MLX91220 Integrated Current Sensor IC

Datasheet

1. Features and Benefits

- Factory trimmed AC and DC current sensor
- Analog ratiometric or fixed output voltage
- Combining sensing element, signal conditioning & isolation in SOIC package
- No application programming required
- High speed sensing
  - DC to 300kHz bandwidth
  - 2µs response time
- Robust against external magnetic fields
- No magnetic hysteresis
- Double overcurrent detection (SOIC-16)
- Low ohmic losses of integrated conductor
  - 1.09mΩ SOIC-8 / 0.89mΩ SOIC-16
- SOIC-8 narrow body and SOIC-16 wide body package, RoHS compliant
- Lead free component, suitable for lead free soldering profile up to 260°C, MSL3
- Rated voltage isolation
  - 3550 V_{RMS} for SOIC-8
  - 5400 V_{RMS} for SOIC-16
- Suitable for Basic and Reinforced voltage isolation



SOIC-8



SOIC-16

IEC/UL 62368-1:2014
(2nd edition)

2. Applications

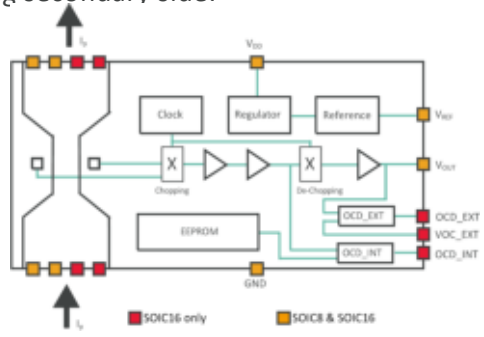
- AC and DC Chargers
- Electric Drives
- DCDC converters
- Solar
- Power Supplies
- Demand/Load control

3. Description

The MLX91220 is an Isolated Integrated Current Sensor that senses the current flowing through the low impedance leadframe of the SOIC package. By virtue of fixing the current conductor position with respect to the monolithic CMOS sensor, a fully integrated Hall-effect current sensor is obtained, that is factory calibrated.

Inside the package, the magnetic flux density generated by the current flow is sensed differentially by two sets of Hall plates. As a result the influence of external disturbing fields is minimized in the fast analog front-end. The residual signal is amplified to provide a high-speed linear analog output voltage.

The close proximity of the Hall plates to the current conductor ensures a high signal-to-noise ratio and an accurate signal over temperature. Even with this miniaturization, high voltage isolation ratings are still maintained between the primary and the opposing secondary side.



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4. Ordering Information

Product Code	Package	Current Measurement Range	Output type	Sensitivity	OCD level
MLX91220KDC-ABF-025-RE	SOIC8	25 A	Fixed, Bipolar	80 mV/A	
MLX91220KDC-ABF-050-RE	SOIC8	50 A	Fixed, Bipolar	40 mV/A	
MLX91220KDC-AUF-050-RE	SOIC8	50 A	Fixed, Unipolar	80 mV/A	
MLX91220KDC-ABR-020-RE	SOIC8	20 A	Ratiometric, Bipolar	100 mV/A	
MLX91220KDC-ABR-025-RE	SOIC8	25 A	Ratiometric, Bipolar	80 mV/A	
MLX91220KDC-ABR-030-RE	SOIC8	30 A	Ratiometric, Bipolar	66 mV/A	
MLX91220KDC-ABR-050-RE	SOIC8	50 A	Ratiometric, Bipolar	40 mV/A	
MLX91220KDF-ABF-117-RE	SOIC16	17 A	Fixed, Bipolar	120 mV/A	14.8 A
MLX91220KDF-ABF-025-RE	SOIC16	25 A	Fixed, Bipolar	80 mV/A	27.8 A
MLX91220KDF-ABF-050-RE	SOIC16	50 A	Fixed, Bipolar	40 mV/A	55.6 A
MLX91220KDF-AUF-050-RE	SOIC16	50 A	Fixed, Unipolar	80 mV/A	55 A
MLX91220KDF-ABF-075-RE	SOIC16	75 A	Fixed, Bipolar	26.7 mV/A	83.4 A
MLX91220KDF-ABR-075-RE	SOIC16	75 A	Ratiometric, Bipolar	26.7 mV/A	83.4 A
MLX91220KDF-ABR-025-RE	SOIC16	25 A	Ratiometric, Bipolar	80 mV/A	27.8 A
MLX91220KDF-ABR-050-RE	SOIC16	50 A	Ratiometric, Bipolar	40 mV/A	55.6 A

Table 1: Ordering information

Legend:

Temperature Code:	K: from -40°C to 125°C ambient temperature
Package Code:	"DC" for SOIC-8 NB (Narrow Body – 150mils) package "DF" for SOIC-16 WB (Wide Body – 300mils) package
Option Code:	Axx-xxx: die version xBx-xxx: "B" for bipolar(1) and "U" for unipolar xxF-xxx: "F" for fixed mode output and "R" for ratiometric output xxx-0xx: "0" for default trimming xxx-x50: "50" for Full Scale current measurement (corresponding to 2V excursion from V_{OQ} in bipolar case, and 4V excursion in unipolar case)
Packing Form:	"RE" for Reel
Ordering Example:	MLX91220KDC-ABF-050-RE

Table 2: Legend

(1) Bipolar output indicates that the sensor provides a symmetrical output around the 0A point which is set at half the output voltage (50% V_{DD}) in case of ratiometric mode, and V_{REF} equals 50%V_{DD} in case of fixed mode. Both designs imply sensing of positive and negative currents.

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

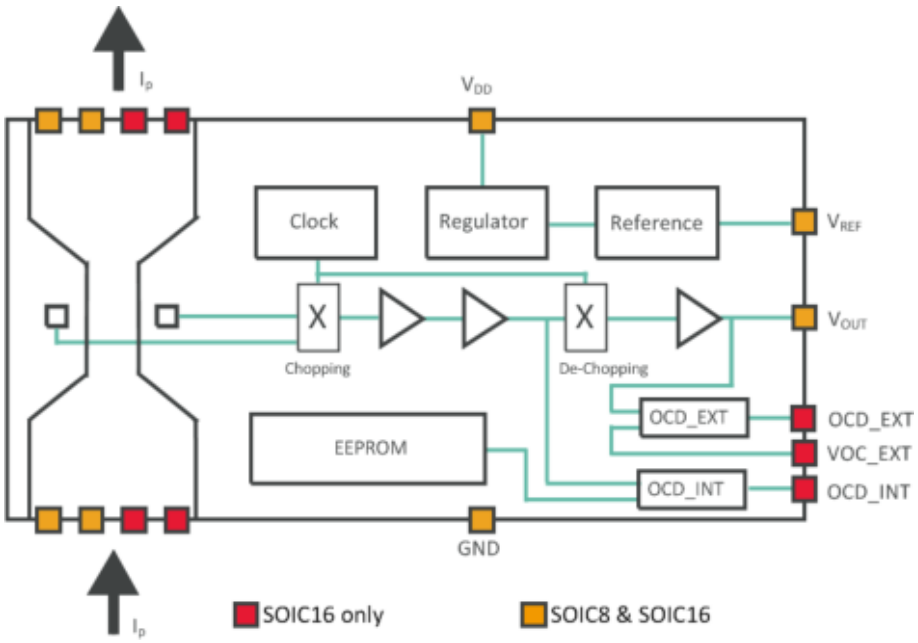


Figure 1: Functional Diagram for MLX91220

The sensor can be used in 2 different modes, depending on the application. Both modes rely on the output voltage of the sensor being proportional to the flow of current, but the difference resides in the signal reconstruction.

5.1. Ratiometric Mode

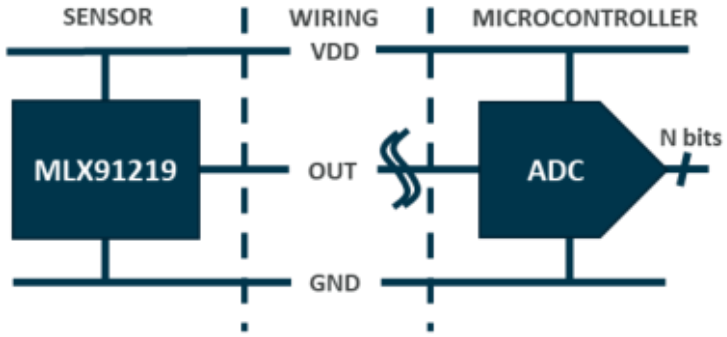


Figure 2: Schematic of ratiometric mode

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 $\%V_{DD}/A$.

5.2. Differential or Fixed Mode(1)

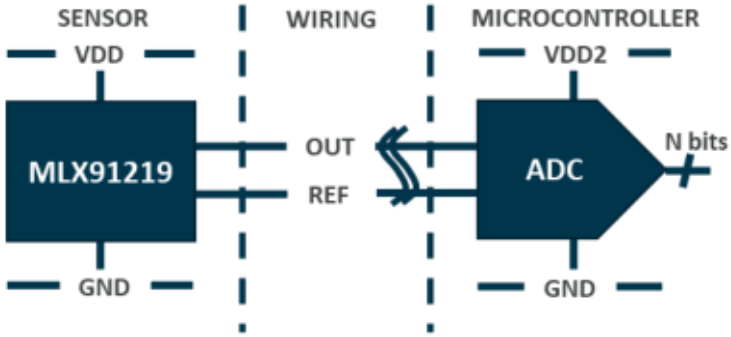


Figure 3: Schemaic of fixed mode

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.

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](2)	[mV/A]
Sensitivity ratiometric	Yes	No
Measured Current	$\frac{(V_{OUT} - V_{OUT}[0A])}{Sensitivity}$	$\frac{(V_{OUT} - V_{REF})}{Sensitivity}$

Table 3: Parameters of differential and fixed modes

(1) More information can be found in Application Note AN91220_ReferencePin on www.melexis.com

(2) The sensitivity in ratiometric mode is expressed as [%VDD/A]. However, for simplicity, in the datasheet the sensitivity will be always expressed in [mV/A]. For ratiometric devices, this corresponds to the sensitivity for VDD=5V, depending on the settings of the sensor.

6. Glossary of Terms

Gauss (G), Tesla (T)	Units for the magnetic flux density - 1 mT = 10 G
TC	**T**emperature **C**oefficient (in ppm/°C)
NC	**N**ot **C**onnected
IP	**I**ntegrated **P**rimary
ASP	**A**nalog **S**ignal **P**rocessing
DSP	**D**igital **S**ignal **P**rocessing
AC	**A**lternate **C**urrent
DC	**D**irect **C**urrent
EMC	**E**lectro-**M**agnetic **C**ompatibility
FS	**F**ull **S**cale
OCD	**O**ver**C**urrent **D**etection

Table 4: Glossary of Terms

7. Pinout

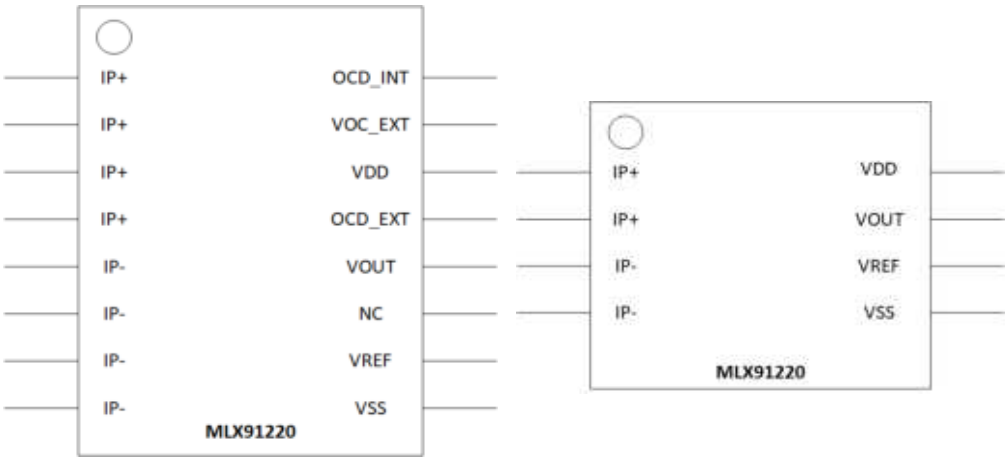


Figure 4: SOIC-16 and SOIC-8 pinouts

PIN	SOIC-8		SOIC-16	
	Pin	Function	Pin	Function
1	IP+	Primary Current Path Input	IP+	Primary Current Path Input
2				
3	IP-	Primary Current Path Output		
4				
5	V_{SS}	Ground Voltage	IP-	Primary Current Path Output
6	V_{REF}	Reference Voltage		
7	V_{OUT}	Output Voltage		
8	V_{DD}	Supply Voltage		
9			V_{SS}	Ground Voltage
10			V_{REF}	Reference Voltage
11			*NC*	*Not connected*
12			V_{OUT}	Output Voltage
13			OCD_{EXT}	External Overcurrent detection
14			V_{DD}	Supply Voltage
15			VOC_{EXT}	External Overcurrent threshold voltage
16			OCD_{INT}	Internal Overcurrent Detection

Table 5: Pinout definition

For optimal EMC behavior, it is recommended to connect the unused pin (NC) to V_{SS} (see Chapter 16).

8. Absolute Maximum Ratings

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

Parameter	Value
Positive Supply Voltage (overvoltage)	+ 8 V
Positive Supply Voltage (maintaining application mode)	+ 6.5 V
Reverse Supply Voltage	- 0.3 V
Positive Pin Voltage(1)	V_{DD} + 0.3 V
Output Sourcing Current	+ 25 mA
Reverse Pin Voltage(1)	- 0.3 V
Output Sinking Current	+50 mA
Operating Ambient Temperature Range, T_A	- 40°C to + 125°C
Storage Temperature Range, T_S	- 40°C to + 150°C
Maximum Junction Temperature, T_J (2)	+ 165°C

Table 6: Absolute maximum ratings

(1) Except for V_{DD} and V_{SS}

(2) For more information on how the junction temperature relates to the applied current and ambient temperature range, please refer to section 10.

9. MLX91220 General Electrical Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified) and for T_A as specified by the Temperature suffix (K).

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Current	I_{DD}	Without R_{LOAD}, in application mode		20	26	mA
V_{OUT} output resistance	R_{OUT}	V_{OUT} = 50%V_{DD}, I_{LOAD} = 10 mA		1	5	Ω
Voltage Reference Output Resistance	R_{REF}	V_{REF} = 50%V_{DD}, I_{SINK} = 5 mA or I_{SOURCE} = 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
Common Mode Field Sensitivity(1)	CMFS	For SOIC16		0.4		mA/G
		For SOIC8		0.4		mA/G
Output Short Circuit Current	I_{SHORT}	Output shorted to V_{DD} or V_{SS} - Permanent			180	mA
Output Leakage current	I_{LEAK}	High impedance mode, T_A=125°C T_J < 150°C		2	20	µA
Output Voltage Linear Swing	V_{OUT_LSW}	V_{DD} > 4.6 V for Fixed Mode versions	10		90	%V_{DD}

Table 7: General electrical specifications

(1) Common Mode Field Sensitivity expresses the sensor's susceptibility to a homogenously applied field perpendicular to the package surface. The differential measurement cancels out such common mode magnetic fields, but due to the matching between both Hall plate clusters flanking the current conductor, this is not perfect. This parameter expresses the mA output error as a result of such 1 mT applied field. It has to be noted, that magnetic fields generated by nearby conductors are not homogenous but introduce gradients. More information in this regard can be found in Application Note AN91220_ExternalFieldImmunity on www.melexis.com

10. MLX91220 General Current Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified) and for T_A as specified by the Temperature suffix (K).

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Electrical Resistance of the Primary Current Path	R_{IP_SOIC8} R_{IP_SOIC16}	T_A=25°C		1.09 0.89		mΩ mΩ
Measurement Range	IP_{MAX}	Option Code AB*x*-117 Option Code AB*x*-025 Option Code AB*x*-030 Option Code AB*x*-050 Option Code AUF-050 Option Code AB*x*-075		16.7 25 30 50 50 75		A A A A A A
Nominal Current	IP_{NOM}	Option Code ABx-117 Option Code ABx-025 Option Code ABx-030 Option Code ABx-050 Option Code AUF-050 Option Code ABx-075		6.7 10 12 20 20 30		A A A A A A
Linearity Error	NL	Current in range IP_{NOM}, T_A=25°C			±0.3	%FS
	NL	Current in range IP_{MAX}, T_A=25°C			±0.6	%FS
Current Capability(1)	IP_{C85_SOIC8} IP_{C25_SOIC8}	Continuous, T_A=-40 to 85°C Continuous, T_A=25°C			±25 ±40	A A
	IP_{C85_SOIC16} IP_{C25_SOIC16}	Continuous, T_A=-40 to 85°C Continuous, T_A=25°C			±30 ±45	A A

Table 8: General current specifications

(1) Current capability based on the reference Melexis PCB made of 2x 105 µm copper layer without any forced air or other form of cooling. Continuous or RMS current ranges in application are typically higher than this. More information can be found in Application Notes AN91220_FuseCurrent Capability and AN91220_ThermalManagement on www.melexis.com.

11. MLX91220 Voltage Isolation Specifications

Parameter	Symbol	Test Conditions	Value	Units
Dielectric Strength Test Voltage (1) (2)	V_{ISO_SOIC8}	IEC62368-1:2018	3550	V_{RMS}
	V_{ISO_SOIC16}		5400	V_{RMS}
Impulse withstand voltage test	$V_{IMPULSE_SOIC8}$	Test according to IEC61000-4-5, ±5 pulses at 2/minute, 1.2 µs (rise) / 50 µs (width)	4000	V_{pk}
	$V_{IMPULSE_SOIC16}$		6000	V_{pk}
Clearance (primary to secondary)	D_{CL_SOIC8}	Shortest distance through air	4	mm
	D_{CL_SOIC16}		8.1	mm
Creepage (primary to secondary)	D_{CR_SOIC8}	Shortest path along body	3.6	mm
	D_{CR_SOIC16}		7.1	mm
Comparative tracking index	CTI		>600	
Material Group	-		I	
Working Voltage for Basic Isolation	V_{WV_SOIC8}	IEC62368-1:2018 Based on Pollution degree 2, Material Group I	715	V_{RMS}
	V_{WV_SOIC16}		1415	V_{RMS}
Working Voltage for Reinforced Isolation	V_{WV_SOIC8}	IEC62368-1:2018 Based on Pollution degree 2, Material Group I	357	V_{RMS}
	V_{WV_SOIC16}		707	V_{RMS}

Table 9: Voltage isolation specifications

(1) Agency type tested, measured between IP (pin 1-4 on SOIC8, pin 1-8 on SOIC16) and Secondary side (pin 5-8 on SOIC8, pin 9-16 on SOIC16).

(2) Melexis performs routine production-line tests, for all SOIC8 & SOIC16 devices produced.

12. MLX91220 Timing Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified) and for T_A as specified by the Temperature suffix (K).

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 5)			2	µs
Bandwidth	BW	-3dB, T_A =25°C		300		kHz
Power on Delay(1)	T_{POD}	V_{REF} capacitor = 47nF			0.6	ms

Table 10: Timing specifications

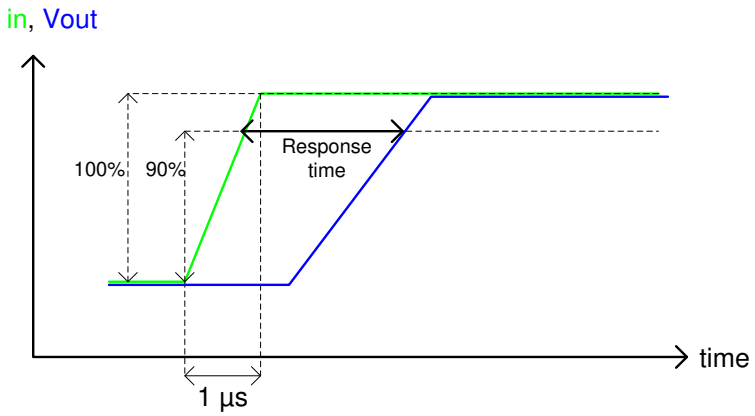


Figure 5: Response Time definition

(1) During the power on, the output follows a routine and is not valid (i.e. it is not related to magnetic field) for T_{POD}=1ms.

13. Diagnostics

It is possible to take advantage of diagnostic features, with the help of adding a pull-down resistor (see Section 16). If a failure event occurs, the measured output will be set to ground. This can be interpreted as failure by the microcontroller unit.

Error	Effect on Output
Calibration data CRC Error	Output stage in high-Z mode. A pull-down resistor to ground will result in output equal to ground.
VDD Under voltage Thresholds: • Power-up: VDD < 2.8V • Power-down: VDD < 2.5V	Output is pulled to GND with a 2kΩ resistance, until VDD is inside the specified ranges, depending if the device is powering on or off.
Broken OUT	Pull-down external resistor allows to measure a voltage equal to GND.

Table 11: Description of the diagnostic modes in MLX91220

14. MLX91220 Accuracy Specifications

14.1. Definitions

14.1.1. Thermal Reference Drift

The thermal reference drift is the variation of the reference voltage (V_{REF}) over temperature. It is expressed in ppm/°C.

$$+\Delta T_{VREF} = \left(\frac{Vref[125°C]}{Vref[35°C]} - 1\right).\frac{1}{(125-35)}.10^6$$

$$-\Delta T_{VREF} = \left(\frac{Vref[-40°C]}{Vref[35°C]} - 1\right).\frac{1}{(-40-35)}.10^6$$

14.1.2. Voltage Output Quiescent

V_{OQ} corresponds to the difference between the measured and the ideal outputs when no current is flowing through the MLX91220 at T_A=25°C.

$$V_{OQ} = V_{OUT}[0A]_{measured} - V_{OUT}[0A]_{ideal}$$

14.1.3. Thermal Offset Drift

ΔT_{VOQ} corresponds to variation of V_{OQ} in temperature.

14.1.4. Sensitivity

The sensitivity is the ratio between the output of the MLX91220 and the input current.

For ratiometric devices, as the output will scale with the supply, sensitivity is expressed as [%V_{DD}]/A. For simplicity, in the datasheet the sensitivity will be always expressed in mV/A. For ratiometric devices, this corresponds to the sensitivity for V_{DD}=5V, depending on the settings of the sensor.

For fixed devices, the output does not vary with the V_{DD}, sensitivity is thus expressed as mV/A.

14.1.5. Linearity Error

The linearity error is the deviation of the output from the expected linear behaviour. To obtain the linearity error, the current is swept from -I_{PM} to I_{PM}. To decorrelate the thermal drift from the linearity error, the junction temperature should be fixed below 50°C.

$$NL = \frac{V_{out}[I] - BESTFIT(V_{out}[I])}{V_{out}[I_{PM}] - V_{out}[-I_{PM}]}.100 \ [\%FS]$$

14.1.6. Ratiometry Offset and Sensitivity Error

Ratiometric Mode

In Ratiometric mode, V_{OUT} and V_{REF} are scaled with the supply voltage. $V_{DDnom} = 5V$

Ratiometric V_{OQ} Error:

$$\Delta R_{VOQ} = V_{OQ}\left[V_{DDnom}\right] - V_{OQ}\left[V_{DDnom} \pm 10\%\right].\frac{V_{DDnom}}{V_{DDnom} \pm 10\%} \ [mV]$$

Ratiometric Sensitivity Error:

$$\Delta R_S = 100.(1 - \frac{S[V_{DDnom} \pm 10\%]}{S[V_{DDnom}]}.\frac{V_{DDnom}}{V_{DDnom} \pm 10\%}) \ [\%]$$

Fixed Mode

In Fixed mode, V_{OUT} and V_{REF} are not scaled with the supply voltage. Ideally, they do not vary. $V_{DDnom} = 5V$

Non-Ratiometric V_{OQ} Error:

$$\Delta R_{VOQ} = V_{OQ}\left[V_{DDnom} \pm 10\%\right] - V_{OQ}[V_{DDnom}] \ [mV]$$

Non-Ratiometric Sensitivity Error:

$$\Delta R_S = \left(\frac{S[V_{DDnom} \pm 10\%]}{S[V_{DDnom}]} - 1\right).100 \ [\%]$$

14.2. MLX91220KDx-ABF-117 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}	For V_{DD} > 4.6 V	-16.7		16.7	A
Nominal Supply Voltage	V_{DD}	For I such as V_{OUT} < V_{DD}-0.1 V	4.5	5	5.5	V
Voltage Reference	V_{REF}	T_A=25°C. No resistive load on Vref pin	2.48	2.5	2.52	V
Thermal Reference Drift	ΔT_{VREF}	Variation versus 25°C			±150	ppm/°C
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT}-V_{REF}, T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -63		7.5 63	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-5		5	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±42	±10 ±84	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 118.8	120	1 121.2	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}	-0.6		0.6	%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Sensitivity Drift over lifetime	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		179		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		116		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			14.8		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		9.7 17.6		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 12: MLX91220KDx-ABF-117 specifications

(1) For SOIC16 version

14.3. MLX91220KDx-ABR-020 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified),for T_A as specified by the Temperature suffix (K) and for Tj < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}		-20		20	A
Nominal Supply Voltage	V_{DD}		4.5	5	5.5	V
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT} –V_{DD}/2, T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -75		7.5 75	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-10		10	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±50	±7.5 ±75	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 99	 100	1 101	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}		±0.5		%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Sensitivity Drift over lifetime	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		186		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		120		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			22.2		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		8 12		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 13: MLX91220KDx-ABR-020 specifications

(1) For SOIC16 version

14.4. MLX91220KDx-ABR-025 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}		-25		25	A
Nominal Supply Voltage	V_{DD}		4.5	5	5.5	V
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT} –V_{DD}/2, T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -94		7.5 94	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-10		10	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±63	±7.5 ±94	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 79.2	 80	1 80.8	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}		±0.5		%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Lifetime Sensitivity Drift	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		190		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		129		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			27.8		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		7.5 11.5		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 14: MLX91220KDx-ABR-025 specifications

(1) For SOIC16 version

14.5. MLX91220KDx-ABF-025 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}	For V_{DD} > 4.6 V	-25		25	A
Nominal Supply Voltage	V_{DD}	For I such as V_{OUT} < V_{DD}-0.1 V	4.5	5	5.5	V
Voltage Reference	V_{REF}	T_A=25°C. No resistive load on Vref pin	2.48	2.5	2.52	V
Thermal Reference Drift	ΔT_{VREF}	Variation versus 25°C			±150	ppm/°C
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT}-V_{REF}, T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -94		7.5 94	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-5		5	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±63	±7.5 ±94	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 79.2	80	1 80.8	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}	-0.6		0.6	%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Lifetime Sensitivity Drift	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		190		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		129		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			27.8		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		7.5 11.5		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 15: MLX91220KDx-ABF-025 specifications

(1) For SOIC16 version

14.6. MLX91220KDx-ABR-030 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}		-30		30	A
Nominal Supply Voltage	V_{DD}		4.5	5	5.5	V
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT} –V_{DD}/2, T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -112		7.5 112	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-10		10	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±75	±7.5 ±112	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 66.0	66.7	1 67.4	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}		±0.5		%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Lifetime Sensitivity Drift	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		197		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		131		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			33.7		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		7 11		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 16: MLX91220KDx-ABR-030 specifications

(1) For SOIC16 version

14.7. MLX91220KDx-ABR-050 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}		-50		50	A
Nominal Supply Voltage	V_{DD}		4.5	5	5.5	V
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT} –V_{DD}/2, T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -188		7.5 188	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-10		10	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±125	±7.5 ±188	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 39.6	 40	1 40.4	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}		±0.5		%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Lifetime Sensitivity Drift	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		186		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		126		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			55.6		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		4.2 6.2		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 17: MLX91220KDx-ABR-050 specifications

(1) For SOIC16 version

14.8. MLX91220KDx-ABF-050 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}	For V_{DD} > 4.6 V	-50		50	A
Nominal Supply Voltage	V_{DD}	For I such as V_{OUT} < V_{DD}-0.1 V	4.5	5	5.5	V
Voltage Reference	V_{REF}	T_A=25°C. No resistive load on Vref pin	2.48	2.5	2.52	V
Thermal Reference Drift	ΔT_{VREF}	Variation versus 25°C			±150	ppm/°C
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT}-V_{REF},T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -188		7.5 188	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-5		5	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±125	±7.5 ±188	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 39.6	 40	1 40.4	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}	-0.6		0.6	%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Lifetime Sensitivity Drift	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		186		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		126		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			55.6		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		4.2 6.2		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 18: MLX91220KDx-ABF-050 specifications

(1) For SOIC16 version

14.9. MLX91220KDx-AUF-050 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}	For V_{DD} > 4.6 V	0		50	A
Nominal Supply Voltage	V_{DD}	For I such as V_{OUT} < V_{DD}-0.1 V	4.5	5	5.5	V
Voltage Reference	V_{REF}	T_A=25°C. No resistive load on Vref pin	0.495	0.5	0.505	V
Thermal Reference Drift	ΔT_{VREF}	Variation versus 25°C			±250	ppm/°C
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT}-V_{REF},T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -188		7.5 188	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-5		5	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±125	±7.5 ±188	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 79.2	 80	1 80.8	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}	-0.6		0.6	%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Lifetime Sensitivity Drift	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		190		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		129		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			55		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		10 10		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-3		3	%FS

Table 19: MLX91220KDx-AUF-050 specifications

(1) For SOIC16 version

14.10. MLX91220KDx-ABR-075 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified),for T_A as specified by the Temperature suffix (K) and for Tj < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}		-75		75	A
Nominal Supply Voltage	V_{DD}		4.5	5	5.5	V
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT} –V_{DD}/2, T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -281		7.5 281	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-10		10	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±187	±7.5 ±281	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 26.4	26.7	1 27	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}		±0.5		%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Sensitivity Drift over lifetime	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		207		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		143		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			83.4		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		4 6		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 20: MLX91220KDx-ABR-075 specifications

(1) For SOIC16 version

14.11. MLX91220KDx-ABF-075 Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified), for T_A as specified by the Temperature suffix (K) and for T_J < 150 °C.

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Primary current	I_{PM}	For V_{DD} > 4.6 V	-75		75	A
Nominal Supply Voltage	V_{DD}	For I such as V_{OUT} < V_{DD}-0.1 V	4.5	5	5.5	V
Voltage Reference	V_{REF}	T_A=25°C. No resistive load on Vref pin	2.48	2.5	2.52	V
Thermal Reference Drift	ΔT_{VREF}	Variation versus 25°C			±150	ppm/°C
Voltage Output Quiescent	V_{OQ}	No current flowing through IP, V_{OUT}-V_{REF},T_A=25°C No resistive load on V_{OUT} and V_{REF}	-7.5 -281		7.5 281	mV mA
Ratiometry Offset Error	ΔR_{VOQ}	T_A=25°C and for ±10% V_{DD}	-5		5	mV
Thermal Offset Drift	ΔT_{VOQ}	Referred to T_A=25°C, IP = 0A		±5 ±187	±7.5 ±281	mV mA
Lifetime Offset Drift	ΔL_{VOQ}			±2		mV
Sensitivity	S	At T_A=25°C For Tj < 50 °C	-1 26.4	 26.7	1 27	%S mV/A
Ratiometry Sensitivity Error	ΔR_S	T_A=25°C and for ±10% V_{DD}	-0.6		0.6	%S
Thermal Sensitivity Drift	ΔT_S	Current range IP_{MAX}		±1	±1.5	%S
Lifetime Sensitivity Drift	ΔL_S			±1	±2	%S
Output Noise Spectral Density	N_{SD}	IP = 0 A, T_A=25°C within BW = 1 … 100kHz		207		µA/√Hz
Output RMS Noise	N_{RMS}	IP = 0 A, T_A=25°C BW = 300kHz		143		mA_{RMS}
OCD_{INT} Threshold Current(1)	I_{OCD}			83.4		A
OCD_{INT} Accuracy(1)	ε_{IOCD}	T_A=25°C T_A=-40°C to 85°C		4 6		%Threshold %Threshold
OCD_{EXT} threshold error(1)	ε_{EOCD}		-6		6	%FS

Table 21: MLX91220KDx-ABF-075 specifications

(1) For SOIC16 version

15. MLX91220 Overcurrent Detection

15.1. General

The MLX91220 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}. This OCD feature is available for SOIC16 version only.

The two OCD functions are able to react to an overcurrent event within few us 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. More information can be found in Application Note AN91220_OverCurrentDetection on www.melexis.com

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

	OCD_{INT}		OCD_{EXT}	
	Min	Max	Min	Max
Typical Application	Short-circuit detection		Out-of-range detection	
Overcurrent effect	OCD_{INT} pin to V_{SS}		OCD_{EXT} pin to V_{SS}	
Detection mode	Bidirectional		Unidirectional / bidirectional	
Accuracy	Lower		Higher	
Threshold trimming	EEPROM		Voltage divider on VOC_{EXT}	
Response time	1.4µs	2.1µs	10µs typical	
Required Input holding time	0.5µs		10µs minimum	
OCD output dwell time	7 µs	14 µs	10µs typical	

Table 22: Comparison between OCD_{INT} and OCD_{EXT} performances

15.2. Electrical Specifications

DC Operating Parameters at V_{DD} = 5V (unless otherwise specified) and for T_A as specified by the Temperature suffix (K).

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(1)	VOC_EXT	V_{DD} = 5V / V_{REF} = 2.5V	0.3		2	V
		V_{DD} = 5V / V_{REF} = 0.5V	3		4.7	V

Table 23: OCD_{INT} and OCD_{EXT} electrical specifications

15.3. Internal Overcurrent Detection Principle

The internal OCD takes fixed threshold voltage values predefined in the EEPROM and do 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 follow, but other values can be set on request. The overcurrent threshold in ampere is deduced from the sensitivity of the sensor [mV/A] and the OCD_{INT} threshold voltage.

	Sensor configuration	Min.	Max.
OCD_{INT} Threshold [% FS]	V_{DD} = 5V / V_{REF} = 2.5V	24.4	220
	V_{DD} = 5V / V_{REF} = 0.5V	12.2	110

Table 24: OCDINT factory programmable range

(1) VOC_ext defines the OCD_ext threshold. In case of a ratiometric device, VOC_ext should change with Vdd to avoid additional errors.

Sensor reference	Sensitivity [mV/A]	OCD_{INT} Threshold Current [% *FS*]	OCD_{INT} Threshold Current [A]
MLX91220KDF-ABF-117	120	87.1	14.8
MLX91220KDF-ABx-020	100	111.2	22.2
MLX91220KDx-ABx-025	80	111.2	27.8
MLX91220KDx-ABx-050	40	111.2	55.6
MLX91220KDx-AUF-050	80	110	55
MLX91220KDC-ABR-030	66	112.3	33.7
MLX91220KDF-ABF-075	26.7	111.2	83.4

Table 25: OCD_{INT} threshold currents for SOIC-16 versions

15.4. External Overcurrent Detection Principle

The external OCD uses the voltage applied on VOC_{EXT} pin as threshold voltage. This translates into an overcurrent threshold in ampere 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 13.1 and 13.3 for more details about the application diagram and the recommended resistances.

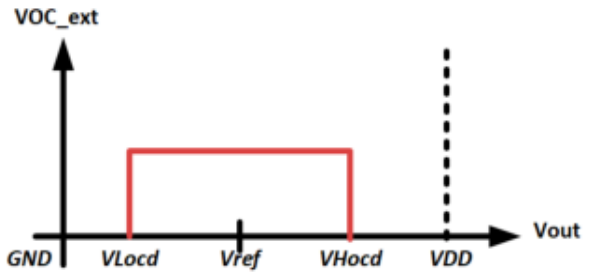
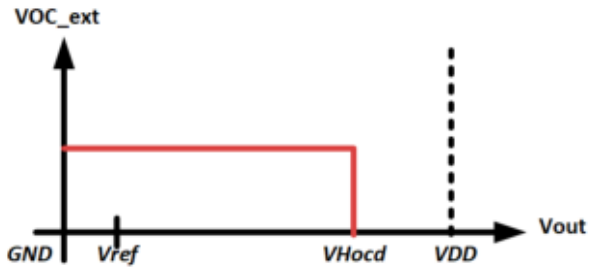
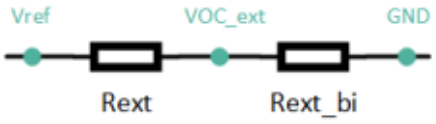
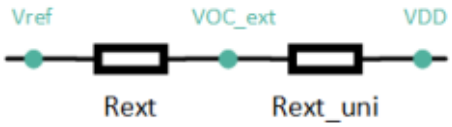
Bidirectional configuration	Unidirectional configuration
	
	
$VOC_{EXT} = V_{REF} * \frac{R_{ext_{bi}}}{R_{ext} + R_{ext_{bi}}}$ $VLocd = VOC_{EXT}$ $VHocd = 2.V_{REF} - VLocd$	$VOC_{EXT} = V_{REF} + (V_{DD} - V_{REF}) * \frac{R_{ext}}{R_{ext} + R_{ext_uni}}$ $VHocd = VOC_{EXT}$

Table 26: External OCD, bidirectionnal and unidirectional configurations

16. Recommended Application Diagrams

16.1. Resistor and Capacitor Values

Part	Description	Value	Unit
C_1	Supply capacitor, EMI, ESD	47	nF
C_2	Decoupling, EMI, ESD	47	nF
C_3	Decoupling, EMI, ESD	4.7	nF
R_{EXT} + R_{EXT_BI} / R_{EXT_UNI}	External OCD Resistor	~200(1)	kΩ
R_{EXT_BI} or R_{EXT_UNI}	External OCD Resistor	custom	-
R_5	Pull-down resistance	>10	kΩ

Table 27: Resistor and Capacitor Values for Recommended Application Diagrams

(1) High impedance needed due to the current source/sink limitation of the V_{REF} pin.

16.2. SOIC8 Application Diagram

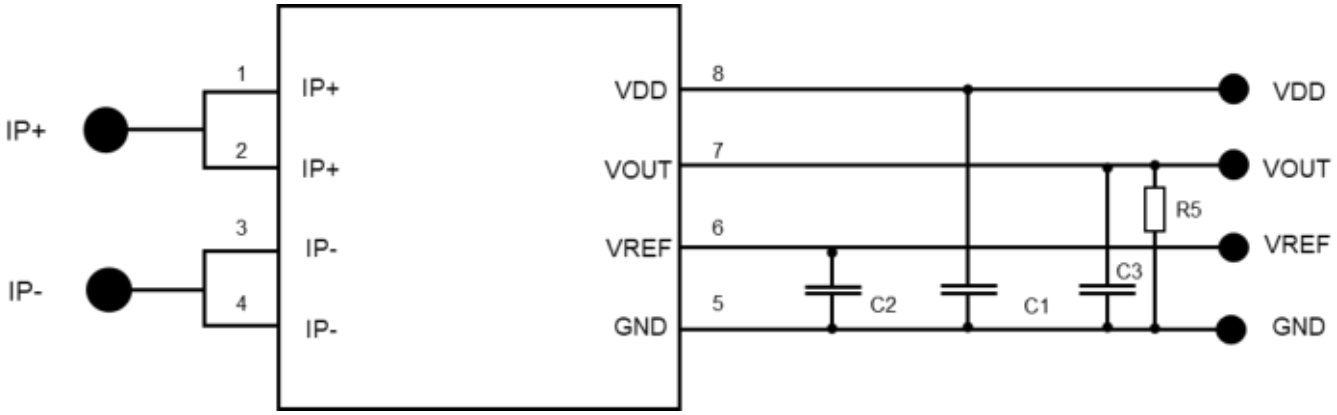


Figure 6: Recommended wiring for the MLX91220 in SOIC-8 package

16.3. SOIC16 Application Diagram

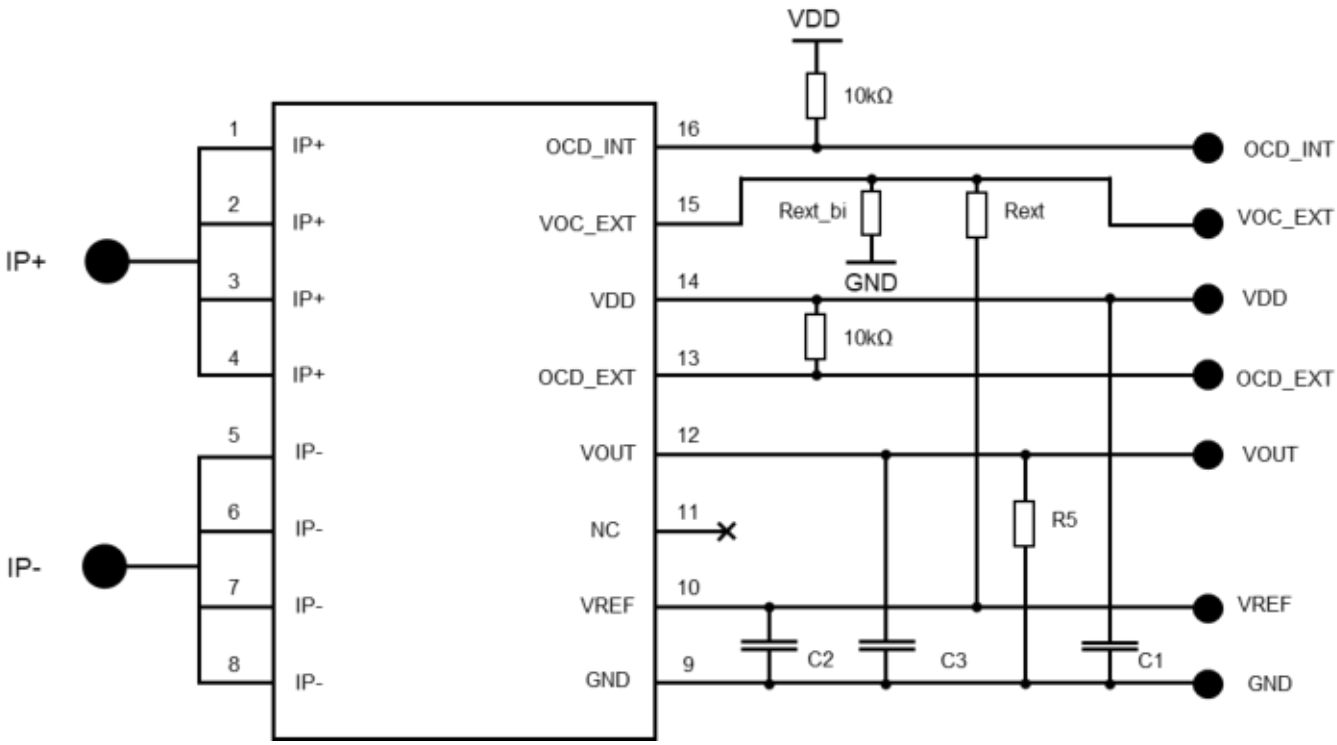


Figure 7: Recommended wiring for the MLX91220 with Bidirectional External OCD

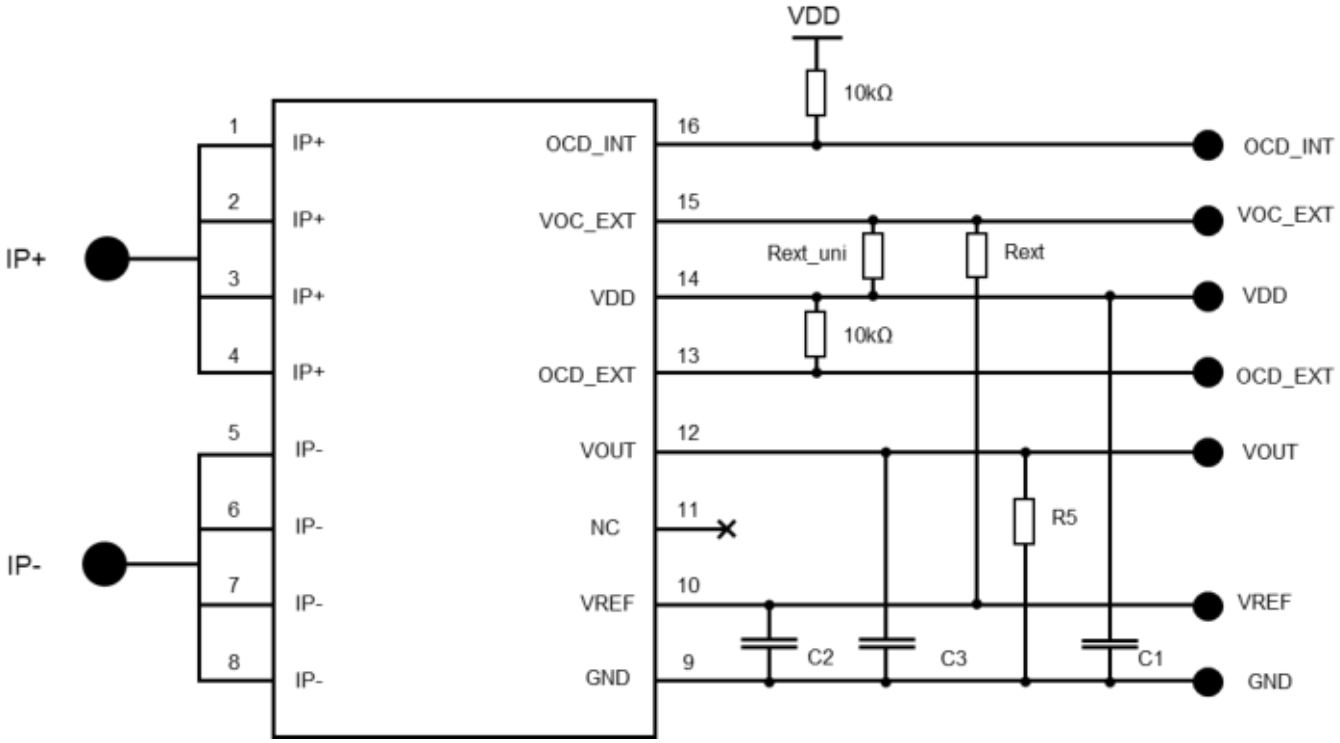


Figure 8: Recommended wiring for the MLX91220 with Unidirectional External OCD

16.3.1. OCD functions not used

In case of OCD functions are not needed (internal or external), OCD pins can be connected to GND. Moreover, when OCD_ext is not needed, VOC_ext pin should be connected to GND. Figure 9 shows the wiring when both OCD functions are not needed.

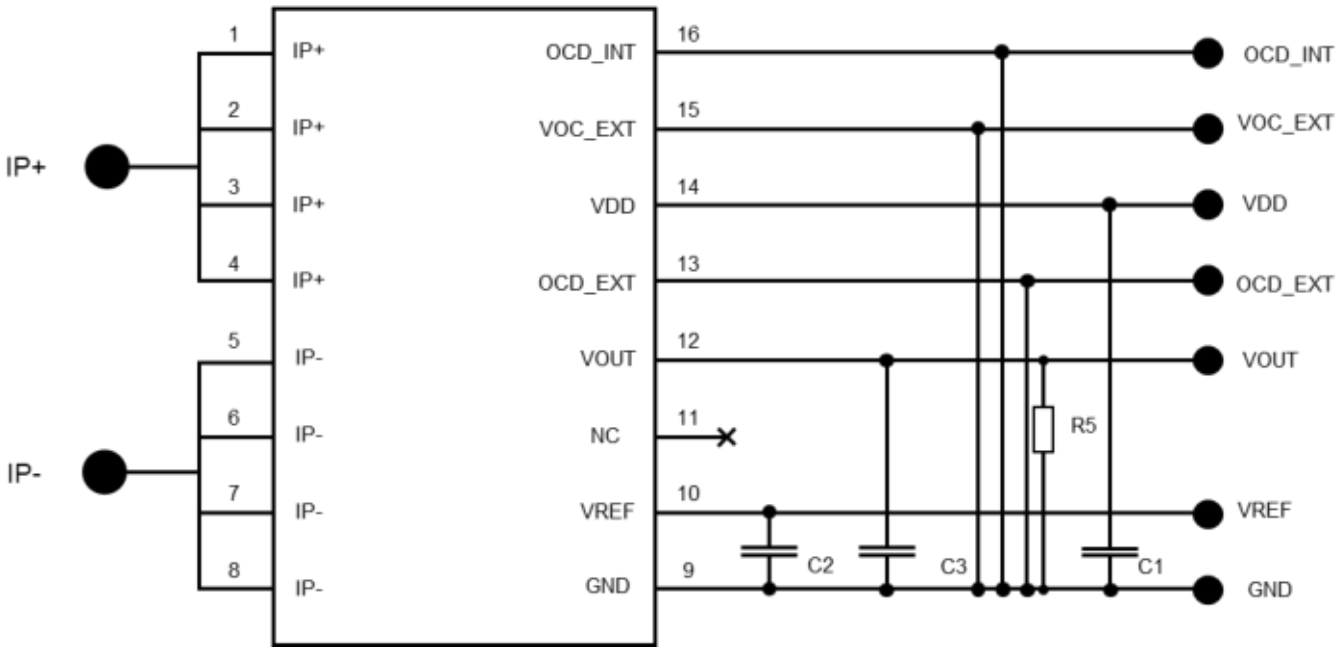


Figure 9 : example of wiring in case of both OCD functions not needed

17. Standard information regarding manufacturability with different soldering processes

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

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).

18. ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).



Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

Parameter	Symbol	Test Method	Value	Unit
Human Body ESD Protection	ESD_{HBM}	AEC-Q100-002 Rev D	2	kV
Charged Device Model ESD Protection	ESD_{CDM}	AEC-Q100-011 Rev B	500	V

Table 28: Electrostatic Discharge Ratings

19. Package Information

19.1. SOIC-8 150mils- Package Dimensions

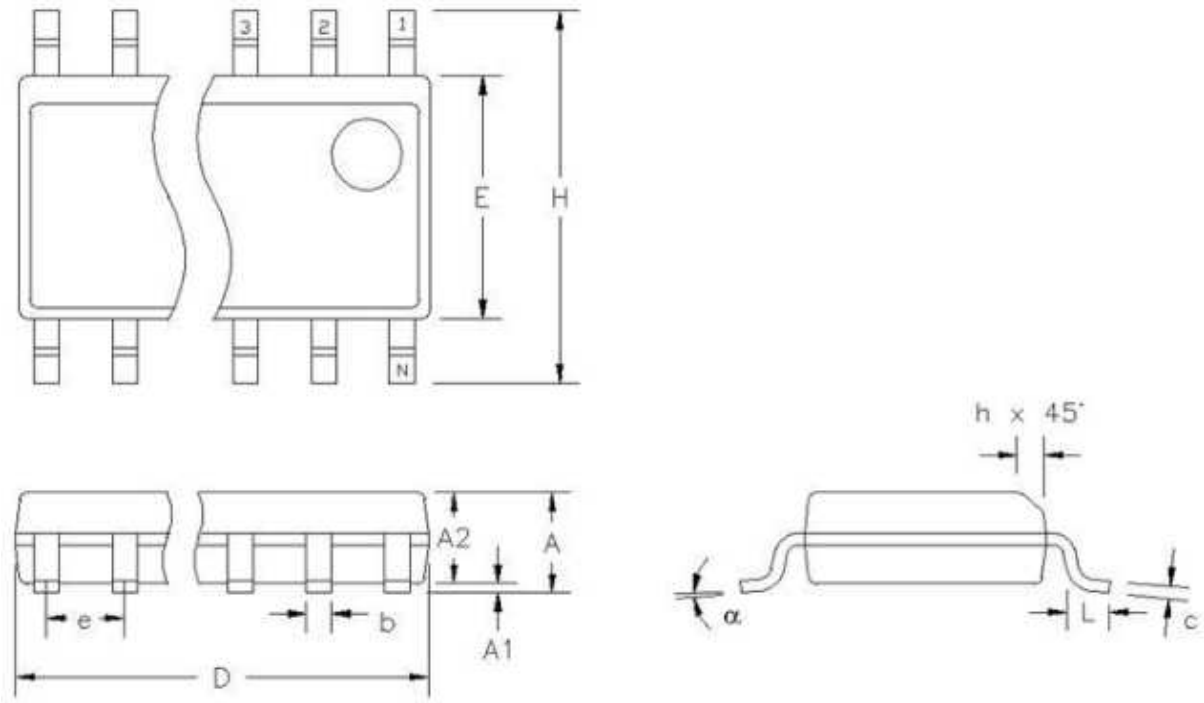


Figure 10 : SOIC8 Package Dimensions

[mm]	A	A1	A2	D	E	H	L	b	c	e	h	⍰
min	1.52	0.10	1.37	4.80	3.81	5.80	0.41	0.35	0.19	1.27 BSC	0.25	0°
max	1.73	0.25	1.57	4.98	3.99	6.20	1.27	0.49	0.25		0.50	8°

[inch]	A	A1	A2	D	E	H	L	b	c	e	h	⍰
min	.060	.004	.054	.189	.150	.228	.016	.014	.008	.050 BSC	.010	0°
max	.068	.010	.062	.196	.157	.244	.050	.019	.010		.020	8°

Table 29: SOIC8 package dimensions in millimeters and inches

19.2. SOIC-16 300mils- Package Dimensions

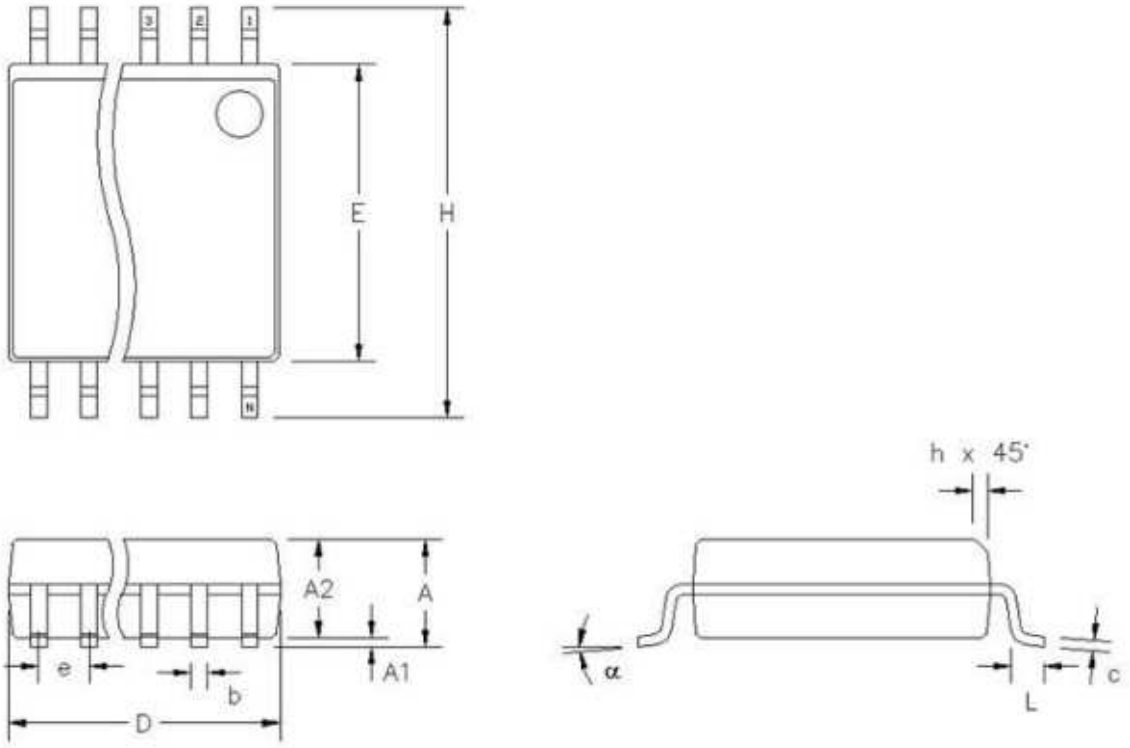


Figure 11: SOIC16 Package Dimensions

[mm]	A	A1	A2	D	E	H	L	b	c	e	h	⍰
min	2.44	0.10	2.24	10.11	7.40	10.11	0.51	0.35	0.23	1.27 BSC	0.25	0°
max	2.64	0.30	2.44	10.46	7.60	10.51	1.02	0.48	0.32		0.71	8°

[inch]	A	A1	A2	D	E	H	L	b	c	e	h	⍰
min	.096	.004	.088	.398	.291	.398	.020	.014	.009	.050 BSC	.010	0°
max	.104	.012	.096	.412	.299	.414	.040	.019	.013		.028	8°

Table 30: SOIC16 package dimensions in millimeters and inches

19.3. Packaging marks

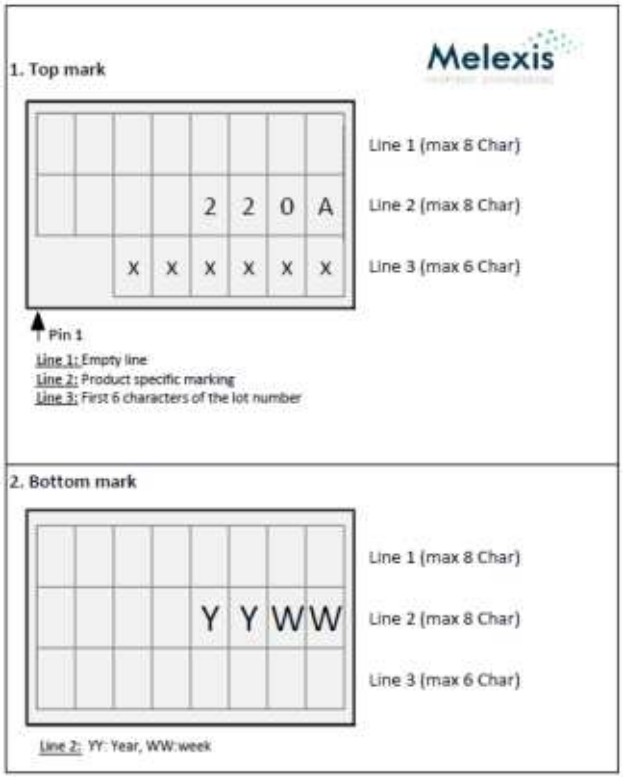
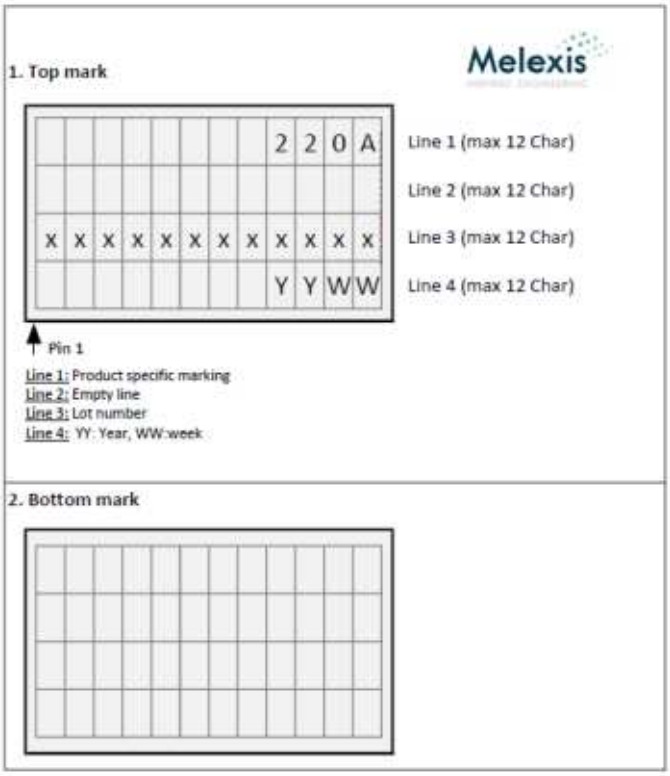
SOIC-8	SOIC-16
	

Table 31: Package marking information

20. 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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