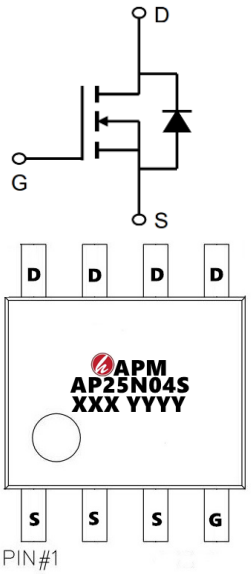
# AP25N04S

## 40V N-Channel Enhancement Mode MOSFET

### Description

The AP25N04S uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.




### General Features

$V_{DS}$=40V $I_D$ =25A

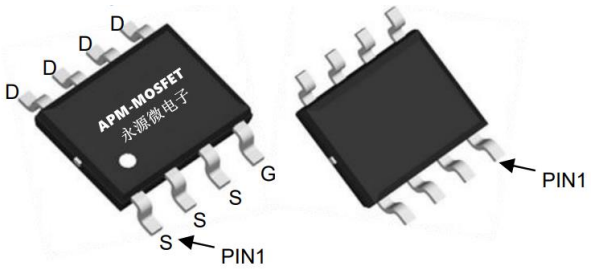
$R_{DS(ON)}$ < 7mΩ @ $V_{GS}$=10V **(Type：5.5mΩ)**

### Application

Battery protection

Load switch

Uninterruptible power supply




### Package Marking and Ordering Information

| Product ID | Pack | Marking | Qty(PCS) |
|---|---|---|---|
| AP25N04S | SOP-8L | AP25N04S XXX YYYY | 3000 |

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

| Symbol | Parameter | Rating | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | 40 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 25.5 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 18.4 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 75 | A |
| EAS | Single Pulse Avalanche Energy[3] | 176 | mJ |
| $I_{AS}$ | Avalanche Current | 39 | A |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 1.5 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | ℃ |
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient | 85 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | 28 | ℃/W |

## Electrical Characteristics ($T_C$=25℃unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| BVDSS | Drain-Source Breakdown Voltage | $V_{GS}$=0V , $I_D$=250uA | 40 | 44 | --- | V |
| △BVDSS/△TJ | BVDSS Temperature Coefficient | Reference to 25℃ , $I_D$=1mA | --- | 0.034 | --- | V/℃ |
| RDS(ON) | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=10A | --- | 5.5 | 7.5 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=8A | --- | 6.5 | 10 | |
| VGS(th) | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =250uA | 1.0 | 1.6 | 2.5 | V |
| △$V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -4.96 | --- | mV/℃ |
| IDSS | Drain-Source Leakage Current | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=32V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 5 | |
| IGSS | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=10A | --- | 40 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 1.6 | --- | |
| $Q_g$ | Total Gate Charge (4.5V) | $V_{DS}$=20V , $V_{GS}$=4.5V , $I_D$=10A | --- | 18.8 | | nC |
| Qgs | Gate-Source Charge | | --- | 4.7 | | |
| Qgd | Gate-Drain Charge | | --- | 8.2 | | |
| Td(on) | Turn-On Delay Time | $V_{DD}$=15V , $V_{GS}$=10V , $R_G$=3.3Ω $I_D$=1A | --- | 14.3 | | ns |
| $T_r$ | Rise Time | | --- | 2.6 | | |
| Td(off) | Turn-Off Delay Time | | --- | 77 | | |
| $T_f$ | Fall Time | | --- | 4.8 | | |
| Ciss | Input Capacitance | $V_{DS}$=15V , $V_{GS}$=0V , f=1MHz | --- | 2332 | | pF |
| Coss | Output Capacitance | | --- | 193 | | |
| Crss | Reverse Transfer Capacitance | | --- | 138 | | |
| IS | Continuous Source Current[1,5] | $V_G$=$V_D$=0V , Force Current | --- | --- | 10.5 | A |
| ISM | Pulsed Source Current[2,5] | | --- | --- | 42 | A |
| VSD | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1 | V |

**Note :**

1、The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper.

2、The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%

3、The power dissipation is limited by 175℃ junction temperature

4、The data is theoretically the same as ID and IDM , in real applications , should be limited by total power dissipation.

## Typical Characteristics

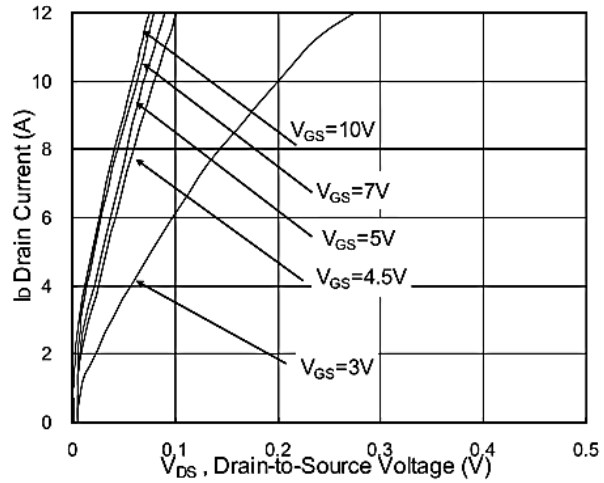



Fig.1 Typical Output Characteristics

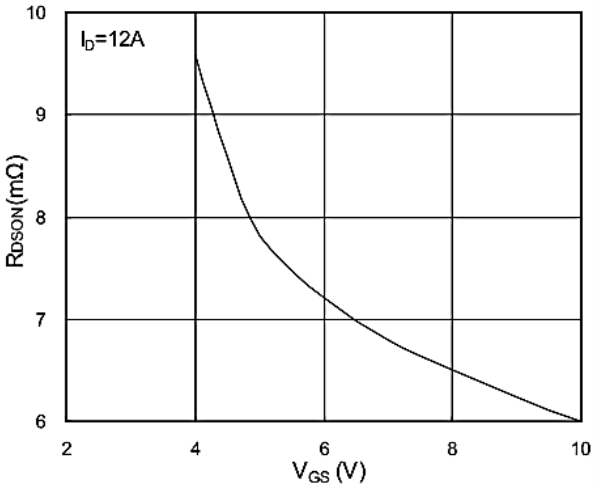



Fig.2 On-Resistance vs. G-S Voltage

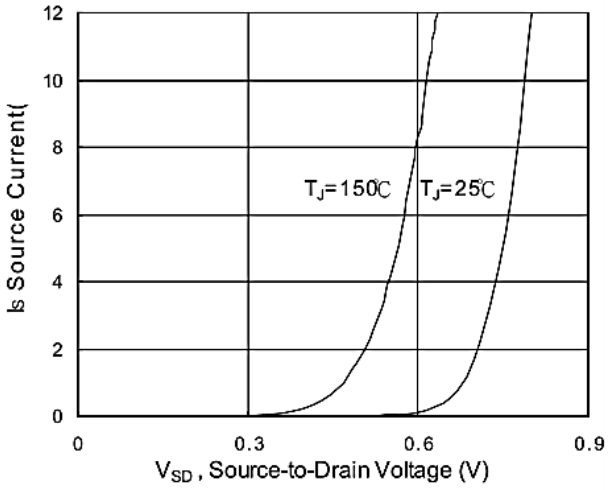



Fig.3 Forward Characteristics of Reverse

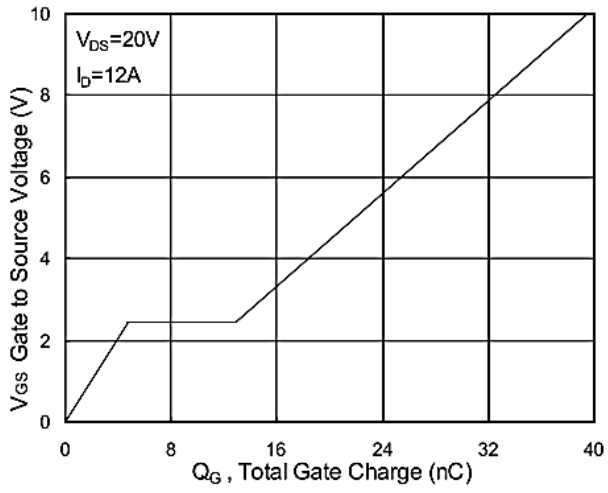



Fig.4 Gate-Charge Characteristics

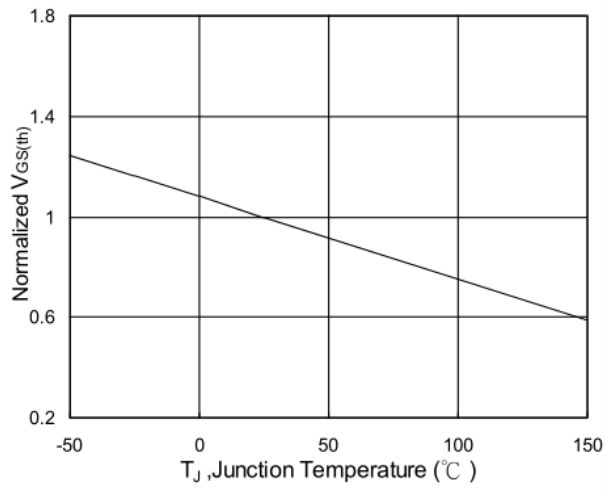



Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$

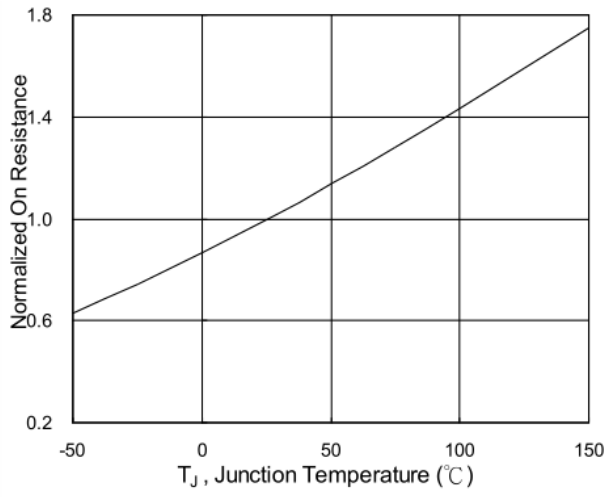



Fig.6 Normalized $R_{DSON}$ vs. $T_J$

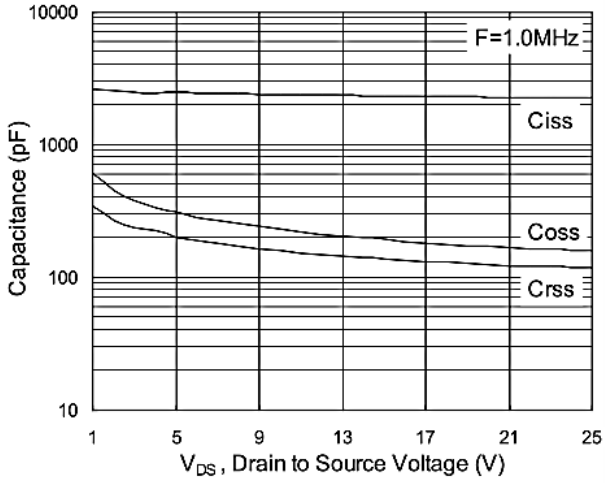



Fig.7 Capacitance

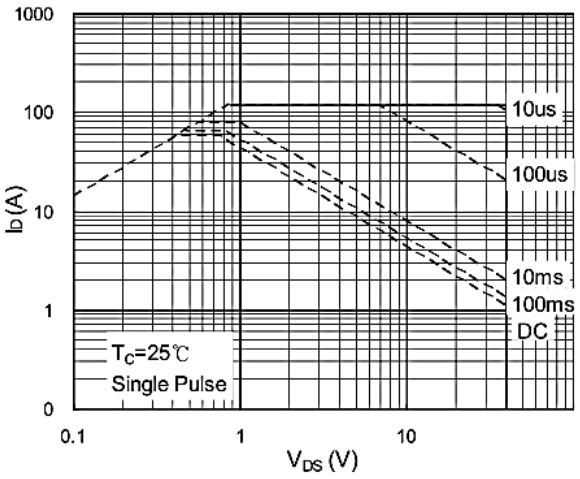



Fig.8 Safe Operating Area

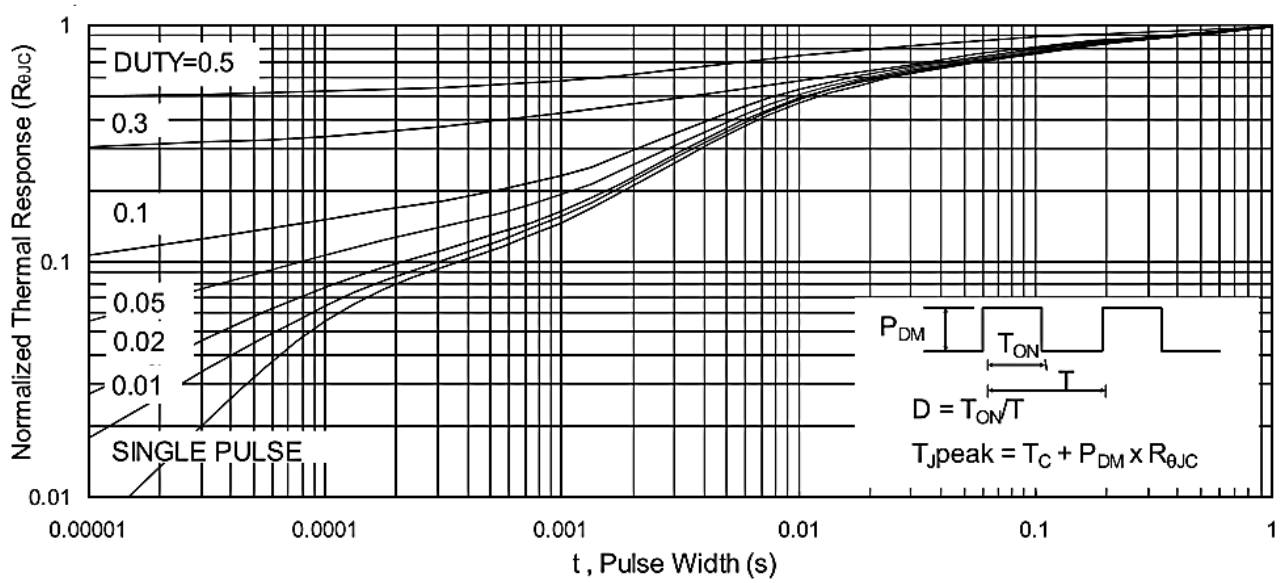



Fig.9 Normalized Maximum Transient Thermal Impedance

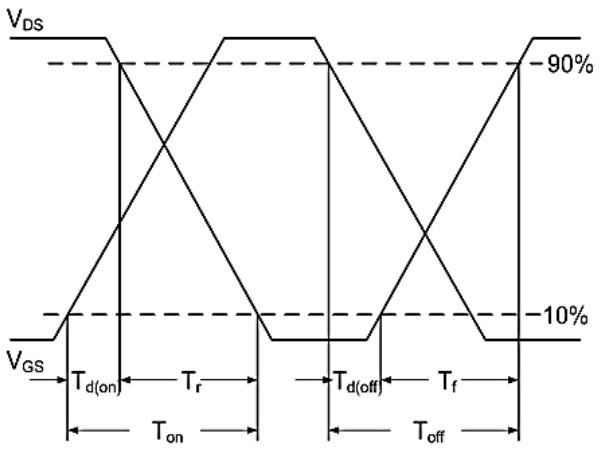



Fig.10 Switching Time Waveform

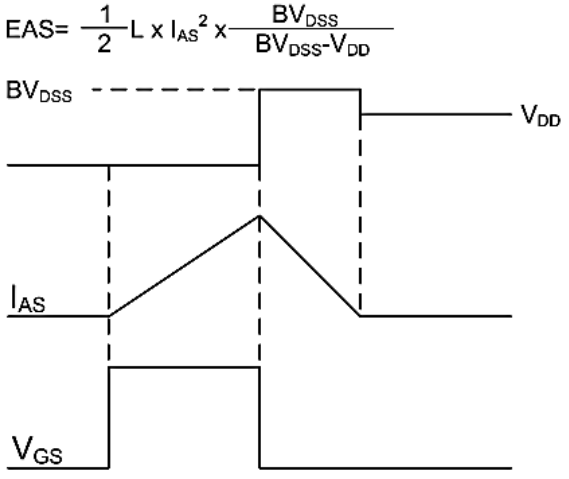
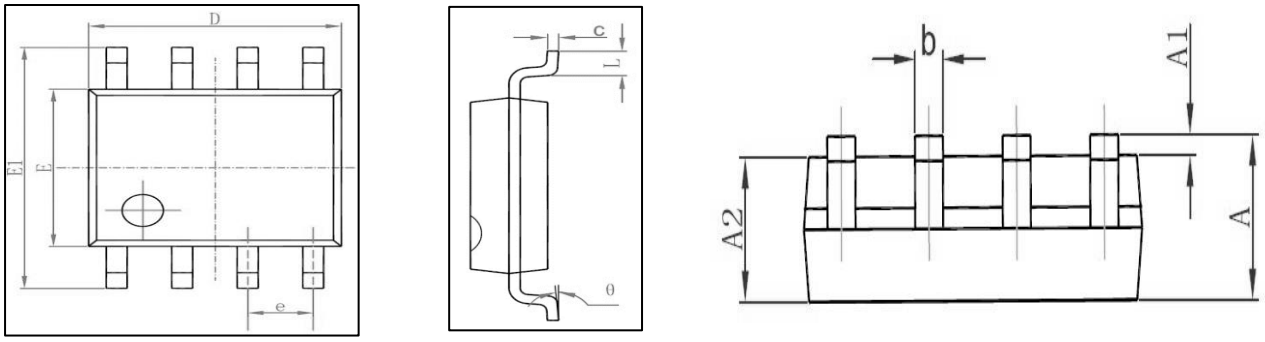
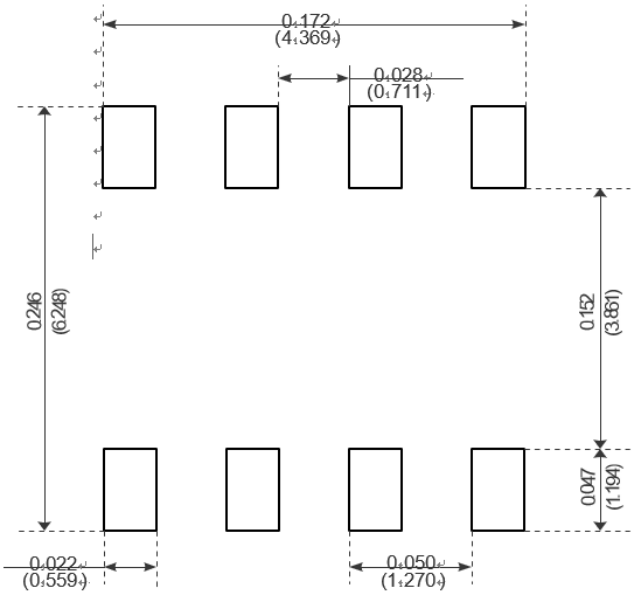



Fig.11 Unclamped Inductive Waveform

## Package Mechanical Data-SOP-8L




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.350 | 1.750 | 0.053 | 0.069 |
| A1 | 0.100 | 0.250 | 0.004 | 0.010 |
| A2 | 1.350 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.700 | 5.100 | 0.185 | 0.200 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.200 | 0.228 | 0.244 |
| e | 1.270 (BSC) | | 0.050 (BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |




Recommended Minimum Pads

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## 40V N-Channel Enhancement Mode MOSFET

| Edition | Date | Change |
|---|---|---|
| Rve1.0 | 2020/5/1 | Initial release |