

MOSFETs Silicon 40V N-Channel MOS
■ Applications

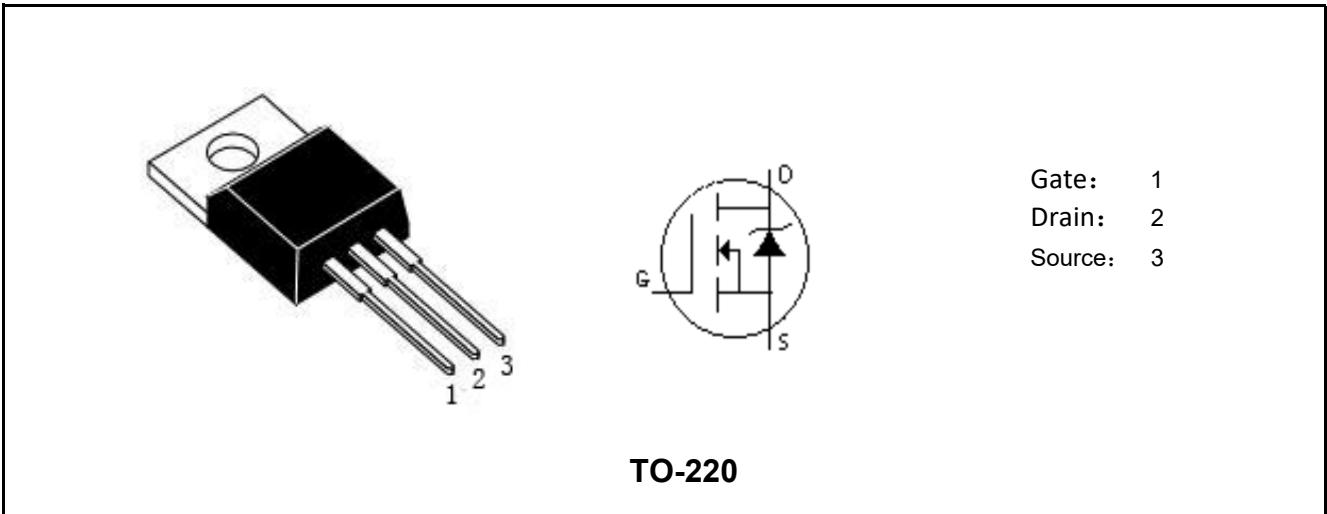
- Synchronus Rectification
- Industrial and Motor Drive
- DC/DC and AC/DC Converters
- Power Tools

■ Features

- High-Speed Switching
- Low $R_{DS(ON)}$
- Good stability and uniformity with high EAS
- RoHS and Halogen-Free Compliant
- 100% UIS and RG Tested

■ Product Summary

| | | |
|-----------------------|-----|------------|
| V_{DS} | 40 | V |
| I_D | 160 | A |
| $R_{DS(ON)}, TYP@10V$ | 4.1 | m Ω |
| Q_g | 105 | nC |



| Marking | Package | Packaging | Min. package quantity |
|-------------|---------|-----------|-----------------------|
| MC005R040PH | TO-220 | Tube | 1000 |



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

| Parameter | Symbol | Ratings | Unit |
|--|-----------|---------|------|
| Drain-Source Voltage | V_{DS} | 40 | V |
| Gate-Source Voltage | V_{GS} | ±20 | V |
| Continuous Drain Current Tc=25°C (Note 1) | I_D | 160 | A |
| Continuous Drain Current Tc=100°C (Note 1) | | 105 | A |
| Drain Current-Pulsed (Note 1) | I_{DM} | 600 | A |
| Total Dissipation | P_D | 278 | W |
| Junction Temperature | T_J | 150 | °C |
| Storage Temperature | T_{stg} | -55-150 | °C |
| Single Pulse Avalanche Energy (Note 2) | E_{AS} | 3000 | mJ |

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 significantly 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 | $R_{\theta JC}$ | 0.45 | °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 2: $V_{DD}=30V$, $T_{ch}=25^\circ C$ (initial), $L=0.5mH$, $R_g=25\Omega$.

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



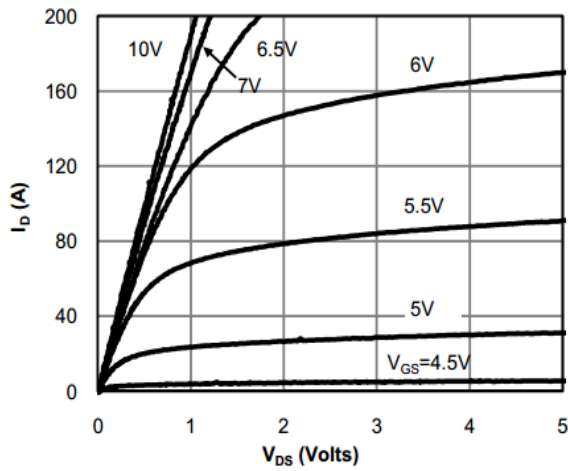
■ Electrical Characteristics (Tc=25°C unless otherwise noted)

| Parameter | Symbol | Test Condition | Min | Typ | Max | Unit |
|-------------------------------------|--------------|--|-----|------|-----------|------------|
| Static Parameters | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 40 | - | - | V |
| Drain-Source Leakage Current | I_{DSS} | $V_{DS}=40V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}=V_{DS}, I_D=250\mu A$ | 2 | 2.8 | 4 | V |
| Drain-Source On Resistance | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=20A$ | - | 4.1 | 5 | m Ω |
| | | Tj=125°C | - | 6.5 | - | |
| Dynamic Characteristics | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=20V, V_{GS}=0V,$ $f=1.0MHz$ | - | 3500 | - | pF |
| Output Capacitance | C_{oss} | | - | 2000 | - | pF |
| Reverse Transfer Capacitance | C_{rss} | | - | 680 | - | pF |
| Gate Resistance | R_g | $V_{DS}=0V, V_{GS}=0V,$ $f=1.0MHz$ | - | 1.3 | - | Ω |
| Switching Parameters | | | | | | |
| Turn-On Delay Time | $t_{d(on)}$ | $V_{DS}=20V, I_D=20A,$ $V_{GS}=10V, R_G=10\Omega$ | - | 25 | - | ns |
| Turn-On Rise Time | t_r | | - | 210 | - | ns |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 45 | - | ns |
| Turn-Off Rise Time | t_f | | - | 40 | - | ns |
| Total Gate Charge | Q_g | $V_{DS}=20V, I_D=20A,$ $V_{GS}=10V$ | - | 105 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 38 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 45 | - | nC |
| Source-Drain Characteristics | | | | | | |
| Diode Forward Voltage | V_{sd} | $V_{GS}=0V, I_S=10A$ | - | 0.8 | 1.2 | V |
| Reverse Recovery Time | t_{rr} | $V_R=20V, I_F=20A,$ $di/dt=100A/\mu s$ | - | 80 | - | ns |
| Reverse Recovery Charge | Q_{rr} | | - | 200 | - | nC |

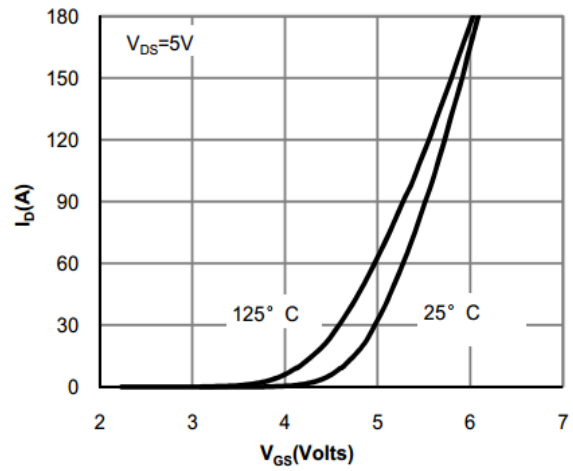




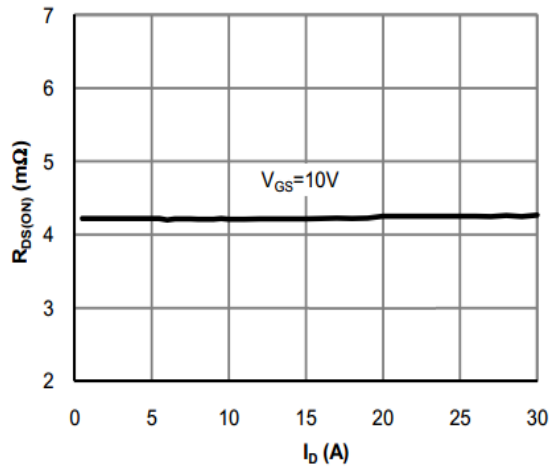
■ Characteristics Curves



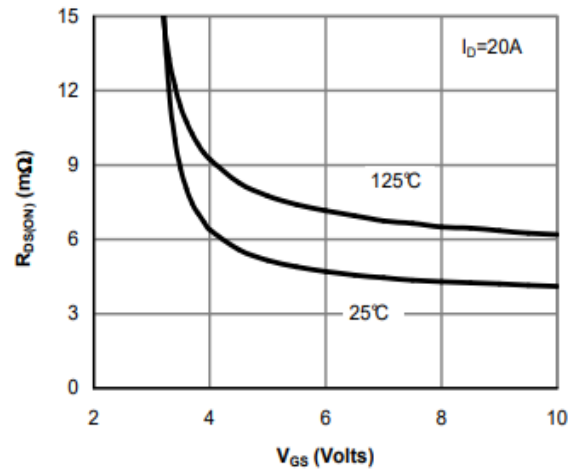
Output Characteristics



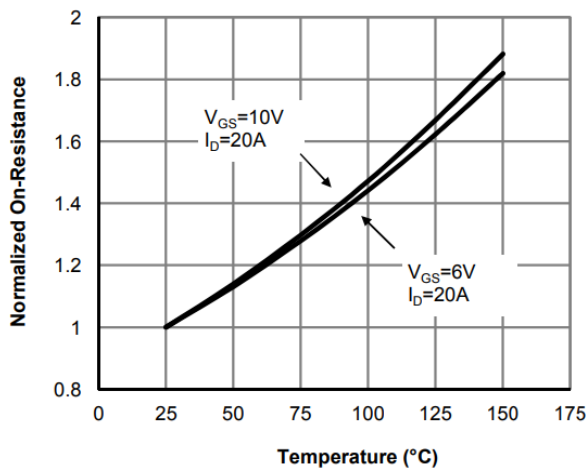
Transfer Characteristics



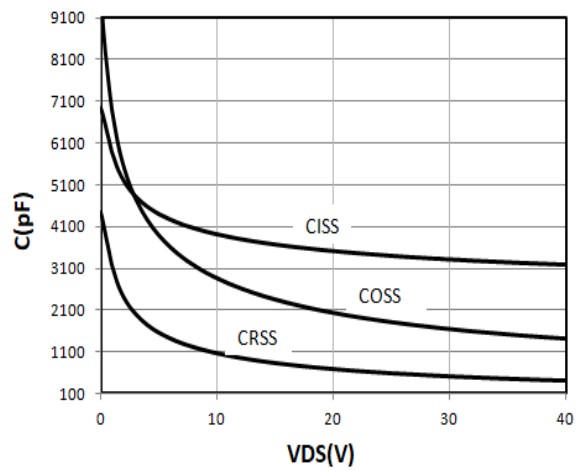
On Resistance Vs Drain Current



On Resistance Vs Gate Source Voltage

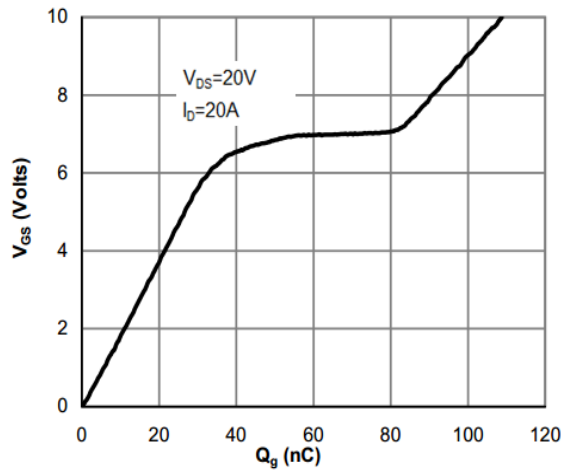


Rdson-JunctionTemperature

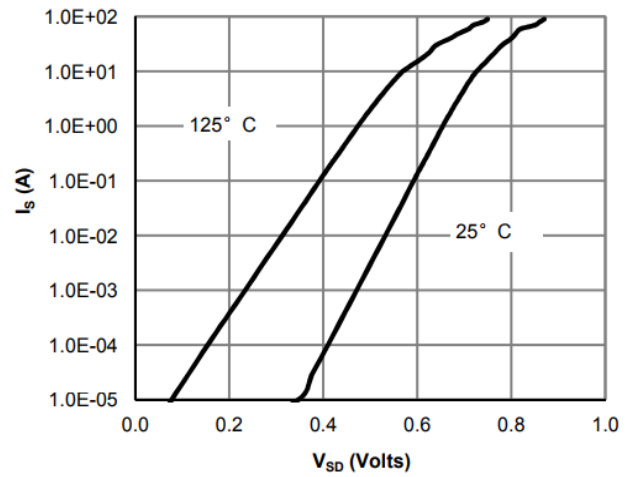


Capacitance

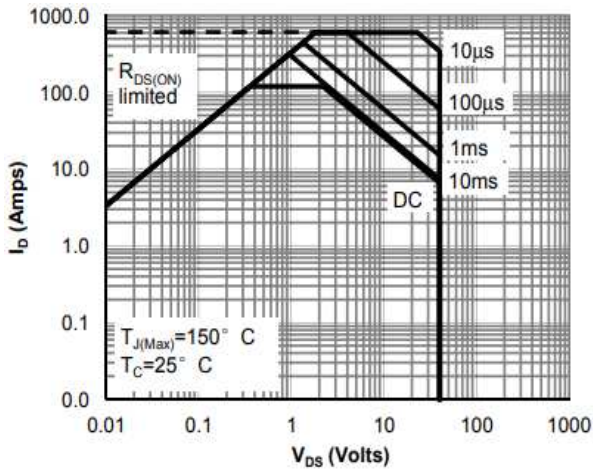




Gate Charge Waveform



Source-Drain Diode Forward Voltage



Maximum Safe Operating Area

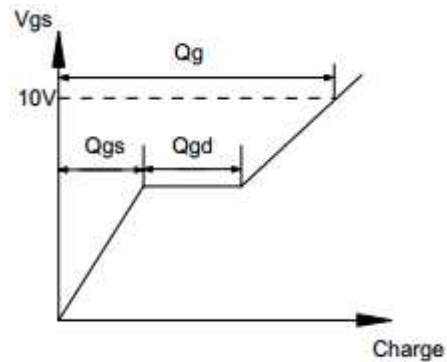
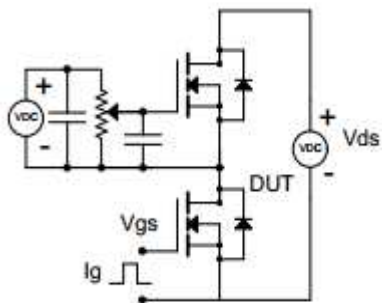
Note : The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.



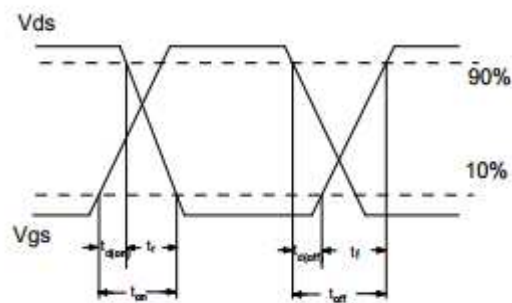
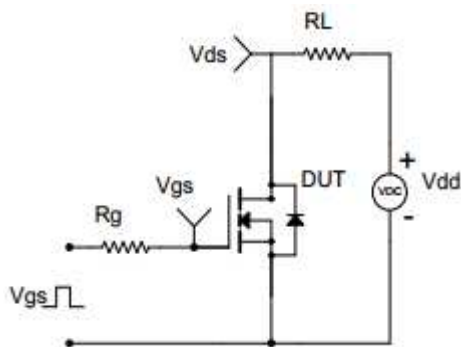


■ Test Circuit & Waveform

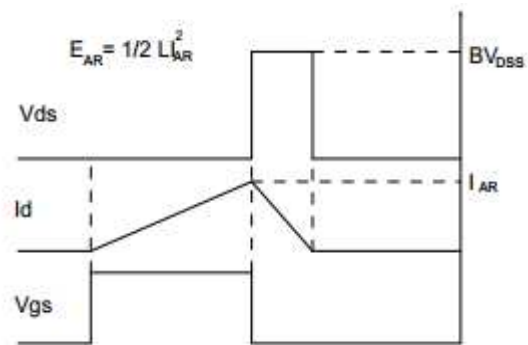
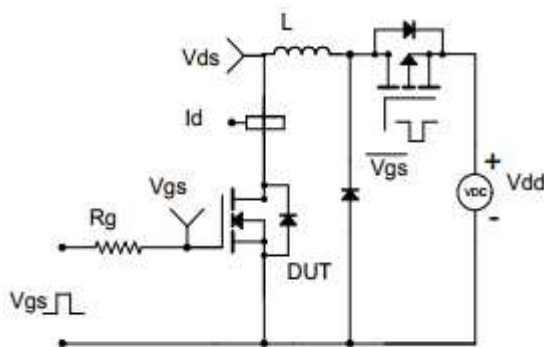
Gate Charge Test Circuit & Waveform



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 |

