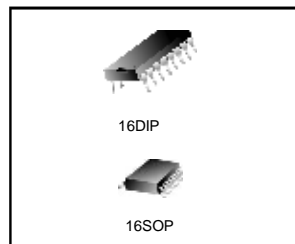


### DESCRIPTION

The IP102/A is a monolithic IC that includes two operational amplifiers, two comparators and an adjustable shunt regulator. This device is offering space and cost saving in many applications like power supply management or data acquisition systems.



### FEATURES

#### Operational Amplifiers

- Low Supply Current : 200uA/amp
- Medium Speed : 1.5MHz
- Low Level Output Voltage Close to VEE : 0.1V Typ.

#### Comparators

- Low Supply Current : 200uA/amp (Vcc = 5V)
- Low Output Saturation Voltage 0.1V (Io = 4mA)

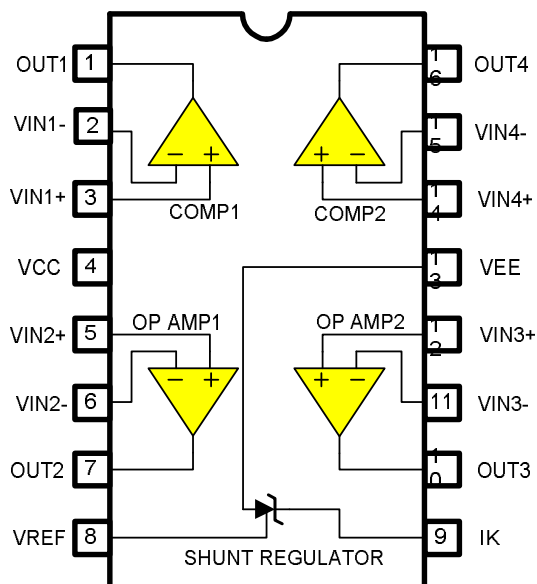
#### Adjustable Shunt Regulator

- Adjustable Output Voltage : Vref to 18V
- Sink Current Capability : 0.5 to 150mA
- 1% Voltage Precision
- Latch-up Immunity

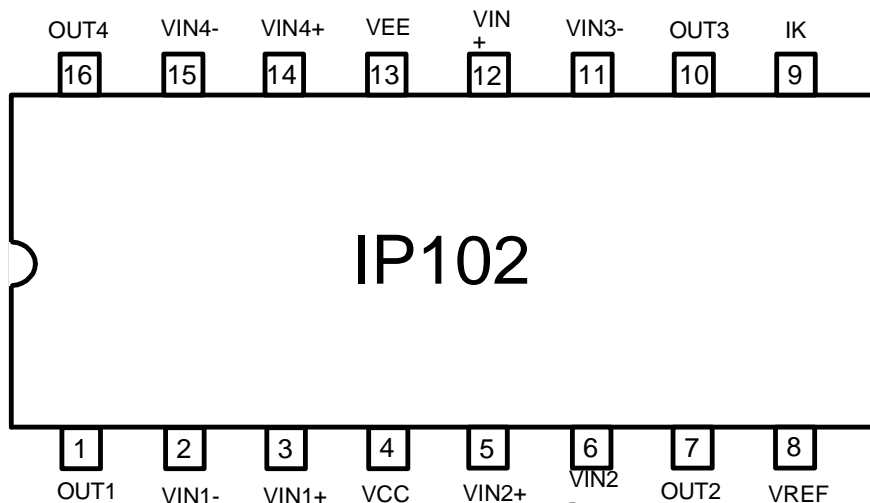
### ORDERING INFORMATION

Device	Package	Operating Temp
IP102A	16DIP	-40°C ~ +85°C
IP102A	16SOP	

### BLOCK DIAGRAM



### PIN CONNECTIONS



### PIN DESCRIPTIONS

NO	SYMBOL	I/O	DESCRIPTION
1	OUT1	O	Comparator 1 Output
2	VIN1-	I	Comparator 1 Inverting Input
3	VIN1+	I	Comparator 1 Non-Inverting Input
4	VCC	-	Positive Supply Voltage
5	VIN2+	I	OP-Amp 1 Non-Inverting Input
6	VIN2-	I	OP-Amp 1 Inverting Input
7	OUT2	O	OP-Amp 1 Output
8	VREF	-	Adjustable Shunt Regulator Voltage Reference
9	IK	I	Adjustable Shunt Regulator Cathode
10	OUT3	O	OP-Amp 2 Output
11	VIN3-	I	OP-Amp 2 Inverting Input
12	VIN3+	I	OP-Amp 2 Non-Inverting Input
13	VEE	-	Negative Supply Voltage
14	VIN4+	I	Comparator 2 Non-Inverting Input
15	VIN4-	I	Comparator 2 Inverting Input
16	OUT4	O	Comparator 2 Output

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	VALUE	UNIT
Supply Voltage	Vcc	18	V
Operating temperature	Topr	-40 ~ +85	°C
Storage temperature	Tstg	-65 ~ 150	°C

### ELECTRICAL CHARACTERISTICS

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

#### TOTAL SUPPLY VOLTAGE SECTION

CHARACTERISTICS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Total Supply Current	Icc	Vee = 0V, No Load		0.8	1.5	mA

#### Operational Amplifiers

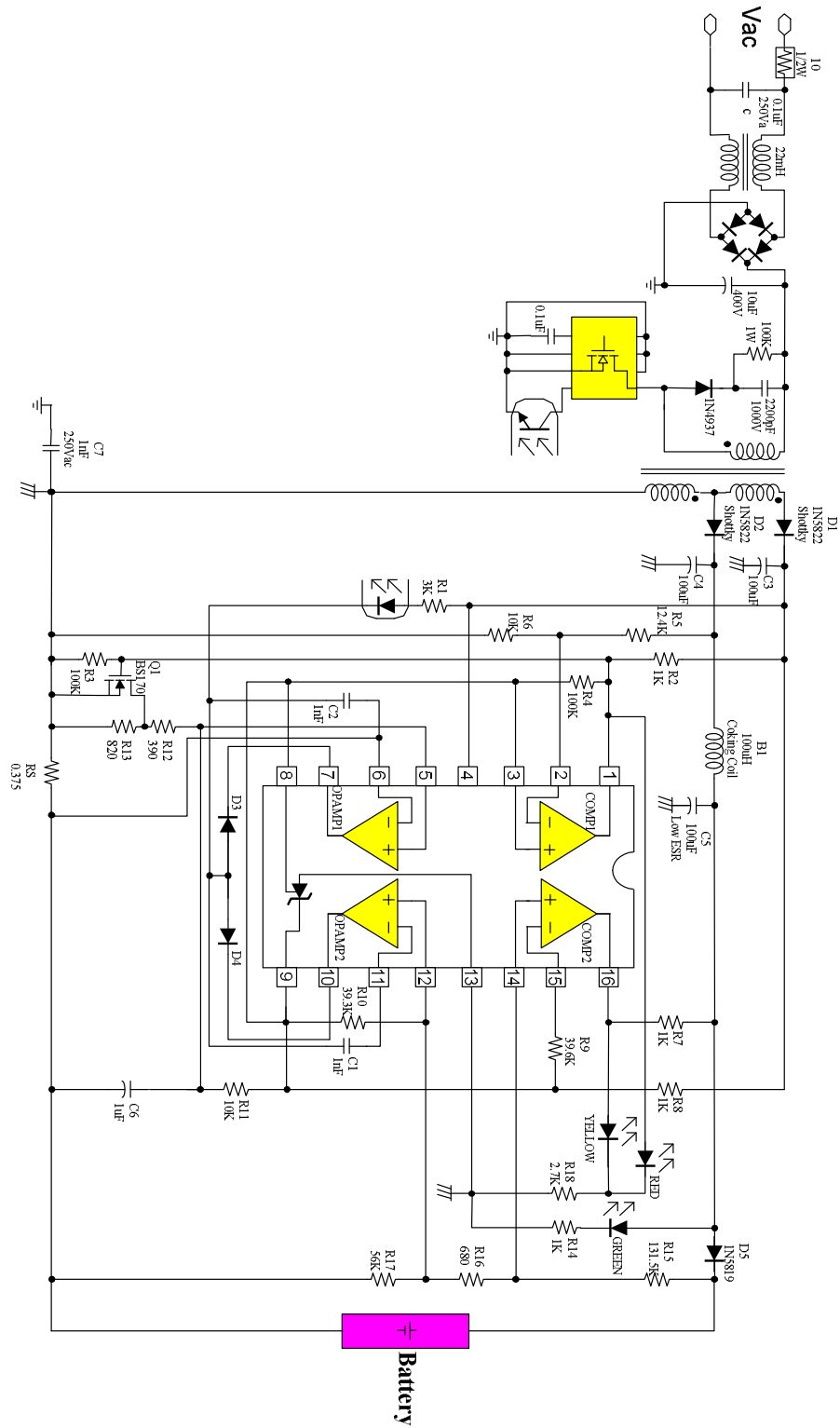
Input Offset Voltage	Vio			1	4.5	mV
Input Offset Current	Iio				50	nA
Input Bias Current	Iib			50	150	nA
Large Signal Voltage Gain	Avd	Vcc=15V, Vo=5~10V, Rload =10K	60	100		dB
Supply Voltage Rejection Ratio	SVRR	Vcc= 5V to 15V	65	100		dB
Common Mode Rejection Ratio	CMRR	Vcc=15V, Vicm=0~(Vcc)-1.8V	70	90		dB
Output Source Current	Isource	Vo=2.5V, Vid=+-1V	3	6		mA
Output Sink Current	Isink	Vo=2.5V, Vid=+-1V	3	6		mA
Phase Margin	PM	Rload=10K,Clod=100pF		55		Degree
Output Voltage High	Voh	Vcc=15V, Rload=10K	12	13		V
Output Voltage Low	Vol	Rload=10K		100	150	mV
Slew Rate	SR	Vi=10V, Vcc=12V,Rload=10K,Clod=100pF	0.5	0.75		V/us
Gain Bandwidth	GB	Rload=10K,Clod=100pF,f=100khz	1.0	1.5		MHz
Total Harmonic Distortion	THD			0.05		%

### ELECTRICAL CHARACTERISTICS

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

<b>Comparators</b>						
CHARACTERISTICS	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Input Offset Voltage	Vio				5	mV
Input Offset Current	lio				50	nA
Input Bias Current	lib				200	nA
High Level Output Current	Ioh	Vid = +1V, Vcc=Vo=15V		0.1	1	uA
Large Signal Voltage Gain	Avd	Vcc+=15V, Rload =15K, Vo=1V to 11V		200		V/mV
Low Level Output Voltage	Vol	Vid = -1V, Isc = 4mA		100	400	mV
Output Sink Current	Isc	Vid = -1V, Vo = 1.5V	6	16		mA
Input Common Mode Voltage Range	Vicm		0		(Vcc) - 1.5	V
Differential Input Voltage	Vid				Vcc	V
<b>Adjustable Shunt Regulator</b>						
Cathode to Anode Voltage	Vka		Vref		18	V
Cathode Current	Ik		0.5		150	mA
Reference Input Voltage	Vref	IP102	2.475	2.5	2.525	V
Reference Input Voltage Deviation	dVref	Vka=Vref, Ik=10mA -40°C < Ta < 85°C		7	30	mV
Load Regulation	Rload	Vka=Vref, Ik=10mA~100mA		20	50	mV
Minimum Cathode Current for Regulation	Imin	Vka = Vref		0.2	0.5	mA
Off-State Cathode Current	Ioff	Vka=18V, Vref=0V		0.1	1	uA

TYPICAL APPLICATION



**ELECTRICAL DIAGRAMS**

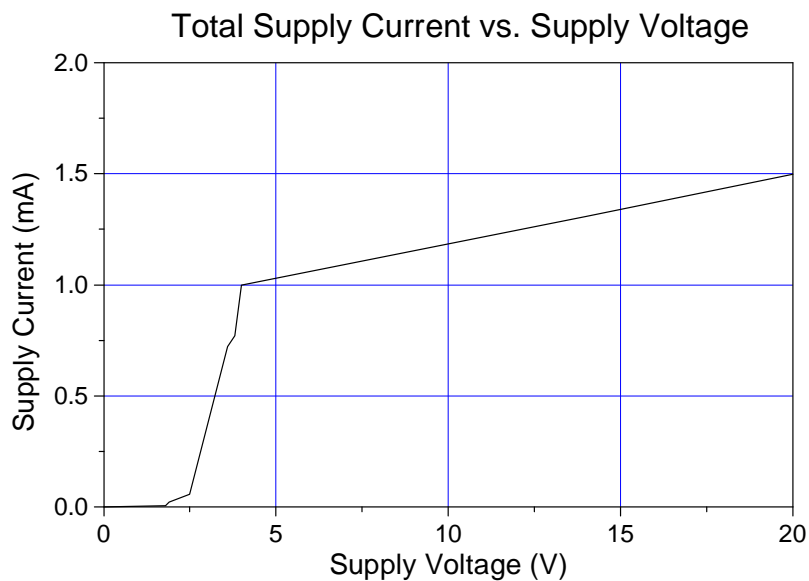


Fig.1 : Total Supply Current vs. Supply Voltage

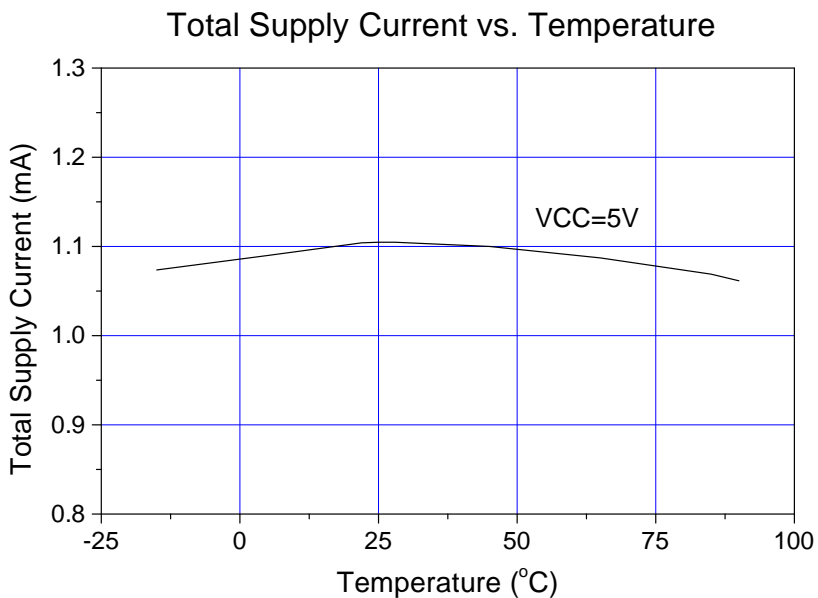


Fig.2 : Total Supply Current vs. Temperature

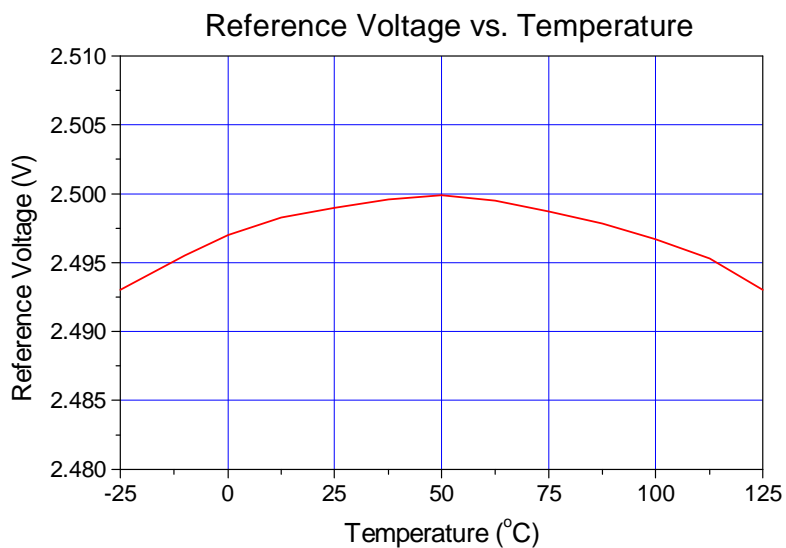


Fig.3 : Reference Voltage vs. Temperature

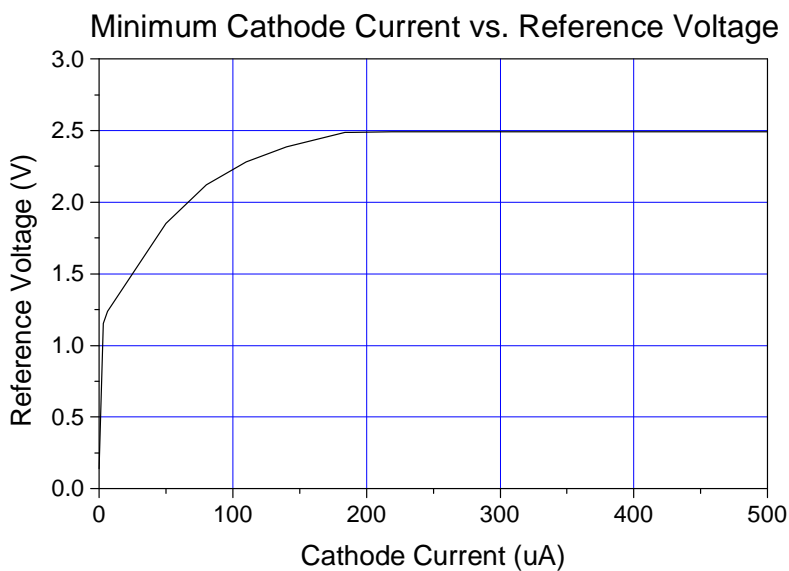


Fig.4 : Minimum Cathode Current VS. Reference Voltage

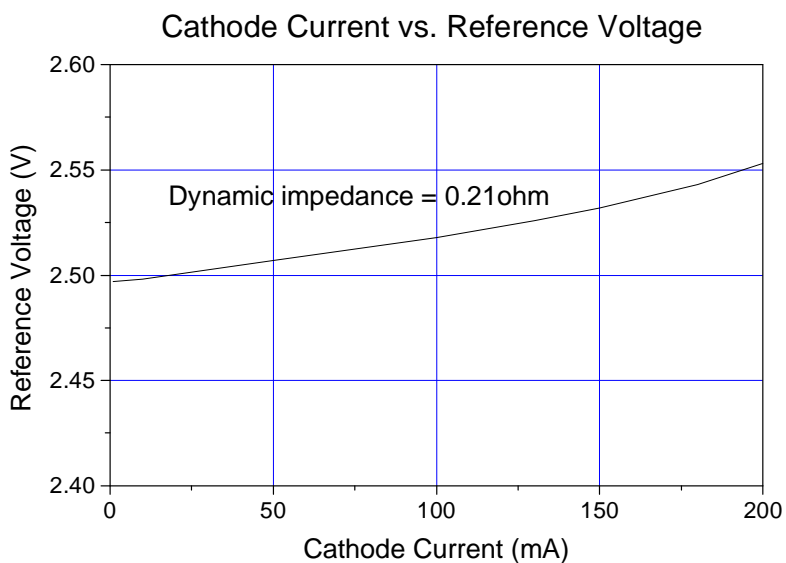


Fig.5 : Cathode Current vs. Reference Voltage

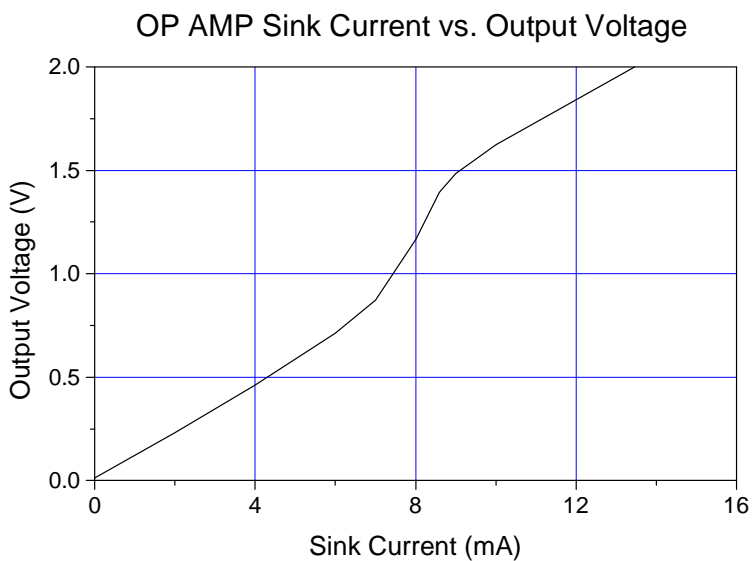


Fig.6 : OP AMP Sink Current vs. Output Voltage



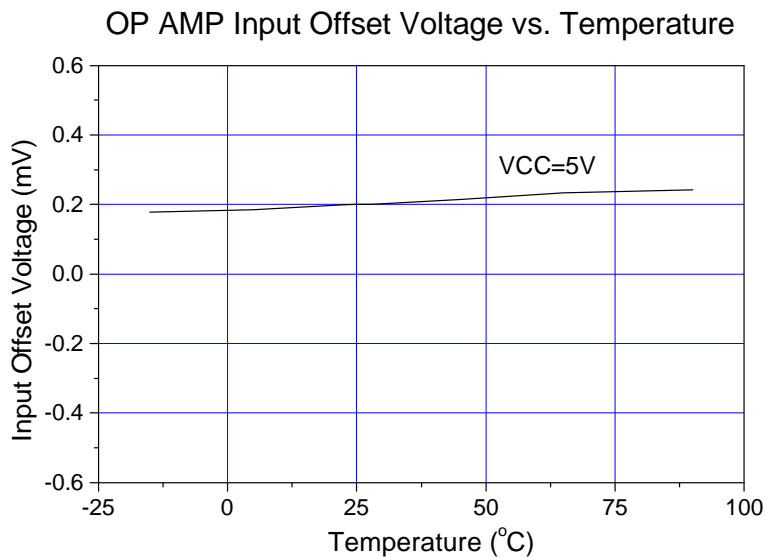


Fig.7 : OP AMP Input Offset Voltage vs. Temperature

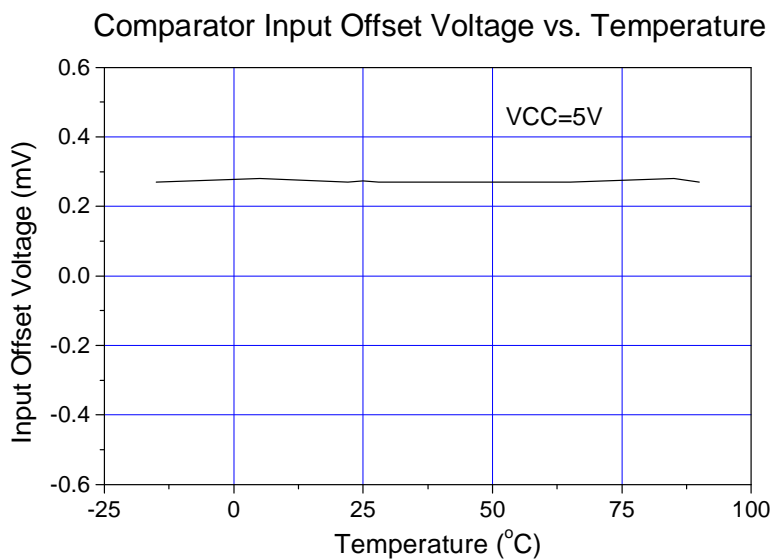


Fig.8 : Comparator Input Offset Voltage vs. Temperature

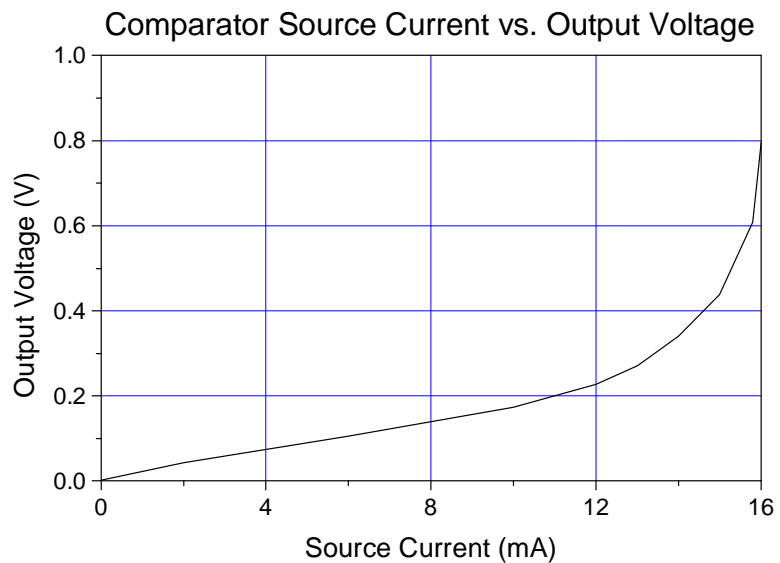
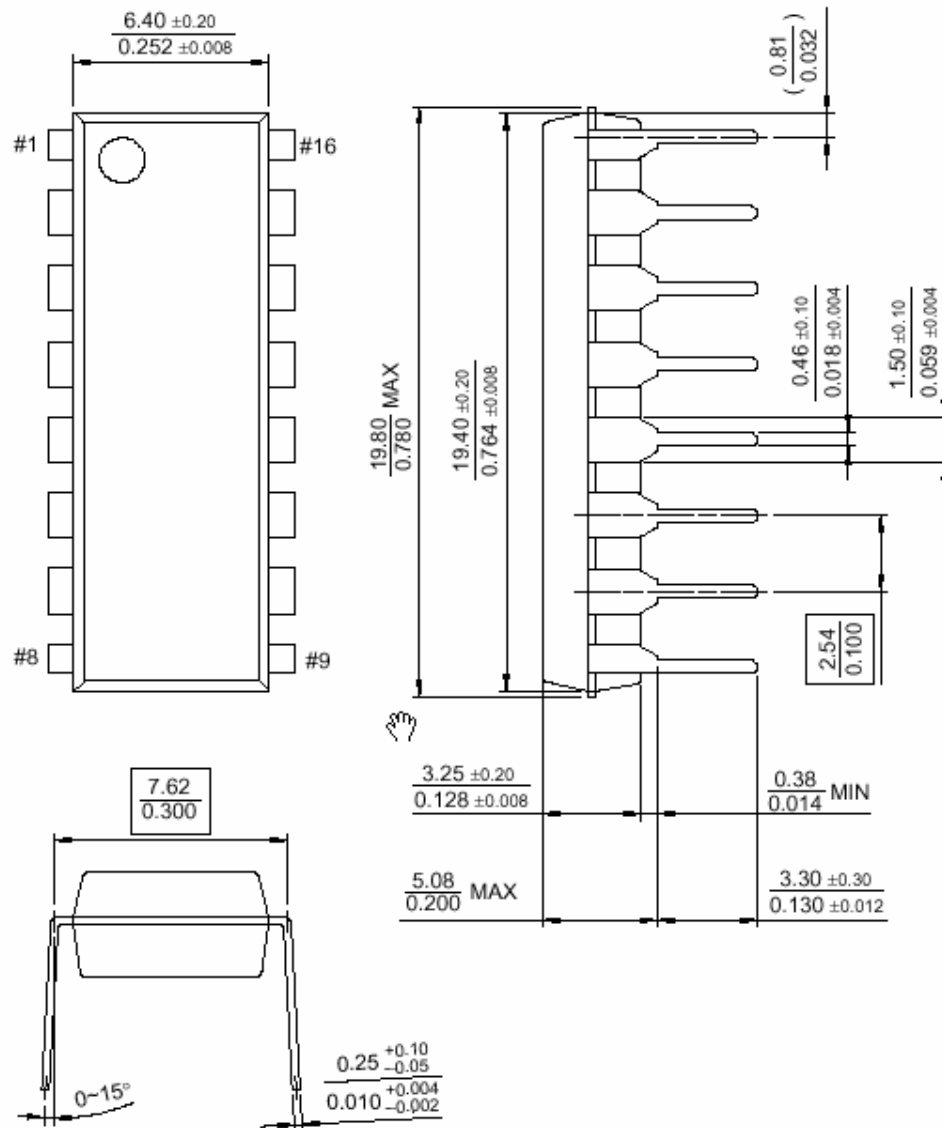


Fig.9 : Comparator Source Current vs. Output Voltage

### PACKAGE DIMENSION

### 16-DIP



### PACKAGE DIMENSION

### 16-SOP

