

P3P622S01J

Timing-Safe™ Peak EMI Reduction IC

Functional Description

P3P622S01J is a versatile, 3.3 V Zero-delay buffer designed to distribute low frequency Timing-Safe Clocks with Peak EMI Reduction.

P3P622S01J accepts an input clock either from a fundamental Crystal or from an external reference clock.

P3P622S01J accepts one reference input and drives out two low-skew clocks.

P3P622S01J has an on-chip PLL that locks to an input reference clock. The PLL feedback is on-chip and is obtained from the CLKOUT pad, internal to the device.

Multiple P3P622S01J devices can accept the same input clock and distribute it. In this case, the skew between the outputs of the two devices is guaranteed to be less than 700 pS.

The output has less than 200 pS of cycle-to-cycle jitter. The input and output propagation delay is guaranteed to be less than 250 pS, and the output-to-output skew is guaranteed to be less than 250 pS.

Refer “Spread Spectrum Control and Input-Output Skew Table” for deviations and Input-Output Skew.

General Features

- Low Frequency Clock Distribution with Timing-Safe Peak EMI Reduction
- Input Frequency Range: 4 MHz – 20 MHz
- Zero Input – Output Propagation Delay
- Low-skew Outputs:
 - ♦ Output-output Skew Less than 250 pS
 - ♦ Device-device Skew Less than 700 pS
- Less than 200 pS Cycle-to-cycle Jitter
- Available in 8 Pin, 4.4 mm TSSOP Package
- Supply Voltage: 3.3 V ± 0.3 V
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

Spread Spectrum Frequency Generation

The clocks in digital systems are typically square waves with a 50% duty cycle and as frequencies increase the edge rates also get faster. Analysis shows that a square wave is composed of fundamental frequency and harmonics. The fundamental frequency and harmonics generate the energy peaks that become the source of EMI. Regulatory agencies test electronic equipment by measuring the amount of peak energy radiated from the equipment. In fact, the peak level allowed decreases as the frequency increases. The standard methods of reducing EMI are to use shielding, filtering, multi-layer PCBs etc. These methods are expensive. Spread spectrum clocking reduces the peak energy by reducing the

Q factor of the clock. This is done by slowly modulating the clock frequency. P3P622S01J uses the center modulation spread spectrum technique in which the modulated output frequency varies above and below the reference frequency with a specified modulation rate. With center modulation, the average frequency is the same as the unmodulated frequency and there is no performance degradation.

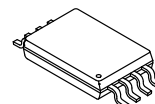
Timing-Safe Technology

Timing-Safe technology is the ability to modulate a clock source with Spread Spectrum technology and maintain synchronization with any associated data path.



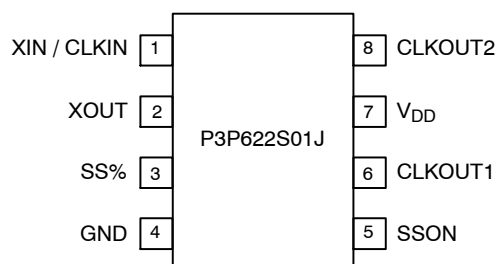
ON Semiconductor®

www.onsemi.com



TSSOP8 4.4x3
CASE 948AL

PIN CONFIGURATION



ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

P3P622S01J

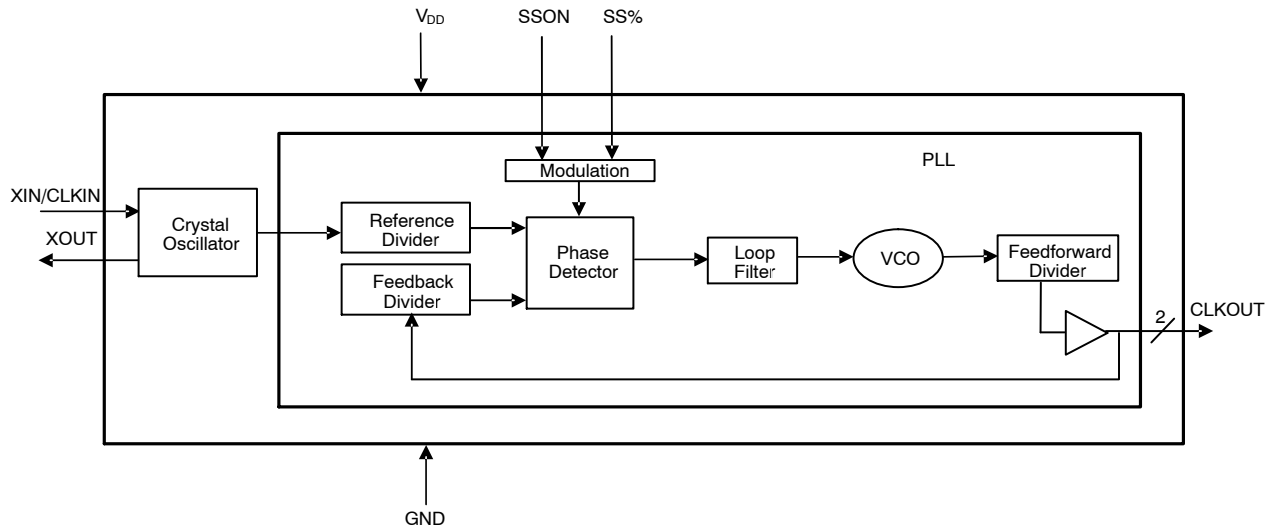


Figure 1. Block Diagram

Table 1. PIN DESCRIPTION FOR P3P622S01J

Pin #	Pin Name	Description
1	XIN / CLKIN	Crystal connection or external reference frequency input. This pin has dual functions. It can be connected either to an external crystal or an external reference clock.
2	XOUT	Crystal connection. If using an external reference, this pin must be left unconnected.
3	SS% (Note 2)	Spread Spectrum Selection
4	GND	Ground.
5	SSON (Note 2)	Spread Spectrum enable and disable option When SSON is HIGH, the spread spectrum is enabled and when LOW, it turns off the spread spectrum.
6	CLKOUT1 (Note 1)	Buffered clock output
7	V _{DD}	3.3 V supply
8	CLKOUT2 (Note 1)	Buffered clock output

1. Weak pull-down on all outputs. Buffered clock outputs are Timing-Safe
2. Weak pull-up on these inputs.

Table 2. SPREAD SPECTRUM CONTROL AND INPUT-OUTPUT SKEW TABLE

Device	Input Frequency	SS%	Deviation	Input-Output Skew ($\pm T_{SKEW}$)
P3P622S01J	12 MHz	0	$\pm 0.25\%$	0.063
		1	$\pm 0.50\%$	0.125

NOTE: T_{SKEW} is measured in units of the Clock Period

Table 3. ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Rating	Unit
V _{DD}	Voltage on any input pin with respect to Ground	-0.5 to +4.6	V
T _{STG}	Storage temperature	-65 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

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

P3P622S01J

Table 4. OPERATING CONDITIONS

Parameter	Description	Min	Max	Unit
VDD	Supply Voltage	3.0	3.6	V
T _A	Operating Temperature (Ambient Temperature)	-40	+85	°C
C _L	Load Capacitance		30	pF
C _{IN}	Input Capacitance		7	pF

Table 5. ELECTRICAL CHARACTERISTICS

Parameter	Description	Test Conditions	Min	Typ	Max	Units
V _{IL}	Input LOW Voltage (Note 1)				0.8	V
V _{IH}	Input HIGH Voltage (Note 1)		2.0			V
I _{IL}	Input LOW Current	V _{IN} = 0 V			50	μA
I _{IH}	Input HIGH Current	V _{IN} = V _{DD}			100	μA
V _{OL}	Output LOW Voltage (Note 2)	I _{OL} = 8 mA			0.4	V
V _{OH}	Output HIGH Voltage (Note 2)	I _{OH} = -8 mA	2.4			V
I _{DD}	Supply Current	Unloaded outputs		15		mA
Z _O	Output Impedance			23		Ω

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. CLKIN input has a threshold voltage of VDD/2

2. Parameter is guaranteed by design and characterization. Not tested in production.

Table 6. SWITCHING CHARACTERISTICS

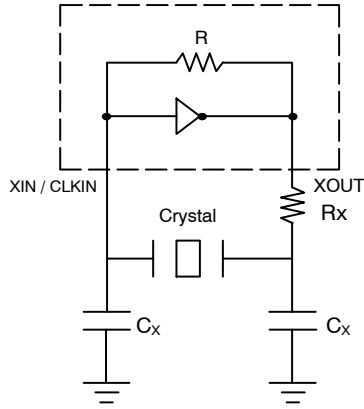
Parameter	Description	Test Conditions	Min	Typ	Max	Units
	Input Frequency		4		20	MHz
1/t ₁	Output Frequency	30 pF load	4		20	MHz
t _D	Duty Cycle (Note 4) = (t ₂ /t ₁) * 100	Measured at V _{DD} /2	40	50	60	%
t ₃	Output Rise Time (Notes 3 and 4)	Measured between 0.8 V and 2.0 V			2.5	nS
t ₄	Output Fall Time (Notes 3 and 4)	Measured between 2.0 V and 0.8 V			2.5	nS
t ₅	Output-to-output skew (Note 4)	All outputs equally loaded			250	pS
t ₆	Delay, CLKIN Rising Edge to CLKOUT Rising Edge (Note 4)	Measured at V _{DD} /2			±250	pS
t ₇	Device-to-Device Skew (Note 4)	Measured at V _{DD} /2 on the CLKOUT pins of the device			700	pS
t _J	Cycle-to-cycle jitter (Note 4)	Loaded outputs			200	pS
t _{LOCK}	PLL Lock Time (Note 4)	Stable power supply, valid clock presented on CLKIN pin			1.0	mS

3. The parameters specified with loaded outputs.

4. Parameter is guaranteed by design and characterization. Not tested in production.

P3P622S01J

Typical Crystal Interface Circuit



$$C_X = 2 * (C_P - C_S),$$

Where C_P = Load capacitance of crystal specified in a Crystal Datasheet

C_S = Stray capacitance due to C_{IN} , PCB, Trace, etc.

C_X = Load capacitance to be used

R_x is used to reduce power dissipation in the Crystal

Figure 2. Typical Crystal Interface Circuit

Switching Waveforms

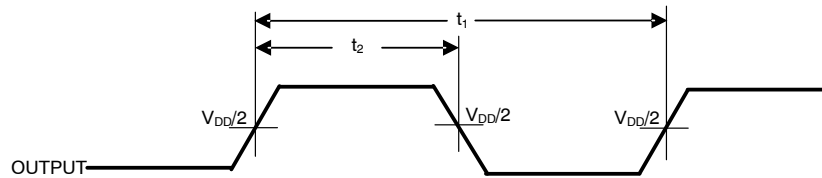


Figure 3. Duty Cycle Timing

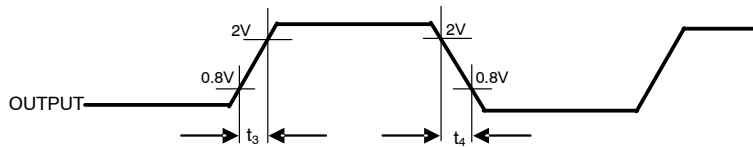


Figure 4. All Outputs Rise/Fall Time

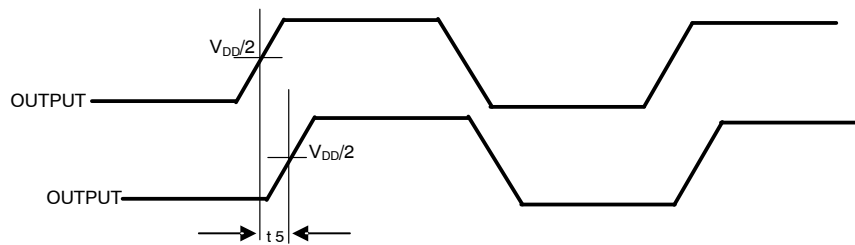


Figure 5. Output-Output Skew

P3P622S01J

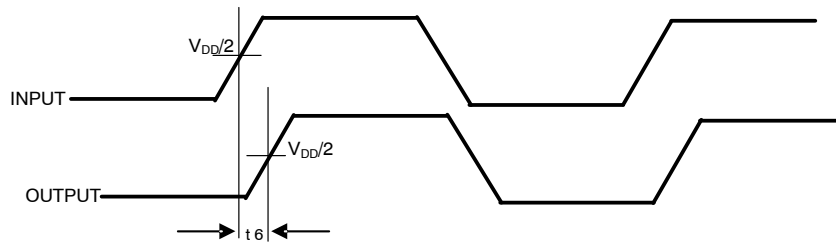


Figure 6. Input-Output Propagation Delay

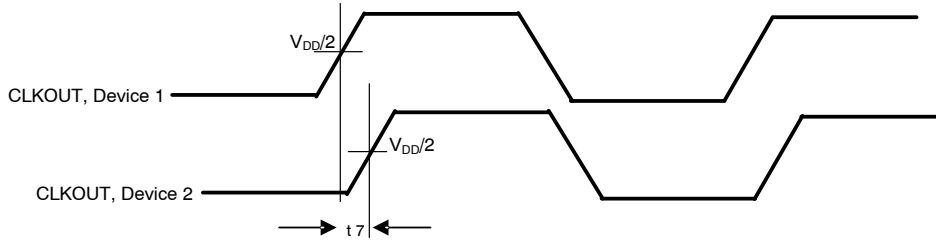


Figure 7. Device-Device Skew

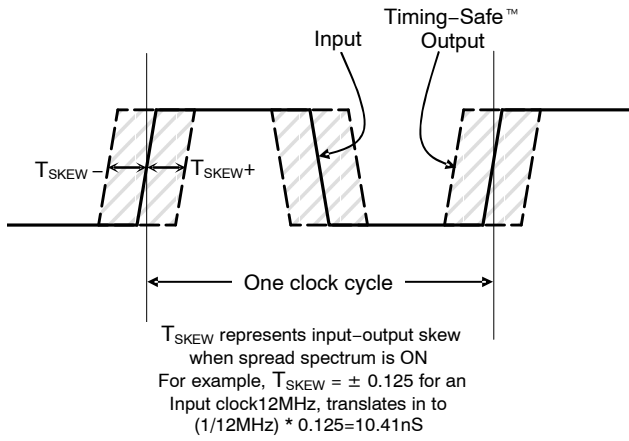


Figure 8. Input-Output Skew

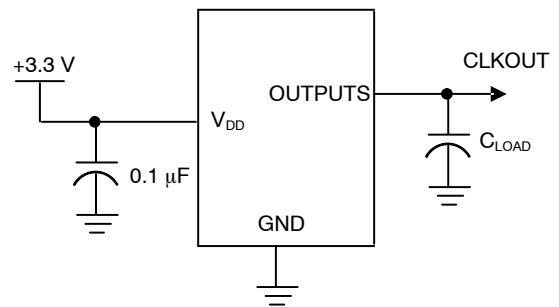


Figure 9. Test Circuit

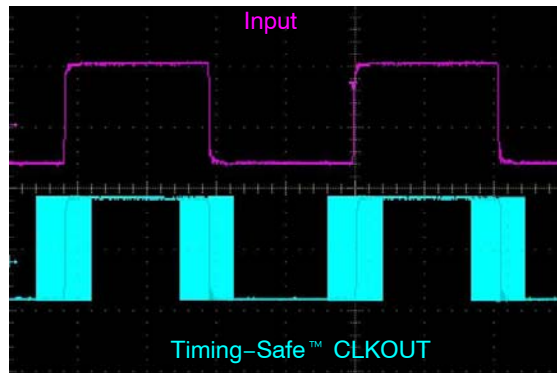
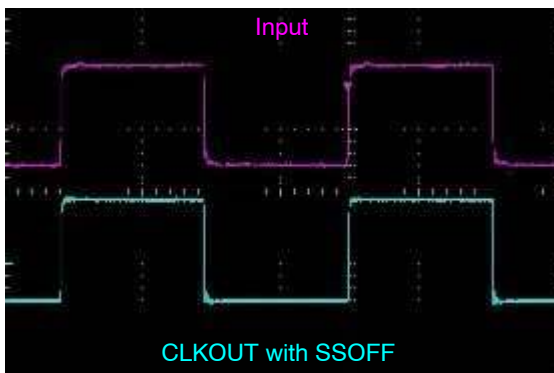


Figure 10. A Typical Example of Timing-Safe Waveform

Table 7. ORDERING INFORMATION

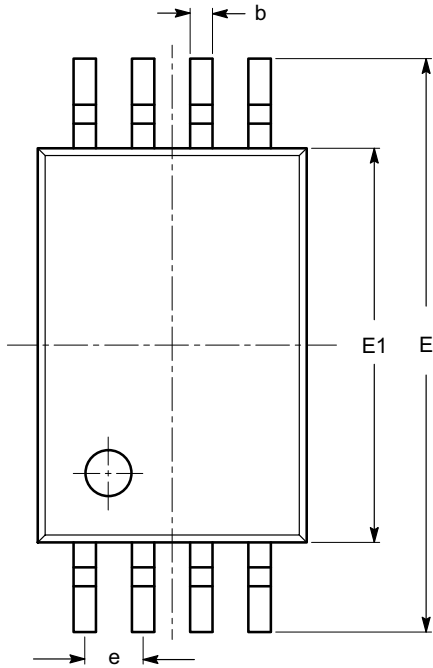
Part Number	Marking	Package Type	Temperature
P3P622S01JG-08TR	ADS	8 pin, 4.4 mm TSSOP, TAPE & REEL, Green	0°C to +70°C

NOTE: A "microdot" placed at the end of last row of marking or just below the last row toward the center of package indicates Pb-free

P3P622S01J

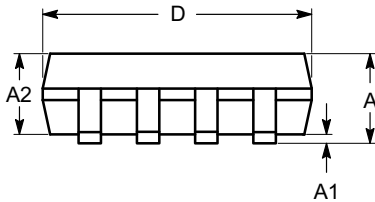
PACKAGE DIMENSIONS

TSSOP8, 4.4x3
CASE 948AL
ISSUE O

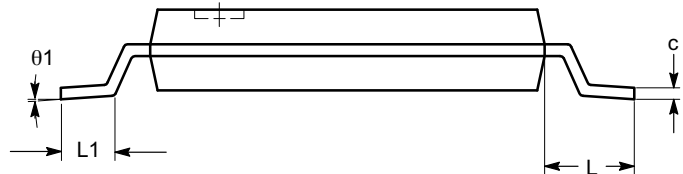


TOP VIEW

SYMBOL	MIN	NOM	MAX
A			1.20
A1	0.05		0.15
A2	0.80	0.90	1.05
b	0.19		0.30
c	0.09		0.20
D	2.90	3.00	3.10
E	6.30	6.40	6.50
E1	4.30	4.40	4.50
e	0.65 BSC		
L	1.00 REF		
L1	0.50	0.60	0.75
θ	0°		8°



SIDE VIEW




END VIEW

Notes:

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-153.

TIMING SAFE is a trademark of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries.

ON Semiconductor and the  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC) or its subsidiaries in the United States and/or other countries. SCILLC owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of SCILLC's product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855 Toll Free
USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5817-1050

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local
Sales Representative