

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 4.3V, 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

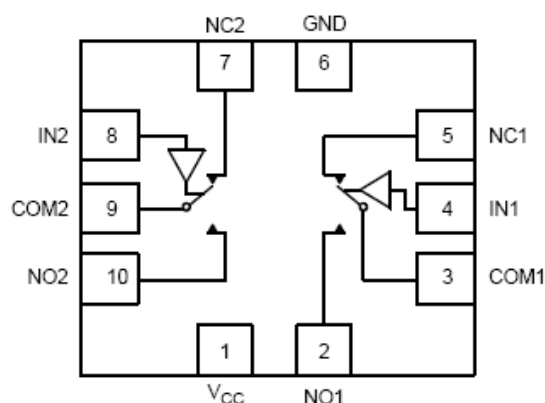
Features

- ◆ Low ON Resistance: 0.4-ohms at 4.2V
- ◆ Wide VCC Range: 1.65V to 4.3V
- ◆ 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):

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

Connection Diagram (Top View)



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	10-pin WQFN 1.4X1.8	-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 +4.6	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} ≤ +4.6	V
I _{anl1}	Continuous DC Current from COM to NC/NO	±300	mA
I _{anl-pk1}	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		V _{CC}	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	Δ 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		0.04	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 _{I_H}		-40° C to +85° C	1.6			V
Input Low Voltage	V _{I_L}		-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	$V_{IN} = 2.1\text{ V to } 0\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, V_{N01} or $V_{NC1} = V_{N02}$ or $V_{NC2} = 2.1\text{ V}$, Test Circuit3	+25° C		6.0		ns
Off Isolation	O_{ISO}	$V_{BIAS} = 2.1\text{ V}$, $V_{IN} = 0\text{ dBm}$, Test Circuit4	100KHz	+25° C		-78	dB
			1MHz	+25° C		-58	dB
Channel-to-Channel Crosstalk	X_{TALK}	$V_{BIAS} = 2.1\text{ V}$, $V_{IN} = 0\text{ dBm}$, Test Circuit5	100KHz	+25° C		-10 3	dB
			1MHz	+25° C		-90	dB
Bandwidth -3 dB	BW	$V_{BIAS} = 2.1\text{ V}$, $V_{IN} = 0\text{ dBm}$, Test Circuit6	+25° C		70		MHz
Charge Injection Select Input to Common I/O	Q	V_{N01} or $V_{NC1} = V_{N02}$ or $V_{NC2} = 0\text{ V}$, $C_L = 1.0\text{ nF}$, 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_+	$V_{CC} = 4.2\text{ V}$, $V_{IN} = 0\text{ V}$ or V_{CC}	- 40° C to +85° C			1	μA

ELECTRICAL CHARACTERISTICS

($V_{CC} = +2.7\text{ V to } +3.6\text{ V}$, $GND = 0\text{ V}$, $V_{IH} = +1.6\text{ V}$, $V_{IL} = +0.4\text{ V}$, $T_A = -40^\circ\text{ C to } +85^\circ\text{ C}$. Typical values are at $V_{CC} = +3.0\text{ V}$, $T_A = +25^\circ\text{ C}$, 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}	$V_{CC} = 2.7\text{ V}$, V_{NO} , V_{NC} or $V_{COM} = 1\text{ V}$, $I_{COM} = -100\text{ mA}$, 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}	$V_{CC} = 2.7\text{ V}$, V_{NO} , V_{NC} or $V_{COM} = 1\text{ V}$, $I_{COM} = -100\text{ mA}$, Test Circuit 1	+25° C		0.03	0.15	Ω
			- 40° C to +85° C			0.2	Ω
On-Resistance Flatness	$R_{FLAT(ON)}$	$V_{CC} = 2.7\text{ V}$, V_{NO} , V_{NC} or $V_{COM} = 1\text{ V}$, $I_{COM} = -100\text{ mA}$, Test Circuit 1	+25° C		0.1	0.18	Ω
			- 40° C to +85° C			0.2	Ω
Source OFF Leakage current	$I_{NC(OFF)}$, $I_{NO(OFF)}$	$V_{CC} = 3.6\text{ V}$, V_{NO} or $V_{NC} = 3.3\text{ V} / 0.3\text{ V}$, $V_{COM} = 0.3\text{ V} / 3.3\text{ V}$	- 40° C to +85° C			1	μA
Channel ON Leakage current	$I_{NC(ON)}$, $I_{NO(ON)}$, $I_{COM(ON)}$	$V_{CC} = 3.6\text{ V}$, $V_{COM} = 0.3\text{ V} / 3.3\text{ V}$, V_{NO} or $V_{NC} = 0.3\text{ V} / 3.3\text{ V}$, 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}	$V_{CC} = 2.7\text{ V}$, $V_{IN} = 0\text{ V}$ or 2.7 V	- 40° C to +85° C			1	μA
DYNAMIC CHARACTERISTICS							

Turn-On Time	t_{ON}	$V_{IN} = 1.5\text{ V to } 0\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, V_{N01} or $V_{NC1} = V_{N02}$ or $V_{NC2} = 1.5\text{ V}$, Test Circuit2	+25° C		100		ns
Turn-Off Time	t_{OFF}	$V_{IN} = 1.5\text{ V to } 0\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, V_{N01} or $V_{NC1} = V_{N02}$ or $V_{NC2} = 1.5\text{ V}$, Test Circuit2	+25° C		20		ns
Break-Before-Make Time Delay	t_D	$V_{IN} = 1.5\text{ V to } 0\text{ V}$, $R_L = 50\ \Omega$, $C_L = 35\text{ pF}$, V_{N01} or $V_{NC1} = V_{N02}$ or $V_{NC2} = 1.5\text{ V}$, Test Circuit3	+25° C		9.2		ns
Off Isolation	O_{ISO}	$V_{BIAS} = 2.1\text{ V}$, $V_{IN} = 0\text{ dBm}$, Test Circuit4	100KHz	+25° C		-78	dB
			1MHz	+25° C		-58	dB
Channel-to-Channel Crosstalk	X_{TALK}	$V_{BIAS} = 2.1\text{ V}$, $V_{IN} = 0\text{ dBm}$, Test Circuit5	100KHz	+25° C		-103	dB
			1MHz	+25° C		-90	dB
Bandwidth -3 dB	BW	$V_{BIAS} = 2.1\text{ V}$, $V_{IN} = 0\text{ dBm}$, Test Circuit6	+25° C		70		MHz
Charge Injection Select Input to Common I/O	Q	V_{N01} or $V_{NC1} = V_{N02}$ or $V_{NC2} = 0\text{ V}$, $C_L = 1.0\text{ nF}$ Test Circuit7	+25° C		3.0		pC
Channel ON Capacitance	C_{ON}		+25° C		106		pF

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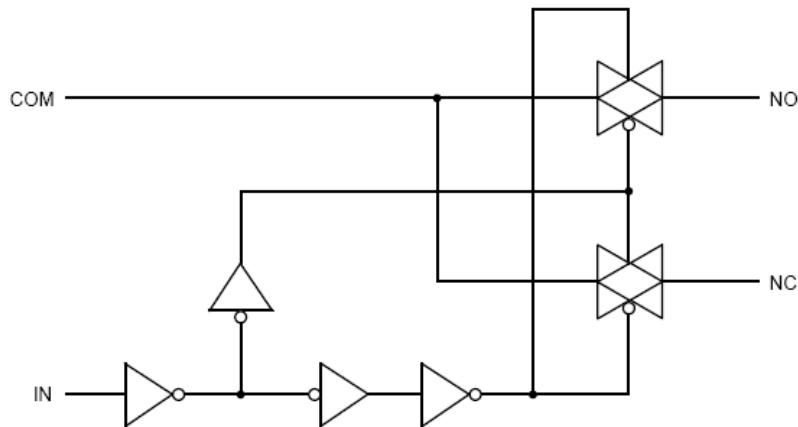
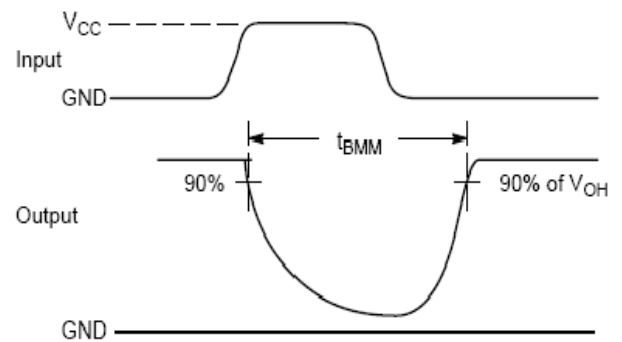
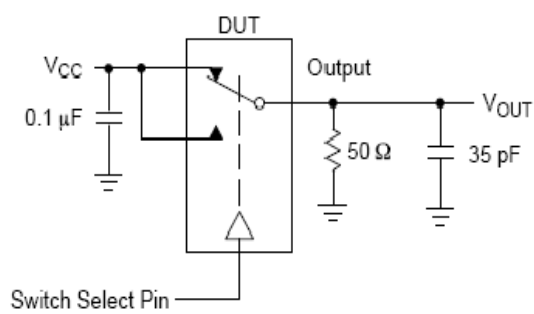
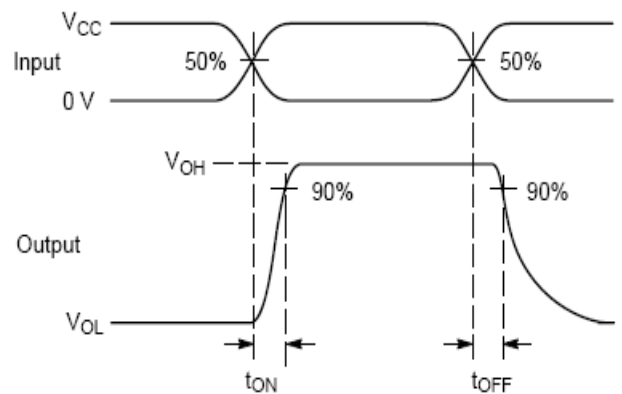
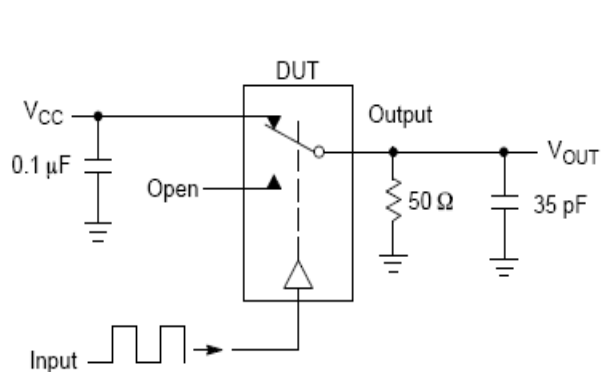


Figure 1. Logic equivalent circuit

Figure 2. t_{BMM} (Time Break-Before-Make)Figure 3. $t_{ON/OFF}$

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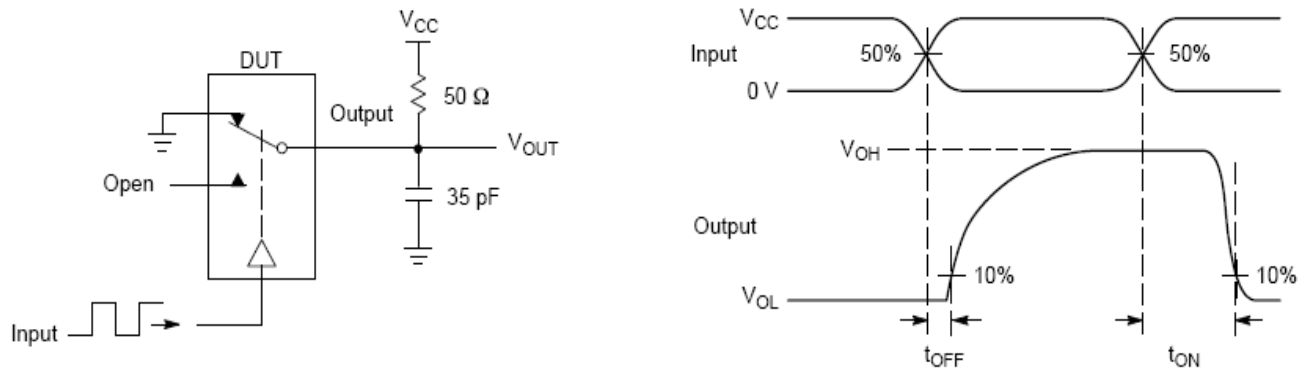
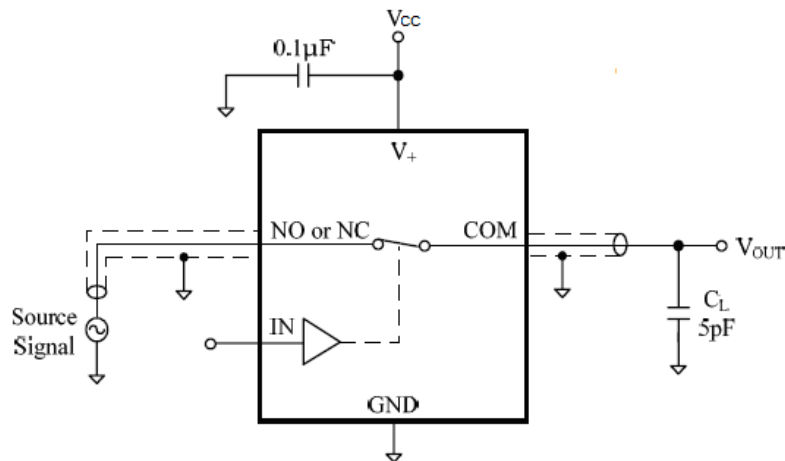
Figure 4. $t_{ON/OFF}$ 

Figure 5. Bandwidth -3dB

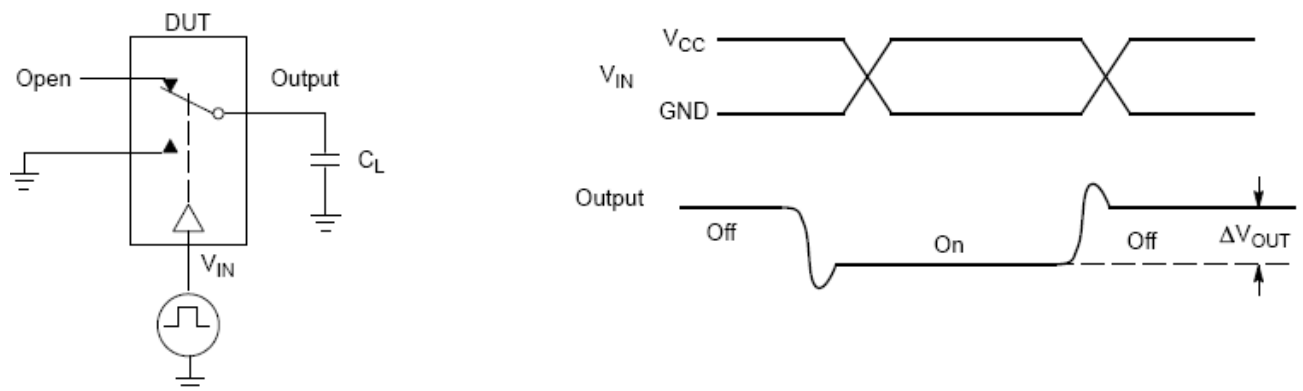
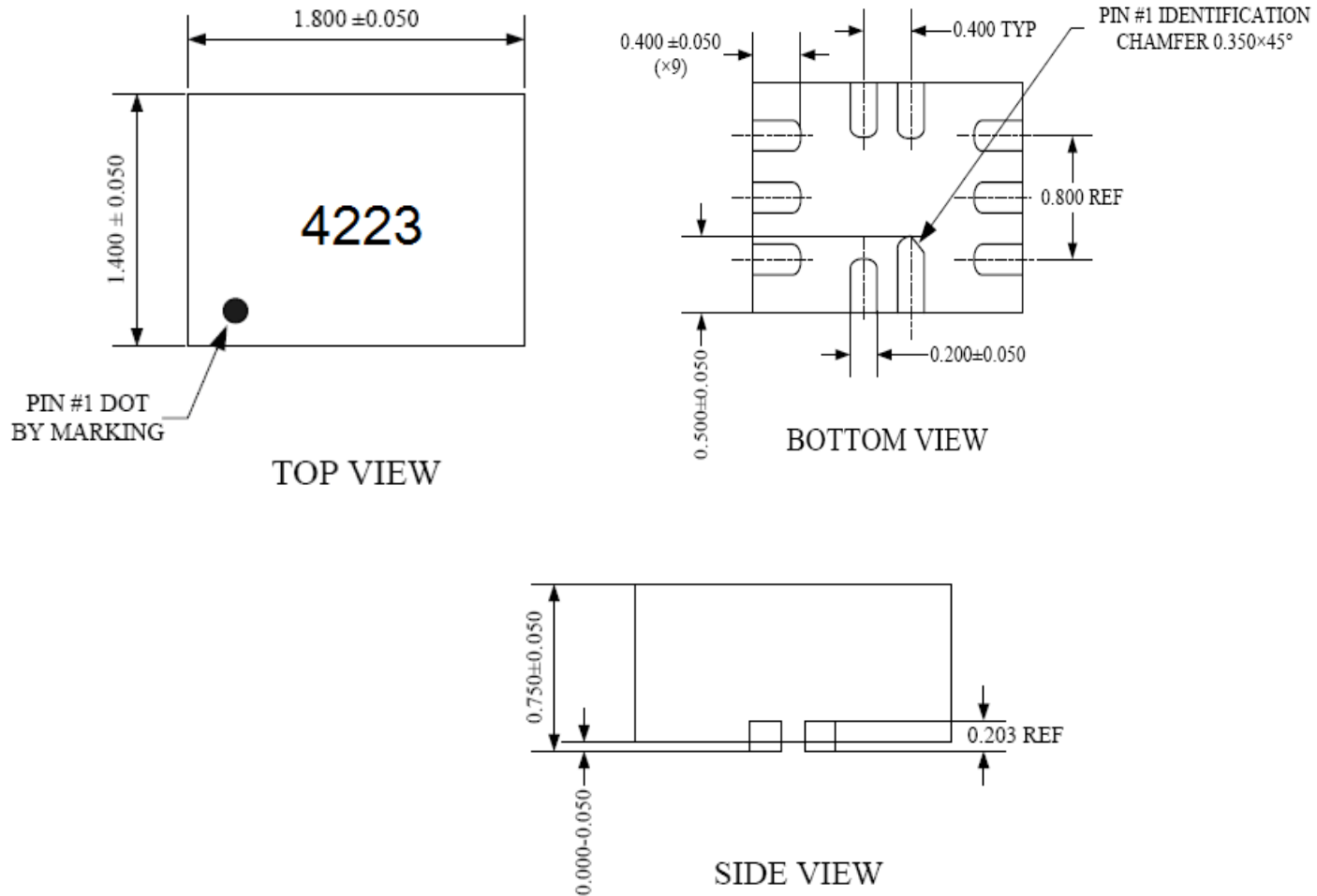


Figure 6. Charge Injecting (Q)

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Package Information



Note: All linear dimensions are in millimeters.