Bandwidth vs. Power Tradeoffs in Digital Hall Sensor Switches & Latches

TI Precision Labs - Getting Started With Hall Effect Sensors

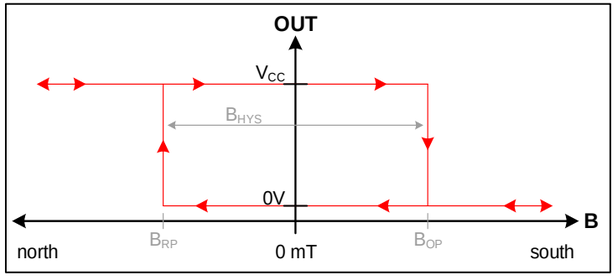
Presented by Manny Soltero

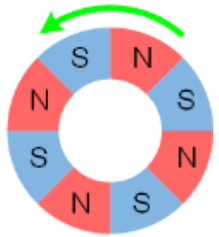
Prepared by Ihsane Wadjinny

Hall effect switch and latch sensors

Hall effect latch

Indicates the most recently measured magnetic flux density. These are used in rotary applications such as BLDC motor sensors and incremental encoding.

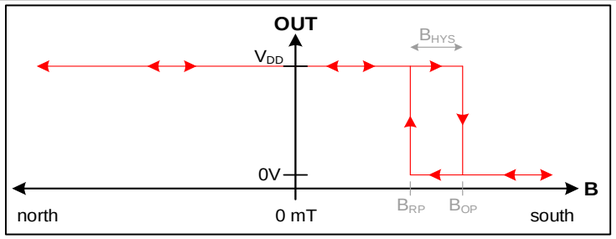




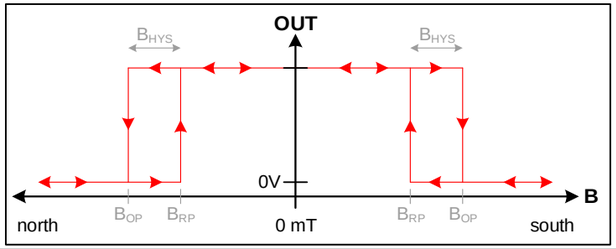
Hall effect switch

Indicates the presence or absence of magnetic flux density compared to a defined threshold.

- Unipolar switch – Responds only to south magnetic poles
- Omnipolar switch – Responds to both south and north magnetic poles



Unipolar



Omnipolar

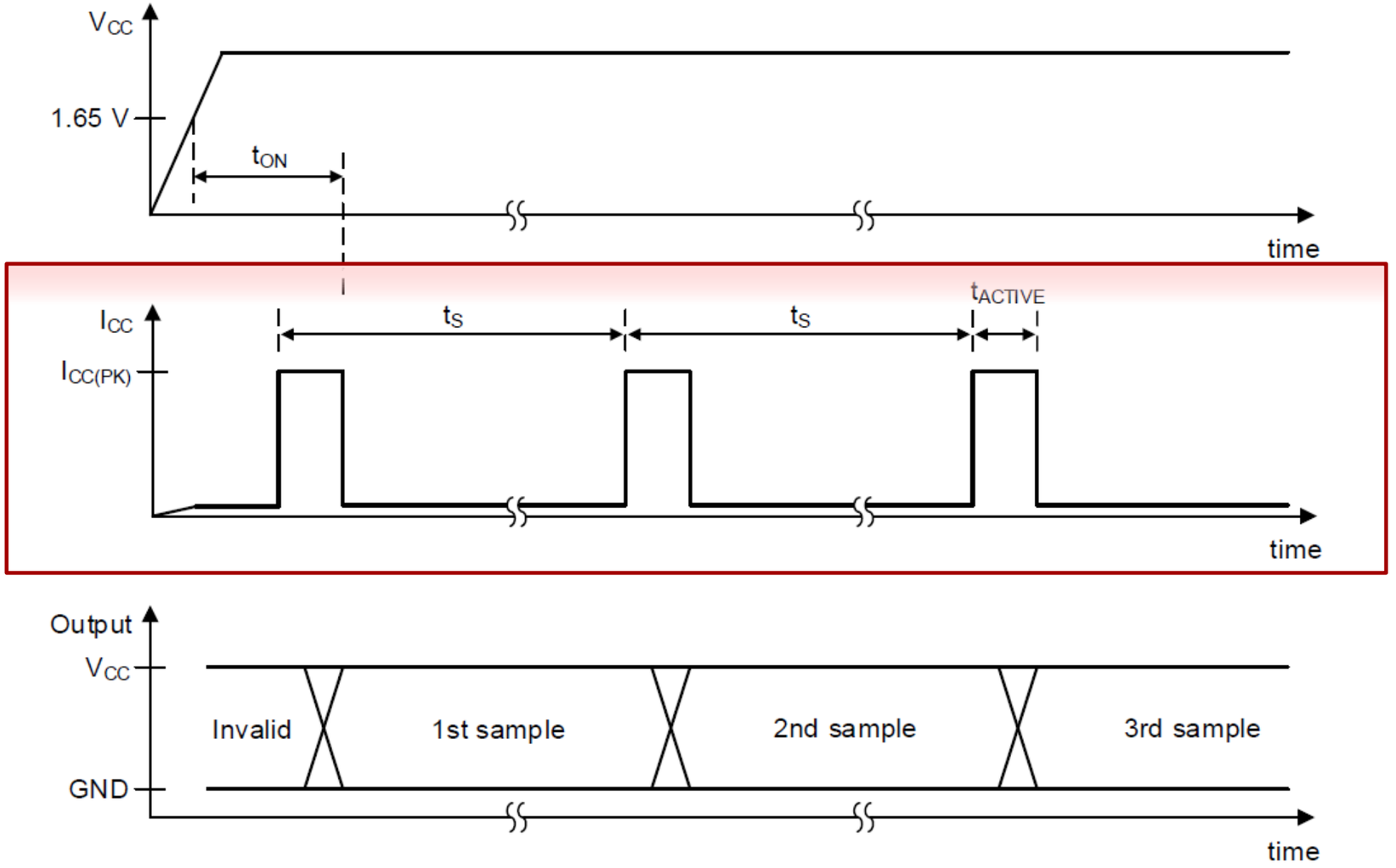
Bandwidth vs. power

	High bandwidth digital switches and latches	Low power digital switches and latches
Sensing bandwidth	10 to 40kHz	5 Hz to 5 kHz
Current consumption	~1 to 5 mA	1 to 150 µA

DRV5032

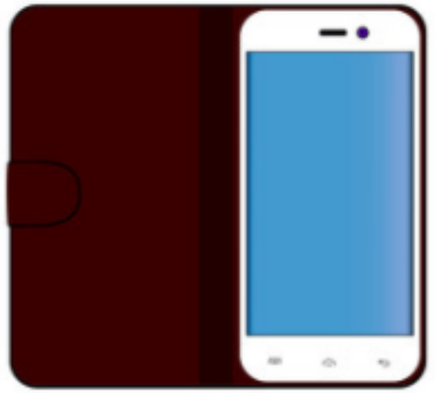
DU, FA, FC, FD, AJ, ZE VERSIONS						
f_S	Frequency of magnetic sampling		13.3	20	37	Hz
t_S	Period of magnetic sampling		27	50	75	ms
$I_{CC(AVG)}$	Average current consumption	V_{CC} = 1.8 V		1.3		µA
		V_{CC} = 3 V		1.6	3.5	
		V_{CC} = 5 V		2.3		
FB VERSION						
f_S	Frequency of magnetic sampling		3.5	5	8.5	Hz
t_S	Period of magnetic sampling		117	200	286	ms
$I_{CC(AVG)}$	Average current consumption	V_{CC} = 1.8 V		0.54		µA
		V_{CC} = 3 V		0.69	1.8	
		V_{CC} = 5 V		1.06		

Bandwidth vs. power



Example applications for low power Hall effect sensors

Door/window open close detection



Phone/Tablet smart-cover closure

Power tool selector switches

Electricity meters to detect magnetic tampering

Washer/Dryer doors

Example applications for high bandwidth Hall effect sensors

Power tool BLDC motors using Latches for commutation

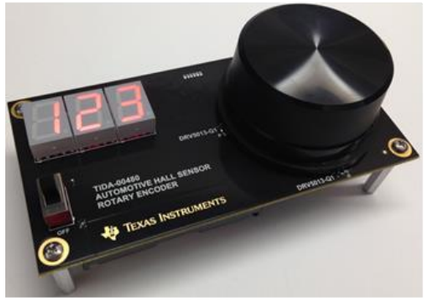
BLDC motors using Latches for commutation

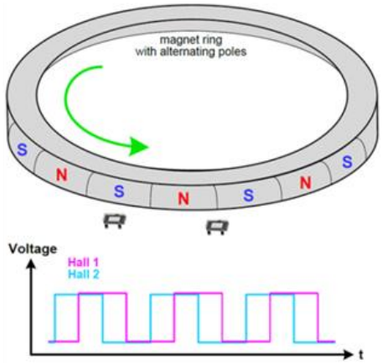
Switches used in flow meters

Support collateral

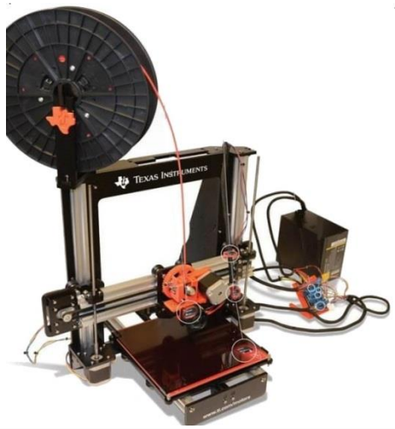
High bandwidth reference designs

TIDA-00480: Hall sensor rotary encoder





TIDA-00405: 3D Printer controller (12V) reference design



Low power reference designs

TIDA-01066: Low-power door and window sensor with sub-1GHz and 10-Year Coin Cell Battery Life Reference Design

TIDA-00839: Magnetic tamper detection using low-power Hall effect sensors reference design

To find more magnetic position sensing technical resources and search products, visit ti.com/halleffect