

General Description

The SN 4409A is the highest performance trench P-Ch MOSFET with extreme high cell density , which provide excellent $R_{DS(on)}$ and gate charge for most of the synchronous buck converter applications .

The SN4409A meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

Features

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

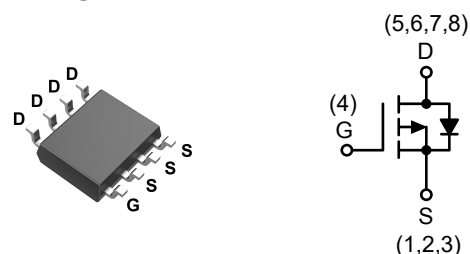
Product Summery

BV_{DSS}	$R_{DS(on)}$	I_D
-30V	8m Ω	-15A

Applications

- Power Management in Notebook Computer, Portable Equipment and Battery Powered Systems.

SOP-8L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	-30	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_c=25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-15	A
$I_D@T_c=70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-10	A
I_{DM}	Pulsed Drain Current ²	-70	A
EAS	Single Pulse Avalanche Energy ³	70	mJ
I_{AS}	Avalanche Current	-38	A
$P_D@T_A=25^\circ C$	Total Power Dissipation ⁴	2.5	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 ¹	---	62.5	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	24	$^\circ C/W$

Electrical Characteristics ($T_J=25^\circ\text{C}$, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	BV_{DSS} Temperature Coefficient	Reference to 25°C , $I_D=-1\text{mA}$	---	-0.018	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance ²	$V_{GS}=-10V, I_D=-15A$	---	8	10	m Ω
		$V_{GS}=-4.5V, I_D=-10A$	---	10	14	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	---	-2.7	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	5.04	---	mV/ $^\circ\text{C}$
I_{DSS}	Drain-Source Leakage Current	$V_{DS}=-24V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	μA
		$V_{DS}=-24V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	-5	
I_{GSS}	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	± 100	nA
g_{fs}	Forward Transconductance	$V_{DS}=-5V, I_D=-10A$	---	15	---	S
Q_g	Total Gate Charge (-4.5V)	$V_{DS}=-15V, V_{GS}=-4.5V, I_D=-15A$	---	72	---	nC
Q_{gs}	Gate-Source Charge		---	12	---	
Q_{gd}	Gate-Drain Charge		---	16	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=6\Omega, I_D=-1A, R_L=15\Omega$	---	16	---	ns
T_r	Rise Time		---	21	---	
$T_{d(off)}$	Turn-Off Delay Time		---	14	---	
T_f	Fall Time		---	80	---	
C_{iss}	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1\text{MHz}$	---	3500	---	pF
C_{oss}	Output Capacitance		---	635	---	
C_{rss}	Reverse Transfer Capacitance		---	645	---	

Guaranteed Avalanche Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy ⁵	$V_{DD}=-25V, L=0.5\text{mH}, I_{AS}=-38A$	30	---	---	mJ

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current ^{1,6}	$V_G=V_D=0V$, Force Current	---	---	-4.0	A
I_{SM}	Pulsed Source Current ^{2,6}		---	---	-70	A
V_{SD}	Diode Forward Voltage ²	$V_{GS}=0V, I_S=-1A, T_J=25^\circ\text{C}$	---	---	-1.3	V
t_{rr}	Reverse Recovery Time	$I_F=-17.6A, dI/dt=100A/\mu s, T_J=25^\circ\text{C}$	---	26	---	nS
Q_{rr}	Reverse Recovery Charge		---	18	---	nC

Note :

1.The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, $t<10\text{sec}$.

2.The data tested by pulsed , pulse width $\leq 300\mu s$, duty cycle $\leq 2\%$

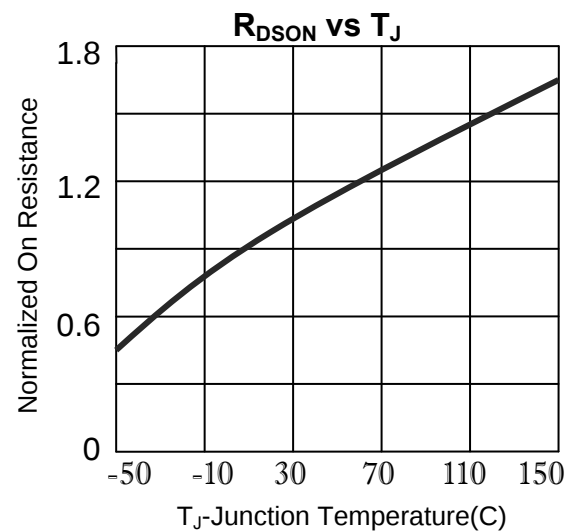
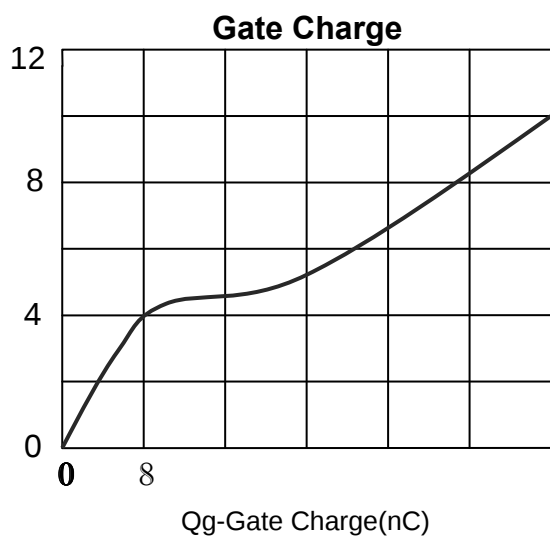
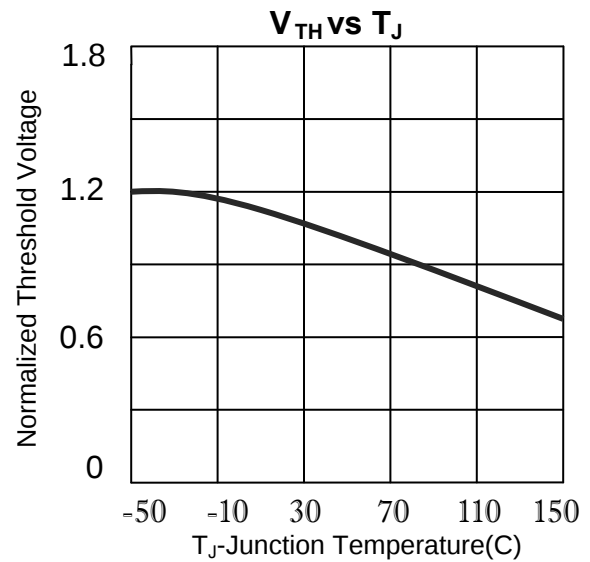
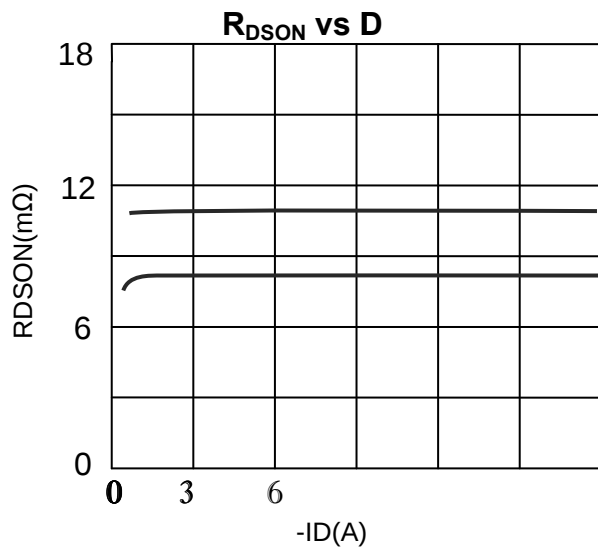
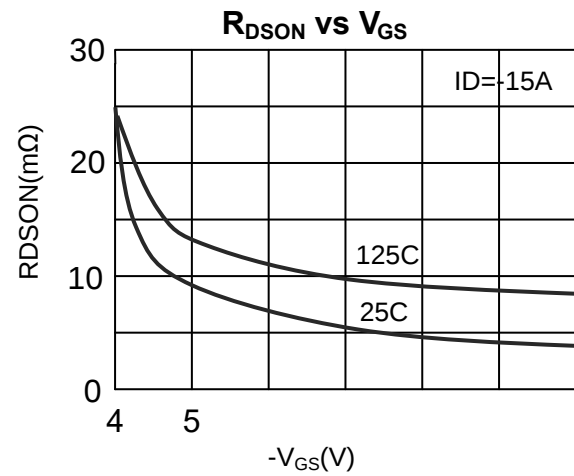
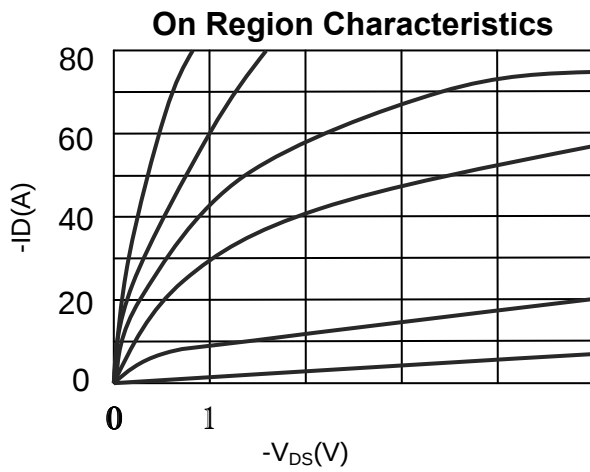
3.The EAS data shows Max. rating . The test condition is $V_{DD}=-25V, V_{GS}=-10V, L=0.5\text{mH}, I_{AS}=-38A$

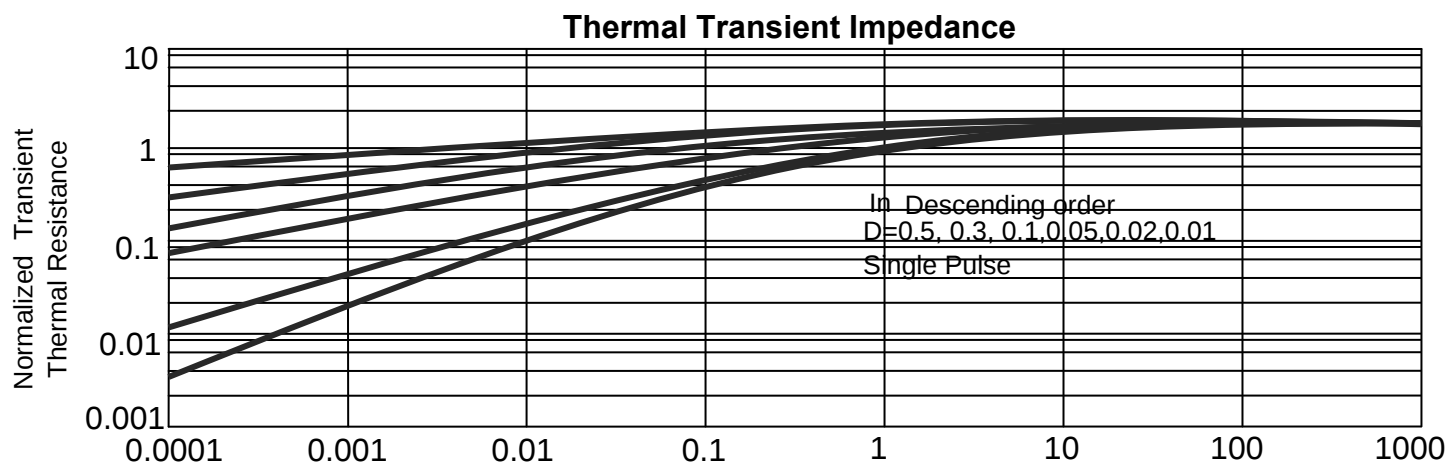
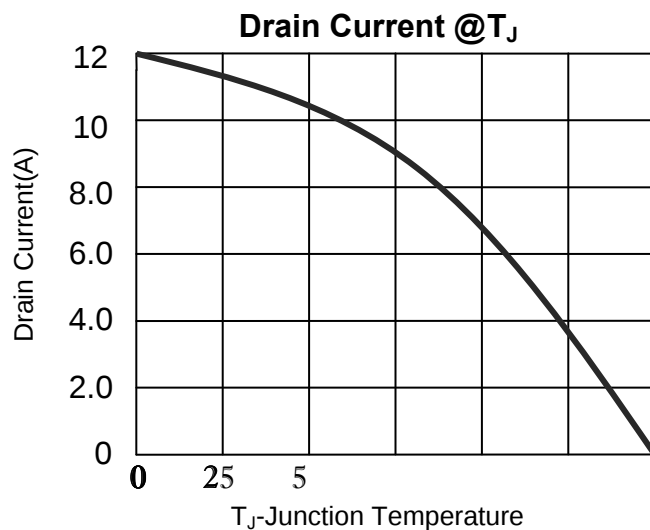
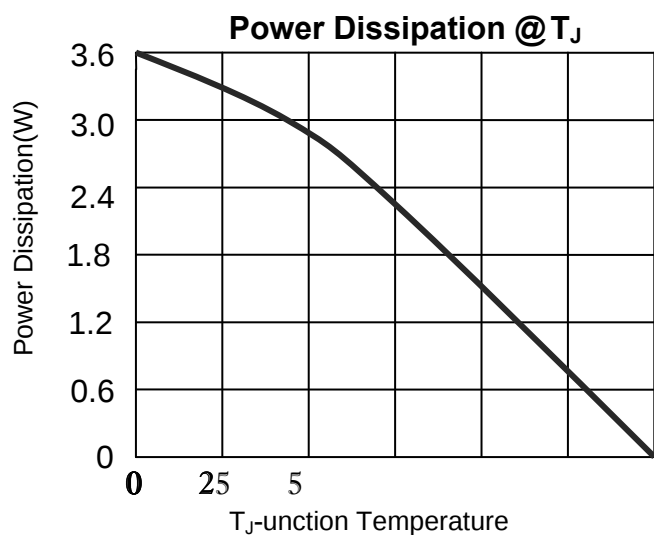
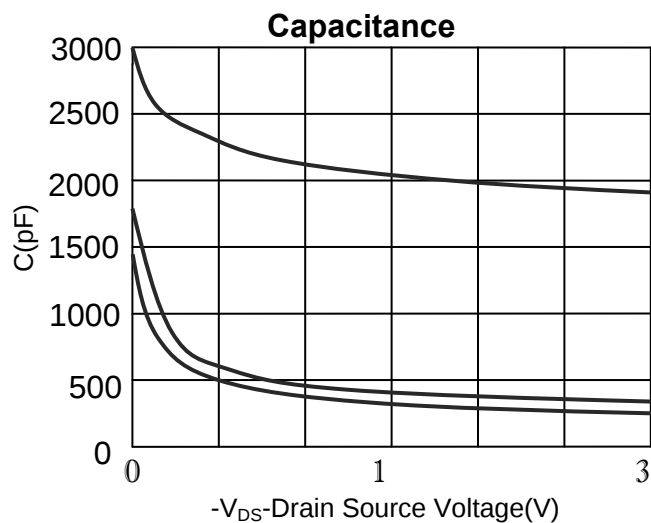
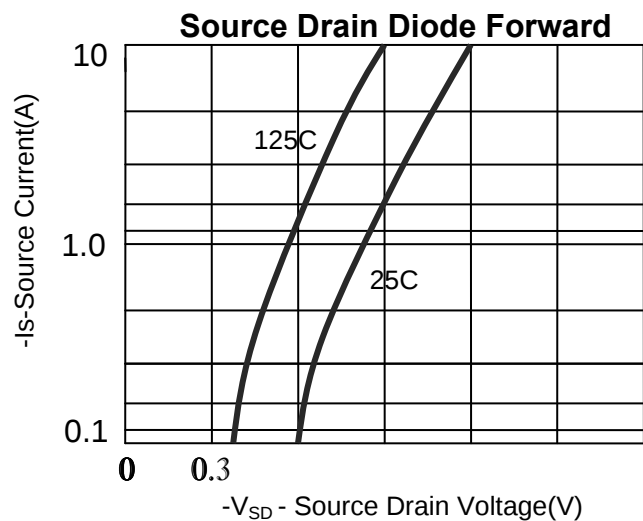
4.The power dissipation is limited by 150°C junction temperature

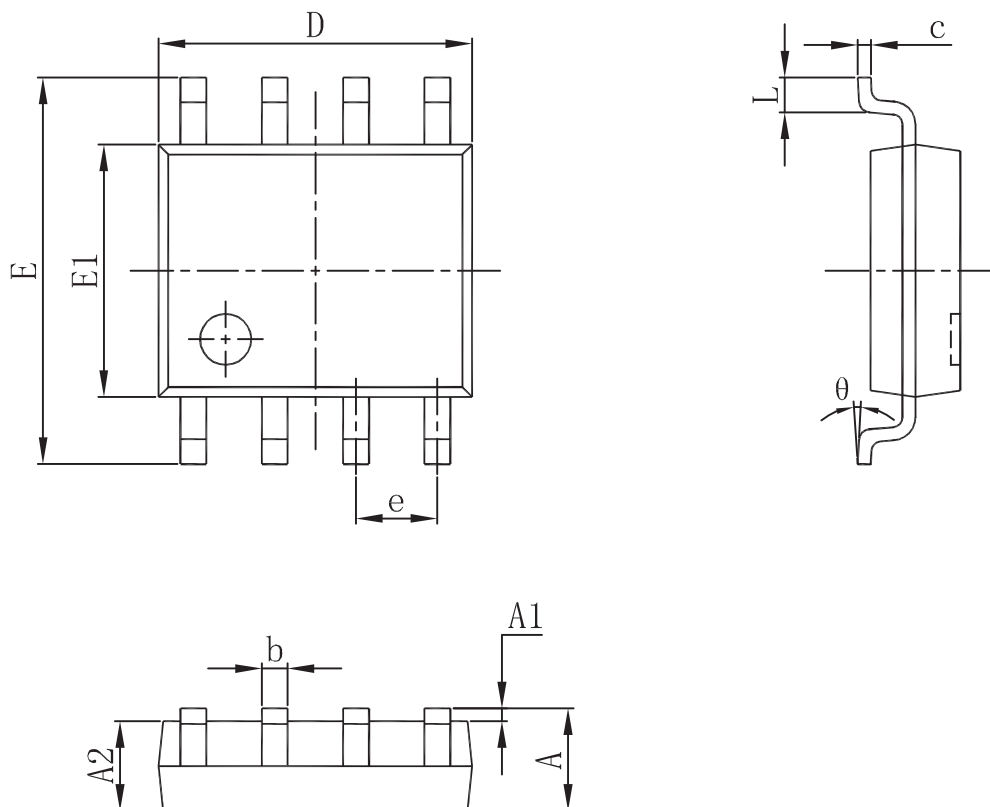
5.The Min. value is 100% EAS tested guarantee.

6.The data is theoretically the same as I_D and I_{DM} , in real applications , should be limited by total power dissipation.

Typical Characteristics





Packaging information


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	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°