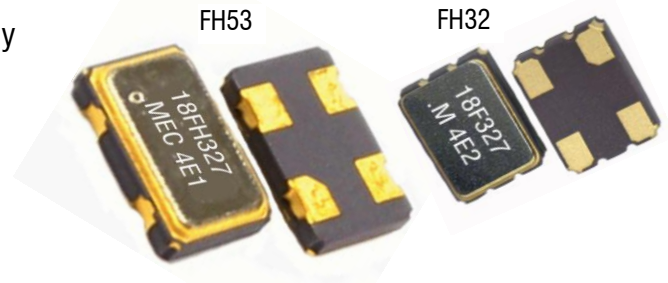


Frequency Shift Keyed Silicon Oscillators “FH32” and “FH53” Series



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The FH series is an extremely low power precision Frequency shift keyed silicon oscillator with a total frequency error less than 1.0%. This Si-gate CMOS oscillator produces a square wave output and requires no external components other than power supply bypass capacitors. The operating voltage range is 1.5V to 3.3V which allows operation from a single Li-Ion cell or 2 AA alkaline cells.



This Frequency shift keyed oscillator has two selectable output frequencies. The output frequency is selected by an external logic level signal applied to its frequency control pin (pin 1). A low level input increases the output frequency by approximately 5% compared to a high level or no input to pin 1. This allows binary data signals to be transmitted as two distinct frequencies. As an example, the output frequency of a 32.768 KHz silicon oscillator will shift to 34.406 KHz when its pin 1 is taken to logic low. The output frequency back to 32.768 KHz if the logic low is removed or logic low high is applied.

If frequency shift is not required, please select “**SH32**” or “**SH53**” series. Their pin 1 is no connection.

Features:

- Hermetically sealed & metal-lid grounded ceramic leadless package
- Superior moisture resistant, compared to plastic molded packaging
- Internally frequency tuned to the specified voltage (no external components needed)
- Ultra-low supply current [10 μ A typical at +2.5V]
- Fast start up time
- Fast frequency shift rate
- Low supply current
- +1.55V to +3.3V single supply
- Withstands high vibration and harsh environments
- Suitable for light weight, compact consumer electronic devices
- Ideal for high density boards
- RoHS compliant and (Pb) lead-free product
- No mechanical part. No PLL
- US Patent 6,281,732. A collaboration with **Micro Oscillator Inc.** www.micro-oscillator.com.



Applications:

- ▲ Microprocessor Clocks
- ▲ Remote Controls
- ▲ Data transmission



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Absolute Maximum Ratings

Power Supply Voltage V_{DD}	+3.6 V max.
Input Voltage	-0V min.; V_{DD} V max.
Output Voltage	-0V min.; V_{DD} V max.
Operation Junction Temperature	-55°C min.; +125°C max.

General Specifications: $T_a = +25^\circ\text{C}$

Product Series	“FH32” series. Package size: 3.2x2.5x1.0 mm CLCC 4 pads				
	“FH53” series. Package size: 5x3.2x1.2 mm CLCC 4 pads				
Frequency Range	20 KHz to 80 KHz				
Popular Frequency	32.768 KHz				
Frequency Shift	5% typical				
Input Voltage (V_{DD}) D.C.	+1.55 V \pm 5%	+1.8 V \pm 5%	+2.5 V \pm 5%	+3.0 V \pm 5%	+3.3 V \pm 5%
Voltage Code for Part No.	15	18	25	3	33
FH32 Availability	FH32			Not available	Not available
FH53 Availability	FH53				
Current Consumption	3 μ A typical	5 μ A typical	10 μ A typical	16 μ A typical	18 μ A typical
Initial Frequency Accuracy	\pm 0.5% max. at +25°C				
Frequency Error vs Supply Voltage	\pm 0.2% typical	\pm 0.2% typical	\pm 0.3% typical	\pm 0.2% typical	\pm 0.2% typical
Frequency Error vs Temperature (0°C to +70°C)	\pm 0.1% typical	\pm 0.1% typical	\pm 0.3% typical	\pm 0.2% typical	\pm 0.2% typical
Frequency Standard Deviation	0.5 Hz. typ.	0.5 Hz. typ.	1 Hz. typ.	2 Hz. typ.	2 Hz. typ.
Output Logic and Waveform	CMOS. Square wave.				
Output “High” Voltage; V_{OH}	0.9* V_{DD} min.				
Output “Low” Voltage; V_{OL}	0.1* V_{DD} max.				
Duty Cycle	50% \pm 5% at 50% V_{DD}				
Rise Time (T_r)/ Fall Time (T_f) Condition: 12 pF Load	38n sec. typ.	33n sec. typ.	25n sec. typ.	24n sec. typ.	24n sec. typ.
Start-up Time (T_s). (note 1)	30 μ sec. max.				
Oscillator Turn On Time. (note 2)	0.3 sec. min				
Supply Voltage Rise Time	1 μ sec. min.				

Notes:

- 1/ Output signal Frequency is stable by second pulse cycle after supply voltage is stable. This time is dependent on oscillator frequency, and is given for 32.768 KHz.
- 2/ Oscillator start up requires a relatively clean supply voltage that does not drop down towards zero volts during turn on. After the supply voltage drops below about 1v, the voltage should go to 0v for 0.3 sec. min. before the oscillator is turned on again.

Environmental Performance Specifications

Green Requirement	RoHS compliant, Pb (lead) free in accordance with EU Directive 2002/95/EC 6/6 (2002/95/EC) and WEEE (2002/96/EC). Free of halide, cadmium, hexavalent chromium, lead, mercury, PBB's and PBDE's.
Moisture Sensitivity Level	Level 1 (infinite) according to IPC/JEDEC J-STD-020D.1
Second Level Interconnect	e4
Operating Temp. Range	0 to +70°C
Storage Temp. Range	-55 to +125°C
Humidity	85% RH, 85°C, 48 hours
Fine Leak / Gross Leak	MIL-Std-883, method 1014, condition A / MIL-Std-883, method 1014, condition C
Solderability	MIL-STD-202F method 208E
Reflow	260°C max. for 10 sec.max. 2 reflows.
Vibration	MIL-STD-202F method 204, 35G, 50 to 2000 Hz
Shock	MIL-STD-202F method 213B, test condi. E, 1000GG ½ sine wave
Resistance to Solvent	MIL-STD-202, method 215
Temperature Cycling	MIL-STD-883, method 1010
Pad Surface Finish	Gold (0.3 to 1.0 μm) over nickel (1.27 to 8.89 μm)
Weight of the Device	FH32: 0.042grams typical; FH53: 0.078grams typical

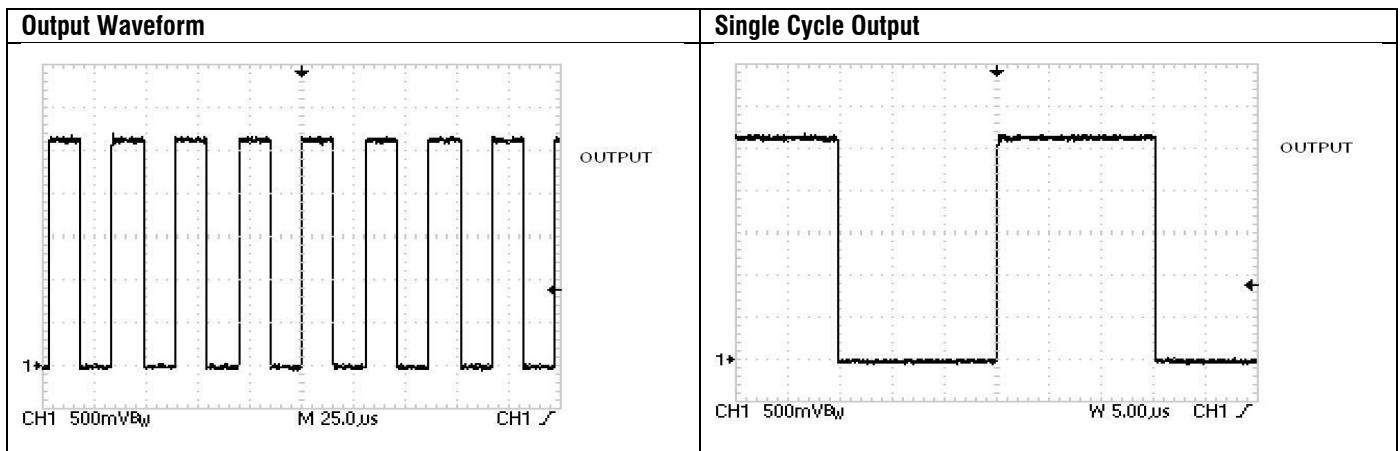
Part Number Format and Example:

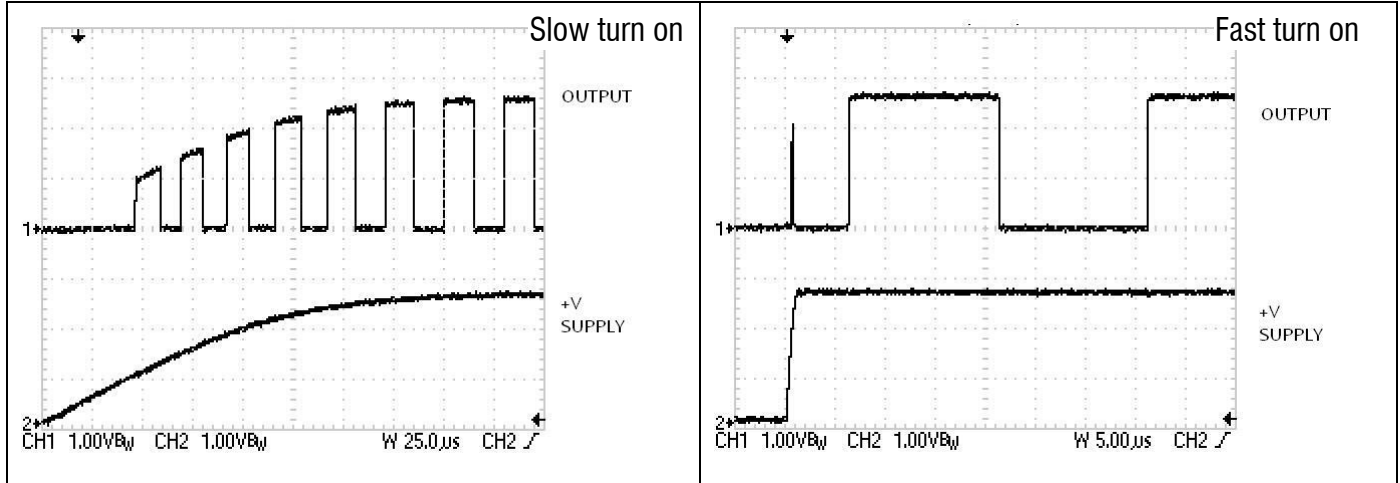
Example: **18FH32-327**

↗: User input

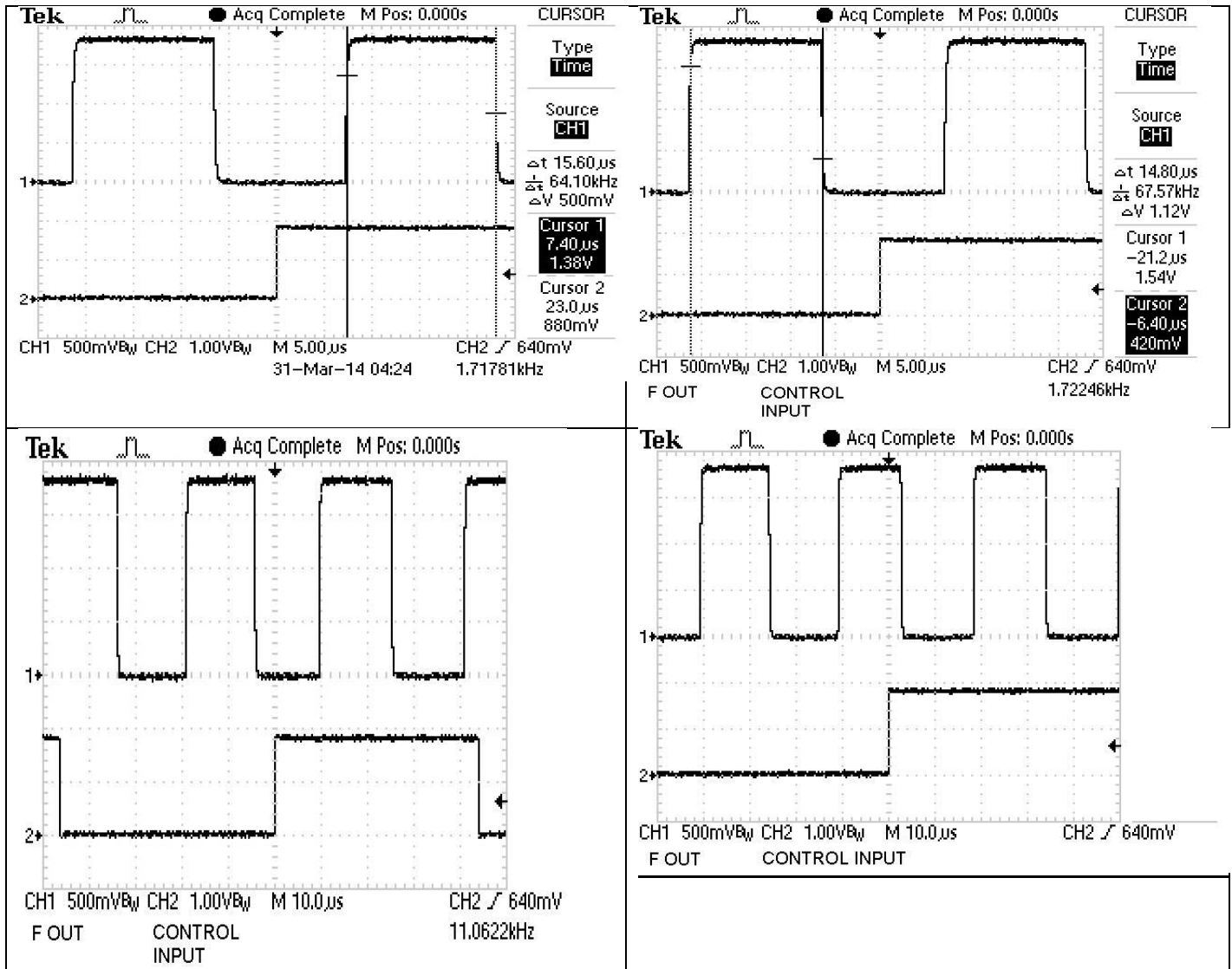
↗		↗		↗
18	FH	32	-	327
Supply voltage code “33” for 3.3V _{DD} “3” for 3.0 V _{DD} “25” for 2.5V _{DD} “18” for 1.8V _{DD} “15” for 1.55V _{DD}	Product series	Package size. “32” for 3.2x2.5x1.0 mm “53” for 5x3.2x1.2 mm		Frequency in KHz. 327 = 32.768 KHz

Typical Output Waveform



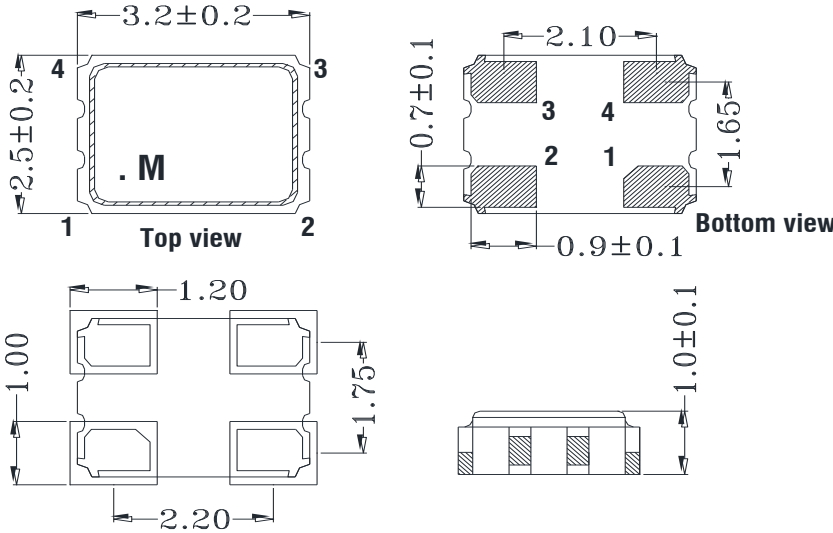


Frequency Shift Control Typical Waveform



FH32 Package Dimensions and Recommended Solder Pad Layout

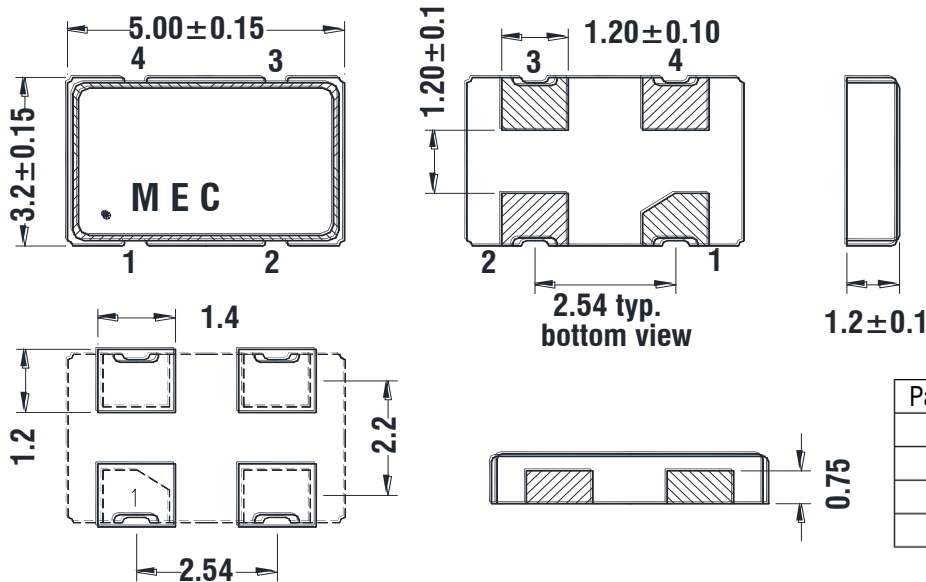
unit: (mm)



Pad No.	Function
1	Frequency Shift Input
2	Ground
3	Output
4	Supply voltage

FH53 Package Dimensions and Recommended Solder Pad Layout

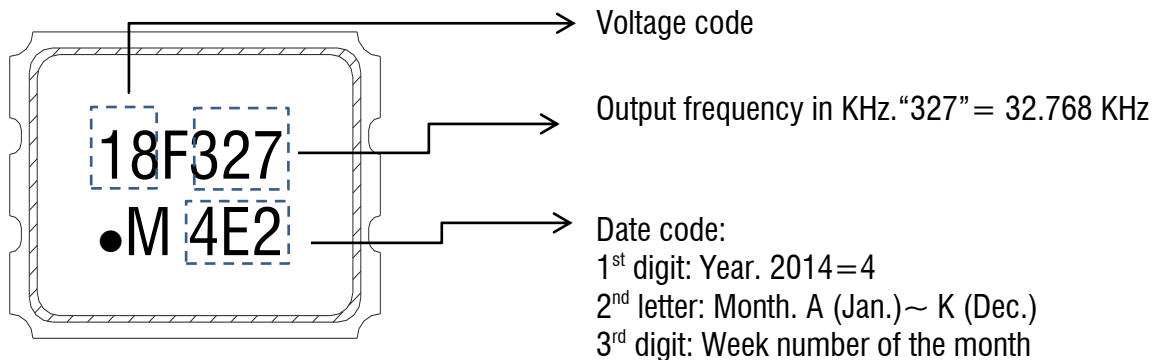
unit: (mm)



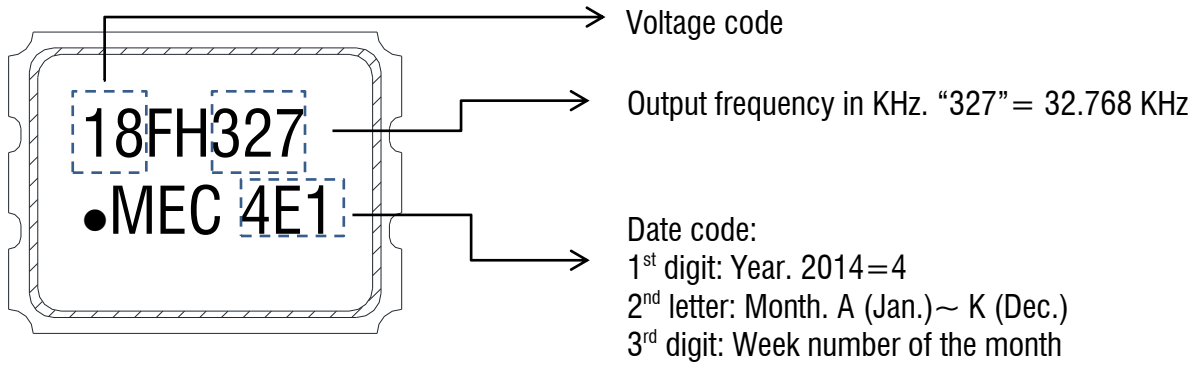
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1	Frequency Shift Input
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FH32 Product Marking

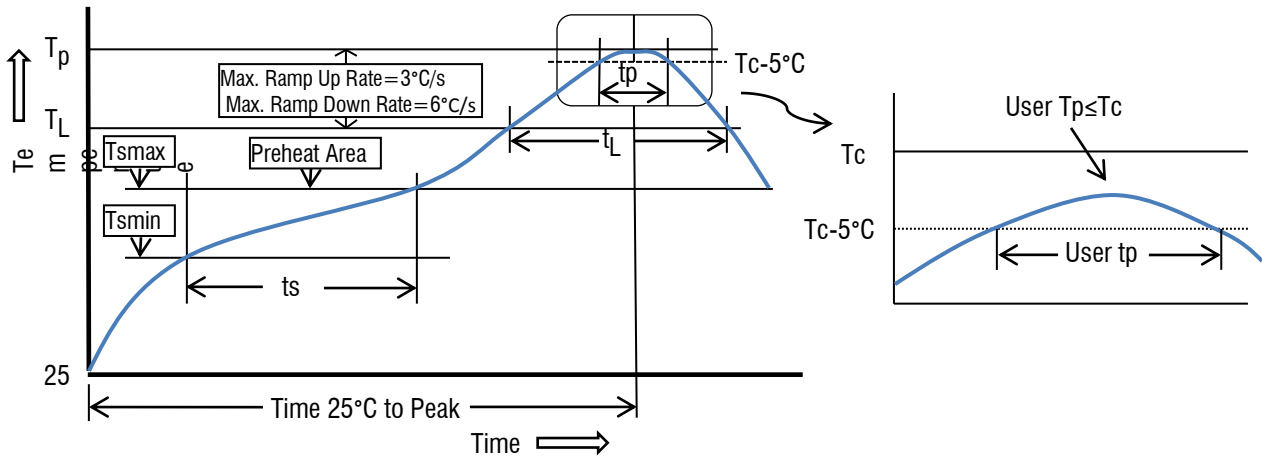
“F”: Frequency shift keyed silicon oscillator. “●”: Pad 1 index (top view); “M”: Mercury



FH53 Product Marking “FH”: Frequency shift keyed silicon oscillator; “●”: Pad 1 index (top view); “MEC”: Mercury



Recommended Solder Reflow Profile(perIPC/JEDEC J-STD-020D.1)



Profile Feature	Sn-Pb Eutectic Assembly	Pb-free Assembly
Preheat/Soak		
- Temperature min. (Ts min.)	100°C	150°C
- Temperature max. (Ts max.)	150°C	200°C
- Time (ts) (Ts min. to Ts max.)	60 to 120 seconds	60 to 180 seconds
Ramp-up rate (T_L to T_p)	3°C / sec. max.	3°C / sec. max.
Liquidous temperature (T_L)	183°C	217°C
Time (t_L) maintained above T_L	60 to 150 seconds	60 to 150 seconds
Peak package body temperature (T_p)	235°C	260°C
Time (T_p) within 5°C of the classification temperature T_c	10 to 30 seconds	20 to 40 seconds
Ramp-down rate (T_p to T_L)	6°C / second max.	6°C / second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.

All temperatures refer to topside of the package, measured on the package body surface.