

### 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

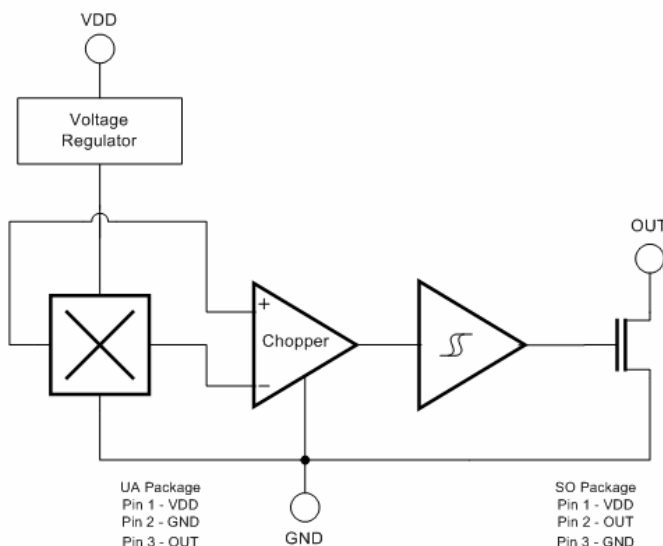
### Applications

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

### Ordering Information

Part No.	Temperature Suffix	Package Code
US3881	E (-40°C to 85°C)	SO ( SOT – 23) or UA (TO – 92)
US3881	K (-40°C to 125°C)	SO ( SOT – 23) or UA (TO – 92)
US3881	L (-40°C to 150°C)	SO ( SOT – 23) or UA (TO – 92)

## 1. Functional Diagram



**Note:** This is a static-sensitive device. Please observe ESD precautions. Reverse VDD protection is not included. For reverse voltage protection a 100Ohms resistor in series with VDD is recommended.

## 2. Description

The US3881 is 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 ( $B_{OP}$ ) 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. 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.

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### 3. Glossary of Terms

MilliTesla (mT), Gauss: Units of magnetic flux density; 1mT = 10 Gauss

### 4. 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°C
Storage Temperature Range, $T_S$	-65 to 150°C
Maximum Junction Temp UA Package, $T_{JUA}$	175°C
Maximum Junction Temp SOT Package, $T_{JSOT}$	150°C

Exceeding the absolute maximum ratings may cause permanent damage. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

### 5. US3881 Electrical Specifications

DC operating parameters:  $T_A = 25^\circ\text{C}$ ,  $V_{DD} = 12\text{VDC}$  (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	$I_{OFF}$	$B < B_{RP}$ , $V_{OUT} = 20\text{V}$		0.01	10.0	uA
Output Rise Time	$t_r$	$V_{DD} = 12\text{V}$ , $R_L = 1.1\text{K}$ , $C_L = 20\text{pF}$		0.04		us
Output Fall Time	$t_f$	$V_{DD} = 12\text{V}$ , $R_L = 1.1\text{K}$ , $C_L = 20\text{pF}$		0.18		us

### 6. US3881 Magnetic Specifications

DC operating parameters:  $T_A = 25^\circ\text{C}$ ,  $V_{DD} = 12\text{V}_{DC}$  (unless otherwise specified).

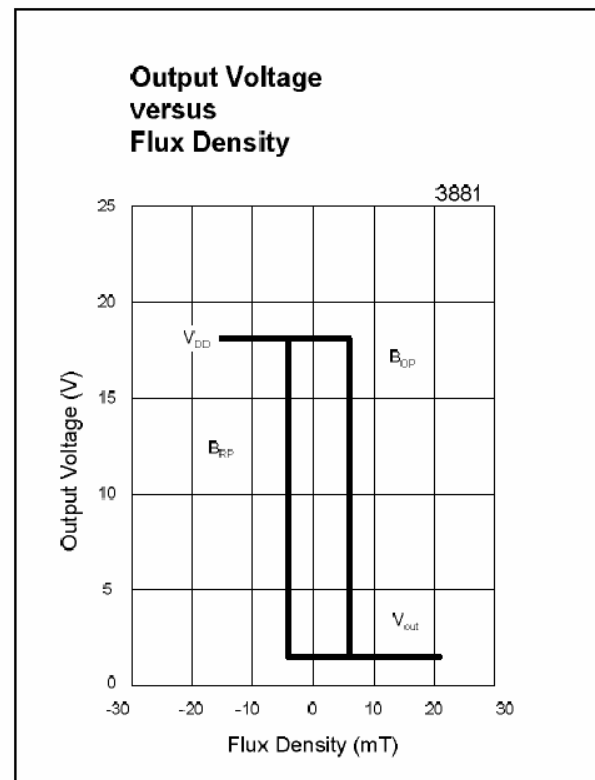
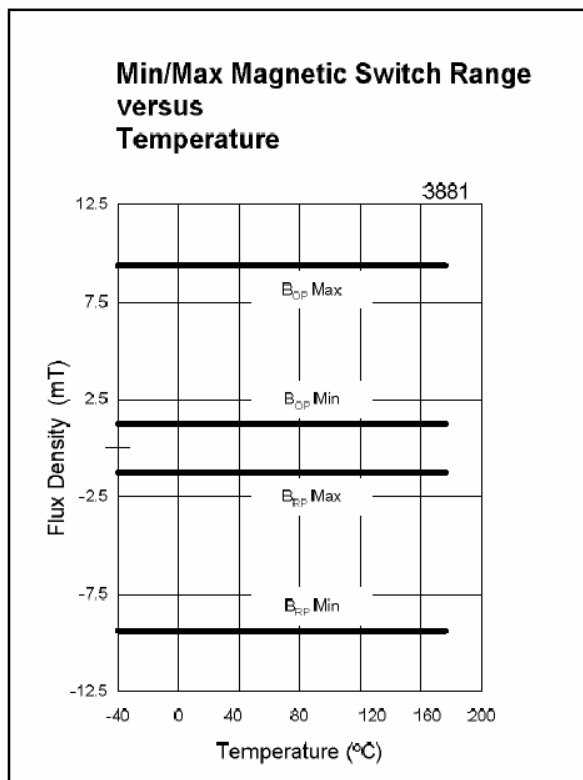
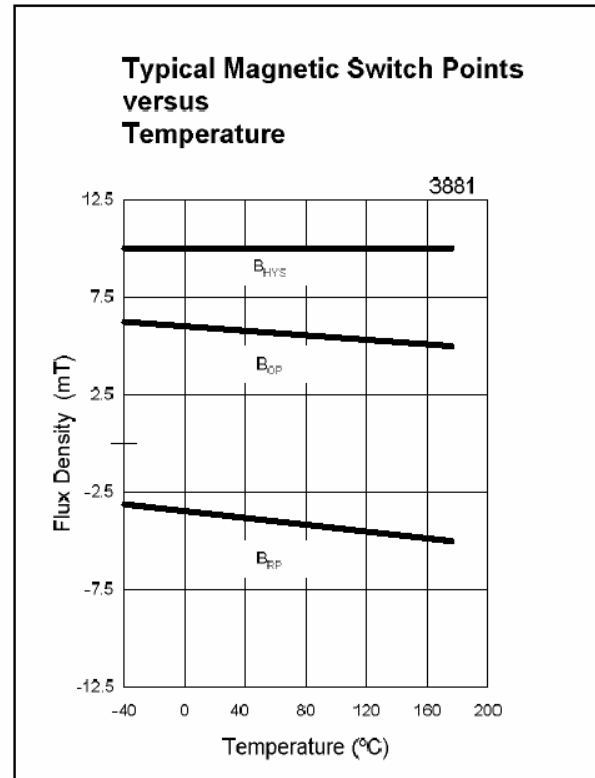
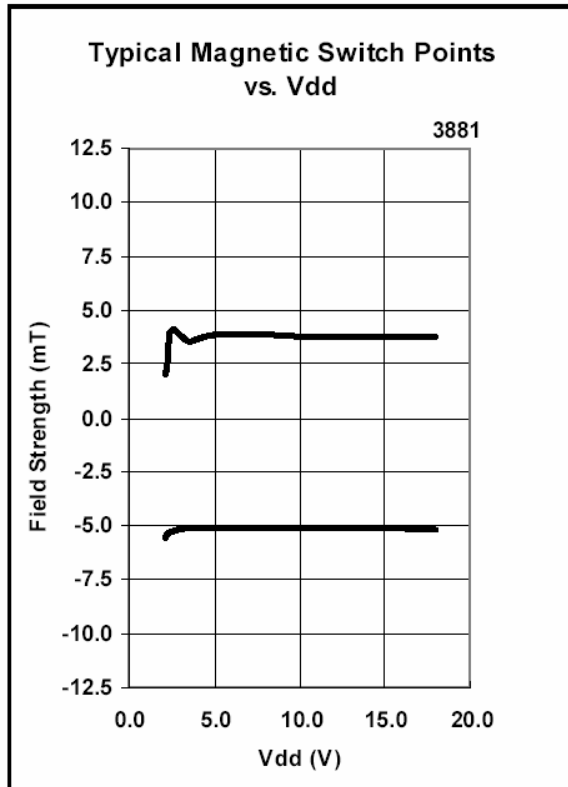
Parameter	Symbol	Test Conditions	Min	Typ	Max	Units
Operating Point	$B_{OP}$	EUA, ESO 25 & 85°C, $V_{dd}=2.2$ & 18VDC	1.0	5.0	9.0	mT
Release Point	$B_{RP}$	EUA, ESO 25 & 85°C, $V_{dd}=2.2$ & 18VDC	-9.0	-5.0	-1.0	mT
Hysteresis	$B_{HYS}$	EUA, ESO 25 & 85°C, $V_{dd}=2.2$ & 18VDC	5.5	10.0	12.0	mT
Operating Point	$B_{OP}$	LUA, LSO 25 & 150°C, $V_{dd}=2.2$ & 18VDC	1.0	5.0	9.0	mT
Release Point	$B_{RP}$	LUA, LSO 25 & 150°C, $V_{dd}=2.2$ & 18VDC	-9.0	-5.0	-1.0	mT
Hysteresis	$B_{HYS}$	LUA, LSO 25 & 150°C, $V_{dd}=2.2$ & 18VDC	5.5	10.0	12.0	mT

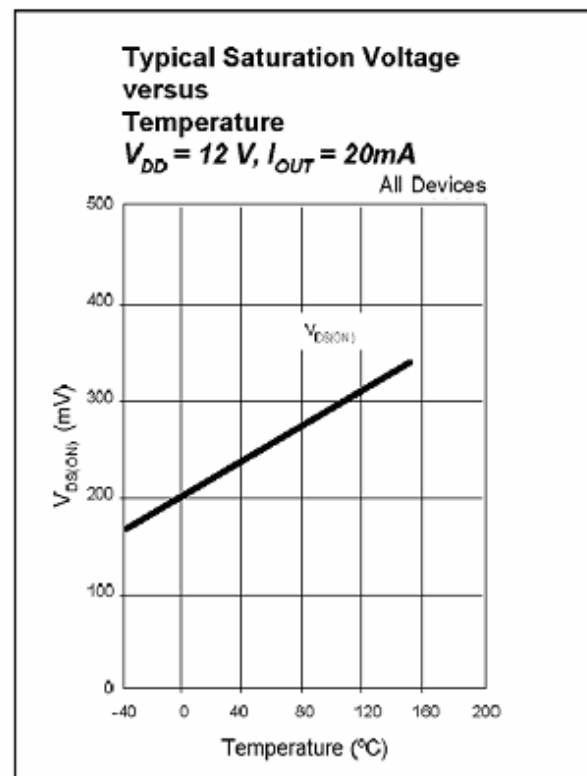
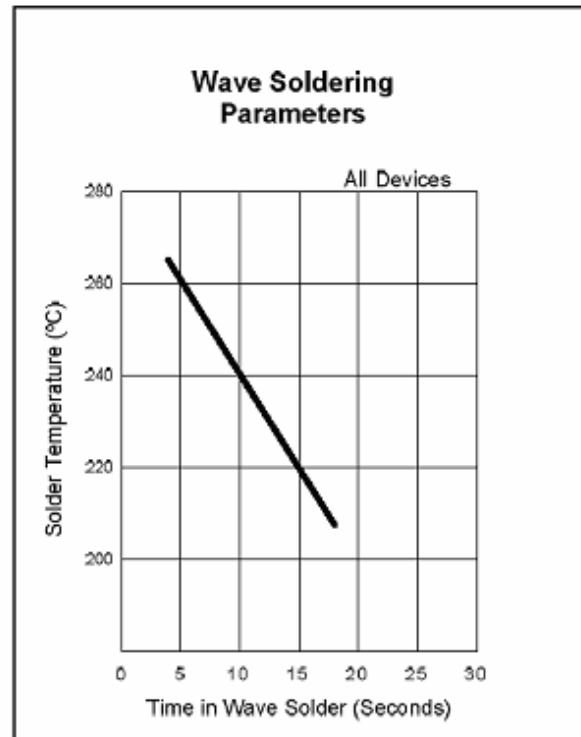
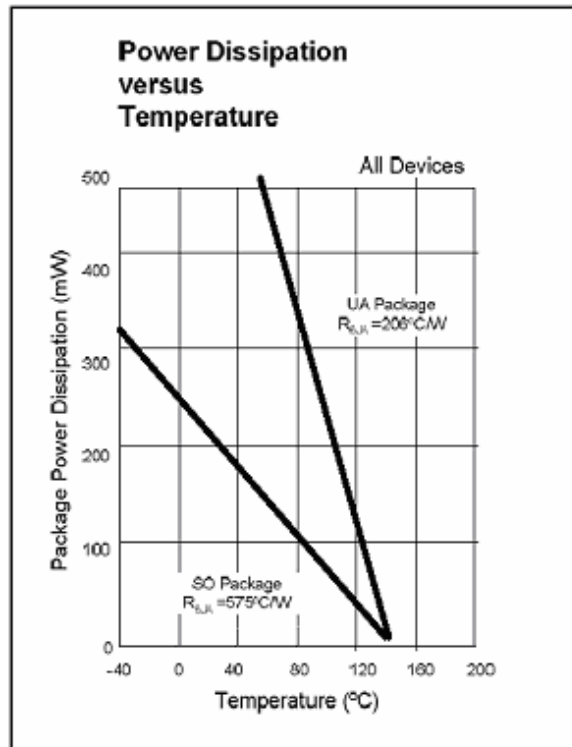
### 7. Unique Features

#### CMOS Hall IC Technology

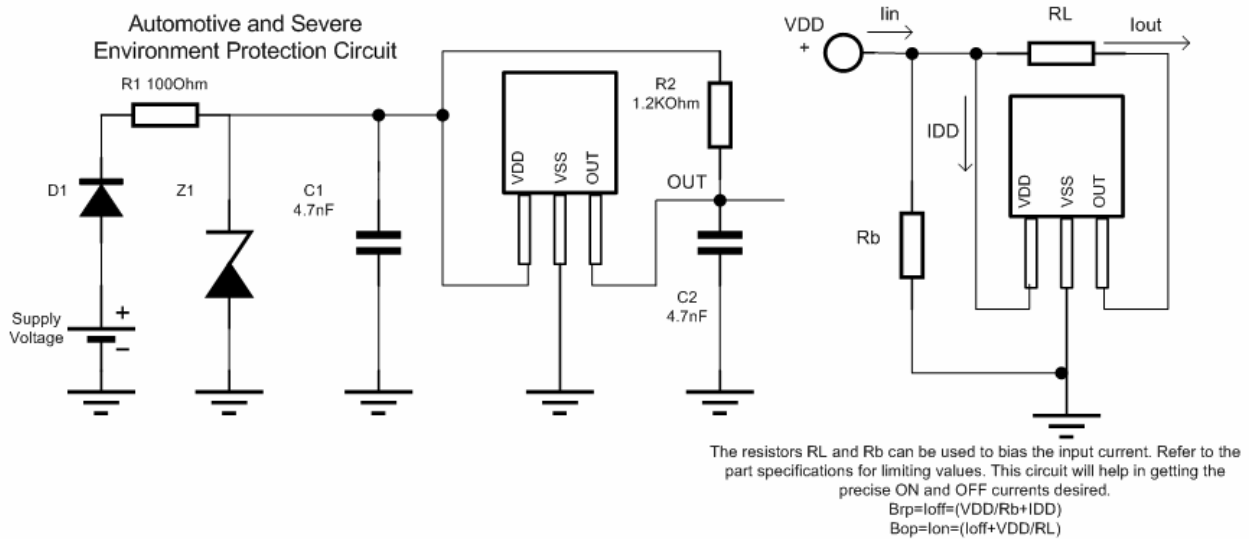
The chopper stabilized amplifier uses switched capacitor techniques to eliminate the amplifier offset voltage, which, in bipolar devices, is a major source of temperature sensitive drift. CMOS makes this advanced technique possible. The CMOS chip is also much smaller than a bipolar chip, allowing very sophisticated circuitry to be placed in less space. The small chip size also contributes to lower physical stress and less power consumption.

## 8. Performance Graphs





### 9. Applications Information



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 on this page.

### 10. Reliability Information

This Melexis device is classified and qualified regarding soldering technology, solderability and moisture sensitivity level, as defined in this specification, according to following test methods:

- IPC/JEDEC J-STD-020  
Moisture/Reflow Sensitivity Classification For Nonhermetic Solid State Surface Mount Devices (classification reflow profiles according to table 5-2)
- EIA/JEDEC JESD22-A113  
Preconditioning of Nonhermetic Surface Mount Devices Prior to Reliability Testing (reflow profiles according to table 2)
- CECC00802  
Standard Method For The Specification of Surface Mounting Components (SMDs) of Assessed Quality
- EIA/JEDEC JESD22-B106  
Resistance to soldering temperature for through-hole mounted devices
- EN60749-15  
Resistance to soldering temperature for through-hole mounted devices
- MIL 883 Method 2003 / EIA/JEDEC JESD22-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.

Based on Melexis commitment to environmental responsibility, European legislation (Directive on the Restriction of the Use of Certain Hazardous substances, RoHS) and customer requests, Melexis has installed a Roadmap to qualify their package families for lead free processes also. Various lead free generic qualifications are running, current results on request.

For more information on manufacturability/solderability see quality page at our website:

<http://www.melexis.com/html/pdf/MLXleadfree-statement.pdf>

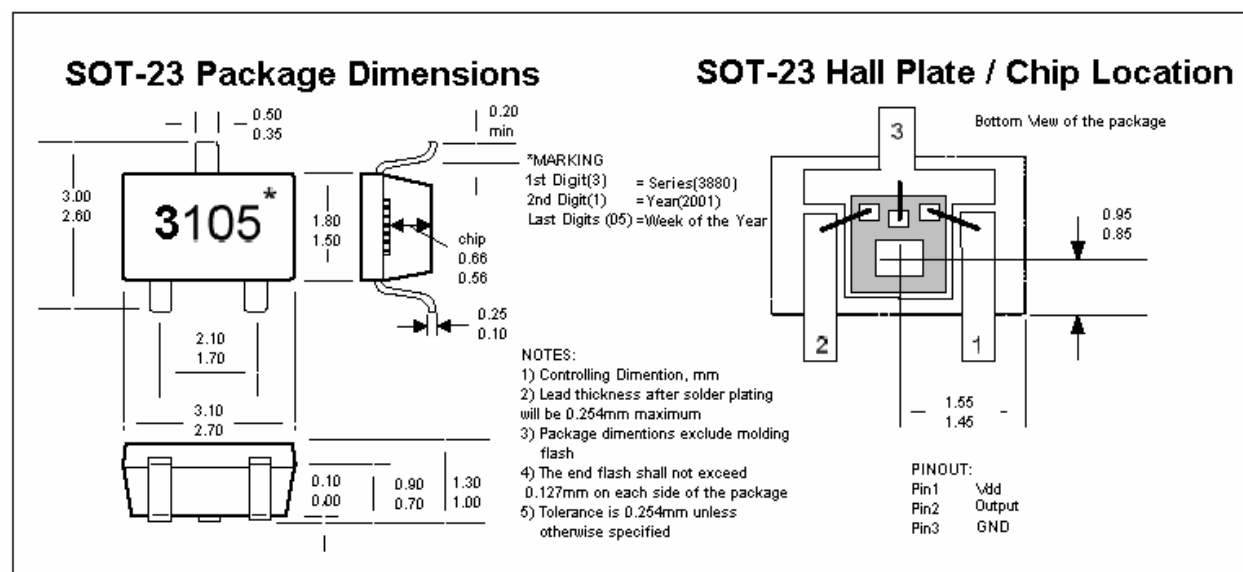
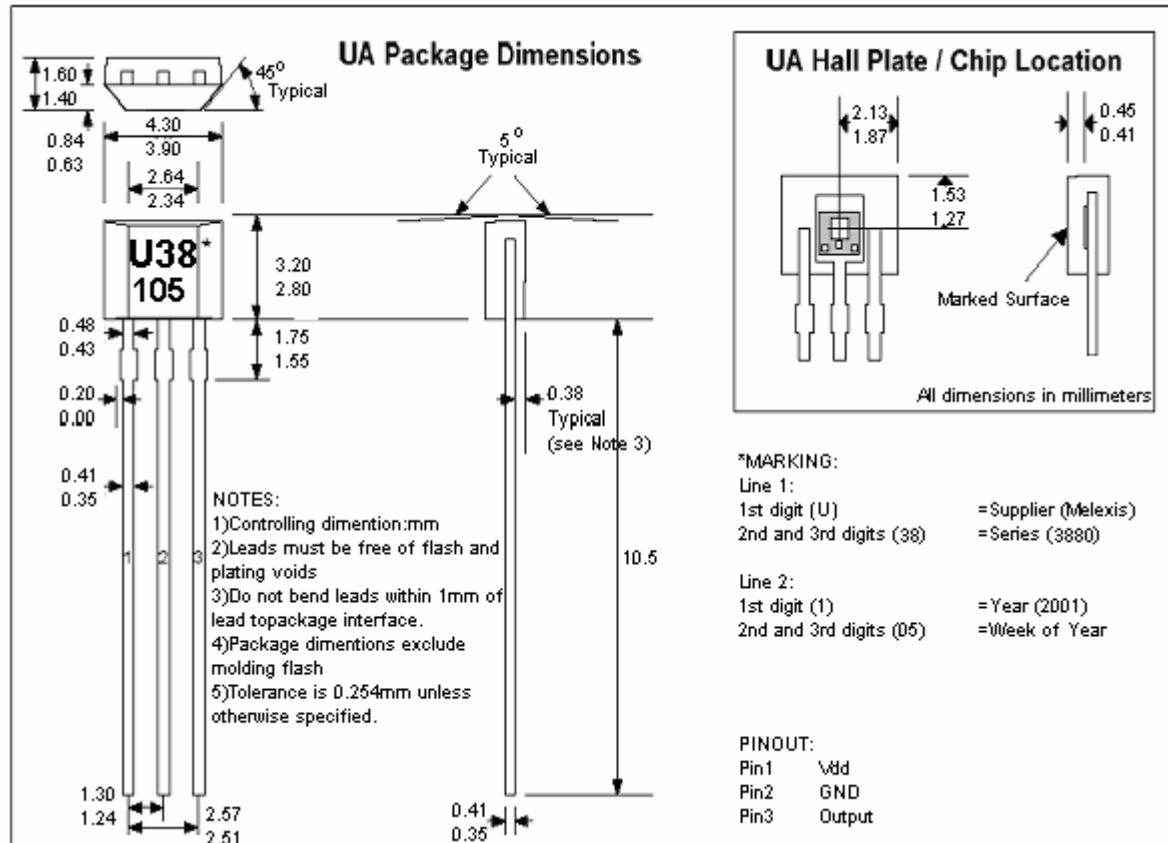
### 11. ESD Precautions

Electronic semiconductor products are sensitive to Electro Static Discharge (ESD).

Always observe Electro Static Discharge control procedures whenever handling semiconductor products.



## 12. Package Information



### 13. Disclaimer

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