# M51292FP

## VIDEO SWITCH

### DESCRIPTION

The M51292FP is a semiconductor integrated circuit for VCR applications.
It is an analog switch IC with mute function for both audio and video signals.

### FEATURES

- Low crosstalk
- Low distortion
- Wide output dynamic range
- 4 Video signal inputs
- 2 Audio signal inputs
- 6 dB Amp for audio signal
- Mute function for video signals
- Relay driver

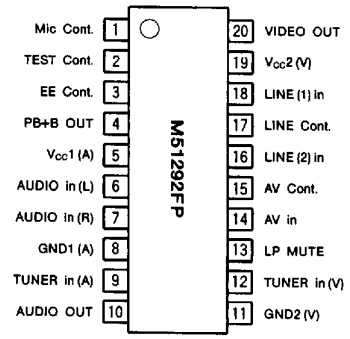
### APPLICATION

VCR

### RECOMMENDED OPERATING CONDITION

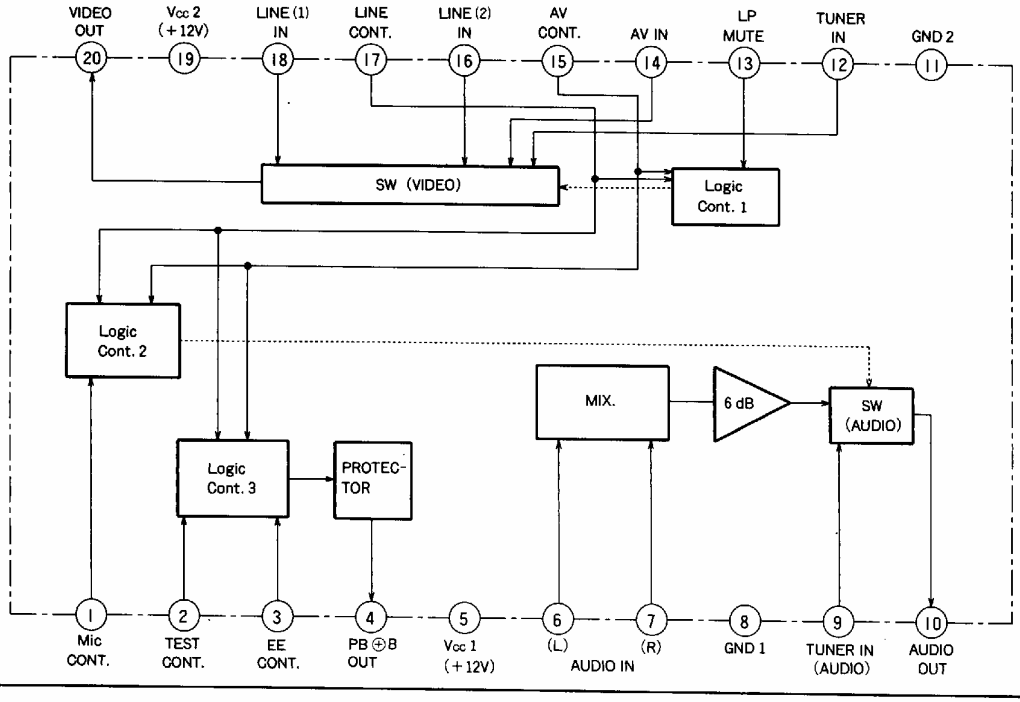
Supply voltage range.....11.5V~12.5V
Rated supply voltage.....12V

### PIN CONFIGURATION (TOP VIEW)




Outline 20P2N-A

### BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Ratings | Unit |
|---|---|---|---|
| $V_{CC}$ | Supply voltage | 14.4 | V |
| Pd | Power dissipation | 500 | mW |
| Topr | Operating temperature | −20∼75 | ℃ |
| Tstg | Storing ambient temperature | −40∼125 | ℃ |
| $K_\theta$ | Thermal derating Ta≧25℃ | 5 | mW/℃ |

## ELECTRICAL CHARACTERISTICS (Ta=25℃, unless otherwise noted)

| | Symbol | Parameter | Test conditions | Test circuit | Limits | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | | Min. | Typ. | Max. | |
| | $V_{CC}R$ | Operating supply voltage range | No abnormality in standard application circuit operation | | 10 | 12 | 14 | V |
| AUDIO OUTPUT | $I_1$ | Circuit current (audio block) | only DC bias | A | 4.5 | 6.0 | 7.5 | mA |
| | V⑥ | 6 pin input terminal voltage | only DC bias | | 7.2 | 7.5 | 7.8 | V |
| | Z⑥ | 6 pin input impedance | onyl DC bias | | 40 | 50 | 60 | kΩ |
| | V⑦ | 7 pin input terminal voltage | only DC bias | | 7.2 | 7.5 | 7.8 | V |
| | Z⑦ | 7 pin input impedance | only DC bias | | 40 | 50 | 60 | kΩ |
| | V⑨ | 9 pin input terminal voltage | only DC bias | | 7.2 | 7.5 | 7.8 | V |
| | Z⑨ | 9 pin input impedance | only DC bias | | 40 | 50 | 60 | kΩ |
| | $G_L$ | Output gain (Lch) ⑥→⑩ | f=1kHz Vi=200mVrms | | −0.5 | 0 | 0.5 | dB |
| | $G_R$ | Output gain (Rch) ⑦→⑩ | f=1kHz Vi=200mVrms | | −0.5 | 0 | 0.5 | dB |
| | $G_{L+R}$ | Output gain (L+R) ⑥+⑦→⑩ | f=1kHz Vi=200mVrms | | 5.5 | 6.0 | 6.5 | dB |
| | $G_{T(A)}$ | Output gain (TUNER) ⑨→⑩ | f=1kHz Vi=200mVrms | | −0.5 | 0 | 0.5 | dB |
| | $CT_{LT}$ | Crosstalk (Lch ⟷ TUNER) | No signal pin → AC GND | | —— | —— | −60 | dB |
| | $CT_{RT}$ | Crosstalk (Rch ⟷ TUNER) | No signal pin → AC GND | | —— | —— | −60 | dB |
| | $THD_L$ | Distortion (Lch input) | f=1kHz Vi=20mVrms | | —— | 0.03 | 0.1 | % |
| | $THD_R$ | Distortion (Rch input) | f=1kHz Vi=20mVrms | | —— | 0.03 | 0.1 | % |
| | $THD_T$ | Distortion (TUNER) | f=1kHz Vi=20mVrms | | —— | 0.01 | 0.05 | % |
| | $V_{DA}$ | Maximum output voltage | Value when output begins to clip f=1kHz | | 8.5 | —— | —— | $V_{P-P}$ |
| | V⑩ | 10 pin output terminal voltage | only DC bias | | 5.1 | 5.4 | 5.7 | V |
| | ⊿V⑩ | 10 pin output DC offset | only DC bias | | −30 | 0 | 30 | mV |
| | I⑩ | 10 pin output bias current | only DC bias SW 10 → 2 side | | 0.7 | 1.0 | 1.5 | mA |
| | Z⑩ | 10 pin output impedance | only DC bias SW 10 → 2 side | | —— | 26 | 50 | Ω |

## ELECTRICAL CHARACTERISTICS (cont.)

| | Symbol | Parameter | Test conditions | Test circuit | Limits | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | | Min. | Typ. | Max. | |
| VIDEO OUTPUT | $I_2$ | Circuit current (video block) | only DC bias | B | 2.5 | 3.5 | 4.5 | mA |
| | V ⑫ | 12 pin input terminal voltage | only DC bias | | 6.7 | 7.0 | 7.3 | V |
| | Z ⑫ | 12 pin input impedance | only DC bias | | 12 | 15 | 18 | kΩ |
| | V ⑭ | 14 pin input terminal voltage | only DC bias | | 6.7 | 7.0 | 7.3 | V |
| | Z ⑭ | 14 pin input impedance | only DC bias | | 12 | 15 | 18 | kΩ |
| | V ⑯ | 16 pin input terminal voltage | only DC bias | | 6.7 | 7.0 | 7.3 | V |
| | Z ⑯ | 16 pin input impedance | only DC bias | | 12 | 15 | 18 | kΩ |
| | V ⑱ | 18 pin input terminal voltage | only DC bias | | 6.7 | 7.0 | 7.3 | V |
| | Z ⑱ | 18 pin input impedance | only DC bias | | 12 | 15 | 18 | kΩ |
| | $G_{T(V)}$ | Output gain (TUNER) ⑫→⑳ | Video signal input $Vi=1V_{P-P}$, 100% | | −0.5 | 0 | 0.5 | dB |
| | $G_{AV}$ | Output gain (AV) ⑭→⑳ | Video signal input $Vi=1V_{P-P}$, 100% | | −0.5 | 0 | 0.5 | dB |
| | $G_{L2}$ | Output gain (LINE 2) ⑯→⑳ | Video signal input $Vi=1V_{P-P}$, 100% | | −0.5 | 0 | 0.5 | dB |
| | $G_{L1}$ | Output gain (LINE 1) ⑱→⑳ | Video signal input $Vi=1V_{P-P}$, 100% | | −0.5 | 0 | 0.5 | dB |
| | CT | Crosstalk (between ⑫ ⑭ ⑯ ⑱) | f=5MHz, $1V_{P-P}$ No signal pin → AC GND | | — | — | −60 | dB |
| | $V_{DV}$ | Maximum output voltage | Value when output begins to clip. Video input | | 8.5 | — | — | $V_{P-P}$ |
| | V ⑳ | 20 pin output terminal voltage | only DC bias (input no signal) | | 6.0 | 6.3 | 6.6 | V |
| | $V_M$ | Mute output DC voltage | only DC bias (input no signal) | | 6.0 | 6.3 | 6.6 | V |
| | Δ V ⑳ | 20 pin output DC offset | only DC bias | | −30 | 0 | 30 | mV |
| | I ⑳ | 20 pin output bias current | only DC bias | | 0.7 | 1.0 | 1.5 | mA |
| | Z ⑳ | 20 pin output impedance | only DC bias | | — | 26 | 50 | Ω |
| PB ⊕ B output | $V_O$ ④ | 4 pin terminal voltage at no load (OPEN) | Logic Cont 3 → ON | C | 11.0 | 11.3 | 11.6 | V |
| | $I_S$ ④ | 4 pin terminal current at short | Logic Cont 3→ ON | | — | 27 | 35 | mA |
| | $V_L$ ④ | 4 pin terminal voltage at $I_L=20mA$ | Logic Cont 3 → ON | | 10.3 | 10.5 | 11.0 | V |
| | $I^{max}$ ④ | Protector ON maximum current | Logic Cont 3 → ON | | 45 | 55 | 65 | mA |
| | $CT_{AV}$ | Audio ⟷ Video crosstalk | f=5MHz | | — | — | −60 | dB |
| | $f_A$ | Audio output frequency characteristic | Vi=200mVrms Output → f −3dB | A | 8 | — | — | MHz |
| | $f_V$ | Video output frequency characteristic | Vi=200mVrms Output → f −3dB | B | 8 | — | — | MHz |
| | $G_{MUTE}$ | Video output MUTE reduction value | Video signal input | | — | — | −60 | dB |
| | $V_N^{L+R}$ | Audio output noise voltage (L+R) | Measure after IHF "A" filter | A | — | 20 | 80 | μVrms |
| | $V_N^T$ | Audio output noise voltage (TUNER) | Measure after IHF "A" filter | | — | 10 | 40 | μVrms |

## CONTROL TERMINAL THRESHOLD RATING

| Pin No. | Terminal | Threshold | Input Mode | Remarks |
|---|---|---|---|---|
| ⑪ | LINE Cont. | 2.5±0.2 | PNP Tr Open Base | 2 value (L ⟷ H) |
| ⑮ | AV Cont. | | | |
| ⑬ | Mute Cont. | | | |
| ① | Mic Cont. | | | |
| ② | TEST Cont. | | | |
| ③ | EE Cont. | | | |

## ELECTRICAL CHARACTERISTICS TEST METHOD

**VccR**
Supply voltage range with no operating abnormality in standard application circuit.

**I1**
PIN5 DC current when only DC bias is added.

**V⑥**
Use only DC bias to measure PIN⑥ terminal voltage.

**Z⑥**
Where V⑥' is PIN⑥ terminal voltage when current is 0.02mA. Use following formula to determine this value.

$$Z⑥=(V⑥-V⑥')/0.02[K\Omega]$$

**V⑦**
Follow procedure for V⑥,Z⑥ and measure PIN⑦ terminal voltage and input impedance.

**Z⑦**
Same as above.

**V⑨**
Follow procedure for V⑥,Z⑥ and measure PIN⑨ terminal voltage and input impedance.

**Z⑨**
Same as above.

**$G_L$**
Set either one of SW1, SW15, or SW17 to "H" and input PIN⑥ f=1kHz, Vi=200mVrms as SG1. Where output at Measuring Point 10 is set to Vo. Use formula below to determine this value.

$$G_L=20 \log \frac{Vo[mVrms]}{200[mVrms]} \text{ (dB)}$$

**$G_R$**
Follow procedure for $G_L$ and input PIN⑦ sine wave of f=1KHz, Vi=200mVrms. Use formula below to determine this value from output Vo at Measuring Point 10.

$$G_R=20 \log \frac{Vo[mVrms]}{200[mVrms]} \text{ (dB)}$$

**$G_{R+L}$**
Set either one of SW1, SW15, or SW17 to "H" and input PIN⑥ and PIN7sine wave of f=1kHz, Vi=200mVrms. Use formula below to determine this value from output Vo at Measuring Point 10.

$$G_{R+L}=20 \log \frac{Vo[mVrms]}{200[mVrms]} \text{ (dB)}$$

**$G_T$(A)**
Set SW11, SW15, and SW17 to "L" and input PIN⑨sine wave of f=1kHz, Vi=200mVrms. Use formula below to determine this value from output Vo at Measuring Point 10.

$$G_T(A)=20 \log \frac{Vo[mVrms]}{200[mVrms]} \text{ (dB)}$$

**$CT_{LT}$**
Input PIN⑥ sine wave of f=1kHz, Vi=200mVrms and set PIN⑦ and PIN⑨ to AC GND. Use formula below to determine this value from output Vo when SW1, SW15, and SW17 are set to "L".

$$CT_{LT}=20 \log \frac{Vo[mVrms]}{200[mVrms]} \text{ (dB)}$$

**$CT_{RT}$**
Input PIN⑦ sine wave and set PIN⑥ and PIN⑨ to AC GND. Use above formula $CT_{LT}$.

**$THD_L$**
Set either one of SW1, SW15, or SW17 to "H" and input PIN⑥ sine wave of f=1kHz, Vi=200mVrms. $THD_L$ is value when output at Measuring Point 10 is measured with distortion meter.

**$THD_R$**
Follow procedure for $THD_L$ and input PIN⑦ sine wave. Measure output ditortion $THD_R$ at Measuring Point 10.

**$THD_T$**
Set SW1, SW15, and SW17 to "L" and input PIN⑨ sine wave of f=1kHz, Vi=200mVrms. $THD_T$ is value when output at Measuring Point 10 is measured with distortion meter.

**$V_{DA}$**
Follow procedure for $THD_T$. $V_{DA}$ is output amplitude when input amplitude is incresed gradually and output waveform at Measuring Point 10 begins to clip.

**V⑩**
Set either one of SW1, SW15, or SW17 to "H". V⑩ is DC terminal voltage output with no signal input at Measuring Point 10.

**⊿V⑩**
Set SW1, SW15, and SW17 to "L"and set PIN⑩ terminal voltage measured as in V⑩to V⑩'. Use following formula to determine this value.

$$\Delta V⑩=V⑩-V⑩$$

**I⑩**
Set SW10 to 2.I ⑩ is DC current flowing into PIN⑩ terminal when V⑩=12V.

**Z⑩**
Set SW10 to 2. Where Z⑩" is set to DC terminal voltage at Measuring Point 10 when PIN ⑩ current is I=1mA. Use following formula to determine this value.

$$V⑩=\frac{V⑩-V⑩"[mA]}{1[mA]} (\Omega)$$

**I2**
DC current flowing into PIN⑲ when only DC bias is added.

**V⑫**
Use only DC bias to measure PIN⑫ terminal voltage at Measuring Point 12.

**Z⑫**
Where V⑫' is set to PIN⑫ terminal voltage with 0.1mA current. Use following formula to determine this value.

$$Z⑫=(V⑫-V⑫')/0.1[k\Omega]$$

**V⑭**
Follow procedure for V⑫, and Z⑫ and measure PIN⑭ terminal voltage and input impedance.

**Z⑭**
Same as above.

**V⑯**

Follow procedure for V⑫, and Z⑫ and measure PIN⑯ terminal voltage and input impedance.

**Z⑯**

Same as above.

**V⑱**

Follow procedure for V⑫, and Z⑫ and measure PIN⑱ terminal voltage and input impedance.

**Z⑱**

Same as above.

**$G_{T(V)}$**

Set SW13, SW15, and SW17 to "L". Where Vo is set to output amplitude at Measuring Point 20 when inputting PIN⑫ video signal Vi=1Vp-p as SG2. Use following formula to determine this value.

$$G_{T(V)}=20 \log \frac{Vo[Vp\text{-}p]}{1[Vp\text{-}p]} \text{ (dB)}$$

**$G_{AV}$**

Set SW13 and SW17 to "L" and SW15 to "H" and input PIN⑭ 1Vp-p video signal. Use following formula to determine this value(same as (32)).

$$G_{AV}=20 \log \frac{Vo[Vp\text{-}p]}{1[Vp\text{-}p]} \text{ (dB)}$$

**$G_{L2}$**

Set SW13 to "L" and SW15 and SW17 to "H" and calculate this value as in PIN⑯ video input.

$$G_{L2}=20 \log \frac{Vo[Vp\text{-}p]}{1[Vp\text{-}p]} \text{ (dB)}$$

**$G_{L1}$**

Set SW13 and SW15 to "L" and SW17 to "H" and calculate this value as in PIN⑱ video input.

**CT**

Set switches to TUNER signal output mode(SW13, SW15 and SW17"L"). Input PIN⑭, PIN⑯, or PIN⑱ f=5MHz, Vi=1Vp-p and set PIN⑫ to AC GND. Where $V_{CT}$ is set to output crosstalk component at Measuring Point 20. Use following formula to determine this value.

$$CT=20 \log \frac{V_{CT}[Vp\text{-}p]}{1[Vp\text{-}p]} \text{(dB)}$$

Measure all other modes in the same way.

**$V_{DV}$**

Set switches to TUNER signal output mode.$V_{DV}$ is output amplitude when PIN⑫ input video signal is gradually increased and output waveform at Measuring Point 20 begins to clip.

**V⑳**

V⑳ is DC terminal voltage with no signal input at Measuring Point 20. (SW13,SW15 and SW17 "L" )

**$V_M$**

$V_M$ is DC output voltage at Measuring Point 20 when SW13 is set to "H".

**$\Delta$V⑳**

Measure DC offset with no signal input at Measuring Point 20 in each mode: TUNER, AV, LINER1, LINE2, MUTE.

**I⑳**

Set SW20 to 2. I ⑳ is DC current flowing into 20 pin when V⑳=12V.

**Z⑳**

Set SW20 to 2. WhereV⑳'is set to DC voltage at Measuring Point 20 when PIN⑳ current is I=1mA. Use following formula to determine this value.

$$Z⑳=20 \log \frac{V⑳\text{-}V⑳'[mV]}{1[mA]} \ (\Omega)$$

**Vo④**

Set Logic Cont.3(protector)to Logic ON and measure PIN④ open terminal voltage.

**Is④**

Follow procedure for Vo④: Is ④ is current flowing out of PIN ④ when short-circuited to GND by ammeter.

**$V_L$④**

Follow procedure for Vo④ and set SW4 to 2. $V_L$ ④ is terminal voltage when PIN ④ current is $I_L$=20mA.

**$I_{⑥}^{max}$**

Set Logic Cont.3 to ON and SW4 to 2 and gradually decrease PIN ④ load resistance. Measure PIN ④ maximum current just before current protector is activated.

**$CT_{AV}$**

Set all video input terminals to AC GND. Measure audio signal crosstalk component of video output pin at Measuring Point 20 when f=1kHz, Vi=200mVp-p are input to audio input terminal.Similarly, set all audio input terminals to AC GND and measure video signal crosstalk component of audio output pin at Measuring Point 10 when 1Vp-p video signal is input to video input terminal.

**$f_A$**

Follow procedure for $G_L$, $G_R$ and $G_{T(A)}$ and measure input frequency when input sine wave frequency is increased and output reduces by 3dB.

**fv**

Follow procedure for $G_{T(V)}$, $G_{AV}$, $G_{L2}$ and $G_{L1}$. Input sine wave of Vi=200mVp-p and measure input frequency when output reduces by 3dB in the same way as above.

**$G_{MUTE}$**

Follow procedure for $G_{T(V)}$.Vo is output amplitude at Measuring Point 20 when 1Vp-p video signal is input from PIN⑫ , and $V_{MUTE}$ is output amplitude when SW13 is set to "H"(Mute). Use following formula to determine this value.

$$G_{MUTE}=20 \log \frac{V_{MUTE}[Vp\text{-}p]}{Vo[Vp\text{-}p]} \text{ (dB)}$$

**$V_N^{L+R}$**

Set audio input to no signal input and (L+R)output mode. Measure output noise voltage after passing through JIS "A" filter at Measuring Point 10.

**$V_N^T$**

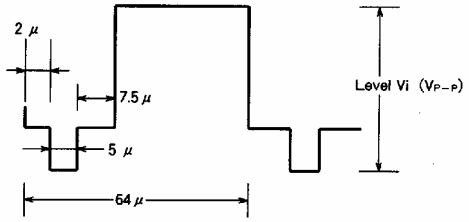
Measure output noise voltage in TUNER mode as in $V_N^{L+R}$.

**INPUT SIGNAL**

SG1 Sine wave

- f=1kHz
- Total harmonic distortion (THD) not more than 0.01%

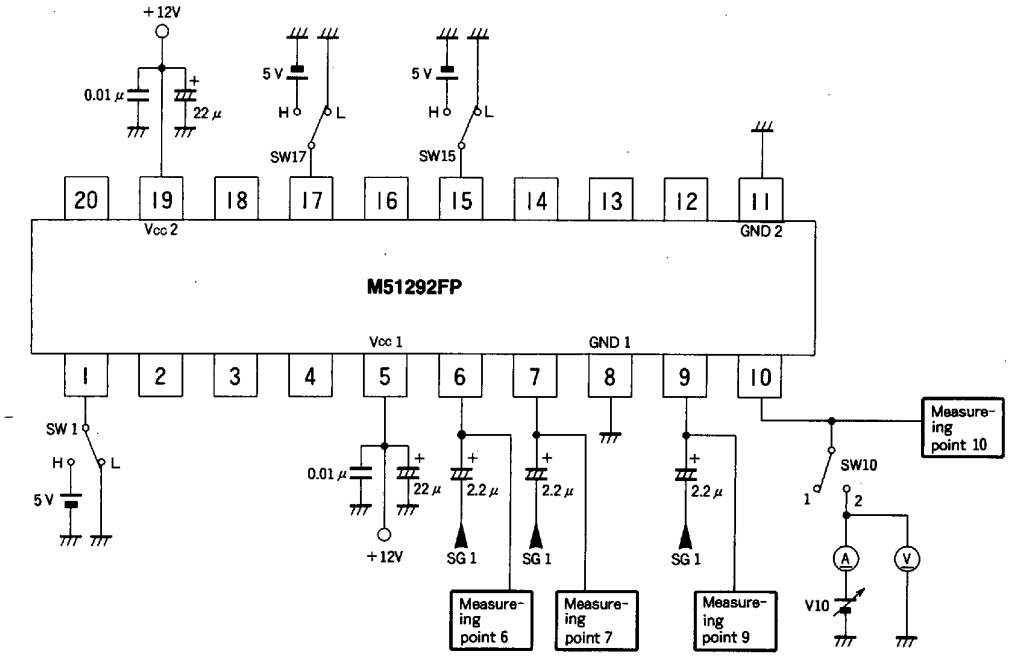
SG2 Video signal(APL 100%, No V synchronism)




Sine wave

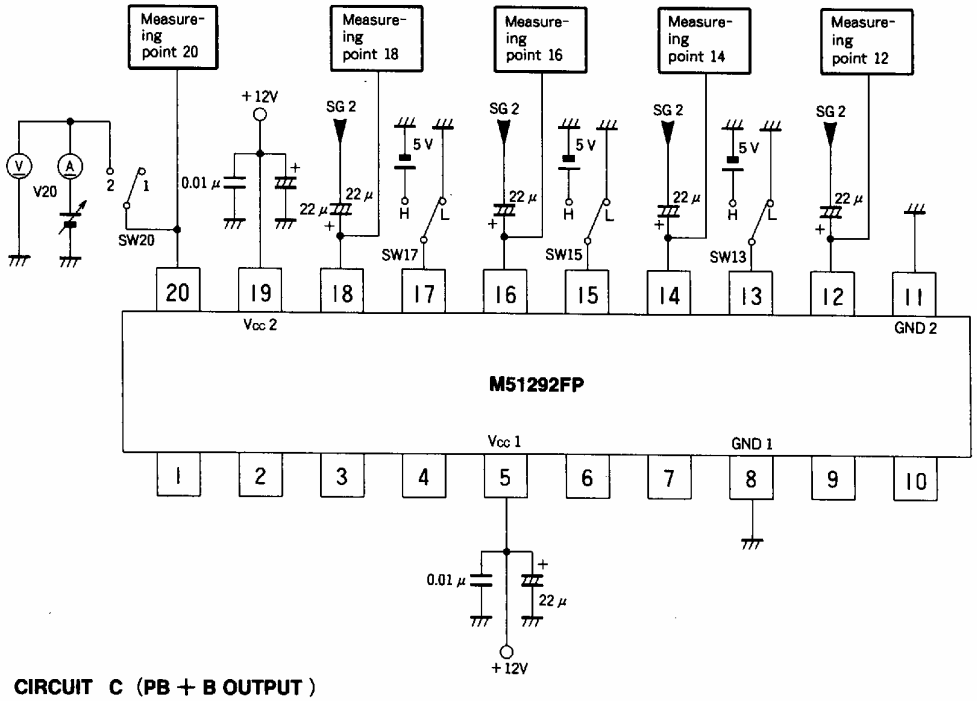
- f=5kHz
- Vi=1Vp-p

**TEST CIRCUIT A (AUDIO OUTPUT)**

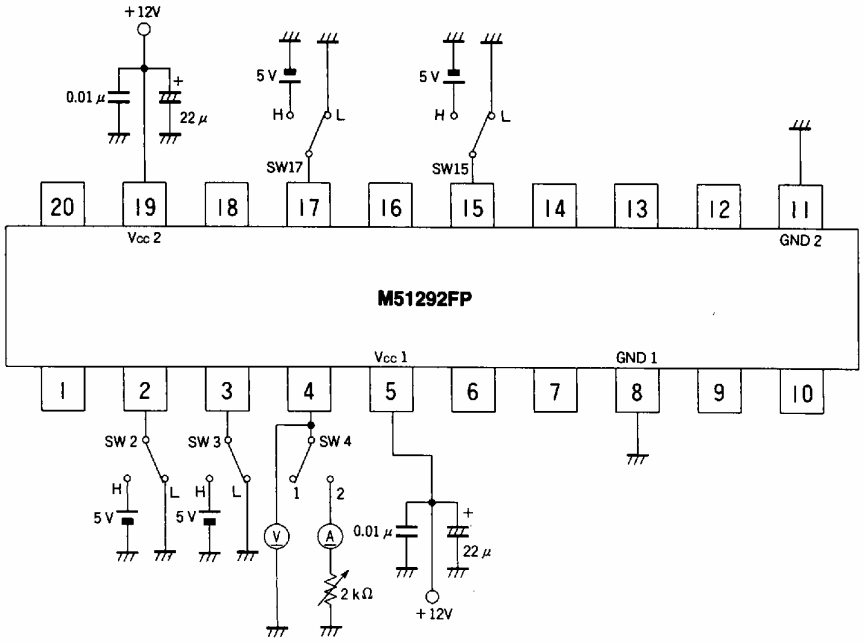



Unit Resistance : Ω
Capacitance : F

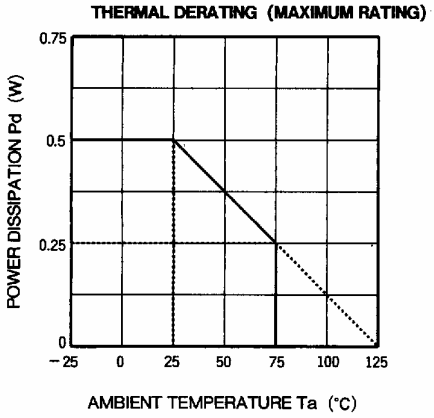
## TEST CIRCUIT B (VIDEO OUTPUT)



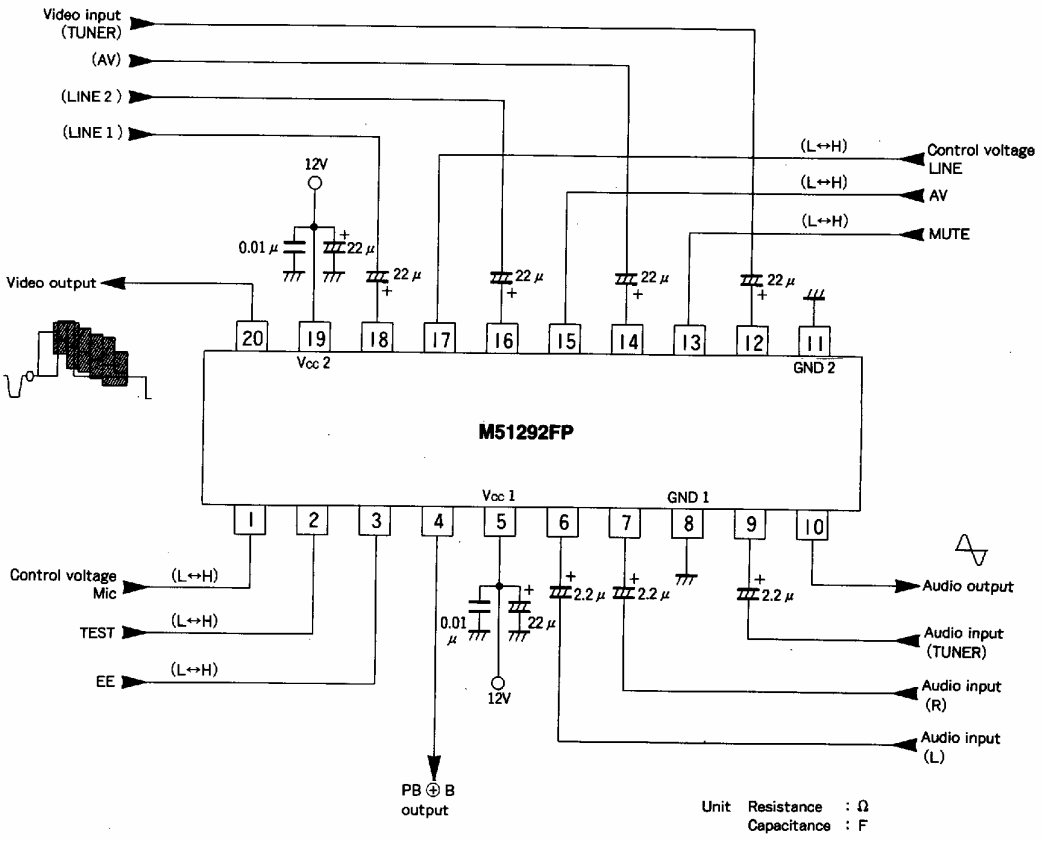

## TEST CIRCUIT C (PB + B OUTPUT)



## TYPICAL CHARACTERISTICS




## APPLICATION EXAMPLE



## LOGIC TABLE

### LOGIC CONT.1 (VIDEO OUT)

| LINE ⑰ | AV ⑮ | MUTE ⑬ | VIDEO OUT ⑳ |
|---|---|---|---|
| L | L | L | TUNER (⑳ pin input) |
| L | H | L | AV (⑭ pin input) |
| H | L | L | LINE 1 (⑱ pin input) |
| H | H | L | LINE 2 (⑯ pin input) |
| ※ | ※ | H | MUTE |

Note ※……L, H is arbitrary

### LOGIC CONT.2 (AUDIO OUT)

| LINE ⑰ | AV ⑮ | MIC ① | VIDEO OUT ⑩ |
|---|---|---|---|
| L | L | L | TUNER (⑨ pin input) |
| H | ※ | ※ | AUDIO { (L) (⑥ pin input) + (R) (⑦ pin input) |
| ※ | H | ※ | |
| ※ | ※ | H | |

Note ※……L, H is arbitrary

### LOGIC CONT.3 (RELAY DRIVER)

| LINE ⑰ | AV ⑮ | TEST ② | EE ③ | PB ⊕ B OUT ④ |
|---|---|---|---|---|
| L | ※ | ※ | L | ON |
| ※ | L | H | ※ | |
| Logic other than the above mentioned | | | | OFF |

Note ※……L, H is arbitrary