

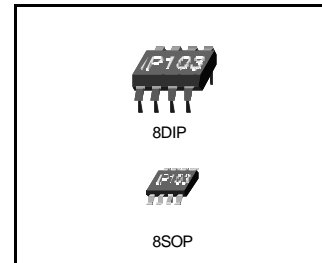
\* The Main Differences of IP103 and IP103H are **V<sub>icm</sub>**(Input Common Mode Voltage Range) and **V<sub>op</sub>**(Operating Voltage)

### DESCRIPTION

The IP103H is designed to be used in battery chargers with a constant voltage and a constant current control.

This device is a monolithic IC that includes one independent op-amp and other op-amp for which the non inverting input is wired to a 2.5V fixed Voltage reference.

Integrating the reference and op-amps creates a solution for low cost charging applications.



### FEATURES

#### Operational Amplifiers

- Low Supply Current : 200uA/amp
- Medium Speed : 1.5MHz
- Low Level Output Voltage Close to VEE : 0.1V Typ.
- **Wide Power Supply Range; 3.6~28V**

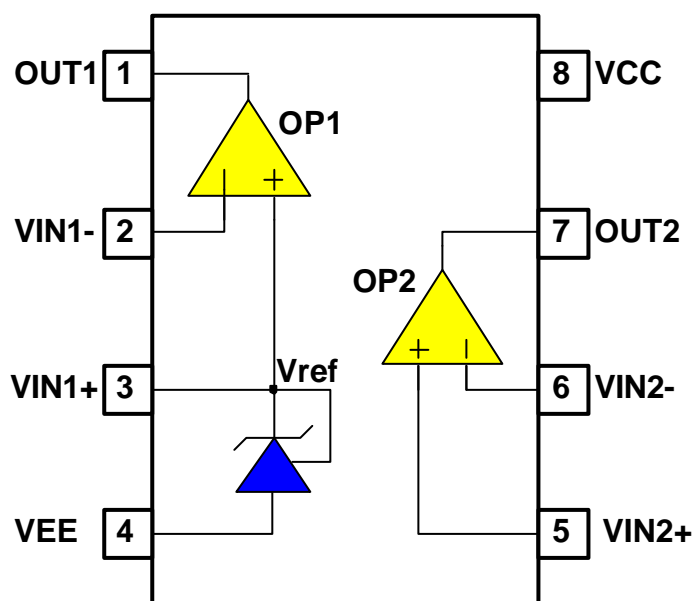
#### Adjustable Shunt Regulator

- Fixed Output Voltage Reference 2.5V
- Sink Current Capability : 0.5 to 150mA
- 1% Voltage Precision
- Latch-up Immunity

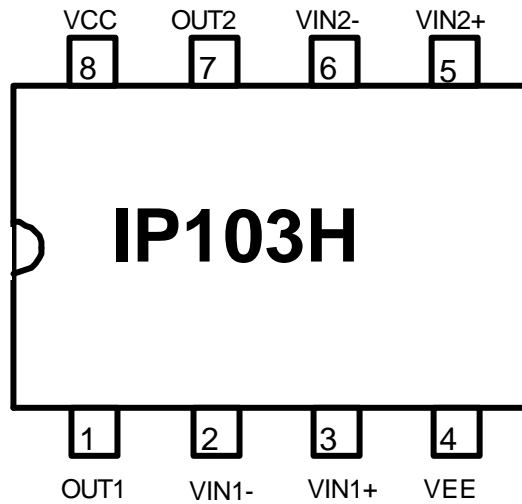
### ORDERING INFORMATION

Device	Package	Operating Temp
IP103H	8DIP	-40°C ~ +105°C
I103H	8SOP	

### BLOCK DIAGRAM



**PIN CONNECTIONS**



**PIN DESCRIPTIONS**

NO	SYMBOL	I/O	DESCRIPTION
1	OUT1	O	OP-Amp 1 Output
2	VIN1-	I	OP-Amp 1 Inverting Input
3	VIN1+	I	OP-Amp 1 Non-Inverting Input
4	VEE	-	Negative Supply Voltage
5	VIN2+	I	OP-Amp 2 Non-Inverting Input
6	VIN2-	I	OP-Amp 2 Inverting Input
7	OUT2	O	OP-Amp 2 Output
8	VCC	-	Positive Supply Voltage

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	V <sub>ccmax</sub>	28	V
Operating Temperature	T <sub>opr</sub>	-40 ~ +105	°C
Storage temperature	T <sub>stg</sub>	-65 ~ 150	°C

### ELECTRICAL CHARACTERISTICS

T<sub>a</sub> = 25°C, V<sub>CC</sub> = 5V, V<sub>EE</sub> = GND (unless otherwise specified. )

#### TOTAL SUPPLY VOLTAGE SECTION

CHARACTERISTICS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Total Supply Current	I <sub>cc</sub>	V <sub>ee</sub> = 0V, No Load		0.8	1.5	mA

#### Operational Amplifiers

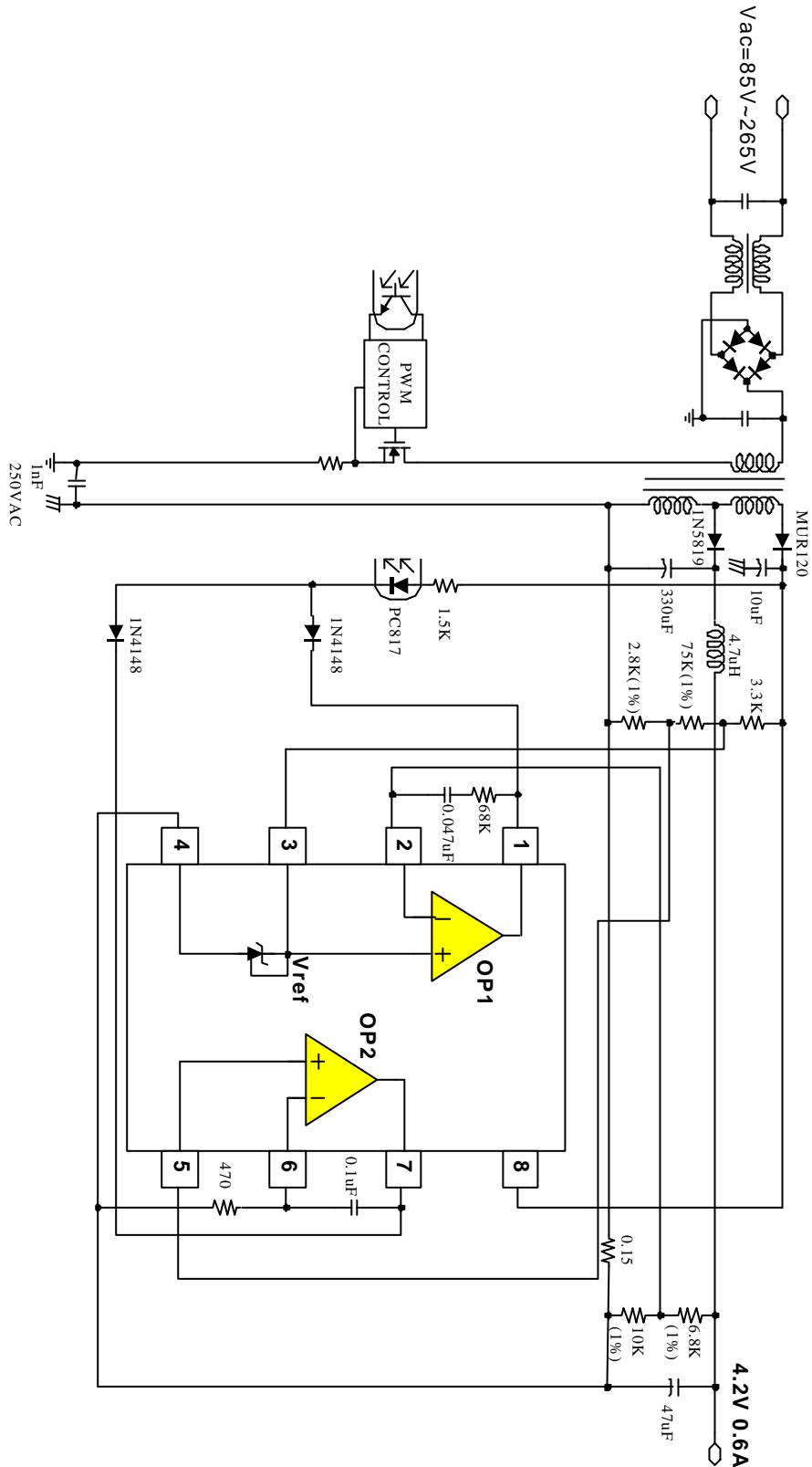
Input Offset Voltage	V <sub>io</sub>		-	1	4.5	mV
Input Bias Current	I <sub>ib</sub>		-	50	150	nA
Large Signal Voltage Gain	A <sub>vd</sub>	V <sub>cc</sub> =15V, V <sub>o</sub> =5~10V, R <sub>load</sub> =10K	60	100	-	dB
Supply Voltage Rejection Ratio	SVRR	V <sub>cc</sub> = 5V to 15V	65	100	-	dB
Input Common Mode Voltage Range	V <sub>icm</sub>	-	0	-	V <sub>cc</sub> -1.8V	V
Common Mode Rejection Ratio	CMRR	V <sub>cc</sub> =15V	70	90	-	dB
Output Source Current	I <sub>source</sub>	V <sub>o</sub> =2.5V, V <sub>id</sub> =+1V	3	6	-	mA
Output Sink Current	I <sub>sink</sub>	V <sub>o</sub> =2.5V, V <sub>id</sub> =-1V	3	6	-	mA
Phase Margin	PM	R <sub>load</sub> =10K, C <sub>load</sub> =100pF	-	55	-	Degree
Output Voltage High	V <sub>oh</sub>	V <sub>cc</sub> =15V, R <sub>load</sub> =10K	12	13	-	V
Output Voltage Low	V <sub>ol</sub>	R <sub>load</sub> =10K	-	100	250	mV
Slew Rate	SR	V <sub>i</sub> =10V, V <sub>cc</sub> =12V, R <sub>load</sub> =10K, C <sub>load</sub> =100pF	-	0.75	-	V/us
Gain Bandwidth	GB	R <sub>load</sub> =10K, C <sub>load</sub> =100pF, f=100kHz	-	1.5	-	MHz
Total Harmonic Distortion	THD		-	0.05	-	%

**ELECTRICAL CHARACTERISTICS**

Ta = 25°C, VCC = 5V, VEE=GND (unless otherwise specified. )

<b>Adjustable Shunt Regulator</b>						
<b>CHARACTERISTICS</b>	<b>SYMBOL</b>	<b>CONDITIONS</b>	<b>MIN</b>	<b>TYP</b>	<b>MAX</b>	<b>UNIT</b>
Recommended Cathode Current	I <sub>k</sub>		0.5		100	mA
Reference Input Voltage	V <sub>ref</sub>		2.475	2.5	2.525	V
Reference Input Voltage Deviation	dV <sub>ref</sub>	V <sub>ka</sub> =V <sub>ref</sub> , I <sub>k</sub> =10mA -40°C < Ta < 105°C		7	30	mV
Load Regulation	R <sub>load</sub>	I <sub>k</sub> =1mA~10mA		3	10	mV
Minimum Cathode Current for Regulation	I <sub>min</sub>			0.2	0.5	mA

### TYPICAL APPLICATION



**ELECTRICAL DIAGRAMS**

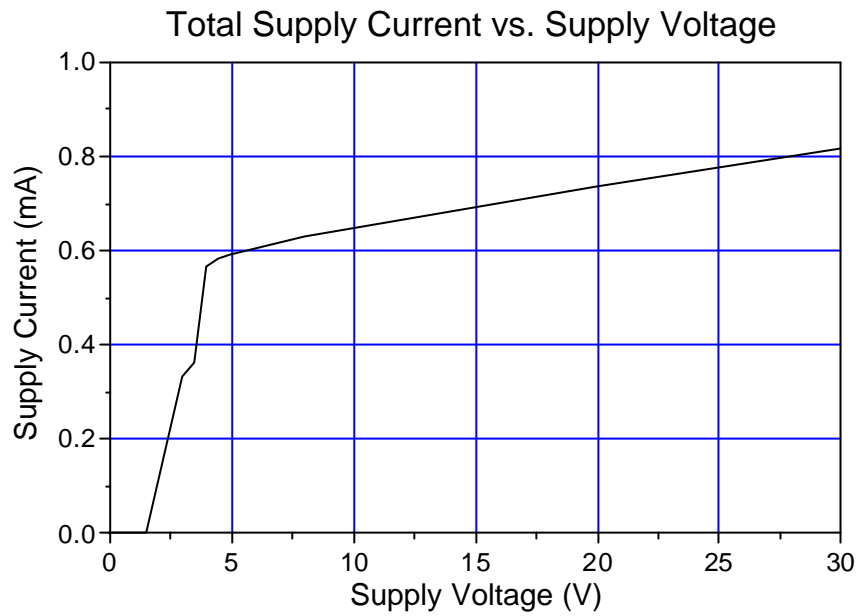


Fig.1 : Toatal Supply Current vs. Supply Voltage

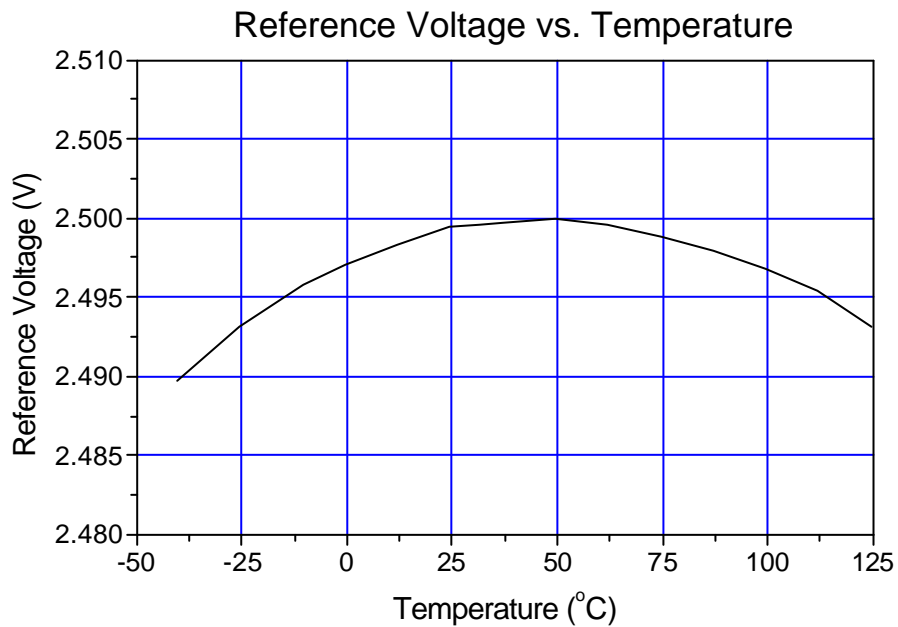


Fig.2 : Reference Voltage vs. Temperature

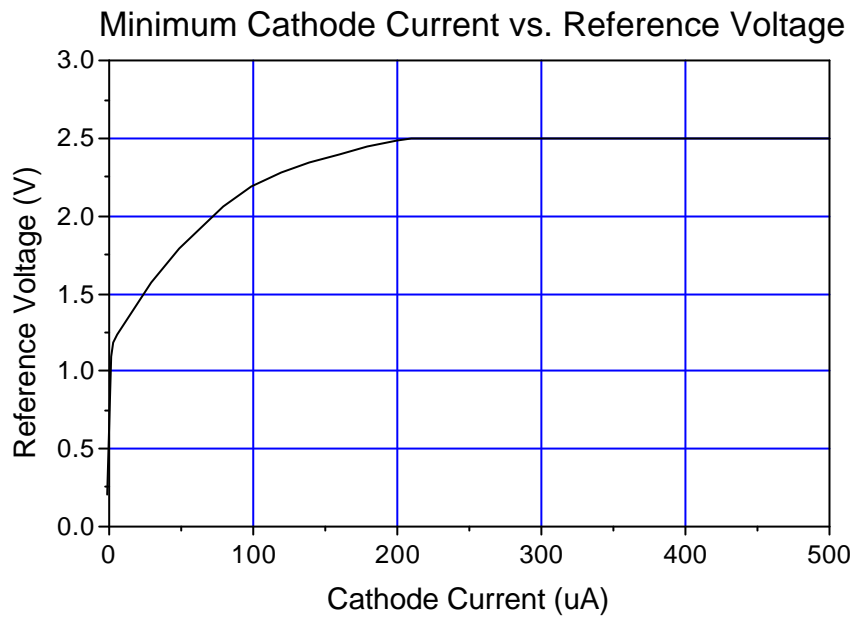


Fig.3 : Minimum Cathode Current vs. Reference Voltage

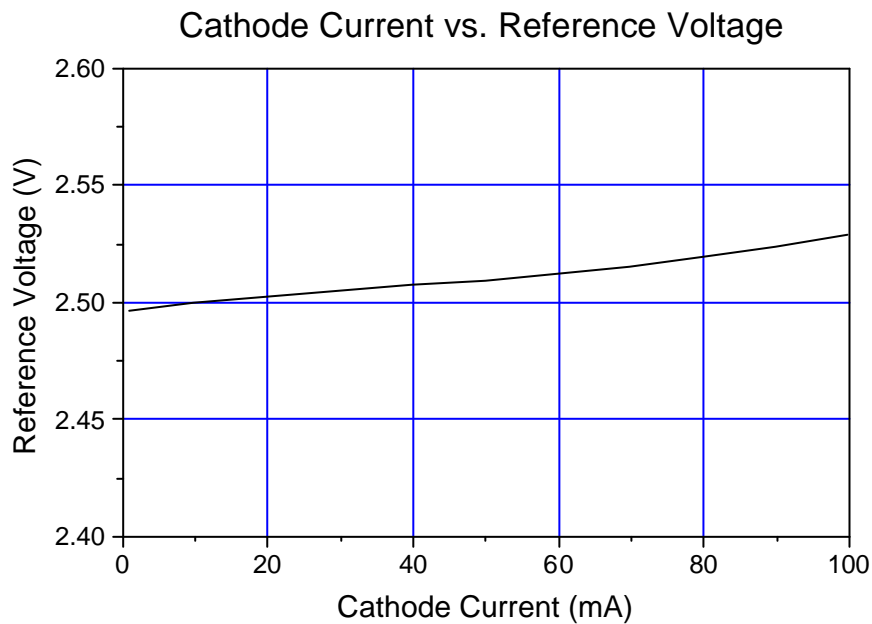


Fig.4 : Cathode Current VS. Reference Voltage

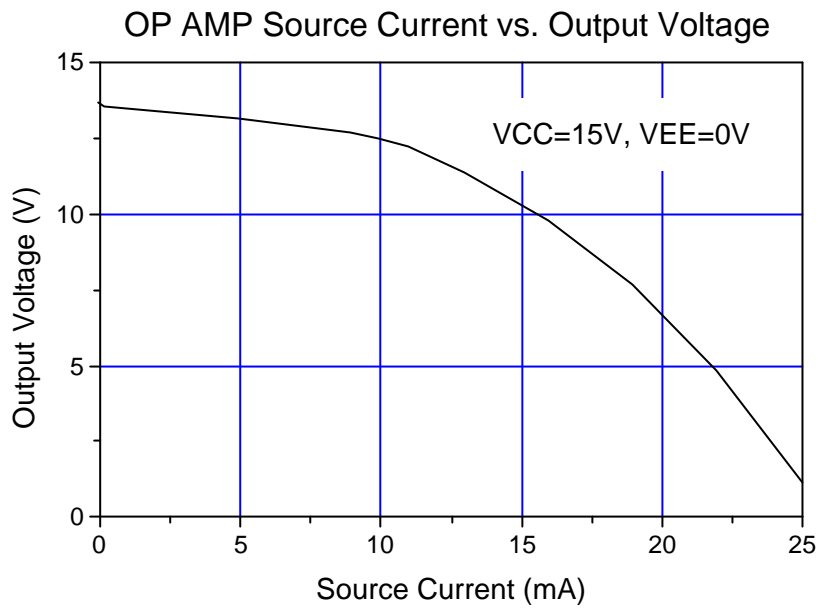


Fig.5 : OP AMP Source Current vs. Output Voltage

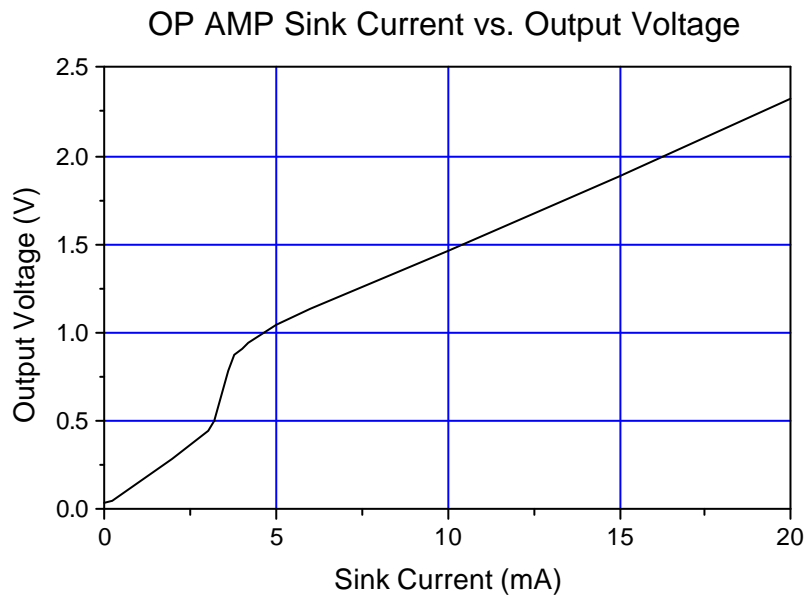


Fig.6 : OP AMP Sink Current vs. Output Voltage



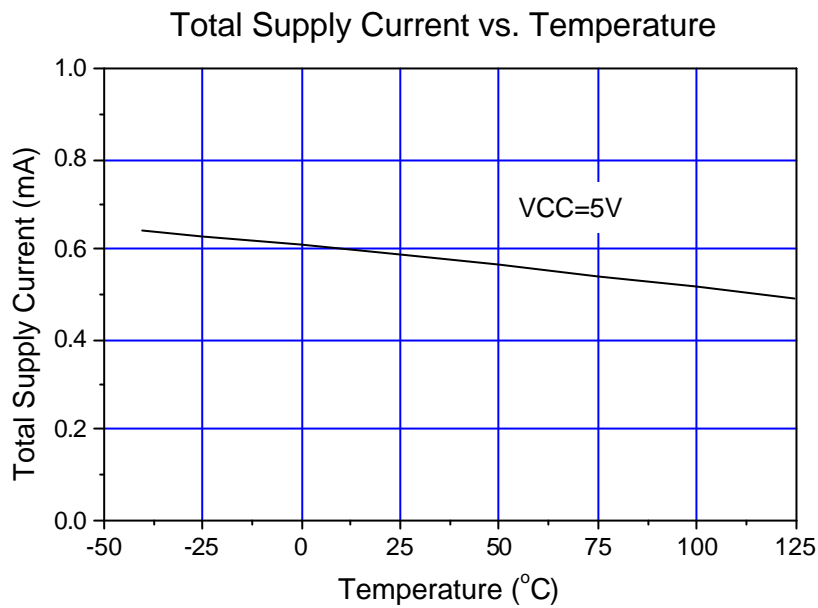


Fig.7 : Total Supply Current vs. Temperature

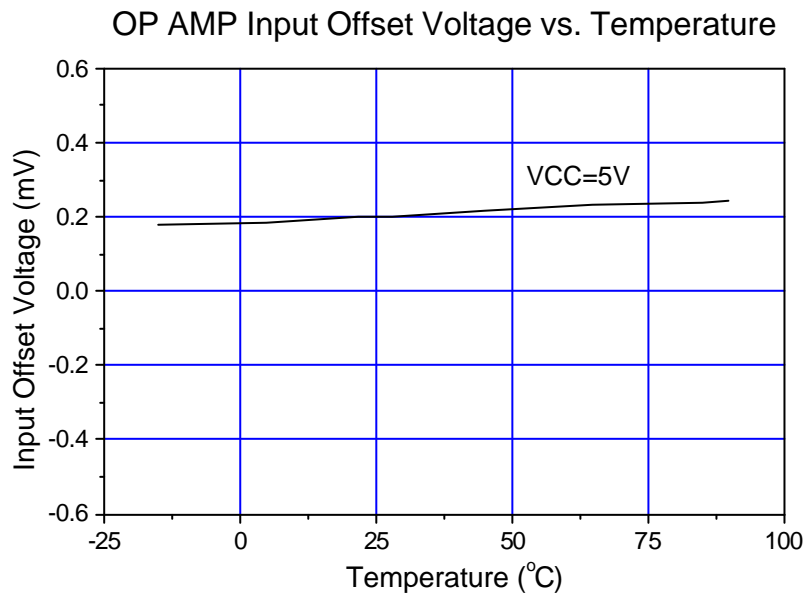
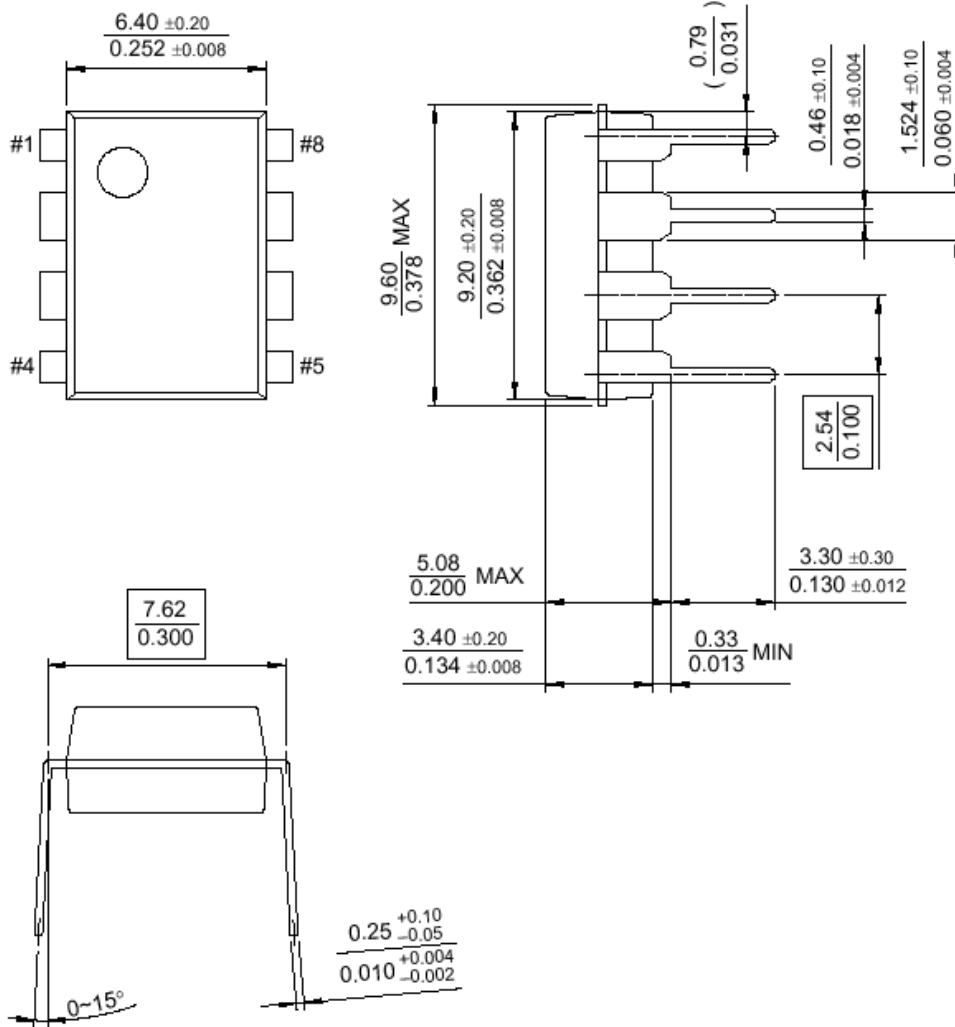


Fig.8 : OP AMP Input Offset Voltage vs. Temperature

**PACKAGE DIMENSION**

**8-DIP**



**PACKAGE DIMENSION**

**8-SOP**

