

Features

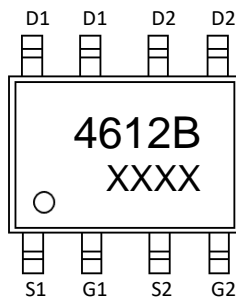
- High power and current handing capability
- Lead free product is acquired
- Surface mount package

Application

- Battery protection
- Load switch
- Power management

Product Summary

| V_{DS} | $R_{DS(ON)}$ TYP | I_D |
|----------|------------------|-------|
| 60V | 58mΩ@10V | 4A |
| | 70mΩ@4.5V | |
| -60V | 160mΩ@-10V | -2A |
| | 200mΩ@-4.5V | |

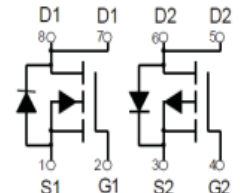


4612B : Device code
 XXXX : Code

Marking and pin assignment



SOP-8 top view



Schematic diagram



Pb-Free



Halogen-Free

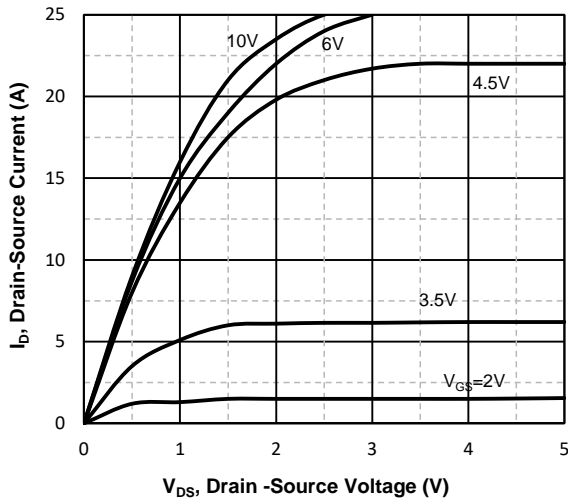
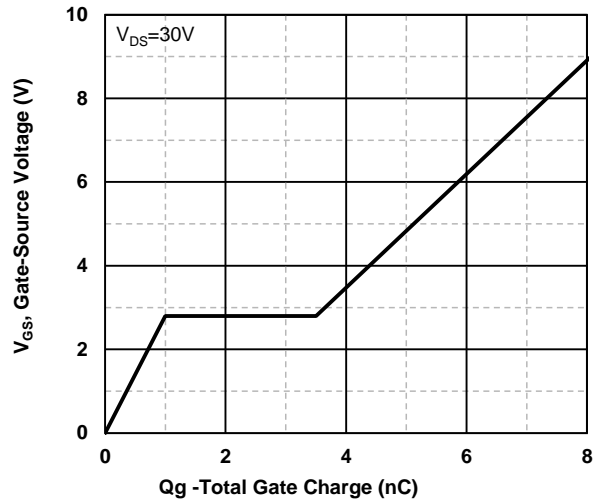
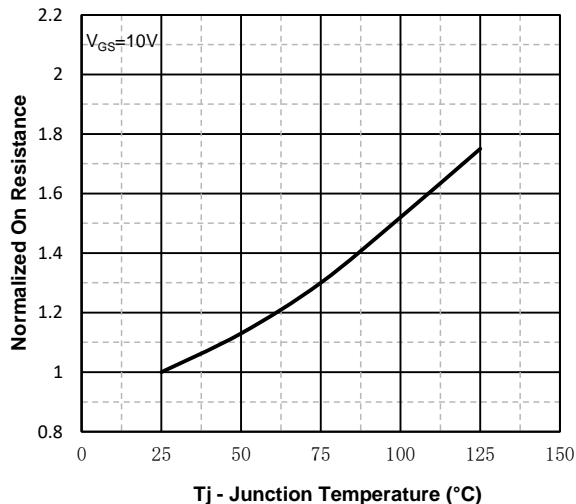
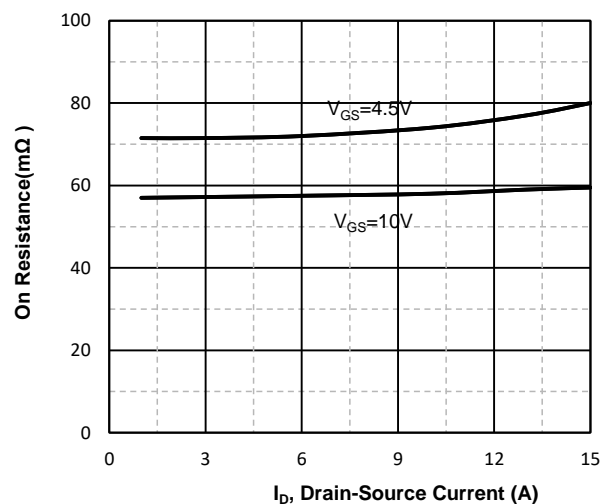
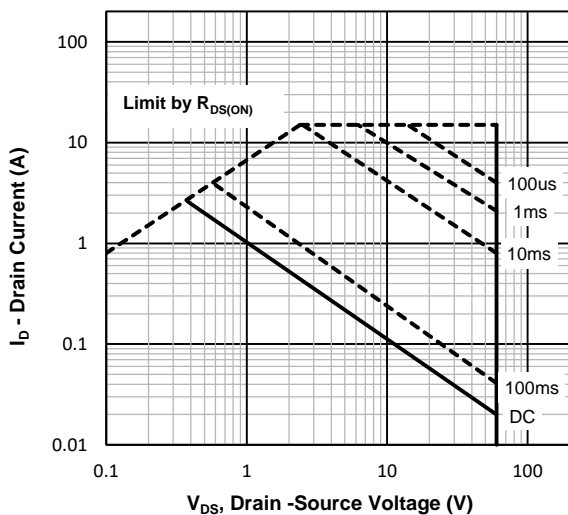
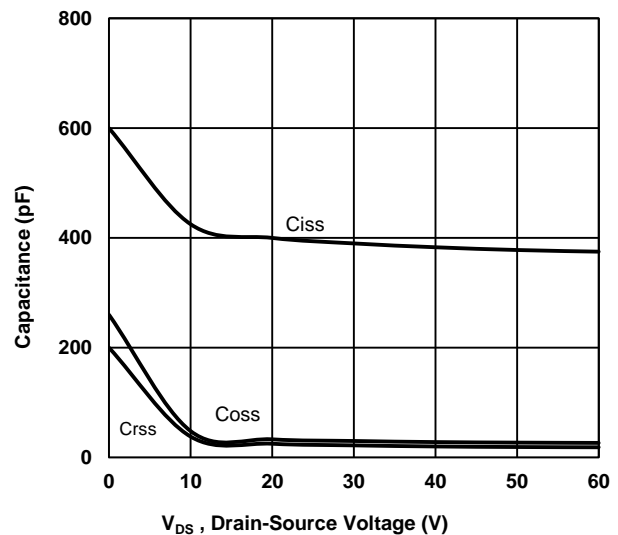
| Absolute Maximum Ratings (TA=25°C unless otherwise noted) | | | | | |
|---|-------------------------------------|------------|------------|------|------|
| Symbol | Parameter | N-Channel | P-Channel | Unit | |
| Common Ratings (TC=25°C Unless Otherwise Noted) | | | | | |
| V_{DS} | Drain-Source Breakdown Voltage | 60 | -60 | V | |
| V_{GS} | Gate-Source Voltage | ±20 | ±20 | V | |
| T_J | Maximum Junction Temperature | 150 | 150 | °C | |
| T_{STG} | Storage Temperature Range | -55 to 150 | -55 to 150 | °C | |
| I_S | Diode Continuous Forward Current | Tc=25°C | 4 | -2 | A |
| Mounted on Large Heat Sink | | | | | |
| I_{DM} | Pulse Drain Current Tested | Tc=25°C | 15 | -7 | A |
| I_D | Continuous Drain Current | Tc=25°C | 4 | -2 | A |
| P_D | Maximum Power Dissipation | Tc=25°C | 2 | 2 | W |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient | | 62.5 | 62.5 | °C/W |

| Ordering Information (Example) | | | | | | |
|--------------------------------|---------|---------|----------------------|-------------------------|----------------------------|---------------|
| Type | Package | Marking | Minimum Package(pcs) | Inner Box Quantity(pcs) | Outer Carton Quantity(pcs) | Delivery Mode |
| MQ4612B | SOP-8 | 4612B | 3,000 | 6,000 | 42,000 | 13"reel |

| N-Ch Electrical Characteristics (T _J =25°C unless otherwise noted) | | | | | | |
|--|----------------------------------|---|-----|------|------|------|
| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
| Static Electrical Characteristics @ T_J = 25°C (unless otherwise stated) | | | | | | |
| BV _{(BR)DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250μA | 60 | -- | -- | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =60V, V _{GS} =0V | -- | -- | 1 | μA |
| I _{GSS} | Gate-Body Leakage Current | V _{GS} =±20V, V _{DS} =0V | -- | -- | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =250μA | 1.0 | 1.5 | 3.0 | V |
| R _{DS(on)} | Drain-Source On-State Resistance | V _{GS} =10V, I _D =3A | -- | 58 | 90 | mΩ |
| | | V _{GS} =4.5V, I _D =2A | -- | 70 | 120 | mΩ |
| Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated) | | | | | | |
| C _{ISS} | Input Capacitance | V _{DS} =30V, V _{GS} =0V, f=1MHz | -- | 400 | -- | pF |
| C _{OSS} | Output Capacitance | | -- | 28 | -- | pF |
| C _{RSS} | Reverse Transfer Capacitance | | -- | 23 | -- | pF |
| Switching Characteristics | | | | | | |
| Q _g | Total Gate Charge | V _{DS} =30V, I _D =4A, V _{GS} =10V | -- | 9 | -- | nC |
| Q _{gs} | Gate Source Charge | | -- | 1 | -- | nC |
| Q _{gd} | Gate Drain Charge | | -- | 2.5 | -- | nC |
| t _{d(on)} | Turn-on Delay Time | V _{DD} =30V, I _D =4A, V _{GS} =10V, R _G =2.3Ω | -- | 4 | -- | nS |
| t _r | Turn-on Rise Time | | -- | 10 | -- | nS |
| t _{d(off)} | Turn-Off Delay Time | | -- | 12.5 | -- | nS |
| t _f | Turn-Off Fall Time | | -- | 1.8 | -- | nS |
| Source- Drain Diode Characteristics | | | | | | |
| V _{SD} | Forward on voltage | T _J =25°C, I _S =4A | -- | -- | 1.2 | V |



| P-Ch Electrical Characteristics (T _J =25°C unless otherwise noted) | | | | | | |
|--|----------------------------------|--|------|------|------|------|
| Symbol | Parameter | Condition | Min | Typ | Max | Unit |
| Static Electrical Characteristics @ T_J = 25°C (unless otherwise stated) | | | | | | |
| BV _{(BR)DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =-250μA | -60 | -- | -- | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =-60V, V _{GS} =0V | -- | -- | -1 | μA |
| I _{GSS} | Gate-Body Leakage Current | V _{GS} =±20V, V _{DS} =0V | -- | -- | ±100 | nA |
| V _{GS(th)} | Gate Threshold Voltage | V _{DS} =V _{GS} , I _D =-250μA | -1.0 | -1.5 | -3.0 | V |
| R _{DS(on)} | Drain-Source On-State Resistance | V _{GS} =-10V, I _D =-3A | -- | 160 | 195 | mΩ |
| | | V _{GS} =-4.5V, I _D =-2A | -- | 200 | 300 | mΩ |
| Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated) | | | | | | |
| C _{ISS} | Input Capacitance | V _{DS} =-30V, V _{GS} =0V, f=1MHz | -- | 430 | -- | pF |
| C _{OSS} | Output Capacitance | | -- | 33 | -- | pF |
| C _{RSS} | Reverse Transfer Capacitance | | -- | 22 | -- | pF |
| Switching Characteristics | | | | | | |
| Q _g | Total Gate Charge | V _{DD} =-30V, I _D =-2A, V _{GS} =-10V | -- | 8.5 | -- | nC |
| Q _{gs} | Gate Source Charge | | -- | 2.1 | -- | nC |
| Q _{gd} | Gate Drain Charge | | -- | 1.6 | -- | nC |
| t _{d(on)} | Turn-on Delay Time | V _{DD} =-30V, I _D =-2A, V _{GS} =-10V, R _G =6Ω | -- | 5.3 | -- | nS |
| t _r | Turn-on Rise Time | | -- | 20 | -- | nS |
| t _{d(off)} | Turn-Off Delay Time | | -- | 33 | -- | nS |
| t _f | Turn-Off Fall Time | | -- | 10 | -- | nS |
| Source- Drain Diode Characteristics | | | | | | |
| V _{SD} | Forward on voltage | T _J =25°C, I _S =-2A | -- | -- | -1.2 | V |

N-Channel Typical Operating Characteristics

Fig1. Typical Output Characteristics

Fig2. Typical Gate Charge Vs. Gate-Source Voltage

Fig3. Normalized On-Resistance Vs. Temperature

Fig4. On-Resistance Vs. Drain-Source Current

Fig5. Maximum Safe Operating Area

Fig6. Typical Capacitance Vs. Drain-Source Voltage

P-Channel Typical Operating Characteristics

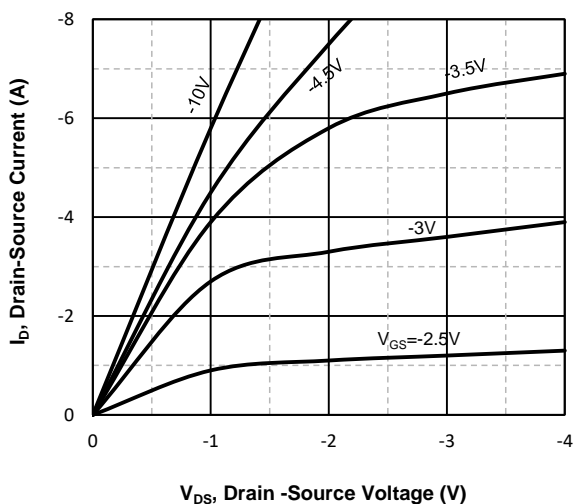


Fig7. Typical Output Characteristics

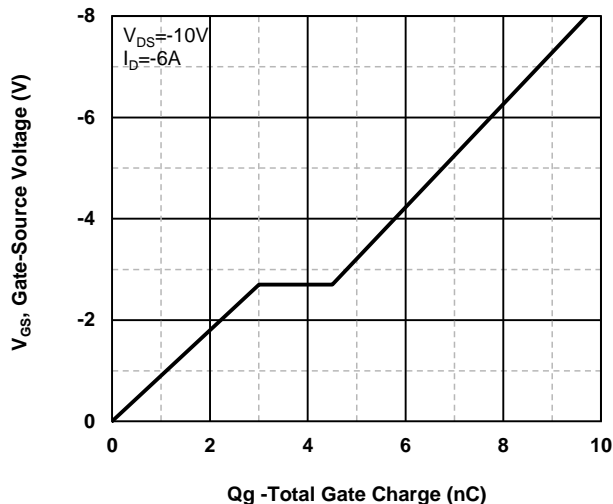


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

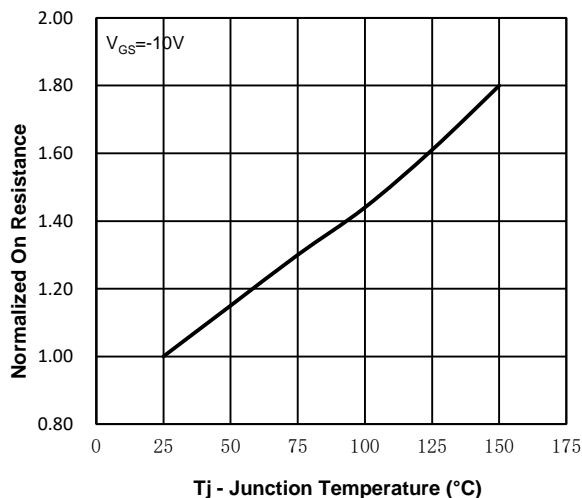


Fig9. Normalized On-Resistance Vs. Temperature

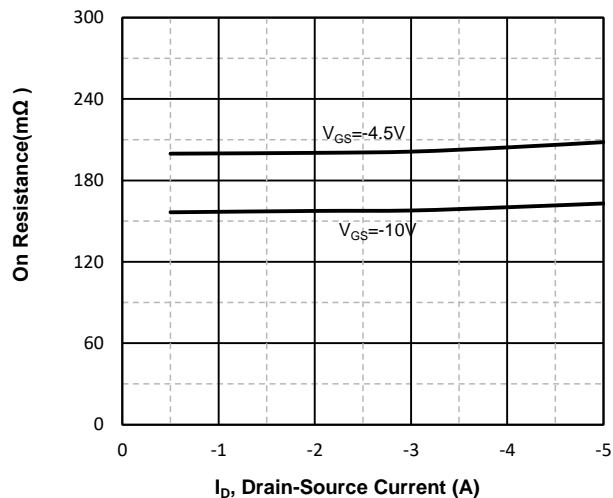


Fig10. On-Resistance Vs. Drain-Source Current

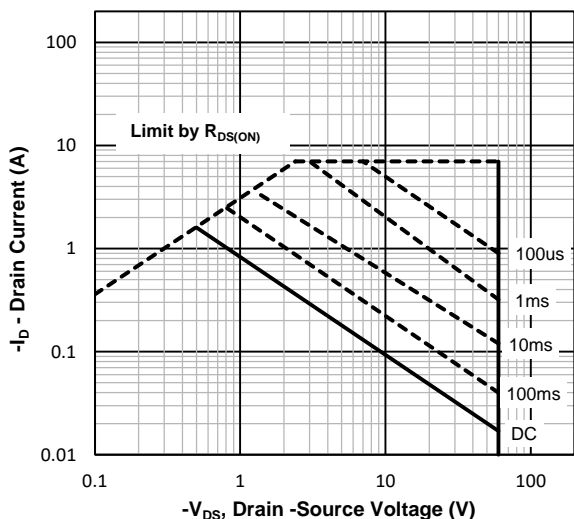


Fig11. Maximum Safe Operating Area

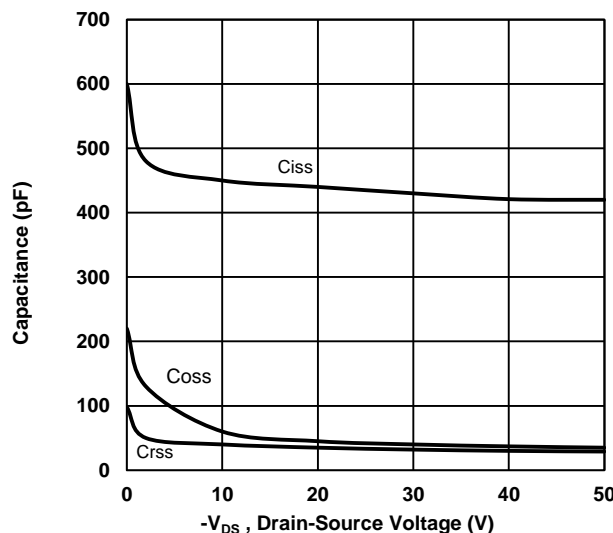
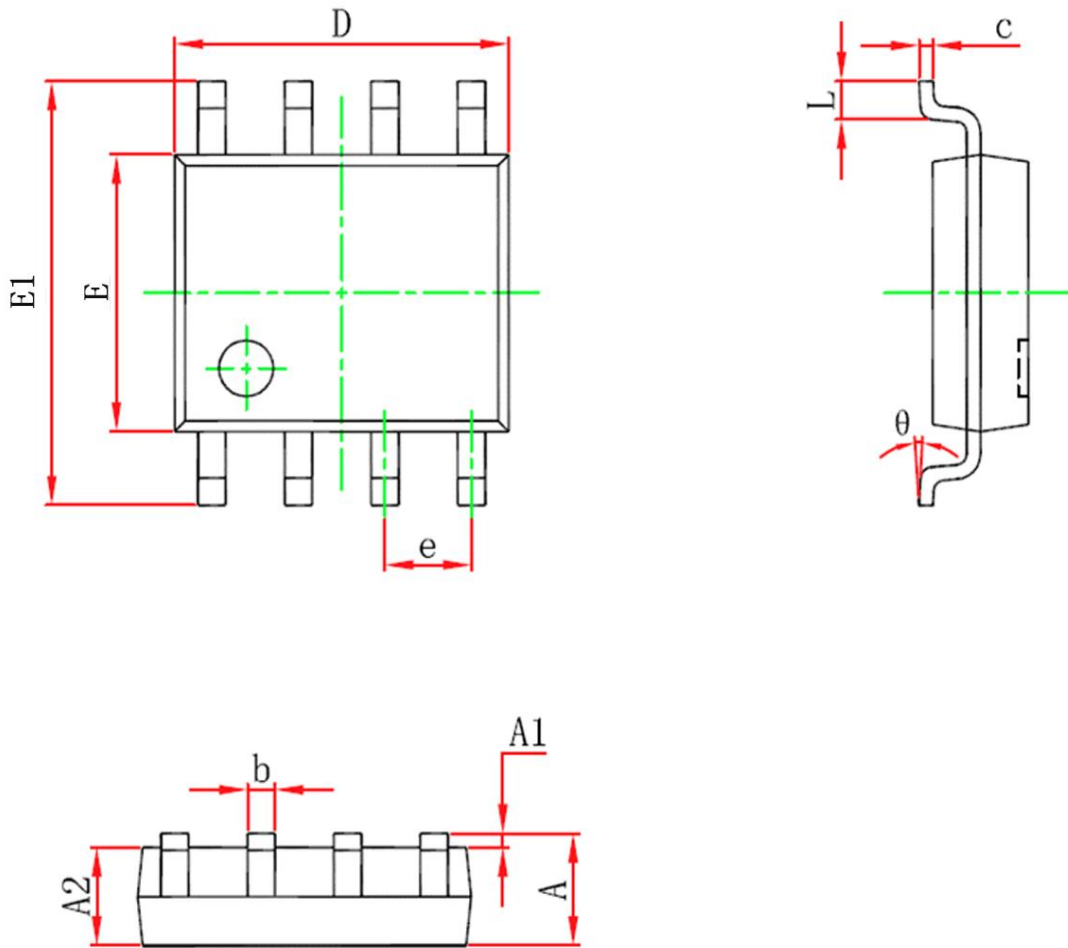


Fig12. Typical Capacitance Vs. Drain-Source Voltage

SOP-8 Package information


| Symbol | Dimensions in Millimeters(mm) | | Dimensions In Inches | |
|--------|-------------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 1.450 | 1.750 | 0.057 | 0.068 |
| A1 | 0.100 | 0.250 | 0.003 | 0.009 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.012 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.009 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| E | 3.800 | 4.000 | 0.149 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| L | 0.400 | 1.270 | 0.015 | 0.050 |
| θ | 0° | 8° | 0° | 8° |