

## Low Power Crystal Oscillator 32.768 kHz

### Description

The EM1564 is a very low power crystal oscillator, which consists of a 32.768 kHz tuning fork crystal and an advanced CMOS circuit assembled in the same very small SMD ceramic package.

Very low power consumption, as low as 300nA, is guaranteed over a very wide supply voltage and temperature ranges.

The EM1564 is a completely lead free product.

### Applications

- General purpose clock generator for digital systems
- Clock drivers for Real Time Clocks
- Timekeeping in network servers and computers
- Data logger
- Electricity, gas and water metering
- Portable field communication
- Mobile phone

### Features

- All-in-one-package solution
- Miniature ceramic package for SMD mounting
- Package height 1.2mm
- Very low power consumption typ. 300nA
- Very tight frequency tolerance
- Excellent oscillator stability: 0.2 ppm/V
- Wide supply voltage range: 1.2V to 5.5V
- Operating temperature range: -40°C to +85°C
- On request extended temperature range: -40°C to +125°C
- Low aging
- High shock and vibration resistant
- 100% lead free, RoHS - compliant

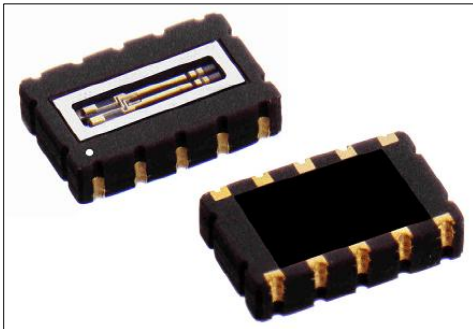


Fig. 1

### Block Diagram

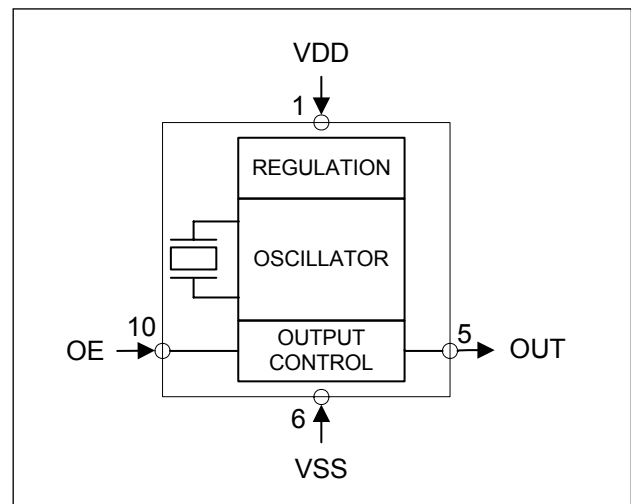
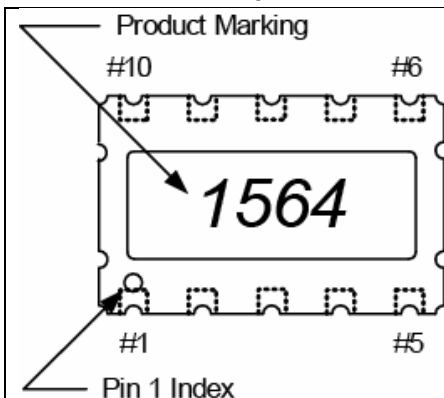


Fig. 2

### Pin Connection Top View



Pin	Connection	
1	V <sub>DD</sub>	Positive Supply Voltage
5	OUT	Frequency Output
6	V <sub>SS</sub>	Negative Supply Voltage
10	OE	Output Enable

Pins 2, 3, 4, 7, 8, 9 are not connected



# EM1564

## Absolute Maximum Ratings

Parameter	Symbol	Conditions
Voltage at $V_{DD}$ to $V_{SS}$	$V_{DD}$	-0.3V to +6V
Minimum voltage at OE	$V_{MIN}$	$V_{SS} - 0.3V$
Maximum voltage at OE	$V_{MAX}$	$V_{DD} + 0.3V$
Storage temperature range	$T_{STG}$	-55°C to +150°C
Maximum soldering	$T_{Smax}$	260°C x 20s

Stresses above these listed maximum ratings may cause permanent damages to the device. Exposure beyond specified operating conditions may affect device reliability or cause malfunction.

## Handling Procedures

This device has built-in protection against high static voltages or electric fields; however, anti-static precautions must be taken as for any other CMOS component. Unless otherwise specified, proper operation can only occur when all terminal voltages are kept within the voltage range. Unused inputs must always be tied to a defined logic voltage level.

## Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply voltage	$V_{DD}$	1.2	5.5	V
Operating temperature	$T_A$	-40	+85	°C

## Electrical Characteristics

Unless otherwise specified:  $V_{DD} = 3.0V$ ,  $V_{SS} = 0V$ ,  $T_A = 25^\circ C$

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Supply voltage range	$V_{DD}$		1.2	3.0	5.5	V
Current consumption (Note1)	$I_{DD1}$	$V_{DD} = 5.0V$ , OE at $V_{SS}$		300	550	nA
		$V_{DD} = 3.0V$ , OE at $V_{SS}$		250	500	nA
		$V_{DD} = 2.0V$ , OE at $V_{SS}$		250	500	nA
		$V_{DD} = 5.0V$ , OE at $V_{SS}$ Top=-40 to +85°C		750	1000	nA
		$V_{DD} = 3.0V$ , OE at $V_{SS}$ Top=-40 to +85°C		650	900	nA
		$V_{DD} = 2.0V$ , OE at $V_{SS}$ Top=-40 to +85°C		650	900	nA
<b>Oscillator</b>						
Start up voltage	$V_{STARTUP}$	$t_{STARTUP} < 3s$	1.2			V
Start up time	$t_{STARTUP}$			0.4	0.8	s
Frequency stability against supply voltage variations	$\Delta f/f \cdot \Delta V$	$1.5 \leq V_{DD} \leq 5.5V$		0.2	2	ppm/V
<b>Input</b>						
Input voltage	$V_{IL}$		$V_{SS}$		$0.2 \times V_{DD}$	V
	$V_{IH}$		$0.8 \times V_{DD}$		$V_{DD}$	V
<b>Output</b>						
Duty cycle			40	50	60	%
Output voltage	$V_{OH}$	$I_{OH} = -1.0 mA$ , $V_{DD} = 5.0V$	$V_{DD} - 0.4$	$V_{DD} - 0.1$		V
	$V_{OL}$	$I_{OL} = 1.0 mA$ , $V_{DD} = 5.0V$		0.14	0.4	V
Output rise time	$T_r$	$C_L = 15pF$ $10\%V_{DD} \rightarrow 90\%V_{DD}$		70	100	ns
Output fall time	$T_f$	$C_L = 15pF$ $90\%V_{DD} \rightarrow 10\%V_{DD}$		70	100	ns
Output frequency	f			32768		kHz
Frequency tolerance	$\Delta f/f$	(Note2)		$\pm 20$		ppm
Aging first year max	$\Delta f/f$			$\pm 3$		ppm
Frequency vs temperature	$(\Delta f/f) / ^\circ C^2$			$-0.035 \pm 10\%$		ppm/°C <sup>2</sup>

**Note1:** The current consumption when the output clock is enabled (OE pin at  $V_{DD}$ ) is a function of the load capacitance on the OUT pin, the output frequency  $f_{OUT} = 32768Hz$  and the supply voltage  $V_{DD}$ .

The additional consumption for a given load can be calculated from:  $\Delta I_{DD} = C_{LOAD} \times V_{DD} \times f_{OUT}$

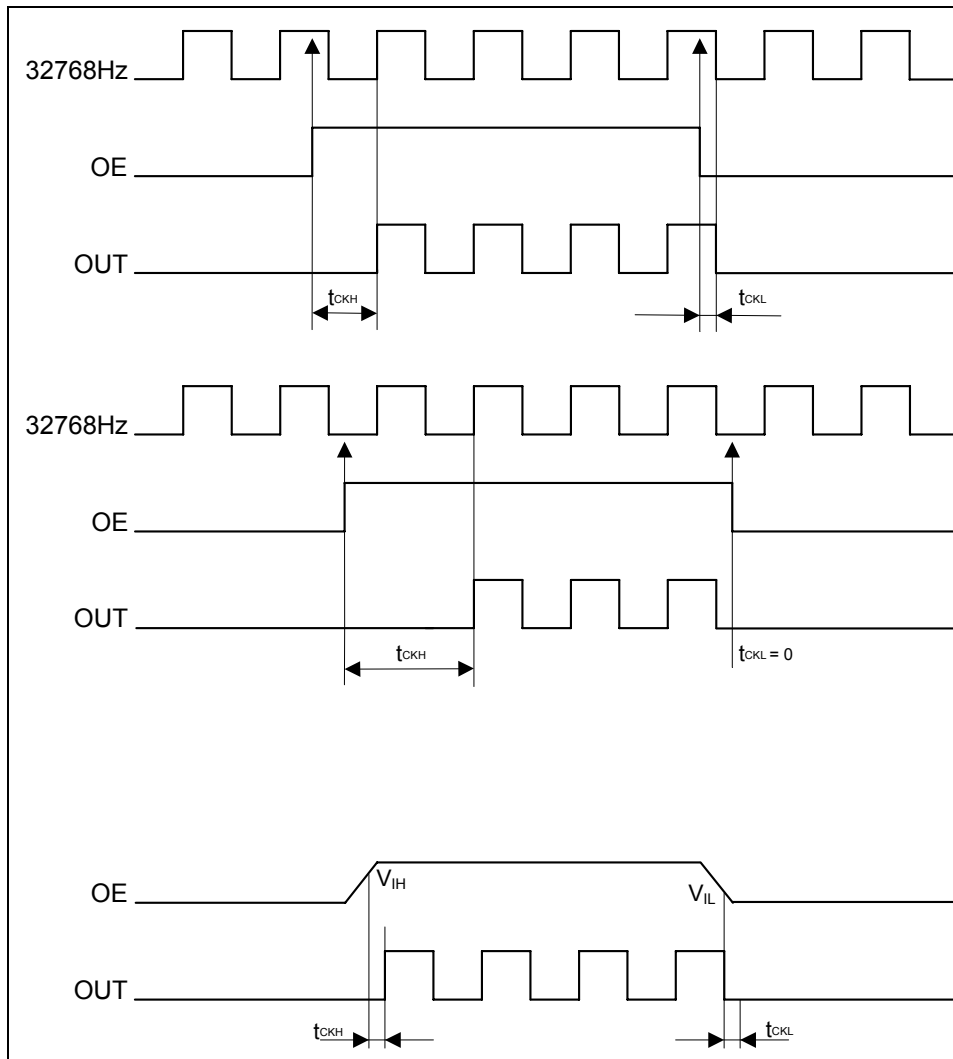
**Note2:** Tighter tolerances are available on request.

## Environmental Characteristics

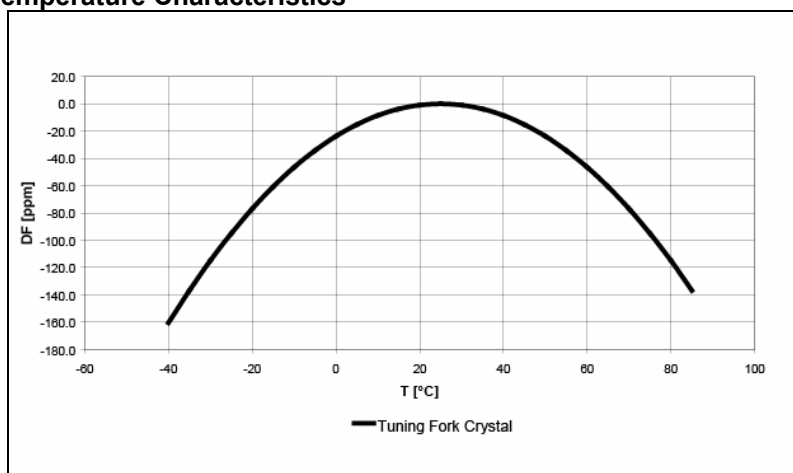
Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Shock resistance	$\Delta f/f$	5000g, 0.3ms, 1/2sine			$\pm 5$	ppm
Vibration resistance	$\Delta f/f$	20g / 10-2000Hz			$\pm 5$	ppm



## Timing Waveforms



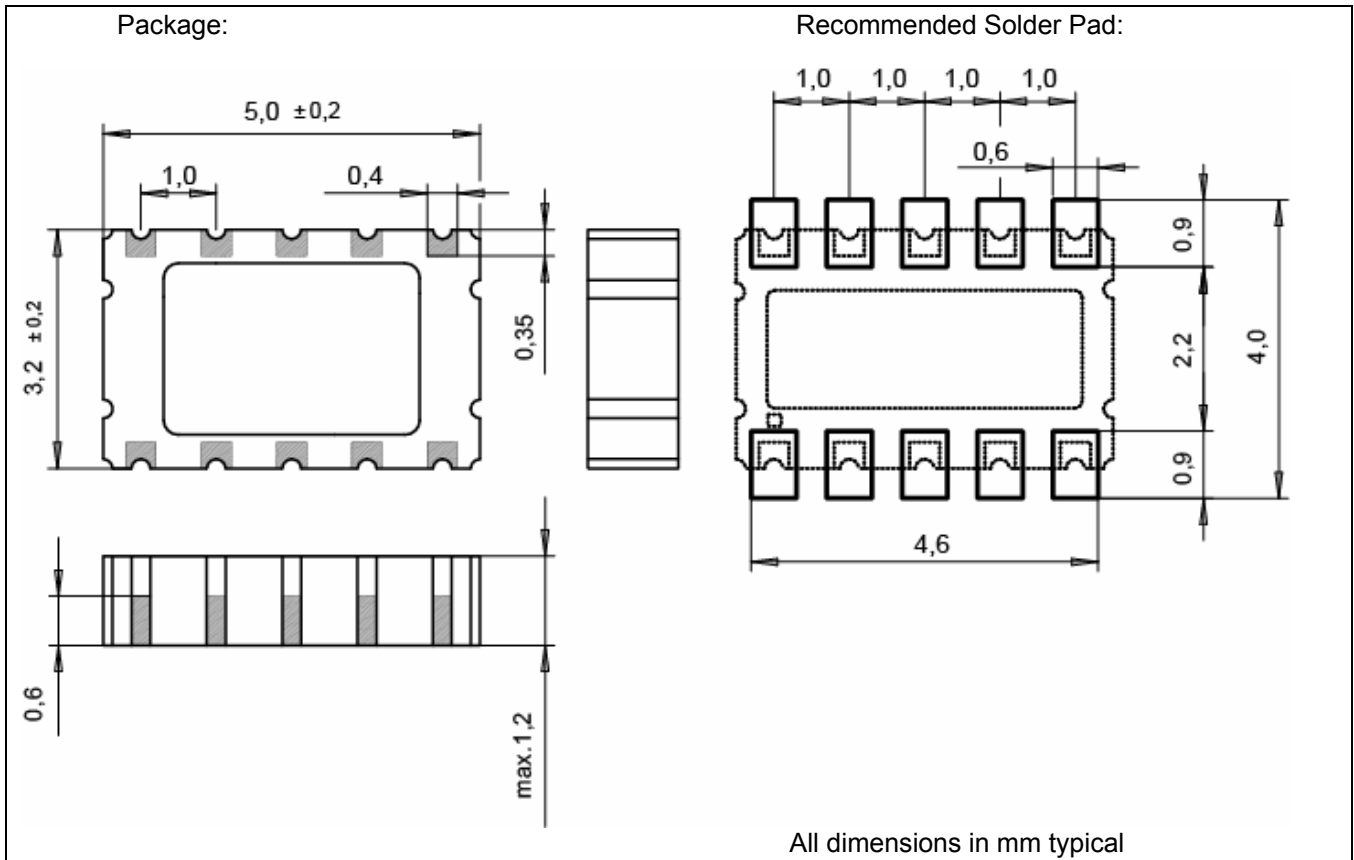
## Frequency Temperature Characteristics





# EM1564

## Package Information:



The termination is with Au flashed pads for SMD mounting.

## Ordering Information

The EM1564 can be delivered with different frequency tolerances and in different packages. Contact EM Microelectronic for availability of different options not shown in the table below. Please make sure to write the exact Part Number when ordering.

Part Number	Version	Frequency Tolerance	Package Type	Top Marking	Delivery Form
EM1564V1SON10B+	V1	$\pm 20$ ppm <b>(Note2)</b>	SON -10	1464	7"(178mm) reel with 1'000 packages 10"(254mm)reel with 2'500 packages 13"(330mm)reel with 5'000 packages

**Note2:** Tighter tolerances are available on request.

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