Princeton Technology Corp.
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Echo Processor IC **PT2399**

DESCRIPTION

PT2399 is an echo audio processor IC utilizing CMOS Technology which is equipped with ADC and DAC, high sampling frequency and an internal memory of 44K Digital processing is used to generate the delay time, it also features an internal VCO circuit in the system clock, thereby, making the frequency easily adjustable. PT2399 boast of very low distortion (THD<0.5%) and very low noise (No<-90dBV), thus producing high quality audio output. The pin assignments and application circuit are optimized for easy PCB layout and cost saving advantage.

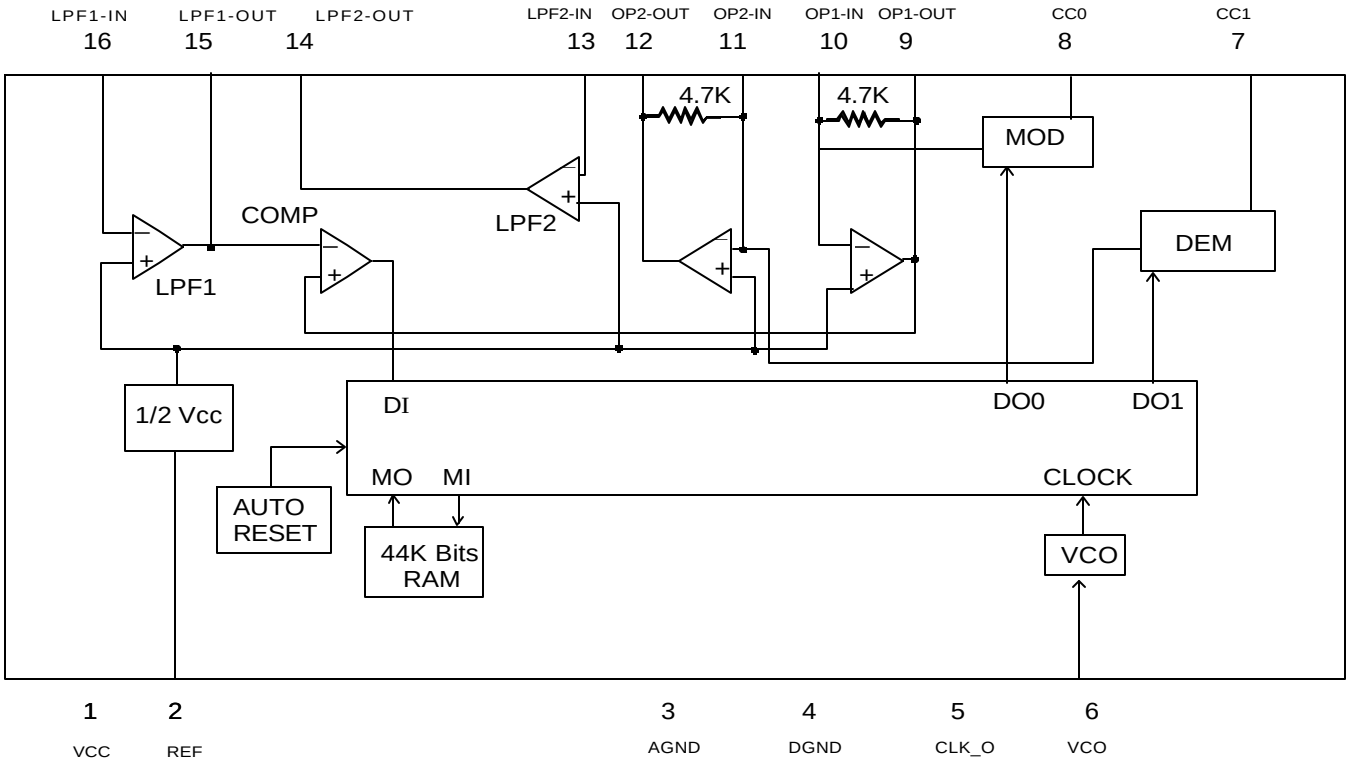
FEATURES

- CMOS Technology
- Least External Components
- Auto Reset Function
- Low Noise, No<-90dBV Typical
- Low Distortion, THD<0.5% Typical
- External Adjustable VCO
- Available in 16 pins, DIP or SO package

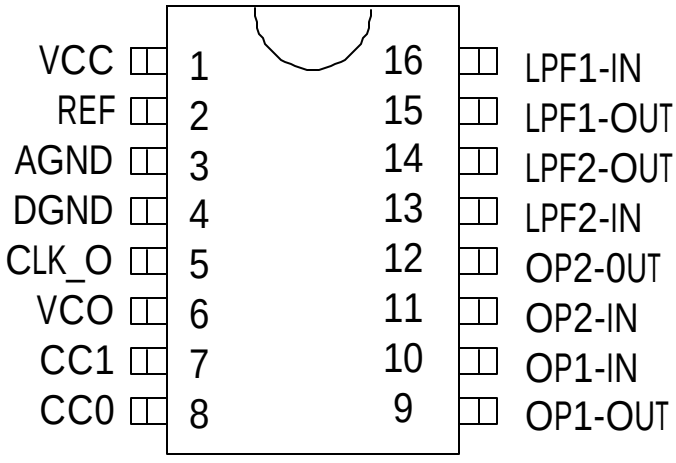
APPLICATIONS

- Video Tape Recorder
- Video Compact Disk
- Television
- CD Player
- Car Stereo
- KARAOKE Mixer
- Electronic Musical Instrument
- Audio Equipment with Echo Processor

BLOCK DIAGRAM



PIN CONFIGURATION



PT2399

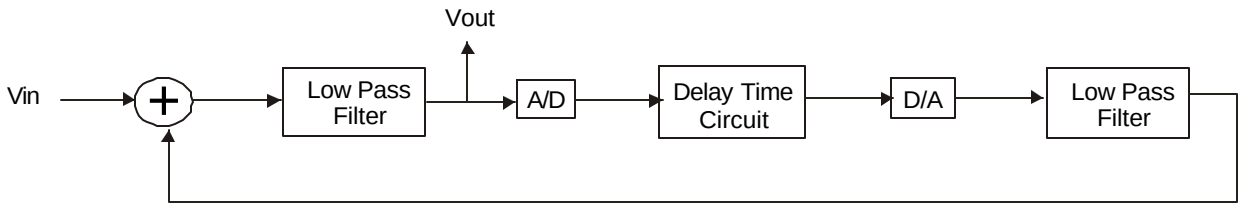
PIN DESCRIPTION

Pin Name	I/O	Description	Pin No.
VCC	-	Analog Supply Voltahe Input	1
REF	-	Analog Reference Voltage (=1/2Vcc)	2
AGND	-	Analog Ground	3
DGND	-	Digital Ground	4
CLK_O	O	System Clock Output Pin	5
VCO	I	Frequency Adjustment Pin	6
CC1	-	Current Control 1	7
CC0	-	Current Conrol 0	8
OP1-OUT	O	OP Amplifier 1 Output This pin can be used as Moodulated Integrator by connecting Capacitor.	9
OP1-IN	I	OP Amplifier 1 Input This pin can be used as Demodulated Integrator by connecting Capacitor.	10
OP2-IN	I	OP Amplifier 2 Input This pin can be used as Demodulated Integrator by connecting Capacitor.	11
OP2-OUT	O	OP Amplifier 2 Output This pin can be used as a Modulated Integrator by connecting Capacitor	12
LPF2-IN	I	Low Pass Filter 2 Input Pin	13
LPF2-OUT	O	Low Pass Filter 2 Output Pin	14
LPF1-OUT	O	Low Pass Filter 1 Output Pin	15
LPF1-IN	I	Low Pass Filter 1 Input Pin	16

FUNCTIONAL DESCRIPTION

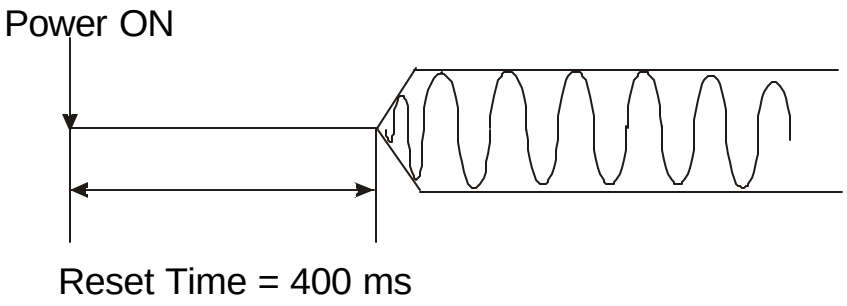
Echo Mode

Please refer to the diagram below:



Auto Reset Function

The waveform of the signal during Power On is given below:



ABSOLUTE MAXIMUM RATINGS

(Ta=25°C, unless otherwise specified)

Symbol	Description	Limits	Unit
Vcc	Supply Voltage	6.5	V
Icc	Supply Current	100	mA
Pd	Power Dissipation	1.7	W
Topr	Operation Temperature	-20 to +75	°C
Tstg	Storage Temperature	-25 to +125	°C

RECOMMENDED OPERATING CONDITIONS

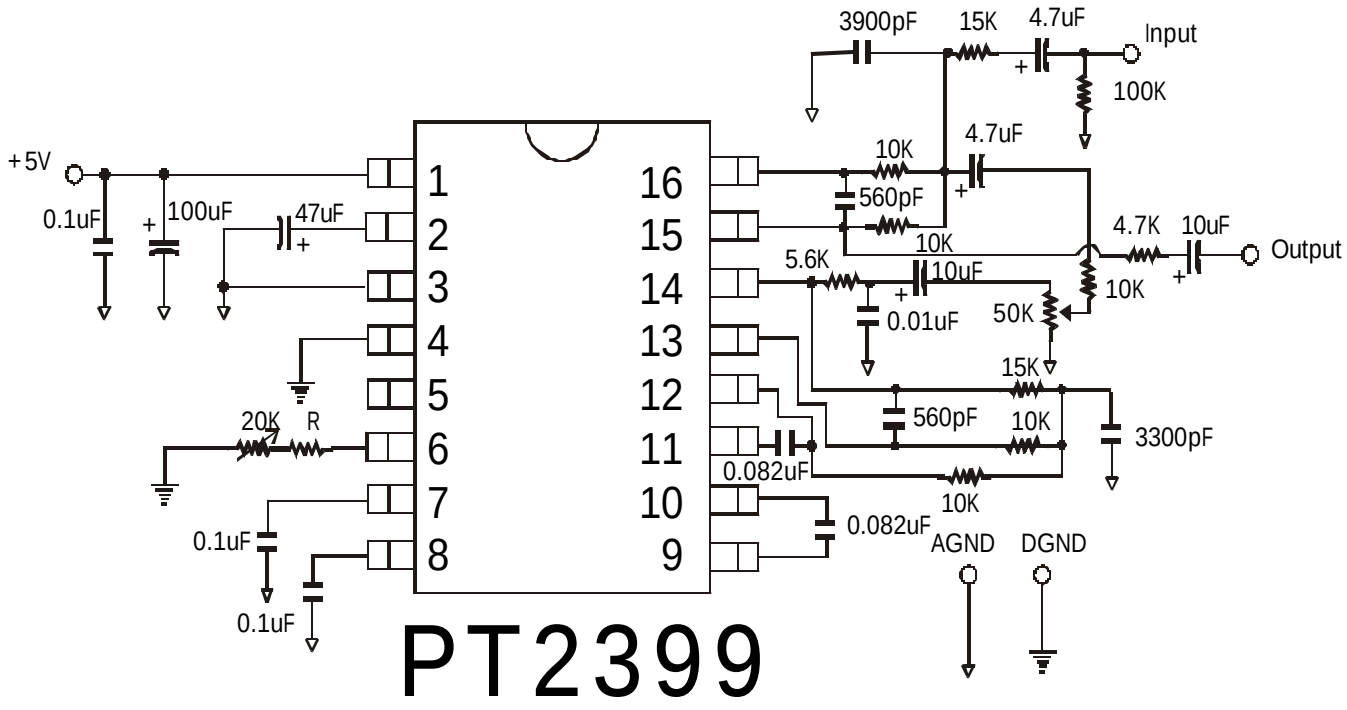
Symbol	Parameter	Limits			Units
		Min.	Typ.	Max.	
Vcc	Supply Voltage	4.5	5	5.5	V
fck	Clock Frequency		4	5	MHz

AC CHARACTERISTICS

(Unless otherwise stated: Vcc=5.0 V, fin=1KHz, Vi=100mVrms, fck=4MHz, Ta=25°C)

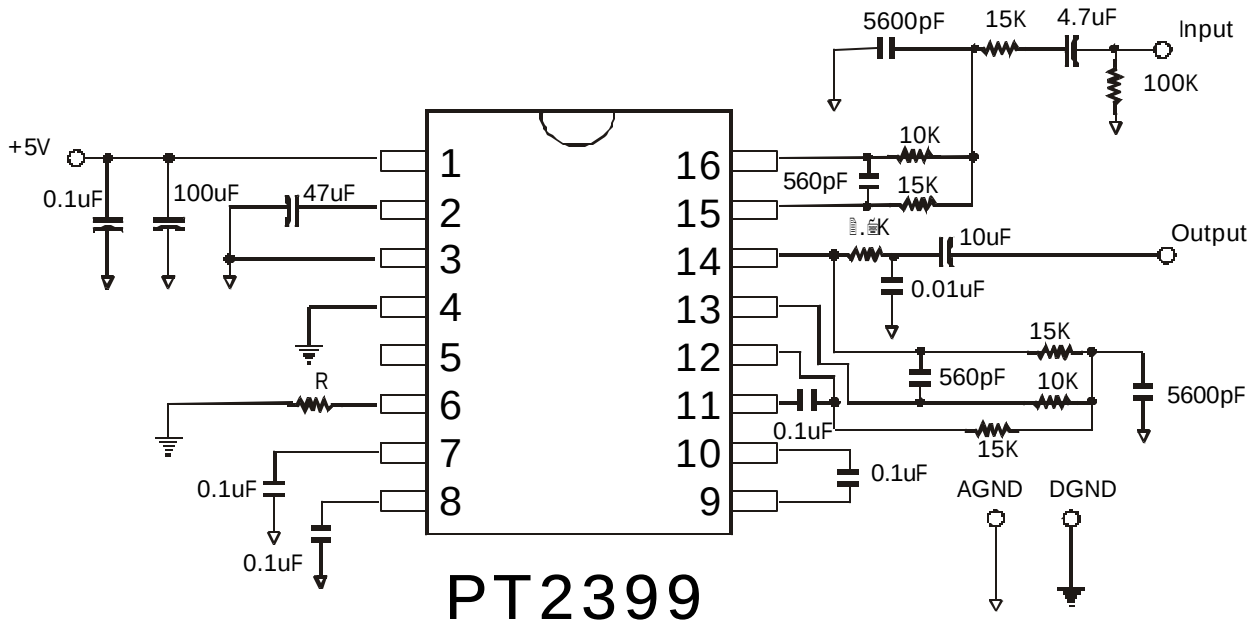
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
Vcc	Supply Voltage		4.5	5.0	5.5	V
Icc	Supply Current			30	40	mA
Gv	Voltage Gain	RL=47K Ohms		-0.5	2.5	dB
Vomax	Maximum Output Voltage	THD=10%	1.5	2	2.5	Vrms
THD	Output Distortion	filter=Audio		0.3	1.0	%
No	Output Noise Voltage	filter=A-weighting		-90	-80	dBV
PSRR	Power Supply Rejection Ratio	ΔVcc=-20dBV(0.1Vrms) f=100Hz		-40	-30	dB

PT2399 ECHO APPLICATION CIRCUIT



Note: External Resistor having a value of 10 K Ohms to 50 K Ohms may be used. The recommended Resistor Value (R) is 10 K Ohms. When the value of the Resistor (R) increases, the range of the Delay Time also increases.

PT2399 SURROUND/DELAY APPLICATION CIRCUIT



Note: Please refer to Table 1 for the Resistor/Delay Time values

TABLE 1: RESISTOR/DELAY TIME VALUES

R	27.6K	21.3K	17.2K	14.3K	12.1K	10.5K	9.2K	8.2K
fck	2.0M	2.5M	3.0M	3.5M	4.0M	4.5M	5.0M	5.5M
td	342ms	273ms	228ms	196ms	171ms	151ms	136.6ms	124.1ms
THD	1.0%	0.8%	0.63%	0.53%	0.46%	0.41%	0.36%	0.33%

R	7.2K	6.4K	5.8K	5.4K	4.9K	4.5K	4K	3.4K
fck	6.0M	6.5M	7.0M	7.5M	8.0M	8.5M	9.0M	10M
td	113.7ms	104.3ms	97.1ms	92.2ms	86.3ms	81ms	75.9ms	68.1ms
THD	0.29%	0.27%	0.25%	0.25%	0.23%	0.22%	0.21%	0.19%

R	2.8K	2.4K	2K	1.67K	1.47K	1.28K	1.08K	894
fck	11M	12M	13M	14M	15M	16M	17M	18M
td	61.6ms	56.6ms	52.3ms	48.1ms	45.8ms	43ms	40.6ms	38.5ms
THD	0.18%	0.16%	0.15%	0.15%	0.15%	0.15%	0.14%	0.14%

R	723	519	288	0.5
fck	19M	20M	21M	22M
td	36.6ms	34.4ms	32.6ms	31.3ms
THD	0.14%	0.13%	0.13%	0.13%

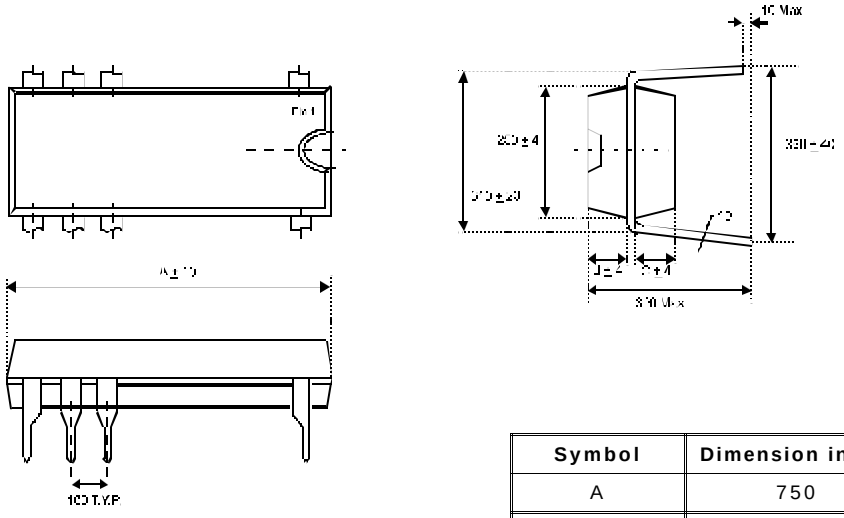
Note: R = External Resistor (Ohms), please refer to PT2399 Surround/Delay Time Application Circuit
fck = Clock Frequency (Hz)
td = Delay Time
THD = Total Harmonic Distortion

ORDER INFORMATION

Part Number	Package
PT2399	16 Pins, DIP (300 mil)
PT2399S	16 Pins, SO Package (300 mil)

PACKAGE INFORMATION

16 Pins, DIP Package



Symbol	Dimension in Mil
A	750
B	65
C	55

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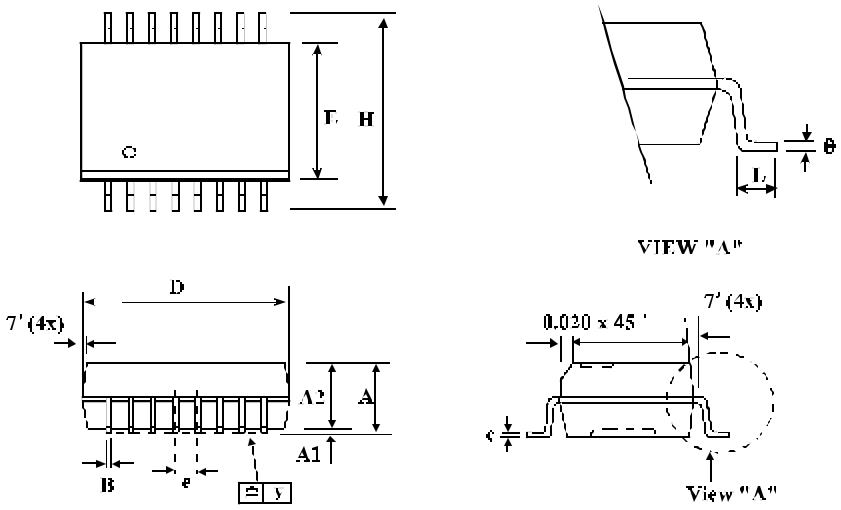
16 Pins, SO Package



Symbol	Dimensions in Millimeter			Dimensions in Inches		
	Min	Nom	Max	Min	Nom	Max
A	2.36	2.49	2.64	0.093	0.098	0.104
A1	0.10	-	0.30	0.004	-	0.012
A2	-	0.31	-	-	0.091	-
B	0.33	0.41	0.51	0.013	0.016	0.020
C	0.18	0.23	0.28	0.007	0.009	0.011
D	10.08	10.31	10.49	0.397	0.406	0.413
E	7.39	7.49	7.59	0.291	0.295	0.299
e	-	1.27	-	-	0.050	-
H	10.01	10.31	10.64	0.394	0.406	0.419
L	0.38	0.81	1.27	0.015	0.032	0.050
y	-	-	0.10	-	-	0.004
θ	0°	-	8°	0°	-	8°

Note:
1. Controlling Dimension: Inch
2. Lead Frame Material: Copper 194
3. After soldering plating lead thickness will be 0.013” max.
4. Dimension “D” does not include mold flash, protrusions or gate burrs.
5. Dimension “E” does not include interlead flash or protrusions.
6. Tolerance: ±0.010” unless otherwise specified.
7. Otherwise dimension follow acceptable spec.