RD151TS3315ARP, RD151TS3325ARP

Spread Spectrum Clock for EMI Solution

REJ03D0796-0100
Rev.1.00
May 11, 2006

Description

RD151TS3315ARP and RD151TS3325ARP is a high-performance Spread Spectrum Clock generator. It is suitable for EMI solution of electric systems.

Features

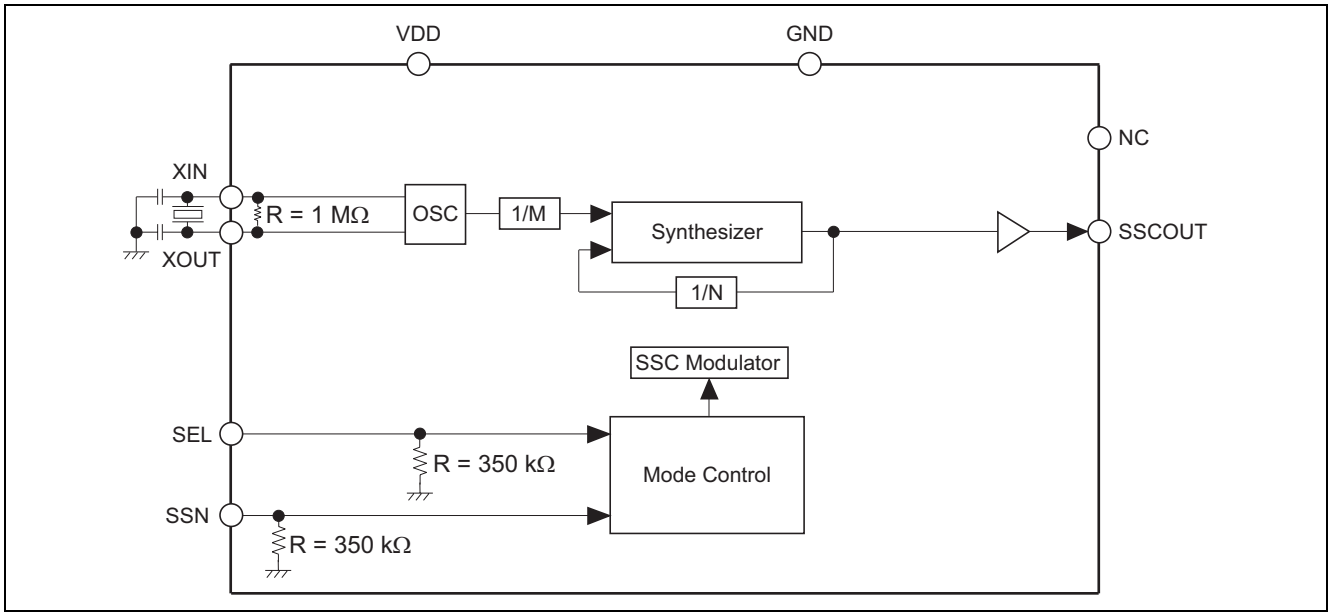
- Supports 20 MHz to 40 MHz operations. Multiple rate (XIN: SSCOUT) = 1: 4
  Input frequency 80 MHz to 160 MHz
- Spread spectrum modulation ; RD151TS3315ARP : ±1.5%, ±0.5% (Central spread modulation)
  RD151TS3325ARP : –3.0%, –1.0% (Down spread modulation)

Key Specifications

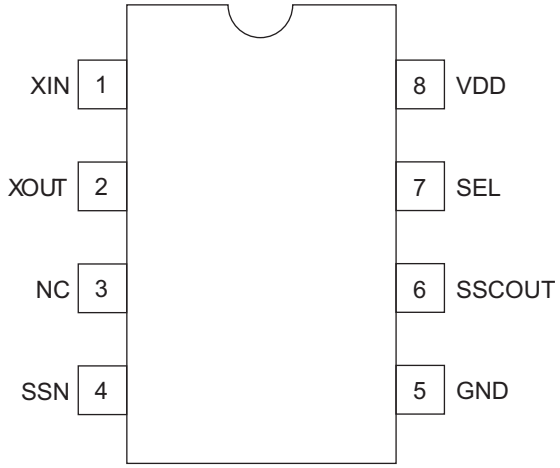
- Supply voltages: V_{DD} = 3.3 V ±0.3 V
- Cycle to cycle jitter = ±100 ps typ.
- Clock output duty cycle = 50 ±5%
- Output slew rate = 0.7 V/ns typ.
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
RD151TS3315ARPH0 RD151TS3325ARPH0	SOP-8 pin (JEDEC)	PRSP0008DD-C (FP-8DCV)	RP	H (2,500 pcs / Reel)

Block Diagram



Pin Arrangement



(Top view)

Pin Descriptions

Pin name	No.	Type	Description
GND	5	Ground	GND pin
VDD	8	Power	Power supply pin.
NC	3	NC	Don't connect any VDD or GND.
SSCOUT	6	Output	Spread spectrum modulated clock output.
XIN	1	Input	Oscillator input.
XOUT	2	Output	Oscillator output.
SEL	7	Input	SSC% mode select pin. LVCMOS level input. Pull-down by internal resistor (350 kΩ).
SSN	4	Input	SSC ON/OFF select pin. LVCMOS level input. Pull–down by internal resistor (350 kΩ).

SSC Function Table

STB	SEL	RD151TS3315ARP(Central spread)	RD151TS3325ARP(Down spread)
0	0	±1.5%*[1]	–3.0%*[1]
0	1	±0.5%	–1.0%
1	0	OFF	OFF
1	1		

Note: 1. ±1.5%(TS3315ARP) / -3.0%(TS3325ARP) SSC is selected for default by internal pull-down resistors.

Clock Frequency Table

PRODUCT	XIN(MHz)	SSCOUT(MHz)	Multiply rate (XIN: SSCOUT)
RD151TS3315ARP	20 to 40	80 to 160	1:4
RD151TS3325ARP	20 to 40	80 to 160	1:4

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{DD}	–0.5 to 4.6	V	
Input voltage	V_I	–0.5 to 4.6	V	
Output voltage [*1]	V_O	–0.5 to V_{DD}+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 V_{DD}
Maximum power dissipation		0.7	W	Ta = 55°C (in still air)
Storage temperature	T_{stg}	–65 to +150	°C	

Notes: Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device.

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	V_{DD}	3.0	3.3	3.6	V	
DC input signal voltage		–0.3	—	V_{DD}+0.3	V	
High level input voltage	V_{IH}	0.7×V_{DD}	—	V_{DD}+0.3	V	
Low level input voltage	V_{IL}	–0.3	—	0.3×V_{DD}	V	
Input clock duty cycle		45	50	55	%	
Operating temperature	T_a	–20	—	85	°C	

DC Electrical Characteristics

Ta = –20 to 85 °C, V_{DD} = 3.0 to 3.6 V

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Input current	I_I	—	—	±20	µA	V_I = 0 V or 3.6 V, V_{DD} = 3.6 V, XIN pin
		—	—	±100		V_I = 0 V or 3.6 V, V_{DD} = 3.6 V, SEL, SSN pins
Input capacitance	C_I	—	3	—	pF	SEL, SSN pins

DC Electrical Characteristics / SSC Clock Output

Ta = –20 to 85 °C, V_{DD} = 3.0 to 3.6 V

Item	Symbol	Min	Typ	Max	Unit	Test Conditions
Output voltage	V_{OH}	V_{DD}–0.2	—	—	V	I_{OH} = –1 mA
	V_{OL}	—	—	200	mV	I_{OL} = 1 mA
Output current	I_{OH}	—	–44	—	mA	V_{OH} = 1.5 V, V_{DD} = 3.3 V
	I_{OL}	—	44	—		V_{OL} = 1.5 V, V_{DD} = 3.3 V
Output impedance		—	40	—	Ω	

Note: Parameters are target of design. Not 100% tested in production.

AC Electrical Characteristics / SSC Clock Output

Ta = 25°C, V_{DD} = 3.3 V, C_L = 15 pF

Item	Symbol	Min	Typ	Max	Unit	Test Conditions	Notes
Operating current	I_{DD}	—	24	30	mA	V_{DD} = 3.3 V, C_L = 15 pF, XIN = 40 MHz	
Cycle to cycle jitter *1	t_{CCS}	—	|100|	—	ps	SEL = 0, C_L = 0 pF SSC = ±1.5% (TS3315ARP) SSC = –3.0% (TS3325ARP)	Figure 1
Slew rate	t_{SL}	—	2.0	5.0	V/ns	V_{DD} = 3.3 V, 0.2 × V_{DD} to 0.8 × V_{DD}	
Clock duty cycle		45	50	55	%		
Stabilization time *2		—	—	2	ms		

Notes: Parameters are target of design. Not 100% tested in production.

1. Cycle to cycle jitter is included spread spectrum modulation.
2. Stabilization time is the time required for the integrated circuit to obtain phase lock of its input signal after power up.

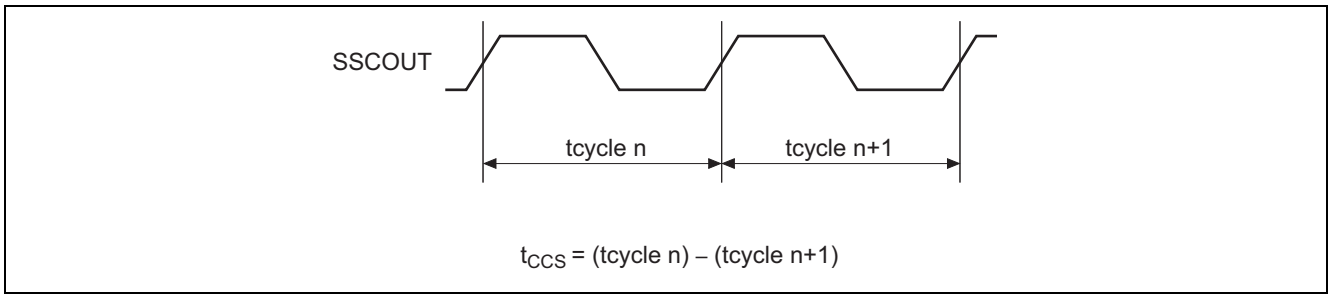


Figure 1 Cycle to cycle jitter

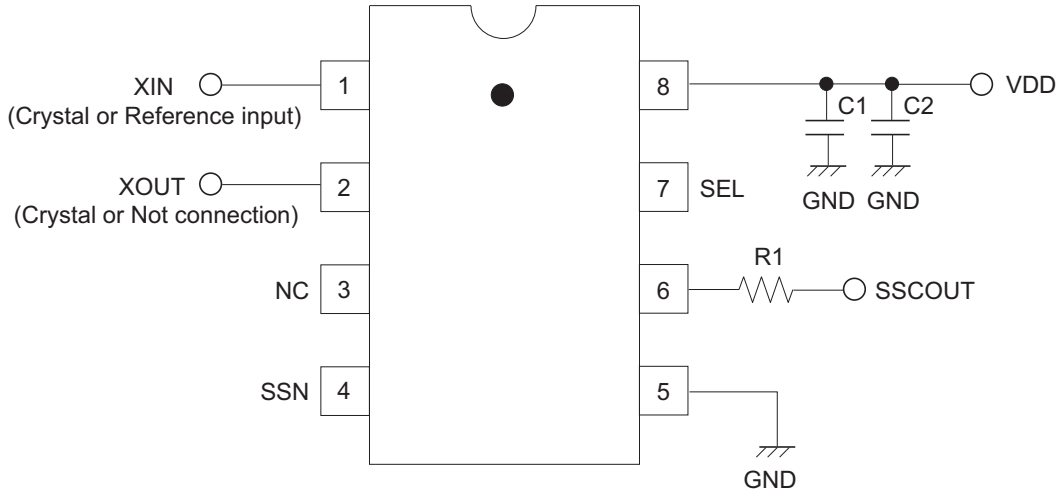
Application Information

1. Recommended Circuit Configuration

The power supply circuit of the optimal performance on the application of a system should refer to Figure 2.

VDD decoupling is important to both reduce Jitter and EMI radiation.

The C1 decoupling capacitor should be placed as close to the VDD pin as possible, otherwise the increased trace inductance will negate its decoupling capability.



Notes: C1 = High frequency supply decoupling capacitor.
(0.1 µF recommended)
C2 = Low frequency supply decoupling capacitor.
(22 µF recommended)
R1 = Match value to line impedance.

Figure 2 Recommended circuit configuration

2. Example Board Layout Configuration

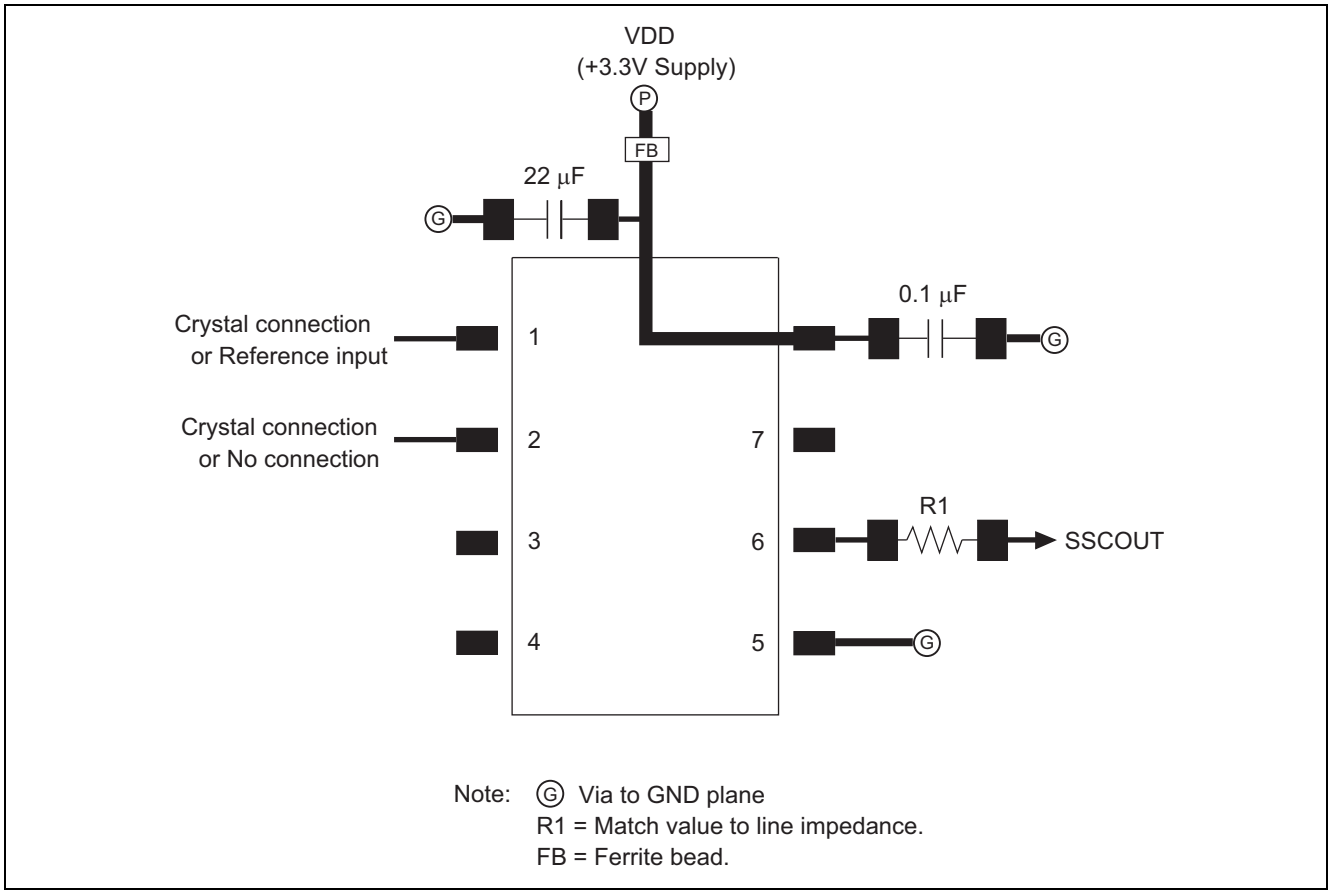


Figure 3 Example Board Layout

3. Example of TS33XX EMI Solution IC's Application

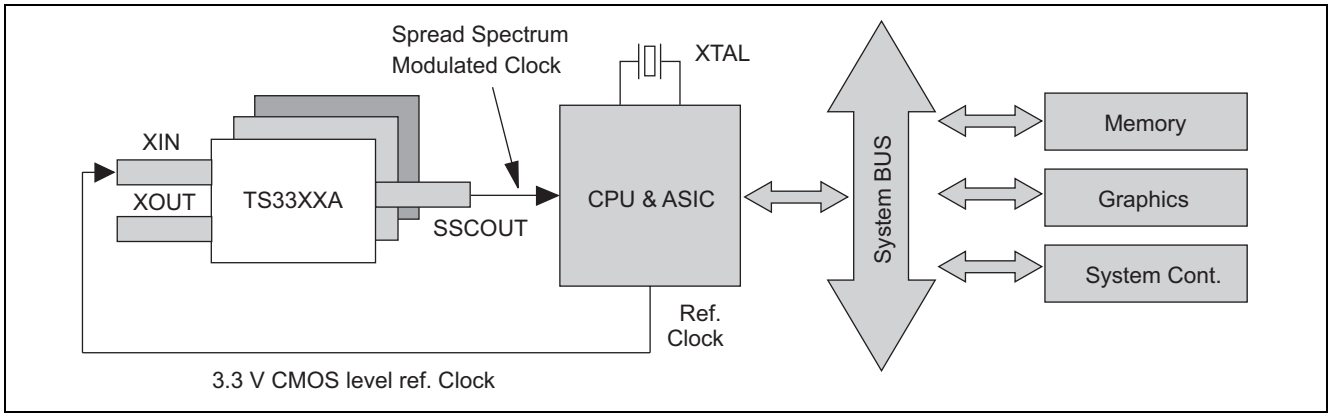


Figure 4 Ref. Clock Input Example

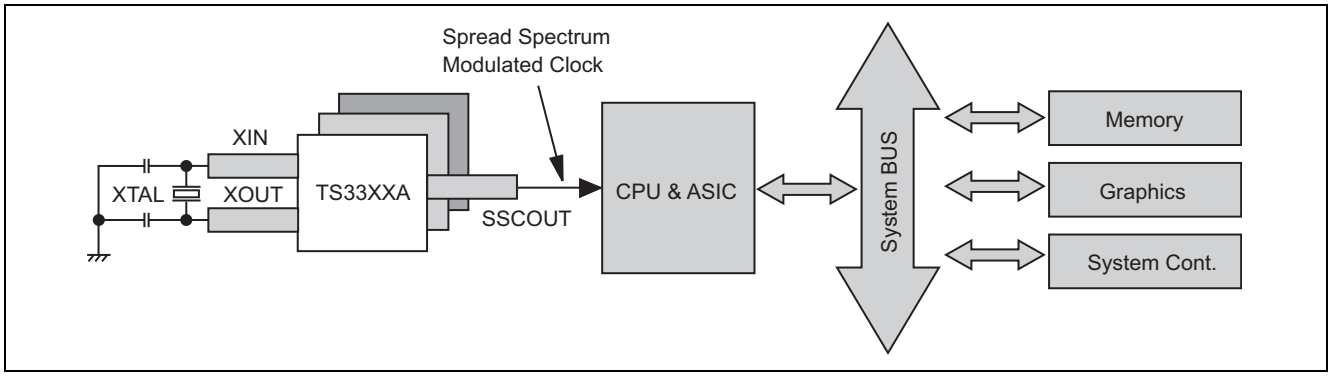
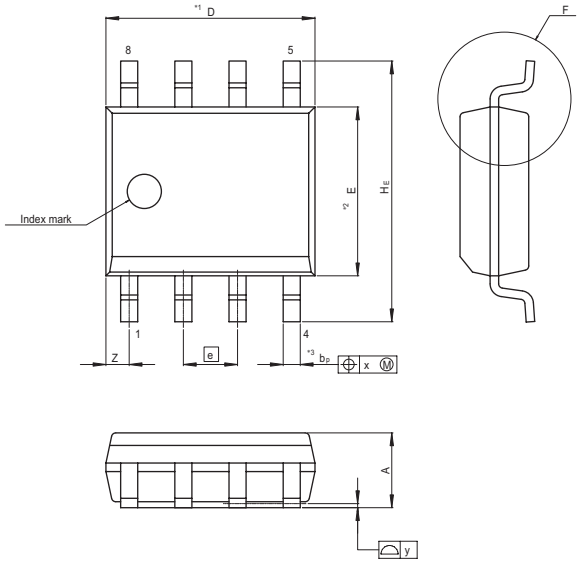
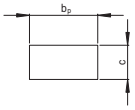


Figure 5 XTAL Ref. Clock Input Example

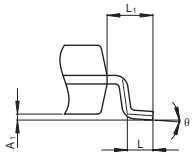
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP8-3.95x4.9-1.27	PRSP0008DD-C	FP-8DCV	0.085g





Terminal cross section
(Ni/Pd/Au plating)



Detail F

NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	4.90	5.30
E	—	3.95	—
A_2	—	—	—
A_1	0.10	0.14	0.25
A	—	—	1.75
b_p	0.34	0.40	0.46
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	5.80	6.10	6.20
e	—	1.27	—
x	—	—	0.25
y	—	—	0.10
Z	—	—	0.75
L	0.40	0.60	1.27
L_1	—	1.08	—

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