

## SUBCARRIER COUPLER

### GENERAL DESCRIPTION

The SAA1044 maintains the correct relationship between subcarrier and horizontal scan frequencies when an exact coupling is required. It is for use in combination with sync generator SAA1043 for application in colour video sources (cameras, film-scanners and similar equipments).

### Features

- Provides exact relationship between subcarrier and horizontal scan frequencies
- Accommodates all standard frequencies
- Facilitates GENLOCK (general locking) applications

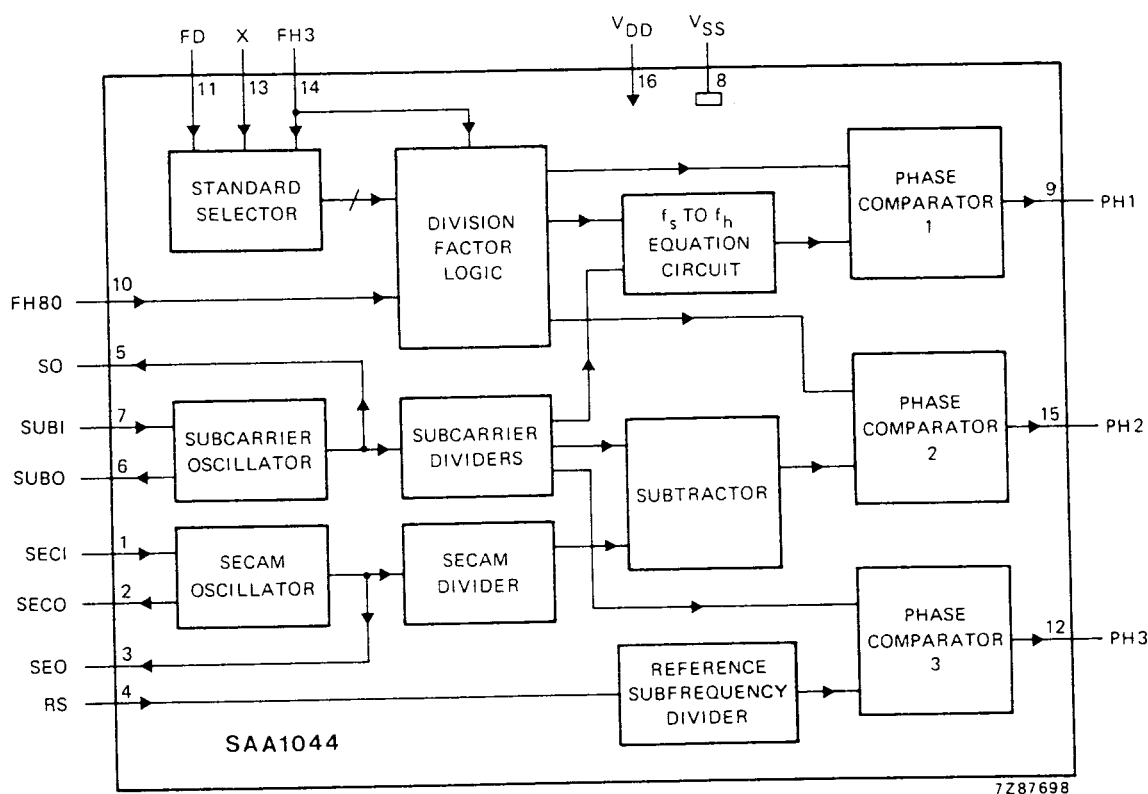


Fig.1 Block diagram.

### PACKAGE OUTLINES

SAA1044: 16-lead DIL; plastic (SOT38).

SAA1044T: 16-lead mini-pack; plastic (SO16L; SOT162A).

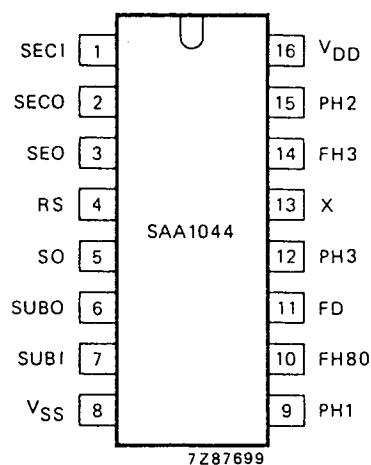


Fig. 2 Pinning diagram.

## PINNING

1	SECI	SECAM oscillator input ( $272f_H$ )
2	SECO	SECAM oscillator output ( $272f_H$ )
3	SEO	inverted SECAM oscillator output
4	RS	reference subfrequency
5	SO	inverted subcarrier oscillator output
6	SUBO	subcarrier oscillator output
7	SUBI	subcarrier oscillator input
8	VSS	negative supply voltage (ground)
9	PH1	phase comparator 1 output (FH80/SUBI)
10	FH80	1.25 MHz input (from SAA1043)
11	FD	standard programming input
12	PH3	phase comparator 3 output (RS/SUBI)
13	X	standard programming input
14	FH3	standard programming input (from SAA1043)
15	PH2	phase comparator 2 output (SECI/FH80)
16	VDD	positive supply voltage

## FUNCTIONAL DESCRIPTION

## Programming of operating standard

The standard required for operation is programmed using the inputs FD, X and FH3 as shown in Table 1.

Table 1 Programming of operating standard

standard	FD	X	FH3	relationship of subcarrier frequency ( $f_S$ ) to horizontal scan frequency ( $f_H$ )
PAL	0	1	400 Hz	$f_S = 283.7516f_H$
SECAM	0	0	don't care	$f_S = 282f_H$
PAL-N	1	1	400 Hz	$f_S = 229.2516f_H$
PAL-M	1	0	1	$f_S = 227.25f_H$
NTSC	1	0	0	$f_S = 227.5f_H$

Positive logic: 1 = HIGH; 0 = LOW

### Subcarrier/horizontal scan frequency relationship

The input FH80 from SAA1043 is the reference for horizontal scan frequency ( $f_H$ ). This frequency is reduced by a factor determined by the selected operating standard to give a value of  $8f_H$  (PAL, SECAM) or  $10f_H$  (PAL-N, PAL-M, NTSC) to phase comparator 1. The subcarrier frequency ( $f_S$ ) is manipulated to provide a comparable value at the second input to the phase comparator. When the frequencies of the two inputs to phase comparator 1 are equal, the relationship between  $f_H$  and  $f_S$  is as shown in Table 1.

Phase comparator 1 functions with an exclusive-OR phase detector circuit and provides an output which may be used to control a voltage-controlled oscillator (VCO) via a low-pass filter. The VCO reference can be the subcarrier or the horizontal scan frequency and the filter can be active or passive, depending on application.

A second subcarrier oscillator circuit is provided for SECAM operation. The operating frequency of this is centred on  $272f_H$  to give, when  $f_S = 282f_H$ , comparable values of  $5f_H$  at the two inputs to phase comparator 2. A second VCO loop can be used to control the SECAM oscillator frequency.

The high degrees of accuracy and stability required for GENLOCK applications are met by phase comparator 3. This compares the internal subcarrier and external reference frequencies. To adjust the phase over  $2\pi$ , this comparator has a linear characteristic over  $4\pi$ . The output signal PH3 has a period time of  $f_S/4$  and a duty factor of between 12.5% and 62.5% giving a sensitivity of 240 mV/rad. Errors due to temperature variation are minimized by symmetrical circuit and chip design.

### RATINGS

parameter	symbol	min.	max.	unit
Supply voltage range with respect to $V_{SS}$	$V_{DD}$	-0.5	+ 15	V
Input voltage range	$V_I$	-0.5	$V_{DD} + 0.5^*$	V
Input current	$\pm I_I$	—	10	mA
Output voltage range	$V_O$	-0.5	$V_{DD} + 0.5^*$	V
Output current	$\pm I_O$	—	10	mA
Total power dissipation per package	$P_{tot}$	—	200	mW
Power dissipation per output	$P_O$	—	100	mW
Operating ambient temperature range	$T_{amb}$	-25	+ 70	°C
Storage temperature range	$T_{stg}$	-55	+ 150	°C

### HANDLING

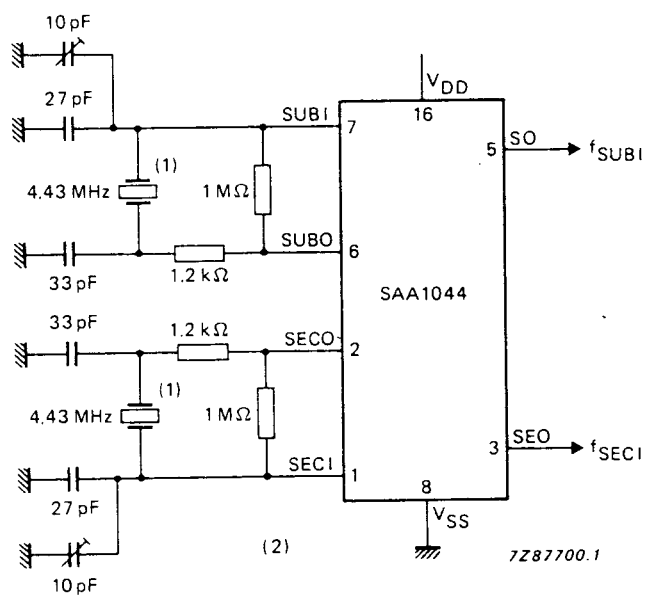
Inputs and outputs are protected against electrostatic discharge in normal handling. However, to be totally safe, it is desirable to take normal precautions appropriate to handling MOS devices (see 'Handling MOS Devices').

\*  $V_{DD} + 0.5$  V not to exceed 15 V.

## CHARACTERISTICS

 $V_{DD} = 5.7 \text{ to } 7.5 \text{ V}$ ;  $V_{SS} = 0 \text{ V}$ ;  $T_{amb} = -25 \text{ to } +70 \text{ }^{\circ}\text{C}$  unless otherwise specified

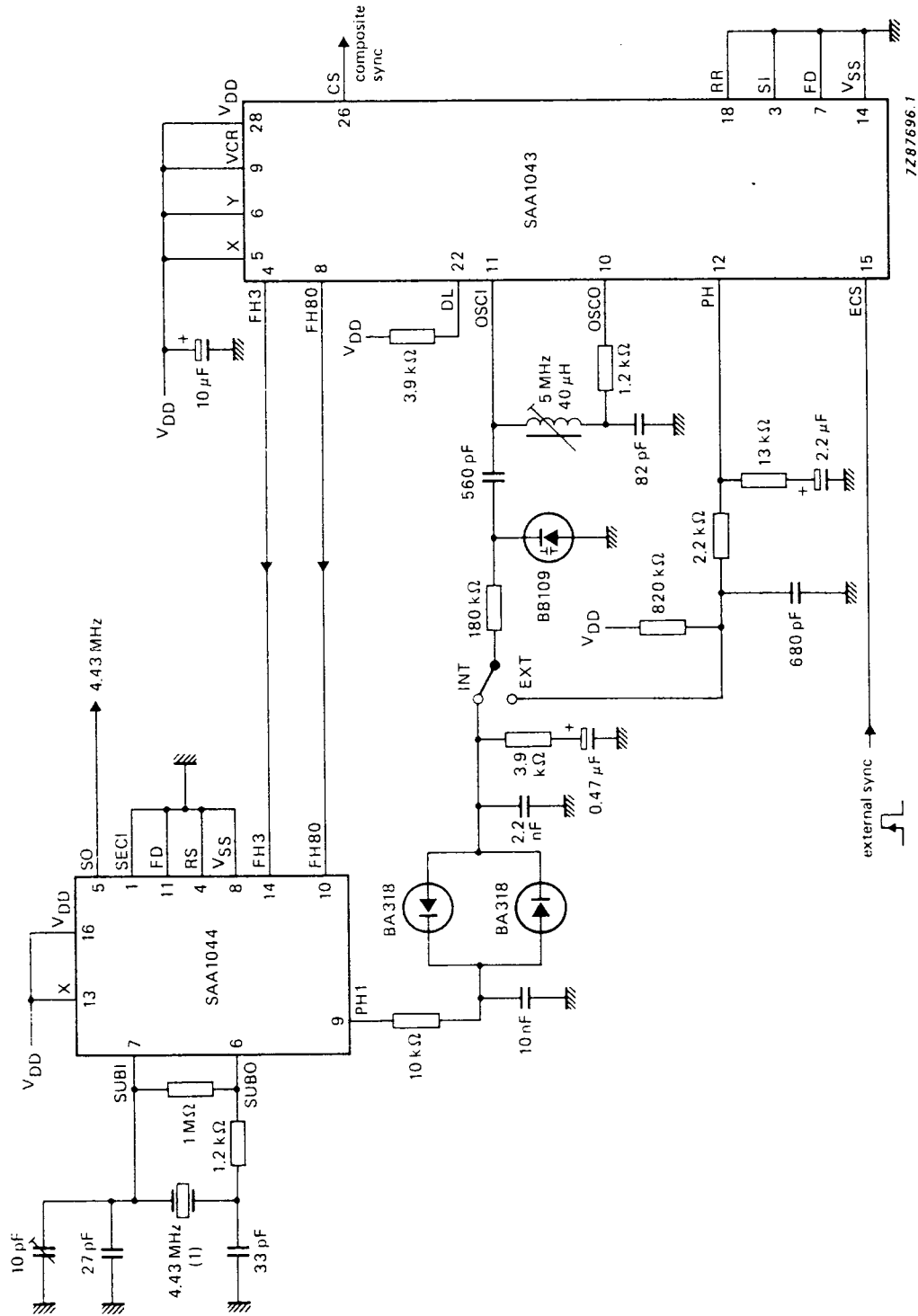
parameter	symbol	min.	typ.	max.	unit
<b>Supplies</b>					
Supply voltage	$V_{DD}$	5.7	—	7.5	V
Supply current (quiescent) at $I_O = 0 \text{ mA}$ at all outputs; $V_{DD} = 7.5 \text{ V}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	$I_{DD}$	—	—	10	$\mu\text{A}$
<b>Inputs</b>					
Input voltage HIGH	$V_{IH}$	$0.7V_{DD}$	—	$V_{DD}$	V
Input voltage LOW	$V_{IL}$	0	—	$0.3V_{DD}$	V
Input leakage current at $V_I = 7.5 \text{ V}$ ; $V_{DD} = 7.5 \text{ V}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	$I_{LI}$	—	—	1	$\mu\text{A}$
Input leakage current at $V_I = 0 \text{ V}$ ; $V_{DD} = 7.5 \text{ V}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	$-I_{LI}$	—	—	1	$\mu\text{A}$
<b>Outputs (except SECO and SUBO)</b>					
Output voltage HIGH at $-I_{OH} = 0.5 \text{ mA}$	$V_{OH}$	$V_{DD} - 0.5$	—	—	V
Output voltage LOW at $I_{OL} = 0.5 \text{ mA}$	$V_{OL}$	—	—	0.4	V
<b>Outputs SECO and SUBO</b>					
Output voltage HIGH at $-I_{OH} = 0.9 \text{ mA}$	$V_{OH}$	$V_{DD} - 0.5$	—	—	V
Output voltage LOW at $I_{OL} = 1.0 \text{ mA}$	$V_{OL}$	—	—	0.4	V
<b>Oscillator frequency (Fig.3)</b>					
Maximum oscillator frequency at $V_{DD} = 5.7 \text{ V}$					
pin 1	$f_{SECI}$	5.1	—	—	MHz
pin 7	$f_{SUBI}$	5.1	—	—	MHz



- (1) Catalogue number of crystal: 4322 143 04040.  
 (2) Inputs not shown are don't care.

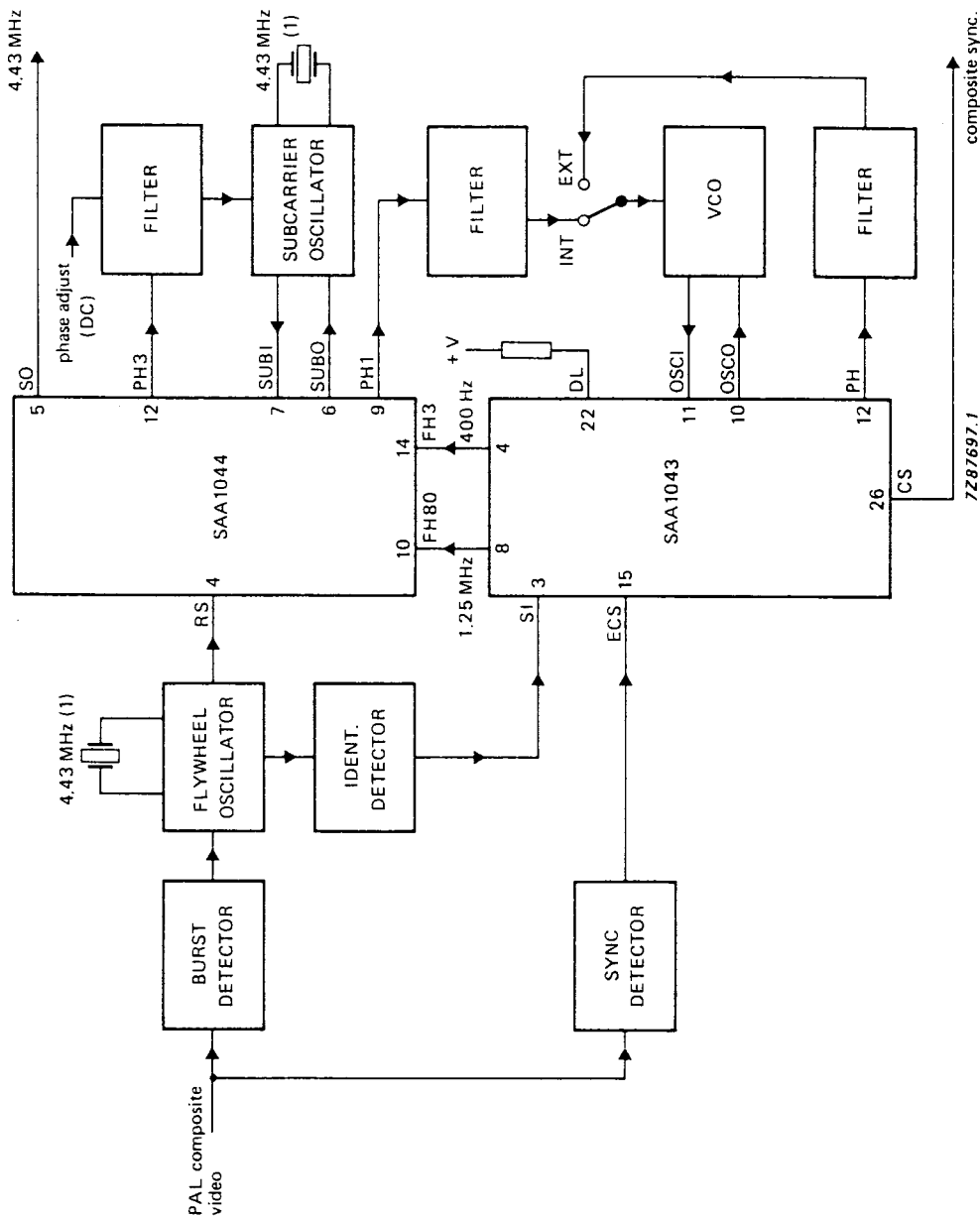
Fig.3 Test set-up for oscillator frequency measurement.

APPLICATION INFORMATION



(1) Catalogue number of crystal: 4322 143 04040.

Fig.4 Subcarrier coupling for PAL application; external synchronization is selected with switch in EXT condition.



(1) Catalogue number of crystal: 4322 143 04040.  
Fig.5 Subcarrier coupling for PAL GENLOCK application.