

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

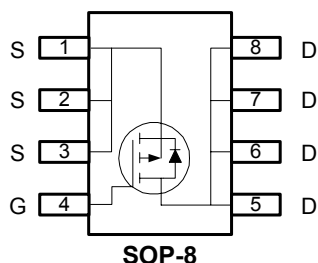
■ Product Summary

V_{DS} (V)	$r_{DS(on)}$ (m Ω)	I_D (A)
-20	20@ $V_{GS}=-4.5V$	10.2
	29@ $V_{GS}=-2.5V$	8.5
	54@ $V_{GS}=-1.8V$	6.2

■ 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.

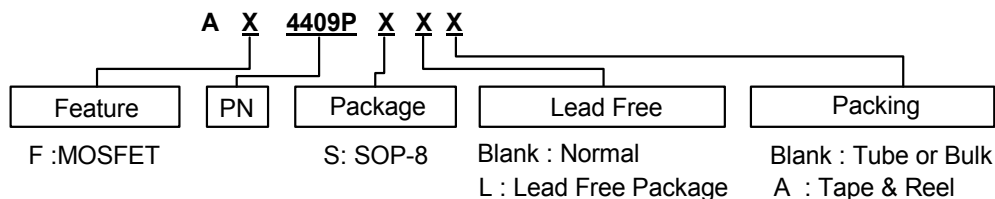
■ Pin Assignments



■ Pin Descriptions

Pin Name	Description
S	Source
G	Gate
D	Drain

■ Ordering information



**AF4409P****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	-20	V
V_{GS}	Gate-Source Voltage	± 12	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)	± 30	A
I_S	Continuous Source Current (Diode Conduction) (Note 1)	-2.3	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 Junction and Storage Temperature Range	-55 to 150	$^\circ\text{C}$

■ Thermal Resistance Ratings

Symbol	Parameter	Maximum	Units
$R_{\theta JA}$	Maximum Junction-to-Ambient (Note 1)	$t \leq 10 \text{ sec}$	$^\circ\text{C/W}$
		Steady State	$^\circ\text{C/W}$

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 _{GS(th)}	Gate-Threshold Voltage	V _{DS} = V _{GS} , I _D =-350uA	-0.6	-	-	V
I _{GSS}	Gate-Body Leakage	V _{DS} =0V, V _{GS} =±12V	-	-	±100	nA
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =-16V, V _{GS} =0V	-	-	-1	uA
		V _{DS} =-16V, V _{GS} =0V, T _J =55°C	-	-	-10	
I _{D(on)}	On-State Drain Current (Note 3)	V _{DS} =-5V, V _{GS} =-4.5V	-20	-	-	A
r _{DS(on)}	Drain-Source On-Resistance (Note 3)	V _{GS} =-4.5V, I _D =-10.2A	-	-	20	mΩ
		V _{GS} =-2.5V, I _D =-8.5A	-	-	29	
		V _{GS} =-1.8V, I _D =-6.2A, T _J =55°C	-	-	54	
g _{fs}	Forward Tranconductance (Note 3)	V _{DS} =-10V, I _D =-10.2A	-	36	-	S
V _{SD}	Diode Forward Voltage	I _S =-2.3A, V _{GS} =0V	-	-0.8	-1.2	V
Dynamic (Note 4)						
Q _g	Total Gate Charge	V _{DS} =-10V, V _{GS} =-5V, I _D =-10.2A	-	30	-	nC
Q _{gs}	Gate-Source Charge		-	4	-	
Q _{gd}	Gate-Drain Charge		-	8.3	-	
Switching						
t _{d(on)}	Turn-On Delay Time	V _{DD} =-10V, R _L =15Ω, I _D =-1A, V _{GEN} =-5V, R _G =6Ω,	-	25	-	nS
t _r	Rise Time		-	45	-	
t _{d(off)}	Turn-Off Delay Time		-	150	-	
t _f	Fall-Time		-	70	-	

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

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

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■ Typical Performance Characteristics

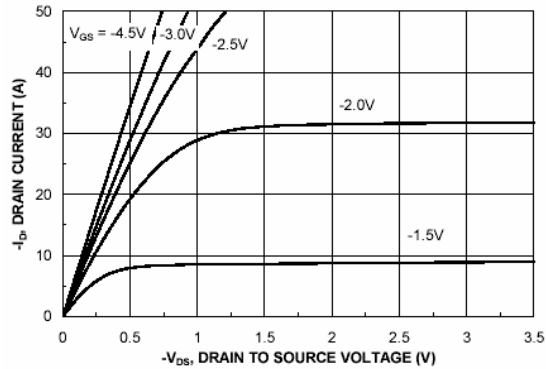


Figure 1. Output Characteristics

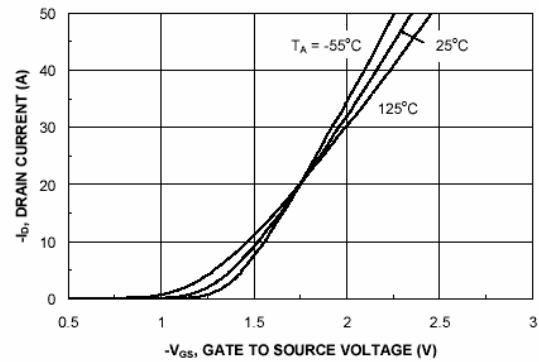


Figure 2. Transfer Characteristics

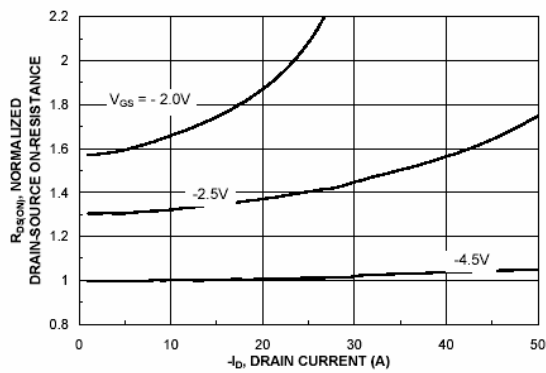


Figure 3. On Resistance vs. Drain Current

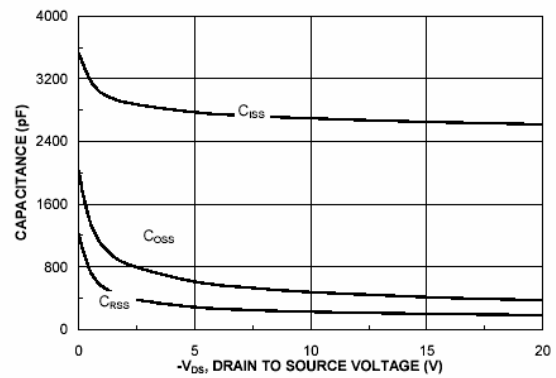


Figure 4. Capacitance

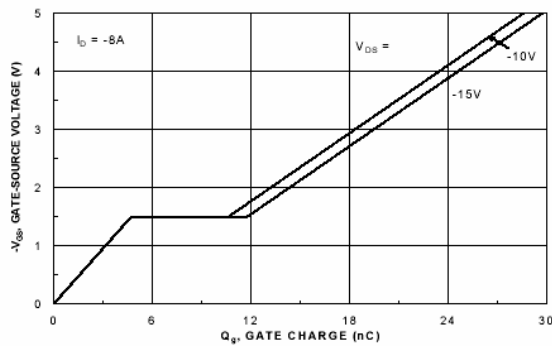


Figure 5. Gate Charge

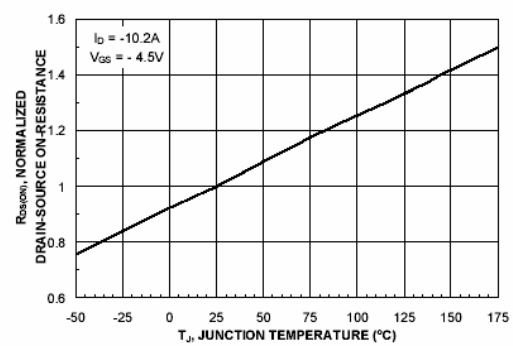


Figure 6. On-Resistance vs. Junction Temperature

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■ Typical Performance Characteristics (Continued)

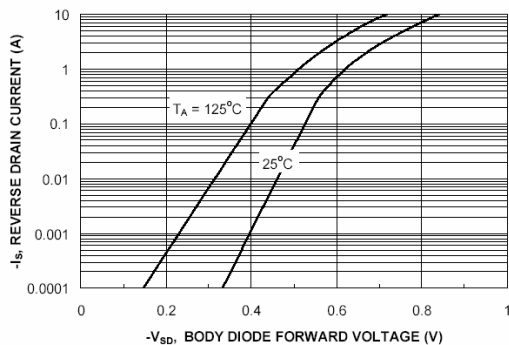


Figure 7. Source-Drain Diode Forward Voltage

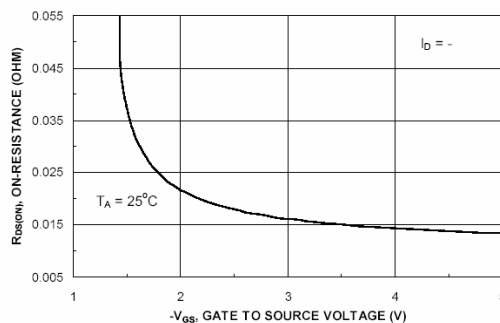


Figure 8. On-Resistance vs. Gate-to-Source Voltage

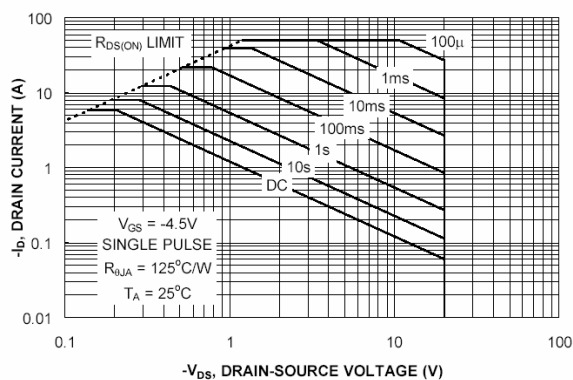


Figure 9. Safe Operating Area

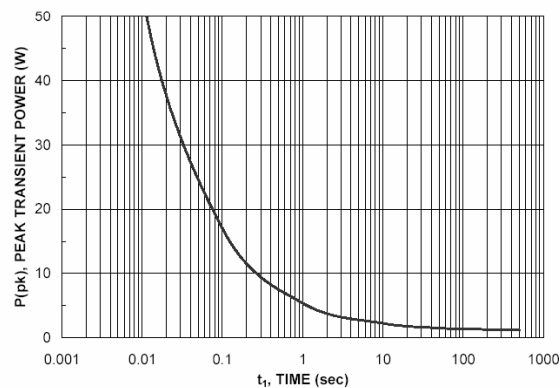


Figure 10. Single Pulse Power, Junction-to-Ambient

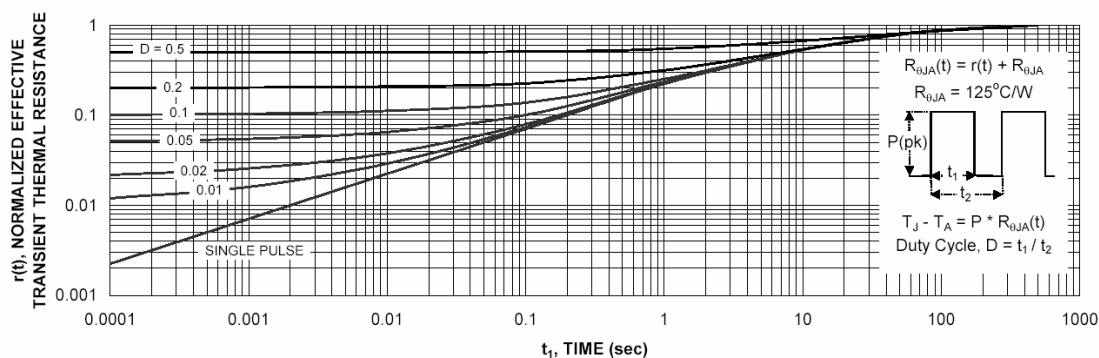
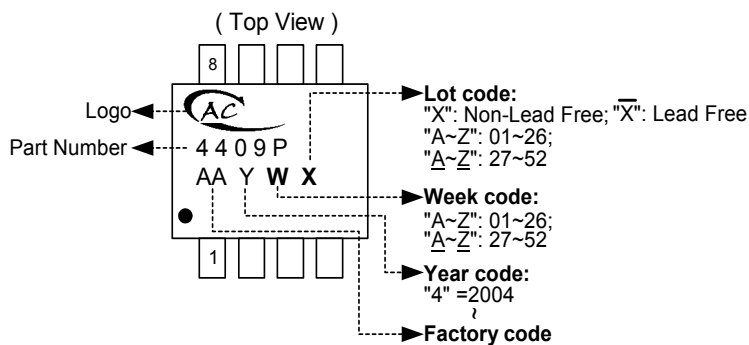


Figure 11. Normalized Thermal Transient Impedance, Junction-to-Ambient

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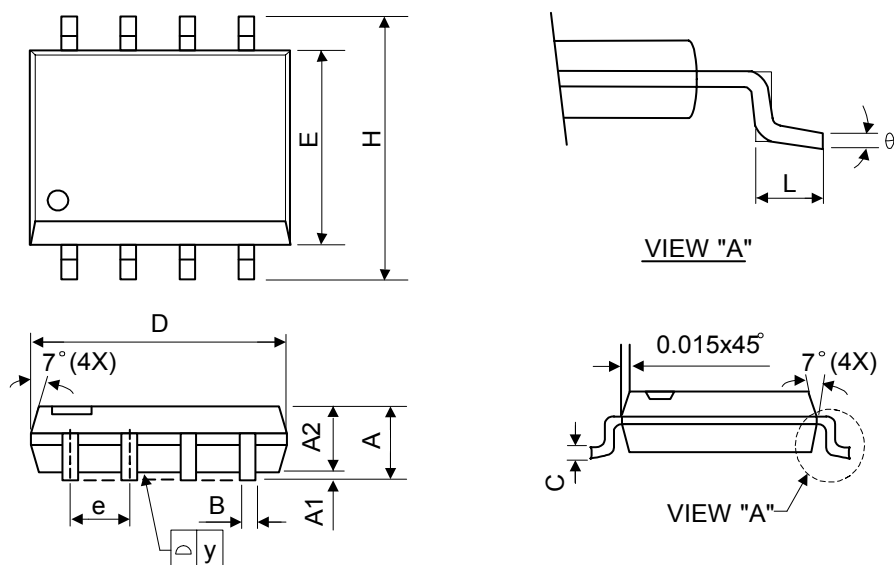
■ Marking Information

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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