TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA1274F

PIF / SIF SYNCHRONOUS DEMODULATOR IC

FEATURES

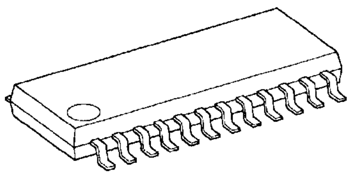
- Compatible pin assignment to TA1267AF

PIF CIRCUIT

- True synchronous PIF demodulator
- 3-stages gain controlled PIF amplifier
- High speed response PIF AGC detector
- Buzz reducer
- Equalizer for video output
- AFT detector without extra reference circuit

SIF CIRCUIT

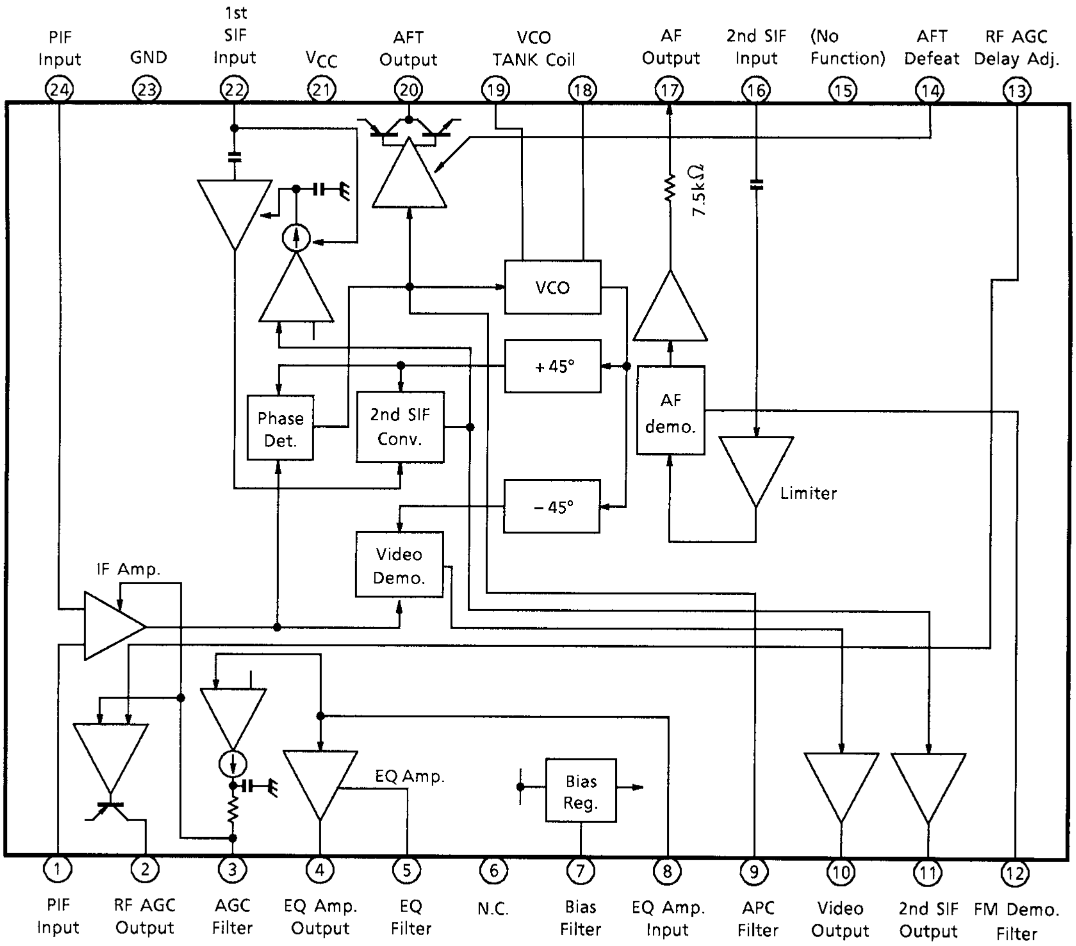
- Wide range gain controlled SIF amplifier
  (control range : 70dB typ.)
- Alignment-free PLL-FM demodulator



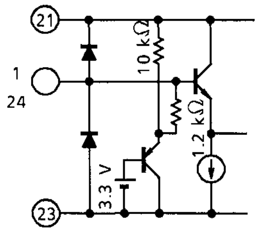
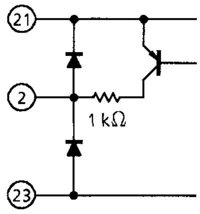
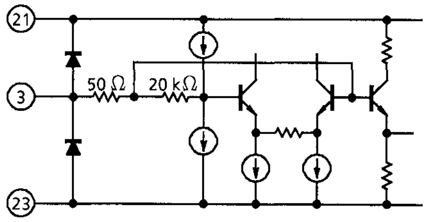
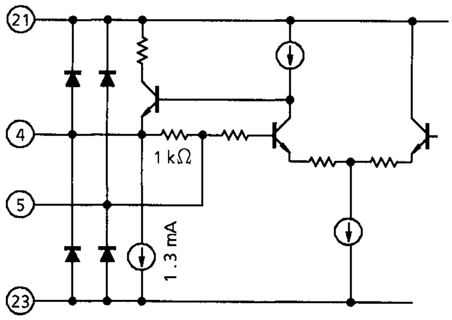
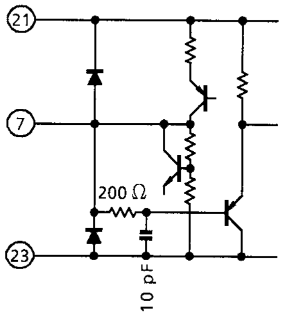
SSOP24-P-300-1.00B

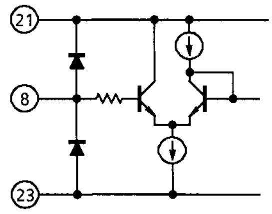
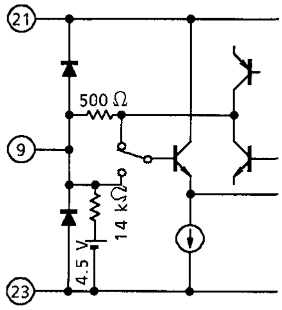
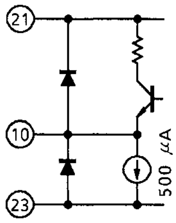
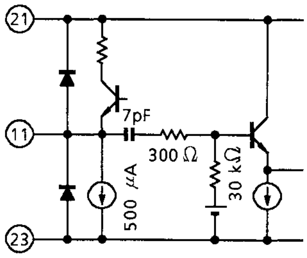
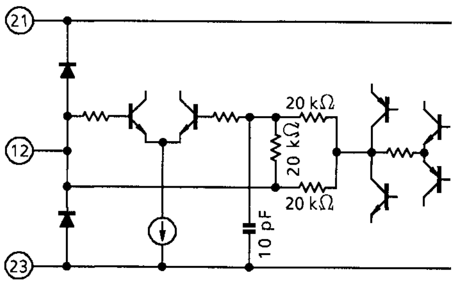
Weight: 0.27 g (typ.)

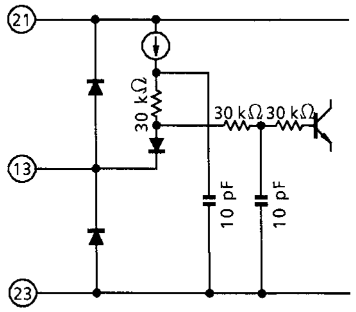
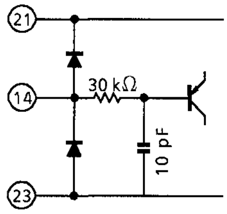
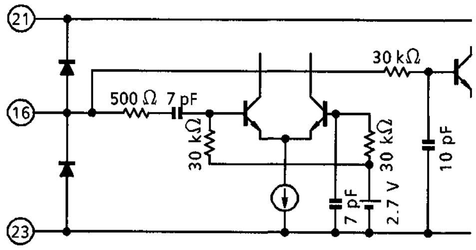
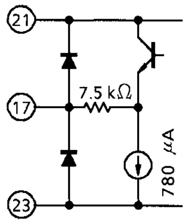
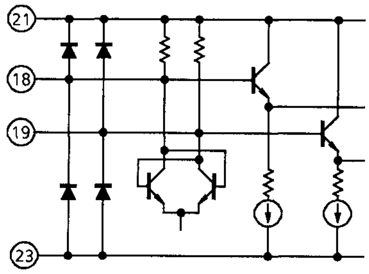
BLOCK DIAGRAM

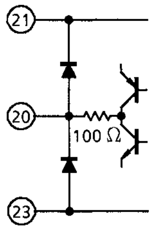
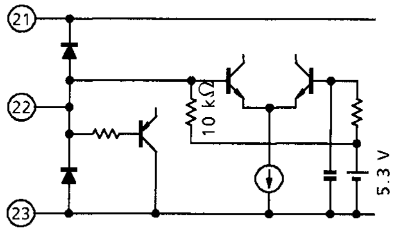


TERMINAL FUNCTION

PIN No.	NAME	FUNCTION	INTERFACE CIRCUIT
1 24	PIF input	Differential type inputs. Typical input level is 85 dBμV.	
2	RF AGC output	Open collector (PNP) type output. Maximum output current is 0.5 mA.	
3	AGC filter	Connect a capacitor (0.47 μF) between GND.	
4 5	EQ amplifier output EQ filter	No.4 terminal is EQ amplifier output. Maximum output current of this terminal is 5 mA. No.5 terminal is for EQ filter.	
6	N.C.		—
7	Bias filter	Connect a capacitor (10 μF) between GND.	

PIN No.	NAME	FUNCTION	INTERFACE CIRCUIT
8	EQ amplifier input	EQ amplifier inputs.	
9	APC filter	Connect a resister (330 Ω) and a capacitor (0.47 μF) between GND in series. And connect a capacitor (1000 pF) between this terminal and GND. Sensitivity of phase detector is 400 μA / rad (Typ.), and sensitivity of VCO is 1.8 MHz / V (Typ.).	
10	Video output	Connect a resister (1 kΩ) between GND. Maximum output current is 10 mA.	
11	2 nd SIF output	2 nd SIF signal is outputted from this terminal.	
12	FM demodulating filter	Connect a capacitor (2.2 μF) between GND.	

PIN No.	NAME	FUNCTION	INTERFACE CIRCUIT
13	RF AGC delay adj.	This terminal is for RF AGC delay point adjustment.100 μA current is outputted from this terminal. Connect a resister (5.6 kΩ) and a volume (10 kΩ) between GND in series.	
14	AFT Defeat SW	This terminal is AFT defeat switch. To open this terminal, AFT function is activate. To connect GND this terminal, AFT function is not activate. And terminal No.20 goes to 1 / 2 V_{CC}.	
15	(No function)	This terminal must be connected to V_{CC}.	—
16	2 nd SIF input	This terminal 2nd SIF input. This terminal must be decoupled outer circuit on D.C.	
17	AF output	Output resistance of this terminal is 7.5 kΩ.	
18 19	VCO tank	Connect tank for VCO between these terminals. Capacitance of the VCO tank is 27 pF.	

PIN No.	NAME	FUNCTION	INTERFACE CIRCUIT
20	AFT output	Push-pull type current output. Reverse type AFT.	
21	V_{CC}	Operating voltage range is 9.0 V ± 10%.	—
22	SIF input	In use inter-carrier application, connect this terminal to GND. In this condition, the SIF amplifier sets gain minimum.	
23	GND	—	—

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	13	V
Power Dissipation	$P_{D\ max}$	1040 (Note 1)	mW
Operating Temperature	T_{opr}	−20~75	°C
Storage Temperature	T_{stg}	−55~150	°C

Note 1: This value is on condition that the IC is mounted on PCB (50 mm × 50 mm). When using the device at Ta = 25°C, decrease the power dissipation by 8.3 mW for each increase of 1°C.

OPERATING SUPPLY VOLTAGE

PIN No.	PIN NAME	MIN	TYP.	MAX	UNIT
21	V_{CC}	8.1	9.0	9.9	V

ELECTRICAL CHARACTERISTICS

DC current characteristics (V_{CC} = 9.0 V, Ta = 25°C)

PIN No.	PIN NAME	SYMBOL	MIN	TYP.	MAX	UNIT
21	V_{CC}	I_{CC}	36	45	60	mA

DC voltage characteristics (V_{CC} = 9.0 V, Ta = 25°C)

PIN No.	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
1	V_1	—	—	3.5	4.0	4.5	V
4	V_4	—	No signal input	4.7	5.2	5.7	
5	V_5	—	—	4.7	5.2	5.7	
7	V_7	—	—	6.3	7.0	7.7	
10	V_{10}	—	No signal input	4.7	5.2	5.7	
11	V_{11}	—	—	3.1	3.5	3.9	
14	V_{14}	—	—	2.5	3.1	3.7	
15	V_{15}	—	—	2.5	3.1	3.7	
16	V_{16}	—	—	2.5	3.1	3.7	
17	V_{17}	—	2nd SIF 4.5 MHz	3.2	3.7	4.2	
18	V_{18}	—	—	7.2	7.6	7.9	
19	V_{19}	—	—	7.2	7.6	7.9	
20	V_{20}	—	In AFT defeat	4.3	4.5	4.7	
22	V_{22}	—	—	4.9	5.3	5.7	
24	V_{24}	—	—	3.5	4.0	4.5	

AC CHARACTERISTICS (V_{CC} = 9.0 V, Ta = 25°C)
PIF section

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
PIF Input Sensitivity	v_{in} min (p)	—	(Note 1)	—	40	45	dBμV
PIF Maximum Input Signal	v_{in} max (p)	—	(Note 1)	105	113	—	dBμV
PIF Gain Control Range	R_{AGC} (p)	—	(Note 1)	68	73	—	dB
RF AGC Maximum Output Voltage	V_{AGC} max	—	(Note 2)	8.5	8.9	—	V
RF AGC Minimum Output Voltage	V_{AGC} min	—	(Note 2)	—	0.0	0.1	V
PIF Input Resistance (*)	Z_{in} R (p)	—	(Note 3)	—	1.2	—	kΩ
PIF Input Capacitance (*)	Z_{in} C (p)	—	(Note 3)	—	3.6	—	pF
Differential Gain	DG	—	(Note 4)	—	1.0	3.0	%
Differential Phase	DP	—	(Note 4)	—	3.0	5.0	deg
Intermodulation	I_M	—	(Note 5)	50	55	—	dB
Video Output Signal Amplitude	v_{Det} (p)	—	(Note 6)	2.0	2.2	2.4	V
Video Output S / N	S / N (p)	—	(Note 7)	55	60	—	dB
Synchronous Signal Level	V_{sync}	—	(Note 8)	2.4	2.7	3.0	V
Threshold Level of the Black Noise Inverter	V_{thB}	—	(Note 9)	1.7	2.0	2.3	V
Clamp Level of the Black Noise Inverter	V_{cpB}	—	(Note 9)	3.3	3.6	3.9	V
Video Bandwidth (−3 dB)	f_{Det} (p)	—	(Note 10)	6	8	10	MHz
Capture Range of the PLL (Upper)	$f_{p\ (p)\ H}$	—	(Note 11)	1.8	2.3	—	MHz
Capture Range of the PLL (Lower)	$f_{p\ (p)\ L}$	—	(Note 11)	—	−2.0	−1.5	MHz
Hold Range of the PLL (Upper)	$f_{h\ (p)\ H}$	—	(Note 11)	1.8	2.3	—	MHz
Hold Range of the PLL (Lower)	$f_{h\ (p)\ L}$	—	(Note 11)	—	−2.0	−1.5	MHz
Control Steepness of the VCO	β	—	(Note 12)	—	1.8	—	MHz / V
Steepness of the AFT Detection	S_{AFT}	—	(Note 13)	20	25	30	kHz / V
AFT Maximum Output Voltage	V_{AFT} max	—	(Note 13)	8.5	8.8	—	V
AFT Minimum Output Voltage	V_{AFT} min	—	(Note 13)	—	0.4	0.6	V
AFT Output Voltage On Defeating	V_{AFT} Def	—	(Note 14)	4.3	4.5	4.7	V

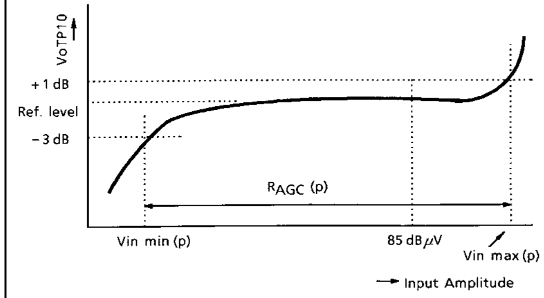
*: Not tested

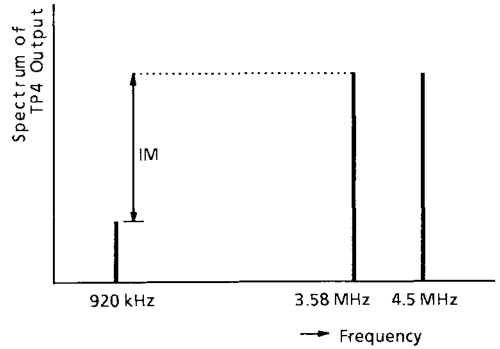
SIF section

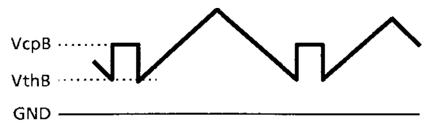
CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
SIF Maximum Input Signal	v_{in} max (s)	—	(Note 15)	105	118	—	dBμV
SIF Gain Control Range	R_{AGC} (s)	—		55	75	—	dB
SIF Input Resistance (*)	Z_{in} R (s)	—	(Note 16)	—	10	—	kΩ
SIF Input Capacitance (*)	Z_{in} C (s)	—		—	2.8	—	pF
Limiting Sensitivity	v_{in} lim	—	(Note 17)	—	40	45	dBμV
AM Reduction Ratio	AMR	—	(Note 18)	55	68	—	dB
AF Output Signal Amplitude	V_{Det} (s)	—	(Note 19)	350	500	710	mV_{rms}
AF Output S / N	S / N (s)	—		55	63	—	dB
Total Harmonics Distortion	THD	—		—	0.2	1.0	%
Hold Range of the FM Demodulator (Lower)	f_h (s) L	—	(Note 20)	—	—	3.9	MHz
Hold Range of the FM Demodulator (Upper)	f_h (s) H	—		5.3	—	—	
Capture Range of the FM Demodulator (Upper)	$f_{p\ (s)\ H}$	—	(Note 21)	—	—	4.0	MHz
Capture Range of the FM Demodulator (Lower)	$f_{p\ (s)\ L}$	—		5.2	—	—	
Ripple Rejection	RR	—	(Note 22)	—	—	−22	dB

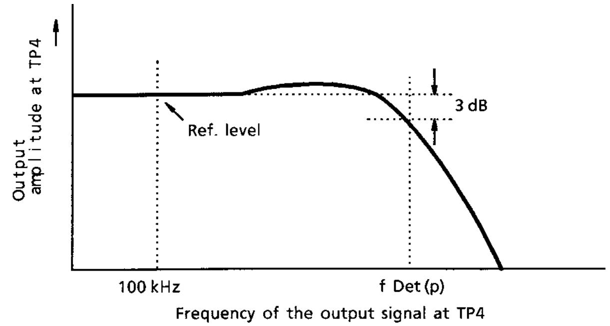
*: Not tested

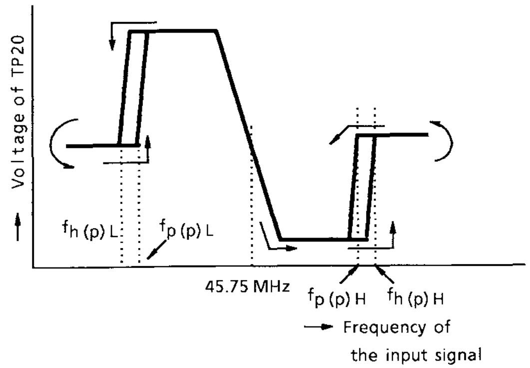
MEASUREMENTS
PIF section

NOTE	TEST CONDITION															
	INPUTPOINT	MEAS.POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 1	J1	TP10	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, 15 kHz sine wave / 30% AM) to J1. • Change amplitude of the input signal, and measure amplitude of the output signal at TP10. • Calculate R_{AGC} (p) show as below. 
Note 2	J1	TP2	OFF		ON	Min. Max.			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, 15 kHz sine wave / 30% AM) to J1. • Set V_{R13} to the minimum. • Measure voltage at TP 2 (V_{AGC} max V.) • Set V_{R13} to the maximum. • Measure voltage at TP 2 (V_{AGC} min V.)
Note 3	—	TP1 TP24	OFF		ON	—			OFF					ON	ON	• Remove all connections from terminal 1 and terminal 24. • Measure resistance (Zin R (p) kΩ) and capacitance (Zin C (p) pF) of TP1 and TP24 by the impedance meter.

NOTE	TEST CONDITION															
	INPUT POINT	MEAS.POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 4	J1	TP4	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, amplitude modulated by 10 step signal) to J1. • Measure DG and DP at TP4.
Note 5	J1	TP4	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, 15 kHz sine wave / 30% AM) from J1. • Measure the minimum voltage of the output signal at TP4 (Vmin). • Input the mixture of 3 signals (signal 1 Frequency : 45.75 MHz, Amplitude : 85 dBμV, signal 2 Frequency : 42.17 MHz, Amplitude : 75 dBμV, and signal 3 Frequency : 41.25 MHz, Amplitude : 75 dBμV) to J1. • Apply DC voltage to TP3 and adjust it so that the bottom of the output signal at TP4 is equal to Vmin. • Measure frequency spectrum of the output signal at TP4. 

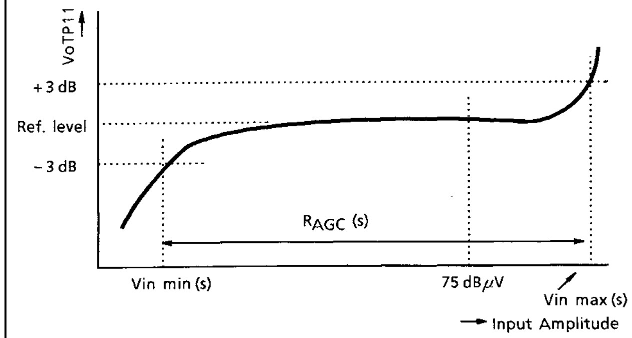
NOTE	TEST CONDITION															
	INPUTPOINT	MEAS.POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 6	J1	TP4	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, amplitude modulated by 100 IRE white picture) to J1. • Measure amplitude of the output signal at TP4 (VDet (p) V).
Note 7	J1	TP4	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, amplitude modulated by black picture) to J1. • Measure video S / N at TP4 (HPF : 100 kHz, LPF : 4.2 MHz, CCIR Weighted) (S / N (p) dB).
Note 8	J1	TP4	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, amplitude modulated by 100 IRE white picture) to J1. • Measure voltage of the sync. tip at TP4 (vsync V)
Note 9	J1	TP4	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV, 15 kHz triangle wave / 50% AM) to J1. • Apply DC voltage to TP3 and adjust it to get the waveform shown as below at TP4. • Measure VthB V and VcpB V at TP4.  Waveform of the TP4 output signal

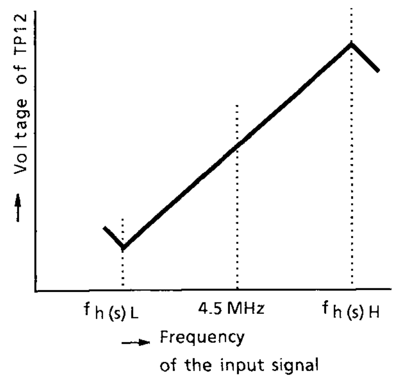
NOTE	TEST CONDITION															
	INPUT POINT	MEAS. POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 10	J1	TP4	OFF		ON	—			OFF					ON	ON	• Input the mixture of 2 signals (signal 1 Frequency : 45.75 MHz, Amplitude : 82 dBμV, signal 2 Frequency : 45.65 MHz, Amplitude : 69 dBμV to J1. • Measure the minimum voltage of the output signal at TP4 (VoTP4). • Apply DC voltage to TP3 and adjust it so that the minimum voltage of the output signal at TP4 is equal to VoTP4. • Decrease frequency of the input signal at J1, and measure amplitude of the output signal at TP4. • Measure f Det (p) show as below. 

NOTE	TEST CONDITION															
	INPUT POINT	MEAS .POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 11	J1	TP20	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV) to J1. • Sweep down the input signal frequency to 41.75 MHz, and sweep up to 49.75 MHz. Sweep down the input signal frequency to 45.75 MHz. • Measure the voltage at TP20. 
Note 12	TP9	Pin 18 Pin 19	OFF		ON	—			OFF					ON	ON	• Set the FET probe which connected to the spectrum analyzer near by pin 18 or pin 19 (Don't touch the probe directly to pin 18 or to pin 19). • Apply 4.3 V to TP9, and measure frequency of the VCO oscillation by the spectrum analyzer (f_{LVCO} MHz). • Apply 4.7 V to TP9, and measure frequency of the VCO oscillation by the spectrum analyzer (f_{HVCO} MHz). • β MHz / V = ($f_{HVCO} - f_{LVCO}$) / 0.4

NOTE	TEST CONDITION															
	INPUTPOINT	MEAS.POINT	SW3		SW8	VR13			SW14b					SW17	SW22	
Note 13	J1	TP20	OFF		ON	—			OFF					ON	ON	• Input the signal (Frequency : 45.75 MHz − 20 kHz, Amplitude : 85 dBμV) to J1. • Measure voltage at TP20 (V_HTP20 V). • Input the signal (Frequency : 45.75 MHz + 20 kHz, Amplitude : 85 dBμV) to J1. • Measure voltage at TP20 (V_LTP20 V). • S AFT kHz / V = 40 / (V_HTP20 − V_LTP20) • Input the signal (Frequency : 45.75 MHz − 500 kHz, Amplitude : 85 dBμV) to J1. • Measure voltage at TP20 (V_{AFT} max V). • Input the signal (Frequency : 45.75 MHz + 500 kHz, Amplitude : 85 dBμV) to J1. • Measure voltage at TP20 (V_{AFT} min V).
Note 14	—	TP20	OFF		ON	—			ON					ON	ON	• Measure voltage at TP20 (V_{AFT} Def V).

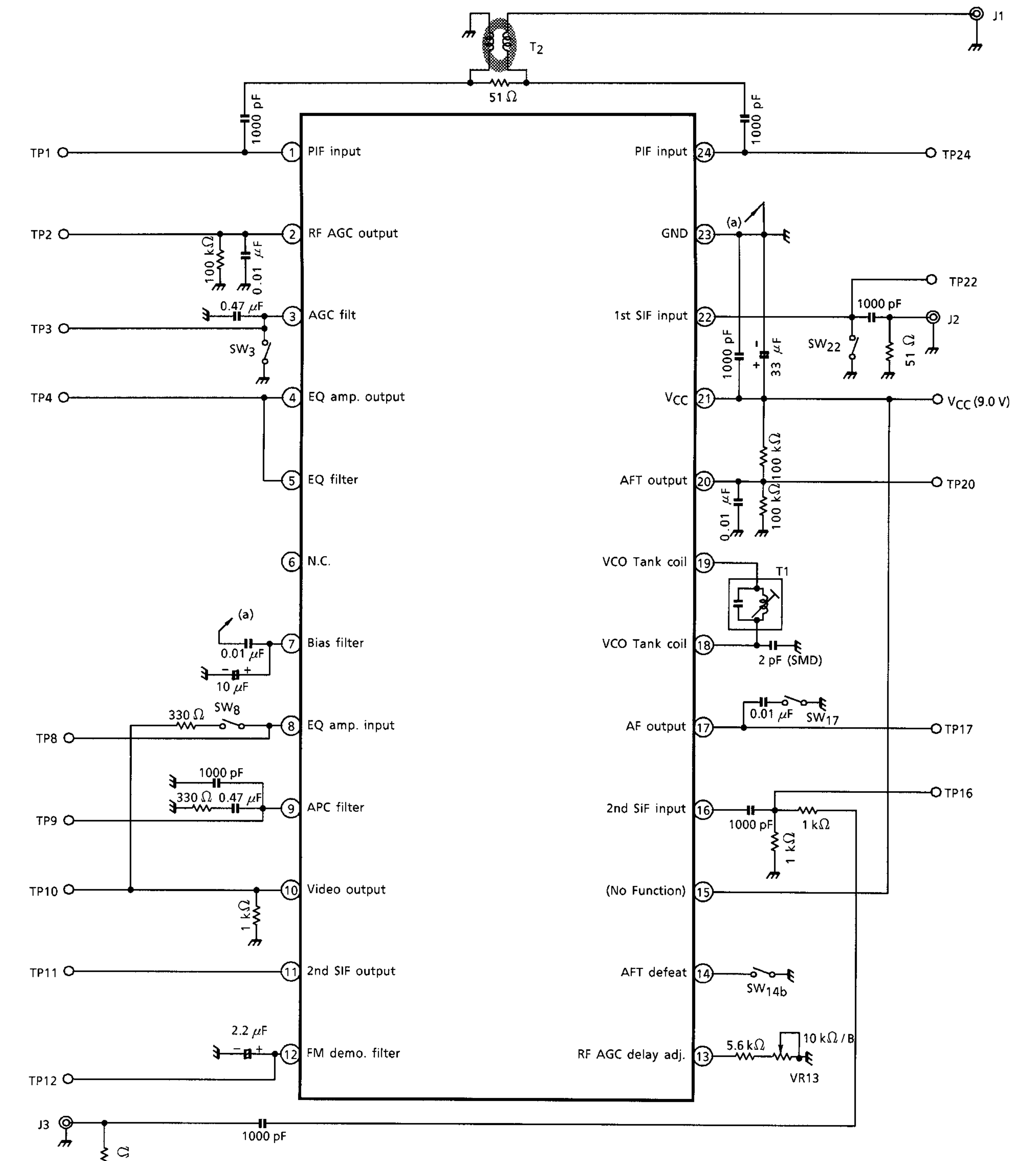
SIF section

NOTE	TEST CONDITION															
	INPUT POINT	MEAS. POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 15	J1 J2	TP11	OFF		ON	—			OFF					ON	OFF	• Input the signal (Frequency : 45.75 MHz, Amplitude : 85 dBμV) to J1, and input the signal (Frequency : 41.25 MHz, Amplitude : 75 dBμV) to J2. • Change the amplitude of the signal at J2, and measure amplitude of the output signal at TP11. 
Note 16	—	TP22	ON		ON	—			OFF					ON	—	• Remove all connections from terminal 22. • Measure resistance (Zin R (s) kΩ and capacitance (Zin C (s) pF) of TP1 and TP24 by the impedance meter.
Note 17	J3	TP17	ON		ON	—			OFF					ON	ON	• Input the signal (Frequency : 4.5 MHz, Amplitude : 100 dBμV, 400 Hz sine wave / 25 kHz Devi FM) to J3. • Measure amplitude of the output signal at TP17 (voTP17). • Measure the input signal amplitude when the output amplitude from TP17 becomes −3 dB of voTP17, by decreasing the input signal amplitude to J3 (vin lim dBμV).

NOTE	TEST CONDITION															
	INPUT POINT	MEAS. POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 18	J3	TP17	ON		ON	—			OFF					ON	ON	• Input the signal (Frequency : 4.5 MHz, Amplitude : 100 dBμV, 400 Hz sine wave / 25 kHz Devi FM) to J3. • Measure amplitude of the output signal at TP17 (v_{FM}TP17 mVrms). • Input the signal (Frequency : 4.5 MHz, Amplitude : 100 dBμV, 400 Hz sine wave / 30% AM) to J3. • Measure amplitude of the output signal at TP17 (v_{AM}TP17 mVrms). • AMR4.5 dB = 20ℓog (v_{FM}TP17 / v_{AM}TP17)
Note 19	J3	TP17	ON		ON	—			OFF					ON	ON	• Input the signal (Frequency : 4.5 MHz, Amplitude : 100 dBμV, 400 Hz sine wave / 25 kHz Devi FM) to J3. • Measure amplitude of the output signal at TP17 (vDet (s) 4.5L mVrms). • Measure distortion of the TP17 output (THD4.5L %). • Input the signal (Frequency : 4.5 MHz, Amplitude : 100 dBμV to J3. • Measure amplitude of the output signal at TP17 (v_NTP17 mVrms). • S / N4.5 = 20ℓog (vDet (s) 4.5 / v_NTP17)
Note 20	J3	TP12	ON		ON	—			OFF					ON	ON	• Input the signal (Frequency : 4.5 MHz, Amplitude : 100 dBμV to J3. • Change the frequency of the input signal, and measure voltage at TP12. 

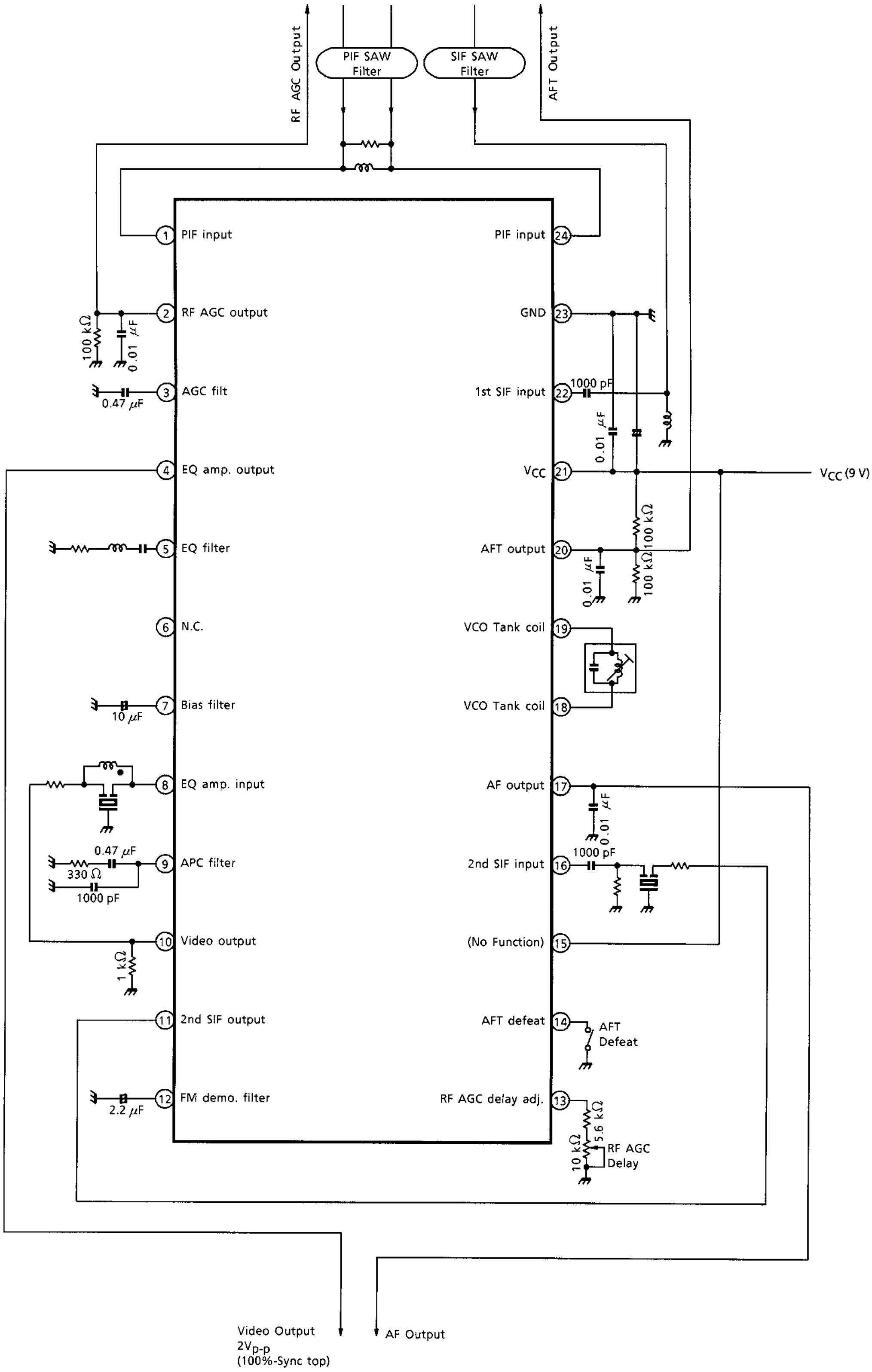
NOTE	TEST CONDITION															
	INPUTPOINT	MEAS.POINT	SW3		SW8	VR13			SW14 b					SW17	SW22	
Note 21	J3	TP12	ON		ON	—			OFF					ON	ON	• Input the signal (Frequency : 1 MHz, Amplitude : 100 dBμV) to J3. • Increase frequency of the input signal. • Measure voltage of TP12 (VTP120 V). • Apply 5 V to TP12. • Stop appling 5 V to TP12. • Measure voltage of TP12 (VTP121 V). • Measure frequency of the input signal when VTP120 = VTP121 ($f_{p\ (s)\ L}$ MHz). • Input the signal (Frequency : 10 MHz, Amplitude : 100 dBμV) to J3. • Decrease frequency of the input signal. • Measure voltage of TP12 (VTP122 V). • Connect TP12 to GND. • Open TP12. • Measure voltage of TP12 (VTP123 V). • Measure frequency of the input signal when VTP122 = VTP123 ($f_{p\ (s)\ H}$ MHz).
Note 22	J3	TP17	ON		ON	—			OFF					ON	ON	• Input the signal (DC 9 V + AC Frequency : 60 Hz, Amplitude : 100 mV_{p-p}) to V_{CC} terminal. • Input the signal (Frequency : 1 MHz, Amplitude : 100 dBμV) to J3. • Measure amplitude of TP17 (vTP17 mV_{p-p}). • RR dB = 20ℓog (vTP17 / 100)

TEST CIRCUIT



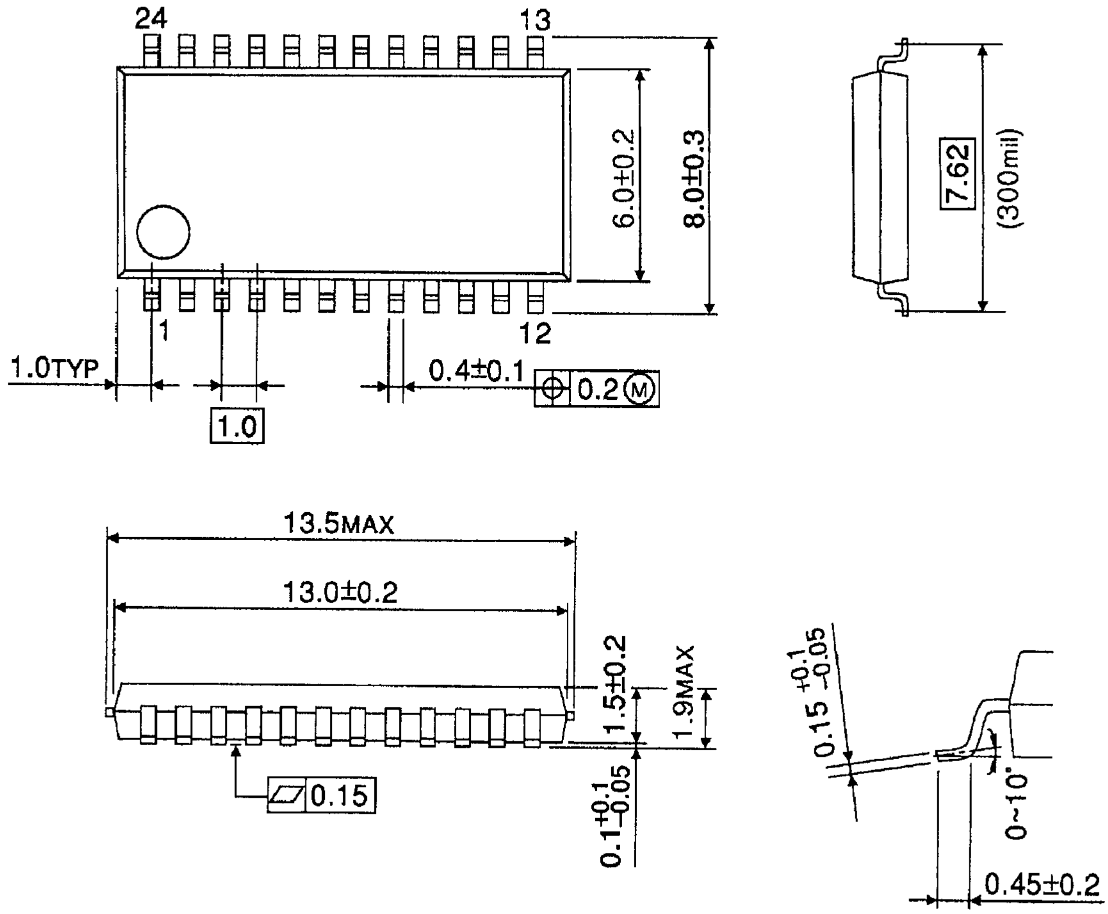
T1 : 292GES-7692BS (Toko Co. Ltd)
T2 : 616DB-1048 (Toko Co. Ltd)

APPLICATION CIRCUIT



PACKAGE DIMENSIONS

SSOP24-P-300-1.00B Unit : mm



Weight: 0.27 g (typ.)

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