**HOLTEK**

# HT1350
# *Step Counter*

## Features

- Operating voltage: 1.5V
- Auto walking or jogging detection
- Step number/mileage/kilometer/calorie display
- LCD display
- An oscillator with 32kHz
- Few external components
- Low power consumption
- An LCD with 1/3 duty, 1/2 bias

## General Description

The HT1350 is a step counter IC implemented in the CMOS technology. It provides an LCD with a whole course (kilometer/mile) as well as the consumed calorie display.
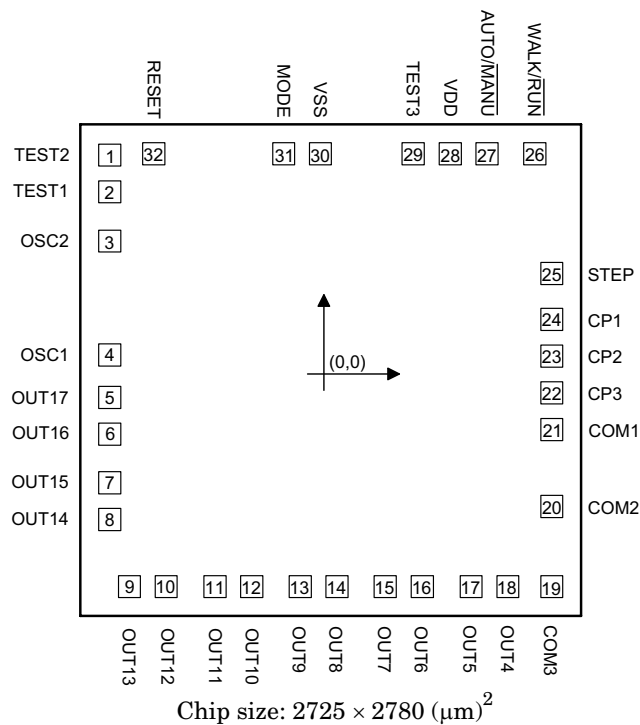
The HT1350 consists of internal oscillator circuit, a step number/kilometer/mile/calorie step counter, a voltage doubler, and an LCD display multiplexer.

The IC can automatically distinguish walking from jogging, thus making appropriate calculations.

## Block Diagram

June 28, 1999

## Pad Assignment



Chip size: 2725 × 2780 (μm)$^2$
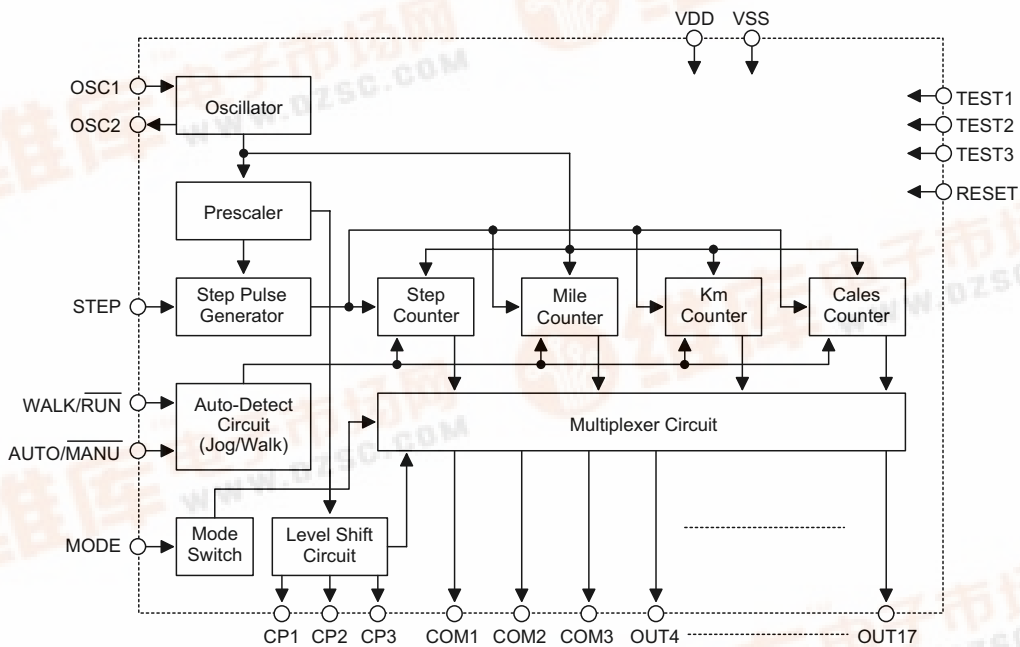
* The IC substrate should be connected to VDD in the PCB layout artwork.

Unit: μm

| Pad No. | X | Y | Pad No. | X | Y |
|---|---|---|---|---|---|
| 1 | −1206.00 | 1159.50 | 17 | 762.00 | −1190.50 |
| 2 | −1206.00 | 994.50 | 18 | 962.00 | −1190.50 |
| 3 | −1206.00 | 661.70 | 19 | 1202.00 | −1190.50 |
| 4 | −1206.00 | 71.50 | 20 | 1202.00 | −753.50 |
| 5 | −1206.00 | −159.50 | 21 | 1202.00 | −335.50 |
| 6 | −1206.00 | −359.50 | 22 | 1202.00 | −135.50 |
| 7 | −1206.00 | −624.50 | 23 | 1202.00 | 65.50 |
| 8 | −1206.00 | −824.50 | 24 | 1202.00 | 259.50 |
| 9 | −1098.00 | −1190.50 | 25 | 1202.00 | 537.00 |
| 10 | −898.00 | −1190.50 | 26 | 1078.00 | 1167.50 |
| 11 | −633.00 | −1190.50 | 27 | 812.00 | 1167.50 |
| 12 | −433.00 | −1190.50 | 28 | 631.00 | 1167.50 |
| 13 | −168.00 | −1190.50 | 29 | 447.00 | 1167.50 |
| 14 | 32.00 | −1190.50 | 30 | −59.00 | 1167.50 |
| 15 | 297.00 | −1190.50 | 31 | −259.00 | 1167.50 |
| 16 | 497.00 | −1190.50 | 32 | −966.00 | 1167.50 |

## Pad Description

| Pad No | Pad Name | I/O | Internal Connection | Descriptions |
|--------|----------|-----|---------------------|--------------|
| 1 | TEST2 | I/O | — | For IC test only |
| 2 | TEST1 | I/O | — | For IC test only |
| 3 | OSC2 | O | — | Oscillator output |
| 4 | OSC1 | I | — | Oscillator input |
| 5~18 | OUT17~OUT4 | O | CMOS | Display data output pads for segments |
| 19~21 | COM3~COM1 | O | NMOS | Display data output pads for commons |
| 22 | CP3 | O | * | Bias supply voltage pad for driving the LCD panel |
| 23~24 | CP2~CP1 | O | * | LCD bias supply voltage control pads |
| 25 | STEP | I | CMOS Pull-high | Step sensor input pad |
| 26 | WALK/$\overline{\text{RUN}}$ | I | CMOS Pull-high | Walk/Run mode manual set pad |
| 27 | AUTO/$\overline{\text{MANU}}$ | I | CMOS Pull-high | Auto detection/Manual set selection pad |
| 28 | VDD | I | — | Positive power supply |
| 29 | TEST3 | I/O | — | For IC test only |
| 30 | VSS | I | — | Negative power supply (GND) |
| 31 | MODE | O | CMOS Pull-high | LCD display mode selection |
| 32 | RESET | O | CMOS Pull-high | System reset pad |

### Approximate internal connection circuits
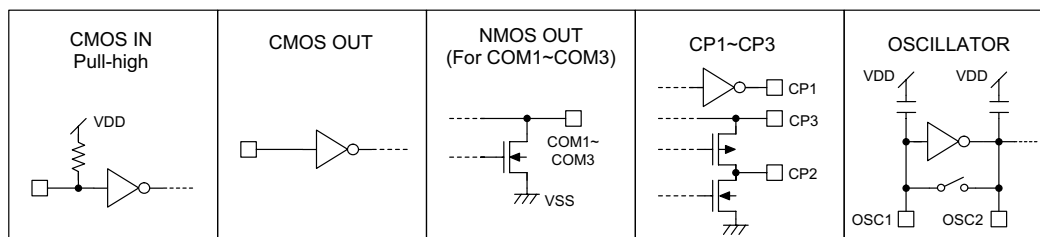
## Absolute Maximum Ratings

Supply Voltage ..................................–0.3V to 5V

Input Voltage .................$V_{SS}$–0.3V to $V_{DD}$+0.3V

Storage Temperature.................–50°C to 125°C

Operating Temperature ..................0°C to 70°C

Note: These are stress ratings only. Stresses exceeding the range specified under ″Absolute Maximum Ratings″ may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

## Electrical Characteristics

Ta=25°C

| Symbol | Parameter | Test Conditions | | Min. | Typ. | Max. | Unit |
|--------|-----------|-----------------|-------------|------|------|------|------|
| | | $V_{DD}$ | Conditions | | | | |
| $V_{DD}$ | Operating Voltage | — | — | 1.3 | 1.5 | 1.7 | V |
| $I_{DD}$ | Operating Current | 1.5V | No load, $f_{OSC}$=32kHz | — | 1.5 | 3 | μA |
| $I_{STB}$ | Standby Current | 1.5V | — | — | 0.5 | 1 | μA |
| $V_{IL}$ | Input Low Voltage | 1.5V | — | — | — | $0.2V_{DD}$ | V |
| $V_{IH}$ | Input High Voltage | 1.5V | — | $0.8V_{DD}$ | — | — | V |
| $f_{OSC}$ | System Frequency | 1.5V | — | — | 32 | — | kHz |

## Functional Description

The HT1350 is a step counter IC. It is used to automatically count the step number taken by a runner and to display the whole course (kilometer/mile) combined with the calories consumed on the LCD.

The IC is turned on and off with respect to the on/off status of a short of spring switch which corresponds to the up/down motion of the steps. The output of step number can be changed to kilometers/miles or calories by counting the total number of times the step switch is closed.
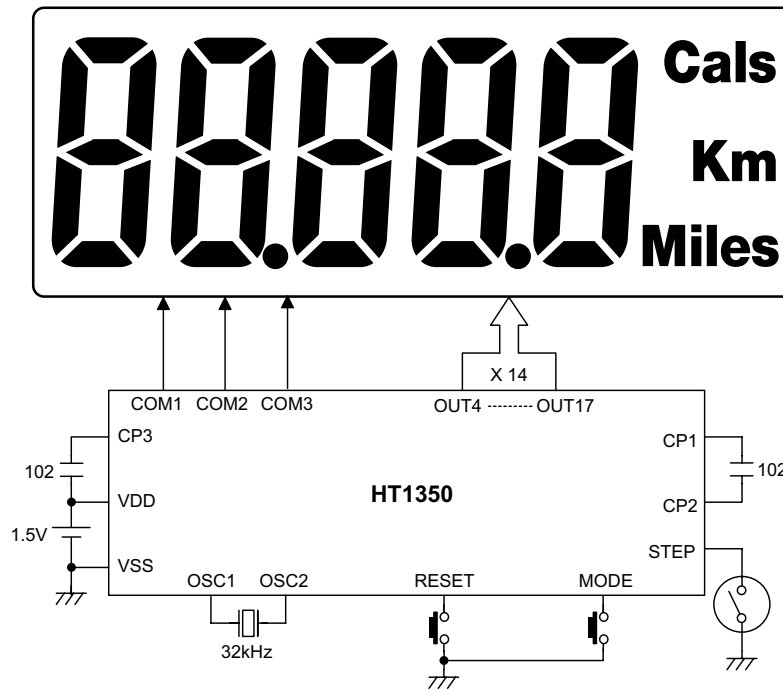
The IC can automatically distinguish between walking and jogging and make the according calculations. The output of the LCD is busy when the RESET key is pressed. Once the LCD is in the busy state, the step counter will start counting at 0 after 0.5 seconds till the runner stops running and stands still. After the step counter stops counting, pressing the MODE key will display the step number→mile→kilometer→calorie in sequence.

## LCD Display
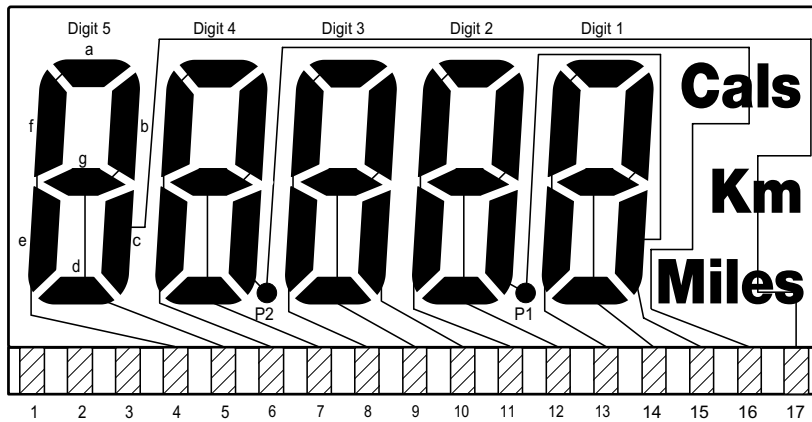


| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|
| Com1 | | | D5e | D5d | D4e | D4d | D3e | D3d | | D2e | D2d | D1e | D1d | P1 | P2 | Miles |
| | Com2 | | D5f | D5g | D4f | D4g | D3f | D3g | D3c | D2f | D2g | D1f | D1g | D2c | D4c | D5c |
| | | Com3 | D5a | D5b | D4a | D4b | D3a | D3b | | D2a | D2b | D1a | D1b | D1c | Cals | Km |

## Application Circuit