# Differential LVDS Crystal Clock Oscillators 300 fs Jitter
# HDK5361 Series +2.5V +3.3V "K" Family

MERCURY
Since 1973

- ◆ **F**emto second integrated phase jitter (300 fs typical, 12 KHz to 20 MHz).
- ◆ Superior phase noise (-138 dBc/Hz at 10 KHz and -142 dBc/Hz at 100 KHz offset).
- ◆ High performance with surprisingly low price.
- ◆ 2.5V or 3.3V supply voltage.

RoHS Compliant Product by Mercury

**General Specifications**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Product Series** | | **HDK5361;** "**K**" family characteristics. Tri-State on pad 1 | | | | | | |
| **Frequency Range** | | 40 MHz ~ 200 MHz. | | | | | | |
| **Output Logic** | | Differential LVDS square wave | | | | | | |
| **Frequency Stability vs Operating Temperature Range** | | Stability Code | **Commercial " C ":**: -10°C to +70°C | | **Industrial " I ":** -40°C to +85°C | | | |
| | | ±25 ppm | **A** | | **D** | | | |
| | | ±50 ppm | **B** | | **E** | | | |
| | | ±100 ppm | **C** | | **F** | | | |
| | | Custom ±xx ppm | **C**xx | | **I**xx | | | |
| | | If custom, use "temperature range code + desired stability in ppm" for the stability code. Example: "**C20**" (±20 ppm over -10 to +70°C). | | | | | | |
| **Supply Voltage $V_{CC}$** | | +2.5 V ± 5 % (Voltage code is "**25**"); or +3.3 V ± 5 % (Voltage code is "**3**") | | | | | | |
| **Output Voltage HIGH "1", $V_{OH}$** | | 1.43V typical; 1.6V max, RL=100 ohms. | | | | | | |
| **Output Voltage LOW "0", $V_{OL}$** | | 0.9V min; 1.1V typical, RL=100 ohms | | | | | | |
| **Output Swing** | | 250 mV min; 350 mv typical; 450 mv max. RL=100 ohms | | | | | | |
| **Current Consumption** | | 16 mA typical; 27 mA max. | | | | | | |
| **Load (RL)** | | 100 ohms between output and complimentary output | | | | | | |
| **Rise Time (Tr)** | | 0.2 n sec. typ; 0.4 n sec. max. 20%→80% of waveform | | | | | | |
| **Fall Time (Tf)** | | 0.2 n sec. typ; 0.4 n sec. max. 80%→20% of waveform | | | | | | |
| **Duty Cycle** | | 50% ± 5% max. measured at 50% waveform | | | | | | |
| **Tri-state Function on pad No. 1** | | If no connection or $V_{DD}$*70% min is applied: Output. Internal pull-up. Oscillation disable time: 0.2 u sec. max. | | | | | | |
| | | If $V_{DD}$*30% max is applied: High impedance. Oscillation enable time: 2.0 m sec. max. Current consumption is 10 uA typical | | | | | | |
| **Phase Jitter (RMS)** | | 300 fs typical (12 KHz to 20 MHz integrated) | | | | | | |
| **SSB Phase Noise (dBc/Hz). Typical** | Offset | 10 Hz | 100 Hz | 1 kHz | 10 kHz | 100 kHz | 1 MHz | 10 MHz |
| | 125 MHz | -60 | -90 | -120 | -136 | -142 | -145 | -148 |
| **Start-up Time** | | 3 ms typical; 10 m sec. max. | | | | | | |
| **Aging** | | ±3 ppm / year max. | | | | | | |
| **Packaging** | | 180 mm reel; 16 mm tape, 8.0 mm pitch. 1000 pcs per reel. | | | | | | |

(1) Inclusive of 25°C tolerance, operating temperature range, ±10% input voltage variation, load change, aging at +25°C, shock and vibration


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**Absolute Maximum Rating** Permanent damage may be created if operate beyond limits specified **Ta=25**°C, Vss=0V

| Parameters | Rating | |
|---|---|---|
| | Min. | Max. |
| Supply Voltage | Vss-0.5V | 5.0V |
| Input Voltage | Vss-0.5V | $V_{DD}$+0.5V |
| Output Voltage | Vss-0.5V | $V_{DD}$+0.5V |

**Environmental Performance Specifications**

| | |
|---|---|
| Green Requirement | RoHS 6/6 (2002/95/EC) and WEEE (2002/96/EC) compliant |
| MSL Level | Level 1 per IPC/JEDEC J-STD-020D.1 |
| Storage temp. range | -55°C to +125°C |
| Humidity | 85% RH, 85°C, 48 hours |
| Hermetic seal | Leak rate $2x10^{-8}$ ATM-$cm^3$/sec max. |
| Solderability | MIL-STD-202F method 208E |
| Reflow | 260°C for 10 sec max.. 2 times max. |
| Vibration | MIL-STD-202F method 204, 35G, 50 to 2000 Hz |
| Shock | MIL-STD-202F method 213B, test condi. E, 1000GG ½ sine wave |
| ESD Protection | 2KV max. Human body model. |
| Contact pad surface finish | Gold (0.3~1.0 um) on nickel (1.27~8.89 um) |
| Weight per unit | 160 mg typical |

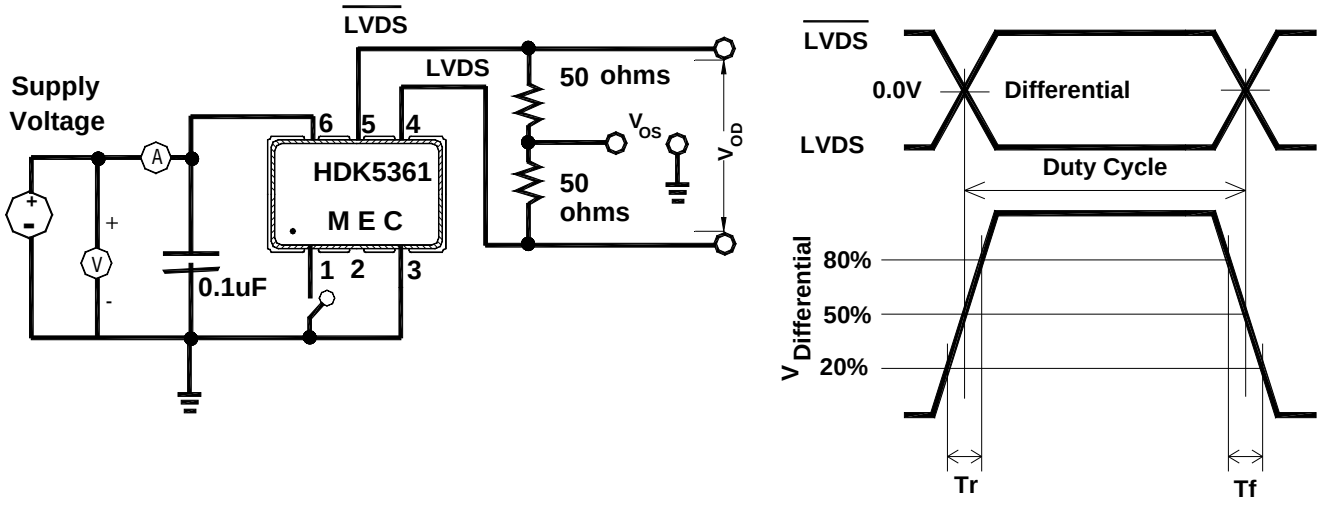
**Part Number Format and Examples**:

**Example**: **3HDK5361-A-155.520; 25HDK5361-A-155.520**
**Explanation**: +3.3V HDK5361 series LVLVDS output clock oscillator, frequency stability is ±25 ppm over -10°C to +70°C, 155.520 MHz

| | | | ✍ | | ✍ | ✍: customer to specify |
|---|---|---|---|---|---|---|
| 3 | HDK5361 | — | A | — | 155.520 | |
| ① | ② | | ③ | | ④ | |

①: $V_{DD}$ voltage codes: "**3**" for +3.3 V; "**25**" for +2.5 V ②: HDK5361 product series. '**H**" for clock; "**D**" for LVDS; "**K**": for "K" family characteristics."**536**" for 3.2x5 mm SMD with 6 pads. '**1**" for Tri-State on pad 1.
③: Frequency stability code: "**A**" ~ "**F**" or custom. See table above. ④: Frequency in MHz

**25HDK5361 and 3HDK5361 Test Circuit and Waveform:**

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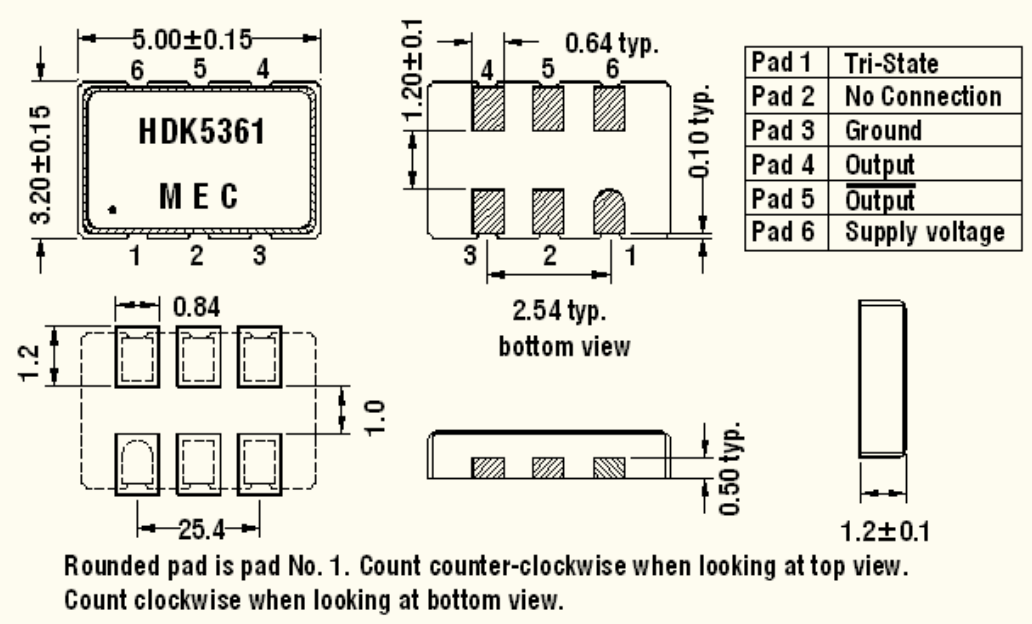
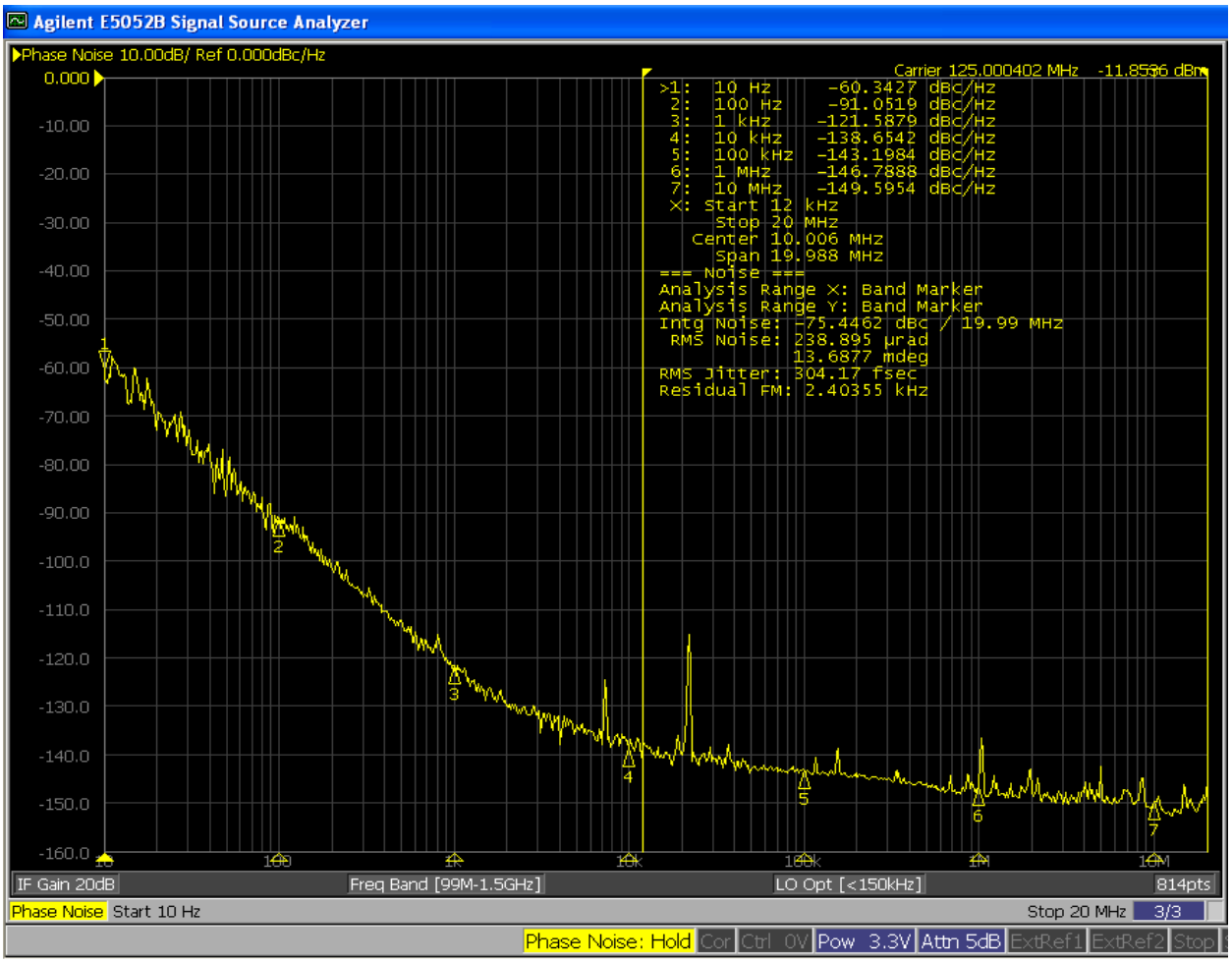
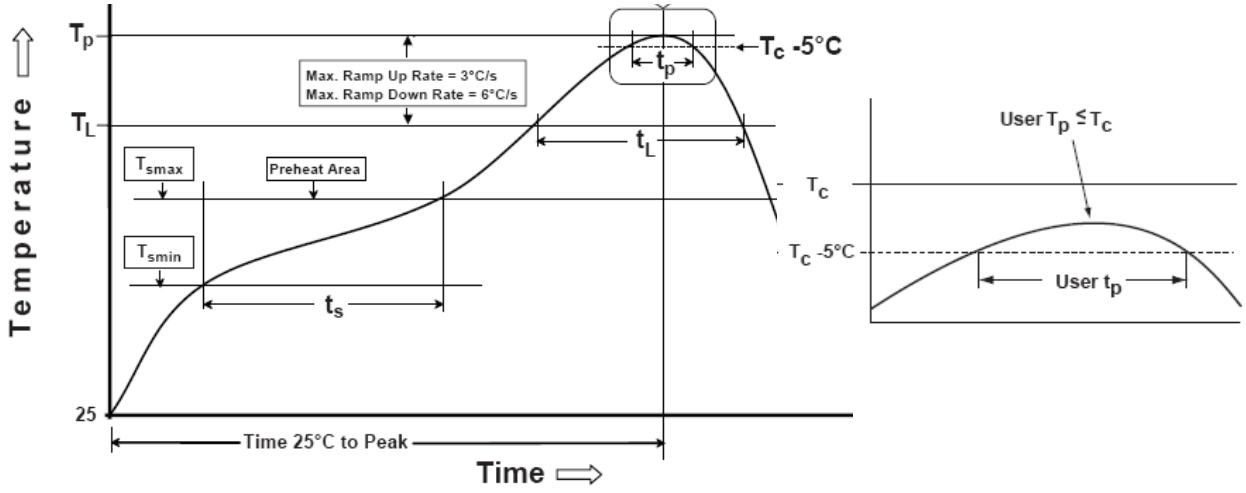
**HDK5361 Package Dimensions and Recommended Solder Pad Layout**: unit mm[inches]




**Typical Phase Noise Plot** **3HDK5361-A-125.000**



**HDK5361 Recommended Solder Reflow Profile** (from IPC/JEDEC J-STD-020D.1)




| Profile Feature | Sn-Pb Eutectic Assembly | Pb-free Assembly |
|---|---|---|
| Preheat/Soak | | |
| - Temperature min. (Ts min.) | 100ºC | 150ºC |
| - Temperature max. (Ts max.) | 150ºC | 200ºC |
| - Time (ts) (Ts min. to Ts max.) | 60 to 120 seconds | 60 to 180 seconds |
| Ramp-up rate ($T_L$ to Tp) | 3ºC / sec. max. | 3ºC / sec. max. |
| Liquidous temperature ($T_L$ )<br>Time ($t_L$) maintained above $T_L$ | 183ºC<br>60 to 150 seconds | 217ºC<br>60 to 150 seconds |
| Peak package body temperature (Tp) | 235ºC | 260ºC |
| Time (Tp) within 5ºC of the classification temperature Tc | 10 to 30 seconds | 20 to 40 seconds |
| Ramp-down rate (Tp to $T_L$) | 6ºC / second max. | 6ºC / second max. |
| Time 25ºC to peak temperature | 6 minutes max. | 8 minutes max. |

All temperatures refer to topside of the package, measured on the package body surface.