

### Features and Benefits

- Chopper Stabilized Amplifier Stage
- CMOS for Optimum Stability, Quality and Cost
- Dual Outputs
- Phase/Direction Detection

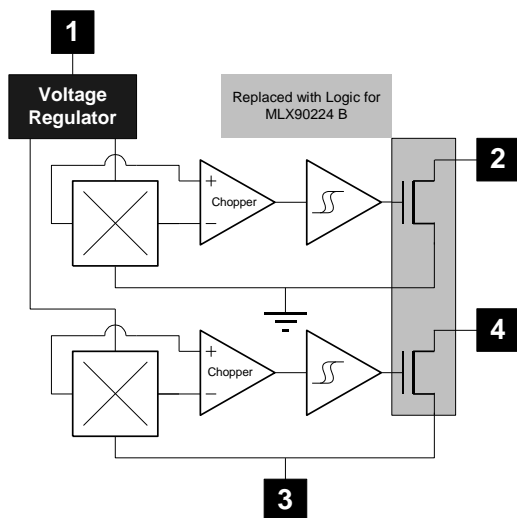
### Applications

- Direction Detector
- Speed Sensor
- Shaft Encoding
- Position Sensing

### Ordering information

Product Code	Temperature Code	Package Code	Packing Form
MLX90224EVA-AAA-000-BU	E (-40°C to 85°C)	VA	BU (Bulk)

### 1. Functional Diagram



### 2. General Description

The MLX90224 is a dual Hall effect latch. It includes two Hall effect latch functions of which typical thresholds are +/- 2.0 mT. In each latch, the magnetic flux detection is performed by a switched silicon Hall plate.

The MLX90224EVA-AAA output transistor will be “latched on” ( $B_{OP}$ ) in the presence of a sufficiently strong South pole magnetic field facing the marked side of the package. Similarly, the output will be “latched off” ( $B_{RP}$ ) in the presence of a North field. Spacing of the Hall plates is 1.85 mm.

The output structure is an Open-Drain NMOS transistor with a capability of 25 mA and protected against short-circuits.

Pin #	Name
1	VDD
2	Out1
3	GND
4	Out2

## Contents

Features and Benefits.....	1
Applications.....	1
Ordering information .....	1
1. Functional Diagram .....	1
2. General Description.....	1
3. Glossary of Terms.....	3
4. Absolute Maximum Ratings.....	3
5. MLX90224 Electrical Specifications .....	3
6. MLX90224 Sensor Specific Specifications .....	4
7. General Description.....	4
8. Performance Graphs .....	5
9. Applications Information .....	6
10. Standard information regarding manufacturability of Melexis products with different soldering processes.....	7
11. ESD Precautions .....	7
12. Package Information .....	8
13. Contact.....	9
14. Disclaimer.....	9

### 3. Glossary of Terms

Gauss, Tesla: Two units to quantify a magnetic flux density. Conversion: 1 mT = 10 Gauss

Bop: B Operating Point: When the magnetic flux density increases and reaches the Bop value, the output switches on. This value is in Gauss.

Brp: B Release Point: When the magnetic flux density decreases and reaches the Brp value, the output switches off. This value is in Gauss.

### 4. Absolute Maximum Ratings

Parameter	Symbol	Value	Units
Supply Voltage	$V_{DD}$	24 V	V
Supply Current	$I_{DD}$	50 mA	mA
Output Current	$I_{OUT}$	40 mA	mA
Output Short-Circuit Current	$I_{SCHORT}$	150 mA	mA
Operating Temperature Range	$T_A$	-40 to 150	°C
Maximum Junction Temp	$T_J$	175	°C
Magnetic Flux Density	B	Unlimited	mT

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

### 5. MLX90224 Electrical Specifications

DC Operating Parameters  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{DD} = 4.5\text{V}$  to  $24\text{V}$  (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Supply Voltage	$V_{DD}$	Operating	4.5		24	V
Supply Voltage Ramp up			1.5			V/ms
Supply Current	$I_{DD}$		5.0	7.5	10	mA
Output Current	$I_{OUT}$	$B > B_{OP}$			20	mA
Saturation Output Voltage	$V_{SAT}$	$B > B_{OP}$ , $I_{OUT} = 20\text{ mA}$		200	400	mV
Output Voltage	$V_{OUT}$	$B < B_{RP}$			24	V
Output Leakage	$I_{LEAK}$				10	$\mu\text{A}$
Oscillator Frequency	$F_{OSC}$			150		kHz
Refresh Time	$T_r$			10		$\mu\text{s}$

## 6. MLX90224 Sensor Specific Specifications

DC Operating Parameters  $T_A = -40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ ,  $V_{DD} = 4.5\text{V}$  to  $16\text{V}$  (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operate Point	$B_{OP}$	$-40^{\circ}\text{C}$ to $85^{\circ}\text{C}$ , $V_{DD} = 4.5\text{V}$ to $16\text{V}$	0.5	2.5	5.5	mT
Release Point	$B_{RP}$	$-40^{\circ}\text{C}$ to $85^{\circ}\text{C}$ , $V_{DD} = 4.5\text{V}$ to $16\text{V}$	-5.5	-2.5	-0.5	mT
Hysteresis	$B_{HYS}$	$-40^{\circ}\text{C}$ to $85^{\circ}\text{C}$ , $V_{DD} = 4.5\text{V}$ to $16\text{V}$	2.5	4.0	6.5	mT

**Note:**

1 mT = 10 Gauss

## 7. General Description

The MLX90224 Speed and Direction Sensor is designed for use with multipole ring magnet targets having evenly distributed North and South magnetic poles on the circumference of the magnet. An example of the basic physical arrangement of the sensor and magnet is shown in Fig. 1. The MLX90224 has two digital output signals. Output Out1 will provide a speed pulse from the changing magnetic flux at sensing element S1. Output Out2 will provide a phase shifted output identical in pulse width and period to Out1. The MLX90224EVA-ABA has latching magnetic Bop and Brp values of typically +/- 2mT.

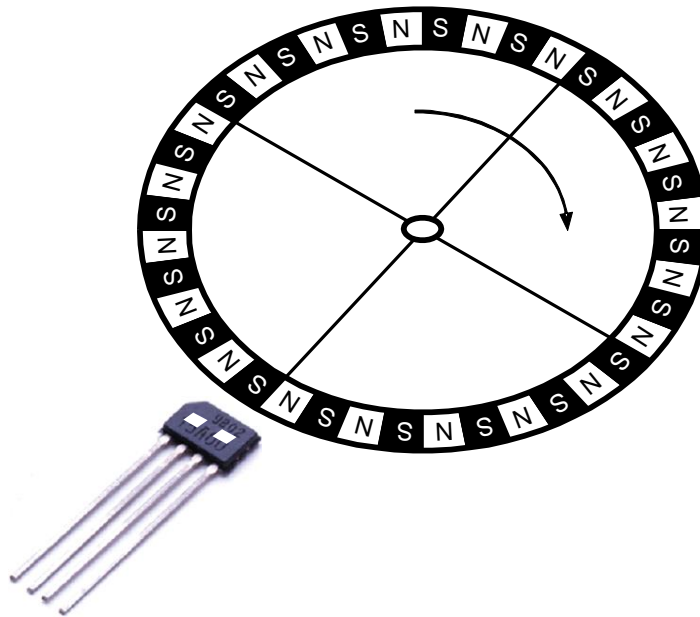
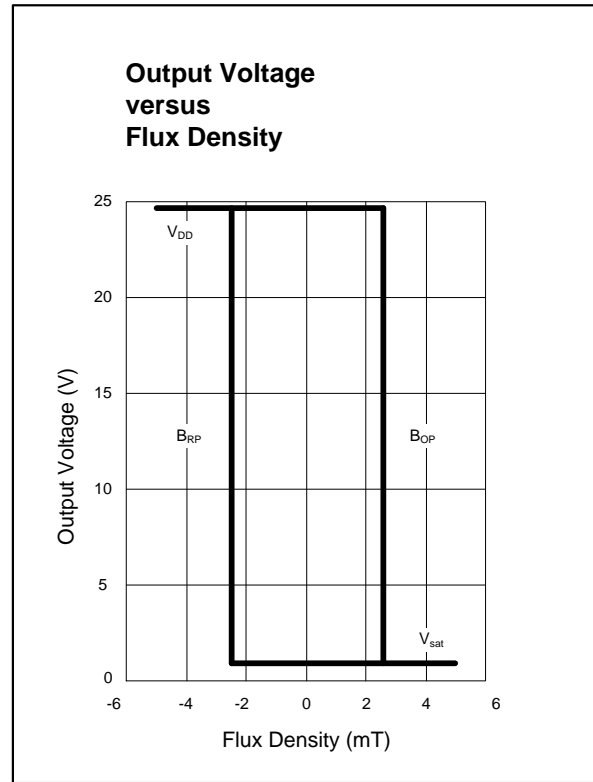
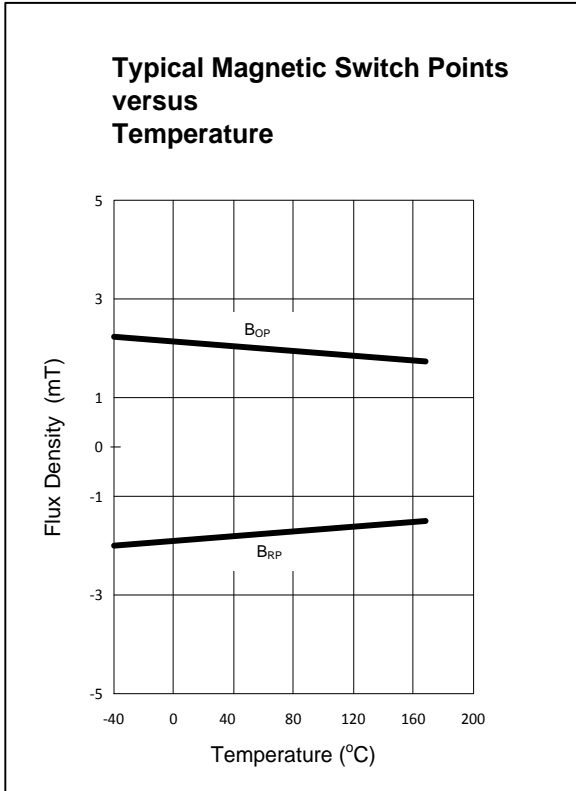
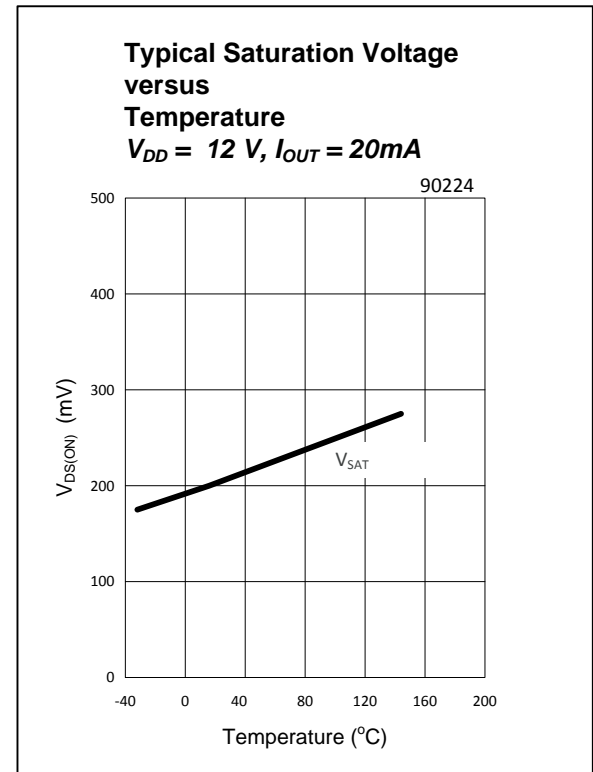
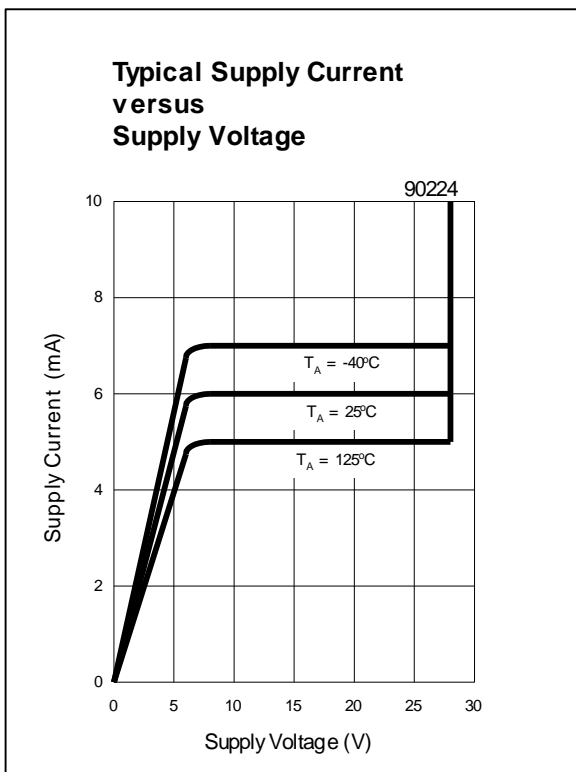


Figure 1: Application with a multipole ring magnet

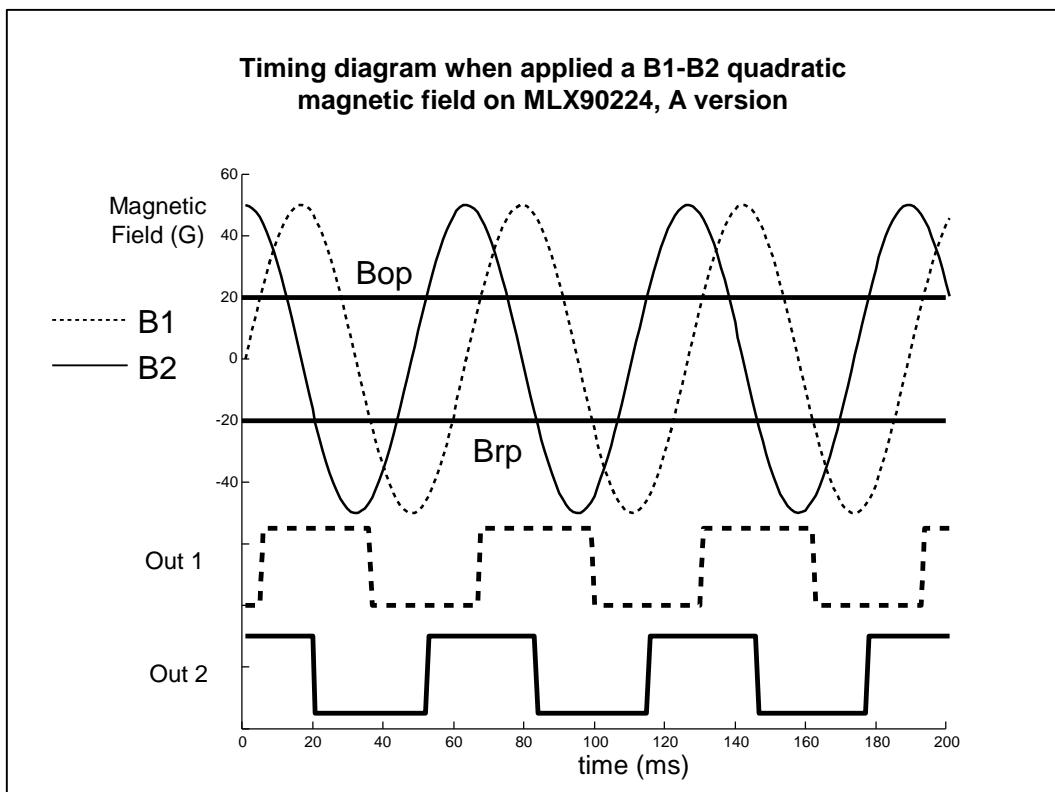
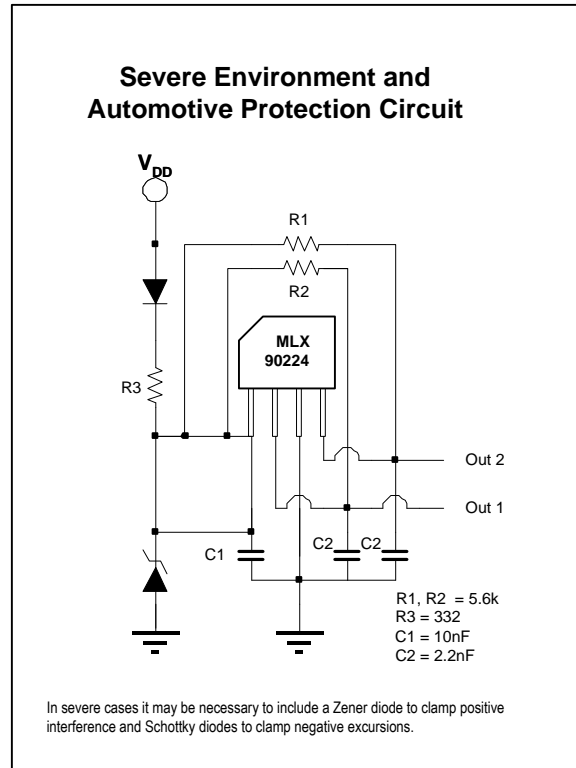
## 8. Performance Graphs



$V_{SAT}$



## 9. Applications Information



## 10. Standard information regarding manufacturability of Melexis products 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 Device)s

- 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 Device)s and THD's (Through Hole Device)s

- 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 Device)s

- EN60749-15  
Resistance to soldering temperature for through-hole mounted devices

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

- 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.

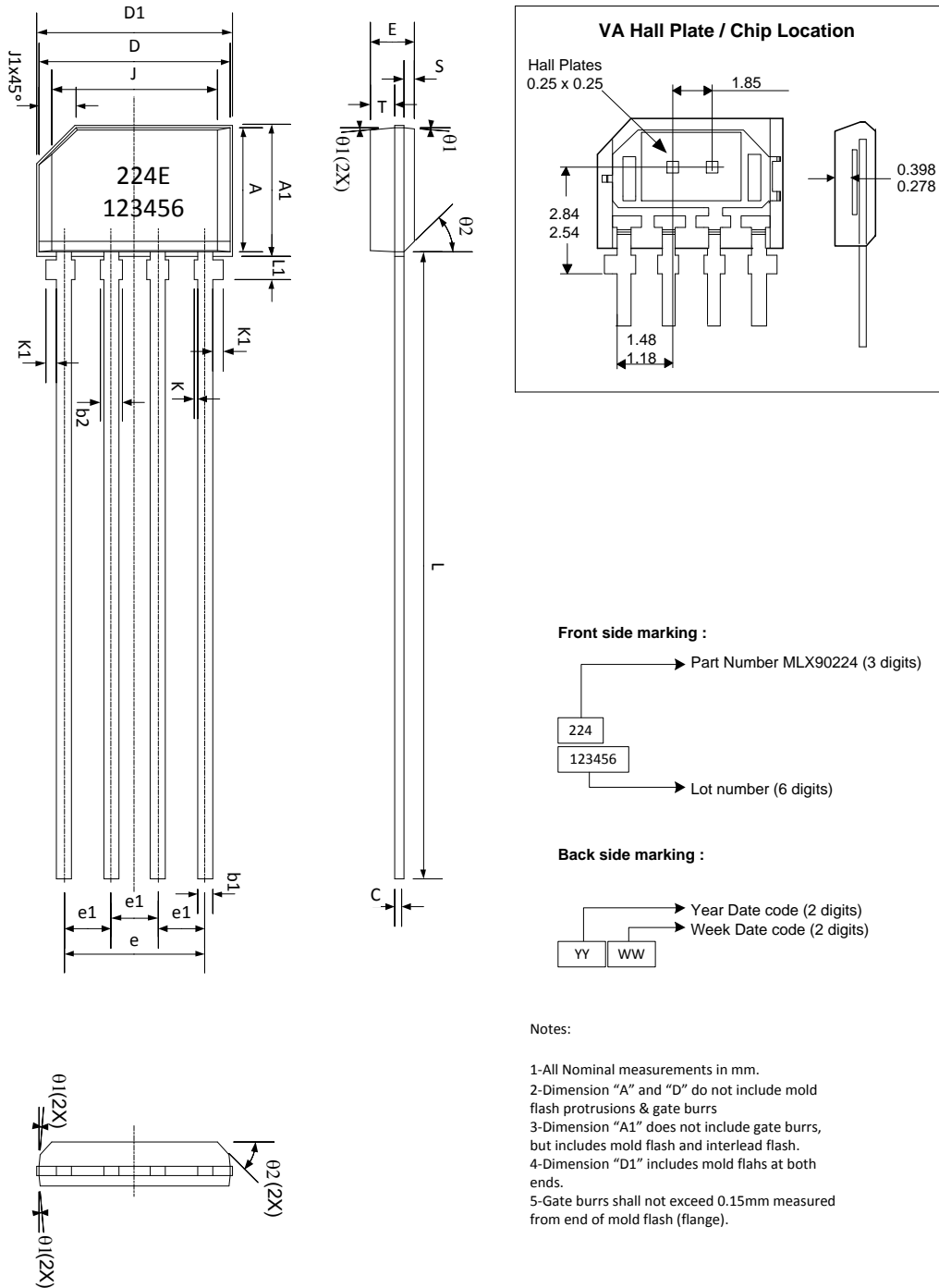
Melexis is contributing to global environmental conservation by promoting **lead free** solutions. For more information on qualifications of **RoHS** compliant products (RoHS = European directive on the Restriction Of the use of certain Hazardous Substances) please visit the quality page on our website: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

## 11. ESD Precautions

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

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

## 12. Package Information



This table in mm

Type		A	A1	D	D1	E	J	J1	K	K1	L	L1	S	T
VA	min	3.30	3.63	5.08	5.33	1.10	4.10	1.00	0.00	0.25	17.5	-	0.24	0.61
	max	3.46	3.79	5.24	5.43	1.20	4.50	REF	0.15	0.35	18.5	1.00	0.29	0.66
		b1	b2	c	e	e1	$\theta 1$	$\theta 2$						
VA	min	0.35	0.40	0.18	3.76	1.22	7° REF	45° REF						
	max	0.48	0.60	0.34	3.86	1.32								

Notes:

- 1-All Nominal measurements in mm.
- 2-Dimension "A" and "D" do not include mold flash protrusions & gate burrs
- 3-Dimension "A1" does not include gate burrs, but includes mold flash and interlead flash.
- 4-Dimension "D1" includes mold flahs at both ends.
- 5-Gate burrs shall not exceed 0.15mm measured from end of mold flash (flange).



## 13. Contact

For the latest version of this document, go to our website at [www.melexis.com](http://www.melexis.com).

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

Europe, Africa	Telephone: +32 13 67 04 95
	Email : sales_europe@melexis.com
Americas	Telephone: +1 603 223 2362
	Email : sales_usa@melexis.com
Asia	Email : sales_asia@melexis.com

## 14. Disclaimer

*The information furnished by Melexis herein ("Information") is believed to be correct and accurate. Melexis disclaims (i) any and all liability in connection with or arising out of the furnishing, performance or use of the technical data or use of the product(s) as described herein ("Product") (ii) any and all liability, including without limitation, special, consequential or incidental damages, and (iii) any and all warranties, express, statutory, implied, or by description, including warranties of fitness for particular purpose, non-infringement and merchantability. No obligation or liability shall arise or flow out of Melexis' rendering of technical or other services.*

*The Information is provided "as is" and Melexis reserves the right to change the Information at any time and without notice. Therefore, before placing orders and/or prior to designing the Product into a system, users or any third party should obtain the latest version of the relevant information to verify that the information being relied upon is current. Users or any third party must further determine the suitability of the Product for its application, including the level of reliability required and determine whether it is fit for a particular purpose.*

*The Information is proprietary and/or confidential information of Melexis and the use thereof or anything described by the Information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights.*

*This document as well as the Product(s) may be subject to export control regulations. Please be aware that export might require a prior authorization from competent authorities.*

*The Product(s) are intended for use in normal commercial applications. Unless otherwise agreed upon in writing, the Product(s) are 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 are specifically not recommended by Melexis.*

*The Product(s) 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.*

*The Products sold by Melexis are subject to the terms and conditions as specified in the Terms of Sale, which can be found at <https://www.melexis.com/en/legal/terms-and-conditions>.*

*This document supersedes and replaces all prior information regarding the Product(s) and/or previous versions of this document.*

*Melexis NV © - No part of this document may be reproduced without the prior written consent of Melexis. (2016)*

*ISO/TS 16949 and ISO14001 Certified*