STANDARD PRODUCT SPECIFICATIONS
(PRELIMINARY)

PRODUCT NAME	RF UNIT FOR JAPAN CORDLESS TELEPHONE
CUSTOMER P/N	
ALPS P/N	URZP9X219A (SLAVE)

1. APPLICATION

This specification shall apply to the RF unit for Japan Cordless Telephone.

2. STANDARD OPERATING CONDITIONS

2-1. GENERAL ITEMS

	ITEM	SPECIFICATION	NOTE
1	Communication System	Duplex	2 PLL, 1 TCXO
2	TX Frequency Coverage	253.8625 ~ 254.9625 MHz	
3	RX Frequency Coverage	380.2125 ~ 381.3125 MHz	1st Lo: 358.9125 ~ 360.0125 MHz 2nd Lo: 21.25 MHz
4	Channels / Spacing	89 ch / 12.5 kHz	
5	Supply Voltage Range	+2.20 V ~ +5.50 V	+2.4 V typ. Satisfy electrical specifications
6	Operating Voltage Range	+2.15 V ~ +6.00 V	
7	Absolute Maximum Supply Voltage Range	+7.0 V max.	
8	Operating Temperature Range	-10 °C ~ +50 °C	
9	Storage Temperature Range	-20 °C ~ +60 °C	
10	Intermediate Frequency	21.3 MHz	1st IF
		50 kHz	2nd IF
11	Measurement Impedance	Nominal 50 Ω	
12	Antenna TX/RX System	Dual	
13	Modulation Data System	Sub Carrier MSK	

2-2. OPERATING CONDITIONS

Standard Conditions: Temperature 25 °C ± 2 °C
Humidity 65 % RH
General Conditions: Temperature 20 °C ~ 35 °C
Humidity 45 % ~ 85 %

The measurement is able to execute on General Conditions when it can exclude a problem of accuracy from the test results.

2-3. Absolute Power Unit

Absolute Power Unit is expressed in dB.
1 mW = 0 dBm

2-4. FM-IC

FM-IC is SANYO (LA8677V) or TOSHIBA (TA31180FN). Characteristics are equal.

3. MECHANICAL CHARACTERISTICS

3-1. ASPECT

There should not be contamination, scratches or strains on model.

3-2. DIMENSIONS

Refer to ASSEMBLY DRAWING.

3-3. MASS

15 g max.

4. ELECTRICAL CHARACTERISTICS

4-1. ELECTRICAL SPECIFICATIONS << TX: TRANSMITTER >>

	ITEM	SPECIFICATION				CONDITION
		UNIT	min.	typ.	max.	NOTE
1	TX Output Power	mW	5.0		12.0	Temperature: 0 ~ +40 °C
			7.0	9.5	11.5	Room temperature. Adjust: +9.5 mW
2	TX Frequency Stability	ppm	-3.8		+3.8	Temperature: 0 ~ +40 °C
			-2.0		+2.0	Room Temperature. Adjust: +1.0 ppm
3	TX Frequency Deviation	kHz	±1.1	±1.5	±2.0	Mod. Freq. = 1 kHz, 100 mV rms LPF: 3 kHz, HPF: 300 Hz
4	Modulation Frequency Response	dB	-2	+0.5	+2	300 Hz : Ref. Freq. = 1 kHz
			-2	-0.1	+2	3 kHz
5	TX Distortion	%		0.5	3.0	Mod. Freq. = 1 kHz, Dev. = 1.5 kHz LPF: 3 kHz, HPF: 300 Hz
6	TX S/N	dB	35	45		Mod. Freq. = 1 kHz, Dev. = 1.5 kHz LPF: 3 kHz, HPF: 300 Hz
7	Spurious Emissions	dBm		-45	-35	0 ~ 1.5 GHz
8	TX PLL Lock Up Time	ms		35	50	-10000ch to 89ch, CP = ±400 µA
				25	35	1ch to 89ch, CP = ±400 µA
						Regular:f±1 kHz
9	TX AMP Lock Up Time	ms		15	25	TX AMP ON, CP = ±400 µA
						Regular:f±1 kHz
10	TX/RX Current Consumption	mA		53	63	

* TX performances satisfy this specification that the UNIT is in a general room environment, except for standardized characteristics especially about temperature range.

* Measurement Method (TX)
Tool: ALPS Tools
Equipment: Modulation Analyzer (HP8901A or compatible)
Filter: Internal BPF of Modulation Analyzer

* CP Output Current
ITEM No. 8, 9: ±400 µA
Other ITEM: ±100 µA

4-2. ELECTRICAL SPECIFICATIONS << RX: RECEIVER >>

	ITEM	SPECIFICATION				CONDITION	
		UNIT	min.	typ.	Max.	NOTE	
1	RX Sensitivity	dBμV EMF			+6.0	0 ~ +40 °C	Mod.Freq.=1 kHz, Dev.=1.5 kHz
				+2.0	+4.0	Room Temp.	SINAD 12 dB
2	RX Frequency Bandwidth	kHz	8	10		-6 dB Bandwidth, NQ Method	
3	Local OSC Stability	ppm	-3.8		+3.8	Correspond to TX Frequency Stability	
4	RX Distortion	dB	20	28		RF = +20 dBμV EMF Mod.Freq. = 1 kHz, Dev. = 1.5 kHz	
5	RX S/N	dB	35	45		RF = +60 dBμV EMF Mod.Freq. = 1 kHz, Dev. = 1.5 kHz	
6	Protection Spurious Response	dB	40	50		DES: Mod.Freq. = 1 kHz, Dev. = 1.5 kHz UND: Mod.Freq. = 400 Hz, Dev. = 1.5 kHz	
7	Intermodulation Response	dB	47	52		DES: Mod.Freq. = 1 kHz, Dev. = 1.5 kHz UND: Only Carrier	
8	Adjacent Channel Selectivity	dB	50	55		DES: Mod.Freq. = 1 kHz, Dev. = 1.5 kHz UND: Mod.Freq. = 400 Hz, Dev. = 1.5 kHz	
9	Carrier Sense	dBμV EMF			+6	0 ~ +40 °C	Carrier Sense ON
	Switching Level		-3	0	+3	Room Temp.	Mod.Freq.=1 kHz, Dev.=1.5 kHz
10	Antenna Leakage	dBm		-60	-54	TX AMP OFF, TX VCO OFF, TX PLL OFF	
11	Carrier Sense	ms		35	55	-10000ch to 89ch, CP = ±400 μA	
	Switching Time			25	45	1ch to 89ch, CP = ±400 μA	
						RF = +12 dBμV EMF Mod. Freq. = 1 kHz, Dev. = 1.5 kHz Carrier sense was switched over low from channel data input	
12	Detector Output Level	mV	100	135	170	RF = +60 dBμV EMF Mod. = 1 kHz, Dev. = 1.5 kHz	
13	RX Current Consumption	mA		23	30	TX AMP OFF, TX VCO OFF, TX PLL OFF	

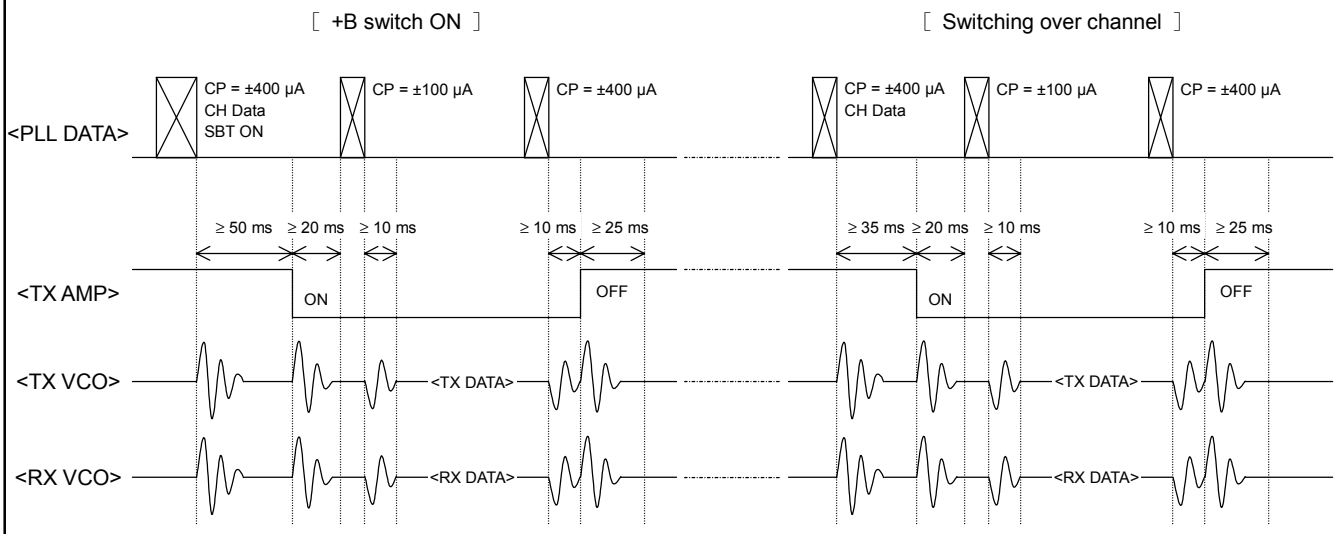
* RX performances satisfy this specification on condition that the UNIT is in a general room environment, except for standardized characteristics especially about temperature range.

* Measurement Method (RX)
  Tool: ALPS Tools
  Filter: ALPS Tools (300 Hz ~ 3 kHz BPF) ITEM No. 1, 2, 4, 5, 6, 7, 8

* PLL IC Operating
  RX measurement conditions: TX side PLL power off by PLL data.
  (By reason of unstable the RX performance.)

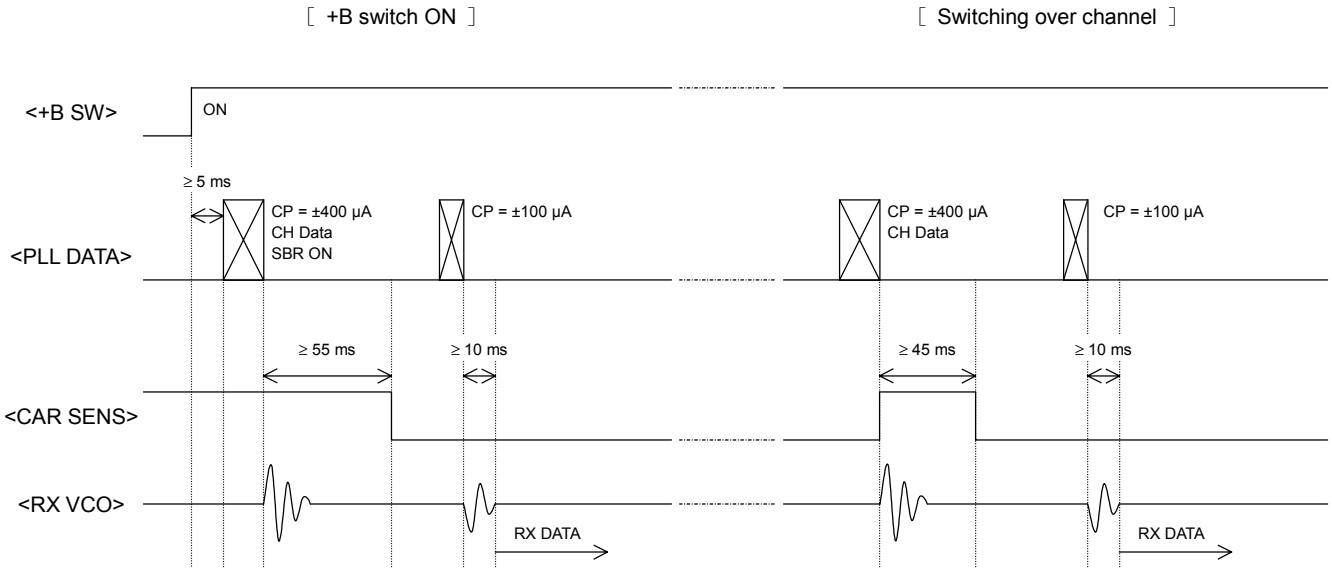
* CP Output Current
  ITEM No. 11 ±400 μA
  Other ITEM ±100 μA

[TX TIMING CHART]



*1 RX VCO frequency offset by changing CP output current. (±300 Hz, 5 ms typ.)
*2 TX VCO frequency offset by changing CP output current. (±300 Hz, 5 ms typ.)
*3 RX VCO frequency offset by switching TX AMP. (ON: 20 ms, OFF: 25 ms typ.)
*4 RX VCO frequency offset by TX PLL lock up. (±1 ~ 2 kHz typ.)

[RX TIMING CHART]



*1 RX VCO frequency offset by changing CP output current. (±300 Hz, 5 ms typ.)

									X219A
							TITLE	URZP9	PRODUCT SPECIFICATION
							DOCUMENT NO.		(5 /)
SYMB.	DATE OR NO.	APPD.	CHKD.	DSGD.			ALPS ELECTRIC CO., LTD.		

5. RELIABILITY TEST

5-1. HIGH TEMPERATURE TEST (NO POWER APPLIED)

The UNIT shall meet the performance of TABLE-1 after storage at +60 °C for 96 hours. The UNIT shall be removed from the test chamber and allowed to stabilize at room ambient conditions for a minimum of 1 hour prior to retest.

5-2. HIGH TEMPERATURE TEST (POWER APPLIED)

The UNIT shall meet the performance of TABLE-1 after storage at +60 °C for 96 hours. (Supply voltage according to standard operating conditions.) The UNIT shall be removed from the test chamber and allowed to stabilize at room ambient conditions for a minimum of 1 hour prior to retest.
<Note> TX/RX VCO condition: on free run

5-3. LOW TEMPERATURE TEST (NO POWER APPLIED)

The UNIT shall meet the performance of TABLE-1 after storage at -20 °C for 96 hours. The UNIT shall be removed from the test chamber and allowed to stabilize at room ambient conditions for a minimum of 1 hour prior to retest.

5-4. THERMAL SHOCK TEST (NO POWER APPLIED)

The UNIT shall meet the performance of TABLE-1 after storage for 10 cycles. The UNIT shall be removed from the test chamber and allowed to stabilize at room ambient condition for a minimum of 1 hour prior to retest.

1 cycle = (-20 °C for 20 minutes) + (+80 °C for 20 minutes)

5-5. HUMIDITY TEST (NO POWER APPLIED)

The UNIT shall meet the performance of TABLE-1 after storage at +60 °C and 90 % RH for 96 hours. The UNIT shall be removed from the test chamber and allowed to stabilize at room ambient condition for a minimum of 2 hours prior to retest.

5-6. VIBRATION TEST

The UNIT shall meet the performance of TABLE-1 after the following vibration. The UNIT shall be removed form the test chamber and allowed to stabilize at room ambient condition for a minimum of 1 hour prior to retest.

Vibration frequency	10 ~ 50 ~ 10 Hz (1 cycle / 1 minute)
Total amplitude	1 mm
Direction	X, Y, Z (each direction 40 minutes)

5-7. DROP SHOCK TEST

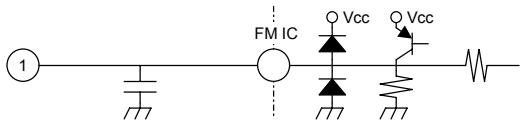
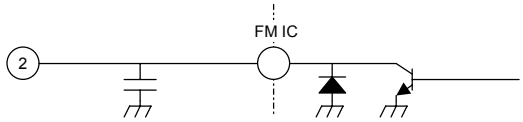
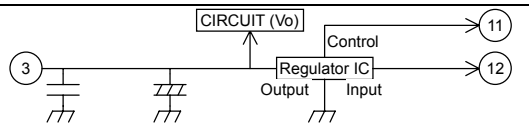
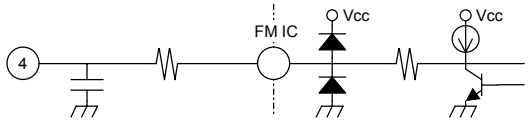
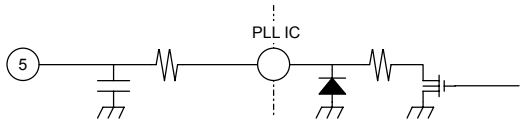
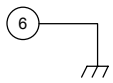
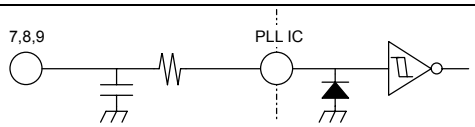
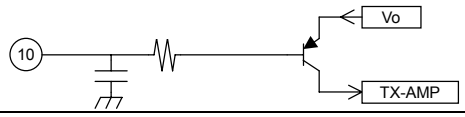
The UNIT shall meet the performances of TABLE-1 after the following shock of drop.

Drop point (Height)	1 m
Receiving board	Wood Board (20 cm X 20 cm X 3 cm) min.
Drop times:	1 time

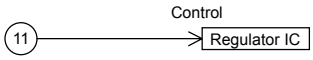
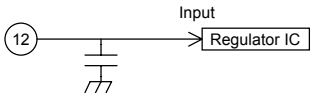
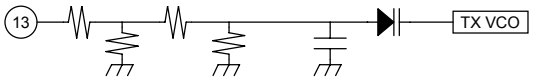
<<TABLE-1>>

	ITEM	SPECIFICATION	NOTE
1	TX Frequency Stability	±4.0 ppm max.	
2	TX Output Power	10 mW, -50 ~ +20 %	
3	RX Sensitivity	+6 dBμV EMF max.	
4	Local OSC Stability	±4.0 ppm max.	
5	Antenna Leakage	-54 dBm max.	
6	Carrier Sense Switching Level	+6 dBμV EMF max.	
7	TX Spurious Emissions	-26 dBm max.	0 ~ 1.5 GHz

6. PIN ASSIGNMENT

No	Pin Name	Description	Equivalent circuit
1	RSSI	Voltage output of the received signal strength indicator (RSSI). +0.1 V (Low level RF) ~ +1.9 V (High level RF) at 10 MΩ load	
2	CAR SENS	Carrier sense output Low = carrier sensed High = no carrier sensed Open collector output (I_{SINK} = 0.2 mA)	
3	REG OUT	Regulated voltage output (Vo) V_{OUT} = +2.0 V typ., I_{OUT} = 2 mA max.	
4	DET OUT	Detected signal output Output level: 135 mV rms typ. Z_{OUT} = 620 Ω typ.	
5	LOCK DET	PLL lock detector output Low = PLL locked High = PLL unlocked Open drain output	
6	GND		
7	PLL CLK	PLL clock pulse input for shift registers 	
8	PLL STB	PLL strobe pulse input	
9	PLL DATA	PLL binary data input 	
10	TX-AMP	TX-AMP control Low = TX-AMP ON High = TX-AMP OFF	

ITEM	min.	typ.	max.	UNIT
“H” Level	+1.6	+2.0	+5.7	V
“L” Level	-0.2	0	+0.4	V
“H” Current			+1.0	μA
“L” Current			-1.0	μA

No	Pin Name	Description	Equivalent circuit
11	+B SW	Internal regulator IC control Low = regulator IC OFF High = regulator IC ON High level = +1.9 V ~ +5.5 V	
12	+B	Supply voltage input +2.20 V ~ +5.50 V	
13	TX-MOD	Modulation signal input Input level: 100 mV rms typ. Z_{in} = 10 kΩ typ.	
14	RF GND	Antenna GND	
15	ANT	Antenna input / output (Electrical characteristics measurement terminal) Nominal 50 Ω	
16	ANT	Antenna input / output Nominal 50 Ω	

7. PLL IC PERFORMANCES

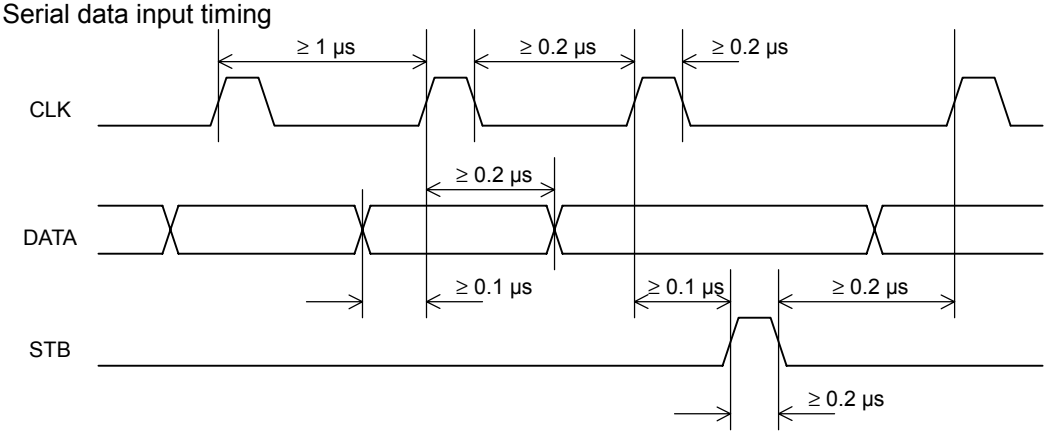
DESCRIPTION OF FUNCTION AND OPERATION

(1) Entry of serial data

- Serial data used to control the IC is input through three terminals, CLK, DATA and STB.
  - [1] During the rise of a clock pulse, data is fed to the shift register in IC in order from the LSB.
  - [2] Upon the reception of all data, the strobe signal (STB) is made “H”.
  - [3] After the reception of a strobe signal (STB) of the “H” level, the data stored in the shift register is transferred to the latch in the block selected by the group code, whereby the IC is controlled.
  - [4] A counters start to operate after the reception of a strobe signal (STB) of the “L” level.
- The three terminals, CLK, DATA and STB, contain schmitt trigger circuits to prevent the data errors by noise, etc.
- Serial data group and group code
  The IC has control divided into four groups that they may be controlled independent of one another. Each group is identified by a 2 bits group code attached at the data end.

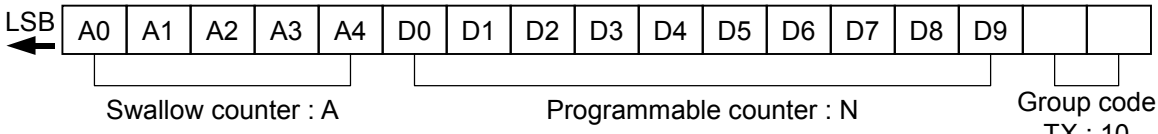
CODE	ITEM
10	Number of divisions by TX programmable divider
01	Number of divisions by RX programmable divider
11	Number of divisions by reference divider (Xin)
00	Optional control

- Serial data input timing



(2) Programmable dividers (TX, RX)

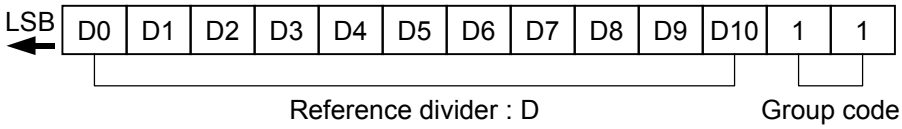
- These programmable dividers are composed of a 5 bits swallow counter (5 bits programmable divider), a 10 bits programmable counter, and a two-modulars prescaler providing 64 and 66 divisions.
- Swallow counter system is adopted to set high reference frequency.
- Sending certain data to the swallow counter and the programmable counter allows the setting of any of 1984 to 65534 divisions (multiple of two).
- The programmable counter and swallow counter are set by each channel. Each channel is specified by a group code.



$A = A0 + A1 \times 2^1 + A2 \times 2^2 + A3 \times 2^3 + A4 \times 2^4$
$N = D0 + D1 \times 2^1 + D2 \times 2^2 + D3 \times 2^3 + \ldots + D9 \times 2^9$
Number of divisions = 2 (32N + A)
$1984 \leq$ Number of divisions ≤ 65534

(3) Reference divider

- This block generates the reference frequency for the PLL.
- The reference divider is composed of an 11 bit reference divider and half fixed divider.
- Sending certain data to the reference divider allows the setting of 6 to 4094 divisions (multiple of two).



$D = D0 + D1 \times 2^1 + D2 \times 2^2 + D3 \times 2^3 + \ldots + D10 \times 2^{10}$
Number of divisions = D
$6 \leq$ Number of divisions ≤ 4094

The example of setting number of divisions in case of
Reference frequency : 21.25 MHz
Start VCO frequency : 253.8625 MHz
Channel step : 12.5 kHz

- Set up phase comparator frequency
  Since a programmable divider is multiple of two, phase comparator frequency is set a half of frequency step.
  Phase comparator frequency = $12.5 \times 10^3 \div 2 = 6.25$ kHz

- Set up programmable divider divisions
  $253.8625 \times 10^6 \div (12.5 \times 10^3 \div 2) = 40618$
  $40618 = 2(32N + A)$
  $N = 634, A = 21$

● Set up reference divider divisions

21.25 X 10^6 ÷ (12.5 X 10^3 ÷ 2) = 3400

2D = 3400

D = 1700 (11010100100 binary)

LSB	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	1	1
←	0	0	1	0	0	1	0	1	0	1	1	1	1

● TX set up at 1 channel

TX VCO frequency = TX carrier frequency = 253.8625 MHz

Number of divisions = (253.8625 X 10^6) ÷ (6.25 X 10^3)

= 40618

= 2(32N + A)

N= 634 (1001111010 binary), A= 21 (10101 binary)

● RX set up at 1 channel

RX VCO frequency = RX carrier frequency - 21.3 MHz = 358.9125 MHz

Number of divisions = (358.9125 X 10^6) ÷ (6.25 X 10^3)

= 57426

= 2(32N + A)

N= 897 (110000001 binary), A= 9 (01001 binary)

LSB	A0	A1	A2	A3	A4	D0	D1	D2	D3	D4	D5	D6	D7	D8	D9		
TX ←	1	0	1	0	1	0	1	0	1	1	1	1	0	0	1	1	0
RX ←	1	0	0	1	0	1	0	0	0	0	0	0	1	1	1	0	1

(4) Optional control

● The optional control below is available.

[1] Test mode (Usually set up T1 = T2 = “0”).

[2] Control of the charge pump output current for each channel.

[3] Output terminal for Lock detector.

[4] Standby control of each channel.

LSB ←	T1	T1	CPT1	CPT2	LD1	LD2	SBT	CPR1	CPR2	*	*	SBR	0	0
	Test mode		Charge pump output current (TX)		Lock detector		Standby (TX)	Charge pump output current (RX)		Meaningless bits		Standby (RX)	Group code	

T1, T2 : Bit for test mode

CPT1, CPT2 : Switchover bit for charge pump output current (TX)

CPR1, CPR2 : Switchover bit for charge pump output current (RX)

LD1, LD2 : Control bit for lock detector output

SBT, SBR : Standby control bit (TX, RX)

* : Disregard any data (Meaningless bits)

● Description of options including their control

[1] Test mode (T1, T2)

Bit “T1, T2” is for test mode. In other than the test mode, set this bit at “0”.

[2] Control of charge pump output current (CPT, CPR)

This IC uses a constant current output type charge pump circuit. Output current is varied by controlling “CPT1, CPT2, CPR1, CPR2”

CHANNEL	CONTROL BIT		CHARGE PUMP OUTPUT CURRENT (CP)
TX	CPT1	CPT2	
RX	CPR1	CPR2	
	0	0	±0 μA
	0	1	±100 μA
	1	0	±200 μA
	1	1	±400 μA

- At +B switching on, switching over channel and TX-AMP on
  CP output current = ±400 μA (High speed lock up)
  This worsen S/N
- At talking
  CP output current = ±100 μA (Slow speed lock up)
- RX VCO frequency and detector output level offset by changing CP output current.
  Use detector output signal after 10 ms from changing CP output current.

[3] Lock detector output

When phase comparator detects phase difference, LD terminal output “H”. When phase comparator locks, LD terminal output “L”. On standby, outputs “L”. LD terminal output is controlled by “SBT”, “SBR”, “LD1” and “LD2”. LD terminal output is open drain output.

CONTROL BIT		LOCK DETECTOR OUTPUT STATE
LD1	LD2	
0	0	H
0	1	TX only detect
1	0	RX only detect
1	1	TX and RX detect

On unlock = “H”
On lock = “L”
On standby = “L”

[4] Standby control (SBT, SBR)

Available standby control for receiver and transmitter independent of each other.

CONTROL BIT		STATE		
SBT	SBR	TX	RX	REF
0	0	ON	ON	ON
0	1	ON	OFF	ON
1	0	OFF	ON	ON
1	1	OFF	OFF	ON

On standby
Current consumption : About 1 mA
Division data : Hold
Other circuit power : Off

8. NOTES

(1) Not washable.

(2) We can not guarantee this specifications in these case,
[1] Add the force to the coil.
[2] Adjust the variable resistor or trimmer capacitor.

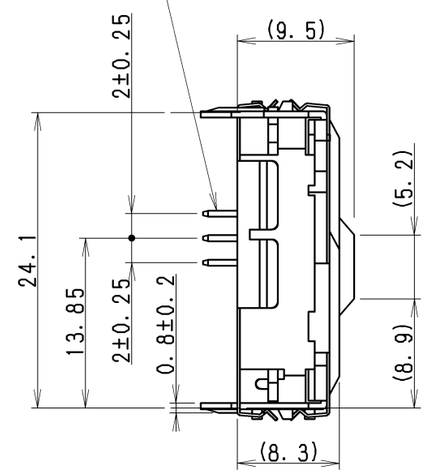
(3) Soldering condition
[1] Dip soldering

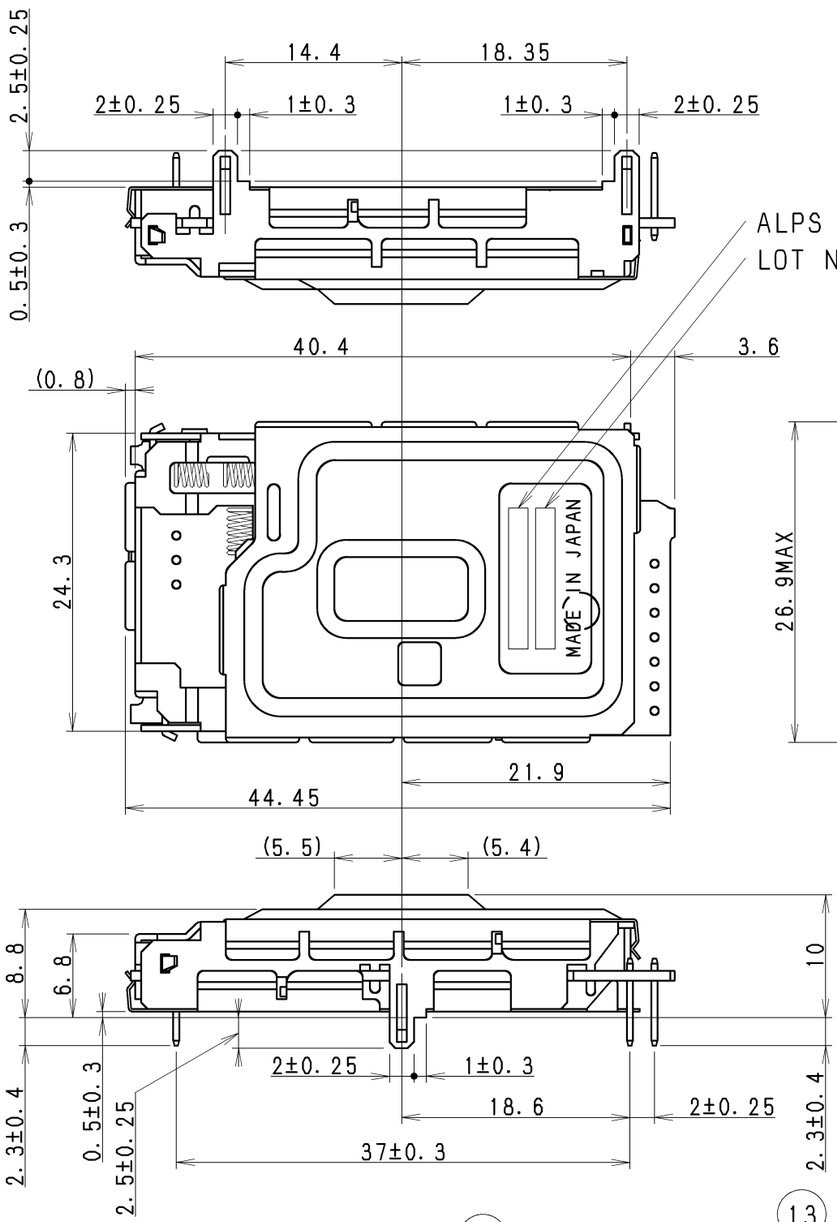
Soldering temperature	260 °C max.
Dipping time	10 s max.
Dipping number of time	1 time only
Preheat temperature	100 °C max.
Preheat time	60 s max.
Amount of flux form	Flux is assumed to be extent which does not go up from surroundings of PWB to the component mounting.

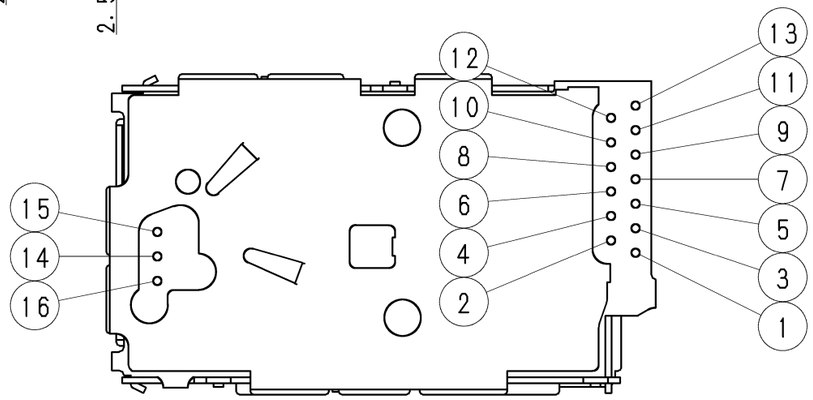
[2] Manual soldering

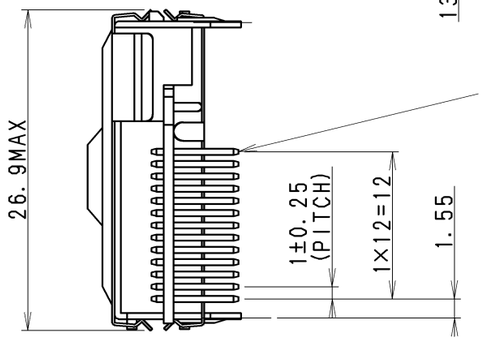
Soldering temperature	320 °C max.
Soldering time	3 s max.

(4) Do not open the cover of the both sides.

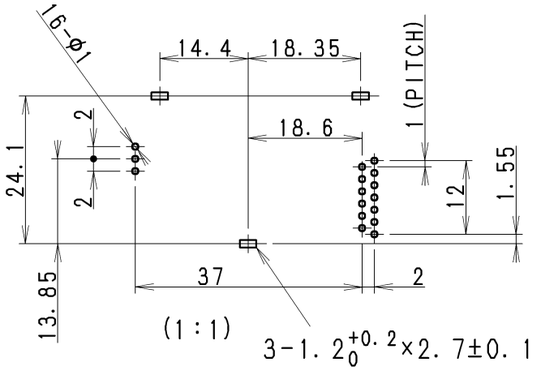








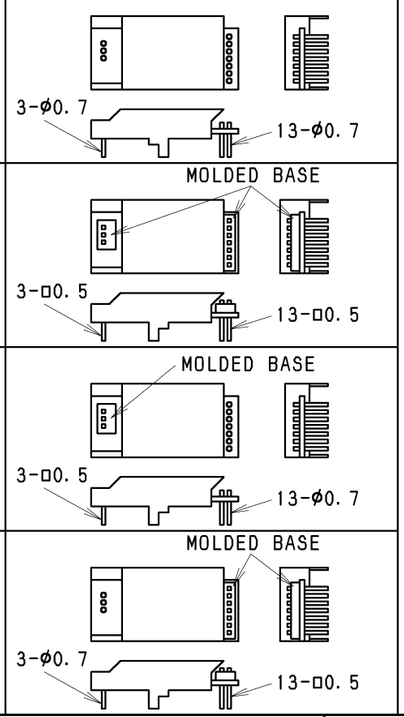
RECOMMENDED PWB DIMENSION FOR MOUNT UNIT.
(GENERAL TOLERANCE:±0.1)



NOTE 1. TOLERANCES ARE ±0.5
UNLESS OTHERWISE SPECIFIED.
2. LOT NO. SHALL BE CONFORMED TO
ALPS ENDOWMENT RULES.
3. THE UNIT HAS 4 DIFFERENT TERMINALS
AS "VARIETY OF TERMINALS".

PIN NO.	CONTENTS
1	RSSI
2	CAR SENS
3	REG OUT
4	DET OUT
5	LOCK DET
6	GND
7	CLK
8	STROBE
9	DATA
10	TX-AMP
11	+B SW
12	+B
13	TX-MOD
14	GND
15	TX ANT
16	RX ANT

TYPE VARIETY OF TERMINALS



	URZP9-2XXA
CUSTOMER'S MODEL NO.	ALPS MODEL NO.

PART NO.	NAME	MATERIAL	SPEC.	FINISH

ALPS ELECTRIC CO., LTD.

DSGD. Jan.11,'01 H.Watanabe	SCALE 2:1		
CHKD.		TITLE URZP9 ASSEMBLY DRAWING	
APPD.	UNIT mm	DOCUMENT NO.	

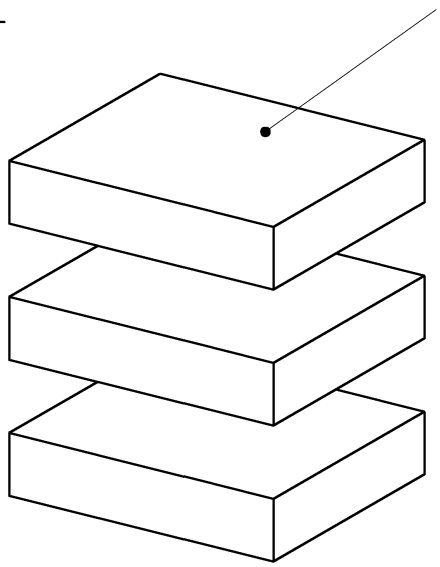
ZONE SYMB. DATE OR NO. APPD. CHKD. DSGD.

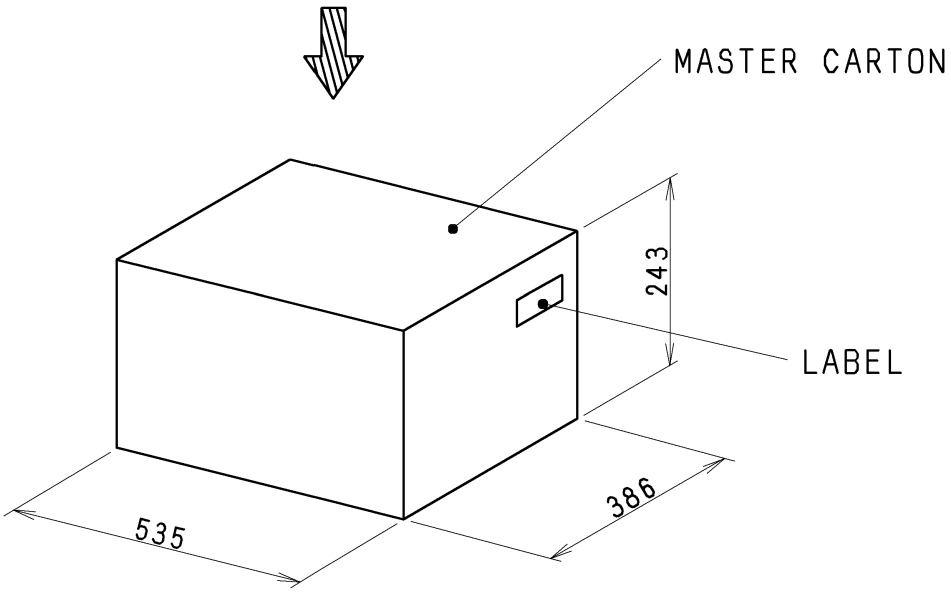
KEY NO.

6 (A3V図面用紙)

ENG1

PACKING





QTY：720pcs (MAX)

GROSS MASS：14kg (MAX)

PART NO.	NAME	MATERIAL	SPEC.	FINISH	

SYMB.	DATE OR NO.	APPD.	CHKD.	DSGD.

ALPS ELECTRIC CO., LTD.

DSGD.	SCALE	URZP
CHKD.		TITLE PRODUCT SPECIFICATION
APPD.	UNIT mm	DOCUMENT NO.

KEY NO.

(A4V図面用紙)