TOSHIBA TA2149N/FN

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2149N, TA2149FN

3 V AM / FM 1 CHIP TUNER IC

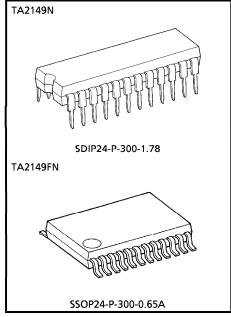
(for Digital Tuning System)

TA2149N, TA2149FN are AM/FM 1 chip tuner ICs, which are designed for portable Radios and 3 V Head phone Radios.

This is suitable for Digital Tuning System Applications. FM Local Oscillation Voltage is set up low relativity, for NEW FCC.

FUNCTIONS

- 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 : 1.3375 MHz (1/8 dividing)
 - AM : 450 kHz
- Built-in Mute Circuit for IF count output.
- For adopting ceramic Discriminator, it is not 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 1/16 Pre-scaler for FM Local OSC Buffer.
- Built-in AM Low cut circuit.
- Low supply current. ($V_{CC} = 3 \text{ V}$, Ta = 25°C) Iccq (FM) = 13 mA (Typ.)Iccq (AM) = 8.5 mA (Typ.)
- Operating Supply voltage range : V_{CC} = 1.8~7 V (Ta = 25°C)



Weight

SDIP24-P-300-1.78 : 1.2 g (Typ.) SSOP24-P-300-0.65A : 0.14 g (Typ.)

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

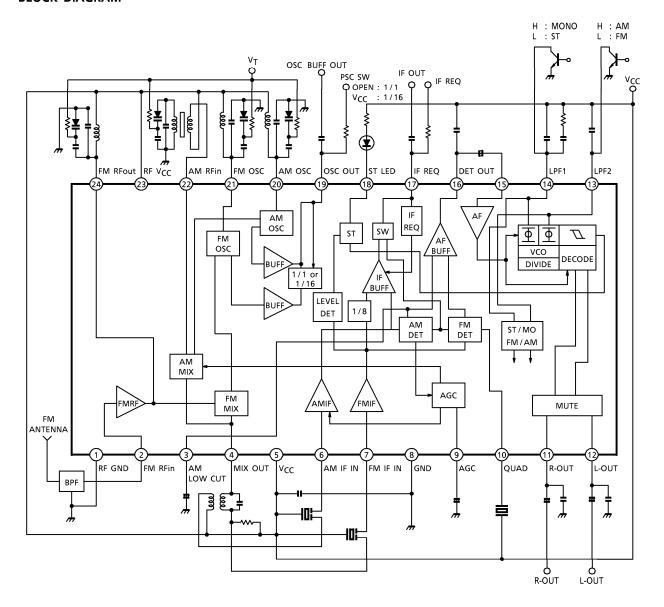
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BLOCK DIAGRAM



EXPLANATION OF TERMINALS

(Terminal Voltage: Typical terminal voltage at no signal with test circuit, $V_{CC} = 3 \text{ V}$, $T_0 = 25^{\circ}\text{C}$)

PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERM VOLT (Typ.	IINAL AGE
1	RF GND (GND for FM RF stage)	_	0	0
2	FM-RFin	3 d0 g W RF GND 1	0	0.8
3	AM LOW CUT	$\begin{array}{c} \text{AM} \\ \text{DET} \\ \\ \text{QND} \\ \text{3} \\ \end{array}$	1.0	_
4	MIX OUT	VCC 5 FM MIX AM MIX RF GND 1 8 GND	3.0	3.0
5	V _{CC} (V _{CC} for AM, FM IF, FM MPX stage)	-	3.0	3.0
6	AM IF IN	3kΩ 60 60 60 60 60 60 60 60 60 60	2.3	2.5
7	FM IF IN	VCC S C S C S C S S S S S S S S S S S S	3.0	3.0

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PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERM VOLT (Typ.	TAGE) (V)
8	GND (GND for AM, FM IF, FM MPX stage)	<u> </u>	AM 0	FM 0
9	AGC	VCC (\$)	0	0
10	QUAD	VCC S GND 8	2.5	2.2
11 12	R-OUT L-OUT	Vcc (5) (11/12) (G) (M) (M) (M) (M) (M) (M) (M) (M) (M) (M	1.2	1.2
13	 LPF2 LPF terminal for phase Detector. Bias terminal AM / FM SW circuit. V₁₃ = GND → AM V₁₃ = OPEN → FM 	AM/FM SW SW SW	0	2.2

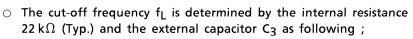
PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERM VOLT (Typ.	TAGE
			AM	FM
14	LPF1 • LPF terminal for Synchronous Detector. • V _{CO} Stop terminal. V ₁₄ = GND → V _{CO} STOP	The state of the s	0.7	2.4
15	MPX IN	(15) 55 kΩ GND (8)	0.7	0.7
16	DET OUT	V _{CC} \bigcirc AM \bigcirc FM \bigcirc	1.0	0.9
17	IF REQ	\$ Vcc	_	_
18	ST LED	19 kHz (B)	_	_

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PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERM VOLT (Typ.	TAGE
		RF V _{CC} 23	AM	FM
19	OSC OUT	RF GND 2	2.8	2.7
20	AM OSC	Vcc (5) (20) (10) (10) (10) (10) (10) (10) (10) (1	3.0	3.0
21	FM OSC	RF V _{CC} (23) GND (1)	3.0	3.0
22	AM RFin	VCC S AGC 23 GND 8	3.0	3.0
23	RF V _{CC} (V _{CC} for FM RF stage)	_	3.0	3.0
24	FM RFout	Cf. pin ①	3.0	3.0

APPLICATION NOTE

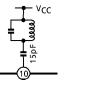
- 1. AM Low-Cut Circuit
 - The AM Low-Cut action is carried out by the bypass of the high frequency component of the positive-feedback signal at the AF AMP stage.
 The external capacitor: C₃ by-pass this component.

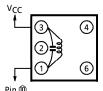


$$f_L = \frac{1}{2 \times \pi \times 22 \times 10^3 \times C_3} \text{ (Hz)}$$

- O In the case of the AM Low-Cut function is not needed, set up the value of C₃ over 1 μ F. In the condition of C₃ \geq 1 μ F, the frequency characteristic has flat response at the low frequency.
- O 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.)





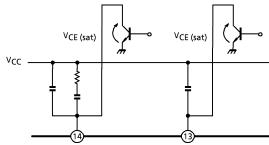
TEST FREQUENCY	IENICY Co		TURNS				WIRE	REFERENCE	
TEST PREQUENCY	(pF)	Qo	1-2	2-3	1-3	4-6	$(mm\phi)$	NEFERENCE	
10.7 MHz	E 1	45			30		0.00 115/4/	TOKO Co., Ltd.	
10.7 10172	31	45	_	_	30	_	0.08 UEW	600BEAS-10018Z	

- 3. FM/AM switch and forced monaural switch.
 - FM / AM switchover and stereo / forced monaural switchover are done by pin (3) and pin (4).
 - FM / AM switch (pin ⁽³⁾)

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

Stereo / forced monaural switch (pin (9))

 $(V14 : Low (Active Low, V_{th} = 0.2 V (Typ.), I_{th} 30 <math>\mu$ A (Typ.) → Forced Monaural V → Stereo

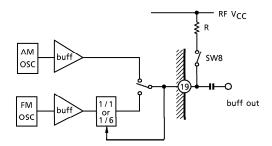


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4. V_{CC} Line

This ICs have two voltage supply terminals, V_{CC} (for AM, FM IF, MPX stage) and RF V_{CC} (for FM RF stage). Set up the potential diffrence between V_{CC} and RF V_{CC} 0.4 V (typ.) or less, otherwise there is the case that this IC doesn't oprete normally.

5. How to control the Divider of FM OSC.



Divider of FM OSC ON/OFF switching is controlled by external pull-up resistor of pin 9. In case of Divider of FM OSC is used, it is necessary to set up the value of R under 470 Ω (typ.). When R is over 470 Ω , it is feared that Divider is not operating. (At this time, buffer output frequency is equal to FM OSC frequency.)

Which ever Divider of FM OSC is used or not, AM OSC buffer frequency and output level is same.

MODE	SW8	OUTPUT FREQUENCY	OUTPUT LEVEL (TYP.)
FM	OPEN	1/1 FM OSC	35 mV _{rms}
'''	ON	1/16 FM OSC	110 mV _{rms}
AM	OPEN	1/1 AM OSC	75 m\/
Alvi	ON	1/1 AIVI OSC	75 mV _{rms}

MAXIMUM RATINGS (Ta = 25°C)

CHARACTER	ISTIC	SYMBOL	RATING	UNIT
Supply Voltage		V _{CC}	8	V
LED Current		ILED	10	mA
LED Voltage		VLED	8	٧
Power Dissipation	TA2149N	PD	1200	mW
Power Dissipation	TA2149FN	(Note)	10	IIIVV
Operating Tempera	ture	T _{opr}	- 25∼75	°C
Storage Temperatu	re	T _{stg}	- 55∼150	°C

(Note) : Derated above Ta = 25°C in the proportion of 9.6 mW/°C for TA2149N of 4 mW/°C for TA2149FN.

ELECTRICAL CHARACTERISTICS

Unless otherwise specified, Ta = 25°C, V_{CC} = 3 V, F/E : f = 98 MHz, f_m = 1 kHz

FM IF: f = 10.7 MHz, Δf = \pm 75 kHz, f_m = 1 kHz

AM : f = 1 MHz, MOD = 30%, f_m = 1 kHz

MPX : f_m = 1 kHz

(CHARACTERISTIC	SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT	
Suppl	y Current	^I CC (FM)	_	V _{in} = 0, FM mode	_	13	16.5	mA	
Заррі		ICC (AM)	_	V _{in} = 0, AM mode	_	8.5	11.0	,	
	Input Limiting Voltage	Vin (lim)	_	$V_{in} = 60 \text{ dB}\mu\text{V EMF},$ -3 dB limiting	_	10	_	$dB\muV$ EMF	
F/E	Local OSC Buffer Output Voltage 1	V _{OSC} (buff) FM ₁	_	f _{OSC} = 108.7 MHz	23	35	-	mV _{rms}	
	Local OSC Buffer Output Voltage 2	VOSC (buff) FM2	_	f _{OSC} = 6.79375 MHz SW8 : ON	75	110	_	mV _{rms}	
	Input Limiting Voltage	V _{in (lim)} IF	_	$V_{in} = 80 \text{ dB}\mu\text{V EMF},$ -3 dB limiting	35	40	45	dBμV EMF	
	Recovered Output Voltage	V _{OD}	_	$V_{in} = 80 dB \mu V EMF$	200	250	300	mV _{rms}	
	Signal To Noise Ratio	S/N	_	$V_{in} = 80 dB \mu V EMF$	_	75	_	dB	
FM	Total Harmonic Distortion	THD	_	$V_{in} = 80 dB \mu V EMF$	_	0.3	_	%	
IF	AM Rejection Ration	AMR	_	V _{in} = 80 dBμV EMF	_	60	_	dB	
	IF Count Output Frequency	f _{IF} (FM)	_	V_{in} = 80 dB μ V EMF, SW7 : ON	1.3373	1.3375	1.3377	MHz	
	IF Count Output Voltage	V _{IF} (FM)	_	V_{in} = 80 dB μ V EMF, SW7 : ON	200	260	_	mV _{p-p}	
	IF Count Output Sensitivity	IF sens (FM)	_	SW7 : ON	47	52	57	dBμV EMF	
	Gain	GV	_	$V_{in} = 27 dB \mu V EMF$	20	38	70	mV _{rms}	
	Recovered Output Voltage	V _{OD}	_	$V_{in} = 60 dB \mu V EMF$	60	85	108	mV _{rms}	
	Signal To Noise Ratio	S/N	_	V _{in} = 60 dBμV EMF	_	41	_	dB	
AM	Total Harmonic Distortion	THD	_	V _{in} = 60 dBμV EMF	_	0.7	_	%	
	Local OSC Buffer Output Voltage	V _{OSC} (buff) AM	_	f _{OSC} = 1.45 MHz	55	75	_	mV _{rms}	
	IF Count Output Voltage	V _{IF} (AM)	_	V_{in} = 60 dB μ V EMF, SW7 : ON	200	250	_	mV _{p-p}	
	IF Count Output Sensitivity	IF sens (AM)	_	SW7 : ON	34	39	44	dBμV EMF	
PINI (1	① Output Resistance	R47		FM mode		0.75	_	kΩ	
L II V	o Output Nesistance	R ₁₇		AM mode	_	15.5	_	V77	

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,	CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION		MIN.	TYP.	MAX.	UNIT
	Input Resis	tance	R _{IN}	_	_		_	55	_	$\mathbf{k}\Omega$
	Output Re	sistance	ROUT	_	_		_	5	_	kΩ
	Max. Composite Signal Input Voltage		V _{in} MAX (Stereo)	ı	L + R = 90%, P = 10%, SW3 : LPF ON f _m = 1 kHz, THD = 3%			700	_	mV _{rms}
					$L + R = 180 \mathrm{mV}_{rms}$	$f_m = 100 Hz$	_	45	_	
	Separation		Sep.	_	$P = 20 \text{ mV}_{rms}$	f _m = 1 kHz	35	45	_	dB
					SW3: LPF ON	$f_m = 10 \text{ kHz}$	_	45	_	
MPX	Total	Monaural	THD (Monaural)	_	V _{in} = 200 mV _{rms}	_	0.3	_	%	
IVIPA	Harmonic Distortion	Stereo	THD (Stereo)	_	$L + R = 180 \text{ mV}_{rms}$, $P = 20 \text{ mV}_{rms}$, SW3	_	0.3	_	70	
	Voltage Gain		GV	_	$V_{in} = 200 \text{mV}_{rms}$		- 2.7	- 1.2	0.2	dB
	Channel B	alance	C.B.	_	$V_{in} = 200 \text{mV}_{rms}$		- 1.5	0	1.5	dB
	Stereo LED	ON	V _L (ON)	_			_	10	14	ma\/
	Sensitivity	OFF	V _L (OFF)	_	Pilot Input (19 kHz)		5	8	_	mV _{rms}
	Stereo LED Hysteresis		VH	_	To LED turn off from	To LED turn off from LED turn on		2	_	mV _{rms}
	Capture Range C.R. Signal Noise Ratio S/N		C.R.	_	$P = 15 \text{ mV}_{rms}$		_	±8	_	%
			S/N	_	V _{in} = 200 mV _{rms}	_	80	_	dB	
Muti	ng Attenua	tion	MUTE	_	V _{in} = 200 mV _{rms}			80		dB

COIL DATA

COIL No.	TEST	L	Со	00			TURNS	1		WIRE	REFERENCE
COIL NO.	FREQ	(μH)	(pF)	Qo	1-2	2-3	1-3	1-4	4-6	$(mm\phi)$	REFERENCE
L ₁ FM RF	100 MHz			79			21			0.16UEW	TOKO Co., Ltd.
	100 101112			, ,			2 1			0.10014	666SNF-305NK
L ₂ FM OSC	100 MHz			76			2			0.16UEW	TOKO Co., Ltd.
L2 1101 O3C	100 101112			,0						U. TOOLVV	666SNF-306NK
T ₁ AM OSC	796 kHz	268		65	19	95				0.05UEW	TOKO Co., Ltd.
I'I AW OSC	7 30 KIIZ	200		0.5	13	93				0.030144	5PNR-5146Y
T ₂ AM IFT	455 kHz		470	60			109		7	0.05UEW	TOKO Co., Ltd.
12 AWI II I	433 KHZ		470	00			103			0.03024	5PLG-5147X

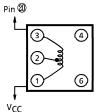
 $L_1:\mathsf{FM}\ \mathsf{RF}$



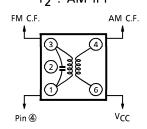
L₂ : FM OSC



 $\mathsf{T}_1:\mathsf{AM}\;\mathsf{OSC}$

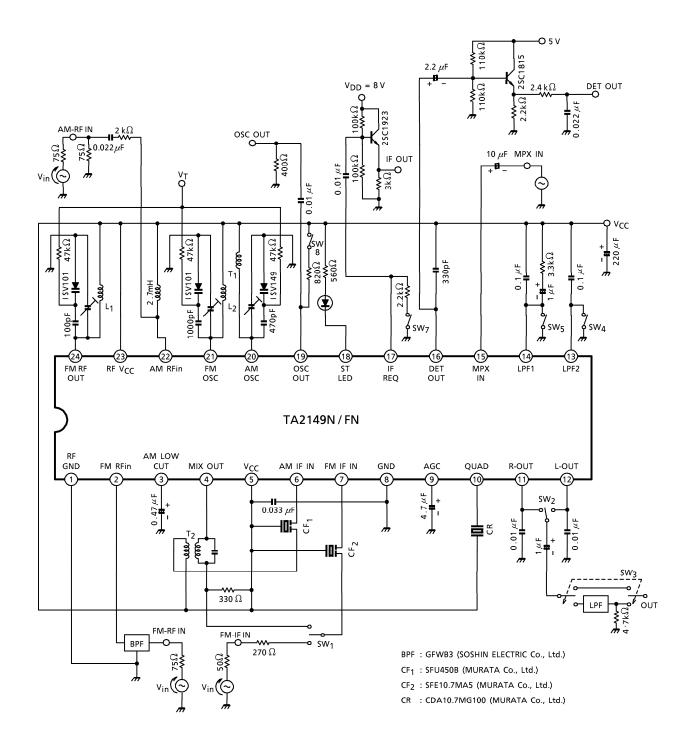


T₂: AM IFT



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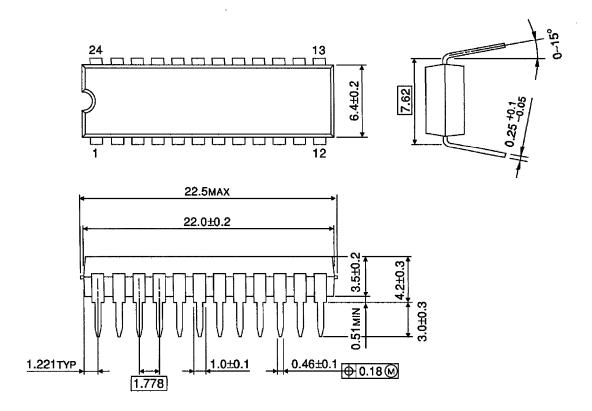
TEST CIRCUIT



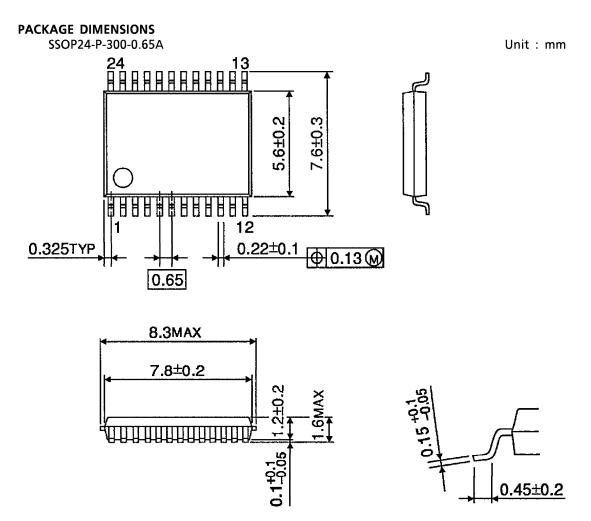
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PACKAGE DIMENSIONS SDIP24-P-300-1.78

Unit: mm



Weight: 1.2 g (Typ.)



Weight: 0.14 g (Typ.)