



# US3881

## CMOS Low Voltage Hall Effect Latch

### 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

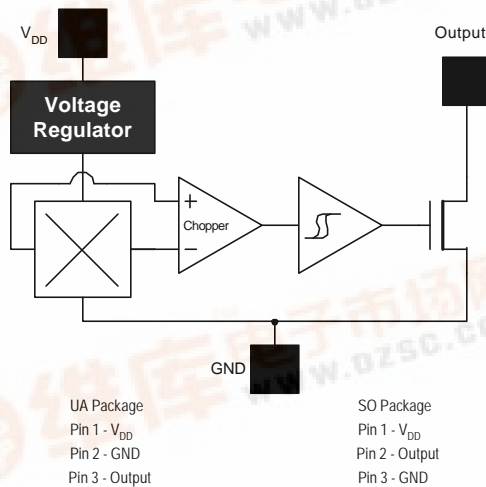
- Solid state switch
- Brushless DC motor commutation
- Speed sensing
- Linear position sensing
- Angular position sensing
- Current sensing

### Ordering Information

Part No.	Temperature Suffix	Package	Temperature Range
US3881	E	SO or UA	-40°C to 85°C Commercial
US3881	L	SO or UA	-40°C to 150°C Automotive

\* Contact factory or Sale Representative for legacy temperature options

### Functional Diagram



### Description

The US3881 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 sensor 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<sub>OP</sub>) 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<sub>RP</sub>) 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 subjected to the marked face.

Note: Static sensitive device; please observe ESD precautions. Reverse V<sub>DD</sub> protection is not included. For reverse voltage protection, a 100 Ω resistor in series with V<sub>DD</sub> is recommended.

## US3881 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	2.2		18	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	$I_{OFF}$	$B < B_{RP}$ , $V_{OUT} = 18V$		0.01	5.0	$\mu A$
Output Rise Time	$t_r$	$V_{DD} = 12V$ , $R_L = 1.1k\Omega$ , $C_L = 20\text{pf}$		0.04		$\mu s$
Output Fall Time	$t_f$	$V_{DD} = 12V$ , $R_L = 1.1k\Omega$ , $C_L = 20\text{pf}$		0.18		$\mu s$

## US3881 Magnetic Specifications

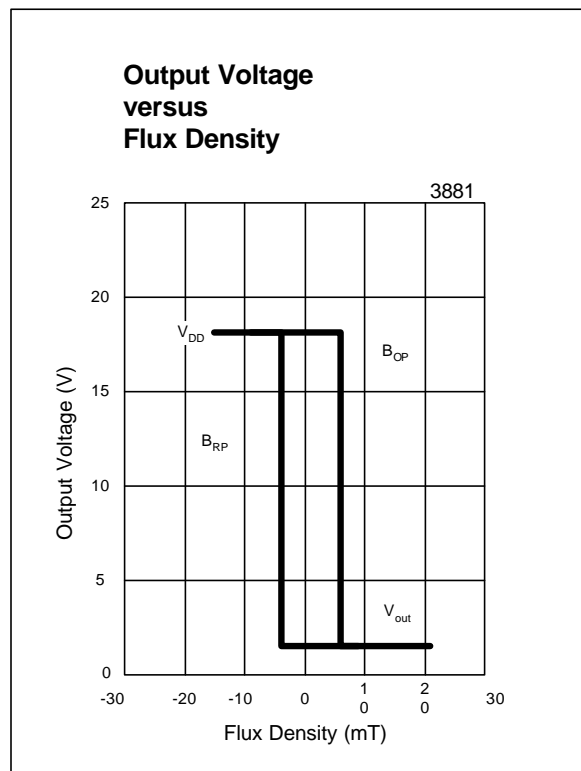
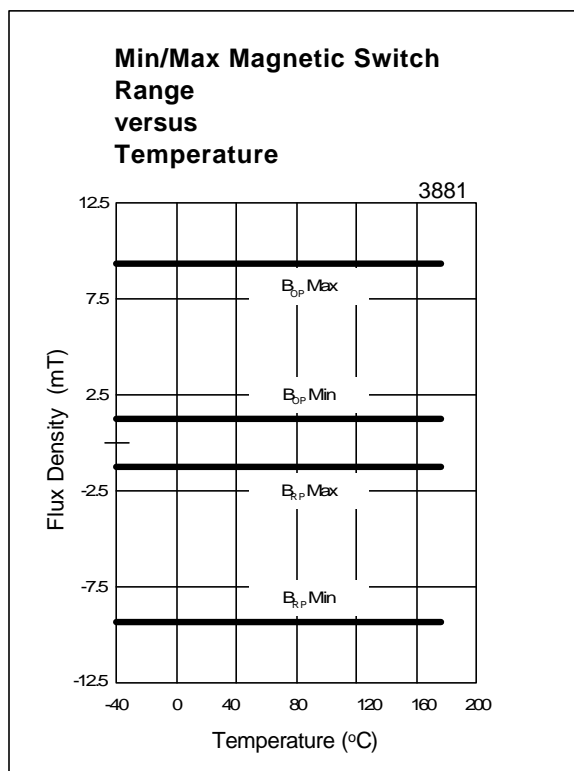
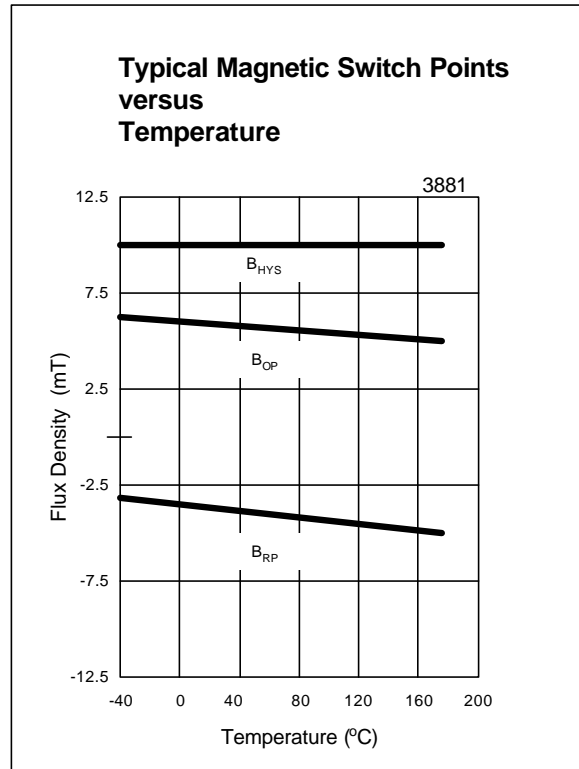
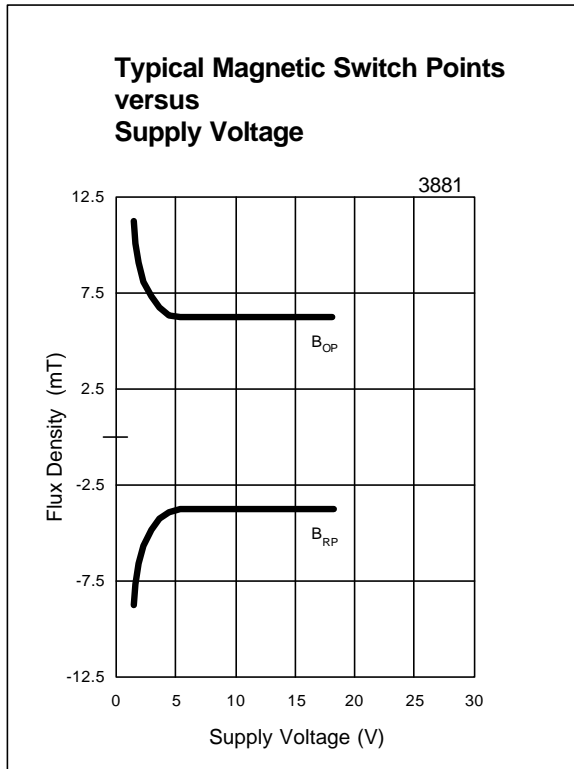
DC Operating Parameters:  $T_A = -40$  to  $150^\circ C$ ,  $V_{DD} = 12 V_{DC}$  (unless otherwise specified).  $1\text{mT} = 10$  Gauss.

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

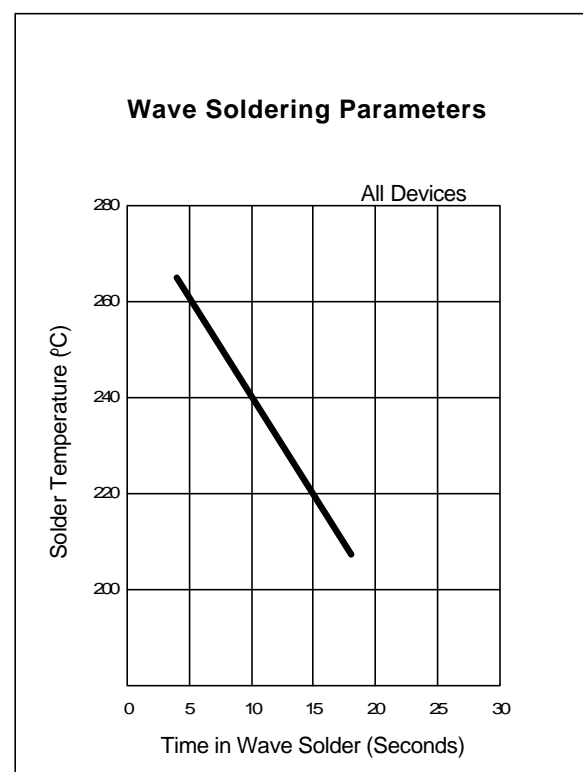
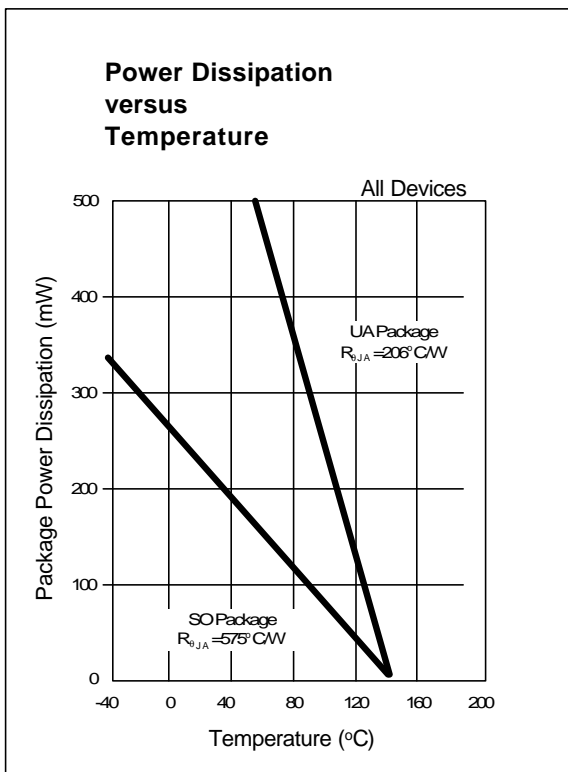
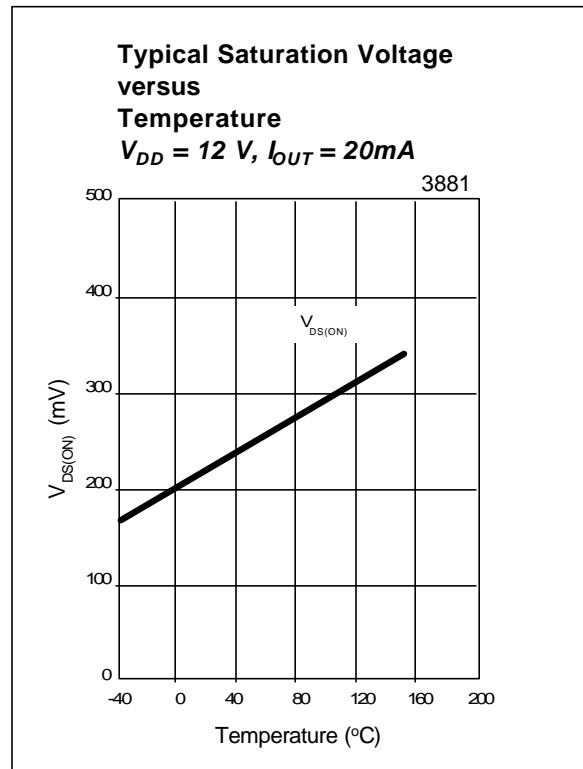
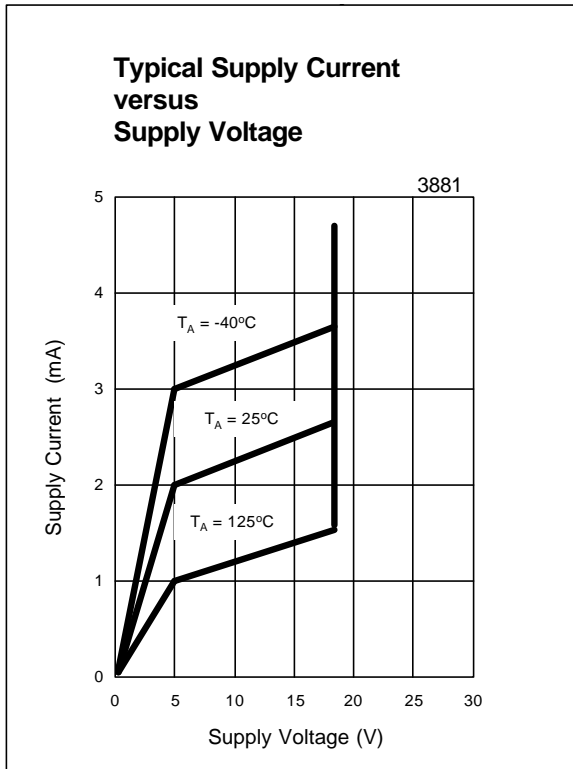
## Absolute Maximum Ratings

Supply Voltage (Operating), $V_{DD}$	18V
Supply Current (Fault), $I_{DD}$	50mA
Output Voltage, $V_{OUT}$	18V
Output Current (Fault), $I_{OUT}$	50mA
Power Dissipation, $P_D$	100mW
Operating Temperature Range, $T_A$	-40 to $150^\circ C$
Storage Temperature Range, $T_S$	-65 to $150^\circ C$
Maximum Junction Temp, $T_J$	$175^\circ C$
ESD Sensitivity (All Pins)	+/- 4KV

## Performance Graphs



## 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.

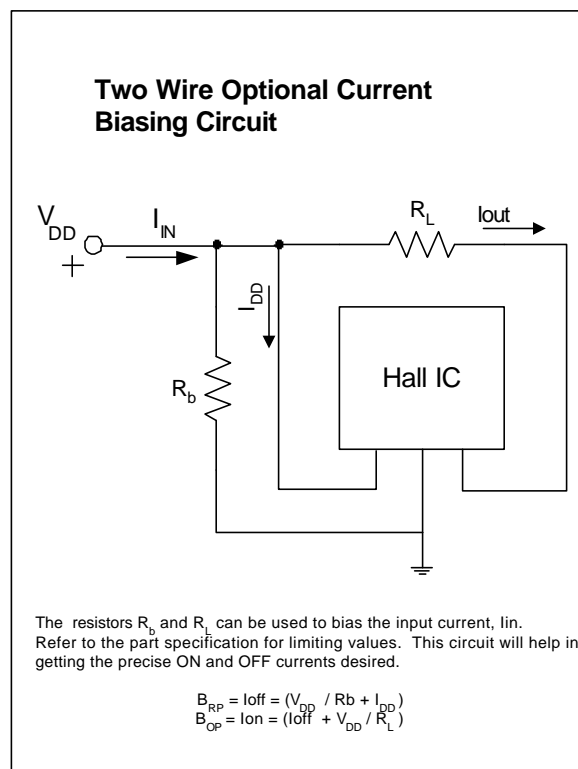
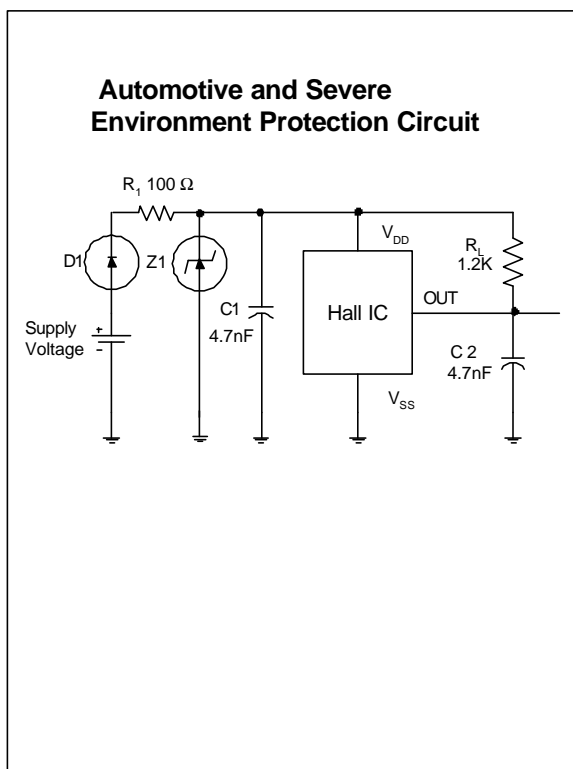
### Installation

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

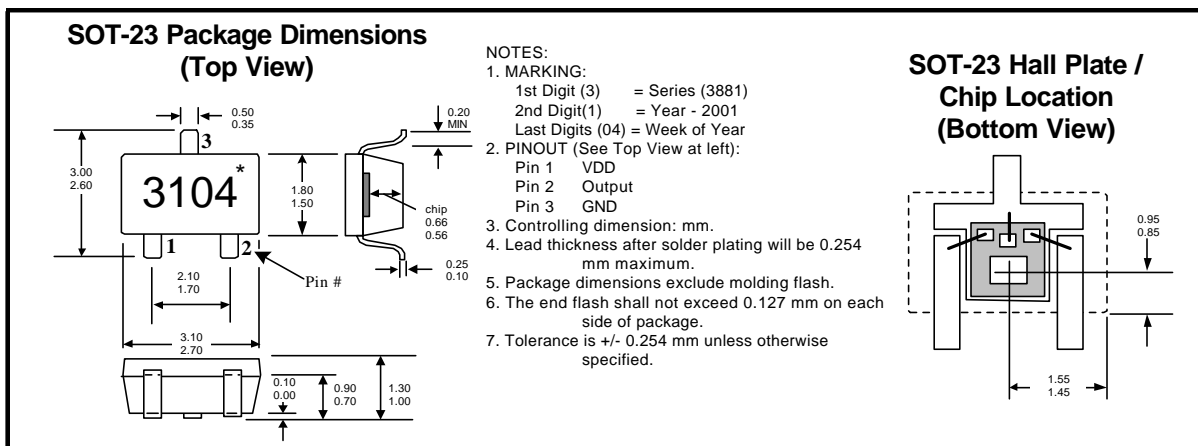
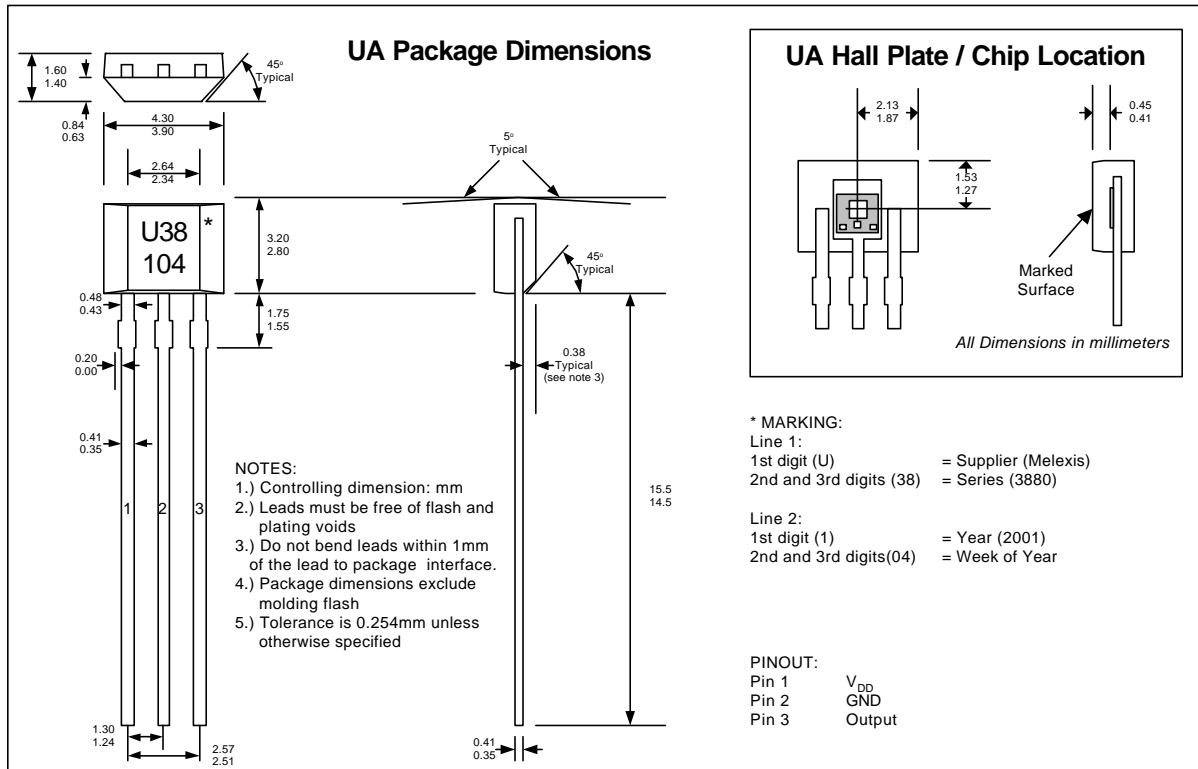
### Applications

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 below.

### Applications Examples



## Physical Characteristics



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