

M62465FP

Dolby Pro Logic Surround

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Rev.2.01
Mar 31, 2008

Description

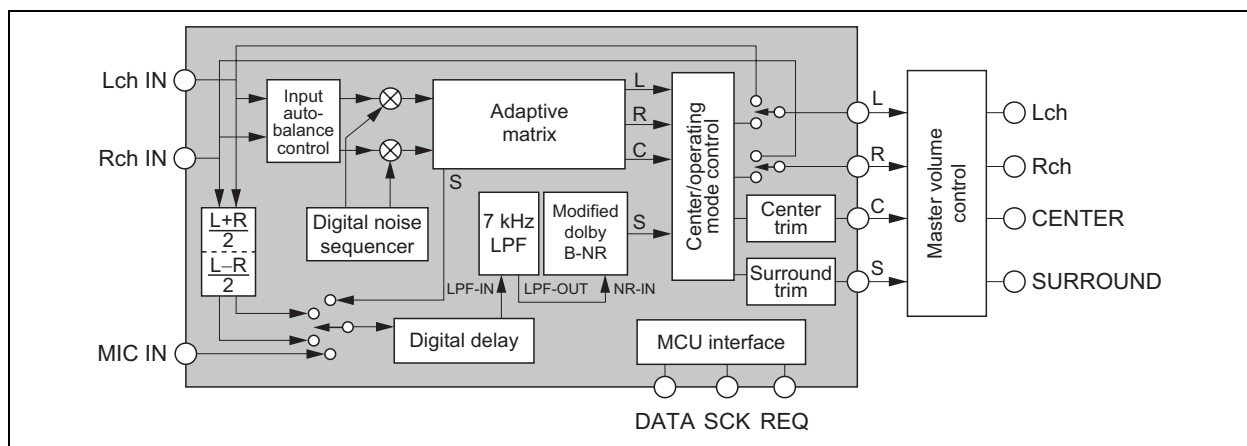
The M62465FP is a single chip LSI supporting the Dolby Pro Logic surround. This LSI contains all functions necessary for Dolby Pro Logic surround. In addition, it has Digital Space Surround functions (Disco, Hall, Live mode etc.) and echo function for karaoke.

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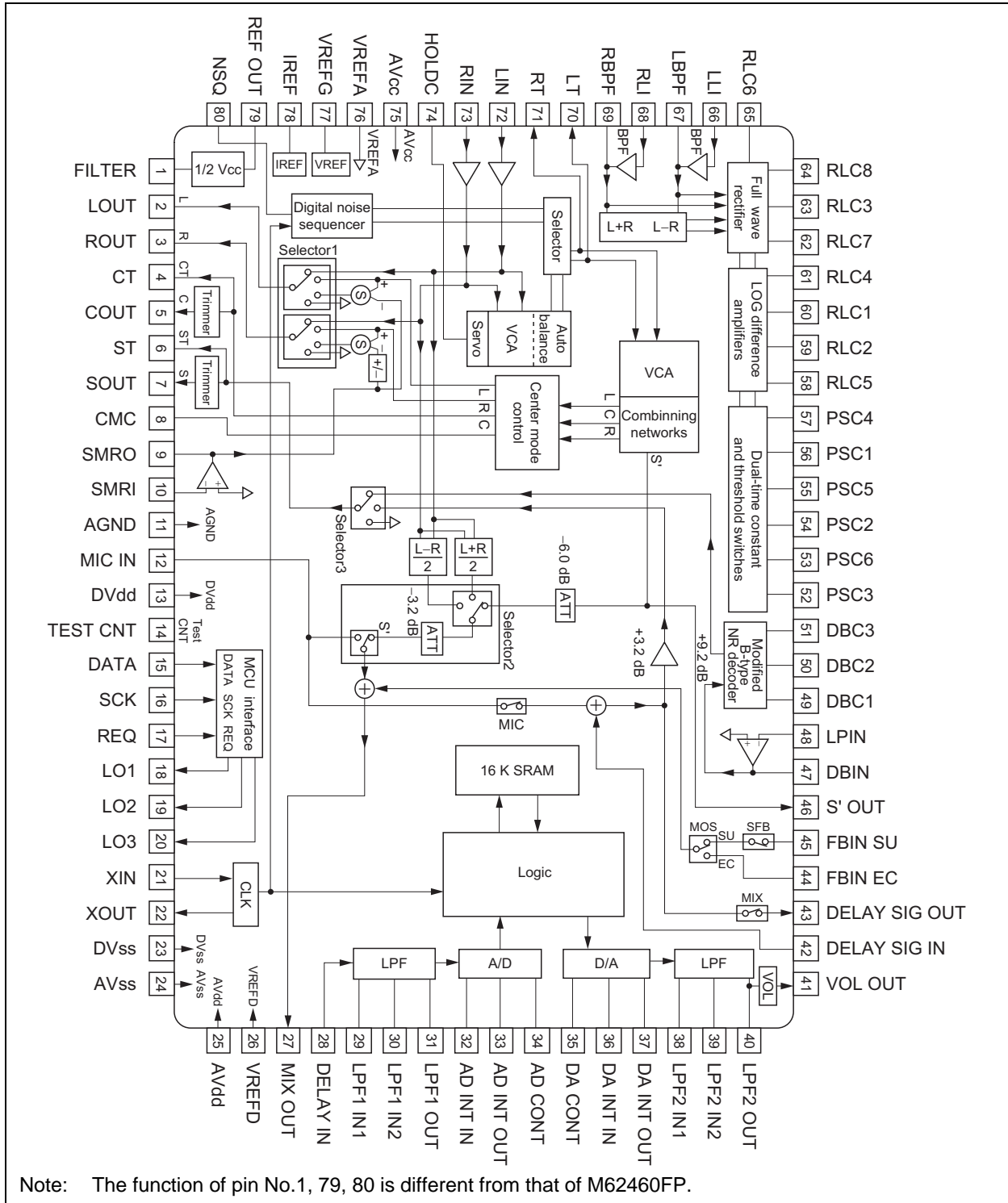
Features (Mode)

- Upper compatible for M62460FP and less external parts than M62460FP.
- Includes all functions requires for Dolby Pro Logic Surround.
 - Adaptive Matrix.
 - Noise Sequencer by digital noise source and switched capacitor filter.
 - Center Mode Control (Wide/Normal/PHANTOM/OFF).
 - Modified Dolby B Type Noise Reduction.
 - 4ch/3ch Stereo Selectable.
 - Digital Delay: 15.4, 20, 28.6 ms for Dolby Pro Logic Surround.
- C/Sch Trimmer: 0 to -31 dB/1 dB Step.
- Digital Space Surround Mode: Disco/Hall/Live mode and 5 delay time positions.
- Digital Echo function for KARAOKE: (Short echo) Delay time = 147.5 ms, (Long echo) Delay time = 196.6 ms.
- BY-PASS Mode: Input signal through output.

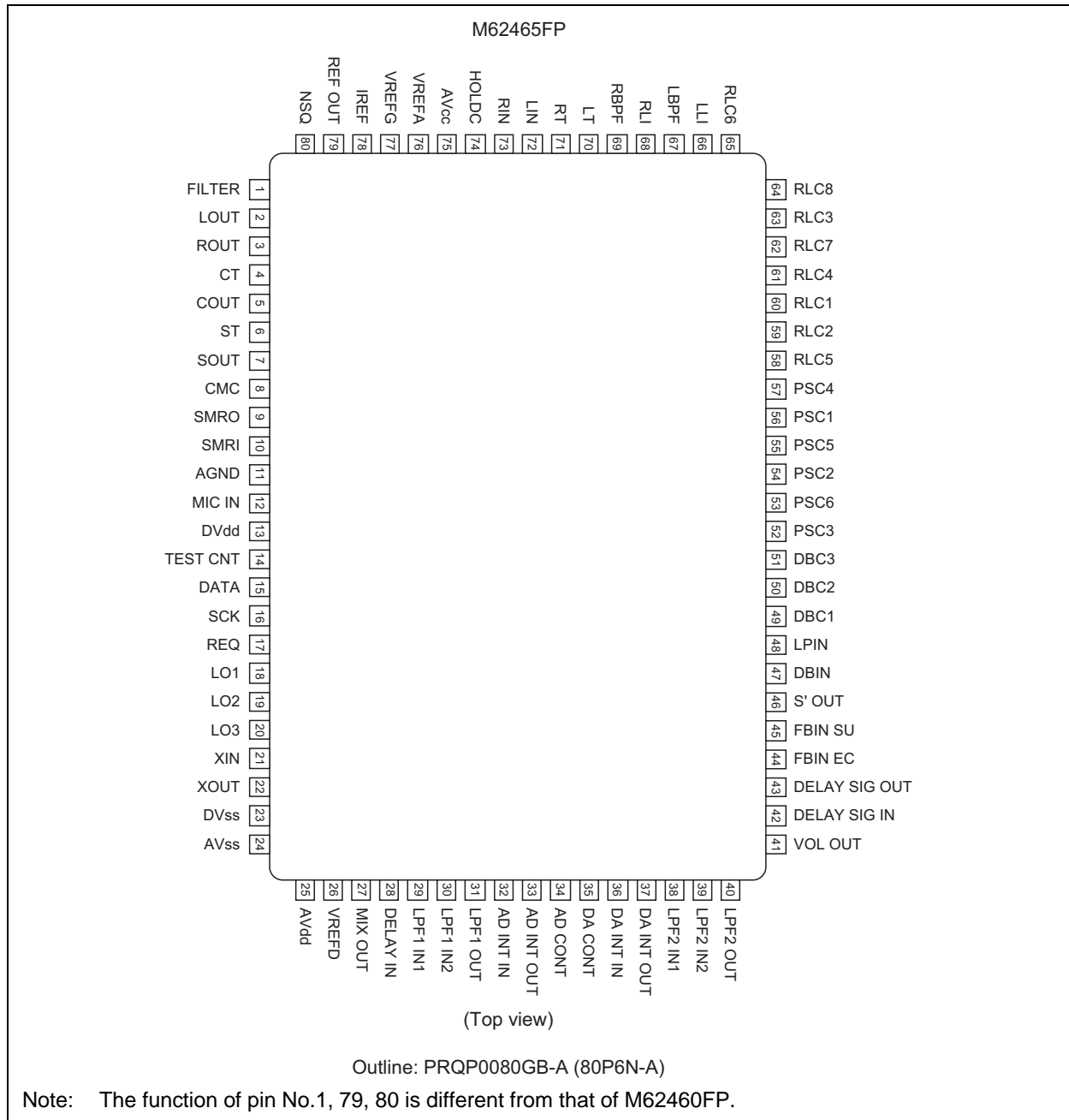
System Block Diagram



Block Diagram



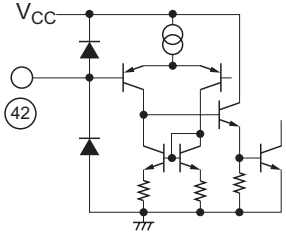
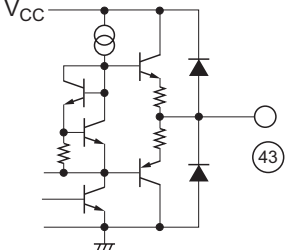
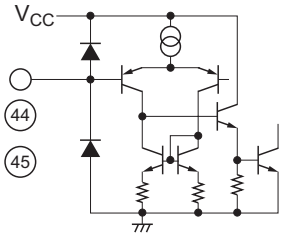
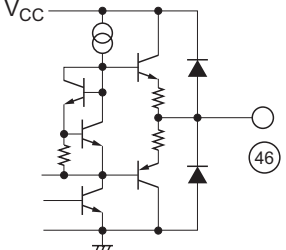
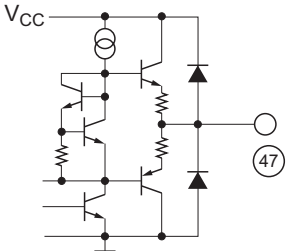
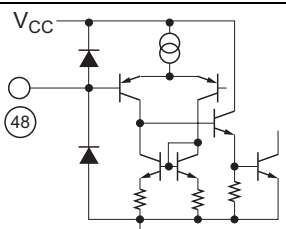
Pin Arrangement



Pin Description

| No. | Symbol | Function | Voltage | Description | Equivalent Circuit |
|-----|--------|------------------|---------|--|--------------------|
| 2 | LOUT | Lch output | 4 V | Direct output R-/L-channel when the operation mode is BY-PASS. When the mode is 4channel, they output Dolby Pro Logic R-/L-channel signals. | |
| 3 | ROUT | Rch output | | | |
| 4 | CT | Cch output | 4 V | No output any signals when the operation mode is center mode is OFF or set to PHANTOM. COUT is output from C. Trimmer. | |
| 5 | COUT | Cch output | | | |
| 6 | ST | Sch output | 4 V | This pin output surround signals. Output is selected from BNRout, Dout No output signal when the operation mode is 3STEREO/MUTE. SOUT is output from S. Trimmer. | |
| 7 | SOUT | Sch output | | | |
| 9 | SMRO | Amplifier output | 4 V | This is a amplifier to control mixed level of surround output with external resistance. | |
| 10 | SMRI | Amplifier input | | | |
| 12 | MIC IN | MIC input | 4 V | Microphone input with ECHO MODE | |

| No. | Symbol | Function | Voltage | Description | Equivalent Circuit |
|-----|----------|-----------------------------|---------|--|--------------------|
| 14 | TEST CNT | TEST control | 0 | Fixed to GND | |
| 15 | DATA | Serial data "DATA" input | — | Input via serial data from MCU. | |
| 16 | SCK | Serial data "SCK" input | 0 | | |
| 17 | REQ | Serial data "REQ" input | | | |
| 18 | LO1 | Port output | — | Open collector output pin (NPN Tr) | |
| 19 | LO2 | | | | |
| 20 | LO3 | | | | |
| 21 | XIN | Oscillator input | — | Connect 4 MHz ceramic resonator | |
| 22 | XOUT | Oscillator output | | | |
| 26 | VREFD | Reference output | 2.5 V | 1/2 V _{CC} output Connect a filter capacitor. | |
| 27 | MIX OUT | S', L+R, L-R and MIC output | 4 V | Signal output precedent to delay generator. That is S', L+R, L-R and MIC output. | |
| 28 | DELAY IN | Delay input | 2.5 V | This is s delay input. Please input by AC coupling. | |
| 40 | LPF2 OUT | Delay signal output | 2.5 V | Delay signal output | |
| 41 | VOL OUT | Output of a delay volume | | This is output of a delay volume that possible to control +3 dB to -∞. | |

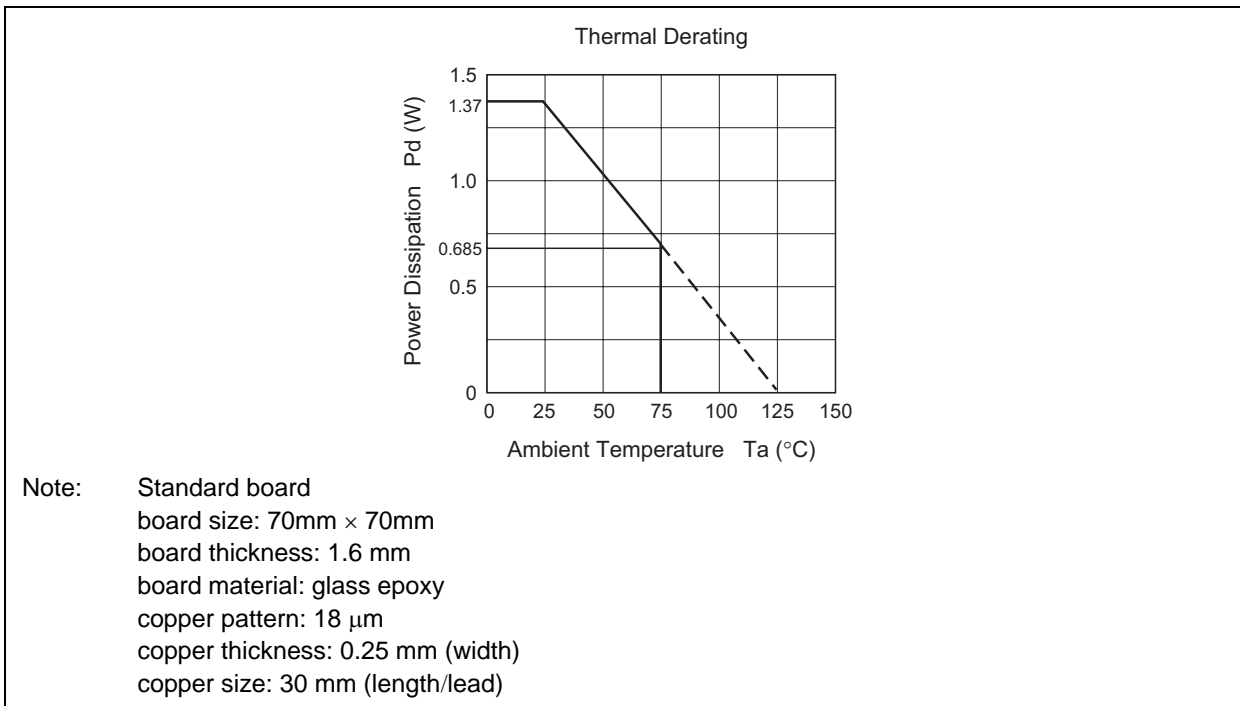
| No. | Symbol | Function | Voltage | Description | Equivalent Circuit |
|-----|-----------------|--------------------------------|---------|--|---|
| 42 | DELAYSIG IN | — | 4 V | Delay signal input to a mixing amplifier |  |
| 43 | DELAYSIG OUT | Input from mixing amplifier | 4 V | Delay signal output from a mixing amplifier |  |
| 44 | FBIN EC | Feedback signal input | 4 V | Feedback signal input with ECHO MODE |  |
| 45 | FBIN SU | | | Feedback signal input with SURROUND MODE | |
| 46 | S'OUT | Sch output | 4 V | Sorround channel output precedent to delay generator. Always outputs signals, irrespectiv of the operation mode (2-/3-/4- channel) |  |
| 47 | DBIN | LPF output | 4 V | This amplifier componert 7 kHz-LPF with external resistances and capaciters. LPF output is conected to input of Modifide BNR. |  |
| 48 | LPIN | Negative input of LPF | |  | |

| No. | Symbol | Function | Voltage | Description | Equivalent Circuit |
|-----|----------------------------------|--|-------------|--|--------------------|
| 72 | LIN | Lch input | 4 V | Input of Lch and Rch that is non-inverted input type. Please pul-up to VREF by external resistances for DC bias. | |
| 73 | RIN | Rch input | | | |
| 70 | LT | Autobalance Lch output | 4 V | Autobalance output. | |
| 71 | RT | Autobalance Rch output | | | |
| 76 | VREFA | Reference voltage input | — | It is a reference voltage input terminal to each circuit inside the IC. | |
| 77 | VREFG | Reference voltage output | 4 V | Reference voltage output. Voltage is the fixed at 4V. | |
| 1 | FILTER New future of M62465FP | $1/2V_{CC}$ Auxiliary $1/2V_{CC}$ reference generator. | $1/2V_{CC}$ | The terminal which make a $1/2V_{CC}$ voltage by the resistance. When it is used, a filter capacitor is connected. | |
| 79 | REFOUT New future of M62465FP | $1/2V_{CC}$ output Auxiliary $1/2V_{CC}$ reference generator. | $1/2V_{CC}$ | $1/2V_{CC}$ voltage output. It is used to change reference voltage except 4V. | |
| 80 | NSQ New future of M62465FP | Noise sequencer monitor | 4 V | Noise sequencer monitor output. It is only for test. | |

Absolute Maximum Ratings

(Ta = 25°C, unless otherwise noted)

| Item | Symbol | Ratings | Unit | Condition |
|-----------------------|------------------|-------------|-------|----------------|
| Supply voltage | V _{CC} | 10.5 | V | |
| | V _{DD} | 6.5 | V | |
| Power dissipation | P _d | 1.37 | W | Standard board |
| Thermal derating | K _θ | 13.7 | mW/°C | Ta ≥ 25°C |
| Operating temperature | T _{opr} | -20 to +75 | °C | |
| Storage temperature | T _{stg} | -40 to +125 | °C | |



Recommended Operating Condition

| Item | Symbol | Limits | | | Unit | Condition |
|------------------------|-----------------|--------|-----|------|------|-----------|
| | | Min | Typ | Max | | |
| Analog supply voltage | V _{CC} | 8.0 | 9.0 | 10.0 | V | |
| Digital supply voltage | V _{DD} | 4.5 | 5.0 | 5.5 | V | |
| OSC clock | f _{ck} | — | 4 | — | MHz | |

Electrical Characteristics (Decoder)

($V_{CC} = 9\text{ V}$, $V_{DD} = 5\text{ V}$, 0dB Reference = 300 mVrms/1 kHz at C-OUT unless otherwise noted. (Cch Trimmer = 0 dB))

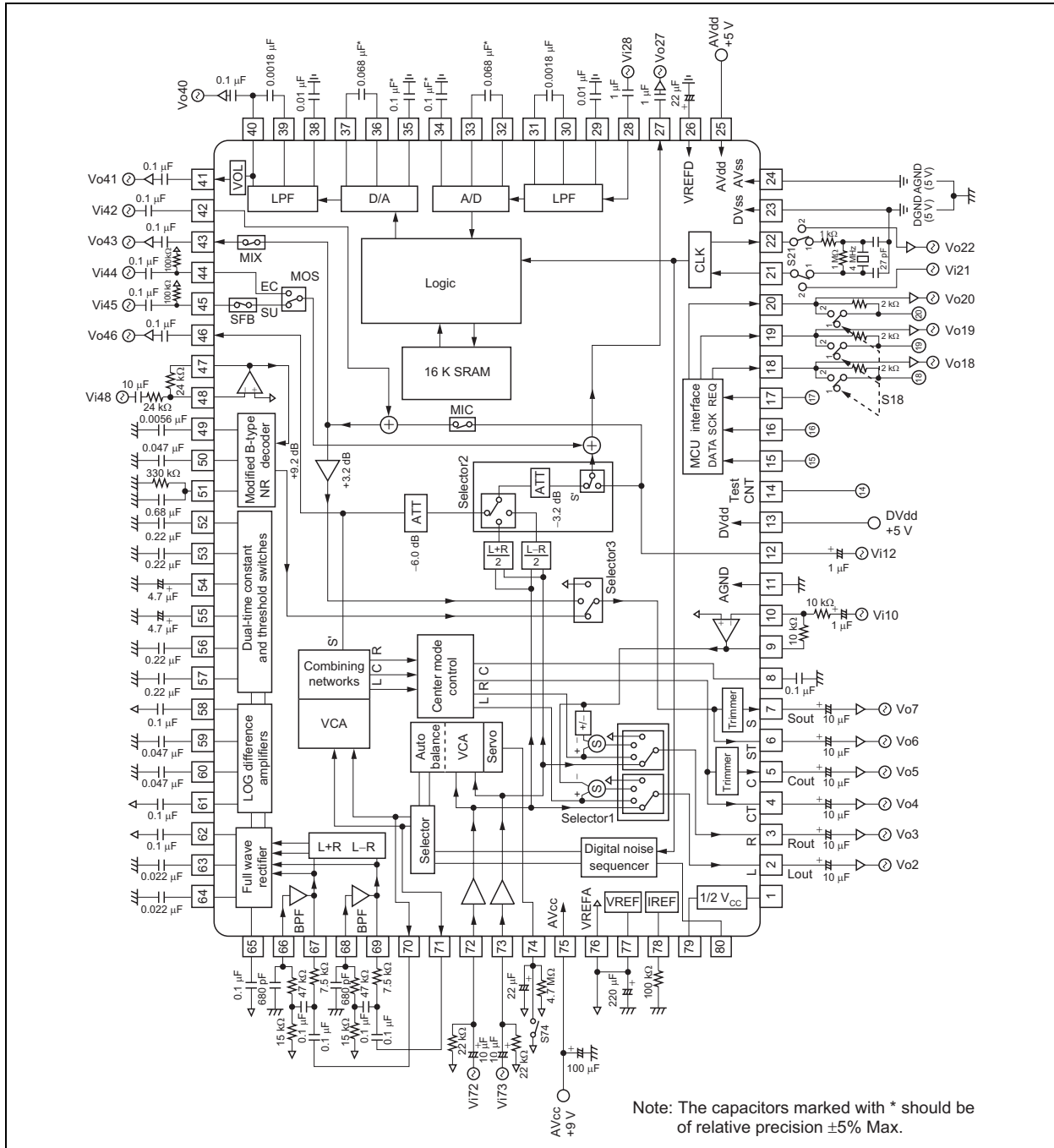
| Item | Symbol | Limits | | | Unit | Conditions |
|---|-----------------|--------|-------|------|-------|--|
| | | Min | Typ | Max | | |
| Overall | | | | | | |
| Circuit current | I_{CC} | — | 25 | 50 | mA | Quiescent |
| Circuit current | I_{DD} | — | 25 | 50 | mA | Quiescent |
| Reference voltage | V_{ref} | 3.5 | 4.0 | 4.5 | V | Quiescent |
| Input auto valance | | | | | | |
| Capture range | CPR | — | ±5 | — | dB | |
| Error correction | CER | — | ±4 | — | dB | |
| Adaptive matrix | | | | | | |
| Output level accuracy relative to Cch | ΔVOL | -0.5 | 0 | 0.5 | dB | L, R, S'ch out |
| Matrix rejection relative. | MR | 25 | 40 | — | dB | L, R, C, S'ch out |
| Headroom | HRAM | 15 | 17 | — | dB | L, R, C, S' out |
| Total harmonic Distortion | THDAM | — | 0.05 | 0.2 | % | L, R, C, S'ch out 4ch mode |
| | | — | 0.002 | 0.05 | | L, Rch out 2ch mode |
| Signal to noise ratio | SNAM | 75 | 80 | — | dB | Rg = 0 Ω , weighted CCIR/AMR 4ch mode |
| | | 95 | 100 | — | | L, Rch out 2ch mode |
| Peak noise | NopAM | — | — | ±0.3 | mVp-p | measurement time = 40ms |
| | | — | — | ±0.3 | | |
| Noise sequencer (0 dBd Reference is input at NR-IN when adjust to 0 dB (300 mVrms/100 Hz) at S out. | | | | | | |
| Output noise level | V_{no} | -15 | -12.5 | -10 | dB | |
| Output level accuracy relative to Cch | ΔV_{no} | -0.5 | 0 | 0.5 | dB | L, R, S'ch out |
| Output noise peak | V_{nop} | — | — | ±550 | mVp-p | Measurement time = 6 s |
| Modified B type noise reduction | | | | | | |
| Voltage gain | VGNR | — | 9.2 | — | dB | $V_{in} = 0\text{ dBd}$, $f = 100\text{ Hz}$ |
| Decode response 1 | DEC1 | -1.6 | -0.1 | 1.4 | dB | $V_{in} = 0\text{ dBd}$, $f = 1.0\text{ kHz}$ |
| Decode response 2 | DEC2 | -3.0 | -1.5 | 0 | | $V_{in} = -15\text{ dBd}$, $f = 1.4\text{ kHz}$ |
| Decode response 3 | DEC3 | -4.9 | -3.4 | -1.9 | | $V_{in} = -20\text{ dBd}$, $f = 1.4\text{ kHz}$ |
| Decode response 4 | DEC4 | -6.8 | -5.3 | -3.8 | | $V_{in} = -40\text{ dBd}$, $f = 5.0\text{ kHz}$ |
| Total harmonic distortion | THDNR | — | 0.0 | 0.3 | % | $V_{in} = 0\text{ dBd}$, $f = 1\text{ kHz}$ |
| Headroom | HRNR | 15 | 717 | — | dB | THD = 1% |
| Signal to noise ratio | SNNR | 73 | 78 | — | dB | Rg = 0 Ω weighted CCIR/AMR |
| Peak noise | NoPNR | — | — | ±0.3 | mVp-p | Measurement time = 40 ms |
| C, Sch trimmer | | | | | | |
| Attenuation level: -12dB | ATT_{-12dB} | -14 | -12 | -10 | dB | Digital input = -12 |
| Maximum attenuation | ATT_{max} | -37 | -31 | -25 | dB | Digital input = -31 |
| Trimmer step | TS | 0.6 | 1.0 | 1.4 | dB | |
| Surround (L+R, L-R) <MIXOUT> | | | | | | |
| Total harmonic distortion | THDSU | — | 0.05 | 0.2 | % | $V_{in} = 0\text{ dBd}$, $f = 1\text{ kHz}$ |
| Signal to noise ratio | SNSU | 85 | 90 | — | dB | Rg = 0 Ω weighted CCIR/AMR |

Electrical Characteristics (Digital Delay)

($T_a = 25^\circ\text{C}$, $V_{CC} = 9\text{ V}$, $V_{DD} = 5\text{ V}$, $V_{in} = 200\text{ mVrms}$, $f_{ck} = 4\text{ MHz}$ unless otherwise noted)

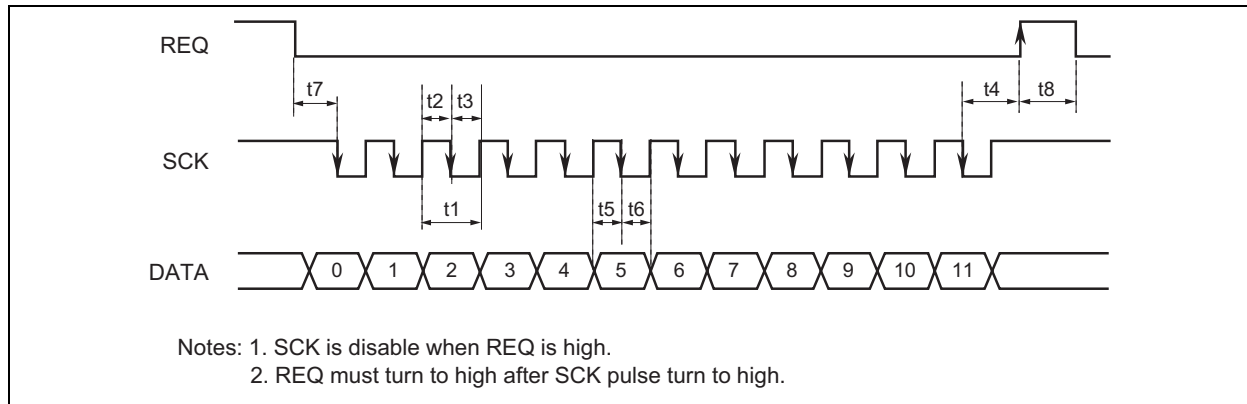
| Item | Symbol | Limits | | | Unit | Conditions | |
|------------------------|--------|--------|-------|-------|------|--|---------------|
| | | Min | Typ | Max | | | |
| Digital delay | | | | | | | |
| Delay time | Td | 12.4 | 15.4 | 18.4 | ms | See delay time control (15/24) for delay time setting. | |
| | | 17.0 | 20.0 | 23.0 | | | |
| | | 25.6 | 28.6 | 31.6 | | | |
| | | 38.0 | 41.0 | 44.0 | | | |
| | | 46.2 | 49.2 | 52.2 | | | |
| | | 137.5 | 147.5 | 157.5 | | | |
| | | 186.6 | 196.6 | 206.6 | | | |
| Input-output gain | Gv | -3.0 | 0 | 3.0 | dB | | |
| Output distortion | THD | — | 0.3 | 0.6 | % | 30 kHz LPF | Td = 15.4 ms |
| | | — | 0.3 | 0.6 | | | Td = 20.0 ms |
| | | — | 0.5 | 1.0 | | | Td = 28.6 ms |
| | | — | 0.6 | 1.2 | | | Td = 41.0 ms |
| | | — | 0.7 | 1.4 | | | Td = 49.2 ms |
| | | — | 1.5 | 3.0 | | | Td = 147.5 ms |
| | | — | 2.0 | 4.0 | | | Td = 196.6 ms |
| Maximum output voltage | Vomax | 0.7 | 1.0 | — | Vrms | 30kHz LPF, THD = 10% | |
| Output noise voltage | No | — | -92 | -80 | dBv | Rg = 620 Ω , Vi = 0 mVrms, IHF-A | Td = 15.4 ms |
| | | — | -92 | -80 | | | Td = 20.0 ms |
| | | — | -92 | -80 | | | Td = 28.6 ms |
| | | — | -90 | -75 | | | Td = 41.0 ms |
| | | — | -90 | -75 | | | Td = 49.2 ms |
| | | — | -82 | -67 | | | Td = 147.5 ms |
| | | — | -77 | -62 | | | Td = 196.6 ms |
| Delay volume (VOL OUT) | | | | | | | |
| Input-output gain | Gv | 0 | 3 | 6 | dB | Volume max | |
| Maximum attenuation | ATTmax | — | -70 | -60 | dB | Delay off mode, Volume min, IHF-A | |

Test Circuit



Digital Control Specifications

(1) Data timing



| Item | Symbol | Min | Typ | Max | Unit |
|---------------------|--------|-----|-----|-----|------|
| SCK clock duration | t1 | 2 | — | — | μs |
| SCK "H" pulse width | t2 | 0.8 | — | — | μs |
| SCK "L" pulse width | t3 | 0.8 | — | — | μs |
| REQ hold time | t4 | 1.6 | — | — | μs |
| DATA setup time | t5 | 0.8 | — | — | μs |
| DATA hold time | t6 | 0.8 | — | — | μs |
| SCK setup time | t7 | 0.8 | — | — | μs |
| REQ "H" pulse width | t8 | 1.6 | — | — | μs |

(2) Data Format

| Serial Data Format | | | | | | | | | | | |
|--------------------|-----------|-----------|------|-----------|--------------|-------------|------|--------|------|---------|-------|
| Data | | | | | | | | | | Address | |
| BIT0 | BIT1 | BIT2 | BIT3 | BIT4 | BIT5 | BIT6 | BIT7 | BIT8 | BIT9 | BIT10 | BIT11 |
| ADD/SUB | NOISE SEQ | | | SELECTOR1 | | CENTER MODE | | No use | | 0 | 0 |
| SELECTOR2 | | SELECTOR3 | | MIX | LO1 | LO2 | LO3 | No use | | 0 | 1 |
| Cch. TRIMMER | | | | | Sch. TRIMMER | | | | | 1 | 0 |
| S1 | S2 | S3 | V1 | V2 | V3 | V4 | SFB | MOS | MIC | 1 | 1 |

(3) Decoder

— Address (BIT10, 11) = 0, 0

| ADD/SUB | |
|---------|------|
| Mode | BIT0 |
| ADD | 0 |
| SUB | 1 |

| NOISE SEQ | | | | |
|-----------|------|------|------|------|
| Mode | BIT1 | Mode | BIT2 | BIT3 |
| OFF | 0 | L | 0 | 0 |
| ON | 1 | C | 0 | 1 |
| | | R | 1 | 0 |
| | | S | 1 | 1 |

| SELECTOR 1 | | |
|------------|------|------|
| Mode | BIT4 | BIT5 |
| PRO LOGIC | 0 | 0 |
| BY-PASS | 0 | 1 |
| OTHER SUR | 1 | 0 |
| L/R MUTE | 1 | 1 |

| CENTER MODE | | |
|-------------|------|------|
| Mode | BIT6 | BIT7 |
| WIDE | 0 | 0 |
| NORMAL | 0 | 1 |
| PHANTOM | 1 | 0 |
| OFF | 1 | 1 |

— Address (BIT10, 11) = 0, 1

| SELECTOR 2 | | |
|------------|------|------|
| Mode | BIT0 | BIT1 |
| S' | 0 | 0 |
| L+R | 0 | 1 |
| L-R | 1 | 0 |
| MIC | 1 | 1 |

| SELECTOR 3 | | |
|--------------|------|------|
| Mode | BIT2 | BIT3 |
| BNR OUT | 0 | 0 |
| D OUT | 0 | 1 |
| 3STEREO/MUTE | 1 | 0 |
| | 1 | 1 |

| Delay Mix Switch | | |
|------------------|--------|------------|
| BIT4 (MIX) | DMIXSW | Remarks |
| 0 | OFF | Mixing OFF |
| 1 | ON | Mixing ON |

| LO (LOGIC DATA OUT) Open Collector | | | |
|------------------------------------|------------|------------|------------|
| Mode | BIT5 (LO1) | BIT6 (LO2) | BIT7 (LO3) |
| Output data "L" | 0 | 0 | 0 |
| Output data "H" | 1 | 1 | 1 |

— Address (BIT10, 11) = 1, 0

| Cch. TRIMMER | | | | | |
|--------------|-------|-------|-------|-------|--------|
| DATA | BIT0 | BIT1 | BIT2 | BIT3 | BIT4 |
| 0 | ±0 dB | ±0 dB | ±0 dB | ±0 dB | ±0 dB |
| 1 | -1 dB | -2 dB | -4 dB | -8 dB | -16 dB |

| Sch. TRIMMER | | | | | |
|--------------|-------|-------|-------|-------|--------|
| DATA | BIT5 | BIT6 | BIT7 | BIT8 | BIT9 |
| 0 | ±0 dB | ±0 dB | ±0 dB | ±0 dB | ±0 dB |
| 1 | -1 dB | -2 dB | -4 dB | -8 dB | -16 dB |

Volume Code

| C(S)ch. TRIMMER | | | | | | | | | | | |
|-----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| ATT(dB) | BIT0(5) | BIT1(6) | BIT2(7) | BIT3(8) | BIT4(9) | ATT(dB) | BIT0(5) | BIT1(6) | BIT2(7) | BIT3(8) | BIT4(9) |
| ±0 | 0 | 0 | 0 | 0 | 0 | -16 | 0 | 0 | 0 | 0 | 1 |
| -1 | 1 | 0 | 0 | 0 | 0 | -17 | 1 | 0 | 0 | 0 | 1 |
| -2 | 0 | 1 | 0 | 0 | 0 | -18 | 0 | 1 | 0 | 0 | 1 |
| -3 | 1 | 1 | 0 | 0 | 0 | -19 | 1 | 1 | 0 | 0 | 1 |
| -4 | 0 | 0 | 1 | 0 | 0 | -20 | 0 | 0 | 1 | 0 | 1 |
| -5 | 1 | 0 | 1 | 0 | 0 | -21 | 1 | 0 | 1 | 0 | 1 |
| -6 | 0 | 1 | 1 | 0 | 0 | -22 | 0 | 1 | 1 | 0 | 1 |
| -7 | 1 | 1 | 1 | 0 | 0 | -23 | 1 | 1 | 1 | 0 | 1 |
| -8 | 0 | 0 | 0 | 1 | 0 | -24 | 0 | 0 | 0 | 1 | 1 |
| -9 | 1 | 0 | 0 | 1 | 0 | -25 | 1 | 0 | 0 | 1 | 1 |
| -10 | 0 | 1 | 0 | 1 | 0 | -26 | 0 | 1 | 0 | 1 | 1 |
| -11 | 1 | 1 | 0 | 1 | 0 | -27 | 1 | 1 | 0 | 1 | 1 |
| -12 | 0 | 0 | 1 | 1 | 0 | -28 | 0 | 0 | 1 | 1 | 1 |
| -13 | 1 | 0 | 1 | 1 | 0 | -29 | 1 | 0 | 1 | 1 | 1 |
| -14 | 0 | 1 | 1 | 1 | 0 | -30 | 0 | 1 | 1 | 1 | 1 |
| -15 | 1 | 1 | 1 | 1 | 0 | -31 | 1 | 1 | 1 | 1 | 1 |

(4) Delay

— Address (BIT10, 11) = 1, 1

| Delay Time Control | | | | |
|--------------------|----------|----------|---------------------------------|-------------------------------|
| BIT0(S1) | BIT1(S2) | BIT2(S3) | DELAY TIME (Sampling frequency) | Delay LPF (Cut-off frequency) |
| 0 | 0 | 0 | 15.4 ms (1 MHz) | 7.0 kHz |
| 0 | 0 | 1 | 20.0 ms (667 kHz) | |
| 0 | 1 | 0 | 28.6 ms (500 kHz) | |
| 0 | 1 | 1 | 41.0 ms (400 kHz) | |
| 1 | 0 | 0 | 49.2 ms (333 kHz) | |
| 1 | 0 | 1 | 147.5 ms (111.1 kHz) | 3.0 kHz |
| 1 | 1 | 0 | 196.6 ms (83.3 kHz) | |
| 1 | 1 | 1 | Delay off mode (clock off) | |

| Feedback Switch | | |
|-----------------|--------|--------------|
| BIT7 (SFB) | SFB SW | Remarks |
| 0 | OFF | Feedback OFF |
| 1 | ON | Feedback ON |

Note: In surround mode only

| Mode Selector | |
|---------------|---------|
| BIT8 (MOS) | MODESEL |
| 0 | SU line |
| 1 | EC line |

| Microphone Mixing Switch | | |
|--------------------------|----------|----------------|
| BIT9 (MIC) | MICMIXSW | Remarks |
| 0 | OFF | Mic mixing OFF |
| 1 | ON | Mic mixing ON |

Note: 1. Settings in power up

When power is turned on, data is setting in under table by power on reset circuit.

| DECODER | | DELAY | |
|----------------|---------------|--------------------------|-----------|
| Mode | Settings | Mode | Settings |
| ADD/SUB | ADD | Delay time control | 20.0 ms |
| Noise SEQ | OFF | Volume control | $-\infty$ |
| SELECTOR1 | PROLOGIC | Feedback switch | OFF |
| Center mode | WIDE | Mode selector | SU line |
| SELECTOR2 | S' | Delay mix switch | OFF |
| SELECTOR3 | BNR OUT | Microphone mixing switch | OFF |
| LO (LOGIC OUT) | "L" | | |
| Cch. Trimmer | 0 dB, ATT (-) | | |
| Sch. Trimmer | 0 dB, ATT (-) | | |

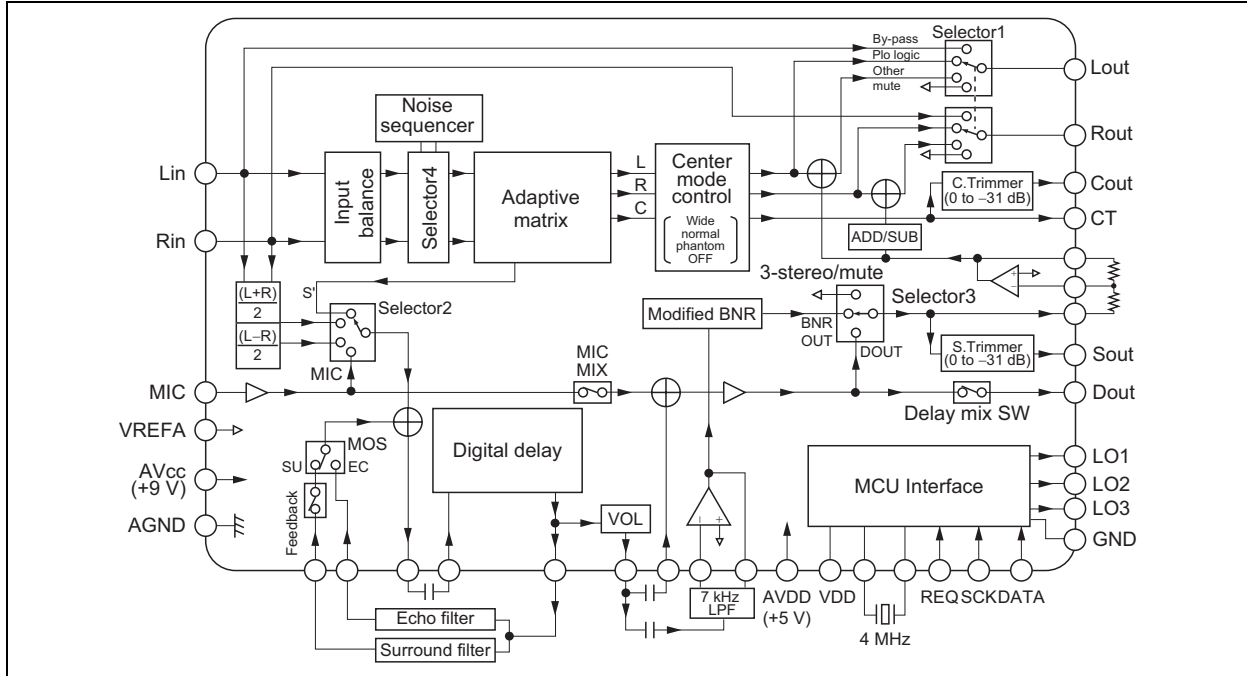
Notes: 2. The digital the noise sequencer stop when the clock is off.

| Volume Control | | | | |
|----------------|-----------|-----------|-----------|-----------------|
| BIT3 (V1) | BIT4 (V2) | BIT5 (V3) | BIT6 (V4) | VOL Attenuation |
| 1 | 1 | 1 | 1 | +3 dB |
| 1 | 1 | 1 | 0 | 0 dB |
| 1 | 1 | 0 | 1 | -2 dB |
| 1 | 1 | 0 | 0 | -3 dB |
| 1 | 0 | 1 | 1 | -4 dB |
| 1 | 0 | 1 | 0 | -6 dB |
| 1 | 0 | 0 | 1 | -8 dB |
| 1 | 0 | 0 | 0 | -9 dB |
| 0 | 1 | 1 | 1 | -10 dB |
| 0 | 1 | 1 | 0 | -12 dB |
| 0 | 1 | 0 | 1 | -15 dB |
| 0 | 1 | 0 | 0 | $-\infty$ |
| 0 | 0 | 1 | 1 | $-\infty$ |
| 0 | 0 | 1 | 0 | $-\infty$ |
| 0 | 0 | 0 | 1 | $-\infty$ |
| 0 | 0 | 0 | 0 | $-\infty$ |

Function Mode (Example)

| Mode | SUB-Mode | Digital Delay | Volume Level | | | Switch Condition | | | | | | Digital Delay Input | Note | | | |
|------------------------|------------|---|--|--------------------------|---|---|-------------|---------|--------------|------|----------|---------------------|-------------------|--|--|--|
| | | | Cch Trimmer | Sch Trimmer | Delay VOL | Selector | Center Mode | ADD/SUB | Delay MIX SW | Mode | Feedback | | | MIC MIX | | |
| Dolby Pro Logic | Wide | td = 15.4 ms, 20.0 ms, 28.6 ms | 0 to -31 dB 1 dB/step | 0 to -31 dB 1 dB/step | VOL OFF (0 dB) | 1 | Pro Logic | Wide | — | OFF | SU | OFF | S' | Feedback level can be changed by output port control (see block diagram) | | |
| | Normal | | | | | Normal | | | | | | | | | | |
| | Phantom | | | | | Phantom | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Digital space surround | Disco | * Delay time can be set to 5 position (15.4, 20.0, 28.6, 41.0, and 49.2 ms) | * Pro Logic decoder function is alive. For example C/S trimmer can be available. | | VOLATT +3 dB 0 dB -2 dB -3 dB -4 dB -6 dB -8 dB -9 dB -10 dB -12 dB -15 dB -∞ | Other | L-R | Phantom | SUB | OFF | SU | ON | $\frac{(L-R)}{2}$ | | | |
| | Hall | | | | | L+R | | ADD | | OFF | | $\frac{(L+R)}{2}$ | | | | |
| | Live | | | | | | | | | | | | | | | |
| | Option | | | | | 5 step delay time (BW = 7 kHz, fck = 4 MHz) | | | | | | | | | | |
| | | | | | | | | | | | | | | | | |
| Karaoke/echo | Short echo | td = 147.5 ms td = 195.5 ms | BW = 3 kHz | | | By-pass | MIC | OFF | ADD | ON | EC | OFF | MIC | | | |
| | Long echo | | | | | | | | | | | | | | | |
| By-pass | By-pass | td = 20.0 ms | -31 dB | | | By-pass | S' | OFF | ADD | OFF | SU | OFF | S' | | | |

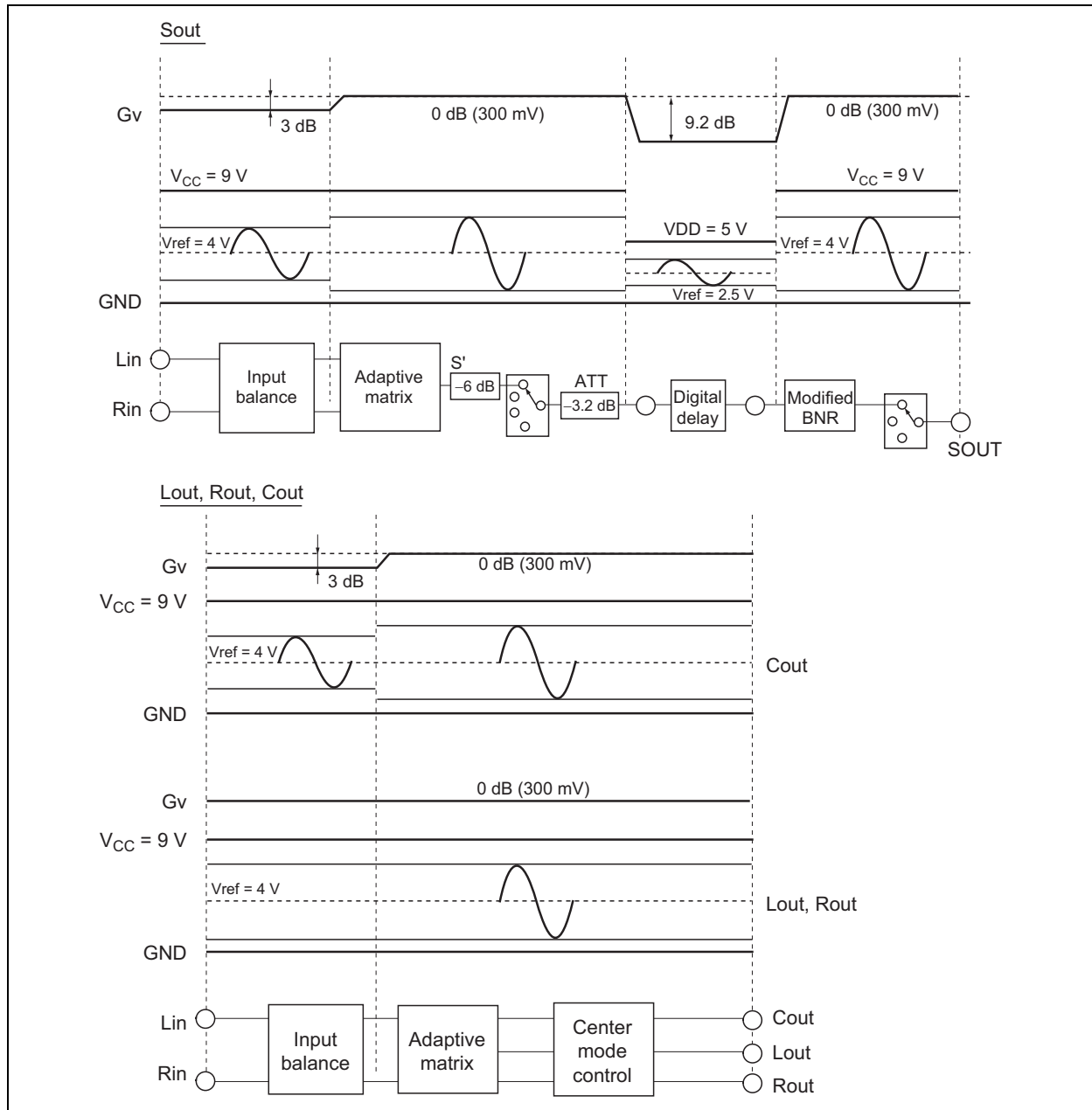
Function Block Diagram



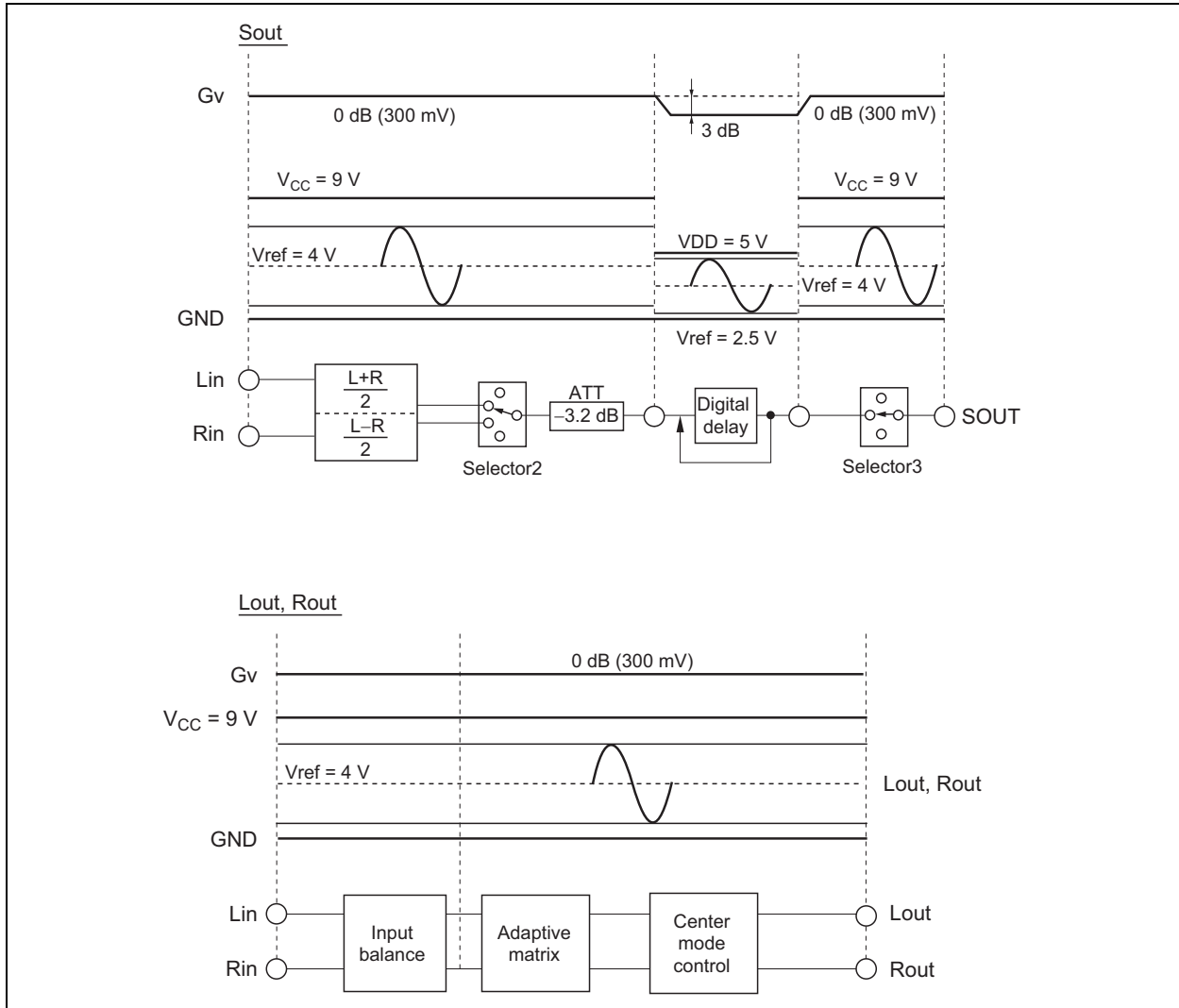
| Block Name | Function |
|----------------------|--|
| Input balance | Revises a level error between the input Lch and Rch for optimum decoder performance. |
| Noise sequencer | A simple noise sequencer circuit adjustment of output level. |
| Adaptive matrix | Continuously analyze the two-channel matrixes audio input to determine the direction and relative magnitude of encoded sound fields. |
| Center mode control | Possible to select 4-center mode position. (WIDE, NORMAL, PHANTOM, OFF) |
| C.Trimmer, S.Trimmer | This is the level adjustment volume of Cch and Sch. (0 to -30 dB: 1 dB/step) |
| Modified BNR | This block restores the signal to its original spectrum while reducing noise and certain cross talk signals in a final stage of the surround chain. |
| ADD/SUB | Select a positive phase signal or a negative phase signal with DIGITAL SPACE SURROUND MODE. |
| Selector1 | This is a selective switch to select the output signal of Lout and Rout from BY-PASS, PRO LOGIC, OTHER SUR and MUTE. |
| Selector2 | This is a selective switch to select the output signal of Sout from S', L+R, L-R and MIC. |
| Selector3 | This is a selective switch to select the output signal of Sout from BNR out, Dout and 3STEREO/MUTE. |
| Selector4 | This is a switch to connect a simple noise sequencer output to ADAPTIVE MATRIX stage for level adjustment. |
| Digital delay | Make 7 kinds of delay signal s. (15.4 ms to 196.6 ms) The delay function and CLK signal stop at the time of DELAY OFF MODE. This mode is for suppress bad effect of digital noise. |
| Feedback | This is a switch to select feedback mode (ON/OFF) for SURROUND MODE. |
| Mode sel (MOS) | This is a switch to select feedback signal from surround signal and echo signal. |
| VOL | Control the ATT level of delay signal from 3 dB to -∞ (12-step) |
| MIC MIX | This is a switch to mix microphone signal to a main signal (Lch, Rch) . |
| Delay mix SW | This is a switch to select output or not a mixed signal to DOUT pin. |

Level Diagram

Dolby Pro Logic Mode

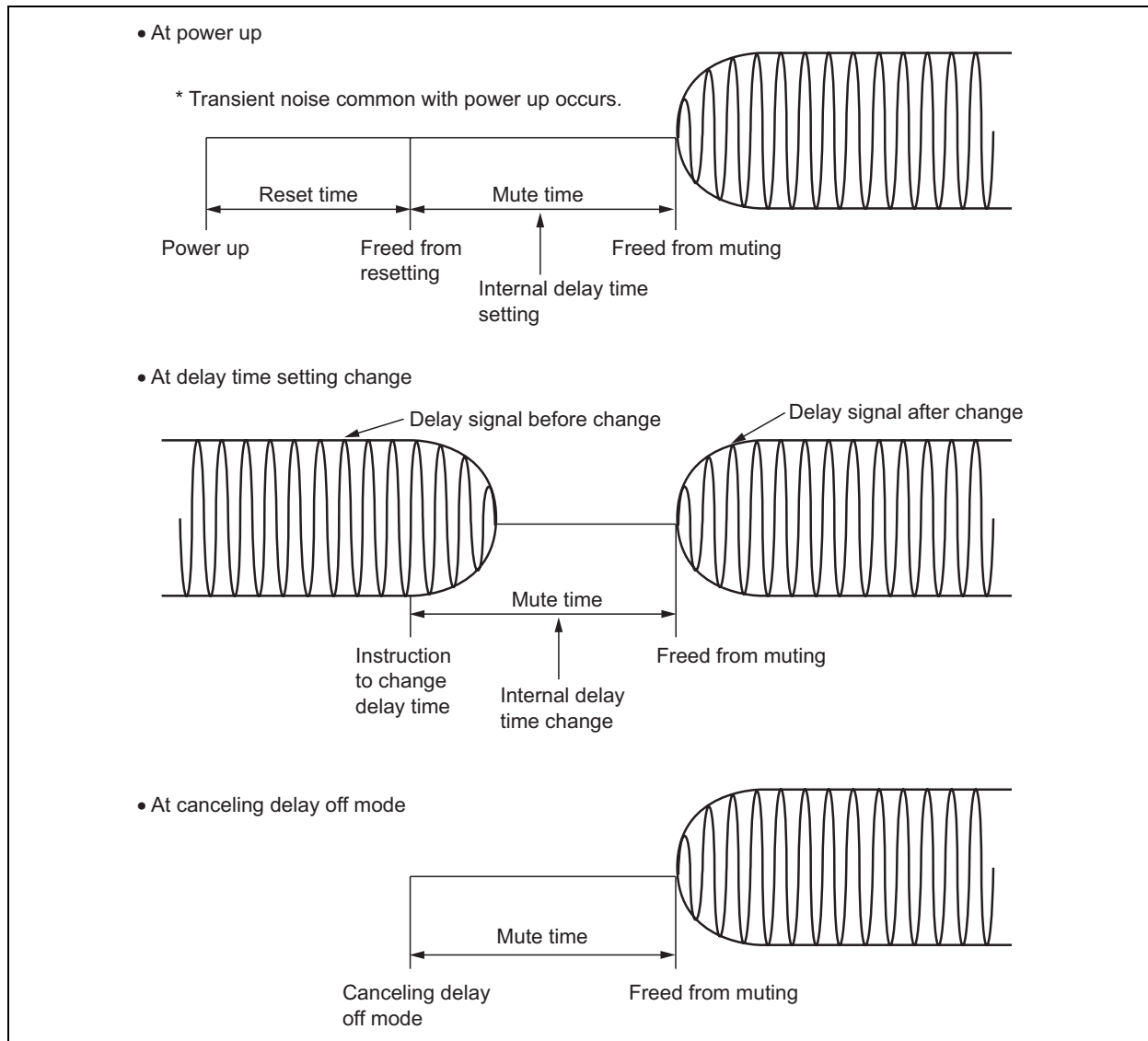


Digital Space Surround Mode



Auto Mute Function

The IC carries out auto mute function at the time of powering up, delay time setting change, and cancelling delay off mode, in order to suppress shock noise that the digital delay may produce.

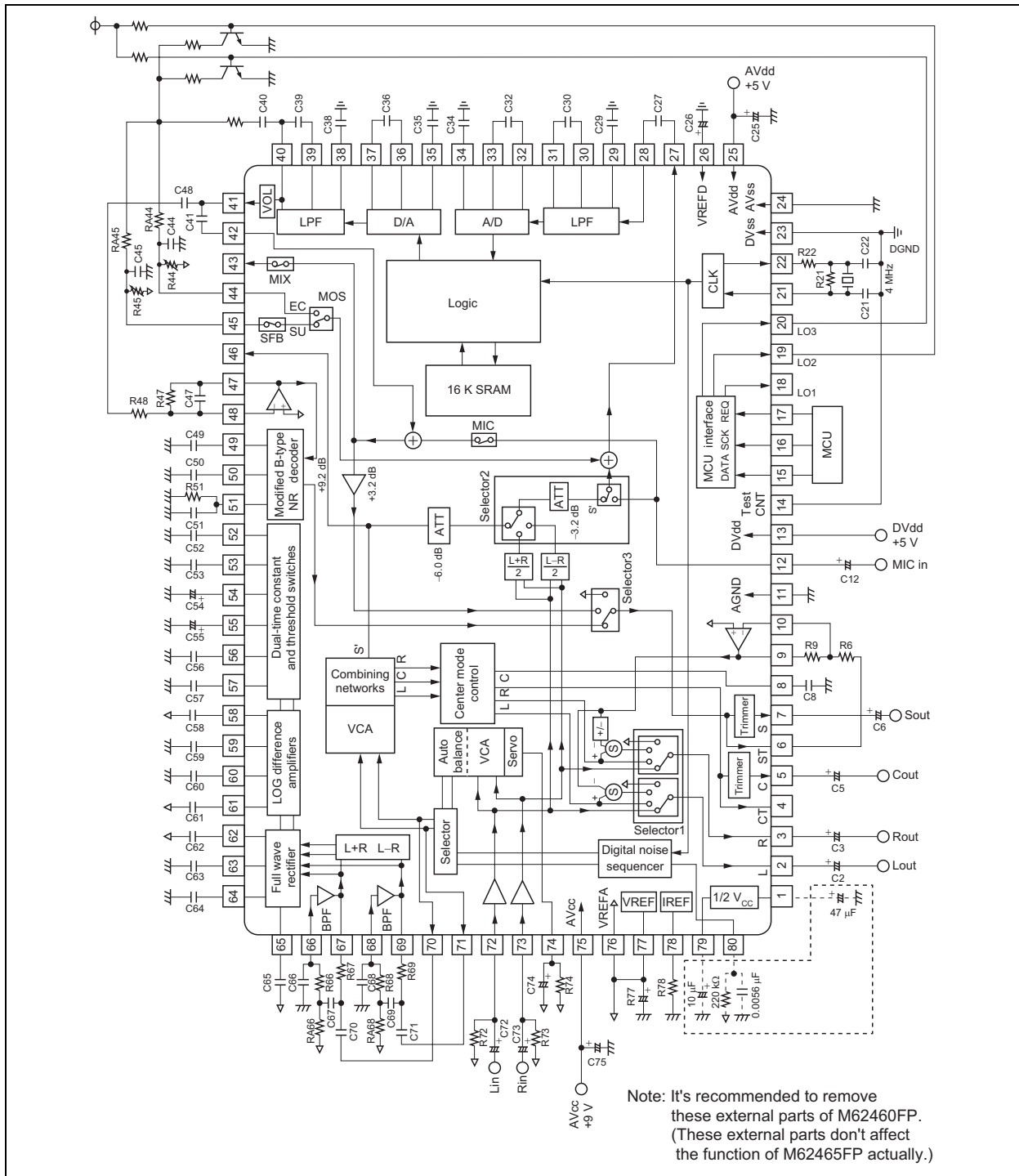


Mute time changes depending on set (or preset) delay time.

| Delay time | Mute time |
|-----------------|-----------|
| 15.4 to 49.2 ms | 123 ms |
| 147.5, 196.6 ms | 492 ms |

Application Example 1 (Upper compatible for M62460FP)

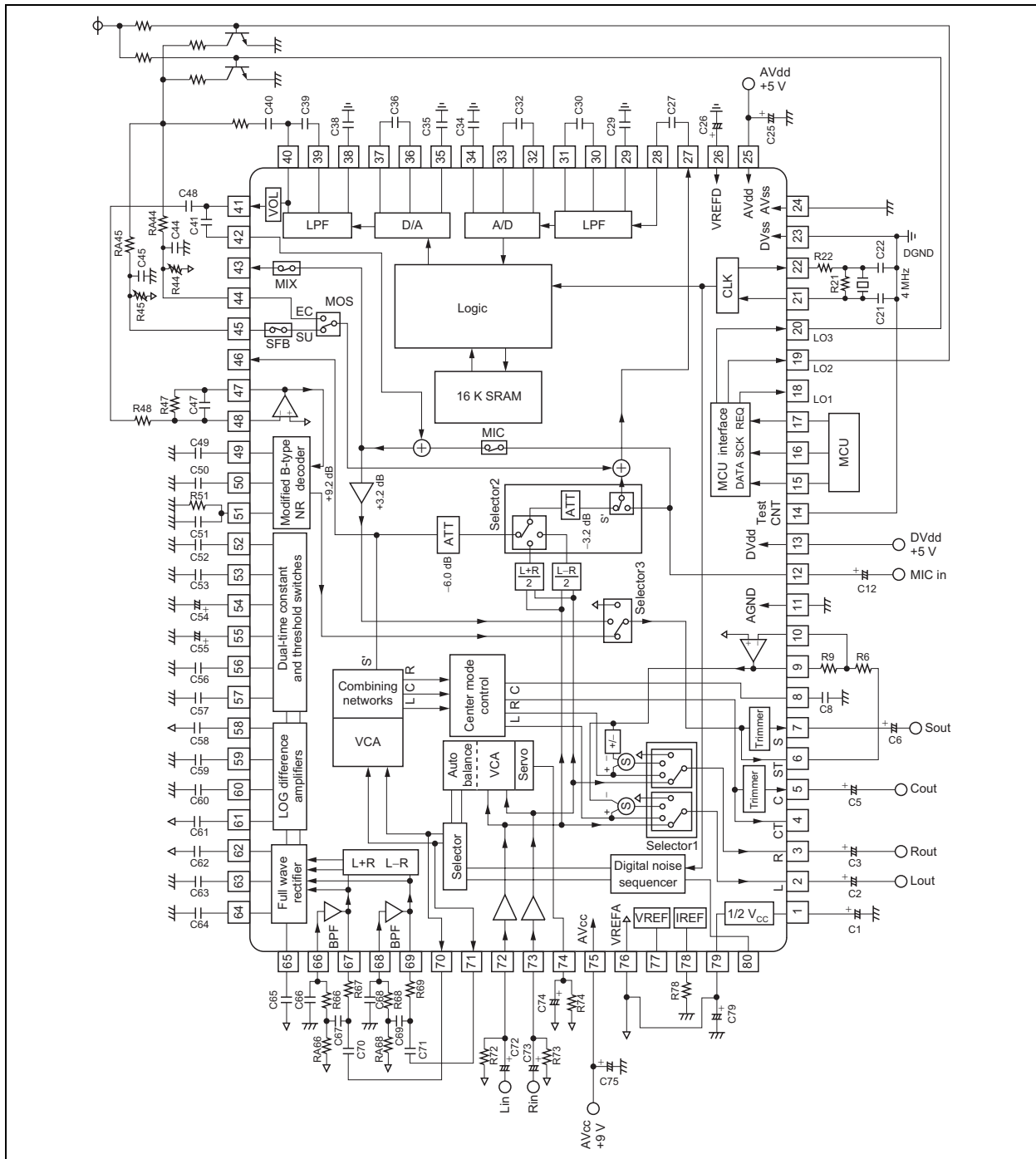
The example is fixed 4 V reference voltage type.



(Example) Feedback Level Control

Application Example 2

The example is $1/2V_{CC}$ reference voltage type.



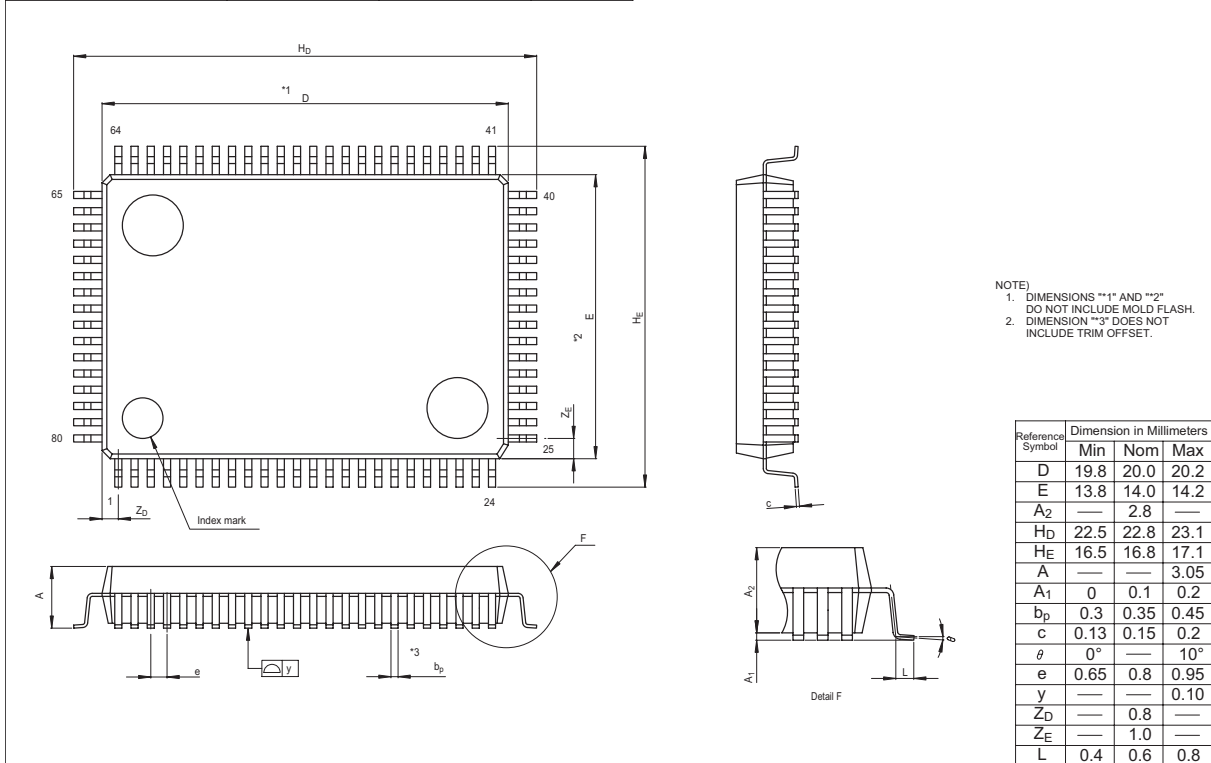
(Example) Feedback Level Control

External Parts List

| Parts No. | Values | Unit | Tol. | Parts No. | Values | Unit | Tol. |
|-----------|--------|------|------|-----------|--------|------|------|
| C1 | 47 | μF | | C65 | 0.1 | μF | 20% |
| C2 | 10 | μF | | C66 | 680 | pF | 5% |
| C3 | 10 | μF | | C67 | 0.1 | μF | 5% |
| C5 | 10 | μF | | C68 | 680 | pF | 5% |
| C6 | 10 | μF | | C69 | 0.1 | μF | 5% |
| C8 | 0.1 | μF | 10% | C70 | 0.1 | μF | 5% |
| C12 | 1 | μF | | C71 | 0.1 | μF | 5% |
| C21 | 27 | pF | | C72 | 10 | μF | |
| C22 | 27 | pF | | C73 | 10 | μF | |
| C25 | 100 | μF | | C74 | 22 | μF | 20% |
| C26 | 22 | μF | | C75 | 100 | μF | |
| C27 | 1 | μF | 5% | C77 | 220 | μF | |
| C29 | 0.01 | μF | 5% | C79 | 220 | μF | |
| C30 | 0.0018 | μF | 5% | | | | |
| C32 | 0.068 | μF | 5% | | | | |
| C34 | 0.1 | μF | 5% | | | | |
| C35 | 0.1 | μF | 5% | R6 | 10 | kΩ | |
| C36 | 0.068 | μF | 5% | R9 | 20 | kΩ | |
| C38 | 0.01 | μF | 5% | R21 | 1 | MΩ | |
| C39 | 0.0018 | μF | 5% | R22 | 1 | kΩ | |
| C40 | 0.1 | μF | | RA44 | 51 | kΩ | |
| C41 | 0.1 | μF | | RA45 | 51 | kΩ | |
| C44 | 1200 | pF | | R44 | Vol | | |
| C45 | 470 | pF | | R45 | Vol | | |
| C47 | 680 | pF | 10% | R47 | 24 | kΩ | 5% |
| C48 | 0.1 | μF | | R48 | 24 | kΩ | 5% |
| C49 | 0.0056 | μF | 5% | R51 | 330 | kΩ | 10% |
| C50 | 0.047 | μF | 5% | R66 | 47 | kΩ | 5% |
| C51 | 0.68 | μF | 10% | RA66 | 15 | kΩ | 5% |
| C52 | 0.22 | μF | 10% | R67 | 7.5 | kΩ | 5% |
| C53 | 0.22 | μF | 10% | R68 | 47 | kΩ | 5% |
| C54 | 4.7 | μF | 20% | RA68 | 15 | kΩ | 5% |
| C55 | 4.7 | μF | 20% | R69 | 7.5 | kΩ | 5% |
| C56 | 0.22 | μF | 10% | R72 | 22 | kΩ | |
| C57 | 0.22 | μF | 10% | R73 | 22 | kΩ | |
| C58 | 0.1 | μF | 20% | R74 | 4.7 | MΩ | 10% |
| C59 | 0.047 | μF | 5% | R78 | 100 | kΩ | 1% |
| C60 | 0.047 | μF | 5% | | | | |
| C61 | 0.1 | μF | 20% | | | | |
| C62 | 0.1 | μF | 20% | | | | |
| C63 | 0.022 | μF | 5% | | | | |
| C64 | 0.022 | μF | 5% | | | | |

Package Dimensions

| | | | |
|--------------------|--------------|---------------|------------|
| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
| P-QFP80-14x20-0.80 | PRQP0080GB-A | 80P6N-A | 1.6g |



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