

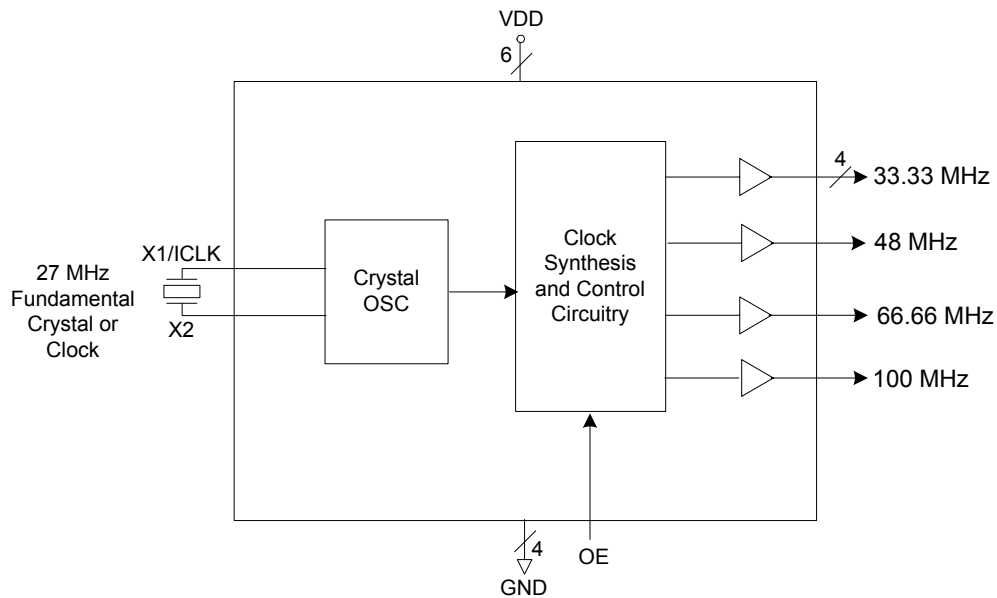
Description

The ICS650-22 is a low-cost, low-jitter, high-performance clock synthesizer for personal video recorders (PVR) and set-top box (STB) applications. Using analog Phase-Locked Loop (PLL) techniques, the device accepts a 27 MHz crystal input to produce multiple clocks for personal video recorder applications.

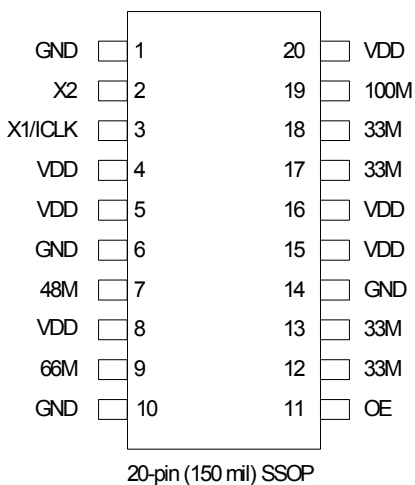
Features

- Packaged in 20-pin narrow SSOP (QSOP)
- Pb (lead) free package, RoHS compliant
- 27 MHz fundamental crystal or clock input
- Zero ppm synthesis error in all clocks
- Low skew 33.33 MHz clock outputs
- Output enable controls all outputs
- Full CMOS output swing with 25 mA output drive capability at TTL levels
- Advanced, low-power, sub-micron CMOS process
- 3.3 V \pm 10% operating voltage

Block Diagram



Pin Assignment



Pin Descriptions

| Pin Number | Pin Name | Pin Type | Pin Description |
|------------|----------|----------|---|
| 1 | GND | Power | Connect to ground. |
| 2 | X2 | Input | Connect to a crystal input or leave open for ICLK. |
| 3 | X1/ICLK | Input | Connect to a crystal or reference clock input. |
| 4, 5 | VDD | Power | Connect to +3.3 V. |
| 6 | GND | Power | Connect to ground. |
| 7 | 48M | Output | 48 MHz clock output. |
| 8 | VDD | Power | Connect to +3.3 V. |
| 9 | 66M | Output | 66 MHz clock output. |
| 10 | GND | Power | Connect to ground. |
| 11 | OE | Input | Output enable active high. Internal pull-up resistor. |
| 12, 13 | 33M | Output | 33.33 MHz clock output. |
| 14 | GND | Power | Connect to ground. |
| 15, 16 | VDD | Power | Connect to +3.3 V. |
| 17, 18 | 33M | Output | 33.33 MHz clock output. |
| 19 | 100M | Output | 100 MHz clock output. |
| 20 | VDD | Power | Connect to +3.3 V. |

Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the ICS650-22. These ratings, which are standard values for IDT commercially rated parts, are stress ratings only. Functional operation of the device at these or any other conditions above those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods can affect product reliability. Electrical parameters are guaranteed only over the recommended operating temperature range.

| Item | Rating |
|-------------------------------|---------------------|
| Supply Voltage, VDD | 7 V |
| All Inputs and Outputs | -0.5 V to VDD+0.5 V |
| Ambient Operating Temperature | -40 to +85° C |
| Storage Temperature | -65 to +150° C |
| Junction Temperature | 125° C |
| Soldering Temperature | 260° C |

Recommended Operation Conditions

| Parameter | Min. | Typ. | Max. | Units |
|---|------|------|------|-------|
| Ambient Operating Temperature | 0 | - | +70 | °C |
| Power Supply Voltage (measured in respect to GND) | +3.0 | +3.3 | +3.6 | V |

DC Electrical Characteristics

Unless stated otherwise, VDD = 3.3V ±10%, Ambient Temperature 0 to +70° C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---------------------------|-----------------|--------------------------|---------|-------|---------|-------|
| Operating Voltage | VDD | | 3.0 | 3.3 | 3.6 | V |
| Input High Voltage | V _{IH} | | VDD/2+1 | VDD/2 | | V |
| Input Low Voltage | V _{IL} | | | VDD/2 | VDD/2-1 | V |
| Output High Voltage | V _{OH} | I _{OH} = -25 mA | 2.4 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = +25 mA | | | 0.5 | V |
| Output High Voltage | V _{OL} | I _{OH} = -8 mA | VDD-0.4 | | | V |
| Operating Supply Current | I _{DD} | No Load, OE=1 | | 29 | | mA |
| | | No Load, OE=0 | | 13 | | mA |
| Short Circuit Current | I _{OS} | Each output | | ±70 | | mA |
| Internal Pull-up Resistor | R _{PU} | Input select | | 390 | | kΩ |

AC Electrical Characteristics

Unless stated otherwise, VDD = 3.3V ±10%, Ambient Temperature 0 to +70° C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|---------------------------------|-----------------|-------------------------------|------|------|------|-------|
| Input Frequency | | | | 27 | | MHz |
| Output Rise Time | t _{OR} | 0.8 to 2.0 V (note 1) | | 500 | | ps |
| Output Fall Time | t _{OF} | 2.0 to 0.8 V (note 1) | | 500 | | ps |
| Output Clock Duty Cycle | | At VDD/2 (note 1) | 45 | 50 | 55 | % |
| Frequency Error | | All clocks | | | 0 | ppm |
| Absolute Jitter, short term | | 33M, 100M clocks (note 1) | | ±100 | | ps |
| Absolute Jitter, short term | | 48M clock (note 1) | | ±160 | | ps |
| Absolute Jitter, short term | | 66M clock (note 1) | | ±140 | | ps |
| Output-to-output Skew, 33M only | | Rising edge at VDD/2 (note 1) | | 0 | 150 | ps |

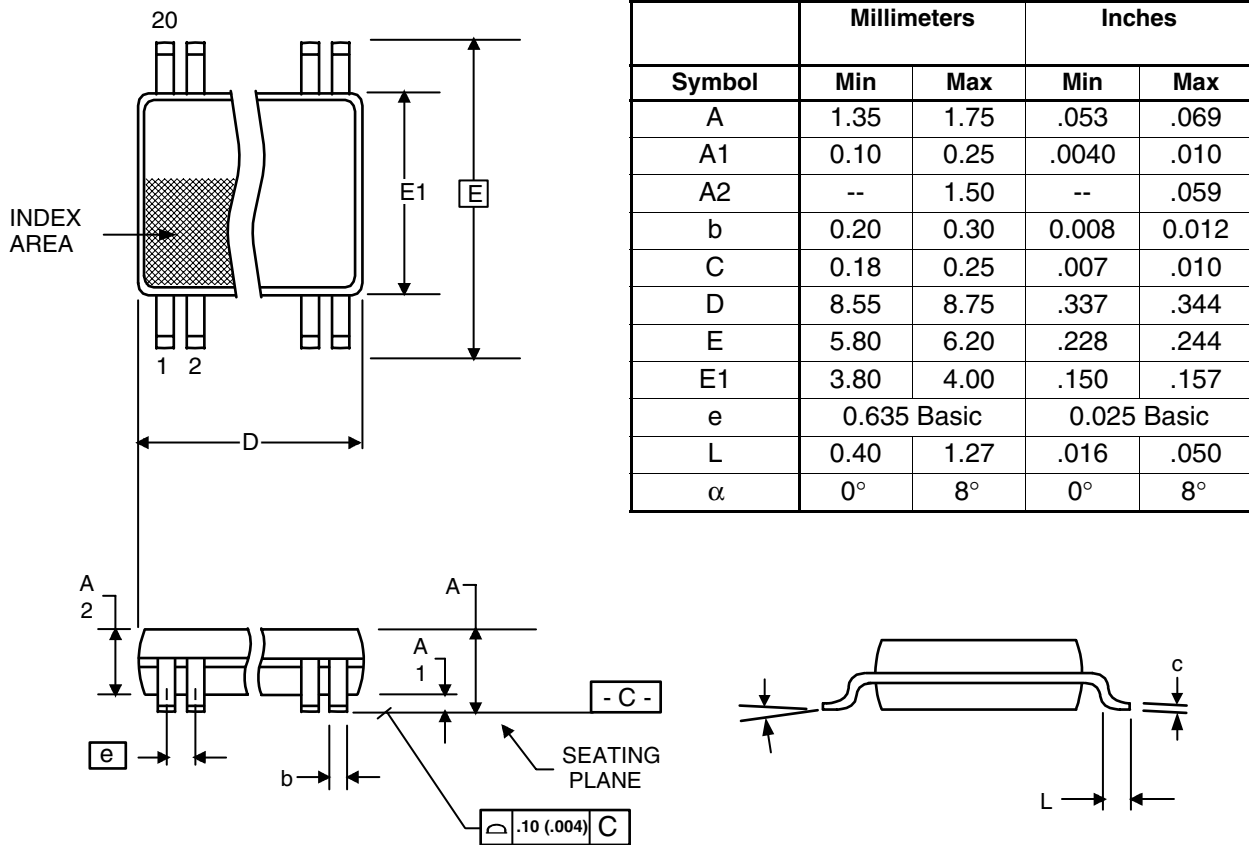
Note 1: Measured with a 15 pF load.

Thermal Characteristics

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|--|-----------------|----------------|------|------|------|-------|
| Thermal Resistance Junction to Ambient | θ _{JA} | Still air | | 135 | | °C/W |
| | θ _{JA} | 1 m/s air flow | | 93 | | °C/W |
| | θ _{JA} | 3 m/s air flow | | 78 | | °C/W |
| Thermal Resistance Junction to Case | θ _{JC} | | | 60 | | °C/W |

Package Outline and Package Dimensions (20-pin SSOP, 150 Mil. Body)

Package dimensions are kept current with JEDEC Publication No. 95



Ordering Information

| Part / Order Number | Marking | Shipping Packaging | Package | Temperature |
|---------------------|----------|--------------------|-------------|-------------|
| 650R-22LF | 650R-22L | Tubes | 20-pin SSOP | 0 to +70° C |
| 650R-22LFT | 650R-22L | Tape and Reel | 20-pin SSOP | 0 to +70° C |

“LF” denotes Pb (lead) free package.

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