MLX90223
Two Wire Switch

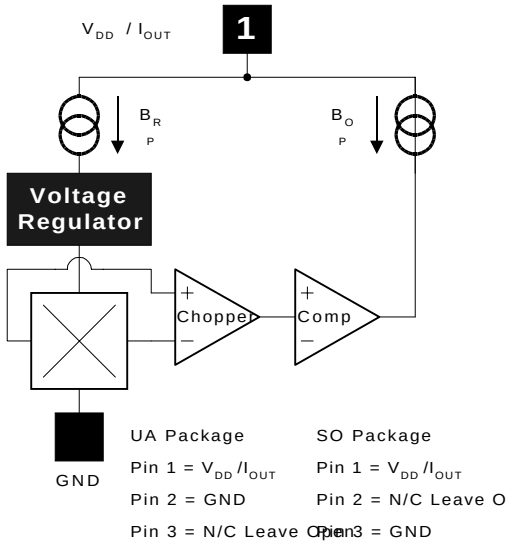
Features and Benefits
- Two wire operation
- CMOS for optimum stability, quality and cost
- New miniature package / thin, high reliability package
- Operation down to 3.5V

Applications
- Automotive reed switch replacement
- Solid state switch
- Speed sensing

Ordering Information

Part Number	Temperature Suffix	Package Suffix	Temperature Range
MLX90223	E	SO or UA	-40 to 85°C Extended

Functional Block Diagram



Description

The MLX90223ESO and MLX90223EUA are Hall effect switches, configured to use two wires rather than three, by combining the leads for power supply and output. The power supply current increases by ~ 10 mA in the Bop state.

With no magnetic field present, the supply current is ~5 mA. In the presence of a sufficiently strong North magnetic flux (>10 mT) to the marked face of the UA package, the device will enter the B_{OP} state and the supply current will increase to l5 mA. Decreasing the flux to 3 mT or less will put the device in the B_{RP} state. The SOT device responds to a magnetic field opposite to that of the UA package. In the presence of a sufficiently strong South pole magnetic field at the marked face of the device, the SOT-23 unit will enter the B_{OP} state and the supply current will increase to l5 mA.

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

MLX90223 Electrical Specifications

DC Operating Parameters: T_A = -40 to 85°C, V_{DD} = 3.75 to 6.0V_{DC} (unless otherwise specified).

Parameter	*Symbol*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*
Supply Voltage	V_{DD}	Operating	3.75	5.0	6.0	V
Operating Current High	$I_{DD\ high}$	B>B_{OP}	11	15	19.4	mA
Operating Current Low	$I_{DD\ low}$	B<B_{RP}	3.9	5	6.9	mA
Data Valid Delay	T_{DLY}	DB>B_{hys}			25	ms
Thermal Resistance	R_{TH}	Operating SO Package		575		°C/W
Thermal Resistance	R_{TH}	Operating UA Package		206		°C/W

MLX90223 Magnetic Specifications

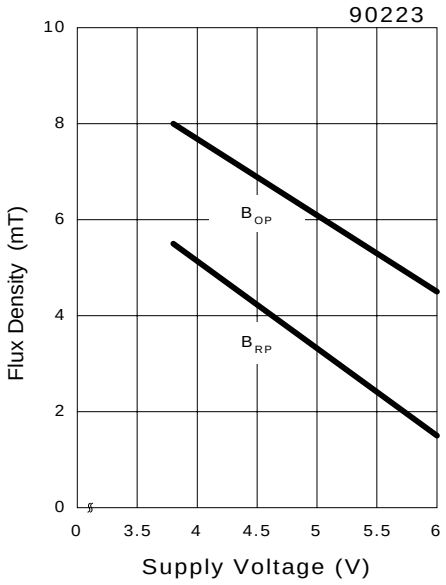
DC Operating Parameters: T_A = -40 to 85°C, V_{DD} = 3.75 to 6.0V_{DC} (unless otherwise specified).

Parameter	*Symbol*	*Test Conditions*	*Min*	*Typ*	*Max*	*Units*
Operating Point	B_{OP}			6.0	12.5	mT
Release Point	B_{RP}		-0.5			mT
Hysteresis	B_{hys}			3.0		mT
Operating Point	B_{OP}	V_{DD} = 5.0 V_{DC}		6.0	8.5	mT
Release Point	B_{RP}	V_{DD} = 5.0 V_{DC}	1.0			mT

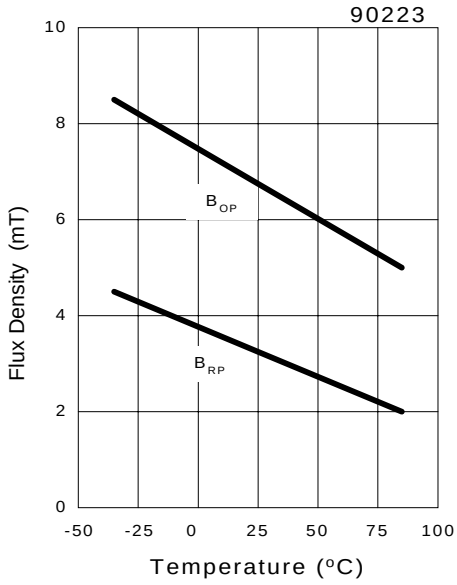
Note: 1 mT = 10 Gauss.

Performance Graphs

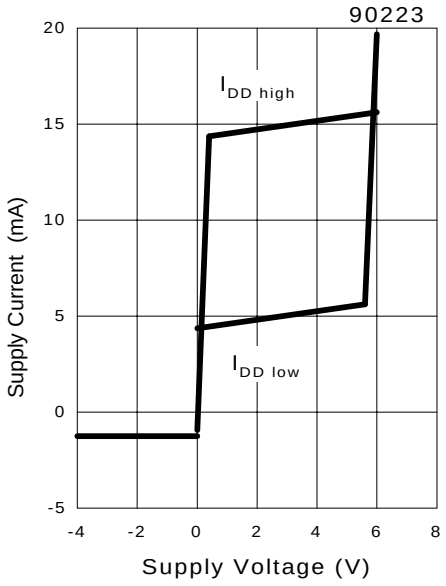
Typical Magnetic Switch Point versus Supply Voltage
(Temperature = 25 (°C)



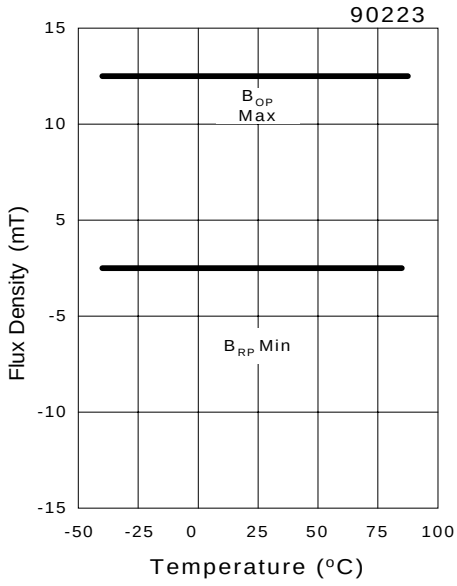
Typical Magnetic Switch Point versus Temperature
Vdd = 5.0v

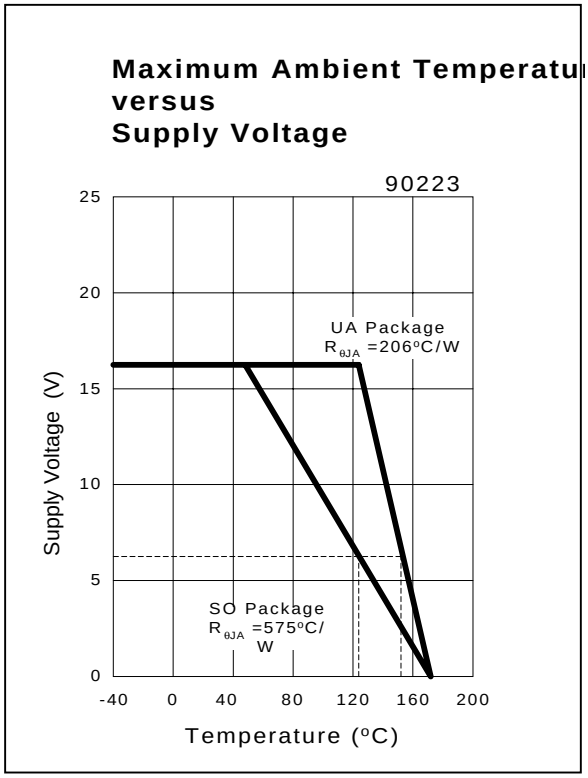


Typical Supply Current versus Supply Voltage
T_A = 25ºC



Min/Max Magnetic Switch Ran versus Temperature





Unique Features

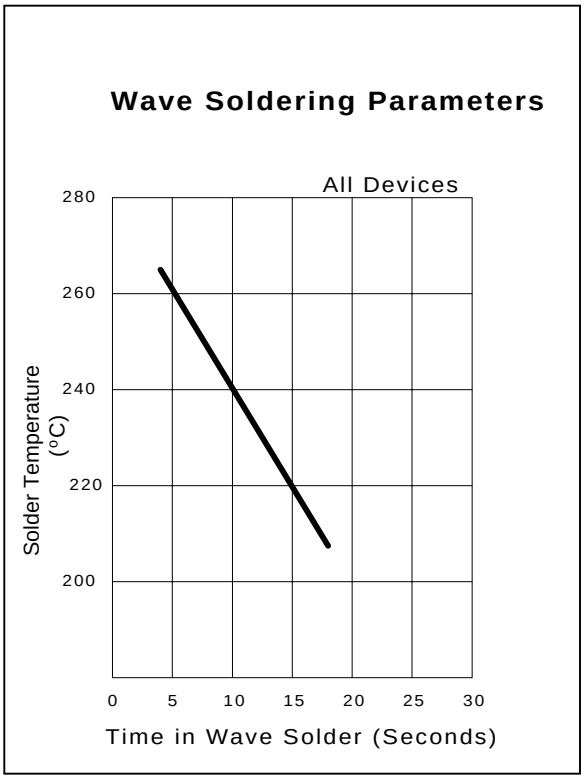
The key feature of the MLX90223LSO is the SOT-23 miniature package, which is made possible by MELEXIS' small Hall IC chip. The chip size is made possible by analog CMOS process and chopper stabilized circuit design. Due to the self heating caused by the 15 mA $I_{DD\ high}$ current, the ambient temperature is limited by the power dissipation of 90mW @ 6V. For example, the graph entitled "Maximum Ambient Temperature vs Supply Voltage" shows that, in a 5V controller application (6V on the graph), the maximum ambient Temperature is 123°C for the SOT package and 156°C for the UA package.

Maximum Ambient Temperature for the SOT Package:

From: $T_J = T_A + q_{J\text{-}C}(PD)$,
$T_A = T_J - q_{J\text{-}C}(V_{DD} \times I_{DD})$.
$T_A = 175°C - 575°C/W\ (6V \times 15mA)$.
$T_A = 175°C - 52°C = 123°C$.

Maximum Ambient Temperature for the UA Package:

From: $T_J = T_A + q_{J\text{-}C}(PD)$,
$T_A = T_J - q_{J\text{-}C}(V_{DD} \times I_{DD})$.
$T_A = 175°C - 206°C/W\ (6V \times 15mA)$.
$T_A = 175°C - 19°C = 156°C$.



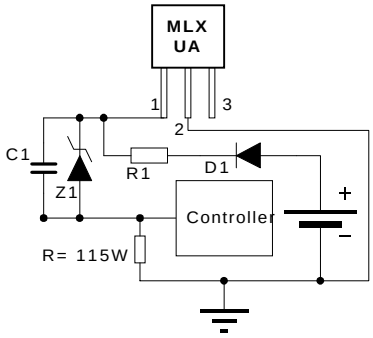
Absolute Maximum Ratings

Supply Voltage (Operating)	16V
Reverse Voltage Protection	-12V
Supply Current, I_{DD}	-50mA
Power Dissipation, P_D	See Graph
Operating Temperature Range, T_A	-40 to 85°C
Storage Temperature Range, T_S	-65 to 150°C
Maximum Junction Temp, T_J	175°C
ESD Sensitivity	+/- 5KV

Applications Examples

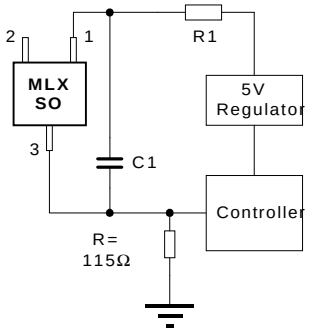
The 2 wire Hall device output / V_{DD} lead must be connected to a controller configured to measure current. The MLX90223ESO is intended to replace reed switches on an automotive interior wall. It was designed to operate with a 5V microcontroller from 3.75 to 5.25V_{DC} and -40 to +85°C.

12V Battery Application UA Package



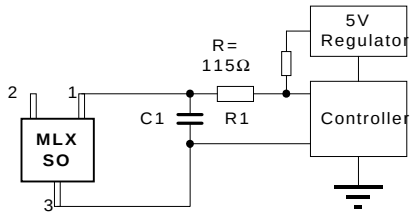
D1 Used for Reverse Voltage Protection, -24v, -150V impl
Z1 Used for over voltage Protection such as +24V, 150V i
R1, C1 Work with the diodes and provide conducted and r
EMC filtering.

5V Microcontroller Application SOT-23 Package



R1,C1Provide Radiated EMC filtering.
Values depend on many factors. The following are suggested values.Optimum values may be determined from EMC testing.
R1=100Ω
C1= 0.001µf

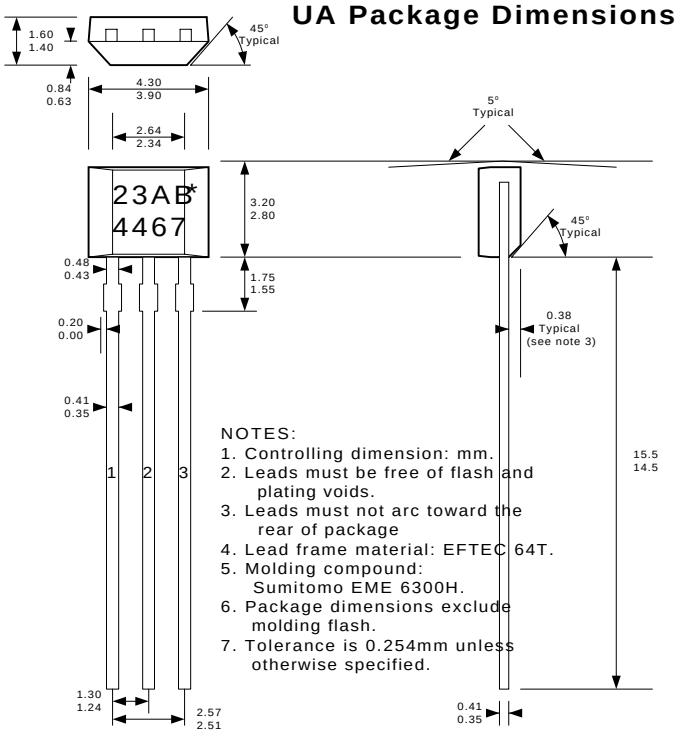
5V Microcontroller Application SOT-23 Package



R1,C1Provide Radiated EMC filtering.
Values depend on many factors. The following are suggest values.Optimum values may be determined from EMC test
R1=100Ω
C1= 0.001µf

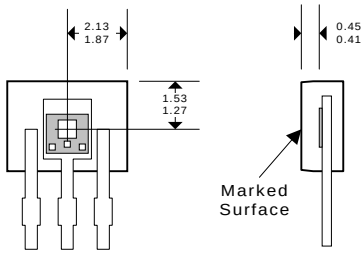
Physical Characteristics

UA Package Dimensions



NOTES:
1. Controlling dimension: mm.
2. Leads must be free of flash and plating voids.
3. Leads must not arc toward the rear of package
4. Lead frame material: EFTEC 64T.
5. Molding compound: Sumitomo EME 6300H.
6. Package dimensions exclude molding flash.
7. Tolerance is 0.254mm unless otherwise specified.

UA Hall Plate / Chip Location



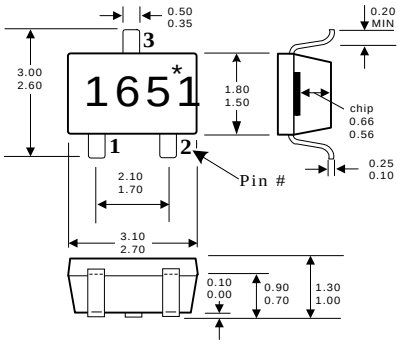
All dimensions in millimeters

* MARKING:
Line 1:
1st and 2nd digits (23) = Chip I.D. (90223)
3rd and 4th digits (AB) = Revision Number

Line 2:
1st digit (4) = Lot Number
2nd and 3rd digits(46) = Week of Year
4th digit (7) = Year (1997)

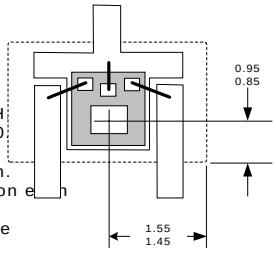
PINOUT:
Pin 1 V_{DD} / I_{DD}
Pin 2 GND
Pin 3 N/C Leave Open

SOT-23 Package Dimensions (Top View)



NOTES:
1. MARKING:
   1st Digit (1) = Series (1880)
   2nd Digit(6) = Year - 1996
   Last Digits (51) = Week of Year
2. PINOUT (See Top View at left):
   Pin 1 VDD
   Pin 2 Output
   Pin 3 GND
3. Controlling dimension: mm.
4. Lead frame material: EFTEC 64T or 1/2H.
5. Molding compound: Sumitomo EME 6300H.
6. Lead thickness after solder plating will be 0.
   mm maximum.
7. Package dimensions exclude molding flash.
8. The end flash shall not exceed 0.127 mm on e
   side of package.
9. Tolerance is +/- 0.254 mm unless otherwise specified.

SOT-23 Hall Plate / Chip Location (Bottom View)



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