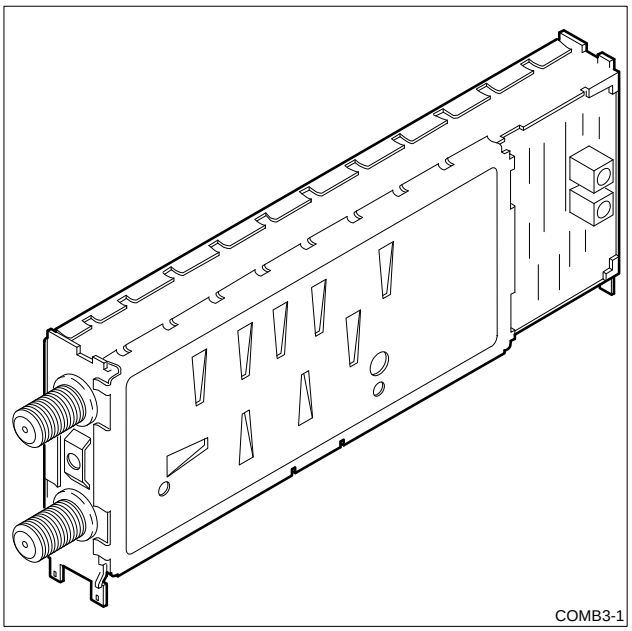
SHARP

RFSO7US3

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: 10 kΩ 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: 92 g ±10 g
- Applicable Standards:
  - EIA Standard No. 544
  - EIA Standard No. 16A
  - FCC Standards
  - UL Standard



FUNCTIONAL DESCRIPTION

The RFSO7US3 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 3-wire 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.

FUNCTIONAL DESCRIPTION (cont'd)

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 Volts 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 AFT Mute function is available as well. The AGC control line from the demodulator to the tuner is not accessible to the system designer.

For additional specific information on programming the PLL and system interface suggestions, refer to the Application Note "VTSS, RFSO/SP Series PLL Electronic Tuners."

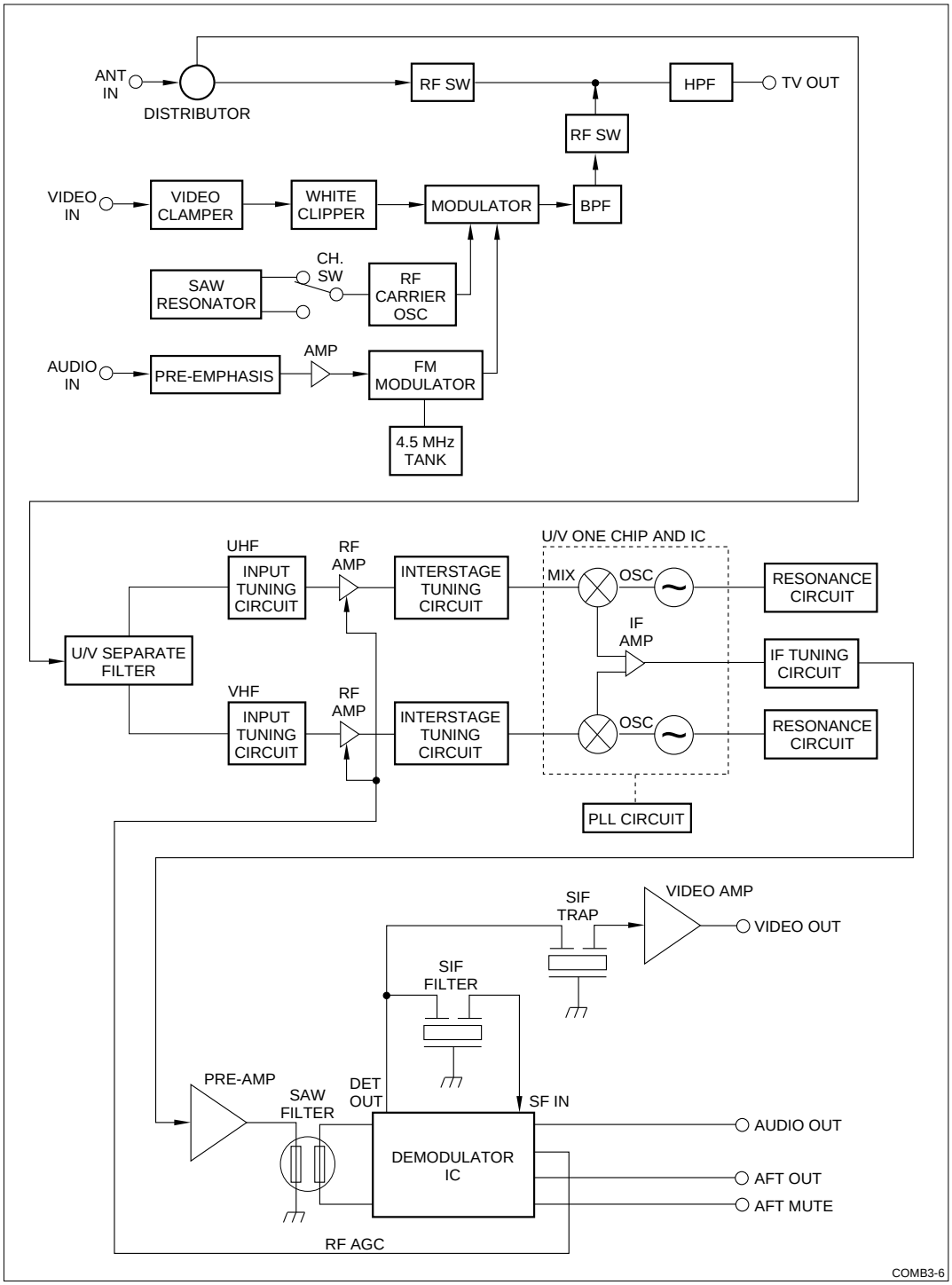


Figure 1. RFSO7US3 Block Diagram

ELECTRICAL CHARACTERISTICS

ITEM	TYPICAL	LIMITS	REMARKS
Nominal Supply Voltages			
BM	5 V		
BT	31 V		
BP	5 V		
B	12 V		
Operating Voltage			
BM	5 V ±0.2 V		
BT	31 V ±2.0 V		
BP	5 V ±0.5 V		
B	12 V ±0.5 V		
Control	5 V ±0.2 V		
Breakdown Voltage			
BM	6 V (minimum)		
BT	34 V (minimum)		
BP	6 V (minimum)		
B	13.2 V (minimum)		
Test Conditions			
BM	5 V		
BT	31 V		
BP	5 V		
B	12 V		
Ambient Temperature	25°C ±5°C		
Relative Humidity	65% ±10%		
Current Consumption			
BM	35 mA (maximum)		
BT	5 mA (maximum)		
BP	86 mA (maximum)		
B	190 mA (maximum)		
Temperature			
Storage	–20 to 75°C		
Operating	–10 to 60°C		
RF Output (Video System)			
Modulation Factor	80%	80 ±5%	Measured by standard demodulator Input 1 Vp-p
Differential Gain	2%	7% (maximum)	
Differential Phase	1.5°	8° (maximum)	
S/N Ratio	55 dB	48 dB (minimum)	
Frequency Characteristics	0 dB	0 ±3 dB	
Change in Modulation Factor to APL	1%	3% (maximum)	
RF Output (Audio System)			
Modulation Factor	±22.5 kHz	±22.5 kHz ±5.5 kHz	Measured by standard demodulator Input 1 kHz, 1.24 Vp-p sincurve
Distortion Rate	0.3%	1% (maximum)	
S/N Ratio	56 dB	48 dB (minimum)	
Frequency Characteristics	0 dB	0 ±3 dB	

ELECTRICAL CHARACTERISTICS (cont'd)

ITEM	TYPICAL	LIMITS	REMARKS
RF Output (Output System)			
Video Carrier Center Frequency Accuracy	±10 kHz	±100 kHz (maximum)	Measured sync level at white 100% signal, input 1 Vp-p
Sound Carrier Center Frequency Accuracy	4.5 MHz	4.5 MHz ±7 kHz	
Video Carrier Output Level	66 dBµ	66 ±3 dBµ	
P/S Ratio	16 dB	16 ±3 dB	
RF Output Spurious (dB)			
Specific Frequency	70 dB	65 dB (minimum)	fp to fp + 4.5 MHz
Other Frequencies	50 dB	30 dB (minimum)	0 to 1 GHz (except fp ±4.6 MHz)
RF Switch (dB)			
Insertion Loss – 55 to 806 MHz	3.0	6.5 (maximum)	
Isolation – 61 to 72 MHz	70	60 (minimum)	
Return Loss – 61 to 72 MHz	8.0	4.0 (minimum)	
RF Switch Operation (dBµ)			
Terminal No. 4	RF OUT ← RF IN		
+5 V	OFF		
Open	ON		
Antenna Terminal Voltage (dBµ)			
Modulator OSC Leakage		9.5 (maximum)	
Tuner OSC Leakage			
Fundamental Wave		60 (maximum)	
Higher Harmonic		60 (maximum)	
Noise Figure (UHF AIR) (dB)			
Maximum	10	16 (maximum)	• $\overline{X} = \Sigma xi/n$ $S = \Sigma\sqrt{(Xi - x)^2/(n-1)}$, 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) * A representative tuner test shall be conducted on the following channels and on the worst channel found CH 14 through CH 69: CH 14, 20, 26, 32, 38, 44, 50, 56, 62, and 69
XIRS	10	16(maximum)	
Image Rejection (dB)			
At –47 dBm Input			
VHF Air	70	60(minimum)	
VHF CATV	60	50(minimum)	
UHF	60	45(minimum)	
At –17 dBm Input			
VHF Air	60	50(minimum)	
VHF CATV	50	40(minimum)	
UHF	50	40(minimum)	

ELECTRICAL CHARACTERISTICS (cont'd)

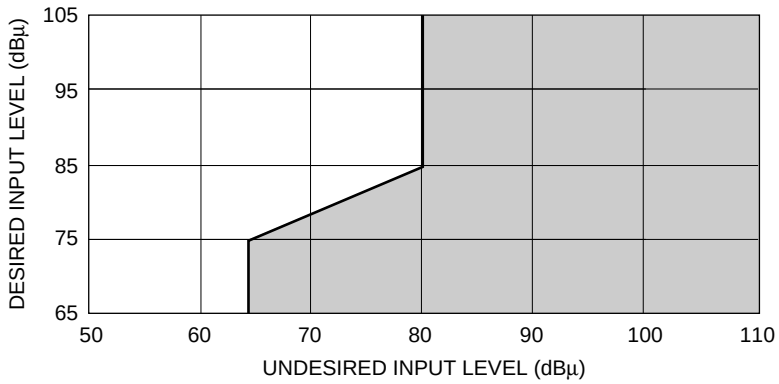
ITEM	TYPICAL	LIMITS	REMARKS
IF Rejection (dB)			
At –47 dBm Input			
VHF Low	80	55 (minimum)	
VHF High	90	60 (minimum)	
UHF	85	60 (minimum)	
At –17 dBm Input			
VHF Low	60	45 (minimum)	
VHF High	70	50 (minimum)	
UHF	65	40 (minimum)	
CB Rejection (dB)			
SI	50	40 (minimum)	
Undesirable: 0.535 MHz to 30 MHz		–7 input (minimum)	
Desirable: 55.25 MHz to 83.25 MHz (CH 2 to CH 6)		–66 input (minimum)	
Specific Channel Rejection (dB)			
D UD			Undesirable: 49 dBµ input Desirable: 54 dBµ input
CH A-3 ← CH A-5	60	55 (minimum)	
CH 6 ← CH A-5	55	50 (minimum)	
CH A-5 ← CH A-5	60	50 (minimum)	
CHP 6 ← CHS 6	55	52 (minimum)	
CHP 5 ← CHP 6	60	45 (minimum)	
Cross Modulation Between Next Adjacent Channels			See Figure 2
Cross Modulation Between Adjacent Channels			See Figure 3
Band Edge Tuning Margin (MHz)			
CH 2	–4.0	–3.25 (minimum)	
CH B	3.0	2.0 (minimum)	
CH C	–4.0	–3.25 (minimum)	
CH W + 11	3.0	2.0 (minimum)	
CH W + 12	–5.0	–3.25 (minimum)	
CH 69	5.0	2.0 (minimum)	
Radiation (3m Method)			See Figure 4
PLL Data			
Bit 1 – UHF			Frequency step: 62.5 kHz Crystal oscillator frequency: 4 MHz
Bit 2 – Dummy (FM Trap)			
Bit 3 – VHF High			
Bit 4 – VHF Low			
Bits 5 to 13 – Main Counter			
Bits 14 to 19 – Swallow Counter			
PLL AC Characteristics			
Setting Up Enable – Tsuen		1 µS (minimum)	See Figure 5
Holding Enable – Thden		1 µS (minimum)	
Setting Up Data – Tsuda		1 µS (minimum)	
Holding Data – Thdda		1 µS (minimum)	
Clock Level High – Thicl		1 µS (minimum)	

ELECTRICAL CHARACTERISTICS (cont'd)

ITEM	TYPICAL	LIMITS	REMARKS
PLL AC Characteristics (cont'd)			
Clock Level Low – Tlocl		1 µS (minimum)	See Figure 5
Clock Rate – Trate		10 µS (minimum)	
Signal Rising – Trise		1 µS (minimum)	
Signal Falling – Tfall		1 µS (minimum)	
Picture Output			
Output Level (CH 10)	2 Vp-p	2 ±0.4 Vp-p	At 1kΩ termination, fp 70 dBµ, White 100%
Differential Gain (CH 10)	3%	16% (maximum)	fp 90 dBµ, Sterstep 80 IRE
Differential Phase (CH 10)	3°	16° (maximum)	fp 90 dBµ, Sterstep 80 IRE
S/N Ratio (dB)	48	43 (minimum)	fp 70 dBµ, White 100%, 100 kHz to 4.2 MHz filter, Sctrap On
Frequency Characteristics (CH10) (dB)			
1.0 MHz	–0.5	–3 to +2	fp 70 dBµ, multi-burst
2.0 MHz	–0.5	–3 to +2	
3.0 MHz	–1.0	–6 to +0.5	
3.58 MHz	–2.3	–6 to +0.5	
Synchronization Ratio (CH 10)	28.5%	23.6 to 33.6%	fp 70 dBµ, SMPTE color bar
Sound Output			fp 70 dBµ, SMPTE color bar 87.5% modulation, P/S 6 dB, fs 1 kHz, sin-curve 60% modulation, 75 µs pre-emphasis
Output level (CH 10)	250 mVrms	180 to 320 mVrms	
Distortion Rate (CH 10)	0.5%	3.0% (maximum)	
S/N Ratio (CH 10)	48 dB	42 dB (maximum)	
Frequency Characteristics (CH 10)	0 dB	0 ±3 dB	
AM Removal Level (CH 10)	45 dB	35 dB (maximum)	
AFT Output			
Output Voltage	0.5 to 11.5	1.0 to 11.0	Center 6 V
Frequency Accuracy	25 kHz	100 kHz (maximum)	
Breakdown Static Voltage (V)			
1 – Audio In		±400 (minimum)	150 pF, 150 Ω, 10 times each
2 – CH SW		±400 (minimum)	
3 – BM (5 V)		±150 (minimum)	
4 – Control		±400 (minimum)	
5 – Video In		±400 (minimum)	
6 – BP (5 V)		±150 (minimum)	
7 – BT (31 V)		±400 (minimum)	
8 – Clock		±400 (minimum)	
9 – Data		±400 (minimum)	
10 – Enable		±400 (minimum)	
11 – (Lock)		±400 (minimum)	
12 – (IF)		±400 (minimum)	

ELECTRICAL CHARACTERISTICS (cont'd)

ITEM	TYPICAL	LIMITS	REMARKS
Breakdown Static Voltage (V) (cont'd)			
13 – B (12 V)		±150 (minimum)	150 pF, 150 Ω, 10 times each
14 – Audio Out		±400 (minimum)	
15 – GND		–	
16 – AFT		±400 (minimum)	
17 – Mute		±400 (minimum)	
18 – Video Out		±400 (minimum)	
19 – RF In		±5000 (minimum)	
20 – RF Out		±5000 (minimum)	



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

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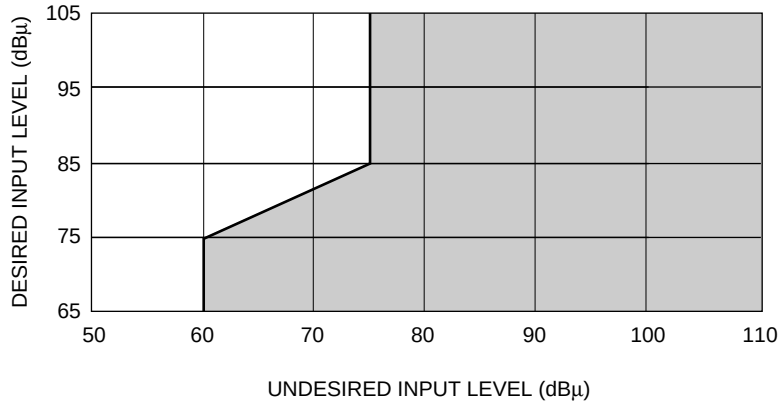
Figure 2. Cross Modulation Between Next Adjacent Channels



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

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Figure 3. Cross Modulation Between Adjacent Channels

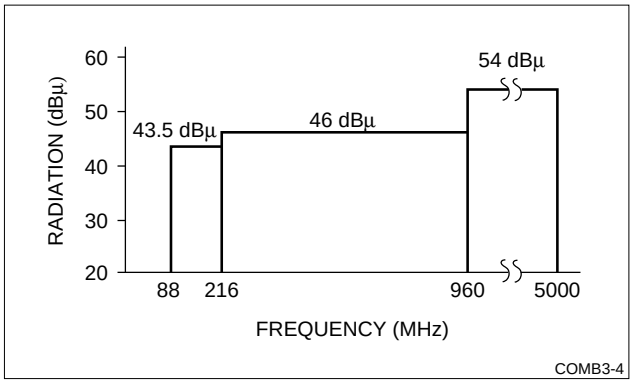


Figure 4. Radiation (3m Method)

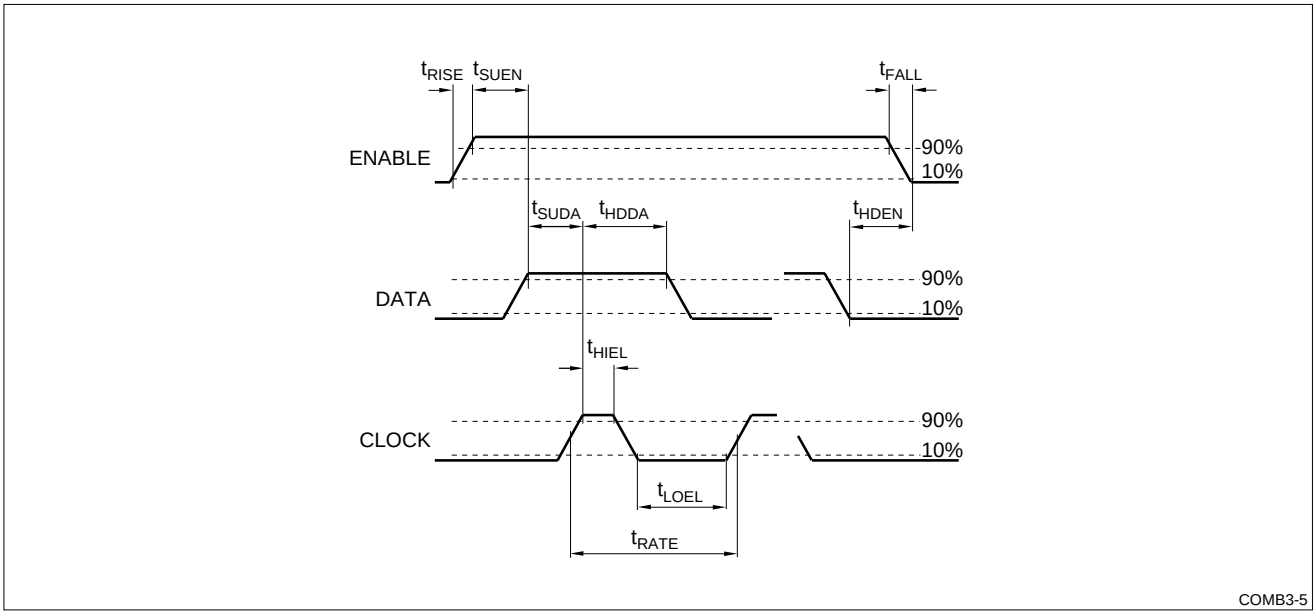
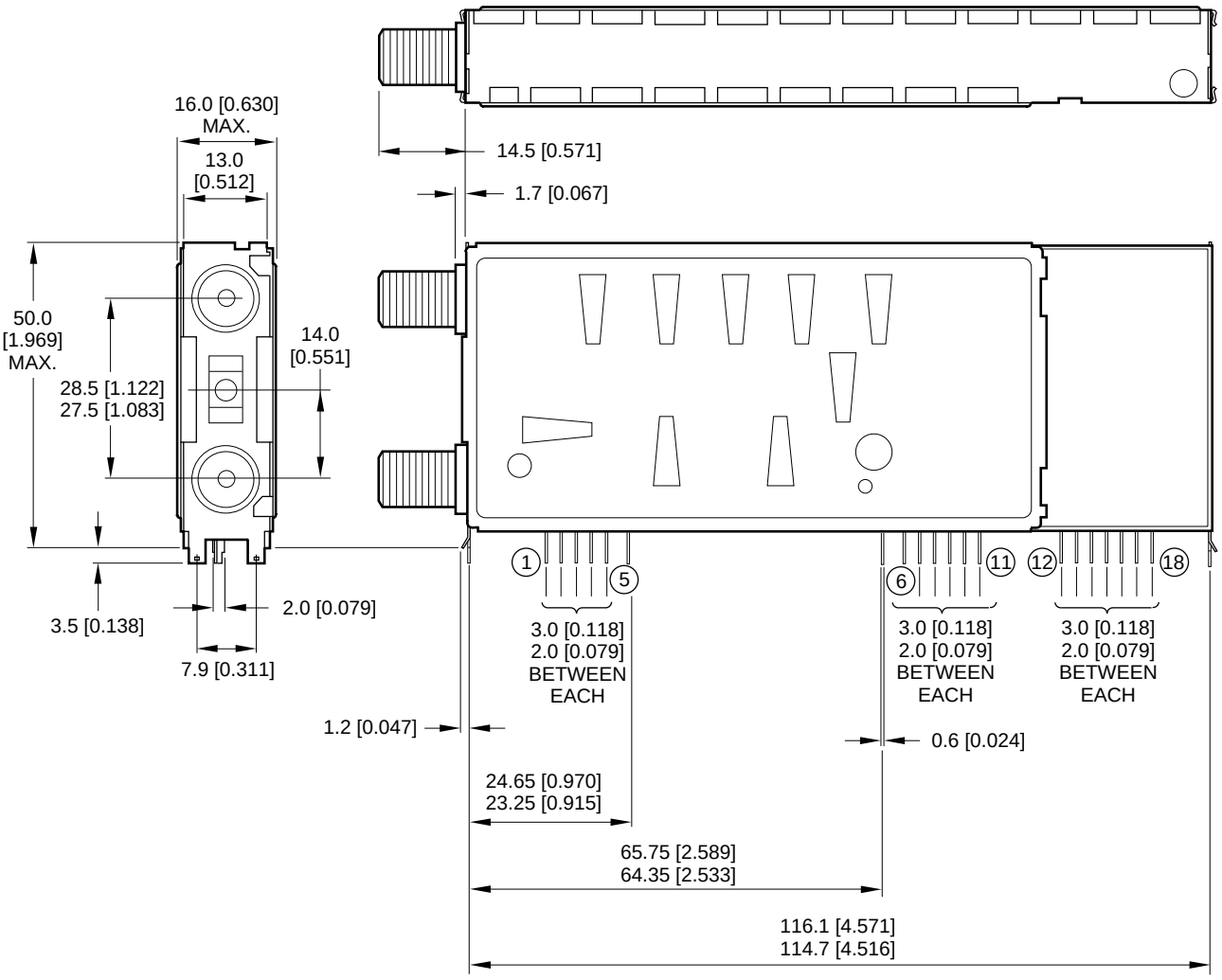


Figure 5. PLL AC Characteristics

OUTLINE DIMENSIONS



NO.	NAME	VOLT.	NO.	NAME	VOLT.
①	AUDIO IN	—	⑩	ENABLE	—
②	CH SW	+5	⑪	(LOCK)	—
③	BM	—	⑫	(IF)	—
④	CONTROL	—	⑬	B	+12
⑤	VIDEO IN	—	⑭	AUDIO OUT	—
⑥	BP	+5	⑮	GND	—
⑦	BT	+31	⑯	AFT	—
⑧	CLOCK	—	⑰	MUTE	—
⑨	DATA	—	⑱	AUDIO OUT	—

NOTE: DIMENSIONS IN MM [INCHES] $\frac{\text{MAXIMUM LIMIT}}{\text{MINIMUM LIMIT}}$

COMBM3