**3.3V CMOS 1-TO-2 CLOCK DRIVER**

**IDT74FCT38072**

**FEATURES:**
- Advanced CMOS Technology
- Guaranteed low skew < 100ps (max.)
- Very low duty cycle distortion < 350ps (max.)
- High speed propagation delay < 3ns (max.)
- Very low CMOS power levels
- TTL compatible inputs and outputs
- 1:2 fanout
- Maximum output rise and fall time < 1ns (max.)
- Low input capacitance: 3pF typical
- $V_{CC} = 3.3V \pm 0.3V$
- Inputs can be driven from 3.3V or 5V components
- Operating frequency up to 166MHz
- Available in SOIC package

**DESCRIPTION:**

The FCT38072 is a 3.3V clock driver built using advanced CMOS technology. This low skew clock driver offers 1:2 fanout. The large fanout from a single input reduces loading on the preceding driver and provides an efficient clock distribution network. Multiple power and grounds reduce noise. Typical applications are clock and signal distribution.

**FUNCTIONAL BLOCK DIAGRAM**

**PIN CONFIGURATION**

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**INDUSTRIAL TEMPERATURE RANGE**

MAY 2010

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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 VO + 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>

NOTES:
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(1)</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.

PIN DESCRIPTION

<table>
<thead>
<tr>
<th>Pin Names</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>Input</td>
</tr>
<tr>
<td>OX</td>
<td>Outputs</td>
</tr>
</tbody>
</table>

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>ICCQ</td>
<td>Quiescent Power Supply Current</td>
<td>VCC = Max. VIN = GND or VCC</td>
<td>—</td>
<td>0.1</td>
<td>30</td>
<td>µA</td>
</tr>
<tr>
<td>ΔICC</td>
<td>Power Supply Current per Input HIGH</td>
<td>VCC = Max. VIN = VCC - 0.6V</td>
<td>—</td>
<td>45</td>
<td>300</td>
<td>µA</td>
</tr>
<tr>
<td>ICCD</td>
<td>Dynamic Power Supply Current per Output(3)</td>
<td>VCC = Max. CL = 15pF All Outputs Toggling</td>
<td>—</td>
<td>80</td>
<td>120</td>
<td>µA/MHz</td>
</tr>
<tr>
<td>Ic</td>
<td>Total Power Supply Current(4)</td>
<td>VCC = Max. CL = 15pF All Outputs Toggling fi = 133MHz</td>
<td>VIN = VCC VIN = GND</td>
<td>60</td>
<td>90</td>
<td>mA</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 = QUIESCENT + INPUTS + IDYNAMIC
   IC = ICC + ΔICC DiNT + ICCD (fi)
   ICC = Quiescent Current
   ΔICC = Power Supply Current for a TTL High Input (VIN = VCC - 0.6V)
   Di = Duty Cycle for TTL Inputs High
   NT = Number of TTL Inputs at Di
   ICCD = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   fi = Input Frequency
### DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified

Industrial: $T_A = -40°C$ to $+85°C$, $V_{CC} = 3.3V ± 0.3V$

<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></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIH</td>
<td>Input HIGH Level</td>
<td></td>
<td>2</td>
<td>—</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>VIL</td>
<td>Input LOW Level</td>
<td></td>
<td>—0.5</td>
<td>—</td>
<td>0.8</td>
<td>V</td>
</tr>
<tr>
<td>IIH</td>
<td>Input HIGH Current</td>
<td>$V_{CC} = $ Max.</td>
<td></td>
<td>—</td>
<td>±1</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_I = 5.5V$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IIL</td>
<td>Input LOW Current</td>
<td>$V_{CC} = $ Max.</td>
<td></td>
<td>—</td>
<td>±1</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$V_I = GND$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VIK</td>
<td>Clamp Diode Voltage</td>
<td>$V_{CC} = $ Min., $I_{IN} = -18mA$</td>
<td></td>
<td>—0.7</td>
<td>—1.2</td>
<td>V</td>
</tr>
<tr>
<td>IODH</td>
<td>Output HIGH Current</td>
<td>$V_{CC} = 3.3V$, $V_IN = VIH$ or $V_IL$, $V_O = 1.5V^{(3,4)}$</td>
<td></td>
<td>-45</td>
<td>-75</td>
<td>180  mA</td>
</tr>
<tr>
<td>IODL</td>
<td>Output LOW Current</td>
<td>$V_{CC} = 3.3V$, $V_IN = VIH$ or $V_IL$, $V_O = 1.5V^{(3,4)}$</td>
<td></td>
<td>50</td>
<td>92</td>
<td>200  mA</td>
</tr>
<tr>
<td>IOS</td>
<td>Short Circuit Current</td>
<td>$V_{CC} = $ Max., $V_O = GND^{(3,4)}$</td>
<td></td>
<td>-60</td>
<td>-135</td>
<td>-240 mA</td>
</tr>
<tr>
<td>VOH</td>
<td>Output HIGH Voltage</td>
<td>$V_{CC} = $ Min.</td>
<td>$I_{OH} = -12mA$</td>
<td>2.4(5)</td>
<td>3</td>
<td>—</td>
</tr>
<tr>
<td>VOL</td>
<td>Output LOW Voltage</td>
<td>$V_{CC} = $ Min.</td>
<td>$I_{OL} = 12mA$</td>
<td>—</td>
<td>0.3</td>
<td>0.5</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 $V_{CC} = 3.3$, $25°C$ ambient.
3. This parameter is guaranteed but not tested.
4. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
5. $V_{OH} = V_{CC} - 0.6V$ at rated current.

### SWITCHING CHARACTERISTICS OVER OPERATING RANGE \(^{(3,4)}\)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions(^{(1,8)})</th>
<th>Min.(2)</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$C_L = 15pF$ $f ≤ 166\text{MHz}$</td>
<td>0.5</td>
<td>3</td>
<td>ns</td>
</tr>
<tr>
<td>ℜ ℜ</td>
<td>PropagationDelay</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ℜ ℜ</td>
<td>Output Rise Time (0.8V to 2V)</td>
<td></td>
<td>—</td>
<td>1</td>
<td>ns</td>
</tr>
<tr>
<td>ℜ ℜ</td>
<td>Output Fall Time (2V to 0.8V)</td>
<td></td>
<td>—</td>
<td>1</td>
<td>ns</td>
</tr>
<tr>
<td>ℜ ℜ</td>
<td>Same device output pin-to-pin skew(^{(5)})</td>
<td></td>
<td>—</td>
<td>100</td>
<td>ps</td>
</tr>
<tr>
<td>ℜ ℜ</td>
<td>Pulse skew(^{(6)})</td>
<td></td>
<td>—</td>
<td>350</td>
<td>ps</td>
</tr>
<tr>
<td>ℜ ℜ</td>
<td>Part to part skew(^{(7)})</td>
<td></td>
<td>—</td>
<td>550</td>
<td>ps</td>
</tr>
<tr>
<td>ℜ ℜ</td>
<td>Input Frequency</td>
<td></td>
<td>—</td>
<td>166</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. Other parameters guaranteed but not production tested. All other parameters are production tested.
4. Propagation delay range indicated by Min. and Max. limit is due to $V_{CC}$, 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 $t_{PH}$ and $t_{PL}$ of same output under identical load conditions.
7. Part to part skew for all outputs given identical transitions and load conditions at identical $V_{CC}$ levels and temperature.
8. Airflow of 1m/s is recommended for frequencies above 133MHz.
TEST WAVEFORMS

**Propagation Delay**

**Pulse Skew - tsk(p)**

**Output Skew - tsk(o)**

**Part-to-Part Skew - tsk(PP)**

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

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74FCT XXXX X X
Device Type Package Process

DCG
SOIC - Green

38072
3.3V CMOS 1-to-2 Clock Driver

-40°C to +85°C (Industrial)
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