Features

- Super Low Gate Charge
- Green Device Available
- 100% EAS Guaranteed
- Excellent CdV/dt effect decline
- Advanced high cell density Trench technology

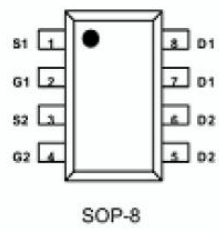
Bvdss	Rdson	ID
-30V	6.6mΩ	-18A

Application

- Battery Switch
- Load switch
- Power management

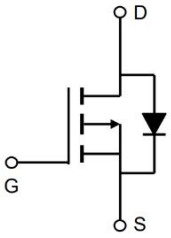
RoHS

Package



1.Marking and pin assignment

2. SOP-8 top view



3.Schematic diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Quantity
4409	4409A	SOP-8	3000

Absolute Maximum Ratings (T_C=25℃unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain-Source Voltage		V_{DS}	-30	V
Gate-Source Voltage		V_{Gs}	±20	V
Continuous Drain Current	T_a= 25℃	I_D	-18	A
Continuous Drain Current	T_a= 100℃	I_D	-8.8	A
Pulsed Drain Current[1]		I_{DM}	-53	A
Single Pulse Avalanche Energy[2]		EAS	80	mJ
Power Dissipation[2]	T_C = 25℃	P_d	3	W
Junction Temperature		T_J	-55~+150	℃
Storage Temperature		T_{STG}	-55~+150	℃

Thermal Resistance Ratings

Parameter	Symbol	Value	Unit
Thermal Resistance Junction-ambient[3]	$R_{\theta JA}$	41.6	℃/W

Ordering Information

Ordering Number	Package	Pin Assignment						Packing
Halogen Free		G1	G2	D1	D2	S1	S2	
HL4409A	SOP-8	2	4	7,8	5,6	1	3	Tape Reel

Electrical Characteristics (Tj=25℃ unless otherwise noted)

Parameter		Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Static Characteristics							
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$	V_{GS} = 0V, I_D = -250μA	-30	-	-	V
Gate-body Leakage current		I_{GSS}	V_{DS} = 0V, V_{GS} = ±20V	-	-	±100	nA
Zero Gate Voltage Drain Current	TJ=25°C	I_{DSS}	V_{DS} = -30V, V_{GS} = 0V	-	-	-1	μA
	TJ=100°C			-	-	-100	
Gate-Threshold Voltage		$V_{GS(th)}$	V_{DS} = V_{GS} ,I_D = -250μA	-1.0	-	-2.5	V
Drain-Source On-Resistance4		$R_{DS(on)}$	V_{GS} = -10V, I_D = -12A	-	6.6	9.8	mΩ
			V_{GS} = -4.5V, I_D = -10A	-	8.8	14	
Forward Transconductance4		gfs	V_{DS}= -10V, I_D = -10A	-	50	-	S
Dynamic Characteristics5							
Input Capacitance		Ciss	V_{DS} = -15V, V_{GS} =0V, f =1MHz	-	3100	-	pF
Output Capacitance		Coss		-	430	-	
Reverse Transfer Capacitance		Crss		-	358	-	
Gate Resistance		Rg	f=1MHz	-	9.5	-	Ω
Switching Characteristics5							
Total Gate Charge		Qg	V_{GS} = -10V, V_{DS}= -15V I_D= -12A	-	35	-	nC
Gate-Source Charge		Qgs		-	9.9	-	
Gate-Drain Charge		Qgd		-	10.5	-	
Turn-On Delay Time		td(on)	V_{GS} =-10V, V_{DD} = -15V R_G = 3Ω, I_D= -12A	-	10.8	-	ns
Rise Time		tr		-	13.2	-	
Turn-Off Delay Time		td(off)		-	73	-	
Fall Time		tf		-	35	-	
Reverse Recovery Time		trr	IF = -12A, dIF/dt = 100A/μs	-	25	-	ns
Reverse Recovery Charge		Qrr		-	10	-	nC

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Units
Drain-source body diode Characteristics						
Diode Forward Voltage4	V_{SD}	I_S = -1A, V_{GS} = 0V	-	-	-1.2	V
Continuous Source Current T_A=25°C	I_S		-	-	-14	A

Notes:

1.Repetitive rating, pulse width limited by junction temperature TJ(MAX)=150° C.

2.The EAS data shows Max. rating . The test condition is V_{DD}= -25V, V_{GS}= -10V, L=0.1mH, IAS= -40A.

3.The data tested by surface mounted on a 1 inch2 FR-4 board with 2OZ copper, The value in any given application depends on the user's specific board design.

4.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%.

5.This value is guaranteed by design hence it is not included in the production test.

Typical Characteristics

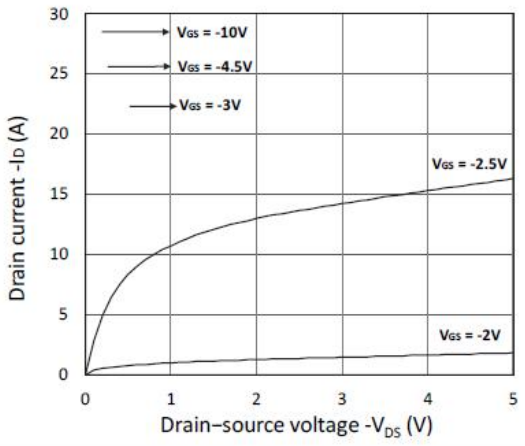


Figure 1. Output Characteristics

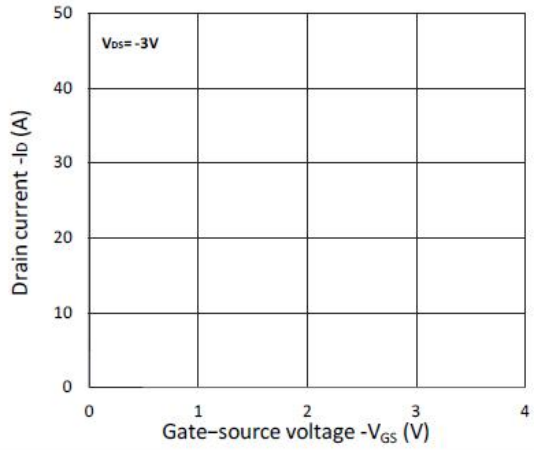


Figure 2. Transfer Characteristics

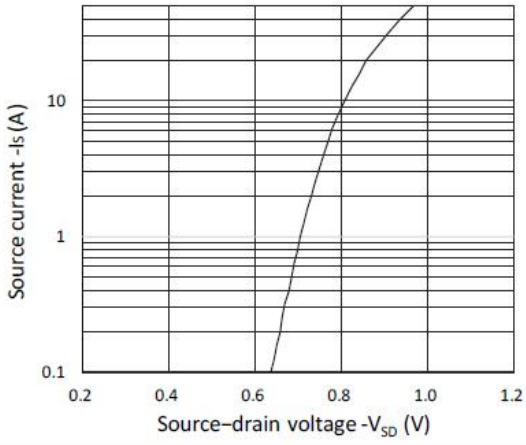


Figure 3. Forward Characteristics of Reverse

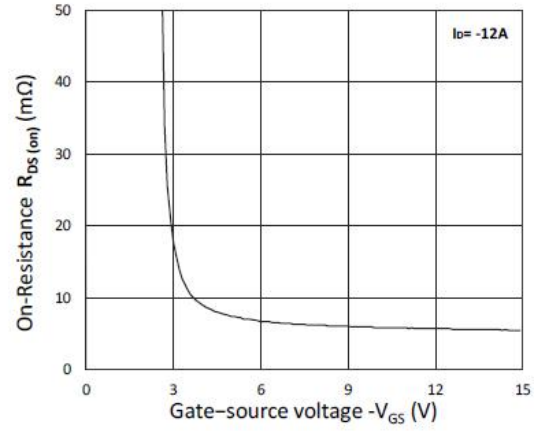


Figure 4. $R_{DS(ON)}$ vs. V_{GS}

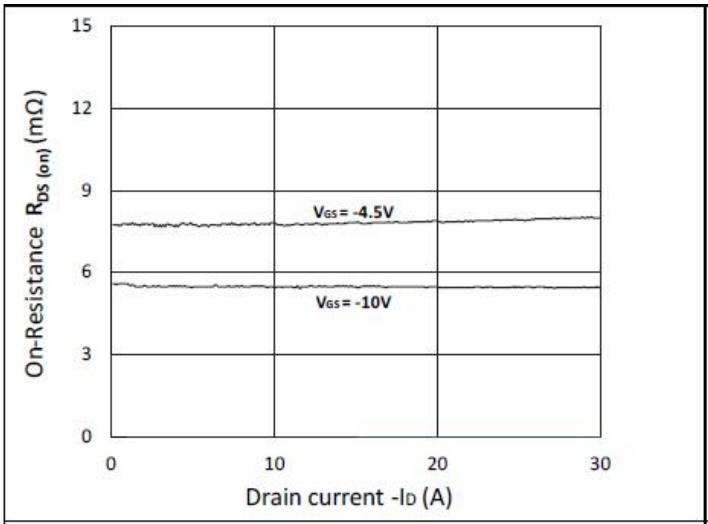


Figure 5. $R_{DS(ON)}$ vs. I_D

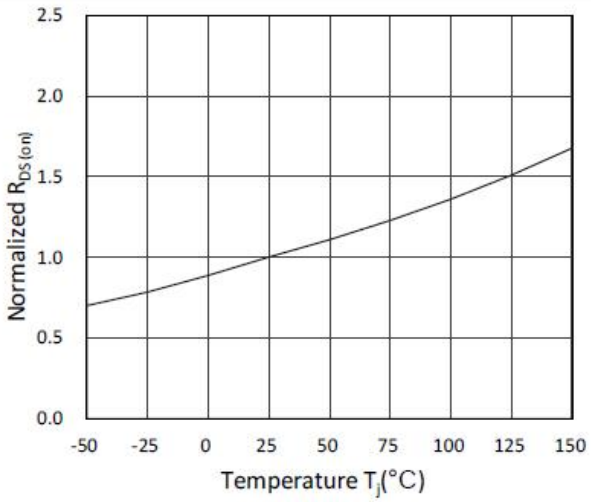


Figure 6. Normalized $R_{DS(on)}$ vs. Temperature

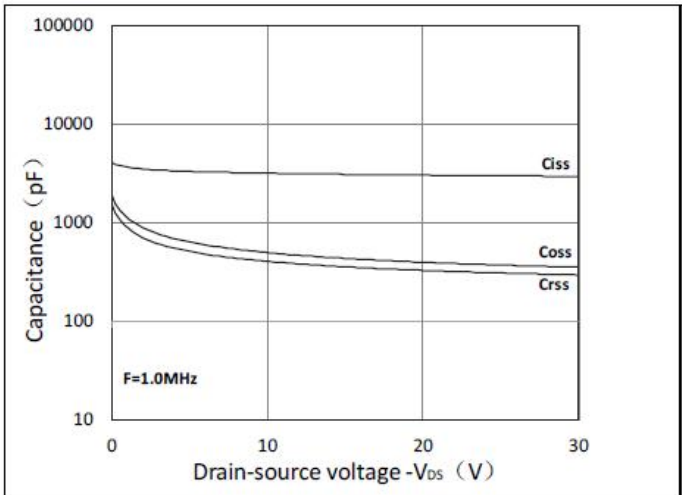


Figure 7. Capacitance Characteristics

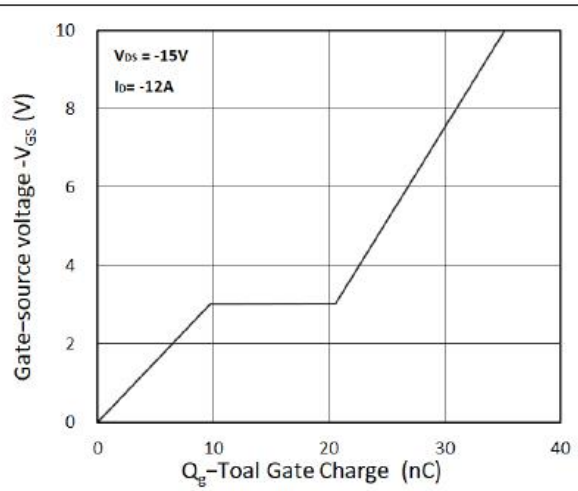


Figure 8. Gate Charge Characteristics

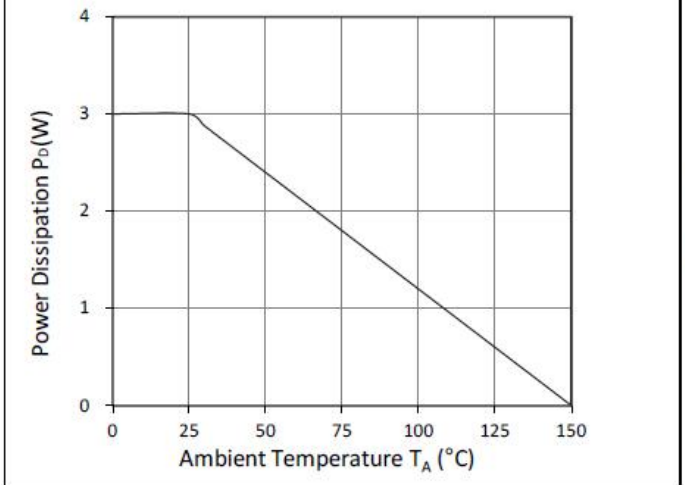


Figure 9. Power Dissipation

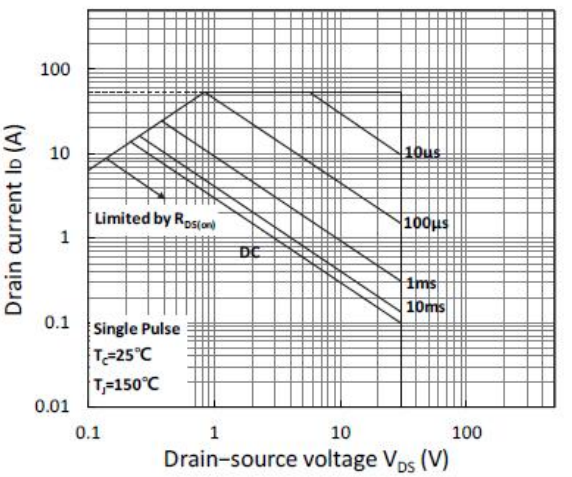


Figure10. Safe Operating Area

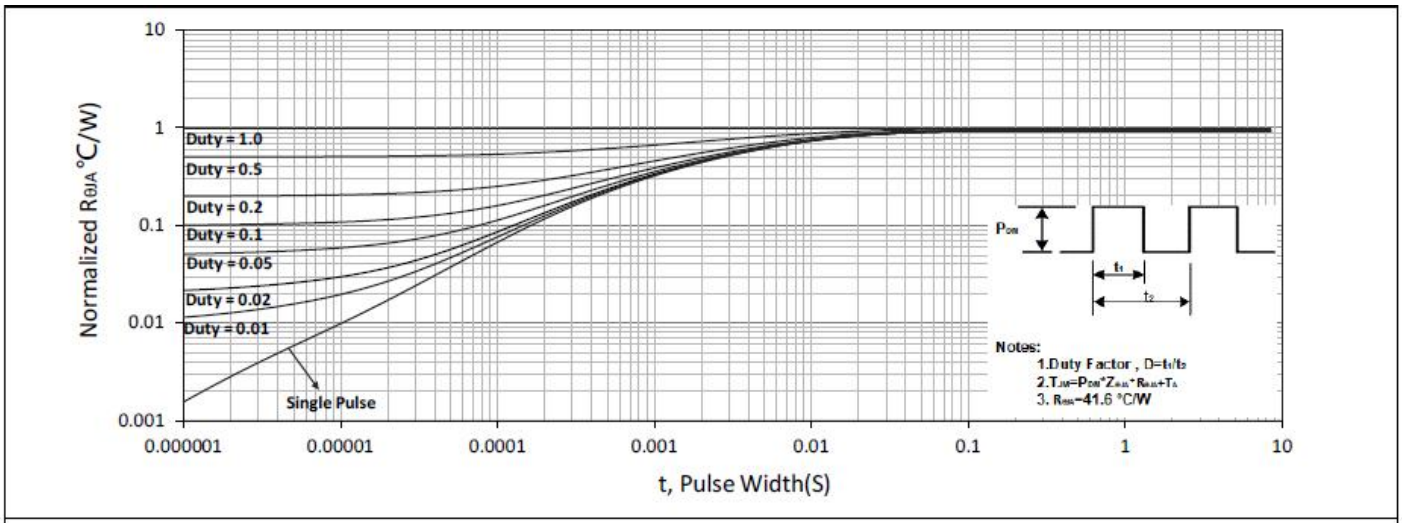


Figure 11. Normalized Maximum Transient Thermal Impedance

Test Circuit

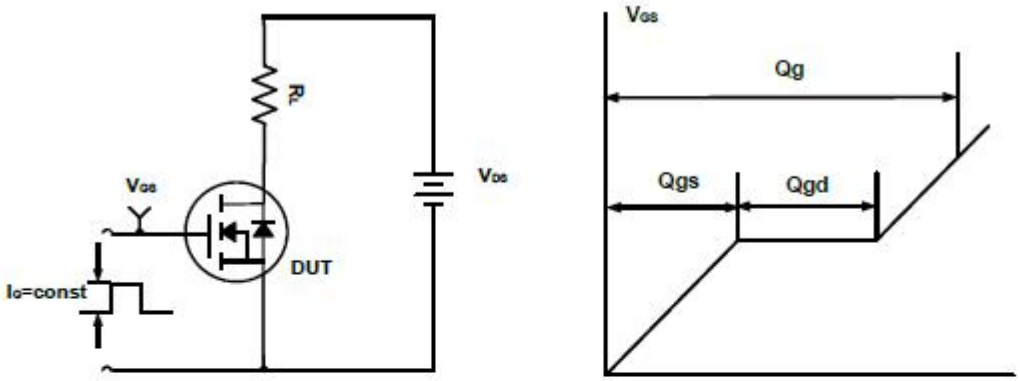


Figure A. Gate Charge Test Circuit & Waveforms

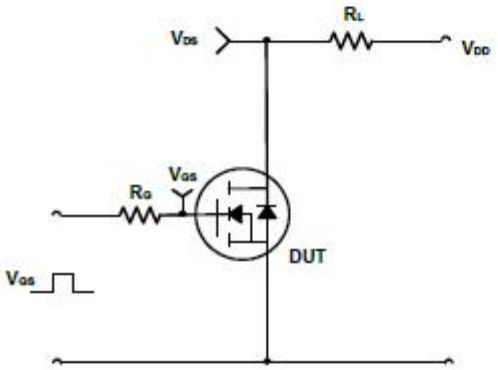


Figure B. Switching Test Circuit & Waveforms

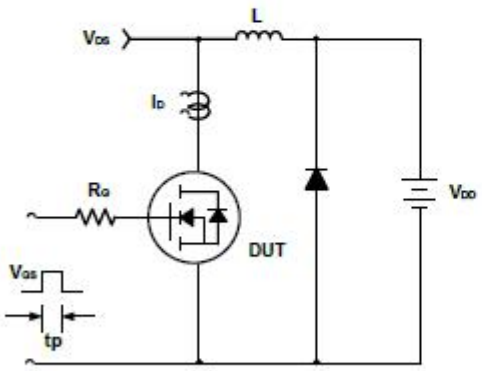
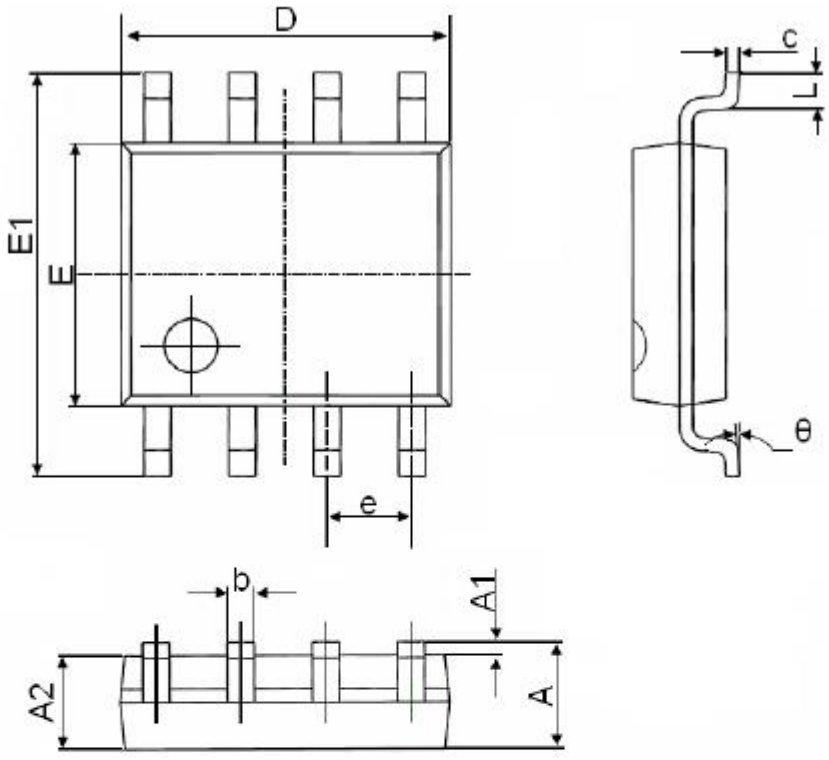


Figure C. Unclamped Inductive Switching Circuit & Waveforms

Package Dimensions

➢ SOP-8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270(BSC)		0.050(BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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