



**THE DATASHEET OF  
CY24713SXC**



# Set-top Box Clock Generator with VCXO

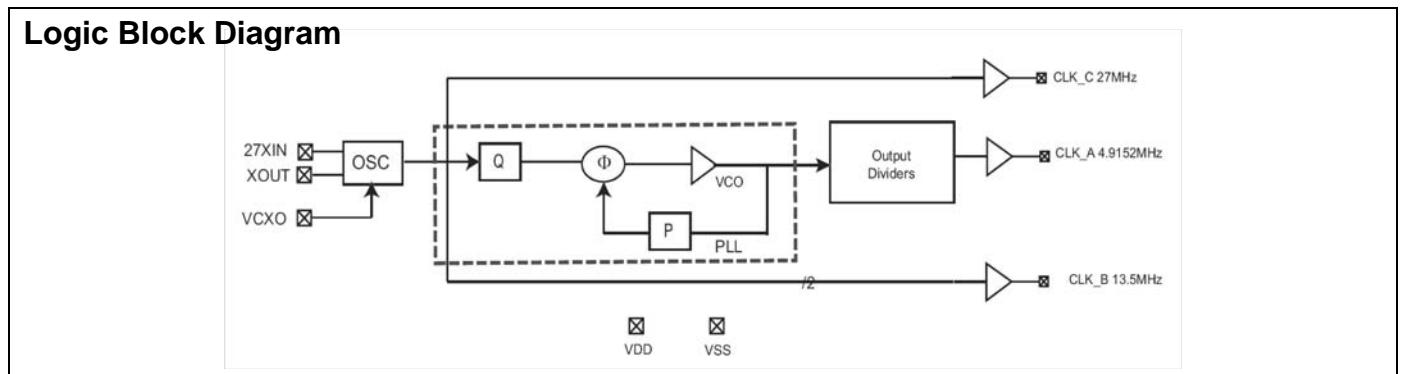
## Features

- Integrated phase-locked loop (PLL)
- Low-jitter, high-accuracy outputs
- VCXO with analog adjust
- 3.3V Operation
- 8-pin SOIC

## Benefits

- High-performance PLL tailored for Set Top Box applications
- Meets critical timing requirements in complex system designs
- Large  $\pm 150$ -ppm range, better linearity
- Meet industry standard voltage platforms
- Industry standard packaging saves on board space

| Part Number | Outputs | Input Frequency Range                                   | Output Frequencies           |
|-------------|---------|---|------------------------------|
| CY24713     | 3       | 27-MHz pullable crystal input per Cypress specification | 4.9152 MHz, 13.5 MHz, 27 MHz |



## Pin Configuration

Figure 1. CY24713, 8-Pin SOIC

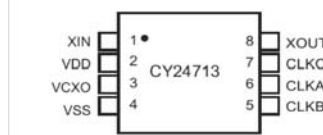


Table 1. Pin Definition

| Name                | Number | Description                   |
|---------------------|--------|-------------------------------|
| XIN                 | 1      | Reference Crystal Input       |
| VDD                 | 2      | 3.3V Voltage Supply           |
| VCXO                | 3      | Input Analog Control for VCXO |
| VSS                 | 4      | Ground                        |
| CLK_B               | 5      | 13.5-MHz Clock Output         |
| CLK_A               | 6      | 4.9152-MHz Clock Output       |
| CLK_C               | 7      | 27-MHz Clock Output           |
| XOUT <sup>[1]</sup> | 8      | Reference Crystal Output      |

### Note

1. Float X<sub>OUT</sub> if X<sub>IN</sub> is externally driven.

## Absolute Maximum Conditions

| Parameter       | Description                                 | Min                   | Max                   | Unit |
|-----------------|---|-----------------------|-----------------------|------|
| V <sub>DD</sub> | Supply Voltage                              | -0.5                  | 7.0                   | V    |
| T <sub>S</sub>  | Storage Temperature <sup>[2]</sup>          | -65                   | 125                   | °C   |
| T <sub>J</sub>  | Junction Temperature                        | -                     | 125                   | °C   |
|                 | Digital Inputs                              | V <sub>SS</sub> - 0.3 | V <sub>DD</sub> + 0.3 | V    |
|                 | Digital Outputs referred to V <sub>DD</sub> | V <sub>SS</sub> - 0.3 | V <sub>DD</sub> + 0.3 | V    |
|                 | Electrostatic Discharge                     | -                     | 2000                  | V    |
|                 | Analog Input                                | -0.5                  | 7.0                   | V    |

## Pullable Crystal Specifications

| Parameter                      | Description  | Condition   | Min  | Typ. | Max  | Unit |
|--------------------------------|--|---|------|------|------|------|
| F <sub>NOM</sub>               | Nominal crystal frequency                                | Parallel resonance, fundamental mode, AT cut  | -    | 27   | -    | MHz  |
| C <sub>LNOM</sub>              | Nominal load capacitance                                 |   | -    | 14   | -    | pF   |
| R <sub>1</sub>                 | Equivalent series resistance (ESR)                       | Fundamental mode  | -    | -    | 25   | Ω    |
| R <sub>3</sub> /R <sub>1</sub> | Ratio of third overtone mode ESR to fundamental mode ESR | Ratio used because typical R <sub>1</sub> values are much less than the maximum spec. | 3    | -    | -    |      |
| DL                             | Crystal drive level                                      | No external series resistor assumed   | -    | 0.5  | 2.0  | mW   |
| F <sub>3SEPHI</sub>            | Third overtone separation from 3*F <sub>NOM</sub>        | High side   | 300  | -    | -    | ppm  |
| F <sub>3SEPLO</sub>            | Third overtone separation from 3*F <sub>NOM</sub>        | Low side  | -    | -    | -150 | ppm  |
| C <sub>0</sub>                 | Crystal shunt capacitance                                |   | -    | -    | 7    | pF   |
| C <sub>0</sub> /C <sub>1</sub> | Ratio of shunt to motional capacitance                   |   | 180  | -    | 250  |      |
| C <sub>1</sub>                 | Crystal motional capacitance                             |   | 14.4 | 18   | 21.6 | pF   |

## Recommended Operating Conditions

| Parameter         | Description   | Min   | Typ. | Max   | Unit |
|-------------------|---|-------|------|-------|------|
| V <sub>DD</sub>   | Operating Voltage   | 3.135 | 3.3  | 3.465 | V    |
| T <sub>A</sub>    | Ambient Temperature   | 0     | -    | 70    | °C   |
| C <sub>LOAD</sub> | Max. Load Capacitance   | -     | -    | 15    | pF   |
| t <sub>PU</sub>   | Power up time for all VDDs to reach minimum specified voltage (power ramps must be monotonic) | 0.05  | -    | 500   | ms   |

## DC Electrical Characteristics

| Parameter         | Description            | Conditions  | Min  | Typ. | Max             | Unit |
|-------------------|------------------------|---|------|------|-----------------|------|
| I <sub>OH</sub>   | Output High Current    | V <sub>OH</sub> = V <sub>DD</sub> - 0.5, V <sub>DD</sub> = 3.3V | 12   | 24   | -               | mA   |
| I <sub>OL</sub>   | Output Low Current     | V <sub>OL</sub> = 0.5, V <sub>DD</sub> = 3.3V                   | 12   | 24   | -               | mA   |
| C <sub>IN</sub>   | Input Capacitance      |   | -    | -    | 7               | pF   |
| I <sub>Iz</sub>   | Input Leakage Current  |   | -    | 5    | -               | μA   |
| f <sub>ΔXO</sub>  | VCXO pullability range |   | ±150 | -    | -               | ppm  |
| V <sub>VCXO</sub> | VCXO input range       |   | 0    | -    | V <sub>DD</sub> | V    |
| I <sub>VDD</sub>  | Supply Current         |   | -    | 25   | 30              | mA   |

**Note**

2. Rated for 10 years

**AC Electrical Characteristics** ( $V_{DD} = 3.3V$ )

| Parameter <sup>[3]</sup> | Description       | Conditions   | Min | Typ. | Max | Unit |
|--------------------------|-------------------|--|-----|------|-----|------|
| DC                       | Output Duty Cycle | Duty Cycle is defined in Figure 3 50% of $V_{DD}$  | 45  | 50   | 55  | %    |
| $ER_0$                   | Rising Edge Rate  | Output Clock Edge Rate, Measured from 20% to 80% of $V_{DD}$ , $C_{LOAD} = 15\text{ pF}$ Figure 4. | 0.8 | 1.4  | –   | V/ns |
| $EF_1$                   | Falling Edge Rate | Output Clock Edge Rate, Measured from 80% to 20% of $V_{DD}$ , $C_{LOAD} = 15\text{ pF}$ Figure 4. | 0.8 | 1.4  | –   | V/ns |
| $t_9$                    | Clock Jitter      | Peak-Peak period jitter maximum absolute jitter  | –   | 200  | 250 | ps   |
| $t_{10}$                 | PLL Lock Time     |  | –   | –    | 3   | ms   |

Figure 2. Test Circuit

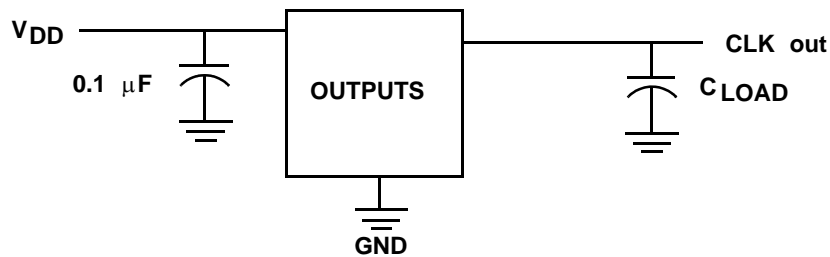


Figure 3. Duty Cycle Definition;  $DC = t_2/t_1$

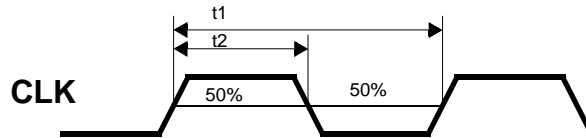
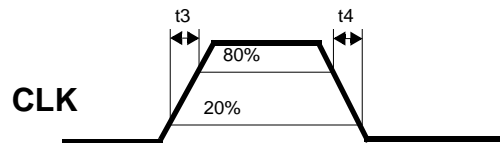


Figure 4. Rise and Fall Time Definitions:  $ER = 0.6 \times V_{DD}/t_3$ ,  $EF = 0.6 \times V_{DD}/t_4$



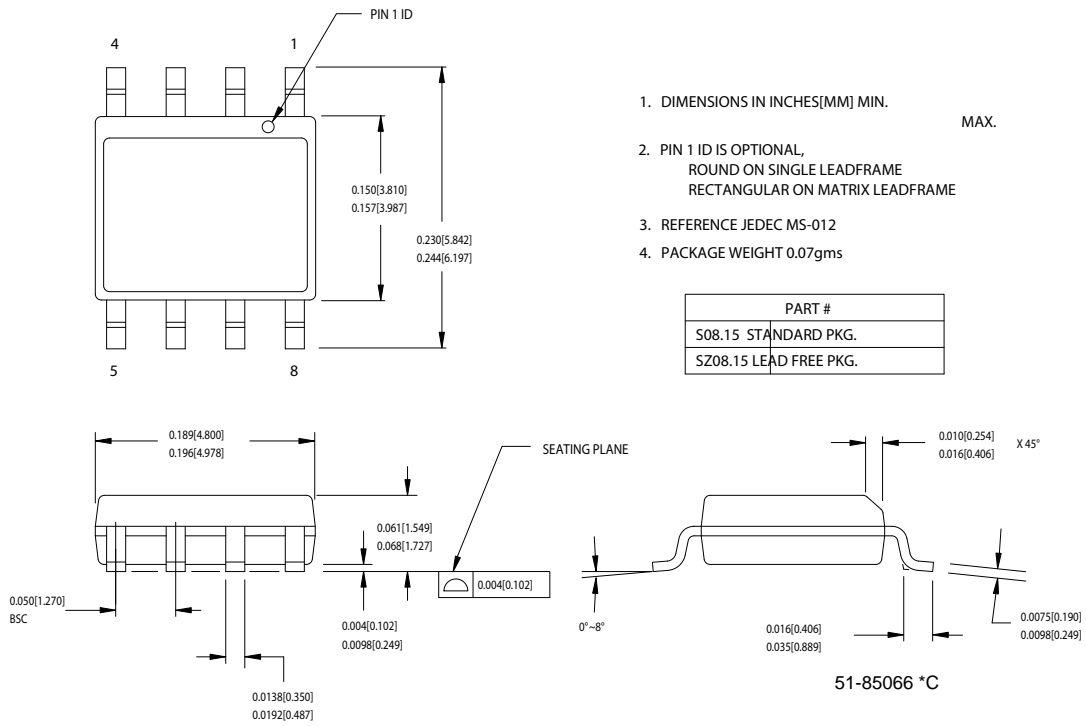
**Note**  
3. Not 100% tested

Ordering Information

| Ordering Code              | Package Type             | Operating Range | Operating Voltage |
|----------------------------|--------------------------|-----------------|-------------------|
| CY24713SC <sup>[4]</sup>   | 8-pin SOIC               | Commercial      | 3.3V              |
| CY24713SCT <sup>[4]</sup>  | 8-pin SOIC               | Commercial      | 3.3V              |
| <b>Pb-free</b>             |                          |                 |                   |
| CY24713SXC <sup>[4]</sup>  | 8-pin SOIC               | Commercial      | 3.3V              |
| CY24713SXCT <sup>[4]</sup> | 8-pin SOIC-Tape and Reel | Commercial      | 3.3V              |
| CY24713KSXC                | 8-pin SOIC               | Commercial      | 3.3V              |
| CY24713KSXCT               | 8-pin SOIC-Tape and Reel | Commercial      | 3.3V              |

Package Diagram

Figure 5. 8-Lead (150-Mil) SOIC S8



Note

4. Not recommended for new designs.

## Document History Page

| Document Title: CY24713 Set-top Box Clock Generator with VCXO<br>Document Number: 38-07396 |         |                 |                 |   |
|--|---------|-----------------|-----------------|---|
| REV.   | ECN No. | Orig. of Change | Submission Date | Description of Change   |
| **   | 333175  | RGL             | See ECN         | New Data Sheet  |
| *A   | 2440886 | AESA            | See ECN         | Updated template. Added Note "Not recommended for new designs."<br>Added part number CY24713KSXC, and CY24713KSXCT in ordering information table.<br>Replaced Lead-Free with Pb-Free. |

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