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

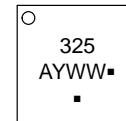- Headsets with Integrated MIC and Remote Control Buttons
- USB Type−C Switching

ON Semiconductor®

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**WLCSP9
FC SUFFIX
CASE 567MD**

MARKING DIAGRAM

```
 ○
    325
   AYWW▪
     ▪
```

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.
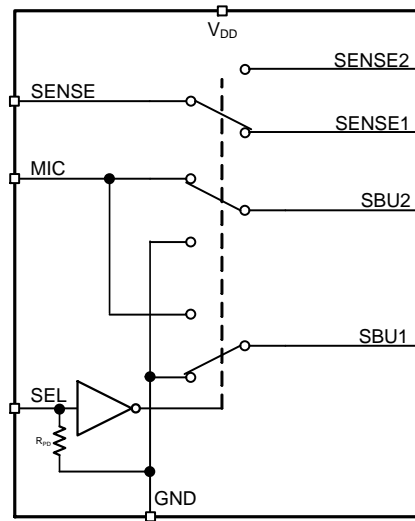
NL3S325

Figure 1. Block Diagram

Table 1. FUNCTION TABLE

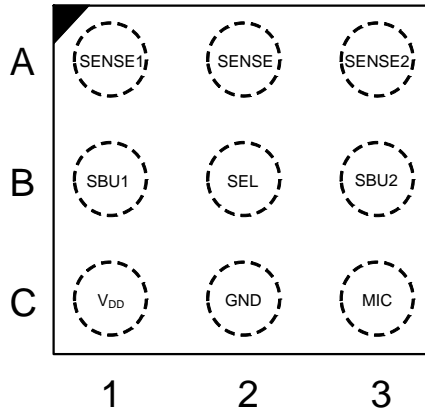| V_{DD}	SEL	Connections	Mode
0 V	X	All I/O Ports Hi−Z	Disabled
1.6 V to 3.6 V	0	SBU2=MIC; SBU1=GND; SENSE1=SENSE	AHJ
1.6 V to 3.6 V	1	SBU1=MIC; SBU2=GND; SENSE2=SENSE	OMTP

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

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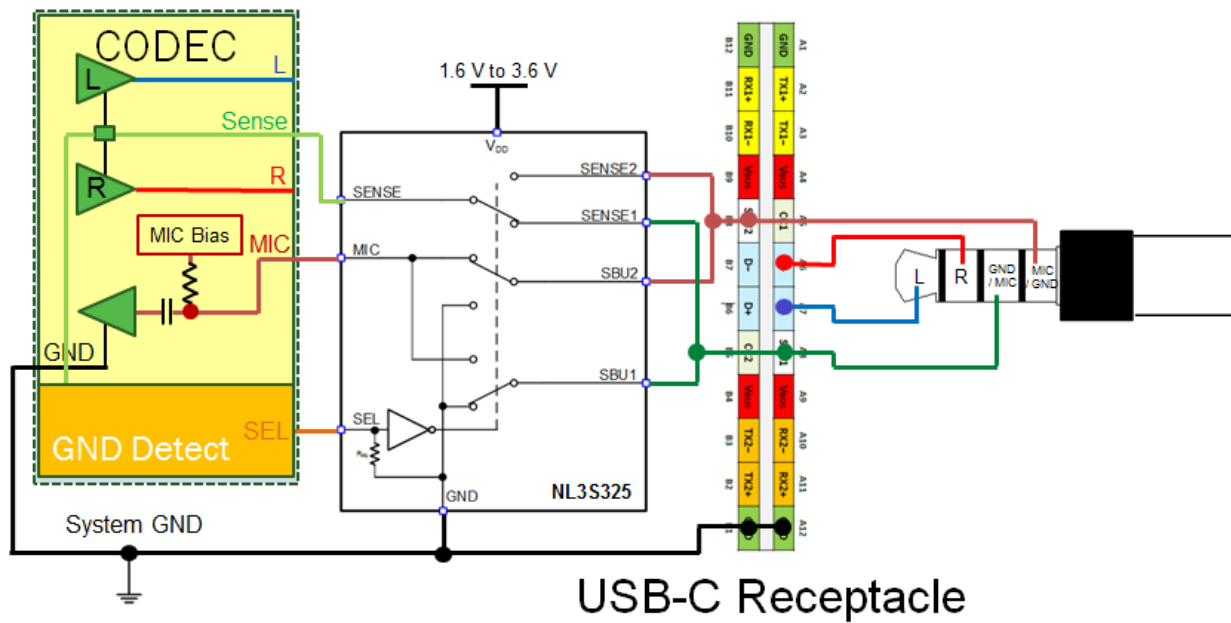
The default configuration (SEL = 0) is for AHJ−compliant headsets.

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 Min	−40°C to 85°C Typ	−40°C to 85°C Max	Unit
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_{ISBUn} = 100 mA	1.8	–	70	130	mΩ
			3.0	–	60	110	mΩ
			3.6	–	57	105	mΩ
$R_{ON(FLAT)}$	ON−Resistance Flatness	I_{ISBUn} = 10 mA	1.8 to 3.6	–	–	50	mΩ
		I_{ISBUn} = 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

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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)	Min	Typ	Max	Unit
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 Flatness	I_{ISENSE} = 10 mA, SENSEn = 0 V	1.8 to 3.6	–	–	50	mΩ
		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
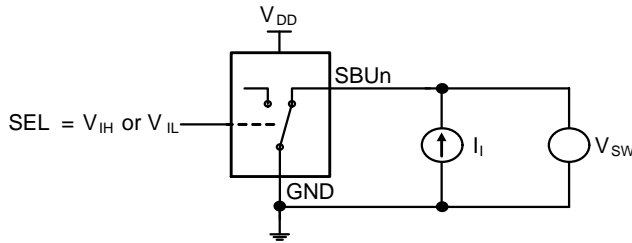
Figure 4. ON Resistance
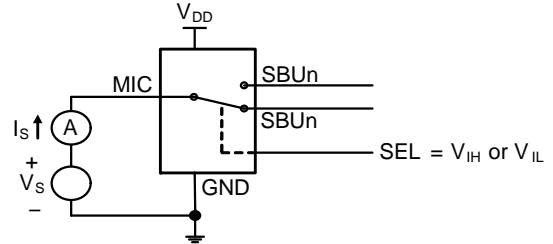
Figure 5. Leakage Current
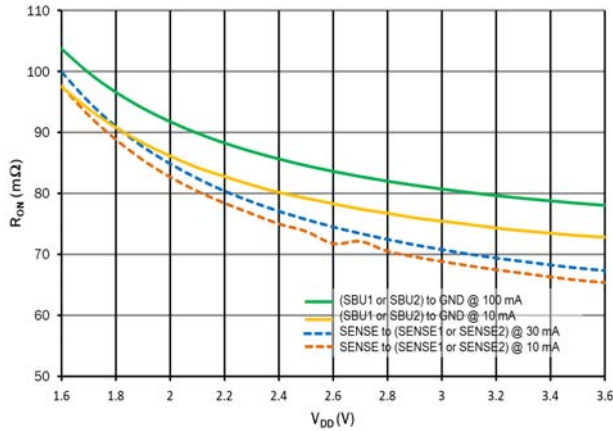
Figure 6. R_{ON} (GND/SENSE @ I_I = 1 mA)
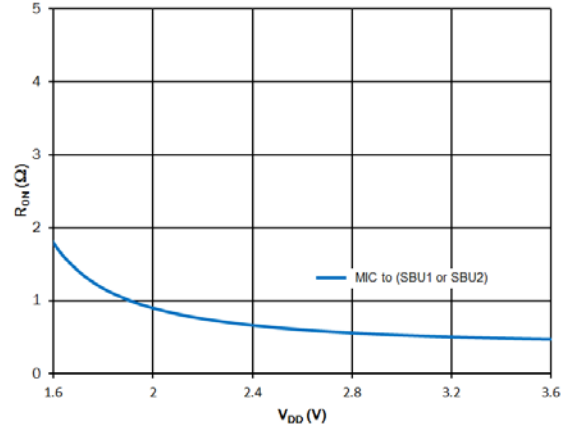
Figure 7. R_{ON} (MIC @ I_I = 30 mA)

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, $R_L = 50\ \Omega$, $C_L = 35$ pF	3.0	–	215	400	ns
t_{OFF}	Turn–Off Time	$V_{MIC} = V_{DD}$, $V_{SENSE} = 0$ V, $R_L = 50\ \Omega$, $C_L = 35$ pF	3.0	–	80	140	ns
t_{BBM}	Break–before–make Time	$V_{MIC} = V_{DD}$, $V_{SENSE} = 0$ V, $R_L = 50\ \Omega$, $C_L = 35$ pF	3.0	70 (Note 4)	100	320	ns

4. Guaranteed by design.
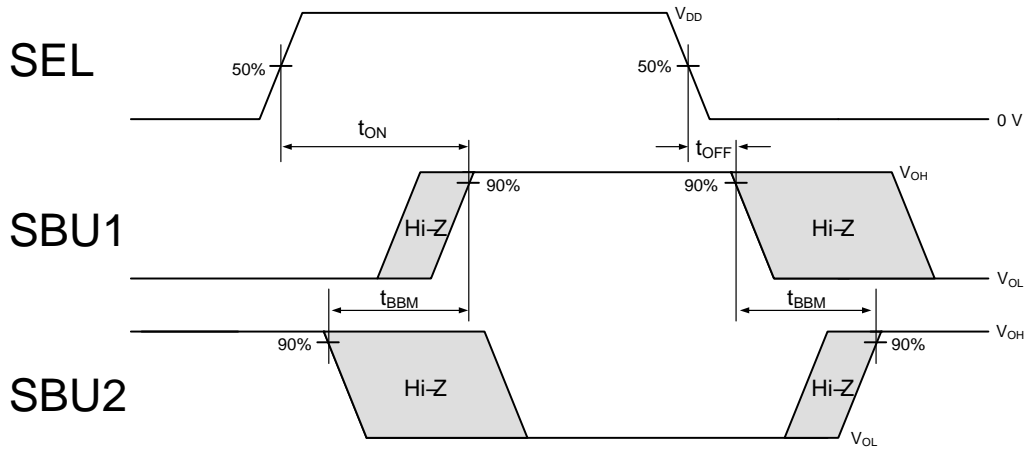
Figure 8. t_{ON}, t_{OFF}, t_{BBM} Waveform

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PACKAGE DIMENSIONS

WLCSP9, 1.19x1.19
CASE 567MD
ISSUE A
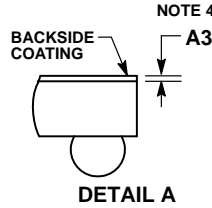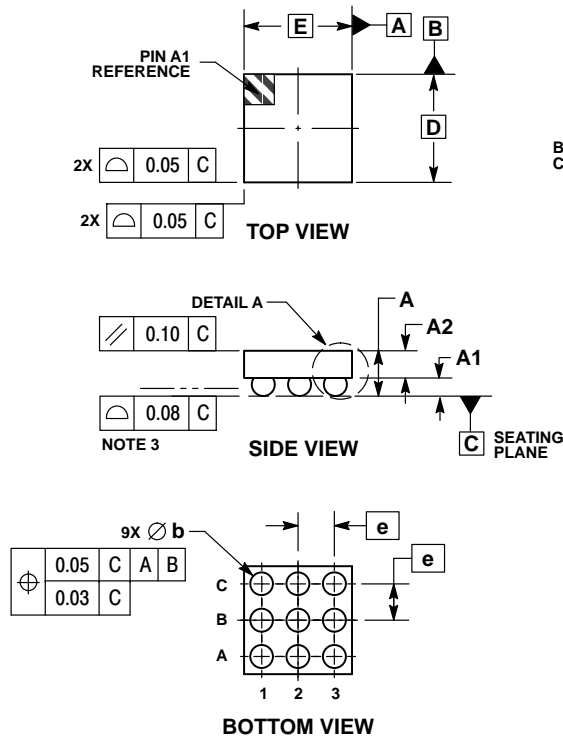
NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. COPLANARITY APPLIES TO THE SPHERICAL CROWNS OF THE SOLDER BALLS.
4. BACKSIDE COATING IS OPTIONAL.

DIM	MILLIMETERS	
	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	

TOP VIEW

PIN A1 REFERENCE

2X [0.05 | C]
2X [0.05 | C]
[E | A | B]
D

DETAIL A

BACKSIDE COATING
NOTE 4
A3

SIDE VIEW

DETAIL A
A
A2
A1
[0.10 | C]
[0.08 | C]
NOTE 3
C SEATING PLANE

BOTTOM VIEW

9X ⌀ b
[⌖ | 0.05 | C | A | B]
[0.03 | C]
C
B
A
1 2 3
e
e

RECOMMENDED SOLDERING FOOTPRINT*

A1
PACKAGE OUTLINE
9X ⌀ 0.27
0.40 PITCH
0.40 PITCH
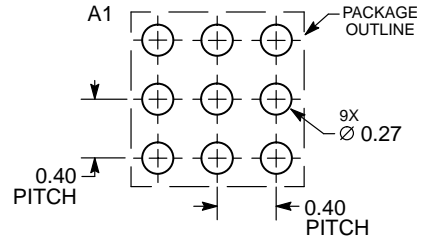
DIMENSIONS: MILLIMETERS

*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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