BCT4222C

High-Speed DPDT Analog Switch

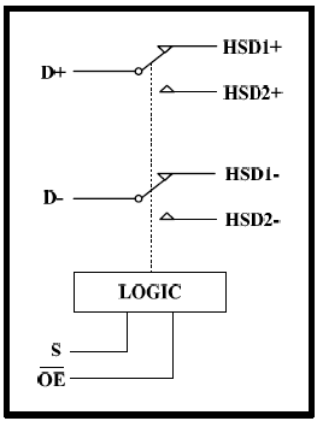
Features

♦ Vcc Operating Range: 1.65V to 5.0V
♦ Rail-to-Rail Signal Range
♦ ON-Resistance Matching: 0.05 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: 700MHz
♦ Extended Industrial Temperature Range: –40°C to 85°C
♦ Packaging (Pb-free & Green available)

Applications

- Cell Phones
- PDAs
- Portable Instrumentation
- Differential Signal Data Routing s
- USB 2.0 Signal Routing

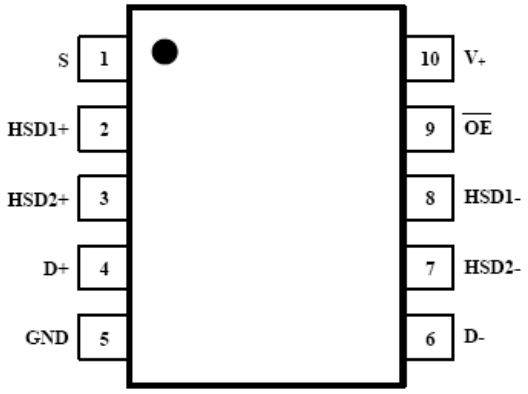
Block Diagram



General Description

BCT4222C is a high bandwidth, fast double-pole double-throw (DPDT) analog switch. It's wide bandwidth and low bit-to-bit skew allow it to pass high-speed differential signals with good signal integrity. Each switch is bidirectional and offers little or no attenuation of the high-speed signals at the outputs. Industry-leading advantages include a propagation delay of less than 250ps, resulting from its low channel resistance and low I/O capacitance. Their high channel-to-channel crosstalk rejection results in minimal noise interference.

Pin Description



MSOP-10

Pin Number	Name	Description
1	S	Select Input
2 , 3	HSD1+,HSD2+	Data Ports
4 , 6	D+, D-	Data Ports
8 , 7	HSD1-,HSD2-	Data Ports
5	GND	Ground
9	/OE	Output Enable
10	V+	Positive Power Supply

Logic Function Table

/OE	S	HSD1+HSD1-	HSD2+HSD2-
1	X	OFF	OFF
0	0	ON	OFF
0	1	OFF	ON

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Ordering Information

Ordering Code	Package Description	Temp Range	Top Marking
BCT4222CEAB	MSOP-10	–40°C to +85°C	4222C

Maximum Ratings

Symbol	Pins	Parameter	Value	Unit
V_{CC}	V_{CC}	Positive DC Supply Voltage	-0.5 to +5.25	V
V_{IS}	HSD1+, HSD1-,HSD2+, HSD2-	Analog Signal Voltage	-0.5 to V_{CC} + 0.3	V
	D+, D-		-0.5 to +5.25	
V_{IN}	/OE	Control Input Voltage	-0.5 to +5.25	V
I_{CC}	V_{CC}	Positive DC Supply Current	50	mA
T_S		Storage Temperature	-65 to +150	°C
I_{IN}	/OE	Control Input Current	±20mA	mA

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions

Symbol	Pins	Parameter	Min	Max	Unit
V_{CC}		Positive DC Supply Voltage	1.65	5.0	V
V_{IS}	HSD1+, HSD1HSD2+, HSD2	Analog Signal Voltage	GND	V_{CC}	V
	D+, D		GND	5.0	
V_{IN}	OE	Digital Select Input Voltage	GND	V_{CC}	V
T_A		Operating Temperature Range	−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.

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ESD Protection

Symbol	Parameter	Value	Unit
ESD	Human Body Model - All Pins	2.0	kV
ESD	Human Body Model - I/O to GND	8.0	kV

DC Electrical Characteristics CONTROL INPUT (Typical: T = 25°C, VCC = 3.3 V)

BCT4222C Supply and Leakage Current

Symbol	Pins	Parameter	Test Conditions	VCC (V)	-40°C to +85°C			Unit
					Min	Typ	Max	
I_{CC}	V_{CC}	Quiescent Supply Current	V_{IS} = V_{CC} or GND; I_{OUT} = 0 A	1.65 – 5.0	-	-	1.0	uA
I_{CCT}	V_{CC}	Increase in I_{CC} per Control Voltage	V_{IN} = 2.6 V	3.6	-	-	10	uA
I_{OZ}	HSD1+, HSD1HSD 2+, HSD2	OFF State Leakage Current	0 ≤ V_{IS} ≤ V_{CC}	1.65 – 5.0	-	-	±1.0	uA
I_{OFF}	D+, D-	Power OFF Leakage Current	0 ≤ V_{IS} ≤ 4.5 V	0	-	-	±1.0	uA

BCT4222C High Speed on Resistance

Symbol	Pins	Parameter	Test Conditions	VCC (V)	-40°C to +85°C			Unit
					Min	Typ	Max	
R_{ON}	V_{CC}	On-Resistance	V_{IS} = 0 V to 0.4 V, I_{ON} = 8 mA	2.7 3.3 4.2	-	9.0 8.0 7.0	12 10 8.0	Ω
R_{FLAT}		On-Resistance Flatness	V_{IS} = 0 V to 1.0 V, I_{ON} = 8 mA	2.7 3.3 4.2	-	1.6 1.5 1.4		Ω
R_{ON}		On-Resistance Matching	V_{IS} = 0 V to 0.4 V, I_{ON} =8 mA	2.7 3.3 4.2		1.6 1.5 1.4		Ω

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BCT4222C DC Electrical Characteristics (continued)

FULL SPEED ON RESISTANCE (Typical: T = 25°C, VCC = 3.3 V)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to +85°C			Unit
RON		On-Resistance	VIS = 0 V to VCC, ION = 8 mA	2.7		9.0	12	Ω
				3.3		8.5	10.5	
				4.2		7.5	8.5	
RFLAT		On-Resistance Flatness	VIS = 0 V to 1.0 V, ION = 8 mA	2.7		1.6		Ω
				3.3		1.5		
				4.2		1.4		
RON		On-Resistance Matching	VIS = 0 V to VCC, ION = 8 mA	2.7		2.20		Ω
				3.3		2.45		
				4.2		2.65		

BCT4222C AC Electrical Characteristics

TIMING/FREQUENCY (Typical: T = 25°C, VCC = 3.3 V, RL = 50Ω , CL = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	V_{CC} (V)	-40°C to +85°C			Unit
					Min	Typ	Max	
tON	Closed to Open	Turn-ON Time	See test circuit 3	1.65 -5.0	-	14	30	ns
tOFF	Open to Closed	Turn-OFF Time	See test circuit 3	1.65 – 5.0	-	10	20	ns
tBBM		Break-Before-Make Delay	See test circuit 2	1.65 – 5.0	3.0	4.4	7.0	ns
BW		-3 dB Bandwidth	CL = 5 pF	1.65 – 5.0	-	550	-	MHz
			CL = 0 pF		-	700	-	

BCT4222C High-Speed DPDT Analog Switch

BCT4222C ISOLATION (Typical: T = 25°C, V_{CC} = 3.3 V, RL = 50Ω, CL = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	Vcc (V)	-40°C to +85°C			Unit
					Min	Typ	Max	
OIRR	Open	OFF-Isolation	f = 250 MHz	1.65 – 5.0	-	-22	-	dB
XTALK	HSD1+ to HSD1	Non-Adjacent Channel Crosstalk	f = 250 MHz	1.65 – 5.0	-	-30	-	dB

BCT4222C CAPACITANCE (Typical: T = 25°C, V_{CC} = 3.3 V, RL = 50Ω, CL = 5 pF, f = 1 MHz)

Symbol	Pins	Parameter	Test Conditions	-40°C to +85°C			Unit
				Min	Typ	Max	
CIN	OE	Control Pin Input Capacitance	VCC = 0 V	-	3.0	-	pF
CON	D+ to HSD1+ or HSD2+	ON Capacitance	VCC = 3.3 V; OE = 0 V	-	8.0	-	pF
COFF	HSD2+, HSD2	OFF Capacitance	VCC = VIS = 3.3 V; OE = 3.3 V	-	4.5	-	pF

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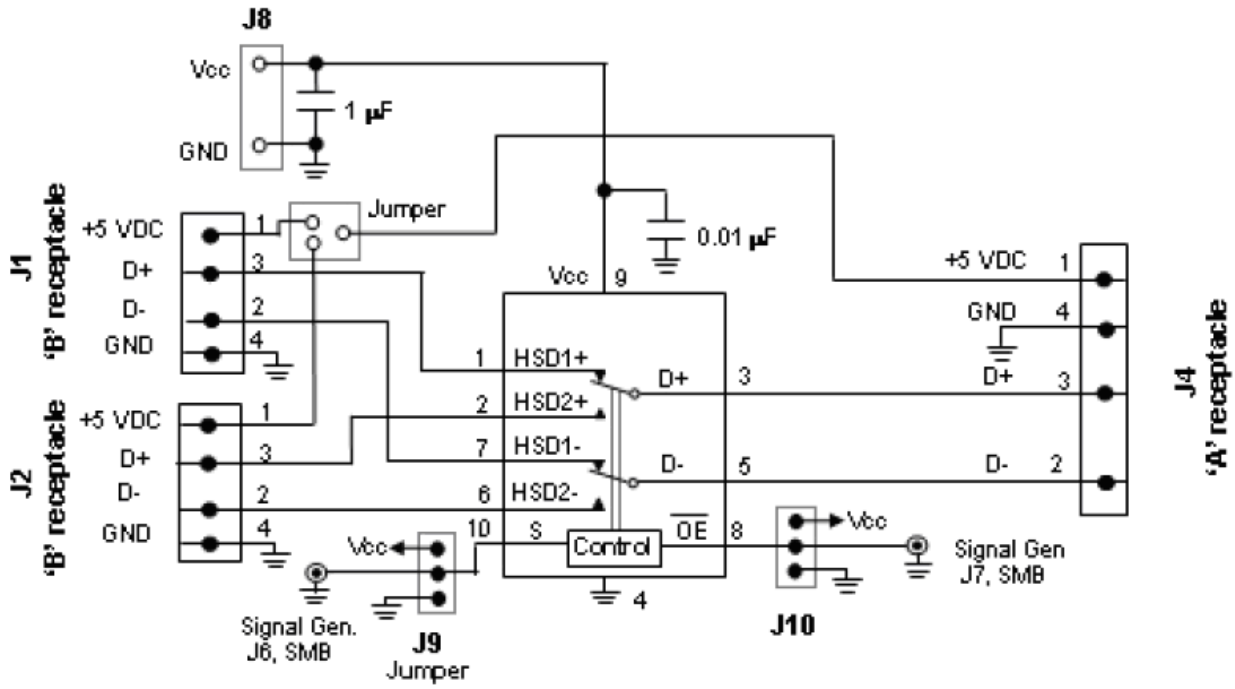

Figure 1. Schematic of the BCT4222 USB demo

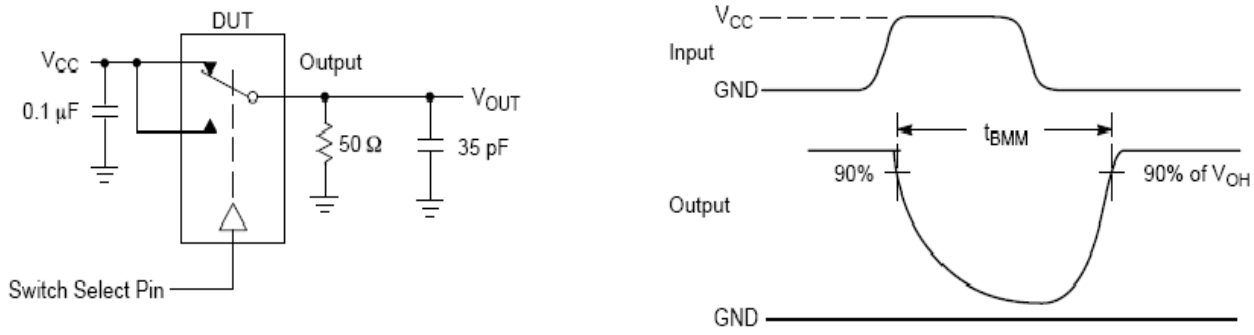

Figure 2. t_{BBM} (Time Break-Before-Make)

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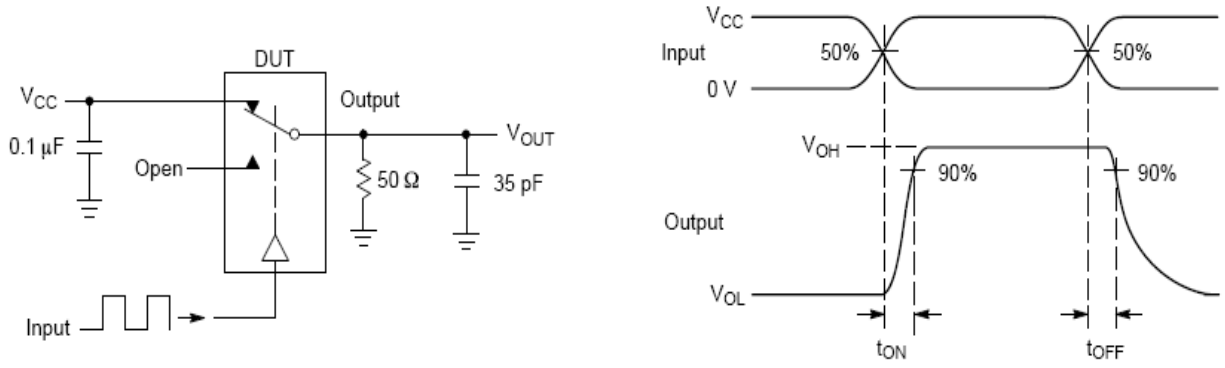

Figure 3. $t_{ON/OFF}$

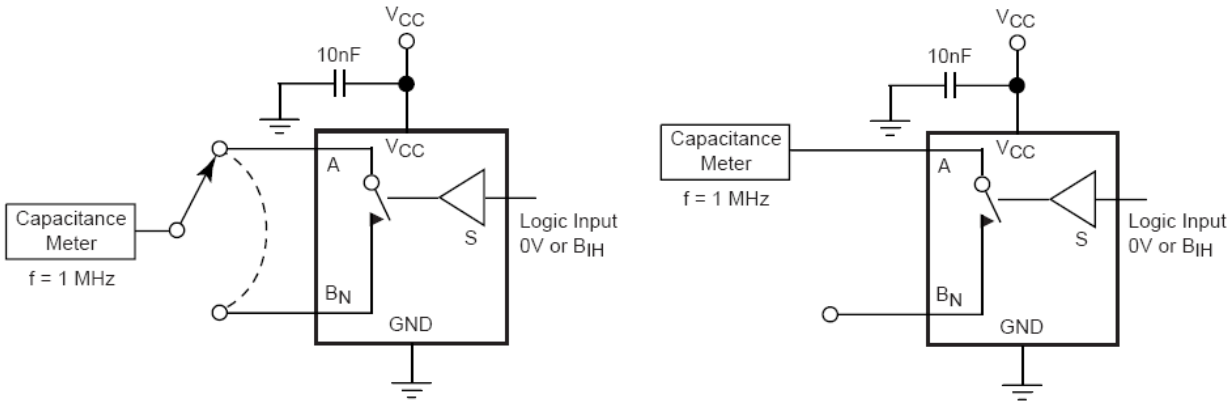

Figure 4. Channel ON/OFF Capacitance

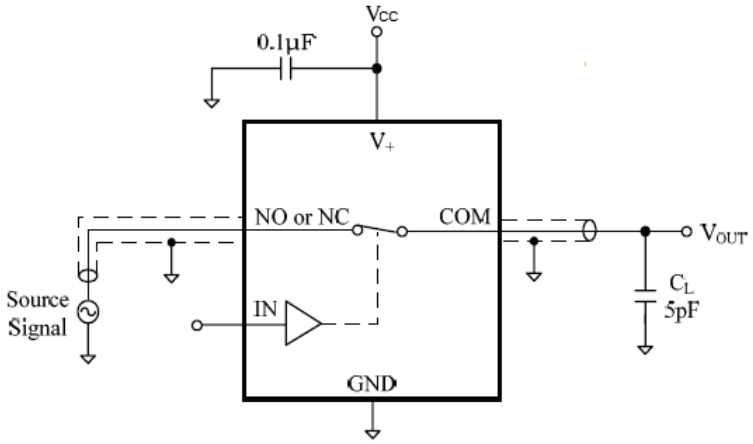

Figure 5. Bandwidth -3dB

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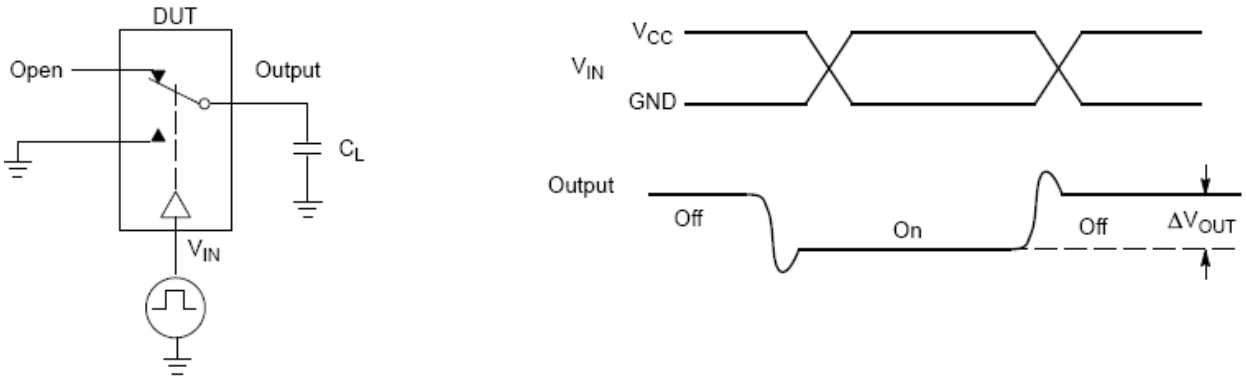

Figure 6. Charge Injecting (Q)

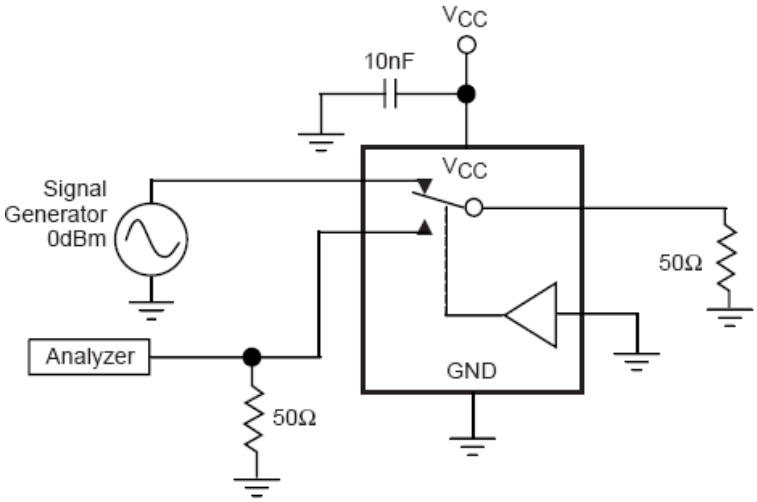

Figure 7. Crosstalk

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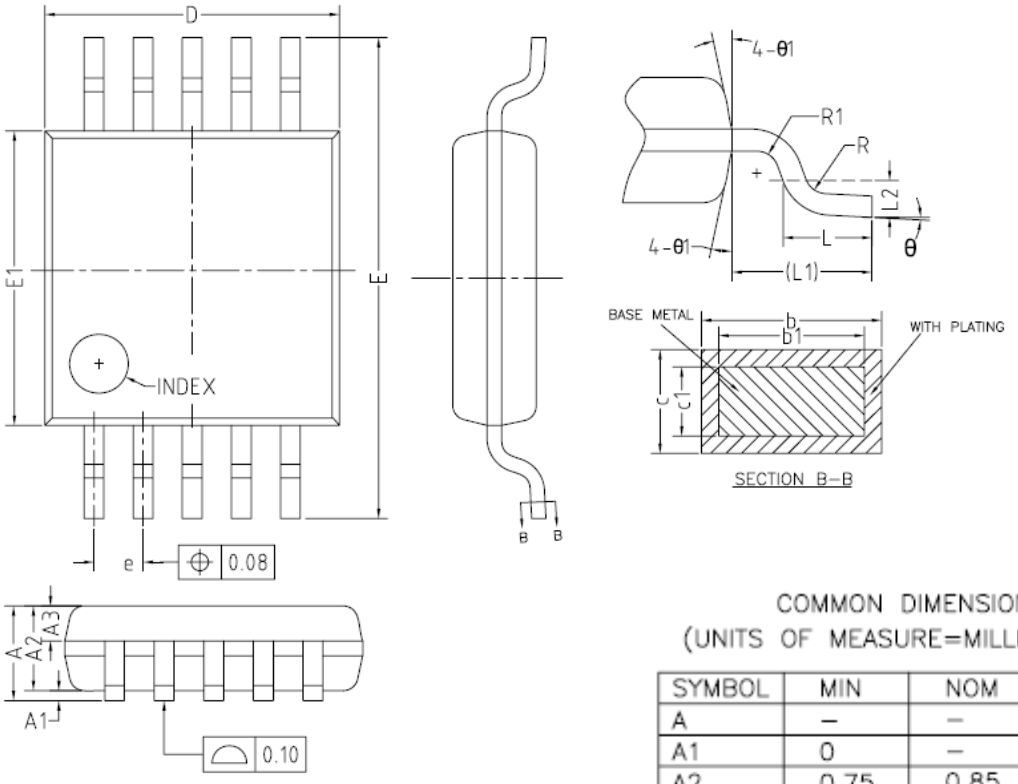
Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

SYMBOL	MIN	NOM	MAX
A	–	–	1.10
A1	0	–	0.15
A2	0.75	0.85	0.95
A3	0.25	0.35	0.39
b	0.18	–	0.27
b1	0.17	0.20	0.23
c	0.15	–	0.20
c1	0.14	0.15	0.16
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.40	0.50	0.60
L	0.40	0.60	0.80
L1	0.95REF		
L2	0.25BSC		
R	0.07	–	–
R1	0.07	–	–
θ	0°	–	8°
θ 1	9°	12°	15°