

Improving functions and performance of in-car TVs.

VIF/SIF Small package IC for In-Car TV Receivers AN16995A

■ Overview

The AN16995A is a VIF/SIF signal-processing IC for use in car TV receivers. It adopts a split carrier system that completely separates video and audio processing and includes soft muting, SD, and other circuits required for car TV use. It provides superb performance in addition to its extensive functionality. This small size package (QFN) is suitable for small size tuners.

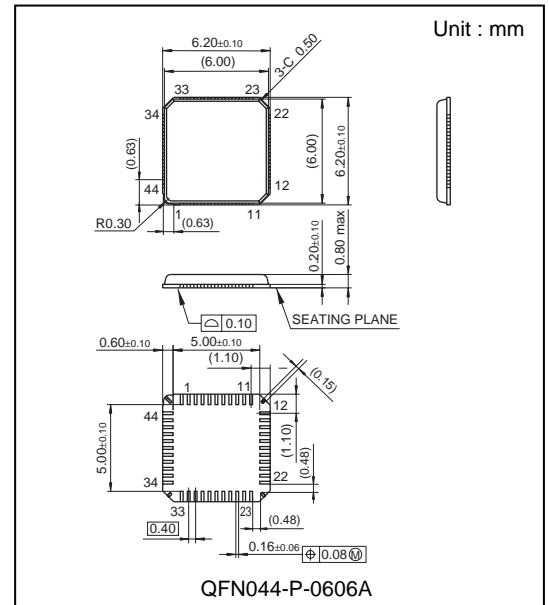
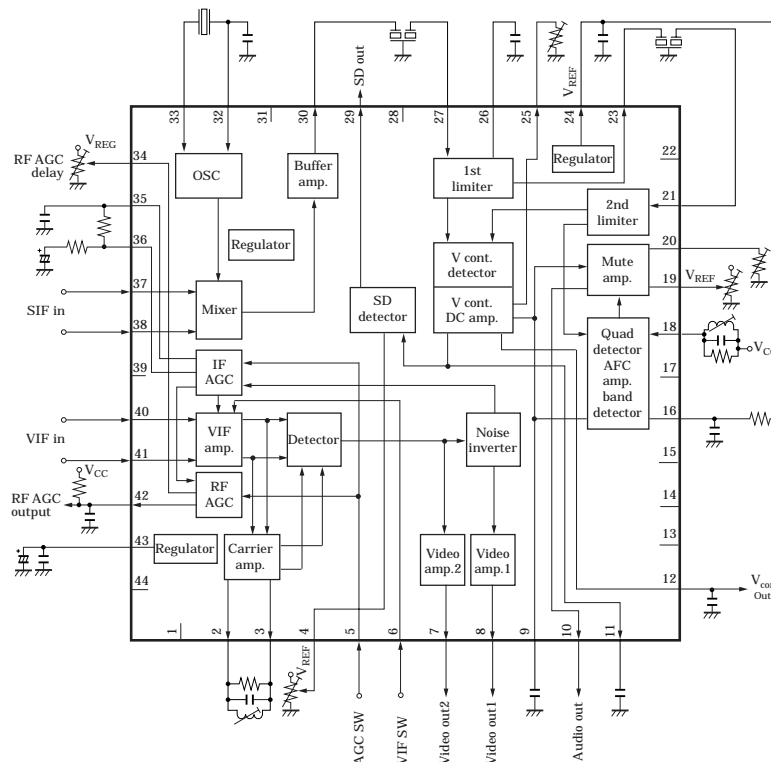
■ Feature

- Split carrier audio detection circuit
- Field detection and bandwidth detection soft muting and SD circuit
- Pseudo-synchronous detection strongly resistant to field strength fluctuations is used in the VIF circuit
- Video output pin for diversity detection (no noise inverter required)
- Supports FM audio reception (function that turns off the VIF system)

■ Applications

Car TV

■ Block Diagram



Products and specifications are subject to change without notice. Please ask for the latest Product Standards to guarantee the satisfaction of your product requirements.

New publication, effective from 19 Mar. 2004
M00630AE

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■ Pin Descriptions

Pin No.	Pin name	Description	Pin No.	Pin name	Description
1	V _{CC1}	V _{CC1}	23	SIFLIMOUT	First limiter output
2	LC1	VIF detection coil 1	24	VREF	SIF reference voltage
3	LC2	VIF detection coil 2	25	VCONTADJ	S-meter voltage adjustment
4	SSC	SD detection adjustment	26	1STIFB	First limiter bypass
5	AGCSW	AGC switch	27	1STIFIN	First limiter input
6	VIFSW	VIF switch	28	GND3	Ground 3
7	VIDEOOUT2	Video output 2	29	SDOUT	SD output
8	VIDEOOUT1	Video output 1	30	MIXOUT	Mixer output
9	SMTC	Muting voltage	31	V _{CC3}	V _{CC3}
10	AUDIOOUT	Audio output	32	OSC1	OSC 1
11	VASC	ASC S-meter voltage	33	OSC2	OSC 2
12	VCONOUT	S-meter voltage	34	AGCDLY	RF AGC delay adjustment
13	NC4	Not connected	35	IFAGC1	IF AGC output
14	NC1	Not connected	36	IFAGC2	IF AGC input
15	NC2	Not connected	37	SIFIN1	SIF input 1
16	AFCOUT	AFC output	38	SIFIN2	SIF input 2
17	V _{CC2}	V _{CC2}	39	GND1	Ground 1
18	QUADIN	SIF detection coil	40	VIFIN1	VIF input 1
19	SMA1	Soft muting start point adjustment	41	VIFIN2	VIF input 2
20	SMA2	Soft muting slope adjustment	42	RFAGCOUT	RF AGC output
21	2NDIFIN	Second limiter input	43	VREG	VIF reference voltage
22	GND2	Ground 2	44	NC3	Not connected

■ Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit	Note
Supply voltage	V_{CC1} V_{CC2} V_{CC3}	10.2	V	1
Supply current	I_{CC}	–	mA	
Power dissipation	P_D	229	mW	2
Operating ambient temperature	T_{opr}	–20 to 85	°C	3
Storage temperature	T_{stg}	–55 to 125	°C	3

Note) 1: The values the condition not exceeding the above absolute maximum ratings and the power dissipation.

2: The power dissipation shown is the value at $T_a=85\text{ °C}$ for the independent (unmounted)IC package without a heat sink.

3: Except for the operation ambient temperature and storage temperature, all ratings are for $T_a=25\text{ °C}$.

■ Operating Supply Voltage Range

Supply voltage	V_{CC1}	7.2V to 10.0V
	V_{CC2}	
	V_{CC3}	

■ Electrical Characteristics $V_{CC1}=V_{CC2}=V_{CC3}=8V$

Note) 1, $T_a=25^{\circ}C\pm 2^{\circ}C$ unless otherwise specified.

Parameter	Symbol	condition	min	typ	max	Unit
VIF block						
Video detector output 1	V_{o8}	Video: 10-step staircase Y signal, $m = 87.5\%$	1.7	2.0	2.3	V[p-p]
Video detector output 2	V_{o7}	Video: 10-step staircase Y signal, $m = 87.5\%$	1.7	2.0	2.3	V[p-p]
Sync peak voltage 1	V_{p8}		2.7	3.1	3.5	V
Sync peak voltage 2	V_{p7}		2.7	3.1	3.5	V
Video frequency Characteristics	f_C	The frequency at which the output is down -3 dB relative to 1 MHz.	6	8	-	dB
RF AGC operating sensitivity	G_{RF}	The input level difference such that V_{42} changes from 1.5 V to 7V.	-	1.0	3.0	dB
RF AGC maximum sink current	I_{AGCmax}	$V_{34} = 2.5 V, V_{36} = 2 V$	2.2	2.9	3.6	mA
RF AGC minimum sink current	I_{AGCmin}	$V_{34} = 2.5 V, V_{36} = 3 V$	-2	0	+2	μA
RF AGC minimum voltage	V_{AGCmin}	$V_{34} = 2.5 V, V_{36} = 2 V$	0	0.25	0.5	V
SIF and mixer block						
S-meter slope(1)	ΔV_{S1}	$f = 10.7 MHz$	1.3	1.7	2.1	V
S-meter slope(2)	ΔV_{S2}	$f = 10.7 MHz$	1.3	1.7	2.1	V
Audio detector output	V_{OS}	$V_{in27} = 70 dB\mu, f = 10.7 MHz, f_m = 1 kHz, \Delta f = \pm 25 kHz$	125	160	195	mV[rms]
Mixer conversion gain	V_{CG}	No modulation, $V_{in37} = 70 dB\mu$	24	30	-	dB
Circuit current						
Circuit current(1)	I_{CC1}	$V_{CC1,2,3} = 8.0 V$ $AGCSW=5.0V, VIFSW=5.0V$	41	53	65	mA
Circuit current(2)	I_{CC2}	$V_{CC1,2,3} = 8.0 V$ $AGCSW=0V, VIFSW=0V$	28	35	42	mA

■ Electrical Characteristics (Reference values for design) $V_{CC1}=V_{CC2}=V_{CC3}=8V$

Note) 1, $T_a=25^{\circ}C\pm 2^{\circ}C$ unless otherwise specified.

Parameter	Symbol	condition	min	typ	max	Unit
VIF block						
VIF input sensitivity	V_{Vs}	The input level such that V_{08} becomes -3 dB	-	42	49	dB μ
Maximum allowable VIF input	V_{Vmax}	The input level such that V_{08} becomes +1 dB	103	108	-	dB μ
Video signal-to noise ratio	S/N_V	BPF: 10kHz to 4 MHz	50	56	-	dB
Differential gain	DG	Video: 10-step staircase	0	4	8	%
Differential phase	DP	Video: 10-step staircase	0	4	8	%
Intermodulation distortion	IM	P/C = 2 dB, P/S = 12 dB	30	36	-	dB
Black noise detection level	ΔV_{BN}	The difference with the sync peak voltage	-	-0.85	-	V
Black noise clamp level	ΔV_{BNC}	The difference with the sync peak voltage	-	0.6	-	V
VIF input resistance	R_{i40}	$f = 58.75$ MHz	-	1.8	-	k Ω
VIF input capacitance	C_{i40}	$f = 58.75$ MHz	-	3.2	-	pF
Video reference voltage	V_{reg}		-	5.0	-	V
Video output resistance 1	R_{08}	$V_{36} = 0$ V	20	50	120	Ω
Video output resistance 2	R_{07}	$V_{36} = 0$ V	20	50	120	Ω
SIF and mixer block						
S-meter voltage(1)	V_{S1}	V_{in27} :no input state	0.05	0.5	1.1	V
S-meter voltage(2)	V_{S2}	$V_{in27} = 40$ dB μ	1.0	1.7	2.4	V
S-meter voltage(3)	V_{S3}	$V_{in27} = 70$ dB μ	2.3	3.4	4.5	V
S-meter voltage(4)	V_{S4}	$V_{in27} = 100$ dB μ	3.9	5.0	5.3	V
AFC offset voltage	VAFC	V_{in27} :no input state	-0.1	0	0.1	V
Limiting sensitivity	Vlim	$V_o = 0$ dB μ The input such that level is reduced by 3 dB	-	32	38	dB μ
SD sensitivity	SDS	The input such that the SD output becomes over 4.5 V when $V_4 = 2$ V	-	38	-	dB μ
SD bandwidth	SDW	The bandwidth such that the SD output becomes over 4.5 V when $V_4 = 2$ V	-	140	-	kHz

■ Electrical Characteristics (Reference values for design) $V_{CC1}=V_{CC2}=V_{CC3}=8V$

Note) 1, $T_a=25^{\circ}C\pm 2^{\circ}C$ unless otherwise specified.

Parameter	Symbol	condition	min	typ	max	Unit
SIF and mixer block (continued)						
SIF input resistance	Ri37	f = 54.25 MHz	–	2.7	–	k Ω
SIF input capacitance	Rc37	f = 54.25 MHz	–	3.2	–	pF
Mixer output resistance	Ro30	f = 10.7 MHz	–	300	–	Ω
S/N sensitivity	Nout	Vin37 = 22dB μ , no modulation However, S is the output for a 1 kHz 100 % modulation.	22	30	–	dB
Audio signal-to noise ratio	S/NA		60	65	–	dB
AM rejection ratio	AMR	V _{in27} = 70 dB μ , AM = 30 %	48	54	–	dB
Total harmonic distortion	THD	f _m = 1 kHz, $\Delta f = \pm 25$ kHz	0	0.2	1.0	%
Soft mute attenuation	Δ Mute		–	50	–	dB
SIF reference voltage	Vref		–	4.1	–	V
Audio output resistance	R _{o10}		260	450	700	Ω
S-meter output resistance (pin 12)	R _{o12}		60	160	260	Ω
Input pins						
AGC switch high level (P5)	VIH ₅		4.5	–	5.0	V
AGC switch low level (P5)	VIL ₅		0.0	–	0.5	V
VIF switch high level (P6)	VIH ₆		4.5	–	5.0	V
VIF switch low level (P6)	VIL ₆		0.0	–	0.5	V