambient	$R_{\theta JA}$	60	°C/W

Note 1: Ensure that the channel temperature does not exceed 150°C.

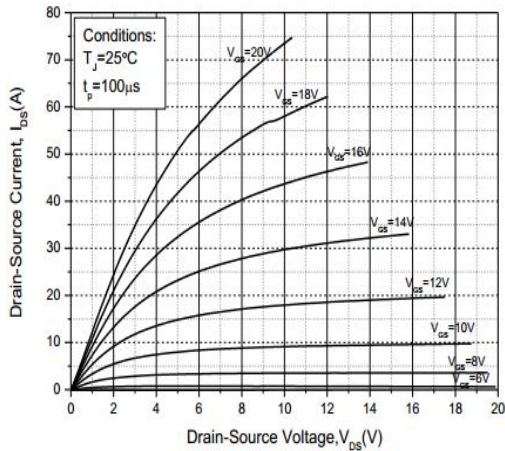
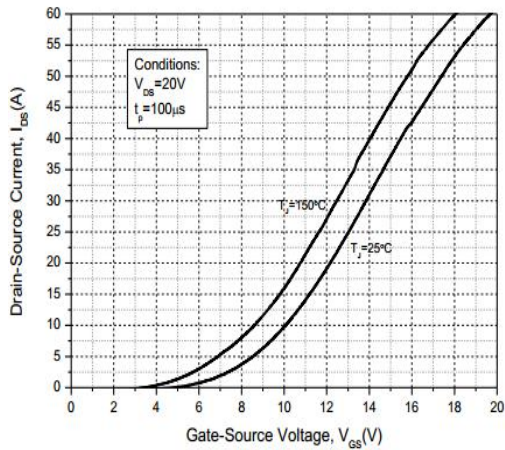
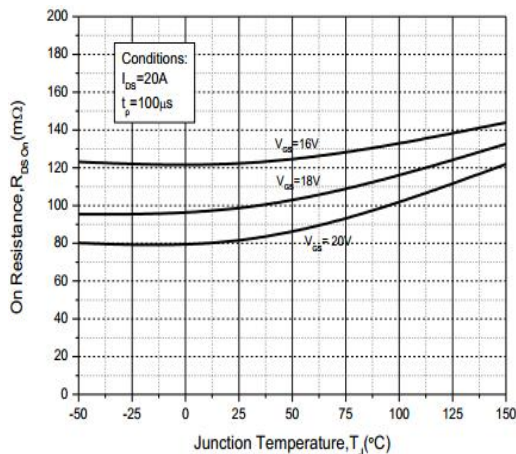
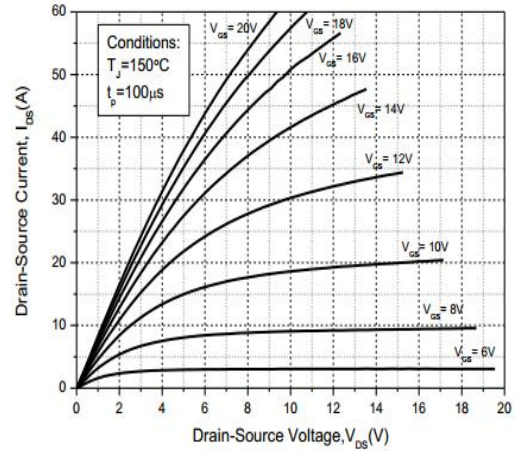
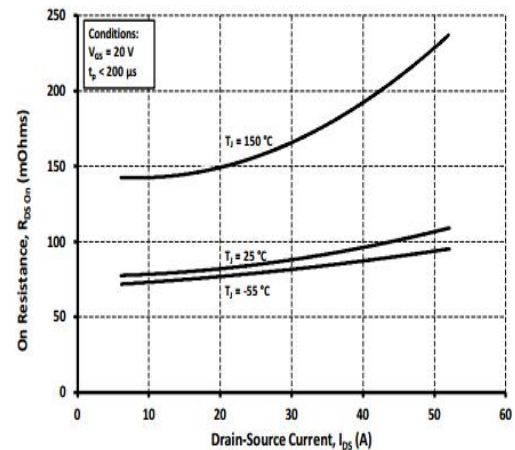
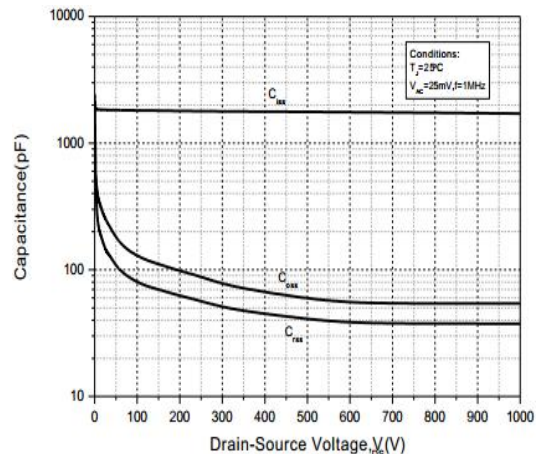
Note: This transistor is sensitive to electrostatic discharge and should be handled with care.

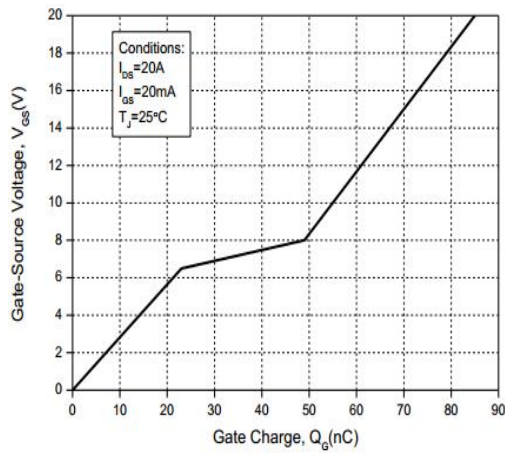


■ Electrical Characteristics (Tc=25°C unless otherwise noted)

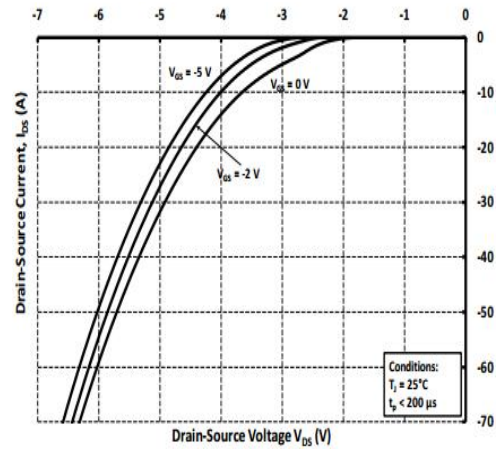
Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Static Parameters						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS}=0V, I_D=100\mu A$	1200	-	-	V
Drain-Source Leakage Current	I_{DSS}	$V_{DS}=1200V, V_{GS}=0V$	-	2	100	μA
Gate-Body Leakage Current	I_{GSS}	$V_{GS}=20V, V_{DS}=0V$	-	50	200	nA
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=5mA$	1.8	2.6	3.5	V
Drain-Source On Resistance	$R_{DS(ON)}$	$V_{GS}=20V, I_D=20A$	-	80	100	m Ω
		$T_j=150^\circ C$	-	130	-	
Transconductance	g_{fs}	$V_{GS}=20V, I_D=20A$	-	2	-	S
Dynamic Characteristics						
Input Capacitance	C_{iss}	$V_{DS}=1000V, V_{GS}=0V,$ $f=1.0MHz$	-	1710	-	pF
Output Capacitance	C_{oss}		-	54	-	pF
Reverse Transfer Capacitance	C_{rss}		-	37	-	pF
Gate Resistance	R_g	$V_{AC}=25mV,$ $f=1.0MHz$	-	2.8	-	Ω
Switching Parameters						
Turn-On Delay Time	$t_{d(on)}$	$V_{DS}=800V, I_D=20A,$ $V_{GS}=-5/20V, R_G=5\Omega$ $R_L=40\Omega,$ Timing relative to V_{DS} $L=142\mu H$	-	23	-	ns
Turn-On Rise Time	t_r		-	60	-	ns
Turn-Off Delay Time	$t_{d(off)}$		-	17	-	ns
Turn-Off Fall Time	t_f		-	12	-	ns
Turn-On Switching Energy	E_{ON}		-	180	-	μJ
Turn-Off Switching Energy	E_{OFF}		-	70	-	
Total Gate Charge	Q_g		$V_{DD}=800V, I_D=20A,$ $V_{GS}=-5/20V$	-	85	-
Gate-Source Charge	Q_{gs}	-		23	-	nC
Gate-Drain Charge	Q_{gd}	-		26	-	nC
Source-Drain Characteristics						
Diode Forward Voltage	V_{sd}	$V_{GS}=-5V, I_S=10A$	-	3.8	-	V
Continuous Diode Forward Current	I_S	$T_C=25^\circ C$	-	-	28	A
Reverse Recovery Time	t_{rr}	$V_{GS}=-5V, I_{SD}=20A$ $V_R=800V$ $di/dt=1200A/\mu s$	-	22	-	ns
Reverse Recovery Charge	Q_{rr}		-	145	-	nC
Peak Reverse Recovery Current	I_{rm}		-	10	-	A



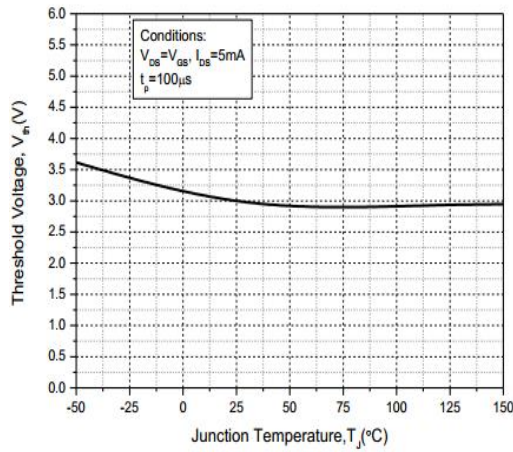
Characteristics Curves

Output Characteristics $T_j = 25^\circ\text{C}$

Transfer Characteristics

Normalized On-Resistance vs. Temperature

Output Characteristics $T_j = 150^\circ\text{C}$

On-Resistance vs. Drain Current

Capacitance

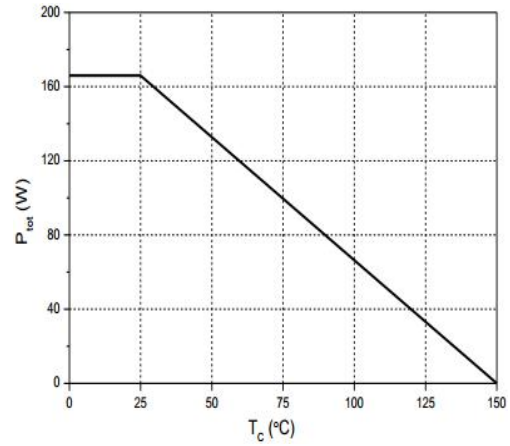
Gate Charge Waveform



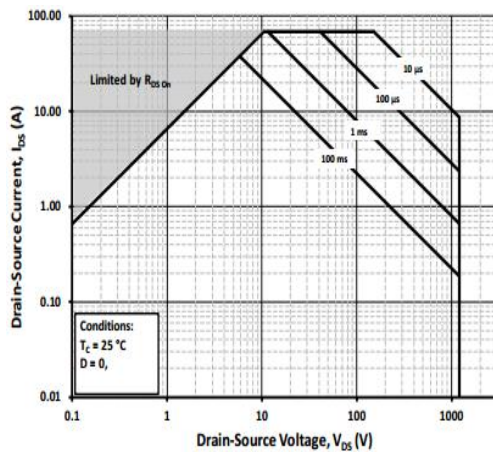
Source-Drain Diode Characteristics



Threshold Voltage vs. Temperature



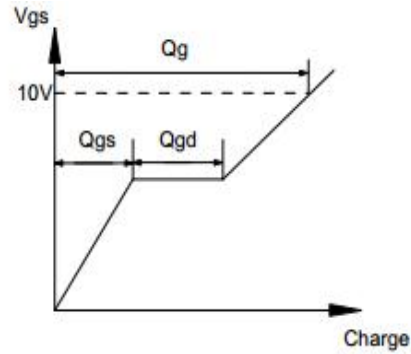
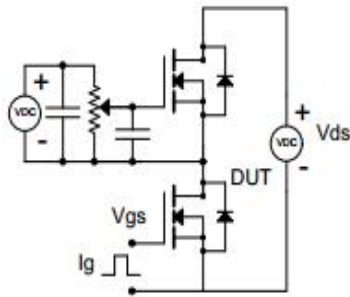
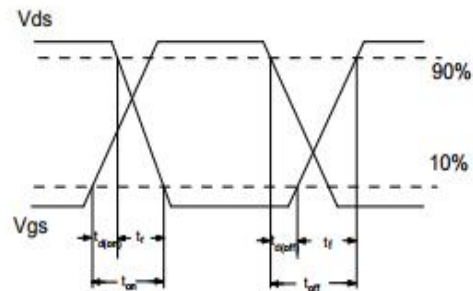
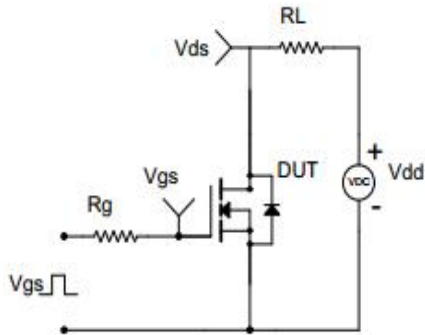
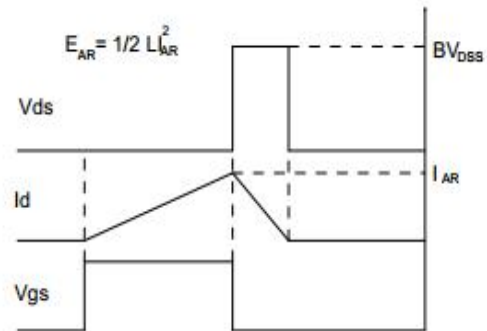
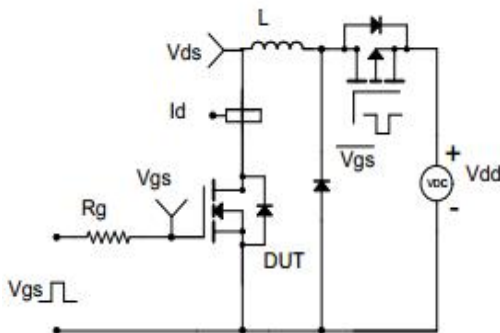
Power Dissipation Derating



Safe Operating Area

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



■ Test Circuit & Waveform
Gate Charge Test Circuit & Waveform

Resistive Switching Test Circuit & Waveform

Unclamped Inductive Switching (UIS) Test Circuit & Waveform




■ TO-220 Package Dimensions

Unit: mm

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	4.00		4.80	e	2.44	2.54	2.64
B	1.20		1.40	F	1.10		1.40
B1	1.00		1.40	L	12.50		14.50
b1	0.75		0.95	L1	3.00	3.50	4.00
c	0.40		0.55	ΦP	3.70	3.80	3.90
D	15.00		16.50	Q	2.50		3.00
D1	5.90		6.90	Q1	2.00		2.90
E	9.90		10.70	Y	8.02	8.12	8.22

