

NLAS5223C, NLAS5223CL

Ultra-Low 0.35 Ω Dual SPDT Analog Switch

The NLAS5223C is an advanced CMOS analog switch fabricated in Sub-micron silicon gate CMOS technology. The device is a dual Independent Single Pole Double Throw (SPDT) switch featuring Ultra-Low R_{ON} of 0.35 Ω, at $V_{CC} = 4.3$ V.

The part also features guaranteed Break Before Make (BBM) switching, assuring the switches never short the driver.

Features

- Ultra-Low R_{ON} , 0.35 Ω (typ) at $V_{CC} = 4.3$ V
- NLAS5223C Interfaces with 2.8 V Chipset
- NLAS5223CL Interfaces with 1.8 V Chipset
- Single Supply Operation from 1.65–4.5 V
- Full 0– V_{CC} Signal Handling Capability
- High Off-Channel Isolation
- Low Standby Current, < 50 nA
- Low Distortion
- R_{ON} Flatness of 0.15 Ω
- High Continuous Current Capability
 - ◆ ±320 mA Through Each Switch
- Large Current Clamping Diodes at Analog Inputs
 - ◆ ±320 mA Continuous Current Capability
- Package:
 - ◆ 1.4 x 1.8 x 0.55 mm UQFN10 Pb-Free
- These are Pb-Free Devices

Applications

- Cell Phone Audio Block
- Speaker and Earphone Switching
- Ring-Tone Chip/Amplifier Switching
- Modems



ON Semiconductor®

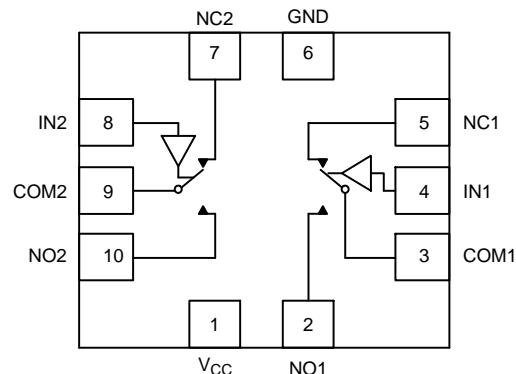
<http://onsemi.com>

MARKING DIAGRAM



XX = Specific Device Code
M = Date Code/Assembly Location
■ = Pb-Free Device

(Note: Microdot may be in either location)



FUNCTION TABLE

IN 1, 2	NO 1, 2	NC 1, 2
0	OFF	ON
1	ON	OFF

ORDERING INFORMATION

See detailed ordering, marking and shipping information in the package dimensions section on page 9 of this data sheet.

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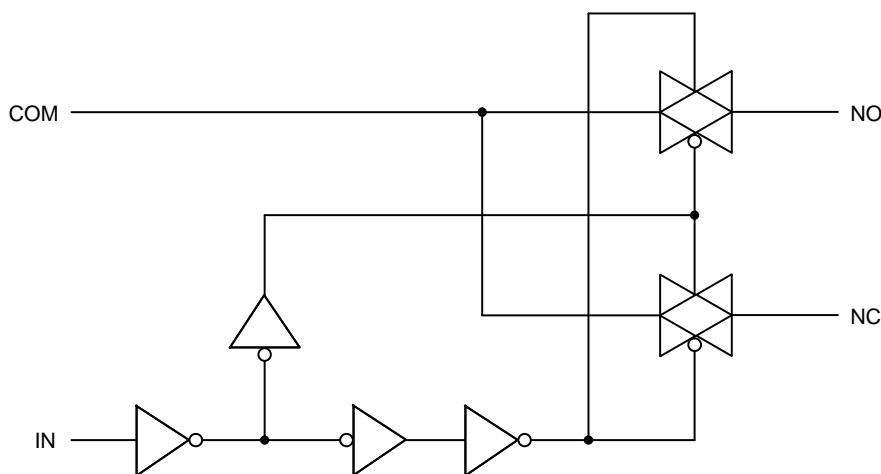


Figure 1. Logic Equivalent Circuit

PIN DESCRIPTION

QFN PIN #	Symbol	Name and Function
2, 5, 7, 10	NC1 to NC2, NO1 to NO2	Independent Channels
4, 8	IN1 and IN2	Controls
3, 9	COM1 and COM2	Common Channels
6	GND	Ground (V)
1	V _{CC}	Positive Supply Voltage

MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{CC}	Positive DC Supply Voltage	-0.5 to +7.0	V
V _{IS}	Analog Input Voltage (V _{NO} , V _{NC} , or V _{COM})	-0.5 ≤ V _{IS} ≤ V _{CC} + 0.5	V
V _{IN}	Digital Select Input Voltage	-0.5 ≤ V _{IN} ≤ +5.5	V
I _{anl1}	Continuous DC Current from COM to NC/NO	±320	mA
I _{anl-pk1}	Peak Current from COM to NC/NO, 10% Duty Cycle, 100 ms = t _{ON} (Note 1)	±600	mA
I _{anl-pk2}	Instantaneous Peak Current from COM to NC/NO, 10% Duty Cycle, t _{ON} < 1 μs	±850	mA
I _{clmp}	Continuous DC Current into COM/NO/NC with Respect to V _{CC} or GND	±100	mA
ESD	ESD Withstand Voltage Human Body Model (HBM)	>3000	V

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. Defined as 10% ON, 90% OFF Duty Cycle.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min	Max	Unit
V _{CC}	DC Supply Voltage	1.65	4.5	V
V _{IN}	Digital Select Input Voltage (OVT) Overvoltage Tolerance	GND	4.5	V
V _{IS}	Analog Input Voltage (NC, NO, COM)	GND	V _{CC}	V
T _A	Operating Temperature Range	-40	+85	°C
t _r , t _f	Input Rise or Fall Time, SELECT V _{CC} = 1.6 V – 2.7 V V _{CC} = 3.0 V – 4.5 V		20 10	ns/V

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NLAS5223C DC CHARACTERISTICS – DIGITAL SECTION (Voltages Referenced to GND)

Symbol	Parameter	Condition	V _{CC}	Guaranteed Limit		Unit
				25°C	-40°C to +85°C	
V _{IH}	Minimum High-Level Input Voltage, Select Inputs		3.0 4.3	1.4 2.0	1.4 2.0	V
V _{IL}	Maximum Low-Level Input Voltage, Select Inputs		3.0 4.3	0.7 0.8	0.7 0.8	V
I _{IN}	Maximum Input Leakage Current, Select Inputs	V _{IN} = V _{CC} or GND	4.3	±0.1	±1.0	µA
I _{OFF}	Power Off Leakage Current	V _{IN} = V _{CC} or GND	0	±0.5	±2.0	µA
I _{CC}	Maximum Quiescent Supply Current (Note 2)	Select and V _{IS} = V _{CC} or GND	1.65 to 4.5	±1.0	±2.0	µA

2. Guaranteed by design. Resistance measurements do not include test circuit or package resistance.

NLAS5223C DC ELECTRICAL CHARACTERISTICS – ANALOG SECTION

Symbol	Parameter	Condition	V _{CC}	Guaranteed Maximum Limit				Unit	
				25°C		-40°C to +85°C			
				Min	Max	Min	Max		
R _{ON}	NC/NO On-Resistance (Note 3)	V _{IN} = V _{IL} or V _{IN} = V _{IH} V _{IS} = GND to V _{CC} I _{COM} = 100 mA	3.0 4.3		0.4 0.35		0.5 0.4	Ω	
R _{FLAT}	NC/NO On-Resistance Flatness (Notes 3 and 4)	I _{COM} = 100 mA V _{IS} = 0 to V _{CC}	3.0 4.3		0.16 0.11		0.20 0.14	Ω	
ΔR _{ON}	On-Resistance Match Between Channels (Notes 3 and 5)	V _{IS} = 1.5 V; I _{COM} = 100 mA V _{IS} = 2.2 V; I _{COM} = 100 mA	3.0 4.3		0.05 0.05		0.05 0.05	Ω	
I _{NC(OFF)} I _{NO(OFF)}	NC or NO Off Leakage Current (Note 3)	V _{IN} = V _{IL} or V _{IH} V _{NO} or V _{NC} = 0.3 V V _{COM} = 4.0 V	4.3	-5.0	5.0	-50	50	nA	
I _{COM(ON)}	COM ON Leakage Current (Note 3)	V _{IN} = V _{IL} or V _{IH} V _{NO} 0.3 V or 4.0 V with V _{NC} floating or V _{NC} 0.3 V or 4.0 V with V _{NO} floating V _{COM} = 0.3 V or 4.0 V	4.3	-10	10	-100	100	nA	

3. Guaranteed by design. Resistance measurements do not include test circuit or package resistance.

4. Flatness is defined as the difference between the maximum and minimum value of On-resistance as measured over the specified analog signal ranges.

5. ΔR_{ON} = R_{ON(MAX)} – R_{ON(MIN)} between NC1 and NC2 or between NO1 and NO2.

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NLAS5223CL DC CHARACTERISTICS – DIGITAL SECTION (Voltages Referenced to GND)

Symbol	Parameter	Condition	V _{CC}	Guaranteed Limit		Unit
				25°C	-40°C to +85°C	
V _{IH}	Minimum High-Level Input Voltage, Select Inputs		3.0 4.3	1.3 1.6	1.3 1.6	V
V _{IL}	Maximum Low-Level Input Voltage, Select Inputs		3.0 4.3	0.5 0.6	0.5 0.6	V
I _{IN}	Maximum Input Leakage Current, Select Inputs	V _{IN} = 4.5 V or GND	4.3	±0.1	±1.0	µA
I _{OFF}	Power Off Leakage Current	V _{IN} = 4.5 V or GND	0	±0.5	±2.0	µA
I _{CC}	Maximum Quiescent Supply Current	Select and V _{IS} = V _{CC} or GND	1.65 to 4.5	±1.0	±2.0	µA
I _{CCV}	Maximum Quiescent Supply Current, Low Voltage Driving (Note 6)	V _{IS} = V _{CC} or GND V _{IN} = 1.65 V	4.3	±145	±150	µA
		V _{IS} = V _{CC} or GND V _{IN} = 1.80 V		±125	±130	
		V _{IS} = V _{CC} or GND V _{IN} = 2.60 V		±50	±55	

6. Guaranteed by design. Resistance measurements do not include test circuit or package resistance.

NLAS5223CL DC ELECTRICAL CHARACTERISTICS – ANALOG SECTION

Symbol	Parameter	Condition	V _{CC}	Guaranteed Maximum Limit				Unit	
				25°C		–40°C to +85°C			
				Min	Max	Min	Max		
R _{ON}	NC/NO On-Resistance (Note 7)	V _{IN} = V _{IL} or V _{IN} = V _{IH} V _{IS} = GND to V _{CC} I _{COM} = 100 mA	3.0 4.3		0.4 0.35		0.5 0.4	Ω	
R _{FLAT}	NC/NO On-Resistance Flatness (Notes 7 and 8)	I _{COM} = 100 mA V _{IS} = 0 to V _{CC}	3.0 4.3		0.16 0.11		0.20 0.14	Ω	
ΔR _{ON}	On-Resistance Match Between Channels (Notes 7 and 9)	V _{IS} = 1.5 V; I _{COM} = 100 mA V _{IS} = 2.2 V; I _{COM} = 100 mA	3.0 4.3		0.05 0.05		0.05 0.05	Ω	
I _{NC(OFF)} I _{NO(OFF)}	NC or NO Off Leakage Current (Note 7)	V _{IN} = V _{IL} or V _{IH} V _{NO} or V _{NC} = 0.3 V V _{COM} = 4.0 V	4.3	-10	10	-100	100	nA	
I _{COM(ON)}	COM ON Leakage Current (Note 7)	V _{IN} = V _{IL} or V _{IH} V _{NO} 0.3 V or 4.0 V with V _{NC} floating or V _{NC} 0.3 V or 4.0 V with V _{NO} floating V _{COM} = 0.3 V or 4.0 V	4.3	-10	10	-100	100	nA	

7. Guaranteed by design. Resistance measurements do not include test circuit or package resistance.

8. Flatness is defined as the difference between the maximum and minimum value of On-resistance as measured over the specified analog signal ranges.

9. $\Delta R_{ON} = R_{ON(MAX)} - R_{ON(MIN)}$ between NC1 and NC2 or between NO1 and NO2.

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AC ELECTRICAL CHARACTERISTICS (Input $t_r = t_f = 3.0$ ns)

Symbol	Parameter	Test Conditions	V_{CC} (V)	V_{IS} (V)	Guaranteed Maximum Limit					Unit	
					25°C			-40°C to +85°C			
					Min	Typ*	Max	Min	Max		
t_{ON}	Turn-On Time	$R_L = 50 \Omega$, $C_L = 35 \text{ pF}$ (Figures 3 and 4)	2.3 – 4.5	1.5			50		60	ns	
t_{OFF}	Turn-Off Time	$R_L = 50 \Omega$, $C_L = 35 \text{ pF}$ (Figures 3 and 4)	2.3 – 4.5	1.5			30		40	ns	
t_{BBM}	Minimum Break-Before-Make Time	$V_{IS} = 3.0$ $R_L = 50 \Omega$, $C_L = 35 \text{ pF}$ (Figure 2)	3.0	1.5	2	15				ns	

		Typical @ 25, $V_{CC} = 3.6$ V			
C_{IN}	Control Pin Input Capacitance		3.5		pF
$C_{NO/NC}$	NO, NC Port Capacitance		60		pF
C_{COM}	COM Port Capacitance When Switch is Enabled		200		pF

*Typical Characteristics are at 25°C.

ADDITIONAL APPLICATION CHARACTERISTICS (Voltages Referenced to GND Unless Noted)

Symbol	Parameter	Condition	V_{CC} (V)	25°C	Unit
				Typical	
BW	Maximum On-Channel –3 dB Bandwidth or Minimum Frequency Response	V_{IN} centered between V_{CC} and GND (Figure 5)	1.65 – 4.5	24	MHz
V_{ONL}	Maximum Feed-through On Loss	$V_{IN} = 0 \text{ dBm}$ @ 100 kHz to 50 MHz V_{IN} centered between V_{CC} and GND (Figure 5)	1.65 – 4.5	-0.06	dB
V_{ISO}	Off-Channel Isolation	$f = 100 \text{ kHz}$; $V_{IS} = 1 \text{ V RMS}$; $C_L = 5.0 \text{ pF}$ V_{IN} centered between V_{CC} and GND (Figure 5)	1.65 – 4.5	-68	dB
Q	Charge Injection Select Input to Common I/O	$V_{IN} = V_{CC}$ to GND, $R_{IS} = 0 \Omega$, $C_L = 1.0 \text{ nF}$ $Q = C_L \times D_{V_{OUT}}$ (Figure 6)	1.65 – 4.5	38	pC
THD	Total Harmonic Distortion THD + Noise	$F_{IS} = 20 \text{ Hz}$ to 20 kHz, $R_L = R_{gen} = 600 \Omega$, $C_L = 50 \text{ pF}$ $V_{IS} = 2.0 \text{ V RMS}$	3.0	0.08	%
VCT	Channel-to-Channel Crosstalk	$f = 100 \text{ kHz}$; $V_{IS} = 1.0 \text{ V RMS}$, $C_L = 5.0 \text{ pF}$, $R_L = 50 \Omega$ V_{IN} centered between V_{CC} and GND (Figure 5)	1.65 – 4.5	-70	dB

10. Off-Channel Isolation = $20\log_{10}(V_{COM}/V_{NO})$, V_{COM} = output, V_{NO} = input to off switch.

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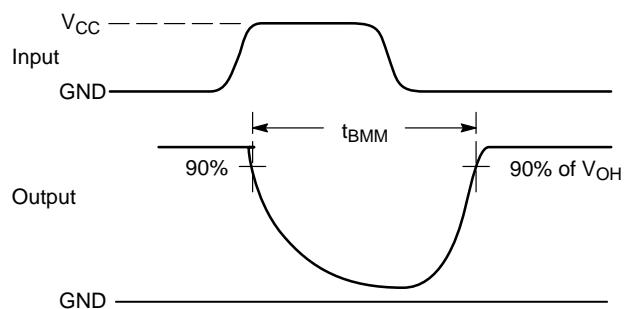
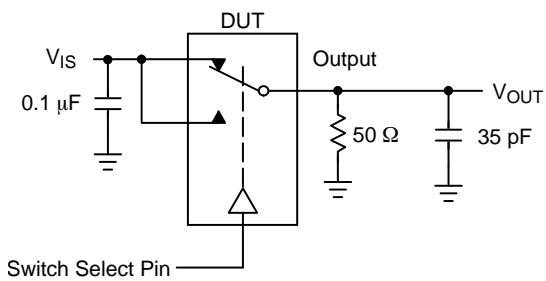


Figure 2. t_{BMM} (Time Break-Before-Make)

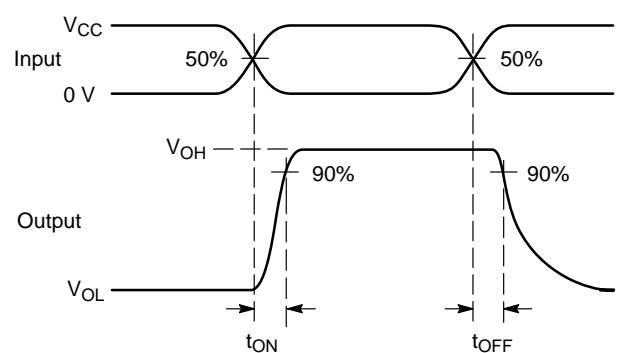
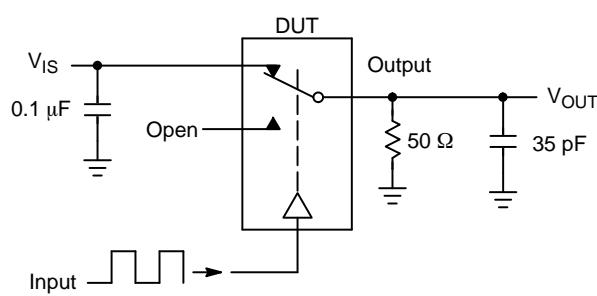


Figure 3. t_{ON}/t_{OFF}

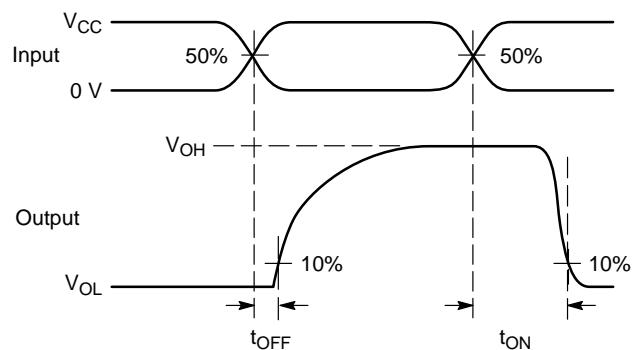
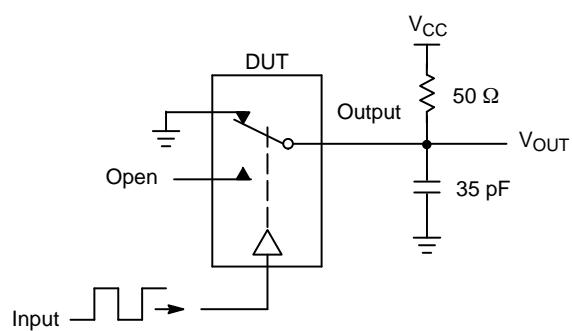
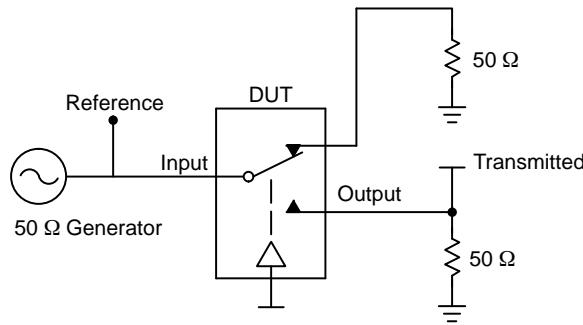


Figure 4. t_{ON}/t_{OFF}

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Channel switch control/s test socket is normalized. Off isolation is measured across an off channel. On loss is the bandwidth of an On switch. V_{ISO} , Bandwidth and V_{ONL} are independent of the input signal direction.

$$V_{ISO} = \text{Off Channel Isolation} = 20 \log\left(\frac{V_{OUT}}{V_{IN}}\right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz}$$

$$V_{ONL} = \text{On Channel Loss} = 20 \log\left(\frac{V_{OUT}}{V_{IN}}\right) \text{ for } V_{IN} \text{ at } 100 \text{ kHz to } 50 \text{ MHz}$$

Bandwidth (BW) = the frequency 3 dB below V_{ONL}

V_{CT} = Use V_{ISO} setup and test to all other switch analog input/outputs terminated with 50 Ω

**Figure 5. Off Channel Isolation/On Channel Loss (BW)/Crosstalk
(On Channel to Off Channel)/ V_{ONL}**

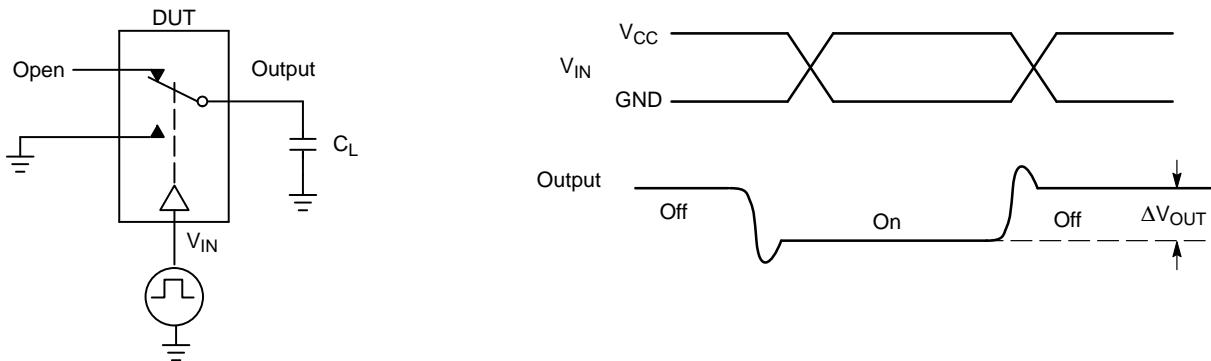
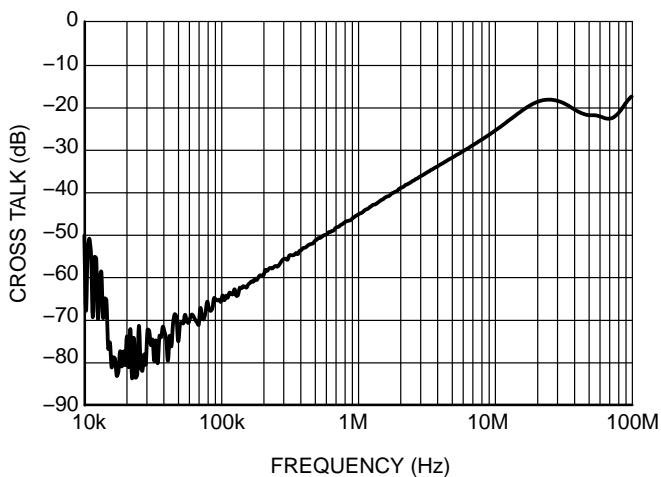
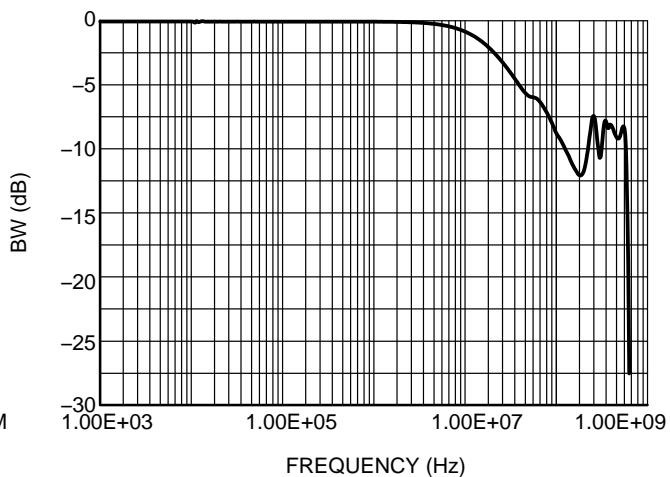


Figure 6. Charge Injection: (Q)

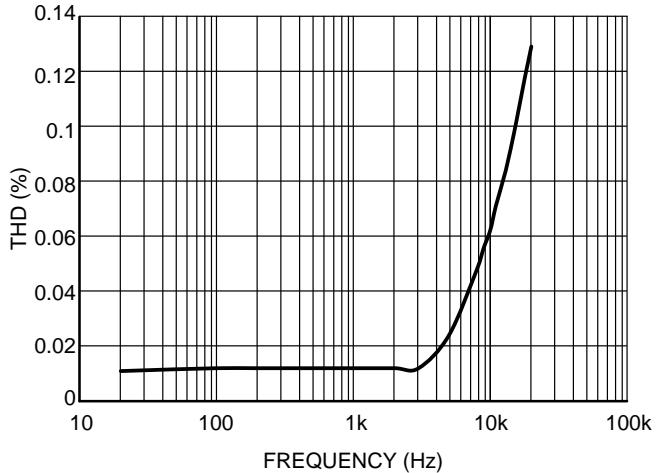
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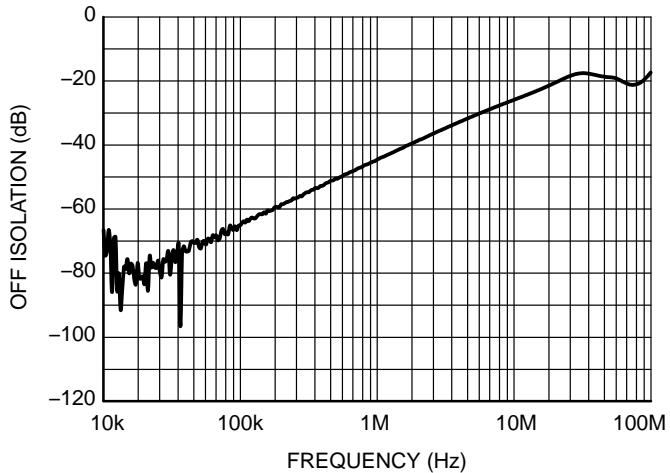
**Figure 7. Cross Talk vs. Frequency
($V_{CC} = 3.0$ V)**



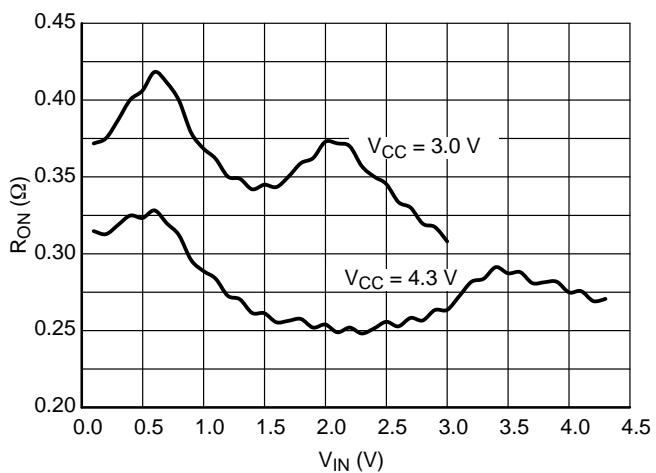
**Figure 8. Bandwidth
($V_{CC} = 3.0$ V)**



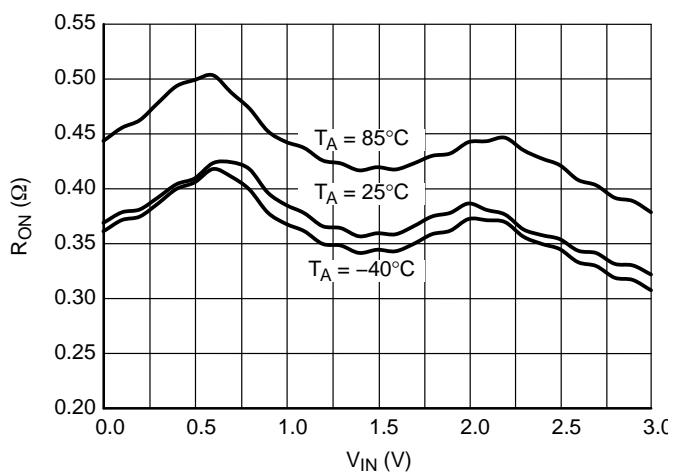
**Figure 9. Total Harmonic Distortion
($V_{CC} = 3.0$ V)**



**Figure 10. Off Isolation
($V_{CC} = 3.0$ V)**

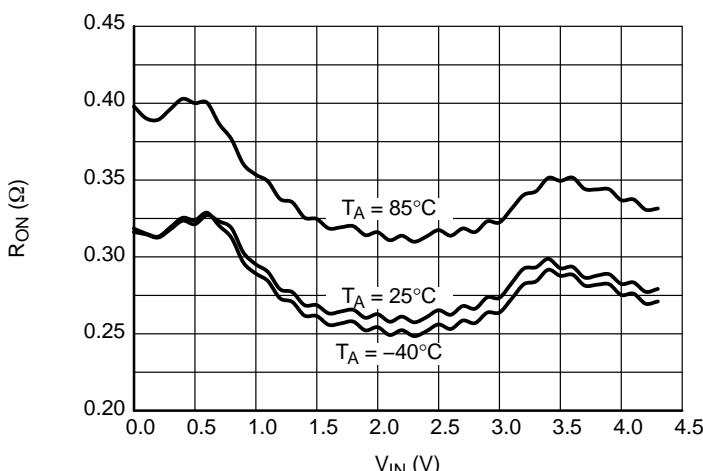


**Figure 11. On-Resistance vs. Input Voltage
@ 25°C and $V_{CC} = 3.0$ V and 4.3 V**



**Figure 12. On-Resistance vs. Input Voltage
@ $V_{CC} = 3.0$ V, $T_A = -40^{\circ}\text{C}$ to 85°C**

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**Figure 13. On-Resistance vs. Input Voltage
@ $V_{CC} = 3.0$ V, $T_A = -40^\circ\text{C}$ to 85°C**

ORDERING INFORMATION

Device	Marking	Package	Shipping [†]
NLAS5223CMUTAG	AK	UQFN10 (Pb-Free)	3000 / Tape & Reel
NLAS5223CLMUTAG	AU	UQFN10 (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.

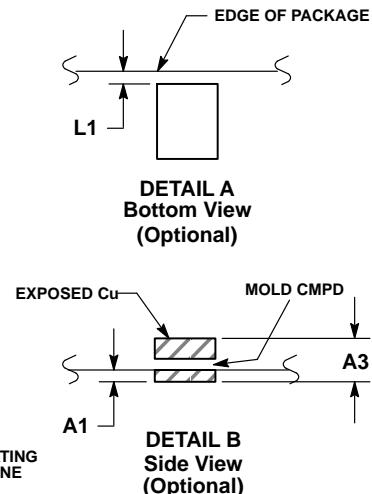
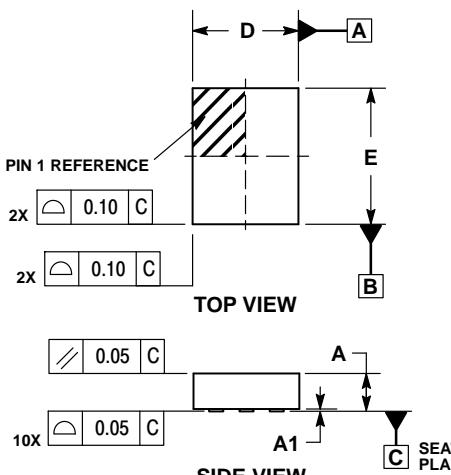
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PACKAGE DIMENSIONS

UQFN10, 1.4x1.8, 0.4P

CASE 488AT

ISSUE A

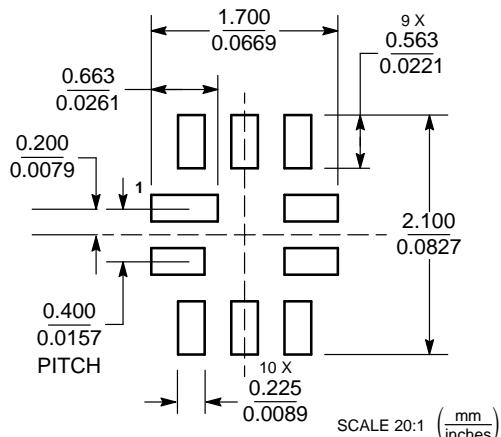


NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

	MILLIMETERS	
DIM	MIN	MAX
A	0.45	0.60
A1	0.00	0.05
A3	0.127 REF	
b	0.15	0.25
D	1.40 BSC	
E	1.80 BSC	
e	0.40 BSC	
L	0.30	0.50
L1	0.00	0.15
L3	0.40	0.60

MOUNTING FOOTPRINT



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ООО "ЛайфЭлектроникс"

"LifeElectronics" LLC

ИНН 7805602321 КПП 780501001 Р/С 40702810122510004610 ФАКБ "АБСОЛЮТ БАНК" (ЗАО) в г.Санкт-Петербурге К/С 30101810900000000703 БИК 044030703

Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибуторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибуторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помочь разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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