



# TS4990

## 1W AUDIO POWER AMPLIFIER WITH ACTIVE LOW STANDBY MODE

ADVANCE DATA

- OPERATING FROM  $V_{CC} = 2.2V$  to  $5.5V$
- **1W** OUTPUT POWER @  $V_{CC}=5V$ , THD=1%,  $f=1kHz$ , with  $8\Omega$  Load
- ULTRA LOW CONSUMPTION IN STANDBY MODE (**10nA**)
- **62dB** PSRR @ 217Hz @ Grounded mode
- **Zero** POP & CLICK
- ULTRA LOW DISTORTION (**0.1%**)
- UNITY GAIN STABLE
- AVAILABLE IN 9 BUMPS **Flip Chip Package**

### DESCRIPTION

The TS4990 has been designed for demanding audio applications such as mobile phones and to minimize the number of external components.

This Audio Power Amplifier is capable of delivering 1W of continuous RMS Output Power into an  $8\Omega$  load @ 5V.

An externally controlled standby mode control reduces the supply current to less than 10nA. It also includes an internal thermal shutdown protection.

The unity-gain stable amplifier can be configured by external gain setting resistors.

### APPLICATIONS

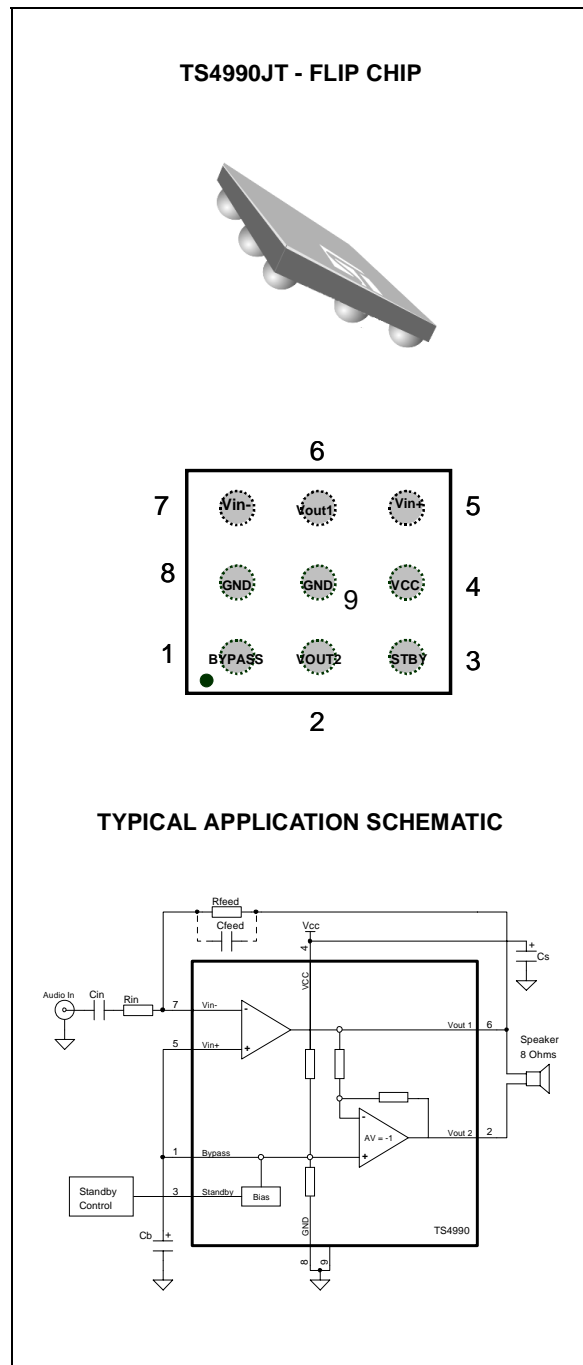
- Mobile Phones (Cellular / Cordless)
- Laptop / Notebook Computers
- PDAs
- Portable Audio Devices

### ORDER CODE

Part Number	Temperature Range	Package	
		J	
TS4990IJT	-40, +85°C	•	

J = Flip Chip Package - only available in Tape & Reel (JT)

### PIN CONNECTIONS (top view)



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply voltage <sup>1)</sup>	6	V
$V_i$	Input Voltage <sup>2)</sup>	$G_{ND}$ to $V_{CC}$	V
$T_{oper}$	Operating Free Air Temperature Range	-40 to + 85	°C
$T_{stg}$	Storage Temperature	-65 to +150	°C
$T_j$	Maximum Junction Temperature	150	°C
$R_{thja}$	Thermal Resistance Junction to Ambient <sup>3)</sup> Flip Chip	TBD	°C/W
$P_d$	Power Dissipation	Internally Limited	
ESD	Human Body Model	2	kV
ESD	Machine Model	200	V
	Latch-up Immunity	Class A (200mA)	
	Lead Temperature (soldering, 10sec)	250	°C

1. All voltages values are measured with respect to the ground pin.
2. The magnitude of input signal must never exceed  $V_{CC} + 0.3V / G_{ND} - 0.3V$
3. Device is protected in case of over temperature by a thermal shutdown active @ 150°C.

**OPERATING CONDITIONS**

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	2.2 to 5.5	V
$V_{ICM}$	Common Mode Input Voltage Range	1.2V to $V_{CC}$	V
$V_{STB}$	Standby Voltage Input : Device ON Device OFF	$1.2 \leq V_{STB} \leq V_{CC}$ $G_{ND} \leq V_{STB} \leq 0.4$	V
$R_L$	Load Resistor	4 - 32	$\Omega$
$R_{OUT_{GND}}$	Resistor Output to GND	> 1	M $\Omega$
$T_{SD}$	Thermal Shutdown Temperature	150 min.	°C
$R_{thja}$	Thermal Resistance Junction to Ambient <sup>1)</sup>	TBD	°C/W

1. This thermal resistance can be reduced with a suitable PCB layout .

**ELECTRICAL CHARACTERISTICS** $V_{CC} = +5V$ ,  $GND = 0V$ ,  $T_{amb} = 25^{\circ}C$  (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$I_{CC}$	Supply Current No input signal, no load		4	6	mA
$I_{STANDBY}$	Standby Current <sup>1)</sup> No input signal, $V_{stdby} = G_{ND}$ , $R_L = 8\Omega$		10	1000	nA
$V_{OO}$	Output Offset Voltage No input signal, $R_L = 8\Omega$		5	20	mV
$P_o$	Output Power THD = 1% Max, $f = 1kHz$ , $R_L = 8\Omega$	0.8	1		W
THD + N	Total Harmonic Distortion + Noise $P_o = 250mW$ rms, $G_v = 2$ , $20Hz < f < 20kHz$ , $R_L = 8\Omega$		0.15		%
PSRR	Power Supply Rejection Ratio <sup>2)</sup> $R_L = 8\Omega$ , $G_v = 2$ , $V_{ripple} = 200mV_{pp}$ , Input Grounded $F = 217Hz$ $F = 1kHz$	55 55	62 66		dB
$T_{WU}$	Wake-Up Time		100	TBD	ms

1. Standby mode is activated when  $V_{stdby}$  is tied to  $Gnd$ 2. Dynamic measurements -  $20 \cdot \log(\text{rms}(V_{out})/\text{rms}(V_{ripple}))$ .  $V_{ripple}$  is the surimposed sinus signal to  $V_{cc}$ . $V_{CC} = +3.3V$ ,  $GND = 0V$ ,  $T_{amb} = 25^{\circ}C$  (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$I_{CC}$	Supply Current No input signal, no load		4	6	mA
$I_{STANDBY}$	Standby Current <sup>1)</sup> No input signal, $V_{stdby} = G_{ND}$ , $R_L = 8\Omega$		10	1000	nA
$V_{OO}$	Output Offset Voltage No input signal, $R_L = 8\Omega$		5	20	mV
$P_o$	Output Power THD = 1% Max, $f = 1kHz$ , $R_L = 8\Omega$	380	450		mW
THD + N	Total Harmonic Distortion + Noise $P_o = 250mW$ rms, $G_v = 2$ , $20Hz < f < 20kHz$ , $R_L = 8\Omega$		0.15		%
PSRR	Power Supply Rejection Ratio <sup>2)</sup> $R_L = 8\Omega$ , $G_v = 2$ , $V_{ripple} = 200mV_{pp}$ , Input Grounded $F = 217Hz$ $F = 1kHz$	55 55	62 66		dB
$T_{WU}$	Wake-Up Time		130	TBD	ms

1. Standby mode is activated when  $V_{stdby}$  is tied to  $V_{cc}$ 2. Dynamic measurements -  $20 \cdot \log(\text{rms}(V_{out})/\text{rms}(V_{ripple}))$ .  $V_{ripple}$  is the surimposed sinus signal to  $V_{cc}$ .

**ELECTRICAL CHARACTERISTICS**

$V_{CC} = 2.6V$ ,  $GND = 0V$ ,  $T_{amb} = 25^{\circ}C$  (unless otherwise specified)

Symbol	Parameter	Min.	Typ.	Max.	Unit
$I_{CC}$	Supply Current No input signal, no load		4	6	mA
$I_{STANDBY}$	Standby Current <sup>1)</sup> No input signal, $V_{stdby} = G_{ND}$ , $R_L = 8\Omega$		10	1000	nA
$V_{OO}$	Output Offset Voltage No input signal, $R_L = 8\Omega$		5	20	mV
$P_o$	Output Power THD = 1% Max, $f = 1kHz$ , $R_L = 8\Omega$	210	260		mW
THD + N	Total Harmonic Distortion + Noise $P_o = 200mW$ rms, $G_v = 2$ , $20Hz < f < 20kHz$ , $R_L = 8\Omega$		0.15		%
PSRR	Power Supply Rejection Ratio <sup>2)</sup> $R_L = 8\Omega$ , $G_v = 2$ , $V_{ripple} = 200mV_{pp}$ , Input Grounded $F = 217Hz$ $F = 1kHz$	55 55	62 66		dB
$T_{WU}$	Wake-Up Time		130	TBD	ms

1. Standby mode is activated when  $V_{stdby}$  is tied to  $V_{CC}$

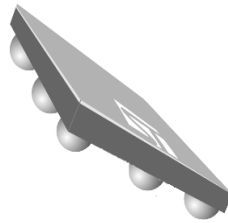
2. Dynamic measurements -  $20 \cdot \log(\text{rms}(V_{out})/\text{rms}(V_{ripple}))$ . Vripple is the surimposed sinus signal to  $V_{CC}$ .

Components	Functional Description
$R_{in}$	Inverting input resistor which sets the closed loop gain in conjunction with $R_{feed}$ . This resistor also form a high pass filter with $C_{in}$ ( $f_c = 1 / (2 \times \pi \times R_{in} \times C_{in})$ )
$C_{in}$	Input coupling capacitor which blocks the DC voltage at the amplifier input terminal
$R_{feed}$	Feed back resistor which sets the closed loop gain in conjunction with $R_{in}$
$C_s$	Supply Bypass capacitor which provides power supply filtering
$C_b$	Bypass pin capacitor which provides half supply filtering
$C_{feed}$	Low pass filter capacitor allowing to cut the high frequency (low pass filter cut-off frequency $1 / (2 \times \pi \times R_{feed} \times C_{feed})$ )
$G_v$	Closed loop gain in BTL configuration = $2 \times (R_{feed} / R_{in})$

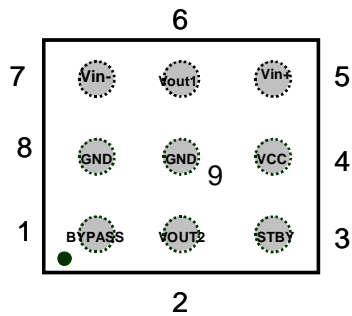
**REMARKS**

1. All measurements, except PSRR measurements, are made with a supply bypass capacitor  $C_s = 1\mu F$ .
2. The standby response time is about  $1\mu s$ .

TS4990IJT

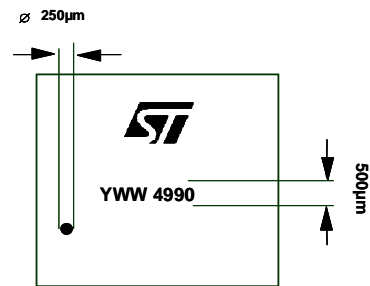


PIN OUT (top view)



■ Balls are underneath

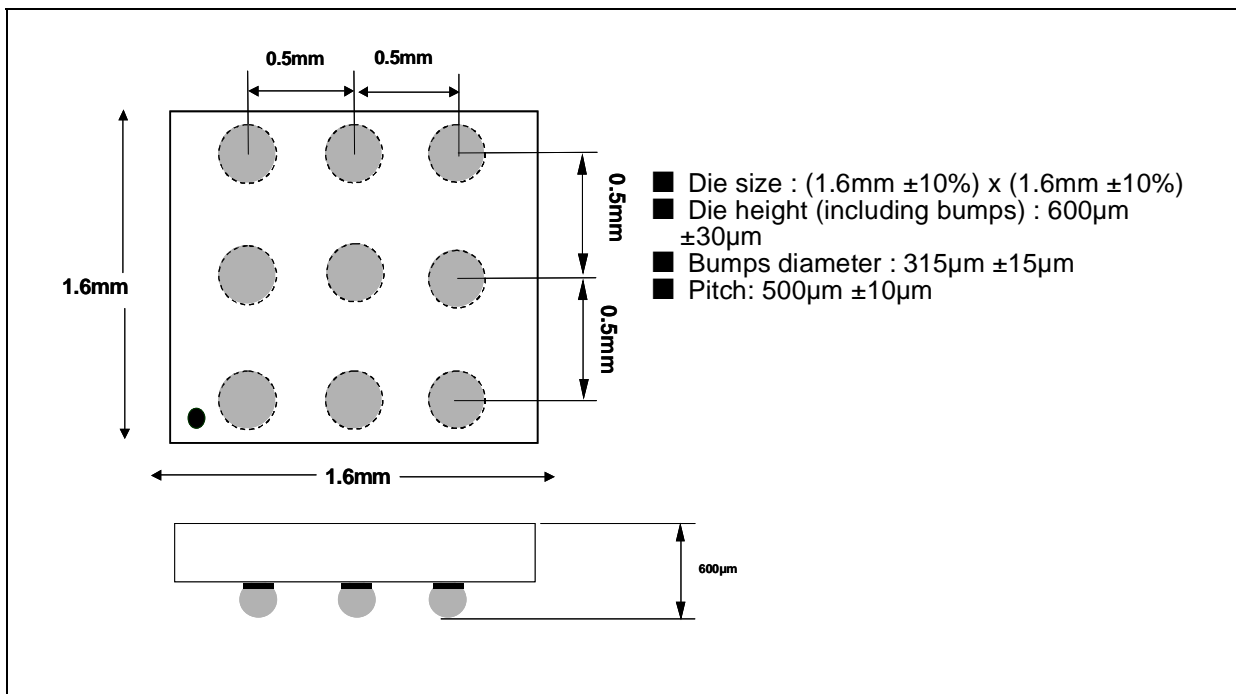
MARKING (top view)



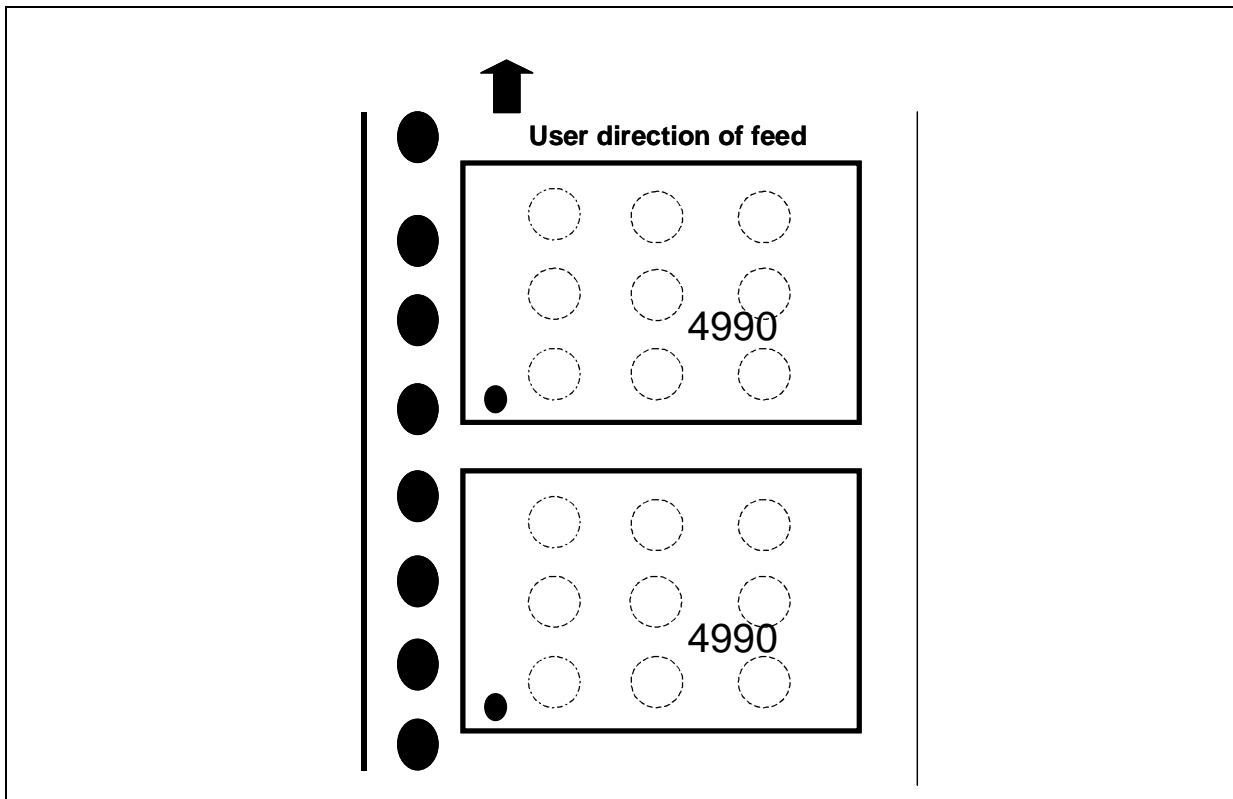
- ST Logo
- Part number 4990
- Three digits Datecode : YWW
- The dot is for marking pin 1

PACKAGE MECHANICAL DATA

FLIP CHIP - 9 BUMPS



TAPE & REEL SPECIFICATION ( top view)



DEVICES ORIENTATION

The devices are oriented in the carrier pocket with pin number 1A adjacent to the sprocket holes.

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