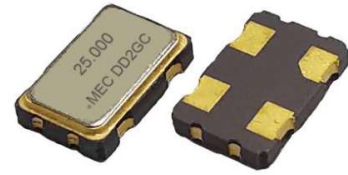


## Surface Mount type

| H21             | H22             | H32             | H53             | SWO             | CMOS | 1.0 V | 1.8 V | 3.3 V | Min.   | Max.    |
|-----------------|-----------------|-----------------|-----------------|-----------------|------|-------|-------|-------|--------|---------|
| 2.0 * 1.6 * 0.8 | 2.5 * 2.0 * 0.9 | 3.2 * 2.5 * 1.0 | 5.0 * 3.2 * 1.2 | 7.0 * 5.0 * 1.4 |      | 1.2 V | 2.5 V | 5.0 V | 50 KHz | 160 MHz |

## Applications

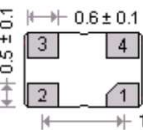
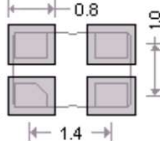
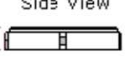
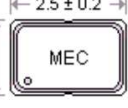
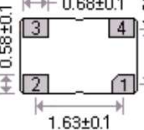
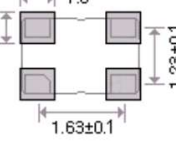
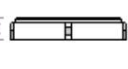
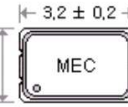
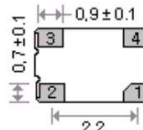
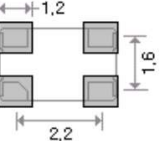
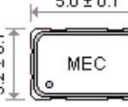
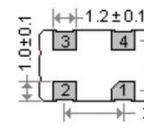
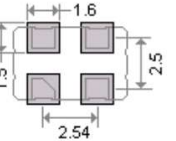
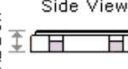
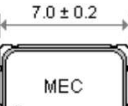
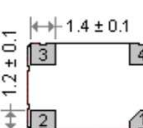
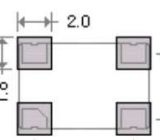
- CPU , Graphics , Multimedia A / V clocks
- MPEG / DVD / HDTV clocks
- Laser engine pixel / set - top clocks
- SONET / SDH / ATM clocks
- Fast Ethernet and Gigabit Ethernet clocks
- NTSC / PAL encoder / decoder clocks
- PLL / synthesizer clocks
- Fibre channel and ADSL clocks



General Specifications [ Ta = +25°C , V<sub>DD</sub> = at specified voltage , Load : 15 pF ]

| Model                                      |               | " H21 " ; " H22 " ; " H32 " ; " H53 " and " SWO " series                                        |                      |                      |                    |                                                                                                                                                                                    |                   |
|--------------------------------------------|---------------|-------------------------------------------------------------------------------------------------|----------------------|----------------------|--------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Type                                       |               | " H21 " series                                                                                  | " H22 " series       | " H32 " series       | " H53 " series     | " SWO " series                                                                                                                                                                     |                   |
| Dimensions                                 |               | 2.0 x 1.6 x 0.8 mm                                                                              | 2.5 x 2.0 x 0.9 mm   | 3.2 x 2.5 x 1.0 mm   | 5.0 x 3.2 x 1.2 mm | 7.0 x 5.0 x 1.4 mm                                                                                                                                                                 |                   |
| Available<br>Frequency Range<br>by Voltage | 1.0 V         | -----                                                                                           | 0.75 MHz ~ 50 MHz    | 0.75 MHz ~ 50 MHz    | 0.75 MHz ~ 50 MHz  | 0.75 MHz ~ 50 MHz                                                                                                                                                                  | 0.75 MHz ~ 50 MHz |
|                                            | 1.2 V         |                                                                                                 |                      |                      |                    |                                                                                                                                                                                    |                   |
|                                            | 1.8 V         | 1 MHz ~ 60 MHz                                                                                  | 0.0625 MHz ~ 160 MHz | 0.0625 MHz ~ 160 MHz | 0.05 MHz ~ 160 MHz | 0.05 MHz ~ 160 MHz                                                                                                                                                                 |                   |
|                                            | 2.5 V         |                                                                                                 |                      |                      |                    |                                                                                                                                                                                    |                   |
|                                            | 3.3 V         |                                                                                                 |                      |                      |                    |                                                                                                                                                                                    |                   |
|                                            | 5.0 V         | -----                                                                                           | 1 MHz ~ 50 MHz       | 1 MHz ~ 50 MHz       | 0.05 MHz ~ 135 MHz | 0.05 MHz ~ 135 MHz                                                                                                                                                                 |                   |
| Supply Voltage ( V <sub>DD</sub> )         |               | +1.0 V ± 5%                                                                                     | +1.2 V ± 5%          | +1.8 V ± 10%         | +2.5 V ± 10%       | +3.3 V ± 10%                                                                                                                                                                       | +5.0 V ± 10%      |
|                                            |               | code is " 10 "                                                                                  | code is " 12 "       | code is " 18 "       | code is " 25 "     | code is " 3 "                                                                                                                                                                      | code is " 5 "     |
| Output Logic " High " , " 1 "              |               | 0.9 V ( min. )                                                                                  | 1.08 V ( min. )      | 1.62 V ( min. )      | 2.25 V ( min. )    | 2.97 V ( min. )                                                                                                                                                                    | 4.5 V ( min. )    |
| Output Logic " Low " , " 0 "               |               | 0.1 V ( max. )                                                                                  | 0.12 V ( max. )      | 0.18 V ( max. )      | 0.25 V ( max. )    | 0.33 V ( max. )                                                                                                                                                                    | 0.5 V ( max. )    |
| Current<br>Consumption                     | < 25 MHz      | 4 mA ( max. )                                                                                   | 4 mA ( max. )        | 5 mA ( max. )        | 5 mA ( max. )      | 5 mA ( max. )                                                                                                                                                                      | 5 mA ( max. )     |
|                                            | 25 ~ 50 MHz   | 5 mA ( max. )                                                                                   | 5 mA ( max. )        | 8 mA ( max. )        | 10 mA ( max. )     | 12 mA ( max. )                                                                                                                                                                     | 10 mA ( max. )    |
|                                            | 51 ~ 100 MHz  | ---                                                                                             | ---                  | 10 mA ( max. )       | 15 mA ( max. )     | 30 mA ( max. )                                                                                                                                                                     | 30 mA ( max. )    |
|                                            | 101 ~ 160 MHz | ---                                                                                             | ---                  | 15 mA ( max. )       | 20 mA ( max. )     | 40 mA ( max. )                                                                                                                                                                     | 40 mA ( max. )    |
| Rise Time ( Tr ) / Fall Time ( Tf )        |               | 6 nsec. ( max. )                                                                                |                      |                      |                    |                                                                                                                                                                                    |                   |
|                                            |               | Measured between 10% ↔ 90% of wave form ( CL = 15pF )                                           |                      |                      |                    |                                                                                                                                                                                    |                   |
| Frequency Stability Codes                  |               | Frequency Stability over<br>Operating Temperature Range                                         | ± 25 ppm             | ± 50 ppm             | ± 100 ppm          | If non-standard , please enter the<br>desired stability after the " C " or " I "<br>For example :<br>" C20 " ±20 ppm over -10°C to +70°C ;<br>" I30 " ± 30 ppm over -40°C to +85°C |                   |
|                                            |               | Commercial ( -10°C to +70°C )                                                                   | A                    | B                    | C                  |                                                                                                                                                                                    |                   |
|                                            |               | Industrial ( -40°C to +85°C )                                                                   | D                    | E                    | F                  |                                                                                                                                                                                    |                   |
| Output Load                                |               | 15 pF ; ( 30 pF and 50 pF load are also available for +3.3V and +5.0V V <sub>DD</sub> )         |                      |                      |                    |                                                                                                                                                                                    |                   |
| Duty Cycle                                 |               | Standard: 50% ± 10%; Option: 50% ± 5%. Please add "-S" at the end of the part number for ± 5% . |                      |                      |                    |                                                                                                                                                                                    |                   |
| Start -up Time                             |               | 1.0 ~ 32.0 MHz : 5 msec. ( max. ) ; 32.1 ~ 160.0 MHz : 10 msec. ( max. )                        |                      |                      |                    |                                                                                                                                                                                    |                   |
| Storage Temperature                        |               | - 55°C to 125°C                                                                                 |                      |                      |                    |                                                                                                                                                                                    |                   |
| Aging at Ta=+25°C                          |               | ± 3 ppm per year ( max. )                                                                       |                      |                      |                    |                                                                                                                                                                                    |                   |
| Output Enable / Disable Function           |               | 70% of V <sub>DD</sub> ( min. ) to enable output.                                               |                      |                      |                    |                                                                                                                                                                                    |                   |
|                                            |               | 30% of V <sub>DD</sub> ( max. ) to disable output.                                              |                      |                      |                    |                                                                                                                                                                                    |                   |
|                                            |               | Disable current : 10 uA max. for OE ≤ 0.3V                                                      |                      |                      |                    |                                                                                                                                                                                    |                   |

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

| [ H21 ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | [ H22 ; H_22 ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Top View</p>  <p>Bottom View</p>  <p>Land Pattern</p>  <p>Side View</p>  <p>Pad Connections :<br/>Pad 1 : OE      Pad 3 : Output<br/>Pad 2 : Ground      Pad 4 : Supply Voltage</p>      | <p>Top View</p>  <p>Bottom View</p>  <p>Land Pattern</p>  <p>Side View</p>  <p>Pad Connections :<br/>Pad 1 : OE      Pad 3 : Output<br/>Pad 2 : Ground      Pad 4 : Supply Voltage</p> |
| [ H32 ; H_32 ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | [ H53 ; H_53 ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>Top View</p>  <p>Bottom View</p>  <p>Land Pattern</p>  <p>Side View</p>  <p>Pad Connections :<br/>Pad 1 : OE      Pad 3 : Output<br/>Pad 2 : Ground      Pad 4 : Supply Voltage</p>      | <p>Top View</p>  <p>Bottom View</p>  <p>Land Pattern</p>  <p>Side View</p>  <p>Pad Connections :<br/>Pad 1 : OE      Pad 3 : Output<br/>Pad 2 : Ground      Pad 4 : Supply Voltage</p> |
| [ SWO ; H_57 ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>Top View</p>  <p>Bottom View</p>  <p>Land Pattern</p>  <p>Side View</p>  <p>Pad Connections :<br/>Pad 1 : OE      Pad 3 : Output<br/>Pad 2 : Ground      Pad 4 : Supply Voltage</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## Part Number Format and Examples

|          |     | [ 1 ]          | [ 2 ]       | - | [ 3 ]               | [ 4 ]       | - | [ 5 ]            |
|----------|-----|----------------|-------------|---|---------------------|-------------|---|------------------|
|          |     | Supply Voltage | Holder Type |   | Frequency Stability | OE Function |   | Center Frequency |
| Examples | (1) | 3              | SWO         | - | D                   | T           | - | 25.000           |
|          | (2) | 3              | HY32        | - | K50                 | T           | - | 24.000           |
|          | (3) | 18             | HA32        | - | B                   | T           | - | 32.768K          |
|          | (4) | 3              | HJ22        | - | E                   | T           | - | 49.152           |

Ex (1) : 3SWO - DT - 25.000 [ 3.3V , H seires 7050 type ,  $\pm 25\text{ppm}$  from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  , OE Function , 25.000MHz ]

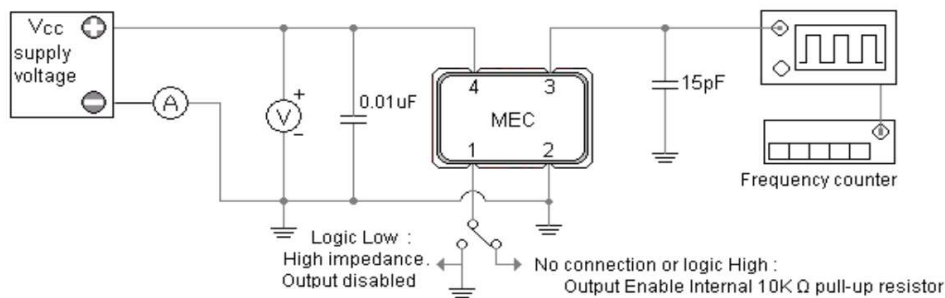
Ex (2) : 3HY32 - K50T - 24.000 [ 3.3V , HY seires 3225 type ,  $\pm 50\text{ppm}$  from  $-40^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  , OE Function , 24.000MHz ]

Ex (3) : 18HA32 - BT - 32.768K [ 1.8V , HA seires 3225 type ,  $\pm 50\text{ppm}$  from  $-10^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  , OE Function , 32.768KHz ]

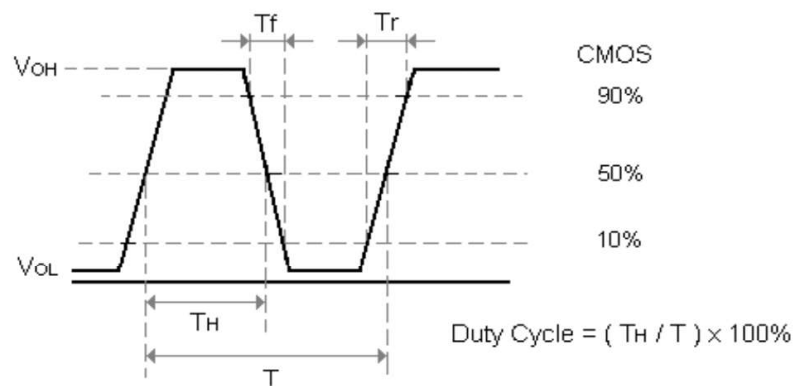
Ex (4) : 3HJ22 - ET - 49.152 [ 3.3V , HJ seires 2520 type ,  $\pm 50\text{ppm}$  from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  , OE Function , 49.152 MHz ]

|     |                                                                                                                              |                                                                                                                         |  |
|-----|------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|--|
| [1] | Supply voltage " 10 " for +1.0V ; " 12 " for +1.2V ; " 18 " for +1.8V ; " 25 " for +2.5V ; " 3 " for +3.3V ; " 5 " for +5.0V |                                                                                                                         |  |
| [2] | Holder Type                                                                                                                  |                                                                                                                         |  |
| [3] | -10°C ~ 70 °C                                                                                                                | " A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ;                                                                        |  |
|     |                                                                                                                              | If non-standard please enter the desired stability after " C " , example " C15 " : represents ±15ppm over -10 to +70°C  |  |
|     | -40°C ~ 85 °C                                                                                                                | " D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;                                                                        |  |
|     |                                                                                                                              | If non-standard please enter the desired stability after " I " , example " I30 " : represents ± 30ppm over -40 to +85°C |  |
| [4] | " T " for OE Function , Leave this space blank if no connection on pad 1.                                                    |                                                                                                                         |  |
| [5] | Frequency in MHz                                                                                                             |                                                                                                                         |  |

## Test Circuit &amp; Test Waveform

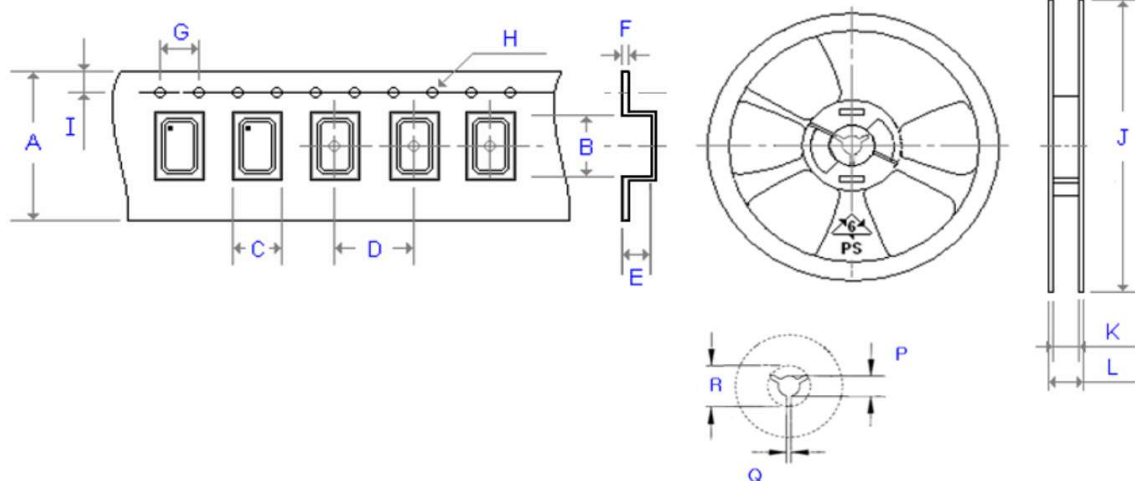
H ; H<sub>-</sub> - series CMOS Test Circuit

CMOS Output Waveform



# 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 1.55 | 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 1.55 | 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 1.55 | 1.75 | 1000       |
| 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 1.55 | 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 1.55 | 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 ) ±2mm

|       | 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_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        |