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## Ordering Information

74 LVC 573A XXX -13

| Logic Device | Function | Package | Packing |
|---|---|---|---|
| 74 : Logic Prefix<br>LVC : Low Voltage CMOS | 573A : Octal Transparent D-Type Latch with 3-State Outputs | T20 : TSSOP-20<br>Q20 : V-QFN4525-20 | -13 : 13" Tape & Reel |

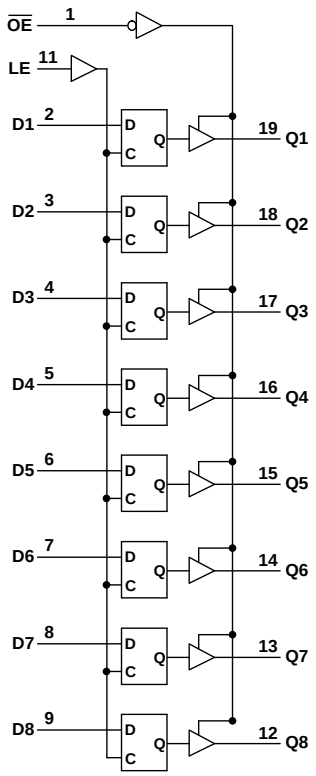
| Part Number | Package Code | Package (Notes 4 & 5) | Package Size | 13" Tape and Reel | |
|---|---|---|---|---|---|
| | | | | Quantity | Part Number Suffix |
| 74LVC573AT20-13 | T20 | TSSOP-20 | 6.4mm X 6.5mm X 1.2mm 0.65mm Lead Pitch | 2500/Tape & Reel | -13 |
| 74LVC573AQ20-13 | Q20 | V-QFN4525-20 | 2.5mm X 4.5mm X 0.95mm 0.50mm Lead Pitch | 2500/Tape & Reel | -13 |

Notes: 4. Pad layout as shown on Diodes Inc. suggested pad layout document AP02001, which can be found on our website at http://www.diodes.com/datasheets/ap02001.pdf.
5. V-QFN4525-20 is a JEDEC recognized naming convention that specifies the package thickness category as V and the number 4525 describes the package as 4.5mm X 2.5mm.

## Pin Descriptions

| Pin Number | Pin Name | Description |
|---|---|---|
| 1 | $\overline{OE}$ | Output Enable |
| 2 | D1 | Data Input |
| 3 | D2 | Data Input |
| 4 | D3 | Data Input |
| 5 | D4 | Data Input |
| 6 | D5 | Data Input |
| 7 | D6 | Data Input |
| 8 | D7 | Data Input |
| 9 | D8 | Data Input |
| 10 | GND | Ground |
| 11 | LE | Latch Enable |
| 12 | Q8 | Latch Output |
| 13 | Q7 | Latch Output |
| 14 | Q6 | Latch Output |
| 15 | Q5 | Latch Output |
| 16 | Q4 | Latch Output |
| 17 | Q3 | Latch Output |
| 18 | Q2 | Latch Output |
| 19 | Q1 | Latch Output |
| 20 | $V_{CC}$ | Supply Voltage |

## Logic Diagram




## Function Table

| (Each Latch) | | | |
|---|---|---|---|
| INPUTS | | | OUTPUT |
| $\overline{OE}$ | LE | D | Q |
| L | H | H | H |
| L | H | L | L |
| L | L | X | $Q_0$ |
| H | X | X | Z |

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## Absolute Maximum Ratings (Notes 6 & 7)

| 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 +7.0 | V |
| $V_I$ | Input Voltage Range | -0.5 to +7.0 | V |
| $I_{IK}$ | Input Clamp Current $V_I < 0V$ | -20 | mA |
| $I_{OK}$ | Output Clamp Current $V_O < 0V$ | -50 | mA |
| $I_O$ | Continuous Output Current $-0.5V < V_O$ $V_{CC}$ $+0.5V$ | ±50 | mA |
| $I_{CC}$ | Continuous Current Through $V_{CC}$ | 100 | mA |
| $I_{GND}$ | Continuous Current Through 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 |

Notes: 6. 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.
7. Forcing the maximum allowed voltage could cause a condition exceeding the maximum current or conversely forcing the maximum current could cause a condition exceeding the maximum voltage. The ratings of both current and voltage must be maintained within the controlled range.

## Recommended Operating Conditions (Note 8)

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | Supply Voltage | Operating | 1.65 | 3.6 | V |
| | | Data Retention Only | 1.5 | — | V |
| $V_I$ | Input Voltage | — | 0 | 5.5 | V |
| $V_O$ | Output Voltage | — | 0 | $V_{CC}$ | V |
| $I_{OH}$ | High-Level Output Current | $V_{CC}$ = 1.65V | — | -4 | mA |
| | | $V_{CC}$ = 2.3V | — | -8 | |
| | | $V_{CC}$ = 2.7V | — | -12 | |
| | | $V_{CC}$ = 3.0V | — | -24 | |
| $I_{OL}$ | Low-Level Output Current | $V_{CC}$ = 1.65V | — | 4 | mA |
| | | $V_{CC}$ = 2.3V | — | 8 | |
| | | $V_{CC}$ = 2.7V | — | 12 | |
| | | $V_{CC}$ = 3.0V | — | 24 | |
| Δt/ΔV | Input Transition Rise or Fall Rate | — | — | 10 | ns/V |
| $T_A$ | Operating Free-Air Temperature | — | -40 | +125 | °C |

Note: 8. Unused inputs should be held at $V_{CC}$ or Ground.

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## Electrical Characteristics

| 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 | $V_{CC}$ X 0.65 | — | $V_{CC}$ X 0.65 | — | V |
| | | — | 2.3V to 2.7V | 1.7 | — | 1.7 | — | |
| | | — | 3.0V to 3.6V | 2 | — | 2 | — | |
| $V_{IL}$ | Low-Level Input Voltage | — | 1.65V to 1.95V | — | $V_{CC}$ X 0.35 | — | $V_{CC}$ X 0.35 | V |
| | | — | 2.3V to 2.7V | — | 0.7 | — | 0.7 | |
| | | — | 3.0V to 3.6V | — | 0.8 | — | 0.8 | |
| $V_{OH}$ | High-Level Output Voltage | $I_{OH}$ = -50µA | 1.65V to 3.6V | $V_{CC}$-0.2 | — | $V_{CC}$-0.3 | — | V |
| | | $I_{OH}$ = -4mA | 1.65V | 1.2 | — | 1.05 | — | |
| | | $I_{OH}$ = -8mA | 2.3V | 1.7 | — | 1.65 | — | |
| | | $I_{OH}$ = -12mA | 2.7V | 2.2 | — | 2.05 | — | |
| | | | 3.0V | 2.4 | — | 2.48 | — | |
| | | $I_{OH}$ = -24mA | 3.0V | 2.3 | — | 2.0 | — | |
| $V_{OL}$ | Low-Level Output Voltage | $I_{OL}$ = 100µA | 1.65V to 3.6V | — | 0.2 | — | 0.3 | V |
| | | $I_{OL}$ = 4mA | 1.65V | — | 0.45 | — | 0.65 | |
| | | $I_{OL}$ = 8mA | 2.3V | — | 0.60 | — | 0.80 | |
| | | $I_{OL}$ = 12mA | 2.7V | — | 0.40 | — | 0.60 | |
| | | $I_{OL}$ = 24mA | 3.0V | — | 0.55 | — | 0.80 | |
| $I_{OFF}$ | Power Down Leakage Current | $V_I$ or $V_O$ = 0 or 5.5V | 0V | — | ±10 | — | 20 | µA |
| $I_I$ | Input Current Control Pins | $V_I$ = GND or 5.5V | 0 to 3.6V | — | ±5 | — | ±20 | µA |
| $I_{OZ}$ | Z-State Current Including Input Current I/O Pins | $V_I$ = GND or 5.5V<br>$V_O$ = 0 to 5.5V | 3.6V | — | ±5 | — | ±20 | µA |
| $I_{CC}$ | Supply Current | $V_I$ = GND or $V_{CC}$, $I_O$ = 0 | 3.6V | — | 10 | — | 40 | µA |
| $\Delta I_{CC}$ | Additional Supply Current | One Input at $V_{CC}$ -0.6V $I_O$ = 0A | 2.7V to 3.6V | — | 500 | — | 5000 | µA |
| $C_I$ | Input Capacitance | Control Pins, $V_I$ = GND or $V_{CC}$ | 0V to 3.6V | 4.0 Typical | | 4.0 Typical | | pF |
| | | I/O Pins, $V_I$ = GND or $V_{CC}$ | | 5.5 Typical | | 5.5 Typical | | |

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## Switching Characteristics

| Symbol | Parameter | Test Conditions | $V_{CC}$ | $T_A$ = +25°C | | | $T_A$ = -40°C to +85°C | | $T_A$ = -40°C to +125°C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | Min | Max | Min | Max | |
| $t_W$ | Pulse Width LE | Figure 1 | 1.8V ± 0.15V | 5.0 | 2.5 | — | 5.0 | — | 5.5 | — | ns |
| | | | 2.5V ± 0.2V | 4.0 | 2.0 | — | 4.0 | — | 4.5 | — | |
| | | | 2.7V | 3.0 | 1.7 | — | 3.0 | — | 3.5 | — | |
| | | | 3.3V ± 0.3V | 3.0 | 1.5 | — | 3.0 | — | 3.5 | — | |
| $t_{SU}$ | Set-up Time $D_N$ to LE | Figure 1 | 1.8V ± 0.15V | 4.0 | 2.0 | — | 4.0 | — | 4.5 | — | ns |
| | | | 2.5V ± 0.2V | 3.0 | 1.5 | — | 3.0 | — | 3.5 | — | |
| | | | 2.7V | 2.0 | 1.0 | — | 2.0 | — | 2.5 | — | |
| | | | 3.3V ± 0.3V | 2.0 | 1.0 | — | 2.0 | — | 2.5 | — | |
| $t_H$ | Hold Time $D_N$ to LE | Figure 1 | 1.8V ± 0.15V | 3.0 | 1.5 | — | 3.0 | — | 3.5 | — | ns |
| | | | 2.5V ± 0.2V | 2.0 | 1.0 | — | 2.0 | — | 2.5 | — | |
| | | | 2.7V | 1.5 | 1.0 | — | 1.5 | — | 2.0 | — | |
| | | | 3.3V ± 0.3V | 1.5 | 1.0 | — | 1.5 | — | 2.0 | — | |
| $t_{PD}$ | Propagation Delay $D_N$ to $Q_N$ | Figure 1 | 1.8V ± 0.15V | 1 | 6 | 12.2 | 1 | 12.7 | 1 | 16.9 | ns |
| | | | 2.5V ± 0.2V | 1 | 3.9 | 7.8 | 1 | 8.3 | 1 | 8.7 | |
| | | | 2.7V | 1 | 4.2 | 7.8 | 1 | 8.1 | 1 | 9.5 | |
| | | | 3.3V ± 0.3V | 1.5 | 3.8 | 6.8 | 1.5 | 7.4 | 1.5 | 8 | |
| $t_{PD}$ | Propagation Delay LE to $Q_N$ | Figure 1 | 1.8V ± 0.15V | 1 | 7 | 14.8 | 1 | 15.3 | 1 | 22.5 | ns |
| | | | 2.5V ± 0.2V | 1 | 4.5 | 10 | 1 | 10.5 | 1 | 12.4 | |
| | | | 2.7V | 1 | 5.4 | 8.2 | 1 | 9.5 | 1 | 12 | |
| | | | 3.3V ± 0.3V | 1.5 | 4.4 | 7.2 | 1.5 | 8.5 | 1.5 | 11 | |
| $t_{EN}$ | Enable Time $\overline{OE}$ to $Q_N$ | Figure 1 | 1.8V ± 0.15V | 1 | 7.8 | 16.5 | 1 | 17 | 1 | 18.7 | ns |
| | | | 2.5V ± 0.2V | 1 | 4 | 9 | 1 | 9.5 | 1 | 10.3 | |
| | | | 2.7V | 1 | 4.4 | 8.3 | 1 | 8.5 | 1 | 9.5 | |
| | | | 3.3V ± 0.3V | 1.7 | 4.1 | 7.3 | 1.7 | 7.5 | 1.7 | 9 | |
| $t_{DIS}$ | Disable Time $\overline{OE}$ to $Q_N$ | Figure 1 | 1.8V ± 0.15V | 1 | 7.8 | 16.5 | 1 | 17 | 1 | 18.4 | ns |
| | | | 2.5V ± 0.2V | 1 | 4 | 9 | 1 | 9.5 | 1 | 10.5 | |
| | | | 2.7V | 1 | 4.4 | 8.3 | 1 | 8.5 | 1 | 9.1 | |
| | | | 3.3V ± 0.3V | 1.7 | 4.1 | 7.3 | 1.7 | 7.5 | 1.7 | 9 | |
| $t_{DIS}$ | Disable Time $\overline{OE}$ to $Q_N$ | Figure 1 | 1.8V ± 0.15V | 1 | 7.8 | 16.5 | 1 | 17 | 1 | 18.4 | ns |
| | | | 2.5V ± 0.2V | 1 | 4 | 9 | 1 | 9.5 | 1 | 10.5 | |
| | | | 2.7V | 1 | 4.4 | 8.3 | 1 | 8.5 | 1 | 9.1 | |
| | | | 3.3V ± 0.3V | 1.7 | 4.1 | 7.3 | 1.7 | 7.5 | 1.7 | 9 | |
| tsk(0) | Output Skew Time | — | 3.3V ± 0.3V | — | — | 1.0 | — | — | — | 1.5 | ns |

## Operating Characteristics

$T_A$ = +25°C

| Symbol | Parameter | Test Conditions | $V_{CC}$ | Typ | Unit |
|---|---|---|---|---|---|
| $C_{PD}$ | Power Dissipation Capacitance per Gate | f = 10MHz<br>Outputs Enabled | 1.8V ± 0.15V | 9.9 | pF |
| | | | 2.5V ± 0.2V | 10.2 | |
| | | | 3.3V ± 0.3V | 10.6 | |

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## Package Characteristics

| Symbol | Parameter | Package | Test Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $\theta_{JA}$ | Thermal Resistance Junction-to-Ambient | TSSOP-20 | (Note 9) | — | 74 | — | °C/W |
| $\theta_{JC}$ | Thermal Resistance Junction-to-Case | TSSOP-20 | (Note 9) | — | 15 | — | °C/W |
| $\theta_{JA}$ | Thermal Resistance Junction-to-Ambient | V-QFN4525-20 | (Note 9) | — | 67 | — | °C/W |
| $\theta_{JC}$ | Thermal Resistance Junction-to-Case | V-QFN4525-20 | (Note 9) | — | 20 | — | °C/W |

Note: 9. Test conditions for TSSOP-20 and V-QFN4525-20: Devices mounted on 4 layer FR-4 substrate PC board, 2oz copper, with minimum recommended pad layout per JESD 51-7.

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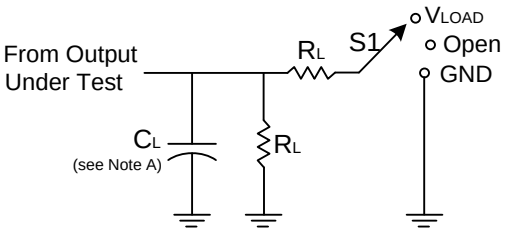
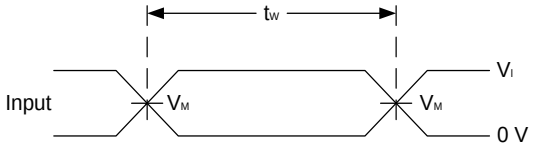
## Parameter Measurement Information

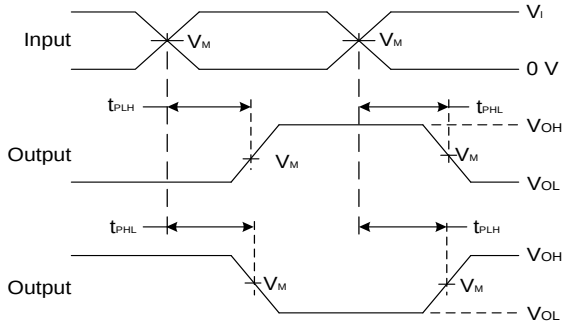



| TEST | S1 |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |
| $t_{PLZ}/t_{PZL}$ | $V_{LOAD}$ |
| $t_{PHZ}/t_{PZH}$ | GND |

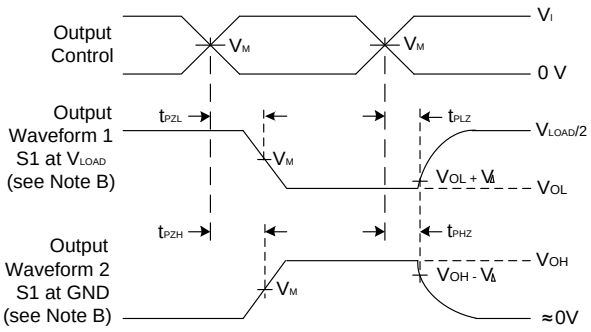
| $V_{CC}$ | Inputs | | $V_M$ | $V_{LOAD}$ | $C_L$ | $R_L$ | $V\Delta$ |
|---|---|---|---|---|---|---|---|
| | $V_I$ | $t_r/t_f$ | | | | | |
| 1.8V ± 0.15V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 2 x $V_{CC}$ | 30pF | 1KΩ | 0.15V |
| 2.5V ± 0.2V | $V_{CC}$ | ≤2ns | $V_{CC}/2$ | 2 x $V_{CC}$ | 30pF | 500Ω | 0.15V |
| 2.7V | 2.7V | ≤2.5ns | 1.5V | 6V | 50pF | 500Ω | 0.3V |
| 3.3V ± 0.3V | 2.7V | ≤2.5ns | 1.5V | 6V | 50pF | 500Ω | 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 ≤ 10MHz.
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**

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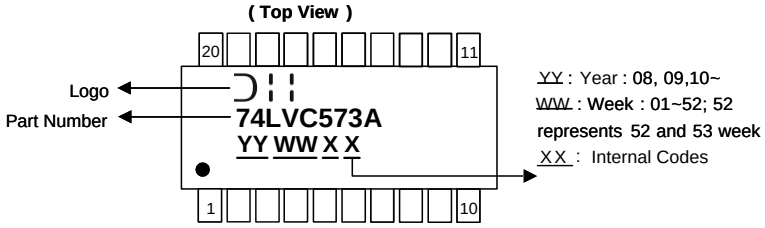
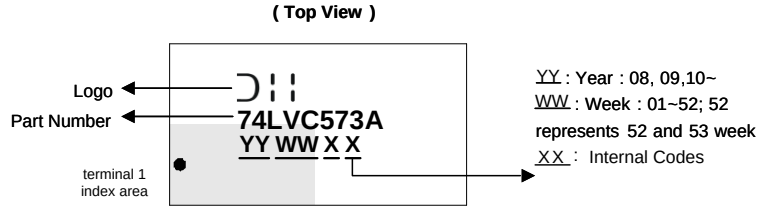
## Marking Information

**(1) TSSOP-20**




| Part Number | Package |
|---|---|
| 74LVC573AT20 | TSSOP-20 |

**(2) V-QFN4525-20**




| Part Number | Package |
|---|---|
| 74LVC573AQ20 | V-QFN4525-20 |

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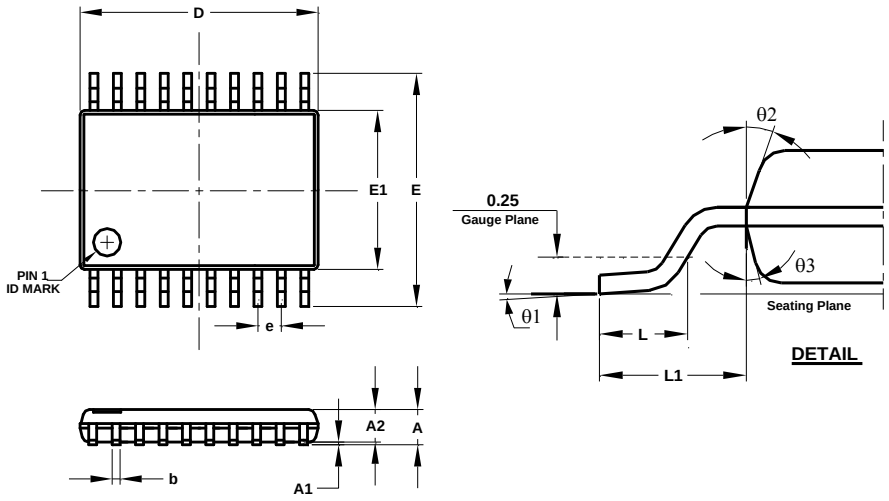
## Package Outline Dimensions

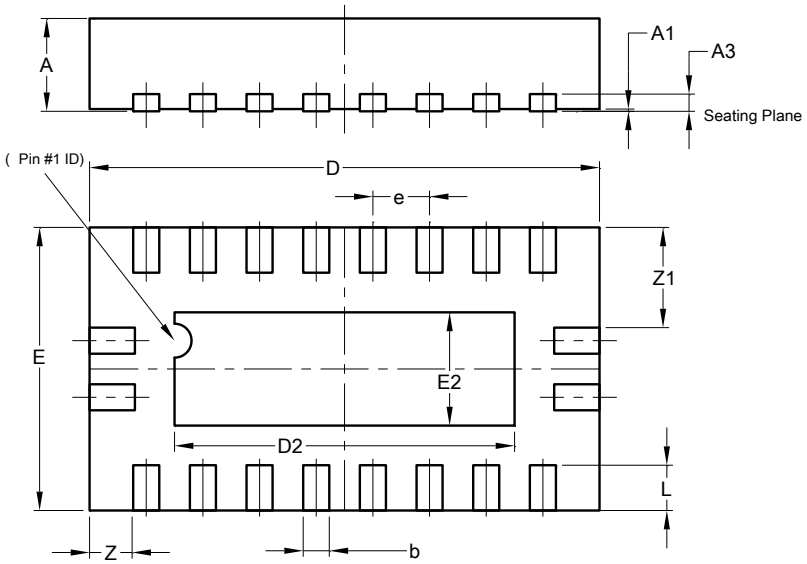
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for the latest version.

**(1) Package Type: TSSOP-20**




| TSSOP-20 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | - | 1.20 | - |
| **A1** | 0.05 | 0.15 | - |
| **A2** | 0.80 | 1.05 | - |
| **b** | 0.19 | 0.30 | - |
| **c** | 0.09 | 0.20 | - |
| **D** | 6.40 | 6.60 | 6.50 |
| **E** | 6.20 | 6.60 | 6.40 |
| **E1** | 4.30 | 4.50 | 4.40 |
| **e** | 0.65 BSC | | |
| **L** | 0.45 | 0.75 | 0.60 |
| **L1** | 1.0 REF | | |
| **θ1** | 0° | 8° | - |
| **θ2** | 10° | 14° | 12° |
| **θ3** | 10° | 14° | 12° |
| **All Dimensions in mm** | | | |

**(2) Package Type: V-QFN4525-20**




| V-QFN4525-20 | | | |
|---|---|---|---|
| **Dim** | **Min** | **Max** | **Typ** |
| **A** | 0.75 | 0.85 | 0.80 |
| **A1** | 0.00 | 0.05 | 0.02 |
| **A3** | - | - | 0.15 |
| **b** | 0.18 | 0.30 | 0.23 |
| **D** | 4.45 | 4.55 | 4.50 |
| **D2** | 2.85 | 3.15 | 3.00 |
| **E** | 2.45 | 2.55 | 2.50 |
| **E2** | 0.85 | 1.15 | 1.00 |
| **e** | 0.50BSC | | |
| **L** | 0.30 | 0.50 | 0.40 |
| **Z** | - | - | 0.385 |
| **Z1** | - | - | 0.885 |
| **All Dimensions in mm** | | | |

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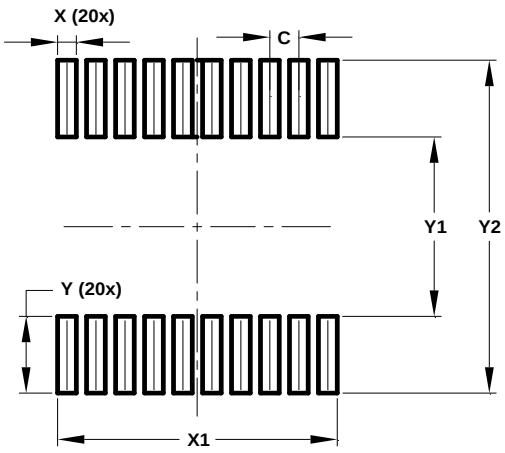
## Suggested Pad Layout

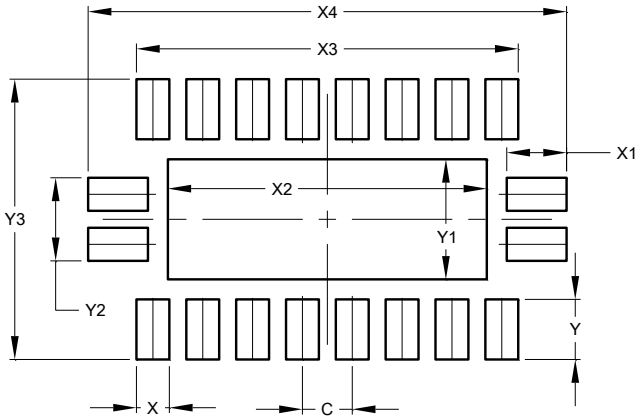
Please see AP02001 at http://www.diodes.com/datasheets/ap02001.pdf for the latest version.

**(1) Package Type: TSSOP-20**




| Dimensions | Value (in mm) |
|---|---|
| C | 0.650 |
| X | 0.420 |
| X1 | 6.270 |
| Y | 1.780 |
| Y1 | 4.160 |
| Y2 | 7.720 |

**(2) Package Type: V-QFN4525-20**




| Dimensions | Value (in mm) |
|---|---|
| C | 0.500 |
| X | 0.330 |
| X1 | 0.600 |
| X2 | 3.200 |
| X3 | 3.830 |
| X4 | 4.800 |
| Y | 0.600 |
| Y1 | 1.200 |
| Y2 | 0.830 |
| Y3 | 2.800 |

NEW PRODUCT

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2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.



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