

## **AP4890B --- 1W AUDIO POWER AMPLIFIER**

### **1. DESCRIPTION :**

*The AP4890B is an audio power amplifier designed for portable communication device applications such as mobile phone applications. The AP4890B is capable of delivering 1W of continuous average power to an 8Ω BTL and with less than 1% distortion (THD+N) from a 5.0V power supply, and 350mW to a 8Ω BTL load from a 3V power supply.*

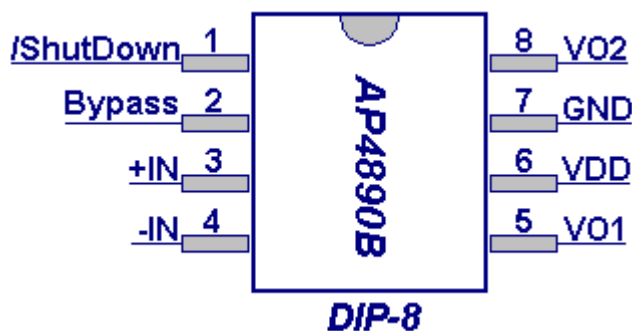
*The AP4890B provides high quality audio while requiring few external components and minimal power consumption. It features a low-power shutdown mode, which is achieved by driving the SHUTDOWN pin with logic low.*

*The AP4890B contains circuitry to prevent from “pop and click” noise that would otherwise occur during turn-on and turn-off transitions. For maximum flexibility, the AP4890B provides an externally controlled gain (with resistors), as well as an externally controlled turn-on and turn-off times (with the bypass capacitor).*

### **2. FEATURE :**

- 2.5-5.2V operation
- 65dB PSRR at 217Hz, VDD=5V
- 0.1μA ultra low current shutdown mode
- Improved pop & click circuitry
- No output coupling capacitors, snubber networks or bootstrap capacitors required
- Thermal shutdown protection
- External gain configuration capability
- RoHS compliant and 100% lead(Pb)-free
  
- APPLICATIONS
- Mobile Phones
- PDAs
- Portable electronic devices

### 3. PIN CONFIGURATION (Top View) :



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### 4. PIN DESCRIPTION :

<b>PIN</b>	<b>PIN</b>	<b>I/O</b>	<b>DESCRIPTION</b>
<b>SHUT DOWN-B</b>	1	I	The device enters in shutdown mode when a low level is applied on this pin
<b>BYPASS</b>	2	I	Bypass capacitor pin which provides the common mode voltage
<b>+IN</b>	3	I	Positive input of the first amplifier, receives the common mode voltage
<b>-IN</b>	4	I	Negative input of the first amplifier, receives the audio input signal. Connected to the feedback resistor $R_f$ and to the input resistor $R_{in}$ .
<b>VO1</b>	5	O	Negative output of the AP4890B. Connected to the load and to the feedback resistor $R_f$
<b>VDD</b>	6	I	Analog VDD input supply.
<b>GND</b>	7		Ground connection for circuitry.
<b>VO2</b>	8	O	Positive output of the AP4890B.

### 5. ABSOLUTE MAXIMUM RATINGS :

- Supply voltage, VDD ----- 6V
- Input voltage, VI ----- -0.3V to VDD +0.3V
- Storage temperature rang, Tstg ----- -65 to 150
- ESD Susceptibility ----- 2kV
- Junction Temperature ----- 150

### 6. ELECTRICAL CHARACTERISTICS VDD=5V, TA=25

Symbol	Parameter	Conditions	AP4890B			UNIT
			MIN	TYP	MAX	
IDD	Quiescent Power Supply Current	VIN=0V, Io=0A, No load		2.4	5	mA
		VIN=0V, Io=0A, 8Ω load		2.5	5	mA
ISD	Shutdown Current	V SHUT DOWN=0V		0.1	2.0	μA
VSDIH	Shutdown Voltage Input High		1.2			V
VSDIL	Shutdown Voltage Input Low				0.4	V
VOS	Output Offset Voltage			5	25	mV
ROUT-GND	Resistor Output to GND		9	10	11	kΩ
PO	Output Power (8Ω)	THD=1%; f=1kHz		1.1		W
TWU	Wake-up time			170	220	ms
TSD	Thermal Shutdown Temperature		150	170		
THD+N	Total Harmonic Distortion + Noise	PO=0.4 Wrms; f=1kHz		0.15		%
PSRR	Power Supply Rejection Ratio	Vripple=200mV sine p-p Input Terminated with 10 ohms to ground	55	65(f=217Hz) 67(f=1kHz)		dB
TSDT	Shutdown Time	8Ω load		1.0		ms

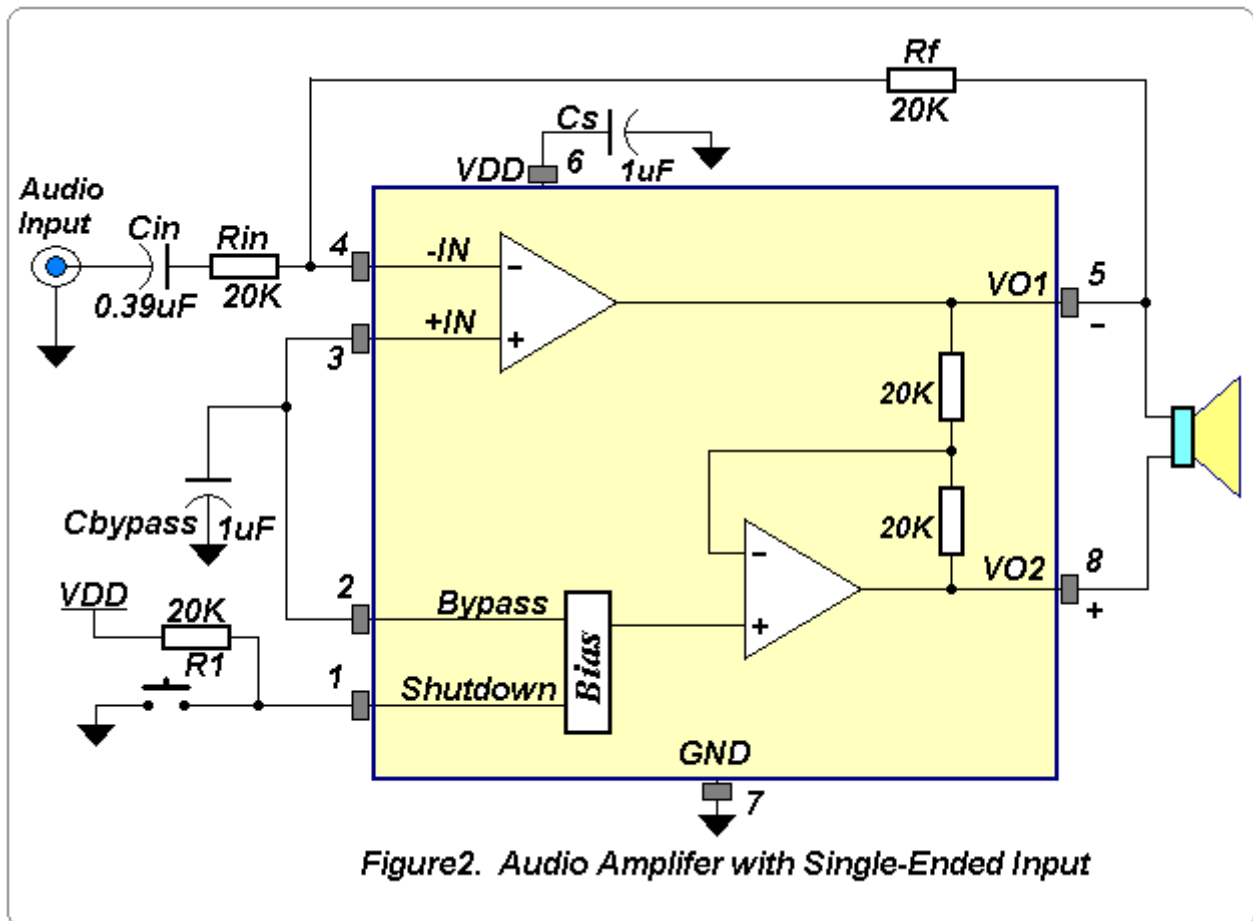
### 6.1 ELECTRICAL CHARACTERISTICS VDD=3V, TA=25

Symbol	Parameter	Conditions	AP4890B			UNIT
			MIN	TYP	MAX	
IDD	Quiescent Power Supply Current	VIN=0V, Io=0A, No load		1.8	4	mA
		VIN=0V, Io=0A, 8Ω load		1.9	4	mA
ISD	Shutdown Current	V SHUT DOWN=0V		0.1	2.0	μA
VSDIH	Shutdown Voltage Input High		1.2			V
VSDIL	Shutdown Voltage Input Low				0.4	V
VOS	Output Offset Voltage			5	25	mV
ROUT-GND	Resistor Output to GND		9	10	11	kΩ
PO	Output Power (8Ω)	THD=1%; f=1kHz	0.28	0.35		W
TWU	Wake-up time			120	180	ms
TSD	Thermal Shutdown Temperature		150	170		
THD+N	Total Harmonic Distortion + Noise	PO=0.4 Wrms; f=1kHz		0.15		%
PSRR	Power Supply Rejection Ratio	Vripple=200mV sine p-p Input Terminated with 10 ohms to ground	45	65(f=217Hz) 66(f=1kHz)		dB

### 6.2 ELECTRICAL CHARACTERISTICS VDD=2.6V, TA=25

Symbol	Parameter	Conditions	AP4890B			UNIT
			MIN	TYP	MAX	
IDD	Quiescent Power Supply Current	VIN=0V, Io=0A, No load		1.7		mA
ISD	Shutdown Current	V SHUT DOWN=0V		0.1		μA
PO	Output Power (8Ω)	THD=1%; f=1kHz		0.25		W
	Output Power (4Ω)			0.32		
THD+N	Total Harmonic Distortion + Noise	PO=0.4 Wrms; f=1kHz		0.15		%
PSRR	Power Supply Rejection Ratio	Vripple=200mV sine p-p Input Terminated with 10 ohms to ground	55	55(f=217Hz) 56(f=1kHz)		dB

## 7. TYPICAL APPLICATION CIRCUIT :



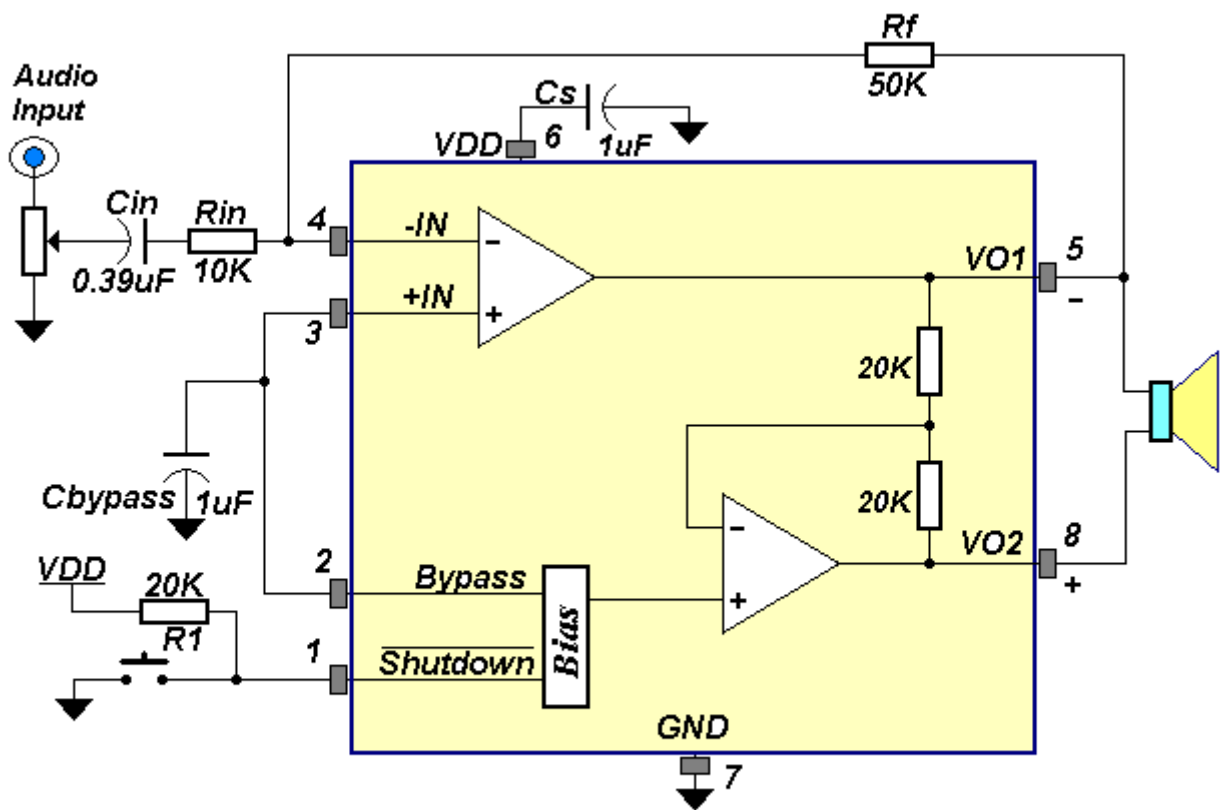


Figure3. Audio Amplifier with Single-Ended Input with Volume Control

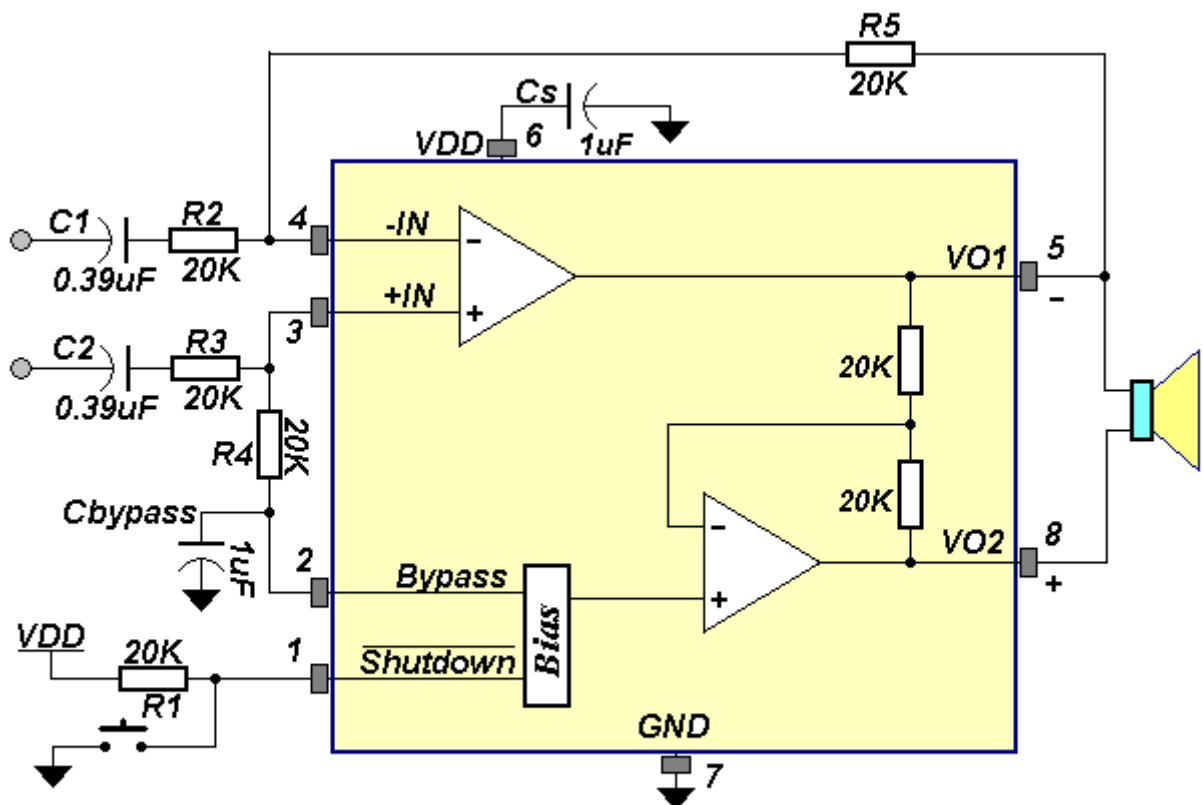
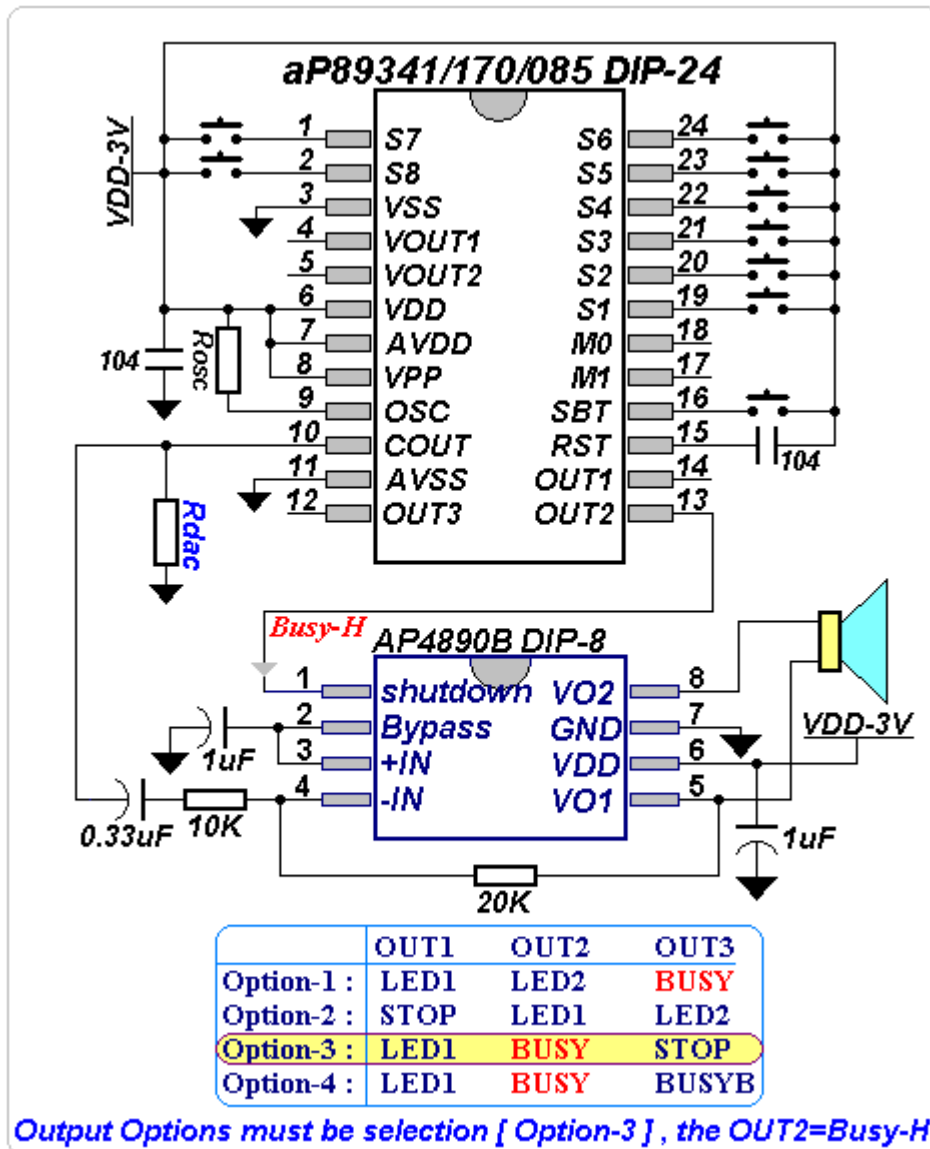
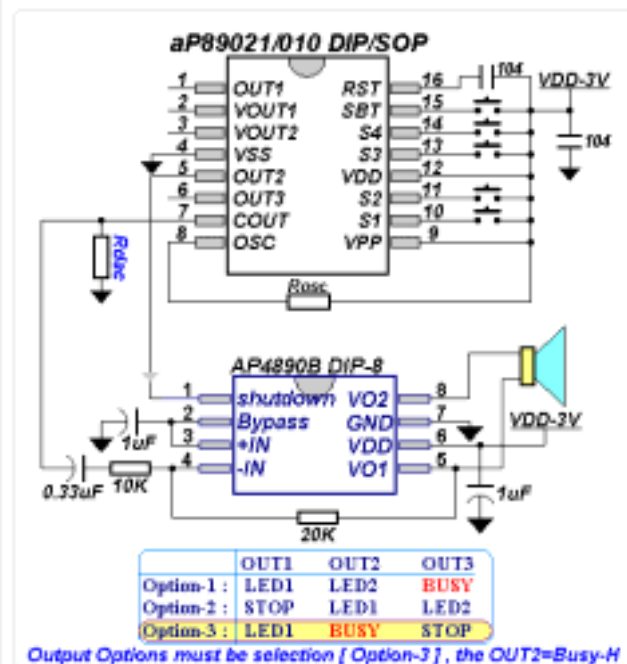
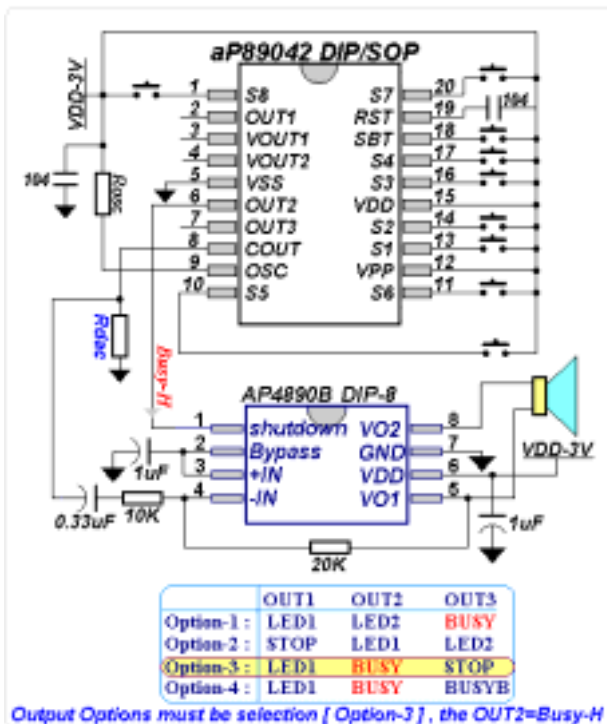
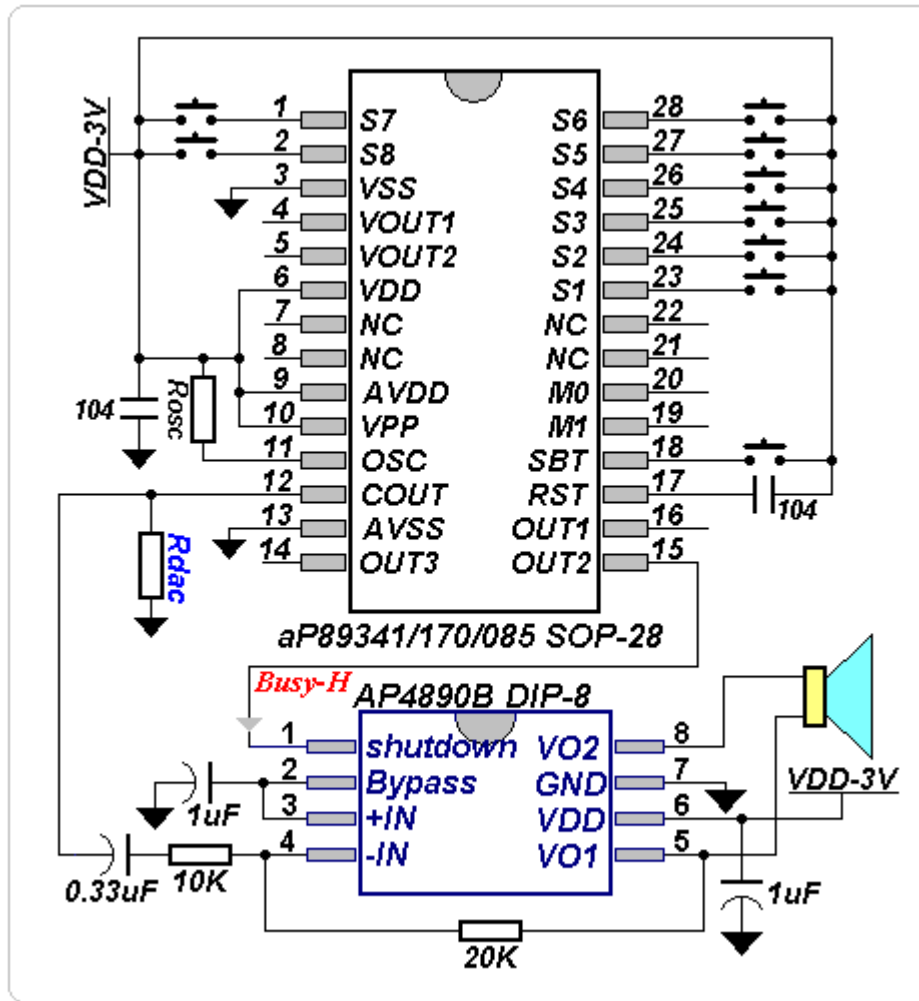


Figure4. Audio Amplifier with Differential Input

- Application for VOICE OTP --- aP89xx series IC :

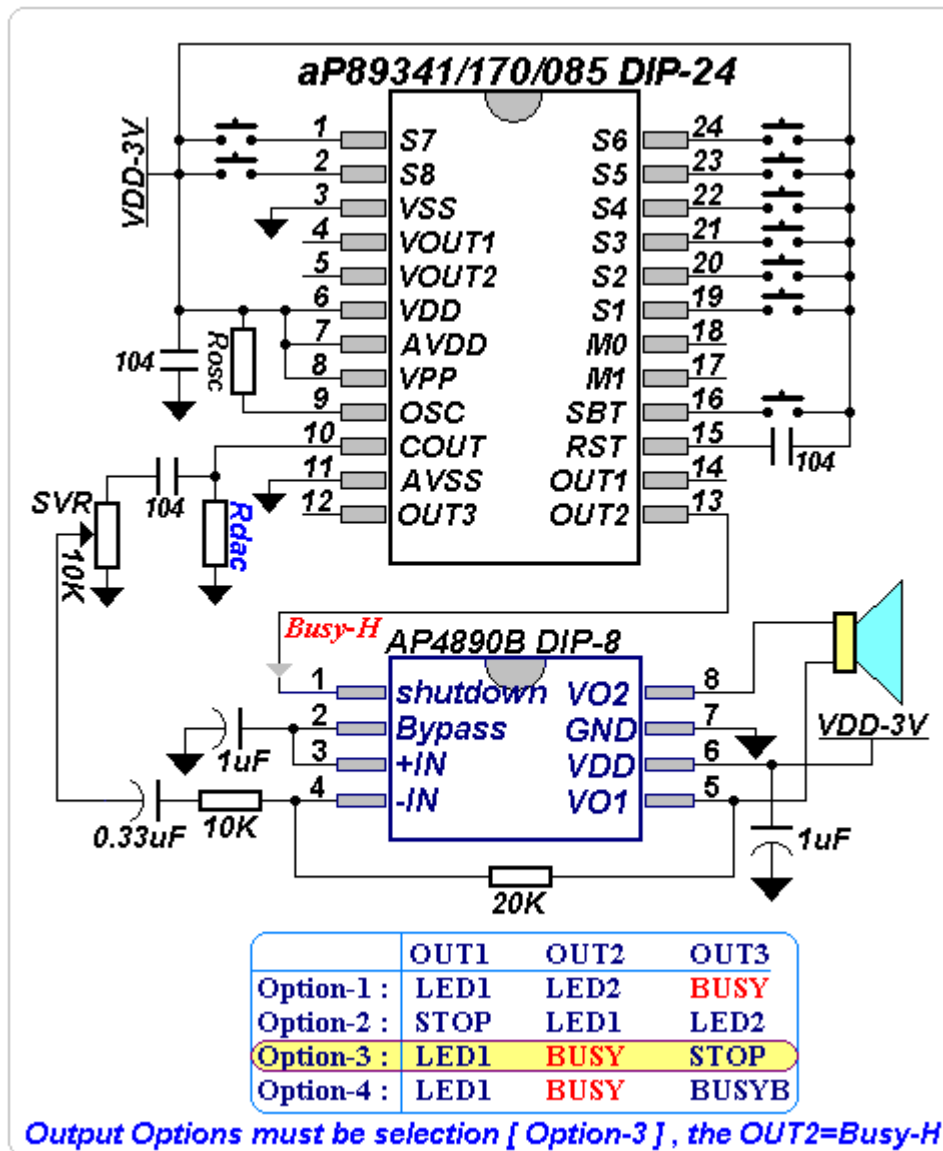


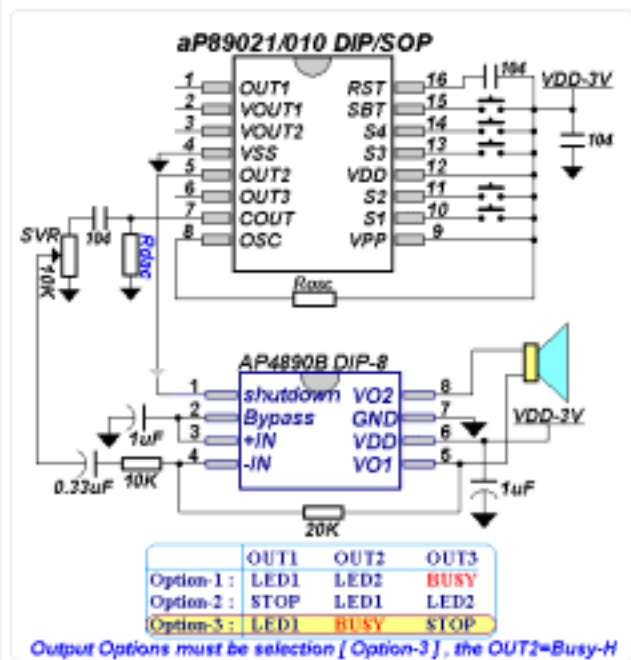
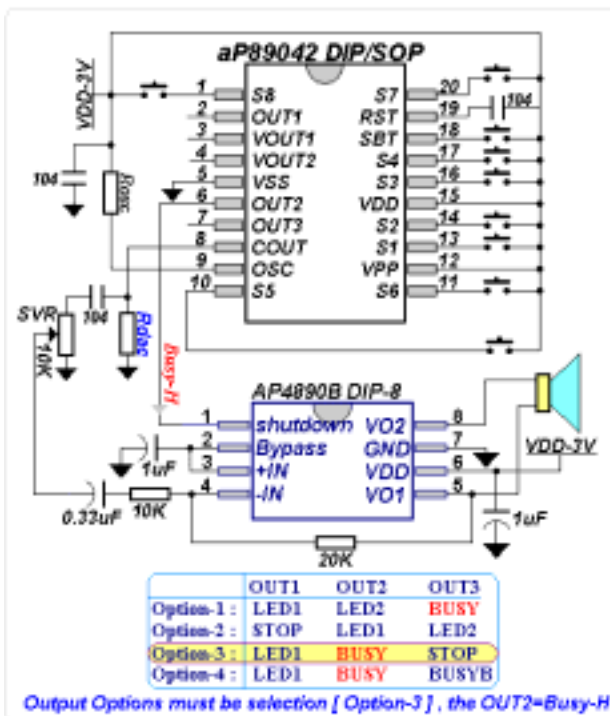
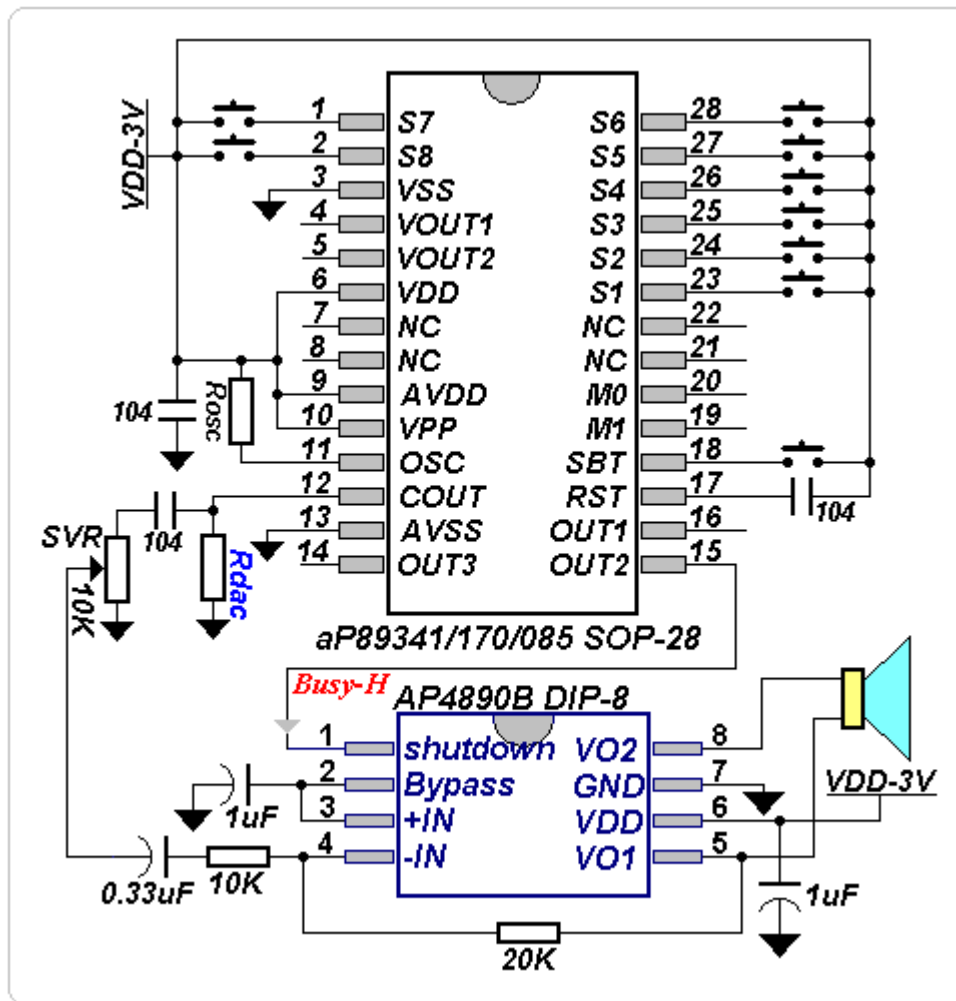
PS : the Rdac about 680 ~ 1K Ohm



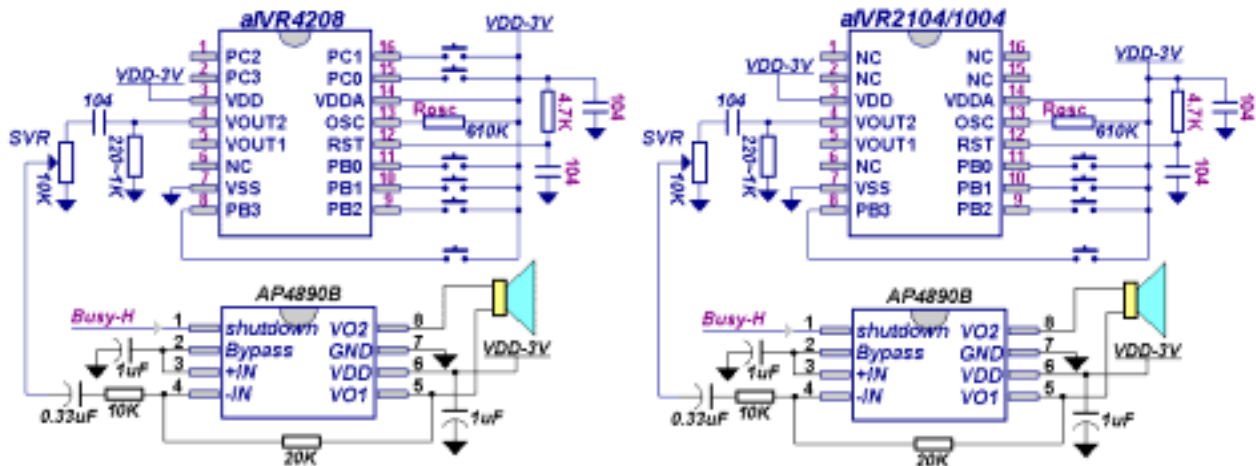


- Application for VOICE OTP ---  
**aP89xx series IC & SVR volume adjust :**



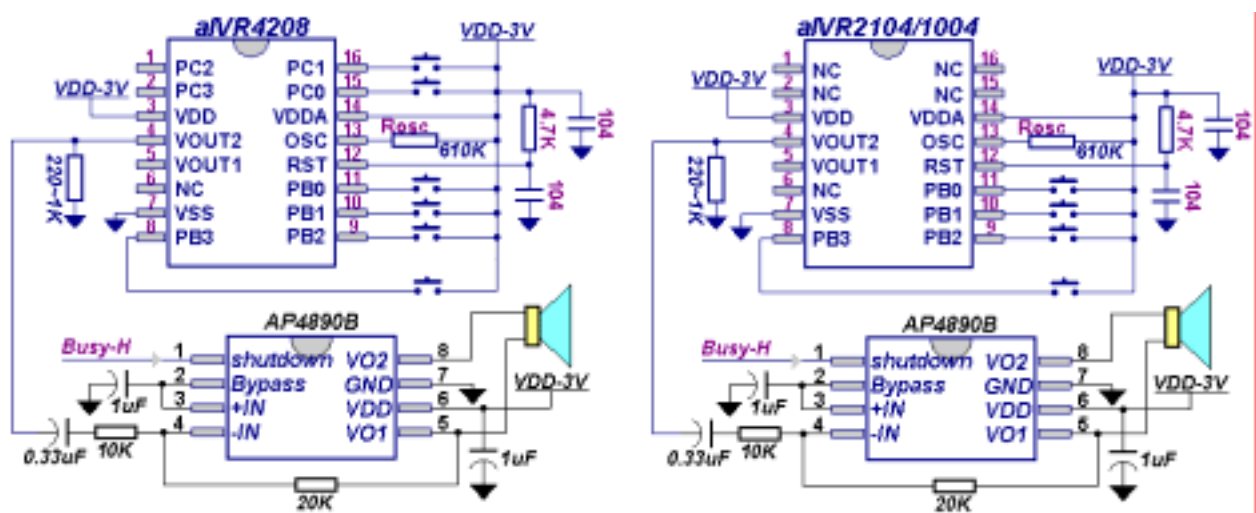


- Application for VOICE OTP ---  
aIVRxx series IC & SVR volume adjust :

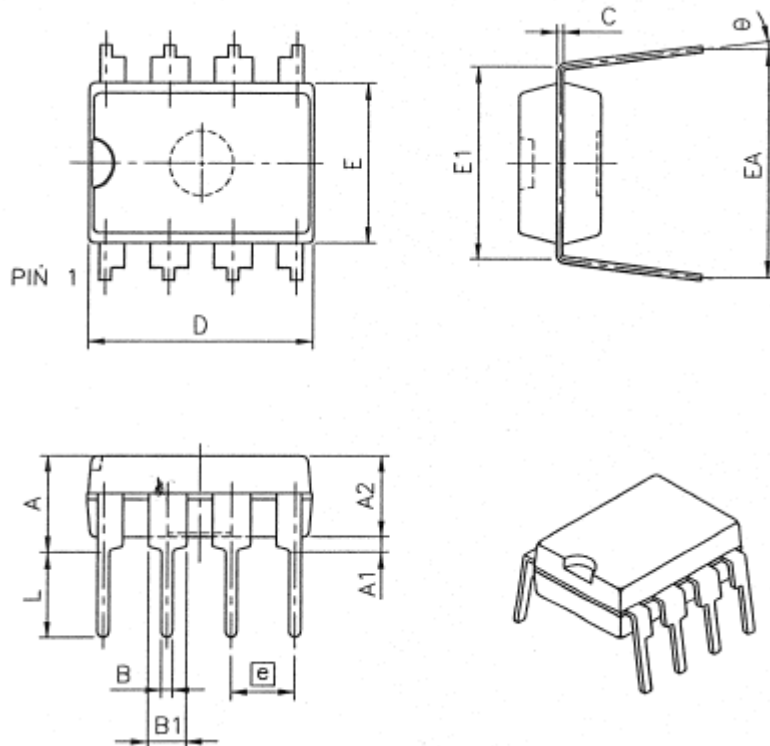
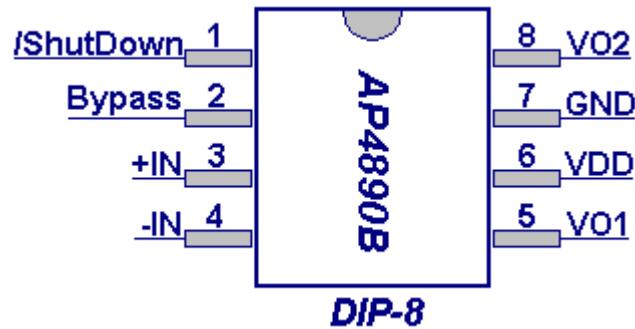


PS : The aIVRxx series IC must be output [ **Busy-H** ] to control the shutdown pin of AP4890 IC for standby current control

- Application for VOICE OTP --- aIVRxx series IC :



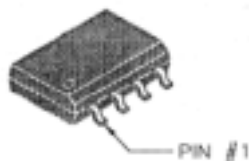
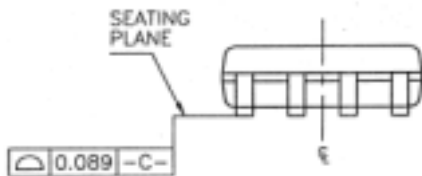
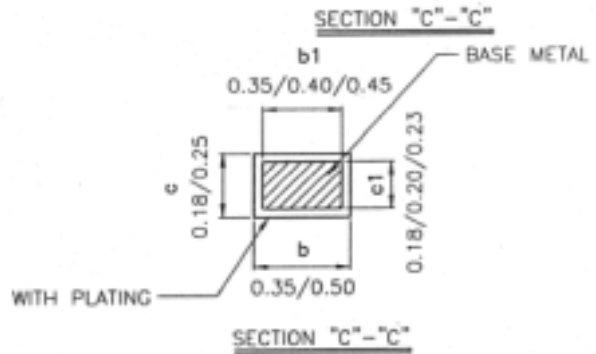
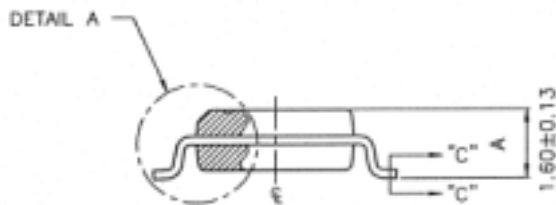
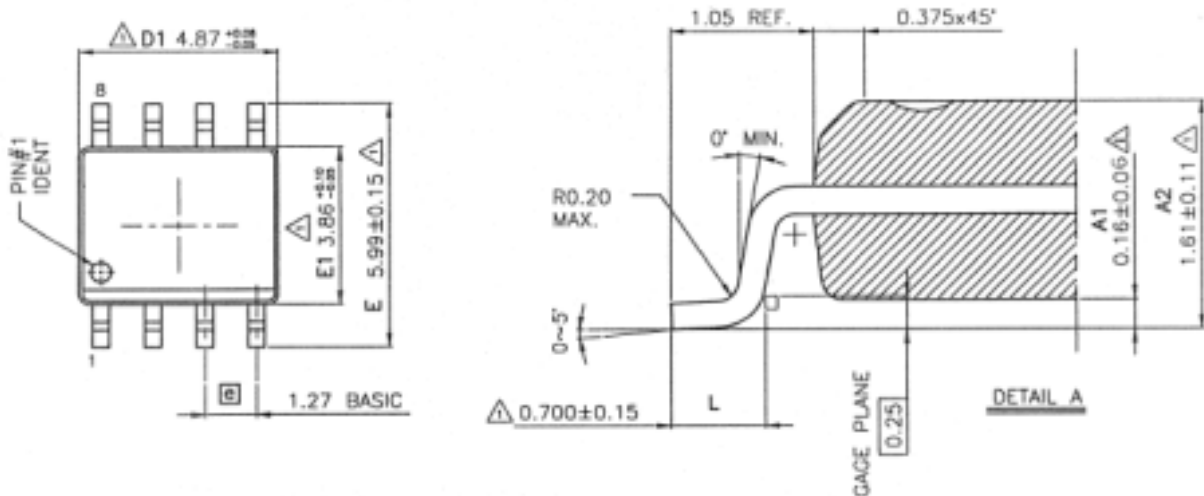
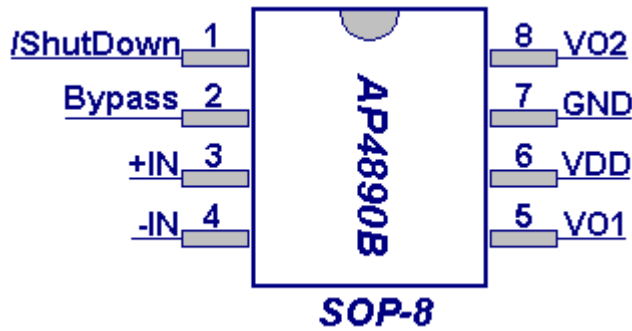
▪ **PACKAGE : DIP-8**



SYMBOL	DIMENSION IN INCH	DIMENSION IN MM
A	0.170 MAX.	4.318 MAX.
A1	0.015 MIN.	0.381 MIN.
A2	0.130±0.005	3.302±0.127
B	0.018 TYP.	0.457 TYP.
B1	0.060 TYP.	1.524 TYP.
C	0.010 NOM.	0.254 NOM.
D	0.362±0.005	9.195±0.127
E	0.252±0.005	6.401±0.127
E1	0.300±0.010	7.62±0.254
EA	0.355±0.020	9.017±0.508
e	0.100 TYP.	2.540 TYP.
L	0.130±0.010	3.302±0.254
θ	0°~15°	0°~15°

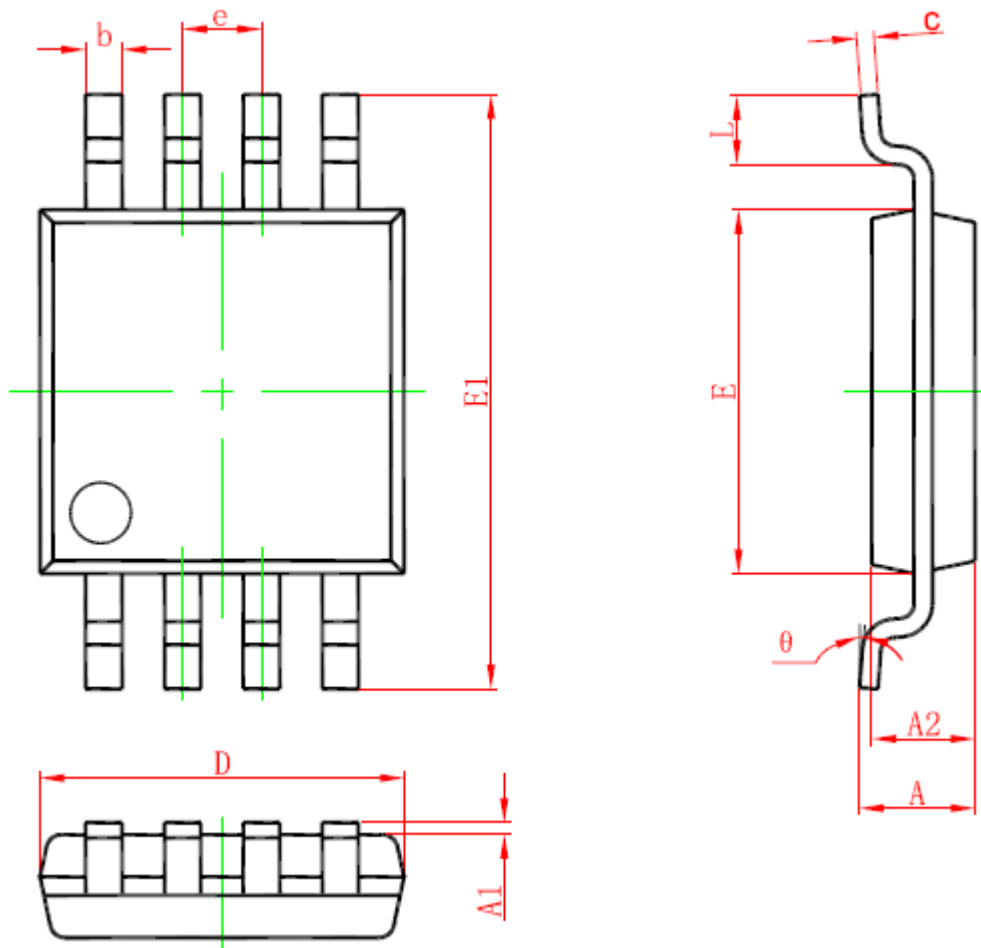
NOTE: 1.DIMENSION D & E DOES NOT INCLUDE FLASH.

▪ **PACKAGE : SOP-8**



- NOTES:
1. CONTROLLING DIMENSIONS ARE IN MILLIMETERS (MM).
  2. DIMENSION  $D1$  &  $E1$  DOES NOT INCLUDE MOLD PROTRUSION.
  3. COPLANARITY OF ALL LEADS SHALL BE (BEFORE TEST) 0.089 MAX. FROM THE SEATING PLANE, UNLESS OTHERWISE SPECIFIED.
  4. GENERAL PHYSICAL OUTLINE SPEC IS REFER TO TMC'S FINAL VISUAL INSPECTION SPEC UNLESS OTHERWISE SPECIFIED.

▪ **PACKAGE : MSOP-8**



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	0.820	1.100	0.032	0.043
A1	0.020	0.150	0.001	0.006
A2	0.750	0.950	0.030	0.037
b	0.250	0.380	0.010	0.015
c	0.090	0.230	0.004	0.009
D	2.900	3.100	0.114	0.122
e	0.650(BSC)		0.026(BSC)	
E	2.900	3.100	0.114	0.122
E1	4.750	5.050	0.187	0.199
L	0.400	0.800	0.016	0.031
θ	0°	6°	0°	6°

▪ REVISION HISTORY :

<b>Date</b>	<b>Revision #</b>	<b>Description</b>	<b>Page</b>
<i>July.22.2009</i>	1.0	First Release	
<i>Aug.27.2009</i>	1.1	Add the MSOP-8 outline	14