

### Features and Benefits

- Chopper Stabilized Amplifier Stage
- CMOS for Optimum Stability, Quality and Cost
- Dual Output
- 4.5V to 28V Operation
- Phase/Direction Detection (B)
- Pulse Doubling Output (C)

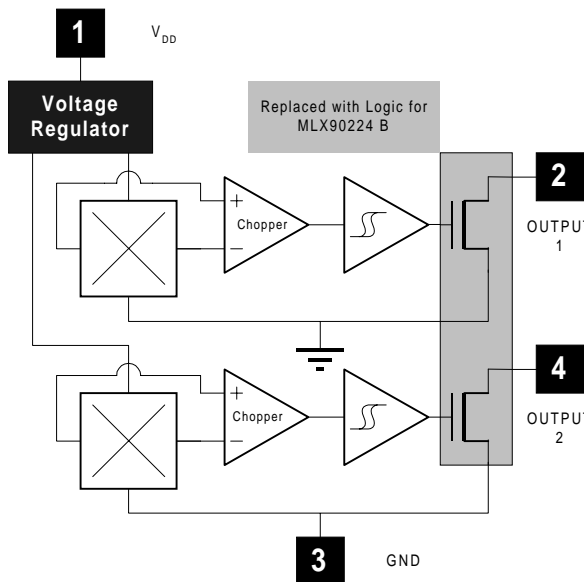
### Applications

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

### Ordering Information

Part No.	Temperature Suffix	Package	Temperature Range
MLX90224 A	L	VA	-40°C to 150°C Automotive
MLX90224 B	L	VA	-40°C to 150°C Automotive
MLX90224 C	L	VA	-40°C to 150°C Automotive

### Functional Diagram



### Description

The MLX90224 series are dual Hall effect latches. 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 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 MLX90224 A, C output transistor will be “latched 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 “latched off” (B<sub>RP</sub>) in the presence of a North field. Spacing on the plates is 1.85mm.

The MLX90224 B series are designed for direction detection with a high speed chopper which provides 15µs delay.

*Note: Static sensitive device, please observe ESD precautions.*

### MLX90224 Electrical Specifications

DC Operating Parameters TA = -40°C to 150°C, VDD = 4.5V to 28V (Unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V <sub>DD</sub>	Operating	4.5	5	28	V
Supply Current	I <sub>DD</sub>		5.0	7.5	10	mA
Output Current	I <sub>OUT</sub>	B>B <sub>OP</sub>			20	mA
Output Voltage	V <sub>SAT</sub>	B>B <sub>OP</sub> I <sub>OUT</sub> = 20 mA		200	400	mV
Output Voltage	V <sub>OUT</sub>	B<B <sub>RP</sub>			28	V
Output Leakage	I <sub>LEAK</sub>	B<B <sub>RP</sub> V <sub>OUT</sub> = V <sub>DD</sub>			1.0	μA
Oscillator Frequency	F <sub>OSC</sub>	MLX90224 A, B MLX90224 C		200 400		kHz kHz
Refresh Time		MLX90224 A, B MLX90224 C		15 7.5		μs μs

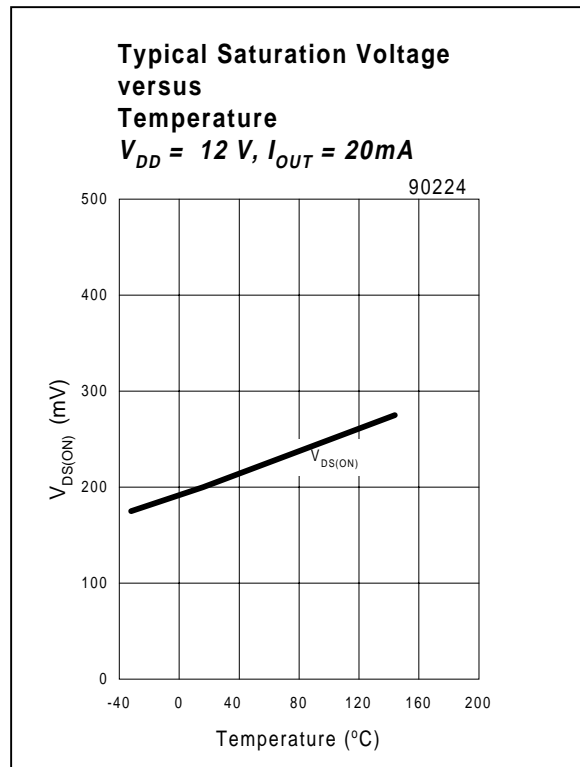
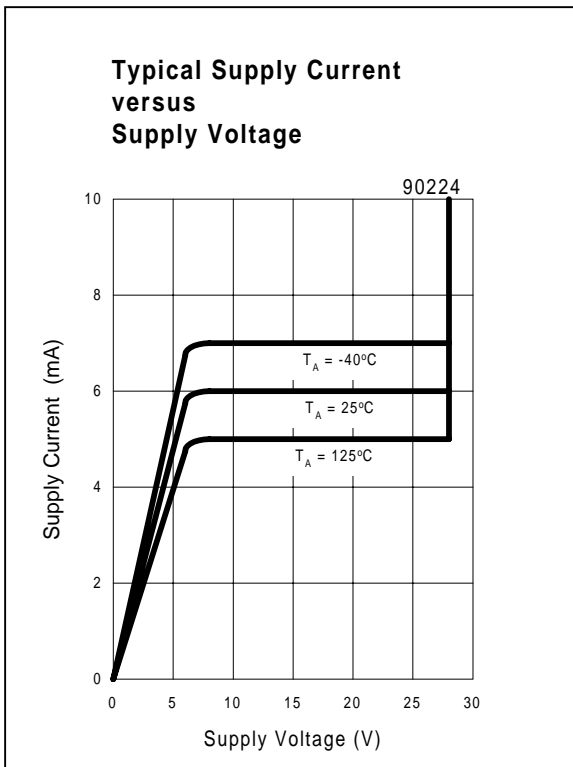
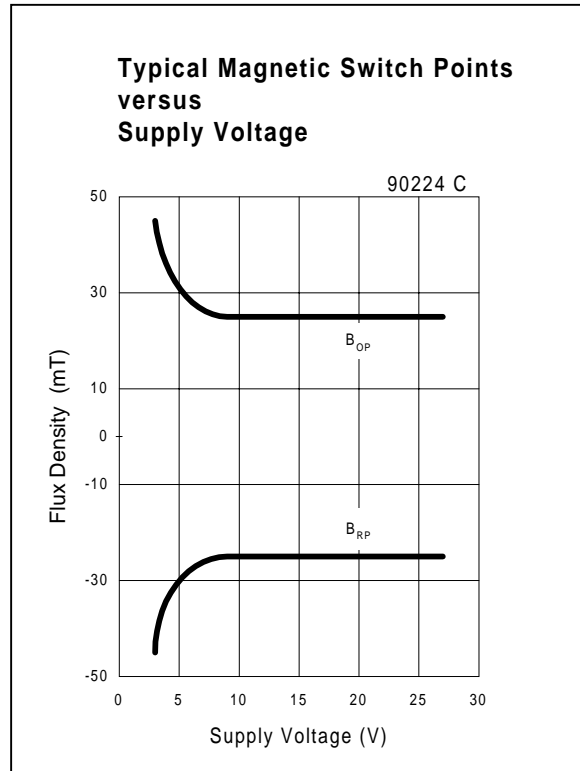
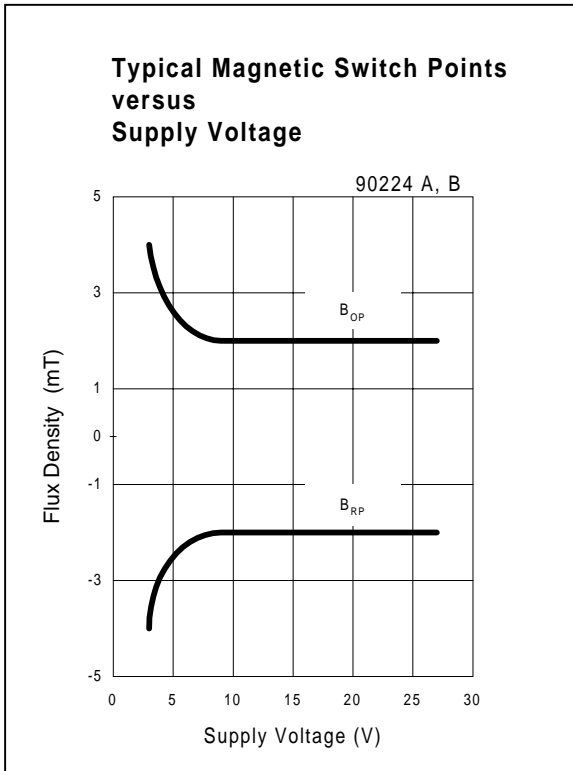
### MLX90224 Magnetic Specifications

DC Operating Parameters TA = -40°C to 150°C, VDD = 4.5V to 28V (Unless otherwise specified)

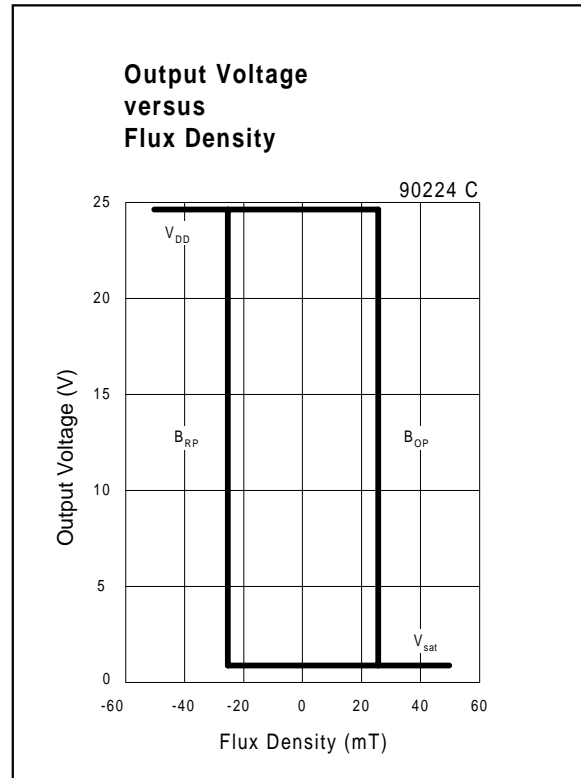
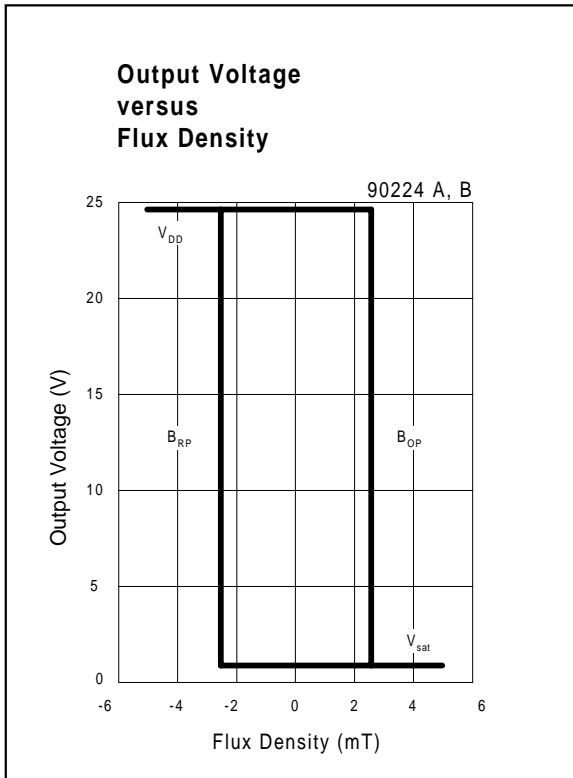
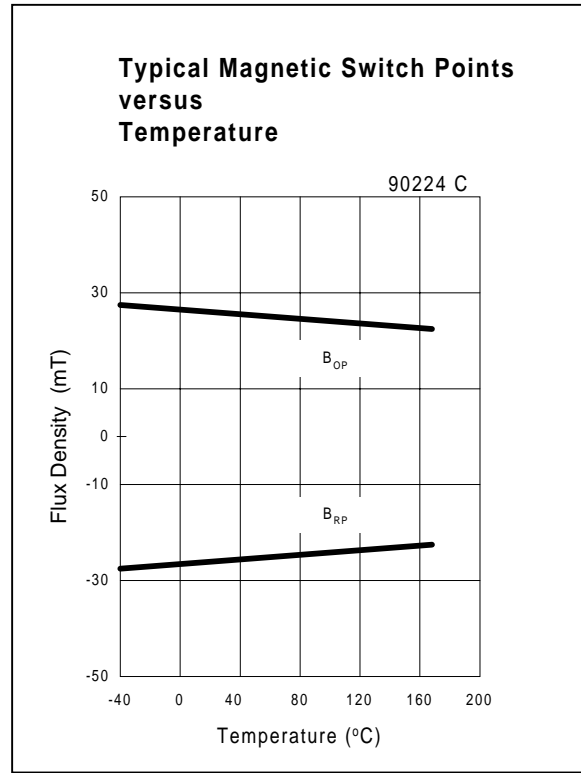
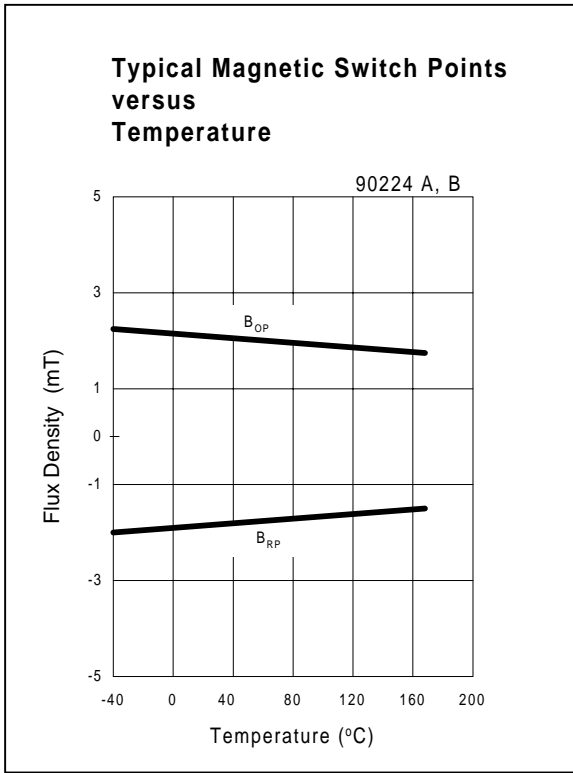
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operate Point	B <sub>OP</sub>	MLX90224 A, B	0.5	2.0	4.0	mT
		MLX90224 C	25	25	27	mT
Release Point	B <sub>RP</sub>	MLX90224 A, B	-4.0	-2.0	-0.5	mT
		MLX90224 C	23	25	27	mT
Hysteresis	B <sub>hys</sub>	MLX90224 A, B	3.0	4.0	5.5	mT
		MLX90224 C	48	50	52	mT

**Notes:** 1mT=10Gauss

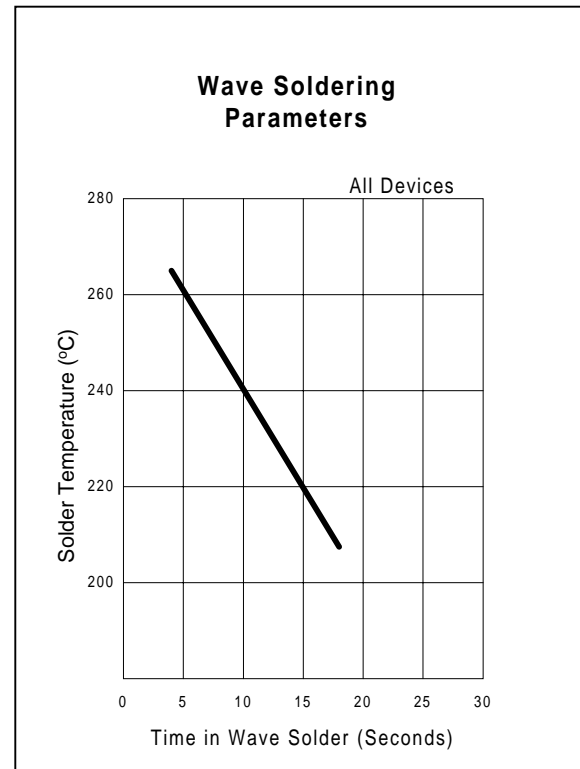
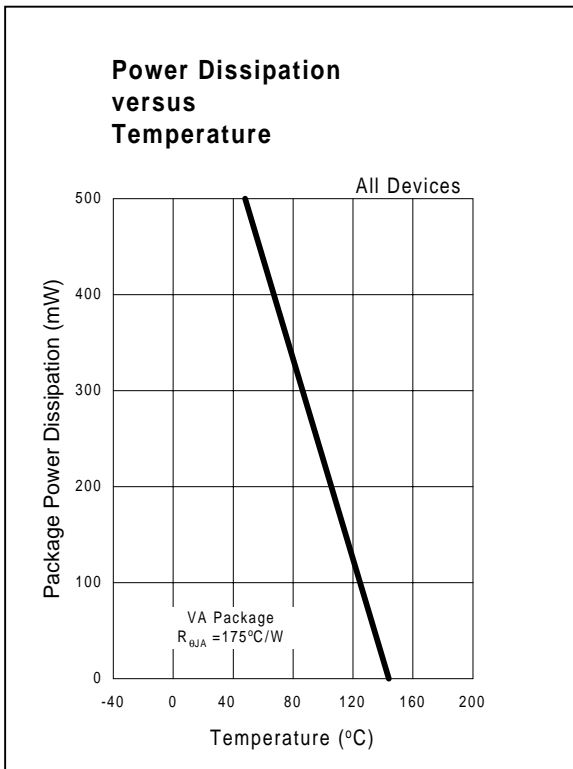
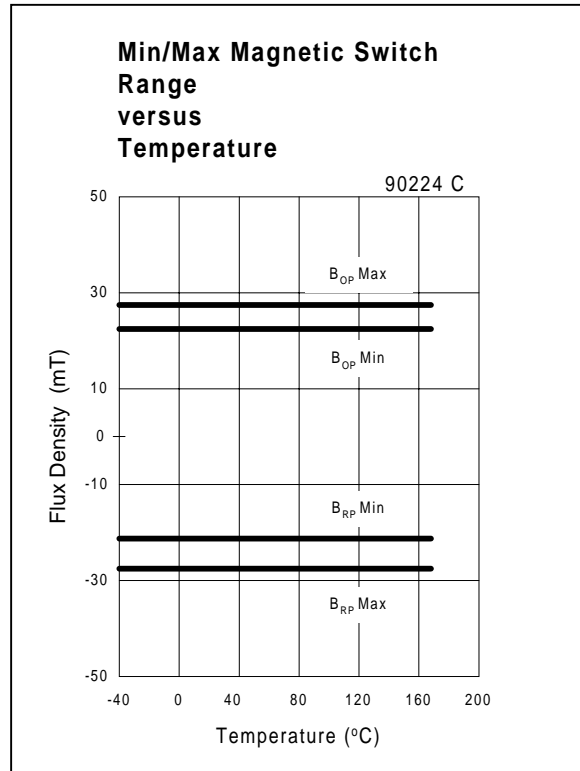
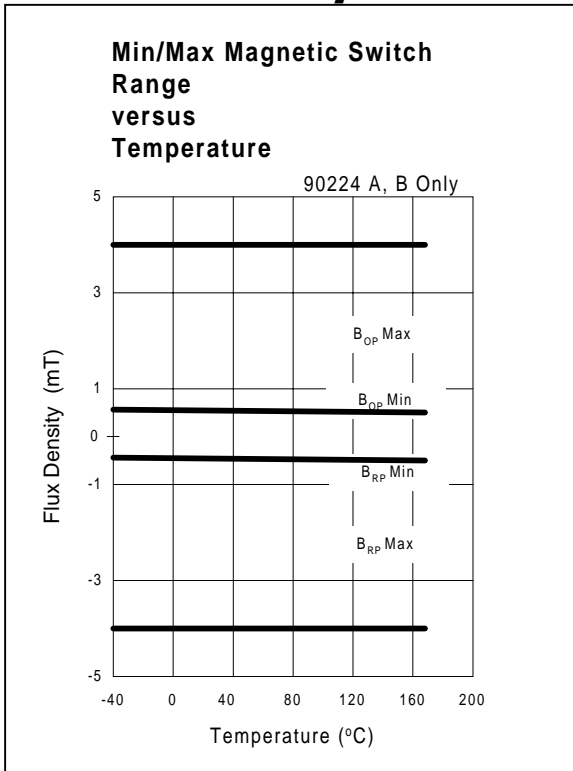
**Performance Graphs**



**Performance Graphs**



**Performance Graphs**



### General Description

The MLX 90224 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 is available in 3 versions. The first version will provide 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 output identical in pulse width and period to S1. This version is referred to as MLX90224 A. The MLX90224 B version will provide an output signal that decodes the phase shifted signals to directly provide an output for the speed which is twice the natural frequency of the alternating magnetic field from the pole spacing of the multipole ring magnet. The other output pin will represent the direction and will change from logic high to logic low when the direction of rotation of the magnet is reversed. This then allows to directly see the condition of the speed with twice the resolution of the MLX90224 A and to also know directly the direction of rotation of the target. The third version of this product the MLX90224 C will be identical in function of the A but with less sensitive magnetic switch points. The MLX90224 A has Latching magnetic Bop and Brp values of typically +/- 2mT as does the internal circuitry of the B. The C version has also Latching magnetic trip points but with the thresholds set to +/- 25mT.

### Typical Application

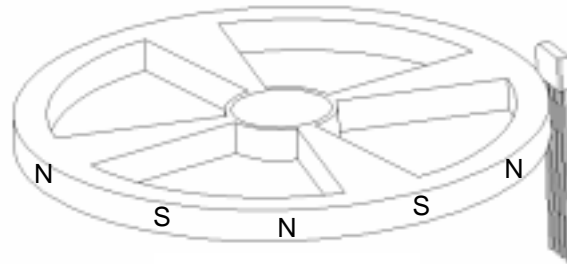


Fig. 1

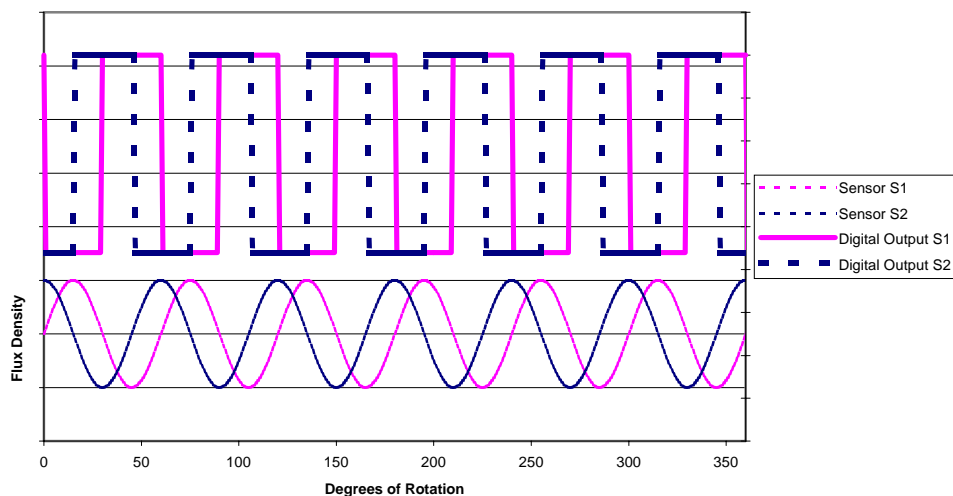
### Cross Reference

The MLX90224LVA can replace the following Hall effect devices: Allegro A3421KA /A3422KA

### Absolute Maximum Ratings

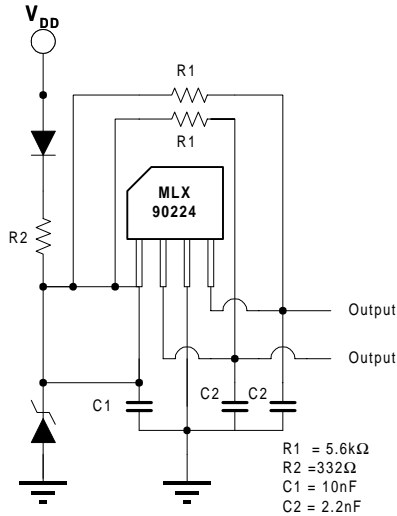
Supply Voltage (Operating), $V_{DD}$	30V
Reverse Voltage Protection	30V
Supply Current, $I_{DD}$	50mA
Output "On" Current, $I_o$	50mA
Power Dissipation, $P_D$	300mW
Operating Temperature Range, $T_A$	-40°C to 150°C
Storage Temperature Range, $T_S$	-65°C to 165°C
Maximum Junction Temp, $T_J$	+175°C
ESD Sensitivity	+/- 7KV

Multipole Ring Magnet and MLX90224BA or BC



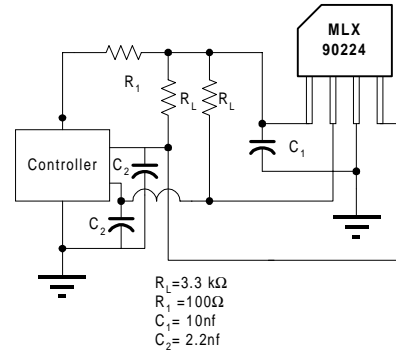
**Application Notes**

**Severe Environment and Automotive Protection Circuit**

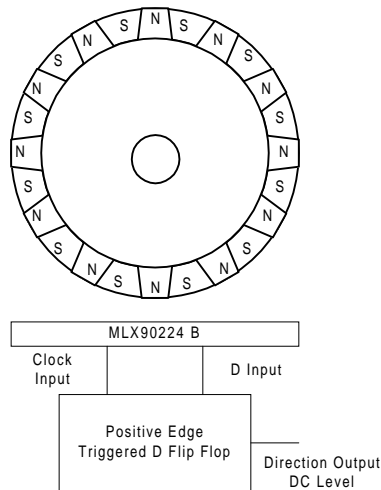


In severe cases it may be necessary to include a Zener diode to clamp positive interference and Schottky diodes to clamp negative excursions.

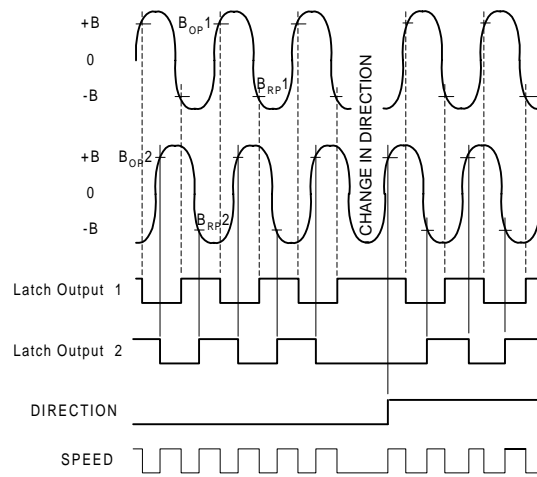
**Microcontroller Application Schematic with EMC Protection**



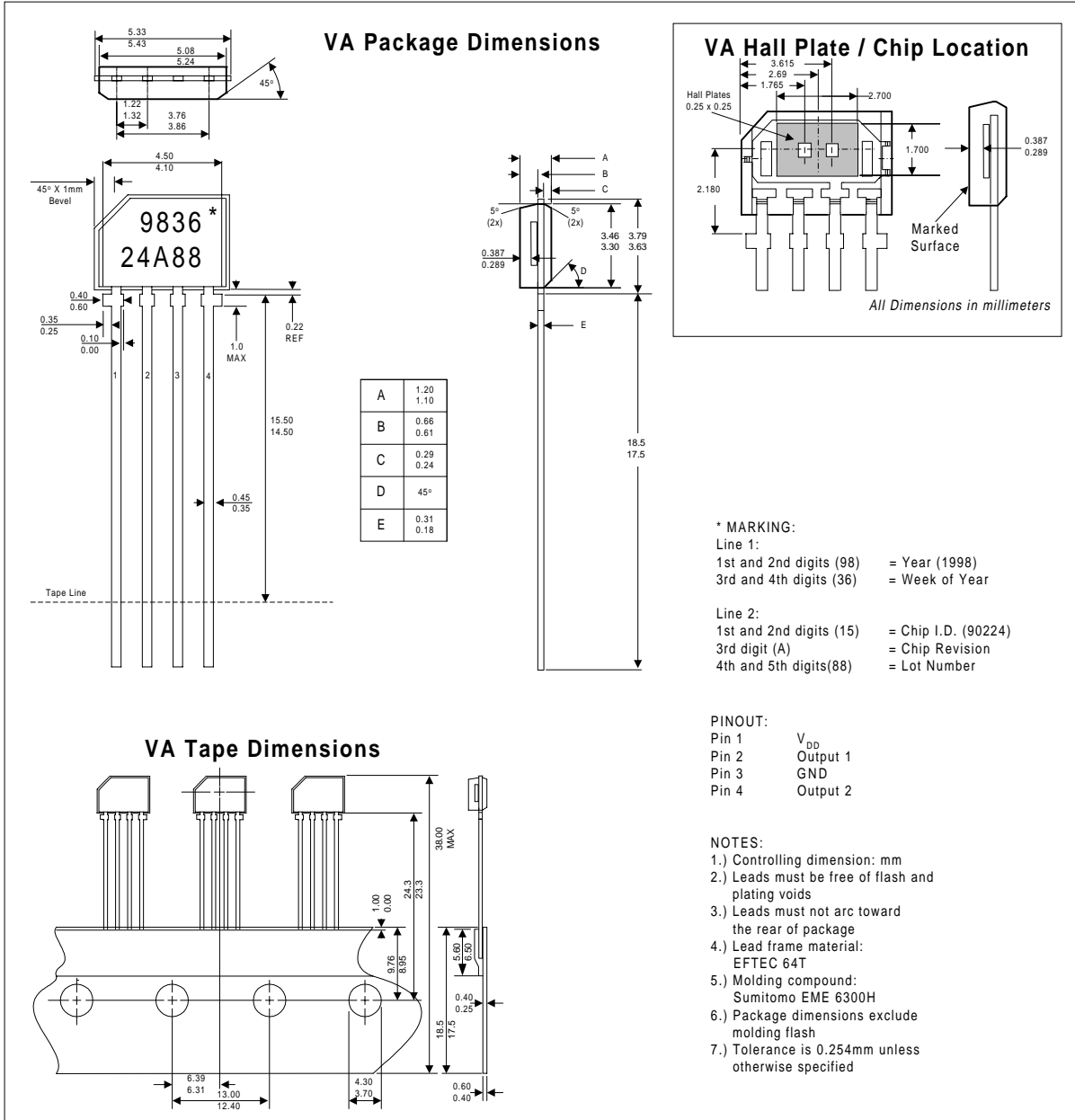
**Direction-Detection Circuit**



**Timing Diagram**



### Physical Characteristics



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