

# Seven Band Graphic Equalizer Data Sheet

MSGEQ7

## Description

The seven band graphic equalizer IC is a CMOS chip that divides the audio spectrum into seven bands, 63Hz, 160Hz, 400Hz, 1kHz, 2.5kHz, 6.25kHz and 16kHz. The seven frequencies are peak detected and multiplexed to the output to provide a DC representation of the amplitude of each band. No external components are needed to select the filter responses. Only an off chip resistor and capacitor are needed to select the on chip clock oscillator frequency. The filter center frequencies track this frequency.

Other than coupling and decoupling capacitors, no other external components are needed. The chip supply can be between 2.7 and 5.5 volts with 5 volts providing the best performance. The device has very low quiescent current ( less than 1mA typical) for portable audio devices. The multiplexor is controlled by a reset and a strobe, permitting multiplexor readout with only two pins. The multiplexor readout rate also controls the decay time (10% decay per read), so no external pins are needed for this function.

## Features

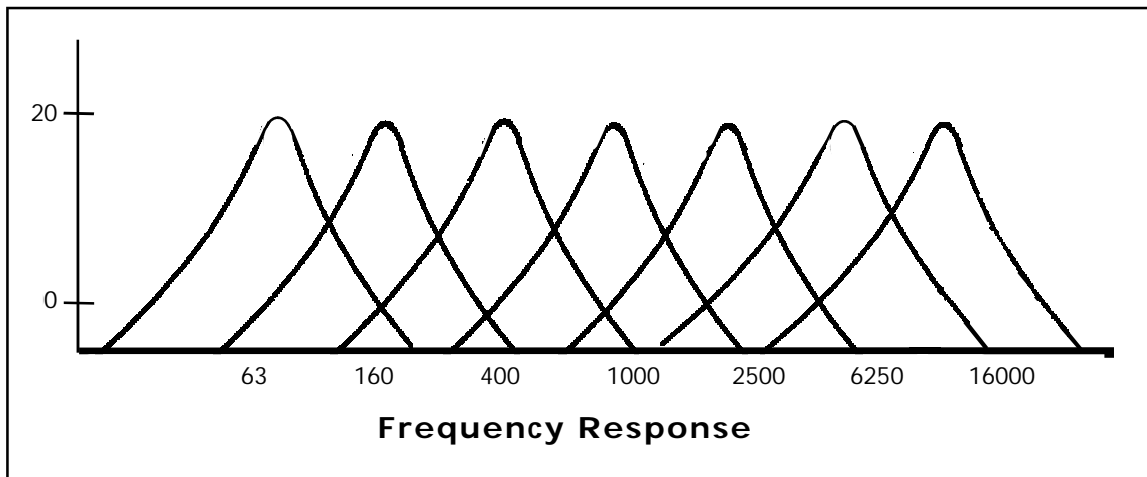
- Low Power Consumption
- Only Two External Components
- On Chip Ground Reference
- Switched - Capacitor Filters
- 3.3 or 5 volt Operation
- 20 dB of Gain Typical
- On Chip Oscillator
- Output Multiplexor
- Variable Decay Time
- 8 Pin Package

## Applications

- Portable Stereos
- Car Stereos
- Hi-Fi Stereos
- Spectrum Analyzers

## Absolute Maximum Ratings

|                       |                |
|-----------------------|----------------|
| Power Supply Voltage  | +6V            |
| Storage Temperature   | -60 to + 150 C |
| Operating Temperature | 0 to 70 C      |



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## Electrical Characteristics\_\_\_\_\_

(VDD = +5.0V, T = 25°C)

| PARAMETER              | SYMBOL | CONDITIONS   | MIN | TYP | MAX | UNITS |
|------------------------|--------|--|-----|-----|-----|-------|
| DC Specifications      |        |  |     |     |     |       |
| Operating Voltage      | VDD    |  | 2.7 | 5.0 | 5.5 | V     |
| Supply Current         | IDD    | 1 Mohm Load on Output                                | 0.5 | 0.8 | 1.0 | mA    |
| Output Drive           | IO     |  |     | 1   |     | mA    |
| Output Impedance       | ZO     |  |     | 700 |     | ohms  |
| Output Offset          | VOS    |  |     |     | 600 | mV    |
| Band Offset Difference |        | Same device  |     |     | 200 | mV    |
| AC Specifications      |        |  |     |     |     |       |
| Gain                   | AV     | Peak input to DC output, Vin = 100 mVpp, fin = 1 kHz | 20  | 22  | 24  | dB    |
| Filter Q               | Q      |  | 5.5 | 6.0 | 6.5 |       |
| Output Swing           |        | Vin = 0.3Vpp, fin = 1 kHz                            | 3.5 | 4   |     | V     |
| Clock Frequency        | FCLK   | C = 33 pF*, R = 200 kohms                            | 145 | 165 | 180 | kHz   |
| Input Impedance        | ZIN    |  | 1   |     |     | Mohm  |

\* includes stray capacitance

## Ordering Information\_\_\_\_\_

Part Number Package Operating Temperature

MSGEQ7P 8 Pin Dip 0-70 °C  
MSGEQ7N 8 Pin 150 mils SOIC 0-70 °C

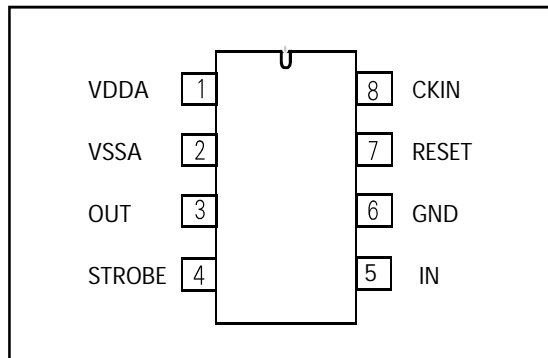


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## Pin Description

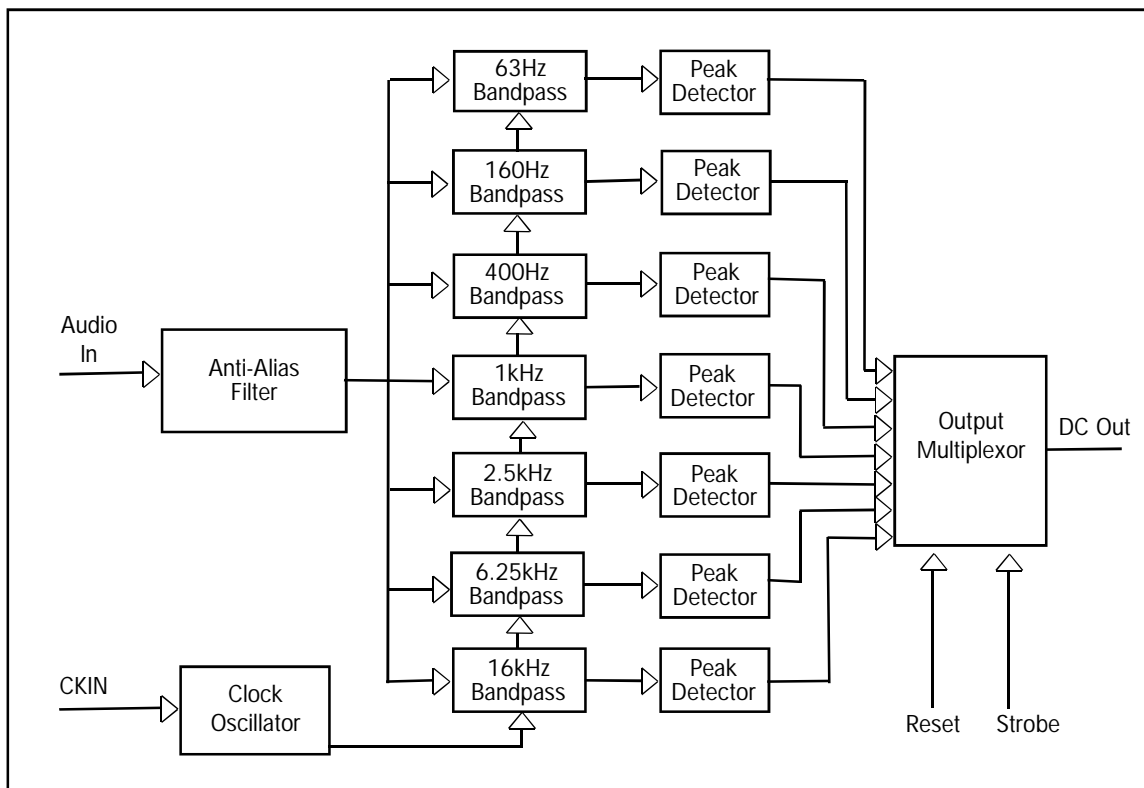
- |           |  |
|-----------|--|
| 1. VDD    | Positive Power Supply<br>Typically 5 Volts               |
| 2. VSS    | Negative Power Supply<br>Typically 0 Volts               |
| 3. OUT    | Multiplexed DC Output                                    |
| 4. STROBE | Channel Selection Pin                                    |
| 5. IN     | Audio Input  |
| 6. GND    | Internally Generated Ground<br>Reference. Typically 2.5V |
| 7. RESET  | Resets Multiplexor                                       |
| 8. CKIN   | Clock Oscillator Pin                                     |

## Pin Configuration



**MSGEQ7**

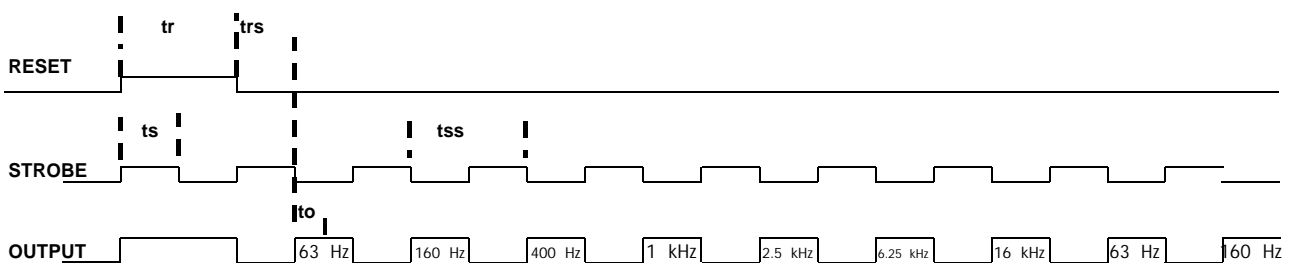
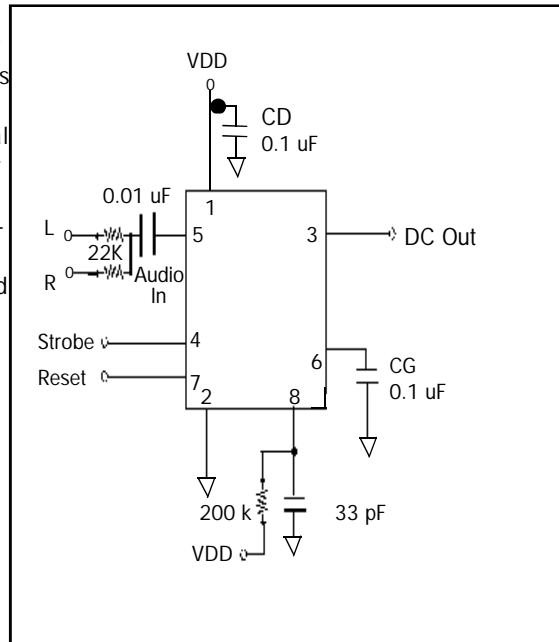
## Block Diagram



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## Multiplexor Operation — Typical Application

The DC peak output for measurement is selected using the reset and strobe pins. Reset high resets the multiplexor. Reset low enables the strobe pin. After the first strobe leading edge, 63Hz output is on OUT. Each additional strobe leading edge advances the multiplexor one channel (63Hz, 160Hz, 400Hz, 1kHz, 2.5kHz, 6.25kHz, 16kHz etc.) and this will repeat indefinitely. The multiplexor read rate is also the output decay time control. Each read decays that channel approximately 10%. The strobe timing is shown below:



|                                     |            |   |
|-------------------------------------|------------|---|
| <b>tr - Reset Pulse Width</b>       | 100 nS min |   |
| <b>trs - Reset to Strobe Delay</b>  | 72 uS min  |   |
| <b>ts - Strobe Pulse Width</b>      | 18 uS min  |   |
| <b>tss - Strobe to Strobe Delay</b> | 72 uS min  |   |
| <b>to - Output Settling Time</b>    | 36 uS min  | (with Cload = 22 pF and Rload = 1 Mohm) |

### Strobe Timing Diagram



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