

**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER****AP4305****General Description**

The AP4305 is a highly integrated solution for a constant voltage/constant current mode SMPS application.

The AP4305 contains one 1.21V voltage reference with  $\pm 0.5\%$  accuracy, one current sensing circuit and two operational amplifiers. Combining the voltage reference with one operational amplifier makes AP4305 an ideal voltage controller for use in adapters and battery chargers. The other low voltage reference combined with the other operational amplifier makes it an ideal current limiter for output low side current sensing.

The AP4305 is available in SOT-23-6 package.

**Features**

- Constant Voltage and Constant Current Control
- Precision Internal Voltage Reference
- Few External Components
- Easy Compensation
- Low Supply Current: 0.5mA
- Operating Temperature Range: -40 to 105°C

**Applications**

- Adapters
- Battery Chargers

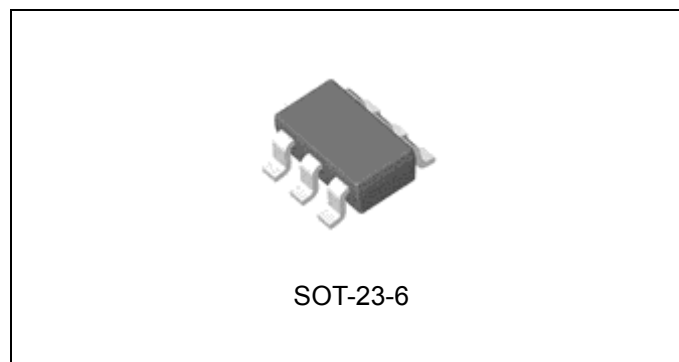


Figure 1. Package Type of AP4305

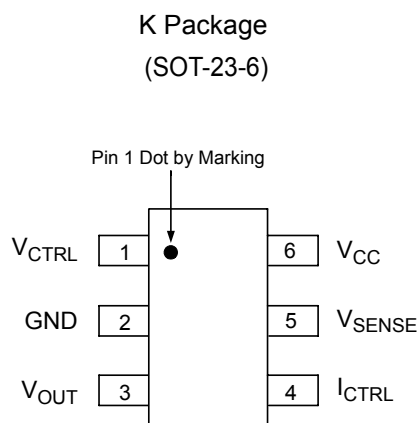
**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**
**Pin Configuration**


Figure 2. Pin Configuration of AP4305 (Top View)

**Pin Description**

Pin Number	Pin Name	Function
1	$V_{CTRL}$	Input pin of the voltage control loop
2	GND	Ground
3	$V_{OUT}$	Output pin. Sinking current only
4	$I_{CTRL}$	Input pin of the current control loop
5	$V_{SENSE}$	Input pin of the current control loop
6	$V_{CC}$	Power supply

**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**

**Functional Block Diagram**

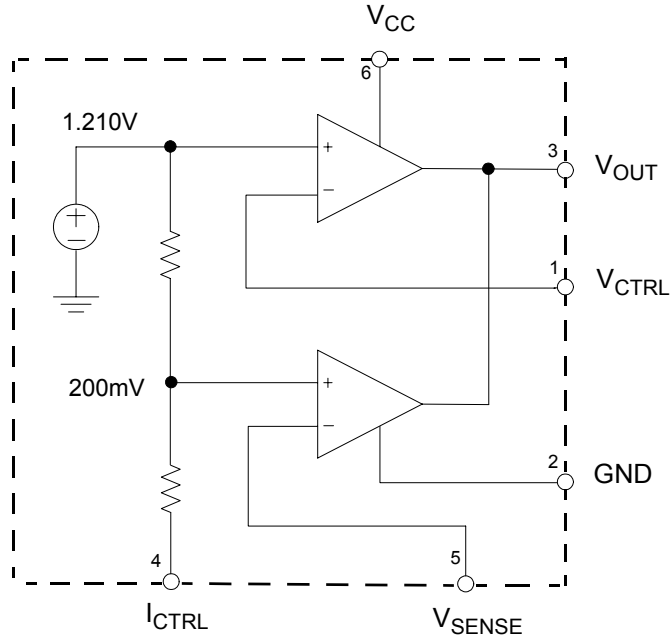
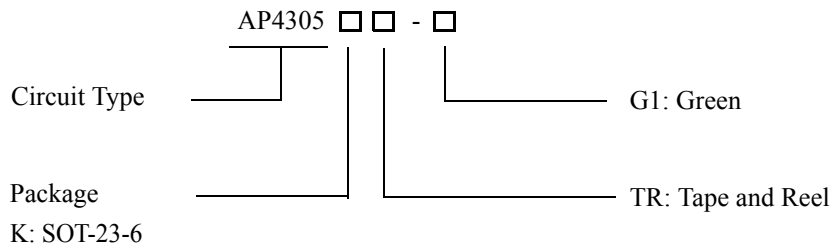


Figure 3. Functional Block Diagram of AP4305

**Ordering Information**



Package	Temperature Range	Part Number	Marking ID	Packing Type
SOT-23-6	-40 to 105°C	AP4305KTR-G1	G2B	Tape & Reel

BCD Semiconductor's products, as designated with "G1" suffix in the part number, are RoHS compliant and Green.

**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305****Absolute Maximum Ratings (Note 1)**

Parameter	Symbol	Value	Unit
Power Supply Voltage	$V_{CC}$	20	V
Input Voltage	$V_{IN}$	-0.3 to $V_{CC}$	V
Junction Temperature	$T_J$	150	°C
Storage Temperature	$T_{STG}$	-65 to 150	°C
Lead Temperature (Soldering, 5sec)	$T_{LEAD}$	260	°C
Package Thermal Resistance (Junction to Case)	$\theta_{JC}$	92	°C/W

Note 1: Stresses greater than those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "Recommended Operating Conditions" is not implied. Exposure to "Absolute Maximum Ratings" for extended periods may affect device reliability.

**Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Power Supply Voltage	$V_{CC}$	2.5	18	V
Operating Temperature Range	$T_A$	-40	105	°C



**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**

**Electrical Characteristics**

( $V_{CC}=5V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
<b>TOTAL CURRENT CONSUMPTION</b>						
Total Supply Current Not Including the Output Sinking Current	$I_{CC}$	$T_A=25^{\circ}C$		0.5	1	mA
		$-40^{\circ}C < T_A < 105^{\circ}C$		0.6		
<b>VOLTAGE CONTROL LOOP</b>						
Transconductance Gain ( $V_{CTRL}$ ). Sink Current Only	$G_{mv}$	$T_A=25^{\circ}C$	1	3.5		mA/mV
		$-40^{\circ}C < T_A < 105^{\circ}C$		2.5		
Voltage Control Loop Reference	$V_{REF}$	$T_A=25^{\circ}C$	1.204	1.21	1.216	V
		$-40^{\circ}C < T_A < 105^{\circ}C$	1.186		1.234	
Input Bias Current ( $V_{CTRL}$ )	$I_{IBV}$	$T_A=25^{\circ}C$		50		nA
		$-40^{\circ}C < T_A < 105^{\circ}C$		100		
<b>CURRENT CONTROL LOOP</b>						
Transconductance Gain ( $I_{CTRL}$ ). Sink Current Only	$G_{mi}$	$T_A=25^{\circ}C$	1.5	7		mA/mV
Current Control Loop Reference	$V_{SENSE}$	$I_{OUT}=2.5mA$ , $T_A=25^{\circ}C$	198	200	202	mV
		$I_{OUT}=2.5mA$ , $-40^{\circ}C < T_A < 105^{\circ}C$	192		208	
Current Out of Pin $I_{CTRL}$ at 200mV	$I_{IBI}$	$T_A=25^{\circ}C$		25		$\mu A$
		$-40^{\circ}C < T_A < 105^{\circ}C$		50		
<b>OUTPUT STAGE</b>						
Low Output Voltage at 10mA Sinking Current	$V_{OL}$	$T_A=25^{\circ}C$		200		mV
Output Short Circuit Current. Output to $V_{CC}$ , Sink Current Only	$I_{OS}$	$T_A=25^{\circ}C$		27	50	mA
		$-40^{\circ}C < T_A < 105^{\circ}C$		35		



**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**

**Typical Performance Characteristics**

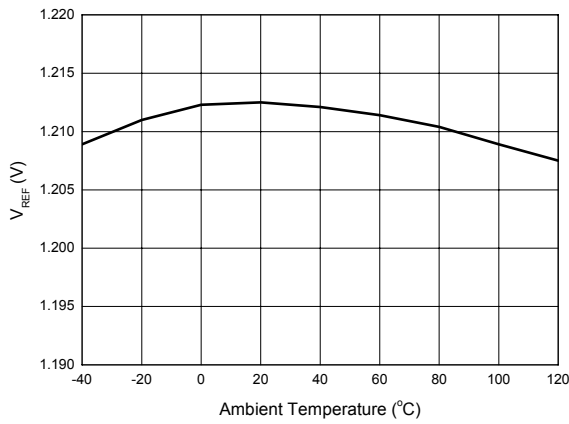


Figure 4. V<sub>REF</sub> vs. Ambient Temperature

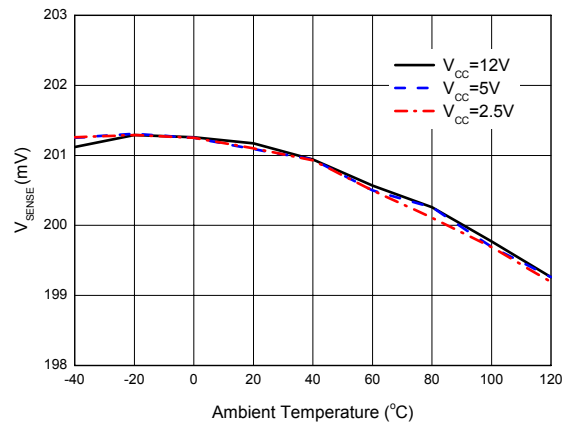


Figure 5. V<sub>SENSE</sub> vs. Ambient Temperature

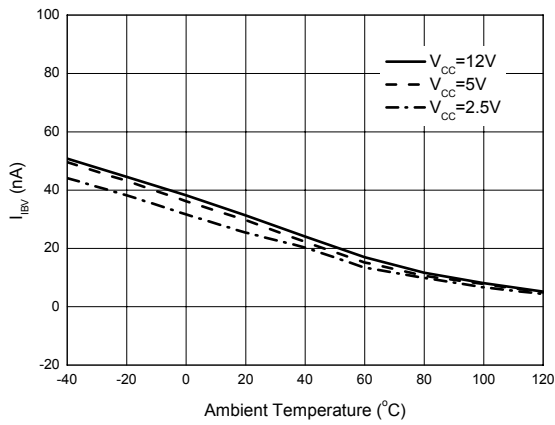


Figure 6. I<sub>IBV</sub> vs. Ambient Temperature

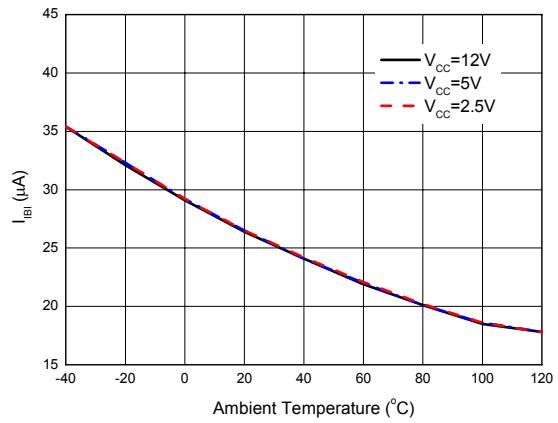


Figure 7. I<sub>IBI</sub> vs. Ambient Temperature



**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**

**Typical Performance Characteristics (Continued)**

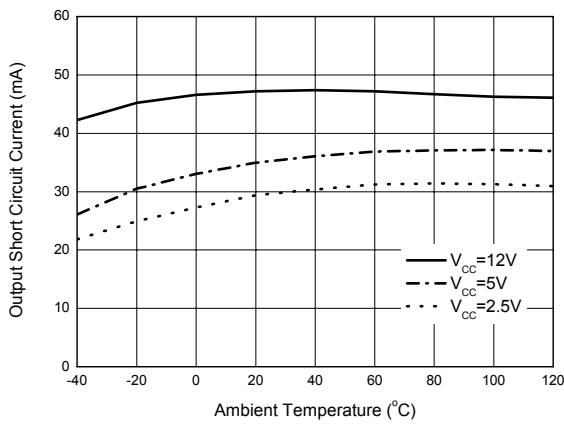


Figure 8. Output Short Circuit Current vs. Ambient Temperature

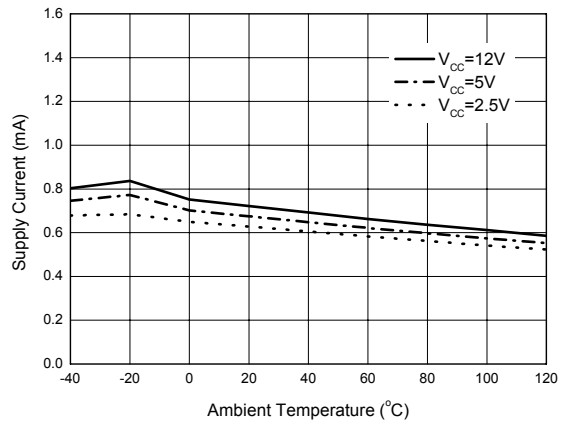
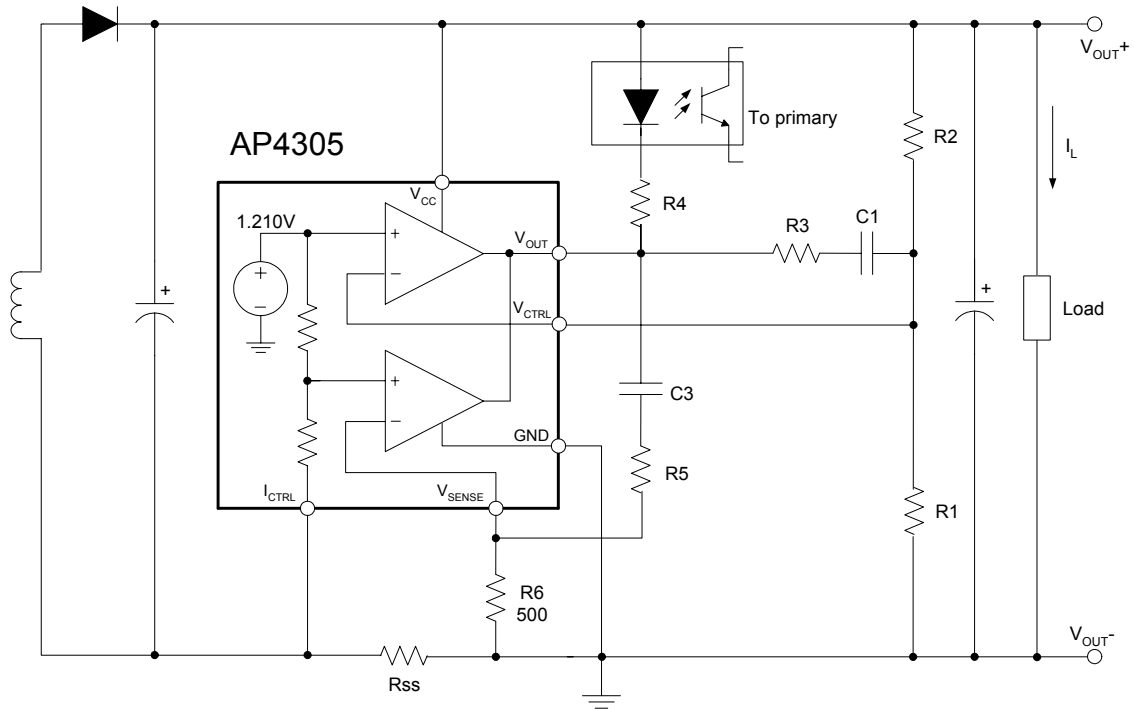


Figure 9. Supply Current vs. Ambient Temperature

**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**

**Typical Application**



$$V_{OUT} = V_{REF} \times \frac{R1 + R2}{R1} \quad (V)$$

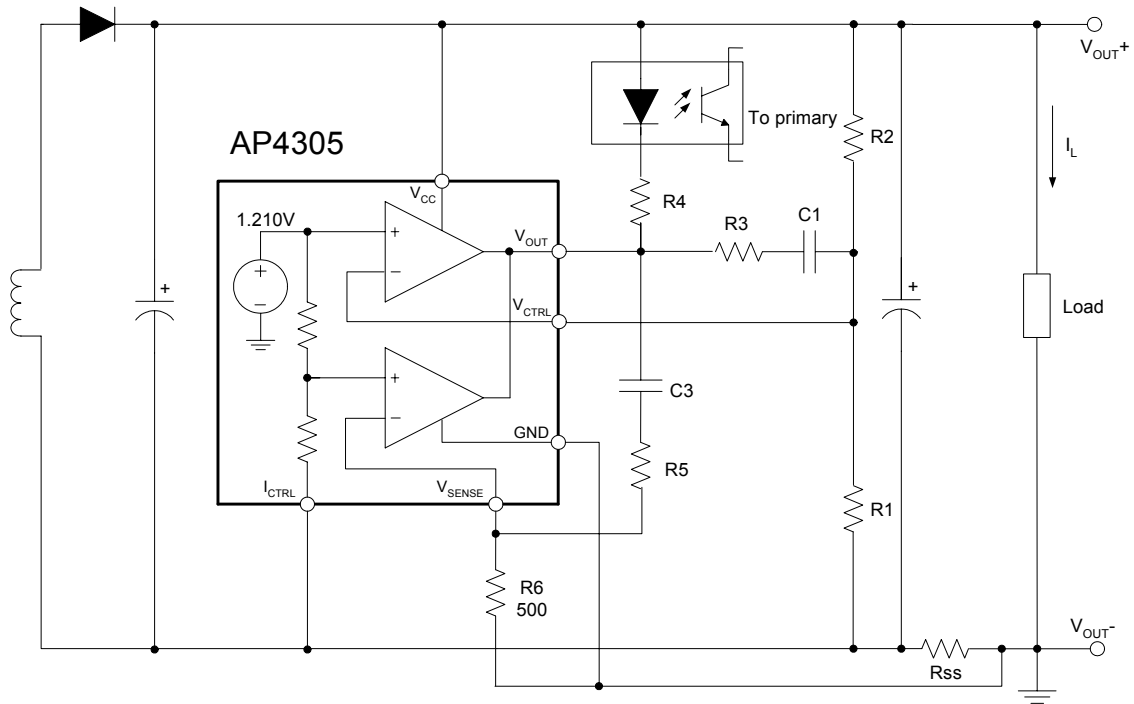
$$CurrentLimit = \frac{V_{SENSE}}{R_{SS}} \quad (A)$$

Figure 10. Typical Application 1 of AP4305



**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**

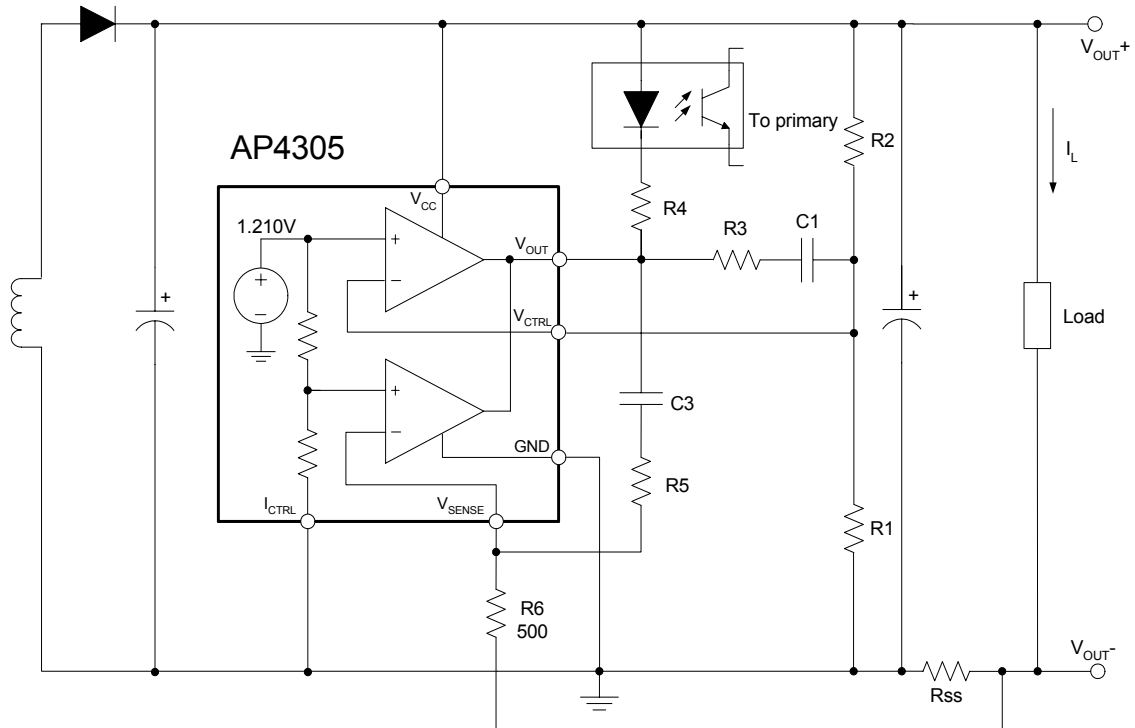
Typical Application (Continued)



$$V_{OUT} = [V_{REF} + (I_L \times R_{SS})] \times \frac{R1 + R2}{R1} - (I_L \times R_{SS}) \quad (V)$$

$$CurrentLimit = \frac{V_{SENSE}}{R_{SS}} \quad (A)$$

Figure 11. Typical Application 2 of AP4305

**Typical Application (Continued)**


$$V_{OUT} = V_{REF} \times \frac{R1 + R2}{R1} - (I_L \times R_{SS}) \quad (V)$$

$$CurrentLimit = \frac{V_{SENSE} \times V_{REF}}{(V_{SENSE} + V_{REF}) \times R_{SS}} \quad (A)$$

Figure 12. Typical Application 3 of AP4305

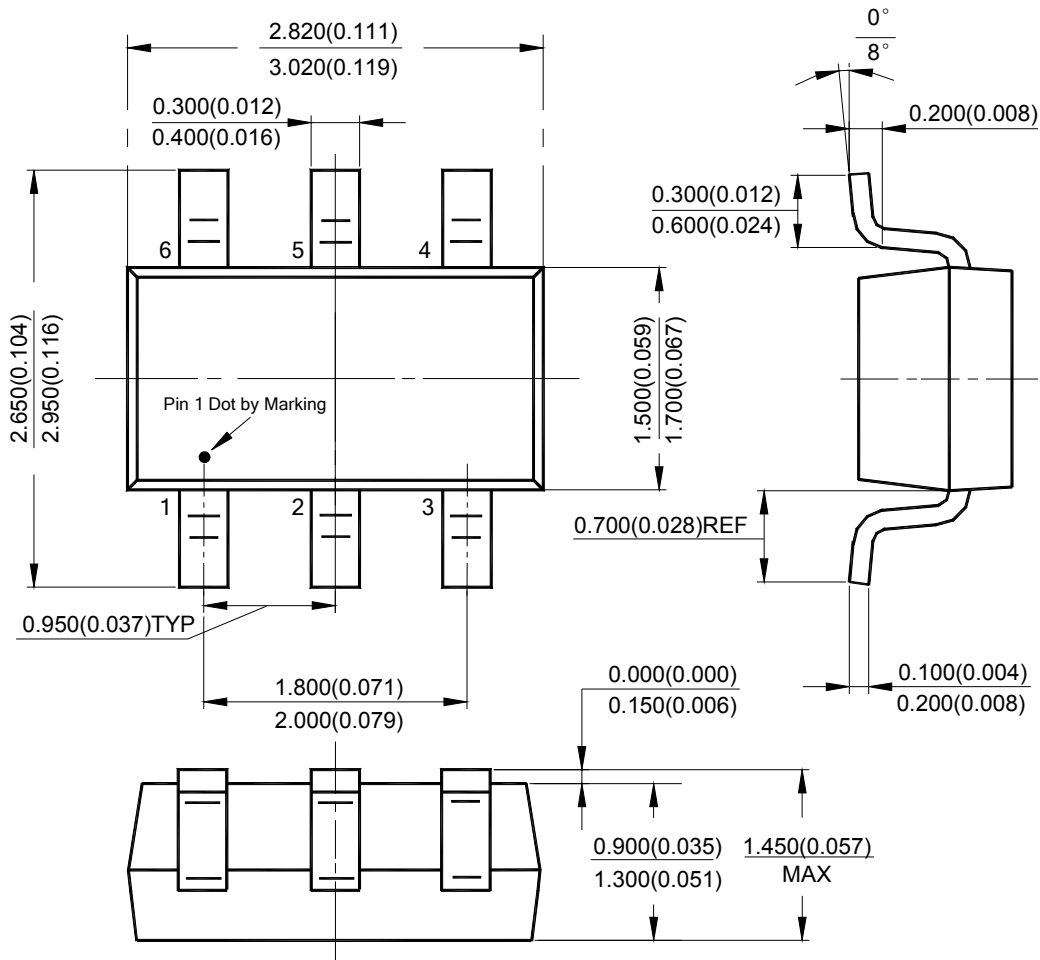


**CONSTANT VOLTAGE AND CONSTANT CURRENT CONTROLLER AP4305**

**Mechanical Dimensions**

**SOT-23-6**

**Unit: mm(inch)**





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#### MAIN SITE

##### - Headquarters

##### BCD Semiconductor Manufacturing Limited

No. 1600, Zi Xing Road, Shanghai Zizhu Science-based Industrial Park, 200241, China  
Tel: +86-21-24162266, Fax: +86-21-24162277

##### - Wafer Fab

##### Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd.

800 Yi Shan Road, Shanghai 200233, China  
Tel: +86-21-6485 1491, Fax: +86-21-5450 0008

#### REGIONAL SALES OFFICE

##### Shenzhen Office

##### Shanghai SIM-BCD Semiconductor Manufacturing Co., Ltd., Shenzhen Office

Unit A Room 1203, Skyworth Bldg., Gaoxin Ave. 1.S., Nanshan District, Shenzhen, China  
Tel: +86-755-8826 7951  
Fax: +86-755-8826 7865

##### Taiwan Office

##### BCD Semiconductor (Taiwan) Company Limited

4F, 298-1, Rui Guang Road, Nei-Hu District, Taipei, Taiwan  
Tel: +886-2-2656 2808  
Fax: +886-2-2656 2806

##### USA Office

##### BCD Semiconductor Corp.

30920 Huntwood Ave. Hayward, CA 94544, USA  
Tel : +1-510-324-2988  
Fax: +1-510-324-2788