# N and P Channel Enhancement Mode Power MOSFET

## Description

The 6706AA uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge. It can be used in a wide variety of applications.

AEC-Q101 Qualified

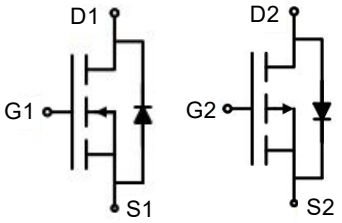
## General Features

- NMOS
- $V_{DS}$ 30V
- $I_D$ (at $V_{GS}$ = 10V) 6.5A
- $R_{DS(ON)}$ (at $V_{GS}$ = 10V) < 20mΩ
- $R_{DS(ON)}$ (at $V_{GS}$ = 4.5V) < 30mΩ
- 100% Avalanche Tested
- RoHS Compliant

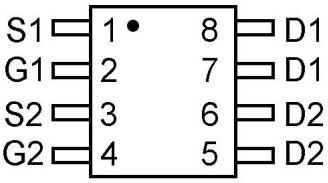
- PMOS
- $V_{DS}$ -30V
- $I_D$ (at $V_{GS}$ = -10V) -5A
- $R_{DS(ON)}$ (at $V_{GS}$ = -10V) < 45mΩ
- $R_{DS(ON)}$ (at $V_{GS}$ = -4.5V) < 70mΩ
- 100% Avalanche Tested
- RoHS Compliant

## Application

- Power switch
- DC/DC converters




Schematic diagram




pin assignment



SOP-8

## Ordering Information

| Device | Package | Marking | Packaging |
|---|---|---|---|
| 6706AA | SOP-8 Dual | 6706 | 4000pcs/Reel |

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

| Parameter | Symbol | NMOS | PMOS | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 30 | -30 | V |
| Continuous Drain Current | $I_D$ | 6.5 | -5 | A |
| Pulsed Drain Current (note1) | $I_{DM}$ | 26 | -20 | A |
| Gate-Source Voltage | $V_{GS}$ | ±20 | ±20 | V |
| Power Dissipation | $P_D$ | 2.0 | 2.0 | W |
| Single pulse avalanche energy （note2） | $E_{AS}$ | 9 | 10 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{stg}$ | -55 To 150 | -55 To 150 | ºC |

## Thermal Resistance

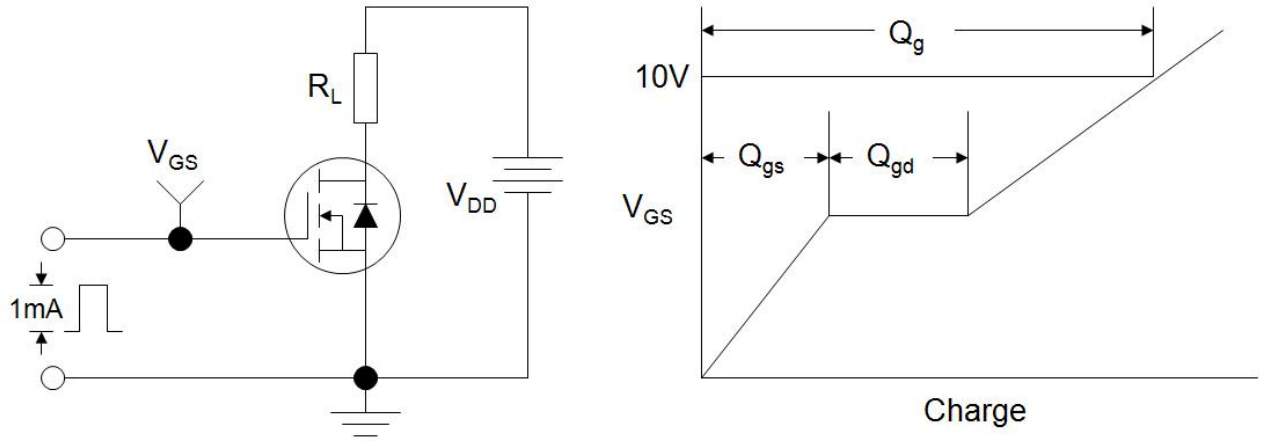
| Parameter | Symbol | NMOS | PMOS | Unit |
|---|---|---|---|---|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 62.5 | 62.5 | ºC/W |

| **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 | 30 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = 30V, $V_{GS}$ = 0V | -- | -- | 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 | 1.5 | 2 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10V, $I_D$ = 5A | -- | 16 | 20 | mΩ |
| | | $V_{GS}$ = 4.5V, $I_D$ = 5A | -- | 23 | 30 | |
| Forward Transconductance | $g_{FS}$ | $V_{GS}$ = 5V, $I_D$ = 5A | -- | 15 | -- | S |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = 15V, f = 1.0MHz | -- | 531 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 68 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 54 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = 15V, $I_D$ = 5A, $V_{GS}$ = 10V | -- | 14.8 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 2.6 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 2.9 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = 15V, $I_D$ = 5A, $R_G$ = 3Ω | -- | 4.5 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 2.5 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 14.5 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 3.5 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | $T_C$ = 25ºC | -- | -- | 6.5 | A |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ =5A, $V_{GS}$ = 0V | -- | -- | 1.2 | V |
| Reverse Recovery Charge | Qrr | $I_F$ = 5A, $V_{GS}$ = 0V di/dt=100A/us | -- | 56 | -- | nC |
| Reverse Recovery Time | Trr | | -- | 47 | -- | ns |

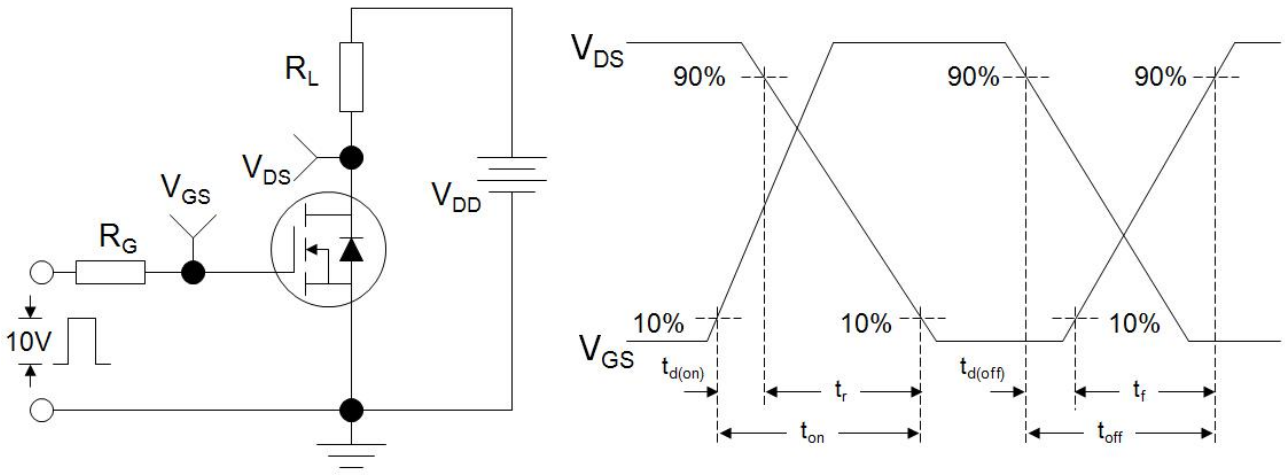
**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : Tj=25℃ ,VDD=30V,VGS=10V,L=0.5mH,Rg=25Ω
3. Identical low side and high side switch with identical $R_G$

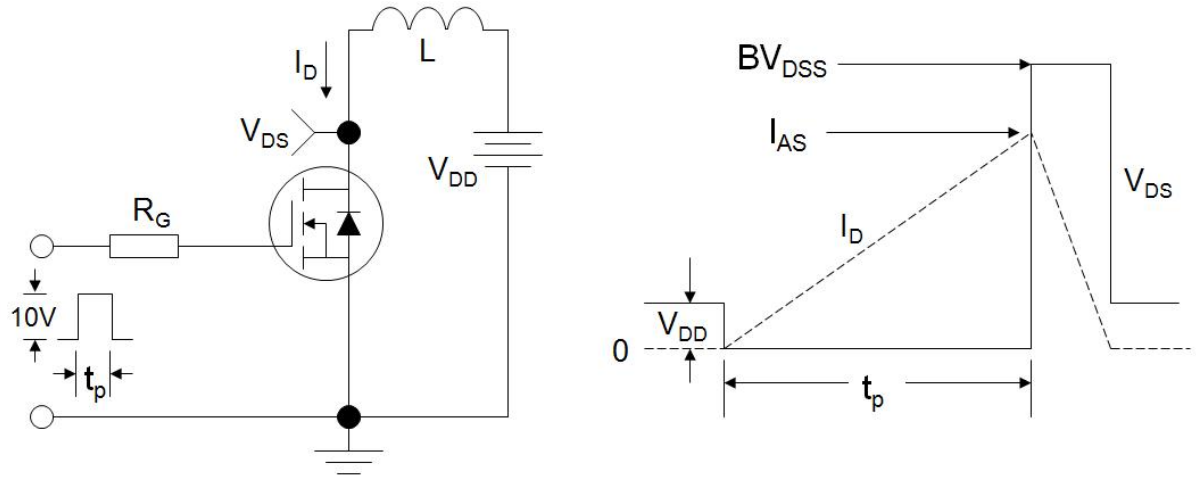
**Gate Charge Test Circuit**




**Switch Time Test Circuit**




**EAS Test Circuit**



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

**Figure 1. Output Characteristics**

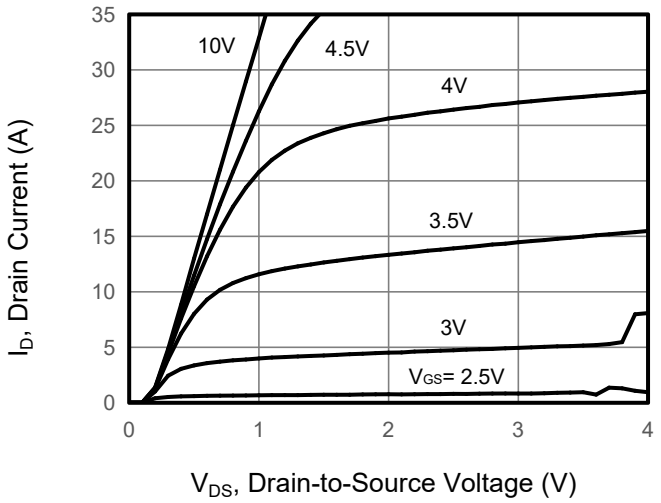



**Figure 2. Transfer Characteristics**

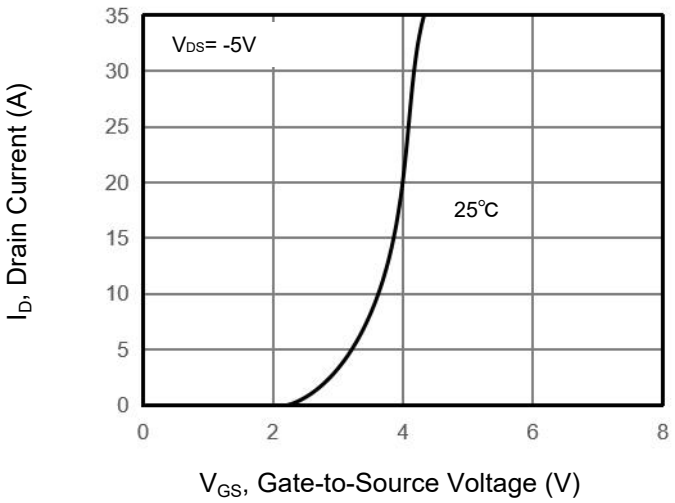



**Figure 3. Drain Source On Resistance**

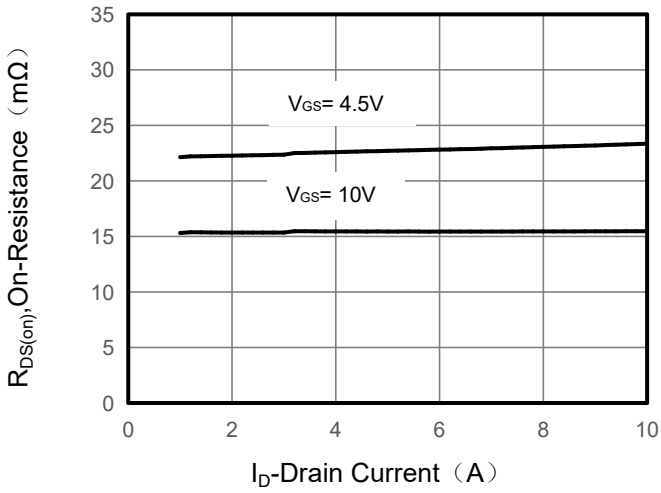



**Figure 4. Gate Charge**

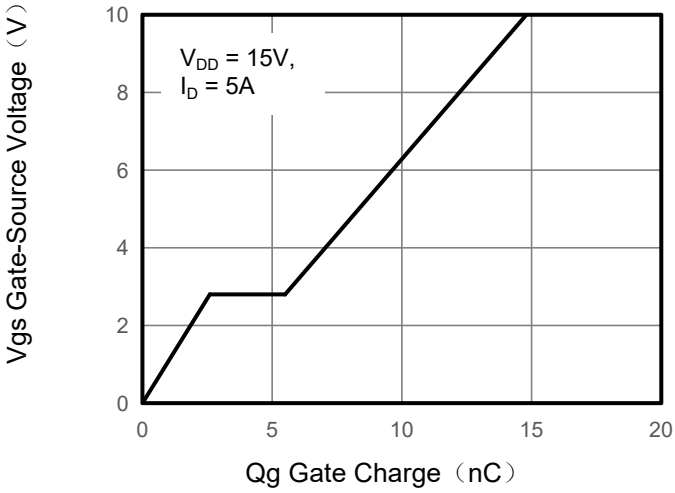



**Figure 5. Capacitance**

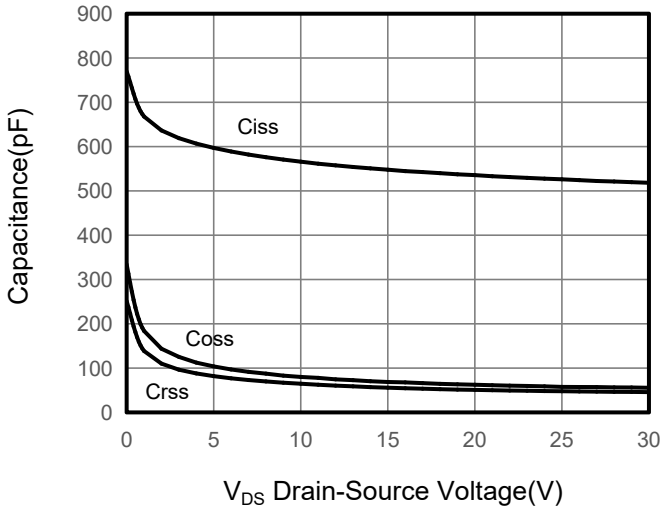
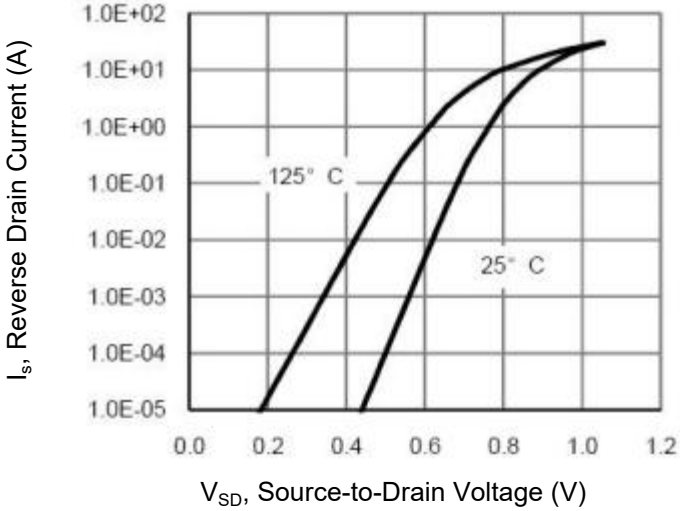



**Figure 6. Source-Drain Diode Forward**



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

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

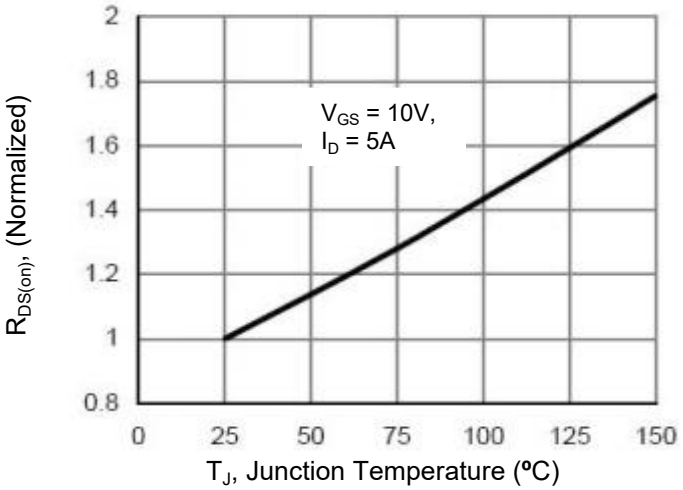



**Figure 8. Safe Operation Area**

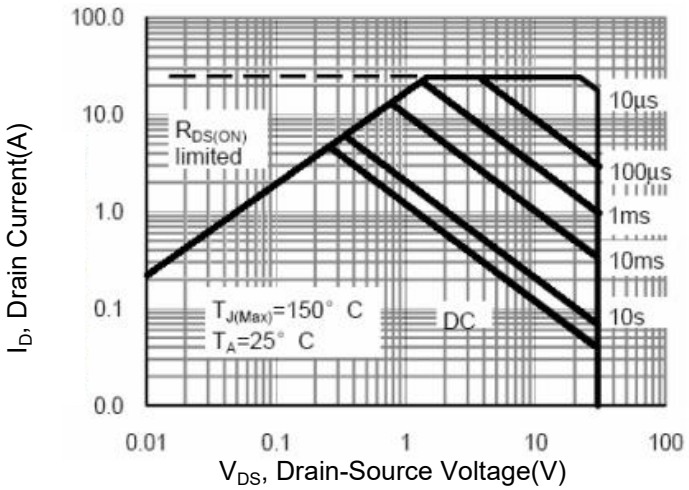
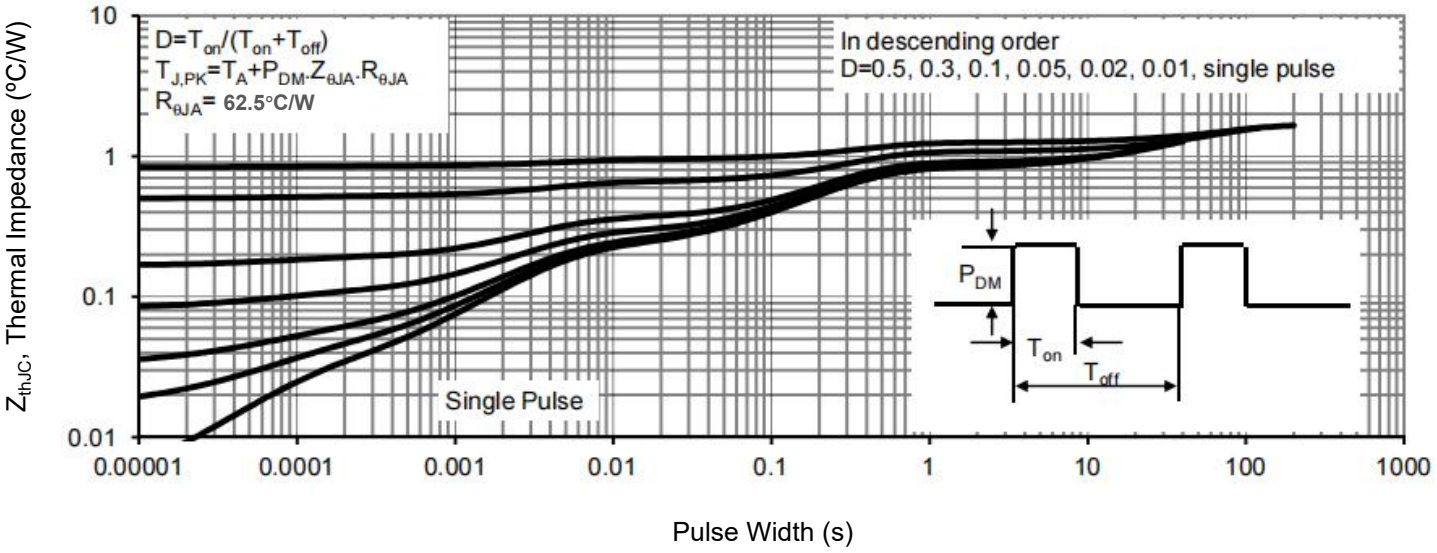



**Figure 9. Normalized Maximum Transient Thermal Impedance**

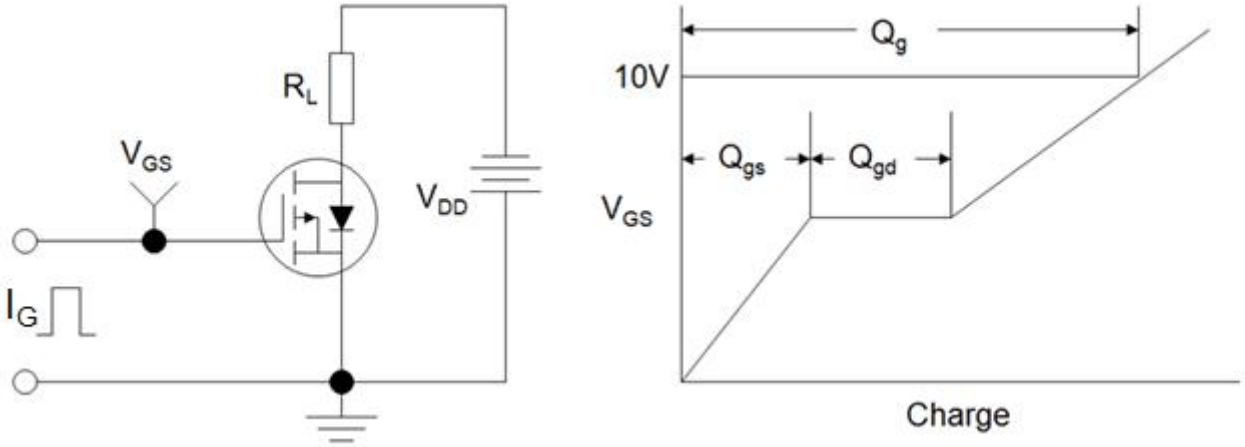


| **PMOS Specifications** $T_J$ = 25ºC, unless otherwise noted | | | | | | |
|---|---|---|---|---|---|---|
| **Parameter** | **Symbol** | **Test Conditions** | **Value** | | | **Unit** |
| | | | **Min.** | **Typ.** | **Max.** | |
| **Static Parameters** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = -250μA | -30 | -- | -- | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$ = -30V, $V_{GS}$ = 0V | -- | -- | -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 | -1.6 | -2.5 | V |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$ = -10V, $I_D$ = -4A | -- | 35 | 45 | mΩ |
| | | $V_{GS}$ = -4.5V, $I_D$ = -4A | -- | 54 | 70 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = -5V,$I_D$ = -5A | -- | 8 | -- | S |
| **Dynamic Parameters** | | | | | | |
| Input Capacitance | $C_{iss}$ | $V_{GS}$ = 0V, $V_{DS}$ = -15V, f = 1.0MHz | -- | 563 | -- | pF |
| Output Capacitance | $C_{oss}$ | | -- | 77 | -- | |
| Reverse Transfer Capacitance | $C_{rss}$ | | -- | 67 | -- | |
| Total Gate Charge | $Q_g$ | $V_{DD}$ = -15V, $I_D$ = -4A, $V_{GS}$ = -10V | -- | 11 | -- | nC |
| Gate-Source Charge | $Q_{gs}$ | | -- | 2 | -- | |
| Gate-Drain Charge | $Q_{gd}$ | | -- | 2.6 | -- | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$ = -15V, $I_D$ = -4A, $R_G$ = 3Ω | -- | 7.5 | -- | ns |
| Turn-on Rise Time | $t_r$ | | -- | 5.5 | -- | |
| Turn-off Delay Time | $t_{d(off)}$ | | -- | 19 | -- | |
| Turn-off Fall Time | $t_f$ | | -- | 7 | -- | |
| **Drain-Source Body Diode Characteristics** | | | | | | |
| Continuous Body Diode Current | $I_S$ | $T_C$ = 25ºC | -- | -- | -5 | A |
| Body Diode Voltage | $V_{SD}$ | $T_J$ = 25ºC, $I_{SD}$ = -4A, $V_{GS}$ = 0V | -- | -- | -1.2 | V |
| Reverse Recovery Charge | $Q_{rr}$ | $I_F$ = -4A, $V_{GS}$ = 0V di/dt=-100A/us | -- | 66 | -- | nC |
| Reverse Recovery Time | $T_{rr}$ | | -- | 53 | -- | ns |

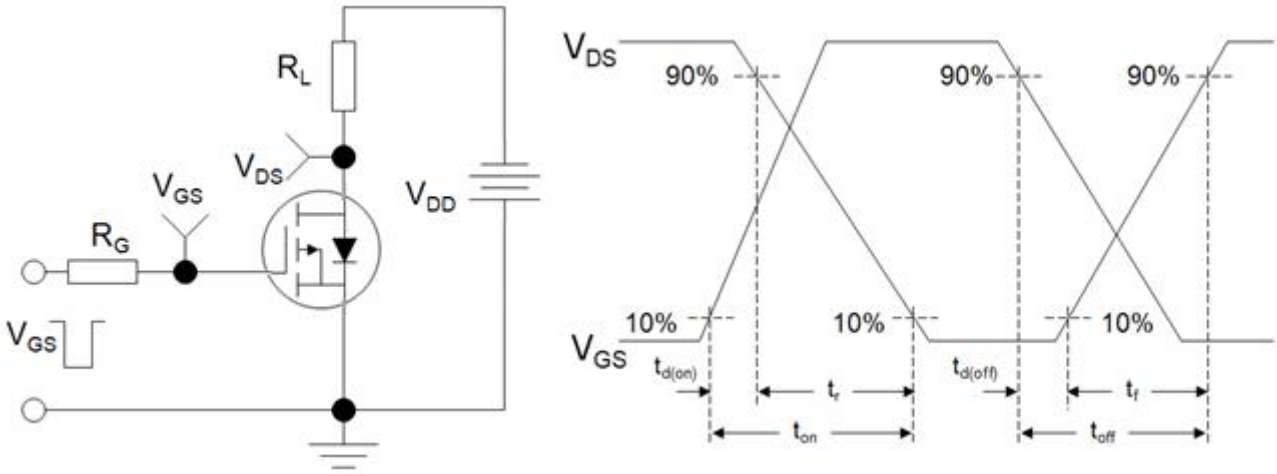
**Notes**

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition : Tj=25℃ ,VDD=-30V,VGS=-10V,L=0.5mH,Rg=25Ω
3. Identical low side and high side switch with identical $R_G$

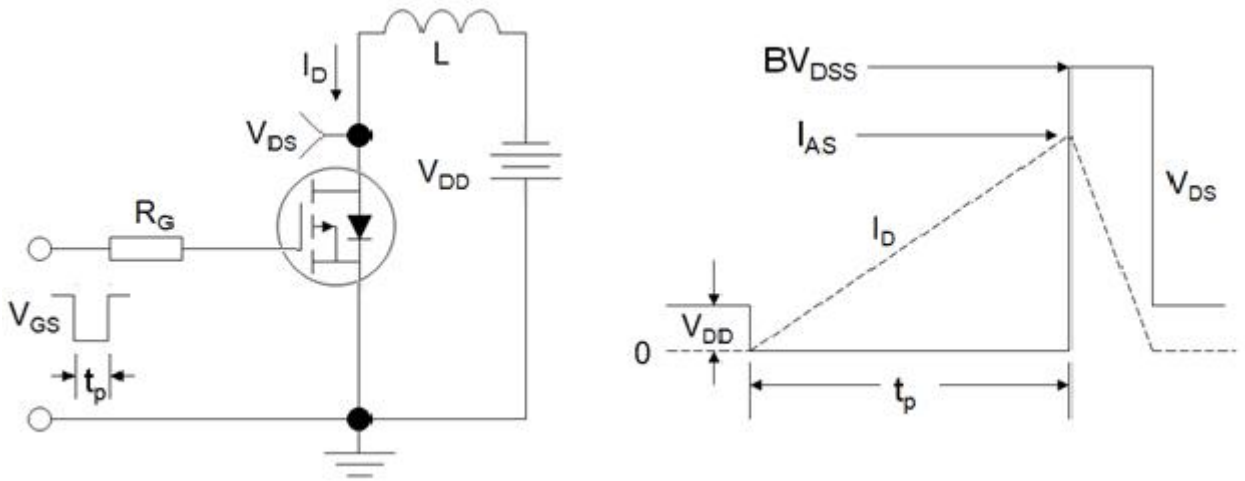
**Gate Charge Test Circuit**




**Switch Time Test Circuit**




**EAS Test Circuit**



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

**Figure 1. Output Characteristics**

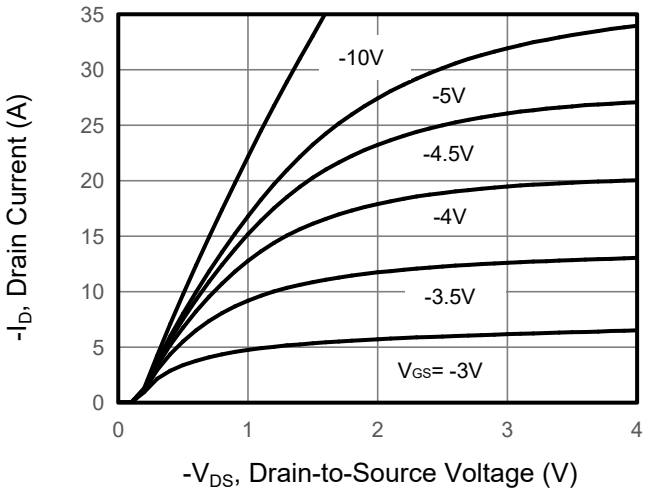



**Figure 2. Transfer Characteristics**

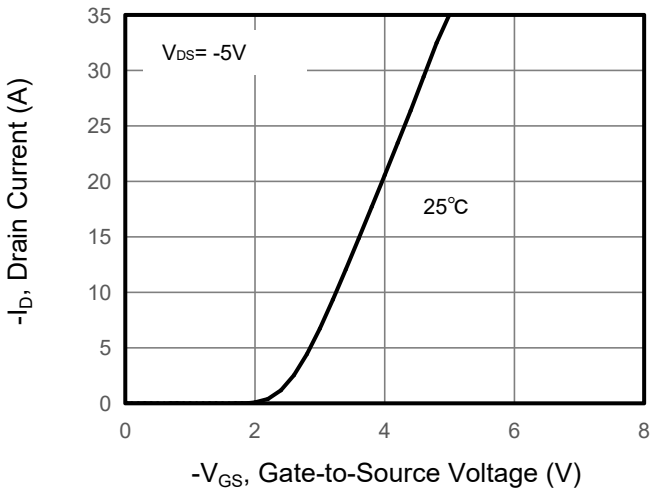



**Figure 3.Drain Source On Resistance**

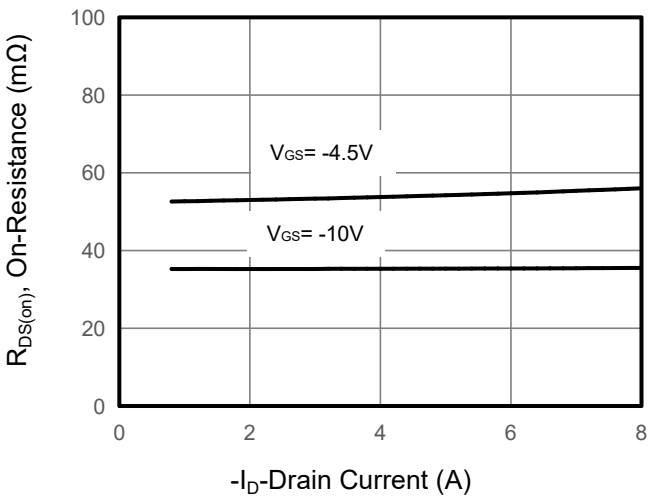



**Figure 4. Gate Charge**

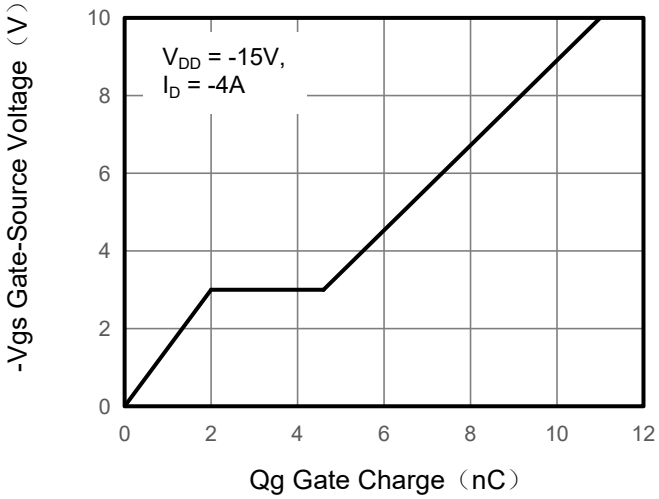



**Figure 5. Capacitance**

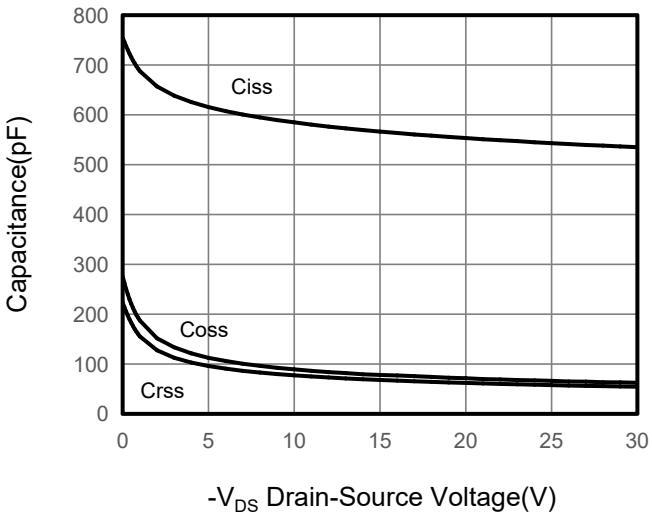
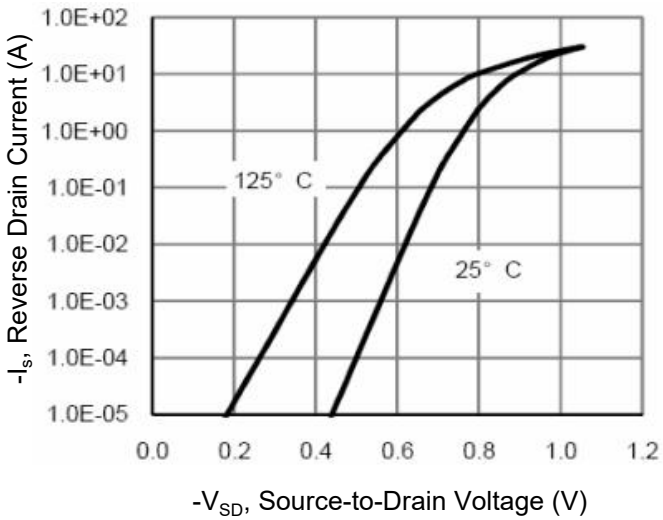



**Figure 6. Source-Drain Diode Forward**



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

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

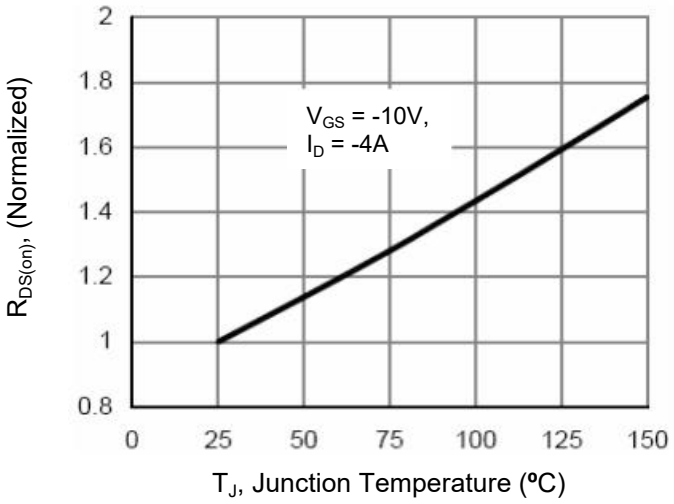



**Figure 10. Safe Operation Area**

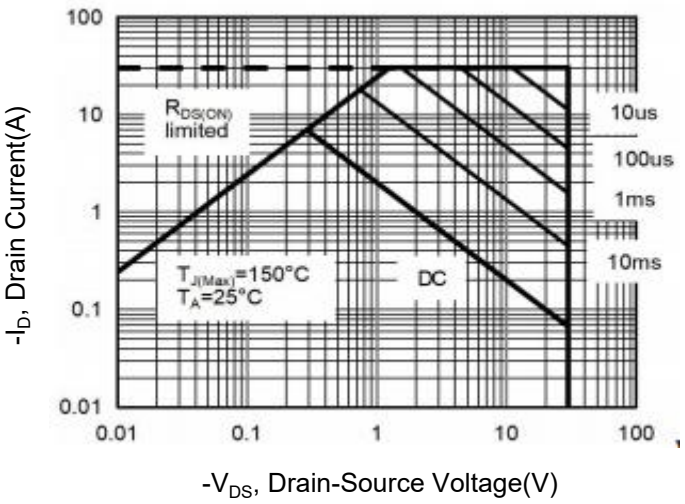
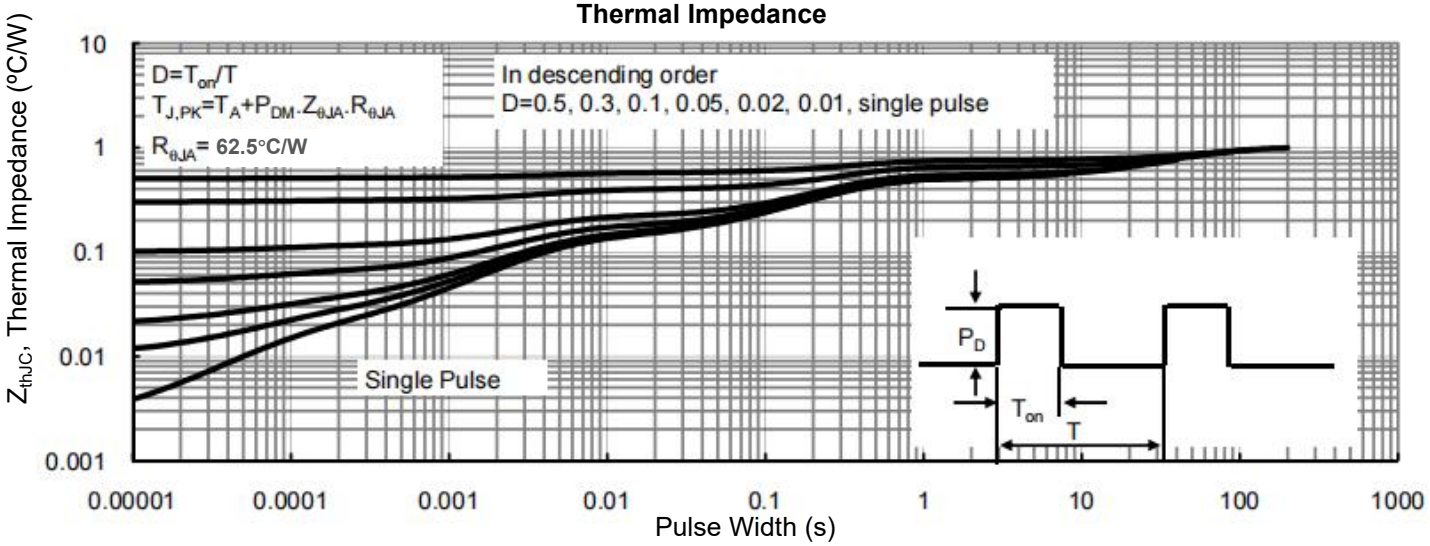
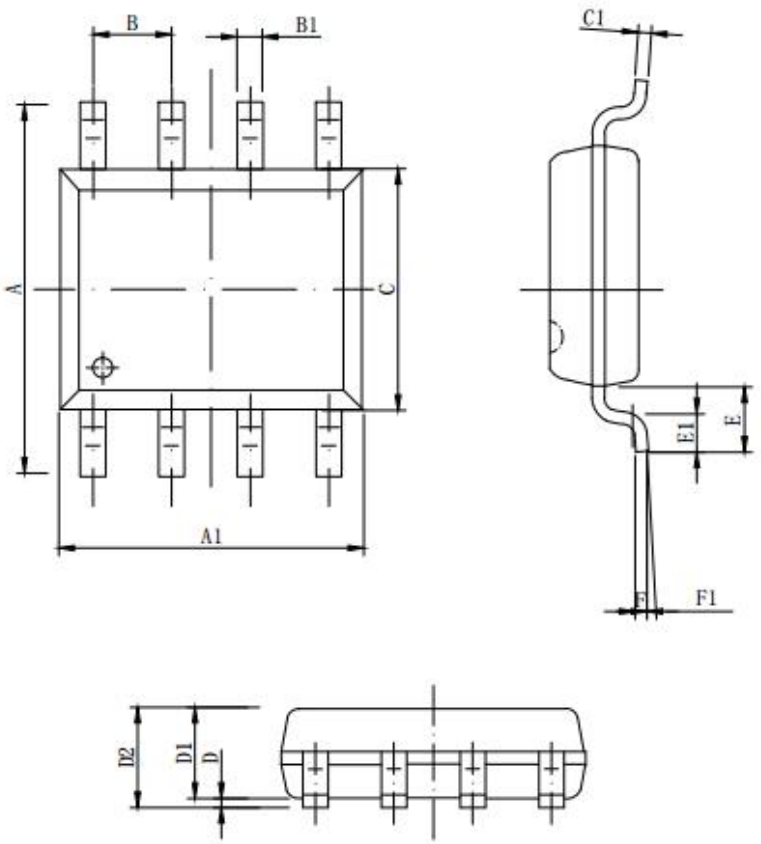



**Figure 9. Normalized Maximum Transient Thermal Impedance**



## SOP-8 Dual 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° |