

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

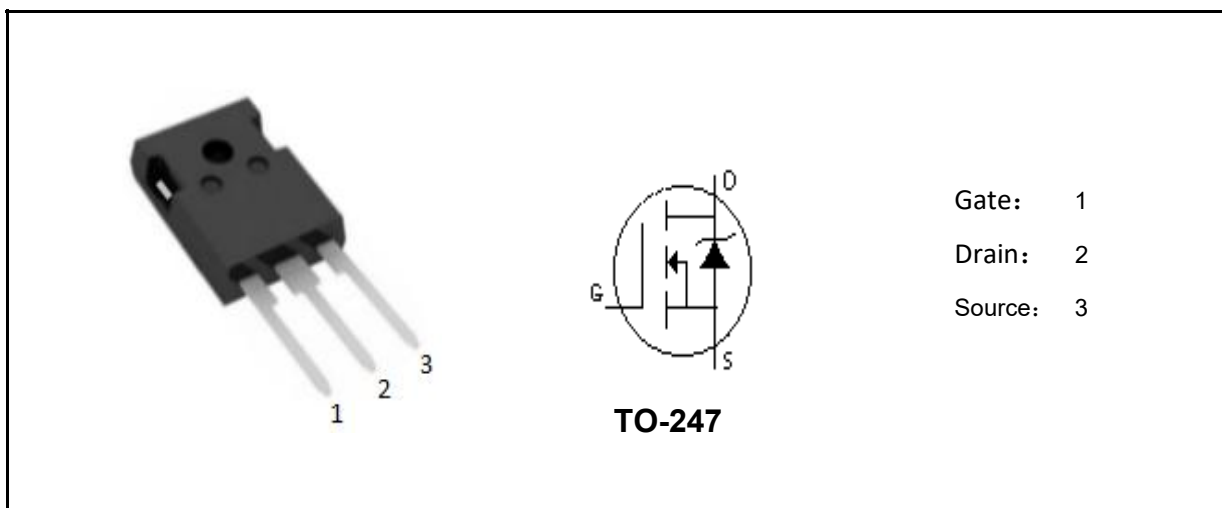
- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

■ Benefits

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

■ Product Summary

| | | |
|-----------------------|------|------------|
| V_{DS} | 1200 | V |
| I_D | 17 | A |
| $R_{DS(ON)}, Typ@20V$ | 160 | m Ω |
| Q_g | 42 | nC |



| Marking | Package | Packaging | Min. package quantity |
|-------------|---------|-----------|-----------------------|
| MS3C160R120 | TO-247 | Tube | 450 |



■ 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 | 17 | A |
| Continuous Drain Current Tc=100°C (Note 1) | | 11 | A |
| Drain Current-Pulsed (Note 1) | I_{DM} | 38 | A |
| Total Dissipation | P_D | 125 | 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 | $R_{\theta JC}$ | 1 | °C/W |
| Maximum Junction-to-Ambient | $R_{\theta JA}$ | 50 | °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.



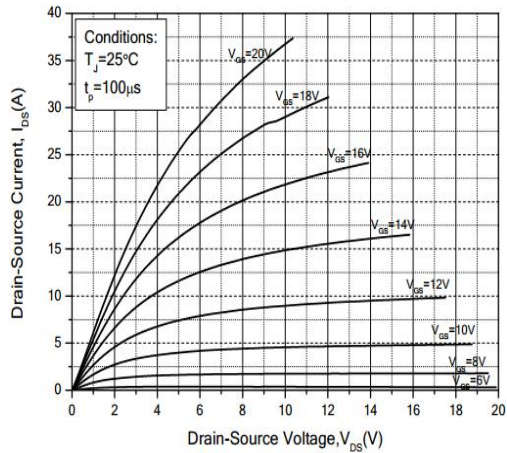
■ Electrical Characteristics (T_c=25°C unless otherwise noted)

| 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} | $V_{DS}=1200V, V_{GS}=0V$ | - | 1 | 100 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | 20 | ± 200 | nA |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=2.5mA$ | 2.0 | 2.4 | 4.0 | V |
| Drain-Source On Resistance | $R_{DS(ON)}$ | $V_{GS}=20V, I_D=10A$ | - | 160 | 192 | m Ω |
| | | T _j =150°C | - | 285 | - | |
| Transconductance | g_{fs} | $V_{GS}=20V, I_D=10A$ | - | 4.2 | - | S |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=1000V, V_{GS}=0V,$ $f=1.0MHz$ | - | 950 | - | pF |
| Output Capacitance | C_{oss} | | - | 35 | - | pF |
| Reverse Transfer Capacitance | C_{rss} | | - | 8.5 | - | pF |
| Gate Resistance | R_g | $V_{AC}=25mV,$ $f=1.0MHz$ | - | 5.8 | - | Ω |
| Switching Parameters | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DS}=800V, I_D=10A,$ $V_{GS}=-5/20V, R_G=2.5\Omega$ $R_L=80\Omega,$ Timing relative to V_{DS} $L=256\mu H$ | - | 12 | - | ns |
| Turn-On Rise Time | t_r | | - | 20 | - | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 15 | - | ns |
| Turn-Off Rise Time | t_f | | - | 10 | - | ns |
| Turn-On Switching Energy | E_{ON} | | - | 95 | - | μJ |
| Turn-Off Switching Energy | E_{OFF} | | - | 48 | - | |
| Total Gate Charge | Q_g | | $V_{DD}=800V, I_D=10A,$ $V_{GS}=-5/20V$ | - | 42 | - |
| Gate-Source Charge | Q_{gs} | - | | 9 | - | nC |
| Gate-Drain Charge | Q_{gd} | - | | 17 | - | nC |
| Source-Drain Characteristics | | | | | | |
| Diode Forward Voltage | V_{sd} | $V_{GS}=-5V, I_S=5A$ | - | 3.5 | - | V |
| Continuous Diode Forward Current | I_S | T _c =25°C | - | - | 17 | A |
| Reverse Recovery Time | t_{rr} | $V_{GS}=-5V, I_{SD}=10A$ $V_R=800V$ $di/dt=1000A/\mu s$ | - | 14 | - | ns |
| Reverse Recovery Charge | Q_{rr} | | - | 44 | - | nC |
| Peak Reverse Recovery Current | I_{rm} | | - | 6.0 | - | A |

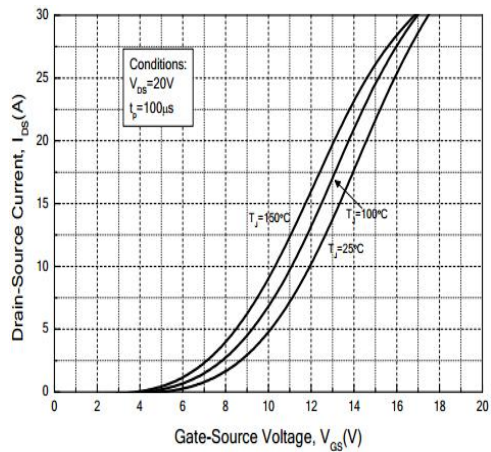




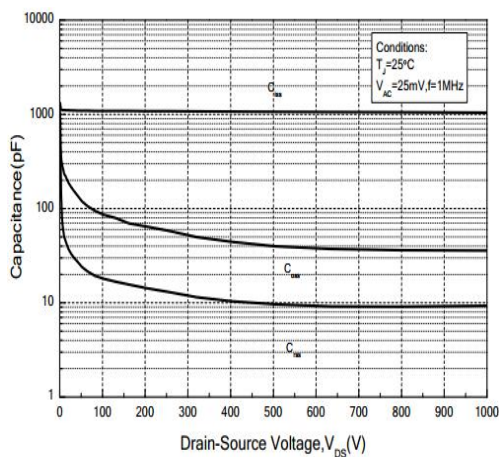
Characteristics Curves



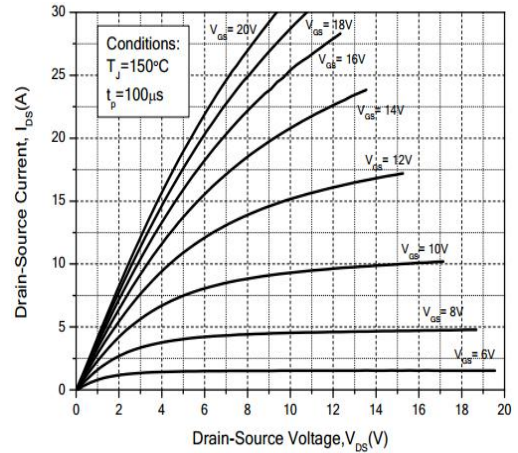
Output Characteristics $T_J = 25^\circ\text{C}$



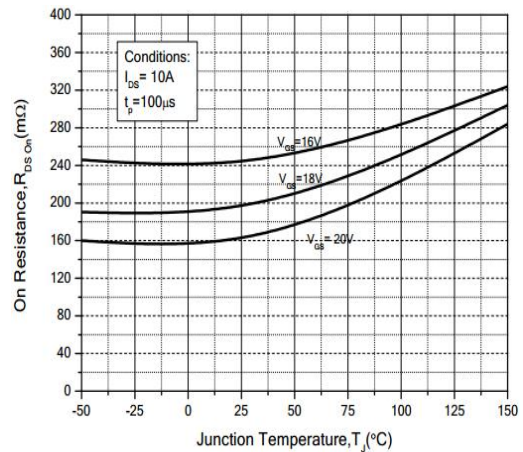
Transfer Characteristics



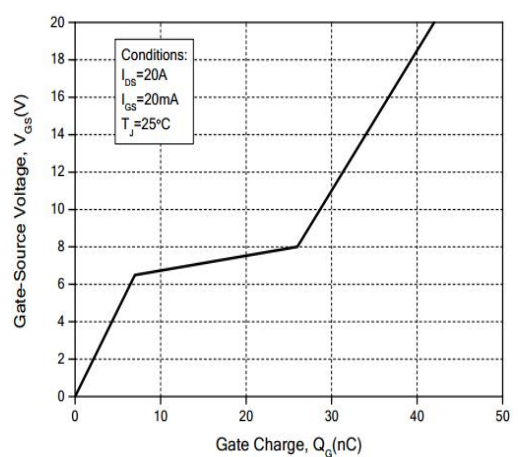
Capacitance



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

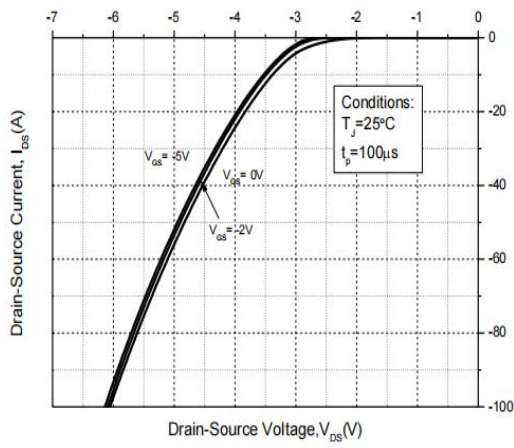


Normalized On-Resistance vs. Temperature

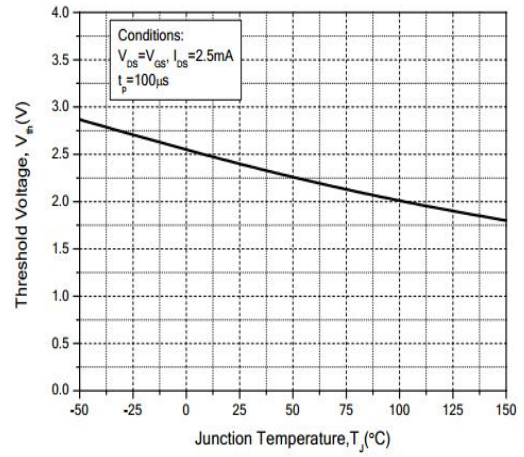


Gate Charge Waveform

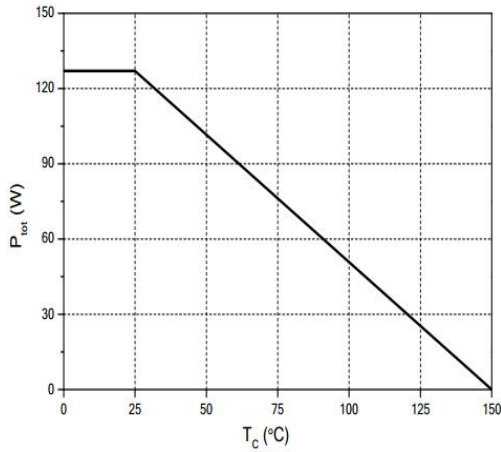




Source-Drain Diode Characteristics



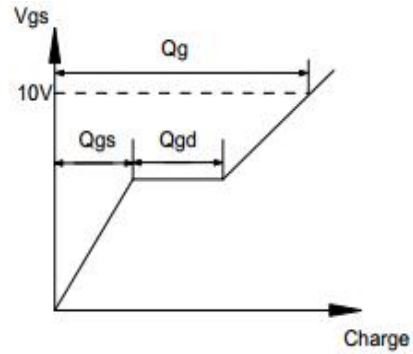
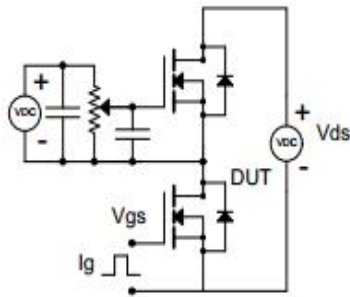
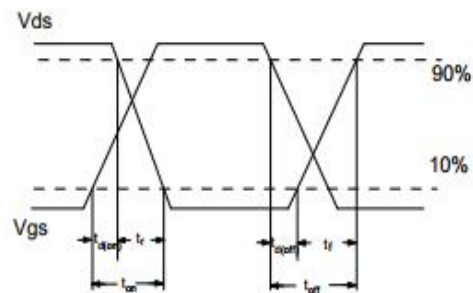
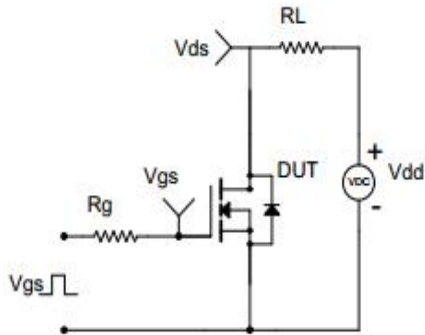
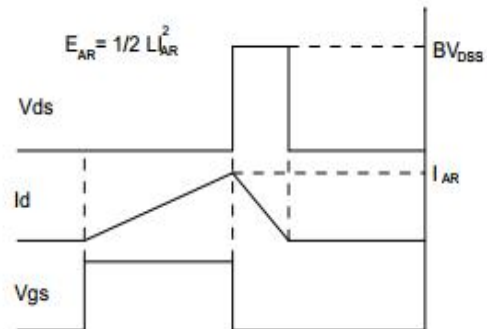
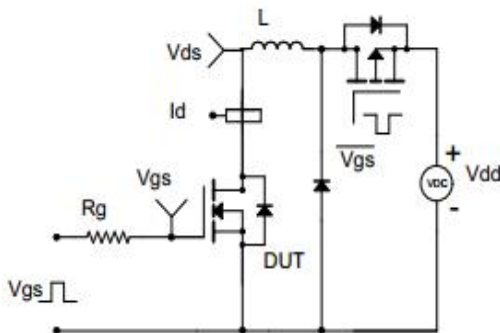
Threshold Voltage vs. Temperature



Power Dissipation Derating

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-247 Package Dimensions

Unit: mm

| Symbol | Min | Nom | Max | Symbol | Min | Nom | Max |
|--------|-------|------|-------|--------|-------|------|-------|
| A | 4.60 | | 5.15 | A1 | 1.30 | | 1.60 |
| b | 2.86 | | 3.26 | b1 | 1.86 | | 2.26 |
| b2 | | 1.20 | | C | | 0.50 | |
| D | 19.00 | | 21.00 | E | 15.45 | | 15.75 |
| E1 | 12.00 | | 13.06 | e | | 5.45 | |
| L | 14.00 | | 14.60 | L1 | 5.20 | | 5.88 |
| L2 | 24.00 | | 24.40 | L3 | 10.00 | | 10.60 |
| ΦP | | 3.50 | | Q | 2.30 | | 2.70 |

