

### 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

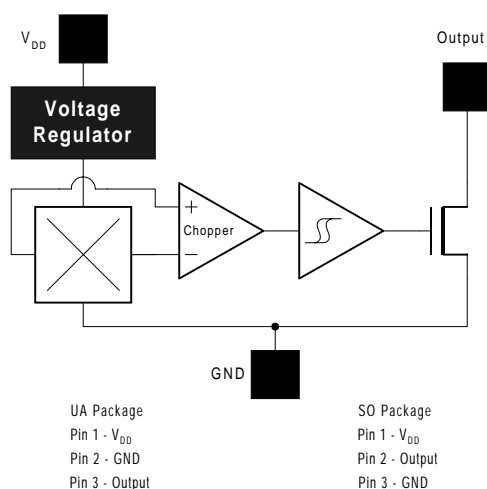
### Applications

- 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	C	SO or UA	0°C to 70°C Commercial
US1881	S	SO or UA	-20°C to 85°C Industrial
US1881	E	SO or UA	-40°C to 85°C Extended
US1881	K	SO or UA	-40°C to 125°C Severe
US1881	L	SO or UA	-40°C to 150°C Full Temp.
MLX1881	L	SO or UA	-40°C to 150°C Automotive

### Functional Diagram



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

### Description

The US1881 is the industry's first Hall integrated circuit in a SOT-23 package. The above table of part numbers provide six selections of Hall effect device (HED) sensor ICs, in two package styles, based on guaranteed temperature specifications.

The temperature ranges are defined by room temperature (25°C) test guardbands and are not 100% tested at either temperature extreme. Special testing is available as in the case of the MLX series. Contact the Melexis marketing office with any questions. Though there are many other applications for this HED, 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" ( $B_{OP}$ ) in the presence of a sufficiently strong North pole magnetic field subjected to the marked face.

### US1881 Electrical Specifications

DC Operating Parameters  $T_A = 25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}$  (unless otherwise specified)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	$V_{DD}$	Operating	3.5		20	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	$I_{OFF}$	$B < B_{RP}$ , $V_{OUT} = 20\text{V}$		0.01	5.0	$\mu\text{A}$
Output Rise Time	$t_r$	$V_{DD} = 12\text{V}$ , $R_L = 1.1\text{K}\Omega$ , $C_L = 20\text{pf}$		0.04		$\mu\text{s}$
Output Fall Time	$t_f$	$V_{DD} = 12\text{V}$ , $R_L = 1.1\text{K}\Omega$ , $C_L = 20\text{pf}$		0.18		$\mu\text{s}$

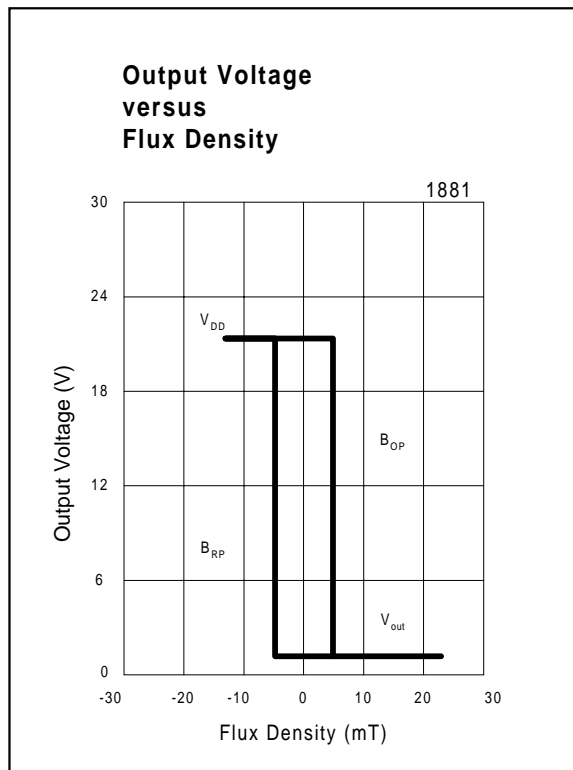
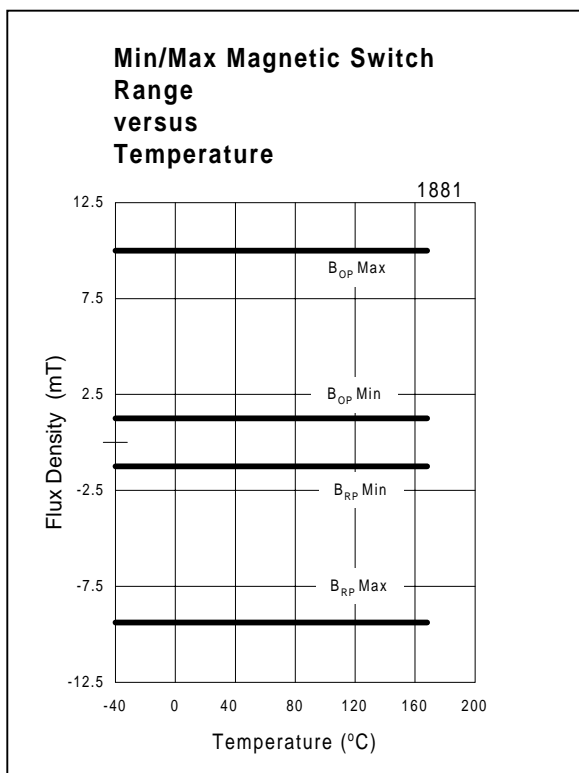
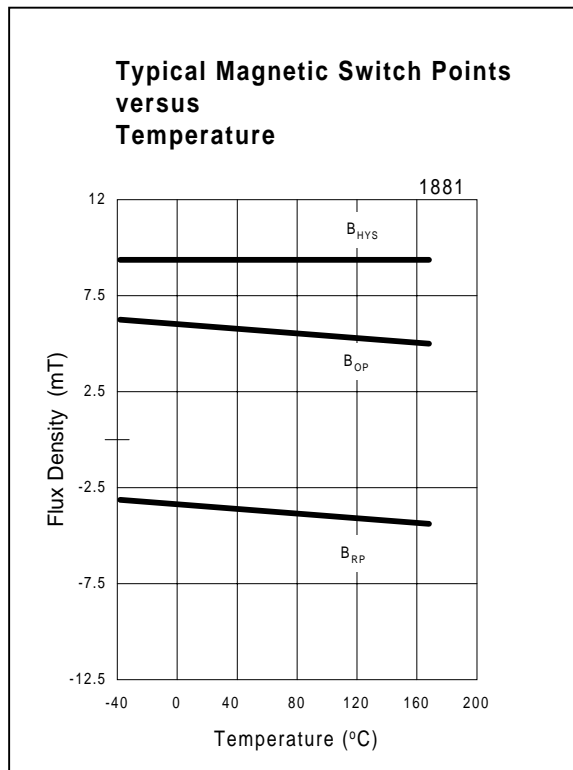
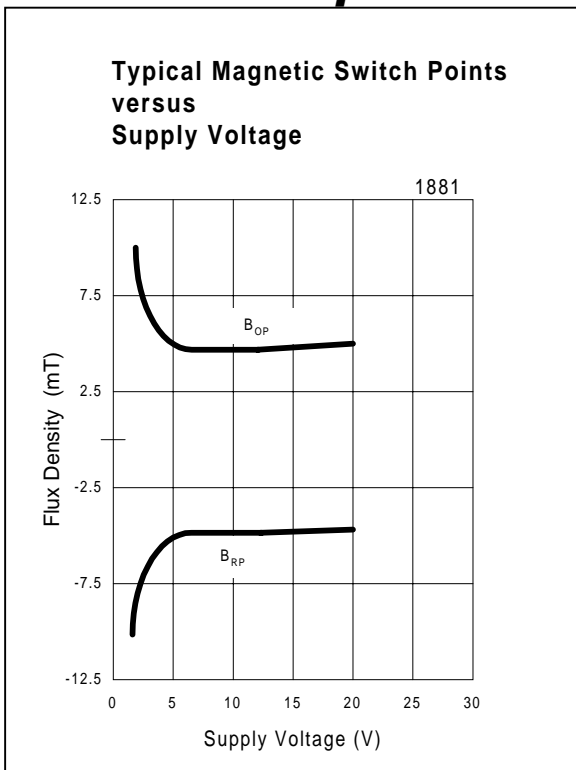
### US1881 Magnetic Specifications

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	$B_{hys}$		7.0	10.0	12.0	mT

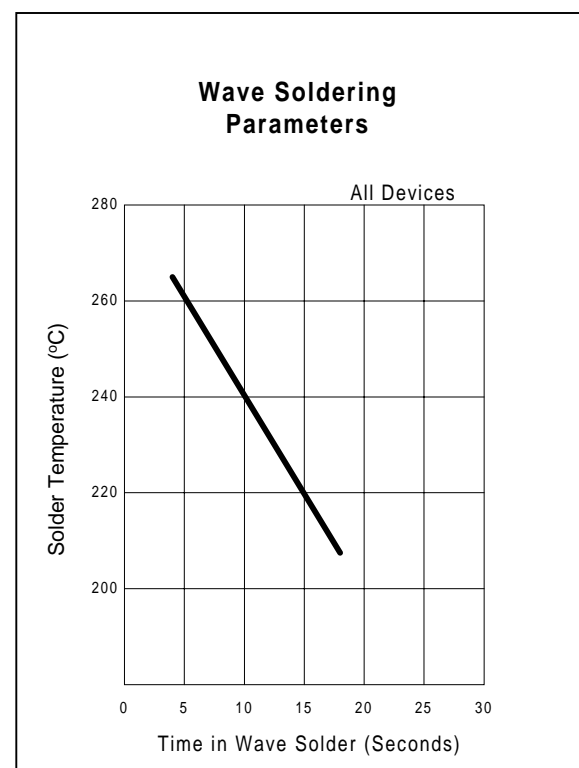
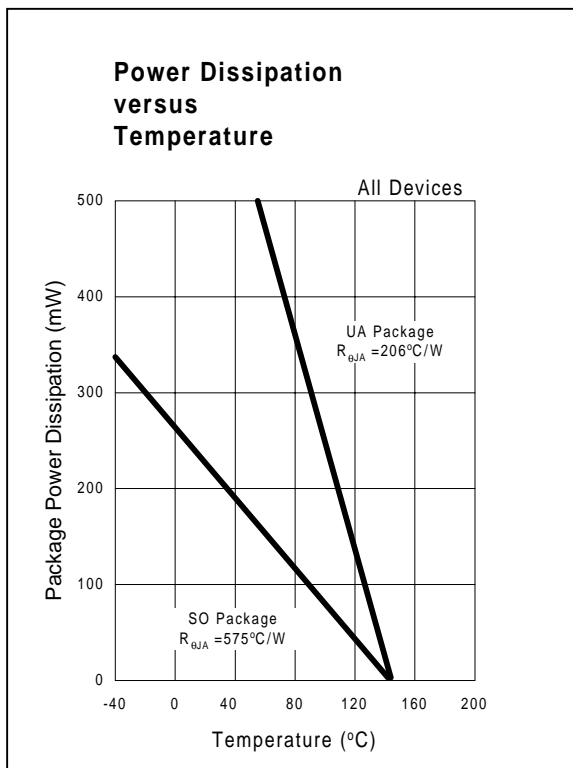
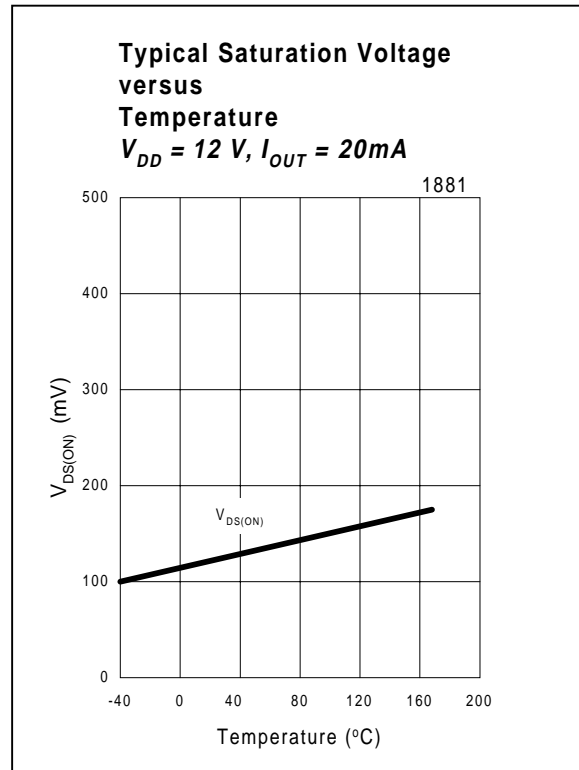
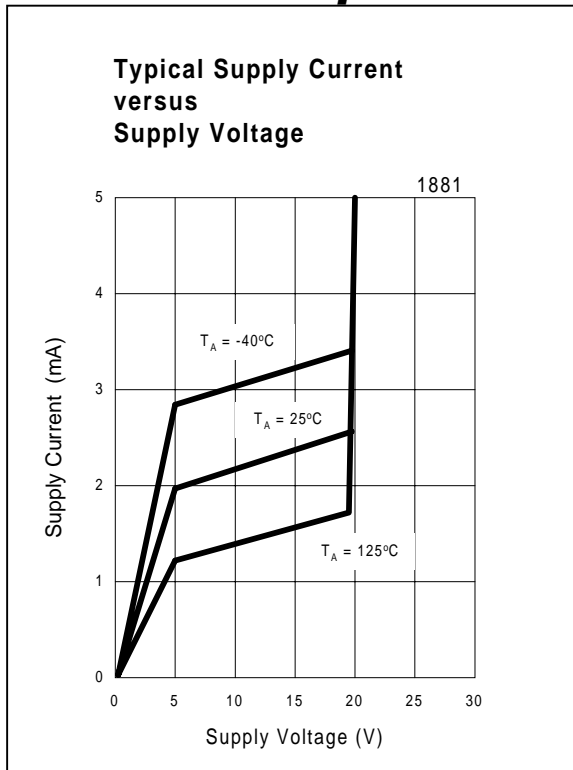
#### Notes: 1mT=10Gauss

The SOT-23 device is reversed from the UA package. The SOT-23 output transistor will be "latched on" ( $B_{OP}$ ) in the presence of a sufficiently strong North pole magnetic field subjected to the marked face.

## Performance Graphs



## Performance Graphs



### **Unique Features**

#### **CMOS Hall IC Technology**

The Chopper Stabilized Amplifier, using switched capacitor techniques, eliminates 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 the 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.

#### **ESD Precautions**

Observe ESD control procedures.

#### **Installation Comments**

Consider Temperature Coefficients of Hall IC and magnetics, as well as air gap and life time variations.

Observe temperature limits during wave soldering.

#### **Application Comments**

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.

#### **Cross Reference**

Highly advanced CMOS technology results in a Hall IC small enough to fit inside of a SOT package. Due to its extraordinary small size, the US1881SO series has no equivalent.

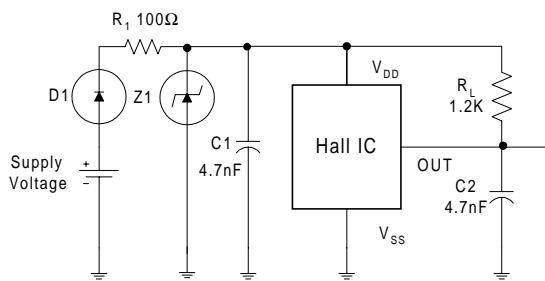
The US1881UA series can replace the following:  
Allegro & Sprague - UGN3175/77UA,  
UGN3075/77UA, A3132/33/34UA  
ITT - HAL105, HAL115, HAL125  
Honeywell - SS41, SS400 series

#### **Absolute Maximum Ratings**

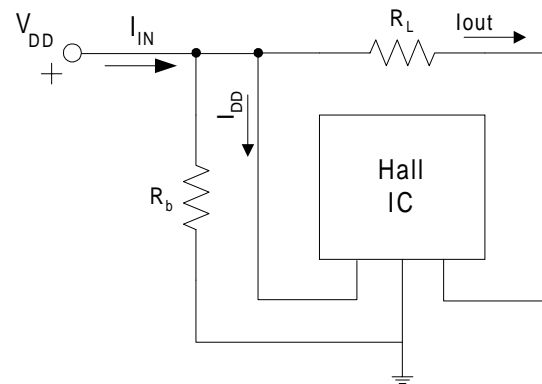
Supply Voltage (Operating), $V_{DD}$	3.5V to 20V
Supply Current (Fault), $I_{DD}$	50mA
Output Voltage, $V_{OUT}$	3.5V to 20V
Output Current (Fault), $I_{OUT}$	50mA
Power Dissipation, $P_D$	100mW
Operating Temperature Range, $T_A$	-40°C to 150°C
Storage Temperature Range, $T_S$	-65°C to 150°C
Maximum Junction Temp, $T_J$	175°C
ESD Sensitivity (All Pins)	+/- 4KV

## Applications Examples

### Automotive and Severe Environment Protection Circuit



### Two Wire Optional Current Biasing Circuit

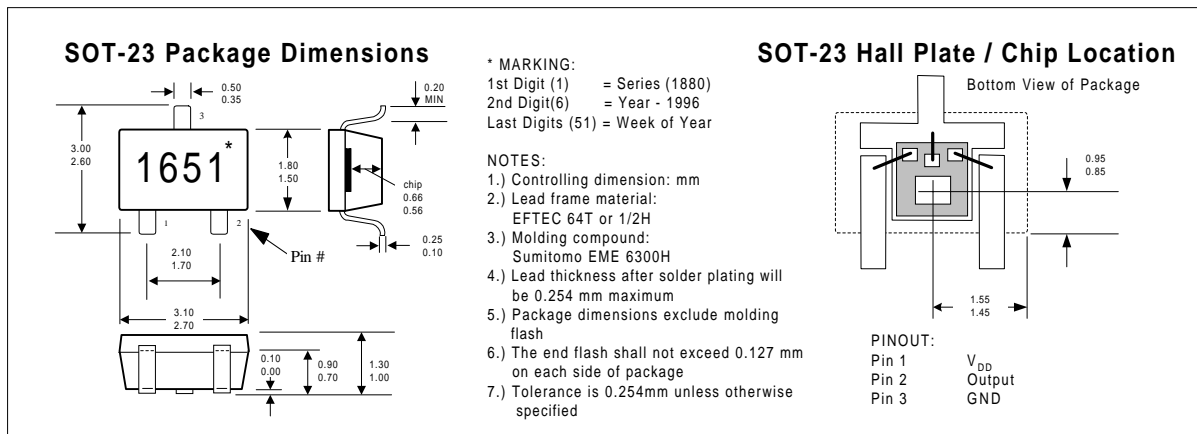
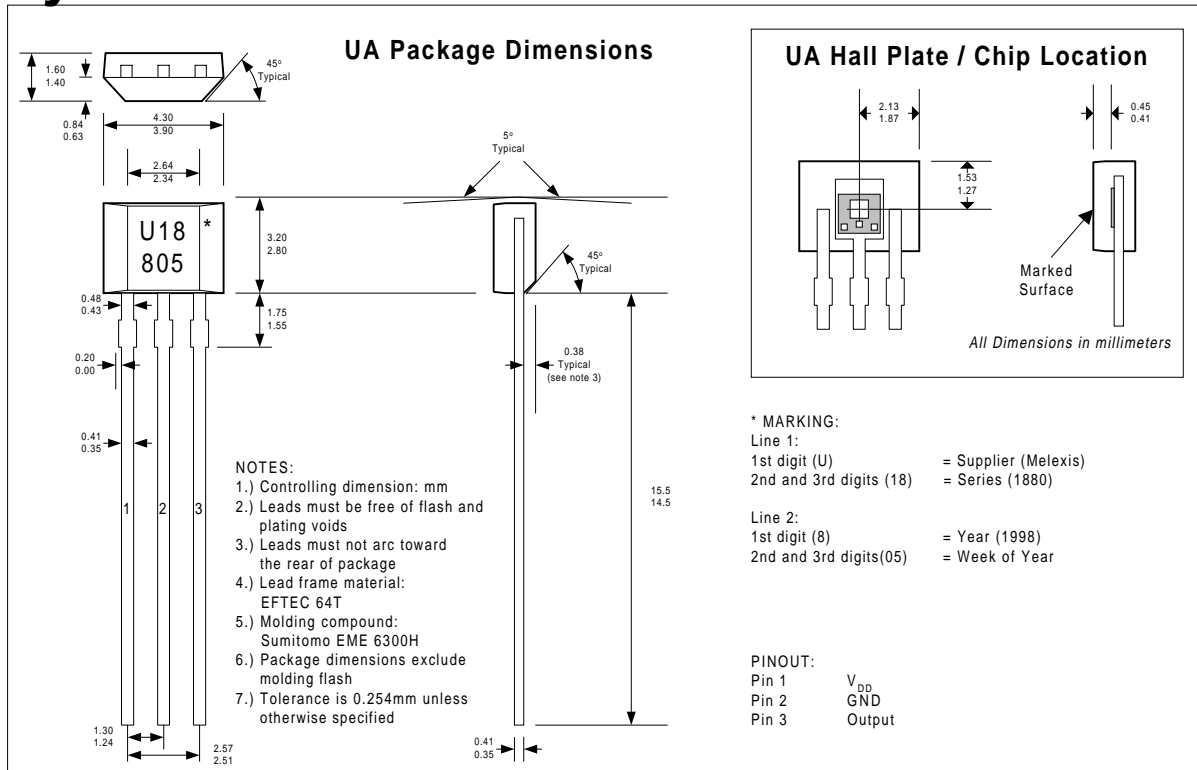


The resistors  $R_b$  and  $R_L$  can be used to bias the input current,  $I_{in}$ . Refer to the part specification for limiting values. This circuit will help in getting the precise ON and OFF currents desired.

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

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

## Physical Characteristics



For more information, please contact:

**Melexis, Inc.**

41 Locke Road  
Concord, NH 03301

Phone: (603) 223-2362

Fax: (603) 223-9614

E-mail: [sales@melexis.com](mailto:sales@melexis.com)

Web: [www.melexis.com](http://www.melexis.com)

