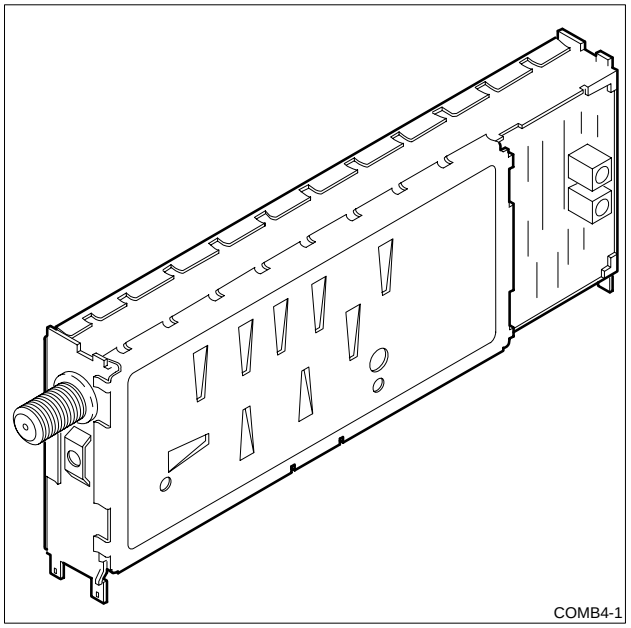
SHARP

VT4T5UF2021

RF Data Sheet Combination Tuner/Demodulator/Modulator

FEATURES

- Receiving Standard: USA
- Receiving Channels:
  - VHF Section
    - Low Band – Air: 2 to 6 CATV: (A-8) A-5 to B
    - High Band – Air: 7 to 13 CATV: C to W + 11
  - UHF Section
    - Air: 14 to 69
    - CATV: W + 12 to W + 84
- Sending Channels:
  - USA Channel 3 and 4
    - CH 3: OPEN
    - CH 4: GND
- Receiving and Sending System: USA Standard M-System (NTSC)
- Channel Selection System: PLL Tuning
- Detection System: Dummy Synchronization Detection System, Intercarrier Sound Receiving System
- Nominal Input Impedance:
  - RF: 75 Ω, Unbalanced
  - Video: 1 kΩ, Unbalanced
  - Audio: 4.7 Ω MIN., Unbalanced
  - Control: 30 kΩ MIN., Unbalanced
- Output Load Impedance:
  - RF: 75 Ω
  - Video: 1 kΩ
  - Audio: 4.7 kΩ
- Intermediate Frequency:
  - Picture: 45.75 MHz
  - Sound: 41.25 MHz
- Weight: 72 g ±10 g
- Applicable Standards:
  - EIA Standard Number 544
  - EIA Standard Number 16A
  - FCC Standards
  - UL Standard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FUNCTIONAL DESCRIPTION

The VT4T5UF2021 is a combination tuner, demodulator and modulator in one package. This unit is compatible with North American NTSC television broadcast signals. An internal Phase-Locked Loop circuit performs all of the required tuning functions. Digital control information is provided to the unit on I2C serial data bus. The tuner and demodulator blocks are internally connected, providing an IF sample point for test purposes. The modulator has separate video and audio inputs and control connections. This single package configuration is useful when there is no need to manipulate the AGC or IF signals prior to demodulation, and provides for a simplified system design. The RF connectors are mounted on the end of the housing so that the smallest possible area is used on the rear panel of the end product.

The RF pass-through feature is electrically controlled via an external interface pin. Output channel 3 or 4 is also electrically selected by asserting 5 V or ground on an external pin. The internal tuner sample point is always active, allowing the tuner and demodulator functions to be used at all times, regardless of the condition of the RF pass-through and the modulator output. Demodulated audio, video AGC and AFT outputs are also provided. The AGC control line from the demodulator to the tuner is not accessible to the system designer.

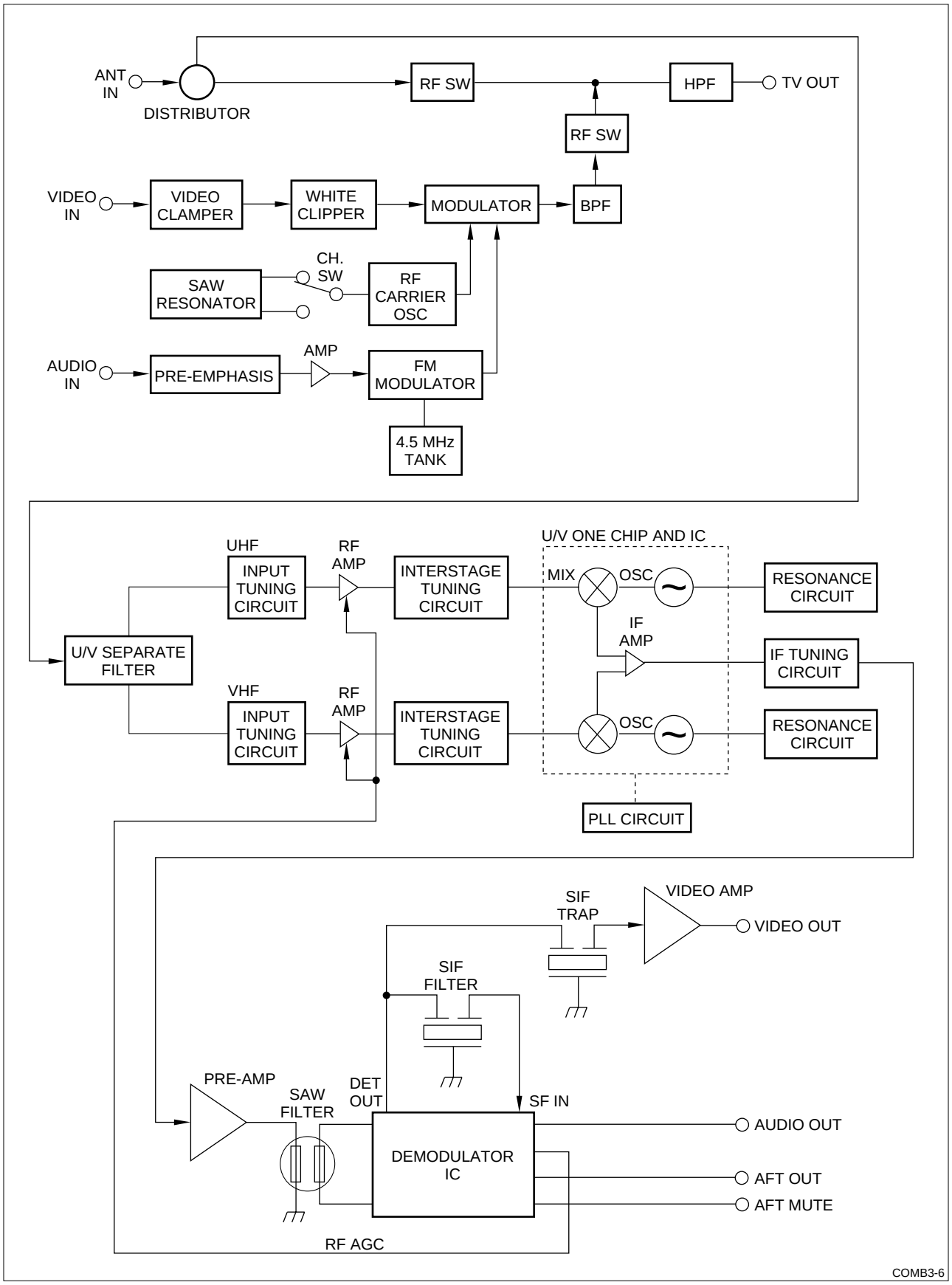


Figure 1. VT4T5UF2021 Block Diagram

ELECTRICAL CHARACTERISTICS

- Nominal Supply Voltage (TYP.)
  - BM: 5 V
  - BT: 33 V
  - BP: 5 V
  - B: 5 V
- Operating Voltage (TYP.)
  - BM: 5V ±0.2 V
  - BT: 33 V ±2.0 V
  - BP: 5 V ±0.5 V
  - B: 5 V ±0.5 V
  - Control: 5 V ±0.2 V
- Breakdown Voltage (MIN.)
  - BM: 5.5 V
  - BT: 34 V
  - BP: 5.5 V
  - B: 5.5 V
- Test Conditions (TYP.)
  - BM: 5 V
  - BT: 33 V
  - BP: 5 V
  - B: 5 V
  - Ambient Temperature 25°C ±5°C
  - Relative Humidity 65% ±10%
- Current Consumption (MAX.)
  - BM: 1.0 mA
  - BT: 5 mA
  - BP: 70 mA
  - B: 40 mA
- Temperature (TYP.)
  - Storage -20°C to +70°C
  - Operating -10°C to +60°C
- RF Output (Video System). Measured by standard demodulator input 1 Vp-p.
  - Modulation Factor 80% (TYP.), 80 ±5%
  - Differential Gain 2% (TYP.), 7% (MAX.)
  - Differential Phase 1.5° (TYP.), 8° (MAX.)
  - S/N Ratio 55 dB (TYP.), 48 dB (MIN.)
  - Frequency Characteristics 0 dB (TYP.), 0 ±3 dB
  - Change in Modulation Factor to APL 1% (TYP.), 5% (MAX.)
- RF Output (Audio System). Measured by standard demodulator input 1 kHz, 1.24 Vp-p sincurve.
  - Modulation Factor ±22.5 kHz (TYP.), ±22.5 kHz - ±5.5 kHz
  - Distortion Rate 0.3% (TYP.), 1% (MAX.)
  - S/N Ratio 56 dB (TYP.), 48 dB (MIN.)
  - Frequency Characteristics 0 dB (TYP.), 0 ±3 dB
- RF Output (Output System). Measured sync level at whilte 100% signal, input 1 Vp-p.
  - Video Carrier Center Frequency Accuracy ±10 kHz (TYP.), ±100 kHz (MAX.)
  - Sound Carrier Center Frequency Accuracy 4.5 MHz (TYP.), 4.5 MHz ±7 kHz
  - Video Carrier Output Level 66 dBµ (TYP.), 66 ±3 dBµ
  - P/S Ratio 16 dB (TYP.), 16 ±3 dB
- RF Output Spurious.
  - Specific Frequency 70 dB (TYP.), 60 dB (MIN.)
    - fp to fp + 4.5 MHz
  - Other Frequencies 50 dB (TYP.), 30 dB (MIN.)
    - 0 to 1 GHz (except fp ±4.6 MHz)
- RF Switch
  - Insertion Loss: 55 to 806 MHz
    - 4.0 dB (TYP.), 8.0 dB (MAX.)
  - Isolation: 61 to 72 MHz
    - 70 dB (TYP.), 60 dB (MIN.)
  - Return Loss: 61 to 72 MHz
    - 8.0 dB (TYP.), 4.0 dB (MIN.)
- RF Switch Operation (dBµ)
  - Terminal Number 4: RF OUT ← RF IN (TYP.)
  - +5 V: OFF
  - Open: ON
- Antenna Terminal Voltage
  - Modulator OSC Leakage 9.5 dBµ (MAX.)
  - Tuner OSC Leakage
    - Fundamental Wave 60 dBµ (MAX.)
    - Higher Harmonic 60 dBµ (MAX.)
- Noise Figure (UHF AIR)
  - Maximum 11 dB (TYP.), 16 dB (MAX.)
    - $\bar{X} = \Sigma xi/n$

      $S = \Sigma\sqrt{(Xi - x)^2/(n-2)}$, n = 10*
      (Tested channels including worst)
    - Shall satisfy the requirements stated in FCC NF Sampling Plan C (effective January, 1980)
    - Noise figure measurement shall be based on FCC OST 50 (effective January, 1980)
  - XIRS 11 dB (TYP.), 16 dB (MAX.)
    - $\bar{X} = \Sigma xi/n$

      $S = \Sigma\sqrt{(Xi - x)^2/(n-2)}$, n = 10*
      (Tested channels including worst)
    - Noise figure measurement shall be based on FCC OST 50 (effective January, 1980)

NOTE: *A representative tuner test shall be conducted on the following channels and on the worst channel found CH 14 through CH69: Ch14, 20, 26, 32, 38, 44, 50, 56, 62, and 69.

- Image Rejection
  - At -47 dBM Input
    - VHF Air: 65 dB (TYP.), 60 dB (MIN.)
    - VHF CATV: 60 dB (TYP.), 50 dB (MIN.)
    - UHF: 55 dB (TYP.), 45 dB (MIN.)
  - At -17 dBM: Input
    - VHF Air: 60 dB (TYP.), 50 dB (MIN.)
    - VHF CATV: 50 dB (TYP.), 40 dB (MIN.)
    - UHF: 50 dB (TYP.), 35 dB (MIN.)
- IF Rejection
  - At -47 dBM: Input
    - VHF Low: 60 dB (TYP.), 50 dB (MIN.)
    - VHF High: 100 dB (TYP.), 60 dB (MIN.)
    - UHF 100: dB (TYP.), 60 dB (MIN.)
  - At -17 dBM Input
    - VHF Low: 60 dB (TYP.), 45 dB (MIN.)
    - VHF High: 70 dB (TYP.), 50 dB (MIN.)
    - UHF: 70 dB (TYP.), 40 dB (MIN.)
- CB Rejection
  - SI: 50 dB (TYP.), 40 dB (MIN.)
  - Undesirable: 0.535 MHz to 30 MHz
    - -7 Input (MIN.)
  - Desirable: 55.25 MHz to 83.25 MHz (CH 2 to Ch 6)
    - -66 Input (MIN.)
- Specific Channel Rejection
  - Desirable 54 dBµ input; Undesireable 49 dbµ input
    - CH A-3 ← CH A-5: 60 dB (TYP.); 55 dB (MIN.)
    - CH 6 ← CH A-5: 55 dB (TYP.); 50 dB (MIN.)
    - CH A-5 ← CH A-5: 60 dB (TYP.); 50 dB (MIN.)
    - CHP 5 ← CHS 6: 55 dB (TYP.); 52 dB (MIN.)
    - CHP 5 ← CHP 6: 60 dB (TYP.); 45 dB (MIN.)
- Band Edge Tuning Margin
  - CH 2: -4.0 MHz (TYP.), -3.25 MHz (MIN.)
  - CH B: 3.0 MHz (TYP.), 2.0 MHZ (MIN.)
  - CH C: -4.0 MHz (TYP.), -3.25 MHz (MIN.)
  - CH W + 11: 3.0 MHz (TYP.), 2.0 MHz (MIN.)
  - CH W + 12: -5.0 MHz (TYP.), -3.25 MHz (MIN.)
  - CH 69: 5.0 MHz (TYP.), 2.0 MHz (MIN.)
- PLL AC Characteristics
  - Setting Up Enable: Tsuen 1 µs (MIN.)
  - Holding Enable: Thden 1 µs (MIN.)
  - Setting Up Data: Tsuda 1 µs (MIN.)
  - Holding Data: Thdda 1 µs (MIN.)
  - Clock Level High: Thicl 1 µs (MIN.)
  - Clock Level Low: Tlocl 1 µs (MIN.)
  - Clock Rate: Trate 10 µs (MIN.)
  - Signal Rising: Trise 1 µs (MIN.)
  - Signal Falling: Tfall 1 µs (MIN.)
- Picture Output.
  - Output Level (CH 10) 1 Vp-p (TYP.), 1 ±2 Vp-p
    - At 1 kΩ termination, fp 70 dBµ, white 100%
  - Differential Gain (CH 10) 5° (TYP.), 10° (MAX.)
    - fp 90 dBµ, Sterstep 80 IRE
  - Differential Phase (CH 10) 1° (TYP.), 10° (MAX.)
    - fp 90 dBµ, Sterstep 80 IRE
  - S/N ratio 47 dB (TYP.), 43 dB (MIN.)
    - fp 70 dBµ, White 100%, 100 kHz to 4.2 MHz filter, Sctrap On
  - Frequency Characteristics (CH 10), fp 70 dBµ, multi-burst
    - 1.0 MHz: 0 dB (TYP.), -3 to +3 dB
    - 2.0 MHz: 0 dB (TYP.), -3 to +3 dB
    - 3.0 MHz: -1.0 dB (TYP.), -4.5 dB to +2.5 dB
    - 3.58 MHz: -1.0 dB (TYP.), 0 dB to 6 dB
  - Synchronized Ratio (CH 10) 28.5% (TYP.), 23.6% to 33.6%
    - fp 70 dBµ, SMPTE color bar
- Sound Output (CH 10)
  - Output Level 480 mVrms (TYP.), 360 mVrms to 580 mVrms
    - fp 70 dBµ, SMPTE color bar 87.5% modulation, P/S 6 dB, fs 1 kHz, sin-curve 60% modulation, 75 µs pre-emphasis
  - Distortion Rate 0.5% (TYP.), 3.0% (MAX.)
  - S/N Ratio 52 dB (TYP.), 42 dB (MAX.)
  - Frequency Characteristics 0 dB (TYP.), 0 ±3 dB
  - AM Removal Level 45 dB (TYP.), 35 dB (MAX.)
- AFT Output
  - Output Voltage 2.5 V (TYP.), 1.75 V to 3.25 V
  - Frequency Accuracy 25 kHz (TYP.), 100 kHz (MAX.)

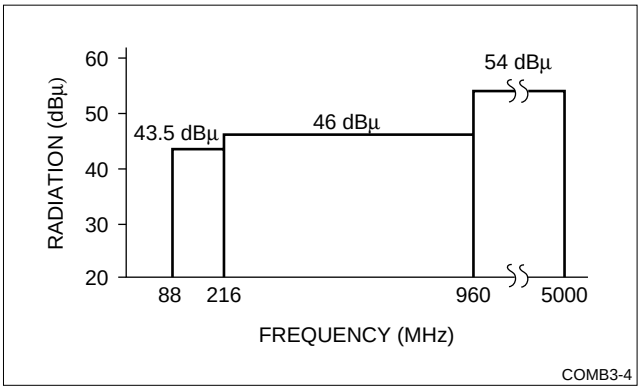
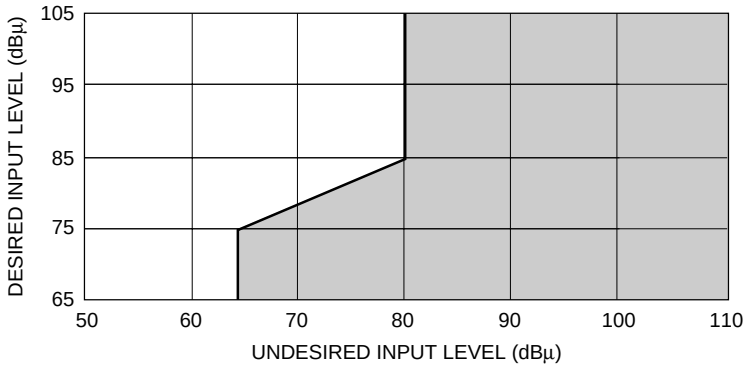


Figure 2. Radiation (3m Method)



NOTE: Input levels causing 1% cross modulation are shown in shaded area.

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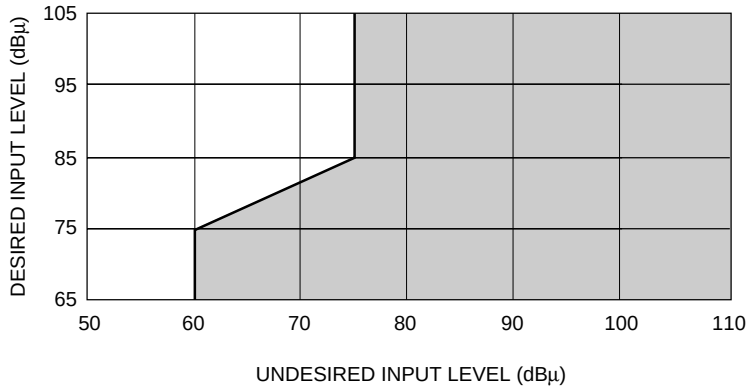
Figure 3. Cross Modulation Between Next and Adjacent Channels



NOTE: Input levels causing 1% cross modulation are shown in shaded area.

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Figure 4. Cross Modulation Between Adjacent Channels

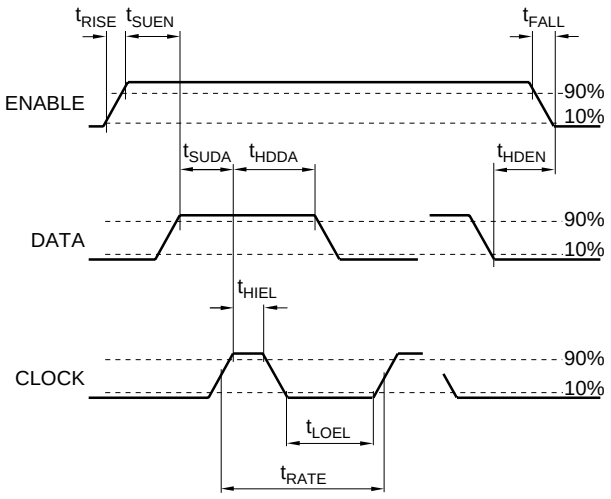

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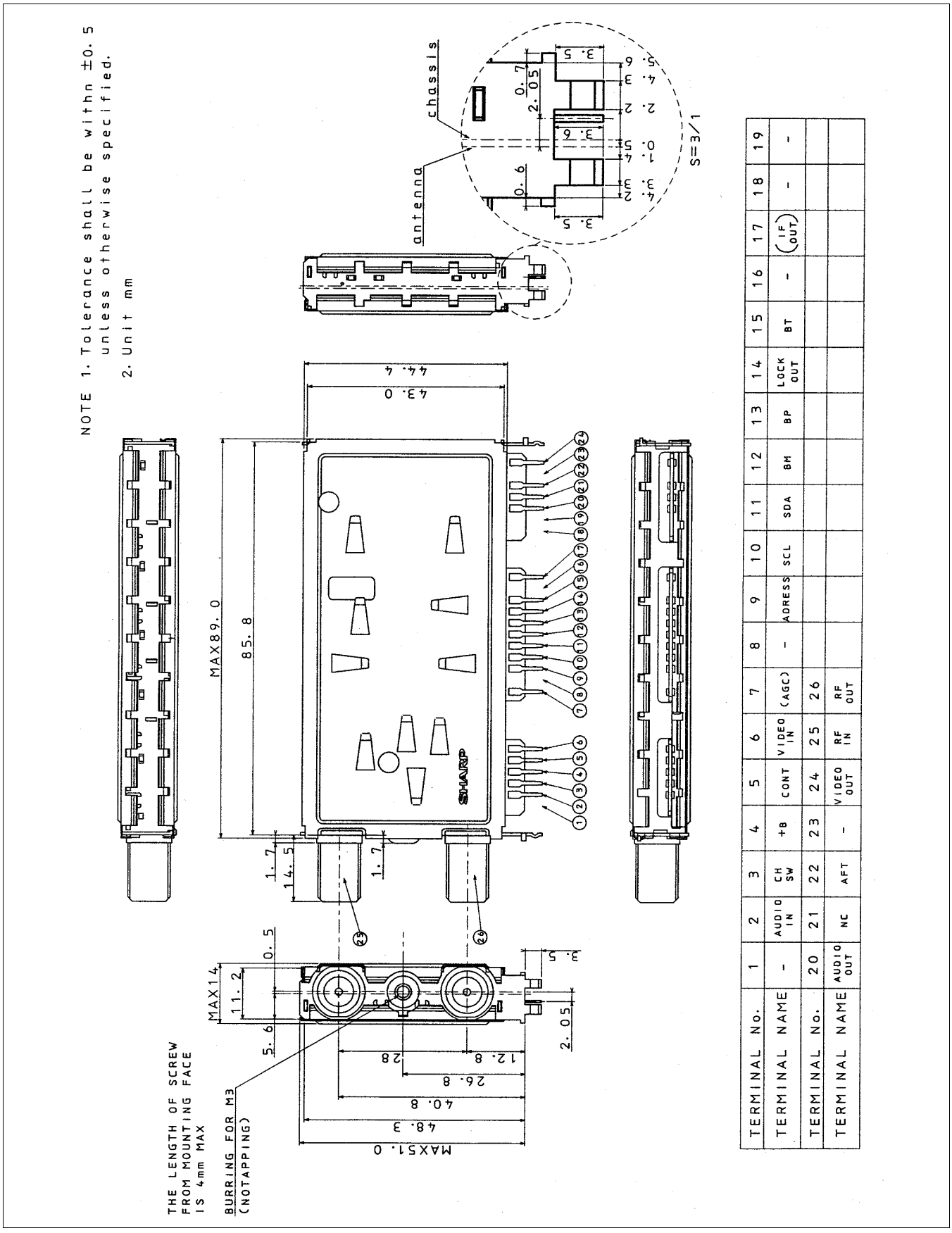
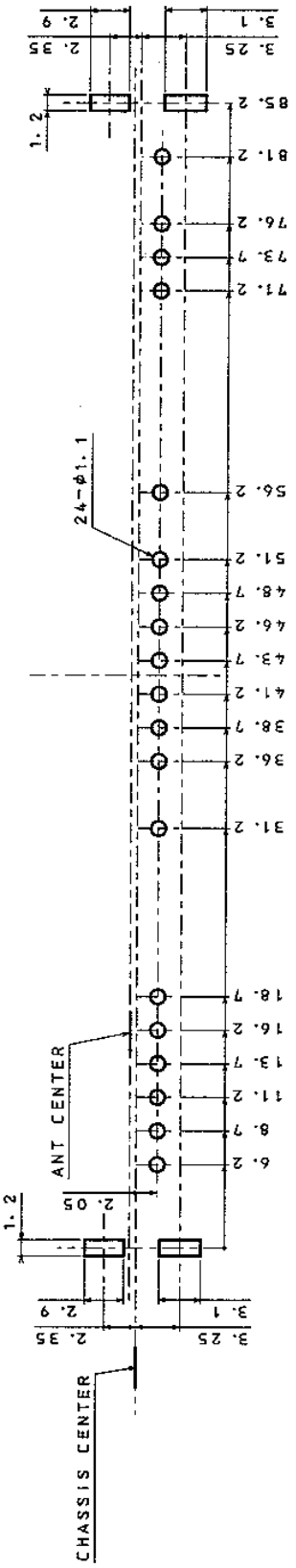
Figure 5. PLL AC Characteristics

OUTLINE DIMENSIONS



TERMINAL No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TERMINAL NAME	-	AUDIO IN	CH SW	+B	CONT	VIDEO IN	(AGC)	-	ADRESS	SCL	SDA	BM	BP	LOCK OUT	BT	-	(IF OUT)	-	-
TERMINAL No.	20	21	22	23	24	25	26												
TERMINAL NAME	AUDIO OUT	NC	AFT	-	VIDEO OUT	RF IN	RF OUT												



Tuner insertion hole.
(The drawing is as viewed
from the pattern side)

LIFE SUPPORT POLICY

SHARP components should not be used in medical devices with life support functions or in safety equipment (or similiar applications where component failure would result in loss of life or physical harm) without the written approval of an officer of the SHARP Corporation.

LIMITED WARRANTY

SHARP warrants to its Customer that the Products will be free from defects in material and workmanship under normal use and service for a period of one year from the date of invoice. Customer's exclusive remedy for breach of this warranty is that SHARP will either (i) repair or replace, at its option, any Product which fails during the warranty period because of such defect (if Customer promptly reported the failure to SHARP in writing) or, (ii) if SHARP is unable to repair or replace, refund the purchase price of the Product upon its return to SHARP. This warranty does not apply to any Product which has been subjected to misuse, abnormal service or handling, or which has been altered or modified in design or construction, or which has been serviced or repaired by anyone other than Sharp. The warranties set forth herein are in lieu of, and exclusive of, all other warranties, express or implied. ALL EXPRESS AND IMPLIED WARRANTIES, INCLUDING THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR USE AND FITNESS FOR A PARTICULAR PURPOSE, ARE SPECIFICALLY EXCLUDED. In no event will Sharp be liable, or in any way responsible, for any incidental or consequential economic or property damage.

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