

Power Controller IC for Cellular Telephones

Description

The CXA1743N is an IC designed for use in transmission power control of cellular mobile telephones.

Features

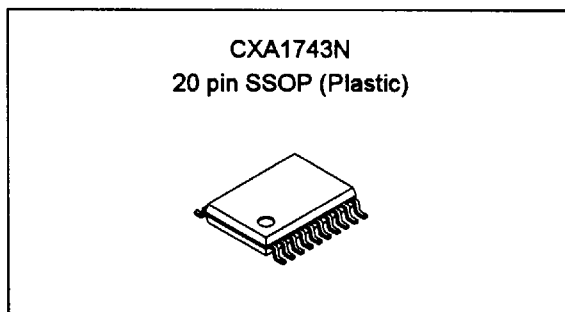
- 8-bit D/A converter used for reference signal achieves fine adjustment of transmission output.
- Temperature sensor circuit
- TX switch driver
- 16 bits of serial data used to control the 8-bit D/A converter and temperature sensor circuits.
- Ultra small 20-pin SSOP package ideal for use in compact sets.

Applications

- Cellular mobile telephones
- Compact portable telephones

Structure

Bipolar silicon monolithic IC



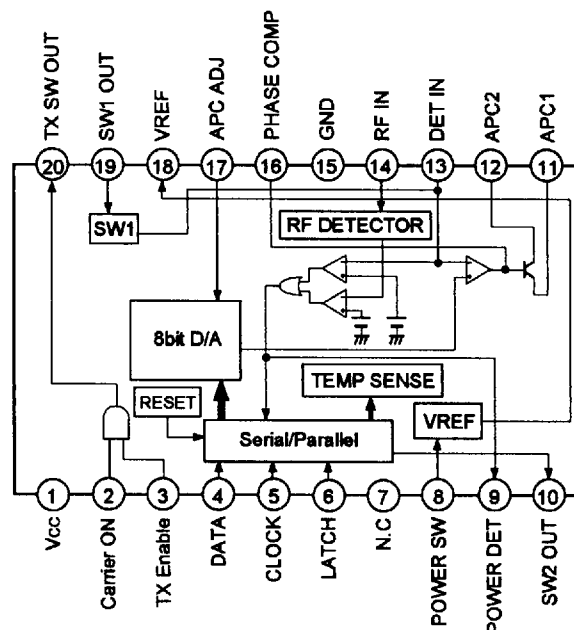
Absolute Maximum Ratings

• Supply voltage	Vcc	7.0	V
• Operating temperature	Topr	-20 to +75	°C
• Storage temperature	Tstg	-65 to +150	°C
• Allowable power dissipation	Pd	230	mW

Operating Conditions

Supply voltage	Vcc	2.7 to 5.0	V
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Block Diagram and Pin Configuration



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Pin Description

Pin No.	Symbol	Equivalent circuit	Description
1	Vcc		Power supply.
2	CARRIER ON		Switching for TX SW (Pin 20).
3	TX ENABLE		
4	DATA		Control serial data input.
5	CLOCK		Serial data clock input.
6	LATCH		Serial data latch pulse input.
7	N.C.		No connected.
8	POWER SW		Controls this IC operation. When this pin goes Low, the IC operation stops, reducing the current consumption.

Pin No.	Symbol	Equivalent circuit	Description
9	POWER DET		Output of transmission output detector.
10	SW2 OUT		SW2 output. Controlled by serial data.
11	APC1		Transmission power control output.
12	APC2		Transmission power control output (open collector output).
13	DET IN		RF detector voltage input. Voltage input from the external detector circuit.
14	RF IN		RF detector circuit input.

Pin No.	Symbol	Equivalent circuit	Description
15	GND		Ground.
16	PHASE COMP		Connects the phase compensation capacitor of APC amplifier.
17	APC ADJ		Fine adjustment for APC reference voltage A/D conversion.
18	VREF		Internal regulator output.
19	SW1 IN		SW1 input. When this pin goes Low, Pin 13 goes High.
20	TXSW OUT		Output for TX SW.

(Ta = 25°C, Vcc = 3V)

Electrical Characteristics

Item	Symbol	Measure- ment circuit	Switch set to ON	LSB	Input conditions for Pin 4												MSB	Measurement contents	Measure- ment point	Min.	Typ.	Max.	Unit
Circuit current 1	Icc1	3	S1, S2	1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0		I4	2.2	3.3	6.5	mA
Circuit current 2	Icc2	3	S2	1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0		I4			5.0	mA
Standby current	Icc3	3		1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0		I4	1	1.6	2.4	mA
APC1 output current	Io	1	S2, S5	0 0 0 0 0 0 0 0	0	0	1	1	0	1	1	0	1	1	0	1	0			30			mA
APC1maximum operating voltage	Von	1	S2	0 0 0 0 0 0 0 0	0	0	1	1	0	1	1	0	1	1	0	1	0		Pin 11	1.9	1.98	3.0	V
APC1minimum operating voltage	Voff	1	S2, S3	1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0		Pin 11	-0.8		0.0	V
APC2 sink current	Vtx	1	S2, S5	0 0 0 0 0 0 0 0	0	0	1	1	0	1	1	0	1	1	0	1	0		I2	26			mA
TX SW maximum voltage	Vtx	1	S1	0 0 0 0 0 0 0 0	0	0	1	1	0	1	1	0	1	1	0	1	0	IS1 = 3mA	V3	1.9		3.0	V
Amp. open-loop gain	Vamp	3	S2 S6, S10	1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0	The output voltage is measured at V7 with 1mV signal applied from SG. Fsg = 200Hz	V7	40			dB
Amp. frequency characteristics	Vf	3	S2 S6, S10	1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0	The output voltage is measured at V7 with 1mV signal applied from SG. Fsg = 200kHz	V7	100			kHz
RF DET sensitivity	Vdet	2	S4	1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0	30mVp-p signal is applied from SG.	V5	30			mVp-p
PDET2 voltage	Vth	2	S4	1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0		V5	90		110.0	mV
Offset voltage	Vofs	2		1 1 1 1 1 1 1 1	0	0	1	1	0	1	1	0	1	1	0	1	0		V6	-20		20.0	mV

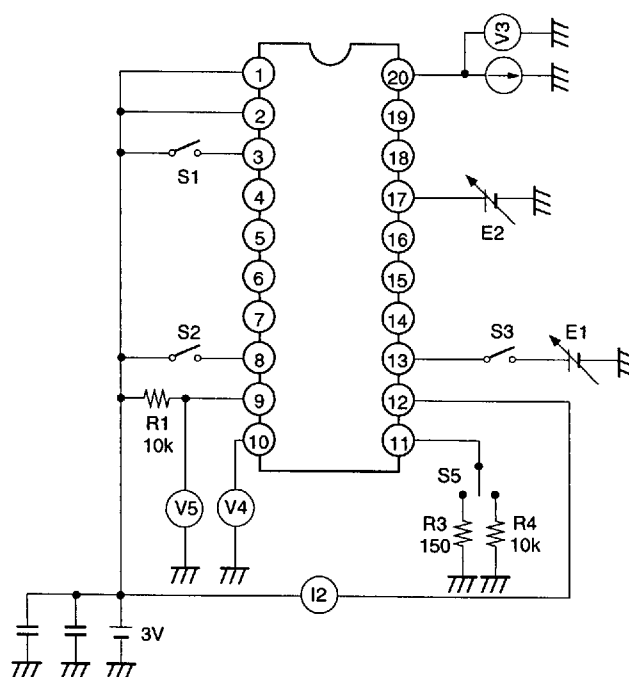
Electrical Characteristics of D/A Converter Linearity Error

LSB 12345678	9 10 11	12 13 14	15 16	Measure- ment point	Formula	Min.	Typ.	Max.	Unit
00000001	0 0 1	1 0 1	1 0	V6	$\left(\frac{(V_a - A)}{(2 - A)} \times \frac{255}{127} - 1 \right) \times 100$	-8		8	%
00000011	0 0 1	1 0 1	1 0	V6	$\left(\frac{(V_a - A)}{(2 - A)} \times \frac{255}{63} - 1 \right) \times 100$	-8		8	%
00000111	0 0 1	1 0 1	1 0	V6	$\left(\frac{(V_a - A)}{(2 - A)} \times \frac{255}{31} - 1 \right) \times 100$	-6		10	%
00001111	0 0 1	1 0 1	1 0	V6	$\left(\frac{(V_a - A)}{(2 - A)} \times \frac{255}{15} - 1 \right) \times 100$	-6		10	%
00011111	0 0 1	1 0 1	1 0	V6	$\left(\frac{(V_a - A)}{(2 - A)} \times \frac{255}{7} - 1 \right) \times 100$	-4		12	%
00111111	0 0 1	1 0 1	1 0	V6	$\left(\frac{(V_a - A)}{(2 - A)} \times \frac{255}{3} - 1 \right) \times 100$	-3		15	%
01111111	0 0 1	1 0 1	1 0	V6	$\left(\frac{(V_a - A)}{(2 - A)} \times \frac{255}{1} - 1 \right) \times 100$	-4		20	%

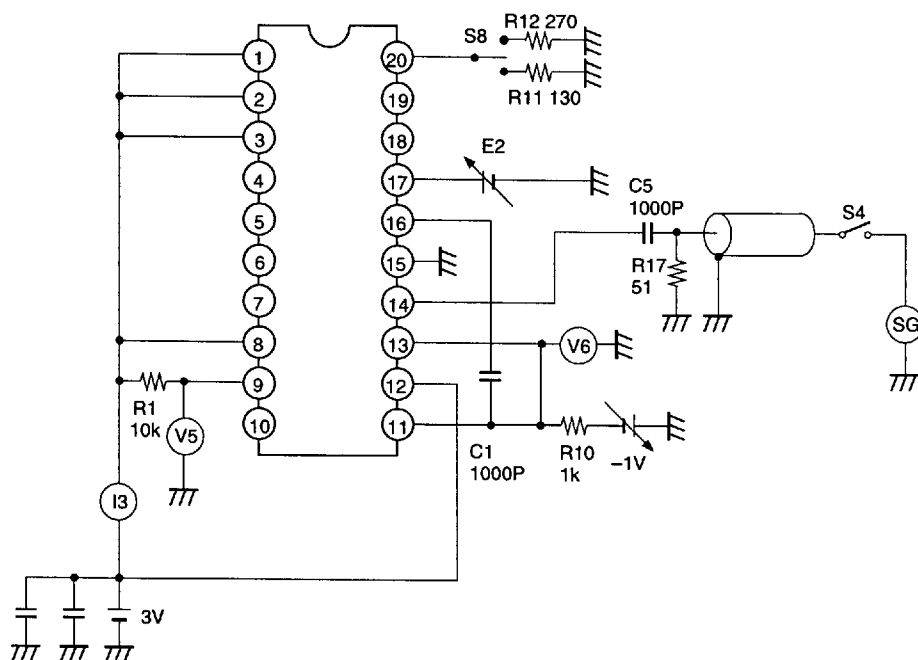
Note) The above characteristics are measured with the following setup performed.

Setting order	LSB Input conditions for pin 4	MSB	Conditions
1	12345678 0 0 0	12 13 14 15 16 1 0	Set E2 so that V6 is 2V
2	11111111 0 0 0	12 13 14 15 16 1 0	A = V6

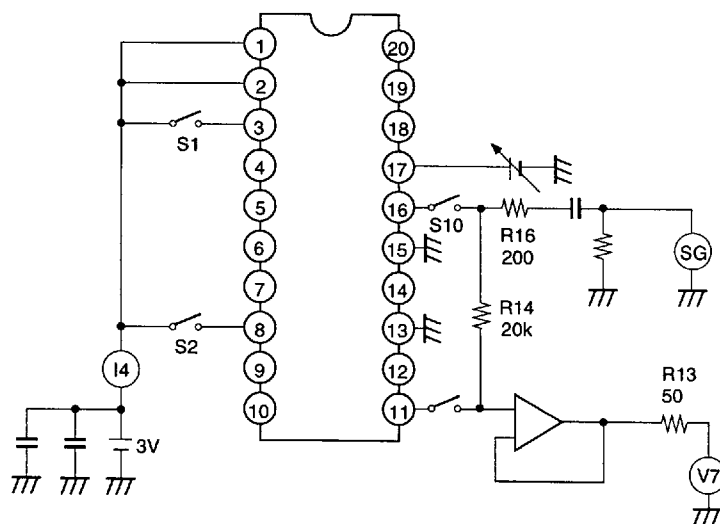
Electrical Characteristics Measurement Circuit



Measurement circuit 1



Measurement circuit 2



Measurement circuit 3

Description of Operation

1. Data I/O

When the upper three bits (ADDRESS) of the 16-bit serial data input from Pin 4 are 1, 1, 0, the 8-bit D/A converter and detection temperature setting are controlled.

2. Transmission power control

The transmission detection voltage input from Pin 13 is converted to a current, and compared with the transmission power reference current output from the D/A converter. The difference is output as a voltage from Pin 1 (emitter follower) and as a current from Pin 12, and then controls the power module and others.

3. Temperature detection

When the ambient temperature becomes extremely high, the transmission output controlled by the voltage of Pins 11 and 12 is forcibly lowered.

The settings for the operating temperature of the temperature detection circuit and transmission output compulsory reduction temperature can be switched by the serial data input to Pin 4.

4. TX SW

The TX SW (Pin 20) voltage is controlled as indicated below by the voltage at Pins 2 and 3, and can be used for transmission amplifier power supply switching and others.

Pin 2	Pin 3	Pin 20
V _{CC}	V _{CC}	High
OPEN	V _{CC}	Low
V _{CC}	OPEN	Low
OPEN	OPEN	Low

5. POWER SW

The POWER SW (Pin 8) is normally used at the V_{CC} level, but when opened or grounded, all functions other than that of the TX switch are disabled. This feature can be used to reduce power consumption for reception.

In this time, the current consumption becomes approximately 1.6mA.

6. SW1 IN

SW1 IN (Pin 19) is normally opened or used at V_{CC} level. If this is grounded, Pin 13 goes High and transmission output is forcibly lowered.

7. System control

DATA IN

1) D/A converter control bits for auto power control

DATA								Transmission output control voltage
D1	D2	D3	D4	D5	D6	D7	D8	
0	0	0	0	0	0	0	0	MAX ↓ MIN
0	0	0	0	0	0	0	1	
0	0	0	0	0	0	1	1	
0	0	0	0	0	1	1	1	
0	0	0	0	1	1	1	1	
0	0	0	1	1	1	1	1	
0	0	1	1	1	1	1	1	
0	1	1	1	1	1	1	1	

When D9 is "1" with the SW2 control, SW2 OUT (Pin 10) goes High. Data setting is unnecessary for D10.

2) Detection temperature setting bits

No	DATA			Setting temperature*
	D11	D12	D13	Transmission power down temperature
1	0	0	0	± 0
2	1	0	0	+13
3	0	1	0	+24
4	1	1	0	+37
5	0	0	1	-45
6	1	0	1	-35
7	0	1	1	-25
8	1	1	1	-15

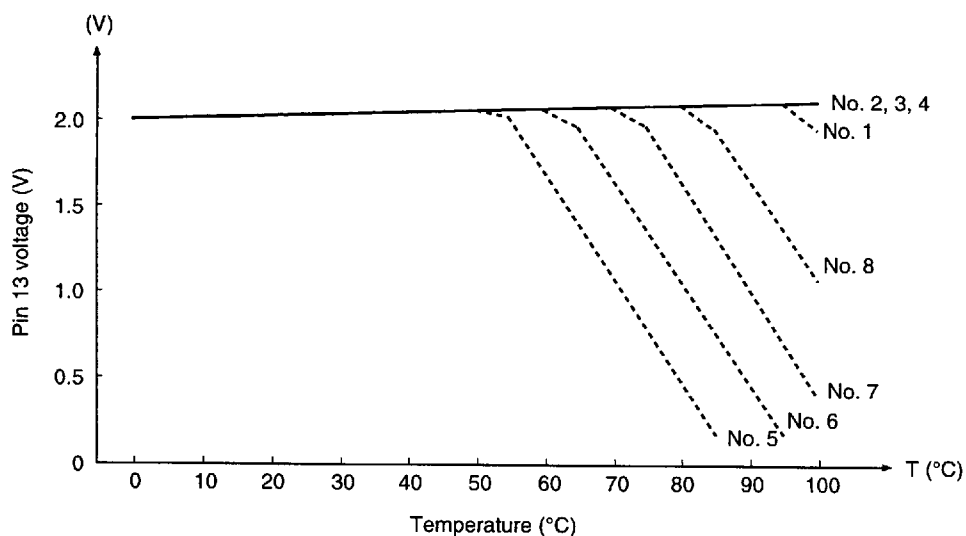
* The setting temperature is the temperature difference with the operating temperature as a reference in DATA setting for No. 1.

3) ADDRESS

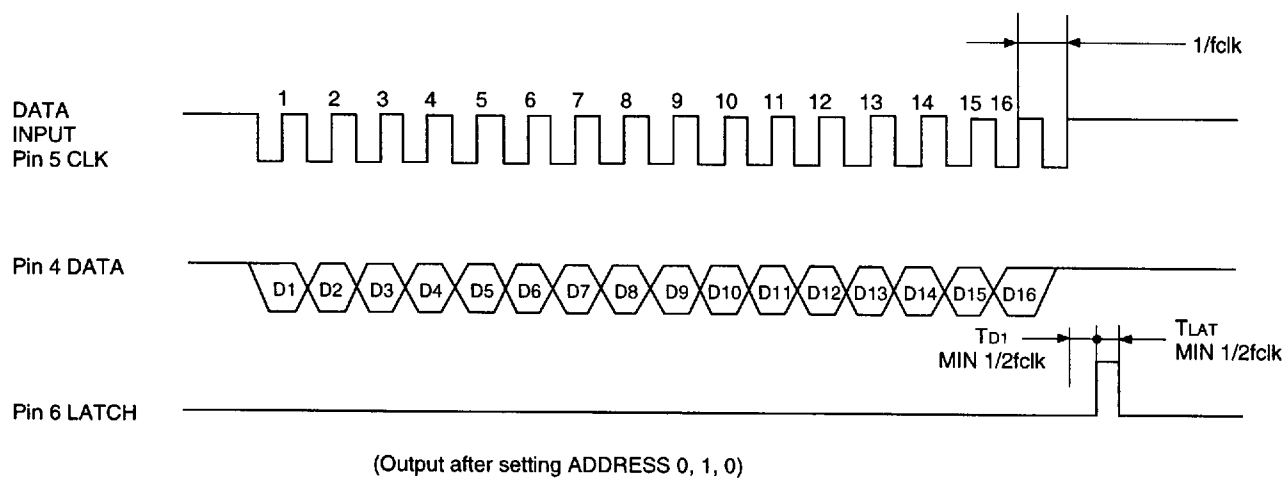
DATA			Circuit operation
D14	D15	D16	
1	0	0	Not defined
0	1	0	Not defined
1	1	0	Data input

4) The representative characteristics of "Detection temperature setting bits" is shown below.

Reference voltage temperature characteristics (Measurement circuit 2)

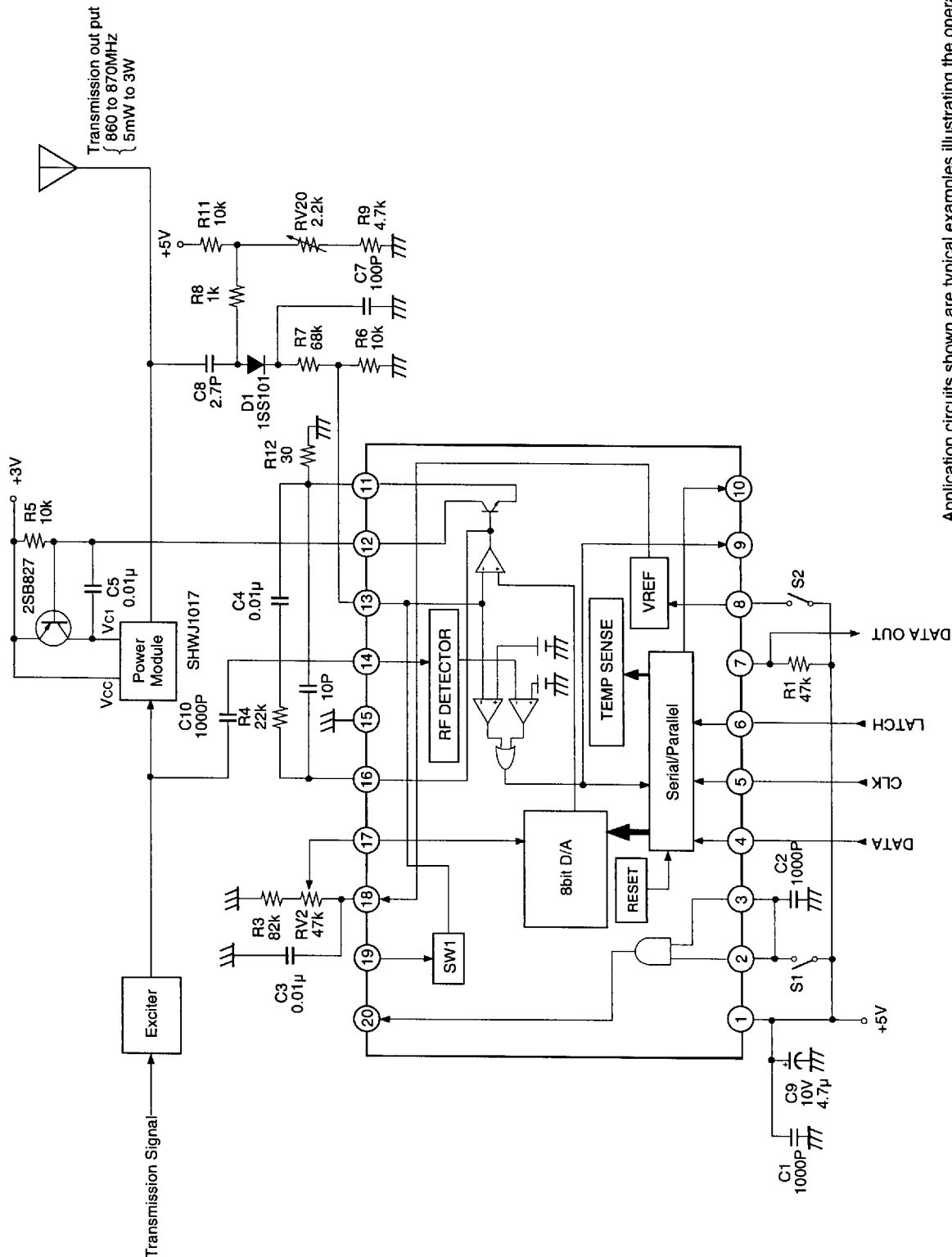


I/O Serial Data Timing Chart



Item	Symbol	Min.	Typ.	Max.	Unit
Clock frequency	f_{clk}	—	—	100	kHz
Latch pulse width	T_{LAT}	$1/2f_{clk}$	—	—	μs
Delay time 1	T_{D1}	$1/2f_{clk}$	—	—	μs
Delay time 2	T_{D2}	$1/2f_{clk}$	—	—	μs

Application Circuit (For cellular mobile telephones)

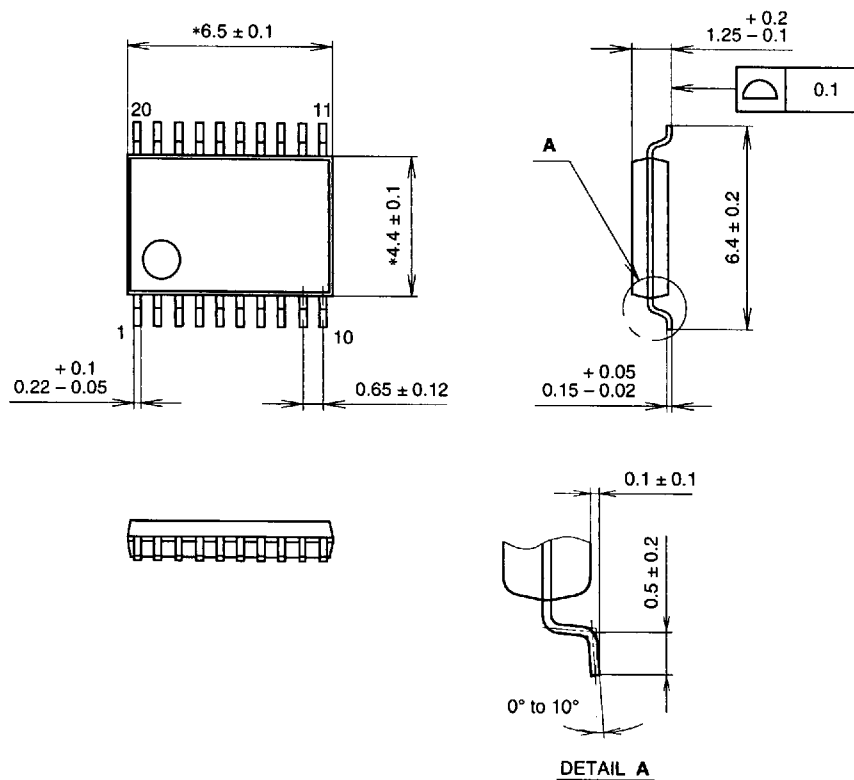


Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Package Outline

Unit: mm

20PIN SSOP (PLASTIC)



NOTE: Dimension "*" does not include mold protrusion.

PACKAGE STRUCTURE

SONY CODE	SSOP-20P-L01
EIAJ CODE	SSOP020-P-0044
JEDEC CODE	

PACKAGE MATERIAL	EPOXY RESIN
LEAD TREATMENT	SOLDER / PALLADIUM PLATING
LEAD MATERIAL	COPPER / 42 ALLOY
PACKAGE WEIGHT	0.1g