

# EMI Reduction Spread Spectrum Clock Oscillators

**HM\_x**

**EMI Reduction Spread Spectrum Clock Oscillators**

**R group**

**Y group**

**P group**

**Thru-Hole**

**SMD**

**CMOS**

**3.3V**

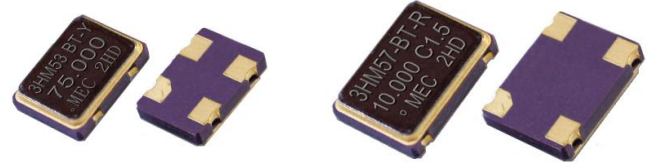
**Min.**

**3.5 MHz**

**Max.**

**220 MHz**

- Reduce electromagnetic interference (EMI) by approx. 7 dB to 16 dB
- Operates with a +2.5V and 3.3V supply Voltage
- 5.0 x 3.2 or 7.0 x 5.0 mm package size



General specifications of all available packages , at Ta=+25°C , CL=15pF

Group	R group			Y group			P group			
Available Packages	3HM572 - R ( 7.0 * 5.0 * 1.4 mm ) ( 3.5 ~ 165.0 MHz )			3HM572 - Y ( 7.0 * 5.0 * 1.4 mm ) ( 8.0 ~ 165.0 MHz )			3HM57 - P ( 7.0 * 5.0 * 1.8 mm )			
Frequency Range	3HM53 - R ( 5.0 * 3.2 * 1.2 mm ) ( 6.0 ~ 160.0 MHz )			3HM53 - Y ( 5.0 * 3.2 * 1.2 mm ) ( 10.0 ~ 160.0 MHz )			( 13.0 ~ 220.0 MHz )			
Spread Type	Total%	Down Spread	Center Spread	Type	Total%	Down Spread	Center Spread	Total%	Down Spread	Center Spread
Spread Percentage	1.0%	-1.0% ( D1.0 )	±0.5% ( C0.5 )	3HM53	1.0%	-1.0% ( D1.0 )	±0.5% ( C0.5 )	0.5%	-0.5% ( D0.5 )	±0.25% ( C0.25 )
					3.0%	-3.0% ( D3.0 )	±1.5% ( C1.5 )	0.75%	-0.75% ( D0.75 )	±0.375% ( C0.375 )
				3HM57	1.0%	-1.0% ( D1.0 )	±0.5% ( C0.5 )	1.25%	-1.25% ( D1.25 )	±0.625% ( C0.625 )
	2.0%	-2.0% ( D2.0 )	±1.0% ( C1.0 )		2.0%	-2.0% ( D2.0 )	±1.0% ( C1.0 )			
	3.0%	-3.0% ( D3.0 )	±1.5% ( C1.5 )		3.0%	-3.0% ( D3.0 )	±1.5% ( C1.5 )			
	3.75%	-3.75% ( D3.75 )	±1.875% ( C1.875 )							
EMI Reduction ( EMI reduction apply to the whole spectrum. )	7 dB ( min. ) , 100MHz at C0.25 9 dB ( min. ) , 100MHz at C0.5 15 dB ( min. ) , 100MHz at C1.5			9 dB ( min. ) , 100MHz at C0.5 12 dB ( min. ) , 100MHz at C1.0 15 dB ( min. ) , 100MHz at C1.5			7 to 16 dB ( typical ) for the main mode			
Modulation Carrier Freq. ( Dither rate )	6.9 KHz ( min. ) ; 55.5 KHz ( max. ) Frequency dependent . Call for details			12 KHz ( min. ) ; 42 KHz ( max. ) Frequency dependent . Call for details			25.3 KHz ( min. ) ; 58.6 KHz ( max. ) Frequency dependent . Call for details			
Input Voltage ( V <sub>DD</sub> )	V <sub>DD</sub> = +3.3V ±5%			V <sub>DD</sub> = +3.3V ±5%			V <sub>DD</sub> = +3.3V ±5%			
Output Logic " High " , " 1 "	2.4V ( min. )			2.4V ( min. ) ; 3.2V ( typ. )			2.4V ( min. )			
Output Logic " Low " , " 0 "	0.5V ( max. )			0.5V ( max. ) ; 0.2V ( typ. )			0.4V ( max. )			
Rise Time / Fall Time	4n sec. ( max. ) [ 10% V <sub>DD</sub> ↔ 90% V <sub>DD</sub> ]			6n sec. ( max. ) [ 10% V <sub>DD</sub> ↔ 90% V <sub>DD</sub> ]			4n sec. ( max. ) [ 10% V <sub>DD</sub> ↔ 90% V <sub>DD</sub> ]			
Load	15pF			15pF			15pF			
Start-up Time	2 m sec. ( typ. ) ; 5 m sec. ( max. )			2 m sec. ( typ. ) ; 5 m sec. ( max. )			2 m sec. ( typ. ) ; 5 m sec. ( max. )			
Current Consumption	10.0 ~ 50.000 MHz : 10mA ( typ. ) 50.0 ~ 100.0 MHz : 18mA ( typ. ) 100.0 ~ 160.0 MHz : 35mA ( typ. )			10.0 ~ 50.000 MHz : 10mA ( typ. ) 50.0 ~ 125.0 MHz : 27mA ( typ. ) , 44mA ( max. )			25mA ( typ. ) ; Frequency dependent			
Duty Cycle	50% ± 5%			50% ± 5%			50% ± 5%			
Storage Temperature	-55°C to + 125°C			-55°C to + 125°C			-55°C to + 125°C			
Aging	± 5 ppm per year ( max. ) ; Ta = +25°C			± 5 ppm per year ( max. ) ; Ta = +25°C			± 5 ppm per year ( max. ) ; Ta = +25°C			
Output Enable Function on pad 1	OE enable high. Output is high impedance when taken low . Enable / disable time: 100 ns max.						Do not make connection to this pad . No OE option available.			
Frequency Stability Codes ( exclude modulation )	Freque. Stability over Operating Temperature Range				± 25 ppm		± 50 ppm		± 100 ppm	
	Commercial ( -10°C to +70°C )				A		B		C	
	Industrial ( -40°C to +85°C )				D		E		F	

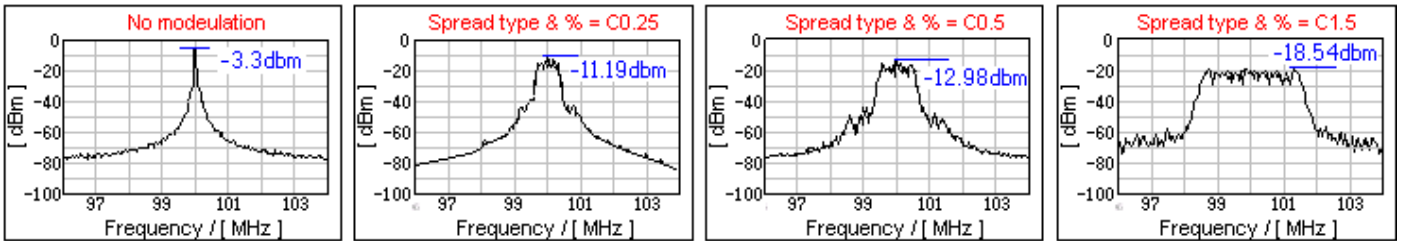
# EMI Reduction Spread Spectrum Clock Oscillators

## Part Number Format and Example

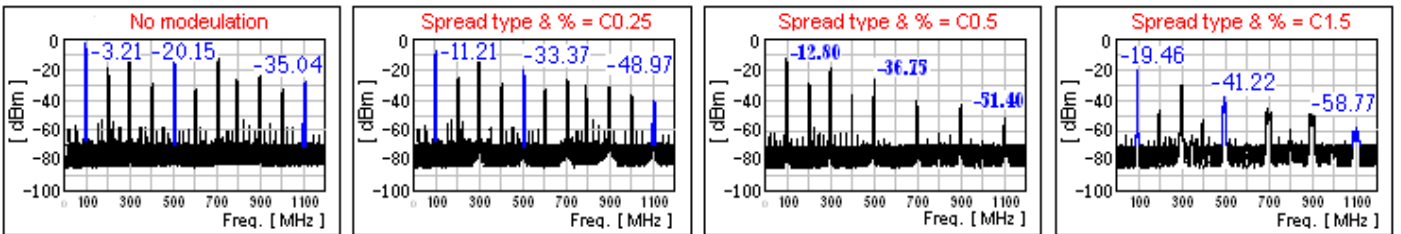
	[ 1 ]		[ 2 ]		[ 3 ]		[ 4 ]		[ 5 ]		[ 6 ]		[ 7 ]	
	Supply Voltage	Holder Type	Frequency Stability	T	Center Frequency	Group Type	Spread type	Percentage						
Examples	(1)	3	HM 572	-	B	T	-	10.000	R	-	C1.5			
	(2)	3	HM 53	-	F	T	-	75.000	Y	-	D1.0			
	(3)	3	HM 43	-	D		-	100.000	P	-	D3.0			

[ 1 ]	Supply voltage code : " 3 " for +3.3V
[ 2 ]	Holder Type ( HM53 , HM57 , HM572 or HM43 )
[ 3 ]	-10°C ~ 70 °C " A " ± 25ppm ; " B " ± 50ppm ; " C " ± 100ppm ; -40°C ~ 85 °C " D " ± 25ppm ; " E " ± 50ppm ; " F " ± 100ppm ;
[ 4 ]	" T " for OE Function , " T " is standard for all grounds except for group P .
[ 5 ]	Frequency in MHz
[ 6 ]	Group " R " , " P " or " Y "
[ 7 ]	Spread type & percentage ; " C " for center spread , " D " for down spread

## EMI Test Data : 3HM57-B-100.000R , 100.0MHz Group " R " , Modulation Carrier Frequency = 34.687KHz

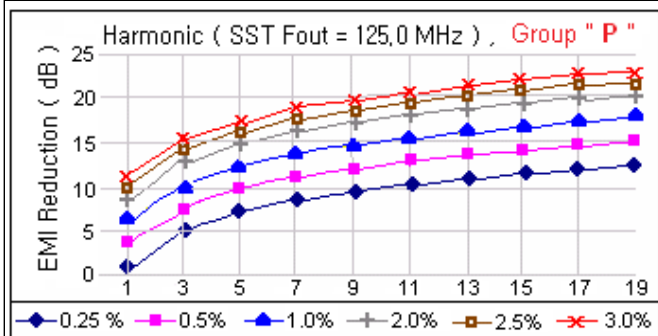


## Whole Spectrum EMI Data : 3HM57-B-100.000R , 100.0MHz Group " R " , Modulation Carrier Frequency = 34.687KHz



### EMI Test Data ( " P " group )

125.0 MHz at various spread percentages.  
Modulation Carrier Frequency : 48.8 KHz



**Main mode :**  

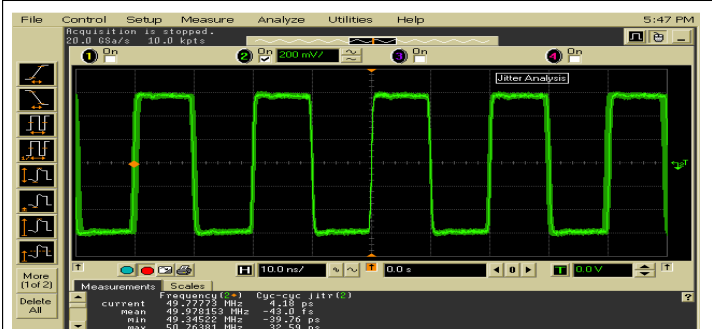
$$\text{EMI reduction (dB)} = 10 \text{ Log} \left( \frac{\text{total \% * frequency (MHz)}}{0.12} \right)$$
**3rd Harmonic :**  

$$\text{EMI reduction (dB)} = 10 \text{ Log} \left( \frac{\text{total \% * frequency (MHz) * 3}}{0.12} \right)$$
**5th Harmonic :**  

$$\text{EMI reduction (dB)} = 10 \text{ Log} \left( \frac{\text{total \% * frequency (MHz) * 5}}{0.12} \right)$$

### Jitter Test Data ( " P " group )

" P " group , cycle to cycle jitter .  
32.59 ps ( min. ) ; 39.76 ps ( max. )



Sample rate : 20.0 G Sa/sec.;No. of sample :1000;Edge Direction: Rising edges

For more technical information please visit the following web site :

[www.mercury-crystal.com](http://www.mercury-crystal.com) and down load our technical note

TN-020 ( Title : Low EMI Spread Spectrum Clock Oscillators )

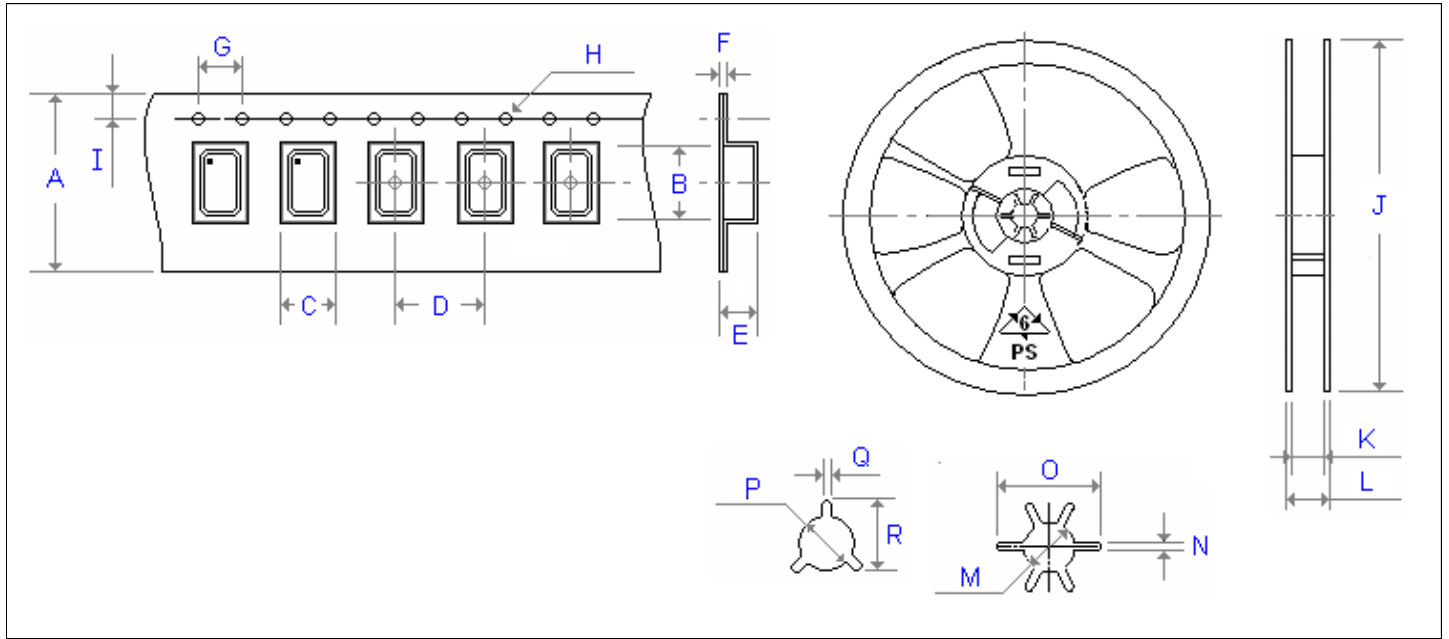
# EMI Reduction Spread Spectrum Clock Oscillators

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

<p><b>[ HM 53 ]</b> For group : <b>R</b> <b>Y</b></p> <p>MEC</p> <p>Land Pattern</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : Groud          Pad 3 : Output          Pad 4 : Supply Voltage</p>	<p><b>[ HM 57 ]</b> For group : <b>P</b></p> <p>MEC</p> <p>Bottom View</p> <p>Land Pattern</p> <p>Pad Connections :          Pad 1 : No Connection          Pad 2 : Groud          Pad 3 : Output          Pad 4 : Supply Voltage</p>
<p><b>[ HM 572 ]</b> For group : <b>R</b> <b>Y</b></p> <p>MEC</p> <p>Bottom View</p> <p>Land Pattern</p> <p>Pad Connections :          Pad 1 : OE          Pad 2 : Groud          Pad 3 : Output          Pad 4 : Supply Voltage</p>	<p><b>[ HM 43 ]</b> For group : <b>R</b> <b>Y</b></p> <p>MEC</p> <p>Pad Connections :          Pad 1 : OE or No Connection          Pad 2 : Groud          Pad 3 : Output          Pad 4 : Supply Voltage</p>

# Emboss Taping and Reel Specifications

[ Crystal Oscillator Units ]



Carrier Type Dimensions ( unit : mm )

	A	B	C	D	E	F	G	H	I	pcs / reel
H_22	8.0	2.8	2.3	4.0	1.1	0.3	4.0	∅ 1.50	1.75	3000
H_32	8.0	3.4	2.7	4.0	1.4	0.3	4.0	∅ 1.50	1.75	3000
H_53	12.0	5.3	3.6	8.0	1.4	0.3	4.0	∅ 1.55	1.75	1000
H_57	16.0	7.3	5.3	8.0	1.9	0.3	4.0	∅ 1.55	1.75	1000
SWO	16.0	7.2	5.4	8.0	1.8	0.3	4.0	∅ 1.55	1.75	1000
H_576	16.0	7.2	5.4	8.0	1.8	0.3	4.0	∅ 1.55	1.75	1000
HP_576	16.0	7.2	5.4	8.0	1.8	0.3	4.0	∅ 1.55	1.75	1000
HD_576	16.0	7.2	5.4	8.0	1.8	0.3	4.0	∅ 1.55	1.75	1000
H_42	24.0	12.4	10.3	16.0	5.1	0.3	4.0	∅ 1.55	1.75	500
H_43	24.0	12.4	10.3	16.0	5.1	0.3	4.0	∅ 1.55	1.75	500

Reel Dimensions ( unit : mm )

	J	K	L	M	N	O	P	Q	R	pcs / reel
H_22	180.0	9.0	12.0	-	-	-	13.2	2.1	-	3000
H_32	180.0	9.0	12.0	-	-	-	13.2	2.1	-	3000
H_53	180.0	13.0	16.0	-	-	-	13.2	2.5	-	1000
H_57	180.0	17.2	19.3	-	-	-	13.3	2.2	22.0	1000
SWO	180.0	17.2	19.3	-	-	-	13.3	2.2	22.0	1000
H_576	180.0	17.2	19.3	-	-	-	13.3	2.2	22.0	1000
HP_576	180.0	17.2	19.3	-	-	-	13.3	2.2	22.0	1000
HD_576	180.0	17.2	19.3	-	-	-	13.3	2.2	22.0	1000
H_42	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	500
H_43	330.0	30.0	25.0	-	-	-	13.4	2.5	19.5	500