TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8874Z

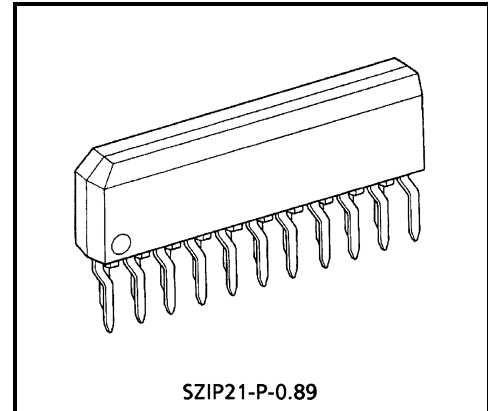## SOUND MULTIPLEX BROADCAST DEMODULATOR IC FOR DOMESTIC TV / VTR

The TA8874Z stores a function necessary for demodulating domestic TV sound multiplex broadcast and trap for eliminating facsimile broadcasting signals that superimpose within the sound multiplex broadcast bandwidth.

Furthermore no adjustment other than separation is necessary by using a $32f_H$ oscillation.

Using an I^2C bus it switches an output mode and performs separation adjustment and broadcast mode read out.

FEATURES

- Band pass filter for sub audio signal
- FM demodulator for sub audio signal
- Stereo matrix
- Main / sub de-emphasis
- Output for stereo / bilingual indication
- Trap for facsimile broadcast ($4.5f_H$, $6f_H$)
- Various controls by I^2C bus

SZIP21-P-0.89

Weight: 1.0 g (Typ.)

000707EBA1

BLOCK DIAGRAM

TERMINAL INTERFACE CIRCUIT
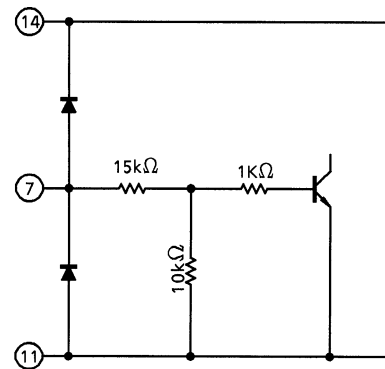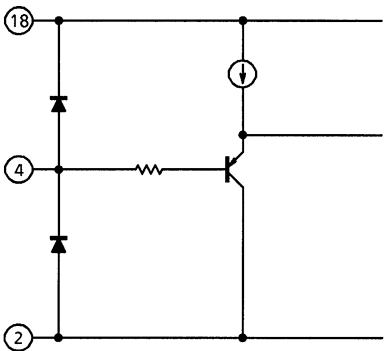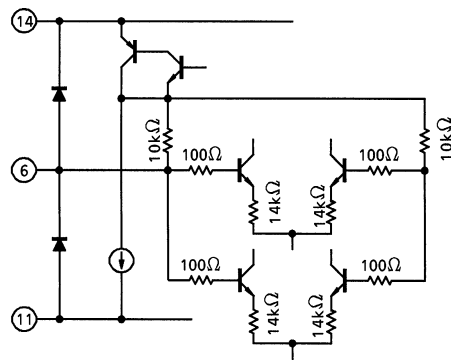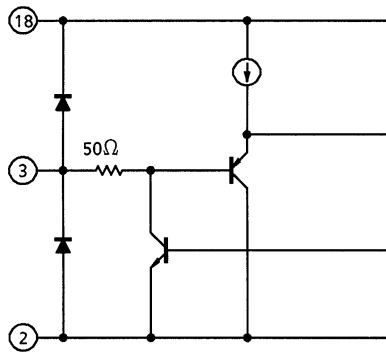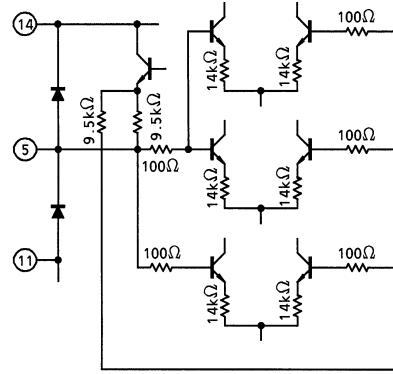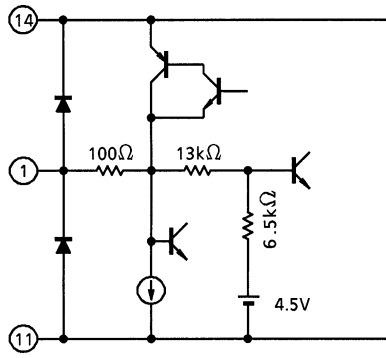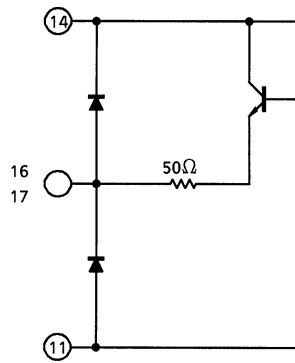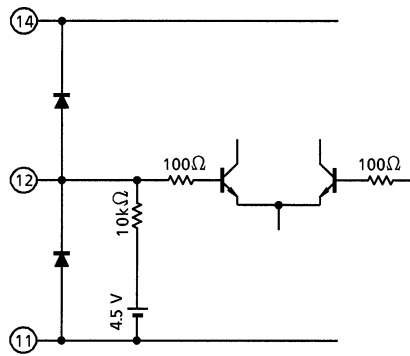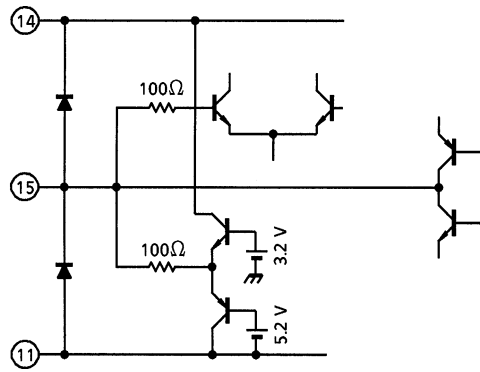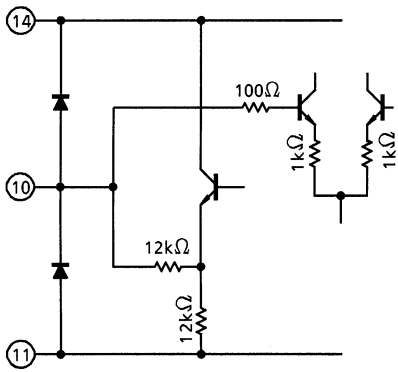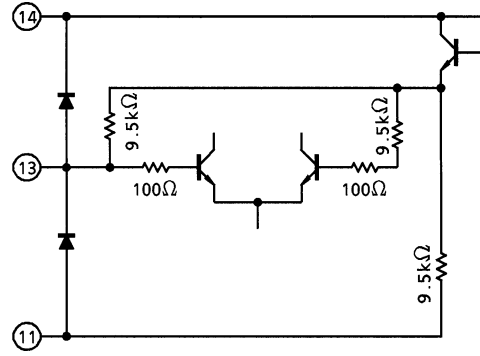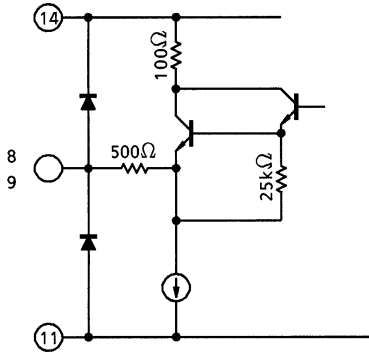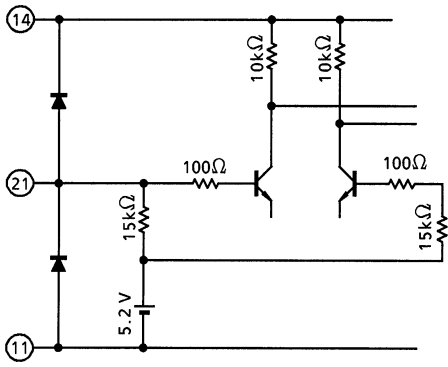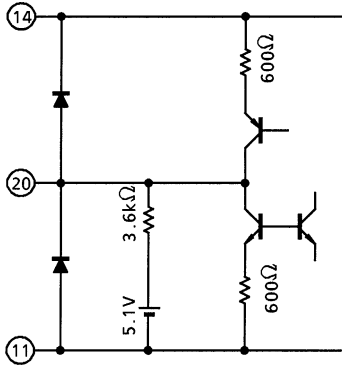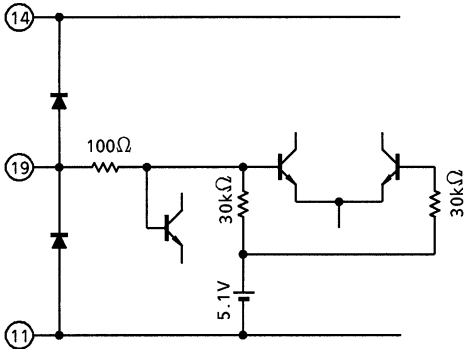
I²C BUS ADDRESS MAP

SLAVE ADDRESS	WRITE	84 (HEX)	READ	85 (HEX)

CHARACTERISTIC	SUB ADDRESS	DATA MSB							LSB	DEFAULT	NOTE
		Write									
Mode Select	– –	LED STE	LED BIL	LDE EXT	Mono Set	Mute	F mono	MODE sub	MODE main	8 (10)	
Separation Adjustment	– –	T1 (*)	×	←			6 bit		→	22 (10)	
		Read									
Mode Output		Ident of broad cast mode B1	B0	CHAG FLAG	×	×	×	×	×	———	

*: This bit is for testing mode. This bit must be "0" at any time.

DATA FORMAT

Write mode

S	Slave address	0	A	Mode select	A	Separation adjustment	A	P

or

S	Slave address	0	A	Mode select	A	P

Read mode

S	Slave address	1	A	Data	A	P

CONTROL BIT MAP
Output signal

BROAD CAST MODE	LED STE	LED BIL	LED EXT	MONO SET	MUTE	F MONO	MODE SUB	MODE MAIN	OUTPUT SIGNAL L	OUTPUT SIGNAL R
mono	×	×	×	×	L	×	×	×	L+R	L+R
mono	×	×	×	×	H	×	×	×	Mute	Mute
Stereo	×	×	×	L	L	L	×	×	L	R
Stereo	×	×	×	×	L	H	×	×	L+R	L+R
Stereo	×	×	×	×	H	×	×	×	Mute	Mute
Stereo	×	×	×	H	L	×	×	×	L+R	L+R
BIL	×	×	×	L	L	×	L	L	main	main
BIL	×	×	×	L	L	×	L	H	main	main
BIL	×	×	×	L	L	×	H	L	sub	sub
BIL	×	×	×	L	L	×	H	H	main	sub
BIL	×	×	×	×	H	×	×	×	Mute	Mute
BIL	×	×	×	H	L	×	×	×	main	main

LED mode

BROAD CAST MODE	LED STE	LED BIL	LED EXT	MONO SET	MUTE	F MONO	MODE SUB	MODE MAIN	LED STE	LED BIL
mono	×	×	L	×	×	×	×	×	—	—
mono	L	L	H	×	×	×	×	×	—	—
mono	L	H	H	×	×	×	×	×	—	O
mono	H	L	H	×	×	×	×	×	O	—
mono	H	H	H	×	×	×	×	×	—	—
Stereo	×	×	L	L	×	L	×	×	O	—
Stereo	×	×	L	L	×	H	×	×	—	—
Stereo	×	×	L	H	×	×	×	×	—	—
Stereo	L	L	H	×	×	×	×	×	—	—
Stereo	L	H	H	×	×	×	×	×	—	O
Stereo	H	L	H	×	×	×	×	×	O	—
Stereo	H	H	H	×	×	×	×	×	—	—
BIL	×	×	L	L	×	×	×	×	—	O
BIL	×	×	L	H	×	×	×	×	—	—
BIL	L	L	H	×	×	×	×	×	—	—
BIL	L	H	H	×	×	×	×	×	—	O
BIL	H	L	H	×	×	×	×	×	O	—
BIL	H	H	H	×	×	×	×	×	—	—

Mode output

BROAD CAST MODE	LED STE	LED BIL	LED EXT	MONO SET	MUTE	F MONO	MODE SUB	MODE MAIN	IDENT OF BROAD CAST MODE B1	IDENT OF BROAD CAST MODE B0
mono	×	×	×	×	×	×	×	×	L	H
Stereo	×	×	×	×	×	×	×	×	L	L
BIL	×	×	×	×	×	×	×	×	H	L

I²C BUS CONTROLLED FORMAT SUMMARY

Data transfer format

S	Slave address	0	A	Data	A	Data	A	P

↑ 7bit   ↑ 8bit   ↑ 8bit
MSB   MSB   MSB

or

S	Slave address	0	A	Data	A	P

↑ 7bit   ↑ 8bit
MSB   MSB
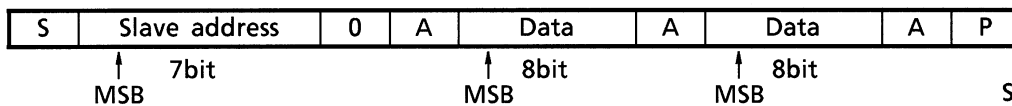
S : Start Condition

P : Stop Condition

A : Acknowledge

Read mode

S	Slave address	1	A	Data	A	P

↑   ↑
MSB   MSB
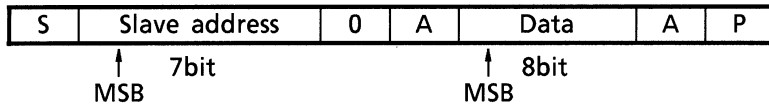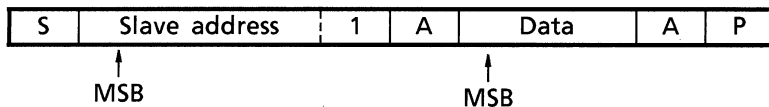
(1) Start and stop condition
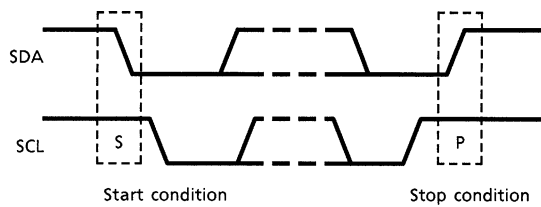
(2) Bit transfer
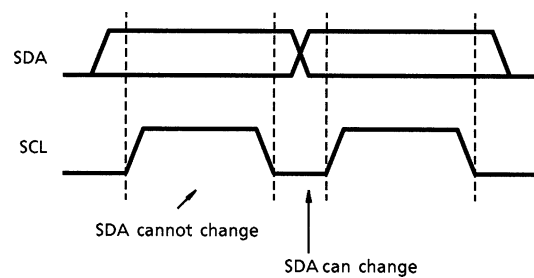
(3) Acknowledge
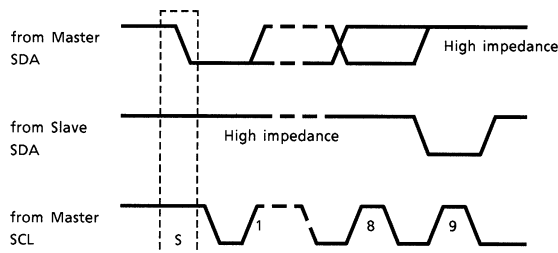
(4) Slave address

A6	A5	A4	A3	A2	A1	A0	R / $\overline{W}$
1	0	0	0	0	1	0	1 / 0

Purchase of TOSHIBA I²C components conveys a license under the Philips I²C Patent Rights to use these components in an I²C system, provided that the system conforms to the I²C Standard Specification as defined by Philips.

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Power Supply Voltage	V_{CC}	15	V
Power Dissipation	P_D (Note 1)	890	mW
Operating Temperature	T_{opr}	−20~65	°C
Storage Temperature	T_{stg}	−55~150	°C

Note 1: When using the device at above Ta = 25°C decrease the power dissipation by 7.2mW for each increase of 1°C.

Note 2: These in refards to this, please handle with care.

RECOMMENDED SUPPLY VOLTAGE

PIN No.	PIN NAME	MIN	TYP.	MAX	UNIT
14	V_{CC9V}	8.1	9.0	9.9	V
18	V_{CC5V}	5.0	5.6	6.2	V

ELECTRICAL CHARACTERISTICS (Unless otherwise specified, V_{CC} = 9V, Ta = 25°C)
DC CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Power Supply and Current	I_{CC14}	—	—	22	32	42	mA
	I_{CC18}	—	—	12	18	25	
Terminal Voltage	V_1	—	—	3.5	4.5	5.5	V
	V_5	—	—	3.5	4.5	5.5	
	V_6	—	—	3.5	4.5	5.5	
	V_8	—	—	2.1	3.1	4.1	
	V_9	—	—	2.1	3.1	4.1	
	V_{10}	—	—	1.4	2.4	3.4	
	V_{12}	—	—	3.5	4.5	5.5	
	V_{13}	—	—	2.8	3.8	4.8	
	V_{19}	—	—	3.5	4.5	5.5	
	V_{20}	—	—	3.5	4.5	5.5	
	V_{21}	—	—	4.2	5.2	6.2	

TOSHIBA

AC CHARACTERISTICS

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION		MIN	TYP.	MAX	UNIT
2f$_H$ (31.5kHz)	A$_{2fH}$	—	(Note 1)		90	130	170	mV$_{p-p}$
f$_H$ (15.7kHz)	A$_{fH}$	—	(Note 2)		—	—	−14	dB
3f$_H$ (47.2kHz)	A$_{3fH}$	—	(Note 3)		—	—	−6	dB
3.5f$_H$ (55.07kHz)	A$_{3.5fH}$	—	(Note 4)		—	—	−24	dB
4.5f$_H$ (70.8kHz)	A$_{4.5fH}^-$	—	(Note 5)		—	—	−20	dB
6f$_H$ (94.4kHz)	A$_{6fH}$	—	(Note 6)		—	—	−26	dB
Output (L, R) MONO SUB	V$_{TV}$	—	(Note 7)	SUB : V$_4$ = 5V	500	650	800	mV$_{rms}$
Output Level Discrepancy (L, R)	ΔV$_{TV}$	—			−1.5	0	1.5	dB
Output Frequency CharacteristicL, R (M, S) 100Hz	A$_{TV.L}$	—	(Note 8)	SUB : V$_4$ = 5V	0	0.9	2.5	dB
Output Frequency CharacteristicL, R (MONO) 10kHz	A$_{TV.H.M}$	—	(Note 9)	—	−16	−13	−10	dB
Output Frequency CharacteristicL, R (SUB) 10kHz	A$_{TV.H.S}$	—	(Note 10)	V$_4$ = 5V	−16	−13	−10	dB
Distortion Factor Output MONO (L, R)	THD TV-M	—	(Note 11)		—	0.2	1.1	%
Distortion Factor Output SUB (L, R)	THD TV-S	—	(Note 12)	V$_4$ = 5V	—	1.5	3.5	%
S / N MONO (L, R)	S / N TV-M	—	(Note 13)		60	70	—	dB
S / N SUB (L, R)	S / N TV-S	—	(Note 14)	V$_4$ = 5V	60	65	—	dB
Cross Talk M→S	CR TV.MS	—	(Note 15)	V$_4$ = 5V	60	70	—	dB
Cross Talk S→M	CR TV.SM	—	(Note 16)	V$_4$ = 0V	60	70	—	dB
Remaining Carrier MAIN	V$_{SUB.M}$	—	(Note 17)	V$_4$ = 0V	—	40	70	mV$_{p-p}$
Remaining Carrier SUB	V$_{SUB.S}$	—	(Note 18)	V$_4$ = 5V	—	130	160	mV$_{p-p}$
Stereo Separation	SE TV	—	(Note 19)		34	—	—	dB
Q Signal AM Detection	V$_Q$	—	(Note 20)		300	—	—	mV$_{p-p}$
Q Signal Sensitivity	S$_Q$	—	(Note 21)		14	—	—	dB
Mute After Sound Output	V$_{TV MUT}$	—	(Note 22)	V$_7$ = 5V	—	—	1.5	mV$_{p-p}$
Mute DC Offset Output	V$_{off}$ TV MUT	—	(Note 23)	V$_7$ = 0→5V	—	5	100	mV
Mute on Voltage	V$_{MUT ON}$	—	(Note 24)	V$_7$ = 0~5V	—	1.75	2.0	V
Input Impedance MPX	R$_{IN}$	—	Input resistance of pin 12		5	10	15	kΩ
Output Impedance	R$_{OUT}$	—	Output resistance of pins 8 and 9		—	500	—	Ω
Q Signal Interference Elimination Efficiency	AV$_Q$	—	(Note 25)		5	10	—	dB

MEASUREMENT CONDITION

NOTE	INPUT SIGNAL	FILTER	APPLIED VOLTAGE	MEASURE-MENT PIN	MEASUREMENT METHOD
1	31.5kHz, 50mV$_{p-p}$ CW	—	—	V_{13}	Measure output signal amplitude exclusive of pin 13 external capacitance.
2	15.75kHz, 50mV$_{p-p}$ CW	—	—	V_{13}	Set 2f$_H$ level to 0dB reference.
3	47.2kHz, 50mV$_{p-p}$ CW				
4	55.07kHz, 50mV$_{p-p}$ CW				
5	70.8kHz, 50mV$_{p-p}$ CW				
6	94.4kHz, 50mV$_{p-p}$ CW				
7	MONO : 400Hz, 250mV$_{rms}$ SUB : 400Hz, 150mV$_{rms}$, 100% modulation BIL.Q signal	15kHz LPF	SUB : $V_4 = 5V$	V_8, V_9	Output : measure V_8 and $_9$ output level. Output level difference : 20 $\log$ (V_8 / V_9)
8	MONO : 100Hz, 250mV$_{rms}$ SUB : 100Hz, 150mV$_{rms}$ 100% modulation BIL.Q signal	15kHz LPF	SUB : $V_4 = 5V$	V_8, V_9	Measure level at 1kHz first and compare to its level.
9	MONO : 10kHz, 250mV$_{rms}$		—		
10	SUB : 10kHz, 150mV$_{rms}$, 100% modulation BIL.Q signal		$V_4 = 5V$		
11	MONO : 1kHz, 250mV$_{rms}$	15kHz LPF	—	V_8, V_9	Measure distortion factor of output.
12	SUB : 1kHz, 150mV$_{rms}$, 100% modulation		$V_4 = 5V$	V_8, V_9	Measure distortion factor of output.
13	MONO : 1kHz, 250mV$_{rms}$	15kHz LPE	—	V_8, V_9	Compare when no signal.
14	SUB : 1kHz, 150mV$_{rms}$, 100% modulation		$V_4 = 5V$	V_8, V_9	Compare when no signal.
15	MONO : 1kHz, 250mV$_{rms}$	1kHz BPF	$V_4 = 5V$	V_8, V_9	Measure output leakage signal in SUB mode.
16	SUB : 1kHz, 150mV$_{rms}$, 100% modulation		$V_4 = 0V$	V_8, V_9	Measure output leakage signal in MAIN mode.
17	SUB carrier, BIL.Q signal	—	$V_4 = 0V$	V_8, V_9	Measure residual carrier (31.5kHz)
18	SUB carrier, BIL.Q signal	—	$V_4 = 5V$	V_8, V_9	Measure residual carrier (63.0kHz)
19	Only R-ch 100% modulation, STE.Q signal	1kHz BPF	—	V_8, V_9	Measure comparison with signal outputted to L when R is 1.
20	BIL.Q signal	—	—	V_1	Measure 922.5Hz detection output.
21	BIL.Q signal	—	—	18Pin LED	Measure level difference until pin 18 LED lamp extinguishes, lowering level from 56.6mVp-p.

NOTE	INPUT SIGNAL	FILTER	APPLIED VOLTAGE	MEASURE-MENT PIN	MEASUREMENT METHOD
22	MONO : 1kHz, 250mV$_{rms}$	1kHz BPF	$V_7 = 5V$	V_8, V_9	Measure signal outputted when muting.
23	—	—	$V_7 = 0{\rightarrow}5V$	V_8, V_9	Measure voltage change of output when $V_7 = 0$ is changed to 5V.
24	MONO : 1kHz, 250mV$_{rms}$	—	$V_7 = 0 \sim 5V$	V_8, V_9	Measure voltage that V_8 and $_9$ output signal is lower than 1mV$_{p-p}$, raising V_7 gradually from 0V.
25	SUB : 1kHz, 150mV$_{rms}$, 100% modulation BIL.Q signal	—	—	V_1	Compare level when only SUB signal to level when only BIL.Q signal.

(Input signal)

    BIL.Q signal : Carrier 55.07kHz, modulation frequency 922.5Hz, 60% AM modulation, 56.6mV$_{p-p}$

    STE.Q signal : Carrier 55.07kHz, modulation frequency 982.5Hz, 60% AM modulation, 56.6mV$_{p-p}$

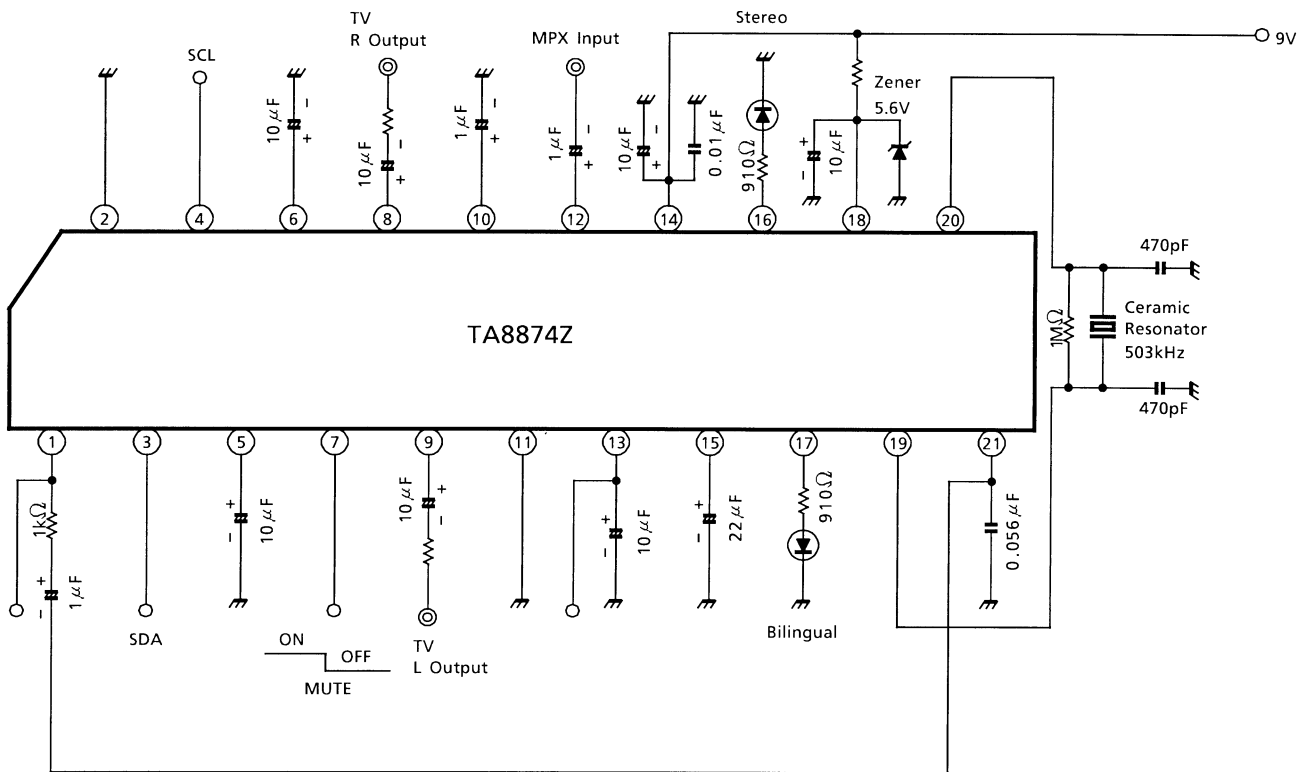   SUB signal : Carrier 31.5kHz, FM modulation, 150mV$_{rms}$

(Filter)

    L.P.F . : Biquadratic Batterworth 15kHz

    B.P.F. : Quadratic 1kHz, bandwidth 200Hz

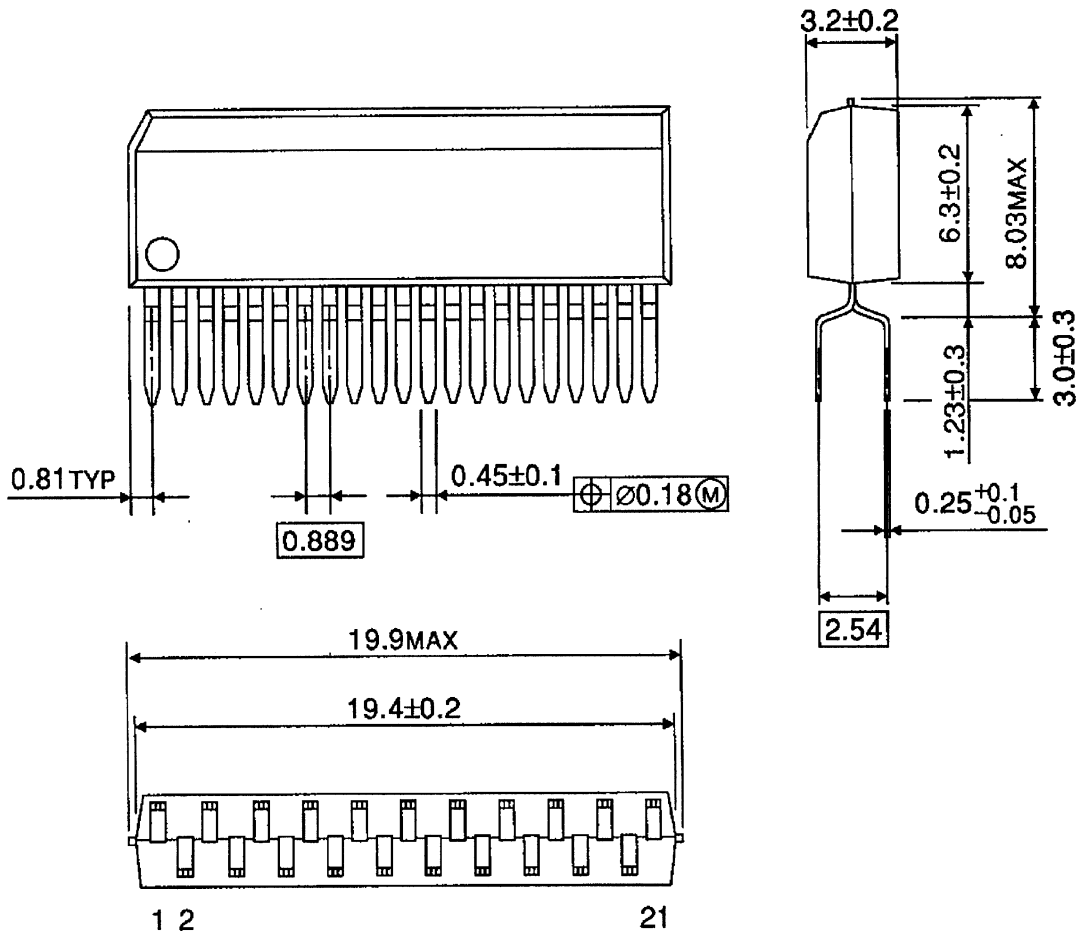   — : Through unless otherwise specified.

TEST CIRCUIT

Ceramic resonator : CSB503-E7 (MURATA MFG. Co., LTD.)

PACKAGE DIMENSIONS

SZIP21-P-0.89

Unit : mm

3.2±0.2

6.3±0.2

8.03MAX

3.0±0.3

1.23±0.3

0.25 +0.1 −0.05

2.54

0.81 TYP

0.889

0.45±0.1

⊕ Ø0.18 Ⓜ

19.9MAX

19.4±0.2

1 2

21

Weight: 1.0 g (Typ.)