

## NTE1633 Integrated Circuit TV Sound Channel w/DC Controls

### **Description:**

The NTE1633 is a complete TV sound channel in a 20-Lead DIP type package with DC tone and volume controls plus separate VCR input and output connections. Supplied in a 20-pin DIP, the device delivers an output power of 4W into 16Ω (d = 10%,  $V_S = 24V$ ) or 1.5W into 8Ω (d = 10%,  $V_S = 12V$ ). Included in the NTE1633 are: IF amplifier limiter, active low-pass filter, AF preamplifier and power amplifier, turnoff muting, mute circuit and thermal protection.

High output, high sensitivity, excellent AM rejection and low distortion make the device suitable for use in TVs of almost any type. Further, no screening is necessary because the device is free of radiation problems.

### **Features:**

- Separate VCR Input and Output Pins
- 4W Output Power into 16Ω
- No Screening Required
- High Sensitivity
- Excellent AM Rejection
- Low Distortion
- DC Tone/Volume Controls
- Thermal Protection

### **Absolute Maximum Ratings:**

|                                                                      |                  |
|----------------------------------------------------------------------|------------------|
| Supply Voltage (Pin18), $V_S$                                        | 28V              |
| Voltage at Pin1, $V_i$                                               | $\pm V_S$        |
| Input Voltage (Pin2), $V_i$                                          | 1V <sub>pp</sub> |
| Output Peak Current, $I_O$                                           |                  |
| Repetitive                                                           | 1.5A             |
| Non-Repetitive                                                       | 2A               |
| Current (Pin4), $I_4$                                                | 10mA             |
| Power Dissipation ( $T_{pins} = +90^\circ C$ ), $P_{tot}$            | 4.3W             |
| Power Dissipation ( $T_A = +70^\circ C$ ), $P_{tot}$                 | 1.0W             |
| Operating Junction Temperature Range, $T_J$                          | -40° to 150°C    |
| Storage Temperature Range, $T_{stg}$                                 | -40° to 150°C    |
| Maximum Thermal Resistance, Junction-to-Pins, $R_{thJPins}$          | 14°C/W           |
| Maximum Thermal Resistance, Junction-to-Ambient (Note 1), $R_{thJA}$ | 80°C/W           |

Note 1. Obtained with GND pins soldered to printed circuit with minimized copper area.

**Electrical Characteristics:**  $V_S = 24V$ , S1: ON,  $\Delta f = \pm 25kHz$ ,  $V_i = 1mV$ ,  $P_1 = 12k\Omega$ ,  $f_0 = 4.5MHz$ ,  $f_m = 400Hz$ ,  $T_A = +25^\circ C$  unless otherwise indicated)

| Parameter                                                | Symbol                               | Test Conditions                                                                                                          | Min  | Typ   | Max | Unit                   |
|----------------------------------------------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------|-------|-----|------------------------|
| DC Characteristics                                       |                                      |                                                                                                                          |      |       |     |                        |
| Supply Voltage (Pin18)                                   | V <sub>S</sub>                       | P <sub>2</sub> = 12kΩ                                                                                                    | 10.8 | –     | 27  | V                      |
| Quiescent Output Voltage (Pin18)                         | V <sub>O</sub>                       |                                                                                                                          | 11   | 12    | 13  | V                      |
| DC Voltage (Pin1)                                        | V <sub>1</sub>                       | P <sub>2</sub> = 12kΩ, R <sub>1</sub> = 270kΩ                                                                            | –    | 5.3   | –   | V                      |
| DC Voltage (Pin4)                                        | V <sub>4</sub>                       | P <sub>2</sub> = 12kΩ                                                                                                    | –    | 3.2   | –   | V                      |
| Quiescent Drain Current (Pin4)                           | I <sub>d</sub>                       |                                                                                                                          | –    | 32    | –   | mA                     |
| IF Amplifier & Detector                                  |                                      |                                                                                                                          |      |       |     |                        |
| Input Limiting Voltage @ Pin2 (–3dB)                     | V <sub>i(threshold)</sub>            | V <sub>O</sub> = 4V <sub>rms</sub>                                                                                       | –    | 50    | 100 | μV                     |
| Recovered Audio Voltage (Pin9)                           | V <sub>9</sub>                       | Δf = ± 7.5kHz, P <sub>2</sub> = 12kΩ                                                                                     | 140  | 200   | 280 | mV                     |
| Amplitude Modulation Rejection                           | AMR                                  | m = 0.3, V <sub>1</sub> = 1mV, V <sub>O</sub> = 4V <sub>rms</sub> , Note 2                                               | –    | 60    | –   | dB                     |
| Input Resistance (Pin2)                                  | R <sub>i</sub>                       | Δf = 0, P <sub>2</sub> = 12kΩ                                                                                            | –    | 30    | –   | kΩ                     |
| Input Capacitance (Pin2)                                 | C <sub>i</sub>                       |                                                                                                                          | –    | 6     | –   | pF                     |
| De–Emphasis Resistance                                   | R9                                   | C <sub>1</sub> = 60 to 888nF                                                                                             | 0.75 | 1.1   | 1.5 | kΩ                     |
| DC Volume Control                                        |                                      |                                                                                                                          |      |       |     |                        |
| Volume Attenuation<br>(Resistance Control)               | K <sub>V</sub>                       | P <sub>2</sub> = 0Ω                                                                                                      | –    | 0     | –   | dB                     |
|                                                          |                                      | P <sub>2</sub> = 4.3kΩ                                                                                                   | 20   | 26    | 32  | dB                     |
|                                                          |                                      | P <sub>2</sub> = 12kΩ                                                                                                    | –    | 88    | –   | dB                     |
| Control Voltage                                          | V <sub>C</sub>                       | K = 0dB                                                                                                                  | –    | 0     | –   | V                      |
|                                                          |                                      | K = 26dB                                                                                                                 | –    | 1.3   | –   | V                      |
|                                                          |                                      | K = 88dB                                                                                                                 | –    | 2.6   | –   | V                      |
| Volume Attenuation Thermal Drift<br>(Resistance Control) | $\frac{\Delta K_V}{\Delta T_{pins}}$ | T <sub>pins</sub> = +25° to +85°C, P <sub>2</sub> = 4.3kΩ                                                                | –    | –0.05 | –   | $\frac{dB}{^{\circ}C}$ |
| DC Tone Control                                          |                                      |                                                                                                                          |      |       |     |                        |
| Tone Cut                                                 | K <sub>T</sub>                       | S1: OFF, V <sub>10</sub> = 200mV, P <sub>1</sub> = 12kΩ to 100kΩ, f <sub>AF</sub> = 10kHz                                | –    | 14    | –   | dB                     |
| Audio Frequency Amplifier                                |                                      |                                                                                                                          |      |       |     |                        |
| Output Power (d = 10%)                                   | P <sub>O</sub>                       | V <sub>S</sub> = 24V, R <sub>L</sub> = 16Ω                                                                               | 3.5  | 4.1   | –   | W                      |
|                                                          |                                      | V <sub>S</sub> = 12V, R <sub>L</sub> = 8Ω                                                                                | –    | 1.5   | –   |                        |
| Frequency Response of Audio Amplifier (–3dB)             | B                                    | P <sub>O</sub> = 1W, R <sub>L</sub> = 16Ω, S1: OFF, V <sub>10</sub> = 200mV V <sub>O</sub> = 4V <sub>rms</sub> , @ 400Hz | 15   | 50    | –   | kHz                    |
| Supply Voltage Rejection                                 | SVR                                  | P <sub>2</sub> = 12kΩ, Δ f =0, f <sub>ripple</sub> = 120Hz                                                               | –    | 26    | –   | dB                     |

Note 2. Test Bandwidth = 20kHz

**Electrical Characteristics (Cont'd):**  $V_S = 24V$ ,  $S1$ : ON,  $\Delta f = \pm 25kHz$ ,  $V_i = 1mV$ ,  $P_1 = 12k\Omega$ ,  
 $f_0 = 4.5MHz$ ,  $f_m = 400Hz$ ,  $T_A = +25^\circ C$  unless otherwise indicated)

| Parameter                                               | Symbol          | Test Conditions                                             | Min | Typ | Max | Unit      |
|---------------------------------------------------------|-----------------|-------------------------------------------------------------|-----|-----|-----|-----------|
| <b>VCR</b>                                              |                 |                                                             |     |     |     |           |
| Total Harmonic Distortion of Pin9 Output Signal         | d               | $\Delta f = \pm 7.5kHz$ , $V_i = 1mV$                       | –   | 0.5 | –   | %         |
| Supply Voltage Rejection at Output Pin9                 | SVR             | $\Delta f = 0$ , $f_{ripple} = 120Hz$ , $P_2 = 12k\Omega$   | –   | 66  | –   | dB        |
| Signal-to-Noise Ratio at Output Pin9                    | $\frac{S+N}{N}$ | $\Delta f = \pm 25kHz$ , $V_i \geq 1mV$                     | –   | 70  | –   | dB        |
| Input Voltage (Playback)                                | $V_{10}$        | $V_0 = 4V_{rms}$ , $P_2 = 0$ , $S1$ : OFF                   | 50  | 70  | 100 | mV        |
| Input Resistance (Playback)                             | $R_{10}$        | $S1$ : OFF                                                  | 10  | –   | –   | $k\Omega$ |
| Total Harmonic Distortion for 20dB Overload of $V_{10}$ | d               | $S1$ : OFF, $V_{10} = 1V_{rms}$ , $V_0 = 4V_{rms}$          | –   | 0.5 | 2.0 | %         |
| <b>Overall Circuit</b>                                  |                 |                                                             |     |     |     |           |
| Signal-to-Noise Ratio                                   | $\frac{S+N}{N}$ | $V_i \geq 1mV$ , $V_0 = 4V_{rms}$ , $\Delta f = 0$ , Note 2 | –   | 70  | –   | dB        |
| Distortion                                              | d               | $P_0 = 50mW$ , $\Delta f = \pm 7.5Hz$ , Note 2              |     |     |     |           |
|                                                         |                 | $V_S = 24V$ , $R_L = 16\Omega$                              | –   | 0.5 | –   | %         |
|                                                         |                 | $V_S = 12V$ , $R_L = 8\Omega$                               | –   | 0.5 | –   | %         |
| Muting                                                  | M               | $V_0 = 4V_{rms}$ @ no $V_1$ ; $V_1 = 0$ , Note 2            | –   | 100 | –   | dB        |
| Deviation Sensitivity                                   | $\Delta f$      | $P_2 = 0$ $V_0 = 4V_{rms}$                                  | –   | 3   | 6   | kHz       |

Note 2. Test Bandwidth = 20kHz



