Infineon Arduino Library Documentation

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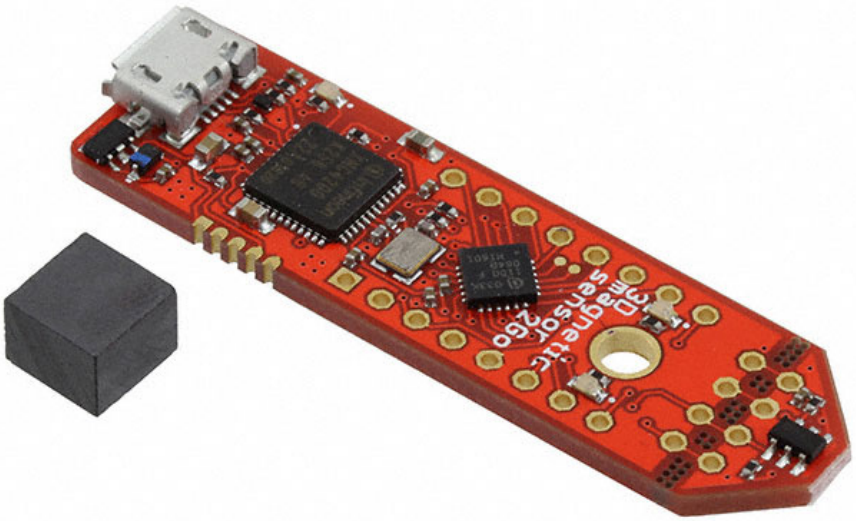
1 Arduino Library for Infineon's Magnetic 3D Sensor TLE493D-W2B6

1.1 Introduction

The TLE493D-W2B6 sensor family comes with I2C interface and wake-up function. This sensor family TLE493D offers accurate three dimensional sensing with extremely low-power consumption.



1.2 Main Features

1.2.1 Interrupts

Interrupts can be sent from the sensor to the microcontroller to notify the completion of a measurement and its ADC conversion. Values read directly after interrupts are guaranteed to be consistent. Without interrupts values read might

be stale.

1.2.2 Collision Avoidance and Clock Stretching

In case of a collision, the sensor interrupt disturbs the I2C clock, causing an additional SCL pulse which shifts the data read out by one bit. If collision avoidance is activated, the sensor monitors the start/stop conditions, and suppresses interrupts in between.

When interrupts are disabled, this feature becomes clock stretching, that is, the data read out only starts after the ADC conversion is finished. Thus it can be avoided that during an ADC conversion old or corrupted measurement results are read out, which may occur when the ADC is writing to a register while this is being read out by the microcontroller. When clock stretching is enabled, the sensor pulls the SCL line down during ongoing ADC conversions, reading of sensor registers or the transmission of valid ACKs.

Two register bits (CA and INT) work together for different configurations. APIs to modify these two bits are not offered since they have to be set according to different operating modes (master controlled mode, low power mode and fast mode) for the sensor to work.

1.2.3 Wake Up Mode

Wake up mode is intended to be used with low power mode or fast mode. This mode disables interrupts within a user-specified range, so that interrupts are generated only when relevant data are available.

2 Bug List

File Tle493d.cpp

sensor not responding after powered off, needs to be reflashed to respond

reset freezes the sensor, fast mode not working

User manual recommands INT=0 in fast mode however only disabling INT works

wake up mode not configured correctly (WA bit = 0)

Member Tle493d::resetSensor (void)

not working

3 Hierarchical Index

3.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

4 Class Index

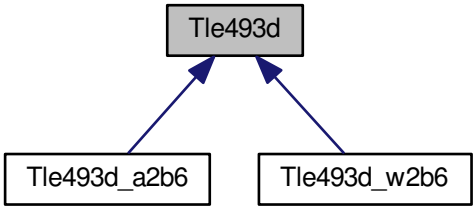
4.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

5 Class Documentation

5.1 Tle493d Class Reference

Inheritance diagram for Tle493d:



Public Types

- enum TypeAddress_e { **TLE493D_A0** = 0x35, **TLE493D_A1** = 0x22, **TLE493D_A2** = 0x78, **TLE493D_A3** = 0x44 }
- enum AccessMode_e { **LOWPOWERMODE** = 0, **MASTERCONTROLLEDMODE** = 1, **FASTMODE** = 3 }

Public Member Functions

- bool setAccessMode (AccessMode_e mode)

  Sets the operating mode of the sensor.
- Tle493d (AccessMode_e mode=MASTERCONTROLLEDMODE, TypeAddress_e productType=TLE493D_A0)

  Constructor of the sensor class.
- ~Tle493d (void)

  Destructor.
- void begin (void)

  Starts the sensor.
- void begin (TwoWire &bus, TypeAddress_e slaveAddress, bool reset, uint8_t oneByteRead)

  Starts the sensor.
- void enableTemp (void)

Enables temperature measurement; by default already enabled.

- void disableTemp (void)

  Disables temperature measurement to reduce power consumption.

- Tle493d_Error updateData (void)

  Reads measurement results from sensor.

- float getX (void)
- float getY (void)
- float getZ (void)
- float getNorm (void)
- float getAzimuth (void)
- float getPolar (void)
- float getTemp (void)
- void resetSensor (void)

  Resets the sensor.

- void **readDiagnosis** (uint8_t(&diag)[7])

Protected Member Functions

- void setRegBits (uint8_t regMaskIndex, uint8_t data)

  Stores new values into the bus interface; for this function to take effect the function writeOut() should be called afterwards.

- uint8_t getRegBits (uint8_t regMaskIndex)

  Returns the value of a register field.

Protected Attributes

- tle493d::BusInterface_t **mInterface**

5.1.1 Member Enumeration Documentation

5.1.1.1 enum Tle493d::AccessMode_e

Enumerates the three available modes; number 2 is reserved In low power mode cyclic measurements and AD↩ C-conversions are carried out with a update rate; the wake-up function is already configured for this mode, so that the sensor can continue making magnetic field measurements. With this configuration the microcontroller will only consume power and access the sensor if relevant measurement data is available. In master controlled mode the sensor powered down if when it is not triggered. This library configures to ADC start before sending first MSB of data registers In fast mode the measurements and ADC-conversions are running continuously.

5.1.1.2 enum Tle493d::TypeAddress_e

Defines four types of the sensor family which are supported by this library and their corresponding addresses The addresses can be concatenated with 0 or 1 for reading or writing

5.1.2 Constructor & Destructor Documentation

5.1.2.1 Tle493d::Tle493d (AccessMode_e *mode* = MASTERCONTROLLEDMODE, TypeAddress_e *productType* = TLE493D_A0)

Constructor of the sensor class.

Parameters

mode	Operating mode of the sensor; default is the master controlled mode
productType	The library supports product types from A0 to A3; default is type A0

5.1.3 Member Function Documentation

5.1.3.1 void Tle493d::begin (TwoWire & *bus*, TypeAddress_e *slaveAddress*, bool *reset*, uint8_t *oneByteRead*)

Starts the sensor.

Parameters

bus	The I2C bus
slaveAddress	The 7-bit slave address as defined in Tle493d_Type
reset	If a reset should be initiated before starting the sensor
oneByteRead	If one-byte read protocol should be used. Otherwise the two-byte protocol is available

5.1.3.2 float Tle493d::getAzimuth (void)

Returns

the Azimuth angle arctan(y/x)

5.1.3.3 float Tle493d::getNorm (void)

Returns

norm of the magnetic field vector sqrt(x^2 + y^2 + z^2)

5.1.3.4 float Tle493d::getPolar (void)

Returns

the angle in polar coordinates arctan(z/(sqrt(x^2+y^2)))

5.1.3.5 uint8_t Tle493d::getRegBits (uint8_t *regMaskIndex*) [protected]

Returns the value of a register field.

Parameters

Register	mask index as defined in Registers_e

5.1.3.6 float Tle493d::getTemp (void)

Returns

the temperature value

5.1.3.7 float Tle493d::getX (void)

Returns

the Cartesian x-coordinate

5.1.3.8 float Tle493d::getY (void)

Returns

the Cartesian y-coordinate

5.1.3.9 float Tle493d::getZ (void)

Returns

the Cartesian z-coordinate

5.1.3.10 void Tle493d::resetSensor (void)

Resets the sensor.

Bug not working

5.1.3.11 bool Tle493d::setAccessMode (AccessMode_e *mode*)

Sets the operating mode of the sensor.

Parameters

mode	MASTERCONTROLLEDMODE,LOWPOWERMODE or FASTMODE, default is MASTERCONTROLLEDMODE

5.1.3.12 void Tle493d::setRegBits (uint8_t *regMaskIndex,* uint8_t *data*) [protected]

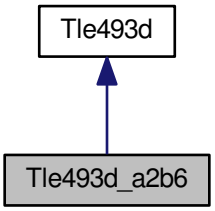
Stores new values into the bus interface; for this function to take effect the function writeOut() should be called afterwards.

Parameters

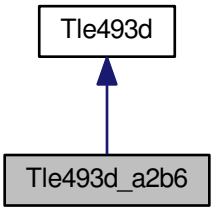
Register	mask index as defined in Registers_e
Value	to be written into the register field specified by the register index

5.2 Tle493d_a2b6 Class Reference

Inheritance diagram for Tle493d_a2b6:



Collaboration diagram for Tle493d_a2b6:



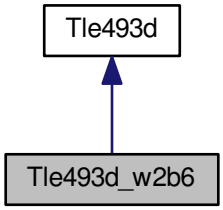
Public Member Functions

- void **setUpdateRate** (uint8_t updateRate)

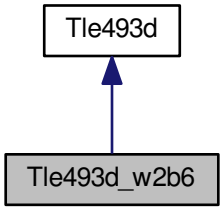
Additional Inherited Members

5.3 Tle493d_w2b6 Class Reference

Inheritance diagram for Tle493d_w2b6:



Collaboration diagram for Tle493d_w2b6:



Public Member Functions

- void setWakeUpThreshold (float xh, float xl, float yh, float yl, float zh, float zl)

  The Wake Up threshold range disabling /INT pulses between upper threshold and lower threshold is limited to a window of the half output range. Here the adjustable range can be set with a ratio of size [-1,1] When all the measurement values Bx, By and Bz are within this range INT is disabled. If the arguments are out of range or any upper threshold is smaller than the lower one, the function returns without taking effect.

- bool wakeUpEnabled (void)

  Checks if WA bit is set. When not interrupt configuration is as specified by the CA and INT bits.

- void setUpdateRate (uint8_t updateRate)

  Sets the update rate in low power mode.

Additional Inherited Members

5.3.1 Member Function Documentation

5.3.1.1 void Tle493d_w2b6::setUpdateRate (uint8_t *updateRate*)

Sets the update rate in low power mode.

Parameters

updateRate	Update rate which is an unsigned integer from the 0 (the fastest) to 7 (the highest)

5.3.1.2 void Tle493d_w2b6::setWakeUpThreshold (float *xh*, float *xl*, float *yh*, float *yl*, float *zh*, float *zl*)

The Wake Up threshold range disabling /INT pulses between upper threshold and lower threshold is limited to a window of the half output range. Here the adjustable range can be set with a ratio of size [-1,1] When all the measurement values Bx, By and Bz are within this range INT is disabled. If the arguments are out of range or any upper threshold is smaller than the lower one, the function returns without taking effect.

Parameters

xh	Upper threshold in x direction
xl	Lower threshold in x direction
yh	Upper threshold in y direction
yl	Lower threshold in y direction
zh	Upper threshold in z direction
zl	Lower threshold in z direction

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