

NCN1154

USB 2.0 High Speed, UART and Audio Switch with Negative Signal Capability

The NCN1154 is a DP3T switch for combined true-ground audio, USB 2.0 high speed data, and UART applications. It allows portable systems to use a single port to pass either high speed data or audio signals from an external headset; the 3 channels being compliant to USB 2.0, USB 1.1 and USB 1.0.

The switch is capable of passing signals with negative voltages as low as 2 V below ground. The device features shunt resistors on the audio ports. These resistors are switched in when the audio channel is off and provide a safe path to ground for any charge that may build up on the audio lines. This reduces Pop & Click noise in the audio system.

The NCN1154 is housed in a space-saving, ultra low profile 2.0x1.7x0.5mm, 12 pin UQFN package.

Features

- 3:1 High Speed Switch
- USB 2.0, USB 1.1 & USB 1.0 Capable on all Channels
- High Bandwidth of 820 MHz on D+/D-
- Capable of Passing Negative Swing Signals Down to -2 V on R/L Channel
- 1.8 V Compatible Control Pins for $2.7\text{ V} \leq V_{CC} \leq 4.2\text{ V}$
- Audio Channel Shunt Resistors for Pop & Click Noise Reduction
- Ultra Low THD in Audio Mode: 0.01% into 16 Ω Load
- 5.25 V Tolerant Common Pins
- This is a Pb-Free Device

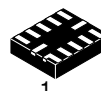
Typical Applications

- Micro or Mini USB Applications
- Shared High Speed Data or Audio on a Single Connector
- Mobile Phones
- Tablets
- Bar Code Scanners
- Portable Devices



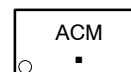
ON Semiconductor®

<http://onsemi.com>



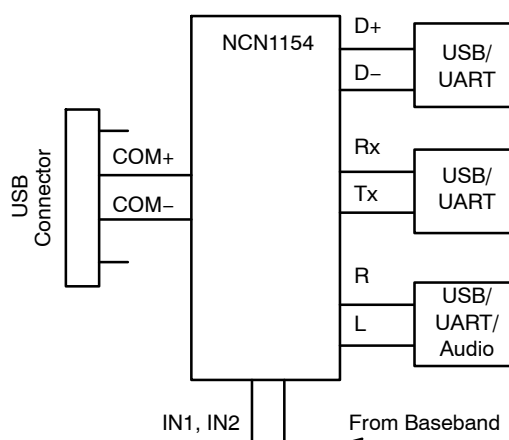
1
UQFN12
MU SUFFIX
CASE 523AE

MARKING DIAGRAM



AC = Specific Device Code
M = Date Code
▪ = Pb-Free Package

APPLICATION DIAGRAM



ORDERING INFORMATION

Device	Package	Shipping†
NCN1154MUTAG	UQFN12 (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.

NCN1154

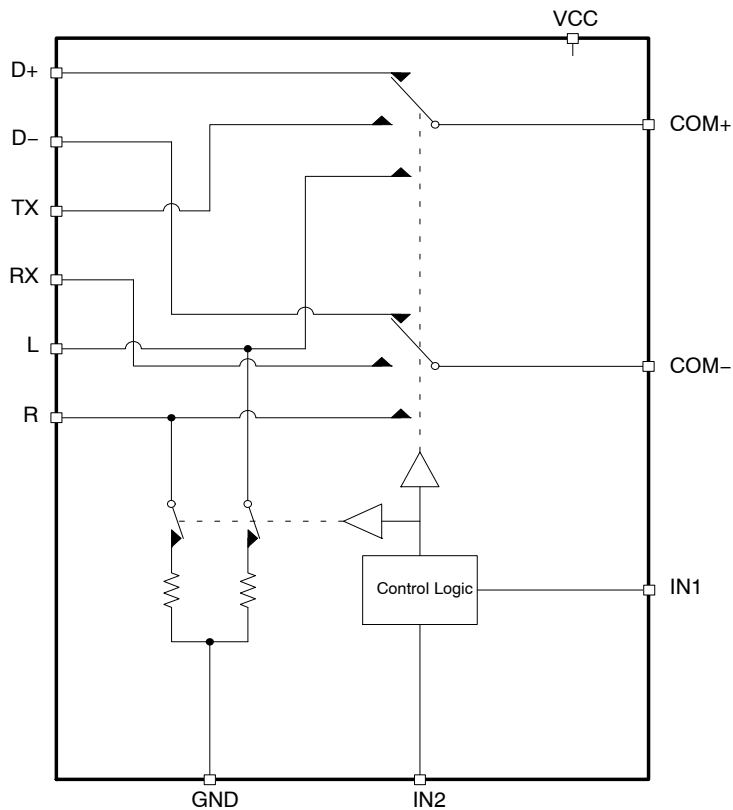


Figure 1. Functional Block Diagram

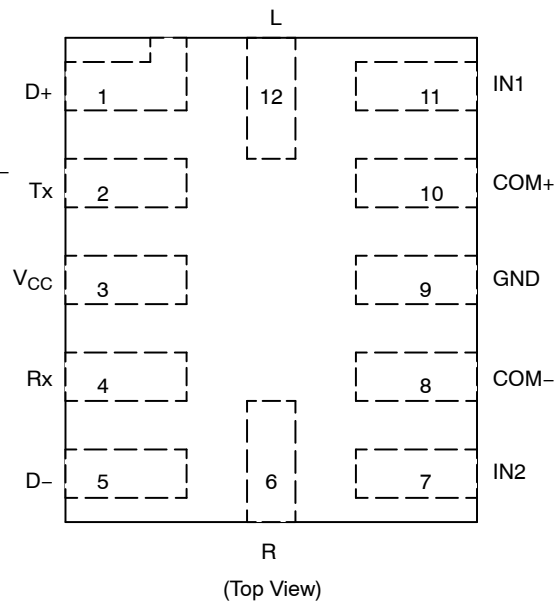


Figure 2. Pinout Diagram

PIN DESCRIPTIONS

Pin #	Name	Direction	Description
1	D+	I/O	Positive Data Line for USB Signals
2	Tx	I/O	Transmit Data Line for UART Signals
3	V _{CC}	Power	Power Supply
4	Rx	I/O	Receive Data Line for UART Signals
5	D-	I/O	Negative Data Line for USB Signals
6	R	I/O	Right Line for Audio Signals
7	IN2	Input	Control Input Select Line
8	COM-	I/O	Right Audio / Negative Data Common Line
9	GND	Power	Ground
10	COM+	I/O	Left Audio / Positive Data Common Line
11	IN1	Input	Control Input Select Line
12	L	I/O	Right Line for Audio Signals

TRUTH TABLE

IN1	IN2	D+, D-	R _X /T _X	L, R	L, R SHUNT
0	0	Hi Z	Hi Z	Hi Z	ON
0	1	ON	Hi Z	Hi Z	ON
1	0	Hi Z	Hi Z	ON	OFF
1	1	Hi Z	ON	Hi Z	ON

NCN1154

OPERATING CONDITIONS

MAXIMUM RATINGS

Symbol	Pins	Parameter	Value	Unit
V _{CC}	V _{CC}	Positive DC Supply Voltage	-0.5 to +6.0	V
V _{IS}	R, L, D+, D-, Rx, Tx	Analog I/O	-2.5 to V _{CC} + 0.5	V
	COM+, COM-		-2.5 to +6.0	
V _{IN}	IN1, IN2	Control Input Voltage	-0.5 to +6.0	V
I _{CC}	V _{CC}	Positive DC Supply Current	50	mA
T _S		Storage Temperature	-65 to +150	°C
I _{IS_CON}	COM+, COM-, R, L, D+, D-, Rx, Tx	Analog Signal Continuous Current-Closed Switch	± 100	mA
I _{IS_PK}	COM+, COM-, R, L, D+, D-, Rx, Tx	Analog Signal Continuous Current 10% Duty Cycle	± 500	mA
I _{IN}	IN1, IN2	Control Input Current	1.0	mA

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.

NOTE: These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Pins	Parameter	Min	Max	Unit
V _{CC}	V _{CC}	Positive DC Supply Voltage	2.7	5.0	V
V _{IS}	D+ to COM+, D- to COM-	Analog Signal Voltage (Note 1)	GND	V _{CC}	V
	L to COM+, R to COM-		-2.0	V _{CC}	
	Tx to COM+, Rx to COM-		GND	V _{CC}	
V _{IN}	IN1, IN2	Control Input Voltage	GND	V _{CC}	V
T _A		Operating Temperature	-40	+85	°C

Minimum and maximum values are guaranteed through test or design across the Recommended Operating Conditions, where applicable. Typical values are listed for guidance only and are based on the particular conditions listed for section, where applicable. These conditions are valid for all values found in the characteristics tables unless otherwise specified in the test conditions.

1. In USB mode, any signal supplied to the off-state audio inputs R, L may not swing below ground or above 1.5 V.

DC ELECTRICAL CHARACTERISTICS

CONTROL INPUT Min and Max apply for T_A between -40°C to +85°C and T_J up to +125°C (Unless otherwise noted). Typical values are referenced to T_A = +25°C, V_{CC} = 3.3 V.

Symbol	Pins	Parameter	Test Conditions	V _{CC} (V)	-40°C to +85°C			Unit
					Min	Typ	Max	
V _{IH}	IN1, IN2	Control Input HIGH Voltage		2.7	1.3	-	-	V
				3.3	1.4	-	-	
				4.2	1.5	-	-	
V _{IL}	IN1, IN2	Control Input LOW Voltage		2.7	-	-	0.4	V
				3.3	-	-	0.4	
				4.2	-	-	0.4	
I _{IN}	IN1, IN2	Current Input Leakage Current	0 ≤ V _{IS} ≤ V _{CC}		-	-	±50	nA

NCN1154

SUPPLY CURRENT AND LEAKAGE Min and Max apply for T_A between -40°C to $+85^{\circ}\text{C}$ and T_J up to $+125^{\circ}\text{C}$ (Unless otherwise noted). Typical values are referenced to $T_A = +25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$.

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to $+85^{\circ}\text{C}$			Unit
					Min	Typ	Max	
$I_{NC,NO(OFF)}$	D+, D- R, L Tx, Rx	OFF State Leakage	$V_{COM-}, V_{COM+} = 0\text{ V}, 4.2\text{ V}$ $V_{D+}, V_{D-} = 4.2\text{ V}, 0\text{ V}$ or float $V_L, V_R = \text{float or } 4.2\text{ V}, 0\text{ V}$	4.2			± 80	nA
$I_{COM(ON)}$	COM-, COM+	ON State Leakage	$V_{COM-}, V_{COM+} = 0\text{ V}, 4.2\text{ V}$ $V_{D+}, V_{D-} = 4.2\text{ V}, 0\text{ V}$ or float $V_L, V_R = \text{float or } 4.2\text{ V}, 0\text{ V}$	4.2			± 100	nA
I_{CC}	V_{CC}	Quiescent Supply	$V_{IS} = \text{GND to } V_{CC}; I_D = 0\text{ A}$	4.2		21	35	μA
I_{OFF}	COM-, COM+	Power OFF Leakage	$0 \leq V_{IS} \leq 5.0\text{ V}$	0			50	μA

USB ON RESISTANCE Min and Max apply for T_A between -40°C to $+85^{\circ}\text{C}$ and T_J up to $+125^{\circ}\text{C}$ (Unless otherwise noted). Typical values are referenced to $T_A = +25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$.

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to $+85^{\circ}\text{C}$			Unit
					Min	Typ	Max	
R_{ON}	D+ to COM+ D- to COM-	On-Resistance	$I_{ON} = 10\text{ mA}$ $V_{IS} = 0\text{ V to } V_{CC}$	2.7 3.3 4.2		5.5 5.5 5.5	7.5 7.5 7.5	Ω
R_{FLAT}	D+ to COM+ D- to COM-	On-Resistance Flatness	$I_{ON} = 10\text{ mA}$ $V_{IS} = 0\text{ V to } V_{CC}$	2.7 3.3 4.2		0.08 0.08 0.08		Ω
ΔR_{ON}	D+ to COM+ D- to COM-	On-Resistance Matching	$I_{ON} = 10\text{ mA}$ $V_{IS} = 0\text{ V to } V_{CC}$	2.7 3.3 4.2		0.03 0.03 0.03		Ω

AUDIO ON RESISTANCE Min and Max apply for T_A between -40°C to $+85^{\circ}\text{C}$ and T_J up to $+125^{\circ}\text{C}$ (Unless otherwise noted). Typical values are referenced to $T_A = +25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$.

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to $+85^{\circ}\text{C}$			Unit
					Min	Typ	Max	
R_{ON}	R to COM+ L to COM-	On-Resistance	$I_{ON} = 10\text{ mA}$ $V_{IS} = -1.5\text{ to } 1.5$	2.7 3.3 4.2		3.0 3.0 3.0	4.7 4.7 4.7	Ω
R_{FLAT}	R to COM+ L to COM-	On-Resistance Flatness	$I_{ON} = 10\text{ mA}$ $V_{IS} = -1.5\text{ to } 1.5$	2.7 3.3 4.2		0.11 0.11 0.11		Ω
ΔR_{ON}	R to COM+ L to COM-	On-Resistance Matching	$I_{ON} = 10\text{ mA}$ $V_{IS} = -1.5\text{ to } 1.5$	2.7 3.3 4.2		0.03 0.03 0.03		Ω
R_{SH}	L, R	Shunt Resistance (Resistor + Switch)	$I_{ON} = 10\text{ mA}$	2.7 – 4.2		118	160	Ω

JART ON RESISTANCE Min and Max apply for T_A between -40°C to $+85^{\circ}\text{C}$ and T_J up to $+125^{\circ}\text{C}$ (Unless otherwise noted). Typical values are referenced to $T_A = +25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$.

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to $+85^{\circ}\text{C}$			Unit
					Min	Typ	Max	
R_{ON}	Tx to COM+ Rx to COM-	On-Resistance	$I_{ON} = 10\text{ mA}$ $V_{IS} = 0\text{ V to } V_{CC}$	2.7 3.3 4.2		5.5 5.5 5.5	7.5 7.5 7.5	Ω
R_{FLAT}	Tx to COM+ Rx to COM-	On-Resistance Flatness	$I_{ON} = 10\text{ mA}$ $V_{IS} = 0\text{ V to } V_{CC}$	2.7 3.3 4.2		0.08 0.08 0.08		Ω
ΔR_{ON}	Tx to COM+ Rx to COM-	On-Resistance Matching	$I_{ON} = 10\text{ mA}$ $V_{IS} = 0\text{ V to } V_{CC}$	2.7 3.3 4.2		0.03 0.03 0.03		Ω

AC ELECTRICAL CHARACTERISTICS

TIMING/FREQUENCY Min and Max apply for T_A between -40°C to $+85^{\circ}\text{C}$ and T_J up to $+125^{\circ}\text{C}$ (Unless otherwise noted). Typical values are referenced to $T_A = +25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$. $R_L = 50\ \Omega$, $C_L = 35\ \text{pF}$, $f = 1\ \text{MHz}$.

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to $+85^{\circ}\text{C}$			Unit
					Min	Typ	Max	
t_{ON}		Turn-ON Time (Closed to Open)				15		μs
t_{OFF}		Turn-OFF Time (Closed to Open)				67		ns
T_{BBM}		Break-Before-Make Time				11		μs
BW	D+ / D- Tx / Rx R / L	-3 dB Bandwidth	$C_L = 5\ \text{pF}$ $R_S = 50\ \Omega$			820 800 750		MHz

ISOLATION Min and Max apply for T_A between -40°C to $+85^{\circ}\text{C}$ and T_J up to $+125^{\circ}\text{C}$ (Unless otherwise noted). Typical values are referenced to $T_A = +25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$. $R_L = 50\ \Omega$, $C_L = 5\ \text{pF}$.

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to $+85^{\circ}\text{C}$			Unit
					Min	Typ	Max	
O_{IRR}	Open	OFF-Isolation	$f = 100\ \text{kHz}$, $R_S = 50\ \Omega$			-81		dB
X_{TALK}	COM+ to COM-	Non-Adjacent Channel Crosstalk	$f = 100\ \text{kHz}$, $R_S = 50\ \Omega$			-93		dB
THD+N		Total Harmonic Distortion + Noise	IN1, IN2 = 3.0 V $f = 20\ \text{Hz}$ to $20\ \text{kHz}$ $V_{COM} = 0.5\ V_{pp}$ $R_L = 600\ \Omega$	3.0		0.001		%
PSRR		Power Supply Rejection Ratio	$f = 10\ \text{kHz}$ $R_{COM} = 50\ \Omega$	3.0		60		dB

CAPACITANCE Min and Max apply for T_A between -40°C to $+85^{\circ}\text{C}$ and T_J up to $+125^{\circ}\text{C}$ (Unless otherwise noted). Typical values are referenced to $T_A = +25^{\circ}\text{C}$, $V_{CC} = 3.3\text{ V}$. $R_L = 50\ \Omega$, $C_L = 5\ \text{pF}$, $f = 1\ \text{MHz}$.

Symbol	Pins	Parameter	Test Conditions	-40°C to $+85^{\circ}\text{C}$			Unit
				Min	Typ	Max	
C_{IN}	IN1, IN2	Control Pin Input Capacitance	$V_{CC} = 0\text{ V}$		2.0		pF
C_{ON}	D+, Tx to COM+ D-, Rx to COM-	USB, UART ON Capacitance			9.0		pF
C_{ON}	R to COM+ L to COM-	Audio ON Capacitance			8.5		pF
C_{OFF}	D+, D- Tx, Rx	USB, UART OFF Capacitance			3.5		pF

TABLE OF GRAPHS

Symbol	Parameter	Figure
NE	Near End Signaling Eye Diagram	3, 4, 5, 6
FE	Far End Signaling Eye Diagram	7, 8, 9, 10
BW	Frequency Response	11, 12, 13

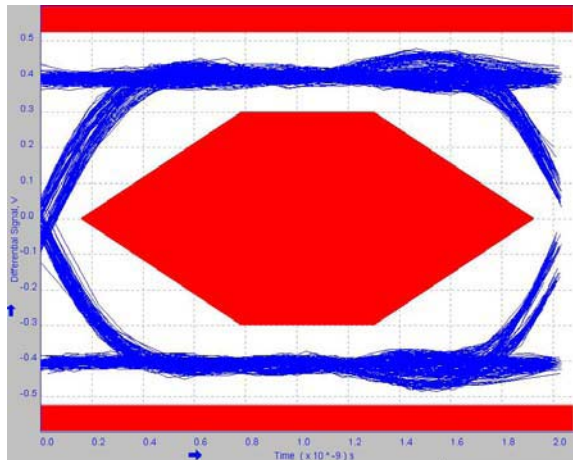


Figure 3. Reference Near End Eye Diagram (Path Trough Dedicated Line, Temp = 25°C)

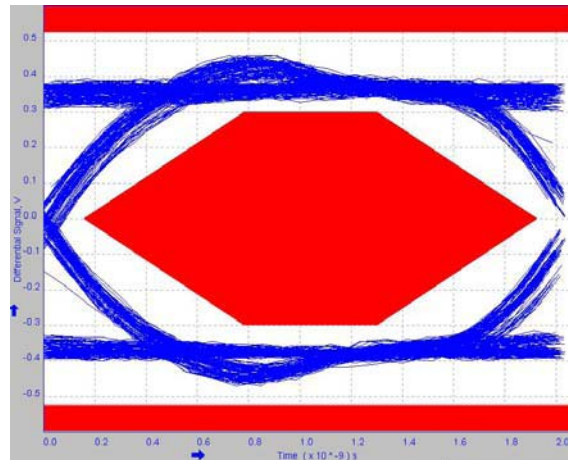


Figure 4. USB Switch Near End Eye Diagram (V_{CC} = 3.6 V, IN1 = 0, IN2 = 1, Temp = 25°C)

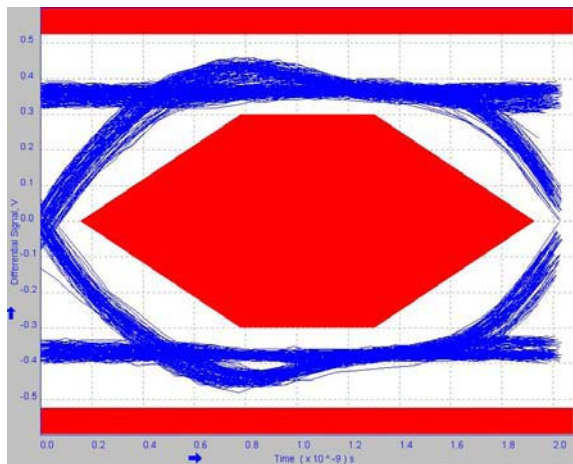


Figure 5. UART Switch Near End Eye Diagram (V_{CC} = 3.6 V, IN1 = 1, IN2 = 1, Temp = 25°C)

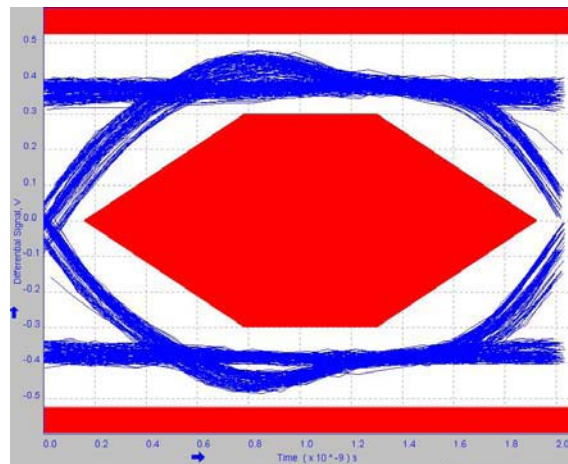


Figure 6. Audio Switch Near End Eye Diagram (V_{CC} = 3.6 V, IN1 = 1, IN2 = 0, Temp = 25°C)

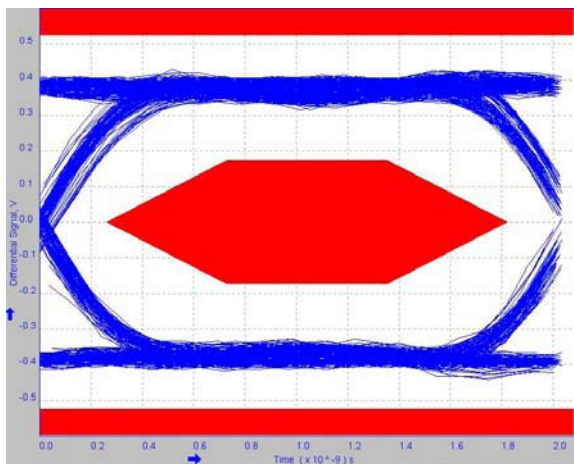


Figure 7. Reference Far End Eye Diagram (Path Trough Dedicated Line, Temp = 25°C)

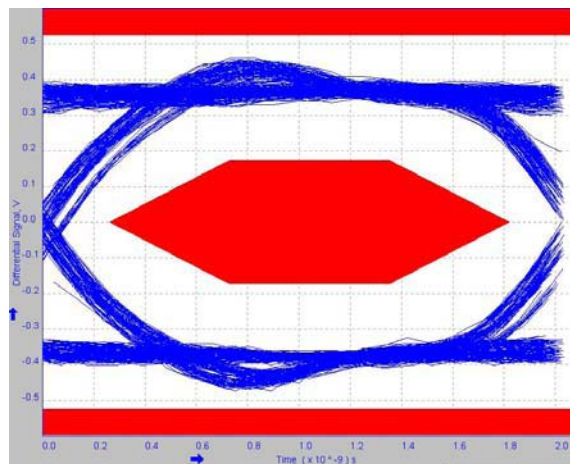


Figure 8. USB Switch Far End Eye Diagram ($V_{CC} = 3.6V$, $IN1 = 0$, $IN2 = 1$, Temp = 25°C)

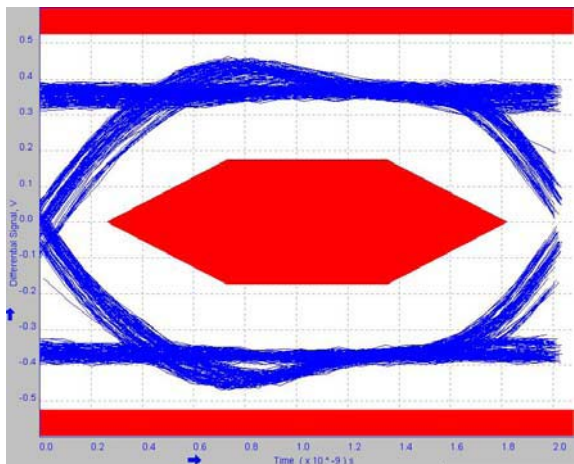


Figure 9. UART Switch Far End Eye Diagram ($V_{CC} = 3.6 V$, $IN1 = 1$, $IN2 = 1$, Temp = 25°C)

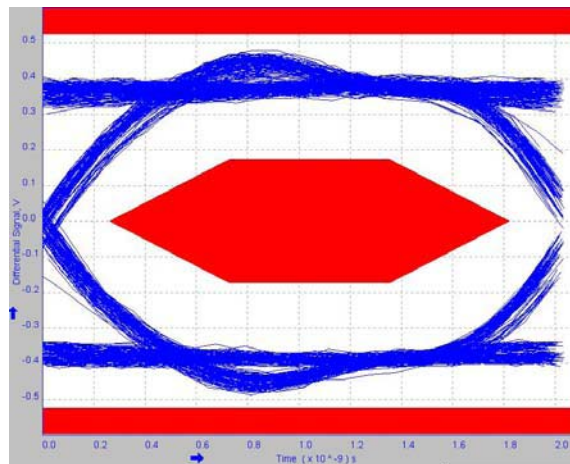


Figure 10. Audio Switch Far End Eye Diagram ($V_{CC} = 3.6 V$, $IN1 = 1$, $IN2 = 0$, Temp = 25°C)

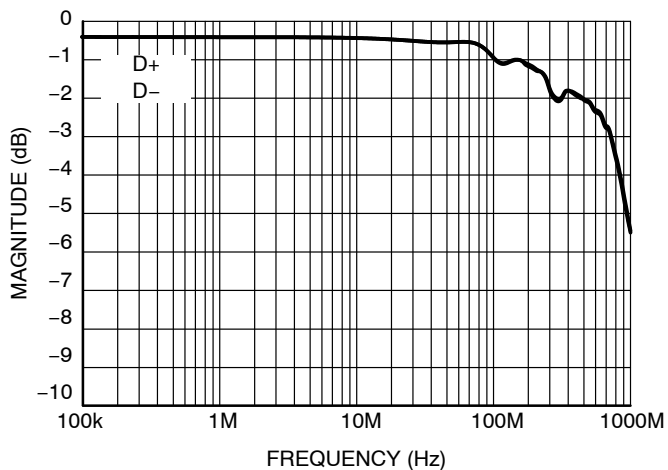


Figure 11. USB Path Frequency Response

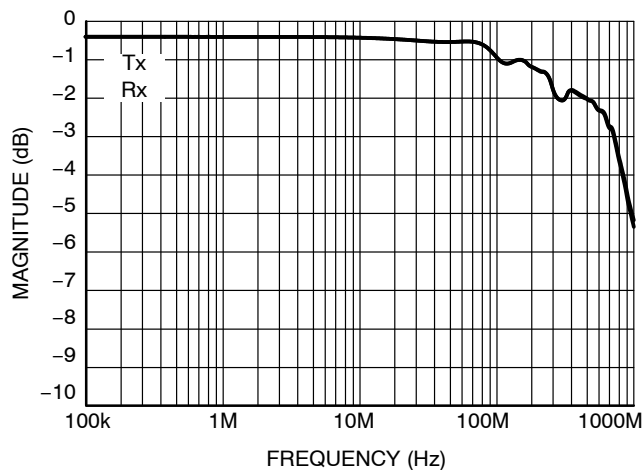


Figure 12. UART Path Frequency Response

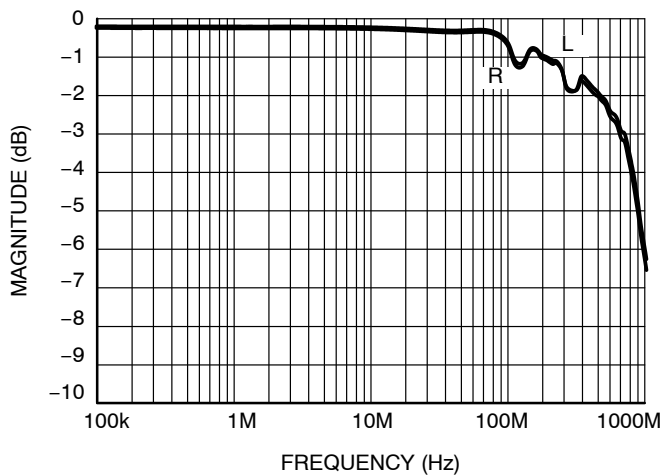
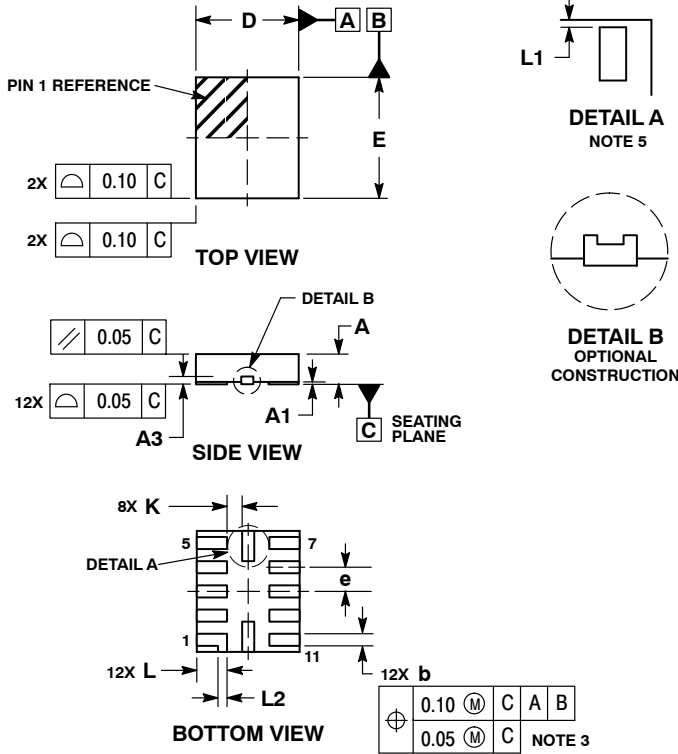


Figure 13. Audio Path Frequency Response

NCN1154

PACKAGE DIMENSIONS

UQFN12 1.7x2.0, 0.4P CASE 523AE-01 ISSUE A

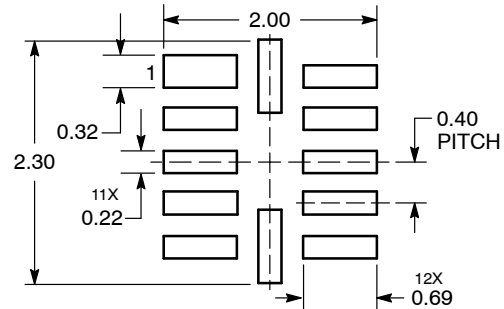


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.30 MM FROM TERMINAL TIP.
4. MOLD FLASH ALLOWED ON TERMINALS ALONG EDGE OF PACKAGE. FLASH 0.03 MAX ON BOTTOM SURFACE OF TERMINALS.
5. DETAIL A SHOWS OPTIONAL CONSTRUCTION FOR TERMINALS.

DIM	MILLIMETERS	
	MIN	MAX
A	0.45	0.55
A1	0.00	0.05
A3	0.127 REF	
b	0.15	0.25
D	1.70 BSC	
E	2.00 BSC	
e	0.40 BSC	
K	0.20	----
L	0.45	0.55
L1	0.00	0.03
L2	0.15 REF	

MOUNTING FOOTPRINT SOLDERMASK DEFINED



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.

ON Semiconductor and are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

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: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local Sales Representative

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А