



CT310KM

2D Angular Sensor

Features

- Angular Error as low as 1.2°
- Dual Full-Bridge Resistor Network
- Operating Magnetic Field: 20 mT to 80 mT
- Differential Outputs for SIN and COS Axes
- Supply Voltage: 1.0 V to 5.5 V
- Package Options:
 - 8-lead TSSOP

Applications

- Angular Measurements
- Rotary and Angular Sensors
- BLDC Motors

Product Description

The CT310KM is a 2D angular sensor in a dual full-bridge configuration from Crocus Technology developed on its patented MLU™ technology. The operating magnetic field for this 2D sensor is 20 mT to 80 mT and has an angular error as low as 1.2° after compensation over the full operating temperature range. It has differential outputs for both sine (SIN) and cosine (COS) axes and operates with a supply voltage range from 1.0 V to 5.5 V.

It is packaged in an 8-lead TSSOP package.

Ordering Information

Part Number	Operating Temperature Range	Angular Error ⁽¹⁾	Output Type	Package	Packing Method
CT310KMLS-IT8-M	-40°C to +85°C	1.2°	Differential	8-lead TSSOP 6.40 x 3.05 x 1.10 mm	Tape & Reel

(1) After Compensation (includes offset cancellation and amplitude normalization).

Block Diagram

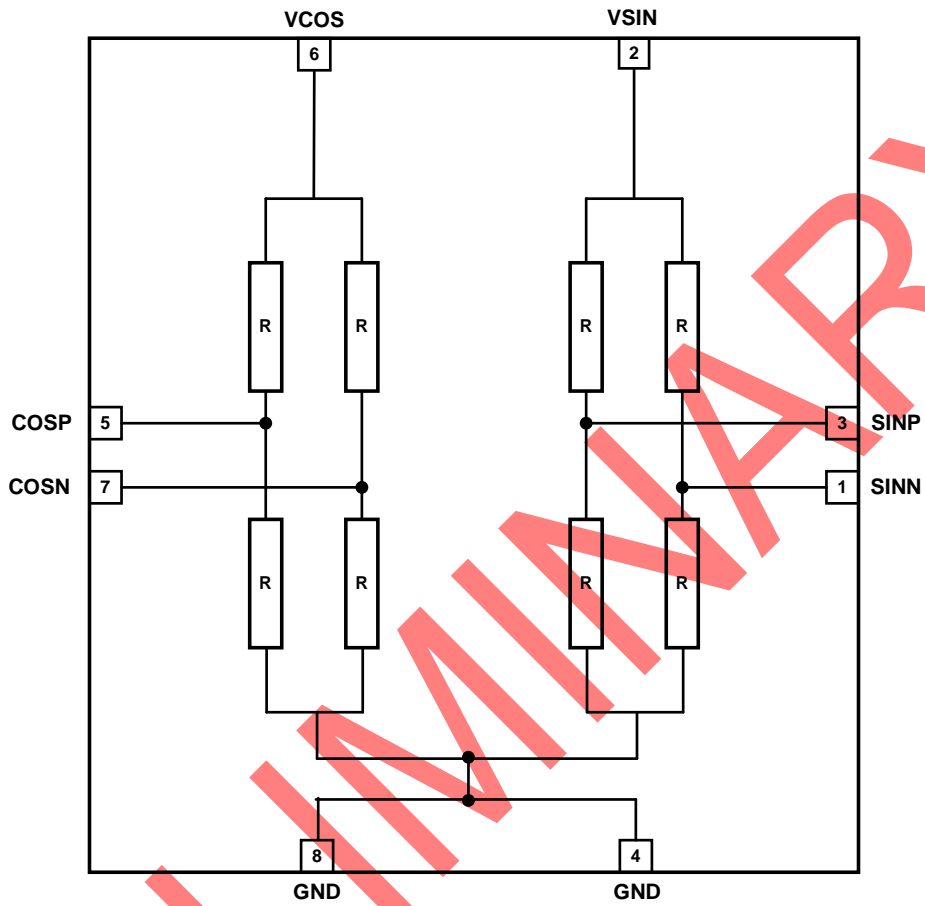


Figure 1. CT310KM Functional Block Diagram

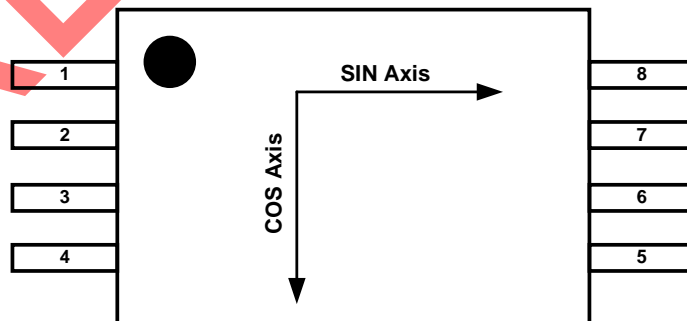


Figure 2. CT310KM Axes of Sensitivity for TSSOP-8

Pin Configurations



TSSOP-8 – Top Down View

Figure 3. CT310KM Pin-out Diagram

Pin Definitions

Pin #	Pin Name	Pin Description
1	SINN	Differential negative output for sine.
2	VSIN	Supply voltage for sine
3	SINP	Differential positive output for sine.
4	GND	Ground for sine.
5	COSP	Differential positive output for cosine.
6	VCOS	Supply voltage for cosine
7	COSN	Differential negative output for cosine.
8	GND	Ground for cosine.

Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the CT310KM and may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Symbol	Parameter		Min.	Max.	Unit
V_{COS}, V_{SIN}	Supply Voltage		-0.3	6.0	V
V_{OUT}	Analog Output Pins Maximum Differential Voltage		-3.00	+3.00	V
ESD	Electrostatic Discharge Protection Level	Human Body Model (HBM) per JESD22-A114	±4.0		kV
		Charged Device Model (CDM) per JESD22-C101	±1.0		
B_{MAX}	Maximum Magnetic Field, ≤ 5 minutes at $T_A = +25^{\circ}C$			±200	mT
B_{SHIFT}	Life-time Shift			TBD	mT
T_{STG}	Storage Temperature		-65	+165	°C
T_L	Lead Soldering Temperature, 10 Seconds			+260	°C

Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual operation of the CT310KM. Recommended operating conditions are specified to ensure optimal performance to the specifications. Crocus Technology does not recommend exceeding them or designing to absolute maximum ratings.

Symbol	Parameter		Min.	Typ.	Max.	Unit
V_{COS}, V_{SIN}	Supply Voltage Range		1.0		5.5	V
V_{COS_D}, V_{SIN_D}	COS and SIN Differential Output Voltage Range		-1.40		+1.40	V
$B_{OPERATING}$	Operating Magnetic Field		20		80	mT
T_A	Operating Ambient Temperature	Industrial	-40	+25	+85	°C

Electrical & Magnetic Specifications

Unless otherwise specified, CT310KM tested under following conditions: $V_{DD} = 1.0\text{ V}$, $C_{BYP} = 0.1\ \mu\text{F}$ and $T_A = +25^\circ\text{C}$.

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
Magnetic						
$B_{OPERATING}$	Operating Magnetic Field	$T_A = +25^\circ\text{C}$	20		80	mT
Electrical						
R_{BRIDGE}	Bridge Resistance	$T_A = +25^\circ\text{C}$		6.0		$k\Omega$
TCR	Temperature Coefficient of Resistance ⁽¹⁾			TBD		ppm/ $^\circ\text{C}$
Differential Outputs						
θ_{ERR}	Angular Error ⁽²⁾	After Compensation (Offset Cancellation and Amplitude Normalization)		1.2		$^\circ$
θ_{ERR_HYST}	Angle Error due to Hysteresis		No Hysteresis			$^\circ$
V_{SIN_D} , V_{COS_D}	SIN, COS Differential Output Voltage Peak-to-Peak	$T_A = +25^\circ\text{C}$		0.30		V/V
V_{OFF_SIN} , V_{OFF_COS}	SIN, COS Voltage Offset	$T_A = +25^\circ\text{C}$		± 5		mV/V
k	SIN, COS Amplitude Synchronism Ratio	$T_A = +25^\circ\text{C}$	97	100	103	%
OE_{SIN} , OE_{COS}	SIN, COS Orthogonality Error	$T_A = +25^\circ\text{C}$	87	90	93	$^\circ$
$t_{RESPONSE}$	SIN, COS Response Time	$C_L = 270\text{ pF}$, $T_A = +25^\circ\text{C}$		1.0		μs

(1) Guaranteed by design and characterization.

(2) Hysteresis error and output noise are included in the Angular Error specification.

Recommended Application Circuit

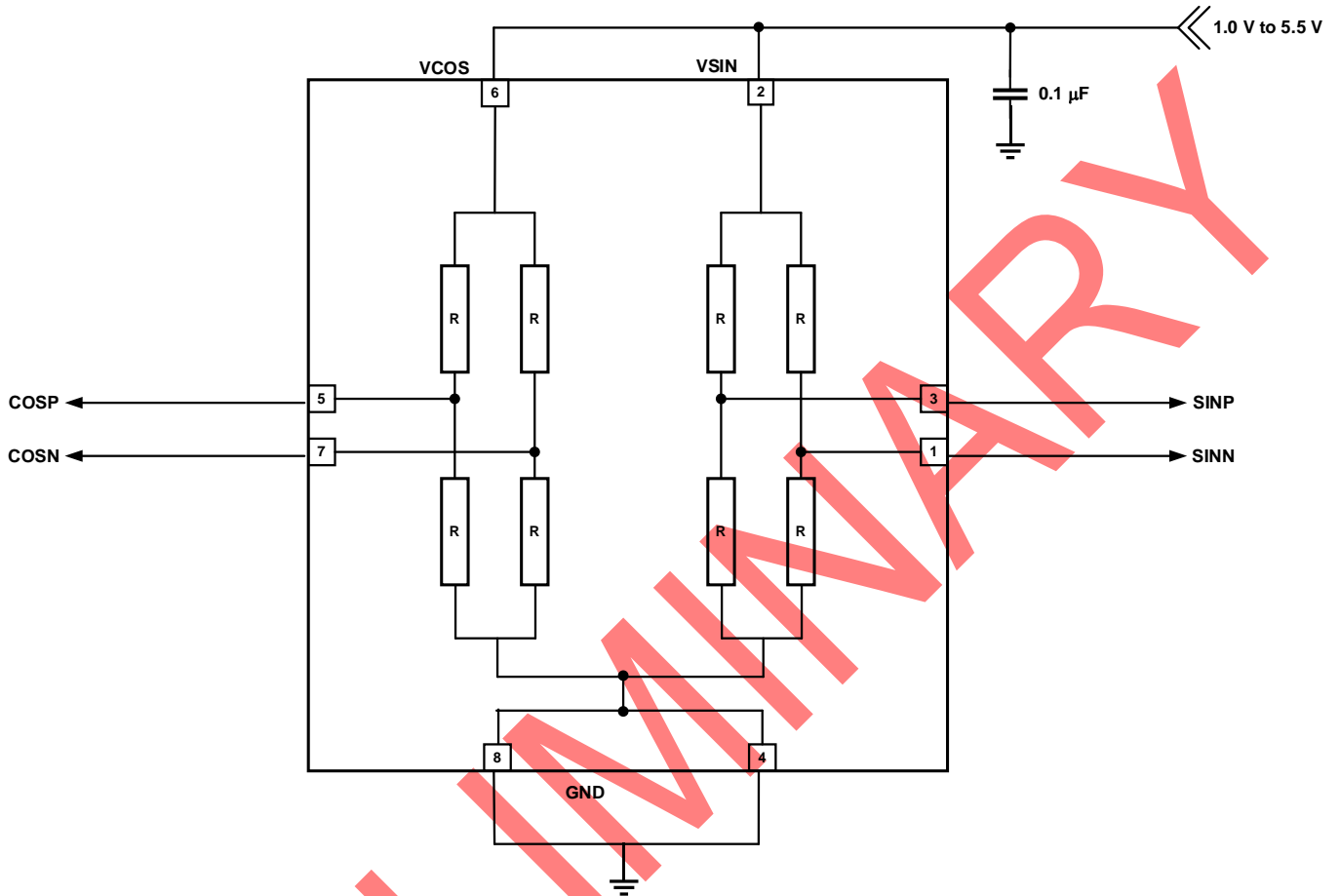


Figure 4. CT310KM Application Diagram

Table 1. Recommended External Components

Component	Description	Vendor & Part Number	Parameter	Min.	Typ.	Max.	Unit
C _{BYP}	0.1 μF, X7R	Murata GRM033Z71A104KE14	C		0.1		μF
		Others					

TSSOP-8 Package Drawing and Dimensions

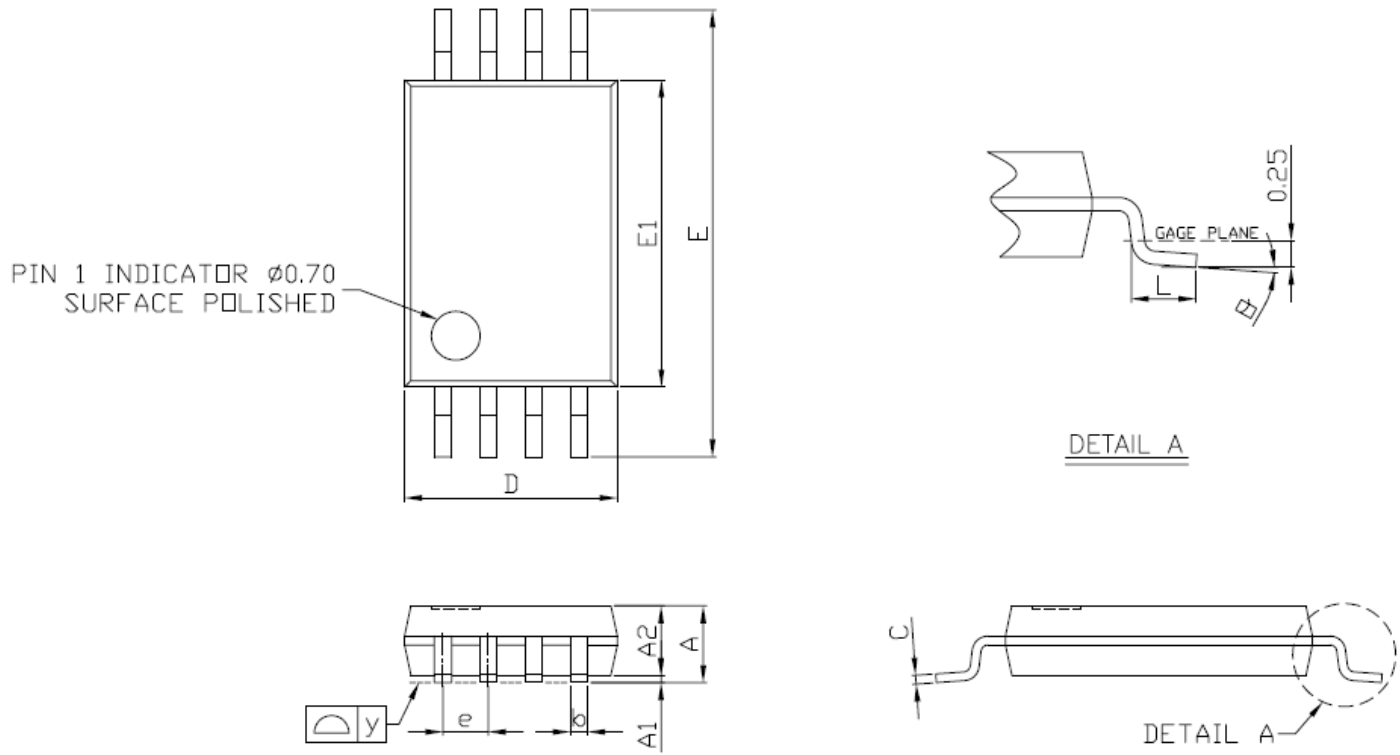


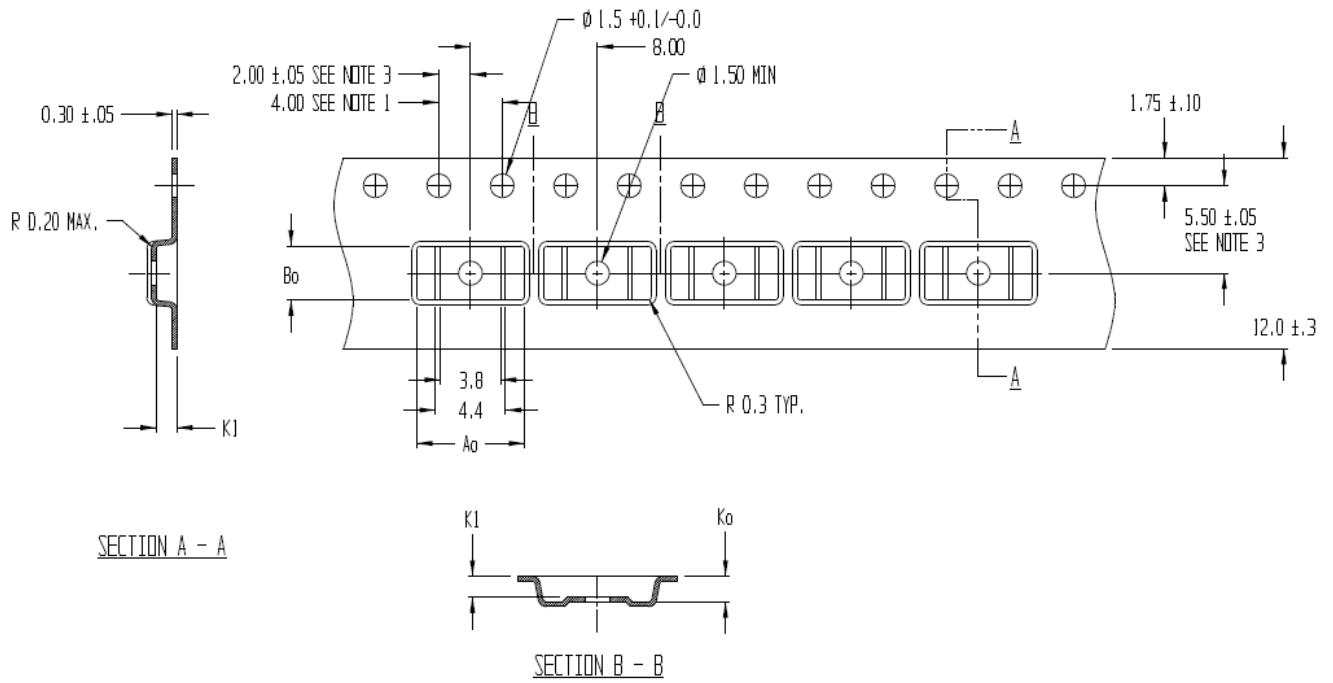
Figure 5. TSSOP-8 Package Drawing

Table 2. CT310KM TSSOP-8 Package Dimensions

Symbol	Dimensions in Millimeters (mm)		
	Min.	Typ.	Max.
A	1.05	1.10	1.20
A1	0.05	0.10	0.15
A2	-	1.00	1.05
b	0.25	-	0.30
C	-	0.127	-
D	2.90	3.05	3.10
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	-	0.65	-
L	0.50	0.60	0.70
y	-	-	0.076
θ	0°	4°	8°

Crocus Technology provides package drawings as a service to customers considering or planning to use Crocus products in their designs. Drawings may change without notice. Please note the revision and date of the data sheet and contact a Crocus Technology representative to verify or obtain the most recent version. The package specifications do not expand the terms of Crocus Technology's worldwide terms and conditions, specifically the warranty therein, which covers Crocus Technology's products.

TSSOP-8 Tape & Pocket Drawing and Dimensions



NOTES:

1. 10 SPROCKET HOLE PITCH CUMULATIVE TOLERANCE ± 0.2
2. CAMBER IN COMPLIANCE WITH EIA 481
3. POCKET POSITION RELATIVE TO SPROCKET HOLE MEASURED AS TRUE POSITION OF POCKET, NOT POCKET HOLE

$A_0 = 6.80$
 $B_0 = 3.40$
 $K_0 = 1.60$
 $K_1 = 1.30$

Figure 6. TSSOP-8 Tape and Pocket Drawings

PREVIEW

Package Information

Table 3. CT310KM Package Information

Part Number	Package Type	# of Leads	Package Quantity	Lead Finish	Eco Plan ⁽¹⁾	MSL Rating ⁽²⁾	Operating Temperature ⁽³⁾	Device Marking
CT310KM-IT8-M	TSSOP	8	3,000	Sn	Green & RoHS	1	-40°C to +85°C	CT310KM-IT8 YYWWSS

- (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 standard classifications.
- (3) Package will withstand ambient temperature range of -40°C to +150°C and storage temperature range of -65°C to +165°C.
- (4) Device Marking for TSSOP is defined as CT310KMLS-XT8 YYWWSS where CT310KMLS = base part number, X = temperature code, T8 = TSSOP-8 package, YY = year, WW = work week and SS = sequential number.

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Product Status Definition

Data Sheet Identification	Product Status	Definition
Objective	Proposed New Product Idea or In Development	Data sheet contains design target specifications and are subject to change without notice at any time.
Preliminary	First Production	Data sheet contains preliminary specifications obtained by measurements of early samples. Follow-on data will be published at a later date as more test data is acquired. Crocus reserves the right to make changes to the data sheet at any time.
None	Full Production	Data sheet contains final specifications for all parameters. Crocus reserves the right to make changes to the data sheet at any time.
Obsolete	Not in Production	Data sheet for a product that is no longer in production at Crocus. It is for reference only.