

**PI49FCT3805D**

**3.3V, 2 x 1:5 CMOS Clock Driver**

## Features

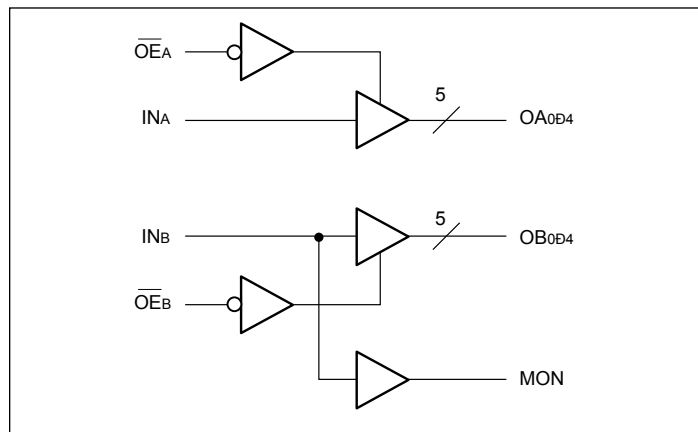
- Low output skew: <200ps
- Switching frequency up to 166 MHz
- Fast output rise/fall time: <1.0ns
- Low propagation delay: <2.5ns
- Low input capacitance: <6.0pF
- Balanced CMOS outputs
- Industrial Temperature: -40°C to +85°C
- 3.3V ±10% operation, 5V Input Tolerant
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- For automotive applications requiring specific change control (i.e. parts qualified to AEC-Q100/101/200, PPAP capable, and manufactured in IATF 16949 certified facilities), please [contact us](https://www.diodes.com/quality/product-definitions/) or your local Diodes representative.
- Packaging (Pb-free & Green available):
  - ♦ 20-pin, 150-mil wide QSOP (Q)
  - ♦ 20-pin, 209-mil wide SSOP (H)

<https://www.diodes.com/quality/product-definitions/>

## Description

Diodes' PI49FCT3805D is composed of non-inverting drivers. The outputs are configured into 2 groups of one-in, five-out with independent output enable. Group B has an extra MON output. Excellent output signals to power and ground ratio minimize power and ground noise and also improves output performance.

## Block Diagram



## Truth Table<sup>(1)</sup>

| Inputs            |        | Outputs |     |
|-------------------|--------|---------|-----|
| $\overline{OE}_X$ | $IN_X$ | $OA_X$  | MON |
| L                 | L      | L       | L   |
| L                 | H      | H       | H   |
| H                 | L      | Z       | L   |
| H                 | H      | Z       | H   |

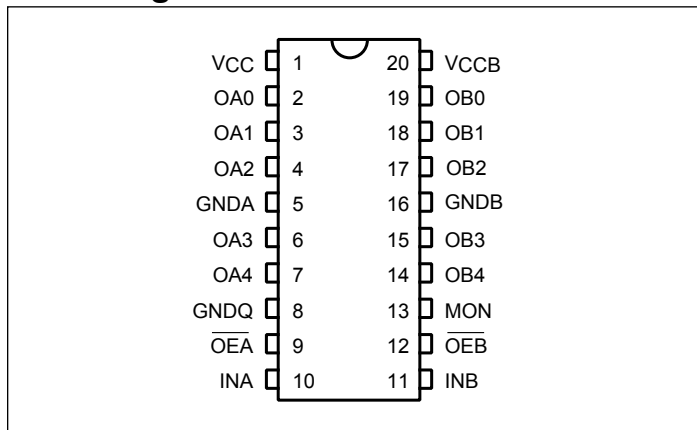
### Note:

1. H = High Voltage Level, L = Low Voltage Level, Z = High Impedance

### Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> 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 Configuration



## Pin Description

| Pin Name          | Description                                  |
|-------------------|--|
| $\overline{OE_X}$ | Hi-Z State Output Enable Inputs (Active Low) |
| $IN_X$            | Clock Inputs                                 |
| $OA_N, OB_N$      | Clock Outputs                                |
| MON               | Monitor Output                               |
| GND               | Ground                                       |
| VCC               | Power  |

## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

|  |                                 |
|--|---------------------------------|
| Storage Temperature .....  | -65°C to +150°C                 |
| Ambient Temperature with Power Applied .....                         | -40°C to +85°C                  |
| Input Voltage to GND Potential (Inputs & V <sub>CC</sub> Only) ..... | -0.5V to 5.5V                   |
| Output Voltage to GND Potential (Outputs & I/O Only)....             | -0.5V to +V <sub>CC</sub> +0.5V |
| V <sub>CC</sub> Input Voltage .....                                  | -0.5V to +4.6V                  |

### Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## DC Electrical Characteristics (T<sub>A</sub> = -40°C to +85°C, V<sub>CC</sub> = 3.3V ± 0.3V)

| Symbol                               | Parameters   | Test Conditions <sup>(1)</sup>  | Min.   | Typ.            | Max.              | Units |
|--------------------------------------|--|---|--|-----------------|-------------------|-------|
| V <sub>OH</sub>                      | Output High Voltage<br>V <sub>CC</sub> = Min.,<br>V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> | I <sub>OH</sub> = -0.1mA<br>I <sub>OH</sub> = -8mA<br>I <sub>OH</sub> = -12mA                                   | V <sub>CC</sub> -0.2<br>2.4 <sup>(3)</sup><br>2.4 <sup>(3)</sup> | -<br>3.0<br>3.0 |                   | V     |
| V <sub>OL</sub>                      | Output Low Voltage<br>V <sub>CC</sub> = Min.,<br>V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub>  | I <sub>OH</sub> = 0.1mA<br>I <sub>OH</sub> = 8mA<br>I <sub>OH</sub> = 12mA                                      |  | -<br>0.2<br>0.3 | 0.2<br>0.4<br>0.4 |       |
| V <sub>IH</sub>                      | Input High Voltage   | Low Logic   | 2.0  |                 | 5.5               |       |
| V <sub>IL</sub>                      | Input Low Voltage  | High Logic  | -0.5   |                 | 0.8               |       |
| I <sub>IH</sub>                      | Input High Current   | V <sub>CC</sub> = Max., V <sub>IN</sub> = 5.5V  |  |                 | 1                 | μA    |
| I <sub>IL</sub>                      | Input Low Current  | V <sub>CC</sub> = Max., V <sub>IN</sub> = GND   |  |                 | -1                |       |
| I <sub>OZH</sub><br>I <sub>OZL</sub> | High Impedance<br>output current   | V <sub>CC</sub> = Max., all<br>outputs disabled<br>V <sub>OUT</sub> = V <sub>CC</sub><br>V <sub>OUT</sub> = GND |  |                 | 1<br>-1           |       |
| V <sub>IK</sub>                      | Clamp Diode Voltage  | V <sub>CC</sub> = Min., I <sub>IN</sub> = -18mA   |  | -0.7            | -1.2              | V     |
| I <sub>ODH</sub>                     | Output High Current <sup>(4, 5)</sup>  | V <sub>OUT</sub> = 1.5V, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , V <sub>CC</sub> = 3.3V          | -40  | -74             | -100              | mA    |
| I <sub>ODL</sub>                     | Output Low Current <sup>(4, 5)</sup>   | V <sub>OUT</sub> = 1.5V, V <sub>IN</sub> = V <sub>IL</sub> or V <sub>IH</sub> , V <sub>CC</sub> = 3.3V          | 50   | 90              | 130               |       |
| I <sub>OS</sub>                      | Short Circuit Current <sup>(4, 5)</sup>  | V <sub>CC</sub> = Max., V <sub>OUT</sub> = GND  | -60  | -100            | -120              |       |

### Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient and maximum loading.
- V<sub>OH</sub> = V<sub>CC</sub> - 0.6V at rated current.
- This parameter is determined by device characterization but is not production tested.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

## Capacitance (T<sub>A</sub> = 25°C, f = 1 MHz)

| Parameters <sup>(1)</sup> | Description        | Test Conditions       | Typ | Max. | Units |
|---------------------------|--------------------|-----------------------|-----|------|-------|
| C <sub>IN</sub>           | Input Capacitance  | V <sub>IN</sub> = 0V  | 3.0 | 4    | pF    |
| C <sub>OUT</sub>          | Output Capacitance | V <sub>OUT</sub> = 0V | —   | 6    |       |

### Note:

- This parameter is determined by device characterization but is not production tested.

## Power Supply Characteristics

| Parameters      | Description                          | Test Conditions <sup>(1)</sup>   |  | Min. | Typ. <sup>(2)</sup> | Max. | Units                        |
|-----------------|--------------------------------------|--|--|------|---------------------|------|------------------------------|
| $I_{CC}$        | Quiescent Power Supply Current       | $V_{CC} = \text{Max.}$   | $V_{IN} = \text{GND or } V_{DD}$       |      | 0.1                 | 30   | $\mu\text{A}$                |
| $I_{DD}$        | Dynamic Supply Current per Output    | $V_{CC} = 3.6\text{V},$<br>$C_L = 15\text{pF},$<br>All Outputs Toggling                            |  |      | 80                  | 120  |                              |
| $I_C$           | Total Power Supply Current           | $V_{CC} = 3.6\text{V},$<br>$C_L = 15\text{pF},$<br>All Outputs Toggling,<br>$f_i = 133\text{ MHz}$ | $V_{IN} = V_{CC} \text{ or GND}$       |      | 100                 | 135  | $\text{mA/}$<br>$\text{MHz}$ |
|                 |                                      |  | $V_{IN} = V_{CC} - 0.6\text{V or GND}$ |      | 100                 | 135  |                              |
|                 |                                      | $V_{CC} = 3.6\text{V},$<br>$C_L = 15\text{pF},$<br>All Outputs Toggling,<br>$f_i = 166\text{ MHz}$ | $V_{IN} = V_{CC} \text{ or GND}$       |      | 120                 | 160  |                              |
|                 |                                      |  | $V_{IN} = V_{CC} - 0.6\text{V or GND}$ |      | 120                 | 160  |                              |
| $\Delta I_{CC}$ | Supply Current per inputs @ TTL High | $V_{CC} = \text{Max.}$   | $V_{IN} = V_{CC} - 0.6\text{V}^{(3)}$  |      | 45                  | 300  | $\mu\text{A}$                |

### Notes:

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at  $V_{CC} = 3.3\text{V}$ ,  $+25^\circ\text{C}$  ambient.
- Per TTL driven input ( $V_{IN} = V_{CC} - 0.6\text{V}$ ); all other inputs at  $V_{CC}$  or GND.

## Switching Characteristics over Operating Range

| Parameters                            | Description                         | Test Conditions <sup>(1)</sup>         | 3805D | Units |
|---------------------------------------|-------------------------------------|--|-------|-------|
|                                       |                                     |  | Max.  |       |
| $t_{PLH}$<br>$t_{PHL}$                | Propagation Delay $I_{NN}$ to $O_N$ | $C_L = 15\text{pF}$<br>133 MHz (3805D) | 3.0   | ns    |
| $t_R/t_F$                             | CLKn Rist/Fall Time 0.8V ~ 2.0V     |  | 1.5   | ns    |
| $t_{SK(o)}^{(3)}$                     | Pulse Skew                          |  | 270   | ps    |
| $t_{SK(p)}^{(3)}$                     | Output Skew                         |  | 270   |       |
| $t_{SK(t)}^{(3)}$                     | Package Skew                        |  | 550   |       |
| $t_{ZL}, t_{ZH},$<br>$t_{LZ}, t_{HZ}$ | Enable/Disable Time                 |  | 5.2   | ns    |
| $F_{MAX}$                             | Input Frequency                     |  | 133   | MHz   |

### Note:

1. These parameters are guaranteed by design
2. Series Resistor loading =  $33\Omega$  (See Test Circuit)

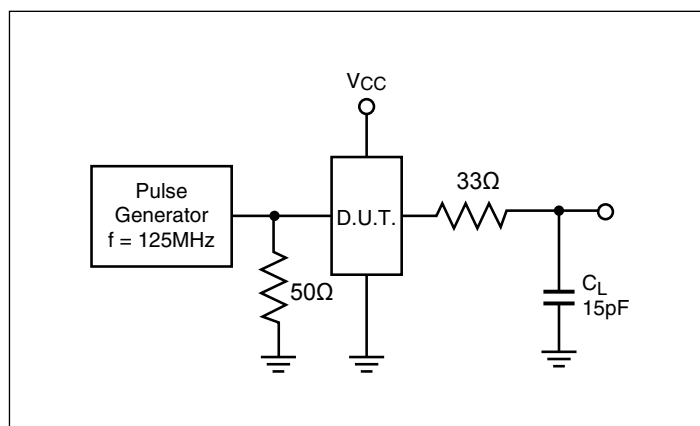
## Switch Position

| Test                        | Switch |
|-----------------------------|--------|
| Disable LOW<br>Enable LOW   | 6V     |
| Disable HIGH<br>Enable HIGH | GND    |
| All Other Inputs            | Open   |

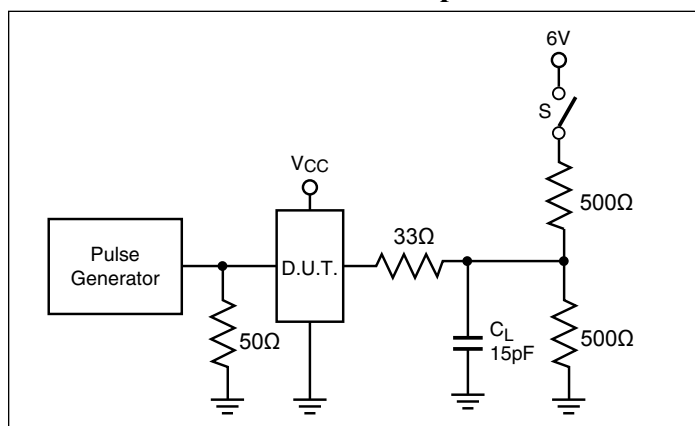
### Definitions:

1.  $C_L$  = Load capacitance: includes jig and probe capacitance.
2.  $R_T$  = Termination resistance: should be equal to  $Z_{OUT}$  of the Pulse Generator.

## Tests Circuit

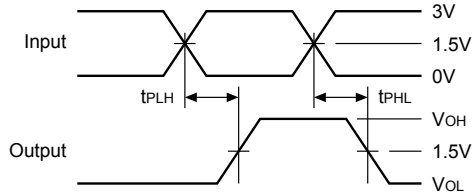


## Enable/Disable Time Test Set-Up

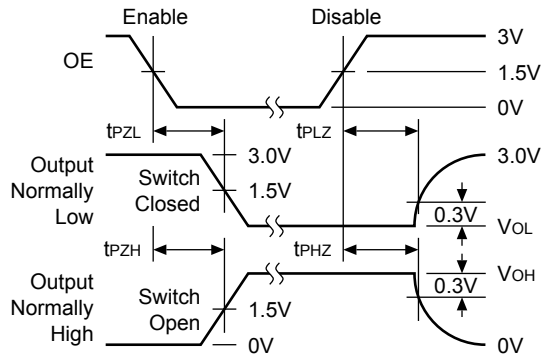


## Switching Waveforms

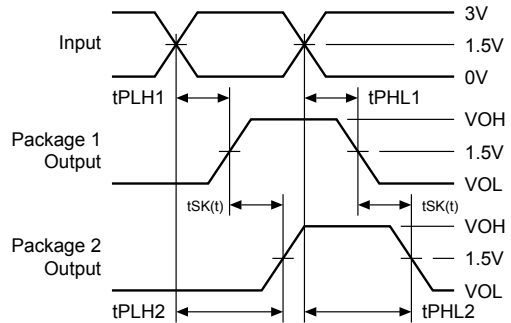
### Propagation Delay



### Enable and Disable Times

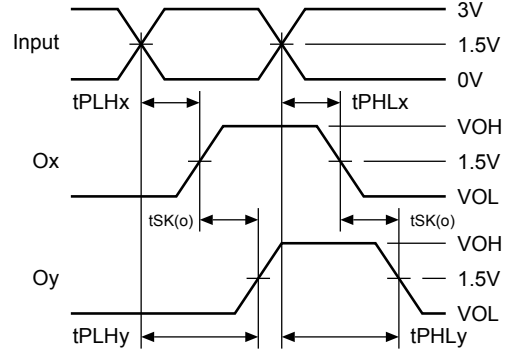


### Package Skew – $t_{SK(t)}$



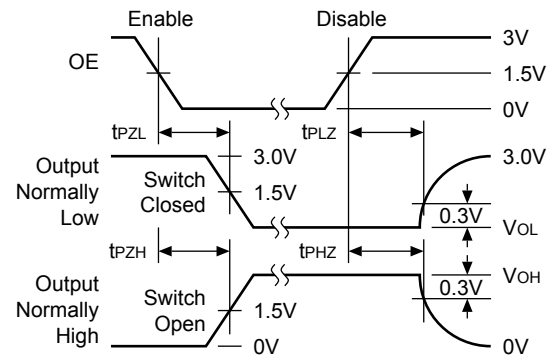
$$t_{SK(t)} = |t_{PLH2} - t_{PLH1}| \text{ or } |t_{PHL2} - t_{PHL1}|$$

### Output Skew – $t_{SK(o)}$



$$t_{SK(o)} = |t_{PLHy} - t_{PLHx}| \text{ or } |t_{PHLy} - t_{PHLx}|$$

### Pulse Skew – $t_{SK(p)}$



**PI49FCT3805D**

## Part Marking

### H Package



YY: Year  
WW: Workweek  
1st X: Assembly Code  
2nd X: Fab Code

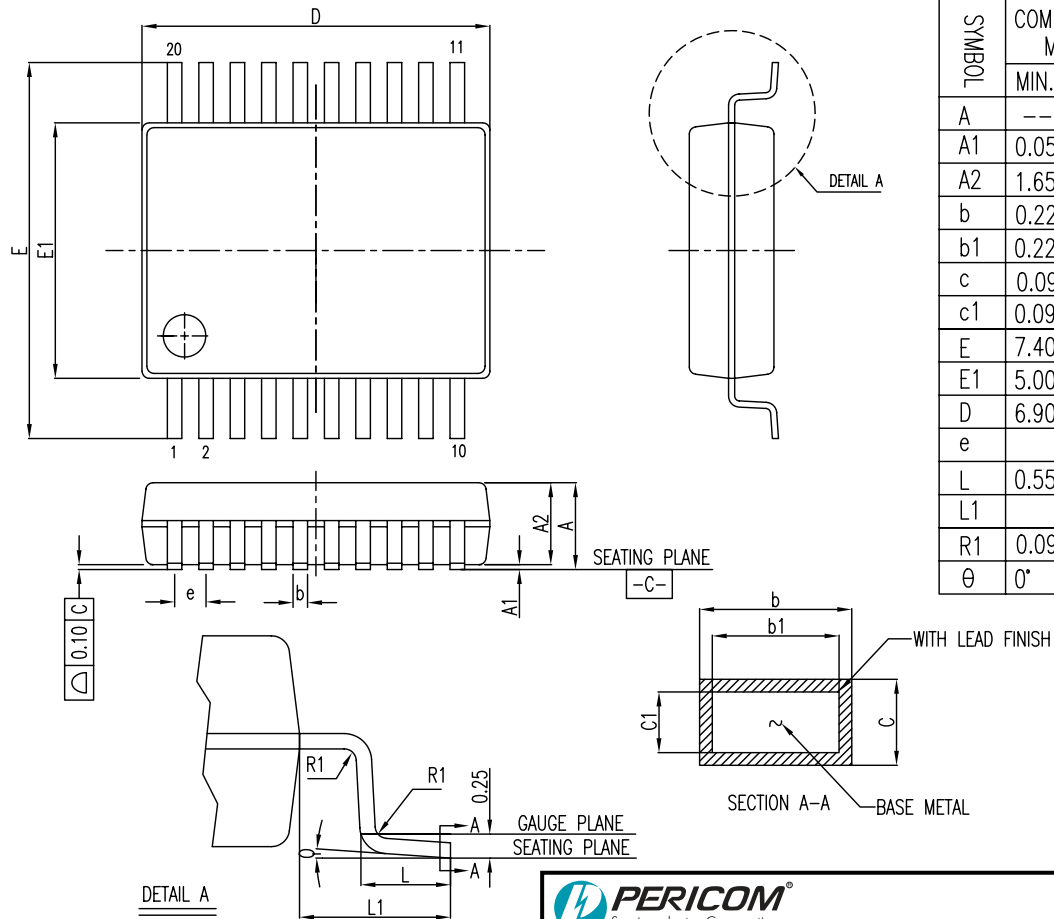
### Q Package



YY: Year  
WW: Workweek  
1st X: Assembly Code  
2nd X: Fab Code

**PI49FCT3805D**

**Packaging Mechanical: 20-SSOP (H)**



**NOTE:**

1. Controlling dimensions in millimeters
2. Ref.: JEDEC MO-150B/AE
3. Package Outline Exclusive of Mold Flash and Metal Burr



DATE: 10/31/13

**DESCRIPTION: 20-Pin, 209-Mil Wide, SSOP**

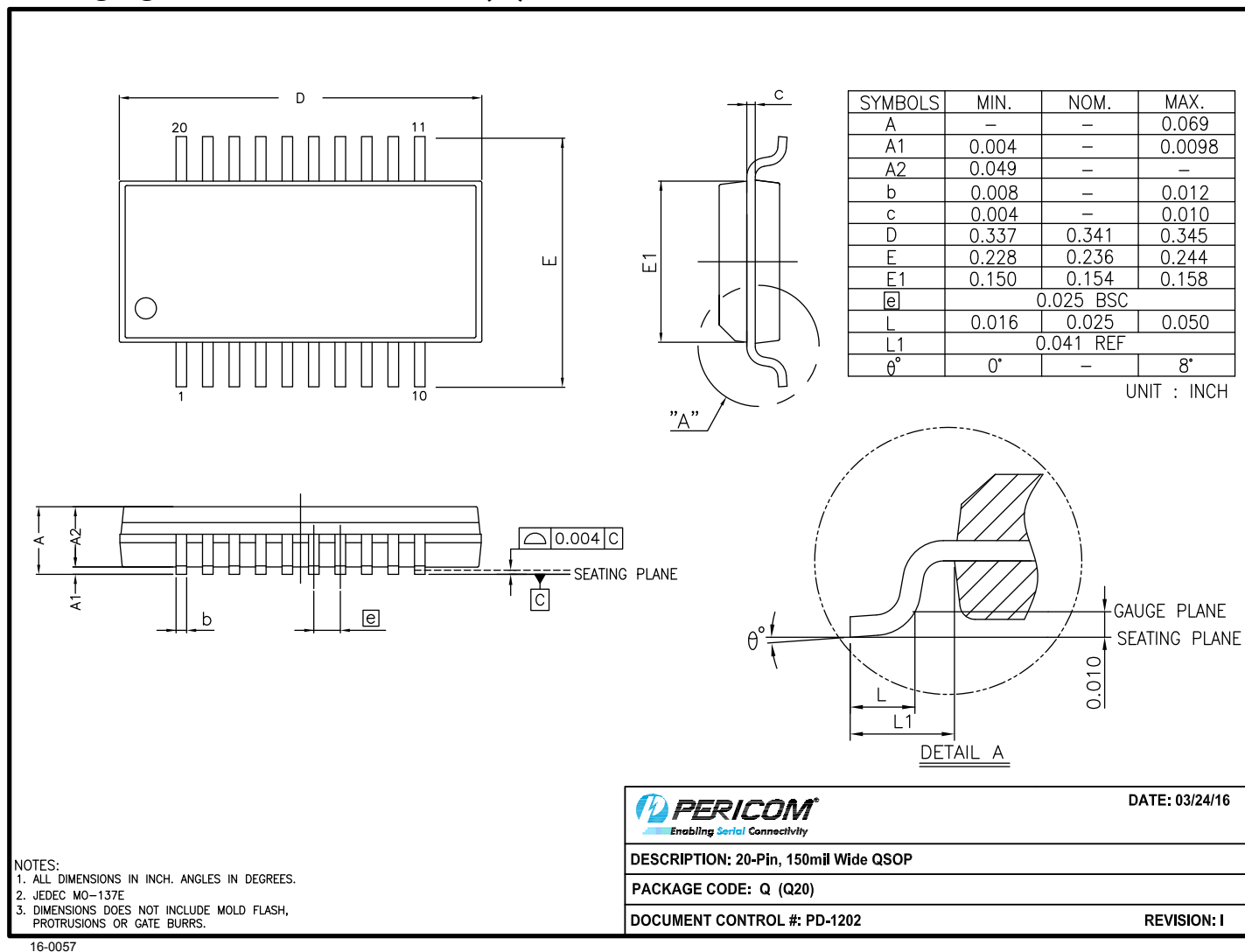
**PACKAGE CODE: H20**

**DOCUMENT CONTROL #: PD-1240**

**REVISION: F**

13-0214



**PI49FCT3805D**
**Packaging Mechanical: 20-QSOP (Q)**

**For latest package info.**

 please check: <http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/>
**Ordering Information**

| Ordering Code   | Package Code | Package Description         |
|-----------------|--------------|-----------------------------|
| PI49FCT3805DHEX | H            | 20-pin, 209-mil Wide (SSOP) |
| PI49FCT3805DQEX | Q            | 20-pin, 150-mil Wide (QSOP) |

**Notes:**

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See <https://www.diodes.com/quality/lead-free/> 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.
4. E = Pb-free and Green
5. X suffix = Tape/Reel

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