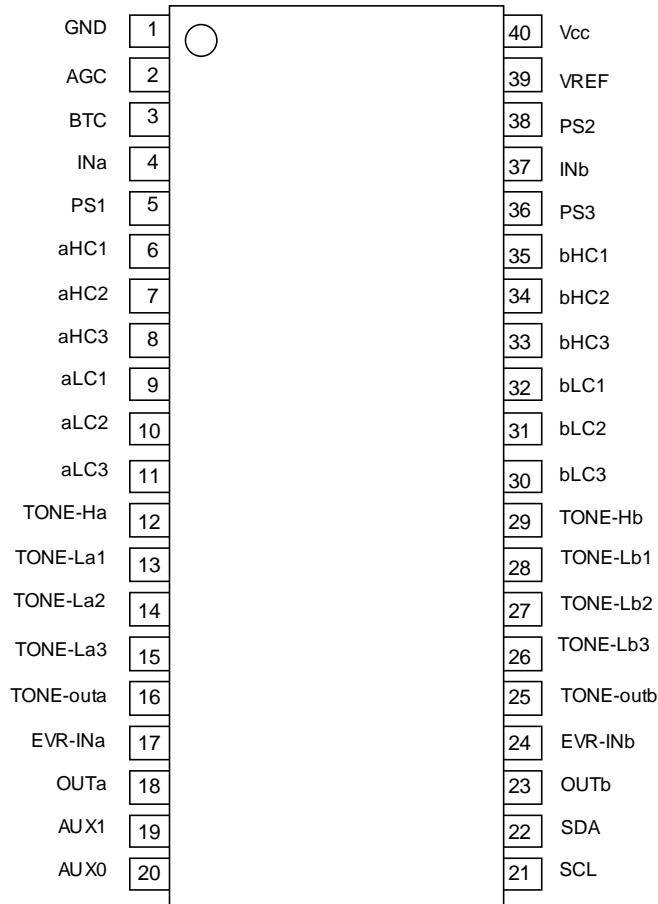


■ PIN FUNCTION



| No. | Symbol | Function | No. | Symbol | Function |
|-----|-----------|---------------------------------------|-----|-----------|---------------------------------------|
| 1 | GND | GND | 21 | SCL | I ² C BUS Clock Terminal |
| 2 | AGC | AGC Response Control Terminal | 22 | SDA | I ² C BUS Data Terminal |
| 3 | BTC | BBE Filter Terminal | 23 | OUTa | Bch Output |
| 4 | INa | Ach Input Terminal | 24 | EVR-INb | Bch VOL2 Input Terminal |
| 5 | PS1 | Surround Filter Terminal | 25 | TONE-outb | Bch Tone Control Output |
| 6 | aHC1 | BBE Filter Terminal | 26 | TONE-Lb3 | Tone Control (Bass) Filter Terminal |
| 7 | aHC2 | BBE Filter Terminal | 27 | TONE-Lb2 | Tone Control (Bass) Filter Terminal |
| 8 | aHC3 | BBE Filter Terminal | 28 | TONE-Lb1 | Tone Control (Bass) Filter Terminal |
| 9 | aLC1 | BBE Filter Terminal | 29 | TONE-Hb | Tone Control (Treble) Filter Terminal |
| 10 | aLC2 | BBE Filter Terminal | 30 | bLC3 | BBE Filter Terminal |
| 11 | aLC3 | BBE Filter Terminal | 31 | bLC2 | BBE Filter Terminal |
| 12 | TONE-Ha | Tone Control (Treble) Filter Terminal | 32 | bLC1 | BBE Filter Terminal |
| 13 | TONE-La1 | Tone Control (Bass) Filter Terminal | 33 | bHC3 | BBE Filter Terminal |
| 14 | TONE-La2 | Tone Control (Bass) Filter Terminal | 34 | bHC2 | BBE Filter Terminal |
| 15 | TONE-La3 | Tone Control (Bass) Filter Terminal | 35 | bHC1 | BBE Filter Terminal |
| 16 | TONE-outa | Ach Tone Control Output | 36 | PS3 | Surround Filter Terminal |
| 17 | EVR-INa | Ach VOL2 Input Terminal | 37 | INb | Bch Input Terminal |
| 18 | OUTa | Ach Output | 38 | PS2 | Surround Filter Terminal |
| 19 | AUX1 | Auxiliary Output Terminal | 39 | VREF | Reference Voltage Terminal |
| 20 | AUX0 | Auxiliary Output Terminal | 40 | Vcc | Voltage Terminal |

■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|-----------------------------|------------------|-------------|------|
| Supply Voltage | V ⁺ | 14 | V |
| Power Dissipation | P _D | 700 | mW |
| Operating Temperature Range | T _{opr} | -40 to +85 | °C |
| Storage Temperature Range | T _{stg} | -40 to +125 | °C |

■ ELECTRICAL CHARACTERISTICS

(Ta=25°C, V+=9V, Rg=600Ω, RL=47kΩ, Vin=100mVrms/1kHz, Vol1/Vol2a/Vol2b=0dB, AGC=OFF, BBE=0dB, TONE=0dB, Surround=OFF unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------|-------------------|---|------|----------------|----------------|----------------|
| Operating Voltage | V+ | | 8.0 | 9.0 | 13.0 | V |
| Supply Current | I _{CC} | No Signal | - | 25 | 40 | mA |
| Reference Voltage | V _{REF} | No Signal | 4.0 | 4.5 | 5.0 | V |
| Maximum Input Voltage | V _{IM} | Vol1=-20dB, Vol2a/2b=0dB, THD=1% | 2.6 | 2.8 | - | Vrms |
| Maximum Output Voltage | V _{OM1} | OUTPUT THD=1% | 2.2 | 2.5 | - | Vrms |
| Maximum Gain | G _{VMAX} | | -2.0 | 0.0 | 2.0 | dB |
| Minimum Gain | G _{VMIN} | Vol1/Vol2a/Vol2b= -40dB | -84 | -80 | -76 | dB |
| Channel Balance | G _{CB} | | -1.5 | 0.0 | 1.5 | dB |
| Total Harmonic Distortion | THD | Vo=0.5Vrms BW=400Hz to 30kHz | - | 0.01 | 0.05 | % |
| Mute Level | MUTE | Vol1/Vol2a/Vol2b= Mute | - | - | -90 | dB |
| Channel Separation | CS | Vin=2Vrms | - | -80 | -70 | dB |
| Output Noise 1 | V _{NO1} | BW=400Hz to 30kHz | - | -100 (10.0) | - | dBV (μVrms) |
| Output Noise 2 | V _{NO2} | Vol1/Vol2a/Vol2b= Mute BW=400Hz to 30kHz | - | -110 (3.2) | -100 (10.0) | dBV (μVrms) |

● TONE CONTROL

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------|-------------------|-----------------------|-------|-------|-------|------|
| High Frequency Boost | HF _{BST} | TREBE=12dB, f=20kHz | 10 | 12.0 | 14.0 | dB |
| High Frequency Flat | HF _{FLT} | TRBE=0dB, f=20kHz | -2.0 | 0.0 | 2.0 | dB |
| High Frequency Cut | HF _{CUT} | TREBLE=-12dB, f=20kHz | -14 | -12.0 | -10.0 | dB |
| Low Frequency Boost | LF _{BST} | BASS=12dB, f=50Hz | 10.0 | 12.0 | 14.0 | dB |
| Low Frequency Flat | LF _{FLT} | BASS=0dB, f=50Hz | -2.0 | 0.0 | 2.0 | dB |
| Low Frequency Cut | LF _{CUT} | BASS=-12dB, f=50Hz | -14.0 | -12.0 | -10.0 | dB |

● AGC CONTROL: AGC= H (AGC-ON)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------|---------------------|-----------------------------|------|------|------|------|
| AGC BOOST | AGC _{BST} | Vin=50mVrms | 2.0 | 3.0 | 4.0 | dB |
| AGC FLAT L | AGC _{FLTL} | Vin=100mVrms AGCLVL=" 1" | -2.5 | 0.0 | 2.5 | dB |
| AGC FLAT M | AGC _{FLTM} | Vin=200mVrms AGCLVL=" 2" | -2.5 | 0.0 | 2.5 | dB |
| AGC FLAT H | AGC _{FLTH} | Vin=400mVrms AGCLVL=" 3" | -2.5 | 0.0 | 2.5 | dB |
| AGC CUT 3 | AGC _{CUT3} | Vin=2Vrms AGCLVL=" 3" | -16 | -12 | -8.0 | dB |

● SURROUND CONTROL (SURROUND-ON)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|------------------------|--------------------|---|------|------|------|------|
| SURROUND Gain 1 | G _{VSUR1} | Ain → Aout, f=100Hz Surround="Sur1 " | 6.5 | 8.5 | 10.5 | dB |
| SURROUND Gain 2 | G _{VSUR2} | Ain → Bout, f=100Hz Surround="Sur1 " | 2.5 | 4.5 | 6.5 | dB |
| SURROUND Gain 3 | G _{VSUR3} | Ain → Aout, f=100Hz Surround="Sur2 " | 10 | 12 | 14 | dB |
| SURROUND Gain 4 | G _{VSUR4} | Ain → Bout, f=100Hz Surround="Sur2 " | 7.5 | 9.5 | 11.5 | dB |
| Simulated Stereo Gain1 | G _{VSST1} | Ain+Bin → Aout, Surround="SST" | 1.0 | 3.0 | 5.0 | dB |
| Simulated Stereo Gain2 | G _{VSST2} | Ain+Bin → Bout, Surround="SST" | 1.0 | 3.0 | 5.0 | dB |

● BBE (BBE ON)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|--------------------------------|---------------------|----------------|------|------|------|------|
| BBE low Frequency Boost Range | BBE _{LOW} | BBE-Low=12dB | - | 12.0 | - | dB |
| BBE High Frequency Boost Range | BBE _{HIGH} | BBE-High=12dB | - | 12.0 | - | dB |

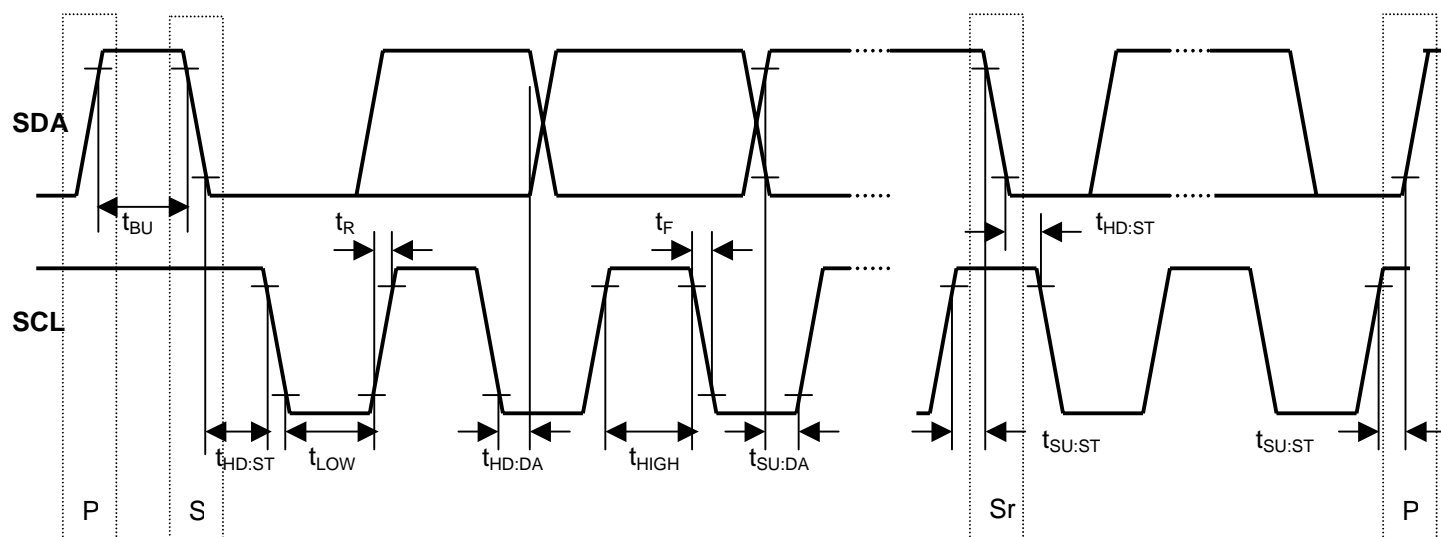
● AUXILIARY OUTPUT

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---------------------------|-----------------|----------------------|------|------|------|------|
| Low level Output Voltage | V _{OL} | I _{OL} =1mA | - | 0.5 | 1.5 | V |
| High level Output Voltage | V _{OH} | I _{OH} =1mA | 3.5 | 4.5 | - | V |

■ I²C BUS BLOCK CHARACTERISTICS (SDA,SCL)

| PARAMETER | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---------------------|------|------|------|------|
| High Level Input Voltage | V _{IH} | 3.0 | - | 5.0 | V |
| Low Level Input Voltage | V _{IL} | 0 | - | 1.5 | V |
| High Level Input Current | I _{IH} | - | - | 10 | μA |
| Low Level Input Current | I _{IL} | - | - | 10 | μA |
| Low Level Output Voltage (3mA at SDA pin) | V _{OL} | 0 | - | 0.4 | dB |
| Maximum Output Current | I _{OL} | -3.0 | - | - | mA |
| Maximum Clock Frequency | f _{SCL} | 0 | - | 100 | kHz |
| Data Change Minimum Waiting Time | t _{BUF} | 4.7 | - | - | μs |
| Data Transfer Start Minimum Waiting Time | t _{HD:STA} | 4.0 | - | - | μs |
| Low Level Clock Pulse Width | t _{LOW} | 4.7 | - | - | μs |
| High Level Clock Pulse Width | T _{HIGH} | 4.0 | - | - | μs |
| Minimum Start Preparation Waiting Time | t _{SU:STA} | 4.7 | - | - | μs |
| Minimum Data Hold Time | t _{HD:DAT} | 5.0 | - | - | μs |
| Minimum Data Preparation Time | t _{SU:DAT} | 250 | - | - | ns |
| Rise Time | t _R | - | - | 1.0 | μs |
| Fall Time | t _F | - | - | 300 | ns |
| Minimum Stop Preparation Waiting Time | t _{SU:STO} | 4.7 | - | - | μs |

I²C BUS Load Condition: Pull up resistance 4kΩ (Connected to +5V)
Load capacitance 200pF (Connected to GND)



■TERMINAL DESCRIPTION

| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|---------|------------|-----------------------|--------------------|---------|
| 1 40 | GND Vcc | Power Supply | | - |
| 2 | AGC | AGC Response Control | | 1.4V |
| 3 | BTC | Terminal for BBE | | Vcc/2 |
| 4 37 | Ina Inb | a/b ch Input Terminal | | Vcc/2 |
| 5 | PS1 | Filter for Surround | | Vcc/2 |

■TERMINAL DESCRIPTION

| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|---------------------|------------------------------|----------------|--------------------|------------|
| 6 35 | aHC1 bHC1 | Filter for BBE | | $V_{cc}/2$ |
| 7 34 | aHC2 bHC2 | Filter for BBE | | $V_{cc}/2$ |
| 8 11 30 33 | aHC3 aLC3 bLC3 bHC3 | Filter for BBE | | $V_{cc}/2$ |
| 9 32 | aLC1 bLC1 | Filter for BBE | | $V_{cc}/2$ |
| 10 31 | aLC2 bLC2 | Filter for BBE | | $V_{cc}/2$ |

■TERMINAL DESCRIPTION

| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|----------------------|--|-------------------------|--------------------|------------|
| 12 29 | TONE-Ha TONE-Hb | Filter for TONE Control | | $V_{cc}/2$ |
| 13 28 | TONE-La1 TONE-Lb1 | Filter for TONE Control | | $V_{cc}/2$ |
| 14 15 26 27 | TONE-La2 TONE-La3 TONE-Lb3 TONE-Lb2 | Filter for TONE Control | | $V_{cc}/2$ |
| 16 25 | TONE-outa TONE-outb | Output | | $V_{cc}/2$ |
| 17 24 | EVR-INa EVR-INb | Input terminal | | $V_{cc}/2$ |

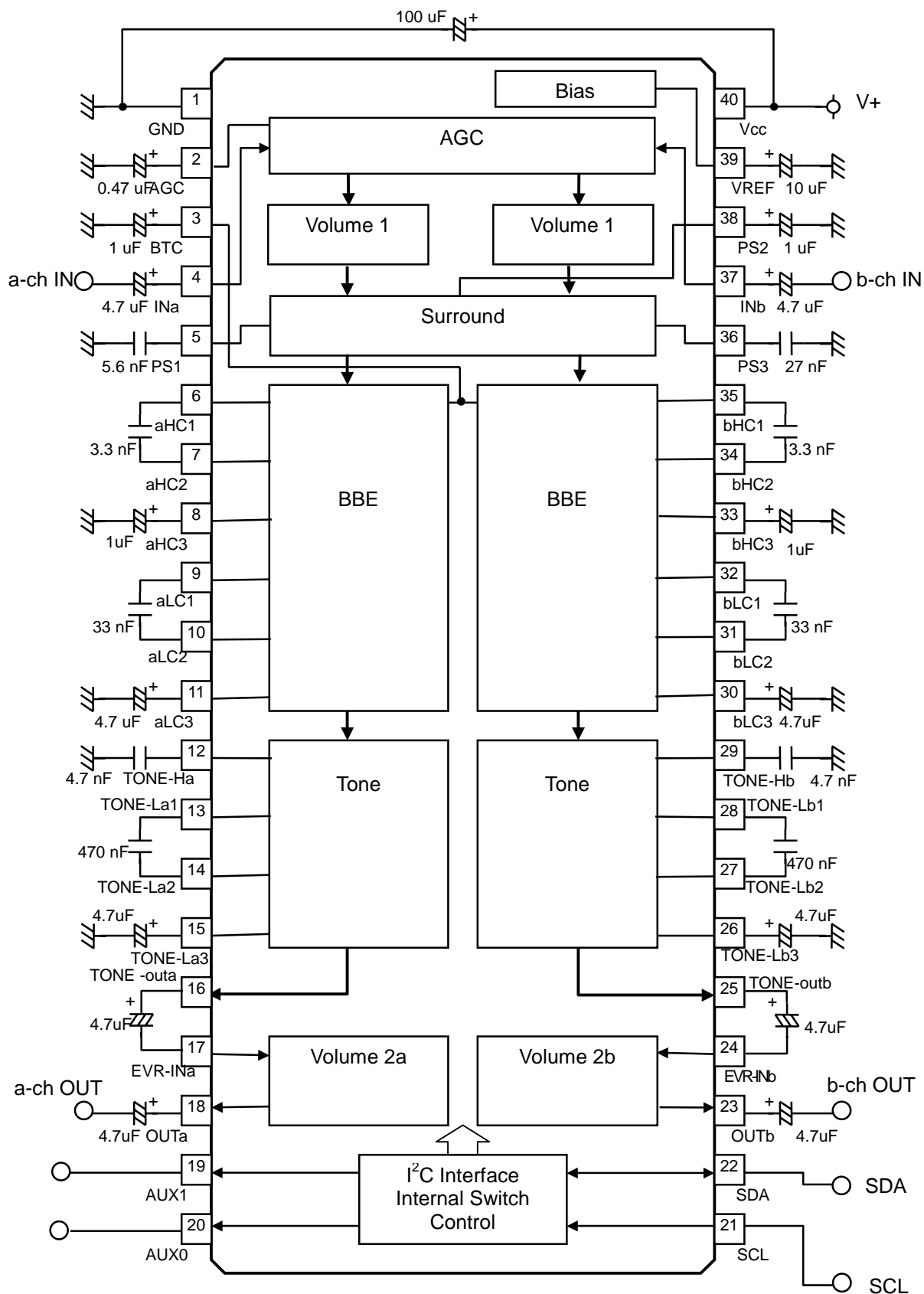
■TERMINAL DESCRIPTION

| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|----------|--------------|----------------------------------|--------------------|--------------|
| 18 23 | OUTa OUTb | Output | | $V_{cc}/2$ |
| 19 20 | AUX1 AUX0 | Auxiliary Output | | L=0V H=5V |
| 21 | SCL | I ² C Bus Clock Input | | L=0V H=5V |
| 22 | SDA | I ² C Bus Data Input | | L=0V H=5V |
| 36 | PS3 | Filter for Surround | | $V_{cc}/2$ |

■TERMINAL DESCRIPTION

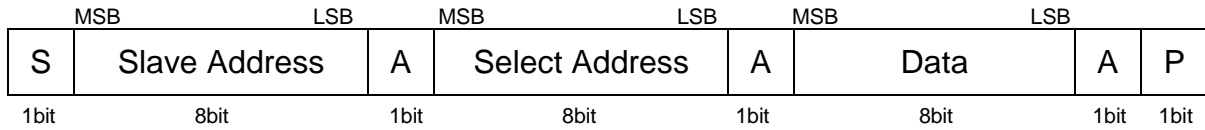
| No. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | VOLTAGE |
|-----|--------|---------------------|--------------------|------------|
| 38 | PS2 | Filter for Surround | | - |
| 39 | VREF | Reference Voltage | | $V_{cc}/2$ |

APPLICATION CIRCUIT



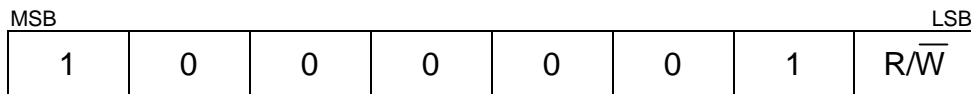
■ DEFINITION OF I²C REGISTER

● I²C BUS FORMAT



S: Starting Term
 A: Acknowledge Bit
 P: Ending Term

● SLAVE ADDRESS



R/W=0: Receive Only
 R/W=1: No Output Data

● CONTROL REGISTER TABLE

| Select Address | BIT | | | | | | | |
|----------------|--|-----------|------|----------|------------|----------|----|-----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 00H | Volume 1 | | | | | | | |
| 01H | * | Volume 2a | | | | | | |
| 02H | Volume 2b | | | | | | | |
| 03H | TONE (Treble) | | | | TONE(Bass) | | | |
| 04H | BBE-Low | | | | BBE-High | | | |
| 05H | * | AUX1 | AUX0 | Surround | | AGC Gain | | AGC |
| 06H | TEST mode (Normally not available. Set 00H.) | | | | | | | |

* : Don't Care

Auto Increment : The selected Address is incremented with the number of Data.

0H → 1H → 2H → 3H → 4H → 5H → 6H



● CONTROL REGISTER DEFAULT VALUE

| Select Address | BIT | | | | | | | |
|----------------|-----|----|----|----|----|----|----|----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 00H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 01H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 03H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 04H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 05H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 06H | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

■ Volume1/2a/2b (Select Address = 00H,01H,02H)

| Gain (dB) | VOL1/2a/2b | | | | | | | |
|-----------|------------|----|----|----|----|----|----|----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 0 | | | 1 | 1 | 1 | 1 | 1 | 1 |
| -1 | | | 1 | 1 | 1 | 1 | 1 | 0 |
| -2 | | | 1 | 1 | 1 | 1 | 0 | 1 |
| -3 | | | 1 | 1 | 1 | 1 | 0 | 0 |
| -4 | | | 1 | 1 | 1 | 0 | 1 | 1 |
| -5 | | | 1 | 1 | 1 | 0 | 1 | 0 |
| -6 | | | 1 | 1 | 1 | 0 | 0 | 1 |
| -7 | | | 1 | 1 | 1 | 0 | 0 | 0 |
| -8 | | | 1 | 1 | 0 | 1 | 1 | 1 |
| -9 | | | 1 | 1 | 0 | 1 | 1 | 0 |
| -10 | | | 1 | 1 | 0 | 1 | 0 | 1 |
| -11 | | | 1 | 1 | 0 | 1 | 0 | 0 |
| -12 | | | 1 | 1 | 0 | 0 | 1 | 1 |
| -13 | | | 1 | 1 | 0 | 0 | 1 | 0 |
| -14 | | | 1 | 1 | 0 | 0 | 0 | 1 |
| -15 | | | 1 | 1 | 0 | 0 | 0 | 0 |
| -16 | | | 1 | 0 | 1 | 1 | 1 | 1 |
| -17 | | | 1 | 0 | 1 | 1 | 1 | 0 |
| -18 | | | 1 | 0 | 1 | 1 | 0 | 1 |
| -19 | | | 1 | 0 | 1 | 1 | 0 | 0 |
| -20 | | | 1 | 0 | 1 | 0 | 1 | 1 |
| -21 | * | | 1 | 0 | 1 | 0 | 1 | 0 |
| -22 | | | 1 | 0 | 1 | 0 | 0 | 1 |
| -23 | | | 1 | 0 | 1 | 0 | 0 | 0 |
| -24 | | | 1 | 0 | 0 | 1 | 1 | 1 |
| -25 | | | 1 | 0 | 0 | 1 | 1 | 0 |
| -26 | | | 1 | 0 | 0 | 1 | 0 | 1 |
| -27 | | | 1 | 0 | 0 | 1 | 0 | 0 |
| -28 | | | 1 | 0 | 0 | 0 | 1 | 1 |
| -29 | | | 1 | 0 | 0 | 0 | 1 | 0 |
| -30 | | | 1 | 0 | 0 | 0 | 0 | 1 |
| -31 | | | 1 | 0 | 0 | 0 | 0 | 0 |
| -32 | | | 0 | 1 | 1 | 1 | 1 | 1 |
| -33 | | | 0 | 1 | 1 | 1 | 1 | 0 |
| -34 | | | 0 | 1 | 1 | 1 | 0 | 1 |
| -35 | | | 0 | 1 | 1 | 1 | 0 | 0 |
| -36 | | | 0 | 1 | 1 | 0 | 1 | 1 |
| -37 | | | 0 | 1 | 1 | 0 | 1 | 0 |
| -38 | | | 0 | 1 | 1 | 0 | 0 | 1 |
| -39 | | | 0 | 1 | 1 | 0 | 0 | 0 |
| -40 | | | 0 | 1 | 0 | 1 | 1 | 1 |
| Mute | | | 0 | 0 | 0 | 0 | 0 | 0 |

* : Don't Care

■ **TONE Control(Treble / Bass ,Select Address = 03H)**

| Boost/Cut Gain(dB) | TREBLE | | | | BASS | | | |
|--------------------|--------|----|----|----|------|----|----|----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 12 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 |
| 10 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 |
| 8 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 6 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| 4 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 2 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| -2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| -4 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| -6 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| -8 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| -10 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| -12 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |

■ **BBE Lo Contour / Process , Select Address = 04H)**

| Boost Gain(dB) | Process | | | | Lo Contour | | | |
|----------------|---------|----|----|----|------------|----|----|----|
| | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
| 12 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| 11 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 |
| 10 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| 9 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 |
| 8 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 7 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 |
| 6 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 5 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 |
| 4 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| 3 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |
| 2 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

■ **Auxiliary Port Control**

| | D6 AUX1 | D5 AUX0 |
|------|------------|------------|
| High | 1 | 1 |
| Low | 0 | 0 |

■ **AGC Function Control**

| | D0 |
|-----|----|
| ON | 0 |
| OFF | 1 |

■ Surround Control

| | D4 | D3 |
|------------------|----|----|
| OFF | 0 | 0 |
| Simulated STEREO | 0 | 1 |
| Surround 1 | 1 | 0 |
| Surround 2 | 1 | 1 |

■ AGC Level Control

| | D2 | D1 |
|---------|----|----|
| Level 1 | 0 | 0 |
| Level 2 | 0 | 1 |
| Level 3 | 1 | 0 |

■NOTE

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BBE Sound, Inc.
 5381 Production Drive
 Huntington Beach, CA 92649
 Tel:(714)897-6766
 Fax:(714)896-0736

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