NTS4409N, NVS4409N

MOSFET – Single, N-Channel, Small Signal, ESD Protection, SC-70/SOT-323

25 V, 0.75 A

ON Semiconductor®

http://onsemi.com

$V_{(BR)DSS}$	$R_{DS(on)}$ Typ	I_D Max
25 V	249 mΩ @ 4.5 V	0.75 A
	299 mΩ @ 2.7 V	

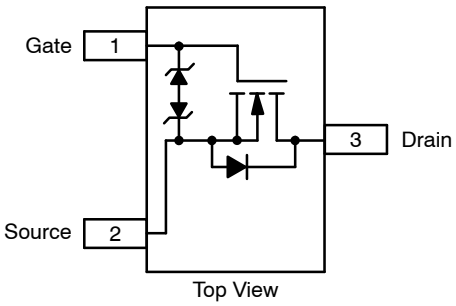
Features

- Advance Planar Technology for Fast Switching, Low $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- AEC−Q101 Qualified and PPAP Capable − NVS4409N
- These Devices are Pb−Free and are RoHS Compliant

Applications

- Boost and Buck Converter
- Load Switch
- Battery Protection

SC−70 (3−Leads)



Top View

MAXIMUM RATINGS (T_J = 25°C unless otherwise noted)

Rating			Symbol	Value	Unit
Drain−to−Source Voltage			V_{DSS}	25	V
Gate−to−Source Voltage			V_{GS}	±8.0	V
Drain Current	t < 5 s	T_A = 25°C	I_D	0.75	A
Continuous Drain Current (Note 1)	Steady State	T_A = 25°C	I_D	0.7	A
		T_A = 75°C		0.6	
Power Dissipation (Note 1)	Steady State		P_D	0.28	W
Power Dissipation (Note 1)	t ≤ 5 s		P_D	0.33	W
Pulsed Drain Current	t_p = 10 μs		I_{DM}	3.0	A
Operating Junction and Storage Temperature			T_J, T_{STG}	−55 to +150	°C
Source Current (Body Diode) (Note 1)			I_S	0.3	A
Lead Temperature for Soldering Purposes (1/8″ from case for 10 s)			T_L	260	°C
ESD Rating − Machine Model				25	V

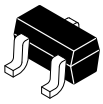
THERMAL RESISTANCE RATINGS

Rating	Symbol	Max	Unit
Junction−to−Ambient − Steady State (Note 1)	$R_{\theta JA}$	450	°C/W
Junction−to−Ambient − t ≤ 5 s (Note 1)	$R_{\theta JA}$	375	

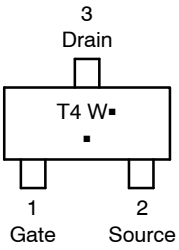
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [1 oz] including traces).

MARKING DIAGRAM & PIN ASSIGNMENT



SC−70/SOT−323
CASE 419
STYLE 8



T4 = Device Code
W = Work Week
▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NTS4409NT1G	SOT−323 (Pb−Free)	3000 / Tape & Reel
NVS4409NT1G	SOT−323 (Pb−Free)	3000 / Tape & Reel

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic	Symbol	Test Condition		Min	Typ	Max	Unit
OFF CHARACTERISTICS							
Drain−to−Source Breakdown Voltage	$V_{(BR)DSS}$	V_{GS} = 0 V, I_D = 250 μA		25			V
Drain−to−Source Breakdown Voltage Temperature Coefficient	$V_{(BR)DSS}/T_J$				30		mV/°C
Zero Gate Voltage Drain Current	I_{DSS}	V_{GS} = 0 V, V_{DS} = 20 V	T_J = 25°C			0.5	μA
			T_J = 70°C			2.0	
			T_J = 125°C			5.0	
Gate−to−Source Leakage Current	I_{GSS}	V_{DS} = 0 V, V_{GS} = 8.0 V				100	nA
ON CHARACTERISTICS (Note 2)							
Gate Threshold Voltage	$V_{GS(TH)}$	V_{GS} = V_{DS}, I_D = 250 μA		0.65		1.5	V
Negative Threshold Temperature Coefficient	$V_{GS(TH)}/T_J$				−2.0		mV/°C
Drain−to−Source On Resistance	$R_{DS(on)}$	V_{GS} = 4.5 V, I_D = 0.6 A			249	350	mΩ
		V_{GS} = 2.7 V, I_D = 0.2 A			299	400	
		V_{GS} = 4.5 V, I_D = 1.2 A			260		
Forward Transconductance	g_{FS}	V_{DS} = 5.0 V, I_D = 0.5 A			0.5		S
CHARGES AND CAPACITANCES							
Input Capacitance	C_{ISS}	V_{GS} = 0 V, f = 1.0 MHz, V_{DS} = 10 V			49	60	pF
Output Capacitance	C_{OSS}				22.4	30	
Reverse Transfer Capacitance	C_{RSS}				8.0	12	
Total Gate Charge	$Q_{G(TOT)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 0.8 A			1.2	1.5	nC
Threshold Gate Charge	$Q_{G(TH)}$				0.2		
Gate−to−Source Charge	Q_{GS}				0.28	0.50	
Gate−to−Drain Charge	Q_{GD}				0.3	0.40	
SWITCHING CHARACTERISTICS (Note 3)							
Turn−On Delay Time	$t_{d(ON)}$	V_{GS} = 4.5 V, V_{DS} = 15 V, I_D = 0.7 A, R_G = 51 Ω			5.0	12	ns
Rise Time	t_r				8.2	8.0	
Turn−Off Delay Time	$t_{d(OFF)}$				23	35	
Fall Time	t_f				41	60	
DRAIN−SOURCE DIODE CHARACTERISTICS							
Forward Diode Voltage	V_{SD}	V_{GS} = 0 V, I_S = 0.6 A	T_J = 25°C		0.82	1.20	V

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

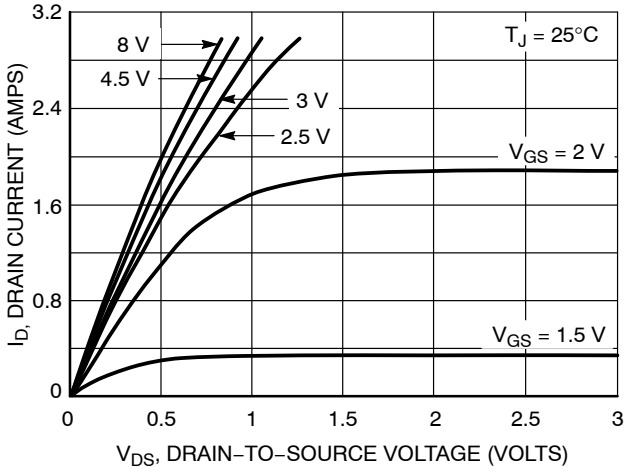


Figure 1. On−Region Characteristics

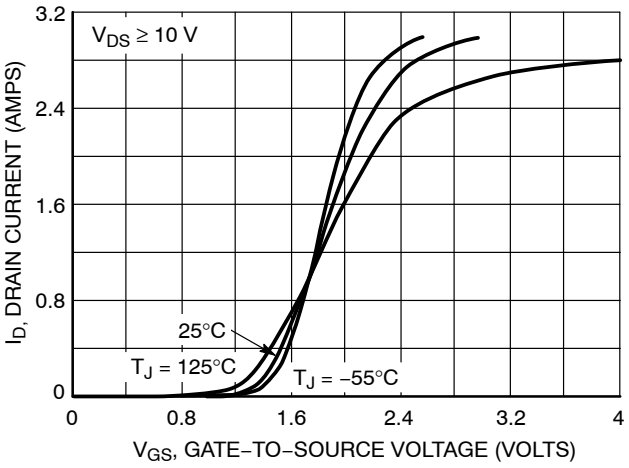


Figure 2. Transfer Characteristics

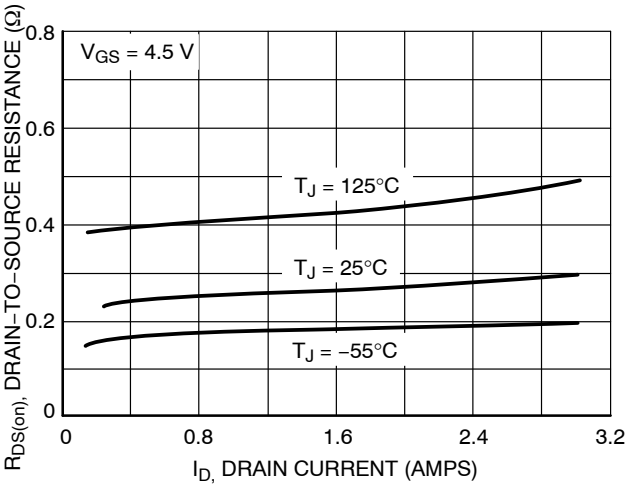


Figure 3. On−Resistance vs. Drain Current and Temperature

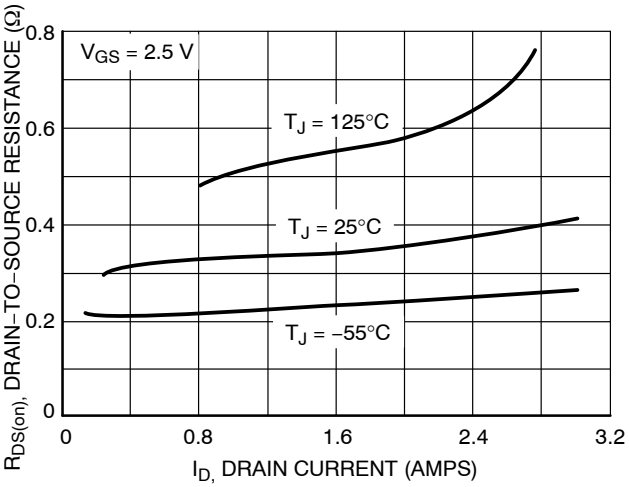


Figure 4. On−Resistance vs. Drain Current and Gate Voltage

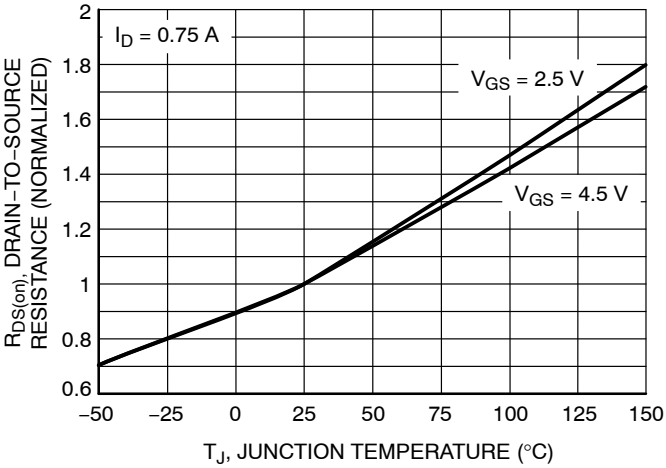


Figure 5. On−Resistance Variation with Temperature

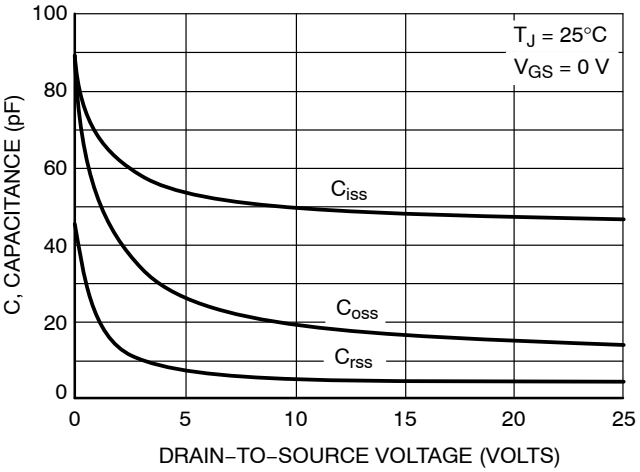


Figure 6. Capacitance Variation

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise noted)

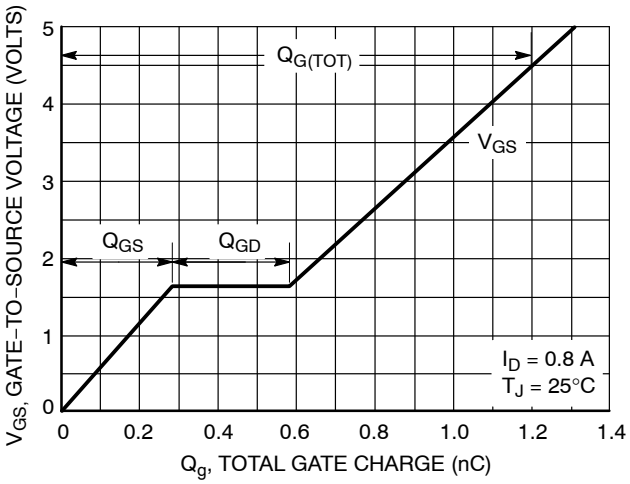


Figure 7. Gate−to−Source and Drain−to−Source Voltage vs. Total Charge

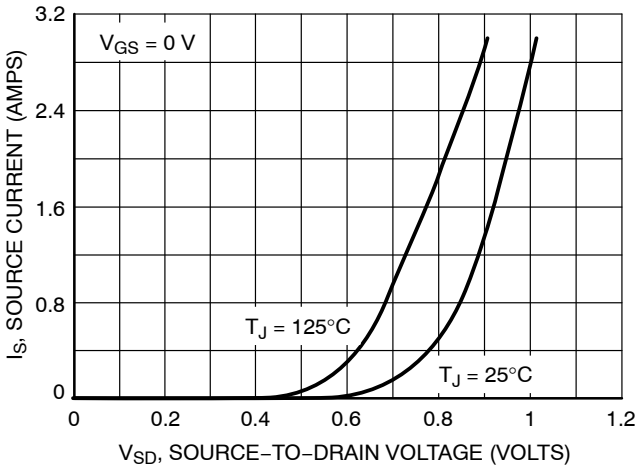
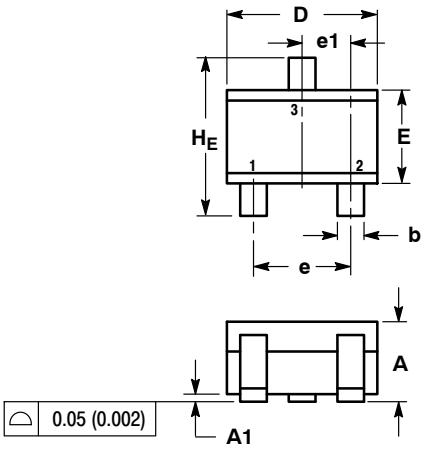
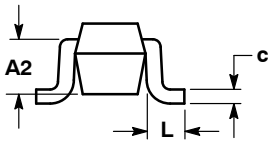


Figure 8. Diode Forward Voltage vs. Current

PACKAGE DIMENSIONS

SC−70 (SOT−323)
CASE 419−04
ISSUE N



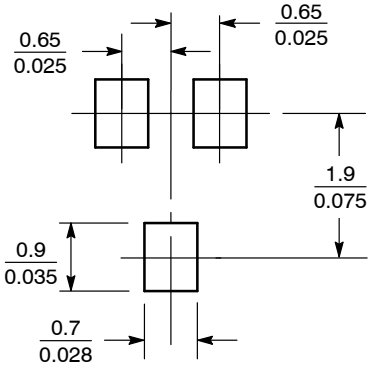


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

	MILLIMETERS			INCHES		
DIM	MIN	NOM	MAX	MIN	NOM	MAX
A	0.80	0.90	1.00	0.032	0.035	0.040
A1	0.00	0.05	0.10	0.000	0.002	0.004
A2		0.70 REF			0.028 REF	
b	0.30	0.35	0.40	0.012	0.014	0.016
c	0.10	0.18	0.25	0.004	0.007	0.010
D	1.80	2.10	2.20	0.071	0.083	0.087
E	1.15	1.24	1.35	0.045	0.049	0.053
e	1.20	1.30	1.40	0.047	0.051	0.055
e1		0.65 BSC			0.026 BSC	
L	0.20	0.38	0.56	0.008	0.015	0.022
H_E	2.00	2.10	2.40	0.079	0.083	0.095

STYLE 8:
PIN 1. GATE
2. SOURCE
3. DRAIN

SOLDERING FOOTPRINT*



*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303−675−2175 or 800−344−3860 Toll Free USA/Canada
Fax: 303−675−2176 or 800−344−3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800−282−9855 Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81−3−5817−1050

ON Semiconductor Website: **www.onsemi.com**

Order Literature: http://www.onsemi.com/orderlit

For additional information, please contact your local Sales Representative