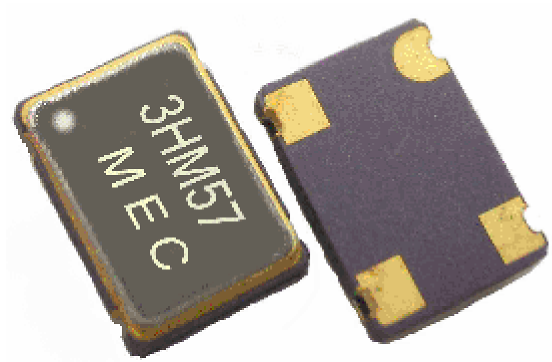
Low EMI Spread Spectrum Clock Oscillators

3HM57 Group "P" ±100 ps Low jitter

A DROP-IN REPLACEMENT SOLUTION FOR YOUR EMI / EMC COMPLIANCE PROBLEM. WHY RE-LAYOUT THE BOARD WHEN YOU CAN HAVE DROP-IN SOLUTION?

The principle sources of the EMI problem come from the system clocks. Therefore, rather than patch the problem with ferrite beads, EMI filters, ground plane and metal shielding, the most efficient and economic way to reduce the peak radiation energy is to use the low EMI clock oscillator.

Compared with the conventional clock oscillators, Mercury HM57 series spread spectrum (dithered) clock oscillators can reduce EMI as much as 12 dB.



3HM57 reduces your EMI and shorten your time to market.

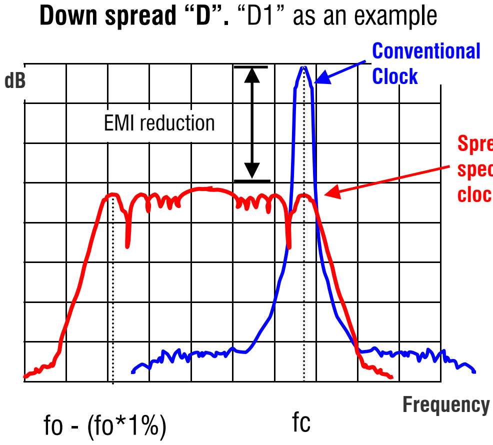
Applications

- Printers; Multiple function printers (MPCs)
- Digital copiers; PDAs
- Networking; LAN / WAN; Routers
- Storage systems **(**CD-ROM, VCD, DVD and HDD)
- Scanner; Modems; projectors
- Hand-held ID readers
- Embedded systems; Electrical musical instrument
- Automotive; GPS car navigation systems
- LCD PC monitors / LCD TVs
- ADSL; PCMCIA
- Stil**l** Digital cameras (SDCs)

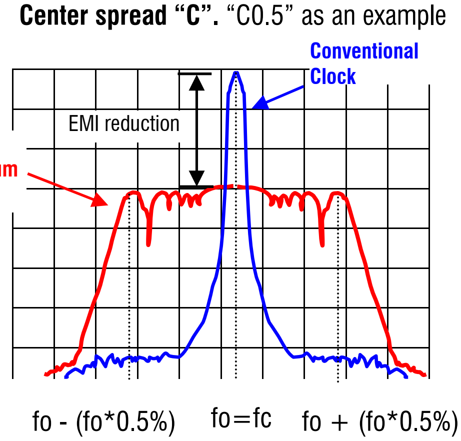
Modulation Types

Output amplitude (dB) vs frequency span (MHz)

Down spread "D". "D1" as an example



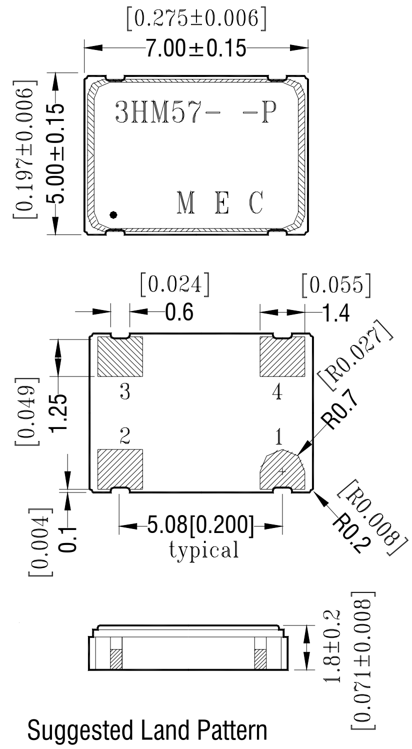
Center spread "C". "C0.5" as an example



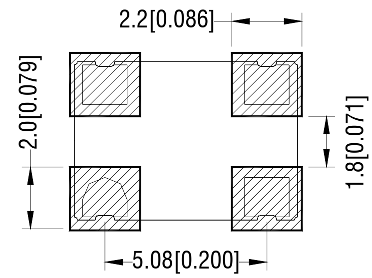
Spread Spectrum Clock (SSC):
Unlike the conventional clock, the mode energy of a spread spectrum clock is spread over a wider bandwidth, resulting from the **frequency modulation** technique. The modulation carrier frequency is in the KHz range which makes the modulation process transparent to the oscillator frequency. The controlled modulation process can be on all of one side of the nominal frequency (**down spread**) or 50% up and 50% down (**center spread**). The down spread is preferred if **over-clocking** is a problem to the system.

General Specifications: at Ta=+25°C, C_L=15 pF

Mercury Model	3HM57 (spec. for group "P")		
Frequency Range	13.0 ~220.0 MHz		
Spread Type and %	Total %	Down Spread (D)	Center Spread (C)
Spread Percentage[1] (Part number suffix) Tolerance: ±30% of the total %	0.25%	-0.25% (D0.25)	±0.125% (C0.125)
	0.5%	-0.5% (D0.5)	±0.25% (C0.25)
	0.75%	-0.75% (D0.75)	±0.375% (C0.375)
	1.25%	-1.25% (D1.25)	±0.625 (C0.625)
	2%	-2% (D2)	±1.0 (C1.0)
	2.5%	-2.5% (D2.5)	±1.25 (C1.25)
	3%	-3% (D3)	±1.5 (C1.5)
	3.5%	-3.5% (D3.5)	±1.75 (C1.75)
	3.75%	-3.75% (D3.75)	±1.875 (C1.875)
EMI Reduction (Reduction is applied to the entire frequency spectrum)	EMI reduction (dB) = 10Log("Total %"x"SSC Frequency(MHz)"/0.12). See 125 MHz example on the next page.		
Modulation Carrier Frequency (Dither rate)	25.3 KHz min.; 58.6 KHz max. Frequency dependent. Call for details.		
Output Logic	CMOS Square Wave		
Input Voltage (V_{DD})	V_{DD} = +3.3 V D.C. ±5%		
Frequency Stability (exclude modulation)	**Commercial** (0°C to +70°C): "**A**": ±25 ppm ; "**B**': ±50 ppm; "**C**":±100 ppm		
	Industrial (-40°C to +85°C): "**D**": ±25 ppm ; "**E**': ±50 ppm; "**F**":±100 ppm		
Output Voltage "High"; "1"	2.4 V min.;(at 80% V_{DD})		
Output Voltage "Low"; "0"	0.4 V max. (at 20% V_{DD})		
Rise Time / Fall Time	1.2 n sec. max. (20% V_{DD} ↔ 80% V_{DD})		
Load	15 pF		
Start-up Time	2 ms typical; 5 ms max.		
Current Consumption	25 mA typical; Frequency dependent		
Duty Cycle	50%±5%. (C_L=15 pF ;at 50% V_{DD})		
Cycle-to-cycle Jitter	±100 ps typical;±150 ps max.		
Output Impedance	40 ohms typical		
Static Discharge Voltage	>2000 V (per MIL-STD-883, method 3015)		
Storage Temperature	-65°C to +150°C		
Aging	±5 ppm per year max.; Ta=+25°C		
Option on Pad 1	No Option available. Do not make connection to this pad		
Packaging	16 mm tape and reel. 1000 pcs per reel		



Suggested Land Pattern



Pad Connections			
1	Do not make connection to this pad.	3	Spread Spectrum Output
2	Ground	4	+3.3 V D.C.

Environmental Performance Specifications

Green Requirement	RoHS Compliant and Pb (lead) free
Storage temp. range	-55 to +125°C
Humidity	85% RH, 85°C, 48 hours
Hermetic seal	Leak rate $2x10^{-8}$ ATM-cm^3/sec max.
Solderability	MIL-STD-202F method 208E
Reflow	260°C for 10 sec.
Vibration	MIL-STD-202F method 204, 35G, 50 to 2000 Hz
Shock	MIL-STD-202F method 213B, test condition. E, 1000GG ½ sine wave

How to Order: **Part Number Example**

Group P

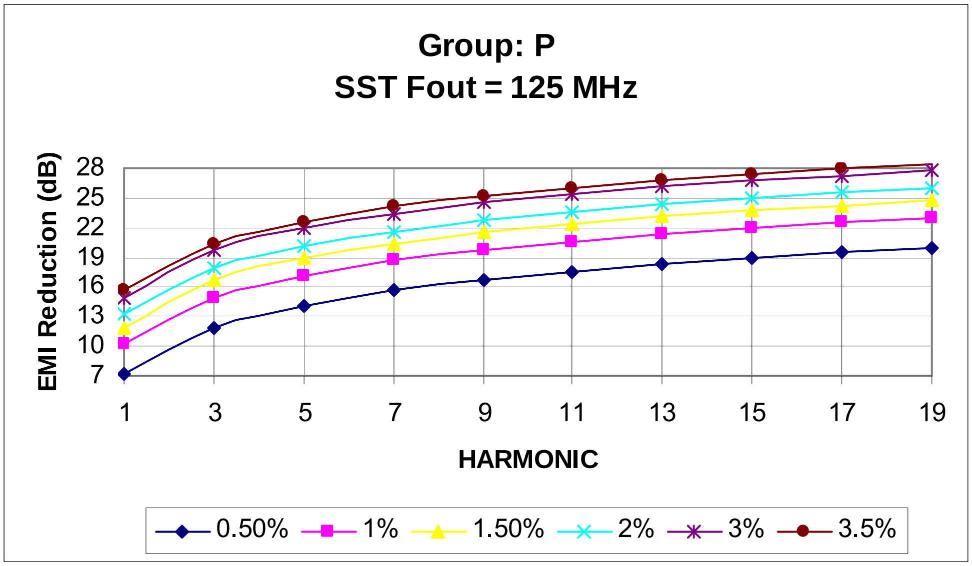
3HM57-B-100.000P-D3

Spread Types and %	
Down Spread	Available from D0.25 (-0.25%) to D3.75 (-3.75%).
Center Spread	Available from C0.125 (±0.125%) to C1.875 (±1.875%).

Frequency Stability Code
"A" ~"F". See table above

Frequency (MHz)

EMI Reduction Data 125 MHz at various spread percentages. Modulation Carrier Frequency: 48.8 KHz



Main mode: EMI reduction (dB) = $$10Log(\frac{Total\% * Frequency(MHz)}{0.12})$$

3rd Harmonic: EMI reduction (dB) = $$10Log(\frac{Total\% * Frequency(MHz) * 3}{0.12})$$

5th Harmonic: EMI reduction (dB) = $$10Log(\frac{Total\% * Frequency(MHz) * 5}{0.12})$$

For more technical information please visit www.mercury-crystal.com and download our technical note TN-020 (Title: "**Low EMI Spread Spectrum Clock Oscillators**").

Other Available Packages:

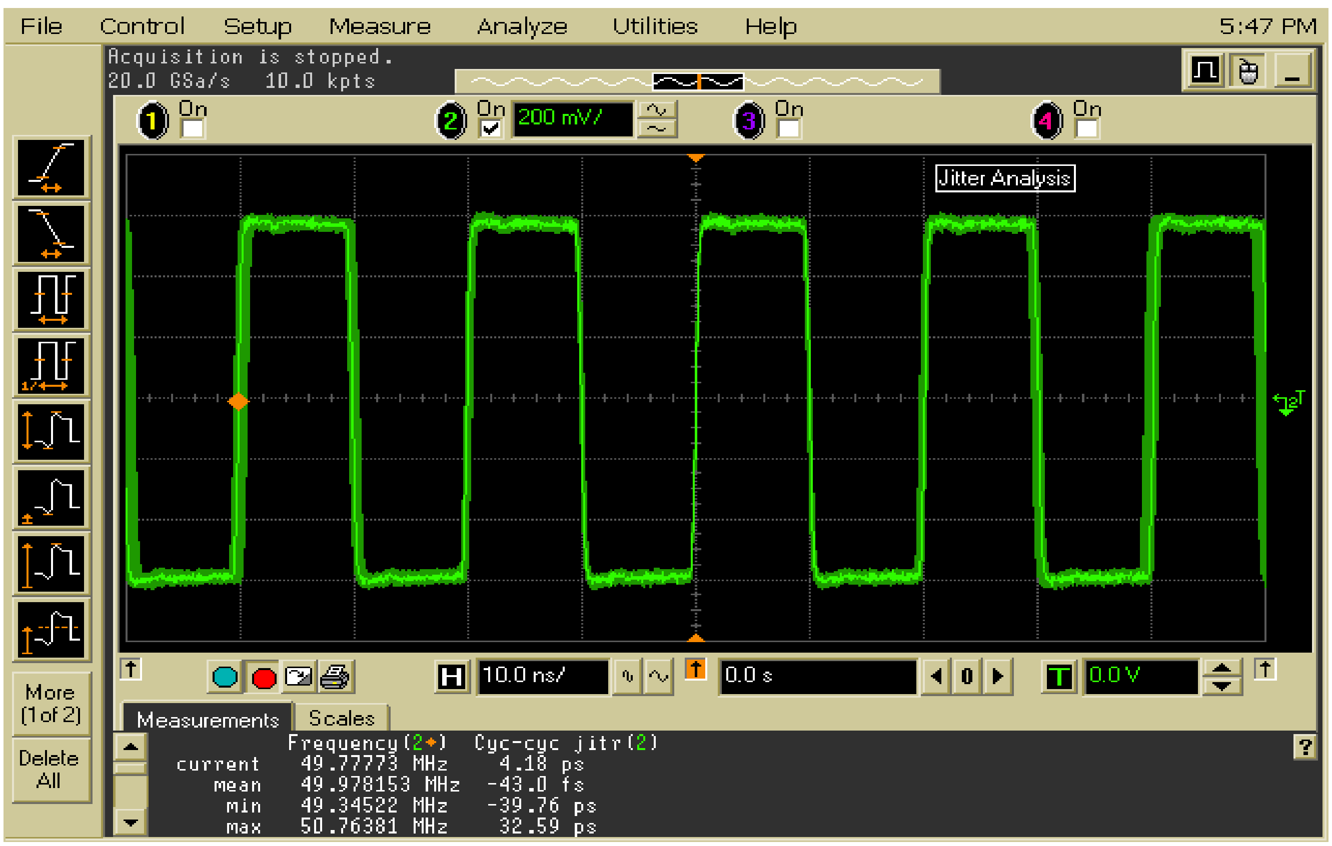
HM14 (full size 4 pin DIPs),
HM8 (half size 4 pin DIPs),
HM42 (9.6x11.4x2.5 mm FR4 base leadless SMDs)
HM44 (9.6x11.4x4.7 mm FR4 base leadless SMDs)
Please visit www.mercury-crystal.com

Instantaneous Frequencies (Example of 100 MHz)

If over-clocking is a problem to your system please choose down spread

Total Spread %	Down Spread Instantaneous Frequency		Center Spread Instantaneous Frequency	
	min.	max.	min.	max.
	Down Range	Up Range	Down Range	Up Range
0.5 %	- 1%	0%	-0.5 %	+0.5%
	-5,000 ppm	0 ppm	-2500 ppm	+2500 ppm
	99.500000	**100.000000**	**99.750000**	**100.250000**
2 %	- 2.0%	0%	-1.0 %	+1.0%
	-20,000 ppm	0 ppm	-10,000 ppm	+10,000 ppm
	98.000000	**100.000000**	**99.000000**	**101.000000**
3 %	- 3.0%	0%	-1.5 %	+1.5%
	-30,000 ppm	0 ppm	-15,000 ppm	+15,000 ppm
	97.000000	**100.000000**	**98.500000**	**101.500000**

Jitter **3HM57-B-50.000P** **Cycle-to-cycle Jitter: 32.59 ps min; 39.76 ps max.**
Sample rate: 20.0 G Sa/sec.; No. of samples: 10,000; Edge Direction: Rising edges



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