普誠科技股份有限公司
Princeton Technology Corp.
Tel: 886-2-66296288
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URL: http://www.princeton.com.tw

DESCRIPTION

PT2396 is a digital echo/surround processor IC utilizing CMOS Technology. Analog Signal inputted to PT2396 is converted to digital signal by A-D converter and then stored into the internal memory. After a certain delay time, this memory-stored digital signal is converted back into analog signal via the D-A converter.

A low cost echo system may be achieved with the PT2396's A-D converter, D-A converter, incorporating ADM (Adaptive Delta Modulation) Algorithm while maintaining lower noise, lower distortion, and higher S/N ratio.

PT2396 is functionally compatible with M65831P. If you are replacing M65831P with our PT2396, you must take note that PT2396 does not need to connect an external resistor (30Ω) to Pin 15 and Pin 21.

FEATURES

- CMOS technology
- Low power consumption
- Low noise (-92dBV typical)
- Low distortion (0.5% typical)
- Built-in 48K memory
- Automatic reset circuit included
- A-D, D-A converters (Adaptive delta modulation), 2 LPFs and 48 K-bit memory
- Sleep mode function
- Parallel or serial data controlled from micro controller

APPLICATIONS

- KARAOKE
- Electronic musical instruments
- VCD, DVD
- Radio set

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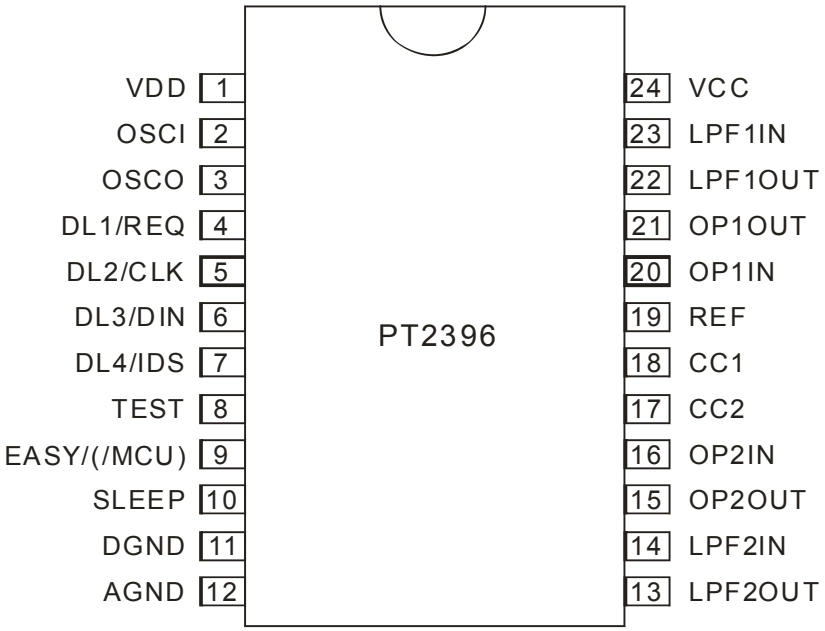
PIN CONFIGURATION



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PIN DESCRIPTION

Pin Name	I/O	Description		Pin No.
VDD	-	Digital supply voltage		1
OSCI	I	Oscillator input pin This pin connects to 2MHz ceramic resonator or inputs an external clock.		2
OSCO	O	Oscillator output pin This pin connects to 2MHz ceramic resonator.		3
DL1/REQ	I	Delay1/Request pin Easy Mode: This pin inputs DL1 data. MCU Mode: This pin inputs request data.		4
DL2/CLK	I	Delay2/Shift clock pin Easy Mode: This pin inputs DL2 data. MCU Mode: This pin inputs shift clock.		5
DL3/DIN	I	Delay 3/Serial data pin. Easy Mode: This pin inputs DL3 data. MCU Mode: This pin inputs serial data.		6
DL4/IDS	I	Delay 4/ID switch pin Easy Mode: This pin inputs DL4 data. MCU Mode: This pin controls ID Code.		7
TEST	I	Test pin Normal mode = Low		8
EASY/(/MCU)	I	EASY/(/MCU) pin. EASY mode = High MCU mode = Low		9
SLEEP	I	Sleep pin Sleep mode = High Normal mode = Low		10
DGND	-	Digital GND pin This pin connects to the Analog GND at one external point.		11
AGND	-	Analog GND pin This pin connected to the Analog GND		12
LPF2OUT	O	Low Pass Filter 2 output pin	These pins form the low pass filter with external C, R.	13
LPF2IN	I	Low Pass Filter 2 Input pin		14
OP2OUT	O	OP-AMP2 output pin	These pins form the integrator with external C, R.	15
OP2IN	I	OP-AMP2 input pin		16
CC2	-	Current control 2 pin		17

Pin Name	I/O	Description		Pin No.
CC1	-	Current control 1 pin.		18
REF	-	Reference pin. Reference voltage = 1/2 VCC		19
OP1IN	-	OP-AMP 1 input pin	These pins form the integrator with external C, R.	20
OP1OUT	I	OP-AMP 1 output pin.		21
LPF1OUT	O	Low pass filter 1 output pin	These pins form the low pass filter with external C, R.	22
LPF1IN	O	Low pass filter 1 input pin		23
VCC	I	Analog supply voltage pin		24

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FUNCTIONAL DESCRIPTION

DELAY TIME

EASY MODE

The Easy Mode is activated when the EASY/(/MCU) Pin is in HIGH State. Under the Easy Mode; namely – DL1/REQ, DL2/CLK, DL3/DIN, and DL4/IDS are all used as inputs for Delay Time Data (DL1 ~ DL4).

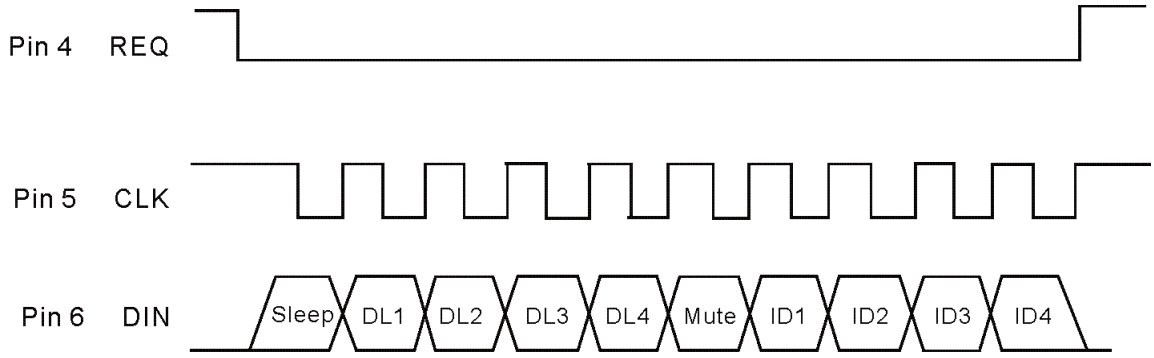
The Delay Pins: namely -- DL1~DL4 determine the amount of time the memory-stored signal would be stored in the 48 K-bit memory (delay time). The following table gives the various Delay Time with reference to the Pins DL1 ~ DL4.

fs	DL4	DL3	DL2	DL1	Td (ms)
500	L	L	L	L	12.3
				H	24.6
			H	L	36.9
				H	49.2
		H	L	L	61.4
				H	73.7
			H	L	86.0
				H	98.3
250	H	L	L	L	110.6
				H	122.9
			H	L	135.2
				H	147.5
		H	L	L	159.7
				H	172.0
			H	L	184.3
				H	196.6

Notes:
1. fs - sampling frequency (KHz)
2. Td = Delay Time (msec)

MCU MODE

The MCU Mode is activated when the EASY/(/MCU) Pin is in Low State. The delay time is set by the serial data from the MCU. Please refer to the timing diagram below:



where: Delay time = DL1 ~ DL4
ID code = ID1 ~ ID4

The DIN Signal is shifted in the falling edge of the CLK Signal when the ID Code Bits values are verified as follows:

ID1 and ID3 = Low
ID2 = High
ID4 = IDS Pin

then, the last ten data bits are latched at the rising edge of the REQ Signal.

When 2 pieces of PT2396 are used, Pin 7 determines which PT2396 is in control. Pin 7 may be pulled High or Low. Please refer to below:

IDS Pin	ID1	ID2	ID3	ID4
0	0	1	0	0
1	0	1	0	1

SLEEP MODE FUNCTION

EASY MODE

Also under this mode, the SLEEP Mode may be activated when the SLEEP Pin is in High State; otherwise, the Normal Mode applies.

MCU MODE

The Sleep Mode is activated when the SLEEP Pin is set to HIGH. At this point, the clock and the RAM stops in order to reduce the circuit current. When the SLEEP Pin is set to LOW, there is normal operation.

SYSTEM RESET

PT2396 features an auto-rest function. The reset time is approximately 120 msec and the delay time is set at 147.5msec if MCU Mode is enabled.

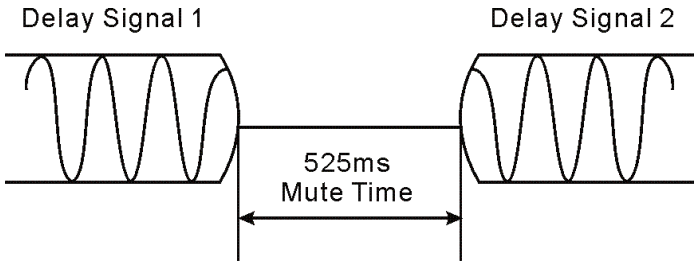
MUTE FUNCTION

EASY MODE

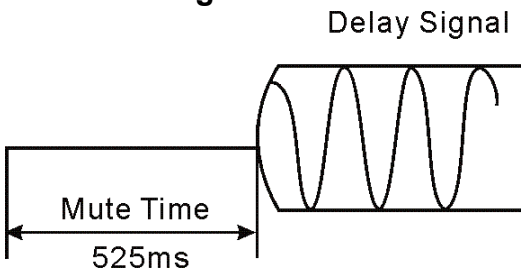
Under the EASY Mode, the mute function is automatically activated under the following conditions:

1. Delay Time is changed.
2. SLEEP Mode is canceled.
3. Power is turned ON.

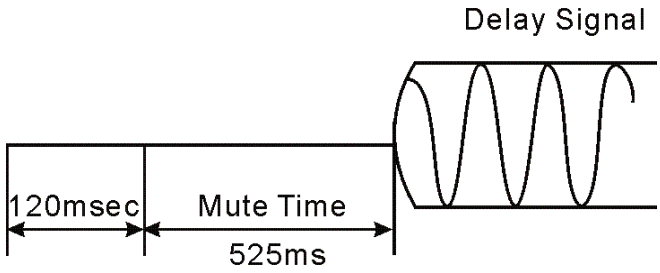
Condition 1: Automatic Mute Function Diagram 1 -- Delay Time Change



Condition 2: Automatic Mute Function Diagram 2 -- SLEEP Mode is canceled.

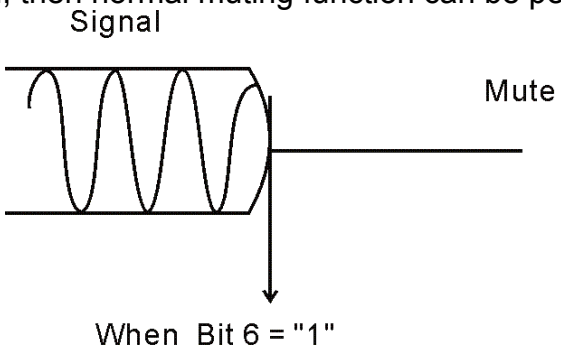


Condition 3: Automatic Mute Function Diagram 3 -- During Power ON



MCU MODE

From the DIN signal (DL3 Pin), if the Mute bit is read as Low, then an automatic muting function can be used (also see EASY Mode Section). Please refer to the diagrams below. However, if this Mute bit (from the DIN Pin) is read High, then normal muting function can be performed (see figure below).



ABSOLUTE MAXIMUM RATING

(Unless otherwise specified, Ta=25℃)

Parameter	Symbol	Ratings	Unit
Supply voltage	Vcc	5.5	V
Operating current	Icc	100	mA
Power dissipation	Pd	1	W
Operating temperature	Topr	-40 ~ +85	℃
Storage temperature	Tstg	-65 ~ +150	℃

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply voltage	Vcc	4.5	5	5.2	V
Clock frequency	Fck	-	2	-	MHz
High input voltage	VIH	0.7VDD	-	VDD	V
Low input voltage	VIL	0	-	0.3VDD	V

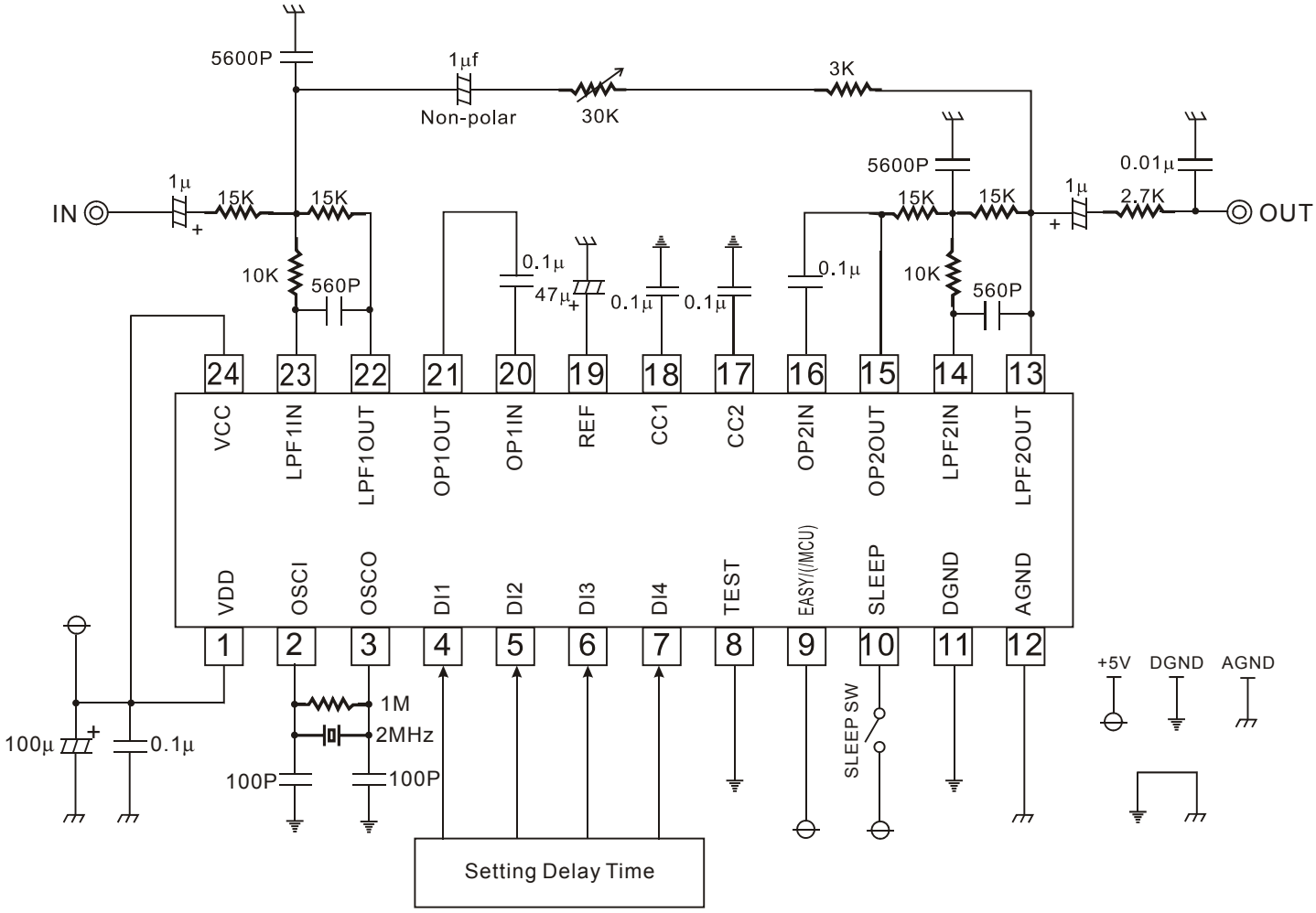
ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, Vcc=5V, f=1KHz, Vi=100mVrms, Ta=25℃)

Parameter	Symbol	Test Conditions		Min.	Typ.	Max.	Unit
Operating current	Icc	RL=47KΩ			16.0	40.0	mA
Voltage gain	Gv	THD=10%		-	-0.5	-	dB
Output distortion	THD	30KHz LPF	fs=500 KHz	-	0.3	1.2	%
		Vi=1Vrms	fs=250 KHz	-	0.5	1.5	
Output noise voltage	VNo	DIN=0V		-	-92	-75	dBV
Supply voltage rejection ratio	SVRR	Vcc=5V, Vp-p=100mV, f=100Hz		-	-40	-25	dB
Mute time	TMUTE	Upon Changing Delay Time		-	525	-	ms
		Upon canceling Sleep Mode		-	525	-	
Operating current (Sleep mode)	Iccs	Sleep Mode		-	12.0	30.0	mA

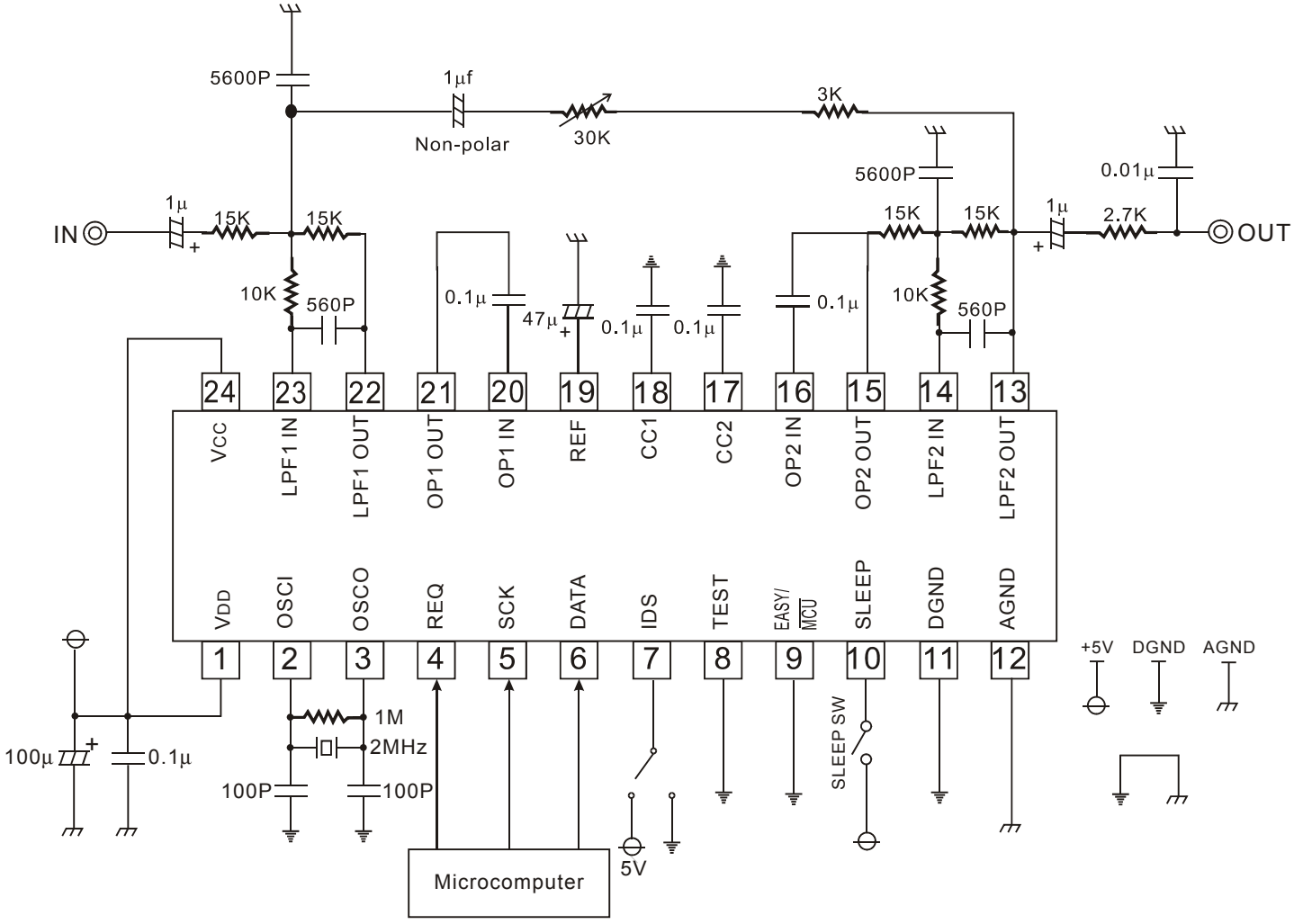
APPLICATION CIRCUITS

EASY MODE



Note:
1. Every Digital GND must be connected to the Analog GND at one Point.
2. When replacing M65831 with PT2396, please take note that PT2396 does not need to connect an external resistor (30 Ohms) to Pin 15 and Pin 21.

MCU MODE



Note:
1. Every Digital GND must be connected to the Analog GND at one Point.
2. For the DL4/IDs Pin (Pin No. 7), please refer below:

IDS Pin	ID1	ID2	ID3	ID4
0	0	1	0	0
1	0	1	0	1

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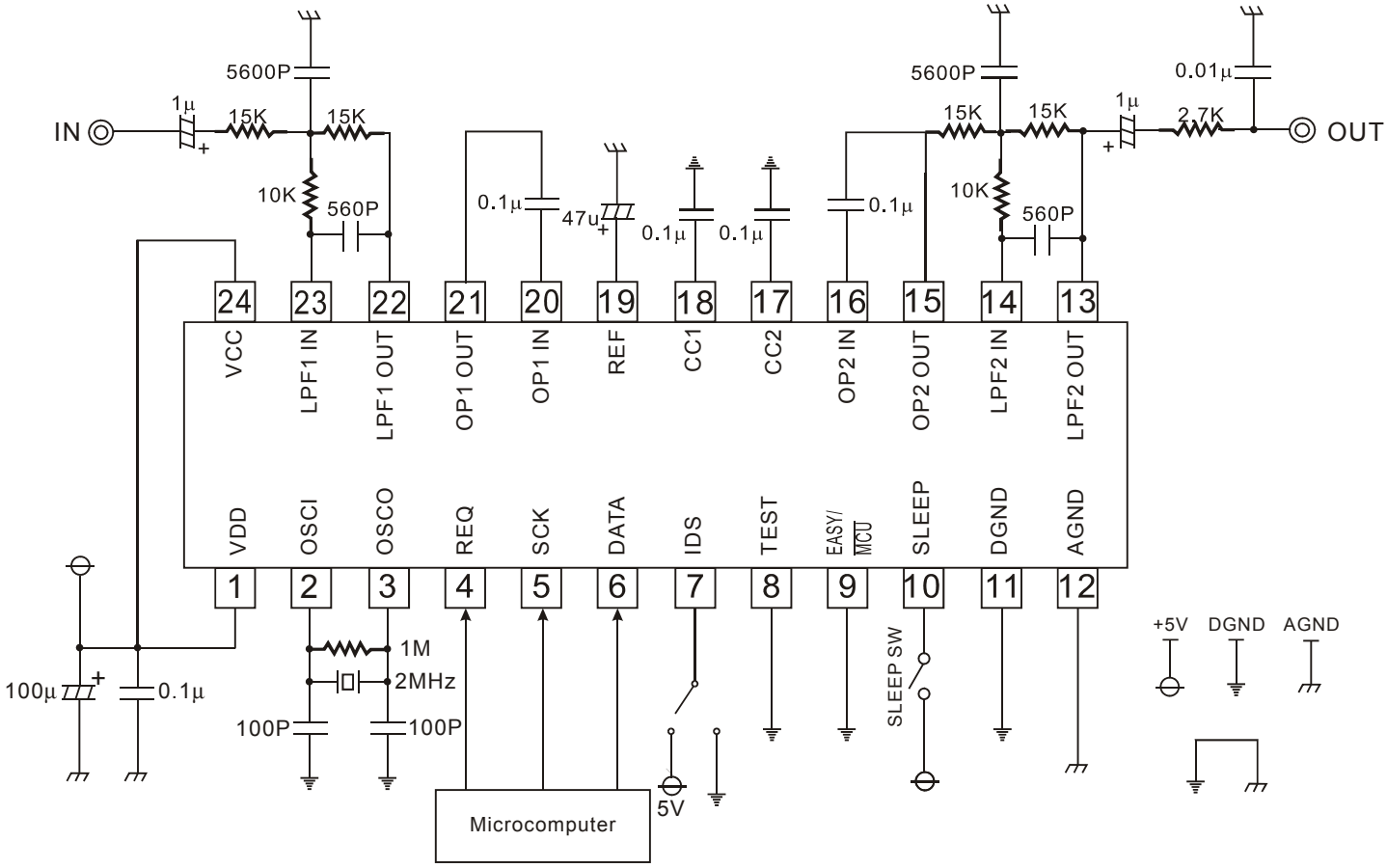
SURROUND APPLICATION CIRCUIT



Notes:
1. Every Digital GND must be connected to the Analog GND at one Point.
2. For the DL4/IDs Pin (Pin No. 7), please refer below:

IDS Pin	ID1	ID2	ID3	ID4
0	0	1	0	0
1	0	1	0	1

ORDER INFORMATION

Valid Part Number	Package Type	Top Code
PT2396	24 pins, DIP, 600mil	PT2396
PT2396-S	24 pins, SOP, 300mil	PT2396-S

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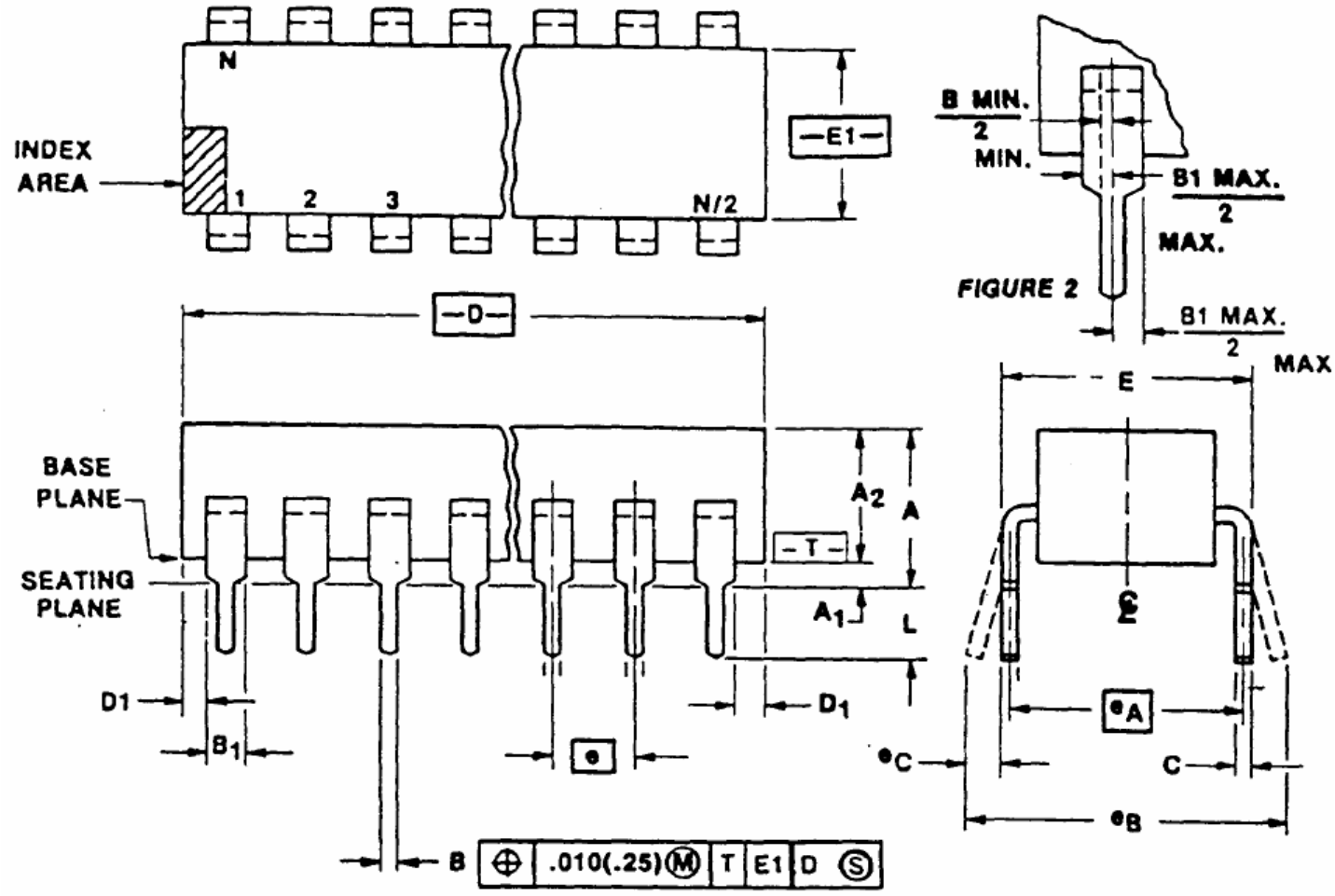
PACKAGE INFORMATION

24 PINS, DIP, 600 MIL



Symbol	Min.	Nom.	Max.
A	-	-	6.35
A1	0.39	-	-
A2	3.18	-	4.95
B	0.356	-	0.558
B1	0.77	-	1.77
C	0.204	-	0.381
D	29.3	-	32.7
D1	0.13	-	-
E	15.24	-	15.87
E1	12.32	-	14.73
e	2.54 BAS.		
eA	15.24 BAS.		
eB	-	-	17.78
L	2.93	-	5.08

Notes:
1. Controlling dimension: MILLIMETER
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Dimensions A, A1 and L are measured with the package seated in JEDEC Seating Plane Gauge GS-3.
4. “D” & “E1” dimensions, for ceramic packages, include allowance for glass overrun and meniscus and lid to base mismatch.
5. “D” & “E1” dimensions for plastic package, do not includes mold flash or protrusion. Mold flash or protrusions shall not exceed 0.01 inch. (0.25mm).
6. “E” and “eA” measured with the leads constrained to be perpendicular to plane T.
7. “eB” and “eC” are measured at the lead tips with the loads un-constrained. “eC” must be zero or greater.
8. “N” is the maximum quantity of lead positions. (N=24)
9. Corner leads (1, N, N/2, and N/2+1) may be configured as shown in Figure 2.
10. Pointed our rounded leads tips are preferred to ease insertion.
11. For automatic insertion, any rained irregularity on the top surface (step, mess, etc.) shall b symmetrical about the lateral and longitudinal package centerlines.
12. Refer JEDEC MS-011 Variation AA.

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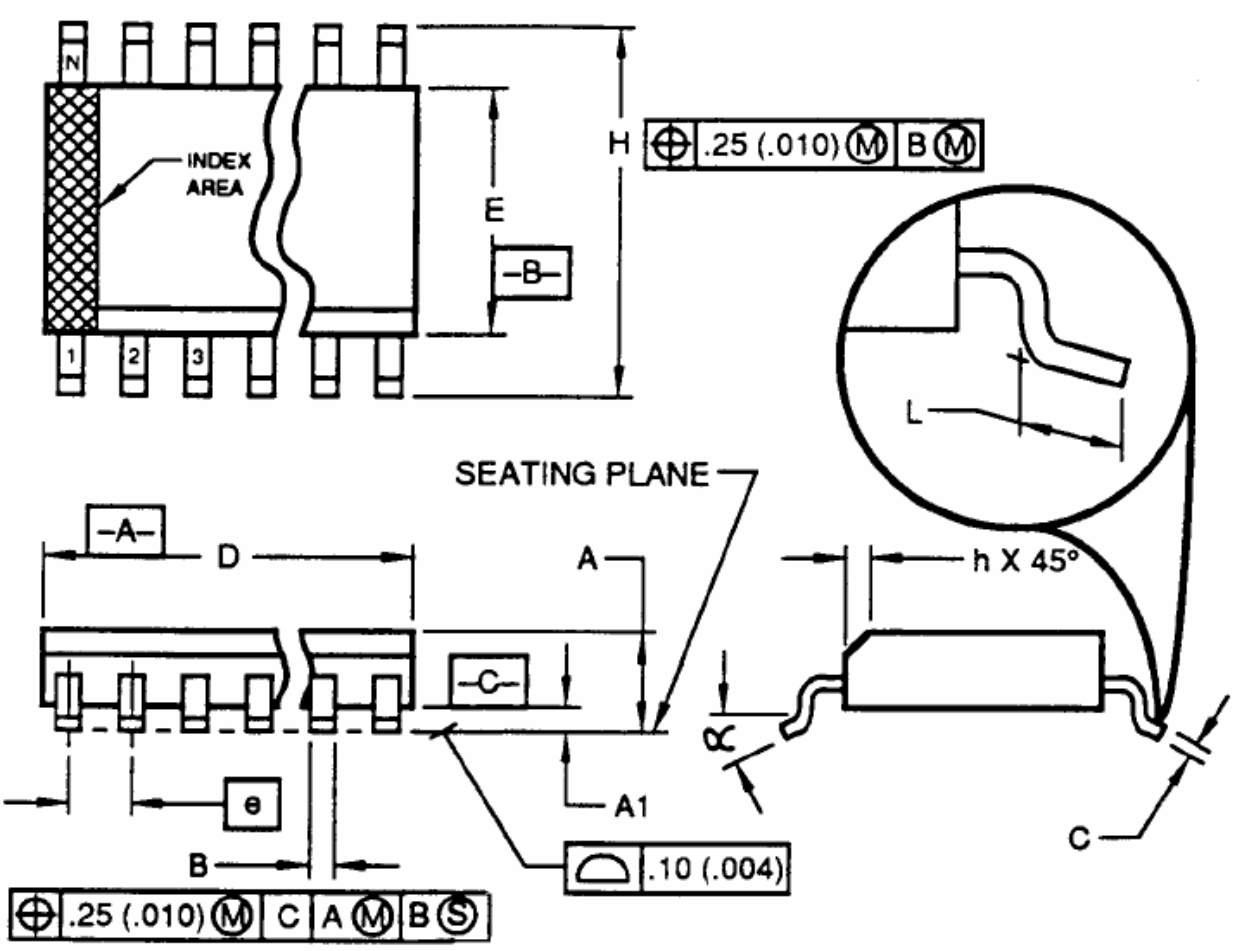
24 PINS, SOP, 300 MIL



Symbols	Min.	Nom.	Max.
A	2.35		2.65
A1	0.10		0.30
B	0.33		0.51
C	0.23		0.32
D	15.20		15.60
E	7.40		7.60
e	1.27 bsc.		
H	10.00		10.65
h	0.25		0.75
L	0.40		1.27
α	0°		8°

Notes:
1. Dimensioning and tolerancing per ANSI Y 14.5-1982.
2. Dimension “D” does not include mold flash, protrusions or gate burrs. Mold Flash, protrusion or gate burrs shall not exceed 0.15mm (0.006 in)per side.
3. Dimension “E” does not include interlead flash protrusions. Interlead flash or protrusions shall not exceed 0.25 mm (0.010 in) per side.
4. The chamfer on the body is optional. It is not present, a visual index feature must be located within the crosshatched area.
5. “L” is the length of the terminal for soldering to a substrate.
6. “N” is the number of terminal position. (N=24)
7. The lead width “B” as measured 0.36 mm (0.014 in) or greater above the seating plane, shall not exceed a maximum value of 0.61mm (0.24 in).
8. Controlling dimension: MILLIMETER.
9. Refer to JEDEC MS-013, Variation AD.

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