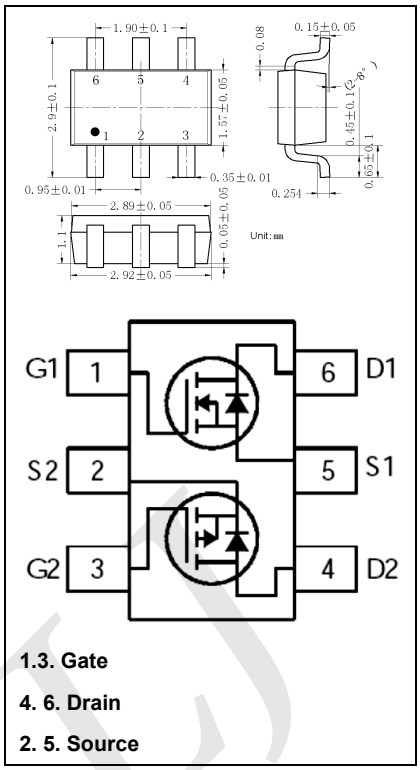
SHENZHEN LONG JING MICRO-ELECTRONICS CO., LTD.

# SOT-23-6L Plastic-Encapsulate MOSFETS

## APM2701

20V Complementary Enhancement Mode Field Effect Transistor




**1.3. Gate**

**4. 6. Drain**

**2. 5. Source**

### Features

| N-channel | P-channel |
|---|---|
| ■ $V_{DS}$ (V) = 20V | $V_{DS}$ (V) = -20V |
| ■ $I_D$ =4A | $I_D$ = -2.5A |
| ■ $R_{DS(ON)}$ | $R_{DS(ON)}$ |
| < 35mΩ ($V_{GS}$=4.5V) | < 85mΩ ($V_{GS}$ = -4.5V) |
| < 42mΩ ($V_{GS}$=2.5V) | < 115mΩ ($V_{GS}$ = -2.5V) |

**Marking: 52907**

### Description

The APM2701 combines advanced trench MOSFET technology with a low resistance package to provide extremely low $R_{DS(ON)}$. This device is ideal for load switch and battery protection applications.

### Maximum Ratings ($T_A$=25°C unless otherwise specified)

| Symbol | Parameter | | N-Channel | P-Channel | Unit |
|---|---|---|---|---|---|
| $V_{DSS}$ | Drain-Source voltage | | 20 | -20 | V |
| $V_{GSS}$ | Gate-Source voltage | | ±12 | ±12 | |
| $I_D$ | Continuous Drain Current [1, 3] | $T_A$ = 25°C | 4 | -2.5 | A |
| | | $T_A$ = 70°C | 3.2 | -2 | |
| $I_{DM}$ | Pulsed Drain Current [2] | | 13 | -13 | A |
| $P_D$ | Power Dissipation | $T_A$ = 25°C | 1.1 | | W |
| | | $T_A$ = 70°C | 0.7 | | |
| $T_J$, $T_{stg}$ | Operating Temperature/ Storage Temperature | | -55 ~ +150 | | °C |

## Electrical Characteristics ($T_J$=25°C unless otherwise specified)

| Symbol | Parameter | Test Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static** | | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$ = 0V, $I_D$ = 250μA | N-Ch | 20 | | | V |
| | | $V_{GS}$ = 0V, $I_D$ = -250μA | P-Ch | -20 | | | |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$ = 20V, $V_{GS}$ = 0V | N-Ch | | | 1 | μA |
| | | $V_{DS}$ = -20V, $V_{GS}$ = 0V | P-Ch | | | -1 | |
| $V_{GS(th)}$ | Gate-Threshold Voltage | $V_{DS}$ = $V_{GS}$, $I_D$ = 250μA | N-Ch | 0.6 | 0.75 | 1.0 | V |
| | | $V_{DS}$ = $V_{GS}$, $I_D$ = -250μA | P-Ch | -0.5 | -0.6 | -1.0 | |
| $I_{GSS}$ | Gate-body Leakage current | $V_{DS}$ = 0V, $V_{GS}$ = ±12V | | | | ±100 | nA |
| $R_{DS(on)}$ | Drain-Source On-Resistance | $V_{GS}$ = 4.5V, $I_D$ = 3.5A | N-Ch | | 29 | 35 | mΩ |
| | | $V_{GS}$ = -4.5V, $I_D$ = -2.8A | P-Ch | | 77 | 85 | |
| | | $V_{GS}$ = 2.5V, $I_D$ = 2.5A | N-Ch | | 35 | 42 | |
| | | $V_{GS}$ = -2.5V, $I_D$ = -2.0A | P-Ch | | 92 | 115 | |
| | | $V_{GS}$ =1.8V, $I_D$ = 2A | N-Ch | | 62 | 75 | |
| | | $V_{GS}$ = -2.5V, $I_D$ = -2.0A | P-Ch | | 118 | 200 | |
| $g_{FS}$ | Forward Transconductance | $V_{DS}$ = 5V, $I_D$ = 3A | N-Ch | | 16 | | S |
| | | $V_{DS}$ = -5V, $I_D$ = 2.5A | P-Ch | | 13 | | |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$ = 0V, $I_S$ = 1.7A | N-Ch | | 0.74 | 1.0 | V |
| | | $V_{GS}$ = 0V, $I_S$ = -1.6A | P-Ch | | -0.81 | -1.0 | |
| $I_S$ | Maximum Body-Diode Continuous Current | | N-Ch | | | 1.7 | A |
| | | | P-Ch | | | -1.6 | |
| **Dynamic** | | | | | | | |
| $C_{iss}$ | Input Capacitance | N-mos: $V_{DS}$ = 8V, $V_{GS}$ = 0V, f = 1MHz P-mos: $V_{DS}$ = -6V, $V_{GS}$ = 0V, f = 1MHz | N-Ch | | 522.3 | | pF |
| | | | P-Ch | | 589 | | |
| $C_{oss}$ | Output Capacitance | | N-Ch | | 98.5 | | |
| | | | P-Ch | | 91.2 | | |
| $C_{rss}$ | Reverse Transfer Capacitance | | N-Ch | | 74.7 | | |
| | | | P-Ch | | 67.2 | | |
| **Switching** | | | | | | | |
| $Q_g$ | Total Gate Charge | N-mos: $V_{DD}$ = 10V, $V_{GS}$ = 4.5V, $I_D$ = 4A P-mos: $V_{DD}$ = -6V, $V_{GS}$ = -4.5V $I_D$ = -2.8A | N-Ch | | 6.3 | 8.1 | nC |
| | | | P-Ch | | 6.6 | 8.6 | |
| $Q_{gs}$ | Gate-Source Charge | | N-Ch | | 1.7 | 2.2 | |
| | | | P-Ch | | 0.3 | 0.4 | |
| $Q_{gd}$ | Gate-Drain Charge | | N-Ch | | 1.4 | 1.8 | |
| | | | P-Ch | | 1.3 | 1.7 | |
| $t_{d(on)}$ | Turn-On Delay Time | N-mos: $V_{DD}$ = 10V, $V_{GS}$ = 4.5V, $I_D$ = 1.0A, $R_G$ = 6Ω P-mos: $V_{DD}$ = -6V, $I_D$ = -1A, $V_{GS}$ = -4.5V, $R_G$ = 6Ω | N-Ch | | 10.4 | 20.8 | ns |
| | | | P-Ch | | 9.7 | 19.4 | |
| $t_r$ | Rise Time | | N-Ch | | 4.4 | 8.8 | |
| | | | P-Ch | | 3.6 | 7.1 | |
| $t_{d(off)}$ | Turn-Off Delay Time | | N-Ch | | 27.4 | 54.8 | |
| | | | P-Ch | | 33.3 | 66.6 | |
| $t_f$ | Fall Time | | N-Ch | | 4.2 | 8.4 | |
| | | | P-Ch | | 4.5 | 9 | |

1: The value of $R_{\theta JA}$ is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with TA=25°C. The value in any given application depends on the user's specific board design.

2: Repetitive rating, pulse width limited by junction temperature.

3: The current rating is based on the t≤ 10s junction to ambient thermal resistance rating.

## N-Channel Typical Characteristics

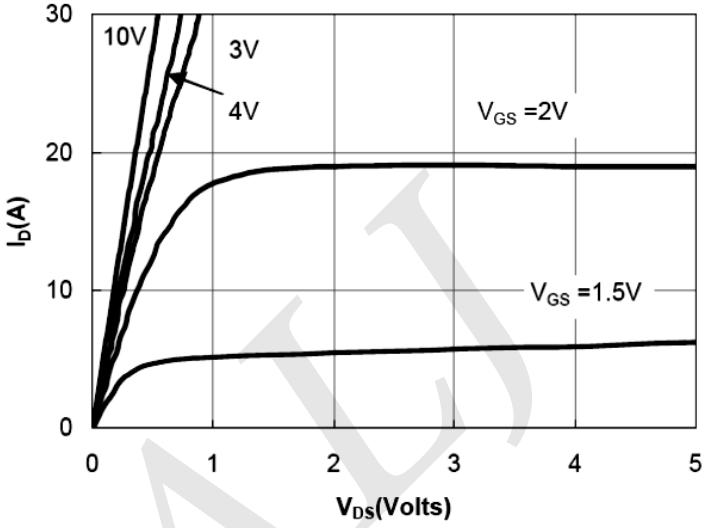



Figure 1: On-Regions Characteristics

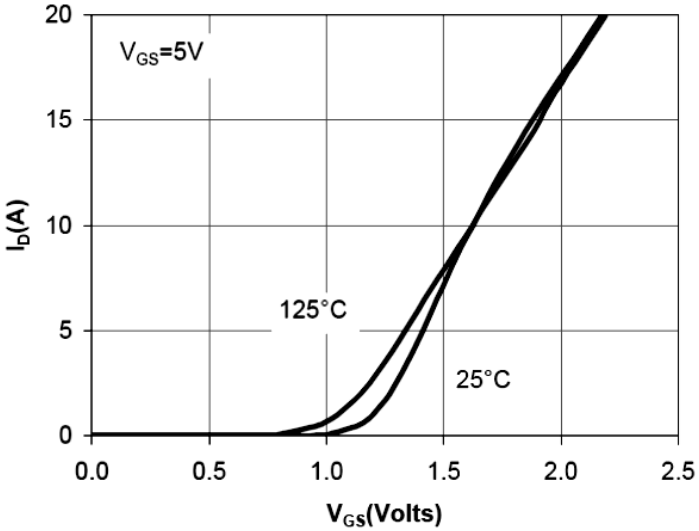



Figure 2: Transfer Characteristics

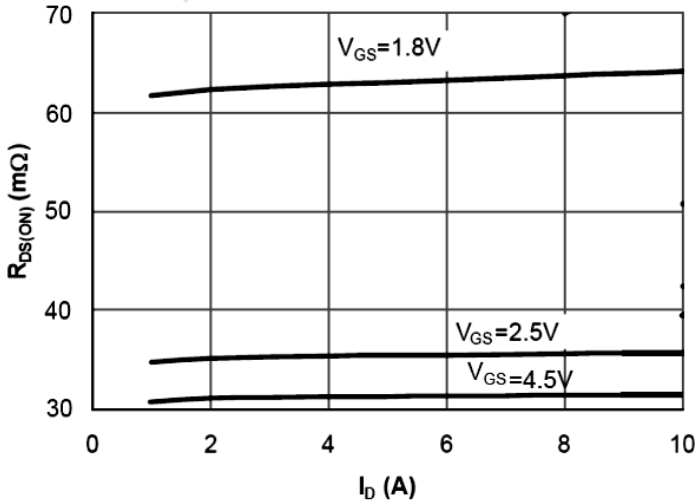



Figure 3: On-Resistance vs. Drain Current and Gate Voltage

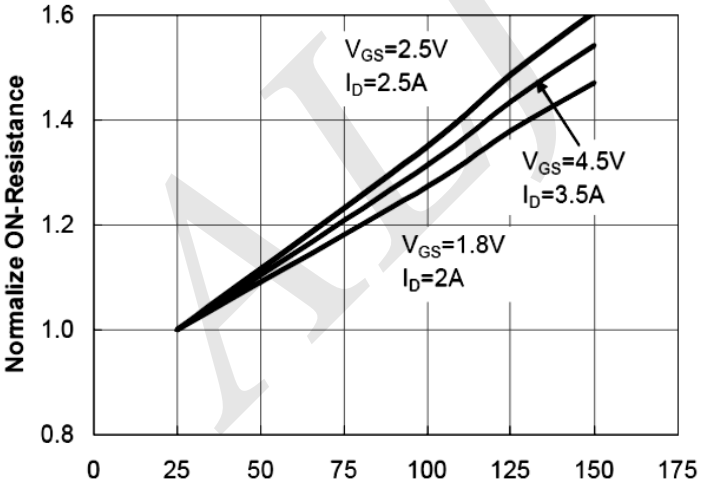



Figure 4: On-Resistance vs. Junction Temperature

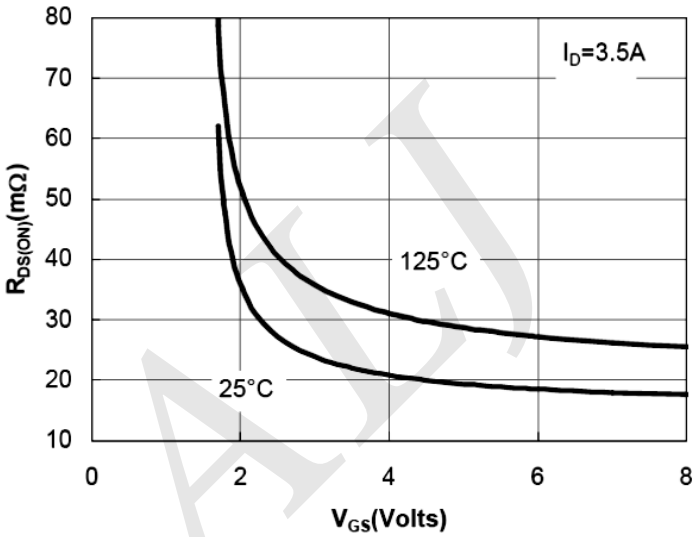



Figure 5: On-Resistance vs. Gate-Source Voltage

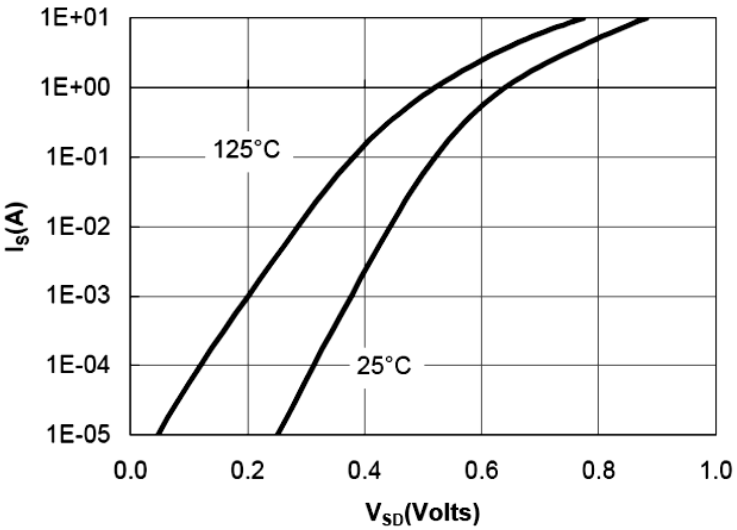



Figure 6: Body-Diode Characteristics

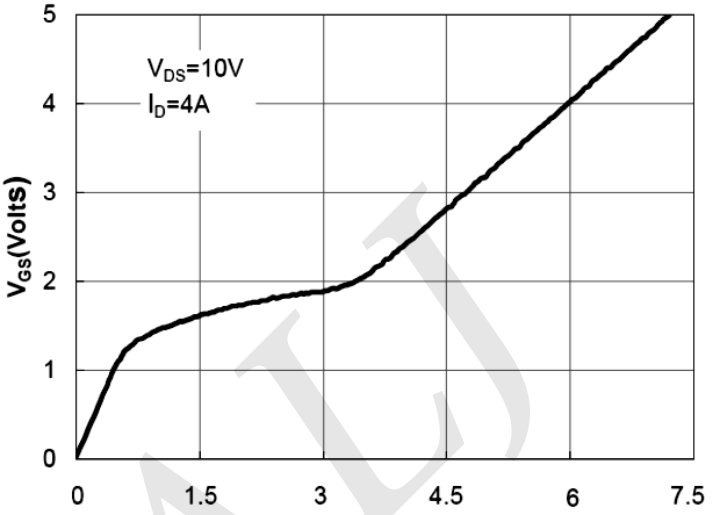



Figure 7: Gate-Charge Characteristics

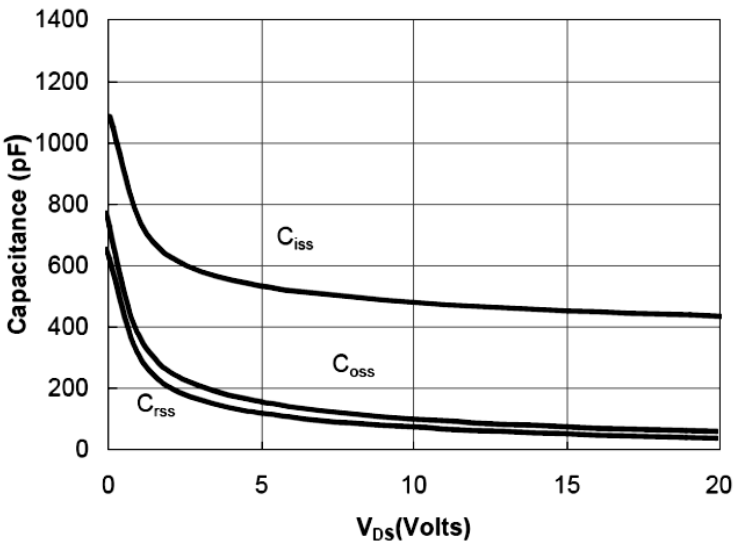



Figure 8: Capacitance Characteristics

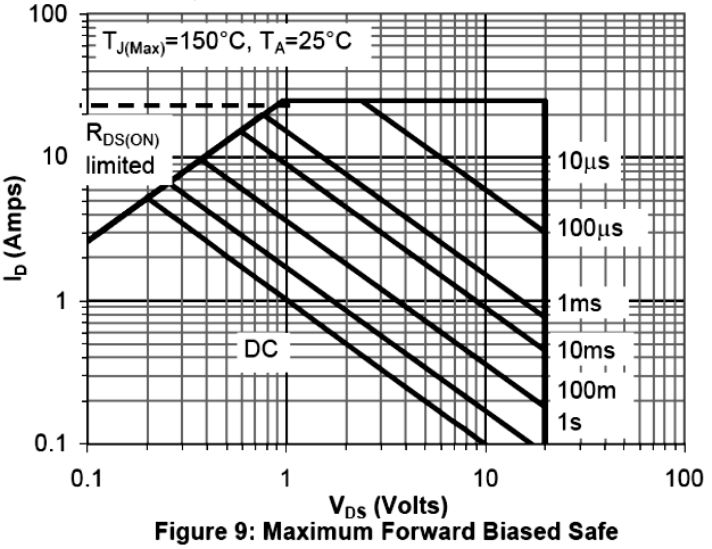



Figure 9: Maximum Forward Biased Safe Operating Area

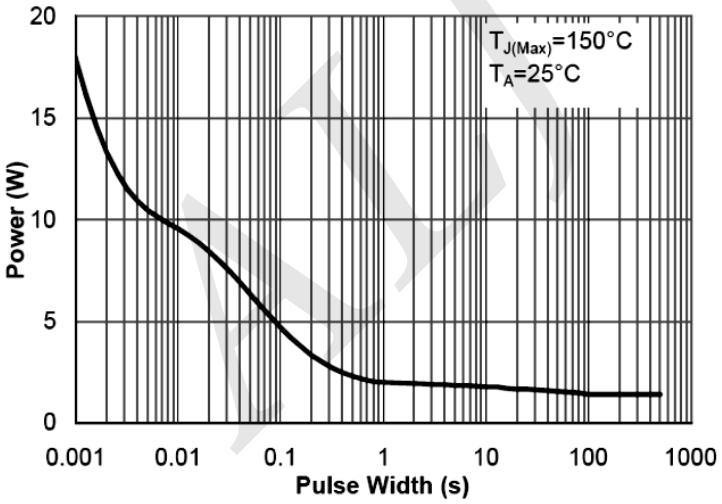



Figure 10: Single Pulse Power Rating Junction-to-Ambient

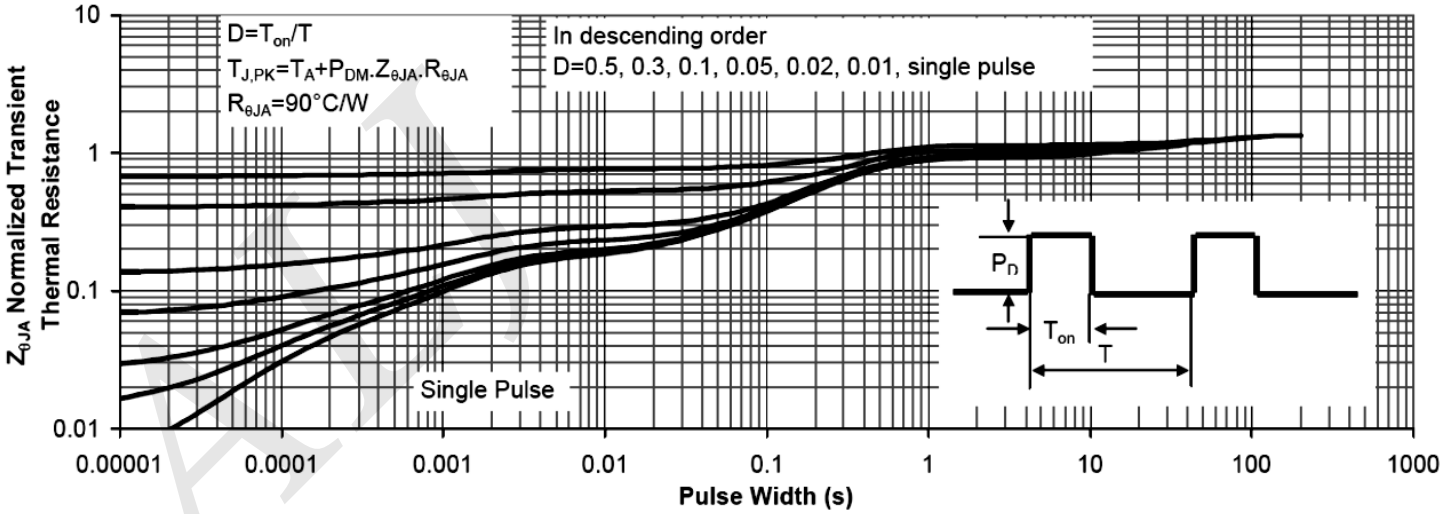



Figure 11: Normalized Maximum Transient Thermal Impedance

## P-Channel Typical Characteristics

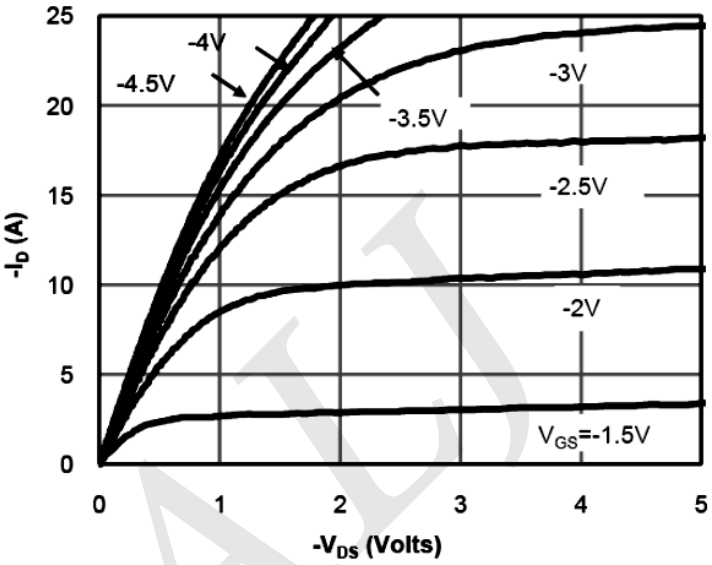
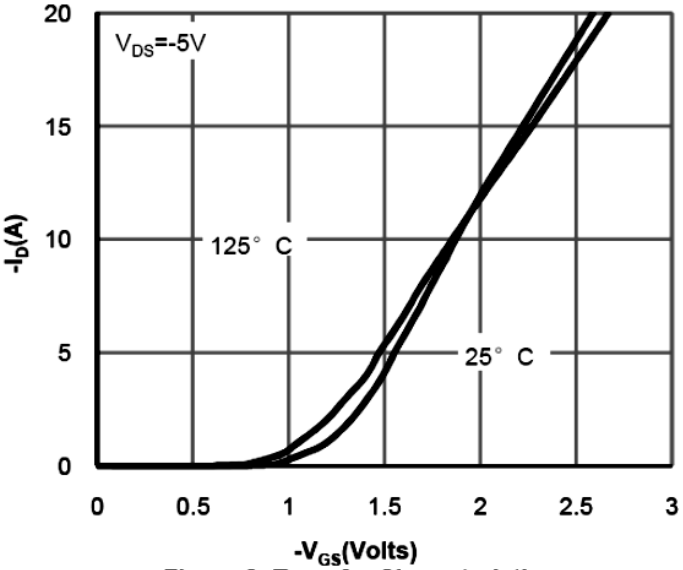



**Figure 1: On-Region Characteristics**

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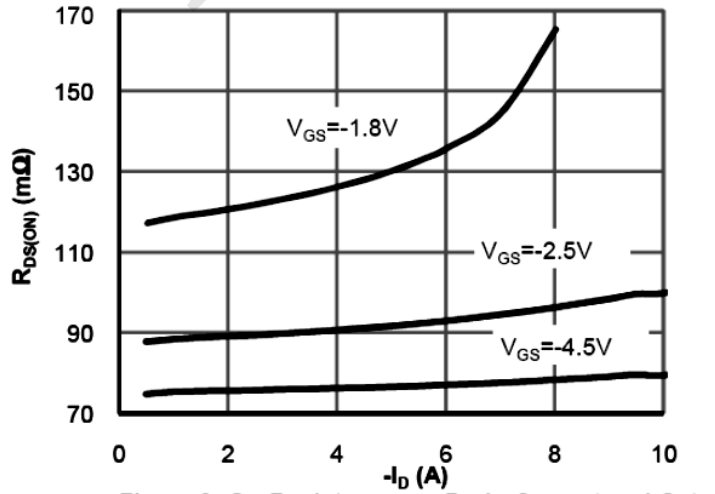


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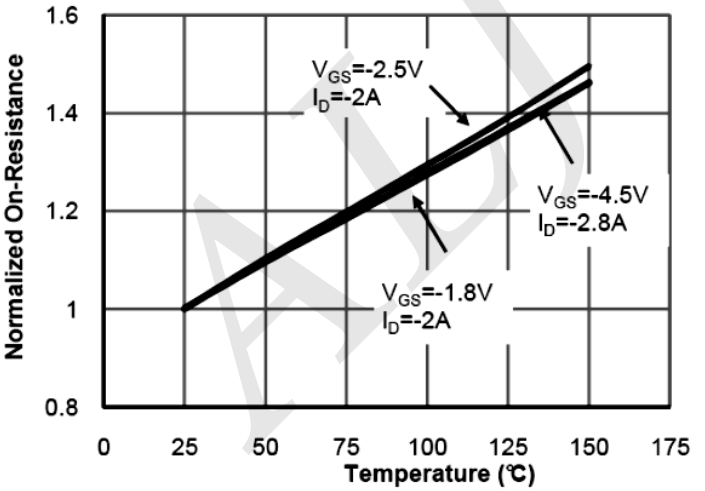


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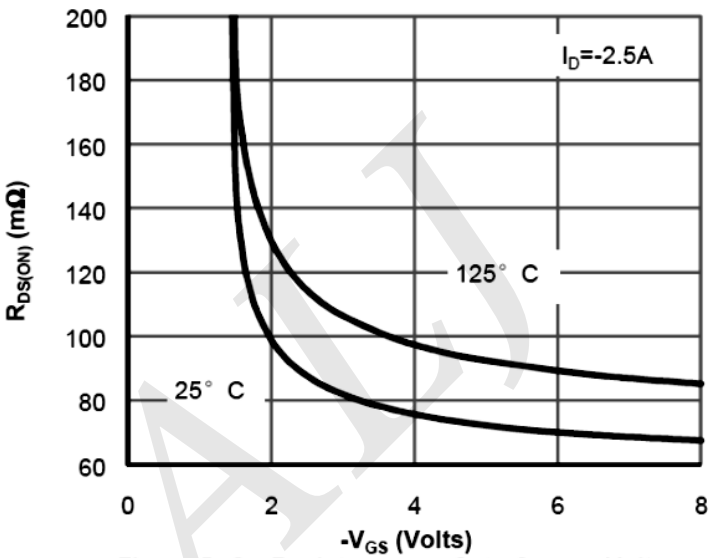
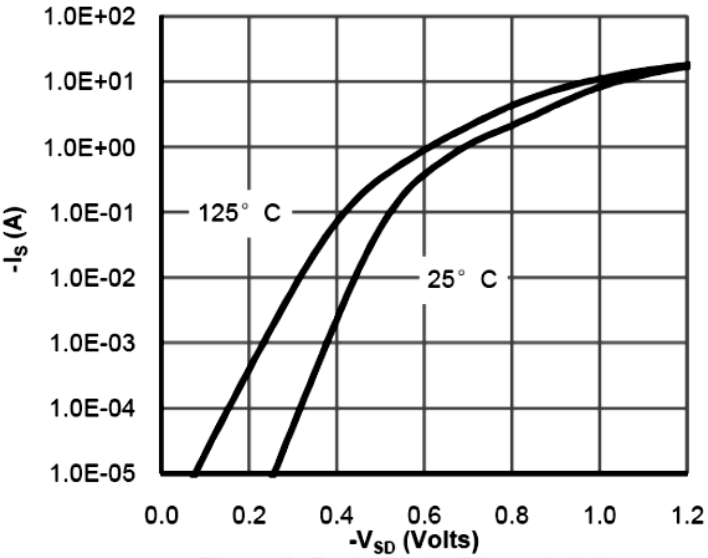



**Figure 5: On-Resistance vs. Gate-Source Voltage**

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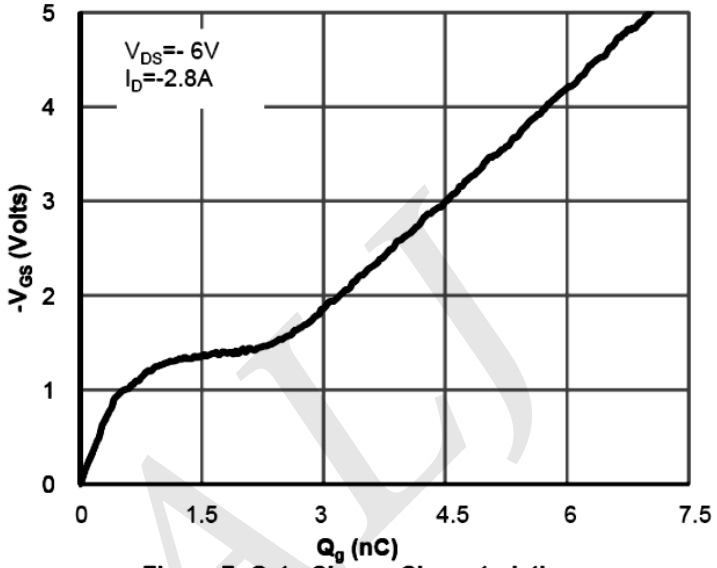


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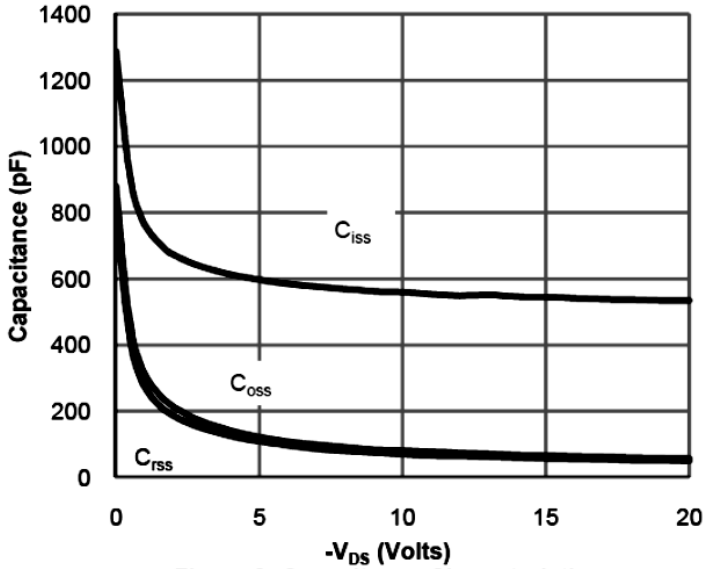


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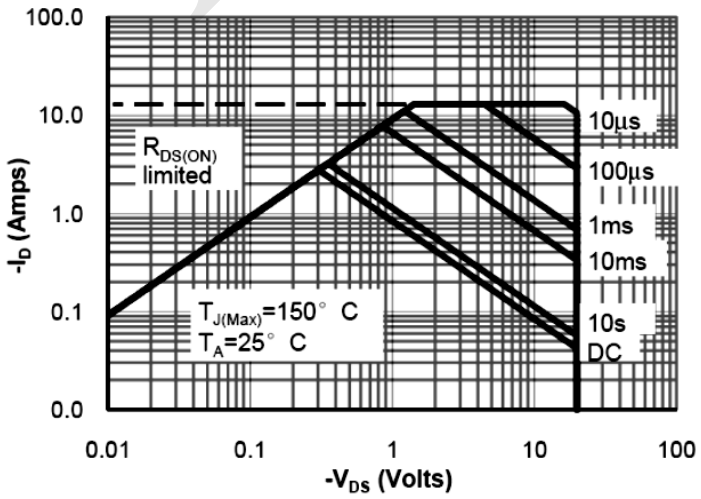


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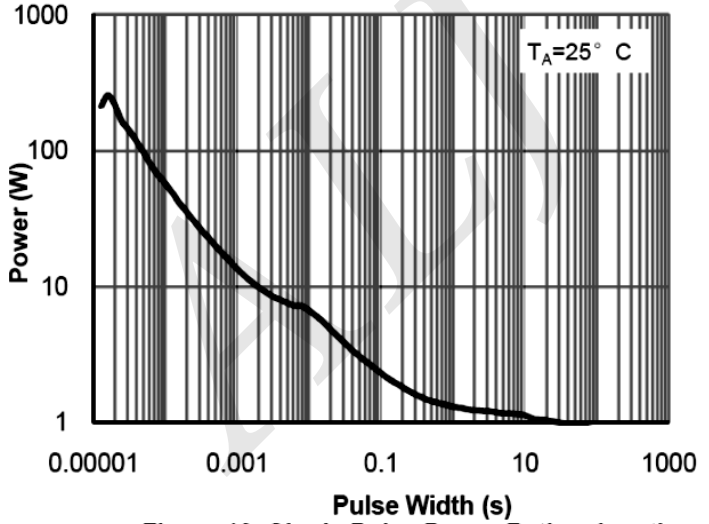


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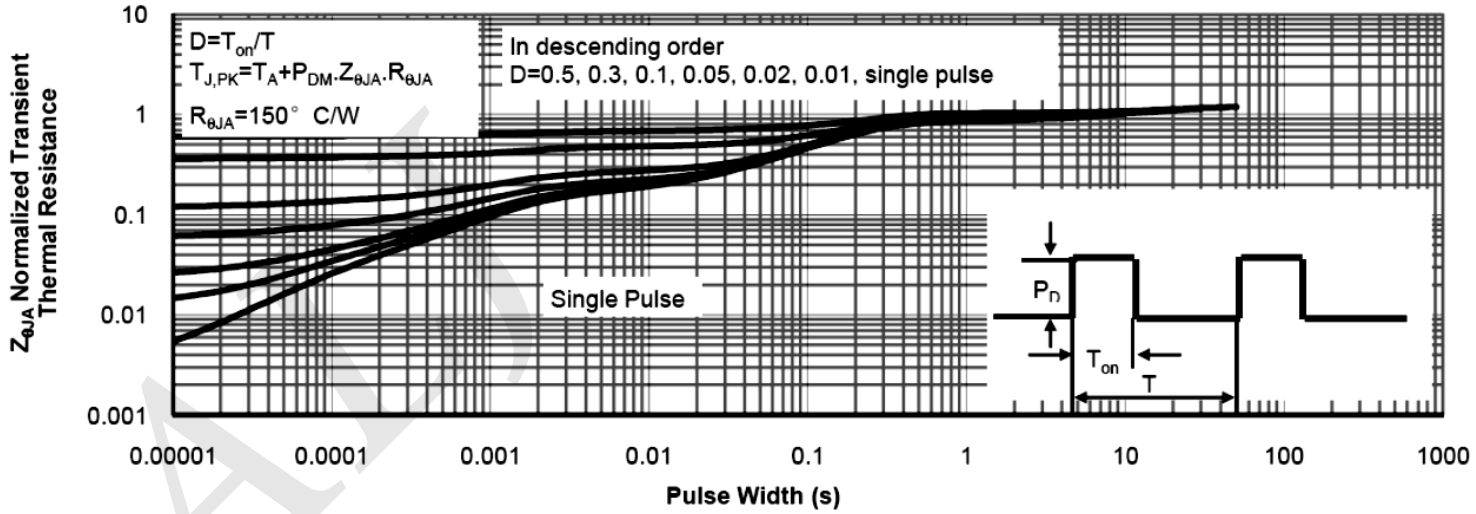


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