Signetics

TEA2000
PAL/NTSC Color Encoder

Objective Specification

Linear Products

DESCRIPTION

The TEA2000 is a monolithic integrated circuit, which encodes color information and provides composite video output for driving a VHF or UHF modulator.

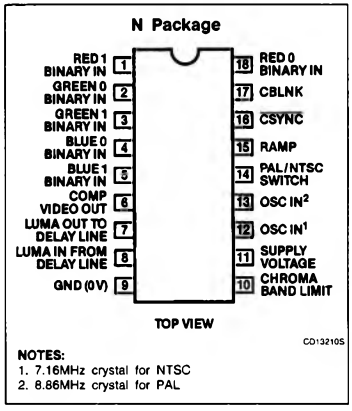
FEATURES

- **European PAL® and American NTSC/M standard selectable**
- **Internal generation of burst timing and PAL switch function**
- **6-bit binary TTL-compatible input provides 64 different colors**
- **TTL-compatible color blanking input**
- **TTL-compatible sync input**

APPLICATIONS

- **Video processing**
- **Graphics**
- **Computers**

PIN CONFIGURATION



NOTES:
1. 7.16MHz crystal for NTSC
2. 8.86MHz crystal for PAL

ORDERING INFORMATION

DESCRIPTION	TEMPERATURE RANGE	ORDER CODE
18-Pin Plastic DIP (SOT-102)	−20°C to +70°C	TEA2000N

ABSOLUTE MAXIMUM RATINGS

SYMBOL	PARAMETER	RATING	UNIT
V_{11-9}	Supply voltage	13.2	V
	Voltages, Pins 1, 2, 3, 4, 5, 14, 16, 17, 18	V_{CC}	V
T_{STG}	Storage temperature range	−65 to +125	°C
T_A	Operating ambient temperature range	−20 to +70	°C

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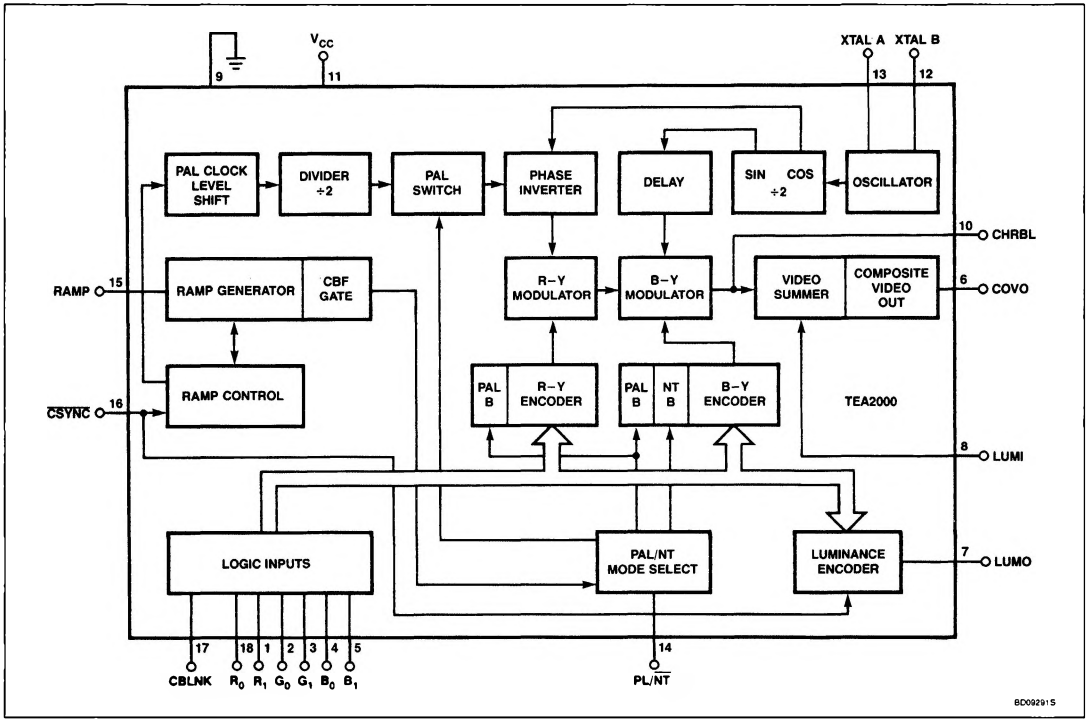
PAL/NTSC Color Encoder TEA2000

BLOCK DIAGRAM



DC AND AC ELECTRICAL CHARACTERISTICS V_{11-9} = 12V; T_A = 25°C; measured in Figure 2, unless otherwise specified.

SYMBOL	PARAMETER	LIMITS			UNIT
		Min	Typ	Max	
Supply					
V_{11-9}	Supply voltage	10.8	12	13.2	V
I_{11}	Supply current V_{11-9} = 12V		55		mA
Oscillator stability (Pins 12 and 13)					
	Crystal type 4322 143 04051 V_{CC} = 10.8 to 12V V_{CC} = 12 to 13.2V		 +50 −50		 Hz Hz
Digital inputs					
 V_{IL} V_{IH}	$\overline{CSYNC}$, CBLNK, PL/$\overline{NT}$ Pins 16, 17, 14 R0, R1, G0, G1, B0, B1, Pins 18, 1, 2, 3, 4, 5 V_{IN} (LOW) V_{IN} (HIGH)	 −0.5 2		 0.8 V_{11-9}	 V V
C_I	Input capacitance			10	pF
t_R, t_F	Input rise and fall times			200	ns
	$\overline{CSYNC}$, CBLNK, R0, R1, G0, G1, B0, B1, Pins 16, 17, 18, 1, 2, 3, 4, 5				
I_{IL}	Input current DC for V_{IN} = 0V			−100	μA
I_{IH}	Input current DC for V_{IN} = 2V			20	μA
	PL/$\overline{NT}$, Pin 14				
I_{IL}	Input current DC for V_{IN} = 0V			−500	μA
I_{IH}	Input current DC for V_{IN} = 2V			−200	μA
Composite video output (Pin 6)					
$V_{6-9\ (P-P)}$	Output amplitude (sync tip-white)		2		V
V_{6-9}	Sync tip level		5		V
R_{6-9}	Output load resistor	0.47	1		kΩ
V_{P-P}	Variation of output amplitude; T_A = 0 to +70°C			TBD	%
ΔV	Over supply range; V_{11-9} = 10.8 to 13.2V			TBD	%
R_L	Output impedance (with 1kΩ load)		15		Ω
ΔV_{RMS}	Residual chrominance on white		30		mV
ΔV	Tolerance on luminance amplitude		10		%
ΔV	Tolerance on chrominance amplitude		10		%
ΔΩ	Tolerance on chrominance phase		TBD		%
Chrominance band limiting (Pin 10)					
R_{10-11}	Internal resistance		1.5		kΩ
Luminance delay (Pins 7 and 8)					
R_S	Nominal series resistor (±5%)		1.2		kΩ
R_L	Nominal load resistor at luminance input (±5%)		1		kΩ
Ramp timing (Pin 15) (see Figure 2)					
	With external RC circuit; R = 36kΩ; C = 330pF[1]				
t_B	Start of burst from line sync		5.7		μs
t_W	Burst width		2.5		μs
t	Threshold for separation of equalizing pulses and sync pulses	36	44	56	μs

NOTE:
1. A figure of 5pF is assumed for external capacitance. This figure includes temperature dependence of the components.

PAL/NTSC Color Encoder — TEA2000

FUNCTIONAL DESCRIPTION

The TEA2000 PAL/NTSC color encoder and video summer integrated circuit has an internal oscillator from which the (R-Y) and (B-Y) waveforms are generated. The TEA2000 accepts timing signals (composite sync, composite blanking) and a 6-bit binary-coded input giving color information. The inputs are organized as 2 bits per primary color, and gamma correction is applied to the resultant luminance and chrominance levels. Each of the equally-spaced intensity levels (for each primary color) is combined with those of the other primary colors. This produces 64 output colors comprising a wide range of saturated and desaturated colors, black, white, and two levels of grey. The resultant output is a composite video signal compatible with the PAL and NTSC/M standards.

PIN DESCRIPTION

R0, R1, G0, G1, B0, B1, Pins 18, 1, 2, 3, 4, and 5. These are the red, green, and blue logic inputs, 2 bits per primary color. These inputs are TTL compatible. The functions of the remaining pins are described beside the corresponding pin number.

16 $\overline{\text{CSYNC}}$ — Composite sync input requiring a negative logic signal, TTL compatible. For PAL operation, the field sync must include line sync information.

12, 13 XTALA, XTALB — Oscillator inputs. A crystal in series with a trimmer capacitor is connected between Pins 12 and 13. The output of the oscillator is divided to provide the four subcarrier phases required in the encoder. The crystal frequencies are:

PAL mode 8.867238MHz
NTSC mode 7.15909MHz

7, 8 LUMO, LUMI — Luminance output and input. The combined luminance and sync signal appearing at Pin 7 must be DC coupled to Pin 8 via an appropriate luminance delay line or resistor network. Resistors must have a tolerance of ±5%, or better, as they affect the DC level at COVO, Pin 6.

10 CHRBL — Chrominance filtering can be accomplished by connecting a chrominance frequency tuned filter (4.43MHz or 3.57MHz), via a blocking capacitor to Pin 10. This point is the chrominance summing junction and has a nominal internal impedance of 1.5kΩ. If a filter is used at this point, then the delay caused to the chrominance signal should be compensated by an appropriate luminance delay line.

6 COVO — Composite video output is internally buffered, giving a nominal output voltage swing of 2V sync-white and a nominal sync 5V level.

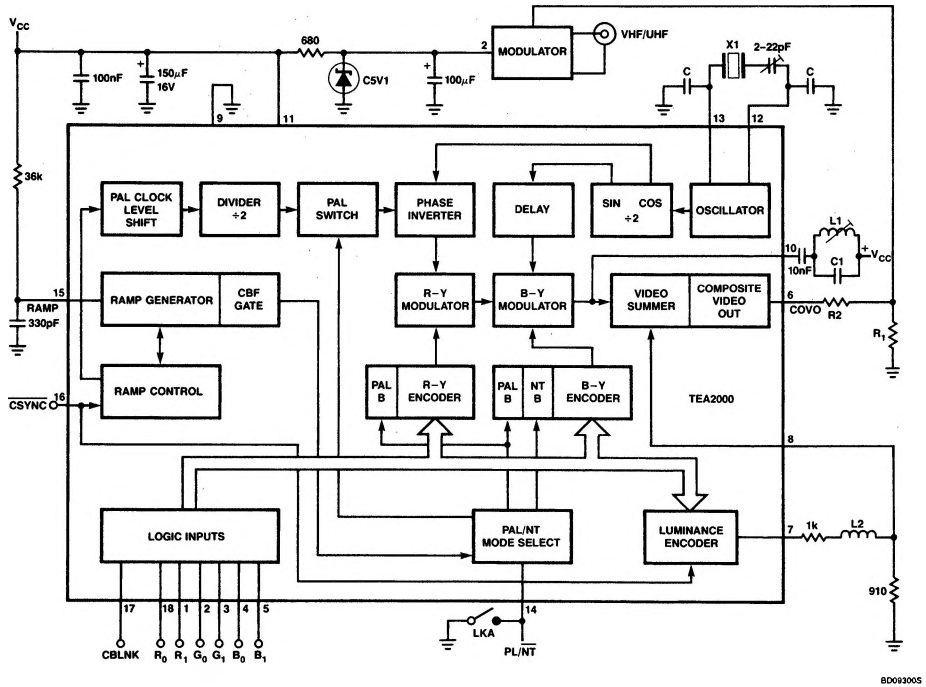
14 PL/$\overline{\text{NT}}$ — PAL/NTSC select input selects PAL mode when HIGH and NTSC mode when LOW. This input is TTL compatible. An internal pull-up resistor selects PAL if the pin is not connected.

15 RAMP — Ramp timing component connection. A capacitor and resistor connected to Pin 15 provide timing information for the color burst and for PAL phase switching. Alternative components may be used to optimize for NTSC operation.

11 V_{CC} — 12V supply.

9 GND — Ground connection, zero volts.

17 CBLNK — Blanking input, when HIGH, switches off color inputs. CBLNK must be HIGH during sync and color burst unless color inputs are all LOW at this time. This input is TTL-compatible.



NOTES:
X1 (PAL) = 8.867238MHz
X1 (NTSC) = 7.159100MHz
C = 5.6pF only for mask version 1

Component List for Figure 1

COMPONENT	PAL	NTSC
L1	15µH	18µH
C1	82pF	100pF
L2	DL270	DL330
R1	430Ω	510Ω
R2	510Ω	750Ω
M1	UM1233	UM1622
LKA	O/C	made

Figure 1. Internal Circuit Details and Typical External Connections

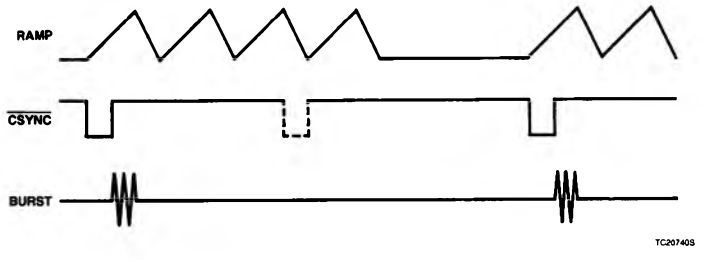


Figure 2. Ramp Timing