

HD151TS302RP

Spread Spectrum Clock for EMI Solution

HITACHI

ADE-205-655A (Z)

Preliminary
Rev. 1
Sep. 2001

Description

The HD151TS302 is a high-performance Spread Spectrum Clock modulator. It is suitable for low EMI solution.

Features

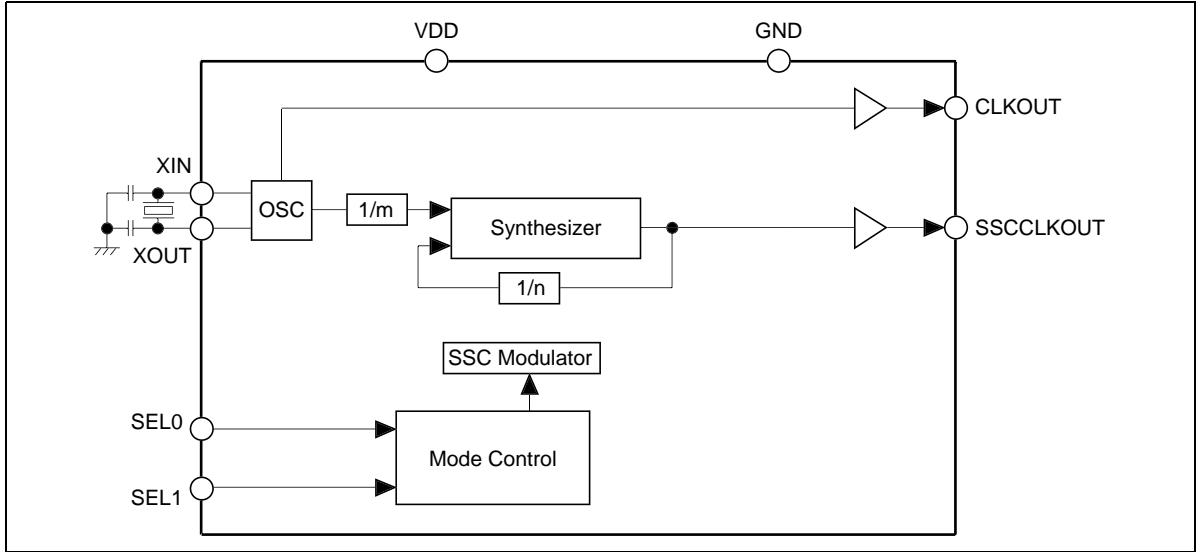
- Supports 10 MHz to 60 MHz operation. (Designed for XIN = 24 MHz and 48 MHz)
- 1 copy of clock out with spread spectrum modulation @3.3 V
- 1 copy of reference clock @3.3 V
- Programmable spread spectrum modulation (-0.5%, -1.0%, -3.0% down spread modulation and spread spectrum disable mode.)
- SOP-8pin
- Pin to pin compatible with HD151TS301RP

Key Specifications

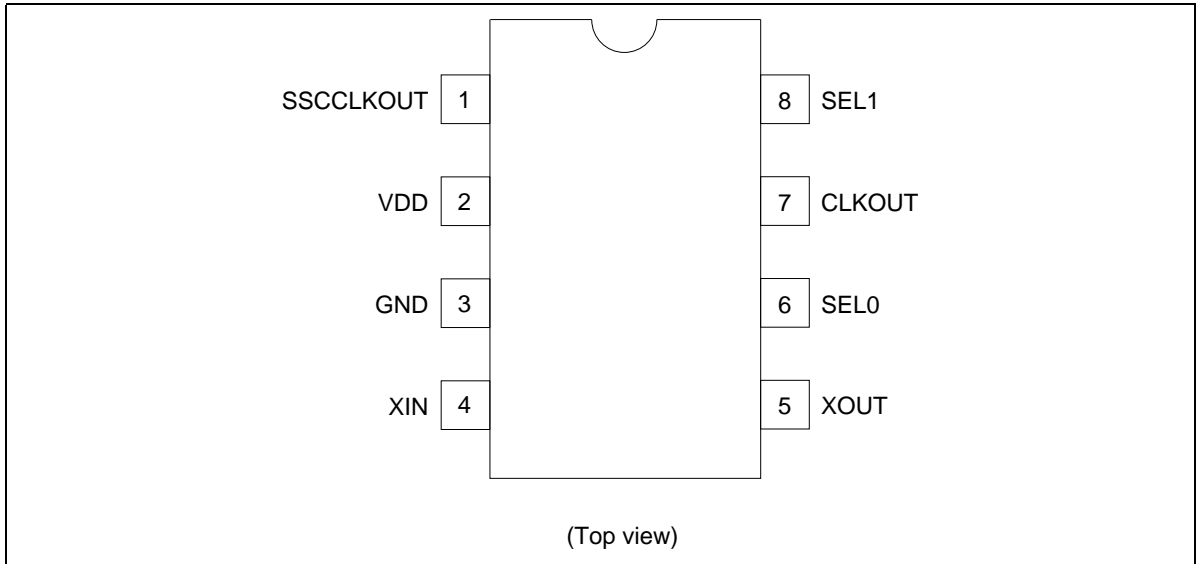
- Supply voltages : VDD = 3.3 V \pm 0.165 V
- Ta = 0 to 70°C operating range
- Clock output duty cycle = 50 \pm 5%
- Cycle to cycle jitter = \pm 250 ps typ.

HD151TS302RP

Block Diagram



Pin Arrangement



SSC Function Table

SEL1 :0	Spread Percentage
0 0	-1.0%
0 1	-3.0%
1 0	SSC OFF
1 1	-0.5%

Note: -3.0% SSC is selected for default by internal pull-up & down resistors.

Clock Frequency Table

XIN(MHz)	SSCCLKOUT(MHz)	CLKOUT(MHz)
48	48 ¹	48 ²
24	24 ¹	24 ²

Notes: 1. With spread spectrum modulation.
2. Without spread spectrum modulation.

Pin Descriptions

Pin name	No.	Type	Description
GND	3	Ground	GND pin
VDD	2	Power	Power supplies pin. Normally 3.3 V.
CLKOUT	7	Output	Normally 3.3 V reference clock output.
SSCCLKOUT	1	Output	Spread spectrum modulated clock output.
XIN	4	Input	Oscillator input.
XOUT	5	Output	Oscillator output.
SEL0	6	Input	SSC mode select pin. LVCMOS level input. Pull-up by internal resistor. (100 kΩ).
SEL1	8	Input	SSC mode select pin. LVCMOS level input. Pull-down by internal resistor (100 kΩ).

HD151TS302RP

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	VDD	-0.5 to 4.6	V	
Input voltage	V_I	-0.5 to 4.6	V	
Output voltage ¹⁾	V_O	-0.5 to VDD+0.5	V	
Input clamp current	I_{IK}	-50	mA	$V_I < 0$
Output clamp current	I_{OK}	-50	mA	$V_O < 0$
Continuous output current	I_O	±50	mA	$V_O = 0$ to VDD
Maximum power dissipation at $T_a = 55^\circ\text{C}$ (in still air)		0.7	W	
Storage temperature	T_{stg}	-65 to +150	°C	

Notes: Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

1. The input and output negative voltage ratings may be exceeded if the input and output clamp current ratings are observed.

Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit	Conditions
Supply voltage	VDD	3.135	3.3	3.465	V	
DC input signal voltage		-0.3	—	VDD+0.3	V	
High level input voltage	V_{IH}	2.0	—	VDD+0.3	V	
Low level input voltage	V_{IL}	-0.3	—	0.8	V	
Operating temperature	T_a	0	—	70	°C	
Input clock duty cycle		45	50	55	%	

DC Electrical Characteristics

Ta = 0 to 70°C, VDD = 3.3 V±5%

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input low voltage	V _{IL}	—	—	0.8	V	
Input high voltage	V _{IH}	2.0	—	—	V	
Input current	I _I	—	—	±10	μA	V _I = 0 V or 3.465 V, VDD = 3.465 V, XIN pin
		—	—	±100		V _I = 0 V or 3.465 V, VDD = 3.465 V, SEL0, SEL1 pins
Input slew rate		1	—	4	V / ns	20% – 80%
Input capacitance	C _I	—	—	4	pF	SEL0, SEL1
Operating current		—	7	—	mA	XIN = 24 MHz, C _L = 0 pF, VDD = 3.3 V

DC Electrical Characteristics / Clock Output & SSC Clock Output

Ta = 0 to 70°C, VDD = 3.3 V±5%

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Output voltage	V _{OH}	3.1	—	—	V	I _{OH} = -1 mA, VDD = 3.3 V
	V _{OL}	—	—	50	mV	I _{OL} = 1 mA, VDD = 3.3 V

AC Electrical Characteristics / Clock Output & SSC Clock Output

Ta = 25°C, VDD = 3.3 V, CL = 30 pF

Item	Symbol	Min	Typ	Max	Unit	Test Conditions	Notes
Cycle to cycle jitter ^{*1,2}	t _{CCS}	—	250	300	ps	SSCCLKOUT, Fig1, 24 MHz	SSC = -0.5% SEL1:0 = 11
		—	250	300		SSCCLKOUT, Fig1, 48 MHz	
		—	250	300		SSCCLKOUT, Fig1, 24 MHz	SSC = -3.0% SEL1:0 = 01
		—	250	300		SSCCLKOUT, Fig1, 48 MHz	
		—	250	300		CLKOUT, Fig1, 24 MHz & 48 MHz	
Output frequency ^{*1,2}		23.7	—	24.2	MHz	SSCCLKOUT, XIN = 24 MHz	SSC = -0.5% SEL1:0 = 11
		47.0	—	48.7		SSCCLKOUT, XIN = 48 MHz	
		23.1	—	24.2		SSCCLKOUT, XIN = 24 MHz	SSC = -3.0% SEL1:0 = 01
		45.9	—	48.7		SSCCLKOUT, XIN = 48 MHz	
		23.8	—	24.2		CLKOUT, 24 MHz	
		47.3	—	48.7		CLKOUT, 48 MHz	
Slew rate ^{*1}	t _{SL}	1.0	—	—	V/ns	@48 MHz CLKOUT	0.4 V to 2.4 V
Clock duty cycle ^{*1}		45	50	55	%		
Output impedance ^{*1}		—	30	—	Ω		
Spread spectrum modulation frequency ^{*1}		—	33	—	KHz	@48 MHz SSCCLKOUT	
Input clock frequency		10	—	60	MHz		
Stabilization time ^{*1,3}		—	—	2	ms		

- Notes: 1. Parameters are guaranteed by design and characterization. Not 100% tested in production.
2. Cycle to cycle jitter and output frequency are included spread spectrum modulation.
3. Stabilization time is the time required for the integrated circuit to obtain phase lock of its input signal after power up.

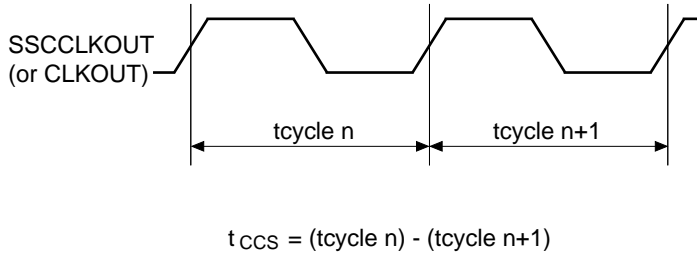
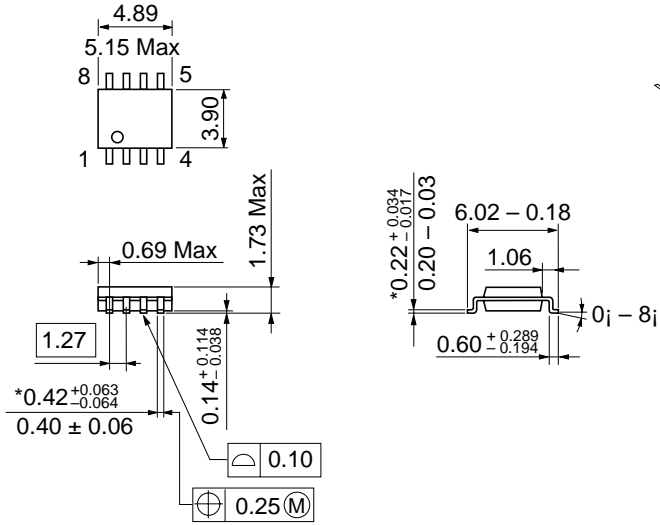


Figure 1 Cycle to cycle jitter

HD151TS302RP

Package Dimensions

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-8DC
JEDEC	—
EIAJ	—
Mass (reference value)	0.08 g

Disclaimer

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

Sales offices

HITACHI

Hitachi, Ltd.

Semiconductor & Integrated Circuits
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: (03) 3270-2111 Fax: (03) 3270-5109

URL <http://www.hitachisemiconductor.com/>

For further information write to:

Hitachi Semiconductor (America) Inc. 179 East Tasman Drive San Jose, CA 95134 Tel: <1> (408) 433-1990 Fax: <1>(408) 433-0223	Hitachi Europe Ltd. Electronic Components Group Whitebrook Park Lower Cookham Road Maidenhead Berkshire SL6 8YA, United Kingdom Tel: <44> (1628) 585000 Fax: <44> (1628) 585200
--	--

Hitachi Europe GmbH Electronic Components Group Dornacher Straße 3 D-85622 Feldkirchen Postfach 201, D-85619 Feldkirchen Germany Tel: <49> (89) 9 9180-0 Fax: <49> (89) 9 29 30 00

Hitachi Asia Ltd. Hitachi Tower 16 Collyer Quay #20-00 Singapore 049318 Tel: <65>-538-6533/538-8577 Fax: <65>-538-6933/538-3877 URL: http://semiconductor.hitachi.com.sg
--

Hitachi Asia Ltd. (Taipei Branch Office) 4/F, No. 167, Tun Hwa North Road Hung-Kuo Building Taipei (105), Taiwan Tel: <886>-(2)-2718-3666 Fax: <886>-(2)-2718-8180 Telex: 23222 HAS-TP URL: http://www.hitachi.com.tw

Hitachi Asia (Hong Kong) Ltd. Group III (Electronic Components) 7/F., North Tower World Finance Centre, Harbour City, Canton Road Tsim Sha Tsui, Kowloon Hong Kong Tel: <852>-(2)-735-9218 Fax: <852>-(2)-730-0281 URL: http://semiconductor.hitachi.com.hk

Copyright © Hitachi, Ltd., 2001. All rights reserved. Printed in Japan.
Colophon 5.0