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# DS76KHz 76.8 kHz TCXO

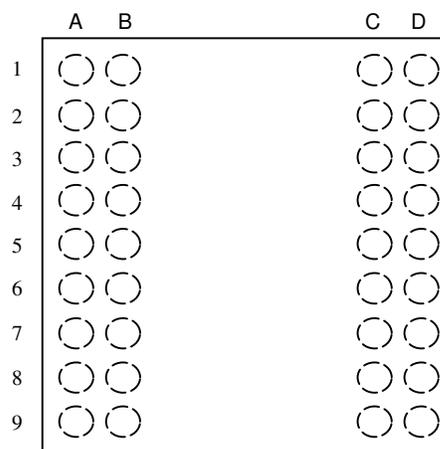
[www.dalsemi.com](http://www.dalsemi.com)

## FEATURES

- Accurate to  $\pm 7.5$  ppm ( $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ )
- Accurate to  $\pm 2$  ppm ( $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$ )
- Battery back up for continuous output
- $V_{\text{BAT}}$  operating voltage 2.7 to 5.5 volts (with  $V_{\text{CC}}$  grounded)
- $V_{\text{CC}}$  operating voltage 4.5 to 5.5 volts
- Operating temperature range:
  - COM:  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$
  - IND:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- No calibration required
- Low power consumption
- Surface mountable

$V_{\text{CC}}$ : C2, C3, D2, D3  
 $V_{\text{BAT}}$ : A4, A5, B4, B5  
 76KHz: C4, C5, D4, D5  
 GND: All Remaining Balls

## PIN ASSIGNMENT



DS76KHz 36-Pin SMD  
(TOP VIEW)

## DESCRIPTION

The DS76KHz is a temperature-compensated crystal oscillator (TCXO) with an output frequency of 76.8 kHz. This device is available in commercial and industrial temperature versions, DS76KHz and DS76KHz-N respectively.

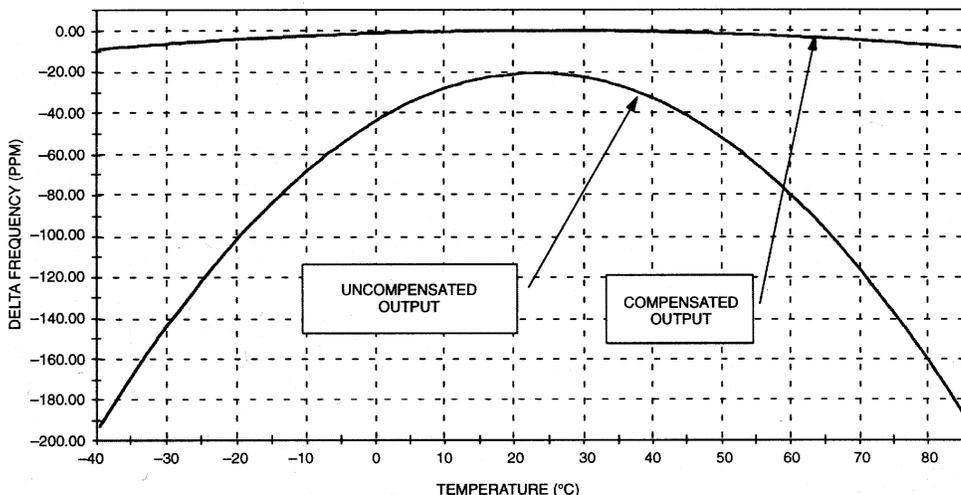
The DS76KHz requires four pins for operation:  $V_{\text{CC}}$ , GND,  $V_{\text{BAT}}$  and 76KHz OUT. See Figures 1, 2 and 3 for connection schemes. Power is applied via  $V_{\text{CC}}$  and GND, while  $V_{\text{BAT}}$  is used to maintain the 76KHz output in the absence of power. The output is accurate to  $\pm 7.5$  ppm from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  and  $\pm 2$  ppm from  $0^{\circ}\text{C}$  to  $40^{\circ}\text{C}$ .

The DS76KHz is packaged in a small 36-pin SMD, utilizing Ball Grid Array (BGA) technology, with dimensions 0.400 inches wide, 0.450 inches long, and 0.180 inches high.

The recommended land pattern layout is shown on page 5.

The additional board space required is negligible in most applications and therefore the recommended land pattern layout should be implemented on all new designs and future board revisions to satisfy applications requiring better accuracy.

## DELTA FREQUENCY vs TEMPERATURE



## POWER SUPPLY CONNECTIONS

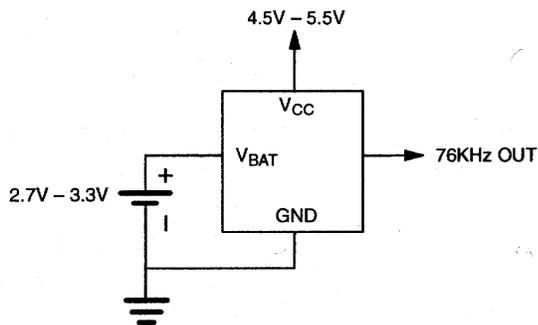


Figure 1.0

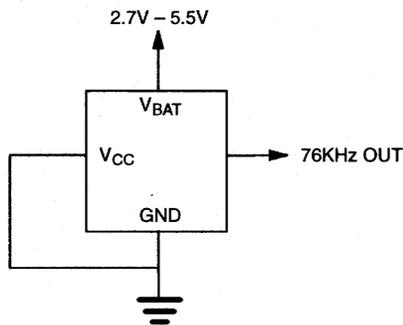


Figure 2.0

Figure 1.0 shows how the DS76KHz should be connected when using two power supplies.  $V_{CC}$  should be between 4.5 and 5.5 volts while  $V_{BAT}$  should be between 2.7 and 3.3 volts. Figure 2.0 shows how the DS76KHz can be used when only a single supply is available.  $V_{CC}$  should be grounded and  $V_{BAT}$  should then be held between 2.7 and 5.5 volts. The  $V_{BAT}$  pin should be connected directly to a battery using no external components. Figure 2.0 illustrates how the DS76KHz can be used in a single supply system.

## DS76KHz CONNECTIONS

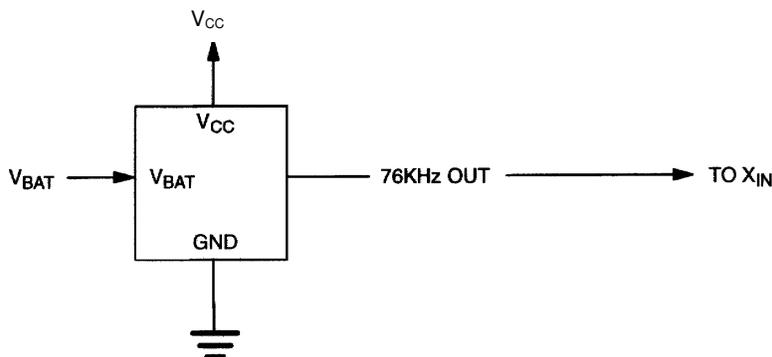


Figure 3.0

**ABSOLUTE MAXIMUM RATINGS\***

Voltage on Any Pin Relative to Ground	-3.0V to +7.0V
Operating Temperature	0°C to 70°C - Commercial -40°C to +85°C - Industrial
Storage Temperature	-40°C to +85°C
Soldering Temperature	+260°C for 10 seconds (2 times max.)

\* This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability. The Dallas Semiconductor DS76KHz is built to the highest quality standards and manufactured for long term reliability.

All Dallas Semiconductor devices are made using the same quality materials and manufacturing methods. However, the DS76KHz is not exposed to environmental stresses, such as burn-in, that some industrial applications require. For specific reliability information on this product, please contact the factory in Dallas at (972) 371-4448.

**RECOMMENDED DC OPERATING CONDITIONS** (-40°C to +85°C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Power Supply Voltage	V <sub>CC</sub>	4.5	5.0	5.5	V	1
Battery Voltage	V <sub>BAT</sub>	2.7	3.0	3.3, 5.5	V	1, 7

**DC ELECTRICAL CHARACTERISTICS** (V<sub>CC</sub>=4.5V to 5.5V; -40°C to +85°C)

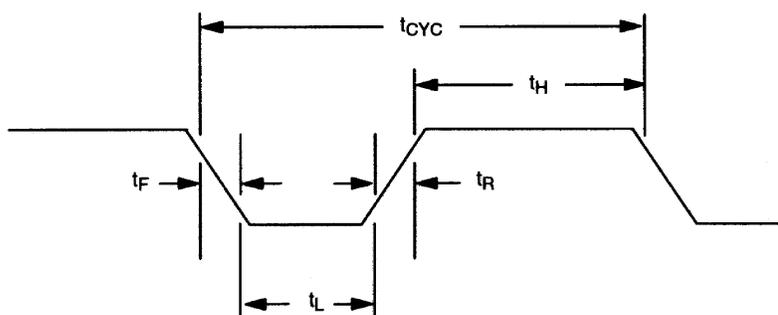
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Active Supply Current	I <sub>CC</sub>		150	180	μA	2, 8
Active Battery Current (V <sub>CC</sub> =0V, V <sub>BAT</sub> =3.3V)	I <sub>BAT</sub>		1	4	μA	3, 8
High Output Voltage (I <sub>OH</sub> =-1.0 mA)	V <sub>OH</sub>	2.4			V	6
Low Output Voltage (I <sub>OL</sub> =2.1 mA)	V <sub>OL</sub>			0.4	V	6
Battery Switch Voltage	V <sub>SW</sub>		V <sub>BAT</sub>		V	

**AC TIMING CHARACTERISTICS** (V<sub>CC</sub>=4.5V to 5.5V; -40°C to +85°C)

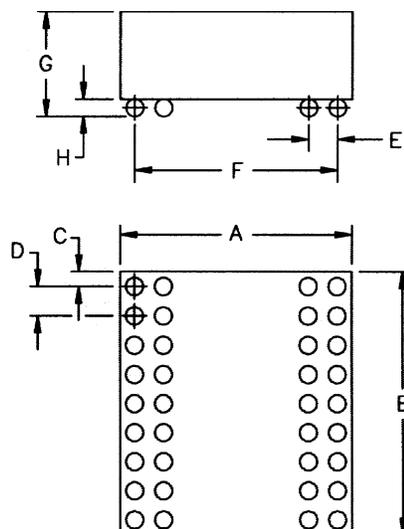
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Output Frequency	f <sub>OUT</sub>		76.8		kHz	
Frequency Stability vs Temp (0°C to 40°C) (-40°C to +85°C)	Δf/f <sub>0</sub>		±2.0 ±7.5	±7.5	PPM	
Frequency Stability vs Operating Voltage	Δf/v		±1.0		ppm/v	
Duty Cycle	T <sub>w</sub> /T	45	50	55	%	
Cycle Time	t <sub>cyC</sub>		13.021		μs	4
High/Low Time	t <sub>H</sub> /t <sub>L</sub>		6.31		μs	4
Rise Time	t <sub>R</sub>		325		ns	4
Fall Time	t <sub>F</sub>		75		ns	4
Oscillator Start-Up Time	t <sub>osc</sub>		150		ms	4

**NOTES:**

1. All voltages are referenced to ground.
2. Typical values are at +25°C and nominal supplies.
3. This current is the active mode current sourced from the backup supply/battery.
4. These parameters are measured using a 15 pF load.
5. DS76KHz-N is tested over the industrial temperature range to meet the specifications above.
6. These parameters are measured with  $V_{CC}$  on under nominal operating conditions.
7. When  $V_{CC}$  is grounded  $V_{BAT}$  can operate from 2.7V to 5.5V. Freq. stability will be affected in this operation, typically 1PPM/Volt above or below 3.0V.
8. These parameters are measured under no load conditions. The difference between  $I_{CC}$  and  $I_{BAT}$  is due to power switching circuitry.
9. Typical crystal aging is  $\pm 1$  ppm/yr after reflow.

**76KHz OUTPUT WAVEFORM****MECHANICAL DIMENSIONS**

PKG	36-PIN BALL GRID	
DIM	MIN	MAX
A (in)	.395	.405
B (in)	.445	.455
C (in)	.022	.028
D (in)	.047	.053
E (in)	.047	.053
F (in)	.347	.353
G (in)	.170	.190
H (in)	.025	.030



# RECOMMENDED LAND PATTERN LAYOUT (36-Pin BGA)

