

### 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)

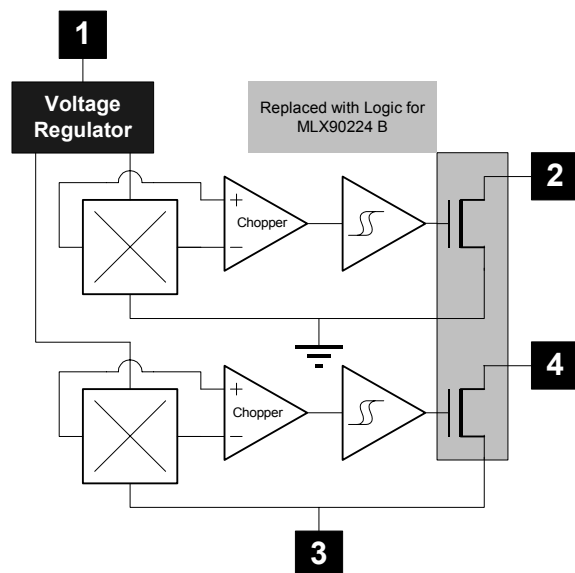
### Applications

Direction Detector  
 Speed Sensor  
 Shaft Encoding  
 Position Sensing

### Ordering Information

Part No.	Temperature Suffix	Package Code	Option code
MLX90224	E (-40°C to 85°C)	VA	A
MLX90224	E (-40°C to 85°C)	VA	B

### 1. Functional Diagram



	MLX90224EVA-A	MLX90224EVA-B
Pin 1	V <sub>DD</sub>	V <sub>DD</sub>
Pin 2	Switch Plate 1	Speed
Pin 3	GND	GND
Pin 4	Switch Plate 2	Direction

### 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<sub>OP</sub> and B<sub>RP</sub> 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<sub>OP</sub>) 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<sub>RP</sub>) 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.

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### 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  $85^\circ\text{C}$ ,  $V_{DD} = 5\text{V}$  to  $24\text{V}$  (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	$\mu\text{A}$
Refresh Time	$T_r$		7		15	$\mu\text{S}$

### 6. MLX90224 Sensor Specific Specifications

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

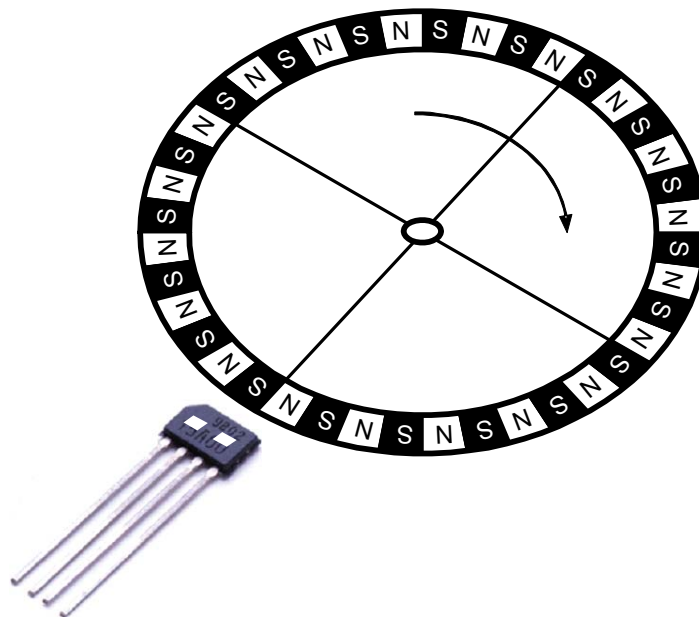
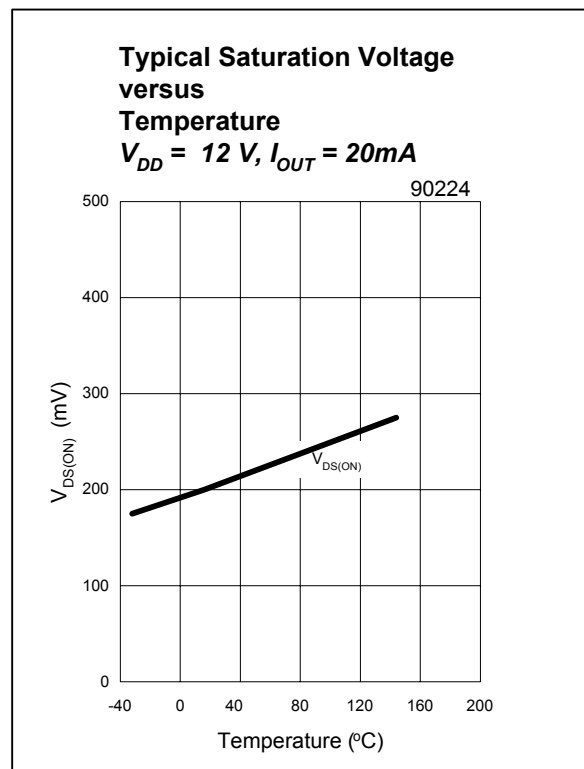
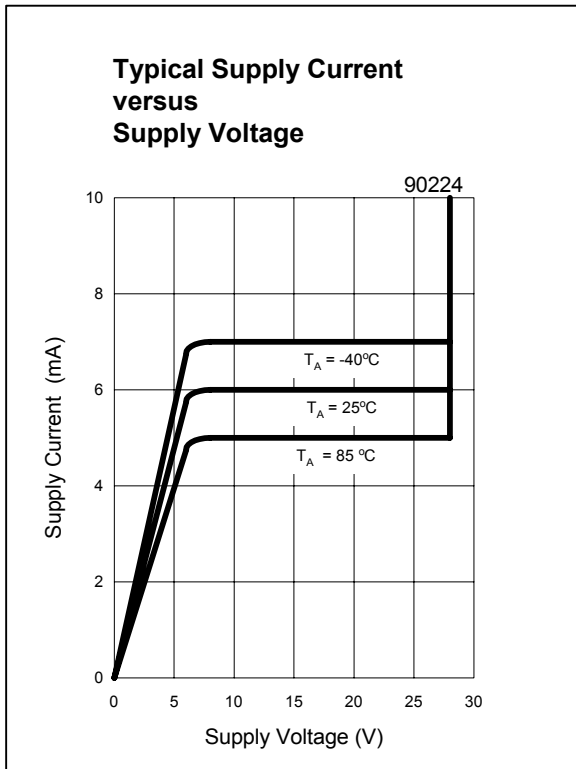
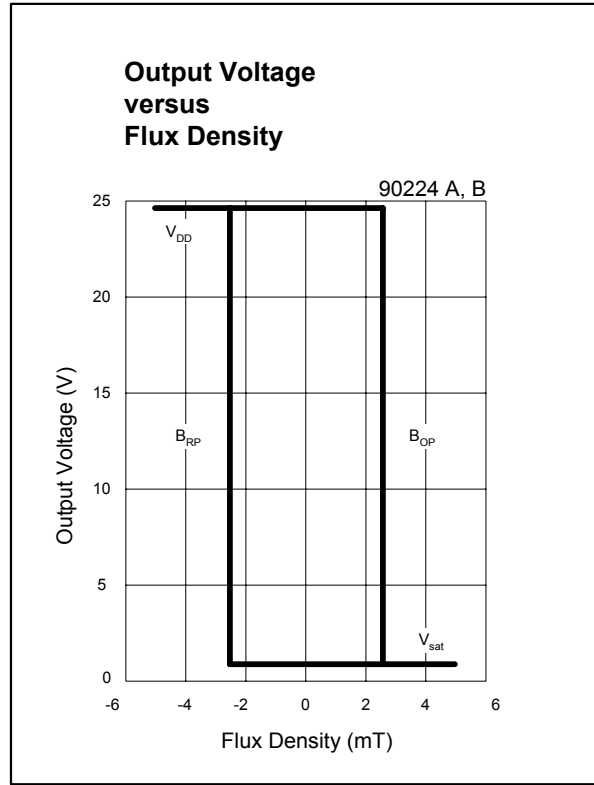
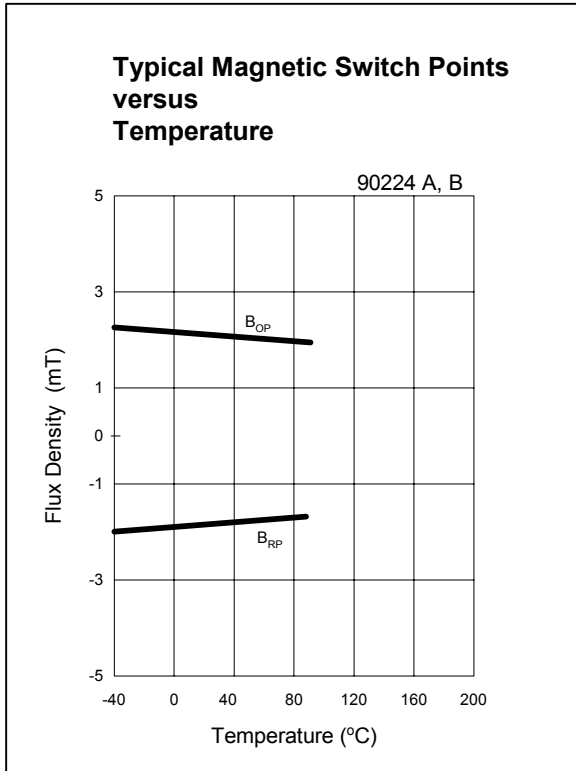
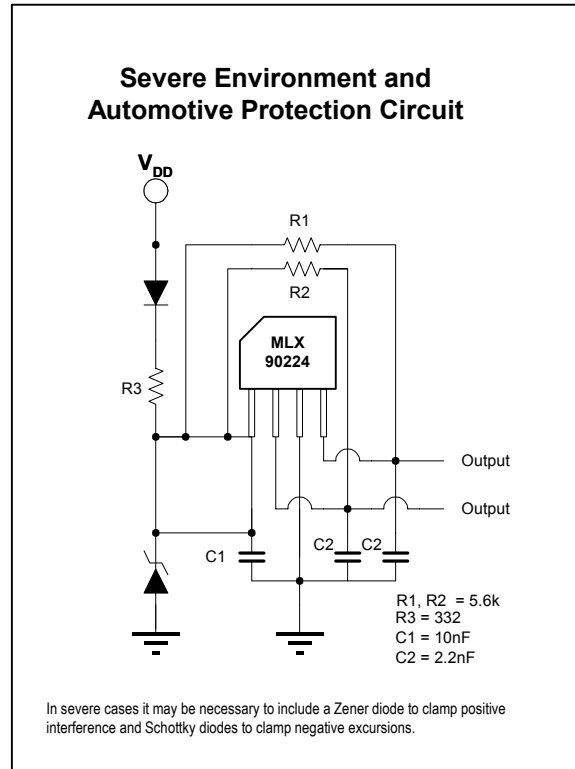


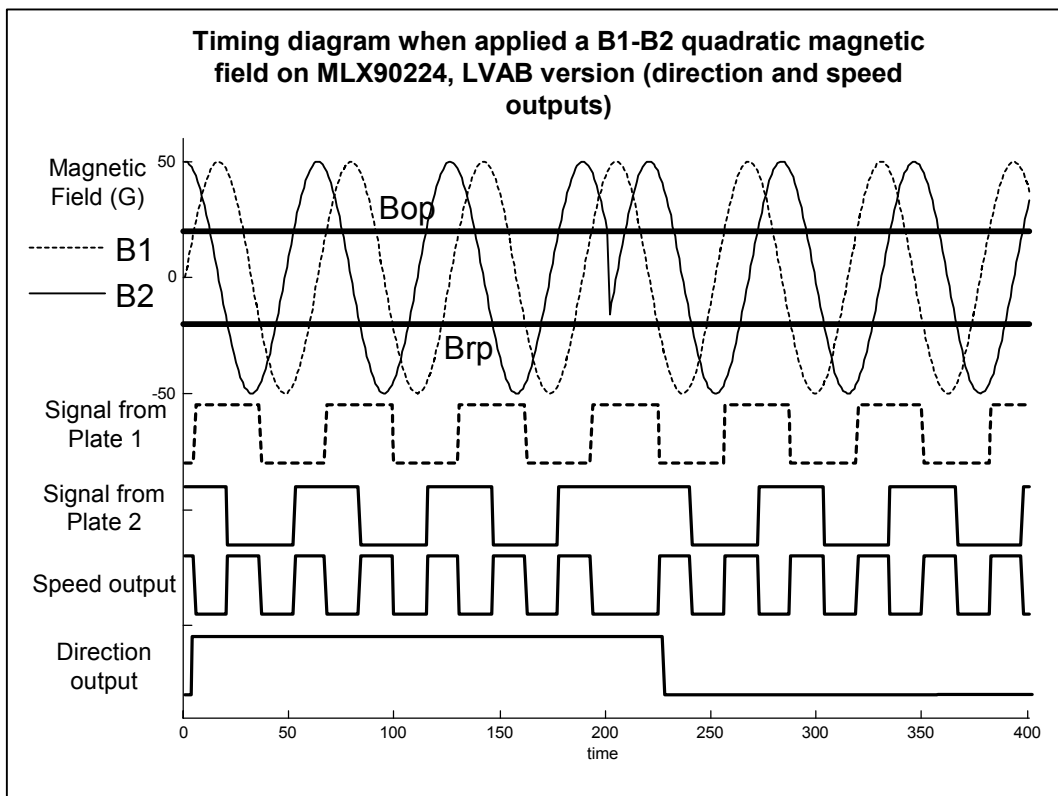
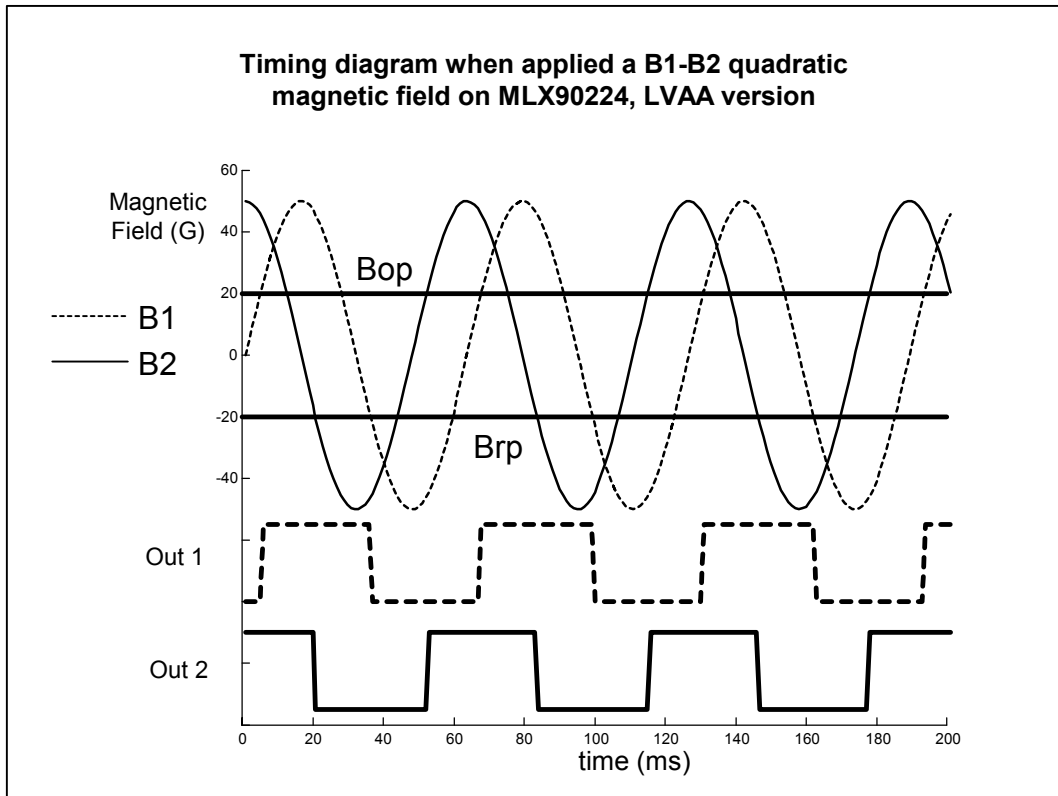
Figure 1: Application with a multipole ring magnet

**8. Performance Graphs**



**9. Applications Information**





## **10. Reliability Information**

Melexis devices are classified and qualified regarding suitability for infrared, vapor phase and wave soldering with usual (63/37 SnPb-) solder (melting point at 183degC).

The following test methods are applied:

IPC/JEDEC J-STD-020A (issue April 1999)

Moisture/Reflow Sensitivity Classification For Nonhermetic Solid State Surface Mount Devices

CECC00802 (issue 1994)

Standard Method For The Specification of Surface Mounting Components (SMDs) of Assessed Quality

MIL 883 Method 2003 / JEDEC-STD-22 Test Method B102

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.

For more information on manufacturability/solderability see quality page at our website:

<http://www.melexis.com/>

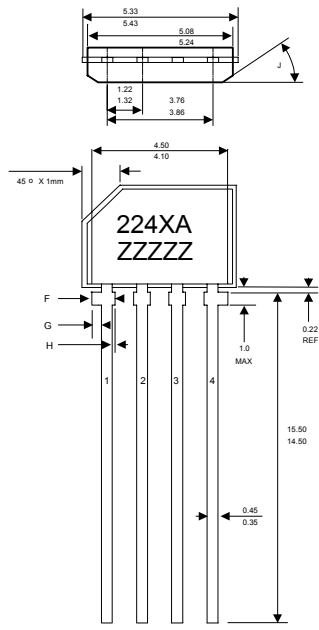
## **11. ESD Precautions**

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

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

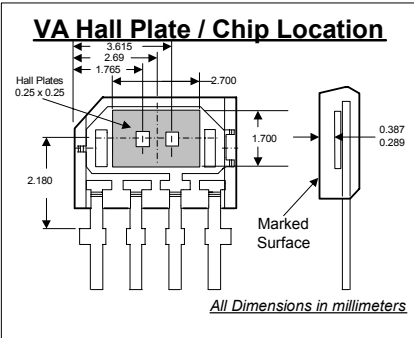


### 12. Package Information



#### 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°



*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
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Back Side Marking

4 digits (WWYY)	=Date Code
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### **13. Disclaimer**

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