

QUADRUPLE 3-STATE BUFFERS

Description

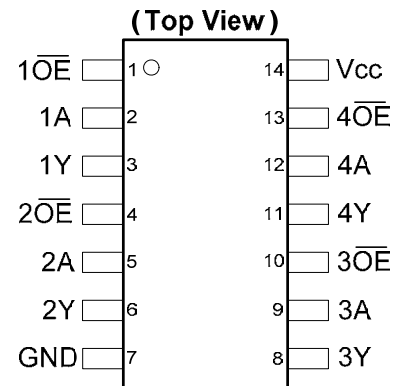
The 74LVC125A provides four independent buffers with three state outputs. Each output is independently controlled by an associated output enable pin (OE) which places the device in the high impedance state when driven high. The device is designed for operation with a power supply range of 1.65V to 5.5V. The inputs are tolerant to 5.5V allowing this device to be used in a mixed voltage environment. The device is fully specified for partial power down applications using IOFF. The IOFF circuitry disables the output preventing damaging current backflow when the device is powered down.

Features

- Supply Voltage Range from 1.65V to 5.5V
- Sinks 24mA at Vcc = 3.3V
- CMOS low power consumption
- IOFF Supports Partial-Power-Down Mode Operation
- Inputs or outputs accept up to 5.5V
- Inputs can be driven by 3.3V or 5.5V allowing for voltage translation applications.
- ESD Protection Exceeds JESD 22
 - 200-V Machine Model (A115-A)
 - 2000-V Human Body Model (A114-A)
 - Exceeds 1000-V Charged Device Model (C101C)
- Latch-Up Exceeds 250mA per JESD 78, Class II
- Range of Package Options SO-14 and TSSOP-14
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Notes: 1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
 2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

Pin Assignments



SO-14 / TSSOP-14

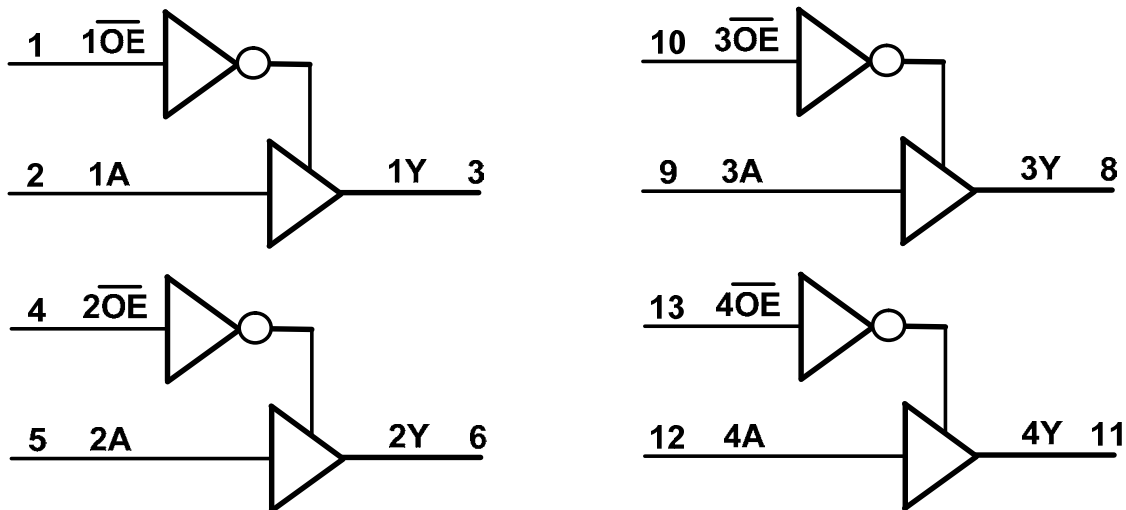
Applications

- Voltage Level Shifting
- General Purpose Logic
- Power Down Signal Isolation
- Wide array of products such as:
 - PCs, networking, notebooks, ultrabooks, netbooks
 - Computer peripherals, hard drives, CD/DVD ROM
 - TV, DVD, DVR, set top box

Pin Descriptions

| Pin Number | Pin Name | Description |
|------------|-----------------|--------------------------------|
| 1 | 1OE | Data Enable Input (active low) |
| 2 | 1A | Data Input |
| 3 | 1Y | Data Output |
| 4 | 2OE | Data Enable Input (active low) |
| 5 | 2A | Data Input |
| 6 | 2Y | Data Output |
| 7 | GND | Ground |
| 8 | 3Y | Data Output |
| 9 | 3A | Data Input |
| 10 | 3OE | Data Enable Input (active low) |
| 11 | 4Y | Data Output |
| 12 | 4A | Data Input |
| 13 | 4OE | Data Enable Input (active low) |
| 14 | V _{CC} | Supply Voltage |

Logic Diagram



Function Table

| Inputs | | Output |
|--------|---|--------|
| OE | A | Y |
| L | H | H |
| L | L | L |
| H | X | Z |

Absolute Maximum Ratings (Note 4) (@T_A = +25°C, unless otherwise specified.)

| Symbol | Description | Rating | Unit |
|------------------------------------|---|------------------------------|------|
| ESD HBM | Human Body Model ESD Protection | 2 | KV |
| ESD CDM | Charged Device Model ESD Protection | 1 | KV |
| ESD MM | Machine Model ESD Protection | 200 | V |
| V _{CC} | Supply Voltage Range | -0.5 to 6.5 | V |
| V _I | Input Voltage Range | -0.5 to 6.5 | V |
| V _O | Voltage applied to output in high impedance or I _{OFF} state | -0.5 to 6.5 | V |
| V _O | Voltage applied to output in high or low state | -0.3 to V _{CC} +0.5 | V |
| I _{IK} | Input Clamp Current V _I < 0 | -50 | mA |
| I _{OK} | Output Clamp Current V _O < 0 | -50 | mA |
| I _O | Continuous output current | ±50 | mA |
| I _{CC} , I _{GND} | Continuous current through V _{CC} or GND | ±100 | mA |
| T _J | Operating Junction Temperature | -40 to +150 | °C |
| T _{STG} | Storage Temperature | -65 to +150 | °C |
| P _{TOT} | Total Power Dissipation | 500 | mW |

Note: 4. Stresses beyond the absolute maximum may result in immediate failure or reduced reliability. These are stress values and device operation should be within recommend values.

Recommended Operating Conditions (Note 5) (@T_A = +25°C, unless otherwise specified.)

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------------|------------------------------------|---------------------------------------|------|-----------------|------|
| V _{CC} | Supply Voltage | | 1.65 | 5.50 | V |
| V _I | Input Voltage | | 0 | 5.5 | V |
| V _O | Output Voltage | Active Mode | 0 | V _{CC} | V |
| | | V _{CC} = 0V; Power Down Mode | 0 | 5.5 | V |
| Δt/ΔV | Input transition rise or fall rate | V _{CC} = 1.65V to 2.7V | | 20 | ns/V |
| | | V _{CC} = 2.7V to 3.6V | | 10 | |
| T _A | Operating free-air temperature | | -40 | +125 | °C |

Note: 5. Unused inputs should be held at V_{CC} or Ground.

Electrical Characteristics (@T_A = +25°C, unless otherwise specified.)

| Symbol | Parameter | Test Conditions | V _{CC} | T _A = -40°C to 85°C | | T _A = -40°C to 125°C | | Unit |
|-------------------------|----------------------------|--|-----------------|--------------------------------|------------------------|---------------------------------|------------------------|------|
| | | | | Min | Max | Min | Max | |
| V _{IH} | High-level Input Voltage | | 1.65V to 1.95V | 0.65 X V _{CC} | | 0.65 X V _{CC} | | V |
| | | | 2.3V to 2.7V | 1.7 | | 1.6 | | |
| | | | 2.7V to 3.6V | 2.0 | | 2.0 | | |
| V _{IL} | Low-level input voltage | | 1.65V to 1.95V | | 0.35 X V _{CC} | | 0.35 X V _{CC} | V |
| | | | 2.3V to 2.7V | | 0.7 | | 0.7 | |
| | | | 2.7V to 3.6V | | 0.8 | | 0.8 | |
| V _{OH} | High Level Output Voltage | I _{OH} = -100μA | 1.65V to 3.6V | V _{CC} - 0.2 | | V _{CC} - 0.3 | | V |
| | | I _{OH} = -4mA | 1.65V | 1.2 | | | | |
| | | I _{OH} = -8mA | 2.3V | 1.9 | | | | |
| | | I _{OH} = -12mA | 2.7V | 2.2 | | 2.05 | | |
| | | | 3.0V | 2.3 | | 2.1 | | |
| I _{OH} = -24mA | 3.0V | 2.2 | | 2.0 | | | | |
| V _{OL} | High-level Output Voltage | I _{OH} = 100μA | 1.65V to 3.6V | | 0.2 | | 0.3 | V |
| | | I _{OH} = 4mA | 1.65V | | 0.45 | | 0.6 | |
| | | I _{OH} = 8mA | 2.3V | | 0.70 | | 0.85 | |
| | | I _{OH} = 12mA | 2.7V | | 0.40 | | 0.6 | |
| | | | 3.0V | | 0.55 | | 0.6 | |
| I _{OH} = -24mA | 3.0V | | 0.55 | | 0.6 | | | |
| I _I | Input Current | V _I = GND to 5.5V | 3.6V | | ±5 | | ±20 | μA |
| I _{OZ} | Z State Leakage Current | V _O = GND or 5.5V | 3.6V | | ±10 | | ±20 | μA |
| I _{OFF} | Power Down Leakage Current | V _I or V _O = 0V to 3.6V | 0 | | 10 | | 20 | μA |
| I _{CC} | Supply Current | V _I = GND or V _{CC} I _O = 0 | 3.6V | | 10 | | 40 | μA |
| ΔI _{CC} | Additional Supply Current | One input at V _{CC} -0.6V Other | 2.7V to 3.6V | | 500 | | 5000 | μA |

Switching Characteristics

| Parameter | From (Input) | To (Output) | Test Conditions See Figure 1 | T _A = +25°C | | | -40°C to +85°C | | -40°C to +125°C | | Unit |
|--------------------|------------------------|-------------|-----------------------------------|------------------------|-----|------|----------------|------|-----------------|------|------|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| t _{pd} | A | Y | V _{CC} = 1.8V ± 0.15V | 1.0 | 4.5 | 11.8 | 1.0 | 12.3 | 1.0 | 13.8 | ns |
| | | | V _{CC} = 2.5V ± 0.2V | 1.0 | 2.7 | 5.8 | 1.0 | 6.3 | 1.0 | 8.4 | |
| | | | V _{CC} = 2.7V | 1.0 | 3.0 | 5.3 | 1.0 | 5.5 | 1.0 | 7.0 | |
| | | | V _{CC} = 3.3V ± 0.3V | 1.0 | 2.5 | 4.6 | 1.0 | 4.8 | 1.0 | 6.0 | |
| t _{en} | $\overline{\text{OE}}$ | Y | V _{CC} = 1.8V ± 0.15V | 1.0 | 4.3 | 13.8 | 1.0 | 14.3 | 1.0 | 15.8 | ns |
| | | | V _{CC} = 2.5V ± 0.2V | 1.0 | 2.7 | 6.6 | 1.0 | 7.4 | 1.0 | 9.5 | |
| | | | V _{CC} = 2.7V | 1.0 | 3.3 | 6.4 | 1.0 | 6.6 | 1.0 | 8.5 | |
| | | | V _{CC} = 3.3V ± 0.3V | 1.0 | 2.4 | 5.2 | 1.0 | 5.4 | 1.0 | 7.0 | |
| t _{dis} | $\overline{\text{OE}}$ | Y | V _{CC} = 1.8V ± 0.15V | 1.0 | 4.3 | 10.6 | 1.0 | 11.1 | 1.0 | 12.6 | ns |
| | | | V _{CC} = 2.5V ± 0.2V | 1.0 | 2.2 | 5.1 | 1.0 | 5.6 | 1.0 | 7.7 | |
| | | | V _{CC} = 2.7V | 1.0 | 2.5 | 4.8 | 1.0 | 5.0 | 1.0 | 6.5 | |
| | | | V _{CC} = 3.3V ± 0.3V | 1.0 | 2.4 | 4.4 | 1.0 | 4.6 | 1.0 | 6.0 | |
| t _{SK(0)} | | | V _{CC} = 3.3V ± 0.3V | | | 1.0 | | 1.0 | | 1.5 | ns |

Operating Characteristics (@T_A = +25°C, unless otherwise specified.)

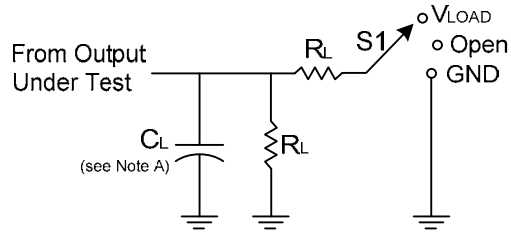
| Parameter | | Test Conditions | V _{CC} = 1.8V | V _{CC} = 2.5V | V _{CC} = 3.3V | Unit |
|-----------------|--|---|------------------------|------------------------|------------------------|------|
| | | | Typ | Typ | Typ | |
| C _{pd} | Power dissipation capacitance per gate | f = 10 MHz | 7.3 | 11.2 | 14.9 | pF |
| C _i | Input Capacitance | V _i = V _{CC} – or GND | 4 | 4 | 4 | pF |

Package Characteristics

| Symbol | Parameter | Test Conditions | V _{CC} | Min | Typ | Max | Unit |
|-----------------|--|-----------------|-----------------|-----|-----|-----|------|
| θ _{JA} | Thermal Resistance Junction-to-Ambient | SO-14 | (Note 6) | | TBD | | °C/W |
| | | TSSOP-14 | | | 159 | | |
| θ _{JC} | Thermal Resistance Junction-to-Case | SO-14 | (Note 6) | | TBD | | °C/W |
| | | TSSOP-14 | | | 25 | | |

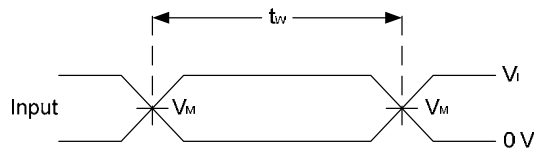
Note: 6. Test condition for SO-14 and TSSOP-14: Device mounted on FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout.

Parameter Measurement Information

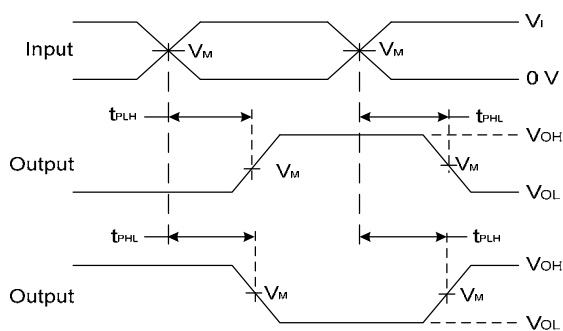


| TEST | S1 |
|-------------------|------------|
| t_{PLH}/t_{PHL} | Open |
| t_{PLZ}/t_{PZL} | V_{LOAD} |
| t_{PHZ}/t_{PZH} | GND |

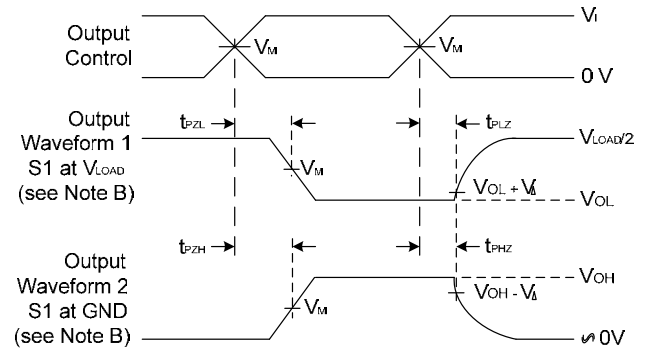
| V_{CC} | Inputs | | V_M | V_{LOAD} | C_L | R_L | V_{Δ} |
|------------------|----------|--------------|------------|-------------------|-------|--------------|--------------|
| | V_I | t_r/t_f | | | | | |
| $1.8V \pm 0.15V$ | V_{CC} | $\leq 2ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 30pF | 1K Ω | 0.15V |
| $2.5V \pm 0.2V$ | V_{CC} | $\leq 2ns$ | $V_{CC}/2$ | $2 \times V_{CC}$ | 30pF | 500 Ω | 0.15V |
| 2.7V | 2.7V | $\leq 2.5ns$ | 1.5V | 6V | 50pF | 500 Ω | 0.3V |
| $3.3V \pm 0.3V$ | 2.7V | $\leq 2.5ns$ | 1.5V | 6V | 50pF | 500 Ω | 0.3V |



Voltage Waveform Pulse Duration



Voltage Waveform Propagation Delay Times Inverting and Non Inverting Outputs

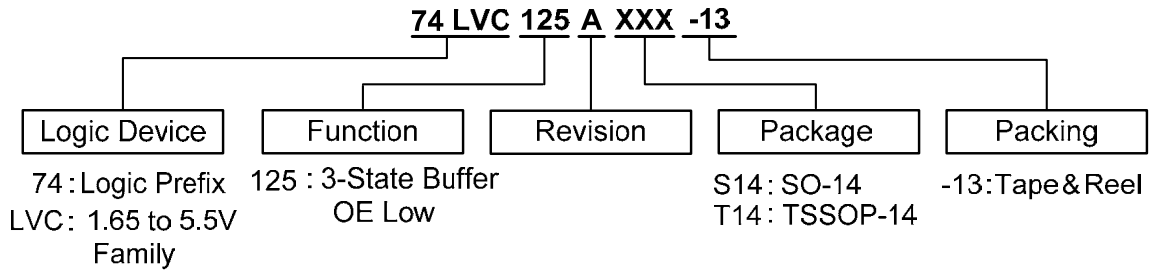


Voltage Waveform Enable and Disable Times Low and High Level Enabling

- Notes:
- A. Includes test lead and test apparatus capacitance.
 - B. All pulses are supplied at pulse repetition rate ≤ 10 MHz.
 - C. Inputs are measured separately one transition per measurement.
 - D. t_{PLZ} and t_{PHZ} are the same as t_{dis} .
 - E. t_{PZL} and t_{PZH} are the same as t_{EN0}
 - F. t_{PLH} and t_{PHL} are the same as t_{PD} .

Figure 1. Load Circuit and Voltage Waveforms

Ordering Information

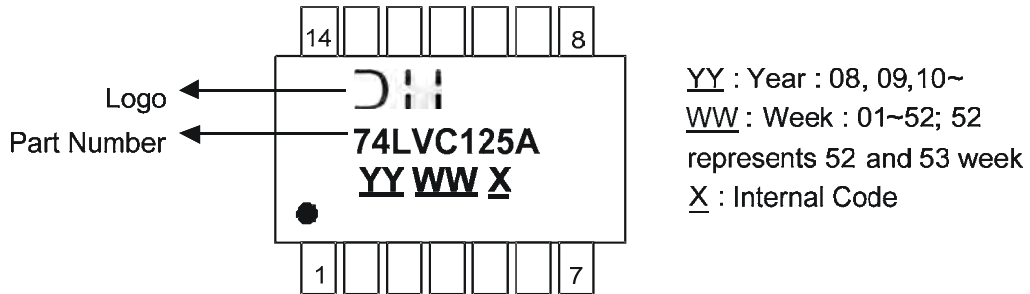


| Device | Package Code | Packaging (Note 7) | 13" Tape and Reel | |
|-----------------|--------------|--------------------|-------------------|--------------------|
| | | | Quantity | Part Number Suffix |
| 74LVC125AS14-13 | S14 | SO-14 | 2500/Tape & Reel | -13 |
| 74LVC125AT14-13 | T14 | TSSOP-14 | 2500/Tape & Reel | -13 |

Notes: 7. The taping orientation and tape details can be found at <http://www.diodes.com/datasheets/ap02007.pdf>

Marking Information

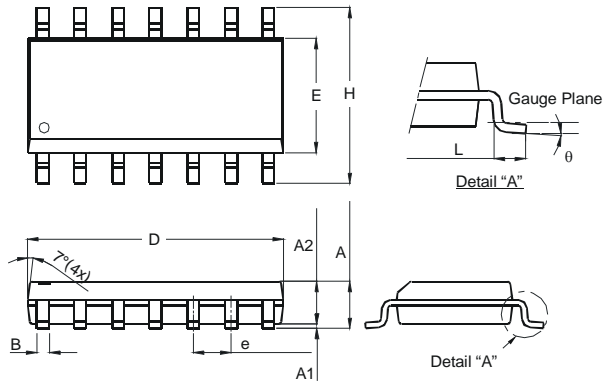
(1) SO-14 , TSSOP-14



| Part Number | Package |
|--------------|----------|
| 74LVC125AS14 | SO-14 |
| 74LVC125AT14 | TSSOP-14 |

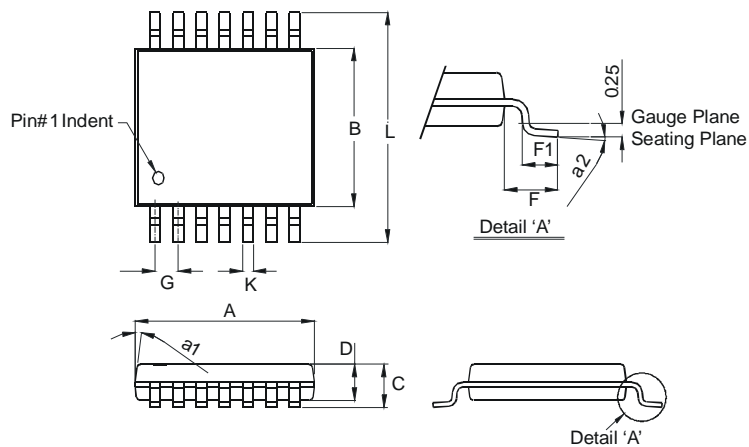
Package Outline Dimensions (All dimensions in mm.)

Package Type: SO-14



| SO-14 | | |
|-----------------------------|----------|------|
| Dim | Min | Max |
| A | 1.47 | 1.73 |
| A1 | 0.10 | 0.25 |
| A2 | 1.45 Typ | |
| B | 0.33 | 0.51 |
| D | 8.53 | 8.74 |
| E | 3.80 | 3.99 |
| e | 1.27 Typ | |
| H | 5.80 | 6.20 |
| L | 0.38 | 1.27 |
| θ | 0° | 8° |
| All Dimensions in mm | | |

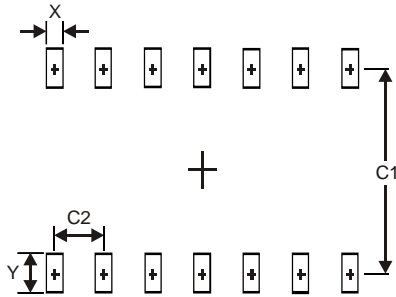
Package Type: TSSOP-14



| TSSOP-14 | | |
|-----------------------------|----------|------|
| Dim | Min | Max |
| a1 | 7° (4X) | |
| a2 | 0° | 8° |
| A | 4.9 | 5.10 |
| B | 4.30 | 4.50 |
| C | — | 1.2 |
| D | 0.8 | 1.05 |
| F | 1.00 Typ | |
| F1 | 0.45 | 0.75 |
| G | 0.65 Typ | |
| K | 0.19 | 0.30 |
| L | 6.40 Typ | |
| All Dimensions in mm | | |

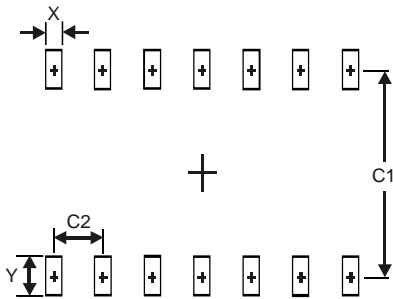
Suggested Pad Layout

Package Type: SO-14



| Dimensions | Value (in mm) |
|------------|---------------|
| X | 0.60 |
| Y | 1.50 |
| C1 | 5.4 |
| C2 | 1.27 |

Package Type: TSSOP-14



| Dimensions | Value (in mm) |
|------------|---------------|
| X | 0.45 |
| Y | 1.45 |
| C1 | 5.9 |
| C2 | 0.65 |

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