

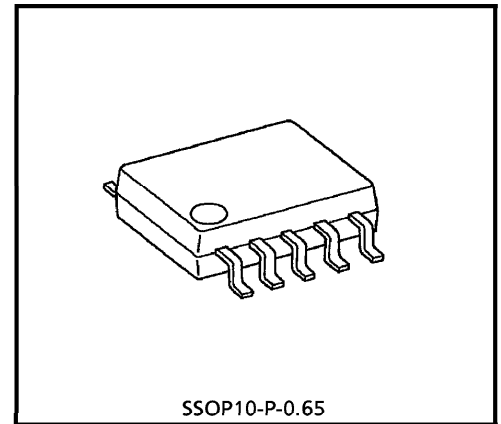
TB31242FN

1.8 GHz Single PLL Frequency Synthesizer

TB31242FN is a PLL frequency synthesizer used for application of the digital mobile communication.

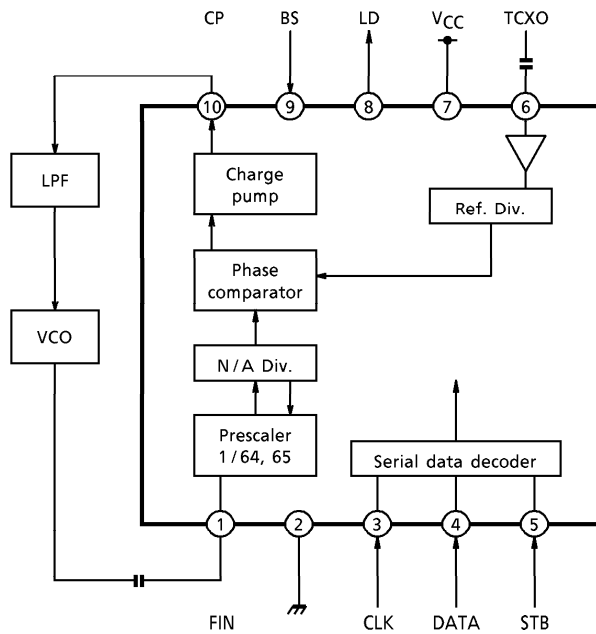
FEATURES

- Operating frequency : 700 to 1800 MHz
- Current consumption : 4.8 mA (Typ.)
- Operating voltage range : 2.4 V to 3.5 V
- Battery save supported
- Compact package : 10-pin SSOP



Weight : 0.04 g (Typ.)

BLOCK DIAGRAM



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

PIN No.	PIN NAME	FUNCTION	INTERNAL EQUIVALENT CIRCUIT
1	FIN	Prescaler input terminal. Inputs frequency from VCO.	
2	GND	Ground terminal	—
3	CLK	Clock input terminal	<p>N = 3, 4, 5, 9</p>
4	DATA	Data input terminal	
5	STB	Strobe input terminal	
9	BS	Battery save terminal	
6	XIN	Reference oscillator input terminal	
7	VCC	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.	

DESCRIPTION OF FUNCTIONS AND OPERATION

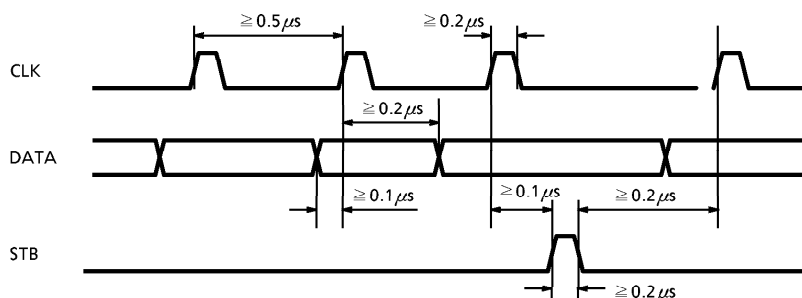
(1) Serial data control

TB31242FN 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

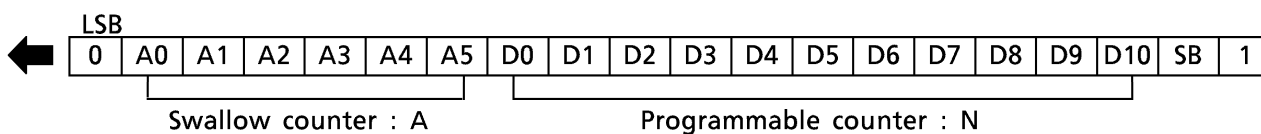
- At the rising edge of the clock pulse, data is sent to the internal shift register from the LSB sequentially. When all the data is sent, set the strobe terminal to high. At this rising edge, data is stored in latches depending on the control contents. At the same time as data is stored, control starts. 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.
- At power on, send the reference divider data before the programmable divider data.

(3) Serial data input timing



(4) Programmable divider data

- Consist of a 6-bit swallow counter (programmable counter), an 11-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 131071.



Number of division = $64N + A$

$A = A_0 + A_1 \times 2^1 + \dots + A_5 \times 2^5$

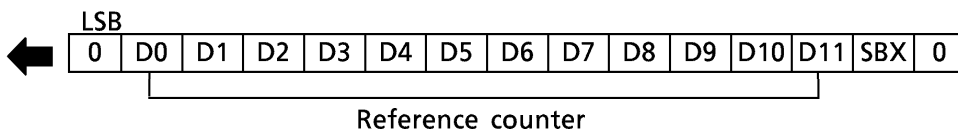
$N = D_0 + D_1 \times 2^1 + \dots + D_{10} \times 2^{10}$

$4032 \leq \text{number of division} \leq 131071$

A : Value of A counter (remainder)

N : Value of N counter (quotient)

(5) Reference divider data



$$D = D0 + D1 \times 2^1 + \dots + D9 \times 2^9 + D10 \times 2^{10} + D11 \times 2^{11}$$

$4 \leq \text{number of division} \leq 4095$

(6) Battery save status

TB31242FN's battery save status can be controlled by the external BS terminal and serial data.

Battery save status has two modes: power down and standby.

In power down mode, all circuits in IC are off.

In standby mode, PLLs are off, and only the TCXO buffer is on.

Logic is as listed in the table below. As power on, set the SB and SBX bits at the same time as setting the dividers.

Battery save status

BS PIN	SB BIT	SBX BIT	PLL	TCXO BUFFER	STATUS
L	—	0	OFF	OFF	Power down
L	—	1	OFF	ON	Standby
H	0	0	OFF	OFF	Power down
H	0	1	OFF	ON	Standby
H	1	0	ON	ON	In operation
H	1	1	ON	ON	In operation

ON : In operation, OFF : Power down (No operation)

(7) 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).

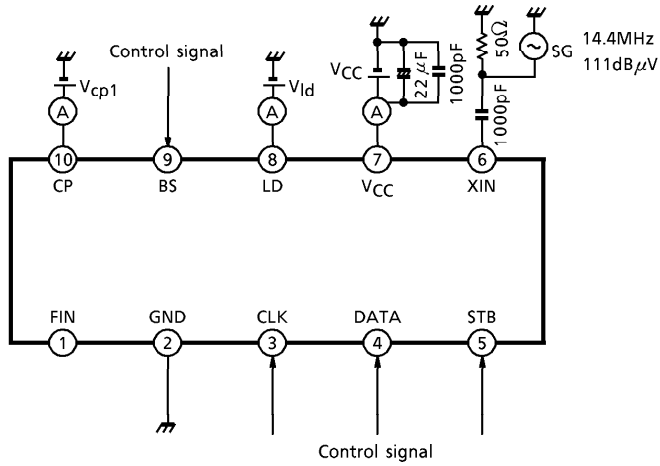
MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power supply voltage	V _{CC}	4	V
Power dissipation	P _D	240	mW
Input terminal voltage	V _{IN}	-0.5~4	V
Operating temperature	T _{opr}	-40~85	°C
Storage temperature	T _{stg}	-55~150	°C

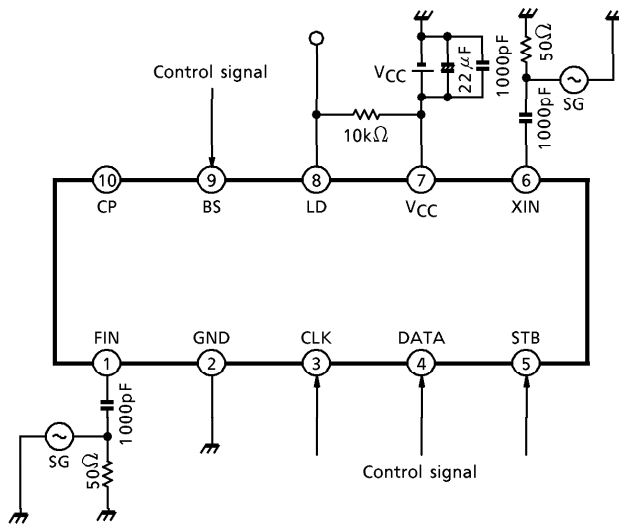
ELECTRICAL CHARACTERISTICS (Unless otherwise stated, V_{CC} = 3.0V, Ta = 25°C)

CHARACTERISTIC	SYMBOL	TEST CIRC UIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Operating power supply voltage	V _{CC}	—	—	2.4	3.0	3.5	V
Current consumption 1 at operation	I _{cco1}	1	All circuits in operation	—	4.8	6.5	mA
Current consumption 2 at operation	I _{cco2}	1	Standby mode	—	0.2	0.6	mA
Current consumption at BS	I _{ccq}	1	Power down mode	—	0	10	μA
Operating frequency	F _{IN}	2	V _{FIN} = 92dBμV	700	—	1800	MHz
F _{IN} input sensitivity	V _{FIN}	2	F _{IN} = 700~1800MHz	92	—	107	dBμV
Reference operating frequency	X _{IN}	2	V _{XIN} = 92dBμV	5	—	25	MHz
Reference input sensitivity	V _{XIN}	2	X _{IN} = 5~25MHz	92	—	112	dBμV
CLK input frequency	F _{CLK}	—	—	1	—	2000	kHz
Charge pump output current	I _{CP}	1	V _{CP} = 1/2V _{CC}	—	1.8	—	mA
Charge pump off leak current	I _{CP (OFF)}	1	V _{CP} = 0~V _{CC}	-0.1	0	0.1	μA
"H" level input voltage	V _{IH}	—	BS, CLK, DATA, STB	0.8 × V _{CC}	V _{CC}	4.0	V
"L" level input voltage	V _{IL}	—	BS, CLK, DATA, STB	-0.2	0	0.2 × V _{CC}	V
LD terminal off leak current	I _{LD}	1	V _{LD} = 3.5V	-1	0	1	μA
LD terminal on resistance	R _{LD}	1	—	—	1100	—	Ω

TEST CIRCUIT DIAGRAM 1



TEST CIRCUIT DIAGRAM 2

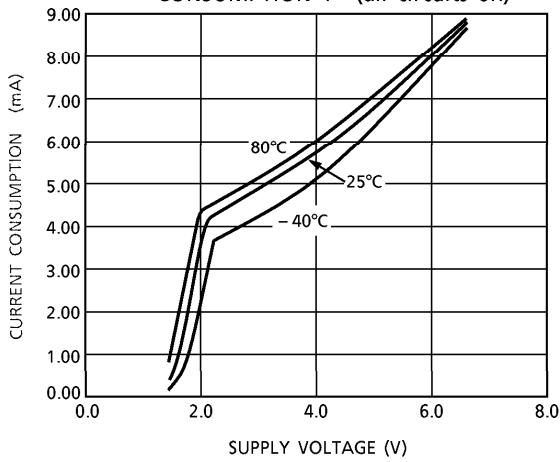


Notes : ← and → in the circuits indicate control signals.

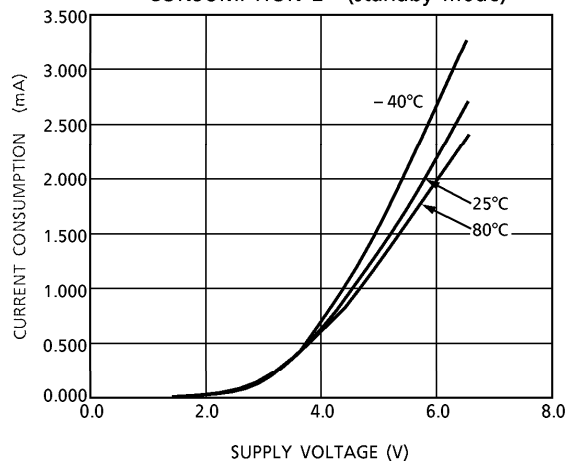
○— indicates a test pin.

In test circuit diagram 1, unless measuring the current consumption, pin 6 is open.

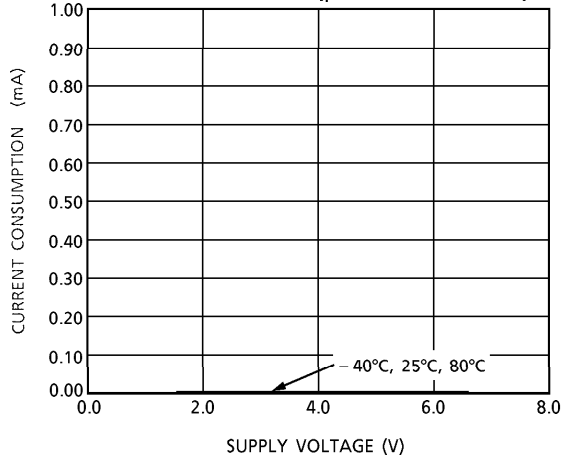
SUPPLY VOLTAGE – CURRENT CONSUMPTION 1 (all circuits on)



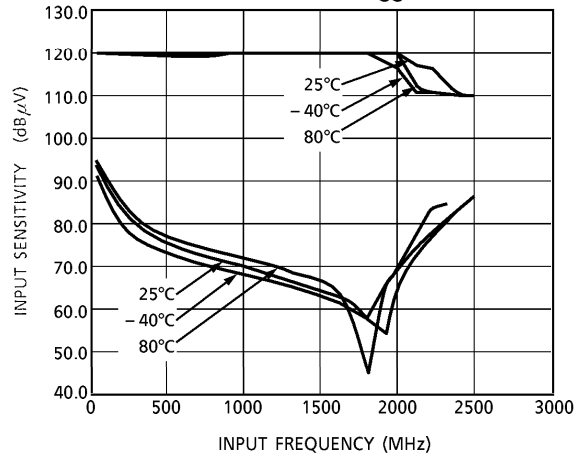
SUPPLY VOLTAGE – CURRENT CONSUMPTION 2 (standby mode)



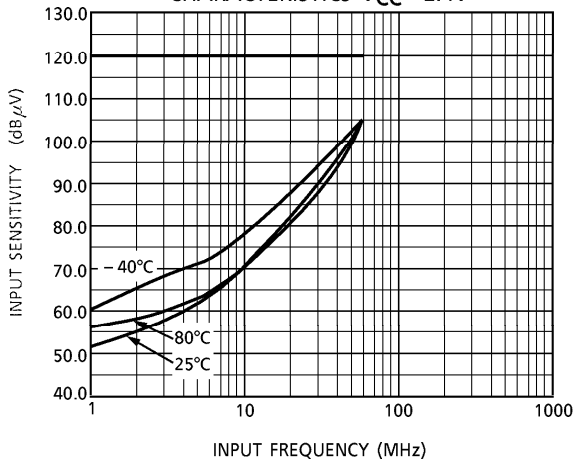
SUPPLY VOLTAGE – CURRENT CONSUMPTION 3 (power down mode)



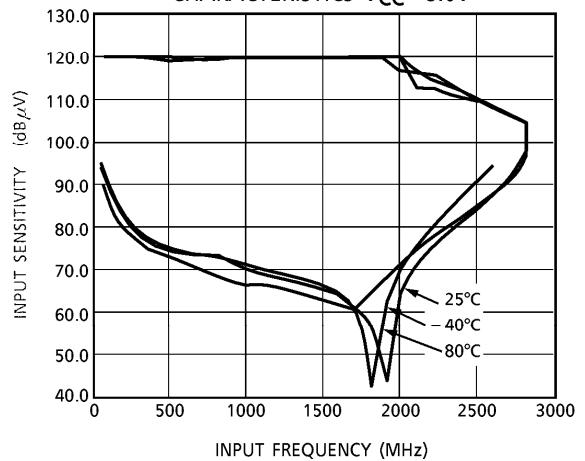
FIN INPUT SENSITIVITY TEMPERATURE CHARACTERISTICS $V_{CC} = 2.4V$



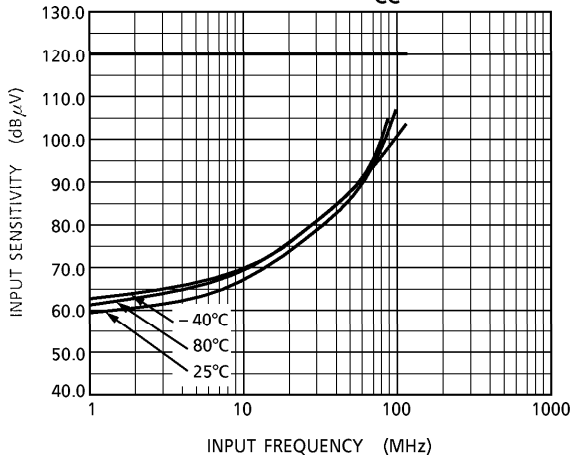
XIN INPUT SENSITIVITY TEMPERATURE CHARACTERISTICS $V_{CC} = 2.4V$



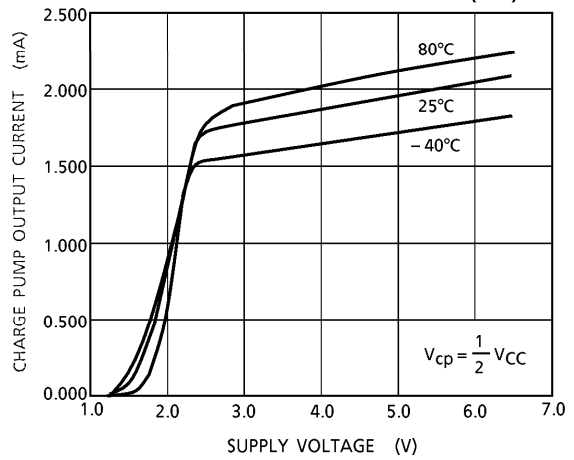
FIN INPUT SENSITIVITY TEMPERATURE CHARACTERISTICS $V_{CC} = 3.0V$



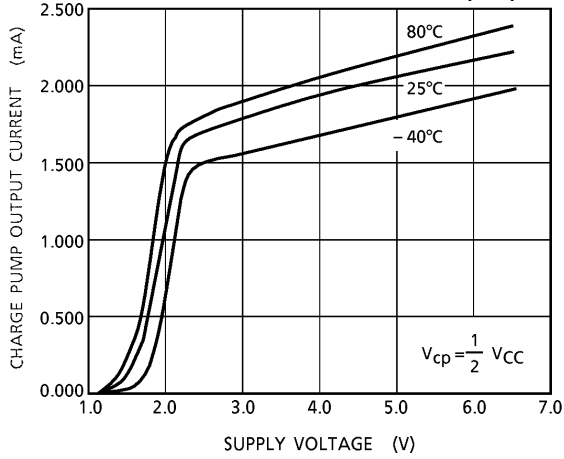
Xin INPUT SENSITIVITY TEMPERATURE CHARACTERISTICS V_{CC} = 3.0V



SUPPLY VOLTAGE – CHARGE PUMP 1 TEMPERATURE CHARACTERISTICS (Pch)

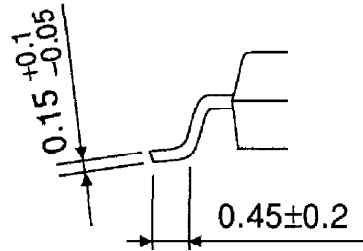
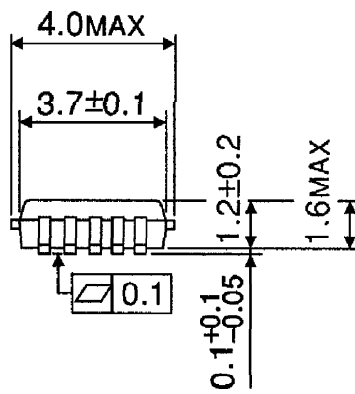
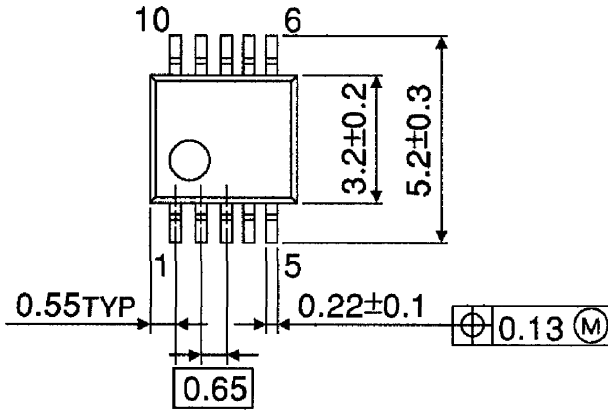


SUPPLY VOLTAGE – CHARGE PUMP 1 TEMPERATURE CHARACTERISTICS (Nch)



PACKAGE DIMENSIONS
SSOP10-P-0.65

Unit : mm



Weight : 0.04 g (Typ.)

RESTRICTIONS ON PRODUCT USE

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