



Description

The AP2309GN uses advanced trench technology to provide excellent $R_{DS(ON)}$. This device is suitable for use as a load switch or in PWM applications.

General Features

$V_{DS} = -30V, I_D = -4.2A$

$R_{DS(ON)} < 58m\Omega @ V_{GS} = -10V$

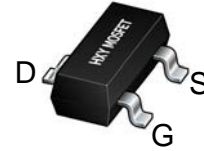
$R_{DS(ON)} < 80m\Omega @ V_{GS} = -4.5V$

Application

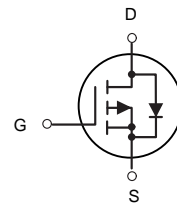
Battery protection

Load switch

Uninterruptible power supply



SOT-23



P-Channel MOSFET

Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|------------|--------|---------|----------|
| AP2309GN | SOT-23 | A19T | 3000 |

Absolute Maximum Ratings (TA=25°C unless otherwise noted)

| Symbol | Parameter | Limit | Unit |
|-----------------|--|------------|------|
| V_{DS} | Drain-Source Voltage | -30 | V |
| V_{GS} | Gate-Source Voltage | ± 12 | V |
| I_D | Drain Current-Continuous | -4.2 | A |
| I_{DM} | Drain Current-Pulsed (Note 1) | -30 | A |
| P_D | Maximum Power Dissipation | 1.2 | W |
| T_J, T_{STG} | Operating Junction and Storage Temperature Range | -55 To 150 | °C |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient (Note 2) | 104 | °C/W |



Electrical Characteristics (TA=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|--|------|-----|-----------|------------|
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=-250\mu A$ | -30 | | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=-24V, V_{GS}=0V$ | - | - | -1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 10V, V_{DS}=0V$ | - | - | ± 100 | nA |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=-250\mu A$ | -0.7 | -1 | -1.3 | V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=-10V, I_D=-4.2A$ | - | 48 | 58 | m Ω |
| | | $V_{GS}=-4.5V, I_D=-4A$ | - | 60 | 80 | m Ω |
| | | $V_{GS}=-2.5V, I_D=-1A$ | - | 85 | 110 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=-5V, I_D=-4.2A$ | - | 10 | - | S |
| Input Capacitance | C_{iss} | $V_{DS}=-15V, V_{GS}=0V,$ $F=1.0MHz$ | - | 806 | - | PF |
| Output Capacitance | C_{oss} | | - | 105 | - | PF |
| Reverse Transfer Capacitance | C_{rss} | | - | 65 | - | PF |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=-15V, I_D=-4.2A, V_{GS}=-10V, R_{GEN}=6\Omega$ | - | 7 | - | nS |
| Turn-on Rise Time | t_r | | - | 3 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 30 | - | nS |
| Turn-Off Fall Time | t_f | | - | 12 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=-15V, I_D=-4.2A, V_{GS}=-4.5V$ | - | 8.5 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 1.8 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 2.7 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage ^(Note 3) | V_{SD} | $V_{GS}=0V, I_S=-4.2A$ | - | - | -1.2 | V |

Notes:

- 1、Repetitive Rating: Pulse width limited by maximum junction temperature.
- 2、Surface Mounted on FR4 Board, $t \leq 10$ sec.
- 3、Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
- 4、Guaranteed by design, not subject to production



Typical Electrical and Thermal Characteristics

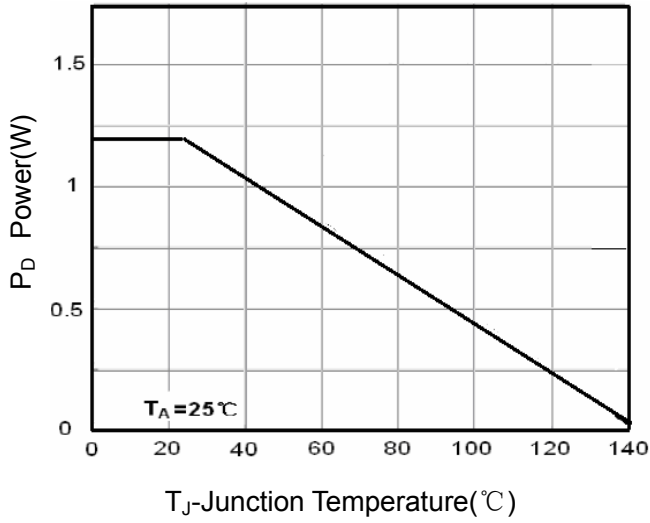


Figure 1 Power Dissipation

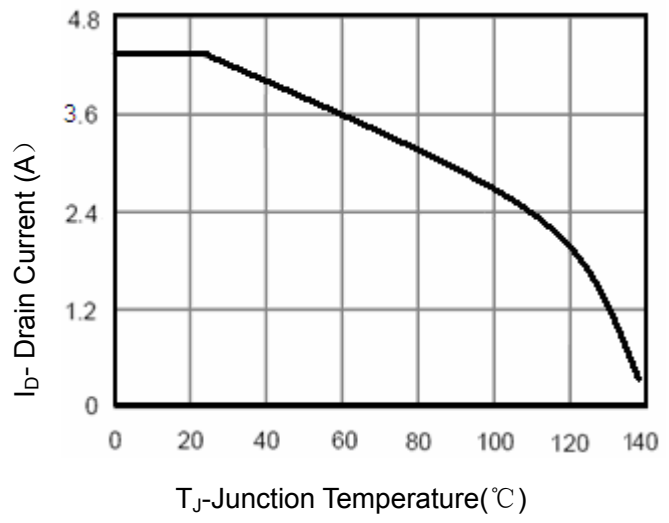


Figure 2 Drain Current

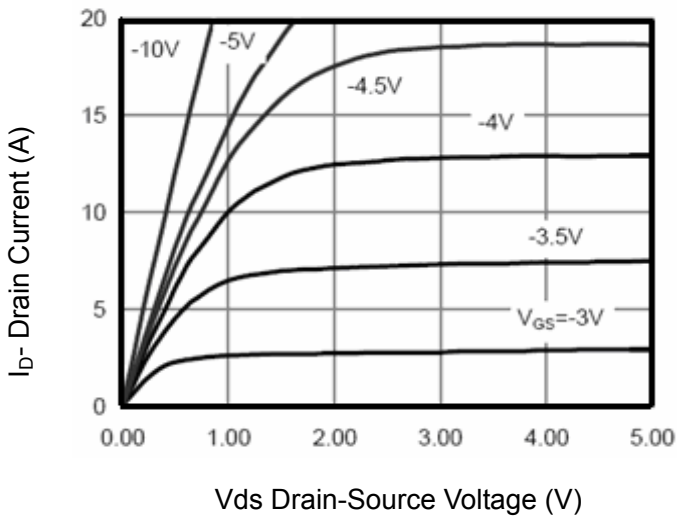


Figure 3 Output Characteristics

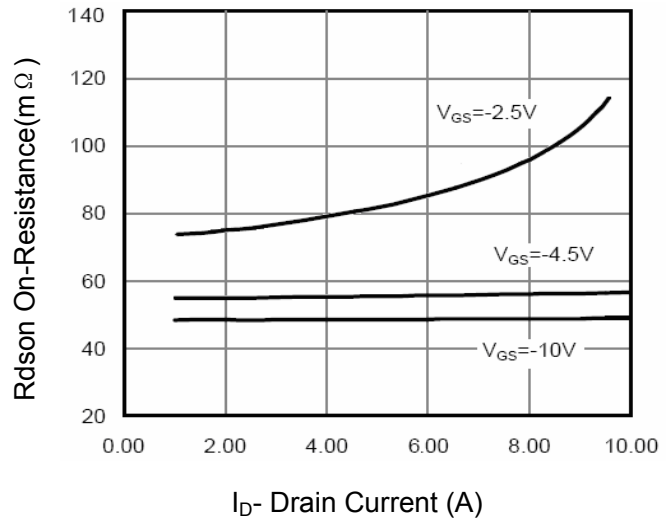


Figure 4 Drain-Source On-Resistance

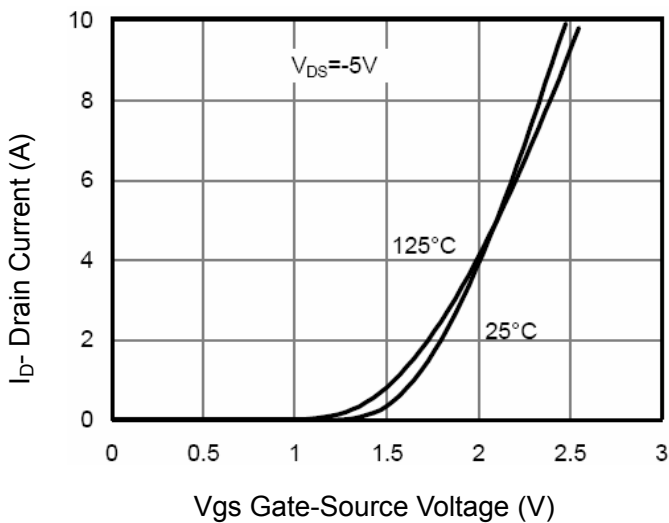


Figure 5 Transfer Characteristics

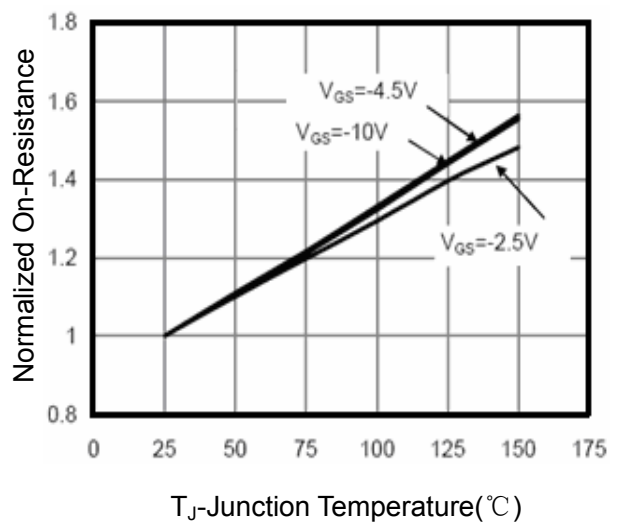
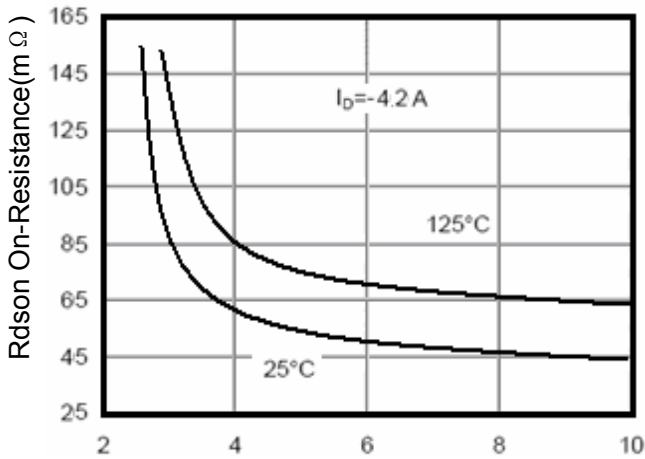
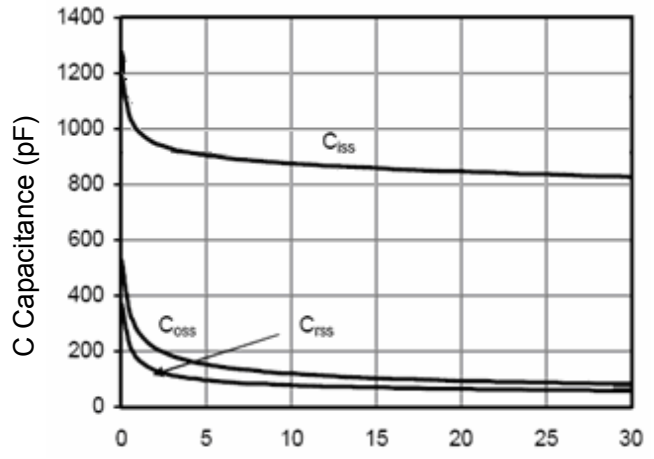


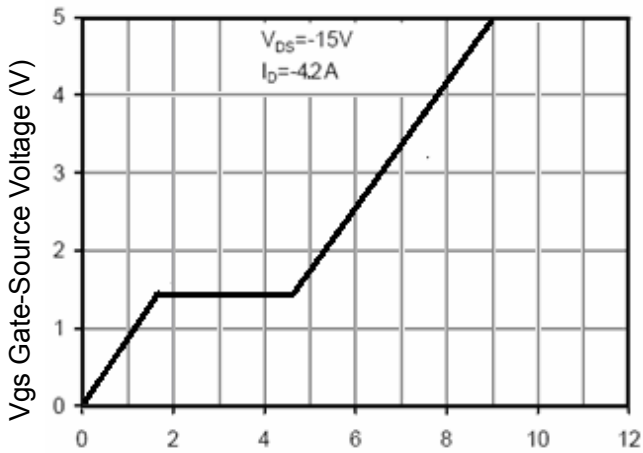
Figure 6 Drain-Source On-Resistance



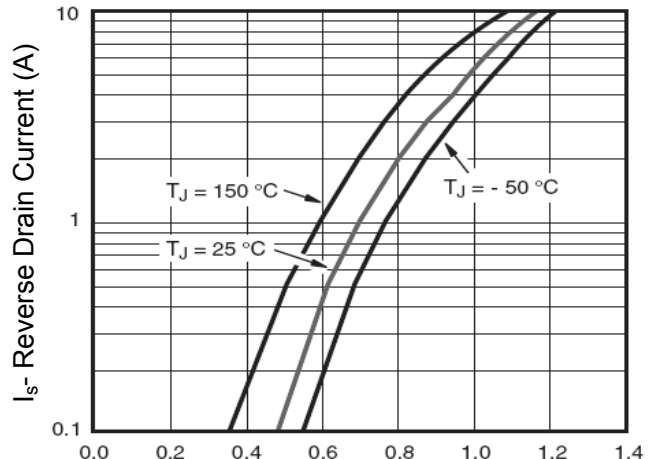
Vgs Gate-Source Voltage (V)
Figure 7 Rdson vs Vgs



Vds Drain-Source Voltage (V)
Figure 8 Capacitance vs Vds



Qg Gate Charge (nC)
Figure 9 Gate Charge



Vsd Source-Drain Voltage (V)
Figure 10 Source- Drain Diode Forward

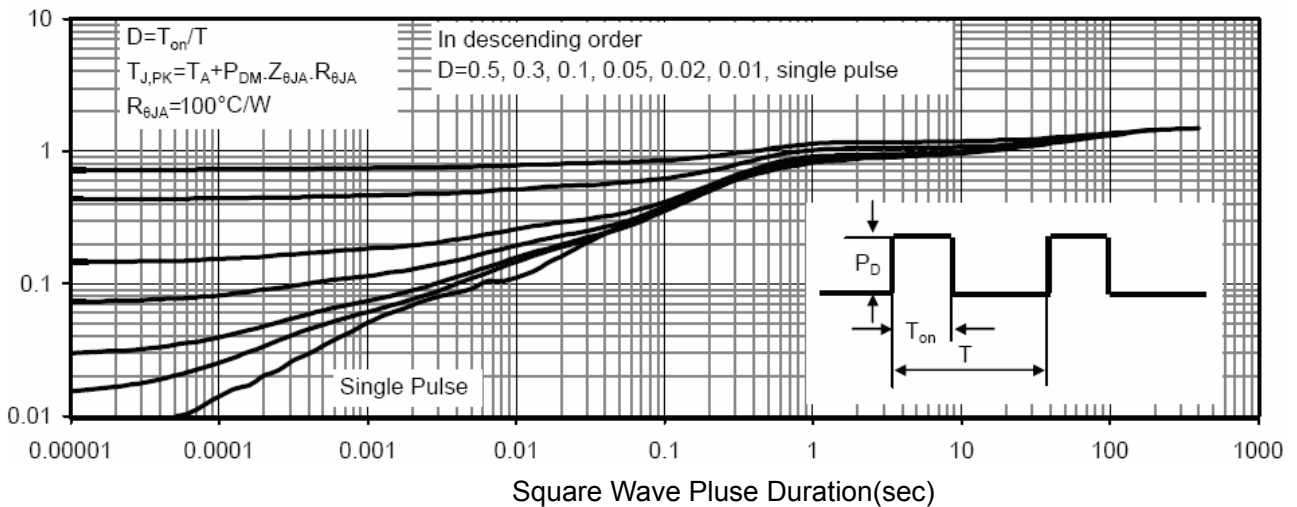
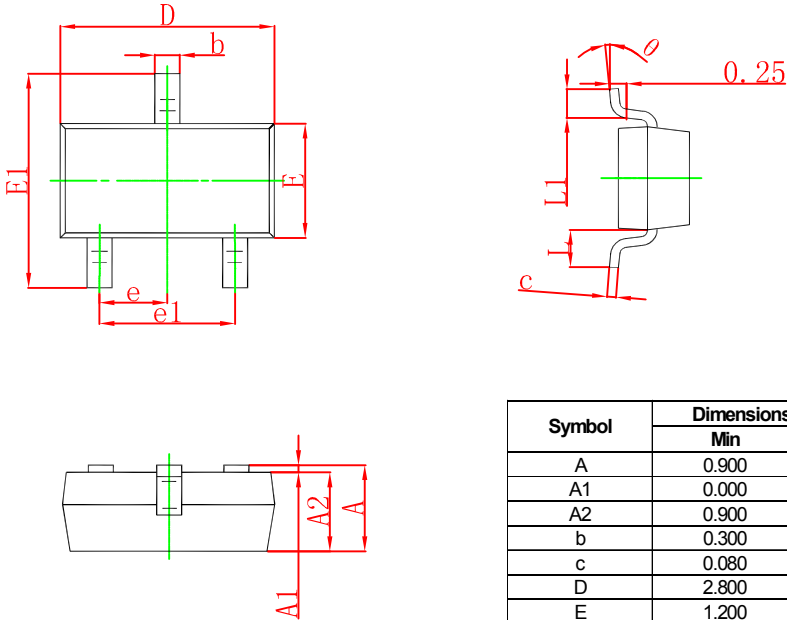


Figure 14 Normalized Maximum Transient Thermal Impedance

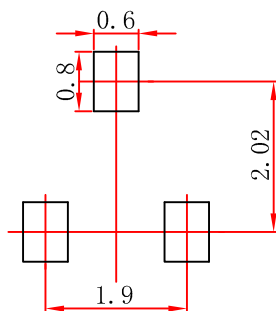


SOT-23 Package Outline Dimensions



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 0.900 | 1.150 | 0.035 | 0.045 |
| A1 | 0.000 | 0.100 | 0.000 | 0.004 |
| A2 | 0.900 | 1.050 | 0.035 | 0.041 |
| b | 0.300 | 0.500 | 0.012 | 0.020 |
| c | 0.080 | 0.150 | 0.003 | 0.006 |
| D | 2.800 | 3.000 | 0.110 | 0.118 |
| E | 1.200 | 1.400 | 0.047 | 0.055 |
| E1 | 2.250 | 2.550 | 0.089 | 0.100 |
| e | 0.950 TYP | | 0.037 TYP | |
| e1 | 1.800 | 2.000 | 0.071 | 0.079 |
| L | 0.550 REF | | 0.022 REF | |
| L1 | 0.300 | 0.500 | 0.012 | 0.020 |
| θ | 0° | 8° | 0° | 8° |

SOT-23 Suggested Pad Layout



Note:

1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.



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