

Features and Benefits

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

Applications

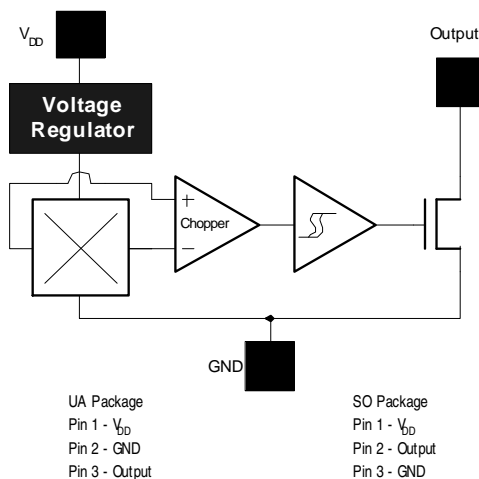
- n Solid state switch
- n Brushless DC motor commutation
- n Speed sensing
- n Linear position sensing
- n Angular position sensing
- n Current sensing

Ordering Information

Part No.	Temperature Suffix	Package
US1881	E (-40°C to 85°C)	SO (SOT-23) or UA (TO-92 flat)
US1881	L (-40°C to 150°C)	SO (SOT-23) or UA (TO-92 flat)

*Contact factory or sales representative for legacy temperature options

Functional Diagram



Description

The US1881 is the industry's first Hall integrated circuit in a SOT-23 package. The US1881 is a bipolar 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 HED in addition to those listed above. The design, specifications and performance have been optimized for commutation applications in 5V and 12V brushless DC motors.

The output transistor will be latched 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 latched off (B_{RP}) in the presence of a North field.

The SOT-23 device is reversed from the UA package. The SOT-23 output transistor will be latched on in the presence of a sufficiently strong North pole magnetic field applied to the marked face.

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

US1881 Electrical Specifications

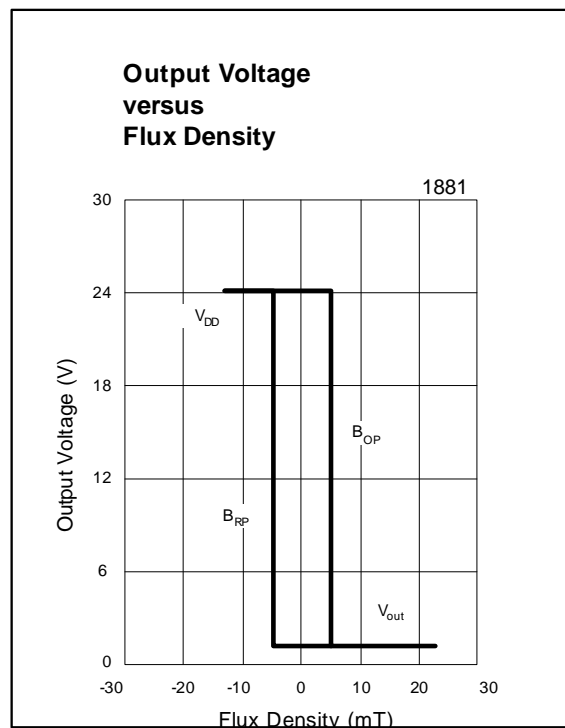
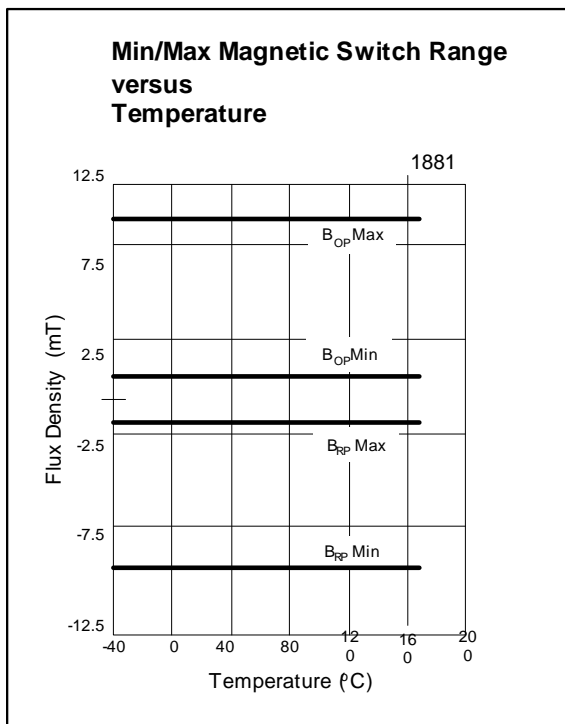
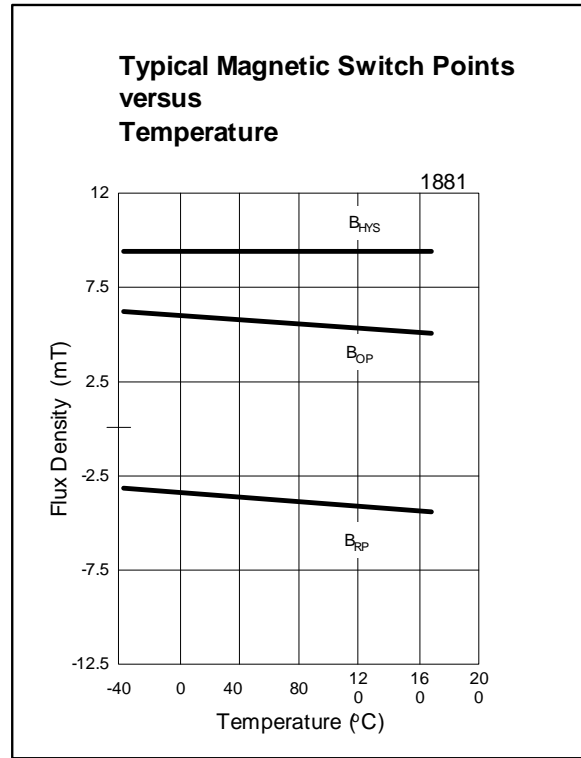
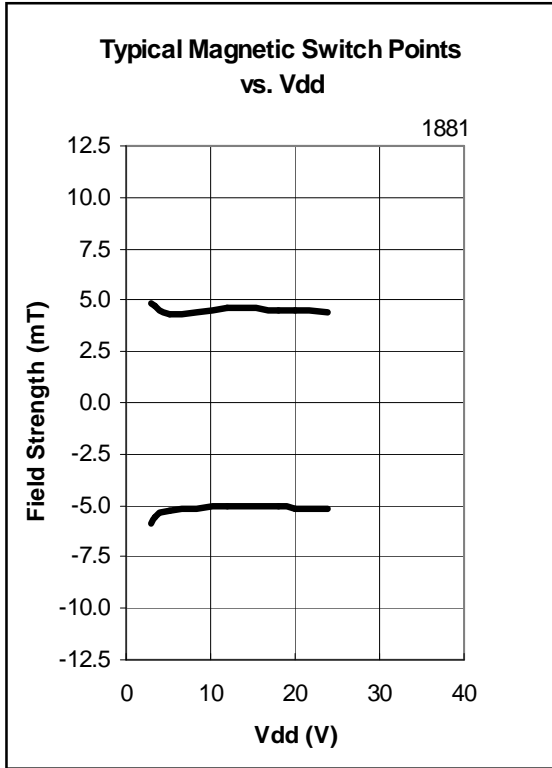
DC Operating Parameters: $T_A = 25$, $V_{DD} = 12V_{DC}$ (unless otherwise specified).

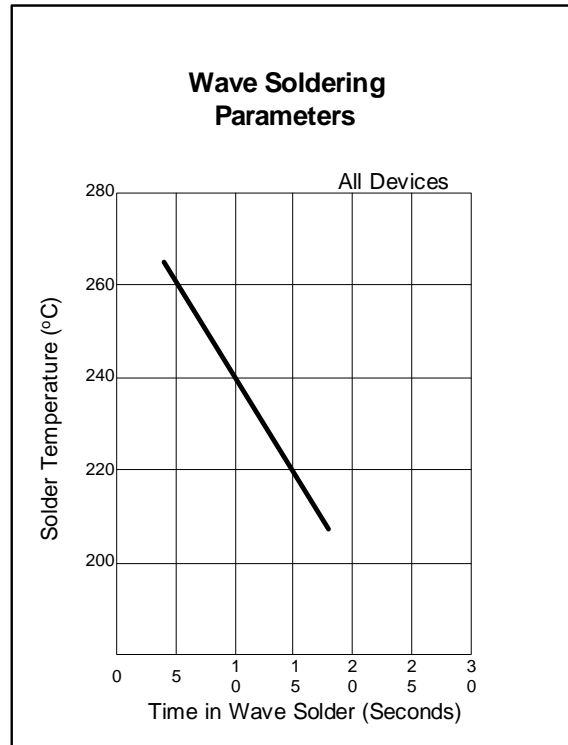
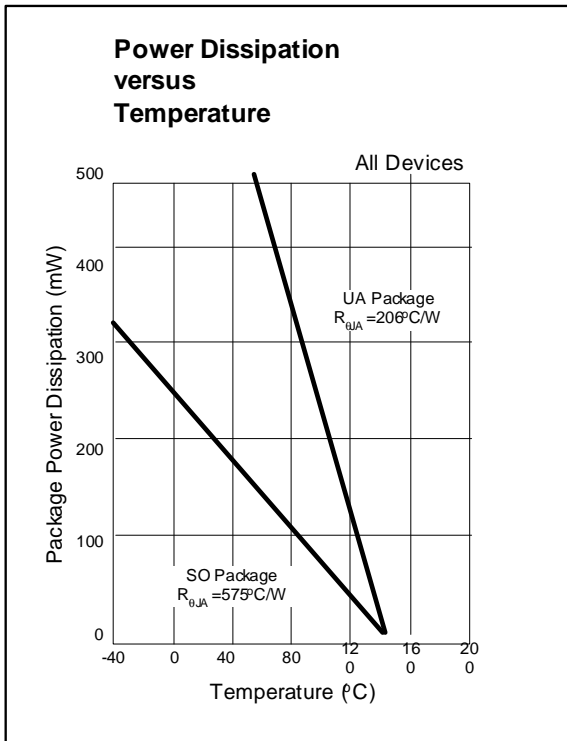
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	3.5		24	V
Supply Current	I_{DD}	$B < B_{OP}$	1.1	2.5	5.0	mA
Saturation Voltage	$V_{DS(on)}$	$I_{OUT} = 20\text{ mA}$, $B > B_{OP}$		0.4	0.5	V
Output Leakage	I_{OFF}	$B < B_{RP}$, $V_{OUT} = 24V$		0.01	10.0	μA
Output Rise Time	t_r	$V_{DD} = 12V$, $R_L = 1.1K\Omega$, $C_L = 20pf$		0.04		μs
Output Fall Time	t_f	$V_{DD} = 12V$, $R_L = 1.1K\Omega$, $C_L = 20pf$		0.18		μs

US1881 Magnetic Specifications

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating Point	B_{OP}	EUA, ESO, LUA, LSO 25°C, $V_{dd} = 3.5$ & 24 volts DC	1.0	5.0	9.0	mT
Release Point	B_{RP}	EUA, ESO, LUA, LSO 25°C, $V_{dd} = 3.5$ & 24 volts DC	-9.0	-5.0	-1.0	mT
Hysteresis	B_{hys}	EUA, ESO, LUA, LSO 25°C, $V_{dd} = 3.5$ & 24 volts DC	7.0	10.0	12.0	mT
Operating Point	B_{OP}	EUA, ESO 85°C, $V_{dd} = 3.5$ & 24 volts DC	0.5	5.0	9.5	mT
Release Point	B_{RP}	EUA, ESO 85°C, $V_{dd} = 3.5$ & 24 volts DC	-9.5	-5.0	-0.5	mT
Hysteresis	B_{hys}	EUA, ESO 85°C, $V_{dd} = 3.5$ & 24 volts DC	7.0	10.0	12.0	mT
Operating Point	B_{OP}	LUA, LSO 150°C, $V_{dd} = 3.5$ & 24 volts DC	0.5	5.0	9.5	mT
Release Point	B_{RP}	LUA, LSO 150°C, $V_{dd} = 3.5$ & 24 volts DC	-9.5	-5.0	-0.5	mT
Hysteresis	B_{hys}	LUA, LSO 150°C, $V_{dd} = 3.5$ & 24 volts DC	6.0	10.0	12.5	mT

Performance Graphs

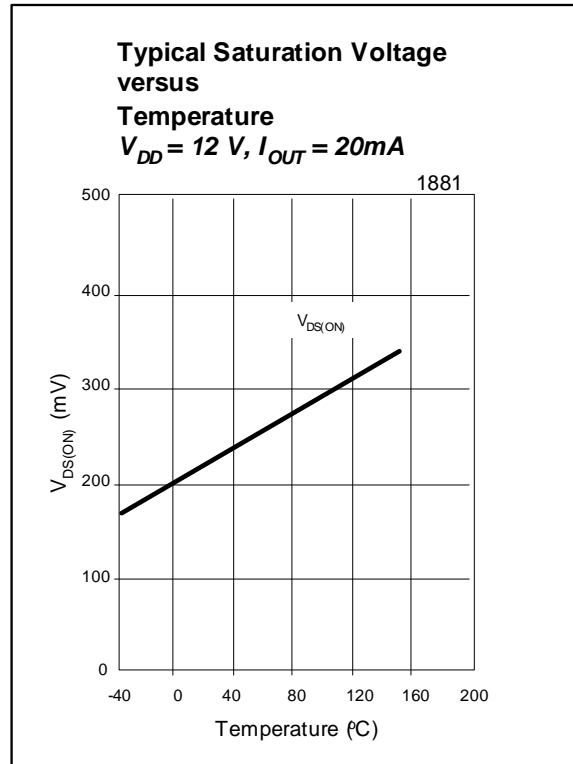
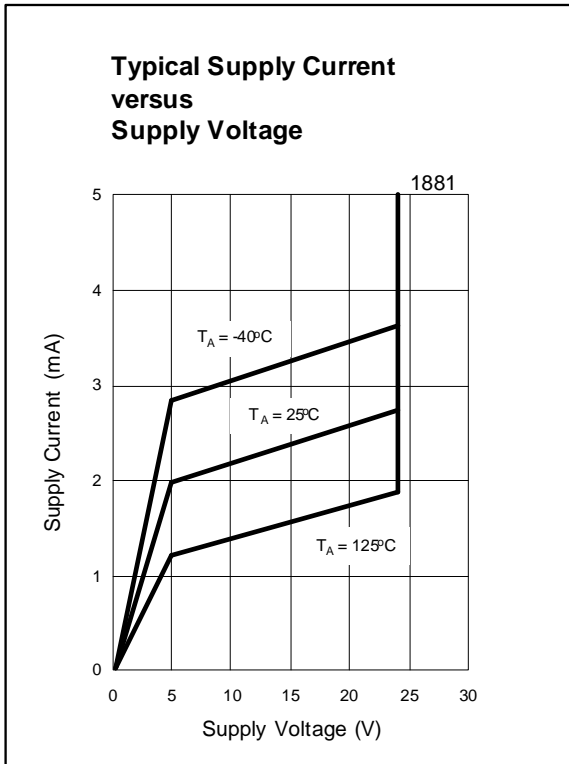




Absolute Maximum Ratings

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°C to 150°C
Maximum Junction Temp, T_J	175°C

Performance Graphs



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

Consider Temperature Coefficients of Hall IC and magnetics, as well as air gap and life time variations. Observe ESD control procedures. Observe temperature limits during wave soldering.

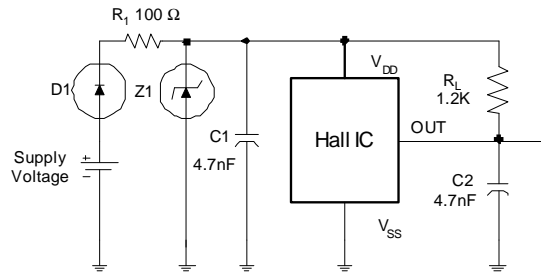
Applications

If reverse supply protection is desired, use a resistor in series with the V_{DD} pin that will limit the Supply Current (Fault), I_{DD} , to 50 mA. For severe

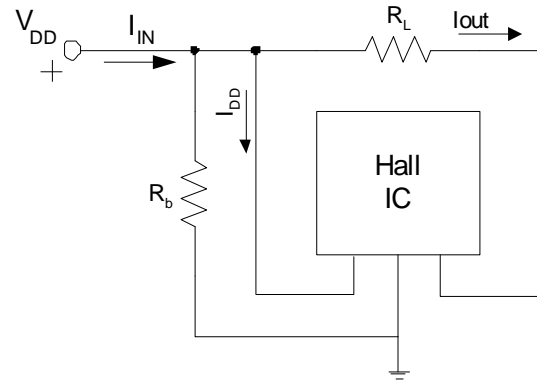
EMC conditions, use the application circuit on the following page.

Applications Examples

Automotive and Severe Environment Protection Circuit



Two Wire Optional Current Biasing Circuit

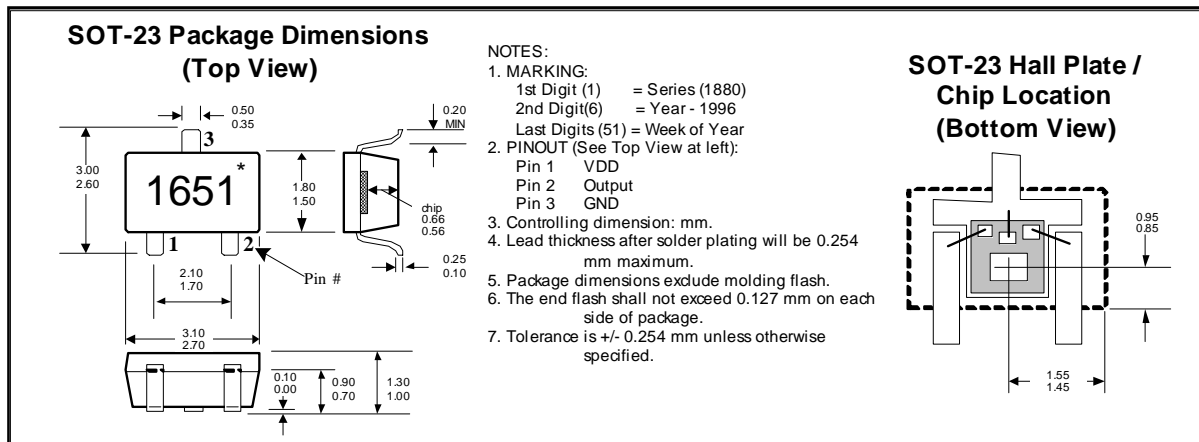
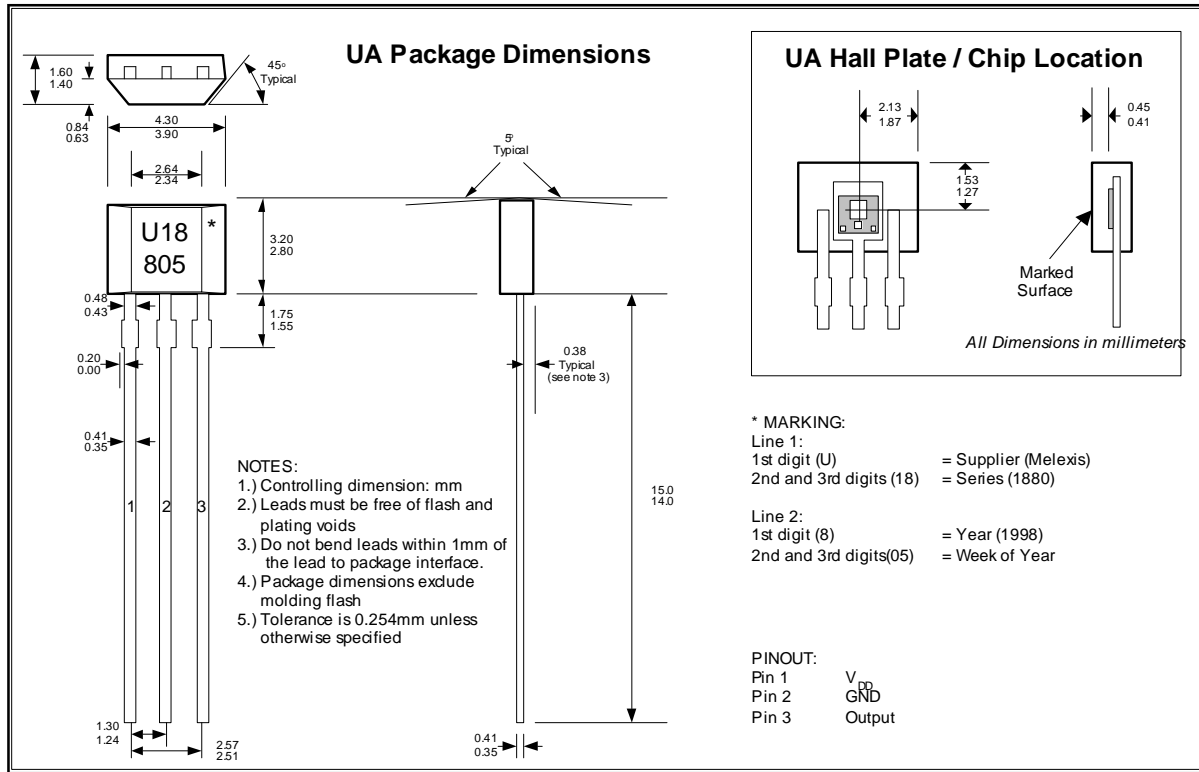


The resistors R_b and R_L can be used to bias the input current, I_{in} . Refer to the part specification for limiting values. This circuit will help in getting the precise ON and OFF currents desired.

$$B_{OP} = I_{off} = (V_{DD} / R_b + I_{DD})$$

$$B_{ON} = I_{on} = (I_{off} + V_{DD} / R_L)$$

Physical Characteristics



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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