

## N-Channel Enhancement Mode Power MOSFET

### ■ Features

- Low On-resistance
- Simple Drive Requirement
- Dual N MOSFET Package
- Pb Free Plating Product

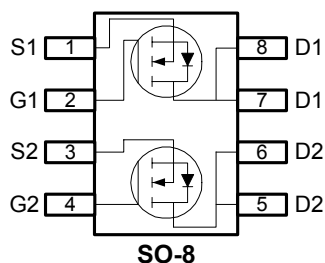
### ■ General Description

The advanced power MOSFET provides the designer with the best combination of fast switching, ruggedized device design, ultra low on-resistance and cost-effectiveness.

### ■ Product Summary

| $BV_{DSS}$ (V) | $R_{DS(ON)}$ (m $\Omega$ ) | $I_D$ (A) |
|----------------|----------------------------|-----------|
| 30             | 26                         | 6.8       |

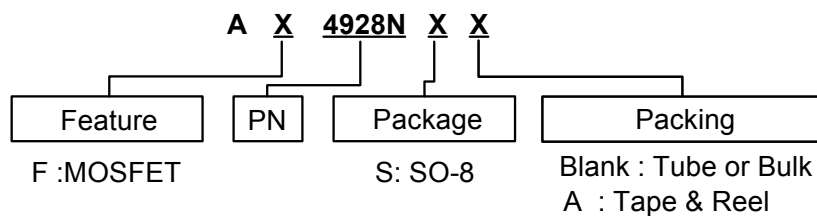
### ■ Pin Assignments



### ■ Pin Descriptions

| Pin Name | Description        |
|----------|--------------------|
| S1/2     | Channel 1/2 Source |
| G1/2     | Channel 1/2 Gate   |
| D1/2     | Channel 1/2 Drain  |

### ■ Ordering information



**AF4928N****N-Channel Enhancement Mode Power MOSFET****■ Absolute Maximum Ratings**

| Symbol    | Parameter                            | Rating                 | Units            |
|-----------|--------------------------------------|------------------------|------------------|
| $V_{DS}$  | Drain-Source Voltage                 | 30                     | V                |
| $V_{GS}$  | Gate-Source Voltage                  | $\pm 20$               | V                |
| $I_D$     | Continuous Drain Current (Note 1)    | $T_A=25^\circ\text{C}$ | A                |
|           |                                      | $T_A=70^\circ\text{C}$ |                  |
| $I_{DM}$  | Pulsed Drain Current (Note 2)        | 40                     | A                |
| $P_D$     | Total Power Dissipation              | $T_A=25^\circ\text{C}$ | W                |
|           | Linear Derating Factor               |                        |                  |
| $T_{STG}$ | Storage Temperature Range            | -55 to 150             | $^\circ\text{C}$ |
| $T_J$     | Operating Junction Temperature Range | -55 to 150             | $^\circ\text{C}$ |

**■ Thermal Data**

| Symbol        | Parameter                                    | Maximum | Units              |
|---------------|----------------------------------------------|---------|--------------------|
| $R_{thj-amb}$ | Thermal Resistance Junction-ambient (Note 1) | Max.    | $^\circ\text{C/W}$ |

**■ Electrical Characteristics at  $T_J=25^\circ\text{C}$  unless otherwise specified**

| Symbol                         | Parameter                                               | Test Conditions                                    | Min. | Typ. | Max.      | Units                     |
|--------------------------------|---------------------------------------------------------|----------------------------------------------------|------|------|-----------|---------------------------|
| $BV_{DSS}$                     | Drain-Source Breakdown Voltage                          | $V_{GS}=0\text{V}, I_D=250\mu\text{A}$             | 30   | -    | -         | V                         |
| $\Delta BV_{DSS} / \Delta T_J$ | Breakdown Voltage Temperature Coefficient               | Reference to $25^\circ\text{C}$ , $I_D=1\text{mA}$ | -    | 0.03 | -         | $\text{V}/^\circ\text{C}$ |
| $R_{DS(on)}$                   | Static Drain-Source On-Resistance (Note 3)              | $V_{GS}=10\text{V}, I_D=6\text{A}$                 | -    | -    | 26        | $\text{m}\Omega$          |
|                                |                                                         | $V_{GS}=4.5\text{V}, I_D=4\text{A}$                | -    | -    | 40        |                           |
| $V_{GS(th)}$                   | Gate Threshold Voltage                                  | $V_{DS}=V_{GS}, I_D=250\mu\text{A}$                | 1    | -    | 3         | V                         |
| $g_{fs}$                       | Forward Transconductance                                | $V_{DS}=10\text{V}, I_D=6\text{A}$                 | -    | 15   | -         | S                         |
| $I_{DSS}$                      | Drain-Source Leakage Current ( $T_J=25^\circ\text{C}$ ) | $V_{DS}=30\text{V}, V_{GS}=0\text{V}$              | -    | -    | 1         | $\mu\text{A}$             |
|                                | Drain-Source Leakage Current ( $T_J=70^\circ\text{C}$ ) | $V_{DS}=24\text{V}, V_{GS}=0\text{V}$              | -    | -    | 25        |                           |
| $I_{GSS}$                      | Gate-Source Leakage                                     | $V_{GS}=\pm 20\text{V}$                            | -    | -    | $\pm 100$ | nA                        |
| $Q_g$                          | Total Gate Charge (Note 3)                              | $I_D=6.8\text{A}$                                  | -    | 9    | 15        | nC                        |
| $Q_{gs}$                       | Gate-Source Charge                                      | $V_{DS}=24\text{V}$                                | -    | 2    | -         |                           |
| $Q_{gd}$                       | Gate-Drain ("Miller") Charge                            | $V_{GS}=4.5\text{V}$                               | -    | 6    | -         |                           |
| $t_{d(on)}$                    | Turn-On Delay Time (Note 3)                             | $V_{DS}=15\text{V}$                                | -    | 10   | -         | ns                        |
| $t_r$                          | Rise Time                                               | $I_D=1\text{A}$                                    | -    | 9    | -         |                           |
| $t_{d(off)}$                   | Turn-Off Delay Time                                     | $R_G=3.3\Omega, V_{GS}=10\text{V}$                 | -    | 18   | -         |                           |
| $t_f$                          | Fall-Time                                               | $R_D=15\Omega$                                     | -    | 6    | -         |                           |
| $C_{iss}$                      | Input Capacitance                                       | $V_{GS}=0\text{V}$                                 | -    | 580  | 930       | pF                        |
| $C_{oss}$                      | Output Capacitance                                      | $V_{DS}=25\text{V}$                                | -    | 150  | -         |                           |
| $C_{rss}$                      | Reverse Transfer Capacitance                            | $f=1.0\text{MHz}$                                  | -    | 108  | -         |                           |
| $R_G$                          | Gate Resistance                                         | $f=1.0\text{MHz}$                                  | -    | 0.9  | -         | $\Omega$                  |

**■ Source-Drain Diode**

| Symbol   | Parameter                      | Test Conditions                     | Min. | Typ. | Max. | Unit |
|----------|--------------------------------|-------------------------------------|------|------|------|------|
| $V_{SD}$ | Forward On Voltage (Note 3)    | $I_S=1.7\text{A}, V_{GS}=0\text{V}$ | -    | -    | 1.3  | V    |
| $t_{rr}$ | Reverse Recovery Time (Note 3) | $I_S=6.8\text{A}, V_{GS}=0\text{V}$ | -    | 15   | -    | ns   |
| $Q_{rr}$ | Reverse Recovery Charge        | $di/dt=100\text{A}/\mu\text{s}$     | -    | 9    | -    | nC   |

**Note 1:** Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 135 $^\circ\text{C/W}$  when mounted on Min. copper pad.

**Note 2:** Pulse width limited by Max. junction temperature.

**Note 3:** Pulse width  $\leq 300\mu\text{s}$ , duty cycle  $\leq 2\%$ .

## N-Channel Enhancement Mode Power MOSFET

### Typical Performance Characteristics

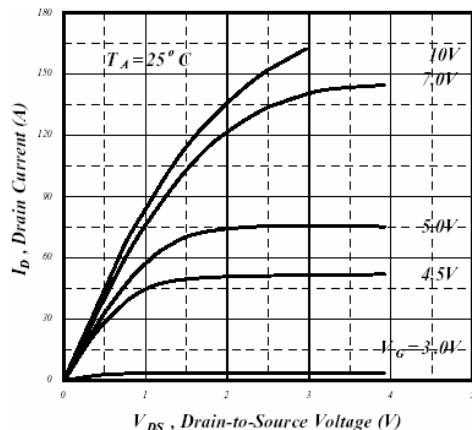


Fig 1. Typical Output Characteristics

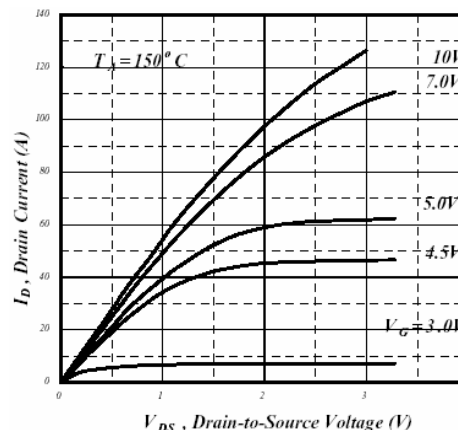


Fig 2. Typical Output Characteristics

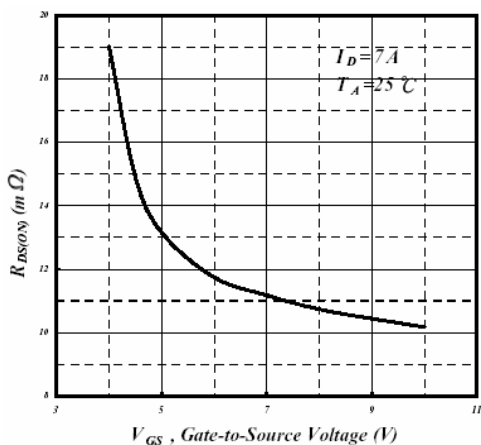


Fig 3. On-Resistance v.s. Gate Voltage

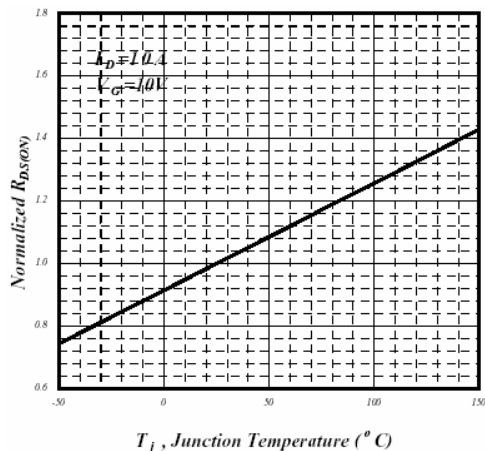


Fig 4. Normalized On-Resistance v.s. Junction Temperature

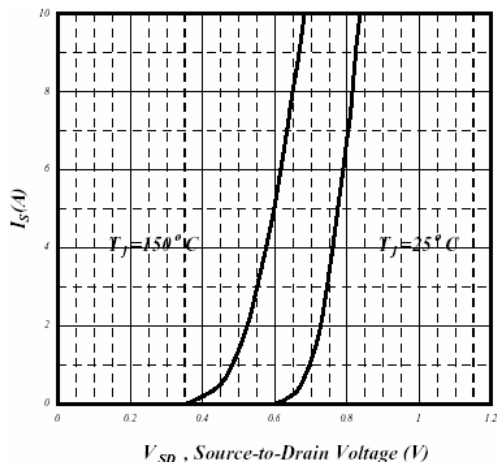


Fig 5. Forward Characteristic of Reverse Diode

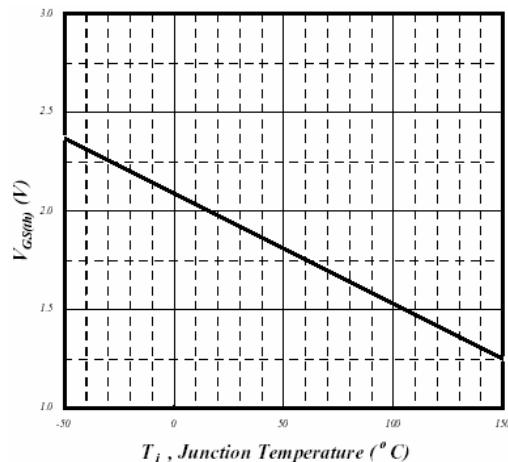


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

## N-Channel Enhancement Mode Power MOSFET

### ■ Typical Performance Characteristics (Continued)

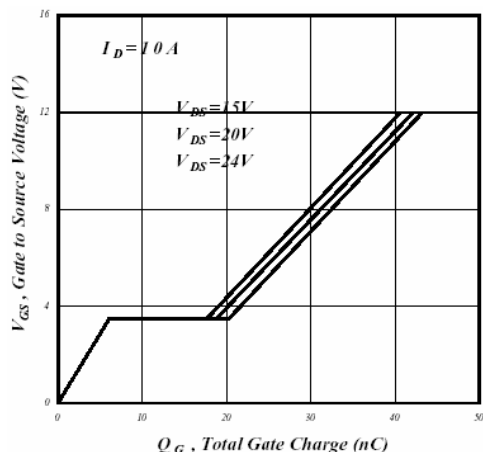


Fig 7. Gate Charge Characteristics

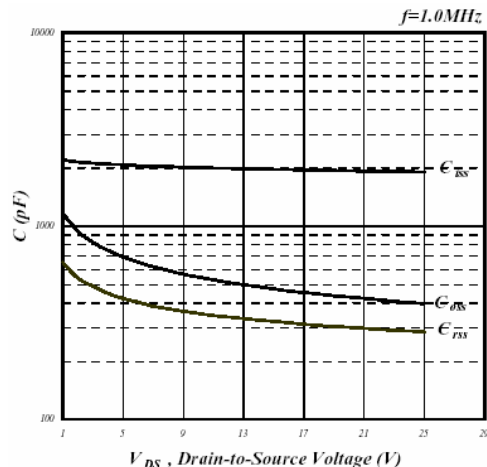


Fig 8. Typical Capacitance Characteristics

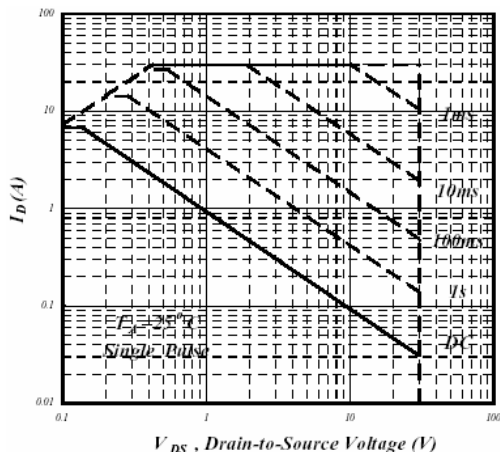


Fig 9. Maximum Safe Operating Area

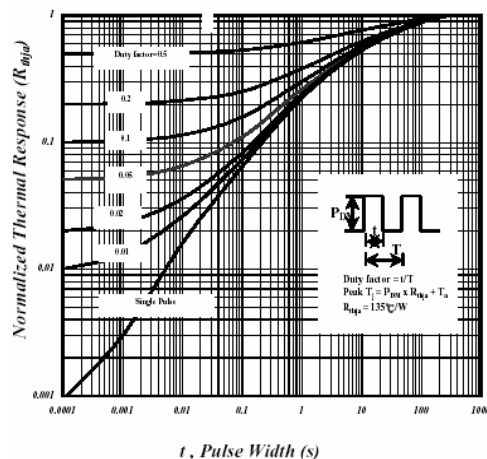


Fig 10. Effective Transient Thermal Impedance

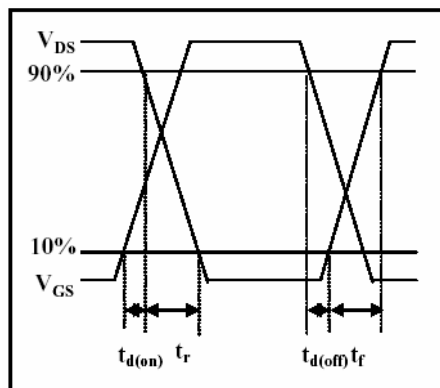


Fig 11. Switching Time Waveform

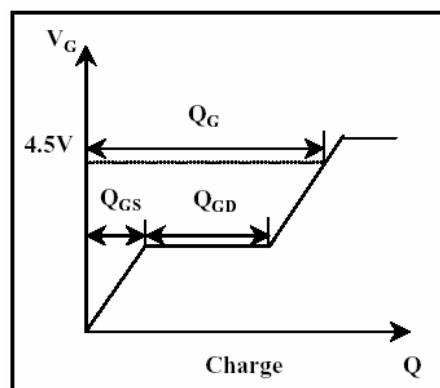
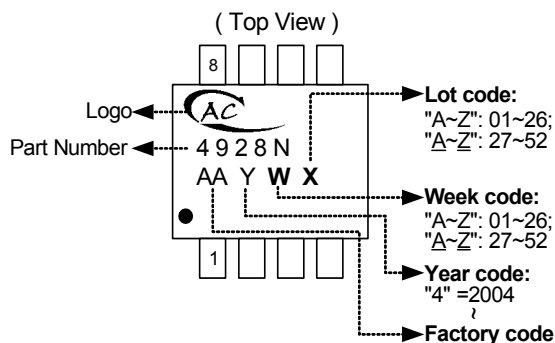


Fig 12. Gate Charge Waveform

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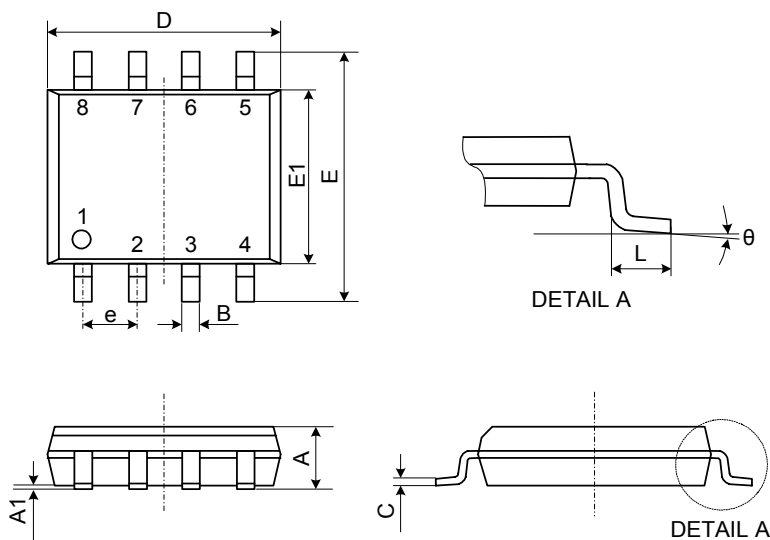
### ■ Marking Information

SO-8



### ■ Package Information

Package Type: SO-8



1. All Dimensions Are in Millimeters.
2. Dimension Does Not Include Mold Protrusions.

| Symbol | Dimensions In Millimeters |      |      |
|--------|---------------------------|------|------|
|        | Min.                      | Nom. | Max. |
| A      | 1.35                      | 1.55 | 1.75 |
| A1     | 0.10                      | 0.18 | 0.25 |
| B      | 0.33                      | 0.41 | 0.51 |
| C      | 0.19                      | 0.22 | 0.25 |
| D      | 4.80                      | 4.90 | 5.00 |
| E      | 5.80                      | 6.15 | 6.50 |
| E1     | 3.80                      | 3.90 | 4.00 |
| L      | 0.38                      | 0.71 | 1.27 |
| θ      | 0°                        | 4°   | 8°   |
| e      | 1.27 TYP.                 |      |      |