

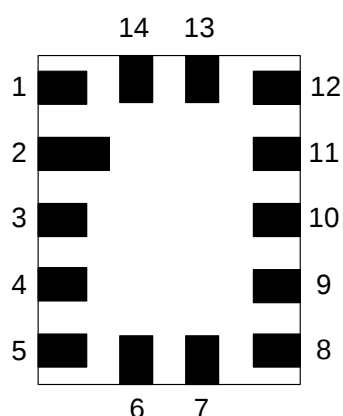
### General Description

LSS10031T is a small 14pin QFN packaged customized ASIC with configurable parameters. It support Voltage Detect ,Watchdog and level shift in a chip to save size and cost.

### Features

- Ultra low power consumption.
- Pb - Free and RoHS Compliant and Halogen - Free
- STQFN - 14 Package

### Pin Configuration



1.6mm x 2.0mm 14 Pin STQFN  
Top View

### Ordering Information

| Part Number | Package Type                       |
|-------------|------------------------------------|
| LSS10031T   | 14-pin QFN, 3k units Tape and Reel |

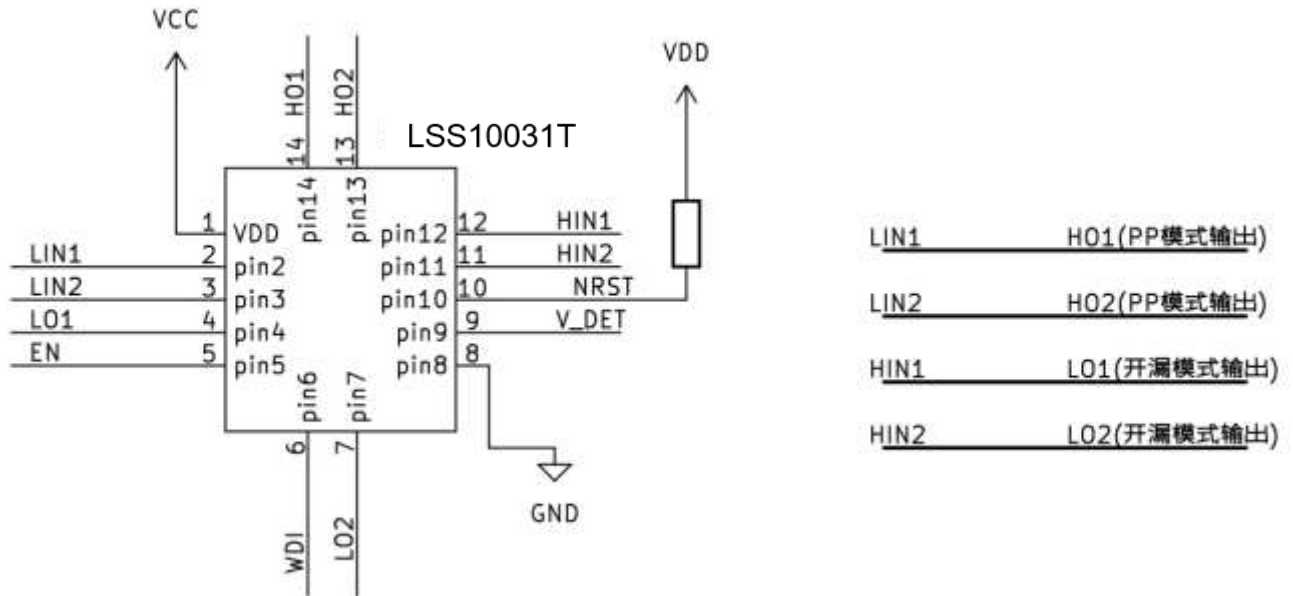
### Program Code Version Information

| Date       | Datasheet Version | Programming Code Version | Lock Status | Checksum   | Part Code | Code Version |
|------------|-------------------|--------------------------|-------------|------------|-----------|--------------|
| 2022-12-13 | 0.1               | 001                      | L           | 0XA1B31EA7 |           |              |

### Datasheet Revision History

| Date       | Version | Change                                       |
|------------|---------|----------------------------------------------|
| 2022-12-13 | 0.1     | Initial version, new design for LS98002 chip |
|            |         |                                              |
|            |         |                                              |
|            |         |                                              |

### Reference Schematic



Note:

1. Voltage on any pin must be with in GND to VDD.
2. ESD protect is must be considered on all Pins which connected to external interface.

### Pin name

| Pin | Pin name | TYPE                           | Function                                       |
|-----|----------|--------------------------------|------------------------------------------------|
| 1   | VDD      | Power                          | Power supply input, 2.3V~5.5V                  |
| 2   | Lin1     | Low Voltage Input              | Low Voltage Input for level shift LIN1         |
| 3   | Lin2     | Low Voltage Input              | Low Voltage Input for level shift LIN2         |
| 4   | LO1      | Low Voltage Open Drain Output  | Low Voltage Open Drain output for LO1          |
| 5   | EN       | Digital input                  | EN for sequence input                          |
| 6   | WDI      | Digital input                  | Watch dog input                                |
| 7   | LO2      | Low Voltage Open Drain Output  | Low Voltage Open Drain output for LO2          |
| 8   | GND      | Power Ground                   | Ground                                         |
| 9   | V_DET    | Analog Input                   | Voltage detector                               |
| 10  | NRST     | Digital output with open drain | NRST output for watch dog and voltage detector |
| 11  | HIN2     | High voltage digital input     | High voltage digital input for HIN2            |
| 12  | HIN1     | High voltage digital input     | High voltage digital input for HIN1            |
| 13  | HO2      | 1x Push Pull Digital Output    | High voltage output for level shift            |
| 14  | HO1      | 1x Push Pull Digital Output    | High voltage output for level shift            |

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**Customize Electrical Characteristics**

| Symbol     | Parameter              | Condition/Note                     | Min. | Typ. | Max. | Unit    |
|------------|------------------------|------------------------------------|------|------|------|---------|
| $I_Q$      | Quiescent Current      | Static inputs and floating outputs | --   | 3.5  | --   | $\mu A$ |
| $T_{WD}$   | Watchdog Time          | At temperature 25°C                |      | 80   |      | s       |
| $T_{nRST}$ | Low Reset Time         | At temperature 25°C                |      | 200  |      | ms      |
| $V_{DET}$  | Voltage Detect of ACMP | At VDD = 3.3V                      |      | 2.9  |      | V       |

## Absolute Maximum Conditions

| Parameter                        | Min. | Max.      | Unit |
|----------------------------------|------|-----------|------|
| Supply Voltage on VDD to GND     | -0.3 | 7         | V    |
| Maximum Voltage Input to Pins    | --   | VDD + 0.3 | V    |
| VDD to GND Maximum DC Current    | --   | 90        | mA   |
| Input Leakage Current            | --   | 1000      | nA   |
| Storage Temperature Range        | -65  | 150       | °C   |
| Junction Temperature             | --   | 150       | °C   |
| ESD Protection (HBM)             | 2000 | --        | V    |
| ESD Protection (CDM)             | 500  | --        | V    |
| Moisture Sensitivity Level (MSL) | 1    |           |      |

## Electrical Characteristics

EC at T = -40°C to +125°C, VDD = 2.3V to 5.5V Unless Otherwise Noted

| Symbol           | Parameter                                                  | Condition/Note                                   | Min. | Typ. | Max. | Unit |
|------------------|------------------------------------------------------------|--------------------------------------------------|------|------|------|------|
| V <sub>DD</sub>  | Supply Voltage                                             |                                                  | 2.3  | 5.0  | 5.5  | V    |
| T <sub>A</sub>   | Operating Temperature                                      |                                                  | -40  | 25   | 85   | °C   |
| C <sub>VDD</sub> | Capacitor Value at VDD                                     |                                                  | --   | 0.1  | --   | μF   |
| V <sub>O</sub>   | Maximal Voltage Applied to any PIN in High-Impedance State |                                                  | --   | --   | VDD  | V    |
| I <sub>VDD</sub> | Maximum Average or DC Current Through VDD Pin              | T <sub>J</sub> = 85°C                            | --   | --   | 90   | mA   |
| I <sub>IH</sub>  | HIGH-Level Input Current                                   | Logic Input PINs; V <sub>IN</sub> = VDD          | -1.0 | --   | 1.0  | μA   |
| I <sub>IL</sub>  | LOW-Level Input Current                                    | Logic Input PINs; V <sub>IN</sub> = 0V           | -1.0 | --   | 1.0  | μA   |
| V <sub>IH</sub>  | HIGH-Level Input Voltage                                   | Logic Input with Schmitt Trigger, at VDD=3.3V    |      |      |      | V    |
|                  |                                                            | Logic Input with Schmitt Trigger, at VDD=5.0V    |      |      |      | V    |
|                  |                                                            | Logic Input without Schmitt Trigger, at VDD=3.3V |      |      |      | V    |
|                  |                                                            | Logic Input without Schmitt Trigger, at VDD=5.0V |      |      |      | V    |
|                  |                                                            | Low Voltage Input, at VDD=3.3V                   |      |      |      | V    |

|                 |                              |                                                             |  |  |  |   |
|-----------------|------------------------------|-------------------------------------------------------------|--|--|--|---|
|                 |                              | Low Voltage Input,<br>at VDD=5.0V                           |  |  |  | V |
| V <sub>IL</sub> | LOW-Level Input Voltage      | Logic Input with Schmitt<br>Trigger,<br>at VDD=3.3V         |  |  |  | V |
|                 |                              | Logic Input with Schmitt<br>Trigger,<br>at VDD=5.0V         |  |  |  | V |
|                 |                              | Logic Input without<br>Schmitt Trigger,<br>at VDD=3.3V      |  |  |  | V |
|                 |                              | Logic Input without<br>Schmitt Trigger,<br>at VDD=5.0V      |  |  |  | V |
|                 |                              | Low Voltage Input,<br>at VDD=3.3V                           |  |  |  | V |
|                 |                              | Low Voltage Input,<br>at VDD=5.0V                           |  |  |  | V |
| V <sub>OH</sub> | HIGH-Level Output<br>Voltage | Push Pull, 1x Drive<br>I <sub>OH</sub> = 3mA, at VDD=3.3 V  |  |  |  | V |
|                 |                              | Push Pull, 1x Drive<br>I <sub>OH</sub> = 5mA, at VDD=5.0 V  |  |  |  | V |
|                 |                              | Push Pull, 2x Drive<br>I <sub>OH</sub> = 3mA, at VDD=3.3 V  |  |  |  | V |
|                 |                              | Push Pull, 2x Drive<br>I <sub>OH</sub> = 5mA, at VDD=5.0 V  |  |  |  | V |
|                 |                              | Open Drain, 1x Drive<br>I <sub>OH</sub> = 3mA, at VDD=3.3 V |  |  |  | V |
|                 |                              | Open Drain, 1x Drive<br>I <sub>OH</sub> = 3mA, at VDD=5.0 V |  |  |  | V |
|                 |                              | Open Drain, 2x Drive<br>I <sub>OH</sub> = 3mA, at VDD=3.3 V |  |  |  | V |
|                 |                              | Open Drain, 2x Drive<br>I <sub>OH</sub> = 3mA, at VDD=5.0 V |  |  |  | V |
| V <sub>OL</sub> | LOW-Level Output<br>Voltage  | Push Pull, 1x Drive<br>I <sub>OH</sub> = 3mA, at VDD=3.3 V  |  |  |  | V |
|                 |                              | Push Pull, 1x Drive<br>I <sub>OH</sub> = 5mA, at VDD=5.0 V  |  |  |  | V |
|                 |                              | Push Pull, 2x Drive<br>I <sub>OH</sub> = 3mA, at VDD=3.3 V  |  |  |  | V |
|                 |                              | Push Pull, 2x Drive<br>I <sub>OH</sub> = 5mA, at VDD=5.0 V  |  |  |  | V |
|                 |                              | Open Drain, 1x Drive                                        |  |  |  | V |

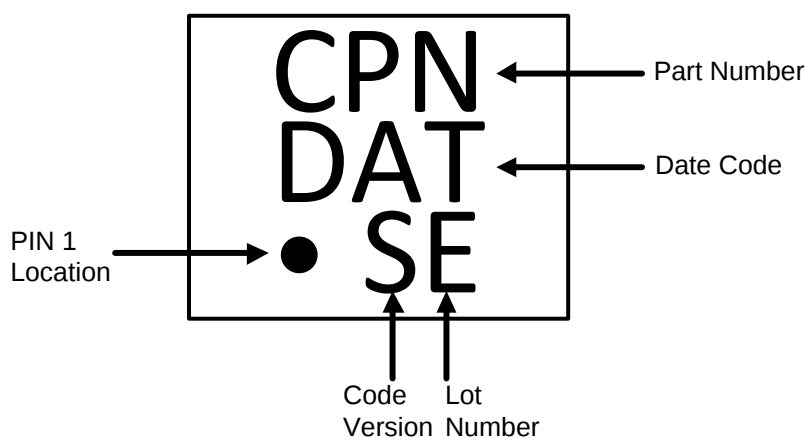
|            |                            |                                                             |  |  |  |    |
|------------|----------------------------|-------------------------------------------------------------|--|--|--|----|
|            |                            | $I_{OH} = 3mA$ , at $VDD=3.3 V$                             |  |  |  |    |
|            |                            | Open Drain, 1x Drive<br>$I_{OH} = 3mA$ , at $VDD=5.0 V$     |  |  |  | V  |
|            |                            | Open Drain, 2x Drive<br>$I_{OH} = 3mA$ , at $VDD=3.3 V$     |  |  |  | V  |
|            |                            | Open Drain, 2x Drive<br>$I_{OH} = 3mA$ , at $VDD=5.0 V$     |  |  |  | V  |
| $I_{OH}$   | HIGH-Level Output Current  | Push Pull, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=3.3 V$  |  |  |  | mA |
|            |                            | Push Pull, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=5.0 V$  |  |  |  | mA |
|            |                            | Push Pull, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=3.3 V$  |  |  |  | mA |
|            |                            | Push Pull, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=5.0 V$  |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=3.3 V$ |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=5.0 V$ |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=3.3 V$ |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=5.0 V$ |  |  |  | mA |
| $I_{OL}$   | LOW-Level Output Current   | Push Pull, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=3.3 V$  |  |  |  | mA |
|            |                            | Push Pull, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=5.0 V$  |  |  |  | mA |
|            |                            | Push Pull, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=3.3 V$  |  |  |  | mA |
|            |                            | Push Pull, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=5.0 V$  |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=3.3 V$ |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>1X Driver, at $VDD=5.0 V$ |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=3.3 V$ |  |  |  | mA |
|            |                            | Open Drain, $V_{OH} = 2.4 V$ ,<br>2X Driver, at $VDD=5.0 V$ |  |  |  | mA |
| $R_{PULL}$ | Pull up or down Resistance | 1Mohm Pull up or down                                       |  |  |  | MΩ |
|            |                            | 100Kohm Pull up or down                                     |  |  |  | kΩ |

# LSS10031T

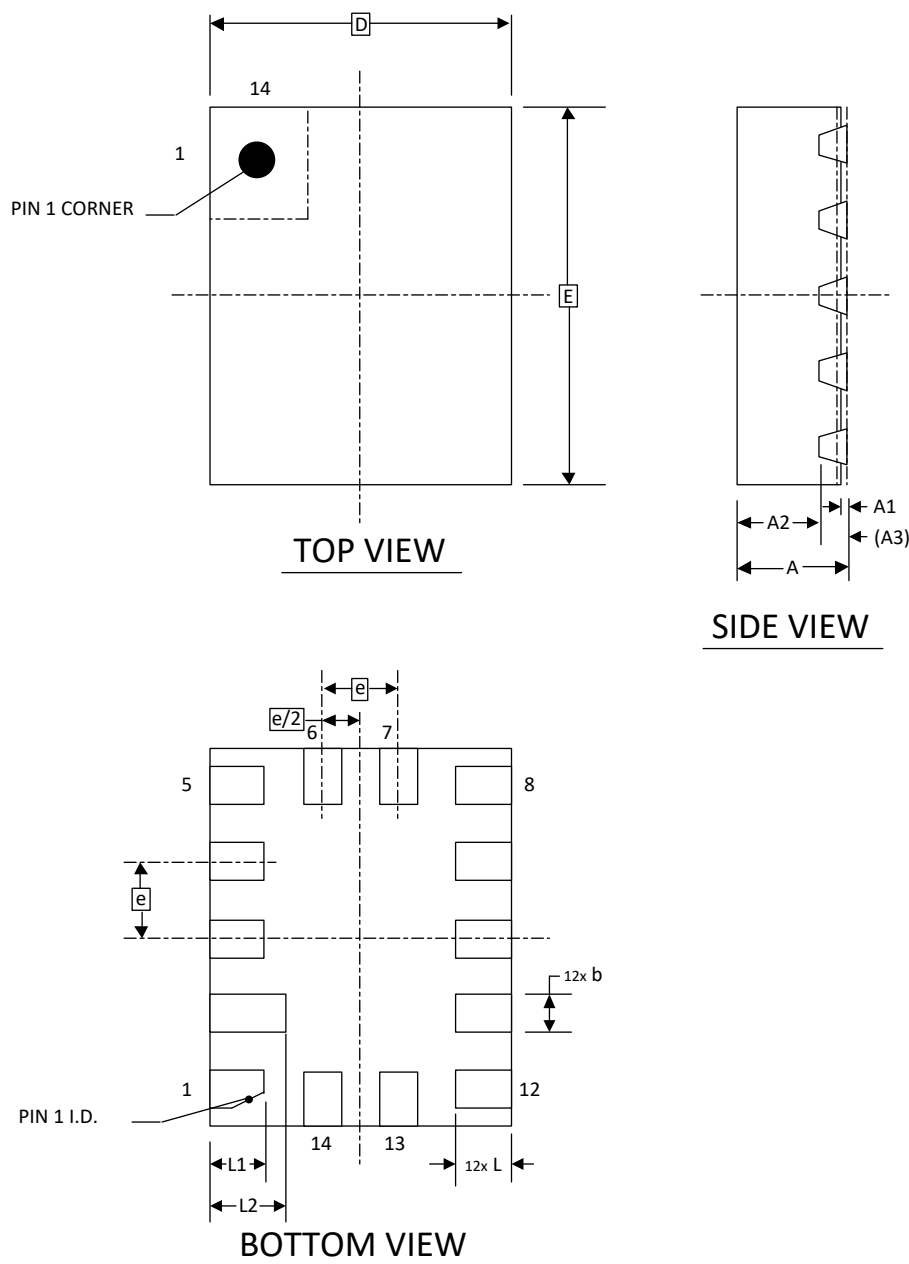
## Voltage Detect ,Watchdog and level shift

|                     |                            |                                                       |  |  |  |    |
|---------------------|----------------------------|-------------------------------------------------------|--|--|--|----|
|                     |                            | 10Kohm Pull up or down                                |  |  |  | kΩ |
| T <sub>SU</sub>     | Startup Time               | From VDD rising past PON threshold                    |  |  |  | ms |
| PON <sub>THR</sub>  | Power On Threshold         | V <sub>DD</sub> Level Required to Start Up the Chip   |  |  |  | V  |
| POFF <sub>THR</sub> | Power Off Threshold        | V <sub>DD</sub> Level Required to Switch Off the Chip |  |  |  | V  |
| E <sub>LFOSC</sub>  | Error of 2KHz Oscillator   | VDD = 2.3V to 5.5V,<br>T = 25°C                       |  |  |  | %  |
|                     |                            | VDD = 2.3V to 5.5V,<br>T = -40°C~125°C                |  |  |  | %  |
| E <sub>MFOSC</sub>  | Error of 2.5MHz Oscillator | VDD = 2.3V to 5.5V,<br>T = 25°C                       |  |  |  | %  |
|                     |                            | VDD = 2.3V to 5.5V,<br>T = -40°C~125°C                |  |  |  | %  |
| E <sub>HFOSC</sub>  | Error of 20MHz Oscillator  | VDD = 2.3V to 5.5V,<br>T = 25°C                       |  |  |  | %  |
|                     |                            | VDD = 2.3V to 5.5V,<br>T = -40°C~125°C                |  |  |  | %  |
|                     |                            |                                                       |  |  |  |    |
|                     |                            |                                                       |  |  |  |    |
|                     |                            |                                                       |  |  |  |    |

## Package Top Marking



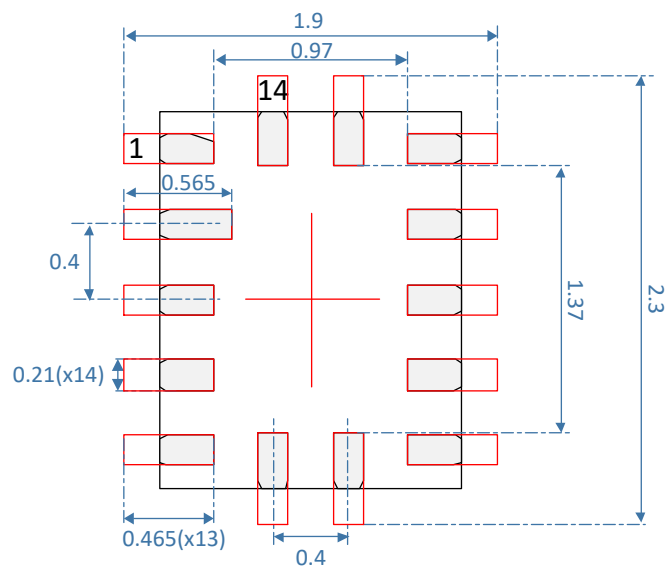
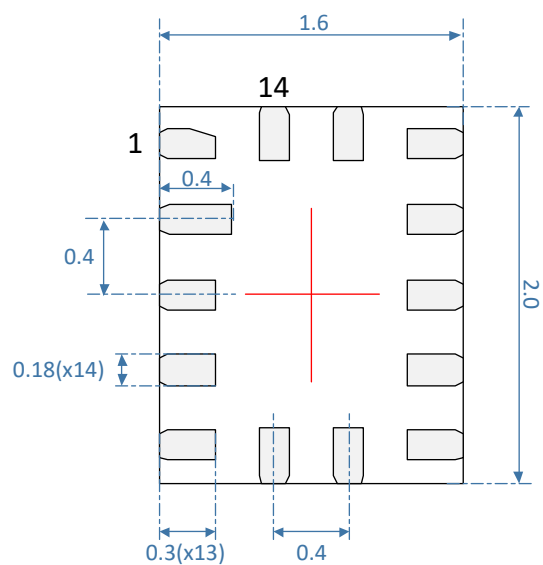
### Package Drawing and Dimensions



Unit: mm

| Symbol | Min       | Nom. | Max  | Symbol | Min  | Nom. | Max  |
|--------|-----------|------|------|--------|------|------|------|
| A      | 0.50      | 0.55 | 0.60 | D      | 1.55 | 1.60 | 1.65 |
| A1     | 0.00      | 0.02 | 0.05 | E      | 1.95 | 2.00 | 2.05 |
| A2     | ---       | 0.40 | ---  | L      | 0.25 | 0.30 | 0.35 |
| A3     | 0.152 REF |      |      | L1     | 0.20 | 0.30 | 0.40 |
| b      | 0.13      | 0.18 | 0.23 | L2     | 0.35 | 0.40 | 0.45 |
| e      | 0.40 BSC  |      |      |        |      |      |      |

### Recommended Land Pattern



Unit: mm

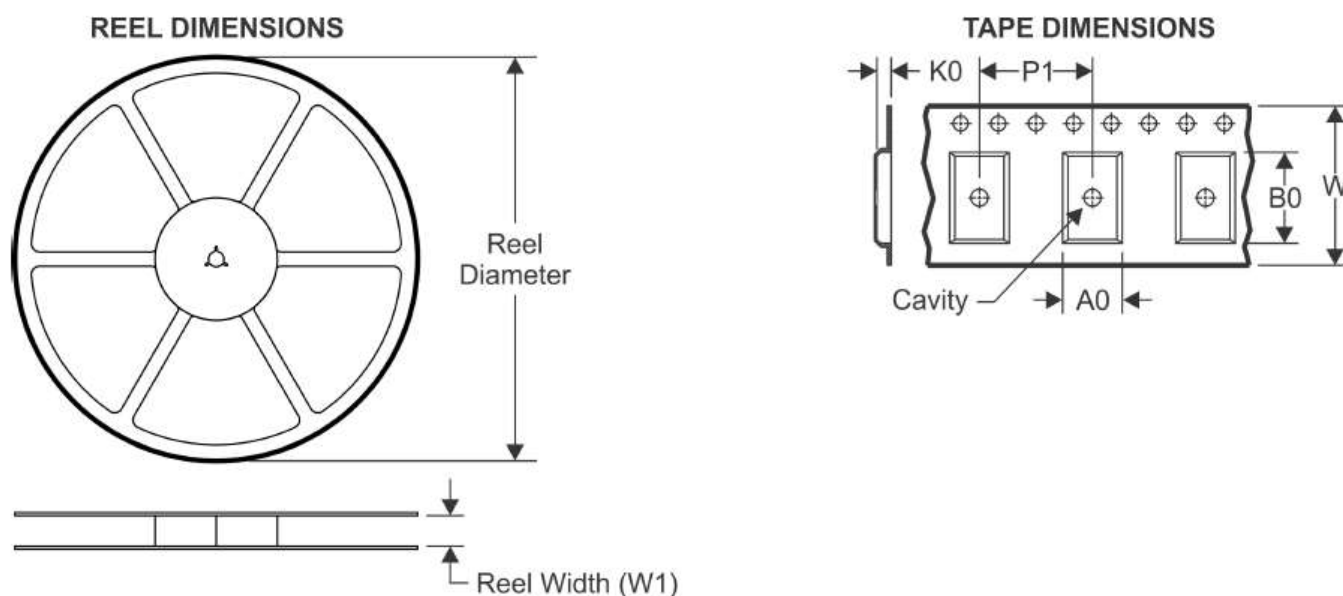
# LSS10031T

## Voltage Detect ,Watchdog and level shift

### Tape and Reel Information

| Package Type          | Num of Pins | Package Size [mm] | Units/package |       | Reel & Hub Size [mm] | Leader (min) |             | Trailer (min) |             | Tape Width [mm] | Part Pitch [mm] |
|-----------------------|-------------|-------------------|---------------|-------|----------------------|--------------|-------------|---------------|-------------|-----------------|-----------------|
|                       |             |                   | SPQ           | 1 Box |                      | Pockets      | Length [mm] | Pockets       | Length [mm] |                 |                 |
| QFN 14L<br>1.6x2.0 mm | 14          | 1.6x2.0x0.55      | 3000          | 3000  | 178/54               | 30           | 120         | 140           | 560         | 8               | 4               |

### Carrier Tape Drawing and Dimensions



|    |                                                           |        |
|----|-----------------------------------------------------------|--------|
| A0 | Dimension designed to accommodate the component width     | 1.70mm |
| B0 | Dimension designed to accommodate the component length    | 2.45mm |
| K0 | Dimension designed to accommodate the component thickness | 0.80mm |
| W  | Overall width of the carrier tape                         | 8.00mm |
| W1 | Reel Width                                                | 8.40mm |
| P0 | Pitch between Index Hole Pitch                            | 4.00mm |
| P1 | Pitch between successive cavity centers                   | 4.00mm |

### Recommended Reflow Soldering Profile

Please see IPC/JEDEC J-STD-020