TOSHIBA TA2111N/F/FN

TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA2111N, TA2111F, TA2111FN

3V AM / FM 1 CHIP TUNER IC

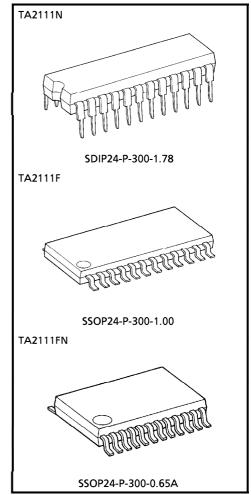
TA2111N/F/FN are AM/FM 1 chip tuner ICs, which are designed for portable Radios and 3V Head phone Radios. FM Local Oscillation Voltage is set up low relativity, for NEW FCC.

FEATURES

- For NEW FCC.
- AM Detector Coil, FM IFT, IF Coupling Condenser are not needed.
- For adopting Ceramic Discriminator, it is not necessary to adjust the FM Quad Detector Circuit.
- Built-in FM MPX VCO circuit.
- Built-in varactor diode for AFC.
- Built-in AM Low cut circuit.
- Low supply current. (V_{CC} = 3V, Ta = 25°C)
 I_{CCq} (FM) = 9.0mA (Typ.)

 I_{CCq} (AM) = 5.0mA (Typ.)

- Operating Supply voltage range : V_{CC} = 1.8~7V (Ta = 25°C)
 - (*) Handle with care to prevent devices from deteriorations by static electricity.



Weight

SDIP24-P-300-1.78 : 1.2g (Typ.) SSOP24-P-300-1.00 : 0.31g (Typ.) SSOP24-P-300-0.65A : 0.14g (Typ.)

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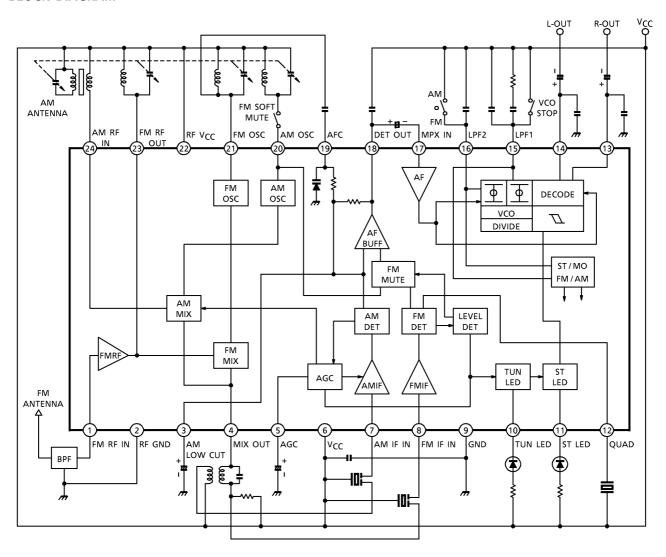
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TOSHIBA

BLOCK DIAGRAM



EXPLANATION OF TERMINALS

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

PIN No.	CHARACTERISTIC	CHARACTERISTIC INTERNAL CIRCUIT							
		<u> </u>	AM	FM					
1	FM-RF IN	To T	0	0.8					
2	RF GND (GND for FM RF, FM OSC stage)	_	0	0					
3	AM LOW CUT	FM DET AM $10k\Omega$ DET $100k\Omega$ GND 9 2 RF GND	1.0	0.8					
4	MIX OUT	VCC 6 FM AM MIX RF GND 2 9 GND	3.0	2.9					
5	AGC (AM AGC)	Vcc (6)	0	0					
6	V _{CC} (V _{CC} for AM, FM IF, FM MPX stage)	_	3.0	3.0					

PIN No.	CHARACTERISTIC	STIC INTERNAL CIRCUIT						
100.			(Typ.	FM				
7	AM IF IN	GND 9	2.3	2.6				
8	FM IF IN	VCC (6	3.0	3.0				
9	GND (GND for AM, FM IF, FM MPX stage)	_	0	0				
10	TUN LED (Tuning LED)	GND (9)	_	_				
11	ST LED (Stereo LED)	19kHz ————————————————————————————————————	_	_				
12	QUAD (FM QUAD. Detector)	VCC (6) GND (9)	2.5	2.2				

PIN No.	CHARACTERISTIC	CHARACTERISTIC INTERNAL CIRCUIT						
			AM	FM				
13 14	R-OUT (R-ch Output) L-OUT (L-ch Output)	VCC 6 (3/14) GND (9)	1.2	1.2				
15	LPF1 • LPF terminal for synchronous Detector • VCO stop terminal V15 = VCC→VCO STOP	3 GND	2.3	2.3				
16	LPF2 • LPF terminal for phase Detector • Bias terminal for AM / FM SW circuit V16 = V _{CC} →AM V16 = OPEN→FM	16 AM/FM SW	3	2.2				
17	MPX IN	(1)————————————————————————————————————	0.7	0.7				

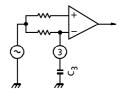
PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERN VOLT (Typ.	AGE
'\\\			AM	FM
18	DET OUT	VCC 6 AM FM FM TSOΩ BLOW-FM, HIGH-AM BLOW-AM, HIGH-FM	1.0	0.9
19	AFC	cf. pin ③	_	
20	AM OSC	V _{CC} (6) (9) (9) (9) (9) (9) (9) (9) (9) (9) (9	3.0	3.0
21	FM OSC	RF V _{CC} (22) GND (9)	3.0	3.0
22	RF V _{CC} (V _{CC} for FM OSC stage)	_	3.0	3.0
23	FM RF OUT	cf. pin ①	3.0	3.0

PIN No.	CHARACTERISTIC	INTERNAL CIRCUIT	TERMINAL VOLTAGE (Typ.) (V)		
			AM	FM	
24	AM RF IN	VCC © AGC AGC AGND ③	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-passes this component.



 \odot The cut-off frequency fL is determined by the internal resistance 10k Ω (Typ.) and the external capacitor C3 as following ;

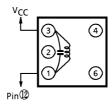
$$f_L = \frac{1}{2 \times \pi \times 10 \times 10^3 \times C_3} \text{ (Hz)}$$

- In the case of the AM Low-Cut function is not needed, set up the value of C₃ over 1μ F. In the condition of C₃ $\ge 1\mu$ F, the frequency characteristic has flat response at the low frequency.
- In FM mode, C₃ is a Capacitor for AFC Low-Pass filter circuit.

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	Co		TURNS				WIRE	REFERENCE
FREQUENCY	(pF)	Ųο	1-2	2-3	1-3	4-6	$(mm\phi)$	REFERENCE
10.7MHz	51	45	_	_	30	_	0.12 UEW	TOKO Co., Ltd. 600BEAS-10018Z

TOSHIBA TA2111N/F/FN

MAXIMUM RATINGS (Ta = 25°C)

CHARACTER	RISTIC	SYMBOL	RATING	UNIT	
Supply Voltage		Vcc	8	V	
LED Current		ILED	10	mA	
LED Voltage		VLED	VLED 8		
	TA2111N	D _D	1200		
Power Dissipation	TA2111F	P _D (Note)	400	mW	
	TA2111FN	(Note)	500		
Operating Temper	ature	T _{opr}	- 25∼75	°C	
Storage Temperati	ıre	T _{stg}	- 55∼150	°C	

(Note) Derated above $Ta = 25^{\circ}C$ in the proportion of $9.6mW/^{\circ}C$ for TA2111N, of $3.2mW/^{\circ}C$ for TA2111F and of 4mW/°C for TA2111FN.

ELECTRICAL CHARACTERISTICS

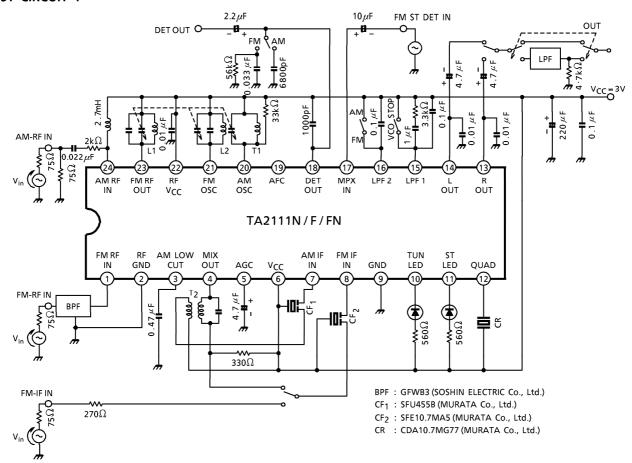
Unless otherwise specified, Ta = 25°C, V_{CC} = 3V, F/E : f = 98MHz, f_m = 1kHz FM IF : f = 10.7MHz, Δf = \pm 22.5kHz, f_m = 1kHz AM : f = 1MHz, MOD = 30%, f_m = 1kHz

 $MPX : f_m = 1kHz$

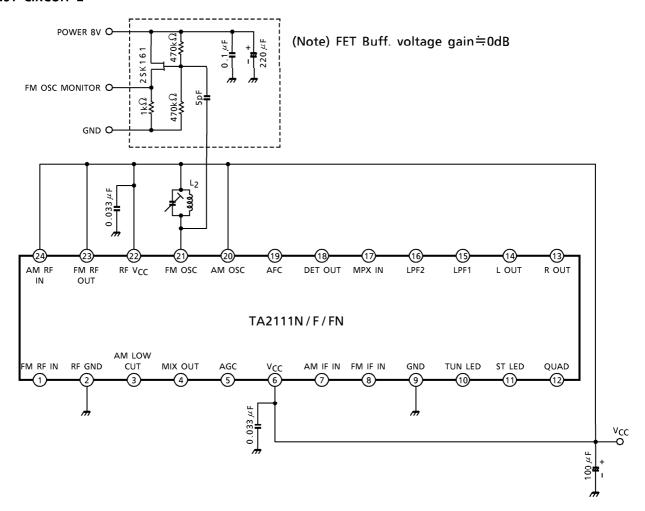
CHARACTERISTIC		SYMBOL	TEST CIR- CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Sunni	y Current	ICC (FM)	1	Vin = 0, FM mode		9	12.5	mA
Juppi	y Current	ICC (AM)	1	Vin = 0, AM mode		5	7.5	l IIIA
F/E	Input Limiting Voltage	Vin (lim)	1	-3dB limiting	I	7	ı	dBμV EMF
	Local OSC Voltage	Vosc	2	f _{OSC} = 108.7MHz	_	105	_	mV _{rms}
	Input Limiting Voltage	Vin (lim) IF	1	-3dB limiting	35	40	45	dBμV EMF
	Recovered Output Voltage	V _{OD}	1	Vin = 80dBμV EMF	60	75	90	mV _{rms}
FM	Signal To Noise Ratio	S/N	1	Vin = $80dB\mu V$ EMF	_	65	_	dB
IF	Total Harmonic Distortion	THD	1	Vin = 80dBμV EMF	_	0.2	_	%
	AM Rejection Ration	AMR	1	Vin = $80dB\mu V$ EMF	_	50	_	dB
	LED On Sensitivity	٧L	1	I _L = 1mA	40	45	50	$dB\muV$ EMF
	Soft Mute Attenuation	MUTE	1	Vin = 0	_	20	_	dB
	Gain	GV	1	Vin = $25dB\mu V$ EMF	18	35	70	mV _{rms}
	Recovered Output Voltage	V _{OD}	1	Vin = 60dBμV EMF	50	70	90	mV _{rms}
AM	Signal To Noise Ratio	S/N	1	Vin = $60dB\mu V$ EMF	_	41	_	dB
	Total Harmonic Distortion	I THD I		Vin = $60dB\mu V$ EMF	_	0.7	_	%
	LED On Sensitivity	VL	1	I _L = 1mA	23	28	33	$dB\muV$ EMF
Din 19	Output Resistance	Pao		FM mode		0.75	_	$\mathbf{k}\Omega$
רווו ע	output nesistance	R ₁₈		AM mode		15.5	_	K77

	CHARACTER	SYMBOL	TEST CIR- CUIT			MIN.	TYP.	MAX.	UNIT	
	Input Resis	tance	R _{IN}	_	_		_	55		kΩ
	Output Res	istance	ROUT	_	_		_	5	_	kΩ
	Max. Comp Signal Inpu		Vin MAX (STEREO)	1	$L + R = 90\%$, $P = 10^{\circ}$ $f_m = 1$ kHz, THD = 3		_	700	_	mV _{rms}
					L . D 190m\/	f _m = 100Hz	_	45	_	
	Separation		Sep	1	$L + R = 180 \text{mV}_{rms}$, $P = 20 \text{mV}_{rms}$	f _m = 1kHz	35	45	_	dB
					r = 20111 vrms	$f_m = 10kHz$	_	45	_	
	Total	Monaural	THD (MONAURAL)	1	Vin = 200mV _{rms}		_	0.3	_	%
MPX	Harmonic Distortion	Stereo THD (STEREO)		1	$L + R = 180 \text{mV}_{rms}$, $P = 20 \text{mV}_{rms}$		_	0.3	_	%0
	Voltage Ga	in	GV	1	Vin = 200mV _{rms}		- 2.5	- 1	0.5	dB
	Channel Ba	lance	C.B.	1	Vin = 200mV _{rms}		- 1.5	0	1.5	dB
	Stereo LED	ON	V _L (ON)	1	Dilet legant		_	8	12	\/
	Sensitivity C		V _L (OFF)	1	Pilot Input		3	6	_	mV _{rms}
	Stereo LED Hysteresi			1	To LED turn off from LED turn on		_	2	_	mV _{rms}
	Capture Range		C.R.	1	P = 20mV _{rms}		_	±8	_	%
	Signal To N Ratio	Noise	S/N	1	—		_	80	_	dB

TEST CIRCUIT 1



TEST CIRCUIT 2



COIL DATA

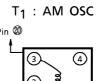
COIL No.	TEST	L	Co (= E)	Qo	1 0		TURNS			WIRE	REFERENCE
	FREQ.	(μH)	(pF)	~ -	1 – 2	2 – 3	1 – 3	1 – 4	4 – 6	$(mm\phi)$	
L ₁ FM RF	100MHz	l	I	79	1	_		2 1 2	1	0.16UEW	① 666SNF-305NK
L ₂ FM OSC	100MHz	l	1	79	1	_		2		0.16UEW	① 666SNF-306NK
T ₁ AM OSC	796kHz	268	l	65	19	95				0.05UEW	① 5PNR-5146Y
T ₂ AM IFT	455kHz		470	60		_	109		7	0.05UEW	① 5PLG-5147X

 $\widehat{\mathbb{T}}: \mathsf{TOKO} \mathsf{Co.,} \mathsf{Ltd}.$

L₁: FM RF

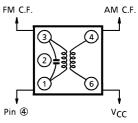
L2: FM OSC



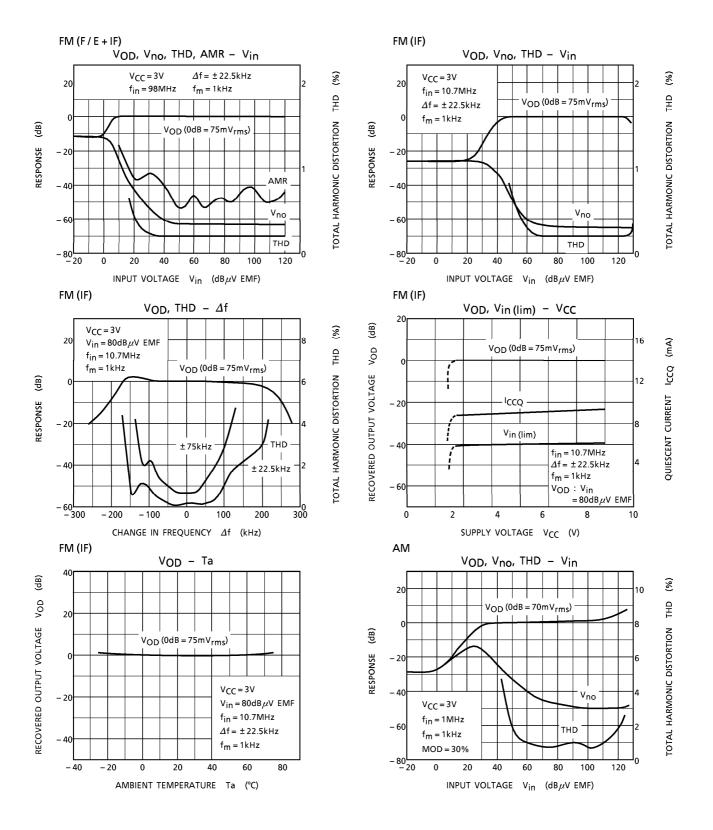


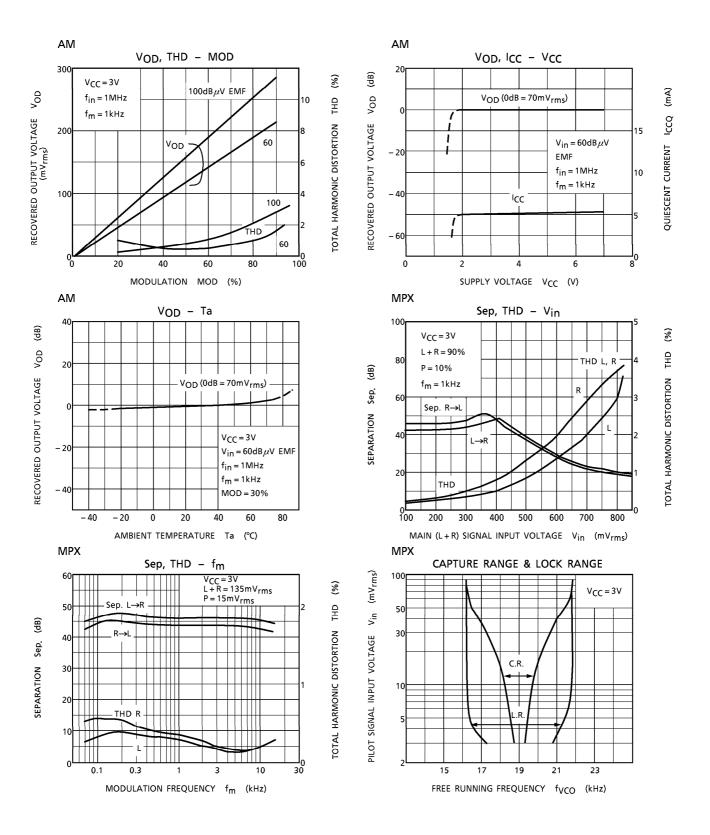
 V_{CC}

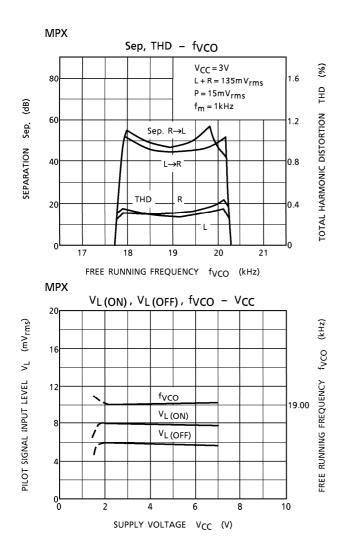
 $T_2: AM\ IFT$

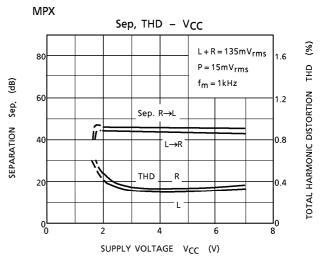


(BOTTOM VIEW)



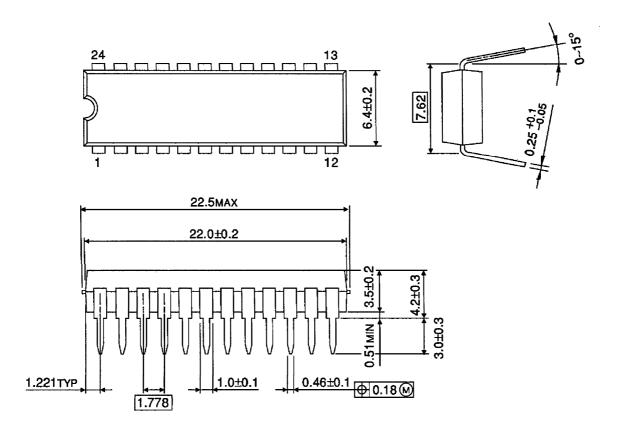






OUTLINE DRAWING SDIP24-P-300-1.78

Unit: mm

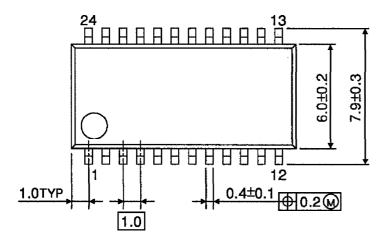


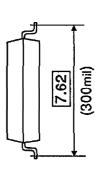
Weight: 1.2g (Typ.)

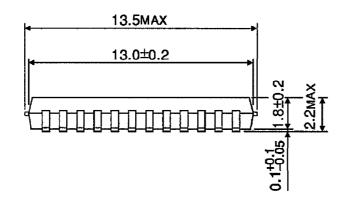
Unit: mm

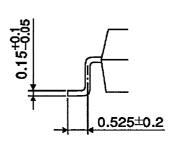
OUTLINE DRAWING

SSOP24-P-300-1.00









Weight: 0.31g (Typ.)

OUTLINE DRAWING SSOP24-P-300-0.65A Unit:mm 24 13 20 49 49 49 49 40 0.325TYP 0.325TYP 8.3MAX 7.8±0.2 0.45±0.2

Weight: 0.14g (Typ.)