

Features and Benefits

- Chopper Stabilized Amplifier Stage
- Optimized for BDC Motor Applications
- New Miniature Package/Thin, High Reliability Package
- Operation Down to 2.2V
- CMOS for Optimum Stability, Quality and Cost

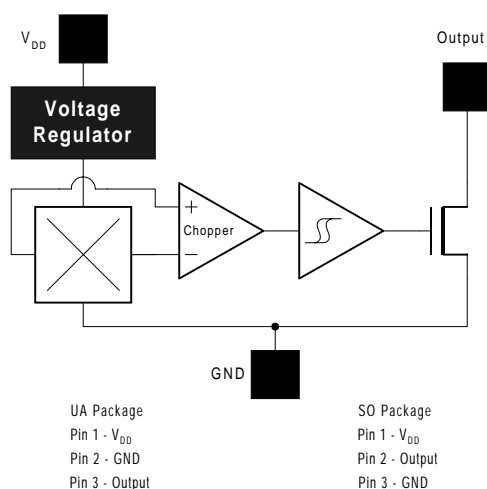
Applications

- 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
US3881	C	SO or UA	0°C to 70°C Commercial
US3881	S	SO or UA	-20°C to 85°C Industrial
US3881	E	SO or UA	-40°C to 85°C Extended
US3881	K	SO or UA	-40°C to 125°C Severe
US3881	L	SO or UA	-40°C to 150°C Full Temp.
MLX3881	L	SO or UA	-40°C to 150°C Automotive

Functional Diagram



Description

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.

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

US3881 Electrical Specifications

Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Supply Voltage	V_{DD}	Operating	2.2		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}	$B < B_{RP}$, $V_{OUT} = 24\text{V}$		0.01	5.0	μA
Output Rise Time	t_r	$V_{DD} = 12\text{V}$, $R_L = 1.1\text{K}\Omega$, $C_L = 20\text{pf}$		0.04		μs
Output Fall Time	t_f	$V_{DD} = 12\text{V}$, $R_L = 1.1\text{K}\Omega$, $C_L = 20\text{pf}$		0.18		μs

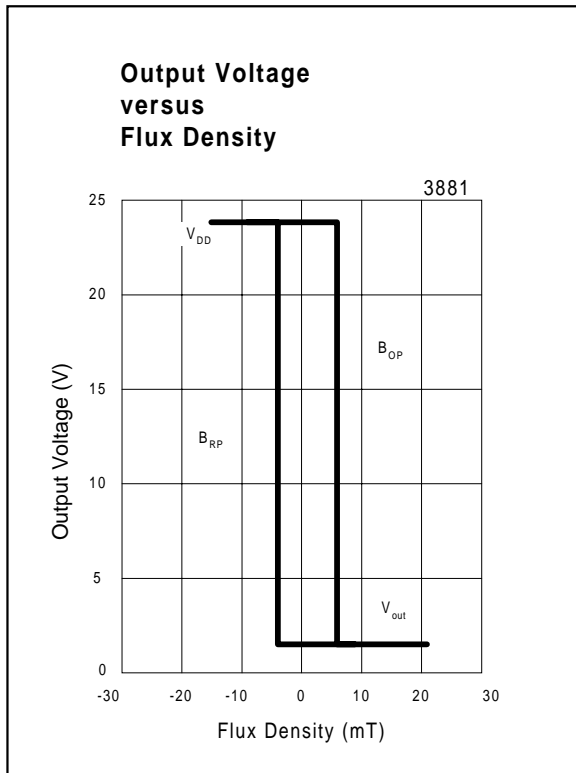
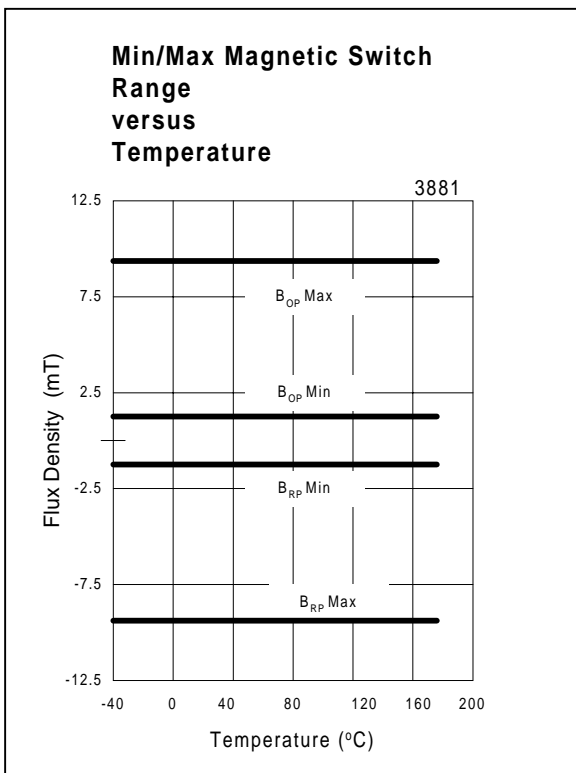
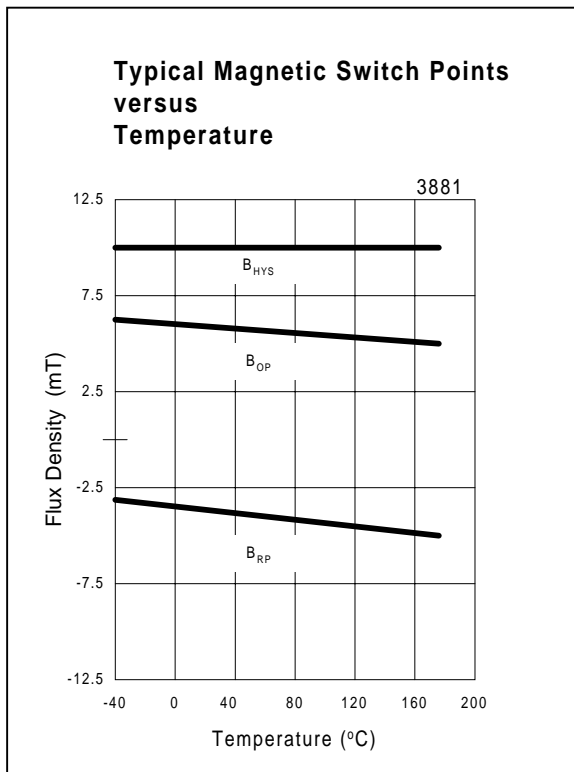
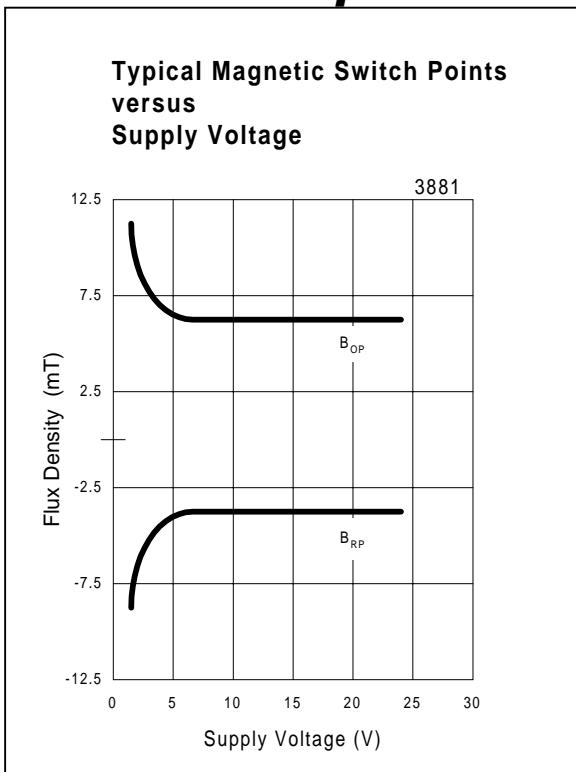
US3881 Magnetic Specifications

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

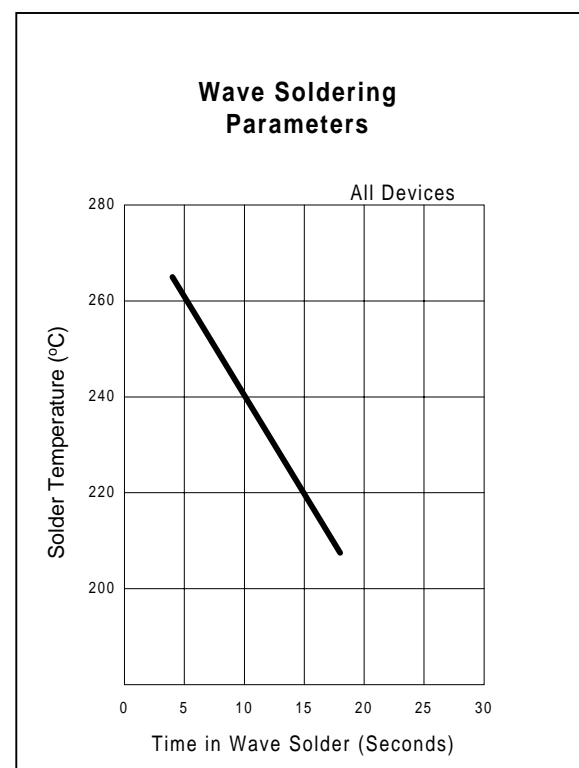
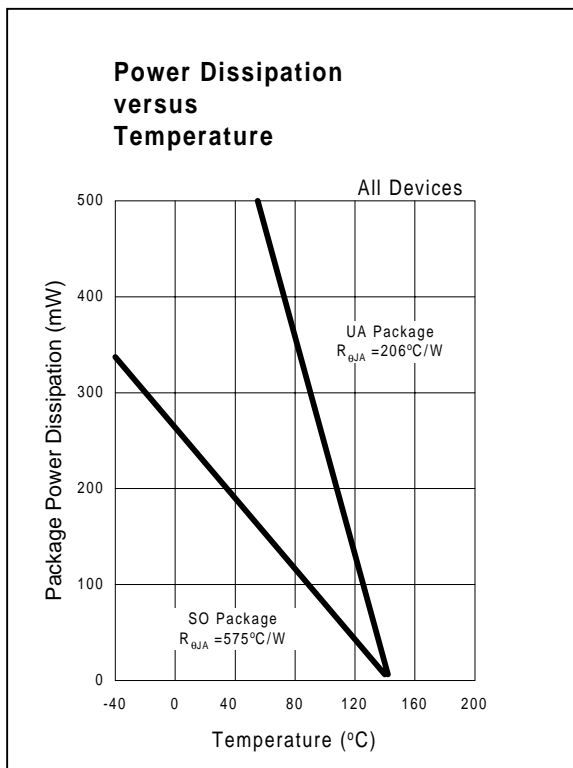
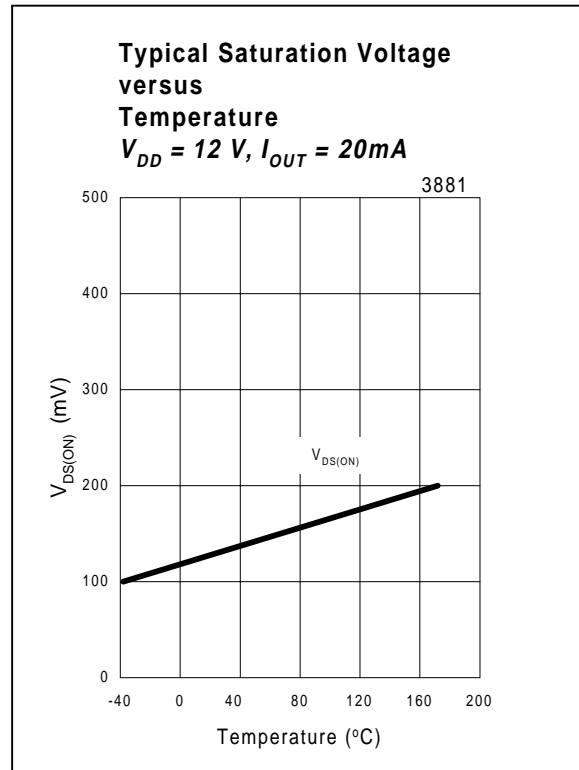
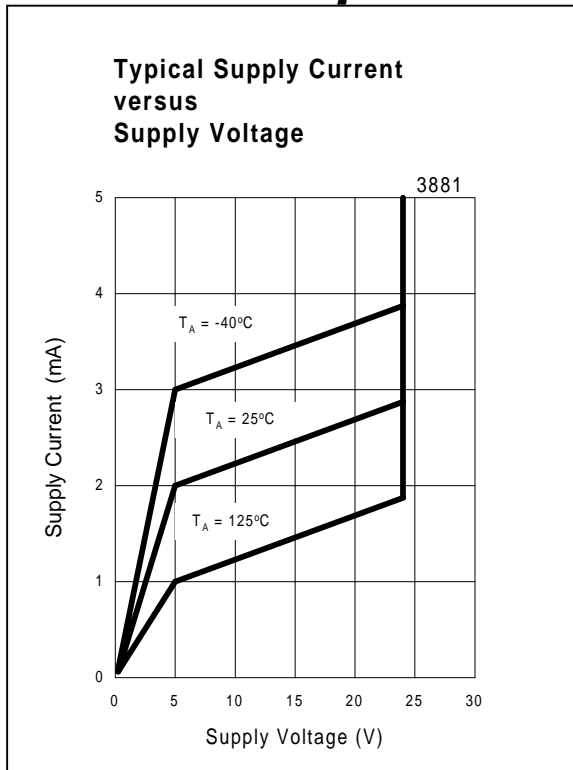
Notes: 1 mT=10Gauss

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 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 US3881SO series has no equivalent.

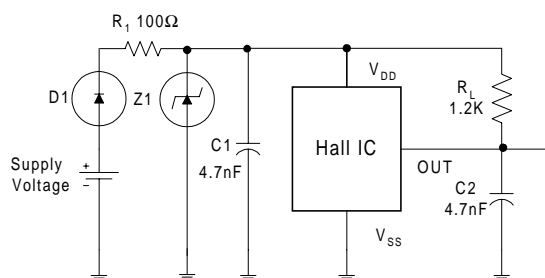
The US3881UA series can replace the following:
 Allegro & Sprague - UGN3175/77UA,
 UGN3075/77UA, A3132/33/34UA
 ITT - HAL105, HAL115, HAL125
 Honeywell - SS41, SS400 series

Absolute Maximum Ratings

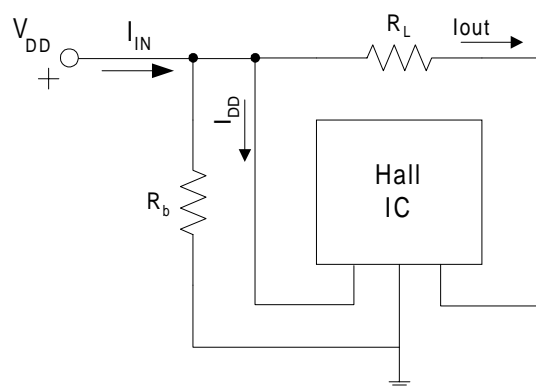
Supply Voltage (Operating), V_{DD}	2.2V to 24V
Supply Current (Fault), I_{DD}	50mA
Output Voltage, V_{OUT}	2.2V to 24V
Output Current (Fault), I_{OUT}	50mA
Power Dissipation, P_D	100mW
Operating Temperature Range, T_A	-40°C to 150°C
Storage Temperature Range, T_S	-65°C to 150°C
Maximum Junction Temp, T_J	175°C
ESD Sensitivity (All Pins)	+/- 4KV

Applications Examples

Automotive and Severe Environment Protection Circuit



Two Wire Optional Current Biasing Circuit

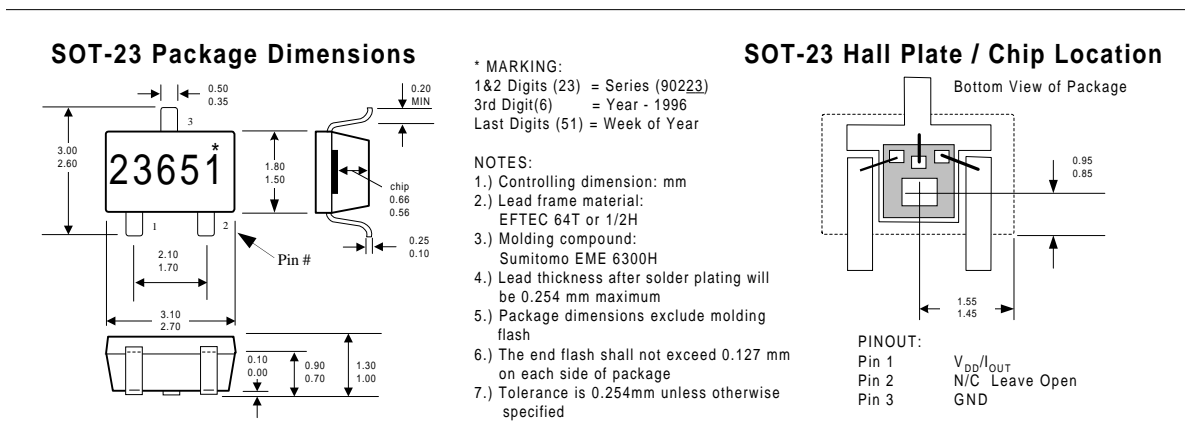
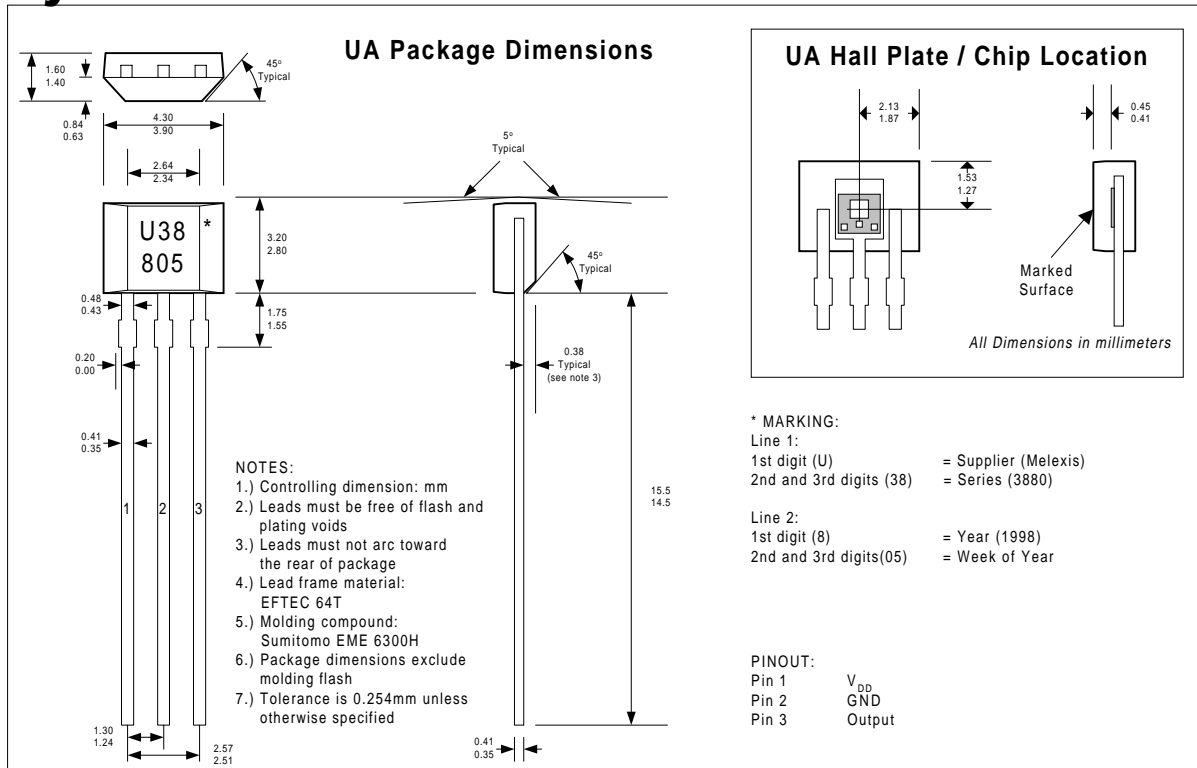


The resistors R_b and R_L can be used to bias the input current, I_{in} . Refer to the part specification for limiting values. This circuit will help in getting the precise ON and OFF currents desired.

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

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

Physical Characteristics



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