

# M52693SP

## BURST LOCK CLOCK GENERATOR

### DESCRIPTION

The M52693SP is a semiconductor integrated circuit developed for analog signal processing of a picture-in-picture system, consisting of a sync separator, an ACC, a burst lock clock generator circuit, an analog switch and a clamp circuit, etc. It is also available on digital video signal systems other than the above.

### FEATURES

- Low power dissipation of supply voltage 5.0V and circuit current 32mA (Typ.)
- Built-in 4fsc burst lock clock generator circuit required for digital video signal processing
- Small picture chroma level following main picture burst level
- Main picture pedestal level matching small picture pedestal level
- Built-in reference voltage source for A/D converter

### APPLICATION

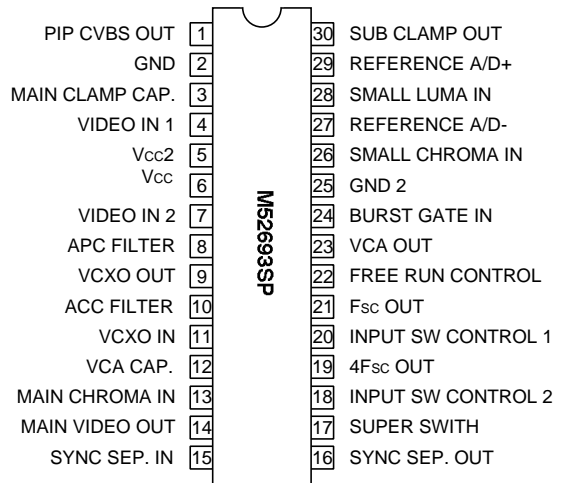
TV, VCR

### RECOMMENDED OPERATING CONDITION

Supply voltage range..... 4.7 to 5.3V

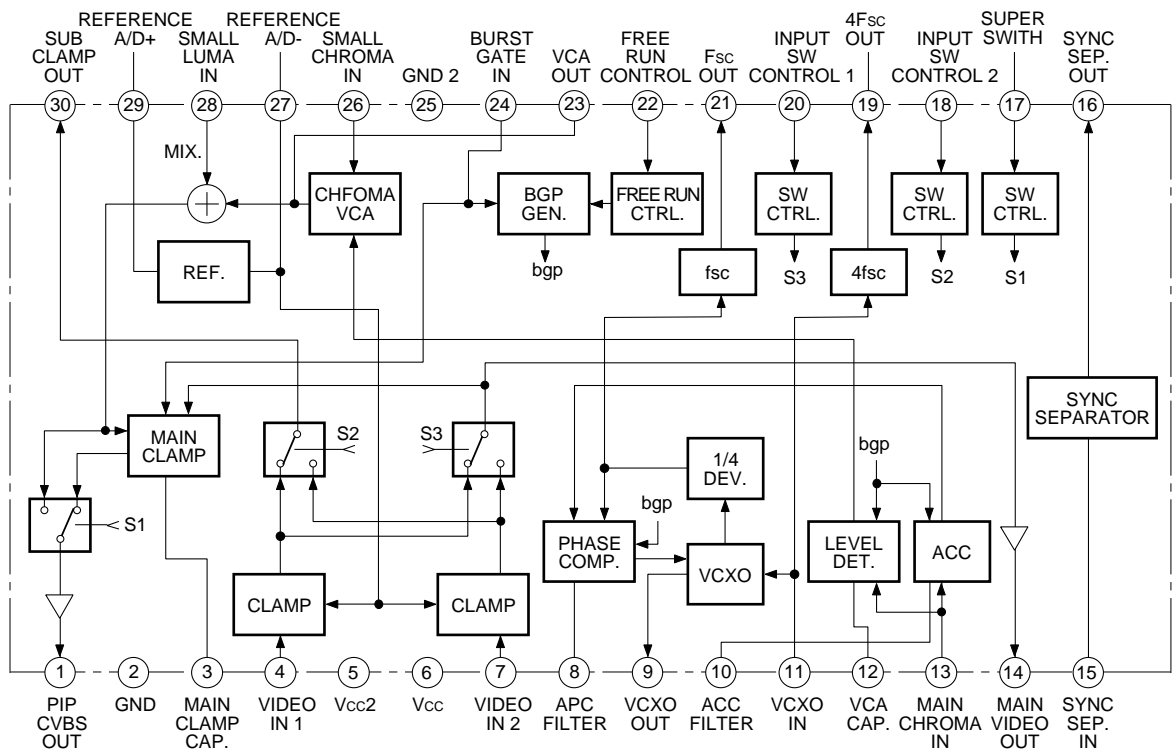
Rated supply voltage.....5.0V

### PIN CONFIGURATION (TOP VIEW)



Outline 30P4B

### BLOCK DIAGRAM



**ABSOLUTE MAXIMUM RATINGS** (Ta=25°C, unless otherwise noted)

Symbol	Parameter	Ratings	Unit
Vcc	Supply voltage	6.0	V
Pd	Power dissipation	1265	mW
Topr	Operating temperature	-20 to +75	°C
Tstg	Storage temperature	-40 to +125	°C

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**ELECTRICAL CHARACTERISTICS** (Ta=25°C, unless otherwise noted)

Symbol	Parameter	Test pin	Test conditions																										Limits		Unit				
			Pin conditions													Switch conditions													Min.	Typ. Max.					
			4	5	6	7	11	13	14	15	16	17	18	19	20	21	22	23	26	27	28	29	30	SW4	SW7	SW11	SW13	SW26				SW28			
Icc	Circuit current	(5)(6)	SG 1	5.0 V	5.0 V	-	-	SG 2	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	b a	a OFF	a b	a a	20.8 32.0	43.2	mA	
Vin1	Video signal input 1 output voltage	(4)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	2.16 2.41	2.66	V	
Vin2	Video signal input 2 output voltage	(7)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	2.16 2.41	2.66	V	
VrH	Reference voltage H	(26)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	3.60 3.75	3.90	V	
VrL	Reference voltage L	(27)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	2.18 2.33	2.48	V	
Vr	(VRT - VRB) voltage	-	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	1.27 1.42	1.57	V	
VsOH	Sync separation signal output voltage H	(16)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	3.40 4.20	-	V	
VsOL	Sync separation signal output voltage L	(16)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	-	0.90	1.20	V
th	Sync separation signal output pulse width	(16)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	5.00 5.30	5.80	µS	
tPDH	Sync separation signal output delay time	(16)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	-	0.12	0.30	µS
Sync-in	Sync separation signal input level	(16)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	0.10 0.30	0.60	Vp-P	
VSub	Video signal output voltage (small picture system)	(30)	-	5.0 V	5.0 V	-	-	-	PG 1	-	-	PG 1	0 V	5.0V 5.0V	-	0V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	2.25 2.40	2.55	V	
ΔVSRB	Clamp offset	(30)	-	5.0 V	5.0 V	-	-	-	PG 1'	-	-	PG 1'	0 V	5.0V 5.0V	-	0V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	30	60	90	mV
GSub	Video signal output gain (small picture system)	(30)	SG 1	5.0 V	5.0 V	1	-	-	PG 1'	-	-	PG 1'	0 V	5.0V 5.0V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	b a	b ON	a a	a a	-1.00	0	1.00	dB
CTSub	Video signal output crosstalk (small picture system)	(30)	SG3 V	5.0 V	5.0 V	SG3	-	-	PG 1'	-	-	PG 1'	5-0V 0-5V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	b/a a	b/a ON	a a	a a	-	-55	-45	dB
fBWsub	Video signal output frequency band (small picture system)	(30)	SG 4	5.0 V	5.0 V	4	-	-	PG 1'	-	-	PG 1'	5.0V 0V	5.0 V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	b a	b ON	a a	a a	10	-	-	MHz
Vmain	Video signal output voltage (main picture system)	(14)	-	5.0 V	5.0 V	-	-	-	PG 1'	-	-	PG 1'	0 V	5.0V 0V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	a a	a ON	a a	a a	1.20 1.45	1.70	V	
Gmain	Video signal output gain (main picture system)	(14)	SG 1	5.0 V	5.0 V	1	-	-	PG 1'	-	-	PG 1'	0 V	5.0V 0V	-	5.0 V	-	0 V	-	-	-	-	0 V	-	-	-	0 V	b a	b ON	a a	a a	1.3	2.3	3.3	dB

BURST LOCK CLOCK GENERATOR

ELECTRICAL CHARACTERISTICS (cont.)

Symbol	Parameter	Test point	Test conditions																												Limits		Unit	
			Pin conditions														Switch conditions														Min.	Typ.		Max.
			4	5	6	7	11	13	14	15	16	17	18	19	20	21	22	23	26	27	28	29	30	SW4	SW7	SW11	SW13	SW26	SW28					
CT <sub>main</sub>	Video signal output crosstalk (main picture system)	(14)	SG3	5.0 V	5.0 V	SG3	-	-	-	PG 1*	0 V	5.0 V	5-0V / 0-5V	-	0 V	-	-	-	-	-	-	b/a	a/b	ON	a	a	a	a	-	-55	-45	dB		
fBW <sub>main</sub>	Video signal output frequency band (main picture system)	(14)	SG4	5.0 V	5.0 V	SG4	-	-	-	PG 1*	0 V	5.0 V	5.0V / 0V	-	0 V	-	-	-	-	-	-	b	b	ON	a	a	a	a	10	-	-	MHz		
V <sub>PIP</sub>	PIP output voltage (Sub)	-	-	5.0 V	5.0 V	-	-	-	-	RG 1	5.0 V	5.0 V	5.0 V	-	0 V	-	-	-	-	-	-	a	a	ON	a	a	a	a	1.40	1.65	1.90	V		
ΔV <sub>PIP</sub>	PIP output clamp offset	-	-	5.0 V	5.0 V	-	-	-	-	RG 1	0 V	5.0V / 0V	5.0V / 0V	-	0 V	-	-	-	-	-	-	a	a	ON	a	a	a	0	-	15	mV			
G <sub>PIFSC</sub>	PIP output gain (Sub-C)	-	-	5.0 V	5.0 V	-	-	-	-	RG 1	5.0 V	5.0 V	5.0 V	-	0 V	-	SG5	-	-	-	-	a	a	ON	a	b	a	4.3	5.3	6.3	dB			
G <sub>PIPSI</sub>	PIP output gain (Sub-Luma)	-	-	5.0 V	5.0 V	-	-	-	-	RG 1	5.0 V	5.0 V	5.0 V	-	0 V	-	SG6	-	-	-	-	a	a	ON	a	a	b	4.6	5.6	6.6	dB			
G <sub>PIP</sub>	PIP output gain	-	SG1	5.0 V	5.0 V	SG1	-	-	-	RG 1	0 V	5.0V / 0V	5.0V / 0V	-	0 V	-	-	-	-	-	-	b	b	ON	a	a	a	4.3	5.3	6.3	dB			
fBW <sub>PIP</sub>	PIP output frequency band	-	SG4	5.0 V	5.0 V	SG4	-	-	-	RG 1	0 V	5.0V / 0V	5.0V / 0V	-	0 V	-	-	-	-	-	-	b	b	ON	a	a	a	10	-	-	MHz			
fBW <sub>PIPS</sub>	PIP output frequency band (s)	-	-	5.0 V	5.0 V	-	-	-	-	RG 1	5.0 V	5.0 V	5.0 V	-	5.0 V	-	SG7	-	-	-	-	a	a	ON	a	b	a	10	-	-	MHz			
CT <sub>PIP</sub>	PIP output crosstalk	-	SG3	5.0 V	5.0 V	SG3	-	-	-	RG 1	0V ↓ / 5V	5.0V / 0V	5.0V / 0V	-	0 V	-	-	-	-	-	-	b	b	ON	a	a	a	-	-50	-45	dB			
CT <sub>PIPS</sub>	PIP output crosstalk (s)	-	-	5.0 V	5.0 V	-	-	SG2	-	RG 1	5V ↓ / 0V	5.0V / 0V	5.0V / 0V	-	0 V	-	SG5	-	-	-	-	a	a	ON	b	b	a	-	-50	-45	dB			
VCA <sub>typ.</sub>	VCA output	(23)	-	5.0 V	5.0 V	-	-	SG2	-	RG 1	0 V	5.0 V	5.0 V	-	0 V	-	SG5	-	-	-	-	a	a	ON	b	b	a	2.0	3.5	5.0	dB			
VCA <sub>max.</sub>	VCA control maximum	(23)	-	5.0 V	5.0 V	-	-	SG2	-	RG 1	0 V	5.0 V	5.0 V	-	0 V	-	SG5	-	-	-	-	a	a	ON	b	b	a	7.0	8.5	10.0	dB			
VCA <sub>min.</sub>	VCA control minimum	(23)	-	5.0 V	5.0 V	-	-	SG2'	-	RG 1	0 V	5.0 V	5.0 V	-	0 V	-	SG5	-	-	-	-	a	a	ON	b	b	a	-120	-9.0	-6.0	dB			
G <sub>max.</sub>	VCA control maximum gain	(23)	-	5.0 V	5.0 V	-	-	SG2'	-	RG 1	0 V	5.0 V	5.0 V	-	5.0 V	-	SG5	-	-	-	-	a	a	ON	b	b	a	0.8	2.8	4.8	dB			
LVCA	VCA output leak	(23)	-	5.0 V	5.0 V	-	-	-	-	RG 1	0 V	5.0 V	5.0 V	-	0 V	-	SG5	-	-	-	-	a	a	ON	a	b	a	-	-	-9.0	dB			
f <sub>FR</sub>	VCXO free running frequency	(19)	-	5.0 V	5.0 V	-	-	-	-	RG 1	0 V	5.0 V	5.0 V	-	0 V	-	-	-	-	-	-	a	a	OFF	a	a	a	-	-	14.318	MHz			
V <sub>4fSCH</sub>	4fsc output voltage H	(19)	-	5.0 V	5.0 V	-	-	SG2	-	PG 1	0 V	5.0 V	5.0 V	-	0 V	-	-	-	-	-	-	a	a	OFF	b	a	a	3.4	3.9	-	V			

**ELECTRICAL CHARACTERISTICS (cont.)**

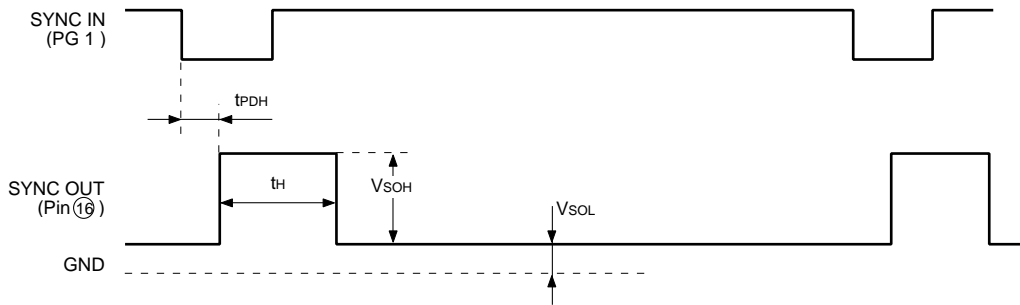
Symbol	Parameter	Test point	Test conditions																												Limits		Unit						
			Pin conditions														Switch conditions														Min.	Typ.		Max.					
			4	5	6	7	11	13	14	15	16	17	18	19	20	21	22	23	26	27	28	29	30	SW4	SW7	SW11	SW13	SW26	SW28	SW									
V4fscL	4fsc output voltage L	(19)	-	5.0 V	5.0 V	-	-	-	SG 2	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	-	0.1	0.5	V
VfSCH	fsc output voltage H	(21)	-	5.0 V	5.0 V	-	-	-	SG 2	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	3.4	3.9	-	V
VfscL	fsc output voltage L	(21)	-	5.0 V	5.0 V	-	-	-	SG 2	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	-	0.1	0.5	V
4fsc	4fsc output frequency	(19)	-	5.0 V	5.0 V	-	-	-	SG 2	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	-	14.318	-	MHz	
fsc	fsc output frequency	(21)	-	5.0 V	5.0 V	-	-	-	SG 2	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	-	3.5795	-	MHz	
fcp (+)	Capture range (+)	(19)	-	5.0 V	5.0 V	-	-	-	SG 8	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	400	650	-	Hz	
fcp (-)	Capture range (-)	(19)	-	5.0 V	5.0 V	-	-	-	SG 8	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	-	-1200	-400	Hz	
C-IN	Chroma signal input level (burst)	(19)	-	5.0 V	5.0 V	-	-	-	SG2' SG2	-	1	PG	-	1	0	5.0 V	0	5.0 V	0	-	-	-	-	-	-	-	-	a	a	OFF	b	a	a	0.01	0.10	0.20	Vp-P		

**ELECTRICAL CHARACTERISTICS TEST METHOD**

**VR**

$VR = VRH - VRL$

**V<sub>SOH</sub>, V<sub>SOL</sub>, t<sub>H</sub> and t<sub>PDH</sub>**



**Sync-in**

Measure t<sub>H</sub> and t<sub>PDH</sub> when the input amplitude of pin ⑮ is 0.1V<sub>P-P</sub>. Make sure that t<sub>H</sub> and t<sub>PDH</sub> are within the allowable range. When the input amplitude of pin ⑮ is 0.6V<sub>P-P</sub>, make sure that t<sub>H</sub> and t<sub>PDH</sub> are within the allowable range.

If the voltage which appears at pin ⑳ when pin ⑮ is "H" is taken as V<sub>sub1</sub>, and the voltage which appears at pin ⑳ when pin ⑮ is "L" is taken as V<sub>sub2</sub>, the clamp offset is given by the following expression:

$DV_{SRB} = (V_{sub1} - V_{27}), (V_{sub2} - V_{27})$

**V<sub>sub</sub> and V<sub>SRB</sub>**

Measure pin ⑳ DC output voltage in correspondence to the "H" and "L" states of pin ⑮ .

**G<sub>sub</sub>**

Measure pin ⑳ gain in correspondence to the "H" and "L" states of pin ⑮ .

**CT<sub>sub</sub>, C<sub>main</sub>, and CT<sub>PIP</sub>**

Measure crosstalk under the following input conditions:

Parameter		Input signal	Pin connection Switching condition:Left Input condition:Right						
			4	7	17	18	20		
CT <sub>sub</sub>	CT <sub>sub</sub> 1	Sine wave Amplitude : 0.3V <sub>P-P</sub> Frequency : 3.58MHz	b	IN	a	--	0V	5 ⇔ 0V	0V
	C <sub>tsub</sub> 2		a	--	b	IN	0V	0 ⇔ 5V	0V
CT <sub>main</sub>	CT <sub>main</sub> 1		b	IN	a	--	0V	0V	5 ⇔ 0V
	CT <sub>main</sub> 2		a	--	b	IN	0V	0V	0 ⇔ 5V
CT <sub>PIP</sub>	CT <sub>PIP</sub> 1		b	IN	a	--	0 ⇔ 5V	0V	5V
	CT <sub>PIP</sub> 2		a	--	b	IN	0 ⇔ 5V	0V	0V

**f<sub>BWsub</sub>**

Measure pin ⑳ frequency characteristics in correspondence to the "H" and "L" states of pin ⑮. Condition: -3dB

**f<sub>BWmain</sub>**

Measure pin ⑭ frequency characteristics in correspondence to the "H" and "L" states of pin ⑳. Condition: -3dB

**V<sub>main</sub>**

Measure pin ⑭ DC output voltage in correspondence to the "H" and "L" states of pin ⑳ .

**V<sub>PIP</sub>**

If the voltage which appears at pin ① when pin ⑳ is "H" is taken as V<sub>pip1</sub>, and the voltage which appears at pin ① when pin ⑳ is "L" is taken as V<sub>pip2</sub>, V<sub>PIP</sub> is given by the following expression:

$V_{PIP} = |V_{pip1} - V_{PIP}|, |V_{pip2} - V_{PIP}|$

**G<sub>main</sub>**

Measure pin ⑭ gain in correspondence to the "H" and "L" states of pin ⑳ .

BURST LOCK CLOCK GENERATOR

**GPIPS**

Pin ② = 2.185V  $V_1$  = Amplitude of pin ①  $V_{23}$  = Amplitude of pin ②③  
 $GPIPS = 20 \log (V_1/V_{23})$

**GPIP**

Measure pin ① gain in correspondence to the "H" and "L" states of pin ②③ .

**fBWPIP**

Measure pin ① frequency characteristics in correspondence to the "H" and "L" states of pin ②③. Condition: -3dB

**fBWPIPS**

Condition: -3dB

**CTPIPS**

Apply 5.0V to pin ②③ . Define as  $V_{OS1}$  the amplitude which appears at pin ① a when pin ①⑦ is "H", and as  $V_{OM1}$  the amplitude which appears when pin ①⑦ is "L". Then apply 0V to pin ②③ . Define as  $V_{OS2}$  the amplitude which appears at pin ① when pin ①⑦ is "H", and as  $V_{OM2}$  the amplitude which appears at pin ① when "L".  
 CTPIPS is given under the above conditions by the equation given below.

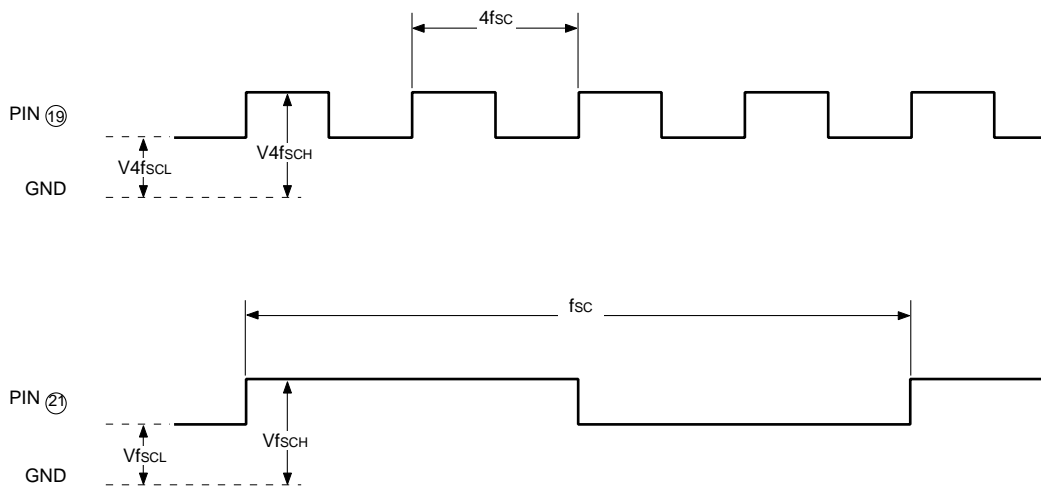
$CTPIPS = 20 \log (V_{OM1}/V_{OS1}), 20 \log (V_{OM2}/V_{OS2})$

**VCA<sub>typ</sub>, VCA<sub>max</sub>, VCA<sub>min</sub>, G<sub>max</sub>, Lv<sub>ca</sub>**

$20 \log \{ (\text{amplitude of pin 23})/SG5 \}$

**V<sub>4fSCH, L</sub>; V<sub>fSCH, L</sub>; 4f<sub>sc</sub>; f<sub>sc</sub>**

Make sure that the input signal at pin ⑬ is synchronous with the output signal at pin ⑱ .



**f<sub>cp</sub> (+)**

- 1) Raise the frequency of SG8 input signal so that the signal is synchronous with pin ⑱ output signal.
- 2) Lower the SG8 frequency.
- 3) Measure the SG8 frequency ( $f_1$ ) when the SG8 input signal is synchronous with the pin ⑱ output signal.
- 4)  $f_{cp}(+) = f_1 - f_c$  ( $f_c = 3.579545\text{MHz}$ )

**f<sub>cp</sub> (-)**

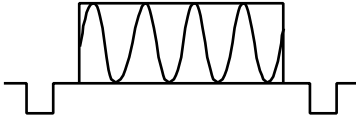
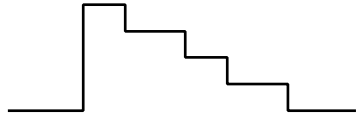
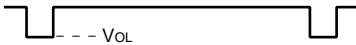
- 1) Lower the frequency of SG8 input signal so that the signal is synchronous with pin ⑱ output signal.
- 2) Raise the SG8 frequency.
- 3) Measure the SG8 frequency ( $f_2$ ) when the SG8 input signal is synchronous with the pin ⑱ output signal.
- 4)  $f_{cp}(-) = f_2 - f_c$  ( $f_c = 3.579545\text{MHz}$ )

**C-IN**

Make sure that the pin ⑬ input signal is synchronous with the pin ⑱ output signal when the input amplitude of pin ⑬ is 0.20V<sub>P-P</sub>. Then make sure that the pin ⑬ input signal is synchronous with the pin ⑱ output signal when the input amplitude is 0.01V<sub>P-P</sub>.

**BURST LOCK CLOCK GENERATOR**

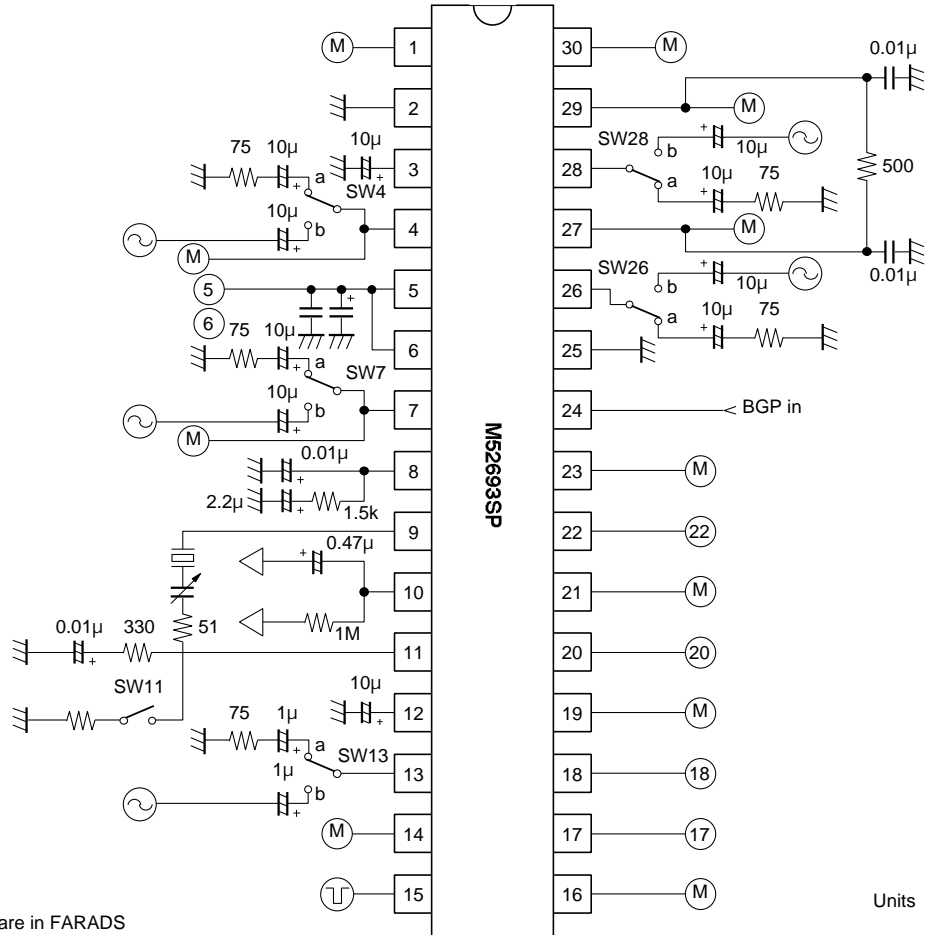
**INPUT SIGNAL**

SG No.	Input signal	Remarks
SG1	NTSC system composite video signal (1V <sub>P-P</sub> )	- - -
SG2	Sine wave Frequency: 3.58MHz Amplitude : 0.1V <sub>P-P</sub>	- - -
SG2'	Sine wave Frequency: 3.58MHz Amplitude : 0.2V <sub>P-P</sub>	- - -
SG2''	Sine wave Frequency: 3.58MHz Amplitude : 0.01V <sub>P-P</sub>	- - -
SG3	Sine wave Frequency: 3.58MHz Amplitude : 0.3V <sub>P-P</sub>	- - -
SG4	C-Sync + sine wave C-Sync Frequency: 15.734kHz Amplitude : 0.285V <sub>P-P</sub> Sine wave Frequency: 1/10MHz Amplitude : 0.715V <sub>P-P</sub>	
SG5	Sine wave Frequency: 3.58MHz Amplitude : 0.2V <sub>P-P</sub>	- - -
SG6	Y signal Amplitude : 0.715V <sub>P-P</sub>	
SG7	Sine wave Frequency: 1/10MHz Amplitude : 0.2V <sub>P-P</sub>	- - -
SG8	Sine wave Frequency: Variable Amplitude : 0.1V <sub>P-P</sub>	- - -
PG1	C-Sync Frequency: 15.734kHz Amplitude : 0.3V <sub>P-P</sub> VOL=2.75V	
PG1'	C-Sync Amplitude : 0.1V <sub>P-P</sub> 0.6V <sub>P-P</sub>	- - -



**BURST LOCK CLOCK GENERATOR**

**TEST CIRCUIT**



Notes:

1. Capacitance values are in FARADS
2. Resistors are in OHMS
3. : Vcc    : GND

Units    Resistance :  
          Capacitance : F

**TYPICAL CHARACTERISTICS**

**THERMAL DERATING (MAXIMUM RATING)**

