

**SuperMOS – SOP8 -30V 5.8mΩ R<sub>DS(ON)</sub>, P-channel MOSFET**

**1. Description**

The AO4409-ES uses advanced trench technology MOSFETs to provide excellent R<sub>DS(ON)</sub> and low gate charge. Device is suitable for use in DC-DC conversion, power switch and charging circuit. Standard Product AO4409-ES Pb-free

**2. Features**

- -30V R<sub>DS(ON)</sub>=5.8mΩ(Typ.) @V<sub>GS</sub>=-10V  
R<sub>DS(ON)</sub>=8.0mΩ(Typ.) @V<sub>GS</sub>=-4.5V
- Fast Switching
- High density cell design for low R<sub>DS(on)</sub>
- Material: Halogen free
- Reliable and rugged
- Avalanche Rated
- Low leakage current

**3. Applications**

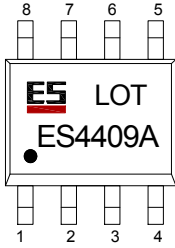
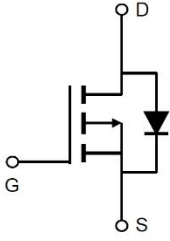
- PWM applications
- Load switch
- Power management in portable/desktop PCs
- DC/DC conversion

**100% UIS TESTED**

**4. Ordering Information**

Part Number	Package	Marking	Material	Packing	Quantity per reel	Flammability Rating	Reel Size
AO4409-ES	SOP8	ES4409/LOT	Halogen free	Tape & Reel	3,000 PCS	UL 94V-0	13 inches

**5. Pin Configuration and Functions**

Pin	Function	Outline	Circuit Diagram
4	Gate		
1/2/3	Source		
5/6/7/8	Drain		

## 6. Specification

### Absolute Maximum Rating & Thermal Characteristics

Ratings at 25 °C ambient temperature unless otherwise specified.

Parameter	Symbol	Limited	Unit
Drain-Source Voltage	$BV_{DSS}$	-30	V
Gate-Source Voltage	$V_{GS}$	±20	V
Continuous Drain Current	$I_D$	$T_A=25^{\circ}C$	-14
		$T_A=100^{\circ}C$	-8.8
Maximum Power Dissipation	$P_D$	$T_A=25^{\circ}C$	3
		$T_A=100^{\circ}C$	1.2
Pulsed Drain Current	$I_{DM}$	-53	A
Single Pulse Avalanche Current <sup>a</sup>	$I_{AS}$	-40	A
Single Pulse Avalanche Energy <sup>a</sup>	$E_{AS}$	80	mJ
Operating Junction Temperature	$T_J$	150	°C
Storage Temperature Range	$T_{stg}$	-55 to +150	°C

#### Thermal resistance ratings

Parameter	Symbol	Typical	Maximum	Unit
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$		41.6	°C/W

Notes:

a: The EAS data shows Max. rating The test condition is  $V_{DD} = -25V$ ,  $V_{GS} = -10V$ ,  $L = 0.1mH$

## Electrical Characteristics

At TA = 25°C unless otherwise specified

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	$BV_{DSS}$	$V_{GS}=0V, I_D=-250\mu A$	-30			V
Zero Gate Voltage Drain Current	$I_{DSS}$	$V_{GS}=0V, V_{DS}=-30V$			-1	$\mu A$
Gate-to-source Leakage Current	$I_{GSS}$	$V_{GS}=\pm 20V, V_{DS}=0V$			$\pm 100$	nA
<b>ON CHARACTERISTICS</b>						
Gate Threshold Voltage	$V_{GS(TH)}$	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0		-2.5	V
Drain-to-source On-resistance	$R_{DS(on)}$	$V_{GS}=-10V, I_D=-12A$		5.8	9	m $\Omega$
		$V_{GS}=-4.5V, I_D=-10A$		8	14	
Forward Transconductance	$g_{FS}$	$V_{DS}=-10V, I_D=-10A$		50		S
<b>CHARGES, CAPACITANCES AND GATE RESISTANCE</b>						
Input Capacitance	$C_{ISS}$	$V_{GS}=0V, V_{DS}=-15V$ $f=1MHz$		3100		pF
Output Capacitance	$C_{OSS}$			430		
Reverse Transfer Capacitance	$C_{RSS}$			358		
Total Gate Charge	$Q_{G(TOT)}$	$V_{GS}=-10V, V_{DS}=-15V$ $I_D=-12A$		35		nC
Gate-to-Source Charge	$Q_{GS}$			10		
Gate-to-Drain Charge	$Q_{GD}$			10.5		
<b>SWITCHING CHARACTERISTICS</b>						
Turn-On Delay Time	$t_{d(ON)}$	$V_{GS}=-10V, V_{DS}=-15V$ $I_D=-12A, R_G=3\Omega$		11		ns
Rise Time	$t_r$			13.3		
Turn-Off Delay Time	$t_{d(OFF)}$			74		
Fall Time	$t_f$			35		
<b>BODY DIODE CHARACTERISTICS</b>						
Forward Voltage	$V_{SD}$	$V_{GS}=0V, I_{SD}=-10A$	-4.5		-1.5	V

### 7. Typical Characteristic

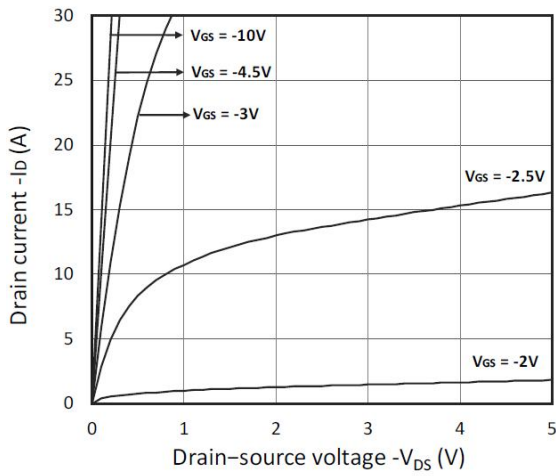


Figure 1. Output Characteristics

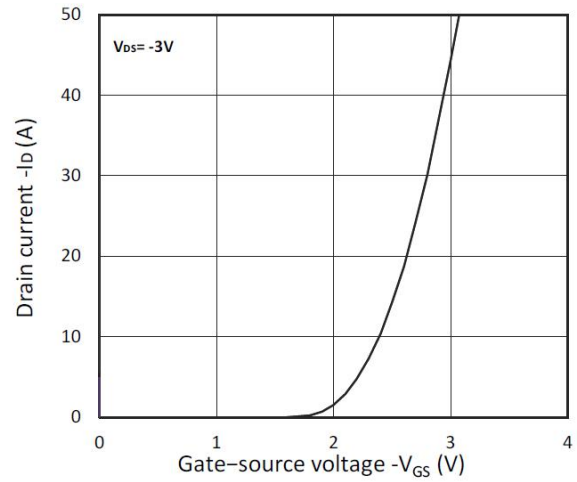


Figure 2. Transfer Characteristics

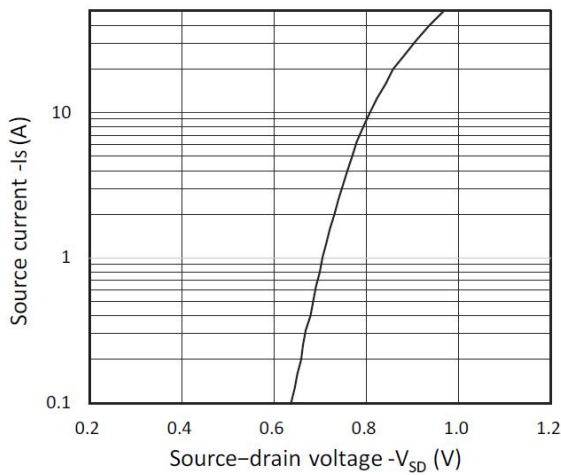


Figure 3. Forward Characteristics of Reverse

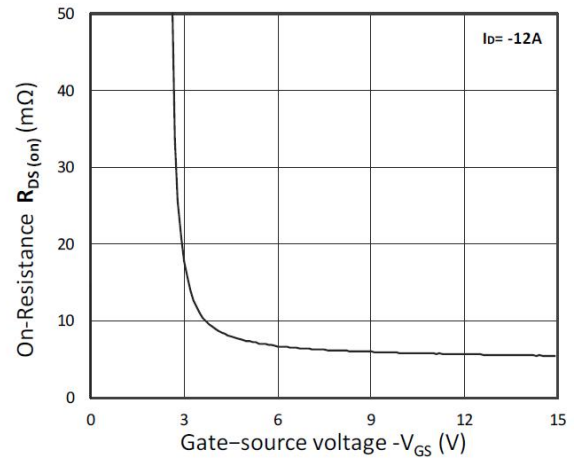


Figure 4.  $R_{DS(on)}$  vs.  $V_{GS}$

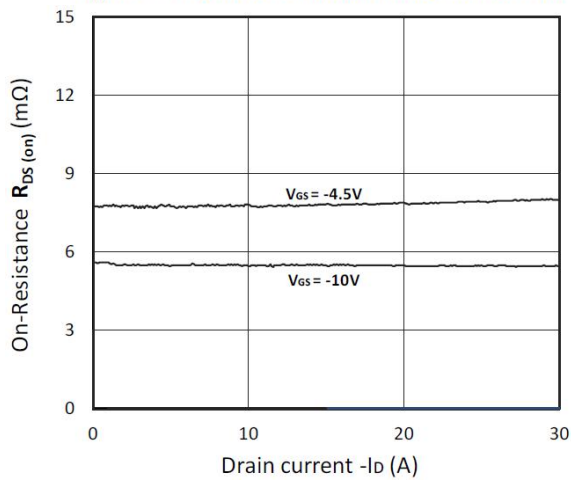


Figure 5.  $R_{DS(on)}$  vs.  $I_D$

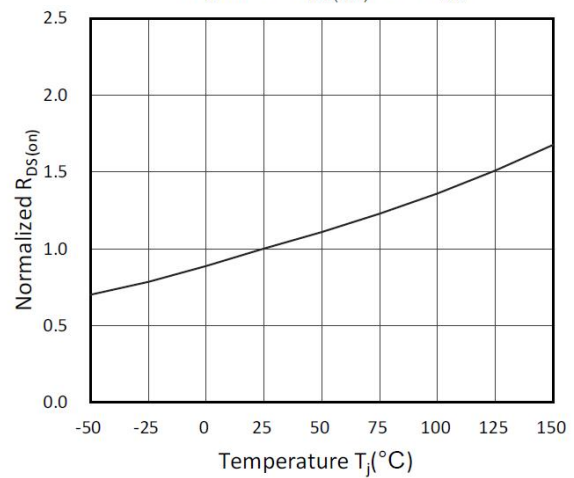


Figure 6. Normalized  $R_{DS(on)}$  vs. Temperature

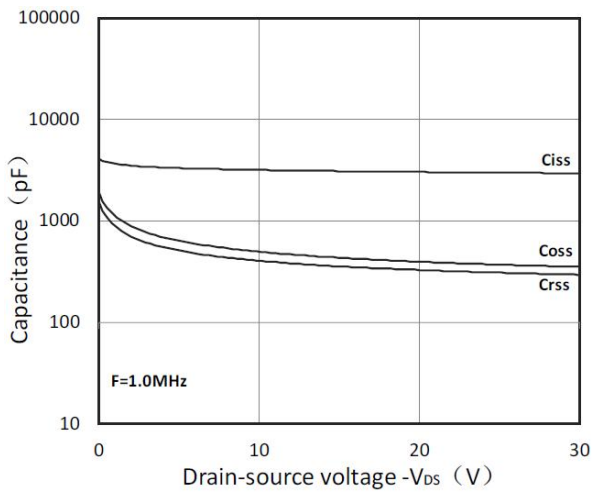


Figure 7. Capacitance Characteristics

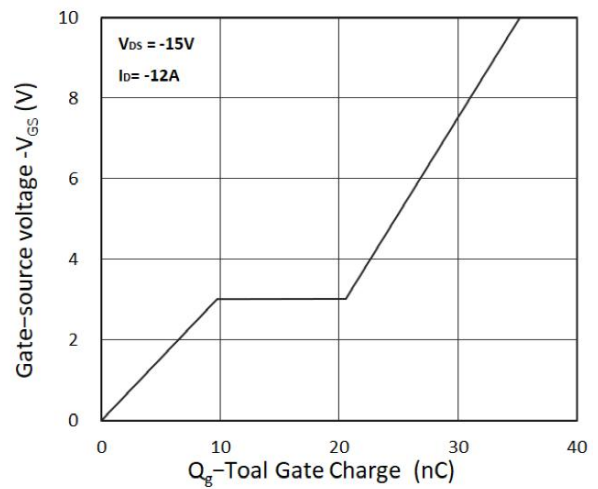


Figure 8. Gate Charge Characteristics

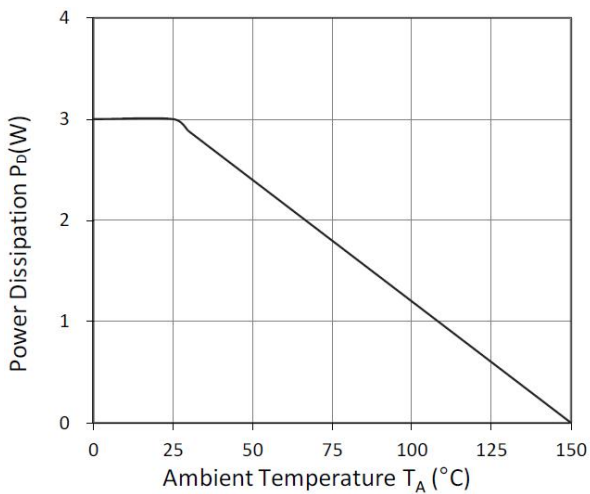


Figure 9. Power Dissipation

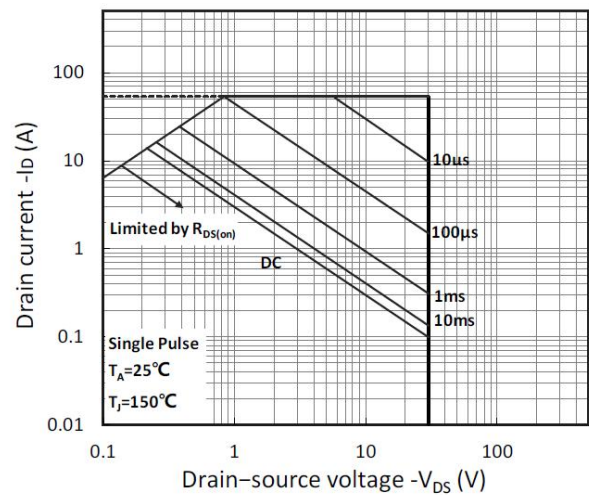


Figure 10. Safe Operating Area

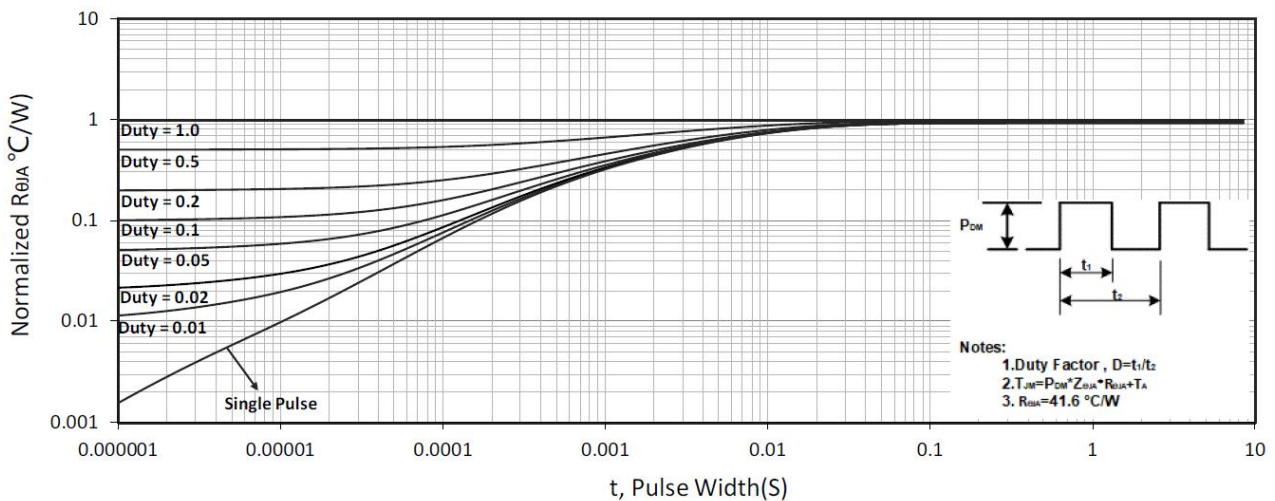
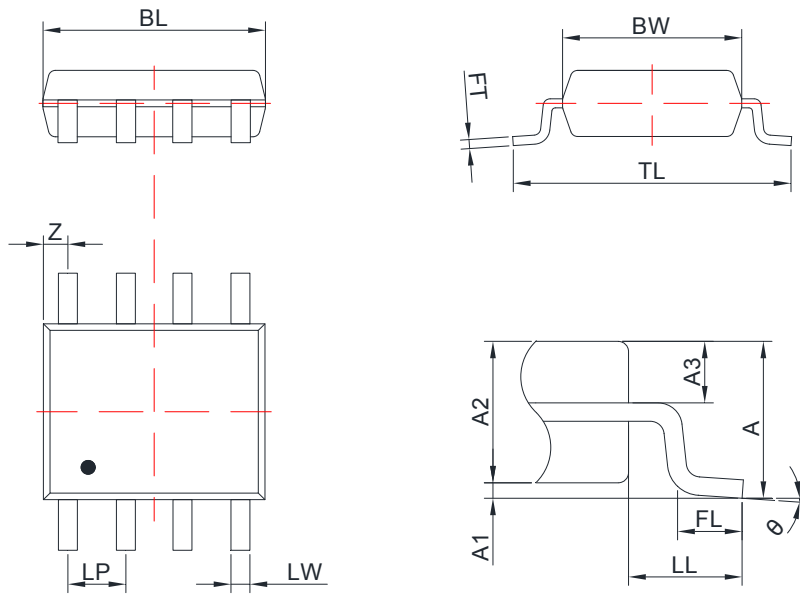


Figure 11. Normalized Maximum Transient Thermal Impedance

**8. Dimension (SOP8)**



COMMON DIMENSIONS: UNITS OF MEASURE=MILLIMETER

Symbol	Dimensions		Symbol	Dimensions	
	Min.	Max.		Min.	Max.
A	1.75		FL	0.50	0.80
A1	0.05	0.15	LP	1.25	1.30
A2	1.40	1.50	LL	1.1 BSC	
A3	0.623 BSC		LW	0.38	0.43
BL	4.80	5.00	TL	5.90	6.10
BW	3.70	4.10	Z	0.54	
FT	0.20	0.21	θ	0°	8°

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