

TENTATIVE TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

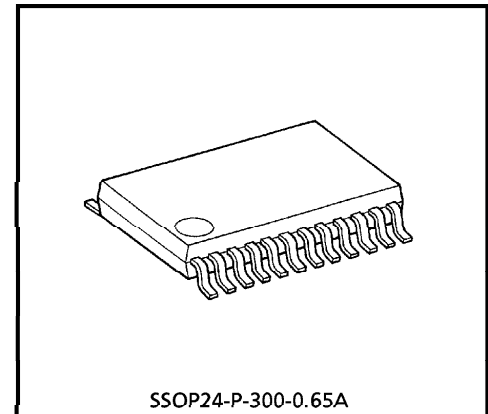
TA2120FN

LOW CONSUMPTION CURRENT STEREO HEADPHONE POWER AMPLIFIER FOR PORTABLE CD (3V USE)

The TA2120FN is a low consumption current stereo headphone power amplifier developed for portable CD players (3V). This IC has active bass boost, output limiter, input pin for beep sound.

FEATURES

- Low consumption current : $I_{CCQ} = 1.9\text{mA}$ (C-CUP) (typ.)
 $I_{CCQ} = 2.6\text{mA}$ (OCL) (typ.)
- Two kinds of gain mode available : $G_V = 16\text{dB}$ or 8.5dB
- Output power ($V_{CC} = 2.0\text{V}$, $f = 1\text{kHz}$, $\text{THD} = 10\%$, $R_L = 16\Omega$)
 $P_o = 8\text{mW}$ (typ.)
- Low noise : $V_{NO} = -98\text{dBV}$ (typ.)
- Built-in the center amplifier ON/OFF function.
(Favorable for low dissipation current in the C-Couple output configuration)
- Built-in active bass boost system
- Built-in output limiter function
- Input pin for beep sound
- Excellent ripple rejection ratio
- Built-in capacitor for reducing buzz noise
- Built-in power mute
- Built-in a power on/off switch
- Operating supply voltage range ($T_a = 25^\circ\text{C}$) : $V_{CC}(\text{opr}) = 1.8 \sim 4.5\text{V}$



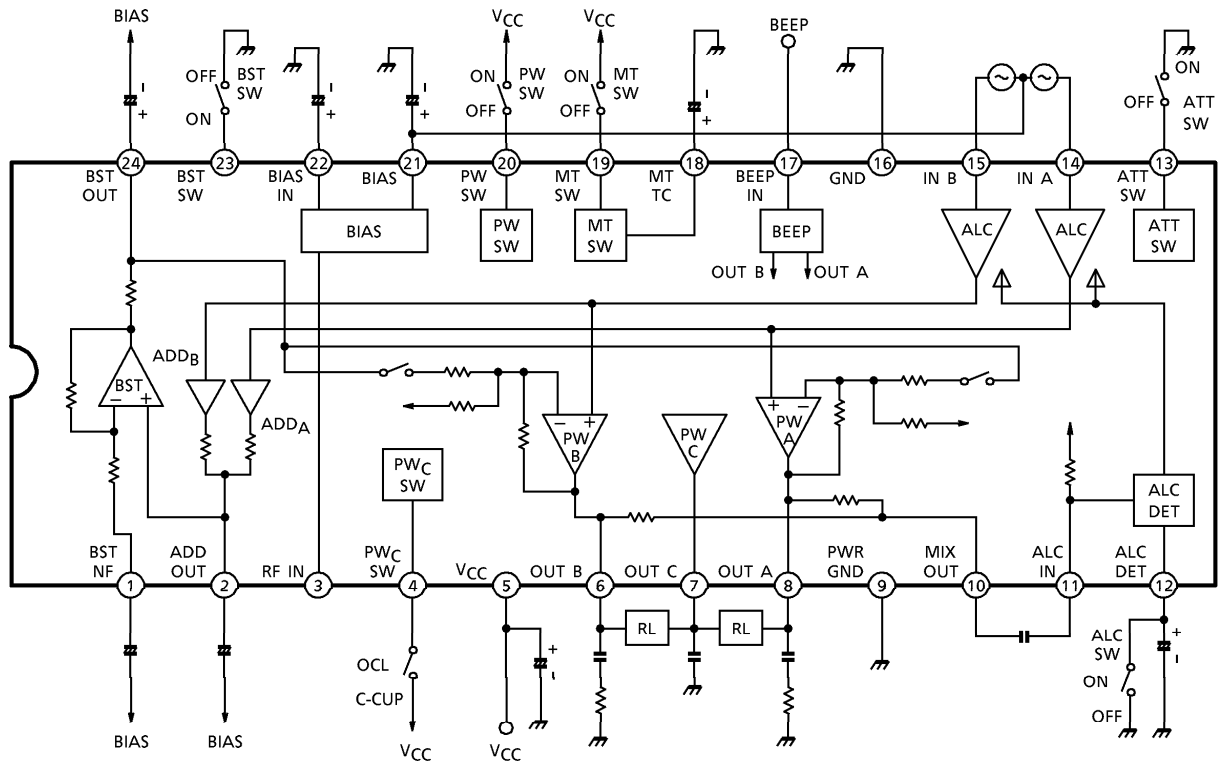
SSOP24-P-300-0.65A

Weight : 0.14g (Typ.)

980910EBA1

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BLOCK DIAGRAM



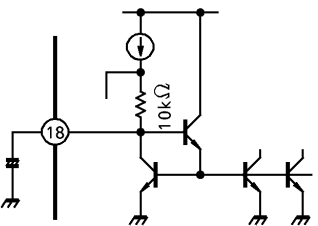
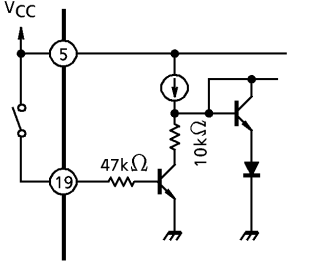
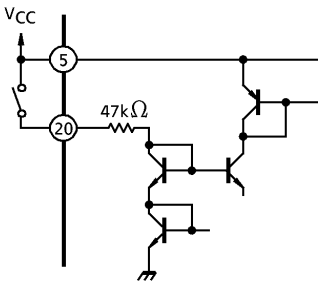
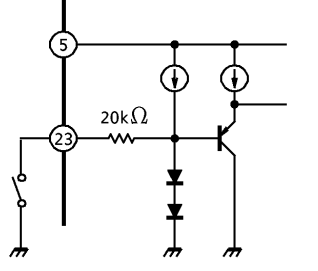
TERMINAL EXPLANATION

(Terminal voltage : Typical terminal voltage at no signal with test circuit, $V_{CC} = 2.4V$, $T_a = 25^\circ C$)

| TERMINAL | | FUNCTION | INTERNAL CIRCUIT | TERMINAL VOLTAGE (V) |
|----------|---------|---|------------------|----------------------|
| No. | NAME | | | |
| 1 | BST NF | NF of BST amplifier | | 0.85 |
| 24 | BST OUT | Output of BST amplifier (Terminal for filter) | | 0.85 |
| 2 | ADD OUT | Output of ADD amplifier (Terminal for filter) | | 0.85 |
| 3 | RF IN | Terminal for ripple filter circuit | | 1.44 |
| 21 | BIAS | BIAS voltage | | 0.85 |
| 22 | BIAS IN | Filter terminal for BIAS circuit | | 0.85 |

| TERMINAL | | FUNCTION | INTERNAL CIRCUIT | TERMINAL VOLTAGE (V) |
|----------|--------------------|---|------------------|----------------------|
| No. | NAME | | | |
| 4 | PW _C SW | Center amplifier on / off switchover (V _{CC} : Center amplifier off (C-Couple) OPEN : Center amplifier on (OCL)) | | — |
| 7 | OUT _C | Output of center amplifier (Common terminal for OCL output configuration) | | 0.85 |
| 5 | V _{CC} | — | — | 2.4 |
| 6 | OUT _B | Output of power amplifier | | 0.85 |
| 8 | OUT _A | | | 0.85 |
| 14 | IN _A | Input of power amplifier | | 0.85 |
| 15 | IN _B | | | 0.85 |
| 10 | MIX OUT | Output of power amplifier (Mixed) | | 0.85 |

| TERMINAL | | FUNCTION | INTERNAL CIRCUIT | TERMINAL VOLTAGE (V) |
|----------|---------|---|------------------|----------------------|
| No. | NAME | | | |
| 9 | PWR GND | GND of power amplifier | — | 0 |
| 11 | ALC IN | Input terminal for ALC detector circuit | | 0.85 |
| 12 | ALC DET | Smoothing for ALC detection, ALC on/off switchover (GND : ALC off OPEN : ALC on) | | — |
| 13 | ATT SW | Power amplifier gain switchover (OPEN/V _{CC} : ATT off (G _V = 16dB) GND : ATT on (G _V = 8.5dB) | | — |
| 16 | GND | GND of input stage in power amplifier | — | 0 |
| 17 | BEEP IN | Input terminal for Beep sound It receive beep sound from microcomputer. And power amplifier outputs this beep sound. | | 0 |

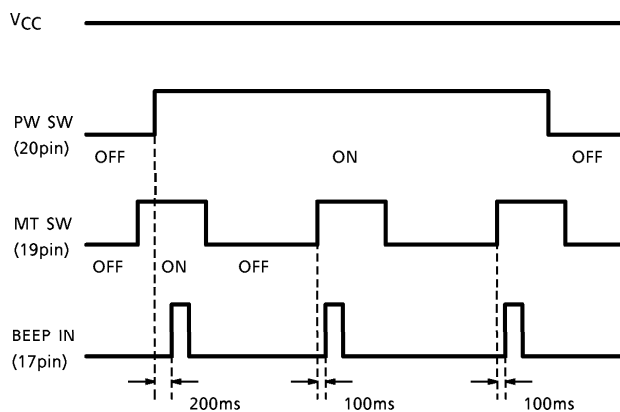
| TERMINAL | | FUNCTION | INTERNAL CIRCUIT | TERMINAL VOLTAGE (V) |
|----------|--------|---|--|----------------------|
| No. | NAME | | | |
| 18 | MT TC | Terminal of mute smoothing Smoothing for shock noise at power muting switch over |  | 1.4 |
| 19 | MT SW | Power mute switchover (GND / OPEN : Mute off VCC : Mute on) |  | — |
| 20 | PW SW | Power on / off switchover (VCC : Power on GND / OPEN : Power off) |  | — |
| 23 | BST SW | Bst on / off switchover (BST on : OPEN / VCC BST off : GND) |  | — |

APPLICATION NOTE

1. Beep Sound

Beep sound signals from, for example, a micro controller can be received through the beep input pin 17. At power mute mode, PW_A and PW_B are turned off. The current of the beep signal input to be via beep amplifier is amplified at the output stage of PW_A and PW_B . The output from beep amplifier becomes the constant voltage source. As a result, the beep sound is output to the headphone load.

If the input signal for beep (Pin 17) is not, this terminal should be fixed GND level.



2. Power Switch

As long as the power switch is not connect to V_{CC} , the IC does not operate. If external noise causes malfunctions, we recommend to connect a pull-down resistor externally (Sensitivity of the power mute switch is high).

3. Center Amplifier (PW_C)

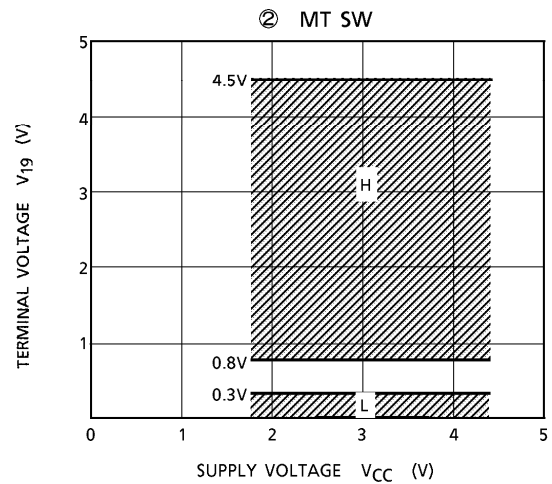
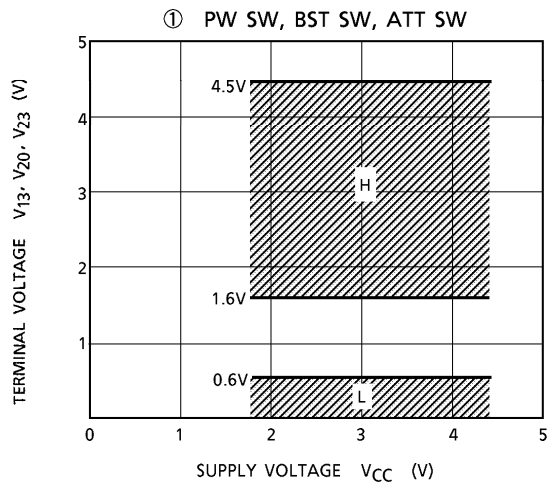
Terminal for PW_C output is common terminal for OCL output configuration. PW_C ON/OFF mode is controlled by PW_C switch (Pin 4). To reduce the consumption current, PW_C should be turned off by this switch.

PW_C SW (OPEN : OCL
 (V_{CC} : C-Couple

4. Terminal of RF IN (3pin)

Adding Capacitor (Recommendation : $10\mu F$) to terminal of RF IN (Pin 3), the ripple rejection ratio is improved by secondly ripple filter (In the C-Couple output configuration , this capacitor should be connected.)

5. Threshold Voltage of Each Switches



| | |
|----------|--------------------|
| | PW SW (V_{20}) |
| 'H' | OPERATING |
| 'L' OPEN | IC OFF |

| | |
|----------|--------------------|
| | MT SW (V_{19}) |
| 'H' | MUTE ON |
| 'L' OPEN | MUTE OFF |

| | | |
|----------|---------------------|---------------------|
| | ATT SW (V_{13}) | BST SW (V_{23}) |
| 'H' OPEN | ATT OFF | BST ON |
| 'L' | ATT ON | BST OFF |

6. External capacitor

These capacitors which are prevent oscillation of power amplifier and de-coupled at terminals of BIAS and V_{CC} need to be small temperature coefficient and excellent frequency characteristic.

MAXIMUM RATINGS (Ta = 25°C)

| CHARACTERISTIC | SYMBOL | RATING | UNIT |
|-----------------------|-----------------------|----------|------|
| Supply Voltage | V _{CC} | 4.5 | V |
| Output Current | I _o (peak) | 100 | mA |
| Power Dissipation | P _D (Note) | 550 | mW |
| Operating Temperature | T _{opr} | - 25~75 | °C |
| Storage Temperature | T _{stg} | - 55~150 | °C |

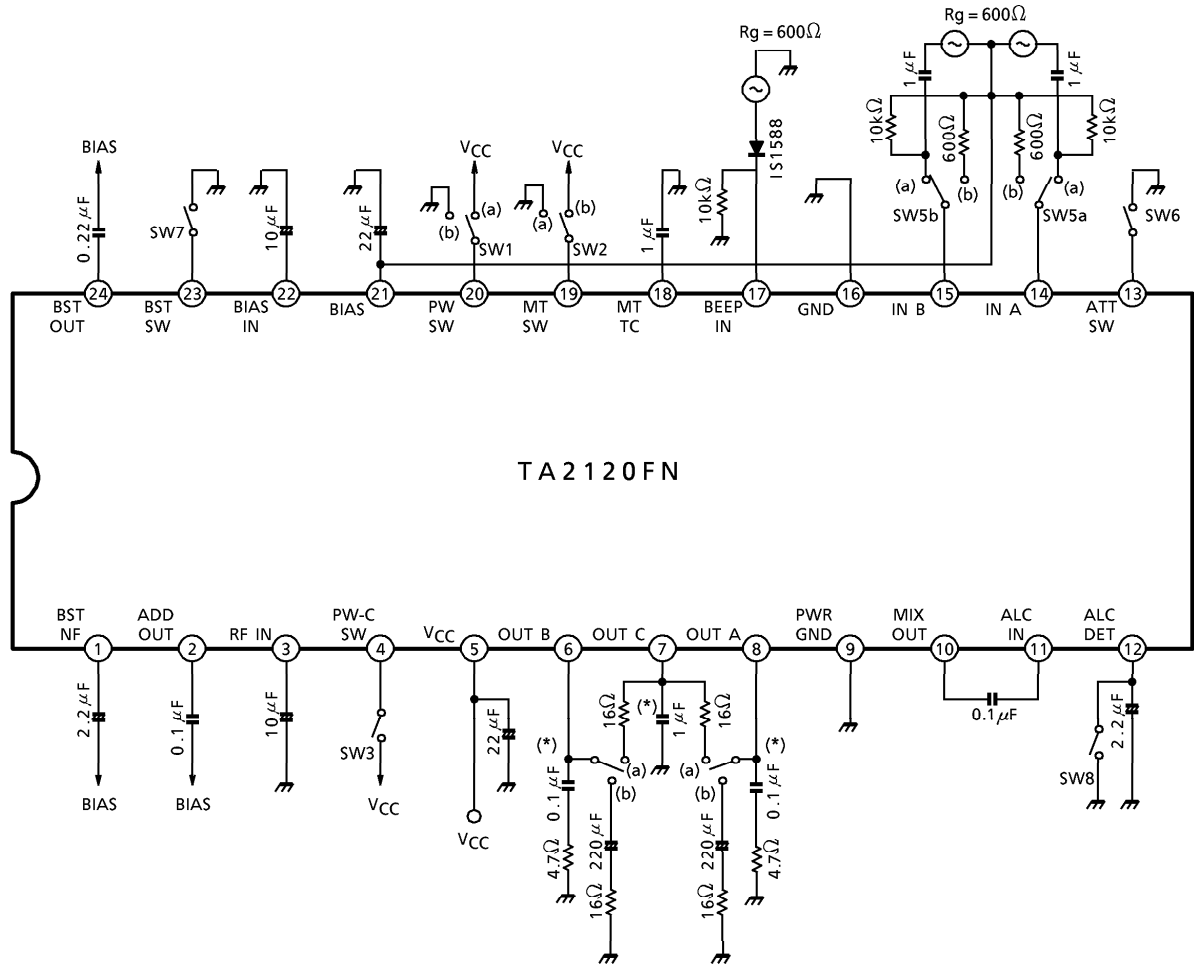
(Note) Deleted above 25°C in the proportion of 4.4mW/1°C.

ELECTRICAL CHARACTERISTICS

(Unless otherwise specified : V_{CC} = 2.4V, R_g = 600Ω, R_L = 16Ω, f = 1kHz, Ta = 25°C
 SW1 : a, SW2 : a, SW3 : OPEN, SW4 : a, SW5 : a, SW6 : OPEN, SW7 : ON,
 SW8 : ON

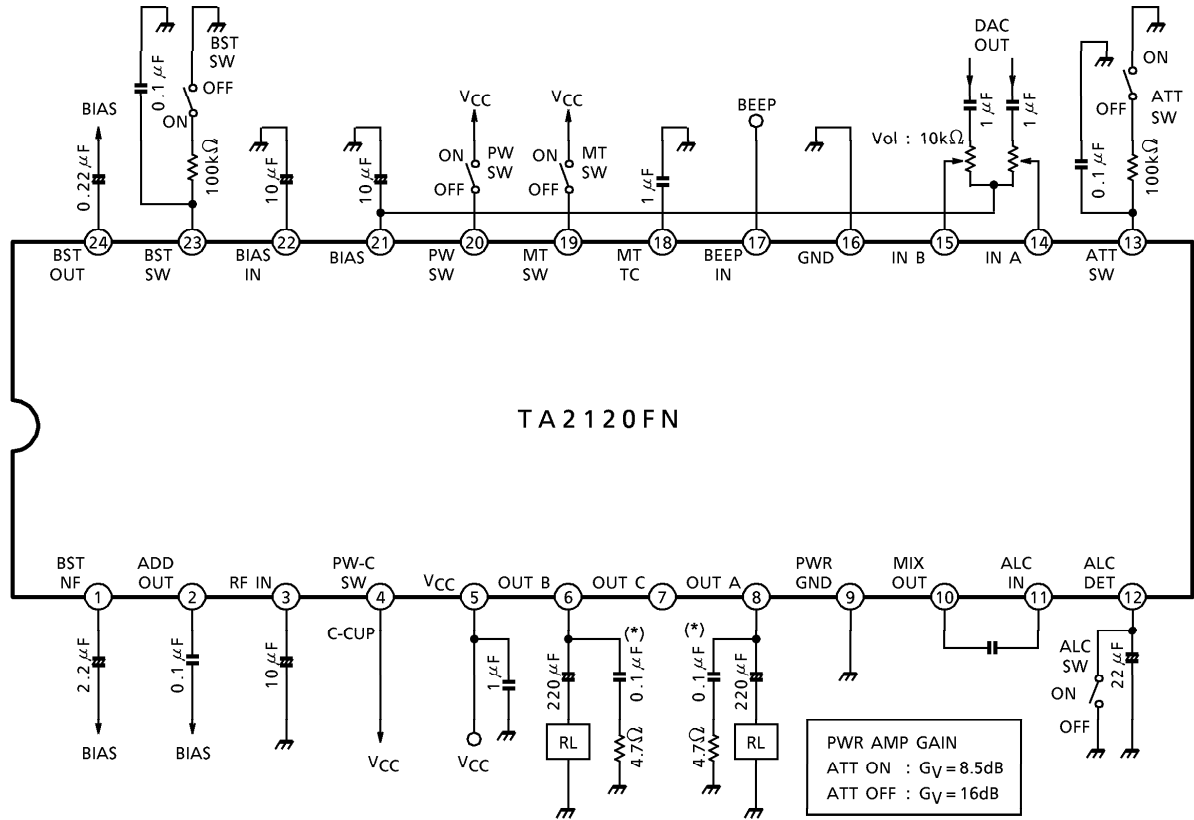
| CHARACTERISTIC | | SYMBOL | TEST CIRCUIT | TEST CONDITION | MIN. | TYP. | MAX. | UNIT |
|----------------------------|---------------------------|-------------------|---|--|--------|--------|------|------|
| Quiescent Supply Current | | I _{CC1} | — | IC OFF (C-Couple) SW1 : b, SW2 : b, SW3 : ON | — | 0.1 | 5 | μA |
| | | I _{CC2} | | IC OFF (OCL) SW1 : b, SW2 : b | — | 0.1 | 5 | μA |
| | | I _{CC3} | | MUTE ON (C-Couple) SW2 : b, SW3 : ON | — | 1 | 2 | mA |
| | | I _{CC4} | | MUTE ON (OCL) SW2 : b | — | 1.7 | 3 | mA |
| | | I _{CC5} | | No signal (C-Couple) SW3 : ON | — | 1.9 | 3.5 | mA |
| | | I _{CC6} | | No signal (OCL) | — | 2.6 | 4.5 | mA |
| Consumption Supply Current | | I _{CC7} | — | P _o = 0.5mW + 0.5mW (C-Couple), SW3 : ON | — | 6.6 | — | mA |
| | | I _{CC8} | — | P _o = 0.5mW + 0.5mW (OCL) | — | 12.1 | — | |
| Power Amplifier Stage | Voltage Gain (1) | G _{V1} | — | V _o = - 22dBV, SW6 : GND | 5.5 | 8.5 | 10.5 | dB |
| | Voltage Gain (2) | G _{V2} | — | V _o = - 22dBV | 14 | 16 | 18 | |
| | Output Power | P _{omax} | — | THD = 10%, V _{CC} = 2.0V | 5 | 8 | — | mW |
| | Total Harmonic Distortion | THD | — | V _o = - 12.2dBV | — | 0.1 | 0.5 | % |
| | Output Noise Voltage | V _{no} | — | R _g = 600Ω, Filter : IHF-A, SW5 : b | — | - 98 | - 92 | dBV |
| | Crosstalk | CT | — | V _o = - 12.2dBV | 24 | 40 | — | dB |
| | Ripple Rejection Ratio | RR | — | V _{CC} = 1.8V, fr = 100Hz, Vr = - 20dBV | 69 | 75 | — | dB |
| | Mute Attenuation | MUTE | — | V _o = - 12.2dBV, SW2 : b | 80 | 90 | — | dB |
| Beep Voltage | VBEEP | — | V Beep IN = 0dBV, SW2 : b | - 56 | - 51 | - 46 | dBV | |
| Boost Gain | Bst | — | V _o = - 30dBV, f = 100Hz, SW7 : ON→OPEN | 9 | 11.5 | 14 | dB | |
| Output Limiter Level | V _{ALC} | — | V _{in} = - 20dBV, SW8 : OPEN | - 41.5 | - 39.5 | - 37.5 | dBV | |

TEST CIRCUIT



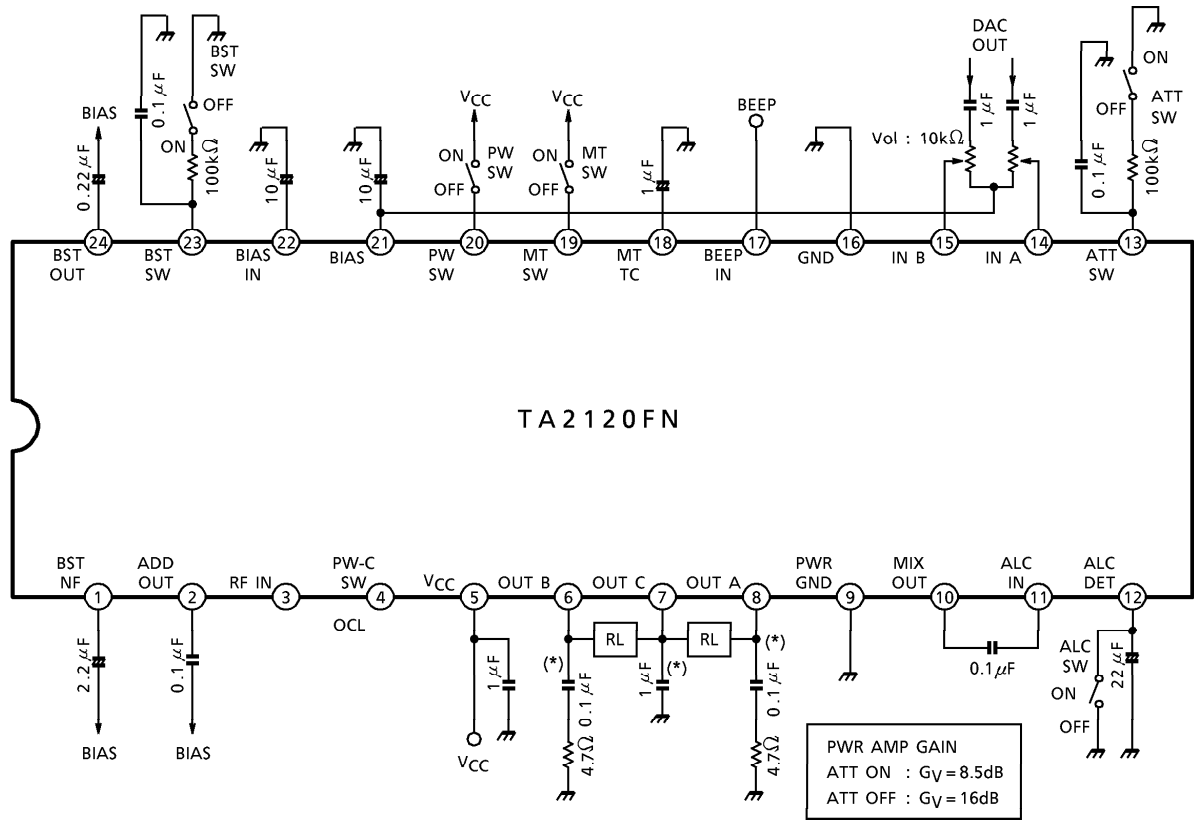
(*) MONOLITHIC CERAMIC CAPACITOR

APPLICATION CIRCUIT 1 (C-Couple MODE)



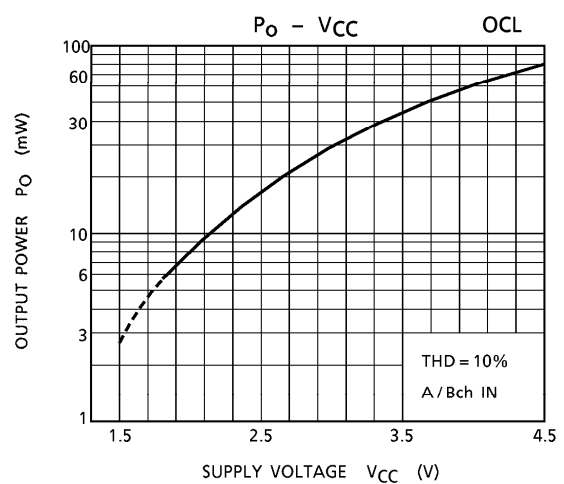
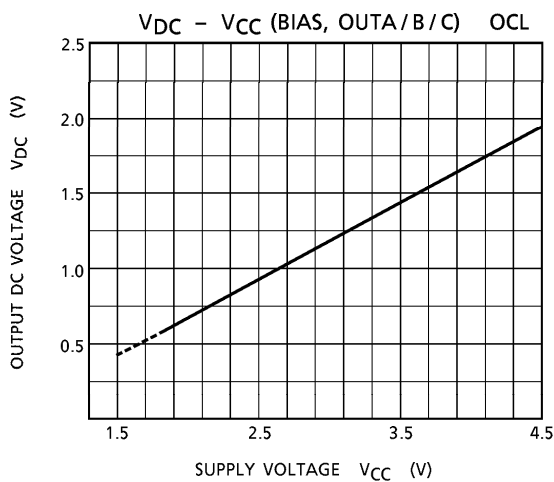
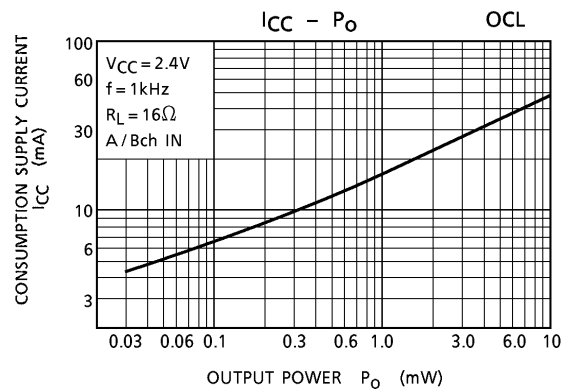
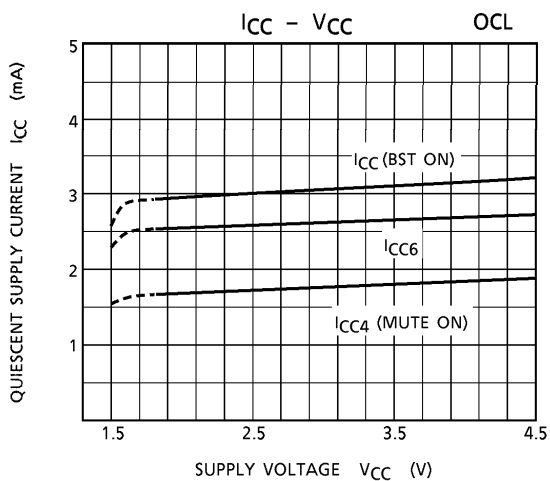
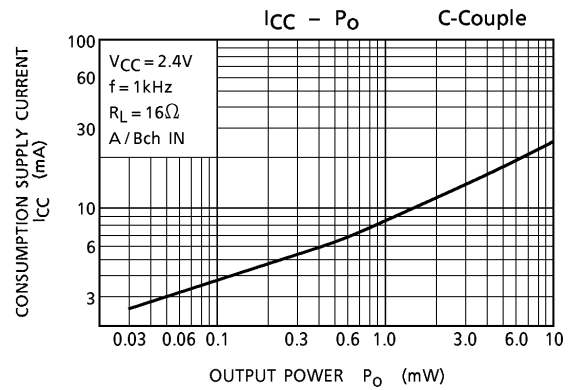
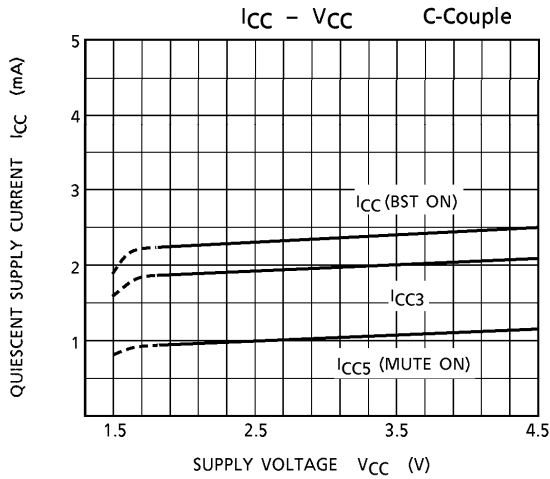
(* MONOLITHIC CERAMIC CAPACITOR

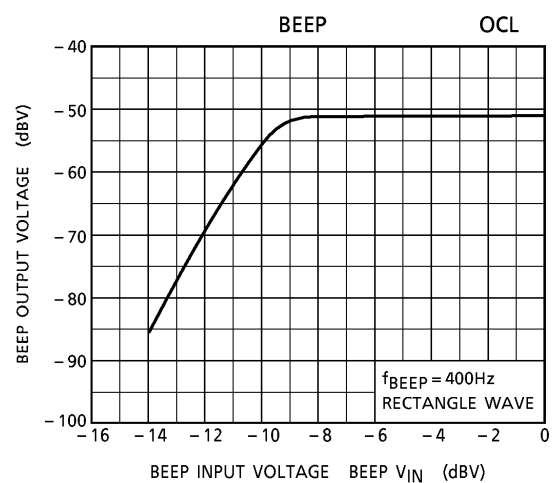
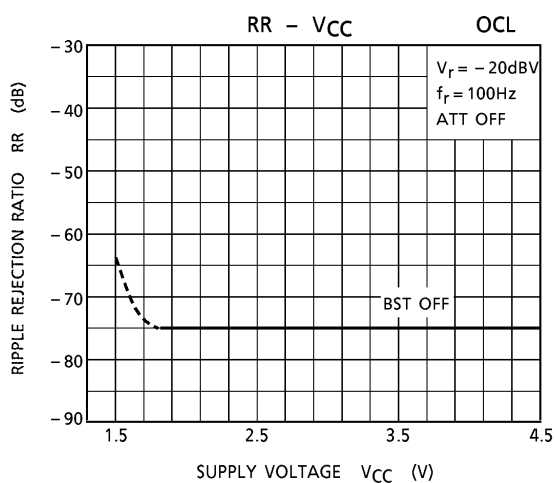
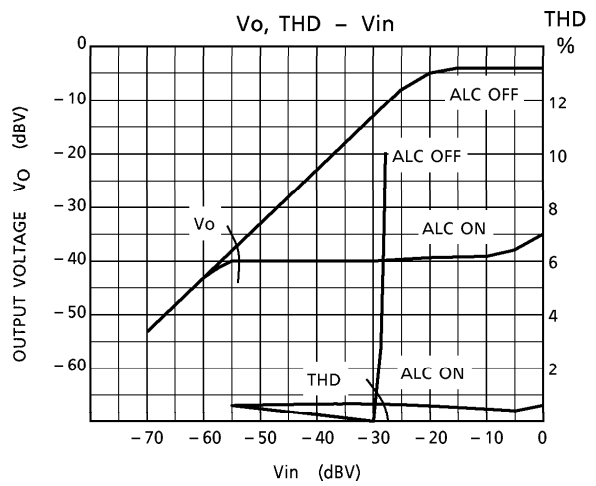
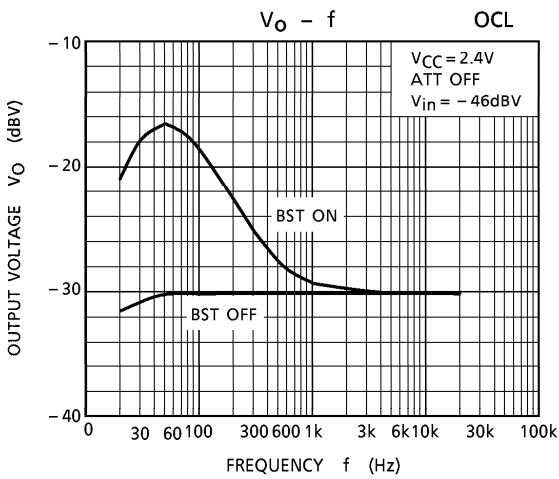
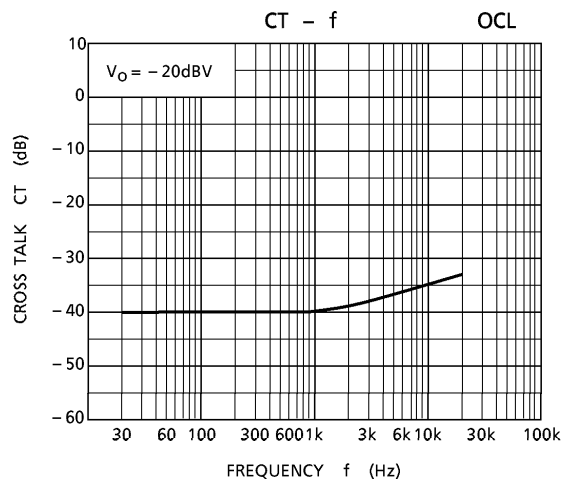
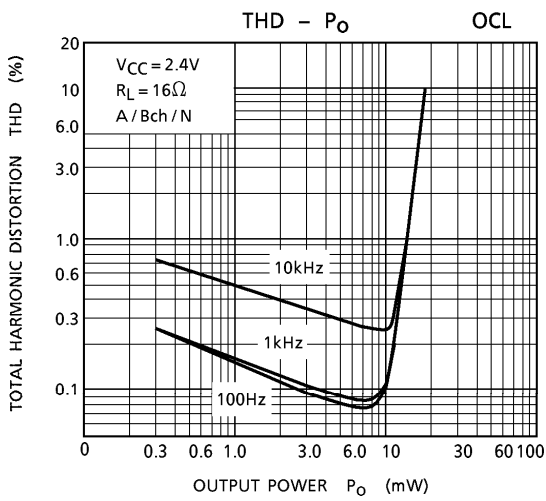
APPLICATION CIRCUIT 2 (OCL MODE)

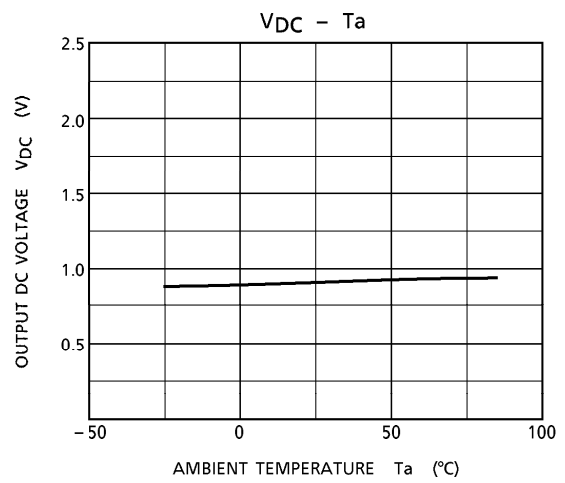
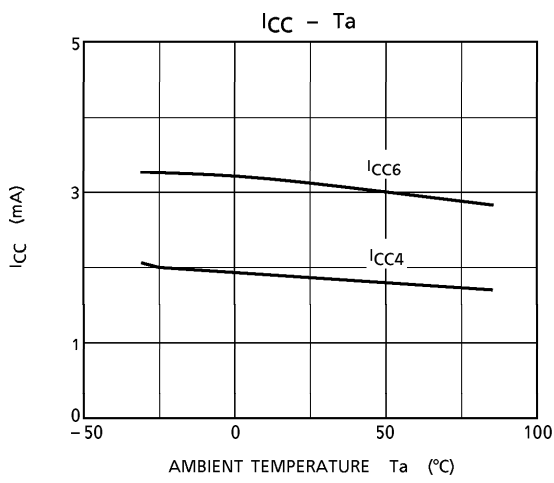


CHARACTERISTICS

(Unless otherwise specified : $V_{CC} = 2.4V$, $R_L = 16\Omega$, $R_g = 600\Omega$, $f = 1kHz$, $T_a = 25^\circ C$, OCL, ATT OFF)

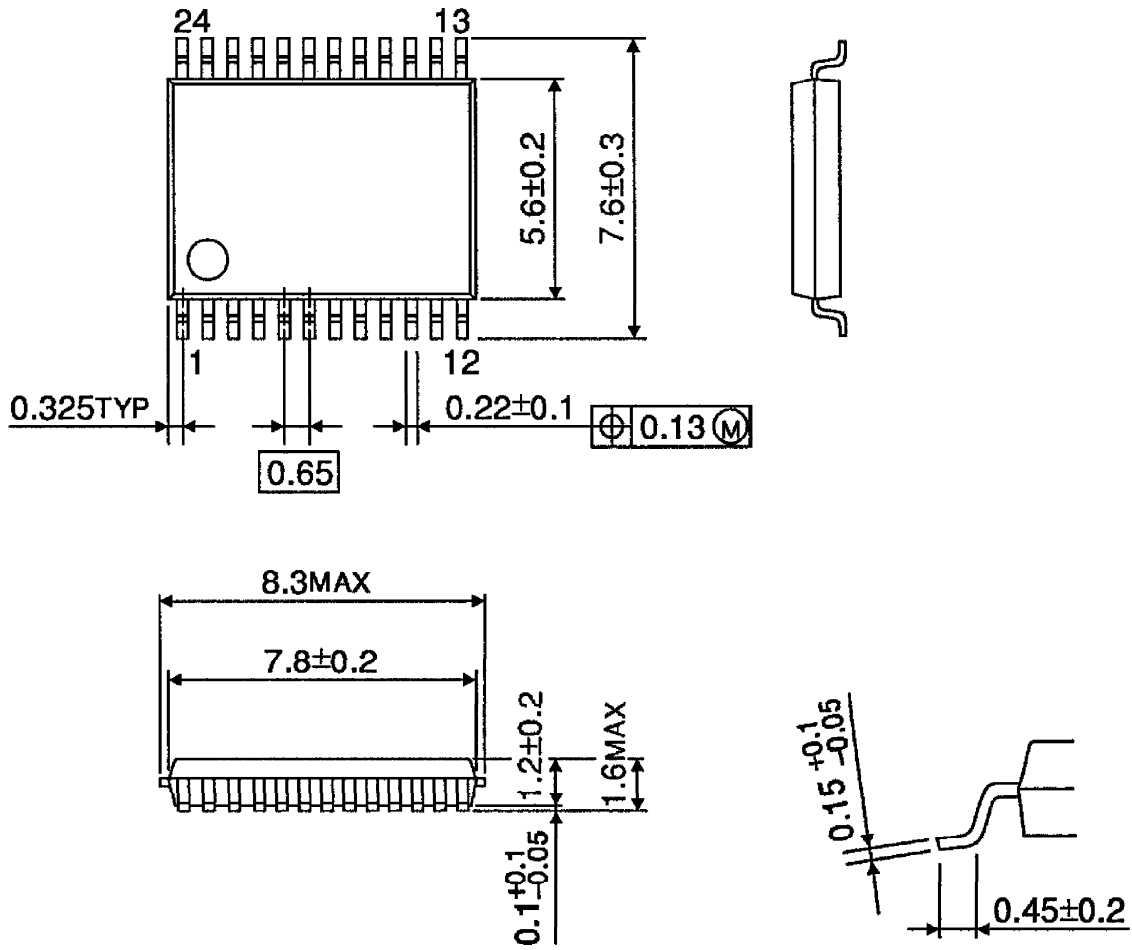






OUTLINE DRAWING
SSOP24-P-300-0.65A

Unit : mm



Weight : 0.14g (Typ.)