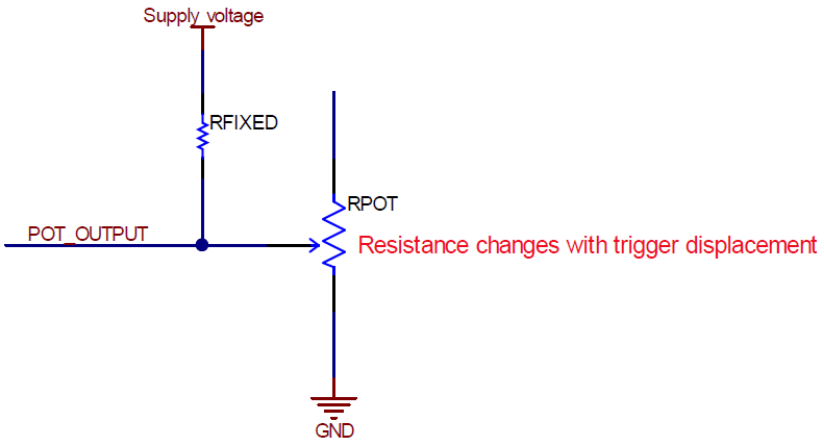
Introduction to head-on applications

TI Precision Labs – Magnetic sensors

Presented and prepared by Mekre Mesganaw

Mechanical solutions for linear position detection



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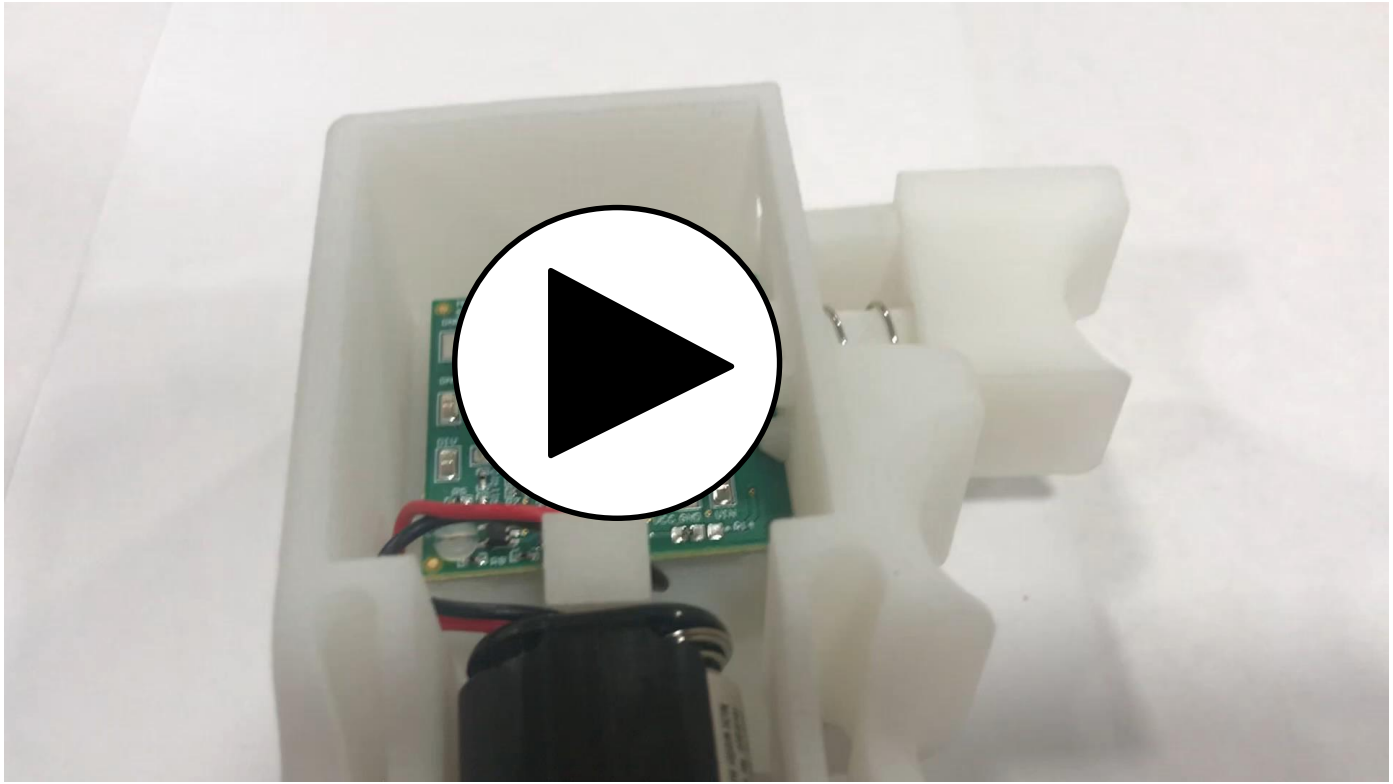
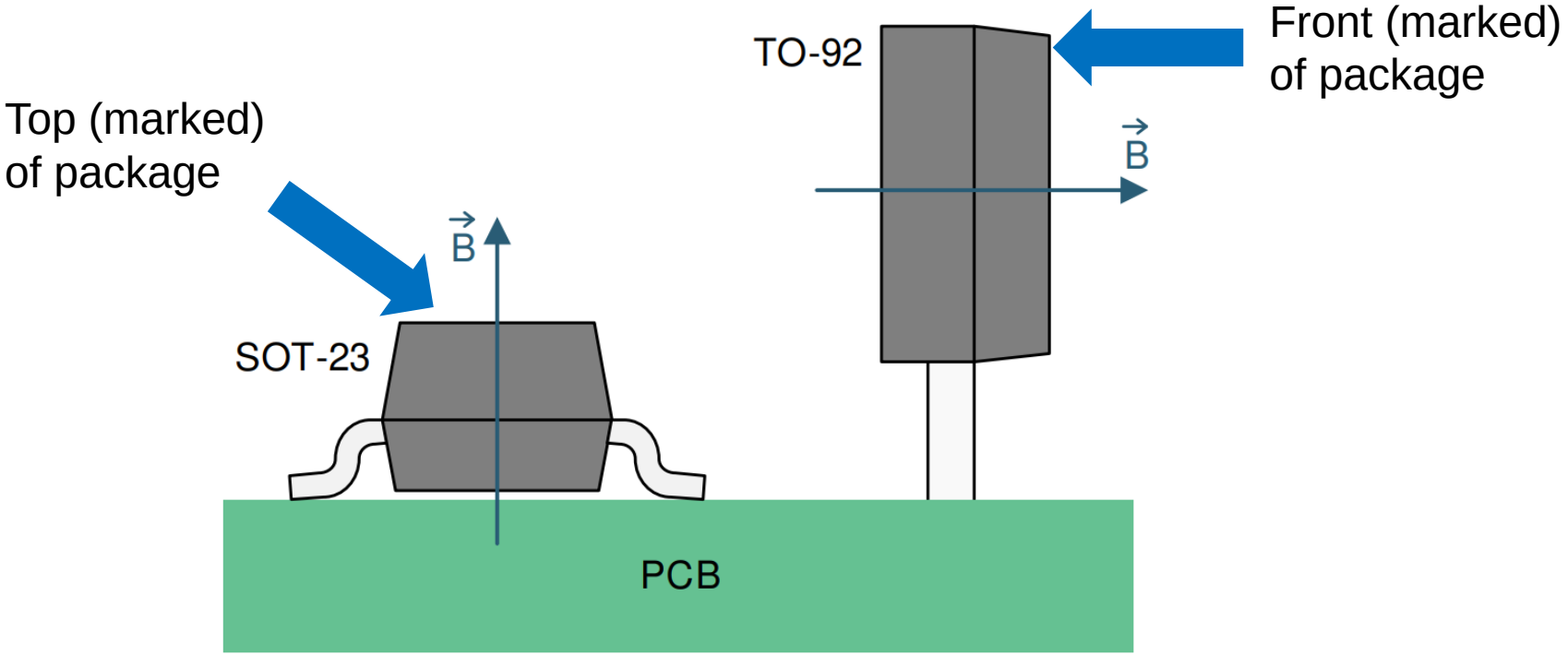
Hall-based contactless linear position detection

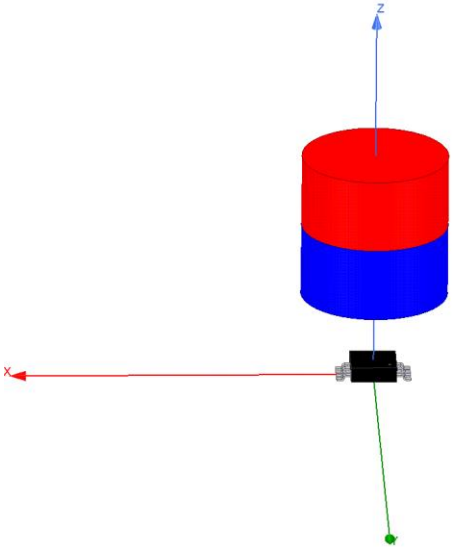


Direction of sensitivity of 1D out-of-plane sensors

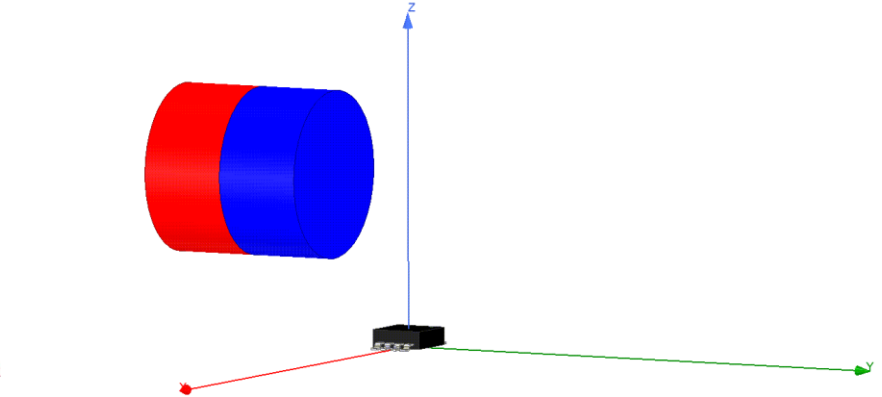


Trigger magnet to sensor orientations

Head-on configuration



Slide-by displacement



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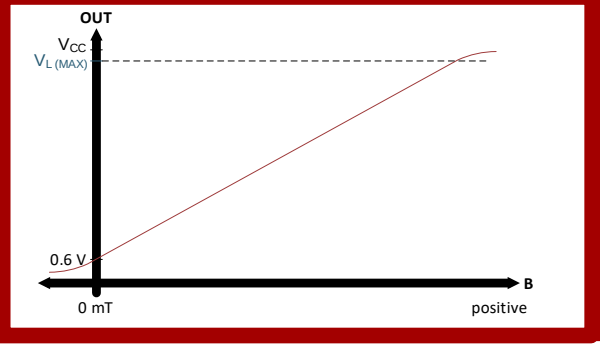
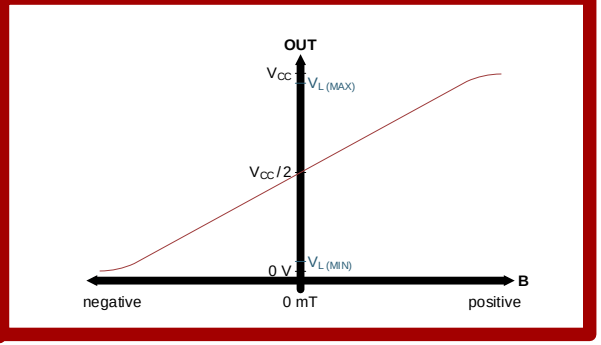
Output interface and sensing bandwidth

Analog

Unipolar

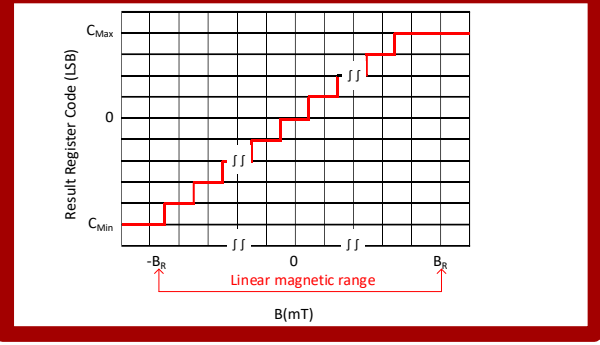


Bipolar

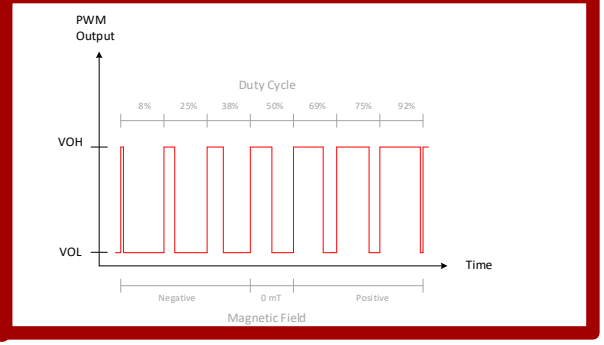


Digital

Communication interface



PWM



Sensitivity

- Analog: mV/mT
- Digital communication interface: LSB/mT
- PWM: %D/mT

Sensing bandwidth should also be considered when selecting Hall-effect devices.

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Linear Hall-effect sensor power supplies

		MIN	MAX	UNIT
V_{CC}	Power supply voltage(1)	3	3.6	V
		4.5	5.5	

PARAMETER		TEST CONDITIONS(1)	MIN	TYP	MAX	UNIT
I_{CC}	Operating supply current			6	10	mA

- $V_{OUT} = S \times B + V_Q$
  - V_{OUT}= output voltage of linear Hall-effect sensor
  - S= sensitivity
  - B= sensed magnetic flux density
  - V_Q= quiescent voltage
- Ratiometric devices scale sensitivity linearly with power supply voltage.
  - Minimizes error from VCC tolerance when the external ADC uses the same VCC for its reference
  - May still be error if quiescent voltage doesn't scaling with power supply voltage

Other parameters for selecting linear Hall-effect sensors

Error sources
Output-referred noise
Offset error
Offset drift
Sensitivity error
Sensitivity drift
Sensitivity linearity

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