



## PA2616

### LINEAR INTEGRATED CIRCUIT

## 2 X 12 W HI-FI AUDIO POWER AMPLIFIERS WITH MUTE

### ■ DESCRIPTION

The **UTC PA2616** is dual power amplifiers which the supplied in a 9-lead plastic power package (HSIP-9B). This is especially suited for such as stereo radio and stereo TV applications.

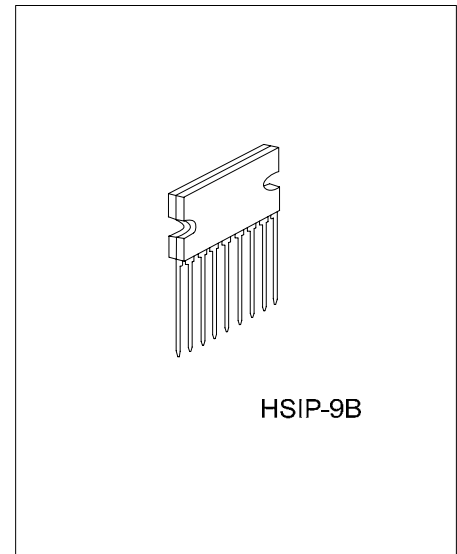
### ■ FEATURES

- \* Needs few external components
- \* No switch-on/switch-off clicks
- \* During switch-on and switch-off input mute
- \* Low offset voltage between output and ground
- \* Both amplifiers has an excellent gain balance
- \* Hi-Fi in accordance with IEC 268 and DIN 45500
- \* Thermal protected and short-circuit proof and
- \* Mute available.

### ■ ORDERING INFORMATION

| Ordering Number |                   | Package | Packing |
|-----------------|-------------------|---------|---------|
| Normal          | Lead Free Plating |         |         |
| PA2616-H09-B-T  | PA2616L-H09-B-T   | HSIP-9B | Tube    |

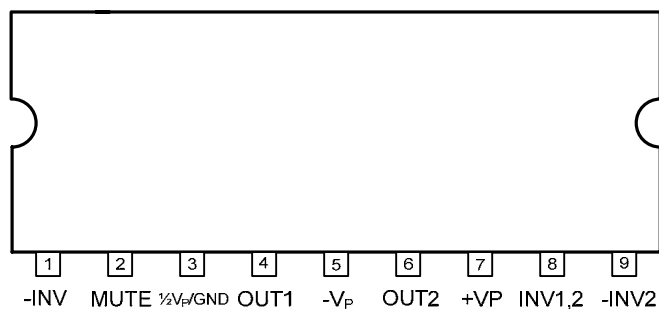
|                                                                                                            |  |                                                                             |
|------------------------------------------------------------------------------------------------------------|--|-----------------------------------------------------------------------------|
| <p>PA2616L-H09-B-T</p>  |  | (1)Packing Type<br>(2)Package Type<br>(3)Lead Plating                       |
|                                                                                                            |  | (1) T: Tube<br>(2) H09-B: HSIP-9B<br>(3) L: Lead Free Plating, Blank: Pb/Sn |



HSIP-9B

\*Pb-free plating product number: PA2616L

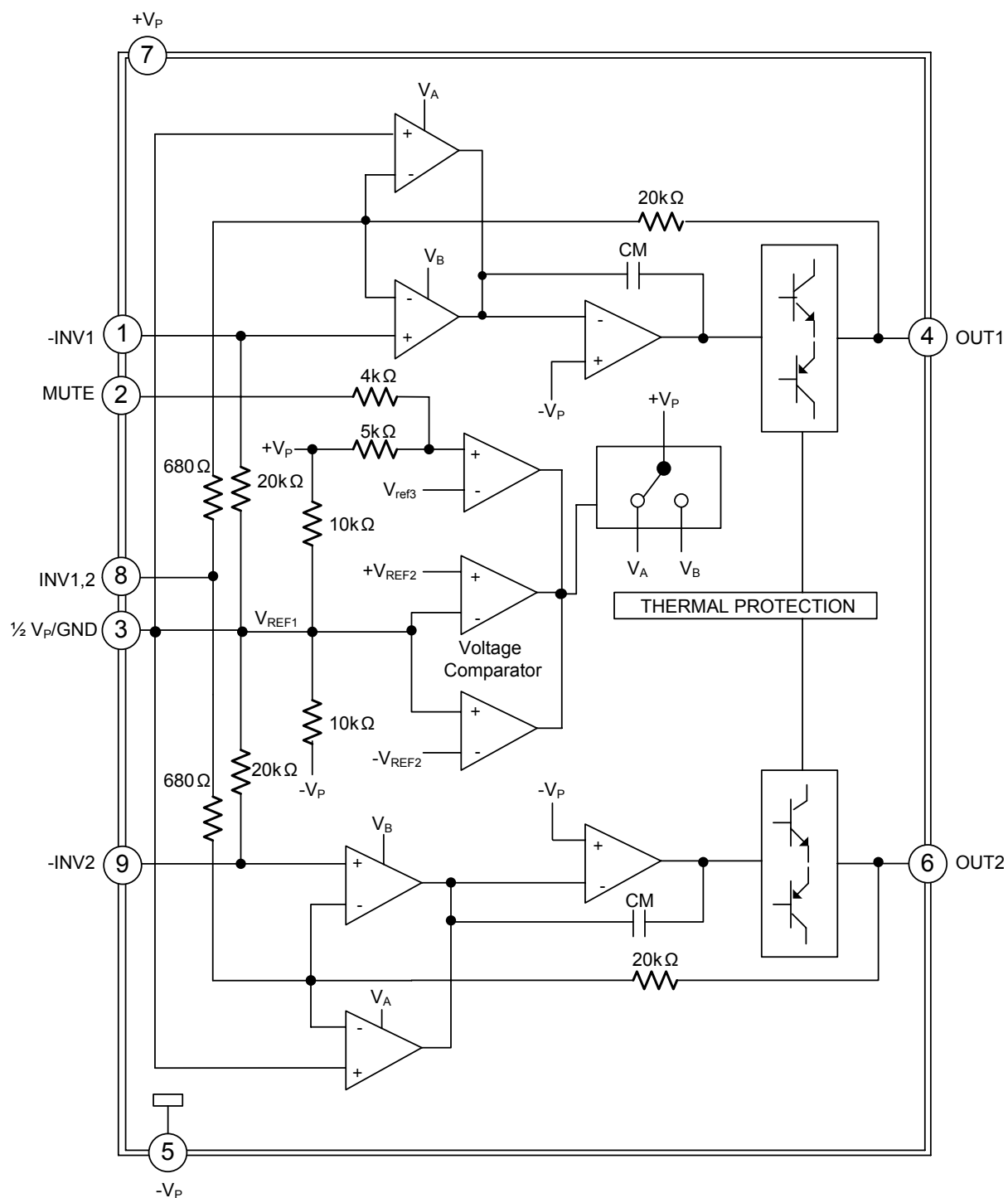
## ■ PIN CONFIGURATION



## ■ PIN DESCRIPTIONS

| PIN NO. | PIN NAME             | I/O | PIN FUNCTION                           |
|---------|----------------------|-----|----------------------------------------|
| 1       | -INV1                | I   | Non-inverting input 1                  |
| 2       | MUTE                 | I   | Mute input                             |
| 3       | $\frac{1}{2}V_p/GND$ |     | $\frac{1}{2}$ supply voltage or ground |
| 4       | OUT1                 | O   | Output 1                               |
| 5       | $-V_p$               |     | Negative supply voltage                |
| 6       | OUT2                 | O   | Output 2                               |
| 7       | $+V_p$               |     | Positive supply voltage                |
| 8       | INV1, 2              | I   | Inverting inputs 1 and 2               |
| 9       | -INV2                | I   | Non-inverting input 2                  |

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATINGS

| PARAMETER                          | SYMBOL     | RATINGS    | UNIT |
|------------------------------------|------------|------------|------|
| Supply Voltage                     | $\pm V_P$  | 21         | V    |
| Non-Repetitive Peak Output Current | $I_{PEAK}$ | 4          | A    |
| Power Dissipation                  | $P_D$      | 25         | W    |
| Short Circuit Time                 | $t_{SC}$   | 1          | h    |
| Junction Temperature               | $T_J$      | +150       | °C   |
| Operating Temperature              | $T_{OPR}$  | -25 ~ +150 | °C   |
| Storage Temperature                | $T_{STG}$  | -50 ~ +150 | °C   |

Note: 1. For asymmetrical power supplies (with the load short-circuited), the maximum unloaded supply voltage is limited to  $V_P = 28$  V and the maximum unloaded supply voltage is limited to 32 V (with the load short-circuited) with an internal supply resistance of  $R_S \geq 4 \Omega$ . The circuit is short-circuit-proof up to  $V_P = \pm 21$  V for symmetrical power supplies.

2. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

## ■ THERMAL DATA

| PARAMETER           | SYMBOL        | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------|---------------|-----------------|-----|-----|-----|------|
| Junction-to-Ambient | $\theta_{JA}$ |                 |     |     | 2.5 | °C/W |

## ■ ELECTRICAL CHARACTERISTICS

| PARAMETER                                                      | SYMBOL             | TEST CONDITIONS      | MIN | TYP    | MAX  | UNIT       |
|----------------------------------------------------------------|--------------------|----------------------|-----|--------|------|------------|
| <b>SUPPLY</b>                                                  |                    |                      |     |        |      |            |
| Supply Voltage                                                 | $\pm V_P$          |                      |     | 16     | 21   | V          |
| Repetitive Peak Output Current                                 | $I_{O(PEAK)}$      |                      |     | 2.2    |      | A          |
| <b>OPERATING POSITION, Note 1</b>                              |                    |                      |     |        |      |            |
| Supply Voltage                                                 | $\pm V_P$          |                      | 7.5 | 16     | 21   | V          |
| Total Quiescent Current                                        | $I_Q$              | $R_L = \infty$       | 18  | 40     | 70   | mA         |
| Output Power                                                   | $P_{OUT}$          | THD = 0.5%           | 10  | 12     |      | W          |
|                                                                |                    | THD = 10%            | 12  | 15     |      |            |
| Total Harmonic Distortion                                      | THD                | $P_{OUT} = 6$ W      |     | 0.15   | 0.2  | %          |
| Power Bandwidth                                                | $B_W$              | THD = 0.5%; Note 2   |     | 20~20K |      | Hz         |
| Voltage Gain                                                   | $G_V$              |                      | 29  | 30     | 31   | dB         |
| Gain Unbalance                                                 | $ G_V $            |                      |     | 0.2    | 1    | dB         |
| Noise Output Voltage                                           | eN                 | Note 3               |     | 70     | 140  | $\mu$ V    |
| Input Impedance                                                | $R_{IN}$           |                      | 14  | 20     | 26   | k $\Omega$ |
| Supply Voltage Ripple Rejection                                | SVRR               | Note 4               | 40  | 60     |      | dB         |
| Channel Separation                                             | $\alpha$           | $R_S = 0$            | 46  | 70     |      | dB         |
| Input Bias Current                                             | $I_{I(BIAS)}$      |                      |     | 0.3    |      | $\mu$ A    |
| DC Output Offset Voltage                                       | $ \Delta V_{GND} $ |                      |     | 30     | 200  | mV         |
| DC Output Offset Voltage                                       | $ \Delta V_{4-6} $ | between two channels |     | 4      | 150  | mV         |
| <b>MUTE POSITION (AT <math>I_{MUTE} \geq 300 \mu A</math>)</b> |                    |                      |     |        |      |            |
| Output Voltage                                                 | $V_{OUT}$          | $V_{IN} = 600$ mV    |     | 0.3    | 1.0  | mV         |
| Mute Input Impedance                                           | $Z_{2-7}$          | Note 7               | 6.7 | 9      | 11.3 | k $\Omega$ |
| Total Quiescent Current                                        | $I_Q$              | $R_L = \infty$       | 18  | 40     | 70   | mA         |
| Noise Output Voltage                                           | eN                 | Note 3               |     | 70     | 140  | $\mu$ V    |
| Supply Voltage Ripple Rejection                                | SVRR               | Note 4               | 40  | 55     |      | dB         |
| DC Output Offset Voltage                                       | $ \Delta V_{GND} $ |                      |     | 40     | 200  | mV         |
| Offset Voltage With Respect To Operating Position              | $ \Delta V_{off} $ |                      |     | 4      | 150  | mV         |
| Current If Pin 2 Is Connected To Pin 5                         | $I_2$              |                      |     |        | 8.2  | mA         |

## ■ ELECTRICAL CHARACTERISTICS

| PARAMETER                                                                | SYMBOL             | TEST CONDITIONS             | MIN | TYP    | MAX  | UNIT          |
|--------------------------------------------------------------------------|--------------------|-----------------------------|-----|--------|------|---------------|
| <b>MUTE POSITION, Note 5</b>                                             |                    |                             |     |        |      |               |
| Supply Voltage                                                           | $\pm V_P$          |                             | 2   |        | 5.8  | V             |
| Total Quiescent Current                                                  | $I_Q$              | $R_L = \infty$              | 9   | 30     | 40   | mA            |
| Output Voltage                                                           | $V_{OUT}$          | $V_{IN} = 600\text{ mV}$    |     | 0.3    | 1.0  | mV            |
| Noise Output Voltage                                                     | eN                 | Note 3                      |     | 70     | 140  | $\mu\text{V}$ |
| Supply Voltage Ripple Rejection                                          | SVRR               | Note 4                      | 40  | 55     |      | dB            |
| <b>OPERATING POSITION, Note 6</b>                                        |                    |                             |     |        |      |               |
| Total Quiescent Current                                                  | $I_Q$              |                             | 18  | 40     | 70   | mA            |
| Output Power                                                             | $P_{OUT}$          | THD = 0.5%                  | 5   | 6      |      | W             |
|                                                                          |                    | THD = 10%                   | 6.5 | 8      |      |               |
|                                                                          |                    | THD = 0.5%; $R_L = 4\Omega$ |     | 10     |      |               |
|                                                                          |                    | THD = 10%; $R_L = 4\Omega$  |     | 14     |      |               |
| Total Harmonic Distortion                                                | THD                | $P_{OUT} = 4\text{ W}$      |     | 0.13   | 0.2  | %             |
| Power Bandwidth                                                          | B                  | THD = 0.5%; note 2          |     | 40~20K |      | Hz            |
| Voltage Gain                                                             | $G_V$              |                             | 29  | 30     | 31   | dB            |
| Gain Unbalance                                                           | $ G_V $            |                             |     | 0.2    | 1    | dB            |
| Noise Output Voltage                                                     | eN                 | Note 3                      |     | 70     | 140  | $\mu\text{V}$ |
| Input Impedance                                                          | $R_{IN}$           |                             | 14  | 20     | 26   | k $\Omega$    |
| Supply Voltage Ripple Rejection                                          | SVRR               |                             | 35  | 44     |      | dB            |
| Channel Separation                                                       | $\alpha$           |                             |     | 45     |      | dB            |
| <b>MUTE POSITION (<math>I_{MUTE} \geq 300\text{ }\mu\text{A}</math>)</b> |                    |                             |     |        |      |               |
| Output Voltage                                                           | $V_{OUT}$          | $V_{IN} = 600\text{ mV}$    |     | 0.3    | 1.0  | mV            |
| Mute Input Impedance                                                     | $Z_{2-7}$          | Note 7                      | 6.7 | 9      | 11.3 | k $\Omega$    |
| Total Quiescent Current                                                  | $I_Q$              |                             | 18  | 40     | 70   | mA            |
| Noise Output Voltage                                                     | eN                 | Note 3                      |     | 70     | 140  | $\mu\text{V}$ |
| Supply Voltage Ripple Rejection                                          | SVRR               | Note 4                      | 35  | 44     |      | dB            |
| Offset Voltage With Respect To Operating Position                        | $ \Delta V_{off} $ |                             |     | 4      | 150  | mV            |
| Current If Pin 2 Is Connected To Pin 5                                   | $I_2$              |                             |     |        | 8.2  | mA            |

Note: 1.  $V_P = \pm 16\text{ V}$ ;  $R_L = 8\text{ }\Omega$ ;  $T_a = 25\text{ }^\circ\text{C}$ ;  $f = 1\text{ kHz}$ ; symmetrical power supply  $I_{MUTE} < 30\text{ }\mu\text{A}$ . See Fig. 1

2. The power bandwidth is measured at  $P_{O(MAX)}$  3 dB output power

3. The noise output voltage (RMS value) is measured at  $R_S = 2\text{ k}\Omega$ , unweighted (20 Hz to 20 kHz)

4. The ripple rejection is measured at  $R_S = 0$  and  $f = 100\text{ Hz}$  to  $20\text{ kHz}$ . The ripple voltage (200 mV) is applied in phase to the positive and the negative supply rails. With asymmetrical power supplies, the ripple rejection is measured at  $f = 1\text{ kHz}$

5.  $\pm V_P = 4\text{ V}$ ;  $R_L = 8\text{ }\Omega$ ;  $T_a = 25\text{ }^\circ\text{C}$ ;  $f = 1\text{ kHz}$ ; symmetrical power supply. See Fig.1

6.  $V_P = 24\text{ V}$ ;  $R_L = 8\text{ }\Omega$ ;  $T_a = 25\text{ }^\circ\text{C}$ ;  $f = 1\text{ kHz}$ ; asymmetrical power supply  $I_{MUTE} < 30\text{ }\mu\text{A}$ . See Fig.2

7. At pin 2 it is a resistor divider of typical 4k $\Omega$  and 5k $\Omega$  to the positive supply rail. And at the connection of the 4k $\Omega$  and 5k $\Omega$  resistor a zener diode of typical 6.6 V is also connected to the positive supply rail. The zener's spread voltage is 6.1 to 7.1 V.

### ■ TYPICAL APPLICATION CIRCUIT

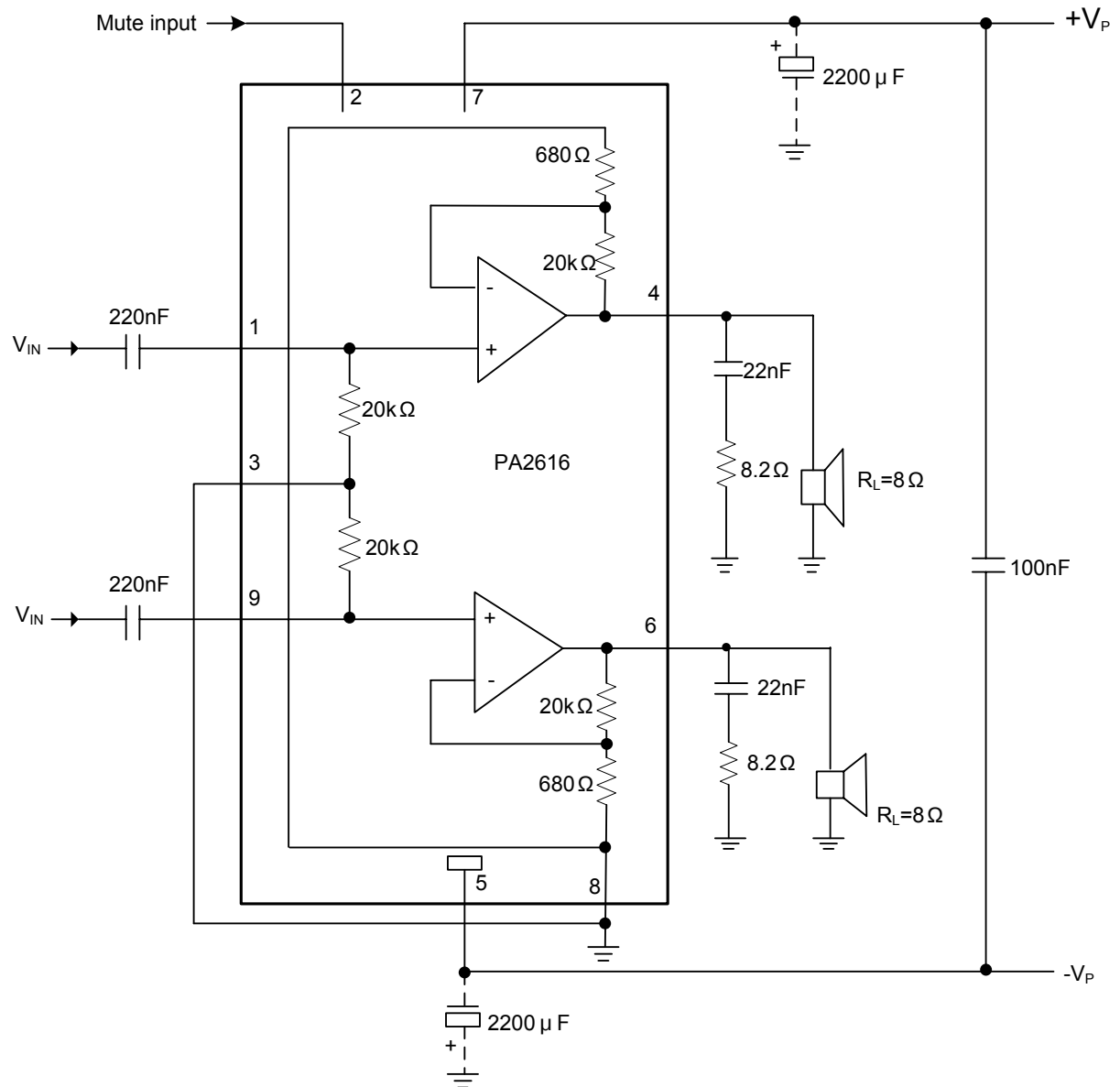


Fig. 1 Test and Application Circuit with Symmetrical Power Supply

### ■ TYPICAL APPLICATION CIRCUIT (Cont.)

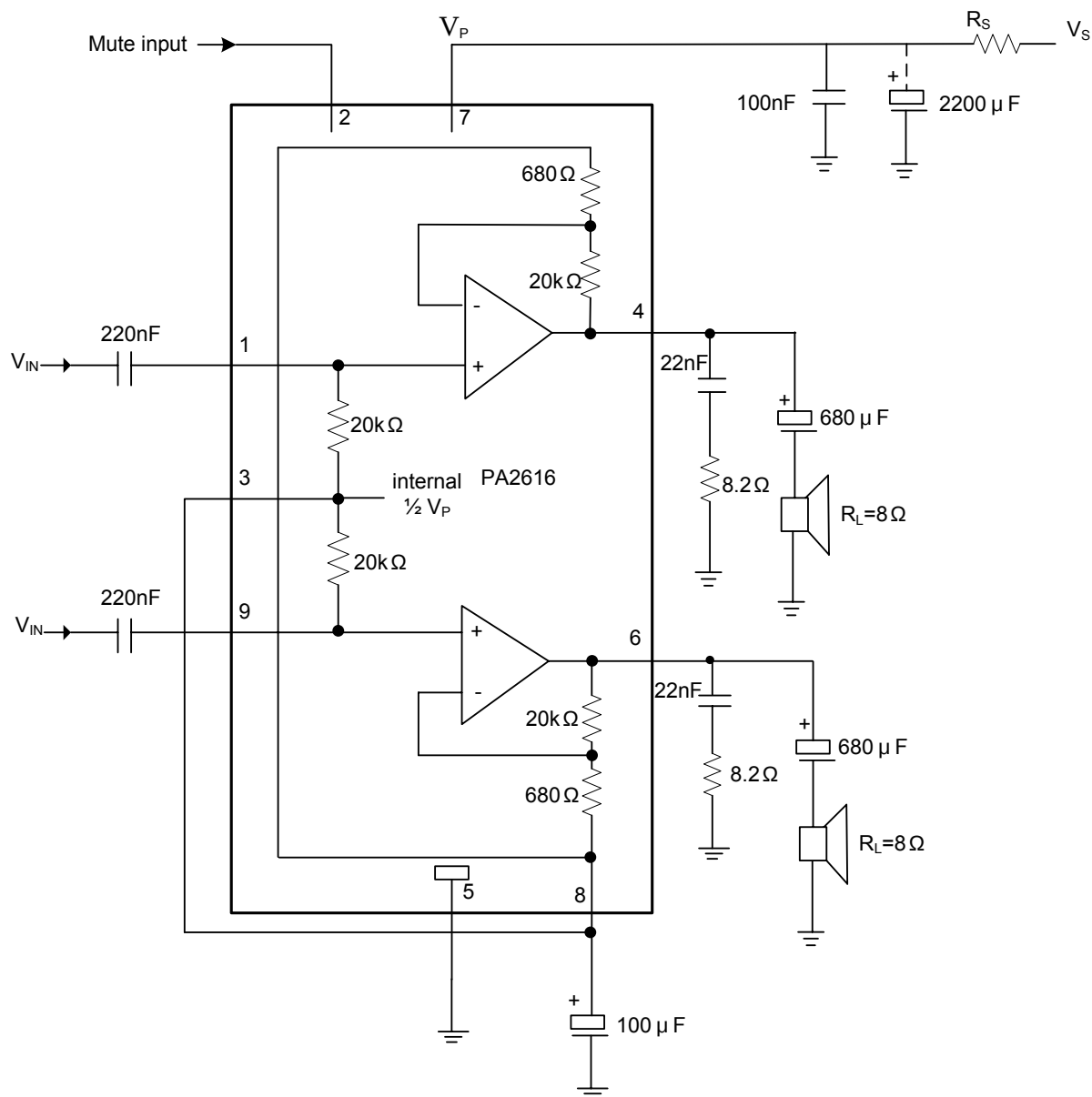


Fig. 2 Test and Application Circuit with Asymmetrical Power Supply

UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.