



rev 0.4

## Low Cost Frequency Multiplier

### Features

- Generates 2X and 4X clocks of the input clock frequency
- Input clock frequency range from 3 MHz to 78 MHz
- Provides up to:  
P2082A: 156 MHz output clock frequency  
P2084A: 312 MHz output clock frequency
- External loop filter
- Low cycle-to-cycle jitter
- 3.3 V operating voltage range
- 10 mA output drives
- TTL or CMOS compatible outputs
- Ultra-low power CMOS design
- Available in industrial temperature range (-25C to +85C)
- Available in 8-pin SOIC and TSSOP

### Product Description

The P2082A and P2084A are versatile frequency

multipliers that are designed specifically as cost effective alternatives to the high precision frequency oscillator.

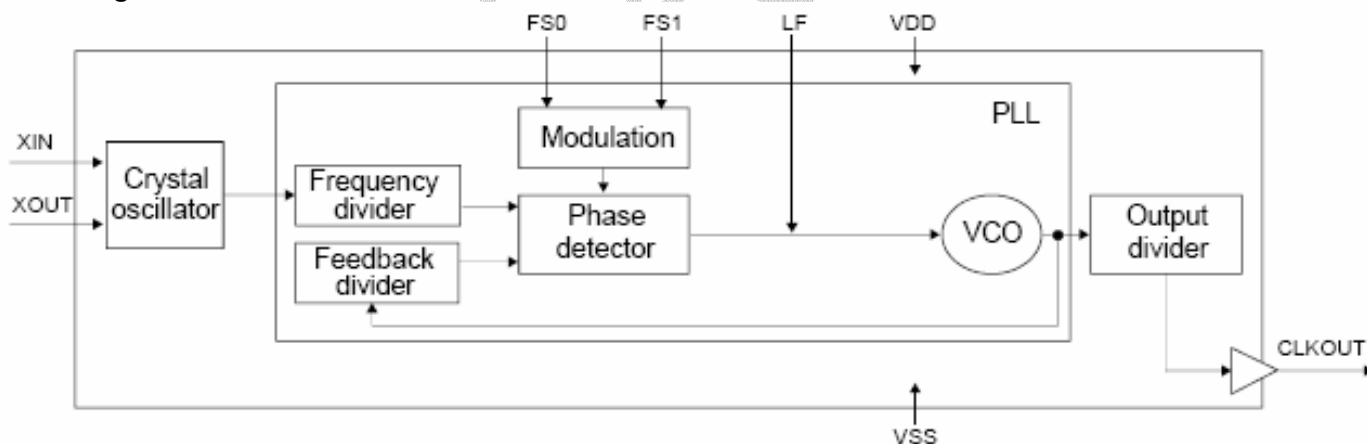
The P2082A/84A can generate a 2X and 4X output clock respectively of the input frequency which allows system cost savings by using an inexpensive crystal or resonator to achieve high frequency multiplication.

The P2082A/84A provides up to 156 MHz and 312 MHz output clock frequencies respectively through the use of the Phase-Lock-Loop (PLL) technique which delivers low jitter and high precision synthesized clocks.

### Applications

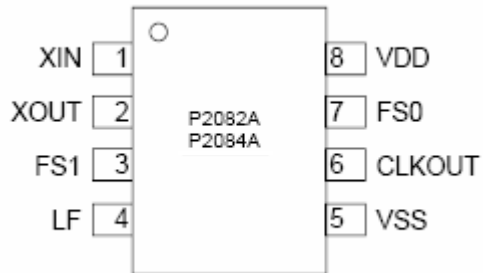
The P2082A/84A is targeted towards the high frequency CAN OSC replacement market. Applications include xDSL, routers, networking, PC peripherals, and embedded systems.

### Block Diagram





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**Pin Configuration****Pin Description**

| Pin# | Pin Name  | Type | Description                                                                                                                           |
|------|-----------|------|---------------------------------------------------------------------------------------------------------------------------------------|
| 1    | XIN/CLKIN | I    | Connect to crystal or clock input.                                                                                                    |
| 2    | XOUT      | I    | Crystal output.                                                                                                                       |
| 3    | FS1       | I    | Digital logic input used to select input frequency range. (See Input Frequency Selection.) This pin has an internal pull-up resistor. |
| 4    | LF        | I    | External loop filter for the PLL. (See Loop Filter Selection Table for value.)                                                        |
| 5    | VSS       | P    | Ground connection. Connect to system ground.                                                                                          |
| 6    | CLKOUT    | O    | Clock output.                                                                                                                         |
| 7    | FS0       | I    | Digital logic input used to select input frequency range. (See Input Frequency Selection.) This pin has an internal pull-up resistor. |
| 8    | VDD       | P    | Connect to +3.3 V.                                                                                                                    |

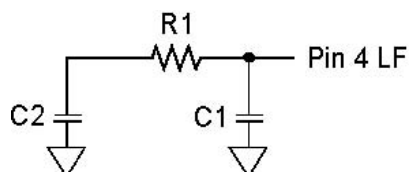
**Input Frequency Selection**

| FS1 | FS0 | Input (MHz) | Output Frequency Scaling |            |
|-----|-----|-------------|--------------------------|------------|
|     |     |             | P2082A                   | P2084A     |
| 0   | 0   | 3 to 9      | 6 to 18                  | 12 to 36   |
| 0   | 1   | 10 to 19    | 20 to 38                 | 40 to 76   |
| 1   | 0   | 20 to 38    | 40 to 76                 | 80 to 152  |
| 1   | 1   | 39 to 78    | 78 to 156                | 156 to 312 |



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Loop Filter Selection Table VDD 3.3 V



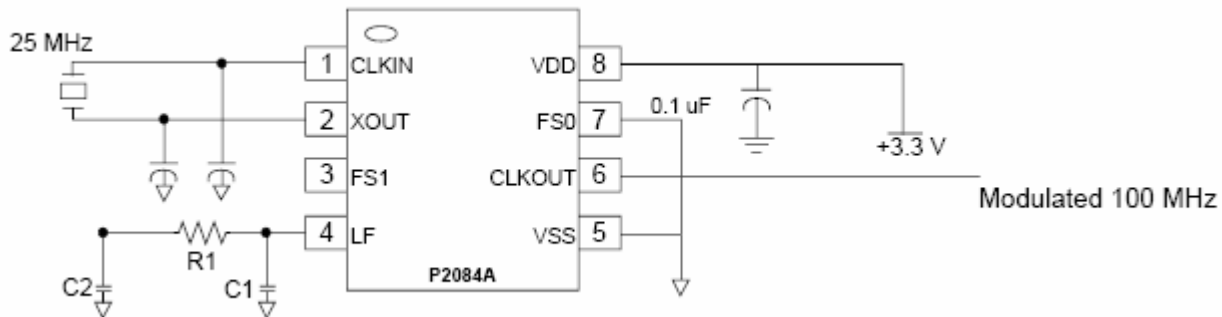
| Input (MHz) | FS1 | FS0 | C1(pF) | C2(pF)  | R1 (ohms) |
|-------------|-----|-----|--------|---------|-----------|
| 3           | 0   | 0   | 270    | 330,000 | 220       |
| 4           | 0   | 0   | 270    | 100,000 | 270       |
| 5           | 0   | 0   | 270    | 100,000 | 390       |
| 6           | 0   | 0   | 270    | 100,000 | 510       |
| 7           | 0   | 0   | 270    | 100,000 | 620       |
| 8           | 0   | 0   | 270    | 100,000 | 820       |
| 9           | 0   | 0   | 270    | 100,000 | 1,000     |
| 10          | 0   | 1   | 270    | 100,000 | 330       |
| 11          | 0   | 1   | 270    | 100,000 | 390       |
| 12          | 0   | 1   | 270    | 100,000 | 510       |
| 13          | 0   | 1   | 270    | 100,000 | 560       |
| 14          | 0   | 1   | 270    | 100,000 | 620       |
| 15          | 0   | 1   | 270    | 100,000 | 750       |
| 16          | 0   | 1   | 270    | 100,000 | 820       |
| 17          | 0   | 1   | 270    | 100,000 | 910       |
| 18          | 0   | 1   | 270    | 100,000 | 1,000     |
| 19          | 0   | 1   | 270    | 100,000 | 1,200     |
| 20          | 1   | 0   | 270    | 100,000 | 330       |
| 21 - 22     | 1   | 0   | 270    | 100,000 | 390       |
| 23 - 24     | 1   | 0   | 270    | 100,000 | 510       |
| 25 - 26     | 1   | 0   | 270    | 100,000 | 560       |
| 27 - 28     | 1   | 0   | 270    | 100,000 | 620       |
| 29 - 30     | 1   | 0   | 270    | 100,000 | 750       |
| 31 - 32     | 1   | 0   | 270    | 100,000 | 820       |
| 33 - 34     | 1   | 0   | 270    | 100,000 | 910       |
| 35 - 36     | 1   | 0   | 270    | 100,000 | 1,000     |
| 37 - 38     | 1   | 0   | 270    | 100,000 | 1,200     |
| 39 - 42     | 1   | 1   | 270    | 100,000 | 330       |
| 43 - 46     | 1   | 1   | 270    | 100,000 | 390       |
| 47 - 50     | 1   | 1   | 270    | 100,000 | 510       |
| 51 - 54     | 1   | 1   | 270    | 100,000 | 560       |
| 55 - 58     | 1   | 1   | 270    | 100,000 | 620       |
| 59 - 62     | 1   | 1   | 270    | 100,000 | 750       |
| 63 - 66     | 1   | 1   | 270    | 100,000 | 820       |
| 67 - 70     | 1   | 1   | 270    | 100,000 | 910       |
| 71 - 74     | 1   | 1   | 270    | 100,000 | 1,000     |
| 75 - 78     | 1   | 1   | 270    | 100,000 | 1,200     |



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**Output Clock Selection Example**

The P2084A can generate 4X from the input reference frequency. P2084A's internal crystal oscillator circuits allow the use of an inexpensive crystal of resonator to replace expensive can oscillators that are used in networking, PC peripherals, xDSL, and consumer applications for high frequency generation. Its input frequency range is optimized for operation from 3 MHz to 78 MHz, and its output frequency can deliver up to 312 MHz.





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## Absolute Maximum Ratings

| Symbol           | Parameter                              | Rating        | Unit |
|------------------|----------------------------------------|---------------|------|
| $V_{DD}, V_{IN}$ | Voltage on any pin with respect to GND | -0.5 to + 7.0 | V    |
| $T_{STG}$        | Storage temperature                    | -65 to +125   | °C   |
| $T_A$            | Operating temperature                  | 0 to 70       | °C   |

## DC Electrical Characteristics

| Symbol    | Parameter                                                                         | Min          | Typ | Max            | Unit |
|-----------|-----------------------------------------------------------------------------------|--------------|-----|----------------|------|
| $V_{IL}$  | Input low voltage                                                                 | GND - 0.3    | –   | 0.8            | V    |
| $V_{IH}$  | Input high voltage                                                                | 2.0          | –   | $V_{DD} + 0.3$ | V    |
| $I_{IL}$  | Input low current (internal input pull-up resistor on FS0 and FS1)                | –            | 60  | –              | μA   |
| $I_{IH}$  | Input high current (internal input pull-up resistor on FS0 and FS1)               | –            | 0   | –              | μA   |
| $I_{XOL}$ | XOUT output low current                                                           | –            | 10  | –              | mA   |
| $I_{XOH}$ | XOUT output high current                                                          | –            | 10  | –              | mA   |
| $V_{OL}$  | Output low voltage ( $V_{DD} = 3.3$ V, $I_{OL} = 20$ mA)                          | –            | –   | 0.4            | V    |
| $V_{OH}$  | Output high voltage ( $V_{DD} = 3.3$ V, $I_{OH} = 20$ mA)                         | 2.5          | –   | –              | V    |
| $I_{DD}$  | Static supply current                                                             | –            | 3   | –              | mA   |
| $I_{CC}$  | Typical dynamic supply current (25 pF scope probe loading)                        | 5.2 at 3 MHz | –   | 21.2 at 82 MHz | mA   |
| $V_{DD}$  | Operating voltage                                                                 | 3.0          | 3.3 | 3.6            | V    |
| $t_{ON}$  | Power-up time ( $C_{LOOP} = 0.1$ μF at 16 MHz, first locked cycle after power up) | –            | 7   | –              | mS   |
| $Z_{OUT}$ | Clock output impedance (at 16 MHz)                                                | –            | 28  | –              | Ω    |

## AC Electrical Characteristics

| Symbol     | Parameter                                     | Min | Typ  | Max | Unit |
|------------|-----------------------------------------------|-----|------|-----|------|
| $f_{IN}$   | Input frequency                               | 3   | –    | 78  | MHz  |
| $f_{OUT}$  | P2082A                                        | 6   | –    | 156 | MHz  |
|            | P2084A                                        | 12  | –    | 312 | MHz  |
| $t_{LH}^1$ | Output rise time (measured at 0.8 V to 2.0 V) | –   | 1    | –   | ns   |
| $t_{HL}^1$ | Output fall time (measured at 2.0 V to 0.8 V) | –   | 1    | –   | ns   |
| $t_{JC}$   | Jitter (cycle to cycle)                       | –   | ±200 | –   | ps   |
| $t_D$      | Output duty cycle                             | 45  | 50   | 55  | %    |

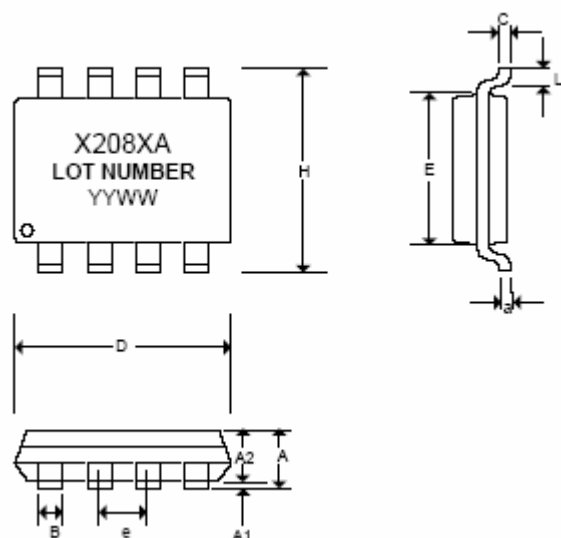
<sup>1</sup>  $t_{LH}$  and  $t_{HL}$  are measured into a capacitive load of 15 pF



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## Package Information

## Mechanical Package Outline 8-Pin SOIC



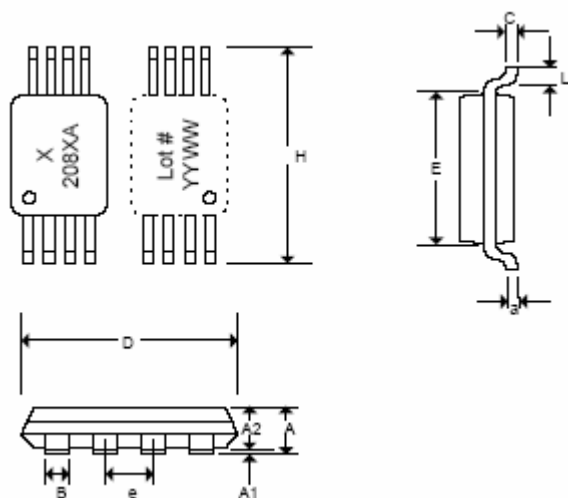
| Symbol | Dimensions in inches |       |       | Dimensions in millimeters |      |      |
|--------|----------------------|-------|-------|---------------------------|------|------|
|        | Min                  | Nor   | Max   | Min                       | Nor  | Max  |
| A      | 0.057                | 0.064 | 0.071 | 1.45                      | 1.63 | 1.80 |
| A1     | 0.004                | 0.007 | 0.010 | 0.10                      | 0.18 | 0.25 |
| A2     | 0.053                | 0.061 | 0.069 | 1.35                      | 1.55 | 1.75 |
| B      | 0.012                | 0.016 | 0.020 | 0.31                      | 0.41 | 0.51 |
| C      | 0.004                | 0.006 | 0.01  | 0.10                      | 0.15 | 0.25 |
| D      | 0.186                | 0.194 | 0.202 | 4.72                      | 4.92 | 5.12 |
| E      | 0.148                | 0.156 | 0.164 | 3.75                      | 3.95 | 4.15 |
| e      | 0.050 BSC            |       |       | 1.27 BSC                  |      |      |
| H      | 0.224                | 0.236 | 0.248 | 5.70                      | 6.00 | 6.30 |
| L      | 0.012                | 0.020 | 0.028 | 0.30                      | 0.50 | 0.70 |
| a      | 0°                   | 5°    | 8°    | 0°                        | 5°   | 8°   |

Note: Controlling dimensions are millimeters  
SOIC – 0.074 grams unit weight



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## Mechanical Package Outline 8-Pin TSSOP



| Symbol | Dimensions in inches |       |       | Dimensions in millimeters |      |      |
|--------|----------------------|-------|-------|---------------------------|------|------|
|        | Min                  | Nor   | Max   | Min                       | Nor  | Max  |
| A      |                      |       | 0.047 |                           |      | 1.10 |
| A1     | 0.002                |       | 0.006 | 0.05                      |      | 0.15 |
| A2     | 0.031                | 0.039 | 0.041 | 0.80                      | 1.00 | 1.05 |
| B      | 0.007                |       | 0.012 | 0.19                      |      | 0.30 |
| C      | 0.004                |       | 0.008 | 0.09                      |      | 0.20 |
| D      | 0.114                | 0.118 | 0.122 | 2.90                      | 3.00 | 3.10 |
| E      | 0.169                | 0.173 | 0.177 | 4.30                      | 4.40 | 4.50 |
| e      | 0.026 BSC            |       |       | 0.65 BSC                  |      |      |
| H      | 0.244                | 0.252 | 0.260 | 6.20                      | 6.40 | 6.60 |
| L      | 0.018                | 0.024 | 0.030 | 0.45                      | 0.60 | 0.75 |
| a      | 0°                   | 5°    | 8°    | 0°                        | 5°   | 8°   |

Note: Controlling dimensions are millimeters  
TSSOP – 0.034 grams unit weight

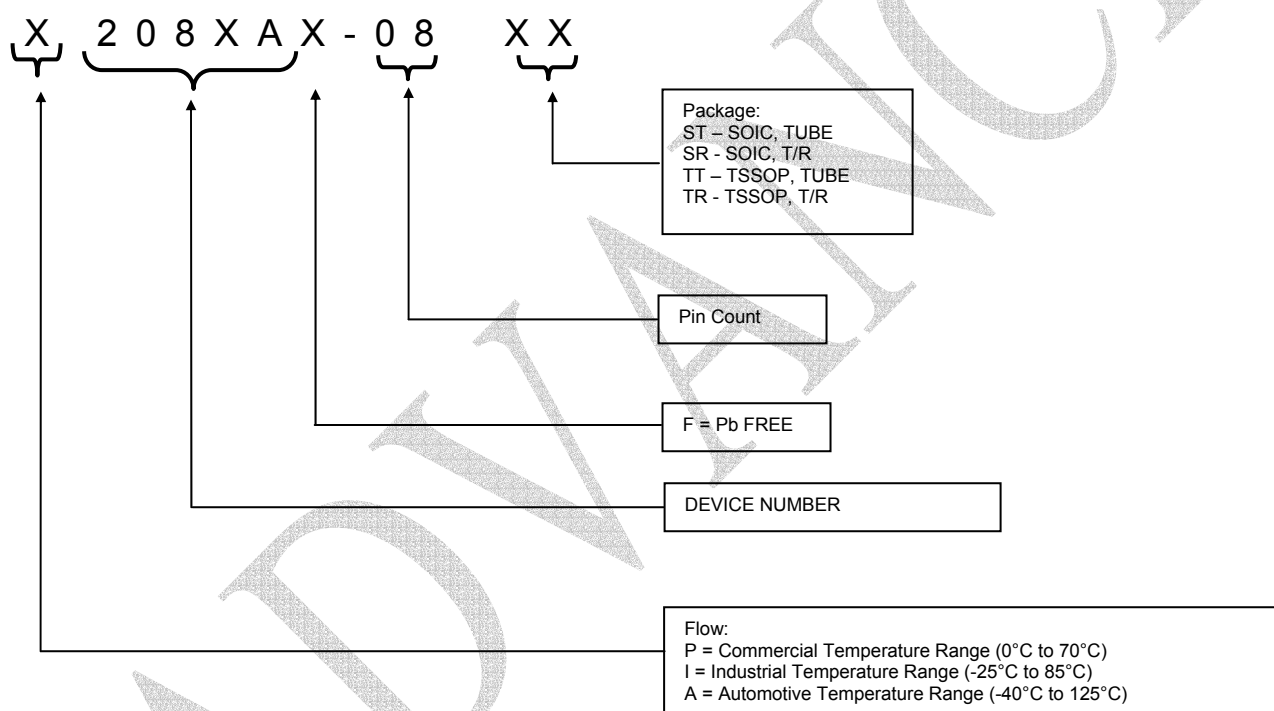


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## Ordering Codes

| Part Number | Marking | Package Type             | Qty per reel | Temperature (°C) |
|-------------|---------|--------------------------|--------------|------------------|
| P208XA-08ST | P208XA  | 8-pin SOIC, tube         |              | 0 to 70          |
| P208XA-08SR | P208XA  | 8-pin SOIC, tape & reel  | 2500         | 0 to 70          |
| P208XA-08TT | P208XA  | 8-pin TSSOP, tube        |              | 0 to 70          |
| P208XA-08TR | P208XA  | 8-pin TSSOP, tape & reel | 2500         | 0 to 70          |

## Device Ordering Information



Licensed under US patent Nos 5,488,627 and 5,631,920.  
Advance datasheet. Specification subject to change without notice.



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