



## SPEAKER ELEVATION AUDIO PROCESSOR with A/V Focus Filter

### ■ GENERAL DESCRIPTION

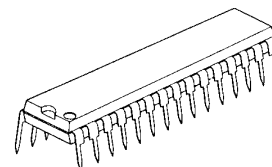
The **NJM2189** is a speaker elevation audio processor with A/V Focus Filter, based on SRS Focus technology. It is capable of raising sound image.

In addition, the **NJM2189** includes the A/V Focus Filter to reduce harsh sound when speakers are directly put on hard-surface floor.

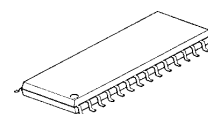
The Bypass and Focus Mode inputs are separate to be the same sound volume in both Bypass and Focus mode.

The **NJM2189** is suitable for almost all car audio, Projection TV, radio cassette, and then.

### ■ PACKAGE OUTLINE



**NJM2189L**



**NJM2189M**

### ■ FEATURES

- Operating Voltage (4.7 to 13V)
- Low Operating Current (7.0mA typ.)
- Low Output Noise (15 $\mu$ Vrms typ.)
- Adjusted by LF/HF Elevation, and Bass Compensation Volume
- Internal A/V Focus Filter
- Independent Audio Input for Bypass Mode
- Bipolar Technology
- Package Outline SDIP30, SDMP30

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

| PARAMETER                   | SYMBOL           | RATING                     | UNIT |
|-----------------------------|------------------|----------------------------|------|
| Supply Voltage              | V <sup>+</sup>   | 15                         | V    |
| Power Dissipation           | P <sub>D</sub>   | (SDIP30)700<br>(SDMP30)700 | mW   |
| Operating Temperature Range | T <sub>opr</sub> | -40 to +85                 | °C   |
| Storage Temperature Range   | T <sub>stg</sub> | -40 to +125                | °C   |

## ■ ELECTRICAL CHARACTERISTICS (V+=12V, Ta=25°C, Connect Bypass Mode input and Focus Mode input)

| PARAMETER             | SYMBOL             | TEST CONDITION                                      |                | MIN.            | TYP.            | MAX.            | UNIT           |
|-----------------------|--------------------|-----------------------------------------------------|----------------|-----------------|-----------------|-----------------|----------------|
| Operating Voltage     | V <sup>+</sup>     |                                                     |                | 4.7             | 12.0            | 13.0            | V              |
| Supply Current        | I <sub>CC</sub>    | No Signal                                           |                | -               | 7.0             | 10.5            | mA             |
| Reference Voltage     | V <sub>REF</sub>   | V+/2                                                |                | 5.8             | 6.0             | 6.2             | V              |
| Maximum Input Voltage | V <sub>INMAX</sub> | f=1kHz<br>at T.H.D.=3%                              | Bypass Mode    | 7.79<br>(2.45)  | 11.8<br>(3.88)  | -               | dBV<br>(Vrms)  |
|                       |                    |                                                     | Focus Mode     | -4.71<br>(0.58) | -1.21<br>(0.87) | -               |                |
|                       |                    |                                                     | A/V Focus Mode | -5.21<br>(0.55) | -1.71<br>(0.82) | -               |                |
|                       |                    | f=70Hz<br>at T.H.D.=3%<br>Controls ∞                | Bypass Mode    | -               | 11.8<br>(3.88)  | -               |                |
|                       |                    |                                                     | Focus Mode     | -               | 0.77<br>(1.1)   | -               |                |
|                       |                    |                                                     | A/V Focus Mode | -               | 0.77<br>(1.1)   | -               |                |
|                       |                    | f=10kHz<br>at T.H.D.=3%<br>Controls ∞               | Bypass Mode    | -               | 11.8<br>(3.88)  | -               |                |
|                       |                    |                                                     | Focus Mode     | -               | -8.71<br>(0.37) | -               |                |
|                       |                    |                                                     | A/V Focus Mode | -               | -8.71<br>(0.37) | -               |                |
| Output Noise          | V <sub>NOISE</sub> | Vin=V <sub>REF</sub><br>A-weight<br>Controls ∞      | Focus Mode     | -               | -94.0<br>(20.0) | -88.0<br>(40.0) | dBV<br>(μVrms) |
|                       |                    |                                                     | A/V Focus Mode | -               | -94.0<br>(20.0) | -88.0<br>(40.0) |                |
|                       |                    | Vin=V <sub>REF</sub><br>A-weight<br>Controls Center | Focus Mode     | -               | -96.5<br>(15.0) | -               |                |
|                       |                    |                                                     | A/V Focus Mode | -               | -96.5<br>(15.0) | -               |                |
|                       |                    | Vin=V <sub>REF</sub><br>A-weight<br>Controls 0      | Focus Mode     | -               | -96.5<br>(15.0) | -               |                |
|                       |                    |                                                     | A/V Focus Mode | -               | -96.5<br>(15.0) | -               |                |

## ■ ELECTRICAL CHARACTERISTICS( $V^+=12V, T_a=25^\circ C$ )

| PARAMETER                   | SYMBOL      | TEST CONDITION                                      |                | MIN.  | TYP.            | MAX.  | UNIT                     |
|-----------------------------|-------------|-----------------------------------------------------|----------------|-------|-----------------|-------|--------------------------|
| Output Noise                | $V_{NOISE}$ | $V_{in}=V_{REF}$<br>DIN-AUDIO<br>Controls $\infty$  | Focus Mode     | -     | -90.1<br>(30.0) | -     | dBV<br>( $\mu V_{rms}$ ) |
|                             |             |                                                     | A/V Focus Mode | -     | -90.1<br>(30.0) | -     |                          |
|                             |             | $V_{in}=V_{REF}$<br>DIN-AUDIO<br>Controls Center    | Focus Mode     | -     | -94.0<br>(20.0) | -     |                          |
|                             |             |                                                     | A/V Focus Mode | -     | -94.0<br>(20.0) | -     |                          |
|                             |             | $V_{in}=V_{REF}$<br>DIN-AUDIO<br>Controls 0         | Focus Mode     | -     | -94.0<br>(20.0) | -     |                          |
|                             |             |                                                     | A/V Focus Mode | -     | -96.5<br>(15.0) | -     |                          |
| Channel Balance             | $CH_{BAL}$  | $V_{in}=-17.2dBV$<br>$f=1kHz$<br>Controls $\infty$  | Focus Mode     | -1.0  | 0.0             | 1.0   | dB                       |
|                             |             |                                                     | A/V Focus Mode | -1.0  | 0.0             | 1.0   |                          |
| Total Harmonic Distortion   | THD         | $V_{in}=-17.2dBV$ Lch<br>$f=1kHz$ Controls $\infty$ | Focus Mode     | -     | 0.05            | 0.20  | %                        |
|                             |             |                                                     | A/V Focus Mode | -     | 0.09            | 0.30  |                          |
| BYPASS Gain                 | $G_{BYP}$   | $V_{in}=-17.2dBV$<br>$f=1kHz$                       | Bypass Mode    | -1.0  | 0.0             | 1.0   | dB                       |
| FOCUS Gain1                 | $G_{FOC1}$  | $V_{in}=-17.2dBV$<br>$f=70Hz$<br>Controls $\infty$  | Focus Mode     | 8.5   | 10.5            | 12.5  | dB                       |
| FOCUS Gain2                 | $G_{FOC2}$  | $V_{in}=-17.2dBV$<br>$f=20kHz$<br>Controls $\infty$ | Focus Mode     | 19.0  | 21.0            | 23.0  | dB                       |
| AVF Gain                    | $G_{AVF}$   | $V_{in}=-17.2dBV$<br>$f=800Hz$<br>Controls 0        | A/V Focus Mode | -12.0 | -10.0           | -8.0  | dB                       |
| MODE Select Control Voltage | $V_{MODE}$  | $V_{in}=\text{High Level}$                          |                | 2.0   | -               | $V^+$ | V                        |
|                             |             | $V_{in}=\text{Low Level}$                           |                | 0.0   | -               | 0.7   |                          |

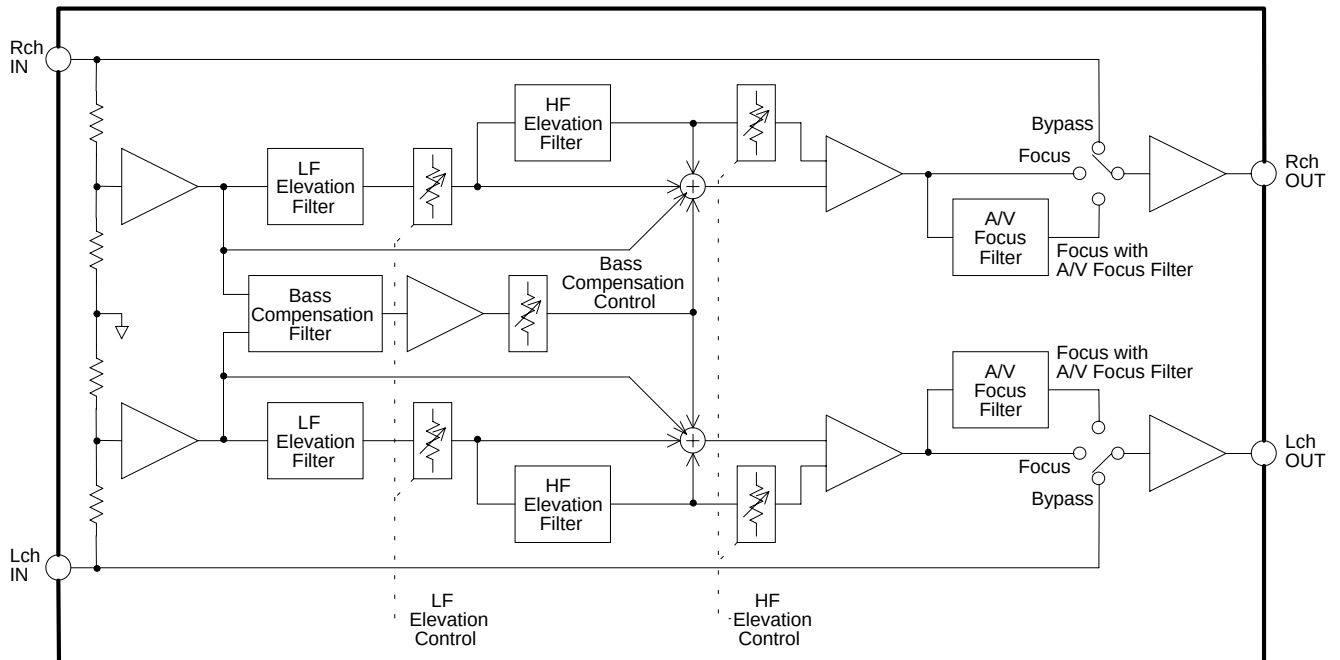
## ■ MODE SWITCH

|                | MODE1 | MODE2 |
|----------------|-------|-------|
| Bypass Mode    | L     | -     |
| Focus Mode     | H     | L     |
| A/V Focus Mode | H     | H     |

## PIN FUNCTION

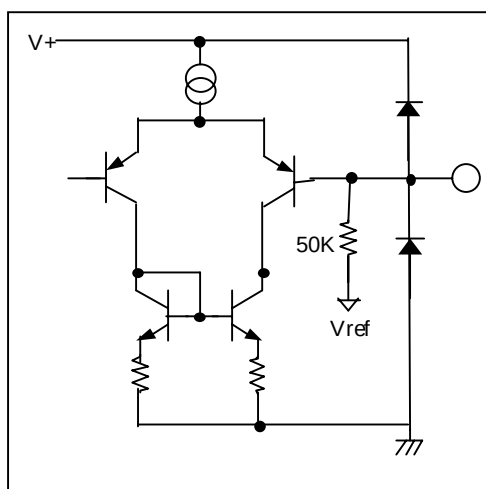
|                                  |    |          |          |    |                                  |
|----------------------------------|----|----------|----------|----|----------------------------------|
| Bypass Mode Lch Input            | 1  | Lin1     | Rin1     | 30 | Bypass Mode Rch Input            |
| FOCUS Mode Lch Input             | 2  | Lin2     | Rin2     | 29 | FOCUS Mode Rch Input             |
| Lch LF Elevation Control Output  | 3  | LFoutL   | LFoutR   | 28 | Rch LF Elevation Control Output  |
| Lch LF Elevation Control Input   | 4  | LFinL    | LFinR    | 27 | Rch LF Elevation Control Input   |
| Lch HF Elevation Control Input 1 | 5  | HFinL1   | HFinR1   | 26 | Rch HF Elevation Control Input 1 |
| Lch HF Elevation Control Input 2 | 6  | HFinL2   | HFinR2   | 25 | Rch HF Elevation Control Input 2 |
| Bass Compensation Control Output | 7  | BCout    | LPFout   | 24 | LPF Output                       |
| Bass Compensation Control Input  | 8  | BCin     | LPFin    | 23 | LPF Input                        |
| Lch Focus Output                 | 9  | FoutL    | FoutR    | 22 | Rch Focus Output                 |
| Lch A/V Focus filter Input       | 10 | AVFFinL  | AVFFinR  | 21 | Rch A/V Focus filter Input       |
| Lch A/V Focus filter Output      | 11 | AVFFoutL | AVFFoutR | 20 | Rch A/V Focus filter Output      |
| Lch Output                       | 12 | Lout     | Rout     | 19 | Rch Output                       |
| Vref Input                       | 13 | REFin    | MODE1    | 18 | Focus/Bypass Mode Select         |
| V+/2                             | 14 | Vref     | MODE2    | 17 | A/V Focus filter ON/OFF select   |
| Ground                           | 15 | GND      | V+       | 16 | 4.7 to 13.0V Supply              |

## BLOCK DIAGRAM

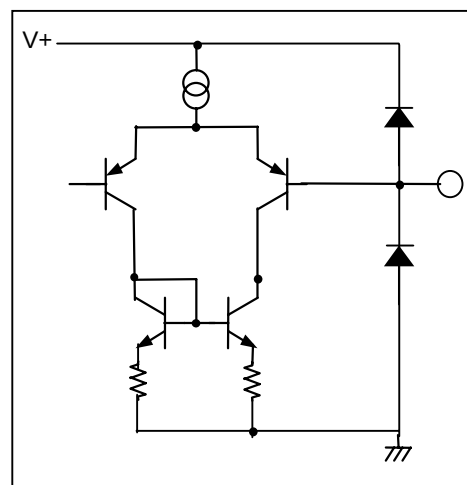


## PIN DESCRIPTION

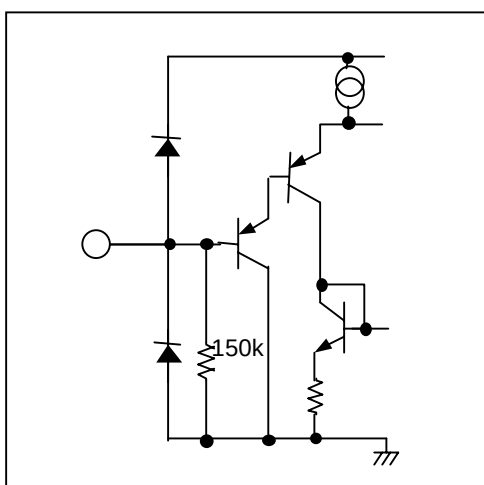
Lin1, Rin1



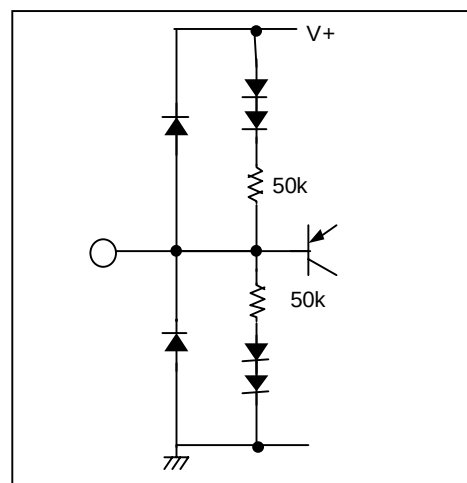
Lin2, Rin2



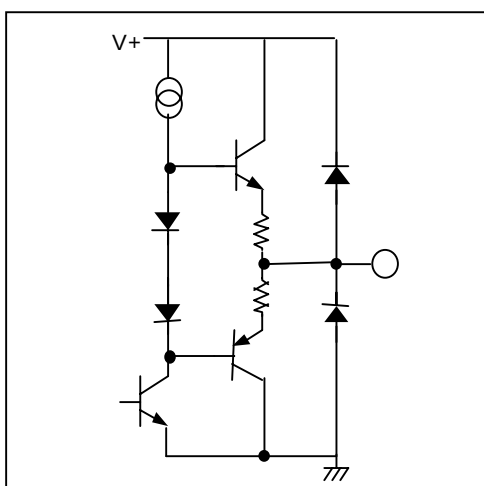
MODE1, MODE2



REFin

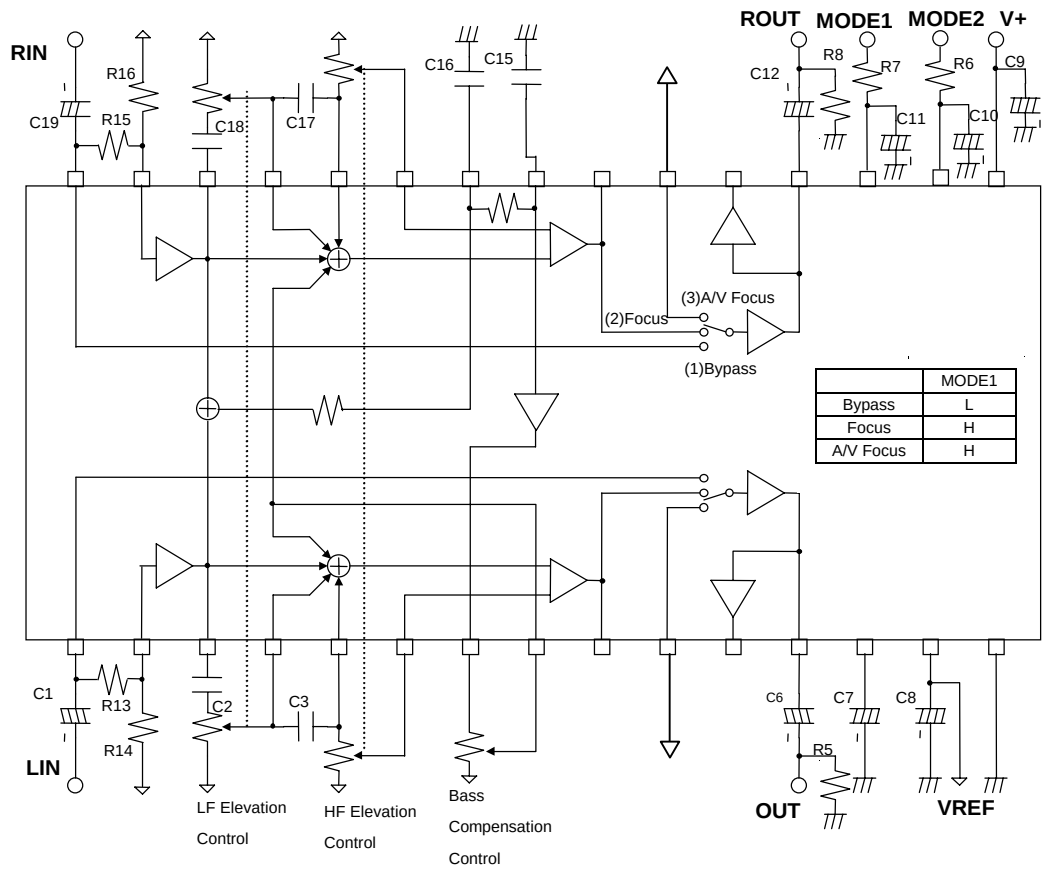


Lout, Rout, Vref





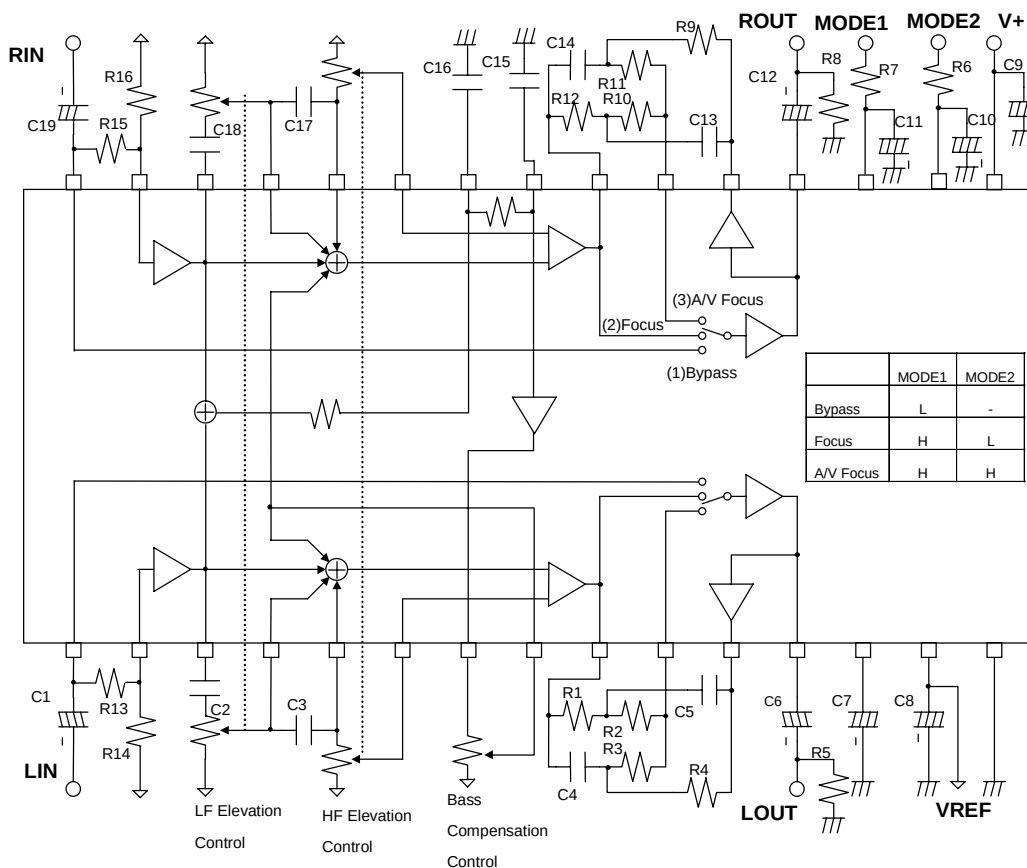
■APPLICATION CIRCUIT



| PART No.        | VALUE  | Tolerance | PART No. | VALUE | Tolerance |
|-----------------|--------|-----------|----------|-------|-----------|
| C1,C6,C7        | 10uF   |           | R5,R6,R8 | 10kΩ  |           |
| C10,C11,C12,C19 | 10uF   |           | R7       | 22kΩ  | ±5%       |
| C8              | 33uF   |           |          |       |           |
| C9              | 100uF  |           |          |       |           |
| C2,C18          | 0.22uF | ±5%       |          |       |           |
| C3,C17          | 3900uF | ±5%       |          |       |           |
| C15             | 0.01uF | ±5%       |          |       |           |
| C16             | 0.1uF  | ±5%       |          |       |           |

- R13(R15), R14(R16)  
The R13 (R15) and R14(R16) control sound pressure level when between Bypass and Focus MODE switch.  
 $R13+R14 \geq 20k\Omega$   
 $R13=R15, R14=R16$
- LF Elevation Control: 1kB Single-shaft Dual-unit
- HF Elevation Control: 10kB Single-shaft Dual-unit
- Bass Compensation Control: 1kB Single-shaft Single-unit

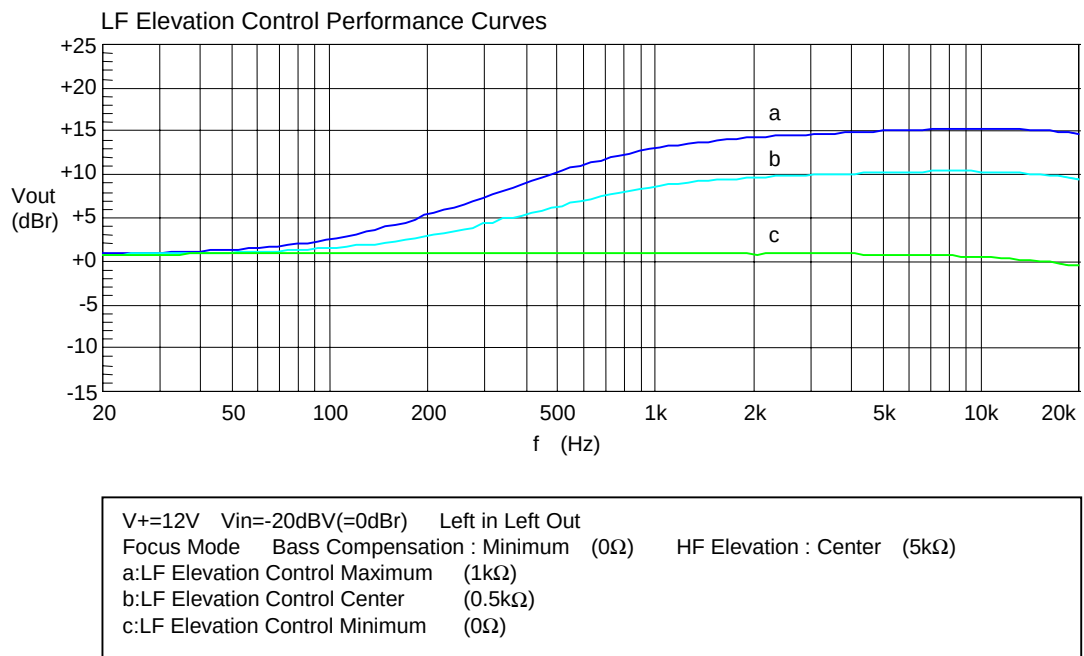
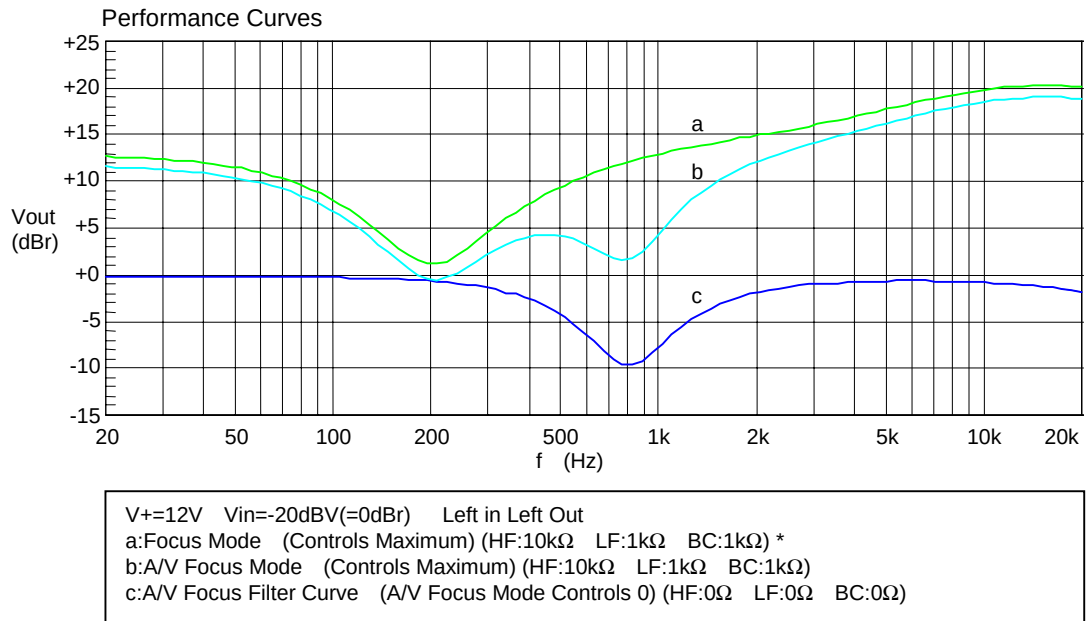
## APPLICATION CIRCUIT (Without A/V Focus filter)



| PART No.        | VALUE  | Tolerance | PART No.         | VALUE | Tolerance |
|-----------------|--------|-----------|------------------|-------|-----------|
| C1,C6,C7        | 10uF   |           | R5,R6,R8         | 10kΩ  |           |
| C10,C11,C12,C19 | 10uF   |           | R1,R12           | 1.8kΩ | ±5%       |
| C8              | 33uF   |           | R2,R3,R7,R10,R11 | 22kΩ  | ±5%       |
| C9              | 100uF  |           | R4,R9            | 5.6kΩ | ±5%       |
| C2,C18          | 0.2uF  | ±5%       |                  |       |           |
| C3,C17          | 3900pF | ±5%       |                  |       |           |
| C4,C14,C15      | 0.01uF | ±5%       |                  |       |           |
| C5,C13          | 0.47uF | ±5%       |                  |       |           |
| C16             | 0.1uF  | ±5%       |                  |       |           |

- R13(R15), R14(R16)  
The R13(R15) and R14(R16) control sound pressure level when between Bypass and Focus MODE switch.  
R13+R14≥20kΩ  
R13=R15, R14=R16
- LF Elevation Control: 1kB Single-shaft Dual-unit
- HF Elevation Control: 10kB Single-shaft Dual-unit
- Bass Compensation Control: 1kB Single-shaft Single-unit

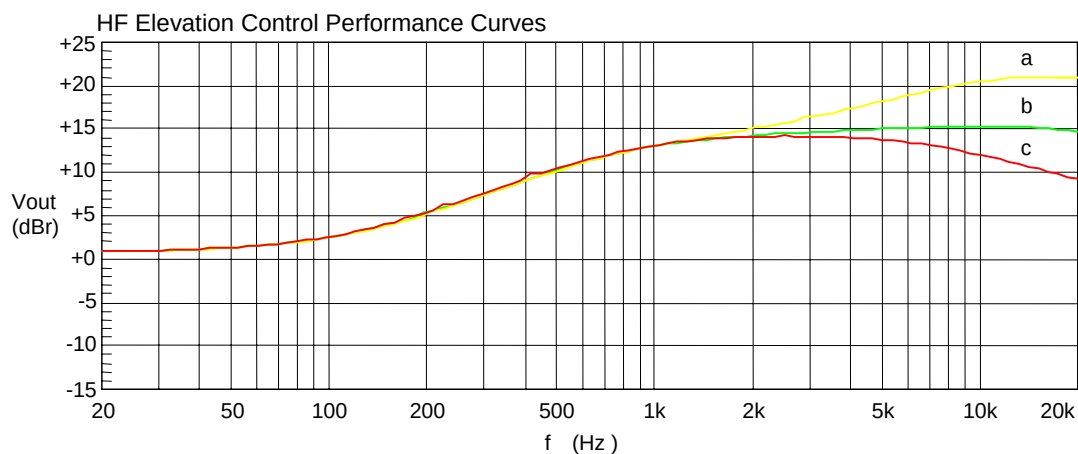
## ■CHARACTERISTICS



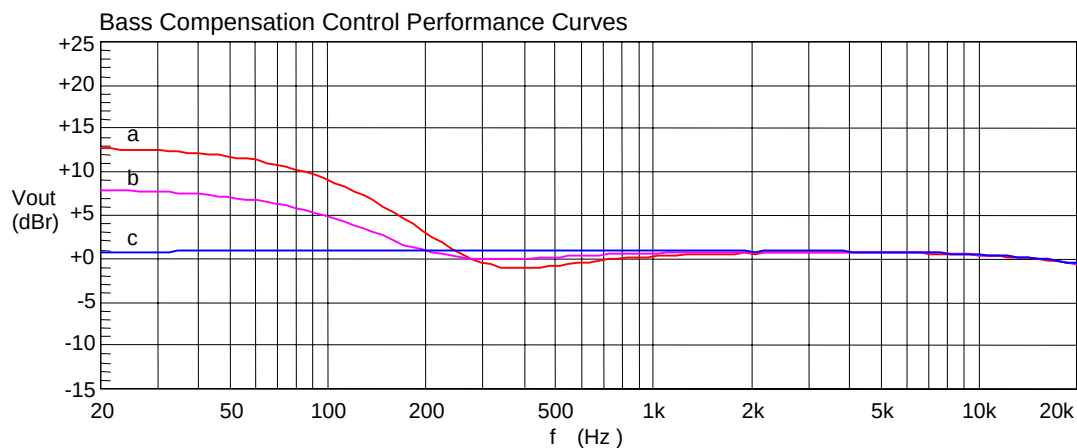
\* HF:HF Elevation  
LF:LF Elevation  
BC:Bass Compensation



## ■CHARACTERISTICS

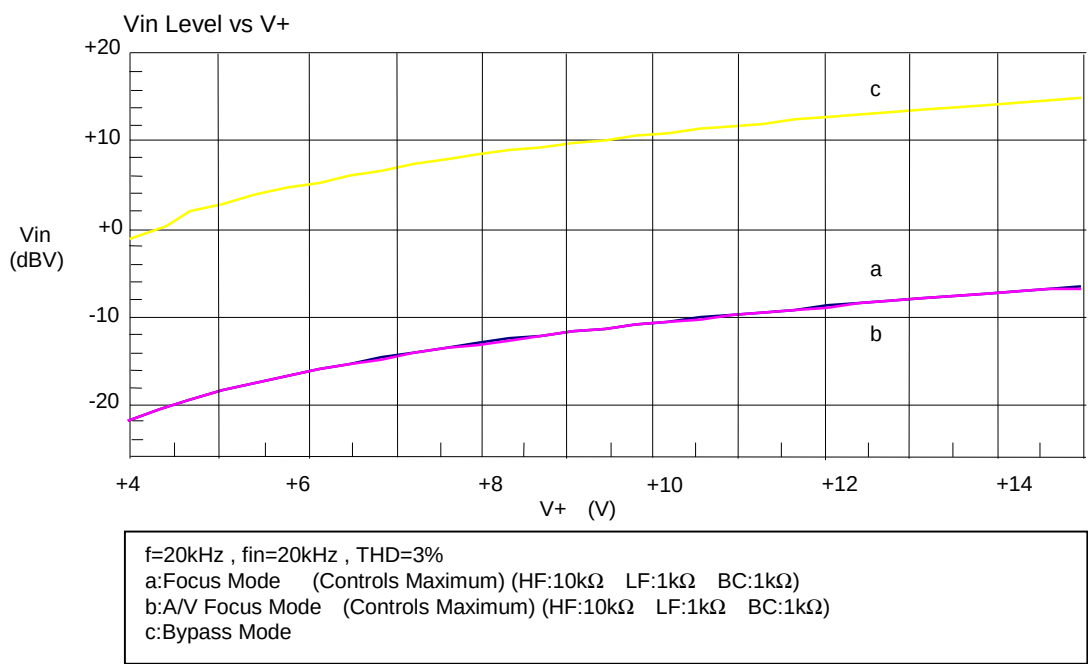
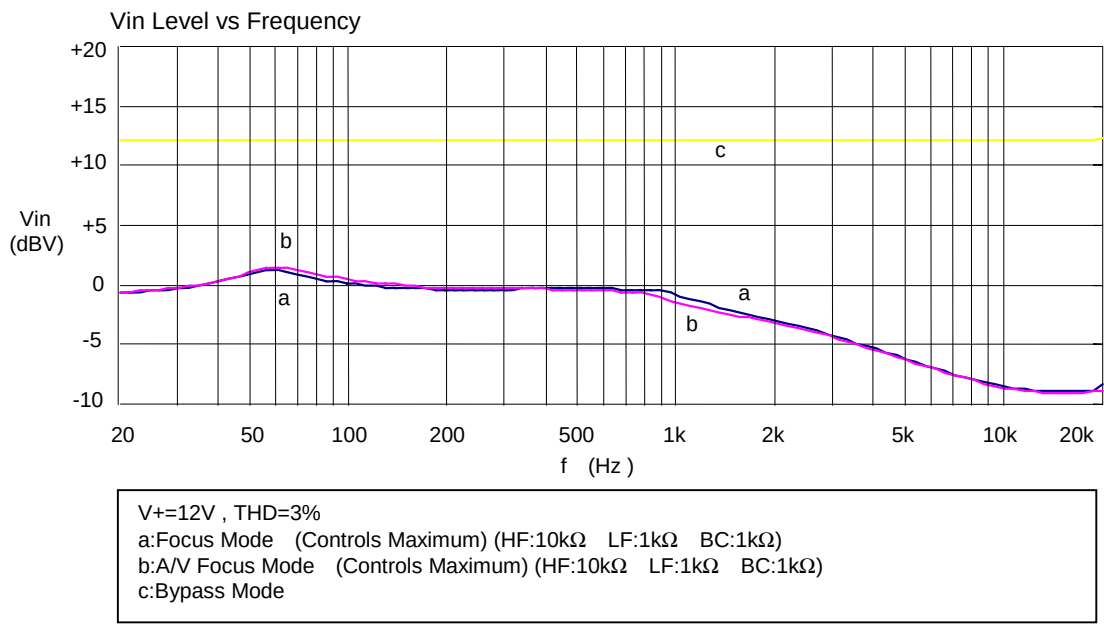


$V_{+}=12V$   $V_{in}=-20dBV(=0dB)$  Left in Left Out  
 Focus Mode bass Compensation : Minimum ( $0\Omega$ ) LF Elevation : Maximum ( $1k\Omega$ )  
 a:HF Elevation Control Maximum ( $10k\Omega$ )  
 b:HF Elevation Control Center ( $5k\Omega$ )  
 c:HF Elevation Control Minimum ( $0\Omega$ )



$V_{+}=12V$   $V_{in}=-20dBV(=0dB)$  Left in Left Out  
 Focus Mode LF Elevation : Minimum ( $0\Omega$ )  
 a:Bass Compensation Control Maximum ( $1k\Omega$ )  
 b:Bass Compensation Control Center ( $0.5k\Omega$ )  
 c:Bass Compensation Control Minimum ( $0\Omega$ )

CHARACTERISTIC



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