DESCRIPTION

The M52034SP/FP is a semiconductor integrated circuit consisting of IF signal processing for VCR and CTV tuners. The circuit realizes PLL detection system with same application as conventional quasi-synchronous VIF/SIF ICs. The circuit includes VIF amplifier, video detector, VCO, APC detector, AFT, SIF detector, IF/RF AGC, SIF limiter and FM detector.

The package is of 20-pin plastic molded shrink.

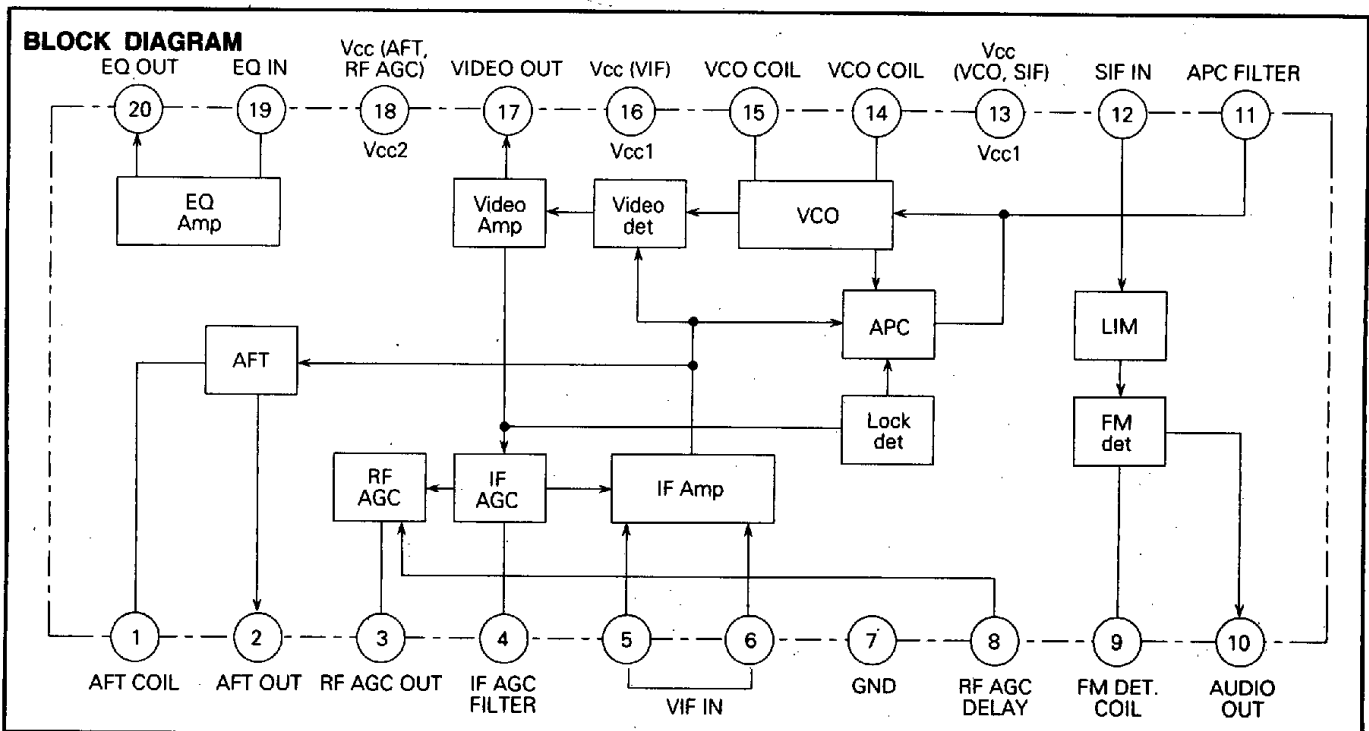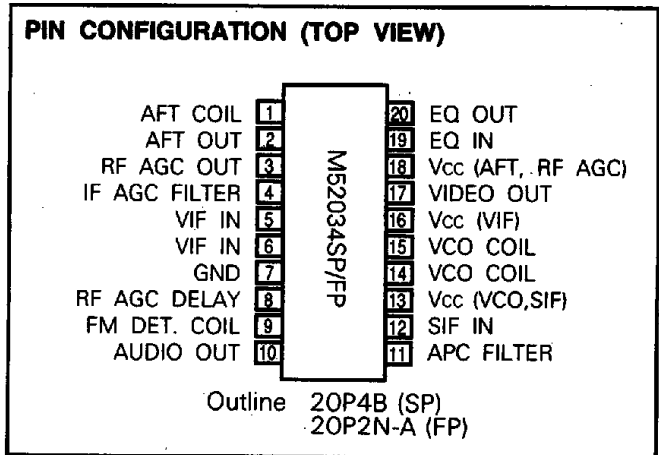Flat package is also available.

FEATURES

● Low power dissipation is realized by 5V PLL detector. (Vcc=5.0V, Icc=30mA)

● A full synchronous detector circuit using PLL as video detector provides excellent DG, DP, 920kHz beat and cross color characteristics.

● Dynamic AGC realizes high speed response with only single filter. 12V power supply can be used for RF AGC and AFT outputs.

● It is optimum for VCR and color TV sets with video output terminals due to the built-in equalizer amplifier.

APPLICATION

CTV, VCR

RECOMMENDED OPERATING CONDITION

Supply voltage range ....4.5~5.5V

Rated supply voltage 5.0V

PIN CONFIGURATION (TOP VIEW)

	M52034SP/FP	
AFT COIL 1		20 EQ OUT
AFT OUT 2		19 EQ IN
RF AGC OUT 3		18 Vcc (AFT, RF AGC)
IF AGC FILTER 4		17 VIDEO OUT
VIF IN 5		16 Vcc (VIF)
VIF IN 6		15 VCO COIL
GND 7		14 VCO COIL
RF AGC DELAY 8		13 Vcc (VCO,SIF)
FM DET. COIL 9		12 SIF IN
AUDIO OUT 10		11 APC FILTER

Outline 20P4B (SP)
20P2N-A (FP)

BLOCK DIAGRAM

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Ratings	Unit
Vcc1	Supply voltage 1	7	V
Vcc2	Supply voltage 2	14	V
Pd	Power dissipation	1000	mW
Topr	Operating temperature	−20~75	°C
Tstg	Storage temperature	−40~125	°C
Surge	Electrostatic discharge	±200	V

ELECTRICAL CHARACTERISTICS (Ta=25°C, Vcc=5V, Vcc=12V, unless otherwise noted)

Symbol	Parameter	Test point	Test circuit	VIF	SIF	1	2	3	4	5	6	V4	V8	Min.	Typ.	Max.	Unit
Icc	Circuit current	A	1	−	−	2	1	1	1	1	1	−	−	25.0	36.0	47.0	mA
V17	Video detector output DC voltage 1	TP7	1	−	−	1	1	1	2	1	1	1	−	2.8	3.1	3.4	V
V20	Video detector output DC voltage 2	TP9	1	−	−	1	1	1	2	1	1	1	−	3.2	3.5	3.8	V
VOdet1	Video detector output 1	TP7	1	SG 1	−	1	1	1	1	1	1	−	−	0.70	0.95	1.20	Vp-p
VOdet2	Video detector output 2	TP9	1	SG 1	−	1	1	1	1	1	1	−	−	1.50	1.93	2.40	Vp-p
P/N	Video S/N	TP8	1	SG 2	−	1	1	1	1	1	1	−	−	48.0	54.0	−	dB
BW	Video frequency characteristics	TP7	1	SG 3	−	1	1	1	1	1	1	−	−	5.5	6.2	−	MHz
Vin (min)	Input sensitivity	TP7	1	SG 4	−	1	1	1	1	1	1	−	−	−	45	52	dBμ
Vin (max)	Maximum allowable input	TP7	1	SG 5	−	1	1	1	1	1	1	−	−	102	108	−	dBμ
GR	AGC control range	−	1	−	−	−	−	−	−	−	−	−	−	50	63	−	dB
V4H	IF AGC maximum voltage	TP3	1	−	−	1	1	1	1	1	1	−	−	3.5	4.6	−	V
V4	IF AGC voltage (80 dBμ)	TP3	1	SG 6	−	1	1	1	1	1	1	−	−	1.9	2.4	2.9	V
V4L	IF AGC minimum voltage (120 dBμ)	TP3	1	SG 7	−	1	1	1	1	1	1	−	−	−	0.0	0.2	V
V2	AFT output voltage	TP1	1	−	−	1	1	1	2	1	1	0	−	3.0	5.0	6.9	V
μ	AFT detector sensitivity	TP1	1	SG10	−	1	1	1	1	1	1	−	−	40	56	78	mV/kHz
V2H	AFT maximum voltage	TP1	1	SG10	−	1	1	1	1	1	1	−	−	11.4	11.8	−	V
V2L	AFT minimum voltage	TP1	1	SG10	−	1	1	1	1	1	1	−	−	−	0.1	0.5	V
V3H	RF AGC maximum voltage	TP2	1	SG 2	−	1	1	1	1	1	1	−	2	10.8	11.6	−	V
V3L	RF AGC minimum voltage	TP2	1	SG 2	−	1	1	1	1	1	1	−	6	−	0.1	1.0	V
DG	DG	TP7	1	SG16	−	1	1	1	1	1	1	−	−	−	3	5	%
DP	DP	TP7	1	SG16	−	1	1	1	1	1	1	−	−	−	2	5	deg
CL-U	Capture range (U)	TP7	1	SG11	−	1	1	1	1	1	1	−	−	0.45	0.84	−	MHz
CL-L	Capture range (L)	TP7	1	SG11	−	1	1	1	1	1	1	−	−	1.70	2.78	−	MHz
CL-T	Capture range (T)	TP7	1	−	−	1	1	1	1	1	1	−	−	2.15	3.62	−	MHz
FC1	EQ frequency characteristics 1	TP7 TP9	1	SG12	−	1	1	1	1	1	1	−	−	3.5	6.0	8.5	dB
FC2	EQ frequency characteristics 2	TP7 TP9	1	SG13	−	1	1	1	1	1	1	−	−	6.6	9.0	11.5	dB
FC3	EQ frequency characteristics 3	TP7 TP9	1	SG14	−	1	1	1	1	1	1	−	−	8.7	11.0	13.3	dB
IM	Intermodulation	TP7	1	SG15	−	1	1	1	1	1	1	−	−	30	36	−	dB
VSYNC	Pin 20 sync level	TP9	1	SG 2	−	1	1	1	1	1	1	−	−	1.0	1.3	1.6	V
Rin (V)	VIF input resistance		2	90dBμ	−	−	−	−	−	−	−	−	−	−	1.2	−	KΩ
Cin (V)	VIF input capacitance		2	90dBμ	−	−	−	−	−	−	−	−	−	−	2.3	−	PF
V10	AF output voltage	TP4	1	−	−	1	1	1	2	1	1	0	−	1.20	1.80	2.40	V

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test point	Test circuit	Input		Test conditions								Limits			Unit
				VIF	SIF	1	2	3	4	5	6	V4	V8	Min.	Typ.	Max.	
VoAF (Max)	Maximum AF output	TP4	1	–	SG17	1	1	1	2	1	1	0	–	141	202	263	mVrms
THD AF	AF output distortion	TP4	1	–	SG21	1	1	1	2	1	1	0	–	–	0.5	1.2	%
Vin (Lim)	Input limiting sensitivity	TP4	1	–	SG18	1	1	1	2	1	1	0	–	–	40	49	dBμ
AMR	AMR	TP4	1	–	SG19	1	1	1	2	1	1	0	–	47	56	–	dB
S/N	AF S/N	TP4	1	–	SG20	1	1	1	2	1	1	0	–	54	68	–	dB

ELECTRICAL CHARACTERISTICS TEST METHOD

"P/N" : Video S/N
a. Input SG2 in VIF IN.
b. The noise appearing at pin 17 is determined by measuring the r.m.s. voltage at TP8 through low pass filter (–3dB at 5MHz).

c. $P/N = 20 \log \left\{ \dfrac{\text{Vodet 1 (V}_{p-p})\times0.7}{\text{Noise (Vr.m.s.)}} \right\}$

"BW" : Video frequency characteristics
a. Set SG3 as follows:
$\left. \begin{array}{l} f_1 = 58.75\text{MHz} \quad Vi = 90\text{dB}\mu \\ f_2 = 57.75\text{MHz} \quad Vi = 70\text{dB}\mu \end{array} \right\}$ Mixed Signal
b. Measure the amplitude of 1MHz at TP7 and let it be V1.
c. Decrease frequency f_2 until the amplitude of (f_1-f_2) at TP7 reaches 3dB smaller than V_1. Then, read frequency f_2.
BW = 58.75 – f_2(MHz) + 1MHz

"Vin (min)" : Input sensitivity
a. Input SG4 in VIF IN.
b. Decrease the SG4 level until the detector output level of pin 17 reaches 3dB smaller than Vodet1 and let the level be input sensitivity.

"Vin (max)" : Maximum allowable input
a. Set SG5 to 90dBμ and input it in VIF IN.
b. Let the detector output of pin 17 be V2.
c. Increase the SG5 voltage until the detector output level reaches 3dB smaller than V2 and let the voltage be maximum allowable input.

"GR" : AGC control range
a. AGC control range is defined as follows:
GR = (Maximum allowable input) – (Input sensitivity)

"μ" : AFT detector sensitivity
a. Input SG10 in VIF IN.
b. Measure difference of frequency between 5V and 7V of DC voltage at TP1 and let it be Δf.
c. AFT detector sensitivity is defined as follows:

$\mu = \dfrac{2000(\text{mV})}{\Delta f(\text{kHz})}$ (mV/kHz)
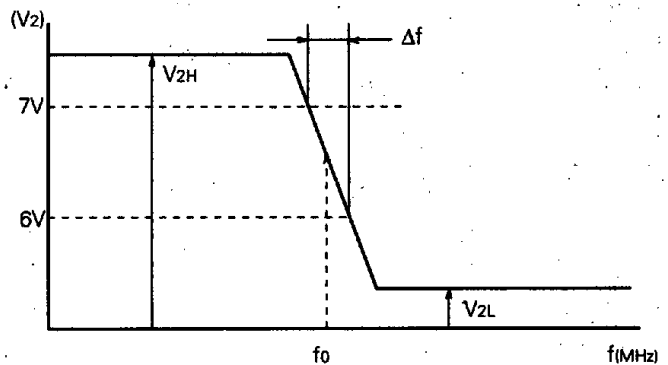
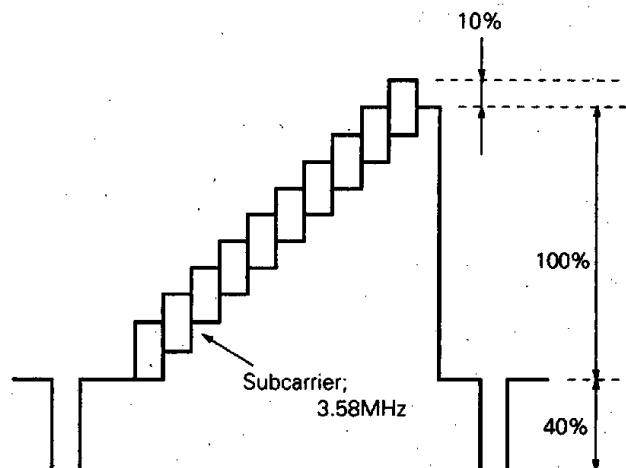### "V2H" : AFT maximum voltage
a. Let maximum DC voltage in the above figure be V2H.

"V2L" : AFT minimum voltage
a. Let minimum DC voltage in the above figure be V2L.

"DG, DP" : DG, DP
a. Modulated waves of SG16 is generated by 87.5% video modulation of the 10-step waves shown in the figure below.
b. At TP7, measure DG and DP with vectorscope.

"CL-u" : Capture range (u)

a. Input SG11 in VIF IN and increase the frequency until VCO lock is released.

b. Decrease the frequency of SG11 and let the frequency at which VCO locks again be f_U (MHz).

c. Capture range(u)=f_U-58.75(MHz)

"CL-L" : Capture range (L)

a. Input SG11 in VIF IN and decrease the frequency until VCO lock is released.

b. Increase the frequency of SG11 and let the frequency at which VCO locks again be f_L(MHz).

c. Capture range(L)=58.75-f_L(MHz).

"CL-T" : Capture range (T)

a. "CL-T"="CL-u"+"CL-L"(MHz)

"FC1," "FC2," "FC3" : EQ frequency characteristics

a. Input SG12 in VIF IN.

b. Measure the level of (f_1-f_2) at TP7 and let it be $V_{EQ\ IN}$ (dBμ).

c. Measure the level of (f_1-f_2) at TP9 and let it be $V_{EQ\ OUT}$ (dBμ).

d. EQ frequency characteristics are defined as follows:
FC1~3=$V_{EQ\ OUT}$-$V_{EQ\ IN}$(dB)

"IM" : Intermodulation

a. Input SG15 in VIF IN.

b. Observe TP7 with oscilloscope and adjust the voltage of V_4 so that minimum level of detector output will come to 2V.

c. Observe TP7 with spectrum analyzer and let the ratio of the 0.92MHz level to the 3.58MHz level be intermodulation.
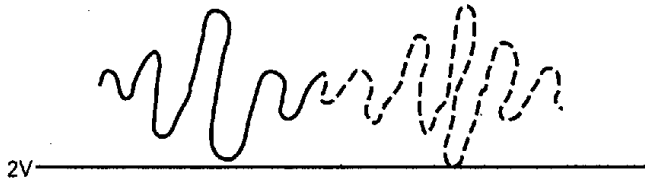
"Vin (lim)" : Input limiting sensitivity

a. Set SG18 to 80 dBμ and input it in SIF IN.

b. Decrease the SG18 output level until the detector output of TP4 reaches 3dB smaller than $V_{O\ AF\ MAX}$ and let the level be input limiting sensitivity.

"AMR" : AMR

a. Input SG19 in SIF IN.

b. Measure the output voltage at TP4 and let it be V_{AM}.

c. AMR is defined as follows:

$$AMR=20\ log\left\{\frac{V_{O\ AF\ MAX}(mVr.m.s.)}{V_{AM}(mVr.m.s)}\right\}\ (dB)$$

"S/N" : AF S/N

a. Input SG20 in SIF IN.

b. Measure the output voltage at TP4 and let it be V_N.

c. AF S/N is defined as follows:

$$S/N=20\ log\left\{\frac{V_{O\ AF\ MAX}(mVr.m.s.)}{V_N(mVr.m.s)}\right\}\ (dB)$$

Note :

● Amplitude level of all AM modulated waves is the peak level of modulated waves.

● The following is used for the mixer.
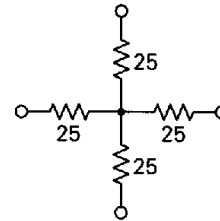
● With VCO coil, IF AGC 0V and non-input condition, adjust free run frequency to 58.75MHz.

INPUT SIGNAL

SG. No.	Signals (50Ω termination)
SG 1	f_0=58.75MHz V_i=90dBμ 77.8% AM (87.5% Video modulation equivalent fm=20kHz)
SG 2	f_0=58.75MHz V_i=90dBμ
SG 3	f_1=58.75MHz V_i=90dBμ / f_2=53±5MHz V_i=70dBμ } mixed signal
SG 4	f_0=58.75MHz V_i=Variable fm=20kHz 77.8% AM
SG 5	f_0=58.75MHz V_i=Variable fm=20kHz 16% AM
SG 6	f_0=58.75MHz V_i=80dBμ
SG 7	f_0=58.75MHz V_i=120dBμ
SG 8	f_0=54.25MHz V_i=100dBμ
SG 9	f_0=54.25MHz V_i=80dBμ
SG10	f_0=58.75MHz±5MHz V_i=90dBμ
SG11	f_0=58.75MHz±5MHz V_i=90dBμ fm=20kHz 77.8% AM
SG12	f_1=58.75MHz V_i=90dBμ / f_2=58.25MHz V_i=60dBμ } mixed signal
SG13	f_1=58.75MHz V_i=90dBμ / f_2=55.75MHz V_i=60dBμ } mixed signal
SG14	f_1=58.75MHz V_i=90dBμ / f_2=53.75MHz V_i=60dBμ } mixed signal
SG15	f_1=58.75MHz V_i=90dBμ / f_2=55.17MHz V_i=80dBμ / f_3=54.25MHz V_i=80dBμ } mixed signal
SG16	f_1=58.75MHz Standard 10-step wave modulation m=87.5% Video modulation Sync chip level V_i=90dBμ
SG17	f_0=4.5MHz±25kHz dev V_i=90dBμ fm=400Hz
SG18	f_0=4.5MHz±25kHz dev V_i=Variable fm=400Hz
SG19	f_0=4.5MHz V_i=90dBμ 30% AM fm=400Hz
SG20	f_0=4.5MHz V_i=90dBμ
SG21	f_0=4.5MHz V_i=90dBμ fm=400Hz±7.5kHz dev

TEST CIRCUIT 1
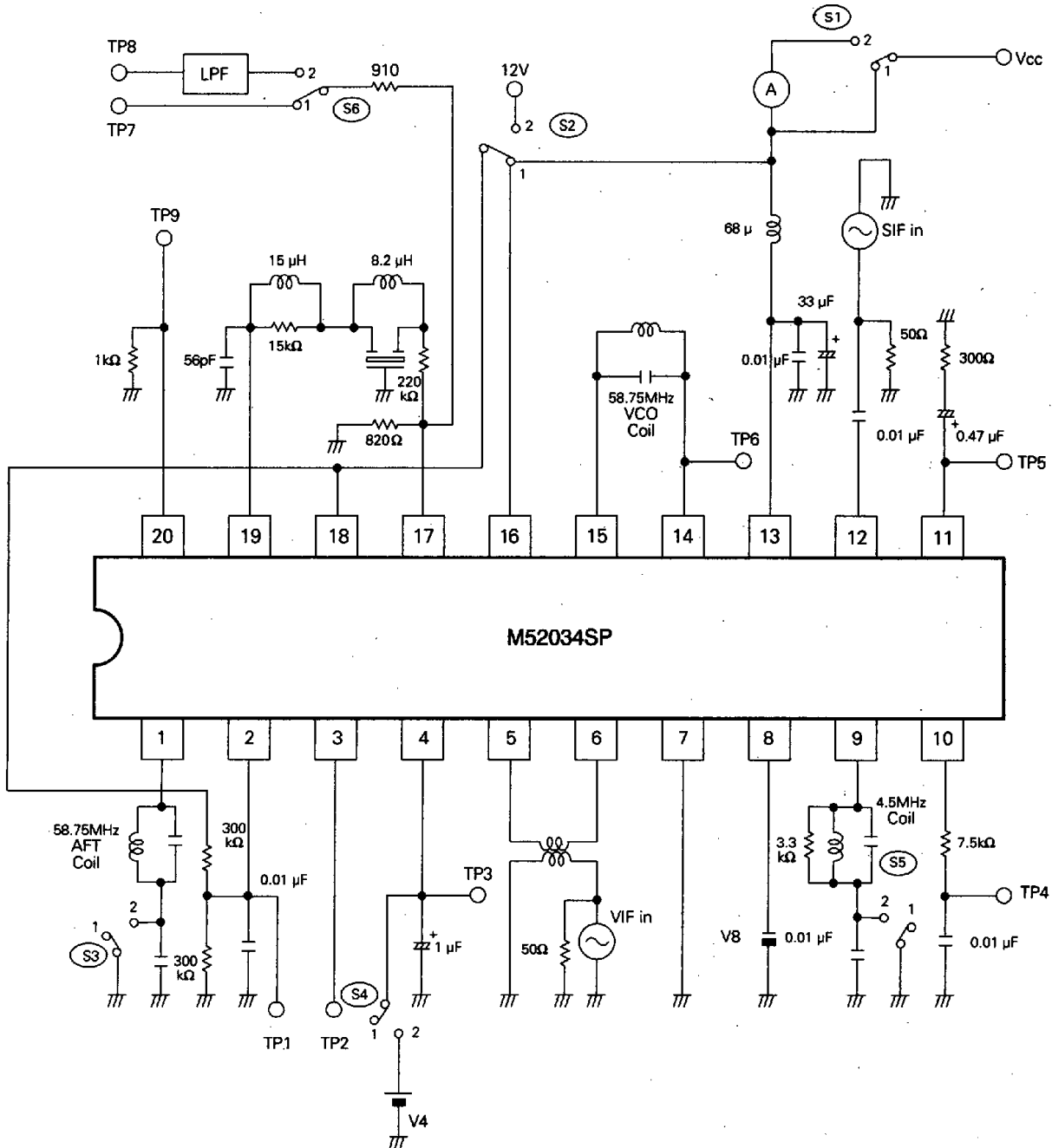
Units Resistance:Ω

Capacitance:F

TEST CIRCUIT 2
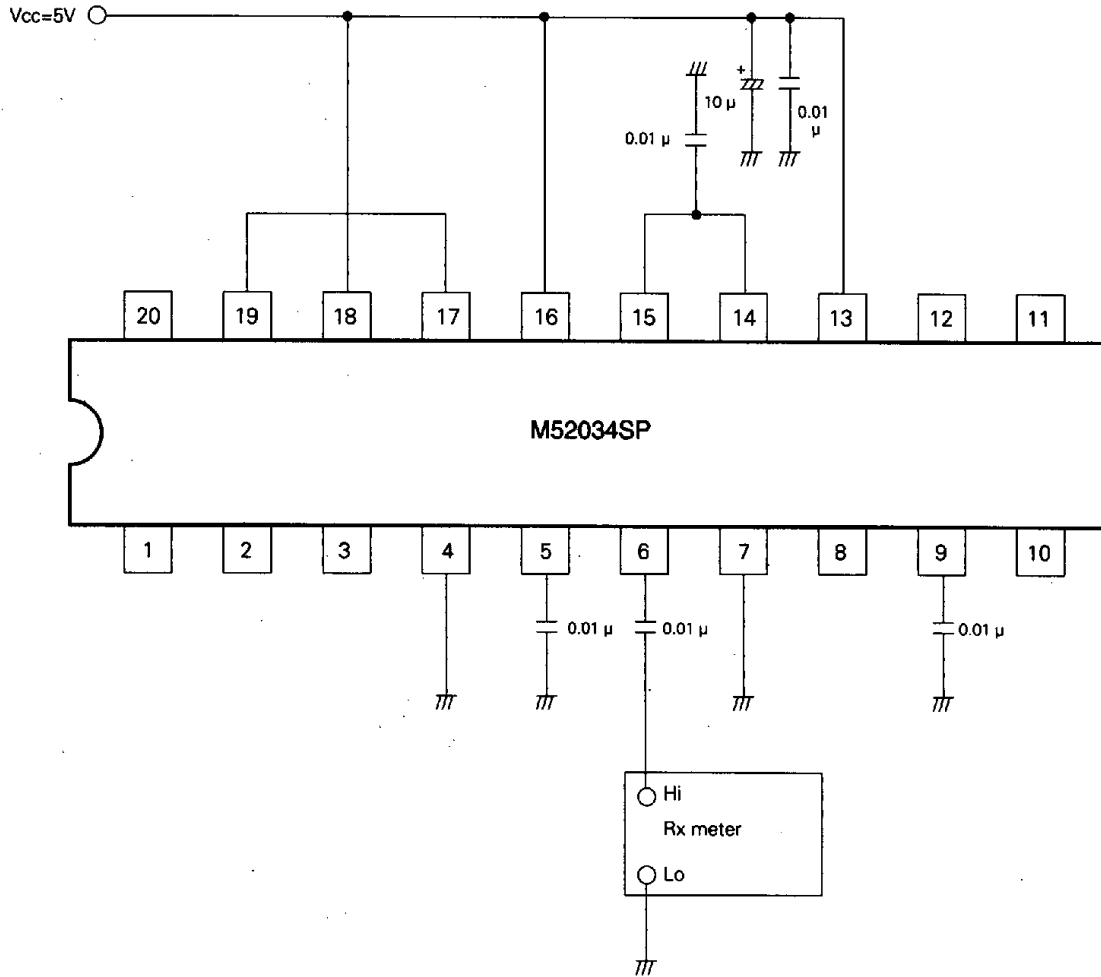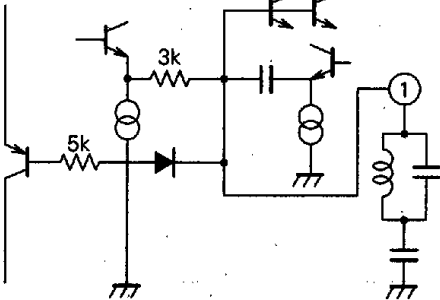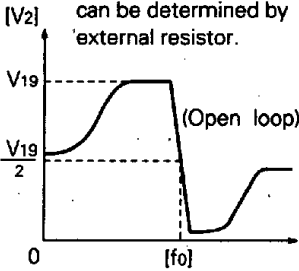
Units Capacitance: F
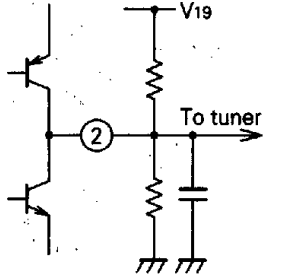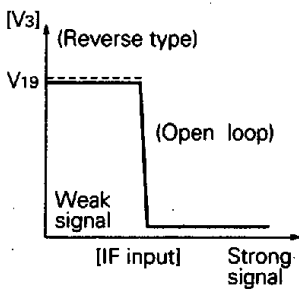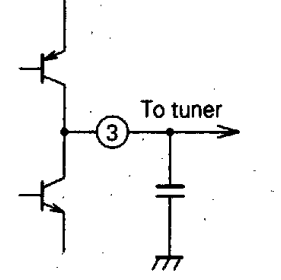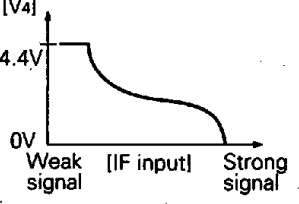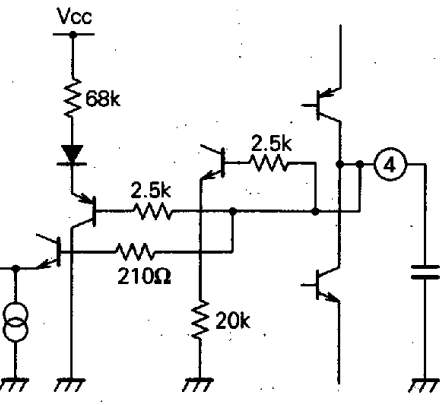
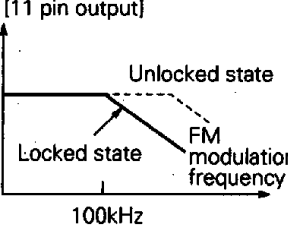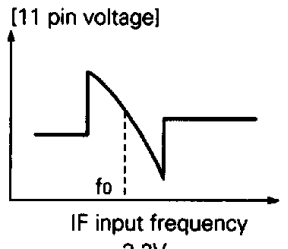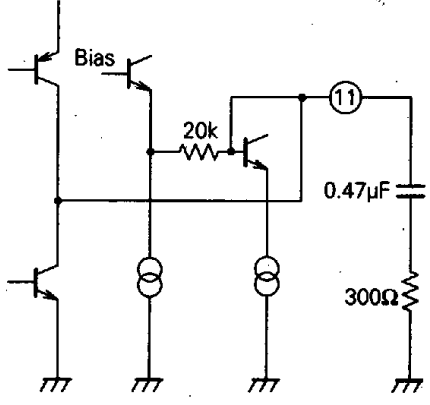## TYPICAL CHARACTERISTICS
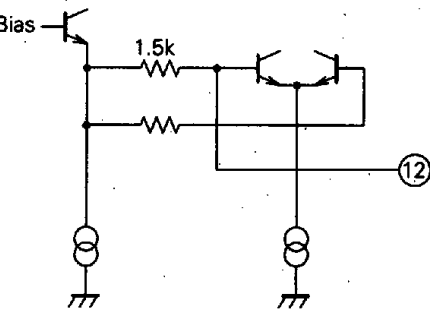
THERMAL DERATING (MAXIMUM RATING)

AMBIENT TEMPERATURE Ta (°C)
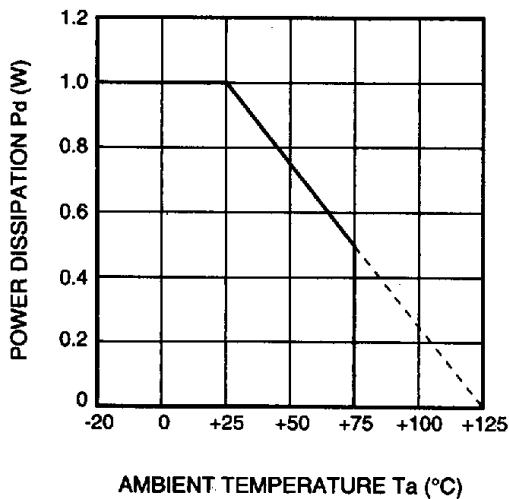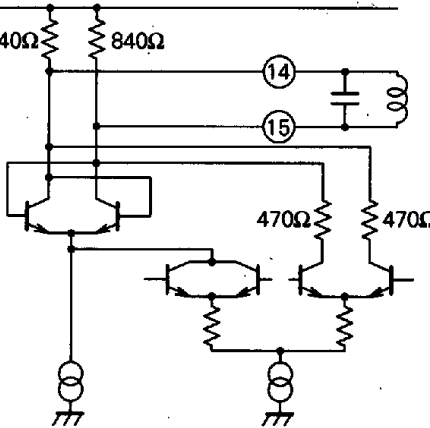
DESCRIPTION OF PIN

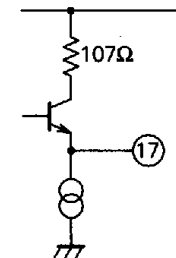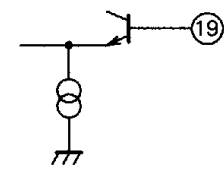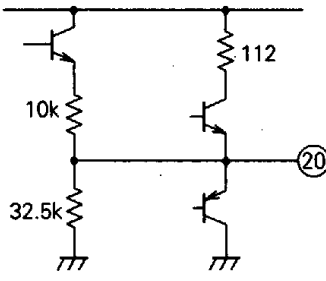| Pin No.	Name	Voltage and wave information	Peripheral circuit of pins
①	AFT coil	Mute function is provided and AFT muting is available by grounding this pin. 5V	
②	AFT out	Since AFT output has high impedance, detector sensitivity can be determined by external resistor. $[V_2]$ (Open loop)	Output current 0.8mA max. Input current 0.8mA max.
③	RF AGC out	$[V_3]$ (Reverse type) (Open loop) Weak signal [IF input] Strong signal	Output current Input current 0.4mA max.
④	IF AGC Filter	$[V_4]$ 4.4V 0V Weak signal [IF input] Strong signal 2-pin filter characteristics can be obtained by only single filter due to the dynamic AGC circuit adopted.	

DESCRIPTION OF PIN (cont.)

Pin No.	Name	Voltage and wave information	Peripheral circuit of pins
⑤ ⑥	VIF in	Since frequency ripple may be caused by improper matching with SAW filter, care should be taken in matching in designing. 2.9V	
⑦	GND	This is the only grounding pin in this IC. 0V	
⑧	RF AGC Delay	RF AGC delay point can be varied by changing the voltage applied to this pin.	
⑨	FM Det coil	The quadrature detector circuit is used for FM detector. It is necessary to provide a capacitor which cuts off DC signal between pin 9 and GND in series with tank coil. It should be noted that ceramic discriminator does not provide good characteristics. Sound muting is available by grounding this pin. 3.0V	
⑩	Audio out	Audio output pin 2.25V	

DESCRIPTION OF PIN (cont.)

Pin No.	Name	Voltage and wave information	Peripheral circuit of pins
⑪	APC Filter	[11 pin output] Unlocked state Locked state / FM modulation frequency 100kHz Frequency response characteristics in locked state is around 100kHz of cut-off frequency, which is the bandwidth of carrier regenerated from IF signal. In unlocked state, cut-off frequency is higher and pull-in range is widened. [11 pin voltage] fo IF input frequency 3.2V	
⑫	SIF in	Input impedance is approx. 1.5kΩ. 2.7V	
⑬	Vcc1	5.0V	
⑭ ⑮	VCO coil	This pin oscillates by adding a coil and tuning capacitor. Set this oscillation frequency to fo for use. Since oscillation level is as large as 112dBμ, malfunction of VCO may be caused. To avoid this, care should be taken in designing of external pattern around this pin. 2.9V	

DESCRIPTION OF PIN (cont.)

Pin No.	Name	Voltage and wave information	Peripheral circuit of pins
⑯	Vcc 1	5V	————
⑰	Video out	Positive output. Output is generated by 87.5% video modulation and has 1 Vp-p amplitude. 1Vp-p 1.95V	107Ω ⑰
⑱	Vcc 2	AFT output and RF AGC output can be input to the tuner by setting this voltage to that of tuner. 5V~12V	————
⑲	EQ in	This is an open base input pin. Usually, 17 pin voltage is used as input voltage to this pin.	⑲
⑳	EQ out	Push-and-pull feedback circuit is used. Output driving capacity is 3.9kΩ, but it can be improved to 600Ω by adding 1kΩ between 20 pin and GND.	112 10k ⑳ 32.5k

PRECAUTIONS FOR APPLICATION

1. Adjustment of free run frequency

Example 1)

a. With no input to IF and IF AGC voltage (pin 4) set to 0V, decrease IF AMP gain.

b. Read the oscillation frequency leaked to video output (pin 17) and adjust the coil to the center frequency (ex. 58.75MHz).

Example 2)

a. Input sweep signal to IF. Add a large capacity capacitor (~10μF) to APC filter pin (pin 11) so that PLL does not follow the sweep frequency.

b. Measure beat signal in the video output and adjust VCO coil so that the zero beat will come to 58.75MHz.

Example 3)

a. With no input to IF, measure DC voltage at APC filter pin(pin 11) when VCO is oscillating in the free run state. At this time, set IF AGC voltage (pin 4) to 0V.

b. With loop IF AGC, input 58.75 MHz in IF AMP and adjust VCO coil so that APC filter pin (pin 11) will come to the voltage measured in (a).

2. Adjustment of IF response

(This adjustment should be made after adjusting free run frequency.)

a. Connect an external power supply to APC filter pin (pin 11) and adjust the applied voltage so that it oscillates at 58.75MHz(V_{11}~5.0V).

b. Input sweep signal in IF. Apply IF AGC voltage (pin 4) from outside and fix the voltage so that beat output to the video output pin (pin 17) does not distort. Envelope of beat at this time indicates general response for both IF and IC.

c. To see characteristics around 58.75MHz, shift the free run frequency.
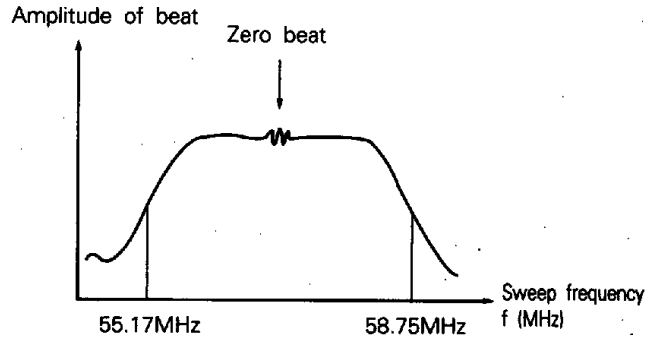
However, response is varied when the free run frequency is shifted from 58.75MHz. This is because frequency characteristics inside IC starts dropping at around 3MHz and accordingly, amplitude level of beat drops slightly as the beat frequency increases.