# XC25BS6 Series

## Divider Signal Output Clock Generator ICs with Built-In Crystal Oscillator Circuit

### ■GENERAL DESCRIPTION

The XC25BS6 is a low operating voltage, low current consumption series of CMOS ICs with built-in crystal oscillator and divider circuits designed for clock generators. Oscillation capacitors Cg and Cd are externally set up. Output is selectable from any one of the following values for f0:f0/1024, f0/512, f0/256, and f0/128. With oscillation feedback resistors built-in, it is possible to configure a stable fundamental oscillator using about 10pF of external oscillation capacitor and an external crystal. The series has a stand-by function. The oscillation completely stops in the stand-by state and output will be one of high-impedance.
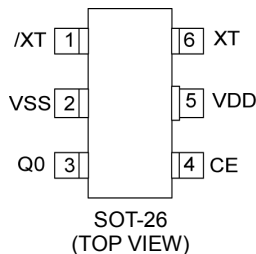
### ■APPLICATIONS
- ●Crystal oscillation modules
- ●Clocks for micro-computers, DSPs, etc.
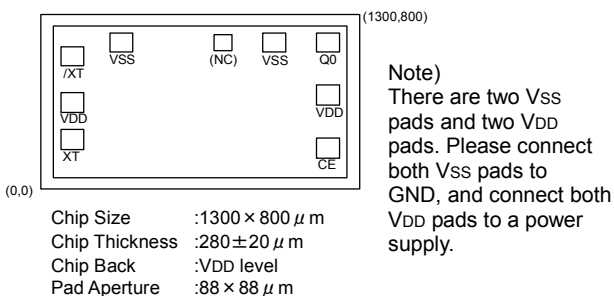- ●Communication equipment
- ●Various system clocks
- ●Clock time-base

### ■FEATURES

| | |
|---|---|
| **Oscillation Frequency** | : 2MHz~36MHz (fundamental) |
| | -Oscillation feedback resistor built-in |
| | -External oscillation capacitor |
| **Divider Ratio** | : f0/1024, f0/512, f0/256, f0/128 |
| **Output** | : 3-State |
| **Operating Supply Voltage Range** | |
| | : 2.3~4.0V |
| **Supply Current** | : 0.5 $\mu$ A (MAX.) when stand-by mode |
| **Chip Form** | : Chip size 1.3 × 0.8mm |
| **CMOS Low Power Consumption** | |
| **Low Operating Supply Voltage** | |
| | : 2.3V (MIN.) |
| **Output Frequency** | : 32.768kHz |
| **Package** | : SOT-26 |

### ■PIN CONFIGURATION



SOT-26
(TOP VIEW)

### ■PAD LAYOUT FOR CHIP FORM



Note)
There are two Vss pads and two VDD pads. Please connect both Vss pads to GND, and connect both VDD pads to a power supply.

| | |
|---|---|
| Chip Size | :1300 × 800 $\mu$ m |
| Chip Thickness | :280 ± 20 $\mu$ m |
| Chip Back | :VDD level |
| Pad Aperture | :88 × 88 $\mu$ m |

### ■BLOCK DIAGRAM
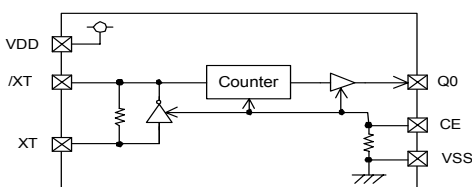


### ■PIN ASSIGNMENT

| PIN NUMBER | PIN NAME | FUNCTIONS |
|---|---|---|
| 1 | /XT | Crystal Oscillator Connection (Output) |
| 2 | Vss | Ground |
| 3 | Q0 | Clock Output |
| 4 | CE | Stand-by Control * |
| 5 | VDD | Power Supply |
| 6 | XT | Crystal Oscillator Connection (Input) |

*The stand-by control pin (pin #4) has a pull-down resistor built-in.

### ■PAD LOCATIONS
(Unit: $\mu$ m)

| PIN NUMBER | PIN NAME | FUNCTIONS | PAD DIMENSIONS | |
|---|---|---|---|---|
| | | | X | Y |
| 1 | /XT | Crystal Oscillator Connection (Output) | 128.0 | 610.0 |
| 2 | Vss | Ground | 328.0 | 672.0 |
| 3 | (NC) | No Connection | 741.0 | 672.0 |
| 4 | Vss | Ground | 952.0 | 672.0 |
| 5 | Q0 | Clock Output | 1172.0 | 672.0 |
| 6 | VDD | Power Supply | 1172.0 | 430.0 |
| 7 | CE | Stand-by Control * | 1172.0 | 189.0 |
| 8 | XT | Crystal Oscillator Connection (Input) | 128.0 | 187.0 |
| 9 | VDD | Power Supply | 128.0 | 399.0 |

*The stand-by control pin (pin #4) has a pull-down resistor built-in.

### ■CE, Q0 PIN FUNCTION

| CE | Q0 |
|---|---|
| 'H' | Clock Output |
| 'L' or Open | High Impedance |

## ■ABSOLUTE MAXIMUM RATINGS

Ta = 25°C

| PARAMETER | SYMBOL | RATINGS | UNITS |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | $V_{SS}$ -0.3 ~ $V_{SS}$ +7.0 | V |
| CE Pin Voltage | $V_{CE}$ | $V_{SS}$ -0.3 ~ $V_{DD}$ +0.3 | V |
| Q0 Pin Voltage | $V_{Q0}$ | $V_{SS}$ -0.3 ~ $V_{DD}$ +0.3 | V |
| Q0 Output Current | $I_{Q0}$ | ±50 | mA |
| Power Dissipation | Pd | 150 ** | mW |
| Operating Temperature Range | Topr | -40 ~ +85 | °C |
| Storage Temperature Range | Tstg | -65 ~ +150 (Chip Form) | °C |
| | | -55 ~ +125 (SOT-26) | |

** SOT-26 package, when implemented on a glass epoxy PCB.

## ■PRODUCT CLASSIFICATION

● Ordering Information

XC25BS6 ①②③④⑤

| DESIGNATOR | DESCRIPTION | SYMBOL | DESCRIPTION |
|---|---|---|---|
| ①②③ | Divider Ratio | 128 | : 128 divider |
| | | 256 | : 256 divider |
| | | 512 | : 512 divider |
| | | A24 | : 1024 divider |
| ④ | Package | C | : Chip form |
| | | W | : Wafer form |
| | | M | : SOT-26 |
| ⑤ | Device Orientation: | R | : Embossed tape, standard feed |
| | | L | : Embossed tape, reverse feed |
| | | T | : Chip Tray |
| | | W | : Wafer |

## ■WIRE BONDING CONNECTION
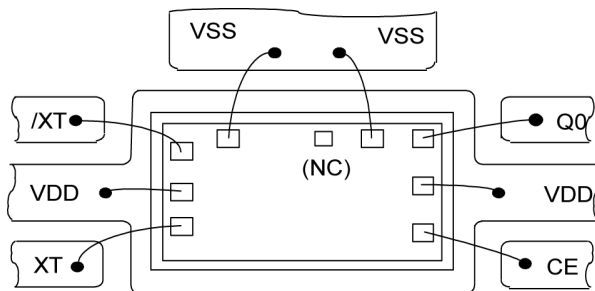


* There are two $V_{SS}$ pads and $V_{DD}$ pads.

  Please connect both $V_{SS}$ pads to GND, and connect both $V_{DD}$ pads to a power supply.

## ■TYPICAL APPLICATION CIRCUIT
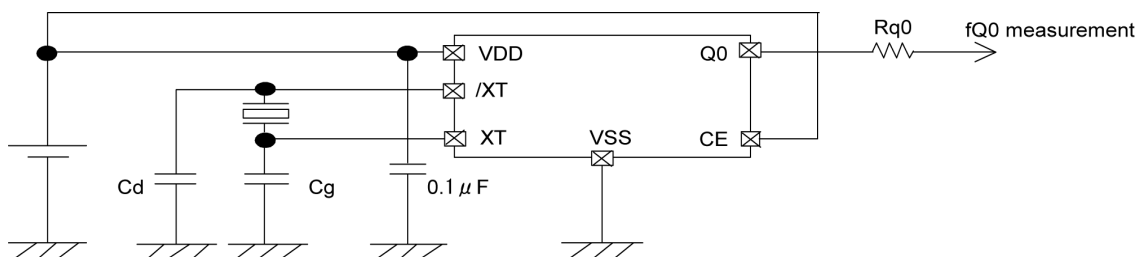


* Please use oscillation capacitors Cg, Cd =10pF externally

* The same power supply can be used for $V_{DD}$ and CE.

# ■NOTES ON USE

(1) The oscillation circuit of this IC does not have internal oscillation capacitors.
   Please make the oscillation circuitry using an external crystal transducer and oscillation capacitors Cg and Cd.
   *) A higher harmonic wave oscillation may occur without Cg and Cd.
   *) Cg and Cd can be connected either to GND or VDD.
      (Cg and Cd in the above circuit example are connected to GND.)
   *) It is recommended to use around for 10pF of Cg and Cd.
      For trimmer capacitors, 10pF as a standard value is appropriate.
   *) The crystal oscillation frequency should be measured at the output of the Q0 pin.
      When a probe is directly connected to the XT pin or the /XT pin, oscillation frequency will change and a precise value can not be taken.

(2) Please insert a by-pass capacitor of 0.1 $\mu$F between VDD and GND.

(3) The use of a matching resistor Rq0 of 50$\Omega$ connected in series to the Q0 pin is recommended in order to counter unwanted radiations.

(4) Please place a by-pass capacitor and the matching resistor as close to the IC as possible. If the by-pass capacitor is placed away from the IC, it may cause abnormal oscillation. If the matching resistor is placed away from the IC, it may cause unwanted radiations in the pattern between the Q0 pin and the resistor.

(5) When the CE pin is not controlled by external signals, please connect the CE pin to VDD power supply.
   *) When the CE pin is not connected, the IC goes into stand-by mode due to the internal pull-down resistor.

(6) As for the supply voltage, it is recommended to apply a low noise power supply, such as a series regulator. Using a power supply like a switching regulator might lead to an unstable oscillation jitter, which in turn may lead the oscillation frequency to fluctuate due to the ripple of the switching regulator.

# ■DC ELECTRICAL CHARACTERISTICS

XC25BS6xxxxx          3.0V Operation (unless otherwise stated, VDD=3.0V, FOSC=16MHz, No load, Ta=25℃)

| PARAMETER | SYMBOL | FUNCTIONS | | STANDARD VALUE | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | MIN. | TYP. | MAX. | |
| Operating Supply Voltage | VDD | | | (2.3) | 3.0 | 4.0 | V |
| Crystal Oscillation Frequency | FOSC | Cg=Cd=10pF (External) | | 2 | - | 36 | MHz |
| H Level Output Voltage | VOH | VDD=2.7V, IOH= - 4mA | | 2.3 | - | - | V |
| L Level Output Voltage | VOL | VDD=2.7V, IOL=4mA | | - | - | 0.4 | V |
| Supply Current 1 | IDD1 | CE=3.0V | fOSC=4MHz, XC25BS6128 | - | (0.4) | (0.8) | mA |
| | | | fOSC=8MHz, XC25BS6256 | - | (0.5) | (1.0) | |
| | | | fOSC=16MHz, XC25BS6512 | - | (0.8) | (1.6) | |
| | | | fOSC=36MHz, XC25BS6A24 | - | (1.0) | (1.8) | |
| Supply Current 2 | IDD2 | CE=0V | | - | - | 0.5 | $\mu$A |
| CE H Level Voltage | VCEH | | | 2.4 | - | - | V |
| CE L Level Voltage | VCEL | | | - | - | 0.6 | V |
| CE Pull-Down Resistance 1 | Rp1 | CE=3.0V | | 0.5 | 1.6 | 3.0 | M$\Omega$ |
| CE Pull-Down Resistance 2 | Rp2 | CE=0.3V | | 22 | 55 | 90 | K$\Omega$ |
| Internal Oscillation Feedback Resistance | Rf | XT Pin, CE=/XT=3.0V | | 0.2 | 0.5 | 1.0 | M$\Omega$ |
| Output Disable Leakage Current | IOZ | Q0 Pin, VDD=4.0V, CE=0V | | - | - | 0.5 | $\mu$A |

*External oscillation capacitor

# ■AC ELECTRICAL CHARACTERISTICS

XC25BS6xxxxx          3.0V Operation (unless otherwise stated, VDD=3.0V, FOSC=16MHz, CL=15pF, Ta=25℃)

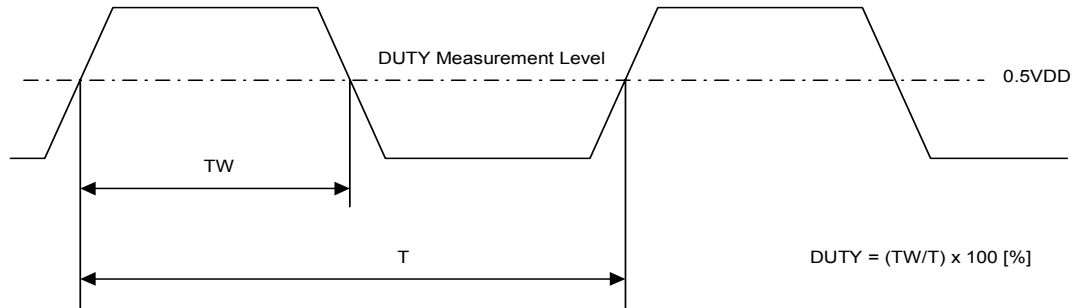| PARAMETER | SYMBOL | FUNCTIONS | STANDARD VALUE | | | UNIT |
|---|---|---|---|---|---|---|
| | | | MIN. | TYP. | MAX. | |
| Output Rise Time | Tr | VDD=3.0V (10% to 90%) *1 | - | 10 | 15 | ns |
| Output Fall Time | Tf | VDD=3.0V (10% to 90%) *1 | - | 10 | 15 | ns |
| Duty Cycle | DUTY | | 45 | 50 | 55 | % |
| Output Start Time | Ton | *1 | - | - | 3.0 | ms |

*1 R&D guarantee

**TOREX**

## ■AC ELECTRICAL CHARACTERISTICS MEASUREMENT WAVE FORMS

(1) Output Rise Time, Output Fall Time
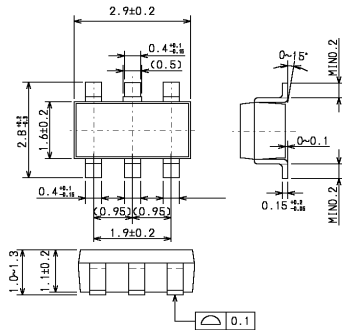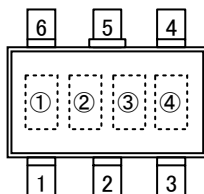


(2) Duty Cycle



$$DUTY = (TW/T) \times 100 \, [\%]$$

## ■PACKAGING INFORMATION

●SOT-26



## ■MARKING RULE

●SOT-26



SOT-26
(TOP VIEW)

①Represents product series

| MARK | PRODUCT SERIES |
|---|---|
| B | XC25BS6 |

②Represents product series

| MARK | PRODUCT SERIES |
|---|---|
| 6 | XC25BS6 |

③Represents divider ratio

| MARK | DIVIDER RATIO | MARK | DIVIDER RATIO |
|---|---|---|---|
| 1 | f0/128 | 2 | f0/256 |
| 5 | f0/512 | A | f0/1024 |

④Represents assembly lot number.
(Based on internal standards)

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