FEATURES:
• Advanced CMOS Technology
• Guaranteed low skew < 200ps (max.)
• Very low propagation delay < 2.5ns (max)
• Very low duty cycle distortion < 270ps (max)
• Very low CMOS power levels
• Operating frequency up to 166MHz
• TTL compatible inputs and outputs
• Inputs can be driven from 3.3V or 5V components
• Two independent output banks with 3-state control
• 1:5 fanout per bank
• "Heartbeat" monitor output
• \( \text{Vcc} = 3.3V \pm 0.3V \)
• Available in SSOP and QSOP packages

DESCRIPTION:
The FCT3805 is a 3.3 volt clock driver built using advanced CMOS technology. The device consists of two banks of drivers, each with a 1:5 fanout and its own output enable control. The device has a "heartbeat" monitor for diagnostics and PLL driving. The MON output is identical to all other outputs and complies with the output specifications in this document. The FCT3805 offers low capacitance inputs.

The FCT3805 is designed for high speed clock distribution where signal quality and skew are critical. The FCT3805 also allows single point-to-point transmission line driving in applications such as address distribution, where one signal must be distributed to multiple receivers with low skew and high signal quality.

For more information on using the FCT3805 with two different input frequencies on bank A and B, please see AN-236.

FUNCTIONAL BLOCK DIAGRAM

PIN CONFIGURATION
### ABSOLUTE MAXIMUM RATINGS (1)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCC</td>
<td>Input Power Supply Voltage</td>
<td>−0.5 to +4.6</td>
<td>V</td>
</tr>
<tr>
<td>VI</td>
<td>Input Voltage</td>
<td>−0.5 to +5.5</td>
<td>V</td>
</tr>
<tr>
<td>VO</td>
<td>Output Voltage</td>
<td>−0.5 to VCC+0.5</td>
<td>V</td>
</tr>
<tr>
<td>TJ</td>
<td>Junction Temperature</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>TSTG</td>
<td>Storage Temperature</td>
<td>−65 to +165</td>
<td>°C</td>
</tr>
</tbody>
</table>

**NOTE:**
1. Stresses greater than those listed under ABSOLUTE 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.

### CAPACITANCE ( TA = +25°C, f = 1.0MHz )

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIN</td>
<td>Input Capacitance</td>
<td>VIN = 0V</td>
<td>3</td>
<td>4</td>
<td>pF</td>
</tr>
<tr>
<td>COUT</td>
<td>Output Capacitance</td>
<td>VOUT = 0V</td>
<td>—</td>
<td>6</td>
<td>pF</td>
</tr>
</tbody>
</table>

**NOTE:**
1. This parameter is measured at characterization but not tested.

### DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified

**Industrial:** TA = −40°C to +85°C, VCC = 3.3V ± 0.3V

### FUNCTION TABLE (1)

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEA, OEB</td>
<td>INA, INB</td>
</tr>
<tr>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

**NOTE:**
1. H = HIGH
   L = LOW
   Z = High-Impedance

### Notes:
1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at VCC = 3.3V, 25°C ambient.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.
5. VOH = Vcc -0.6V at rated current.

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### POWER SUPPLY CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions(1)</th>
<th>Min.</th>
<th>Typ.(2)</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICCL</td>
<td>Quiescent Power Supply Current</td>
<td>VCC = Max.</td>
<td>—</td>
<td>0.1</td>
<td>30</td>
<td>µA</td>
</tr>
<tr>
<td>ICCH</td>
<td></td>
<td>VIN = GND or VCC</td>
<td>—</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICCZ</td>
<td></td>
<td>VCC = Max.</td>
<td>—</td>
<td>45</td>
<td>300</td>
<td>µA</td>
</tr>
<tr>
<td>ΔICC</td>
<td>Power Supply Current per Input HIGH</td>
<td>VCC = Max.</td>
<td>—</td>
<td>80</td>
<td>120</td>
<td>µA/MHz</td>
</tr>
<tr>
<td>ICCD</td>
<td>Dynamic Power Supply Current per Output(3)</td>
<td>VCC = Max.</td>
<td>—</td>
<td>125</td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CL = 15pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIN = VCC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIN = GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All Outputs Toggling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>fi = 133MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC</td>
<td>Total Power Supply Current(4)</td>
<td>VCC = Max.</td>
<td>—</td>
<td>125</td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CL = 15pF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIN = VCC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>VIN = GND</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All Outputs Toggling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>fi = 133MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>fi = 166MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>All Outputs Toggling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>fi = 166MHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTES:**

1. For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at VCC = 3.3V, +25°C ambient.
3. This parameter is not directly testable, but is derived for use in Total Power Supply calculations.
4. IC = IQUIESCENT + INPUTS + IDYNAMIC
   = ICCL + ΔICC DHNT + ICCD (foNo)
   ICCL = Quiescent Current (ICCL, ICCH and ICCZ)
   ΔICC = Power Supply Current for a TTL High Input (VIN = VCC -0.6V)
   DH = Duty Cycle for TTL Inputs High
   NT = Number of TTL Inputs at DH
   ICCD = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   fo = Output Frequency
   No = Number of Outputs at fo
### SWITCHING CHARACTERISTICS OVER OPERATING RANGE - 3805D (3,4)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPLH</td>
<td>Propagation Delay</td>
<td>CL = 15pF, f ≤133MHz</td>
<td>1</td>
<td>3</td>
<td>ns</td>
</tr>
<tr>
<td>tPHL</td>
<td>INA to OAn, INB to OBn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tR</td>
<td>Output Rise Time (0.8V to 2V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tF</td>
<td>Output Fall Time (2V to 0.8V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSK(O)</td>
<td>Same device output pin to pin skew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSK(P)</td>
<td>Pulse skew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSK(PP)</td>
<td>Part to part skew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tP2L</td>
<td>Output Enable Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tP2H</td>
<td>OEA to OAn, OEB to OBn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tPLZ</td>
<td>Output Disable Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tPHZ</td>
<td>OEA to OAn, OEB to OBn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fMAX</td>
<td>Input Frequency</td>
<td></td>
<td></td>
<td></td>
<td>MHz</td>
</tr>
</tbody>
</table>

### SWITCHING CHARACTERISTICS OVER OPERATING RANGE - 3805E (3,4)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>tPLH</td>
<td>Propagation Delay</td>
<td>CL = 15pF, f ≤166MHz</td>
<td>0.5</td>
<td>2.5</td>
<td>ns</td>
</tr>
<tr>
<td>tPHL</td>
<td>INA to OAn, INB to OBn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tR</td>
<td>Output Rise Time (0.8V to 2V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tF</td>
<td>Output Fall Time (2V to 0.8V)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSK(O)</td>
<td>Same device output pin to pin skew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSK(P)</td>
<td>Pulse skew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tSK(PP)</td>
<td>Part to part skew</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tP2L</td>
<td>Output Enable Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tP2H</td>
<td>OEA to OAn, OEB to OBn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tPLZ</td>
<td>Output Disable Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tPHZ</td>
<td>OEA to OAn, OEB to OBn</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>fMAX</td>
<td>Input Frequency</td>
<td></td>
<td></td>
<td></td>
<td>MHz</td>
</tr>
</tbody>
</table>

**NOTES:**
1. See test circuits and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. tPLH, tPHL, tSK(p), and tSK(o) are production tested. All other parameters guaranteed but not production tested.
4. Propagation delay range indicated by Min. and Max. limit is due to VCC, operating temperature and process parameters. These propagation delay limits do not imply skew.
5. Skew measured between all outputs under identical transitions and load conditions.
6. Skew measured is difference between propagation delay times tPHL and tPLH of same outputs under identical load conditions.
7. Part to part skew for all outputs given identical transitions and load conditions at identical VCC levels and temperature.
8. Airflow of 1m/s is recommended for frequencies above 133MHz.
9. This parameter is measured using f = 1MHz.
TEST CIRCUITS AND WAVEFORMS

**Enable and Disable Time Circuit**

**Switch Position**

<table>
<thead>
<tr>
<th>Test</th>
<th>Switch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disable Low</td>
<td>6V</td>
</tr>
<tr>
<td>Enable Low</td>
<td>GND</td>
</tr>
<tr>
<td>Disable High</td>
<td>GND</td>
</tr>
<tr>
<td>Enable High</td>
<td>GND</td>
</tr>
</tbody>
</table>

**Test Conditions**

<table>
<thead>
<tr>
<th>Symbol</th>
<th>VCC = 3.3V ±0.3V</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td>15</td>
<td>pF</td>
</tr>
<tr>
<td>RT</td>
<td>Zout of pulse generator</td>
<td>Ω</td>
</tr>
<tr>
<td>RL</td>
<td>33</td>
<td>Ω</td>
</tr>
<tr>
<td>tr / tf</td>
<td>1 (0V to 3V or 3V to 0V)</td>
<td>ns</td>
</tr>
</tbody>
</table>

**Definitions:**

- **CL** = Load capacitance: includes jig and probe capacitance.
- **RT** = Termination resistance: should be equal to Zout of the Pulse Generator.
- **tr / tf** = Rise/Fall time of the input stimulus from the Pulse Generator.
TEST CIRCUITS AND WAVEFORMS

Enable and Disable Times

NOTE:
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH

Part-to-Part Skew - tsk(PP)

Part-to-Part Skew is for the same package and speed grade.

Propagation Delay

Pulse Skew
ORDERING INFORMATION

49FCT XXXX X X
Device Type Package Process

PYG SSOP - Green
QG QSOP - Green

3805D 3.3V CMOS Dual 1-to-5 Clock Driver
3805E

-40°C to +85°C (Industrial)
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Corporate Headquarters
TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information
For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
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