

# AN7333S

## 4-Element Graphic Equalizer IC for Radio/Radio Cassette Recorder

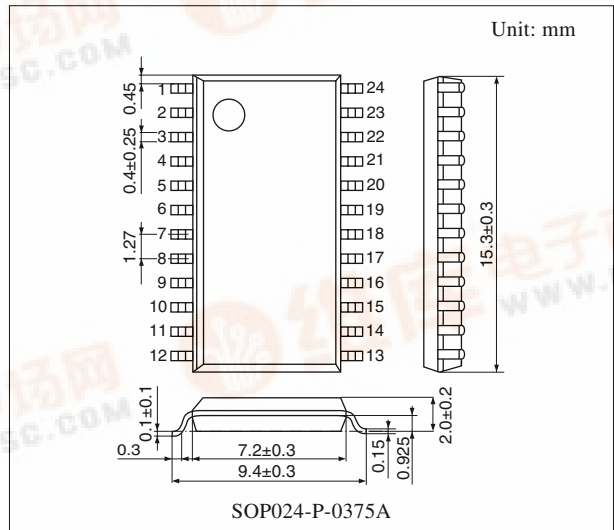
### Overview

The AN7333S is an integrated circuit for 4-element graphic equalizers most suitable for radio cassette / portable component stereo equipment.

2-channel 4-element graphic equalizer can be configured by applying frequency setting capacitors and variable resistors externally. Non-step adjustment of the boost and the cutting quantity is possible by variable resistors.

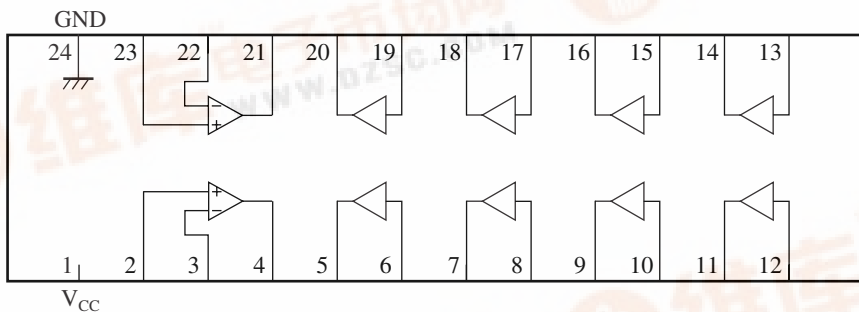
### Features

- The resonance frequency can be freely set by optional selection of the capacitor capacitance.
- Low distortion rate: THD = 0.04% ( $V_{CC} = 5V$ )
- Wide dynamic range:  $V_O = 800\text{ mV[rms]}$  (at Boost THD = 1%)
- Low noise level:  $V_{no} = 10\text{ }\mu\text{V}$  ( $V_{CC} = 5V$ )



Note) The package of this product will be changed to lead-free type (SOP024-P-0375C). See the new package dimensions section later of this datasheet.

### Block Diagram



### ■ Pin Descriptions

| Pin No. | Description         | Pin No. | Description         |
|---------|---------------------|---------|---------------------|
| 1       | Power supply        | 13      | Input pin           |
| 2       | Non inverting input | 14      | Negative feedback   |
| 3       | Inverting input     | 15      | Input pin           |
| 4       | Output              | 16      | Negative feedback   |
| 5       | Negative feedback   | 17      | Input pin           |
| 6       | Input pin           | 18      | Negative feedback   |
| 7       | Negative feedback   | 19      | Input pin           |
| 8       | Input pin           | 20      | Negative feedback   |
| 9       | Negative feedback   | 21      | Output              |
| 10      | Input pin           | 22      | Inverting input     |
| 11      | Negative feedback   | 23      | Non inverting input |
| 12      | Input pin           | 24      | GND                 |

### ■ Absolute Maximum Ratings

| Parameter                                   | Symbol    | Rating      | Unit |
|---------------------------------------------|-----------|-------------|------|
| Supply voltage                              | $V_{CC}$  | 14.4        | V    |
| Supply current                              | $I_{CC}$  | 30          | mA   |
| Power dissipation                           | $P_D$     | 432         | mW   |
| Operating ambient temperature <sup>*1</sup> | $T_{opr}$ | -20 to +75  | °C   |
| Storage temperature <sup>*1</sup>           | $T_{stg}$ | -55 to +125 | °C   |

Note) \*1: Except for the operating ambient temperature and storage temperature, all ratings are for  $T_a = 25^\circ\text{C}$ .

### ■ Recommended Operating Range

| Parameter      | Symbol             | Range   | Unit |
|----------------|--------------------|---------|------|
| Supply voltage | $V_{CC1}, V_{CC2}$ | 4 to 14 | V    |

### ■ Electrical Characteristics at $V_{CC} = 5\text{ V}$ , $T_a = 25^\circ\text{C}$

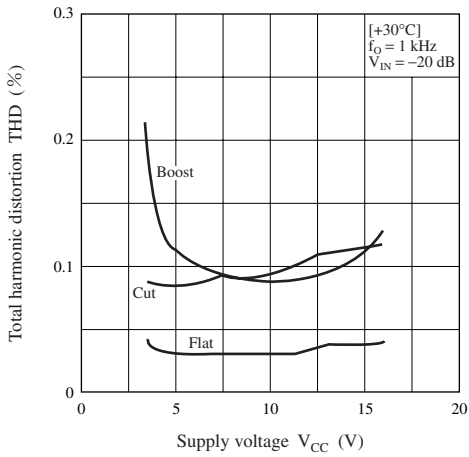
| Parameter                 | Symbol    | Conditions                                                                  | Min | Typ  | Max | Unit          |
|---------------------------|-----------|-----------------------------------------------------------------------------|-----|------|-----|---------------|
| Total circuit current     | $I_{tot}$ | $V_{IN} = 0\text{ mV}$                                                      | —   | 7.5  | —   | mA            |
| Voltage gain              | $G_V$     | $f = 1\text{ kHz}$ , $V_O = -10\text{ dBV}$                                 | —   | -1.5 | —   | dB            |
| Boost quantity            | Boost     | $V_O = -20\text{ dBV}$ is set to 0 dBV                                      | —   | 9.5  | —   | dB            |
| Cut quantity              | Cut       | $V_O = -20\text{ dBV}$ is set to 0 dBV                                      | —   | -9.5 | —   | dB            |
| Total harmonic distortion | THD       | $f = 1\text{ kHz}$ , $V_O = -20\text{ dBV}$                                 | —   | 0.04 | —   | %             |
| Output noise voltage      | $V_{no}$  | $R_g = 0\ \Omega$ , Total Flat, DIN/AUDIO                                   | —   | 10   | —   | $\mu\text{V}$ |
| Crosstalk                 | CT        | $f = 1\text{ kHz}$ , $R_g = 0\ \Omega$ , Total Flat, $V_O = -20\text{ dBV}$ | —   | 12   | —   | $\mu\text{V}$ |

## Terminal Equivalent Circuits

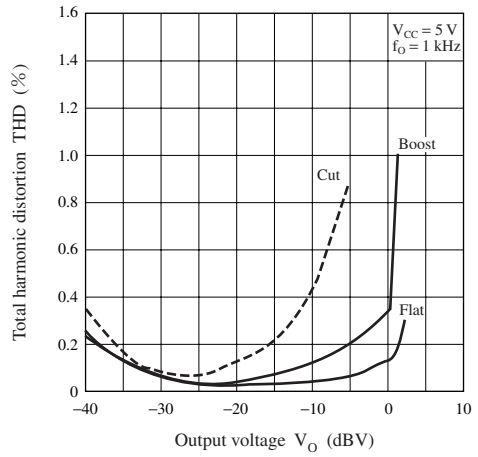
| Pin No.                               | Equivalent circuit | Description                                                           | Pin voltage (V)           |
|---------------------------------------|--------------------|-----------------------------------------------------------------------|---------------------------|
| 1                                     | —                  | Power supply:<br>Supply pin                                           | 5                         |
| 2<br>23                               |                    | Non inverting input:<br>Output buffer circuit non-inverting input pin | $\frac{1}{2} V_{CC}$      |
| 3<br>22                               |                    | Inverting input:<br>Output buffer circuit inverting input pin         | Center electric potential |
| 4<br>21                               |                    | Output:<br>Output buffer output pin                                   | Center electric potential |
| 5, 7,<br>9, 11,<br>14, 16,<br>18, 20  |                    | Negative feedback:<br>Resonance circuit negative feedback pin         | Center electric potential |
| 6, 8,<br>10, 12,<br>13, 15,<br>17, 19 |                    | Input pin:<br>Resonance circuit input pin                             | Center electric potential |
| 24                                    | —                  | GND pin:                                                              | 0                         |

■ Main Characteristics

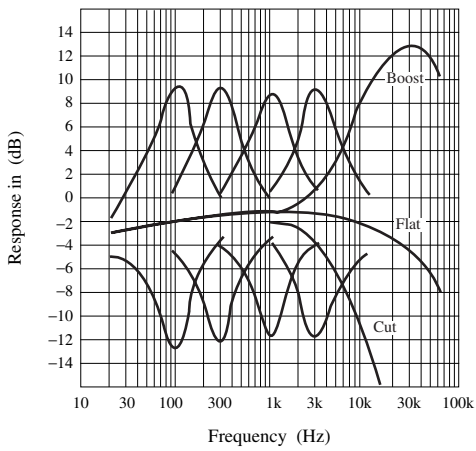
THD —  $V_{CC}$



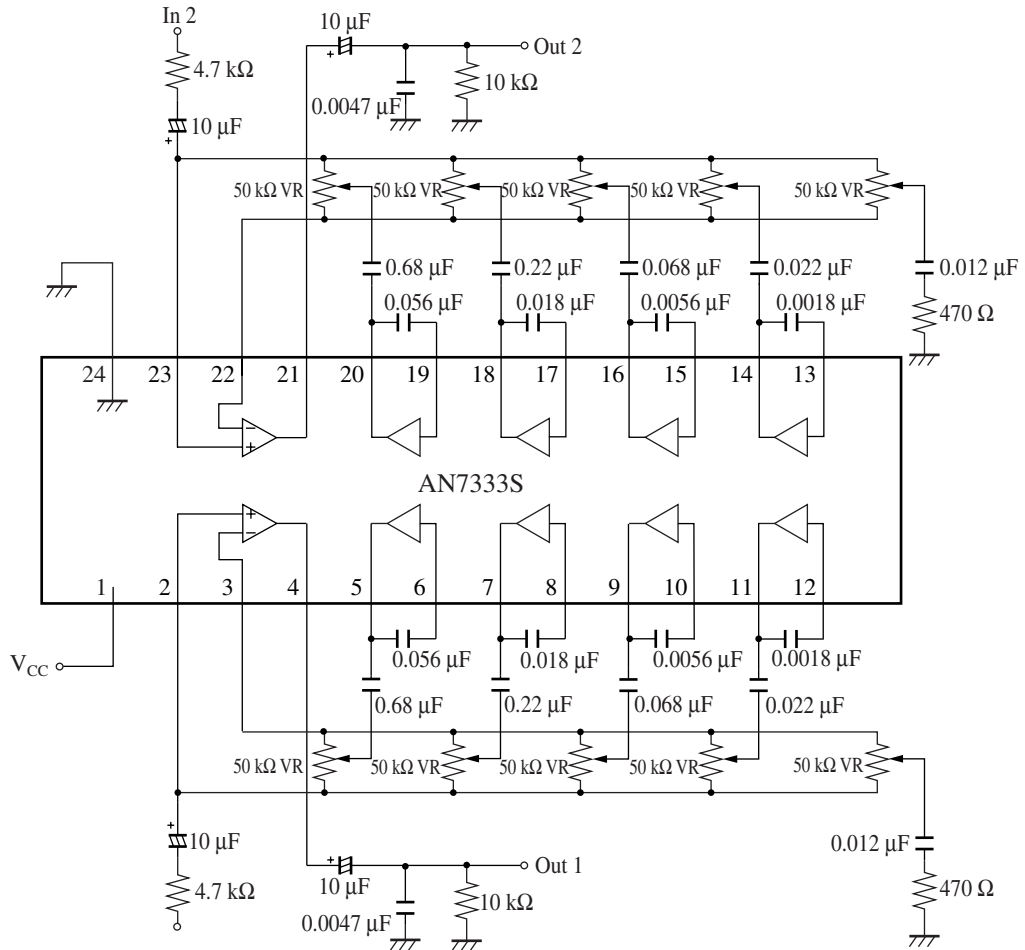
THD —  $V_O$



Frequency characteristics

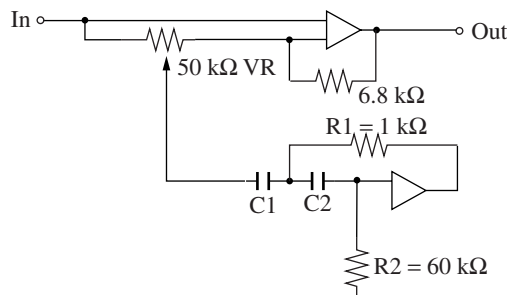


■ Application Circuit Example



Note) VR is B or G type.

• Resonant frequency fo



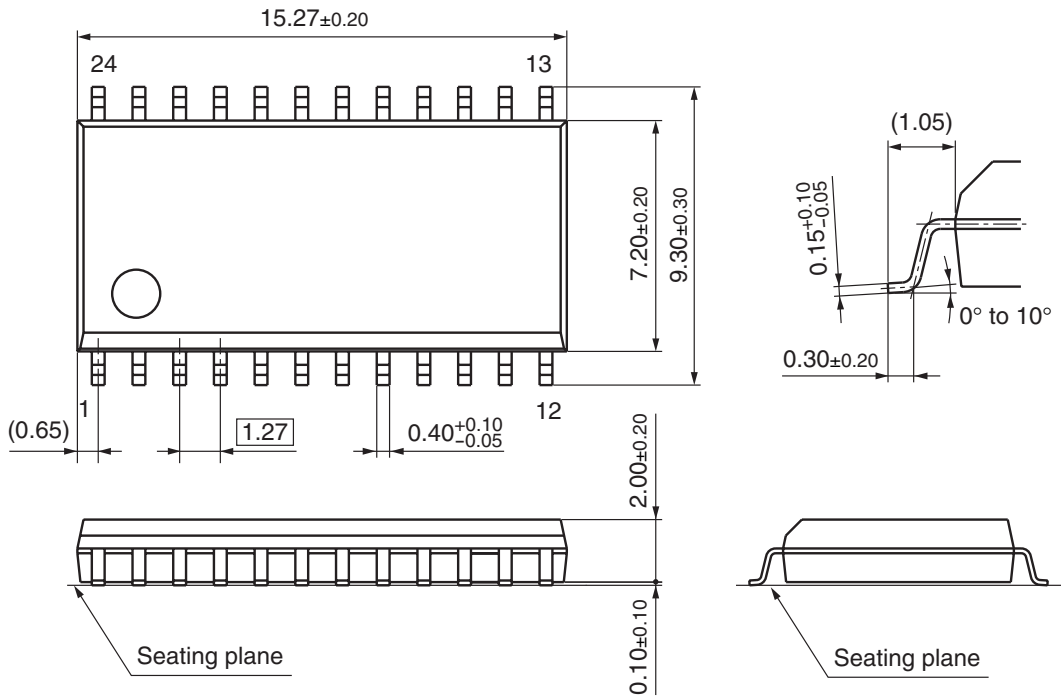
$$f_o = \frac{1}{2\pi\sqrt{C1 \times C2 \times R1 \times R2}}$$

(Internal resistance: R1 = 1 kΩ, R2 = 60 kΩ)

- \* Internal resistance: As R1 and R2 of internal resistors are common in each oscillation circuit, fo can be adjustable from an external capacitor.
- \* Gain can be adjusted by the 50 kΩ variable resistor.

## ■ New Package Dimensions (Unit: mm)

- SOP024-P-0375C (Lead-free package)



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