

32.768 KHZ CLOCK OSCILLATOR

MK3200

Description

The MK3200 is IDT's lowest cost, low power clock oscillator that generates a low power 32.768 kHz output from an inexpensive 32.768 kHz crystal. This part includes a power down pin and allows you to tri state the output clock for in-circuit testing.

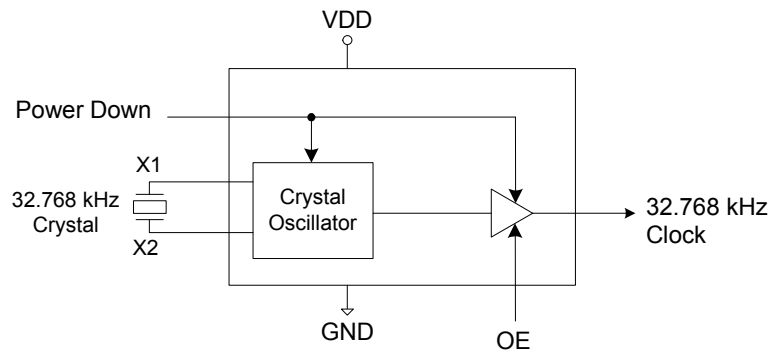
IDT manufactures the largest variety of clock synthesizers for all applications. If more clock outputs are needed, including MHz frequencies, see the MK32xx family of parts. Consult IDT to eliminate VCXOs, crystals and oscillators from your board.

Features

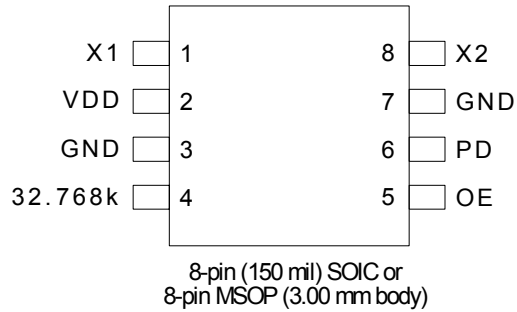
- Packaged in 8-pin SOIC or 8-pin MSOP (3.00 mm body)
- 8-pin MSOP available in Pb (lead) free package
- Operates from 2.5 V to 5 V
- Consumes only 3.5 μ A in normal operation
- Accepts an inexpensive 32.768 kHz crystal input
- Offers power down mode
- Includes an Output Enable pin to tri state the output for in-circuit testing
- Advanced, low power, sub-micron CMOS process
- For other 32.768 kHz-based clocks with MHz outputs, please consult IDT
- Industrial temperature version available

NOTE: EOL for non-green parts to occur on 5/13/10 per PDN U-09-01

Block Diagram



Pin Assignment



Power Down Select Table

| PD | 32.768k | Oscillator |
|----|---------|------------|
| 0 | On | On |
| 1 | Low | Off |

Output Enable Select Table

| OE | 32.768k | Oscillator |
|----|------------------|------------|
| 0 | Tri state (Hi-Z) | On |
| 1 | On | On |

0 = connect directly to GND.

1 = connect directly to VDD.

Pin Descriptions

| Pin Number | Pin Name | Pin Type | Pin Description |
|------------|----------|----------|--|
| 1 | X1 | Input | Crystal connection. Connect to a 32.768 kHz crystal. |
| 2 | VDD | Power | Connect to +3.3 V. |
| 3 | GND | Power | Connect to ground. |
| 4 | 32.768k | Input | 32.768 kHz clock output. |
| 5 | OE | Output | Output Enable. |
| 6 | PD | Input | Power down pin. Turns off entire chip when high. |
| 7 | GND | Input | Connect to ground. |
| 8 | X2 | Output | Crystal connection. Connect to a 32.768 kHz crystal. |

External Components

Series Termination Resistor

Clock output traces over one inch should use series termination. To series terminate a 50 Ω trace (a commonly used trace impedance), place a 33 Ω resistor in series with the clock line, as close to the clock output pin as possible. The nominal impedance of the clock output is 20 Ω .

Decoupling Capacitor

As with any high-performance mixed-signal IC, the MK3200 must be isolated from system power supply noise to perform optimally.

A decoupling capacitor of 0.01 μ F must be connected between VDD and the PCB ground plane.

PCB Layout Recommendations

For optimum device performance and lowest output phase noise, the following guidelines should be observed.

- 1) The 0.01 μ F decoupling capacitor should be mounted on the component side of the board as close to the VDD pin as possible. No vias should be used between the decoupling capacitor and VDD pin. The PCB trace to VDD pin should be kept as short as possible, as should the PCB trace to the ground via. Distance of the ferrite bead and bulk decoupling from the device is less critical.
- 2) To minimize EMI, the 33 Ω series termination resistor (if needed) should be placed close to the clock output.
- 3) An optimum layout is one with all components on the same side of the board, minimizing vias through other signal layers. Other signal traces should be routed away from the MK3200. This includes signal traces just underneath the device, or on layers adjacent to the ground plane layer used by the device.
- 4) The input crystal must be connected as close to the chip as possible. The input crystal should be a parallel mode crystal with a 12 pF load capacitance.

Absolute Maximum Ratings

Stresses above the ratings listed below can cause permanent damage to the MK3200. 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.

| Parameter | Condition | Min. | Typ. | Max. | Units |
|-----------------------|-------------------|------|------|----------|-------|
| Supply Voltage, VDD | Referenced to GND | | | 7 | V |
| Inputs | Referenced to GND | -0.5 | | VDD+ 0.5 | V |
| Clock Outputs | Referenced to GND | -0.5 | | VDD+ 0.5 | V |
| Storage Temperature | | -65 | | 150 | °C |
| Soldering Temperature | Max 10 seconds | | | 260 | °C |
| Junction Temperature | | | | 125 | °C |

Recommended Operation Conditions

| Parameter | Min. | Typ. | Max. | Units |
|---|-------|------|-------|-------|
| Ambient Operating Temperature | -40 | | +85 | °C |
| Power Supply Voltage (measured in respect to GND) | +3.15 | +3.3 | +3.45 | V |

DC Electrical Characteristics

Unless stated otherwise, **VDD = 3.3 V ±5%**, Ambient Temperature -40 to +85° C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|----------------------------------|-----------------|---------------------------|---------|------|-------|-------|
| Operating Voltage | VDD | | 2.375 | | 5.250 | V |
| Supply Current | IDD | No load, OE=1 | | 3.5 | | μA |
| | | PD = 0 | | 3.5 | | μA |
| Output High Voltage (CMOS level) | V _{OH} | I _{OH} = -1.5 mA | VDD-0.4 | | | V |
| Output High Voltage | V _{OH} | I _{OH} = -3 mA | 2.4 | | | V |
| Output Low Voltage | V _{OL} | I _{OL} = 3mA | | | 0.4 | V |
| Short Circuit Current | I _{OS} | | | ±6 | | mA |

AC Electrical Characteristics

Unless stated otherwise, VDD = 3.3 V \pm 5%, Ambient Temperature -40 to +85° C

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|------------------------|-----------------|--------------------|------|--------|----------|-------|
| Input Frequency | F _{IN} | | | 32.768 | | kHz |
| Output Rise Time | t _{OR} | 20% to 80%, Note 1 | | 8 | | ns |
| Output Fall Time | t _{OF} | 80% to 20%, Note 1 | | 8 | | ns |
| Duty Cycle | | at VDD/2 | 40 | 50 | 60 | % |
| Input Crystal Accuracy | | | | 0 | \pm 30 | ppm |

Thermal Characteristics (8SOIC)

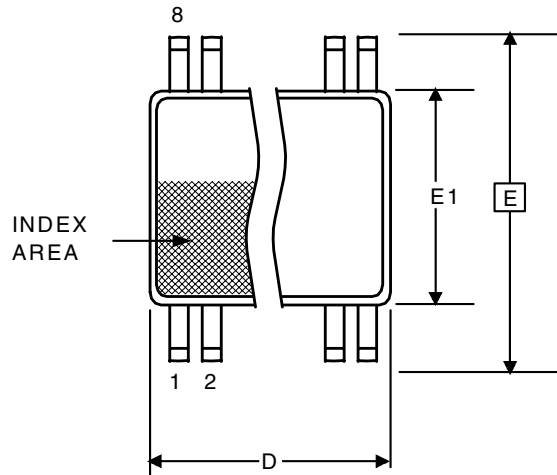
| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|--|---------------|----------------|------|------|------|-------|
| Thermal Resistance Junction to Ambient | θ_{JA} | Still air | | 135 | | °C/W |
| | θ_{JA} | 1 m/s air flow | | 93 | | °C/W |
| | θ_{JA} | 3 m/s air flow | | 78 | | °C/W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

Thermal Characteristics (8MSOP)

| Parameter | Symbol | Conditions | Min. | Typ. | Max. | Units |
|--|---------------|------------|------|------|------|-------|
| Thermal Resistance Junction to Ambient | θ_{JA} | Still air | | 95 | | °C/W |
| Thermal Resistance Junction to Case | θ_{JC} | | | 48 | | °C/W |

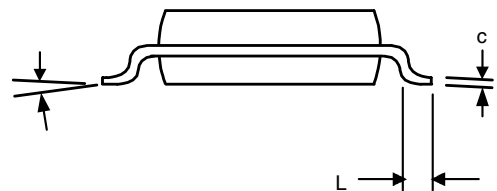
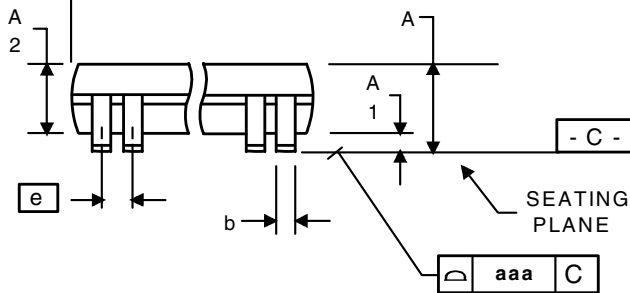
Package Outline and Package Dimensions (8-pin MSOP, 3.00 mm Body)

Package dimensions are kept current with JEDEC Publication No. 95



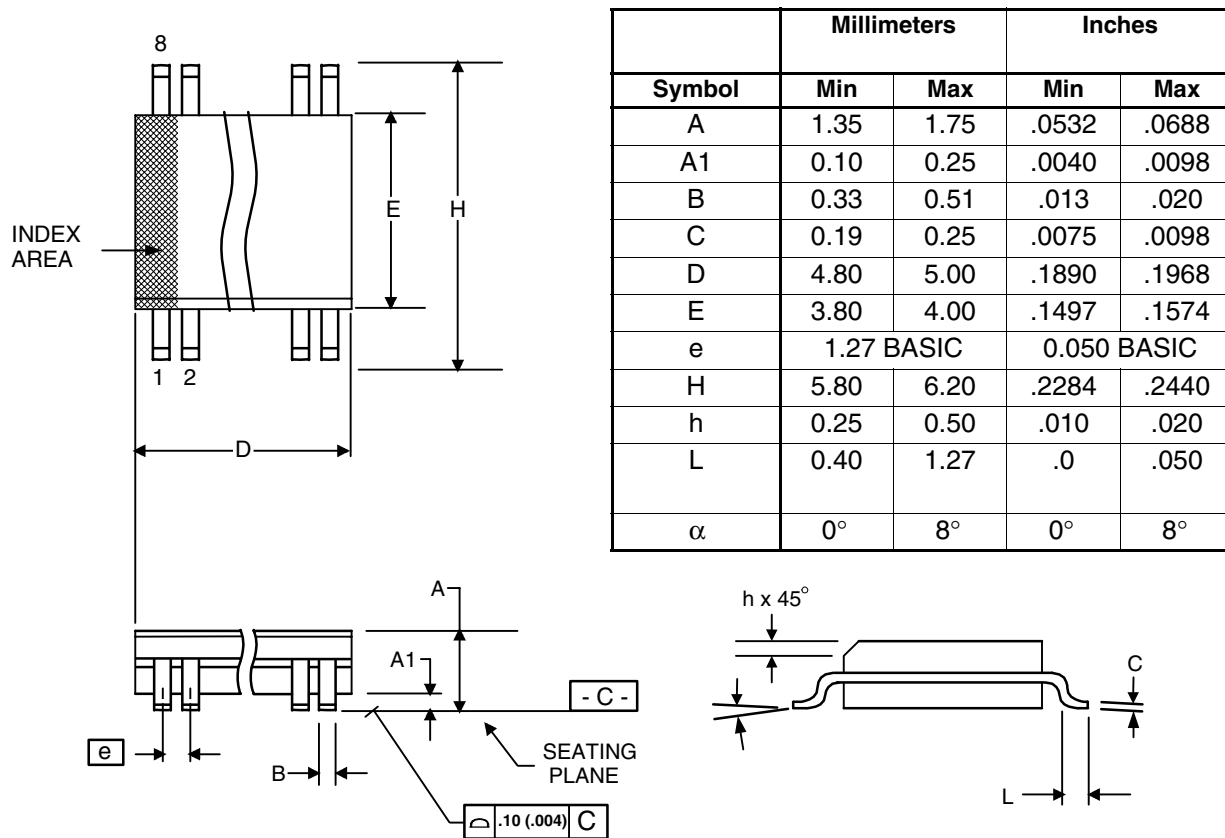
| Symbol | Millimeters | | Inches* | |
|----------|-------------|------|--------------|-------|
| | Min | Max | Min | Max |
| A | -- | 1.10 | -- | 0.043 |
| A1 | 0 | 0.15 | 0 | 0.006 |
| A2 | 0.79 | 0.97 | 0.031 | 0.038 |
| b | 0.22 | 0.38 | 0.008 | 0.015 |
| C | 0.08 | 0.23 | 0.003 | 0.009 |
| D | 3.00 BASIC | | 0.118 BASIC | |
| E | 4.90 BASIC | | 0.193 BASIC | |
| E1 | 3.00 BASIC | | 0.118 BASIC | |
| e | 0.65 Basic | | 0.0256 Basic | |
| L | 0.40 | 0.80 | 0.016 | 0.032 |
| α | 0° | 8° | 0° | 8° |
| aaa | - | 0.10 | - | 0.004 |

*For reference only. Controlling dimensions in mm.



Package Outline and Package Dimensions (8-pin SOIC, 150 Mil. Body)

Package dimensions are kept current with JEDEC Publication No. 95



Ordering Information

| Part / Order Number | Marking | Shipping Packaging | Package | Temperature |
|---------------------|----------|--------------------|------------|---------------|
| MK3200S* | MK3200S | Tubes | 8-pin SOIC | 0 to +70° C |
| MK3200STR* | MK3200S | Tape and Reel | 8-pin SOIC | 0 to +70° C |
| MK3200SLF | MK3200SL | Tubes | 8-pin SOIC | 0 to +70° C |
| MK3200SLFTR | MK3200SL | Tape and Reel | 8-pin SOIC | 0 to +70° C |
| MK3200SI* | MK3200SI | Tubes | 8-pin SOIC | -40 to +85° C |
| MK3200SITR* | MK3200SI | Tape and Reel | 8-pin SOIC | -40 to +85° C |
| MK3200G* | 3200G | Tubes | 8-pin MSOP | 0 to +70° C |
| MK3200GT* | 3200G | Tape and Reel | 8-pin MSOP | 0 to +70° C |
| MK3200GLF | 3200GL | Tubes | 8-pin MSOP | 0 to +70° C |
| MK3200GLFT | 3200GL | Tape and Reel | 8-pin MSOP | 0 to +70° C |

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