Welcome!
Texas Instruments New Product Update

- This webinar will be recorded and available at www.ti.com/npu
- Phone lines are muted
- Please post questions in the chat or contact your TI sales contact or field applications engineer

TMAG5115: LOW JITTER & FAST HALL-EFFECT LATCH

New Product Update

Manny Soltero
- Position Sensing PME

Agenda

- Hall-effect portfolio
- TMAG5115 product overview
- System-level benefits

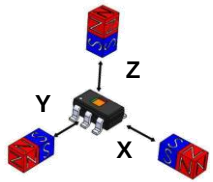
Please feel free to “chat” Isaac Lara, Apps Engineer, who is available to answer any questions you have throughout this presentation.

Hall-effect switches and latches

	Unipolar switch	Omnipolar switch	1D latch	2D latch
High Voltage (up to 38V)	Z: DRV5023 High bandwidth (30kHz); TMAG5124 Two-wire (current output)	DRV5033 High bandwidth (30kHz)	Z: DRV5013 High bandwidth (30kHz); TMAG5115 Low jitter; High speed High bandwidth (60kHz)	
	X or Y	TMAG5123 In-plane	XY YZ ZX	TMAG5110 Independent 2D outputs; TMAG5111 Speed and direction outputs
Low Voltage (1.65V to 5.5V)	Z: DRV5021 High bandwidth (30kHz)	DRV5032* Low power; TMAG5231 General purpose; TMAG5328 Resistor-adjustable threshold	Z: DRV5015 High sensitivity; DRV5011 High bandwidth (30kHz); DRV5012 Low power	
	X or Y		XY YZ ZX	

Legend:

- Released
- Development (APL)
- Automotive option available
- TO-92 option available
- X2SON option available
- WCSP option available



Capacity improvements:

- 300mm fab
- 300mm & LBC9 capacity optimized

* DU and FD versions in X2SON package only are dual unipolar

TMAG5115: High-speed Hall-effect latch sensor

Features

- **Fast 5µs jitter and propagation delay**
- Magnetic sensitivity perpendicular to surface of the package
- Four magnetic sensitivity threshold options
  - 1mT (typ B_{OP})
  - 3mT (typ B_{OP}) ← recently released!
  - 6mT (typ B_{OP})
  - 12mT (typ B_{OP})
- $B_{OP,min}$ to $B_{OP,max}$ spread of **2mT max**
- Wide operating supply voltage: 2.7 V to 26 V

Applications

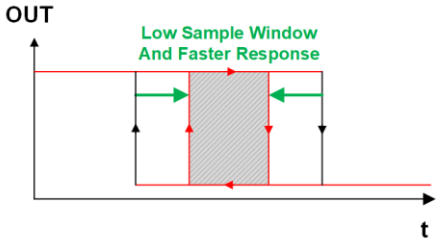
- Power tools
- Flow control
- Valves and Solenoid
- Brushless DC motor
- Fans
- Appliances

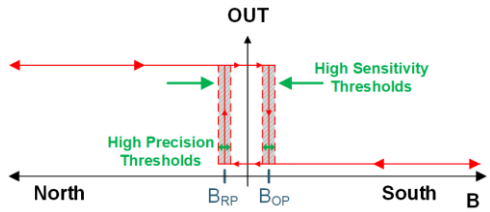
Tools & resources

- TMAG5115EVM
- Application note coming soon

Benefits

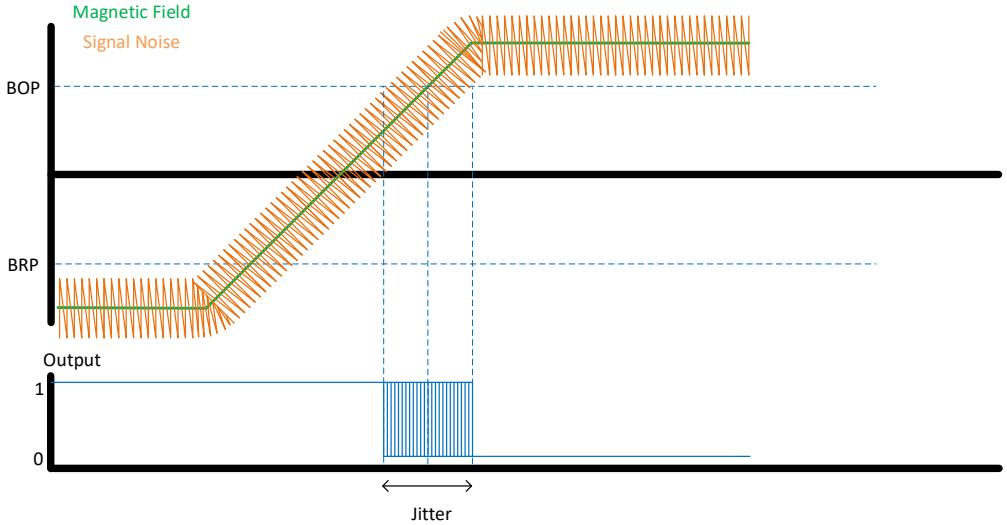
- Low output delay allows for higher rotation speed
- Low jitter performance allows for more efficient apps
- Sensitivity options enable use with a wider range of magnets and distances
- Higher magnetic precision allows flexible mechanical design
- Excellent power supply noise rejection allows for reliable behavior regardless of the system-level power supply performance

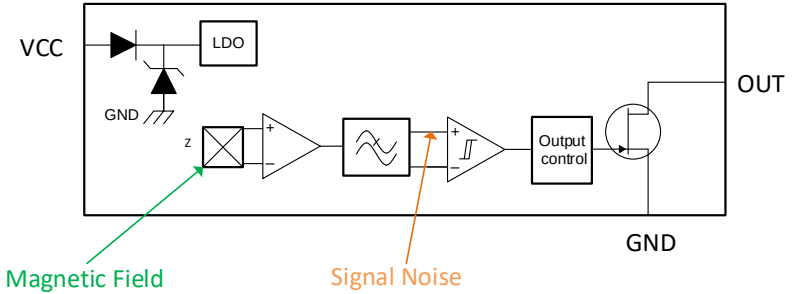




Jitter

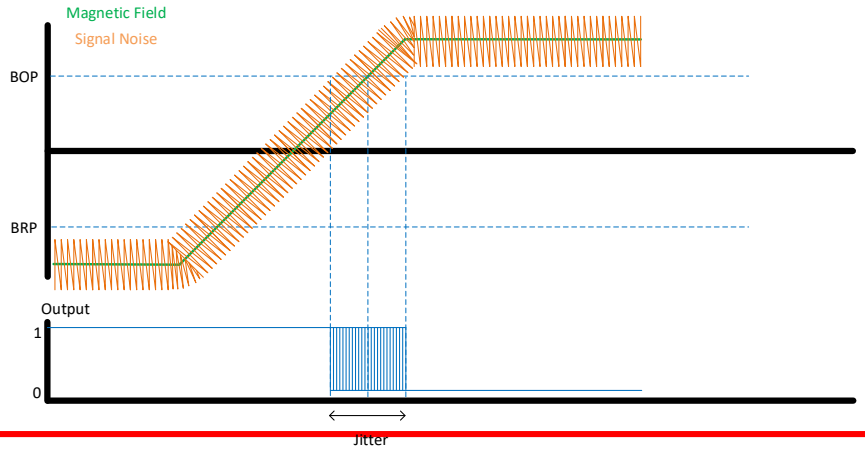
- Jitter is caused mainly by signal chain noise internal to the IC.
- Jitter “rides” on top of the internally-generated signal which is produced from the magnetic field.
- Jitter causes the internal comparator to trip at an unpredictable time.
- The uncertainty in output transition directly impacts the precision of the sensor.

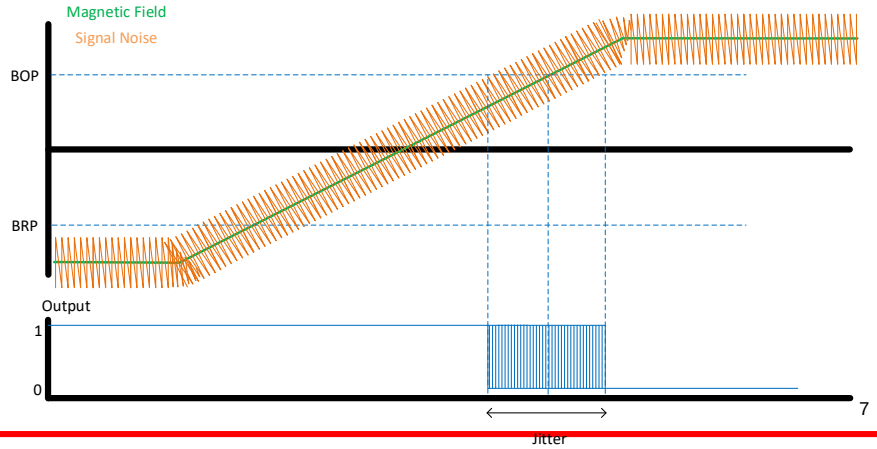




Slew rate impact on jitter

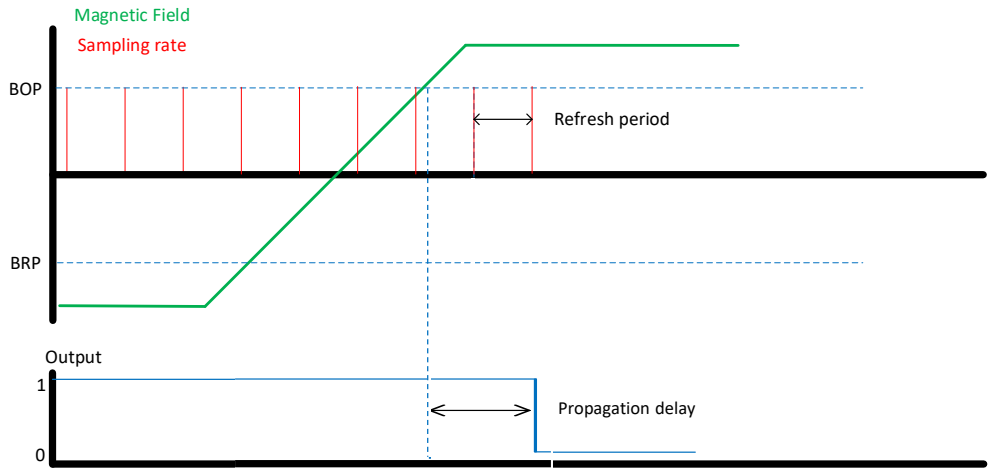
- While jitter is created within the signal chain, its spread is dependent on the slew rate (slope of the magnetic field).
- The lowest jitter will be manifested when the magnetic signal slew rate is infinite (i.e. a unit step or square input signal) and the worst-case jitter will be manifested when the magnetic signal is at its slowest at the B_{OP} or B_{RP} threshold.
- Most competitors provide jitter specs with a 1 kHz square field only.





Propagation delay and refresh period

- Propagation delay is defined as the time between the field crossing a B_{OP} or B_{RP} threshold and the time the output changes its state.
- The refresh period is determined strictly by the sampling rate of the IC.
- The propagation delay is also impacted by the refresh period.



Low jitter and fast propagation delay benefits

Jitter has an impact on system accuracy

- Low jitter → higher precision → higher system accuracy
- **Applications**: Incremental rotary encoding (direction and speed detection)

Output delay has an impact on motor RPM

- Fast propagation delay → faster motor
- Looking at it another way…
- Slow propagation delay → limited signal bandwidth → higher latency between sensor and MCU → lower system RPM
- **Applications**: High-speed BLDCs motors

Getting started

You can start evaluating this device leveraging the following:

Content type	Content title	Link to content or more details
Product folder	TMAG5115	www.ti.com/product/tmag5115
Customer training series or webinar session	Designing BLDC Commutation Board Using Hall-Effect Sensors	Coming 1Q23
Technical blog content or white paper	Brushless DC Motor Commutation Using Hall-Effect Sensors	http://www.ti.com/lit/pdf/slvaeg3b
Technical Video	Specifications of Hall-effect latches for rotary encoding	https://training.ti.com/specifications-hall-effect-latches-rotary-encoding
Application Note	System impact of fast response (low-jitter and low-delay) Hall-effect latches	Coming 2Q23
Selection and design tools and models	TIMSS (Texas Instruments Magnetic Sensing Simulator)	Coming 1Q23
Development tool or evaluation kit	TMAG5115EVM	https://www.ti.com/tool/TMAG5115EVM

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