

Thru - Hole	
<b>H8</b>	<b>H14</b>
12.8 * 12.8 * 6.3	20.2 * 12.8 * 5.8

<b>CMOS</b>
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1.0 V	1.2 V	1.8 V	2.5 V	3.3 V	5.0 V
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Min.
<b>312 KHz</b>

Max.
<b>160 MHz</b>

### 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 ]

Type	Thru - Hole type					
Model ( Dimensions )	H8 ( 12.8 * 12.8 * 6.3 mm )			H14 ( 20.2 * 12.8 * 5.8 mm )		
Supply Voltage ( V <sub>DD</sub> )	+ 1.0V ± 5%	+ 1.2V ± 5%	+ 1.8V ± 10%	+ 2.5V ± 10%	+ 3.3 V ± 10%	+ 5.0V ± 10%
	code is " 10 "	code is " 12 "	code is " 18 "	code is " 25 "	code is " 3 "	code is " 5 "
Frequency Range	0.75 ~ 50 MHz			0.312 ~ 160 MHz		0.312 ~ 135 MHz
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 Consumption	< 25 MHz	4 mA ( max. )	4 mA ( max. )	5 mA ( max. )	5 mA ( max. )	5 mA ( max. )
	50 MHz	5 mA ( max. )	5 mA ( max. )	8 mA ( max. )	10 mA ( max. )	12 mA ( max. )
	100 MHz	---	---	10 mA ( max. )	15 mA ( max. )	30 mA ( max. )
	160 MHz	---	---	15 mA ( max. )	20 mA ( max. )	35 mA ( max. )
Disable Current	10 uA ( max. ) at OE ≤ 0.3V					
Frequency Stability Codes	Frequency Stability over		± 25 ppm	± 50 ppm	± 100 ppm	If non-standard , please enter the desired stability after the " C " or " I "  For example :  " C20 " ±20 ppm over -10°C to +70°C ;  " I30 " ± 30 ppm over -40°C to +85°C
	Operating Temperature Range					
	Commercial ( -10°C to +70°C )		A	B	C	
Industrial ( -40°C to +85°C )		D	E	F		
Output Load	15 pF ( max. ) ; 30 pF load for frequencies up to 70 MHz ; Contact Mercury for 50 pF load					
Rise Time ( Tr )	10 nsec. ( max. ) ; 3 nsec. ( typ. ) . Measured between 10% to 90% waveform ( CL=15pF )					
Fall Time ( Tf )	10 nsec. ( max. ) ; 3 nsec. ( typ. ) . Measured between 10% to 90% waveform ( CL=15pF )					
Duty Cycle	50% ± 10 % of waveform [ 50% ± 5% is also available , add " S " at the end of the part number ]					
Start - Up Time	10 msec. ( max. ) ; 5 msec. ( typ. )					
Storage Temperature	- 55°C to 150°C					
Aging at Ta=+25°C	± 5.0 ppm per year ( max. )					
Output Enable / Disable Function on pin1	70% of V <sub>DD</sub> ( min. ) to enable output.					
	30% of V <sub>DD</sub> ( max. ) to disable output.					
	Add " T " in part number for OE option					

# Crystal Oscillators

CMOS output

## Surface Mount type

H21	H22	H32	H53	SWO
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

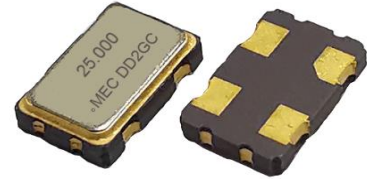
CMOS

1.0 V	1.8 V	3.3 V
1.2 V	2.5 V	5.0 V

Min.	Max.
312 KHz	160 MHz

### Applications

- CPU , Graphics , Multimedia A / V clocks
- MPEG / DVD / HDTV clocks
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- SONET / SDH / ATM clocks
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- PLL / synthesizer clocks
- Fibre channel and ADSL clocks



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

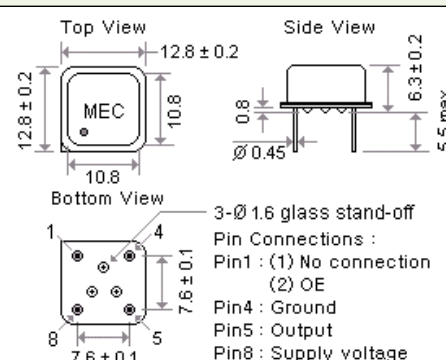
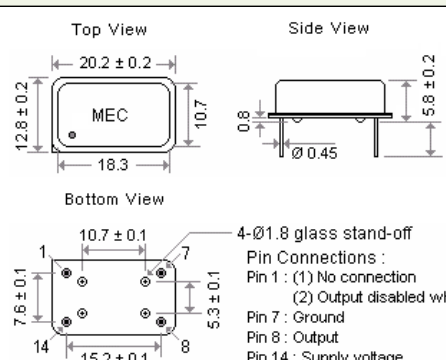
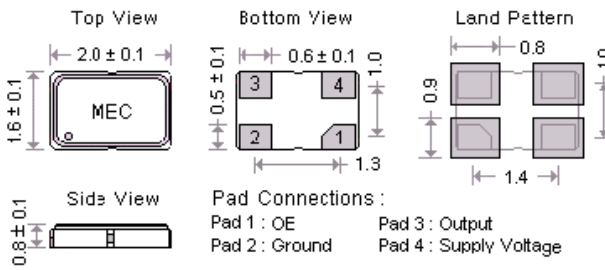
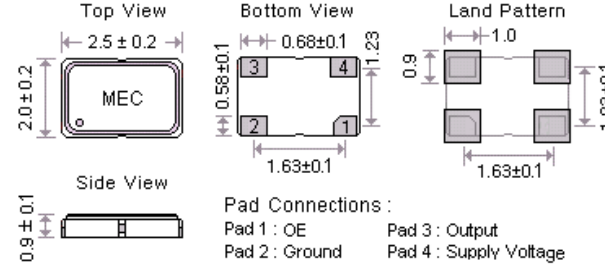
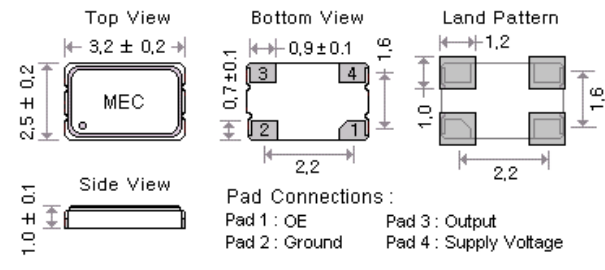
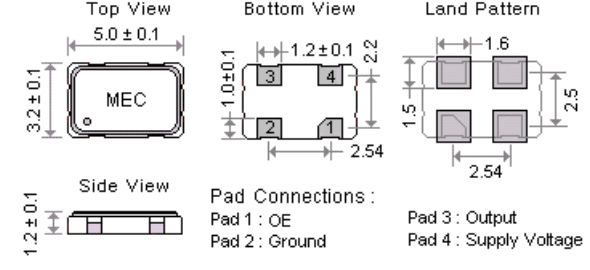
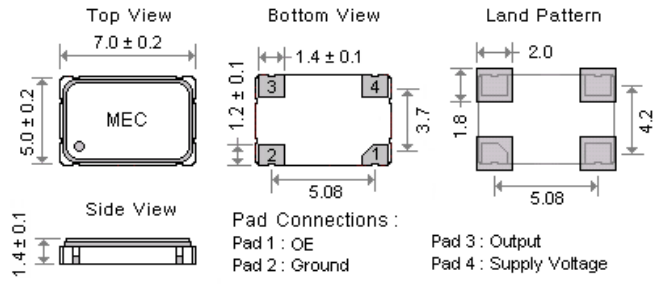
Model	" H21 " ; " H22 " ; " H32 " ; " H53 " and " SWO " series				
Type	" H21 " series	" H22 " series	" H32 " series	" H53 " series	" SWO " series
Dimensions	2.0 x 1.6 x 0.8 mm	2.5 x 2.0 x 0.9 mm	3.2 x 2.5 x 1.0 mm	5.0 x 3.2 x 1.2 mm	7.0 x 5.0 x 1.4 mm
Available Frequency Range by Voltage	1.0 V	----	0.75 MHz ~ 50 MHz	0.75 MHz ~ 50 MHz	0.75 MHz ~ 50 MHz
	1.2 V	----	0.75 MHz ~ 50 MHz	0.75 MHz ~ 50 MHz	0.75 MHz ~ 50 MHz
	1.8 V	1 MHz ~ 60 MHz	1.75 MHz ~ 160 MHz	0.312 MHz ~ 160 MHz	0.312 MHz ~ 160 MHz
	2.5 V	1 MHz ~ 60 MHz	1.75 MHz ~ 160 MHz	0.312 MHz ~ 160 MHz	0.312 MHz ~ 160 MHz
	3.3 V	1 MHz ~ 60 MHz	1.75 MHz ~ 160 MHz	0.312 MHz ~ 160 MHz	0.312 MHz ~ 160 MHz
5.0 V	----	1.75 MHz ~ 50 MHz	1.75 MHz ~ 50 MHz	0.375 MHz ~ 135 MHz	0.375 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 Consumption	< 25 MHz	4 mA ( max. )	4 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. )
	51 ~ 100 MHz	---	---	10 mA ( max. )	15 mA ( max. )	30 mA ( max. )
	101 ~ 160 MHz	---	---	15 mA ( max. )	20 mA ( max. )	35 mA ( max. )
Rise Time ( Tr ) / Fall Time ( Tf )	6 nsec. ( max. )	6 nsec. ( max. )	7 nsec. ( max. )	7 nsec. ( max. )	10 nsec. ( max. )	10 nsec. ( max. )
	Measured between 10% ~ 90% of wave form ( CL = 15pF )					

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 " or " I " For example : " C20 " ±20 ppm over -10°C to +70°C ; " 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

<p>[ H8 ; H_8 ]</p>  <p>Top View: 12.8 ± 0.2, 10.8, 10.8, 12.8 ± 0.2</p> <p>Side View: 0.8, 6.3 ± 0.2, 5.5 max., Ø 0.45</p> <p>Bottom View: 7.6 ± 0.1, 7.6 ± 0.1, 1, 4, 8, 5</p> <p>3-Ø 1.6 glass stand-off</p> <p>Pin Connections :          Pin1 : (1) No connection          (2) OE          Pin4 : Ground          Pin5 : Output          Pin8 : Supply voltage</p>	<p>[ H14 ; H_14 ]</p>  <p>Top View: 20.2 ± 0.2, 12.8 ± 0.2, 18.3, 10.7</p> <p>Side View: 0.8, 5.8 ± 0.2, 6.3 max., Ø 0.45</p> <p>Bottom View: 10.7 ± 0.1, 7.6 ± 0.1, 15.2 ± 0.1, 8, 5.3 ± 0.1, 7</p> <p>4-Ø 1.8 glass stand-off</p> <p>Pin Connections :          Pin 1 : (1) No connection          (2) Output disabled when low          Pin 7 : Ground          Pin 8 : Output          Pin 14 : Supply voltage</p>
<p>[ H21 ]</p>  <p>Top View: 2.0 ± 0.1, 1.6 ± 0.1</p> <p>Side View: 0.8 ± 0.1</p> <p>Bottom View: 0.6 ± 0.1, 1.0, 1.3, 0.5 ± 0.1, 3, 4, 2, 1</p> <p>Land Pattern: 0.8, 1.0, 0.9, 1.4</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : Ground          Pad 3 : Output          Pad 4 : Supply Voltage</p>	<p>[ H22 ; H_22 ]</p>  <p>Top View: 2.5 ± 0.2, 2.0 ± 0.2</p> <p>Side View: 0.9 ± 0.1</p> <p>Bottom View: 0.68 ± 0.1, 1.23, 1.63 ± 0.1, 0.58 ± 0.1, 3, 4, 2, 1</p> <p>Land Pattern: 1.0, 1.23 ± 0.1, 0.9, 1.63 ± 0.1</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : Ground          Pad 3 : Output          Pad 4 : Supply Voltage</p>
<p>[ H32 ; H_32 ]</p>  <p>Top View: 3.2 ± 0.2, 2.5 ± 0.2</p> <p>Side View: 1.0 ± 0.1</p> <p>Bottom View: 0.9 ± 0.1, 1.6, 2.2, 0.7 ± 0.1, 3, 4, 2, 1</p> <p>Land Pattern: 1.2, 1.6, 1.0, 2.2</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : Ground          Pad 3 : Output          Pad 4 : Supply Voltage</p>	<p>[ H53 ; H_53 ]</p>  <p>Top View: 5.0 ± 0.1, 3.2 ± 0.1</p> <p>Side View: 1.2 ± 0.1</p> <p>Bottom View: 1.2 ± 0.1, 2.2, 2.54, 1.0 ± 0.1, 3, 4, 2, 1</p> <p>Land Pattern: 1.6, 2.5, 1.5, 2.54</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : Ground          Pad 3 : Output          Pad 4 : Supply Voltage</p>
<p>[ SWO ; H_57 ]</p>  <p>Top View: 7.0 ± 0.2, 5.0 ± 0.2</p> <p>Side View: 1.4 ± 0.1</p> <p>Bottom View: 1.4 ± 0.1, 3.7, 5.08, 1.2 ± 0.1, 3, 4, 2, 1</p> <p>Land Pattern: 2.0, 4.2, 1.8, 5.08</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : Ground          Pad 3 : Output          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 , ±25ppm from -40°C to +85°C , OE Function , 25.000MHz ]

Ex (2) : 3HY32 - K50T - 24.000 [ 3.3V , HY seires 3225 type , ±50ppm from -40°C to +125°C , OE Function , 24.000MHz ]

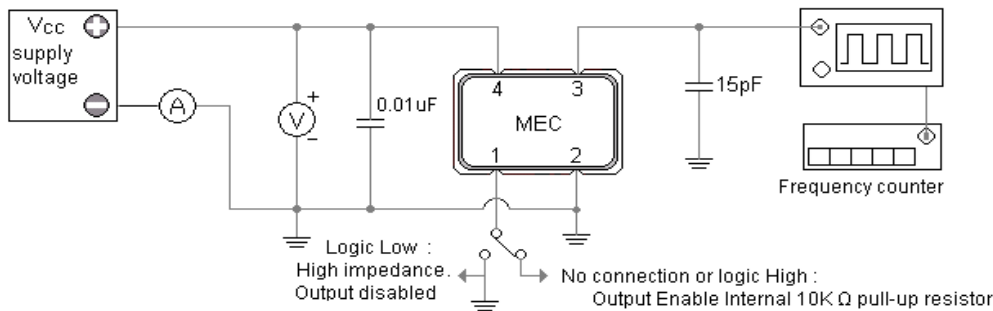
Ex (3) : 18HA32 - BT - 32.768K [ 1.8V , HA seires 3225 type , ±50ppm from -10°C to +70°C , OE Function , 32.768KHz ]

Ex (4) : 3HJ22 - ET - 49.152 [ 3.3V , HJ seires 2520 type , ±50ppm from -40°C to +85°C , OE Function , 49.152 MHz ]

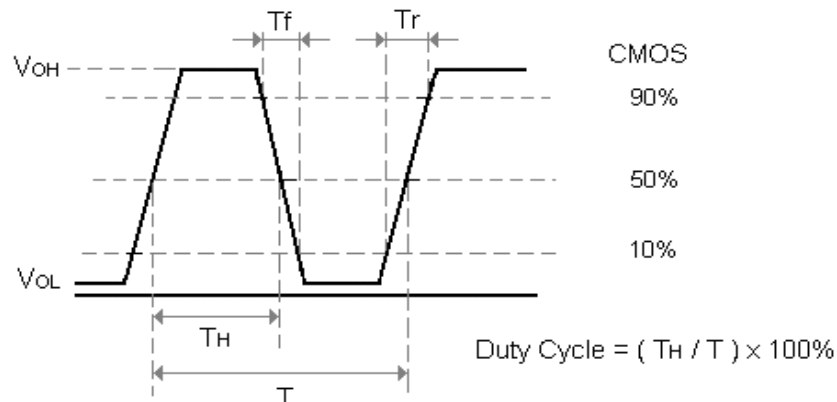
[1]	Supply voltage " 10 " for +1.0V ; " 12 " for +1.2V ; " 18 " for +1.8V ; " 25 " for +2.5V ; " 3 " for +3.3V ; " 5 " for +5.0V	
[2]	Holder Type	
[3]	-10°C ~ 70 °C	" A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ; If non-standard please enter the desired stability after " C " , example " C15 " : represents ±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 & Test Waveform

#### H ; H\_ - series CMOS Test Circuit

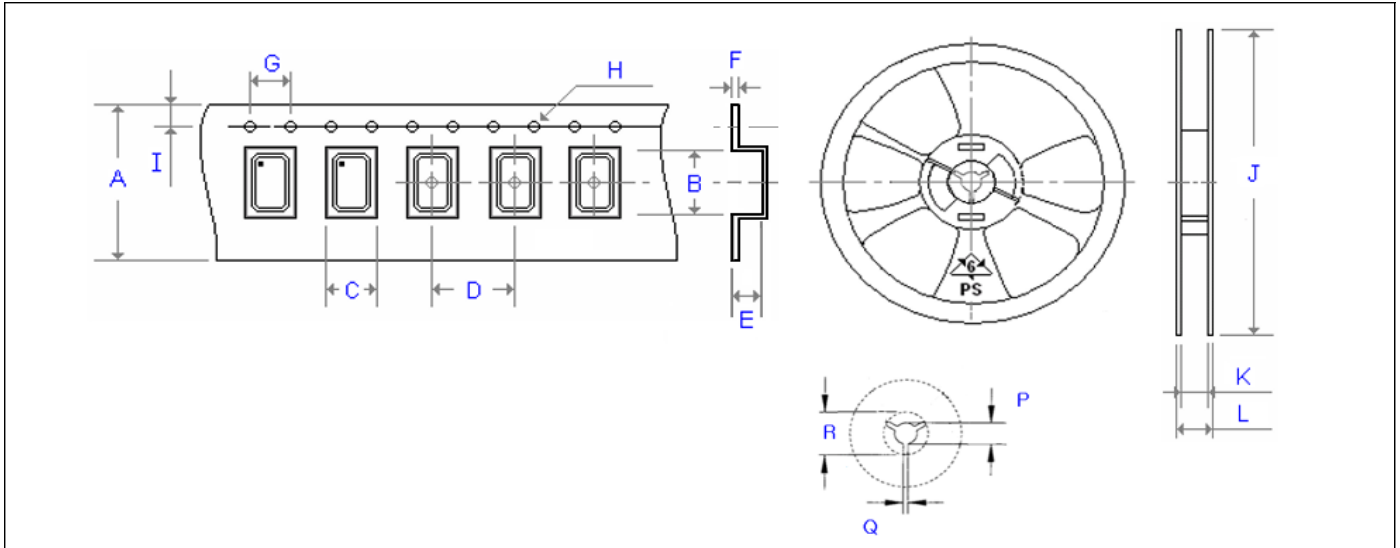


#### CMOS Output Waveform



# 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	∅ 1.50	1.75	3000
H_22	8.00	2.80	2.25	4.00	1.10	0.30	4.00	∅ 1.50	1.75	3000
H_32	8.00	3.40	2.70	4.00	1.40	0.25	4.00	∅ 1.50	1.75	3000
H_53	12.00	5.30	3.60	8.00	1.40	0.30	4.00	∅ 1.50	1.75	1000
H_57	16.00	7.30	5.30	8.00	1.90	0.32	4.00	∅ 1.50	1.75	1000
SWO	16.00	7.20	5.40	8.00	1.80	0.32	4.00	∅ 1.50	1.75	1000
H_226	8.00	2.80	2.25	4.00	1.10	0.30	4.00	∅ 1.50	1.75	3000
H_326	8.00	3.40	2.70	4.00	1.40	0.25	4.00	∅ 1.50	1.75	3000
H_536	12.00	5.30	3.60	8.00	1.40	0.30	4.00	∅ 1.50	1.75	1000
H_576	16.00	7.30	5.30	8.00	1.90	0.32	4.00	∅ 1.50	1.75	1000
H_328	8.00	3.40	2.70	4.00	1.40	0.25	4.00	∅ 1.50	1.75	3000
H_538	12.00	5.40	3.60	8.00	1.70	0.30	4.00	∅ 1.50	1.75	1000
H_578	16.00	7.30	5.30	8.00	1.90	0.32	4.00	∅ 1.50	1.75	1000
H_43	24.00	11.80	10.00	16.00	5.00	0.30	4.00	∅ 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	13.00	2.50	20.20	3000
H_22	180.00	8.40	11.40	13.00	2.50	20.20	3000
H_32	180.00	9.00	12.00	13.00	2.50	20.20	3000
H_53	180.00	13.00	16.00	13.00	2.50	20.20	1000
H_57	180.00	17.20	19.30	13.00	2.50	20.20	1000
SWO	180.00	17.20	19.30	13.00	2.50	20.20	1000
H_226	180.00	8.40	11.40	13.00	2.50	20.20	3000
H_326	180.00	9.00	12.00	13.00	2.50	20.20	3000
H_536	180.00	13.00	16.00	13.00	2.50	20.20	1000
H_576	180.00	17.20	19.30	13.00	2.50	20.20	1000
H_328	180.00	8.00	12.00	13.00	2.50	20.20	3000
H_538	180.00	13.00	16.00	13.00	2.50	20.20	1000
H_578	180.00	17.20	19.30	13.00	2.50	20.20	1000
H_43	330.00	24.50	29.10	13.00	2.50	20.20	500