A product Line of
Diodes Incorporated

# PI49FCT3805/PI49FCT3806

**3.3V Fast CMOS Buffer/Clock Driver**

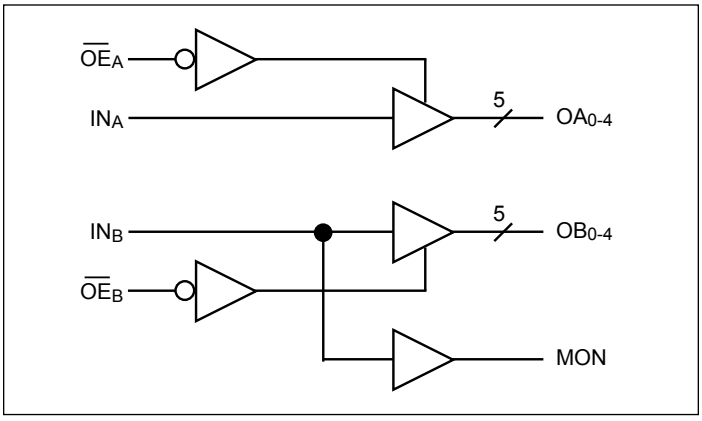
## Features

- 3.3V version of PI49FCT805/806
- Extremely low output skew: 0.5ns
- Monitor output pin
- Clock busing with 3-state control
- TTL input and CMOS output compatible
- Industrial operation at –40°C to 85°C
- Extremely low static power (1mW, typ.)
- Hysteresis on all inputs
- 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 or your local Diodes representative. https://www.diodes.com/quality/product-definitions/
- Packaging (Pb-free & Green available):
  - 20-pin 150-mil wide QSOP (Q)
  - 20-pin 209-mil wide SSOP (H)

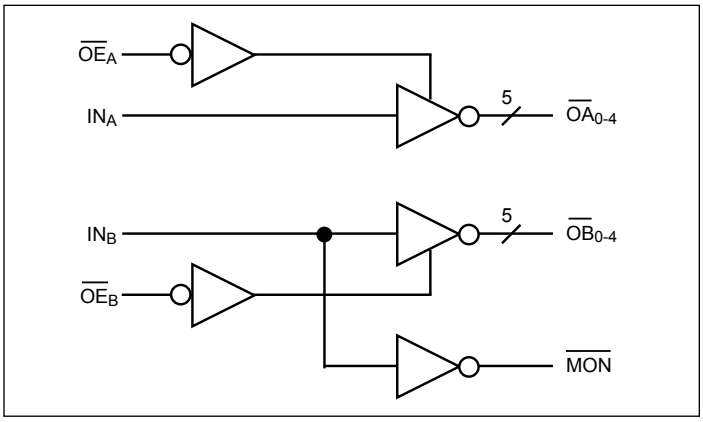
## Description

Diodes' PI49FCT3805 is a 3.3V non-inverting clock driver and the PI49FCT3806 is a 3.3V inverting clock driver designed with two independent groups of buffers. These buffers have 3-state Output Enable inputs (active LOW) with a 1-in, 5-out configuration per group. Each clock driver consist of two banks of drivers, driving five outputs each from a standard TTL compatible CMOS input.

## PI49FCT3805 Block Diagram

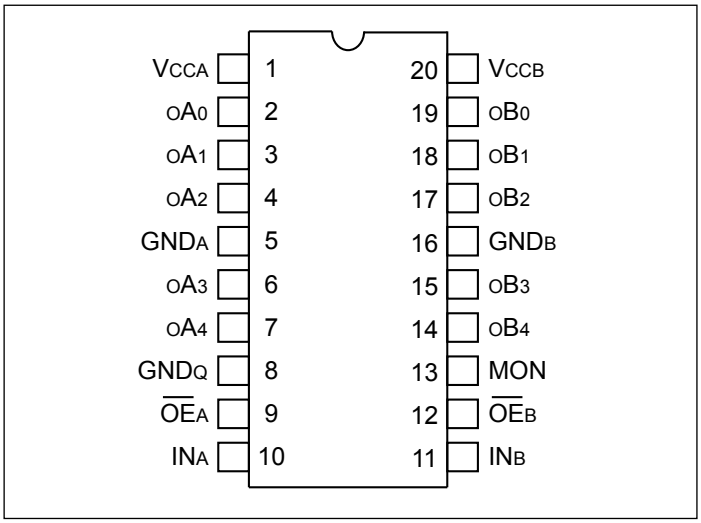



## PI49FCT3806 Block Diagram

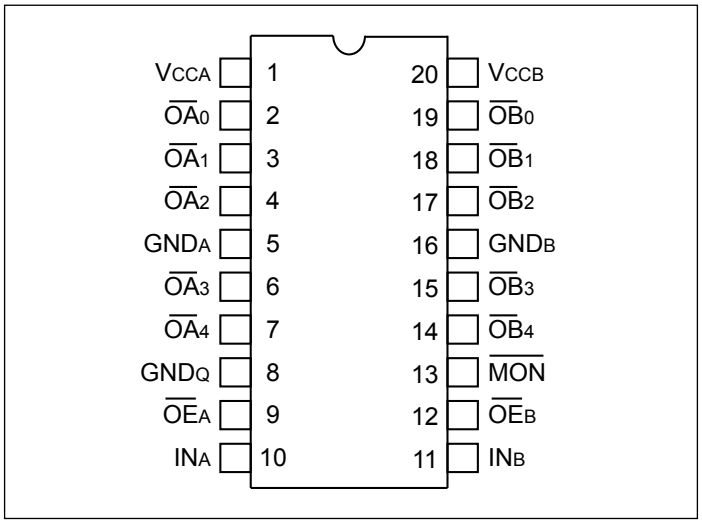



**Notes:**
1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS), 2011/65/EU (RoHS 2) & 2015/863/EU (RoHS 3) compliant.
2. See https://www.diodes.com/quality/lead-free/ for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

## PI49FCT3805 Pin Configuration




## PI49FCT3806 Pin Configuration




## Pin Description

| Pin Name | Description |
|---|---|
| $\overline{OE}_A$, $\overline{OE}_B$ | 3-State Output Enable Inputs (Active LOW) |
| $IN_A$, $IN_B$ | Clock Inputs |
| $OA_N$, $OB_N$ | Clock Outputs |
| MON | Monitor Output |
| GND | Ground |
| $V_{CC}$ | Power |

## PI49FCT3805 Truth Table(1)

| Inputs | | Outputs | |
|---|---|---|---|
| $\overline{OE}_A$, $\overline{OE}_B$ | $IN_A$, $IN_B$ | $OA_N$, $OB_N$ | 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

## PI49FCT3806 Truth Table(1)

| Inputs | | Outputs | |
|---|---|---|---|
| $\overline{OE}_A$, $\overline{OE}_B$ | $IN_A$, $IN_B$ | $\overline{OA}_N$, $\overline{OB}_N$ | $\overline{MON}$ |
| L | L | H | H |
| L | H | L | L |
| H | L | Z | H |
| H | H | Z | L |

**Note:**

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

## 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
Supply Voltage to Ground Potential (Inputs & Vcc Only)....–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & I/O Only) .–0.5V to +7.0V
DC Input Voltage .....–0.5V to +7.0V
DC Output Current ..... 120 mA
Power Dissipation .....0.5W

**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 ($T_A$ = –40°C to +85°C, $V_{CC}$ = 3.3V ±0.3V)

| Symbol | Parameter | Test Condition[1] | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|---|
| $V_{OH}$ | Output High Voltage<br>$V_{CC}$ = 3.0V, $V_{IN}$ = $V_{IL}$ or $V_{IH}$ | $V_{CC}$ = Min.,<br>$V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OH}$ = -0.1mA<br>$I_{OH}$ = -8mA | $V_{CC}$ -0.2<br>2.4 (3) | -<br>3.0 | | V |
| $V_{OL}$ | Output Low Voltage<br>$V_{CC}$ = 3.0V, $V_{IN}$ = $V_{IL}$ or $V_{IH}$ | $V_{CC}$ = Min.,<br>$V_{IN}$ = $V_{IH}$ or $V_{IL}$ | $I_{OL}$ = 0.1mA<br>$I_{OL}$ = 16mA<br>$I_{OL}$ = 24mA | | -<br>0.2<br>0.3 | 0.2<br>0.4<br>0.5 | |
| $V_{IH}$ | Input High Voltage | Guaranteed Logic HIGH level | Input Pins | 2.0 | | 5.5 | |
| $V_{IL}$ | Input Low Voltage | Guaranteed Logic LOW level | Input Pins | -0.5 | | 0.8 | |
| $I_{IH}$ | Input High Current | $V_{CC}$ = Max | $V_{IN}$ = $V_{CC}$ (Input Pins) | -1 | | 1 | µA |
| $I_{IL}$ | Input Low Current | $V_{CC}$ = Max | $V_{IN}$ = GND (Input & I/O Pins) | -1 | | 1 | |
| $I_{OZH}$ | High Impedance Output Current | $V_{CC}$ = Max.,<br>All outputs Disabled | $V_{OUT}$ = $V_{CC}$<br>$V_{OUT}$ = GND | -1 | | 1 | |
| $I_{OZL}$ | High Impedance Output Current | $V_{CC}$ = Max.,<br>All outputs Disabled | $V_{OUT}$ = $V_{CC}$<br>$V_{OUT}$ = GND | -1 | | 1 | |
| $V_{IK}$ | Clamp Diode Voltage | $V_{CC}$ = Min., $I_{IN}$ = -18mA | | | -0.7 | -1.2 | V |
| $I_{ODH}$ | Output HIGH Current | $V_{OUT}$ = 3.3V, $V_{IN}$ =$V_{IL}$ or $V_{IH}$,<br>$V_{OUT}$ = 1.5V[4] | | -35 | -86 | -110 | mA |
| $I_{ODL}$ | Output LOW Current | $V_{OUT}$ = 3.3V, $V_{IN}$ = $V_{IL}$ or $V_{IH}$,<br>$V_{OUT}$ = 1.5V[4] | | 50 | 168 | 200 | |
| $I_{OS}$ | Short Circuit[5] Current | $V_{CC}$ = Max., $V_{OUT}$ = GND[5] | | -60 | -135 | -240 | |
| $V_H$ | Input Hysteresis | | | | 150 | | mV |

**Note:**
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC}$ = 3.3V, +25°C ambient and maximum loading.
3. $V_{OH}$ = $V_{CC}$ – 0.6V at rated current.
4. This parameter is determined by device characterization but is not production tested.
5. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

## Power Supply Characteristics ($T_A$ = –40°C to +85°C, $V_{CC}$ = 3.3V ±0.3V)

| Parameters | Description | Test Conditions[1] | | Min. | Typ[2] | Max. | Units |
|---|---|---|---|---|---|---|---|
| $I_{CC}$ | Quiescent Power Supply Current | $V_{CC}$ = Max. | $V_{IN}$ = GND or $V_{CC}$ | — | | 30 | µA |
| $\Delta I_{CC}$ | Supply Current per Inputs @ TTL HIGH | $V_{CC}$ = Max. | $V_{IN}$ = $V_{CC}$ – 0.6V[3] | — | 11 | 300 | |
| $I_{CCD}$ | Supply Current per Input per MHz[4] | $V_{CC}$ = Max.,<br>Outputs Open<br>$\overline{OE}_A$ or $\overline{OE}_B$ = GND<br>Per Output Toggling<br>50% Duty Cycle | $V_{IN}$ = $V_{CC}$<br>$V_{IN}$ = GND | — | 0.1 | 0.16 | mA/ MHz |
| $I_C$ | Total Power Supply Current[6] | $V_{CC}$ = Max.,<br>Outputs Open<br>FO = 10 MHz<br>50% Duty Cycle<br>$\overline{OE}_A$ or $\overline{OE}_B$ = GND<br>Mon. Outputs Toggling | $V_{IN}$ = $V_{CC}$<br>$V_{IN}$ = GND | — | 3.3 | 9.0[5] | mA |
| | | | $V_{IN}$ = $V_{CC}$ – 0.6V<br>$V_{IN}$ = GND | — | 3.3 | 10.0[5] | |
| | | $V_{CC}$ = Max.,<br>Outputs Open<br>$f_O$ = 2.5 MHz<br>50% Duty Cycle<br>$\overline{OE}_A$ or $\overline{OE}_B$ = GND<br>Eleven Outputs Toggling | $V_{IN}$ = $V_{CC}$<br>$V_{IN}$ = GND | — | 1.8 | 6.0[5] | |
| | | | $V_{IN}$ = $V_{CC}$ – 0.6V<br>$V_{IN}$ = GND | — | 1.8 | 7.0[5] | |

**Note:**

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at $V_{CC}$ = 3.3V, +25°C ambient.
3. Per TTL driven input ($V_{IN}$ = $V_{CC}$ – 0.6V); all other inputs at $V_{CC}$ or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of the Ic formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_O N_O)$
   $I_{CC}$ = Quiescent Current
   $\Delta I_{CC}$ = Power Supply Current for a TTL High Input ($V_{IN}$ = $V_{CC}$ – 0.6V)
   $D_H$ = Duty Cycle for TTL Inputs High
   $N_T$ = Number of TTL Inputs at $D_H$
   $I_{CCD}$ = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   $f_O$ = Output Frequency
   $N_O$ = Number of Outputs at $f_O$

**All currents are in milliamps and all frequencies are in megahertz.**

## Capacitance ($T_A$ = 25°C, f = 1 MHz)

| Parameters[1] | Description | Test Conditions | Typ | Max. | Units |
|---|---|---|---|---|---|
| $C_{IN}$ | Input Capacitance | $V_{IN}$ = 0V | 3.0 | 6.0 | pF |
| $C_{OUT}$ | Output Capacitance | $V_{OUT}$ = 0V | 6.0 | 8.0 | |

**Note:**
1. This parameter is determined by device characterization but is not production tested.

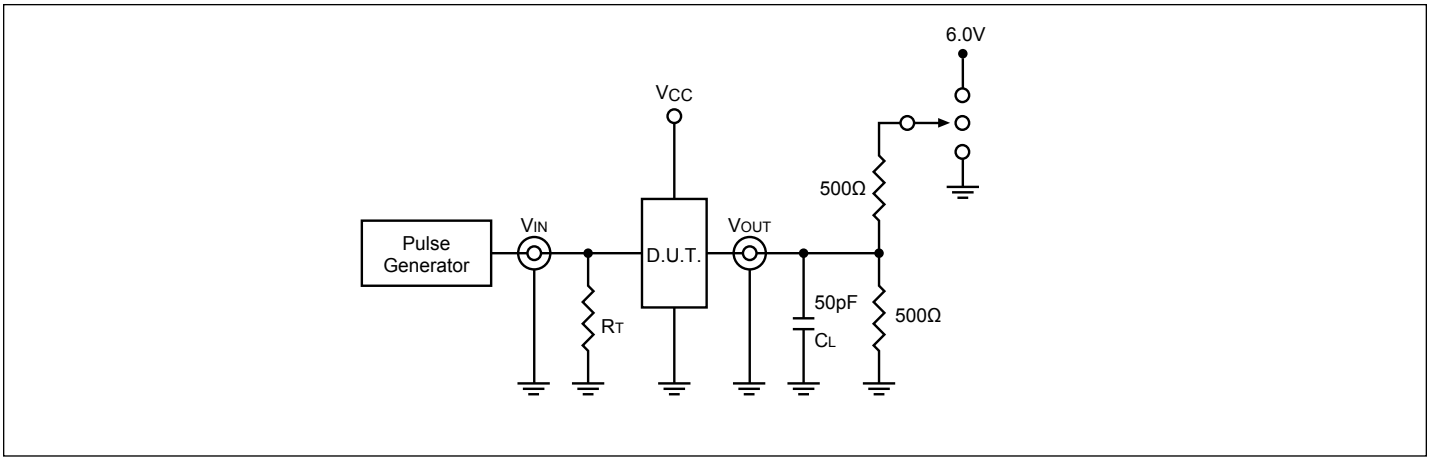
## Switching Characteristics ($T_A$ = –40°C to +85°C, $V_{CC}$ = 3.3V ±0.3V)

| Parameter | Description | Test Conditions[1] | 3805 3806 Com. Min. | 3805 3806 Com. Max. | 3805A 3806A Com. Min. | 3805A 3806A Com. Max. | 3805B 3806B Com. Min. | 3805B 3806B Com. Max. | 3805C 3806C Com. Min. | 3805C 3806C Com. Max. | Units |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $t_{PLH}$<br>$t_{PLH}$ | Propagation Delay<br>$IN_A$ to $OA_N$,<br>$IN_B$ to $OB_N$ | $C_L$ = 50pF<br>$R_L$ = 500Ω | 1.5 | 6.5 | 1.5 | 5.8 | 1.5 | 5.0 | 1.5 | 4.5 | ns |
| $t_{PZH}$<br>$t_{PZL}$ | Output Enable Time<br>$\overline{OE}_A$ to $OA_N$, $\overline{OE}_B$ to $OB_N$ | | 1.5 | 8.0 | 1.5 | 8.0 | 1.5 | 6.5 | 1.5 | 6.2 | |
| $t_{PHL}$<br>$t_{PLZ}$ | Output Disable Time<br>$\overline{OE}_A$ to $OA_N$, $\overline{OE}_B$ to $OB_N$ | | 1.5 | 7.0 | 1.5 | 7.0 | 1.5 | 6.0 | 1.5 | 5.0 | |
| $t_{SK(o)}$[3] | Skew between two outputs of same package (same transition) | | | 0.7 | | 0.7 | | 0.5 | | 0.5 | |
| $t_{SK(P)}$[3] | Skew between opposite transitions ($t_{PHL}$ - $t_{PLH}$) of the same output | | | 1.0 | | 0.7 | | 0.5 | | 0.5 | |
| $t_{SK(t)}$[3] | Skew between two outputs of different package at same temperature (Same transition) | | | 1.5 | | 1.2 | | 1.0 | | 0.8 | |

**Note:**
1. See test circuit and waveforms
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. Skew measured at worst cast temperature (max. temp).

## Tests Circuits for All Outputs

Except for $F_{IN}$ >100 MHz




## Switch Position

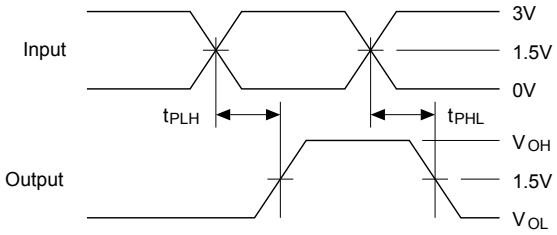
| Test | Switch |
|---|---|
| Disable LOW<br>Enable LOW | 6V |
| Disable HIGH<br>Enable HIGH | GND |
| All Other Inputs | Open |

**Definitions:**

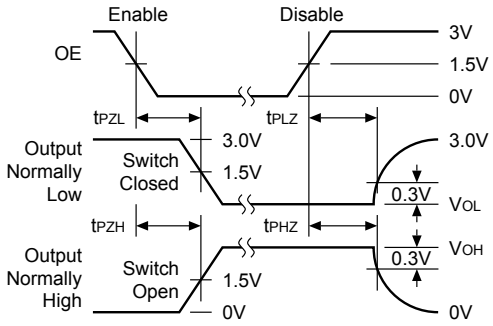
$C_L$ = Load capacitance: includes jig and probe capacitance.

$R_T$ = Termination resistance: should be equal to ZOUT of the Pulse Generator.

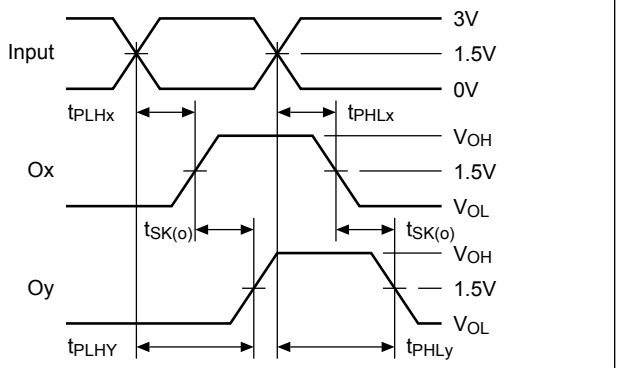
## Switching Waveforms




Propagation Delay

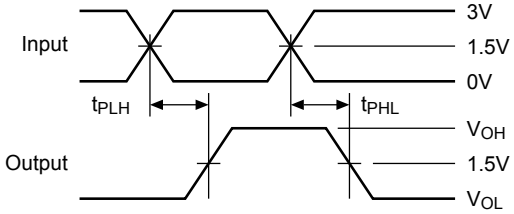



Enable and Disable Times



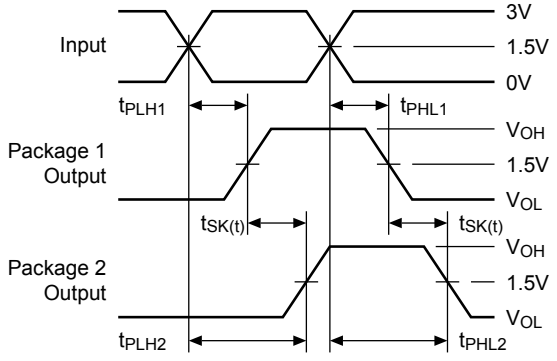

$t_{SK(o)} = | t_{PLHy} - t_{PLHx} |$ or $| t_{PHLy} - t_{PHLx} |$

Output Skew – $t_{SK(O)}$




$t_{SK(p)} = | t_{PHL} - t_{PLH} |$

Pulse Skew – $t_{SK(P)}$




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

Package Skew – $t_{SK(t)}$

## Part Marking

PI49FCT3805

Q Package


B on the Part# = Speed Code
B: Fab 2 Port Code
W: Die Rev
YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: Fab Code


C on the Part# = Speed Code
B: Fab 2 Port Code
W: Die Rev
YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: Fab Code


B: Fab 2 Port Code
W: Die Rev
YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: Fab Code

H Package

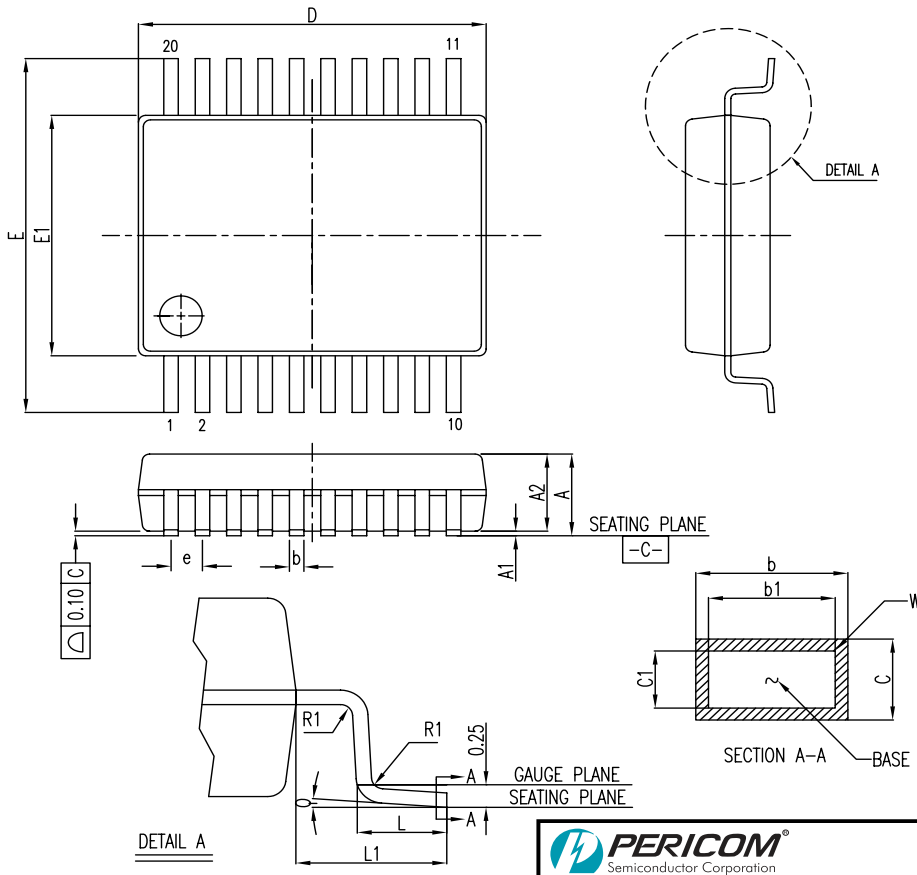

C on the Part# = Speed Code
B: Fab 2 Port Code
W: Die Rev
YY: Year
WW: Workweek
1st X: Assembly Code
2nd X: Fab Code

## Part Marking

PI49FCT3806

Top mark not available at this time. To obtain advance information regarding the top mark, please contact your local sales representative.

## Packaging Mechanical: 20-SSOP (H20)




| SYMBOL | COMMON DIMENSION MILLIMETERS | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | -- | -- | 2.0 |
| A1 | 0.05 | -- | -- |
| A2 | 1.65 | 1.75 | 1.85 |
| b | 0.22 | -- | 0.38 |
| b1 | 0.22 | 0.30 | 0.33 |
| c | 0.09 | -- | 0.25 |
| c1 | 0.09 | 0.15 | 0.21 |
| E | 7.40 | 7.80 | 8.20 |
| E1 | 5.00 | 5.30 | 5.60 |
| D | 6.90 | 7.20 | 7.50 |
| e | 0.65 BSC | | |
| L | 0.55 | 0.75 | 0.95 |
| L1 | 1.25 REF. | | |
| R1 | 0.09 | -- | -- |
| θ | 0° | 4° | 8° |

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

PERICOM Semiconductor Corporation

**DATE: 10/31/13**

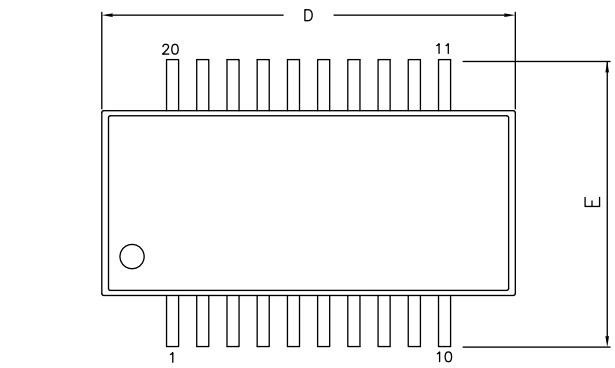
**DESCRIPTION: 20-Pin, 209-Mil Wide, SSOP**

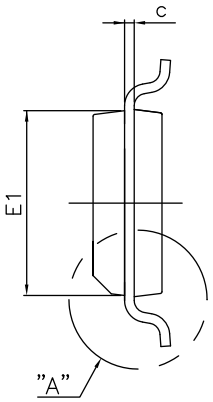
**PACKAGE CODE: H20**

**DOCUMENT CONTROL #: PD-1240** **REVISION: F**

13-0214

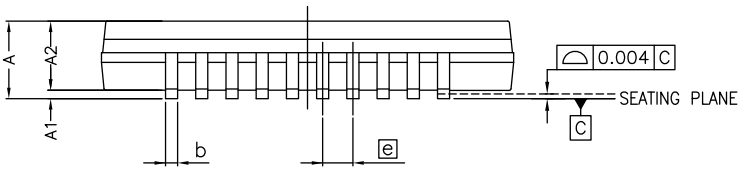
## Packaging Mechanical: 20-QSOP (Q)

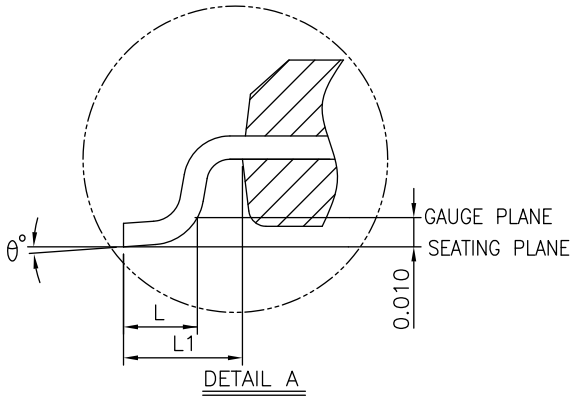



| SYMBOLS | MIN. | NOM. | MAX. |
|---|---|---|---|
| A | – | – | 0.069 |
| A1 | 0.004 | – | 0.0098 |
| A2 | 0.049 | – | – |
| b | 0.008 | – | 0.012 |
| c | 0.004 | – | 0.010 |
| D | 0.337 | 0.341 | 0.345 |
| E | 0.228 | 0.236 | 0.244 |
| E1 | 0.150 | 0.154 | 0.158 |
| e | | 0.025 BSC | |
| L | 0.016 | 0.025 | 0.050 |
| L1 | | 0.041 REF | |
| θ° | 0° | – | 8° |

UNIT : INCH




NOTES:
1. ALL DIMENSIONS IN INCH. ANGLES IN DEGREES.
2. JEDEC MO–137E
3. DIMENSIONS DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS.

16-0057

PERICOM Enabling Serial Connectivity

DATE: 03/24/16

DESCRIPTION: 20-Pin, 150mil Wide QSOP

PACKAGE CODE: Q (Q20)

DOCUMENT CONTROL #: PD-1202 REVISION: I

**For latest package info.**

please check: http://www.diodes.com/design/support/packaging/pericom-packaging/packaging-mechanicals-and-thermal-characteristics/

## PI49FCT3805 Ordering Information

| Ordering Code | Package Code | Speed Grade | Package Description |
|---|---|---|---|
| PI49FCT3805BQEX | Q | B | 20-pin, 150-mil (QSOP) |
| PI49FCT3805CHEX | H | C | 20-pin, 209-mil (SSOP) |
| PI49FCT3805CQEX | Q | C | 20-pin, 150-mil (QSOP) |
| PI49FCT3805QEX | Q | Blank | 20-pin, 150-mil (QSOP) |

## PI49FCT3806 Ordering Information

| Ordering Code | Package Code | Speed Grade | Package Description |
|---|---|---|---|
| PI49FCT3806BQEX | Q | B | 20-pin, 150-mil (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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Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or

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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