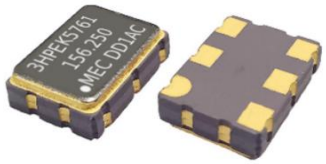
# Superb phase noise differential oscillators

*Differential*

| HPEK | HDEK | HCEK | SMD | 2.5 V | 3.3 V | Min. | Max. |
|---|---|---|---|---|---|---|---|
| LVPECL | LVDS | HCSL | | 2.5 V ~ 3.3 V | | 13.5 MHz | 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 | LVPECL | LVDS | HCSL |
| Available Frequency Range | 13.5 MHz ~ 60 MHz<br>90 MHz ~ 220 MHz | 13.5 MHz ~ 60 MHz<br>90 MHz ~ 220 MHz | 13.5 MHz ~ 60 MHz<br>90 MHz ~ 220 MHz |
| Supply Voltage ( $V_{DD}$ ) | + 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 $V_{DD}$ - 2.0V<br>or Thevenin equivalent | 100 Ω between output<br>and complimentary output | 50 Ω to ground on each output |
| Rise Time / Fall Time<br>( 20%↔80% of waveform ) | 0.2 nsec ( typ. )<br>0.4 nsec ( max. ) | 0.2 nsec ( typ. )<br>0.4 nsec ( max. ) | 0.5 nsec ( typ. )<br>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 " | $V_{DD}$ - 1.03 ( min. ) , $V_{DD}$ - 0.88 ( max. ) | 1.4 V ( typ. ) , 1.6 V ( max. ) | 0.5 V ( min. ) , 0.9 V ( max. ) |
| Output Logic " Low " , " 0 " | $V_{DD}$ - 1.81 ( min. ) , $V_{DD}$ - 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<br>( 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<br>[ 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 $V_{DD}$ to enable output.<br>Enable time : 5 msec ( max. ) | | | | | |
| | Disable | 30% ( max. ) of $V_{DD}$ to disable output.<br>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 |

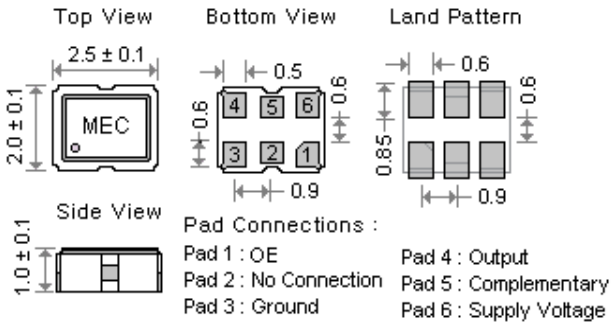
Ex ( 1 ) : 3HCEK5361 - H - 156.250 [ +3.3V, HCEK type, HCSL output, 5.0 x 3.2mm size, OE on pad 1, ±50ppm from -40°C to 105°C, 156.250MHz ]

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 ]

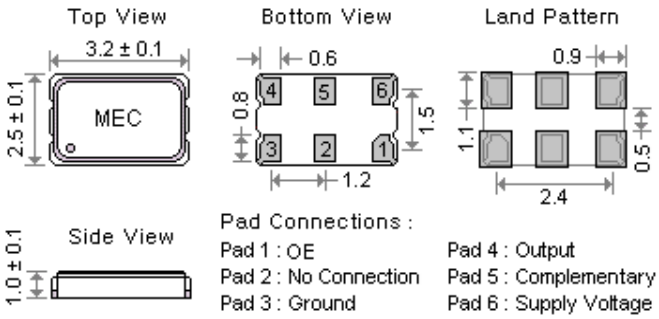
| | | |
|---|---|---|
| [ 1 ] | Supply voltage , " 25 " for +2.5V ; " 3 " for +3.3V ; " 25V3 " for +2.5V ~ +3.3V ±10% | |
| [ 2 ] | Holder Type | |
| [ 3 ] | " 1 " : OE function on pad # 1 , " 2 " : OE function on pad # 2 | |
| [ 4 ] | -20°C ~ 70°C | " A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;<br>If 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 ;<br>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 ;<br>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

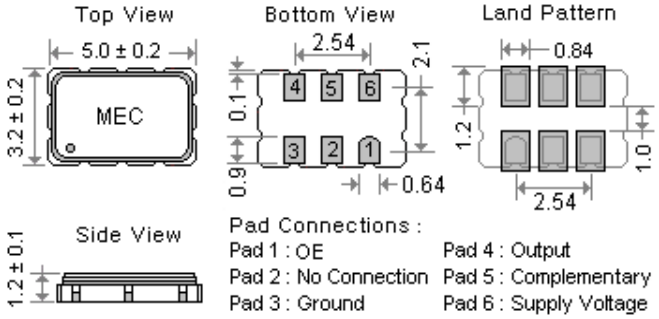
### H_EK226



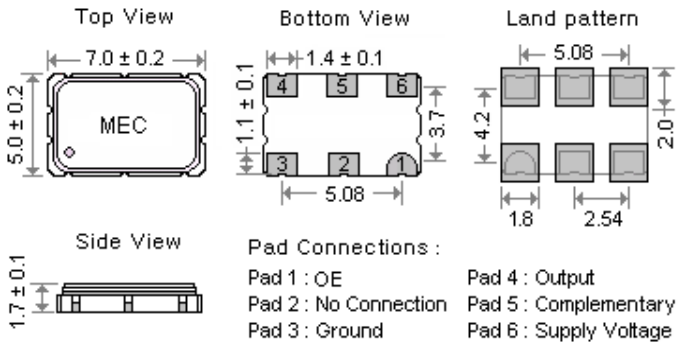

### H_EK326



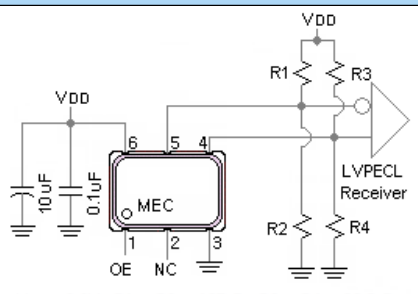

### H_EK536




### H_EK576



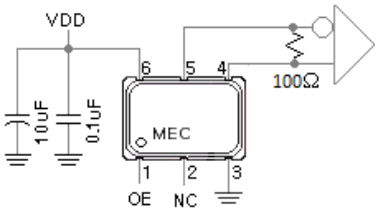

### LVPECL Test Circuit



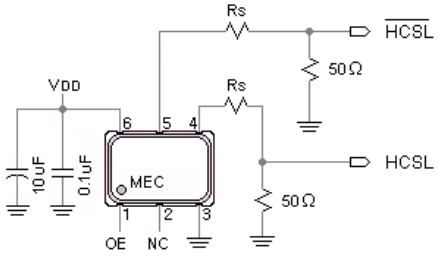

$V_{DD}$ = 3.3V ; R1 = R3 = 127 Ω ; R2 = R4 = 82.5 Ω

$V_{DD}$ = 2.5V ; R1 = R3 = 250 Ω ; R2 = R4 = 62.5 Ω

### LVDS Test Circuit



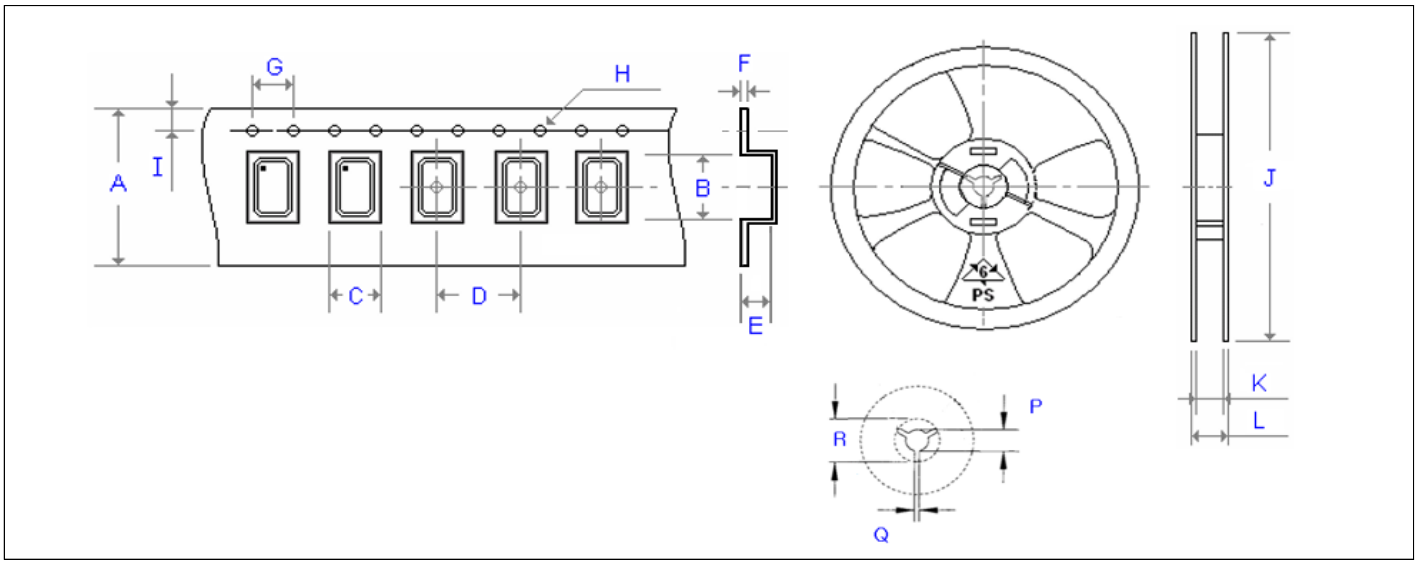

### HCSL Test Circuit




Rs = 0 to 33Ω to minmize ringing in application.

# 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 |

### 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 |