

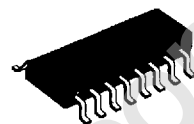
**VHF BAND RF MODULATOR**

The KA2990D is a monolithic integrated circuit of small out-line package designed for use in the VHF RF converter for VCRs, video game machines and so on.

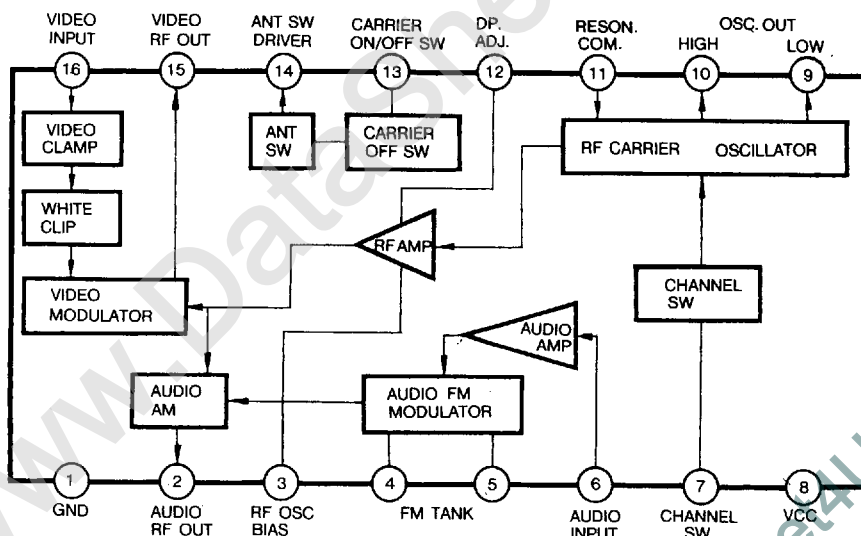
**FEATURES**

- Supply voltage 5V(4.5V~5.5V.)
- Symmetrical RF oscillator up to 100MHz
- Video input clamp/white clip
- Negative video AM
- FM audio modulation
- Audio/Video AM conversion
- Built-in antenna switch driver
- Channel switch/RF carrier switch

16-SOP-225A

**ORDERING INFORMATION**

| Device  | Package     | Operating Temperature |
|---------|-------------|-----------------------|
| KA2990D | 16-SOP-225A | -20°C~+70°C           |

**BLOCK DIAGRAM**

ABSOLUTE MAXIMUM RATINGS ( $T_a = 25^\circ\text{C}$ )

| Characteristic        | Symbol    | Value           | Unit             |
|-----------------------|-----------|-----------------|------------------|
| Power supply          | $V_{CC}$  | 6               | V                |
| Power Dissipation     | P         | 600             | mW               |
| Operating Temperature | $T_{opr}$ | $-20 \sim +70$  | $^\circ\text{C}$ |
| Storage Temperature   | $T_{stg}$ | $-55 \sim +125$ | $^\circ\text{C}$ |

ELECTRICAL CHARACTERISTICS ( $V_{CC} = 5\text{V}$ ,  $T_a = 25^\circ\text{C}$ )

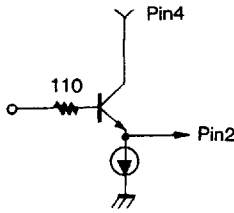
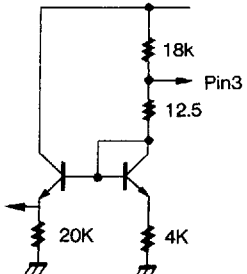
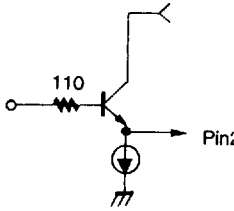
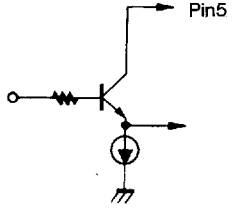
| Characteristic        | Symbol       | Conditions                                       | SPEC |      |      | Unit |
|-----------------------|--------------|--------------------------------------------------|------|------|------|------|
|                       |              |                                                  | Min. | Typ. | Max. |      |
| Supply Current        | $I_{CC}$     | No input signal                                  | 9    | 13   | 17   | mA   |
| RF Out Level          | $V_O$        | CH3(61.25MHz)<br>CH4(67.25MHz)                   | 83   | 87   | 90   | dBuV |
| <b>VIDEO PART</b>     |              |                                                  |      |      |      |      |
| Video MOD. Depth      | $M_V$        | 0.635V <sub>p-p</sub> 100%<br>White video signal | 75   | 80   | 85   | %    |
| RF Out Level          | $\Delta V_O$ | CH3(61.25MHz)                                    | -2   | 0    | +2   | dB   |
| Channel Difference    |              | CH4(67.25MHz)                                    |      |      |      |      |
| Video MOD. Depth      | $\Delta M_V$ |                                                  | -2   | 0    | +2   | %    |
| Channel Difference    |              |                                                  |      |      |      |      |
| MAX. Video MOD. Depth | $M_{max}$    | 1V <sub>p-p</sub> 100%<br>White video signal     | 89   | 92.5 | 96   | %    |
| Differential Phase    | DP           | 0.635V <sub>p-p</sub> Stair-step measured        | —    | 2    | 5    | deg  |
| Differential Gain     | DG           | APL 50% (Chroma = 20IRE)                         | —    | 2    | 5    | %    |
| Video (S/N) Ratio     | $V_{SNV}$    | 100% White ( $M_V = 50\%$ )                      | 40   | 45   | —    | dB   |
| Video Input Impedance | $Z_{in}$     |                                                  | 10   | 30   | —    | Kohm |

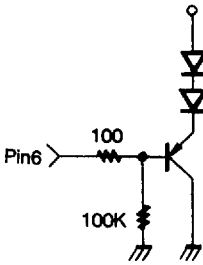
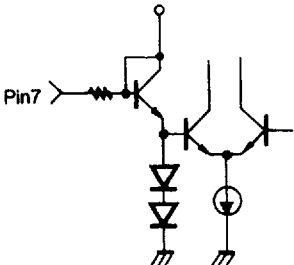
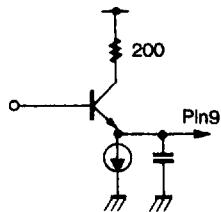
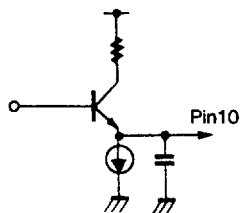
| Characteristic                     | Symbol      | Conditions                      | SPEC |      |      | Unit         |
|------------------------------------|-------------|---------------------------------|------|------|------|--------------|
|                                    |             |                                 | Min. | Tpy. | Max. |              |
| AUDIO PART                         |             |                                 |      |      |      |              |
| Audio MOD. Depth                   | $M_{sf}$    | 0.14V <sub>p-p</sub> 1 KHz Sine | 19.4 | 21.4 | 23.4 | KHz/<br>Dev. |
|                                    |             | Audio Input signal              | 22.4 | 24.4 | 26.4 |              |
| Audio (S/N) Ratio                  | $V_{sna}$   | 1 KHz Sine( $M_v=60\%$ )        | 40   | 50   | —    | dB           |
| Audio Input Impedance              | $Z_{sin}$   |                                 | 75   | 100  | 145  | Kohm         |
| OUTPUT PART                        |             |                                 |      |      |      |              |
| P/S Carrier Ratio                  | $R_{ps}$    | No input signal                 | 7.2  | 8.7  | 10.2 | dB           |
| Antenna Switch(ON)<br>Pin Voltage  | $V_{swon}$  | $I_{load}=10mA$                 | 3.1  | 3.4  | 3.7  | V            |
| Antenna Switch(OFF)<br>Pin Voltage | $V_{swoff}$ |                                 | —    | —    | 0.1  | V            |
| RF Carrier SW(ON)<br>Pin Voltage   | $V_{con}$   |                                 | 2.5  | —    | 5    | V            |
| RF Carrier SW(OFF)<br>Pin Voltage  | $V_{coff}$  |                                 | —    | —    | 0.5  | V            |

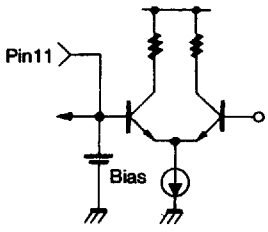
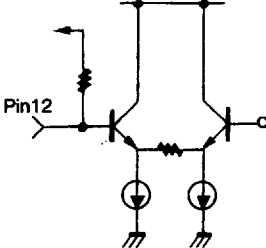
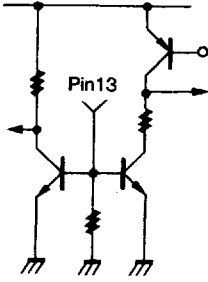
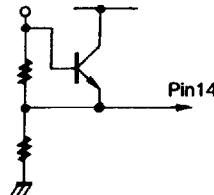
Guarantee Item.

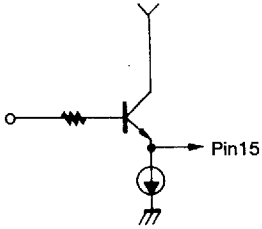
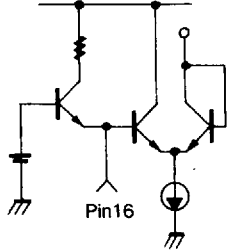
1. In Band Spurious: Minmum Data -60dB
2. 920KHz Chroma Beat: Minmum Data -60dB.

## PIN DESCRIPTION

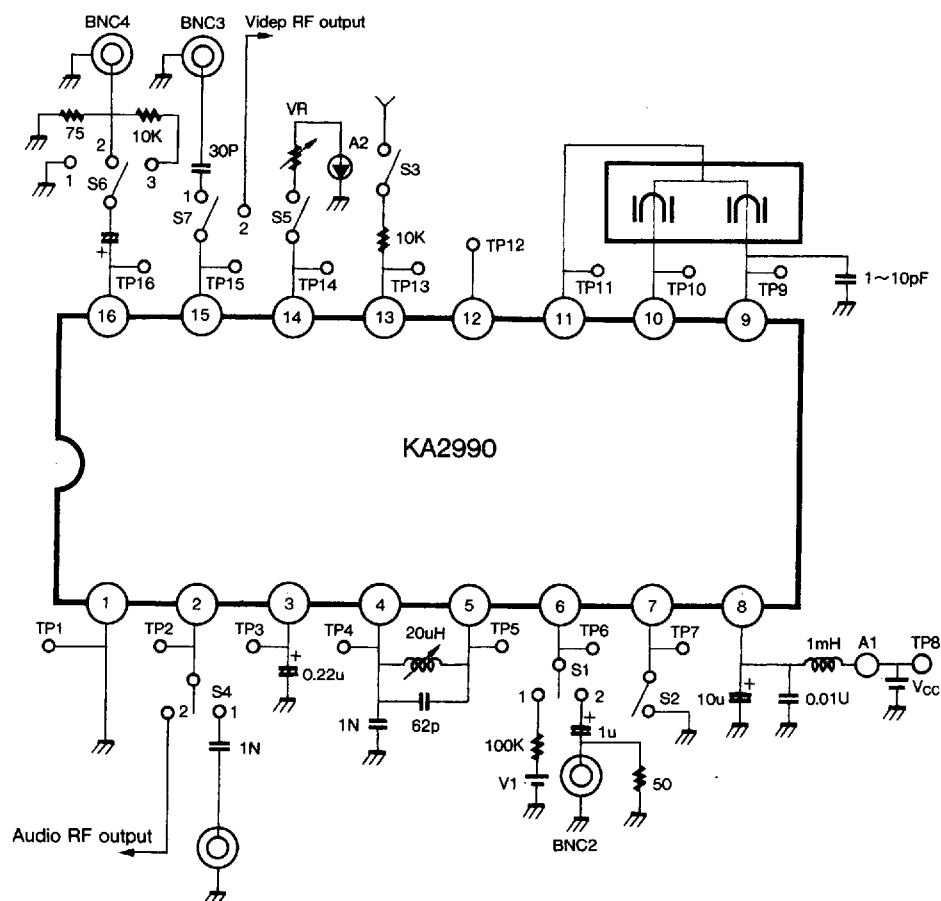
| Pin | Function            | Description                              | Equivalent                                                                          | Reference voltage |
|-----|---------------------|------------------------------------------|-------------------------------------------------------------------------------------|-------------------|
| 1   | GND                 |                                          |                                                                                     | 0V                |
| 2   | Audio RF OUT        | AM Conversion Wave                       |    | 3.25V             |
| 3   | RF Bias             | RF Oscillator bias                       |    | 3.2V              |
| 4   | Audio Tank (4.5MHz) | Audio FM Modulator Tank                  |   | 4.1V              |
| 5   | Audio Tank (4.5MHz) | Audio FM Modulator Tank (FM carrier out) |  | 4.1V              |

| Pin  | Function                  | Description                                                                                                                                                                            | Equivalent                                                                          | Reference voltage   |      |     |      |       |                                                                                   |                    |
|------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------|------|-----|------|-------|-----------------------------------------------------------------------------------|--------------------|
| 6    | Audio IN                  | Audio input signal                                                                                                                                                                     |    | 0V                  |      |     |      |       |                                                                                   |                    |
| 7    | Channel switch            | RF Oscillator<br>CH. selector<br><table border="1"><tr><td>OPEN</td><td>LOW</td><td>Pin9</td></tr><tr><td>GND</td><td>HIGH</td><td>Pin10</td></tr></table> | OPEN                                                                                | LOW                 | Pin9 | GND | HIGH | Pin10 |  | $\frac{2.75V}{0V}$ |
| OPEN | LOW                       | Pin9                                                                                                                                                                                   |                                                                                     |                     |      |     |      |       |                                                                                   |                    |
| GND  | HIGH                      | Pin10                                                                                                                                                                                  |                                                                                     |                     |      |     |      |       |                                                                                   |                    |
| 8    | Vcc                       |                                                                                                                                                                                        |                                                                                     | 5V                  |      |     |      |       |                                                                                   |                    |
| 9    | SAW resonator<br>Low out  | SAW resonator<br>Low channel out                                                                                                                                                       |   | $\frac{3.7V}{4.2V}$ |      |     |      |       |                                                                                   |                    |
| 10   | SAW resonator<br>High out | SAW resonator<br>High channel out                                                                                                                                                      |  | $\frac{3.7V}{4.2V}$ |      |     |      |       |                                                                                   |                    |

| Pin  | Function                 | Description                                                                                                                                                           | Equivalent                                                                          | Reference voltage |    |            |                                                                                    |  |
|------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------|----|------------|------------------------------------------------------------------------------------|--|
| 11   | SAW resonator<br>Common  | Common of<br>Pin9 & Pin10                                                                                                                                             |    | 3.2V              |    |            |                                                                                    |  |
| 12   | DP Adjust                | Adjustment of RF<br>Differential Phase.<br>Connect a cap. for<br>DP control                                                                                           |    | 3.2V              |    |            |                                                                                    |  |
| 13   | RF carrier switch        | RF carrier &<br>ANT. switch<br><table border="1"><tr><td>OPEN</td><td>RF OSC.OFF</td></tr><tr><td>5V</td><td>RF OSC. ON</td></tr></table> | OPEN                                                                                | RF OSC.OFF        | 5V | RF OSC. ON |  |  |
| OPEN | RF OSC.OFF               |                                                                                                                                                                       |                                                                                     |                   |    |            |                                                                                    |  |
| 5V   | RF OSC. ON               |                                                                                                                                                                       |                                                                                     |                   |    |            |                                                                                    |  |
| 14   | Antenna switch<br>Driver | Drive the antenna<br>switch                                                                                                                                           |  | $\frac{3.4V}{0V}$ |    |            |                                                                                    |  |

| Pin | Function     | Description        | Equivalent                                                                        | Reference voltage |
|-----|--------------|--------------------|-----------------------------------------------------------------------------------|-------------------|
| 15  | Video RF out | AM conversion wave |  | 3.1V              |
| 16  | Video IN     | Video signal input |  | 1.6V              |

## TEST CIRCUIT





## APPLICATION INFORMATION

## 1. FUNCTION DESCRIPTION

## 1) RECOMMENDATION OF SAW

| Company | Frequency           | Mark       | Region       | Remark        |
|---------|---------------------|------------|--------------|---------------|
| Kyocera | 91.24 + / - 0.08MHz | KAR 91CS   | JAPAN        | Japan;        |
|         | 97.24 + / - 0.08MHz |            |              | CH1: 91.25MHz |
|         | 61.24 + / - 0.06MHz | KAR61CT    | Korea<br>USA | CH1: 97.25MHz |
|         | 67.24 + / - 0.06MHz |            |              |               |
| Murata  | 91.24 + / - 0.1MHz  | SAR91MB40X | JAPAN        | Korea, USA;   |
|         | 97.24 + / - 0.1MHz  |            |              | CH3: 61.25MHz |
|         | 61.24 + / - 0.1MHz  | SAR61MB40X | Korea<br>USA | CH4: 67.25MHz |
|         | 67.24 + / - 0.06MHz |            |              |               |

## 2) TANK COIL

| Company | Mark         | Remark                   |
|---------|--------------|--------------------------|
| Tokko   | 291ACS-4060Z | Internal type (62pF CAP) |
|         | 36PSN-1458Z  | External type (62pF CAP) |

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## 2. PACKAGE DIMENSION. (Dimension in milimeter)

16-SOP-225A 16 9 #1 8 650.030 10.000.020 1.27 (0.56) 040.010 450.020 572 050.0200.15 +0.01 -0.05 155.020 1.95MAX 0 0MIN  
0.1MAX 0~8°

## APPLICATION CIRCUIT

