BCT4223
Low-Voltage, 0.4Ω Dual-SPDT Analog Switch

General Description

The BCT4223 is a high-performance, dual single-pole double-throw (SPDT) analog switch. Specified over a wide operating power supply voltage range, 1.65V to 5.0V, Targeted applications include battery powered equipment that benefit from ultra low ON-resistance(0.4Ω) and fast switching speeds.

Break-before-make switching prevents both switches being enabled simultaneously. This eliminates signal disruption during switching.

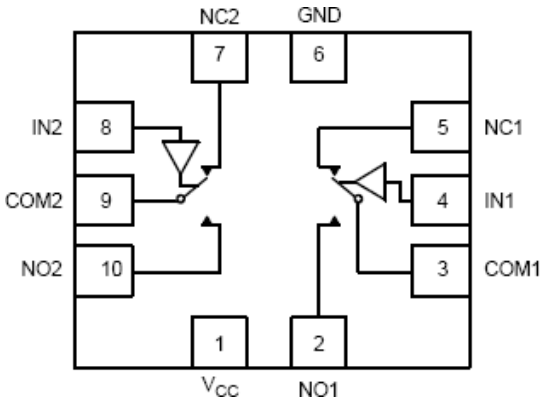
Applications

- Cell Phones
- PDAs
- Portable Instrumentation
- Battery Powered Communications
- Computer Peripherals

Features

♦ Low ON Resistance: 0.4-ohms at 5.0V
♦ Wide VCC Range: 1.65V to 5.0V
♦ Rail-to-Rail Signal Range
♦ ON-Resistance Matching: 0.04 Ω (TYP)
♦ ON-Resistance Flatness: 0.08Ω (TYP)
♦ High Off Isolation: 57dB at 10MHz
♦ 54dB (10MHz) Crosstalk Rejection Reduces Signal Distortion
♦ Break-Before-Make Switching
♦ -3dB Bandwidth: 70 MHz
♦ Extended Industrial Temperature Range: –40°C to 85°C
♦ Improved Direct Replacement for NLAS5223
♦ Packaging (Pb-free & Green available):

Connection Diagram (Top View)



Pin Description

Pin Number	Name	Description
2 , 10	NO1,NO2	Data Port
6	GND	Ground
5 , 7	NC1,NC2	Data Port (Normally Closed)
3 , 9	COM1,COM2	Common Output/Data Port
1	VCC	Positive Power Supply
4 , 8	IN1,IN2	Logic Control

Logic Function Table

Logic Input (S)	Function
0	NC1/NC2 Connected to COM1/COM2
1	NO1/NO2 Connected to COM1/COM2

Ordering Information

Ordering Code	Package Description	Temp Range	Top Marking
BCT4223ETB-TR	QFN1.8x1.4-10L	–40°C to +85°C	AFX

Notes: X=month

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Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CC}	Positive DC Supply Voltage	−0.5 to +5.25	V
V_{IS}	Analog Input Voltage (V_{NO}, V_{NC}, or V_{COM})	$-0.5 \leq V_{IS} \leq V_{CC} + 0.5$	V
V_{IN}	Digital Select Input Voltage	$-0.5 \leq V_{IN} \leq +5.25$	V
$I_{anl}1$	Continuous DC Current from COM to NC/NO	±300	mA
$I_{anl\text{-}pk}1$	Peak Current from COM to NC/NO, 10 Duty Cycle (Note 1)	±500	mA
I_{clmp}	Continuous DC Current into COM/NO/NC with Respect to V_{CC} or GND	±100	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.

Electrical Characteristics

(V_{cc} = +4.2V, GND = 0V, V_{IH} = +1.6V, V_{IL} = +0.6V, T_A = - 40°C to + 85°C. Typical values are at V_{cc} = +4.2V, T_A = + 25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS		TEMP	MIN	TPY	MAX	UNITS
ANALOG SWITCH								
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}			- 40°C to +85°C	0		VCC	V
On-Resistance	R_{ON}	V_{cc} = 4.2 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1		+25°C		0.4	0.65	Ω
				- 40°C to +85°C			0.75	Ω
On-Resistance Match Between Channels	ΔR_{ON}	V_{cc} = 4.2 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1		+25°C		0.04	0.15	Ω
				- 40°C to +85°C			0.2	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	V_{cc} = 4.2 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1		+25°C		0.08	0.12	Ω
				- 40°C to +85°C			0.2	Ω
Source OFF Leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	V_{cc} = 4.2 V, V_{NO} or V_{NC} = 3.3 V/ 0.3 V, V_{COM} = 0.3 V/ 3.3 V		- 40°C to +85°C			1	µA
Channel ON Leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	V_{cc} = 4.2 V, V_{COM} = 0.3 V/ 3.3 V, V_{NO} or V_{NC} = 0.3 V/ 3.3 V, or floating		- 40°C to +85°C			1	µA
DIGITAL INPUTS								
Input High Voltage	V_{INH}			- 40°C to +85°C	1.6			V
Input Low Voltage	V_{INL}			- 40°C to +85°C			0.5	V
Input Leakage Current	I_{IN}	V_{cc} = 4.2 V, V_{IN} = 0 V or 4.2 V		- 40°C to +85°C			1	µA
DYNAMIC CHARACTERISTICS								
Turn-On Time	t_{ON}	V_{IN} = 2.1 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 2.1 V, Test Circuit2		+25°C		88		ns
Turn-Off Time	t_{OFF}	V_{IN} = 2.1 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 2.1 V, Test Circuit2		+25°C		16		ns
Break-Before-Make Time Delay	t_D	V_{IN} = 2.1 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 2.1 V, Test Circuit3		+25°C		6.0		ns
Off Isolation	O_{ISO}	V_{BIAS} = 2.1 V, V_{IN} = 0 dBm, Test Circuit4	100KHz	+25°C		-78		dB
			1MHz	+25°C		-58		dB
Channel-to-Channel	X_{TALK}	V_{BIAS} = 2.1 V, V_{IN} = 0	100KHz	+25°C		-103		dB

Crosstalk		dBm, Test Circuit5	1MHz	+25°C		-90		dB
Bandwidth –3 dB	BW	V_{BIAS} = 2.1 V, V_{IN} = 0 dBm, Test Circuit6		+25°C		70		MHz
Charge Injection Select Input to Common I/O	Q	V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 0 V, C_L = 1.0 nF, Test Circuit7		+25°C		4.0		pC
Channel ON Capacitance	C_{ON}			+25°C		106		pF
POWER REQUIREMENTS								
Power Supply Range	VCC			- 40°C to +85°C	1.8		4.2	V
Power Supply Current	I_+	VCC = 4.2 V, V_{IN} = 0 V or V_{cc}		- 40°C to +85°C			1	µA

Electrical Characteristics

(V_{cc} = +2.7V to +3.6V, GND = 0V, V_{IH} = +1.6V, V_{IL} = +0.4V, T_A = - 40°C to + 85°C. Typical values are at V_{cc} = +3.0V, T_A = + 25°C, unless otherwise noted.)

PARAMETER	SYMBOL	CONDITIONS	TEMP	MIN	TPY	MAX	UNITS
ANALOG SWITCH							
Analog Signal Range	V_{NO}, V_{NC}, V_{COM}		- 40°C to +85°C	0		VCC	V
On-Resistance	R_{ON}	Vcc = 2.7 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.5	0.7	Ω
			- 40°C to +85°C			0.8	Ω
On-Resistance Match Between Channels	ΔR_{ON}	Vcc = 2.7 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.03	0.15	Ω
			- 40°C to +85°C			0.2	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	Vcc = 2.7 V, V_{NO}, V_{NC} or V_{COM} = 1 V, I_{COM} = -100 mA, Test Circuit 1	+25°C		0.1	0.18	Ω
			- 40°C to +85°C			0.2	Ω
Source OFF Leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	Vcc = 3.6 V, V_{NO} or V_{NC} = 3.3 V / 0.3 V, V_{COM} = 0.3 V/ 3.3 V	- 40°C to +85°C			1	µA
Channel ON Leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	Vcc = 3.6 V, V_{COM} = 0.3 V/ 3.3 V, V_{NO} or V_{NC} = 0.3 V/ 3.3 V, or floating	- 40°C to +85°C			1	µA
DIGITAL INPUTS							
Input High Voltage	V_{INH}		- 40°C to +85°C	1.5			V
Input Low Voltage	V_{INL}		- 40°C to +85°C			0.4	V
Input Leakage Current	I_{IN}	Vcc = 2.7 V, V_{IN} = 0 V or 2.7 V	- 40°C to +85°C			1	µA
DYNAMIC CHARACTERISTICS							
Turn-On Time	t_{ON}	V_{IN} =1.5 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 1.5 V, Test Circuit2	+25°C		100		ns
Turn-Off Time	t_{OFF}	V_{IN} = 1.5 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} = 1.5 V, Test Circuit2	+25°C		20		ns
Break-Before-Make Time Delay	t_D	V_{IN} = 1.5 V to 0 V, R_L = 50 Ω, C_L = 35 pF, V_{NO1} or V_{NC1} = V_{NO2} or V_{NC2} =1.5 V, Test Circuit3	+25°C		9.2		ns
Off Isolation	O_{ISO}	V_{BIAS} = 2.1 V, V_{IN} = 0 dBm, Test Circuit4 — 100KHz	+25°C		-78		dB
		1MHz	+25°C		-58		dB
Channel-to-Channel Crosstalk	XTALK	VBIAS = 2.1 V, VIN = 0 dBm, Test Circuit5 — 100KHz	+25°C		-103		dB
		1MHz	+25°C		-90		dB
Bandwidth –3 dB	BW	VBIAS = 2.1 V, VIN = 0 dBm, Test Circuit6	+25°C		70		MHz

Charge Injection Select Input to Common I/O	Q	VNO1 or VNC1 = VNO2 or VNC2 =0 V, CL=1.0nF Test Circuit7	+25°C		3.0		pC
Channel ON Capacitance	CON		+25°C		106		pF

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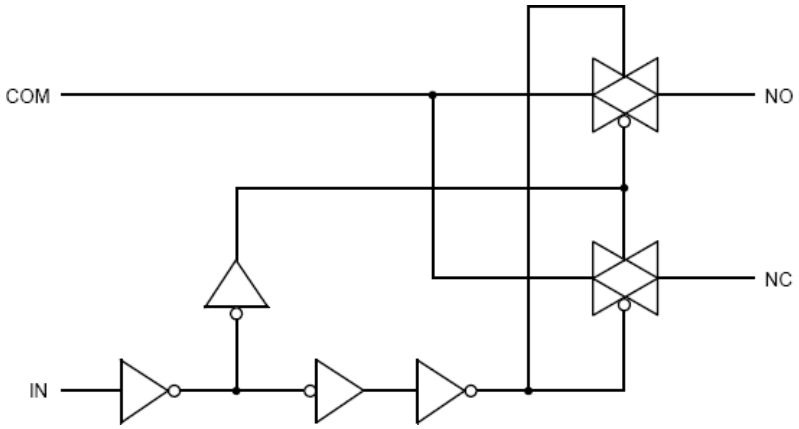


Figure 1. Logic equivalent circuit

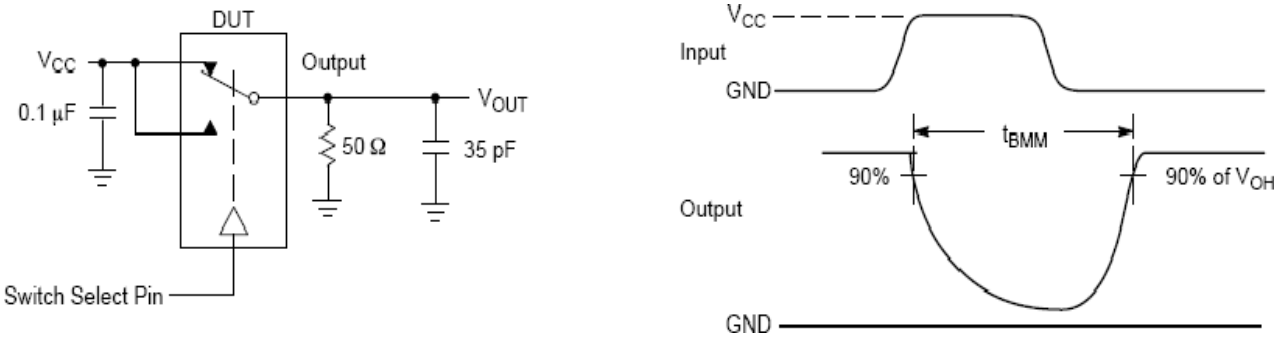


Figure 2. t_{BBM} (Time Break-Before-Make)

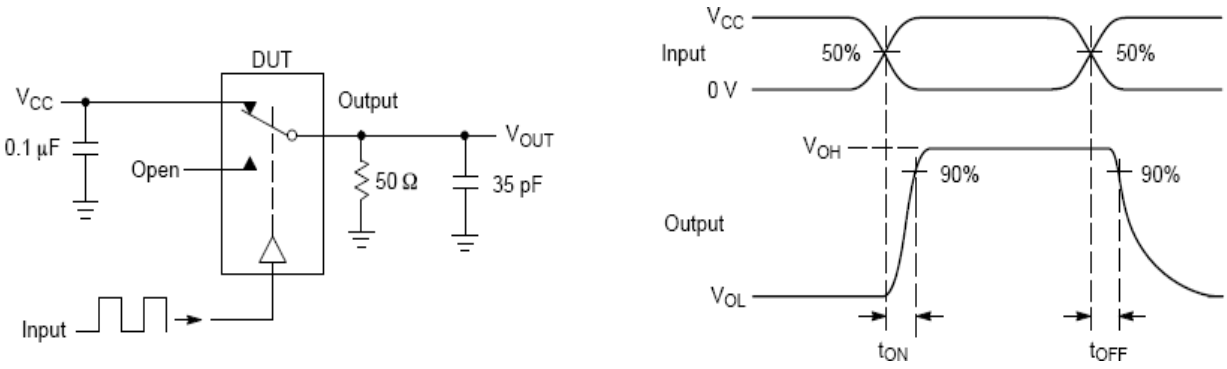


Figure 3. $t_{ON/OFF}$

Low-Voltage, 0.4Ω Dual-SPDT Analog Switch

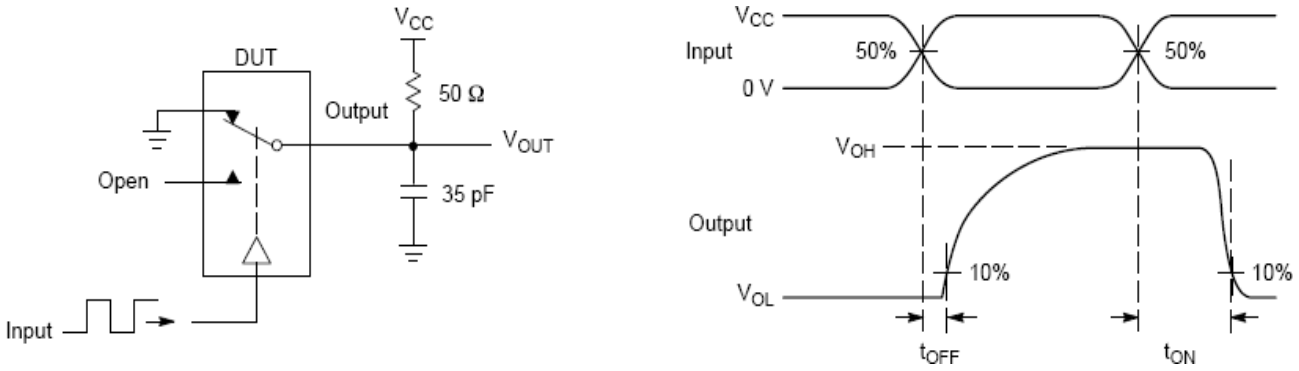


Figure 4. $t_{ON/OFF}$

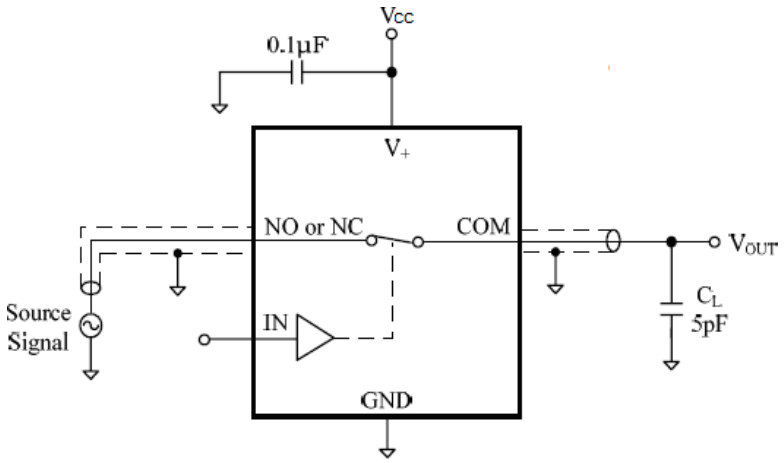


Figure 5. Bandwidth -3dB

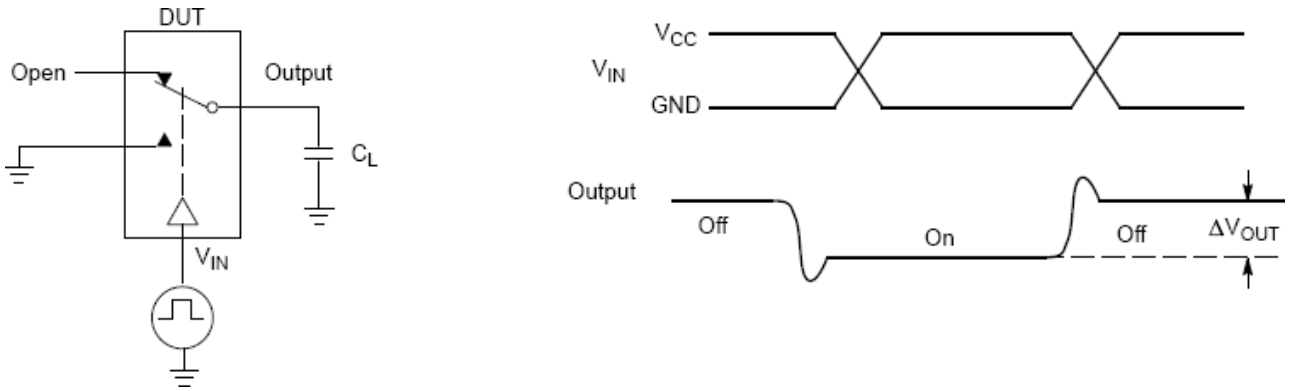
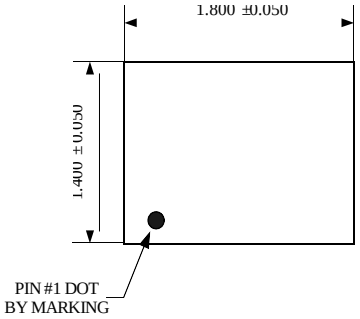


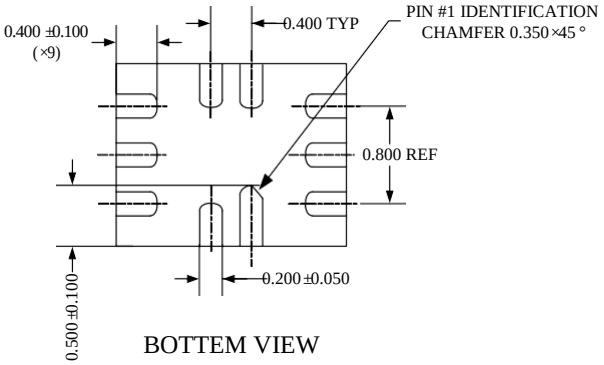
Figure 6. Charge Injecting (Q)

Low-Voltage, 0.4Ω Dual-SPDT Analog Switch

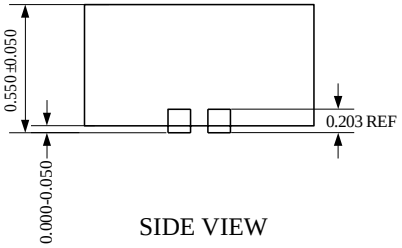
Package Information



TOP VIEW



BOTTEM VIEW



SIDE VIEW

Note: All linear dimensions are in millimeters.