US5782

CMOS High Sensitivity Switch
Datasheet

Features and Benefits

- Chopper stabilized amplifier stage
- New miniature package / thin, high reliability package
- Operation down to 3.5V
- CMOS for optimum stability, quality, and cost

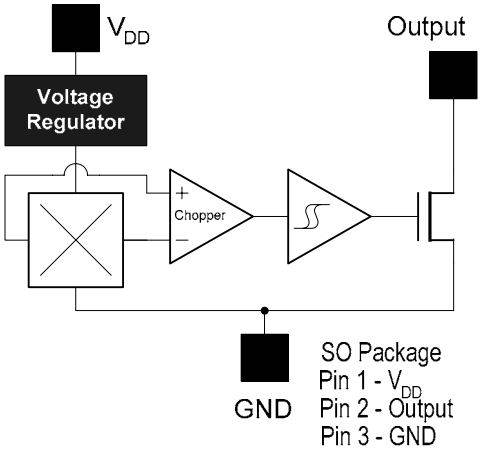
Applications

- Solid state switch
- Limit switch
- Current limit
- Interrupter

Ordering Information

Part No.	Temperature Suffix	Package Code
US5782	L (-40°C to 150°C)	SO (SOT-23)

Functional Diagram



Description

The US5782 is a unipolar Hall effect sensor IC fabricated from mixed signal CMOS technology. It incorporates advanced chopper stabilization techniques to provide accurate and stable magnetic switch points. There are many applications for this sensor in addition to those listed above. The design, specifications and performance have been optimized for applications of solid state switches.

The 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 weaker South field and remain off with “0” field.

***Note: This is a** static-sensitive device; please observe ESD precautions. Reverse V_{DD} protection is not included. For reverse voltage protection, a 100 R resistor in series with V_{DD} is recommended.*

US5782 Electrical Specifications

DC operating parameters: T_A = 25°C, V_{DD} = 12V_{DC} (unless otherwise specified).

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	3.5		24	V
Supply Current	I_{DD}	B<B_{RP}	0.5	2.5	5.0	mA
Saturation Voltage	$V_{DS(on)}$	I_{OUT} = 20 mA, B>B_{OP}		0.3	0.5	V
Output Leakage	I_{OFF}	B<B_{RP}, V_{OUT} = 27V		0.01	10.0	µA
Output Rise Time	t_r	V_{DD} = 12V, R_L = 1.1KΩ, C_L = 20pf		0.04		µs
Output Fall Time	t_f	V_{DD} = 12V, R_L = 1.1KΩ, C_L = 20pf		0.18		µs

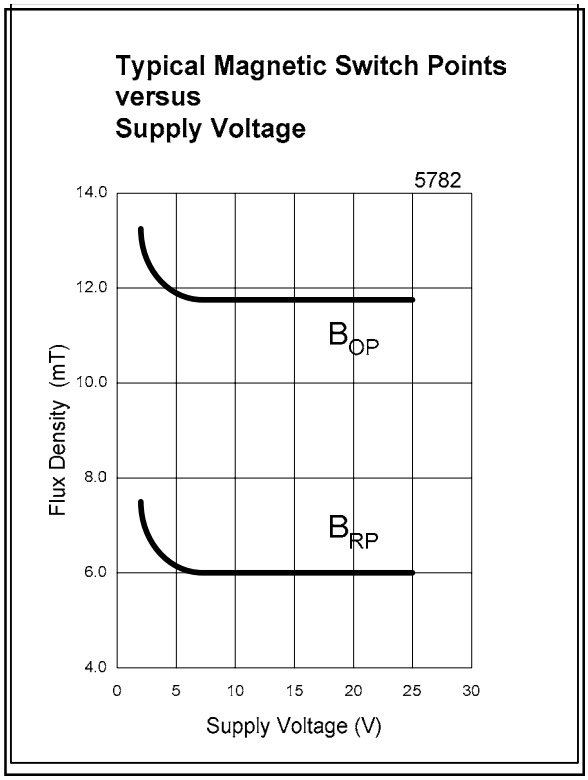
US5782 Magnetic Specifications

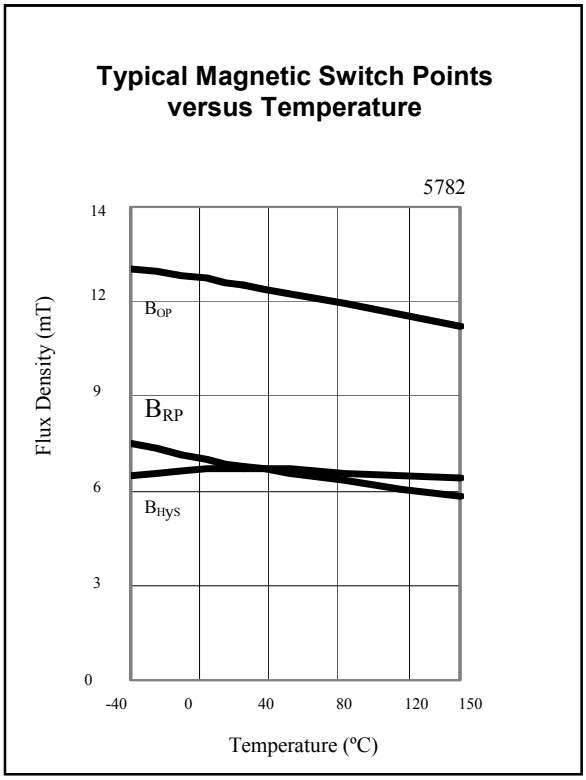
Magnetic operating parameters: T_A = 25°C, V_{DD} =12 V_{DC} (unless otherwise specified).

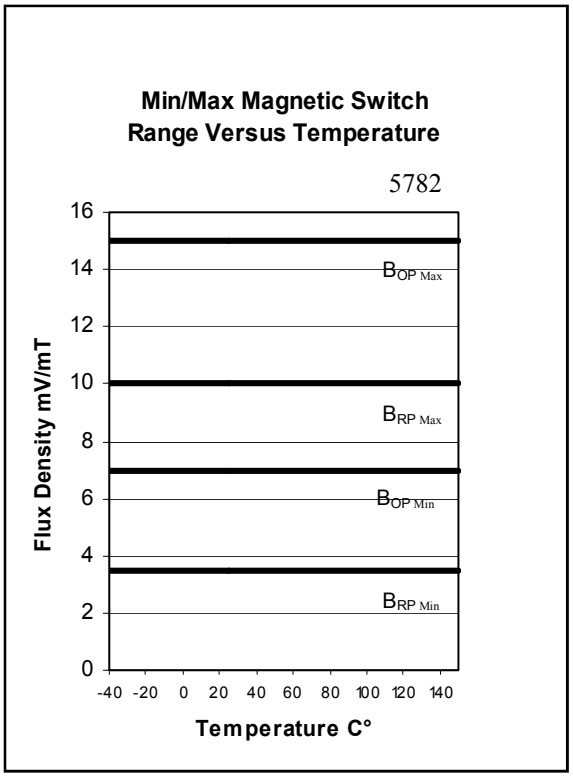
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating Point	B_{OP}		7.0	12.0	15.0	mT
Release Point	B_{RP}		3.5	7.0	10.0	mT
Hysteresis	B_{hys}		2.0	5.0	7.0	mT

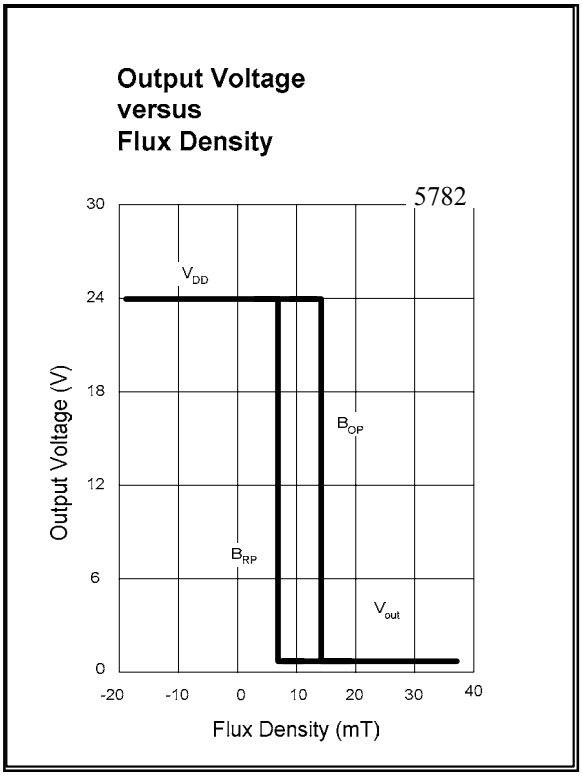
Note: 1 mT = 10 Gauss.

Performance Graphs



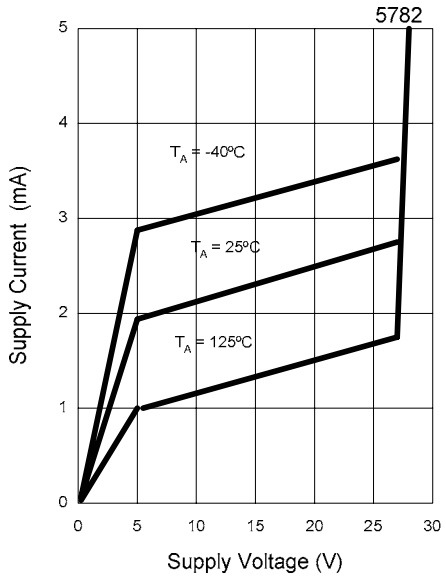




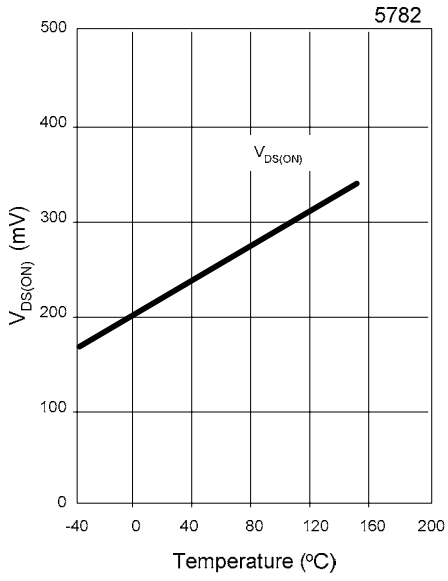


Performance Graphs

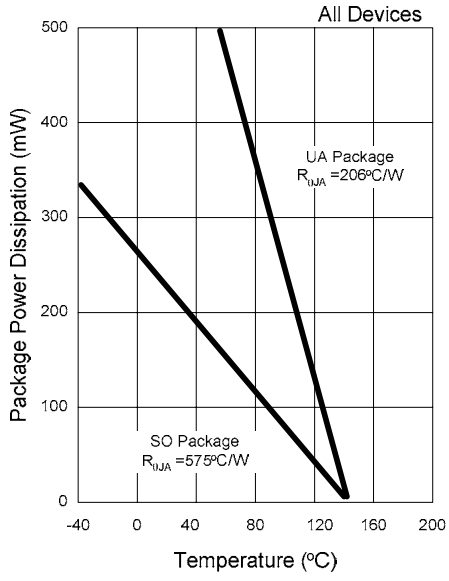
Typical Supply Current versus Supply Voltage



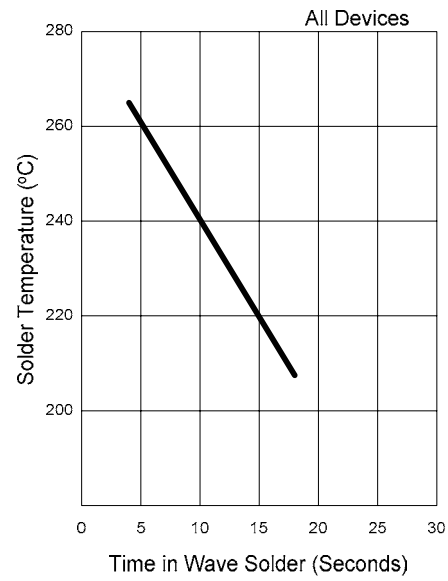
Typical Saturation Voltage versus Temperature
V_{DD} = 12 V, I_{OUT} = 20mA



Power Dissipation versus Temperature



Wave Soldering Parameters



Unique Features

CMOS Hall IC Technology

The chopper stabilized amplifier uses switched capacitor techniques to eliminate the amplifier offset voltage, which, in bipolar devices, is a major source of temperature sensitive drift. CMOS makes this advanced technique possible. The CMOS chip is also much smaller than a bipolar chip, allowing very sophisticated circuitry to be placed in less space. The small chip size also contributes to lower physical stress and less power consumption.

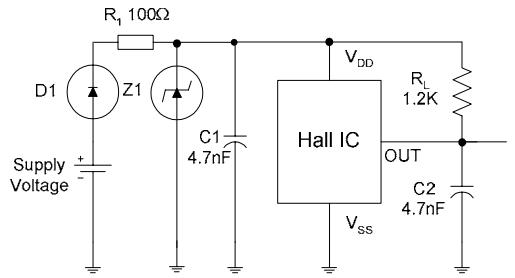
Installation Comments

Consider temperature coefficients of Hall IC and magnetics, as well as air gap life time variations. Observe temperature limits during wave soldering.

Applications

If reverse supply protection is desired, use a resistor in series with the V_{DD} pin. The resistor will limit the supply current (Fault), I_{DD}, to 50 mA. For severe EMC conditions, use the application circuit on this page.

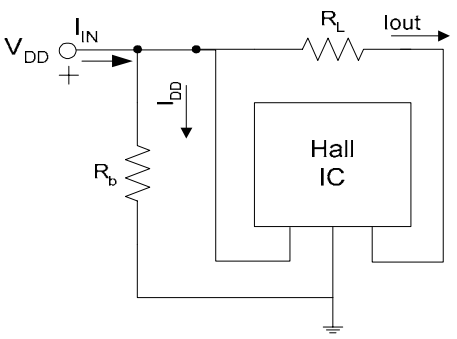
Automotive and Severe Environment Protection Circuit



Absolute Maximum Ratings

Supply Voltage (Operating), V_{DD}	3.5V to 24V
Supply Current (Fault), I_{DD}	50mA
Output Voltage, V_{OUT}	3.5V to 24V
Output Current (Fault), I_{OUT}	50mA
Power Dissipation, P_D	100mW
Operating Temperature Range, T_A	-40 to 150°C
Storage Temperature Range, T_S	-65 to 150°C
Maximum Junction Temp, T_J	175°C

Two Wire Current Biasing Circuit

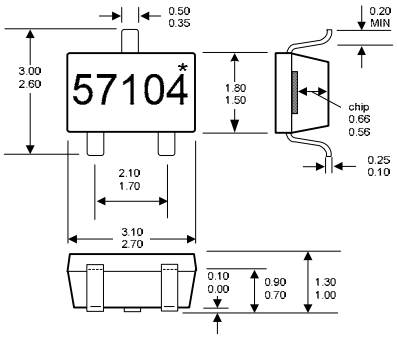


The resistors R_b and R_L can be used to bias the input current, Iin. Refer to the part specification for limiting values. This circuit will help in getting the precise ON and OFF currents desired.

$$B_{RP} = Ioff = (V_{DD} / Rb + I_{DD})$$
$$B_{OP} = Ion = (Ioff + V_{DD} / R_L)$$

Physical Characteristics

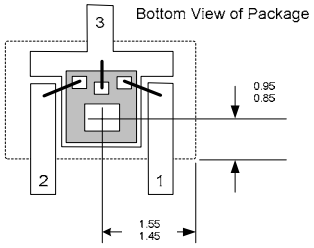
SOT-23 Package Dimensions



* MARKING:
1st & 2nd Digit (57) = Series (5780)
3rd Digit(1) = Year - 2001
Last Digits (04) = Week of Year

NOTES:
1.) Controlling dimension: mm
2.) Lead thickness after solder plating will be 0.254 mm maximum
3.) Package dimensions exclude molding flash
4.) The end flash shall not exceed 0.127mm on each side of package
5.) Tolerance is 0.254mm unless otherwise specified

SOT-23 Hall Plate / Chip Location



PINOUT:
Pin 1 V_{DD}
Pin 2 Output
Pin 3 GND

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/

ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).
Always observe Electro Static Discharge control procedures whenever handling semiconductor products.

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Or for additional information contact Melexis Direct:

Europe and Japan:
Phone: +32 13 67 04 95
E-mail: sales_europe@melexis.com

All other locations:
Phone: +1 603 223 2362
E-mail: sales_usa@melexis.com

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