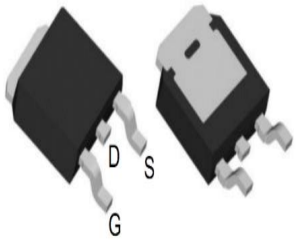
# 60$V_{DS}$/±20$V_{GS}$ N-Channel Enhancement Mode MOSFET

## Features

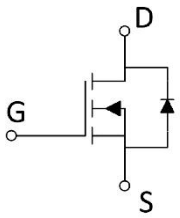
- $V_{DS}$=60V,$I_D$=50A
- $R_{DS(ON)}$=13mΩ（TYP.）$V_{GS}$=10V
- Reliable and Rugged
- Avalanche Rated
- Low On-Resistance
- High Current Capability

TO-252




## Applications

- Load Switch
- Power management in portable/desktop PCs
- DC/DC conversion




## Ordering Information

| Device | Package | | Marking | Package Qty. |
|---|---|---|---|---|
| HMN6050A4 | TO-252 | Pb-Free | N6050A4 | 2500pcs/Reel |

## Absolute Maximum Ratings ($T_C$=25℃,unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain-Source Voltage ($V_{GS}$=0V) | $V_{DS}$ | 60 | V |
| Gate-Source Voltage ($V_{GS}$=0V,static) | $V_{GS}$ | ±20 | V |
| Continuous Drain Current ($T_C$=25℃) | $I_D$ | 50 | A |
| Continuous Drain Current ($T_C$=100℃) | | 30 | A |
| Pulesd Drain Current | $I_{DM}$ | 200 | A |
| Maximum Power Dissipation | $P_D$ | 75 | W |
| Maximum Power Dissipation | | 0.4 | W/℃ |
| Single pulse avalanche energy | Eas | 130 | mJ |
| Operating,Storage Temperature Range | $T_J$,$T_{STG}$ | -55~175 | ℃ |

## Electrical Characteristics

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V,$I_D$=250μA | 60 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=30V, $V_{GS}$=0V | - | - | 1 | μA |
| Gate -Source Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V, $V_{DS}$=0V | - | - | ±100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$= $V_{GS}$,$I_D$=250μA | 1 | 1.6 | 2.5 | V |
| Drain-SourceOn-stageResistance | $R_{DS(ON)}$ | $V_{GS}$=10V,$I_D$=20A | - | 13 | 18 | mΩ |
| | | $V_{GS}$=4.5V,$I_D$=20A | - | 17 | 25 | |

## Thermal Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Thermal Resistance,Junction-to-Case | $R_{\theta JC}$ | - | 1.67 | - | ℃/ W |

## Dynamic Characteristics

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | $V_{DS}$=15V | - | 1700 | - | pF |
| Output capacitance | $C_{oss}$ | $V_{GS}$=0V | - | 120 | - | |
| Reverse transfer capacitance | $C_{rss}$ | f=1MHz | - | 110 | - | |
| Gate Resistance | $R_g$ | f=1MHz | - | 0.8 | - | Ω |
| Total Gate Charge | $Q_g$ | $V_{DS}$=15V | - | 28 | - | nC |
| Gate Source Charge | $Q_{gs}$ | $V_{GS}$=10V | - | 3.5 | - | |
| Gate Drain Charge | $Q_{gd}$ | $I_D$=20A | - | 8.2 | - | |
| Turn-on delay Time | $t_{d(on)}$ | $V_{GS}$=10V | - | 8.2 | - | ns |
| Rise time | $t_r$ | $V_{DS}$=15V | - | 6.4 | - | |
| Turn-off delay Time | $t_{d(off)}$ | $R_L$=0.75Ω | - | 26 | - | |
| Fall time | $t_f$ | $R_G$=3Ω | - | 4.0 | - | |

## Reverse Diode Characteristics

| Parameter | Symbol | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Body Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V,$I_{SD}$=1A | - | - | 1.2 | V |
| Reverse Recovery Time | $t_{rr}$ | $V_{GS}$=0V,$I_{SD}$=20A | - | 22 | - | ns |
| Reverse Recovery Charge | $Q_{rr}$ | $d_i/d_t$=500A/μs | - | 11 | - | nC |

## Electrical Characteristics Diagrames

**Figure 1. On-Regin Characteristics**

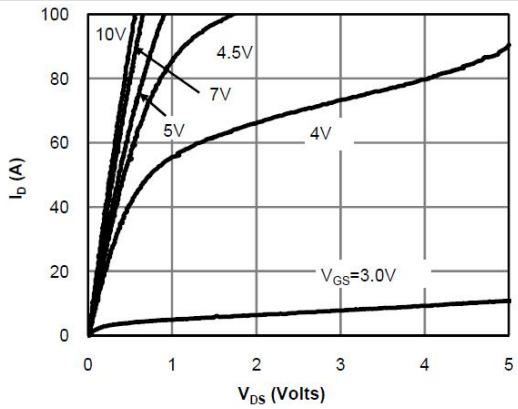



**Figure 2. Transfer Characteristics**

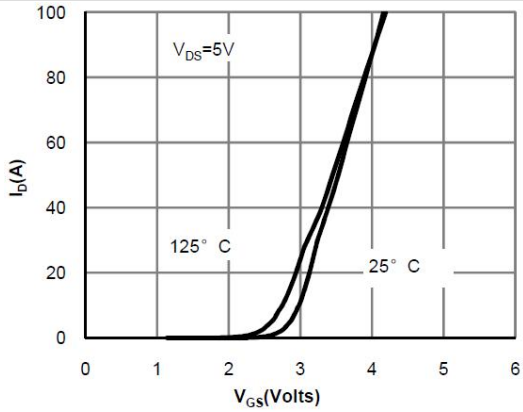


**Figure 3. On-Resistance vs. Drain Current and Gate Voltage**

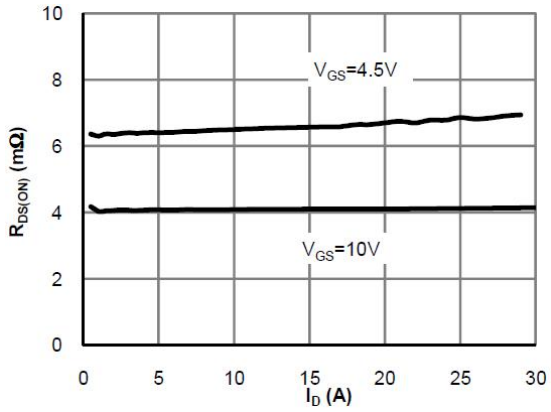



**Figure 4. On-Resistance vs. Junction Temperature**

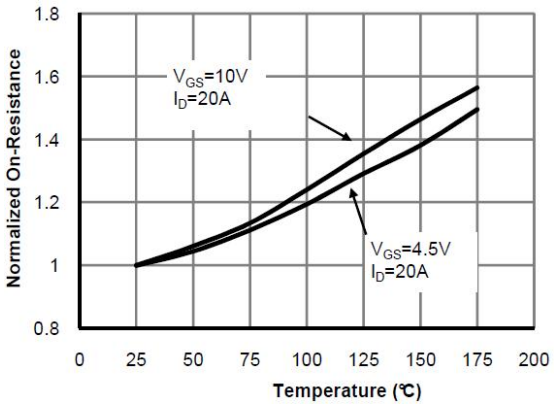



**Figure 5. On-Resistance vs. Gate-Source Voltage**

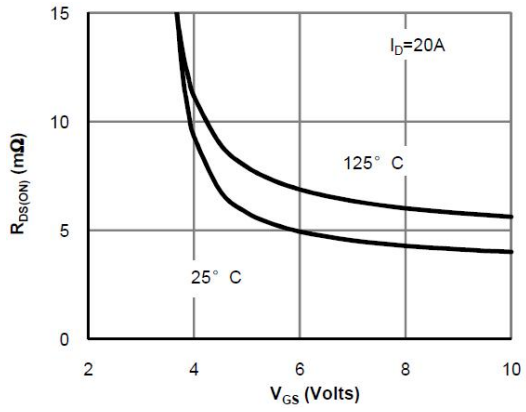



**Figure 6. Body-Diode Characteristics**

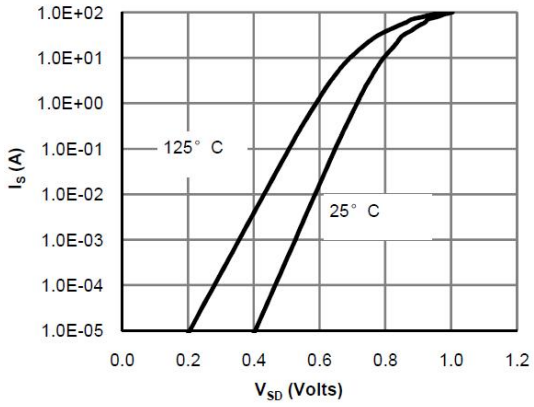



**Figure 7. Gate-Charge Characteristics**

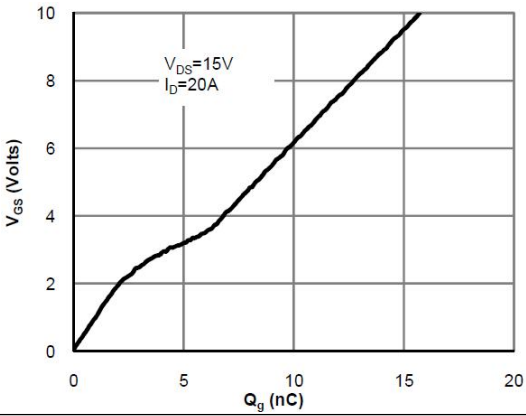



**Figure 8. Capacitance Characteristics**

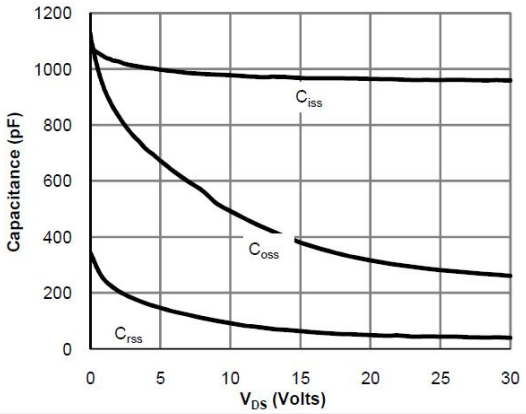


**Figure 9. Maximum Forward Biased Safe Operating Area**

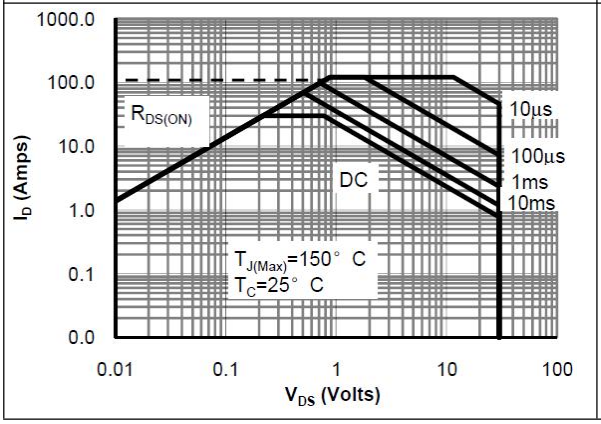



**Figure 10. Single Pulse Power Rating Junction-to-Case**

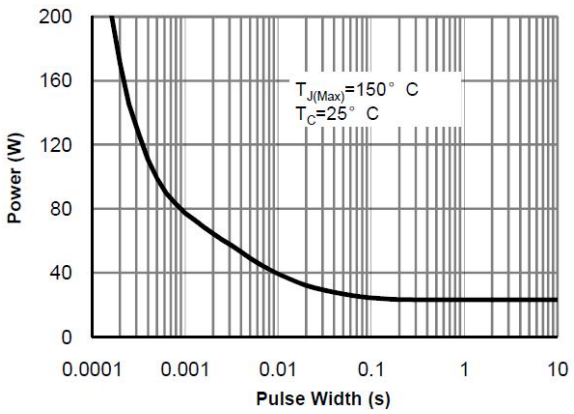



**Figure 11. Normalized Maximum Transient Thermal Impedance**