Circuit Description

This is a 900MHz Band cordless telephone for domestic use. Radio transmitter with FM technology provides greater mobility to the user within approximately 200 meters radius around the base.

Following paragraphs describe the detail of major building blocks.

1. Ringer Detection

a. Base

Incoming ringer signal is first attenuated by C39, Z2, Z6 and R10. The signal is then feed to micro-controller (MCU) U2 for generating response signal according to the setting of inputs and sends digitally coded information to handset via RF link.

b. Handsets

When digitally coded information is received from the base it will be decoded at MCU U2. Then necessary ringer is generated and applied to Q10, which drive the Buzzer BZ1.

2. Surge protection

The surge absorber V1 is mounted in the Base unit. It designed to operate when voltage over 330V. In general it is common to have induced surges in the telephone line due to lightening. If it allow entering the unit damage to the unit is imminent. The line interface, fuse and ringer detected circuit is most venerable to high voltage surges and V1 surge absorber can prevent it.

3. Line control

When the unit is operated by remote handset, line control is done by MCU. It turns on transistor Q11. Then telephone line power feeds to line interface circuit (Q8, Q9), turn on the telephone line and internal voice path, and around component.

4. Power Control

a. Base unit

The main power is come from AC/DC adaptor, which provide 9V DC to the unit. Radio part, MCU and line interface related circuit is supplied with non-backup regulated 5V voltage.

b. Handset

Three cells of Ni-CAD battery(3.6V) provided necessary power to the handset. In order to keep power consumption to minimum, the radio receiver is turn on and off periodically by MCU and Q1. The MCU is supplied with regulated 3.6V by U3.

c. Charger

Base includes the charger function, which divided into two charging system, slow charge and fast charge. In slow charging, the current from adaptor passes through D6 L2 L3 and current regulated in R2. In fast charging, the gate at Q6 transistor will open and charging current will pass in parallel through R2 and R30.

After handset is in cradle on base, the MCU starts control in fast charging mode. But after 8 hrs charging. MCU will shut down Q6 and circuit undergoes slow charging.

5.Radio Module

Both handsets and base use 900MHz analogue radio that transmits and receive signal in full duplex mode. Audio and data signal is FM modulated before transmitting from the module. The radio module is fully cover with shield plate in order to minimize interference to other equipment.

The whole RF system is composed of one antenna, one antenna supporting PCB, and one RF module integrated together by soldering. Antenna is immovable, and made of cylindrical-shape white copper wire with 0.8mm diameter.

6.Security Code

The Security code contains 16 bits of data, which makes of 65535 combinations. Security code is changed (randomly)once only when the handset is on cradle after the base first power up. Unless the base is cold-boot again, which means the base loss power to around 2.9V and then insert power again, the security code of handset and base remain no change.

Basic 900MHz RF module:

The RF module consists of transmit and receive paths. The transmit path uses direct modulation architecture such that the audio signal directly modulates on the VCO. The receiver side uses super heterodyne architecture such that the RF signal is down-converted to IF frequency 10.7MHz and then demodulated to audio signal by FM discriminator.

Transmitter:

The audio signal from telephone line is firstly compressed by compander and the compressed signal is then amplified and pre-emphasized in Baseband.

As the amplitude of the signal determines the FM frequency derivation, the amplitude is controlled by the potential divider before modulating the Tx VCO in Mitsubishi M64884 RF transceiver. If channel 20 is selected, the Tx VCO is locked at Base:903.75MHz/ Handset:926.25MHz. Once the signal enters the Tx VCO, Tx VCO frequency derivatives with the analog signal giving FM modulation. The FM signal is transmitted out after amplification and filtering.

Receiver:

The transmitted signal from the Handset is received at the receiver in RF module. If channel 20 is used, the received signal is at Base:926.25MHz/ Handset:903.75MHz while the Rx VCO inside the transceiver is locked at Base:936.95MHz/ Handset:893.05MHz. The two frequencies are then mixed by the mixer inside the transceiver giving 10.7MHz IF. To increase adjacent channel rejection, two IF filters are used to filter the 10.7MHz signal. This filtered 10.7MHz IF is then further down-converted to 75kHz by the mixer inside the Samsung 0429 FM detector. Finally the audio signal can be discriminated out from the 75kHz signal by the FM detector.

Lastly, the demodulated audio signal is de-emphasized and decompressed in baseband.

900MHz FREQUENCY TABLE (WIDE BAND)

CH	HAND			BASE		
	TX	RX	LOCAL	TX	RX	LOCAL
1	925.3	902.8	892.1	902.8	925.3	936
2	925.35	902.85	892.15	902.85	925.35	936.05
3	925.4	902.9	892.2	902.9	925.4	936.1
4	925.45	902.95	892.25	902.95	925.45	936.15
5	925.5	903	892.3	903	925.5	936.2
6	925.55	903.05	892.35	903.05	925.55	936.25
7	925.6	903.1	892.4	903.1	925.6	936.3
8	925.65	903.15	892.45	903.15	925.65	936.35
9	925.7	903.2	892.5	903.2	925.7	936.4
10	925.75	903.25	892.55	903.25	925.75	936.45
11	925.8	903.3	892.6	903.3	925.8	936.5
12	925.85	903.35	892.65	903.35	925.85	936.55
13	925.9	903.4	892.7	903.4	925.9	936.6
14	925.95	903.45	892.75	903.45	925.95	936.65
15	926	903.5	892.8	903.5	926	936.7
16	926.05	903.55	892.85	903.55	926.05	936.75
17	926.1	903.6	892.9	903.6	926.1	936.8
18	926.15	903.65	892.95	903.65	926.15	936.85
19	926.2	903.7	893	903.7	926.2	936.9
20	926.25	903.75	893.05	903.75	926.25	936.95
21	926.3	903.8	893.1	903.8	926.3	937
22	926.35	903.85	893.15	903.85	926.35	937.05
23	926.4	903.9	893.2	903.9	926.4	937.1
24	926.45	903.95	893.25	903.95	926.45	937.15
25	926.5	904	893.3	904	926.5	937.2
26	926.55	904.05	893.35	904.05	926.55	937.25
27	926.6	904.1	893.4	904.1	926.6	937.3
28	926.65	904.15	893.45	904.15	926.65	937.35
29	926.7	904.2	893.5	904.2	926.7	937.4
30	926.75	904.25	893.55	904.25	926.75	937.45
31	926.8	904.3	893.6	904.3	926.8	937.5
32	926.85	904.35	893.65	904.35	926.85	937.55
33	926.9	904.4	893.7	904.4	926.9	937.6
34	926.95	904.45	893.75	904.45	926.95	937.65
35	927	904.5	893.8	904.5	927	937.7
36	927.05	904.55	893.85	904.55	927.05	937.75
37	927.1	904.6	893.9	904.6	927.1	937.8
38	927.15	904.65	893.95	904.65	927.15	937.85
39	927.2	904.7	894	904.7	927.2	937.9
40	927.25	904.75	894.05	904.75	927.25	937.95

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SPECIFICATION	DATE	* Feb 15, 1999			
	PREPARED BY	T. Ebara			
	CHECKED BY	K.Hasegawa, F.Watanabe			
	APPROVED BY	H. Yamashita			

INTEGRATED CIRCUIT

1. **Model Number** M64884FP

2. **Functions**

 2.1 **Function name** Transistor for VCO, Mixer for 1st-IF and 2-multiple transmission circuit built-in 500MHz/1GHz Dual PLL Synthesizer

 2.2 **Block diagram** Shown in page 3

3. **Applications** 900MHz Analog Cordless Telephone

4. **Package Specifications**

 4.1 **Package name** 24-pin plastic mold package (24SSOP)

 4.2 **Package diagram number** G465190

5. **Circuit Diagram Number** Shown in page 9

6. **Pin Configuration**

TXGND1	1	24	MIXIN
TXOUT	2	23	MIXGND
TXVCC	3	22	RXVCC
TXB	4	21	RXB
TXGND2	5	20	RXE
TXE	6	19	RXGND
PD1	7	18	PD2
VCC	8	17	RST
XIN	9	16	SI
XOUT	10	15	CPS
XBO	11	14	$\overline{\text{LOCK}}$
GND	12	13	MIXOUT

7. **Related Document**

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8. General Description

The M64884FP is a monolithic 2-system PLL frequency synthesizer IC for cordless telephone that can be directly input up to 500MHz frequencies in the transmission system and up to 1000MHz in the reception system .
By adopting high performance Bi-CMOS process , this IC has low power consumption type 2-modulus prescalers , 1/16 , 17 (Transmission system) , 1/32 , 33 (Reception system) , which can be directly input frequencies of up to 500MHz (transmission system) and up to 1000MHz (reception system) .
This IC also contains VCO oscillation transistors in the transmission system and in the reception system , the 2-multiple circuit for the transmission output and the double balance type mixer for the 1st intermediate frequency (1st IF) . The PLL standard oscillation circuit can adopt a B-E Colpitts type oscillation circuit to form a stable oscillation circuit . In addition , as the 2nd MIX local oscillator , the IC employs a buffer amplifier to share the X'tal oscillation frequency .
Adoption of a 24-pin 0.65 milli-pitch small package can make equipment compact .

9. Features

1) Low Current Consumption
   Icc=24mA (Vcc=3.0V , Each VCO and 2-multiple output current=2mA)
2) Transmission system has 2-modulus prescaler(1/16 , 17) , which can be directly input frequencies of up to 500MHz .
3) Reception system has 2-modulus prescaler(1/32 , 33) , which can be directly input frequencies of up to 1GHz .
4) Built-in the transistor for the reference oscillator circuit . (Fosc = 4 ~ 25MHz)
5) Built-in the 1st IF mixer in the reception system .
6) Built-in transistors for VCOs of the transmission and reception system .
7) Software-compatible with M64084AGP .
8) Built-in the programmable divider for the transmission system PLL . (Nvco = 256 ~ 131071)
9) Built-in the programmable divider for the reception system PLL . (Nvco = 1024 ~ 131071)
10) Built-in the programmable divider for the reference frequency .
    the transmission system : Nref (TX) = (20 ~ 8191) *4
    the reception system : Nref (RX) = (20 ~ 8191) *2
11) Rated current output type Charge Pump . (Charge Pump current can be set in this systems.)
    Output current can be set by serial data . (Io=100 , 300 , 500 , 700μA)
12) PLL lock/unlock status display function .
    (Judged in the system turned on if the other system is turned off .)
13) Independent ON/OFF setting of 2-system PLL Power Supply .
14) Adoption of small package . 24P2E (0.65 milli-pitch) .

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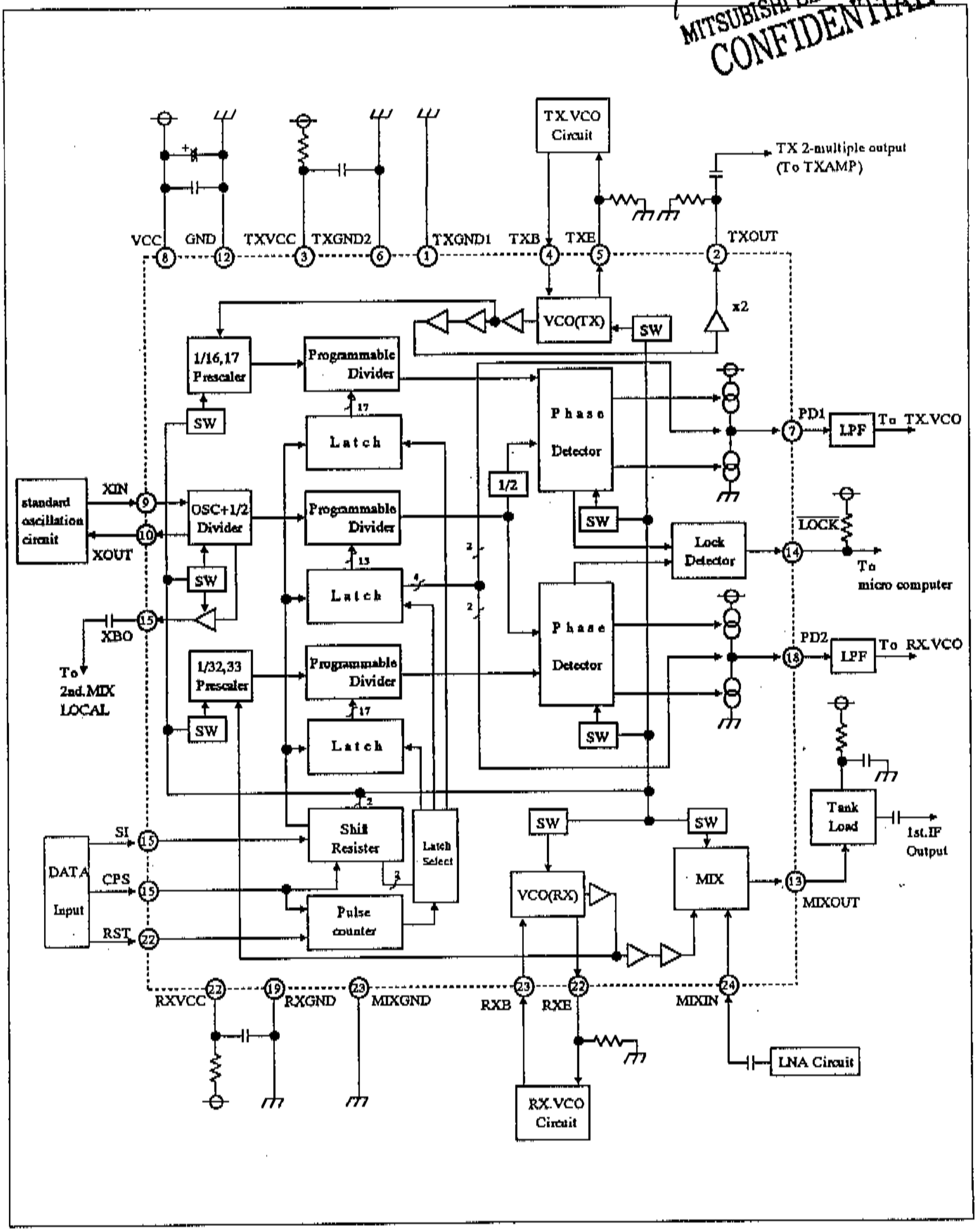
10. Block Diagram



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11. PIN Description

Pin No.	Symbol	Pin Name	Functions
1	TXGND1	Transmission system ground 1	1st ground for transmission system. 0V.
2	TXOUT	Transmission output	Output frequency that multiples the oscillation frequency of the transmission system by 2 , and outputs an open emitter .
3	TXVCC	Transmission system power supply	Power supply pin for transmission VCO circuit . TXVCC = 2.7 ~ 3.6V .
4	TXB	Transmission circuit base	Base pin of the transmission VCO transistor .
5	TXE	Transmission circuit emitter	Emitter pin of the transmission VCO transistor. Set the current of the transmission oscillation circuit by pull-down resistance .
6	TXGND2	Transmission system ground 2	2nd ground for transmission system . 0V .
7	PD1	Transmission system Charge Pump output	Output the set current according to the difference in phase between Charge Pump output pins in the PLL1(TX) system . HiZ with the power supply turned off .
8	VCC	Power supply	Power supply pin for the PLL system . VCC = 2.7 ~ 3.6V .
9	XIN	X'tal oscillator input	Inputs 4 ~ 25MHz output from the base oscillator to the XIN . External X'tal oscillator is available for oscillation .
10	XOUT		
11	XBO	Buffer output	Buffer output pin of base oscillation .
12	GND	Ground	Ground pin for the PLL system . 0V .
13	MIXOUT	Mixer Output	Extracts IF frequencies .
14	$\overline{LOCK}$	Lock detection output	Judgment is made in a system turned on when the other system is turned off .
15	CPS	Clock pulse input	Operates at the rising edge of the clock pulse of the shift resistor .
16	SI	Data input	Inputs serial data .
17	RST	Reset pulse input	Inputs the reset pulse of 21 pulse counters .
18	PD2	Reception system Charge Pump Output	Output the set current according to the difference in phase between Charge Pump output pins in the PLL2(RX) system . HiZ with the power supply turned off .
19	RXGND	Reception system ground	Ground for reception system . 0V .
20	RXE	Reception circuit emitter	Emitter pin of the reception VCO transistor. Set the current of the reception oscillation circuit by pull-down resistance .
21	RXB	Reception circuit base	Base pin of the reception VCO transistor .
22	RXVCC	Power supply pin for the reception system	Power supply pin for reception VCO circuit . TXVCC = 2.7 ~ 3.6V .
23	MIXGND	Mixer system ground	Ground for mixer system . 0V .
24	MIXIN	Mixer input	Mixer signal input pin .

12. Functional Description

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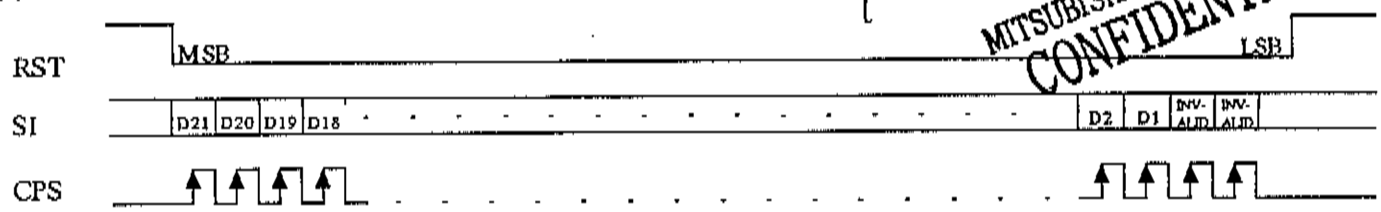
12-1. Data Input

(1) Data Entry

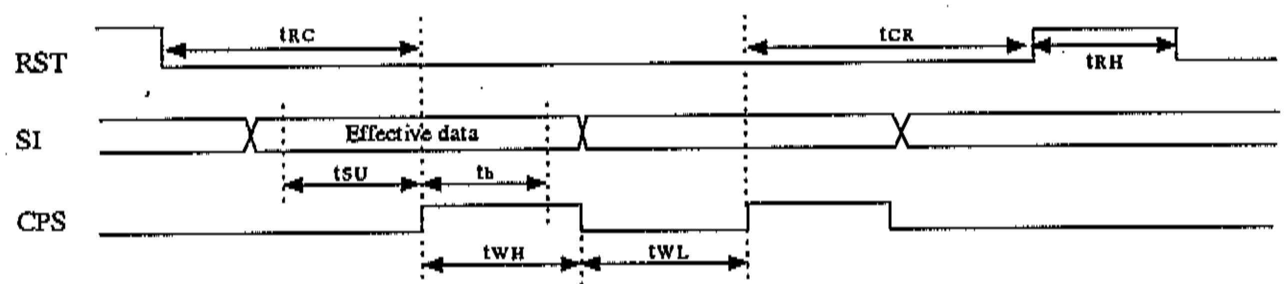


Note 1) At the positive edge of CPS input, SI input status is read into the shift resistor in sequence .

Note 2) All data is set at the positive edge of the 21st pulse . After that , CPS is invalid .

Note 3) While RST is set to "H" , neither CPS nor SI is received .

(2) Input Signal Timing



$t_{SU} = t_h = t_{WH} = t_{WL} > 0.5\ \mu s$

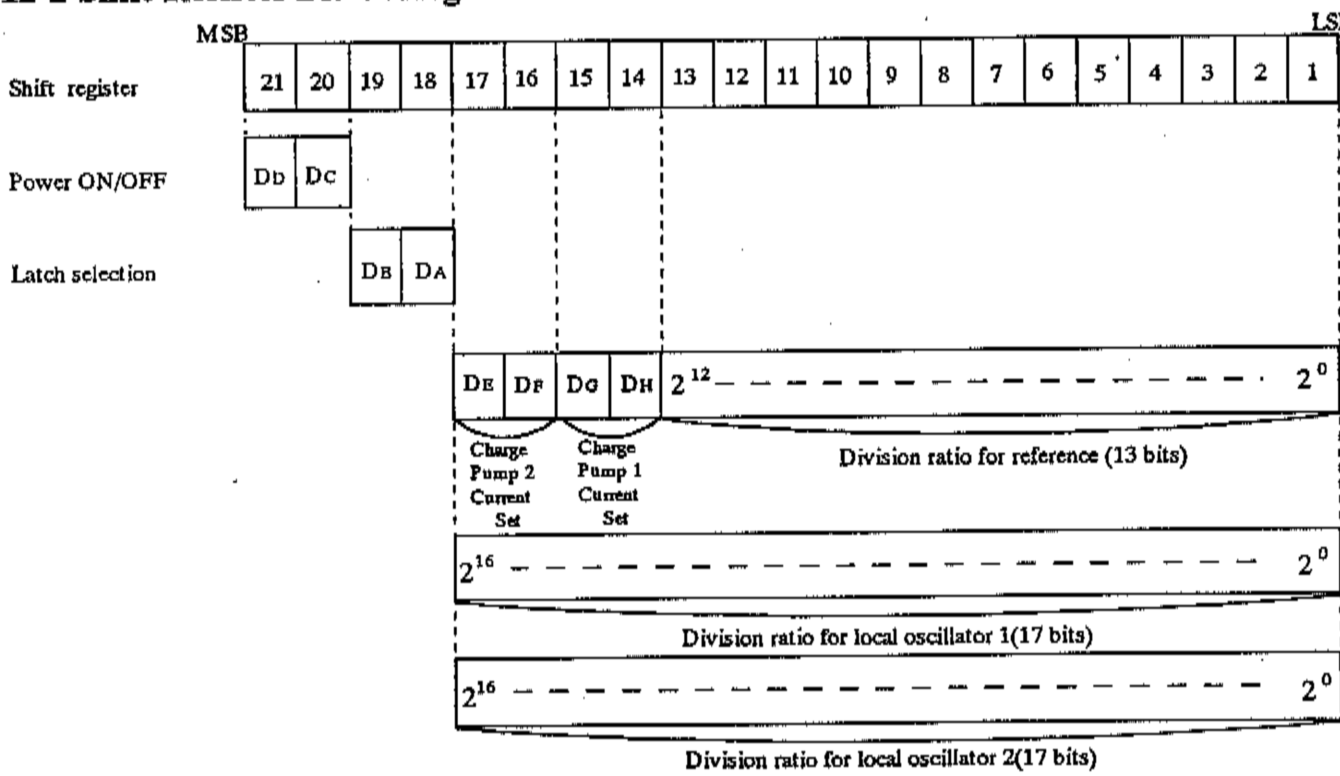
$t_{CR} = t_{RH} = t_{RC} > 1\ \mu s$

(3) Input Voltage

$V_{IH} = 0.7 * Vcc \sim 3.6$ (V)

$V_{IL} = -0.2 \sim 0.3 * Vcc$ (V)

12-2 Shift Resister Bit Configuration



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Note 4) DD and DC are used to turn on/off the power supply to the PLL system.

Data		Description
DD	DC	
L	L	Both two PLLs are on .
L	H	Only PLL of local oscillator 1 is on .
H	L	Only PLL of local oscillator 2 is on .
H	H	Both two PLLs are off .

Note 5) DB and DA are used to select data latch to be updated .

Data		Description
DB	DA	
L	L	Testing mode only. Inhibited from use .
L	H	Updates data of local oscillator 1 .
H	L	Updates data of local oscillator 2 .
H	H	Updates data for comparison frequency .

Note 6) DE/DF and DG/DH are used to set the current of charge pump .

DE DG	DF DH	Output current value of charge pump
L	L	100μA
L	H	300μA
H	L	500μA
H	H	700μA

Note 7) Current supplied to the charge pump for local oscillators 1 and 2 can be set independently in systems . However,when power supply is turned off , the charge pump output is set in "HiZ" status regardless of set value .

Note 8) The division ratio of the programmable divider for comparison frequency is given in 13-bit binary code .

For transmission local oscillator N(Fref) = 4 * P However , P = 20 ~ 8191

For reception local oscillator N(Fref) = 2 * P However , P = 20 ~ 8191

Note 9) The division ratio of programmable divider for local oscillators 1 and 2 are given in 17-bit binary code .

For transmission local oscillator N(FvcoTX) = 256 ~ 131071

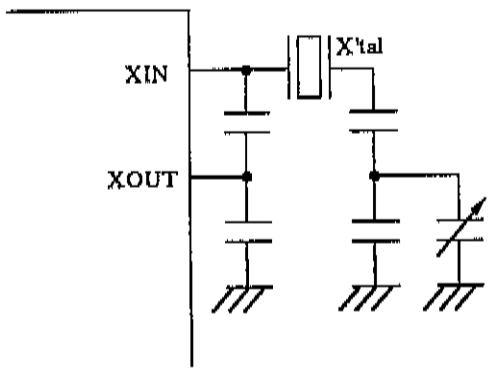
For reception local oscillator N(FvcoRX) = 1024 ~ 131071

12-3. X'tal OSCILLATION CIRCUIT

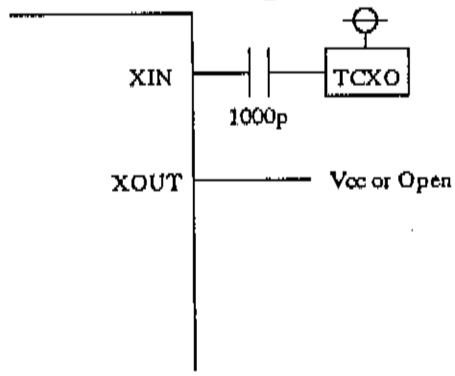
12-3-1. Connection of oscillation block

Built-in buffer transistor for oscillation enables direct oscillation at X'tal.
Connections of X'tal and TCXO are shown below. (recommended circuit)

When X'tal is in use



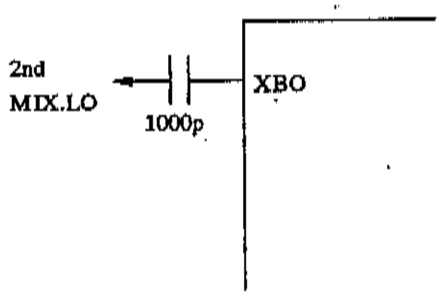
When TCXO is in use



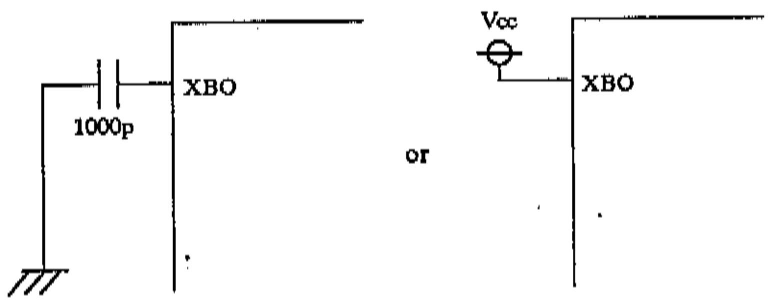
12-3-2. Connection of Buffer Block

As the 2nd mixer local oscillator, the buffer output pin (XBO) is set to share X'tal. The pin is available as follows.

When the pin is shared

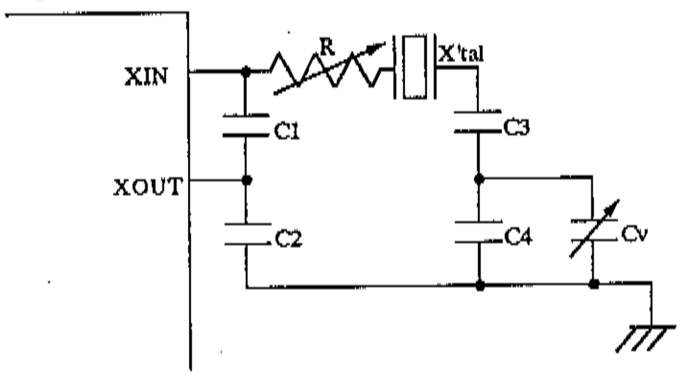


When the pin is not shared



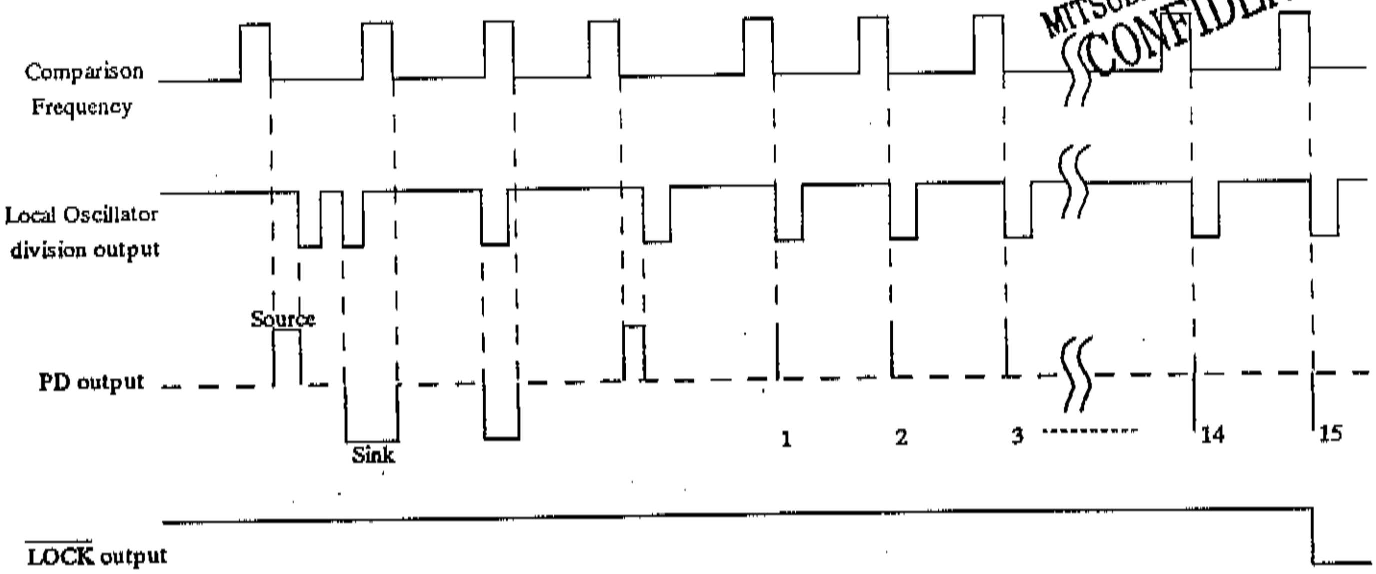
12-3-3. Negative Resister Evaluation Circuit

Negative resistor in the oscillation circuit are measured on the conditions with coefficients shown in drawing below.



X'tal : 21.25MHz (TEW CORP. TR-1, CI = 20ohm)
C1 : 18 pF
C2 : 36 pF
C3 : 52 pF
C4 : 36 pF
Cv : ~30 pF
VCC : 3V
Ta : 25°C

12-4. Lock Detection, PD Output



Note 10) The PD output is placed in the "Source" status when the phase of local oscillator division output is behind the phase comparison frequency . It is placed in the "Sink" status when the phase of local oscillator division output advances .

11) "— — —" means the high impedance status .

12) When the phase difference that is 8 times or less* of the OSC frequency continues 15 or more cycles of comparison frequency (Fref) , $\overline{\text{LOCK}}$ output is placed in the "L" status . (*625ns when a 12.8MHz oscillator is used)

13) When the power supply of each system is turned off , the $\overline{\text{LOCK}}$ output status goes to "H" .

14) The $\overline{\text{LOCK}}$ output circuit is an open drain output of the N channel MOS transistor . Use this circuit with pull-up .

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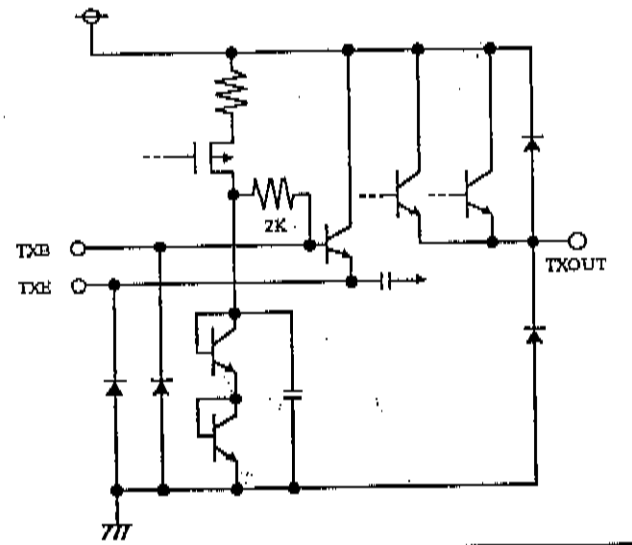
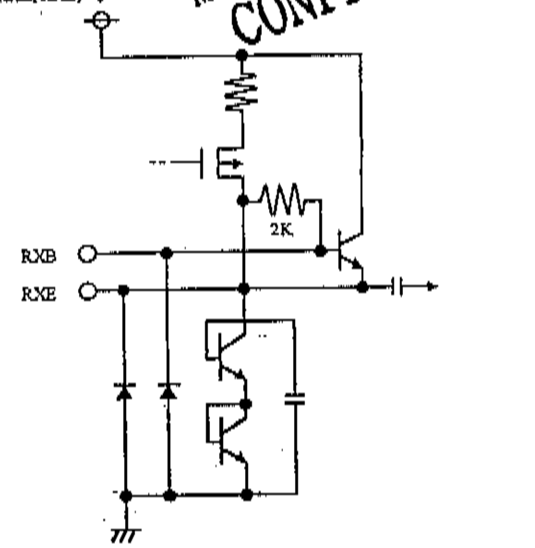
13. INPUT OUTPUT EQUIVALENT CIRCUIT

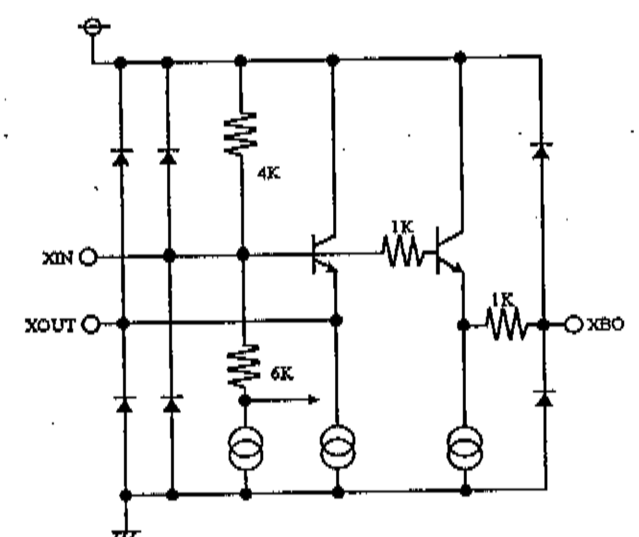
TXVCO(TXB, TXE, TXOUT)



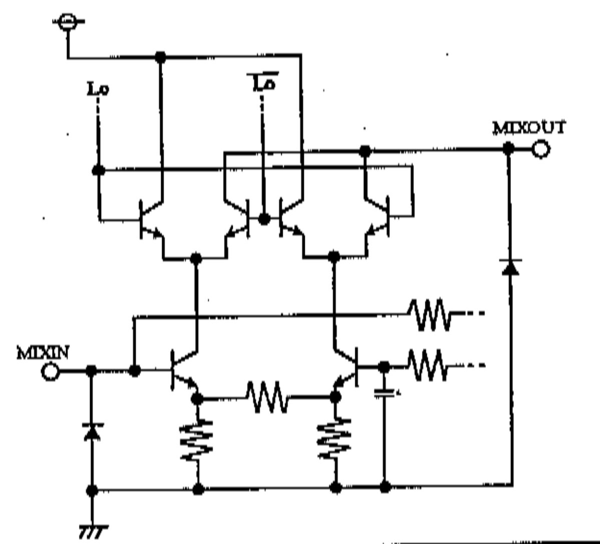
RXVCO(RXB, RXE)



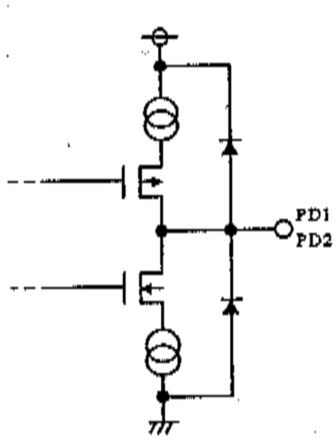
OSC(XIN, XOUT, XBO)



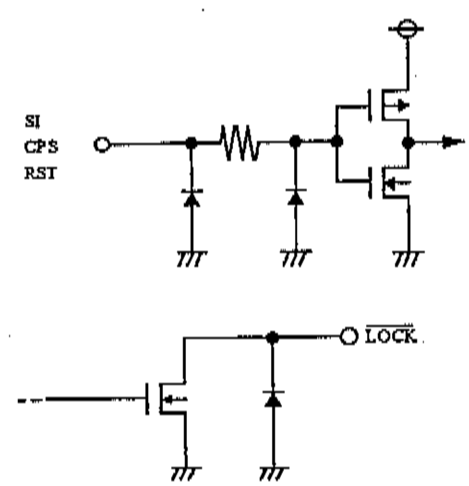
MIX(MIXIN, MIXOUT)



Charge Pump output(PD1, PD2)



Data input(SI, CPS, RST)
$\overline{\text{LOCK}}$ Detection output ($\overline{\text{LOCK}}$)



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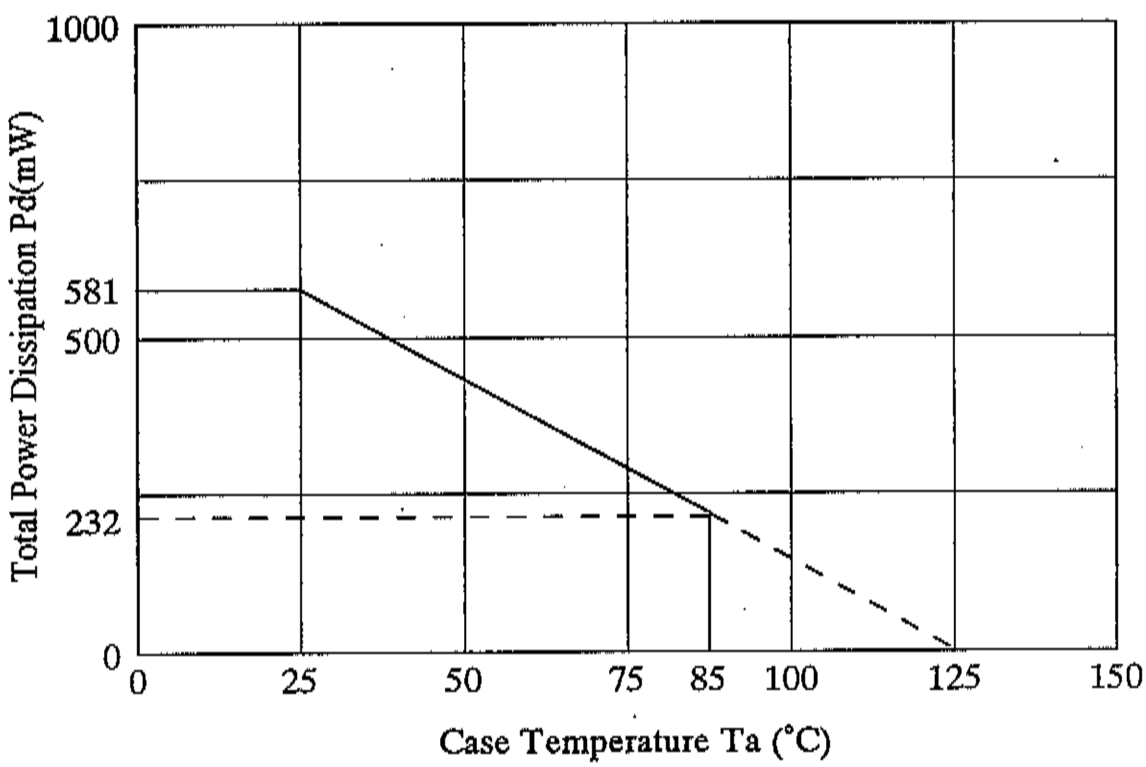
14. ABSOLUTE MAXIMUM RATINGS

(Ta=-30°C to +85°C, unless otherwise noted) 11 of 23

Parameter	Symbol	Test Condition	Ratings Min.	Ratings Max.	Unit
Supply Voltage	Vcc	GND=0V	-0.3	4.5	V
Output Voltage	Vo	$\overline{LOCK}$, MIXOUT	0	4.5	V
Output Current	Io	TXE, RXE, TXOUT	0	6.0	mA
Input Voltage	Vi	SI, CPS, RST	-0.3	5.5	V
Input Current	Ii	$\overline{LOCK}$, GND=0V	0	1.0	mA
Power Consumption	Pd	Ta=85°C, Tj=125°C, θja=172°C/W		232	mW
Junction Temperature	Tj			125	°C
Operating Ambient Voltage	Topr		-30	85	°C
Storage Ambient Voltage	Tstg		-40	125	°C

Total Power Dissipation Delating Curve



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15. RECOMMENDED OPERATING CONDITIONS
(Vcc=2.7 to 3.6V, Ta=-30°C to +85°C, unless otherwise noted)

Parameter	Symbol	Pin	Test Condition	Recommended Values Min.	Typ.	Max.	Unit
Supply Voltage	Vcc	VCC TXVCC RXVCC	GND=0V	2.7	3.0	3.6	V
Transmission Local Oscillation Amplitude	PLoTX	TXE	FLoTX=350 ~ 700MHz	-15	-10	-5	dBm
Reception Local Oscillation Amplitude	PLoRX	RXE	FLoRX=700 ~ 1000MHz	-15	-10	-5	dBm
Transmission Local Oscillation Frequency	FLoTX	TXE	PLoTX=-15 ~ -5dBm	350		500	MHz
Reception Local Oscillation Frequency	FLoRX	RXE	PLoRX=-15 ~ -5dBm	700		1000	MHz
XIN Input Amplitude	VXIN	XIN	Fosc=4 ~ 25MHz XIN input impedance Zs=3.1K-j426 (Rp=3.18Kohm, Cp=1.71pF at.Fosc=4MHz)	0.2		1.0	Vpp
Reference Oscillation Frequency	Fosc	XIN	VXIN=0.2 ~ 1.0Vpp	4		25	MHz
MIXIN Input Amplitude	PRFin	MIXIN	Input Frequency =700 ~ 1000MHz			0	dBm
"L" Output Current	IOL	$\overline{LOCK}$				1	mA
Electric Potential between VCC and TXVCC		VCC TXVCC		0		0.2	V
Electric Potential between VCC and RXVCC		VCC RXVCC		0		0.2	V

16-1. ELECTRICAL CHARACTERISTICS 1
(Ta= -30°C to +85°C, unless otherwise noted)

Block	Parameter	Symbol	Pin	Test Condition	Limits Min.	Typ.	Max.	Unit	Measurement circuit
ALL	Standby Current	IccOff	VCC TXVCC RXVCC	Vcc=3.0V, Ta=25°C, when 2 PLLs are turned off			50	μA	17-1
	Operating Current	IccOn	VCC TXVCC RXVCC	Vcc=3.0V, Ta=25°C, when 2 PLLs are turned on, TXE,RXE,TXOUT=OPEN XIN,MIXOUT=Vcc		18	24	mA	

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16-2. ELECTRICAL CHARACTERISTICS 2
(Ta= -30°C to +85°C, unless otherwise noted)

Block	Parameter	Symbol	Pin	Test condition		Limits Min.	Typ.	Max.	Unit	Measurement circuit
PLL	"H" input voltage	VIH	SI RST CPS	Vcc=2.7 ~ 3.6V		0.7*Vcc		3.6	V	-
	"L" input voltage	VIL	〃	Vcc=2.7 ~ 3.6V		-0.2		0.3*Vcc	V	-
	"H" input current	IIH	〃	Vcc=3.6V VIH=3.6V				2	μA	17-2
	"L" input current	IIL	〃	Vcc=3.6V VIL=0V		-2			μA	17-3
	"L" output voltage	VOL	$\overline{\text{LOCK}}$	Vcc=3.0V Io=1.0mA				0.2	V	17-4
	CP output current (Source and Sink current)	Icpo	PD1 PD2	Vcc=3.0V VPD=1.5V Ta=25°C Data: DB/DG, DF/DH (1) L, L (2) L, H (3) H, L (4) H, H	(1)	70	100	130	μA	17-5
					(2)	210	300	390		
					(3)	350	500	650		
					(4)	490	700	910		
	CP output leak current	IcpLK	PD1 PD2	Vcc=3.6V, VPD=1.8V Vo=Hiz (OFF)		-100		100	nA	17-6
	$\overline{\text{LOCK}}$ output leak current	ILDLK	$\overline{\text{LOCK}}$	Vcc=3.6V VOH=3.6V				5	μA	
OSC	OSC bias current	IBias1	XOUT	Vcc=3.0V Ta=25°C VIH=3.0V		175	250	325	μA	17-2
		IBias2	XBO			175	250	325	μA	
	OSC bias voltage	VBias1	XOUT	Vcc=3.0V IIL=0μA		1.7	2.0	2.3	V	17-7
		VBias2	XBO			1.7	2.0	2.3	V	
	Buffer output amplitude	Vsw	XBO	Vcc=3.0V, Ta=25°C Fosc=4 ~ 25MHz VXIN=0.2 ~ 1.0Vpp XBO=non load		0.1		1.0	Vpp	17-8
	Negative Resister	NR	XIN	Vcc=3.0V Ta=25°C		100	330		ohm	shown in page 7

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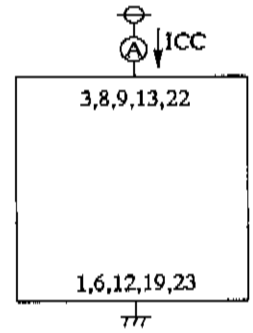
16-3. ELECTRICAL CHARACTERISTICS 3
(Ta= -30°C ~ +85°C, unless otherwise noted)

Block	Parameter	Symbol	Application pin	Test condition	Limits Min.	Limits Typ.	Limits Max.	Unit	Measurement circuit
TX/RX VCO	"L" input current	IILB	TXB RXB	Vcc=3.6V , VIL=3.1V	-0.6	-0.45		mA	17-3
	bias voltage	VB	TXB RXB	Vcc=3.6V , IIF=0uA R.TXE=R.RXE=390ohm R.TXOUT=1kohm	1.4	1.7	2.0	V	17-7
		VE	TXE RXE		0.6	0.9	1.2	V	
	output current	IOE	TXE RXE	Vcc=3.0V , Ta=25°C R.TXE=R.RXE=390ohm R.TXOUT=1kohm	1.0	2.0	3.0	mA	–
	emitter current (when use BUF)	ITXE	TXE	Vcc=3.0V , Ta=25°C B-E between loss < 2dB	1.5	3.0	5.0	mA	–
		IRXE	RXE		2.0	3.0	5.0		
MIX	bias current	IBMIX	MIXIN	Vcc=3.0V , Ta=25°C VIL=0V	-400	-300		uA	17-3
	bias voltage	VBMIXIN	MIXIN	Vcc=3.0V , IIL=0uA	1.35	1.65	1.95	V	17-7
		VBMIXOUT	MIXOUT	Vcc=3.0V , IIL=0uA R.MIXOUT=100ohm	2.5	2.8		V	
	Conversion gain	CG	MIXIN MIXOUT RXE	Vcc=3.0V , Ta=25°C FLoRX(SG)=892MHz PLoRX(SG)=-10dBm FRFin=913.7MHz PRFin=-40dBm IFOUT=21.7MHz delta.f=25kHz MIXIN=50ohm matting MIXOUT=tank load	7	10	13	dB	17-9
	Intercept point	IIP3				0 (reference value)		dBm	17-10
	Noise Figure	NF	MIXIN MIXOUT RXE	Vcc=3.0V , Ta=25°C FLoRX(SG)=892MHz PLoRX(SG)=-10dBm FRFin=913.7MHz IFOUT=21.7MHz MIXIN=50ohm matting MIXOUT=tank load		15 (reference value)		dB (SSB)	–
2-multiple	Emitter bias current	IEbias	TXOUT	Vcc=3.0V , Ta=25°C R.TXOUT=1kohm	1.0	2.0	3.0	mA	–
	2-multiple Transmission Output Power	PRFout	TXOUT	Vcc=3.0V , Ta=25°C R.TXOUT=1kohm PLoTX=-10dBm FLoTX=463MHz FTXOUT=926MHz	-20	-15		dBm	17-11

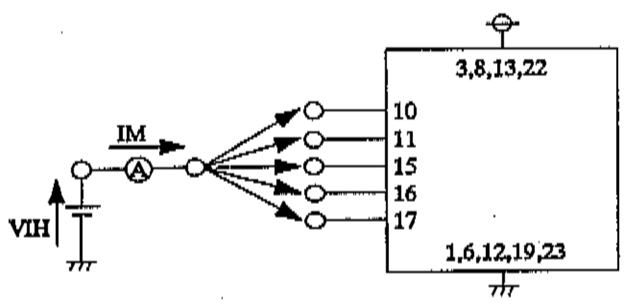
17. Measurement Circuit Diagram

17-1. Power Supply Current (VCC, TXVCC, RXVCC)



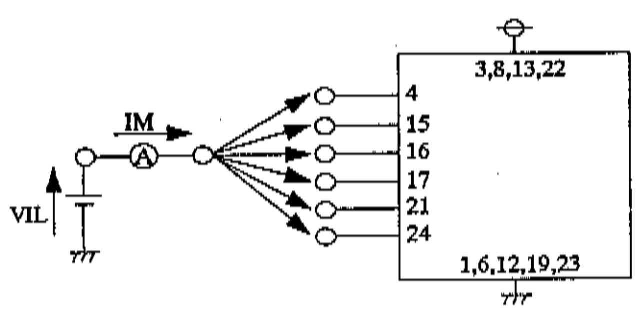
- In measuring IccOff :
  Transfer the serial data that turn off the measured PLL system circuit .
- In measuring IccOn :
  Transfer the serial data that turn on the measured PLL system circuit .

17-2. OSC Bias Current (XOUT, XBO) , "H" Input Current (CPS, SI, RST)



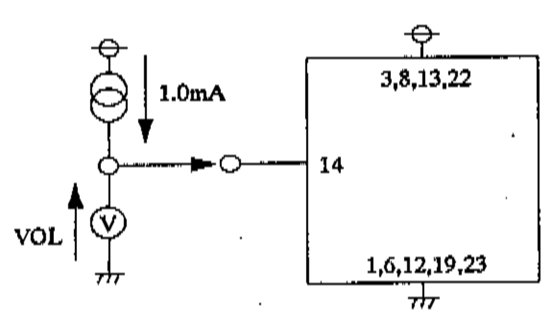
- The measured pins : XOUT , XBO , CPS , SI , RST

17-3. MIX Bias Current (MIXIN), "L" Input Current (CPS, SI, RST, TXB, RXB)



- The measured pins : MIXIN , CPS , SI , RST , TXB , RXB

17-4. "L" Output Voltage ($\overline{\text{LOCK}}$)



- Transfer the data that the measured pin falls into "L" state .
- The measured pin : $\overline{\text{LOCK}}$

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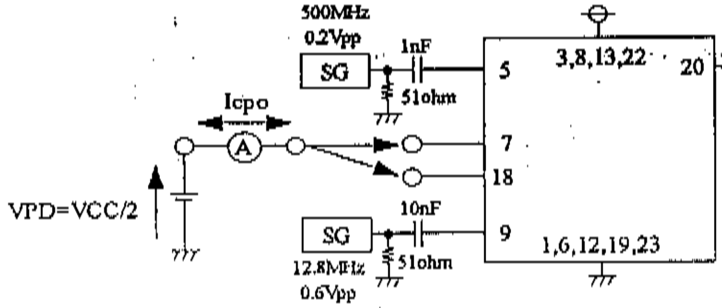
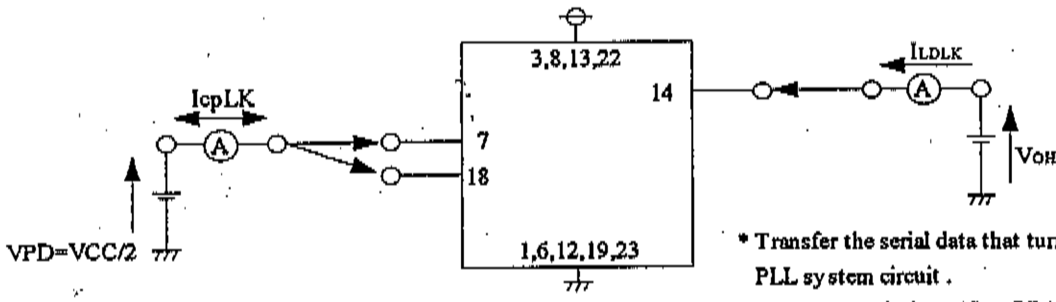
17-5. PD Output Current (PD1, PD2)



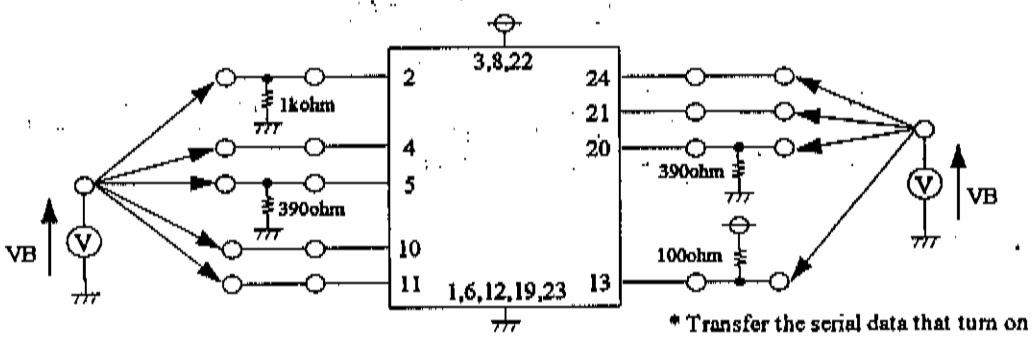
* Transfer the serial data that :
  * Turn on the measured PLL system circuit .
  * produce advance phase mode or delay phase mode .
* The measured pins : PD1, PD2

17-6. Output leak Current (PD1, PD2, $\overline{\text{LOCK}}$)



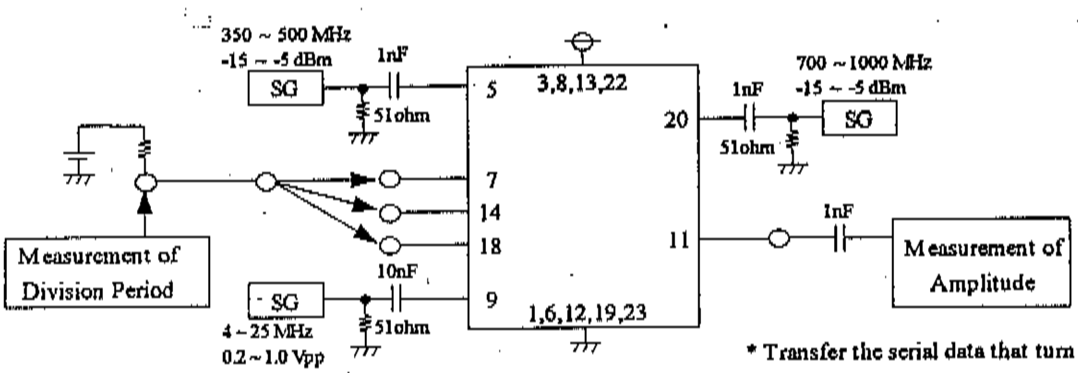
* Transfer the serial data that turn off the measured PLL system circuit .
* The measured pins : PD1, PD2, $\overline{\text{LOCK}}$

17-7. Bias Voltage (XOUT, XBO, TXB, TXE, RXB, RXE, MIXIN, MIXOUT)



* Transfer the serial data that turn on the measured PLL system circuit .
* The measured pins : XOUT, XBO, TXB, TXE, RXB, RXE, MIXIN, MIXOUT

17-8. Input Sensitivity Characteristics, OSC Buffer Output Amplitude (TXE, PD1, RXE, PD2, XIN, XBO, $\overline{\text{LOCK}}$)



* Transfer the serial data that turn on the measured PLL system circuit , and then transfer the test mode data .
* The measured pins : PD1, PD2, $\overline{\text{LOCK}}$

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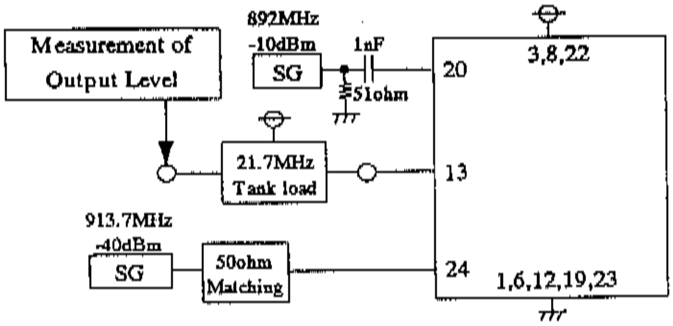
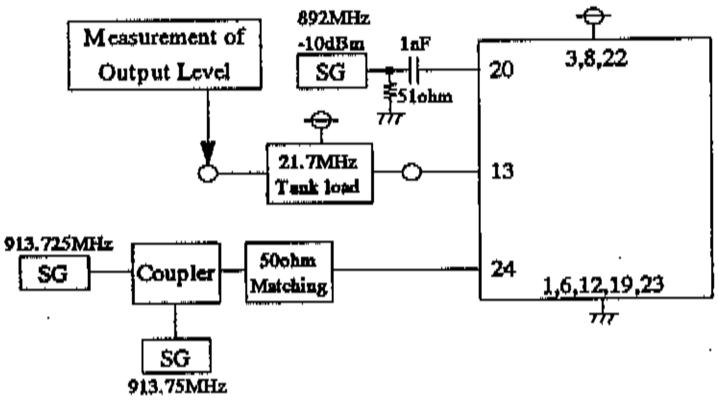
17-9. MIX Voltage Conversion Gain



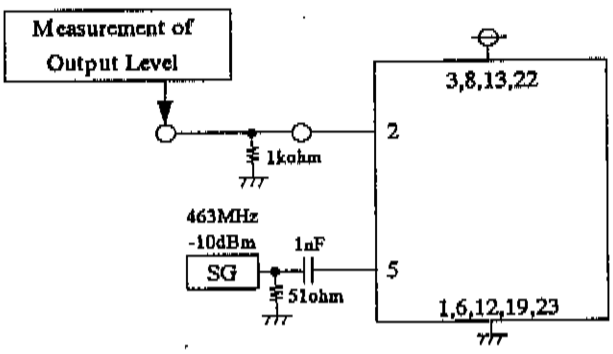
* Transfer the serial data that turn on only reception system circuit.
* The measured pin : MIXOUT
* Gmix (The Voltage Conversion Gain) =20*log((Output Voltage Amplitude) / (Input Voltage Amplitude))

17-10. The 3rd Intercept Point of MIX Input



* Transfer the serial data that turn on only reception system circuit.
* The measured pin : MIXOUT (On the condition that the circuits are in the non-overflowing state.)
* IIP3 = { (1st Output Level) - (3rd Output Level) } / 2 + (Input Level)

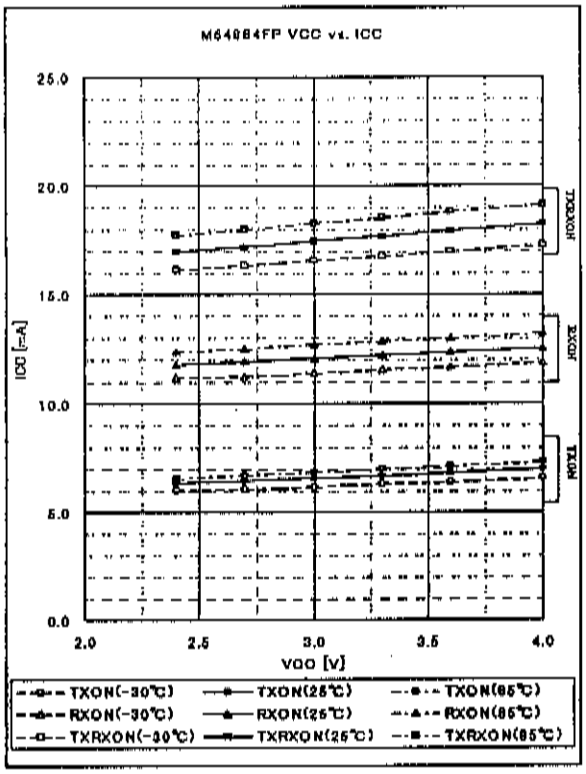
17-11. Output Power of Double Frequency Transmission in TXOUT

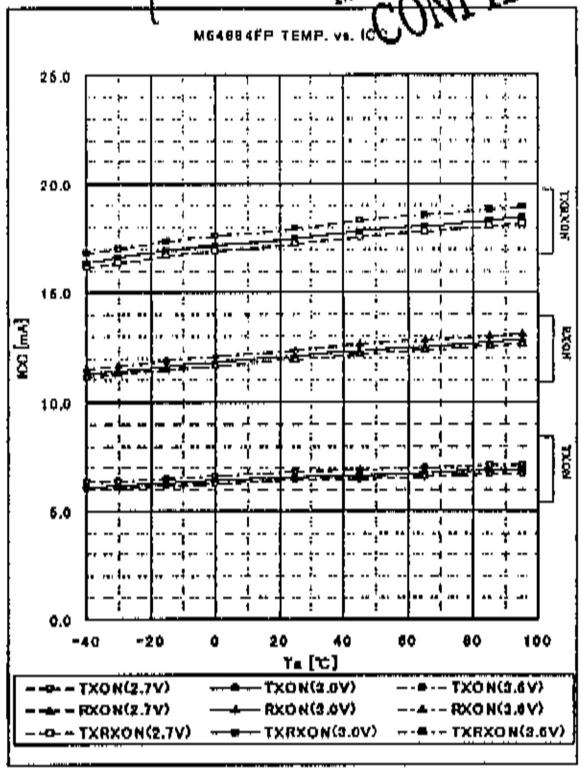


* Transfer the serial data that turn on only transmission system circuit.
* The measured pin : TXOUT

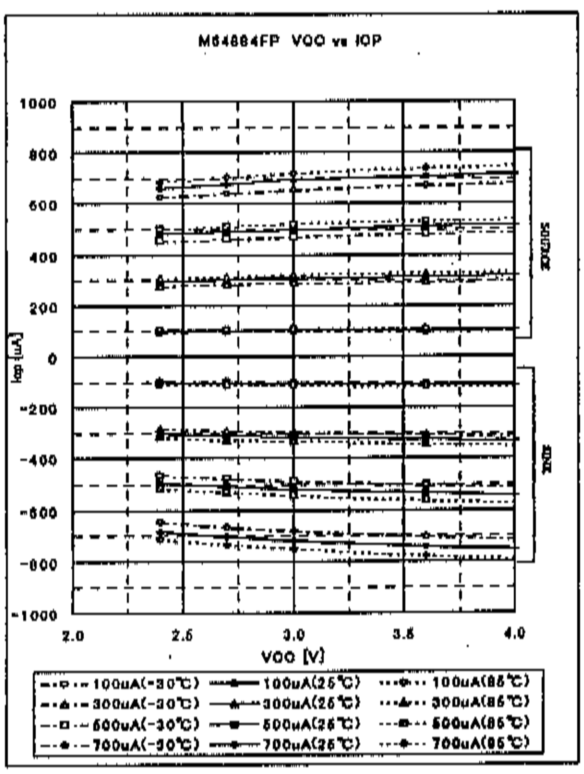
18. Referential Data

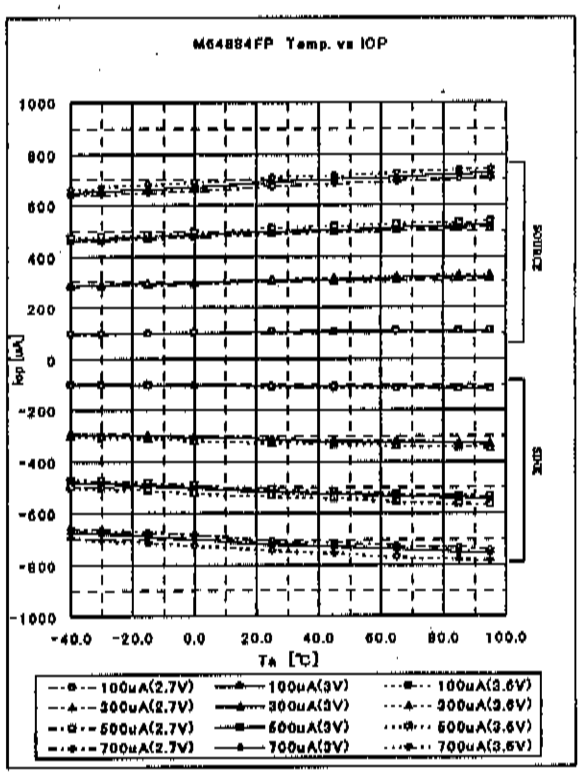
18-1. Power Supply Current





18-2. PD Output Current





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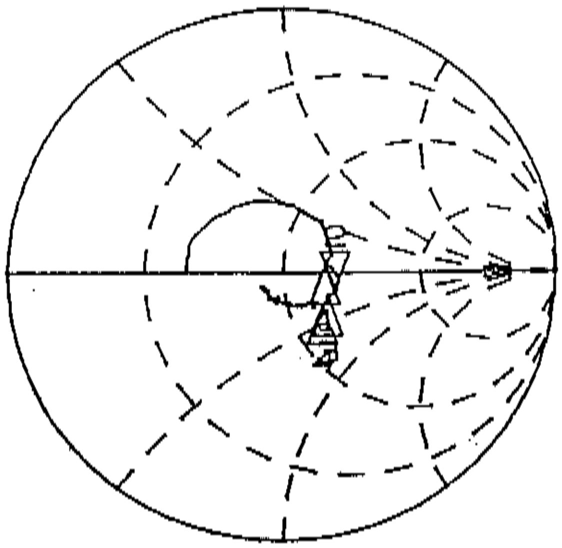
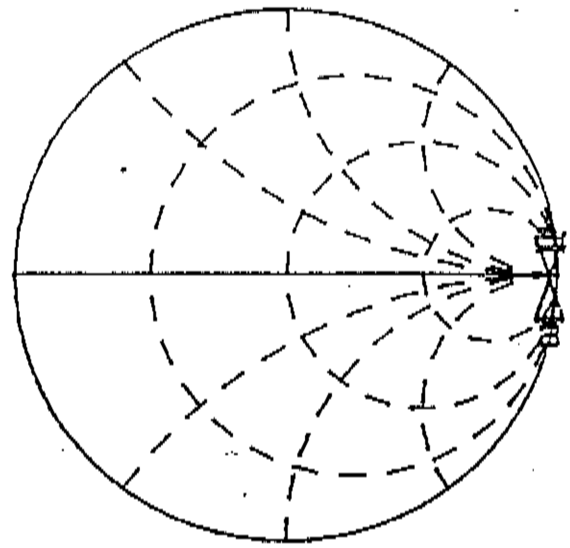
18-3. Input/Output pins Impedances

TXOUT(2PIN)



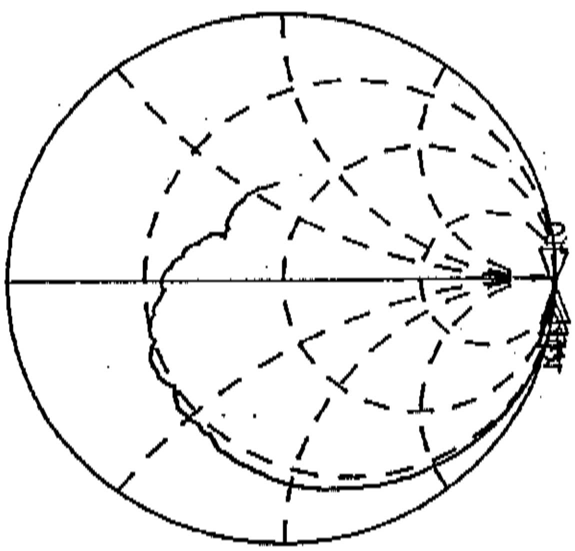
1. 700MHz :80.664 ohm - j 14.590 ohm
2. 900MHz :74.895 ohm - j 27.582 ohm
3. 930MHz :72.156 ohm - j 26.809 ohm
4. 1GHz :67.867 ohm - j 31.941 ohm

XIN(9PIN)



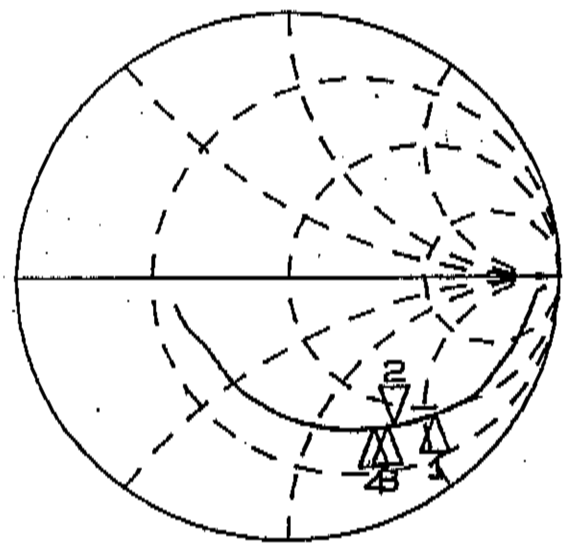
1. 4MHz :3.1244k ohm - j 425.63 ohm
2. 10MHz :2.8344k ohm - j 944.50 ohm
3. 25MHz :1.9011k ohm - j 1.5148k ohm

MIXOUT(13PIN)



1. 10MHz :506.75 ohm - j 5.0748k ohm
2. 20MHz :217.25 ohm - j 2.3545k ohm
3. 30MHz :90.31 ohm - j 1.5096k ohm
4. 50MHz :44.188 ohm - j 906 ohm

MIXIN(24PIN)



1. 700MHz :45.402 ohm - j 108.27 ohm
2. 900MHz :38.555 ohm - j 81.934 ohm
3. 930MHz :37.828 ohm - j 78.852 ohm
4. 1GHz :35.945 ohm - j 72.188 ohm

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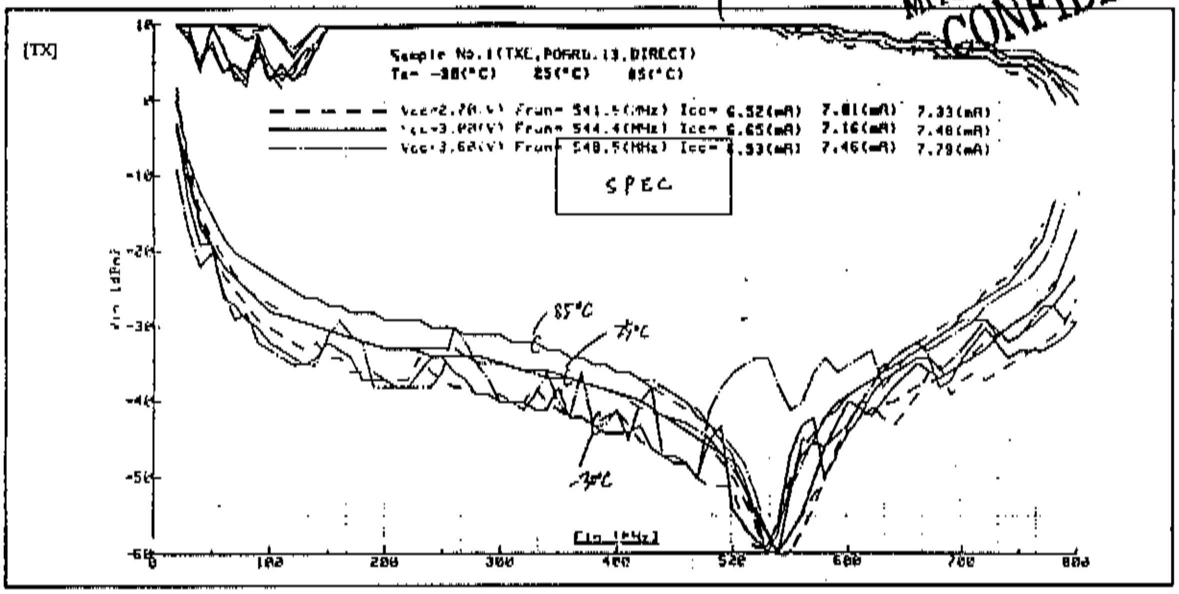
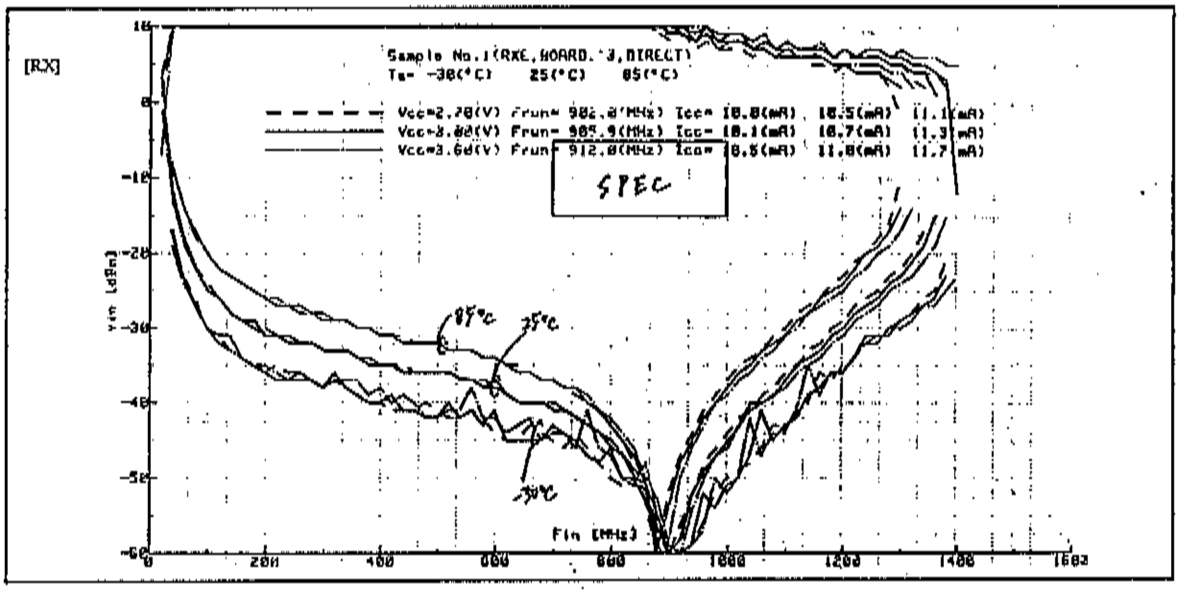
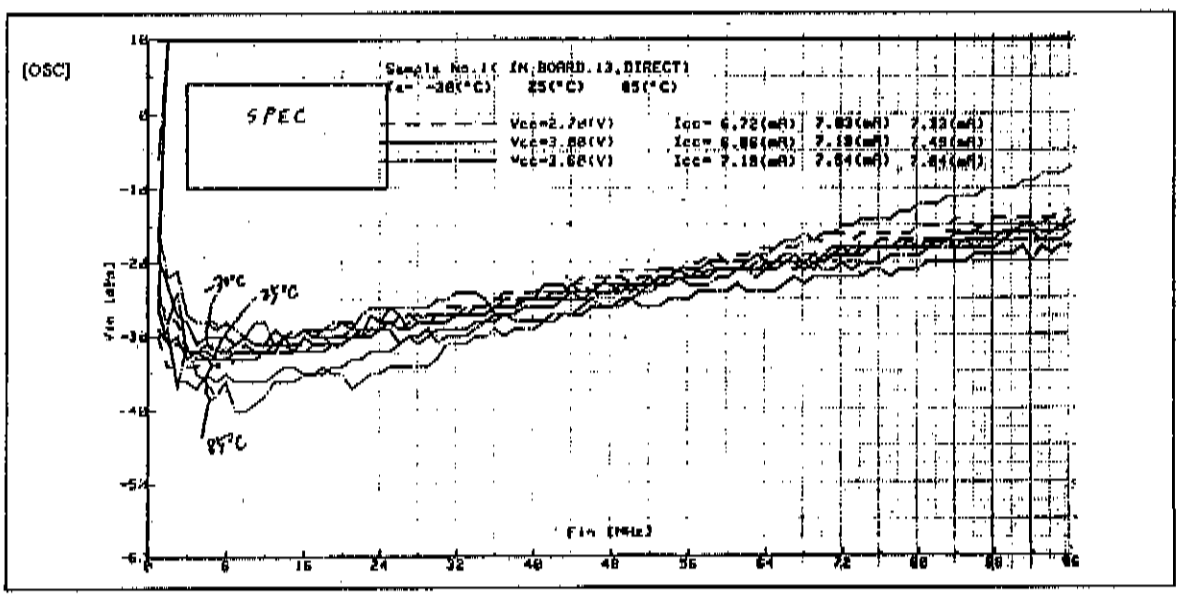
18-4. Input Sensitivity Characteristics







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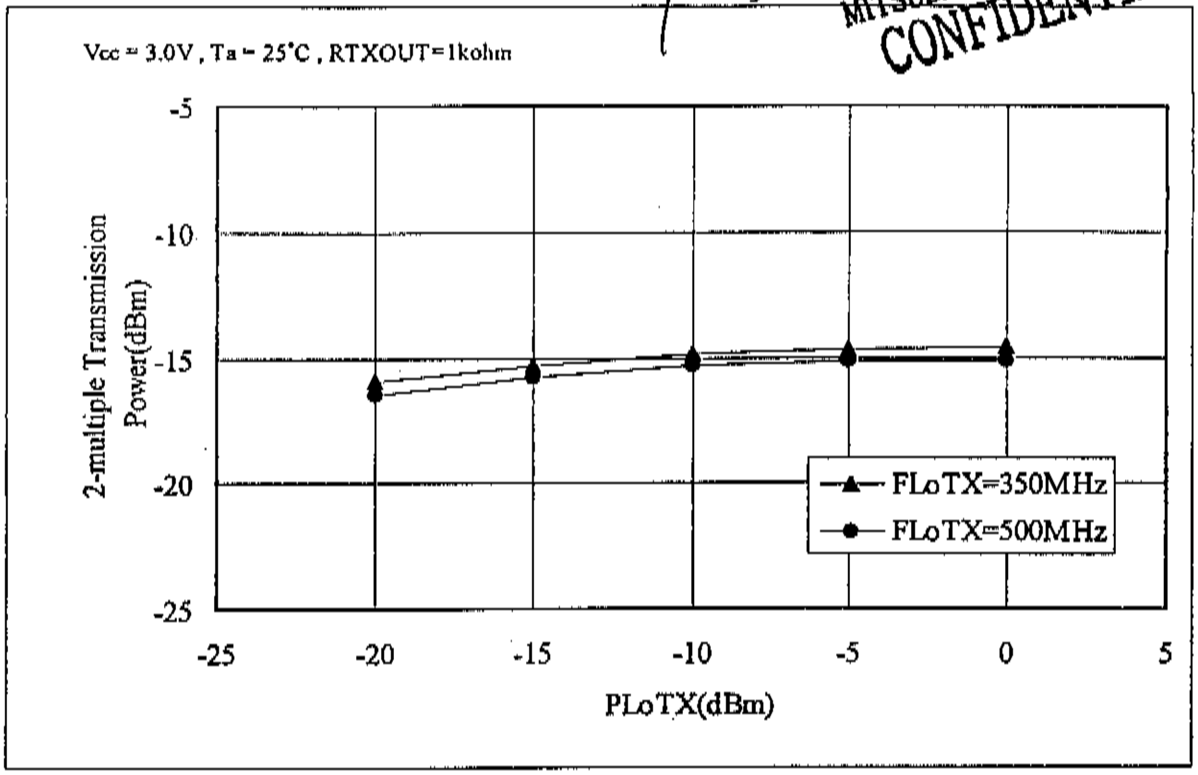
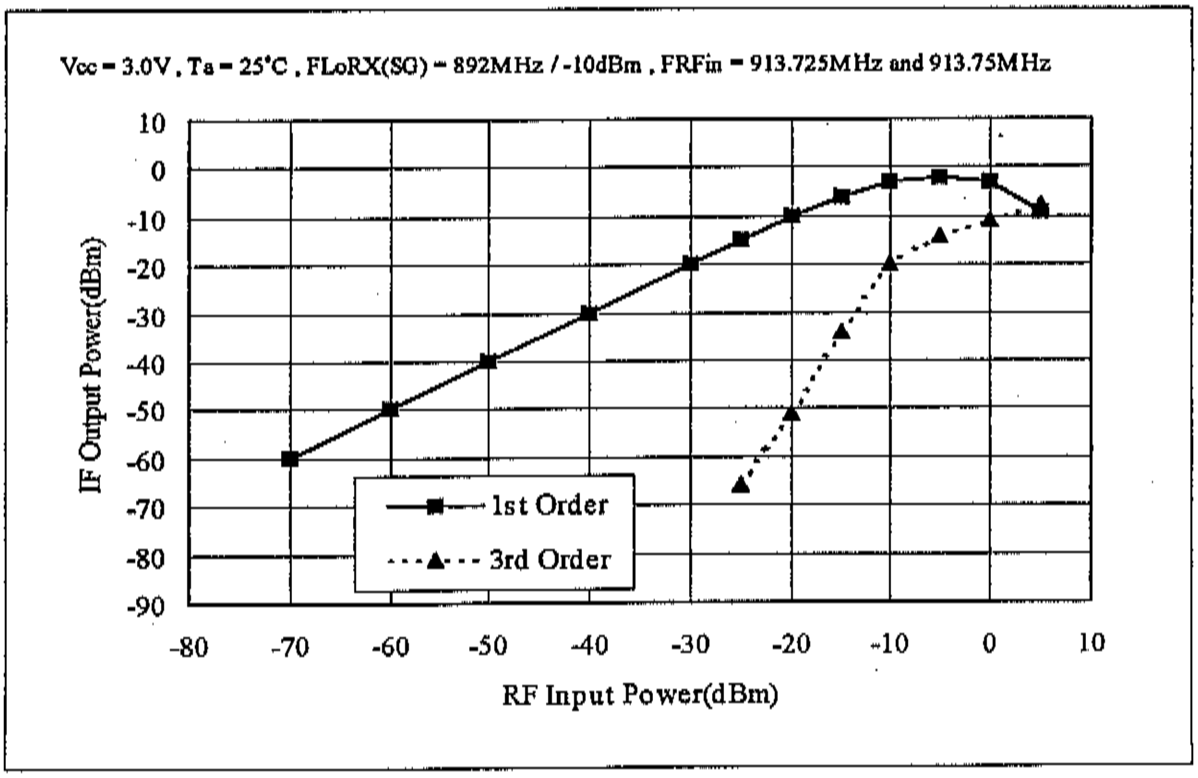
18-5. TXOUT Output Characteristics



18-6. MIX Characteristics



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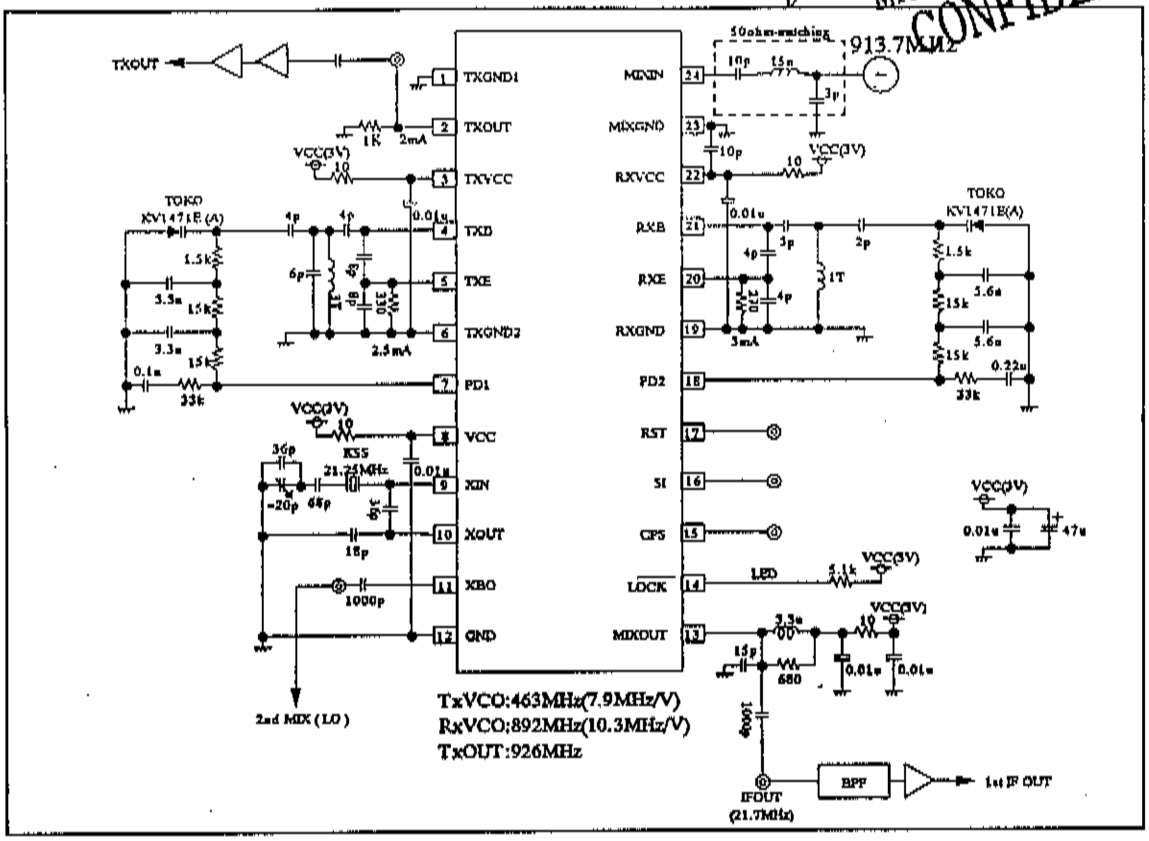
19. Application Circuit Connection Diagram



Cautions for Constructing an Application Circuit

- In this diagram each element constant is only an example, so please check up the values before using this IC. (About element constants of X'tal unit oscillation circuit, please ask for those best values to its vendor.)
- For the high-performance use of the mixer, 50ohm-matching in the MIXIN port is necessary.
- Please set the external elements connected to RF line, near the pins. (Especially, resisters of TXOUT, TXE and RXE)
- The decoupling capacitances of VCC, TXVCC and RXVCC are important for the achievement of high performances. Please set these elements near the pins.
- This IC suits for the use in North America. We don't recommend to use this IC in the cordless telephones in the countries where the RX.IMD standard is rigid, for example, in Europe.

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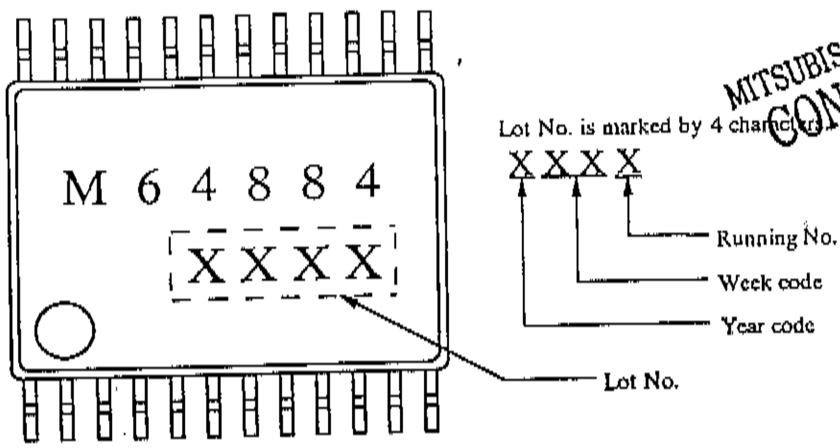
20. Symbol on Package



Cautions for Handling

- For the achievement of high performances , fine structure elements are used in this IC . to prevent surge voltage from being applied to the IC due to static electricity , take great care for handling .
- For system not to be used , set PLL to off by transferring data .