MLX91218

High Speed Current Sensor IC with OCD

Datasheet

1. Features and Benefits

- IMC-Hall® Technology
- Very High Field and Extra High Field variants
- End-of-line programmable sensor
- Flexible Supply Voltage with factory selectable 5V or 3.3V mode
- Selectable analog output
  - Ratiometric or fixed (Vref)
- Measurement range from ±8 to ±333mT
- Wideband sensing: DC to 400kHz
- Very short response time (2µs)
- High linearity down to ±0.5% full scale
- AEC-Q100 – Grade 0 Automotive Qualified
- Very low thermal drift for wide temperature range
  - Offset drift (<5mV)
  - Sensitivity drift (<1.5%)
- Dual overcurrent detection
  - Internal threshold
  - External threshold
- RoHS compliant
- SOIC-8 package
- MSL-3

2. Application Examples

- Redundant monitoring of battery-management system (BMS)
- High Voltage Traction Motor Inverter
  - Phase current measurement
  - DC link current measurement
- 48V Boost Recuperation Inverter
  - Phase current measurement
  - DC link current measurement
- DCDC Converter
- Smart Battery Junction Boxes
- Smart Fuse Overcurrent Detection

3. Description

The MLX91218 is a monolithic Hall-effect sensor utilizing the IMC-Hall® technology. The sensor provides an analog output voltage proportional to the applied magnetic flux density parallel to the IC surface.

The transfer characteristic of the MLX91218 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 U-shaped shield which facilitates the mechanical assembly of the current sensor over traditional ferromagnetic cores. This shield is recommended to be laminated for high bandwidth applications. The MLX91218 can then be mounted over the bus bar and separated from it by the PCB. As the shield does not serve the primary purpose of concentration, it can be made smaller and lighter than ferromagnetic cores without losing signal thanks to the integrated magnetic concentrator (IMC) depicted also in Figure 1. As a result, dense power electronics can be achieved enabling system savings and surface mount assembly.

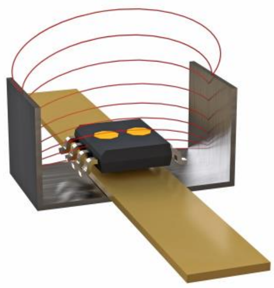


Figure 1: Typical IMC-Hall® Current Sensing Application

Contents

4. Ordering Information

Product	Temperature	Package	Option Code	Packing Form	Typical Sensitivity	Supply Voltage	OCD Level
MLX91218	L	DC	ARV-500	RE	40 mV/mT	5V	128 %FS
MLX91218	L	DC	ARV-303	RE	30 mV/mT	3.3V	121 %FS
MLX91218	L	DC	AFV-204	RE	80 mV/mT	3.3V	264 %FS
MLX91218	L	DC	ARX-501	RE	30 mV/mT	5V	128 %FS
MLX91218	L	DC	ARX-300	RE	14 mV/mT	3.3V	121 %FS

Table 1: Available ordering codes.

Legend:

Temperature Code	**L**	from -40°C to 150°C ambient temperature
Package Code	**DC**	for SOIC8 package, refer to Chapter 16 for detailed drawings
Option Code	**Axx-xxx**	"A" for silicon version
	xRx-xxx **xFx-xxx**	"R" for ratiometric output mode "F" for fixed output mode
	xxV-xxx **xxX-xxx**	"V" for Very High Field IMC "X" for Extra High Field IMC
	xxx-2xx **xxx-3xx** **xxx-4xx** **xxx-5xx**	"2" for 3.3V supply, unipolar output "3" for 3.3V supply, bipolar output "4" for 5V supply, unipolar output "5" for 5V supply, bipolar output
	xxx-500 **xxx-303** **..**	"500" for a sensitivity of 40mV/mT and overcurrent detection of 128% full scale "303" for a sensitivity of 30mV/mT and overcurrent detection of 121% full scale ..
Packing Form	**RE** **SP** **TU**	Plastic Tape on Reel. Sample pack Tube
Ordering Example	"**MLX91218LDC-ARV-501-RE**" MLX91218 IMC-Hall® current sensor in SOIC8 package, temperature range -40°C to 150°C. Analog ratiometric output, Very high Field IMC, Sensitivity 30mV/mT. Parts delivered in Plastic 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

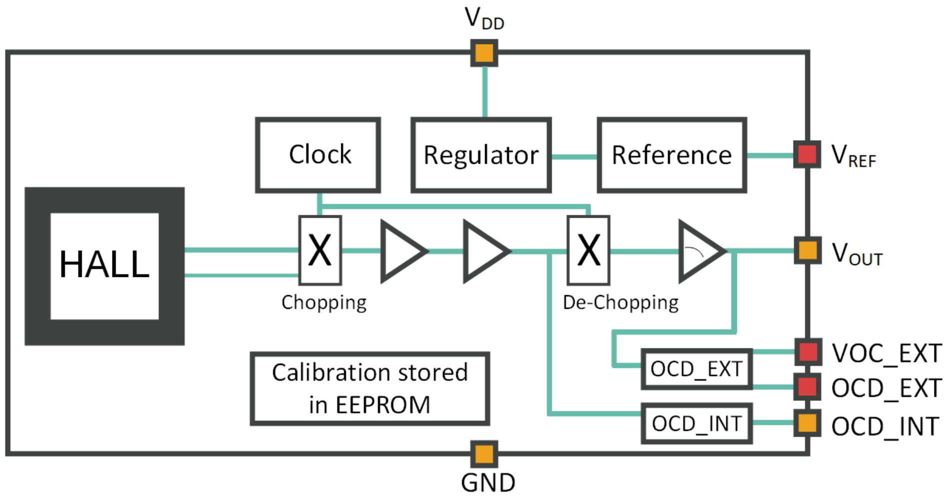


Figure 2: Block Diagram of the MLX91218

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]
PTC	Programming Through Connector
IMC	Integrated Magnetic Concentrator
OCD	Overcurrent detection
MSL	Moisture Sensitivity Level
RoHS	Restriction of Hazardous Substances Directive

Table 3: Glossary of Terms

7. Pin Definitions and Descriptions

Note: MLX91218 is not pin-to-pin compatible with MLX91208 or MLX91216.

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 4: Pin definitions and descriptions

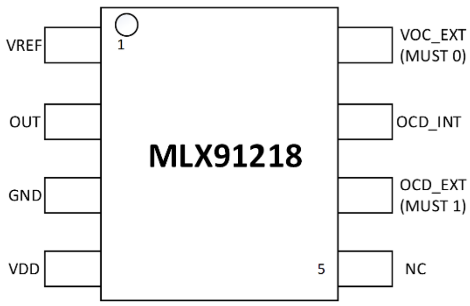


Figure 3: Pinout MLX91218

For optimal EMC results, it is recommended to connect the unused (NC) pins to the Ground.

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 Sink Current	I_{out_max}	50	mA
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}	GND-0.3	V
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
Magnetic Flux Density	B_{MAX}	±3	T
Human Body ESD Protection	ESD_{HBM}	2	kV
Charged Device Model ESD Protection	ESD_{CDM}	500	V

Table 5: Absolute maximum ratings

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

9. General Electrical Specifications

Operating Parameters T_A = -40 to 150°C and 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}	MLX91218LDC-Axx-5xx MLX91218LDC-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 VDD= 5V VDD=3.3		15.5 15	19 18	mA
Output Resistance	R_{OUT}	V_{OUT} = 50%V_{DD}, I_{LOAD} = 10mA		1	5	Ω
Voltage Reference Output Resistance	RREF	VREF = 50%VDD, ISINK = 5 mA or ISOURCE = 0.2 mA	120	200	333	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}	Pull-down or pull-up ≥ 10 kΩ	10		90	%V_{DD}

Table 6: General electrical parameters

10. Magnetic specification

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

10.1. Very High Field version (option code AxV with x = R or F)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operational Magnetic Field Range	B_{OP}				±60	mT
Linearity Error (Magnetic)	NL	B within B_{OP}, T_A = 25°C			±0.5	%FS
Hysteresis – Remanent Field	B_R	Measured after B = B_{OP}			±60	µT
Programmable Sensitivity	S_{PROG}	Generic part MLX91218LDC-ARV-500 MLX91218LDC-ARV-303 MLX91218LDC-AFV-204	18 33.5 22 47.5	 40 30 80	165 71 35 165	mV/mT
Sensitivity Programming Resolution	S_{RES}	B = B_{OP}		0.5		%

Table 7: Magnetic specification Very High Field version

10.2. Extra High Field version (option code AxX with x = R or F)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operational Magnetic Field Range	B_{OP}				±100	mT
Linearity Error (Magnetic)	NL	B within B_{OP}, T_A = 25°C			±0.5	%FS
Hysteresis – Remanent Field	B_R	Measured after B = B_{OP}			±90	µT
Programmable Sensitivity	S_{PROG}	Generic part MLX91218LDC-ARX-501 MLX91218LDC-ARX-300	12 20 13.2	 30 14	115 40 19.5	mV/mT
Sensitivity Programming Resolution	S_{RES}	B = B_{OP}		0.5		%

Table 8: Magnetic specification Extra High Field version

11. Analog output specification

11.1. 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, AFx-5xx versions T_A=25°C, AFx-3xx versions T_A=25°C, AFx-2xx and AFx-4xx		2.5 1.65 0.5		V
Non-ratiometric VREF Error	ΔV_{REF}	Fixed mode devices	-3		3	mV
Thermal Reference Drift	ΔT_{VREF}	Variation versus 25°C, VREF=2.5V Variation versus 25°C, VREF=0.5V			±150 ±300	ppm/°C
Voltage Output Quiescent	V_{OQ}	No magnetic field applied, T_A=25°C	-5		5	mV
Ratiometric Offset Error[2]	$\Delta^R V_{OQ}$	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	 ±6	5	mV
Total Offset Drift[5]	ΔV_{OQ}	T_A = -40 to 125°C T_A = -40 to 150°C		±6 ±8		mV
Ratiometric Sensitivity Error[2]	$\Delta^R S$			0.16		%/%V_{DD}
Non-Ratiometric Sensitivity Error	$\Delta^R S$		-0.6		0.6	%
Thermal Sensitivity Drift[3]	$\Delta^T S$	T_A = -40 to 125°C T_A = -40 to 150°C[4]	-1.5	±1 ±2.2	1.5	%S
Total Sensitivity Drift[5]	ΔS			±1.5		%S
Input referred noise spectral density	N_{PSD}	within BW = 1 .. 400kHz,Max gain option code AxV option code AxX		 110 175		nT/√Hz

Table 9: 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}.

[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 T_A = 155°C with respect to after pre-conditioning at T_A = 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.*

Trimming capability is higher than measurement accuracy. End-user calibration can therefore increase the accuracy of the system.

11.2. 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 4)			2	µs
Bandwidth	BW	-3dB, T_A =25°C SF=1 (default) SF=2 SF=3		 400 200 100		kHz
Power on Delay	T_{POD}	VREF capacitor = 47nF			1	ms

Table 10: Timing specifications of the high-speed analog output

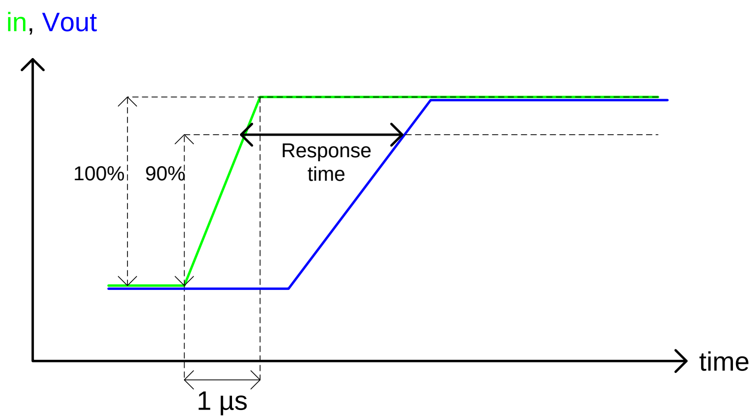


Figure 4: Response Time definition

12. Overcurrent Detection Specification[6]

12.1. General

The MLX91218 provides two OCD features that allow detecting overcurrent applied on the integrated sensor primary. In case of OCD detection, the OCD_{INT} or OCD_{EXT} is pulled to ground. During normal operation the OCD voltage remains at V_{DD}. If not used, OCD_{INT} and OCD_{EXT} 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 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}

Table 11: Comparison between OCD_{INT} and OCD_{EXT}

12.2. 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[7]		±10		%
OCD_{EXT} accuracy	OCD_{EXT}			±1.5 ±30		% mV

Table 12: Electrical Specifications OCD

[6] More information can be found in Application Note AN91220_OverCurrentDetection on www.melexis.com.
[7] 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.

12.3. 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			1		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 13: OCD_{INT} and OCD_{EXT} timing specifications

12.4. 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]
MLX91218LDC-ARV-500-RE	40	128
MLX91218LDC-ARV-303-RE	30	121
MLX91218LDC-AFV-204-RE	80	264
MLX91218LDC-ARX-501-RE	30	128
MLX91218LDC-ARX-300-RE	14	121

Table 14: OCD_{INT} thresholds

	Sensor configuration	Min [% FS]	Max [% FS]
OCD_{INT} Threshold	V_{DD} = 5V / V_{REF} = 2.5V	24	206
	V_{DD} = 5V / V_{REF} = 0.5V	13	102
	V_{DD} = 3.3V / V_{REF} = 1.65V	41	336
	V_{DD} = 3.3V / V_{REF} = 0.5V	37	264

Table 15: OCD_{INT} factory programmable range

12.5. 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.

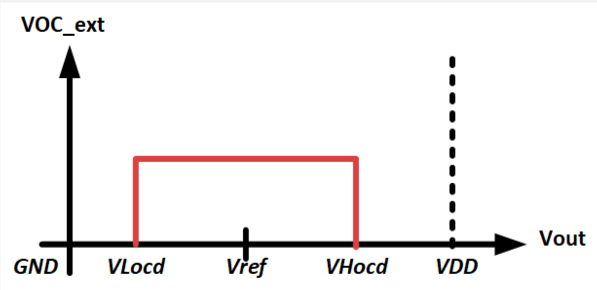
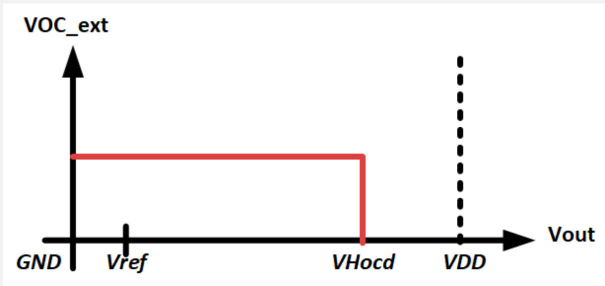
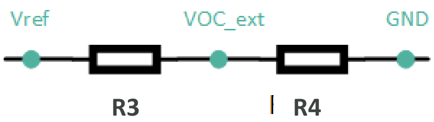
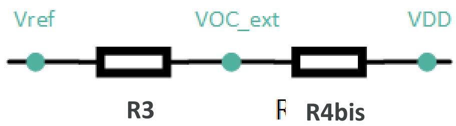
<table>
<tr><th>Bidirectional configuration</th><th>Unidirectional configuration</th></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>
</td><td>
</td></tr>
<tr><td>$$VOC_{EXT} = V_{REF} * \frac{R_4}{R_3 + R_4}$$
$$VLocd = VOC_{EXT}$$
$$VHocd = 2 * V_{REF} - VLocd$$</td><td>$$VOC_{EXT} = V_{REF} + (V_{DD}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

Table 16: External OCD, bidirectional and unidirectional configurations

13. Recommended Application Diagram

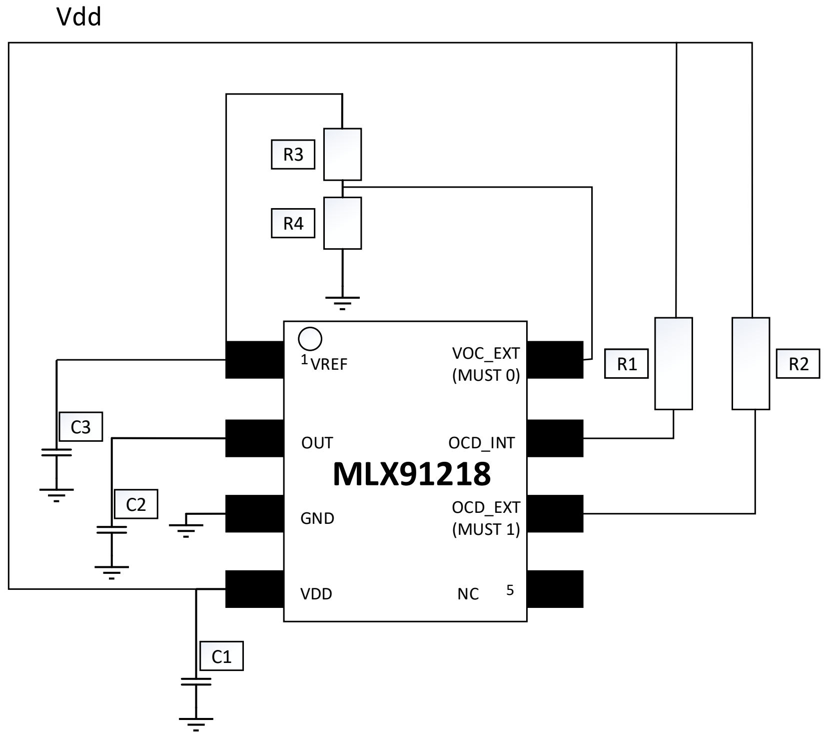


Figure 5: Application Diagram with external Pull-Down resistance

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 17: Resistor and capacitor values

14. Standard Information

Our products are classified and qualified regarding soldering technology, solderability and moisture sensitivity level according to standards in place in Semiconductor industry.

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

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.

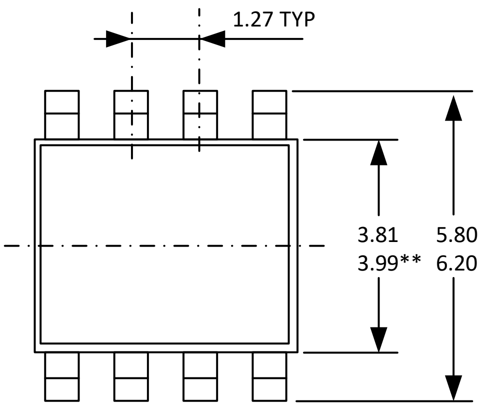
Melexis recommends reviewing on our web site the General Guidelines soldering recommendation (https://www.melexis.com/en/quality-environment/soldering).

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).

15. ESD Precautions

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

16. Packaging information



NOTES:

All dimensions are in millimeters (angles in degrees).
* Dimension does not include mold flash, protrusions or gate burrs (shall not exceed 0.15 per side).
** Dimension does not include interleads flash or protrusion (shall not exceed 0.25 per side).
*** Dimension does not include dambar protrusion. Allowable dambar protrusion shall be 0.08 mm total in excess of the dimension at maximum material condition. Dambar cannot be located on the lower radius of the foot.

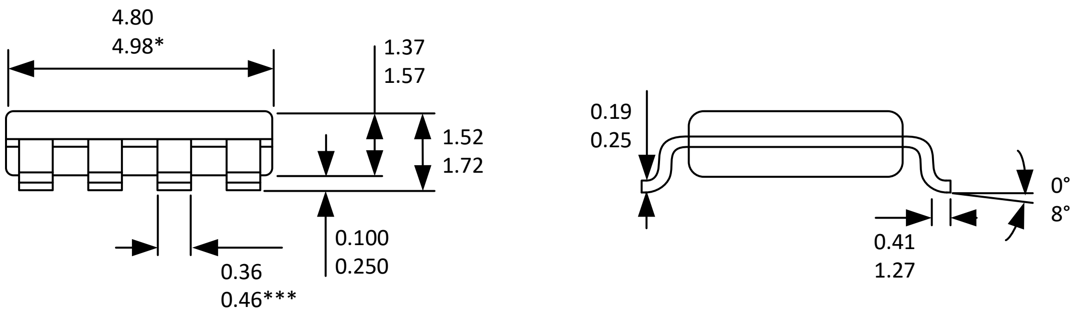
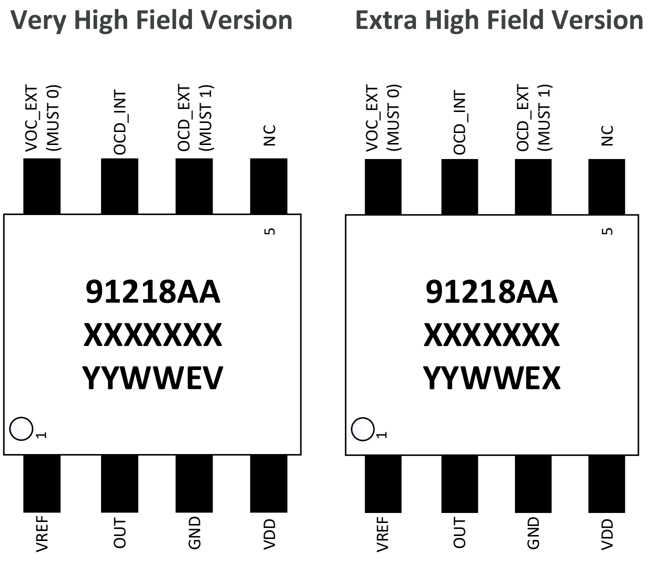


Figure 6: SOIC8 - Package Information

16.1. SOIC-8 Pinout and Marking



Marking description:
1st line: 91218AA - product and product revision
2nd line: XXXXXXX - wafer LOT number
3rd line: YY......... - assembly LOT year
3rd line: ...WW...... - assembly LOT week
3rd line: ....EV - very high field version
3rd line: ....EX - extra high field version

Figure 7: SOIC8 - Pinout and marking

16.2. Hall plate position

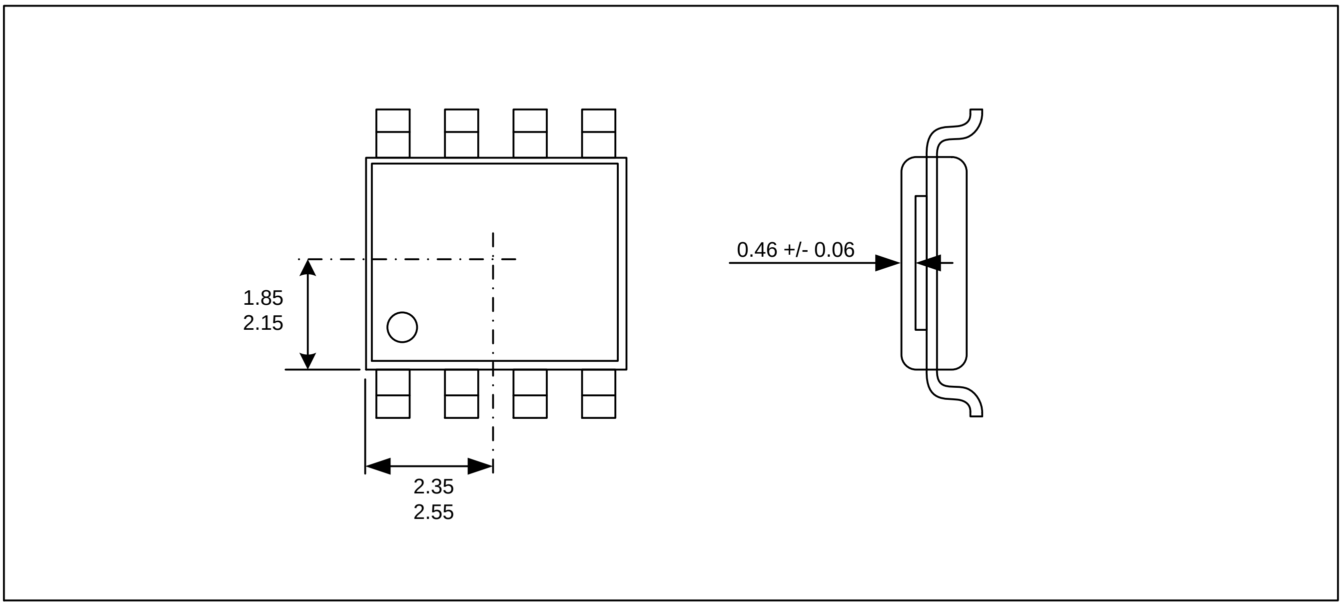


Figure 8: Hall plate position

16.3. IMC Position and sensor active measurement direction

IMC size not at scale, for representation only

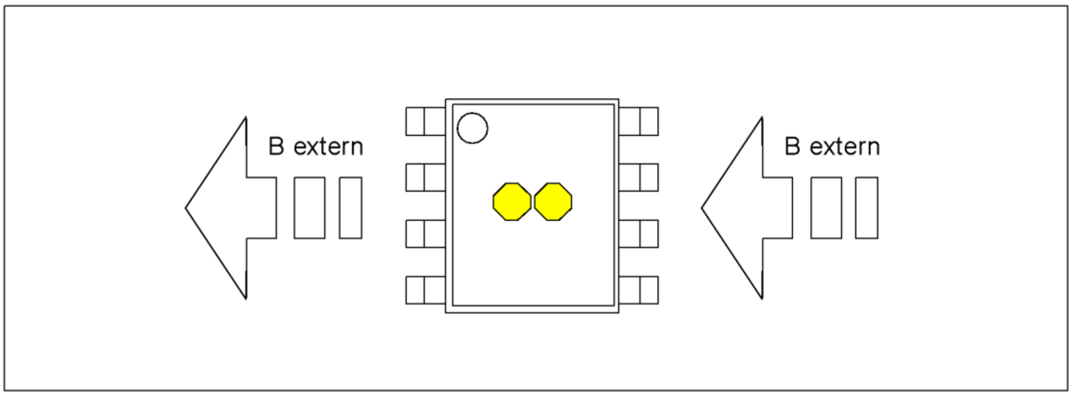


Figure 9: IMC position and geometry very high-field version

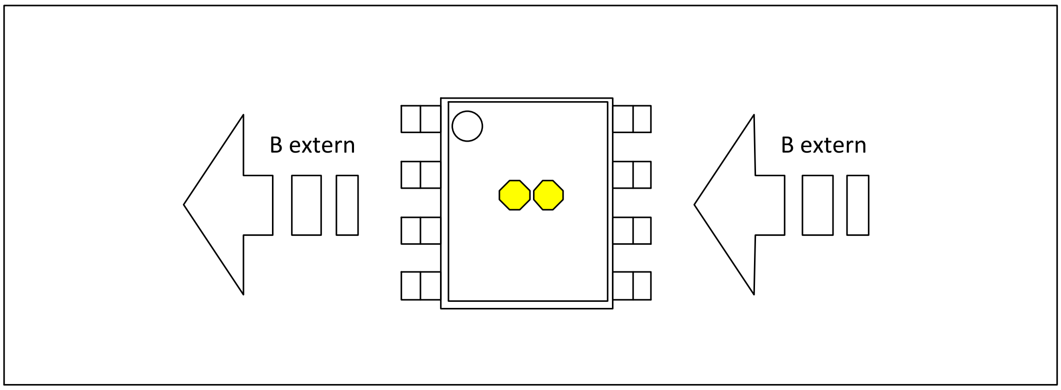


Figure 10: IMC position and geometry extra high-field version

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

18. Disclaimer

The content of this document is believed to be correct and accurate. However, the content of this document is furnished "as is" for informational use only and no representation, nor warranty is provided by Melexis about its accuracy, nor about the results of its implementation. Melexis assumes no responsibility or liability for any errors or inaccuracies that may appear in this document. Customer will follow the practices contained in this document under its sole responsibility. This documentation is in fact provided without warranty, term, or condition of any kind, either implied or expressed, including but not limited to warranties of merchantability, satisfactory quality, non-infringement, and fitness for purpose. Melexis, its employees and agents and its affiliates' and their employees and agents will not be responsible for any loss, however arising, from the use of, or reliance on this document. Notwithstanding the foregoing, contractual obligations expressly undertaken in writing by Melexis prevail over this disclaimer.

This document is subject to change without notice, and should not be construed as a commitment by Melexis. Therefore, before placing orders or prior to designing the product into a system, users or any third party should obtain the latest version of the relevant information. Users or any third party must determine the suitability of the product described in this document for its application, including the level of reliability required and determine whether it is fit for a particular purpose.

This document as well as the product here described may be subject to export control regulations. Be aware that export might require a prior authorization from competent authorities. The product is not designed, authorized or warranted to be suitable in applications requiring extended temperature range and/or unusual environmental requirements. High reliability applications, such as medical life-support or life-sustaining equipment or avionics application are specifically excluded by Melexis. The product may not be used for the following applications subject to export control regulations: the development, production, processing, operation, maintenance, storage, recognition or proliferation of:
1. chemical, biological or nuclear weapons, or for the development, production, maintenance or storage of missiles for such weapons;
2. civil firearms, including spare parts or ammunition for such arms;
3. defense related products, or other material for military use or for law enforcement;
4. any applications that, alone or in combination with other goods, substances or organisms could cause serious harm to persons or goods and that can be used as a means of violence in an armed conflict or any similar violent situation.

No license nor any other right or interest is granted to any of Melexis' or third party's intellectual property rights.

If this document is marked "restricted" or with similar words, or if in any case the content of this document is to be reasonably understood as being confidential, the recipient of this document shall not communicate, nor disclose to any third party, any part of the document without Melexis' express written consent. The recipient shall take all necessary measures to apply and preserve the confidential character of the document. In particular, the recipient shall (i) hold document in confidence with at least the same degree of care by which it maintains the confidentiality of its own proprietary and confidential information, but no less than reasonable care; (ii) restrict the disclosure of the document solely to its employees, agents, professional advisors and contractors for the purpose for which this document was received, on a strictly need to know basis and providing that such persons to whom the document is disclosed are bound by confidentiality terms substantially similar to those in this disclaimer; (iii) use the document only in connection with the purpose for which this document was received, and reproduce document only to the extent necessary for such purposes; (iv) not use the document for commercial purposes or to the detriment of Melexis or its customers. The confidentiality obligations set forth in this disclaimer will have indefinite duration and in any case they will be effective for no less than 10 years from the receipt of this document.

This disclaimer will be governed by and construed in accordance with Belgian law and any disputes relating to this disclaimer will be subject to the exclusive jurisdiction of the courts of Brussels, Belgium.

The invalidity or ineffectiveness of any of the provisions of this disclaimer does not affect the validity or effectiveness of the other provisions. The previous versions of this document are repealed.

IATF 16949 and ISO 14001 Certified

For the latest version of this document or find your local contact, visit us at
http://www.melexis.com/MLX91218