



MLX90224

Dual Hall Effect Switch

Features and Benefits

- Chopper Stabilized Amplifier Stage
- CMOS for Optimum Stability, Quality and Cost
- Dual Output
- 5V to 24V Operation
- Phase/Direction Detection (option code B)

Applications

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

Ordering Code

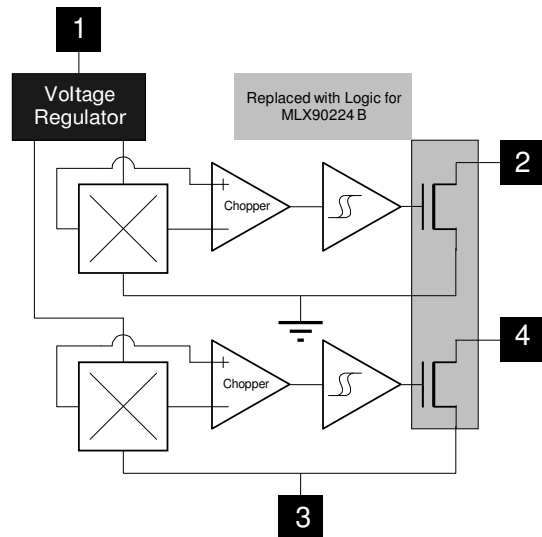
Product Code	Temperature Code	Package Code	Option Code	Packing Form Code
MLX90224	E	VA	AAA-000	BU

Legend:

Temperature Code:	E for Temperature Range -40°C to 85°C
Package Code:	VA for Plastic Single in Line
Option Code:	xxx-000: Standard version
Packing Form:	BU for Bulk

Ordering example: MLX90224EVA-AAA-000-BU

1. Functional Diagram



2. Description

The MLX90224 series are dual Hall effect switches. It includes two Hall effect switch functions of which typical thresholds are +/- 2.0 mT. In each switch, the magnetic flux detection is performed by a switched silicon Hall plate. The B_{OP} and B_{RP} are temperature-compensated and give a sensitivity temperature coefficient of 500 ppm/°C to compensate popular magnets.

The MLX90224LVAA output transistor will be "switched 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 "switched off" (B_{RP}) in the presence of a North field. Spacing on the plates is 1.85mm.

The MLX90224LVAB serie is designed for direction detection with a high speed chopper.

The output structure is an Open-Drain NMOS transistor with a capability of 25 mA.

	MLX90224EVA-A	MLX90224EVA-B
Pin 1	V_{DD}	V_{DD}
Pin 2	Switch Plate 1	Speed
Pin 3	GND	GND
Pin 4	Switch Plate 2	Direction



TABLE OF CONTENTS

FEATURES AND BENEFITS	1
APPLICATIONS.....	1
ORDERING INFORMATION.....	1
1. FUNCTIONAL DIAGRAM.....	1-1
2. DESCRIPTION.....	2-1
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.....	8
11. ESD PRECAUTIONS.....	8
12. PACKAGE INFORMATION.....	9
13. DISCLAIMER	10



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

Supply Voltage, V_{DD}	24 V
Supply Current, I_{DD}	50 mA
Output Current, I_{OUT}	40 mA
Output Short-Circuit Current	150 mA
Operating Temperature Range, T_A	-40°C to 150°C
Storage Temperature Range, T_S	-65°C to 150°C
Maximum Junction Temp, T_J	+ 175°C
Magnetic Flux Density	Infinite

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°C , $V_{DD} = 5\text{V}$ to 24V (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	5		24	V
Supply Current	I_{DD}		3.0	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	600	mV
Output Voltage	V_{OUT}	$B < B_{RP}$			24	V
Output Leakage	I_{LEAK}				10	μA
Refresh Time	T_r		7		15	μS

6. MLX90224 Sensor Specific Specifications

DC Operating Parameters $T_A = -40^{\circ}\text{C}$ to 85°C , $V_{DD} = 5\text{V}$ to 24V (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operate Point	B _{OP}		-	2.5	5.5	mT
Release Point	B _{RP}		-5.5	-2.5	-	mT
Hysteresis	B _{HYS}		1.0	4.0	7.5	mT

Note:

1 mT = 10 Gauss

7. General Description

The MLX 90224 is designed for use with multipole ring magnet targets having evenly distributed North and South magnetic poles on the circumference of the target. An example of the basic physical arrangement of the sensor and magnet is shown in Fig. 1. The MLX90224 is available in 2 versions. The first version provides the user with two digital output signals. Output S1 will provide a speed pulse from the changing magnetic flux at sensing element S1. Output S2 will provide a phase shifted ($d = 1.85\text{ mm}$) output identical in pulse width and period to S1. This version is referred to as MLX90224LVAA. The MLX90224LVAB version provides an output signal that decodes the phase shifted signals to directly provide an output for the speed which is twice the rotation speed of the target. The other output pin represent the direction and changes from logic-high to logic-low when the direction of rotation of the magnet is reversed. It allows to directly see the condition of the speed with twice the resolution of the MLX90224LVAA and to also know directly the direction of rotation of the target. The MLX90224LVAA has switching magnetic Bop and Brp values of typically +/- 2.5 mT as does the internal circuitry of the LVAB.

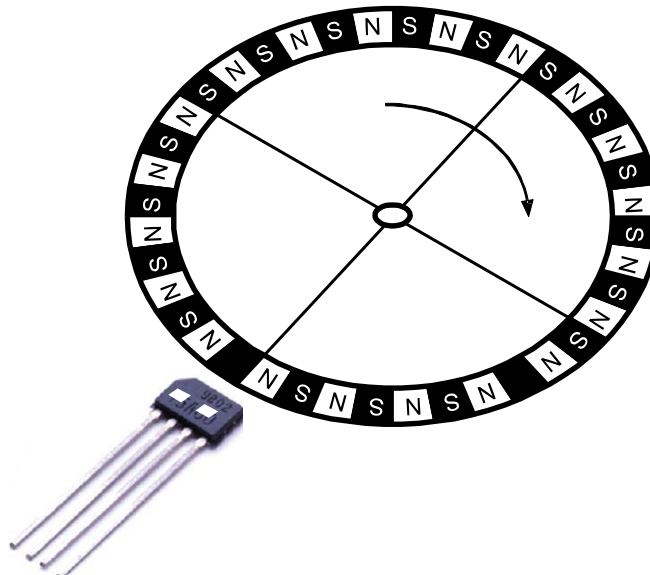


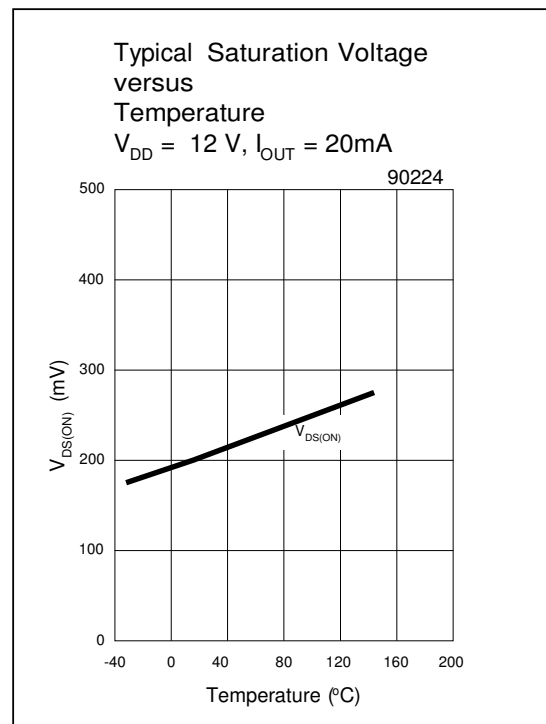
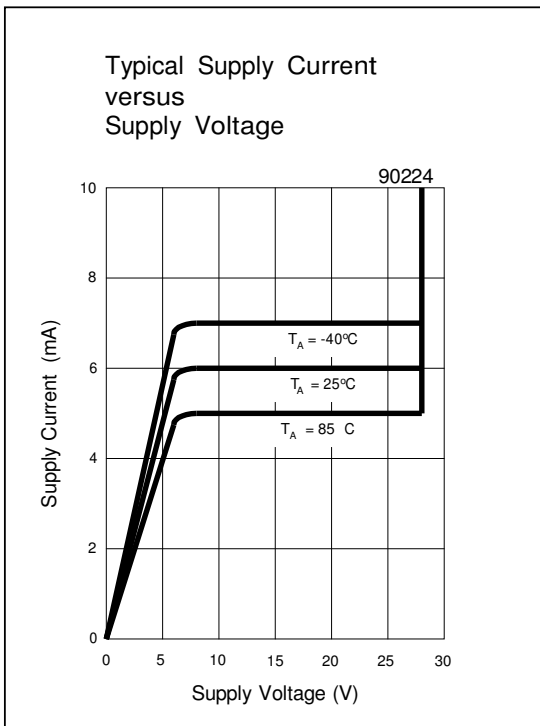
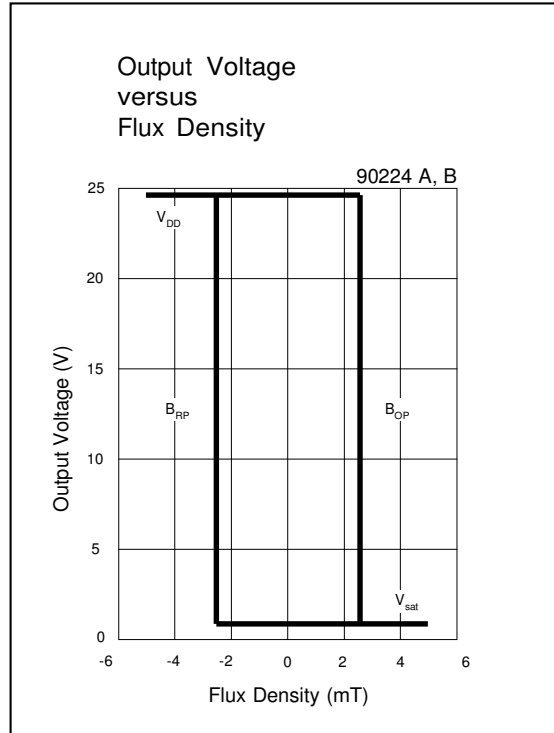
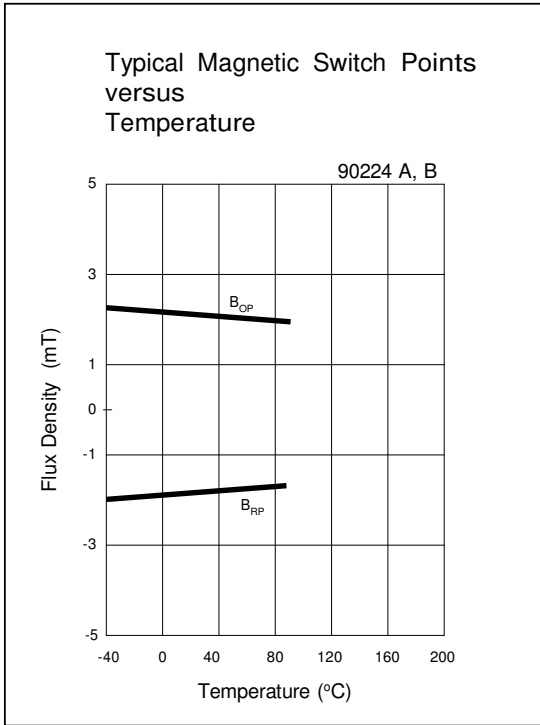
Figure 1: Application with a multipole ring magnet



MLX90224

Dual Hall Effect Switch

8. Performance Graphs

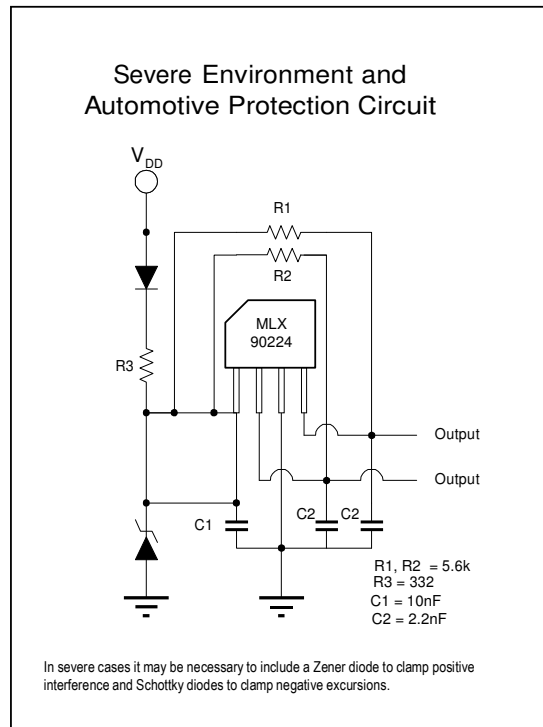




MLX90224

Dual Hall Effect Switch

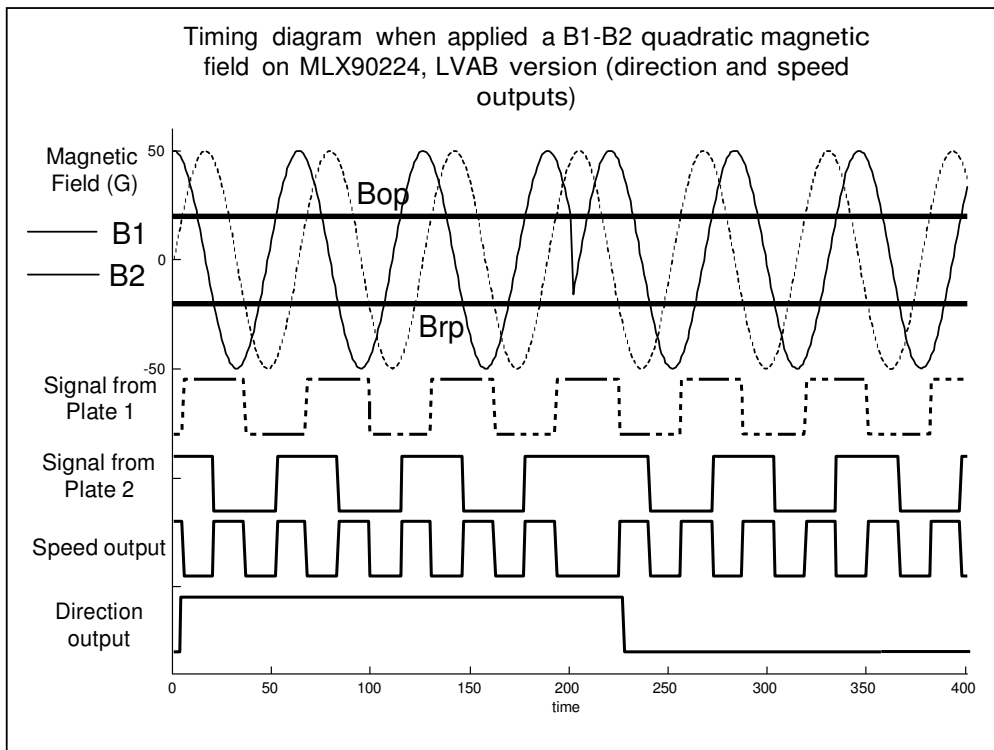
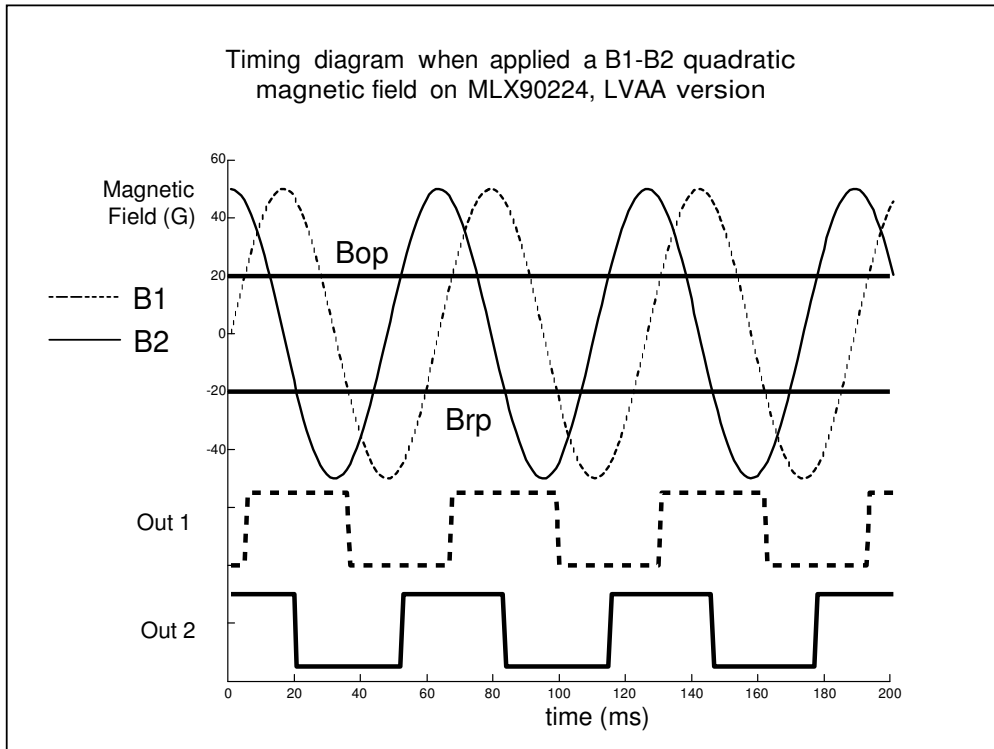
9. Applications Information





MLX90224

Dual Hall Effect Switch





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 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 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.



MLX90224

Dual Hall Effect Switch

12. Package Information

VA Package Dimensions

	VA
A	1.20 1.10
B	0.66 0.61
C	0.29 0.24
D	45°
E	0.31 0.18
F	0.60 0.40
G	0.35 0.25
H	0.15 0.0
J	45°

VA Hall Plate / Chip Location

All Dimensions in millimeters

Notes:

- Pinout: Pin 1 Vdd
Pin 2 Latch Plate 1/ Speed
Pin 3 GND
Pin 4 Latch Plate 2 / Direction
- Controlling dimension: mm .
- Leads must be free of flash and plating voids.
- Leads must not arc toward the rear of package.
- Package dimensions exclude molding flash.
- Tolerance: +/- 0.254 mm unless otherwise specified.
- Marking:
 - Line 1:
 - 3 first digits (224) =Part Number MLX90224
 - 4th and 5th digits (XA) = Version A (double latch)
 - (XB) = Version B (Speed-Direction)
 - Line 2:
 - 5 digits (ZZZZZ) =Lot Number
 - Back Side Marking
 - 4 digits (WWYY) =Date Code



13. Disclaimer

Devices sold by Melexis are covered by the warranty and patent indemnification provisions appearing in its Term of Sale. Melexis makes no warranty, express, statutory, implied, or by description regarding the information set forth herein or regarding the freedom of the described devices from patent infringement. Melexis reserves the right to change specifications and prices at any time and without notice. Therefore, prior to designing this product into a system, it is necessary to check with Melexis for current information. This product is intended for use in normal commercial applications. Applications requiring extended temperature range, unusual environmental requirements, or high reliability applications, such as military, medical life-support or life-sustaining equipment are specifically not recommended without additional processing by Melexis for each application.

The information furnished by Melexis is believed to be correct and accurate. However, Melexis shall not be liable to recipient or any third party for any damages, including but not limited to personal injury, property damage, loss of profits, loss of use, interrupt of business or indirect, special incidental or consequential damages, of any kind, in connection with or arising out of the furnishing, performance or use of the technical data herein. No obligation or liability to recipient or any third party shall arise or flow out of Melexis' rendering of technical or other services.

© 2012 Melexis NV. All rights reserved.

For the latest version of this document, go to our website at
www.melexis.com

Or for additional information contact Melexis Direct:

Europe, Africa, Asia:	America:
Phone: +32 1367 0495	Phone: +1 248 306 5400
E-mail: sales_europe@melexis.com	E-mail: sales_usa@melexis.com

ISO/TS 16949 and ISO14001 Certified