## MUSES

# ±18V Operation 2-Channel Electronic Volume

■ **GENERAL DESCRIPTION**

The **MUSES72320** is a ±18V operation 2-channel electronic volume, which is optimized for high-end audio and professional audio applications with advanced circuitry and layout. The **MUSES72320** performs low noise and low distortion characteristics and with resistance ladder circuit.

All of functions are controlled via three-wired serial bus. Selectable 8-Chip address is available for using eight chips on same serial bus line.

It's suitable for highly linear volume control of Hi-fi audio systems.

■ **PACKAGE OUTLINE**
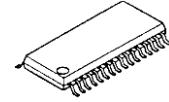
**MUSES72320V**

■ **FEATURES**

- Operating Voltage                ±8.5 to ±18V
- 3-Wired Serial Control          Chip Address Select Function
- Selectable 8-Chip Address    Available for using eight chips on same serial bus line
- Low Output Noise                 *It conforms to the characteristic of an external operational amplifier.
- Low Distortion                      *It conforms to the characteristic of an external operational amplifier.
- Volume                                0dB to −111.5dB /0.25dBstep, MUTE
                                              +31.5 to 0dB / 0.5dBstep
- Channel Separation             -120dB typ.
- Zero Cross Detection circuit Detection
- CMOS Technology
- Package Outline                   SSOP32

■ **BLOCK DIAGRAM**
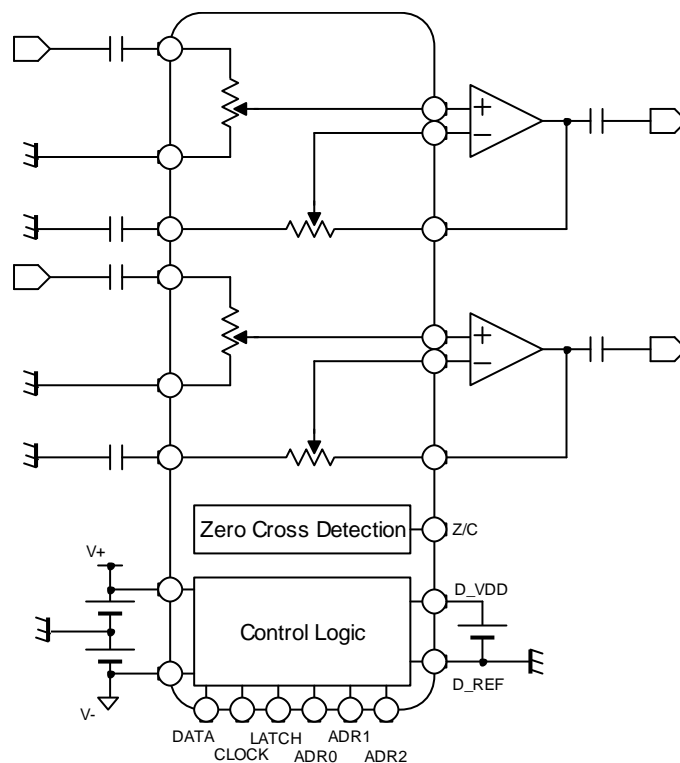
# MUSES72320

■ **PIN FUNCTION**
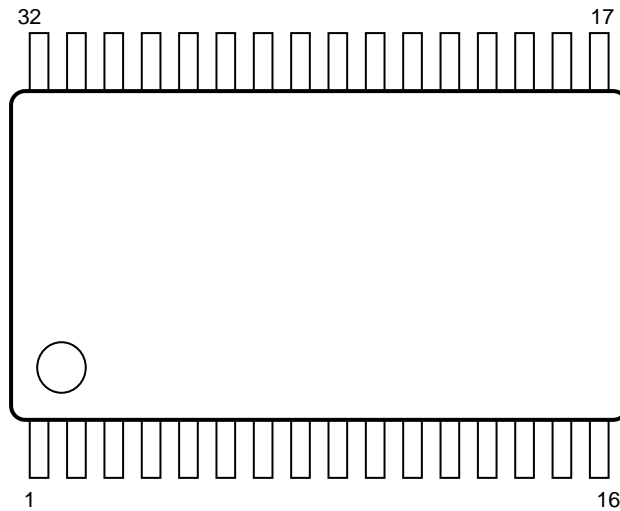


| No. | SYMBOL | FUNCTION | No. | SYMBOL | FUNCTION |
|-----|--------|----------|-----|--------|----------|
| 1 | Z/C REFL | Lch Zero Cross Detection circuit Reference Voltage | 17 | D_VDD | Digital block Power Supply |
| 2 | L_REF | Lch Reference Voltage | 18 | DATA | Control data signal input |
| 3 | L+ | Lch Opamp non-inverting input connect terminal | 19 | CLOCK | Clock signal input |
| 4 | L_REF | Lch Reference Voltage | 20 | LATCH | Latch signal input |
| 5 | L- | Lch Opamp inverting input connect terminal | 21 | D_REF | Digital block Reference Voltage |
| 6 | L_REF | Lch Reference Voltage | 22 | V+ | Power Supply (+) |
| 7 | OutL | Lch output | 23 | InR | Rch input |
| 8 | DCCAP_L | Switching noise rejection capacitor (Lch) | 24 | V+ | Power Supply (+) |
| 9 | DCCAP_R | Switching noise rejection capacitor (Rch) | 25 | V - | Power Supply (-) |
| 10 | OutR | Rch output | 26 | InL | Lch input |
| 11 | R_REF | Rch Reference Voltage | 27 | V - | Power Supply (-) |
| 12 | R- | Rch Opamp inverting input connect terminal | 28 | D_CAP | Digital block Noise Rejection Capacitor terminal |
| 13 | R_REF | Rch Reference Voltage | 29 | ADR2 | Chip address setting terminal 2 |
| 14 | R+ | Rch Opamp non-inverting input connect terminal | 30 | ADR1 | Chip address setting terminal 1 |
| 15 | R_REF | Rch Reference Voltage | 31 | ADR0 | Chip address setting terminal 0 |
| 16 | Z/C REFR | Rch Zero Cross Detection circuit Reference Voltage | 32 | Z/C | Zero Cross Detection circuit ON/OFF setting terminal |

# MUSES72320

## ■ ABSOLUTE MAXIMUM RATING (Ta=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|---|---|---|---|
| Power Supply Voltage | $V_+/V_-$ | +20/-20 | V |
| Maximum Input Voltage | $V_{IM}$ | $V_+/V_-$ | V |
| Power Dissipation | $P_D$ | 1000<br>NOTE: EIA/JEDEC STANDARD Test board (76.2x114.3x1.6mm, 2layer, FR-4) mounting | mW |
| Operating Temperature Range | Topr | -40 ~ +85 | °C |
| Storage Temperature Range | Tstg | -40 ~ +125 | °C |

## ■ ELECTRICAL CHARACTERISTICS

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| ◆ **Power Supply** (Ta=25°C, $V^+/V^-$=±15V, unless otherwise specified) | | | | | | |
| Operating Voltage | $V_+/V_-$ | | ±8.5 | ±15.0 | ±18.0 | V |
| Supply Current 1 | $I_{CC}$ | No signal | - | 2.0 | 10.0 | mA |
| Supply Current 2 | $I_{EE}$ | No signal | - | 2.0 | 10.0 | mA |
| ◆ **Input/Output Characteristics 1** (Ta=25°C,$V^+/V^-$=±15V, $V_{IN}$=2Vrms, f=1kHz, Volume=0dB, Gain=0dB, $V_{OUT}$ with MUSES01, $R_L$=47kΩ, unless otherwise specified) | | | | | | |
| Maximum Input Voltage | $V_{IM}$ | f=1kHz,THD=1%<br>Volume=-20dB | 10.9 | - | - | Vrms |
| Voltage Gain 1 | $G_{V1}$ | $V_{IN}$=2Vrms, f=1kHz | -0.5 | 0 | +0.5 | dB |
| Voltage Gain 2 | $G_{V2}$ | $V_{IN}$=200mVrms, f=1kHz<br>Gain=+15dB | +14 | +15 | +16 | dB |
| Voltage Gain Error 1 | $\Delta G_{V1}$ | $V_{IN}$=2Vrms, f=1kHz | -0.5 | 0 | +0.5 | dB |
| Voltage Gain Error 2 | $\Delta G_{V2}$ | $V_{IN}$=2Vrms, f=1kHz<br>Volume=-60dB | -1.0 | 0 | +1.0 | dB |
| Maximum Attenuation | $A_{TT}$ | $V_{IN}$=4Vrms, f=1kHz<br>Volume=-111.5dB, A-weight | - | -111.5 | - | dB |
| Mute level | Mute | f=1kHz, $V_{IN}$=4Vrms<br>Volume=Mute, A-weight | - | -120 | - | dB |
| Channel Separation 1 | CS1 | f=1kHz, $V_{IN}$ =2Vrms, Rg=0Ω<br>A-weight | - | -110 | -90 | dB |
| Channel Separation 2 | CS2 | f=20kHz, $V_{IN}$ =2Vrms, Rg=0Ω | - | -90 | - | dB |
| Input Impedance | $R_{IN}$ | 23pin, 26pin | 14 | 20 | - | kΩ |
| ◆ **Input/Output Characteristics 2** (Ta=25°C,$V^+/V^-$=±15V, $V_{IN}$=2Vrms, f=1kHz, Volume=0dB, Gain=0dB, $V_{OUT}$ with MUSES01, $R_L$=47kΩ, unless otherwise specified) | | | | | | |
| Maximum Output Voltage | $V_{OM}$ | f=1kHz,THD=1%<br>Volume=-6dB, Gain=+6dB | - | 9.5 | - | Vrms |
| Total Harmonic Distortion 1 | THD1 | f=1kHz,$V_{IN}$=1Vrms<br>BW=400Hz-30kHz | - | 0.0005 | - | % |
| Total Harmonic Distortion 2 | THD2 | f=10kHz,$V_{IN}$=1Vrms<br>BW=400Hz-30kHz | - | 0.001 | - | % |

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## ■ ELECTRICAL CHARACTERISTICS

### ◆ Input/Output Characteristics 3
(Ta=25°C, V$^+$/V$^-$=±15V, V$_{IN}$=2Vrms, f=1kHz, Volume=0dB, V$_{OUT}$ : 3pin, 14pin, R$_L$=100kΩ, unless otherwise specified)

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| Output Noise1 | V$_{NO1}$ | Rg=0Ω, A-weight | - | -118 (1.26μ) | -100 (10μ) | dBV (Vrms) |
| Output Noise2 | V$_{NO2}$ | Volume=-111.5dB Rg=0Ω, A-weight | - | -118 (1.26μ) | - | dBV (Vrms) |

## ■ Logic Control Characteristics

| PARAMETER | SYMBOL | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| **◆ Digital block Power Supply Characteristics** | | | | | | |
| D_VDD Terminal Input Voltage | V$_{DVDD}$ | 17pin Terminal Input | - | - | 0.8*V+ | V |
| D_REF Terminal Input Voltage | V$_{DREF}$ | 21pin Terminal Input | V - | - | - | V |
| Digital block Supply Voltage Range | V$_{DD}$ | V$_{DD}$ = V$_{DVDD}$ − V$_{DREF}$ | 3.0 | 5.0 | 6.0 | V |
| **◆ Logic Control Terminal Characteristics** | | | | | | |
| (Ta=25°C, V$^+$/V$^-$=±15V, V$_{DREF}$ =0V, unless otherwise specified) | | | | | | |
| High Level Input Voltage1 | V$_{IH1}$ | DATA, CLOCK, LATCH | 0.7*V$_{DD}$ | - | V$_{DD}$ | V |
| Low Level Input Voltage1 | V$_{IL1}$ | DATA, CLOCK, LATCH | 0 | - | 0.3*V$_{DD}$ | V |
| **◆ Chip Address / Zero cross Terminal Characteristics** | | | | | | |
| (Ta=25°C, V$^+$/V$^-$=±15V, V$_{DREF}$ =0V, unless otherwise specified) | | | | | | |
| High Level Input Voltage2 | V$_{IH2}$ | ADR0, ADR1, ADR2, Z/C | 0.7*V$_{DD}$ | - | V$^+$ | V |
| Low Level Input Voltage2 | V$_{IL2}$ | ADR0, ADR1, ADR2, Z/C | 0 | - | 0.3*V$_{DD}$ | V |

■ **TERMINAL DESCRIPTION**
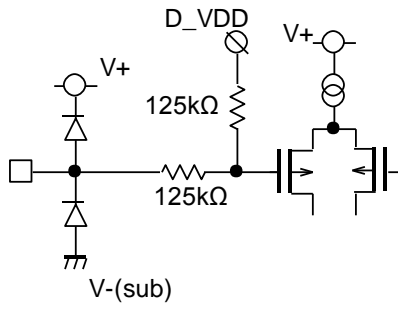
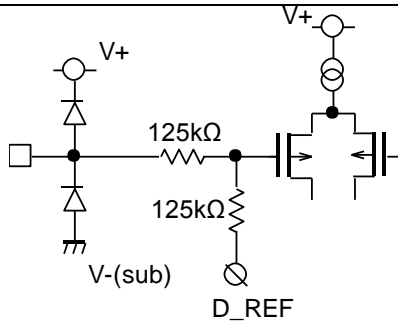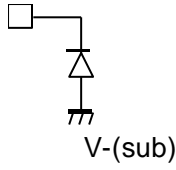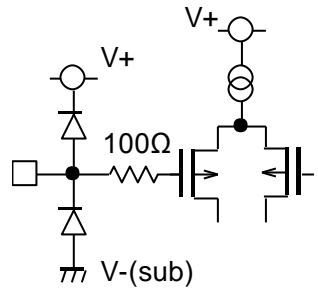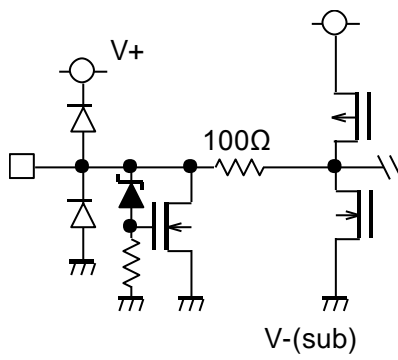| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | TERMINAL DC VOLTAGE |
|---|---|---|---|---|
| 23<br>26 | InR<br>InL | Rch input<br>Lch input |  | 0V |
| 2<br>4<br>6<br>11<br>13<br>15 | L_REF<br><br>R_REF | Lch Reference Voltage<br><br>Rch Reference Voltage |  | 0V |
| 3<br><br>14 | L+<br><br>R+ | Lch Opamp non-inverting input connect terminal<br>Rch Opamp non-inverting input connect terminal |  | 0V |
| 5<br><br>12 | L-<br><br>R- | Lch Opamp inverting input connect terminal<br>Rch Opamp inverting input connect terminal |  | 0V |

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■ TERMINAL DESCRIPTION

| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | TERMINAL DC VOLTAGE |
|---|---|---|---|---|
| 7<br>10 | OutL<br>OutR | Lch output<br>Rch output |  | 0V |
| 8<br><br>9 | DCCAP_L<br><br>DCCAP_R | Switching noise rejection capacitor (Lch)<br><br>Switching noise rejection capacitor (Rch) |  | 0V |
| 16<br><br>1 | Z/C REFR<br><br>Z/C REFL | Rch Zero Cross Detection circuit Reference Voltage<br>Lch Zero Cross Detection circuit Reference Voltage |  | 0V |
| 18<br>19<br>20 | DATA<br>CLOCK<br>LATCH | Control data signal input<br>Clock signal input<br>Latch signal input |  | - |

# MUSES72320

■ TERMINAL DESCRIPTION

| PIN NO. | SYMBOL | FUNCTION | EQUIVALENT CIRCUIT | TERMINAL DC VOLTAGE |
|---------|--------|----------|--------------------|---------------------|
| 21 | D_REF | Digital block Reference Voltage |  | - |
| 17 | D_VDD | Digital block Power Supply |  | - |
| 22 24 | V$^+$ | Power Supply (+) |  | V$^+$ |
| 32 29 30 31 | Z/C ADR2 ADR1 ADR0 | Zero Cross Detection circuit ON/OFF setting terminal Chip address setting terminal 2 Chip address setting terminal 1 Chip address setting terminal 0 |  | - |
| 28 | D_CAP | Digital block Noise Rejection Capacitor terminal |  | 0V |

# MUSES72320

■ **TEST CIRCUIT 1**

Supply Current 1 ($I_{CC}$) , Supply Current 1 ($I_{EE}$)
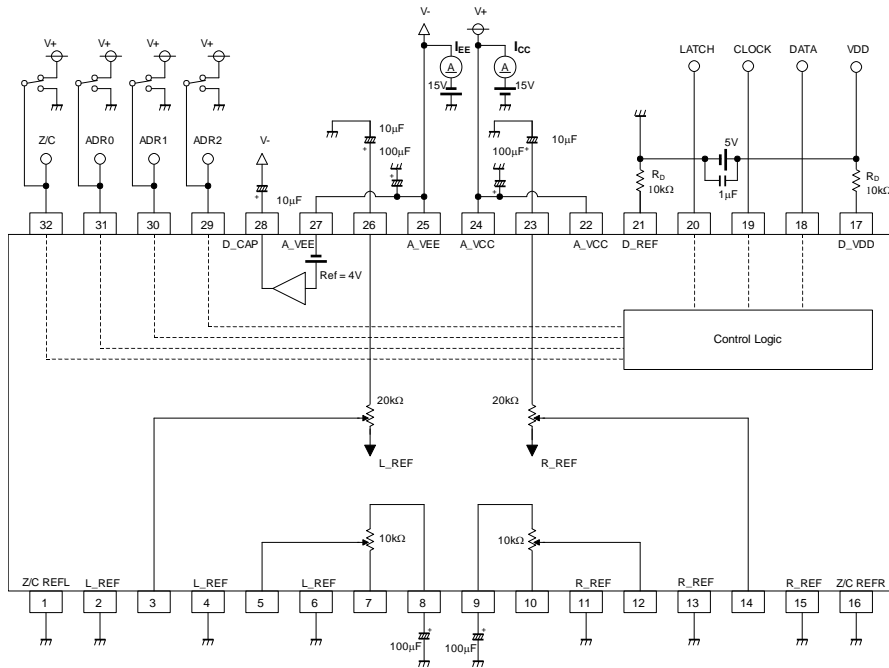


■ **TEST CIRCUIT 2**

Maximum Input Voltage ($V_{IM}$), Maximum Output Voltage ($V_{OM}$), Voltage Gain 1 ($G_{V1}$), Voltage Gain 2 ($G_{V2}$),
Maximum Attenuation ($A_{TT}$), Mute level Mute), Total Harmonic Distortion 1(THD1), Total Harmonic Distortion 2(THD2)
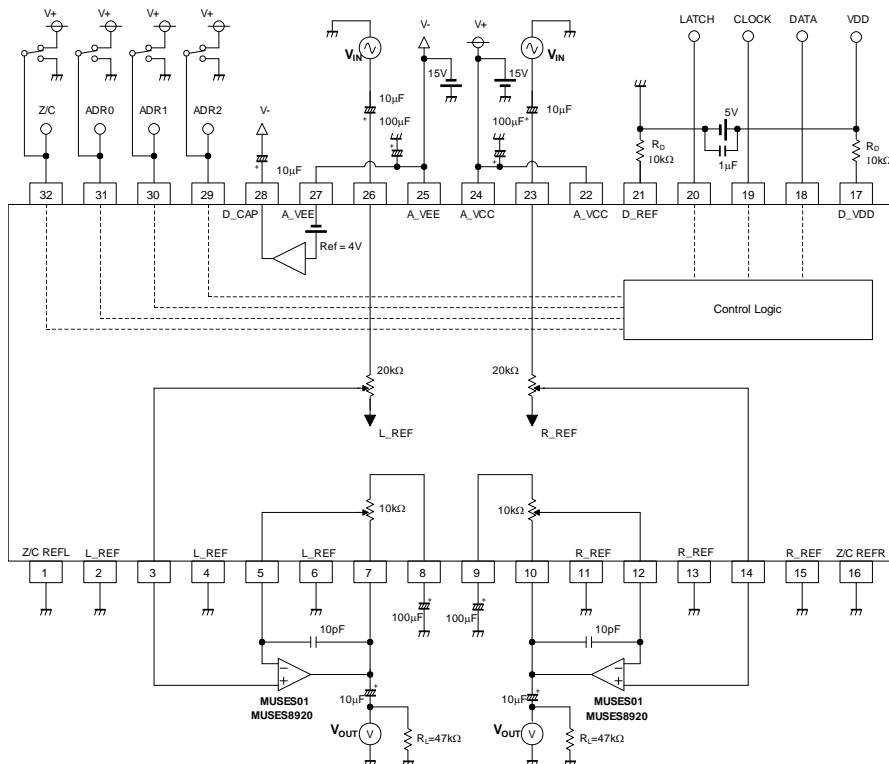
## ■ TEST CIRCUIT 3

Output Noise 1($V_{NO1}$), Output Noise 1($V_{NO2}$)
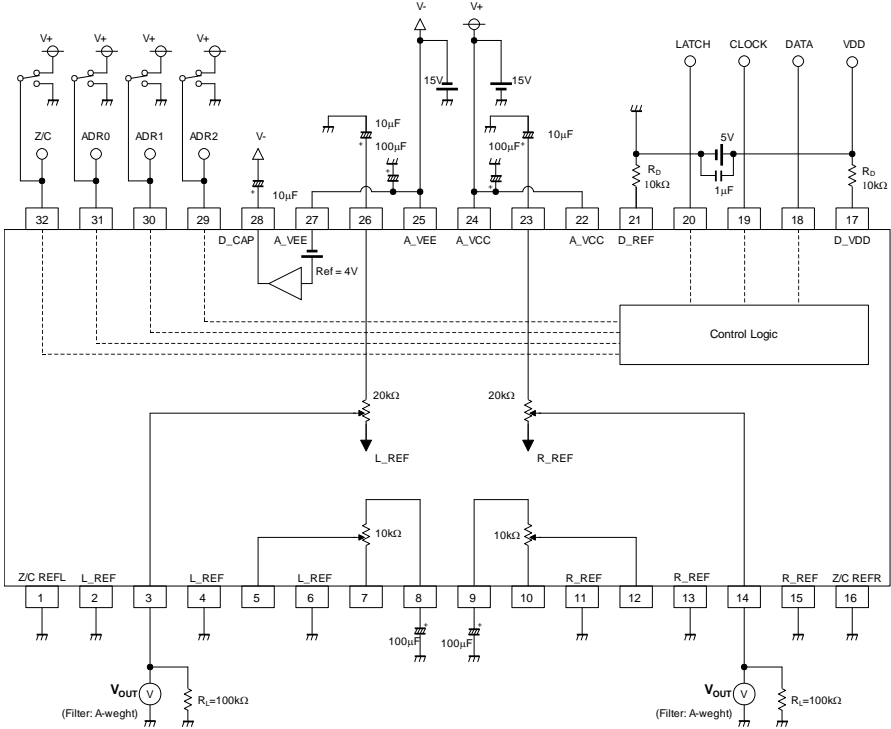


## ■ TEST CIRCUIT 4

Channel Separation 1(CS1), Channel Separation 2(CS2)
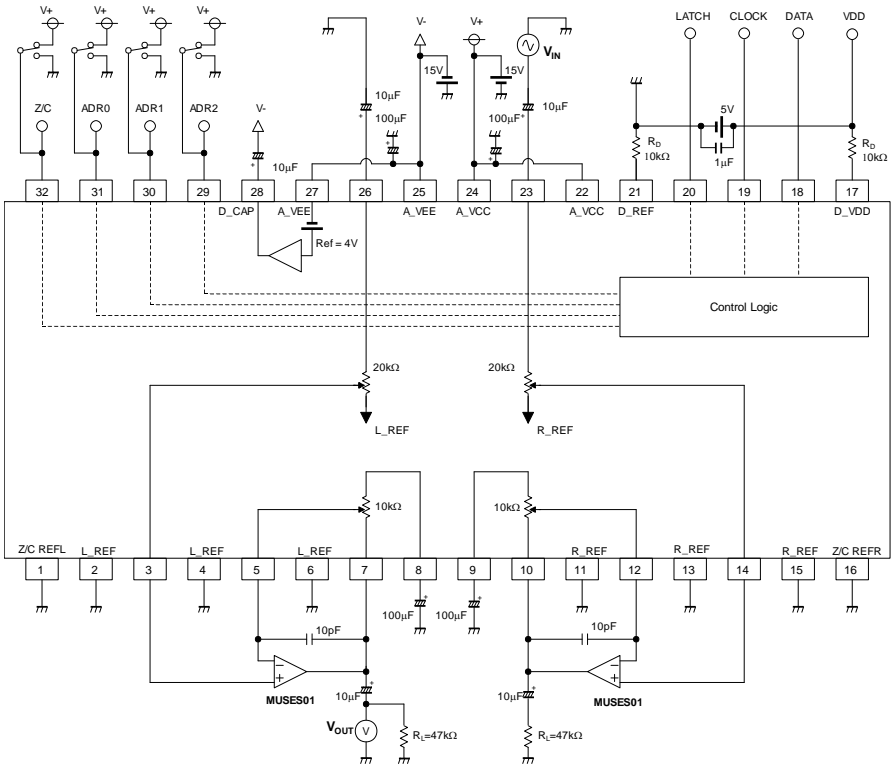
# MUSES72320

## ■ APPLICATION CIRCUIT

<Application circuit with **J-FET** Input type OpAmp.>



<Application circuit with **Bipolar** Input type OpAmp.>
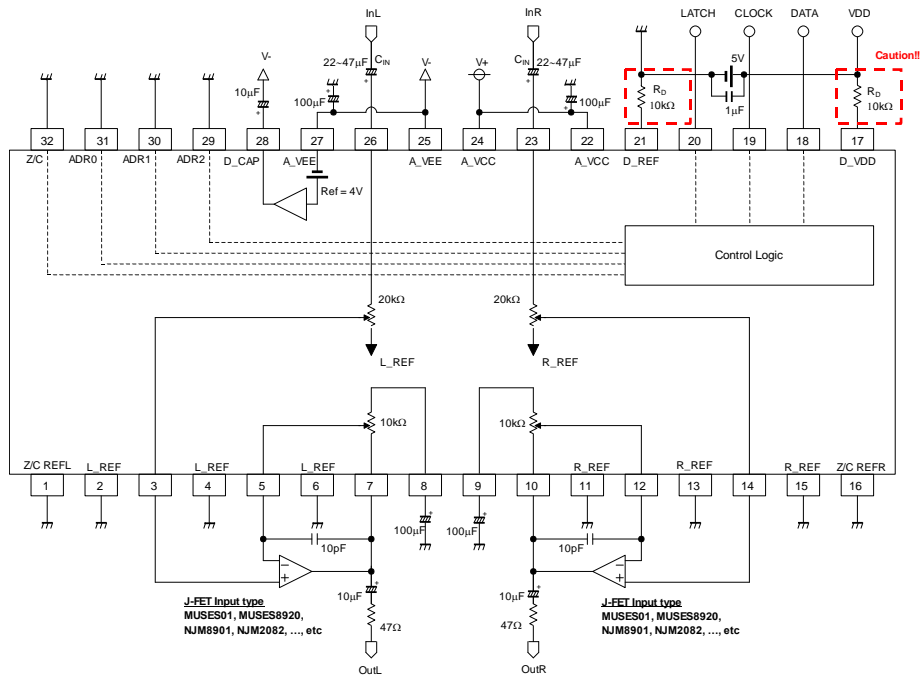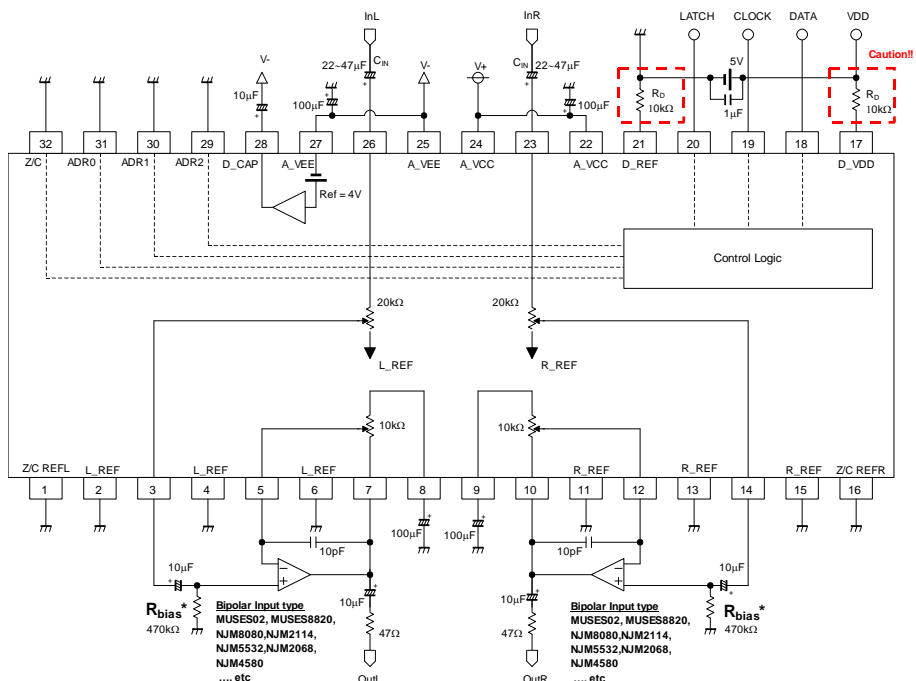
■ **NOTES**

It is necessary to add $R_D$ to 10kΩ for the over-current protection. Without this resistor, the IC may be damaged, depending on the power procedure.



a) The power[V+] is greater than the power[D_VDD].          b) The power[V+] is less than the power[D_VDD].
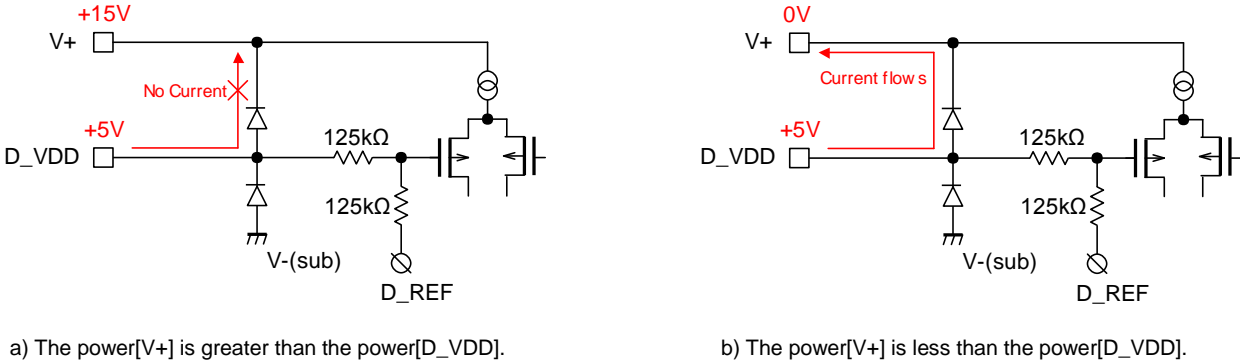
Fig.1 Damaged path of the MUSES72320

The input coupling capacitors($C_{IN}$) and the input resistance($R_{IN}$=20kΩ) form a high-pass filter with the corner frequency determined in [fc=1/($2\pi R_{IN}C_{IN}$)].

The $R_{bias}$ affects the Volume(Att.) linearity characteristic. When $R_{bias}$ value is too small, the amount of attenuation increases, so that the output amplitude becomes small and THD deteriorates by an internal analog switch. On the other hand, when $R_{bias}$ is too large, it may be affected at the noise from the outside. Please decide resistance value after it verifies it enough by an actual application.

Separate for REF terminals for High and Middle voltage(AC) and REF terminals for Low voltage(AC) in the pattern design.

| Pin No. | Function | Purpose |
|---|---|---|
| 2 | Lch Reference Voltage | for Low voltage(AC) signal |
| 4 | Lch Reference Voltage | for Middle voltage(AC) signal |
| 6 | Lch Reference Voltage | for High voltage(AC) signal |
| 11 | Rch Reference Voltage | for High voltage(AC) signal |
| 13 | Rch Reference Voltage | for Middle voltage(AC) signal |
| 15 | Rch Reference Voltage | for Low voltage(AC) signal |

Table.1 Purpose of Reference Voltage Terminal

# MUSES72320

## ■ CONTROL DATA FORMAT



(*) MSB First
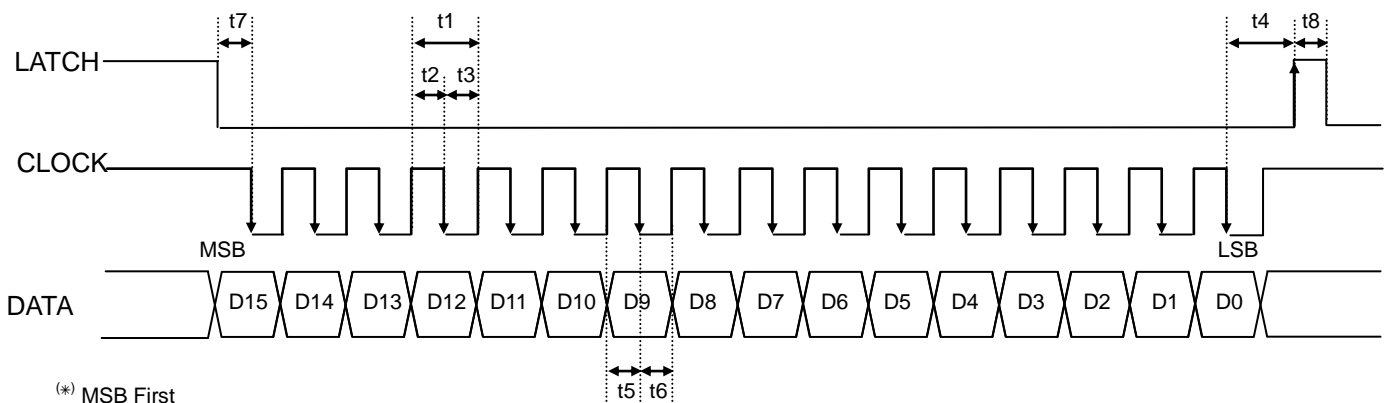
Note.) Set CLOCK in High to prevent incorrect operation during a standby period.

| SYMBOL | PARAMETER | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| t1 | CLOCK Clock Width | 4 | - | - | μsec |
| t2 | CLOCK Pulse Width (High) | 2 | - | - | μsec |
| t3 | CLOCK Pulse Width (Low) | 2 | - | - | μsec |
| t4 | LATCH Rise Hold Time | 4 | - | - | μsec |
| t5 | DATA Setup Time | 1.6 | - | - | μsec |
| t6 | DATA Hold Time | 1.6 | - | - | μsec |
| t7 | CLOCK Setup Time | 1.6 | - | - | μsec |
| t8 | LATCH High Pulse Width | 1.6 | - | - | μsec |

## ■ CONTROL DATA
MUSES72320 control data is constructed with 16bits.

MSB                                                                                                              LSB

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Data | | | | | | | | Select Address | | | | Chip Address | | | |

MSB                                                                                                              LSB

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lch Volume Control (Att.) | | | | | | | | 0 | 0 | 0 | 0 | 0 | * | * | * |
| 0 | 0 | Lch Volume Control (Gain) | | | | | | 0 | 0 | 0 | 1 | 0 | * | * | * |
| Rch Volume Control (Att.) | | | | | | | | 0 | 0 | 1 | 0 | 0 | * | * | * |
| 0 | 0 | Rch Volume Control (Gain) | | | | | | 0 | 0 | 1 | 1 | 0 | * | * | * |
| L/R Cont 1 | L/R Cont 2 | Z/C | Don't Care | Don't Care | Don't Care | Don't Care | Don't Care | 0 | 1 | 0 | 0 | 0 | * | * | * |

\* Chip address is set by chip address select terminals (ADR0, ADR1,ADR2) status.

| Chip address select terminal | | | Chip address | | | |
|---|---|---|---|---|---|---|
| ADR2 (29pin) | ADR1 (30pin) | ADR0 (31pin) | D3 | D2 | D1 | D0 |
| Low | Low | Low | 0 | 0 | 0 | 0 |
| Low | Low | High | 0 | 0 | 0 | 1 |
| Low | High | Low | 0 | 0 | 1 | 0 |
| Low | High | High | 0 | 0 | 1 | 1 |
| High | Low | Low | 0 | 1 | 0 | 0 |
| High | Low | High | 0 | 1 | 0 | 1 |
| High | High | Low | 0 | 1 | 1 | 0 |
| High | High | High | 0 | 1 | 1 | 1 |

## ■ INITIAL CONDITION

MSB                                                                                                                      LSB

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | * | * | * |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | * | * | * |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | * | * | * |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | * | * | * |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | * | * | * |

Note.) This product starts up by MUTE setting in power "ON". Use it after removing MUTE of each setting.

If any audio signal is inputted in input signal terminal before power "ON", it may cause initial condition abnormality.

In conditions of use such as the above, it prevents that abnormality by setting MUTE before power "OFF"

## ■ DEFINITION OF RESISTOR

◆**Volume Control (Att.)**   : 0dB to –111.5dB / 0.5dBstep.
   : Lch Volume and Rch Volume are controlled independently when L/R Cont 1 ="0".

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|
| | | | | | | | | | | | | | | | |

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|
| Lch Volume Control (Att.) | | | | | | | | 0 | 0 | 0 | 0 | * | * | * | * |
| Rch Volume Control (Att.) | | | | | | | | 0 | 0 | 1 | 0 | * | * | * | * |

< Volume Control Data >

| Data | | | | | | | | Setting |
|-----|-----|-----|-----|-----|-----|-----|-----|---------|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Mute[*] |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0dB |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | -0.5dB |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | -1.0dB |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | -1.5dB |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | -2.0dB |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | -2.5dB |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | -3.0dB |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | -3.5dB |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | -4.0dB |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | -4.5dB |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | -5.0dB |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | -5.5dB |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | -6.0dB |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | -6.5dB |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | -7.0dB |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | -7.5dB |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | -8.0dB |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | -8.5dB |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | -9.0dB |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | -9.5dB |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | -10.0dB |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | -10.5dB |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | -11.0dB |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | -11.5dB |
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | -12.0dB |
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | -12.5dB |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | -13.0dB |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | -13.5dB |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | -14.0dB |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | -14.5dB |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | -15.0dB |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | -15.5dB |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | -16.0dB |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | -16.5dB |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | -17.0dB |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | -17.5dB |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | -18.0dB |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | -18.5dB |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -19.0dB |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | -19.5dB |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | -20.0dB |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | -20.5dB |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | -21.0dB |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | -21.5dB |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | -22.0dB |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | -22.5dB |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | -23.0dB |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | -23.5dB |

< Volume Control Data >

| Data | | | | | | | | Setting |
|---|---|---|---|---|---|---|---|---|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | -24.0dB |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | -24.5dB |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | -25.0dB |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | -25.5dB |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | -26.0dB |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | -26.5dB |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | -27.0dB |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | -27.5dB |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | -28.0dB |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | -28.5dB |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | -29.0dB |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | -29.5dB |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | -30.0dB |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | -30.5dB |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | -31.0dB |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | -31.5dB |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | -32.0dB |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | -32.5dB |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | -33.0dB |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | -33.5dB |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | -34.0dB |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -34.5dB |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | -35.0dB |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | -35.5dB |
| 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | -36.0dB |
| 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | -36.5dB |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | -37.0dB |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | -37.5dB |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | -38.0dB |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | -38.5dB |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | -39.0dB |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | -39.5dB |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | -40.0dB |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | -40.5dB |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | -41.0dB |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | -41.5dB |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | -42.0dB |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | -42.5dB |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | -43.0dB |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | -43.5dB |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | -44.0dB |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | -44.5dB |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | -45.0dB |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | -45.5dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | -46.0dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | -46.5dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | -47.0dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | -47.5dB |

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< Volume Control Data >

| Data | | | | | | | | Setting |
|------|------|------|------|------|------|------|------|---------|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | -48.0dB |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | -48.5dB |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | -49.0dB |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | -49.5dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | -50.0dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | -50.5dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | -51.0dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | -51.5dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | -52.0dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | -52.5dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | -53.0dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | -53.5dB |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | -54.0dB |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | -54.5dB |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | -55.0dB |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | -55.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | -56.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | -56.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | -57.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | -57.5dB |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | -58.0dB |
| 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | -58.5dB |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | -59.0dB |
| 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | -59.5dB |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | -60.0dB |
| 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | -60.5dB |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | -61.0dB |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | -61.5dB |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | -62.0dB |
| 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | -62.5dB |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | -63.0dB |
| 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | -63.5dB |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | -64.0dB |
| 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | -64.5dB |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | -65.0dB |
| 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | -65.5dB |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | -66.0dB |
| 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | -66.5dB |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | -67.0dB |
| 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | -67.5dB |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | -68.0dB |
| 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | -68.5dB |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | -69.0dB |
| 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | -69.5dB |
| 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | -70.0dB |
| 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | -70.5dB |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | -71.0dB |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | -71.5dB |

< Volume Control Data >

| Data | | | | | | | | Setting |
|------|------|------|------|------|------|------|------|---------|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | -72.0dB |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | -72.5dB |
| 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | -73.0dB |
| 1 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | -73.5dB |
| 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | -74.0dB |
| 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | -74.5dB |
| 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | -75.0dB |
| 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | -75.5dB |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | -76.0dB |
| 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | -76.5dB |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | -77.0dB |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | -77.5dB |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | -78.0dB |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | -78.5dB |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | -79.0dB |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | -79.5dB |
| 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | -80.0dB |
| 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | -80.5dB |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | -81.0dB |
| 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | -81.5dB |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | -82.0dB |
| 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | -82.5dB |
| 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | -83.0dB |
| 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | -83.5dB |
| 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | -84.0dB |
| 1 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | -84.5dB |
| 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | -85.0dB |
| 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | -85.5dB |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | -86.0dB |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | -86.5dB |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | -87.0dB |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | -87.5dB |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | -88.0dB |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | -88.5dB |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | -89.0dB |
| 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | -89.5dB |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | -90.0dB |
| 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | -90.5dB |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | -91.0dB |
| 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | -91.5dB |
| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | -92.0dB |
| 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | -92.5dB |
| 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | -93.0dB |
| 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | -93.5dB |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | -94.0dB |
| 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | -94.5dB |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | -95.0dB |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | -95.5dB |

< Volume Control Data >

| Data | | | | | | | | Setting |
|---|---|---|---|---|---|---|---|---|
| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | -96.0dB |
| 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | -96.5dB |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | -97.0dB |
| 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | -97.5dB |
| 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | -98.0dB |
| 1 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | -98.5dB |
| 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | -99.0dB |
| 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | -99.5dB |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | -100.0dB |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | -100.5dB |
| 1 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | -101.0dB |
| 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | -101.5dB |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | -102.0dB |
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | -102.5dB |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | -103.0dB |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | -103.5dB |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | -104.0dB |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | -104.5dB |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | -105.0dB |
| 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | -105.5dB |
| 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | -106.0dB |
| 1 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | -106.5dB |
| 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | -107.0dB |
| 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | -107.5dB |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | -108.0dB |
| 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | -108.5dB |
| 1 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | -109.0dB |
| 1 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | -109.5dB |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | -110.0dB |
| 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | -110.5dB |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | -111.0dB |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | -111.5dB |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Mute |

(*)Initial Setting

◆**Volume Control (Gain.)** : +31.5dB to 0dB / 0.5dBstep.
: Lch Volume and Rch Volume are controlled independently when L/R Cont 2 =”0”.

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | | | Lch Volume Control (Gain) | | | | 0 | 0 | 0 | 1 | 0 | * | * | * |
| 0 | 0 | | | Rch Volume Control (Gain) | | | | 0 | 0 | 1 | 1 | 0 | * | * | * |

< Volume Control Data >

| Data | | | | | | | Setting |
|---|---|---|---|---|---|---|---|
| D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0dB(+) |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | +0.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | +0.5dB |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | +1.0dB |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | +1.5dB |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | +2.0dB |
| 0 | 0 | 0 | 0 | 1 | 0 | 1 | +2.5dB |
| 0 | 0 | 0 | 0 | 1 | 1 | 0 | +3.0dB |
| 0 | 0 | 0 | 0 | 1 | 1 | 1 | +3.5dB |
| 0 | 0 | 0 | 1 | 0 | 0 | 0 | +4.0dB |
| 0 | 0 | 0 | 1 | 0 | 0 | 1 | +4.5dB |
| 0 | 0 | 0 | 1 | 0 | 1 | 0 | +5.0dB |
| 0 | 0 | 0 | 1 | 0 | 1 | 1 | +5.5dB |
| 0 | 0 | 0 | 1 | 1 | 0 | 0 | +6.0dB |
| 0 | 0 | 0 | 1 | 1 | 0 | 1 | +6.5dB |
| 0 | 0 | 0 | 1 | 1 | 1 | 0 | +7.0dB |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | +7.5dB |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | +8.0dB |
| 1 | 0 | 1 | 0 | 0 | 0 | 0 | +8.25dB |
| 0 | 0 | 1 | 0 | 0 | 0 | 1 | +8.5dB |
| 0 | 0 | 1 | 0 | 0 | 1 | 0 | +9.0dB |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | +9.5dB |
| 0 | 0 | 1 | 0 | 1 | 0 | 0 | +10.0dB |
| 0 | 0 | 1 | 0 | 1 | 0 | 1 | +10.5dB |
| 0 | 0 | 1 | 0 | 1 | 1 | 0 | +11.0dB |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | +11.5dB |
| 0 | 0 | 1 | 1 | 0 | 0 | 0 | +12.0dB |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | +12.5dB |
| 0 | 0 | 1 | 1 | 0 | 1 | 0 | +13.0dB |
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | +13.5dB |
| 0 | 0 | 1 | 1 | 1 | 0 | 0 | +14.0dB |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | +14.5dB |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | +15.0dB |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | +15.5dB |
| 0 | 1 | 0 | 0 | 0 | 0 | 0 | +16.0dB |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | +16.25dB |
| 0 | 1 | 0 | 0 | 0 | 0 | 1 | +16.5dB |
| 0 | 1 | 0 | 0 | 0 | 1 | 0 | +17.0dB |
| 0 | 1 | 0 | 0 | 0 | 1 | 1 | +17.5dB |
| 0 | 1 | 0 | 0 | 1 | 0 | 0 | +18.0dB |
| 0 | 1 | 0 | 0 | 1 | 0 | 1 | +18.5dB |
| 0 | 1 | 0 | 0 | 1 | 1 | 0 | +19.0dB |
| 0 | 1 | 0 | 0 | 1 | 1 | 1 | +19.5dB |
| 0 | 1 | 0 | 1 | 0 | 0 | 0 | +20.0dB |
| 0 | 1 | 0 | 1 | 0 | 0 | 1 | +20.5dB |
| 0 | 1 | 0 | 1 | 0 | 1 | 0 | +21.0dB |
| 0 | 1 | 0 | 1 | 0 | 1 | 1 | +21.5dB |
| 0 | 1 | 0 | 1 | 1 | 0 | 0 | +22.0dB |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | +22.5dB |
| 0 | 1 | 0 | 1 | 1 | 1 | 0 | +23.0dB |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | +23.5dB |

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< Volume Control Data >

| Data | | | | | | | Setting |
|------|------|------|------|------|------|------|---------|
| D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 0 | 1 | 1 | 0 | 0 | 0 | 0 | +24.0dB |
| **1** | **1** | **1** | **0** | **0** | **0** | **0** | **+24.25dB** |
| 0 | 1 | 1 | 0 | 0 | 0 | 1 | +24.5dB |
| 0 | 1 | 1 | 0 | 0 | 1 | 0 | +25.0dB |
| 0 | 1 | 1 | 0 | 0 | 1 | 1 | +25.5dB |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | +26.0dB |
| 0 | 1 | 1 | 0 | 1 | 0 | 1 | +26.5dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | +27.0dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | +27.5dB |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | +28.0dB |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | +28.5dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | +29.0dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | +29.5dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | +30.0dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | +30.5dB |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | +31.0dB |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | +31.5dB |

(*)Initial Setting

◆**L/R Cont 1** : Select " the independent control" or " the Lch-Rch link control" of the method of the volume control (Att).
 **L/R Cont 2** : Select " the independent control" or " the Lch-Rch link control" of the method of the volume control (Gain).
 **Z/C** : Zero Cross Detection circuit ON/OFF setting

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L/R Cont 1 | L/R Cont 2 | Z/C | Don't Care | Don't Care | Don't Care | Don't Care | Don't Care | 0 | 1 | 0 | 0 | 0 | * | * | * |

<L/R Cont 1 :   Method of the volume control (Att).>

| D15 | Setting |
|---|---|
| 0 | Lch, Rch independent control (*) |
| 1 | Lch-Rch link control |

(*)Initial Setting

<L/R Cont 2 :   Method of the volume control (Gain).>

| D14 | Setting |
|---|---|
| 0 | Lch, Rch independent control (*) |
| 1 | Lch-Rch link control |

(*)Initial Setting

* Command table when Lch, Rch interconnected control

| D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lch-Rch link control (Att.) | | | | | | | | 0 | 0 | 0 | 0 | 0 | * | * | * |
| Lch-Rch link control (Gain) | | | | | | | | 0 | 0 | 0 | 1 | 0 | * | * | * |
| No Acceptable | | | | | | | | 0 | 0 | 1 | 0 | 0 | * | * | * |
| No Acceptable | | | | | | | | 0 | 0 | 1 | 1 | 0 | * | * | * |

<Z/C : Zero Cross Detection circuit ON/OFF setting >

| D13 | Setting |
|---|---|
| 0 | Zero Cross Detection circuit: ON(*) |
| 1 | Zero Cross Detection circuit: OFF |

(*)Initial Setting

* Zero cross detection circuit is ON When "Z/C terminal = Low" and "Z/C bit =0" are set.

| | | Z/C bit ("D13") | |
|---|---|---|---|
| | | 0 | 1 |
| Z/C terminal (32pin) | Low | Zero Cross Detection circuit : ON | Zero Cross Detection circuit : OFF |
| | High | Zero Cross Detection circuit : OFF | Zero Cross Detection circuit : OFF |

# MUSES72320

◆**Volume Control (Att) +0.25dB to -111.5dB(0.25dB/step) setting example**

　Using Volume Control(Gain) +0.25dB enables to set 0.25dB/step in the range of +0.25dB to –111.5dB.
(+8.25dB, +16.25,+24.25 also can be used)

< Volume Control Data >

| Lch / Rch Volume Control (Gain) | | | | | | | Lch / Rch Volume Control (Att) | | | | | | | | Gain Setting |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D14 | D13 | D12 | D11 | D10 | D9 | D8 | D15 | D14 | D13 | D12 | D11 | D10 | D9 | D8 | |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +31.5dB |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +31.0dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +30.5dB |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +30.0dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +29.5dB |
| 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +29.0dB |
| 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +28.5dB |
| 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +28.0dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +27.5dB |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +27.0dB |
| : | : | | | | | | | : | | | | | | : | : |
| : | : | | | | | | | : | | | | | | : | : |
| 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +2.0dB |
| 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +1.5dB |
| 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +1.0dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +0.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +0.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | +0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | -0.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | -0.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | -0.75dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | -1.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | -1.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | -1.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | -1.75dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | -2.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | -2.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | -2.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | -2.75dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | -3.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | -3.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | -3.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | -3.75dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | -4.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | -4.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | -4.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | -4.75dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | -5.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | -5.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | -5.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | -5.75dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | -6.0dB |
| : | : | | | | | | | : | | | | | | : | : |
| : | : | | | | | | | : | | | | | | : | : |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | -110.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | -110.5dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | -110.75dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | -111.0dB |
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | -111.25dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | -111.5dB |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Mute |

■ **TYPICAL CHARACTERISTICS**

**ICC vs Supply Voltage**
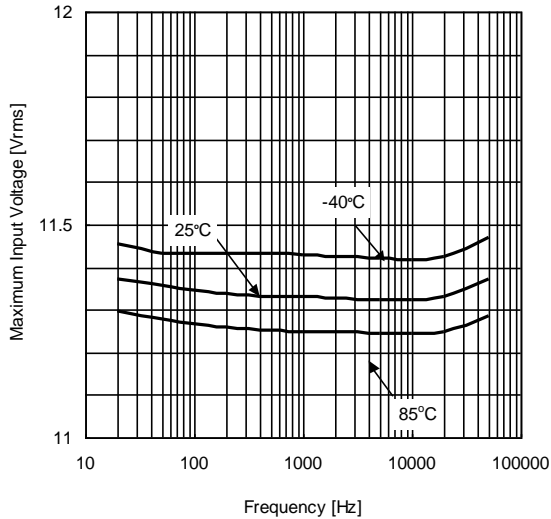No signal
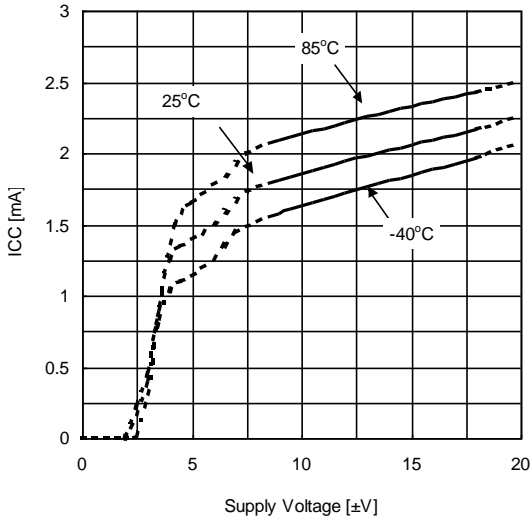


**IEE vs Supply Voltage**
No signal
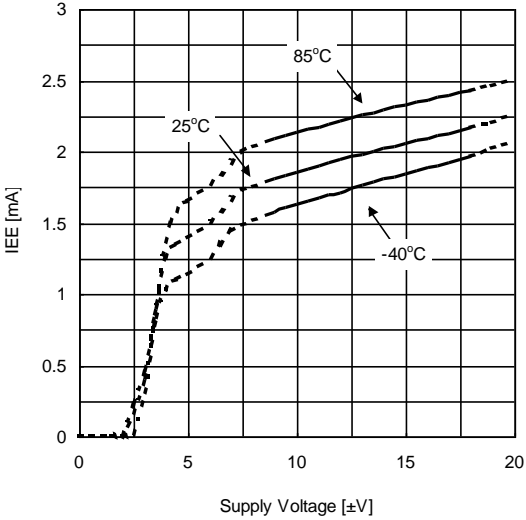


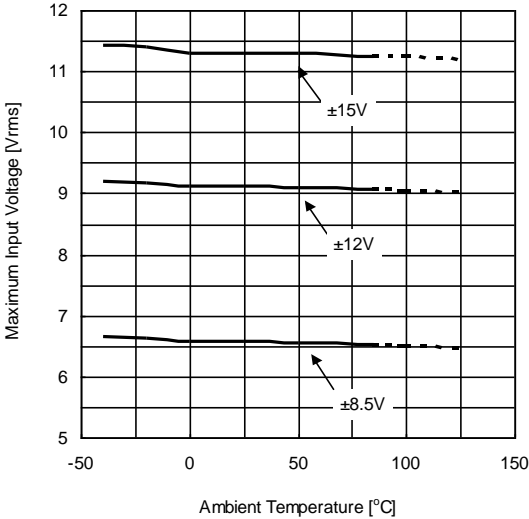**ICC vs Ambient Temperature**
V=±15V, No signal
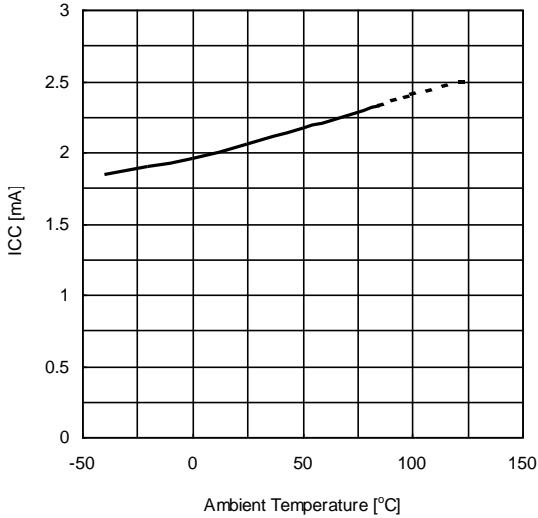


**IEE vs Ambient Temperature**
V=±15V, No signal
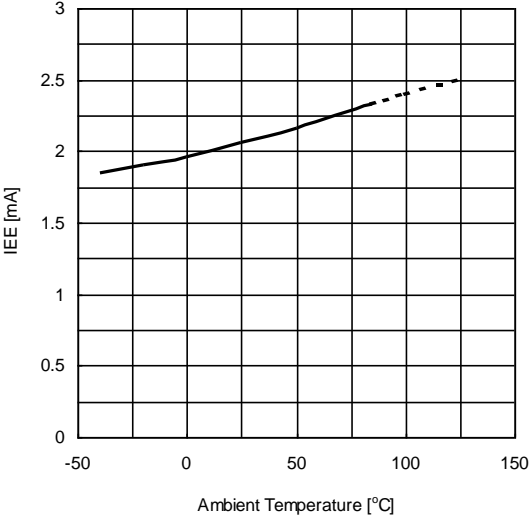


**Maximum Input Voltage vs Frequency**
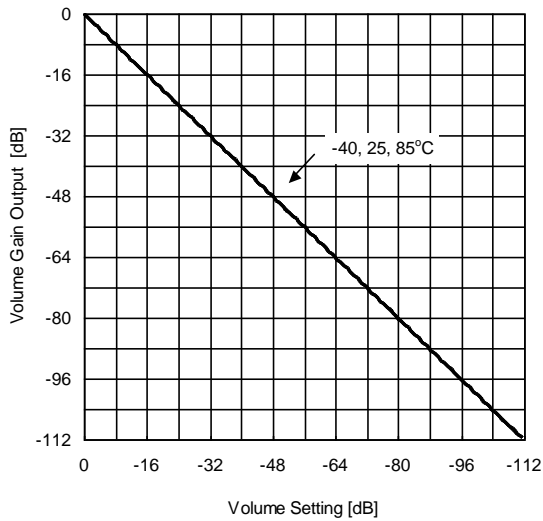V=±15V, THD=1%, VOL=-20dB, GAIN=0dB



**Maximum Input Voltage vs Ambient Temperature**
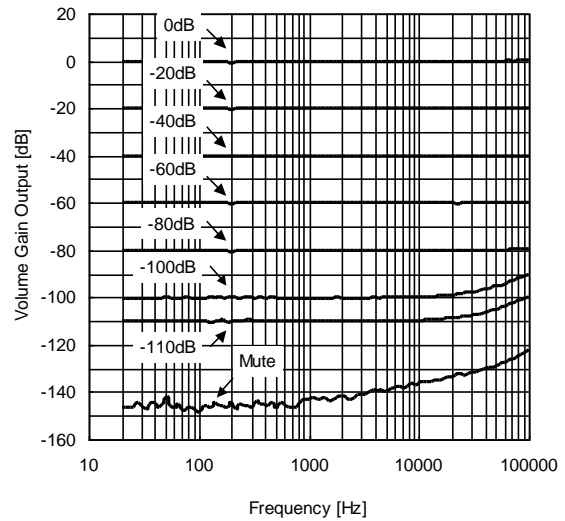V=±15V, THD=1%, VOL=-20dB, GAIN=0dB

# MUSES72320

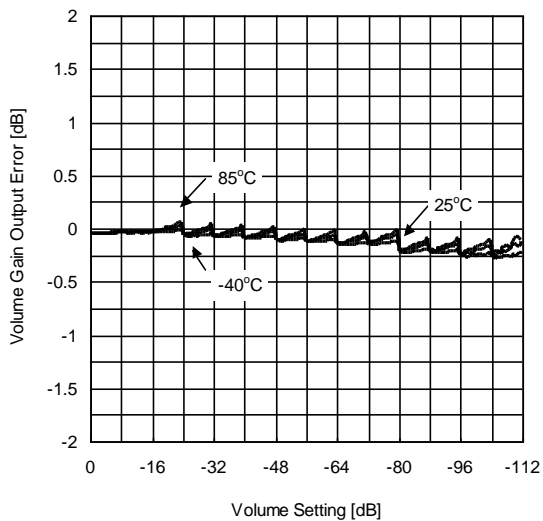**Volume Gain Output vs Volume Setting**
V=±15V, f=1kHz, Vin=4Vrms, GAIN=0dB, Bandpass



**Volume Gain Output vs Frequency**
V=±15V, f=1kHz, Vin=4Vrms, GAIN=0dB, Bandpass



**Volume Gain Output Error vs Volume Setting**
V=±15V, f=1kHz, Vin=4Vrms, GAIN=0dB, Bandpass



**Volume Gain Output Error vs Volume Setting**
V=±15V, f=1kHz, Vin=100mVrms, VOL=0dB, Bandpass
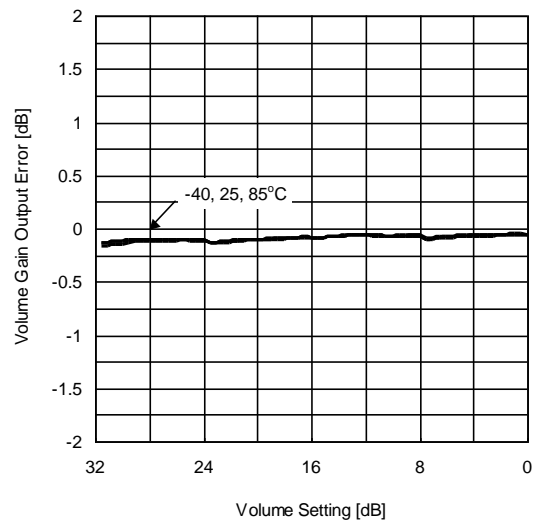


**Volume Resolution vs Volume Setting**
V=±15V, f=1kHz, Vin=4Vrms, GAIN=0dB, Bandpass
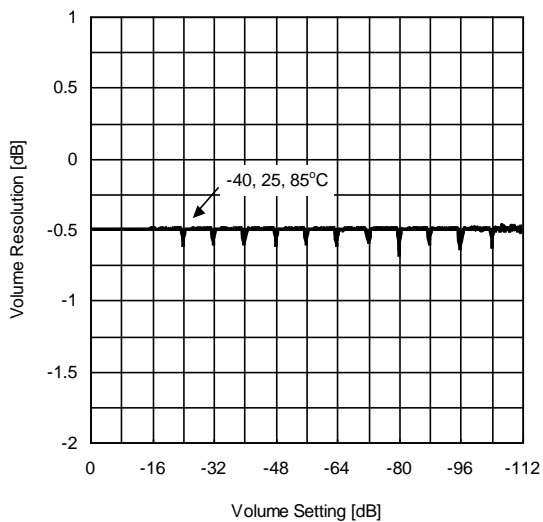


**Volume Resolution vs Volume Setting**
V=±15V, f=1kHz, Vin=100mVrms, VOL=0dB, Bandpass
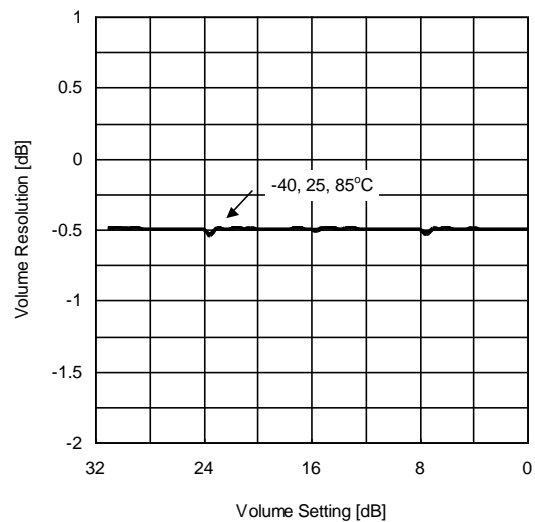
**Volume Matching Error vs Volume Setting**
V=±15V, f=1kHz, Vin=4Vrms, GAIN=0dB, Bandpass
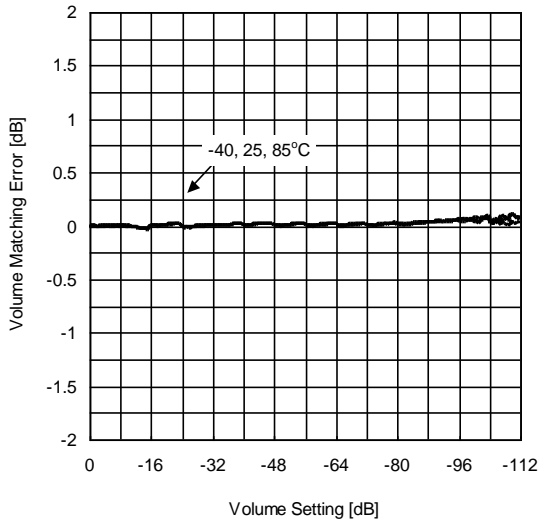
**Volume Matching Error vs Volume Setting**
V=±15V, f=1kHz, Vin=100mVrms, VOL=0dB, Bandpass
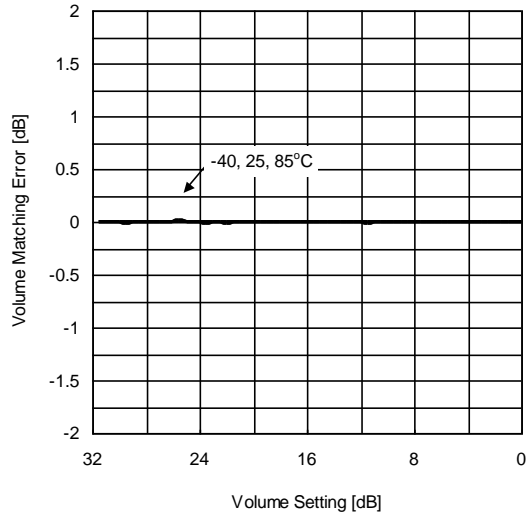
**Input Resistance vs Volume Setting**
V=±15V, No signal, Measure:InL
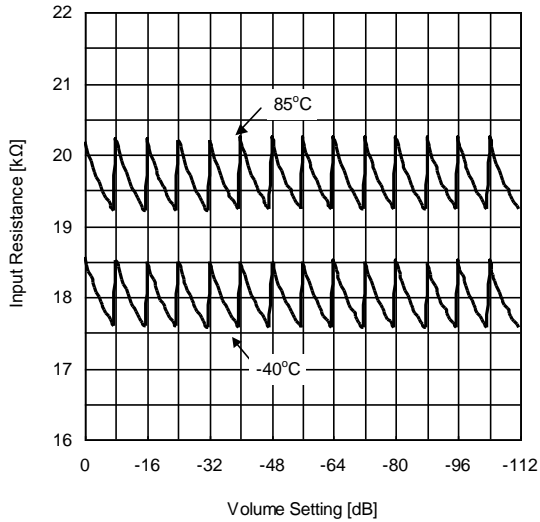
**Output Resistance vs Volume Setting**
V=±15V, No signal, Measure:L+
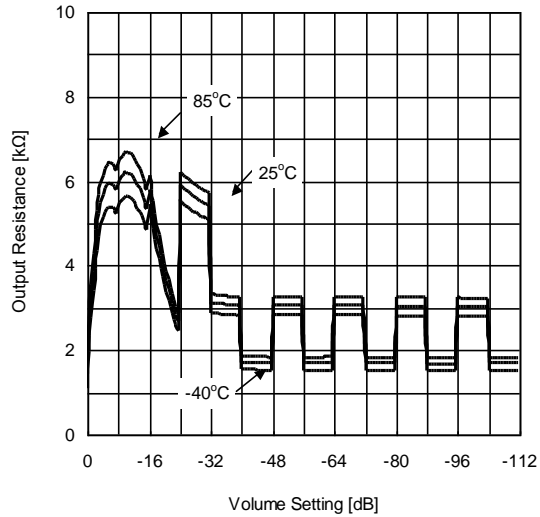
**Maximum Output Voltage vs Frequency**
V=±15V, THD=1%, VOL=-6dB, GAIN=+6dB
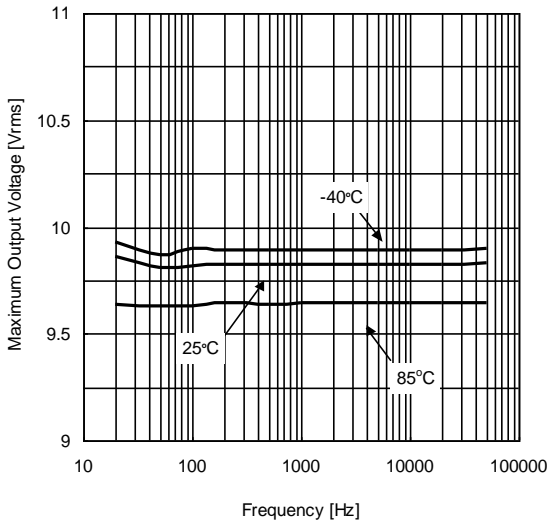
**Maximum Output Voltage vs Ambient Temperature**
V=±15V, THD=1%, VOL=-6dB, GAIN=+6dB
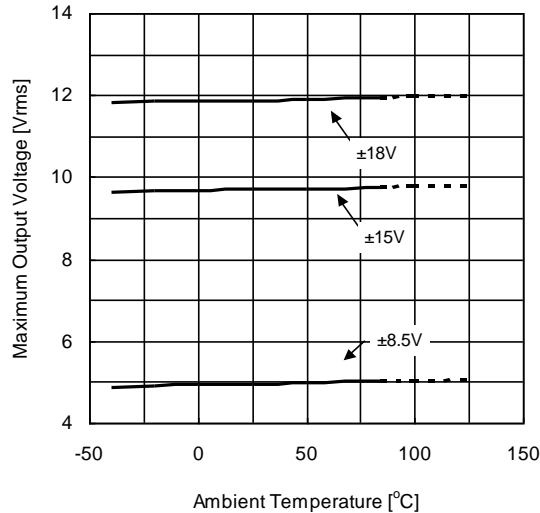
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