

## Integrated Unipolar TMR Digital Switches

### FEATURES AND BENEFITS

- Sensitivity with  $B_{OP}$  as low as 15 G
- Ultra-low power consumption:  $\sim 145 \text{ nA}$  @  $V_{DD} = 1.8 \text{ V}$  and  $f_S = 10 \text{ Hz}$
- Supply voltage range: 1.7 V to 5.5 V
- Sensor polarity: unipolar
- Digital CMOS outputs:
  - Push-pull
  - Open drain
- Undervoltage lockout (UVLO)
- 3-lead SOT23 package

### APPLICATIONS

- IoT devices
- Door or lid closure
- Reed switch replacement
- Tamper-proofing for utility smart meters
- Fluid level sensing/detection
- Proximity detection
- Motor controllers
- Gimbals for camera systems in drones/UAVs
- Industrial machinery/robots
- Medical devices

### DESCRIPTION

The CT811x series of unipolar tunnel magnetoresistance (TMR) digital switches are designed for consumer and industrial applications. The devices are based on Allegro patented XtremeSense™ TMR technology with integrated CMOS process to provide a monolithic solution for superior sensing performance. The CT811x digital switches offer stable magnetic operation over the operating temperature range.

This product family has very low power consumption—as low as 145 nA—which is ideal for battery-operated products where minimal current consumption is required. The devices support magnetic fields down to 15 G for applications where there is a large air gap requirement.

The CT811x is available in an industry-standard 3-lead SOT-23 package to support high-volume manufacturing for industrial markets.

### PACKAGE:



3-lead SOT-23

*Not to scale*

### FUNCTIONAL BLOCK DIAGRAMS

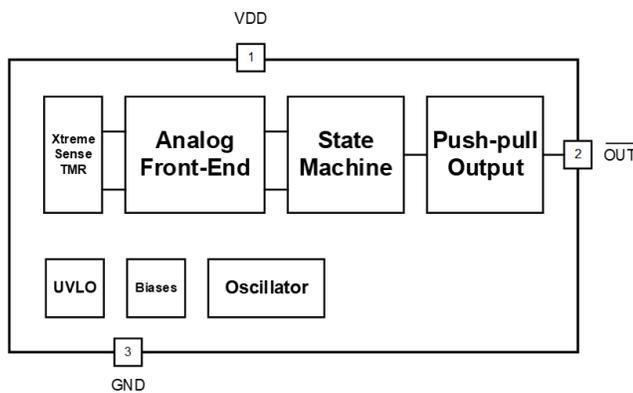


Figure 1: CT8112 with Push-Pull Output Block Diagram for 3-Lead SOT23 Package

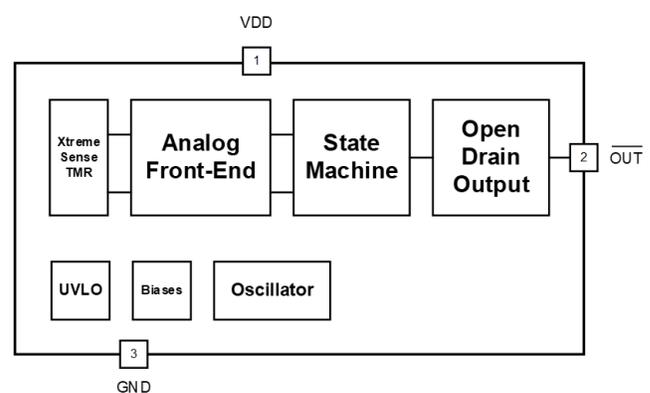


Figure 2: CT8111 with Open Drain Output Block Diagram for 3-Lead SOT23 Package

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## SELECTION GUIDE

Part Number	Operating Temp. Range (°C)	Sensor Type	Output	B <sub>OP</sub> (mT)	B <sub>RP</sub> (mT)	f <sub>s</sub>	Package	Packing
CT8111BK-IS3	-40 to 85	Unipolar	Open Drain	+3.0	+2.0	10 Hz	3-lead SOT23	Tape and Reel
CT8111BK-HS3	-40 to 125							
CT8111BH-IS3	-40 to 85	Unipolar	Open Drain	+3.0	+2.0	10 kHz	3-lead SOT23	Tape and Reel
CT8111BH-HS3	-40 to 125							
CT8111DK-IS3	-40 to 85	Unipolar	Open Drain	+1.5	+1.0	10 Hz	3-lead SOT23	Tape and Reel
CT8111DK-HS3	-40 to 125							
CT8111DT-IS3	-40 to 85	Unipolar	Open Drain	+1.5	+1.0	20 Hz	3-lead SOT23	Tape and Reel
CT8111DT-HS3	-40 to 125							
CT8112BK-IS3	-40 to 85	Unipolar	Push-Pull	+3.0	+2.0	10 Hz	3-lead SOT23	Tape and Reel
CT8112BK-HS3	-40 to 125							
CT8112DK-IS3	-40 to 85	Unipolar	Push-Pull	+1.5	+1.0	10 Hz	3-lead SOT23	Tape and Reel
CT8112DK-HS3	-40 to 125							
CT8112DT-IS3	-40 to 85	Unipolar	Push-Pull	+1.5	+1.0	20 Hz	3-lead SOT23	Tape and Reel
CT8112DT-HS3	-40 to 125							

## ABSOLUTE MAXIMUM RATINGS [1]

Characteristic	Symbol	Notes	Rating	Unit
Supply Voltage	$V_{DD}$		-0.3 to 6.0	V
Push-Pull Output (Active Low)	$V_{OUT\_PP}$		-0.3 to $V_{DD} + 0.3$ [2]	V
Open Drain Output (Active Low)	$V_{OUT\_OD}$		-0.3 to 6.0	V
Analog Input/Output Pins Maximum Voltage	$V_{I/O}$		-0.3 to $V_{DD} + 0.3$ [2]	V
Input and Output Current	$I_{IN}, I_{OUT}$		$\pm 20.0$	mA
Maximum External Magnetic Field	$B_{MAX}$	$T_A = 25^\circ\text{C}$	$\pm 2000$	G
Electrostatic Discharge Protection Level	ESD	Human Body Model (HBM) per JESD22-A114	$\pm 4.0$ (min)	kV
		Charged Device Model (CDM) per JESD22-C101	$\pm 0.5$ (min)	kV
Junction Temperature	$T_J$		-40 to 150	$^\circ\text{C}$
Storage Temperature	$T_{STG}$		-65 to 150	$^\circ\text{C}$
Lead Soldering Temperature	$T_L$	10 seconds	260	$^\circ\text{C}$

[1] Stresses exceeding the absolute maximum ratings may damage the CT811x 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. Allegro does not recommend exceeding or designing to absolute maximum ratings

[2] The lower of  $V_{DD} + 0.3$  V or 6.0 V.

## RECOMMENDED OPERATING CONDITIONS [1]

Characteristic	Symbol	Notes	Min.	Typ.	Max.	Unit
Supply Voltage Range	$V_{DD}$		1.7	3.3	5.5	V
Output Voltage Range	$V_{OUT}$		0	-	$V_{DD}$	V
Operating Magnetic Flux	$B_{OP}$		-	-	300	G
Output Current	$I_{OUT}$		-	-	$\pm 3.0$	mA
Bypass Capacitor	$C_{BYP}$		-	1.0	-	$\mu\text{F}$
Operating Ambient Temperature	$T_A$	Industrial	-40	25	85	$^\circ\text{C}$
		Extended Industrial	-40	25	125	$^\circ\text{C}$

[1] The Recommended Operating Conditions table defines the conditions for actual operation of the CT811x. Recommended operating conditions are specified to ensure optimal performance to the specifications. Allegro does not recommend exceeding them or designing to absolute maximum ratings.

## THERMAL CHARACTERISTICS

Characteristic	Symbol	Test Conditions	Value	Unit
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	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 2s2p FR-4 printed circuit board (PCB) with 2 oz. of copper (Cu) and 4 oz. of copper (Cu) or more for 65 A. Special attention must be paid not to exceed junction temperature $T_{J(MAX)}$ at a given ambient temperature $T_A$ .	202	$^\circ\text{C/W}$

PINOUT DIAGRAM AND TERMINAL LIST

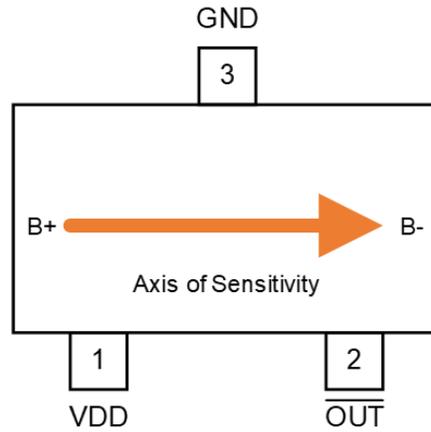


Figure 3: CT811x: 3-Lead SOT23 Package for Digital Output (Top-Down View)

Terminal List

Number	Name	Function
1	VDD	Supply Voltage
2	$\overline{\text{OUT}}$	Output Signal (Active Low)
3	GND	Ground

**ELECTRICAL CHARACTERISTICS:** Valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ$ C to  $125^\circ$ C, typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ$ C, unless otherwise specified

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
<b>PUSH-PULL OUTPUT</b>						
Output Voltage High $\overline{O\!U\!T}$ [1]	$V_{OH}$		$0.9 \times V_{DD}$	–	–	V
Output Voltage Low $\overline{O\!U\!T}$ [1]	$V_{OL}$		–	–	$0.1 \times V_{DD}$	V
$\overline{O\!U\!T}$ Current [1]	$I_{OUT}$		–	$\pm 2.0$	–	mA
<b>OPEN DRAIN OUTPUT</b>						
Output Voltage High [1]	$V_{OH}$		–	–	5.5	V
Output Voltage Low	$V_{OL}$	$I_{OUT} \leq 20$ mA	0	–	0.5	V
High Output Leakage Current [1]	$I_{LEAK}$	$V_{OH} = 5.5$ V, $B_{OP} = 0$	–	20	–	$\mu$ A
<b>TIMINGS</b>						
Power-On Time [1]	$t_{ON}$	$V_{DD} \geq 1.7$ V	–	50	75	$\mu$ s
Active Mode Time [1]	$t_{ACTIVE}$		–	2.6	–	$\mu$ s
<b>PROTECTION</b>						
Undervoltage Lockout [1]	$V_{UVLO}$	Rising $V_{DD}$	–	1.60	1.64	V
		Falling $V_{DD}$	1.44	1.53	–	V
UVLO Hysteresis [1]	$V_{UV\_HYS}$		–	70	–	mV

[1] Guaranteed by design and characterization; not tested in production.

## TYPICAL TIMING CHARACTERISTICS

$V_{DD} = 3.3$  V,  $T_A = 25^\circ$ C, and  $C_{BYP} = 1.0$   $\mu$ F (unless otherwise specified)

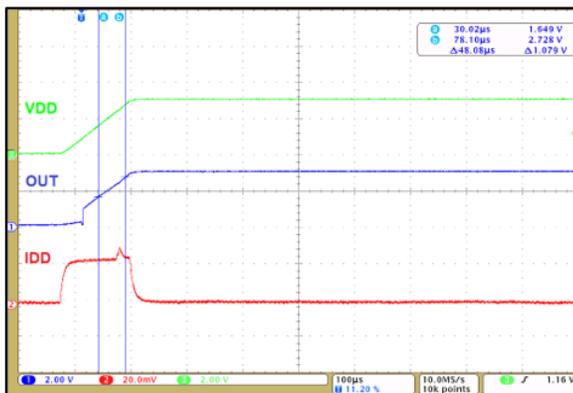


Figure 4: Power-On Time for Push-Pull Output

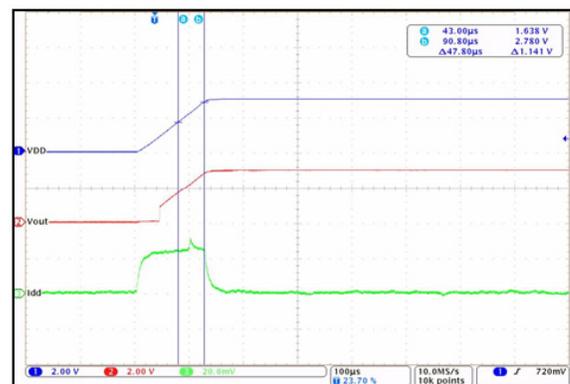


Figure 5: Power-On Time for Open Drain Output

**CT8111BK – ELECTRICAL CHARACTERISTICS and MAGNETIC SPECIFICATIONS:** Unless otherwise specified, valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ$ C to  $125^\circ$ C, typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ$ C

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Average Supply Current	$I_{DD(AVG)}$	$t \geq 10$ seconds	–	190	900	nA
	$I_{DD(AVG)}_{1.8V}$	$t \geq 10$ seconds, $V_{DD} = 1.8$ V	–	145	700	nA
Sampling Frequency	$f_{S1}$		6	10	14	Hz
Idle Mode Time	$t_{IDLE1}$	$f_S = 2$ Hz	71	100	167	ms
Operate Point	$B_{OP}$		23	30	38	G
Release Point	$B_{RP}$		14	20	27	G
Hysteresis	$B_{HYST}$		5	10	–	G

**CT8111BH – ELECTRICAL CHARACTERISTICS and MAGNETIC SPECIFICATIONS:** Unless otherwise specified, valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ$ C to  $125^\circ$ C, typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ$ C

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Average Supply Current	$I_{DD(AVG)}$	$t \geq 10$ seconds	–	45	57	$\mu$ A
	$I_{DD(AVG)}_{1.8V}$	$t \geq 10$ seconds, $V_{DD} = 1.8$ V	–	41	47	$\mu$ A
Sampling Frequency	$f_{S1}$		6	10	14	kHz
Idle Mode Time	$t_{IDLE1}$	$f_S = 10$ Hz	71	100	167	$\mu$ s
Operate Point	$B_{OP}$		23	30	38	G
Release Point	$B_{RP}$		14	20	27	G
Hysteresis	$B_{HYST}$		5	10	–	G

## TYPICAL MAGNETIC CHARACTERISTICS FOR CT8111Bx

$V_{DD} = 3.3$  V,  $T_A = 25^\circ$ C, and  $C_{BYP} = 1.0$   $\mu$ F (unless otherwise specified)

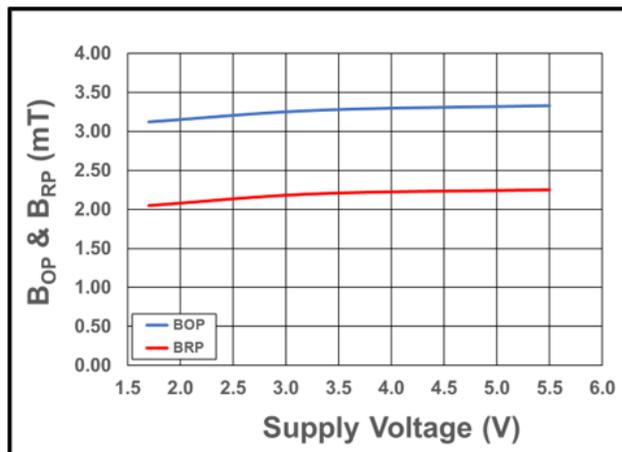


Figure 6:  $B_{OP}$  (Blue) and  $B_{RP}$  (Red) vs. Supply Voltage at  $T_A = 25^\circ$ C

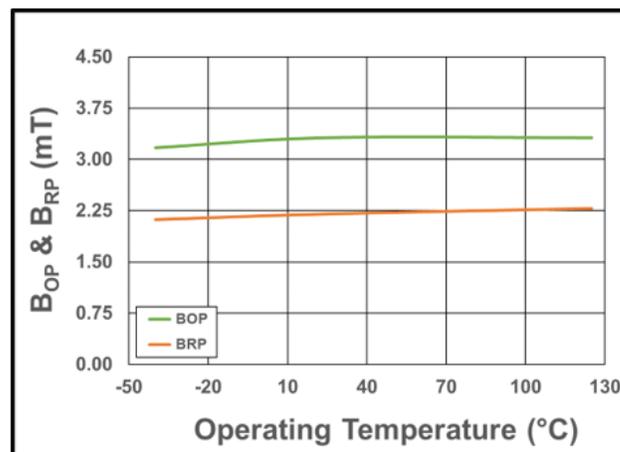


Figure 7:  $B_{OP}$  (Green) and  $B_{RP}$  (Orange) vs. Temperature at  $V_{DD} = 3.3$  V

**TYPICAL ELECTRICAL CHARACTERISTICS FOR CT8111BK**

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0\ \mu\text{F}$  (unless otherwise specified)

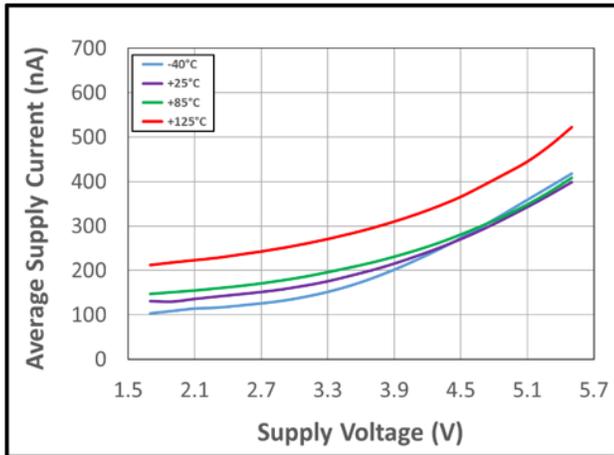


Figure 8: Average Supply Current vs. Supply Voltage vs. Temperature

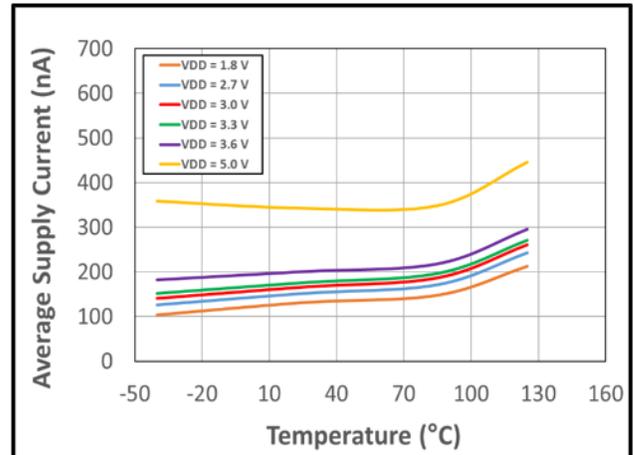


Figure 9: Average Supply Current vs. Temperature vs. Supply Voltage

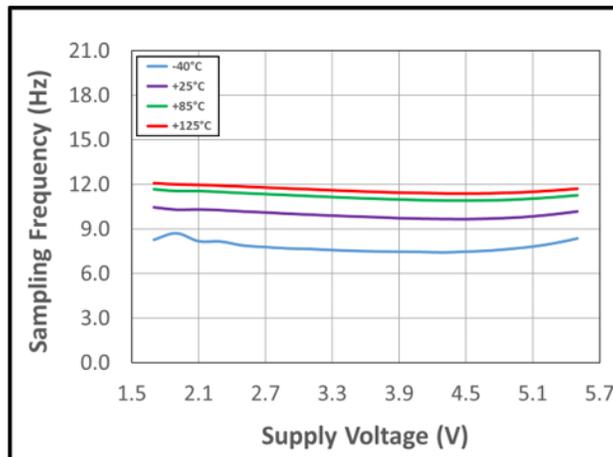


Figure 10: Sampling Frequency vs. Supply Voltage vs. Temperature

**TYPICAL ELECTRICAL CHARACTERISTICS FOR CT8111BH**

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0\ \mu\text{F}$  (unless otherwise specified)

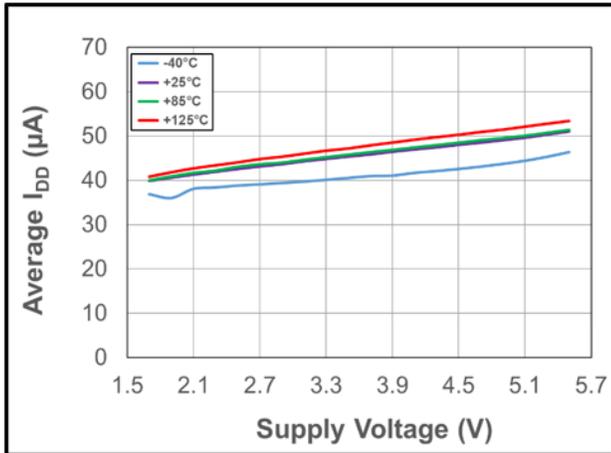


Figure 11: Average Supply Current vs. Supply Voltage vs. Temperature

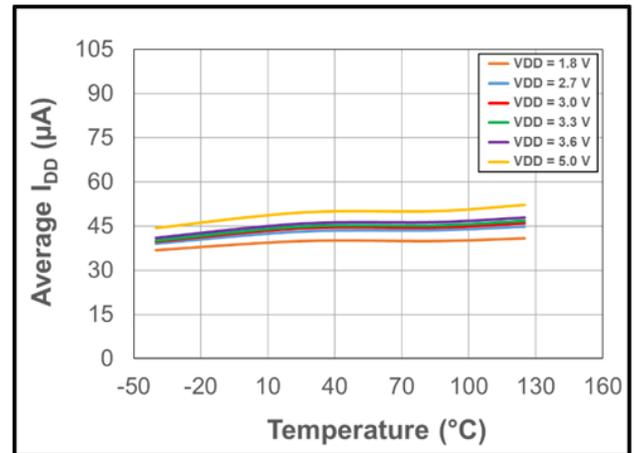


Figure 12: Average Supply Current vs. Temperature vs. Supply Voltage

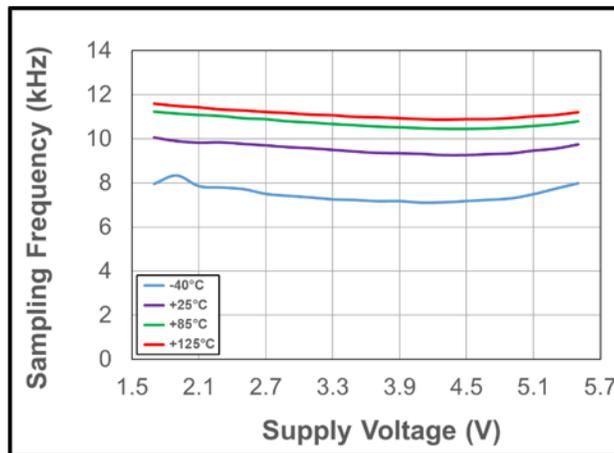


Figure 13: Sampling Frequency vs. Supply Voltage vs. Temperature

**CT8111DK – ELECTRICAL CHARACTERISTICS and MAGNETIC SPECIFICATIONS:** Unless otherwise specified, valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ , typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ\text{C}$

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Average Supply Current	$I_{DD(AVG)}$	$t \geq 10$ seconds	–	190	900	nA
	$I_{DD(AVG)\_1.8V}$	$t \geq 10$ seconds, $V_{DD} = 1.8$ V	–	145	700	nA
Sampling Frequency	$f_S$		6	10	14	Hz
Idle Mode Time	$t_{IDLE}$	$f_S = 10$ Hz	71	100	167	ms
Operate Point	$B_{OP}$		11	15	19	G
Release Point	$B_{RP}$		6	10	14	G
Hysteresis	$B_{HYST}$		3	5	–	G

**CT8111DT – ELECTRICAL CHARACTERISTICS and MAGNETIC SPECIFICATIONS:** Unless otherwise specified, valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ , typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ\text{C}$

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Average Supply Current	$I_{DD(AVG)}$	$t \geq 10$ seconds	–	220	900	nA
	$I_{DD(AVG)\_1.8V}$	$t \geq 10$ seconds, $V_{DD} = 1.8$ V	–	175	700	nA
Sampling Frequency	$f_S$		14	20	26	Hz
Idle Mode Time	$t_{IDLE}$	$f_S = 20$ Hz	38	50	71	ms
Operate Point	$B_{OP}$		11	15	19	G
Release Point	$B_{RP}$		6	10	14	G
Hysteresis	$B_{HYST}$		3	5	–	G

## TYPICAL MAGNETIC CHARACTERISTICS FOR CT8111Dx

$V_{DD} = 3.3$  V,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0$   $\mu$ F (unless otherwise specified)

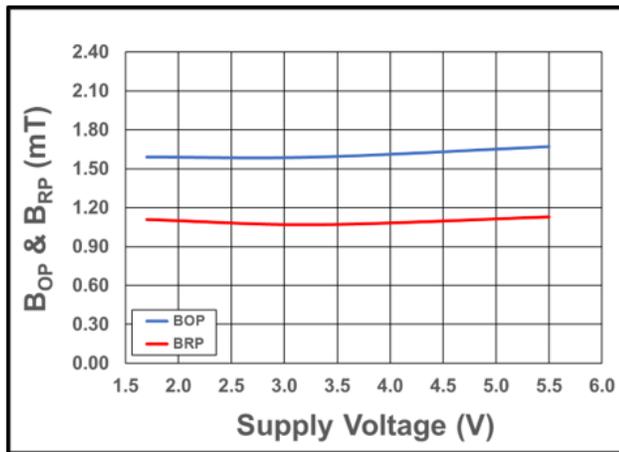


Figure 14:  $B_{OP}$  (Blue) and  $B_{RP}$  (Red) vs. Supply Voltage at  $T_A = 25^\circ\text{C}$

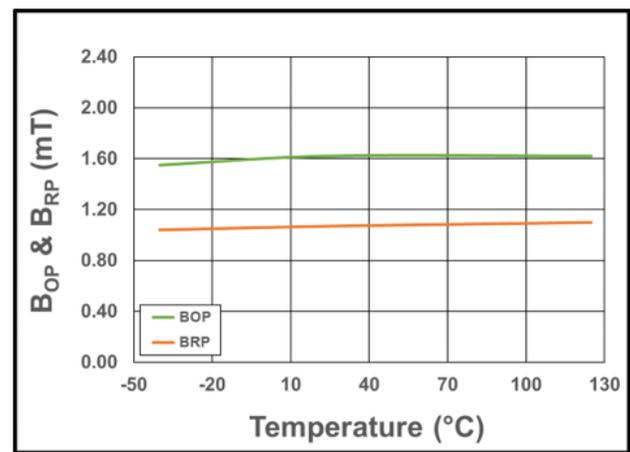


Figure 15:  $B_{OP}$  (Green) and  $B_{RP}$  (Orange) vs. Temperature at  $V_{DD} = 3.3$  V

TYPICAL ELECTRICAL CHARACTERISTICS FOR CT8111DK

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0\ \mu\text{F}$  (unless otherwise specified)

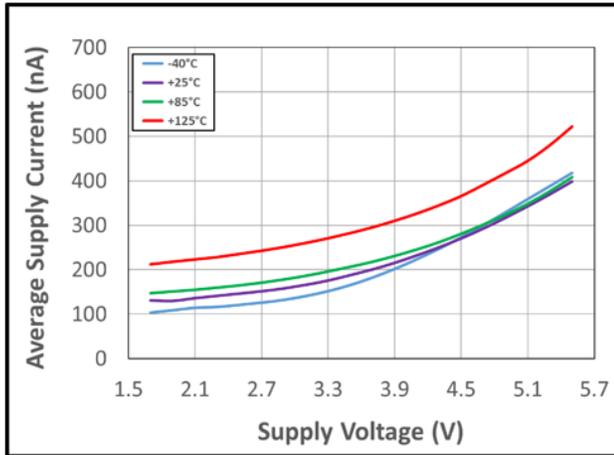


Figure 16: Average Supply Current vs. Supply Voltage vs. Temperature

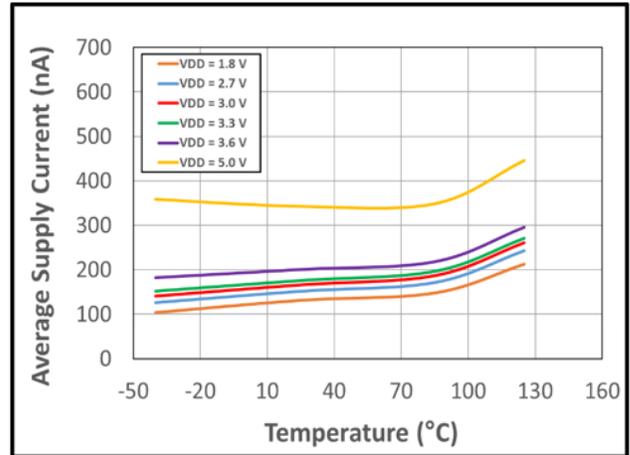


Figure 17: Average Supply Current vs. Temperature vs. Supply Voltage

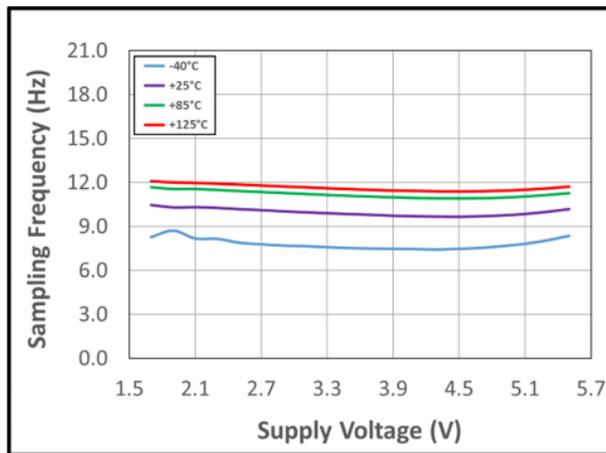


Figure 18: Sampling Frequency vs. Supply Voltage vs. Temperature

**TYPICAL ELECTRICAL CHARACTERISTICS FOR CT8111DT**

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0\ \mu\text{F}$  (unless otherwise specified)

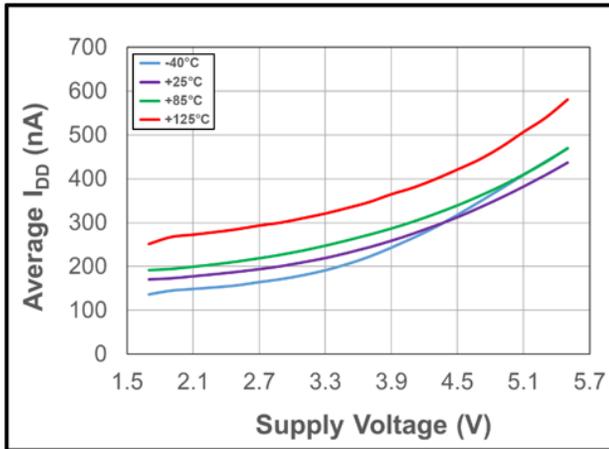


Figure 19: Average Supply Current vs. Supply Voltage vs. Temperature

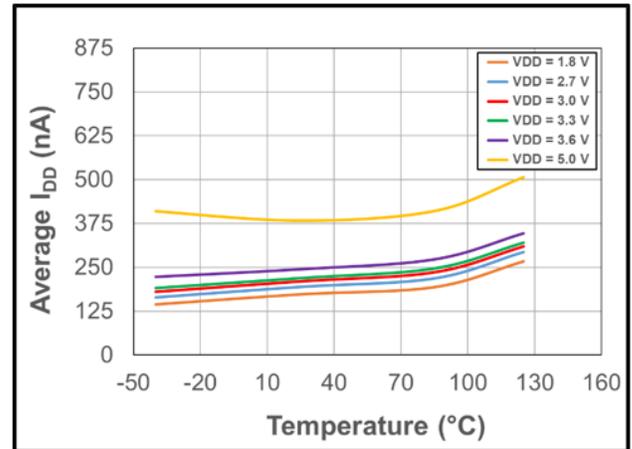


Figure 20: Average Supply Current vs. Temperature vs. Supply Voltage

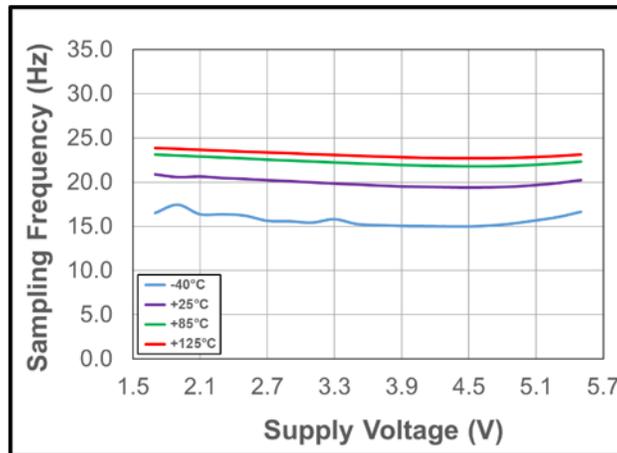


Figure 21: Sampling Frequency vs. Supply Voltage vs. Temperature

**CT8112BK – ELECTRICAL CHARACTERISTICS and MAGNETIC SPECIFICATIONS:** Unless otherwise specified, valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ$ C to  $125^\circ$ C, typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ$ C

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Average Supply Current	$I_{DD(AVG)}$	$t \geq 10$ seconds	–	190	900	nA
	$I_{DD(AVG)}_{1.8V}$	$t \geq 10$ seconds, $V_{DD} = 1.8$ V	–	145	700	nA
Sampling Frequency	$f_{S1}$		6	10	14	Hz
Idle Mode Time	$t_{IDLE1}$	$f_S = 10$ Hz	71	100	167	ms
Operate Point	$B_{OP}$		23	30	38	G
Release Point	$B_{RP}$		14	20	27	G
Hysteresis	$B_{HYST}$		5	10	–	G

## TYPICAL MAGNETIC CHARACTERISTICS FOR CT8112BK

$V_{DD} = 3.3$  V,  $T_A = 25^\circ$ C, and  $C_{BYP} = 1.0$   $\mu$ F (unless otherwise specified)

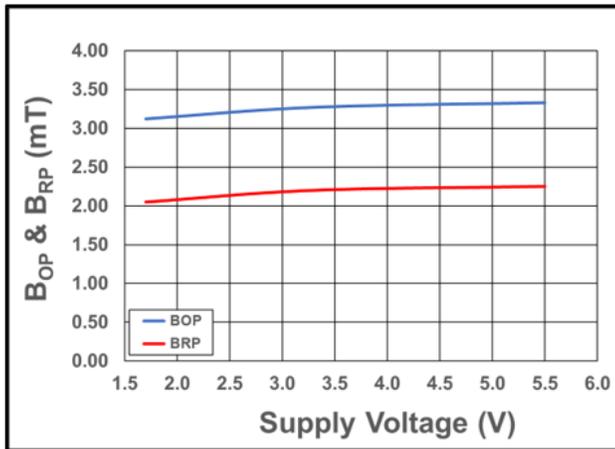


Figure 22:  $B_{OP}$  (Blue) and  $B_{RP}$  (Red) vs. Supply Voltage at  $T_A = 25^\circ$ C

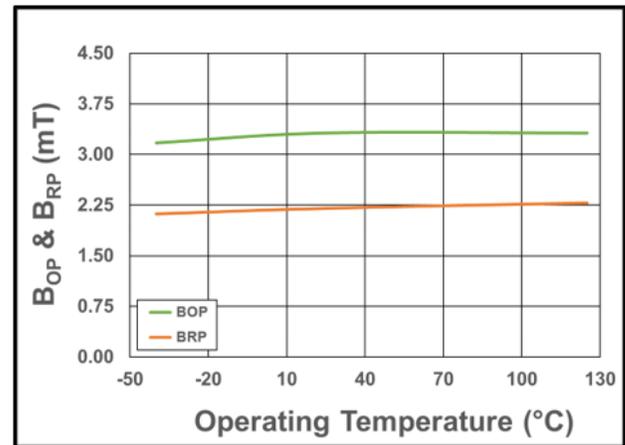


Figure 23:  $B_{OP}$  (Green) and  $B_{RP}$  (Orange) vs. Temperature at  $V_{DD} = 3.3$  V

**TYPICAL ELECTRICAL CHARACTERISTICS FOR CT8112BK**

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0\ \mu\text{F}$  (unless otherwise specified)

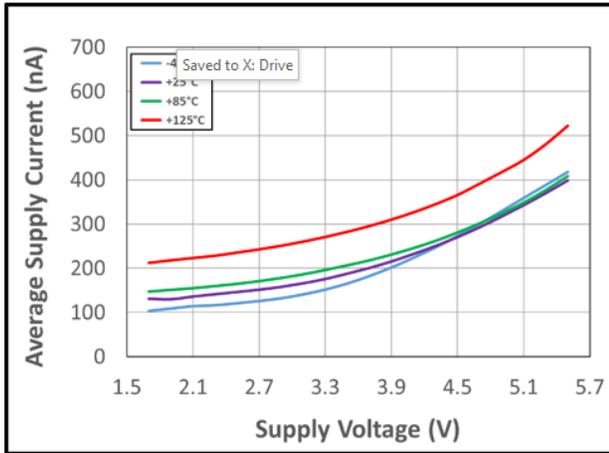


Figure 24: Average Supply Current vs. Supply Voltage vs. Temperature

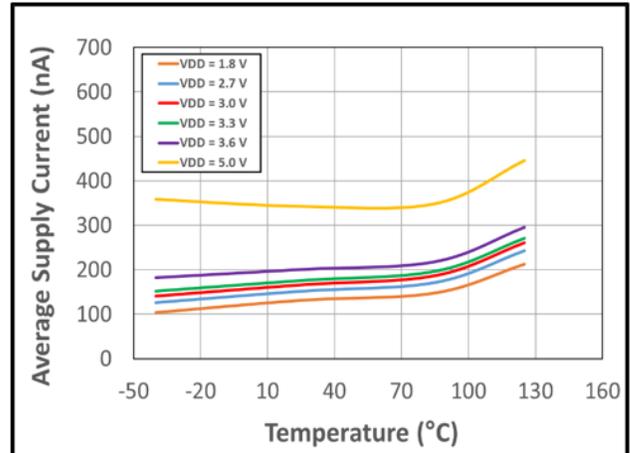


Figure 25: Average Supply Current vs. Temperature vs. Supply Voltage

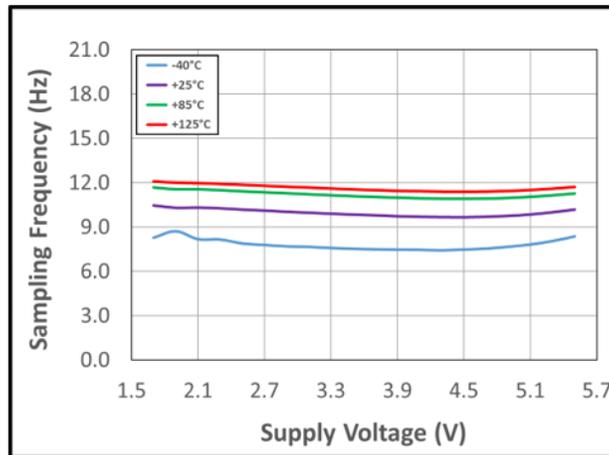


Figure 26: Sampling Frequency vs. Supply Voltage vs. Temperature

**CT8112DK – ELECTRICAL CHARACTERISTICS and MAGNETIC SPECIFICATIONS:** Unless otherwise specified, valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ , typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ\text{C}$

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Average Supply Current	$I_{DD(AVG)}$	$t \geq 10$ seconds	–	190	900	nA
	$I_{DD(AVG)\_1.8V}$	$t \geq 10$ seconds, $V_{DD} = 1.8$ V	–	145	700	nA
Sampling Frequency	$f_S$		6	10	14	Hz
Idle Mode Time	$t_{IDLE}$	$f_S = 10$ Hz	71	100	167	ms
Operate Point	$B_{OP}$		11	15	19	G
Release Point	$B_{RP}$		6	10	14	G
Hysteresis	$B_{HYST}$		3	5	–	G

**CT8112DT – ELECTRICAL CHARACTERISTICS and MAGNETIC SPECIFICATIONS:** Unless otherwise specified, valid for  $V_{DD} = 1.7$  to  $5.5$  V,  $C_{BYP} = 1.0$   $\mu$ F, and  $T_A = -40^\circ\text{C}$  to  $125^\circ\text{C}$ , typical values are  $V_{DD} = 3.3$  V and  $T_A = 25^\circ\text{C}$

Characteristics	Symbol	Test Conditions	Min.	Typ.	Max.	Unit
Average Supply Current	$I_{DD(AVG)}$	$t \geq 10$ seconds	–	220	900	nA
	$I_{DD(AVG)\_1.8V}$	$t \geq 10$ seconds, $V_{DD} = 1.8$ V	–	175	700	nA
Sampling Frequency	$f_S$		14	20	26	Hz
Idle Mode Time	$t_{IDLE}$	$f_S = 20$ Hz	38	50	71	ms
Operate Point	$B_{OP}$		11	15	19	G
Release Point	$B_{RP}$		6	10	14	G
Hysteresis	$B_{HYST}$		3	5	–	G

## TYPICAL MAGNETIC CHARACTERISTICS FOR CT8112Dx

$V_{DD} = 3.3$  V,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0$   $\mu$ F (unless otherwise specified)

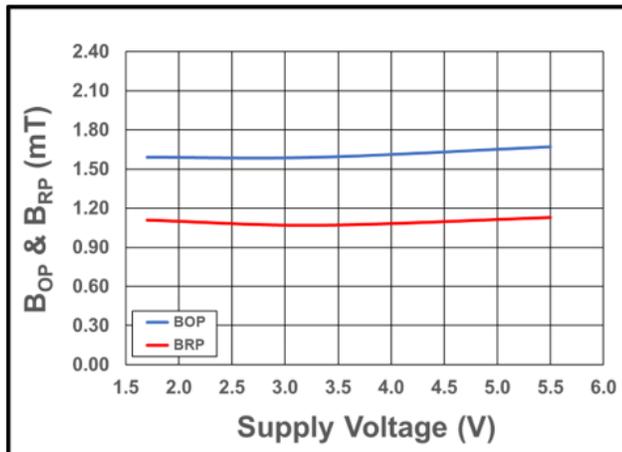


Figure 27:  $B_{OP}$  (Blue) and  $B_{RP}$  (Red) vs. Supply Voltage at  $T_A = 25^\circ\text{C}$

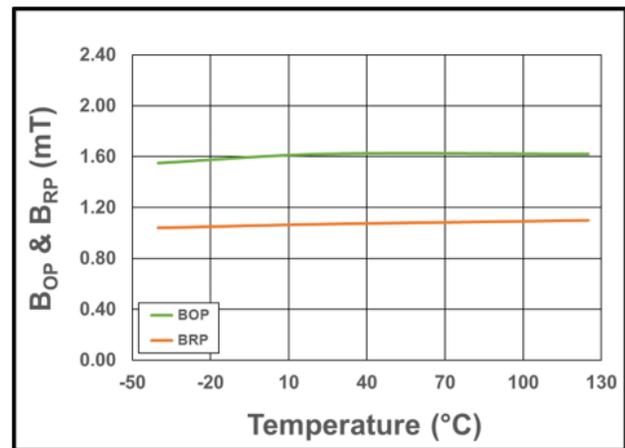


Figure 28:  $B_{OP}$  (Green) and  $B_{RP}$  (Orange) vs. Temperature at  $V_{DD} = 3.3$  V

**TYPICAL ELECTRICAL CHARACTERISTICS FOR CT8112DK**

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0\ \mu\text{F}$  (unless otherwise specified)

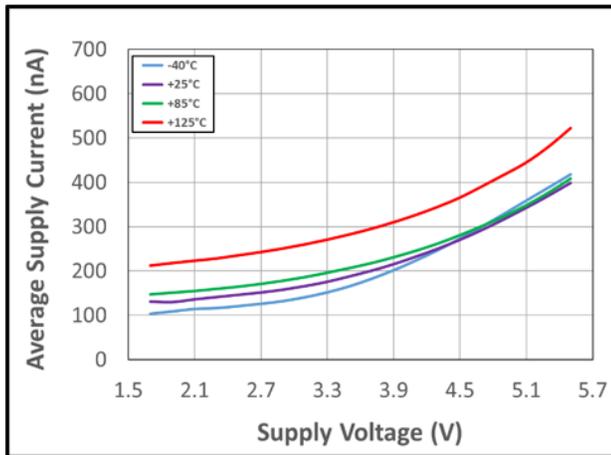


Figure 29: Average Supply Current vs. Supply Voltage vs. Temperature

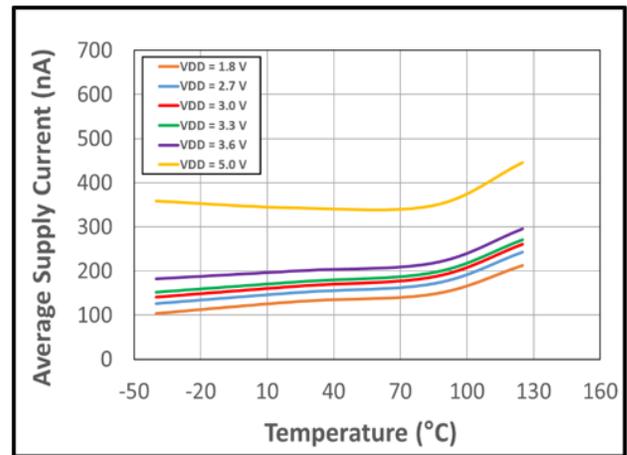


Figure 30: Average Supply Current vs. Temperature vs. Supply Voltage

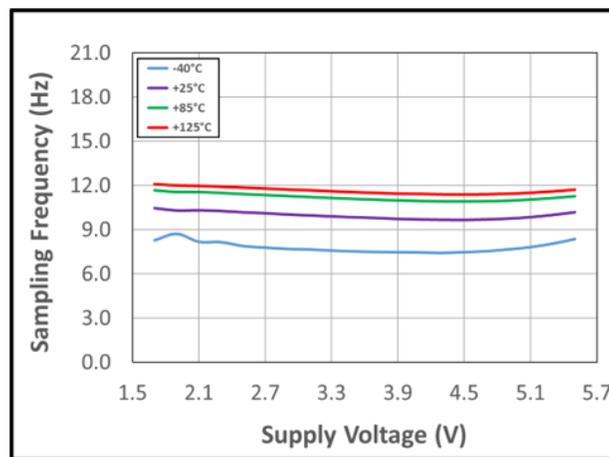


Figure 31: Sampling Frequency vs. Supply Voltage vs. Temperature

**TYPICAL ELECTRICAL CHARACTERISTICS FOR CT8112DT**

$V_{DD} = 3.3\text{ V}$ ,  $T_A = 25^\circ\text{C}$ , and  $C_{BYP} = 1.0\ \mu\text{F}$  (unless otherwise specified)

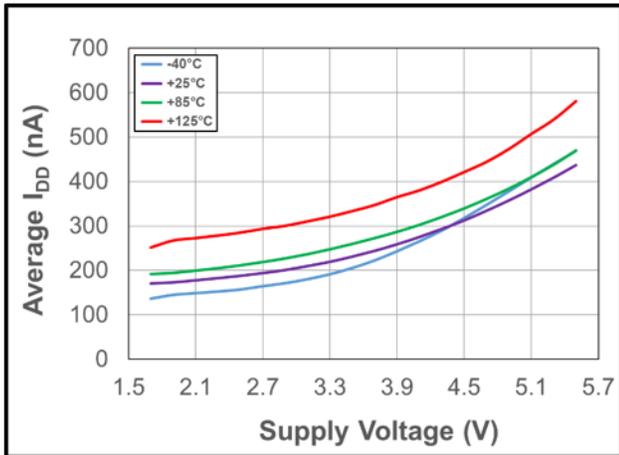


Figure 32: Average Supply Current vs. Supply Voltage vs. Temperature

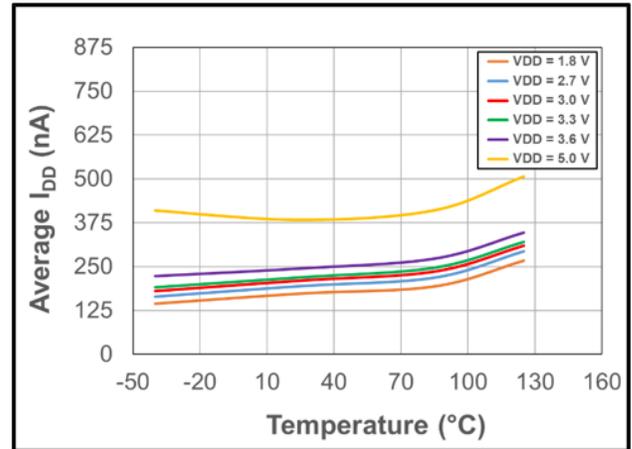


Figure 33: Average Supply Current vs. Temperature vs. Supply Voltage

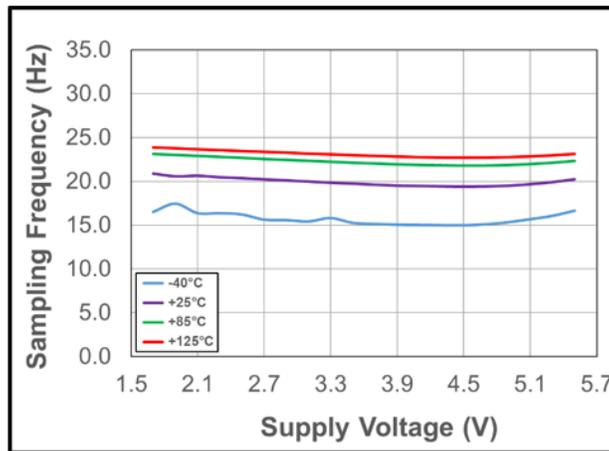


Figure 34: Sampling Frequency vs. Supply Voltage vs. Temperature

## FUNCTIONAL DESCRIPTION

### Overview

The CT811x is a product family of unipolar TMR magnetic switches that supports a wide operating voltage range of 1.7 to 5.5 V and is capable of providing two digital output configurations: open drain or push-pull. These unipolar TMR digital switches are designed to consume a minimal amount of current which is ideal for battery-operated products. It also supports a wide range of sensitivity levels for various applications.

### Undervoltage Lockout (UVLO)

The Undervoltage Lockout protection circuitry of the CT811x is activated when the supply voltage ( $V_{DD}$ ) falls below 1.53 V. The CT811x remains in a low quiescent state and the  $\overline{OUT}$  output is not valid until  $V_{DD}$  rises above the UVLO threshold (1.60 V).

### Power-On Time ( $t_{ON}$ )

The Power-On Time ( $t_{ON}$ ) of 50  $\mu s$  is the amount of time required by the CT811x to start up, power-on, and acquire the first sample. The chip is fully powered up and operational from the moment the supply voltage passes the rising UVLO point (1.60 V). This time includes the ramp-up time and the settling time (within 10% of steady-state voltage under an applied magnetic field) after the power supply have reach the minimum  $V_{DD}$ .

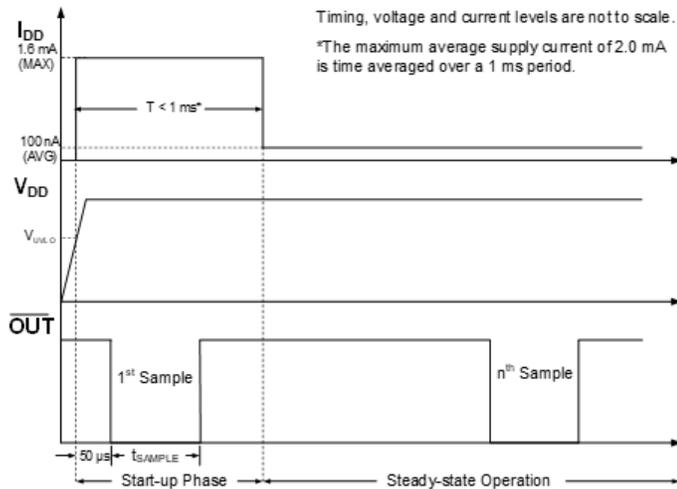


Figure 35: CT811x Power-On Timing Diagram

### Unipolar Magnetic Flux

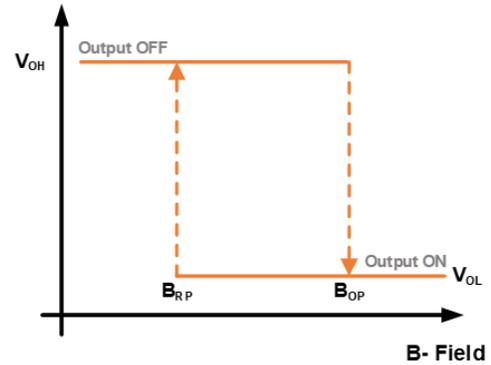


Figure 36: CT811x Output Behavior vs. Magnetic Field

Table 1: CT8111 Open Drain Output Behavior

Magnetic Field	Condition	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)

Table 2: CT8112 Push-Pull Output Behavior

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

## APPLICATIONS INFORMATION

A decoupling capacitor,  $C_{BYP}$ , between the supply voltage (VDD) and ground (GND) is required to lower the noise going into the CT8111 as well as providing isolation from the other circuits. The decoupling capacitor should be placed close to the TMR digital switch. A typical capacitor value of  $1.0 \mu\text{F}$  (ceramic) will be sufficient. A pull-up resistor of  $47 \text{ k}\Omega$  connected from  $\overline{\text{OUT}}$  to the system voltage ( $V_{\text{SYS}}$ ) is required for the CT8111.

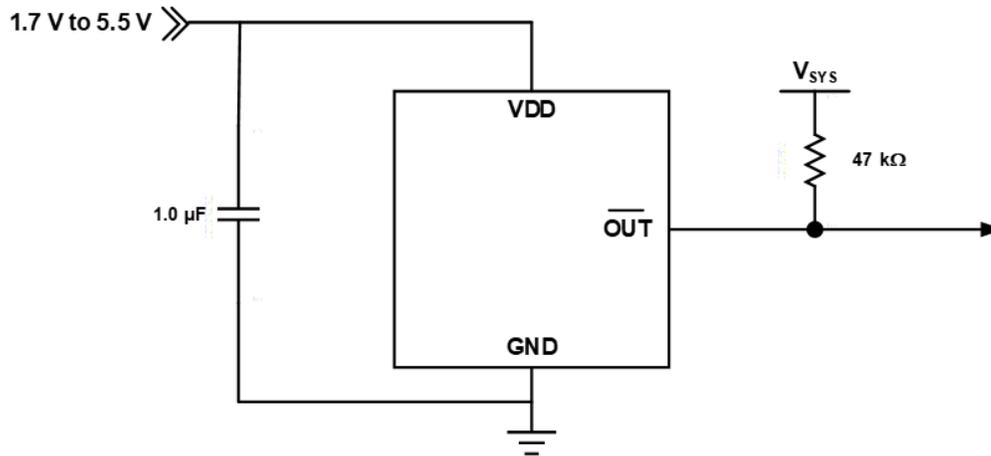


Figure 37: CT8111 Application Block Diagram

Like the CT8111, the CT8112 products require a  $1.0 \mu\text{F}$  (ceramic) bypass capacitor to be connected between the supply voltage and ground.

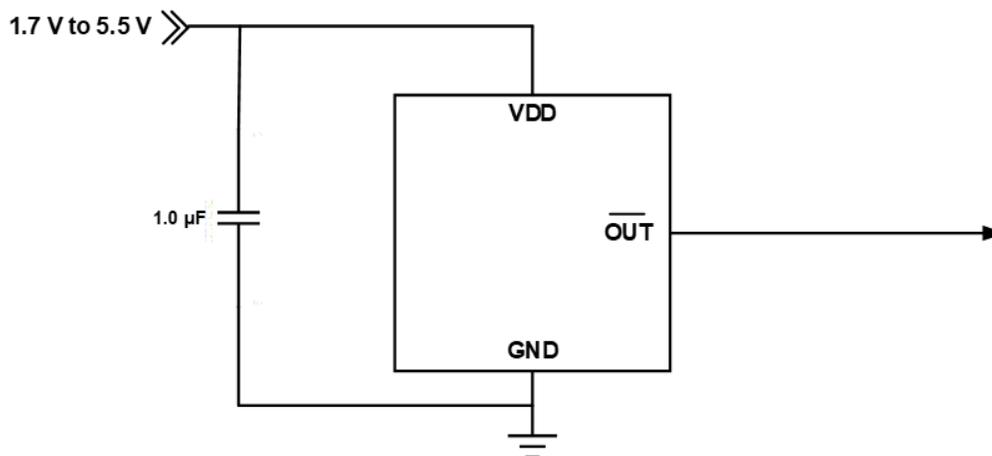
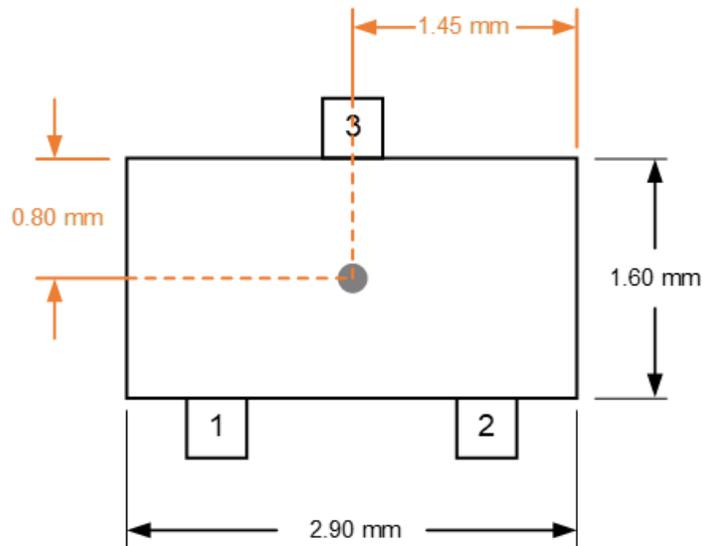


Figure 38: CT8112 Application Block Diagram

**XtremeSense TMR Current Sensor Location**

The XtremeSense TMR sensor location for the CT811x products are shown in Figure 39. The dimensions shown are typical values.



**Figure 39: XtremeSense TMR Sensor Location for CT811x products in 3-lead SOT23 Package**

## PACKAGE OUTLINE DRAWING

For Reference Only – Not for Tooling Use

Dimensions in millimeters – NOT TO SCALE

Dimensions exclusive of mold flash, gate burs, and dambar protrusions  
Exact case and lead configuration at supplier discretion within limits shown

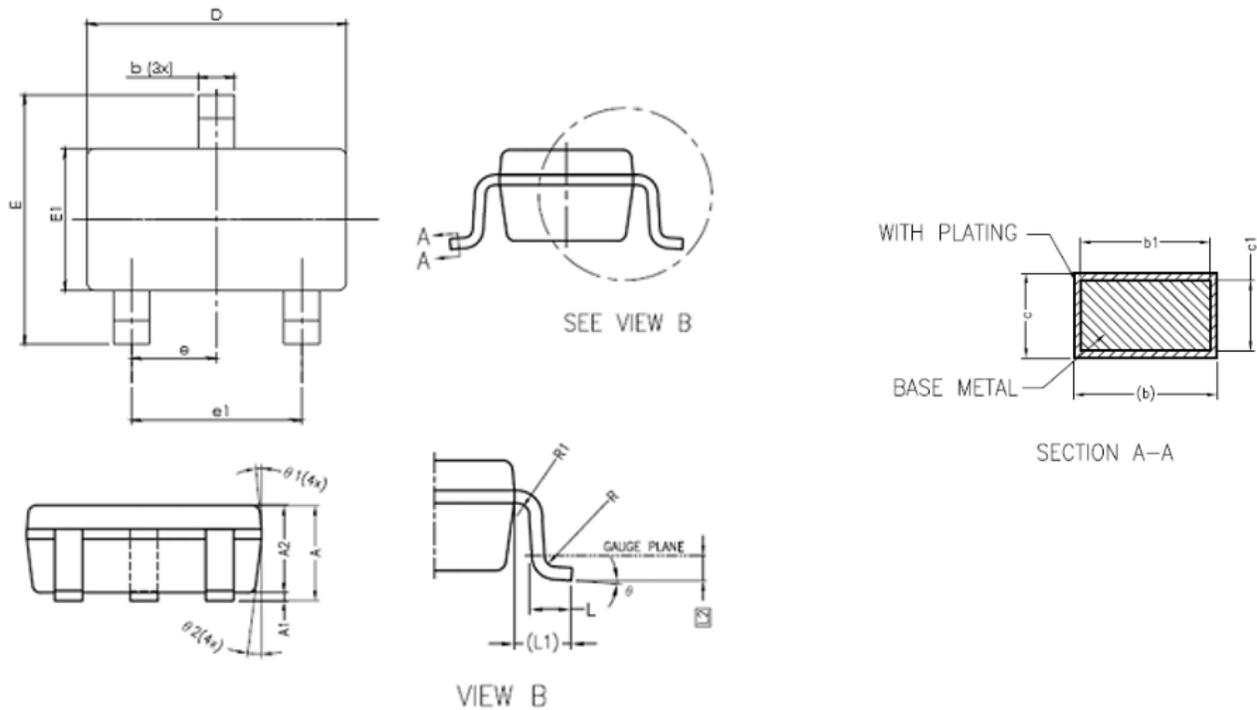


Figure 40: 3-Lead SOT23 Package Drawing

Table 3: CT811x 3-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	0.30	–	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

Symbol	Dimensions in Millimeters (mm)		
	Min.	Typ.	Max.
e	0.95 BSC		
e1	1.90 BSC		
L	0.35	0.43	0.60
L1	0.50 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°

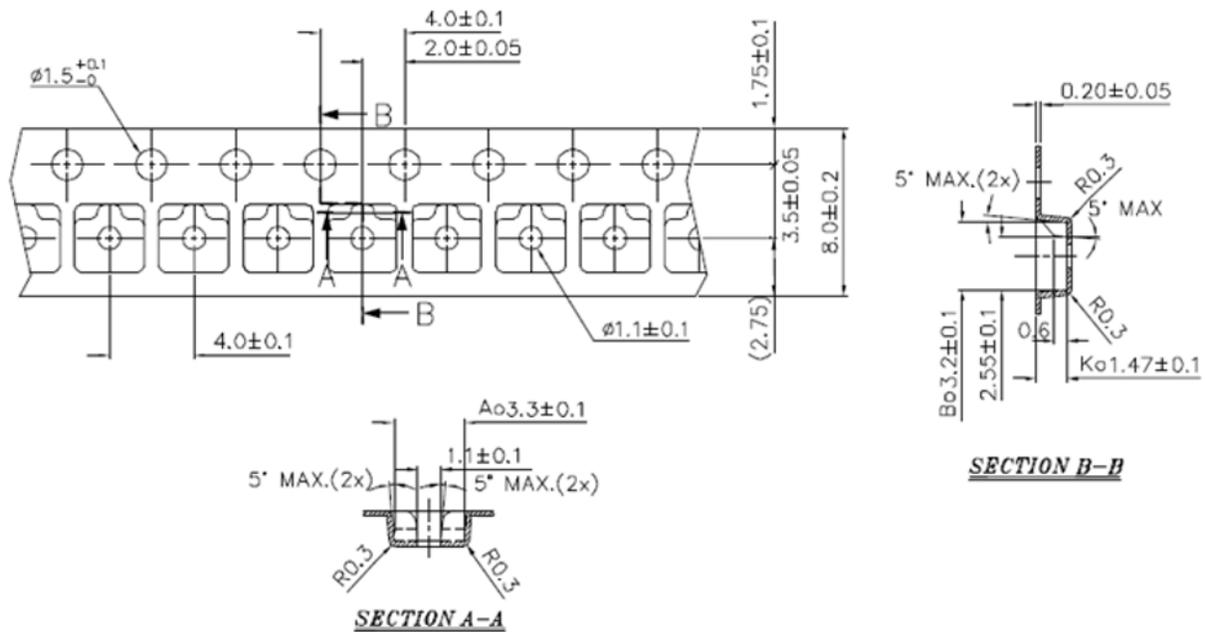
**TAPE AND REEL POCKET DRAWING AND DIMENSIONS**

**For Reference Only – Not for Tooling Use**

Dimensions in millimeters – NOT TO SCALE

Dimensions exclusive of mold flash, gate burs, and dambar protrusions

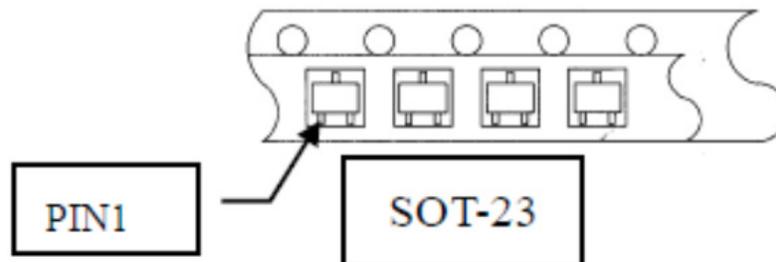
Exact case and lead configuration at supplier discretion within limits shown



NOTES:

1. Material: Conductive Polystyrene.
2. Dimensions in mm.
3. 10 sprocket hole pitch cumulative tolerance  $\pm 0.20$  mm.
4. Camber not 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.  $\Omega$ /sq) means surface electric resistivity of the carrier tape.

**Figure 41: Tape and Pocket Drawing for 3-lead SOT23 Package**



**Figure 42: SOT23 Orientation in Tape Pocket**

## PACKAGE INFORMATION

Table 4: CT811x Package Information

Part Number	Package Type	# of Leads	Package Quantity	Lead Finish	Eco Plan [1]	MSL Rating [2]	Operating Temperature (°C) [3]	Device Marking [4]
CT8111BK-IS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 85	EK YWWS
CT8111BK-HS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 125	EK YWWS
CT8111BH-IS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 85	TBD
CT8111BH-HS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 125	TBD
CT8111DK-IS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 85	EJ YWWS
CT8111DK-HS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 125	EJ YWWS
CT8111DT-IS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 85	EL YWWS
CT8111DT-HS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 125	EL YWWS
CT8112BK-IS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 85	DK YWWS
CT8112BK-HS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 125	DK YWWS
CT8112DK-IS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 85	DJ YWWS
CT8112DK-HS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 125	DJ YWWS
CT8112DT-IS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 85	DL YWWS
CT8112DT-HS3	SOT23	3	3000	Sn	Green & RoHS	1	-40 to 125	DL YWWS

[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  $-40^{\circ}\text{C}$  to  $150^{\circ}\text{C}$  and storage temperature range of  $-65^{\circ}\text{C}$  to  $150^{\circ}\text{C}$ .

[4] Device Marking for SOT23 is defined as XZ YWWS where XZ = part number, Y = year, WW = work week, and S = sequential number.

## Revision History

Number	Date	Description
2	December 11, 2023	Document rebranded and minor editorial updates
3	May 14, 2024	Changed "latch(es)" to "switch(es)"
4	June 5, 2024	Added notes to package drawings (pages 20 and 21)

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