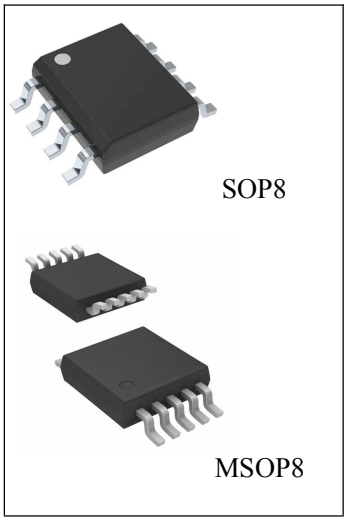
# D4890
## 1.1 Watt Audio Power Amplifier

## General Description

The D4890 is a Class-AB audio power amplifier designed for mobile phone, MID and other portable communication devices. It is capable of delivering 1.1 watts of continuous average power to an 8Ω BTL load with less than 1% distortion (THD+N) from a $5V_{DC}$ power supply.




The D4890 was designed specifically to provide high quality output power with a minimal amount of external components. It does not require output coupling capacitors or bootstrap capacitors. And with ultra low shutdown current, the D4890 is ideally suited for mobile phone , MID and other low voltage applications where minimal power consumption is a primary requirement.

The D4890 is unity-gain stable and can be configured by external gain-setting resistors.

The D4890 is available in SOP8 and MSOP8 package.

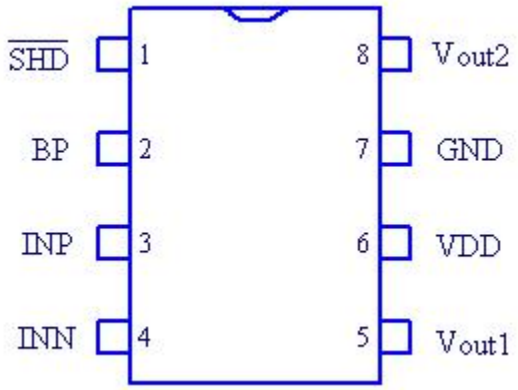
## Features

- Improved PSRR at 217Hz & 1KHz 60dB
- Power output at 5.0V, 1% THD+N, 8Ω 1.1W (type)
- Ultra low shutdown current 0.1μA (type)
- 2.2V—5.5V operation
- Improved circuitry eliminates pop-click noise during turn-on and turn-off transitions
- No output coupling capacitors, snubber networks or bootstrap capacitors required
- Unity-gain stable
- External gain configuration capability

## Applications

- MID
- Wireless handsets
- Portable electronic devices
- PDAs, Handheld computers

## Pin Configuration




## Pin Description

| No. | Pin Name | I/O | Description |
|---|---|---|---|
| 1 | $\overline{SHD}$ | I | Shut-down Logical Control, '0' is active. |
| 2 | BP | I/O | Analog ground for inner OPAs. It's about a half of VDD. |
| 3 | INP | I | Positive Input |
| 4 | INN | I | Negative Input |
| 5 | Vout1 | O | Negative BTL Output |
| 6 | VDD | I/O | Power Supply (2.2 – 5.5 V) |
| 7 | GND | I/O | Ground |
| 8 | Vout2 | O | Positive BTL Output |

## Absolute Maximum Ratings

| Parameter | | Limit | Unit |
|---|---|---|---|
| Supply Voltage | | -0.3～6 | V |
| Input Voltage | | -0.3V to $V_{DD}$+0.3V | V |
| Power Dissipation | | See Dissipation Rating Table | |
| Junction Temperature | | -40～150 | ℃ |
| Storage Temperature | | -65～150 | ℃ |
| Thermal Resistance | $\theta_{JC}$(MSOP8) | 56 | ℃/W |
| | $\theta_{JA}$(MSOP8) | 190 | |
| | $\theta_{JA}$(SOP8) | 184 | |
| Operating Temperature | | -40～85 | ℃ |
| Operating Supply Voltage | | 2.2～5.5 | V |

* Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Rating

indicate conditions for which the device is functional, but do not guarantee specific performance limits.

## Electrical Characteristics (The following specifications apply for the circuit shown in Figure 1, unless otherwise specified. Limits apply for $T_A$ = 25℃.)

**$V_{DD}$ = 5V**

| Symbol | Parameter | Test Conditions | Limit | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $I_{DD}$ | Quiescent Power Supply Current | $V_{IN}$ = 0V, 8Ω Load | | 3.0 | 8.0 | mA |
| | | $V_{IN}$ = 0V, No Load | | 2.5 | 7.0 | mA |
| $I_{SD}$ | Shutdown Current | $V_{IN}$=0V, $V_{SHD}$=GND, No Load | | 0.1 | 2.0 | μA |
| $V_{SDIH}$ | Shutdown Voltage Input High | | 1.2 | | | V |
| $V_{SDIL}$ | Shutdown Voltage Input Low | | | | 0.9 | V |
| $V_{OS}$ | Output Offset Voltage | | -50 | 6 | 50 | mV |
| THD+N | Total Harmonic Distortion+Noise | Po=0.5W, f=1KHz, 8Ω Load | | 0.07 | | % |
| $P_O$ | Output Power | THD+N<=1%, f=1KHz, 8Ω Load | 0.9 | 1.1 | | W |
| PSRR | Power Supply Rejection Ratio | Input terminated with 10Ω, $V_{DDRIPPLE}$=0.2$V_{P-P}$, f=217Hz | | 60 | | dB |
| | | Input terminated with 10Ω, $V_{DDRIPPLE}$=0.2$V_{P-P}$, f=1KHz | | 61 | | dB |
| $T_{WU}$ | Wake-up time | | | 100 | | ms |

**$V_{DD}$ = 3V**

| Symbol | Parameter | Test Conditions | Spec | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $I_{DD}$ | Quiescent Power Supply Current | $V_{IN}$ = 0V, 8Ω Load | | 2.0 | 7.0 | mA |
| | | $V_{IN}$ = 0V, No Load | | 1.5 | 6.0 | mA |
| $I_{SD}$ | Shutdown Current | $V_{IN}$=0V, $V_{SHD}$=GND, No Load | | 0.1 | 2.0 | μA |
| $V_{SDIH}$ | Shutdown Voltage Input High | | 1.0 | | | V |
| $V_{SDIL}$ | Shutdown Voltage Input Low | | | | 0.7 | V |
| $V_{OS}$ | Output Offset Voltage | | -50 | 6 | 50 | mV |
| THD+N | Total Harmonic Distortion+Noise | Po=0.25W, f=1KHz, 8Ω Load | | 0.08 | | % |
| $P_O$ | Output Power | THD+N<=1%, f=1KHz, 8Ω Load | | 310 | | mW |
| PSRR | Power Supply Rejection Ratio | Input terminated with 10Ω, $V_{DDRIPPLE}$=0.2$V_{P-P}$, f=217Hz | | 57 | | dB |
| | | Input terminated with 10Ω, $V_{DDRIPPLE}$=0.2$V_{P-P}$, f=1KHz | | 58 | | dB |
| $T_{WU}$ | Wake-up time | | | 75 | | ms |

**$V_{DD}$ = 2.6V**

| Symbol | Parameter | Test Conditions | Spec | | | Units |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| $I_{DD}$ | Quiescent Power Supply Current | $V_{IN}$ = 0V, 8Ω Load | | 1.7 | | mA |
| | | $V_{IN}$ = 0V, No Load | | 1.2 | | mA |
| $I_{SD}$ | Shutdown Current | $V_{IN}$=0V, $V_{SHD}$=GND, No Load | | 0.1 | | μA |
| $V_{SDIH}$ | Shutdown Voltage Input High | | 1.0 | | | V |
| $V_{SDIL}$ | Shutdown Voltage Input Low | | | | 0.7 | V |
| $V_{OS}$ | Output Offset Voltage | | -50 | 4 | 50 | mV |
| THD+N | Total Harmonic Distortion+Noise | Po=0.15W, f=1KHz, 8Ω Load | | 0.08 | | % |
| $P_O$ | Output Power | THD+N<=1%, f=1KHz, 8Ω Load | | 230 | | mW |
| PSRR | Power Supply Rejection Ratio | Input terminated with 10Ω, $V_{DDRIPPLE}$=0.2$V_{P-P}$, f=217Hz | | 56 | | dB |
| | | Input terminated with 10Ω, $V_{DDRIPPLE}$=0.2$V_{P-P}$, f=1KHz | | 57 | | dB |
| $T_{WU}$ | Wake-up time | | | 70 | | ms |

## Typical Application

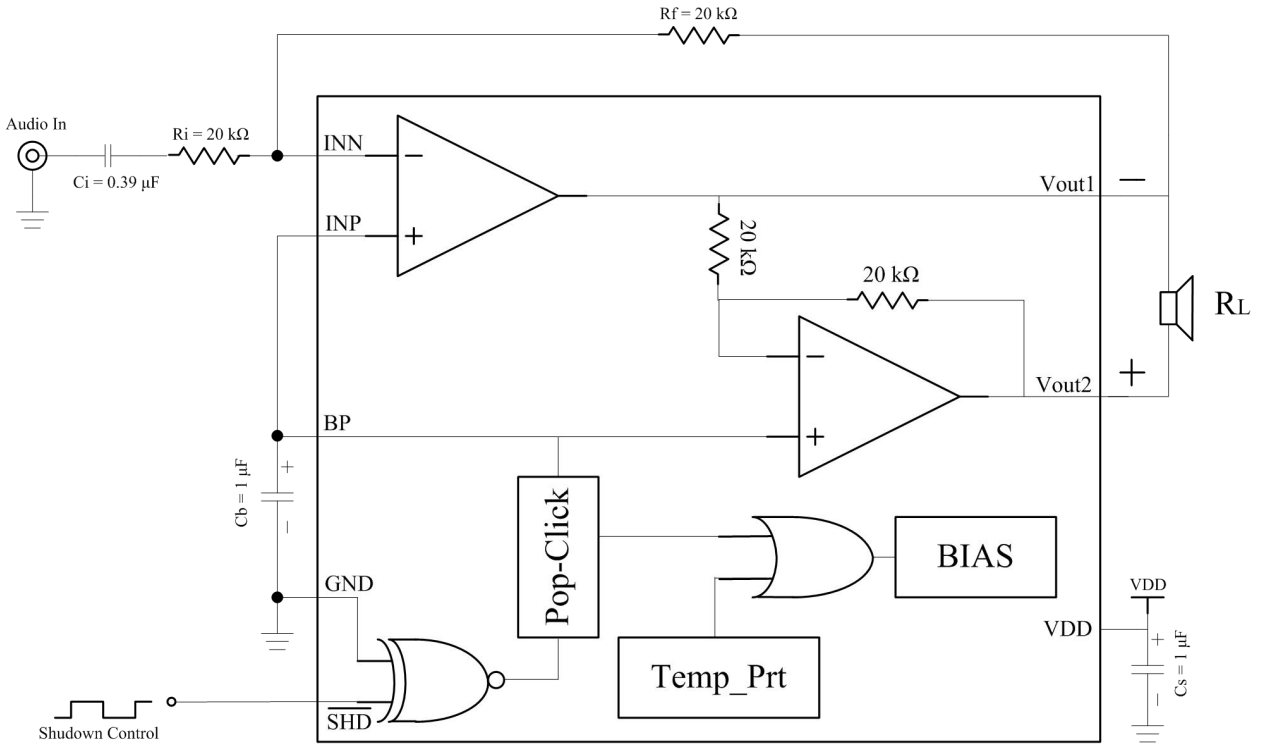



Fig 1. D4890 Typical Application Circuit

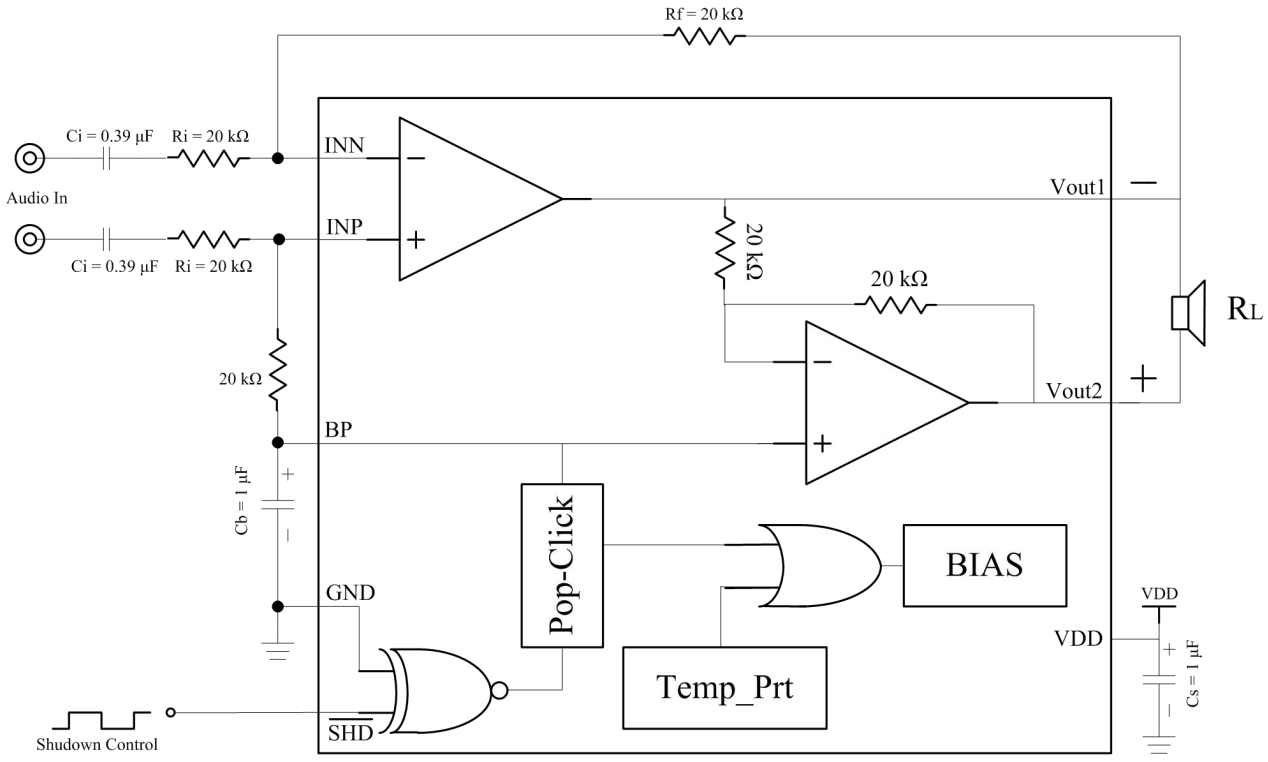
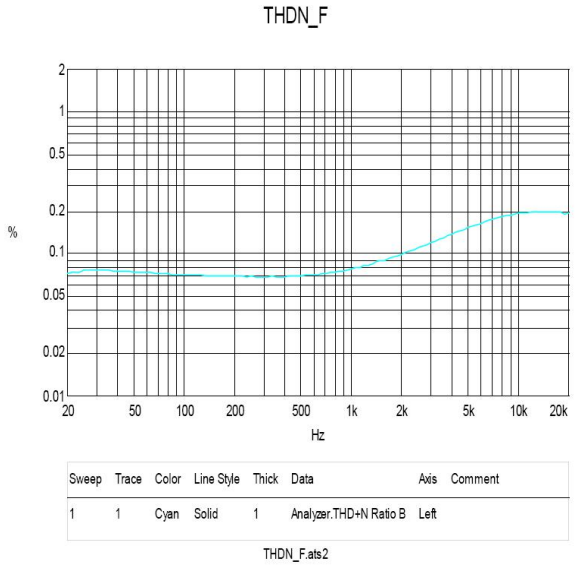



Fig 2. D4890 Differential Amplifier Configuration

## External Components Description

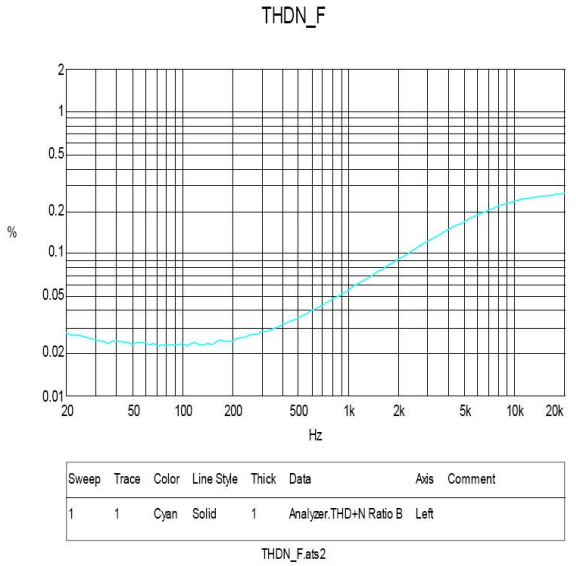
| Components | Functional Description |
|---|---|
| Ri | Inverting input resistance which sets the closed-loop gain in conjunction with Rf. This resistor also forms a high pass filter with Ci at $fc = \frac{1}{2\pi Ri \times Ci}$. |
| Ci | Input coupling capacitor which blocks the DC voltage at the amplifiers input terminates. Also creates a high-pass filter with Ri at $fc = \frac{1}{2\pi Ri \times Ci}$. |
| Rf | Feedback resistance which sets the closed-loop gain in conjunction with Ri. The gain is $A_{VD} = 2 \times (\frac{Rf}{Ri})$. |
| Cs | Supply bypass capacitor which provides power supply filtering. |
| Cb | Bypass pin capacitor which provides half-supply filtering. Refer to the section. |

## Characteristics Curve



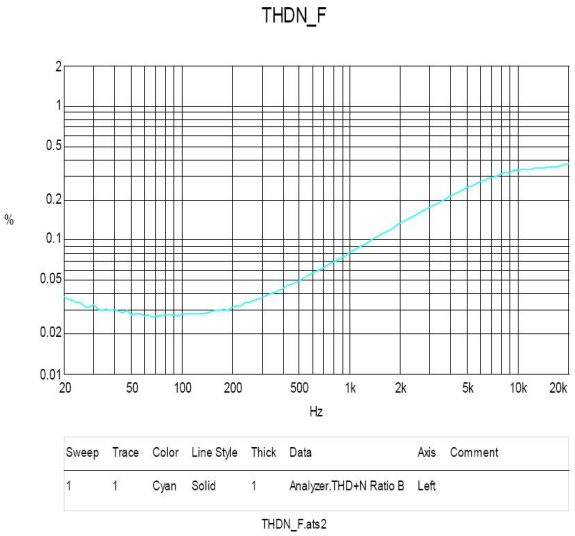

THDN vs Frequency

VDD=5V $R_L$=8Ω Po=500mW



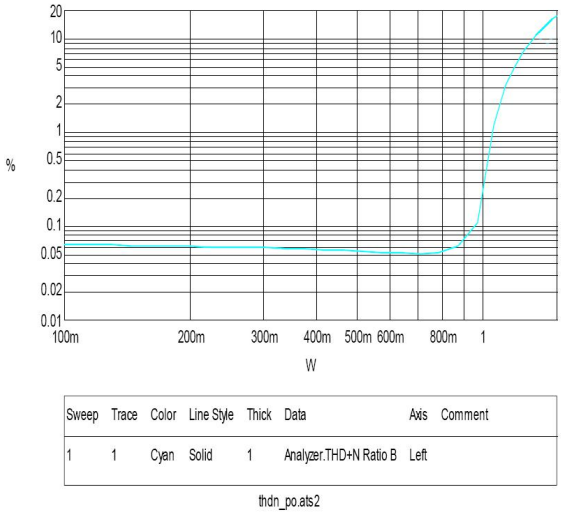

THDN vs Frequency

VDD=3V $R_L$=8Ω Po=250mW



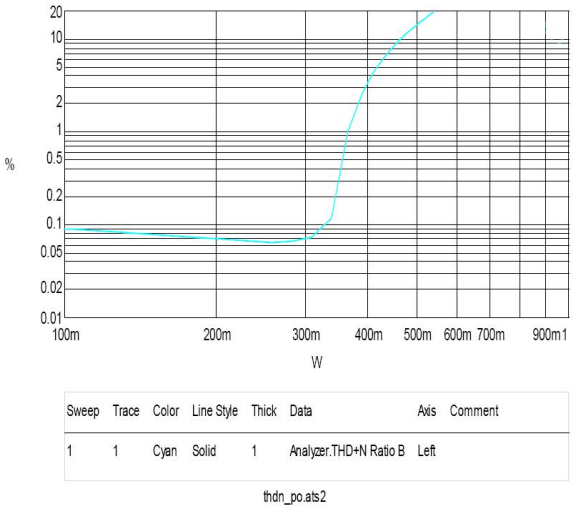

THDN vs Frequency

VDD=2.6V $R_L$=8Ω Po=150 mW



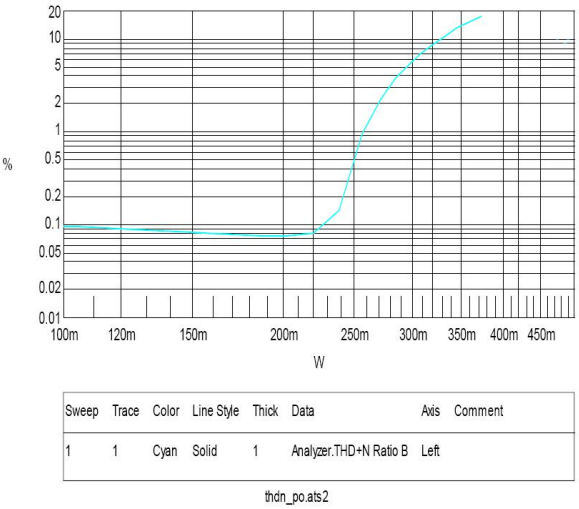

THDN vs Output Power

VDD=5V $R_L$=8Ω f=1KHz




THDN vs Output Power

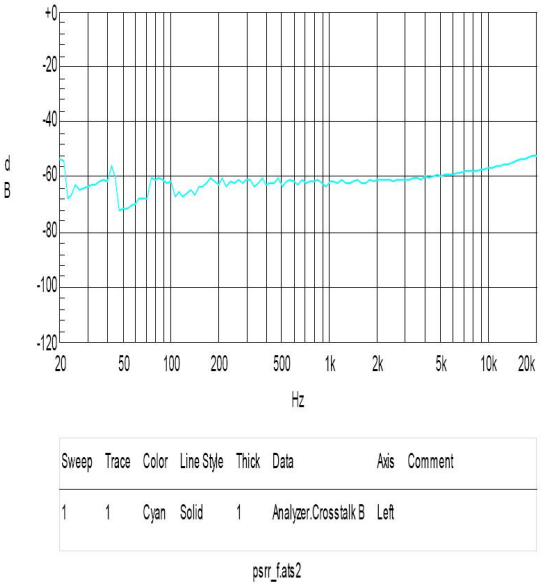
VDD=3V $R_L$=8Ω f=1KHz




THDN vs Output Power

VDD=2.6V $R_L$=8Ω f=1KHz

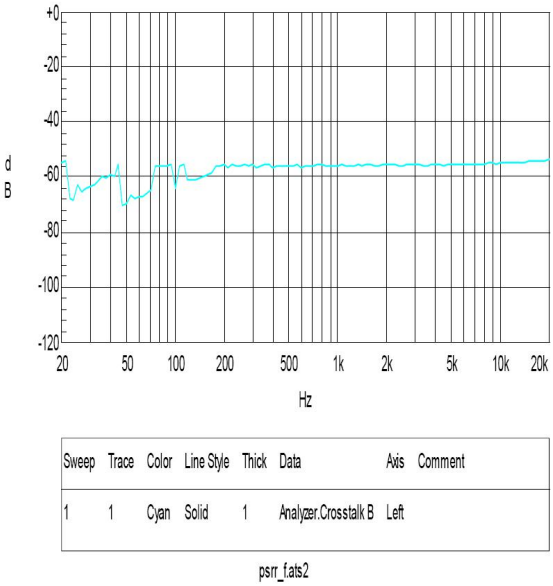
PSRR_F




PSRR vs Frequency

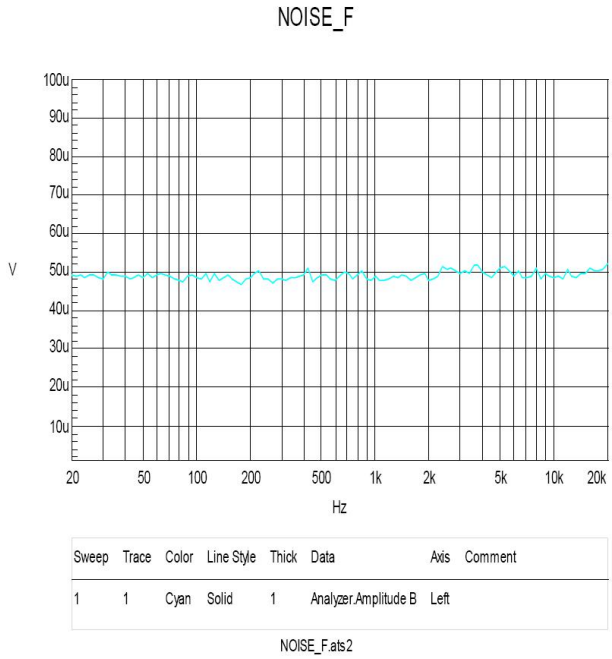
VDD=5V $R_L$=8Ω

PSRR_F




PSRR vs Frequency

VDD=3V $R_L$=8Ω

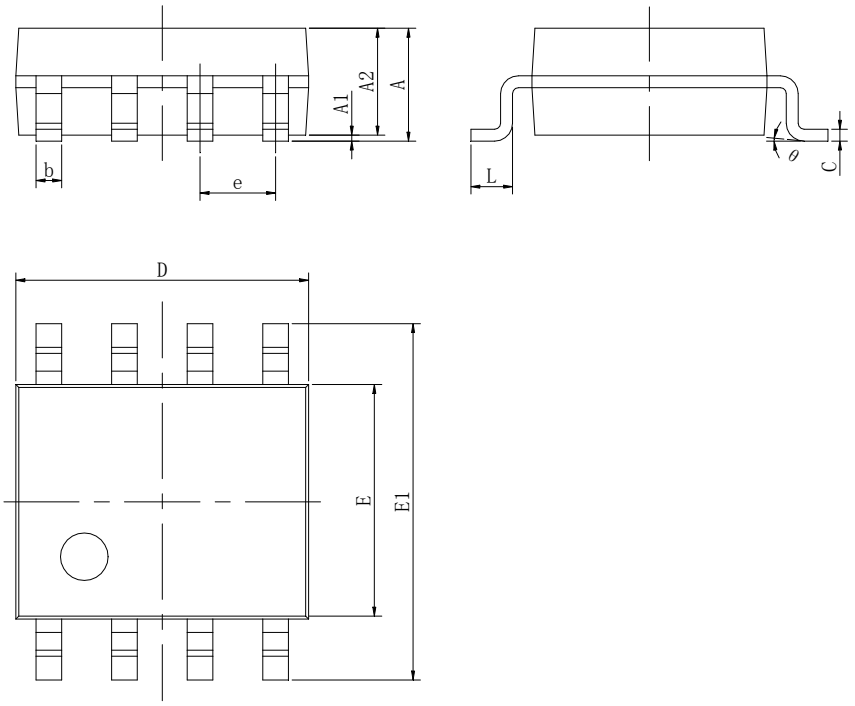



Noise Floor 20KBW

VDD=5V $R_L$=8Ω

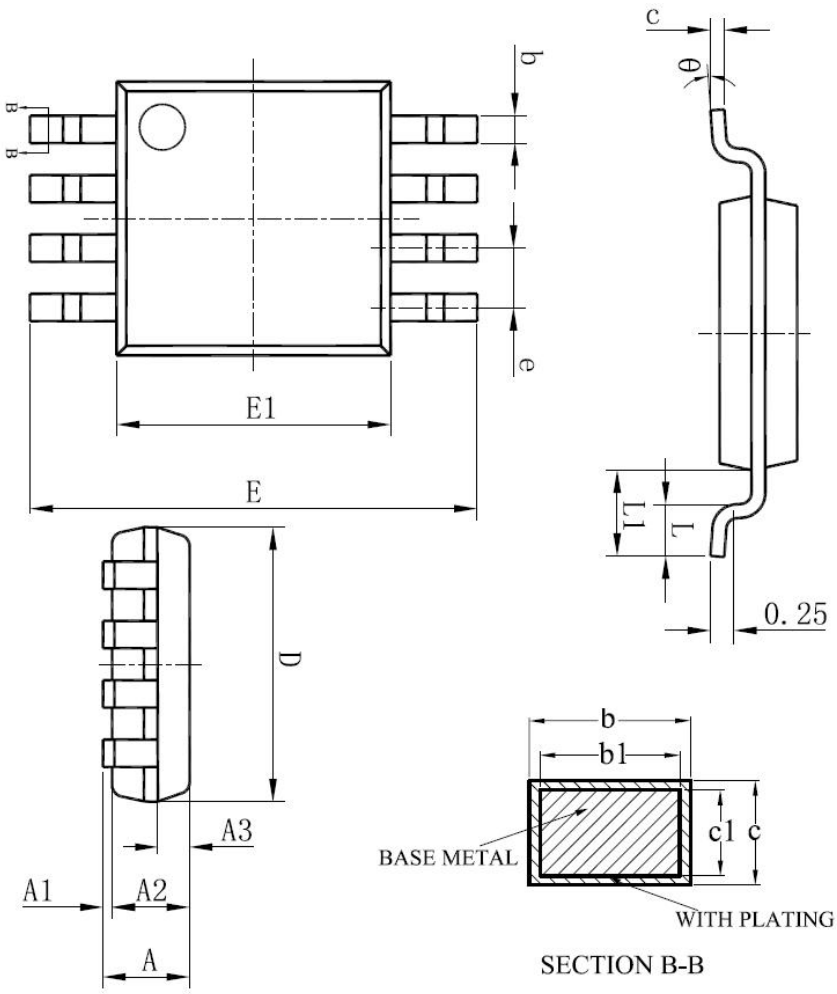
## Outline Drawing

SOP8 Unit:mm




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.350 | 1.800 | 0.053 | 0.071 |
| A1 | 0.050 | 0.250 | 0.004 | 0.010 |
| A2 | 1.250 | 1.550 | 0.053 | 0.061 |
| b | 0.330 | 0.510 | 0.013 | 0.020 |
| c | 0.170 | 0.250 | 0.006 | 0.010 |
| D | 4.780 | 5.000 | 0.185 | 0.197 |
| E | 3.800 | 4.000 | 0.150 | 0.157 |
| E1 | 5.800 | 6.300 | 0.228 | 0.244 |
| e | 1.270(BSC) | | 0.050(BSC) | |
| L | 0.400 | 1.270 | 0.016 | 0.050 |
| θ | 0° | 8° | 0° | 8° |

MSOP8 Unit:mm




| SYMBOL | MILLIMETER | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | — | — | 1.10 |
| A1 | 0.05 | — | 0.15 |
| A2 | 0.75 | 0.85 | 0.95 |
| A3 | 0.30 | 0.35 | 0.40 |
| b | 0.29 | — | 0.38 |
| b1 | 0.28 | 0.30 | 0.33 |
| c | 0.15 | — | 0.20 |
| c1 | 0.14 | 0.152 | 0.16 |
| D | 2.90 | 3.00 | 3.10 |
| E | 4.70 | 4.90 | 5.10 |
| E1 | 2.90 | 3.00 | 3.10 |
| e | 0.65BSC | | |
| L | 0.40 | — | 0.70 |
| L1 | 0.95BSC | | |
| θ | 0 | — | 8° |
| L/F载体尺寸 (mil) | 71*96 | | |

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