# GWM02S60

POWER FIELD EFFECT TRANSISTOR

## GENERAL DESCRIPTION

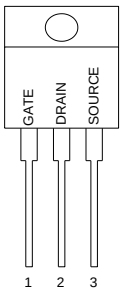
This advanced high voltage MOSFET is designed to withstand high energy in the avalanche mode and switch efficiently. This new high energy device also offers a drain-to-source diode with fast recovery time. Designed for high voltage, high speed switching applications such as power supplies, converters, power motor controls and bridge circuits.

## FEATURES

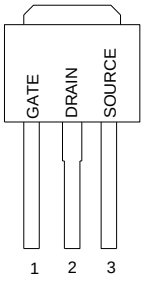
- SJ MOS
- Higher Current Rating
- Lower Rds(on)
- Lower Capacitances
- Lower Total Gate Charge

## PIN CONFIGURATION

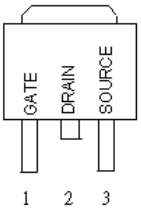
TO-220 / TO-220FP
Front View



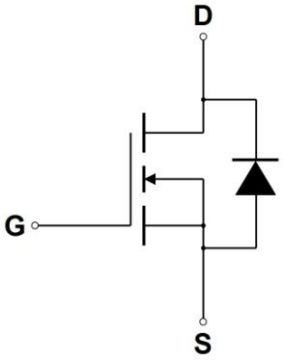

TO-251/TO-251S
Front View




TO-252
Front View




## SYMBOL




N-Channel MOSFET

## ABSOLUTE MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| Drain to Current — Continuous | $I_D$ | 2.3 | A |
| — Pulsed | $I_{DM}$ | 6.9 | |
| Gate-to-Source Voltage — Continue | $V_{GS}$ | ±20 | V |
| Total Power Dissipation TO-220 | $P_D$ | 60 | W |
| TO-220FP | | 24 | |
| TO-251/TO-251S/TO-252 | | 35.7 | |
| Derate above 25℃ TO-220 | | 0.5 | |
| TO-220FP | | 0.2 | |
| TO-251/TO-251S/TO-252 | | 0.29 | |
| Junction and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 150 | ℃ |
| Single Pulse Drain-to-Source Avalanche Energy — $T_J$ = 25℃ ($V_{DD}$ = 100V, $V_{GS}$ = 10V, $I_L$ = 1.0A, L = 10mH, $R_G$ = 25Ω) | $E_{AS}$ | 5 | mJ |
| Thermal Resistance — Junction to Case TO-220 | $\theta_{JC}$ | 2.1 | ℃/W |
| TO-220FP | | 5.3 | |
| TO-251/TO-251S/TO-252 | | 3.5 | |
| — Junction to Ambient TO-251/TO-251S/TO-252/TO-220/TO-220FP | $\theta_{JA}$ | 100 | |
| Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds | $T_L$ | 260 | ℃ |

## ORDERING INFORMATION

| Part Number | TOP MARK | Part Number | Packing Mthod | Note |
|---|---|---|---|---|
| GWM02S60XN251 (Note1) | GWM02S60X | TO-251 | Tube | |
| GWM02S60XN251S (Note1) | GWM02S60X | TO-251S | Tube | |
| GWM02S60XN252 (Note1) | GWM02S60X | TO-252 | Tube | |
| GWM02S60XN252TR (Note1) | GWM02S60X | TO-252 | Tape and Reel | |
| GWM02S60XN220 (Note1) | GWM02S60X | TO-220 | Tube | |
| GWM02S60XN220FP (Note1) | GWM02S60X | TO-220FP | Tube | |
| GWM02S60GN251 (Note1) | GWM02S60G | TO-251 | Tube | |
| GWM02S60GN251S (Note1) | GWM02S60G | TO-251S | Tube | |
| GWM02S60GN252 (Note1) | GWM02S60G | TO-252 | Tube | |
| GWM02S60GN252TR (Note1) | GWM02S60G | TO-252 | Tape and Reel | |
| GWM02S60GN220 (Note1) | GWM02S60G | TO-220 | Tube | |
| GWM02S60GN220FP (Note1) | GWM02S60G | TO-220FP | Tube | |

**Note1:** X : Suffix for Halogen Free and PB Free Product / G : Suffix for PB Free Product

## ELECTRICAL CHARACTERISTICS

Unless otherwise specified, $T_J$ = 25℃.

| | | | GWM02S60 | | | |
|---|---|---|---|---|---|---|
| **Characteristic** | | **Symbol** | **Min** | **Typ** | **Max** | **Units** |
| Drain-Source Breakdown Voltage ($V_{GS}$ = 0 V, $I_D$ = 1 mA) | | $V_{(BR)DSS}$ | 600 | | | V |
| Drain-Source Leakage Current ($V_{DS}$ =600 V, $V_{GS}$ = 0 V) | | $I_{DSS}$ | | | 1 | uA |
| Gate-Source Leakage Current-Forward ($V_{gsf}$ = 20 V, $V_{DS}$ = 0 V) | | $I_{GSSF}$ | | | 100 | nA |
| Gate-Source Leakage Current-Reverse ($V_{gsr}$ = - 20 V, $V_{DS}$ = 0 V) | | $I_{GSSR}$ | | | 100 | nA |
| Gate Threshold Voltage ($V_{DS}$ = $V_{GS}$, $I_D$ = 250 μ A) | | $V_{GS(th)}$ | 2 | | 4 | V |
| Static Drain-Source On-Resistance ($V_{GS}$ = 10 V, $I_D$ = 0.67 A) * | | $R_{DS(on)}$ | | | 2.6 | Ω |
| Input Capacitance | ($V_{DS}$ = 100 V, $V_{GS}$ = 0 V, f = 1.0 MHz) | $C_{iss}$ | | 146 | | pF |
| Output Capacitance | | $C_{oss}$ | | 11 | | pF |
| Reverse Transfer Capacitance | | $C_{rss}$ | | 20 | | pF |
| Turn-On Delay Time | ($V_{DD}$ = 300 V, $I_D$ = 2 A, $V_{GS}$ = 10 V, $R_G$ = 9.1Ω) * | $t_{d(on)}$ | | 6.6 | | ns |
| Rise Time | | $t_r$ | | 20 | | ns |
| Turn-Off Delay Time | | $t_{d(off)}$ | | 15.6 | | ns |
| Fall Time | | $t_f$ | | 22 | | ns |
| Total Gate Charge | ($V_{DS}$ = 480 V, $I_D$ = 2 A, $V_{GS}$ = 10 V)* | $Q_g$ | | 24.6 | | nC |
| Gate-Source Charge | | $Q_{gs}$ | | 13.3 | | nC |
| Gate-Drain Charge | | $Q_{gd}$ | | 37.9 | | nC |
| **SOURCE-DRAIN DIODE CHARACTERISTICS** | | | | | | |
| Forward On-Voltage(1) | ($I_S$ = 2 A, $dI_S/d_t$ = 100A/μs) | $V_{SD}$ | | | 1.5 | V |
| Forward Turn-On Time | | $t_{on}$ | | ** | | ns |
| Reverse Recovery Time | | $t_{rr}$ | | 142.2 | | ns |

* Pulse Test: Pulse Width ≦300μs, Duty Cycle ≦2%

** Negligible, Dominated by circuit inductance

## TYPICAL ELECTRICAL CHARACTERISTICS

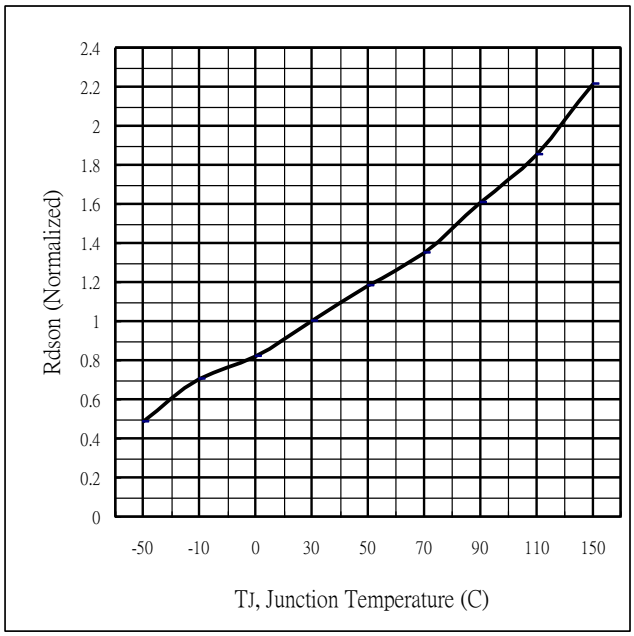



**Fig 1. On-Resistance Variation with vs. Temperature**

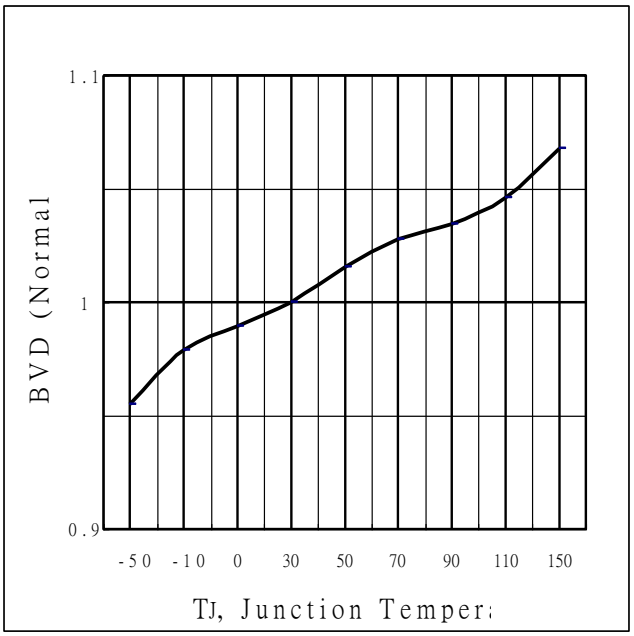



**Fig.2 Breakdown Voltage Variation vs. Temperature**

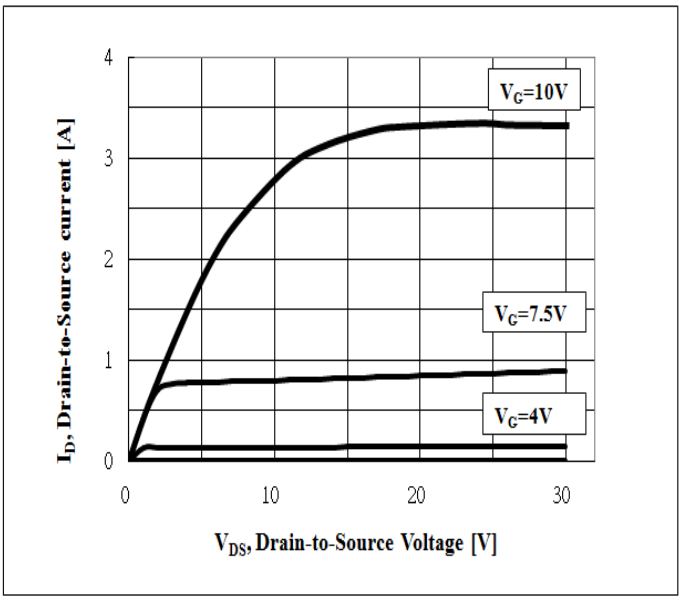



**Fig 3. Typical Output Characteristics**

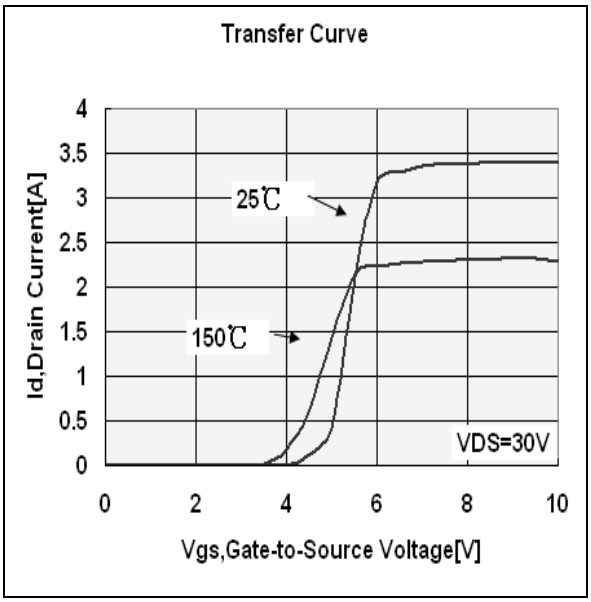



**Fig 4. Typical Transfer Characteristics**

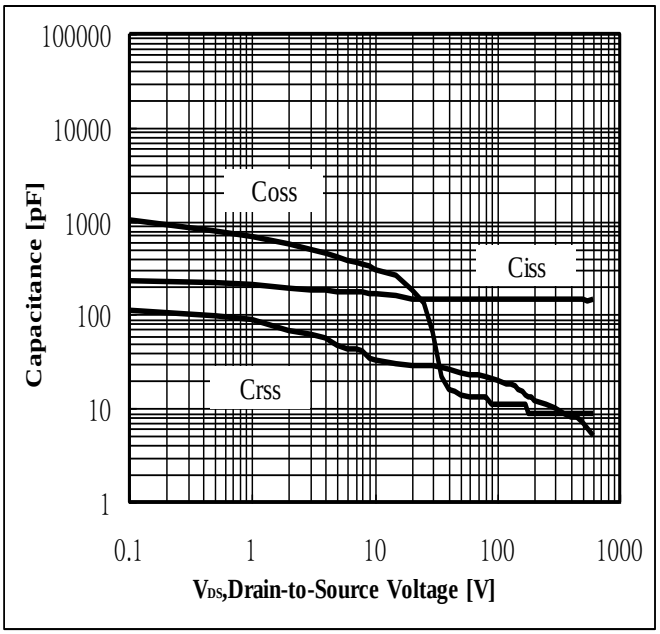



**Fig 5. Typical Capacitance Vs. Drain-to-Source Voltage**

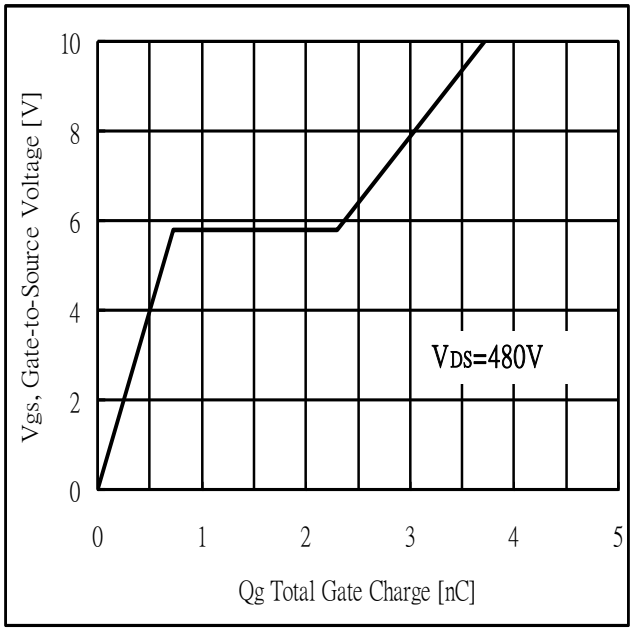



**Fig 6. Typical Gate Charge Vs. Gate-to-Source Voltage**