

### 3V AM/FM +MPX TUNER IC (FOR DIGITAL TUNING SYSTEM)

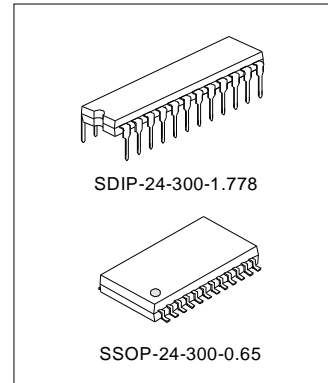
#### DESCRIPTION

The SA2105 are AM/FM 1 chip tuner ICs, which are designed for portable radios and 3V headphone radios.

This is suitable for digital tuning system applications. FM local oscillation voltage is set up low relatively, for NEW FCC.

#### FEATURES

- \* For NEW FCC
- \* Suitable for combination with digital tuning system which is included IF counter.
- \* One terminal type AM/FM IF count output for IF counter of digital tuning system.
  - FM: 10.7MHz
  - AM: 450kHz
- \* Built-in mute circuit for IF count output
- \* For adopting ceramic discriminator, it is necessary to adjust the FM quad detector circuit.
- \* Built-in FM MPX VCO circuit
- \* Built-in one terminal type AM/FM local oscillator buffer output for digital tuning system applications.
- \* Built-in AM low cut circuit
- \* Low supply current. ( $V_{CC}=3V$ ,  $T_{amb}=25^{\circ}C$ )
  - $I_{CCq}$  (FM)=14.0mA (Typ.)
  - $I_{CCq}$  (AM)=10.0mA (Typ.)

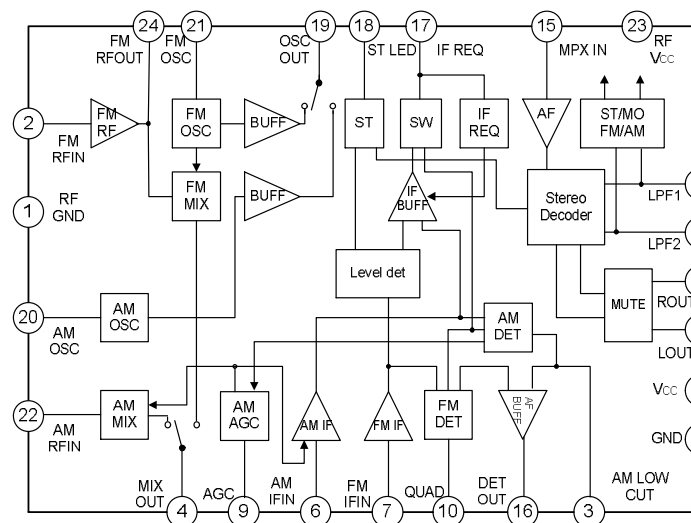


#### ORDERING INFORMATION

Device	Package
SA2105	SDIP-24-300-1.778
SA2105S	SSOP-24-300-0.65

- \* Operating supply voltage range:  
 $V_{CC}=1.8\sim 9V$  ( $T_{amb}=25^{\circ}C$ )
- Note: Handle with care to prevent devices from deteriorations by static electricity.

#### BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub>=25°C)**

Characteristic		Symbol	Value	Unit
Supply Voltage		V <sub>CC</sub>	12	V
LED Current		I <sub>LED</sub>	10	mA
LED Voltage		V <sub>LED</sub>	12	V
Power Dissipation	SA2105	PD (note)	1200	mW
	SA2105S		500	
Operating Temperature		T <sub>opr</sub>	-20~+70	°C
Storage Temperature		T <sub>stg</sub>	-40~+125	°C

Note: Derated above T<sub>amb</sub>=25°C in the proportion of 9.6mW/°C for SA2105 of 4mW/°C for SA2105S.

**ELECTRICAL CHARACTERISTICS (Unless otherwise specified, T<sub>amb</sub>=25°C, V<sub>CC</sub>=3V, F/E : f=98 MHz, fm=1 kHz ,FM IF : f=10.7 MHz, Δf =±75 kHz, fm= 1 kHz . AM : f=1 MHz, MOD=30%, fm=1 kHz. MPX: fm=1kHz)**

Characteristics		Symbol	Test Condition	Min.	Typ.	Max.	Unit
Supply Current		I <sub>CC(FM)</sub>	V <sub>IN</sub> =0, FM mode	--	14	18	mA
		I <sub>CC(AM)</sub>	V <sub>IN</sub> =0, AM mode	--	10	14	
F/E	Input Limiting Voltage	V <sub>in(lim)</sub>	V <sub>IN</sub> =60 dBμV EMF -3dB limiting	--	12	--	dBμV EMF
	Local OSC BUFFER OUTPUT Voltage	V <sub>OSC (buff) FM</sub>	f <sub>osc</sub> =108.7MHz	0.23	0.35	--	mVrms
FM IF	Input Limiting Voltage	V <sub>IN(lim) IF</sub>	V <sub>IN</sub> =80dBμV EMF -3dB limiting	37	42	47	dBμV EMF
	Recovered Output Voltage	V <sub>OD</sub>	V <sub>IN</sub> =80dBμV EMF	200	250	300	mVrms
	Signal To Noise Ratio	S/N	V <sub>IN</sub> =80dBμV EMF	--	75	--	dB
	Total Harmonic Distortion	THD	V <sub>IN</sub> =80dBμV EMF	--	0.3	--	%
	AM Rejection Ration	AMR	V <sub>IN</sub> =80dBμV EMF	--	60	--	dB
	IF Count Output Frequency	f <sub>IF (FM)</sub>	V <sub>IN</sub> =80dBμV EMF SW7: ON	10.5	10.7	10.9	MHz
	IF Count Output Voltage	V <sub>IF (FM)</sub>	V <sub>IN</sub> =80dBμV EMF SW7: ON	60	80	--	mVp-p
AM	IF Count Output Sensitivity	IF sens (FM)	SW7: ON	41	46	51	dBμV EMF
	Gain	GV	V <sub>IN</sub> =27dBμV EMF	20	38	70	mVrms
	Recovered Output Voltage	V <sub>OD</sub>	V <sub>IN</sub> =60dBμV EMF	60	85	108	mVrms
	Signal To Noise Ratio	S/N	V <sub>IN</sub> =60dBμV EMF	--	41	--	dB
	Total Harmonic Distortion	THD	V <sub>IN</sub> =60dBμV EMF	--	0.7	--	%
	Local OSC Buffer Output Voltage	V <sub>OSC (buff) AM</sub>	f <sub>osc</sub> =1.45MHz	44	66	--	mVrms
	IF Count Output Voltage	V <sub>IF (AM)</sub>	V <sub>IN</sub> =60dBμV EMF, SW7: ON	200	250	--	mVp-p
IF Count Output Sensitivity	IF sens (AM)	SW7: ON	38	43	48	dBμV EMF	

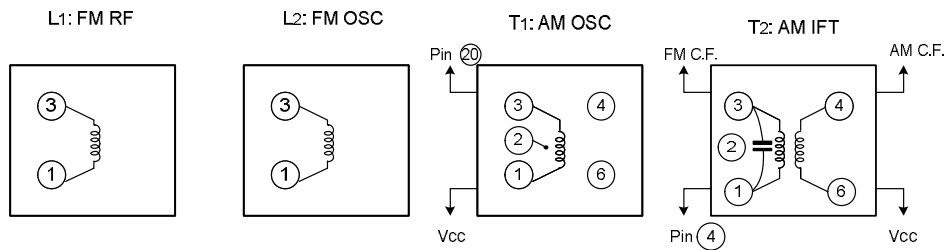
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Characteristics		Symbol	Test Condition	Min.	Typ.	Max.	Unit	
Pin (17) Output Resistance		R17	FM mode	--	0.75	--	kΩ	
			AM mode	--	15.5	--		
MPX	Input Resistance		RIN	--	55	--	kΩ	
	Output Resistance		ROUT	--	5	--	kΩ	
	Max. Composite Signal Input Voltage		VIN MAX (Stereo)	L+R=90%, P=10%, SW3: LPF ON fm=1kHz, THD=3%	--	700	--	mVrms
	Separation		Sep	L+R=180mVrms, fm=100Hz	--	45	--	dB
				P=20mVrms, fm=1kHz	35	45	--	
				SW3: LPF ON, fm=10kHz	--	45	--	
	Total Harmonic Distortion	Monaural	THD (Monaural)	VIN=200mVrms	--	0.3	--	%
		Stereo	THD (Stereo)	L+R=180mVrms, P=20mVrms SW3: LPF ON	--	0.3	--	
	Voltage Gain		GV	VIN=200mVrms	-2.7	-1.2	0.2	dB
	Channel Balance		C.B.	VIN=200mVrms	-1.5	0	1.5	dB
	Stereo LED Sensitivity	ON	VL (ON)	Pilot input(19KHZ)	--	10	14	mVrms
		OFF	VL (OFF)		5	8	--	
Stereo LED Hysteresis		VH	To LED turn off from LED turn on	--	2	--	mVrms	
Capture Range		C.R.	P=15mVrms	--	±8	--	%	
Signal To Noise Ratio		S/N	VIN=200mVrms	--	80	--	dB	
Muting Attenuation		MUTE	VIN=200mVrms	--	80	--	dB	

**COIL DATA**

Coil No.	Test Freq.	L (μH)	Co (pF)	Qo	Turns					Wire (mmØ)	Reference
					1-2	2-3	1-3	1-4	4-6		
L1 FM RF	100MHz	--	--	79	--	--	--	2 1 2	--	0.16UEW	Toko Co., Ltd. 666SNF-305NK
L2 FM OSC	100MHz	--	--	76	--	--	--	2	--	0.16UEW	Toko Co., Ltd. 666SNF-306NK
T1 AM OSC	796kHz	268	--	65	19	95	--	--	--	0.05UEW	Toko Co., Ltd. 5PNR-5146Y
T2 AM IFT	455kHz	--	470	60	--	--	10 9	--	7	0.05UEW	Toko Co., Ltd. 5PNR-5147Y



### PIN CONFIGURATION



### PIN DESCRIPTION

Pin No.	Symbol	Pin Descriptions
1	RF GND	GND for FM OSC stage
2	FM RFIN	FM RF input
3	AM LOW CUT	AM low frequency cut down.
4	MIX OUT	FM & AM mixer output.
5	VCC	VCC for AM, FM IF, FM MPX stage
6	AMIF IN	AM IF input pin
7	FMIF IN	FM IF input pin
8	GND	GND for AM, FM IF, FM MPX stage
9	AGC	Automatic gain control pin.
10	QUAD	FM QUAD. Detector
11	ROUT	R-channel Output
12	LOUT	L-channel Output
13	LPF2	LPF terminal for phase detector; Bias terminal for AM/FM SW circuit V13=GND→AM; V13=OPEN→FM
14	LPF1	LPF terminal for synchronous detector VCO stop terminal V14=GND→VCO STOP
15	MPX IN	MPX INPUT
16	DET OUT	FM & AM detect output

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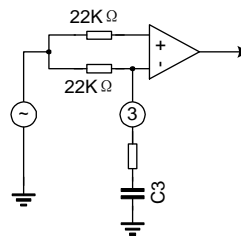
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Pin No.	Symbol	Pin Descriptions
17	IF REQ	IF output
18	ST LED	Stereo LED
19	OSC OUT	OSC output
20	AM OSC	AM OSC
21	FM OSC	FM OSC
22	AM RF IN	AM RF input
23	RF VCC	VCC for FM OSC stage
24	FM RF OUT	FM RF output

## FUNCTION DESCRIPTION

Application note:

### 1. AM low-cut circuit



The AM low-cut action is carried out by the bypass of the high frequency component of the positive-feedback signal at the AF AMP stage. The external capacitor: C3 by-pass this component.

The cut-off frequency  $f_L$  is determined by the internal resistance 22kΩ (Typ.) and the external capacitor C3 as following:

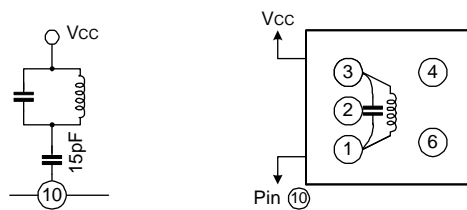
$$f_L = \frac{1}{2 \times \pi \times 22 \times 10^3 \times C3} \text{ (Hz)}$$

In the case of the AM low-cut function is not needed, set up the value of C3 over 1μF. In the condition of C3  $\geq 1\mu\text{F}$ , the frequency characteristic has flat response at the low frequency.

It is possible to reduce the recovered output level at AM mode, by additional resistance between the pin (3) and GND line.

### 2. FM detection circuit

For the FM detection circuit, detection coil is able to use instead of ceramic discriminator. Recommended circuit and recommended coil are as follows. In this case, please take care that  $V_{in}$  (lim) falls a little.



Test frequency	Co (pF)	Qo	Turns				Wire (mmØ)	Reference
			1-2	2-3	1-3	4-6		
10.7MHZ	51	45	--	--	30	--	0.08UEW	Toko Co., Ltd. 600BEAS-10018Z

3. FM/AM switch and forced monaural switch.

Fm/AM switchover and stereo/forced monaural switchover are done by pin 13 and pin 14.

FM/AM switch pin 13

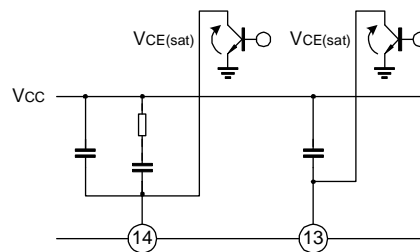
V13: Low (Active low,  $V_{th}=0.2V(Typ.)$ ,  $I_{th} 30\mu A(Typ.)$ ) → AM

V13: Open → FM

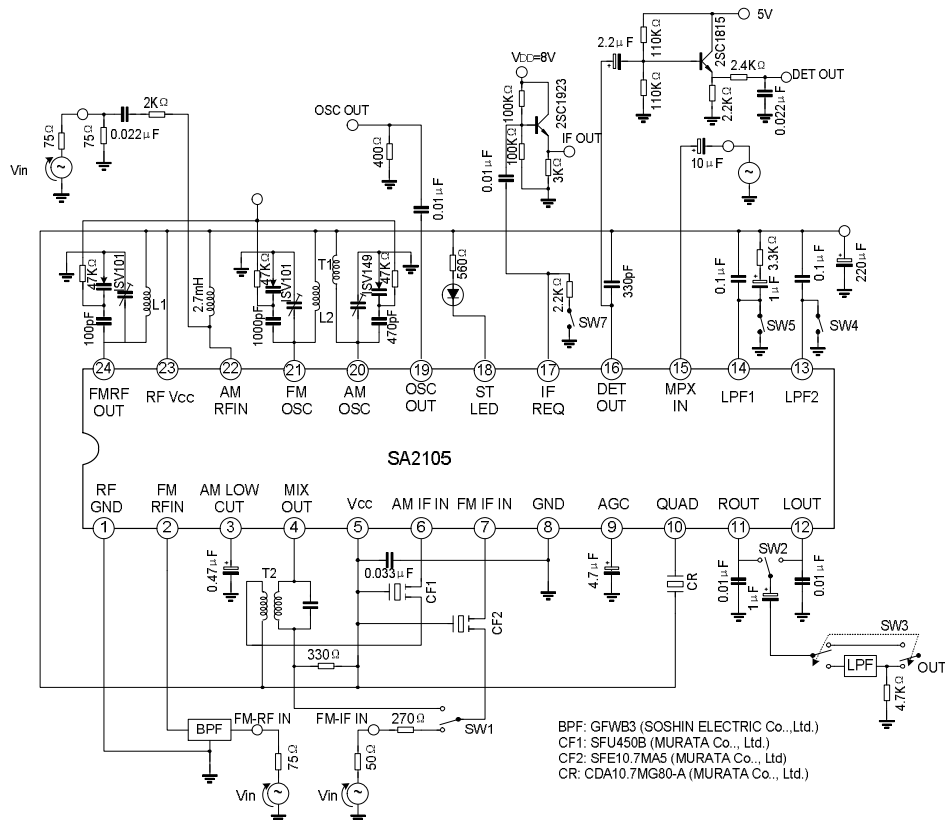
Stereo/forced monaural switch pin 14

V13: Low (Active low,  $V_{th}=0.2V(Typ.)$ ,  $I_{th} 30\mu A(Typ.)$ ) → Forced monaural

V13: Open → Stereo



TYPICAL APPLICATION CIRCUIT



PACKAGE OUTLINE

