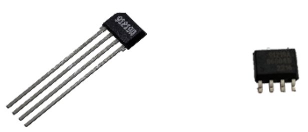
MLX91219

High Speed Current Sensor IC with OCD

Datasheet

1. Features and Benefits

- End-of-line programmable sensor
- Ratiometric analog output
- Flexible Supply Voltage with factory selectable 5V or 3.3V mode
- Measurement range from ±12.5 to ±400mT
- High speed sensing
    - DC to 400kHz bandwidth
    - 2µs response time
- High linearity down to ±0.5% full scale
- Low noise
- AEC-Q100 – Grade 0 Automotive Qualification
- Very low thermal drift for wide temperature range
    - Offset drift (<5mV)
    - Sensitivity drift (<1%)
- Internal overcurrent detection
- RoHS compliant
- Available in SIP4-VA (MSL-1) and SOIC8 packages (MSL-3)



2. Application Examples

- High Voltage Traction Motor Inverter
- 48V Boost Recuperation Inverter
- DCDC Converter
- Smart Battery Junction Boxes
- Smart Fuse Overcurrent Detection
- Redundant monitoring of Battery Management System (BMS)

3. Description

The MLX91219 is a monolithic Hall-effect sensor which is sensitive to the flux density applied orthogonally to the IC surface. The sensor provides an analog output voltage proportional to the applied magnetic flux density.

The transfer characteristic of the MLX91219 is factory trimmed over temperature, and is programmable (offset, sensitivity, filtering, internal overcurrent threshold) during end-of-line customer calibration. With the 400kHz bandwidth and fast response time, it is particularly adapted for high speed applications such as inverters and converters where fast response time due to fast switching is required.

In a typical current sensing application, the sensor is used in combination with a ring shaped soft ferromagnetic core. This core is recommended to be laminated for high bandwidth applications. The MLX91219 is placed in a small air gap and the current conductor – a bus bar or a cable – is passed through the inner part of the ferromagnetic ring. On the one hand the ring concentrates and amplifies the magnetic flux seen by the sensor IC, and at the same time it attenuates external magnetic field disturbances.

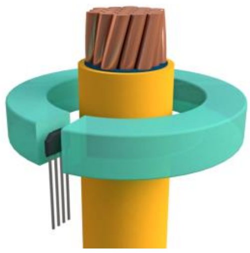


Figure 1. Typical Current Sensing Application

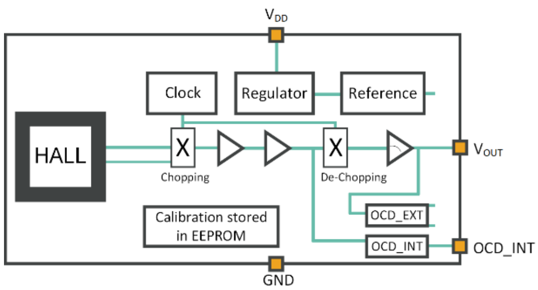


Figure 2. General Block Diagram

Contents

4. Ordering Information

Product Code	Temperature	Package	Option Code	Packing Form	Typical Sensitivity	Supply Voltage	OCD Level
MLX91219	L	VA	AAA-500	CR	7 mV/mT	5V	136 %FS
MLX91219	L	VA	AAA-501	RE	10mV/mT	5V	136 %FS
MLX91219	L	DC	ARA-501	RE	10mV/mT	5V	142 %FS
MLX91219	L	VA	AAA-502	CR	15mV/mT	5V	136 %FS
MLX91219	L	VA	AAA-503	CR	25mV/mT	5V	136 %FS
MLX91219	L	VA	AAT-505	RE	10mV/mT	5V	90 %FS

Table 1: Available ordering codes.

Legend:

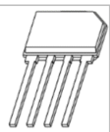
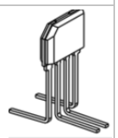
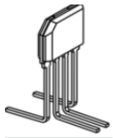
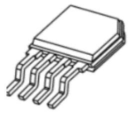
Temperature Code	**L**	from -40°C to 150°C ambient temperature
Package Code	**VA**	"VA" for SIP-4 VA package
	DC	"DC" for SOIC8 package
Option Code	**Axx-xxx**	"A" for Silicon revision
	xAx-xxx	"A" for ratiometric output (only for SIP-4 VA package)
	xRx-xxx	"R" for fixed output (only for SOIC8 package)
	xFx-xxx	"F" for fixed output (only for SOIC8 package)
	xxA-xxx **xxR-xxx** **xxS-xxx** **xxT-xxx** **xxZ-xxx**	Default straight leads TF-VA-2L-1.27-5.34-91.3-4.3 TF-VA-2L-1.27-3.7-91.3-4.3 TF-VA-2L-1.27-1.68-91.8-3 TF-VA-ZB-1.27-2.15 **xxA-xxx**  **xxR-xxx** **xxS-xxx**  **xxT-xxx**  **xxZ-xxx** 
	xxx-3xx **xxx-5xx**	"3" for 3.3 V supply, bipolar output "5" for 5 V supply, bipolar output
	xxx-x00 **xxx-x01** ..	Typical sensitivity of 7 mV/mT and overcurrent detection of 128 %full scale Typical sensitivity of 10 mV/mT and overcurrent detection of 128 %full scale ..
Packing Form	**CR** **RE** **SP**	Carton Reel – Radial taping Plastic Tape on Reel Sample pack
Ordering Example	"**MLX91219LVA-AAA-500-CR**" MLX91219 Conventional Hall current sensor in SIP4-VA package, temperature range -40°C to 150°C. Sensitivity 7 mV/mT. 5V Supply, bipolar ratiometric output. Parts delivered in Carton Reel.	

Table 2: Legend ordering codes.

Melexis is continuously expanding its product portfolio by adding new option codes to better meet the needs of our customer's applications. This table is being updated frequently, please go to the Melexis website to download the latest version of this datasheet. For custom transfer characteristics, please contact your local Melexis Sales representative or distributor.

5. Functional Diagram

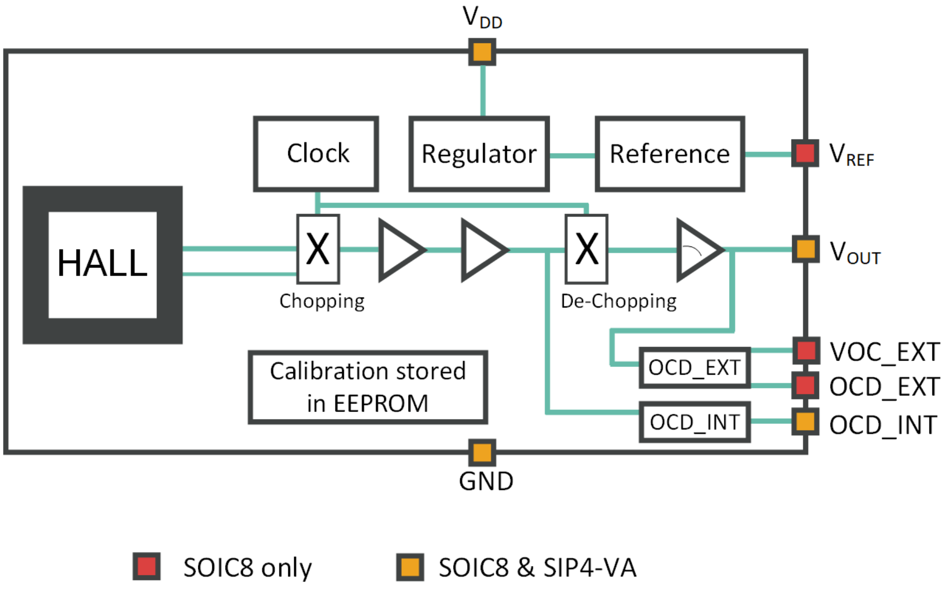


Figure 3: Block Diagram of the MLX91219.

Ratiometric Mode

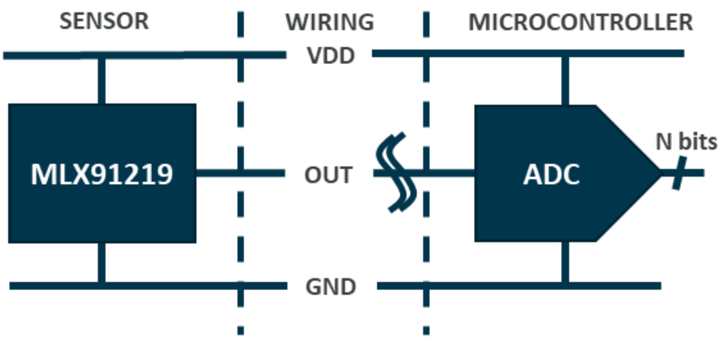


Figure 4: Schematic of ratiometric mode

No matter if the V_{DD} line is at 5V or deviating +/-10%, the ADC code for a given measured current will always be the same as the ADC is supplied by the same voltage as the sensor. The sensor has a sensitivity expressed in %V_{DD}/A.

Differential or Fixed Mode(1)

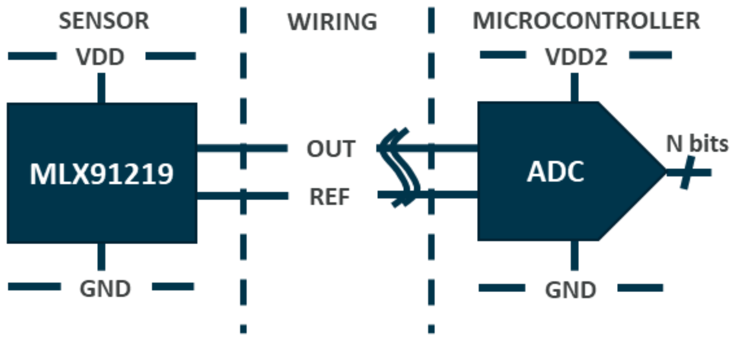


Figure 5: Schematic of fixed mode

In this particular case the ADC does not necessarily share the same supply voltage with the sensor. For this reason, the sensor is calibrated with an absolute sensitivity regardless of the actual supply voltage. The output signal can be reconstructed by taking the difference between the output and the reference voltage from the IC. The ADC gets these two signals as inputs for establishing the sensed current accurately, and is not influenced by the supply voltage differences between both sensor and microcontroller, if applicable. Only available in SOIC8 package.

Parameter	Ratiometric Mode	Differential or Fixed Mode
Output Signal	V_{OUT} [%V_{DD}] Example: output is 2.5V when supply is 5V → output is then 50%V_{DD}. If the supply (V_{DD}) increases with 5% to 5.25V the sensor output will (for the same measured input current) scale **proportionally** with the supply voltage, becoming 2.625V, but as a percentage (i.e. ratiometrically seen) it remains at 50% of V_{DD}.	V_{OUT} - V_{REF} [V] Example: output is 2.501V and V_{REF} is 2.501V when supply is 5V. When the supply voltage is increasing to 5.1V due to supply system variation, the sensor will still maintain the same "fixed" output values V_{OUT} and V_{REF}.
Offset	V_{OUT}[0A] = 50 [%V_{DD}] (factory trimmed)	V_{REF} = 2.5 [V] (factory trimmed) V_{OUT}[0A]-V_{REF} = 0 [V]
Offset ratiometric	Yes	No
Sensitivity	[%V_{DD}/A]	[mV/A]
Sensitivity ratiometric	Yes	No
Measured Current	(V_{OUT}-V_{OUT}[0A]) / Sensitivity	(V_{OUT}-V_{REF}) / Sensitivity

Table 3: Parameters of differential and fixed modes

(1) Only available in SOIC8 package. More information can be found in Application Note ANCurrent_sensors_gen2_ReferencePin on www.melexis.com

6. Glossary of Terms

Terms	Definition
TC	Temperature Coefficient
FS	Full Scale, output referred. Corresponds to 2V excursion around 2.5V at 5V supply or 1.25V excursion from 1.65V at 3.3V supply for bipolar designs
T, mT	Tesla, milliTesla = units for the magnetic flux density
G	Gauss = unit for the magnetic flux density [1mT = 10G]
OCD	Overcurrent Detection
MSL	Moisture Sensitivity Level

Table 4: Glossary of Terms

7. Pin Definitions and Descriptions

Note: MLX91219 is not pin-to-pin compatible with MLX91209 or MLX91217.

7.1. SIP-4 VA Package

Pin #	Name	Type	Description
1	VDD	Supply	Supply voltage
2	OUT	Analog Output	Output voltage (measurement)
3	OCD_INT	Analog Output	Overcurrent detection based on internal threshold
4	GND	Supply	Ground voltage

Table 5: Pin definitions and descriptions.

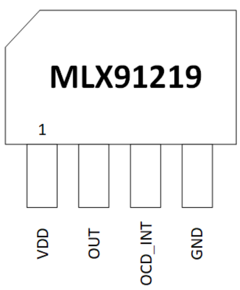


Figure 6:Pinout of SIP4-VA package.

7.2. SOIC8 package

Pin #	Name	Type	Description
1	VREF	Analog	Reference voltage
2	OUT	Analog Output	Output voltage (measurement)
3	GND	Supply	Ground voltage
4	VDD	Supply	Supply voltage
5	NC	-	Not connected
6	OCD_EXT	Analog Output	Overcurrent detection based on external threshold
7	OCD_INT	Analog Output	Overcurrent detection based on internal threshold
8	VOC_EXT	Analog Input	External threshold for the OCD

Table 6: Pin definitions and descriptions.

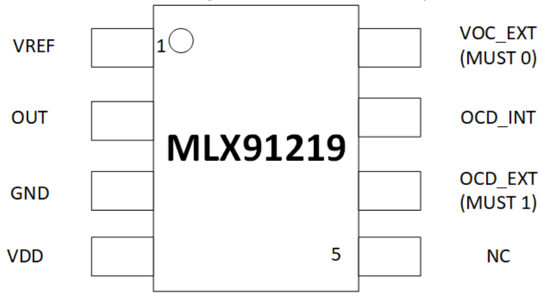


Figure 7: Pinout of SOIC8 package.

8. Absolute Maximum Ratings

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute maximum-rated conditions for extended periods of time may affect device reliability.

Parameter	Symbol	Value	Unit
Positive Supply Voltage (overvoltage)	V_{DD}	+8	V
Positive Pin Voltage[1]	V_{PIN}	V_{DD} + 0.3	V
Output Short Circuit Current to GND	I_{SHORT_GND}	-100	mA
Output Short Circuit Current to V_{DD}	I_{SHORT_VDD}	60	mA
Reverse Pin Voltage[1]	V_{min_REV}	GNDv-0.3	V
Output Sinking Current	I_{out_max}	50	mA
Maximum Junction Temperature	T_{j_MAX}	165	°C
Operating Ambient Temperature Range	T_A	-40 to +150	°C
Storage Temperature Range	T_S	-55 to +165	°C
Human Body ESD Protection	ESD_{HBM}	2	kV
Charged Device Model ESD Protection	ESD_{CDM}	500	V

Table 7: Absolute maximum ratings.

[1] *Except V_{DD} and GND*

9. General Electrical Specifications

Operating Parameters T_A = -40 to 150°C, V_{DD}=5 V or 3.3 V factory trimmed devices unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Nominal Supply Voltage	V_{DD}	MLX91219Lxx-Axx-5xx MLX91219Lxx-Axx-3xx	4.5 3.135	5 3.3	5.5 3.465	V
Positive Supply Voltage (maintaining application mode)	V_{DD}			6.5		V
Supply Current	I_{DD}	Without R_{LOAD} on output, in application mode V_{DD}= 5 V V_{DD} = 3.3 V		15.5 15	19 18	mA
V_{OUT} Output Resistance	R_{OUT}	V_{OUT} = 50%V_{DD}, I_{LOAD} = 10 mA		1	5	Ω
Output Capacitive Load	C_{LOAD}	Output amplifier stability is optimized for this typical value	0	4.7	6	nF
Output Leakage current	I_{LEAK}	High impedance mode, T_A=150°C		6	20	µA
Output Voltage Linear Swing	V_{OUT_LSW}	V_{DD} > 4.6 V for Fixed Mode versions	10		90	%V_{DD}

Table 8: General electrical parameters.

10. Magnetic specification

Operating Parameters T_A = -40 to 150°C, V_{DD}=5 V or 3.3 V factory trimmed unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operational Magnetic Field Range	B_{OP}				±400	mT
Linearity Error (Magnetic)	NL	B within B_{OP}, T_A = 25°C			±0.5	%FS
Programmable Sensitivity	S_{PROG}	Generic part MLX91219LVA-AAA-500 MLX91219LVA-AAA-501 MLX91219LDC-ARA-501 MLX91219LVA-AAA-502 MLX91219LVA-AAA-503 MLX91219LVA-AAT-505	5 6.5 6.5 6.5 6.5 16 6.5	 7 10 10 15 25 10	105 22.5 22.5 22.5 22.5 55 22.5	mV/mT
Sensitivity Programming Resolution	S_{RES}	B = B_{OP}		0.5		%

Table 9: Magnetic specification.

Analog output specification

10.1. SIP-4 VA Accuracy specifications

Operating Parameters T_A = -40 to 150°C, V_{DD}=5 V or 3.3 V factory trimmed unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Voltage Output Quiescent	V_{OQ}	No magnetic field applied, T_A=25°C	-5		5	mV
Ratiometric Offset Error[2]	ΔR_{VOQ}	V_{DD} = 5V V_{DD} = 3.3V		1.6 1		mV/%V_{DD}
Thermal Offset Drift[3]	$\Delta^T V_{OQ}$	T_A = -40 to 125°C T_A = -40 to 150°C[4]	-5	 ±5	5	mV
Total Offset drift[5]	ΔV_{OQ}			±6		mV
Ratiometric Sensitivity Error[2]	$\Delta^R S$			0.16		%/%V_{DD}
Thermal Sensitivity Drift[3]	$\Delta^T S$	T_A =-40°C to 125°C T_A =-40°C to 150°C[4]	-1	 ±1	1	%S
Total Sensitivity Drift[5]	ΔS			±1.5		%S
Input referred noise spectral density	N_{SD}	within BW = 1 .. 400kHz, Max Gain		210		nT/√Hz

Table 10: Accuracy specifications – analog parameters.

The accuracy specifications are defined for the factory calibrated sensitivity. The achievable accuracy is dependent on the user's end-of-line calibration. Resolution for offset and offset drift calibration is better than 0.05%V_{DD}. Trimming capability is higher than measurement accuracy. End-user calibration can therefore increase the accuracy of the system.

[2] *Ratiometry Error is verified at maximum V_{DD} deviation (5%V_{DD} at 3.3V and 10%V_{DD} at 5V) over temperature in production. Typical values are the maximum mean ±3 sigma out of all characterized lots.*

[3] *Performance after factory trimming.*

[4] *Based on results from AEC-Q003 Characterization. Typical values are the maximum mean ±3 sigma out of all characterized lots.*

[5] *After 1000h HTOL at TA = 155°C with respect to after pre-conditioning at TA = 35°C. Pre-conditioning is performed with MSL level 3 based on J-STD-020. Typical values are the highest average ±3 sigma across all qualification lots.*

10.2. SOIC8 Accuracy specifications

Operating Parameters T_A = -40 to 150°C, V_{DD}=5 V or 3.3 V factory trimmed unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Voltage Reference	V_{REF}	T_A=25°C, xFx-5xx (fixed) versions T_A=25°C, xFx-3xx (fixed) versions		2.5 1.65		V
Thermal Reference Drift	ΔT_{VREF}	Variation versus 25°C, for fixed output			±150	ppm/°C
Non-ratiometric VREF Error	ΔV_{REF}	Fixed mode devices (only SOIC8)	-3		3	mV
Voltage Output Quiescent	V_{OQ}	No magnetic field applied, T_A=25°C	-5		5	mV
Ratiometric Offset Error[6]	ΔR_{VOQ}	V_{DD} = 5V V_{DD} = 3.3V		1.6 1		mV/%V_{DD}
Thermal Offset Drift[7]	$\Delta^T V_{OQ}$	T_A = -40 to 125°C T_A = -40 to 150°C[8]	-5	 ±6	5	mV
Total Offset drift[9]	ΔV_{OQ}			±6		mV
Ratiometric Sensitivity Error[2]	$\Delta^R S$			0.16		%/%V_{DD}
Thermal Sensitivity Drift[3]	$\Delta^T S$	T_A =-40°C to 125°C T_A =-40°C to 150°C[4]	-1	 ±1.3	1	%S
Total Sensitivity Drift[5]	ΔS			±1.5		%S
Input referred noise spectral density	N_{SD}	within BW = 1 .. 400kHz, Max Gain		210		nT/√Hz

Table 11: Accuracy specifications – analog parameters.

The accuracy specifications are defined for the factory calibrated sensitivity. The achievable accuracy is dependent on the user's end-of-line calibration. Resolution for offset and offset drift calibration is better than 0.05%V_{DD}. Trimming capability is higher than measurement accuracy. End-user calibration can therefore increase the accuracy of the system.

[6] *Ratiometry Error is verified at maximum V_{DD} deviation (5%V_{DD} at 3.3V and 10%V_{DD} at 5V) over temperature in production. Typical values are the maximum mean ±3 sigma out of all characterized lots.*

[7] *Performance after factory trimming.*

[8] *Based on results from AEC-Q003 Characterization. Typical values are the maximum mean ±3 sigma out of all characterized lots.*

[9] *After 1000h HTOL at TA = 155°C with respect to after pre-conditioning at TA = 35°C. Pre-conditioning is performed with MSL level 3 based on J-STD-020. Typical values are the highest average ±3 sigma across all qualification lots.*

10.3. Timing specifications

Operating Parameters T_A = -40 to 150°C, V_{DD}=5 V or 3.3 V factory trimmed unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Step Response Time	T_{RESP}	Delay between the input signal reaching 90% and the output reaching 90% (see Figure 8)			2	µs
Bandwidth	BW	-3dB, TA =25°C, SF=1 (default) SF=2 SF=3		 400 200 100		kHz
Power on Delay	T_{POD}				1	ms

Table 12: Timing specifications of the high-speed analog output

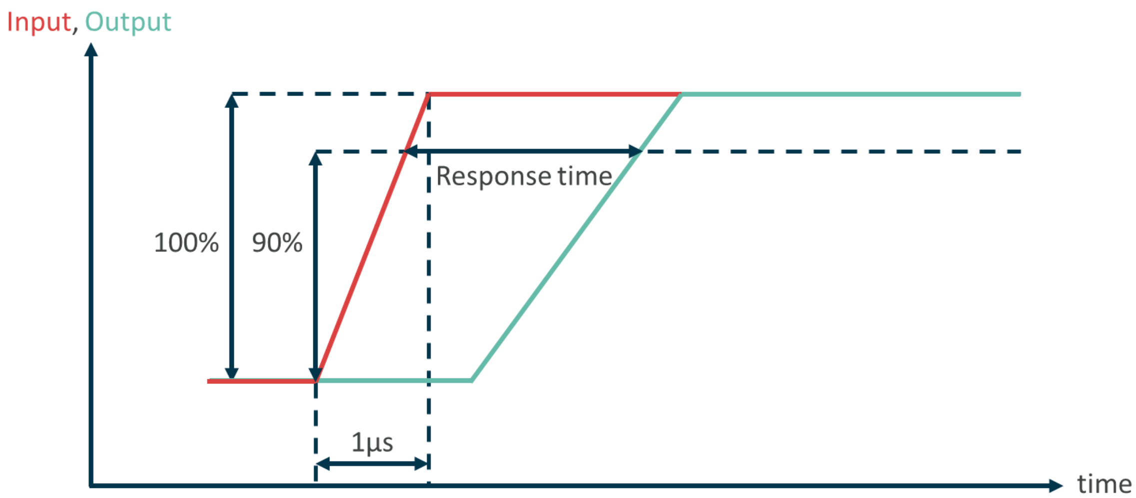


Figure 8: Response Time definition

11. Overcurrent Detection Specification[10]

11.1. General

The MLX91219 provides two OCD features (called internal and external) that allow the detection of overcurrent events. The internal OCD (OCD_{INT}) is available in both packages SIP4-VA and SOIC8, while the external OCD (OCD_{EXT}) is only available in SOIC8 package. When an overcurrent event occurs, the OCD pins are pulled to ground. During normal operation the OCD voltage remains at V_{DD}. If not used, OCD pins can be connected to GND.
The two OCD functions are able to react to an overcurrent event within few µs of response time. To avoid false alarm, the overcurrent has to be maintained for at least 1µs for the detection to occur. After detection by the sensor the output flag is maintained for 10µs of dwell time. This allows the overcurrent to be easily detected at microcontroller level.

The following table offers a comparison between OCD_{INT} and OCD_{EXT}:

Description	OCD_{INT}	OCD_{EXT}
Typical Application	Short-circuit detection	Out-of-range detection
Overcurrent effect	OCD_{INT} pin to GND	OCD_{EXT} pin to GND
Detection mode	Bidirectional	Unidirectional / bidirectional
Threshold trimming	EEPROM	Voltage divider on VOC_{EXT}
Availability in package	SIP4-VA, SOIC8	SOIC8

Table 13: Comparison between OCD_{INT} and OCD_{EXT}

10 More information can be found in Application Note ANCurrent_sensors_gen2_OverCurrentDetection on www.melexis.com.

11.2. Electrical Specifications

Operating Parameters T_A = -40 to 150°C, V_{DD}=5 V or 3.3 V factory trimmed unless otherwise specified.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
OCD_INT Internal ON Resistance	$R_{ON\_OCD\_INT}$	I_{SINK} = 1 mA	60	90	150	Ω
OCD_EXT Internal ON Resistance	$R_{ON\_OCD\_EXT}$	I_{SINK} = 1 mA	160	190	280	Ω
VOC_EXT Voltage Range V_{DD}= 5 V, 5xx versions	VOC_{EXT_5V}	RS = 0 , Bidirectional RS = 3, Unidirectional	0.5 0.9		2.0 4.5	V
VOC_EXT Voltage Range V_{DD}= 3.3 V, 3xx versions	VOC_{EXT3V3}	RS = 1, Bidirectional RS = 3, Unidirectional	0.5 0.74		1.525 2.9	V
OCD_{INT} accuracy	OCD_{INT}	Ratiometric output[11]		±10		%Thr[12]
OCD_{EXT} accuracy	OCD_{EXT}			±1.5		%FS

Table 14: Electrical Specifications OCD

11.3. Timing Specifications

Operating Parameters T_A = -40 to 150°C, V_{DD}=5 V or 3.3 V factory trimmed unless otherwise specified.

Parameter	Test Conditions	Min	Typ	Max	Units
OCD_{INT} response time	programmable		1.4 2.1		µs
OCD_{EXT} response time			10		µs
OCD_{INT} required Input holding time			0.5		µs
OCD_{EXT} required Input holding time			10		µs
OCD_{INT} output dwell time		7		14	µs
OCD_{EXT} output dwell time			10		µs

Table 15: OCD_{INT} and OCD_{EXT} timing specifications

[11] OCD_{INT} threshold will not scale with VDD variation (in ratiometric output mode) therefore at lower supply voltage results in a higher OCD_{INT} threshold and vice versa. VDD variation should be accounted for when defining the OCD threshold.

[12] The error of OCD_{INT} is expressed as percentage of the threshold value. Example: if the nominal threshold is 282mT, the typical threshold of OCD_{INT} will be in the range between 253.8mT and 310.2

11.4. Internal Overcurrent Detection Principle

The internal OCD takes the threshold voltage values predefined in the EEPROM and does not require any extra components. The OCD_{INT} implementation allows detecting overcurrent outside of the output measurement range of the sensor and is therefore suitable for large current peaks as occurring during short-circuit. If the theoretical sensor output overcomes the OCD_{INT} voltage threshold, the overcurrent event is flagged on OCD_{INT} pin. The default OCD threshold voltages are defined as follows, but other values can be set on request.

Sensor reference	Typical Sensitivity [mV/mT]	OCD_{INT} Threshold Current [%FS]
MLX91219LVA-AAA-500	7	136
MLX91219LVA-AAA-501	10	136
MLX91219LDC-ARA-501	10	142
MLX91219LVA-AAA-502	15	136
MLX91219LVA-AAA-503	25	136
MLX91219LVA-AAT-505	10	90

Table 16: OCD_{INT} thresholds

	Sensor configuration	Min [% FS]	Max [% FS]
OCD_{INT} Threshold	V_{DD} = 5V / V_{REF} = 2.5V	24	221

Table 17: OCD_{INT} factory programmable range

11.5. External Overcurrent Detection Principle

The external OCD uses the voltage applied on VOC_{EXT} pin as threshold voltage. This translates into an overcurrent threshold depending on the sensitivity of the sensor. A voltage divider on VOC_{EXT} allows defining the threshold voltage in a custom way. Depending on the voltage divider configuration, the OCD_{EXT} can be used either in bidirectional or unidirectional mode. The External OCD threshold is defined within the measurement range of the sensor output. This feature is then suitable for out-of-range detection where the OCD threshold remains close to the nominal current. It offers a better accuracy than OCD_{INT} but the response is slower. The below table presents the unidirectional and bidirectional external OCD configurations. Please refer to section 13 for more details about the application diagram and the recommended resistances.

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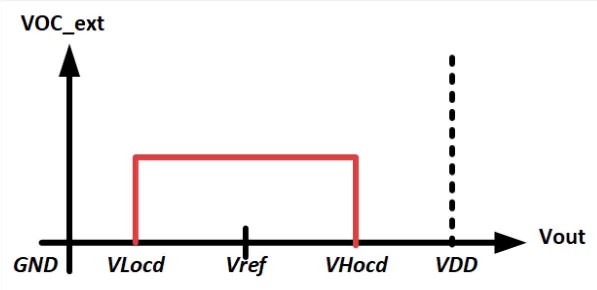
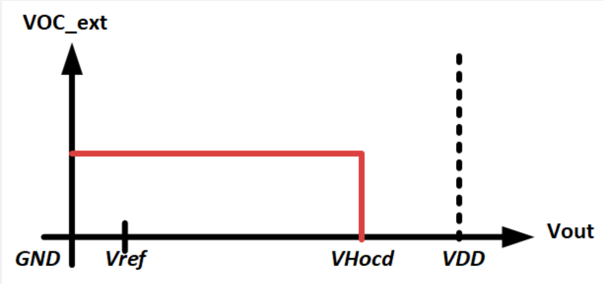
<tr><td>
</td><td>
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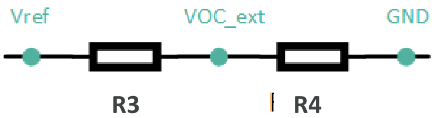
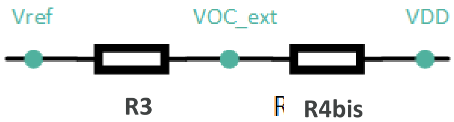
<tr><td>
</td><td>
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<tr><td>$$VOC_{EXT} = V_{REF} * \frac{R_4}{R_3 + R_4}$$
$$VLocd = VOC_{EXT}$$
$$VHocd = 2 * V_{REF} - VLocd$$</td><td>$$VOC_{EXT} = V_{REF} + (V_{DD} - V_{REF}) * \frac{R_{4bis}}{R_3 + R_{4bis}}$$
$$VHocd = VOC_{EXT}$$</td></tr>
</table>

Table 18: External OCD, bidirectional and unidirectional configurations

12. Recommended Application Diagram

12.1. SIP-4 VA Package

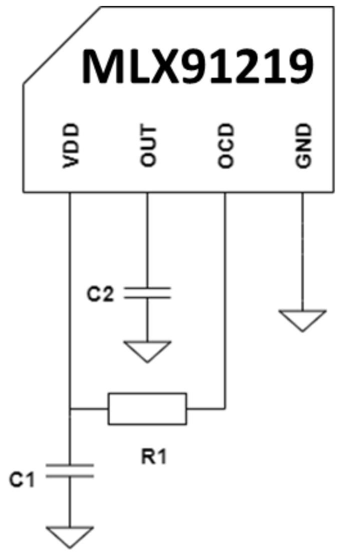


Figure 9: Application Diagram for SIP-4 VA package

Part	Description	Value	Unit
C1	Supply capacitor, EMI, ESD	47	nF
C2	Decoupling, EMI, ESD	4.7	nF
R1	Internal OCD resistor	10	kΩ

Table 19: Resistor and capacitor values for SIP-4 VA package

12.2. SOIC8 package

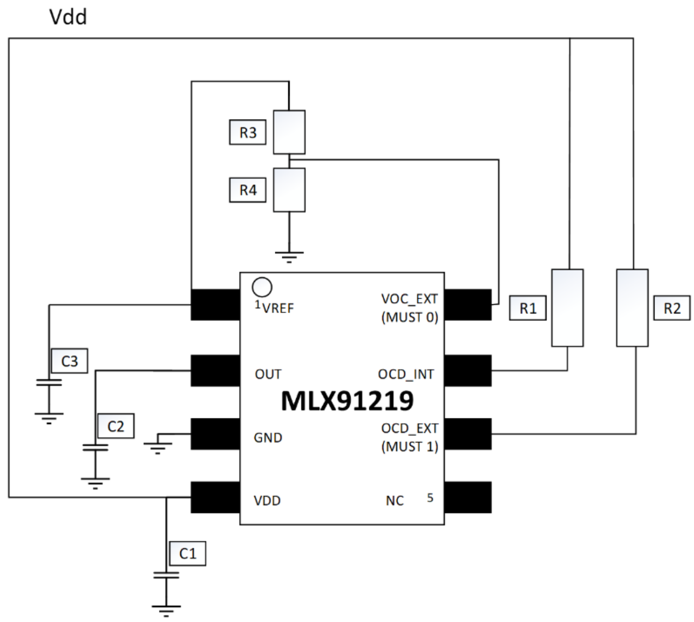


Figure 10: Application Diagram for SOIC8 package

Part	Description	Value	Unit
C1	Supply capacitor, EMI, ESD	47	nF
C2	Decoupling, EMI, ESD	4.7	nF
C3	Decoupling, EMI, ESD	47	nF
R1	Internal OCD resistor	10	kΩ
R2	External OCD resistor	10	kΩ
R3/R4/R4bis	Uni-/Bidirectional OCD customized ratio	-	kΩ

Table 20: Resistor and capacitor values for SOIC8 package

13. Standard Information

Our products are classified and qualified regarding soldering technology, solderability and moisture sensitivity level according to following test methods:

Reflow Soldering SMD's (Surface Mount Devices)

- IPC/JEDEC J-STD-020

  Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices (classification reflow profiles according to table 5-2)

- EIA/JEDEC JESD22-A113

  Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing (reflow profiles according to table 2)

Wave Soldering SMD's (Surface Mount Devices) and THD's (Through Hole Devices)

- EN60749-20

  Resistance of plastic- encapsulated SMD's to combined effect of moisture and soldering heat

- EIA/JEDEC JESD22-B106 and EN60749-15

  Resistance to soldering temperature for through-hole mounted devices

Iron Soldering THD's (Through Hole Devices)

- EN60749-15

  Resistance to soldering temperature for through-hole mounted devices

  Soldering by iron or other methods that require a peak temperature equal or above 350degC are not allowed.

Solderability SMD's (Surface Mount Devices) and THD's (Through Hole Devices)

- EIA/JEDEC JESD22-B102 and EN60749-21

  Solderability

For all soldering technologies deviating from above mentioned standard conditions (regarding peak temperature, temperature gradient, temperature profile etc.) additional classification and qualification tests have to be agreed upon with Melexis. The application of Wave Soldering for SMD's is allowed only after consulting Melexis regarding assurance of adhesive strength between device and board.

Melexis recommends reviewing on our web site the General Guidelines soldering recommendation (https://www.melexis.com/en/quality-environment/soldering).

Melexis is contributing to global environmental conservation by promoting **lead free** solutions. For more information on qualifications of **RoHS** compliant products (RoHS = European directive on the Restriction Of the use of certain Hazardous Substances) please visit the quality page on our website (https://www.melexis.com/en/quality-environment).

For package technology embedding trim and form post-delivery capability, Melexis recommends to consult the dedicated trim and form recommendation application note: Lead trimming and forming recommendations.

14. ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).
Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

15. Packaging information: SIP4-VA

15.1. Sensor active measurement direction and magnetic center

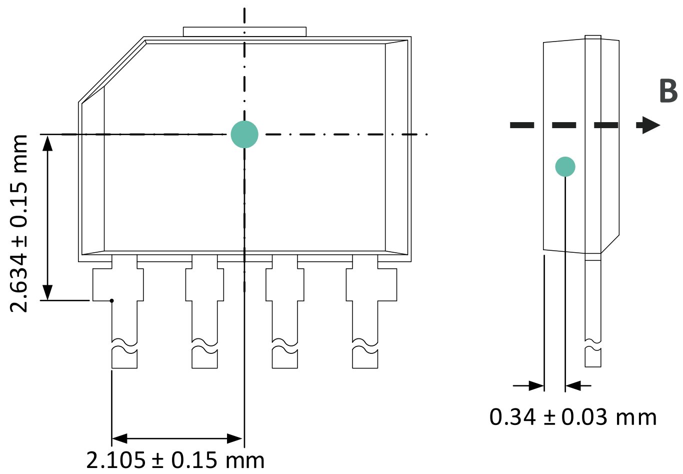


Figure 11: VA/SIL-4L Magnetic center and sensor's active measurement direction B

15.2. Package marking & Hall plate position

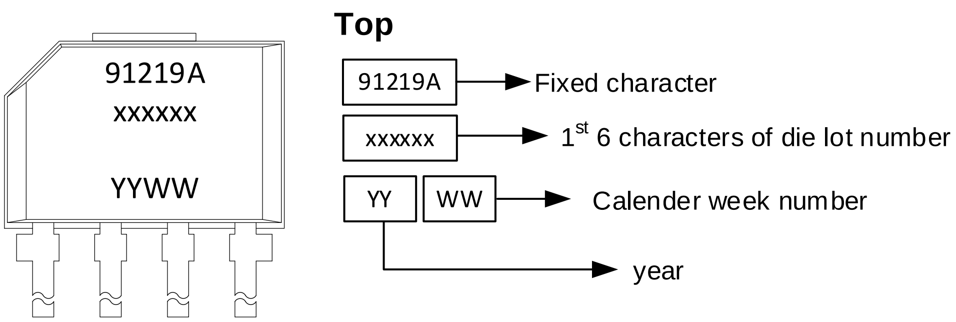
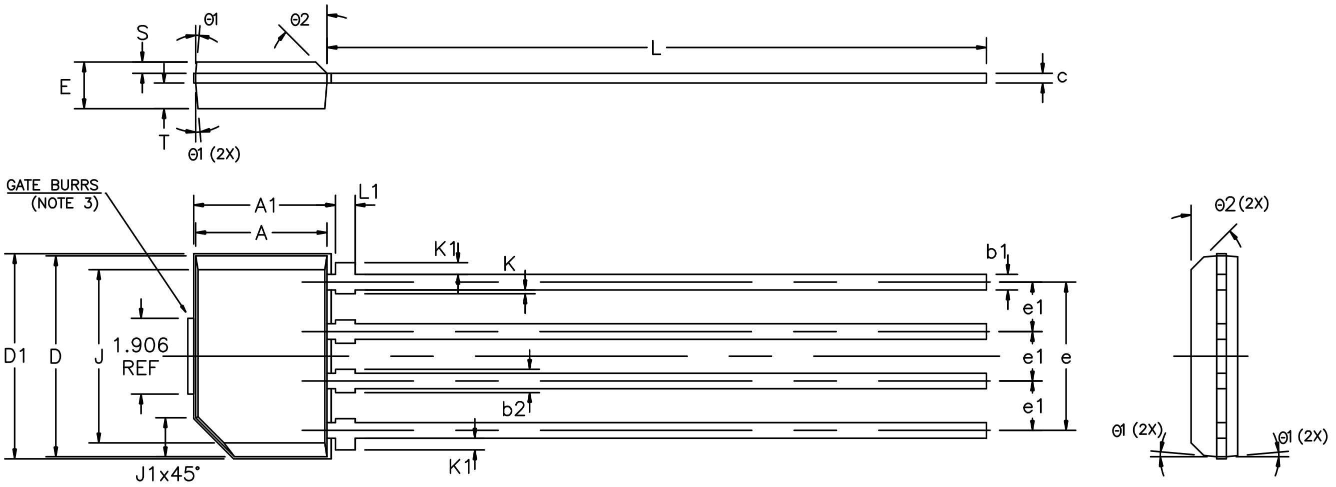


Figure 12. VA/SIP 4L (single in-line package) / 18mm lead length - Package Information

15.3. VA Straight leg (MLX91219LVA-ARA-xxx-xx)



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	3.30	3.38	3.46
A1	3.63	3.71	3.79
D	5.08	5.16	5.24
D1	5.33	5.38	5.43
E	1.10	---	1.20
J	4.10	4.30	4.50
J1	1.00 REF		
K	0.00	---	0.15
K1	0.25	0.30	0.35
L	17.5	18.0	18.5
L1	0.48	0.53	0.58
S	0.24	---	0.29
T	0.61	---	0.66
b1	0.35	---	0.48
b2	0.40	---	0.60
c	0.18	---	0.34
e	3.76	---	3.86
e1	1.22	1.27	1.32
Θ1	5° REF		
Θ2	45° REF		

Note:

1. DIMENSIONS "A" AND "D" DO NOT INCLUDE MOLD FLASH, PROTRUSIONS AND GATE BURRS.
2. DIMENSIONS "A1" DOES NOT INCLUDE GATE BURRS BUT INCLUDES MOLD FLASH AT BOTH ENDS.
3. MOLD GATE BURRS SHALL NOT EXCEED 0.15 mm MEASURED FROM EDGE OF MOLD FLASH (FLANGE).
4. DIMENSION "D1" INCLUDES MOLD FLASH AT BOTH ENDS.
5. LEAD PLATING; MATTE TIN PLATING THICKNESS 7.62 – 15.42 um.
6. THE LEADS MAY BE SLIGHTLY DEFORMED DURING TRANSPORTATION IF PACKED IN BULK (BAG), AFFECTING e1 DIMENSION. IT IS RECOMMENDED TO ORDER RADIAL TAPE (REEL OR AMMOPACK) IF SUCH DEFORMATION IS CRITICAL FOR THE LEAD FORMING PROCESS, EVEN IF MANUAL LOADING INTO THE TOOL IS FORESEEN.

Figure 13: VA Straight leg

15.4. Trim and form-variant TF-VA-2L-1.27-5.34-91.3-4.3

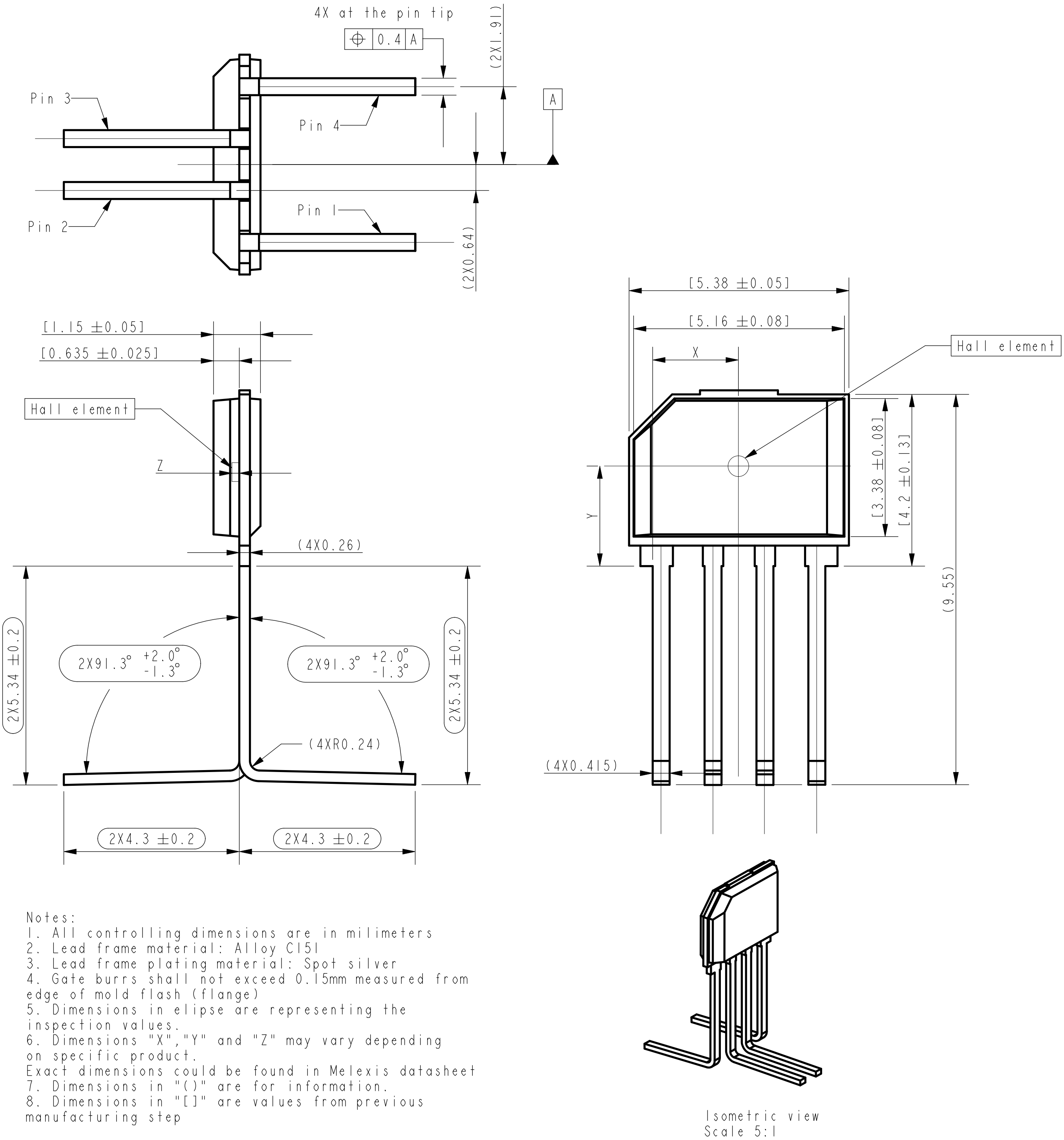


Figure 14: Trim and form type: 90° 2x2x91.3 (h=5.34), bending-STD2 (AAR-xxx)

15.5. Trim and form-variant TF-VA-2L-1.27-3.7-91.3-4.3

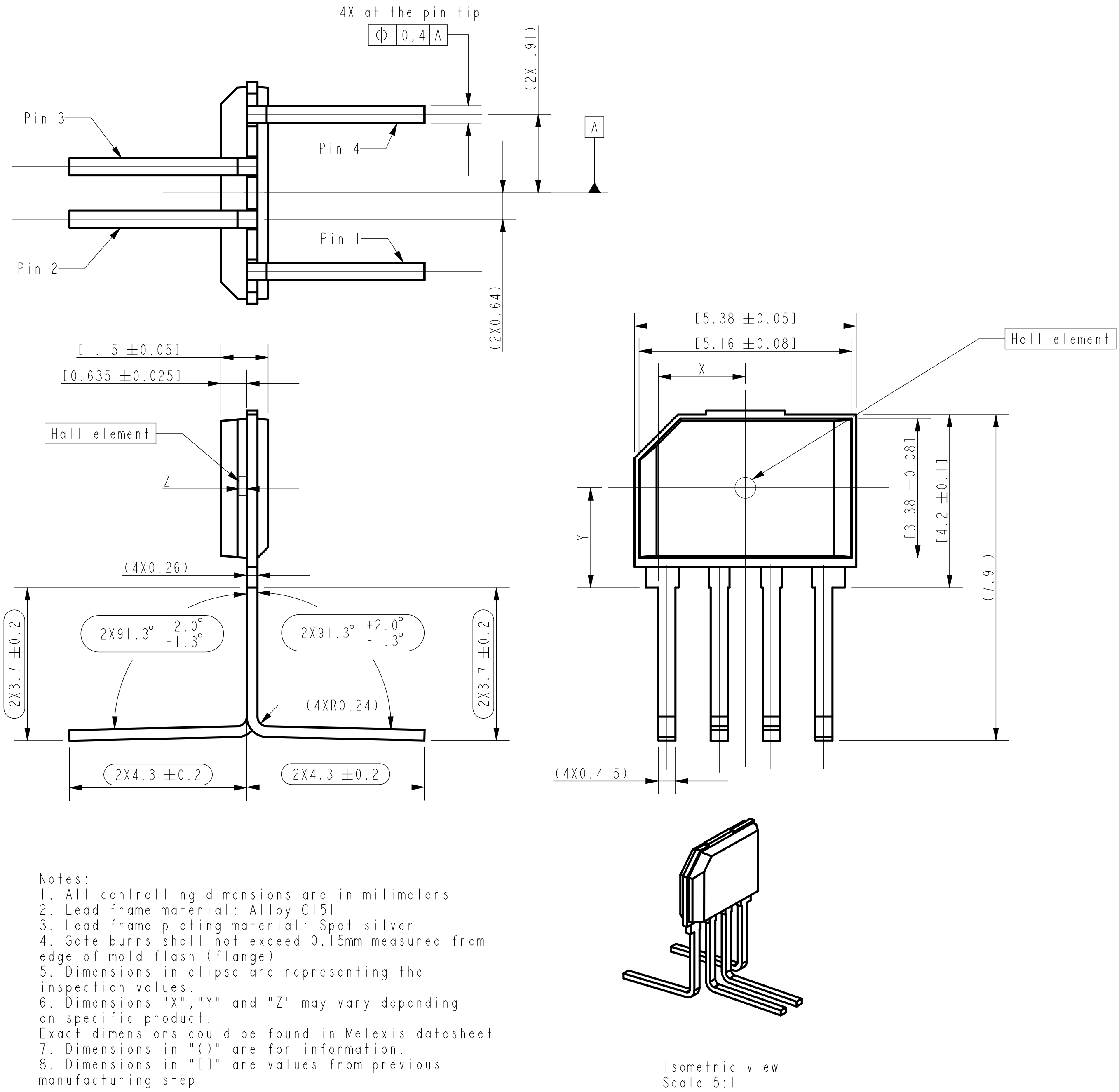


Figure 15: Trim and form type: 90° 2x2x91.3 (h=3.7), bending-STD3 (AAS-xxx)

15.6. Trim and form-variant TF-VA-2L-1.27-1.68-91.8-3

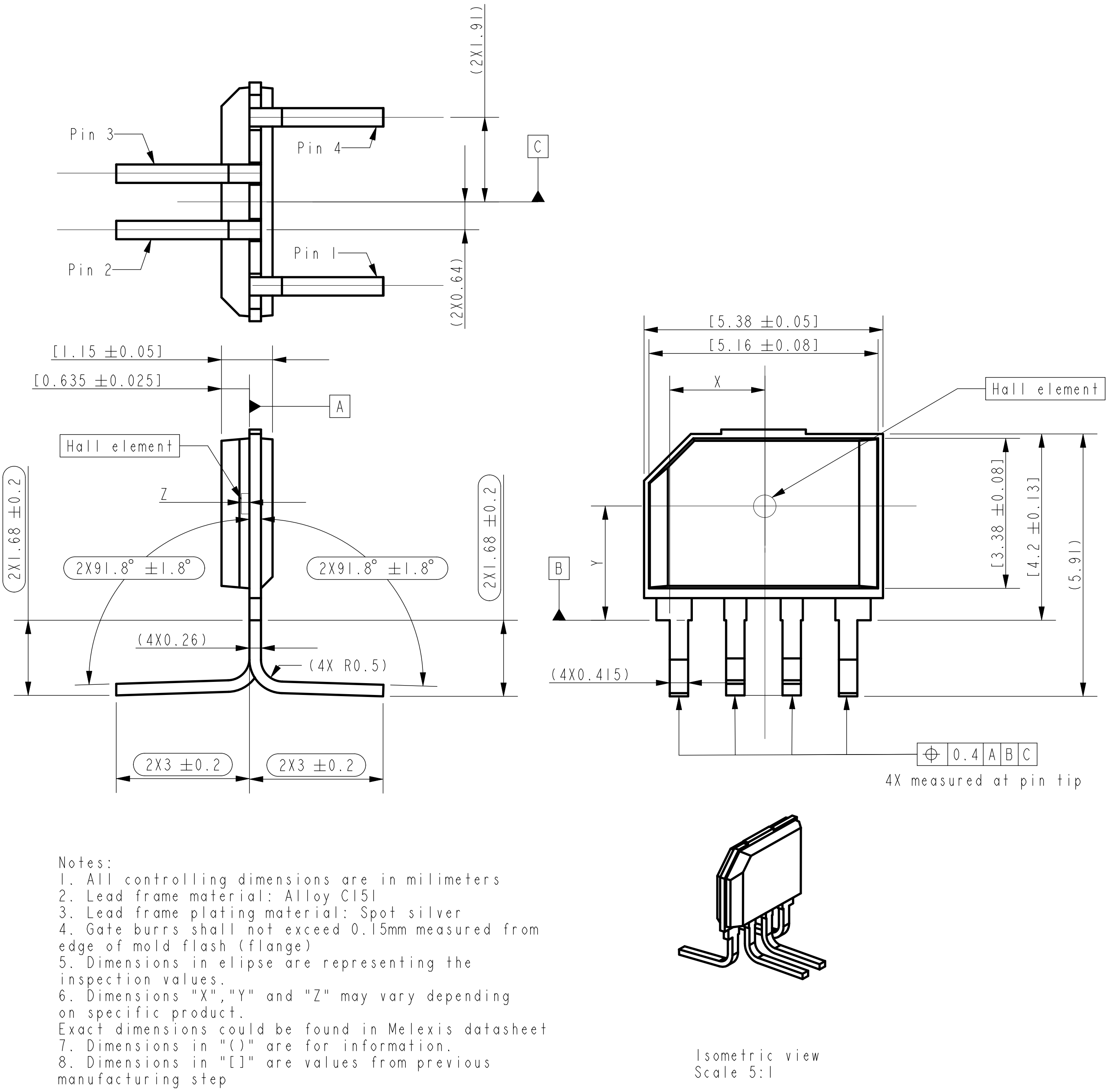


Figure 16: Trim and form type: 90° 2x2x91.8 (h=1.68), bending-STD4 (AAT-xxx)

15.7. Trim and form-variant TF-VA-ZB-1.27-2.15

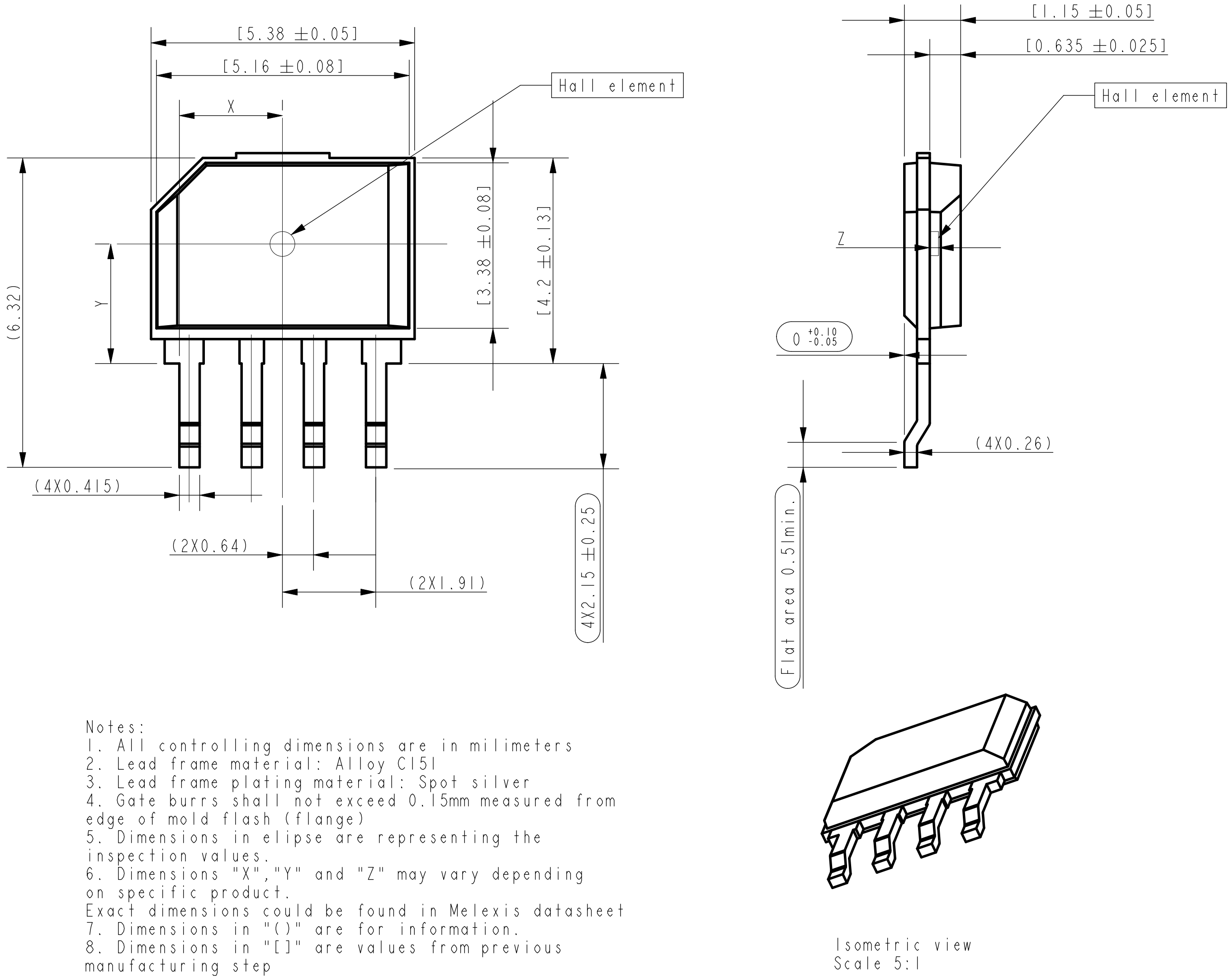


Figure 17: Trim and form SMD style TFT4K1 (AAZ-xxx)

16. Packaging information: SOIC8

16.1. Sensor active measurement direction and magnetic center

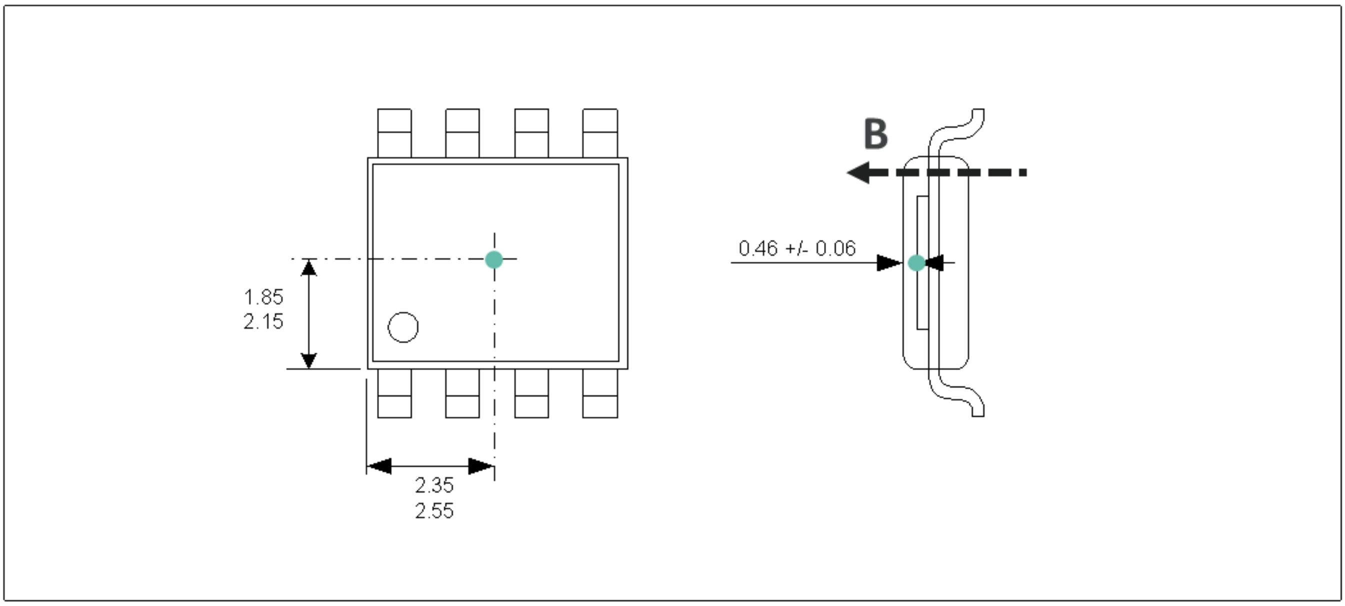


Figure 18: VA/SIL-4L Magnetic center and sensor's active measurement direction B

16.2. Package marking

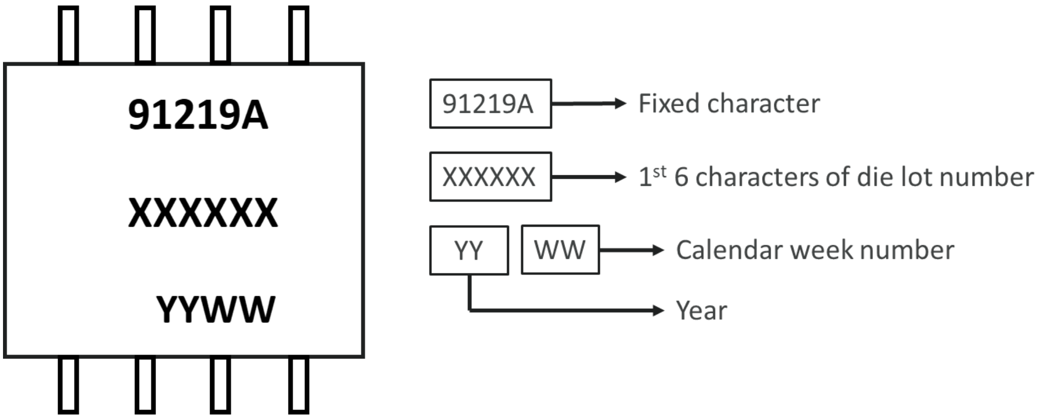


Figure 19. SOIC8 package marking

16.3. Package dimensions

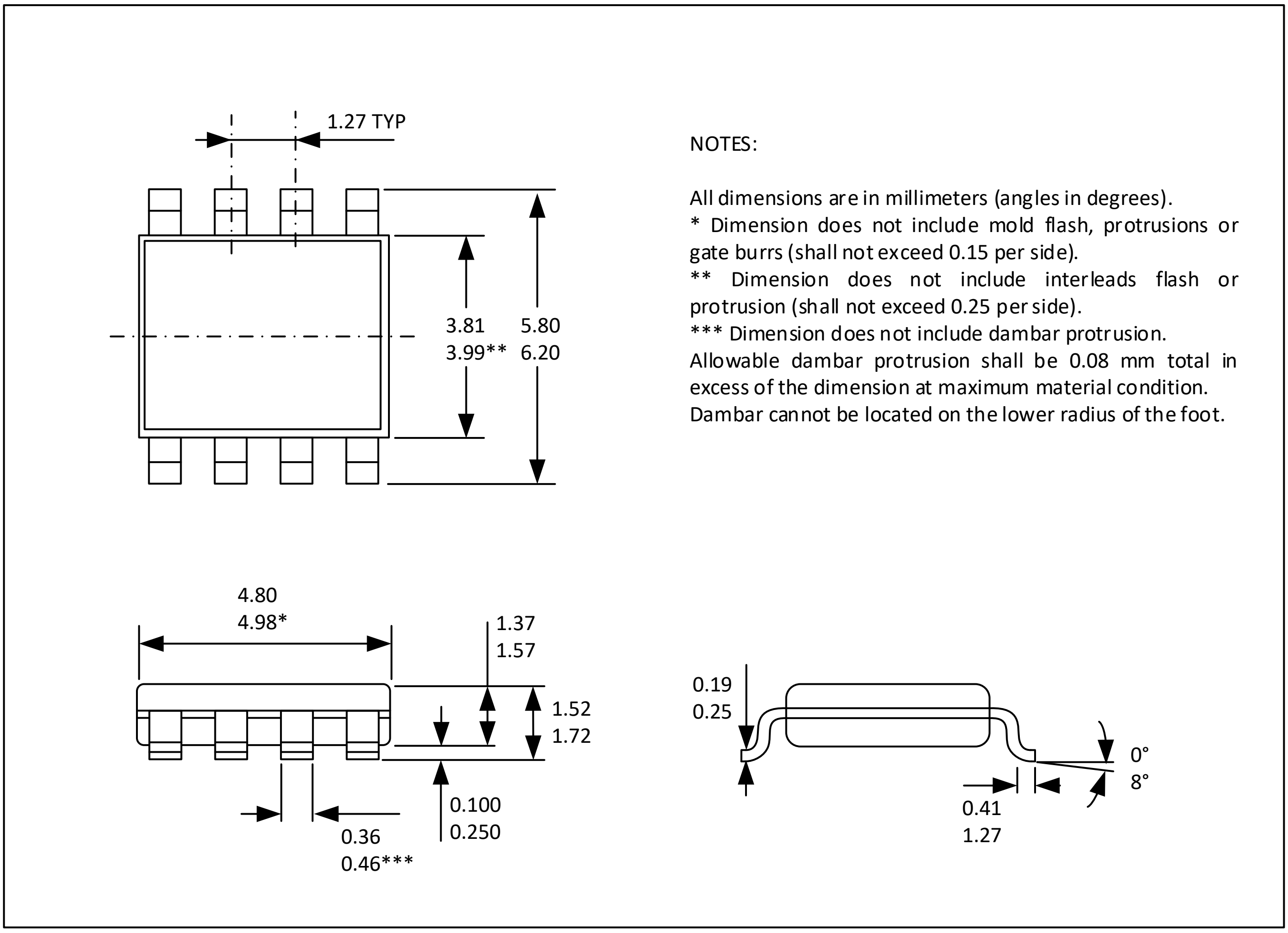


Figure 20: SOIC8 package

17. Contact

For additional information, please contact our Direct Sales team and get help for your specific needs:

Europe, Africa	Email : sales_europe@melexis.com
Americas	Email : sales_usa@melexis.com
Asia	Email : sales_asia@melexis.com

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