

Low Power Crystal Oscillator 32.768 kHz

Description

The EM7604-C7 is a very low power crystal oscillator, which consists of a 32.768 kHz tuning fork crystal and an advanced CMOS oscillator circuit assembled in the same ultra small, cost-effective SMD ceramic package C7. No external components are required.

It combines excellent oscillator stability with a very low power consumption of typ. 300nA, guaranteed over a very wide supply voltage and temperature range.

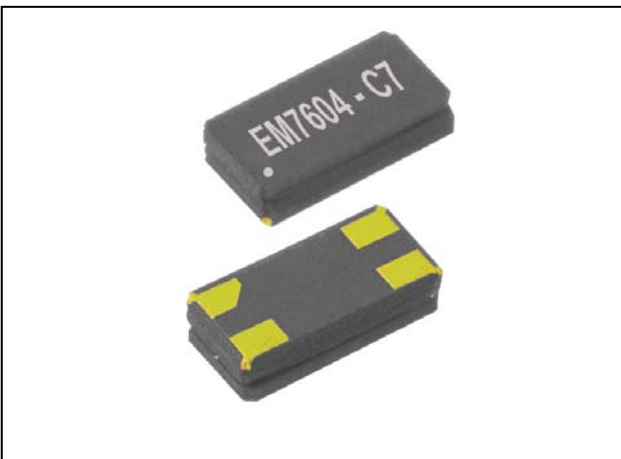
The output frequency is synchronized with signal on input Clock Enable CLKEN. The frequency output CLKOUT is enabled by connecting Clock Enable pin CLKEN to V_{DD} . Connecting CLKEN to V_{SS} , disables the frequency and the output CLKOUT is at Low State.

Typical Applications

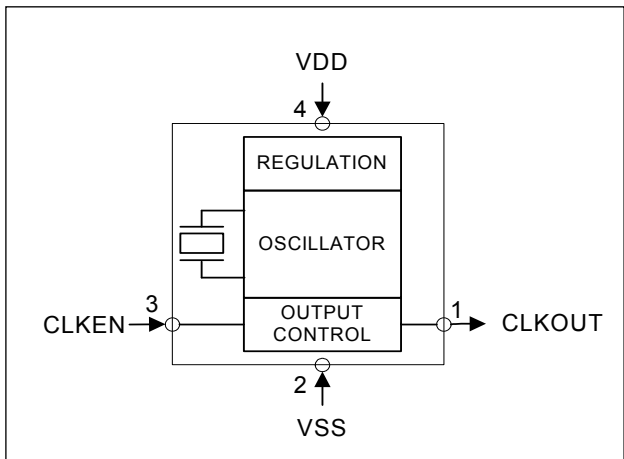
- General purpose clock generator for digital systems
- Clock drivers for Real Time Clocks
- Timekeeping in network servers and computers
- Electricity, gas and water metering
- Portable field communication
- Mobile phone

Features

- Very low power consumption typ. 300nA
- Wide supply voltage range: 1.2V to 5.5V
- Operating temperature range: -40°C to $+85^{\circ}\text{C}$. Extended temperature range from -40°C to $+125^{\circ}\text{C}$ is available on request
- Very tight frequency tolerances: $\pm 20\text{ppm}$ and $\pm 5\text{ppm}$
- Excellent oscillator stability: 0.2 ppm/V
- Synchronised output after Enable/Disable
- Low aging
- High shock and vibration resistant
- All-in-one-package solution
- Miniature ceramic package for SMD mounting, package height 1.0mm
- 100% lead free, RoHS - compliant

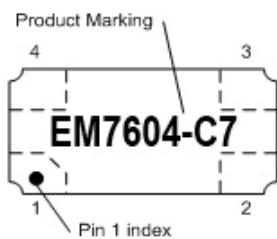


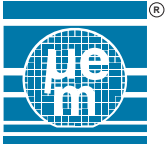
Block Diagram



Pin Connection Top View

| Pin | Connection | |
|-----|------------|-------------------------|
| 1 | CLKOUT | Frequency Output |
| 2 | V_{SS} | Negative Supply Voltage |
| 3 | CLKEN | Output Enable |
| 4 | V_{DD} | Positive Supply Voltage |





EM7604-C7

Absolute Maximum Ratings

| Parameter | Symbol | Conditions |
|---------------------------------|------------|-----------------|
| Voltage at V_{DD} to V_{SS} | V_{DD} | -0.3V to +6V |
| Minimum voltage | V_{MIN} | $V_{SS} - 0.3V$ |
| Maximum voltage | 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

$V_{DD} = 3.0V$; $V_{SS} = 0V$; $T_A = 25^\circ C$; unless otherwise specified.

| Parameter | Symbol | Conditions | Min | Typ | Max | Unit |
|-----------------------------------|--------------------------------|---|---------------------|-----------|---------------------|---------------------|
| Supply | | | | | | |
| Supply voltage range | V_{DD} | | 1.2 | 3.0 | 5.5 | V |
| Mean current consumption (Note 1) | I_{DD} | $V_{DD} = 5.0V$, CLKEN at V_{SS} | | 300 | 550 | nA |
| | | $V_{DD} = 3.0V$, CLKEN at V_{SS} | | 250 | 500 | nA |
| | | $V_{DD} = 5.0V$, CLKEN at V_{SS} , $T_A = -40$ to $+85^\circ C$ | | 750 | 1000 | nA |
| | | $V_{DD} = 3.0V$, CLKEN at V_{SS} , $T_A = -40$ to $+85^\circ C$ | | 650 | 900 | nA |
| Oscillator + Quartz | | | | | | |
| Output frequency | f_o | | | 32.768 | | kHz |
| Frequency tolerance (Note 2) | | | | | ± 20 | ppm |
| Starting voltage | V_{ST} | Within 3 seconds | 1.2 | | | V |
| Start-up time | T_{ST} | | | 0.4 | 0.8 | sec |
| Voltage coefficient | $\Delta f/f_o * \Delta V_{DD}$ | $1.5V \leq V_{DD} \leq 5.5V$ | | ± 0.2 | ± 2 | ppm/V |
| Aging first year @ 25°C | $\Delta f/f_o$ | | | | ± 3 | ppm |
| Temperature coefficient | β | | -0.039 | -0.035 | -0.031 | ppm/°C ² |
| Output driver CLKOUT | | | | | | |
| Output voltage high | V_{OH} | $I_{OH} = -1.0mA$ | $V_{DD} - 0.4$ | | | V |
| Output voltage low | V_{OL} | $I_{OL} = 1.0mA$ | | | $V_{SS} + 0.4$ | V |
| Output rise time | t_r | $C_L = 15pF$, 10% to 90% V_{DD} | | 70 | 100 | ns |
| Output fall time | t_f | $C_L = 15pF$, 10% to 90% V_{DD} | | 70 | 100 | ns |
| Duty cycle | | | 49 | 50 | 51 | % |
| Output Enable CLKEN | | | | | | |
| Input voltage low | V_{IL} | | V_{SS} | | $0.2 \times V_{DD}$ | V |
| Input voltage high | V_{IH} | | $0.8 \times V_{DD}$ | | V_{DD} | V |

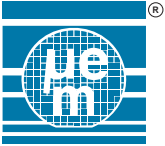
Note 1: The current consumption when the output clock is enabled (CLKEN pin at V_{DD}) is a function of the load capacitance on the CLKOUT pin, the output frequency $f_{OUT} = 32768Hz$ and the supply voltage V_{DD} .

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

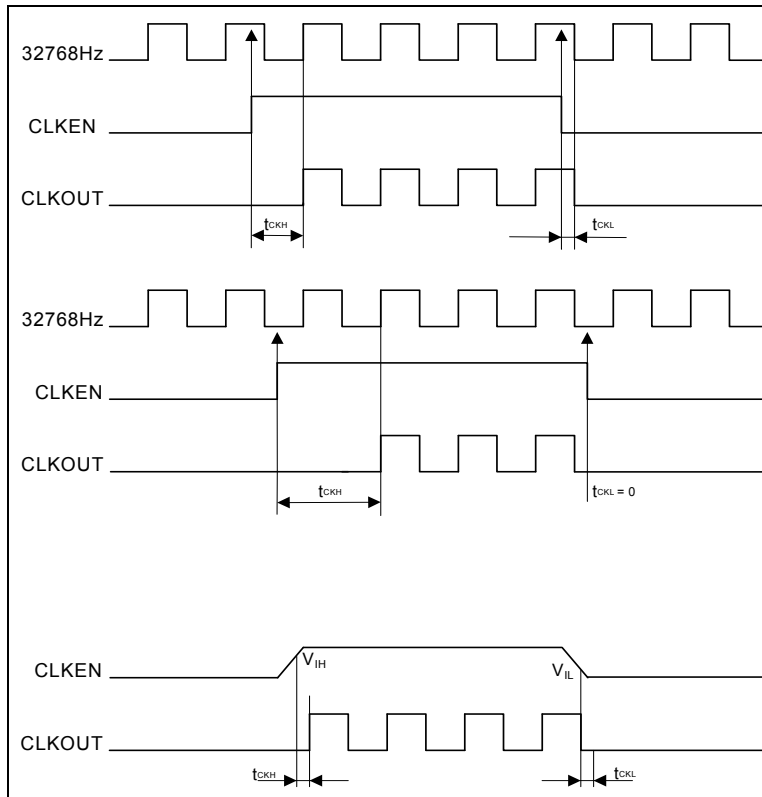
Note 2: ± 5 ppm is also available on request.

Environmental Characteristics

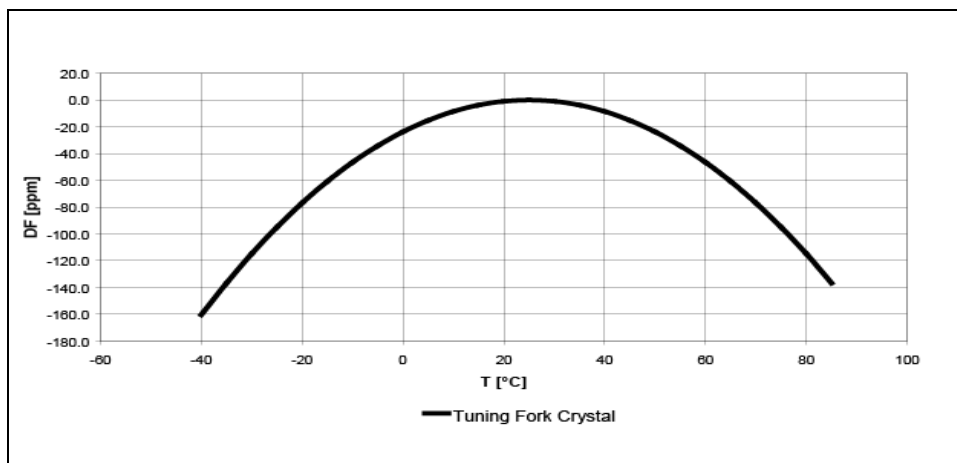
| Parameter | Symbol | Conditions | Maximum Deviation | Unit |
|----------------------|----------------|--------------------------|-------------------|------|
| Shock resistance | $\Delta f/f_o$ | 5000 g, 0.3 ms, 1/2 sine | ± 5 | ppm |
| Vibration resistance | $\Delta f/f_o$ | 20 g / 10 – 2000Hz | ± 5 | ppm |

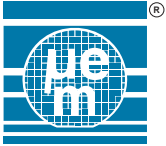


Timing Waveforms



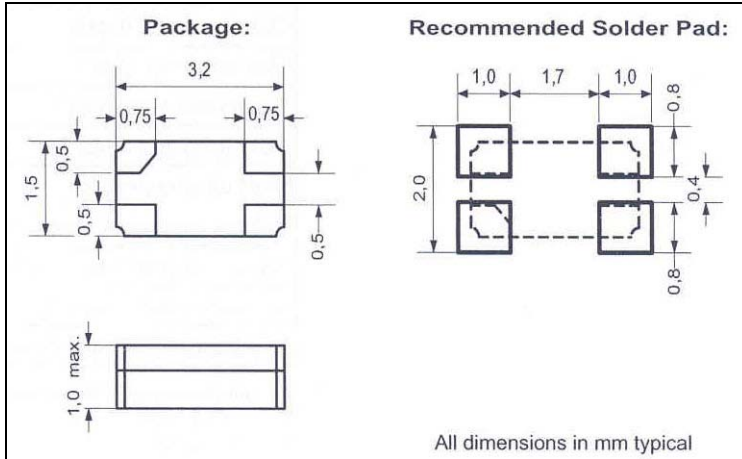
Frequency Temperature Characteristics





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Package Information:



The termination is with Au flashed pads for SMD mounting.

Ordering Information

Please make sure to quote the exact Part Number when ordering.

| Part Number | Version | Frequency Tolerance | Package Type | Marking | Delivery Form |
|------------------------|------------|---------------------|--------------|------------|--|
| EM7604V20SCP4B+ | V20 | ± 20 ppm | SCP – 4 pin | OV-7604-C7 | 12mm tape, 7" reel with 1'000 packages 12mm tape, 10" reel with 2'500 packages 12mm tape, 13" reel with 5'000 packages |
| EM7604V05SCP4B+ | V05 | ± 5 ppm | SCP – 4 pin | OV-7604-C7 | 12mm tape, 7" reel with 1'000 packages 12mm tape, 10" reel with 2'500 packages 12mm tape, 13" reel with 5'000 packages |

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