



SANYO Semiconductors

DATA SHEET

An ON Semiconductor Company

CMOS LSI

LC75106V — Digital Echo LSI with Built-in Mic Amplifier

Overview

The LC75106V is a digital echo LSI for karaoke. It has the microcomputer control mode (I²C BUS control) and non-control mode. Therefore, various karaoke systems can be made.

This LSI has 2ch mic amplifier (with ALC), volume of 2ch mic, echo feed back volume and echo volume.

In addition, when the stereo signal internal connected mode has the function of the vocal cancellation etc.

The karaoke system can be constructed with this LSI.

Functions

- 2ch mic amplifier (with built-in Auto Level Control)
- Volume of 2ch mic
- With built-in for digital echo memory 32kbit
- Feedback volume for digital echo
- Digital echo volume
- Mic mixing function
- Vocal cancellation
- With built-in oscillation circuit
- I²C bus control

Application

- Mini component audio and other

* I²C Bus is a trademark of Philips Corporation.

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SANYO Semiconductor Co., Ltd.

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LC75106V

Specifications

Absolute Maximum Ratings at Ta = 25°C, Analog GND = 0V

| Parameter | Symbol | Conditions | Ratings | unit |
|------------------------------|---------------------|-----------------|---------------|------|
| Maximum power supply voltage | V _{DD} max | V _{DD} | +8.0 to +10.0 | V |
| Allowable consumption power | P _d max | Ta ≤ 70°C * | 500 | mW |
| Operating temperature range | Ta | | -20 to +70 | °C |
| Storage temperature range | Tstg | | -40 to +125 | °C |

* Mounted reference PCB (114.3mm × 76.1mm × 1.6mm, glass epoxy resin)

DC Electrical Characteristics Ratings at Ta = 25°C, V_{SS} = 0V

Operating Condition/Ta = 25°C

| Parameter | Symbol | Pin name | Conditions | min | typ | max | unit |
|-----------------------------------|---------------------|-----------------|-----------------------|-----|-----|------|------|
| Recommended supply voltage | V _{DD} | V _{DD} | | | 9.0 | | V |
| Range of operating supply voltage | V _{DD} opg | V _{DD} | V _{DD} =9.0V | 8.0 | | 10.0 | V |

Electric Characteristics/Ta = 25°C, V_{DD} = 9.0V, fin = 1kHz, V_{IN} = 1mVrms = 0dB, R_L = 10kΩ

| Parameter | Symbol | Pin name | Conditions | min | typ | max | unit |
|----------------------------------|-------------------|-----------------|---------------|------|------|------|------|
| Current without signal | I _{DDO} | V _{DD} | | | | 60 | mA |
| Clock frequency | F _{CLK} | OSC | OSC Ex.R=30kΩ | 1.72 | 2.45 | 3.19 | MHz |
| Control data Hi Level voltage | V _{IH} | SCL, SDA | | 2.0 | | 3.5 | V |
| Control data Low Level voltage | V _{IL} | SCL, SDA | | 0.0 | | 0.5 | V |
| Control data Input pulse width | t _{φW} | SCL, SDA | | 1.0 | | | μs |
| Control data Hold time | t _{hold} | SCL, SDA | | 1.0 | | | μs |
| Control data Operation frequency | fopg | SCL, SDA | | | | 500 | kHz |

AC Electrical Characteristics (Reference data: No measurement)

| Parameter | Symbol | Pin name | Conditions | min | typ | max | unit |
|---|-------------------|-----------|--|-------|-------|-------|------|
| [Mic-AMP] Input=MICIN1/MICIN2, Output=MICOUT1/MICOUT2, V _{IN} =-48dBV, VALC=VREF - 1.414V, Mic-AMP NF Ex.R=680Ω, ALC Ex.C=2.2μF | | | | | | | |
| Mic Gain | V _{GM2} | MICOUT1/2 | Mic-AMP NF Ex.R=680Ω | +34.0 | +37.0 | +42.0 | dB |
| Max output voltage | V _{oTM} | MICOUT1/2 | Mic Gain=+38dB, THD=1%, Filter=A-filter, ALC=OFF | 1.75 | | | Vrms |
| Total harmonic distortion rate 1 | THD _{M1} | MICOUT1/2 | Mic Gain=+38dB, ALC=OFF, V _O =-10dBV, Filter=A-filter | | 0.07 | 0.5 | % |
| Total harmonic distortion rate 2 | THD _{M2} | MICOUT1/2 | Mic Gain=+38dB, ALC=ON, V _O =0dBV, V _{IN} =-32dBV, Filter=A-filter | | 0.1 | 1.0 | % |
| Output noise voltage | V _{NOM} | MICOUT1/2 | Mic Gain=+38dB, Filter=A-filter | | -74.0 | -65.0 | dBV |
| ALC attack time | Ta _A | MICOUT1/2 | Mic Gain=+38dB, ALC=ON, V _O =0dBV, V _{IN} =-32dBV | | 60 | | ms |
| ALC release time | Ta _R | MICOUT1/2 | Mic Gain=+38dB, ALC=ON, V _O =0dBV, V _{IN} =-32dBV | | 6.0 | | s |
| Input impedance | Z _{IM} | MICIN1/2 | | 45 | 60 | 75 | kΩ |
| Output impedance | Z _{oM} | MICOUT1/2 | Mic-Gain=+38dB, ALC=OFF, V _O =0dBV | 0.75 | 1.5 | 3.0 | kΩ |
| [Digital ECHO] Stereo signal outside connection modes, Input=SUMIN, Output=ECHOOUT, V _{IN} =-10dBV, Delay Time=100ms, Mic Volume 1/2=0dB, Feedback Volume=-∞ | | | | | | | |
| Delay time | DT | ECHOOUT | F _{CLK} =2.45MHz | 75 | 100 | 125 | ms |
| Output Gain | V _{GE} | ECHOOUT | | -4.5 | -2.0 | +0.5 | dB |
| Max output voltage | V _{oE} | ECHOOUT | THD=10%, Filter=A-filter | 1.5 | | | Vrms |
| Total harmonic distortion rate | THD _E | ECHOOUT | Filter=A-filter | | 0.7 | 2.0 | % |
| Output noise voltage | V _{NOE} | ECHOOUT | Filter=A-filter | | -65 | -55 | dBV |
| Input impedance | Z _{iE} | SUMIN | | 45 | 60 | 75 | kΩ |
| Output impedance | Z _{oE} | ECHOOUT | Delay time=100ms, V _O =0dBV | 45 | 60 | 75 | kΩ |

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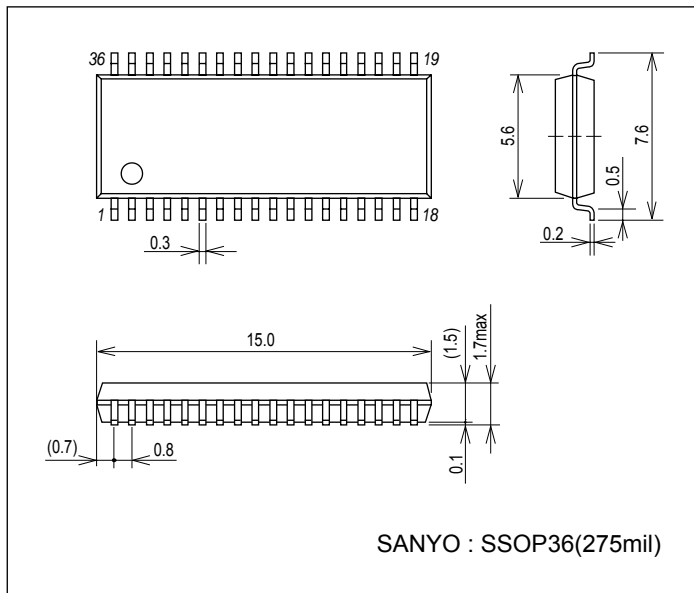
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| Parameter | Symbol | Pin name | Conditions | min | typ | max | unit |
|--|------------|--------------|-------------------------|-------|-------|-------|-----------|
| [Stereo Line] Stereo signal internal connection modes, Input=LCHIN/RCHIN, Output=LCHOUT/RCHOUT, $V_{IN}=-10\text{dBV}$, Line Select=Stereo, Mic-Volume 1/2=ECHO Volume= $-\infty$ | | | | | | | |
| Output Gain | V_{GS} | Lch/RchOUT | | -3.5 | -1.5 | +0.5 | dB |
| Max output voltage | V_{oS} | Lch/RchOUT | THD=1%, Filter=A-filter | 1.75 | | | Vrms |
| Total harmonic distortion rate | THD_S | Lch/RchOUT | Filter=A-filter | | 0.03 | 0.1 | % |
| Output noise voltage | V_{NOS} | Lch/RchOUT | Filter=A-filter | | -85.0 | -75.0 | dBV |
| Vocal removal rate | | Lch/RchOUT | | -21.5 | -17.5 | -14.5 | |
| Input impedance | Z_{iS} | Lch/RchIN | | 75 | 100 | 125 | $k\Omega$ |
| Output impedance | Z_{oS} | Lch/RchOUT | $V_O=0\text{dBV}$ | 0.75 | 1.5 | 3.0 | $k\Omega$ |
| [Mic Sum-AMP] Stereo signal outside connection modes, Input=IN1/IN2, Output=SUMOUT, $V_{IN}=-10\text{dBV}$ | | | | | | | |
| Output Gain | V_{GMS} | SUMOUT | | +4.0 | +5.5 | +7.0 | dB |
| Max output voltage | V_{oMS} | SUMOUT | THD=1%, Filter=A-filter | 1.75 | | | Vrms |
| Total harmonic distortion rate | THD_{MS} | SUMOUT | Filter=A-filter | | 0.05 | 0.5 | % |
| Output noise voltage | V_{NOMS} | SUMOUT | Filter=A-filter | | -77.0 | -70.0 | dBV |
| Input impedance | Z_{iMS} | IN1/IN2 | | 45 | 60 | 75 | $k\Omega$ |
| Output impedance | Z_{oMS} | SUMOUT | $V_O=0\text{dBV}$ | 1.0 | 2.0 | 4.0 | $k\Omega$ |
| [ECHO Sum-AMP] Stereo signal outside connection modes, Input=SUMIN/ECHOIN, Output=OUT, $V_{IN}=-10\text{dBV}$ | | | | | | | |
| Output Gain | V_{GES} | OUT | | +4.0 | +5.5 | +7.0 | dB |
| Max output voltage | V_{oES} | OUT | THD=1%, Filter=A-filter | 1.75 | | | Vrms |
| Total harmonic distortion rate | THD_{ES} | OUT | Filter=A-filter | | 0.05 | 0.5 | % |
| Output noise voltage | V_{NOES} | OUT | Filter=A-filter | | -77.0 | -70.0 | dBV |
| Input impedance | Z_{iES} | SUMIN/ECHOIN | | 45 | 60 | 75 | $k\Omega$ |
| Output impedance | Z_{oES} | OUT | $V_O=0\text{dBV}$ | 1.0 | 2.0 | 4.0 | $k\Omega$ |

Package Dimensions

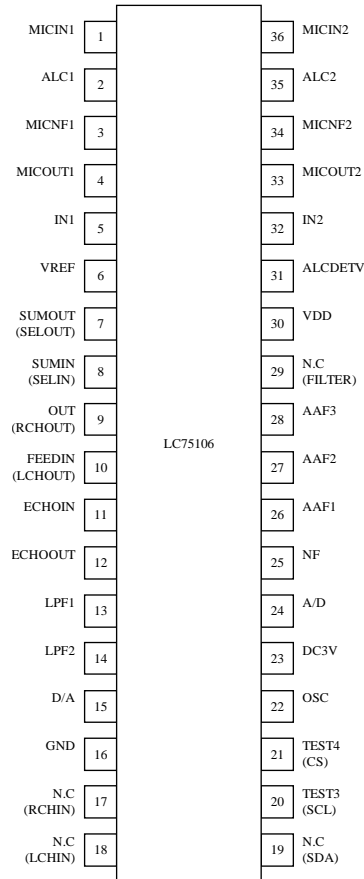
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3247A



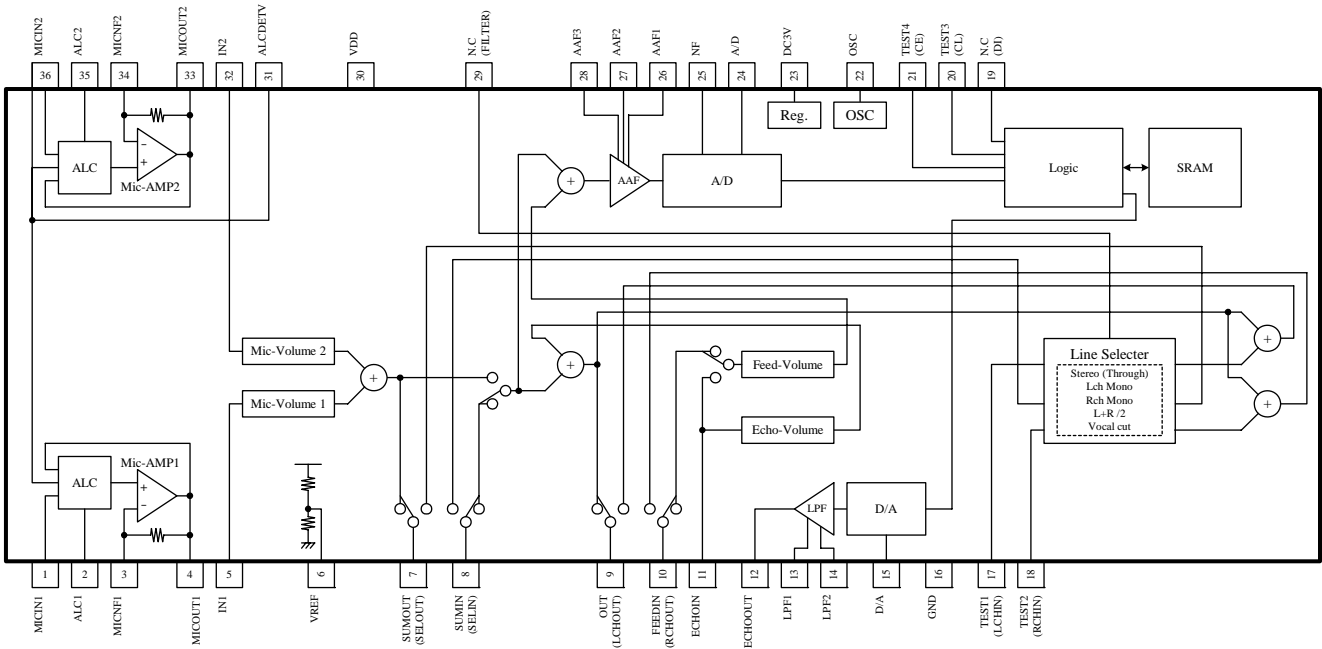
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Pin Assignment



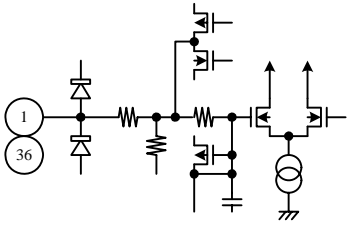
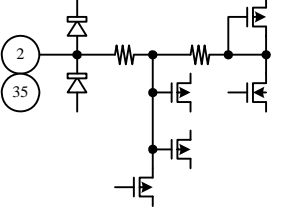
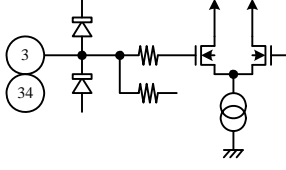
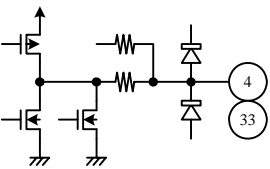
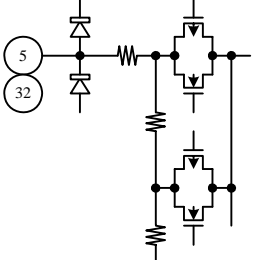
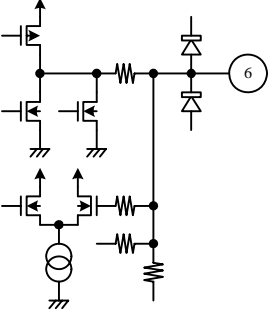
Top view

Block Diagram



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Pin Descriptions

| Pin No. | Pin Name | Voltage | Description | Equivalent circuit |
|---------|--------------------|------------|--|---|
| 1 36 | MICIN1 MICIN2 | $V_{DD}/2$ | Mic signal input 1 Mic signal input 2 |  |
| 2 35 | ALC1 ALC2 | | Auto level control terminal 1 Auto level control terminal 2 |  |
| 3 34 | MICNF1 MICNF2 | | Mic feedback signal input terminal 1 Mic feedback signal input terminal 2 |  |
| 4 33 | MICOUT1 MICOUT2 | | Mic signal output terminal 1 Mic signal output terminal 2 |  |
| 5 32 | IN1 IN2 | | Mic volume input terminal 1 Mic volume input terminal 2 |  |
| 6 | VREF | | Internal standard voltage |  |

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| Pin No. | Pin Name | Voltage | Description | Equivalent circuit |
|---------|---------------|---------|---|--------------------|
| 7 | SUMOUT/SELOUT | | [CS terminal = "L"] Mic volume 1/2 sum output [CS terminal = "H"] Selector output terminal | |
| 8 | SUMIN/SELIN | | [CS terminal = "L"] Delay signal input [CS terminal = "H"] Selector input terminal | |
| 9 | OUT/RCHOUT | | [CS terminal = "L"] ECHOIN signal, MICSUM signal sum output [CS terminal = "H"] Rch output | |
| 10 | FEEDIN/LCHOUT | | [CS terminal = "L"] Echo feed back signal input [CS terminal = "H"] Lch output | |
| 11 | ECHOIN | | Echo signal input (Echo volume input) | |
| 12 | ECHOOOUT | | Echo signal output | |

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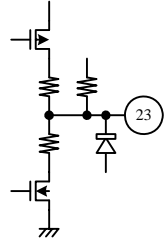
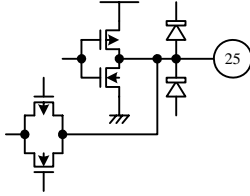
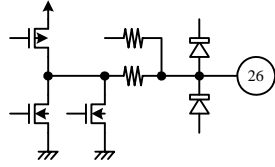
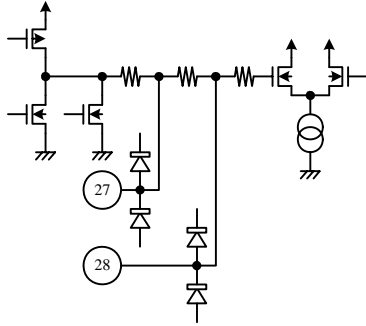
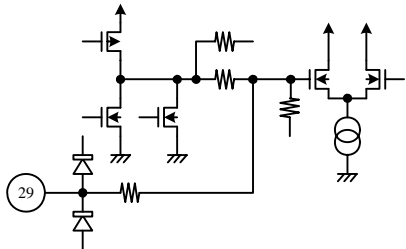
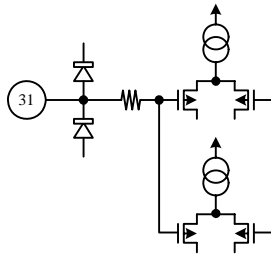
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| Pin No. | Pin Name | Voltage | Description | Equivalent circuit |
|----------|----------------------|---------|---|--------------------|
| 13 14 | LPF1 LPF2 | | LPF input terminal 1 LPF input terminal 2 | |
| 15 24 | D/A A/D | | Terminal for A/D Terminal for D/A | |
| 16 | GND | | Analog GND | |
| 17 18 | NC/RCHIN NC/LCHIN | | Rch input terminal Lch input terminal | |
| 19 | SDA | 0V/3.3V | I ² C bus SDA terminal | |
| 20 21 | SCL CS | 0V/3.3V | I ² C bus SCL terminal MODE select terminal | |
| 22 | OSC | | Oscillator circuit adjustment terminal | |

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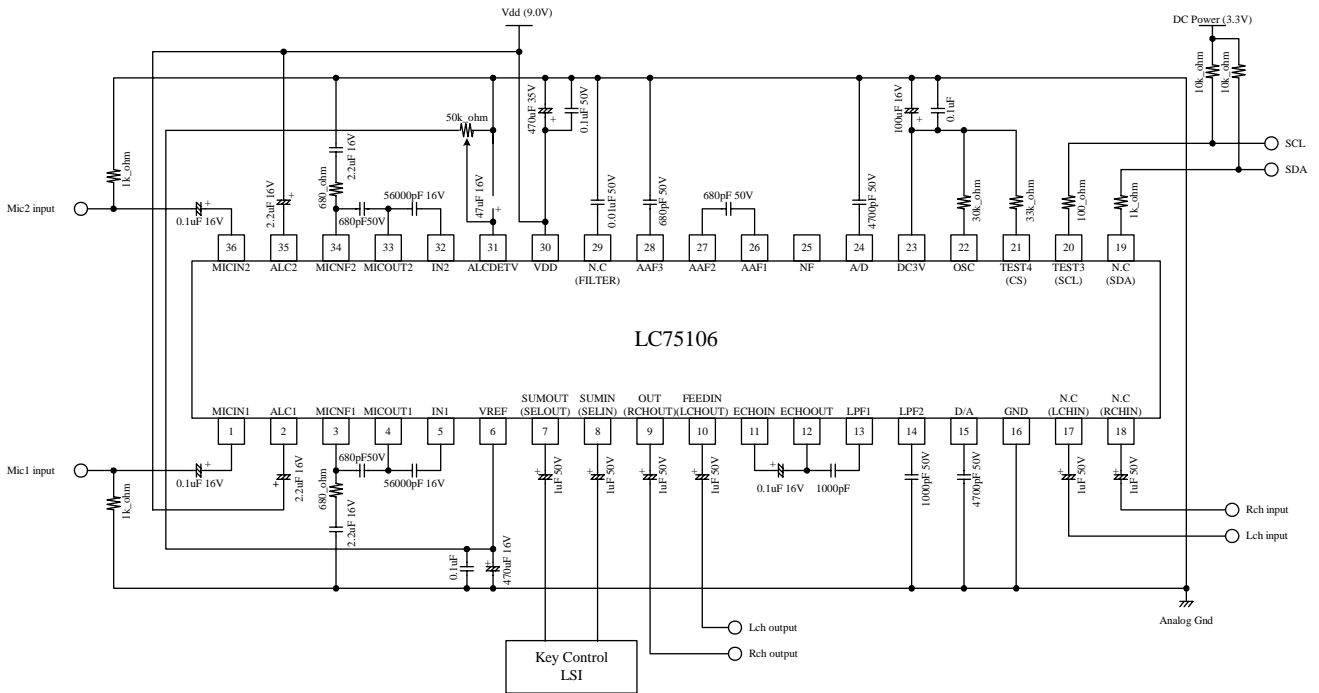
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| Pin No. | Pin Name | Voltage | Description | Equivalent circuit |
|----------|-----------------|---------|--|---|
| 23 | DC3V | 3.3V | Power source for logic block |  |
| 25 | NF | | Terminal for A/D |  |
| 26 | AAF1 | | AAF input terminal 1 |  |
| 27 28 | AAF2 AAF3 | | AAF input terminal 2 AAF input terminal 3 |  |
| 29 | NC/FILTER | | Filter input terminal |  |
| 30 | V _{DD} | | Supply voltage | |
| 31 | ALCDETV | | ALC setting voltage input terminal |  |

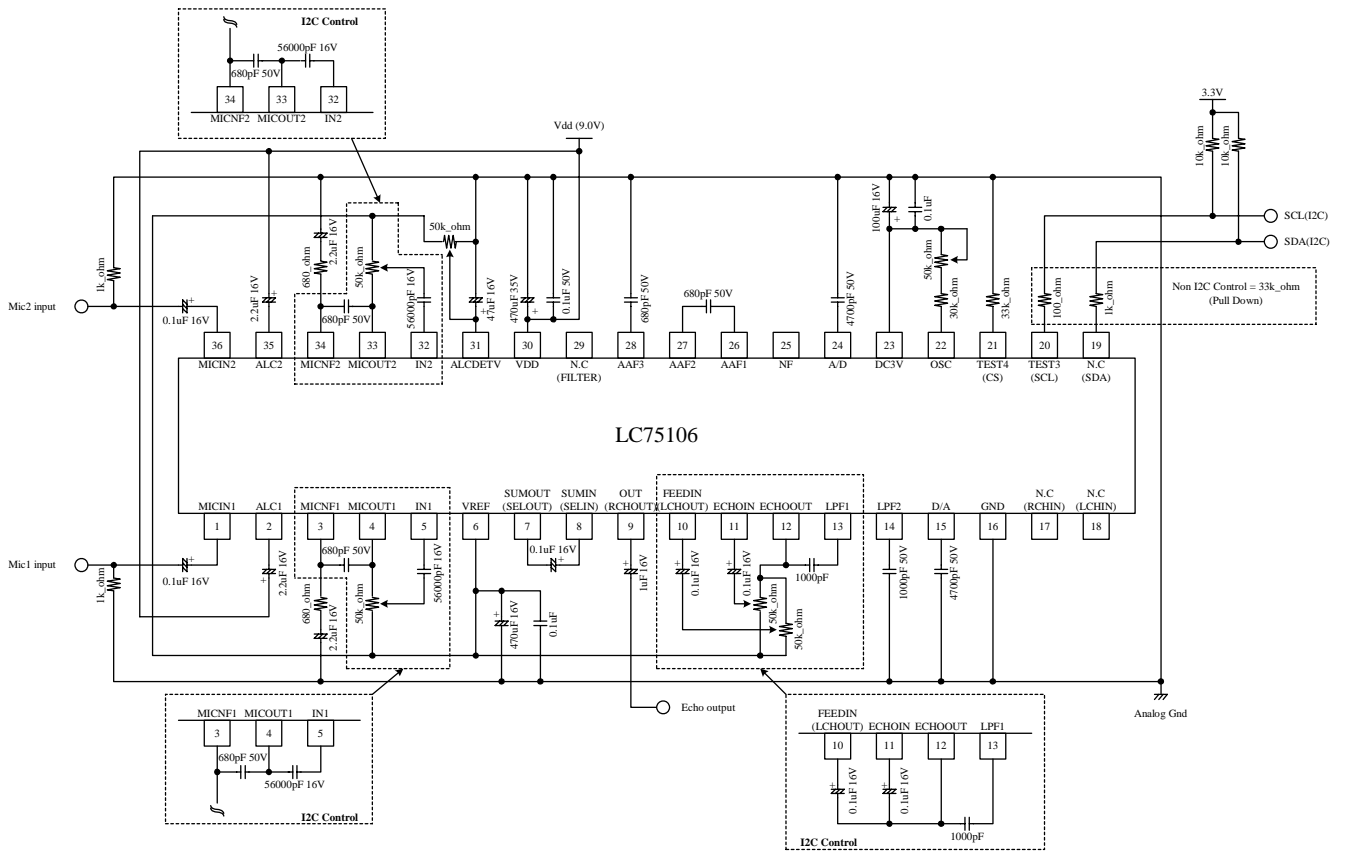
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Sample Application Circuit (Mic-Gain = +38dB)

Stereo signal internal connection modes



Stereo signal outside connection modes



Control Data Structure (Serial Data Input)

The setting of LC75106 can be controlled with I²C Bus.

All the settings can be controlled by I²C Bus at the stereo signal internal connection modes (CS terminal = “H”), and all the volumes except the stereo source control can be set at the stereo signal outside connection modes (CS terminal = “L”).

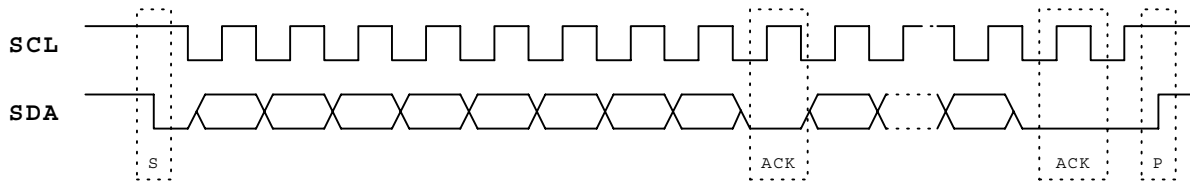
The karaoke system can be made from external resistance by doing I²C Bus Line in Pull Up at the stereo signal outside connection modes.

1) The explanation of I²C Bus

I²C Bus (Inter IC Bus) is the bus system which the PHILIPS company developed.

It does controls such as the start, the stop by two control signals of SDA (Serial Data) and SCL (Serial Clock).

The output of each signal is open drain and forms out of wired OR.



S; Start condition/P; Stop condition/ACK; Acknowledge

Data is transmitted in the MSB first.

1 unit is composed of 8 bits and ACK is put back from the slave to confirm.

Slave IC reads data with rising edge of SCL.

Master IC changes data by falling edge in SCL.

2) The control register

Table1 Slave Address

| | | | | | | | | | | |
|--|-----|---|---|---|---|---|---|---|--|-----|
| | MSB | | | | | | | | | LSB |
| | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | | |

Note; LC75106 is reception exclusive use. It depends and it uses LSB by the “0” fixation.

• I²C data

| Function | Sub Address | | Data | | | | | | | |
|--------------------------------|-------------|-----|------|------|------|------|-------|-------|-------|-------|
| | BINARY | HEX | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| Stereo line select/Mic1 volume | 0000 0001 | 01 | LD2 | LD1 | LD0 | KEY | M1D3 | M1D2 | M1D1 | M1D0 |
| Mic2 volume/Test | 0000 0010 | 02 | M2D3 | M2D2 | M2D1 | M2D0 | TEST3 | TEST2 | TEST1 | TEST0 |
| Delay time/ECHO volume | 0000 0011 | 03 | 0 | DT2 | DT1 | DT0 | 0 | ED2 | ED1 | ED0 |
| Feed back volume | 0000 0100 | 04 | 0 | FB2 | FB1 | FB0 | 0 | 0 | 0 | 0 |

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Control Data Description

| No | Control Part/ Data | Description | Related Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|------|--|--|---------------------------------|-----------------------|------|---------------------------|---|-------|--------|---------------------------------|------|---|---|------------------------|---|---|-----------------------|-----------------|---|---|---|--------------|---|---|---|------------------|------|---|---|---------|---|------|---|---------|---|---|------|---------|--------|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|-------|---|---|---|---|----|--|
| (1) | Line select LD2 LD1 LD0 | <p>•The data determines line output.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-left: 20px;"> <thead> <tr> <th style="width: 10%;">LD2</th> <th style="width: 10%;">LD1</th> <th style="width: 10%;">LD0</th> <th style="width: 70%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>Stereo output (Initial setting)</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>Lch Mono output</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>Rch Mono output</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>L+R/2 output</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>Vocal cut output</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>Reserve</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>Reserve</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>Reserve</td> </tr> </tbody> </table> | LD2 | LD1 | LD0 | | 0 | 0 | 0 | Stereo output (Initial setting) | 0 | 0 | 1 | Lch Mono output | 0 | 1 | 0 | Rch Mono output | 0 | 1 | 1 | L+R/2 output | 1 | 0 | 0 | Vocal cut output | 1 | 0 | 1 | Reserve | 1 | 1 | 0 | Reserve | 1 | 1 | 1 | Reserve | CS="H" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| LD2 | LD1 | LD0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | Stereo output (Initial setting) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | Lch Mono output | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | Rch Mono output | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | L+R/2 output | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | Vocal cut output | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (2) | External key control switching data key | <p>•This data determines route where external key control is used.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-left: 20px;"> <thead> <tr> <th style="width: 10%;">KEY</th> <th style="width: 90%;">External key control</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td>Invalid (Initial setting)</td> </tr> <tr> <td style="text-align: center;">1</td> <td>valid</td> </tr> </tbody> </table> | KEY | External key control | 0 | Invalid (Initial setting) | 1 | valid | CS="H" | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| KEY | External key control | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | Invalid (Initial setting) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | valid | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (3) | Microphone volume gain setting data M1D3 M1D2 M1D1 M1D0 M2D3 M2D2 M2D1 M2D0 | <p>•The data determines the gain of MICIN 1/2.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-left: 20px;"> <thead> <tr> <th style="width: 10%;">M1D3</th> <th style="width: 10%;">M1D2</th> <th style="width: 10%;">M1D1</th> <th style="width: 10%;">M1D0</th> <th style="width: 70%;"></th> </tr> <tr> <th style="width: 10%;">M2D3</th> <th style="width: 10%;">M2D2</th> <th style="width: 10%;">M2D1</th> <th style="width: 10%;">M2D0</th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>0dB (Initial setting)</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>-2dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>-4dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>-6dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>-8dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>-10dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>-12dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>-14dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>-16dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>-18dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>-20dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>-23dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>-26dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>-29dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>-32dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>-∞</td> </tr> </tbody> </table> | M1D3 | M1D2 | M1D1 | M1D0 | | M2D3 | M2D2 | M2D1 | M2D0 | | 0 | 0 | 0 | 0 | 0dB (Initial setting) | 0 | 0 | 0 | 1 | -2dB | 0 | 0 | 1 | 0 | -4dB | 0 | 0 | 1 | 1 | -6dB | 0 | 1 | 0 | 0 | -8dB | 0 | 1 | 0 | 1 | -10dB | 0 | 1 | 1 | 0 | -12dB | 0 | 1 | 1 | 1 | -14dB | 1 | 0 | 0 | 0 | -16dB | 1 | 0 | 0 | 1 | -18dB | 1 | 0 | 1 | 0 | -20dB | 1 | 0 | 1 | 1 | -23dB | 1 | 1 | 0 | 0 | -26dB | 1 | 1 | 0 | 1 | -29dB | 1 | 1 | 1 | 0 | -32dB | 1 | 1 | 1 | 1 | -∞ | |
| M1D3 | M1D2 | M1D1 | M1D0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| M2D3 | M2D2 | M2D1 | M2D0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 0 | 0dB (Initial setting) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 1 | -2dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 0 | -4dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 1 | -6dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | 0 | -8dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | 1 | -10dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 0 | -12dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 1 | -14dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | 0 | -16dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | 1 | -18dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | 0 | -20dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | 1 | -23dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | 0 | -26dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | 1 | -29dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 0 | -32dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | 1 | -∞ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (4) | Delay time setting data DT2 DT1 DT0 | <p>•The data determines delay time for echo.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-left: 20px;"> <thead> <tr> <th style="width: 10%;">DT2</th> <th style="width: 10%;">DT1</th> <th style="width: 10%;">DT0</th> <th style="width: 70%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>OFF</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>75ms (Initial setting)</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>100ms</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>125ms</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>150ms</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>175ms</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>200ms</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>Reserve</td> </tr> </tbody> </table> | DT2 | DT1 | DT0 | | 0 | 0 | 0 | OFF | 0 | 0 | 1 | 75ms (Initial setting) | 0 | 1 | 0 | 100ms | 0 | 1 | 1 | 125ms | 1 | 0 | 0 | 150ms | 1 | 0 | 1 | 175ms | 1 | 1 | 0 | 200ms | 1 | 1 | 1 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| DT2 | DT1 | DT0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | OFF | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | 75ms (Initial setting) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | 100ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | 125ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | 150ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | 175ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | 200ms | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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LC75106V

Continued from the previous page.

| No | Control Part/ Data | Description | Related Data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|--|---|------------------------|-----|-----|--|---|---|---|------------------------|---|---|---|------|---|---|---|------|---|---|---|-------|---|---|---|------|---|---|---|---------|---|---|---|---------|---|---|---|---------|--|
| (5) | Echo volume gain setting data ED2 ED1 ED0 | <p>•The data determines gain of echo output.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">ED2</th> <th style="width: 10%;">ED1</th> <th style="width: 10%;">ED0</th> <th style="width: 70%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>0dB (Initial setting)</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>-2dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>-4dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>-6dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>-9dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>-12dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>-15dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>-∞</td> </tr> </tbody> </table> | ED2 | ED1 | ED0 | | 0 | 0 | 0 | 0dB (Initial setting) | 0 | 0 | 1 | -2dB | 0 | 1 | 0 | -4dB | 0 | 1 | 1 | -6dB | 1 | 0 | 0 | -9dB | 1 | 0 | 1 | -12dB | 1 | 1 | 0 | -15dB | 1 | 1 | 1 | -∞ | |
| ED2 | ED1 | ED0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | 0dB (Initial setting) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | -2dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | -4dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | -6dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | -9dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | -12dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | -15dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | -∞ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (6) | Feedback volume gain setting data FB2 FB1 FB0 | <p>•The data determines feedback volume for echo.</p> <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">FB2</th> <th style="width: 10%;">FB1</th> <th style="width: 10%;">FB0</th> <th style="width: 70%;"></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>-4dB (Initial setting)</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>-6dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>-9dB</td> </tr> <tr> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>-12dB</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td>-∞</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td>Reserve</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td>Reserve</td> </tr> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td>Reserve</td> </tr> </tbody> </table> | FB2 | FB1 | FB0 | | 0 | 0 | 0 | -4dB (Initial setting) | 0 | 0 | 1 | -6dB | 0 | 1 | 0 | -9dB | 0 | 1 | 1 | -12dB | 1 | 0 | 0 | -∞ | 1 | 0 | 1 | Reserve | 1 | 1 | 0 | Reserve | 1 | 1 | 1 | Reserve | |
| FB2 | FB1 | FB0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 0 | -4dB (Initial setting) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 0 | 1 | -6dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 0 | -9dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 0 | 1 | 1 | -12dB | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 0 | -∞ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 0 | 1 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 0 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | 1 | 1 | Reserve | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| (7) | LSI test data TEST3 TEST2 TEST1 TEST0 | <p>•Data for LSI testing</p> <p>TEST3 to TEST0 should be set to "0".</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

LC75106V

Control with external parts

LC75106 can adjust the setting with external parts at the stereo signal outside connection modes.

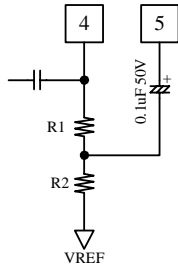
(1) Delay time setting

The Delay time changes if the CR oscillation frequency with built-in LC75106 is adjusted.

| Delay time | external Resistance | OSC Freq | Note |
|------------|---------------------|----------|------|
| 75ms | 30kΩ | 2.458MHz | |
| 100ms | 47kΩ | 1.843MHz | |
| 120ms | 56kΩ | 1.536MHz | |
| 150ms | 75kΩ | 1.228MHz | |
| 190ms | 187kΩ | 0.970MHz | |

(2) Mic-Volume/ECHO Volume setting

When Mic Volume and ECHO Volume are set with external parts, it is possible to set it in the ratio of R1 and R2 as shown in the figure below.

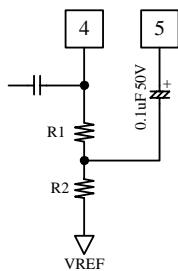


| Gain | R1 | R2 | Note |
|-------|----------|----------|------|
| -2dB | 10.284kΩ | 39.716kΩ | |
| -4dB | 18.452kΩ | 31.548kΩ | |
| -6dB | 24.941kΩ | 25.059kΩ | |
| -8dB | 30.095kΩ | 19.905kΩ | |
| -9dB | 32.259kΩ | 17.741kΩ | |
| -10dB | 34.189kΩ | 15.811kΩ | |
| -12dB | 37.441kΩ | 12.559kΩ | |
| -14dB | 40.024kΩ | 9.976kΩ | |
| -15dB | 41.109kΩ | 8.891kΩ | |
| -16dB | 42.076kΩ | 7.924kΩ | |
| -18dB | 43.705kΩ | 6.295kΩ | |
| -20dB | 45.000kΩ | 5.000kΩ | |
| -23dB | 46.460kΩ | 3.540kΩ | |
| -26dB | 47.494kΩ | 2.506kΩ | |
| -29dB | 48.226kΩ | 1.774kΩ | |
| -32dB | 48.744kΩ | 1.256kΩ | |
| -∞dB | 50.000kΩ | 0 | |

(3) Feed Back Volume setting

To prevent the oscillation, the Echo Feed Back signal input terminal has Gain of -4dB.

Therefore, please calculate in consideration of the attenuation of -4dB when you set Volume.

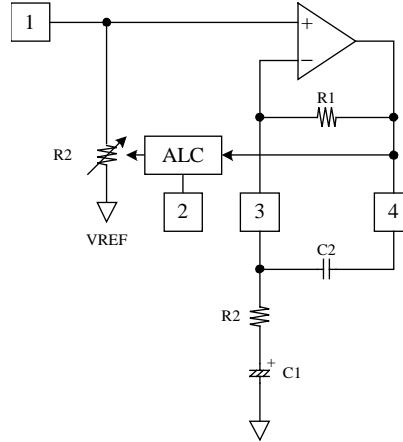


| Gain | R1 | R2 | Note |
|-------|----------|----------|------|
| -4dB | 0 | 50.000kΩ | |
| -6dB | 10.284kΩ | 39.716kΩ | |
| -9dB | 18.452kΩ | 31.548kΩ | |
| -12dB | 24.941kΩ | 25.059kΩ | |
| -∞dB | 50.000kΩ | 0 | |

(4) Mic AMP Gain setting

Mic Amplifier Gain is adjusted according to the resistance value applied to 3pin and 34pin. And low frequency is cut off by connecting condenser.

Mic Amplifier has built-in ALC (Auto Level Control). Output level can be controlled by inputting the standard voltage to 31pin.



1) Mic AMP Gain setting

- R1 = 56.2kΩ
[Mic Gain = 38dB]
R2 = R1/Mic Gain
= 56.2k/79.4
≈ 680

2) fc setting

$$f_c = \frac{1}{2\pi R_1 C_1}$$

(5) ALC control voltage setting

1) ALC control voltage setting

When the ALC detecting voltage is input to 31pin, the ALC operation level can be set.

The setting method becomes as follows.

[VDD = 9.0V/1Vrms setting]

$$V_{DD}/2 = 9.0/2 = 4.5$$

$$1V_{rms}/2 = \sqrt{2} * 1 = 1.414V$$

$$VALC \text{ setting voltage} = 4.5 - 1.414 = 3.086V \text{ (DC)}$$

ALC setting voltage can be set to put resistance between the terminal VREF and the terminal GND.

* The voltage of the terminal VREF depends on the power-supply voltage and changes.

2) ALC attack time/release time setting

The attack time and the release time of ALC can be set with the capacitor between 2pin - VDD and 35pin - VDD.

| capacitor | Attack time | Release time | Note |
|-----------|-------------|--------------|------|
| 2.2μF | About 60ms | About 6.0s | |
| 1.0μF | About 35ms | About 2.5s | |
| 0.1μF | About 16ms | About 0.25s | |

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