



LA3241

Preamplifier for Compact Cassette Recording-Only Use

Overview

The LA3241 is a preamp IC for compact cassette player recording-only use. The distinctive feature of the LA3241 is that it contains mechanical switches which have been so far connected externally as peripheral parts.

Applications

- Radio-cassette tape recorder/tape deck-use stereo compact cassette player.

Features

- Wide ALC : $ALC_W=60\text{dB}$ typ.
- 2-step ALC level : $ALC_{V_0}=0.42\text{V}, 0.65\text{V}$.
- On-chip electronic select switches permitting selection of normal/metal tape and normal/higher speed mode recording equalizer.
- On-chip mike amp : Gain 25dB typ fixed.
- Low-voltage operaton because the Schottky barrier diode is used for ALC rectifier diode.
- Wide operating voltage : $V_{CC}=4.5$ to 14.0V.

Functions

- Recording preamp ×2
- Mike amp ×1
- ALC ×1
- Electronic switch ×6

Specifications

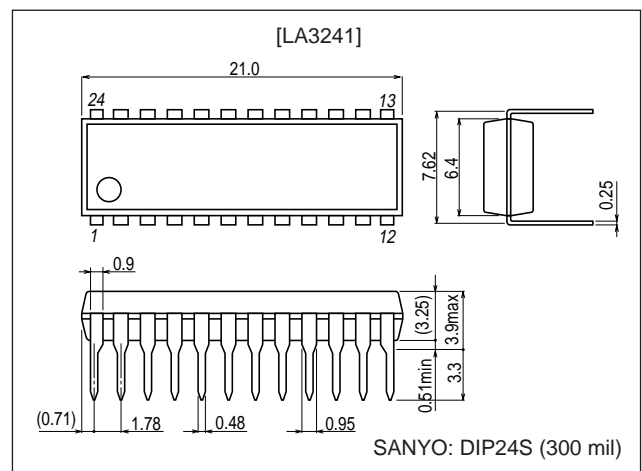
Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Supply Voltage	V_{CC} max		16	V
Allowable Power Dissipation	P_d max		720	mW
Operating Temperature	T_{opr}		-20 to +75	$^\circ\text{C}$
Storage Temperature	T_{stg}		-40 to +125	$^\circ\text{C}$

Package Dimensions

unit: mm

3067A-DIP24S



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LA3241

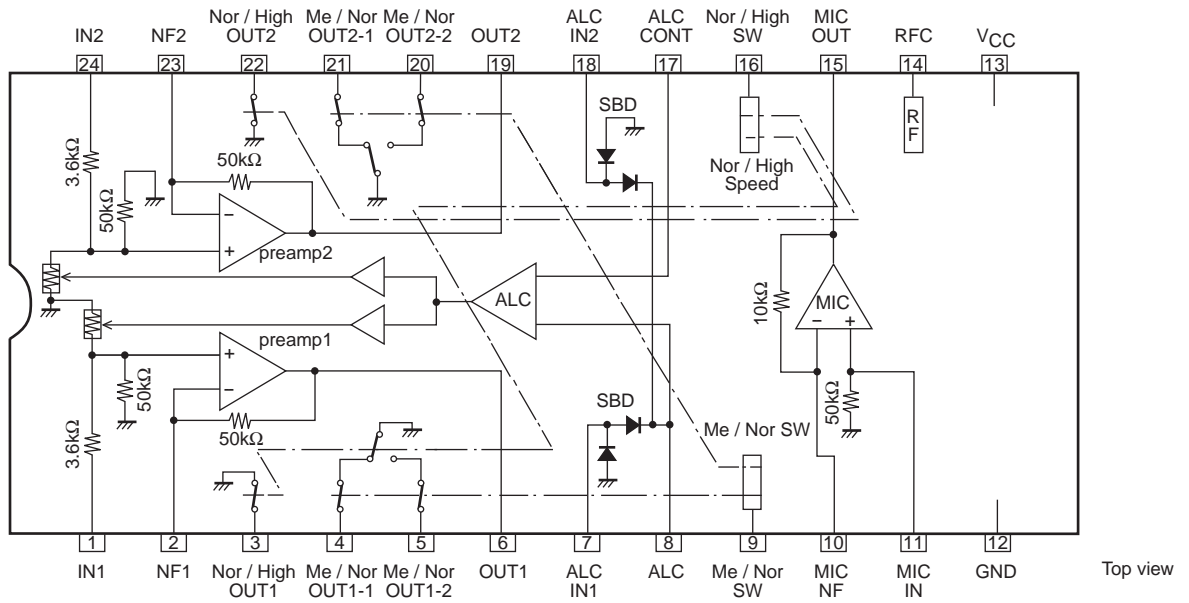
Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Recommended Supply Voltage	V _{CC}		6	V
Operating Voltage range	V _{CC op}		4.5 to 14.0	V

Operating Characteristics at Ta = 25°C, V_{CC} = 6 V, R_L = 10kΩ, f = 1 kHz, 0dB = 0.775 V

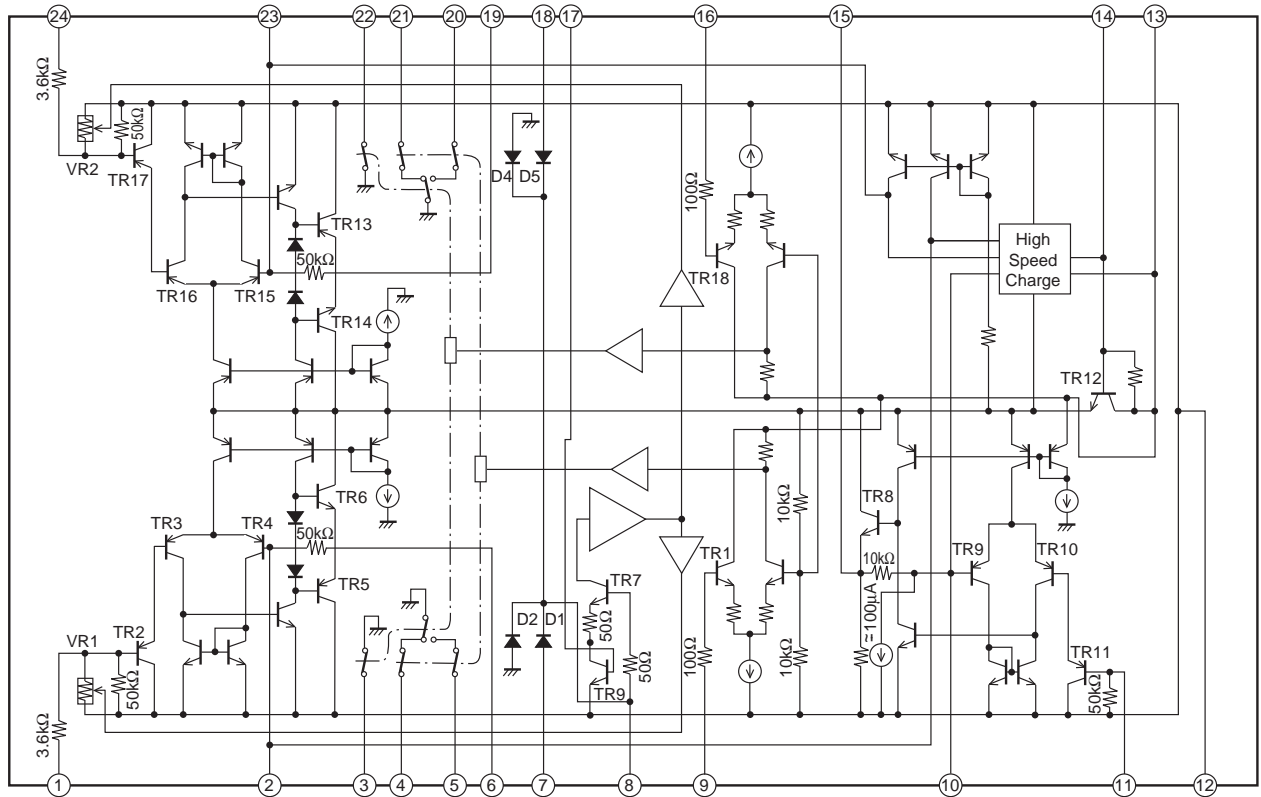
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Quiescent Current	I _{CC0}	Me/Nor, Nor/High SW off	5	7.5	12	mA
Quiescent Current	I _{CCS}	Me/Nor, Nor/High SW on	10	15	20	mA
[REC Amp]						
Voltage Gain (Open)	VG _{O1}		75	85		dB
Voltage Gain (Closed)	VG1	VO=0dBm	41.5	43.5	46.0	dB
Total Harmonic Distortion	THD1	VO=0.4V		0.1	0.7	%
Maximum Output Voltage	V _{O max}	THD=1%	0.7	1.0		V
Equivalent Input Noise Voltage	V _{NI1}	Rg=2.2kΩ, BPF : 20Hz to 20kHz		1.2	1.8	μV
Input Resistance	Ri1		40	50	60	kΩ
Crosstalk	CT1	Between REC amps	50	70		dB
	CT2	REC amp → Mike amp	60	80		dB
Channel Balance	CB	Vi=-50dBm		0	2	dB
[Mike Amp]						
Voltage Gain	VG _{O2}		40	50		dB
Voltage Gain	VG2	VO=0dBm	23	25	27	dB
Total Harmonic Distortion	THD2	VO=0.4V		0.1	0.7	V
Maximum Output Voltage	VO2	THD=1%	0.8	1.1		V
Equivalent Input Noise Voltage	VNI2	Rg=2.2kΩ, BPF : 20Hz to 20kHz		1.2	1.7	μV
Input Resistance	Ri2		40	50	60	kΩ
Crosstalk	CT3	Mike amp → REC amp	45	60		dB
[ALC]						
ALC Range	ALC _W	Input range when output distortion becomes 1% after ALC begins to be applied.	45	55		dB
ALC Balance	ALC _B	Output difference between CH1 and CH2.		0	2	dB
ALC Distortion	ALC _{THD}	Vi=-40dBm		0.15	0.80	%
ALC Output Voltage	ALC _{V0}	Vi=-40dBm, pin 17 Gnd	0.37	0.46	0.57	V
		Vi=-40dBm, pin 17 open	0.6	0.7	0.85	V
Crosstalk	CT4	Between REC amps	45	60		dB
	CT5	REC amp → Mike amp	50	70		dB
[Switch]						
On-State Resistance	R _{ON}			30	70	Ω
DC Feedback Resistance	R _{F1}		40	50	60	kΩ

Equivalent Circuit Block Diagram



ILA00602

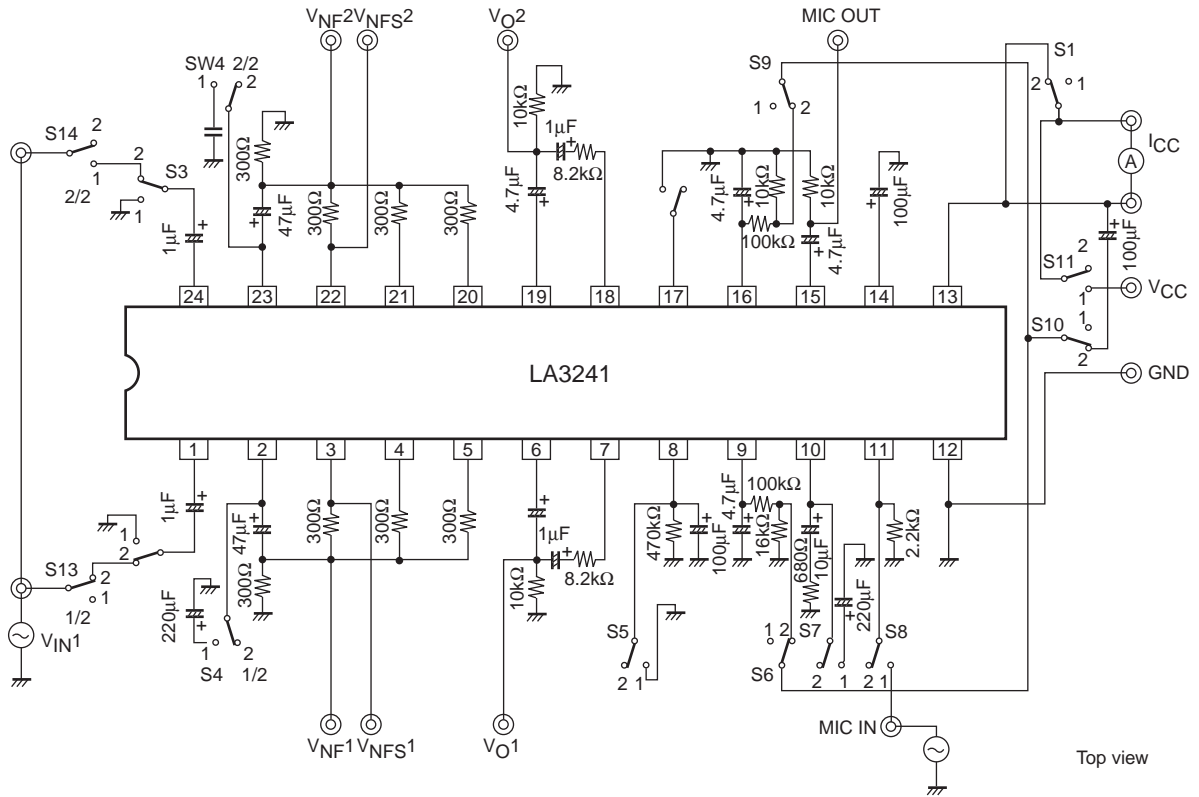
Equivalent Circuit



ILA00603

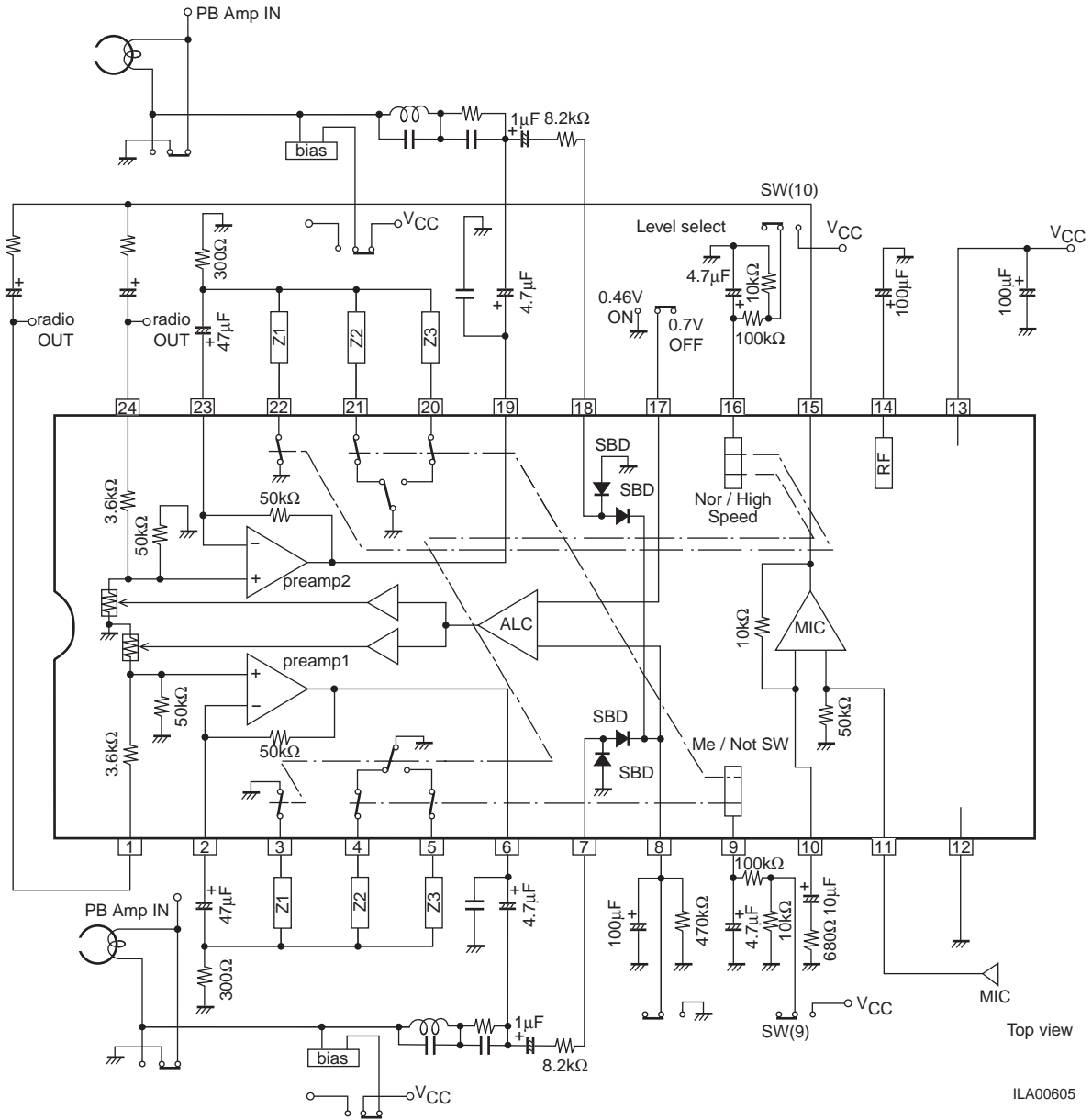
LA3241

Test Circuit Diagram



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Sample Application Circuit

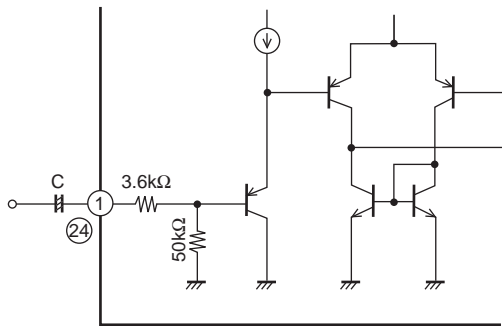


(Notes)

1. The electronic select switch 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. The electronic select switch mode illustrated above shown no V_{CC} being impressed on Me/Nor SW[®] or Nor/High SW[®].
5. The ALC level on pin 7 should not be changed over while V_{CC} is impressed.

Usage Notes

(1) Input pins 1 and 24 have internal resistors of 3.6 kΩ (typical) inserted.



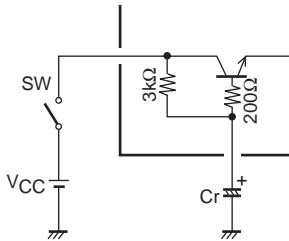
ILA00607

When applying external voltages to input pins 1 and 24, insert capacitors in the input. We recommend capacitances in the range 0.1 to 10 μF. The DC voltage $V_{IN DC}$ when pins 1 or 24 is left open will be 50 mV or lower.

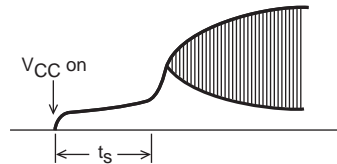
($V_{IN DC} = 20$ mV typical)

See the $V_{CC} - V_{IN DC}$ Characteristics for the supply voltage V_{CC} and $V_{IN DC}$ characteristics.

(2) Output waveform starting time



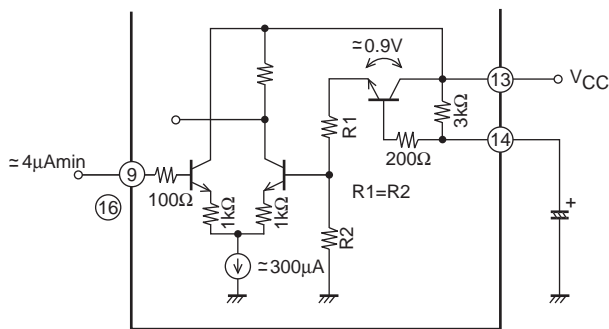
ILA00608



ILA00609

When the supply voltage V_{CC} is applied, the amplifier outputs (pins 6 and 19) start up. The output waveform turn-on time, t_s , can be modified by adding the capacitor C_r to pin 12. The minimum value for C_r is 33 μF. Values smaller than this will aggravate the power-on impulse noise and degrade the ripple rejection ratio. At $C_r = 100$ μF, t_s will be 0.7 s, typical.

(3) Electronic switch control circuit

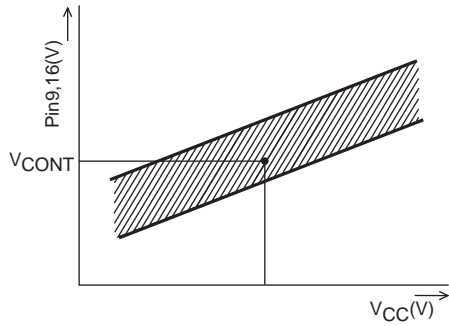


ILA00610

The control pin (pins 9 and 16) switching circuit has the structure shown in the figure. The control circuit switching level, V_{CONT} , is given by the following formula.

$$V_{CONT} = 1/2 \times (V_{CC} - 0.9) [V]$$

- (4) Relationship between the electronic switch on and off control voltage levels and the power supply voltage
(See $V_{CC} - V_{CONT}$ for the data.)



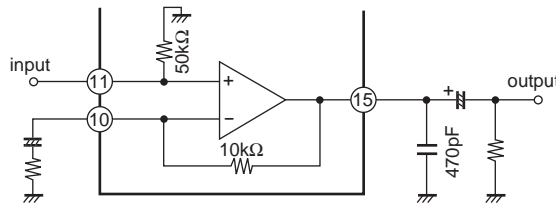
ILA00611

When the supply voltage V_{CC} is determined, the corresponding electronic switch control pin (pins 9 and 16) control levels will be determined. There is a threshold area of about 1 V. The center point of the threshold area for a given supply voltage V_{CC} will be roughly:

$$1/2 \times (V_{CC} - 0.9) \text{ [V]}$$

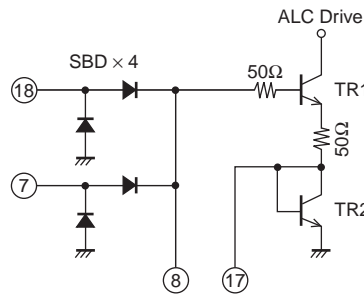
Therefore, the electronic switches can be turned on and off reliably by applying voltages that are at least ± 0.5 V of this center point voltage to the electronic switch control pins (pins 9 and 16).

- (5) Add a 470 pF capacitor between pin 15 and ground to prevent oscillation at low temperature in the microphone amplifier output.



ILA00612

- (6) The ALC switching level can be implemented with pin 7. The IC supply voltage V_{CC} must be turned off temporarily when switching to prevent ALC failure.



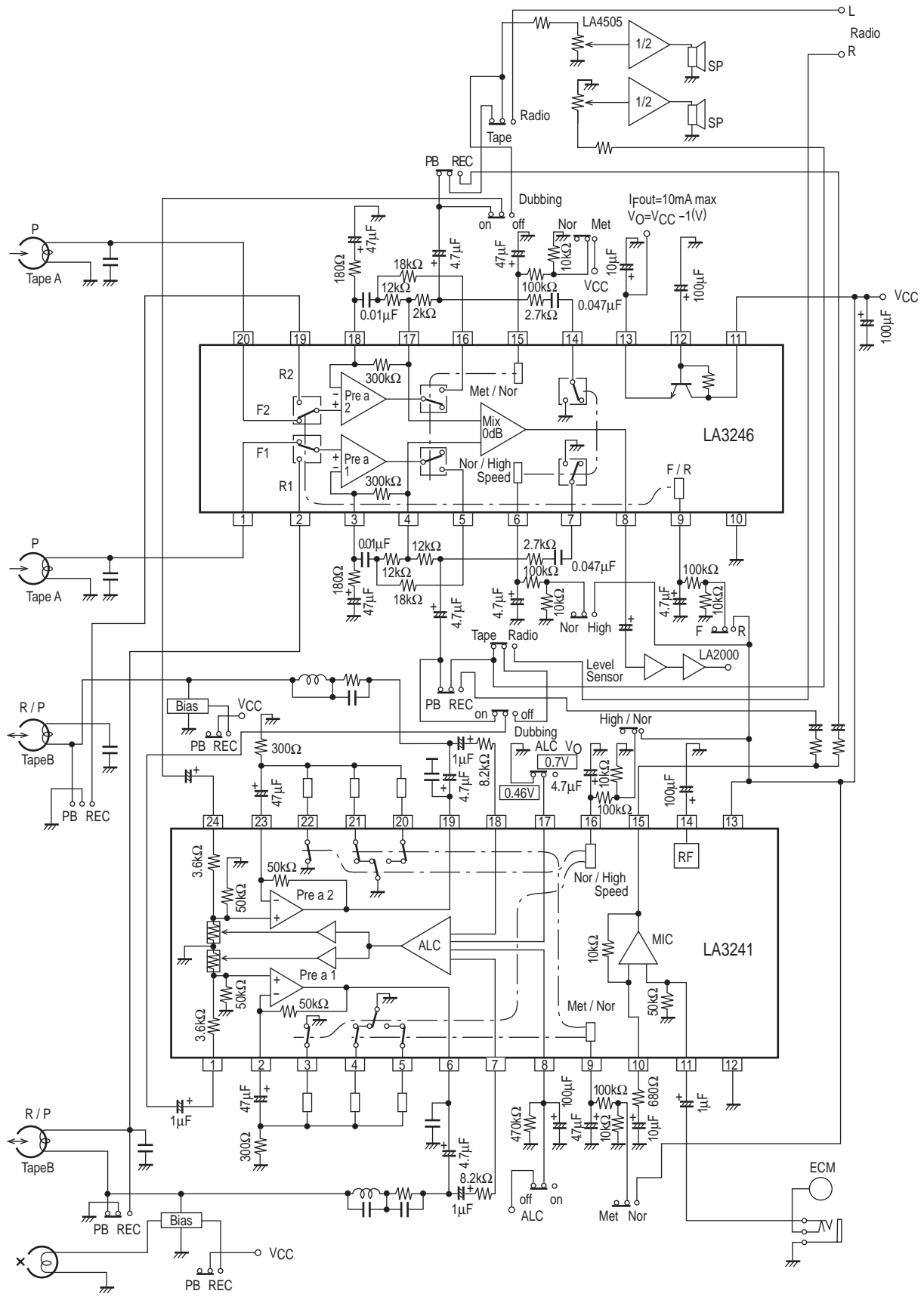
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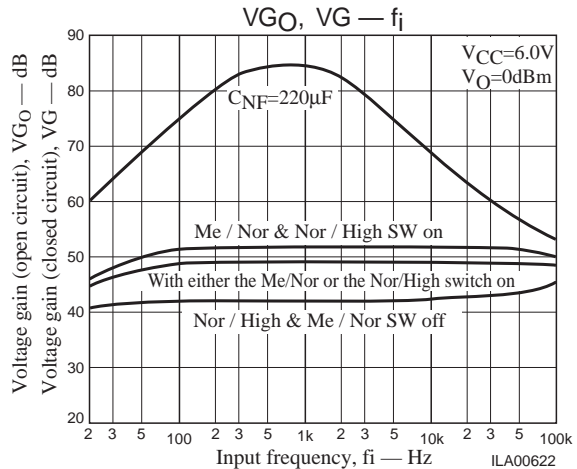
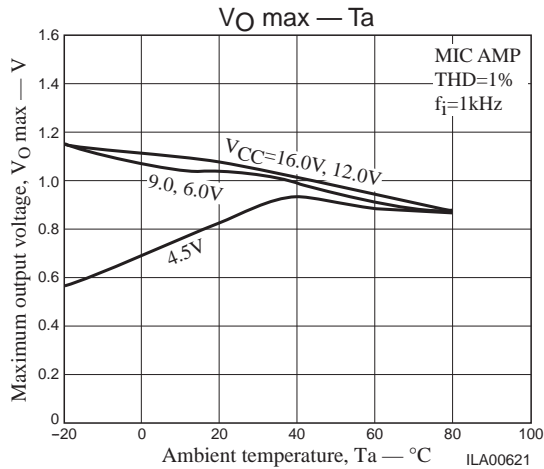
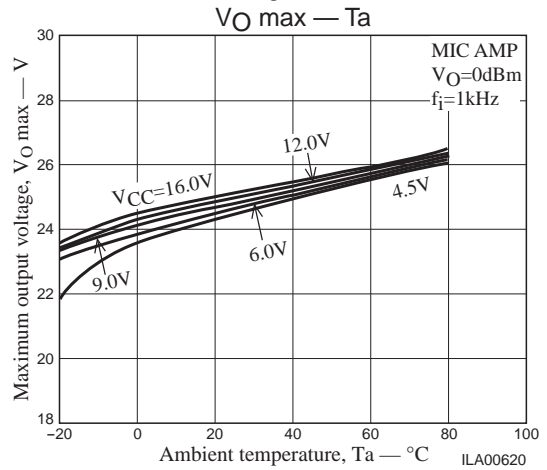
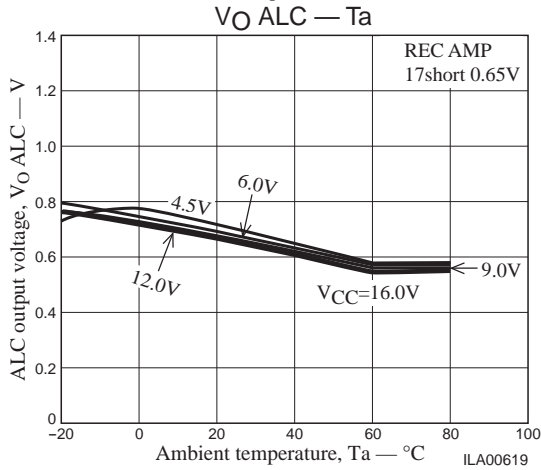
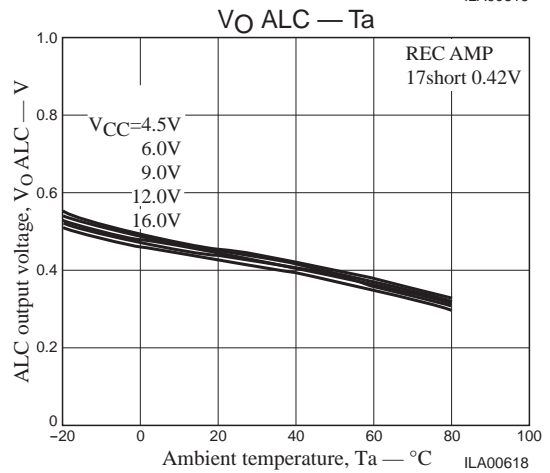
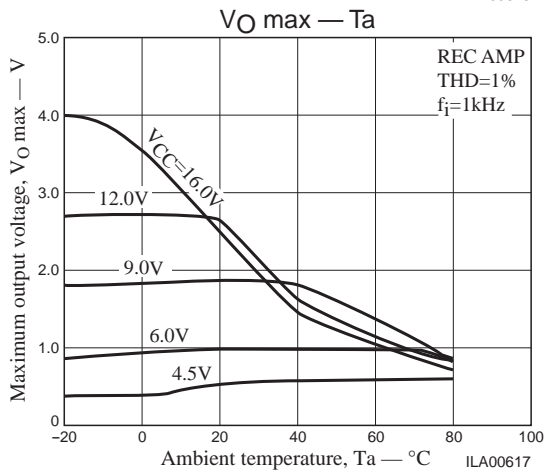
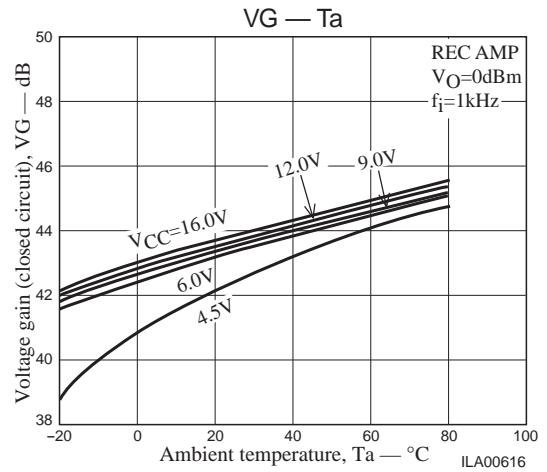
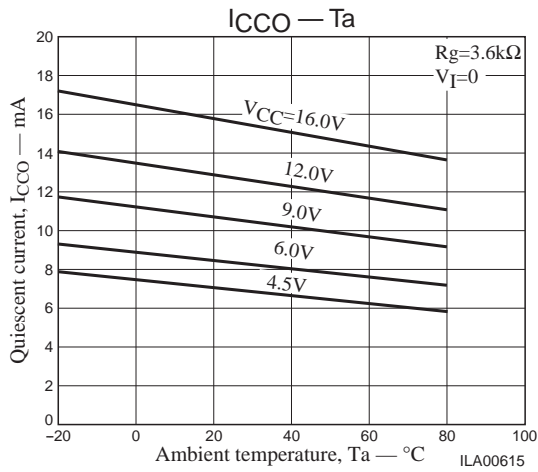
Rectifier Block Equivalent Circuit

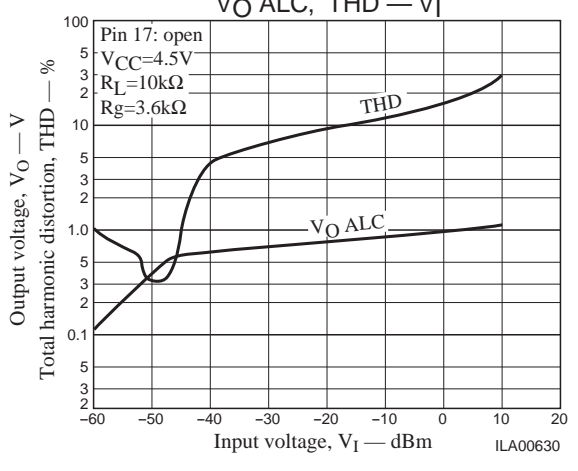
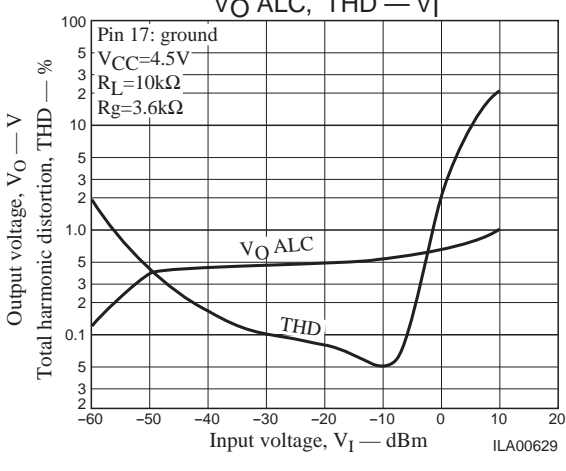
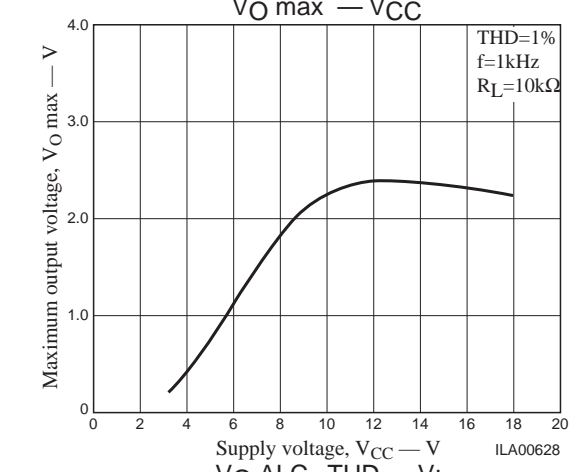
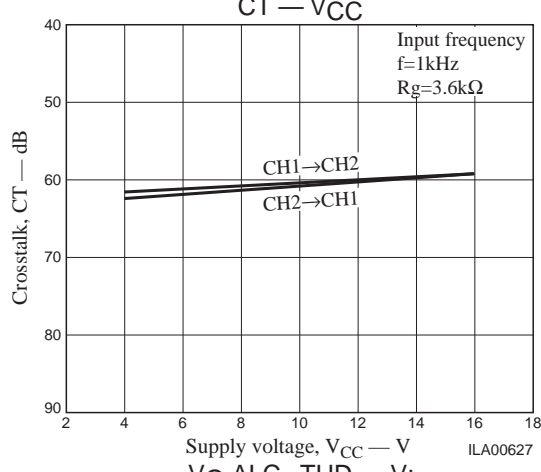
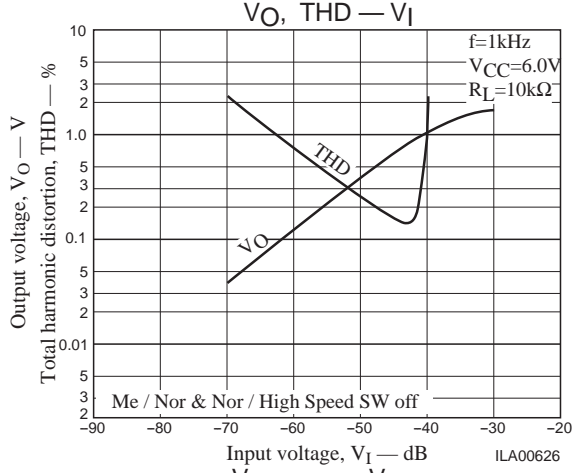
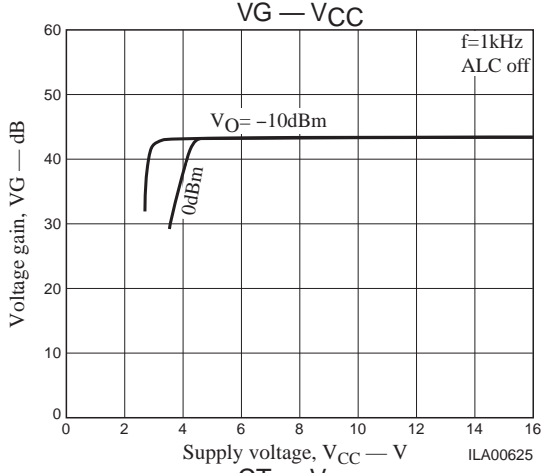
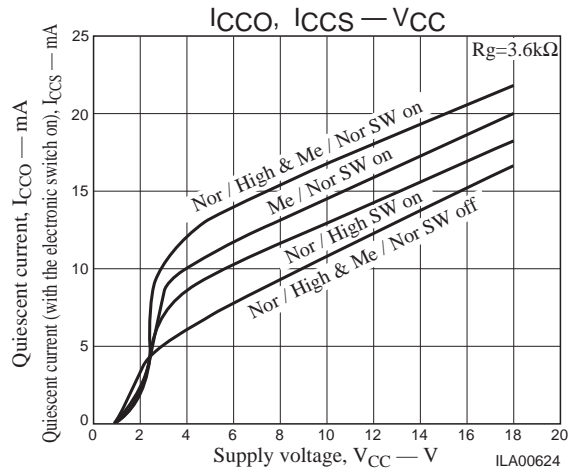
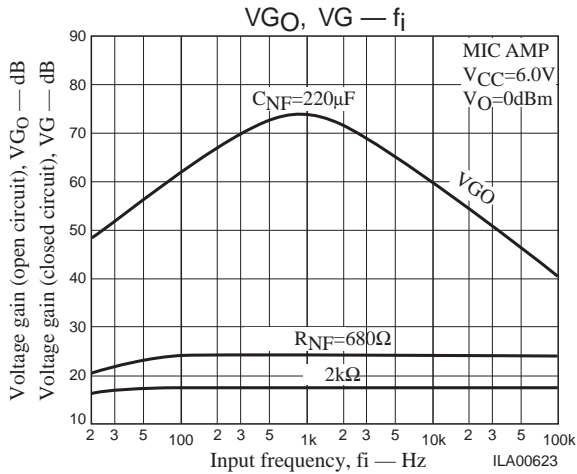
- (7) Although the ALC level is converted by opening (0.7 V) or shorting (0.46 V) pin 17, basically, the ALC start DC threshold level is switched by turning transistor TR2 on (pin 17 open) or off (pin 17 shorted).

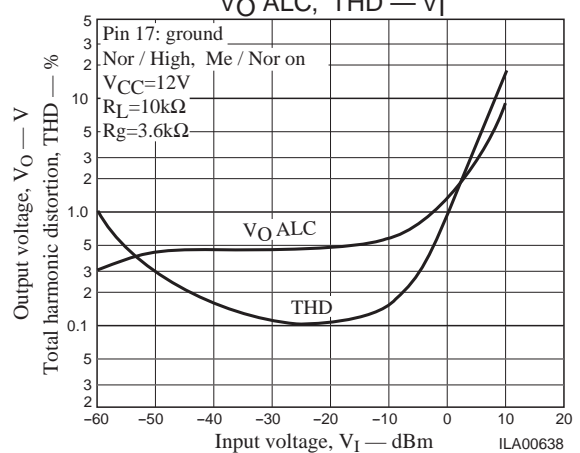
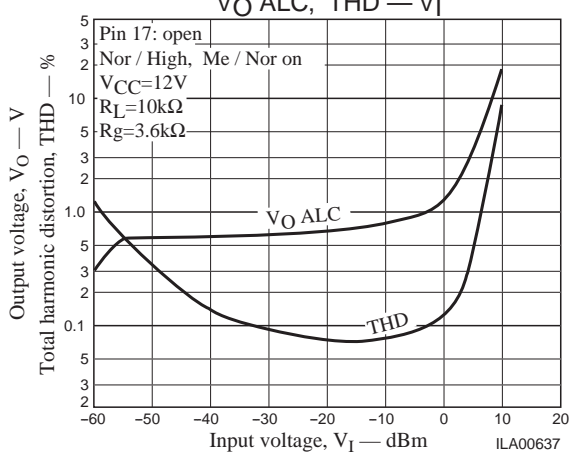
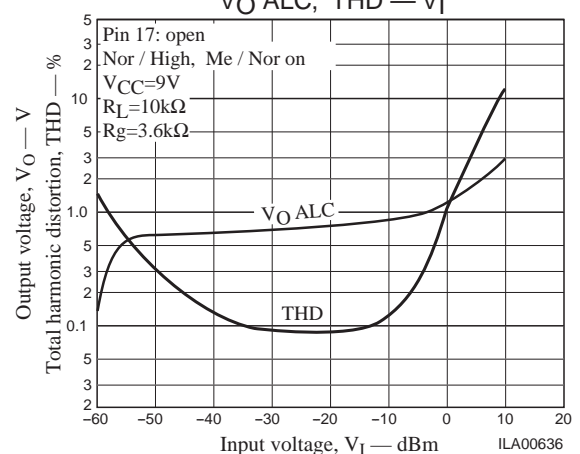
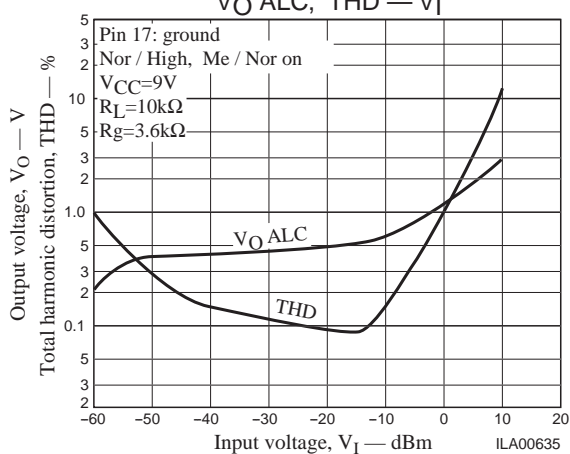
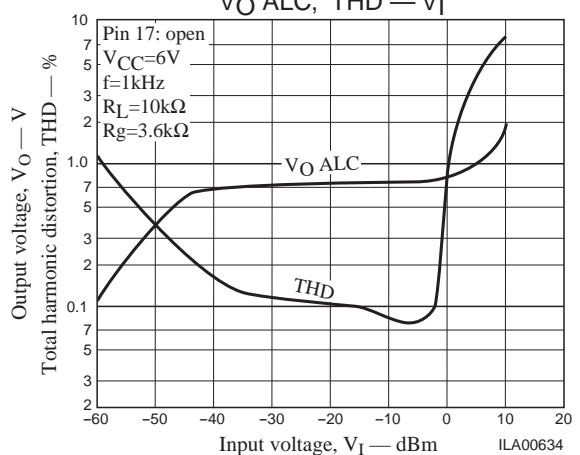
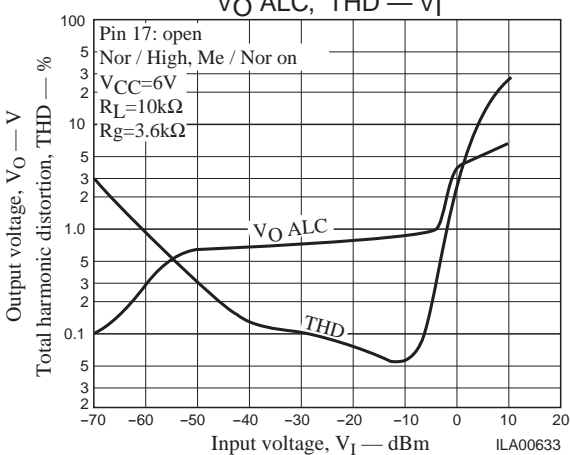
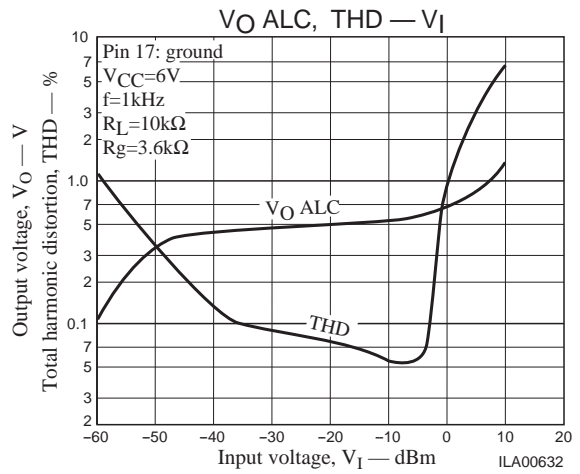
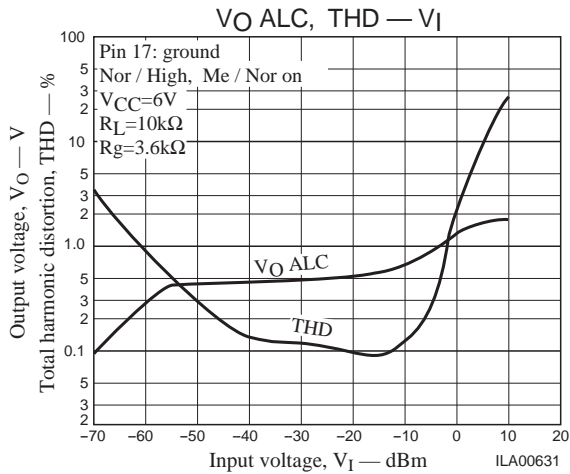
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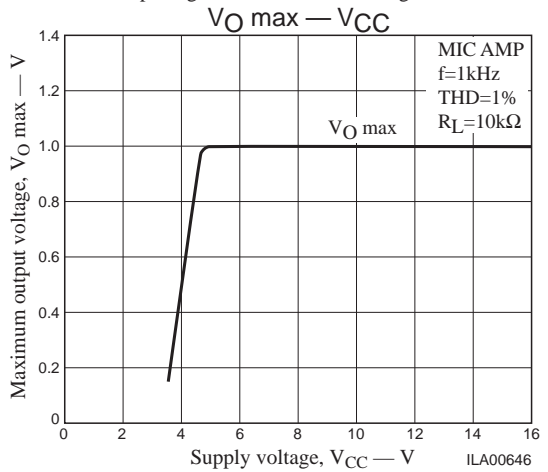
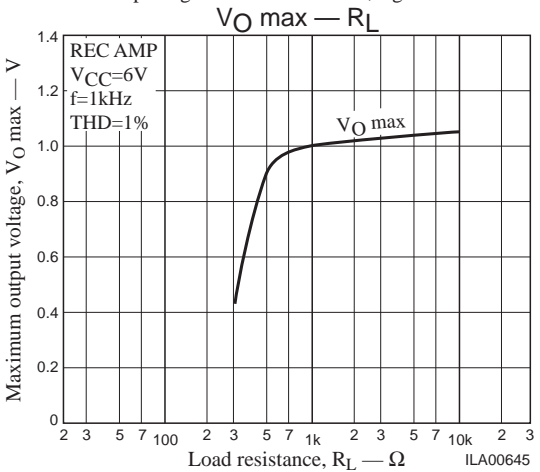
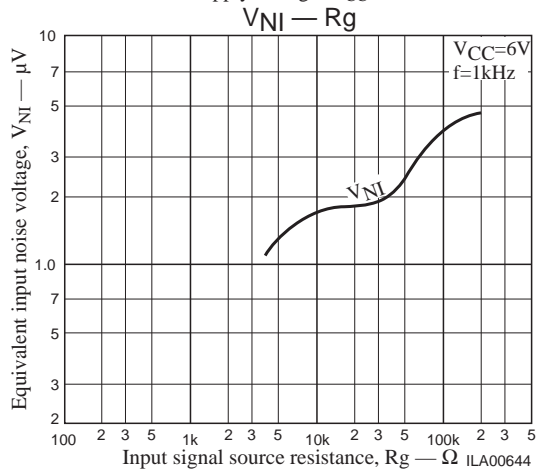
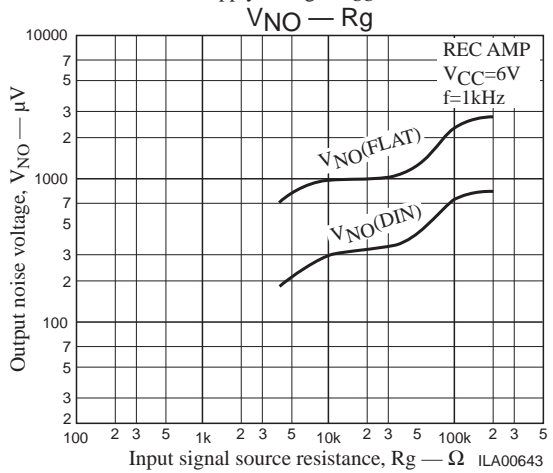
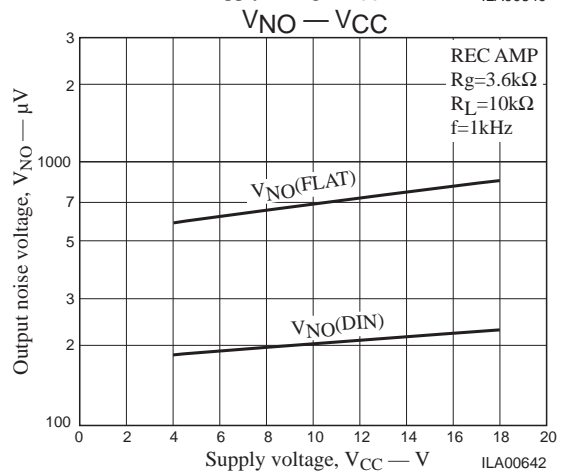
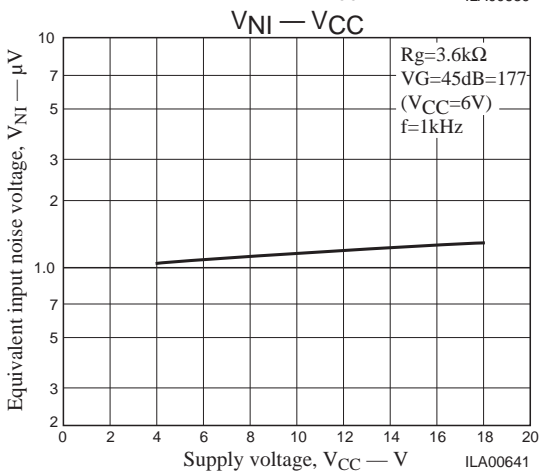
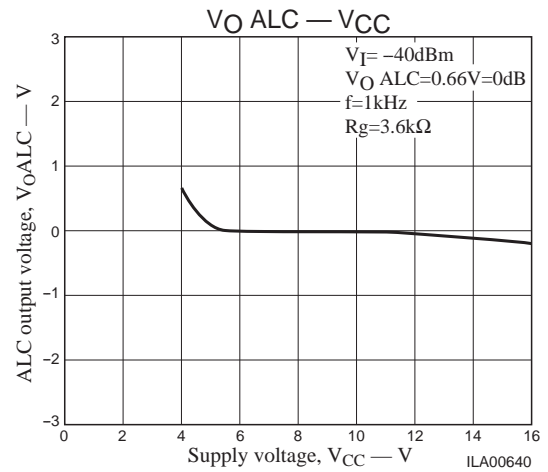
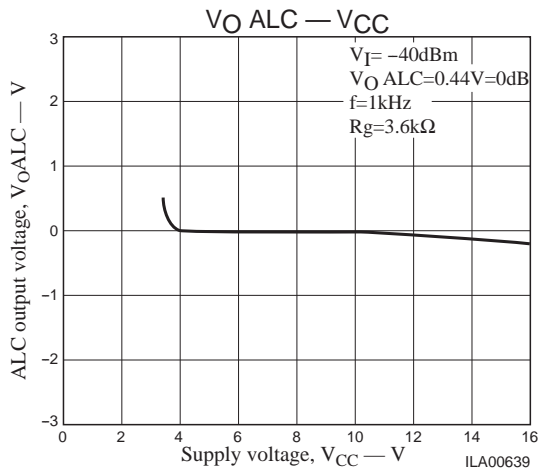
LA3241 and LA3246 Cassette Dubbing System Circuit Example

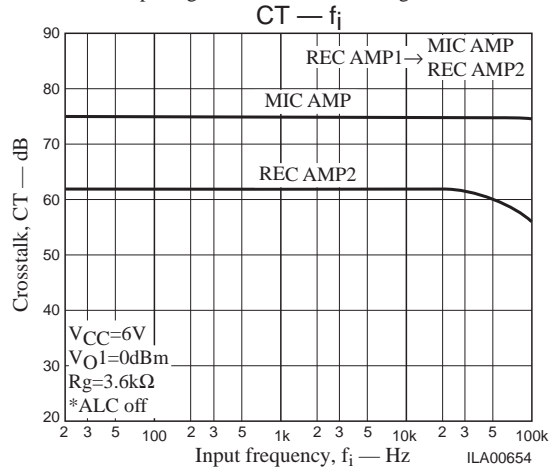
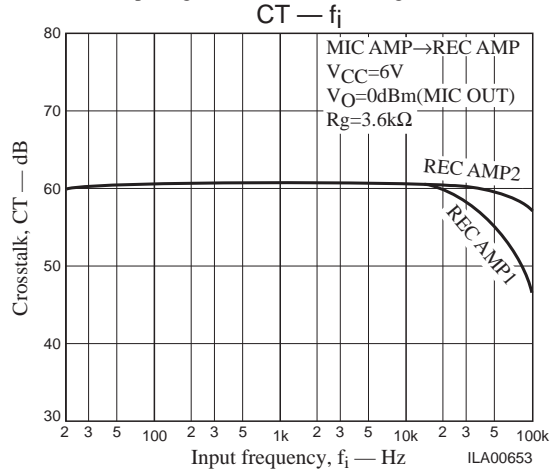
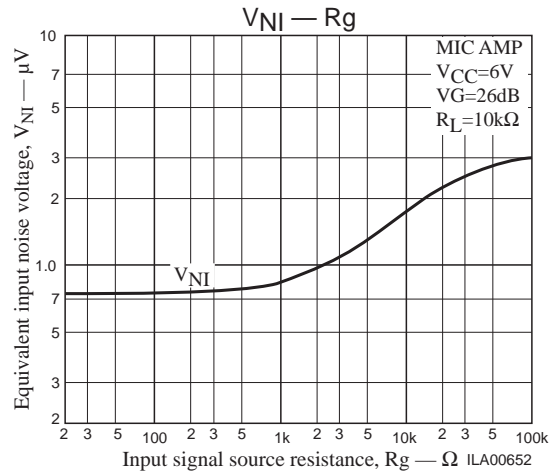
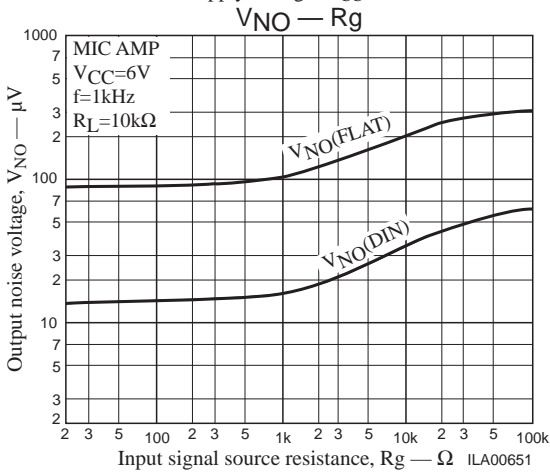
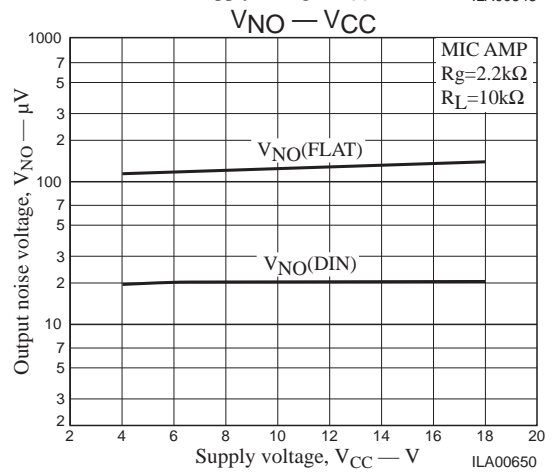
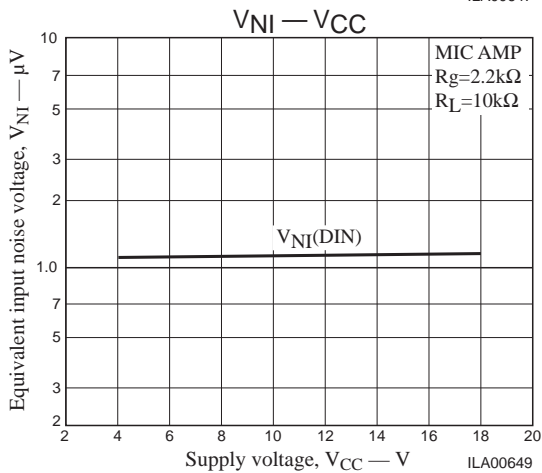
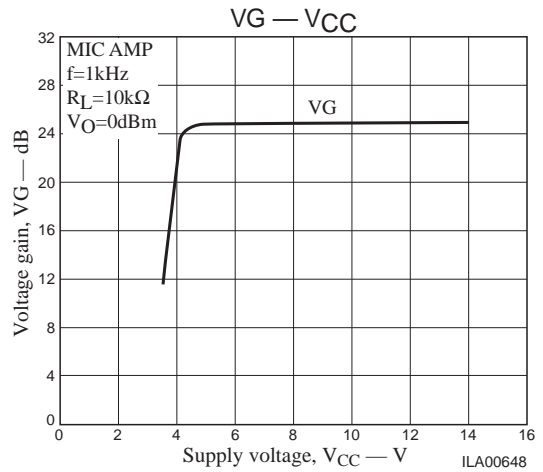
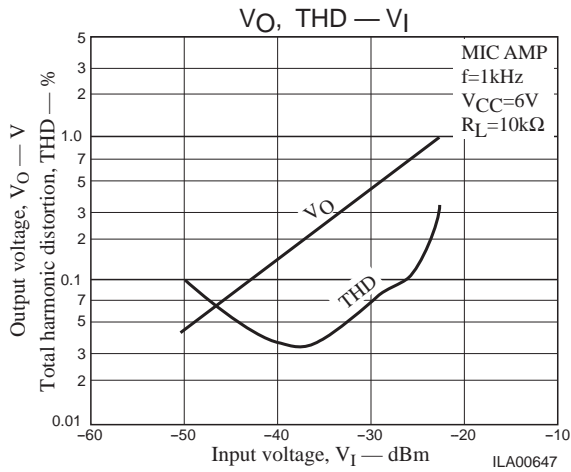


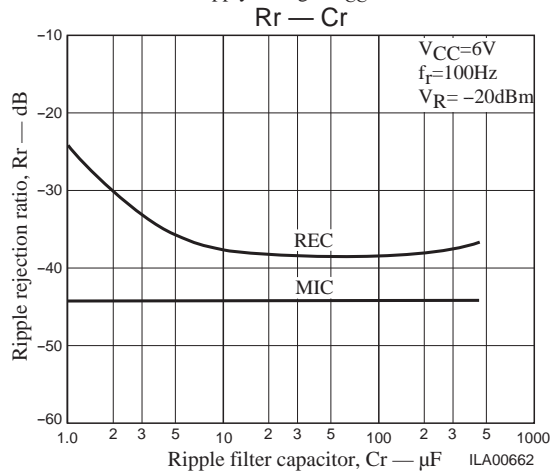
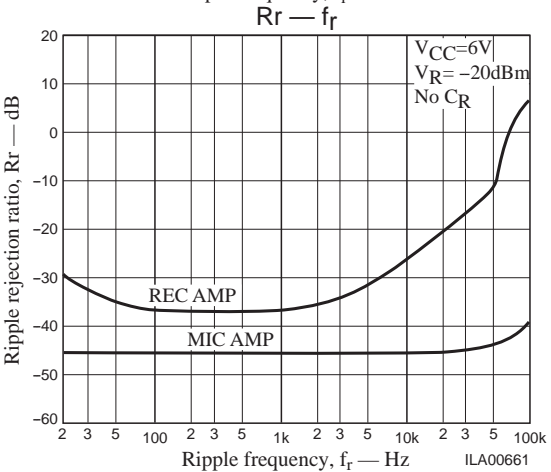
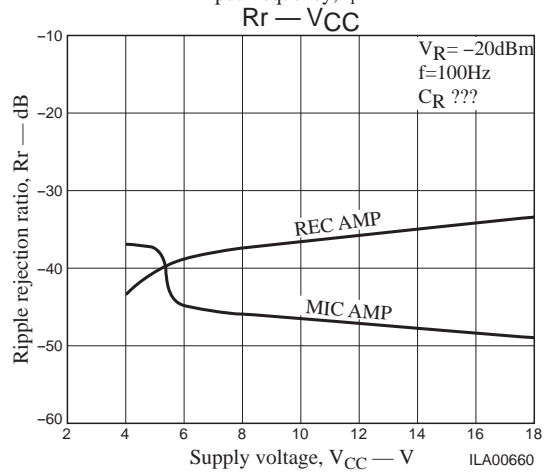
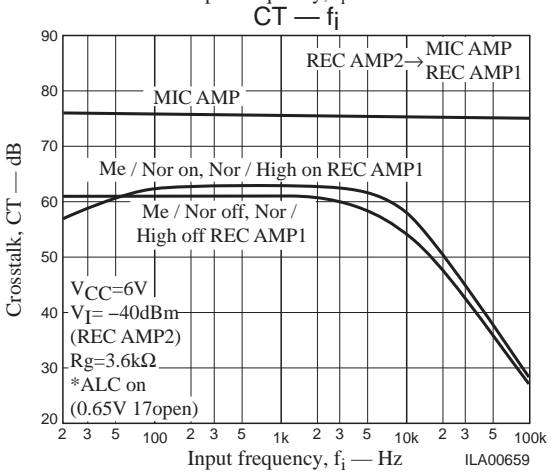
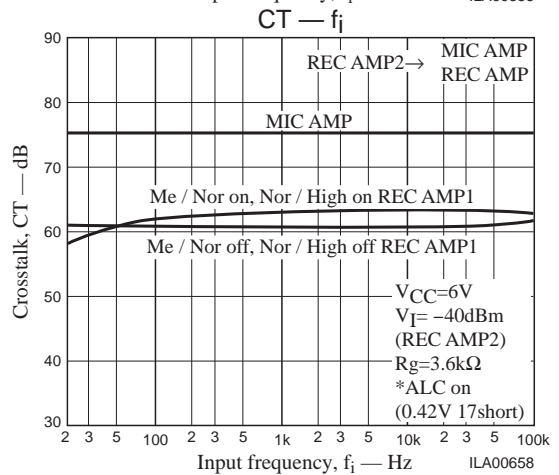
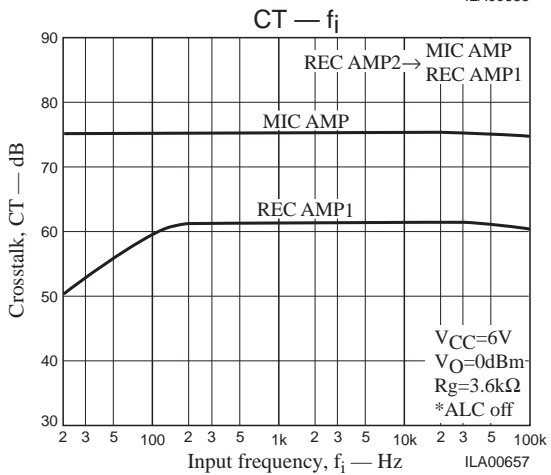
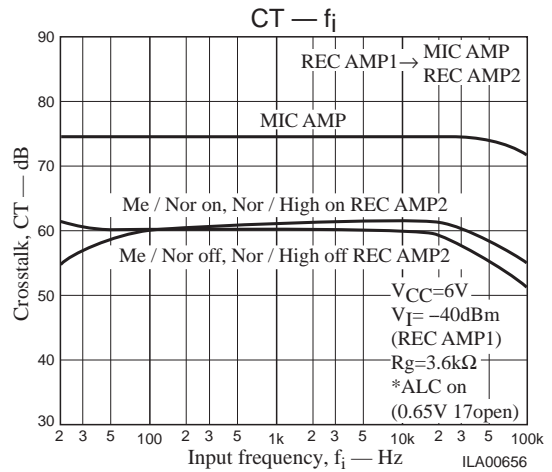
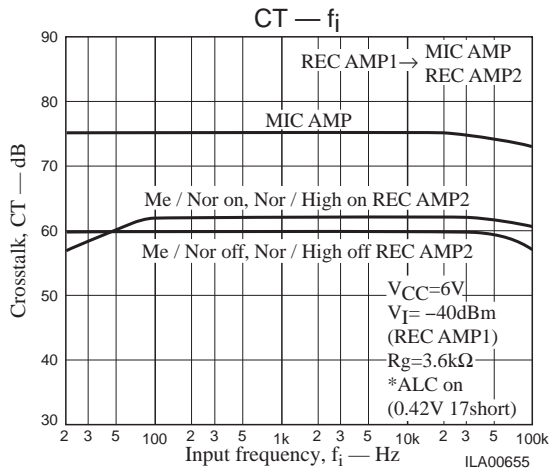












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