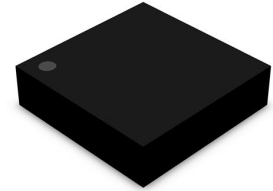




Product Description

The CT815ST is an integrated magnetic latch with dual outputs designed for consumer switching applications that supports independent activation in the presence of negative and positive fields. It is based on Crocus Technology's patented Magnetic Logic Unit™ (MLU™) technology with integrated CMOS process to provide a monolithic solution for superior sensing performance.

This dual unipolar magnetic latch features an industry leading low power consumption as low as 280 nA. It is capable of handling large air gap applications with magnetic fields down to 0.9 mT. The CT815ST is offered in a dual active-low push-pull CMOS output configuration. Therefore OUT1 will turn on when there is a positive (South) field of sufficient strength and likewise with OUT2 for a negative (North) field. It is available in a low profile and small form factor 4-lead LGA package, providing cost effective and space-saving solutions for high volume manufacturing. Please contact factory for custom solutions.



1.40 x 1.40 x 0.44 mm LGA

Features

- High sensitivity, B_{OP} as low as 0.9 mT
- Dual unipolar TMR sensors
- Supports dual output to signal either negative or positive field activation
- Dual digital CMOS push-pull outputs
- Resistant to mechanical stress
- Ultra-low power consumption as low as 280 nA
- Low profile and small form factor packaging
- RoHS Compliant

Applications

- IoT devices
- Smartphones, tablets, and laptops
- Door or lid closure detection
- Proximity detection
- Power switch or open-close detection



CT815ST

Dual Unipolar TMR Latch
With Dual Outputs for
Consumer Applications

Figure 1: CT815ST Block Diagram

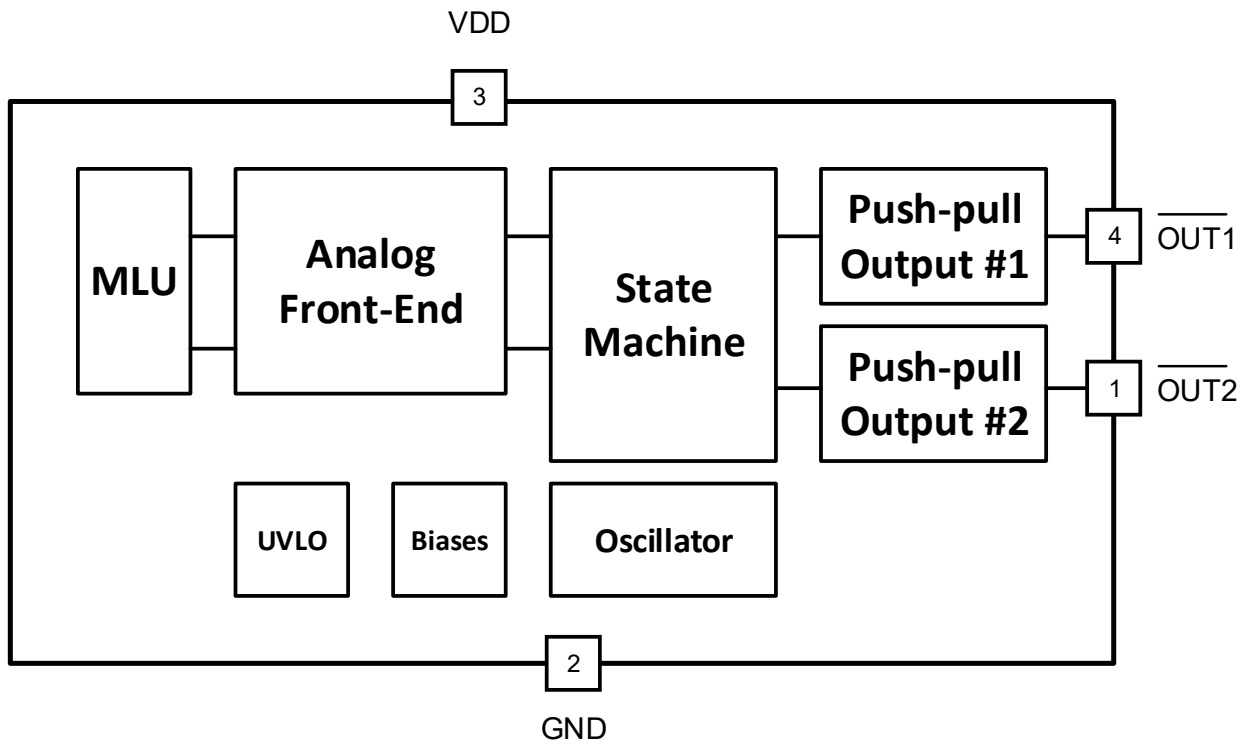
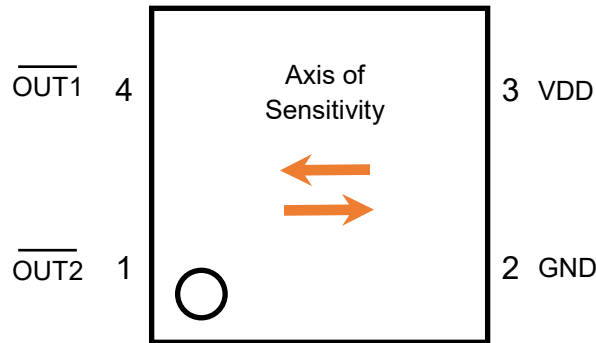




Figure 2: Package Pin-out with Axis of Sensitivity Diagram



LGA Package for CT815ST, Top View

Table 1: Pin-out Information

Pin # for LGA Package	Pin Name	Pin Description
1	$\overline{\text{OUT2}}$	Output Signal #1 for B- (North) Field (Active LOW)
2	GND	Ground
3	VDD	Supply Voltage
4	$\overline{\text{OUT1}}$	Output Signal #2 for B+ (South) Field (Active Low)


Table 2: Absolute Maximum Ratings

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

Parameter	Symbol	Min	Max	Unit
Supply Voltage	V_{DD}	-0.3	4.0	V
Digital Outputs (Active LOW)	\overline{OUTx}	-0.3	$V_{DD} + 0.3$	V
Input and Output Current	I_{IN} / I_{OUT}	-10	+10	mA
Junction temperature	T_J	-40	+125	°C
Storage temperature	T_{STG}	-65	+150	°C
Soldering temperature	T_{SOL}		+260	°C
ESD Level, Human Body Model per JESD22-A114	V_{ESD_HBM}	4.0		kV

Table 3: Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for the actual device operation. Recommended operating conditions are specified to ensure optimal performance to the data sheet specifications. Crocus Technology does not recommend exceeding them or designing to absolute maximum ratings.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{DD}		2.7	3.0	3.6	V
Output Voltage	$V_{OUT1,2}$				3.6	V
Operating Magnetic Flux	B				12	mT
Ambient Temperature	T_A		-40	+25	+125	°C
Junction Temperature	T_J		-40		+125	°C

Table 4: Thermal Properties

Junction-to-ambient thermal resistance is a function of application and board layout and is determined in accordance to JEDEC standard JESD51 for a four (4) layer FR-4 PCB. Special attention must be paid not to exceed junction temperature $T_{J(MAX)}$ at a given ambient temperature.

Parameter	Symbol	Min	Typ	Max	Unit
Junction-to-Ambient Thermal Resistance for LGA Package	$\theta_{JA(LGA)}$		165		°C/W

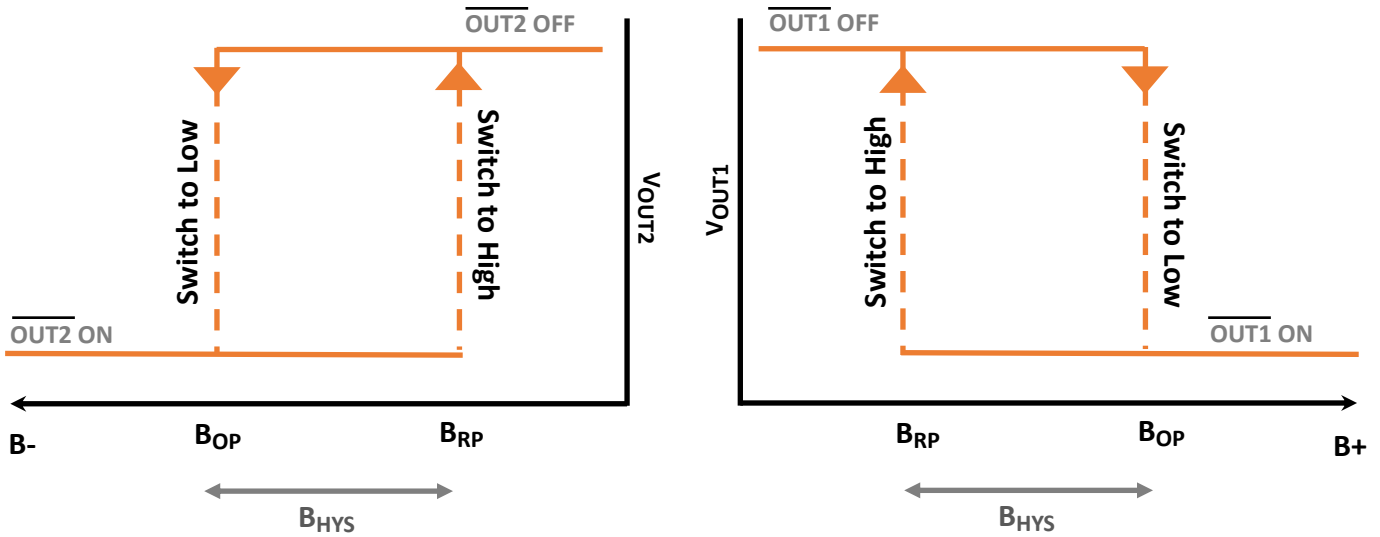

Table 5: Electrical Characteristics for CT815ST

Unless otherwise specified: $V_{DD} = 2.7\text{ V to }3.6\text{ V}$, $C_{DD} = 1.0\text{ }\mu\text{F}$ for $T_A = -40^\circ\text{C to }+125^\circ\text{C}$. Typical values are $V_{DD} = 3.0\text{ V}$ and $T_A = +25^\circ\text{C}$.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Power Supplies						
Average Supply Current	$I_{VDD(AVG)}$	$t \geq 10\text{ s}$		280	700	nA
Sampling Frequency	f_S		12	20	28	Hz
Output Voltage High, \overline{OUTx}	V_{OH}		$0.9 \times V_{DD}$			V
Output Voltage Low, \overline{OUTx}	V_{OL}				$0.1 \times V_{DD}$	V
Under-voltage Lockout Threshold, Rising V_{DD}	V_{UVLO_RISE}	Rising V_{DD}		2.20	2.60	V
Under-voltage Lockout Threshold, Falling V_{DD}	V_{UVLO_FALL}	Falling V_{DD}	1.90	2.15		V
Under-voltage Lockout Hysteresis	V_{UV_HYST}			50		mV
Timing						
Power-On Time	t_{ON}			500		μs
Active Mode Time	t_{ACT}			1.4		μs
Idle Mode Time	t_{IDLE}		36	50	83	ms
Magnetics						
Operate Point	B_{OPS}		0.8	0.9	1.2	mT
Operate Point	B_{OPN}		-1.2	-0.9	-0.8	mT
Release point	B_{RPS}		0.3	0.5	0.7	mT
Release point	B_{RPN}		-0.7	-0.5	-0.3	mT
Hysteresis	B_{HYST}	$B_{HYST} = B_{OP} - B_{RP}$	0.3	0.4		mT



Figure 3: Unipolar Magnetic Flux for Dual Outputs



OUT2: Negative Field

Output Behavior vs. Magnetic Field

OUT1: Positive Field

Output Behavior vs. Magnetic Field

Characteristic	Conditions	Output
Positive Field	$B > B_{OP}$	High-Z (OFF)
Null or Weak Magnetic Field	$B < B_{RP}$	High-Z (OFF)
Negative Field	$B > B_{OP}$	Low (ON)

Characteristic	Conditions	Output
Negative Field	$B > B_{OP}$	High-Z (OFF)
Null or Weak Magnetic Field	$B < B_{RP}$	High-Z (OFF)
Positive Field	$B > B_{OP}$	Low (ON)



Figure 4: Application Circuit

A decoupling capacitor between the supply voltage and ground is required with placement close to the magnetic switch. A typical capacitor value of 1.0 μF (Ceramic) will suffice.

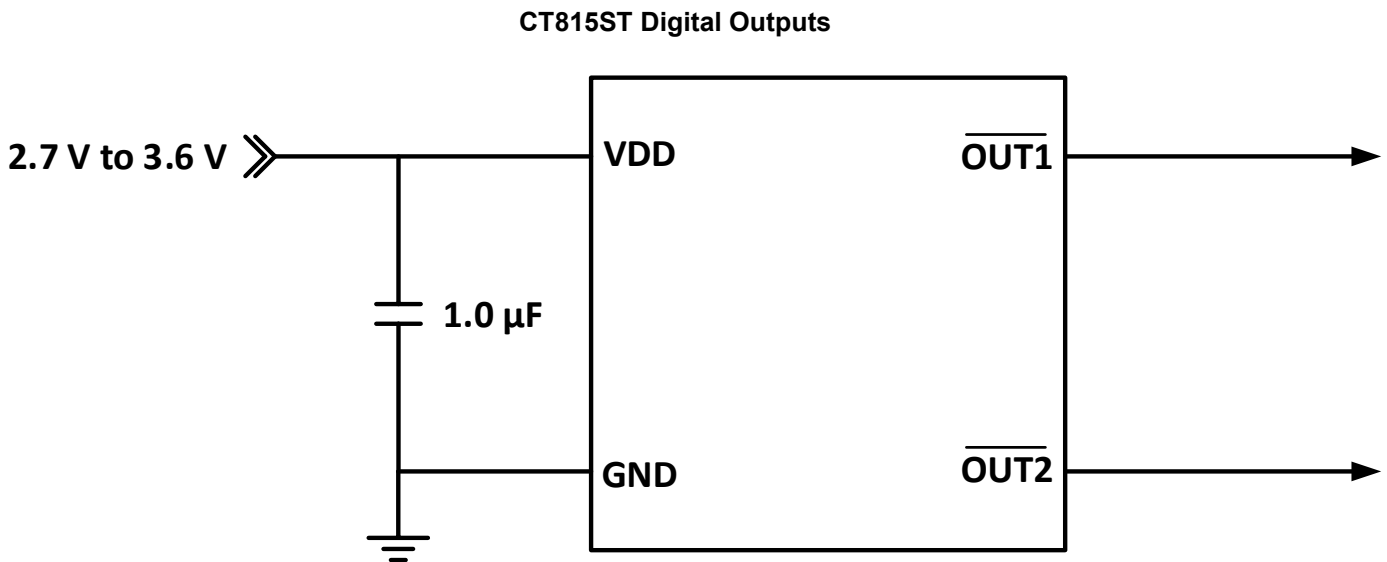
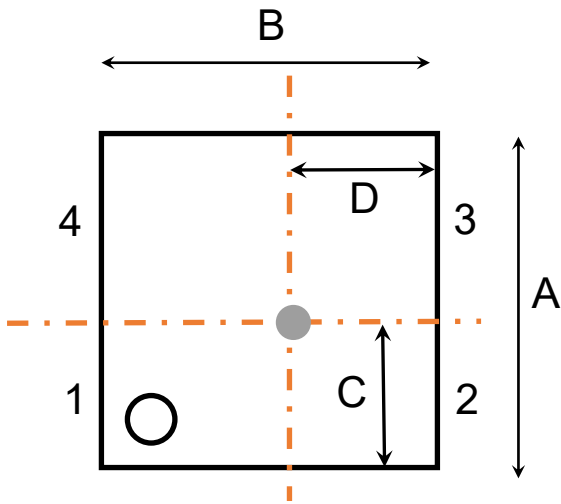




Figure 5: MLU Sensor Location



LGA Package

Symbols	Nominal Dimensions (mm)
A	1.40
B	1.40
C	0.54
D	0.54



Table 6: Order Guide

Part Number	Polarity	Output Type	B_{OP}	B_{RP}	$I_{DD (AVG)}$	f_s	Description
CT815ST-HL1 CT815ST-IL1	Unipolar	Push-Pull	± 0.9 mT	± 0.5 mT	280 nA	20 Hz	Dual unipolar magnetic latch with dual outputs LGA Package, Tape & Reel packaging



CT815ST

Dual Unipolar TMR Latch
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Table 7. Packaging Information

Orderable Part Number	Package Type	Pins	Package Quantity	Lead Finish	Eco Plan ⁽¹⁾	MSL Rating ⁽²⁾	Operating Temperature	Device Marking ⁽³⁾
CT815ST-HL1	LGA	4	3,000	Sn	Green & RoHS	3	-40°C to +125°C	X YZ
CT815ST-IL1	LGA	4	3,000	Sn	Green & RoHS	3	-40°C to +85°C	X YZ

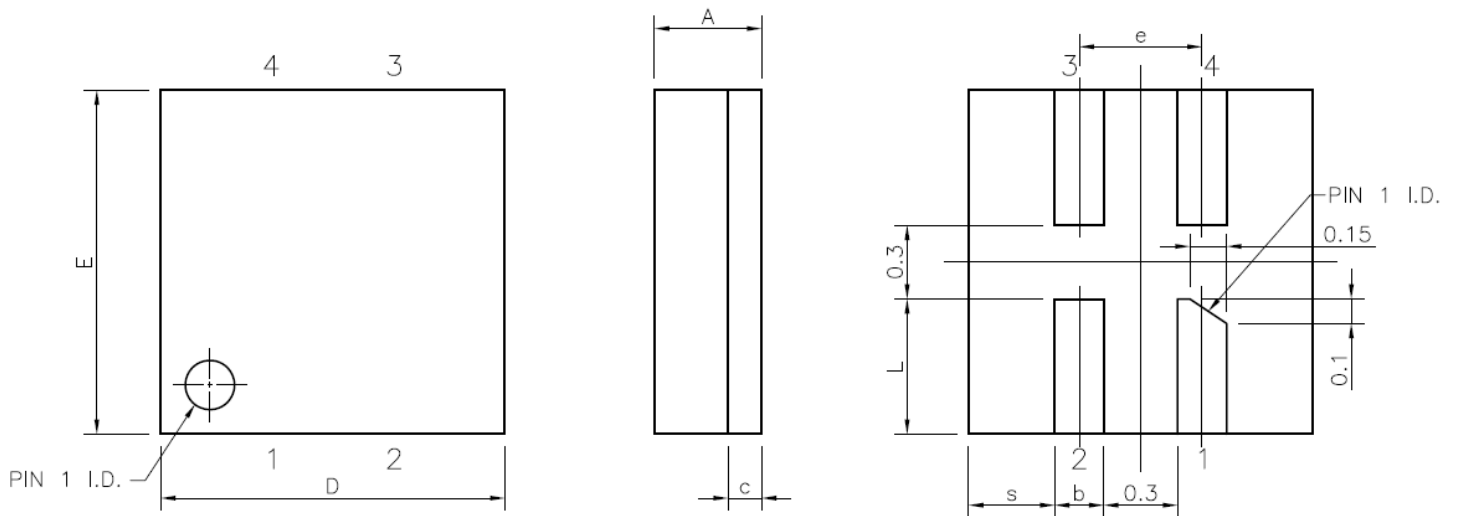
(1) RoHS is defined as semiconductor products that are compliant to the current EU RoHS requirements. It also will meet the requirement that RoHS substances do not exceed 0.1% by weight in homogeneous materials. Green is defined as the content of Chlorine (Cl), Bromine (Br) and Antimony Trioxide based flame retardants satisfy JS709B low halogen requirements of $\leq 1,000$ ppm.

(2) MSL Rating = Moisture Sensitivity Level Rating as defined by JEDEC industry standard classifications.

(3) Device Marking for LGA is defined as X where X = part number and YZ = date code information



Figure 6: 4-Lead LGA Package Dimensions



NOTE: ALL DIMENSIONS ARE IN MILLIMETERS.

SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.386	0.436	0.486
b	0.15	0.20	0.25
c	---	0.136 REF.	---
D	1.35	1.40	1.45
E	1.35	1.40	1.45
e	---	0.50	---
L	0.50	0.55	0.60
s	0.30	0.35	0.40



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