2nd Generation 3D Hall Sensors

ATV Sense & Control
January 20

- DRAFT -

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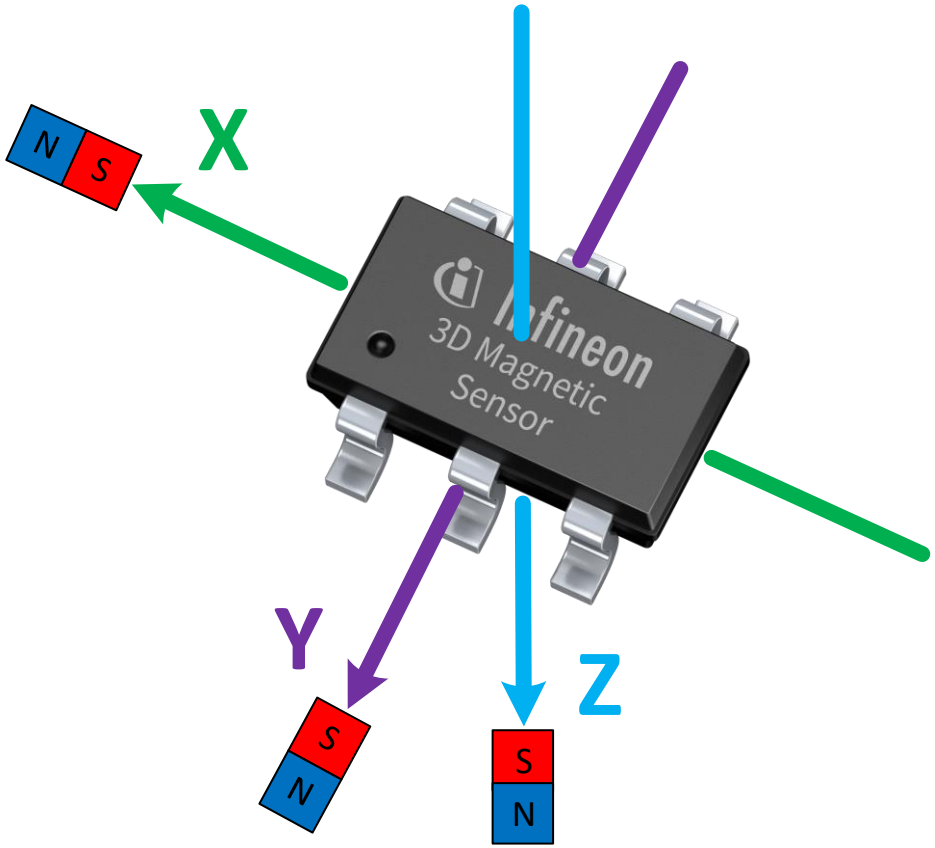
Magnetic field measurement in three dimensions



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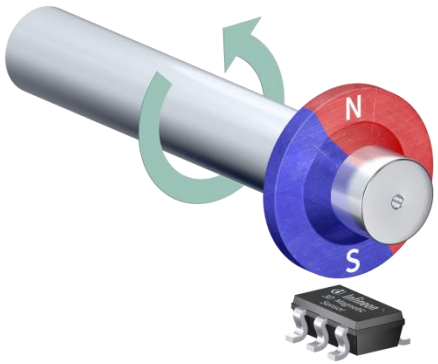
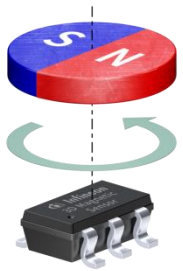
3DHall benefits

⇨ **Strong flexibility in PCB orientation!**
⇨ **Very small 3 mm x 3 mm package!**

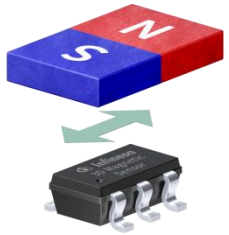
Supporting the applications



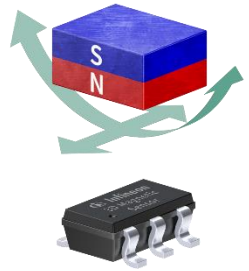
Out of shaft angle measurement



End of shaft angle measurement



Linear movement measurement



Joystick movement measurement

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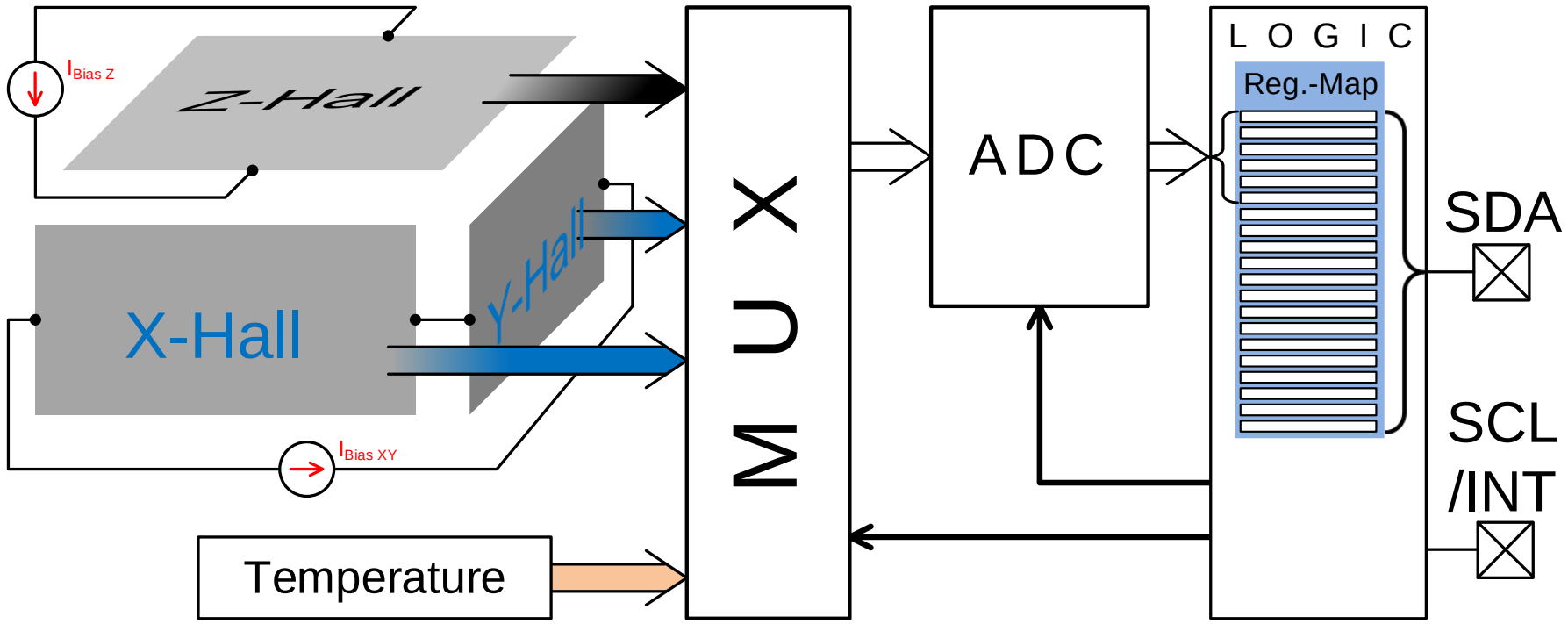
The 3D Hall block schematic



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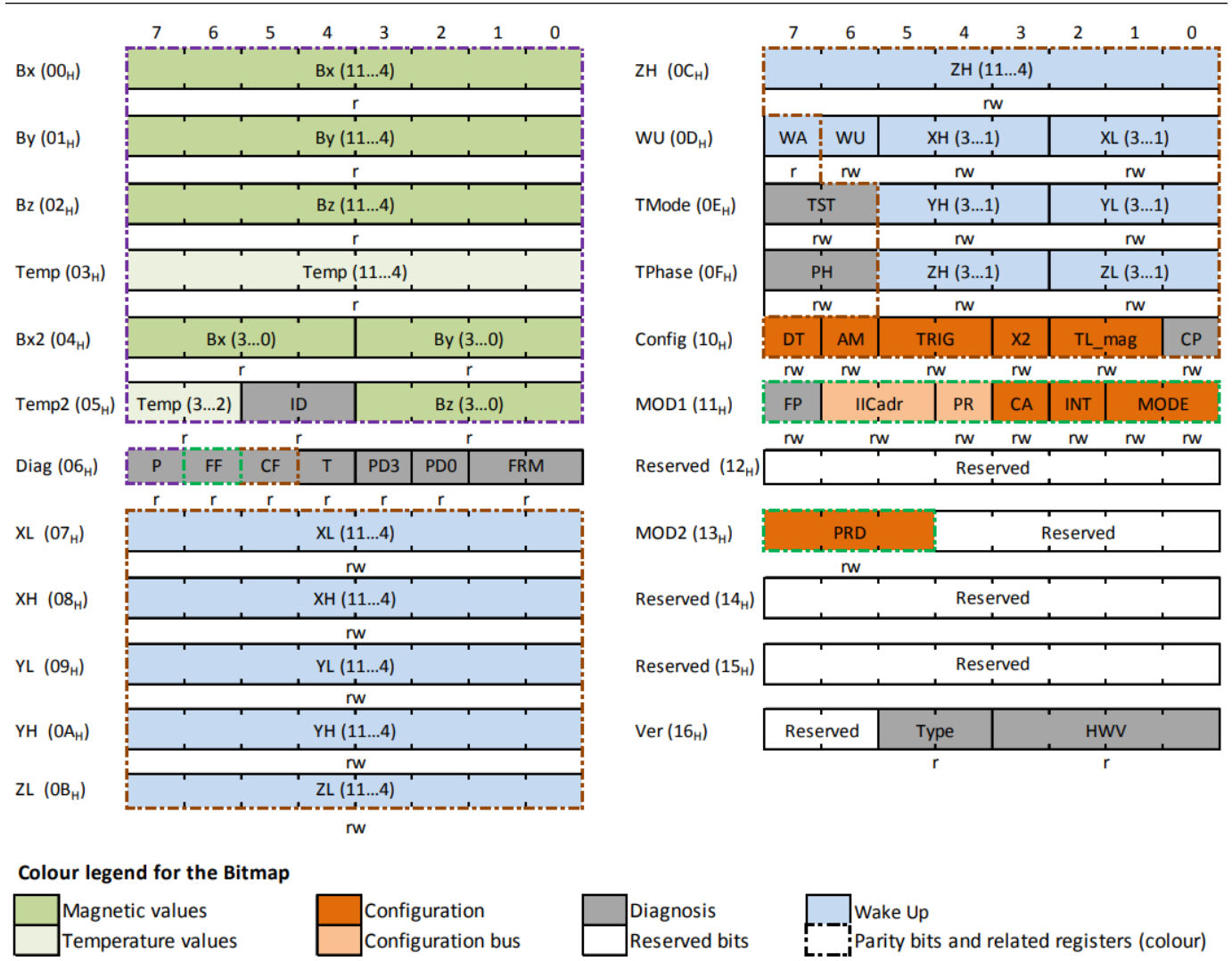
Bitmap example: TLE493D-W2B6



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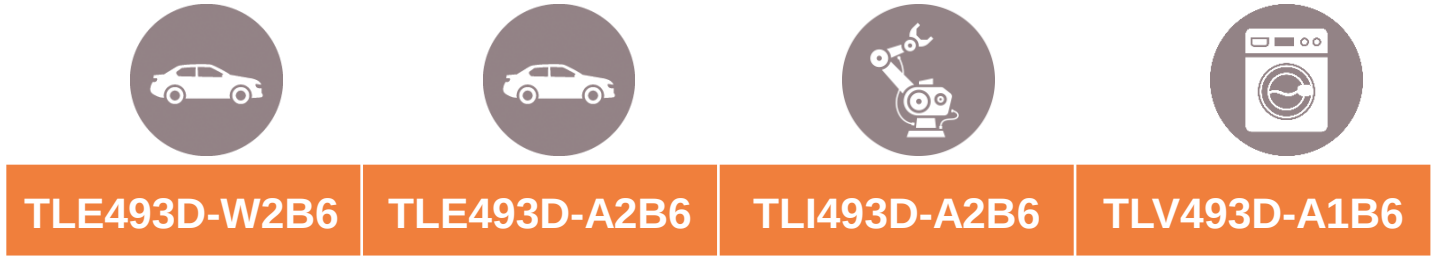
The 3D Hall sensor family



TLE493D-W2B6	TLE493D-A2B6	TLI493D-A2B6	TLV493D-A1B6

T L E 4 9 3 D - W 2 B 6

Qualification
- TLV = Consumer
- TLI = Industrial
- TLE = Automotive

Technology
- Hall effect

Sensor type
- 3D

Derivative
- A = Basic features
- W = Wake UP

Generation
- 1
- 2

Interface
- B = I²C

Package
- 6 = TSOP-6

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The 3D Hall sensor family

	TLE493D-W2B6	TLE493D-A2B6	TLI493D-A2B6	TLV493D-A1B6
Generation	2nd			1st
Temperature range	-40…125°C		-40…105°C	-40…125°C
Linear magnetic field range	selectable: min. 100 and 160 mT			typ. 130 mT
Magnetic accuracy	high (min./max. spec.)			basic (typ. spec.)
Update rate XYZ	typ. 7.5 kHz			typ. 3.3 kHz
Functional safety	ASIL B (ISO26262 ready)	-		
Wake up mode	Yes	-		
Preconfigured address variants	4 (A0 … A3)	1		

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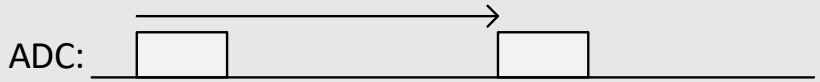
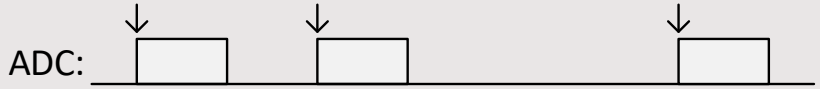
Different power modes for a high flexibility (2nd generation 3D Hall)

Modes	Measurements	Typ. current consumption
Power down	No measurements: ADC:	7 nA
Low power	Cyclic measurements with a selectable update rate between 0.05 and 700 Hz: ADC: 	0.3 µA…430 µA
Fast	Continuous measurements: ADC: 	3.4 mA
Master controlled	Measurements triggered by the microcontroller via I² C: ADC: 	Between power down and fast mode

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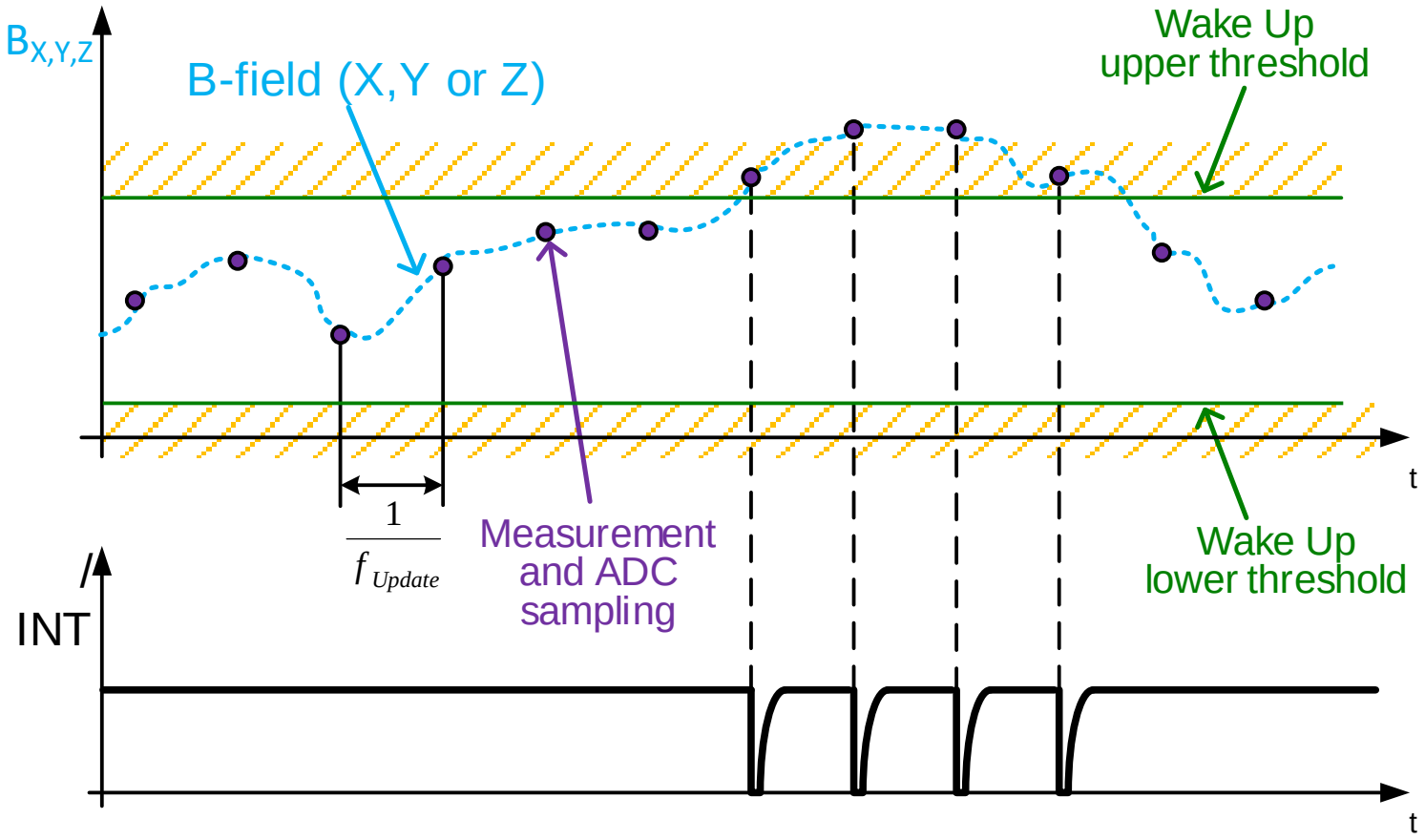
Power saving using the Wake-Up feature (TLE493D-W2B6)



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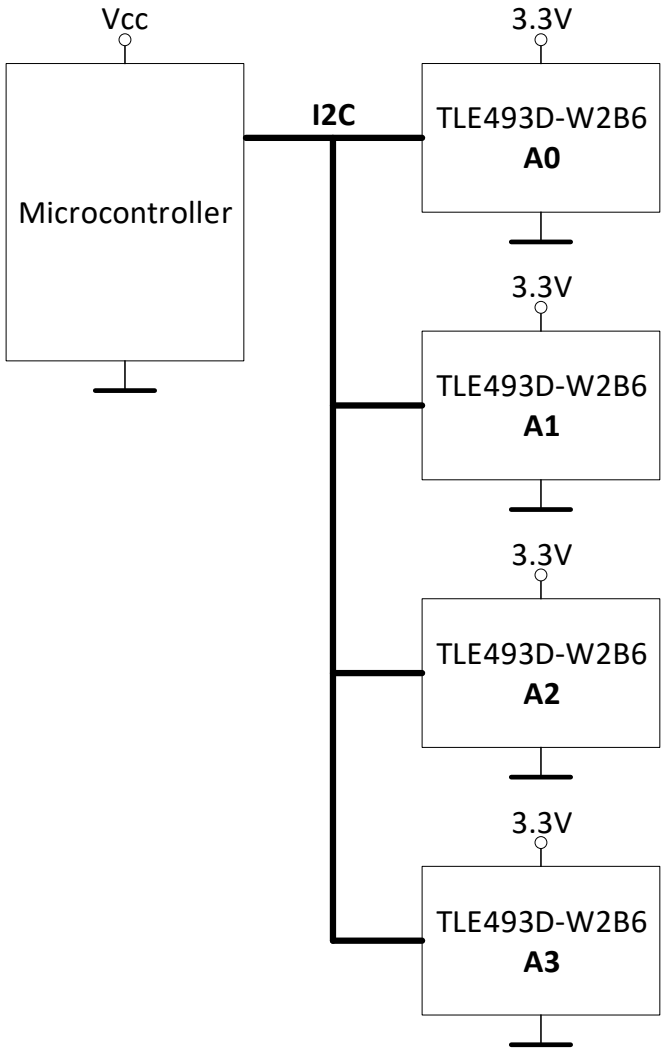
Bus mode for multiple 3D Hall sensors

- 4 preconfigured address variants allow an out of the box bus mode
  ➔ TLE493D-W2B6 only

- Alternative for all 3D Hall sensors:
  - Control the VDD of all sensors but the first with a GPIO pin
  - Reconfigure the I2C address at startup

- For functional safety critical applications a separate bus for each sensor is recommended



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Improvements of the 2nd generation 3D Hall sensors

Topic	Description
Higher reliability	› Designed to meet the automotive quality standards › Min / max datasheet specifications › Improved power on reset › Improved ADC stability in fast and master controlled mode › Removed dynamic I²C address setting at power-up
Higher performance	› Increased sensitivity (two magnetic field ranges) › Higher update rate › Generally higher accuracy
New features	› Improved master controlled mode: – Flexible new ADC trigger options – Automated power down after a finished measurement cycle › I²C clock stretching › /INT collision avoidance › Advanced features with the TLE493D-W2B6 variant: – Wake up mode – Dedicated I²C address variants – Functional safety support – Additional low power modes

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Edition 2019-01-24
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