



SANYO Semiconductors

DATA SHEET

LA75676M

Monolithic Linear IC For TV and VCR Products IF Signal Processor (VIF+SIF)

Overview

The LA75676M is a VIF/SIF IC that supports NTSC intercarrier reception and adopts a semi-adjustment-free design. It is provided in the MFP24S (300mil, 1.0mm lead pitch) package, which is appropriate for miniature 2-in-1 tuner products. In the VIF block, it adopts a design that uses AFT adjustment to obviate the need for VCO adjustment, and thus can simplify the adjustment steps required in end product manufacturing. It uses a PLL technique for FM detection. It features the 5V supply voltage appropriate for multimedia products. In addition, it achieves superb audio quality by incorporating a buzz canceller that suppresses Nyquist buzzing.

Functions

- VIF block: VIF amplifier, buzz canceller, PLL detector, IF AGC, RF AGC, AFT, and an equalizer amplifier
- SIF block: Limiter amplifier, PLL FM detector

Specifications

Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	V _{CC} max		6	V
Circuit voltage	V13, V17		V _{CC}	V
Circuit current	I6		-3	mA
	I10		-10	mA
	I24		-2	mA
Allowable power dissipation	Pd max	Ta ≤ 70°C * Mounted on a board	400	mW
Operating temperature	Topr		-20 to +70	°C
Storage temperature	Tstg		-55 to +150	°C

* When mounted on a 114.3x76.1x1.6mm³, glass epoxy board.

■ Any and all SANYO Semiconductor Co.,Ltd. products described or contained herein are, with regard to "standard application", intended for the use as general electronics equipment (home appliances, AV equipment, communication device, office equipment, industrial equipment etc.). The products mentioned herein shall not be intended for use for any "special application" (medical equipment whose purpose is to sustain life, aerospace instrument, nuclear control device, burning appliances, transportation machine, traffic signal system, safety equipment etc.) that shall require extremely high level of reliability and can directly threaten human lives in case of failure or malfunction of the product or may cause harm to human bodies, nor shall they grant any guarantee thereof. If you should intend to use our products for applications outside the standard applications of our customer who is considering such use and/or outside the scope of our intended standard applications, please consult with us prior to the intended use. If there is no consultation or inquiry before the intended use, our customer shall be solely responsible for the use.

■ Specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

SANYO Semiconductor Co., Ltd.

TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

LA75676M

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

Parameter	Symbol	Conditions	Ratings	Unit
Recommended supply voltage	V_{CC}		5	V
Operating supply voltage range	$V_{CC\text{ op}}$		4.5 to 5.5	V

Electrical Characteristics at $T_a = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $f_p = 45.75\text{MHz}$

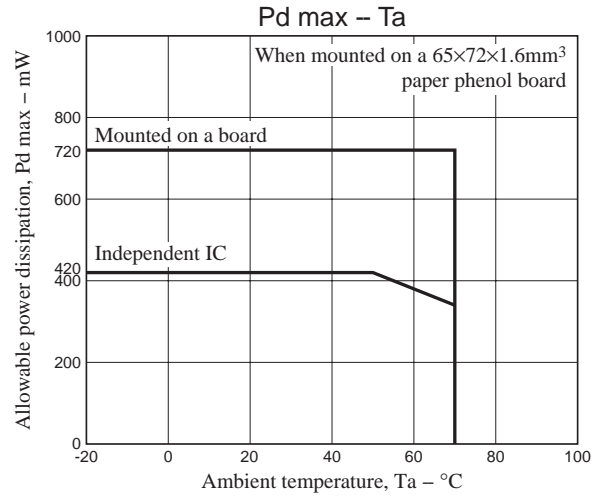
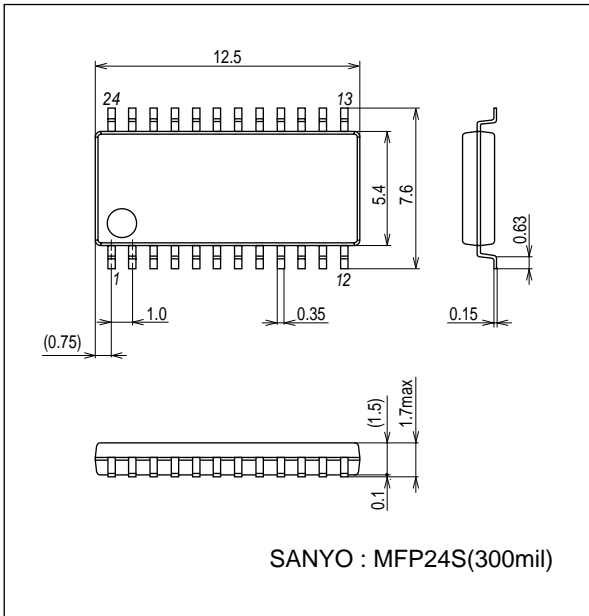
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
[VIF Block]						
Circuit current	I5		32	40	48	mA
Maximum RF AGC voltage	V14H		$V_{CC}-0.5$	V_{CC}		V
Minimum RF AGC voltage	V14L			0	0.5	V
Input sensitivity	V_i	S1 = OFF	32	38	44	$\text{dB}\mu\text{V}$
AGC range	GR		58	63		dB
Maximum allowable input	$V_i\text{ max}$		95	100		$\text{dB}\mu\text{V}$
Video output voltage (no input)	V6		3.5	3.8	4.1	V
Sync signal tip voltage	V6tip		0.9	1.2	1.5	V
Video output level	V_O		1.7	2	2.3	Vp-p
Black noise threshold voltage	VBTH		0.5	0.8	1.1	V
Black noise clamp voltage	VBCL		1.6	1.9	2.2	V
Video signal-to-noise ratio	S/N		48	52		dB
C-S beating	IC-S		38	43		dB
Frequency characteristics	f_c	6MHz	-3	-1.5		dB
Differential gain	DG			3	6.5	%
Differential phase	DP			3	5	$^\circ\text{C}$
AFT voltage (no signal)	V13		2.0	2.5	3.0	V
Maximum AFT voltage	V13H		4.0	4.4	5.0	V
Minimum AFT voltage	V13L			0.18	1.0	V
AFT detection sensitivity	Sf		28	40	52	mV/kHz
VIF input resistance	R_i	45.75MHz		1.5		$\text{k}\Omega$
VIF input capacitance	C_i	45.75MHz		3		pF
APC pull-in range (U)	fpu		1.3	2.0		MHz
APC pull-in range (L)	fpl			-2.0	-1.4	MHz
AFT tolerance frequency 1	dfa1		-150	0	+150	kHz
VCO 1 maximum range (U)	dfu		1.5	2.0		MHz
VCO 1 maximum range (L)	dfL			-2.0	-1.5	MHz
VCO control sensitivity	B		1.3	2.7	5.4	kHz/mV
[SIF BLOCK]						
Limiting sensitivity	$V_{li}\text{ (lim)}$		39	45	51	$\text{dB}\mu\text{V}$
FM detection output voltage*	$V_O\text{ (FM)}$	4.5MHz \pm 25kHz	400	520	660	mV_{rms}
AMR	AMR		50	60		dB
Total harmonic distortion	THD			0.3	0.8	%
SIF signal-to-noise ratio	S/N (FM)		59	64		dB
4.5MHz output level	V_{sout}	SIF IN 80 $\text{dB}\mu\text{V}$	87	94	101	$\text{dB}\mu\text{V}$

* : If a wider FM detection output dynamic range is required, insert a resistor and capacitor in series between pin 23 and ground to adjust the level.

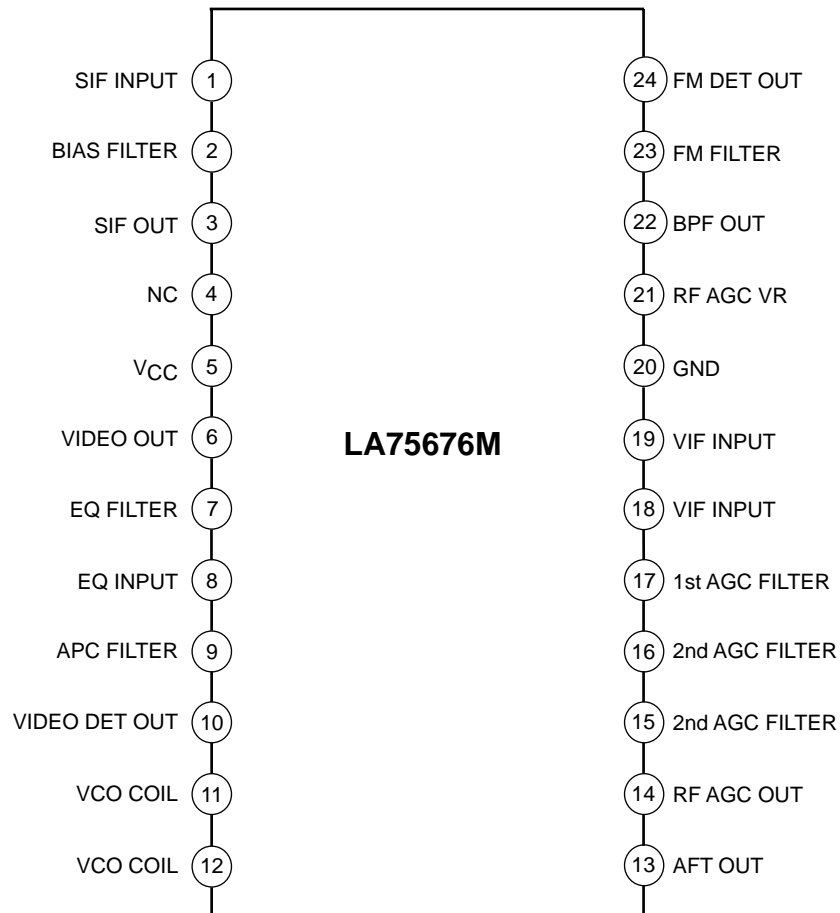
LA75676M

Package Dimensions

unit : mm (typ)
3112B

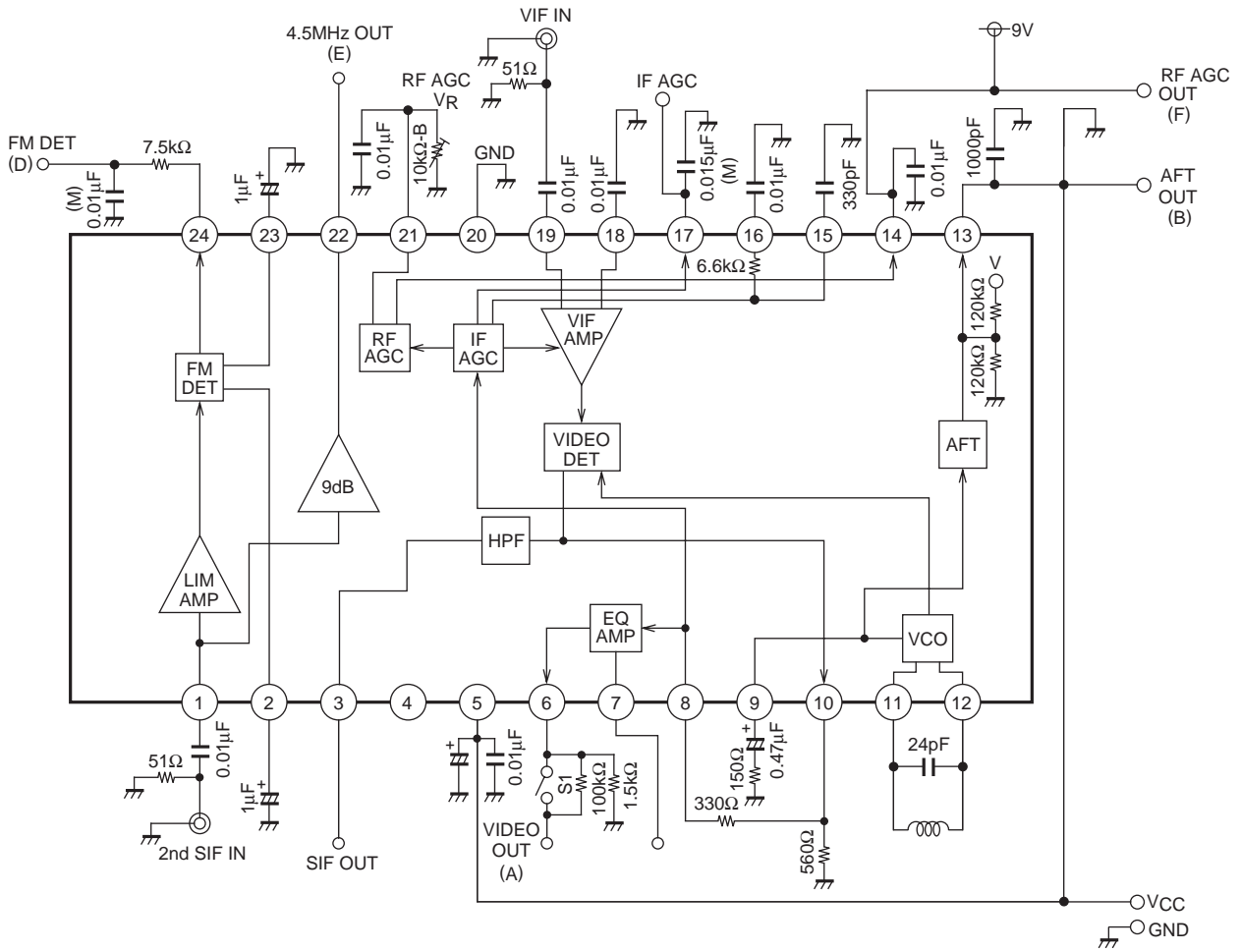


Pin Assignment

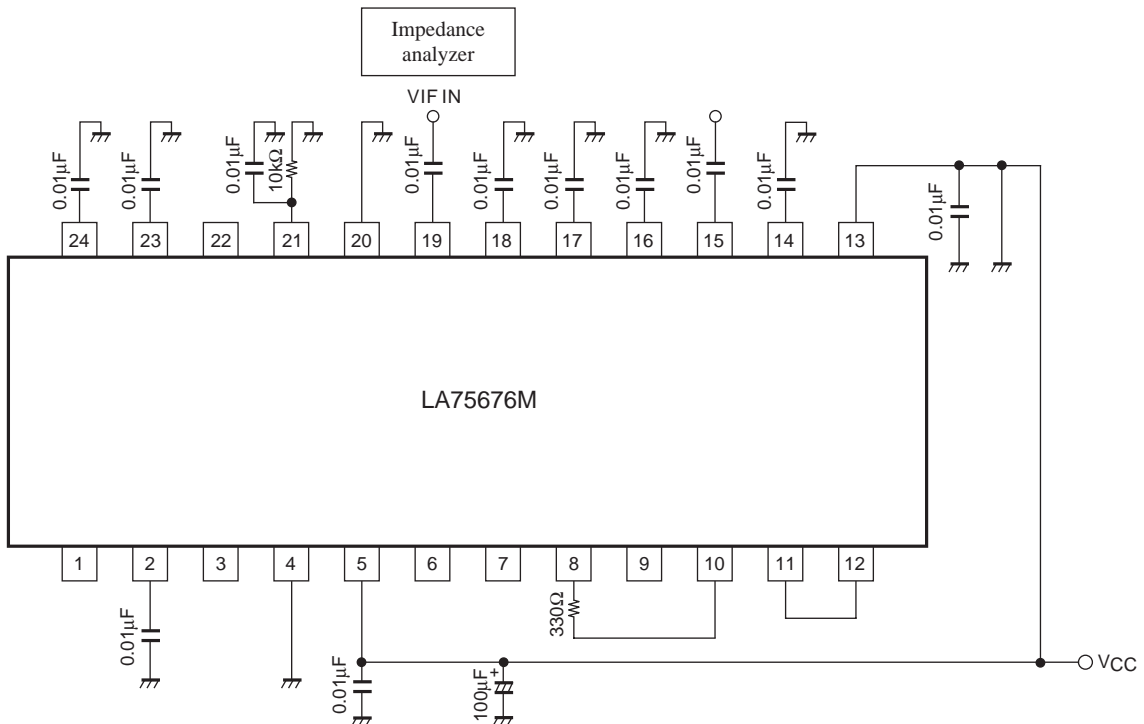


LA75676M

Block Diagram and AC Characteristics Test Circuit



Test Circuit (Input impedance)



Test Conditions

V1. Circuit current •••• [I5]

1. Internal AGC
2. Input a 45.75MHz, 10mVrms, CW signal to the VIF input pin.
3. RF AGC Vr maximum
4. Connect a current meter to V_{CC} and measure the current flowing into the IC.

V2, V3. Maximum RF AGC voltage, minimum RF AGC voltage •••• [V9H, V9L]

1. Internal AGC
2. Input a 45.75MHz, 10mVrms, CW signal to the VIF input pin.
3. Vary the RF AGC Vr and, at the maximum resistance, measure the maximum RF AGC voltage. (F)
4. Vary the RF AGC Vr and, at the minimum resistance, measure the maximum RF AGC voltage. (F)

V4. Input sensitivity •••• [Vi]

1. Internal AGC
2. fp = 45.75MHz, 400Hz 40% AM (VIF input)
3. Set S1 to the off position and pass the input through a 100kΩ resistor.
4. Measure the VIF input level such that the 400Hz detection output level at test point A becomes 0.64Vp-p.

V5. AGC range •••• [GR]

1. External AGC. Apply the V_{CC} voltage to the IF AGC input (pin 17).
2. With the same conditions as used for V4, measure the VIF input level such that the detection output level becomes 0.64Vp-p. ••• Vi1
3. $GR = 20 \log \frac{Vi1}{Vi}$ dB

V6. Maximum allowable input •••• [Vi max]

1. Internal AGC
2. fp = 45.75MHz, 15kHz 78% AM (VIF input)
3. Measure the VIF input level such that the detection output level at test point A is ±1dB of the video output (Vo).

V7. Video output voltage (no input) •••• [V6]

1. External AGC. Apply the V_{CC} voltage to the IF AGC input (pin 17).
2. Measure the video output (A) DC voltage.

V8. Sync signal tip voltage •••• [V6tip]

1. Internal AGC
2. Input a 45.75MHz, 10mVrms, CW signal to the VIF input pin.
3. Measure the video output (A) DC voltage.

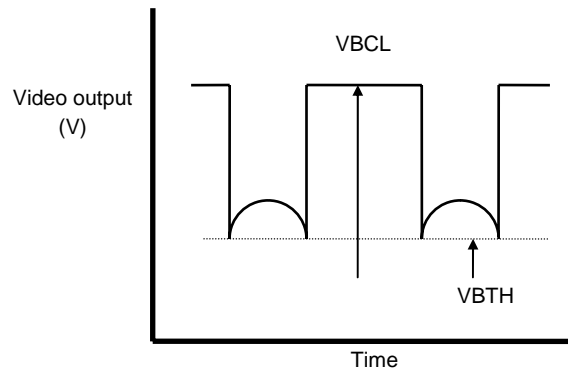
V9. Video output level •••• [VO]

1. Internal AGC
2. fp = 45.75MHz, 15kHz 78% AM
Vi = 10mVrms (VIF input)
3. Measure the wave height of the detection output level at test point A. (Vp-p)

LA75676M

V10, V11. Black noise threshold and clamp voltages •••• [VBTH, VBCL]

1. Apply a DC voltage to the external AGC IF input (pin 17) and vary that voltage.
2. $f_p = 45.75\text{MHz}$, 400Hz, 40% AM, 10mVrms (VIF input)
3. Vary the IF AGC (pin 17) voltage so that the noise canceller operates.
Measure VBTH and VBCL at test point A.



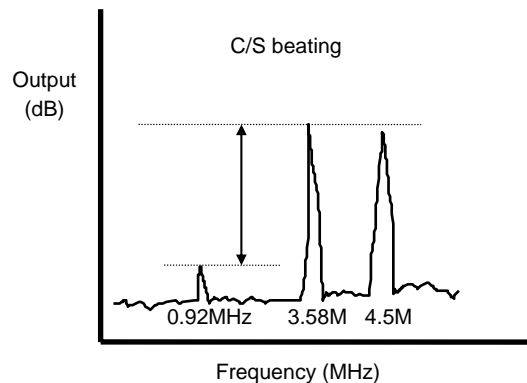
V12. Video signal-to-noise ratio •••• [S/N]

1. Internal AGC
2. $f_p = 45.75\text{MHz}$, CW, 10mVrms (VIF input)
3. Measure the noise voltage as an RMS level at test point A after passing through a 10kHz to 4MHz bandpass filter.
This is the noise voltage (N).

$$4. S/N = 20\log \frac{\text{Video component (Vp-p)}}{\text{Noise voltage (Vrms)}} = 20\log \frac{1.12\text{Vp-p}}{\text{Noise voltage}} = (\text{dB})$$

V13. C/S beating •••• [ICS]

1. Apply a DC voltage to the external AGC IF input (pin 17) and vary that voltage.
2. $f_p = 45.75\text{MHz}$, CW ; 10mVrms
 $f_c = 42.17\text{MHz}$, CW ; 10mVrms - 10dB
 $f_s = 41.25\text{MHz}$, CW ; 10mVrms - 10dB
3. Vary the IF AGC (pin 17) voltage to adjust the output level at test point A to be 1.3Vp-p.
4. Measure the difference in level between the 3.58MHz and the 0.92MHz components at test point A.



LA75676M

V14. Frequency characteristics •••• [fc]

1. Apply a DC voltage to the external AGC IF input (pin 17) and vary that voltage.
2. SG1 : 45.75MHz, CW, 10mVrms
SG2 : from 45.65MHz to 39.75MHz, CW, 2mVrms
Add SG1 and SG2 using a T pad, adjust the signal generator levels to those listed above, and apply the result to VIF IN.
3. First, set the SG2 frequency to 45.65MHz.
Next, adjust the IF AGC voltage (pin 17) so that the output level at test point A becomes 0.5Vp-p. •• V1
4. Set the SG2 frequency to 39.75MHz and measure the output level. •• V2
5. Perform the following calculation.

$$f_c = 20 \log \frac{V_2}{V_1} \text{ (dB)}$$

V15, V16. Differential gain and differential phase •••• [DG, DP]

1. Internal AGC
2. fp = 45.75MHz, APL 50%, 87.5% video signal, Vi = 10mVrms
3. Measure DG and DP at test point A.

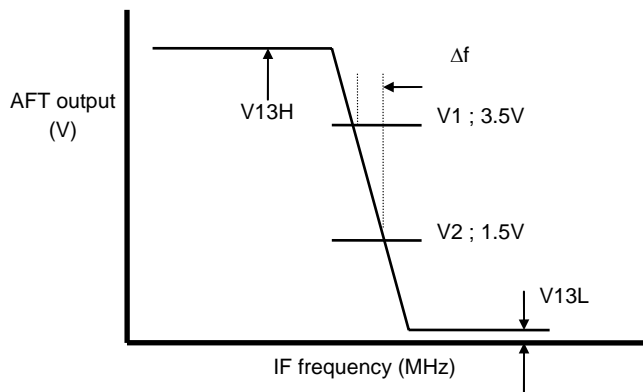
V17. AFT voltage (no signal) •••• V13

1. Internal AGC
2. Measure the DC voltage on the AFT output (B).

V18, V19, V20. Maximum AFT voltage, minimum AFT voltage, AFT detection sensitivity •••• [V13H, V13L, Sf]

1. Internal AGC
2. fp = 45.75MHz, ±1.5MHz sweep, 10mVrms (VIF input)
3. Record the maximum voltage as V13H and the minimum voltage as V13L.
4. Measure the frequency shift for the change in voltage at test point B from V1 to V2. •• Δf

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



V21, V22. VIF input resistance, input capacitance •••• [Ri, Ci]

1. Use an impedance analyzer to measure Ri and Ci in the input impedance test circuit.

V23, V24. APC pull-in range •••• [fpu, fpl]

1. Internal AGC
2. fp = 39MHz to 51MHz, CW : 10mVrms
3. Vary the signal generator from fp = 45.75MHz towards higher frequencies until PLL lock is lost.
Note : PLL lock is lost at the point beating is output at test point A.
4. Lower the signal generator frequency until the PLL locks again. (f1)
5. Lower the signal generator frequency until PLL lock is lost.
6. Raise the signal generator frequency until the PLL locks again. (f2)
7. Perform the following calculations.

$$fpu = f1 - 45.75\text{MHz}$$

$$fpl = f2 - 45.75\text{MHz}$$

V25. AFT tolerance frequency 1 •••• [$\Delta Fa1$]

1. Internal AGC
2. SG1 : Vary this frequency from 43.75MHz to 47.75MHz, CW, 10mVrms
3. Vary the SG1 frequency so that the AFT output (test point B) becomes 2.5V.
Record the SG1 frequency at that point as f1.
4. External AGC (Adjust V17.)
5. Apply 5V to the IF AGC (pin 17), pick up the VCO oscillator frequency from ground or some other point, and measure that frequency. f2
6. Perform the following calculation.
AFT tolerance frequency 1 $\Delta Fa1 = f2 - f1$ (kHz)

V26, V27. VCO maximum range (U, L) •••• [dfu, dfl]

1. External AGC. Apply the VCC voltage to the IF AGC (pin 17).
2. Pick up the VCO oscillator frequency from the video output (A), ground, or some other point and adjust the VCO coil so that frequency becomes 45.75MHz.
3. Apply 1V to the APC pin (pin 9) and let f1 be the frequency at that time.
Similarly, apply 5V and let fu be the frequency at that time.

$$dfu = fu - 45.75\text{MHz}$$

$$dfl = f1 - 45.75\text{MHz}$$

V28. VCO control sensitivity •••• [β]

1. External AGC. Apply the VCC voltage to the IF AGC (pin 17).
2. Pick up the VCO oscillator frequency from the video output (A), ground, or some other point and adjust the VCO coil so that frequency becomes 45.75MHz.
3. Apply 3V to the APC pin (pin 9) and let f1 be the frequency at that time.
Similarly, apply 3.4V and let f2 be the frequency at that time.

$$\beta = \frac{f2 - f1}{400} \text{ (kHz/mV)}$$

S1. SIF limiting sensitivity •••• [Vi (lim)]

1. External AGC. Apply the VCC voltage to the IF AGC (pin 17).
2. fs = 4.5MHz, fm = 400Hz, $\Delta F = \pm 25\text{kHz}$ (SIF input)
3. Set the SIF input level to 100mVrms and measure the value at test point D at that time. •• V1
4. Lower the SIF input level and measure the input level such that V1 is down by 3dB.

S2, S4. FM detection output voltage, total harmonic distortion •••• [VO(FM), THD]

1. External AGC. Apply the VCC voltage to the IF AGC (pin 17).
2. fs = 4.5MHz, fm = 400Hz, $\Delta F = \pm 25\text{kHz}$ (SIF input, Vi = 100mVrms)
3. Measure the FM detection output voltage and total harmonic distortion at test point D.

S3. AM rejection ratio •••• [AMR]

1. External AGC. Apply the V_{CC} voltage to the IF AGC (pin 17).
2. $f_s = 4.5\text{MHz}$, $f_m = 400\text{Hz}$, $AM = 30\%$ (SIF input, $V_i = 90\text{dB}\mu\text{V}$)
3. Measure the output voltage at test point D. ••• VAM

$$4. AMR = 20\log\frac{V_{O(DET)}}{V_{AM}} \text{ dB}$$

S5. SIF signal-to-noise ratio •••• [S/N]

1. External AGC ($V_{17} = V_{CC}$)
2. $f_s = 4.5\text{MHz}$, no modulation, $V_i = 100\text{mV}_{\text{rms}}$
3. Measure the output voltage at test point D. •••• V_n

$$4. S/N = 20\log\frac{V_{O(DET)}}{V_n} \text{ dB}$$

S6. 4.5MHz output level •••• [S/N]

1. External AGC ($V_{17} = V_{CC}$)
2. $f_s = 4.5\text{MHz}$, no modulation, $V_i = 10\text{mV}_{\text{rms}}$
3. Measure the output voltage at test point E. •••• V_{out}

Note 1. Unless specified otherwise, when measuring VIF, apply the V_{CC} voltage to the AGC and adjust the VCO coil so that it oscillates at 45.75MHz.

Note 2. Unless specified otherwise, switch SW1 must be in the on position.

- SANYO Semiconductor Co.,Ltd. assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all SANYO Semiconductor Co.,Ltd. products described or contained herein.
- SANYO Semiconductor Co.,Ltd. strives to supply high-quality high-reliability products, however, any and all semiconductor products fail or malfunction with some probability. It is possible that these probabilistic failures or malfunction could give rise to accidents or events that could endanger human lives, trouble that could give rise to smoke or fire, or accidents that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.
- In the event that any or all SANYO Semiconductor Co.,Ltd. products described or contained herein are controlled under any of applicable local export control laws and regulations, such products may require the export license from the authorities concerned in accordance with the above law.
- No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written consent of SANYO Semiconductor Co.,Ltd.
- Any and all information described or contained herein are subject to change without notice due to product/technology improvement, etc. When designing equipment, refer to the "Delivery Specification" for the SANYO Semiconductor Co.,Ltd. product that you intend to use.
- Information (including circuit diagrams and circuit parameters) herein is for example only; it is not guaranteed for volume production.
- Upon using the technical information or products described herein, neither warranty nor license shall be granted with regard to intellectual property rights or any other rights of SANYO Semiconductor Co.,Ltd. or any third party. SANYO Semiconductor Co.,Ltd. shall not be liable for any claim or suits with regard to a third party's intellectual property rights which has resulted from the use of the technical information and products mentioned above.

This catalog provides information as of April, 2007. Specifications and information herein are subject to change without notice.