

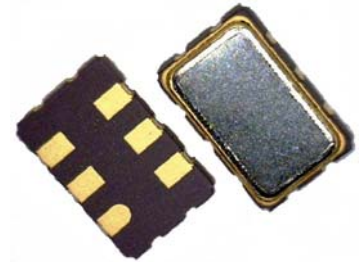
# Differential LVPECL Crystal Clock Oscillators

## HPK5361 Series 200 fsec Jitter +2.5V +3.3V "K" Family



**MERCURY**  
Since 1973

- ◆ Femto second integrated phase jitter (200 fs typical, 12 KHz to 20 MHz)
- ◆ Superior phase noise (-138 dBc/Hz at 10 KHz and -144 dBc/Hz at 100 KHz offset).
- ◆ High performance with surprisingly low price.
- ◆ 2.5V or 3.3V supply voltage.



### General Specifications

<b>Product Series</b>	HPK5361; "K" family characteristics. Tri-State on pad 1							
<b>Frequency Range</b>	40 MHz ~ 200 MHz.							
<b>Output Logic</b>	Differential PECL square wave							
<b>Frequency Stability vs Operating Temperature Range</b>	Stability Code	<b>Commercial "C"::</b> -10°C to +70°C			<b>Industrial "I"::</b> -40°C to +85°C			
	±25 ppm	<b>A</b>			<b>D</b>			
	±50 ppm	<b>B</b>			<b>E</b>			
	±100 ppm	<b>C</b>			<b>F</b>			
	Custom ±xx ppm	<b>Cxx</b>			<b>Ixx</b>			
	If custom, use "temperature range code + desired stability in ppm" for the stability code. Example: " <b>C20</b> " (±20 ppm over -10 to +70°C).							
<b>Supply Voltage V<sub>CC</sub></b>	+2.5 V ± 5 % (Voltage code is " <b>25</b> "); or +3.3 V ± 5 % (Voltage code is " <b>3</b> ")							
<b>Output Voltage HIGH "1", V<sub>OH</sub></b>	V <sub>DD</sub> -1.025 V min.; V <sub>DD</sub> -0.95 V typical; V <sub>DD</sub> -0.88 V max. Condition: 50 ohms to V <sub>DD</sub> -2V							
<b>Output Voltage LOW "0", V<sub>OL</sub></b>	V <sub>DD</sub> -1.810 V min.; V <sub>DD</sub> -1.70 V typical; V <sub>DD</sub> -1.62 V max. Condition: 50 ohms to V <sub>DD</sub> -2V							
<b>Output Swing</b>	595 mV min; 750 mV typical; 930 mV max.							
<b>Current Consumption</b>	35 mA typical; 50 mA max.							
<b>Load</b>	50 ohms into V <sub>CC</sub> -2V or Thevenin equivalent (terminating resistors required on all outputs).							
<b>Rise Time (Tr)</b>	0.3 n sec. typ; 0.5 n sec. max. 20%→80% of waveform							
<b>Fall Time (Tf)</b>	0.3 n sec. typ; 0.5 n sec. max. 80%→20% of waveform							
<b>Duty Cycle</b>	50% ± 5% max. measured at 50% waveform							
<b>Tri-state Function on pad No. 1</b>	If no connection or V <sub>DD</sub> *70% min is applied: Output. Internal pull-up Oscillation disable time is 0.2 u sec max.							
	If V <sub>DD</sub> *30% max is applied: High impedance. Current consumption is 10 uA typical Oscillation enable time is 2 m sec. max.							
<b>Phase Jitter (RMS)</b>	200 fs typical (12 KHz to 20 MHz integrated)							
<b>SSB Phase Noise (dBc/Hz). Typical</b>	Offset	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz	10 MHz
	125 MHz	-50	-82	-116	-138	-144	-149	-155
<b>Start-up Time</b>	3 ms typical; 10 m sec. max.							
<b>Aging</b>	±3 ppm / year max.							
<b>Packaging</b>	180 mm reel; 16 mm tape, 8.0 mm pitch. 1000 pcs per reel.							

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

**MERCURY** [www.mercury-crystal.com](http://www.mercury-crystal.com)

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**Absolute Maximum Rating** Permanent damage may be created if operate beyond limits specified  $T_a=25^{\circ}\text{C}$ ,  $V_{ss}=0\text{V}$

Parameters	Rating	
	Min.	Max.
Supply Voltage	$V_{ss}-0.5\text{V}$	5.0V
Input Voltage	$V_{ss}-0.5\text{V}$	$V_{DD}+0.5\text{V}$
Output Voltage	$V_{ss}-0.5\text{V}$	$V_{DD}+0.5\text{V}$

### 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	$-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$
Humidity	85% RH, $85^{\circ}\text{C}$ , 48 hours
Hermetic seal	Leak rate $2 \times 10^{-8}$ ATM-cm <sup>3</sup> /sec max.
Solderability	MIL-STD-202F method 208E
Reflow	$260^{\circ}\text{C}$ 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 $\frac{1}{2}$ 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:

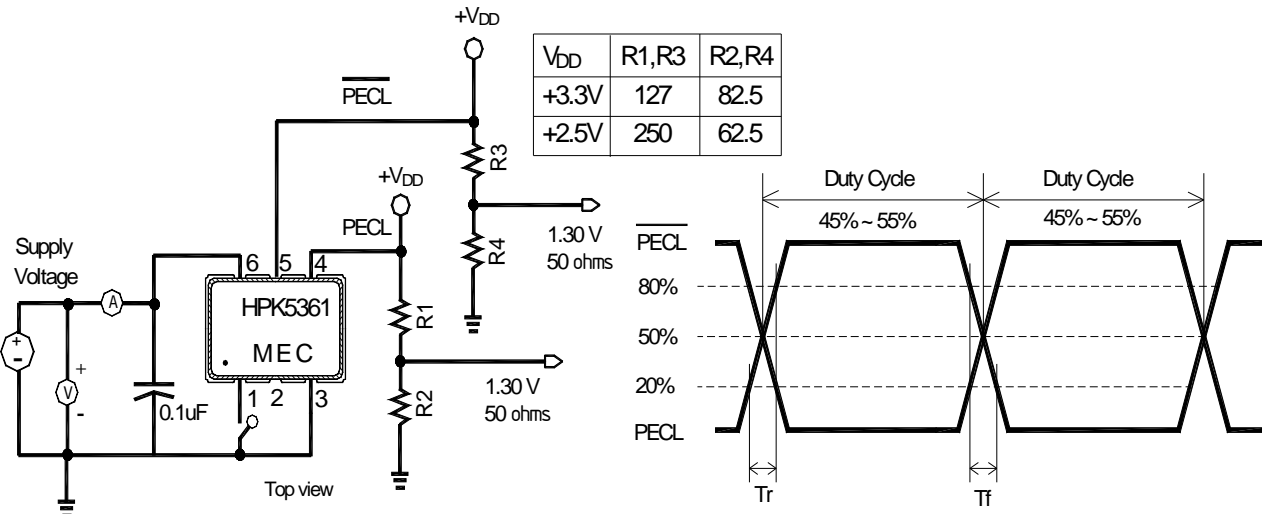
**Example: 3HPK5361-A-155.520; 25HPK5361-A-155.520**

**Explanation:** +3.3V HPK5361 series LVPECL output clock oscillator, frequency stability is  $\pm 25$  ppm over  $-10^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$ , 155.520 MHz

			⌀		⌀	⌀: customer to specify
3	HPK5361	—	A	—	155.520	
①	②		③		④	

①:  $V_{DD}$  voltage codes: "3" for +3.3 V; "25" for +2.5 V ②: HPK5361 product series. 'H' for clock; 'P' for PECL; '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

### 25HPK5361 and 3HPK5361 Test Circuit and Waveform:



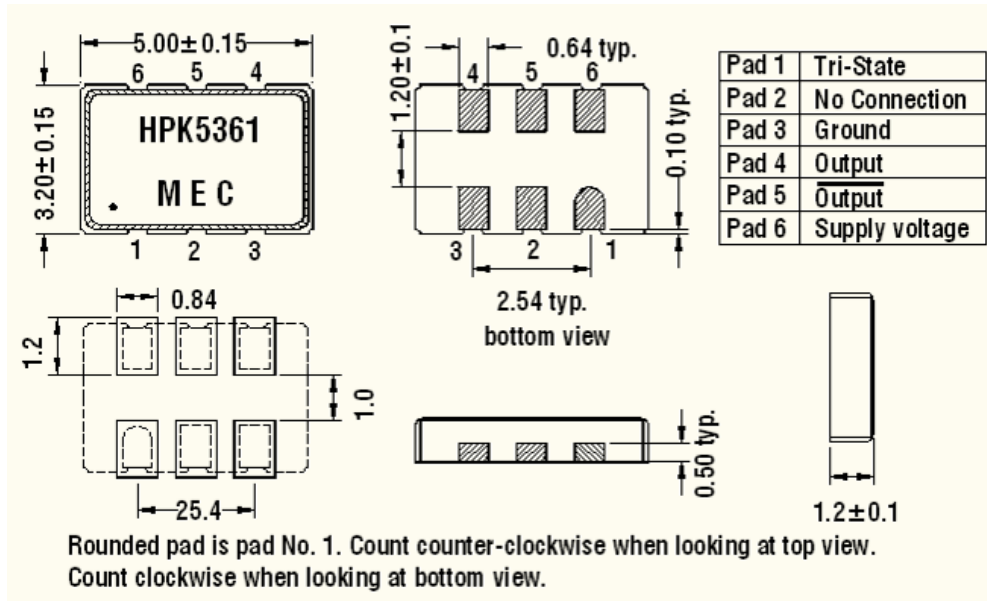
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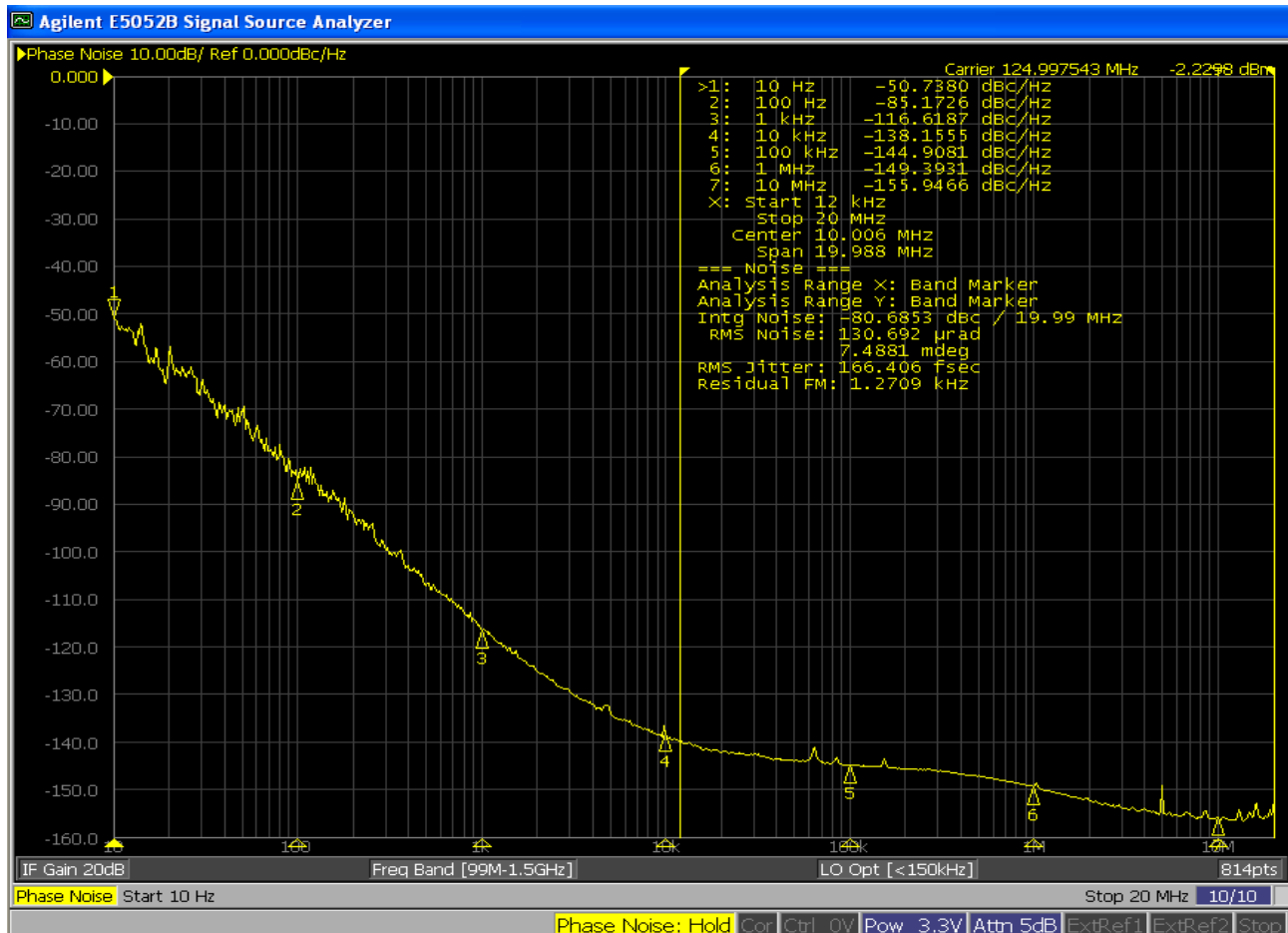


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**HPK5361 Package Dimensions and Recommended Solder Pad Layout:** unit mm



**Typical Phase Noise Plot 3HPK5361-A-125.000**



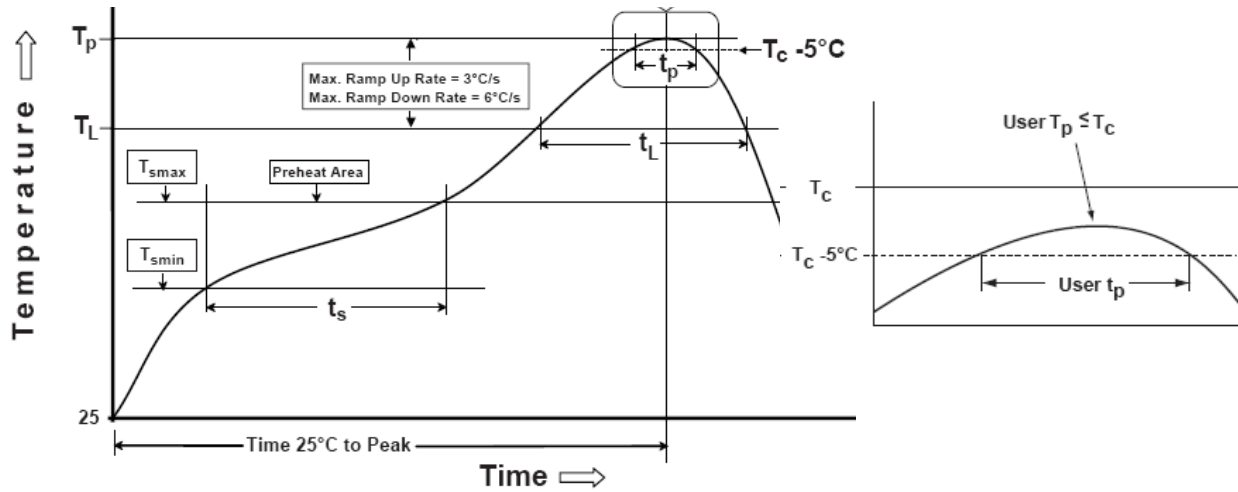
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### HPK5361 Recommended Solder Reflow Profile (from IPC/JEDEC J-STD-020D.1)



Profile Feature	Sn-Pb Eutectic Assembly	Pb-free Assembly
Preheat/Soak		
- Temperature min. (Ts min.)	100°C	150°C
- Temperature max. (Ts max.)	150°C	200°C
- Time (ts) (Ts min. to Ts max.)	60 to 120 seconds	60 to 180 seconds
Ramp-up rate (T <sub>L</sub> to T <sub>p</sub> )	3°C / sec. max.	3°C / sec. max.
Liquidous temperature (T <sub>L</sub> )	183°C	217°C
Time (t <sub>L</sub> ) maintained above T <sub>L</sub>	60 to 150 seconds	60 to 150 seconds
Peak package body temperature (T <sub>p</sub> )	235°C	260°C
Time (T <sub>p</sub> ) within 5°C of the classification temperature T <sub>c</sub>	10 to 30 seconds	20 to 40 seconds
Ramp-down rate (T <sub>p</sub> to T <sub>L</sub> )	6°C / second max.	6°C / second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

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