

Spread Spectrum Clock Generator

Features

- Generates four 4X low EMI spread spectrum clocks
- Input frequency: 15MHz
- Output frequency: 60MHz
- Internal loop filter minimizes external components and board space
- Selectable Centre Spread frequency deviation:
±0.5%, ±0.75%, ± 1.0%,
± 1.25%, ± 1.5%, ± 1.75% ± 2.0%
- 3.3V ± 0.3V Operating Voltage
- Commercial and Industrial temperature range
- 16-pin TSSOP Package
- Advanced low power CMOS process

output. PCS3P2191A offers seven selectable centre spread options of ±0.5% to ±2.0%, and a no spread option. (Refer Spread Deviation Selection Table). PCS3P2191A reduces electromagnetic interference (EMI) at the clock source, allowing system wide reduction of EMI of all clock dependent signals. The PCS3P2191A allows significant system cost savings by reducing the number of circuit board layers, ferrite beads, and shielding that are traditionally required to pass EMI regulations. The PCS3P2191A uses the most efficient and optimized modulation profile approved by the FCC and is implemented in a proprietary all digital method. The Device is available in 16 Pin TSSOP package, in Commercial and Industrial temperature range.

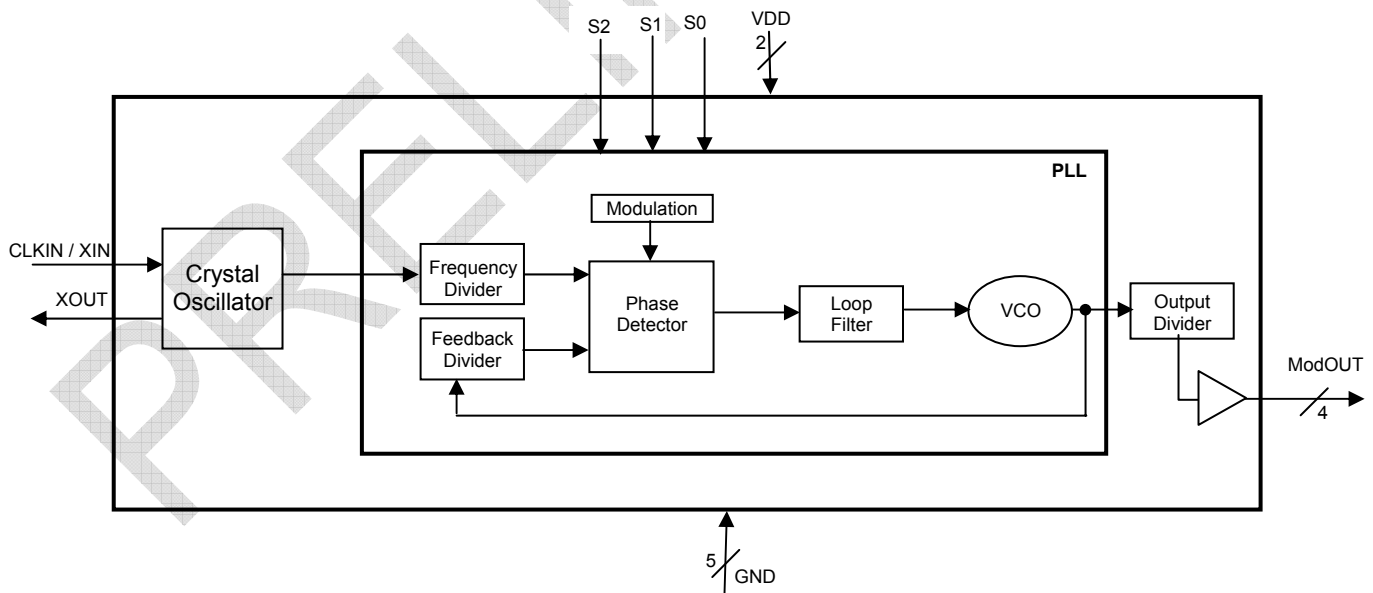
Product Description

PCS3P2191A is a versatile spread spectrum frequency modulator that generates four low EMI 4x clocks at the

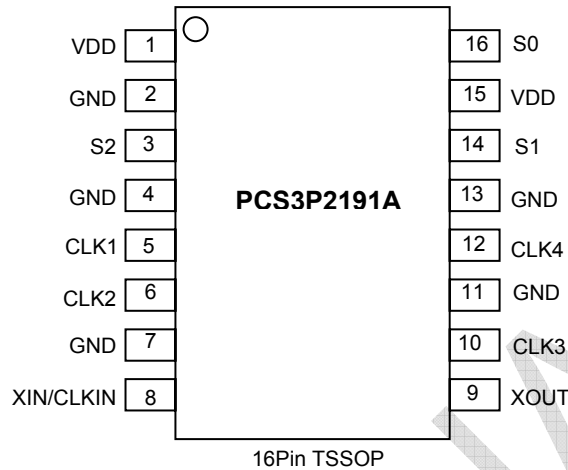
Application

PCS3P2191A is targetted for LCD panel application

Block Diagram



Pin Configuration



Pin Description

Pin#	Pin Name	Type	Description
1	V _{DD}	power	Power Supply Voltage Pin. Connect to +3.3V.
2	GND	power	Ground Connection. Connect to system ground.
3	S2	Input	Spread range select. Digital logic input used to select frequency deviation (Refer <i>Spread Deviation Table</i>). This pin has an internal pull-up resistor.
4	GND	power	Ground Connection. Connect to system ground.
5	CLK1	Output	Low EMI 4x clock output.
6	CLK2	Output	Low EMI 4x clock output.
7	GND	power	Ground Connection. Connect to system ground.
8	XIN/CLKIN	Input	Crystal connection or external reference frequency input. It can be connected to a 15MHz fundamental mode crystal.
9	XOUT	Output	Crystal connection. If using an external reference, this pin must be left unconnected.
10	GND	power	Ground Connection. Connect to system ground.
11	CLK3	Output	Low EMI 4x clock output.
12	CLK4	Output	Low EMI 4x clock output.
13	GND	power	Ground Connection. Connect to system ground.
14	S1	Output	Spread range select. Digital logic input used to select frequency deviation (Refer <i>Spread Deviation Table</i>). This pin has an internal pull-up resistor.
15	S0	Output	Spread range select. Digital logic input used to select frequency deviation (Refer <i>Spread Deviation Table</i>). This pin has an internal pull-up resistor.
16	V _{DD}	power	Power Supply Voltage Pin. Connect to +3.3V.

Spread Deviation Selection Table

S2	S1	S0	Deviation
0	0	0	OFF
0	0	1	± 0.5%
0	1	0	± 0.75%
0	1	1	± 1.0%
1	0	0	± 1.25%
1	0	1	± 1.5%
1	1	0	± 1.75%
1	1	1	± 2.0%

Absolute Maximum Ratings

Symbol	Parameter	Rating	Unit
V _{DD}	Supply Voltage pin with respect to Ground	-0.5 to +4.6	V
V _{IN}	Input Voltage pin with respect to Ground	VSS-0.5 to VDD+0.5	V
V _{OUT}	Output Voltage pin with respect to Ground	VSS-0.5 to VDD+0.5	V
T _{STG}	Storage temperature	-55 to +125	°C
T _s	Max. Soldering Temperature (10 sec)	260	°C
T _J	Junction Temperature	150	°C
T _{DV}	Static Discharge Voltage(As per JEDEC STD22- 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.

Recommended Operating Conditions

Parameter	Description	Min	Typ	Max	Unit
V _{DD}	Operating Voltage	3.0	3.3	3.6	V
T _A	Operating Temperature	-40		+85	°C
C _L	Load Capacitance			15	pF
C _{IN}	Input Capacitance		5		pF

DC Electrical Characteristics (TA=-40°C to +85°C, VDD=3.3V ± 0.3V)

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	(XIN / CLKIN)			-35	µA
I _{IH}	Input high current				+35	
I _{IL}	Input low current	(S0:S1:S2)			-50	µA
I _{IH}	Input high current				+50	
I _{XOL}	X _{OUT} output low current (V _{XOL} @ 0.4V, VDD = 3.3V)			3		mA
I _{XOH}	X _{OUT} output high current (V _{XOH} @ 2.5V, VDD = 3.3V)			3		mA
V _{OL}	Output low voltage	I _{OL} = 12mA	VSS		0.4	V
V _{OH}	Output high voltage	I _{OH} = -12mA	2.4		V _{DD}	V
I _{CC}	Dynamic supply current , 60 MHz Output, no load			15		mA
I _{DD}	Static supply current standby mode*				8	mA
V _{DD}	Operating voltage		3.0	3.3	3.6	V
t _{ON}	Power up time (first locked clock cycle after power up)**				5	mS
Z _{OUT}	Clock output impedance			27		Ω
C _{IN}	Input Capacitance			5		pF
C _L	Load Capacitance				15	pF

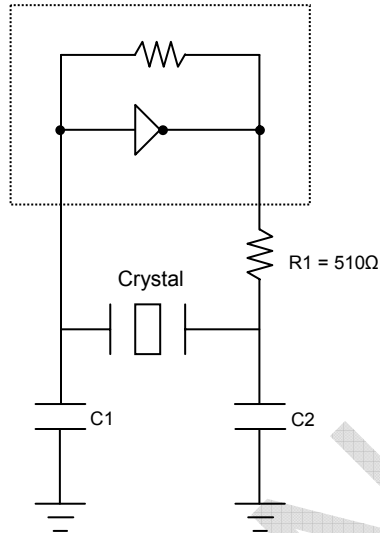
*CLKIN pulled Low
 **V_{DD} and CLKIN inputs are stable

AC Electrical Characteristics (TA=-40°C to +85°C, VDD=3.3V ± 0.3V)

Symbol	Parameter		Min	Typ	Max	Unit
XIN/ CLKIN	Input frequency			15		MHz
CLKOUT	Output frequency	(Pin 5,6,11,12)		60		MHz
F _{MOD}	Spread Spectrum Modulation Rate			39		KHz
t _{LH} *	Output rise time (Measured from 20% to 80%)			1.5		nS
t _{HL} *	Output fall time (Measured from 80% to 20%)			1.0		nS
	Output frequency Synthesis error			0		ppm
t _{JC} *	Cycle to Cycle Jitter			275		pS
t _D *	Output duty cycle		45	50	55	%

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

Typical Crystal Oscillator Circuit

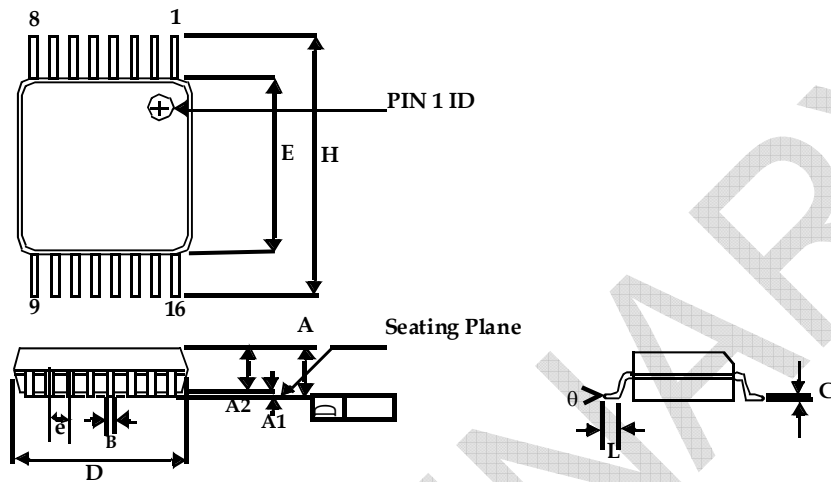


Typical Crystal Specifications

Fundamental AT cut parallel resonant crystal	
Nominal frequency	15MHz
Frequency tolerance	± 50 ppm or better at 25°C
Operating temperature range	-45°C to +90°C
Load capacitance	18pF
Shunt capacitance	7pF maximum
ESR	25Ω

Package Information

16-lead Thin Shrunken Small Outline Package (4.40-MM Body)



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A		0.043		1.20
A1	0.002	0.006	0.05	0.15
A2	0.031	0.041	0.80	1.05
B	0.007	0.012	0.19	0.30
C	0.004	0.008	0.09	0.20
D	0.193	0.201	4.90	5.10
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	0.030	0.50	0.75
θ	0°	8°	0°	8°

Ordering Codes

Part Number	Marking	Package Type	Temperature
PCS3P2191AG-16TT	3P2191AG	16-Pin TSSOP, TUBE, Green	Commercial
PCS3P2191AG-16TR	3P2191AG	16-Pin TSSOP, TAPE & REEL, Green	Commercial
PCS3P2191AF-16TT	3P2191AF	16-Pin TSSOP, TUBE, Pb Free	Commercial
PCS3P2191AF-16TR	3P2191AF	16-Pin TSSOP, TAPE & REEL, Pb Free	Commercial
PCS3I2191AG-16TT	3I2191AG	16-Pin TSSOP, TUBE, Green	Industrial
PCS3I2191AG-16TR	3I2191AG	16-Pin TSSOP, TAPE & REEL, Green	Industrial
PCS3I2191AF-16TT	3I2191AF	16-Pin TSSOP, TUBE, Pb Free	Industrial
PCS3I2191AF-16TR	3I2191AF	16-Pin TSSOP, TAPE & REEL, Pb Free	Industrial

Device Ordering Information

P C S 3 P 2 1 9 1 A G - 1 6 T R

R = Tape & Reel, T = Tube or Tray																					
<table border="0"> <tr> <td>O = TSOT23</td> <td>U = MSOP</td> <td>J=TSOT26</td> </tr> <tr> <td>S = SOIC</td> <td>E = TQFP</td> <td></td> </tr> <tr> <td>T = TSSOP</td> <td>L = LQFP</td> <td></td> </tr> <tr> <td>A = SSOP</td> <td>U = MSOP</td> <td></td> </tr> <tr> <td>V = TVSOP</td> <td>P = PDIP</td> <td></td> </tr> <tr> <td>B = BGA</td> <td>D = QSOP</td> <td></td> </tr> <tr> <td>Q = QFN</td> <td>X = SC-70</td> <td></td> </tr> </table>	O = TSOT23	U = MSOP	J=TSOT26	S = SOIC	E = TQFP		T = TSSOP	L = LQFP		A = SSOP	U = MSOP		V = TVSOP	P = PDIP		B = BGA	D = QSOP		Q = QFN	X = SC-70	
O = TSOT23	U = MSOP	J=TSOT26																			
S = SOIC	E = TQFP																				
T = TSSOP	L = LQFP																				
A = SSOP	U = MSOP																				
V = TVSOP	P = PDIP																				
B = BGA	D = QSOP																				
Q = QFN	X = SC-70																				
DEVICE PIN COUNT																					
G = GREEN PACKAGE, LEAD FREE, and RoHS																					
PART NUMBER																					
<table border="0"> <tr> <td>X= Automotive (-40C to +125C)</td> <td>I= Industrial (-40C to +85C)</td> <td>P or n/c = Commercial (0C to +70C)</td> </tr> </table>	X= Automotive (-40C to +125C)	I= Industrial (-40C to +85C)	P or n/c = Commercial (0C to +70C)																		
X= Automotive (-40C to +125C)	I= Industrial (-40C to +85C)	P or n/c = Commercial (0C to +70C)																			
<table border="0"> <tr> <td>1 = Reserved</td> <td>6 = Power Management</td> </tr> <tr> <td>2 = Non PLL based</td> <td>7 = Power Management</td> </tr> <tr> <td>3 = EMI Reduction</td> <td>8 = Power Management</td> </tr> <tr> <td>4 = DDR support products</td> <td>9 = Hi Performance</td> </tr> <tr> <td>5 = STD Zero Delay Buffer</td> <td>0 = Reserved</td> </tr> </table>	1 = Reserved	6 = Power Management	2 = Non PLL based	7 = Power Management	3 = EMI Reduction	8 = Power Management	4 = DDR support products	9 = Hi Performance	5 = STD Zero Delay Buffer	0 = Reserved											
1 = Reserved	6 = Power Management																				
2 = Non PLL based	7 = Power Management																				
3 = EMI Reduction	8 = Power Management																				
4 = DDR support products	9 = Hi Performance																				
5 = STD Zero Delay Buffer	0 = Reserved																				
PulseCore Semiconductor Mixed Signal Product																					

Licensed under U.S Patent Nos 5,488,627 and 5,631,921



PulseCore Semiconductor Corporation
1715 S. Bascom Ave Suite 200
Campbell, CA 95008
Tel: 408-879-9077
Fax: 408-879-9018
www.pulsecoresemi.com

Copyright © PulseCore Semiconductor
All Rights Reserved
Part Number: PCS3P2191A
Document Version: v0.2

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

© Copyright 2006 PulseCore Semiconductor Corporation. All rights reserved. Our logo and name are trademarks or registered trademarks of PulseCore Semiconductor. All other brand and product names may be the trademarks of their respective companies. PulseCore reserves the right to make changes to this document and its products at any time without notice. PulseCore assumes no responsibility for any errors that may appear in this document. The data contained herein represents PulseCore's best data and/or estimates at the time of issuance. PulseCore reserves the right to change or correct this data at any time, without notice. If the product described herein is under development, significant changes to these specifications are possible. The information in this product data sheet is intended to be general descriptive information for potential customers and users, and is not intended to operate as, or provide, any guarantee or warranty to any user or customer. PulseCore does not assume any responsibility or liability arising out of the application or use of any product described herein, and disclaims any express or implied warranties related to the sale and/or use of PulseCore products including liability or warranties related to fitness for a particular purpose, merchantability, or infringement of any intellectual property rights, except as express agreed to in PulseCore's Terms and Conditions of Sale (which are available from PulseCore). All sales of PulseCore products are made exclusively according to PulseCore's Terms and Conditions of Sale. The purchase of products from PulseCore does not convey a license under any patent rights, copyrights; mask works rights, trademarks, or any other intellectual property rights of PulseCore or third parties. PulseCore does not authorize its products for use as critical components in life-supporting systems where a malfunction or failure may reasonably be expected to result in significant injury to the user, and the inclusion of PulseCore products in such life-supporting systems implies that the manufacturer assumes all risk of such use and agrees to indemnify PulseCore against all claims arising from such use.