

AN5101NSC

VIF/SIF IC for TV and VCR

Overview

The AN5101NSC is a VIF/SIF signal processing IC for TV and VCR. Reduction of sound noise and improvement of picture quality have been realized by adoption of the gated PLL detection system.

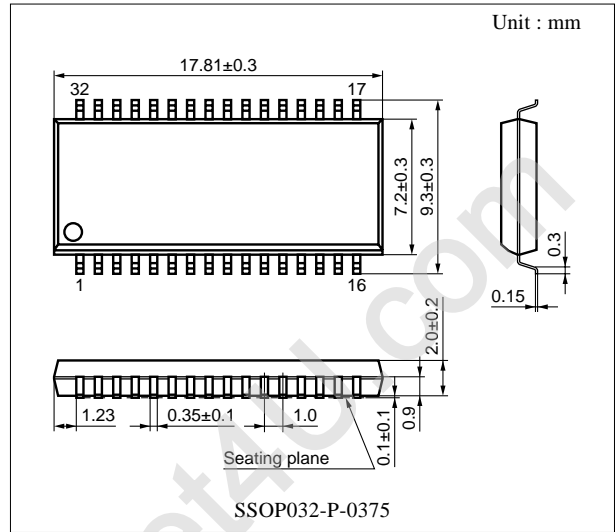
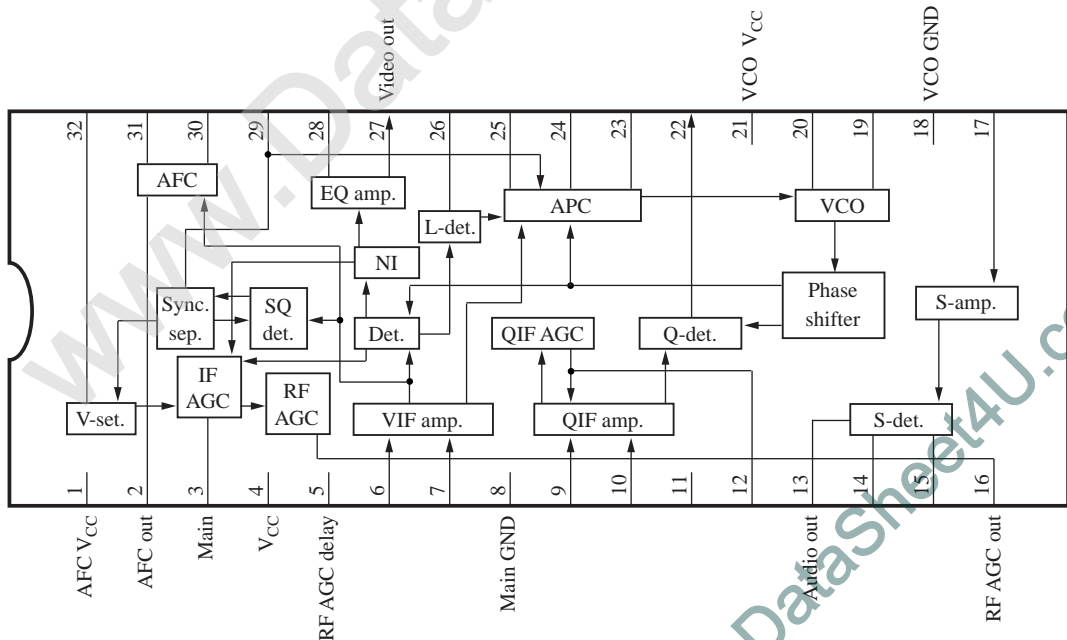
Features

- Reduction of buzz-beat (sound noise) when receiving for sound multiplex broadcasting service
- Improvement of video over-modulation characteristics
- Built-in equalizing amplifier which enables the correction of video frequency characteristics.
- Low power consumption (5 V, 46.5 mA)
- Respond to diversity antenna

Applications

- TV and VCR

Block Diagram



■ Pin Descriptions

Pin No.	Description	Pin No.	Description
1	Supply pin V_{CC1} (AFC output use)	17	SIF input pin
2	AFC output pin	18	GND pin (for VCO)
3	VIF AGC filter pin	19	VCO coil pin
4	Supply pin V_{CC2} (for main)	20	VCO coil pin
5	RF AGC delay adjustment pin	21	Supply pin V_{CC3} (for VCO)
6	VIF input pin	22	QIF detection output pin
7	VIF input pin	23	APC detection output pin
8	GND pin (for main)	24	VCO control pin
9	QIF input pin	25	APC time-constant switchover pin
10	QIF input pin	26	Lock detection pin
11	N.C.	27	Video detection output pin
12	QIF AGC filter pin	28	Feed back pin
13	Audio output pin	29	Sync. signal separation use pin
14	SIF coil pin	30	AFC coil pin
15	SIF coil pin	31	AFC coil pin
16	RF AGC output pin	32	Vertical sync. signal separation use pin

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	
Supply voltage	V_{CC}	V_{CC2}, V_{CC3}	5.6	V
		V_{CC1}	12.5	
Circuit voltage	$V_{16-8, 18}$	0 to 12.5	V	
	$V_{25-8, 18}$	0 to 12.5		
Supply current	I_{CC}	$I_{CC2} + I_{CC3}$	63.0	mA
		I_{CC1}	1.8	
Power dissipation	P_D	376	mW	
Operating ambient temperature*1	T_{opr}	-30 to + 85	°C	
Storage temperature*1	T_{stg}	-55 to + 150	°C	

Note) Don't supply current and voltage from external for not described pins.

The circuit current show that (+) flows into the IC and (-) flows out from the IC.

*1 : All parameter values except for the power dissipation, the operating ambient temperature and the storage temperature are $T_a = 25^\circ\text{C}$.

■ Recommended Operating Range

Parameter	Symbol	Range	Unit
Supply voltage	V_{CC2}, V_{CC3}	4.5 to 5.3	V
Supply voltage	V_{CC1}	V_{CC2}, V_{CC3} to 12.2	V
Circuit voltage	$V_{2-8, 18}$	0 to $V_{1-8, 18}$	V
Circuit voltage	$V_{3-8, 18}$	0 to $V_{4, 21-8, 18}$	V
Circuit voltage	$V_{5-8, 18}$	0 to $V_{4, 21-8, 18}$	V
Circuit voltage	$V_{12-8, 18}$	0 to $V_{4, 21-8, 18}$	V
Circuit voltage	$V_{32-8, 18}$	0 to $V_{4, 21-8, 18}$	V
Circuit current	I_6, I_7	-1.0 to 0.05	mA
Circuit current	I_9, I_{10}	-1.0 to 0.05	mA
Circuit current	I_{13}	-5.0 to 0.3	mA
Circuit current	I_{14}, I_{15}	-1.0 to 0.05	mA
Circuit current	I_{16}	0 to 3	mA
Circuit current	I_{17}	-1.0 to 0.3	mA
Circuit current	I_{22}	-5.0 to 5.0	mA
Circuit current	I_{23}	-0.2 to 0.2	mA
Circuit current	I_{25}	0 to 1.0	mA
Circuit current	I_{27}	-5.0 to 1.0	mA
Circuit current	I_{28}	-0.1 to 0.1	mA
Circuit current	I_{29}	-1.0 to 0	mA
Circuit current	I_{30}, I_{31}	-1.0 to 0.05	mA

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
VIF amp. det. block						
Video detection output	V_{O27}	Standard color signal (with white color) $m = 87.5\%$, $v_{IN} = 80\text{ dB}\mu$	1.7	2.0	2.3	V[p-p]
Video frequency characteristics	f_C	Attenuation amount at 8 MHz	-4.0	-1.0	+0	dB
Sync. peak voltage	V_P		1.1	1.3	1.5	V
PLL block						
APC pull-in range high	f_{PH}		1.0	—	—	MHz
APC pull-in range low	f_{PL}		—	—	-1.0	MHz
VCO control sensitivity	β	$V_{24} = 2.3\text{ V to }2.5\text{ V}$	1.5	2.0	2.5	kHz/mV

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

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
AGC block						
RF AGC operation sensitivity	v_{RFAGC}		0	1.0	3.0	dB
RF AGC max. pull-in current	$I_{16\text{max}}$	By the DC characteristics measurement method	1.5	2.1	2.7	mA
RF AGC min. pull-in current	$I_{16\text{min}}$	By the DC characteristics measurement method	-3.0	0	3.0	μA
AFC block						
AFC discrimination sensitivity	μ_{AFC}	$R_L = 150\text{ k}\Omega / 150\text{ k}\Omega$	18	26	34	mV/kHz
AFC center voltage	I_2	By the DC characteristics measurement method	5.0	6.0	7.0	V
AFC max. output voltage	$V_{2\text{max}}$	$f = f_0 - 500\text{ kHz}$	10.5	11.2	—	V
AFC min. output voltage	$V_{2\text{min}}$	$f = f_0 + 500\text{ kHz}$	—	0.7	1.5	V
QIF amp. det.block						
Q- det. output level	v_{QDET}		95	100	105	$\text{dB}\mu$
SIF block						
Audio detection output	V_{O13}	$f_0 = 4.5\text{ MHz}$, $v_{\text{IN}} = 100\text{ dB}\mu$, $\Delta f = \pm 25\text{ kHz}$, $f_M = 400\text{ Hz}$, $R_D = 6.8\text{ k}\Omega$	327	385	443	mV[rms]
DC characteristics						
Circuit current 1 (pin 4, pin 21)	$I_4 + I_{21}$	By the DC characteristics measurement method	36.5	46.5	56.5	mA
Circuit current 2 (pin 1)	I_1	By the DC characteristics measurement method	0.8	1.1	1.4	mA
VIF input pin voltage	V_6, V_7	By the DC characteristics measurement method	2.6	3.0	3.4	V
QIF input pin voltage	V_9, V_{10}	By the DC characteristics measurement method	2.6	3.0	3.4	V
Audio output pin voltage	V_{13}	By the DC characteristics measurement method	1.5	2.0	2.5	V
SIF coil pin voltage	V_{14}, V_{15}	By the DC characteristics measurement method	4.0	4.2	4.5	V
SIF input pin voltage	V_{17}	By the DC characteristics measurement method	1.2	1.5	1.8	V
VCO coil pin voltage	V_{19}, V_{20}	By the DC characteristics measurement method	2.7	3.2	3.7	V
Q-det. output pin voltage	V_{22}	By the DC characteristics measurement method	2.5	2.9	3.3	V
VCO control pin voltage	V_{24}	By the DC characteristics measurement method	2.0	2.45	2.9	V
APC time-constant switchover pin	V_{25}	By the DC characteristics measurement method	4.5	5.0	—	V
Video detection output pin voltage	V_{27}	By the DC characteristics measurement method	3.2	3.7	4.2	V
AFC coil pin voltage	V_{30}, V_{31}	By the DC characteristics measurement method	2.4	2.8	3.2	V

■ Electrical Characteristics at $V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$ (continued)

• Design reference data

Note) The following values are typical and not guaranteed values.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
VIF amp. det. block						
Input sensitivity	v_{SV}	$V_{O27} = -3\text{dB}$	—	42	46	$\text{dB}\mu$
Maximum allowable input	$v_{\text{max}V}$		97	102	—	$\text{dB}\mu$
SN ratio	S/N		50	55	—	dB
Differential gain	DG		—	2	5	%
Differential phase	DP		—	2	5	deg
Black noise detection level	ΔV_{BN}	$V_{BN} - V_P$	—	-0.85	—	V
White noise clamp level	ΔV_{WNC}	$V_{WNC} - V_P$	—	-1.9	—	V
Intermodulation	IM		45	50	—	dB
Input resistance (pin 6)	R_{I6}		—	1.2	—	$\text{k}\Omega$
Input capacitance (pin 6)	C_{I6}		—	3.2	—	pF
Output resistance (pin 27)	R_{O27}		—	10	—	Ω
PLL block						
VCO max. variable range 1	Δf_{VU}	$V_{24} = 1.0\text{ V}$	1.8	—	—	MHz
VCO max. variable range 2	Δf_{VD}	$V_{24} = 4.0\text{ V}$	—	—	-1.8	MHz
VCO frequency SW on drift	Δf_{VON}	3 minutes after swich-on	-0.1	0	+0.1	MHz
VCO frequency temperature drift	Δf_{VT}	-20°C to $+70^\circ\text{C}$	—	-0.2	—	MHz
VCO reference oscillation level	v_{VCO}		100	106	112	$\text{dB}\mu$
VCO 2nd harmonics wave level	v_{VCO2}		—	70	—	$\text{dB}\mu$
AGC block						
RF AGC delay point temperature drift	Δv_{RFDT}	-20°C to $+70^\circ\text{C}$	—	+1	—	dB
Noise canceller operation voltage (W)	$\Delta V_{NC(W)}$	$V_{NC(W)} - V_P$	—	2.6	—	V
Noise canceller operation voltage (B)	$\Delta V_{NC(B)}$	$V_{NC(B)} - V_P$	—	-0.85	—	V
IF AGC filter charge current	I_{3C}		-15.0	-8.5	-4.0	μA
IF AGC filter discharge current	I_{3D}		340	470	600	μA
AFC block						
AFC defeat SW operation voltage	$V_{\text{AFC-SW}}$		—	0.9	—	V

■ Electrical Characteristics at $T_a = 25^\circ\text{C}$ (continued)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
QIF amp. det. block						
Input sensitivity	v_{SQ}	$v_{QDET} = -3 \text{ dB}$	—	46	50	$\text{dB}\mu$
Max. allowable input	$v_{\text{max}Q}$		99	104	—	$\text{dB}\mu$
Input resistance (pin 9)	R_{I9}	$f = 54.25 \text{ MHz}$	—	1.2	—	$\text{k}\Omega$
Input capacitance (pin 9)	C_{I9}	$f = 54.25 \text{ MHz}$	—	3.2	—	pF
Output resistance (pin 22)	R_{O22}	$f = 4.5 \text{ MHz}$	—	170	—	Ω
SIF block						
Input limiting voltage	$v_{I(LIM)}$	$V_{O13} = -3 \text{ dB}$	—	37	—	$\text{dB}\mu$
AM rejection ratio	AMR	$v_{IN} = 90 \text{ dB}\mu$	45	55	—	dB
Total harmonic distortion	THD		—	0.15	—	%
Input resistance (pin 17)	R_{I17}	$f = 4.5 \text{ MHz}$	—	1.1	—	$\text{k}\Omega$
Input capacitance (pin 17)	C_{I17}	$f = 4.5 \text{ MHz}$	—	8.0	—	pF
Detector input resistance (pin 13)	R_{I13}	$f = 4.5 \text{ MHz}$	—	10	—	$\text{k}\Omega$
Detector input capacitance (pin 13)	C_{I13}	$f = 4.5 \text{ MHz}$	—	25	—	pF
Output resistance (pin 12)	R_{O12}	$f = 500 \text{ MHz}$	—	400	—	Ω

■ Application Circuit Example

