

**LA3242**

## Preamplifier for Compact Cassette Recorder Recording-only Use

### Overview

The LA3242 is a preamp IC for compact cassette recorder recording-only use. The distinctive feature of the LA3242 is that it contains mechanical switches which have been so far connected externally as peripheral parts.

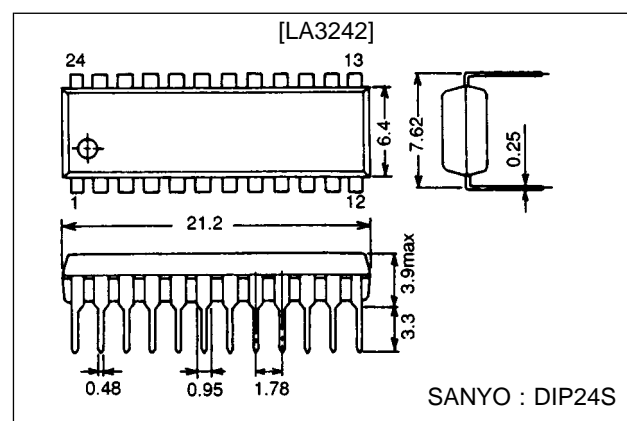
### Features

- On-chip electronic select switches permitting selection of normal/higher speed recording and metal(chrome)/normal tape recording mode by using the dedicated control pins.
- Two ALC output pins making it easy to make up a Dolby recording system.
- The control voltage from a microcomputer, etc. can be used to turn ON/OFF the ALC and to set the ALC control voltage to the initial value.
- On-chip microphone amplifier making it easy to provide microphone mixing.
- Wide operating voltage range ( $V_{CC} = 4.5$  to  $14.0$  V).
- Can be used in conjunction with playback-only preamp LA3246 to make up a double-cassette dubbing system.

### Package Dimensions

unit : mm

#### 3067-DIP24S



### Functions

- Recording preamplifier ×2
- Microphone amplifier ×1
- ALC output ×2
- Electronic switch ×6

### Specifications

#### Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max		16	V
Allowable power dissipation	$P_d$ max		720	mW
Operating temperature	$T_{op}$		-20 to +75	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

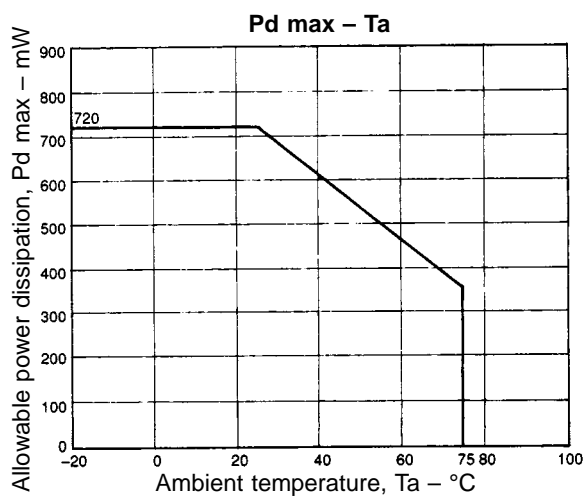
#### Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	$V_{CC}$		6	V
Operating voltage range	$V_{CC}$ op		4.5 to 14.0	V

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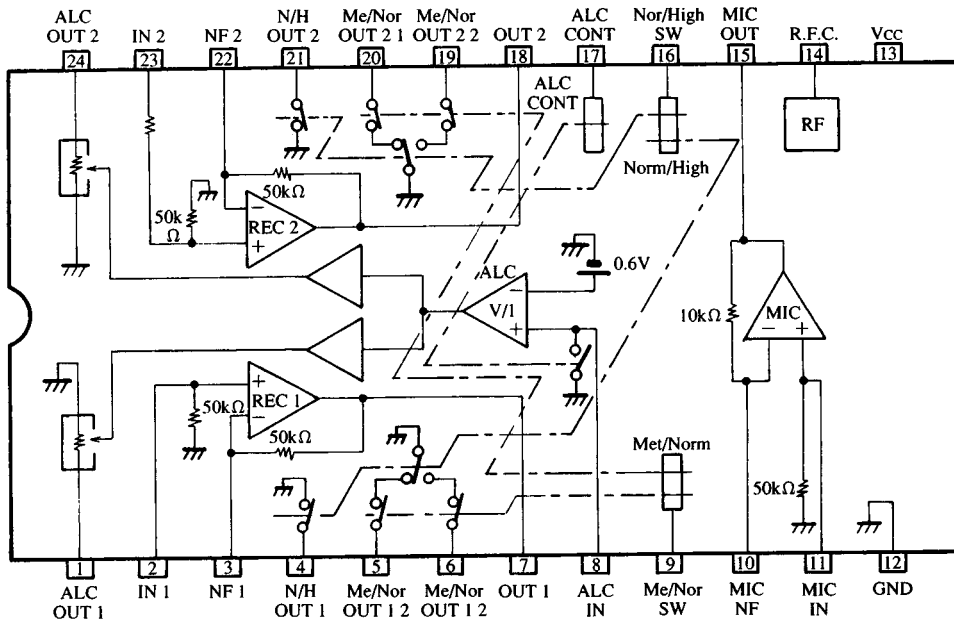
**Operating Characteristics at  $T_a = 25^\circ\text{C}$ ,  $V_{CC} = 6.0\text{ V}$ ,  $R_L = 10\text{ k}\Omega$ ,  $f = 1\text{ kHz}$ ,  $0\text{ dB} = 0.775\text{ V}$**

Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	$I_{CCO}$	Me/Nor, Nor/High SW OFF	5	7.5	12	mA
Quiescent current	$I_{CCS}$	Me/Nor, Nor/High SW ON	12	16	20	mA
<b>[REC Amp]</b>						
Voltage gain (Open)	$V_{G_O1}$		75	85		dB
Voltage gain (Closed)	$V_{G1}$	$V_O = 0\text{ dBm}$	42.5	44.5	46.0	dB
Total harmonic distortion	THD 1	$V_O = 0.4\text{ V}$		0.1	0.7	%
Maximum output voltage	$V_O\text{ max}$	THD = 1%	0.7	1.0		V
Equivalent input noise voltage	$V_{N_I1}$	$R_g = 2.2\text{ k}\Omega$ , B.P.F = 20 Hz to 20 kHz		1.1	1.7	$\mu\text{V}$
Input resistance	$R_{I1}$		40	50	60	$\text{k}\Omega$
Crosstalk	CT1	Between REC amps	50	60		dB
	CT2	REC amp→Microphone amp	50	75		dB
Channel balance	$V_{BL}$	$V_{IN} = -50\text{ dBm}$		0	2	dB
<b>[Microphone Amp]</b>						
Voltage gain (Open)	$V_{G_O2}$		60	70		dB
Voltage gain (Closed)	$V_{G2}$	$V_O = 0\text{ dBm}$	23	25	27	dB
Total harmonic distortion	THD2	$V_O = 0.4\text{ V}$		0.05	0.5	%
Maximum output voltage	$V_O\text{ max}$	THD = 1%	0.8	1.1		V
Equivalent input noise voltage	$V_{N_I2}$	$R_g = 2.2\text{ k}\Omega$ , B.P.F = 20 Hz to 20 kHz		1.1	1.7	$\mu\text{V}$
Input resistance	$R_{I2}$		40	50	60	$\text{k}\Omega$
Crosstalk	CT3	Microphone amp→REC amp	45	60		dB
<b>[ALC]</b>						
ALC range	$ALC_W$	Input range when output distortion becomes 1% after ALC begins to be applied.	40	45		dB
ALC balance	$ALC_B$	Output difference between CH1 and CH2		0	2	dB
ALC distortion	$ALC_{THD}$	$V_{IN} = -40\text{ dBm}$		0.15	0.8	%
ALC output voltage	$ALC_{V_O}$	$V_{IN} = -40\text{ dBm}$	0.33	0.42	0.53	V
Crosstalk	CT4	Between REC amps	45	60		dB
Crosstalk	CT5	REC amp→Microphone amp	50	70		dB
ALC ON-state voltage	$ALC_{ON}$	Voltage on pin 17			1.0	V
ALC OFF-state voltage	$ALC_{OFF}$	Voltage on pin 17	1.5			V
<b>[Switch]</b>						
ON-state resistance	$R_{ON}$			30	70	$\Omega$
DC feedback resistance	$R_{F1}$		40	50	60	$\text{k}\Omega$



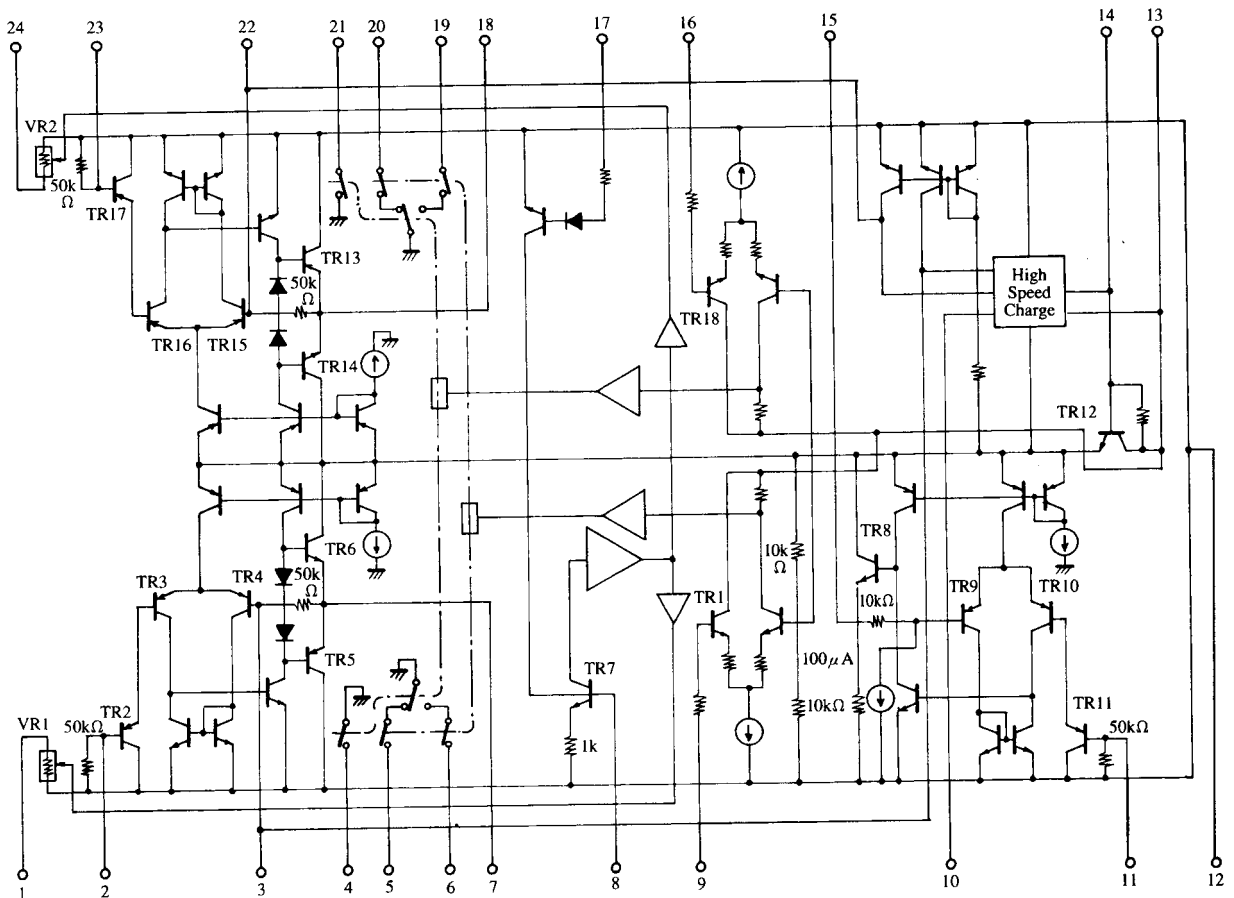
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## Equivalent Circuit Block Diagram

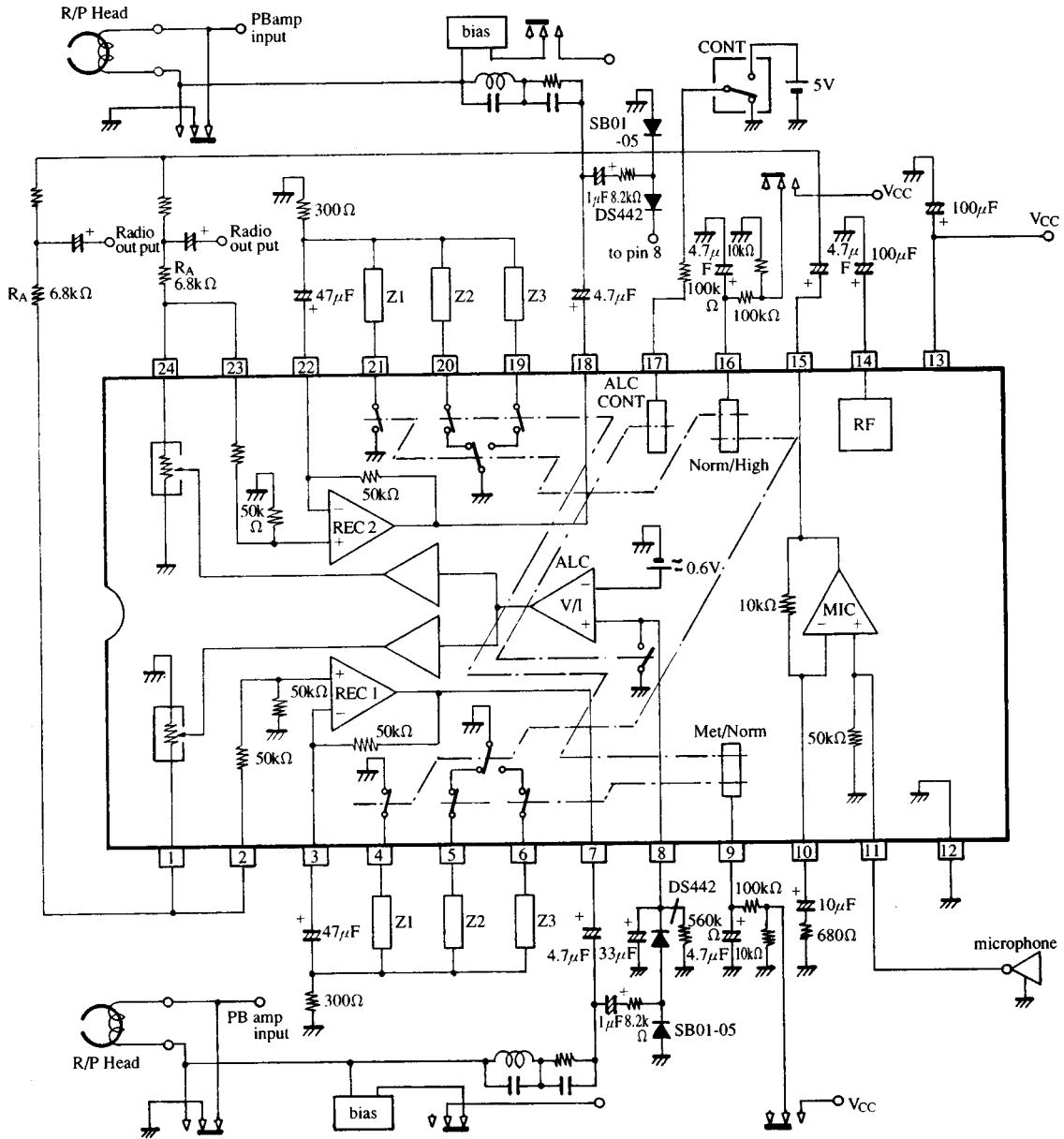


Top view

## Equivalent Circuit



Sample Application Circuit

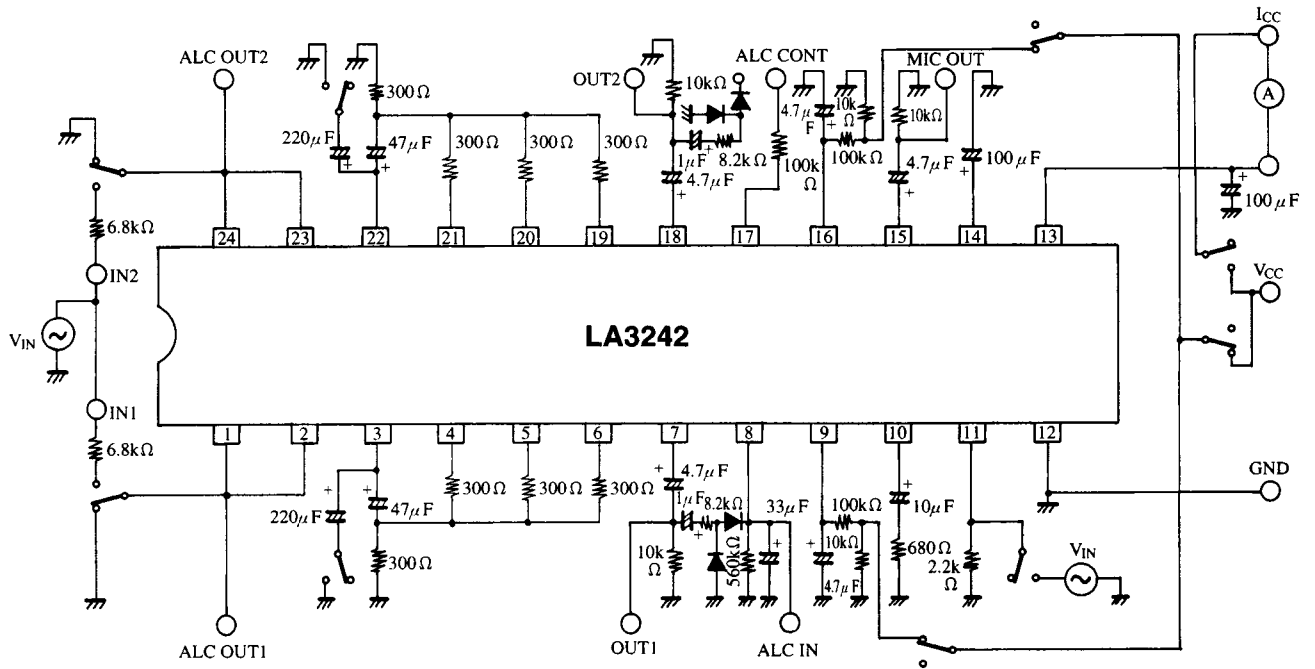


Note:

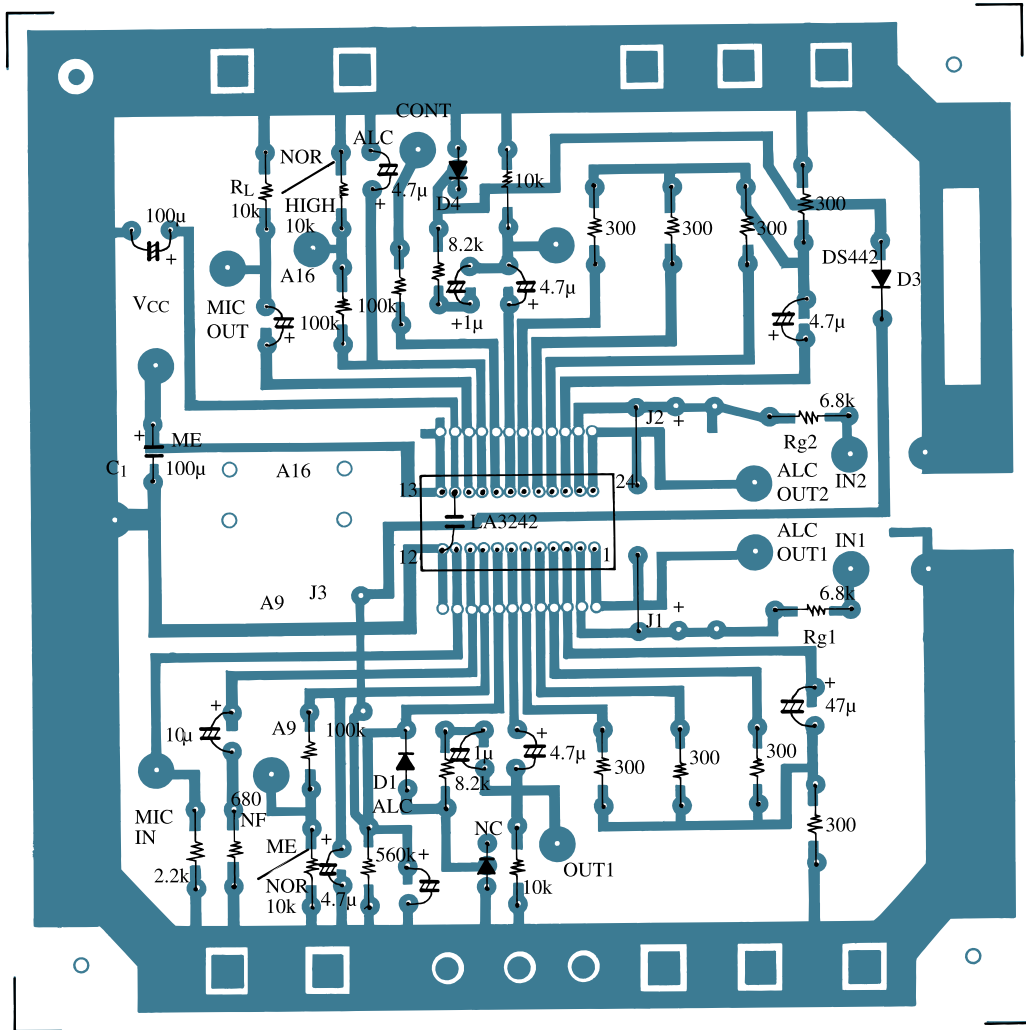
1. The electronic select switching level is approximately  $(V_{CC} - 0.9)/2$ .
2. REC amplifier NF parameters Z1 through Z3 should be selected to accommodate the recording level and frequency response that will be required in metal/normal tape and normal/higher speed modes.
3. Z1 through Z3 may be configured with coil "L", capacitor "C", and resistor "R".
4. When electronic control pins 9 and 16 are at the GND level, each electronic switch is turned ON.
5. When ALC ON/OFF control pin 17 is at 1 V or less/1.5 V or greater, the ALC is turned ON/OFF, respectively ( $T_a = 25^\circ\text{C}$ ).
6. The ALC width depends on external resistor  $R_A$ .

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## Test Circuit



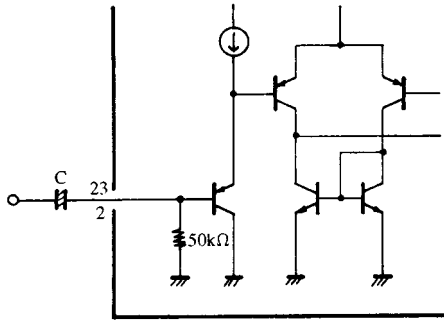
## Sample Printed Circuit Pattern (Cu-foiled area)



130 x 130 mm<sup>2</sup>  
Unit (resistance: Ω, capacitance: F)

IC usage Notes

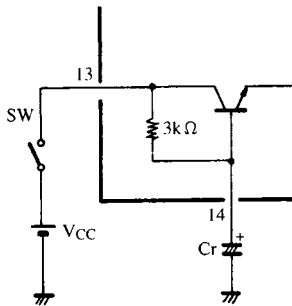
- (1) The base of a PNP transistor is connected to input pins 2 and 23.



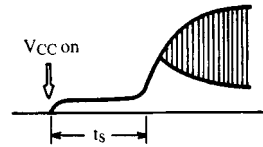
When a voltage is applied to input pins 2 and 23 externally, connect a capacitor to the input pins. The recommended value of capacitor C is 0.1 μF to 10 μF. DC voltage  $V_{INDC}$  with input pins 2 and 23 open is 50 mV max ( $V_{INDC} = 20$  mV typ).

For the relation between supply voltage  $V_{CC}$  and  $V_{INDC}$ , refer to the  $V_{CC} - V_{INDC}$  characteristic.

- (2) Output waveform starting time (Refer to Data  $t_s - C_T$ .)

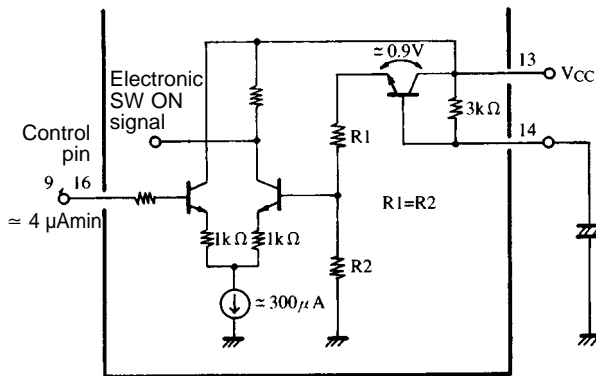


Rise waveform at pin 7 or 18



When supply voltage  $V_{CC}$  is switched ON, the amplifier output (pins 7 and 18) will rise. Output waveform ON time  $t_s$  can be varied by capacitor  $C_r$  connected to pin 12. The minimum value of  $C_r$  is 33 μF. If the value of  $C_r$  is made less than 33 μF, more pop noise will occur and the ripple rejection will worsen at the time supply voltage  $V_{CC}$  is switched ON. ( $t_s = 0.7$  s. typ at  $C_r = 100$  μF)

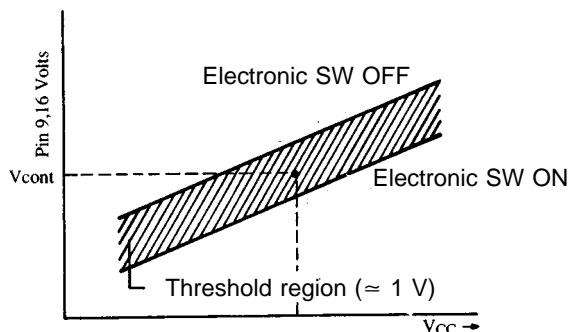
- (3) Electronic switch control circuit



The control circuit for control pins 9 and 16 is configured as shown left.

Control level  $V_{CONT}$  of the control circuit is given by:  
 $V_{CONT} = 1/2 \times (V_{CC} - 0.9)$  [V]

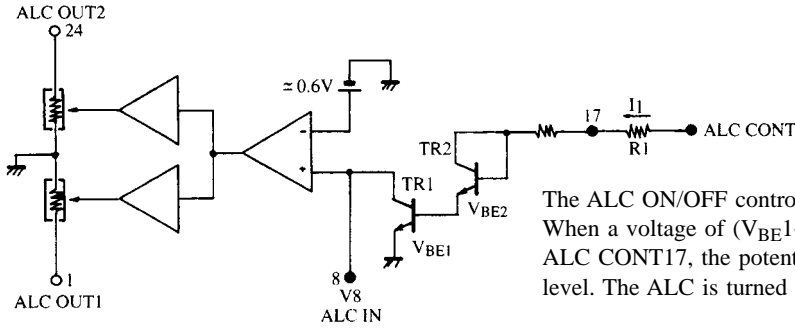
- (4) Relation between control voltage to turn ON/OFF electronic switch and supply voltage (Refer to Data  $V_{CONT} - V_{CC}$ .)



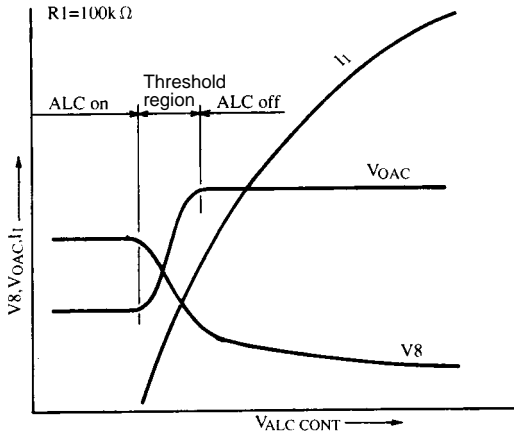
The control level at electronic switch CONT pin 9 and 16 is fixed by supply voltage  $V_{CC}$ . The threshold region has a range of approximately 1 V. The middle point of threshold region at a given value of supply voltage  $V_{CC}$  is represented by approximately  $1/2 \times (V_{CC} - 0.9)$  V.

The electronic switch can be turned ON/OFF by applying a voltage of the middle point voltage  $\pm 0.5$  V or more/less, respectively, to electronic switch CONT pins 9 and 16.

(5) ALC control pin and ON/OFF level

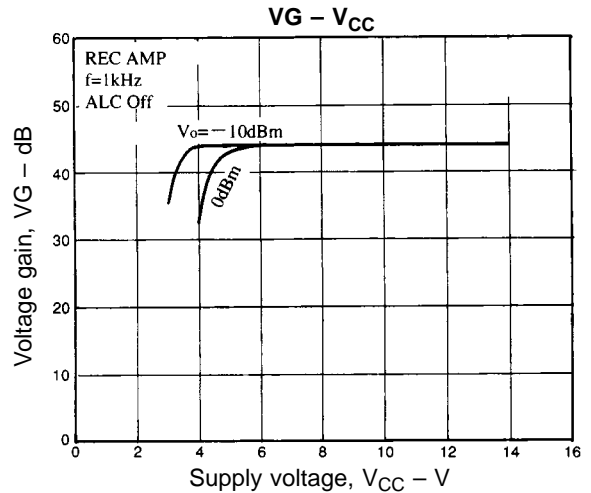
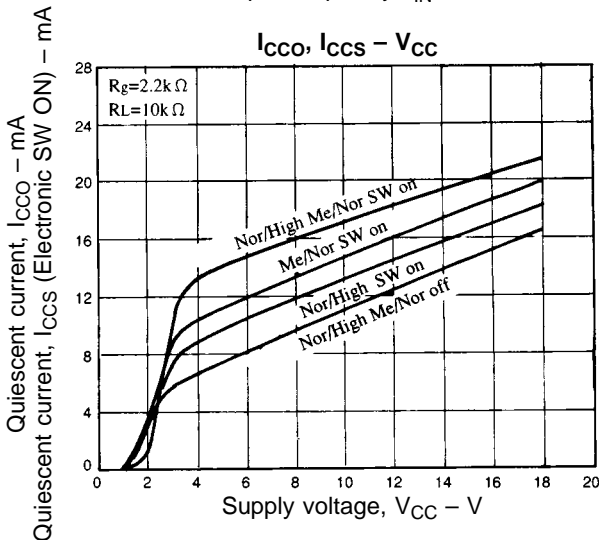
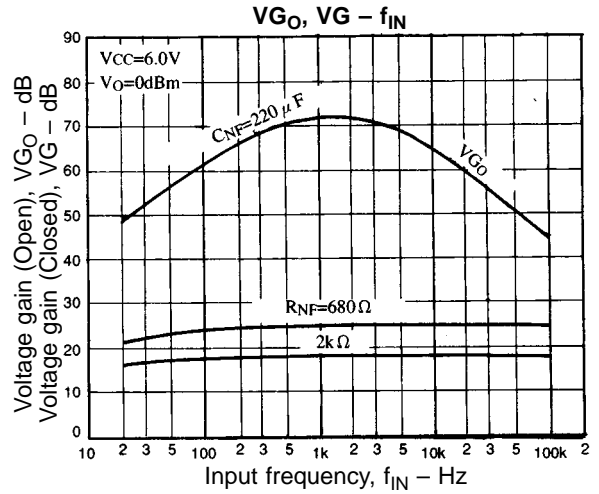
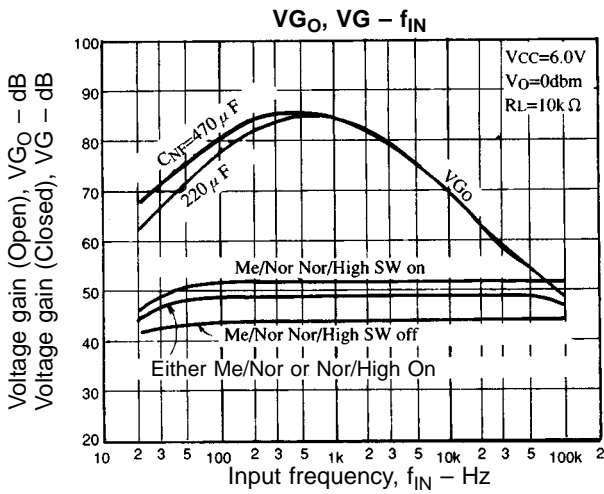


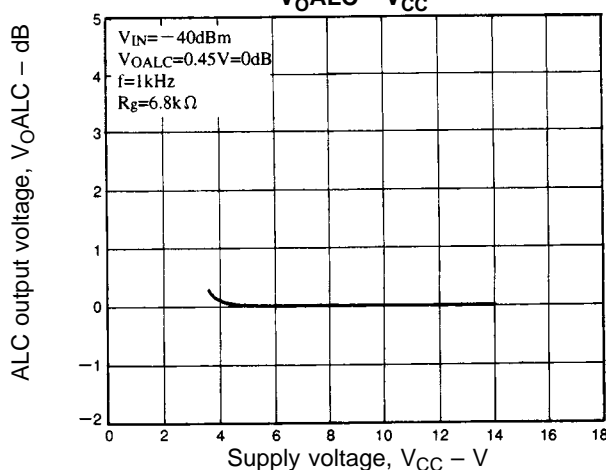
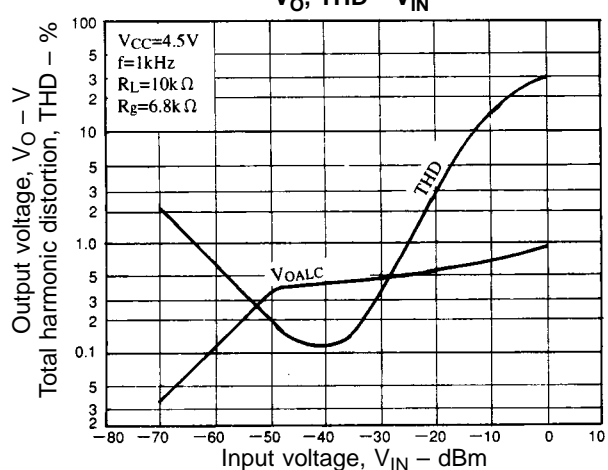
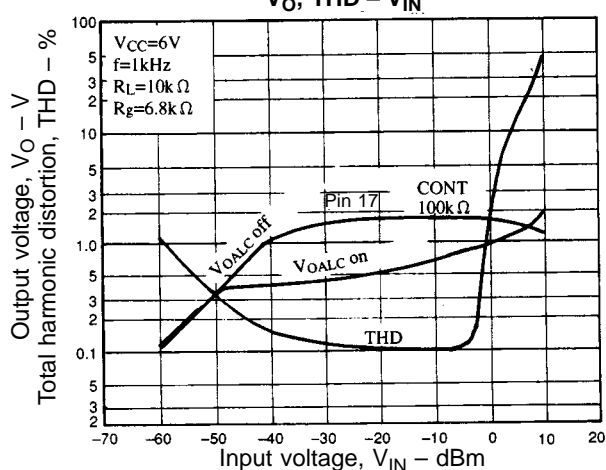
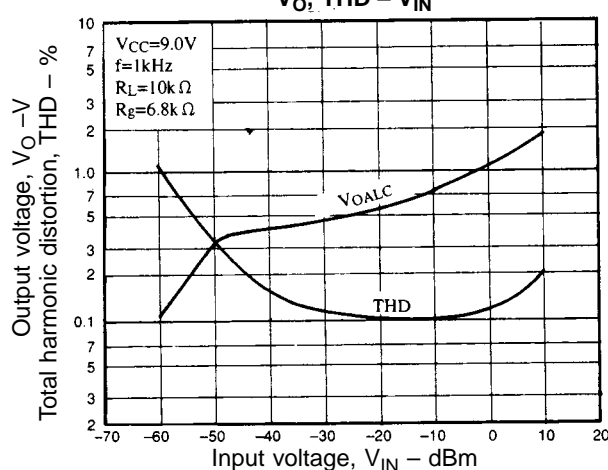
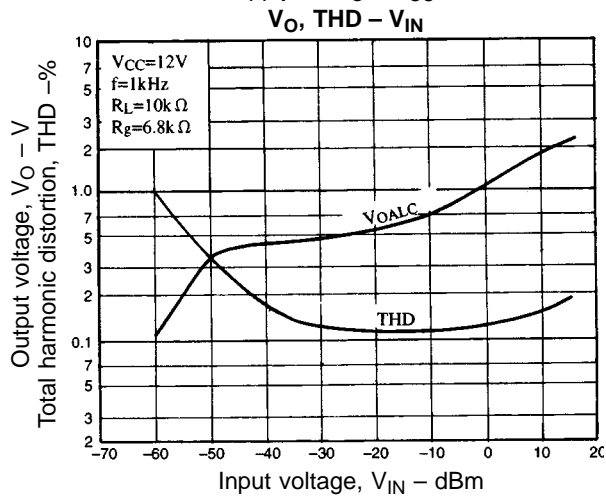
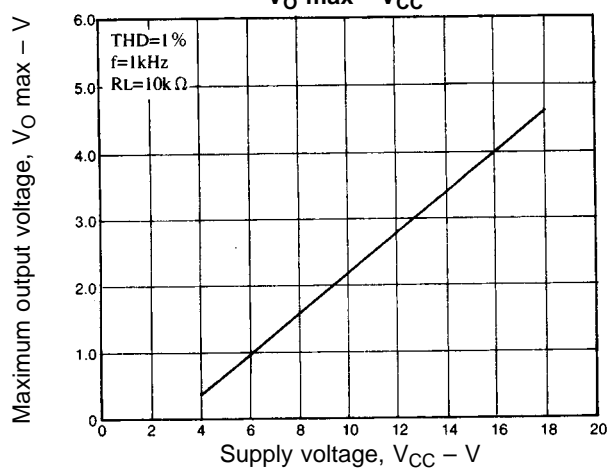
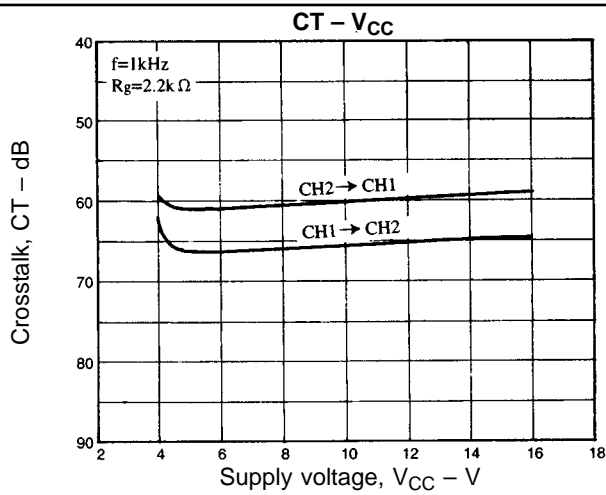
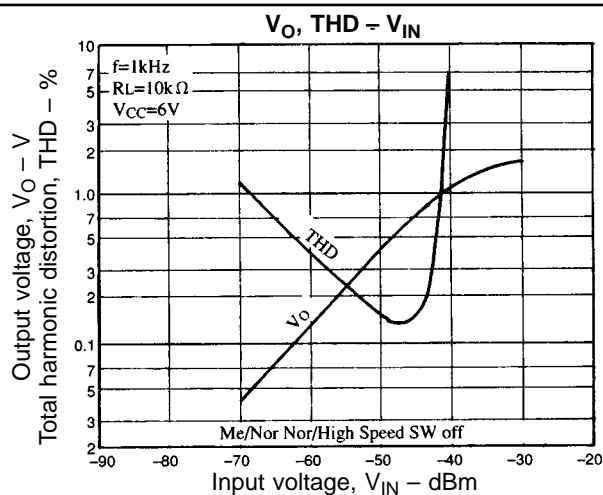
The ALC ON/OFF control circuit is configured as shown left. When a voltage of  $(V_{BE1} + V_{BE2}) = 1.5$  V or greater is applied to the ALC CONT17, the potential on the ALC IN (pin 8) drops to GND level. The ALC is turned OFF (ALC function release).



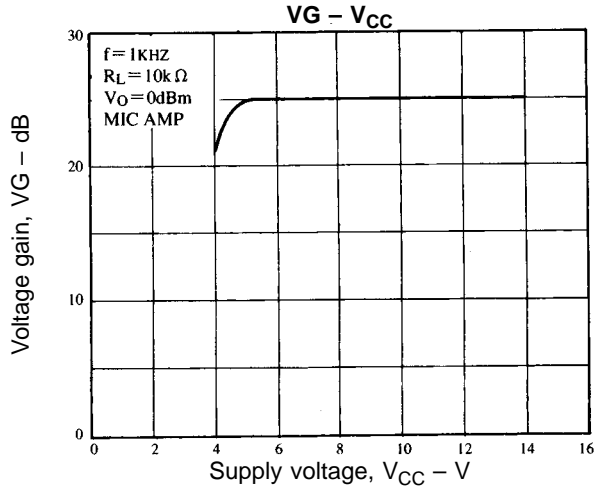
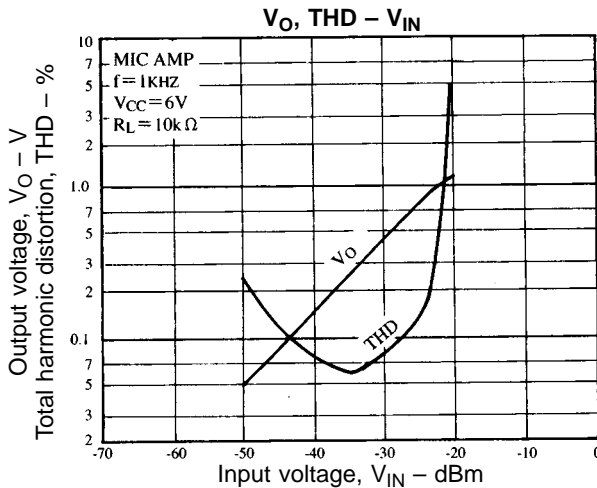
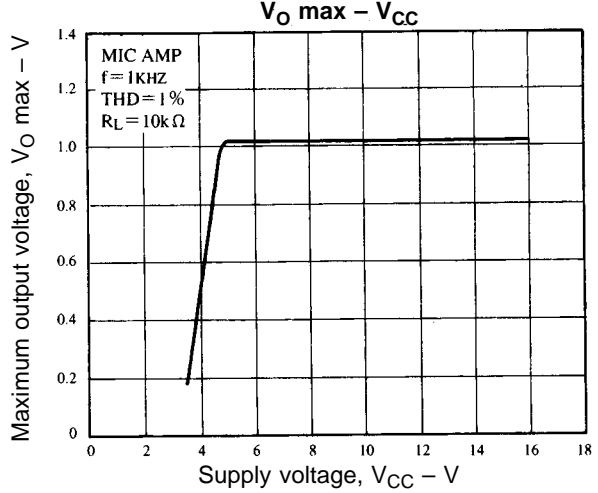
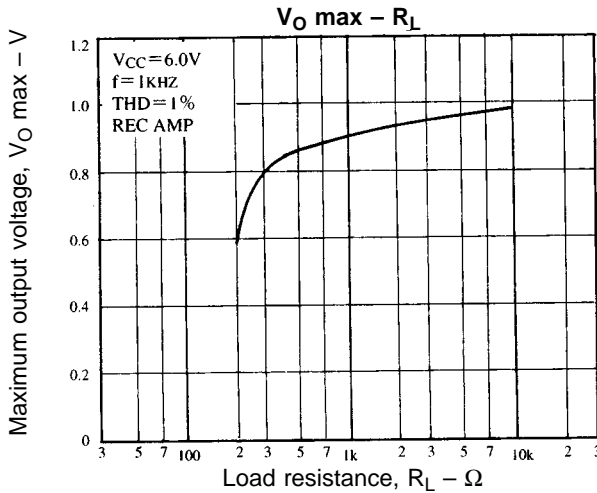
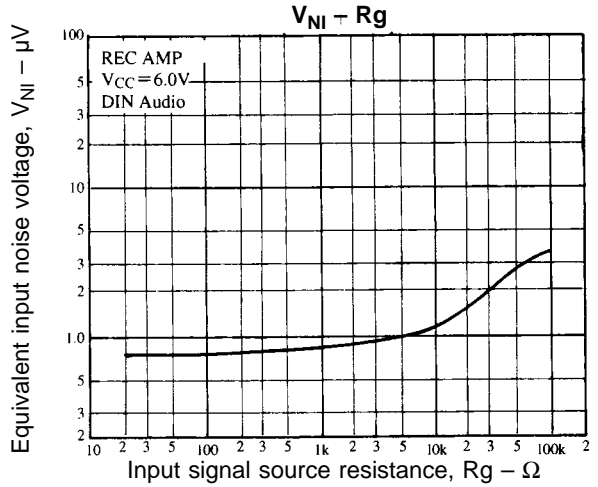
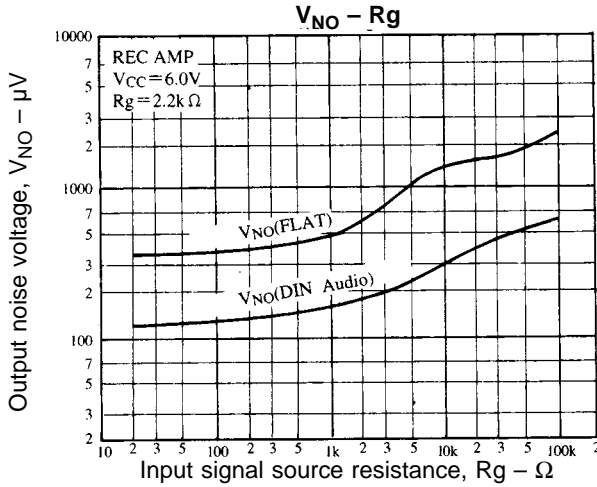
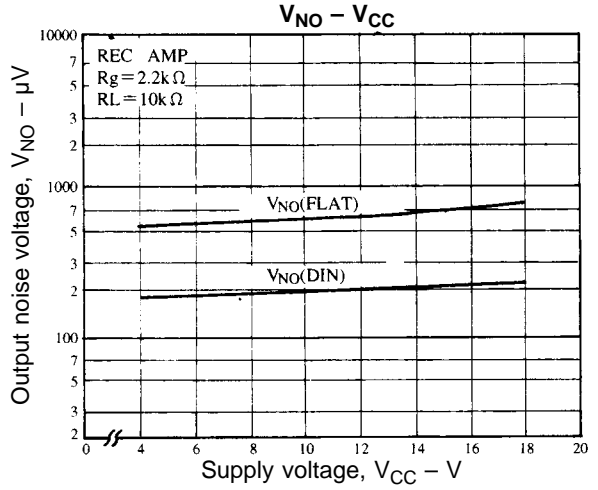
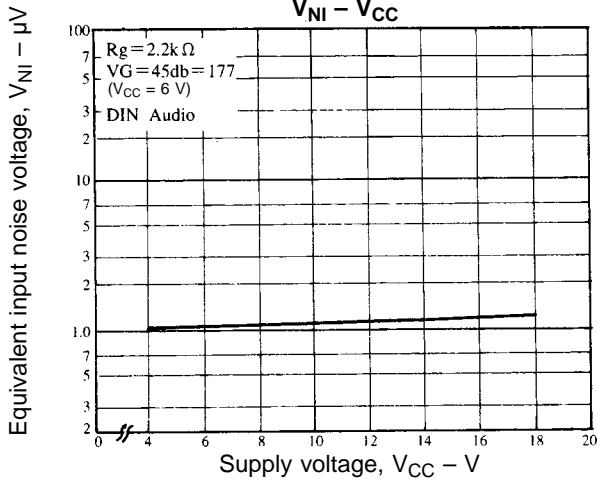
REC amplifier output  $V_{OAC}$  is controlled by the ALC CONT voltage and the threshold region has a range of approximately 0.5 V. The ALC CONT voltage is set to 1.0 V or less/1.5 V or greater to turn ON/OFF the ALC, respectively.

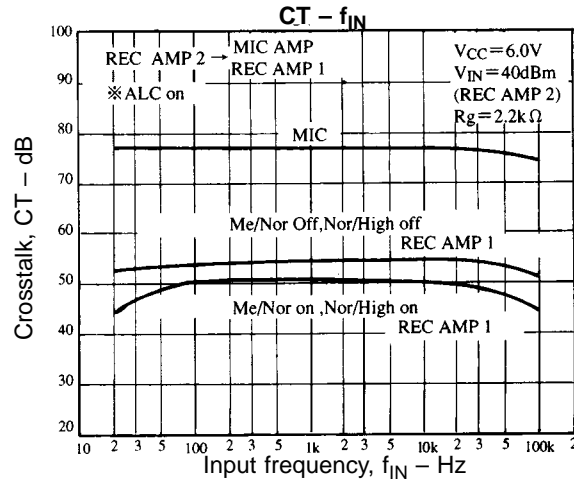
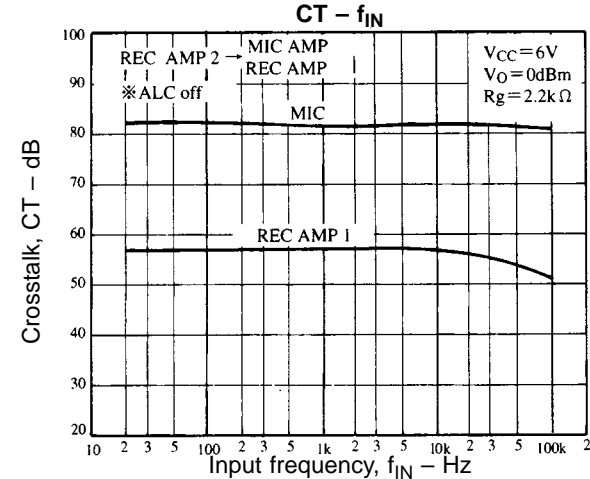
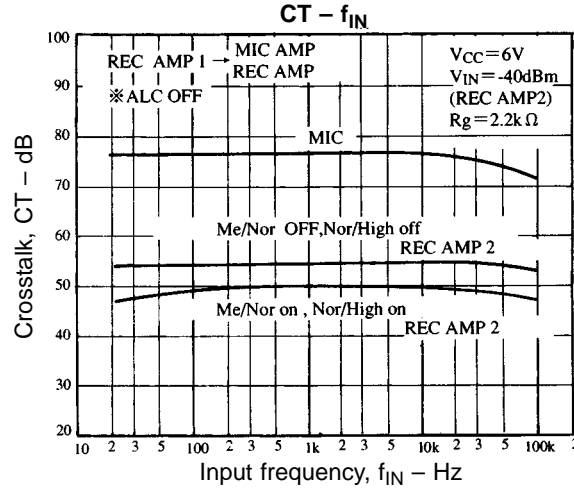
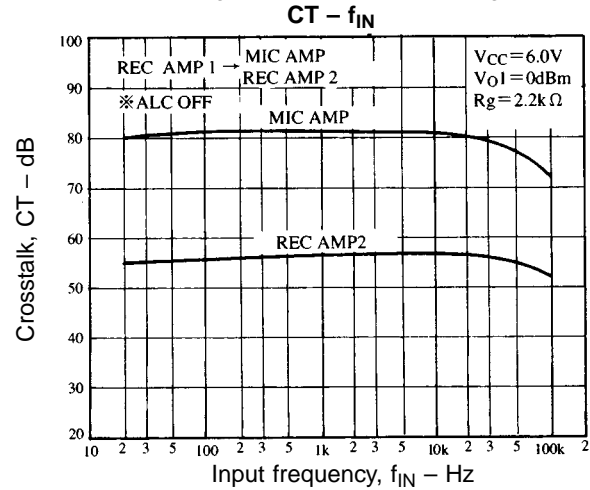
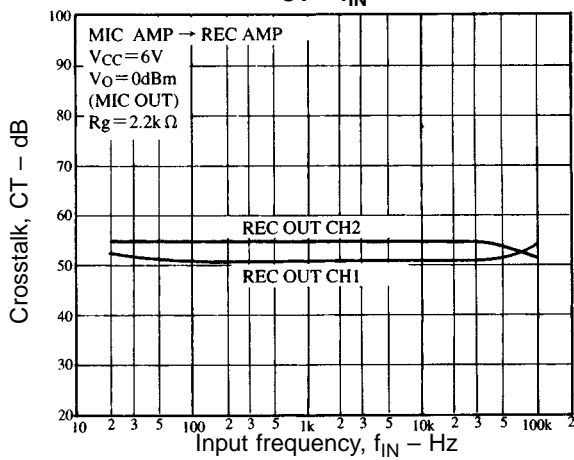
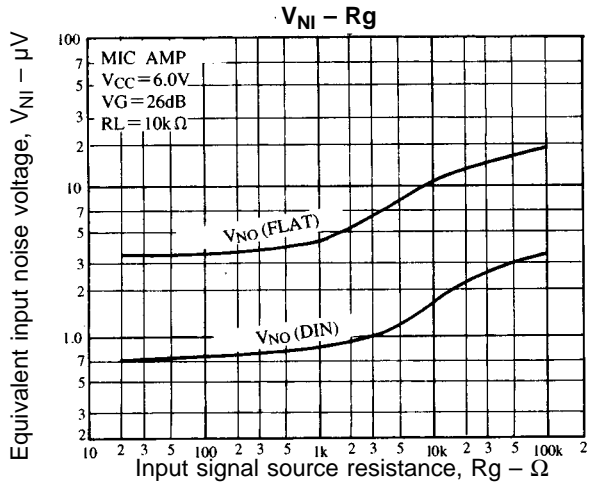
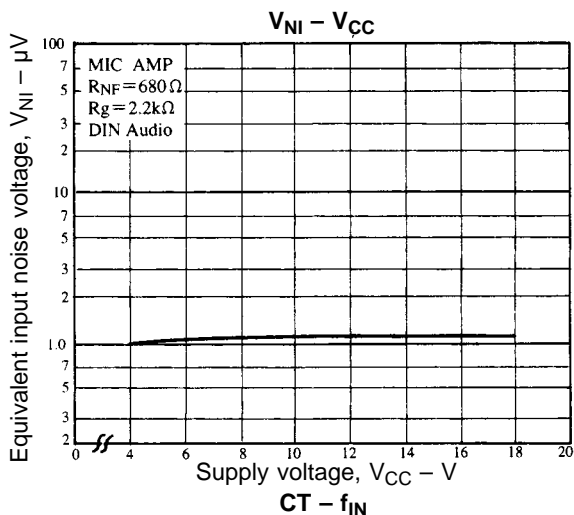
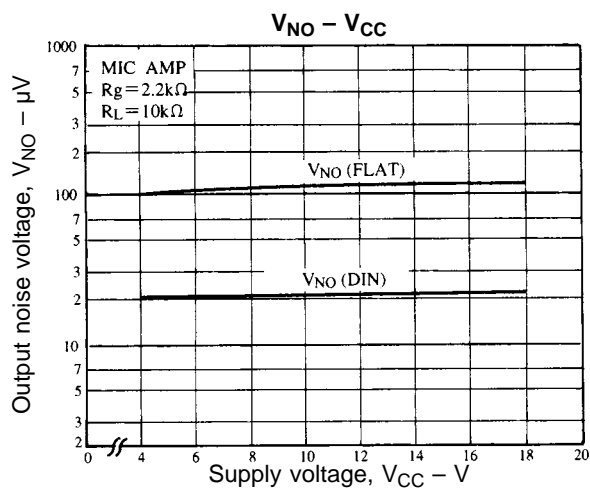
(Refer to Data  $V_{OAC}$ , V8,  $I_1 - V_{ALC CONT}$ .)

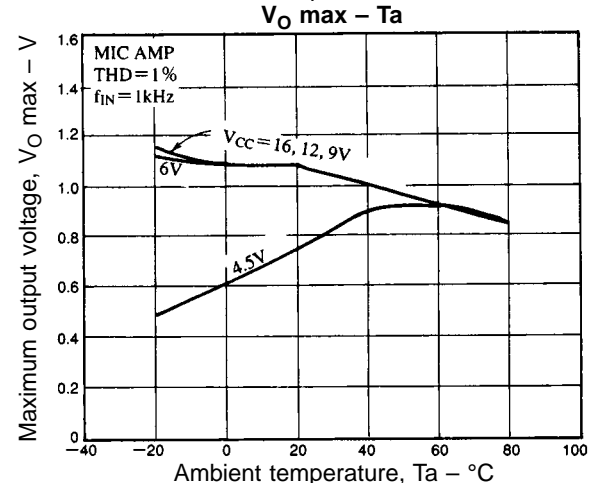
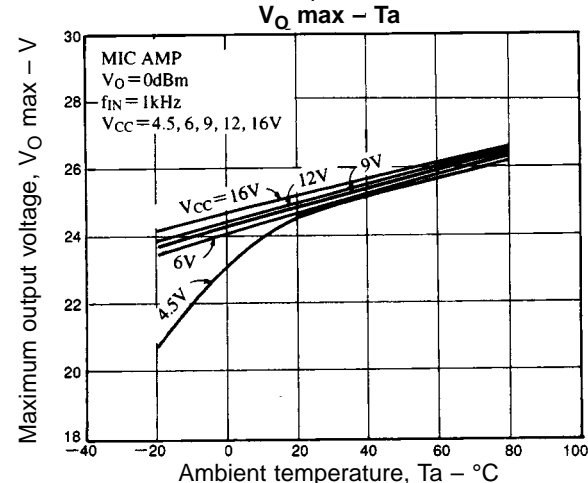
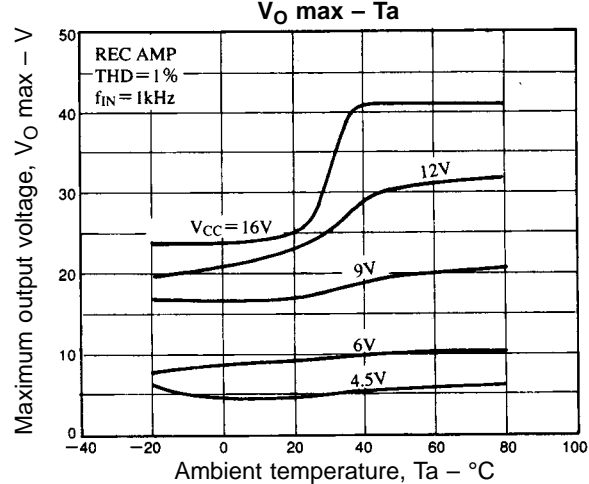
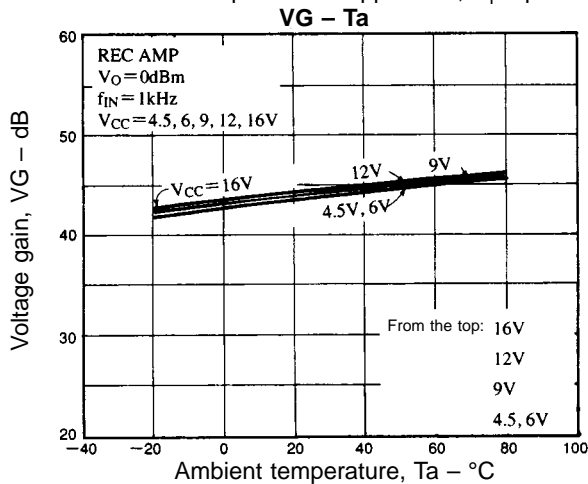
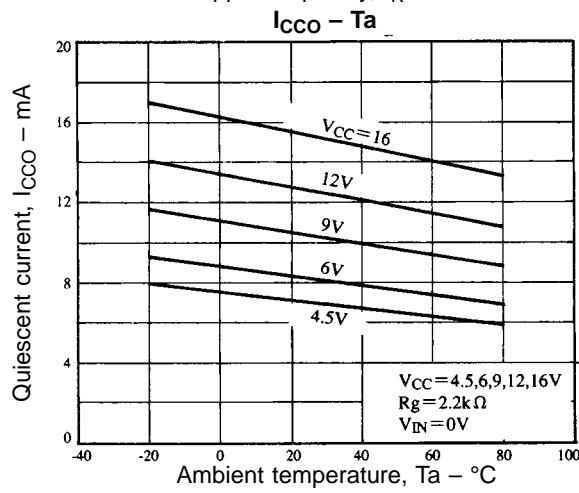
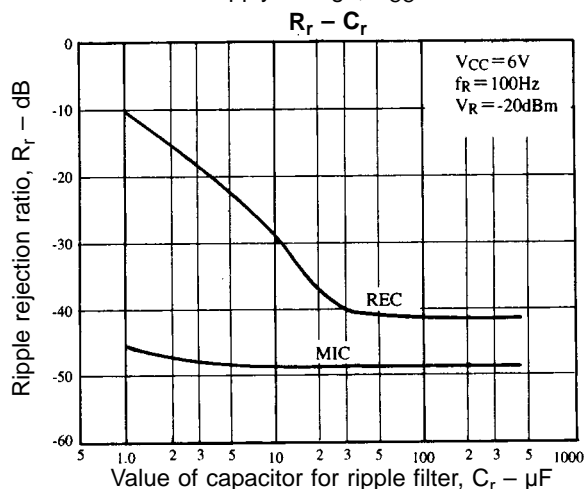
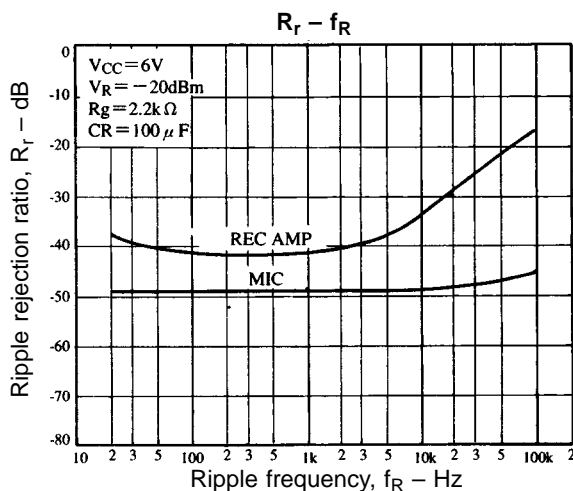
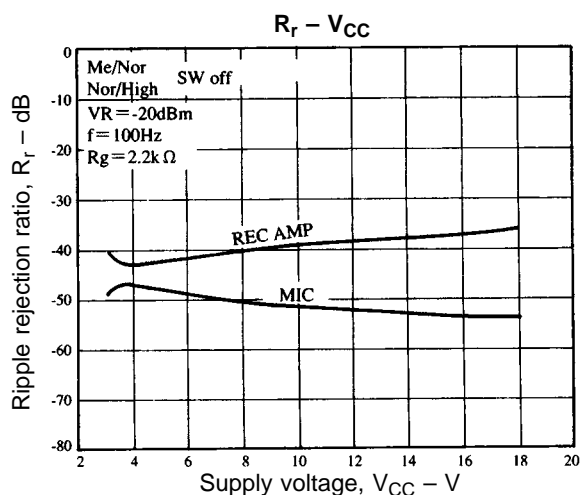


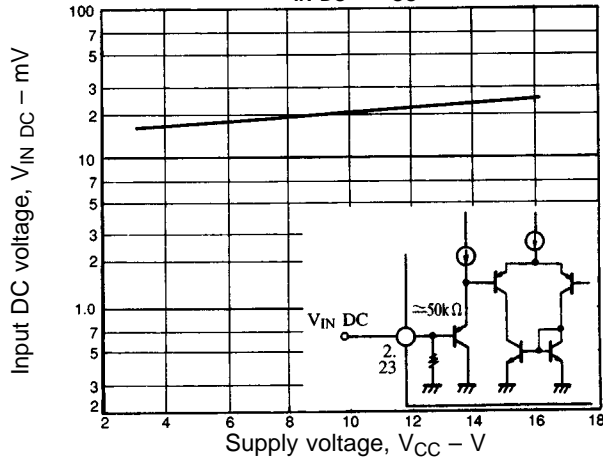
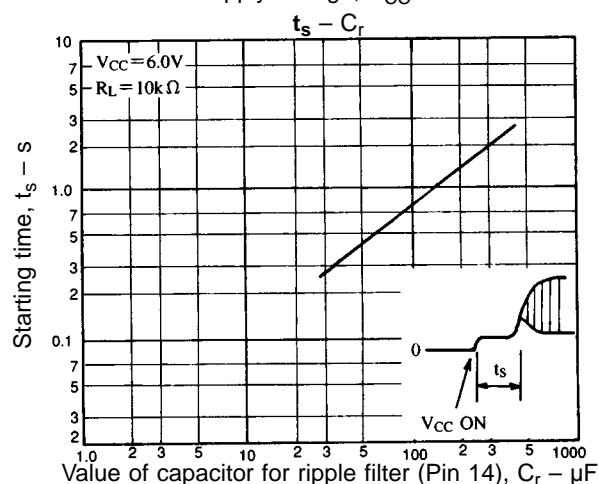
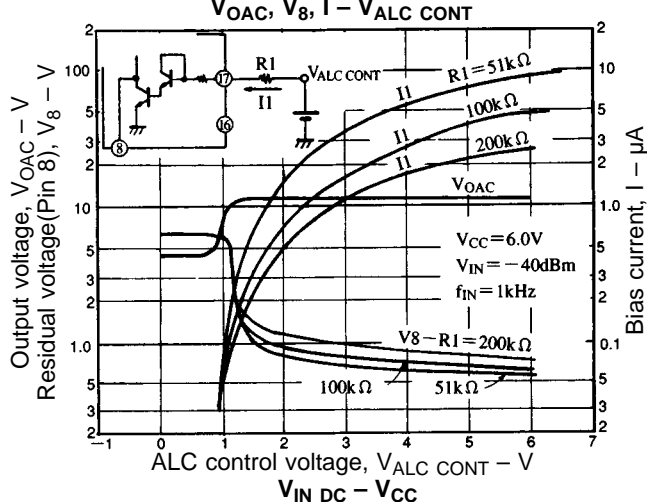
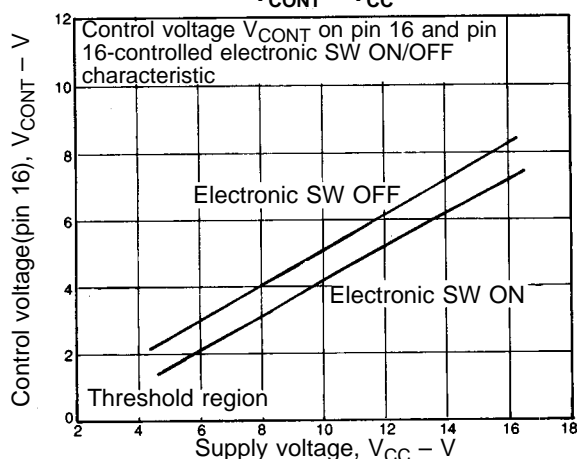
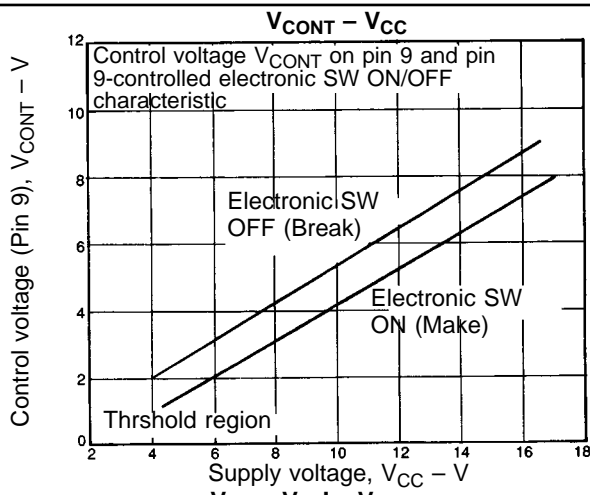
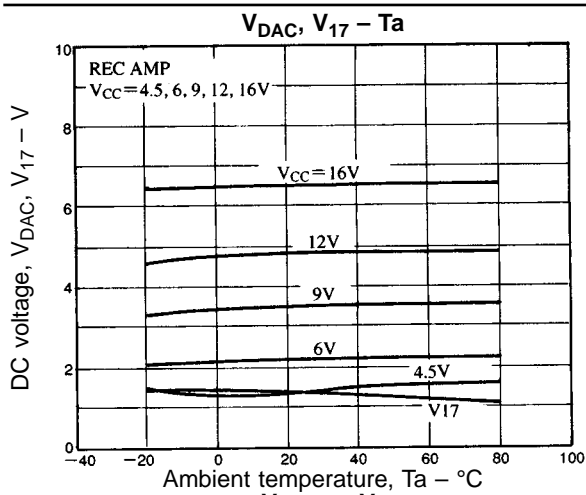












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