Bipolar circuit

PLL divider with programmable dividing ratio 1:2 to 1:8191
Together with the types S 0436, TBB 1331 A, and a voltage-controlled oscillator a frequency and phase comparison circuit can be designed, intended for the channel selection in TV sets.
Programming allows quartz-controlled setting of the oscillator frequency for the television bands I/III/IV/V) in 125 kHz raster.

- Few external components
- Internal time base
- High noise immunity

Type	Ordering code	Package outline
S 0437	Q67000-A1347	DIP 16

Maximum ratings

Supply voltage	V_9	6.5	V
	V_3	13.5	V
Input voltage IFO	V_{15}	16	V
Input voltage PLE	V_{14}	16	V
Input voltage divider F, $\bar{F}$	V_7; V_8	7.5	V
Output voltage clock CL	V_{12}	16	V
Sync. output voltage SYC	V_{13}	16	V
Thermal resistance (system-air)	$R_{th\ SA}$	90	K/W
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−40 to 125	°C

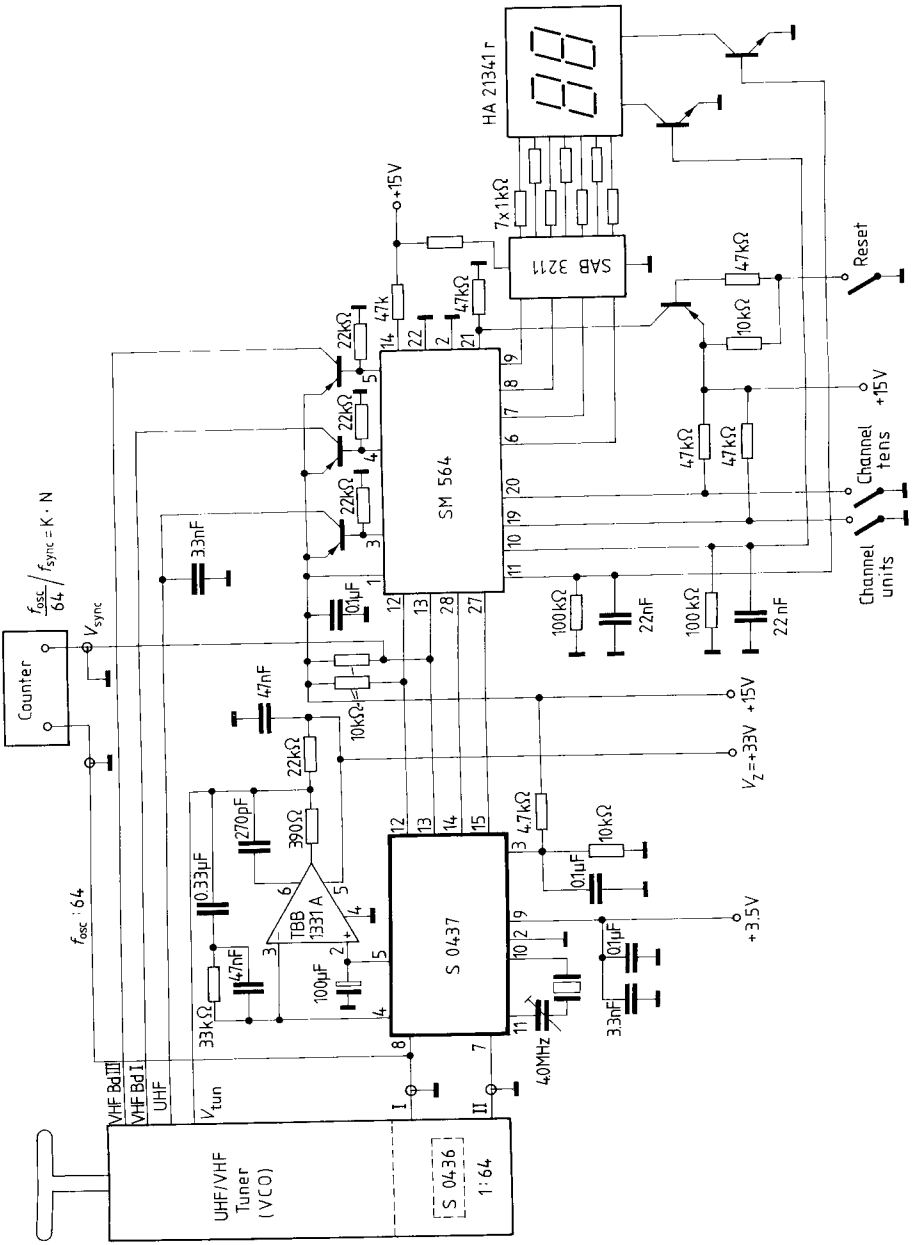
Range of operation

Supply voltage range	V_9	3.25 to 3.75	V
	V_3	3.5 to 12.5	V
Input frequency	f_i	≤ 15	MHz
Ambient temperature range	T_{amb}	0 to 60	°C

Characteristics (V_9 = 3.5 V; T_{amb} = 25 °C) according to test circuit

		min	typ	max	
Current consumption	I_9	100	150	200	mA
	I_3			1	mA
Input level					
$I_{7/8\,H}$ = 2.4 mA	$V_{7/8\,H}$		6.2		V
$I_{7/8\,L}$ = 2,2 mA	$U_{7/8\,L}$		5.3		V
Inputs IFO, PLE					
(V_{pp} = 15 V; τ = 500 µs; T/τ = 250)	$V_{14/15\,H}$	14	14.5	15	V
	$I_{14/15\,H}$			1.5	mA
	$I_{14/15\,L}$			50	µA
Set-up time	t_S		1.5		µs
Hold time	t_H		3.0		µs
Clock output CL					
(V_{pp} = 15 V; $R_L \geqq$ 6.8 kΩ)	$V_{12\,H}$	14	14.5	15	V
	$V_{12\,L}$			1.5	V
Switching times					
High pulse width	t_{WH}		4		µs
Low pulse width	t_{WL}		12		µs
High-low transition time (R_L = 9.5 kΩ)	t_{THL}			0.5	µs
Low-high transition time (C_L = 50 pF)	t_{TLH}			1.5	µs
Synchronous output SYC					
(V_{pp} = 15 V; $R_L \geqq$ 6.8 kΩ)	$V_{13\,H}$	14	14.5	15	V
	$V_{13\,L}$			1.5	V
Switching times					
High pulse width	t_{WH}		8		µs
Low pulse width	t_{WL}		504		µs
High-low transition time (R_L = 9.5 kΩ)	t_{THL}			0.5	µs
Low-high transition time (C_L = 50 pF)	t_{TLH}			1.5	µs
Delay time	t_p		4		µs
Phase detector output PD	$I_{4\,Load}$		+100		µA
	$I_{4\,Sink}$		−100		µA
PD reference PD REF	V_3	$\frac{V_3}{2}+0.2$		$\frac{V_3}{2}+0.7$	V
Divider input sensitivity (f_i = 15 MHz)	$V_{7/8_{pp}}$	600	800	1000	mV
Lock indication output LOCK IND	$V_{6\,L}$		0		V
(R_L = 10 kΩ)	$V_{6\,H}$	2.5			V

Test circuit



Functional description

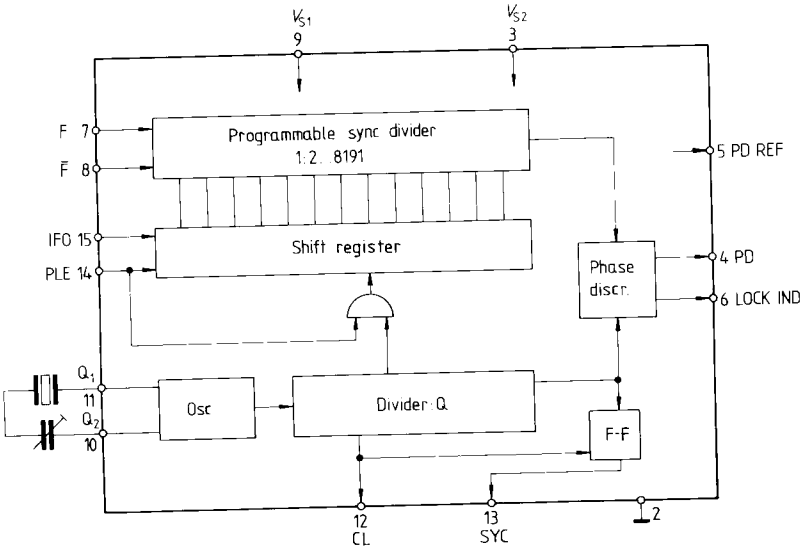
S 0437 includes a 13 bit parallel-programmable synchronous divider (divider factor N = 2 to 8191), a 13 bit shift register, a quartz oscillator (f_{osc} = 4.0 MHz) with subsequent divider (divider factor Q = 2048) and a frequency and phase sensitive digital phase detector. The dividing factor N — in 13 digit dual code — is serially input into a 13 bit shift register with parallel output. As first bit the LSB (least significant bit) is pushed in, and the MSB (most significant bit) as last one. Acceptance at the information input (IFO) only takes place when the enable input is at high level (PLE). The shifting clock (f = 62.5 kHz) is available at the open collector output (CL). Shifting is done by the low — high transition of the shifting cycle.

Referred to the high — low transition of the enable input, only the last 13 cycles are utilized. Possible preceding dummy bits remain without importance. H level of the enable input is only allowed to exist when the synchronous output (SYC) is at L level. The synchronous divider has balanced pushpull clock inputs (F, $\overline{F}$) for ECL level.

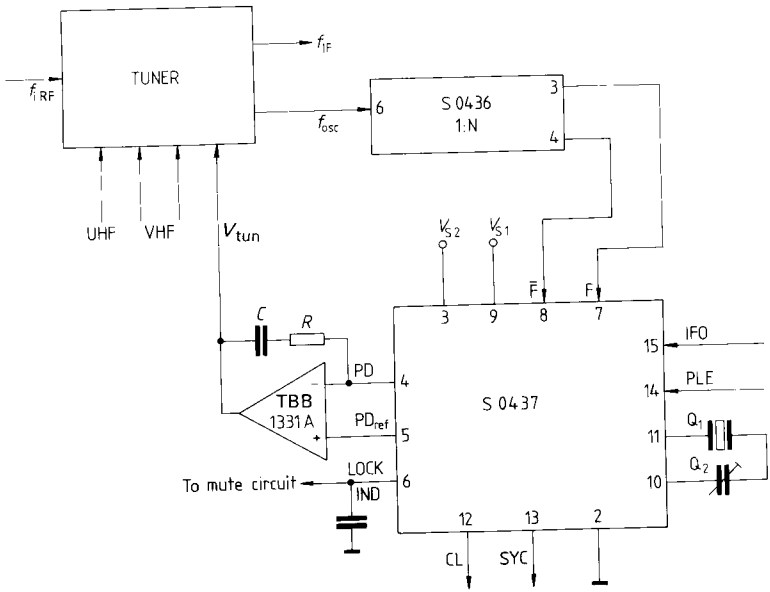
L signal is obtained at the output LOCK IND in case of frequency and phase synchronization.

The phase detector may be operated with a separated voltage supply (V_{S2}). From the output phase detector (PD), the fine tuning voltage for the VCO (tuner) is gained by means of an active PI network (OP AMP). The output PD REF can be used as reference potential for the operational amplifier.

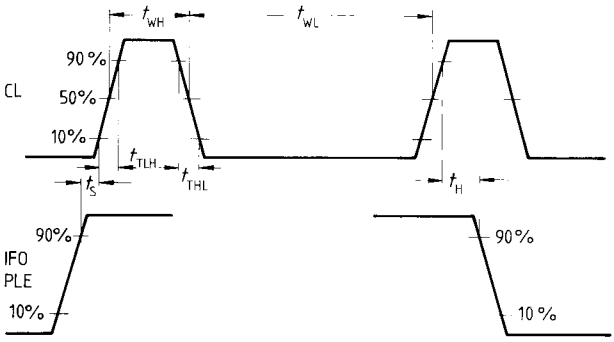
Block diagram

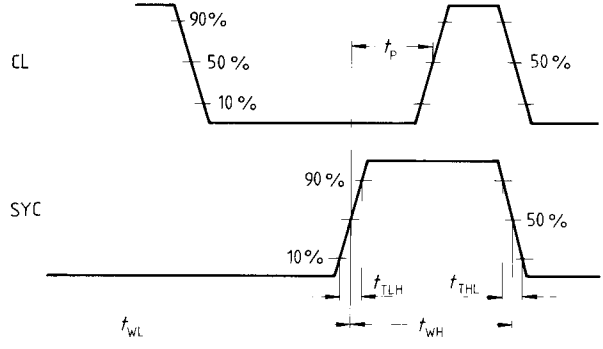


Application circuit (schematic)



Pulse diagram





Timing diagram