

Features and Benefits

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

Applications

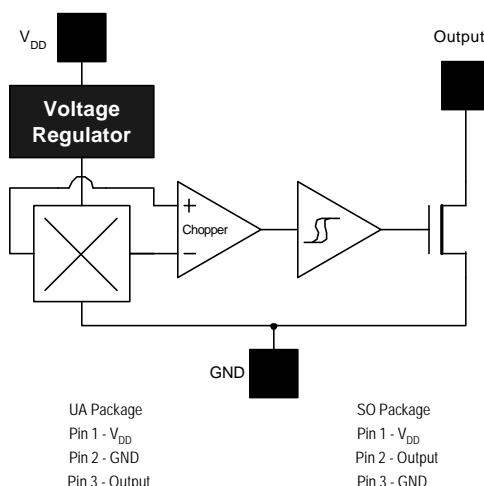
- Solid state switch
- Brushless DC motor commutation
- Speed sensing
- Linear position sensing
- Angular position sensing
- Current sensing

Ordering Information

Part No.	Temperature Suffix	Package	Temperature Range
US1881	E	SO or UA	-40°C to 85°C Commercial
US1881	L	SO or UA	-40°C to 150°C Automotive

*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 100 μ A resistor in series with V_{DD} is recommended.

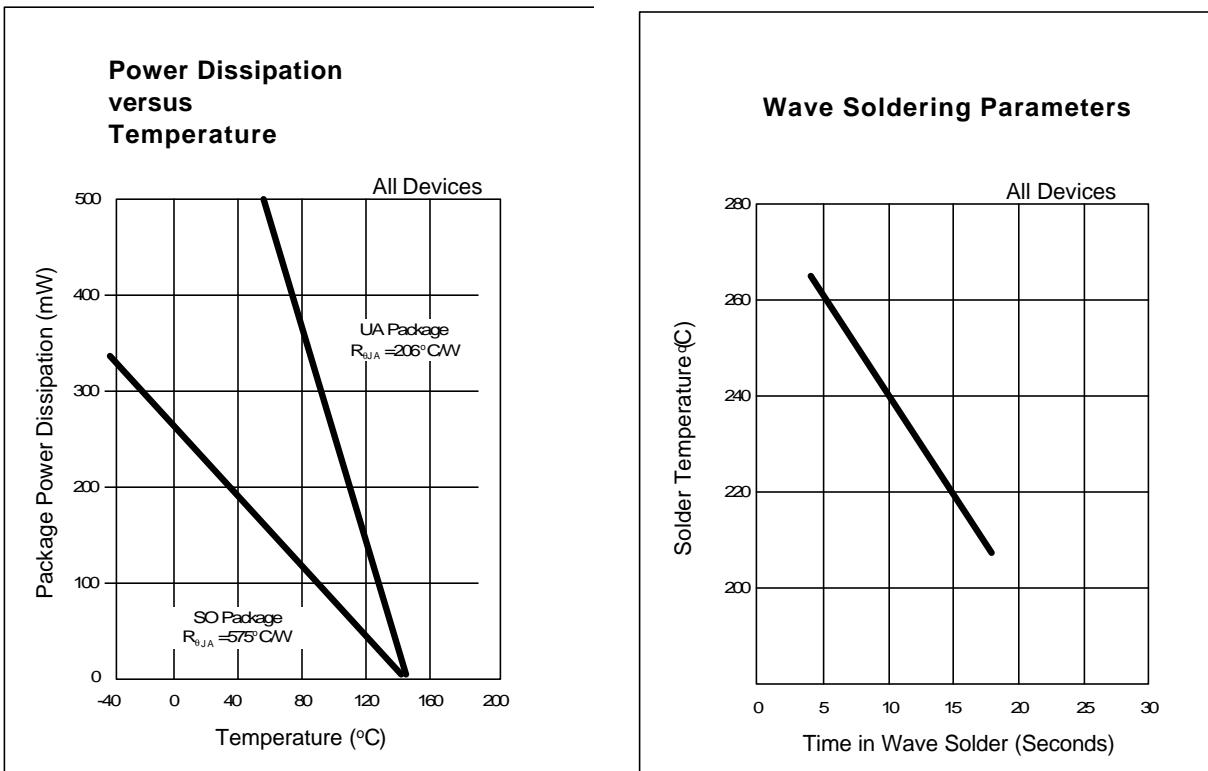
US1881 Electrical Specifications

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}	$B < B_{OP}$	1.5	2.5	4.0	mA
Saturation Voltage	$V_{DS(on)}$	$I_{OUT} = 20 \text{ mA}$, $B > B_{OP}$		0.4	0.5	V
Output Leakage	I_{OFF}	$B < B_{RP}$, $V_{OUT} = 20V$		0.01	5.0	mA
Output Rise Time	t_r	$V_{DD} = 12V$, $R_L = 1.1\text{K}\Omega$, $C_L = 20\text{pf}$		0.04		μs
Output Fall Time	t_f	$V_{DD} = 12V$, $R_L = 1.1\text{K}\Omega$, $C_L = 20\text{pf}$		0.18		μs

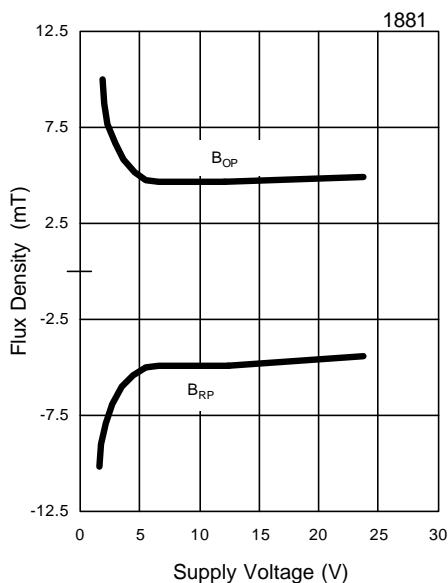
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating Point	B_{OP}		1.0	5.0	9.0	mT
Release Point	B_{RP}		-9.0	-5.0	-1.0	mT
Hysteresis	B_{hys}		5.5	10.0	12.0	mT

Performance Graphs

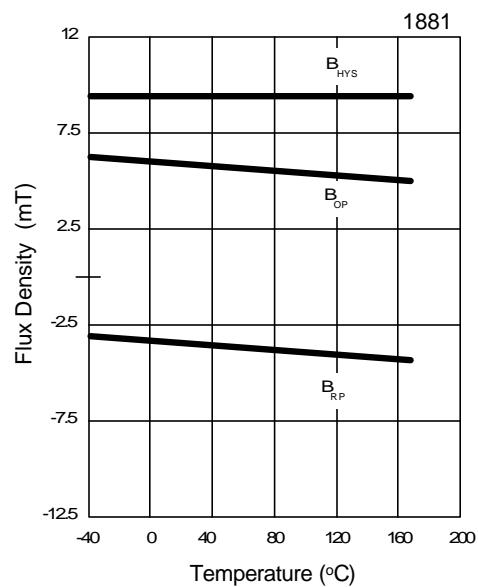


Performance Graphs

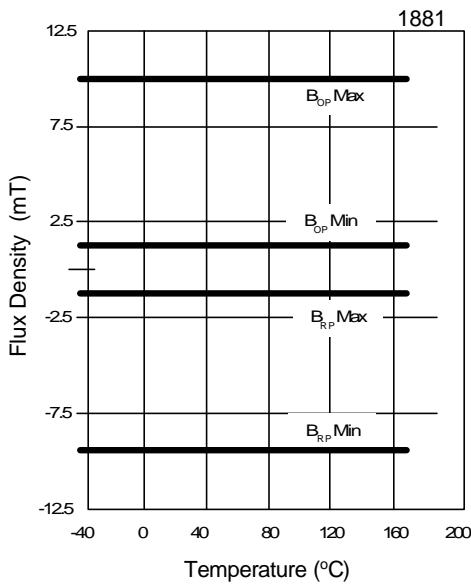
**Typical Magnetic Switch Points
versus
Supply Voltage**



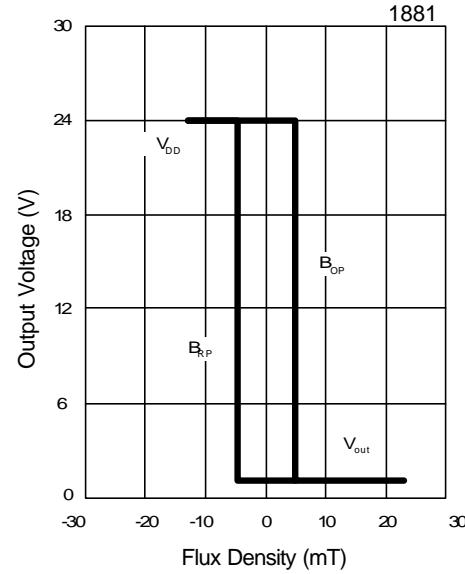
**Typical Magnetic Switch Points
versus
Temperature**



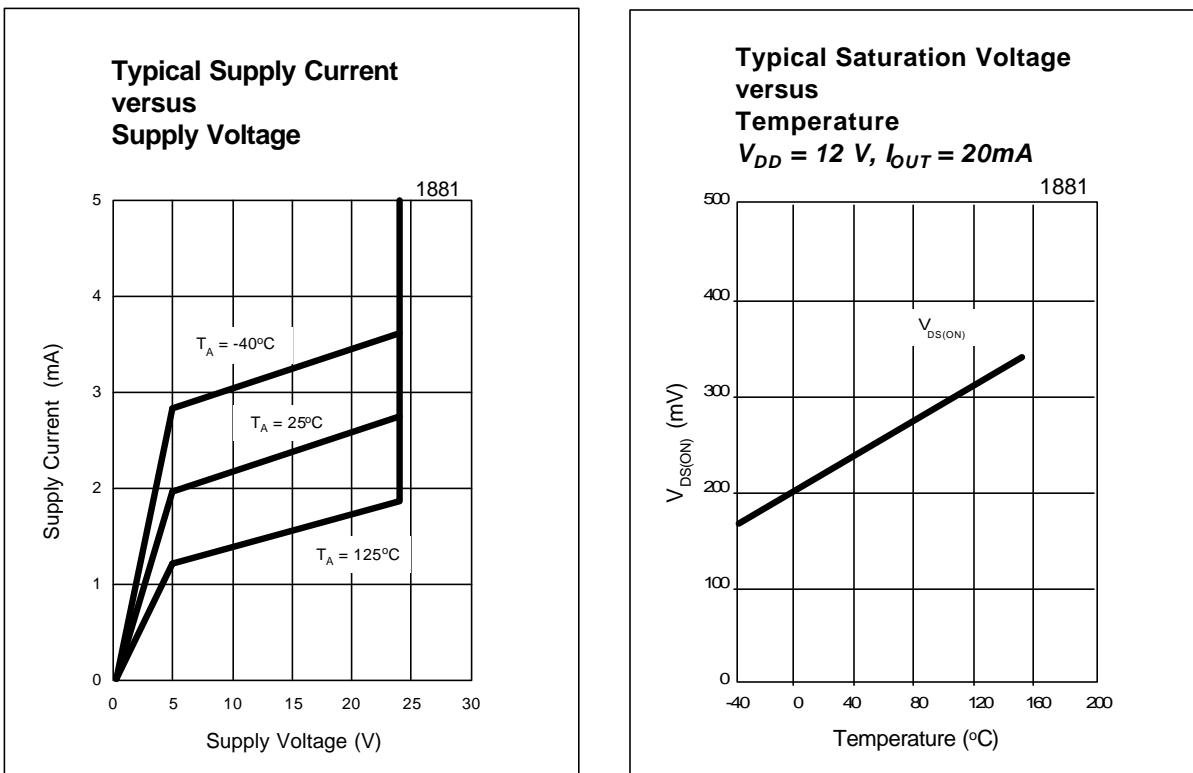
**Min/Max Magnetic Switch Range
versus
Temperature**



**Output Voltage
versus
Flux Density**



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.

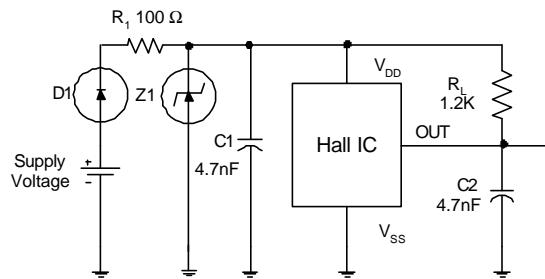
Applications

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 se-

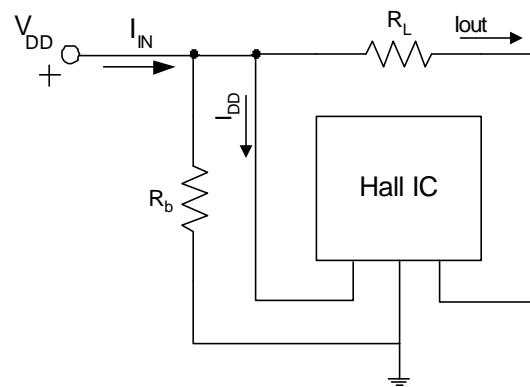
vere EMC conditions, use the application circuit on the following page.

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.

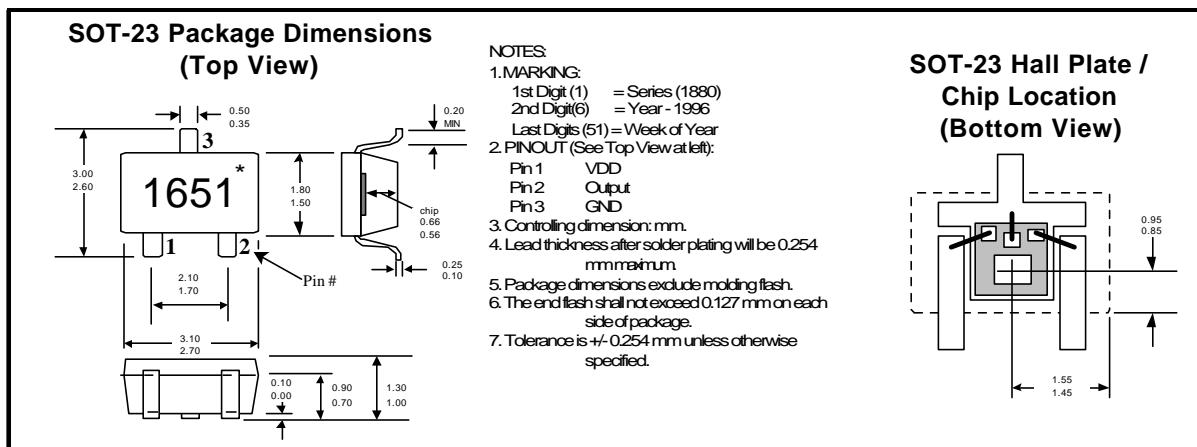
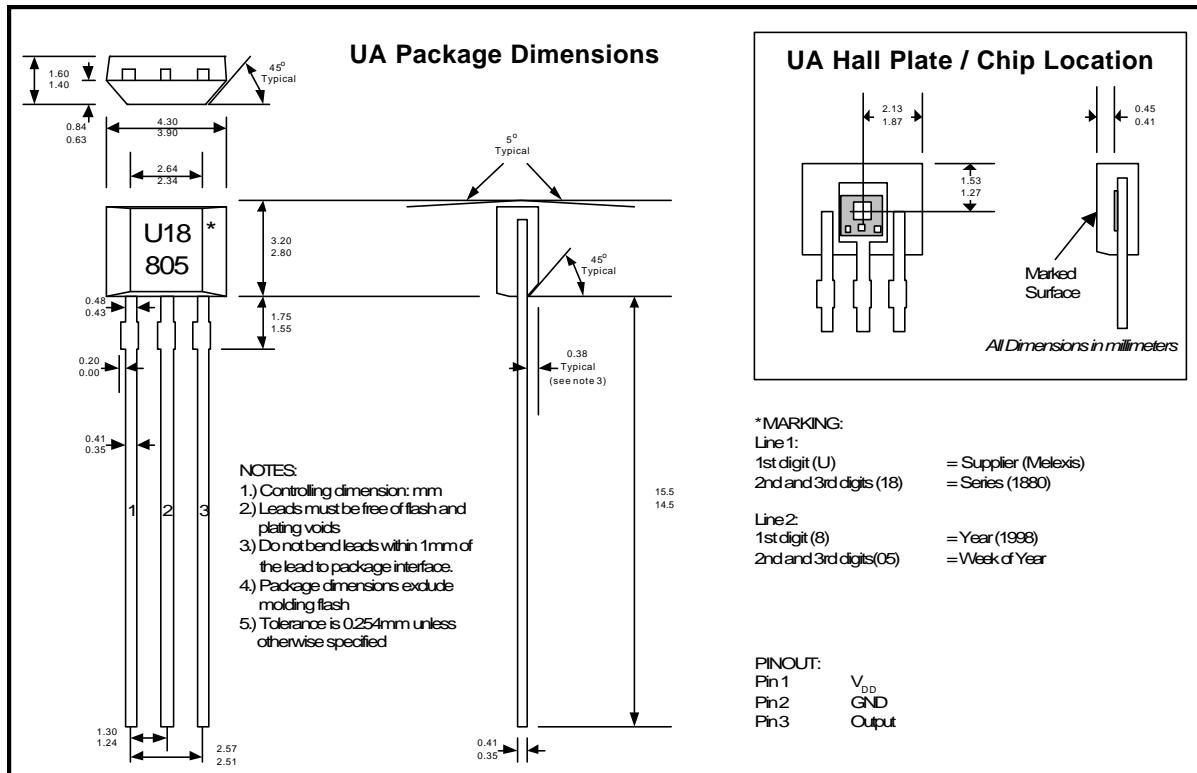
$$B_{RP} = I_{OFF} = (V_{DD} / R_b + I_{DD})$$

$$B_{OP} = I_{ON} = (I_{OFF} + V_{DD} / R_L)$$

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
ESD Sensitivity (All Pins)	+/- 4KV

Physical Characteristics



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