

Product Description

The CT51x Series is an integrated magnetic sensor especially designed for consumer switching applications based on Crocus Technology's patented Magnetic Logic Unit™ (MLU™) technology with integrated CMOS process.

The CT51x Series operates with low power consumption in low magnetic fields and large air gaps with industry leading high frequency performance. The CT51x is available in either push-pull or open drain configuration for design flexibility with high sensitivity. The CT51x is available in either a SOT-23 or TO-92 package and provides a cost effective solution for high volume manufacturing. Custom solutions are available.



SOT-23 Package



TO-92 Package

Features and Benefits

- High sensitivity
- Resistant to mechanical stress
- Low power consumption
- High frequency performance
- Digital push-pull and open drain options
- Cost-effective
- RoHS Compliant

Application Examples

- Door or lid closure detection
- Smart phones, tablets, and laptops
- Reed switch replacement
- Motor controllers
- Proximity detection
- Power switch or open-close detection
- Water, electric, and gas utility meters
- Fluid level detection

Table 1: Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Voltage	Vs		7	V
Supply Current	I _{dd}		15	mA
Operating Temp	Ta	-40	85	°C
Storage Temp	Ts		150	°C
Soldering Temp	T		260	°C
ESD Level (HBM)	Vesd		4,000	V

Table 2: Electrical Characteristics for CT51xVA Series

Supply Voltage = 3.0V, Ta = 25C unless otherwise specified.

Characteristic	Symbol	Min	Typ	Max	Unit
Operating Temperature		-40	25	85	°C
Operating Magnetic Flux	B	0		10	mT
Supply Voltage	V _{cc}	2.7	3.0	3.3	V
Output Voltage High	V _{oh}		2.7		V
Output Voltage Low	V _{ol}		0.2		V
Active Mode Current	I _{on}			80	μA
Sleep Mode Current	I _{stb}			170	nA
Average Current	I _{avg}		350		nA
Switching Frequency	F _{sw}		10		Hz
Awake Mode Time	t _{aw}		80		μS
Standby Mode Time	T _{stb}		43		mS
Duty Cycle	DC		0.2		%
Output Voltage High (CT511)	V _{SYSH}		0.7V _{sys}		V
Output Voltage Low (CT511)	V _{SYSL}		0.3V _{sys}		V
I/O pin Source Current ¹	I _{OH}		20		mA
I/O pin Sink Current ¹	I _{OL}		-20		mA

Note: 1) Current measured using R_{pull-up} = 220 Ω, V_{sys} = 3.6V

Table 3: Electrical Characteristics for CT51xVB Series

Supply Voltage = 3.0V, Ta = 25C unless otherwise specified.

Characteristic	Symbol	Min	Typ	Max	Unit
Operating Temperature		-40	25	85	°C
Operating Magnetic Flux	B	0		10	mT
Supply Voltage	Vcc	2.7	3.0	3.3	V
Output Voltage High	Voh		2.7		V
Output Voltage Low	Vol		0.2		V
Active Mode Current	Ion			80	µA
Sleep Mode Current	Istb			170	nA
Average Current	Iavg		2		µA
Switching Frequency	Fsw		100		Hz
Awake Mode Time	taw		80		µS
Standby Mode Time	Tstb		3.5		mS
Duty Cycle	DC		2.2		%
Output Voltage High (CT511)	V _{SYSH}		0.7V _{sys}		V
Output Voltage Low (CT511)	V _{SYSL}		0.3V _{sys}		V
I/O pin Source Current ¹ (CT511)	IOH		20		mA
I/O pin Sink Current ¹ (CT511)	IOL		-20		mA

Note: 1) Current measured using R_{pull-up} = 220 Ω, V_{sys} = 3.6V

Table 4: Electrical Characteristics for CT51xVC Series

Supply Voltage = 3.0V, Ta = 25C unless otherwise specified.

Characteristic	Symbol	Min	Typ	Max	Unit
Operating Temperature		-40	25	85	°C
Operating Magnetic Flux	B	0		10	mT
Supply Voltage	Vcc	2.7	3.0	3.3	V
Output Voltage High	Voh		2.7		V
Output Voltage Low	Vol		0.2		V
Active Mode Current	Ion			80	µA
Sleep Mode Current	Istb			170	nA
Average Current	Iavg		20		µA
Switching Frequency	Fsw		1.5		KHz
Awake Mode Time	taw		80		µS
Standby Mode Time	Tstb		240		µS
Duty Cycle	DC		25		%
Output Voltage High (CT511)	V _{SYSH}		0.7V _{sys}		V
Output Voltage Low (CT511)	V _{SYSL}		0.3V _{sys}		V
I/O pin Source Current ¹ (CT511)	IOH		20		mA
I/O pin Sink Current ¹ (CT511)	IOL		-20		mA

Note: 1) Current measured using R_{pull-up} = 220 Ω, V_{sys} = 3.6V

Table 5: Magnetic Characteristics

Supply Voltage = 3.0V

Characteristic	Symbol	Conditions	Min	Typ	Max	Unit
Operate Point	B_{OP}	$T_a = -40C$ to $85C$	2	3	4	mT
Release point	B_{RP}	$T_a = -40C$ to $85C$	0.8	1.5	2.5	mT
Hysteresis	B_{HYS}	$B_{OP} - B_{RP}$, $T_a = -40C$ to $85C$		1.5		mT

Figure 1: Magnetic Flux

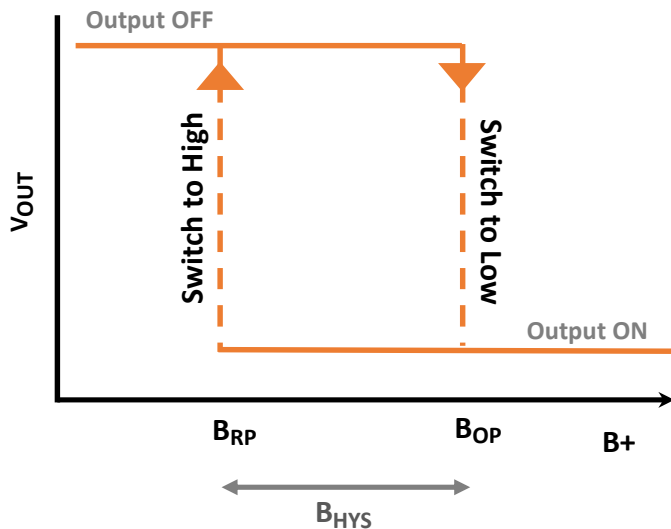


Table 6: Output Behavior versus Magnetic Field

Characteristic	Conditions	Output
South Pole	$B > B_{OP}$	Low
Null or weak magnetic field	$B < B_{RP}$	High
North Pole	$B > B_{OP}$	High

Figure 2: CT51xVA Typical Performance Characteristics

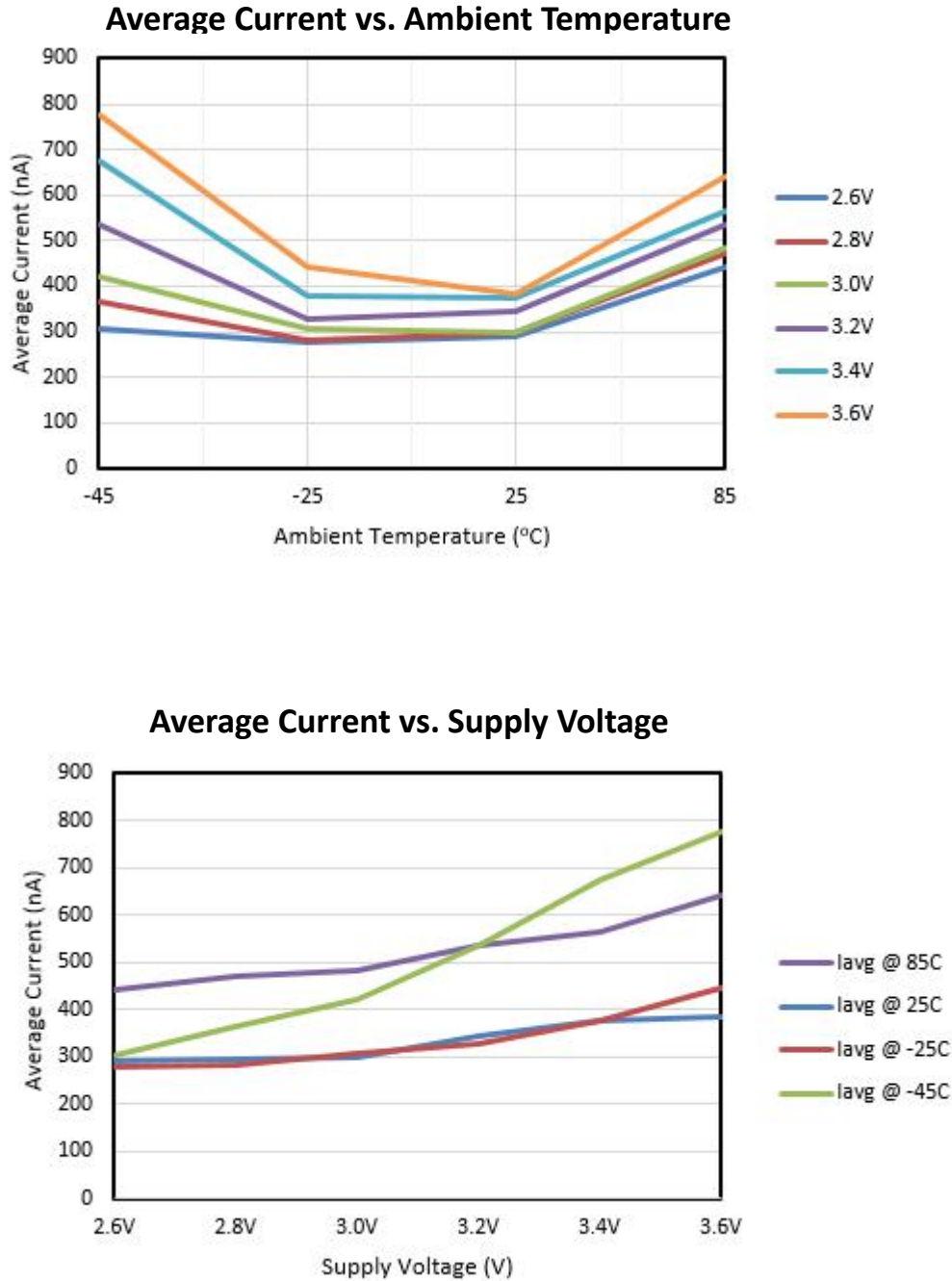


Figure 3: CT512 Digital Push-Pull Functional Block Diagram

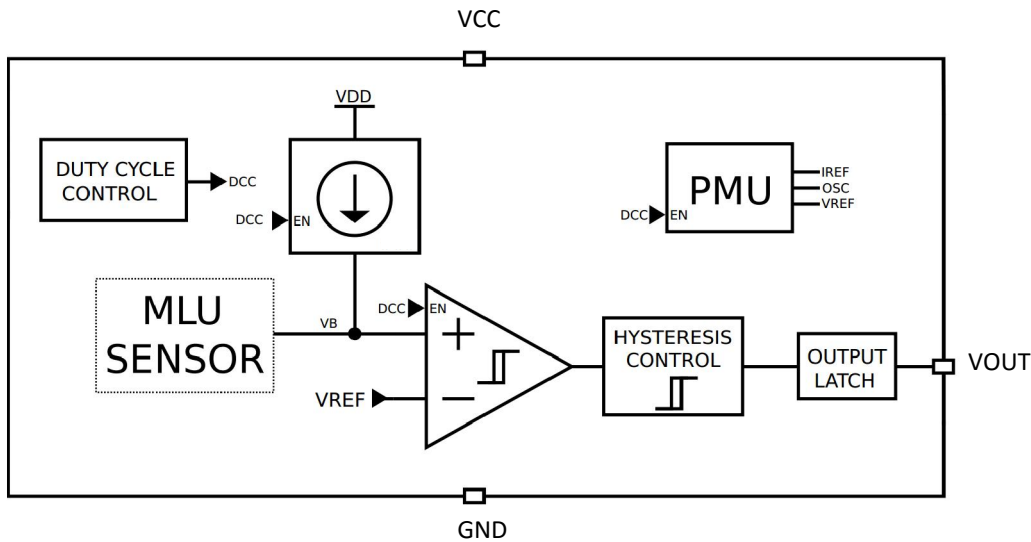


Figure 4: CT511 Digital Open Drain Functional Block Diagram

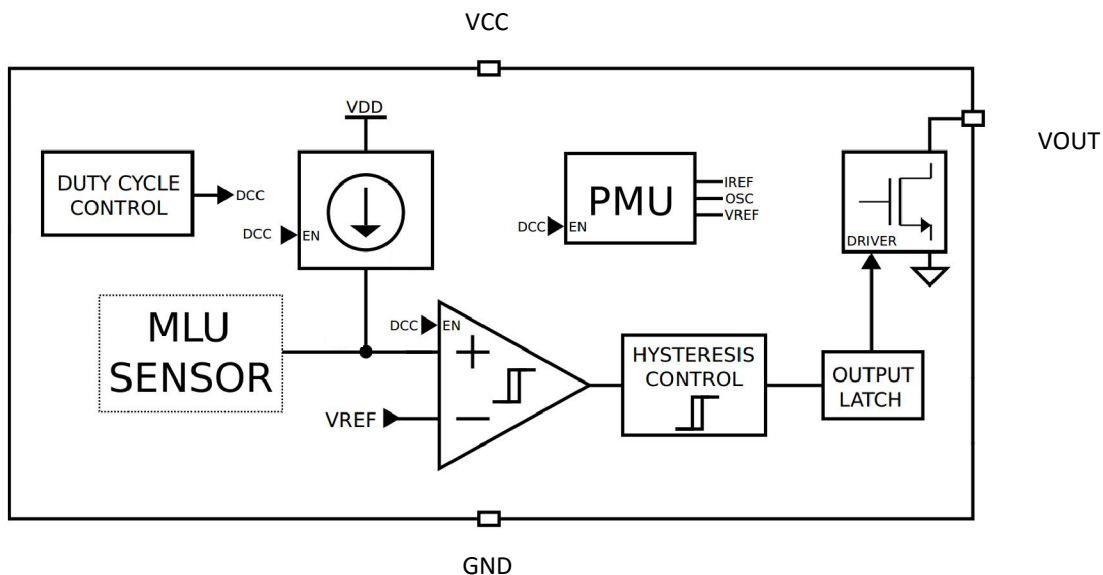
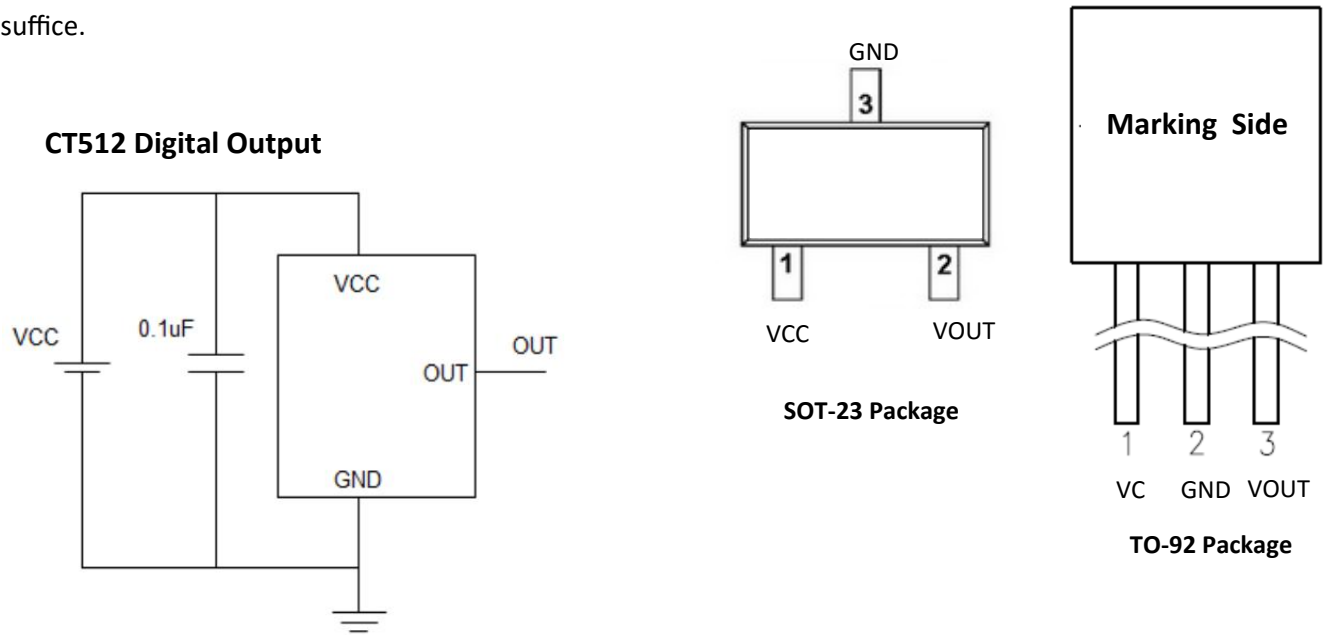


Figure 5: Application Circuit

A decoupling capacitor between the supply voltage and ground is required with placement close to the magnetic sensor. A typical capacitor value of 0.1 uF will suffice.



With the open drain output, the system voltage can range up to 6V. Please keep in mind the supply to the CT511 must remain at 3V. A decoupling capacitor between the supply voltage and ground is required with placement close to the magnetic sensor. A typical capacitor value of 0.1 uF will suffice.

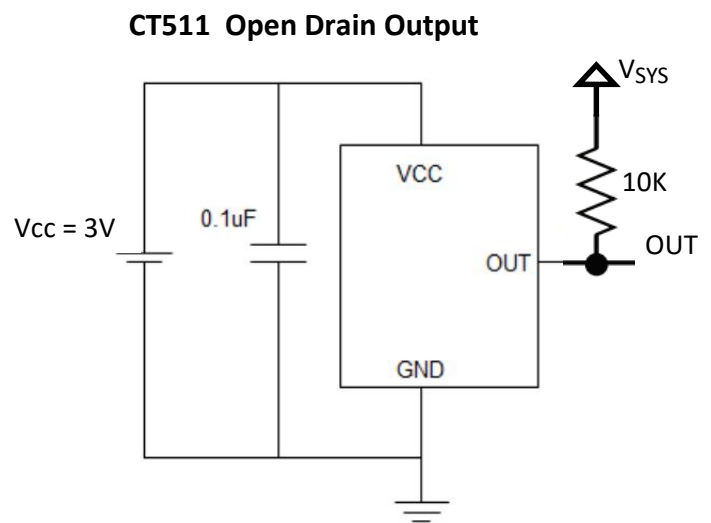
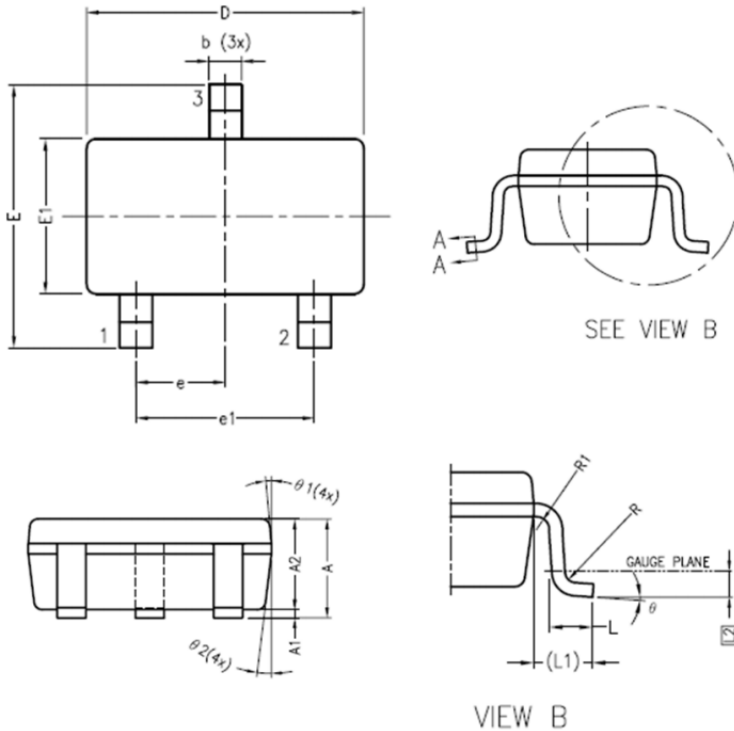
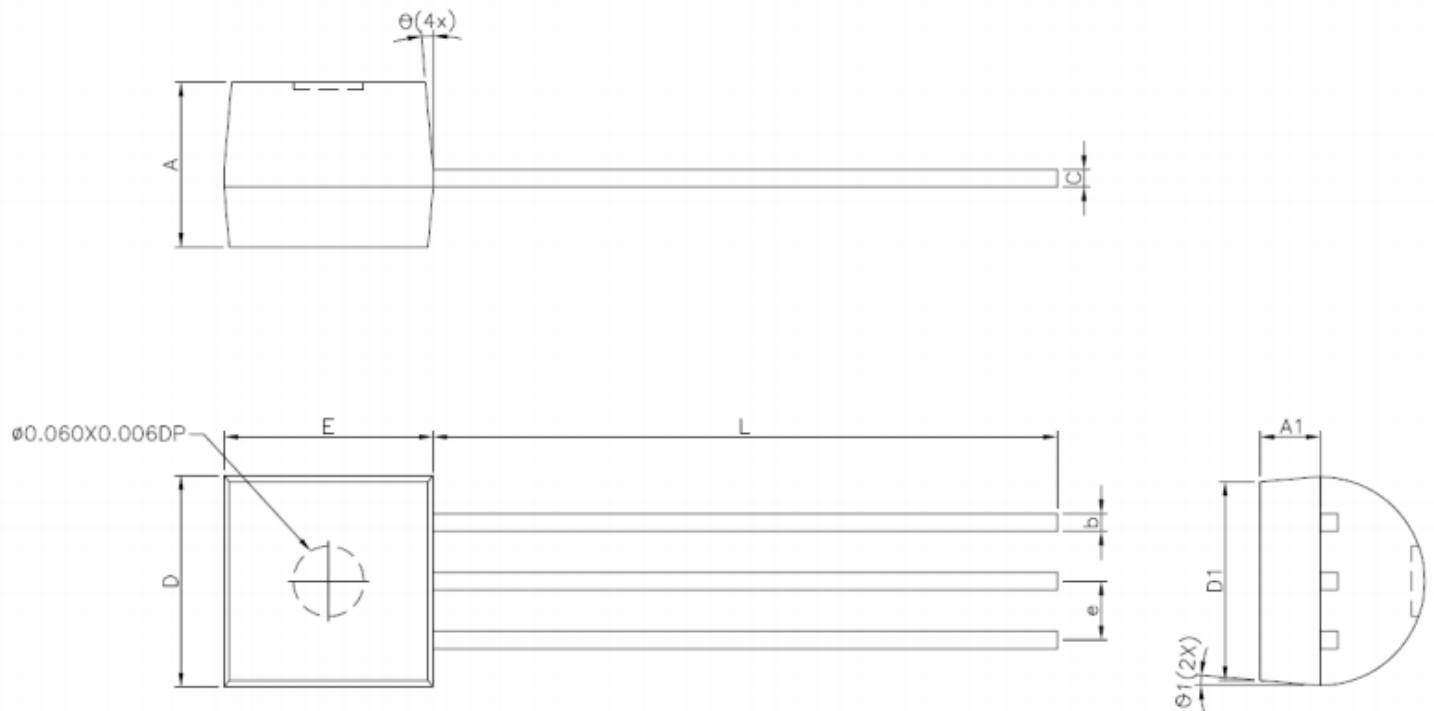


Figure 6: SOT-23 Package Dimensions



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	1.05	1.20	1.35
A1	0.00	0.10	0.15
A2	1.00	1.10	1.20
b	0.30	—	0.50
b1	0.30	0.35	0.45
c	0.08	—	0.22
c1	0.08	0.13	0.20
D	2.80	2.90	3.00
E	2.60	2.80	3.00
E1	1.50	1.60	1.70
e	0.95 BSC		
e1	1.90 BSC		
L	0.35	0.43	0.60
L1	0.60 REF		
L2	0.25 BSC.		
R	0.10	—	—
R1	0.10	—	0.25
θ	0°	4°	8°
$\theta1$	5°	6°	15°
$\theta2$	5°	8°	15°

Figure 7: TO-92 Package Dimensions



SYMBOLS	DIMENSIONS IN MILLIMETERS			DIMENSIONS IN INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	3.45	3.56	3.66	0.136	0.140	0.144
A1	1.22	1.30	1.37	0.048	0.051	0.054
b	—	0.38	—	—	0.015	—
C	—	0.38	—	—	0.015	—
D	4.27	4.52	4.78	0.168	0.178	0.188
D1	4.14	4.29	4.45	0.163	0.169	0.175
E	4.32	4.57	4.83	0.170	0.180	0.190
L	12.98	13.49	14.00	0.511	0.531	0.551
e	—	1.27	—	—	0.050	—
θ'	—	5°	—	—	5°	—
θ1	—	5°	—	—	5°	—

Figure 8: Sensor Polarity Configuration

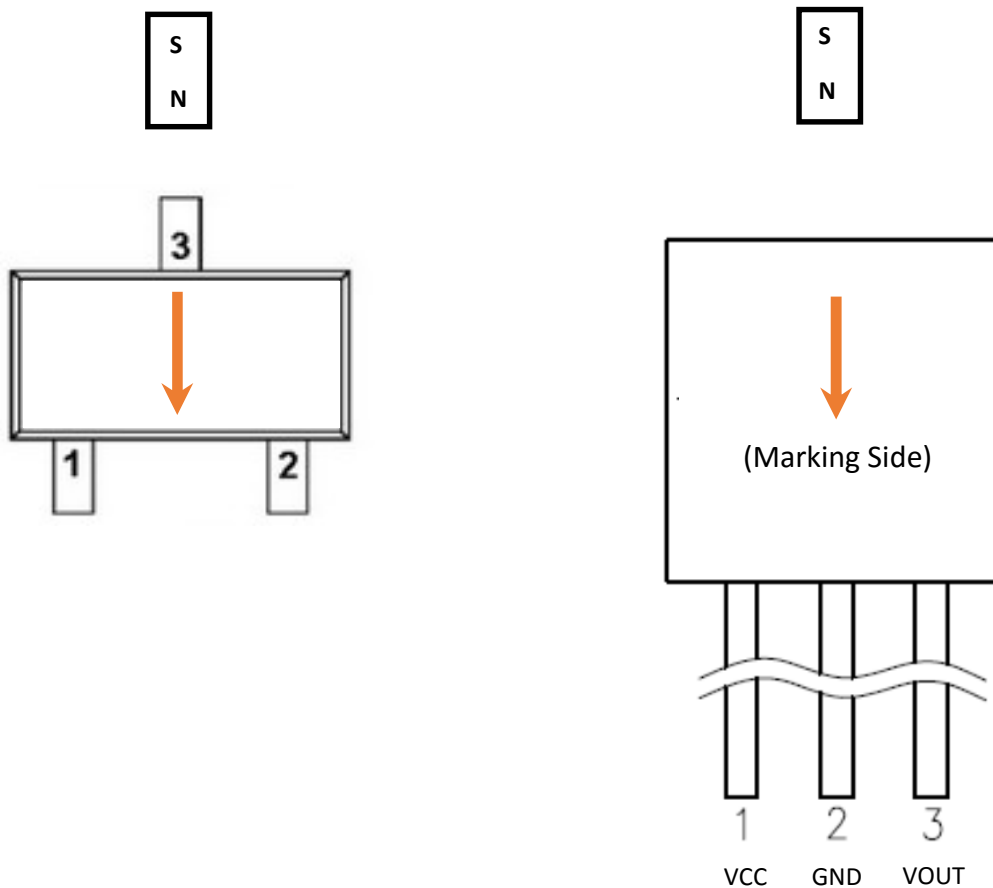
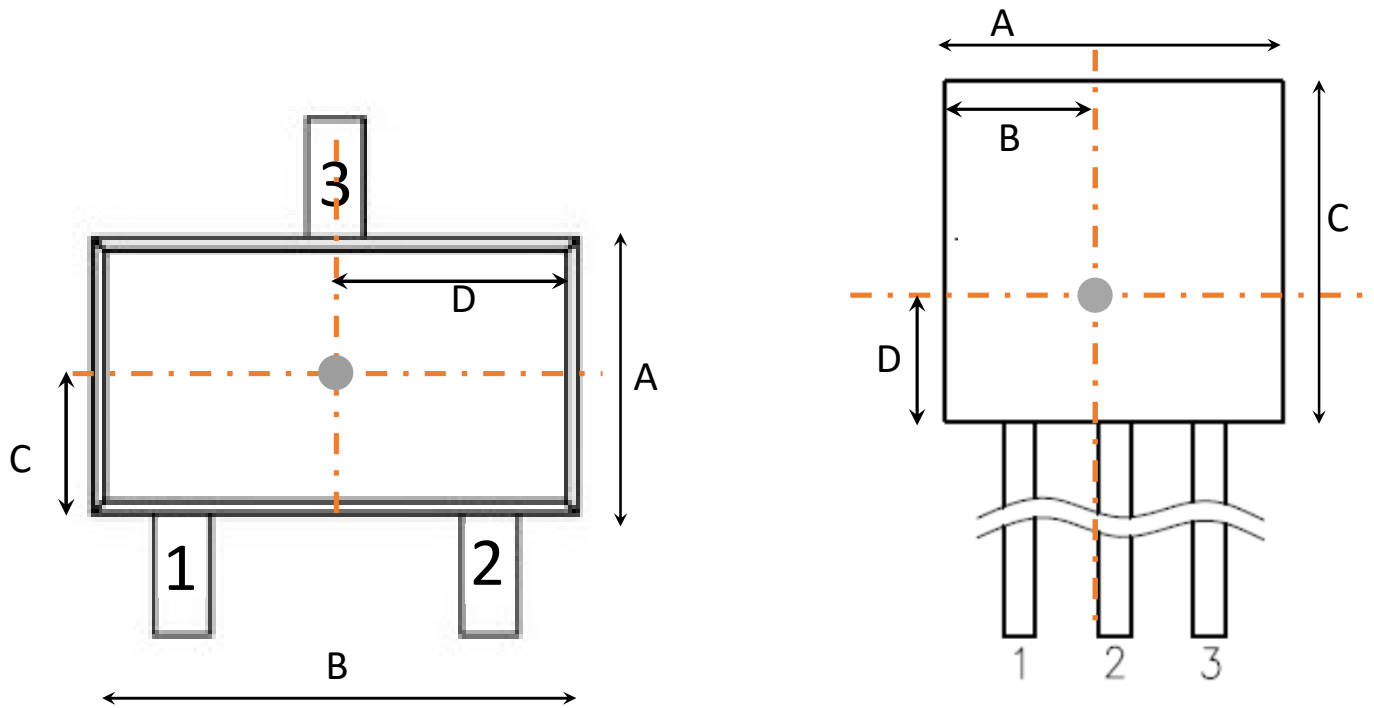


Figure 9: MLU Sensor Location



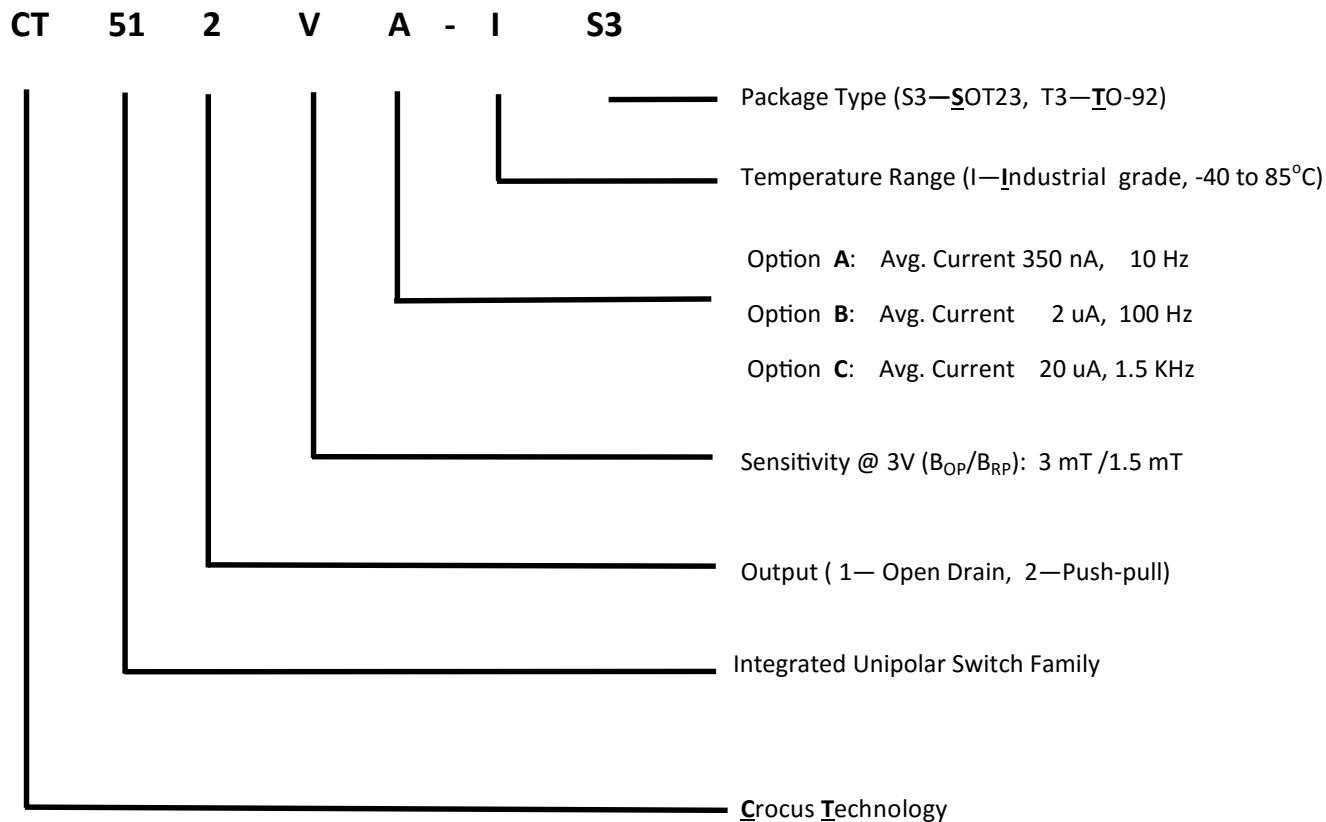
Symbols	Nominal Dimensions (mm)
A	1.60
B	2.90
C	0.80
D	1.45

Symbols	Nominal Dimensions (mm)
A	4.52
B	1.9
C	4.57
D	1.3

Table 7: Order Guide

Part Number	Digital Output	Average Current	Switching Frequency	Description
CT512VA-IS3	Push-Pull	350 nA	10 Hz	Unipolar magnetic switch with digital push-pull SOT-23 Package, Tape-and-reel packaging
CT512VB-IS3		2 μ A	100 Hz	
CT512VC-IS3		20 μ A	1.5 KHz	
CT512VA-IT3		350 nA	10 Hz	Unipolar magnetic switch with digital push-pull TO-92 Package
CT512VB-IT3		2 μ A	100 Hz	
CT512VC-IT3		20 μ A	1.5 KHz	
CT511VA-IS3	Open Drain	350 nA	10 Hz	Unipolar magnetic switch with digital push-pull SOT-23 Package, Tape-and-reel packaging
CT511VB-IS3		2 μ A	100 Hz	
CT511VC-IS3		20 μ A	1.5 KHz	
CT511VA-IT3		350 nA	10 Hz	Unipolar magnetic switch with digital push-pull TO-92 Package
CT511VB-IT3		2 μ A	100 Hz	
CT511VC-IT3		20 μ A	1.5 KHz	

Figure 10: Part Number Legend



Revision Number	Revision Date	Summary of Changes
0.1	12/15/16	Datasheet Initiated
0.2	01/7/16	Updated Part Number Guide. Deleted awake and sleep mode times. Updated Order Guide.
0.3	2/11/16	Updated Switch Point Sensitivity.
0.4	4/22/16	Updated Switch Point Sensitivity
0.5	5/5/16	Updated temperature range
0.6	6/2/16	Removed Preliminary Watermark
0.7	7/19/16	Updated Part Numbering System. Added Sensitivity Designator and removed supply voltage designator
0.8	7/27/16	Added Revision Table
0.9	8/1/16	Updated Switch Point Sensitivity and application circuit requirement.
1.0	8/26/16	Updated polarity
1.1	9/2/16	Added typical performance characteristics.
1.2	9/6/16	Added Digital Open Drain Option to create CT51x Datasheet.

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