# N and P Channel Enhancement Mode Power MOSFET

## Description

This Product uses advanced trench technology MOSFETs to provide excellent $R_{DS(ON)}$ and low gate charge. The complementary MOSFETs may be used to form a level shifted high side switch, and for a host of other applications.

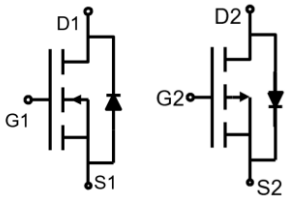
## General Features

- **NMOS**
- $V_{DS}$ 60V
- $I_D$ (at $V_{GS}$ = 10V) 5A
- $R_{DS(ON)}$ (at $V_{GS}$ = 10V) < 36mΩ
- $R_{DS(ON)}$ (at $V_{GS}$ = 4.5V) < 40mΩ

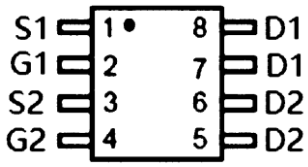
- **PMOS**
- $V_{DS}$ -60V
- $I_D$ (at $V_{GS}$ = -10V) -3.1A
- $R_{DS(ON)}$ (at $V_{GS}$ = -10V) < 80mΩ
- $R_{DS(ON)}$ (at $V_{GS}$ = -4.5V) < 95mΩ
- RoHS Compliant

## Application

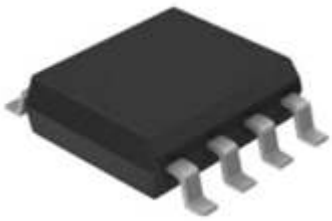
- Power switch
- DC/DC converters




Schematic diagram




Marking and pin assignment



SOP-8

| Device | Package | Marking | Packaging |
|---|---|---|---|
| G05NP06S2 | SOP-8双基 | G05NP06 | 4000pcs/Reel |

## Absolute Maximum Ratings $T_C$ = 25ºC, unless otherwise noted

| Parameter | Symbol | NMOS | PMOS | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 60 | -60 | V |
| Continuous Drain Current | $I_D$ | 5 | -3.1 | A |
| Pulsed Drain Current (note1) | $I_{DM}$ | 20 | -12.4 | A |
| Gate-Source Voltage | $V_{GS}$ | ±20 | ±20 | V |
| Power Dissipation | $P_D$ | 2.5 | 1.9 | W |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | -55 To 150 | -55 To 150 | ºC |

## Thermal Resistance

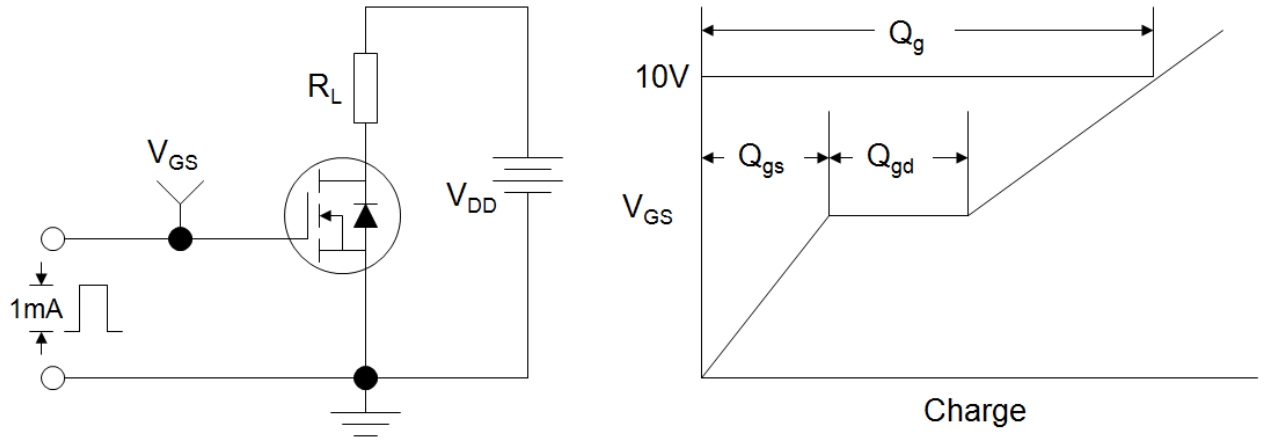
| Parameter | Symbol | NMOS | PMOS | Unit |
|---|---|---|---|---|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 50 | 65 | ºC/W |

| **NMOS Specifications** $T_J$ = 25ºC, unless otherwise noted | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Value** | | | **Unit** |
| | | | **Min.** | **Typ.** | **Max.** | |
| **Static Parameters** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 250μA | 60 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 60V, $V_{GS}$ = 0V, $T_J$ = 25ºC | -- | -- | 1 | μA |
| Gate-Source Leakage | $I_{GSS}$ | $V_{GS}$ = ±20V | -- | -- | ±100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | 1.0 | 1.5 | 2.0 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 4.3A | -- | 28 | 36 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 3.9A | -- | 31 | 40 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=4.3A | -- | 9.6 | -- | S |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 30V, f = 1.0MHz | -- | 1336 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 56 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 52 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DS}$ = 30V, $I_D$ = 5A, $V_{GS}$ = 10V | -- | 22 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 3.3 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 5.2 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 30V, $I_D$ = 5A, $R_G$ = 3Ω | -- | 5.2 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 3 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 17 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 2.5 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ = 1.7A, $V_{GS}$ = 0V | -- | -- | 1.2 | V |
| Continuous Body Diode Current | $I_S$ | $T_C$ = 25ºC | -- | -- | 5 | A |

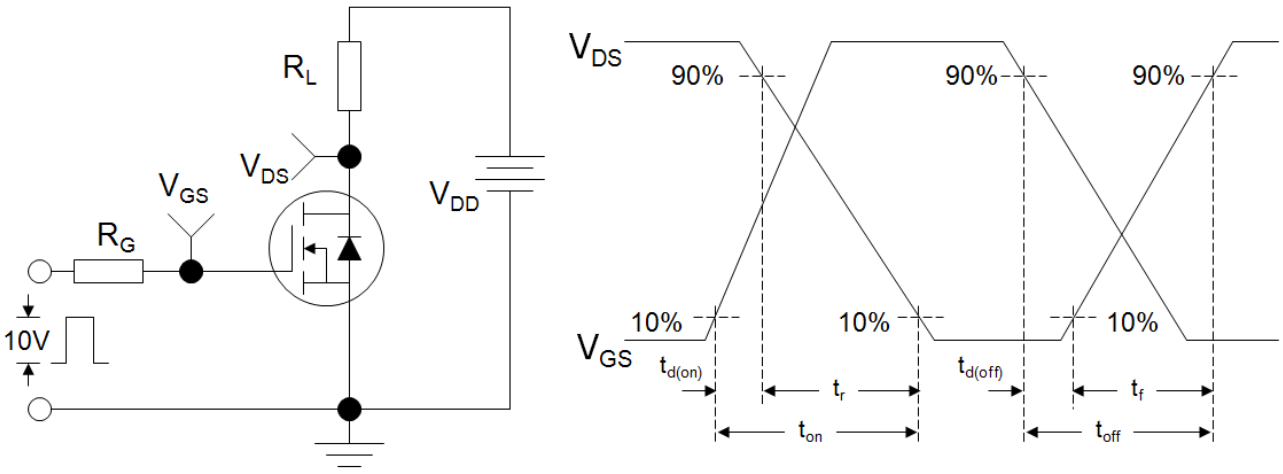
**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Identical low side and high side switch with identical $R_G$

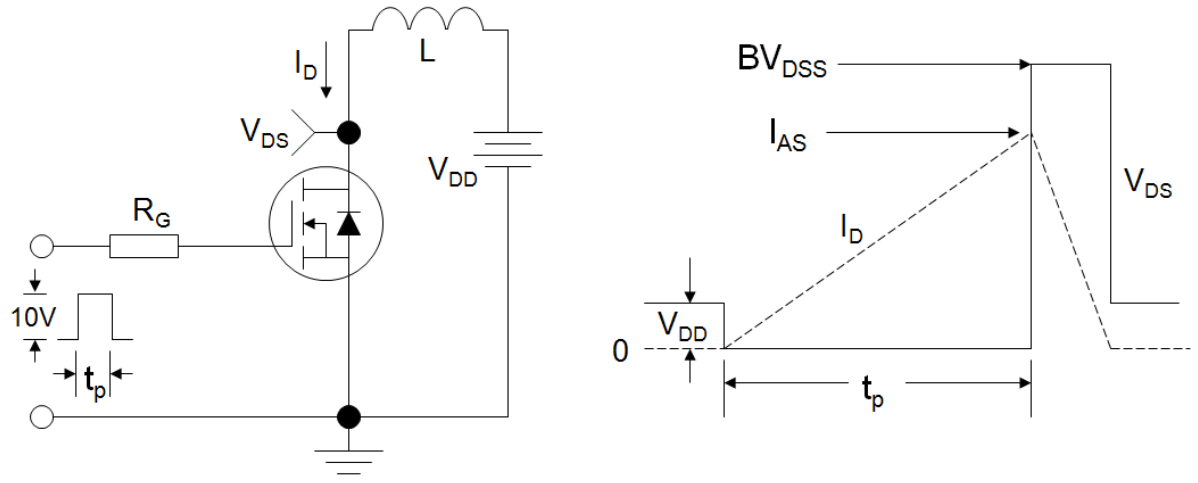
**Gate Charge Test Circuit**




**Switch Time Test Circuit**




**EAS Test Circuit**



## NMOS Typical Characteristics $T_J$ = 25ºC, unless otherwise noted

**Figure 1. Output Characteristics**

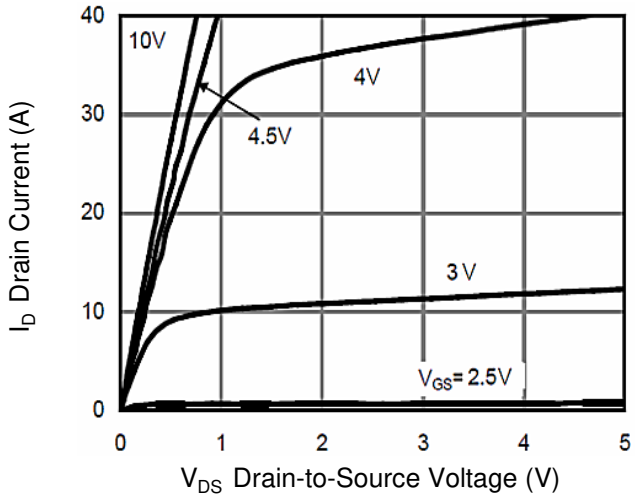



**Figure 2. Transfer Characteristics**

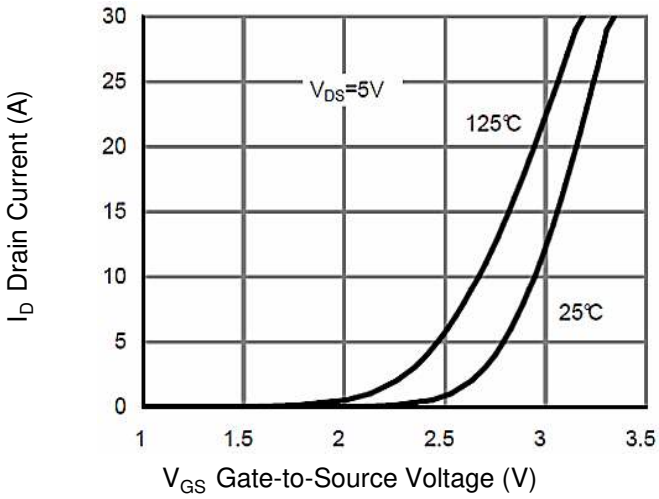



**Figure 3.Drain-Source On-Resistance**

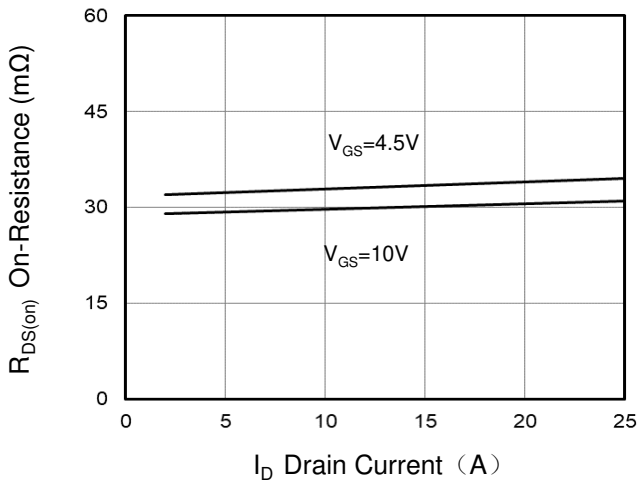



**Figure 4. Gate Charge**

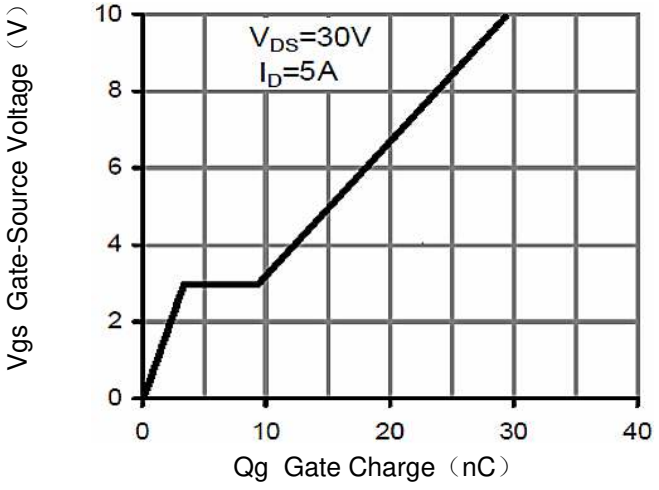



**Figure 5. Capacitance**

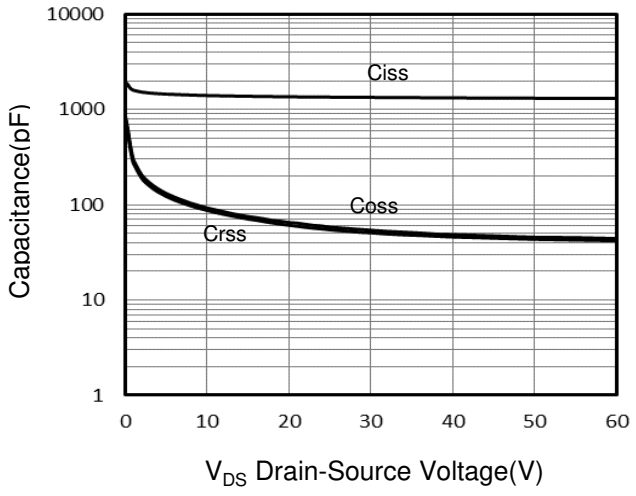
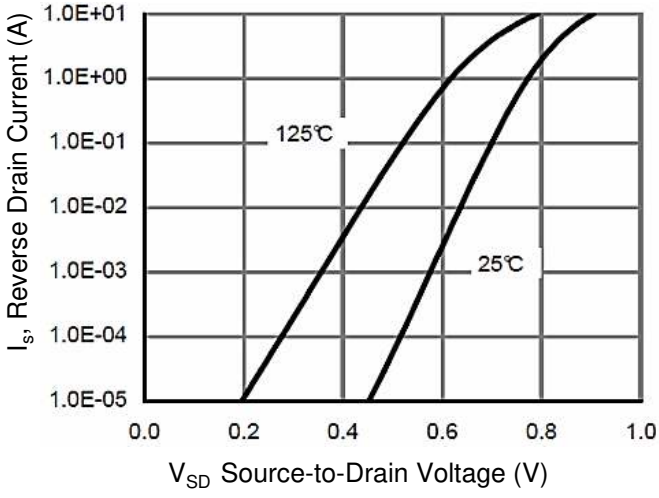



**Figure 6. Source-Drain Diode Forward**



## NMOS Typical Characteristics $T_J$ = 25ºC, unless otherwise noted

**Figure 7. Drain-Source On-Resistance**

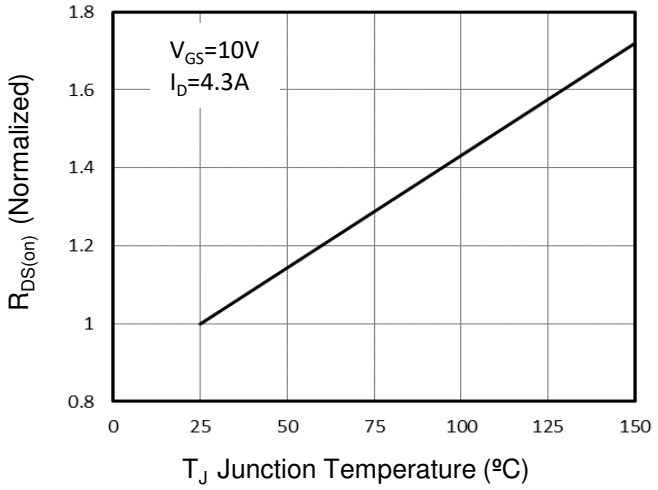



**Figure 8. Safe Operation Area**

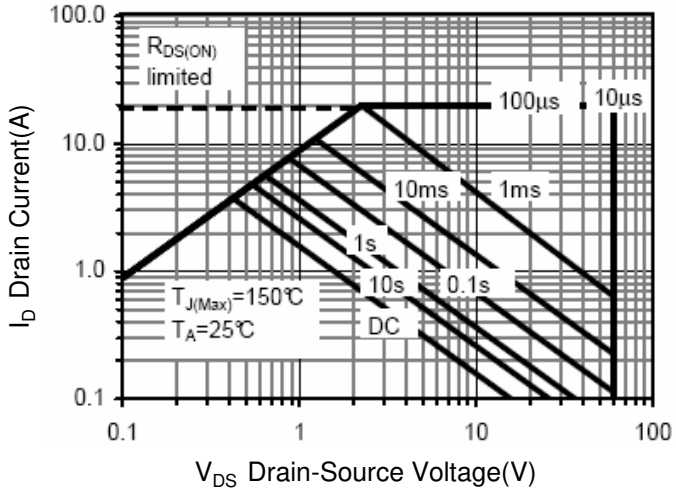
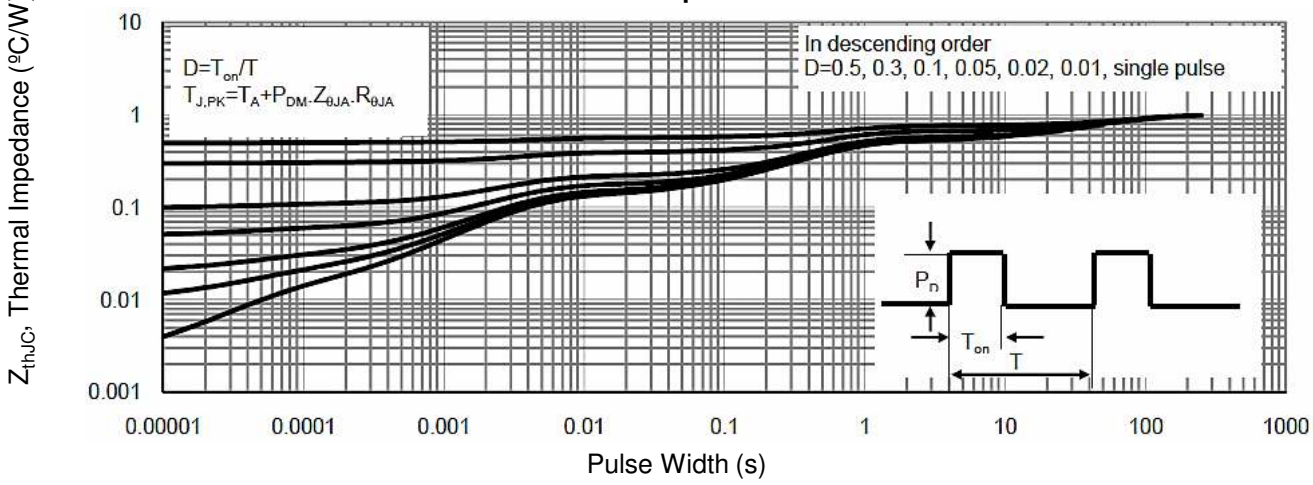



**Figure 9. Normalized Maximum Transient Thermal Impedance**

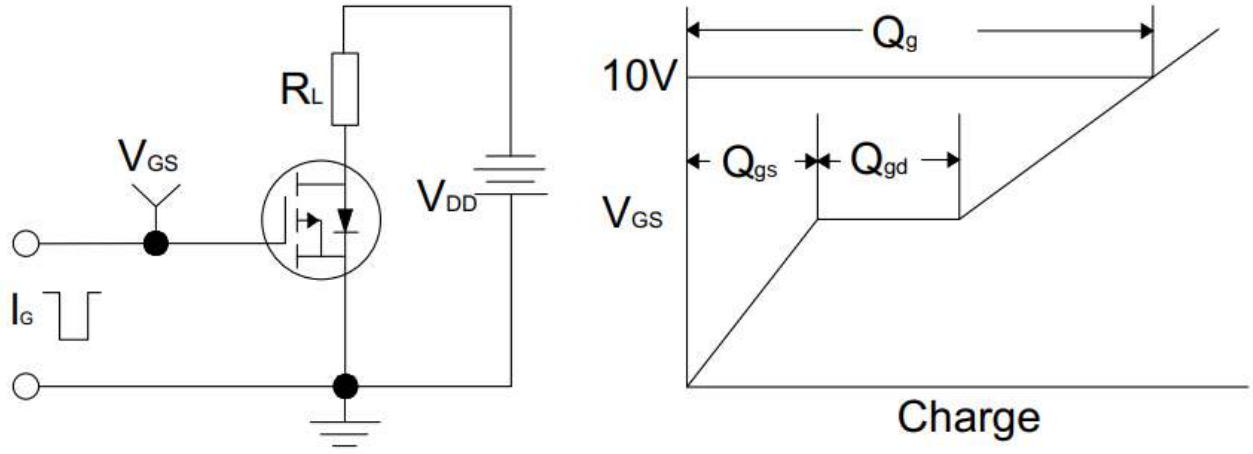


| **PMOS Specifications** $T_J$ = 25ºC, unless otherwise noted | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Value** | | | **Unit** |
| | | | **Min.** | **Typ.** | **Max.** | |
| **Static Parameters** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = -250μA | -60 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -60V, $V_{GS}$ = 0V, $T_J$ = 25ºC | -- | -- | -1 | μA |
| Gate-Source Leakage | $I_{GSS}$ | $V_{GS}$ = ±20V | -- | -- | ±100 | nA |
| Gate-Source Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA | -1.2 | -1.7 | -2.2 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$ = -10V, $I_D$ = -3.1A | -- | 62 | 80 | mΩ |
| | | $V_{GS}$ = -4.5V, $I_D$ = -0.2A | -- | 72 | 95 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=-5V,$I_D$=-3.1A | -- | 6.6 | -- | S |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = -30V, f = 1.0MHz | -- | 1454 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 62 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 58 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = -30V, $I_D$ = -3A, $V_{GS}$ = -10V | -- | 37 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 4.5 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 10.5 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = -30V, $I_D$ = -3A, $R_G$ = 3Ω | -- | 8 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 4 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 32 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 7 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | $T_C$ = 25ºC | -- | -- | -3.1 | A |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ = -2A, $V_{GS}$ = 0V | -- | -- | -1.2 | V |

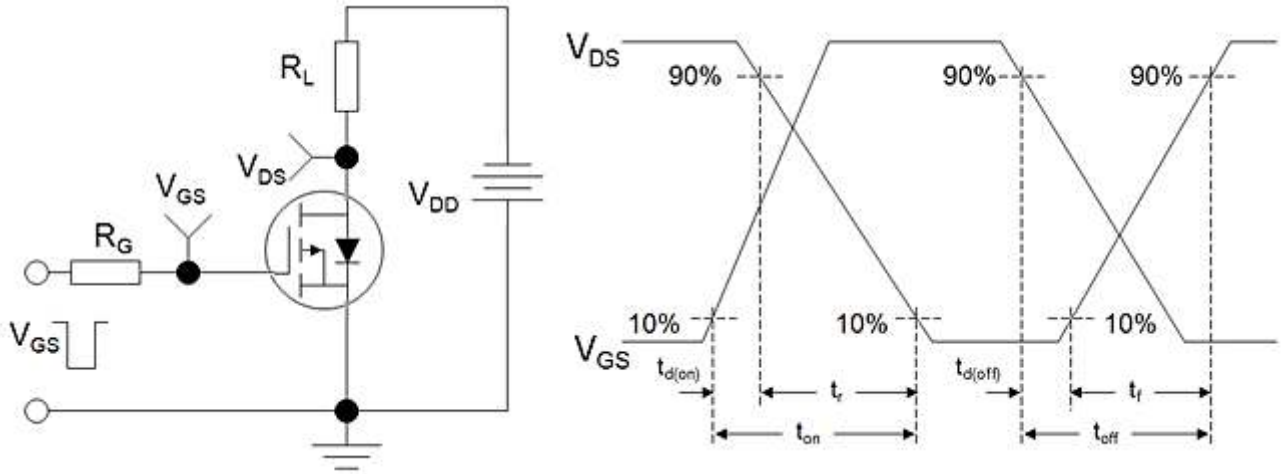
**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Identical low side and high side switch with identical $R_G$

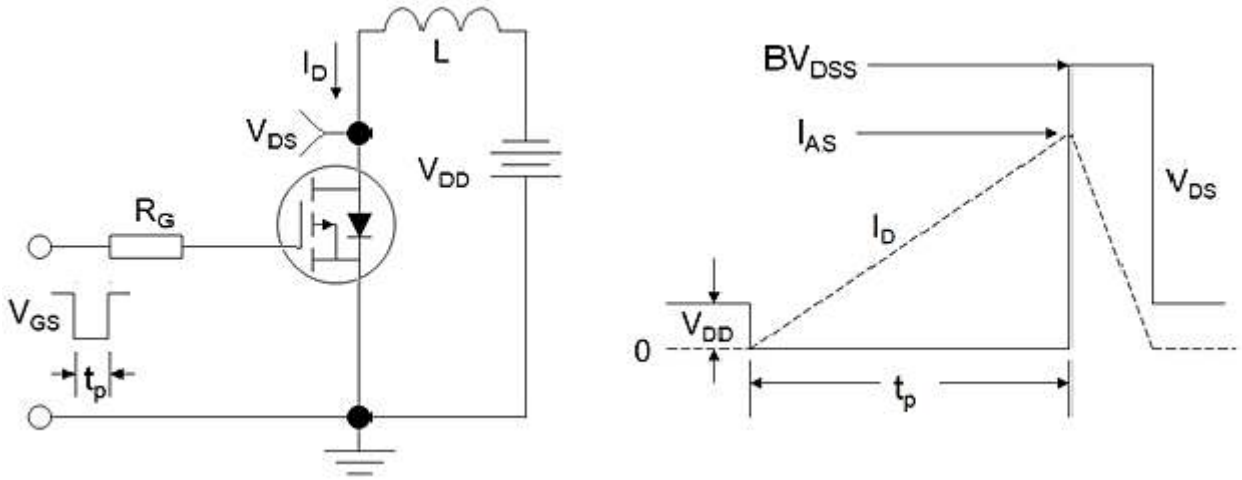
**Gate Charge Test Circuit**




**Switch Time Test Circuit**




**EAS Test Circuit**



## PMOS Typical Characteristics $T_J$ = 25ºC, unless otherwise noted

**Figure 1. Output Characteristics**

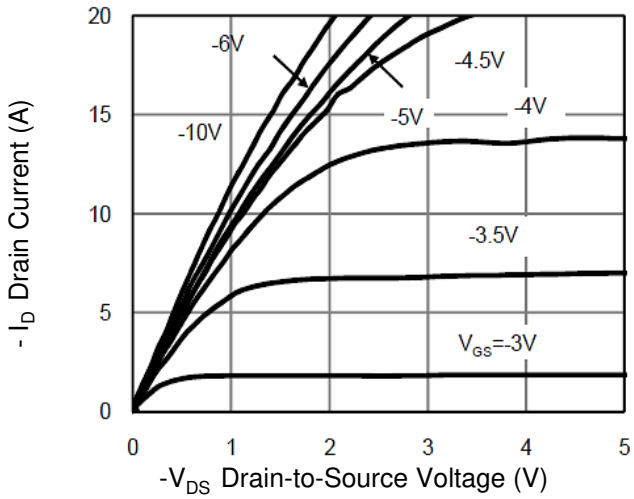



**Figure 2. Transfer Characteristics**

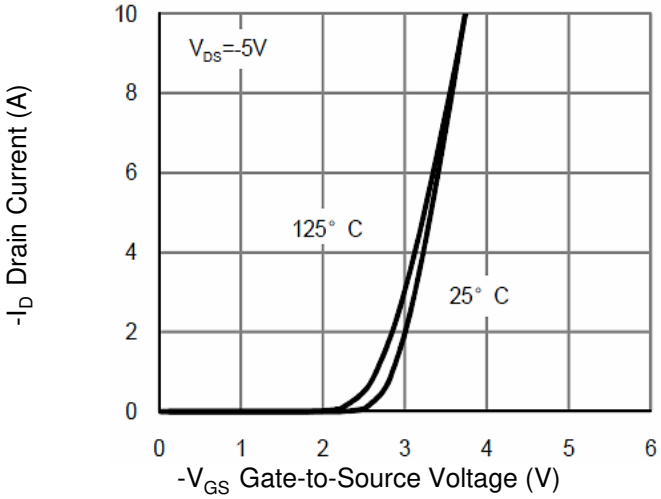



**Figure 3.Rdson-Drain Current**

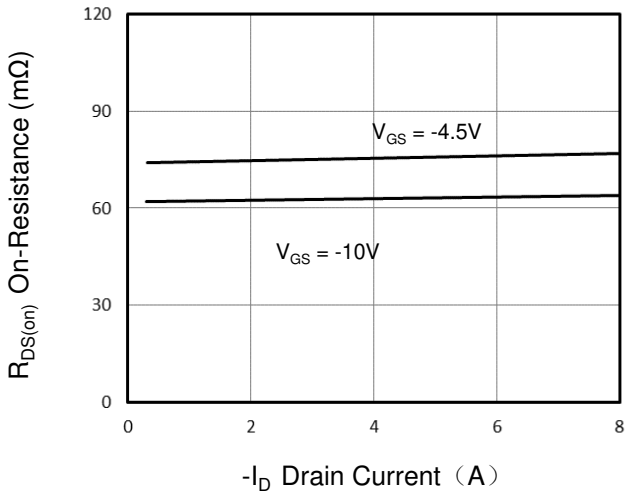



**Figure 4. Gate Charge**

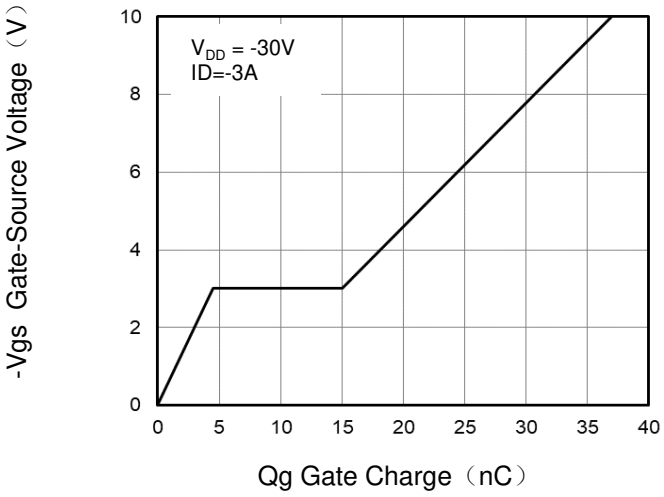



**Figure 5. Capacitance**

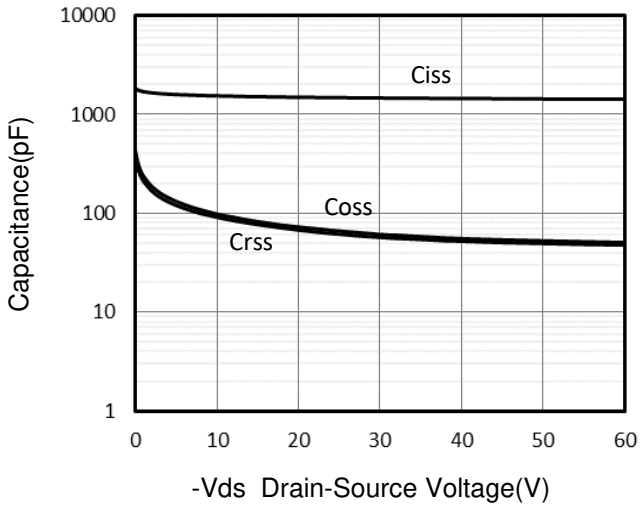
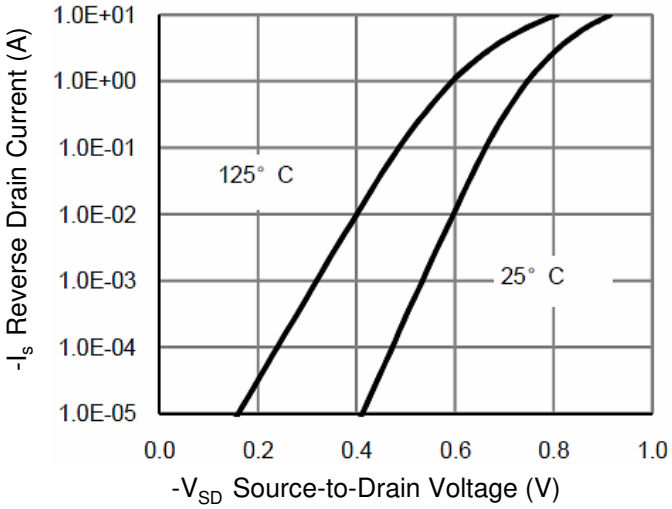



**Figure 6. Source-Drain Diode Forward**



## PMOS Typical Characteristics $T_J$ = 25ºC, unless otherwise noted

**Figure 7. Drain-Source On-Resistance**

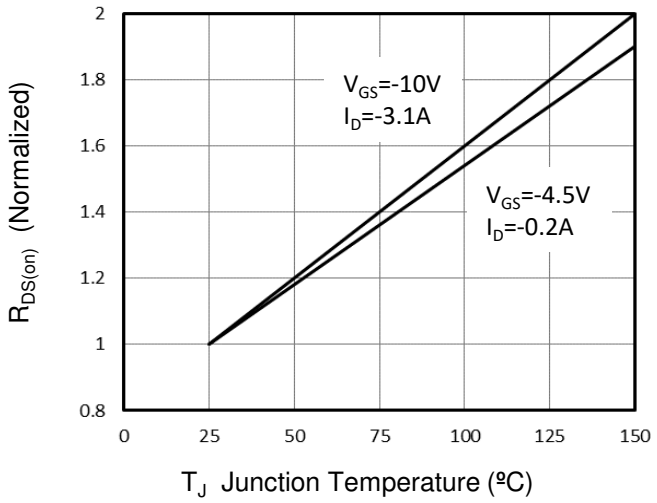



**Figure 8. Safe Operation Area**

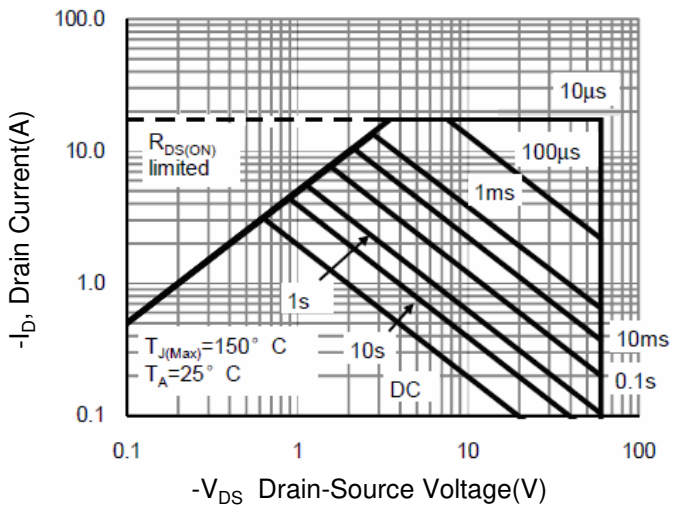
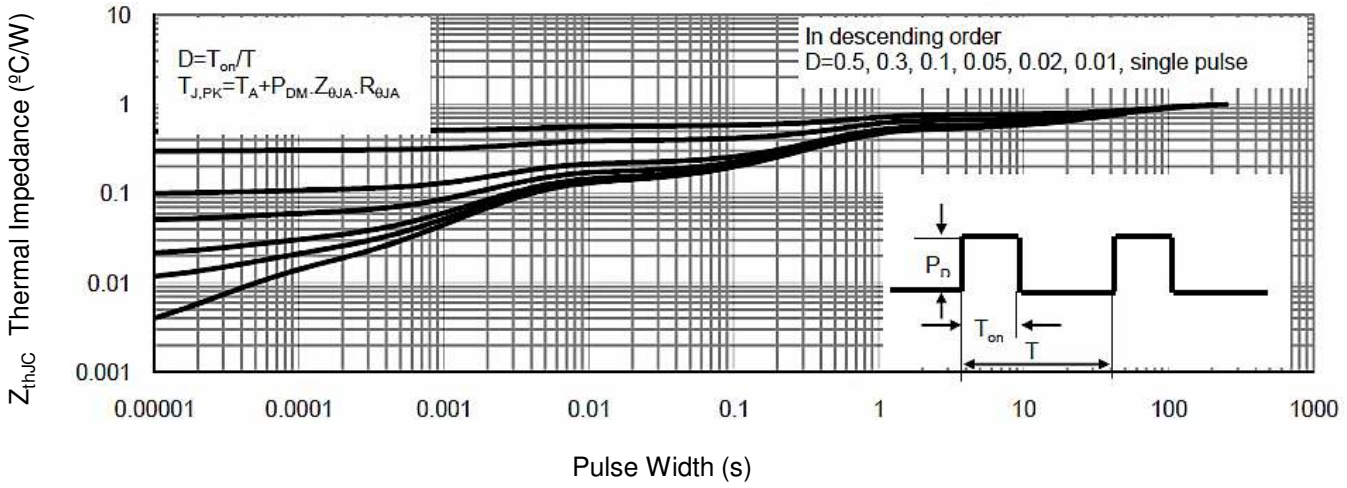
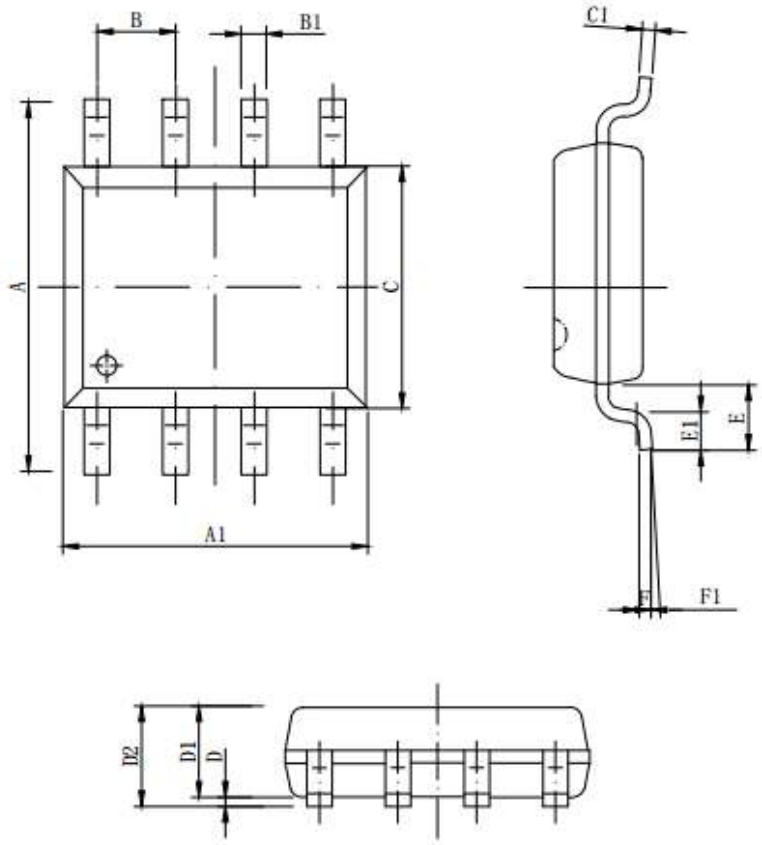



**Figure 9. Normalized Maximum Transient Thermal Impedance**



## SOP-8 Package Information




| Symbol | Dimensions in Millimeters | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 5.800 | 6.000 | 6.200 |
| A1 | 4.800 | 4.900 | 5.000 |
| B | | 1.270BSC | |
| B1 | 0.35^8x | 0.40^8x | 0.45^8x |
| C | 3.780 | 3.880 | 3.980 |
| C1 | -- | 0.203 | 0.253 |
| D | 0.050 | 0.150 | 0.250 |
| D1 | 1.350 | 1.450 | 1.550 |
| D2 | 1.500 | 1.600 | 1.700 |
| D2 | 1.500 | 1.600 | 1.700 |
| E | | 1.060REF | |
| E1 | 0.400 | 0.700 | 0.100 |
| F | | 0.250BSC | |
| F1 | 2° | 4° | 6° |