

## General Description

The AO4409 is the high cell density trench P-ch MOSFETs, which provide excellent RDS(ON) and gate charge for most of the synchronous buck converter applications.

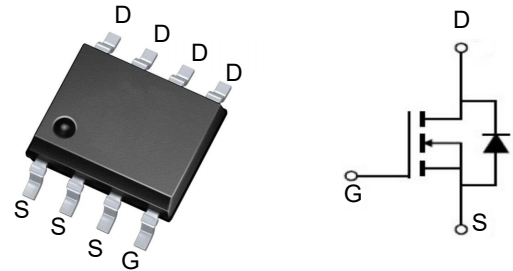


## Features

$V_{DSS}$	30	V
$I_D$	15	A
$R_{DS(ON)}(at V_{GS} = -10V)$	8	m $\Omega$
$R_{DS(ON)}(at V_{GS} = -4.5V)$	11	m $\Omega$

## Application

- Battery protection
- Load switch
- PWM application



## Package Marking and Ordering Information

Product ID	Pack	Marking	Qty(PCS)
MY4409	SOP-8	4409	3000

## Absolute Maximum Ratings ( $T_A=25^{\circ}C$ unless otherwise noted)

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-30	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_A=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ -10V^1$	- 15	A
$I_D@T_A=70^{\circ}C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-9	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-46	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	55	mJ
$I_{AS}$	Avalanche Current	-50	A
$P_D@T_A=25^{\circ}C$	Total Power Dissipation <sup>4</sup>	4.5	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^{\circ}C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^{\circ}C$

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	75	$^{\circ}C/W$
	Thermal Resistance Junction-Ambient <sup>1</sup> ( $t \leq 10s$ )	---	40	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	24	$^{\circ}C/W$

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Units
<b>Off Characteristic</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA	-30	-	-	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> = -30V, V <sub>GS</sub> =0V,	-	-	-1	μA
I <sub>GSS</sub>	Gate to Body Leakage Current	V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V	-	-	±100	nA
<b>On Characteristics</b>						
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA	-1.0	-1.6	-2.5	V
R <sub>DS(on)</sub>	Static Drain-Source on-Resistance Note3	V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A	-	8	10	mΩ
		V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A	-	11	15	
<b>Dynamic Characteristics</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> = -15V, V <sub>GS</sub> =0V, f=1.0MHz	-	1970	-	pF
C <sub>oss</sub>	Output Capacitance		-	233	-	pF
C <sub>riss</sub>	Reverse Transfer Capacitance		-	206	-	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> = -15V, I <sub>D</sub> = -5A, V <sub>GS</sub> = -10V	-	22	-	nC
Q <sub>gs</sub>	Gate-Source Charge		-	1.0	-	nC
Q <sub>gd</sub>	Gate-Drain("Miller") Charge		-	1.8	-	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> = -15V, I <sub>D</sub> = -10A, V <sub>GS</sub> =-10V, R <sub>GEN</sub> =2.5Ω	-	9	-	ns
t <sub>r</sub>	Turn-on Rise Time		-	13	-	ns
t <sub>d(off)</sub>	Turn-off Delay Time		-	48	-	ns
t <sub>f</sub>	Turn-off Fall Time		-	20	-	ns
<b>Drain-Source Diode Characteristics and Maximum Ratings</b>						
I <sub>S</sub>	Maximum Continuous Drain to Source Diode Forward		-	-	-12	A
I <sub>SM</sub>	Maximum Pulsed Drain to Source Diode Forward Current		-	-	-60	A
V <sub>SD</sub>	Drain to Source Diode Forward	V <sub>GS</sub> =0V, I <sub>S</sub> = -15A	-	-0.8	-1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>J</sub> =25°C, V <sub>DD</sub> = -24V, I <sub>F</sub> =- 2.8A, di/dt=-100A/μs	-	64	-	ns
Q <sub>rr</sub>	Reverse Recovery Charge		-	25	-	nC

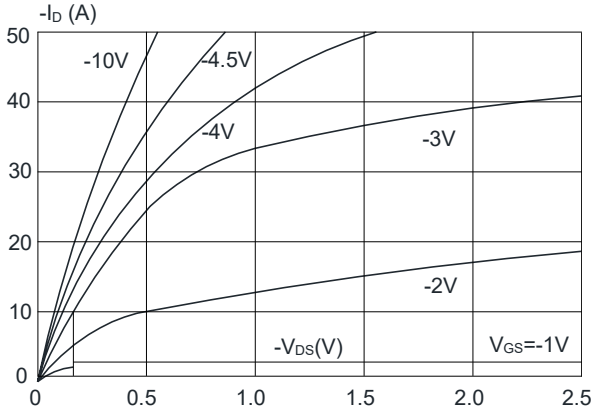
Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

2. EAS condition: T<sub>J</sub>=25°C, V<sub>GS</sub>=10V, R<sub>G</sub>=25Ω, L=0.5mH, I<sub>AS</sub>=-12.7A

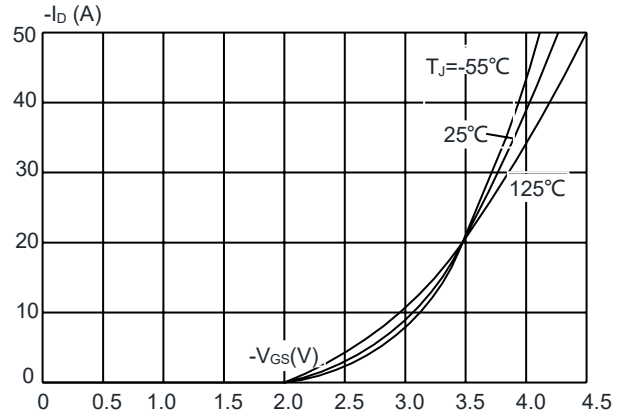
3. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

**Typical Characteristics**

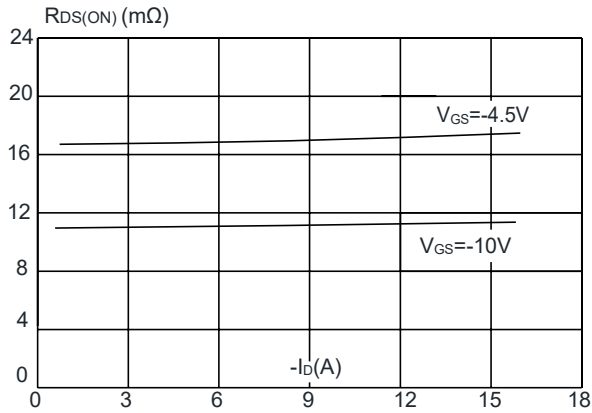
**Figure 1: Output Characteristics**



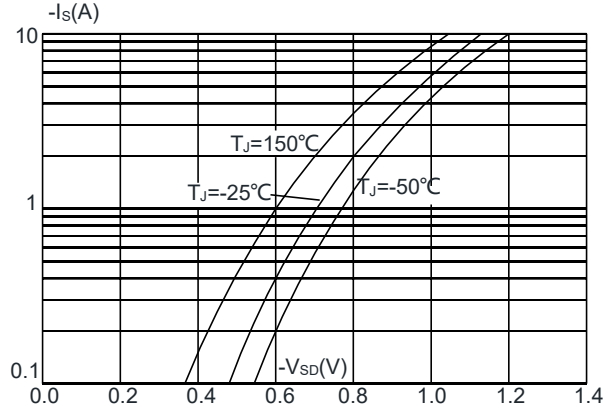
**Figure 2: Typical Transfer Characteristics**



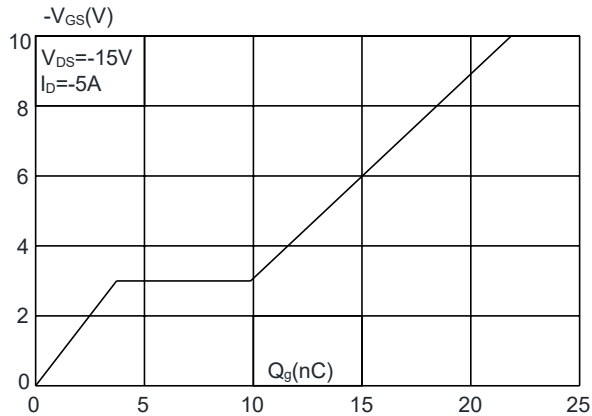
**Figure 3: On-resistance vs. Drain Current**



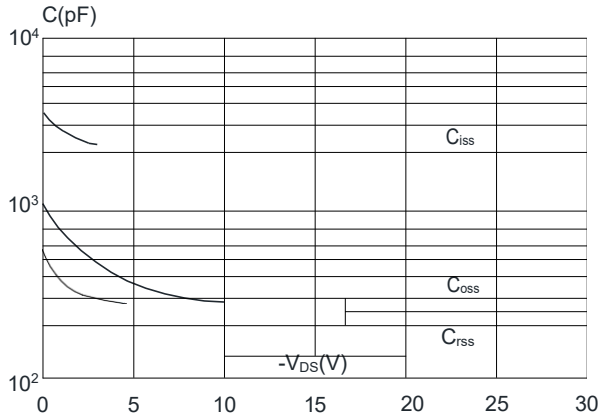
**Figure 4: Body Diode Characteristics**



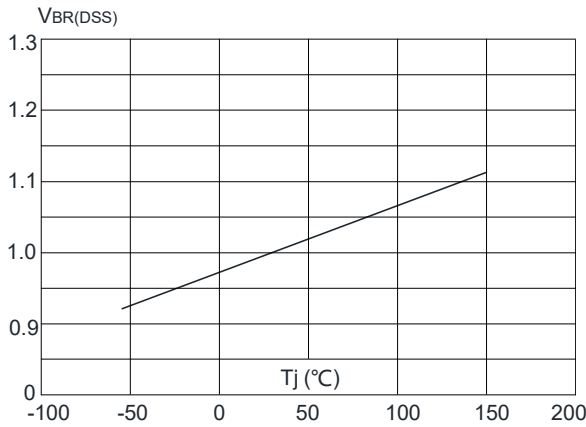
**Figure 5: Gate Charge Characteristics**



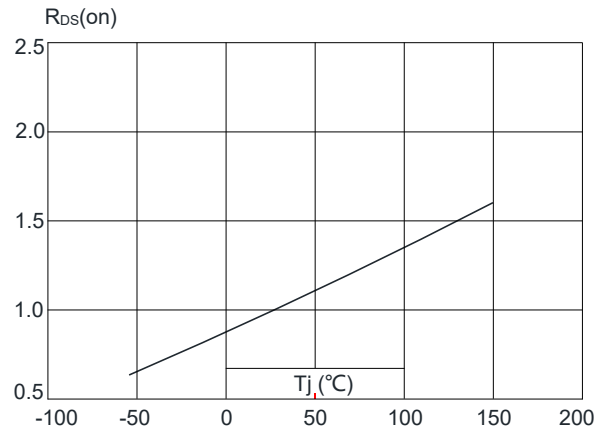
**Figure 6: Capacitance Characteristics**



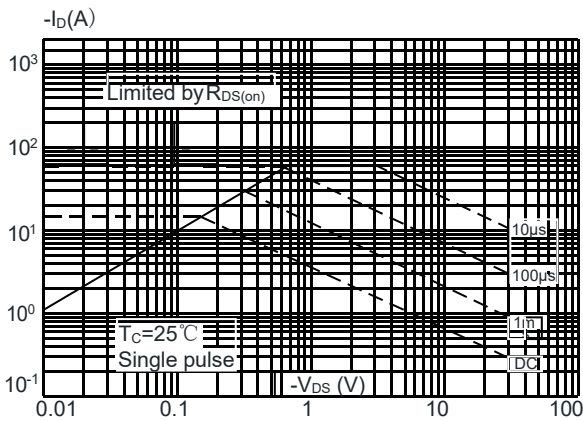
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



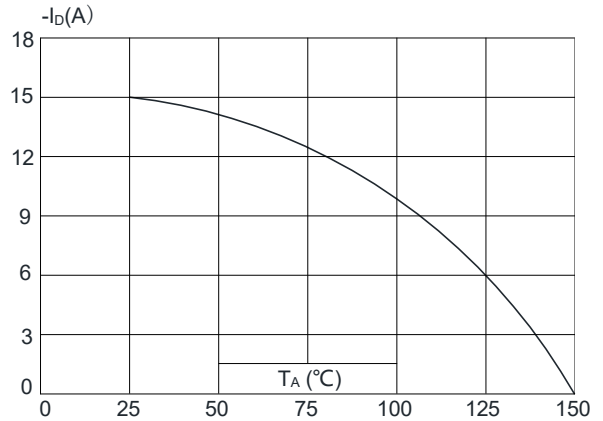
**Figure 8:** Normalized on Resistance vs. Junction Temperature



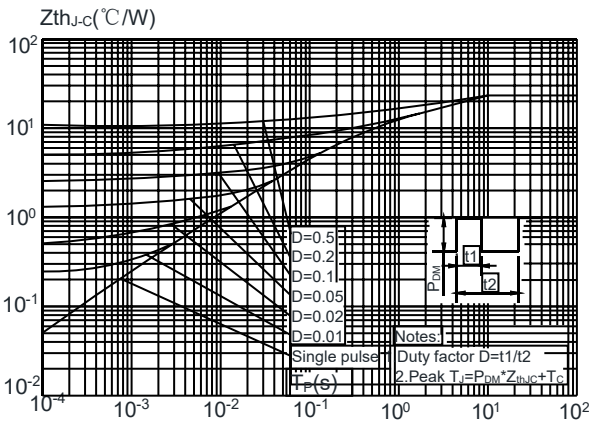
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature

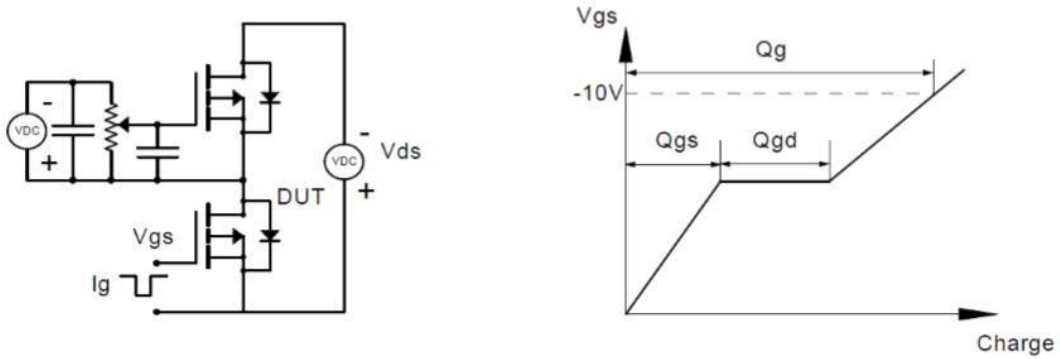


**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case

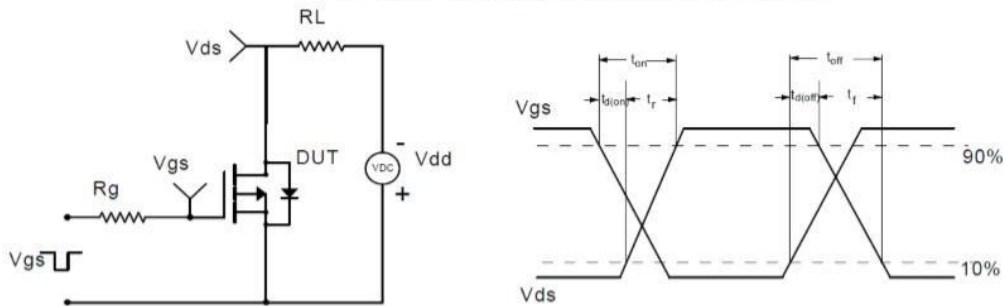


**Test Circuit**

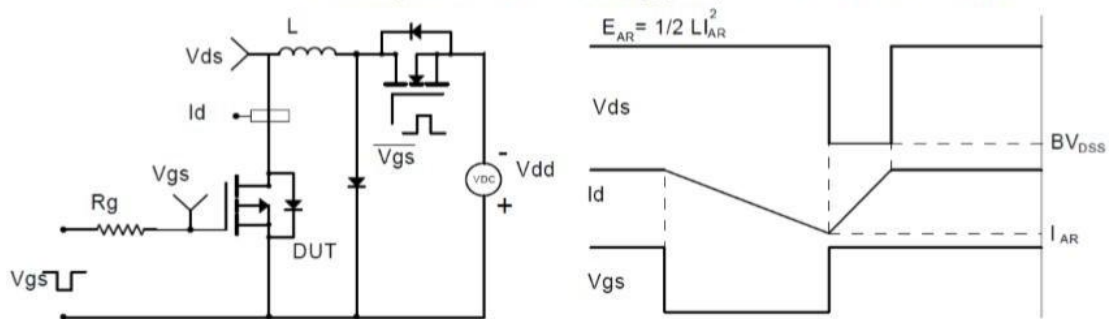
Gate Charge Test Circuit & Waveform



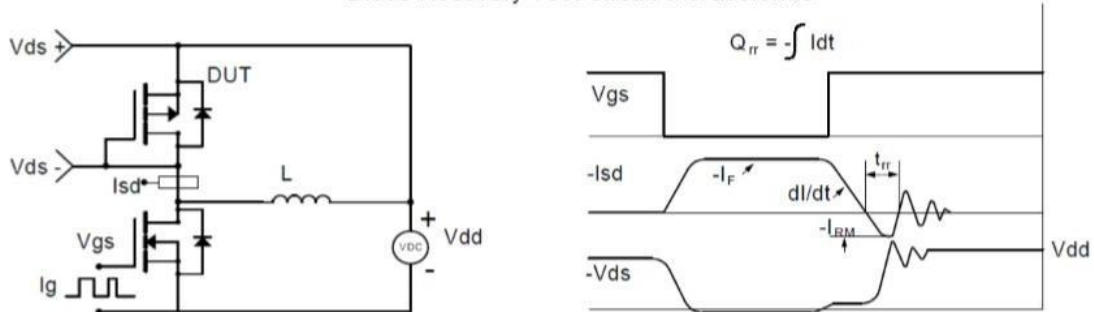
Resistive Switching Test Circuit & Waveforms



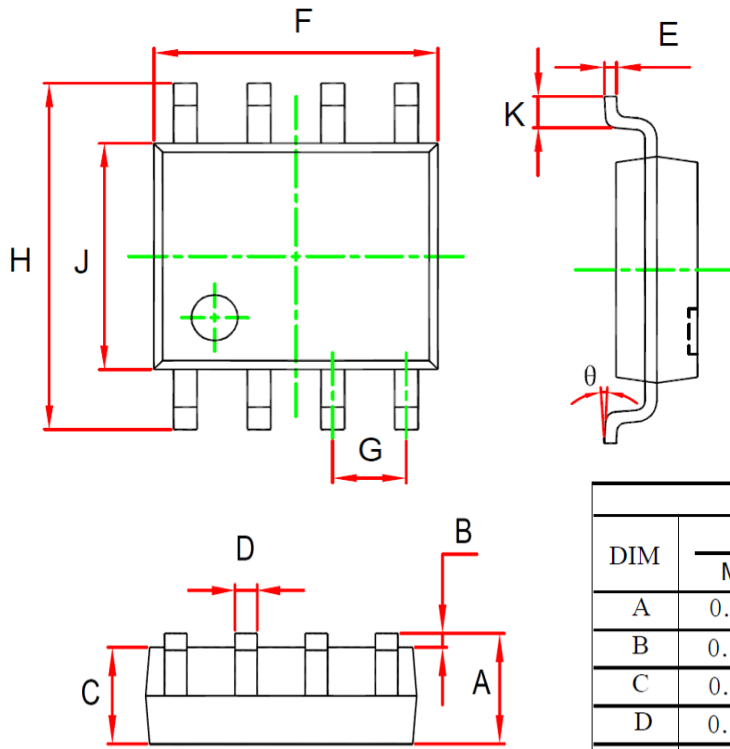
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



**Package Mechanical Data-SOP-8**



DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.053	0.069	1.350	1.750	
B	0.004	0.010	0.100	0.250	
C	0.053	0.061	1.350	1.550	
D	0.013	0.020	0.330	0.510	
E	0.007	0.010	0.170	0.250	
F	0.189	0.197	4.800	5.000	
G	0.050 (BSC)		1.270 (BSC)		
H	0.228	0.244	5.800	6.200	
J	0.150	0.157	3.800	4.000	
K	0.016	0.050	0.400	1.270	
θ	0°	8°	0°	8°	