NL3S325

Audio Jack GND/MIC Configuration Switch

The NL3S325 is an audio jack configuration switch device. It allows reconfiguration of the GND, microphone−bias contact to comply with the American Headset Jack (AHJ) and the Open Mobile Terminal Platform (OMTP) pinout. It also provides a GND sense path that supports quasi−differential audio amplifier architectures.

Features

- AHJ and OMTP Headset Jack Pinout Support
- Wide V_{DD} Range: 1.6 V to 3.7 V
- Low Supply Current
- Sense Path to GND for Quasi Differential Audio Amplifier Configuration
- Low THD and Noise Microphone Pass-through Channel
- Ultra−low R_{ON} of Ground and Sense Switches
- High Power Supply Ripple Rejection
- ESD Performance:
  8 kV HBM on SBUn, SENSEn, SENSE, V_{DD}, GND
  3 kV HBM on MIC, SEL
- Available in 1.19 mm x 1.19 mm WLCSP9
- This Device is Pb−Free, Halogen Free/BFR Free and RoHS Compliant

Applications

- Headsets with Integrated MIC and Remote Control Buttons
- USB Type−C Switching

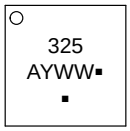
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WLCSP9
FC SUFFIX
CASE 567MD

MARKING DIAGRAM



325	= Specific Device Code
A	= Assembly Location
Y	= Year
WW	= Work Week
▪	= Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
NL3S325FCT2G	WLCSP9 (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 Specifications Brochure, BRD8011/D.

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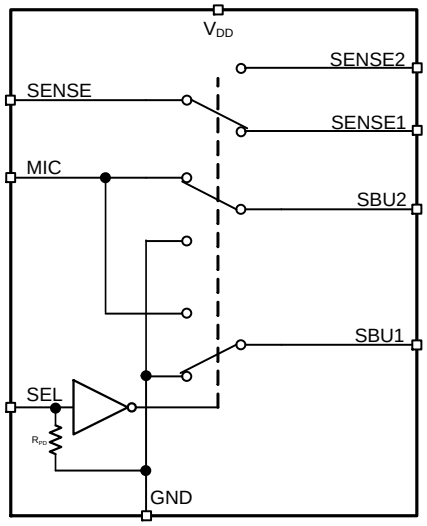


Figure 1. Block Diagram

Table 1. FUNCTION TABLE

V_{DD}	SEL	Connections	Mode
0 V	X	All I/O Ports Hi−Z	Disabled
1.6 V to 3.6 V	0	SBU2=MIC; SBU1=GND; SENSE1=SENSE	AHJ
1.6 V to 3.6 V	1	SBU1=MIC; SBU2=GND; SENSE2=SENSE	OMTP

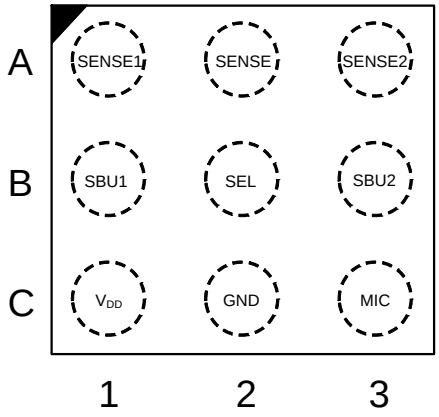
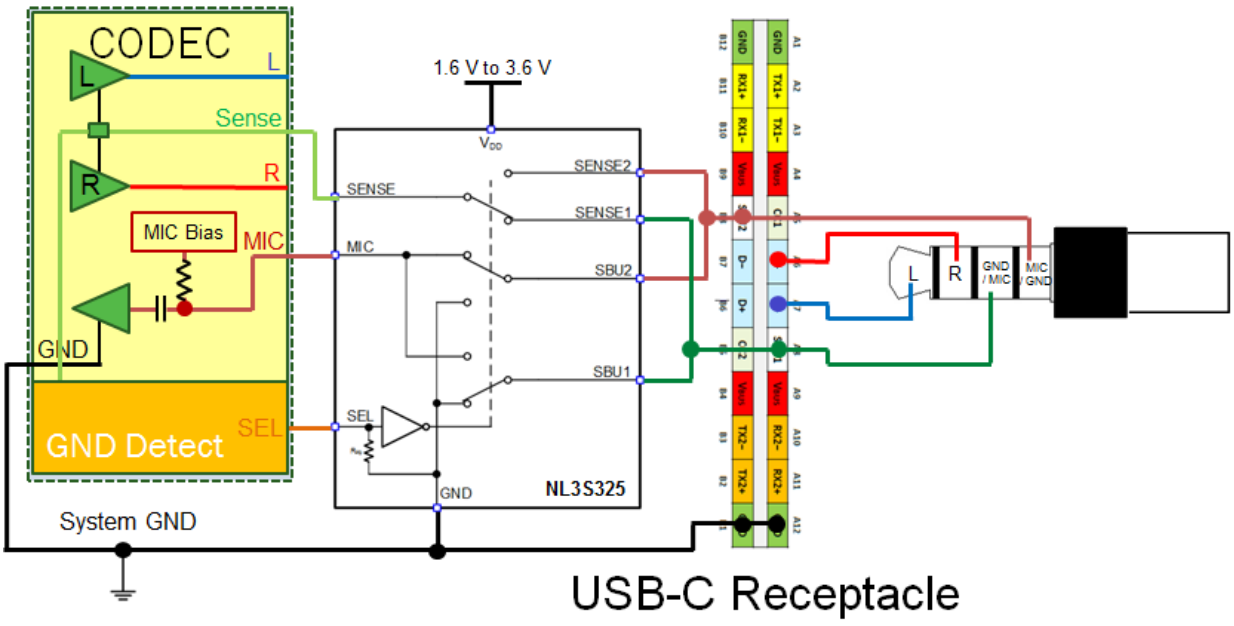


Figure 2. WLCSP9 − Top Through View

Table 2. PIN DESCRIPTIONS

Pin Name	Ball	Description
SENSE1	A1	Sense Path 1 to Headset Jack GND
SENSE	A2	Sense Path for GND Sensing
SENSE2	A3	Sense Path 2 to Headset Jack GND
SBU1	B1	USB Type−C SBU1 Connection
SEL	B2	Configuration Select
SBU2	B3	USB Type−C SBU2 Connection
V_{DD}	C1	Power Supply
GND	C2	Ground
MIC	C3	MIC Bias Path CODEC Side



The default configuration (SEL = 0) is for AHJ−compliant headsets.

Figure 3. Typical Application

NOTE: When V_{DD} is not powered, all the FETs become open by default. Thus, the ground return path becomes floating. Noise might be heard if a speaker (with external powered amplifier) is plugged in the audio jack. It is highly recommended when the audio jack detects a plug−in, the NL3S325 is kept powered until unplug.

Table 3. MAXIMUM RATINGS

Symbol	Rating	Value	Unit
V_{DD}	Positive DC Supply Voltage	−0.5 to +4.5	V
V_{IS}	Analog Input/Output Voltage	−0.5 to +4.5	V
V_{IN}	Digital Control Pin Voltage, SEL	−0.5 to +4.5	V
$I_{SW(GND)}$	Continuous SBU1 or SBU2 to GND Current	100	mA
$I_{SW(MIC)}$	Continuous MIC to SBU1 or SBU2 Current	50	mA
$I_{SW(SNS)}$	Continuous SENSE to SENSE1 or SENSE2 Current	50	mA
T_S	Storage Temperature	−55 to +150	°C
T_L	Lead Temperature, 1 mm from Case for 10 seconds	260	°C
T_J	Junction Temperature Under Bias	150	°C
MSL	Moisture Sensitivity (Note 1)	Level 1	
I_{LU}	Latchup Current (Note 2)	±100	mA
ESD	ESD Protection (Note 3)		V
	Human Body Model — SENSE, SENSEn, SBUn, V_{DD}, GND	8000	
	MIC, SEL	3000	
	Machine Model — All Pins	200	
	Charged Device Model — All Pins	1000	

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Moisture Sensitivity Level (MSL): 1 per IPC/JEDEC standard: J−STD−020A.
2. Latch up Current Maximum Rating: ±100 mA per JEDEC standard: JESD78.
3. This device series contains ESD protection and passes the following tests:
   Human Body Model (HBM) per JEDEC standard: JESD22−A114.
   Machine Model (MM) per JEDEC standard: JESD22−A115.

Table 4. RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V_{DD}	Positive DC Supply Voltage	1.6	3.7	V
V_{IS}	Switch Input / Output Voltage	GND	3.6	V
V_{IN}	Digital Control Input Voltage	GND	3.6	V
T_A	Operating Temperature Range	−40	+85	°C

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

Table 5. DC ELECTRICAL CHARACTERISTICS (Typical values are at V_{DD} = +3.0 V and T_A = +25°C unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{DD} (V)	−40°C to 85°C			Unit
				Min	Typ	Max	
POWER SUPPLY							
I_{DD}	Supply Current	T_A = 25°C	3.0	−	0.1	1	μA
		T_A = 85°C	3.0	−	−	5	
CONTROL LOGIC (SEL)							
V_{IH}	Input High Voltage		3.0	1.0	−	−	V
V_{IL}	Input Low Voltage		3.0	−	−	0.4	V
R_{PD}	Pull−down Resistor		1.6 – 3.6	−	550	−	kΩ
I_{OFF}	Power OFF Leakage	V_{IN} = 3.6 V	0	−	−	1	μA
MIC BIAS SWITCH (MIC to SBU1 or SBU2)							
R_{ON}	ON−Resistance	V_{IS} = 850 mV, I_O = 30 mA	1.8	−	1.6	2.0	Ω
			3.0	−	0.5	0.9	Ω
			3.6	−	0.46	0.8	Ω
$R_{ON(FLAT)}$	ON−Resistance Flatness	V_{IS} = 0.8 V to 1.2 V, I_O = 30 mA	1.8	−	−	0.6	Ω
			3.0	−	−	0.2	Ω
			3.6	−	−	0.1	Ω
I_S	Switch Leakage Current	V_{MIC} = 850 mV, SBUn Open, SEL = H or L	1.6 to 3.6	−	−	1.5	μA
C_S	Switch Capacitance	MIC, SBUn Open, SEL = H or L	3.0	−	250	−	pF
THD	Total Harmonic Distortion of Conducting Switch	R_S = R_L = 600 Ω, f_{AC} = 20 kHz, V_{AC} = 0.5 V_{PP}, V_{DC} = 1.7 V, SEL = H or L	3.0	−	0.002	−	%
PSRR	Power Supply Rejection Ratio of Conducting Switch	R_S = R_L = 600 Ω, f = 217 Hz, V_{AC} = 0.3 V_{PP}, V_{DC} = 2.1 V, SEL = H or L	3.0	−	−103	−	dB
GND SWITCH (SBU1 or SBU2 to GND)							
R_{ON}	ON−Resistance	I_{SBUn} = 100 mA	1.8	−	70	130	mΩ
			3.0	−	60	110	mΩ
			3.6	−	57	105	mΩ
$R_{ON(FLAT)}$	ON−Resistance	I_{SBUn} = 10 mA	1.8 to 3.6	−	−	50	mΩ
	Flatness	I_{SBUn} = 1 mA	1.8 to 3.6	−	−	30	mΩ
PSRR	Power Supply Rejection Ratio of Conducting Switch	R_S = 8 Ω, V_S = 1 V, f = 217 Hz, V_{AC} = 0.3 V_{PP}, SEL = H or L	3.0	−	−88	−	dB

Table 5. DC ELECTRICAL CHARACTERISTICS (Typical values are at V_{DD} = +3.0 V and T_A = +25°C unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{DD} (V)	−40°C to 85°C			Unit
				Min	Typ	Max	
SENSE SWITCH (SENSE to SENSE1 or SENSE2)							
R_{ON}	ON−Resistance	I_{ISENSE} = 30 mA, SENSEn = 0 V	1.8	−	80	130	mΩ
			3.0	−	60	90	
			3.6	−	57	82	
$R_{ON(FLAT)}$	ON−Resistance	I_{ISENSE} = 10 mA, SENSEn = 0 V	1.8 to 3.6	−	−	50	mΩ
	Flatness	I_{ISENSE} = 1 mA, SENSEn = 0 V	1.8 to 3.6	−	−	40	
I_S	Switch Leakage Current	V_{SENSE} = 1 V, SEL = L, SENSE1 Open, SENSE2 = GND	1.6 to 3.6	−	−	1	μA
		V_{SENSE} = 1 V, SEL = H, SENSE1 = GND, SENSE2 Open				1	

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

Test Circuit and Graphs

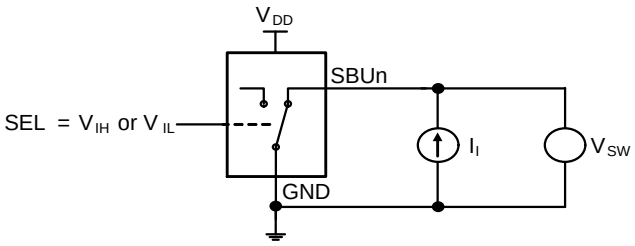


Figure 4. ON Resistance

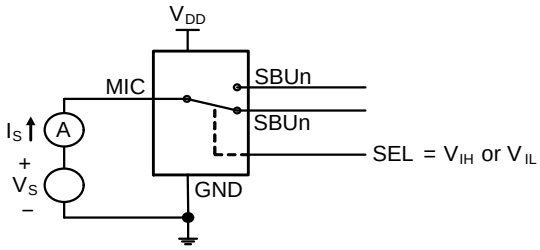


Figure 5. Leakage Current

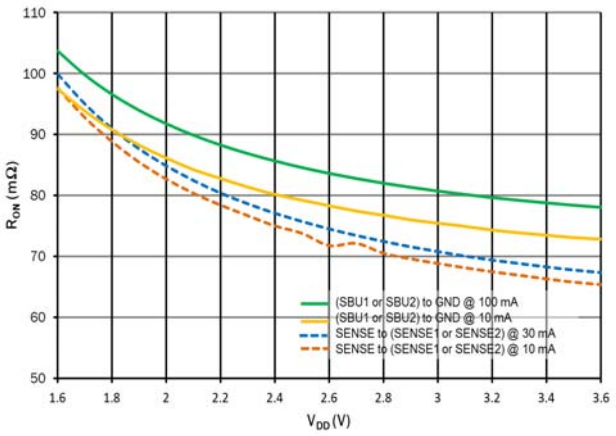


Figure 6. R_{ON} (GND/SENSE @ I_I = 1 mA)

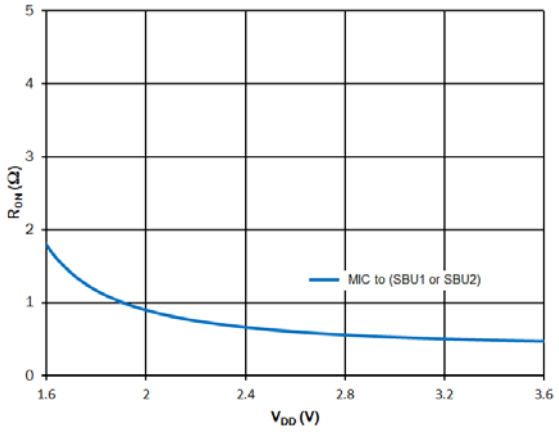


Figure 7. R_{ON} (MIC @ I_I = 30 mA)

Table 6. AC ELECTRICAL CHARACTERISTICS (Typical values are at V_{DD} = +3.0 V and T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Test Conditions	V_{CC} (V)	−40°C to 85°C			Unit
				Min	Typ	Max	
t_{ON}	Turn−On Time	V_{MIC} = V_{DD}, V_{SENSE} = 0 V, R_L = 50 Ω, C_L = 35 pF	3.0	−	215	400	ns
t_{OFF}	Turn−Off Time	V_{MIC} = V_{DD}, V_{SENSE} = 0 V, R_L = 50 Ω, C_L = 35 pF	3.0	−	80	140	ns
t_{BBM}	Break−before−make Time	V_{MIC} = V_{DD}, V_{SENSE} = 0 V, R_L = 50 Ω, C_L = 35 pF	3.0	70 (Note 4)	100	320	ns

4. Guaranteed by design.

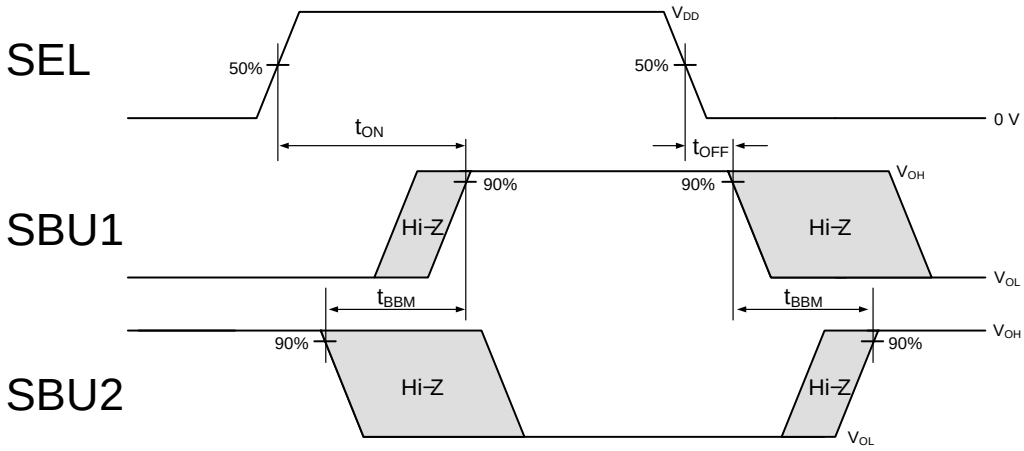
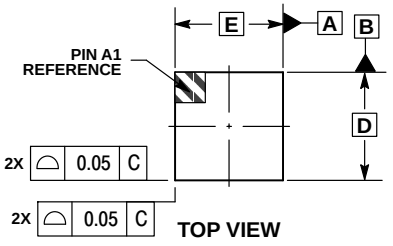


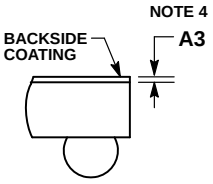
Figure 8. t_{ON}, t_{OFF}, t_{BBM} Waveform

PACKAGE DIMENSIONS

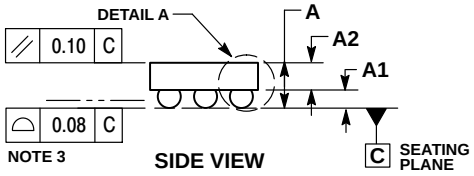
WLCSP9, 1.19x1.19
CASE 567MD
ISSUE A



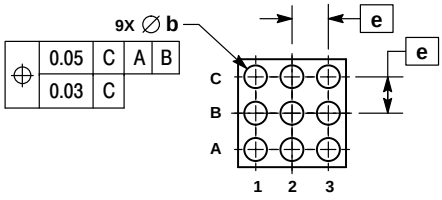
TOP VIEW



DETAIL A



SIDE VIEW

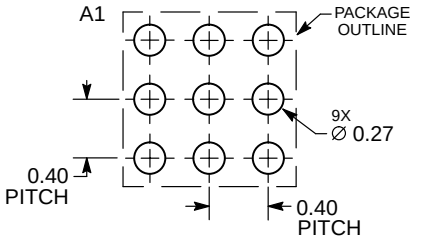


BOTTOM VIEW

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE SOLDER BALLS.
4. BACKSIDE COATING IS OPTIONAL.

	MILLIMETERS	
DIM	MIN	MAX
A	−−−	0.52
A1	0.18	0.22
A2	0.26	0.29
A3	0.000	0.027
b	0.24	0.28
D	1.19 BSC	
E	1.19 BSC	
e	0.40 BSC	

RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

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

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