ITRI
ERSO

# ES56028

## ECHO SOUD PROCESSOR (20K)

### FEATURES:

- External adjustable VCO.
- Low cost digital elay sytem.
- Low noise: echo mode:-85dB.
  Surround mode:-90dB
- Low distortion: echo mode:1.5%
  surround mode:0.3%
- Wide range time delay settings:
  echo mode:from20.5msec to 163.8msec(8 steps)
  surround mode:from 4.1 msec to 41 msec(8 steps)
- up/manual control mode setting and time delay
- Auto muting
- Auto reset

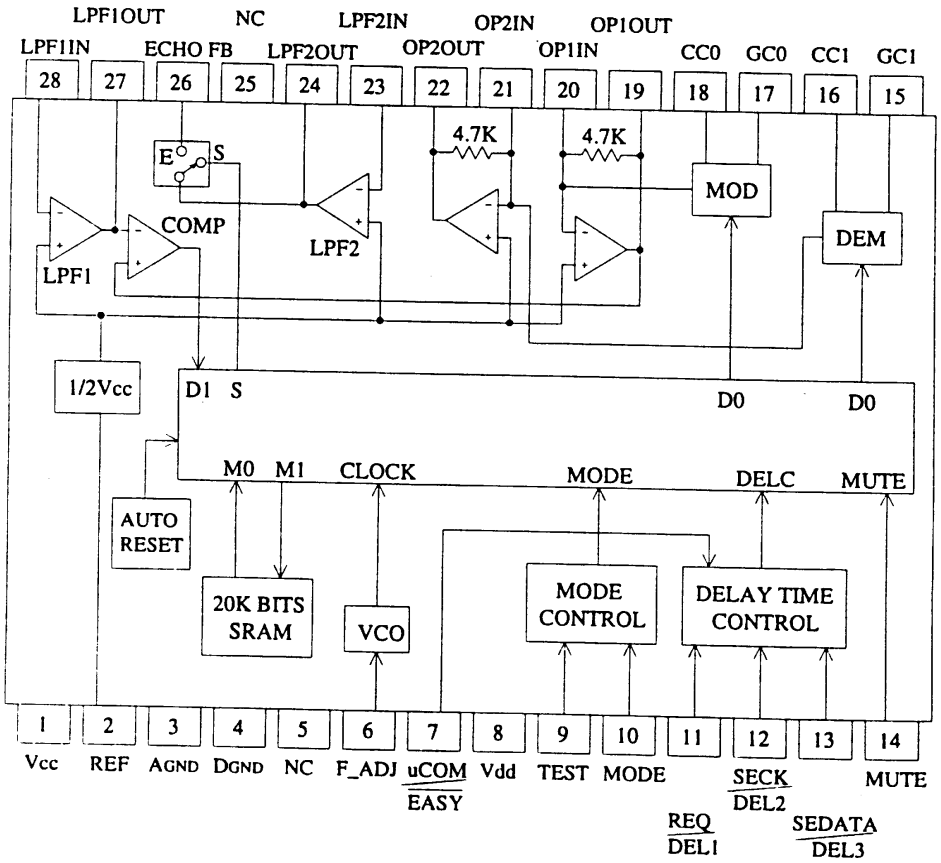
### GENERAL DESCRIPTION:

ES 56028 is a monolithic CMOS echo IC for audio processing It has an ADC, DAC, and uses digital processing for time delay. Time delay can be controlled by the micro controllo controller or manual settings. Including an intemal VCO circuit for the system clock. It can be adjusted to the suitable frequency. It can be used easily in sing alone, TV, surround processor and electronic instruments.

### APPLICATIONS

- Video tape recorder
- TV
- CD player
- Car stereo
- Sound processing equipment
-

### FUNCTION BLOCK DIAGRAM



ITRI
ERSO

# ES56028

ECHO SOUD PROCESSOR (20K)

PIN CONFIGURATION

| | | | |
|---|---|---|---|
| 1 | Vcc | LPF1 IN | 28 |
| 2 | REF | LPF1 OUT | 27 |
| 3 | $A_{GND}$ | ECHO FB | 26 |
| 4 | $D_{GND}$ | NC | 25 |
| 5 | NC | LPF2 OUT | 24 |
| 6 | F_ADJ | LPF2 IN | 23 |
| 7 | uCOM/$\overline{EASY}$ | LPF2 IN | 22 |
| 8 | Vdd | OP2 IN | 21 |
| 9 | TEST | OP1 IN | 20 |
| 10 | MODE | OP1 OUT | 19 |
| 11 | REQ/DEL1 | CC0 | 18 |
| 12 | SECK/DEL2 | GC0 | 17 |
| 13 | SEDATA/DEL3 | CC1 | 16 |
| 14 | MUTE | GC1 | 15 |

ITRI
ERSO

# ES56028
ECHO SOUD PROCESSOR (20K)

## PIN DESCRIPTION

| Pin | Name | Type | Function |
|---|---|---|---|
| 1 | Vcc | | Analog supply voltage input |
| 2 | REF | | Analog reference voltage (=1/2 VCC) |
| 3 | $A_{GND}$ | | Analog ground |
| 4 | $D_{GND}$ | | Digital ground |
| 5 | NC | | No connect |
| 6 | F_ADJ | I | Frequency_Adjust |
| 7 | uCOM/EASY | I | H=Ucom mode--serial data control |
| | | | L=EASY mode--parallel data control |
| 8 | Vdd | | Digital supply voltage input |
| 9 | TEST | I | L=normal mode |
| 10 | MODE | I | H=echo mode |
| | | | L=surround mode |
| 11 | REQ/DEL1 | I | uCOM mode:inputs data request signal |
| | | | EASY mode:inputs delay time 1 |
| 12 | SECK/DEL2 | I | uCOM mode:inputs serial clock |
| | | | EASY mode:inputs delay time 2 |
| 13 | SEDATA/DEL3 | I | uCOM mode:inputs serial data |
| | | | EASY mode:inputs delay time 3 |

PIN DESCRIPTION(continued)

| Pin | Name | Type | Function |
|---|---|---|---|
| 14 | MUTE | I | H=mute control |
| 15 | GC1 | | Gain control 1 |
| 16 | CC1 | | Current control 1 |
| 17 | GC0 | | Gain control 1 |
| 18 | CC0 | | Current control 0 |
| 19 | OP1OUT | O | Modulated integrator by connecting capacitor |
| 20 | OP1IN | I | Modulated integrator by connecting capacitor |
| 21 | OP2IN | I | Demodulated integrator by connecting capacitor |
| 22 | OP2 OUT | O | Demodulated integrator by connecting capacitor |
| 23 | LPF2IN | I | Low pass filter 2 input |
| 24 | LPF2OUT | O | Low pass filter 2 output |
| 25 | NC | | No connect |
| 26 | ECHO FB | O | Echo feedback pin. In echo mode, it can be adjusted the needed echo feedback. |
| 27 | LPF1OUT | O | Low pass filter 1 output |
| 28 | LPF1IN | I | Low pass filter 1 input |

## ABSOLUTE MAXIMUM RATINGS

(Ta=25℃, unless otherwise noted)

| Symbol | Description | Limits | Unit |
|---|---|---|---|
| Vcc | Supply voltage | 6.5 | V |
| Icc | Supply current | 100 | mA |
| Pd | Power dissipation | 1.7 | W |
| Topr | Operation temperature | -20~75 | ℃ |
| Tstg | Storage temperature | -25~125 | ℃ |

## RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Limits | | | Unit |
|---|---|---|---|---|---|
| | | Min | Typ | Maz | |
| Vcc | Supply voltage | 4.5 | 5 | 5.5 | V |
| Fck | Clock frequency | | 4 | 5 | MHz |
| $V_{IH}$ | "H" input voltage | 0.7Vdd | | | V |
| $V_{IL}$ | "L" input voltage | | | 0.3Vdd | V |

ELECTRICAL CHARACTERISTICS

(Vcc=5.0V, fin=1 kHz, Vi=100Mv, fck=4MHz

Ta=25℃, unless othrwise noted)

| Symbol | Parameter | Test condition | | Min | Typ | Maz | Unit |
|---|---|---|---|---|---|---|---|
| Icco | Supply current | | | | 14 | 20 | mA |
| Gv | Voltage gain | RL = 47 k Ω | | | -0.5 | 2.5 | dB |
| Vomax | Maximum output voltage | THD=10% | | 0.7 | 1.2 | | Vrms |
| THD | Output distortion | 30KHz L.P.F. | Echo mode | | 1.5 | 3.0 | % |
| | | | Surround mode | | 0.3 | 1.0 | % |
| No | Output Noise voltage | DIN Audio | Echo mode | | -85 | -60 | dBV |
| | | | Surround mode | | -90 | -70 | dBV |
| SVRR | Supply voltage Rejection ratio | ΔVcc=-20 dBV F= 100 Hz | | | -40 | -25 | dB |
| Tmute | Mute time | Echo mode | | 490 | 505 | 520 | msec |
| | | Surround mode | | 122 | 127 | 132 | msec |

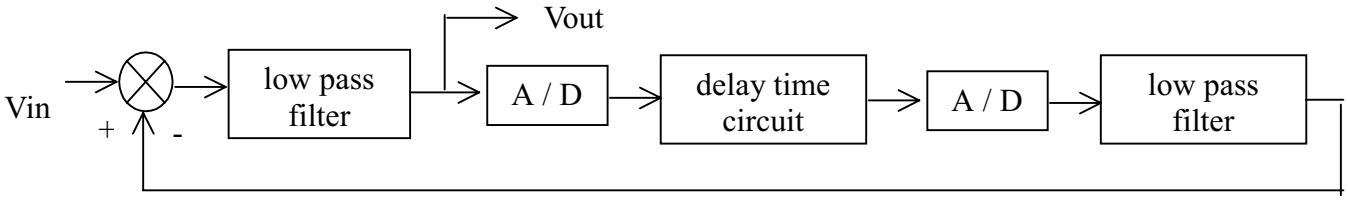
FUNCTION DESCRIPTION AND OPERATION MODE

＊MODE

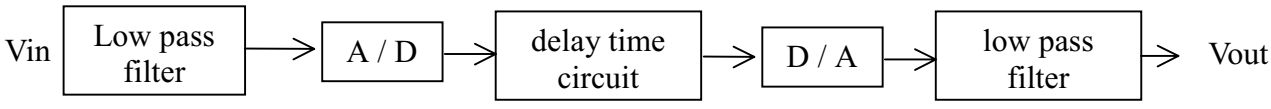
| Mode Pin | Mode | Echo FB output |
|---|---|---|
| L | Surround mode | Off |
| H | Echo mode | On |

In this moment, the pin 9(TEST pin)should be low.

Echo mode:




Surround mode:



＊EASY MODE(parallel data input)

When the pin uCOM / $\overline{\text{EASY}}$ = "low"，then in the easy mode.

| Pin name | | | | Surround mode | | Echo mode | |
|---|---|---|---|---|---|---|---|
| uCOM / EASY | DEL1 | DEL2 | DEL3 | Fs | Td | Fs | Td |
| L | L | L | L | 500 | 4.1 | 250 | 20.5 |
| | H | H | L | | 10.2 | | 41.0 |
| | H | L | L | | 14.3 | | 61.4 |
| | L | H | L | | 20.5 | | 81.9 |
| | H | L | H | 500 | 24.6 | 125 | 98.3 |
| | L | H | H | | 30.7 | | 122.9 |
| | L | H | H | | 34.8 | | 139.3 |
| | H | H | H | | 41.0 | | 163.8 |

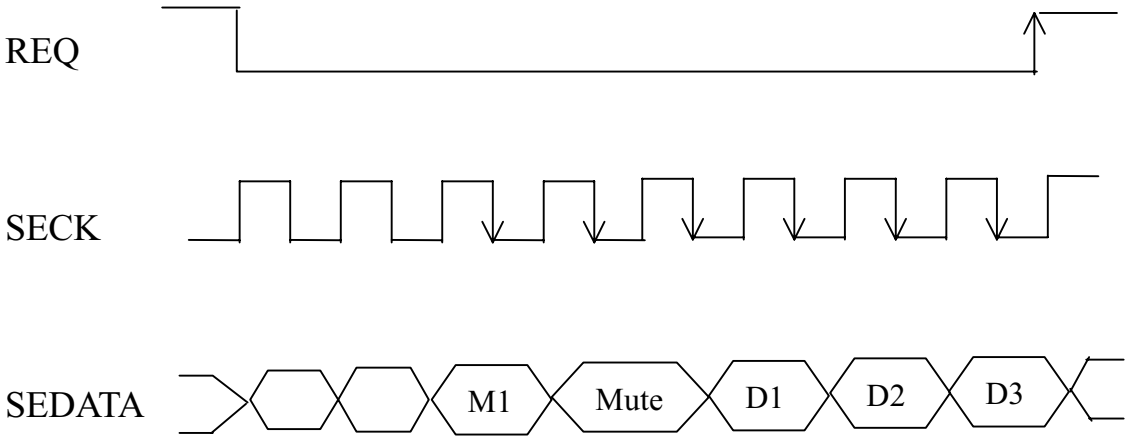
Fs = Sampling frequency (kHz)

Td = Delay time(msec) , Fck = 4.0 MHz

＊uCOM MODE(serial data input)

When the pin uCOM / $\overline{\text{EASY}}$ = "high"，then in the uCOM mode.

The timing diagram is shown as belows:




When the REQ signal is low level, the SEDATA signal is latched at the falling edge of the SECK signal , and the last five delay time modes are the rising edge of the REQ signal.

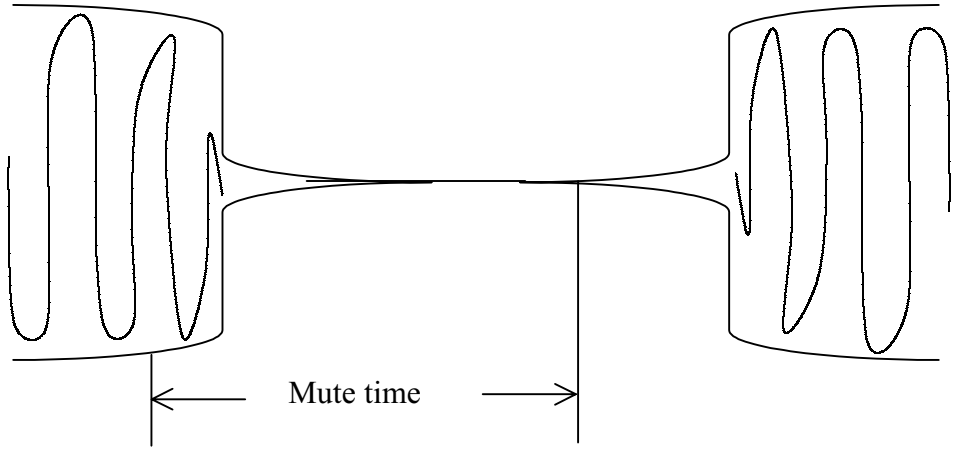
Delay time:D1 = Del 1, D2 = Del 2, D3 = Del 3

Mode:M1 = Mode; Mute(H = Mute)

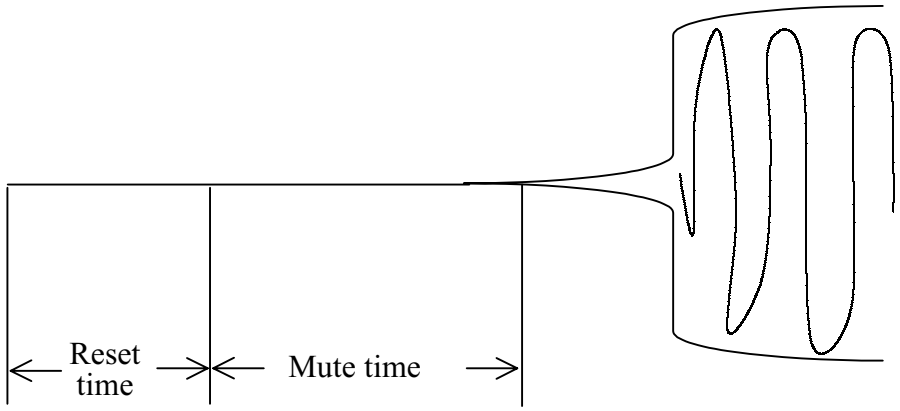
＊MUTING

Delay signal
before changinf mode

Delay signal
after changinf mode




(i) Waveforms of the signal during delay time changing mode



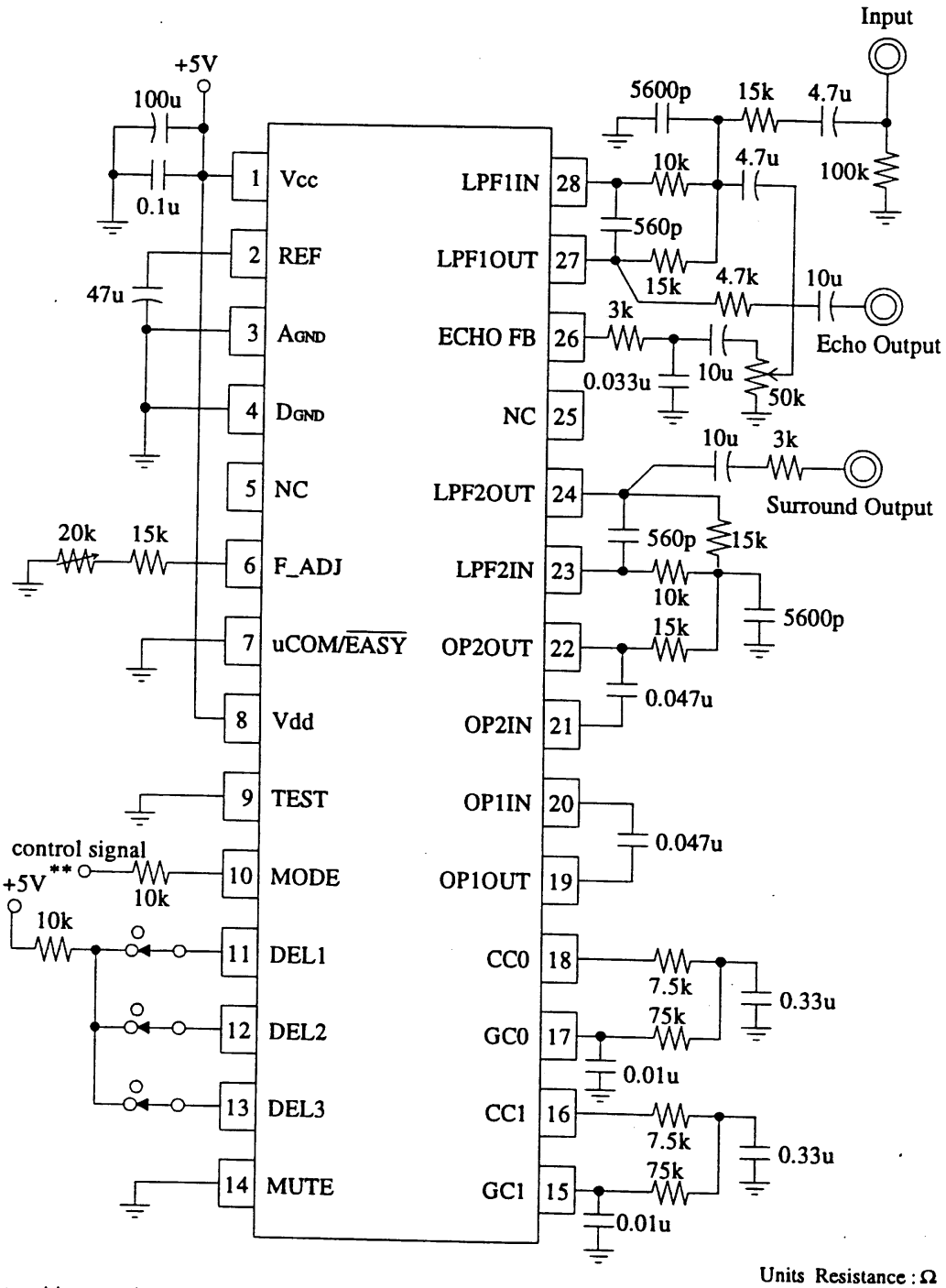

(ii)Waveforms of the signal during power on

ITRI
ERSO

# ES56028

## ECHO SOUD PROCESSOR (20K)

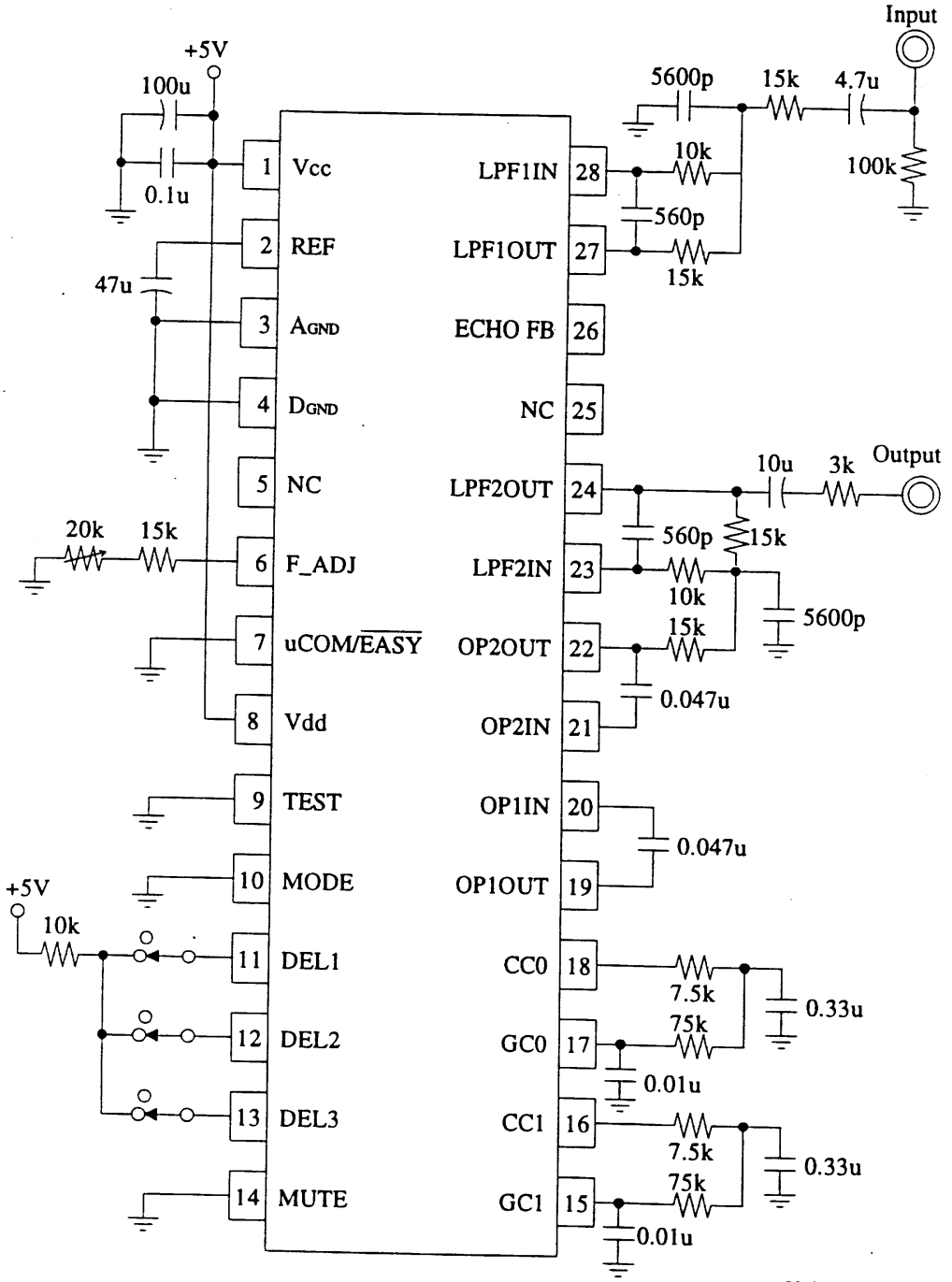
APPLICATION CIRCUIT




Units Resistance : Ω
Capacitance : F

Note : ** control signal 5V indicates echo mode ; 0V indicates surround mode
Echo mode & surround mode can't be operated at the same time .

* Surround application circuit

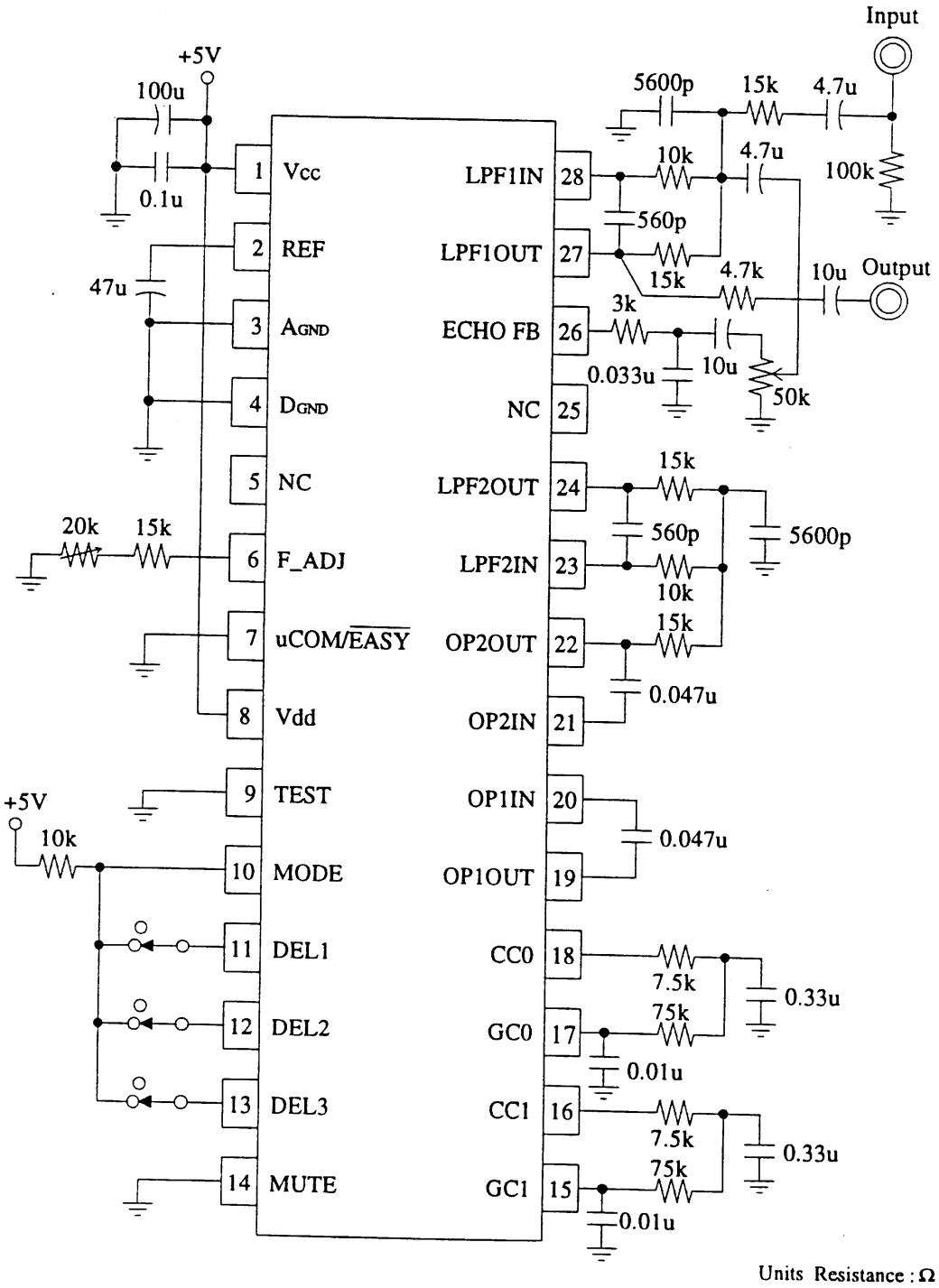



Units Resistance : Ω
Capacitance : F

ITRI
ERSO

# ES56028
## ECHO SOUD PROCESSOR (20K)

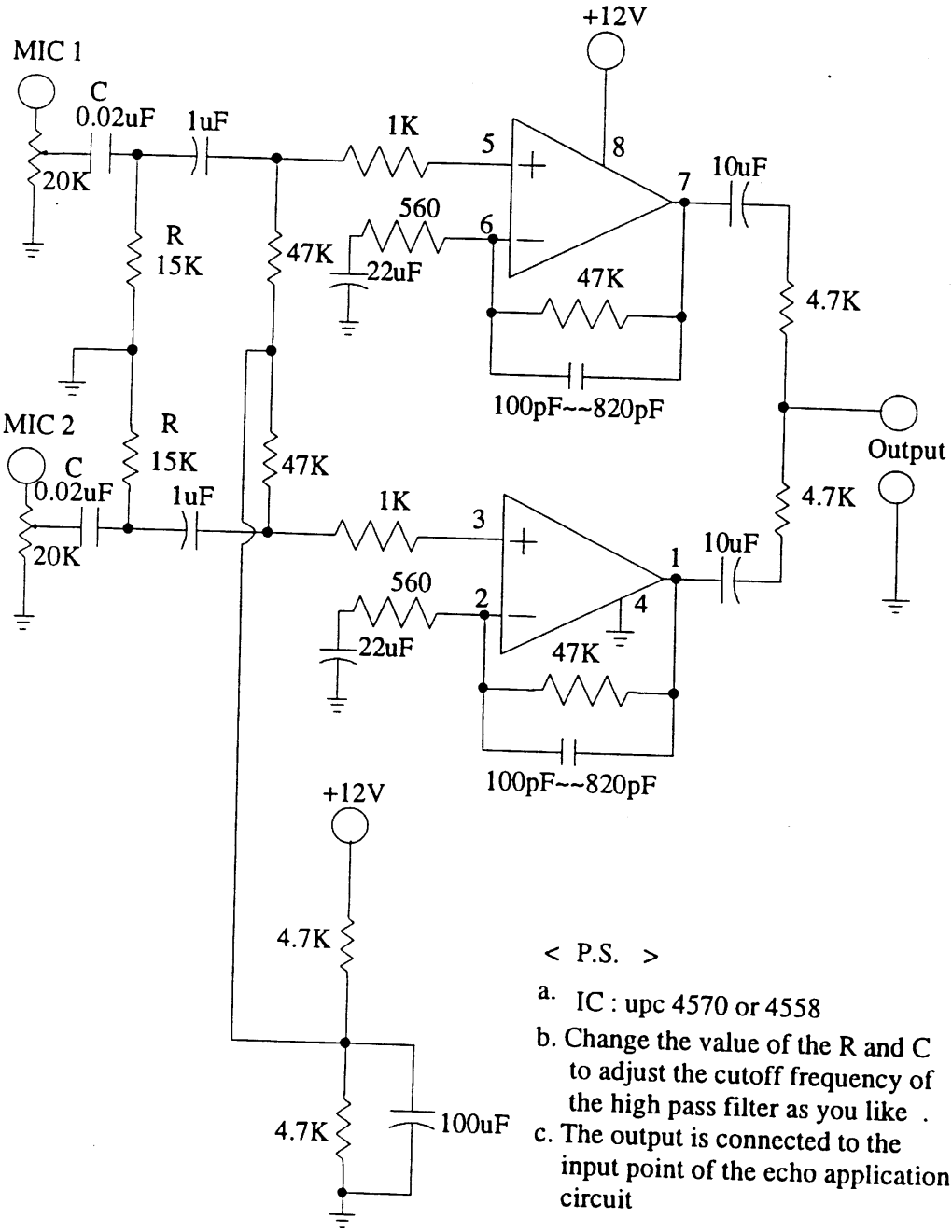
* Echo application circuit




Units Resistance : Ω
Capacitance : F

* Echo application circuit ( continued )

MIC Pre-Amp Application circuit




< P.S. >

a. IC : upc 4570 or 4558

b. Change the value of the R and C to adjust the cutoff frequency of the high pass filter as you like .

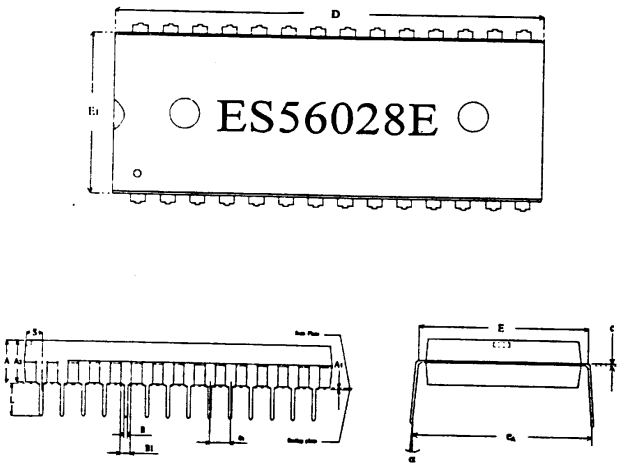
c. The output is connected to the input point of the echo application circuit

ITRI
ERSO

# ES56028

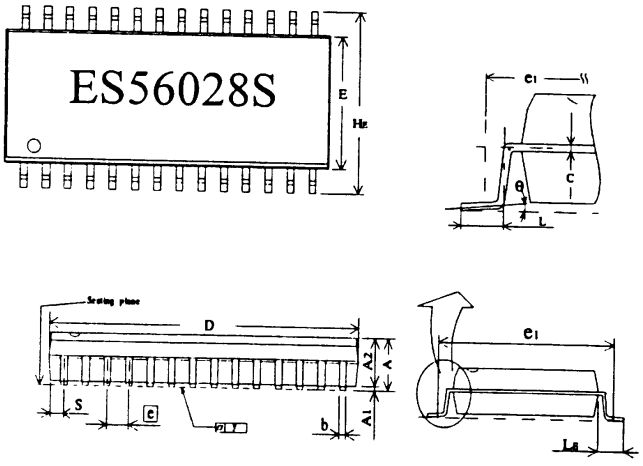
## ECHO SOUD PROCESSOR (20K)

### 28 PINS DIP PACKAGE SIZE




| Symbol | Dimension in inch | Dimension in mm |
|---|---|---|
| A | 0.210 MAX | 5.334 MAX |
| A1 | 0.010 MIN | 0.254 MIN |
| A2 | 0.155 +/- 0.005 | 3.937 +/- 0.127 |
| B | $0.018^{+0.004}_{-0.002}$ | $0.457^{+0.102}_{-0.051}$ |
| B1 | $0.060^{+0.004}_{-0.002}$ | $1.524^{+0.102}_{-0.051}$ |
| C | $0.010^{+0.004}_{-0.002}$ | $0.254^{+0.102}_{-0.051}$ |
| D | 1.460TYP (1.470MAX) | 37.084TYP (37.338MAX) |
| E | 0.600 +/- 0.010 | 15.240 +/- 0.254 |
| E1 | 0.545 +/- 0.005 | 13.843 +/- 0.127 |
| e1 | 0.100 +/- 0.010 | 2.540 +/- 0.254 |
| L | 0.130 +/- 0.010 | 3.302 +/- 0.254 |
| α | 0°~ 15° | 0°~ 15° |
| eA | 0.650 +/- 0.020 | 16.510 +/- 0.508 |
| S | 0.090 MAX | 2.286 MAX |

### 28 PINS SOP PACKAGE SIZE




| Symbol | Dimension in inch | Dimension in mm |
|---|---|---|
| A | 0.110 MAX | 2.794 MAX |
| A1 | 0.004 MIN | 0.102 MIN |
| A2 | 0.093 +/- 0.005 | 2.362 +/- 0.127 |
| b | $0.016^{+0.004}_{-0.002}$ | $0.406^{+0.102}_{-0.051}$ |
| C | $0.010^{+0.004}_{-0.002}$ | $0.254^{+0.102}_{-0.051}$ |
| D | 0.705TYP (0.725MAX) | 17.907TYP (18.415MAX) |
| E | 0.295 +/- 0.005 | 7.493 +/- 0.127 |
| c | 0.050 +/- 0.006 | 1.270 +/- 0.152 |
| e1 | 0.370 NOM | 9.398 NOM |
| HE | 0.406 +/- 0.012 | 10.312 +/- 0.305 |
| L | 0.036 +/-0.008 | 0.914 +/- 0.203 |
| LE | 0.055 +/- 0.008 | 1.397 +/- 0.203 |
| S | 0.043 MAX | 1.092 MAX |
| y | 0.004 MAX | 0.102 MAX |
| θ | 0°~ 10° | 0°~ 10° |