

Electronic two-tone ringer

Features

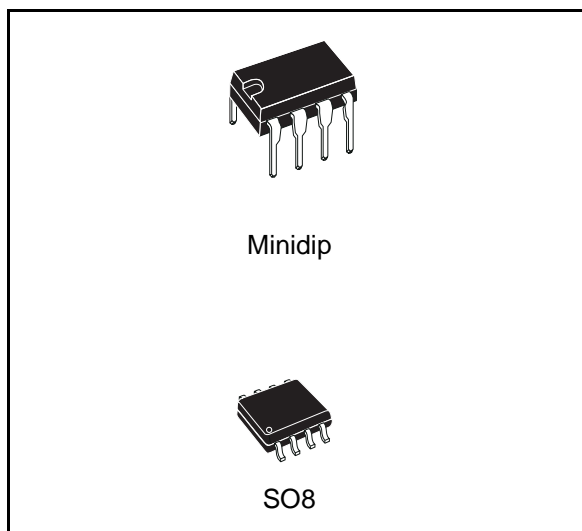
- Low current consumption, in order to allow the parallel operation of 4 devices
- Integrated rectifier bridge with zener diodes to protect against over voltages little external circuitry
- Tone and switching frequencies adjustable by external components
- Integrated voltage and current hysteresis

Description

LS1240 is a monolithic integrated circuit designed to replace the mechanical bell in telephone sets in connection with an electro-acoustical converter. It can drive directly a piezoceramic converter (buzzer) or a dynamic loudspeaker.

The output current capability of LS1240 is higher than the one of a standard ringer. To drive a dynamic loudspeaker LS1240 can simply use a decoupling capacitor, thus eliminating the usual transformer.

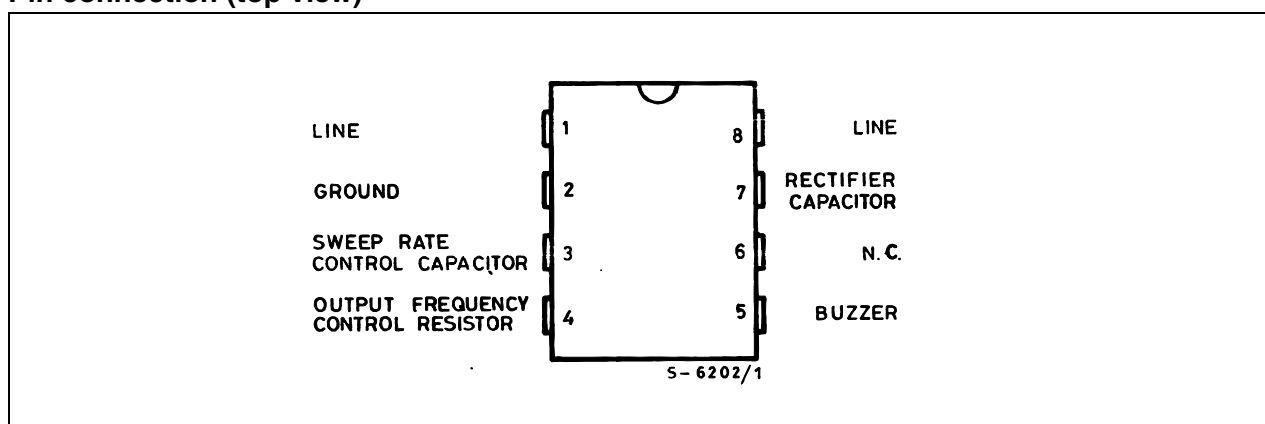
No current limitation is provided on the output stage of LS1240, so a minimum load DC of 50 Ω is advised, in series with a proper capacitor.



The two tone frequencies generated are switched by an internal oscillator in a fast sequence and are made audible across an output amplifier in the loudspeaker. Both tone frequencies and the switching frequency can be externally adjusted.

The supply voltage is obtained from the AC ring signal and the circuit is designed so that noise on the line or variations of the ringing signal cannot affect correct operation of the device.

Pin connection (top view)



1 Block diagram and test circuit

Figure 1. LS1240 block diagram

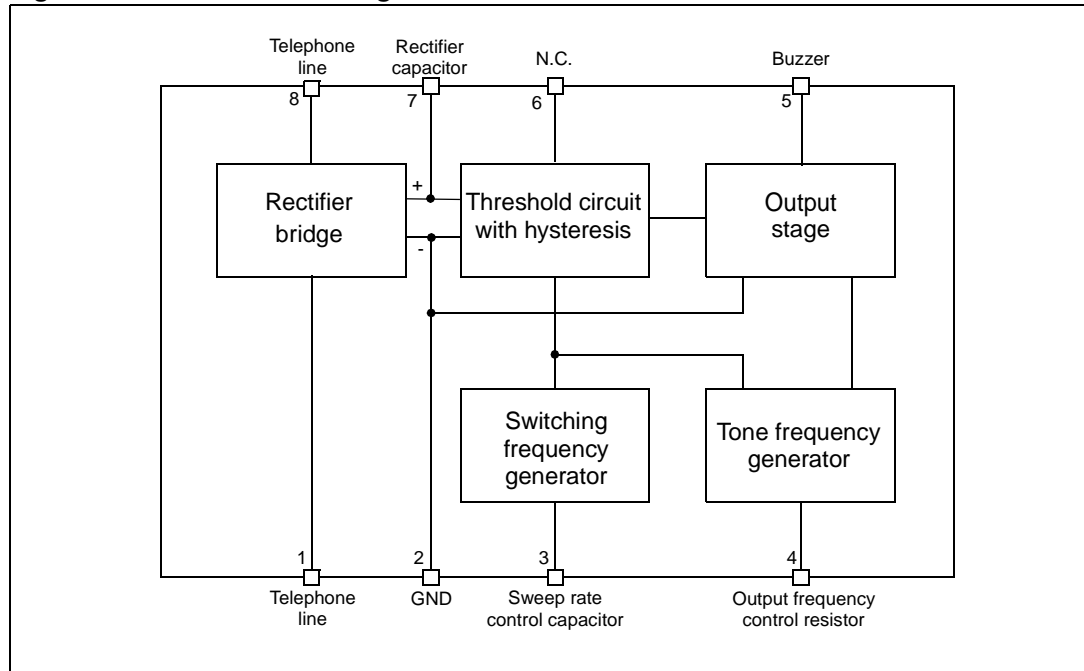
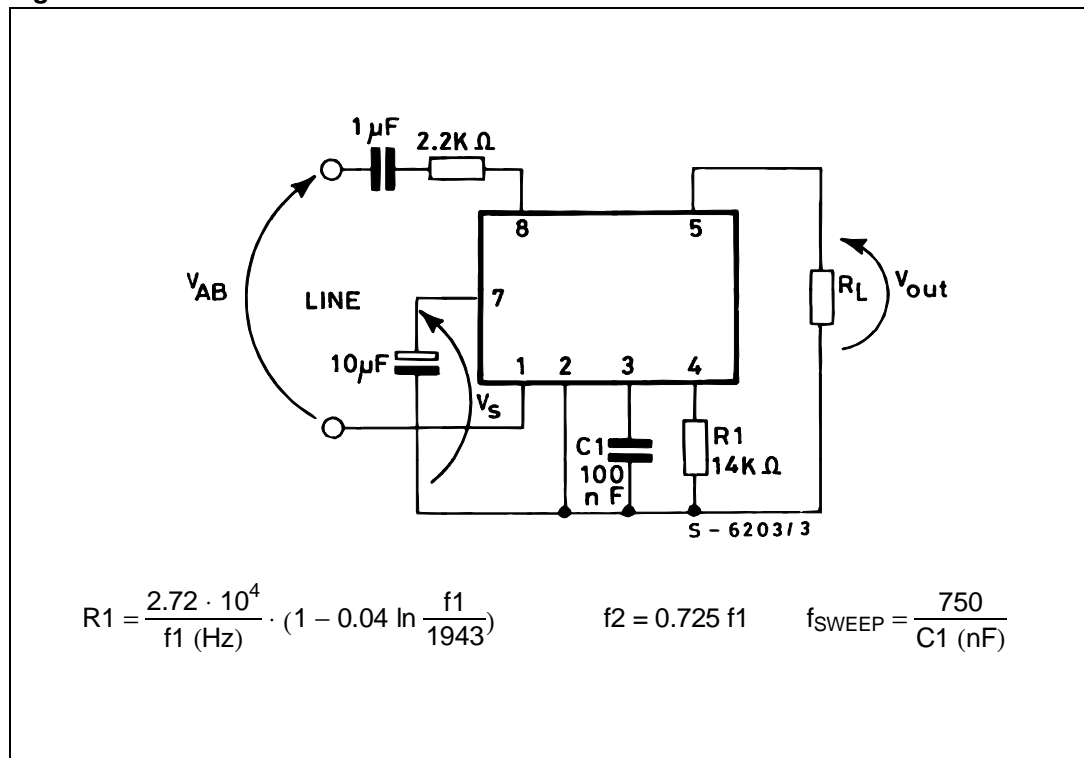


Figure 2. Test circuit



2 Electrical characteristics

Table 1. Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------|---|-------------|------|
| V_{AB} | Calling voltage (f = 50 Hz) continuous | 120 | Vms |
| V_{AB} | Calling voltage (f = 50 Hz) 5s ON/10s OFF | 200 | Vms |
| DC | Supply current | 30 | mA |
| T_{OP} | Operating temperature | -40 to 70 | °C |
| Tstg | Storage and junction temperature | -65 to +150 | °C |

Table 2. Thermal data

| Symbol | Parameter | Value | Unit |
|---------------|---|-------|------|
| $R_{thj-amb}$ | Maximum thermal resistance junction-ambient | 100 | °C/W |

$T_{amb} = 25^{\circ}\text{C}$, $V_S =$ applied between pins 7-2 unless otherwise specified.

Table 3. Electrical characteristics

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | unit |
|---------------------|--|--|------|-----------|------|------------|
| V_S | Supply voltage | | | | 26 | V |
| I_B | Current consumption without load (pins 8-1) | $V_{8-1} = 9.3$ to 25 V | | 1.5 | 1.8 | mA |
| V_{ON} | Activation voltage | | 12.2 | | 13.2 | V |
| V_{OFF} | Sustaining voltage | | 8 | | 9 | V |
| R_D | Differential resistance in OFF conditions (pins 8-1) | | 6.4 | | | k Ω |
| V_{OUT} | Output voltage swing | | | $V_S - 5$ | | V |
| I_{OUT} | Short circuit current (pins 5-2) | $V_S = 20$ V $R_L = 250\Omega$ | | 70 | | mA |
| AC operation | | | | | | |
| f_1 | Output frequencies | $V_S = 26$ V, $R_1 = 14\Omega$ | | | | |
| f_2 | f_{OUT1} | $V_S = 0$ V | 1.74 | | 2.14 | kHz |
| | f_{OUT2} | $V_S = 6$ V | 1.22 | | 1.6 | |
| | $\frac{f_{OUT1}}{f_{OUT2}}$ | | 1.33 | | 1.43 | |
| | Programming resistor range | | 8 | | 56 | k Ω |
| | Sweep frequency | $R_1 = 14$ k Ω , $C_1 = 100$ nF | 5.25 | 7.5 | 9.75 | Hz |

3 Application schematics

Figure 3. Typical application with buzzer

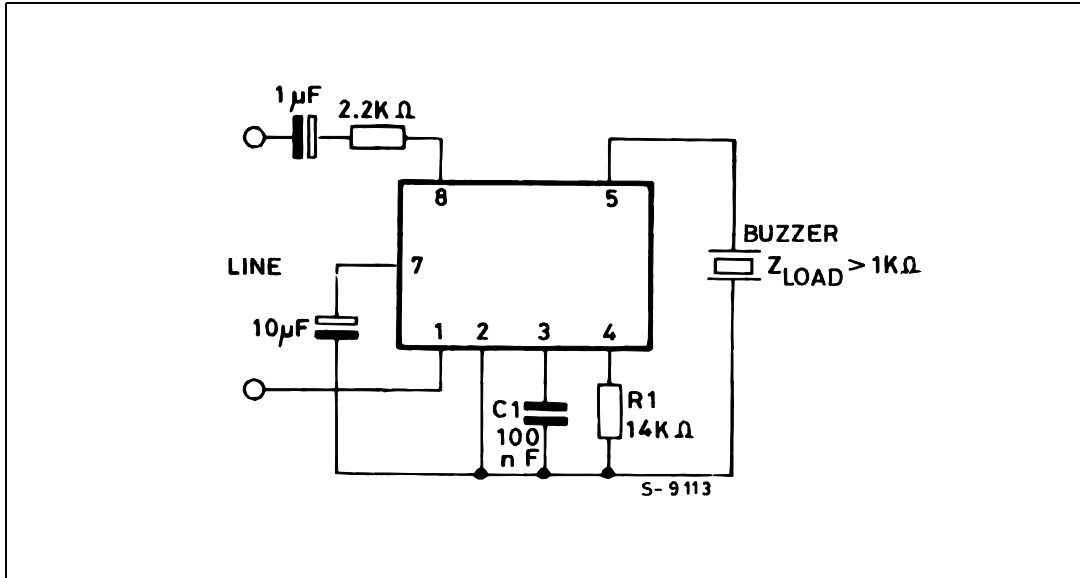
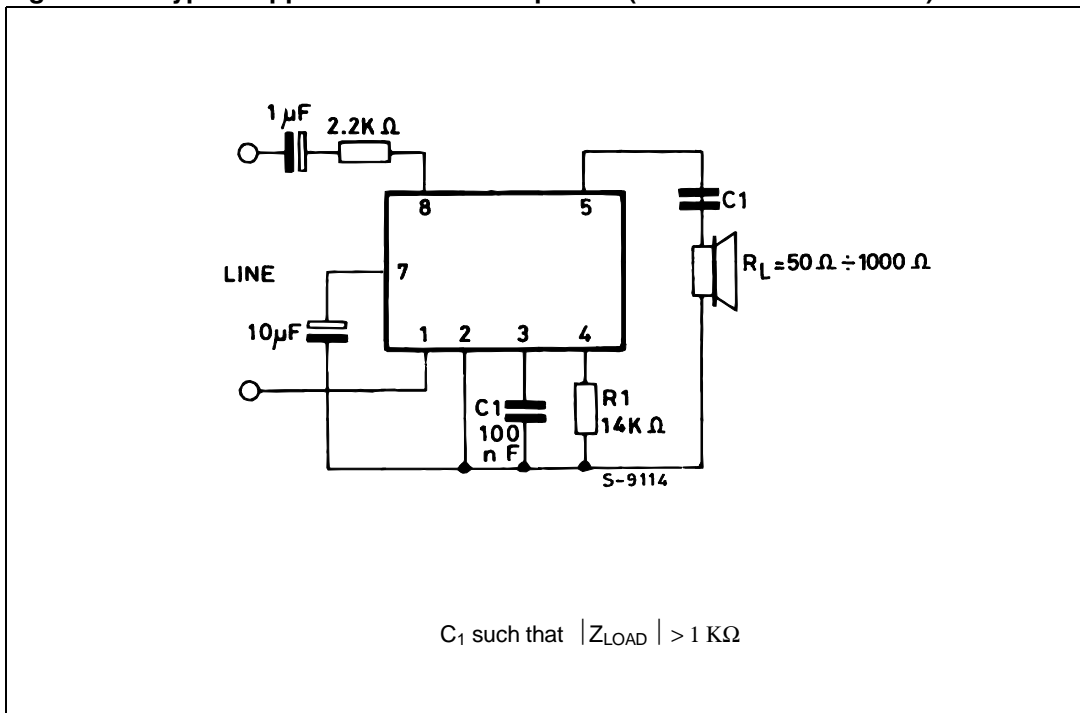


Figure 4. Typical application with loudspeaker (no transformer needed)



4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect . The category of second Level Interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

Table 4. Minidip package dimensions

| Dim. | mm | | | inch | | |
|------|-------|------|-------|-------|-------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | | 3.32 | | | 0.131 | |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.15 | | 1.65 | 0.045 | | 0.065 |
| b | 0.356 | | 0.55 | 0.014 | | 0.022 |
| b1 | 0.204 | | 0.304 | 0.008 | | 0.012 |
| D | | | 10.92 | | | 0.430 |
| E | 7.95 | | 9.75 | 0.313 | | 0.384 |
| e | | 2.54 | | | 0.100 | |
| e3 | | 7.62 | | | 0.300 | |
| e4 | | 7.62 | | | 0.300 | |
| F | | | 6.6 | | | 0.260 |
| I | | | 5.08 | | | 0.200 |
| L | 3.18 | | 3.81 | 0.125 | | 0.150 |
| Z | | | 1.52 | | | 0.060 |

Figure 5. Minidip package mechanical drawing

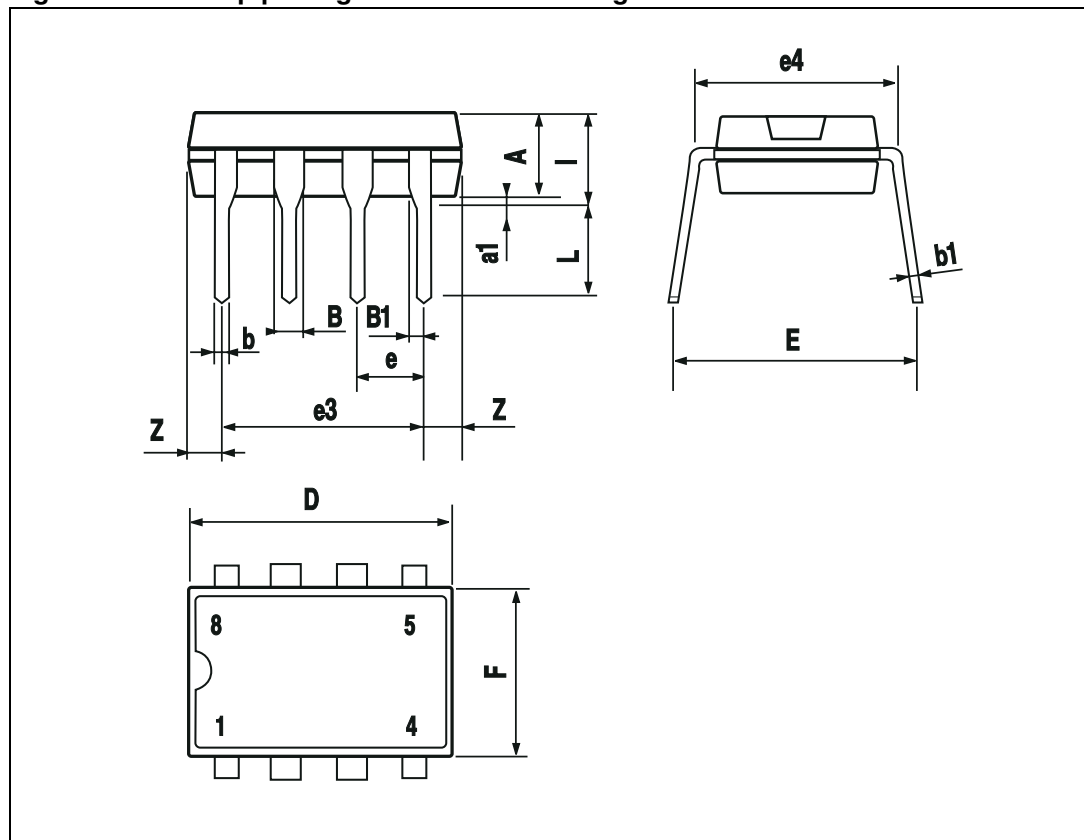
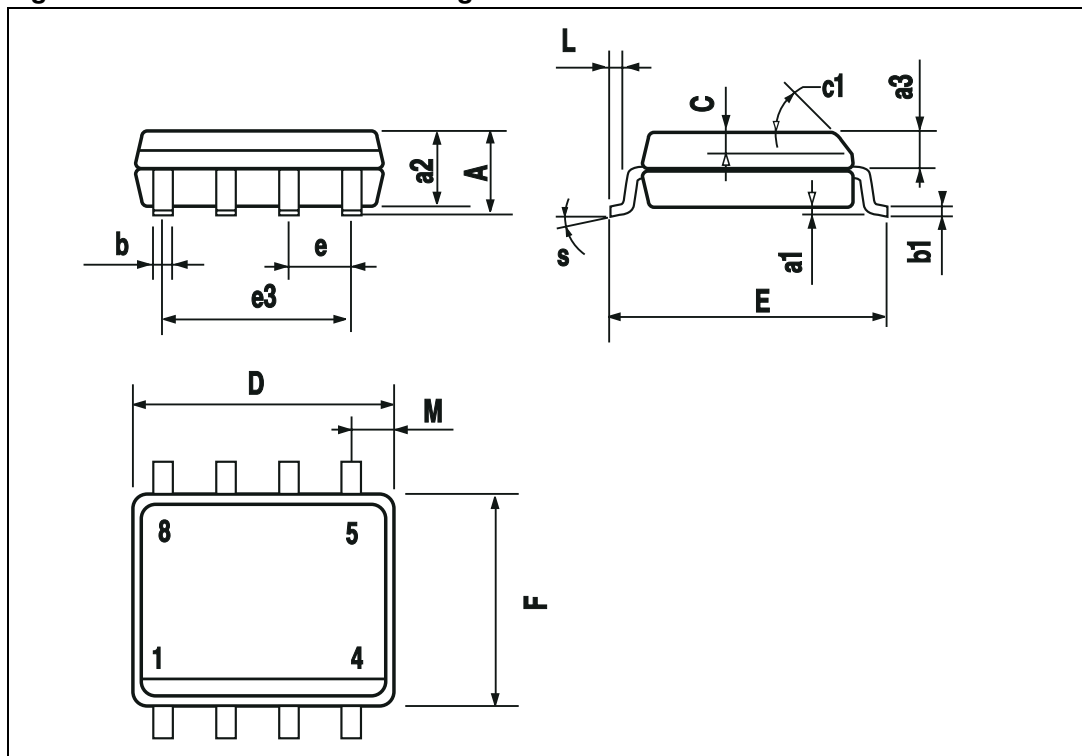


Table 5. SO8 package dimensions

| Dim. | mm | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | | | 1.75 | | | 0.069 |
| a1 | 0.1 | | 0.25 | 0.004 | | 0.010 |
| a2 | | | 1.65 | | | 0.065 |
| a3 | 0.65 | | 0.85 | 0.026 | | 0.033 |
| b | 0.35 | | 0.48 | 0.014 | | 0.019 |
| b1 | 0.19 | | 0.25 | 0.007 | | 0.010 |
| C | 0.25 | | 0.50 | 0.010 | | 0.020 |
| c1 | 45° (typ.) | | | | | |
| D(1) | 4.8 | | 5.0 | 0.189 | | 0.197 |
| E | 5.8 | | 6.2 | 0.228 | | 0.244 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 3.81 | | | 0.150 | |
| F(1) | 3.8 | | 4.0 | 0.15 | | 0.157 |
| L | 0.4 | | 1.27 | 0.016 | | 0.050 |
| M | | | 0.6 | | | 0.024 |
| S | 8° (max.) | | | | | |

Figure 6. SO8 mechanical drawing



5 Ordering information

Table 6. Order codes

| Part number | Package |
|----------------------------|---------|
| LS1240A | Minidip |
| LS1240AD1 | SO8 |
| E-LS1240A ⁽¹⁾ | Minidip |
| E-LS1240AD1 ⁽¹⁾ | SO8 |

1. ECOPACK[®] (see [Chapter 4](#))

6 Revision history

Table 7. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 15-Jul-1998 | 1 | Initial release. |
| 23-Aug-2006 | 2 | Updated the document to reflect the fact that packages are leadfree and part numbers have changed. |

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