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

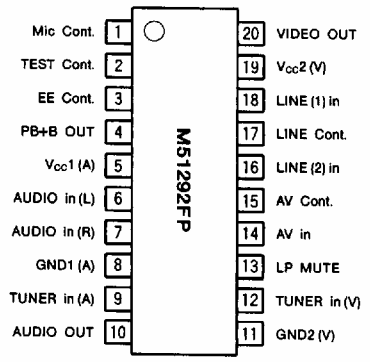
APPLICATION

VCR

RECOMMENDED OPERATING CONDITION

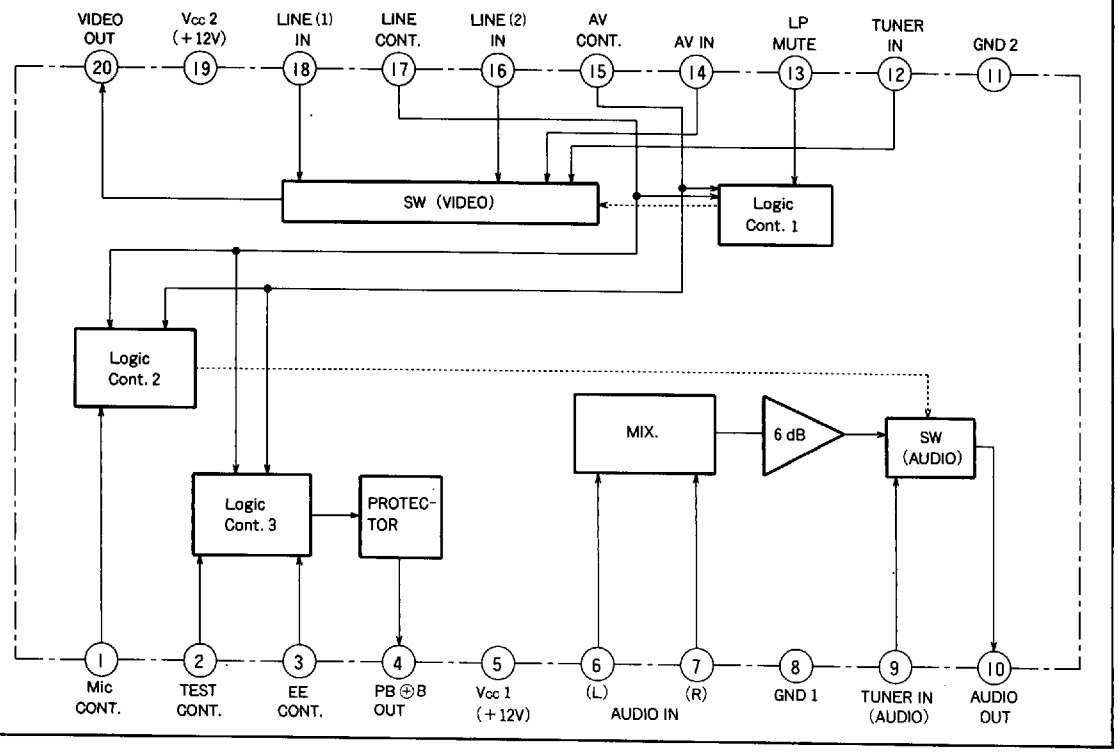
Supply voltage range.....11.5V~12.5V
Rated supply voltage.....12V

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_θ	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_{OA}	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 V_i=1V_{P-P}, 100%		−0.5	0	0.5	dB
	G_{AV}	Output gain (AV) ⑭→⑳	Video signal input V_i=1V_{P-P}, 100%		−0.5	0	0.5	dB
	G_{L2}	Output gain (LINE 2) ⑯→⑳	Video signal input V_i=1V_{P-P}, 100%		−0.5	0	0.5	dB
	G_{L1}	Output gain (LINE 1) ⑱→⑳	Video signal input V_i=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	V_i=200mVrms Output → f −3dB	A	8	—	—	MHz
	f_V	Video output frequency characteristic	V_i=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
⑰	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".

⊿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. I⑳ 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.

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

V_O④

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_L④

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

$I_{⑧}^{max}$

Set Logic Cont.3 to ON and SW4 to 2 and gradually decrease PIN④ load resistance. Measure PIN④ 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.

f_V

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^I

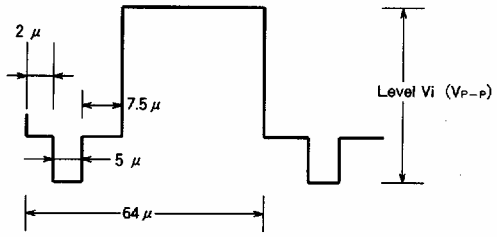
Measure output noise voltage in TUNER mode as in V_N^{L+R}.

INPUT SIGNAL

SG1 Sine wave

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

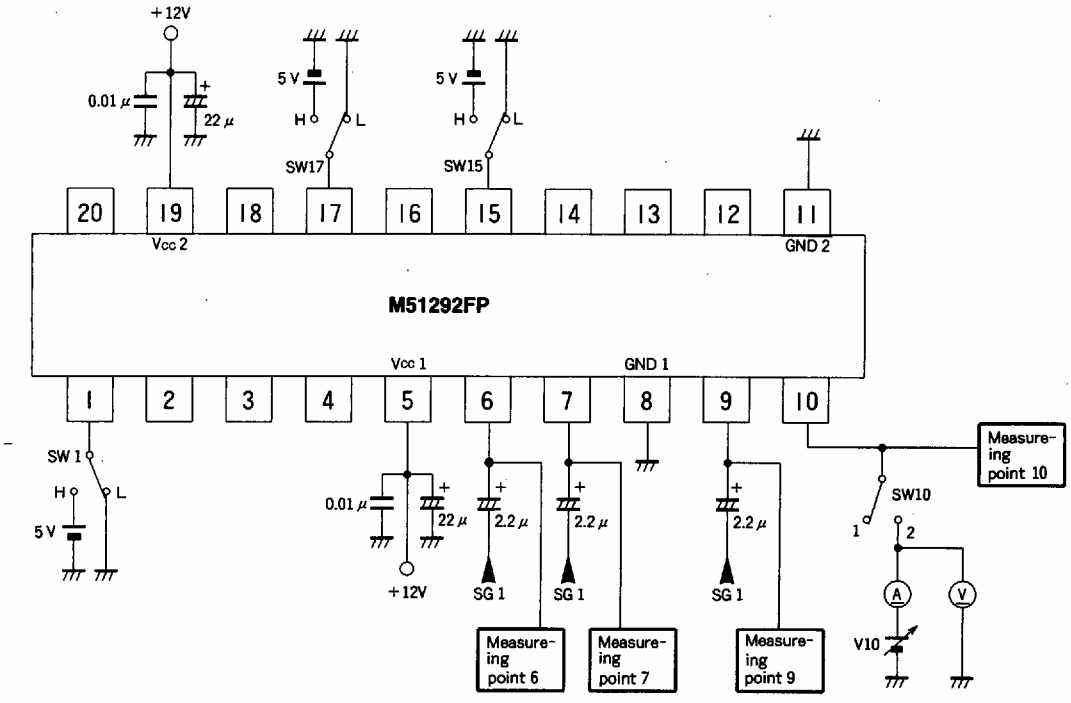
SG2 Video signal(APL 100%, No V synchronism)



Sine wave

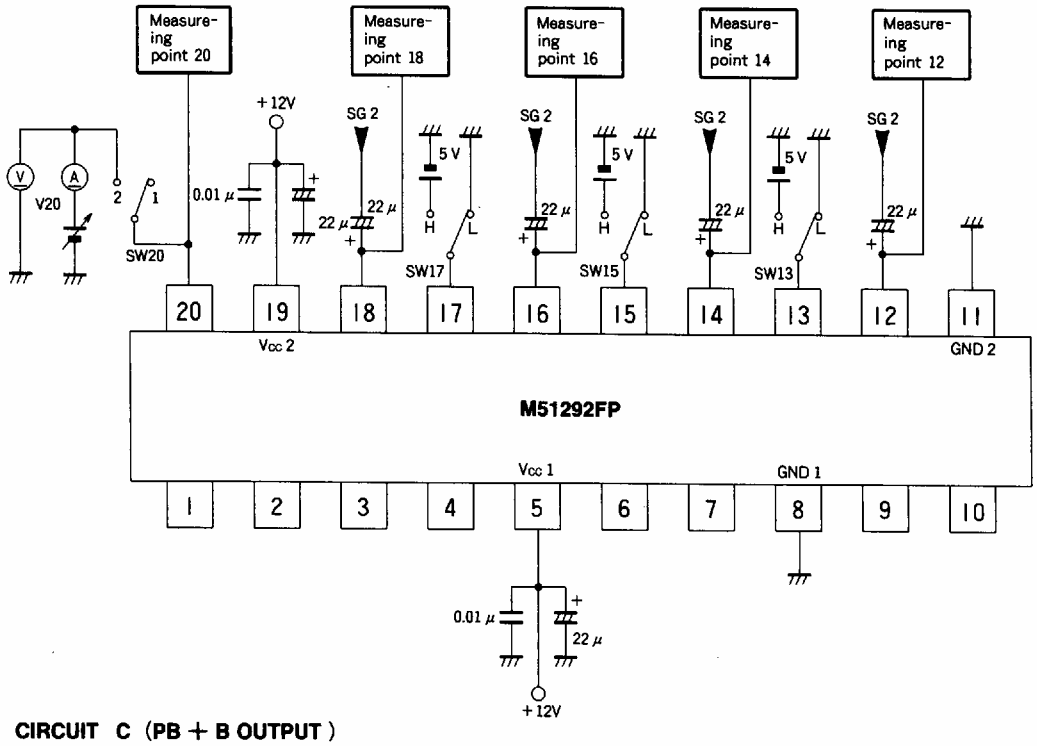
- f=5kHz
- Vi=1Vp-p

TEST CIRCUIT A (AUDIO OUTPUT)

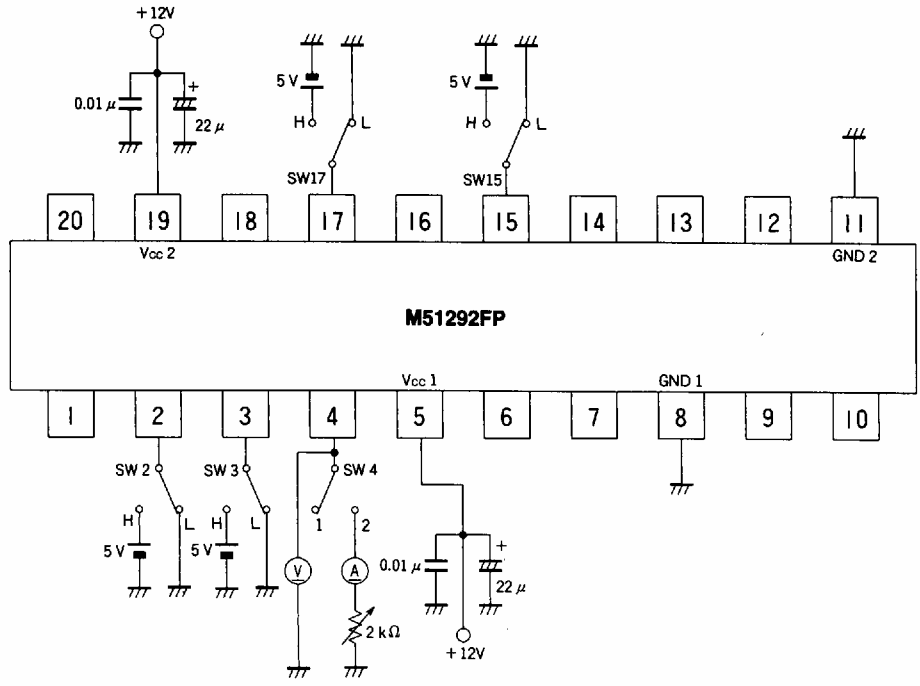


Unit Resistance : Ω
Capacitance : F

TEST CIRCUIT B (VIDEO OUTPUT)

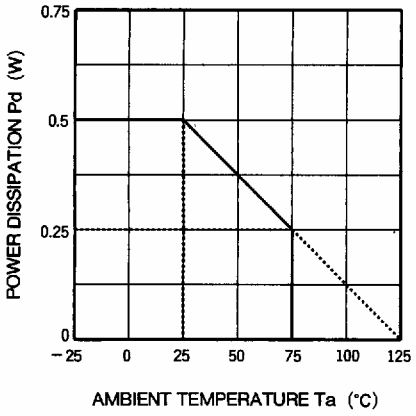


TEST CIRCUIT C (PB + B OUTPUT)

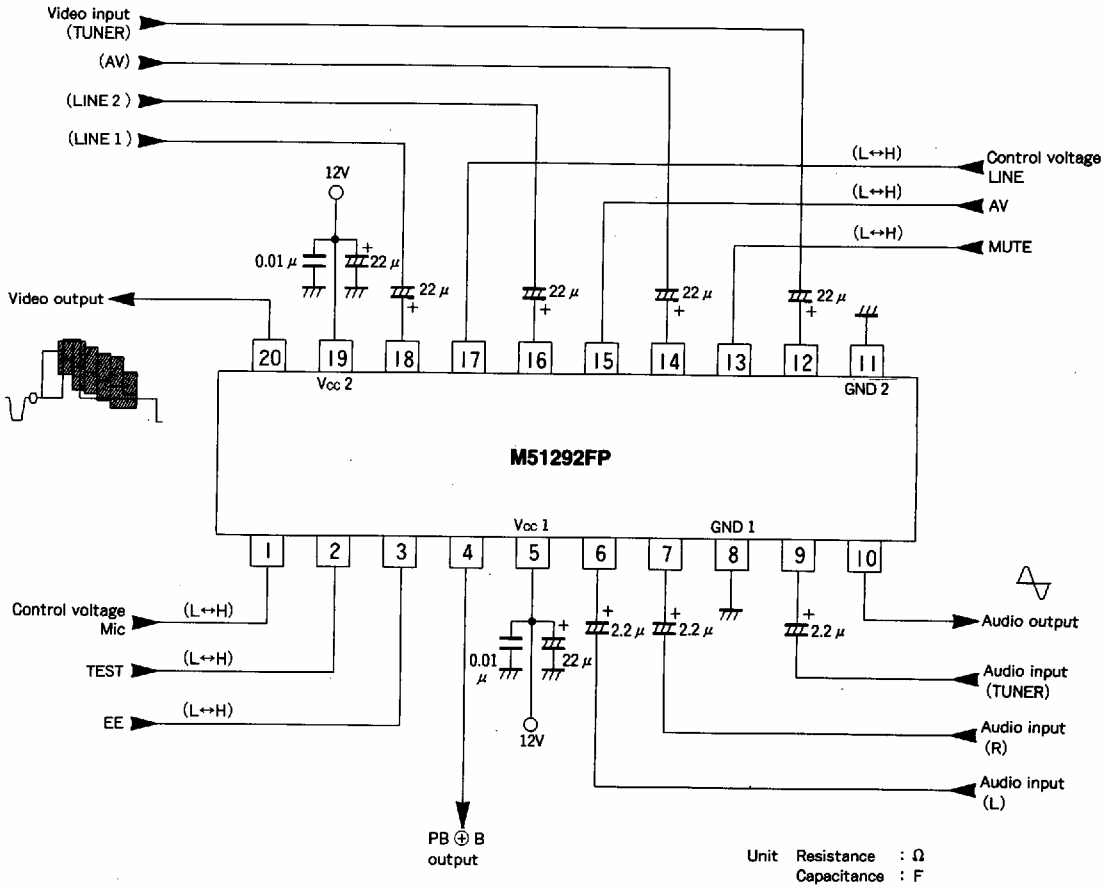


TYPICAL CHARACTERISTICS

THERMAL DERATING (MAXIMUM RATING)



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