

# Superb phase noise differential oscillators

Differential

**HPEK**

**HDEK**

**HCEK**

**SMD**

**2.5 V**

**3.3 V**

Min.

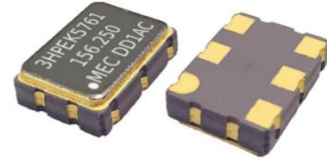
**13.5 MHz**

Max.

**220 MHz**

## Features

- Noise improved version for H\_EK-series
- Femtosecond integrated phase jitter ( 98 fs typical , 12 KHz to 20 MHz )
- Superior phase noise ( -149 dBc/Hz at 100 KHz and -157 dBc/Hz at 10 MHz offset )



## General specifications , at Ta=+25°C

Model	HPEK	HDEK	HCEK
Output Logic	<b>LVPECL</b>	<b>LVDS</b>	<b>HCSL</b>
Available Frequency Range	13.5 MHz ~ 60 MHz 90 MHz ~ 220 MHz	13.5 MHz ~ 60 MHz 90 MHz ~ 220 MHz	13.5 MHz ~ 60 MHz 90 MHz ~ 220 MHz
Supply Voltage ( V <sub>DD</sub> )	+ 2.5 V ± 5%	+ 2.5 V ± 10%	+ 2.5 V ± 10%
	+ 3.3 V ± 10%	+ 3.3 V ± 10%	+ 3.3 V ± 10%
	---	+ 2.5 V ~ + 3.3 V ± 10%	+ 2.5 V ~ + 3.3 V ± 10%
Output Load	50 Ω into V <sub>DD</sub> - 2.0V or Thevenin equivalent	100 Ω between output and complimentary output	50 Ω to ground on each output
Rise Time / Fall Time ( 20%↔80% of waveform )	0.2 nsec ( typ. )	0.2 nsec ( typ. )	0.5 nsec ( typ. )
	0.4 nsec ( max. )	0.4 nsec ( max. )	0.8 nsec ( max. )
Current Consumption	38 mA ( typ. ) , 60 mA ( max. )	15 mA ( typ. ) , 35 mA ( max. )	32 mA ( typ. ) , 40 mA ( max. )
Output Logic " High " , " 1 "	V <sub>DD</sub> - 1.03 ( min. ) , V <sub>DD</sub> - 0.88 ( max. )	1.4 V ( typ. ) , 1.6 V ( max. )	0.5 V ( min. ) , 0.9 V ( max. )
Output Logic " Low " , " 0 "	V <sub>DD</sub> - 1.81 ( min. ) , V <sub>DD</sub> - 1.62 ( max. )	0.9 V ( min. ) , 1.1 V ( typ. )	- 0.15 V ( min. ) , 0.15 V ( max. )
Output Swing ( single-end )	400 mV ( min. )	250 mV ( min. )	500 mV ( min. )

Frequency Stability Codes	Frequency Stability over Operating Temperature Range	± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " ; " F " ; " J " represents . For example : " C20 " ± 20 ppm over -20°C to +70°C ; " F30 " ± 30 ppm over -40°C to +85°C ; " J40 " ± 40 ppm over -40°C to +105°C
	Commercial ( -20 °C to +70 °C )	A	B	C	
	Industrial ( -40 °C to +85 °C )	D	E	F	
	Extended Industrial ( -40 °C to +105 °C )	G	H	J	

Start-up Time	1.0 msec. ( typ. ) , 5.0 msec ( max. )						
Duty Cycle	50% ± 5%						
Storage Temperature	-55°C to +150°C						
Aging at Ta = +25°C	± 3 ppm ( max. ) first year						
RMS Jitter ( 12 KHz to 20 MHz )	Freq. output < 100MHz : 350 fsec ( typ. ) , [ 50MHz , 3.3V , LVDS ]						
	Freq. output > 100MHz : 98 fsec ( typ. ) , [ 156.250MHz , 3.3V , LVDS ]						
Phase Noise [ dBc / Hz ( typ. ) ]	Offset	100 Hz	1 KHz	10 KHz	100 KHz	1 MHz	10 MHz
	50 MHz	-104	-134	-147	-153	-152	-157
	156.250 MHz	-93	-123	-140	-149	-152	-157
Output Enable / Disable Function	Enable	70% ( min. ) of V <sub>DD</sub> to enable output. Enable time : 5 msec ( max. )					
	Disable	30% ( max. ) of V <sub>DD</sub> to disable output. Disable current : 10 uA ( max. ) [ OE ≤ 0.3V ] , Disable time : 0.2 usec ( max. )					

# Crystal Oscillators

HPEK [ LVPECL Differential ]

HDEK [ LVDS Differential ]

HCEK [ HCSL Differential ]

## Part Number Format and Example

	[ 1 ]	[ 2 ]	[ 3 ]	-	[ 4 ]	-	[ 5 ]	
	Supply Voltage	Holder Type	1 or 2		Frequency Stability		Center Frequency	
Example	(1)	3	HCEK536	1	-	H	-	156.250
	(2)	25V3	HDEK576	1	-	D	-	40.000

Ex ( 1 ) : 3HCEK5361 - H - 156.250 [ +3.3V, HCEK type, HCSL output, 5.0 x 3.2mm size, OE on pad 1, ±50ppm from -40°C to 105°C, 156.250MHz ]

Ex ( 2 ) : 25V3HDEK5761 - D - 40.000 [ +2.5V ~ +3.3V, HDEK type, LVDS output, 7.0 x 5.0mm size, OE on pad 1, ±25ppm from -40°C to 85°C, 40.000MHz ]

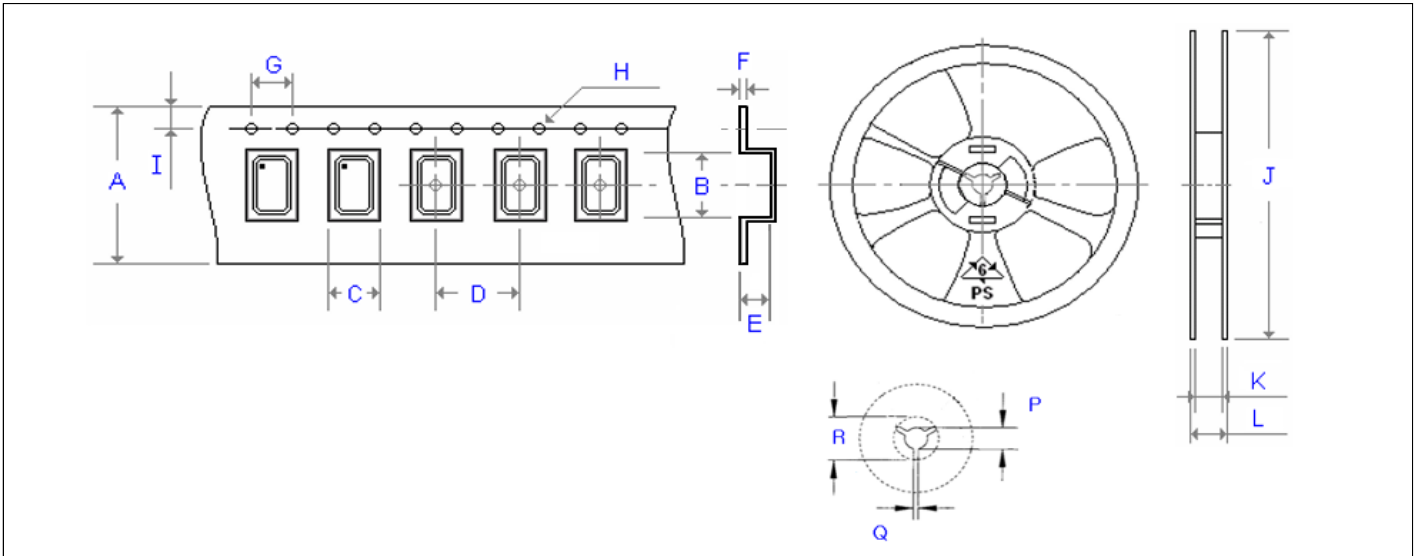
[ 1 ]	Supply voltage , " 25 " for +2.5V ; " 3 " for +3.3V ; " 25V3 " for +2.5V ~ +3.3V ±10%	
[ 2 ]	Holder Type	
[ 3 ]	" 1 " : OE function on pad # 1 , " 2 " : OE function on pad # 2	
[ 4 ]	-20°C ~ 70°C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ; If non-standard please enter the desired stability after " C " , for example " C20 " : represents ±20ppm over -20 to +70°C
	-40°C ~ 85°C	" D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ; If non-standard please enter the desired stability after " F " , for example " F30 " : represents ±30ppm over -40 to +85°C
	-40°C ~ 105°C	" G " ± 25ppm ; " H " ± 50ppm ; " J " ± 100ppm ; If non-standard please enter the desired stability after " J " , for example " J40 " : represents ±40ppm over -40 to +105°C
[ 5 ]	Frequency in MHz	

## Outline Dimensions ( Unit : mm ) , Suggested pad Layout for SMDs , Test Circuits

<p style="text-align: center;"><b>H_EK226</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Top View</p> </div> <div style="text-align: center;"> <p>Bottom View</p> </div> <div style="text-align: center;"> <p>Land Pattern</p> </div> </div> <p style="text-align: center;">Side View</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : No Connection          Pad 3 : Ground          Pad 4 : Output          Pad 5 : Complementary          Pad 6 : Supply Voltage</p>	<p style="text-align: center;"><b>H_EK326</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Top View</p> </div> <div style="text-align: center;"> <p>Bottom View</p> </div> <div style="text-align: center;"> <p>Land Pattern</p> </div> </div> <p style="text-align: center;">Side View</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : No Connection          Pad 3 : Ground          Pad 4 : Output          Pad 5 : Complementary          Pad 6 : Supply Voltage</p>	
<p style="text-align: center;"><b>H_EK536</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Top View</p> </div> <div style="text-align: center;"> <p>Bottom View</p> </div> <div style="text-align: center;"> <p>Land Pattern</p> </div> </div> <p style="text-align: center;">Side View</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : No Connection          Pad 3 : Ground          Pad 4 : Output          Pad 5 : Complementary          Pad 6 : Supply Voltage</p>	<p style="text-align: center;"><b>H_EK576</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>Top View</p> </div> <div style="text-align: center;"> <p>Bottom View</p> </div> <div style="text-align: center;"> <p>Land pattern</p> </div> </div> <p style="text-align: center;">Side View</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : No Connection          Pad 3 : Ground          Pad 4 : Output          Pad 5 : Complementary          Pad 6 : Supply Voltage</p>	
<p style="text-align: center;">LVPECL Test Circuit</p> <p><math>V_{DD} = 3.3V ; R_1 = R_3 = 127 \Omega ; R_2 = R_4 = 82.5 \Omega</math>  <math>V_{DD} = 2.5V ; R_1 = R_3 = 250 \Omega ; R_2 = R_4 = 62.5 \Omega</math></p>	<p style="text-align: center;">LVDS Test Circuit</p>	<p style="text-align: center;">HCSL Test Circuit</p> <p><math>R_s = 0 \text{ to } 33\Omega \text{ to minimize ringing in application.}</math></p>

# Emboss Taping and Reel Specifications

[ Crystal Oscillator Units ]



**Carrier Type Dimensions ( unit : mm ) ±0.3mm**

	A	B	C	D	E	F	G	H	I	pcs / reel
H21	8.00	2.30	1.90	4.00	0.90	0.25	4.00	Ø 1.50	1.75	3000
H_22	8.00	2.80	2.25	4.00	1.10	0.30	4.00	Ø 1.50	1.75	3000
H_32	8.00	3.40	2.70	4.00	1.40	0.25	4.00	Ø 1.50	1.75	3000
H_53	12.00	5.30	3.60	8.00	1.40	0.30	4.00	Ø 1.50	1.75	1000
H_57	16.00	7.30	5.30	8.00	1.90	0.30	4.00	Ø 1.50	1.75	1000
SWO	16.00	7.20	5.40	8.00	1.80	0.30	4.00	Ø 1.50	1.75	1000
H_216	8.00	2.30	1.90	4.00	0.90	0.25	4.00	Ø 1.50	1.75	3000
H_226	8.00	2.80	2.25	4.00	1.10	0.30	4.00	Ø 1.50	1.75	3000
H_326	8.00	3.40	2.70	4.00	1.40	0.25	4.00	Ø 1.50	1.75	3000
H_536	12.00	5.30	3.60	8.00	1.40	0.30	4.00	Ø 1.50	1.75	1000
H_576	16.00	7.30	5.30	8.00	1.90	0.30	4.00	Ø 1.50	1.75	1000
H_328	8.00	3.40	2.70	4.00	1.40	0.25	4.00	Ø 1.50	1.75	3000
H_538	12.00	5.40	3.60	8.00	1.70	0.30	4.00	Ø 1.50	1.75	1000
H_578	16.00	7.30	5.30	8.00	1.90	0.30	4.00	Ø 1.50	1.75	1000
H_43	24.00	11.80	10.00	16.00	5.00	0.30	4.00	Ø 1.50	1.75	500

**Reel Dimensions ( unit : mm ) +2.0 / -0.0mm**

	J	K	L	P	Q	R	pcs / reel
H21	180.00	9.00	12.00	13.20	2.10	-	3000
H_22	180.00	9.00	12.00	13.20	2.10	-	3000
H_32	180.00	9.00	12.00	13.20	2.10	-	3000
H_53	180.00	13.00	16.00	13.20	2.50	-	1000
H_57	180.00	17.20	19.30	13.30	2.20	22.00	1000
SWO	180.00	17.20	19.30	13.30	2.20	22.00	1000
H_216	178.00	8.40	11.40	13.30	2.50	20.50	3000
H_226	180.00	8.40	11.40	13.20	2.10	-	3000
H_326	180.00	9.00	12.00	13.20	2.10	-	3000
H_536	180.00	13.00	16.00	13.20	2.50	-	1000
H_576	180.00	17.20	19.30	13.30	2.20	22.00	1000
H_328	180.00	8.00	12.00	13.20	2.10	-	3000
H_538	180.00	13.00	16.00	13.20	2.50	-	1000
H_578	180.00	17.20	19.30	13.30	2.20	22.00	1000
H_43	330.00	24.50	29.10	13.00	2.20	17.30	500