Ordering number : EN 2250C

SANYO Semiconductors

DATA SHEET

LA1810 — AM/FM/MPX Tuner System for Radio-Cassette Recorders, Music Centers

Functions

- FM-IF : IF amp, quadrature detector, soft muting, tuning indicator.
- MPX : PLL stereo decoder, stereo indicator, forced monaural, VCO stop.
- AM : RF amp, MIX, OSC (with ALC), IF amp, detector, AGC, tuning indicator.

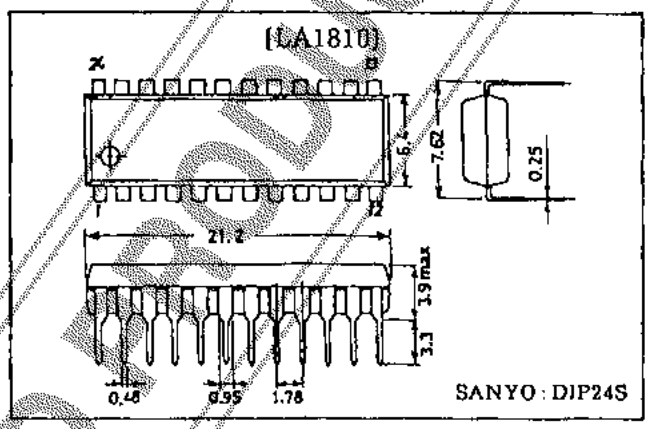
Features

- FM/AM/MPX functions contained on a single chip.
- Munimum number of external parts required.
- On-chip FM muting function.
- High sensitivity.
- Less carrier leak of MPX.

Package Dimensions

(unit : mm)

3067-DIP24S



Specifications

Maximum Ratings at Ta = 25°C, See specified Test Circuit.

				Unit
Maximum Supply Voltage	V_{CC} max	3,7,8,11,20,21	9	V
Maximum Supply Current	I_{CC} max	3+20+21	50	mA
Flow-in Current (Indicator Drive Current)	I_{LED}	7,8	20	mA
Flow-out Current	I_{23}	23	0.1	mA
Allowable Power Dissipation	Pd max	Ta≦70°C	500	mW
Operating Temperature	Topr		−20 to +70	°C
Storage Temperature	Tstg		−40 to +125	°C

Operating Conditions at Ta = 25°C

			Unit
Recommended Operating Voltage	V_{CC}	4.5	V
Operating Voltage Range	V_{CC} op	3.0 to 8.0	V

※ The FM output level forms an N curve (LA1810) and an S curve (LA1811).
LA1810 : N curve (for US band)
LA1811 : S curve (for Japan band). Your desired outoput level can be set by varying the output resistance.

Operating Characteristics at Ta = 25°C, V_{CC}4.5V, See specified Test Circuit.

FMCharacteristics (Mono) : f_c = 10.7MHz, f_m = 1kHz			min	typ	max	Unit
Quiescent Current	Icco	No input		13	20	mA
−3dB Sensitivity	−3dBL.S.	Referenced to V_{IN} = 100dBμ, 100%, down 3dB		28	35	dBμ
Demodulation Output	Vo	V_{IN} = 100dBμ, 100 mod.	150	220	300	mV
Channel Balance	C.B.	V_{IN} = 100dBμ, 100 mod.	0	0	1.5	dB

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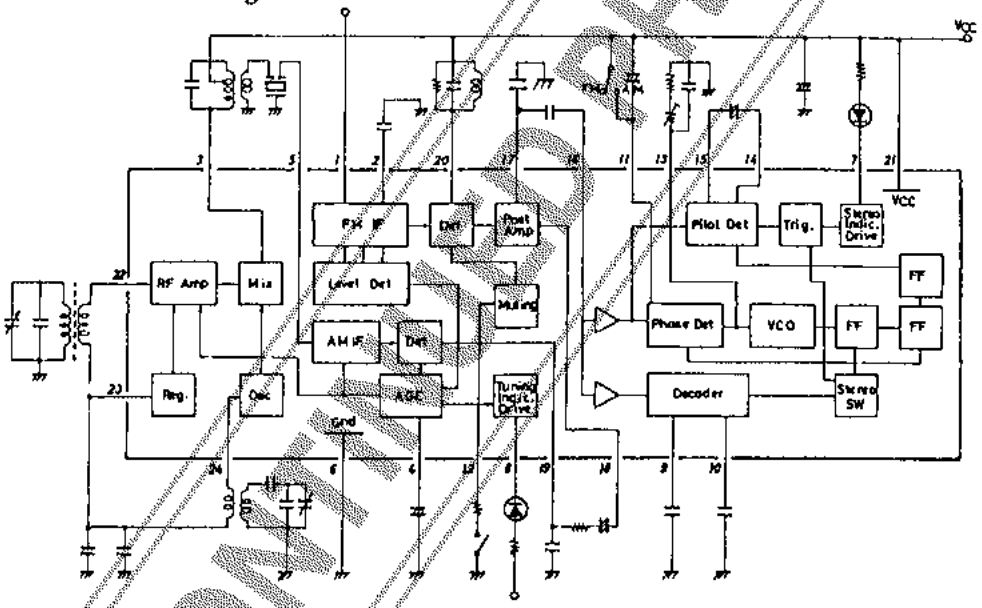
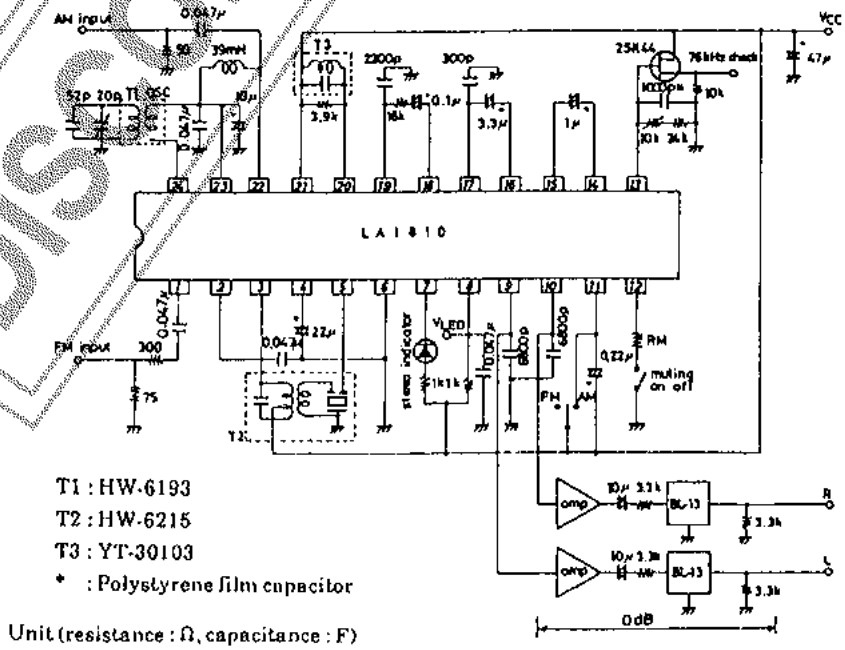
			min	typ	max	Unit
Total Harmonic Distortion	THD	V_{IN} = 100dBμ,100% mod.		0.45	1.2	%
Signal to Noise Ratio	S/N	V_{IN} = 100dBμ,100% mod.	70	80		dB
LED ON Sensitivity	V_{LED}	I_L = 1mA	23	33	43	dBμ
FM Characteristics (Stereo) : f_c = 10.7MHz, f_m = 1kHz,L+R = 90%.pilot = 10%, V_{IN} = 100dBμ						
Separation	Sep			35		dB
Stereo Distortion	THD(Main)			0.8	1.8	%
LED ON Level	V_{LED}-on		2.0	3.5	5.0	%
LED OFF Level	V_{LED}-off			2.7		%
AM Characteristics : f_c = 1000kHz, f_m = 1kHz						
Quiescent Current	Icco	No input		9.5	14.5	mA
Detection Output	Vo1	V_{IN} = 23dBμ,30% mod.	18	33	60	mV
	Vo2	V_{IN} = 80dBμ,30% mod.	40	65	100	mV
Signal to Noise Ratio	S/N1	V_{IN} = 23dBμ,30% mod.	15	19		dB
	S/N2	V_{IN} = 80dBμ,30% mod.	46	51		dB
Total Harmonic Distortion	THD1	V_{IN} = 80dBμ,30% mod.		0.45	1.3	%
	THD2	V_{IN} = 100dBμ,30% mod.		0.6	2.0	%
LED ON Sensitivity	V_{LED}	I_L = 1mA	12	20	28	dBμ

Note : Be fully careful of electrostatic discharge damage.

Equivalent Circuit Block Diagram



Test Circuit



T1 : HW-6193
T2 : HW-6215
T3 : YT-30103
* : Polystyrene film capacitor

Unit (resistance : Ω, capacitance : F)

How to use the LA1810

1. Forced monaural mode

Fig.1 shows how to cause the forced monaural mode to be entered.

① Connect pin 14 to V_{CC} through a resistor of 100kΩ (Turn ON the SW1 in Fig.1).

② Connect pin 15 to GND through a resistor of 47kΩ (Turn ON the SW2 in Fig.2).

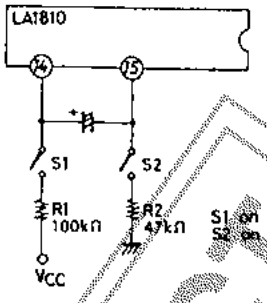
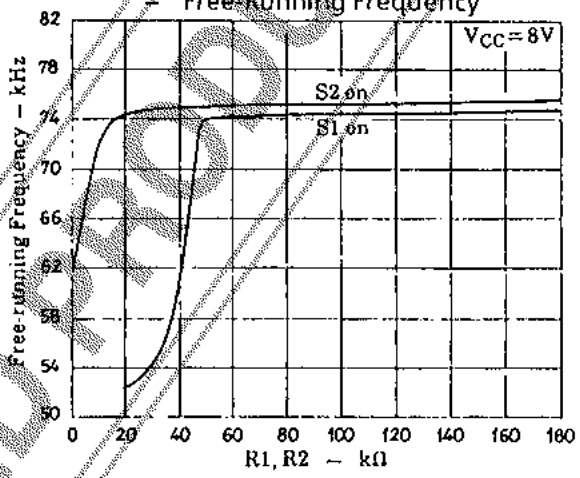


Fig.1 Forced Monaural Mode Setting Method

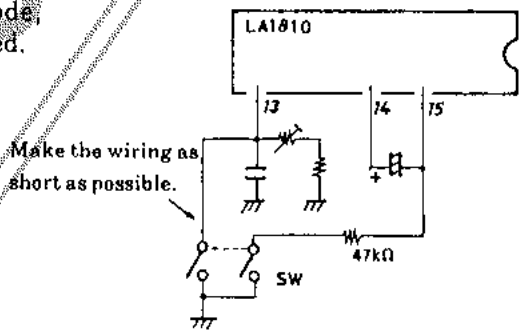
Either above-mentioned ① or ② causes the forced monaural mode to be entered. In this case, the VCO does not stop operating. If the resistance of R1 and R2 is decreased, internal bias will vary and the VCO frequency will vary when the S1 or S2 is turned ON. This data is shown in Fig.2.

Fig.2 Forced Monaural Mode Setting Resistance — Free-Running Frequency



2. VCO stop

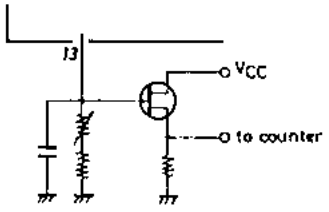
There is no pin available for stopping the VCO at the FM mode. However, the method shown right can be used to stop the VCO at the FM mode, causing the forced monaural mode to be entered.



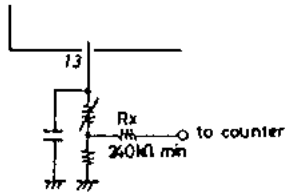
3. Free-running frequency measurement and adjustmet

Either of the following two methods is used to measure the free-running frequency.

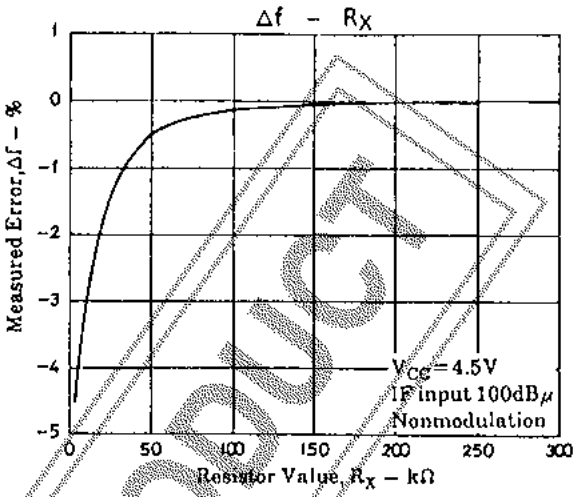
1) Connect pin 13 to a frequency counter through a high input impedance amplifier.



2) Connect the connection point of the semifixed resistor connected to pin 13 and the fixed resistor to a frequency counter throught a resistor of 240kΩ or greater.

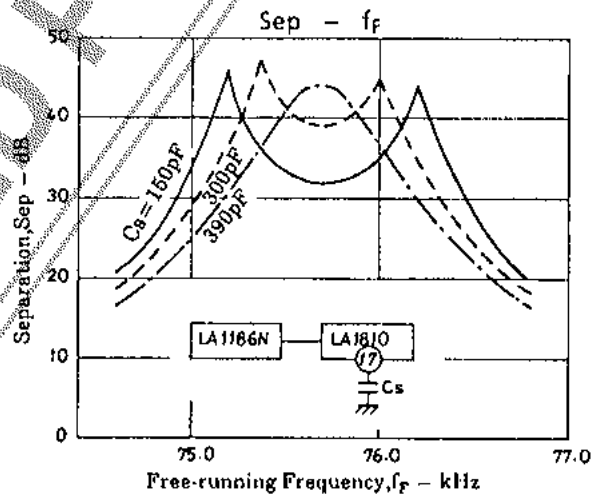


How the error changes with the resistor value is shown right.

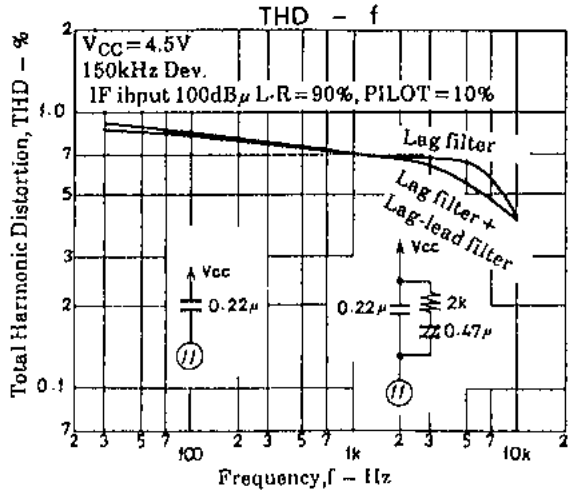


When setting the free-running frequency, the following must be noted.
Apply a 10.7MHz 100dBμ nonmodulation carrier as IF input signal and set to 76kHz±50Hz with the tuning indicator lighted.

4. Separation setting capacitor Cs
The separation characteristic for the LA1810 alone (IF input) differs from that for the antenna input with a front end. This difference is caused by the characteristics of the front end and ceramic filter. Shown right is how the separation setting capacitor value affects the separation characteristic when the LA1186N is used as front end. Referring to this separation characteristic, choose the optimum separation for your set model.

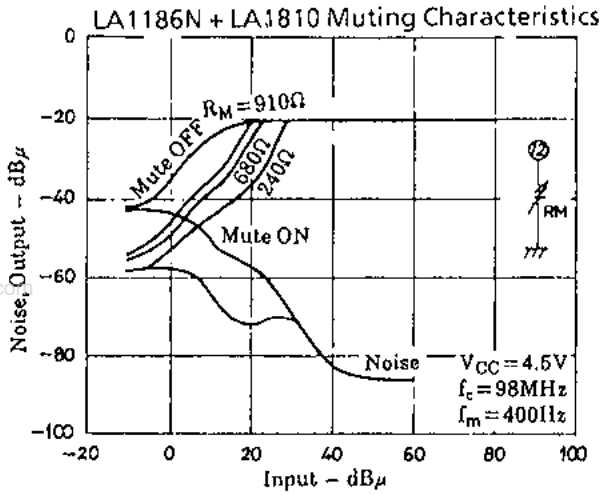


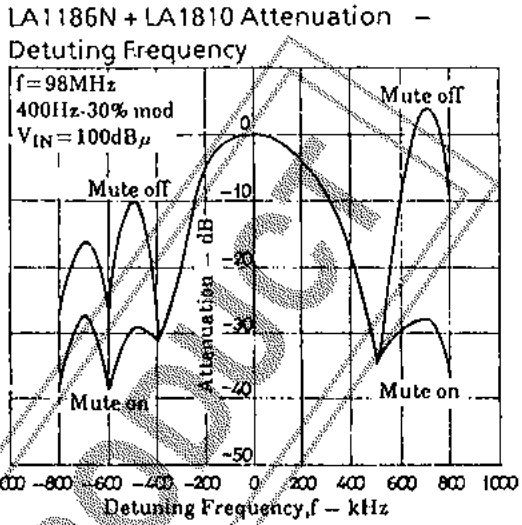
5. A lag-lead filter can be connected across pin 11 and V_{CC}, as shown right, to improve the stereo distortion at low frequencies.



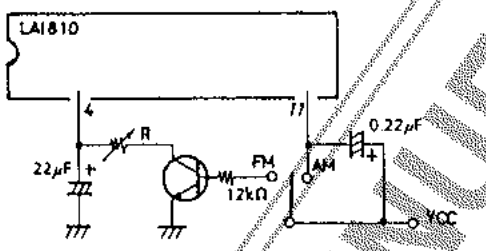
Unit (resistance : Ω, capacitance : F)

6. FM muting pin
The external resistor connected to pin 12 can be used to vary the muting level (Fig.1). The abnormal sound at the time of side peak reception at the FM mode can be reduced by weak signal muting.





7. The following method can be used to change the LED ON sensitivity at the FM mode (Fig.1). The data on the LED ON sensitivity setting resistance and LED ON sensitivity is shown in Fig.2.



Filg.1 Method to Change the LED ON Sensitivity at the FM Mode

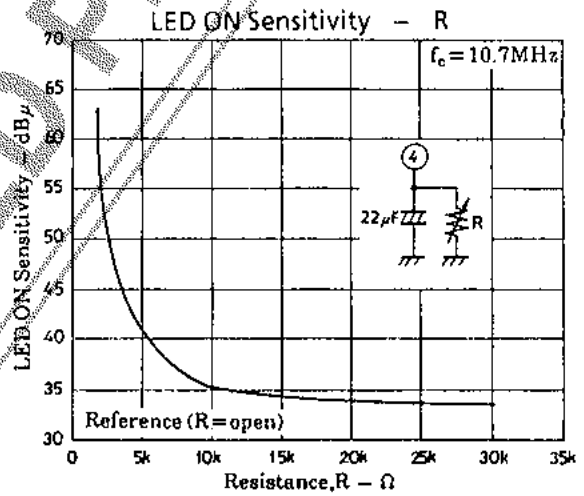
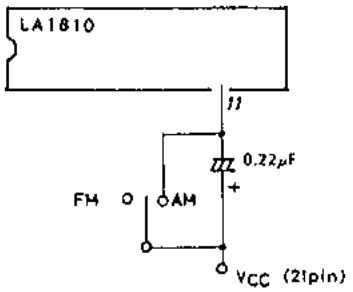
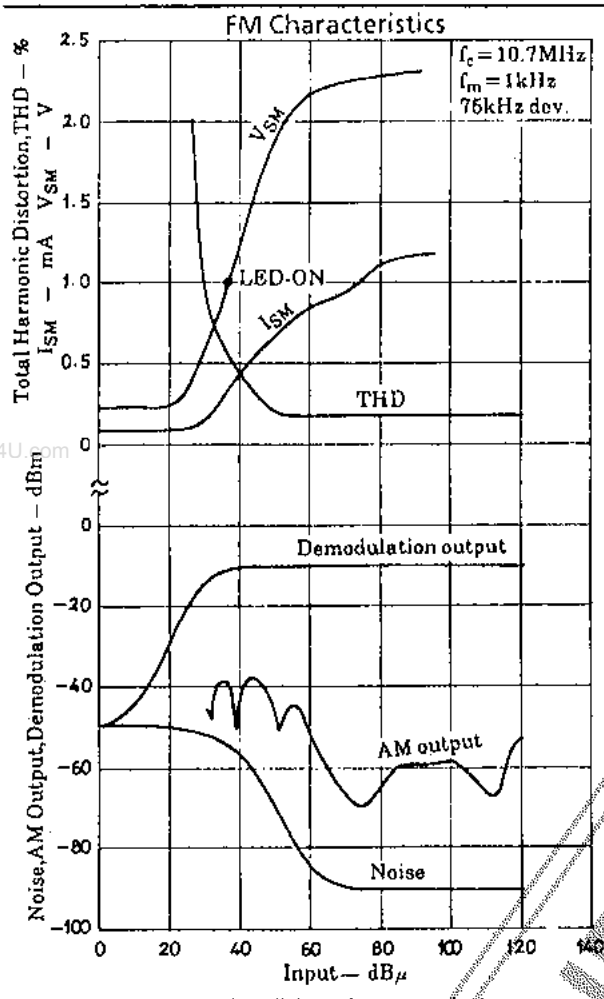


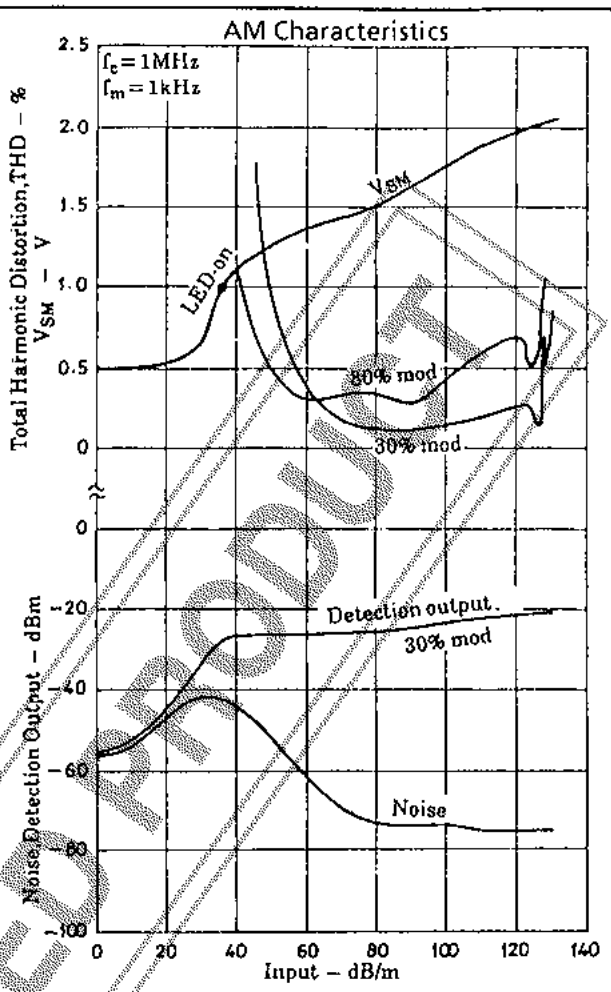
Fig.2 LED ON Sensitivity Setting Resistance – LED ON Sensitivity

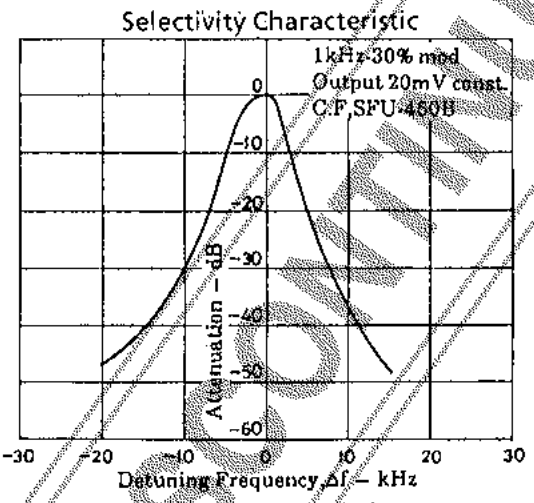
8. AM-FM selection
The FM mode is entered with pin 11 open as shown right. When pin 11 and pin 21 are made to be at the same potential in terms of DC, the AM mode is entered. It should be noted that the dynamic range is narrowed whether the potential at pin 22 is lower or higher than that at pin 21.

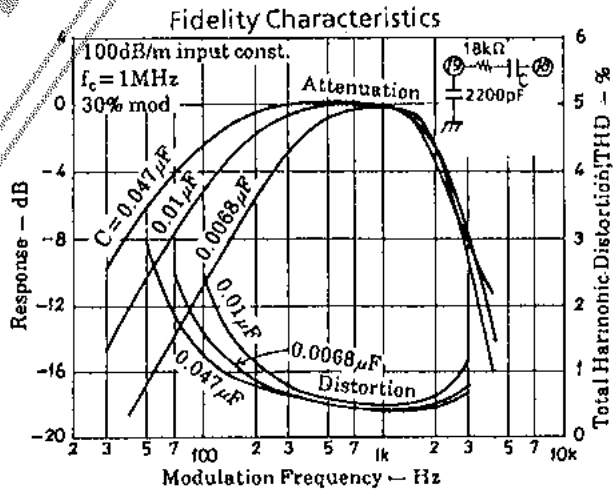


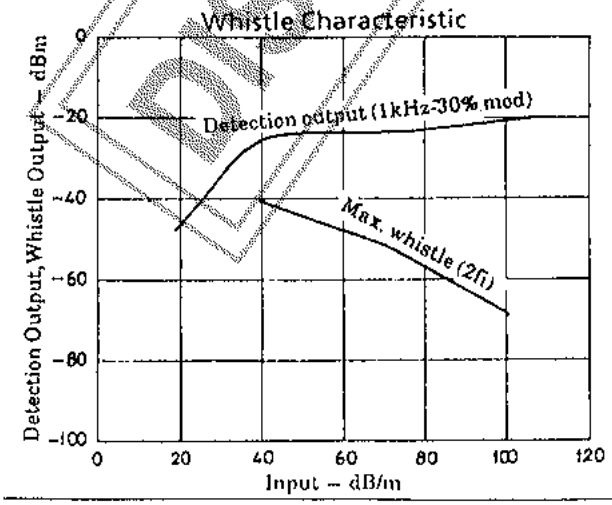
9. If a noise appears in the detection output when the tuning LED goes ON at the AM mode, connect a capacitor across pin 8 and GND to eliminate the noise.

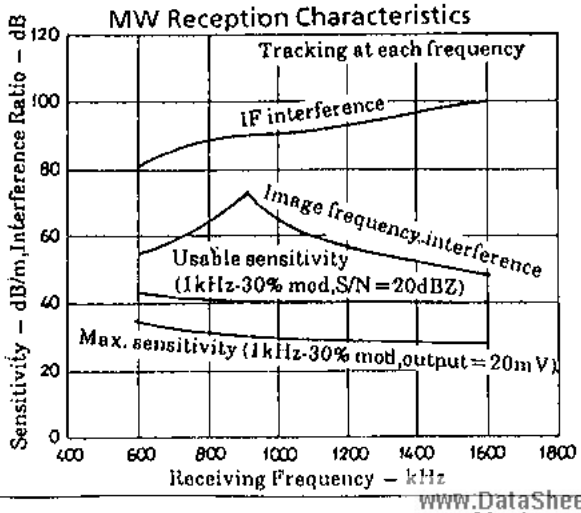




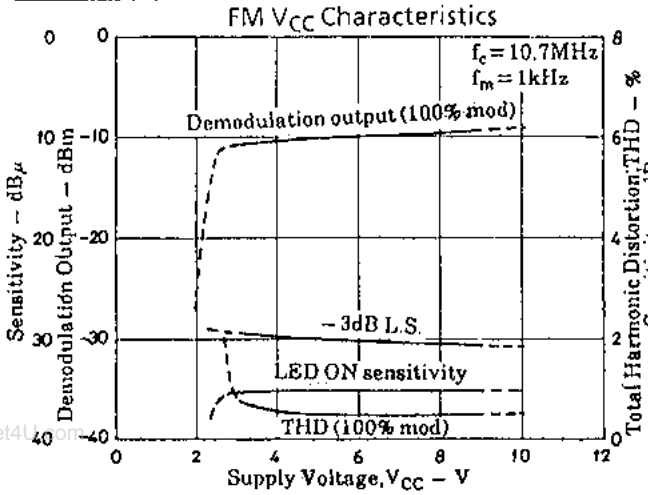




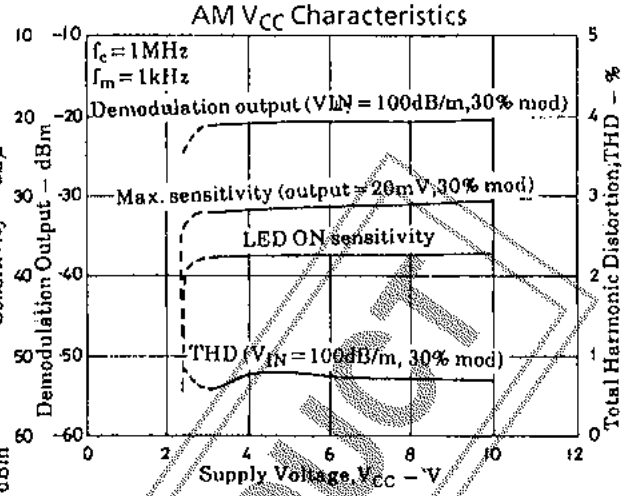




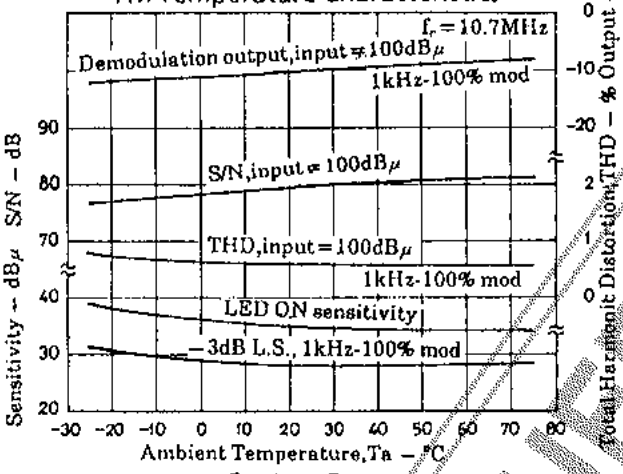
FM V_{CC} Characteristics



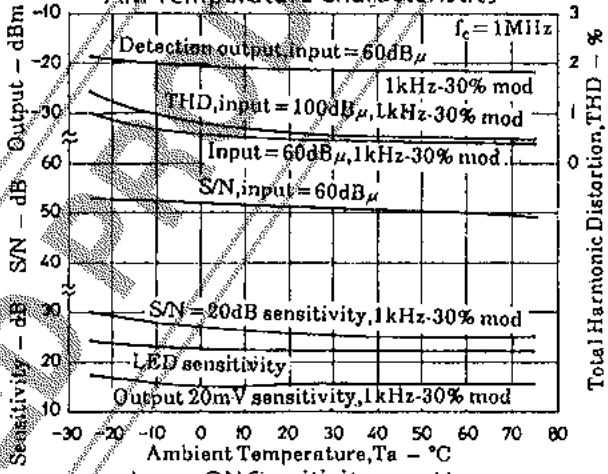
AM V_{CC} Characteristics



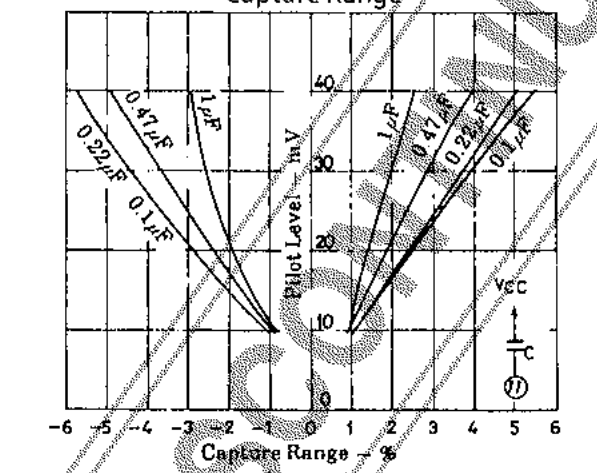
FM Temperature Characteristics



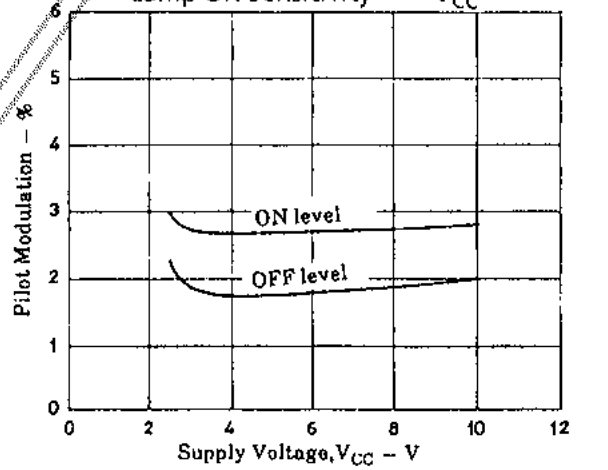
AM Temperature Characteristics



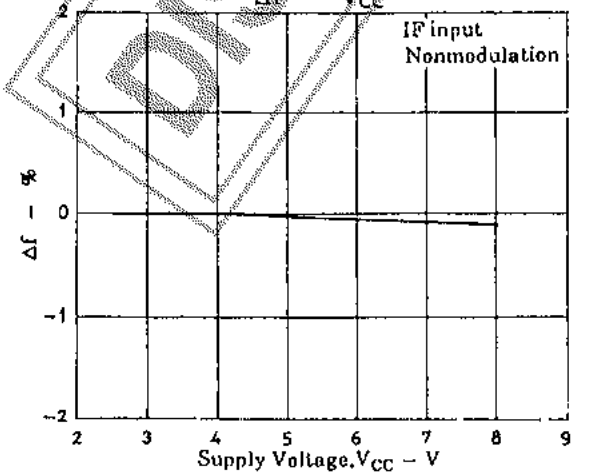
Capture Range



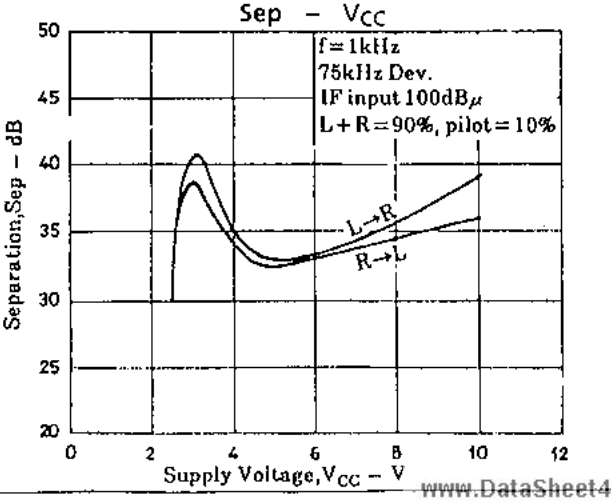
Lamp ON Sensitivity − V_{CC}



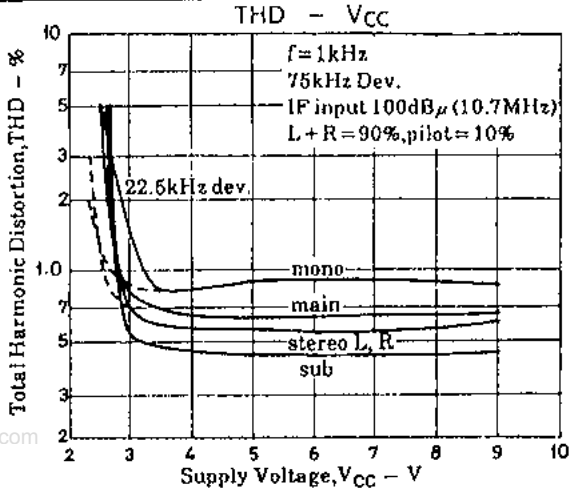
Δf − V_{CC}



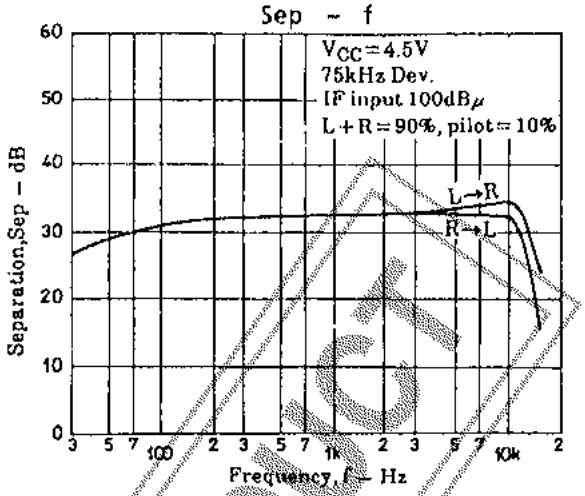
Sep − V_{CC}



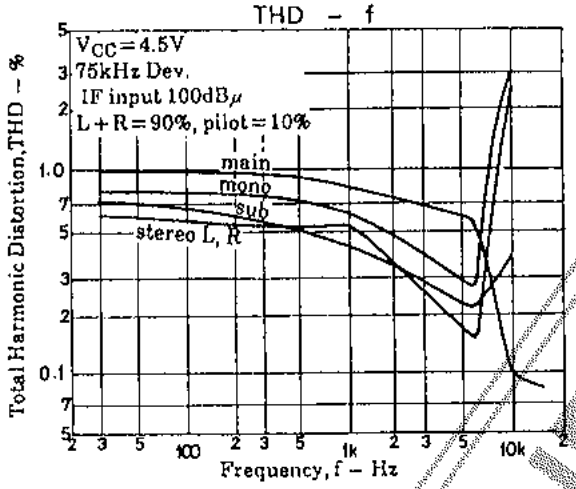
THD – V_{CC}



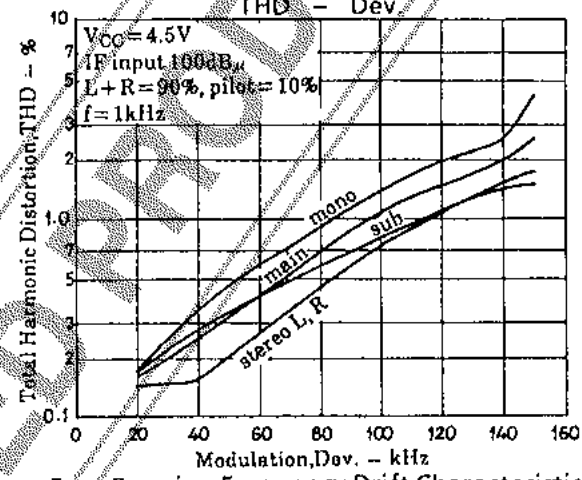
Sep – f



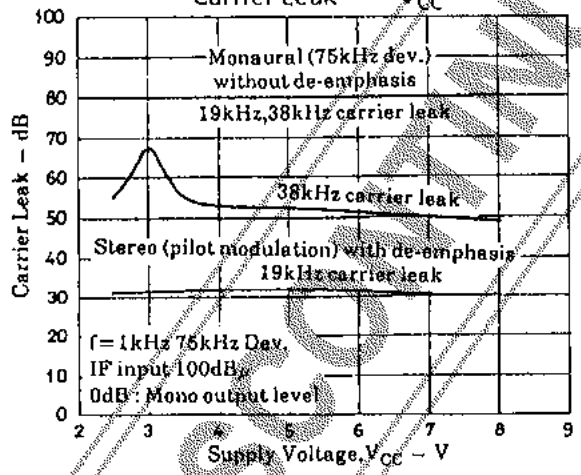
THD – f



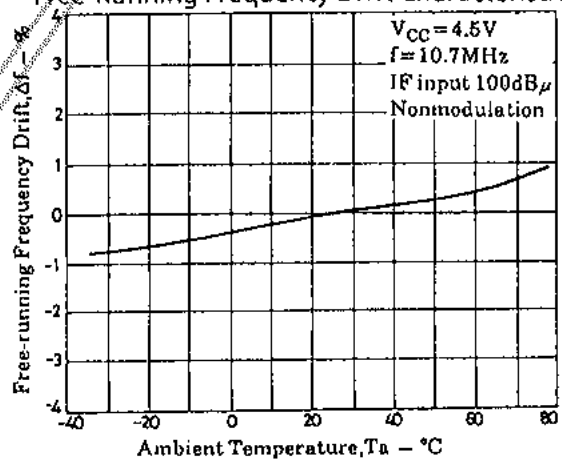
THD – Dev.



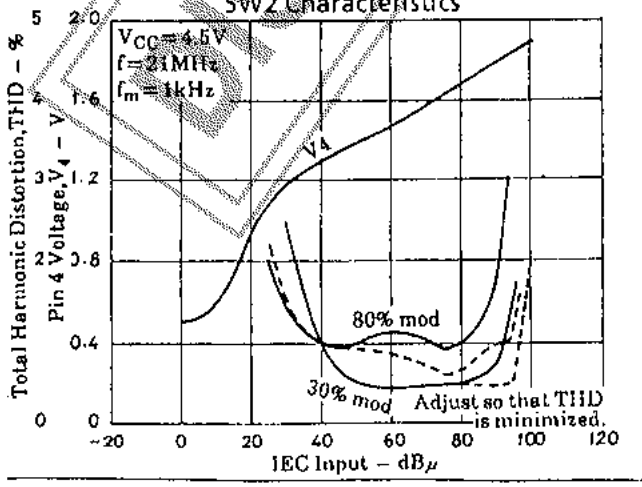
Carrier Leak – V_{CC}



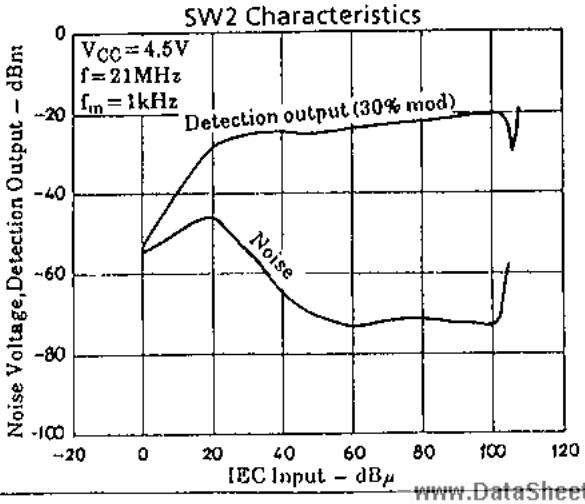
Free-Running Frequency Drift Characteristic



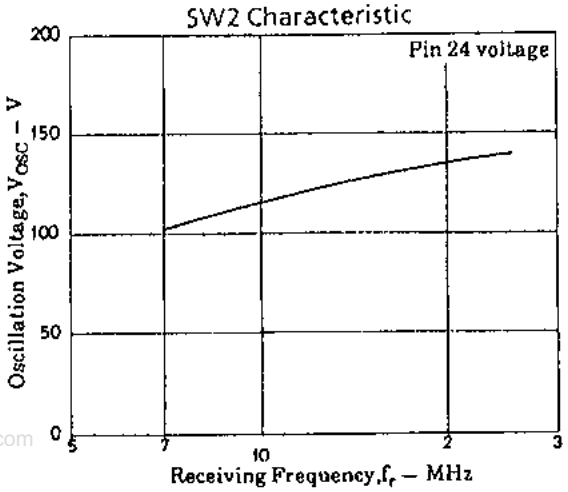
SW2 Characteristics



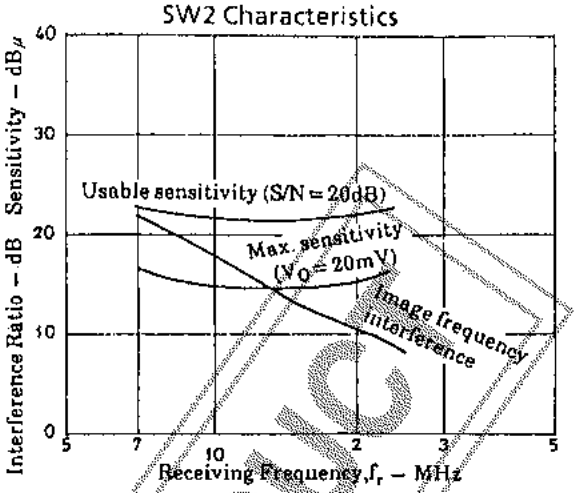
SW2 Characteristics



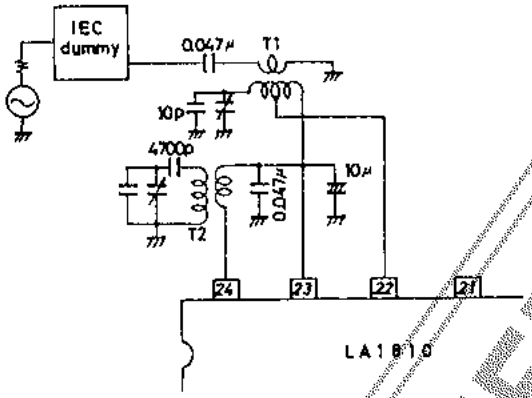
SW2 Characteristic



SW2 Characteristics



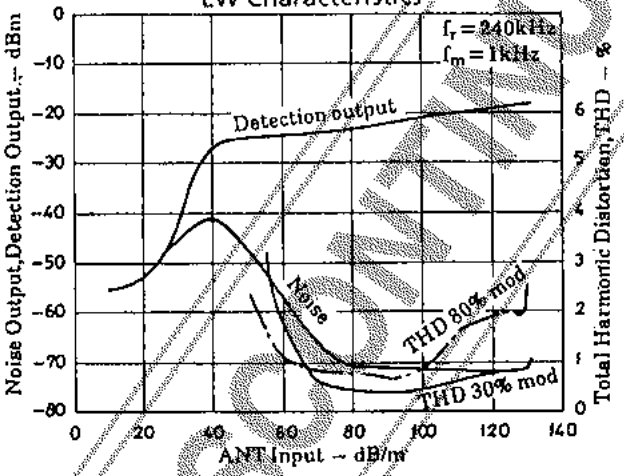
SW Band Test Circuit



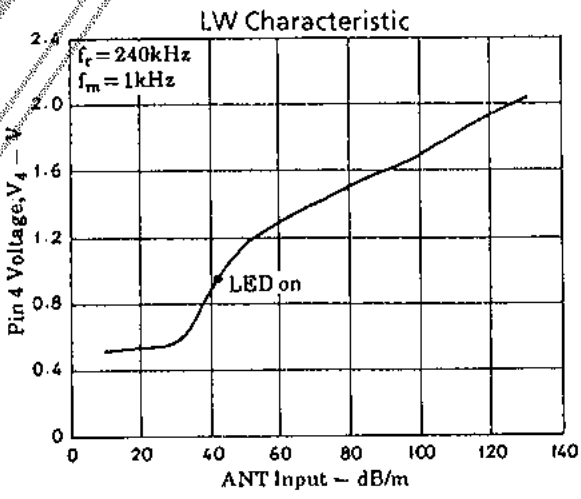
Unit (capacitance : F)

T1 : YT-30117 (Mitsumi), 2158-4095-319A (Sumida)
T2 : HW-40184 (Mitsumi), 0237-1500 (Sumida)

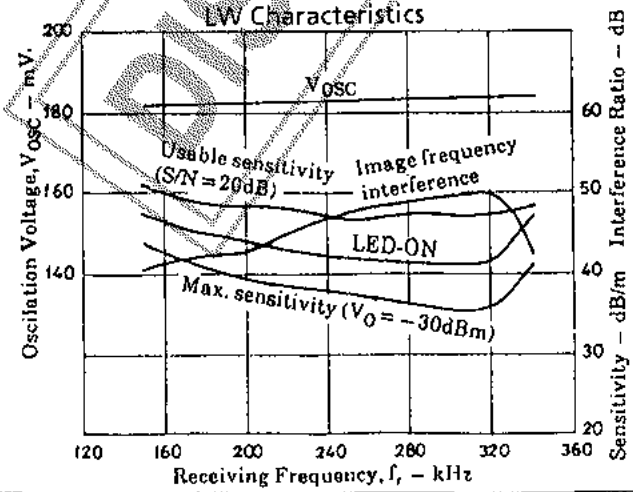
LW Characteristics



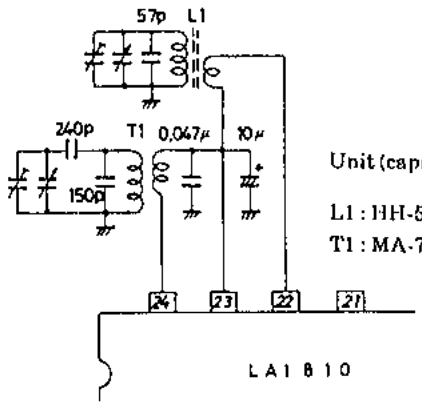
LW Characteristic



LW Characteristics



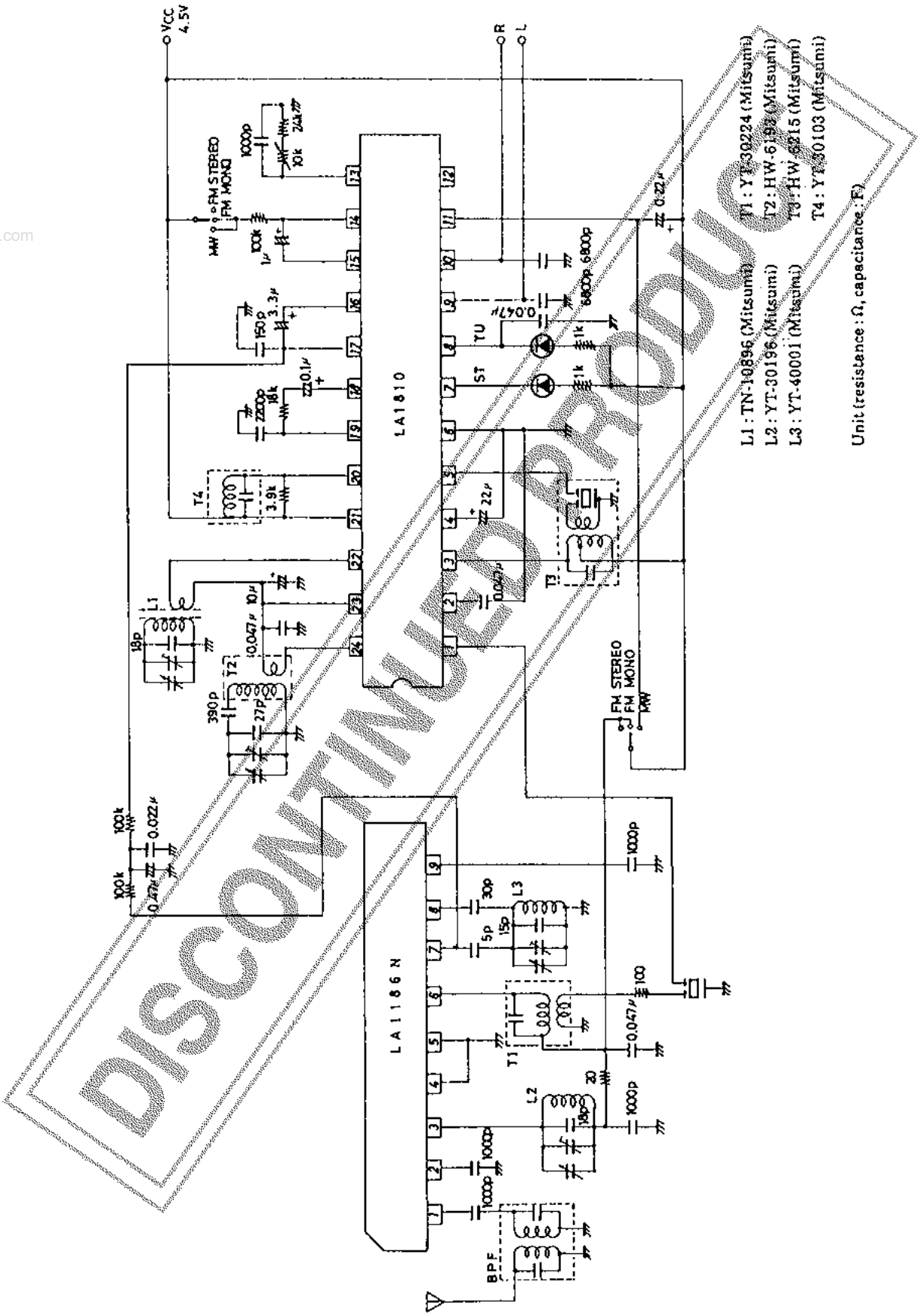
LW Band Test Circuit



Unit (capacitance : F)

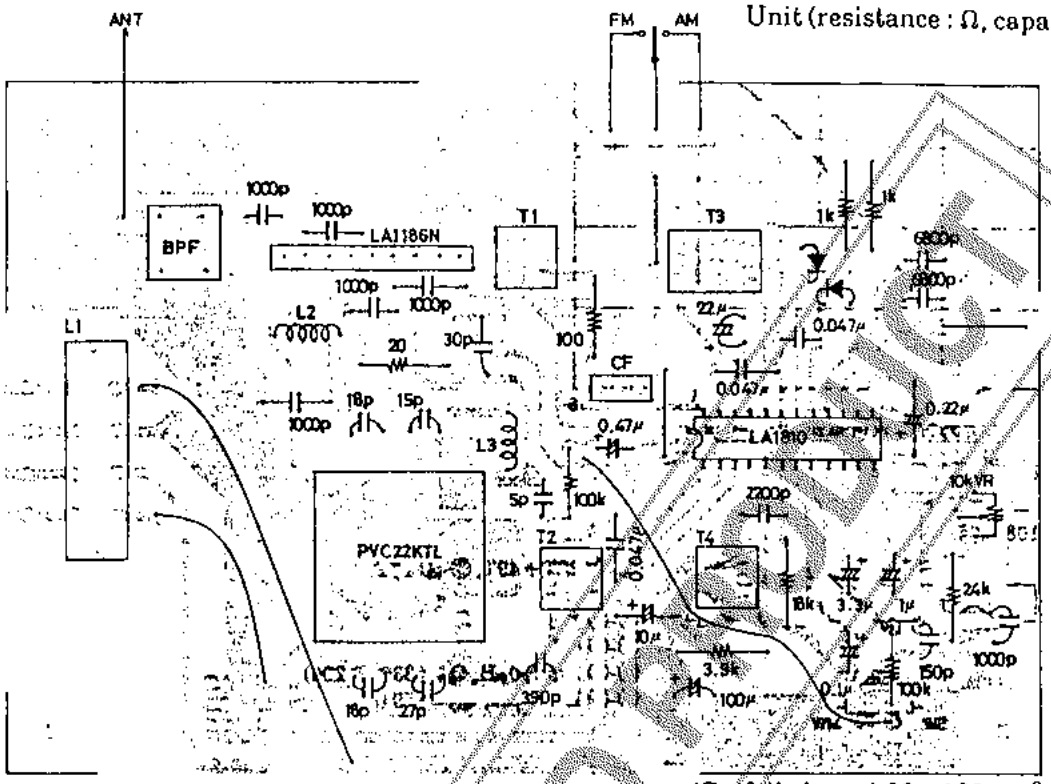
L1 : HH-50161 (Mitsumi)
T1 : MA-7014 (Mitsumi)

Sample Application Circuit : LA1186N + LA1810 FM/MW

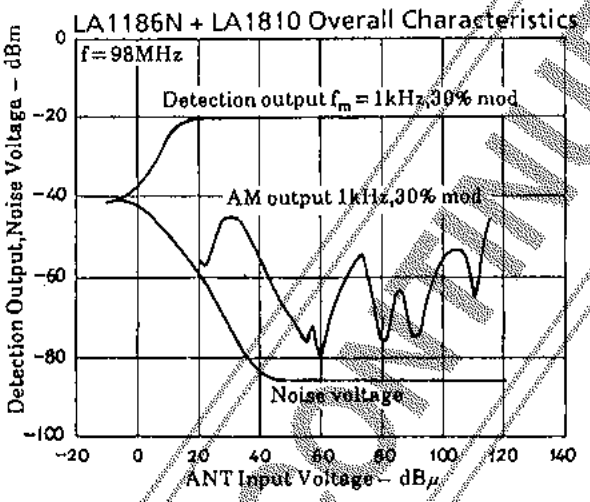


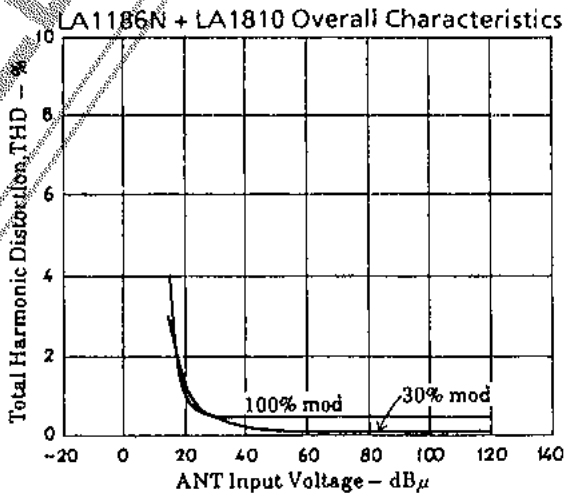
Sample Printed Circuit Pattern (See Sample Application Circuit).

Unit (resistance : Ω, capacitance : F)



(Cu-foiled area) 80×120mm²

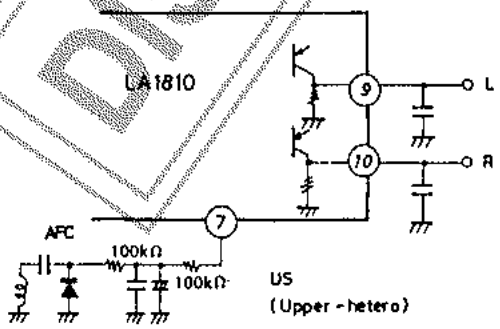




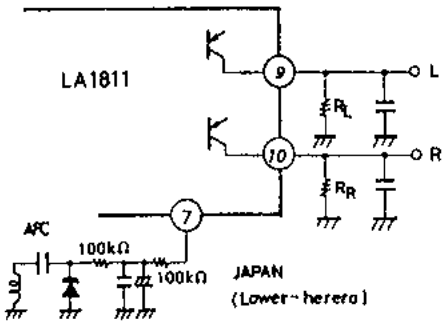
Differences between LA1810 and LA1811

(1) Same pin assignment.

(2) The internal circuit of the MPX OUT (pin 9, pin 10) is different as shown below.

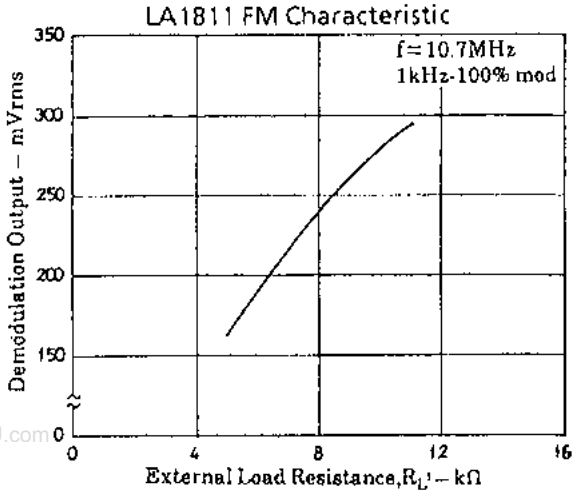


The LA1810 contains the output load resistors. (Output load resistance = 6.8kΩ)



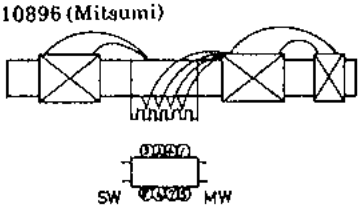
For the LA1811, output load resistors R_L, R_R are connected externally. The graph of demodulation output vs. R_L (R_R) is shown below.

LA1811 FM Characteristic



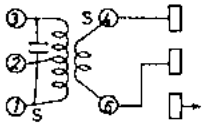
Coil specifications

· MW bar-antenna
TN-10896 (Mitsumi)



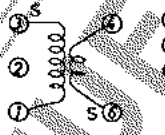
①-② 22T+49T, ③-④ 10T
⑤-⑥ 17T, 0.5φ
⑦-⑧ 4T
①-② L=260μH, Q_O=330 (≧200)
⑤-⑥ L=15μH, Q_O=250 (≧150)

· AM IFT
HW-6215 (Mitsumi) HW-6194
SFU-450B



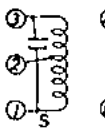
①-② 94T
④-⑥ 7T
②-③ 58T
180pF

· MW OSC
HW-6193 (Mitsumi)



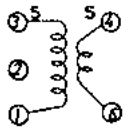
⑥-④ 32T
③-① 64T
Q_O=140, L=140μH

· FM quadrature
YT-30103 (Mitsumi)



④ ①-③ 10T
Q_O=90, f=10.7MHz
82pF
⑤

· SW2 OSC
HW-40184 (Mitsumi)

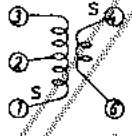


④-⑥ 8T
③-① 12T
Q_O≧28, L=1.31μH

0237-1500 (Sumida)

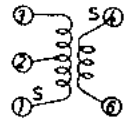
④-⑥ 8T
③-① 12T
Q_O≧20, L=1.31μH

· SW2 ANT
YT-30117 (Mitsumi)



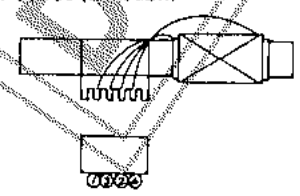
①-② 4T
④-⑤ 2T
②-③ 4T
Q_O=95, L=1.4μH

2158-4095-319A (Sumida)



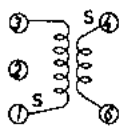
④-⑥ 2T
①-② 5T
②-③ 5T
Q_O≧40, L=1.4μH

· LW bar antenna
HH-50161 (Mitsumi)



①-② 20T
③-④ 200T
③-④ L=2.74mH, Q_O≧200

· LW OSC
MA-7014 (Mitsumi)



④-⑥ 40T
①-③ 80T
L=220μH, Q_O=130

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