Ordering number : ENA0932

SANYO Semiconductors
DATA SHEET

# LV4992TT — Bi-CMOS IC For Portable Audio Equipment Stereo SE Power Amplifier

## Overview

The LV4992TT is the best LSI for the speaker drive for portable equipment that is battery drive, including the power amplifier circuit capable of low voltage (from 2.7V) operation and stand-by function to reduce the consumption current.

## Functions and Features

- Built-in stereo SE power amplifier
  Output power 1= 160mW ($V_{CC}$ = 3.6V, $R_L$ = 8Ω and THD = 10%)
  Output power 2= 340mW ($V_{CC}$ = 5.0V, $R_L$ = 8Ω and THD = 10%)
  Output power 3= 55mW ($V_{CC}$ = 3.6V, $R_L$ = 32Ω and THD = 10%)
  Output power 4= 110mW ($V_{CC}$ = 5.0V, $R_L$ = 32Ω and THD = 10%)
- Enabling low voltage operation : $V_{CC}$ = from 2.7V
- Standby function : (supply current in standby mode : 0.1μA (standard) : ($V_{CC}$ = 3.6V)
- Thermal shut down circuit
- Enabling gain setting : Voltage gain (0 to 14dB)
- No capacitor for output phase compensation is necessary.

## Specifications

### Absolute Maximum Ratings at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Maximum supply voltage | $V_{CC}$ max | | 6 | V |
| Allowable power dissipation | Pd max | Substrate mounted* | 750 | mV |
| Operating temperature | Topr | | -40 to +85 | °C |
| Storage temperature | Tstg | | -40 to +150 | °C |

* When mounted on the specified printed circuit board ( 58 × 89 × 1.6mm, glass epoxy, both side)




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## Operating Conditions at Ta = 25°C

| Parameter | Symbol | Conditions | Ratings | Unit |
|---|---|---|---|---|
| Recommended supply voltage | $V_{CC}$ | | 3.6 | V |
| Recommended load resistance | $R_L$ | | 8 to 32 | Ω |
| Operating supply voltage range | $V_{CC}$ op | | 2.7 to 5.5 | V |

Note : Please determine supply voltage used with due consideration of allowable power dissipation

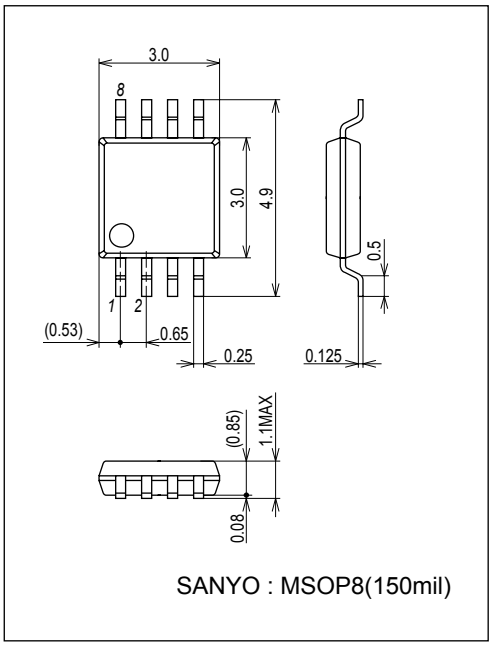
## Electrical Characteristics Ta = 25°C, $V_{CC}$ = 3.6V, fin = 1kHz, $R_L$ = 8Ω

| Parameter | Symbol | Conditions | Ratings | | | Unit |
|---|---|---|---|---|---|---|
| | | | min | typ | max | |
| Supply current during no signal | $I_{CCO}P$ | No signal | | 2.7 | 4.5 | mA |
| Standby supply current | $I_{STBY}$ | No signal, V2 = LOW | | 0.1 | 10 | μA |
| Output power | $P_OMX$ | THD = 10% | 100 | 160 | | mW |
| Voltage gain | VG | $V_{IN}$ = -30dBV | 5 | 6.5 | 8 | dB |
| Voltage gain difference | VGR | | 0 | | 14 | dB |
| Total harmonic distortion | THD | $V_{IN}$ = -10dBV | | 0.1 | 1 | % |
| Output noise voltage | $V_N$OUT | Rg = 620Ω, 20 to 20kHz | | 65 | 195 | μVrms |
| Channel separation | CHSEP | $P_O$ = 50mW, Rg = 620Ω and 20 to 20kHz | 50 | 60 | | dB |
| Ripple rejection ratio | SVRR | Rg = 620Ω, fr = 100Hz and Vr = -20dBV | | 47 | | dB |
| Reference voltage (pin 3) | VREF | | | 1.81 | | V |
| High level control voltage (pin 2) | VSTBH | Power amplifier operation mode | 1.9 | | $V_{CC}$ | V |
| Low level control voltage (pin 2) | VSTBL | Power amplifier standby mode | 0 | | 0.3 | V |

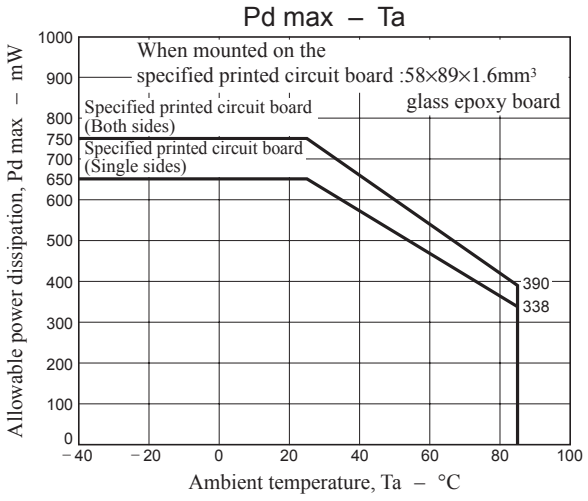
## Package Dimensions

unit : mm (typ)

3245B



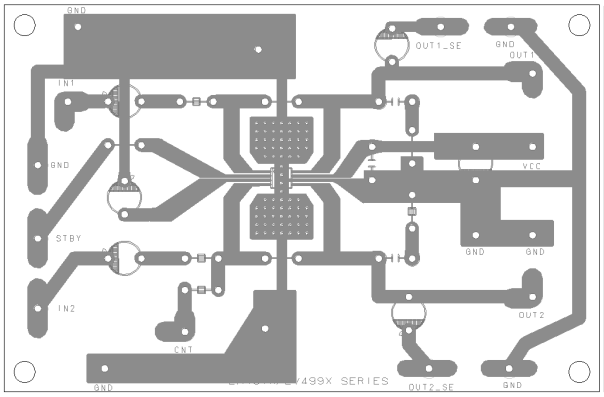

SANYO : MSOP8(150mil)



Recommended Board Layout

1. Both side

Size : 58mm×89mm×1.6mm

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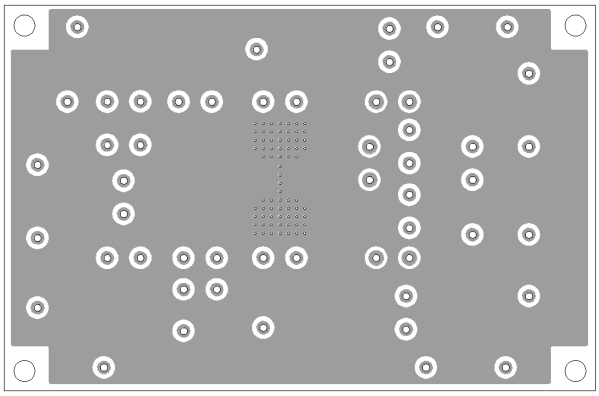
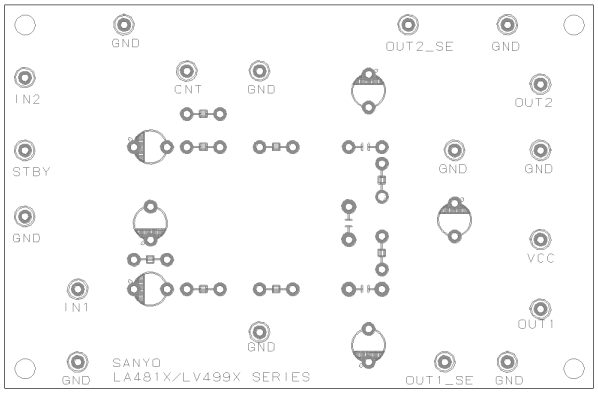


Bottom Layer

2. Single side

Size : 58mm×89mm×1.6mm

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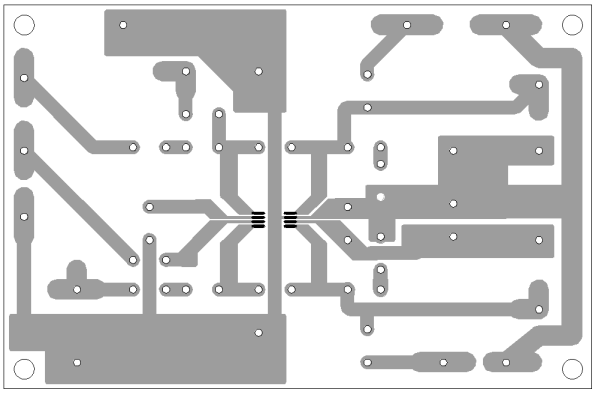
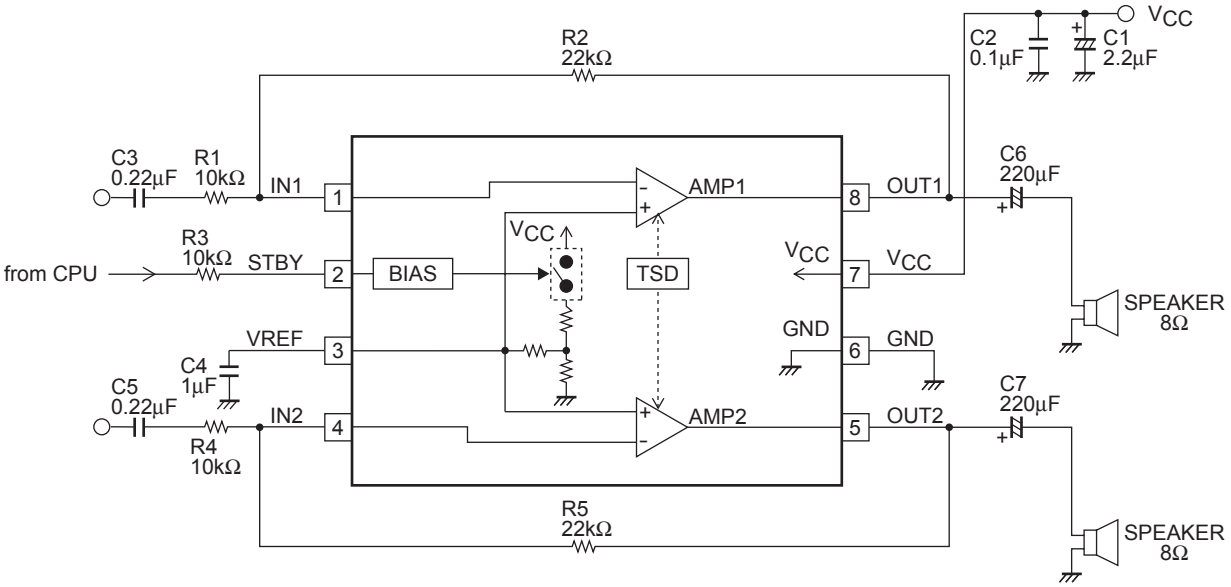
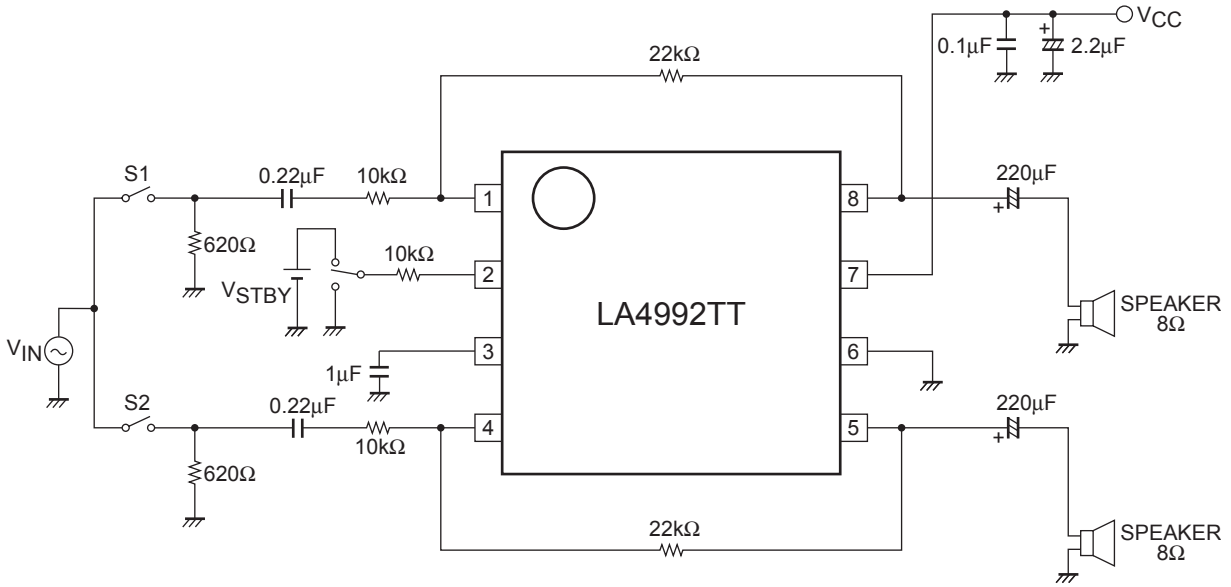


Bottom Layer

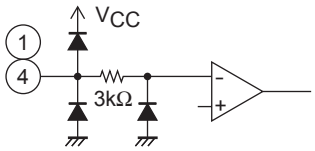
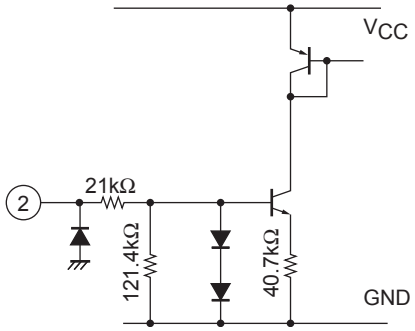
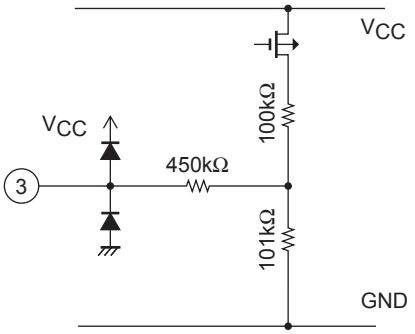
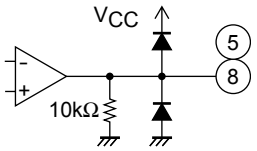
## Block Diagram and Sample Application Circuit




## Test Circuit



## Pin Function

| Pin No. | Pin name | Pin voltage $V_{CC}$ = 3.6V | Description | Equivalent circuit |
|---|---|---|---|---|
| 1<br>4 | IN1<br>IN2 | 1.81 | Input pin |  |
| 2 | STBY | | Standby pin<br>•Standby mode (0 to 0.3V)<br>•Operation mode (1.9 to $V_{CC}$) |  |
| 3 | VREF | 1.81 | Ripple filter pin<br>(Capacity connection for filter) |  |
| 5<br>8 | OUT2<br>OUT1 | 1.81 | Power amplifier output pin |  |
| 6 | GND | 0 | Ground pin | |
| 7 | $V_{CC}$ | 3.6 | Power supply pin | |

## Usage Note

1. Input coupling capacitor (C3 and C5)
   Since the high pass filter is formated by the input coupling capacitor C3, C5 and the input resistance R1, R4, low frequency attenuates. Therefore, it is necessary to select the capacitance value with due considelation of passband. The capacitance value influences a shock noise when the switch is turned on, caution is demanded because the level of shock noise becomes large when a bigger capacitance value is set.

2. The 3rd pin capacitor (C4)
   The power supply ripple is reduced by the 3rd pin capacitor C4. The Ripple rejection ratio improves when the capacitance value is large. However, this capacitor influences the shock noise and rise time of amplifier.
   Please design with both characteristics in mind.

3. Standby pin (pin 2)
   The standby mode and the operation mode can be switched by controlling the standby pin.

   Standby mode $\Rightarrow$ V2 = 0 to 0.3V
   Operation mode $\Rightarrow$ V2 = 1.9 to $V_{CC}$V

   In addition, caution is necesssary since the current $I_{ST}$ flows to the standby pin when the standby pin is used by working with power supply as shown in FIG.1.

$$I_{ST} = \frac{V_{CC} - 1.4V}{R3 + 21k\Omega} \text{ (Approximate value)}$$

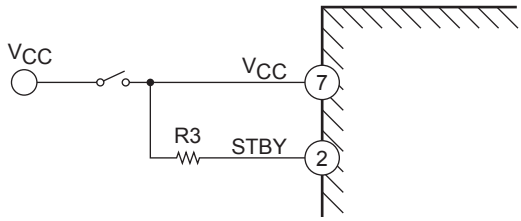



Fig. 1

4. Power supply bypass capacitor (C2)
   The bypass capacitor must be inserted, as close as possible to the power supply pin (pin 7).

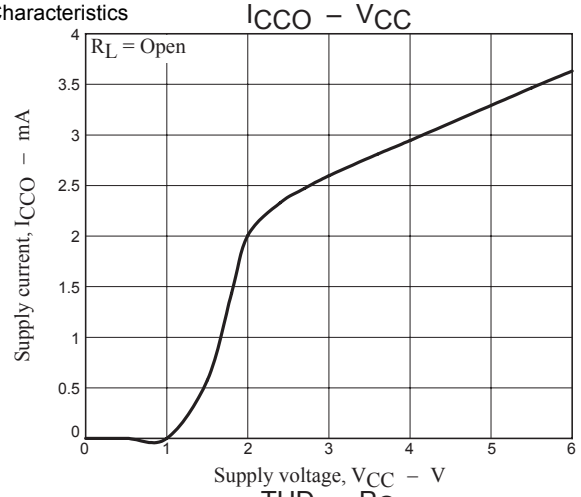
5. Short-circuit between terminals
   Turning on the power supply with the short-circuit between terminals leads to the deterioration and destruction of IC. When fixing the IC to the substrate, please check that the solder is not short-circuited between the terminals before turning on the power.

6. Load Short-circuit
   Leaving the IC in the load short-circuit for many hours leads to the deterioration and destruction of the IC.
   The load must not be short-circuited absolutely.

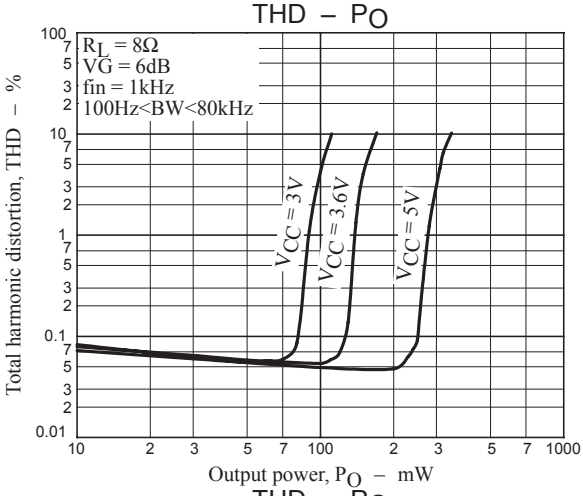
7. Maximum rating
   When the rated value used is just below to the absolute maximum ratings value, there is a possibillity to exceed the maxixmum rating value with slight extrusion variable. Also, it can be a destructive accident.
   Please use within the absolute maximum ratings with sufficient variation margin of supply voltage.

General Characteristics

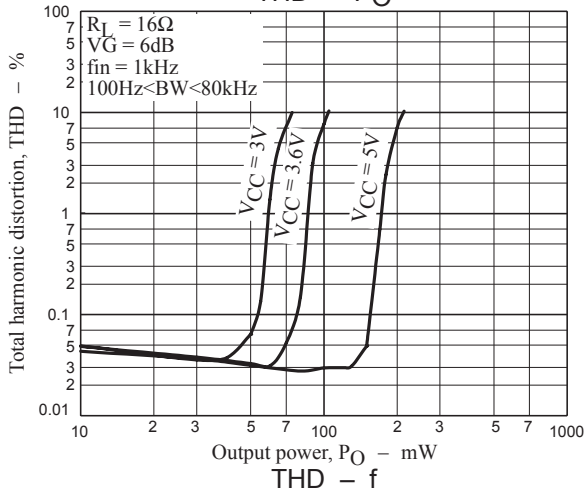
$I_{CCO}$ – $V_{CC}$



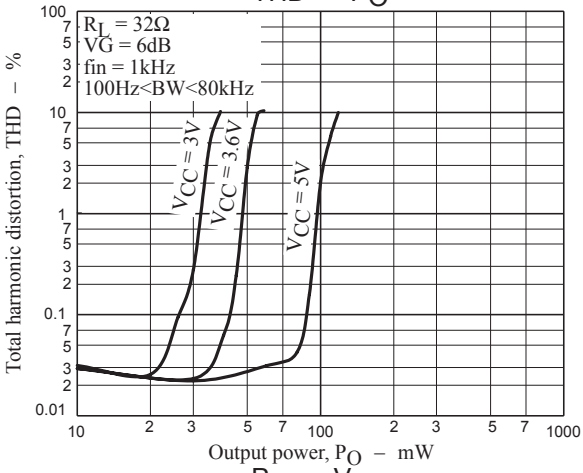

THD – $P_O$



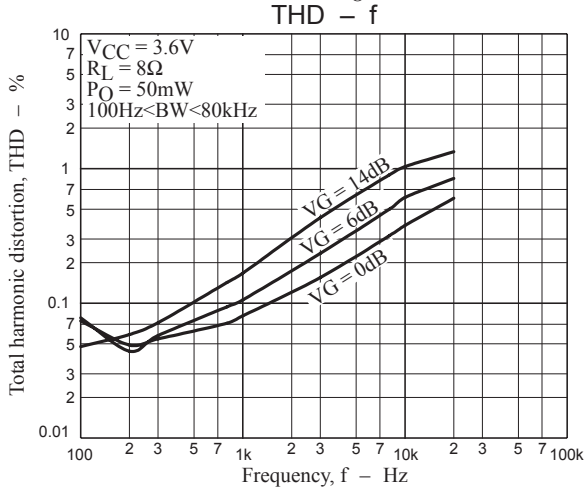

THD – $P_O$



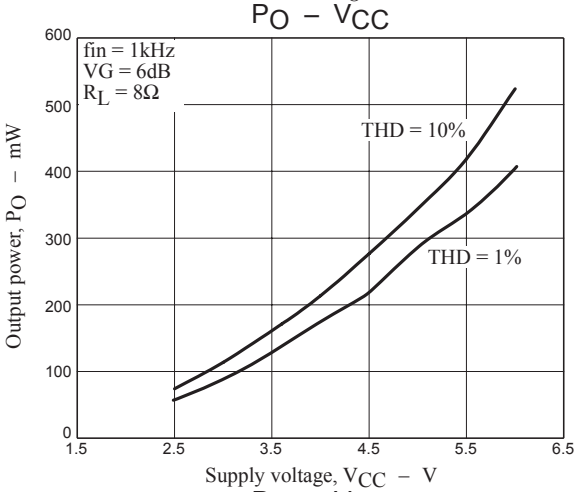

THD – $P_O$



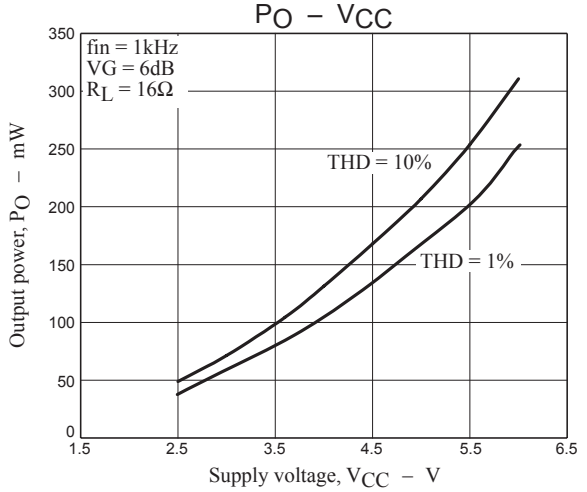

THD – f



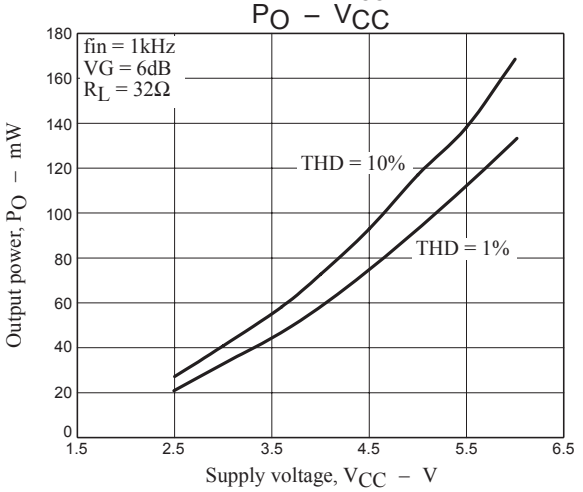

$P_O$ – $V_{CC}$



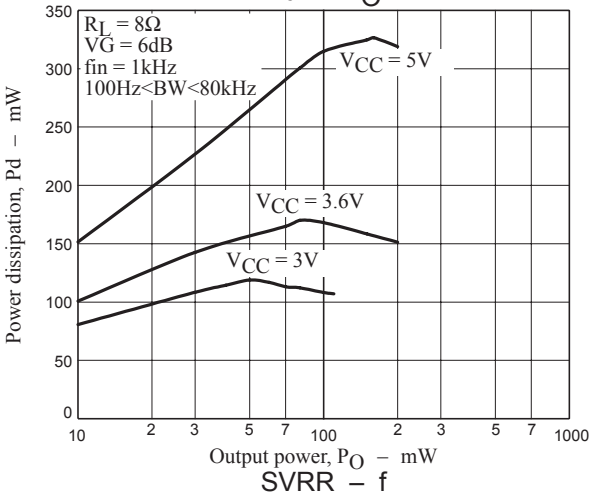

$P_O$ – $V_{CC}$



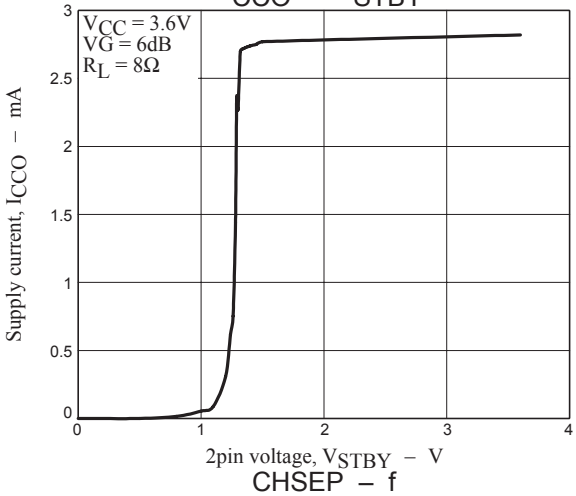

$P_O$ – $V_{CC}$



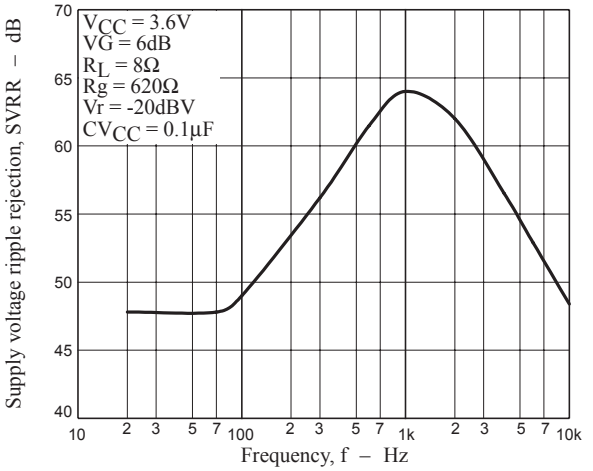
Pd – $P_O$



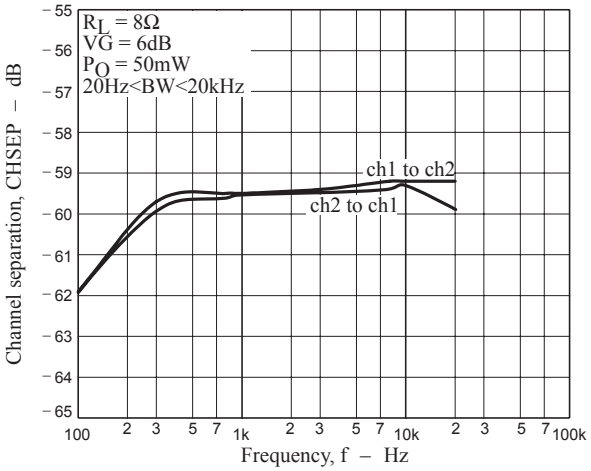

$I_{CCO}$ – $V_{STBY}$



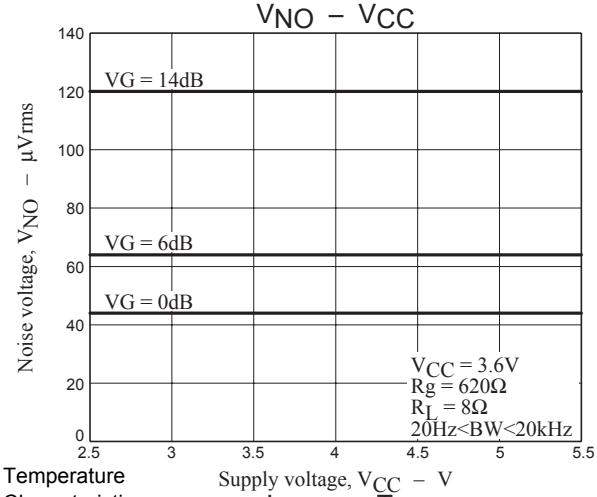

SVRR – f




CHSEP – f

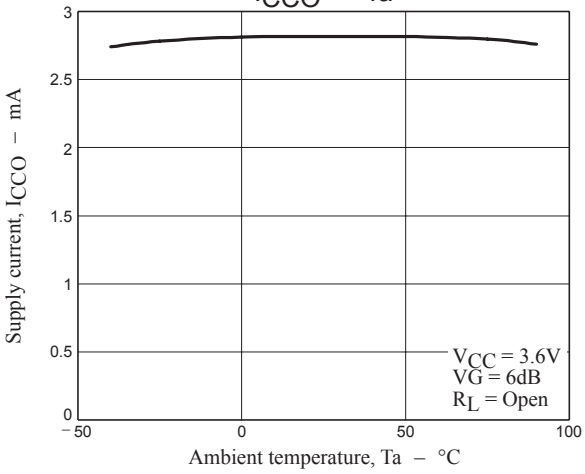



$V_{NO}$ – $V_{CC}$

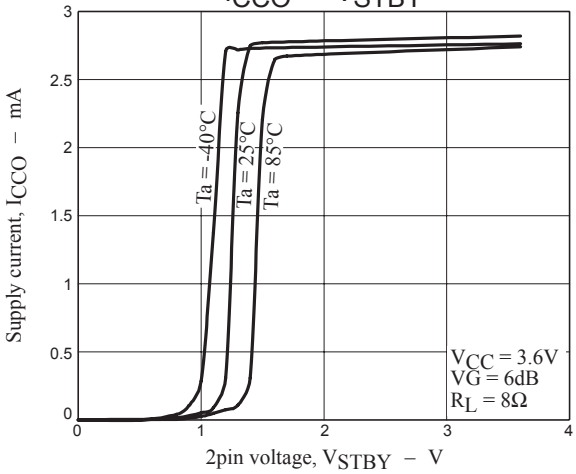



Temperature Characteristics

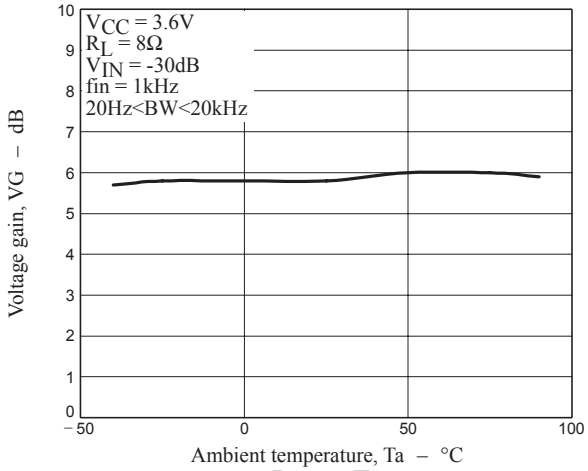
$I_{CCO}$ – Ta



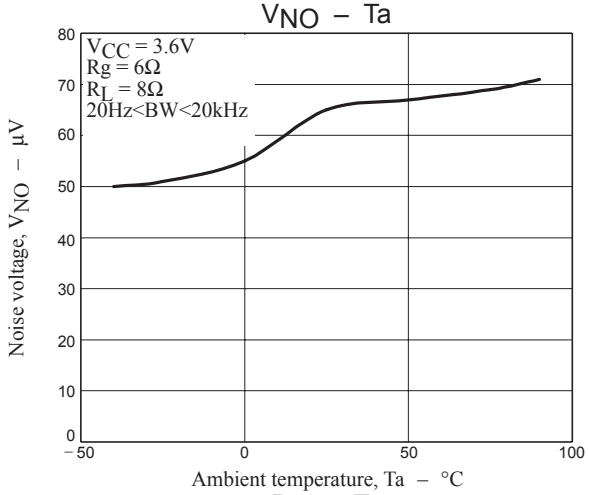

$I_{CCO}$ – $V_{STBY}$



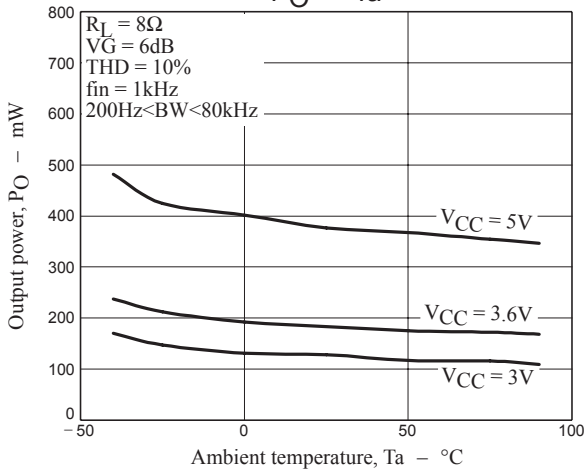
VG – Ta




VNO – Ta




PO – Ta

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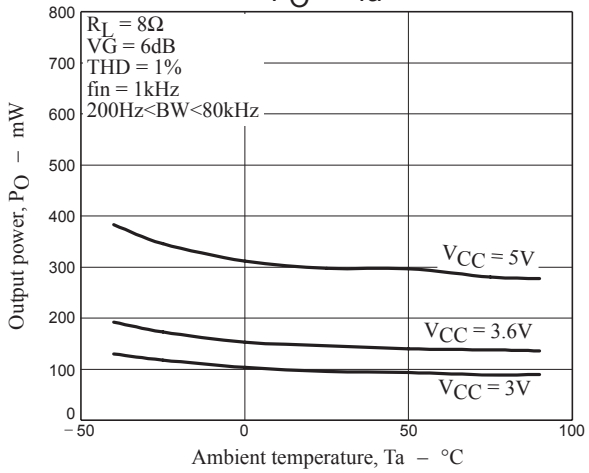


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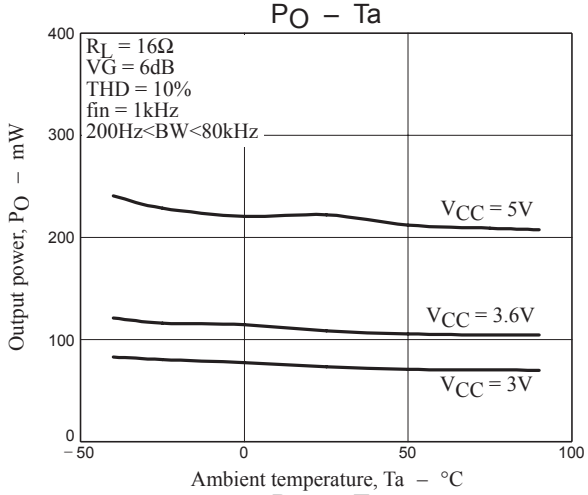


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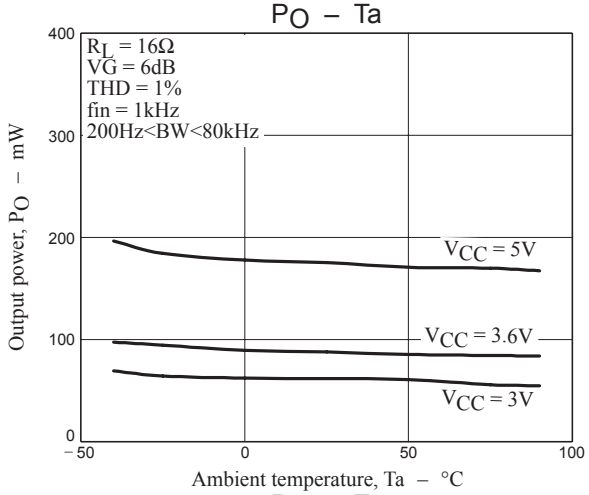


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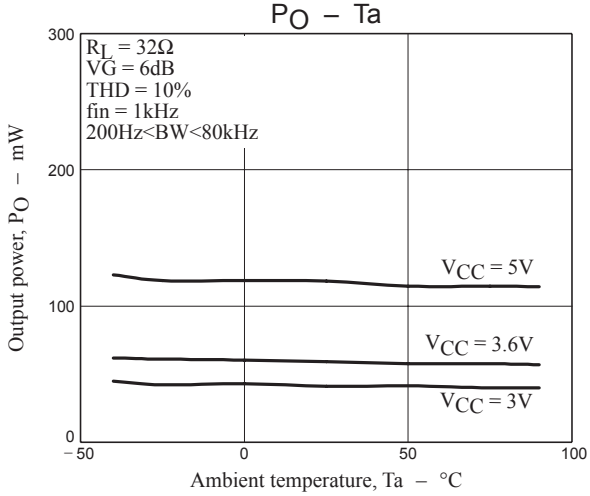


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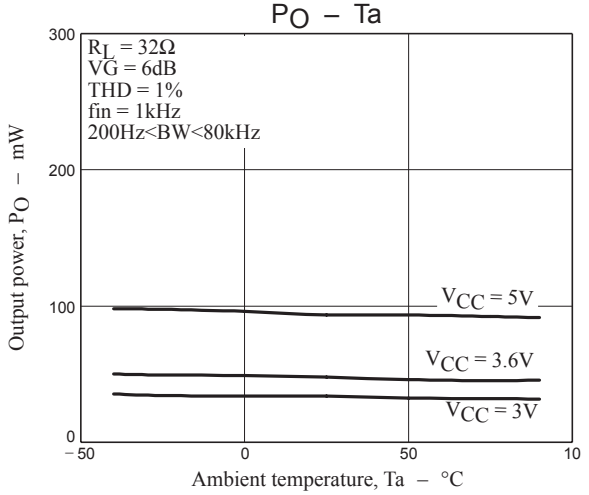
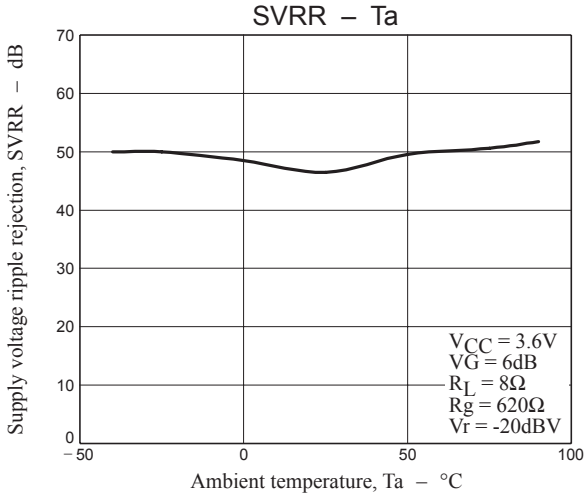
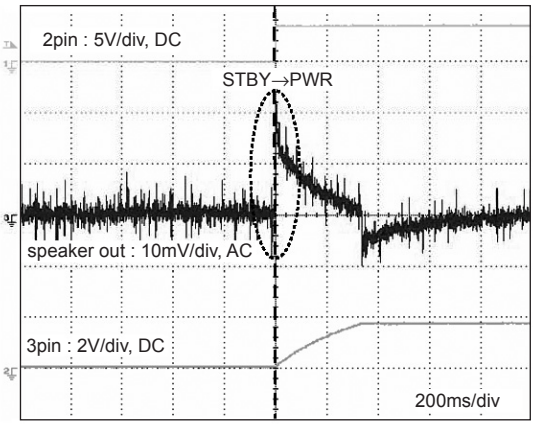





Shock Noise

1. Rising edge




2. Falling edge