Typical Applications

Prescaler for DC to X Band PLL Applications:

- Satellite Communication Systems
- Fiber Optic
- Point-to-Point and Point-to-Multi-Point Radios
- VSAT

Features

- Ultra Low SSB Phase Noise: -153 dBc/Hz
- Wide Bandwidth
- Output Power: -6 dBm
- Single DC Supply: +5V
- Small Size: 1.45 x 0.69 x 0.1 mm

General Description

The HMC363 is a low noise Divide-by-8 Static Divider with InGaP GaAs HBT technology that has a small size of 1.45 x 0.69 mm. This device operates from DC (with a square wave input) to 12 GHz input frequency with a single +5V DC supply. The low additive SSB phase noise of -153 dBc/Hz at 100 kHz offset helps the user maintain good system noise performance.

Electrical Specifications, $T_A = +25^\circ$ C, 50 Ohm System, Vcc = 5V

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Input Frequency</td>
<td></td>
<td>12</td>
<td>13</td>
<td></td>
<td>GHz</td>
</tr>
<tr>
<td>Minimum Input Frequency</td>
<td>Sine Wave Input. [1]</td>
<td>0.2</td>
<td>0.5</td>
<td></td>
<td>GHz</td>
</tr>
<tr>
<td>Input Power Range</td>
<td>Fin = 1 to 8 GHz</td>
<td>-15</td>
<td>-20</td>
<td>+10</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>Fin = 8 to 10 GHz</td>
<td>-10</td>
<td>-15</td>
<td>+2</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>Fin = 10 to 12 GHz</td>
<td>-5</td>
<td>-8</td>
<td>0</td>
<td>dBm</td>
</tr>
<tr>
<td>Reverse Leakage</td>
<td>Both RF Outputs Terminated</td>
<td>60</td>
<td></td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>SSB Phase Noise (100 kHz offset)</td>
<td>Pin = 0 dBm, Fin = 6 GHz</td>
<td>153</td>
<td></td>
<td></td>
<td>dBc/Hz</td>
</tr>
<tr>
<td>Output Transition Time</td>
<td>Pin = 0 dBm, Fout = 882 MHz</td>
<td>100</td>
<td></td>
<td></td>
<td>ps</td>
</tr>
<tr>
<td>Supply Current (Icc) [2]</td>
<td></td>
<td>70</td>
<td></td>
<td></td>
<td>mA</td>
</tr>
</tbody>
</table>

[1] Divider will operate down to DC for square-wave input signal.

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HMC363

GaAs HBT MMIC
DIVIDE-BY-8, DC - 12 GHz

Input Sensitivity Window, T = 25 °C

Input Sensitivity Window vs. Temperature

Output Power vs. Temperature

SSB Phase Noise Performance, Pin = 0 dBm, T = 25 °C

Output Harmonic Content, Pin = 0 dBm, T = 25 °C

Reverse Leakage, Pin = 0 dBm, T = 25 °C

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HMC363
GaAs HBT MMIC
DIVIDE-BY-8, DC - 12 GHz

Output Voltage Waveform,
Pin= 0 dBm, Fout= 882 MHz, T= 25 °C

Absolute Maximum Ratings
RF Input (Vcc = +5V) +13 dBm
Vcc +5.5V
VLogic Vcc -1.6V to Vcc -1.2V
Storage Temperature -65 to +150 °C
Operating Temperature -55 to +85 °C

Typical Supply Current vs. Vcc

<table>
<thead>
<tr>
<th>Vcc (V)</th>
<th>Icc (mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.75</td>
<td>64</td>
</tr>
<tr>
<td>5.0</td>
<td>70</td>
</tr>
<tr>
<td>5.25</td>
<td>75</td>
</tr>
</tbody>
</table>

Note: Divider will operate over full voltage range shown above

Outline Drawing

Die Packaging Information [1]

<table>
<thead>
<tr>
<th>Standard</th>
<th>Alternate</th>
</tr>
</thead>
<tbody>
<tr>
<td>WP-8 (Waffle Pack)</td>
<td>[2]</td>
</tr>
</tbody>
</table>

[1] Refer to the "Packaging Information" section for die packaging dimensions.

Note:
1. ALL DIMENSIONS IN INCHES (MILLIMETERS)
2. ALL TOLERANCES ARE ±0.001 (0.025)
3. DIE THICKNESS IS 0.004 (0.100) BACKSIDE IS GROUND
4. BOND PADS ARE 0.004 (0.100) SQUARE
5. BOND PAD SPACING, CTR-CTR: 0.006 (0.150)
6. BACKSIDE METALLIZATION: GOLD
7. BOND PAD METALLIZATION: GOLD

For price, delivery, and to place orders: Analog Devices, Inc.,
One Technology Way, P.O. Box 9106, Norwood, MA 02062-9106
Phone: 781-329-4700 • Order online at www.analog.com
Application Support: Phone: 1-800-ANALOG-D
## Pad Description

<table>
<thead>
<tr>
<th>Pad Number</th>
<th>Function</th>
<th>Description</th>
<th>Interface Schematic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IN</td>
<td>RF Input 180° out of phase with pad 3 for differential operation. AC ground for single ended operation.</td>
<td><img src="image1" alt="Interface Schematic 1" /></td>
</tr>
<tr>
<td>2</td>
<td>IN</td>
<td>RF Input must be DC blocked.</td>
<td><img src="image2" alt="Interface Schematic 2" /></td>
</tr>
<tr>
<td>3, 4, 5</td>
<td>Vcc</td>
<td>Supply Voltage 5V ±0.25V can be applied to pad 3, 4, or 5.</td>
<td><img src="image3" alt="Interface Schematic 3" /></td>
</tr>
<tr>
<td>6</td>
<td>OUT</td>
<td>Divided Output</td>
<td><img src="image4" alt="Interface Schematic 4" /></td>
</tr>
<tr>
<td>7</td>
<td>OUT</td>
<td>Divided output 180° out of phase with OUT.</td>
<td><img src="image5" alt="Interface Schematic 5" /></td>
</tr>
<tr>
<td>8</td>
<td>PWR SEL</td>
<td>In the low power mode, the power select pin is left floating. By grounding this pin, the output power is increased by approximately 10 dB.</td>
<td><img src="image6" alt="Interface Schematic 6" /></td>
</tr>
<tr>
<td>9</td>
<td>PWR DWN</td>
<td>The power down pin is grounded for normal operation. Applying 5 volts to this pin will power down this device.</td>
<td><img src="image7" alt="Interface Schematic 7" /></td>
</tr>
<tr>
<td>10</td>
<td>DISABLE</td>
<td>The disable pin is grounded for normal operation. Applying 5 volts to this pin will disable the input buffer amplifier.</td>
<td><img src="image8" alt="Interface Schematic 8" /></td>
</tr>
</tbody>
</table>
Truth Table

<table>
<thead>
<tr>
<th>Function</th>
<th>Pin</th>
<th>5V</th>
<th>GND</th>
<th>Float</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISABLE</td>
<td>10</td>
<td>Output Off</td>
<td>Output On</td>
<td>X</td>
</tr>
<tr>
<td>PWR DWN</td>
<td>9</td>
<td>Power Down</td>
<td>Power Up</td>
<td>X</td>
</tr>
<tr>
<td>PWR SEL</td>
<td>8</td>
<td>X</td>
<td>High Power Output</td>
<td>Low Power Output</td>
</tr>
</tbody>
</table>

X = State not permitted.

Assembly Diagram

- **IN**
  - Optional AC coupled differential input. Should be AC grounded for single ended operation.
- **DISABLE**
  - This port should be grounded for normal operation. Applying +5V to this port will disable the input buffer amplifier.
- **PWR DWN**
  - This port should be grounded for normal operation. Applying +5V to this port will power down the device.
- **PWR SEL**
  - For high power output, this port should be bonded to ground. For low power output, this port should be floating.

- To +5V Vcc Supply (Bypassed via 10 uF Capacitor).

- AC coupling capacitors.
Handling Precautions

Follow these precautions to avoid permanent damage.

**Cleanliness:** Handle the chips in a clean environment. DO NOT attempt to clean the chip using liquid cleaning systems.

**Static Sensitivity:** Follow ESD precautions to protect against ESD strikes.

**Transients:** Suppress instrument and bias supply transients while bias is applied. Use shielded signal and bias cables to minimize inductive pick-up.

**General Handling:** Handle the chip along the edges with a vacuum collet or with a sharp pair of bent tweezers. The surface of the chip has fragile air bridges and should not be touched with vacuum collet, tweezers, or fingers.

Mounting

The chip is back-metallized and can be die mounted with electrically conductive epoxy. The mounting surface should be clean and flat.

**Epoxy Die Attach:** Apply a minimum amount of epoxy to the mounting surface so that a thin epoxy fillet is observed around the perimeter of the chip once it is placed into position. Cure epoxy per the manufacturer’s schedule.

Wire Bonding

Ball or wedge bond with 0.025 mm (1 mil) diameter pure gold wire. Thermosonic wirebonding with a nominal stage temperature of 150 °C and a ball bonding force of 40 to 50 grams or wedge bonding force of 18 to 22 grams is recommended. Use the minimum level of ultrasonic energy to achieve reliable wirebonds. Wirebonds should be started on the chip and terminated on the package or substrate. All bonds should be as short as possible <0.31 mm (12 mils).