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

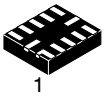
- 3:1 High Speed Switch
- USB 2.0, USB 1.1 & USB 1.0 Capable on all Channels
- High Bandwidth of 820 MHz on D+/D−
- Capable of Passing Negative Swing Signals Down to −2 V on R/L Channel
- 1.8 V Compatible Control Pins for 2.7 V $\leq$ V_{CC} $\leq$ 4.2 V
- Audio Channel Shunt Resistors for Pop & Click 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

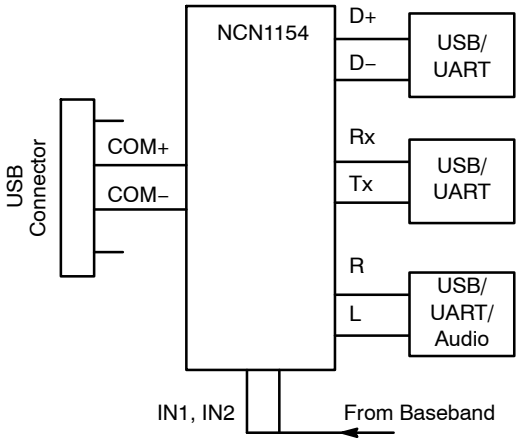


UQFN12
MU SUFFIX
CASE 523AE

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.

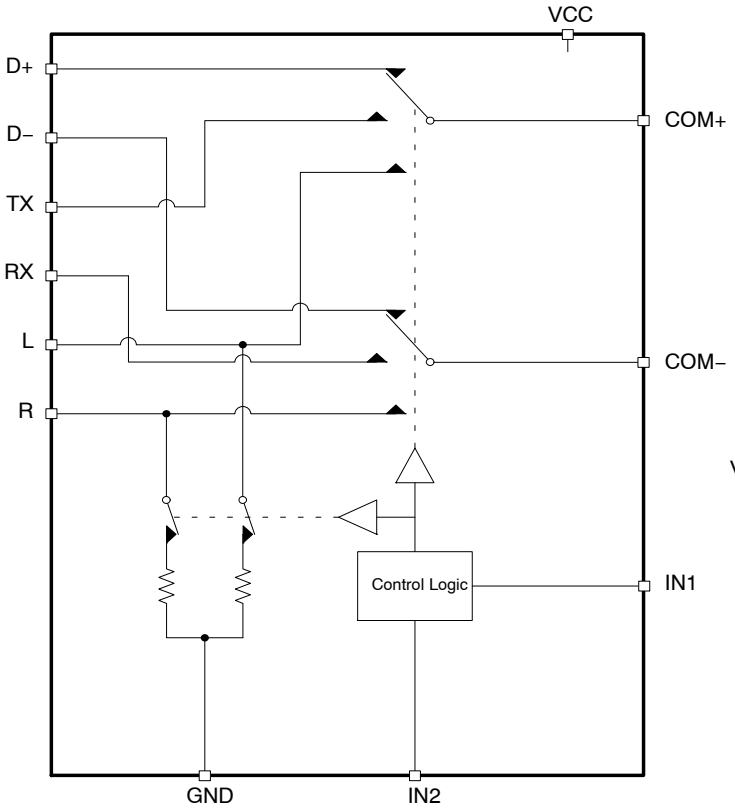


Figure 1. Functional Block Diagram

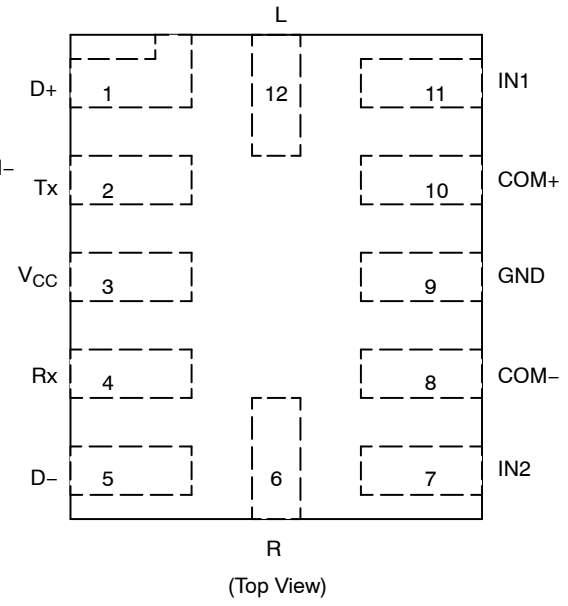


Figure 2. Pinout Diagram

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

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 3.3 4.2	1.3 1.4 1.5	−	−	V
V_{IL}	IN1, IN2	Control Input LOW Voltage		2.7 3.3 4.2	−	−	0.4 0.4 0.4	V
I_{IN}	IN1, IN2	Current Input Leakage Current	$0 \le V_{IS} \le V_{CC}$		−	−	±50	nA

SUPPLY CURRENT AND LEAKAGE 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	
$I_{NC,NO(OFF)}$	D+, D− R, L Tx, Rx	OFF State Leakage	V_{COM-}, V_{COM+} = 0 V, 4.2 V V_{D+}, V_{D-} = 4.2 V, 0 V or float V_L, V_R = float or 4.2 V, 0 V	4.2			±80	nA
$I_{COM(ON)}$	COM−, COM+	ON State Leakage	V_{COM-}, V_{COM+} = 0 V, 4.2 V V_{D+}, V_{D-} = 4.2 V, 0 V or float V_L, V_R = float or 4.2 V, 0 V	4.2			±100	nA
I_{CC}	V_{CC}	Quiescent Supply	V_{IS} = GND to V_{CC}; I_D = 0 A	4.2		21	35	μA
I_{OFF}	COM−, COM+	Power OFF Leakage	0 ≤ V_{IS} ≤ 5.0 V	0			50	μA

USB ON RESISTANCE 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	
R_{ON}	D+ to COM+ D− to COM−	On−Resistance	I_{ON} = 10 mA V_{IS} = 0 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 mA V_{IS} = 0 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 mA V_{IS} = 0 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°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	
R_{ON}	R to COM+ L to COM−	On−Resistance	I_{ON} = 10 mA V_{IS} = −1.5 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 mA V_{IS} = −1.5 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 mA V_{IS} = −1.5 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 mA	2.7 − 4.2		118	160	Ω

UART ON RESISTANCE 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	
R_{ON}	Tx to COM+ Rx to COM−	On−Resistance	I_{ON} = 10 mA V_{IS} = 0 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 mA V_{IS} = 0 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 mA V_{IS} = 0 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°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. R_L = 50 Ω, C_L = 35 pF, f = 1 MHz.

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	−40°C to +85°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 pF R_S = 50 Ω			820 800 750		MHz

ISOLATION 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. R_L = 50 Ω, C_L = 5 pF.

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

CAPACITANCE 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. R_L = 50 Ω, C_L = 5 pF, f = 1 MHz.

Symbol	Pins	Parameter	Test Conditions	−40°C to +85°C			Unit
				Min	Typ	Max	
C_{IN}	IN1, IN2	Control Pin Input Capacitance	V_{CC} = 0 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

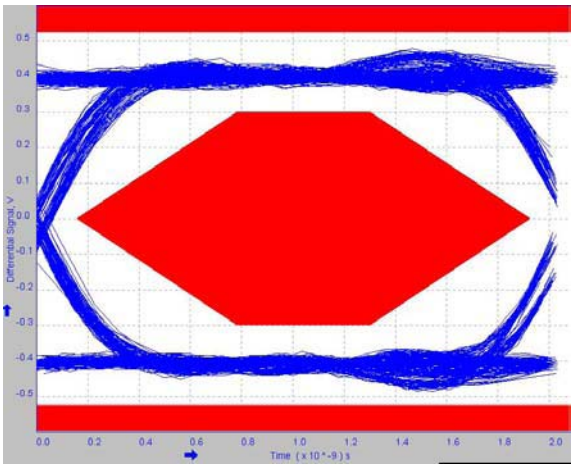


Figure 3. Reference Near End Eye Diagram (Path Trough Dedicated Line, Temp = 25°C)

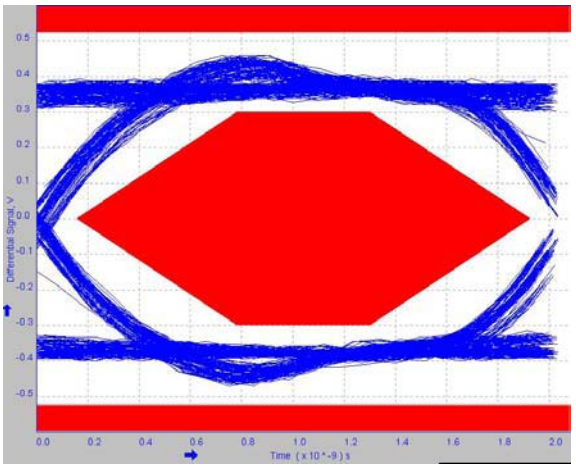


Figure 4. USB Switch Near End Eye Diagram (V_{CC} = 3.6 V, IN1 = 0, IN2 = 1, Temp = 25°C)

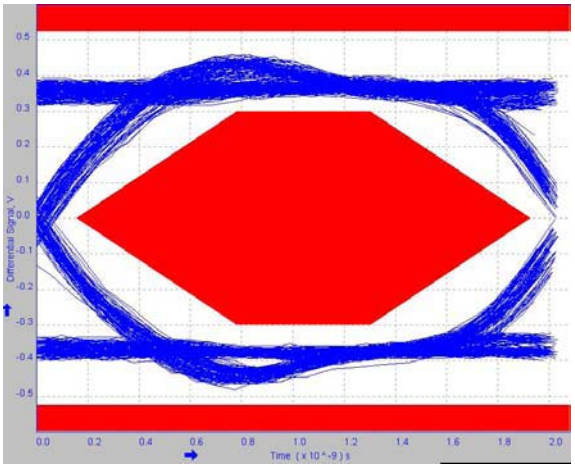


Figure 5. UART Switch Near End Eye Diagram (V_{CC} = 3.6 V, IN1 = 1, IN2 = 1, Temp = 25°C)

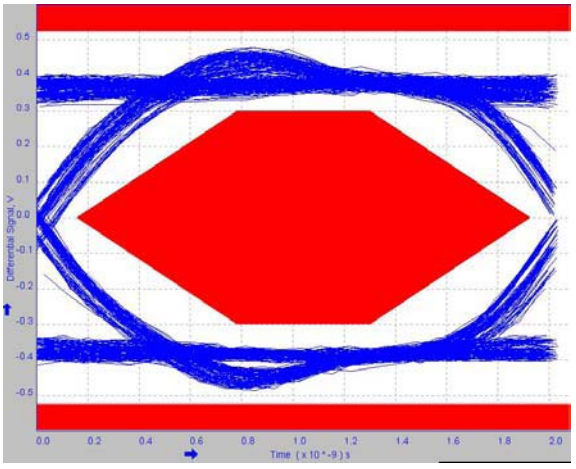


Figure 6. Audio Switch Near End Eye Diagram (V_{CC} = 3.6 V, IN1 = 1, IN2 = 0, Temp = 25°C)

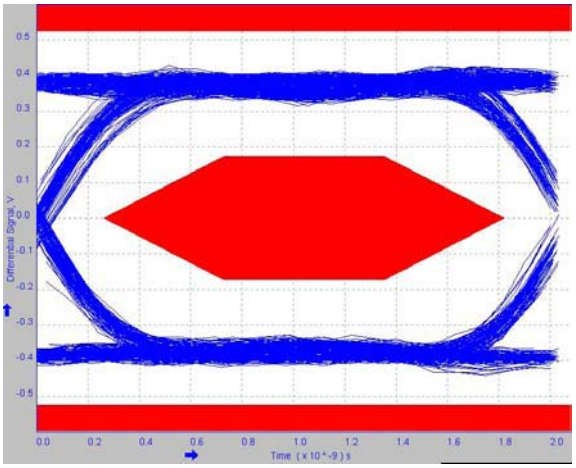


Figure 7. Reference Far End Eye Diagram
(Path Trough Dedicated Line, Temp = 25°C)

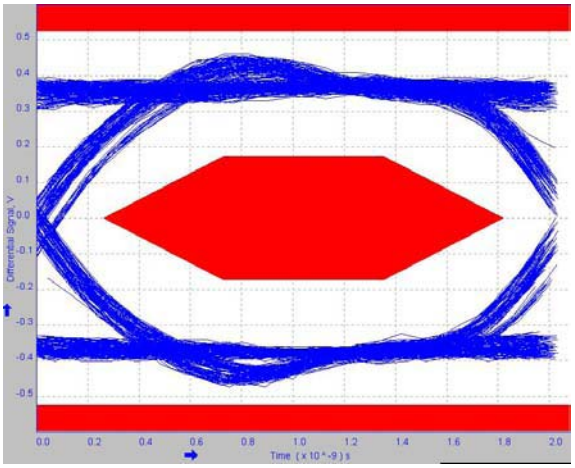


Figure 8. USB Switch Far End Eye Diagram
(V_{CC} = 3.6V, IN1 = 0, IN2 = 1, Temp = 25°C)

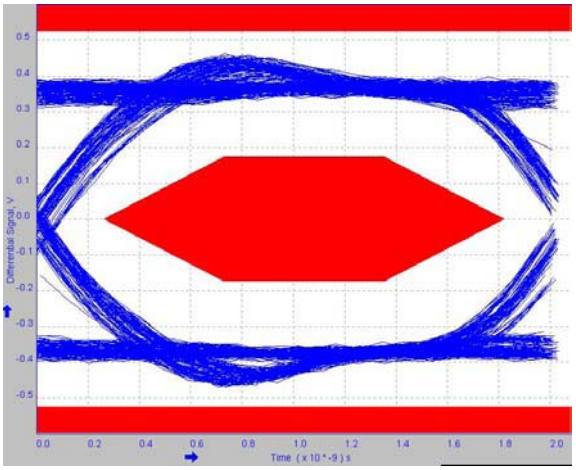


Figure 9. UART Switch Far End Eye Diagram
(Vcc = 3.6 V, IN1 = 1, IN2 = 1, Temp = 25°C)

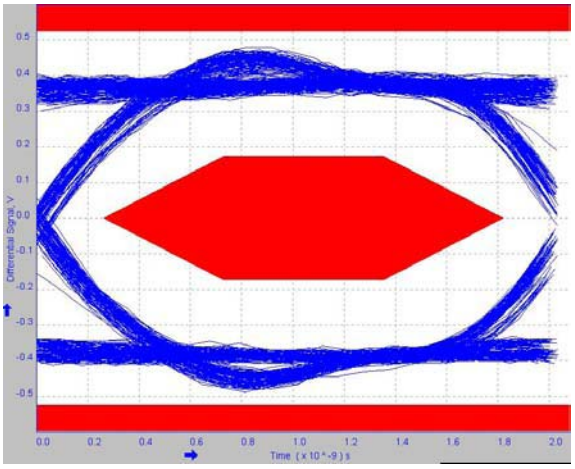


Figure 10. Audio Switch Far End Eye Diagram
(V_{CC} = 3.6 V, IN1 = 1, IN2 = 0, Temp = 25°C)

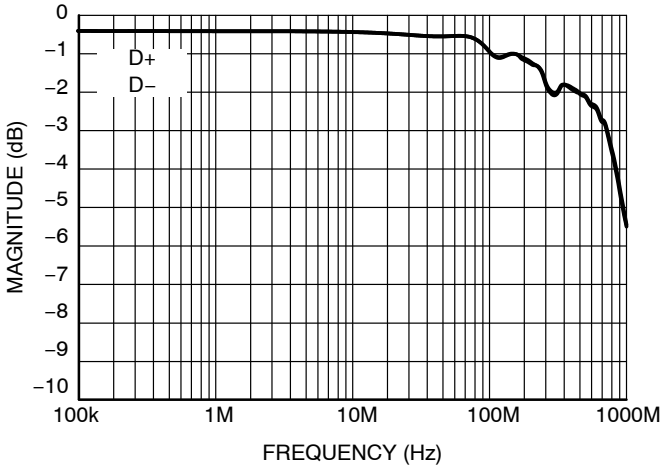


Figure 11. USB Path Frequency Response

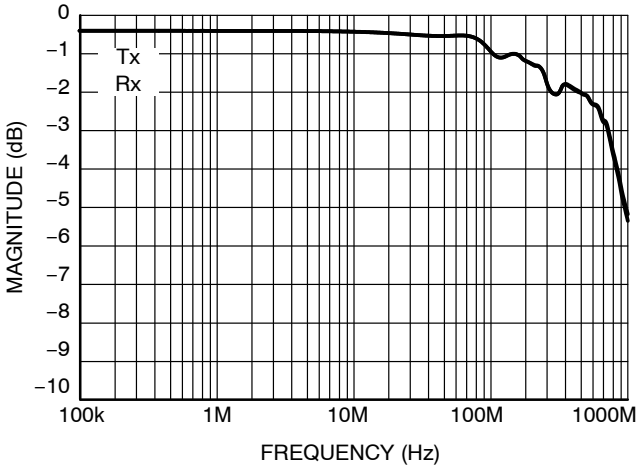


Figure 12. UART Path Frequency Response

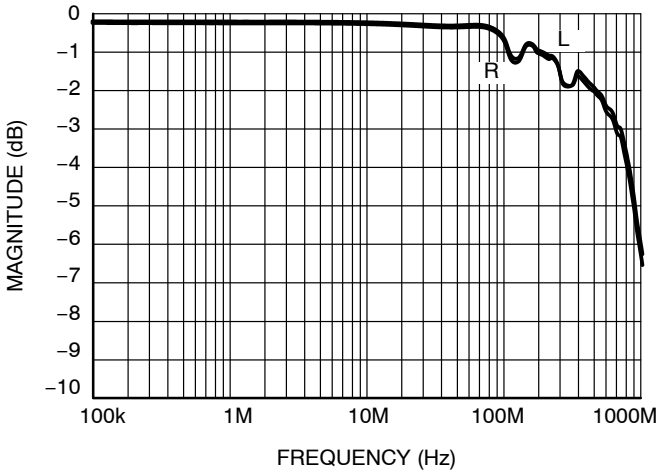
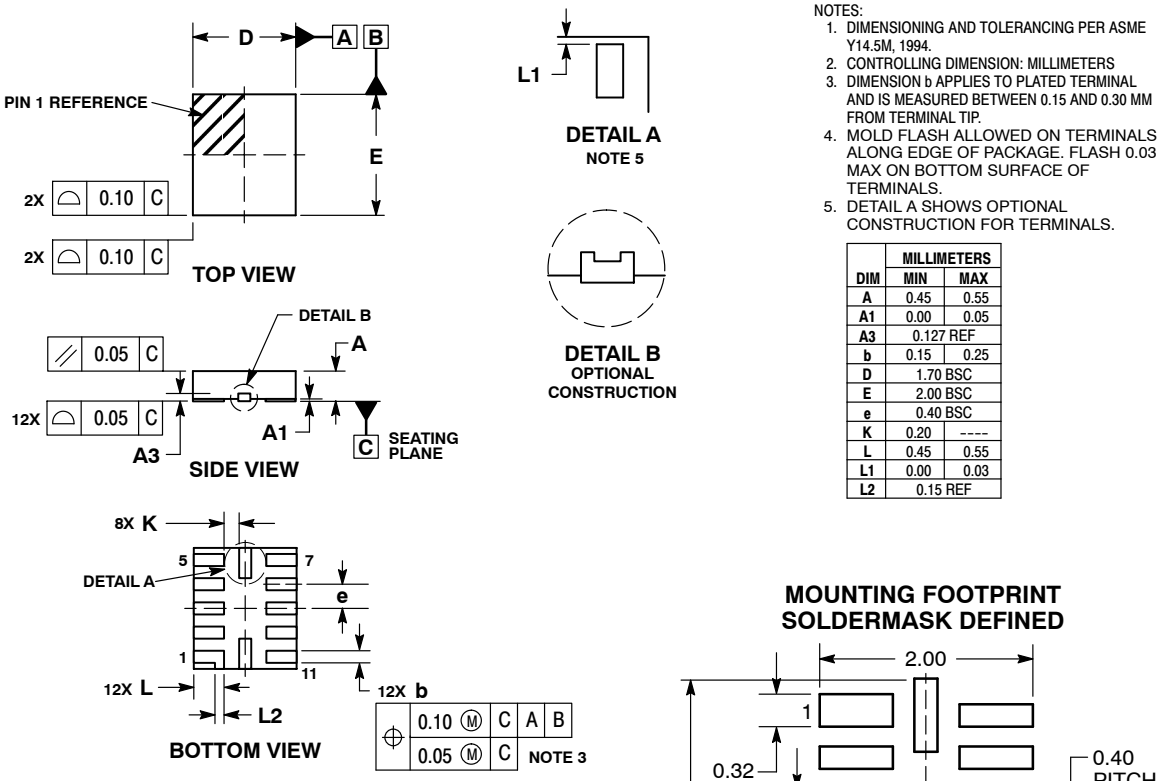


Figure 13. Audio Path Frequency Response

PACKAGE DIMENSIONS

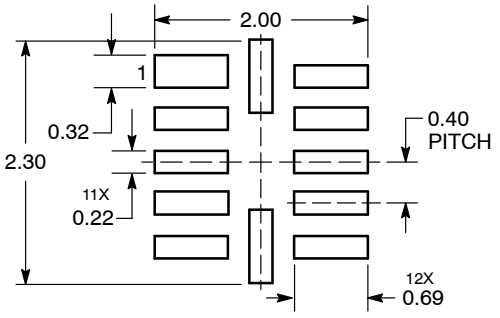
UQFN12 1.7x2.0, 0.4P
CASE 523AE−01
ISSUE A



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.

	MILLIMETERS	
DIM	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.

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

NCN1154/D

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

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**».

AVIC 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).

FORSTAR®

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