

TOSHIBA Bipolar Linear Integrated Circuit Silicon Monolithic

TA2042F

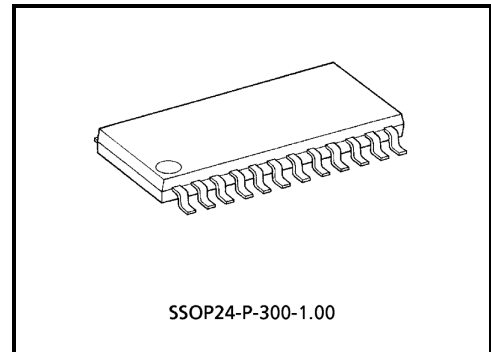
Dual Pre Amplifier With A Music Search For Auto Reverse Car Stereo

The TA2042F is dual pre amplifier with a music interval detection circuit for auto reverse car stereo.

This IC contains dual amplifier, forward / reverse control switch and metal / normal tape equalizer control switch.

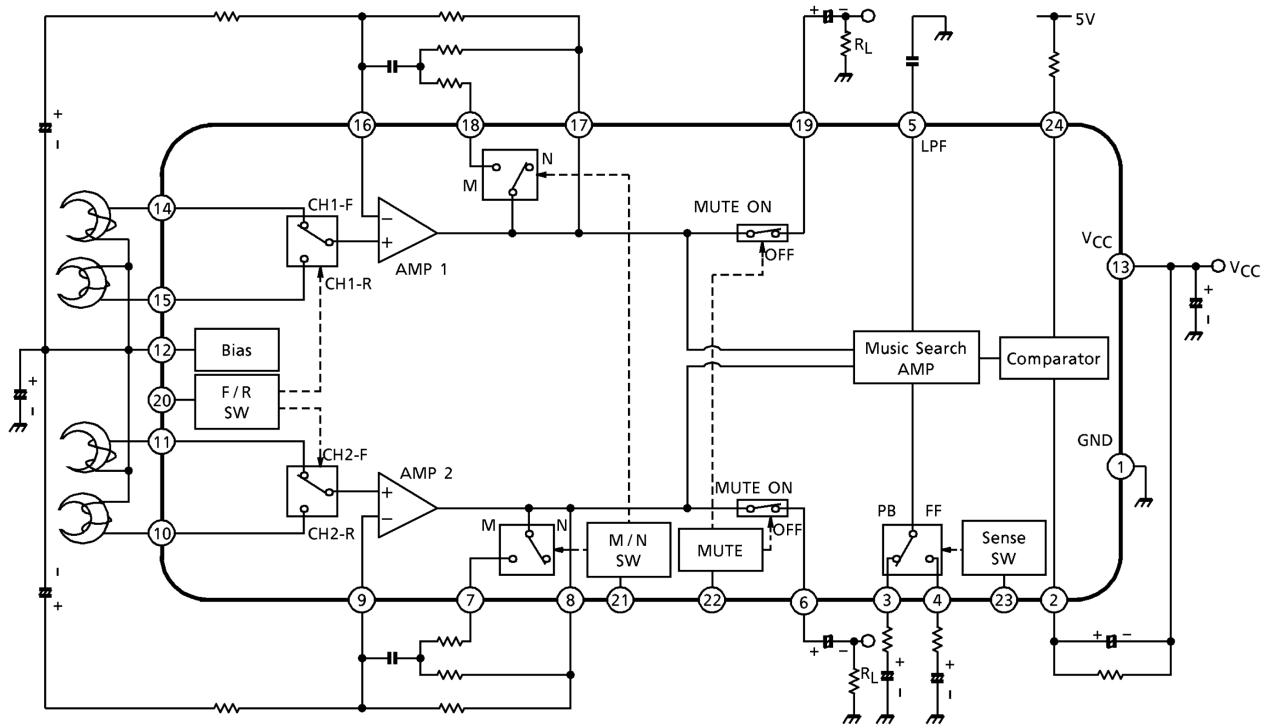
Features

- Low noise: $V_{NI} = 0.7\mu V_{rms}$ (typ.)
($R_g = 620\Omega$, $BW = 20\sim 20kHz$, NAB)
- No input coupling capacitor
- High voltage gain: $G_{VO} = 100dB$ (typ.)
($V_{CC} = 9V$, $f = 1kHz$)
- Built-in forward / reverse control switch.
- Built-in selecting the sensitivity of the music interval detection circuit.
- Built-in muting function.
- Operating supply voltage: $V_{CC (opr)} = 6\sim 15V$



Weight: 0.31g (typ.)

Block Diagram



Application Information

1. Forward, reverse select switch

(1) Threshold voltage

Pin(20) is coupled to the base of Q₁ (PNP-Tr) as shown in Fig.1.

The recommended forward, reverse select circuit is shown in Fig.2.

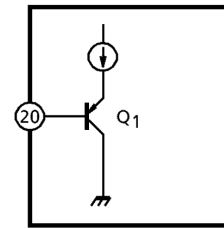


Fig.1

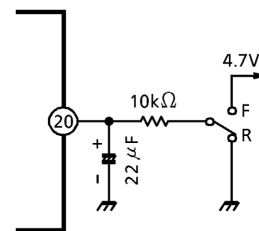


Fig.2

2. Equalizer control switch

Pin(21) is coupled to the base of Q₂ (PNP-Tr) as shown in Fig.3.

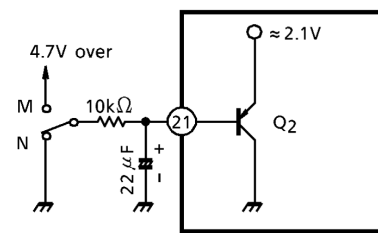


Fig.3

3. Mute control switch

Pin(22) is coupled to the base of Q₃ (PNP-Tr) through 10kΩ resistance as shown in Fig.4.

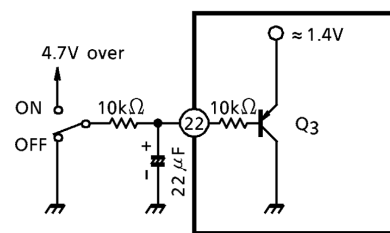


Fig.4

4. Sensitivity select switch

Pin(23) is to select the sensitivity of music search.

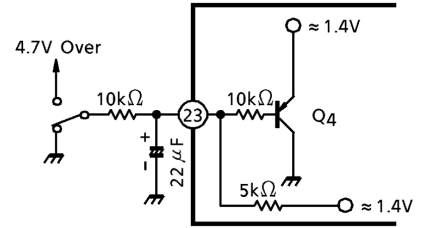


Fig.5

5. Music search system

(1) Sensor amp.

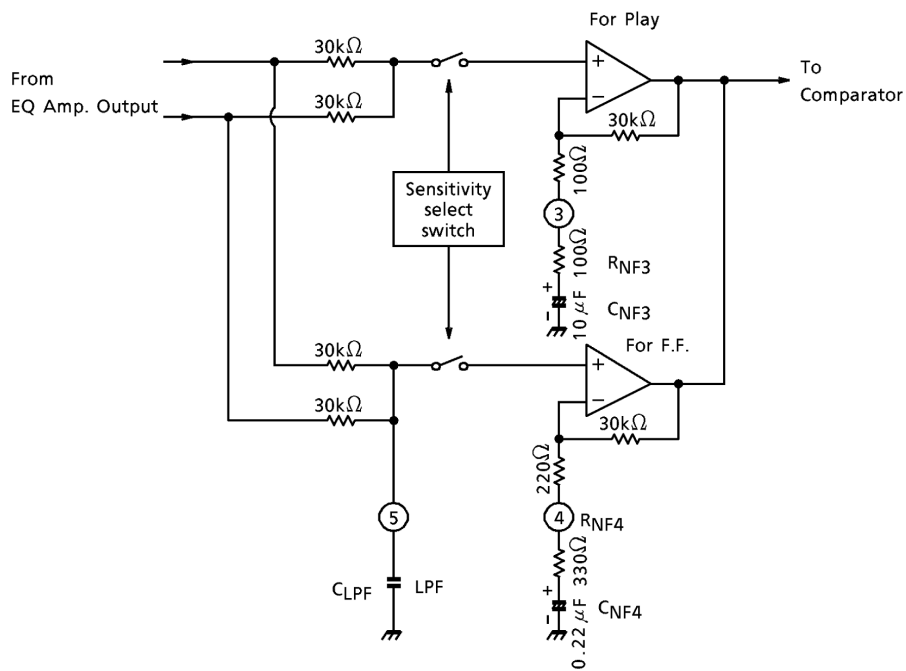


Fig.6 Sensor amp.

This portion is to amplify the voltage between some recorded music signal and next one.

Voltage gains are:

$$\text{For play mode: } G_V(\text{play}) = 20 \log \frac{30k\Omega + 100 + R_{NF3}}{100 + R_{NF3}} \text{ (dB)}$$

$$\text{For F.F. mode: } G_V(\text{F.F.}) = 20 \log \frac{30k\Omega + 220 + R_{NF4}}{220 + R_{NF4}} \text{ (dB)}$$

Lower side cut off frequency:

$$\text{For play mode: } f_L(\text{play}) = \frac{1}{2\pi C_{NF3}(100 + R_{NF3})} \text{ (Hz)}$$

$$\text{For F.F. mode: } f_L(\text{F.F.}) = \frac{1}{2\pi C_{NF4}(220 + R_{NF4})} \text{ (Hz)}$$

This R_{NF3} and R_{NF4} value decide the sensitivity of music searching, but be careful below as table.

Sensitivity (= $G_V(\text{play}), G_V(\text{F.F.})$)	Influence
Too high	Easy to misoperation or unstable condition. Especially, there is influence by pin 2 voltage variation.
Too low	Possible to be oscillation condition

Noise voltage level at tape F. F. mode is larger than play mode's one, and its noise is high frequency. Therefore the sense amp. for F. F. mode has L. P. F. (low pass filter) circuit.

Its cut off frequency is:

$$f_H(\text{L.P.F.}) = \frac{1}{2\pi C_{LPF}(30k\Omega // 30k\Omega)} \text{ (Hz)}$$

(2) Comparator

This comparator judges whether the signal which is recorded on tape is music or noise.

If the signal level from sensor amp. is more than " V_{ref} ", this comparator judges it is "music".

On the other hand, the signal level from sensor amp. is less than " V_{ref} ", this judges "noise".

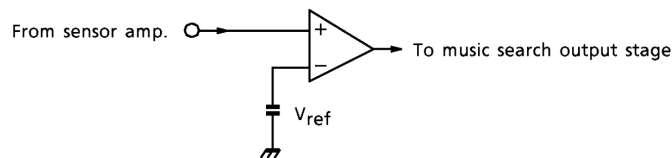


Fig.7 Comparator

(3) Music search output stage

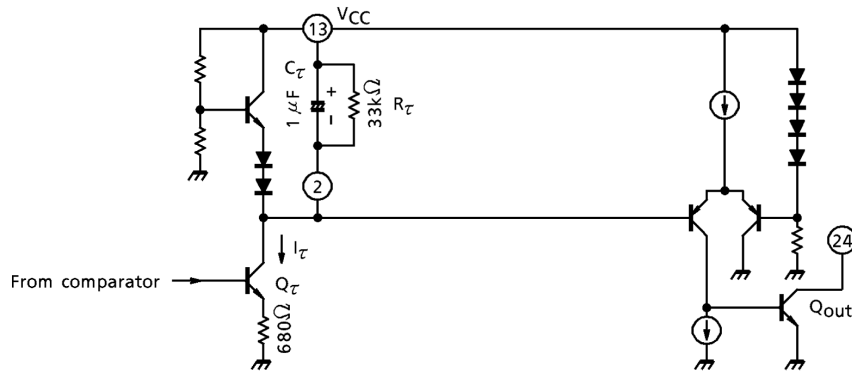


Fig.8 Output stage

To prevent misoperation of music searching, output stage has time constant circuit.

Operation Flow Table

Comparator Output	Q _τ	Pin(2) Voltage	Q _{OUT} = Music Search Output
H	On	Decrease	"L" at pin(2) voltage become [V _{CC} -2.7V]
L	Off	Increase	"H" at pin(2) voltage become [V _{CC} -2.0V]

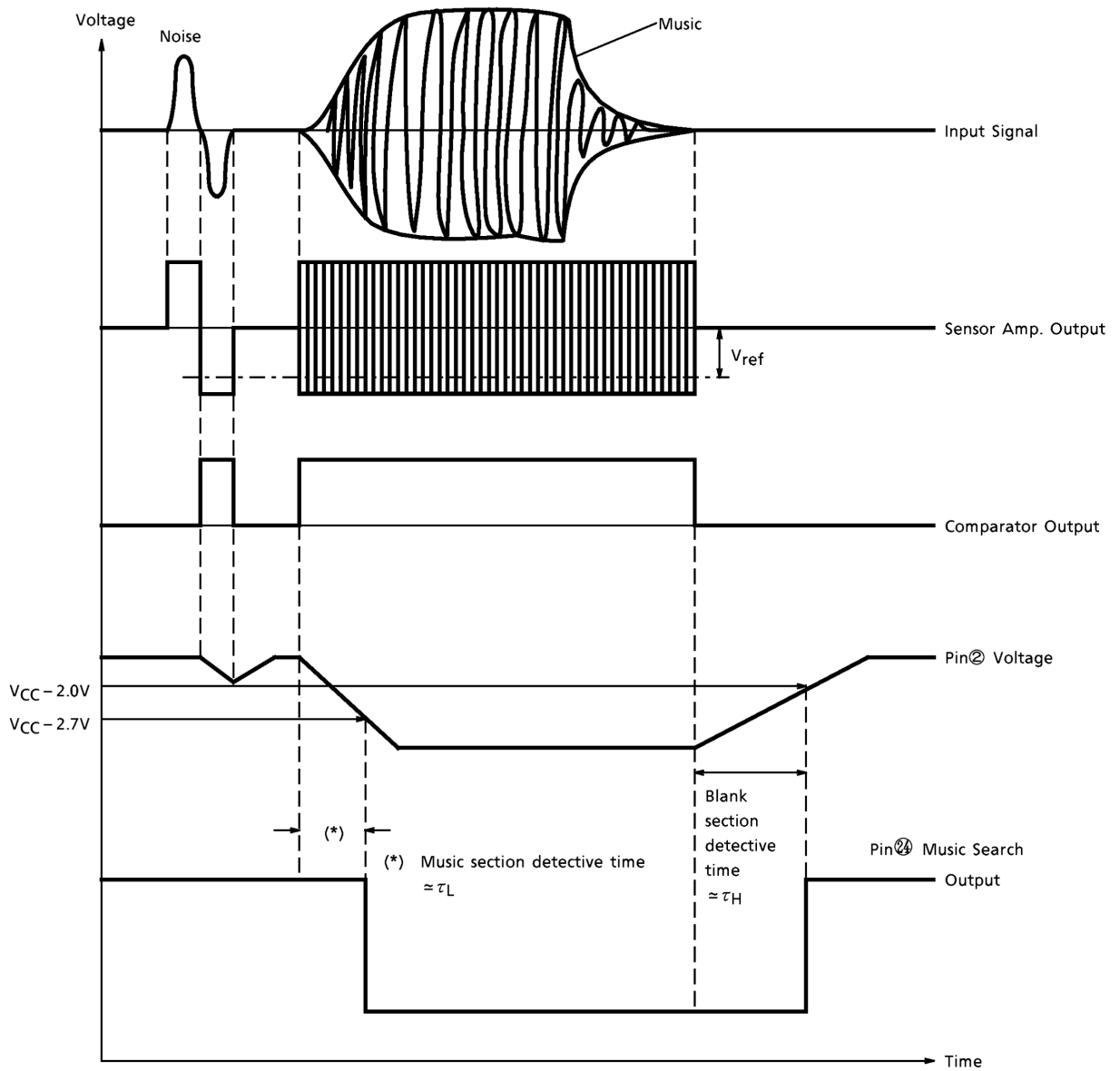
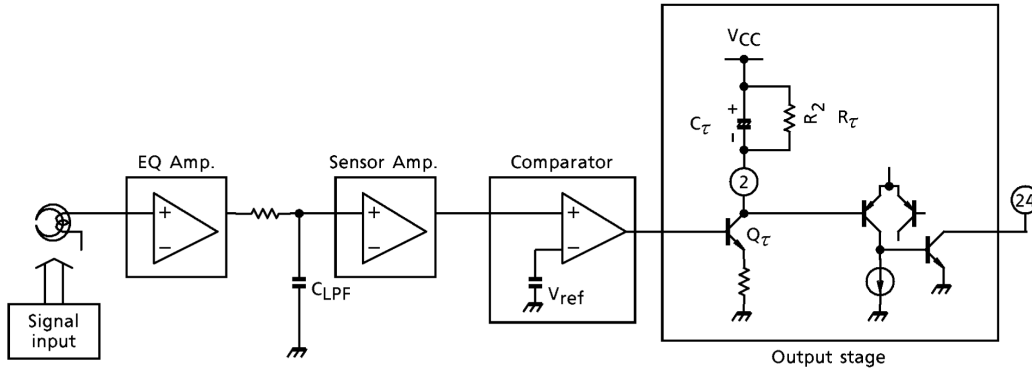
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Time constant

Q_{out} will be "L": $\tau_L = \frac{5.4C_\tau}{I} \text{ (s)} (I=1\text{mA})$
 "H": $\tau_H = C_\tau \cdot R_\tau \cdot \lambda_n = \frac{V_{CC} + 2.0}{2.0} \text{ (s)}$

R_τ must be used more than 22kΩ

(4) Music searching flow



Maximum Ratings (Ta = 25°C)

Characteristic	Symbol	Rating	Unit
Supply voltage	V _{CC}	16	V
Power dissipation	P _D	750	mW
Operating temperature	T _{opr}	-30~85	°C
Storage temperature	T _{stg}	-55~150	°C

(Note) Derated above Ta = 25°C in the proportion of 6mW / °C

Electrical Characteristics

(unless otherwise specified V_{CC} = 9.0V, f = 1kHz, R_L = 10kΩ, R_g = 600Ω, Ta = 25°C, normal EQ: EQ SW = 0.2V, mute off: Mute SW = 0.2V, play mode: Sense SW = 0.2V)

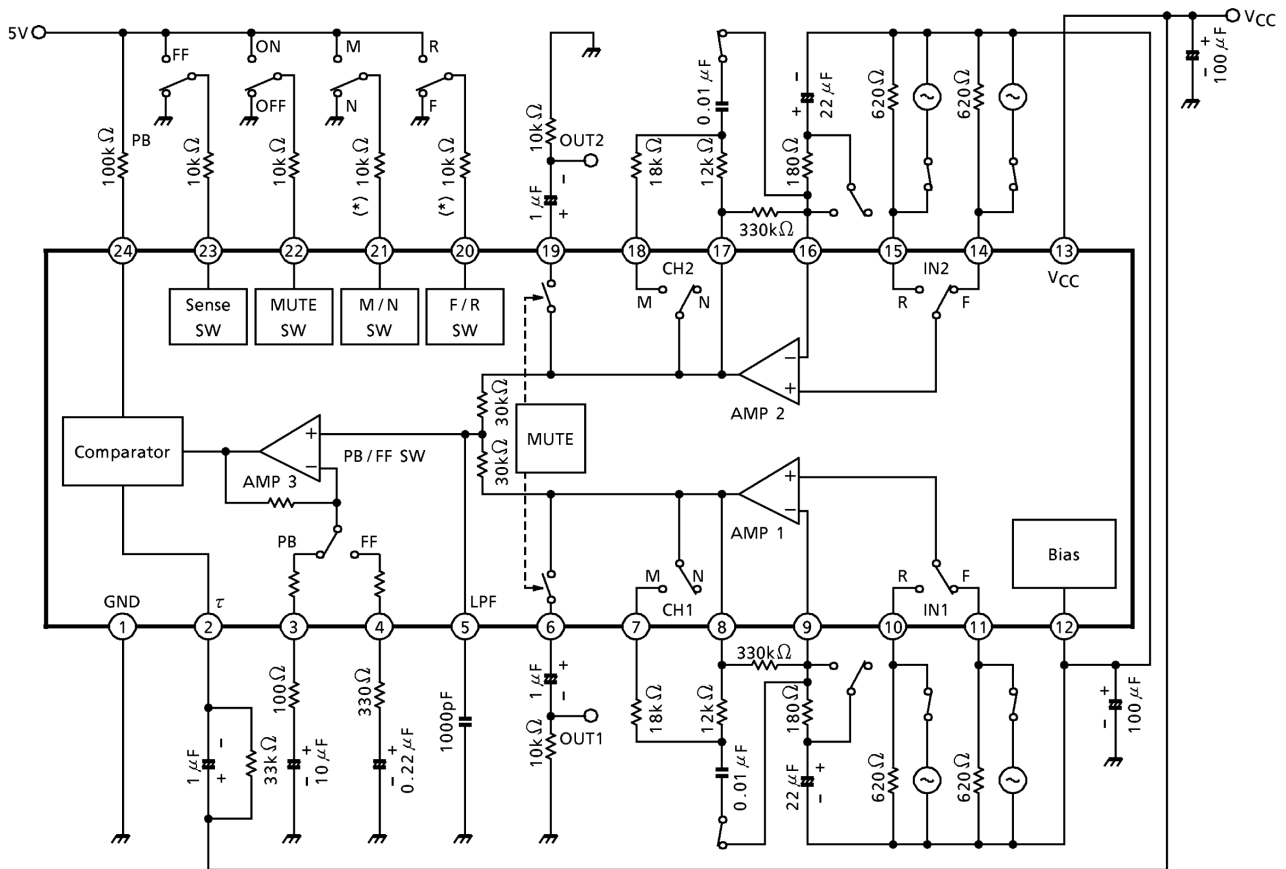
Characteristic	Symbol	Test Cir-cuit	Test Condition	Min.	Typ.	Max.	Unit
Quiescent current	I _{CCQ} (1)	—	V _{IN} = 0 normal EQ	—	10	15	mA
	I _{CCQ} (2)		V _{IN} = 0 metal EQ EQ SW = 4.7V	—	11	16	
Open loop gain	G _{VO}	—	C _f = 100μF, R _f = 0	—	100	—	dB
Maximum output voltage	V _{OM}	—	THD = 1%	1.5	2.0	—	V _{rms}
Total harmonic distortion	THD	—	V _{OUT} = 0.5V _{rms}	—	0.03	0.12	%
Equivalent input noise voltage	V _{NI}	—	R _g = 620Ω, BPF = 20~20kHz	—	0.7	1.5	μV
Ripple rejection	R. R.	—	V _{RIP} = -20dBV, f _{RIP} = 100Hz	40	56	—	dB
Cross talk	C. T.	—	V _{OUT} = 1V _{rms}	55	68	—	dB
Forward / reverse cross talk	C. T.	—	V _{OUT} = 0.775V _{rms} @forward F / R SW = 0.2V @reverse F / R SW = 4.7V	55	65	—	dB
Mute level	M. L.	—	V _{OUT} = -10dBV Mute on: Mute SW = 4.7V	60	78	—	dB
Music detective input level 1	V _{ON1}	—	f = 5kHz, play	-90.5	-93.5	-96.5	dBV
Music detective input level 2	V _{ON2}	—	f = 10kHz, fast forward	-78	-82	—	dBV
Music section detective time (*)	τ 1	—	V _{IN} = -78dBV, step input	—	7	—	ms
Blank section detective time (*)	τ 2	—	V _{IN} = -66dBV, step input Fast forward: Sense SW = 4.7V	—	48	—	ms

(*) Design guarantee (not tested)

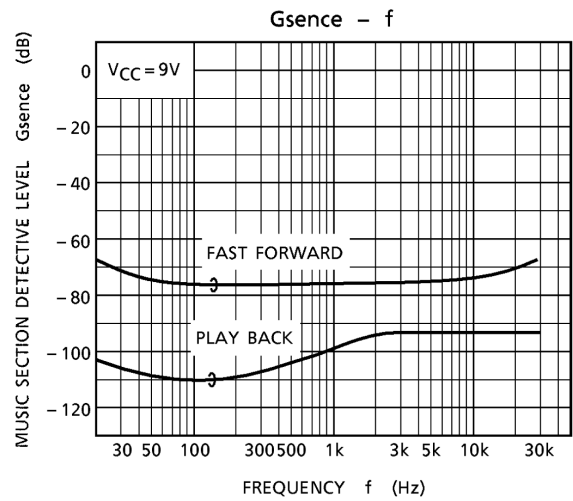
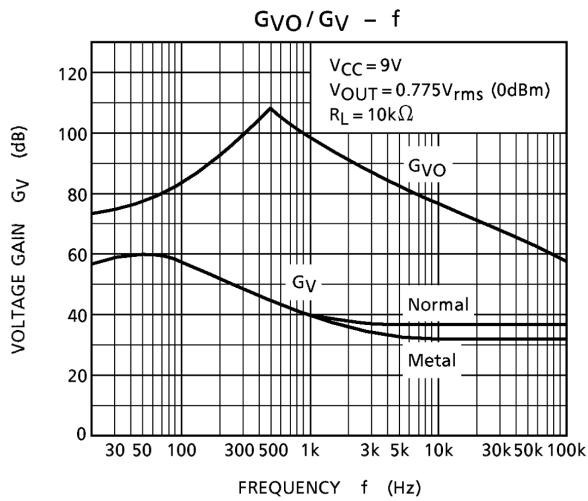
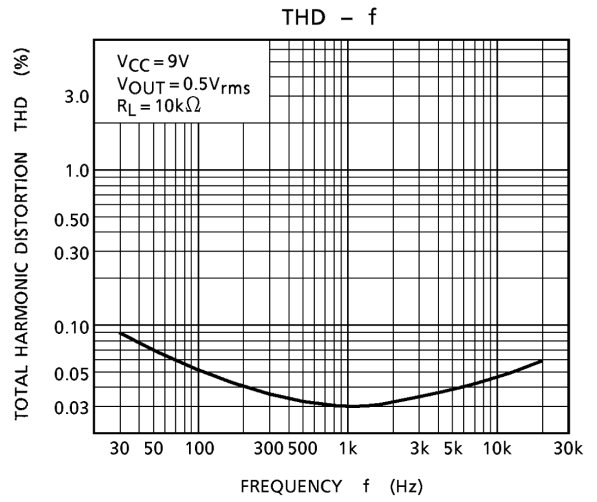
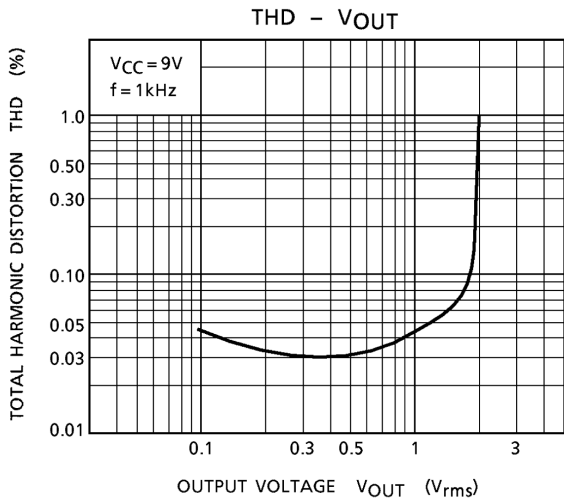
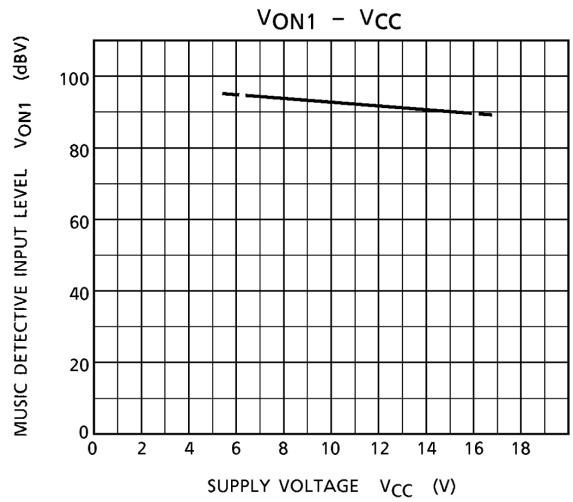
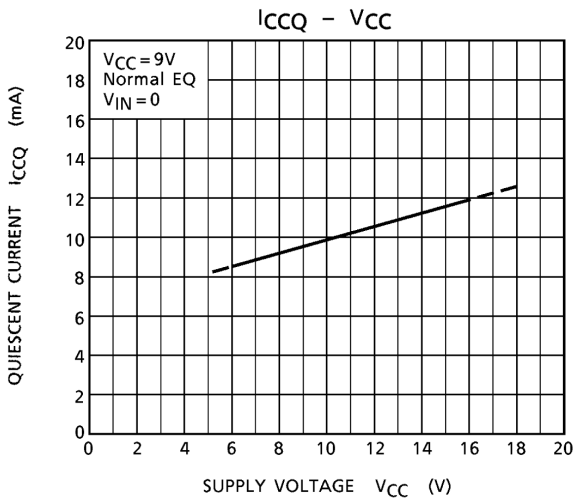
Characteristic	Symbol	Test Cir-cuit	Test Condition	Min.	Typ.	Max.	Unit
Output sink current; logic is low	I_{OL}	—	$R1 = 1k\Omega$, $V_{IN} = -78dBV$, $f = 5kHz$	1	5	—	mA
Output leak current; logic is high	I_{OH}	—	$V_{IN} = -84dBV$, $f = 10kHz$ Fast forward: Sense SW = 4.7V	—	1	10	μA
logic input threshold level (low) (*)	V_{IL}	—		—	—	0.2	V
logic input threshold level (high) (*)	V_{IH}	—		4.7	—	—	V

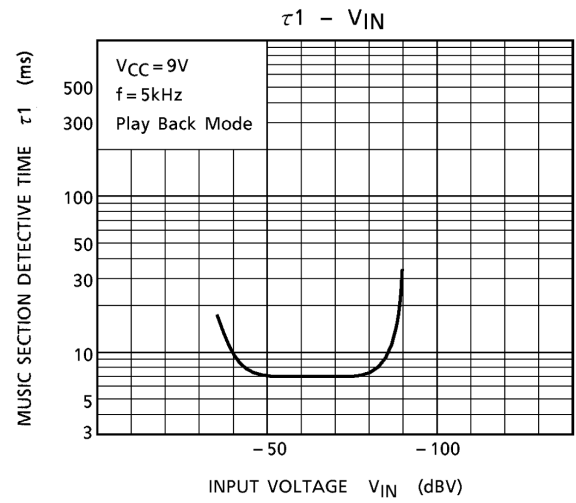
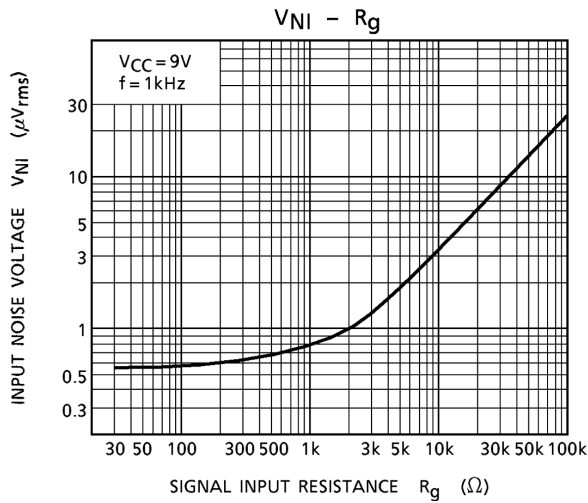
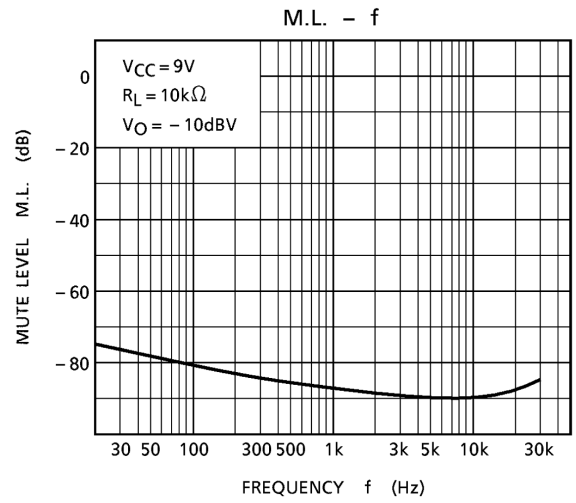
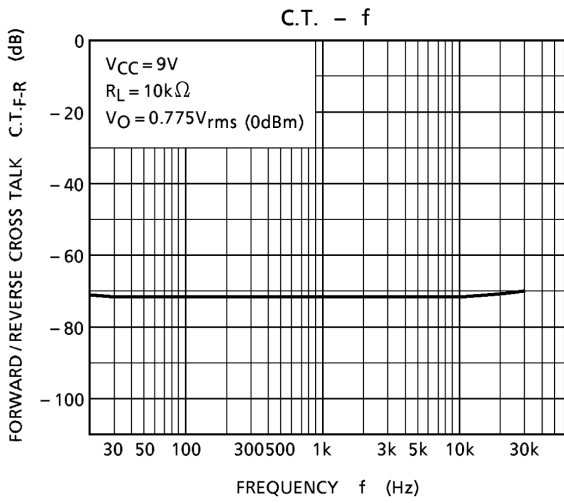
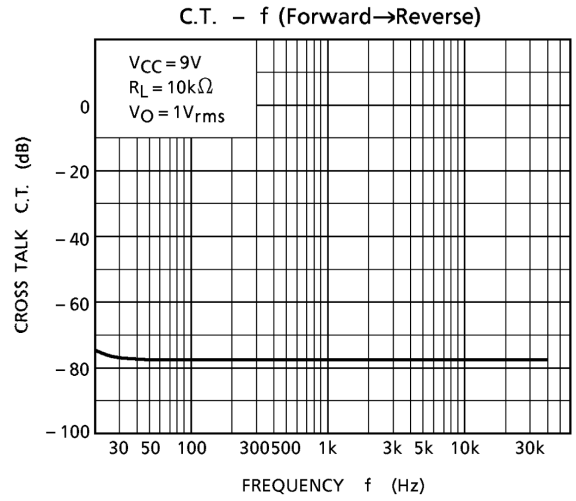
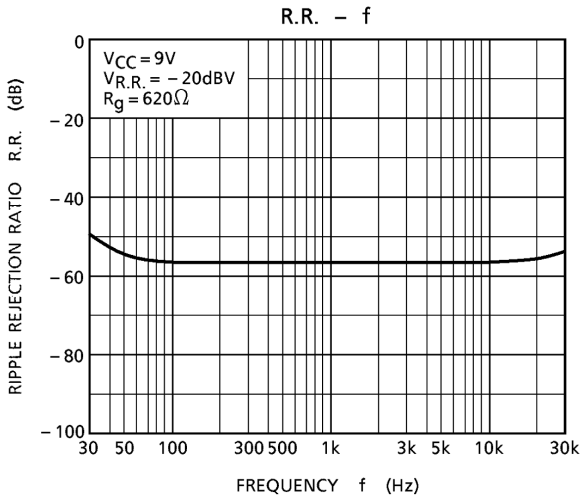
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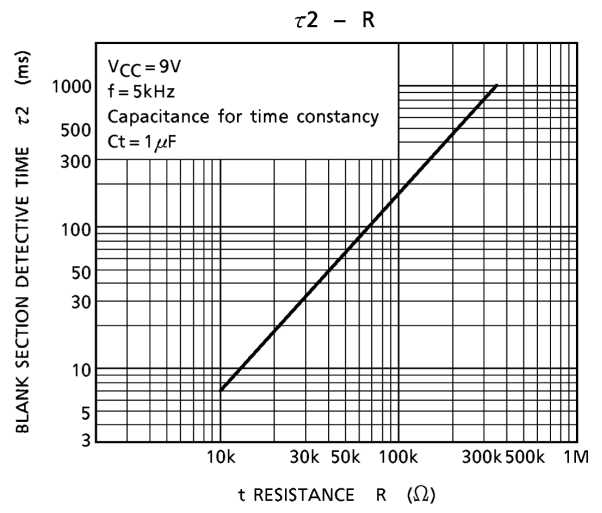
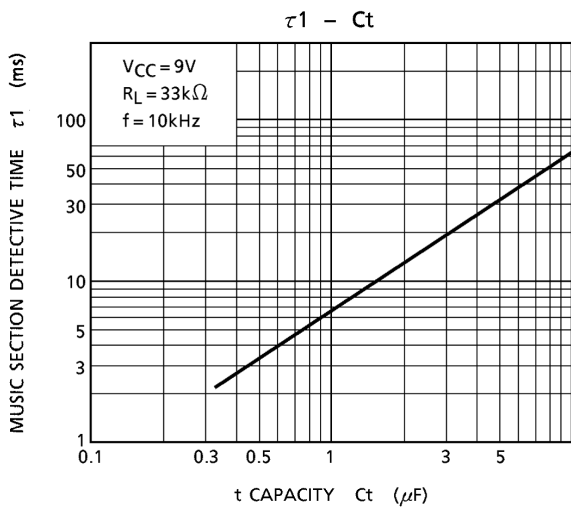
Test Circuit



(*) Caution: This value is different from pervious announced it.



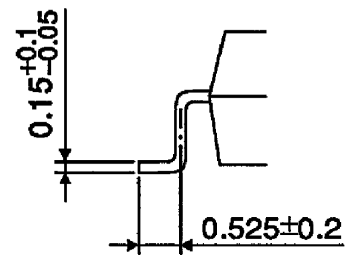
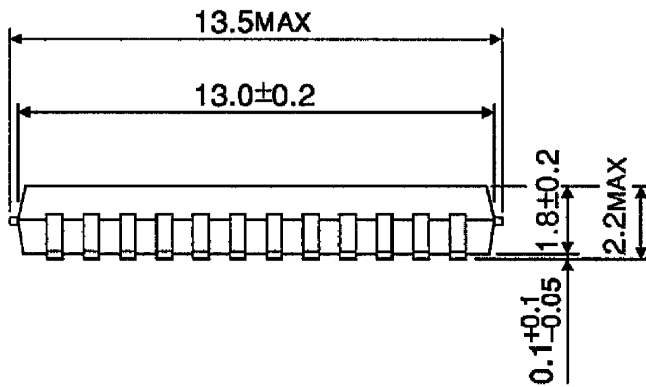
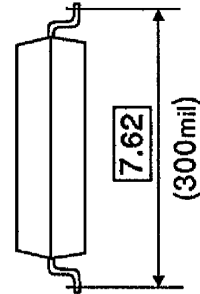
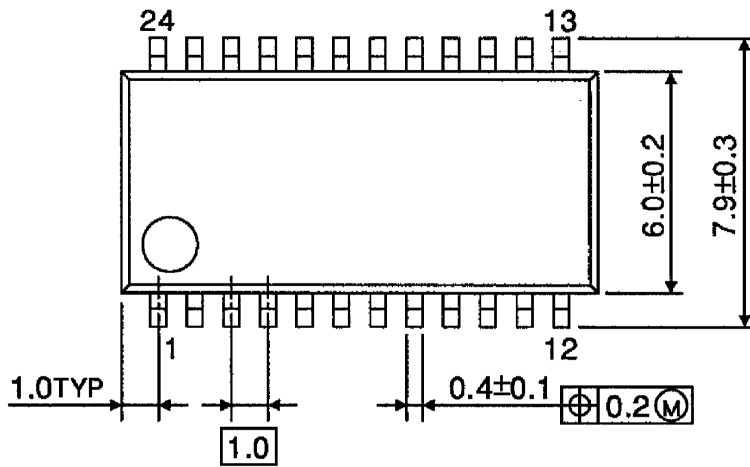




Package Dimensions

SSOP24-P-300-1.00

Unit : mm



Weight: 0.31g (typ.)

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