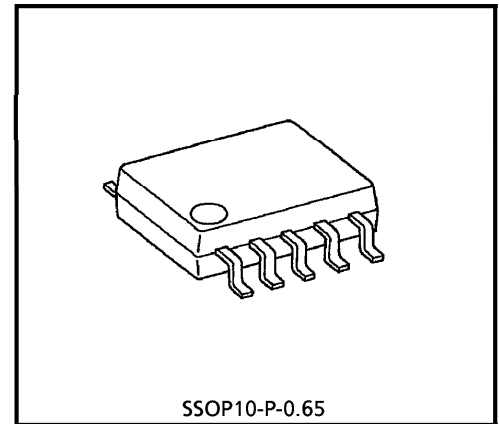TOSHIBA Bi-CMOS INTEGRATED CIRCUIT SILICON MONOLITHIC

T B 3 1 2 4 5 F N

PLL Frequency Synthesizer for PHS

TB31245FN is a PLL frequency synthesizer used for application of the digital mobile communication.

FEATURES

● Operating frequency   : 1610.5 MHz to 1699.5 MHz

● Current consumption   : 4.8 mA (Typ.)

● Operating voltage range : 2.4 V to 5.5 V

● Power-down mode (Battery save) available

● Compact package   : SSOP10 (10 pin, 0.65 mm pitch)

SSOP10-P-0.65

Weight : 0.04 g (Typ.)
Abbreviated marked on product
:B14

000707EDA1

BLOCK DIAGRAM

Handle with care to prevent devices from deterioration by static electricity.

PIN FUNCTION (All resistance and capacitance values in the table below are typical.)

PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIVALENT CIRCUIT (around pins)
1	FIN	Prescaler input terminal. Inputs frequency from VCO.	
2	GND	Ground terminal	—
3	CLK	Clock input terminal	
4	DATA	Data input terminal	
5	STB	Strobe input terminal	
9	BS	Battery save terminal	
6	XIN	Reference oscillator input terminal	
7	V$_{CC}$	Supply voltage terminal	—
8	LD	Lock detect output terminal. Open drain output. Locked : Open Unlocked : Low Power down : Open	
10	CP	Charge pump output terminal. Constant current output.	

● Lock detection

When the phase difference (time converted) is within one count of the TCXO, the lock detect output timer starts. After seven counts of phase comparing, LD output becomes high (lock signal). When the phase difference (time converted) exceeds one count of the TCXO, LD output becomes low (unlock signal).

● Power down mode

TB31245FN can be switched between power down mode and operating status by SB bit.
This status is as listed in the table below include a relation of external battery save terminal and this IC.

External pin	Serial data	Operating mode
BS	SB	PLL
L	*	OFF
H	0	OFF
H	1	ON

ON : In operation, OFF : Power down (No operation)
External battery save terminal H = High, L = Low

(5) Reference divider data

● Reference divider is fixed to 1 / 64.

● Reference frequency (phase comparing frequency) is 300 kHz. (at reference signal (XO input) is 19.2 MHz)

DESCRIPTION OF FUNCTIONS AND OPERATION

(1) Serial data input

TB31245FN operates according to the serial data program. Serial data is input from the clock terminal (CLK), data terminal (DATA), and strobe terminal (STB).

(2) Entry of serial data

- At the rising edge of the clock pulse, data is sent to the internal shift register from the LSB sequentially. When all the data is sent, set the strobe terminal to high. At this rising edge, data is stored in latches depending on the control contents. At the same time as data is stored, control starts. Phase comparing starts with the falling edge of the strobe terminal.
  The clock, data, and strobe terminal contain the Schmitt trigger circuit to prevent the data errors by noise, etc.

(3) Serial data input timing
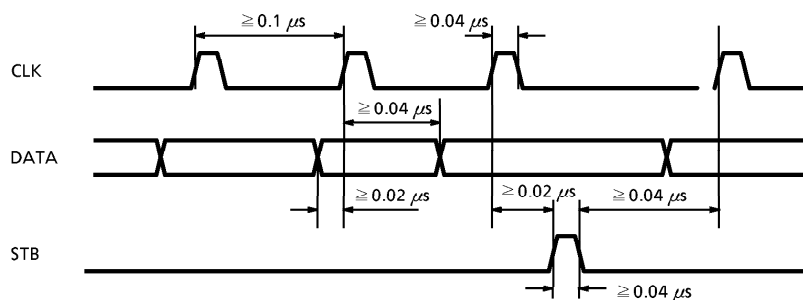
(4) Programmable divider data

- Consist of a 6-bit swallow counter (programmable counter), an 7-bit programmable counter, a 1/64, 1/65 two modulus prescaler.

- By sending any data to the swallow counter and programmable counter, number of division can be set from 4032 to 8191.

LSB

A0	A1	A2	A3	A4	A5	D0	D1	D2	D3	D4	D5	D6	*	*	SB	*	0	0	0

Swallow counter : A   Programmable counter : N   Battery save
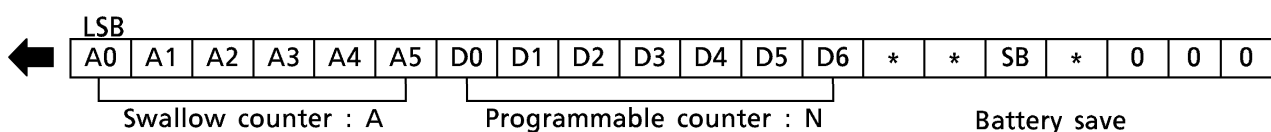
Number of division $= 64N + A$

$A = A0 + A1 \times 2^1 \ldots + A5 \times 2^5$ A : Value of A counter (remainder)

$N = D0 + D1 \times 2^1 \ldots + D6 \times 2^6$ N : Value of N counter (quotient)

$4032 \leqq$ number of division $\leqq 8191$

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC	SYMBOL	RATING	UNIT
Power supply voltage	V_{CC}	6.0	V
Power dissipation	P_D	240	mW
Input terminal voltage	V_{IN}	$-0.5\sim6.0$	V
Operating temperature range	T_{opr}	$-40\sim85$	°C
Storage temperature range	T_{stg}	$-55\sim150$	°C

ELECTRICAL CHARACTERISTICS (Unless otherwise stated, V_{CC} = 3.0 V, Ta = 25°C)

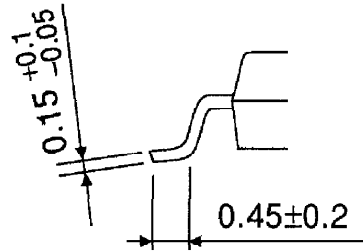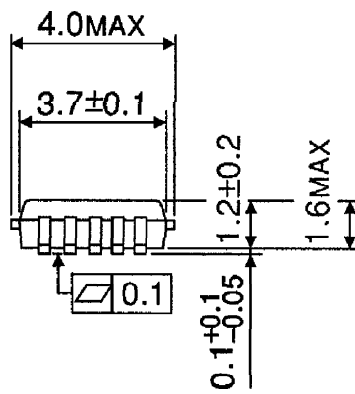| CHARACTERISTIC	SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating power supply voltage	V_{CC}	—	—	2.4	3.0	5.5	V
Current consumption at operation	Icco	1	All circuits in operation	—	4.8	6.5	mA
Current consumption at BS	Iccq	1	Power down mode	—	0	10	μA
Operating frequency	F_{IN}	2	$V_{FIN} = 97dB\mu V$	1610.5	—	1699.5	MHz
FIN input level	V_{FIN}	2	$F_{IN} = 1610.5\sim1699.5\,MHz$	92	—	107	$dB\mu V$
Reference operating frequency	X_{IN}	2	$V_{XIN} = 97\sim112dB\mu V$	—	19.2	—	MHz
Reference input level	V_{XIN}	2	$X_{IN} = 19.2\,MHz$	97	—	112	$dB\mu V$
CLK input frequency	F_{CLK}	—	—	0.1	0.5	10	MHz
Charge pump output current	I_{CP}	1	$V_{CP} = 1/2V_{CC}$	1.2	1.8	2.4	mA
Charge pump output off leak	$I_{CP (OFF)}$	1	$V_{CP} = 0\sim V_{CC}$	-0.1	0	0.1	μA
"H" level input voltage	V_{IH}	—	BS, CLK, DATA, STB	$0.8\times V_{CC}$	V_{CC}	5.5	V
"L" level input voltage	V_{IL}	—	BS, CLK, DATA, STB	-0.2	0	$0.2\times V_{CC}$	V
LD terminal off leak	I_{LD}	1	VLD = 5.5 V	-1	0	1	μA
LD terminal on resistance	R_{LD}	1	VLD = 0.4 V	800	1100	2000	Ω

TEST CIRCUIT DIAGRAM 1
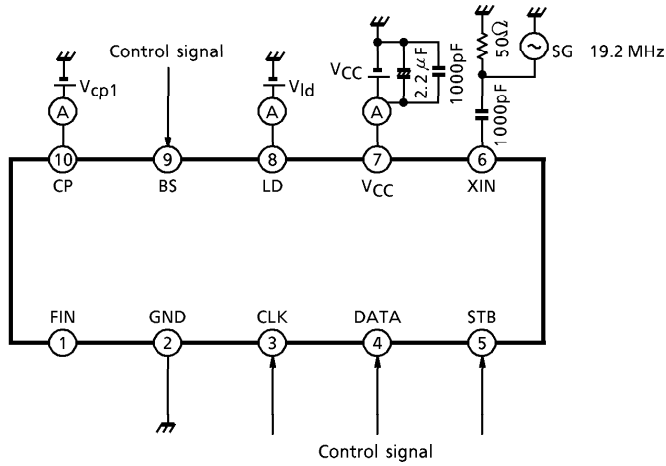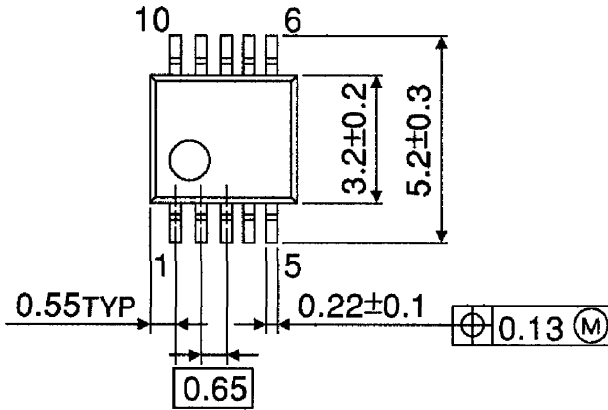

TEST CIRCUIT DIAGRAM 2
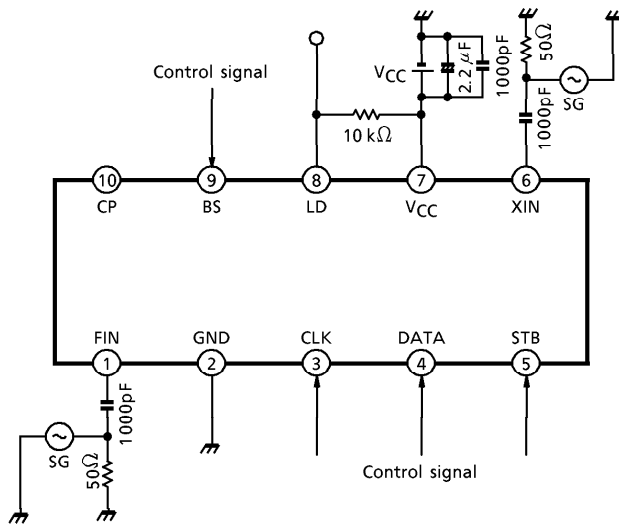
Notes : ← and → in the circuits indicate control signals.
○ indicates a test pin.
In test circuit diagram 1, unless measuring the current consumption, pin 6 is open.

PACKAGE DIMENSIONS

SSOP10-P-0.65

Unit : mm

Weight : 0.04 g (Typ.)