High Performance Differential MEMS Oscillators

Features

• Very Low RMS Phase Jitter: <650 fs (typ.)
• High Stability: ±20 ppm, ±25 ppm, ±50 ppm
• Wide Temperature Range:
  - Automotive: –40°C to +125°C (DSC12x3 LVDS Only)
  - Extended Industrial: –40°C to +105°C
  - Industrial: –40°C to +85°C
  - Commercial: –20°C to +70°C
• Supports LVPECL, LVDS, or HCSL Differential Outputs
• Wide Frequency Range: 2.5 MHz to 450 MHz
• Small Industry-Standard Footprints
  - 2.5 mm x 2.0 mm
  - 3.2 mm x 2.5 mm
  - 5.0 mm x 3.2 mm
  - 7.0 mm x 5.0 mm
• Excellent Shock and Vibration Immunity
  - Qualified to MIL-STD-883
• High Reliability
  - 20x Better MTF than Quartz Oscillators
• Supply Range of 2.25V to 3.63V
• Standby, Frequency Select, and Output Enable Functions
• Lead-Free and RoHS-Compliant

Applications

• Storage Area Networks
• Passive Optical Networks
• 10/100G Ethernet
• HD/SD/SDI Video and Surveillance
• PCI Express Gen 1/2/3/4
• Display Port

General Description

The DSC12x2/3/4 family of high performance oscillators utilizes the latest generation of silicon MEMS technology that reduces close-in noise and provides excellent jitter and stability over a wide range of supply voltages and temperatures. By eliminating the need for quartz or SAW technology, MEMS oscillators significantly enhance reliability and accelerate product development, while meeting stringent clock performance criteria for a variety of communications, storage, and networking applications.

The DSC12x2/3/4 family features a control function on pin 1 or pin 2 that permits either a standby feature (complete power down when STDBY is low), output enable (output is tri-stated with OE low), or a frequency select (choice of two frequencies selected by FS high/low). See the Product Identification System section for detailed information.

All oscillators are available in industry-standard packages, including the small 2.5 mm x 2.0 mm, and are “drop-in” replacements for standard 6-pin LVPECL/LVDS/HCSL crystal oscillators.

Package Types
Functional Block Diagrams

Pin 1: OE/STDBY/FS
Pin 2: NC
Pin 3: GND
Pin 4: CLK+
Pin 5: CLK–
Pin 6: VDD
# 1.0 ELECTRICAL CHARACTERISTICS

## Absolute Maximum Ratings †

- **Supply Voltage**: –0.3V to +4.0V
- **Input Voltage**: –0.3V to \( V_{DD} + 0.3V \)
- **ESD Protection (HBM)**: 4 kV
- **ESD Protection (MM)**: 400V
- **ESD Protection (CDM)**: 1.5 kV

† **Notice**: Stresses above 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 those or any other conditions above those indicated in the operational sections of this specification is not intended. Exposure to maximum rating conditions for extended periods may affect device reliability.

## ELECTRICAL CHARACTERISTICS

**Electrical Characteristics**: \( V_{DD} = 2.5V \pm 10\% \) or 3.3V±10%; \( T_A = -40°C \) to +105°C, unless noted.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>( V_{DD} )</td>
<td>2.25</td>
<td>—</td>
<td>3.63</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Supply Current</td>
<td>( I_{DD} )</td>
<td>—</td>
<td>50</td>
<td>—</td>
<td>mA</td>
<td>( \text{LVPECL, } f_{OUT} = 100 \text{ MHz} ) ( \text{LVDS, } f_{OUT} = 100 \text{ MHz} ) ( \text{HCSL, } f_{OUT} = 100 \text{ MHz} )</td>
</tr>
<tr>
<td>Standby Current</td>
<td>( I_{STDBY} )</td>
<td>—</td>
<td>2.5</td>
<td>5</td>
<td>( \mu A )</td>
<td>Input pin = STDBY = Asserted ( (V_{DD} = 3.3V) )</td>
</tr>
<tr>
<td>Frequency Stability</td>
<td>( \Delta f )</td>
<td>—</td>
<td>—</td>
<td>±20</td>
<td>ppm</td>
<td>Includes frequency variations due to initial tolerance, temp., and power supply voltage</td>
</tr>
<tr>
<td>Startup Time</td>
<td>( t_{SU} )</td>
<td>—</td>
<td>5.5</td>
<td>6</td>
<td>ms</td>
<td>From 90% ( V_{DD} ) to valid clock output, ( T = +25°C ), Note 2</td>
</tr>
<tr>
<td>Input Logic Levels</td>
<td>( V_{IH} )</td>
<td>0.75 ( x ) ( V_{DD} )</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>Input logic high</td>
</tr>
<tr>
<td></td>
<td>( V_{IL} )</td>
<td>—</td>
<td>—</td>
<td>0.25 ( x ) ( V_{DD} )</td>
<td>—</td>
<td>Input logic low</td>
</tr>
<tr>
<td>Output Disable Time</td>
<td>( t_{DA} )</td>
<td>—</td>
<td>—</td>
<td>25</td>
<td>ns</td>
<td>Note 3</td>
</tr>
<tr>
<td>Output Enable Time</td>
<td>( t_{EN} )</td>
<td>—</td>
<td>—</td>
<td>6</td>
<td>ms</td>
<td>STDBY</td>
</tr>
<tr>
<td>Enable Pull-Up Resistor</td>
<td>—</td>
<td>—</td>
<td>1.5</td>
<td>—</td>
<td>( \Omega )</td>
<td>Pull-up resistor on pin 1, Note 4</td>
</tr>
<tr>
<td>LVPECL (DSC12x2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency</td>
<td>( f_0 )</td>
<td>2.5</td>
<td>—</td>
<td>450</td>
<td>MHz</td>
<td>—</td>
</tr>
<tr>
<td>Output Logic Levels</td>
<td>( V_{OH} )</td>
<td>( V_{DD} - 1.145 )</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>( R_L = 50\Omega )</td>
</tr>
<tr>
<td></td>
<td>( V_{OL} )</td>
<td>—</td>
<td>—</td>
<td>( V_{DD} - 1.695 )</td>
<td>—</td>
<td>Pull-up resistor on pin 1, Note 4</td>
</tr>
<tr>
<td>Peak-to-Peak Output Swing</td>
<td>( V_{PP} )</td>
<td>—</td>
<td>800</td>
<td>—</td>
<td>mV</td>
<td>Single-Ended</td>
</tr>
<tr>
<td>Output Transition Time</td>
<td>( t_R )</td>
<td>—</td>
<td>200</td>
<td>250</td>
<td>ps</td>
<td>20% to 80%, ( R_L = 50\Omega )</td>
</tr>
<tr>
<td></td>
<td>( t_F )</td>
<td>—</td>
<td>250</td>
<td>300</td>
<td>ps</td>
<td>Pull-up resistor on pin 1, Note 4</td>
</tr>
<tr>
<td>Output Duty Cycle</td>
<td>SYM</td>
<td>48</td>
<td>—</td>
<td>52</td>
<td>%</td>
<td>Differential</td>
</tr>
<tr>
<td>Period Jitter RMS</td>
<td>( J_{PER} )</td>
<td>—</td>
<td>2.0</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 156.25 \text{ MHz}, \text{ 10k cycles} )</td>
</tr>
</tbody>
</table>
### ELECTRICAL CHARACTERISTICS (CONTINUED)

**Electrical Characteristics:** \( V_{DD} = 2.5V \pm 10\% \) or \( 3.3V \pm 10\% \); \( T_A = -40^\circ C \) to \(+105^\circ C \), unless noted.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period Jitter Peak-to-Peak</td>
<td>( J_{PTP} )</td>
<td>—</td>
<td>20</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 156.25 \text{ MHz, 10k cycles} )</td>
</tr>
<tr>
<td>Integrated Phase Noise (Random)</td>
<td>( J_{PH} )</td>
<td>—</td>
<td>0.65</td>
<td>—</td>
<td>psRMS</td>
<td>12 kHz to 20 MHz @156.25 MHz</td>
</tr>
</tbody>
</table>

#### LVDS (DSC12x3)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>( f_0 )</th>
<th>2.3</th>
<th>—</th>
<th>450</th>
<th>MHz</th>
<th>—</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Offset Voltage</td>
<td>( V_{OS} )</td>
<td>1.15</td>
<td>1.25</td>
<td>1.35</td>
<td>V</td>
<td>( R = 1000 \Omega \text{ Differential} )</td>
</tr>
<tr>
<td>Peak-to-Peak Output Swing</td>
<td>( V_{PP} )</td>
<td>250</td>
<td>350</td>
<td>450</td>
<td>mV</td>
<td>Single-Ended</td>
</tr>
<tr>
<td>Output Transition Time</td>
<td>( t_R )</td>
<td>—</td>
<td>120</td>
<td>170</td>
<td>220</td>
<td>ps 20% to 80%, ( R_L = 100 \Omega )</td>
</tr>
<tr>
<td>Output Duty Cycle</td>
<td>SYM</td>
<td>48</td>
<td>—</td>
<td>52</td>
<td>%</td>
<td>Differential</td>
</tr>
<tr>
<td>Period Jitter RMS</td>
<td>( J_{PER} )</td>
<td>—</td>
<td>2.5</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 156.25 \text{ MHz, 10k cycles} )</td>
</tr>
<tr>
<td>Period Jitter Peak-to-Peak</td>
<td>( J_{PTP} )</td>
<td>—</td>
<td>20</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 156.25 \text{ MHz, 10k cycles} )</td>
</tr>
<tr>
<td>Integrated Phase Noise (Random)</td>
<td>( J_{PH} )</td>
<td>—</td>
<td>0.65</td>
<td>—</td>
<td>psRMS</td>
<td>12 kHz to 20 MHz @156.25 MHz</td>
</tr>
<tr>
<td>Period Jitter RMS</td>
<td>( J_{PER} )</td>
<td>—</td>
<td>3</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 156.25 \text{ MHz, } T_A = -40^\circ \text{C to } +125^\circ \text{C} )</td>
</tr>
<tr>
<td>Period Jitter Peak-to-Peak</td>
<td>( J_{PTP} )</td>
<td>—</td>
<td>25</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 156.25 \text{ MHz, } T_A = -40^\circ \text{C to } +125^\circ \text{C} )</td>
</tr>
<tr>
<td>Integrated Phase Noise (Random)</td>
<td>( J_{PH} )</td>
<td>—</td>
<td>0.9</td>
<td>—</td>
<td>psRMS</td>
<td>12 kHz to 20 MHz @156.25 MHz</td>
</tr>
</tbody>
</table>

#### HCSL (DSC12x4)

<table>
<thead>
<tr>
<th>Frequency</th>
<th>( f_0 )</th>
<th>2.3</th>
<th>—</th>
<th>450</th>
<th>MHz</th>
<th>—</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Logic Levels</td>
<td>( V_{OH} )</td>
<td>0.64</td>
<td>—</td>
<td>—</td>
<td>V</td>
<td>( R_L = 50 \Omega )</td>
</tr>
<tr>
<td>( V_{OL} )</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>0.1</td>
<td>V</td>
<td>Single-Ended</td>
</tr>
<tr>
<td>Peak-to-Peak Output Swing</td>
<td>( V_{PP} )</td>
<td>—</td>
<td>750</td>
<td>—</td>
<td>mV</td>
<td>Single-Ended</td>
</tr>
<tr>
<td>Output Transition Time</td>
<td>( t_R )</td>
<td>200</td>
<td>260</td>
<td>400</td>
<td>ps</td>
<td>20% to 80%, ( R_L = 50 \Omega )</td>
</tr>
<tr>
<td>Output Duty Cycle</td>
<td>SYM</td>
<td>48</td>
<td>—</td>
<td>52</td>
<td>%</td>
<td>Differential</td>
</tr>
<tr>
<td>Period Jitter RMS</td>
<td>( J_{PER} )</td>
<td>—</td>
<td>2</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 100.00 \text{ MHz, 10k cycles} )</td>
</tr>
<tr>
<td>Period Jitter Peak-to-Peak</td>
<td>( J_{PTP} )</td>
<td>—</td>
<td>16</td>
<td>—</td>
<td>ps</td>
<td>( f_0 = 100.00 \text{ MHz, 10k cycles} )</td>
</tr>
<tr>
<td>Integrated Phase Noise (Random)</td>
<td>( J_{PH} )</td>
<td>—</td>
<td>0.65</td>
<td>—</td>
<td>psRMS</td>
<td>12 kHz to 20 MHz @100.00 MHz</td>
</tr>
</tbody>
</table>

**Note 1:** \( V_{DD} \) pin should be filtered with a 0.1 \( \mu \text{F} \) capacitor.

**Note 2:** \( t_{SU} \) is the time to 100 ppm stable output frequency after \( V_{DD} \) is applied and outputs are enabled.

**Note 3:** \( t_{DA} \): See the Output Waveforms and the Test Circuits sections for more information.

**Note 4:** Output is enabled if pad is floated (not connected).
### TEMPERATURE SPECIFICATIONS (Note 1)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Sym.</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Temperature Ranges</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Junction Temperature</td>
<td>$T_J$</td>
<td>—</td>
<td>—</td>
<td>+150</td>
<td>°C</td>
<td>—</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>$T_S$</td>
<td>—55</td>
<td>—</td>
<td>+150</td>
<td>°C</td>
<td>—</td>
</tr>
<tr>
<td>Lead Temperature</td>
<td></td>
<td>—</td>
<td>—</td>
<td>+260</td>
<td>°C</td>
<td>Soldering, 40s</td>
</tr>
</tbody>
</table>
2.0 PIN DESCRIPTIONS

The descriptions of the pins are listed in Table 2-1.

TABLE 2-1: DSC120X/1X/2X PIN FUNCTION TABLE

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>OE/STDBY/FS</td>
<td>Control pin: Output enable/standby/frequency select.</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>No connect.</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Power supply ground.</td>
</tr>
<tr>
<td>4</td>
<td>CLK+</td>
<td>Clock output +.</td>
</tr>
<tr>
<td>5</td>
<td>CLK–</td>
<td>Clock output –.</td>
</tr>
<tr>
<td>6</td>
<td>VDD</td>
<td>Power supply.</td>
</tr>
</tbody>
</table>

TABLE 2-2: DSC123X/4X/5X PIN FUNCTION TABLE

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>No connect.</td>
</tr>
<tr>
<td>2</td>
<td>OE/STDBY/FS</td>
<td>Control pin: Output enable/standby/frequency select.</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
<td>Power supply ground.</td>
</tr>
<tr>
<td>4</td>
<td>CLK+</td>
<td>Clock output +.</td>
</tr>
<tr>
<td>5</td>
<td>CLK–</td>
<td>Clock output –.</td>
</tr>
<tr>
<td>6</td>
<td>VDD</td>
<td>Power supply.</td>
</tr>
</tbody>
</table>
3.0 TERMINATION SCHEME

**FIGURE 3-1:** LVPECL Termination (DSC12x2).

In Figure 3-1, Thevenin termination for 3.3V operation. Values will differ for $V_{DD} = 2.5V$.

**FIGURE 3-2:** LVDS Termination (DSC12x3).
**FIGURE 3-3:** HCSL Termination (DSC12x4).

$R_S$ serves to match the trace impedances. Depending on board layout, the value may range from $0 \Omega$ to $30 \Omega$. 

$R_S = 0 \Omega$ for test.
4.0 OUTPUT WAVEFORM

**FIGURE 4-1:** LVPECL, LVDS, and HCSL Output Waveform.

**TABLE 4-1:** OUTPUT VOLTAGE SWING BY LOGIC TYPE

<table>
<thead>
<tr>
<th>Output Logic Protocol</th>
<th>Typical Peak-to-Peak Output Swing</th>
</tr>
</thead>
<tbody>
<tr>
<td>LVPECL</td>
<td>830 mV</td>
</tr>
<tr>
<td>LVDS</td>
<td>350 mV</td>
</tr>
<tr>
<td>HCSL</td>
<td>675 mV</td>
</tr>
</tbody>
</table>
5.0 TEST CIRCUITS

**FIGURE 5-1:** LVPECL Test Circuit.

**FIGURE 5-2:** LVDS Test Circuit.
RS serves to match the trace impedances. Depending on board layout, the value may range from 0Ω to 30Ω.

**FIGURE 5-3:** HCSL Test Circuit.
6.0 SOLDER REFLOW PROFILE

**FIGURE 6-1:** Solder Reflow Profile.

**TABLE 6-1: SOLDER REFLOW**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramp-Up Rate (200°C to Peak Temp.)</td>
<td>3°C/sec. max.</td>
</tr>
<tr>
<td>Preheat Time 150°C to 200°C</td>
<td>60 to 180 sec.</td>
</tr>
<tr>
<td>Time Maintained above 217°C</td>
<td>60 to 150 sec.</td>
</tr>
<tr>
<td>Peak Temperature</td>
<td>255°C to 260°C</td>
</tr>
<tr>
<td>Time within 5°C of Actual Peak</td>
<td>20 to 40 sec.</td>
</tr>
<tr>
<td>Ramp-Down Rate</td>
<td>–6°C/sec. max.</td>
</tr>
<tr>
<td>Time 25°C to Peak Temperature</td>
<td>8 minutes max.</td>
</tr>
</tbody>
</table>
7.0 BOARD LAYOUT (RECOMMENDED)

FIGURE 7-1: DSC12x2/3/4 Recommended Board Layout.
8.0 PHASE NOISE

**FIGURE 8-1:** DSC12x4 Phase Noise at 100 MHz.
**FIGURE 8-2:** DSC12x2 Phase Noise at 156.25 MHz.
9.0 PACKAGING INFORMATION

9.1 Package Marking Information

Legend:

XX...X  Product code or customer-specific information
Y       Year code (last digit of calendar year)
YY      Year code (last 2 digits of calendar year)
WW      Week code (week of January 1 is week '01')
SSS     Alphanumeric traceability code
E3      Pb-free JEDEC® designator for Matte Tin (Sn)

* This package is Pb-free. The Pb-free JEDEC designator (E3) can be found on the outer packaging for this package.

●, ▲, ▼ Pin one index is identified by a dot, delta up, or delta down (triangle mark).

Note: In the event the full Microchip part number cannot be marked on one line, it will be carried over to the next line, thus limiting the number of available characters for customer-specific information. Package may or may not include the corporate logo.

Underbar (_) and/or Overbar (') symbol may not be to scale.
6-Lead VDFN 2.5 mm x 2.0 mm Package Outline and Recommended Land Pattern

6-Lead Very Thin Dual Flatpack No-Leads (J7A) - 2.5x2.0 mm Body [VDFN]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging
6-Lead Very Thin Dual Flatpack No-Leads (J7A) - 2.5x2.0 mm Body [VDFN]

**Notes:**
- Pin 1 visual index feature may vary, but must be located within the hatched area.
- Package is saw singulated.
- Dimensioning and tolerancing per ASME Y14.5M

<table>
<thead>
<tr>
<th>Units</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimension Limits</strong></td>
<td><strong>MIN</strong></td>
</tr>
<tr>
<td>Number of Terminals</td>
<td>N</td>
</tr>
<tr>
<td>Pitch</td>
<td>e</td>
</tr>
<tr>
<td>Overall Height</td>
<td>A</td>
</tr>
<tr>
<td>Standoff</td>
<td>A1</td>
</tr>
<tr>
<td>Overall Length</td>
<td>D</td>
</tr>
<tr>
<td>Overall Width</td>
<td>E</td>
</tr>
<tr>
<td>Terminal Width b1</td>
<td>b1</td>
</tr>
<tr>
<td>Terminal Width b2</td>
<td>b2</td>
</tr>
<tr>
<td>Terminal Length L1</td>
<td>L1</td>
</tr>
<tr>
<td>Terminal Length L2</td>
<td>L2</td>
</tr>
</tbody>
</table>

**Notes:**
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated.
3. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.
REF: Reference Dimension, usually without tolerance, for information purposes only.
# 6-Lead Very Thin Dual Flatpack No-Leads (J7A) - 2.5x2.0 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at [http://www.microchip.com/packaging](http://www.microchip.com/packaging)

---

**RECOMMENDED LAND PATTERN**

<table>
<thead>
<tr>
<th>Units</th>
<th>Dimension Limits</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Pitch</td>
<td>E</td>
<td>0.825 BSC</td>
</tr>
<tr>
<td>Contact Pad Width (X4)</td>
<td>X1</td>
<td>0.65</td>
</tr>
<tr>
<td>Contact Pad Width (X2)</td>
<td>X2</td>
<td>0.25</td>
</tr>
<tr>
<td>Contact Pad Length (X6)</td>
<td>Y</td>
<td>0.85</td>
</tr>
<tr>
<td>Contact Pad Spacing</td>
<td>C</td>
<td>1.45</td>
</tr>
<tr>
<td>Space Between Contacts (X4)</td>
<td>G1</td>
<td>0.38</td>
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<tr>
<td>Space Between Contacts (X3)</td>
<td>G2</td>
<td>0.60</td>
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</tbody>
</table>

**Notes:**

1. Dimensioning and tolerancing per ASME Y14.5M
   
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.

2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process.

---

Microchip Technology Drawing C04-3005A
6-Lead VDFN 3.2 mm x 2.5 mm Package Outline and Recommended Land Pattern

6-Lead Very Thin Plastic Dual Flatpack No-Lead (H5A) - 3.2x2.5 mm Body [VDFN]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

Microchip Technology Drawing C04-1007A Sheet 1 of 2
6-Lead Very Thin Plastic Dual Flatpack No-Lead (H5A) - 3.2x2.5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

<table>
<thead>
<tr>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Dimension</td>
<td>MIN</td>
</tr>
<tr>
<td>Number of Terminals</td>
<td>N</td>
</tr>
<tr>
<td>Pitch</td>
<td>e</td>
</tr>
<tr>
<td>Overall Height</td>
<td>A</td>
</tr>
<tr>
<td>Standoff</td>
<td>A1</td>
</tr>
<tr>
<td>Overall Length</td>
<td>D</td>
</tr>
<tr>
<td>Overall Width</td>
<td>E</td>
</tr>
<tr>
<td>Terminal Width</td>
<td>b1</td>
</tr>
<tr>
<td>Terminal Width</td>
<td>b2</td>
</tr>
<tr>
<td>Terminal Length</td>
<td>L</td>
</tr>
<tr>
<td>Terminal Pullback</td>
<td>L1</td>
</tr>
</tbody>
</table>

Notes:
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M
   - BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   - REF: Reference Dimension, usually without tolerance, for information purposes only.
6-Lead Very Thin Plastic Dual Flatpack No-Lead (H5A) - 3.2x2.5 mm Body [VDFN]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

![Diagram of 6-Lead VDFN Package]

<table>
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<tr>
<th>Dimension Limits</th>
<th>Units</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>X1Contact Pad Width (X4)</td>
<td>C</td>
<td>1.05 BSC</td>
</tr>
<tr>
<td>Contact Pitch</td>
<td>E</td>
<td>1.05 BSC</td>
</tr>
<tr>
<td>Contact Pad Spacing</td>
<td>C</td>
<td>1.60</td>
</tr>
<tr>
<td>Contact Pad Width (X4)</td>
<td>X1</td>
<td>1.00</td>
</tr>
<tr>
<td>Contact Pad Width (X2)</td>
<td>X2</td>
<td>0.60</td>
</tr>
<tr>
<td>Contact Pad Length (X6)</td>
<td>Y</td>
<td>0.60</td>
</tr>
<tr>
<td>Space Between Contacts (X4)</td>
<td>G1</td>
<td>0.25</td>
</tr>
</tbody>
</table>

Notes:

1. Dimensioning and tolerancing per ASME Y14.5M

BSC: Basic Dimension. Theoretically exact value shown without tolerances.

Microchip Technology Drawing C04-3007A
6-Lead CDFN 5.0 mm x 3.2 mm Package Outline and Recommended Land Pattern

NOTE:
1. * Power Supply Decoupling Capacitor is required in Recommended Land Pattern.
2. Green shaded rectangles in Recommended Land Pattern are solder stencil opening.
3. Red circles in Recommended Land Pattern are thermal VIA.

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging.
6-Lead VDFN 7.0 mm x 5.0 mm Package Outline and Recommended Land Pattern

6-Lead Very Thin Dual Flatpack, No Lead Package (HPA) - 7x5 mm Body [VDFN]

Note: For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

[Diagram showing the 6-Lead VDFN package outline with dimensions and annotations for top, side, and bottom views.]
# 6-Lead Very Thin Dual Flatpack, No Lead Package (HPA) - 7x5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at [http://www.microchip.com/packaging](http://www.microchip.com/packaging)

![Package Diagram](image)

<table>
<thead>
<tr>
<th>Units</th>
<th>MILLIMETERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimension Limits</td>
<td>MIN</td>
</tr>
<tr>
<td>Number of Terminals</td>
<td>N</td>
</tr>
<tr>
<td>Pitch</td>
<td>e</td>
</tr>
<tr>
<td>Overall Height</td>
<td>A</td>
</tr>
<tr>
<td>Standoff</td>
<td>A1</td>
</tr>
<tr>
<td>Overall Length</td>
<td>D</td>
</tr>
<tr>
<td>Overall Width</td>
<td>E</td>
</tr>
<tr>
<td>Terminal Width</td>
<td>b</td>
</tr>
<tr>
<td>Terminal Length</td>
<td>L</td>
</tr>
<tr>
<td>Pullback</td>
<td>L1</td>
</tr>
</tbody>
</table>

**Notes:**
1. Pin 1 visual index feature may vary, but must be located within the hatched area.
2. Package is saw singulated
3. Dimensioning and tolerancing per ASME Y14.5M
   - BSC: Basic Dimension. Theoretically exact value shown without tolerances.
   - REF: Reference Dimension, usually without tolerance, for information purposes only.

Microchip Technology Drawing C04-1227 Rev A Sheet 2 of 2
6-Lead Very Thin Dual Flatpack, No Lead Package (HPA) - 7x5 mm Body [VDFN]

**Note:** For the most current package drawings, please see the Microchip Packaging Specification located at http://www.microchip.com/packaging

**RECOMMENDED LAND PATTERN**

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<thead>
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<th>Units</th>
<th>Dimension Limits</th>
<th>MILLIMETERS</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>MIN</td>
<td>NOM</td>
</tr>
<tr>
<td>Contact Pitch</td>
<td>E</td>
<td>2.54 BSC</td>
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<tr>
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<td>3.90</td>
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<td>Contact Pad Width (X6)</td>
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<tr>
<td>Contact Pad Length (X6)</td>
<td>Y1</td>
<td>1.40</td>
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</table>

Notes:
1. Dimensioning and tolerancing per ASME Y14.5M
   BSC: Basic Dimension. Theoretically exact value shown without tolerances.
2. For best soldering results, thermal vias, if used, should be filled or tented to avoid solder loss during reflow process

Microchip Technology Drawing C04-3227 Rev A
APPENDIX A: REVISION HISTORY

Revision A (April 2019)

• Initial release of DSC12x2/3/4 as Microchip data sheet DS20006011A.
# PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, contact your local Microchip representative or sales office.

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>Device</th>
<th>Control Pin</th>
<th>Output Format</th>
<th>Package</th>
<th>Temperature</th>
<th>Freq. Stability</th>
<th>Output Frequency</th>
<th>Media Type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DSC12</td>
<td>0</td>
<td>Pin 1 STDDBY with Pull-up</td>
<td>N</td>
<td>–40°C to +125°C (Available on certain options)</td>
<td>±50 ppm</td>
<td>&lt;10 MHz</td>
<td>Bulk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>Pin 1 Frequency Select with Pull-up</td>
<td>B</td>
<td>–40°C to +105°C</td>
<td>±25 ppm</td>
<td>&lt;100 MHz</td>
<td>T</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Pin 1 OE with Pull-up</td>
<td>C</td>
<td>–40°C to +85°C</td>
<td>±20 ppm</td>
<td>&gt;100 MHz</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Pin 2 STDDBY with Pull-up</td>
<td>D</td>
<td>–20°C to +70°C</td>
<td>±20 ppm</td>
<td>CCCCCC with Frequency Select</td>
<td>1,000/Reel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>Pin 2 Frequency Select with Pull-up</td>
<td></td>
<td></td>
<td></td>
<td>PROG = TimeFlash</td>
<td>3,000/Reel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Pin 2 OE with Pull-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please visit the Microchip ClockWorks Configurator® website to configure the part number for customized frequency select settings. http://clockworks.microchip.com/timing

**Examples:**

a) DSC1202NE1-25M00000T: Pin 1 STDDBY with Pull-up, LVPECL Output, 7x5 VDFN, –20°C to +70°C, ±50 ppm, 25 MHz Output Frequency, 1,000/Reel

b) DSC1243CL3-C0013: Pin 2 Frequency Select with Pull-up, LVDS Output, 3.2x2.5 VDFN, –40°C to +105°C, ±20 ppm, Multiple Output Frequency, Bulk

c) DSC1224BI2-19M50000B: Pin 1 OE with Pull-up, HCSL Output, 5x3.2 CDFN, –40°C to +85°C, ±25 ppm, 19.5 MHz Output Frequency, 3,000/Reel

d) DSC1232DL3-55M82000T: Pin 2 STDDBY with Pull-up, LVPECL Output, 2.5x2 VDFN, –40°C to +105°C, ±20 ppm, 55.82 MHz Output Frequency, 1,000/Reel

e) DSC1213NI1-C0014B: Pin 1 Frequency Select with Pull-up, LVDS Output, 7x5 VDFN, –40°C to +85°C, ±50 ppm, Multiple Output Frequency, 3,000/Reel

**Note 1:** Tape and Reel identifier only appears in the catalog part number description. This identifier is used for ordering purposes and is not printed on the device package. Check with your Microchip Sales Office for package availability with the Tape and Reel option.
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