



# CT100

## 1D Linear Sensor

### Features

- Operating Magnetic Field Range:  $\pm 50$  mT
- Stable Magnetic Performance over Temperature
- Linearity Error:  $\pm 0.5\%$  from -20 mT to +20 mT
- Differential Outputs
- Supply Voltage: 1.0 V to 5.5 V
- Operating Temperature:  $-40^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$
- Package Options:
  - 6-lead SOT23
  - 6-lead DFN,  $1.50 \times 1.50 \times 0.45$  mm
  - KGD (Known Good Die) in Wafer Form

### Applications

- Linear Measurements
- Proximity Sensing
- Current Sensing

### Product Description

The CT100 is a 1D linear sensor in full-bridge configuration from Crocus Technology developed on its patented XtremeSense® TMR technology. The total magnetic field range for the CT100 is from -50 mT to +50 mT and it achieves a linearity error of  $\pm 0.5\%$  for a range of -20 mT to +20 mT while providing XtremeSense® performance to achieve unparalleled temperature stability across the full temperature range. It supports a wide operating voltage range of 1.0 V to 5.5 V.

It is available in a 6-lead SOT23 package and for space critical applications, a low profile and small form factor 6-lead DFN package that is  $1.50 \times 1.50 \times 0.45$  mm in size. The CT100 is also made available in die form where it will be shipped as unsawn wafers (wafer map files will be provided to indicate known good die).

## Ordering Information

Part Number	Operating Temperature Range	Output Type	Package	Packing Method
CT100LW-IS6	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	Differential	6-lead SOT23 $2.90 \times 2.80 \times 1.20$ mm	Tape & Reel
CT100LW-HS6	$-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$			
CT100LW-FS6	$-40^{\circ}\text{C}$ to $+150^{\circ}\text{C}$			
CT100LW-ID6	$-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$	Differential	6-lead DFN $1.50 \times 1.50 \times 0.45$ mm	Tape & Reel
CT100LW-HD6	$-40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$			
CT100LW-FD6	$-40^{\circ}\text{C}$ to $+150^{\circ}\text{C}$			
CT100LW-KGD	$-40^{\circ}\text{C}$ to $+150^{\circ}\text{C}$	Differential	Wafer Form	Unsawn Wafer

Block Diagram

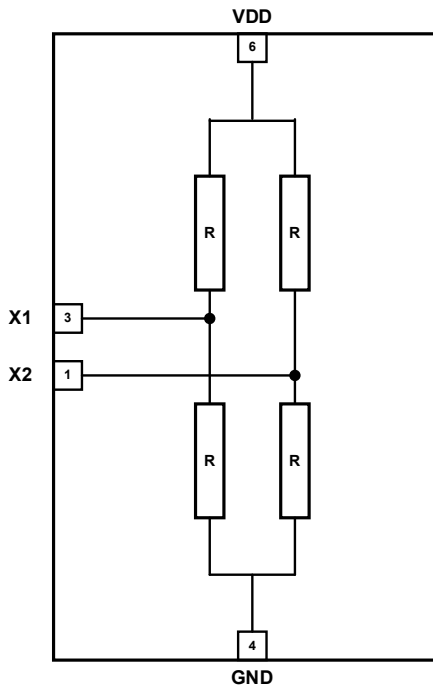


Figure 1. CT100 Functional Block Diagram for SOT23-6

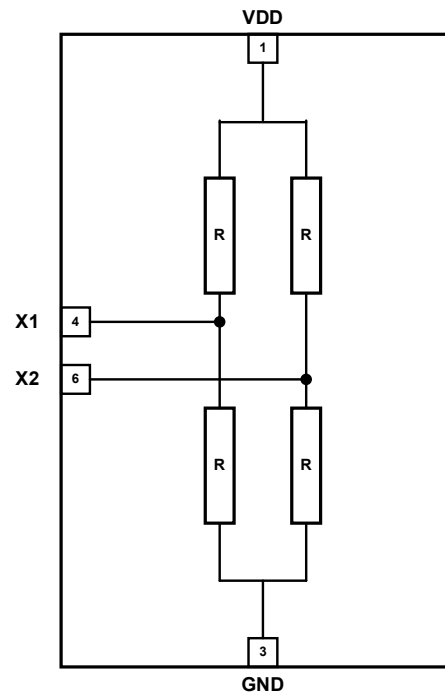


Figure 2. CT100 Functional Block Diagram for DFN-6

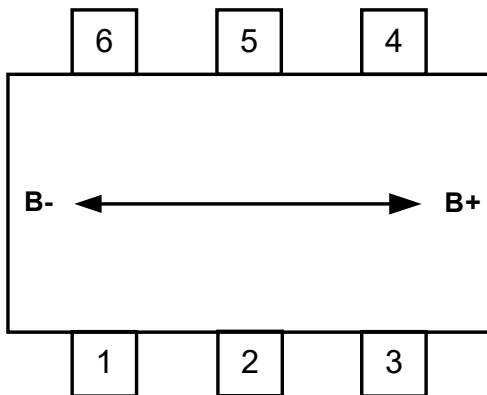


Figure 3. CT100 Axis of Sensitivity for SOT23-6 (Top Down View)

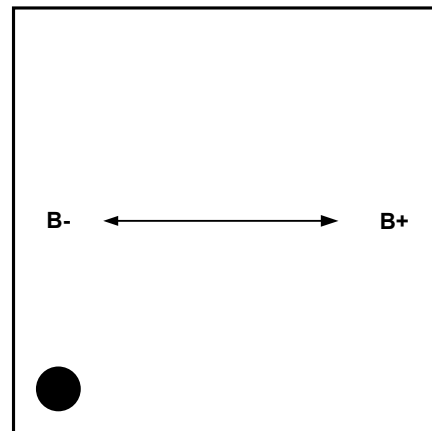


Figure 4. CT100 Axis of Sensitivity for DFN-6 (Top Down View)

Pin Configuration

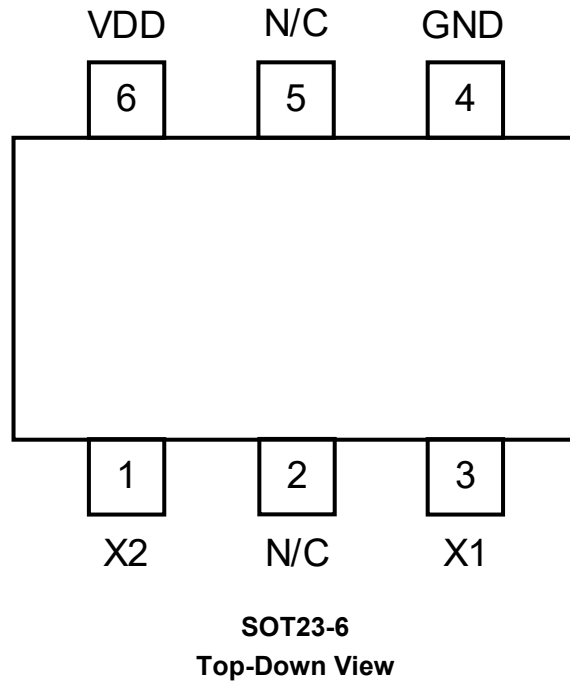
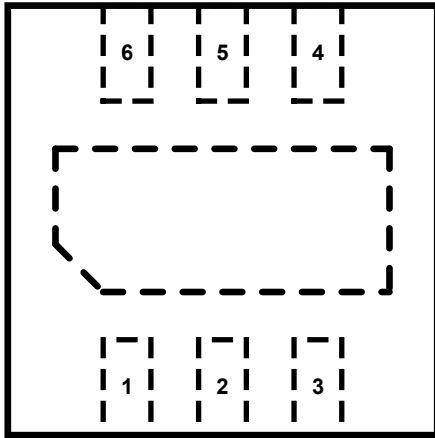


Figure 5. CT100 Pin-out Diagram

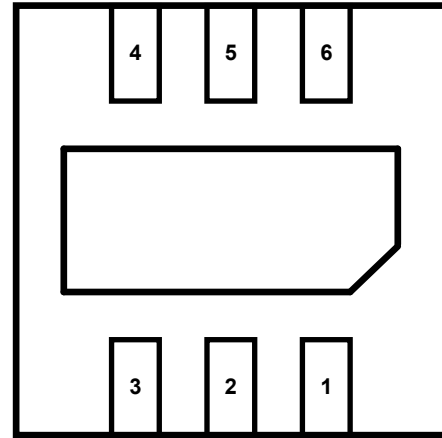
Pin Definitions

SOT23-6 Pin #	Pin Name	Pin Description
1	X2	Differential Output X2
2	N/C	No Connect
3	X1	Differential Output X1
4	GND	Ground
5	N/C	No Connect
6	VDD	Supply Voltage

Pin Configuration



DFN-6 – Top-Down View



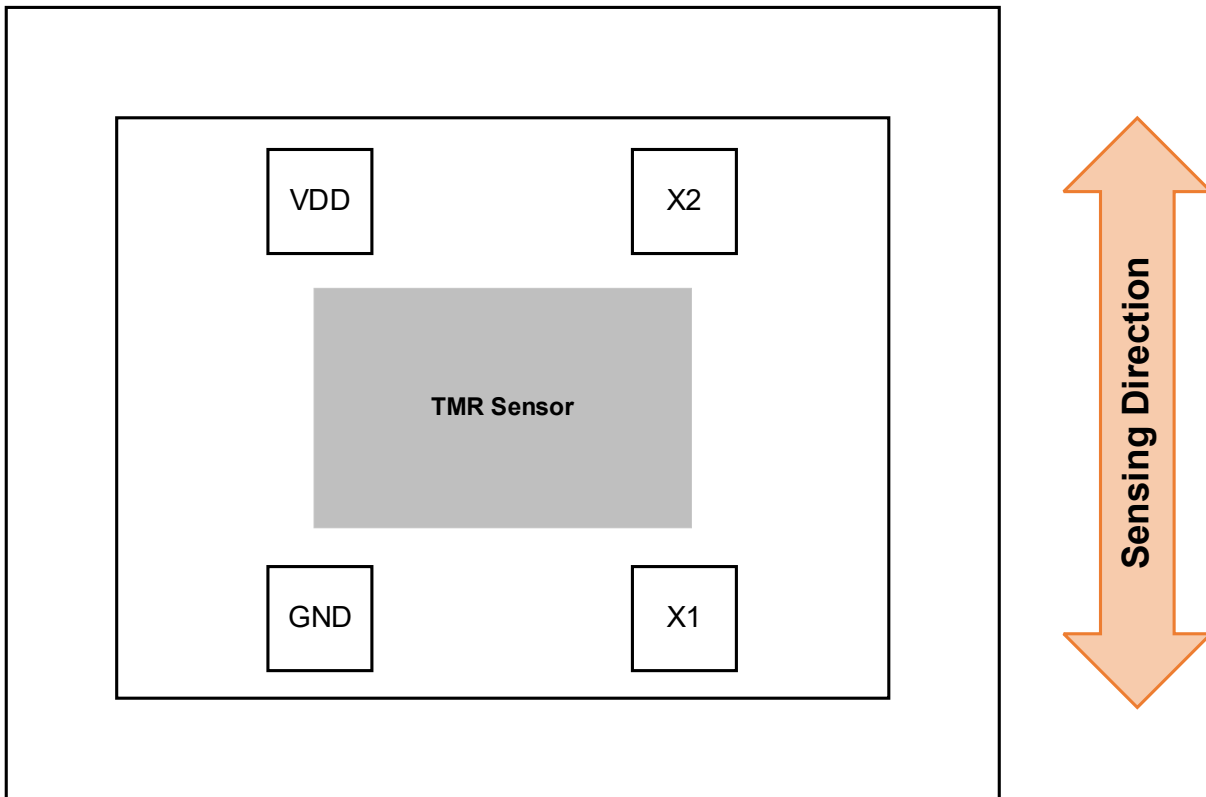
DFN-6 – Bottoms Up View

Figure 6. CT100 Pin-out Diagrams

Pin Definitions

DFN-6 Pin #	Pin Name	Pin Description
1	VDD	Supply Voltage
2	N/C	No Connect
3	GND	Ground
4	X1	Differential Output X1
5	N/C	No Connect
6	X2	Differential Output X2

**Pad Configuration**



**CT100 Die Layout and Axis of Sensitivity  
Top-Down View**

**Figure 7. CT100 Pad Diagram**

**Pad Definitions**

Pad #	Pad Name	Pad Description
1	VDD	Supply Voltage
2	X2	Differential Output X2
3	X1	Differential Output X1
4	GND	Ground

## Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the CT100 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 <sub>DD</sub>	Supply Voltage	-0.3	6.0	V
V <sub>OUT</sub>	Analog Output Pins Maximum Voltage	-1560	+1560	mV
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 <sub>MAX</sub>	Maximum Magnetic Field @ T <sub>A</sub> = +25°C		±200	mT
T <sub>STG</sub>	Storage Temperature	-65	+160	°C
T <sub>L</sub>	Lead Soldering Temperature, 10 Seconds		+260	°C

## Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual operation of the CT100. 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 <sub>DD</sub>	Supply Voltage Range	1.0	3.0	5.5	V	
V <sub>OUT</sub>	OUT Voltage Range	-1430		+1430	mV	
B <sub>OPERATING</sub>	Operating Magnetic Field			±50	mT	
T <sub>A</sub>	Operating Ambient Temperature	Industrial	-40	+25	+85	°C
		Extended Industrial	-40	+25	+125	
		Full Range	-40	+25	+150	

## Electrical & Magnetic Specifications

Unless otherwise specified:  $V_{DD} = 1.0\text{ V}$  to  $5.5\text{ V}$  and  $T_A = -40^\circ\text{C}$  to  $+150^\circ\text{C}$ . Typical values are  $V_{DD} = 3.0\text{ V}$  and  $T_A = +25^\circ\text{C}$ .

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
<b>Magnetic</b>						
$B_{OPERATING}$	Operating Magnetic Field <sup>(1)</sup>				$\pm 50$	mT
<b>Electrical</b>						
$R_{BRIDGE}$	Bridge Resistance		20		40	$k\Omega$
$P_D$	Power Consumption	$V_{DD} = 3.0\text{ V}$ , $R_{BRIDGE} = 30\text{ k}\Omega$		0.30		mW
$V_{OFFSET}$	Offset Voltage	$B_{OP} = \pm 20\text{ mT}$	-5		+5	mV/V
S	Sensitivity (Full-bridge Gain)	$B_{OPERATING} = \pm 20\text{ mT}$	3.8	4.5	5.2	mV/V/mT
$TCR_{BRIDGE}$	Temperature Coefficient Resistance of Bridge <sup>(1)</sup>				-750	ppm/ $^\circ\text{C}$
TCO	Temperature Coefficient of Offset Voltage <sup>(1)</sup>				$\pm 4.0$	$\mu\text{V/V}/^\circ\text{C}$
TCS	Temperature Coefficient of Sensitivity <sup>(1)</sup>			-250	-350	ppm/ $^\circ\text{C}$
L	Linearity	$B_{OP} = \pm 20\text{ mT}$			$\pm 0.5$	%
$E_{HYST}$	Hysteresis Error	$B_{OP} = \pm 20\text{ mT}$ , $T_A = +25^\circ\text{C}$			0.05	%
$e_N$	Output Noise <sup>(1)</sup>	$f = 10\text{ Hz}$ , $V_{DD} = 1.0\text{ V}$ , $B_{OPERATING} = 0\text{ mT}$ , $T_A = +25^\circ\text{C}$		700		$\text{nV}_{RMS}/\sqrt{\text{Hz}}$

(1) Not tested in production. Guaranteed by design and characterization.

## Electrical Characteristics

$V_{DD} = 1.0\text{ V}$  and  $T_A = +25^\circ\text{C}$ .

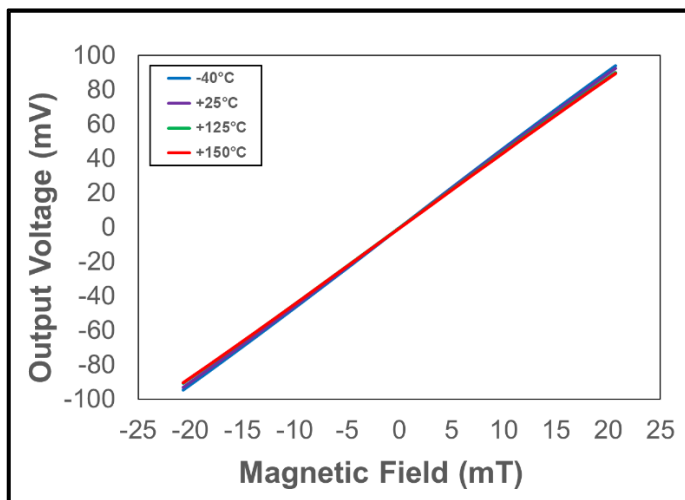


Figure 8. Sensitivity: Output Voltage vs. Magnetic Field vs. Temperature

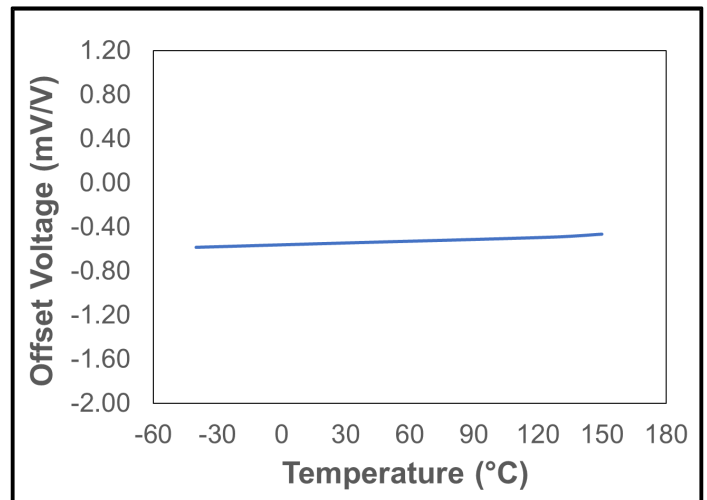


Figure 9. Offset Voltage vs. Temperature

Recommended Application Circuit

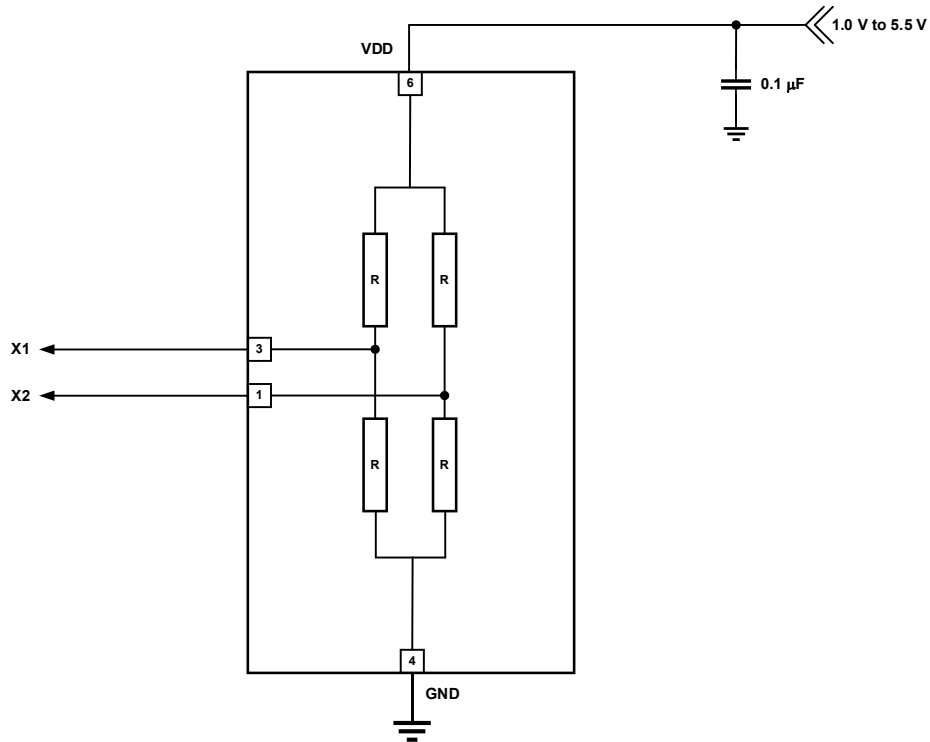


Figure 10. CT100 (SOT23-6) Application Diagram

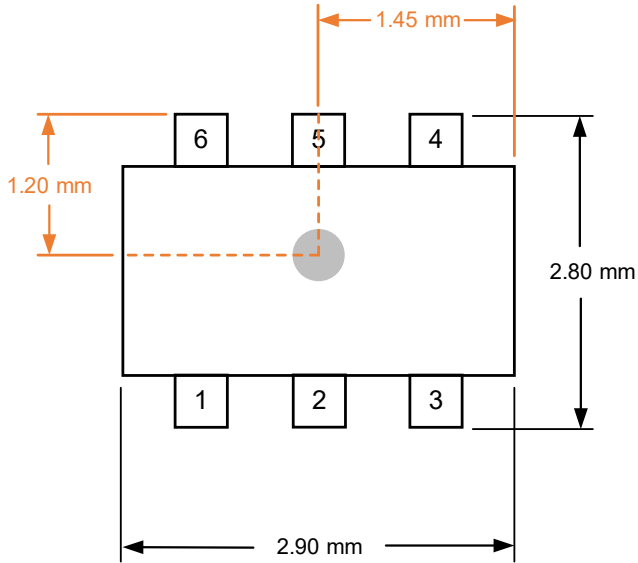
Table 1. Recommended External Components

Component	Description	Vendor & Part Number	Parameter	Min.	Typ.	Max.	Unit
C <sub>BYP</sub>	0.1 μF, X7R	Murata GRM033Z71A104KE14	C		0.1		μF
		Others					

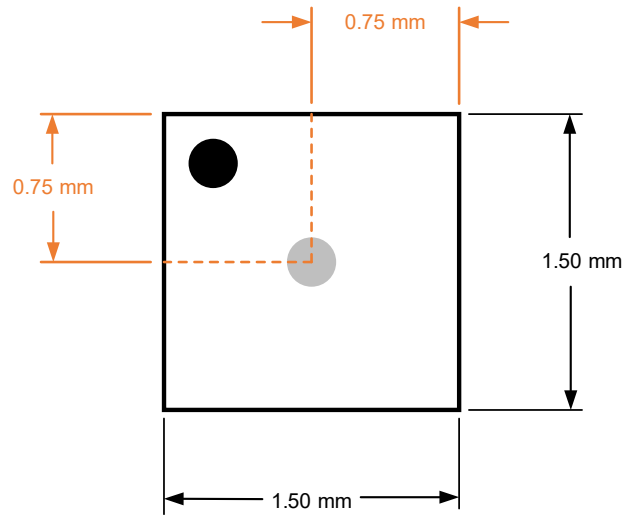


**Applications Information**

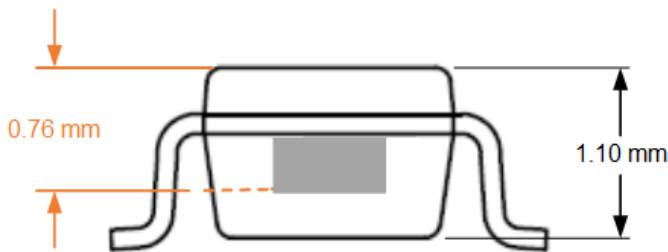
The XtremeSense TMR sensor location for the CT100 for the x, y dimensions are shown in Figure 11 and Figure 12 for the SOT23-6 and DFN-6 packages, respectively. Figure 13 and Figure 14 illustrates the location of the CT100's XtremeSense TMR sensor from the z dimension. All dimensions in the figures below are nominal.



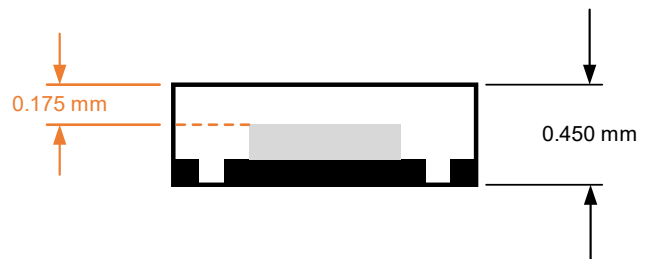
**Figure 11. XtremeSense TMR Sensor Location in x-y Plane for CT100 in SOT23-6 Package**



**Figure 12. XtremeSense TMR Sensor Location in x-y Plane for CT100 in DFN-6 Package**



**Figure 13. XtremeSense TMR Sensor Location in z Dimension for CT100 in SOT23-6 Package**



**Figure 14. XtremeSense TMR Sensor Location in z Dimension for CT100 in DFN-6 Package**

## SOT23-6 Package Drawing and Dimensions

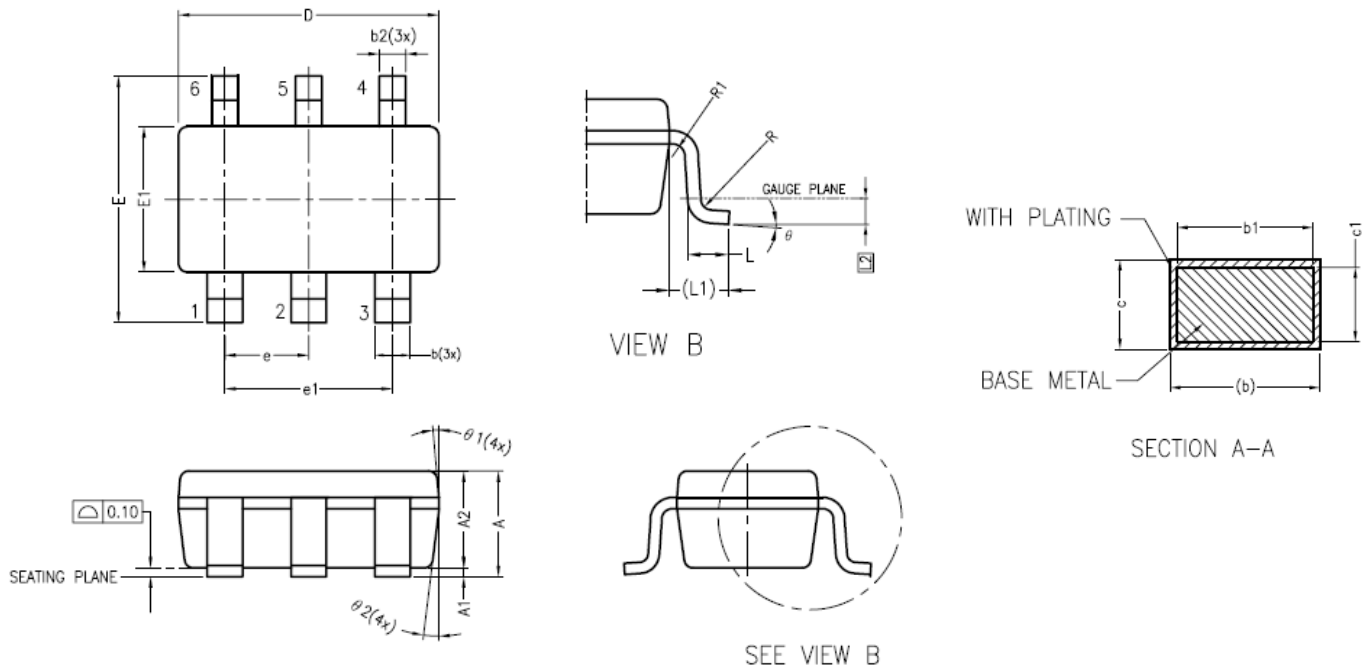


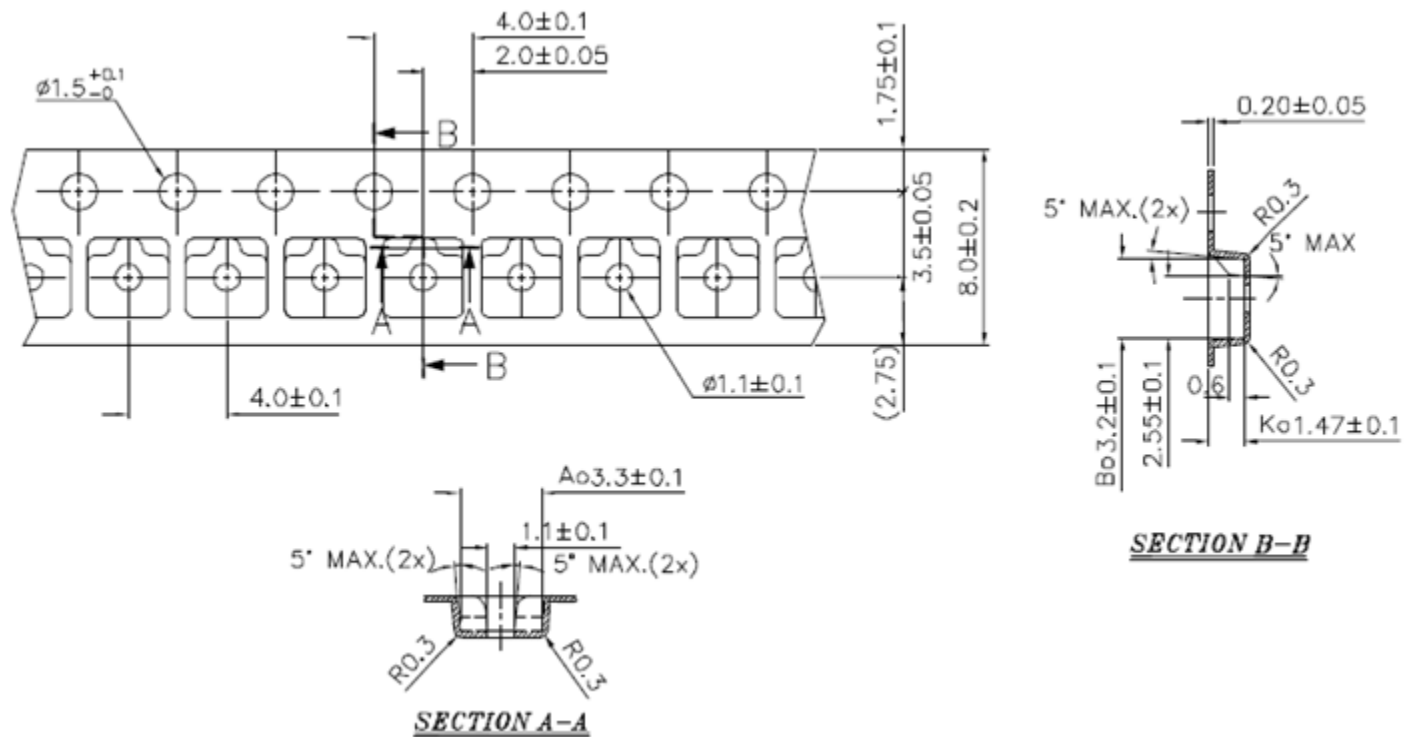
Figure 15. 6-Lead SOT23 Package Drawing

Table 2. CT100 6-Lead SOT23 Package Dimensions

Symbol	Dimensions in Millimeters (mm)		
	Min.	Typ.	Max.
A	1.05	1.20	1.35
A1	0.00	0.10	0.15
A2	1.00	1.10	1.20
b	0.40	-	0.50
b1	0.40	-	0.45
b2	0.30	-	0.40
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°
θ1	5°	6°	15°
θ2	5°	8°	15°

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## SOT23 Tape &amp; Pocket Drawing and Dimensions



## NOTES:

1. Material: Conductive Polystyrene
2. Dimensions in mm.
3. 10 sprocket hole pitch cumulative tolerance  $\pm 0.20$  mm.
4. Camber bot to exceed 1 mm in 100 mm.
5. Pocket position relative to sprocket hole measured as true position of pocket and not pocket hole.
6. (S.R.  $\Omega/\text{sq}$ ) means surface electric resistivity of the carrier tape.

Figure 16. Tape and Pocket Drawing for SOT23 Package

## DFN-6 Package Drawing and Dimensions

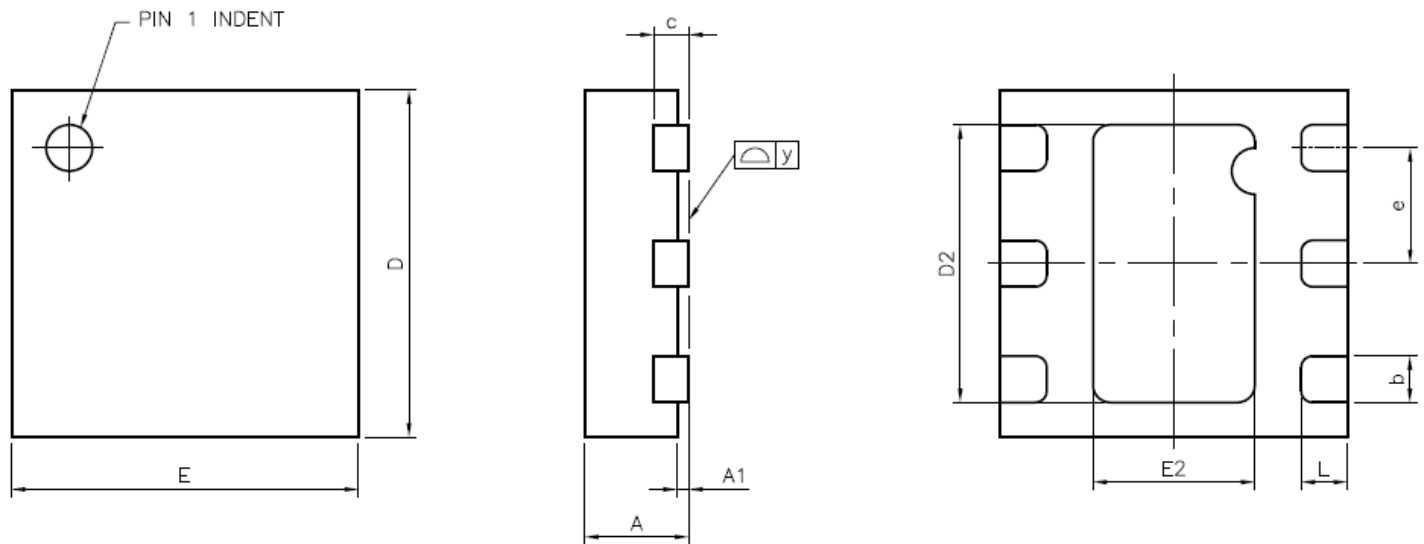


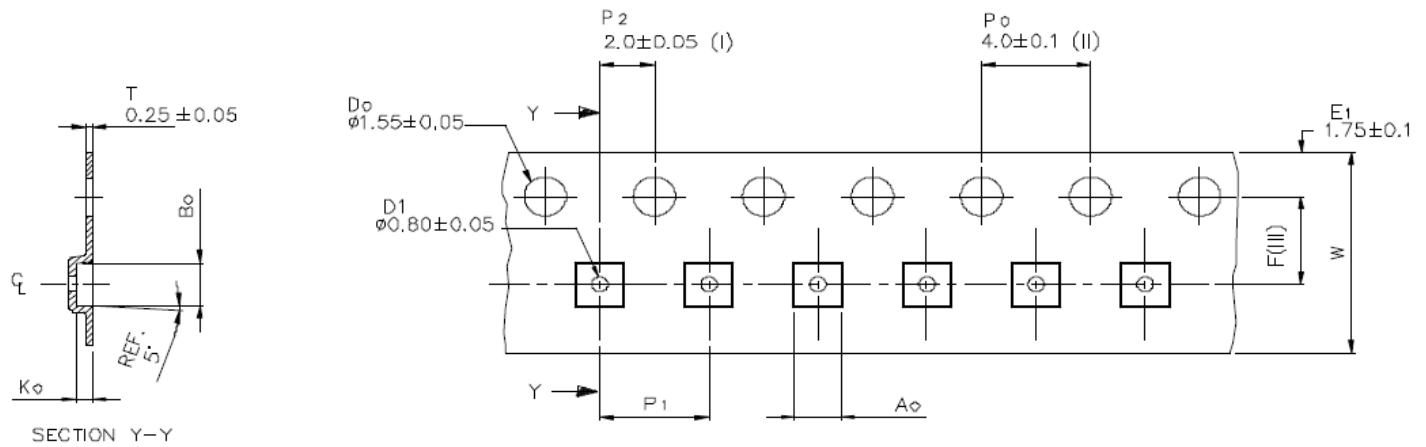
Figure 17. DFN-6 Package Drawing

Table 3. CT100 DFN-6 Package Dimensions

Symbol	Dimensions in Millimeters (mm)		
	Min.	Typ.	Max.
A	0.40	0.45	0.50
A1	0.00	0.02	0.05
b	0.15	0.20	0.25
c	-	0.15 REF	-
D	1.40	1.50	1.60
D2	1.15	1.20	1.25
E	1.40	1.50	1.60
E2	0.65	0.70	0.75
e	-	0.50	-
L	0.15	0.20	0.25
y	0.000	-	0.075

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## DFN-6 Tape &amp; Pocket Drawing and Dimensions



## NOTES:

- I. Measured from centerline of sprocket hole to centerline of pocket.
- II. Cumulative tolerance of 10 sprocket holes is  $\pm 0.20$ .
- III. Measured from centerline of sprocket hole to centerline of pocket.
- IV. Other material available.

Figure 18. Tape and Pocket Drawing for DFN-6 Package

Table 4. DFN-6 Tape and Pocket Dimensions

Symbol	Dimension (mm)
Ao	$1.70 \pm 0.05$
Bo	$1.70 \pm 0.05$
Ko	$0.60 \pm 0.05$
F	$3.50 \pm 0.05$
P1	$4.00 \pm 0.10$
DW	$8.00 \pm 0.30$

## Package Information

Table 5. CT100 Package Information

Part Number	Package Type	# of Leads	Package Quantity	Lead Finish	Eco Plan <sup>(1)</sup>	MSL Rating <sup>(2)</sup>	Operating Temperature <sup>(3)</sup>	Device Marking
CT100LW-IS6	SOT23	6	3,000	Sn	Green & RoHS	1	-40°C to +85°C	CT YWWS
CT100LW-HS6	SOT23	6	3,000	Sn	Green & RoHS	1	-40°C to +125°C	CT YWWS
CT100LW-FS6	SOT23	6	3,000	Sn	Green & RoHS	1	-40°C to +150°C	CT YWWS
CT100LW-ID6	DFN	6	3,000	Sn	Green & RoHS	1	-40°C to +85°C	C YZ
CT100LW-HD6	DFN	6	3,000	Sn	Green & RoHS	1	-40°C to +125°C	C YZ
CT100LW-FD6	DFN	6	3,000	Sn	Green & RoHS	1	-40°C to +150°C	C 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 ≤ 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 +160°C.
- (4) Device Marking for SOT23 is defined as XZ YWWS where XZ = part number, Y = year, WW = work week and S = sequential number. DFN is defined as X where X = part number and YZ = date code information.

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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.
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