

<b>SANYO</b>	No.4805B	LA1832, 1832M
	Support for AM Stereo and Electronic Tuning Radio Cassette Recorder/Music Center-Use Single-Chip IC (AM/FM IF + MPX)	

**Overview**

The LA1832 and 1832M are single-chip AM/FM IF and MPX tuner ICs that support electronic tuning. These chips were developed for consumer audio systems and is optimal for auto-seek systems based on IF count methods used together with SD. Since no adjustments are required in the FM detector and MPX VCO circuits, use of these chips can significantly reduce the number of adjustment steps in the end-product manufacturing line.

**Functions**

- AM: RF amplifier, mixer, oscillator (with ALC), IF amplifier, detector AGC, oscillator buffer, tuning indicator, IF buffer output, stereo IF output.
- FM IF: IF amplifier, quadrature detector, S curve detection, tuning indicator, IF buffer output, S-meter
- MPX: PLL stereo decoder, stereo indicator, forced mono, VCO stop

**Features**

- Major reduction in required adjustments
  - FM detector: No adjustments (ceramic discriminator used)
  - MPX VCO: No adjustments (ceramic resonator used)
- Tuning indicator pin provided (can be used as a narrowband stop signal or a muting drive output): SD output
- Supports IF count scheme
- Built-in SD time constant switching circuit
- Variable FM stop sensitivity and bandwidth
- Built-in AM local oscillator buffer
- Supports AM low-cut control
- Pin compatibility with the LA1831 (See page 9 for details on the differences between the LA1832 and the LA1831.)
- Built-in IF output function for AM stereo

**Specifications**

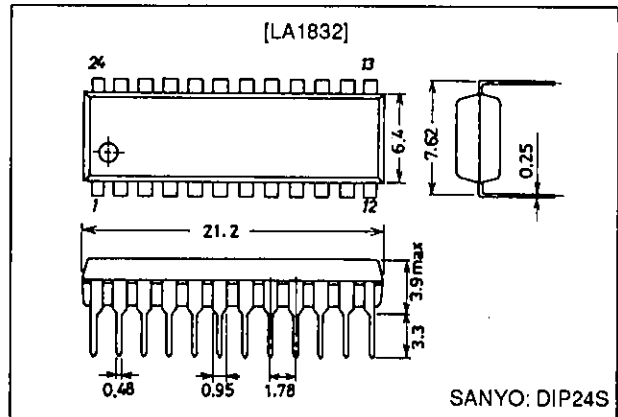
Maximum Ratings at  $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC \text{ max}}$		9.0	V
Indicator drive current	$I_{LED}$	Pins 6 and 7	20	mA
Allowable power dissipation	$P_d \text{ max}$	$T_a \leq 70^\circ\text{C}$ (LA1832)	400	mW
		$T_a \leq 70^\circ\text{C}$ (LA1832M)	270	mW
Operating temperature	$T_{opr}$		-20 to +70	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +125	$^\circ\text{C}$

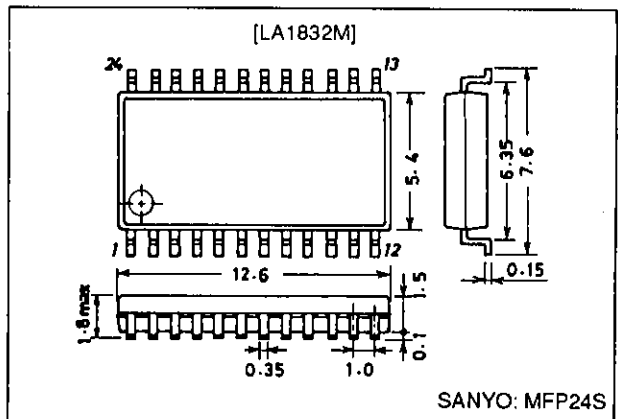
**Package Dimensions**

unit: mm

**3067-DIP24S**



**3112-MFP24S**



## LA1832, 1832M

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

Parameter	Symbol	Ratings	Unit
Recommended supply voltage	$V_{CC}$	5.0	V
Operating supply voltage range	$V_{CC\ op}$	4.0 to 8.0	V

### Operating Characteristics at $T_a = 25^\circ\text{C}$ , $V_{CC} = 5.0\text{ V}$ , (for the specified test circuits)

FM Characteristics (mono):  $f_c = 10.7\text{ MHz}$ ,  $f_m = 1\text{ kHz}$

Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	$I_{CCO-FM}$	No input	12	23	33	mA
Demodulation output	$V_{O-FM}$	100 dB $\mu$ , 100% mod, pin 14 output	290	410	580	mVrms
Channel balance	C.B	100 dB $\mu$ , 100% mod, ratio of pin 14 to pin 15	-1.5	0	+1.5	dB
Total harmonic distortion (mono)	THD-FMmono	100 dB $\mu$ , 100% mod, pin 14 output*		0.3	1.5	%
Signal to noise ratio	S/N-FM	100 dB $\mu$ , 100% mod, pin 14 output	68	76.5		dB
Input limiting voltage	-3 dB L.S	With an input reference of 100 dB $\mu$ , the IF input that reduces the output by 3 dB		32	40	dB $\mu$
LED sensitivity	$V_{LED-SENS}$	The IF input that turns the TU-LED on	34	44	54	dB $\mu$
LED bandwidth	LED-BAND	The frequency bandwidth that turns the TU-LED on	100	160	230	kHz
IF count buffer output	$V_{IFBUFF-FM}$	The pin 10 output for 100 dB $\mu$ , no modulation	90	130	180	mVrms

Note: Using a discriminator with guaranteed band characteristics with a THD under 0.5% (10.7 MHz  $\pm$ 20 kHz)

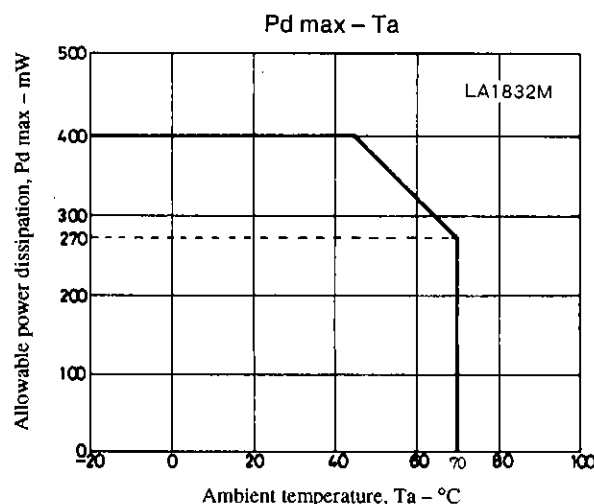
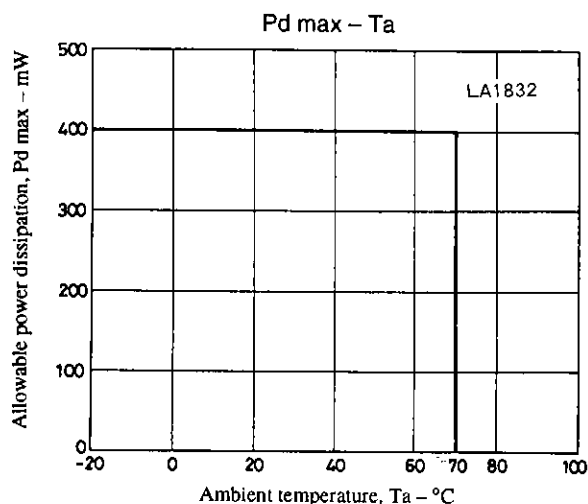
FM Characteristics (stereo):  $f_c = 10.7\text{ MHz}$ ,  $f_m = 1\text{ kHz}$ , L + R = 90%, PILOT = 10%,  $V_{IN} = 100\text{ dB}\mu$

Parameter	Symbol	Conditions	min	typ	max	Unit
Separation	Sep	Pin 14 output	30	45		dB
Stereo on level	ST-ON	The pilot modulation level for which $V_7$ becomes less than 1.5 V	1.5	3.0	5.0	%
Total harmonic distortion (main)	THD-Main	Pin 14 output*		0.3	1.5	%

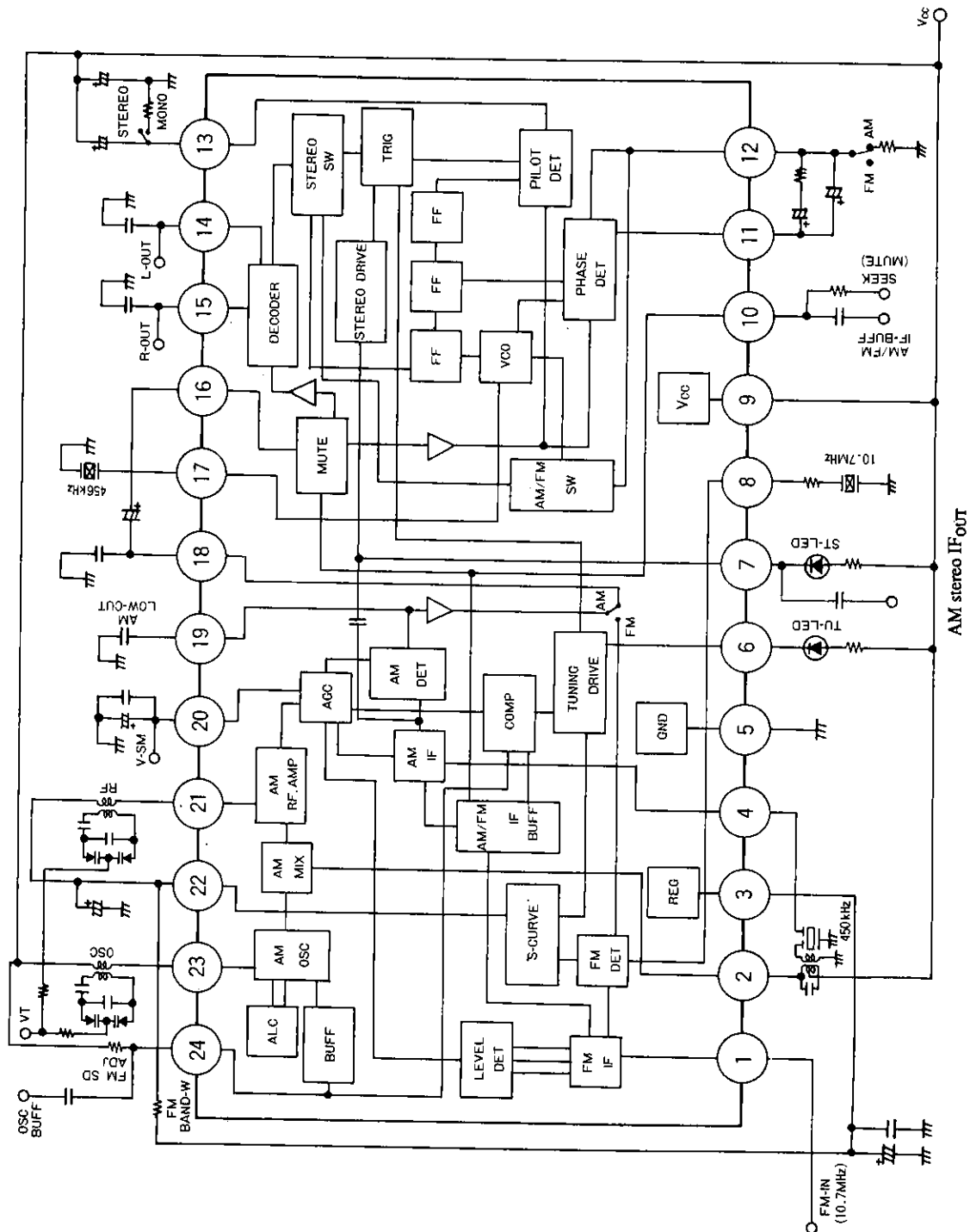
Note: Using a discriminator with guaranteed band characteristics with a THD under 0.5% (10.7 MHz  $\pm$ 20 kHz)

AM Characteristics:  $f_c = 1000\text{ kHz}$ ,  $f_m = 1\text{ kHz}$ , 30% modulation

Parameter	Symbol	Conditions	min	typ	max	Unit
Quiescent current	$I_{CCO-AM}$	No input	10	20	33	mA
Detector output	$V_{O\ 1}$	23 dB $\mu$ , pin 14 output	25	50	100	mVrms
	$V_{O\ 2}$	80 dB $\mu$ , pin 14 output	75	125	190	mVrms
Signal to noise ratio	S/N 1	23 dB $\mu$ , pin 14 output	16	20		dB
	S/N 2	80 dB $\mu$ , pin 14 output	48	54		dB
Total harmonic distortion	THD-AM	80 dB $\mu$ , pin 14 output		0.3	1.0	%
		100 dB $\mu$ , pin 14 output		0.4	1.2	%
LED sensitivity	$V_{LED-SENS}$	The ANT input level at which the TU-LED turns on	18	28	38	dB $\mu$
Local oscillator buffer output	$V_{OSC-AM}$	No input, pin 24 output	140	200		mVrms
Low band attenuation	LOW-CUT	Output when $f_m = 100\text{ Hz}$ , referenced to 1 kHz	6.0	9.0	12.0	dB
IF count buffer output	$V_{IFBUFF-AM}$	80 dB $\mu$ , no modulation, pin 10 output	140	200	280	mVrms
Stereo IF output	$V_{ST-IF-AM}$	80 dB $\mu$ , no modulation, pin 7 output	8.0	17.0		mVrms

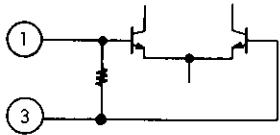
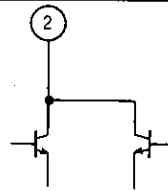
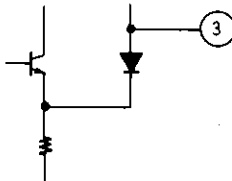
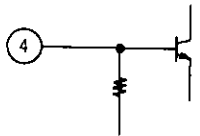
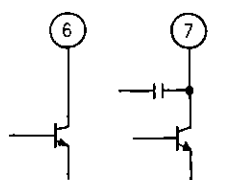
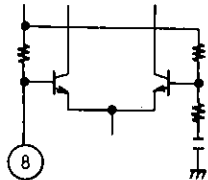
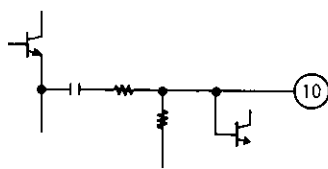
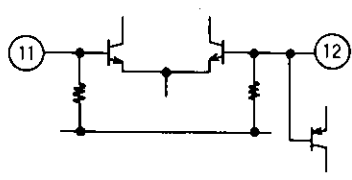


Equivalent Circuit Diagram





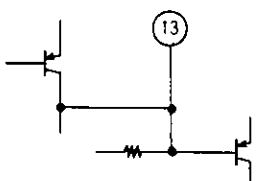
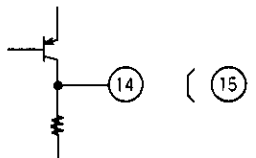
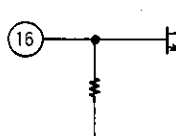
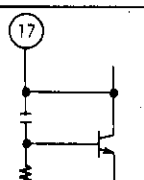
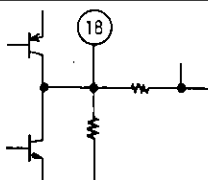
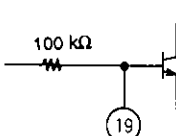
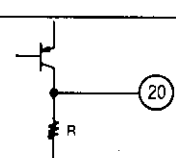
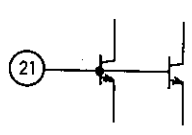
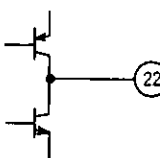
Pin Functions and Quiescent Voltages

No.	Function	Pin voltage (V)	Equivalent circuit	Notes
1	FM IF input	2.1		Input impedance $r_i = 330 \Omega$
2	AM MIX output	5.0		Used for the MIX coil between pin 2 and pin 9 (the $V_{CC}$ voltage)
3	REG	2.1		$V_{reg} = 2.1 \text{ V}$
4	AM IF input	2.1		Input impedance $r_i = 2 \text{ k}\Omega$
5	GND	0		
6	TU-LED	5.0		Active-"L" Open collector
7	ST-LED and IF output for AM stereo			
8	FM-DET	2.8 (FM) 3.4 (AM)		Recommended ceramic discriminator: CDA10.7MG46-A (Murata Mfg. Co., Ltd.) FCD1070MA11SRL (TDK)
9	$V_{CC}$	5.0		
10	AM/FM IF count output and control SW, and muteSW.	0		$V_{10} \leq 0.5 \text{ V}$ ... Reception state (normal) $1.4 \text{ V} \leq V_{10} \leq 2.2 \text{ V}$ ... Muting on (mute) $V_{10} \geq 3.5 \text{ V}$ ... Muting on, IF counter on (seek) Note: During seek, to improve SD speed the IF buffer will be output only when SD is in the on state.
11	Phase comparator filter pin, and AM/FM switch	Pin 11 3.8 (FM) 1.5 (AM)		AM mode is selected when over $200 \mu\text{A}$ flows from pin 12.
12		Pin 12 3.8 (FM) 0 (AM)		

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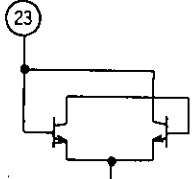
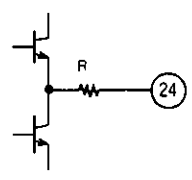
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No.	Function	Pin voltage (V)	Equivalent circuit	Notes
13	Pilot detector filter pin, forced mono, VCO stop	3.5		Mode forced to mono when over 50 $\mu$ A flows from this pin The VCO stops at currents over 200 $\mu$ A
14 15	Left output Right output	1.2		Output impedance $r_o = 5 \text{ k}\Omega$
16	MPX input	2.1		Input impedance $r_i = 20 \text{ k}\Omega$
17	MPX VCO	2.4 (FM) 0 (AM)		Recommended ceramic oscillator: CSB456F15 (Murata Mfg. Co., Ltd)
18	AM/FM demodulator output	2.0 (FM) 0.9 (AM)		Output impedance FM: $r_o = 2.3 \text{ k}\Omega$ AM: $r_o = 10 \text{ k}\Omega$
19	AM LOW CUT	0 (FM) 1.9 (AM)		The low-band frequency characteristics are changed by an external capacitor connected to pin 19
20	S-meter, AM AGC	0.2 (FM) 0.9 (AM)		Built-in load resistance: $R = 13.9 \text{ k}\Omega$ An external capacitor connected to pin 20 determines the seek time SD response speed.
21	AM RF-IN	2.9 (FM) 2.1 (AM)		Pin 21 is used at the same potential as pin 22 (the AFC voltage).
22	AFC	2.9 (FM) 2.1 (AM)		The FM-SD bandwidth can be changed with an external resistor connected between pin 22 and pin 3 (Reg voltage). Note: A setting of 180 kHz or higher is recommended for the FM-SD bandwidth.

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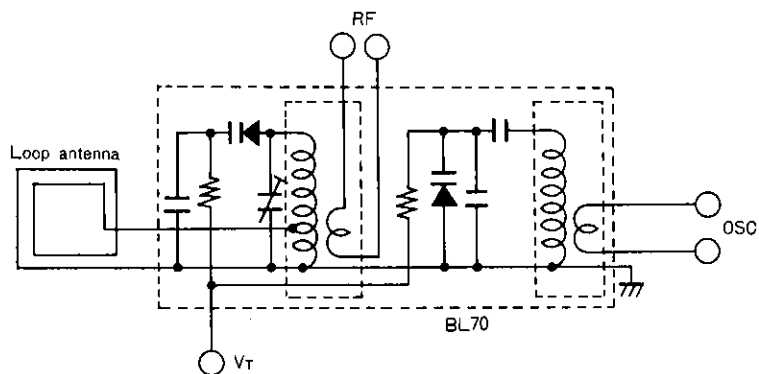
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No.	Function	Pin voltage (V)	Equivalent circuit	Notes
23	OSC	5.0		An oscillator coil is used between pin 23 and pin 9 (the V <sub>CC</sub> voltage). Note: An oscillator coil with an impedance of 5 kΩ or over (secondary side) should be used.
24	OSC buffer, FM SD adj.	3.6		The FM SD sensitivity can be changed with an external resistor connected to pin 24. R = 200 Ω Note: A resistor of 3.3 kΩ or over should be used for the pin 24 external resistor.

## Coil Specifications

### AM ANT BLOCK

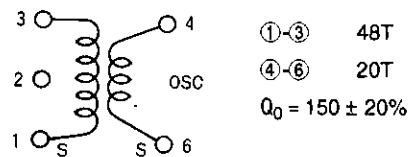
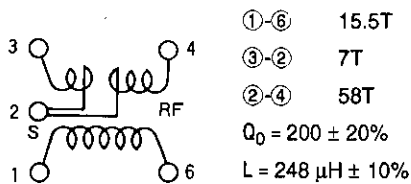


### Loop antenna

- LA300 (Kohringiken, Ltd.)

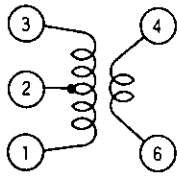
### Loop antenna matching coil

- KL-412 (Kohringiken, Ltd.) (for use with the SVC321)
- KO-387 (Kohringiken, Ltd.) (for SVC321 use)



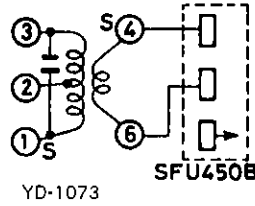
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- AM OSC (for DUT use)  
HW-50425 (Mitsumi Electric Co., Ltd.)



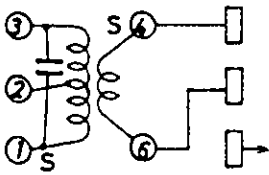
③-② 2T  
④-⑥ 9T  
②-① 86T  
 $Q_0 \geq 80$   
 $L = 270 \mu\text{H}$

- IFT  
YD-1073-1 (Mitsumi Electric Co., Ltd.)



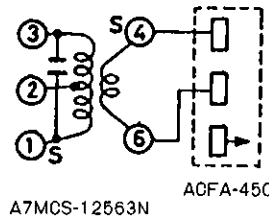
①-② 58T  
④-⑥ 7T  
②-③ 94T  
 $f_0 = 450 \text{ kHz}$   
 $Q_0 = 110$   
180 pF internal  
SFU 450B

- IFT (for DUT use)  
HW-6215 (Mitsumi Electric Co., Ltd.)



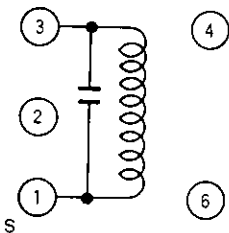
HW-6194  
SFU-450B  
①-② 94T  
④-⑥ 7T  
②-③ 58T  
180 p

- IFT  
PCFAZ-043 (TOKO ELECTRIC CO.)



①-② 58T  
④-⑥ 7T  
②-③ 94T  
 $f_0 = 450 \text{ kHz}$   
 $Q_0 = 110$   
180 pF internal  
SFU 450B

- FM DET  
7KL-7252 (TOKO ELECTRIC CO.)

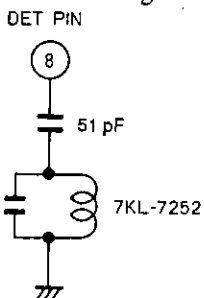


①-③ 15T  
 $f_0 = 10.7 \text{ MHz}$   
 $Q_0 = 85 \pm 20\%$   
120 pF internal

- FM detector coil usage characteristics

Characteristic Item	Discriminator	Coil
Demodulator output	410 mV	300 mV
S/R ratio	76.5dB	74 dB
LED on bandwidth	160 kHz	220 kHz
ST on level	3.0%	4.2%

- Application circuit using an FM detector coil



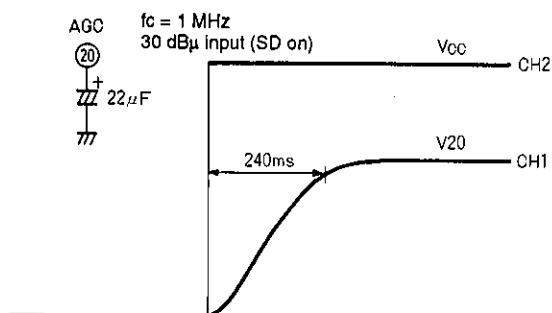


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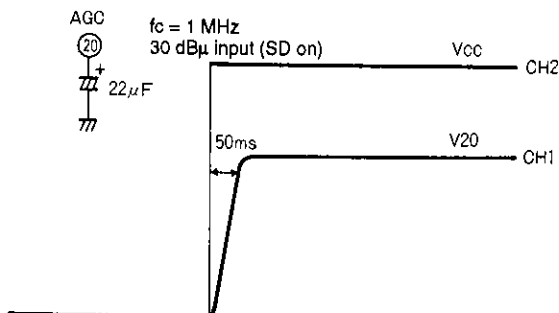
The LA1832 differs from the LA1831 in that functions have been added and the characteristics have been improved as follows.

### 1. SD time constant switching circuit added

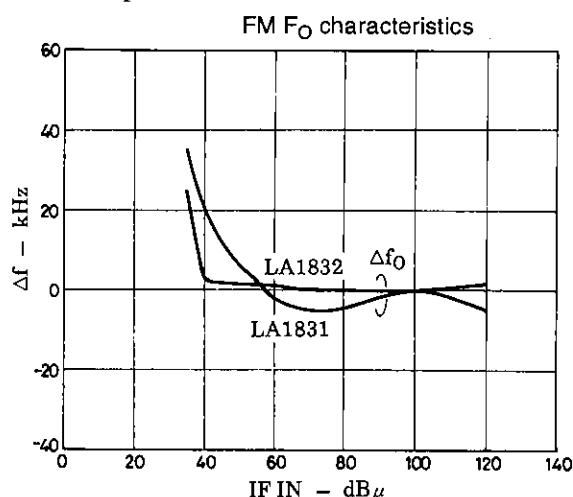
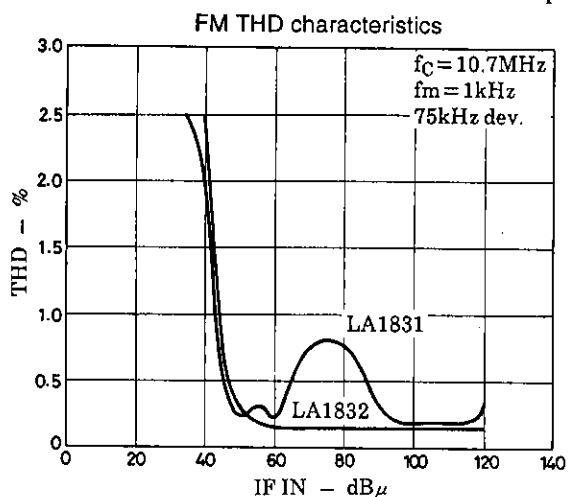
AM AGC voltage rise characteristics  
V10 = 0 V (normal)



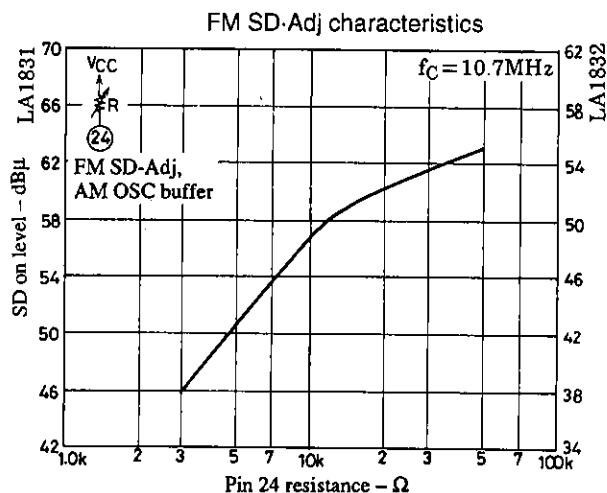
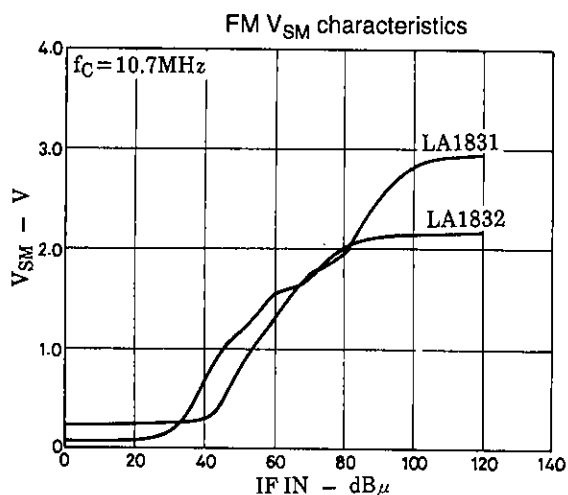
AM AGC voltage rise characteristics  
V10 = 5.0 V (seek mode)



### 2. Improved distortion waviness and $F_o$ drift with respect to the FM input level



### 3. Changes in the FM SD on level

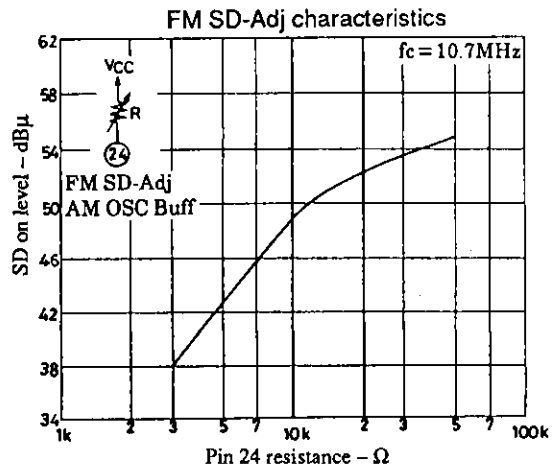
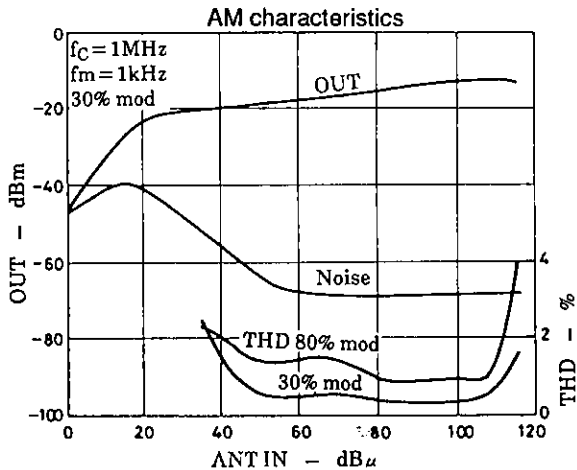
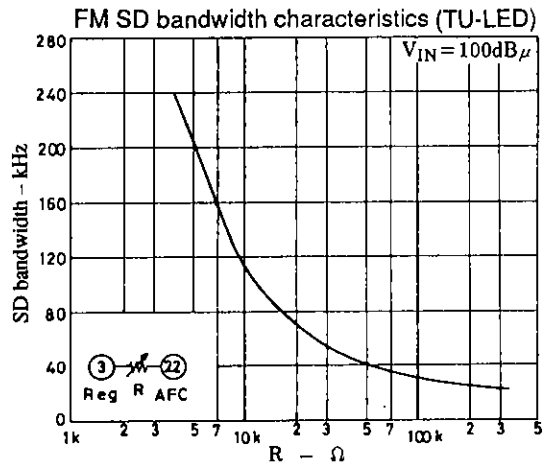
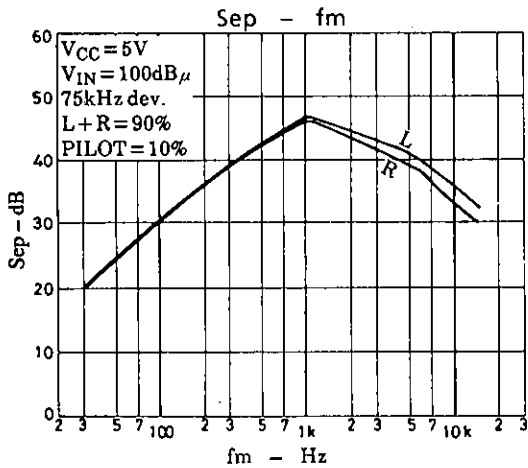
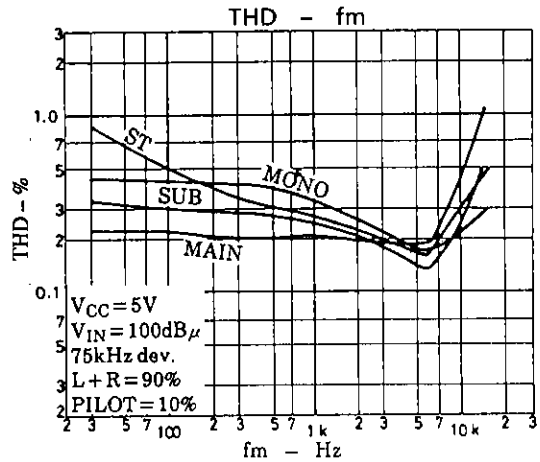
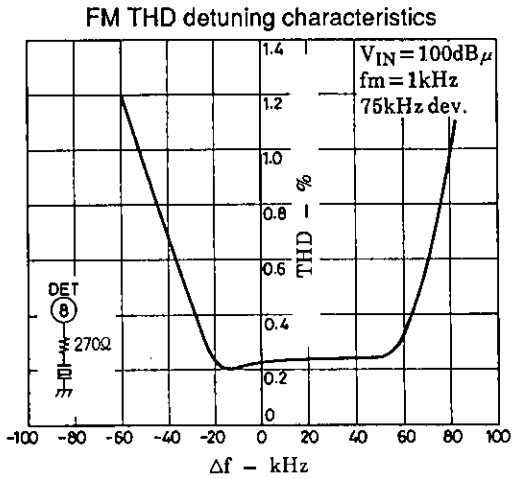
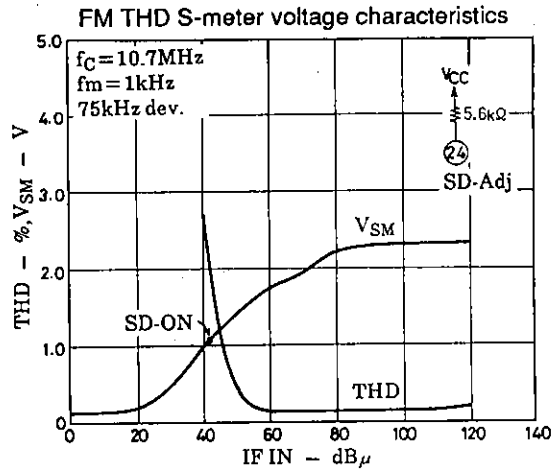
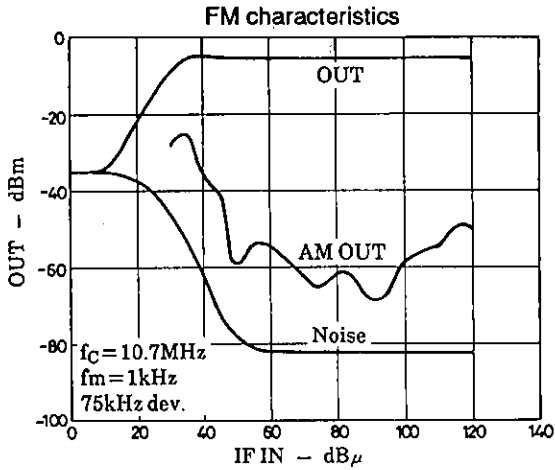


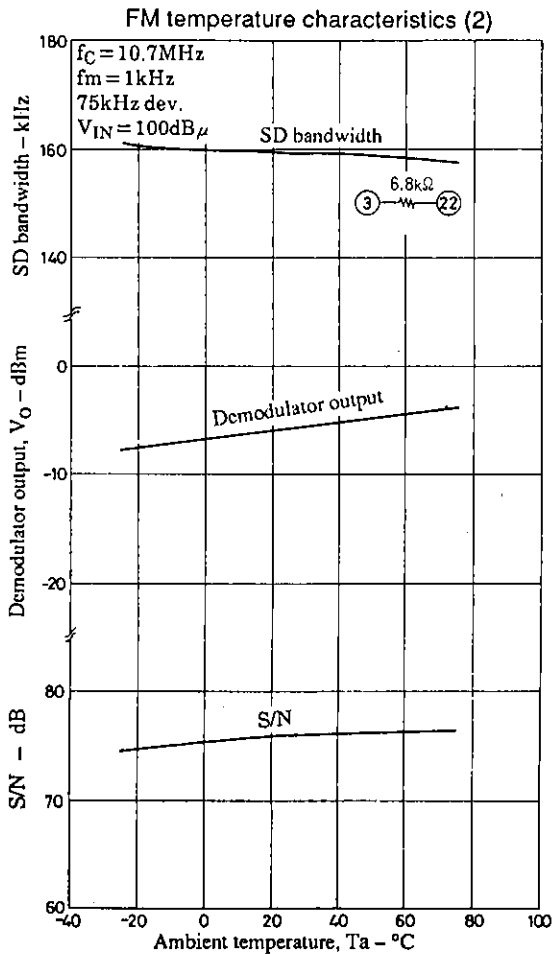
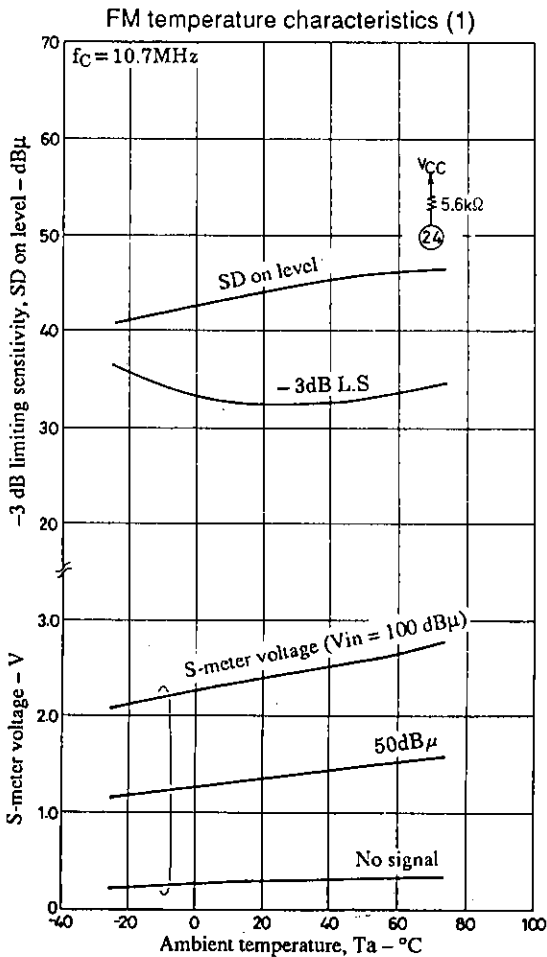
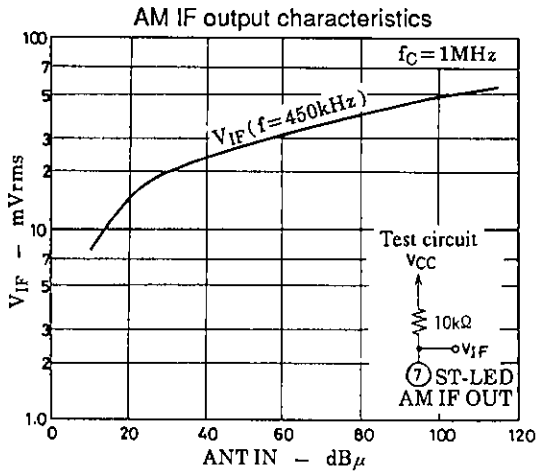
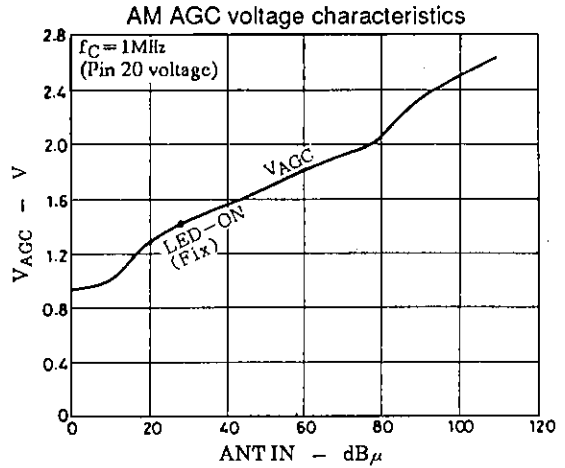
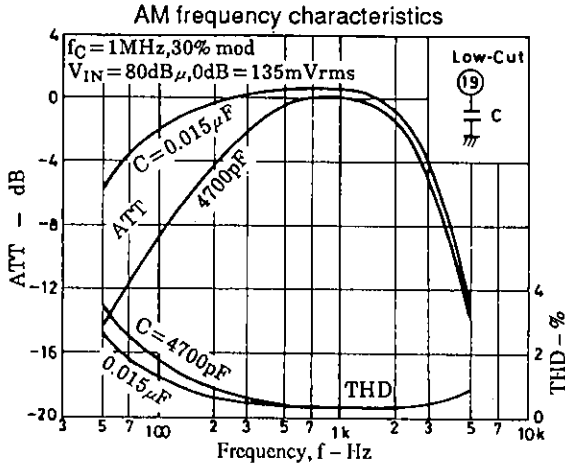
### 4. Improved FM S/N ratio and AMR

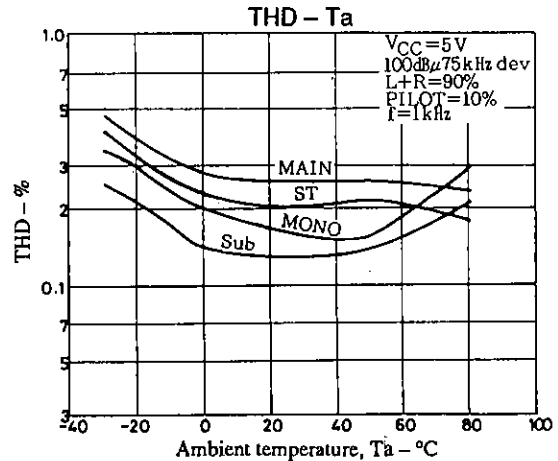
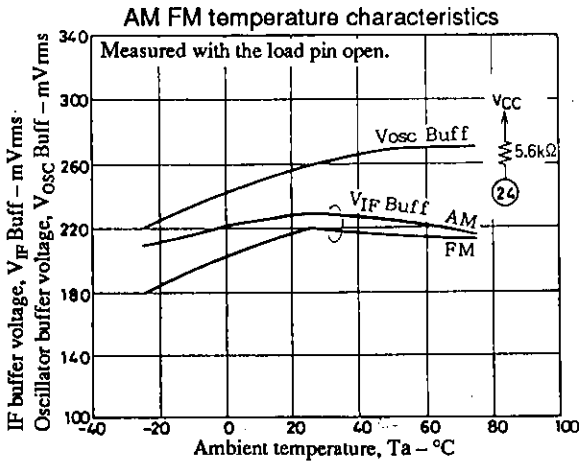
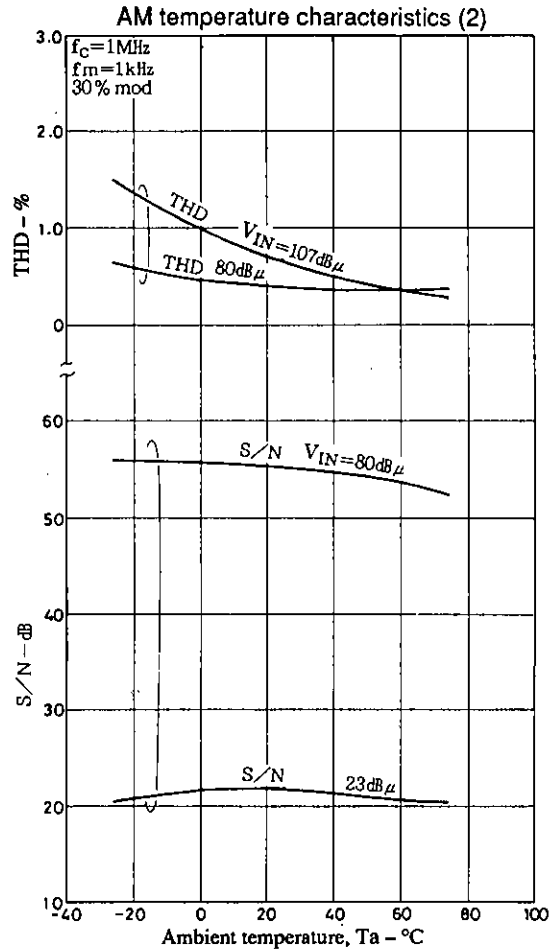
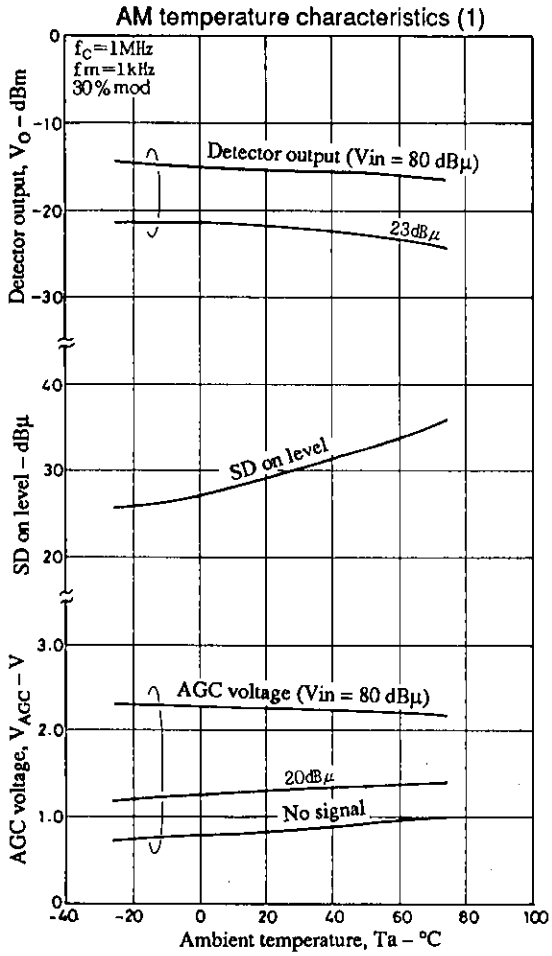
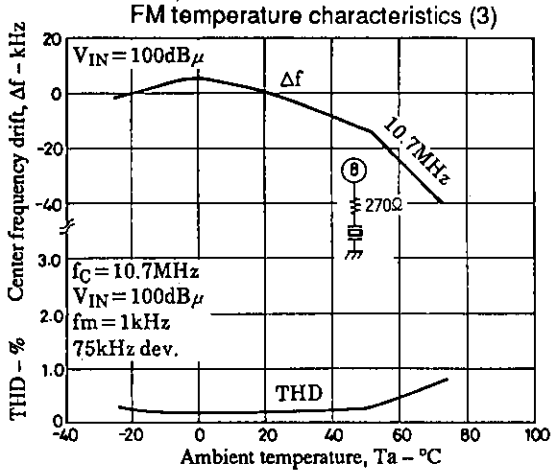
	S/N	AMR(for a 90 dB $\mu$ level)
LA1832	76.5 dB	55 dB
LA1831	75 dB	40 dB

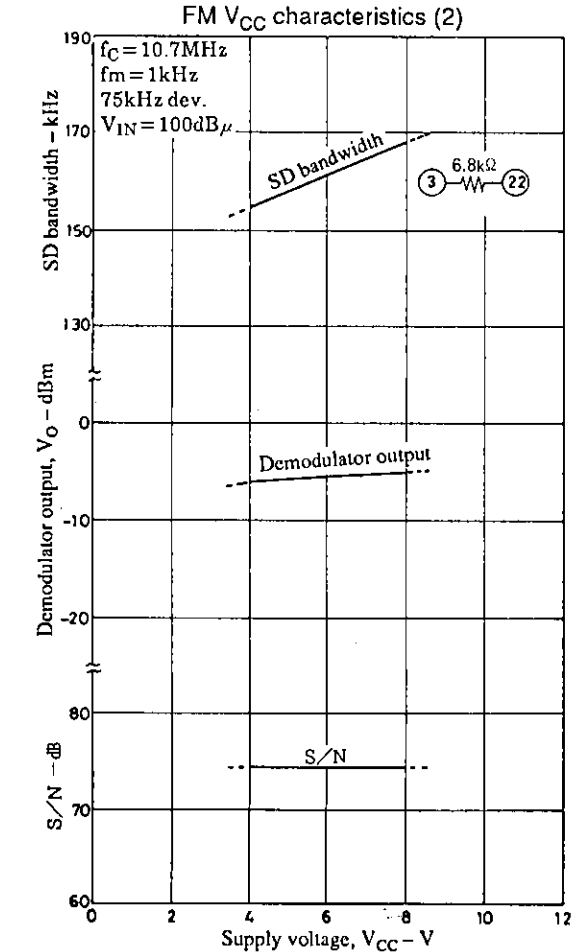
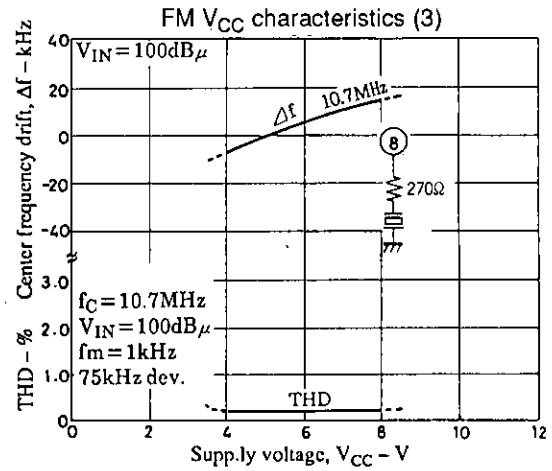
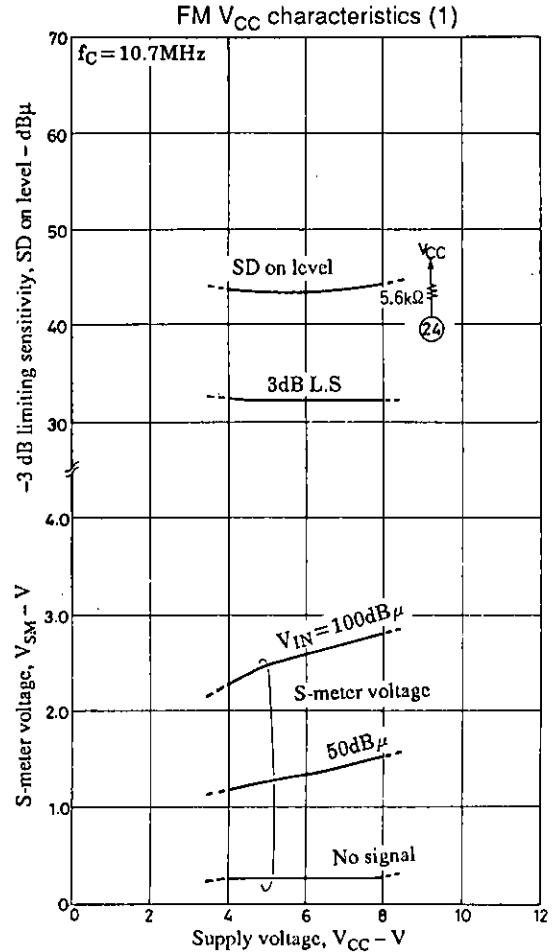
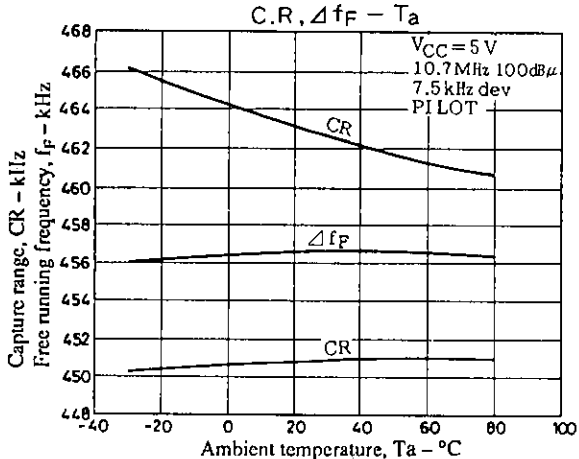
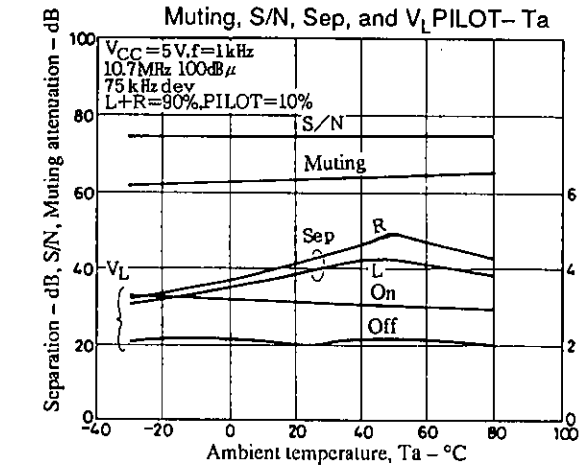
### 5. Improved mute setting voltage range (to handle AM stereo)

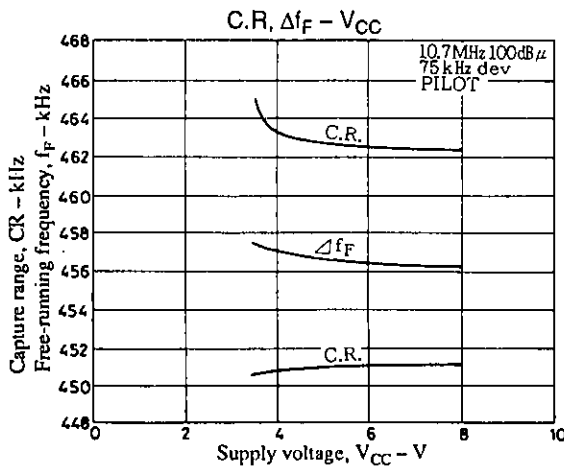
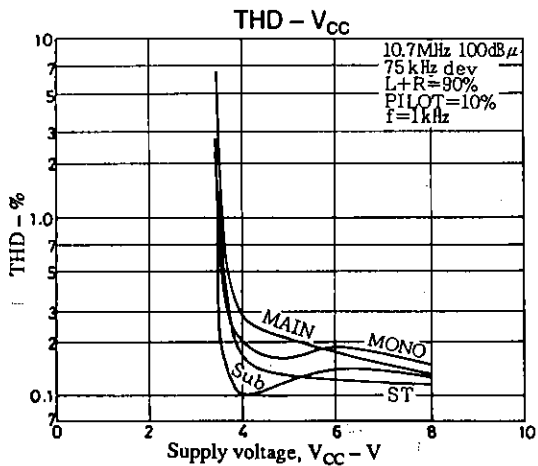
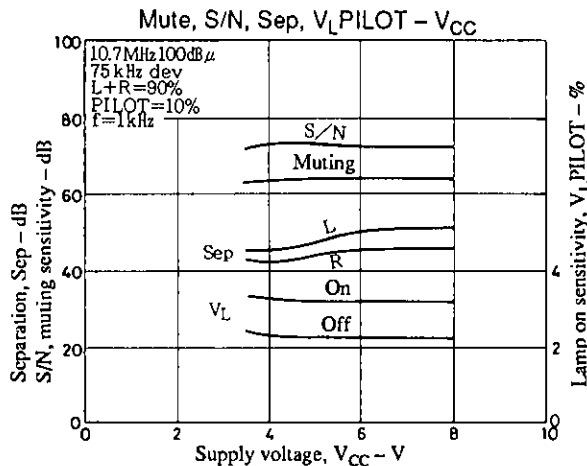
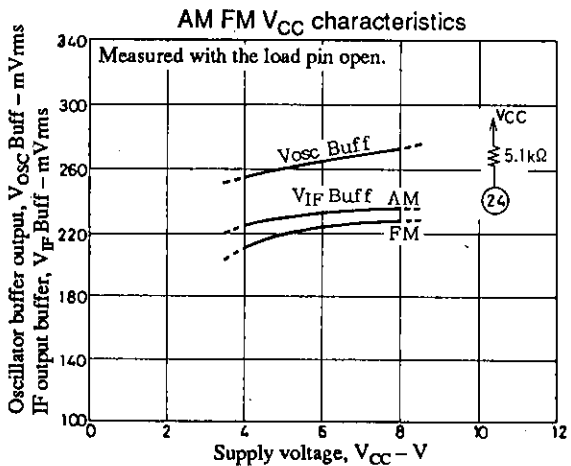
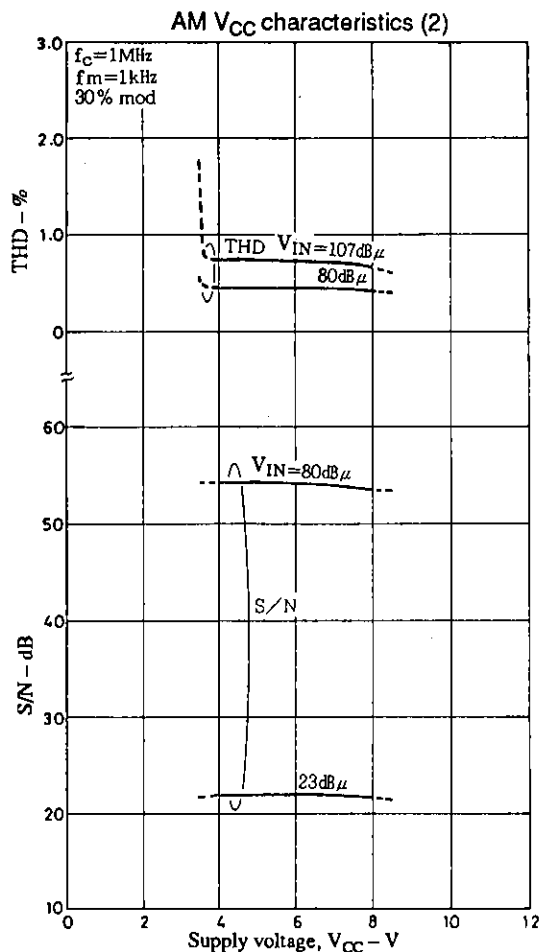
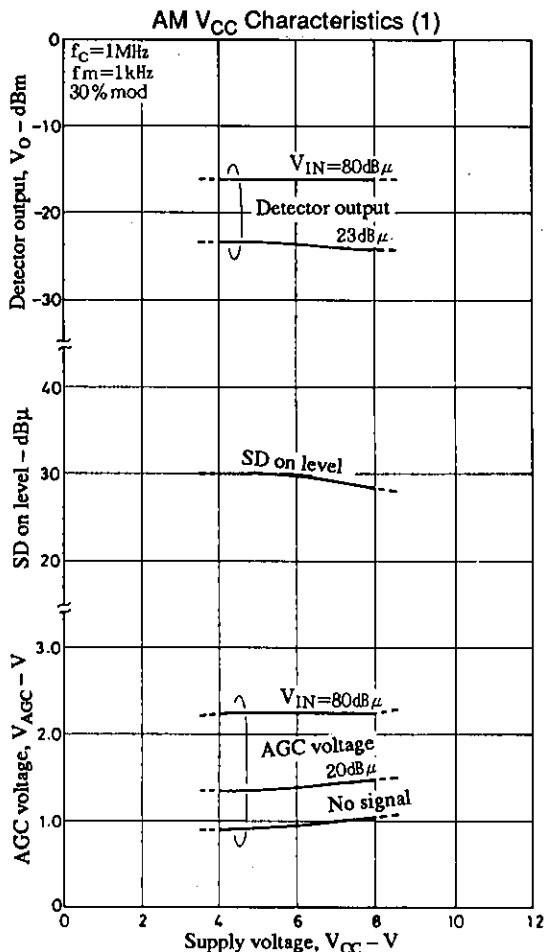
It is now possible to create a muting only condition by setting the pin 10 supply voltage to  $1.8 \text{ V} \pm 0.4 \text{ V}$ .











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