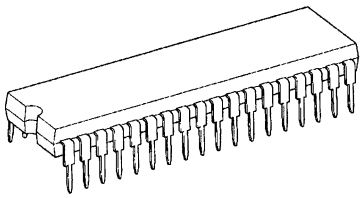
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA8865BN

PLL MULTI PIF / SIF SYSTEM FOR COLOR TV AND VCR

The TA8865BN is a PIF / SIF with PLL detection that is compatible with the PAL, NTSC and L-SECAM systems. Intercarrier PLL detection system is adopted to realize high quality audio in L-SECAM. Use of a 2-stage variable high-gain SIF AGC amplifier makes possible NICAM compatibility. The TA8865BN combine these functions in a 36pin dual-in-line shrink type plastic package.



SDIP36-P-500-1.78

Weight: 2.98g (Typ.)

FEATURES

PIF circuit

- PLL type synchronous detector
- 2-stage variable-gain PIF amplifier
- High-speed AGC with dual time constant
- Keyed AGC with L-SECAM system ; peak AGC with B / G system
- Keyed APC with L-SECAM system
- Synchronous separation circuit
- Mute output (can be used to distinguish that signal is inputted or not.)
- Adjustment free AFT (bipolar)
- Reverse RF AGC

SIF circuit

- SIF split input
- High-gain SIF AGC amplifier (compatible NICAM system)
- Quadrature-type FM audio detector (for B / G system)
- Direct PLL AM detector (for L-SECAM system)

Note: Handle with care as the static withstand voltage of this product is low.
(MM : ±150V HBM : ±1750V)

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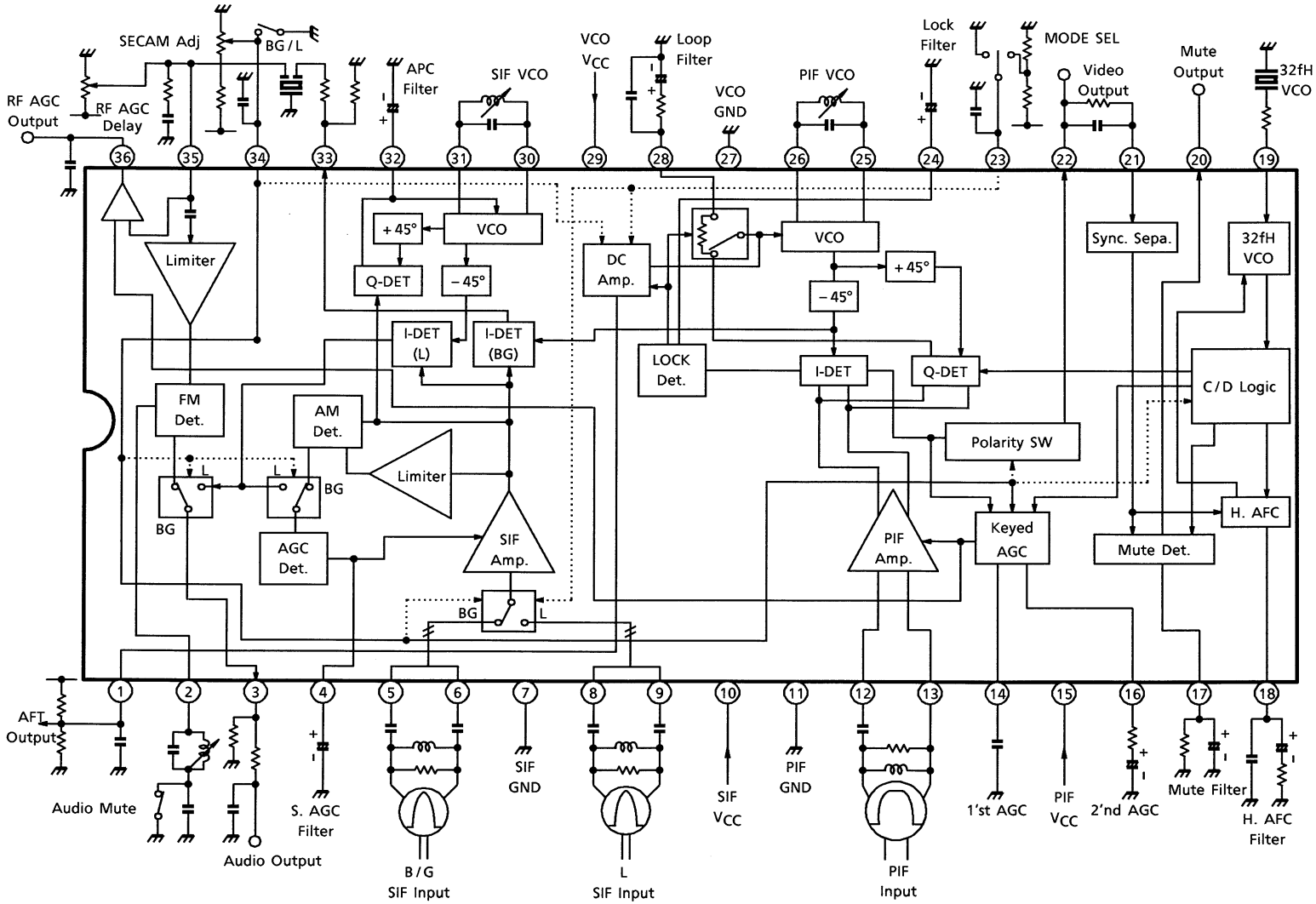
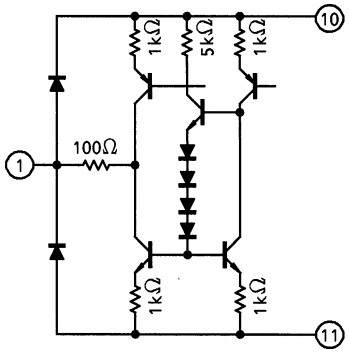
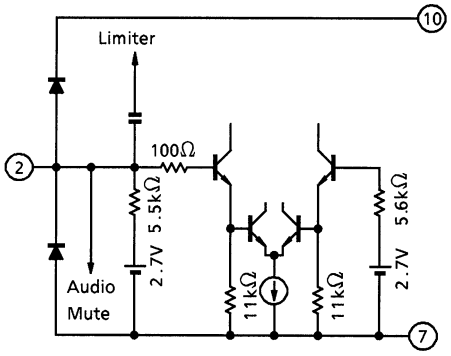
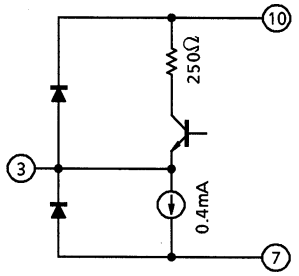
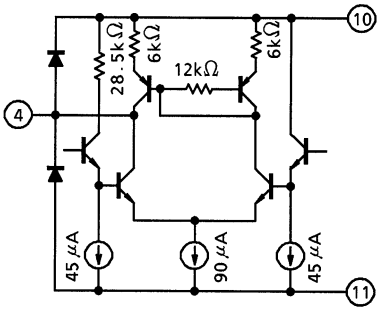
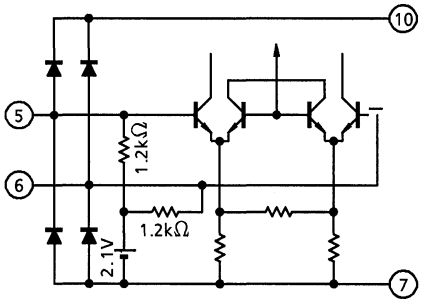
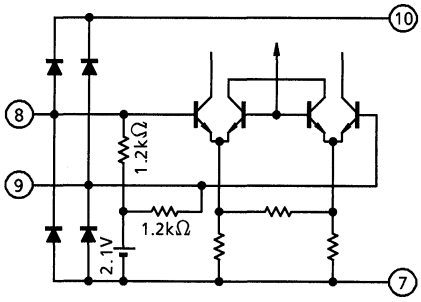
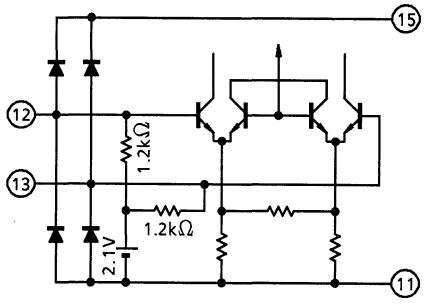
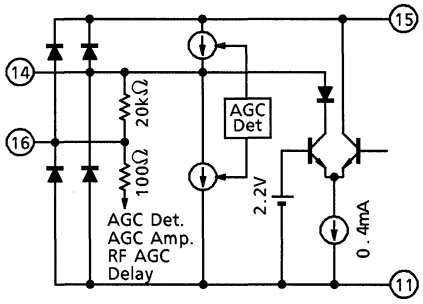
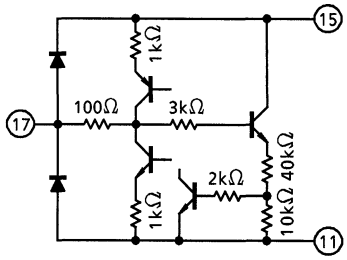
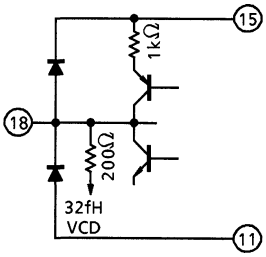
BLOCK DIAGRAM

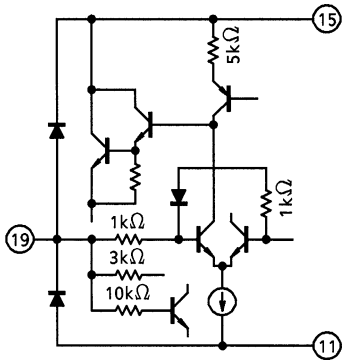
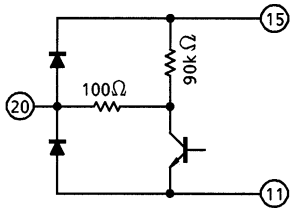
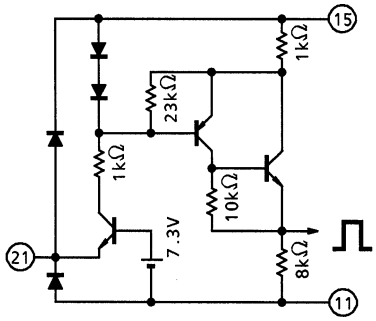
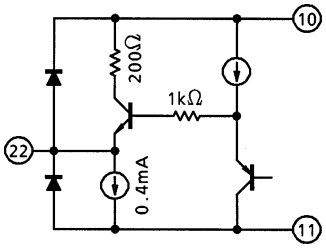


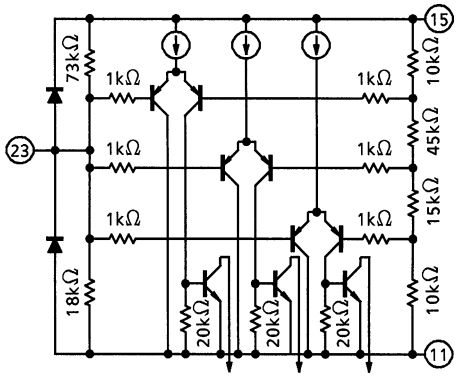
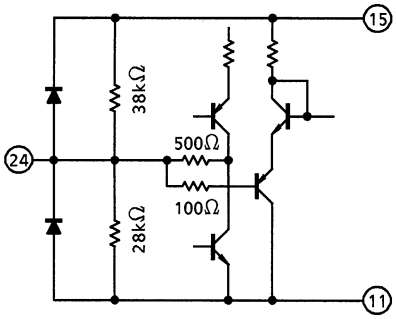
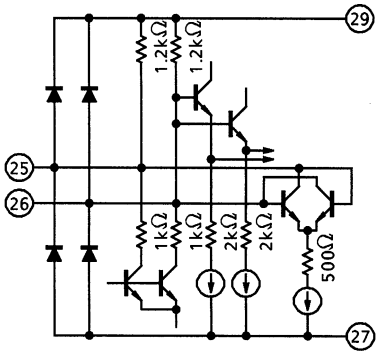
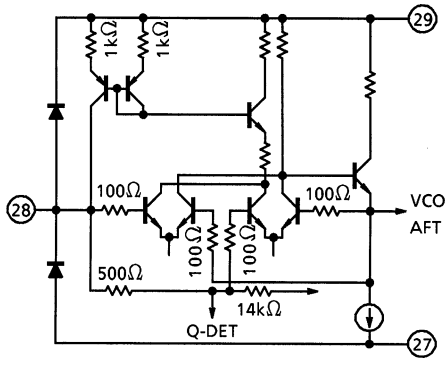
TERMINAL FUNCTION

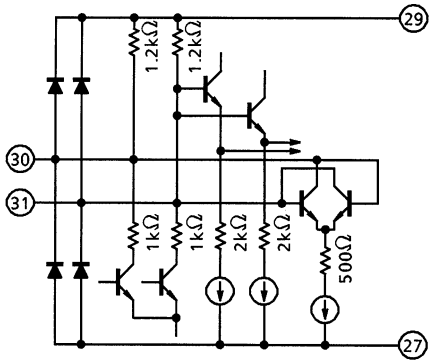
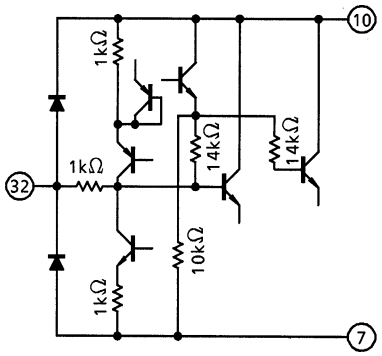
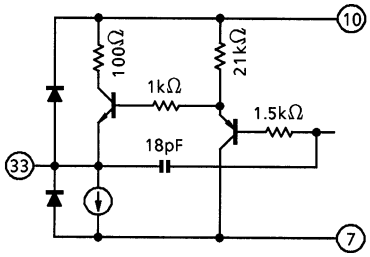
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
1	AFT Output	AFT output pin ; polarity can be reversed by switching pin 23 (MODE SEL). When there is no signal, AFT OUT is muted (approximately 4.5V) using pin 24 (LOCK FILTER) voltage (approximately 4V).	
2	FM Det	Generates a 90 degrees phase shifted signal for FM detection. If this terminal is set to 0.2V or below, Audio out is muted (approximately 4V).	
3	Audio Output	Audio output pin ; for a monaural audio circuit, connect a de-emphasis circuit. The maximum flew out current of this terminal is 4mA (minimum load : 1kΩ).	
4	SIF AGC Filter	AGC filter of the SIF ; applies average-value AGC. The L-SECAM AM audio distortion can be improved by increasing the filter capacitance, but AGC response is slowed down.	

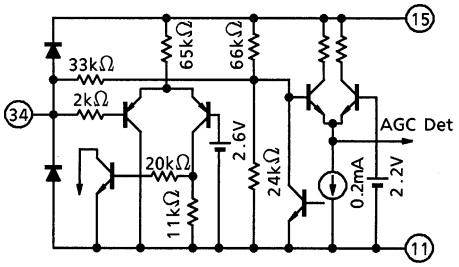
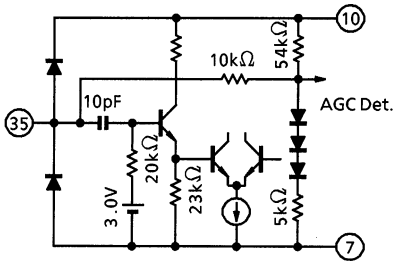
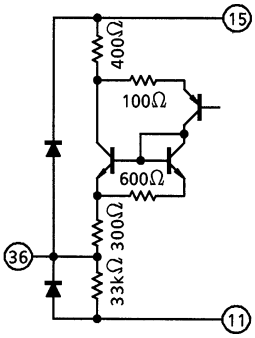
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
5 6	SIF Input A	Input pin for lower-side SIF ; built-in 2-stage high-gain AGC amplifier (AGC range : approximately 55dB) makes possible NICAM compatibility. SIF input A (pins 5 and 6) can be switched to SIF input B (pins 8 and 9) depending on combination of pin 23 and 35 voltage. SIF standard input level is 80dBμV.	
7	SIF GND	Ground for the SIF circuit.	—
8 9	SIF Input B	Input pin for upper-side SIF ; built-in 2-stage high-gain AGC amplifier (AGC range : approximately 55dB). SIF input B (pins 8 and 9) can be switched to SIF input A (pins 5 and 6) depending on combination of pins 23 and 35 voltage. SIF standard input level is 80dBμV.	
10	SIF V_{CC}	V_{CC} for the SIF circuit. External signals could be mixed into the IC, causing various characteristics to be deteriorated. To prevent it, insert the following trap filters between the external power supply and this pin. : PIF carrier frequency trap filter Horizontal scanning frequency (f_H) trap filter (In the application circuit, a 68μH coil is inserted. V_{CC} = 9.0V (Typ).)	—
11	PIF GND	Ground for the PIF circuit	—
12 13	PIF Input	Input pin for PIF ; built-in 2-stage, dual time-constant high-speed AGC amplifier (AGC range : approximately 60dB). PIF standard input level is 90dBμV.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
14 16	1st AGC Filter 2nd AGC Filter	First and second AGC filters of PIF circuit. This IC uses keyed AGC in L mode and peak AGC in BG mode.	
15	PIF V_{CC}	V_{CC} for the PIF circuit. External signals could be mixed in to the IC, causing various characteristics to be deteriorated. To prevent it, insert the following trap filters between the external power supply and this pin. : PIF carrier frequency trap filter Horizontal scanning frequency (f_H) trap filter. (In the application circuit, a 68μH coil is inserted. V_{CC} = 9.0V (Typ).)	—
17	Mute Filter	The filter of the mute detector. Performs sync detection between the input sync and f_H generated in the IC.	
18	H.AFC Filter	AFC filter of the horizontal-oscillation PLL circuit. 32f_H Vco is controlled by this terminal voltage.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
19	H. VCO	For connection of the $32f_H$ ceramic oscillator. For keyed AGC / APC in L mode and mute output, a horizontal countdown system is adopted.	
20	Mute Output	Mute output pin ; When input sync. synchronize with f_H generated in the IC, the output is low (≈GND). When not synchronize the output is high (≈V_{CC}). Use to distinguish that signal is inputted or not. The maximum flew out current of this terminal is 1.5mA.	
21	Sync Input	Input pin for the horizontal sync signal separation circuit ; Apply $2V_{p-p}$ synchronous negative-polarity video signal through a filter.	
22	Video Output	PIF detected signal output pin ; The standard output level is $2V_{p-p}$. Apply V / C / D through a sound trap of 5.5 / 6.0 / 6.5MHz. It is recommended to insert buffer amplifier (emitter follower) between this terminal and sound trap to suppress intermodulation. The maximum flew out current of this terminal is 4mA (minimum load is 1.4kΩ).	

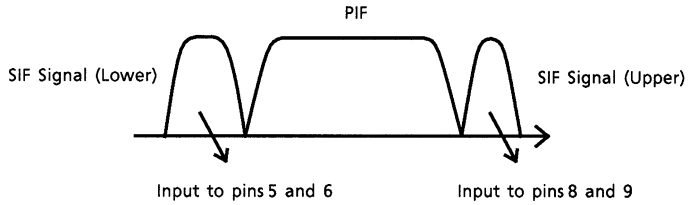
PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
23	MODE SEL	For switching between SIF inputs A and B in L mode (pin 35 : 3.5~6.5V), and switching AFT output polarity. For details see the mode table on page 10.	
24	LOCK Filter	PLL synchronous detection circuit filter ; distinguishes that signal is inputted or not by detection of average of PIF output signal. Pin voltage is approximately 2V (narrow pull-in) when signal is inputted and approximately 4V (broad pull-in) with no signal. At no signal, pin voltage can be used to apply AFT mute.	
25 26	PIF VCO1 PIF VCO2	For PLL VCO tank coil for PIF ; VCO frequency is adjusted by changing the variable capacitance in the IC. When the resonance circuit has capacitor of 27pF the frequency should be adjusted to approximately 3MHz.	
27	VCO GND	Ground for the VCO circuit	—
28	LOOP Filter	PLL loop filter of the PIF detection ; This IC has a built-in circuit for changing the loop filter time constant. Keyed APC is applied in L mode, full-time APC in BG mode.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
29	VCO V_{CC}	V_{CC} for the VCO circuit. External signals could be mixed into the IC, causing various characteristics to be deteriorated. To prevent it, insert the following trap filters between the external power supply and this pin. : PIF carrier frequency trap filter. Horizontal scanning frequency (f_H) trap filter. (In the application circuit 68μH coil is inserted. V_{CC} = 9.0V (Typ).)	—
30 31	SIF VCO1 SIF VCO2	For PLL VCO tank coil for AM SIF in the L system ; VCO frequency is adjusted by changing the variable capacitance in the IC. When the resonance circuit has capacitor of 27pF the frequency should be adjusted to approximately 3MHz.	
32	SIF APC Filter	APC filter for AM SIF detection in L systems ; SIF VCO frequency is controlled by this terminal voltage.	
33	1st SIF Output	FM SIF detection output ; Insert BPF between this pin and Limiter input (pin 34). In application circuits, recommendation is to use together with SIF converter TA8710S.	

PIN No.	PIN NAME	FUNCTION	INTERFACE CIRCUIT
34	L / BG SECAM Adj	Switching between L and BG modes ; In L mode, video output amplitude can be adjusted by varying pin voltage between 3.5 and 6.5V.	
35	Limiter Input RF AGC Delay	Both limiter input pin and RF AGC delay level adjustment pin ; Inputted signal is divided into AC and DC components Internally. Standard limiter input level is 110dBμV ; RF AGC delay level should be used to adjust tuner gain in accordance with electric field strength.	
36	RF AGC Output	RF AGC output pin (reverse type) ; To reduce noise, insert capacitor between this pin and GND. If a resistor of 33kΩ is connected to ground the output gain is reduces by 6dB.	

MODE SW (Pins 34 and 23)

RECEIVING SYSTEM	PIN 34 (S-adj.) VOLTAGE	PIN 23 (MODE SEL) VOLTAGE	SIF INPUT	AFT POLARITY	RECEIVING CHANNEL	
L-SECAM	4.5V ~ 7.0V	5V (2.8~6.7V)	Pin 8, 9	+	—	V_L
		OPEN	Pin 8, 9	−	V_L	V_H, U
		GND (0~0.7V)	Pin 5, 6	−	V_H, U	—
Others	GND (0~1.0V)	—	Pin 5, 6	−	All channels	



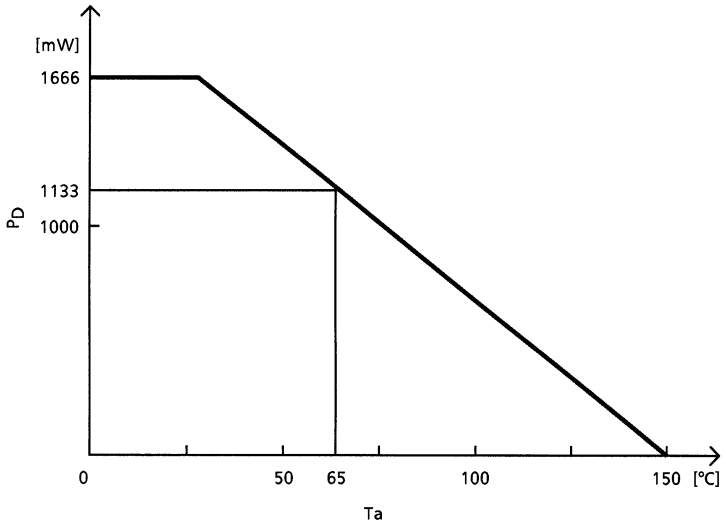
MUTE OUTPUT

	PIN 20 (MUTE OUTPUT)
f_H Lock	Low level (≈GND)
f_H Unlock	High level (≈V_{CC})

MAXIMUM RATINGS (TA = 25°C V_{CC} = 9.0V)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Supply Voltage	V_{CC}	15	V
Power Dissipation	P_D (Note)	1666	mW
Input Signal Amplitude	e_{in}	4.0	V_{p-p}
Input Terminal Voltage	V_{in}	GND − 0.2 ~V_{CC} + 0.2	V
Operating Temperature	T_{opr}	−20~65	°C
Storage Temperature	T_{stg}	−55~150	°C

Note: When using the device at above Ta = 25°C, decrease the power dissipation by 13.6mW for each increase of 1°C.



RECOMMENDED OPERATING CONDITIONS

CHARACTERISTIC	SYMBOL	MIN	TYP.	MAX	UNIT	REMARKS
SIF Power Supply Voltage	V_{CCP}	8.5	9.0	9.5	V	
PIF Power Supply Voltage	V_{CCS}	8.5	9.0	9.5	V	
VCO Power Supply Voltage	V_{CCV}	8.5	9.0	9.5	V	
PIF Input Level	V_{inTYP}	—	90	100	dBμV	
SIF Input Level	V_{FinTYP}	—	80	100	dBμV	
Limiter Input Level	V_{LinTYP}	—	110	—	dBμV	
Sync Separation Input Level	V_{SPin}	—	2.0	—	V_{p-p}	

ELECTRICAL CHARACTERISTICS

DC CHARACTERISTICS (Unless otherwise specified V_{CC} = 9V, Ta = 25±3°C)

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITIONS	MIN	TYP.	MAX	UNIT
Power Supply Current	I_{PIF}	1	Pin 34-5V, pin 2-GND, pin 4-3V, pin 16-3V, pin 23-Open	18	28	38	mA
	I_{SIF}			20	30	40	
	I_{VCO}			9	16	21	
Terminal Voltage	V2	1	(*1)	2.4	2.7	3.0	V
	V3		(*2)	3.8	4.0	4.2	
	V5		Pin 34-GND, pin 2-GND, pin 4-3V, pin 16-3V, pin 23-Open	1.8	2.0	2.2	
	V6			1.8	2.0	2.2	
	V8		Pin 34-5V, pin 2-GND, pin 4-3V, pin 16-3V, pin 23-Open	1.8	2.0	2.2	
	V9			1.8	2.0	2.2	
	V12		Pin 34-GND, pin 2-GND, pin 4-3V, pin 16-3V, pin 23-Open	1.8	2.0	2.2	
	V13			1.8	2.0	2.2	
	V17			0	0.1	0.2	
	V19			5.4	5.8	6.2	
	V20			8.8	9.0	—	
	V21			6.4	6.6	6.8	
	V22			4.2	4.5	4.8	
	V23			1.6	1.75	1.9	
	V25			7.5	7.7	7.9	
	V26			7.5	7.7	7.9	
	V30		Pin 34-5V, pin 2-GND, pin 4-3V, pin 16-3V, pin 23-Open	7.5	7.7	7.9	
	V31			7.5	7.8	7.9	
	V33		(*2)	3.8	4.1	4.4	

* 1: pin 34-GND, pin 2-Open, pin 4-3V, pin 16-3V, pin 23-Open
* 2: pin 34-GND, pin 2-GND, pin 4-3V, pin 16-3V, pin 23-Open

AC CHARACTERISTICS (Unless otherwise specified V_{CC} = 9V, Ta = 25±3°C)
PIF circuit

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
B / G Video Output Amplitude	$V_{oB\,/\,G}$	1	(Note 1)	1.8	2.0	2.2	V_{p-p}
B / G Input Sensitivity	V_{inBMIN}	1	(Note 2)	—	37	42	dBμV
B / G Maximum Input	V_{inBMAX}	1	(Note 3)	100	107	112	dBμV
B / G Output Level For No Input	V_{noSGB}	1	(Note 4)	4.0	4.3	4.6	V
B / G Sync Tip Level	V_{SYNCB}	1	(Note 5)	1.9	2.2	2.5	V
Differential Gain	DG	1	(Note 21)	—	2.0	5.0	%
Differential Phase	DP			—	2.0	5.0	°
Video S / N	S / N	1	(Note 7)	51	56	61	dB
Carrier Suppression Ratio	CR	1	(Note 8)	45	53	—	dB
2nd Harmonic Suppression Ratio	HR	1	(Note 9)	45	60	—	dB
Intermodulation	IM	1	(Note 10)	40	47	—	dB
Video Frequency Characteristic	f_c	1	(Note 11)	6	8	10	MHz
L-SECAM Max. Video Output Amplitude	V_{oLMAX}	1	(Note 12)	2.3	2.5	—	V_{p-p}
L-SECAM Min. Video Output Amplitude	V_{oLMIN}	1	(Note 13)	—	0.5	1.0	V_{p-p}
L Input Sensitivity	V_{inLMIN}	1	(Note 14)	—	37	42	dBμV
L Maximum Input	V_{inLMAX}	1	(Note 15)	100	107	112	dBμV
L Output Level for No Input	V_{noSGL}	1	(Note 16)	2.2	2.5	2.8	V
L Sync Tip Level	V_{SYNCL}	1	(Note 17)	2.1	2.4	2.7	V
PIF AGC Range	R_{PIAG}	1	(Note 18)	63	70	77	dB
PIF AGC Min. Output	V_{PImi}	1	(Note 19)	3.0	3.5	4.0	V
PIF AGC Max. Output	V_{PIma}	1	(Note 20)	8.0	8.4	8.6	V
RF AGC Min. Output	V_{RFmi}	1	(Note 21)	—	2	10	mV
RF AGC Max. Output	V_{RFma}			7.7	8.0	8.3	V
AFT Min. Output	V_L	1	(Note 22)	0.3	0.5	0.7	V
AFT Max. Output	V_H	1	(Note 23)	8.3	8.5	8.7	V
AFT Center Voltage	V_{CENT}	1	(Note 24)	4.4	4.5	4.6	V
AFT Sensitivity	$\Delta F / \Delta V$	1	(Note 25)	19	22	25	kHz / V
P Pull-in Range, Upper 1	f_{PpU1}	1	(Note 26)	600	1200	—	kHz
P Pull-in Range, Lower 1	f_{PpL1}			600	1200	—	
P Pull-in Range, Upper 2	f_{PpU2}			1000	1500	—	
P Pull-in Range, Lower 2	f_{PpL2}			1000	1500	—	
P VCO Control Sensitivity	β_p	1	(Note 27)	2.5	3.7	5.0	MHz / V

SIF circuit

CHARACTERISTIC		SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
1st SIF Output Amplitude	B / G	V_{1sBG}	1	f_S = 5.5MHz (Note 28)	109	112	115	dBμV
	L	V_{1sL}		f_S = 6.5MHz (Note 29)	107	110	113	
S FM Input Sensitivity		V_{Fin}	1	(Note 28)	—	40	45	dBμV
SIF AGC Range		R_{SIAG}	1	(Note 30)	55	60	—	dB
1st SIF Output Level for No Input		V_{no1s}	1	(Note 31)	3.7	4.0	4.3	V
FM Detection Output		V_{oFM}	1	(Note 32)	575	675	775	mV_{rms}
FM Limiting Sensitivity		V_{Lim}			—	40	50	dBμV
AM Suppression Ratio		AMR	1	(Note 33)	45	52	—	dB
FM Audio S / N		No_{FM}	1	(Note 34)	60	67	—	dB
FM Audio Distortion		DI_{FM}	1	(Note 35)	—	0.3	1.0	%
Detection Band Width Upper		$+\Delta F_G$	1	(Note 36)	70	100	—	kHz
Detection Band Width Lower		$-\Delta F_G$			—	100	—	
AM Detection Output		Vo_{AM}	1	(Note 37)	450	525	600	mV_{rms}
AM Input Sensitivity		V_{Ain}			—	37	42	dBμV
AM Maximum Input		V_{AinMAX}			100	107	112	
AM Output Level for No Input		V_{noAM}	1	(Note 38)	4.5	4.8	5.1	V
AM Audio S / N		No_{AM}	1	(Note 39)	57	62	—	dB
AM Audio Distortion		DI_{AM}	1	(Note 40)	—	0.7	1.7	%
Pull-in Range, Upper		f_{SpU}	1	(Note 41)	1000	1500	—	kHz
Pull-in Range, Lower		f_{SpL}			1000	1500	—	
VCO Control Sensitivity		β_S	1	(Note 42)	2.5	3.7	5.0	MHz / V

$32f_H$ VCO stage

CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN	TYP.	MAX	UNIT
Free-run Frequency	f_H	1	(Note 43)	15.300	15.600	15.900	kHz
Pull-In Range, Upper	f_{HpU}	1	(Note 44)	500	750	—	Hz
Pull-In Range, Lower	f_{HpL}			500	750	—	
Frequency Control Range	f_{VHi}	1	(Note 45)	500	800	—	Hz
	f_{VLo}			500	800	—	
Frequency Control Sensitivity	β_H	1	(Note 46)	1.8	2.3	2.8	kHz / V
Sync Detection Level	V_{HVin}	1	(Note 47)	—	80	100	mV
	V_{HLin}			—	25	35	dBμV

COIL ADJUSTMENT PROCEDURE

Before making measurements, adjust all coils in accordance with the following procedure :

1. PIF VCO coil : Set pin 34 (L / BG) to ground. Input SIG1 to Tp8 (PIF Input). While observing Tp1 (AFT Output), adjust the PIF VCO coil. Find the area at which Tp1 voltage changes abruptly. Within this range, further adjust the PIF VCO coil until Tp1 voltage reaches 4.5V area voltage.
2. SIF VCO coil : Set voltage of pin 34 (L / BG) to 5V and pin 23 (MODE SEL) to ground. In no-input state, set Tp5 (AGC Filter) to 3V, and measure the Tp22 (S APC FIL.) voltage (Vp1).
   Then remove 3V from Tp5 and input SIG2 to Tp7 (B / G SIF Input). Adjust the SIF VCO coil so that the Tp21 voltage reaches Vp1.
3. SIF coil : Set pin 35 to ground and input SIG3 to Tp20 (Limiter Input).
   Then set the sound mute switch to open and measure the Tp2 (Audio Output) voltage.
   Adjust the SIF coil so that the Audio Output DC voltage reaches 4.0V.

TEST CONDITION

Note 1: B / G Video Output Amplitude
(1) Set SW6 to a and SW3 to a, and input SIG4 to Tp8.
(2)Measure Tp16 output amplitude.

Note 2: B / G Input Sensitivity
(1) Same as above.
(2) Gradually lower the input level, and measure the input level at which Tp16 output amplitude reached −3dB. The reference value (0dB) is the Tp16 signal amplitude when input signal amplitude is 90dBμV.

Note 3: B / G maximum Input
(1) Same as above.
(2) Gradually raise the input level, and measure the input level at which Tp16 output amplitude reaches −0.5dB. The reference value (0dB) is the Tp16 signal amplitude when input signal amplitude is 90dBμV.

Note 4: B / G No-Signal Level
(1) Set SW6 to a and SW3 to a, with no input, apply 3V to Tp10.
(2) Measure the Tp16 DC voltage.

Note 5: B / G Sync Tip Level
(1) Set SW6 to a and SW3 to a, and input SIG4 to Tp8.
(2) Measure the sync tip DC level of Tp16.

Note 6: DG / DP
(1) Same as above.
(2) Measure DG and DP using a vector scope.

Note 7: Video S / N Ratio
(1) Set SW6 to a and SW3 to a, and input SIG5 to Tp8.
(2) Measure the Tp16 output amplitude using an RMS meter.→ ($V_{S / N1}$)
(3) Input SIG1 (non-modulation) to Tp8 measure the Tp16 output amplitude.→ ($V_{S / N2}$)
(4) Determine the video S / N ratio using the following equation :

$$S/N_V = 20\ell og\left(\frac{V_{S/N1}\,[mV_{rms}]}{V_{S/N2}\,[mV_{rms}]} \times 6\right)\,[dB]$$

Note 8: Carrier Suppression Ratio
(1) Set SW6 to a and SW3 to a, and input SIG5 to Tp8.
(2) Measure the output amplitude of Tp16.→ (V_{CR1}) [rms]
(3) Input SIG1 (non-modulation) to Tp8 using a spectrum analyzer, measure the 38.9MHz component of Tp16 output.→ (V_{CR2}) [rms]
(4) Determine the carrier suppression ratio using the following equation :

$$CR = 20\ell og\frac{V_{CR1}\,[mV_{rms}]}{V_{CR2}\,[mV_{rms}]}\,[dB]$$

Note 9: 2nd Harmonic Suppression Ratio

(1) Set SW6 to a and SW3 to a, and input SIG5 to Tp8.

(2) Measure the output amplitude of Tp16.→(V_{I1}) [rms]

(3) Input SIG1 (non-modulation) to Tp8 using a spectrum analyzer, measure the 77.8MHz component of Tp16 output.→(V_{I2}) [rms]

(4) Determine the 2nd harmonic suppression ratio using the following equation :

$$HR = 20\ell og\frac{V_{I1}\,[mV_{rms}]}{V_{I2}\,[mV_{rms}]}\,[dB]$$

Note 10: Intermodulation

(1) Set SW6 to a and SW3 to a, input SIG7 to Tp8, and apply an external voltage to Tp10. Adjust DC voltage applied to Tp10 so that output signal bottom level of Tp16 reaches V_{SYNCB}.

(2) Using a spectrum analyzer, measure the 1.07MHz component (V_{IM}) [dBμV], and 4.43MHz (V_{CHR}) [dBμV] component.

(3) Determine the intermodulation using following equation :
IM = $V_{CHR}-V_{IM}$

Note 11: Video frequency characteristic

(1) Set SW6 to a and SW3 to a, input SIG5 to Tp8, and set f2 to 37.9MHz.

(2) While observing Tp16, apply an external voltage to Tp10. Adjust DC voltage applied to Tp10 so that bottom level of Tp16 output signal reaches V_{SYNCB}.

(3) Gradually lower f2 until the output amplitude of Tp16 reaches −3dB.
The reference value (0dB) is Tp16 signal amplitude when f2 is 37.9MHz.
The difference between f2 and f1 is fc.

Note 12: L-SECAM max. video output amplitude

(1) Apply 4.0V (SW5-a) to pin 35, set SW3 to a, and input SIG8 to Tp8.

(2) Measure the output amplitude of Tp16.

Note 13: L-SECAM Min. Video Output Amplitude

(1) Apply 7.0V (SW6-b) to pin 35, set SW3 to a, and input SIG8 to Tp8.

(2) Measure the output amplitude of Tp16.

Note 14: L Input Sensitivity

(1) Set to SW3-a and input SIG8 Tp8, and adjust pin 35 voltage using VR (SW6-b) so that output amplitude of Tp16 is $2V_{p-p}$.

(2) Gradually lower the input level and measure the input level at which Tp16 output amplitude reaches −3dB.
The reference value (0dB) is the Tp16 output amplitude when input signal amplitude is 90dBμV.

Note 15: L Maximum Input
(1) Same as above.
(2) Gradually raise the input level and measure the input level at which Tp16 output amplitude reaches −0.5dB.The reference value (0dB) is the Tp16 signal amplitude when input signal amplitude is 90dBμV.

Note 16: L No-Signal Level
(1) Apply 3V to Tp10 with no input, and measure the DC voltage on Tp16.

Note 17: L Sync Tip Level
(1) Set SW-3 to a and input SIG8 to Tp8, and adjust pin 35 voltage using VR (SW6-b) so
(2) Measure the sync tip DC level of the Tp16 output.

Note 18: PIF AGC Range
(1) (PIF AGC range) = (B / G-maximum input) − (B / G-input sensitivity) [dB]

Note 19: PIF AGC Min. Output
(1) Set SW6 to a and SW3 to a, with no input to Tp8.
(2) Measure Tp10 voltage.

Note 20: PIF AGC Max. Output
(1) Set SW6 to a and SW3 to a, and input SIG9 to Tp8.
(2) Same as above.

Note 21: RF AGC Min. Output
(1) Set SW6 to a and SW3 to a, and input SIG9 to Tp8.
(2) Adjust pin 35 (RF AGC Delay) voltage to 7.0V using VR.
(3) Measure Tp21 voltage.

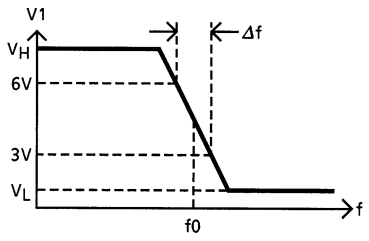
Note 22: RF AGC Max. Output
(1) Set SW6 to a and SW3 to a, with no input to Tp8.
(2) Adjust pin 35 (RF AGC Delay) voltage to 1.0V using VR.
(3) Measure Tp21 voltage.

Note 23: AFT Min. Output
(1) Set SW6 to a and SW3 to a, input SIG10 to Tp8, and set f0 to 39.4MHz.
(2) Measure Tp1 voltage.

Note 24: AFT Max. Output
(1) Set SW6 to a and SW3 to a, input SIG10 to Tp8, and set f0 to 38.5MHz.
(2) Measure Tp1 voltage.
(3) V_{CENT} is Tp1 voltage with no input.

Note 25: AFT Sensitivity
(1) Set SW6 to a and SW3 to a, and input SIG10 to Tp8.
(2) Measure the input frequency (f AF1) when Tp1 reaches 3V and the input frequency when Tp1 reaches 6V (f AF2).
(3) Determine the AFT Sensitivity using the following equation :

$$\Delta F / \Delta / = \frac{\Delta f\ (= fAF1 - fAF2)\ [kHz]}{3.0\ [V]} [kHz / V]$$



Note 26: PIF VCO Pull-In Range

(1) Same as above.

(2) Set Tp17 (LOCK Filter) to 2V and, while observing Tp16 (Video Output), gradually decrease input frequency until PLL locks. The difference between this frequency and 38.9MHz is f_{PpU1}. In the same way, gradually increase input frequency until PLL locks. The difference between this frequency and 38.9MHz is f_{PpL1}.

(3) Set Tp17 to 6V, and make the same measurement as in (2) above with f_{PpU2} and f_{PpL2} as the differences.

Note 27: PIF VCO Control Sensitivity

(1) Set SW6 to a and SW3 to a, with no input, apply 3V to Tp10.

(2) Measure Tp18 voltage (VβP).

(3) Using a spectrum analyzer, measure the frequency of P-VCO leaking to Tp16. Set the Tp18 voltage to (VβP+0.2V) and measure P-VCO frequency (fβ1), set the Tp18 voltage to (VβP−0.2V) and measure P-VCO frequency (fβ2). Determine βP using the following equation :

$$\beta P = \frac{|f\beta\beta - f\beta\beta|\ [kHz]}{400\ [mV]}\ [MHz / V]$$

Note 28: 1st SIF Output Amplitude (BG), SIF FM Input Sensitivity

(1) Set SW6 to a, input SIG1 to Tp8, and input SIG16 to Tp7.

(2) Measure Tp19 output amplitude (V_{1S}).

(3)Gradually lower the input level and measure the input level at which Tp19 output amplitude reaches −6dB. The reference value (0dB) is the V_{1S}.

Note 29: 1st SIF Output Amplitude (L)

(1) Apply 5V to pin 34 (SW6-b). Input SIG1 to Tp8. Input SIG2 to Tp7

(2) Measure Tp19 Output Amplitude (V_{1SL}).

Note 30: SIF AGC Range

(1) (SIF AGC range) = 100− (S-FM input sensitivity) [dB]

Note 31: 1st SIF No-Signal Level

(1) Set SW6 to a, input SIG1 to Tp8, and no signal to Tp7, apply 3V to Tp5.

(2) Measure Tp3 voltage.

Note 32: FM Limiting Sensitivity

(1) Set SW1 to b, SW2 to a and SW6 to a, input SIG11 to Tp20 (SW5-b), and set f0 to 6.0MHz.

(2) Measure Tp3 output amplitude (V_{oFM} [mV_{rms}])

(3) Gradually lower the input level and measure the input level at which Tp3 output amplitude V_{oFM} reaches −6dB.
The reference value (0dB) is the Tp3 output amplitude when input signal amplitude is 110dBμV.

Note 33: AM Suppression Ratio

(1) Set SW1 to b, SW2 to a and SW6 to a, and input SIG11 to Tp20 (SW5-b).

(2) Measure Tp3 output amplitude (V AMR). Determine the AM suppression ratio using the following equation.

$$AMR = 20\log\frac{V_{oFM}\,[mV_{rms}]}{V\ AMR\,[mV_{rms}]}\,[dB]$$

Note 34: FM Audio S / N

(1) Set SW1 to b, SW2 to a and SW6 to a, and input SIG3 to Tp20 (SW5-b).

(2) Measure Tp3 output amplitude (V SNF). Determine the FM audio S / N using the following equation.

$$No_{FM} = 20\log\frac{V_{oFM}\,[mV_{rms}]}{V\ SNF\,[mV_{rms}]}\,[dB]$$

Note 35: FM Audio Distortion

(1) Set SW1 to b, SW2 to a, SW2 to a and SW6 to a, input SIG11 to Tp20 (SW5-b), and set f0 to 6.0MHz.

(2) Measure distortion in Tp3 output.

Note 36: Detection Band Width

(1) Set SW1 to b, SW2 to a and SW6 to a, and input SIG11 to Tp20 (SW5-b).

(2) Gradually increase input frequency from 6.0MHz and measure the input frequency (+ΔFG) at which Tp3 output amplitude reaches −3dB. The reference value (0dB) is the Tp3 output amplitude when f0 is 6.0MHz.

Note 37: SIF AM Detection Output, Input Sensitivity and Maximum Input

(1) Set SW1 to b, SW2 to b, and SW4 to c, and apply pin 35 to 5V (SW6-b) and input SIG13 to Tp7.

(2) Measure the Tp4 output amplitude (V_{oAM}).

(3) Gradually lower the input level and measure the input level (V_{Ain}) at which Tp4 output amplitude reaches −3dB. The reference value (0dB) is the Tp4 output amplitude when input signal amplitude is 90dBμV.

(4) Gradually raise the input level and measure the input level (V_{Ain}MAX) at which Tp4 output amplitude reaches −0.5dB. The reference value (0dB) is the Tp4 output amplitude when input signal amplitude is 90dBμV.

Note 38: AM No-Signal Level

(1) Apply 5V to pin 35 (SW6-b), set SW2 to b and SW4 to c, and with no input, apply 3V to Tp5.

(2) Measure Tp2 DC voltage.

Note 39: AM Audio S / N Ratio

(1) Apply 5V to pin 35 (SW6-b), set SW2 to b and SW4 to c, and input SIG2 to Tp7.

(2) Measure Tp4 output amplitude (V SNA), and determine the AM audio S / N using the following equation :

$$No_{AM} = 20\ell og \frac{V_{oAM}\,[mV_{rms}]}{V\,SNF\,[mV_{rms}]}\,[dB]$$

Note 40: AM Audio Distortion

(1) Apply 5V to pin 35 (SW6-b), set SW2 to b and SW4 to c, and input SIG13 to Tp7.

(2) Measure the distortion Tp4 output.

Note 41: SIF VCO Pull-In Range

(1) Apply 5V to pin 35 (SW6-b), set SW2 to b and input SIG7 to Tp7.

(2) While observing Tp4, gradually decrease input frequency until PLL locks. The difference between this frequency and 32.4MHz is f_{SpU}. In the same way, gradually increase input frequency until PLL locks. The difference between this frequency and 32.4HMz is f_{SpL}.

Note 42: S VCO Control Sensitivity

(1) Apply 5V to pin 35 (SW6-b), set SW2 to b and input SIG7 to Tp7.

(2) Measure Tp22 Voltage (VβS).

(3) Using a spectrum analyzer, measure the frequency of S-VCO leaking to Tp2. Set the Tp22 voltage to (VβS+0.2V) and measure S-VCO frequency (fβ3), set the Tp22 voltage to (VβS−0.2V) and measure S-VCO frequency (fβ4). Determine βS using the following equation :

$$\beta S = \frac{|f\beta 3 - f\beta 4|\ [kHz]}{400\ [mV]}\,[MHz / V]$$

Note 43: H Free-run Frequency

(1) Set SW5 to b and with no input to Tp15, measure Tp12 voltage (V_{HF}).

(2) Input SIG17 to Tp15. Changing input frequency and measure the input frequency at which Tp12 voltage reaches V_{HF}.

Note 44: H Pull-In Range

(1) Set SW3 to b, SW6 to a, input SIG17 to Sync Input (Tp15), and apply 9V to Tp11.

(2) While observing Tp13, gradually decrease input frequency (f_H) until Tp13 output voltage change from 9V to 0V. The difference between this frequency and 15.625kHz is f_{HpU}.

(3) While observing Tp13, gradually increase input frequency (f_H) until Tp13 output voltage change from 9V to 0V. The difference between this frequency and 15.625kHz is f_{HpL}.

Note 45: H Frequency Control Range

(1) Apply 8.7V to pin 35 (SW6-a), set SW2 to b, apply 2V to Tp17, V_{CC} to Tp with no input.

(2) Apply 8.5V to Tp12, and measure the frequency of Tp9 output. The difference between this frequency and 15.625kHz is f_{VHi}.

(3) Apply 6.5V to Tp12, and measure the frequency of Tp9 output. The difference between this frequency and 15.625kHz is f_{VLo}.

Note 46: H Frequency Control Sensitivity

(1) Same as above.

(2) Measure Tp12 voltage (VβH)

(3) Set the Tp12 voltage to (VβH+0.2V) and measure the frequency of Tp9 output (fβ5) set the Tp12 voltage to (VβH−0.2V) and measure the frequency of Tp9 output (fβ6). Determine βH using the following equation :

$$\beta H = \frac{|f\beta 5 - f\beta 6| \ [kHz]}{400 \ [mV]} [kHz / V]$$

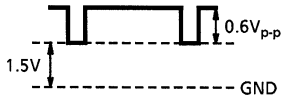
Note 47: Sync Detection Level

(1) Set SW3 to b SW6 to a, input SIG17 to Tp15, and set f_H to 15.625kHz.

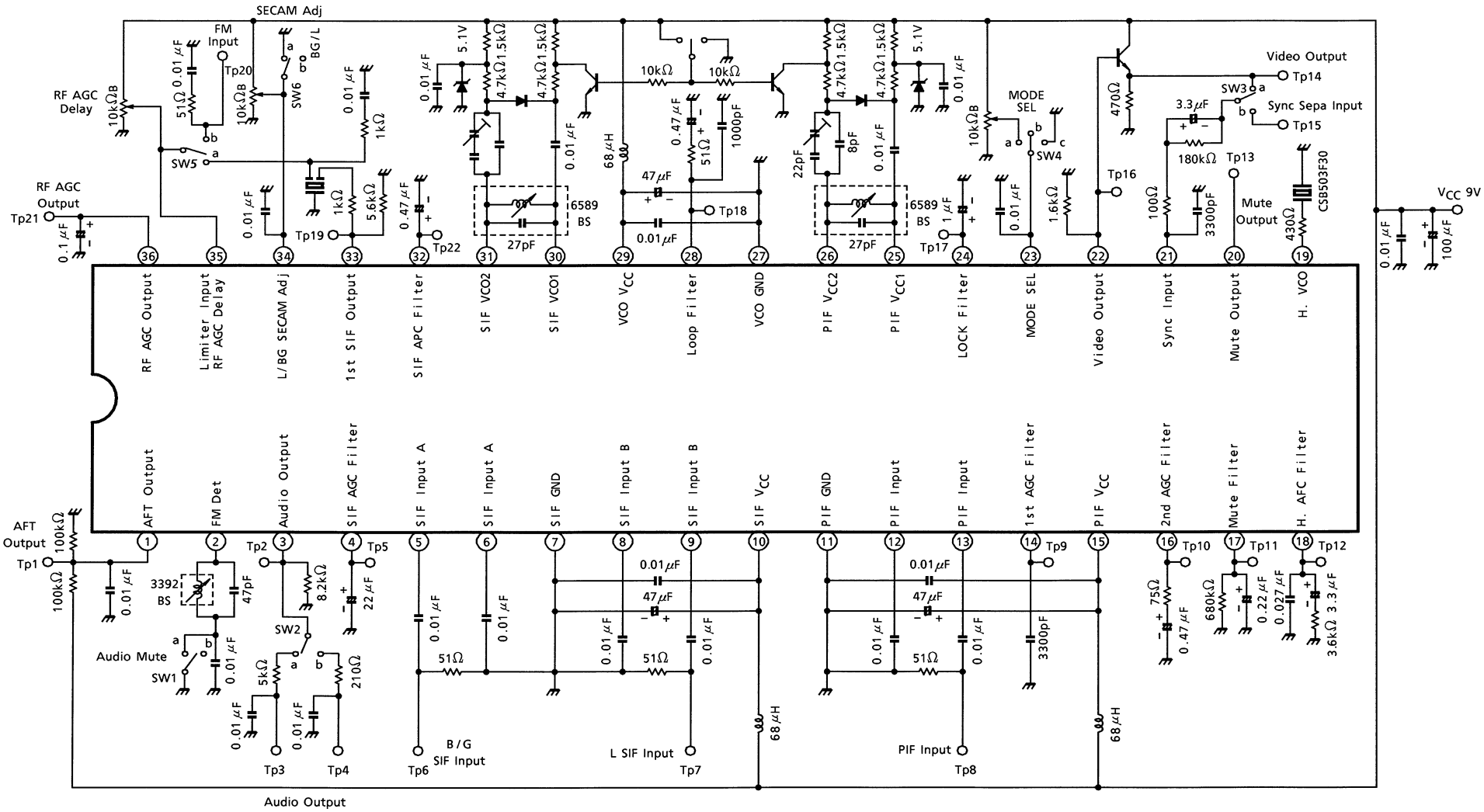
(2) Gradually lower the input amplitude and measure the amplitude (V_{HVin}) at which Tp13 voltage changes from 0V to 9V.

(3) Set SW3 to a and SW6 to a, and input SIG4 to Tp8.

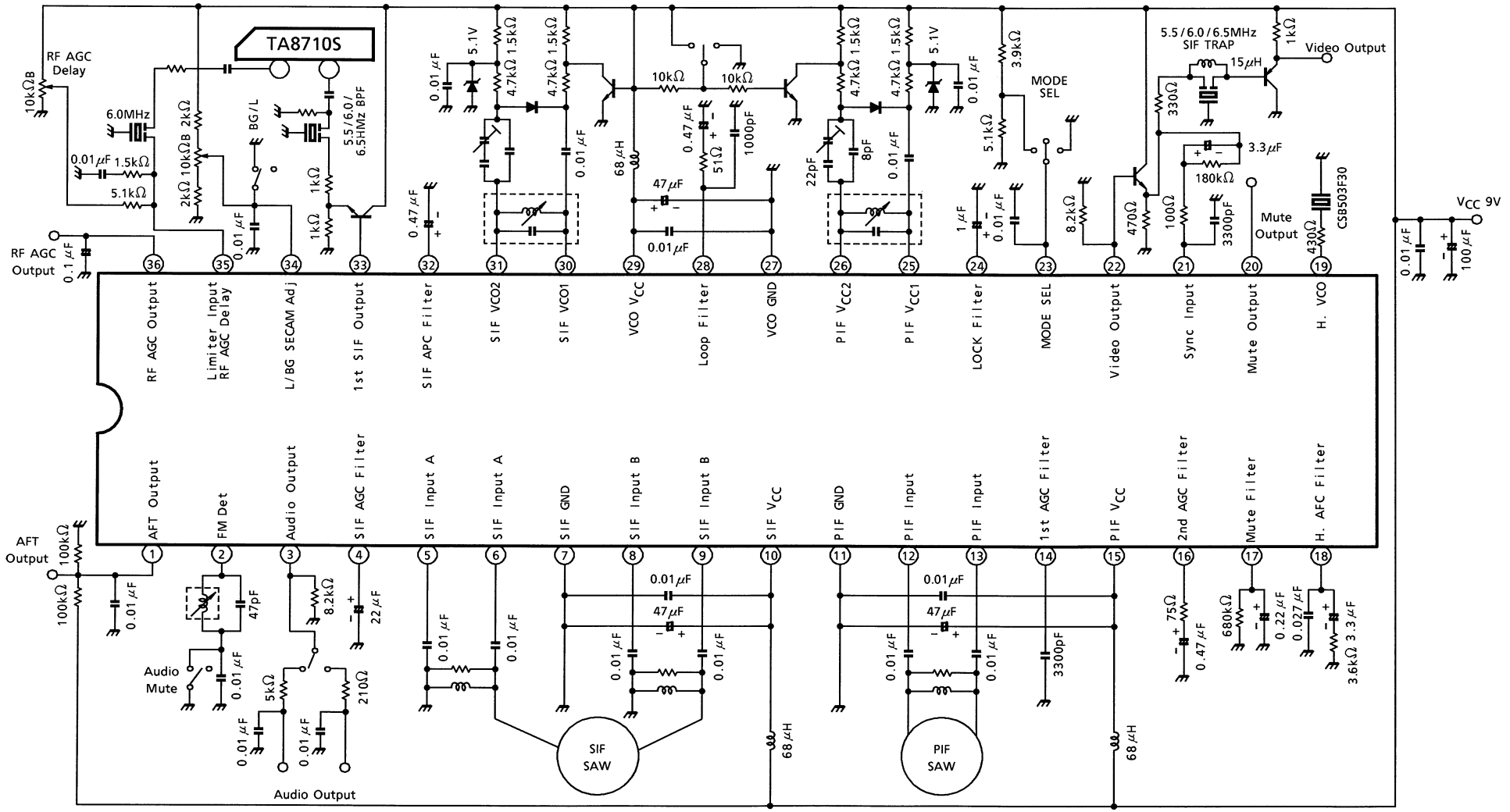
(4) Gradually lower the input level and measure the level (V_{HLin}) at which Tp13 output voltage changes from 0V to 9V.

SG	INPUT SIGNAL (Terminating Resistance : 50Ω)
SIG1	f0 = 38.9MHz, 90dBμV, CW
SIG2	f0 = 32.4MHz, 80dBμV, CW
SIG3	f0 = 6.0MHz, 110dBμV, CW
SIG4	f0 = 38.9MHz, 5-stair bar (V / S = 10 : 4), 87.5% AM, 90dBμV,
SIG5	f0 = 38.9MHz, fm = 15.63kHz, 30% AM, 90dBμV
SIG6	f0 = 38.9MHz, fm = 15.63kHz, 78% AM, 90dBμV
SIG7	f1 = 38.9MHz, 90dBμV f2 = 34.47MHz, 80dBμV mixed signal f2 = 33.4MHz, 80dBμV
SIG8	f0 = 38.9MHz, 5-stair bar (V / S = 10 : 4), positive modulation 97% AM, 90dBμV
SIG9	f0 = 38.9MHz, fm = 15.63kHz, 30% AM, 110dBμV
SIG10	f0 = 38.9MHz±5MHz, 90dBμV, CW
SIG11	f0 = 6.0MHz±2MHz, fm = 400Hz, 50kHz / devi FM, 110dBμV
SIG12	f0 = 6.0MHz, fm = 400Hz, 30% AM, 110dBμV
SIG13	f0 = 32.4MHz, fm = 1kHz, 80% AM, 90dBμV
SIG14	f0 = 32.4MHz±5MHz, fm = 1kHz, 80% AM, 90dBμV
SIG15	f1 = 38.9MHz, 90dBμV f2 = 27.9~37.9MHz, 80dBμV mixed signal
SIG16	f0 = 33.4MHz, 80dBμV, CW
SIG17	fH = 15.625MHz±2.0kHz, amplitude $0.6V_{p-p}$, Duty 90% 

TEST CIRCUIT 1



APPLICATION CIRCUIT



PERIPHERALS

(1) Tank coils

- PIF VCO Coil: 292GES-6589BS (Toko)
- SIF VCO Coil: 292GES-6589BS (Toko)
- FM Coil : F292XNS-3392BS (Toko)

(2) SAW filters

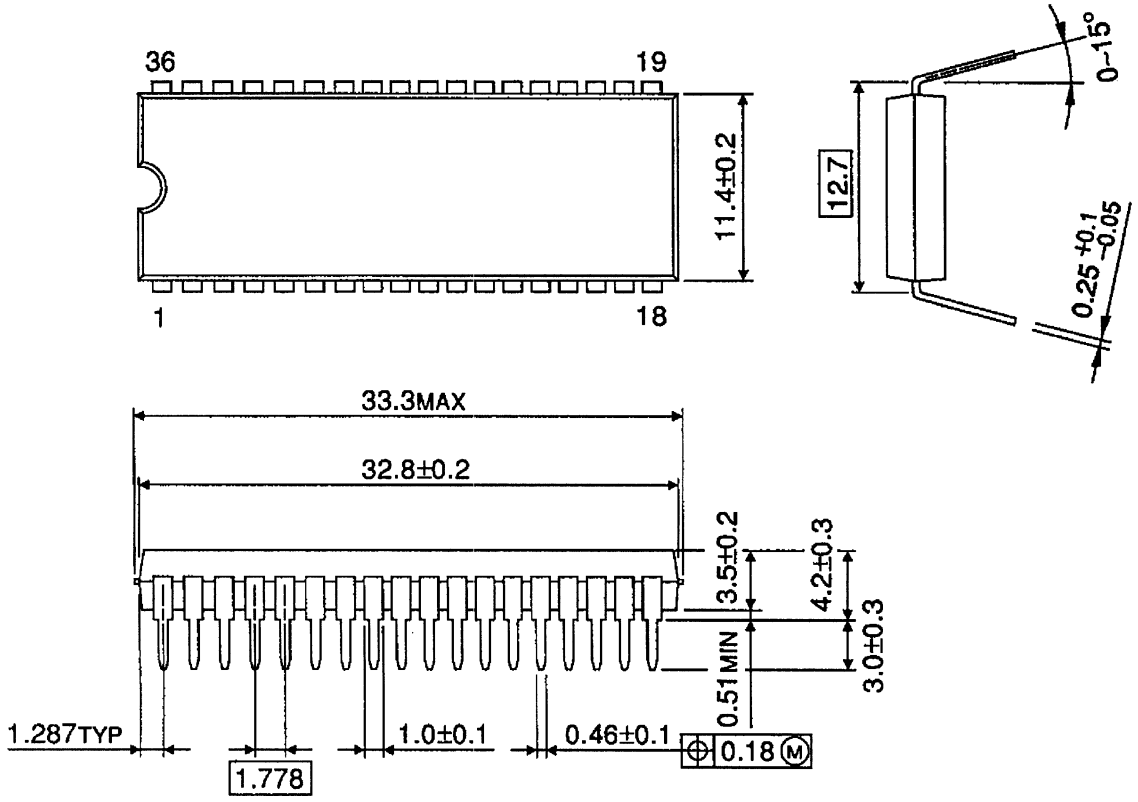
- PIF SAW Filters F1054E For B, G
- SIF SAW Filters F328FM For D, K, L

(3) Ceramic resonators

- CSB503F30 (Murata MFG. Co., Ltd)

PACKAGE DIMENSIONS

SDIP36-P-500-1.78 Unit : mm



Weight: 2.98g (Typ.)