

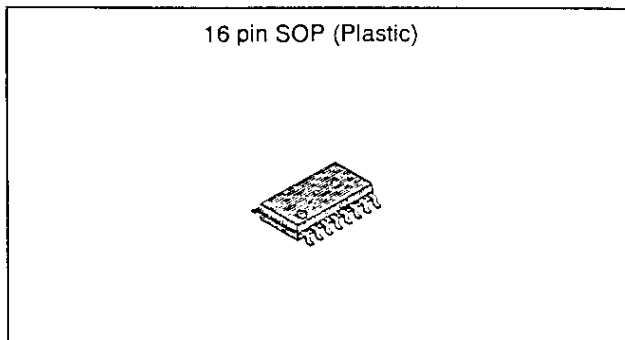
**UHF-Band RF Modulator for VCRs**

**Description**

The CXA1433M is a UHF-band RF modulator which converts the frequency of audio and video signals. Some circuits which comprise this IC are a UHF oscillator video clamp, white clip, video modulator, audio FM modulator, test pattern signal generator, and an intercarrier SW.

**Features**

- Low voltage of 5V.
- Wide bandwidth 470 to 630MHz.
- Few external element due to on-chip UHF oscillator.
- Sharp white clip circuit.
- Tolerance to power supply fluctuations provided by on-chip regulator.
- 0.5Vp-p video input allows general use.
- On-chip MIXER simplifies RF unit design.
- Picture/sound ratio can be adjusted through an external capacitor.
- On-chip test pattern generator.
- On-chip intercarrier SW.



**Structure**

Bipolar silicon monolithic IC

**Applications**

PAL format VCR

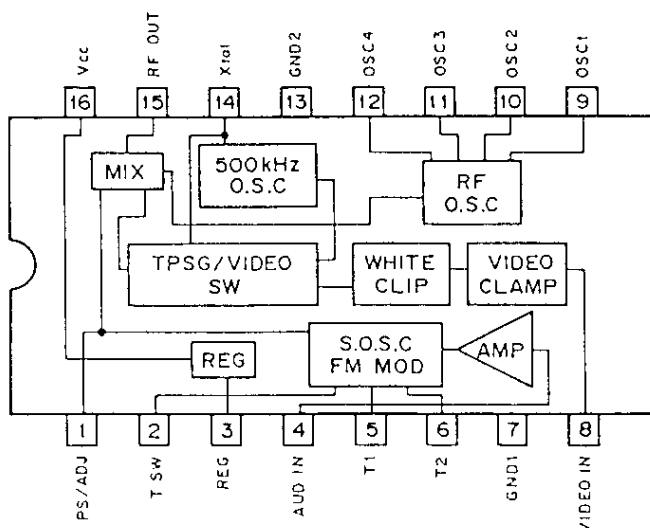
**Absolute Maximum Ratings (Ta=25°C)**

- Supply voltage Vcc 7 V
- Operating temperature Topr -20 to +75 °C
- Storage temperature Tstg -55 to +150 °C
- Allowable power dissipation Pd 700 mW

**Recommended Operating Conditions**

Supply voltage Vcc 4.5 to 5.5 V

**Block Diagram**



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Pin Description and Equivalent Circuits

Pin No.	Symbol	Voltage (Typ.)	Equivalent circuit	Description
1	P/S ADJ	1.8		<p>P/S adjustment (Adding a capacitor between Pin 1 and GND increases P/S ratio).                      Video modulation depth adjustment (Adding a resistor between Pin 1 and GND increases the modulation depth; adding a resistor between Pins 1 and 3 decreases the modulation depth).</p>
2	T <sub>1</sub> /T <sub>2</sub> SW	2.3		<p>T<sub>1</sub>/T<sub>2</sub> switch.                      T<sub>1</sub> selected when pin at GND.                      T<sub>2</sub> selected when pin OPEN.</p>
3	REG OUT	3.95		<p>Regulator output.</p>
4	AUDIO IN	0		<p>Audio input.</p>
5 6	TANK	3.1		<p>Audio tank coil connection.</p>

Pin No.	Symbol	Voltage (Typ.)	Equivalent circuit	Description
7	GND1			Audio GND.
8	VIDEO IN	2.6		Video input.
9 10 11 12	OSC	2.6 1.9 1.9 2.6		UHF OSC pins.
13	GND2			Video GND.
14	TPSG SW	1.8		Xtal connection. TPSG set OFF when pin at GND.
15	RF OUT	3.6		RF output (Output for AM modulated Video and FM signals).
16	Vcc	5.0		Vcc power supply.

## Electrical Characteristics 1

Refer to Electrical Characteristics Test Circuit  
(Ta=25°C, Vcc=5V, fp=590MHz)

Item	Symbol	Test conditions	Min.	Typ.	Max.	Unit
Supply current	Icc	V <sub>1</sub> (VIDEO IN), V <sub>2</sub> (AUDIO IN) at no signal	37	47	58	mA
Video output level	V <sub>o</sub>		76.4	79.2	82.0	dB μV
Video modulation depth	mp	White signal input, V <sub>1</sub> =0.5Vp-p	66.0	77.0	85.0	%
Maximum video modulation depth (During limiter operation)	mp (Max)	V <sub>1</sub> =1.0Vp-p, WHITE signal input, mp=80% during modulation (Note 2)	89.5	94.4	98.0	%
Chroma beat	V <sub>cb</sub>	V <sub>1</sub> : 4.43MHz sine wave input (Note 6), P/C=18dB	68.0	78.0	—	dB
Sync crush level	Δ Sync	V <sub>1</sub> =0.5Vp-p, WHITE signal input, Δ Sync=(1 - $\frac{S}{W} \cdot \frac{10}{4}$ ) × 100	0	3.5	8	%
Differential gain	DG	STAIR STEP signal input when adjusted for mp=80%, V <sub>1</sub> =0.5Vp-p (Note 3)	0	4.2	7	%
Differential phase	DP	STAIR STEP signal input when adjusted for mp=80%, V <sub>1</sub> =0.5Vp-p (Note 3)	-7	-1	+7	deg
Video 2nd-harmonic wave ratio	V <sub>vh</sub>	V <sub>1</sub> =0.5Vp-p, 1MHz sine wave input (Note 4)	46	50	—	dB
PS ratio	V <sub>ps</sub>	V <sub>1</sub> =no input signal, fs=5.5MHz	10.7	13.2	15.7	dB
Audio FM modulation sensitivity	β S1 (T1)	V <sub>2</sub> =100mVp-p, 1kHz sine wave input, fs frequency change per 0.1V (Note 7) fs=5.5MHz	0.425	0.497	0.56	kHz/mV
	β S2 (T2)		0.400	0.471	0.53	
Audio distortion	THD	V <sub>2</sub> =1kHz sine wave input (Note 5)	0	0.4	1	%
Audio S/N	ASN	V <sub>2</sub> =1kHz sine wave input, 0dB defined at 60kHz dev and fs=5.5MHz, V <sub>1</sub> =STAIR STEP signal input (rms measurement)	45	56	—	dB
Maximum audio FM modulation depth	ms (Max)	V <sub>2</sub> =1Vp-p, 1kHz sine wave input (T1), fs frequency change per 100kHz×100	410	463	510	%
Audio 2nd- harmonic wave ratio	V <sub>s2</sub>	Difference between video carrier (V <sub>1</sub> =no input) and 2nd-harmonic wave.	46.5	51	—	dB
TPSG synchronization period	TMtp	S <sub>1</sub> OFF	62	64	66	μsec
TP-VIDEO video modulation depth difference	Mtp	S <sub>1</sub> OFF: for adjustment mp=80% and TP modulation depth-80%	-19	-10	5	%
Supply current when TPSG is ON	Icc Ton	S <sub>1</sub> OFF	39	52	66	mA

**Classification according to difference in audio modulation sensitivity (T1, fs=5.5MHz)**

CXA1433M-1	0.465 to 0.520	kHz/mV
CXA1433M-2	0.425 to 0.475	kHz/mV
CXA1433M-3	0.510 to 0.560	kHz/mV

**Electrical Characteristics 2** (Design security items: This parameter is not 100% tested.)

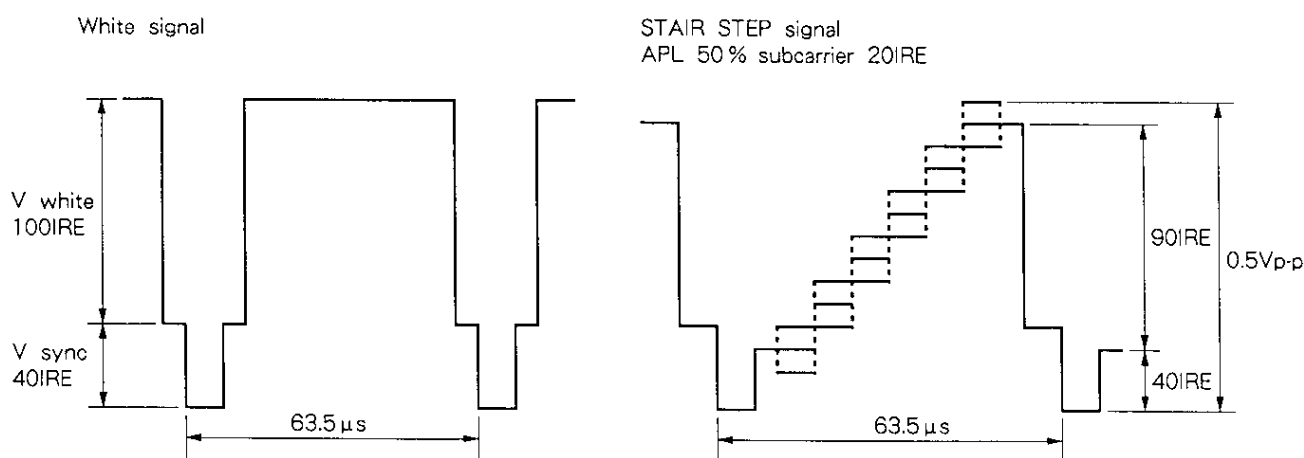
1. Video S/N	MIN 49.5dB TYP 52dB
2. Video amplitude frequency characteristics (0dB at 1MHz)	Within $\pm 1$ dB at $-1.25$ to $5$ MHz
3. APL variation (Normalized to APL50%)	Within $\pm 2\%$ at APL10 to 90%
4. Mode within bandrange	$-70$ dB and below
5. Pin 4 input impedance	$1M\Omega$ and above
6. Pin 8 input impedance	$1M\Omega$ and above

**Notes)**

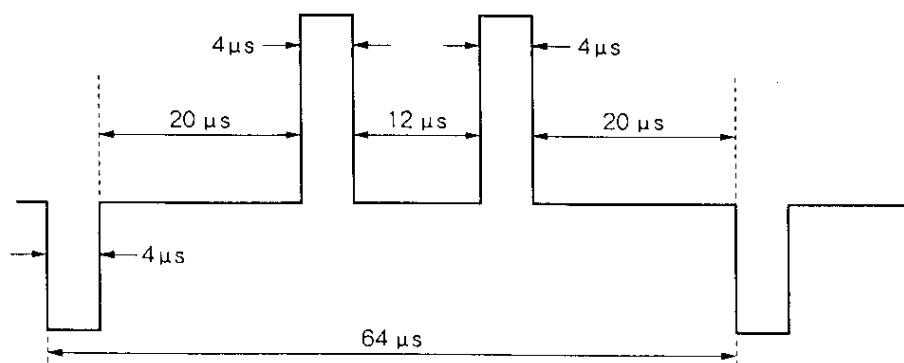
1. Spectrum analyzer with  $50\Omega$  input impedance should be used to test video output level. Measured value  $V_o$  (dBm) is used to calculate output according to following relationship:  

$$\text{Output (dB}\mu\text{)} = V_o \text{ (dBm)} + 107 \text{ } 50\Omega \text{ terminal direct reading value}$$
2. The maximum video modulation depth can be measured by setting the VIDEO input to  $1.0V_{p-p}$  when the video modulation depth adjusted to 80%.
3. Measured after demodulation by standard demodulator.
4.  $f_c + 2\text{MHz}$  component of  $V_1$  carrier ( $f_c$ ) level.
5. Adjust the  $V_2$  level to obtain an FM deviation of  $\pm 30\text{kHz}$  and measure the harmonic distortion after demodulating  $V_o$  with a standard demodulator.
6. Value determined by measuring ratio (dB) of chroma beat to video carrier level when  $V_1 = \text{no signal}$  by spectrum analyzer.
7. R3 ( $10k\Omega$ ) of the Electrical Characteristics Test Circuit is added for obtaining a better match between the audio modulation classifications and the actual pre-emphasis.

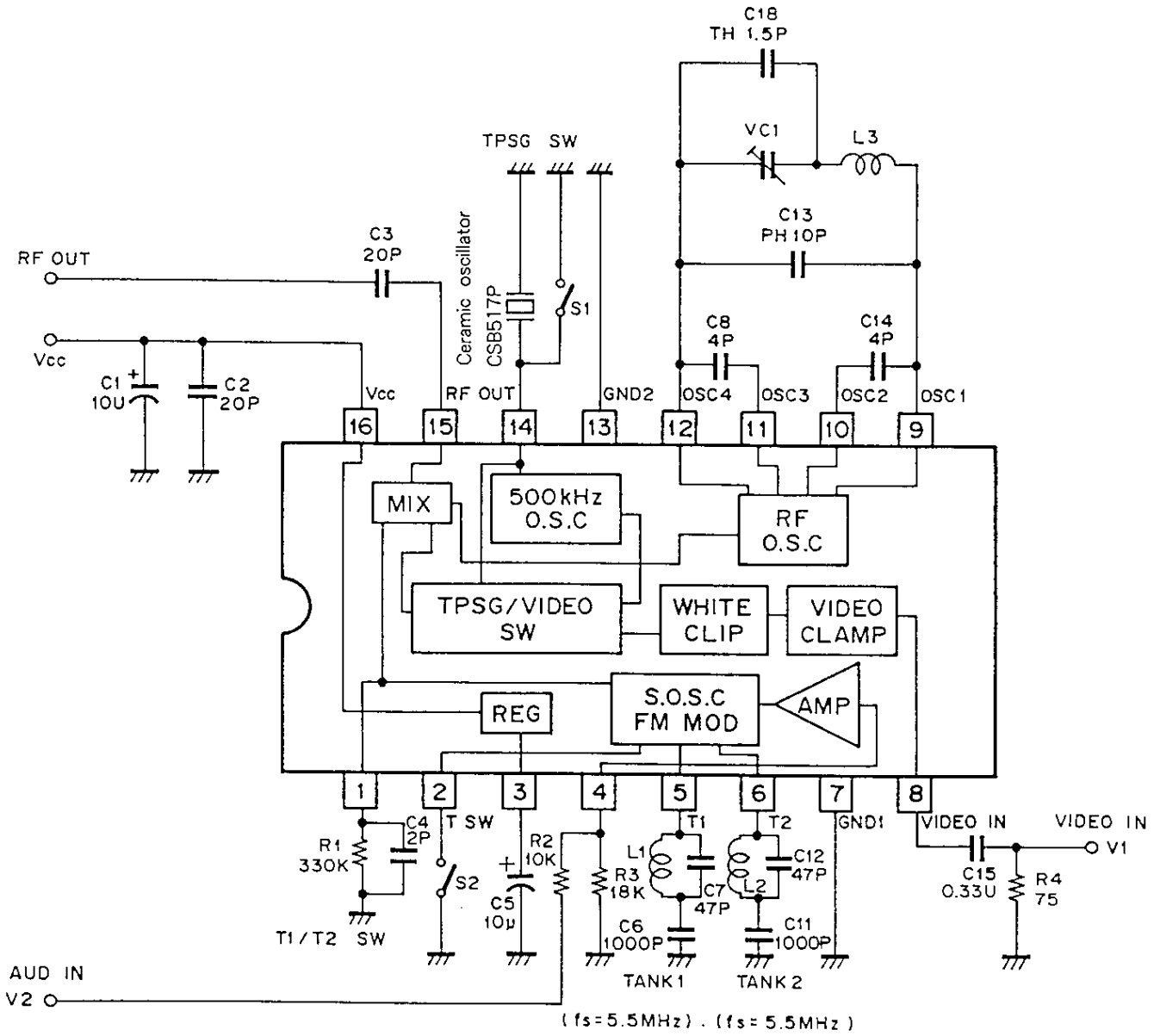
**Input Waveform**



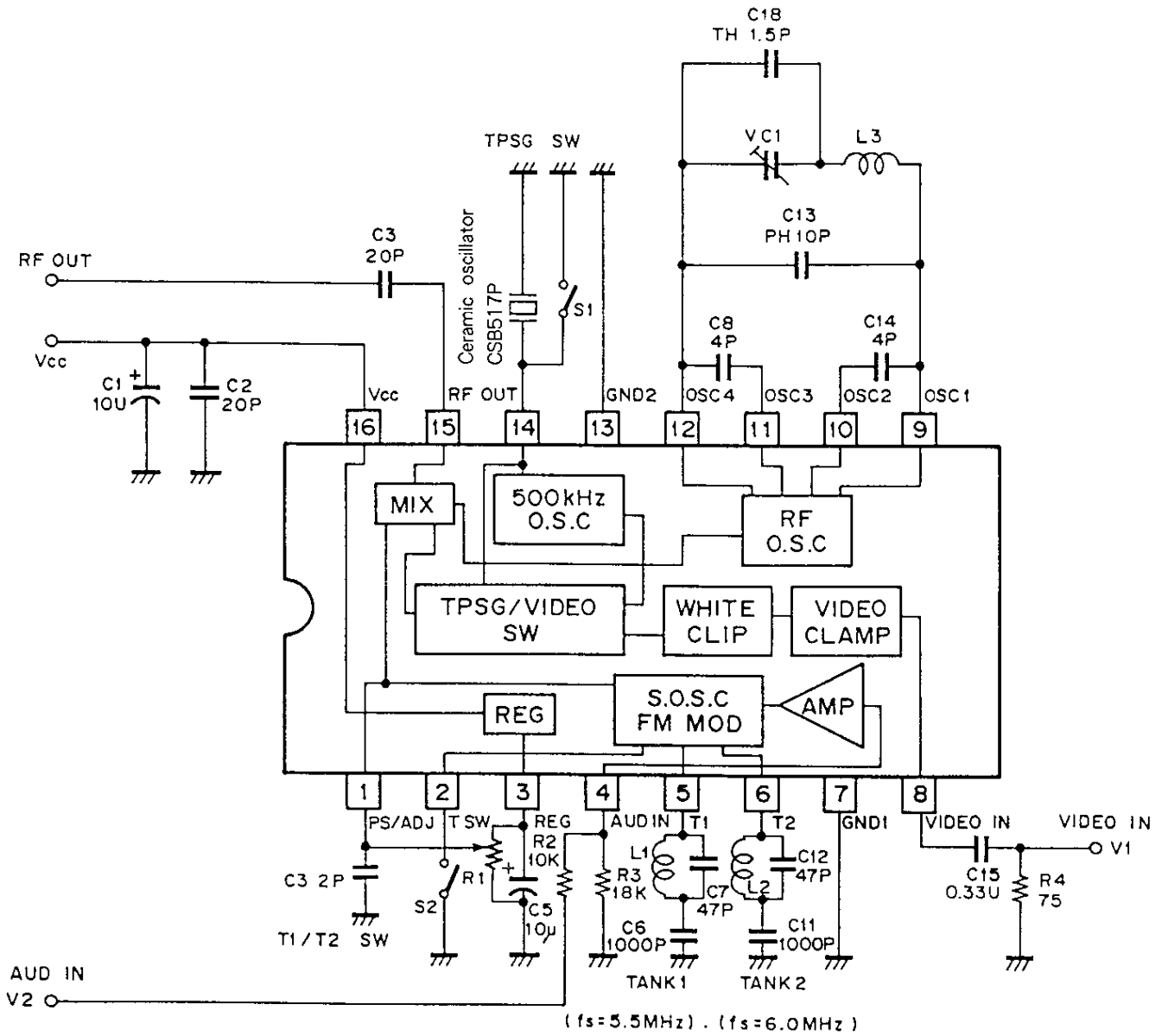
**TPSG Waveform**



Electrical Characteristics Test Circuit



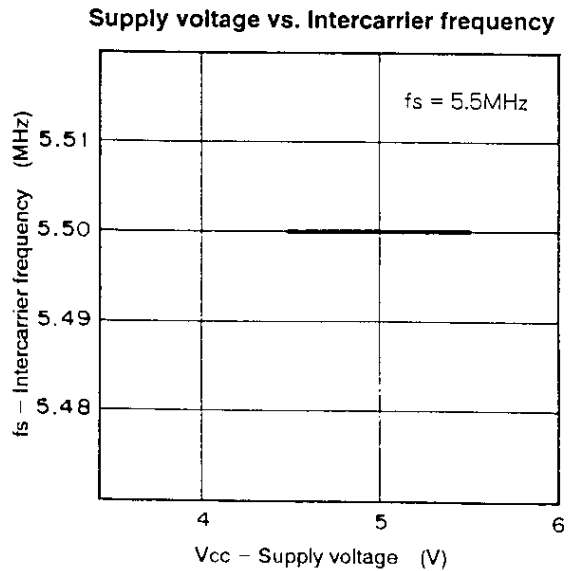
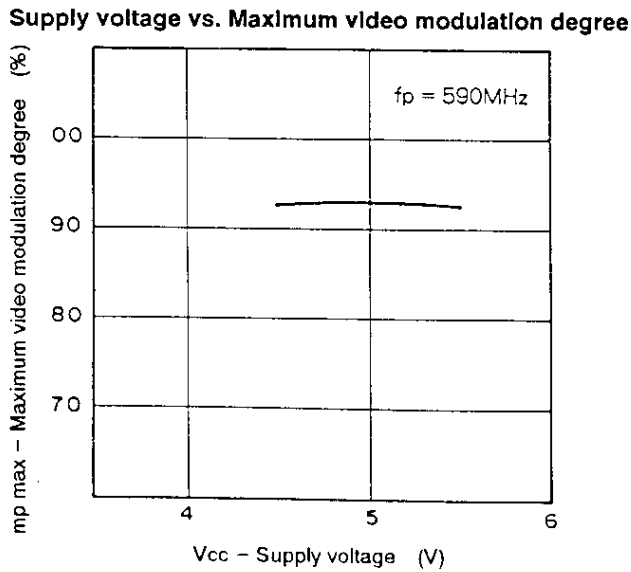
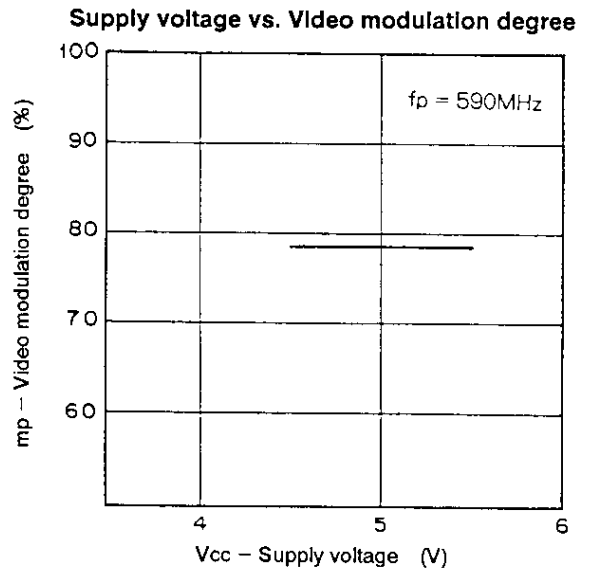
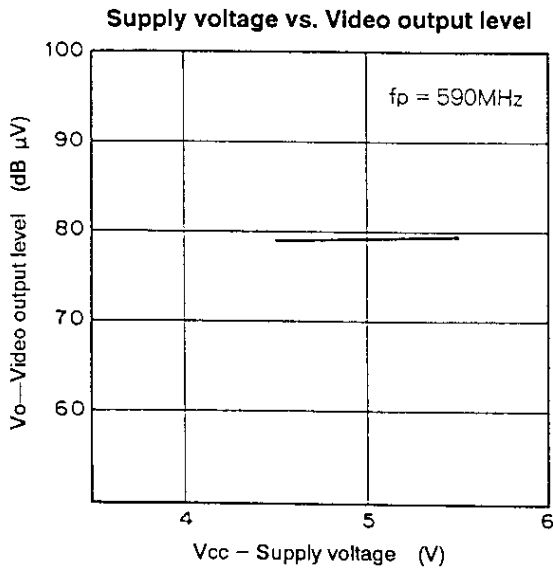
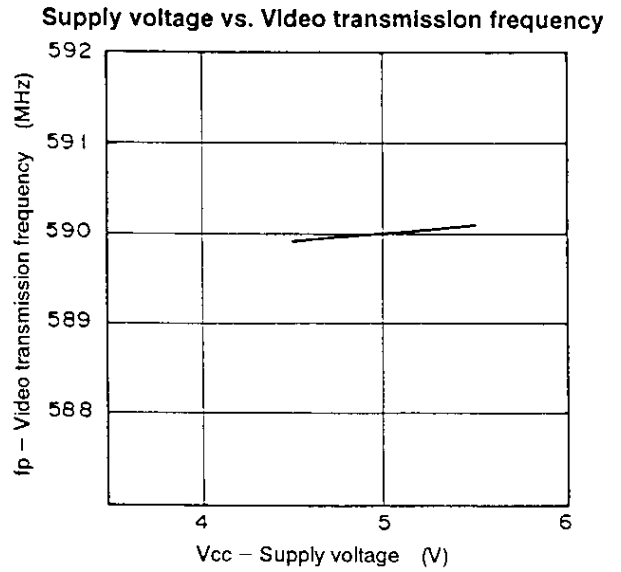
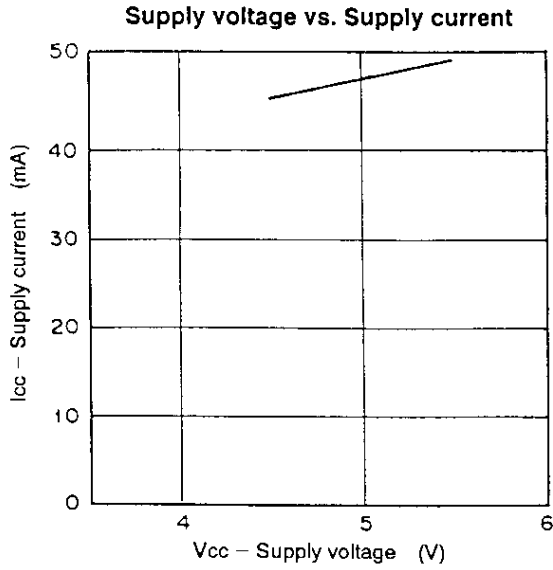
Application Circuit



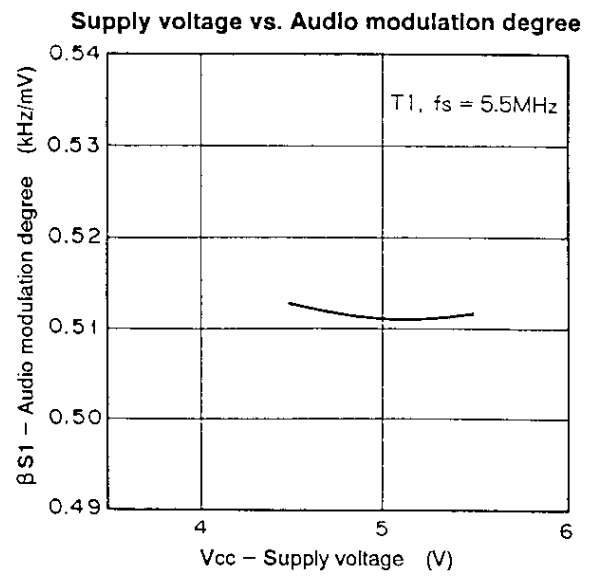
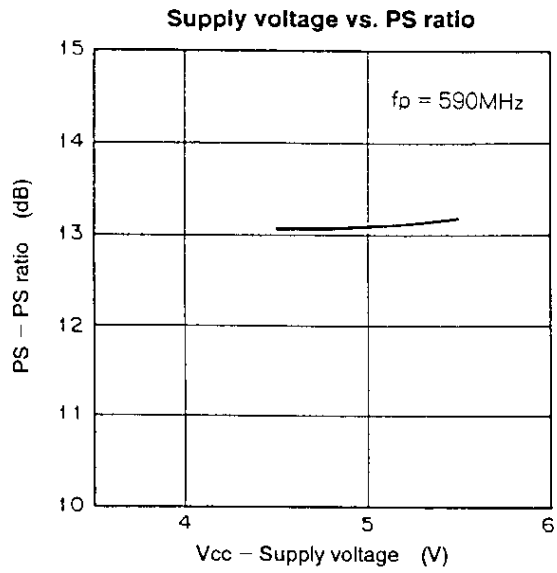
Application circuits shown are typical examples illustrating the operation of the devices. Sony cannot assume responsibility for any problems arising out of the use of these circuits or for any infringement of third party patent and other right due to same.

Example of Representative Characteristics

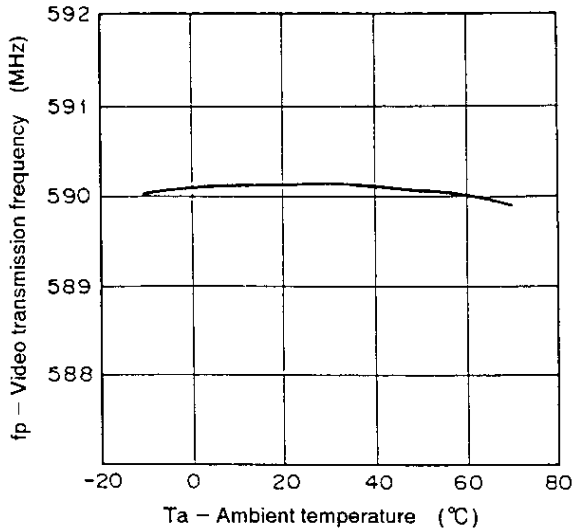
( $f_p=590\text{MHz}$ ,  $T_a=25^\circ\text{C}$ )



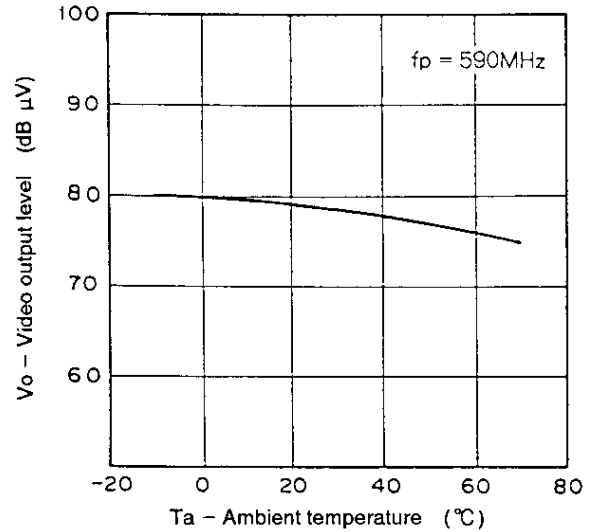




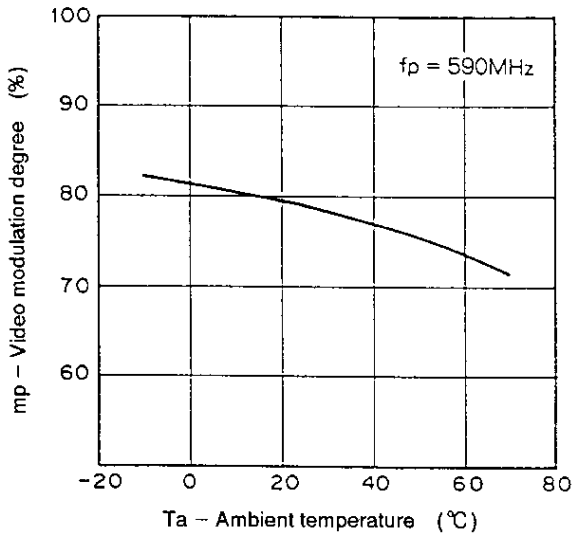
**Ambient temperature vs. Video transmission frequency**



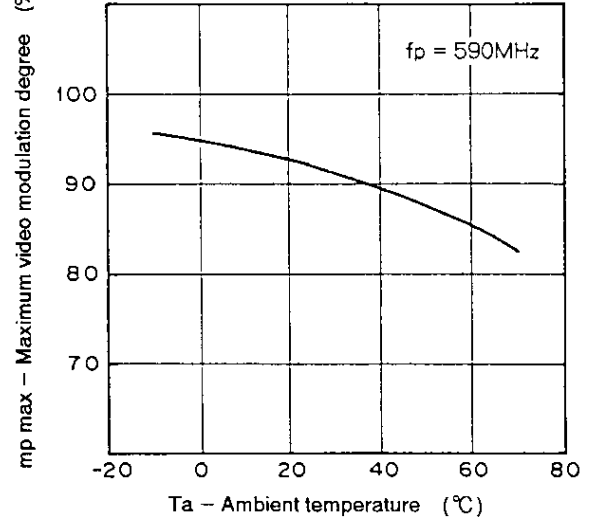
**Ambient temperature vs. Video output level**



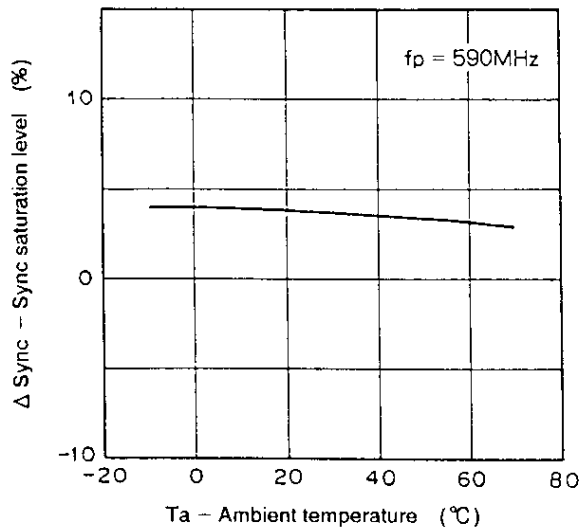
**Ambient temperature vs. Video modulation degree**



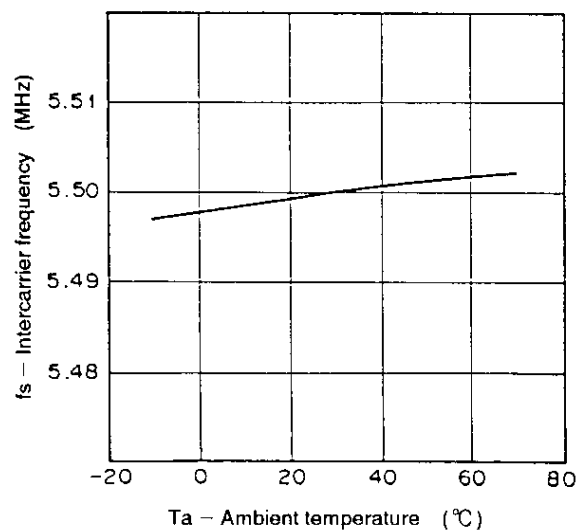
**Ambient temperature vs. Maximum video modulation degree**



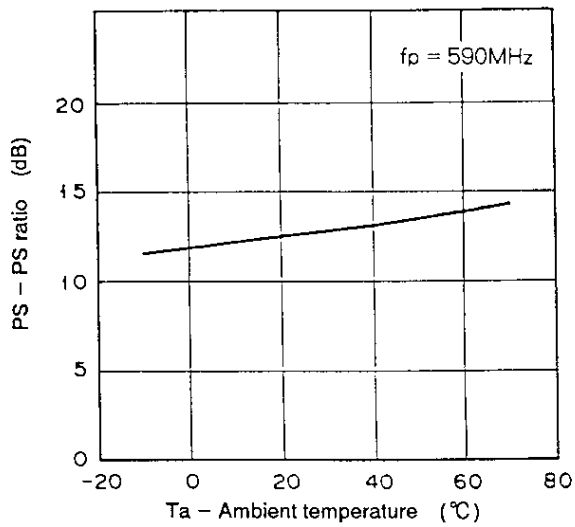
**Ambient temperature vs. Sync saturation level**



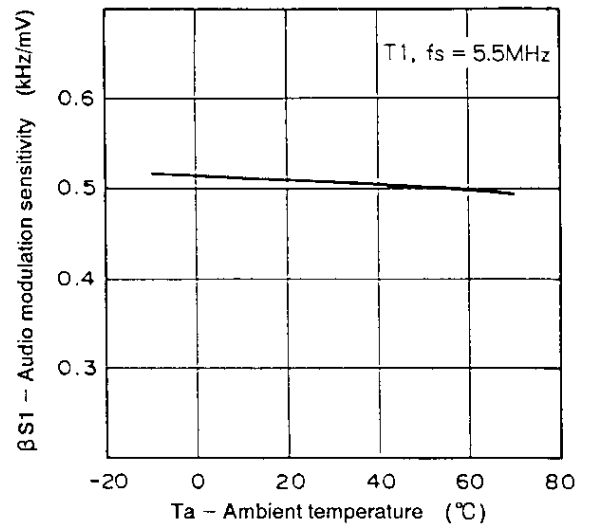
**Ambient temperature vs. Inter-carrier frequency**



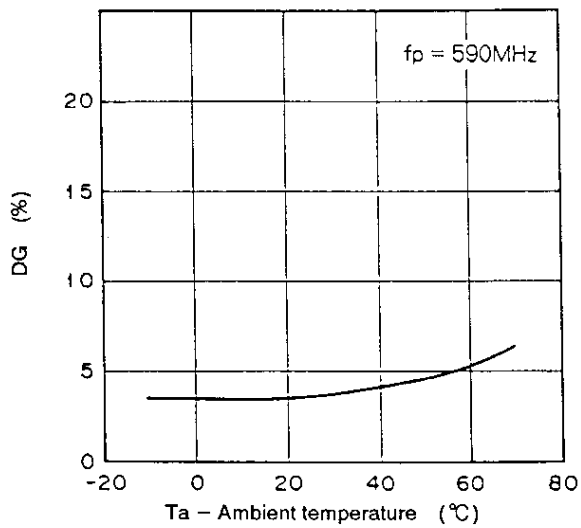
Ambient temperature vs. PS ratio



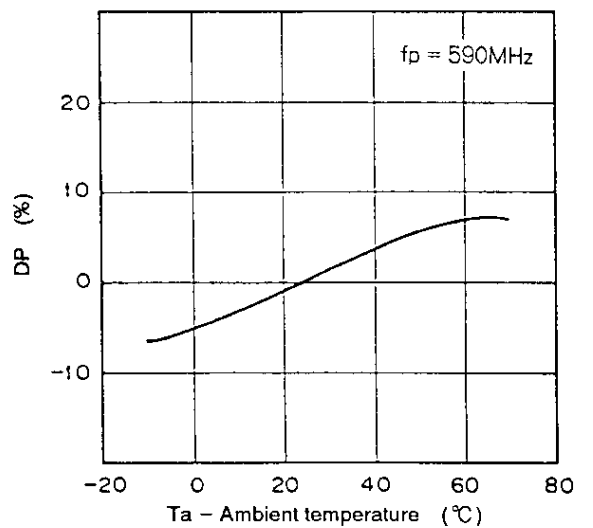
Ambient temperature vs. Audio modulation degree



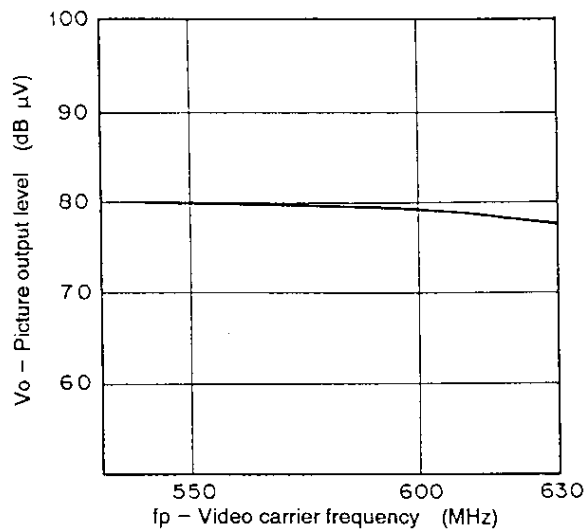
Ambient temperature vs. DG



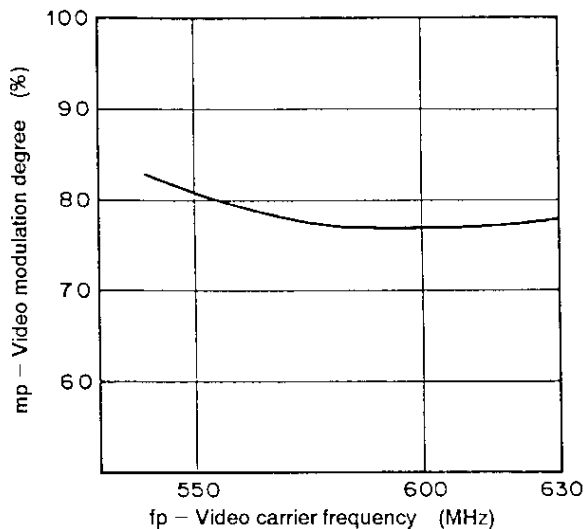
Ambient temperature vs. DP



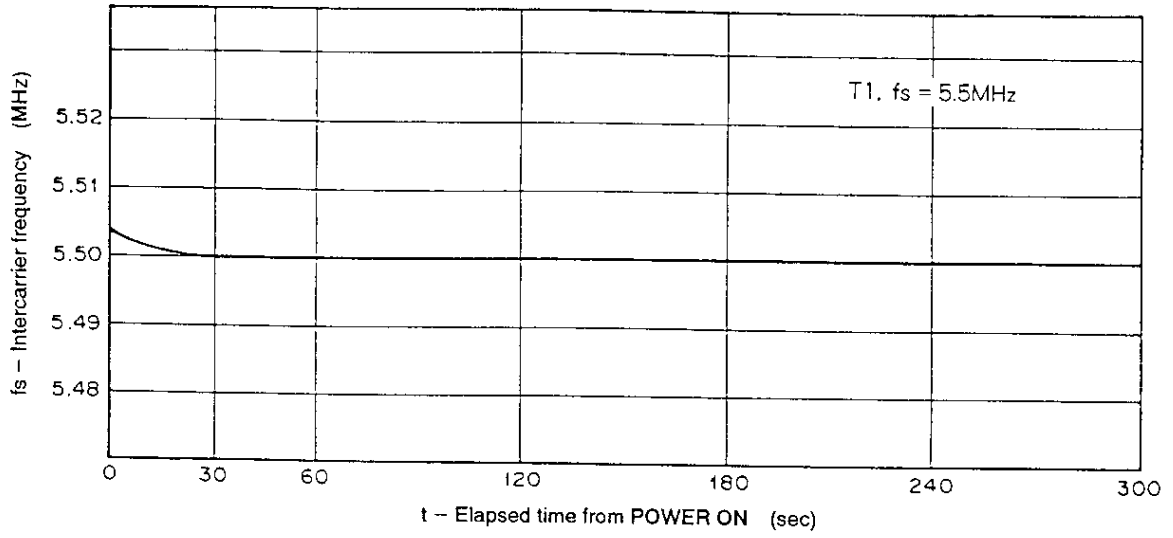
Video carrier frequency vs. Picture output level



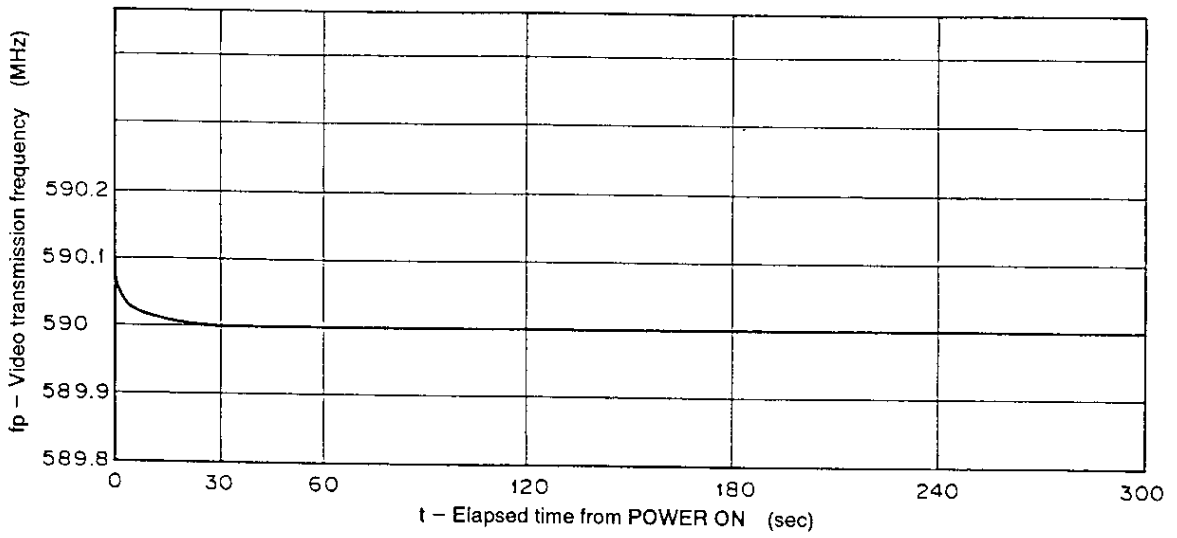
Video carrier frequency vs. Video modulation degree



Elapsed time from POWER ON vs. Inter-carrier frequency

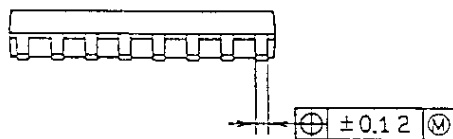
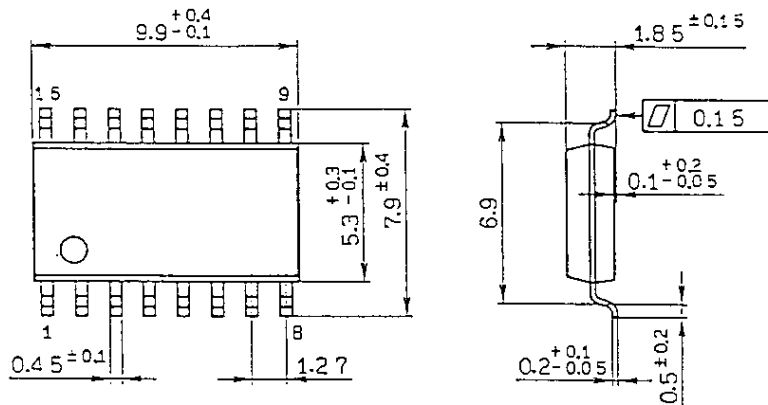


Elapsed time from POWER ON vs. Video transmission frequency



Package Outline Unit : mm

16pin SOP (Plastic) 300mil 0.2g



SONY NAME	SOP-16P-L01
EIAJ NAME	*SOP016-P-0300-A
JEDEC CODE	_____