Ordering number: EN 1506D

Monolithic Linear IC

SANYO No.1506D

LA1260

FM/AM TUNER SYSTEM FOR RADIO-CASSETTE RECORDERS, MUSIC CENTERS

Functions

FM: IF amp., quadrature detector, AF preamp., tuning indicator drive output
AM: RF amp., MIX, OSC (with ALC), IF amp, Detector, AGC, tuning indicator drive

Featues

- Minimum number of external parts required.(No AM detection coil required)
- High S/N : FM 81dB
  AM 53dB
- Low-level AM oscillator with ALC: Pin 16 OSC output MW 130mV
  SW 70mV to 90mV
  (7MHz) (24MHz)
- Less AM whistle interference: Whistle 1% at input 100dB/m
- On-chip LED tuning indicator driver.
- On-chip FM/AM selector
- Independent FM/AM output pins: Possible to set FM/AM frequency characteristic independently.

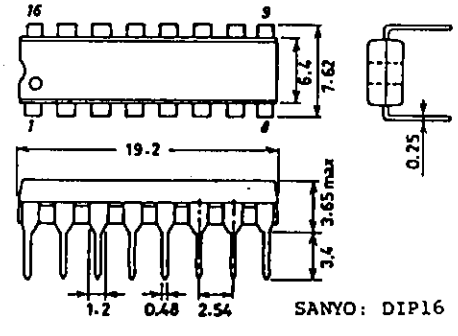
Maximum Ratings at Ta=25°C, See specified Test Circuit.

				unit
Maximum Supply Voltage	V_{CC}max	Pins 6,12	9	V
Maximum Current Dissipation	I_{CC}max	Pins 6+7+12	50	mA
Flow-in Current	I_7	Pin 7	20	mA
Flow-out Current	I_{15}	Pin 15	0.1	mA
Allowable Power Dissipation	$P_d$max	Ta≦70°C	450	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

Package Dimensions
(unit: mm)
3006B



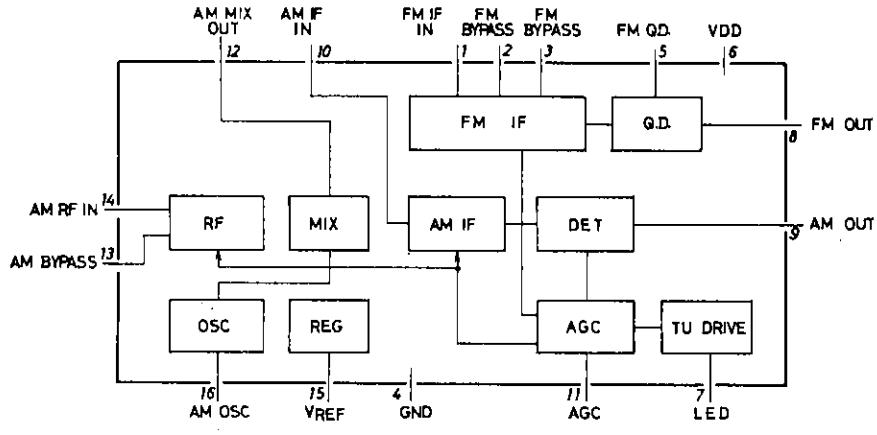
SANYO: DIP16

SANYO Electric Co.,Ltd. Semiconductor Business Headquarters
TOKYO OFFICE Tokyo Bldg.,1-10,1 Chome, Ueno, Taito-ku, TOKYO, 110 JAPAN

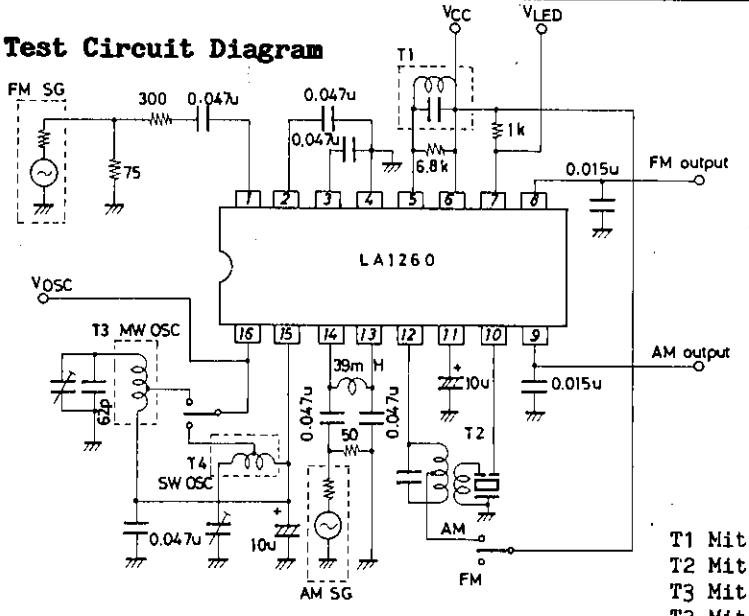
Operating Characteristics at Ta=25°C, V_{CC}=4.5V, See specified Test Circuit.

			min	typ	max	unit
[AM Characteristics: f=1MHz]						
Quiescent Current	IccoAM	V_{IN}=No input		7.5	10.5	mA
Detection Output	Vo1	V_{IN}=23dBu,400Hz-30%mod	-33	-28	-23	dBm
			17.3	31	55	mV
S/N Ratio	S/N1	V_{IN}=23dBu,400Hz-30%mod	18.0	21.5		dB
Detection Output	Vo2	V_{IN}=60dBu,400Hz-30%mod	-19.0	-16.0	-13.0	dBm
			87	122	174	mV
S/N Ratio	S/N2	V_{IN}=60dBu,400Hz-30%mod	48	53		dB
Total Harmonic Distortion	THD1	V_{IN}=60dBu,400Hz-30%mod		0.45	1.3	%
	THD2	V_{IN}=100dBu,400Hz-30%mod		1.5	3.0	%
LED Lighting Voltage	V_{LEDAM}	I_C=1mA	22	30	38	dBm
Oscillation Output(24MHz)	V_{OSC24M}		60	86	120	mV
[FM Characteristics: f=10.7MHz]			min	typ	max	unit
Quiescent Current	Icco	V_{IN}=No input		8.5	12.0	mA
-3dB Sensitivity	Vilim	-3dBdown,400Hz-100%mod		35	42	dBu
Demodulation Output	Vo3	V_{IN}=80dBu,400Hz-100%mod	-12.5	-9.5	-6.5	dBm
			183	260	367	mV
S/N Ratio	S/N3	V_{IN}=80dBu,400Hz-100%mod	77	81		dB
	S/N4	V_{IN}=80dBu,400Hz-30%mod		71		dB
Total Harmonic Distortion	THD3	V_{IN}=80dBu,400Hz-100%mod		0.55	1.2	%
	THD4	V_{IN}=80dBu,400Hz-30%mod		0.05		%
LED Lighting Level	V_{LEDFM}	I_L=1mA		39	49	dBu
AM Rejection	AMR	V_{IN}=80dBu,400Hz-100%mod 1kHz-30%mod		60		dB

Equivalent Circuit Block Diagram



Specified Test Circuit Diagram



Unit (resistance: Ω, capacitance: F)

T1 Mitsumi YT30194(56PF tuning)
T2 Mitsumi KW30011
T3 Mitsumi YT30105
T3 Mitsumi YT30112

Proper Cares in Using the IC

External parts placement and pattern

- The AM local oscillation parts, AM local oscillation coil, and antenna circuit parts such as bar antenna must be separated from each other as far as possible to prevent Qs from worsening.
- Pin 16 (AM oscillation injection pin) and pin 14 (RF input pin) must be separated from each other on the pattern as shown in Fig. A below. Care should be taken not to make unwanted coupling by parallel wiring as shown in Fig. B to prevent Qs from worsening.

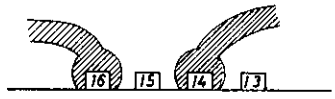


Fig. A Good example

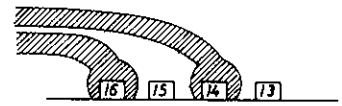


Fig. B Bad example

FM quadrature detection coil

- The values recommended for the detection coil are shown below. (See Fig. 1.)

Tuning capacitance 56pF
Damping resistance 6.8kohms

- Values other than recommended provide the LED drive characteristic as shown below.

	Value increased	Value decreased
Tuning capacitance	. Lighting is delayed. . No lighting may occur at low temperatures.	. Lighting is advanced. . Mislighting may occur in the absence of signal.
Damping resistance	. Lighting is advanced. . Mislighting may occur in the absence of signal.	. Lighting is delayed. . No lighting may occur at low temperature.

If the product of tuning capacitance and damping resistance is equal to that of values recommended above (e.g. tuning capacitance=82pF, damping resistance=4.7kohms), other characteristics (demodulation output, S/N, THD, etc.)

Continued on next page.

Continued from preceding page.

than the LED drive characteristic remain almost unaffected.

. For applications where a double tuning coil is used, refer to "Applications where a double coil is used" on page 15.

How to apply FM AFC

The S curve at the FM output pin (pin 8) is as shown in Fig. 1. Therefore, the domestic (Japan) band (lower local oscillation) use and foreign band (upper local oscillation) use differ as shown in Figs. 2 and 3.

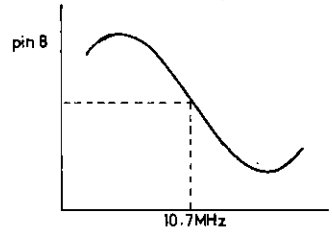


Fig. 1

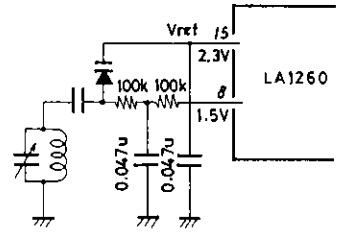


Fig. 2 Domestic (lower local oscillation) band

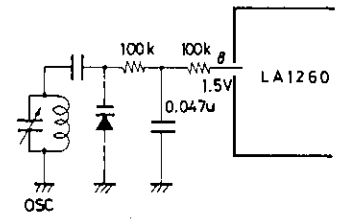
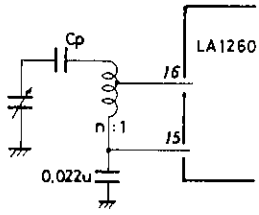


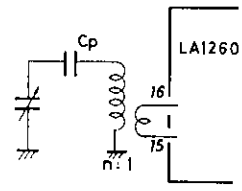
Fig. 3 Foreign (upper local oscillation) band

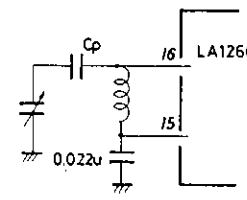
Unit (resistance: Ω, capacitance: F)

AM local oscillation

Since the LA1260 contains an ALC circuit, the oscillation level at pin 16 can be limited to 60 to 150mV in the following applications where a coil is used.







Unit (capacitance: F)

Stable oscillation occurs at a coil impedance of 5kohms or greater viewed from across pins 16 and 15. Turn ratio n and Qo must be determined so that the oscillation level at pin 16 becomes 75mV or greater for MW use and 60mV or greater for SW use.

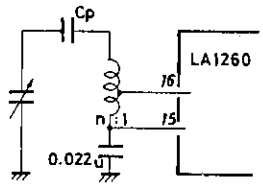


Fig. 4

If turn ratio n is increased more than needed, the oscillation level at pin 16 drops, thereby lowering the maximum sensitivity as shown in Figs. 5 and 6. Fig. 7 shows the relation between turn ratio n and oscillation level at pin 16 in the MW band.

Unit (capacitance: F)

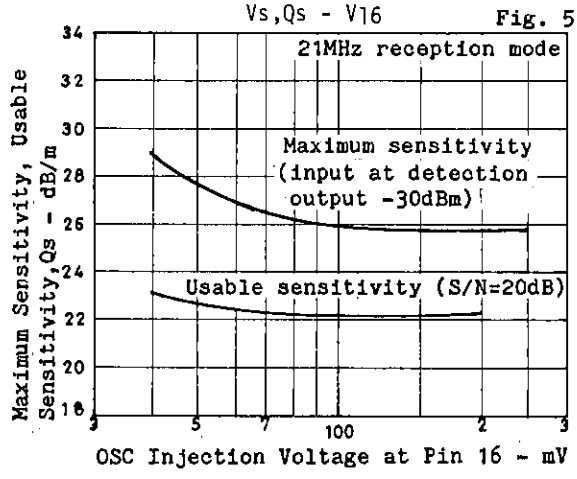


Fig. 5

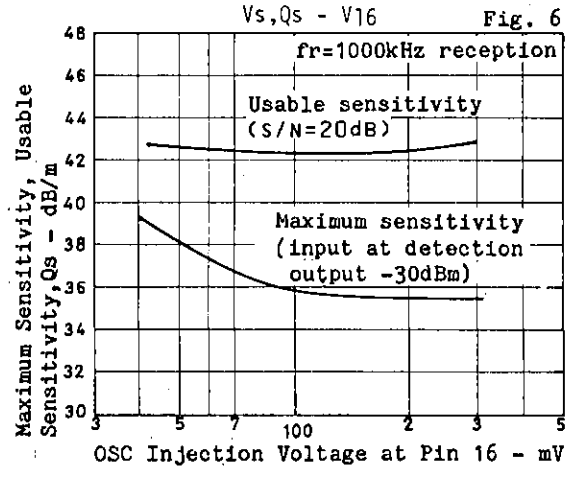
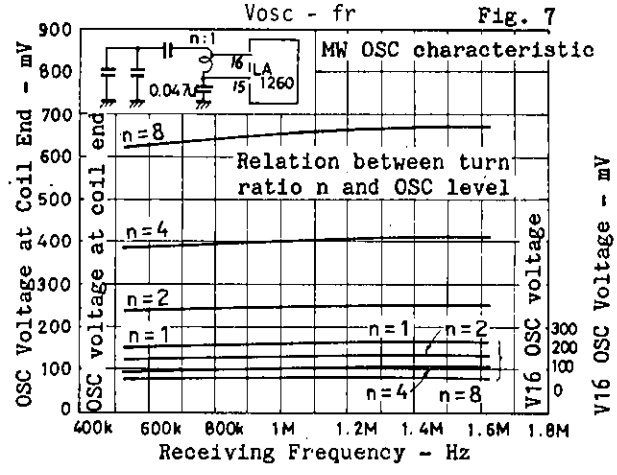
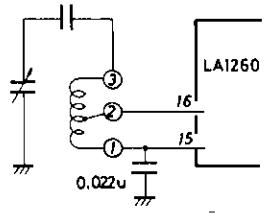


Fig. 6



AM oscillation coil



Unit (capacitance: F)

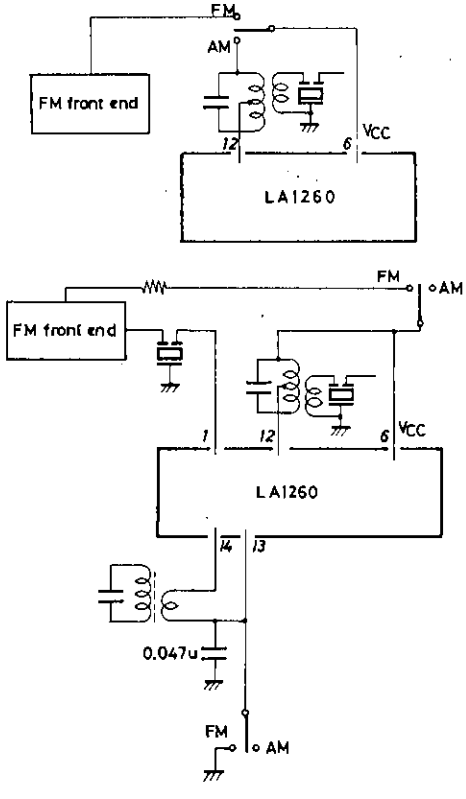
Generally speaking, the following should be noted. Winding with loose coupling between ① and ② and between ① and ③ must be avoided. (Particularly SW1, SW2)

To put it concretely, the pot core type is better than the screw core type which is loose in coupling. This prevents the local oscillation frequency from turning third resonance frequency related to the coupling coefficient.

LED unlighted time and distortion in AM (MW)

By increasing the value of the electrolytic capacitor for AGC at pin 11 (Fig. 8), the distortion in the AM mode can be improved, but the LED unlighted time is made longer. 10uF is recommended for obtaining the optimum LED unlighted time and distortion. The LED unlighted time is 200msec. at this value. (Approximately 400msec. at 22uF)

FM-AM selection and dc level at pin 12



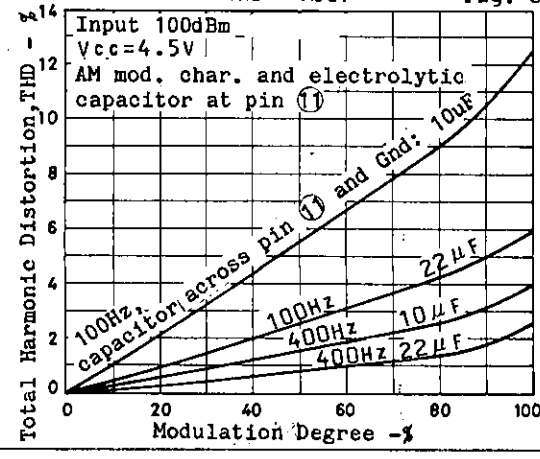
Unit (capacitance: F)

(1) Pin 12-used method=recommended circuit

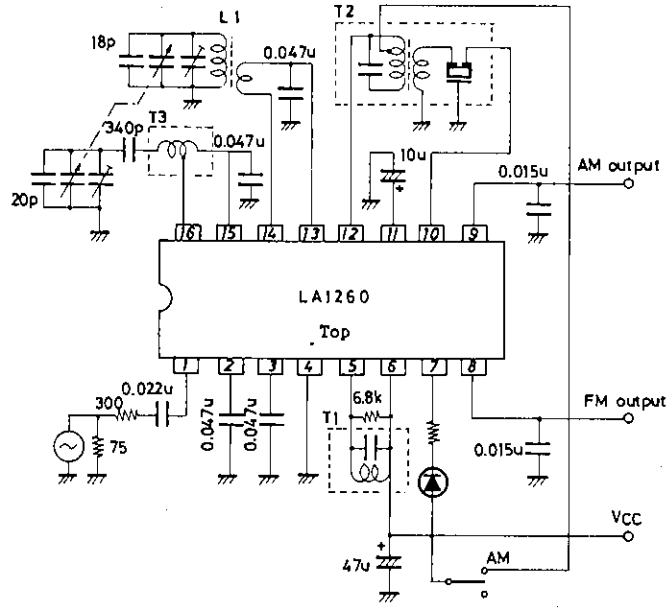
The FM mode is entered with pin 12 open. When pin 12 and pin 6 are at the same potential in terms of DC, the AM circuit is turned on by the internal switch. It should be noted that the dynamic range is narrowed whether the potential at pin 12 is lower or high than that at pin 6.

(2) Pin 13-used method

The AM mode is entered with pin 13 open. When pin 13 is grounded, the FM circuit is turned on and the AM circuit is turned off by the internal switch. In this case, pin 12 and pin 6 (V_{CC}) are at the same potential.



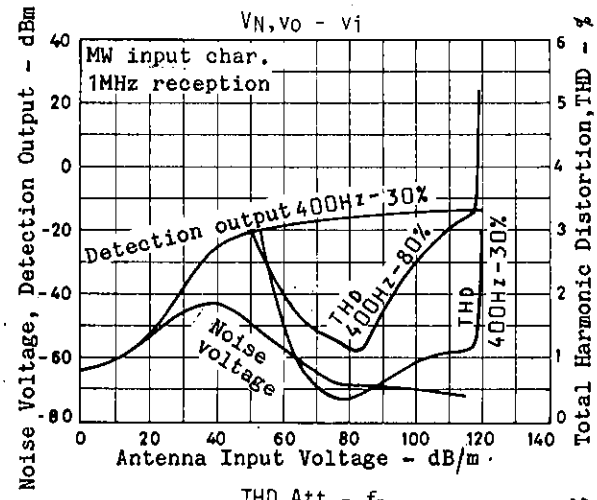
FM IF/MW Test Circuit

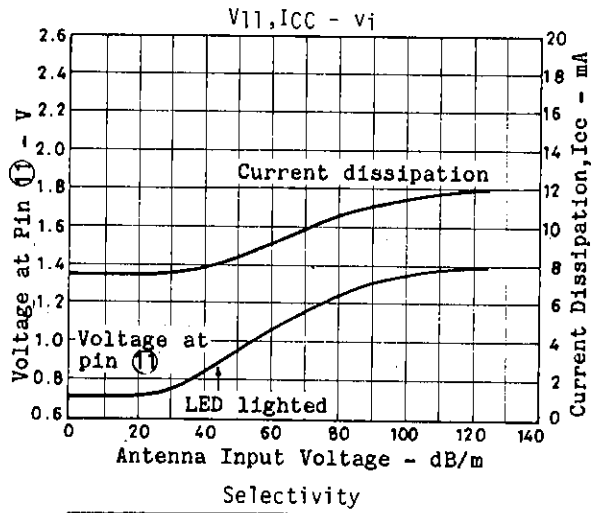


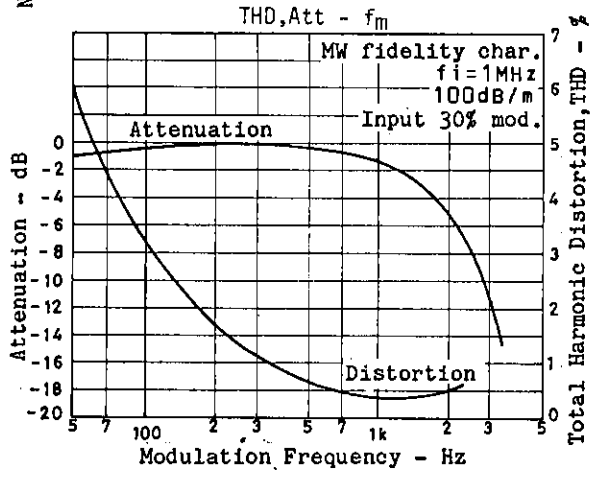
Unit (resistance: Ω, capacitance: F)

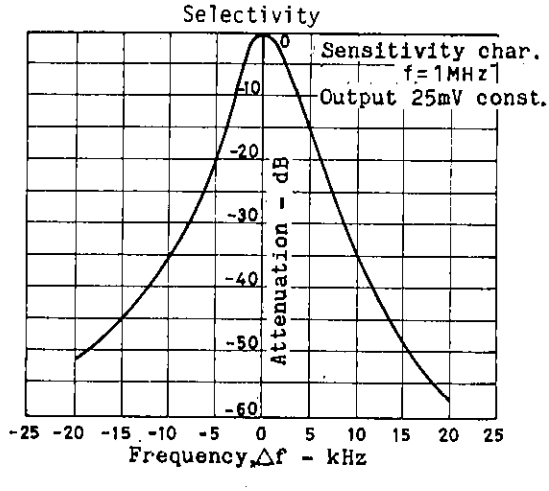
L1 TN10896(Mitsumi)
T1 YT-30194(Mitsumi),2153-4095-239(Sumida)
T2 KW-30011(Mitsumi)
T3 YT-30105(Mitsumi)

[MW Characteristics]

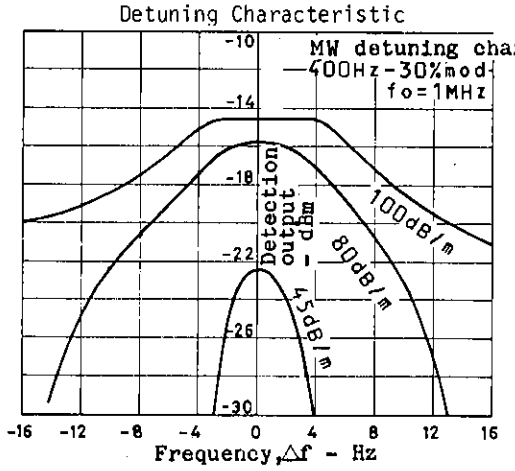




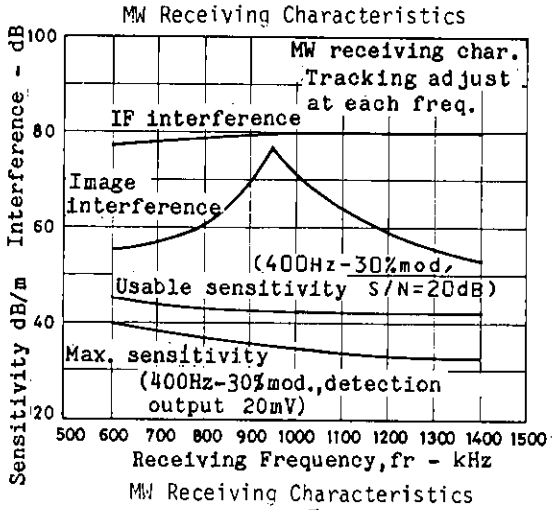




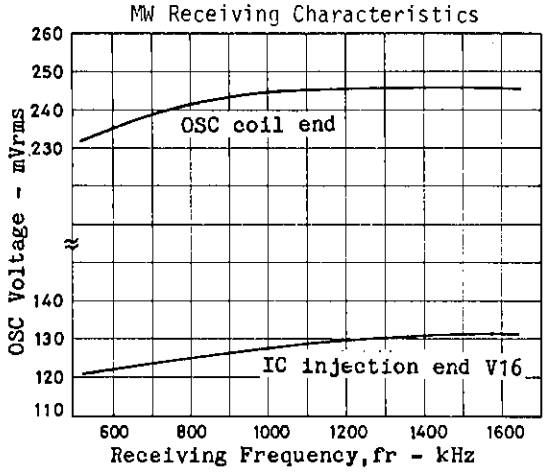
Detuning Characteristic



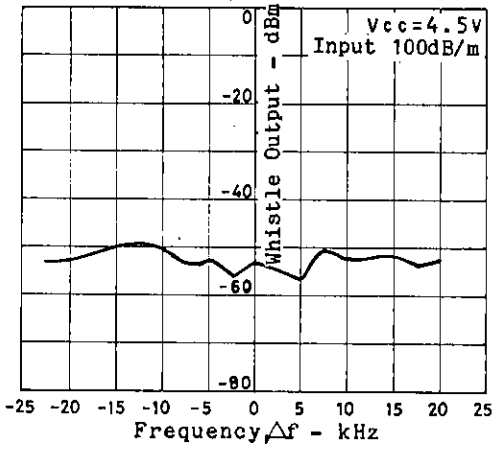
MW Receiving Characteristics



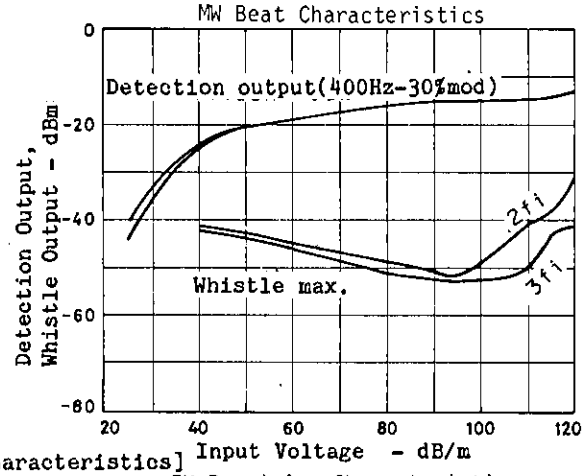
MW Receiving Characteristics



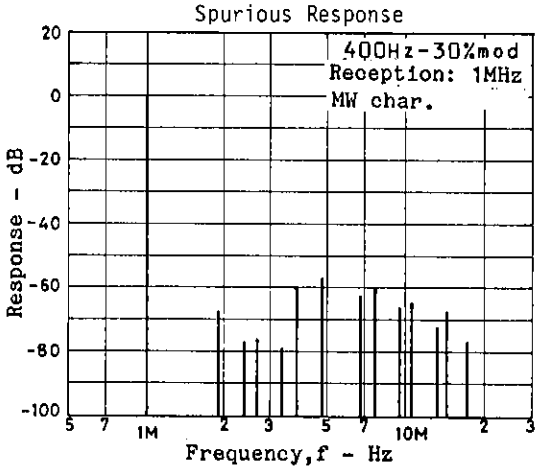
MW Receiving Characteristics



MW Beat Characteristics

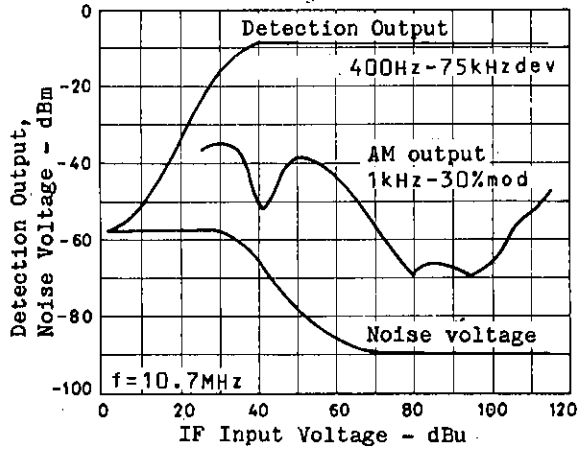


Spurious Response

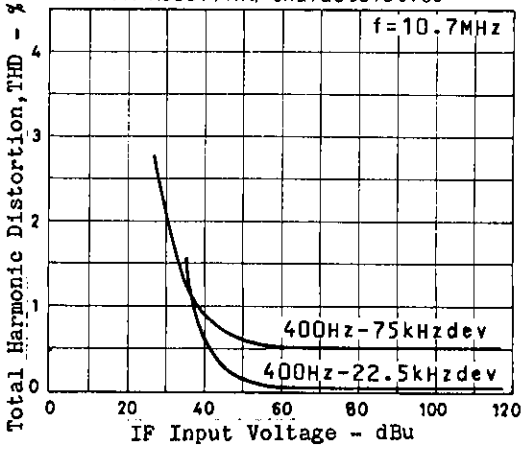


[FM Characteristics]

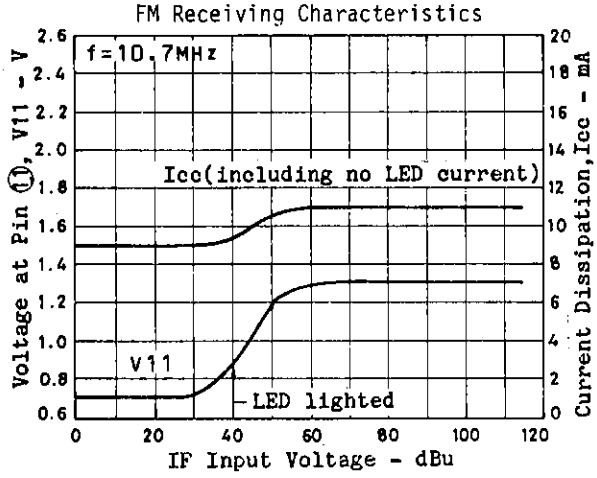
FM Receiving Characteristics



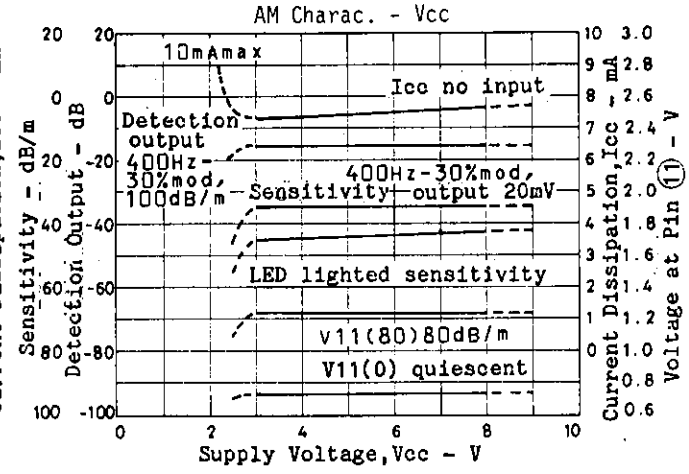
FM Receiving Characteistics



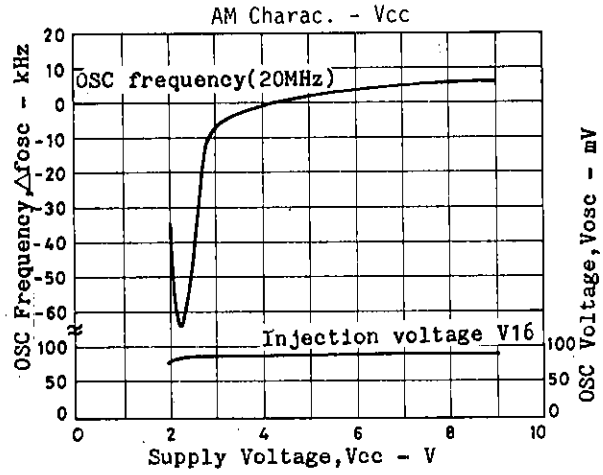
FM Receiving Characteristics



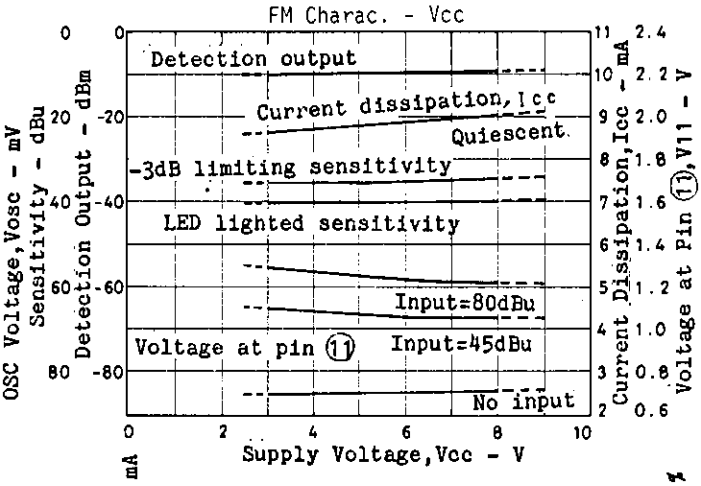
AM Charac. - Vcc



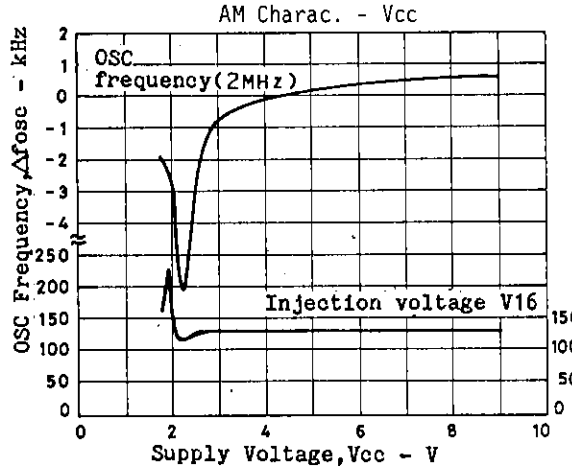
AM Charac. - Vcc



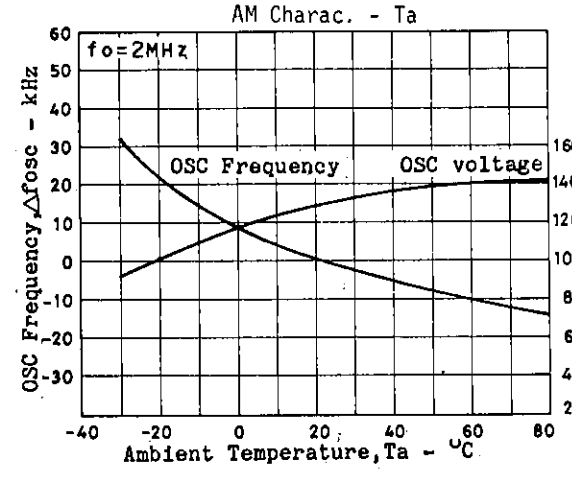
FM Charac. - Vcc



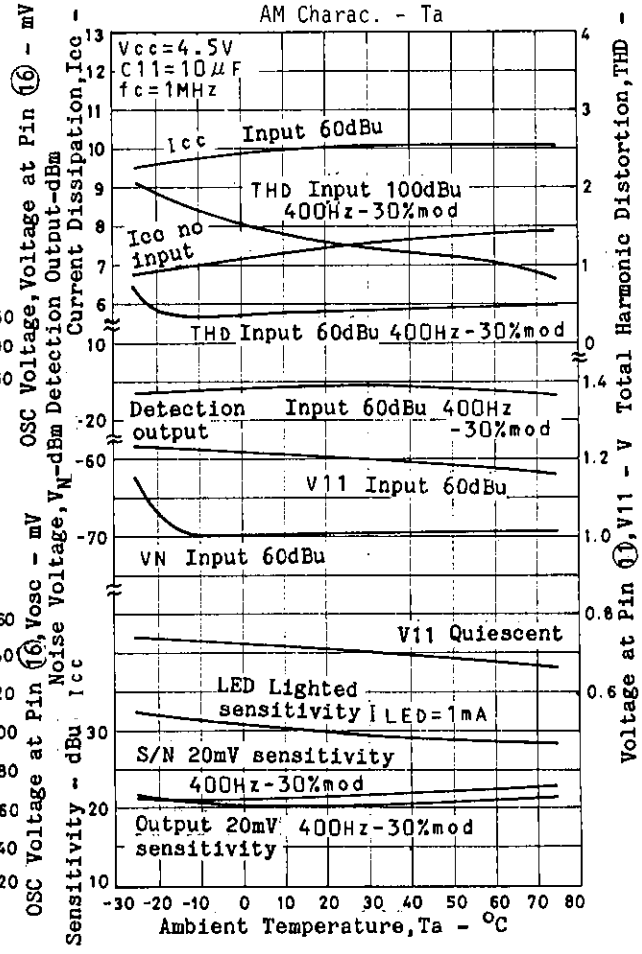
AM Charac. - Vcc

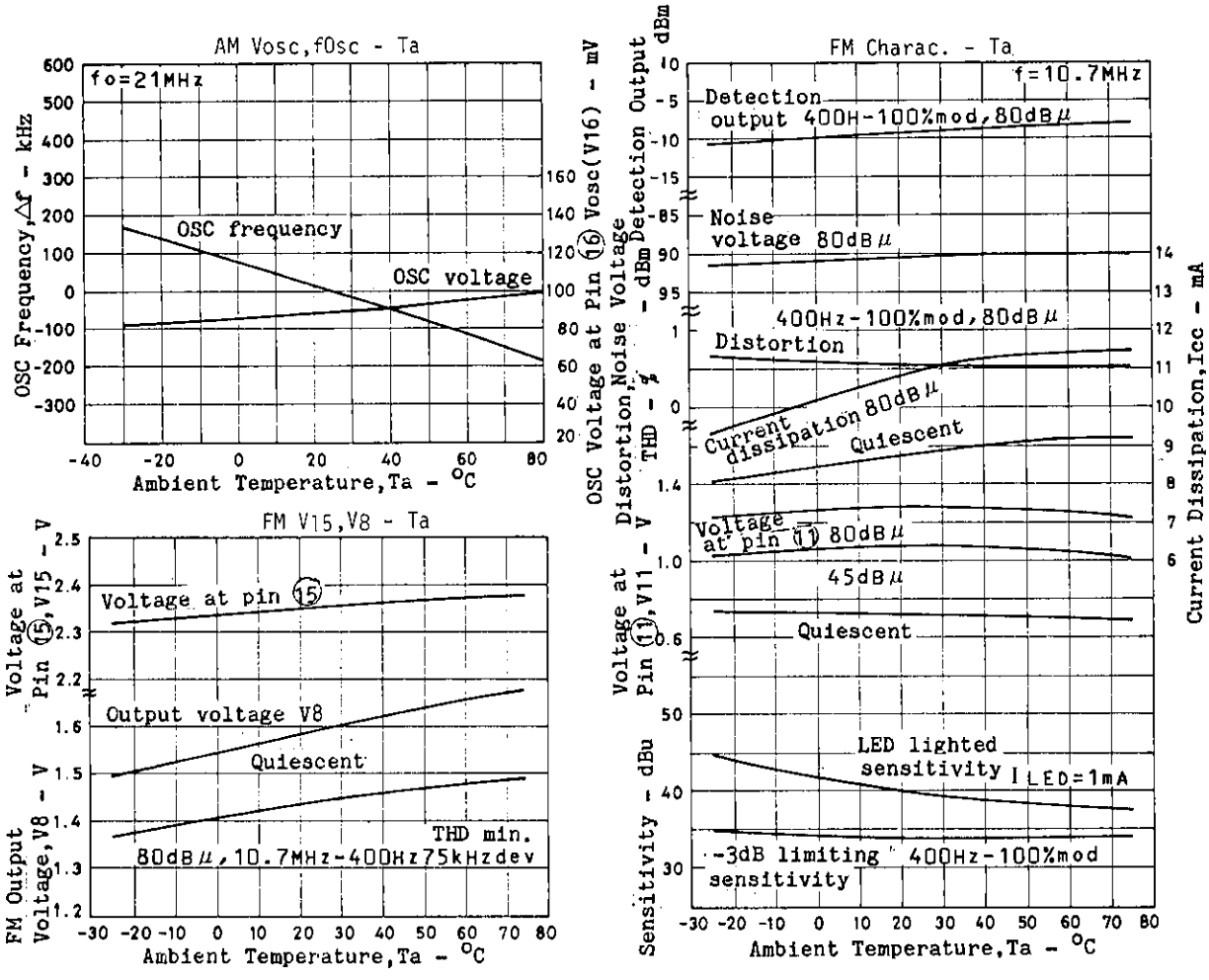


AM Charac. - Ta

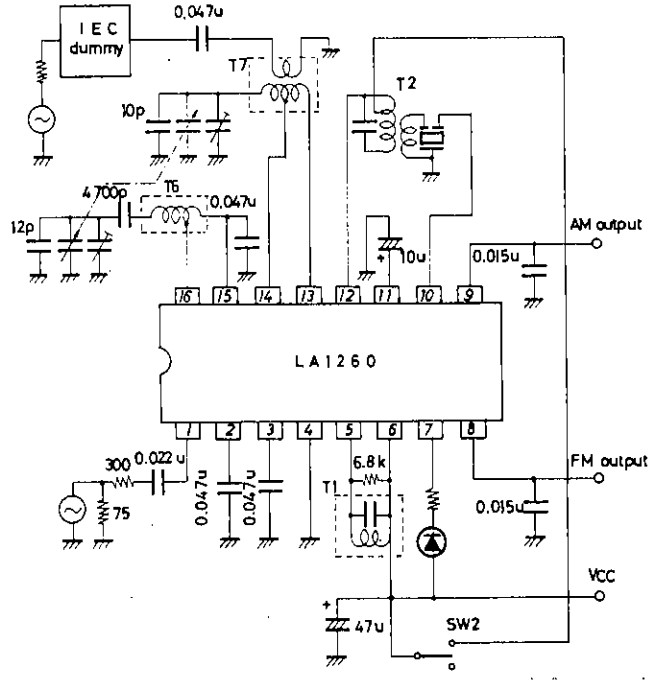


AM Charac. - Ta



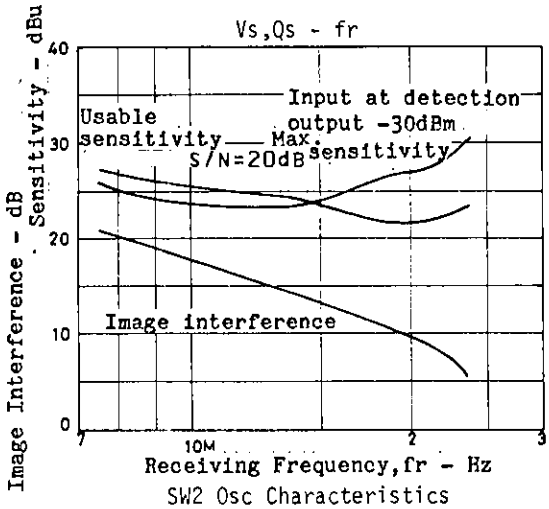


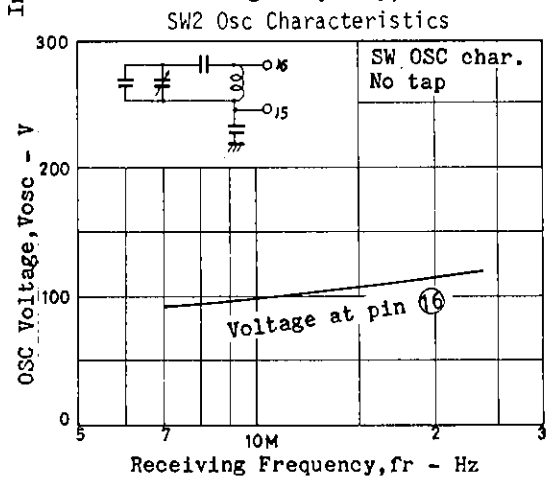
Sample Application Circuit 1 : FM IF/SW2 (7.2 to 24.0 MHz)

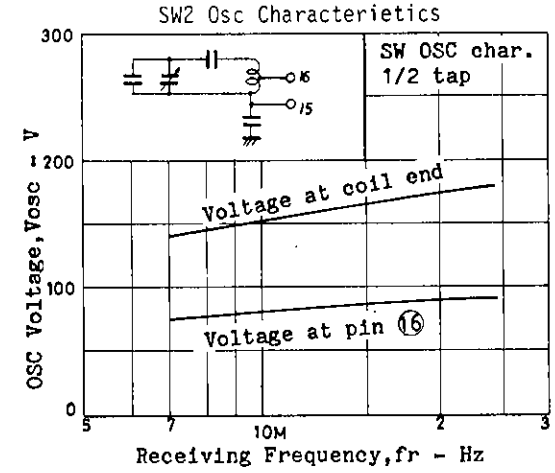


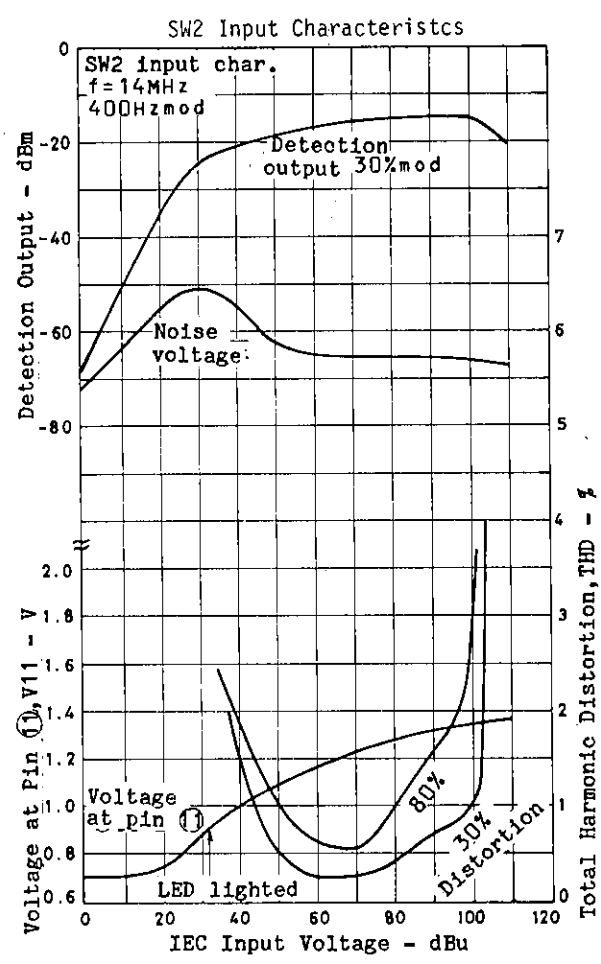
Unit (resistance: Ω, capacitance: F)

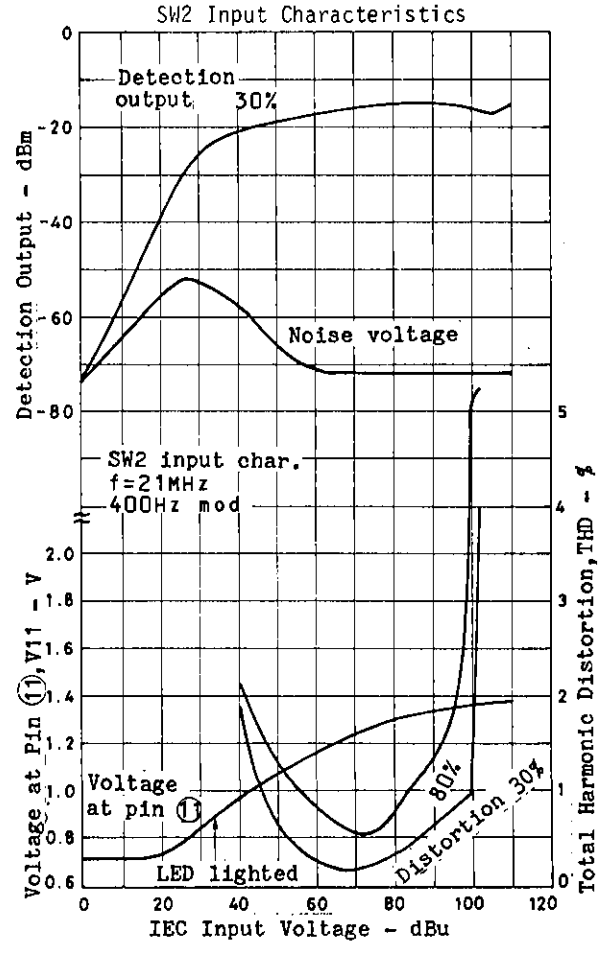
T1 YT-30194(Mitsumi),2153-4095-339(Sumida)
T2 KW-30011(Mitsumi)
T6 YT-30112(Mitsumi)
T7 YT-30117(Mitsumi),2153-4140-044(Sumida)

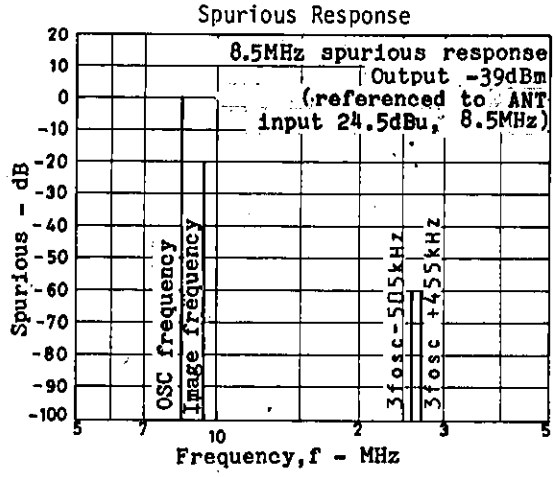

Vs,Qs - fr
Image Interference - dB
Sensitivity - dBu
Usable sensitivity
Max. sensitivity
S/N=20dB
Input at detection output -30dBm
Image interference
Receiving Frequency,fr - Hz

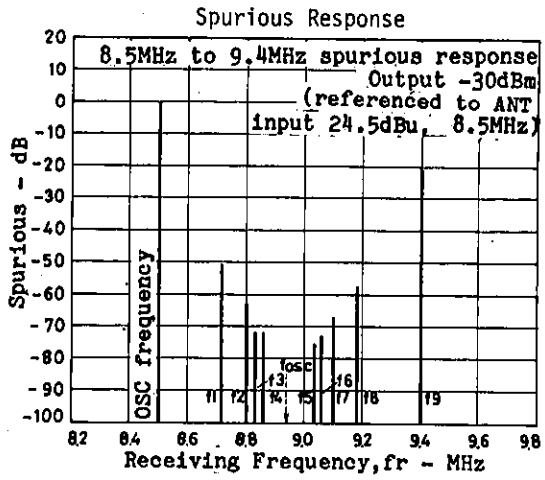

SW2 Osc Characteristics
SW OSC char.
No tap
OSC Voltage,Vosc - V
Voltage at pin 16
Receiving Frequency,fr - Hz


SW2 Osc Characterietics
SW OSC char.
1/2 tap
OSC Voltage,Vosc - V
Voltage at coil end
Voltage at pin 16
Receiving Frequency,fr - Hz


SW2 Input Characteristcs
SW2 input char.
f=14MHz
400Hzmod
Detection output 30%mod
Noise voltage
Detection Output - dBm
Voltage at Pin 11, V11 - V
Voltage at pin 11
LED lighted
80%
30%
Distortion
Total Harmonic Distortion,THD - %
IEC Input Voltage - dBu


SW2 Input Characteristics
Detection output 30%
Noise voltage
SW2 input char.
f=21MHz
400Hz mod
Detection Output - dBm
Voltage at Pin 11, V11 - V
Voltage at pin 11
LED lighted
80%
Distortion 30%
Total Harmonic Distortion,THD - %
IEC Input Voltage - dBu

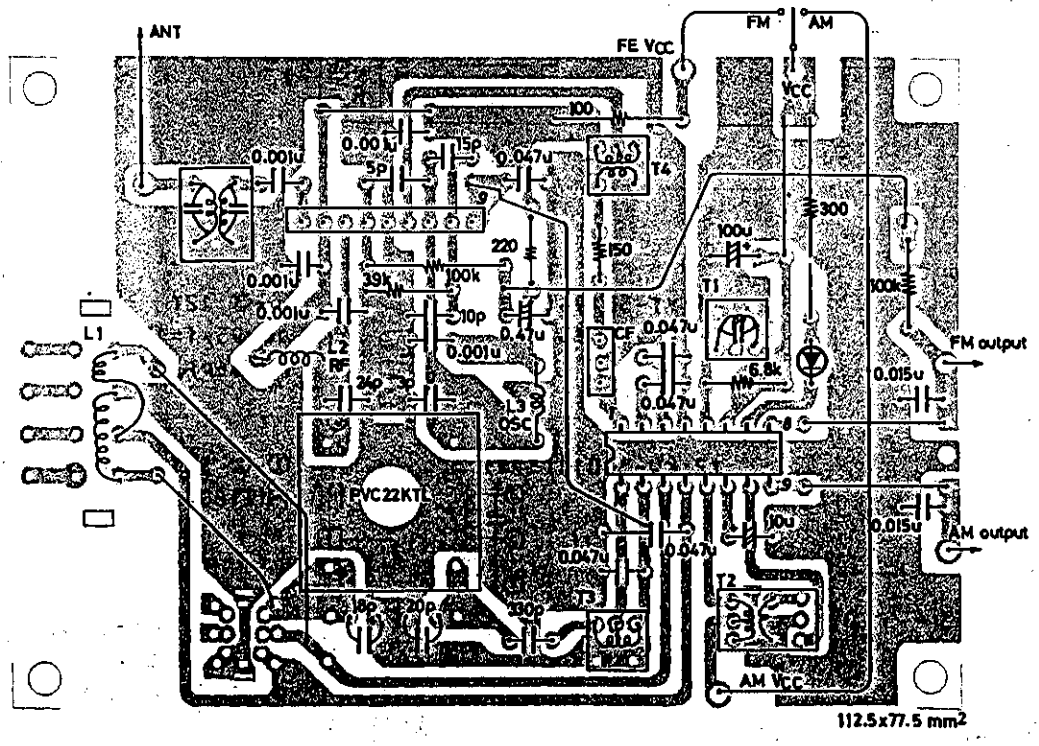




f1:8.729MHz →2fosc-2f1=455kHz
f2:8.803MHz →3fosc-3f2=455kHz
f3:8.840MHz →4fosc-4f3=455kHz
f4:8.864MHz →5fosc-5f4=455kHz
f5:9.047MHz →5f5-5fosc=455kHz
f6:9.069MHz →4f6-4fosc=455kHz
f7:9.107MHz →3f7-3fosc=455kHz
f8:9.183MHz →2f8-2fosc=455kHz

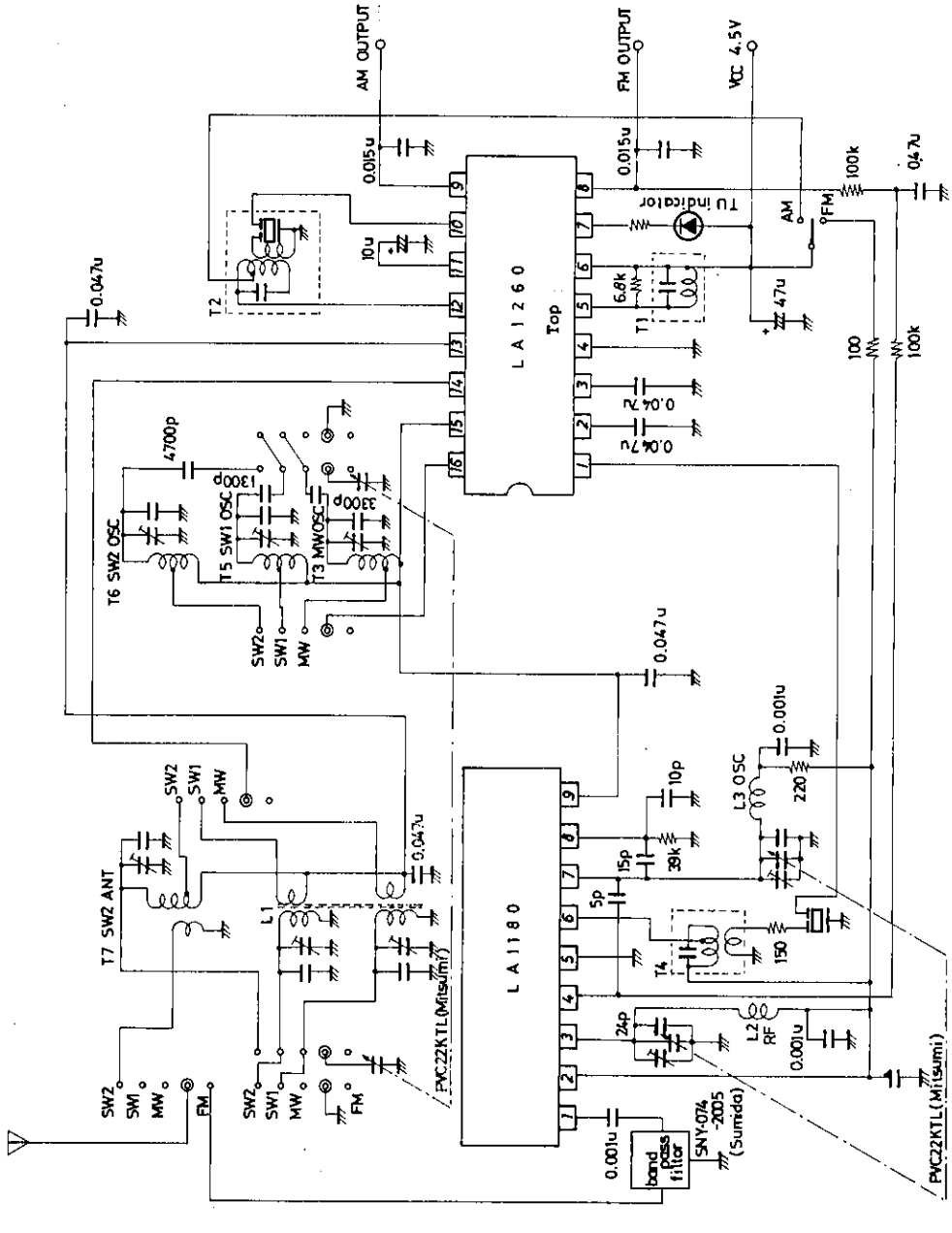
Sample Application Circuit 2 : FM (band in Japan)/MW/SW1(2.2 to 7.5MHz)/SW2(7.2 to 24.0MHz)
Application where the LA1185 and LA1260 are used

Sample printed circuit pattern (Cu-foiled area) (The circuit diagram is shown on page 12.



Unit (resistance: Ω, capacitance: F)

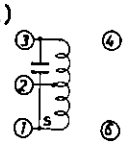
[Circuit Diagram] (The sample printed circuit pattern is shown on page 11.)



L1 TN10896 bar antenna (Mitsumi)
L2 5.5mmφ air core 0.8mm wire 5T RT
L3 5.5mmφ air core 0.8mm wire 6T OSC
T1 YT-30194(Mitsumi)
T2 KW-30011(AM Mix)
T3 YT-30105(Mitsumi)
T4 YT-30070(Mitsumi)
T5 YT-30134(Mitsumi)
T6 YT-30112(Mitsumi)
T7 YT-30117(Mitsumi),
2158-4140-044(Sumida)

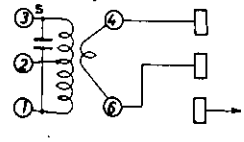
Unit (resistance: Ω, capacitance: F)

T1:YT-30194(Mitsumi)
FM quadrature



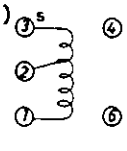
①-③ 12T
Qo=95, f=10.7MHz
Internal 56pF, external 15pF

T2:KW-30011(Mitsumi)
AM IF



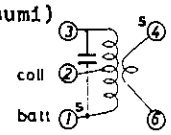
①-② 58T, ③-② 94T, ④-⑥ 7T
Internal 180pF

T3:YT-30105(Mitsumi)
MW OSC



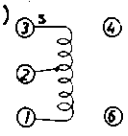
③-② 32T, ②-① 32T
0.07mm 2UEW,
Qo=140, L=140uH

T4:YT-30070(Mitsumi)
FM IF



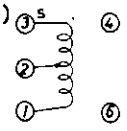
①-② 7T,②-③ 3T,④-⑥ 1T
0.12mm 2UEW
Internal 100pF, external 5pF
fo=10.7MHz,Qo=85

T5:YT-30134(Mitsumi)
SW1 OSC



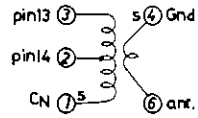
③-② 12T,②-① 12T
0.1mm 2UEW,
Qo=80,L=12uH

T6:YT-30112(Mitsumi)
SW2 OSC



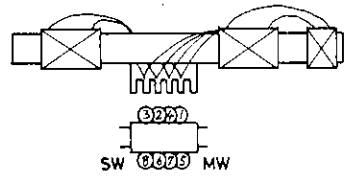
③-② 4T,②-① 4T
0.12mm 2UEW
Qo=80,L=1.25uH

T7:2158-4140-044(Sumida)

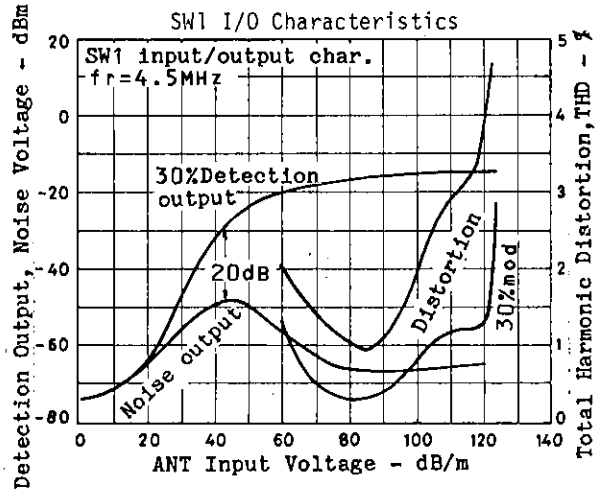


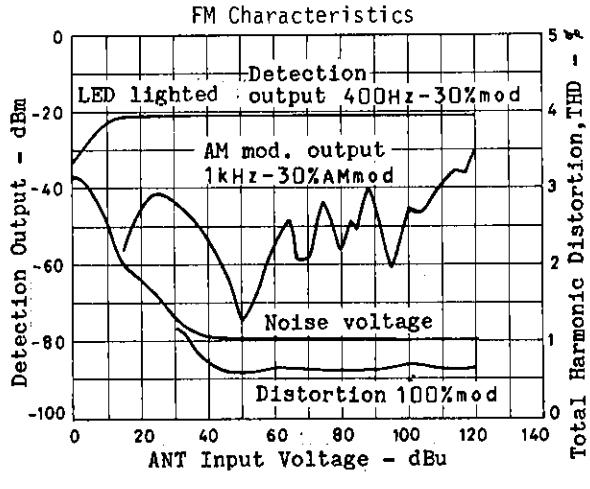
①-② 4T,②-③ 5T,④-⑥ 2T
0.12mm UEW,
Qo≧50,L=1.4uH

L1:TN-10896(Mitsumi)
MW bar antenna



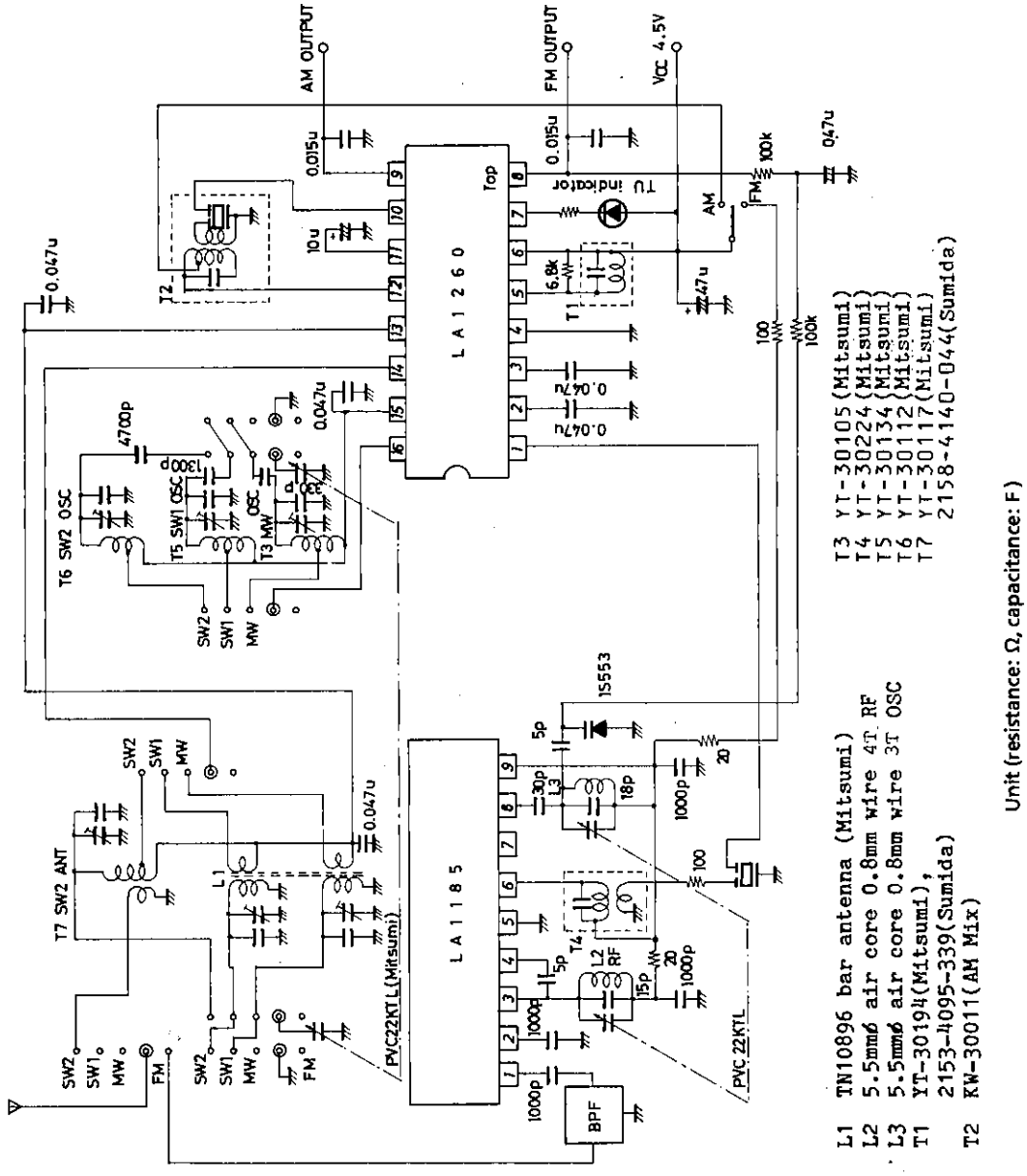
①-② 22T+49T,③-④ 10T
Tight solenoid direct winding
⑤-⑥ 17T 0.5ø space winding
⑦-⑧ 4T tight solenoid winding
①-② L=260uH,Qo=330(≧200)
⑤-⑥ L=15uH,Qo=250(≧150)





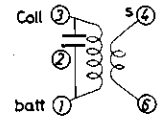
Sample Application Circuit 3 : FM (band in US)/MW/SW1(2.2 to 7.5MHz)/SW2(7.2 to 24.0MHz)
Application where the LA1185 and LA1260 are used

[Circuit Diagram] (The sample printed circuit pattern is shown on page 15.)



T4:YT-30224(Mitsumi)

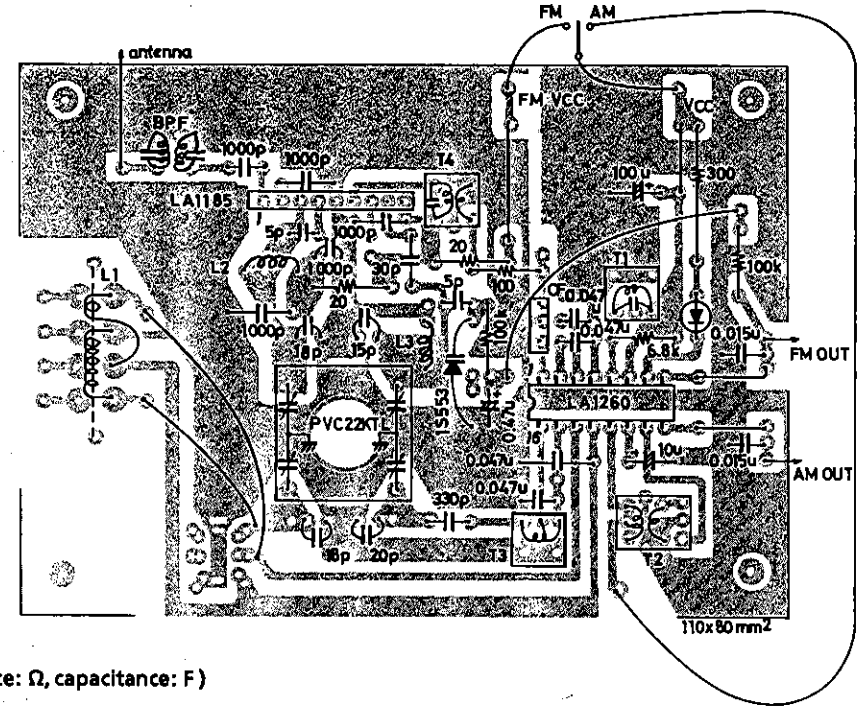
FM IF



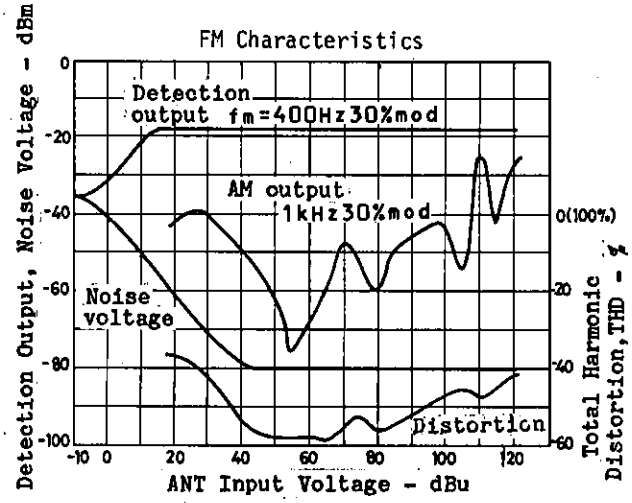
①-③ 8T, ④-⑥ 2T
0.12mm 2UEW
Internal 100pF, external 5pF
fo=10.7MHz, Qo=80

For the specifications for other coils than T4, refer to Sample Application Circuit 2.

[Sample Printed Circuit Pattern=Cu-foiled area] (The circuit diagram is shown on page 14.)

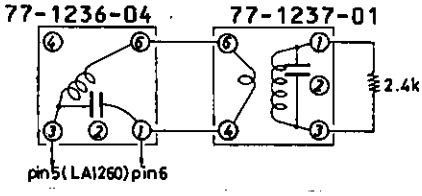


Unit (resistance: Ω, capacitance: F)

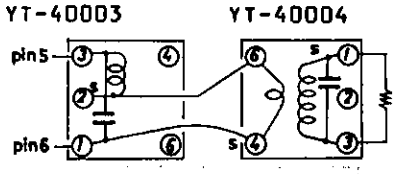


fr=108MHz
Vcc=4.5V
Q.S.=9.5dBμ
-3dB L.S.=9dBμ
LED lighting sensitivity 11.5dBu

. Applications where a double-tuning coil is used (See page 3.)
The use of the following coil improves the distortion approximately 0.1% at 100% modulation.



77-1236-04 (Korin Giken)	77-1237-01 (Korin Giken)
③-⑥ 19.5T	①-③ 20T
①-③ 68pF	⑥-④ 1T
Qo=78±20%	①-③ 82pF
0.08φ 2UEW	Qo=59±20%



YT-40003 (Mitsumi)	YT-40004 (Mitsumi)
②-③ 25T	④-⑥ 1T
①-③ 56pF	①-③ 23T 82pF
Qo=40±20%	Qo=40±20%
0.1mmφ2UEW	0.1mmφ 2UEW