

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2142FN

1.5 V AM / FM 1 CHIP TUNER IC (FOR DIGITAL TUNING SYSTEM)

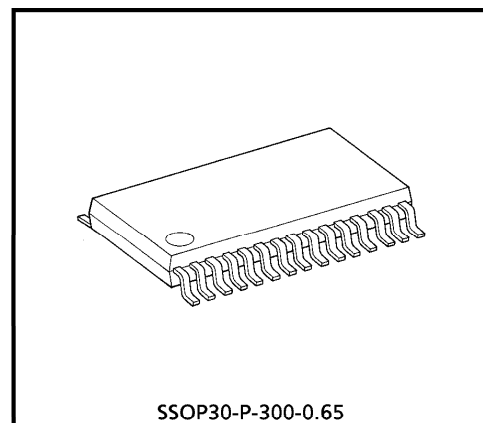
TA2142FN is the AM / FM 1 chip tuner IC, which is designed for portable radios.

This is suitable for digital Tuning system applications. FM local oscillation voltage is set up low relativity, 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.
 - AM : 450 kHz
 - FM : 10.7 MHz
- One terminal type AM / FM osc buffer output.
(FM : 1 / 16 dividing)
- For adopting ceramic discriminator, it is not necessary to adjust the FM quad detector circuit.
- Built-in FM MPX V_{CO} circuit.
- Low supply current ($V_{CC} = 1.2\text{ V}$, $T_a = 25^\circ\text{C}$)
 - $I_{CCQ}(\text{AM}) = 4.7\text{ mA (Typ.)}$
 - $I_{CCQ}(\text{FM}) = 9.8\text{ mA (Typ.)}$
- Operating supply voltage : $V_{CC} = 0.95 \sim 2.2\text{ V}$ ($T_a = 25^\circ\text{C}$)
- Operating supply voltage : $V_{CC} = 1.0 \sim 2.2\text{ V}$ ($T_a = 25^\circ\text{C}$)

(*) : Handle with care to prevent devices from deteriorations by static electricity.



Weight : 0.17 g (Typ.)

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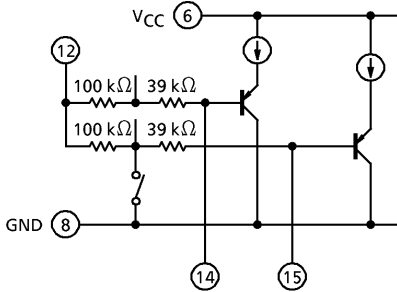
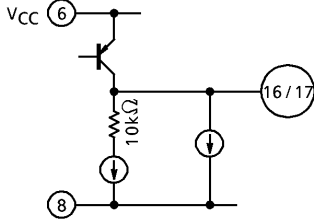
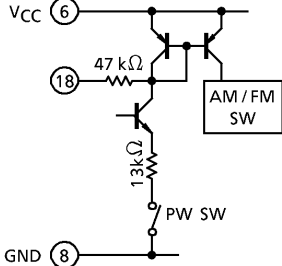
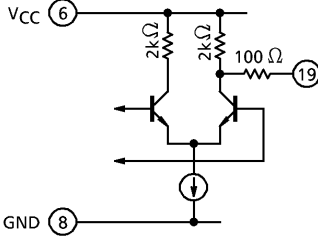
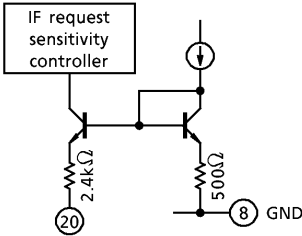
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EXPLANATION OF TERMINALS

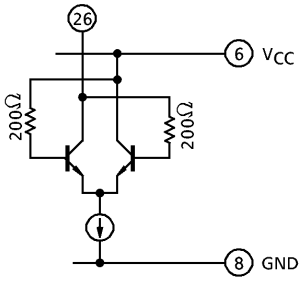
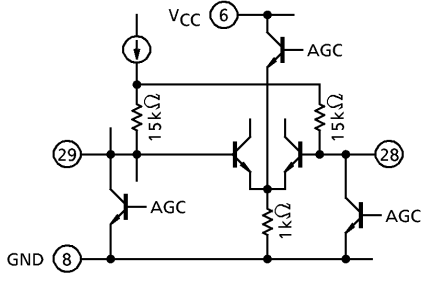
(Terminal voltage : Typical terminal voltage at no signal with the test circuit, $V_{CC} = 1.2\text{ V}$, $T_a = 25^\circ\text{C}$)

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)	
No.	NAME			AM	FM
1	FM RF IN	Input of FM RF signal		0	0.1
2	RF GND	GND (GND for FM RF stage)	—	0	0
3	FM MIX	Output of FM signal		—	0.5
4	AM MIX	Output of AM IF signal		0.6	—
5	AGC	AGC AGC time constant is determined by external capacitor		0.1	0.1
6	V_{CC}	V_{CC} (V_{CC} for AM, FM IF, MPX sage)	—	1.2	1.2
7	FM IF IN	Input of FM IF signal Input impedance $330\ \Omega$ (Typ.)		—	0.7
8	GND	GND (GND for AM, FM IF, MPX stage)	—	0	0

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)	
No.	NAME			AM	FM
9	AM IF IN	Input of AM IF signal Input impedance 3 k Ω (Typ.)		1.2	1.2
10	QUAD	FM QUAD Detector		1.2	1.1
11	DET OUT	Detector output • Output impedance (AM : 8 k Ω (Typ.) FM : 800 Ω (Typ.)		0.6	0.8
12	MPX IN	Input of MPX		0.1	0.1
13	LPF1	LPF terminal for phase detector VCO stop terminal V ₁₃ = GND → VCO stop (forced Monaural)		—	—

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)	
No.	NAME			AM	FM
14	LPF2A	LPF terminals for synchronous detector		—	—
15	LPF2B			—	—
16	R-OUT	Output of stereo signal These terminals are high-impedance in power off mode.		0.5	0.5
17	L-OUT			0.5	0.5
18	AM / FM SW	Bias terminal for AM / FM SW (VCC : AM mode OPEN : FM mode)		1.2	—
19	IF COUNT	Output of IF count signal (AM : 450 kHz FM : 10.7 MHz)		1.2	1.2
20	IF REQ	IF request switch IF count sensitivity can be controlled by external resistor RSEN.		—	—

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)	
No.	NAME			AM	FM
21	ST-IND	Stereo indicator terminal		—	—
22	TUN-IND	Turning indicator terminal		—	—
23	OSC OUT	Local oscillation Buffer Output (AM : 1 / 1 dividing FM : 1 / 16 dividing)		1.0	1.0
24	PW SW	Power Switch (VCC : IC on OPEN / GND : IC off)		1.2	1.2
25	FM OSC	FM OSC		1.2	1.2

TERMINAL		FUNCTION	INTERNAL CIRCUIT	TERMINAL VOLTAGE (V)	
No.	NAME			AM	FM
26	AM OSC	AM OSC		1.2	1.2
27	RF V _{CC}	V _{CC} for FM F/E stage	—	1.2	1.2
28	AM BY-PASS	Referential Voltage Bypass terminal for AM RF and FM IF Amplifier		0.9	0.7
29	AM RF IN	Input of AM RF signal		0.9	0
30	FM RF OUT	FM RF tuning circuit	cf. pin 1	1.2	1.2

APPLICATION NOTE

1. Power switch

It is necessary to connect an external pull-down resistor with the terminal of PW SW (pin ⑭), in case that this IC is turned on due to external noise etc.

2. Mode switch

The terminal of AM/FM changeover is pin ⑮.

In controlling the AM/FM mode with voltage, it is applied as follows.

V_{CC} : AM mode

OPEN : FM mode

In FM mode, care should be taken to eliminate influence due to external noise etc, because this terminal is opened.

The leak current flows through this terminal, in case that the terminal is connected to V_{CC} line independently, even through this IC is OFF mode (the terminal of PW SW is OFF mode).

3. IF count output

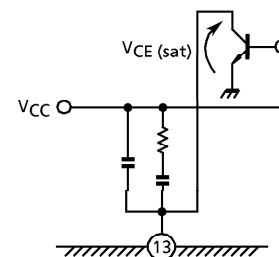
IF count signal can be taken from IF output terminal (pin ⑯), when IF request (pin ⑰) is connected with GND through R_{SEN} and IF count sensitivity is ON.

	SWITCH CONDITION		OUTPUT FREQUENCY	OUTPUT VOLTAGE (Typ.)	OUTPUT IMPEDANCE
	pin ⑰	pin ⑮			
AM	GND	V_{CC}	450 kHz	180 mV _{p-p}	2 k Ω
FM		OPEN	10.7 MHz	190 mV _{p-p}	

4. Forced monaural switch

Stereo/forced monaural switch over is done by pin ⑬.

In case of the electrical switch over by transistor, set up V_{CE} (saturation voltage between collector and emitter) 100 mV or less, otherwise there are some cases that it does not become forced monaural mode.



5. Constant of LPF (pin ⑬, ⑭, ⑮)

Caputer range and Lock range is decided by constant of LPF.

Care should be taken in changing constant of LPF. Otherwise there are some cases that stereo characteristics may worse or IC may not operate stereo mode.

MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	4.5	V
Power Dissipation	P_D (Note)	550	mW
Operating Temperature	T_{opr}	0~50	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55~150	$^\circ\text{C}$

(Note) : Derated above $T_a = 25^\circ\text{C}$ in the proportion of 4.4 mW/ $^\circ\text{C}$.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified

 $V_{CC} = 1.2\text{ V}$, $T_a = 25^\circ\text{C}$ FM F/E : $f = 98\text{ MHz}$, $f_m = 1\text{ kHz}$, $\Delta f = \pm 75\text{ kHz}$, $V_{in} = 60\text{ dB}\mu\text{V EMF}$ FM IF : $f = 10.7\text{ MHz}$, $f_m = 1\text{ kHz}$, $\Delta f = \pm 75\text{ kHz}$, $V_{in} = 80\text{ dB}\mu\text{V EMF}$ AM : $f = 1000\text{ kHz}$, $f_m = 1\text{ kHz}$, $\text{MOD} = 30\%$, $V_{in} = 60\text{ dB}\mu\text{V EMF}$ MPX : $f_m = 1\text{ kHz}$, $f_p = 19\text{ kHz}$

CHARACTERISTIC		SYMBOL	TEST CIRCUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Current		I_{CC1}	—	PW SW off			9	μA
		I_{CC2}	—	AM mode, $V_{in} = 0$		4.7	7	mA
		I_{CC3}	—	FM mode, $V_{in} = 0$		9.8	13	
F/E	Input Limiting	$V_{in}(\text{lim})$	—	-3 dB Limiting	—	15	—	$\text{dB}\mu\text{V EMF}$
	Local OSC Buffer Output Voltage	$V_{osc}(\text{Buff})\text{ FM}$	—	$f_{osc} = 6.79375\text{ MHz}$	135	180	—	mV_{p-p}
FM IF	Input Limiting	$V_{in}(\text{lim})$	—	-3 dB limiting	37	42	47	$\text{dB}\mu\text{V EMF}$
	Recovered Output Voltage	V_{OD1}	—		115	140	180	mV_{rms}
	Signal to Noise Ratio 1	S/N1	—		—	74	—	dB
	Total Harmonic Distortion 1	THD1	—		—	0.7	—	%
	AM Rejection Ration	AMR	—	MOD = 30%	—	62	—	dB
	IF Count Output Voltage	$V_1 / 8\text{ IF (FM)}$	—		140	190	—	mV_{p-p}
	IF Count Sensitivity	$IF_{SENS}(\text{FM})$	—		50	55	60	$\text{dB}\mu\text{V EMF}$
AM	Gain	G_v	—	$V_{in} = 29\text{ dB}\mu\text{V EMF}$	22	32	54	mV_{rms}
	Recovered Output Voltage	V_{OD2}	—		30	45	60	mV_{rms}
	Signal to Noise Ratio 2	S/N2	—		—	34	—	dB
	Total Harmonic Distortion 1	THD2	—		—	2	—	%
	Local OSC Buffer Output Voltage	$V_{osc}(\text{Buff})\text{ FM}$	—	$f_{osc} = 14.5\text{ MHz}$	120	170	—	mV_{p-p}
	IF Count Output Voltage	$V_{IF}(\text{AM})$	—		140	180	—	mV_{p-p}
	IF Count Sensitivity	$IF_{SENS}(\text{AM})$	—		32	37	42	$\text{dB}\mu\text{V EMF}$

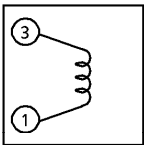
CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT	
MPX	Input Resistance		R _{IN}	—		—	100	—	kΩ	
	Output Resistance		R _{OUT}	—		—	10	—		
	Voltage Gain		G _V	V _{in} = 150 mV _{rms} (MONO)		− 2.5	− 0.5	+ 1.5	dB	
	Channel Balance		C.B.			− 2.0	0	+ 2.0	dB	
	Max. Composite Signal Input Level		V _{in} MAX	—	L + R = 90%, P = 10%, THD = 3%		—	250	—	mV _{rms}
	Separation		SEP.	—	L + R =	fm = 100 Hz	—	35	—	dB
					135 mV _{rms}	fm = 1 kHz	36	45	—	
					P = 15 mV _{rms}	fm = 10 kHz	—	40	—	
	Total Harmonic Distortion	MONO	THD (MONO)	—	V _{in} = 150 mV _{rms} (MONO)		—	0.2	—	%
		ST	THD (ST)	—	L + R = 135 mV _{rms} , P = 15 mV _{rms}		—	0.1	—	
	ST Indicator Sensitivity	ON	ST (ON)	—	—		—	8.5	11.5	mV _{rms}
		OFF	ST (OFF)	—	—		3	6	—	mV _{rms}
	Stereo Indicator Sensitivity		V _H	—	To indicator turn OFF from turn ON		—	2.5	—	mV _{rms}
Capture Range		C.R.	—	P = 18 mV _{rms}		—	10	—	%	
Signal to Noise Ratio		S / N3	—	V _{in} = 150 mV _{rms} (MONO)		—	70	—	dB	

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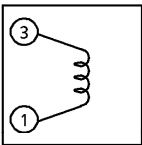
COIL DATA

COIL	TEST FREQUENCY	L (μ H)	Co (pF)	Q0	TURNS				WIRE (mm ϕ)	
					1-2	2-3	1-3	4-6		
L1 FM RF	100 MHz	—	—	79	—	—	$2\frac{1}{2}$	—	0.16 UEW	TOKO 666SNF-305NK
L2 FM OSC	100 MHz	—	—	76	—	—	2	—	0.16 UEW	TOKO 666SNF-306NK
T1 AM OSC	796 kHz	268	—	65	19	95	—	—	0.05 UEW	TOKO 5PNR-4957Y

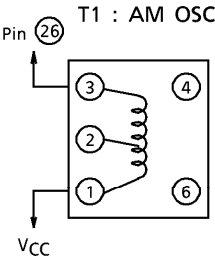
L1 : FM RF



L2 : FM OSC



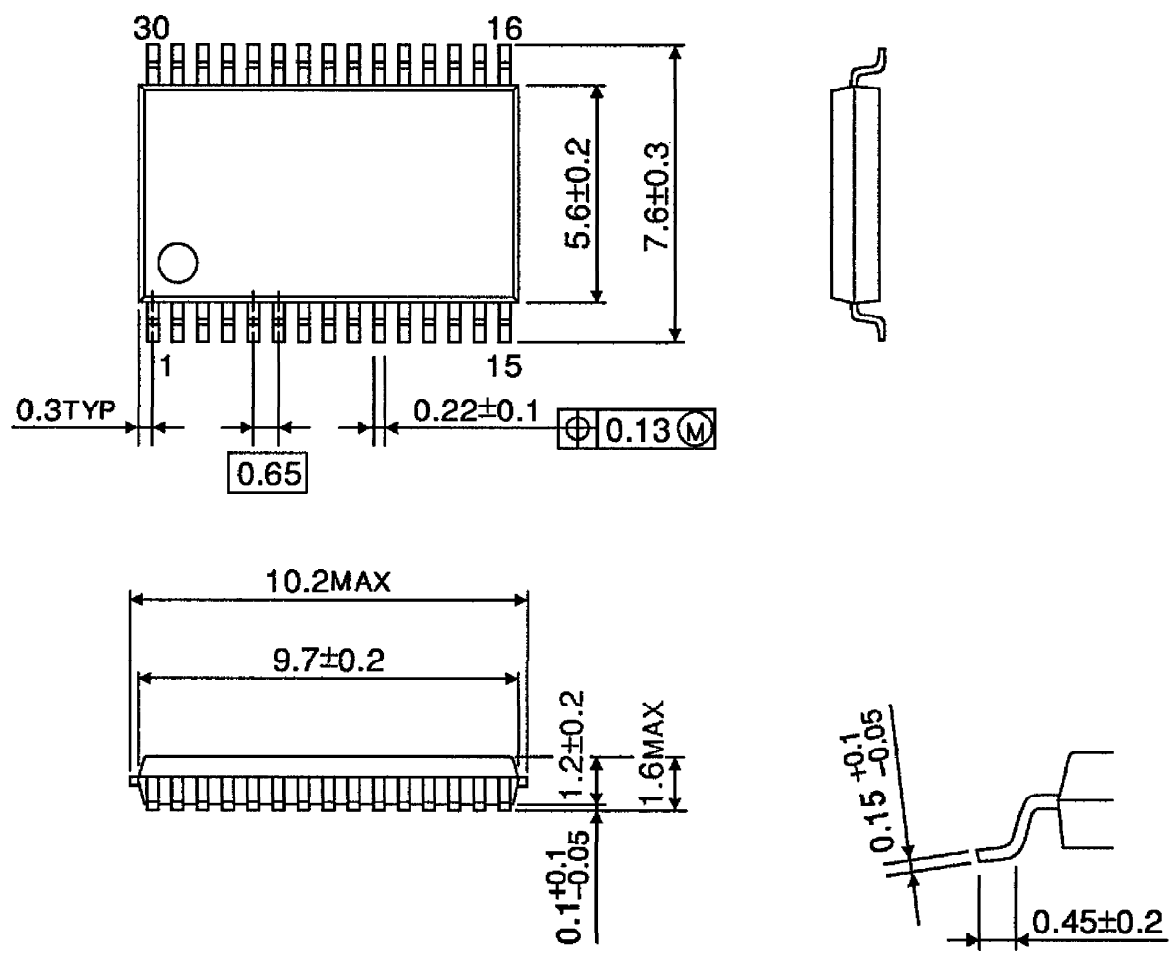
T1 : AM OSC



(BOTTOM VIEW)

PACKAGE DIMENSIONS
SSOP30-P-300-0.65

Unit : mm



Weight : 0.17 g (Typ.)