Low Cost Frequency Multiplier

Features

- Generates 4X clocks of the Input Clock frequency
- Input clock frequency range from 20 MHz to 78 MHz
- Provides up to 312 MHz Output Clock frequency
- External loop filter
- Low Cycle-to-cycle jitter
- 3.3 V Operating Voltage
- TTL or CMOS compatible outputs
- Ultra-low power CMOS design
- Available in Commercial and Industrial temperature ranges
- Available in 8-pin SOIC and TSSOP Packages

Product Description

The P2384A is a versatile frequency multiplier that is designed specifically as cost effective alternative to the high precision frequency oscillator.

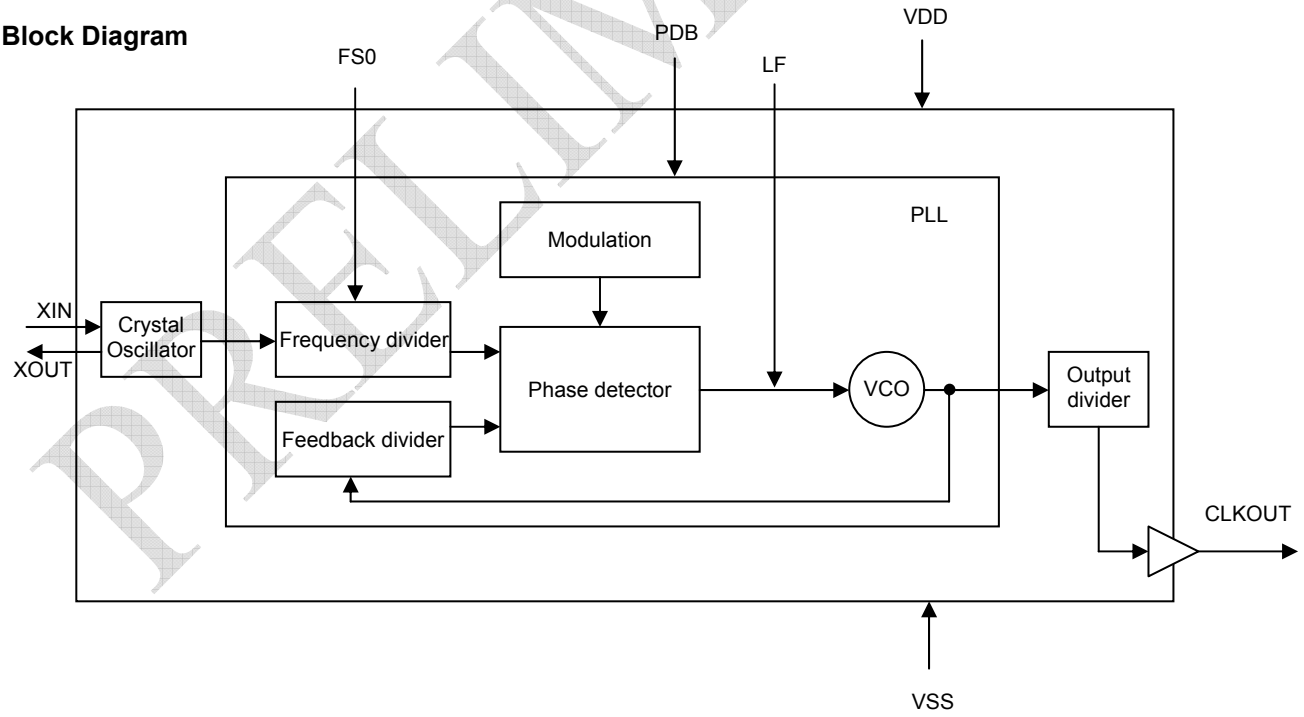
The P2384A can generate a 4X output clock of the input frequency that allows system cost savings by using an inexpensive crystal or resonator to achieve high frequency multiplication.

The P2384A provides up to 312 MHz output clock frequency through the use of the Phase-Lock-Loop (PLL) technique which delivers low jitter and high precision synthesized clocks.

Applications

The P2384A is targeted towards the high frequency CAN OSC replacement market. Applications include xDSL, routers, networking, PC peripherals, and embedded systems.

Block Diagram

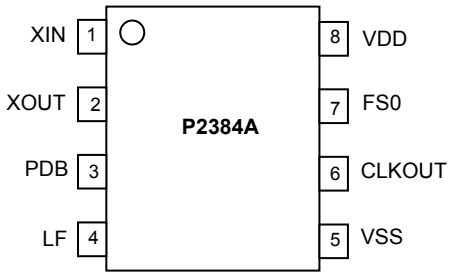


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Pin Configuration



Pin Description

Pin#	Pin Name	Type	Description
1	XIN	I	Crystal connection or external reference frequency input
2	XOUT	O	Crystal connection. If using an external reference, this pin must be left unconnected.
3	PDB	I	Power-down control pin. Pull low to enable power-down mode. Connect directly to VDD in normal operation and if not used.
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.

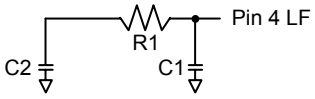
Input Frequency Selection

FS0	Input (MHz)	Output Frequency Scaling (MHz)
0	20 to 38	80 to 152
1	39 to 78	156 to 312

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Loop Filter Selection Table (VDD 3.3 V)



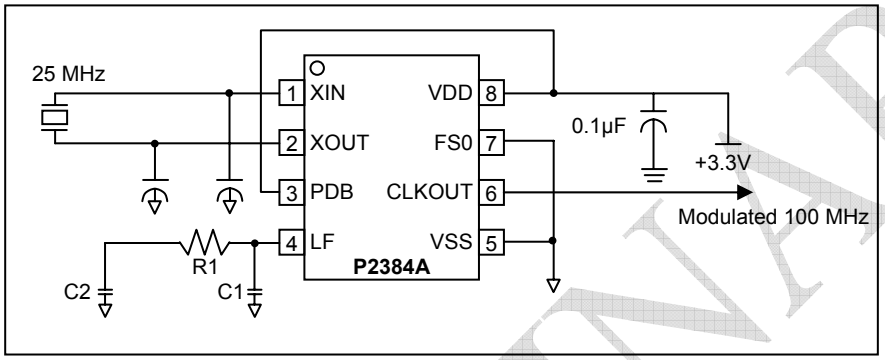
Input (MHz)	FS0	C1(pF)	C2(pF)	R1 (ohms)
20	0	270	100,000	330
21 - 22	0	270	100,000	390
23 - 24	0	270	100,000	510
25 - 26	0	270	100,000	560
27 - 28	0	270	100,000	620
29 - 30	0	270	100,000	750
31 - 32	0	270	100,000	820
33 - 34	0	270	100,000	910
35 - 36	0	270	100,000	1,000
37 - 38	0	270	100,000	1,200
39 - 42	1	270	100,000	330
43 - 46	1	270	100,000	390
47 - 50	1	270	100,000	510
51 - 54	1	270	100,000	560
55 - 58	1	270	100,000	620
59 - 62	1	270	100,000	750
63 - 66	1	270	100,000	820
67 - 70	1	270	100,000	910
71 - 74	1	270	100,000	1,000
75 - 78	1	270	100,000	1,200

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Output Clock Selection Example

The P2384A can generate 4X Clock from the Input reference frequency. P2384A's internal crystal oscillator circuits allow the use of an inexpensive crystal or 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 operations from 20 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 Ground	-0.5 to +4.6	V
T_{STG}	Storage temperature	-65 to +125	°C
T_A	Operating temperature	-40 to +85	°C
T_s	Max. Soldering Temperature (10 sec)	260	°C
T_J	Junction Temperature	150	°C
T_{DV}	Static Discharge Voltage (As per JEDEC STD 22- A114-B)	2	KV

Note: These are stress ratings only and are not implied for functional use. Exposure to absolute maximum ratings for prolonged periods of time may affect device reliability.

DC Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
V_{IL}	Input low voltage	VSS - 0.3	–	0.8	V
V_{IH}	Input high voltage	2.0	–	VDD + 0.3	V
I_{IL}	Input low current (Internal input pull-up resistor on FS0 and PDB)	–	180	–	µA
I_{IH}	Input high current (Internal input pull-up resistor on FS0 and PDB)	–	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)	–	28	–	mA
V_{DD}	Operating voltage	3.0	3.3	3.6	V
t_{ON}	Power-up time	–	7	–	mS
Z_{OUT}	Clock output impedance	–	28	–	Ω

* XIN and PBD are pulled low.

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AC Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
f_{IN}	Input frequency	20	–	78	MHz
f_{OUT}	Output frequency	80	–	312	MHz
t_{LH}*	Output rise time (measured at 0.8 V to 2.0 V)	–	1	–	nS
t_{HL}*	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	%

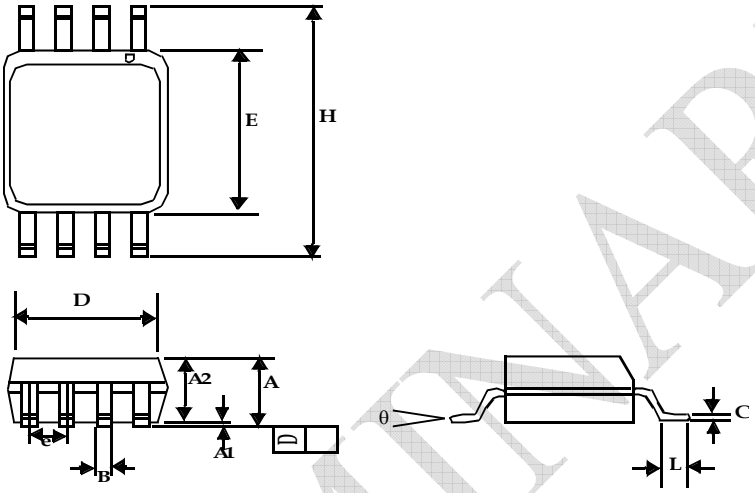
* t_{LH} and t_{HL} are measured into a capacitive load of 15 pF

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Package Information

8-lead (150-mil) SOIC Package

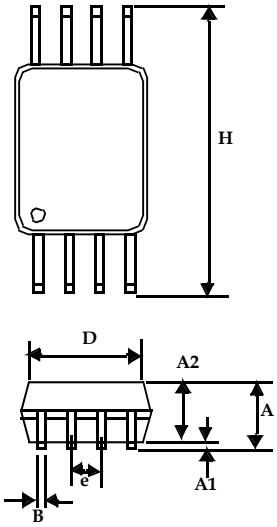


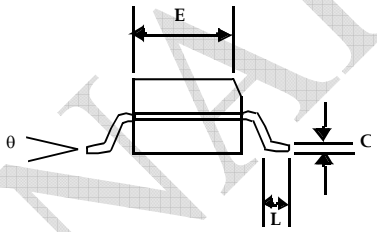
Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A1	0.004	0.010	0.10	0.25
A	0.053	0.069	1.35	1.75
A2	0.049	0.059	1.25	1.50
B	0.012	0.020	0.31	0.51
C	0.007	0.010	0.18	0.25
D	0.193 BSC		4.90 BSC	
E	0.154 BSC		3.91 BSC	
e	0.050 BSC		1.27 BSC	
H	0.236 BSC		6.00 BSC	
L	0.016	0.050	0.41	1.27
θ	0°	8°	0°	8°

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8-lead Thin Shrunk Small Outline Package (4.40-MM Body)





Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.043		1.10
A1	0.002	0.006	0.05	0.15
A2	0.033	0.037	0.85	0.95
B	0.008	0.012	0.19	0.30
c	0.004	0.008	0.09	0.20
D	0.114	0.122	2.90	3.10
E	0.169	0.177	4.30	4.50
e	0.026 BSC		0.65 BSC	
H	0.252 BSC		6.40 BSC	
L	0.020	0.028	0.50	0.70
θ	0°	8°	0°	8°

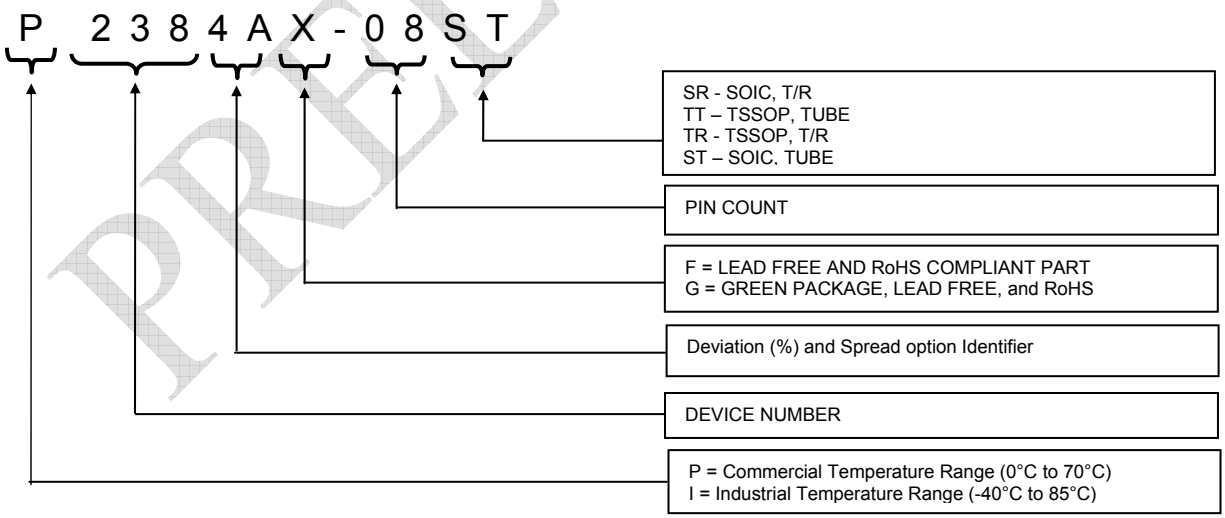
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Ordering Codes

Part Number	Marking	Package Type	Qty per reel	Temperature
P2384A-08ST	P2384AG	8-pin SOIC, Tube, GREEN		Commercial
P2384A-08SR	P2384AG	8-pin SOIC, Tape & reel, GREEN	2500	Commercial
P2384A-08TT	P2384AG	8-pin TSSOP, Tube, GREEN		Commercial
P2384A-08TR	P2384AG	8-pin TSSOP, Tape & reel, GREEN	2500	Commercial
I2384A-08ST	I2384AG	8-pin SOIC, Tube, GREEN		Industrial
I2384A-08SR	I2384AG	8-pin SOIC, Tape & reel, GREEN	2500	Industrial
I2384A-08TT	I2384AG	8-pin TSSOP, Tube, GREEN		Industrial
I2384A-08TR	I2384AG	8-pin TSSOP, Tape & reel, GREEN	2500	Industrial
P2384AF-08ST	P2384AF	8-pin SOIC, Tube, Pb Free		Commercial
P2384AF-08SR	P2384AF	8-pin SOIC, Tape & reel, Pb Free	2500	Commercial
P2384AF-08TT	P2384AF	8-pin TSSOP, Tube, Pb Free		Commercial
P2384AF-08TR	P2384AF	8-pin TSSOP, Tape & reel, Pb Free	2500	Commercial
I2384AF-08ST	I2384AF	8-pin SOIC, Tube, Pb Free		Industrial
I2384AF-08SR	I2384AF	8-pin SOIC, Tape & reel, Pb Free	2500	Industrial
I2384AF-08TT	I2384AF	8-pin TSSOP, Tube, Pb Free		Industrial
I2384AF-08TR	I2384AF	8-pin TSSOP, Tape & reel, Pb Free	2500	Industrial

Device Ordering Information



Licensed under US patent Nos 5,488,627 and 5,631,920.

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Part Number: P2384A
Document Version: v0.2

Note: This product utilizes US Patent # 6,646,463 Impedance Emulator Patent issued to PulseCore Semiconductor, dated 11-11-2003

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