



## P-Channel 30-V (D-S) MOSFET

### ■ Features

- Low  $r_{DS(on)}$  Provides Higher Efficiency and Extends Battery Life
- Miniature SO-8 Surface Mount Package Saves Board Space
- High power and current handling capability
- Extended  $V_{GS}$  range ( $\pm 25$ ) for battery pack applications

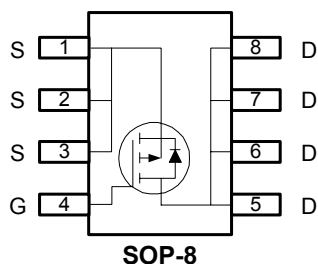
### ■ General Description

These miniature surface mount MOSFETs utilize High Cell Density process. Low  $r_{DS(on)}$  assures minimal power loss and conserves energy, making this device ideal for use in power management circuitry. Typical applications are PWM DC-DC converters, power management in portable and battery-powered products such as computers, printers, battery charger, telecommunication power system, and telephones power system.

### ■ Product Summary

| $V_{DS}$ (V) | $r_{DS(on)}$ (m $\Omega$ ) | $I_D$ (A) |
|--------------|----------------------------|-----------|
| -30          | 9@ $V_{GS}=-10V$           | -15       |
|              | 13@ $V_{GS}=-4.5V$         | -11       |

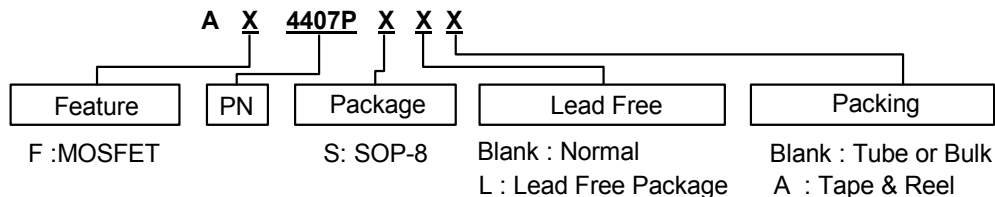
### ■ Pin Assignments



### ■ Pin Descriptions

| Pin Name | Description |
|----------|-------------|
| S        | Source      |
| G        | Gate        |
| D        | Drain       |

### ■ Ordering information



**AF4407P****P-Channel 30-V (D-S) MOSFET****■ Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

| Symbol         | Parameter                                             | Rating                 | Units            |
|----------------|-------------------------------------------------------|------------------------|------------------|
| $V_{DS}$       | Drain-Source Voltage                                  | -30                    | V                |
| $V_{GS}$       | Gate-Source Voltage                                   | $\pm 25$               | 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)                         | $\pm 50$               | A                |
| $I_S$          | Continuous Source Current (Diode Conduction) (Note 1) | -2.1                   | A                |
| $P_D$          | Power Dissipation (Note 1)                            | $T_A=25^\circ\text{C}$ | W                |
|                |                                                       | $T_A=70^\circ\text{C}$ |                  |
| $T_J, T_{STG}$ | Operating and Storage Junction Temperature Range      | -55 to 150             | $^\circ\text{C}$ |

**■ Thermal Resistance Ratings**

| Symbol          | Parameter                            | Maximum | Units              |
|-----------------|--------------------------------------|---------|--------------------|
| $R_{\theta JC}$ | Maximum Junction-to-Case (Note 1)    | 25      | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Maximum Junction-to-Ambient (Note 1) | 50      | $^\circ\text{C/W}$ |

Note 1: surface Mounted on 1"x 1" FR4 Board.

Note 2: Pulse width limited by maximum junction temperature

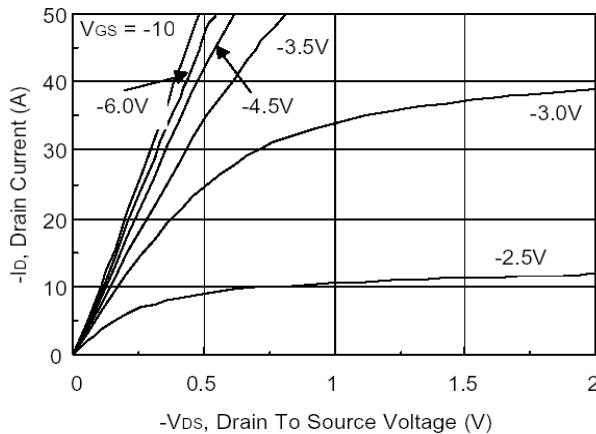
**■ Specifications ( $T_A=25^\circ\text{C}$  unless otherwise noted)**

| Symbol           | Parameter                           | Test Conditions                                                                                 | Limits      |                |               | Unit       |
|------------------|-------------------------------------|-------------------------------------------------------------------------------------------------|-------------|----------------|---------------|------------|
|                  |                                     |                                                                                                 | Min.        | Typ.           | Max.          |            |
| Static           |                                     |                                                                                                 |             |                |               |            |
| $V_{(BR)DSS}$    | Drain-Source breakdown Voltage      | $V_{GS}=0V, I_D=-250\mu A$                                                                      | -30         | -              | -             | V          |
| $V_{GS(th)}$     | Gate-Threshold Voltage              | $V_{DS}=V_{GS}, I_D=-250\mu A$                                                                  | -1          | -1.6           | -3            | V          |
| $I_{GSS}$        | Gate-Body Leakage                   | $V_{DS}=0V, V_{GS}=\pm 25V$                                                                     | -           | -              | $\pm 100$     | nA         |
| $I_{DSS}$        | Zero Gate Voltage Drain Current     | $V_{DS}=-24V, V_{GS}=0V$<br>$V_{DS}=-24V, V_{GS}=0V, T_J=55^{\circ}C$                           | -           | -              | -1<br>-5      | $\mu A$    |
| $I_{D(on)}$      | On-State Drain Current (Note 3)     | $V_{GS}=-5V, V_{DS}=-10V$                                                                       | -50         | -              | -             | A          |
| $r_{DS(on)}$     | Drain-Source On-Resistance (Note 3) | $V_{GS}=-10V, I_D=-13A$<br>$V_{GS}=-4.5V, I_D=-11A$<br>$V_{GS}=-10V, I_D=-13A, T_J=55^{\circ}C$ | -<br>-<br>- | 7.3<br>10<br>9 | 9<br>13<br>11 | m $\Omega$ |
| $g_{fs}$         | Forward Tranconductance (Note 3)    | $V_{GS}=-5V, I_D=-13A$                                                                          | -           | 44             | -             | S          |
| $V_{SD}$         | Diode Forward Voltage               | $I_S=2.1A, V_{GS}=0V$                                                                           | -           | -0.7           | -1.2          | V          |
| Dynamic (Note 4) |                                     |                                                                                                 |             |                |               |            |
| $Q_g$            | Total Gate Charge                   | $V_{DS}=-15V, V_{GS}=-10V, I_D=-13A$                                                            | -           | 71             | 100           | nC         |
| $Q_{gs}$         | Gate-Source Charge                  |                                                                                                 | -           | 12             | -             |            |
| $Q_{gd}$         | Gate-Drain Charge                   |                                                                                                 | -           | 15             | -             |            |
| Switching        |                                     |                                                                                                 |             |                |               |            |
| $t_{d(on)}$      | Turn-On Delay Time                  | $V_{DD}=-15V, R_L=6\Omega, I_D=-1A, V_{GEN}=-10V$                                               | -           | 19             | 36            | nS         |
| $t_r$            | Rise Time                           |                                                                                                 | -           | 11             | 21            |            |
| $t_{d(off)}$     | Turn-Off Delay Time                 |                                                                                                 | -           | 121            | 186           |            |
| $t_f$            | Fall-Time                           |                                                                                                 | -           | 68             | 112           |            |

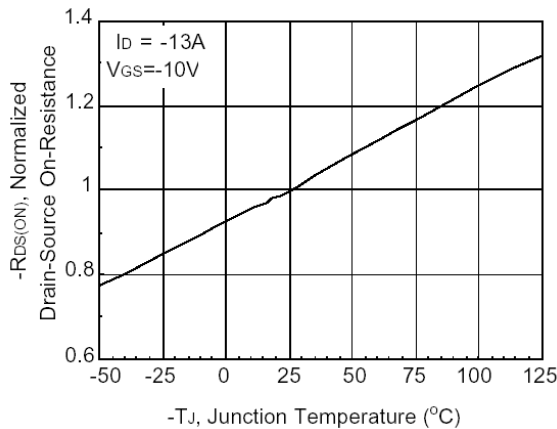
Note 3: Pulse test:  $PW \leq 300\mu s$  duty cycle  $\leq 2\%$ .

Note 4: Guaranteed by design, not subject to production testing.

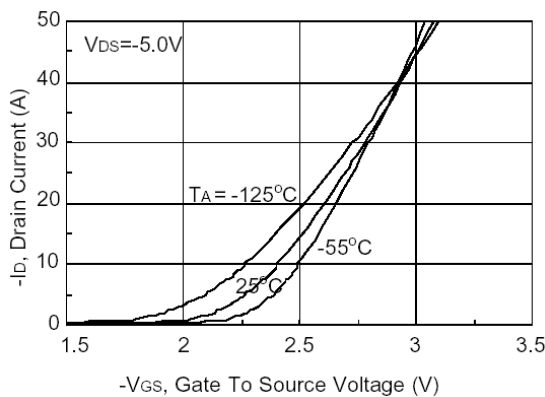
## ■ Typical Performance Characteristics



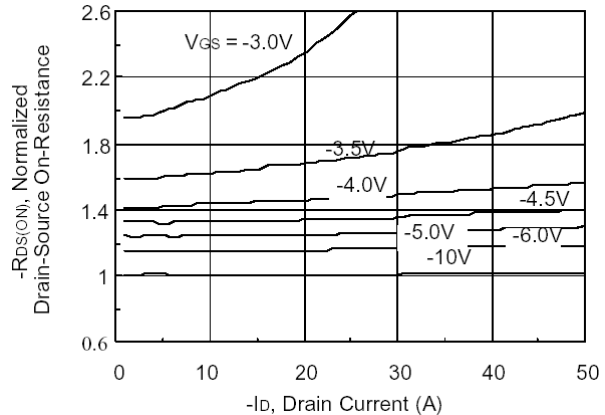
**Figure 1. On-Region Characteristics**



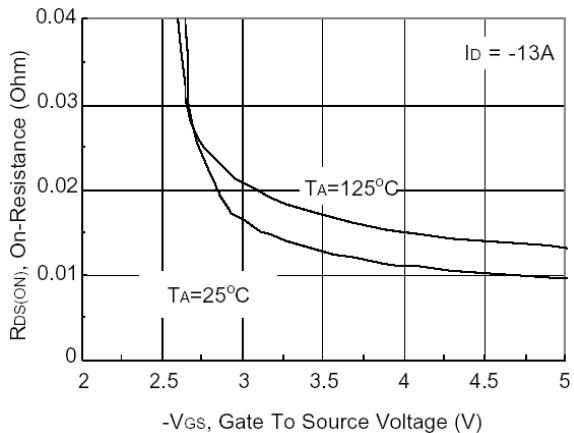
**Figure 3. On-Resistance Variation With Temperature**



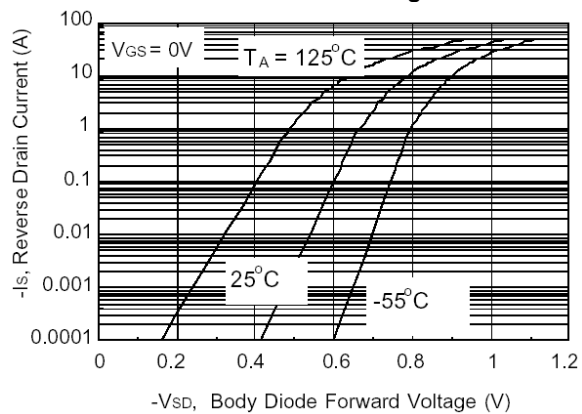
**Figure 5. Transfer Characteristics**



**Figure 2. On-Resistance Variation with Drain Current and Gate Voltage**



**Figure 4. On-Resistance Variation with Gate to Source Voltage**



**Figure 6. Body Diode Forward Voltage Variation With Source Current and Temperature**

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### ■ Typical Performance Characteristics (Continued)

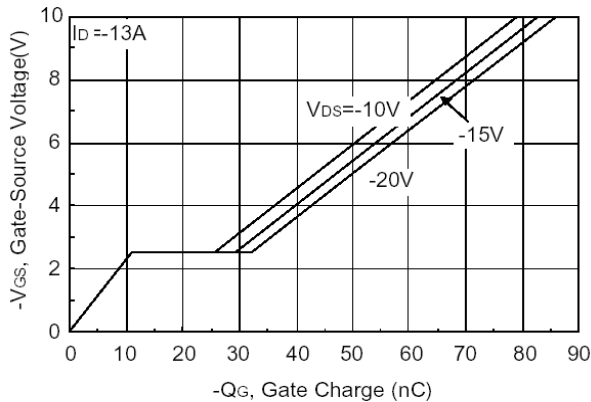


Figure 7. Gate Charge Characteristics

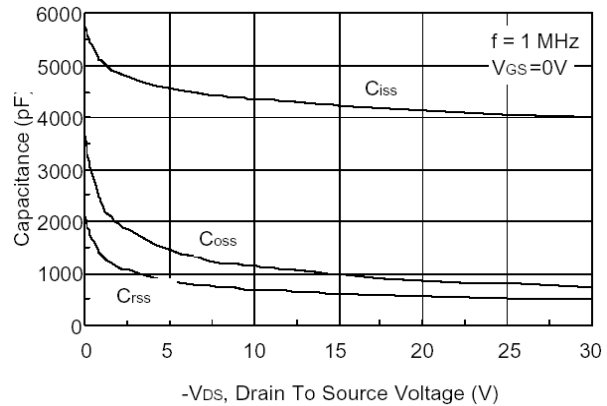


Figure 8. Capacitance Characteristics

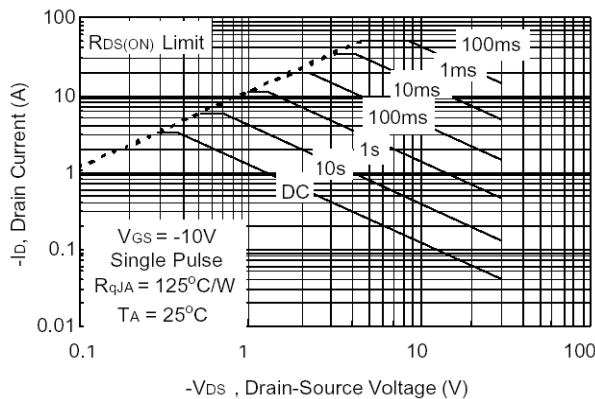


Figure 9. Maximum Safe Operating Area

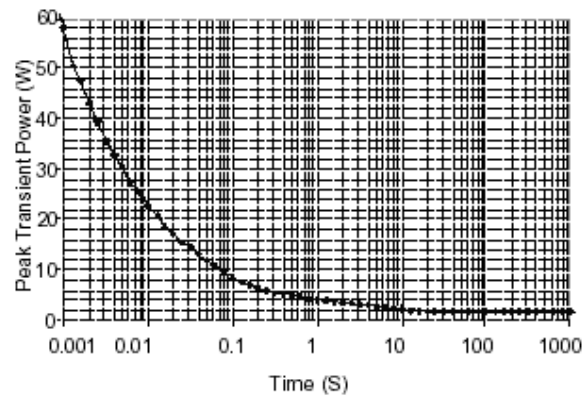


Figure 10. Single Pulse Maximum Power Dissipation

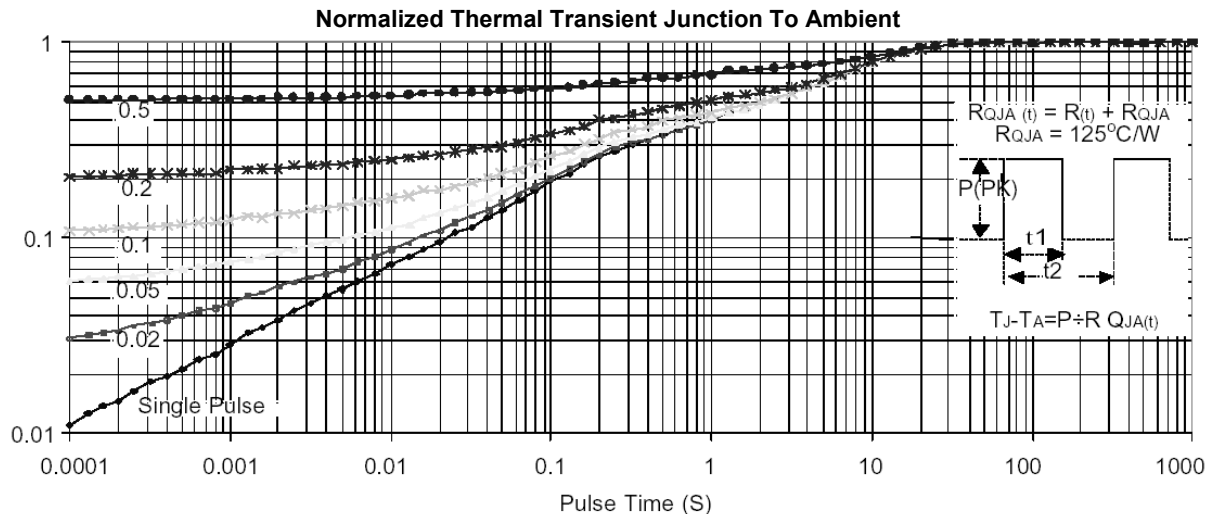
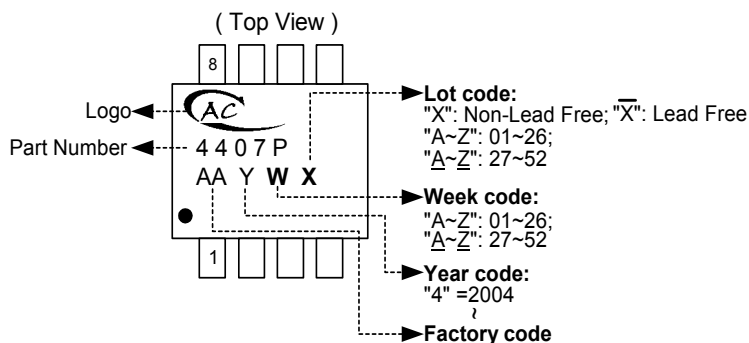


Figure 11. Transient Thermal Response Curve

## P-Channel 30-V (D-S) MOSFET

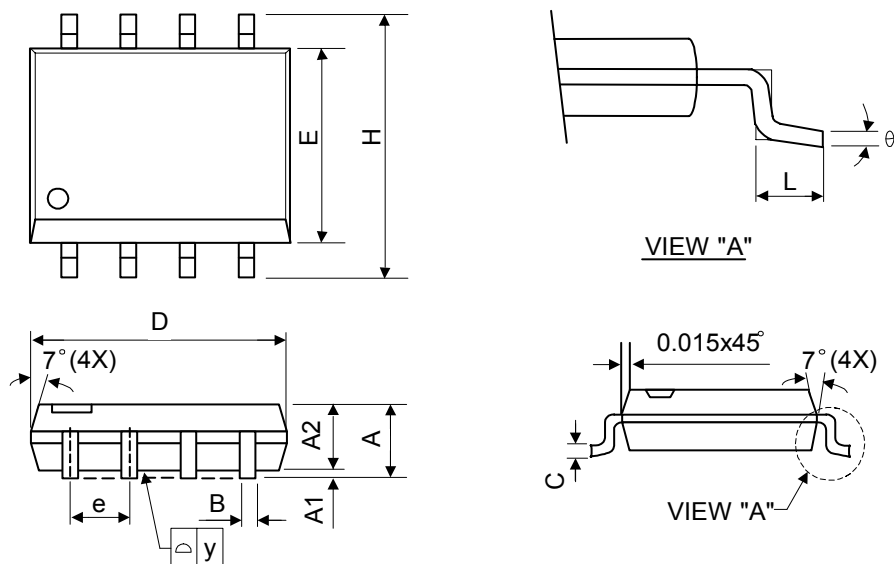
### ■ Marking Information

SOP-8L



### ■ Package Information

Package Type: SOP-8L



| Symbol | Dimensions In Millimeters |      |      | Dimensions In Inches |       |       |
|--------|---------------------------|------|------|----------------------|-------|-------|
|        | Min.                      | Nom. | Max. | Min.                 | Nom.  | Max.  |
| A      | 1.40                      | 1.60 | 1.75 | 0.055                | 0.063 | 0.069 |
| A1     | 0.10                      | -    | 0.25 | 0.040                | -     | 0.100 |
| A2     | 1.30                      | 1.45 | 1.50 | 0.051                | 0.057 | 0.059 |
| B      | 0.33                      | 0.41 | 0.51 | 0.013                | 0.016 | 0.020 |
| C      | 0.19                      | 0.20 | 0.25 | 0.0075               | 0.008 | 0.010 |
| D      | 4.80                      | 5.05 | 5.30 | 0.189                | 0.199 | 0.209 |
| E      | 3.70                      | 3.90 | 4.10 | 0.146                | 0.154 | 0.161 |
| e      | -                         | 1.27 | -    | -                    | 0.050 | -     |
| H      | 5.79                      | 5.99 | 6.20 | 0.228                | 0.236 | 0.244 |
| L      | 0.38                      | 0.71 | 1.27 | 0.015                | 0.028 | 0.050 |
| y      | -                         | -    | 0.10 | -                    | -     | 0.004 |
| θ      | 0°                        | -    | 8°   | 0°                   | -     | 8°    |

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