

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8874Z

SOUND MULTIPLEX BROADCAST DEMODULATOR IC FOR DOMESTIC TV / VTR

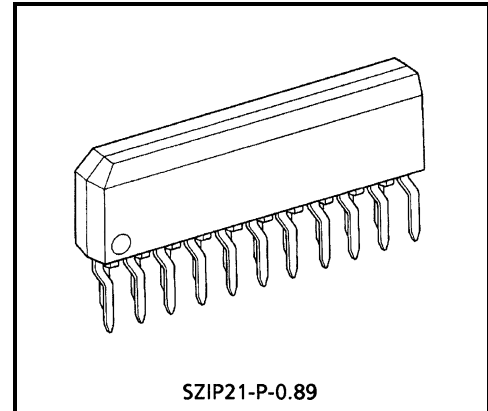
The TA8874Z stores a function necessary for demodulating domestic TV sound multiplex broadcast and trap for eliminating facsimile broadcasting signals that superimpose within the sound multiplex broadcast bandwidth.

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

Using an I²C 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 (4.5fH, 6fH)
- Various controls by I²C bus



Weight: 1.0 g (Typ.)

000707EBA1

• TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.

In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..

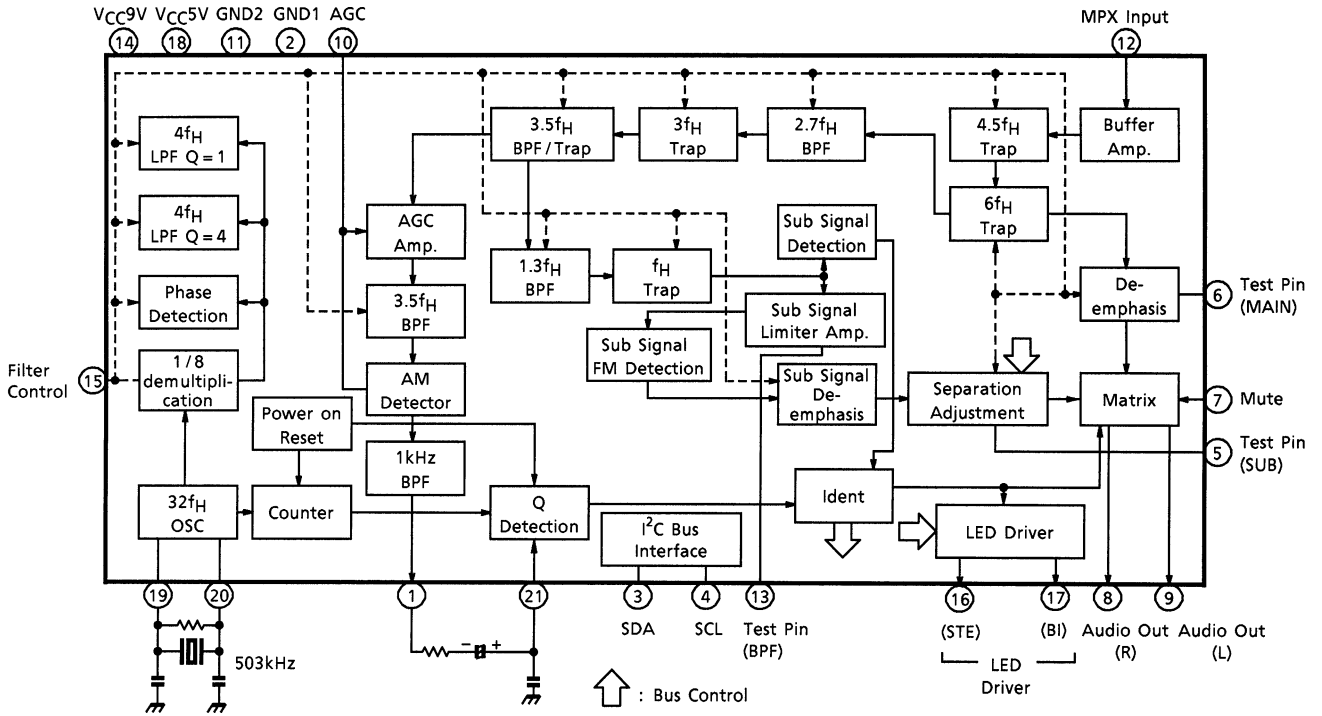
• The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.

• The products described in this document are subject to the foreign exchange and foreign trade laws.

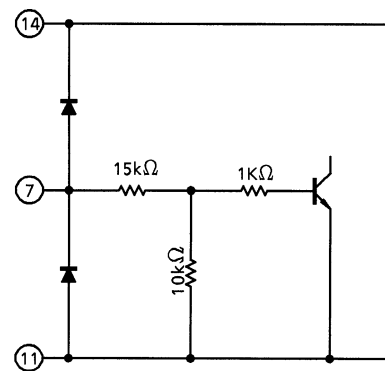
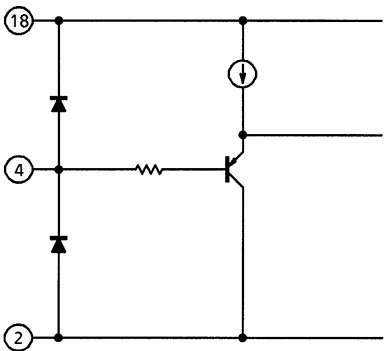
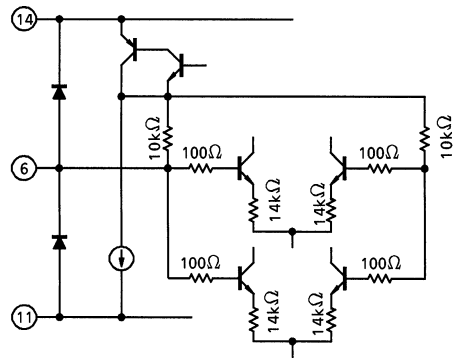
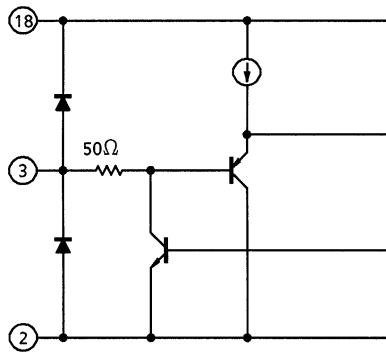
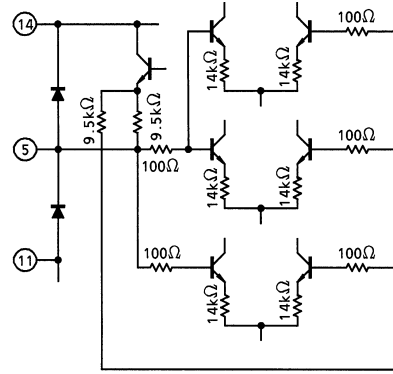
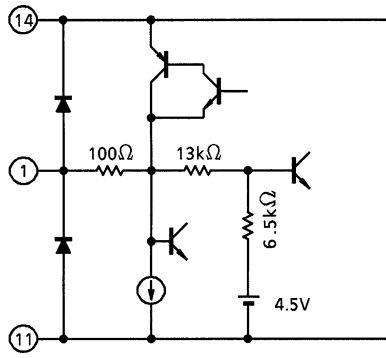
• The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.

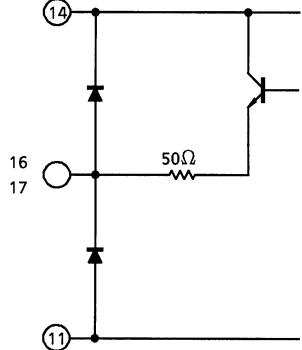
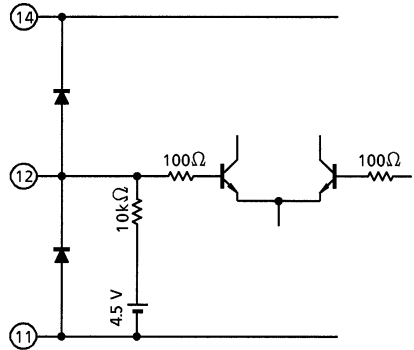
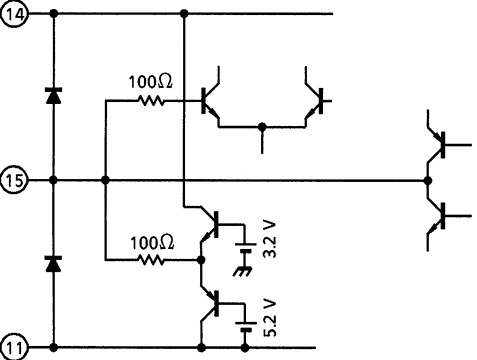
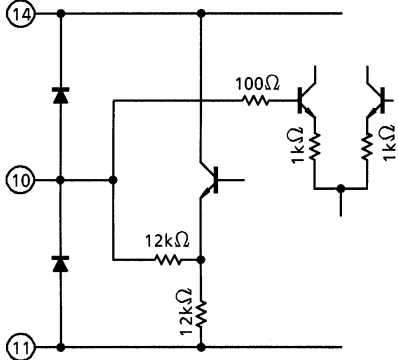
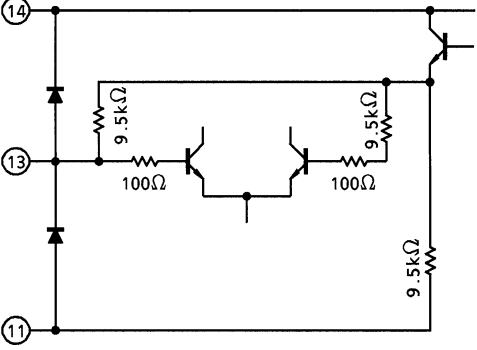
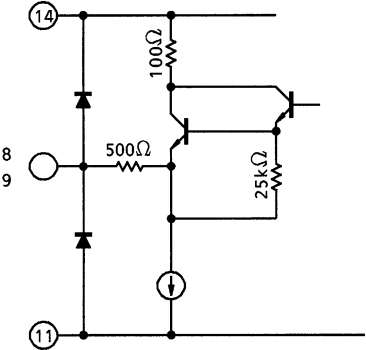
• The information contained herein is subject to change without notice.

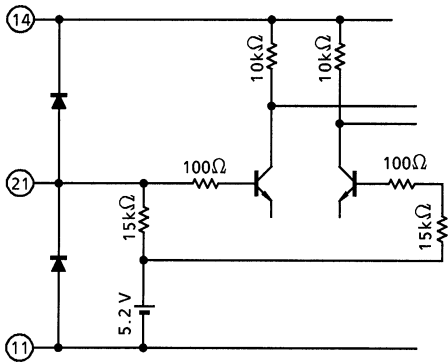
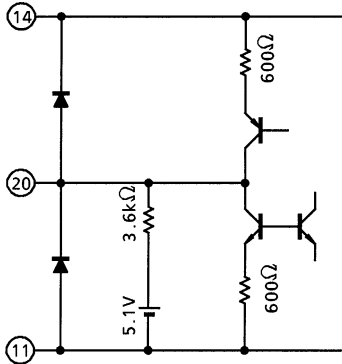
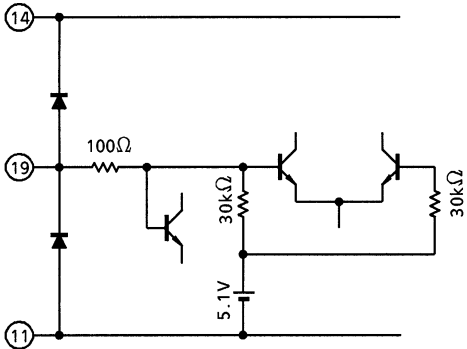
BLOCK DIAGRAM



TERMINAL INTERFACE CIRCUIT







I²C BUS ADDRESS MAP

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

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

*: 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 | R |
| mono | x | x | x | x | L | x | x | x | L+R | L+R |
| | x | x | x | x | H | x | x | x | Mute | Mute |
| Stereo | x | x | x | L | L | L | x | x | L | R |
| | x | x | x | x | L | H | x | x | L+R | L+R |
| | x | x | x | x | H | x | x | x | Mute | Mute |
| | x | x | x | H | L | x | x | x | L+R | L+R |
| BIL | x | x | x | L | L | x | L | L | main | main |
| | x | x | x | L | L | x | L | H | main | main |
| | x | x | x | L | L | x | H | L | sub | sub |
| | x | x | x | L | L | x | H | H | main | sub |
| | x | x | x | x | H | x | x | x | Mute | Mute |
| | x | x | x | H | L | x | x | x | main | main |

LED mode

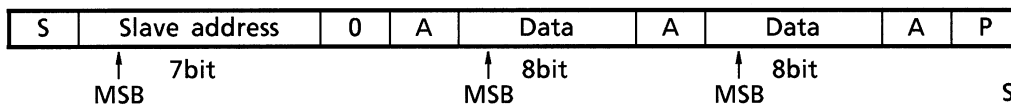
| BROAD CAST MODE | LED STE | LED BIL | LED EXT | MONO SET | MUTE | F MONO | MODE SUB | MODE MAIN | LED | |
|--------------------|------------|------------|------------|-------------|------|-----------|-------------|--------------|-----|-----|
| | | | | | | | | | STE | BIL |
| mono | x | x | L | x |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

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 | B0 |
| mono | x | x | x | x | x | x | x | x | L | H |
| Stereo | x | x | x | x | x | x | x | x | L | L |
| BIL | x | x | x | x | x | x | x | x | H | L |

I²C BUS CONTROLLED FORMAT SUMMARY

Data transfer format

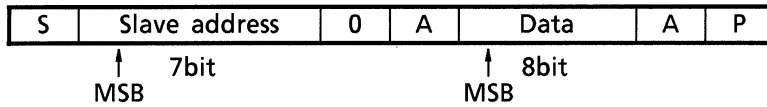


S : Start Condition

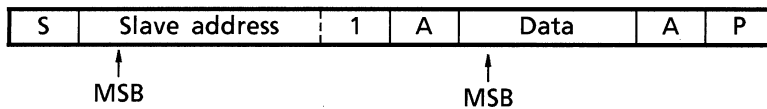
P : Stop Condition

A : Acknowledge

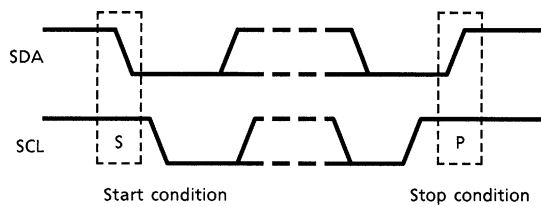
or



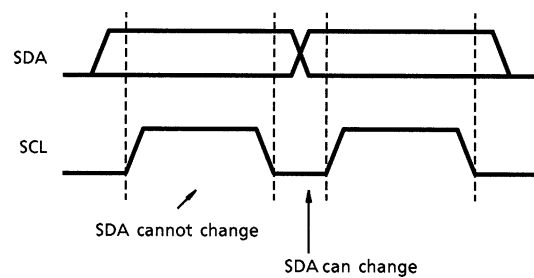
Read mode



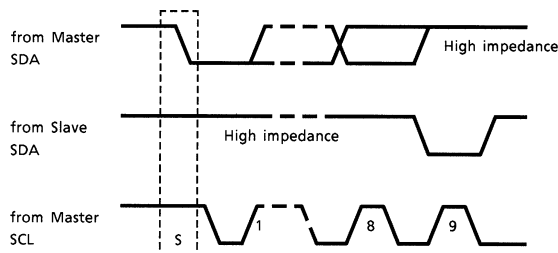
(1) Start and stop condition



(2) Bit transfer



(3) Acknowledge



(4) Slave address

| A6 | A5 | A4 | A3 | A2 | A1 | A0 | R / \bar{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 regards 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 CIRCUIT | 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 | | |

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) | 500 | 650 | 800 | mV _{rms} |
| Output Level Discrepancy (L, R) | ΔV _{TV} | — | | SUB : V ₄ = 5V | -1.5 | 0 | 1.5 |
| Output Frequency CharacteristicL, R (M, S) 100Hz | A _{TV.L} | — | (Note 8) | 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) | -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) | — | 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) | 60 | 65 | — | dB |
| Cross Talk M→S | CR TV.MS | — | (Note 15) | 60 | 70 | — | dB |
| Cross Talk S→M | CR TV.SM | — | (Note 16) | 60 | 70 | — | dB |
| Remaining Carrier MAIN | V _{SUB.M} | — | (Note 17) | — | 40 | 70 | mV _{p-p} |
| Remaining Carrier SUB | V _{SUB.S} | — | (Note 18) | — | 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) | — | — | 1.5 | mV _{p-p} |
| Mute DC Offset Output | V _{off TV MUT} | — | (Note 23) | — | 5 | 100 | mV |
| Mute on Voltage | V _{MUT ON} | — | (Note 24) | — | 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 | MEASUREMENT 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 V 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 | — | V ₈ , V ₉ | Measure distortion factor of output. |
| 12 | SUB : 1kHz, 150mV _{rms} , 100% modulation | LPF | V ₄ = 5V | V ₈ , V ₉ | Measure distortion factor of output. |
| 13 | MONO : 1kHz, 250mV _{rms} | 15kHz | — | V ₈ , V ₉ | Compare when no signal. |
| 14 | SUB : 1kHz, 150mV _{rms} , 100% modulation | LPE | 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 56.6mV _{p-p} . |

| NOTE | INPUT SIGNAL | FILTER | APPLIED VOLTAGE | MEASUREMENT 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→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 ~ 5V | V ₈ , V ₉ | Measure voltage that V ₈ and V 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}

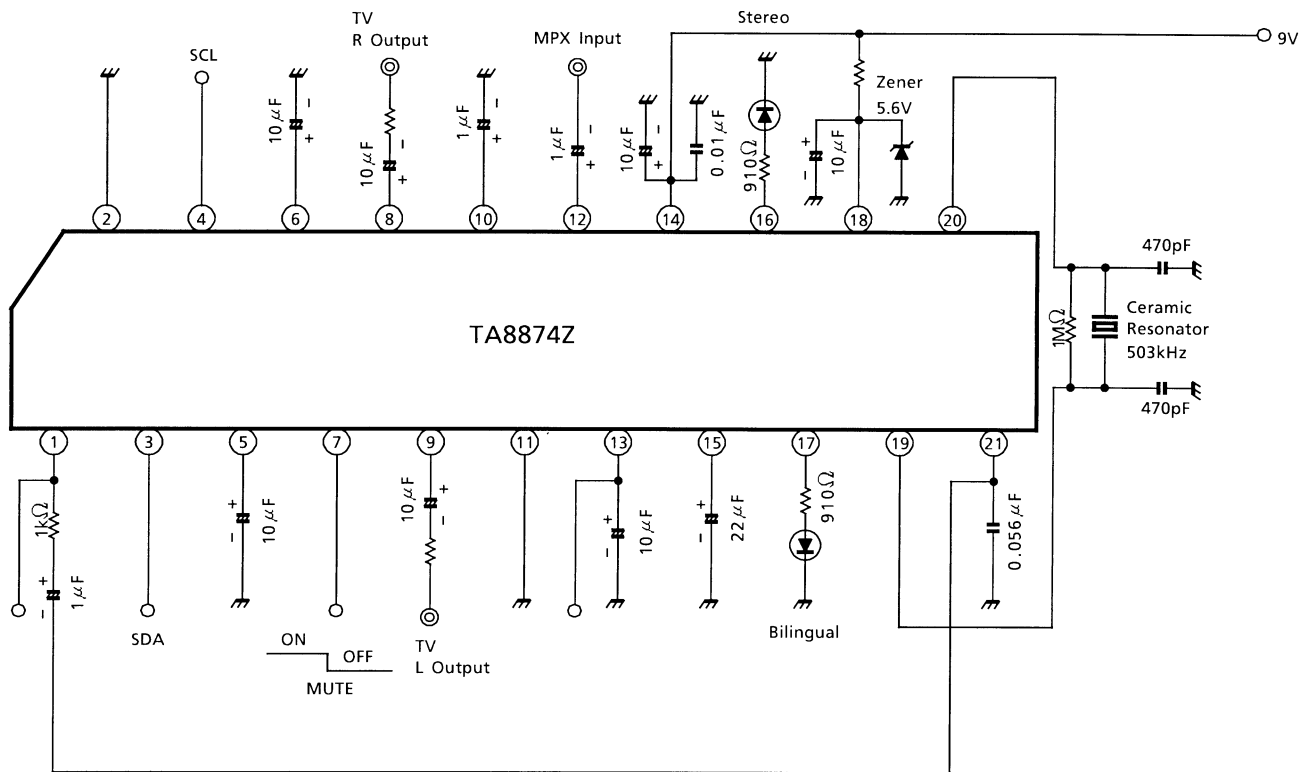
(Filter)

L.P.F. : Biquadratic Butterworth 15kHz

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

— : Through unless otherwise specified.

TEST CIRCUIT

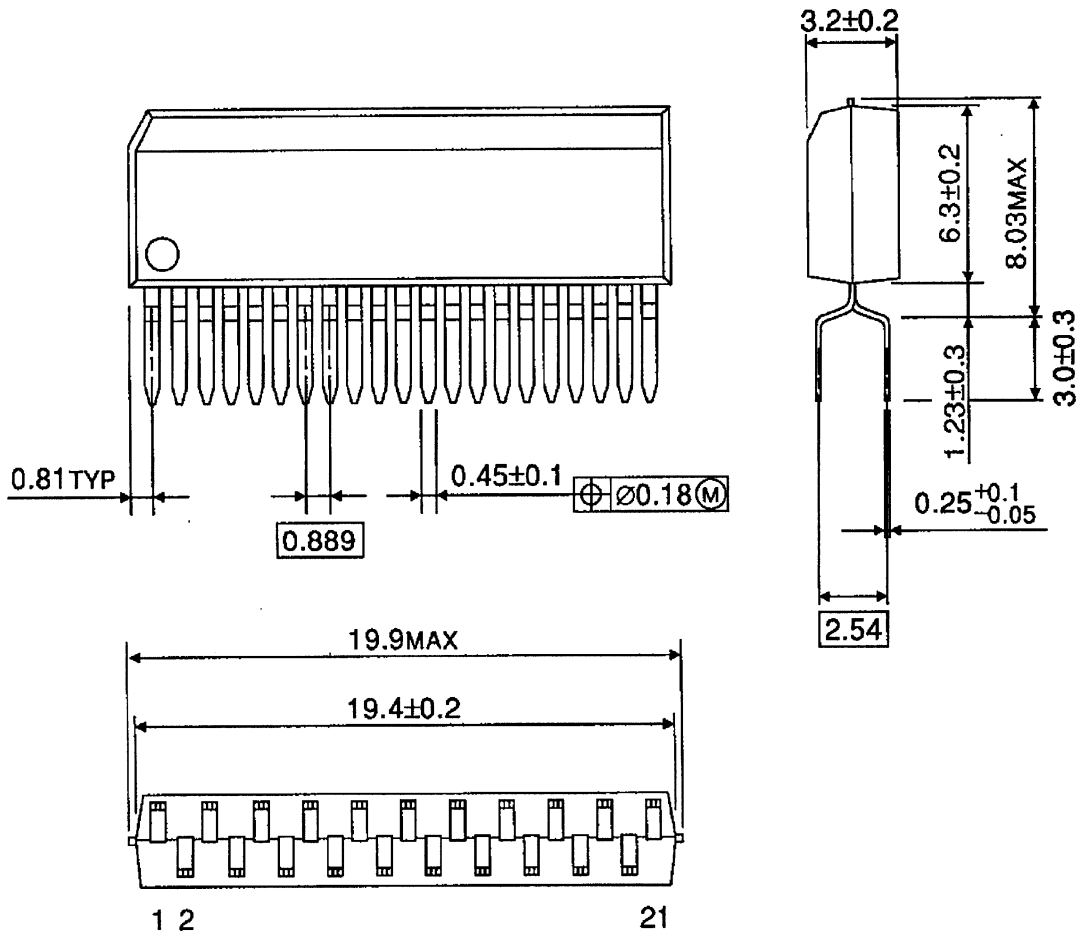


Ceramic resonator : CSB503-E7 (MURATA MFG. Co., LTD.)

PACKAGE DIMENSIONS

SZIP21-P-0.89

Unit : mm



Weight: 1.0 g (Typ.)