

Low Power Crystal Oscillator 32.768 kHz

Description

The EM7604 is an advanced low power CMOS circuit intended to be used together with a 32.768 kHz tuning fork crystal as a low frequency clock oscillator.

Except the crystal, no other external components are required.

In order to achieve a high frequency accuracy, the matched crystals should have a ± 20 ppm tolerance or tighter.

Very low power consumption, as low as 250nA, is guaranteed over a very wide supply voltage and temperature ranges.

Offered in a small SOT23-6 package, the EM7604 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
- Electricity, gas and water metering
- Portable field communication
- Mobile phone
- Solution for problems with embedded quartz oscillators

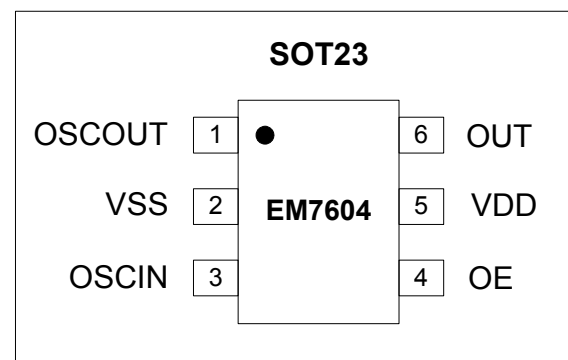
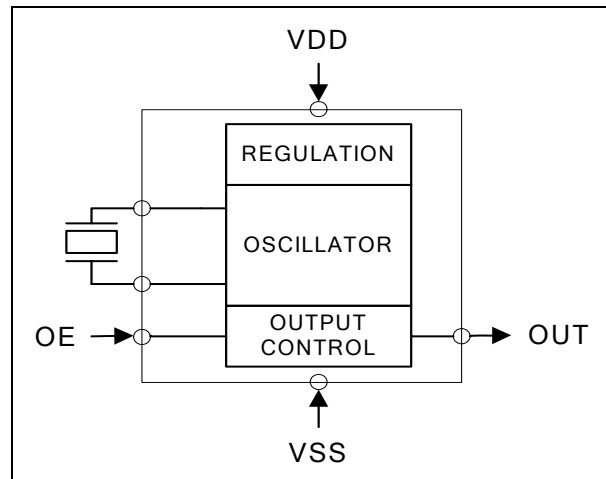
Pin Assignment

Pin	Connection	Assignment
1	OSCOUT	Oscillator Output
2	VSS	Negative Supply Voltage
3	OSCIN	Oscillator Input
4	OE	Output Enable
5	VDD	Positive Supply Voltage
6	OUT	Frequency Output

Features

- Very low power consumption: typ. 250nA
- On chip integrated oscillation capacitor: $C_L=8$ pF
- Matched low cost SMD quartz available from Micro Crystal
- Compatibility with crystals having high series resistance
- Very tight frequency tolerance
- Excellent oscillator stability: 0.2ppm/V
- Wide supply voltage range: 1.2V to 5.5V
- Operating temperature range: -40°C to $+125^{\circ}\text{C}$
- Small SOT23-6 package
- 100% lead free, RoHS – compliant

Block Diagram





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.

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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	+125	°C

Electrical Characteristics

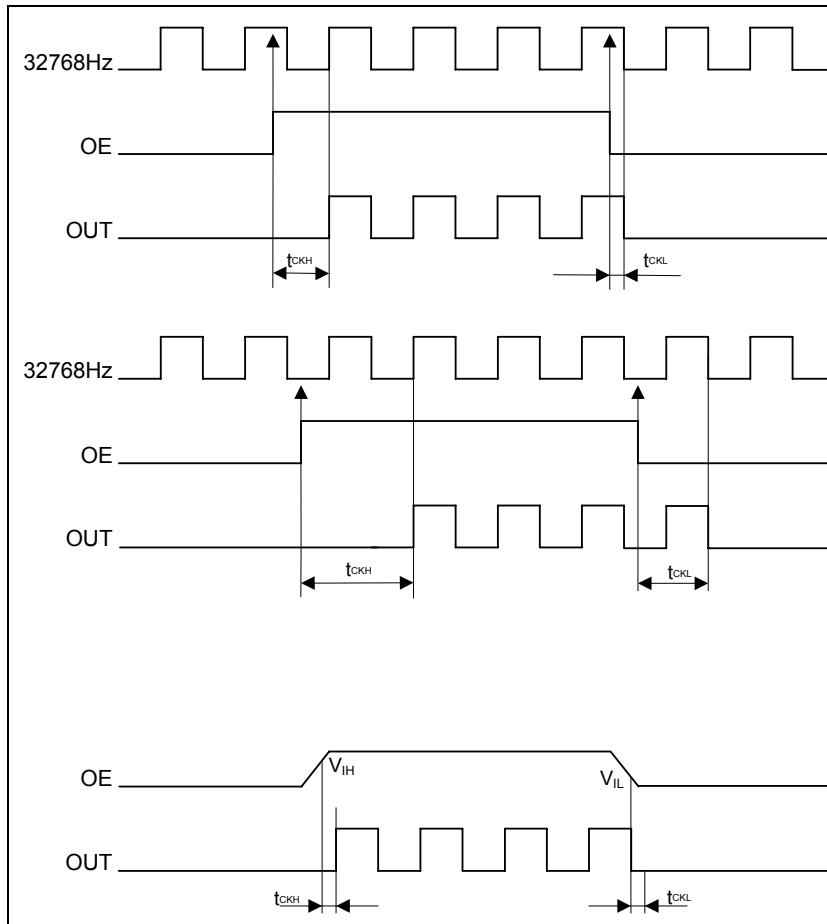
Unless otherwise specified: $V_{DD}= 3.0V$, $V_{SS}= 0V$, $T_A=25^\circ C$ and $R_S= 60k\Omega$

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
Oscillator						
Input Capacitance	C_{IN}			16		pF
Output Capacitance	C_{OUT}			16		pF
Start Up Voltage	$V_{STARTUP}$	$t_{START} < 3s$	1.2			
Start Up Time	$t_{STARTUP}$			0.4	0.8	s
Frequency Stability against Supply Voltage Variations	$\Delta f/f * \Delta V$	$1.5 \leq V_{DD} \leq 5.5V$		0.2	2	ppm/V
Input						
Input Voltage	V_{IL}		V_{SS}		$0.2 \times V_{DD}$	V
	V_{IH}		$0.8 \times V_{DD}$		V_{DD}	V
Output						
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 and Fall Time	t_{RF}	$C_L = 15pF$ 10% - 90%		70	100	ns

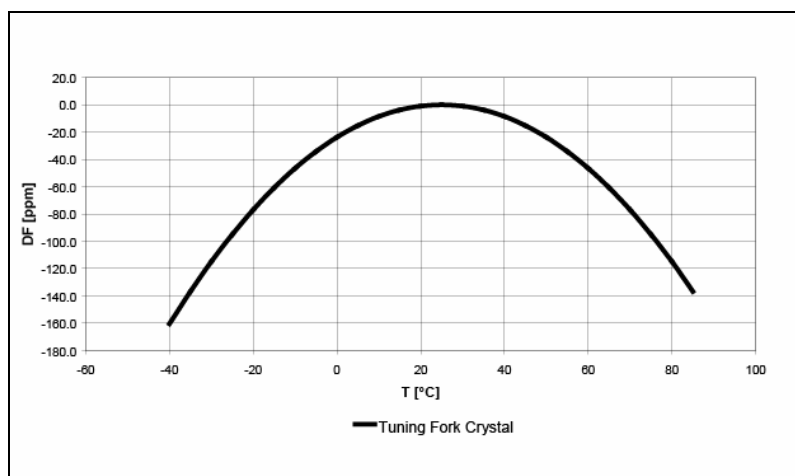
Note1: The current consumption when the output clock is enabled (OE pin at V_{DD}) is a function of the load capacitance on the OUT pin, the output frequency $f_{OUT} = 32768Hz$ and the supply voltage V_{DD} .

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

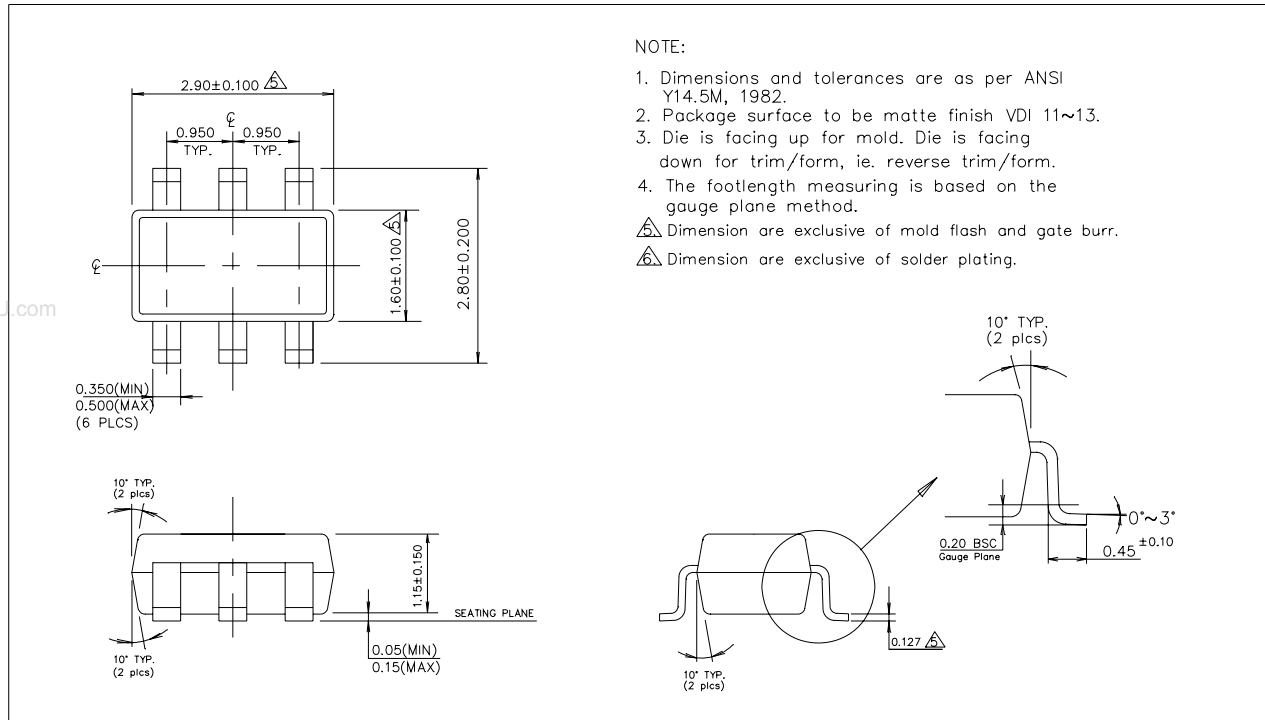
Timing Waveforms



Frequency Temperature Characteristics with Standard 32.768 kHz Crystal



Package Information:



Ordering Information

Part Number	Package Type	Top Marking	Delivery Form
EM7604V1SP6B+	SOT23	OVXY	Tape & Reel

Contact EM Microelectronic for availability in chip form or in other packages.

XY characters of the Top Marking are used for the lot traceability.

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