

M52313SP

STANDARD PLL VIF/SIF

DESCRIPTION

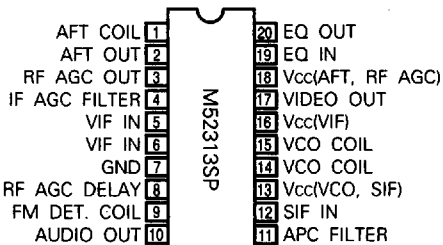
The M52313SP is a semiconductor integrated circuit consisting of IF signal processing for VCR or CTV tuner. The circuit realizes PLL detection system with same application as conventional quasi-synchronous VIF/SIF ICs. The circuit includes VIF amplifier, video detector, VCO, APC detector, AFT, SIF detector, IF/RF AGC, SIF limiter and FM detector functions.

The package is of the 20-pin shrink type. Flat package is also available.

FEATURES

- Low power dissipation is realized by 5V PLL detector. ($V_{cc} = 5.0V, I_{cc} = 35mA$)
- 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.
- Optimum for VCR and CTV with video output terminals due to the built-in equalizer amplifier.

PIN CONFIGURATION (TOP VIEW)



Outline 20P4B

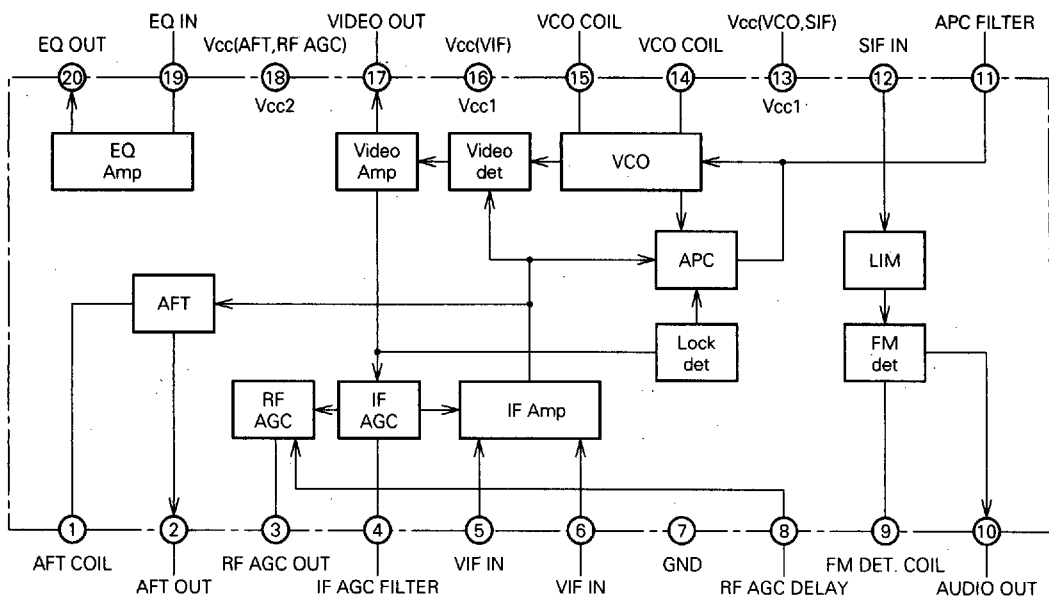
APPLICATION

CTV, VCR

RECOMMENDED OPERATING CONDITION

Supply voltage range 4.5~5.5V
 Rated supply voltage 5.0V

BLOCK DIAGRAM



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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, Vcc1=5V, Vcc2=12V, unless otherwise noted)

VIF SECTION

Symbol	Parameter	Test point	Input		Test conditions								Test circuit	Limits			Unit	
			VIF	SIF	1	2	3	4	5	6	V4	V8		Min.	Typ.	Max.		
Icc	Circuit current	A	-	-	2	1	1	1	1	1	1	-	-	1	25.0	36.0	47.0	mA
V17	Video detector output DC voltage 1	TP7	-	-	1	1	1	2	1	1	1	-	1	2.61	3.35	4.09	V	
V20	Video detector output DC voltage 2	TP9	-	-	1	1	1	2	1	1	1	-	1	2.74	3.5	4.27	V	
V0det1	Video detector output 1	TP7	SG 1	-	1	1	1	1	1	1	-	-	1	0.74	1.00	1.26	Vp-p	
V0det2	Video detector output 2	TP9	SG 1	-	1	1	1	1	1	1	-	-	1	1.55	2.00	2.50	Vp-p	
P/N	Video S/N	TP8	SG 2	-	1	1	1	1	1	1	-	-	1	50.0	57.0	-	dB	
BW	Video frequency characteristics	TP7	SG 3	-	1	1	1	1	1	1	-	-	1	5.5	6.2	-	MHz	
Vin (min)	Input sensitivity	TP7	SG 4	-	1	1	1	1	1	1	-	-	1	-	45	52	dBμ	
Vin (max)	Maximum allowable input	TP7	SG 5	-	1	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	3.23	4.25	-	V	
V4	IF AGC voltage (80 dBμ)	TP3	SG 6	-	1	1	1	1	1	1	-	-	1	2.3	2.9	3.5	V	
V4L	IF AGC minimum voltage (120 dBμ)	TP3	SG 7	-	1	1	1	1	1	1	-	-	1	-	0.0	0.2	V	
V2	AFT output voltage	TP1	-	-	1	1	1	2	1	1	0	-	1	3.0	5.0	6.9	V	
μ	AFT detector sensitivity	TP1	SG10	-	1	1	1	1	1	1	-	-	1	40	56	78	mV/kHz	
V2H	AFT maximum voltage	TP1	SG10	-	1	1	1	1	1	1	-	-	1	11.4	11.8	-	V	
V2L	AFT minimum voltage	TP1	SG10	-	1	1	1	1	1	1	-	-	1	-	0.1	0.5	V	
V3H	RF AGC maximum voltage	TP2	SG 2	-	1	1	1	1	1	1	-	2	1	-	11.6	-	V	
V3L	RF AGC minimum voltage	TP2	SG 2	-	1	1	1	1	1	1	-	6	1	-	0.1	1.0	V	
DG	DG	TP7	SG16	-	1	1	1	1	1	1	-	-	1	-	3	5	%	
DP	DP	TP7	SG16	-	1	1	1	1	1	1	-	-	1	-	2	5	deg	
CL-U	Capture range (U)	TP7	SG11	-	1	1	1	1	1	1	-	-	1	0.96	1.80	-	MHz	
CL-L	Capture range (L)	TP7	SG11	-	1	1	1	1	1	1	-	-	1	1.00	2.00	-	MHz	
CL-T	Capture range (T)	TP7	-	-	1	1	1	1	1	1	-	-	1	1.96	3.80	-	MHz	
FC1	EQ frequency characteristics 1	TP7 TP9	SG12	-	1	1	1	1	1	1	-	-	1	3.5	6.0	8.5	dB	
FC2	EQ frequency characteristics 2	TP7 TP9	SG13	-	1	1	1	1	1	1	-	-	1	6.6	9.0	11.5	dB	
FC3	EQ frequency characteristics 3	TP7 TP9	SG14	-	1	1	1	1	1	1	-	-	1	8.7	11.0	13.3	dB	
IM	Intermodulation	TP7	SG15	-	1	1	1	1	1	1	-	-	1	29	35	-	dB	
Vsync	Pin 20 sync level	TP9	SG 2	-	1	1	1	1	1	1	-	-	1	1.0	1.3	1.6	V	
Rin (V)	VIF input resistance		90dBμ	-	-	-	-	-	-	-	-	-	2	-	1.3	-	KΩ	
Cin (V)	VIF input capacitance		90dBμ	-	-	-	-	-	-	-	-	-	2	-	7.4	-	PF	



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SIF SECTION

Symbol	Parameter	Test point	Input		Test conditions								Test circuit	Limits			Unit
			VIF	SIF	1	2	3	4	5	6	V4	V8		Min.	Typ.	Max.	
V ₁₀	AF output voltage	TP4	-	-	1	1	1	2	1	1	0	-	1	1.20	2.00	2.40	V
V _{0AF (Max)}	Maximum AF output	TP4	-	SG17	1	1	1	2	1	1	0	-	1	160	230	299	mVrms
THD AF	AF output distortion	TP4	-	SG21	1	1	1	2	1	1	0	-	1	-	0.5	1.2	%
V _{in (Lim)}	Input limiting sensitivity	TP4	-	SG18	1	1	1	2	1	1	0	-	1	-	46	57	dBμ
AMR	AMR	TP4	-	SG19	1	1	1	2	1	1	0	-	1	50	60	-	dB
S/N	AF S/N	TP4	-	SG20	1	1	1	2	1	1	0	-	1	45	57	-	dB

ELECTRICAL CHARACTERISTICS TEST METHOD

P/N Video S/N

- Input SG2 in VIF IN.
- The noise appearing at pin 17 is determined by measuring the r.m.s. voltage at TP8 through low pass filter (-3dB at 5MHz).

$$c. P/N = 20 \log \left\{ \frac{V_{odet\ 1} (V_{p-p}) \times 0.7}{Noise (V_{r.m.s})} \right\}$$

BW Video frequency characteristics

- Set SG3 as follows:

$$\left. \begin{matrix} f_1 = 58.75\text{MHz } V_i = 90\text{dB}\mu \\ f_2 = 57.75\text{MHz } V_i = 70\text{dB}\mu \end{matrix} \right\} \text{Mixed Signal}$$

- Measure the amplitude of 1 MHz at TP7 and let it be V₁.
- Decrease frequency f₂ until the amplitude of (f₁ - f₂) at TP7 reaches 3dB smaller than V₁. Then, read frequency f₂.

$$BW = 58.75 - f_2 \text{ (MHz)} + 1\text{MHz}$$

V_{in (min)} Input sensitivity

- Input SG4 in VIF IN.
- Decrease the SG4 level until the detector output of pin 17 reaches 3 dB smaller than V_{odet1} and let the level be input sensitivity.

V_{in (max)} Maximum allowable input

- Set SG5 to 90dBμ, and input it in VIF IN.
- Let the detector output level at pin 17 be V₂.
- 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

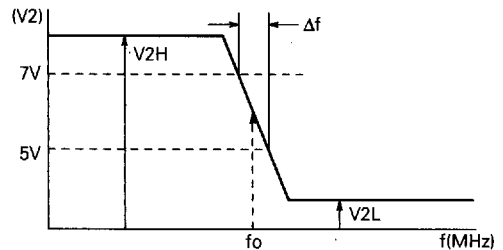
- AGC control range is defined as follows:

$$GR = (\text{Maximum allowable input}) - (\text{Input sensitivity})$$

μ AFT detector sensitivity

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

$$\mu = \frac{2000 \text{ (mV)}}{\Delta f \text{ (kHz)}} \text{ (mv/kHz)}$$



V_{2H} AFT maximum voltage

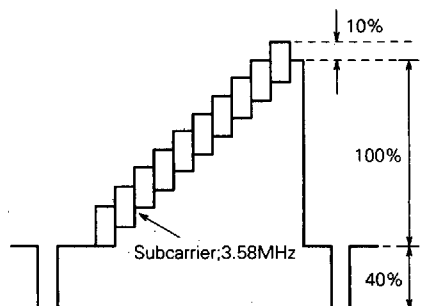
- In the above figure, let maximum DC voltage be V_{2H}.

V_{2L} AFT minimum voltage

- In the above figure, let minimum DC voltage be V_{2L}.

DG, DP DG, DP

- Modulated waves of SG16 is generated by 87.5% video modulation of the 10-step waves shown in the figure below.
- 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)

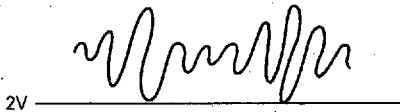
FC1, FC2, FC3 EQ frequency characteristics

- 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:

$$FC1\sim3 = V_{EQ OUT} - V_{EQ IN} \text{ (dB)}$$

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 waveform 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 80dBμ and input it in SIF IN.
- b. Decrease the output level of SG18 until the detector output of TP4 reaches 3dB smaller than $V_{O AF MAX}$ and let the level be input limiting sensitivity.

AMR

- a. Input SG19 in SIF IN.
- b. Measure output voltage at TP4 and let it be V_{AM} .
- c. AMR is defined as follows:

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

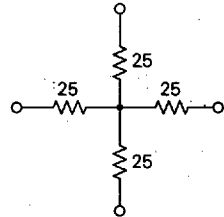
S/N AF S/N

- a. Input SG20 in SIF IN.
- b. Measure output voltage at TP4 and let it be V_n .
- c. AF S/N is defined as follows:

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

Notes:

- Amplitude level of all AM modulated waves shall be 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	$f_0=58.75\text{MHz}$ $V_i=90\text{dB}\mu$ 77.8% AM (87.5% Video modulation equivalent $f_m=20\text{kHz}$)
SG 2	$f_0=58.75\text{MHz}$ $V_i=90\text{dB}\mu$
SG 3	$f_1=58.75\text{MHz}$ $V_i=90\text{dB}\mu$ $f_2=53\pm 5\text{MHz}$ $V_i=70\text{dB}\mu$ } mixed signal
SG 4	$f_0=58.75\text{MHz}$ $V_i=\text{Variable}$ $f_m=20\text{kHz}$ 77.8% AM
SG 5	$f_0=58.75\text{MHz}$ $V_i=\text{Variable}$ $f_m=20\text{kHz}$ 16% AM
SG 6	$f_0=58.75\text{MHz}$ $V_i=80\text{dB}\mu$
SG 7	$f_0=58.75\text{MHz}$ $V_i=120\text{dB}\mu$
SG 8	$f_0=54.25\text{MHz}$ $V_i=100\text{dB}\mu$
SG 9	$f_0=54.25\text{MHz}$ $V_i=80\text{dB}\mu$
SG10	$f_0=58.75\text{MHz}\pm 5\text{MHz}$ $V_i=90\text{dB}\mu$
SG11	$f_0=58.75\text{MHz}\pm 5\text{MHz}$ $V_i=90\text{dB}\mu$ $f_m=20\text{kHz}$ 77.8% AM
SG12	$f_1=58.75\text{MHz}$ $V_i=90\text{dB}\mu$ $f_2=58.25\text{MHz}$ $V_i=60\text{dB}\mu$ } mixed signal
SG13	$f_1=58.75\text{MHz}$ $V_i=90\text{dB}\mu$ $f_2=55.75\text{MHz}$ $V_i=60\text{dB}\mu$ } mixed signal
SG14	$f_1=58.75\text{MHz}$ $V_i=90\text{dB}\mu$ $f_2=53.75\text{MHz}$ $V_i=60\text{dB}\mu$ } mixed signal
SG15	$f_1=58.75\text{MHz}$ $V_i=90\text{dB}\mu$ $f_2=55.17\text{MHz}$ $V_i=80\text{dB}\mu$ $f_3=54.25\text{MHz}$ $V_i=80\text{dB}\mu$ } mixed signal
SG16	$f_0=58.75\text{MHz}$ Standard 10-step wave modulation $m=87.5\%$ Video modulation Sync tip level $V_i=90\text{dB}\mu$
SG17	$f_0=4.5\text{MHz}\pm 25\text{kHz}$ dev $V_i=90\text{dB}\mu$ $f_m=400\text{Hz}$
SG18	$f_0=4.5\text{MHz}\pm 25\text{kHz}$ dev $V_i=\text{Variable}$ $f_m=400\text{Hz}$
SG19	$f_0=4.5\text{MHz}$ $V_i=90\text{dB}\mu$ 30% AM $f_m=400\text{Hz}$
SG20	$f_0=4.5\text{MHz}$ $V_i=90\text{dB}\mu$
SG21	$f_0=4.5\text{MHz}$ $V_i=90\text{dB}\mu$ $f_m=400\text{Hz}\pm 7.5\text{kHz}$ dev

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APPLICATION EXAMPLE

