DATA SHEET

TDA9725
Y/C automatic adjustment processor (VHS standard)

Product specification
Supersedes data of 1995 Dec 06
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Philips Semiconductors

PHILIPS

Y/C automatic adjustment processor (VHS standard)

TDA9725

FEATURES

- Automatic adjustment by control loops
- Integrated filters
- Simple SVHS playback
- Colour sequence correction for long-play still mode
- Automatic gain control for FM.

GENERAL DESCRIPTION

The TDA9725 is an integrated circuit for chrominance and luminance processing (record and playback) in VHS tape recorders for PAL, SECAM/ME and NTSC systems (4.43 MHz playback only) with internal filter and without adjustments.

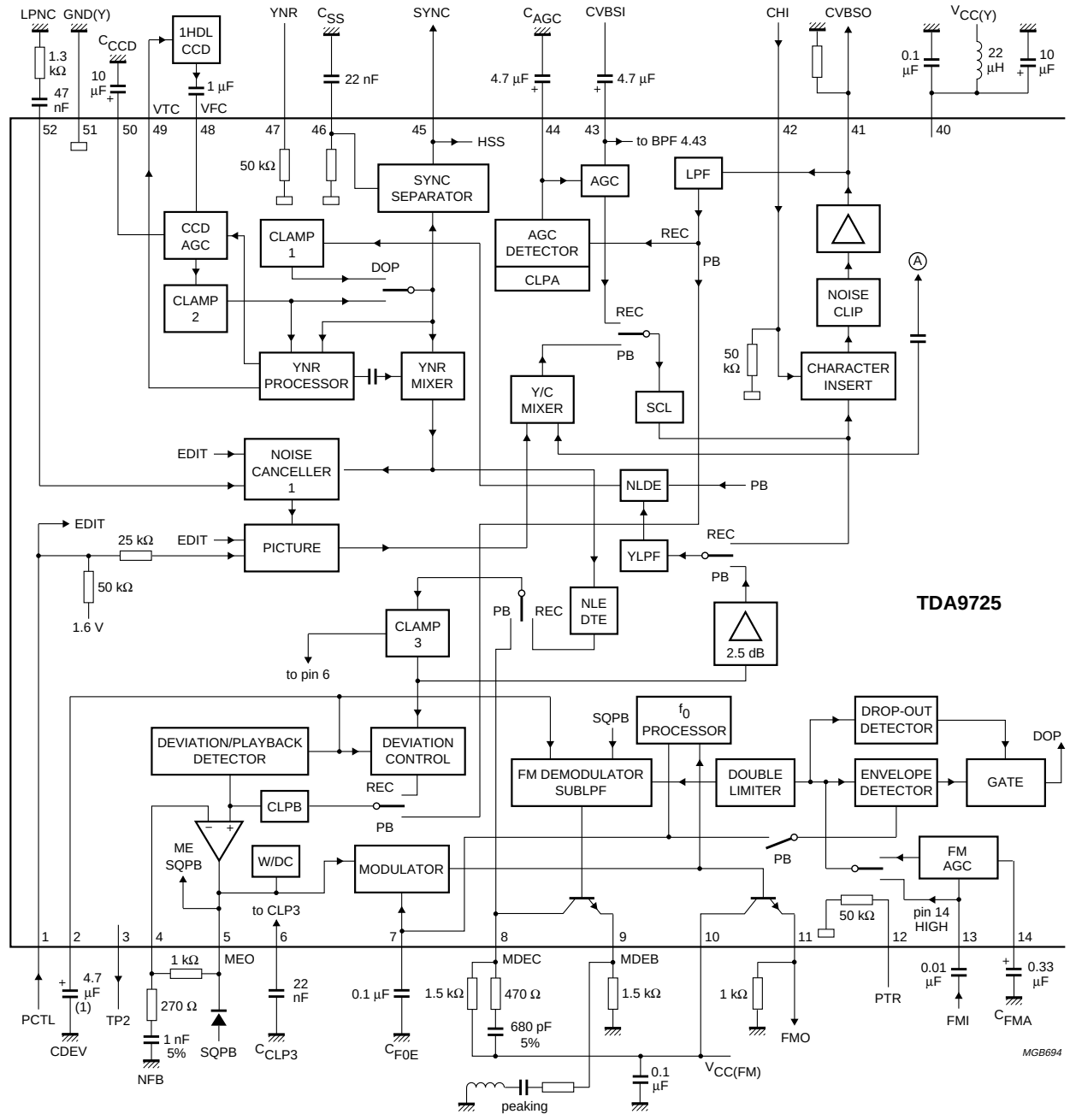
QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	supply voltage		4.5	5.0	5.5	V
I_{CC}	supply current	V_{CC} = 5 V; playback	140	170	200	mA
$V_{i(p-p)}$	video input voltage; CVBS signal (peak-to-peak value)		0.6	1.0	2.0	V
$V_{oREC(p-p)}$	video output record voltage (peak-to-peak value)	video/sync = 7/3	2.03	2.14	2.25	V
$V_{oPB(p-p)}$	video output playback voltage (peak-to-peak value)	video/sync = 7/3; nominal FM signal	2.03	2.14	2.25	V
$V_{iFM(p-p)}$	FM input voltage (peak-to-peak value)	FM AGC active	63	200	632	mV
$V_{oFM(p-p)}$	FM output voltage (peak-to-peak value)	R_L = 1 kΩ	0.7	0.9	1.1	V
$V_{CFT(p-p)}$	chrominance input voltage (+FM) from tape (peak-to-peak value)		11	110	310	mV
$V_{CTT(p-p)}$	chrominance output voltage to tape (peak-to-peak value)		467	660	932	mV
T_{stg}	storage temperature		–25	–	+150	°C
T_{amb}	operating ambient temperature		–20	–	+70	°C

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
TDA9725	SDIP52	plastic shrink dual in-line package; 52 leads (600 mil)	SOT247-1

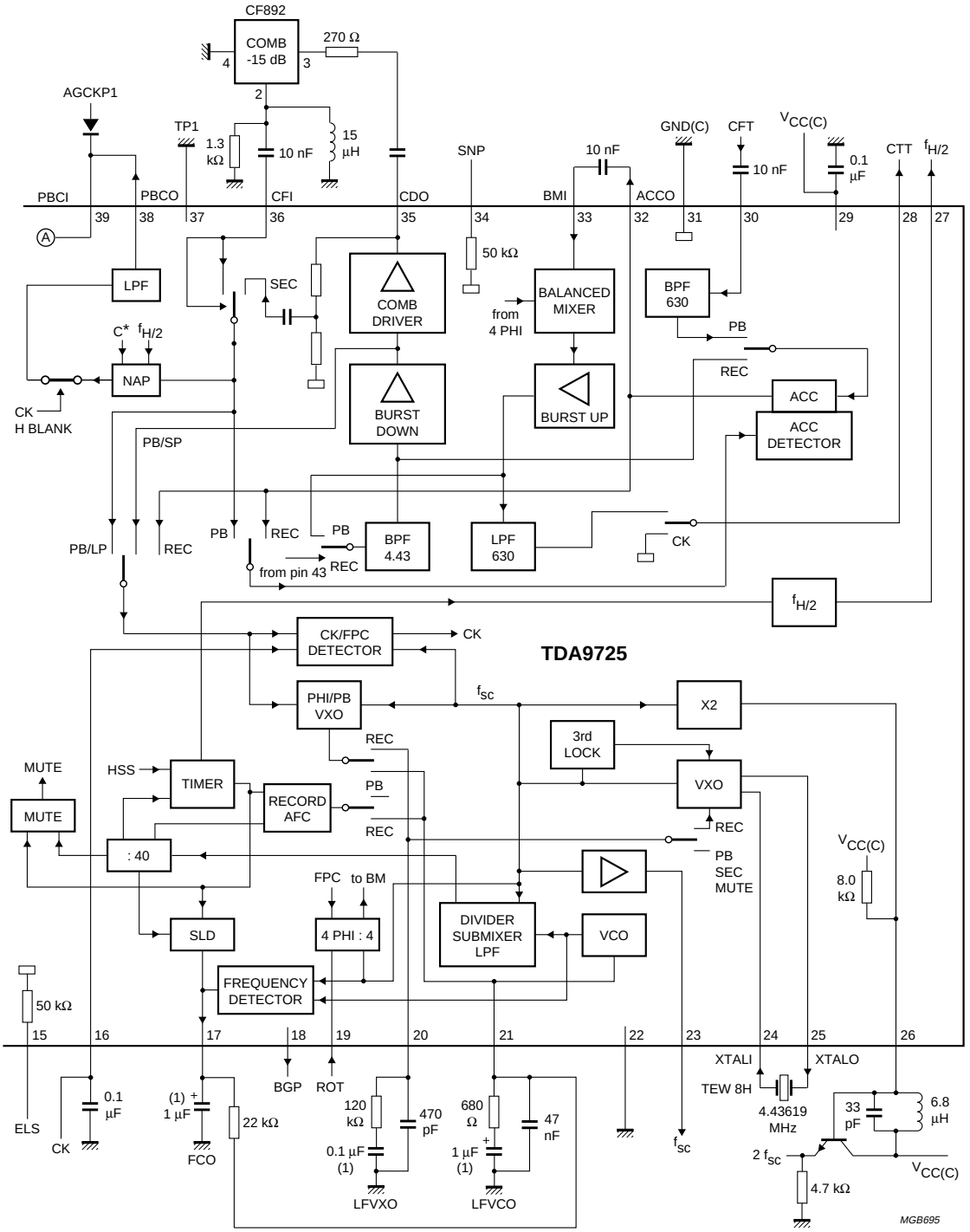
BLOCK DIAGRAM



(1) Low leakage current.

All capacitors for loop filter ±10%; all other capacitors +10%/–50%; all resistors ±5%; all inductors ±10%; unless otherwise specified.

Fig.1 Block diagram (continued in Fig.2).



(1) Low leakage current.

Fig.2 Block diagram (continued from Fig.1).

Table 1 Explanation of symbols in Figs 1 and 2

SYMBOL	DESCRIPTION
AGCKP1	mode with shortened key pulse for AGC
BGP	burst gate pulse
DOP	dropout pulse
f_H	line frequency
f_{sc}	subcarrier frequency (4.433619 MHz)
HDL CCD	charged coupled device with 1H delay
NLDE	non-linear de-emphasis
NLEDTE	non-linear emphasis/detail enhancer
ROT	rotary pulse
VXO	voltage controlled XTAL oscillator
YNR	vertical noise reduction
YLPF	luminance low-pass filter

PINNING

SYMBOL	PIN	DESCRIPTION
PCTL	1	picture control/edit switch input
CDEV	2	deviation/playback AGC detector input
TP2	3	test pin 2/correlation detector output
NFB	4	negative feedback input of main emphasis
MEO	5	main emphasis output/white clip/modulator input/SQPB selector
C_{CLP3}	6	capacitor for clamp 3
C_{F0E}	7	storage capacitor for f_0 processor (record)/envelope detector (playback)
MDEC	8	main de-emphasis output
MDEB	9	main de-emphasis and peaking output
$V_{CC(FM)}$	10	FM supply voltage
FMO	11	FM output
PTR	12	switch (PB/TRICK/REC)
FMI	13	playback FM input
C_{FMA}	14	storage capacitor for FM AGC
ELS	15	PAL: switch (LP C*/LP/SP); NTSC: switch (EP/LP/SP)
CK	16	colour killer terminal
FCO	17	frequency correction output
BGP	18	burst gate pulse output
ROT	19	rotary pulse input
LFVXO	20	loop filter VXO
LFVCO	21	loop filter VCO
n.c.	22	not connected; note 1
f_{sc}	23	f_{sc} output
XTALI	24	VXO input from crystal
XTALO	25	VXO output to crystal
$2f_{sc}$	26	$2f_{sc}$ output
$f_{H/2}$	27	$f_{H/2}$ output
CTT	28	chrominance output to tape
$V_{CC(C)}$	29	chrominance supply voltage
CFT	30	playback chrominance input from tape
GND(C)	31	chrominance ground
ACCO	32	automatic chrominance control output
BMI	33	balanced mixer input
SNP	34	switch (SECAM/NTSC/PAL)
CDO	35	comb driver output
CFI	36	chrominance input from comb filter
TP1	37	test pin 1; note 1
PBCO	38	playback chrominance output
PBCI	39	playback chrominance input
$V_{CC(Y)}$	40	luminance supply voltage
CVBSO	41	CVBS output
CHI	42	character insertion input (artificial sync/black/white/through)
CVBSI	43	CVBS input
C_{AGC}	44	AGC detector capacitor
SYNC	45	sync separator push-pull output
C_{SS}	46	sync separator detector capacitor
YNR	47	YNR switch
VFC	48	video input from 1HDL CCD
VTC	49	video output to 1HDL CCD
C_{CCD}	50	storage capacitor for CCD AGC level
GND(Y)	51	luminance ground
LPNC	52	low-pass filter noise canceller

Note

1. It is recommended that this pin should be connected to ground.

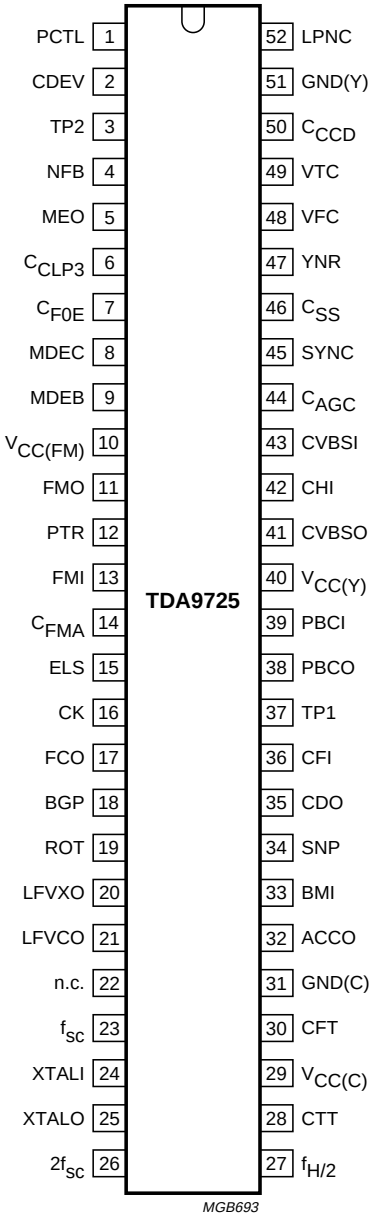


Fig.3 Pin configuration.

FUNCTIONAL DESCRIPTION

Record (REC)/electric to electric (EE) mode

LUMINANCE

From input pin 43 the CVBS signal is fed via the automatic gain control (AGC) and subclamp (SCL) to the output pin 41. Instead of the controlled and clamped CVBS signal it is also possible to switch (dependent on the level at pin 42) white, black or sync-level to this pin. To eliminate chrominance parts the CVBS signal is fed to the luminance low-pass filter (YLPF) and to the sync separator stage. The sync signal is available at pin 45. The signal is also fed via vertical emphasis non-linear emphasis (NLE), deviation control stage, main emphasis and white-dark clip to the FM modulator. The FM signal is available at pin 11.

CHROMINANCE

The chrominance signal is selected out of CVBS (from pin 43) in BPF 4.43 MHz (band-pass filter) and controlled in automatic chrominance control (ACC).
The chrominance signal is mixed with 5.06 MHz to 627 kHz and via LPF 627 kHz to the output pin 30.

Playback (PB)/video to video (VV) mode

LUMINANCE

The FM signal is fed via FM AGC and double limiter to the controlled FM demodulator. After demodulation and filtering in sub low-pass filter (SUBLPF) main de-emphasis, YLPF and non-linear de-emphasis the signal is fed to the vertical noise reduction (YNR) and in parallel to the sync separator. The chrominance signal is added in the Y/C mixer. The complete CVBS signal is available at pin 41.

CHROMINANCE

The 627 kHz chrominance signal coming from tape via BPF 627 kHz and field ACC to the balanced mixer. Mixed with 5.06 MHz the 4.43 MHz chrominance signal is fed via comb driver stage to the external comb filter (pin 35) and via internal conjugated complex (C*) stage and internal AC coupling to the luminance part.

Record and playback

In both modes record (REC) and playback (PB) the 5.06 MHz mixer frequency is produced by the 20.24 MHz voltage controlled oscillator (VCO) and a divide-by-four.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{CC}	supply voltage		0	–	6.0	V
V_I	input voltage at pin 22		0	–	1.6	V
V_n	input voltage on all other pins		0	–	V_{CC}	V
I_I	input current at pin 22		–	–	10	mA
P_{tot}	total power dissipation		–	–	1250	mW
T_{stg}	storage temperature		–25	–	+150	°C
T_{amb}	operating ambient temperature		–20	–	+70	°C
V_{es}	electrostatic handling for all pins	note 1	–300	–	+300	V

Note

1. Charge device model class B: discharging a 200 pF capacitor via a 0 Ω series resistor.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}a}$	thermal resistance from junction to ambient in free air	43	K/W

CHARACTERISTICS

V_{CC} = 5 V; T_{amb} = +25 °C and typical application (see Figs 1 and 2), unless otherwise specified.
Luminance part: All amplitudes are VBS peak-to-peak values, unless otherwise specified.
Chrominance part: All amplitudes for PAL and NTSC are red values with 75% saturation and chrominance-to-burst ratio of 2.2 : 1, unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supplies						
V_{CC}	supply voltage		4.5	5.0	5.5	V
I_{PB}	current consumption ($I_{10} + I_{29} + I_{40}$)	playback mode	140	170	200	mA
I_{REC}	current consumption ($I_{10} + I_{29} + I_{40}$)	record mode	125	155	185	mA
FM SUPPLY (PIN 10)						
I_{PB}	DC playback current		–	22	–	mA
I_{REC}	DC record current		–	12	–	mA
CHROMINANCE SUPPLY (PIN 29)						
$I_{CC(C)}$	DC supply current	playback mode	–	85	–	mA
		record mode	–	85	–	mA
LUMINANCE SUPPLY (PIN 40)						
I_{PB}	DC playback current		–	63	–	mA
I_{REC}	DC record current		–	57	–	mA
Picture control/edit switch input (pin 1)						
V_1	DC input voltage	pin open-circuit	–	1.6	–	V
		sharp picture	0	–	1.6	V
		soft picture	1.6	–	3.2	V
		edit mode	4.1	–	5.0	V
Deviation/playback AGC detector input (pin 2)						
V_2	detection voltage		1.8	2.5	3.2	V
Test pin 2/correlation detector output (pin 3)						
V_{OH}	HIGH level output voltage	correlation of Y signal; pin 37 LOW; $R_L \geq 10\ k\Omega$	1.5	2.1	3.0	V
V_{OL}	LOW level output voltage	non-correlation of Y signal	–	0.1	0.5	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Negative feedback input of main emphasis (pin 4; open-base) and main emphasis output/white-clip/modulator/SQPB selector (pin 5)						
FEEDBACK LOOP CLOSED (PIN 4 CONNECTED TO PIN 5; MAIN EMPHASIS OFF)						
V_{SY}	DC voltage level	sync tip	–	1.9	–	V
$V_{oREC(p-p)}$	record output voltage level; standard output level (peak-to-peak value)	video/sync = 7/3; ΔV_{CC} = ±0.25 V; T_{amb} = –10 to +70 °C	450	500	550	mV
$t_{FRAMEDET}$	time for correcting carrier interleave relationship to half picture	HIGH during half picture 1; note 1	–	–	200	ms
NON-LINEAR EMPHASIS/DETAIL ENHANCER; notes 2 and 3						
RD1	response D1	–20 dB; f_i = 500 kHz; SP; NORM	1.7	2.7	3.7	dB
RD2	response D2	–20 dB; f_i = 2 MHz; SP; NORM	6.0	7.5	9.0	dB
RS1	response S1	–20 dB; f_i = 500 kHz; SP; EDIT	1.0	1.7	2.4	dB
RS1	response S2	–20 dB; f_i = 2 MHz; SP; EDIT	4.5	5.5	6.5	dB
RL1	response L1	–20 dB; f_i = 500 kHz; LP	3.1	4.4	5.7	dB
RL2	response L2	–20 dB; f_i = 2 MHz; LP	7.0	9.0	11	dB
RL3	response L3	0 dB; f_i = 2 MHz; LP	1.6	2.3	3.0	dB
VERTICAL EMPHASIS						
PL1	peak level 1	–30 dB recursive; note 4	3.5	4.3	5.3	dB
PL2	peak level 2	–20 dB recursive; note 4	3.5	4.0	4.5	dB
PL3	peak level 3	0 dB recursive	0	0.4	1.0	dB
FEEDBACK LOOP NORMAL APPLICATION						
DCL	dark-clip level		50	60	70	%
WCL	white-clip level		180	187	194	%
V_5	SQPB input voltage	playback mode	4.0	–	–	V
Record storage capacitor for f_0 processor and playback storage capacitor for envelope detector (pin 7)						
V_I	DC voltage	record mode	–	1.2	–	V
V_{NOR}	DC voltage of normal mode	playback mode; V_i = 350 mV (p-p); pin 14 HIGH	2.3	3.3	4.0	V
V_{OFF}	DC voltage of dropout correction (DOC) off mode	playback mode	0	–	1.3	V
V_{NS}	DC voltage at no input signal	playback mode	1.1	1.6	2.1	V
G_{Eon}	envelope detector switch-on level (dropout active)	playback mode; 0 dB = V_i = 350 mV (p-p); f_i = 3.8 MHz; pin 14 HIGH	–13	–10	–7	dB
t_{env}	envelope detector operating time	C_i = 0.1 µF	380	500	620	µs

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Main de-emphasis output (pin 8; open collector)						
V_8	DC output voltage	f_i = 3.8 MHz at VHS	2.9	3.4	3.9	V
$V_{VID(p-p)}$	video output voltage level (peak-to-peak value)	f_{DEV} = 1 MHz	230	300	370	mV
Φ_{DEM}	demodulator sensitivity	VHS mode	0.23	0.3	0.37	V/MHz
		SQPB mode	0.14	0.19	0.24	V/MHz
LIN1	demodulator linearity 1 $\frac{V_0(5\ MHz) - V_0(4\ MHz)}{V_0(4\ MHz) - V_0(3\ MHz)}$	VHS mode	0.97	1.0	1.03	
LIN2	demodulator linearity 2 $\frac{V_0(9\ MHz) - V_0(7\ MHz)}{V_0(7\ MHz) - V_0(5\ MHz)}$	SQPB mode	0.90	1.0	1.07	
Main de-emphasis and peaking output (pin 9)						
V_9	DC output voltage	f_i = 3.8 MHz at VHS	1.1	1.6	2.1	V
$V_{VR(p-p)}$	reverse video voltage level (peak-to-peak value)		230	300	370	mV
α_{DEM}	suppression of demodulated carrier		40	–	–	dB
FM output (pin 11)						
V_{11}	DC mean value output voltage	R_L = 1 kΩ	2.9	3.2	3.5	V
$V_{11(p-p)}$	output voltage level (peak-to-peak value)	R_L = 1 kΩ	0.7	0.9	1.1	V
f_{sync}	sync output frequency	$V_5 = V_{sync}$; V_{43} = 0 dB	3.75	3.8	3.85	MHz
Δf_{sync}	stability of sync output frequency	ΔV_{CC} = ±0.25 V or T_{amb} = −10 to +70 °C	−20	–	+20	kHz
f_{dev}	frequency deviation	$V_5 = V_{white}$; V_{43} = 0 dB; video/sync = 7/3	0.95	1.0	1.05	MHz
Δf_{dev}	stability of frequency deviation	ΔV_{CC} = ±0.25 V or T_{amb} = −10 to +70 °C	−20	–	+20	kHz
Δf_{rot}	carrier interleave frequency	rotary pulse (pin 19) HIGH/LOW; at SP and LP	6.8	7.8	8.8	kHz
H_2	second harmonic distortion	f_i = 3.8 MHz	–	−50	−42	dB
L_{mod}	modulator linearity		0.95	1.00	1.05	

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Switch: PB/TRICK/REC (pin 12)						
R_I	internal resistance to ground		40	50	60	kΩ
V_{PB}	voltage range for active playback mode		3.5	–	5	V
V_{TR}	voltage range for active trick mode		1.75	–	3	V
V_{REC}	voltage range for active record mode		0	–	1.25	V
Playback FM input (pin 13)						
V_{13}	DC voltage		1.7	2.2	2.7	V
$V_{i(p-p)}$	input voltage level (peak-to-peak value)	FM AGC active	63	200	632	mV
		FM AGC not active; pin 14 HIGH	–	350	–	mV
$V_{iBO(p-p)}$	boundary input voltage (peak-to-peak value)	f_i = 3.8 MHz; pin 14 HIGH	10	–	1000	mV
G_{DOC}	DOC on level	V_i = 350 mV (p-p); f_i = 3.8 MHz; pins 7 and 14 HIGH	–18	–15	–12	dB
ΔG_{hys}	DOC on/off hysteresis	V_i = 350 mV (p-p); f_i = 3.8 MHz; pins 7 and 14 HIGH	1	3	5	dB
G_{Eon}	envelope detector switch-on level	playback mode; 0 dB = V_i = 350 mV (p-p); f_i = 3.8 MHz; pin 14 HIGH	–13	–10	–7	dB
Storage capacitor for FM AGC (pin 14; playback mode)						
V_{14}	DC voltage	AGC on	2.6	3.1	3.6	V
	DC input voltage	AGC off	4.3	–	5.0	V
Switch LP C*/LP/SP at PAL; EP/LP/SP at NTSC (pin 15)						
R_I	internal resistance to ground		40	50	60	kΩ
V_C	input voltage for active C* (conjugated complex chrominance signal)	PAL	3.5	–	5	V
V_E	input voltage for active EP	NTSC	3.5	–	5	V
V_L	input voltage for active LP		1.75	–	3	V
V_S	input voltage for active SP		0	–	1.25	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Colour killer terminal (pin 16)						
V_{NC}	DC voltage black and white	luminance input without chrominance	1.6	1.8	2.0	V
V_{16}	input voltage	forced colour off	0	–	1.5	V
		forced colour on	3.0	–	4.3	V
V_{th}	threshold voltage	colour on	2.0	2.2	2.4	V
CK_{th}	colour killer threshold	relative to nominal input; V_{30} = 110 mV (p-p)	–25	–30	–35	dB
CK_{hys}	colour killer hysteresis	relative to nominal input; V_{30} = 110 mV (p-p)	1	3	5	dB
Frequency correction output (pin 17)						
V_{17}	operating range		0.8	–	4.2	V
I_{oSLD}	SLD output current	SLD	±12	±17	±22	µA
t_{SLD}	SLD pulse duration	SLD	–	1	–	t_H
f_{SLH}	start of detection at positive frequency deviation (referenced to $f_{sc} + N \times f_H$ at pin 35; $-I_{17}$)	SLD/PAL	1.0	2.0	3.0	kHz
		SLD/NTSC	2.0	4.0	5.0	kHz
f_{SLL}	start of detection at negative frequency deviation (referenced to $f_{sc} + N \times f_H$ at pin 35; $+I_{17}$)	SLD/PAL	–3.0	–2.0	–1.0	kHz
		SLD/NTSC	–5.0	–4.0	–2.0	kHz
I_{ofDET}	output current of frequency detector	FDET	±12	±17	±22	µA
t_{fDET}	frequency detector pulse duration	FDET	68	73	78	µs
f_{fDETH}	start of detection at positive frequency deviation (referenced to $f_{sc} + N \times f_H$ at pin 35; $-I_{17}$)	record mode	40	70	100	kHz
f_{fDETL}	start of detection at negative frequency deviation (referenced to $f_{sc} + N \times f_H$ at pin 35; $+I_{17}$)	record mode	–100	–70	–40	kHz

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Burst gate pulse output (or sandcastle output; pin 18); note 5						
t_{BGP}	burst gate pulse duration		4.2	4.45	4.7	µs
t_{BGS}	start of burst gate beyond sync start at pin 45		3.25	3.5	3.75	µs
$V_{O(L)}$	LOW level DC output voltage	inactive; I_{18} = 1 mA	–	–	0.7	V
		inactive; I_{18} = 0 mA	–	–	0.5	V
$V_{O(M)}$	medium level DC output voltage	horizontal blanking; 10 kΩ connected to V_{CC}	2.2	2.6	3.0	V
$V_{O(H)}$	HIGH level DC output voltage	BGP; I_{18} = –0.4 mA	4.0	4.4	–	V
		BGP; I_{18} = 0 mA	4.6	–	–	V
$t_{VBL(start)}$	vertical blanking of BGP start	referring to first equalisation pulse in mid of line	–	0	–	t_H
$t_{VBL(stop)}$	vertical blanking of BGP stop	referring to rotary transition	23	–	–	t_H
		referring to last equalisation pulse in mid of line	1	–	–	t_H
Rotary pulse input (pin 19; open PNP base)						
V_{C2}	voltage for –90° phase rotation	channel 2	0	–	2.25	V
V_{C1}	voltage for non-rotation (PAL) or +90° rotation (NTSC)	channel 1	2.75	–	5	V
Loop filter VXO (pin 20; record mode)						
V_{20}	DC voltage		1	2.4	3.6	V
Φ_{VXO}	VXO sensitivity		–1.6	–1.2	–0.8	Hz/mV
$f_{PI(U)}$	upper pull-in frequency		0.6	1.0	1.8	kHz
$f_{PI(L)}$	lower pull-in frequency		–1.8	–1.0	–0.6	kHz
Loop filter VCO (pin 21)						
V_{21}	DC voltage		1.3	2.1	2.9	V
Φ_{VCO}	VCO sensitivity	f_H related; record mode	–34	–38	–42	kHz/V
		f_{sc} related; playback mode	–1.3	–1.5	–1.7	MHz/V
f_{sc} output (pin 23)						
V_{23}	DC output voltage		1.8	2.3	2.8	V
$V_{o(p-p)}$	output signal voltage (peak-to-peak value)	no load	500	600	700	mV
H_2	second harmonic distortion		–	–	–25	dB
H_3	third harmonic distortion		–	–	–20	dB
VXO input from crystal (pin 24); note 6						
V_{24}	DC voltage		2.6	3.0	3.4	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
VXO output to crystal (pin 25)						
V_{25}	DC output voltage		2.9	3.3	3.7	V
Δf_{osc}	deviation of oscillator frequency	due to internal spread; playback mode	–50	–	+50	Hz
		video signal without burst; record mode	–1.4	–	+1.4	kHz
		no video signal; record mode	–100	–	+100	Hz
		V_{CC} = 4.75 to 5.25 V; T_{amb} = –10 to +70 °C; playback mode	–100	–	+100	Hz
$2f_{sc}$ output (pin 26)						
V_{26}	DC output voltage		4.5	4.9	–	V
V_o	output signal voltage	1.2 kΩ connected to V_{CC} and emitter follower (EF)	40	55	70	mV
		tuned LC circuit to V_{CC} and EF	400	550	700	mV
H_2	second harmonic distortion	tuned LC circuit (Q > 20) and EF	–	–	–30	dB
$f_{H/2}$ output; coupled to burst sequence (pin 27)						
$V_{O(L)}$	LOW level DC output voltage	burst phase = +135°	–	–	0.5	V
$V_{O(H)}$	HIGH level DC output voltage	burst phase = –135°	4.5	–	–	V
$V_{NTSC4.43}$	input level for forced NTSC 4.43 mode (no NAP)	NTSC; playback mode	–	–	1.5	V
Chrominance output to tape (pin 28); see Table 2						
V_{28}	DC output voltage	colour on	2.1	2.4	2.7	V
		colour killer active	–	0.1	0.3	V
$V_{o(p-p)}$	chrominance output signal voltage ($N \times f_H$) (peak-to-peak value)	record mode; PAL	467	660	932	mV
G_{UP}	SECAM-f_{OR} burst related to PAL burst	SECAM	0.2	1.0	1.8	dB
H_2	second harmonic distortion	V_{33} = 0 dB	–	–	–40	dB
		V_{33} = +6 dB	–	–	–35	dB
H_3	third harmonic distortion	V_{33} = 0 dB	–	–	–40	dB
		V_{33} = +6 dB	–	–	–35	dB
α_{CK}	colour killer suppression		40	–	–	dB
Playback chrominance input from tape (pin 30)						
V_{30}	DC voltage		1.7	2.2	2.7	V
$V_{i(p-p)}$	input signal voltage (peak-to-peak value)	chrominance + FM	–	–	310	mV
		chrominance	11	110	220	mV

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
ACC output (pin 32); see Table 5						
V_{32}	DC output voltage		1.75	2.25	2.75	V
$V_{o(p-p)}$	controlled output signal voltage (peak-to-peak value)	V_i = 0 dB; record mode	370	460	550	mV
		V_i = 0 dB; playback mode; PAL; –15 dB comb filter	350	440	530	mV
ΔG_o	deviation of output signal	V_i = –15 dB/+6 dB; record and playback modes	–1.0	–	+1.0	dB
H_2	second harmonic distortion	nominal input and output signal	–	–	–40	dB
H_3	third harmonic distortion	nominal input and output signal	–	–	–40	dB
Balanced mixer input (pin 33)						
V_{33}	DC voltage		1.6	1.9	2.2	V
$V_{i(p-p)}$	nominal input signal voltage (peak-to-peak value)		–	440	–	mV
Switch SECAM/NTSC/PAL (pin 34)						
R_I	internal resistance to ground		40	50	60	kΩ
V_i	input voltage	active SECAM mode	3.5	–	5	V
		active NTSC mode	1.75	–	3	V
		active PAL mode	0	–	1.25	V
Comb driver output (pin 35); see Tables 3, 4 and 10						
V_{35}	DC output voltage	record and playback modes	2.0	2.5	3.0	V
$V_{o(p-p)}$	output signal voltage (peak-to-peak value)	playback mode; NTSC; –10 dB comb filter	304	380	456	mV
		playback mode; PAL/SECAM; –15 dB comb filter	540	675	810	mV
H_2	second harmonic distortion	playback mode; 0 dB	–	–	–40	dB
H_3	third harmonic distortion	playback mode; 0 dB	–	–	–40	dB
$\Delta G_{BD(S)}$	burst down	playback mode; NTSC; SP	–6.0	–5.0	–4.0	dB
$\Delta G_{BD(E)}$	burst down	playback mode; NTSC; EP	–5.0	–4.0	–3.0	dB
G_{SECid}	gain of output signal for SECAM identification	record mode (ACC is not active) from pin 43	–	3.0	–	dB
Chrominance input from comb filter (pin 36)						
V_{GL}	DC voltage for glass comb	AC coupled	3.2	4.0	4.8	V
V_{CCD}	DC voltage for CCD comb	DC coupled	0	–	1.5	V
$V_{i(p-p)}$	input signal voltage (peak-to-peak value)	PAL; NTSC	–	120	–	mV

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Playback chrominance output (pin 38; sync blanking is always active); see Table 6						
V_{38}	DC output voltage		1.1	1.6	2.1	V
$V_{o(p-p)}$	output signal voltage (peak-to-peak value)	V_{30} = 110 mV (p-p)	270	325	420	mV
H_2	second harmonic distortion	V_{30} = 110 mV (p-p)	–	–	–40	dB
α_{CK}	colour killer/pilot burst suppression	colour killer or sync blanking interval	40	–	–	dB
ΔV_{C*}	output amplitude deviation	C to C*; V_{36} = 120 mV (p-p)	–1.5	0	+1.5	dB
$\Delta\varphi_{C*}$	output phase deviation	C to C* or NAP line n to n + 1	–15	0	+15	°
$\Delta\varphi_{NAP}$	phase for NAP burst	NAP burst to –(B – Y) axis	±30	±45	±60	°
α_{2fsc}	$2f_{sc}$ suppression	C*; V_{36} = 120 mV (p-p)	35	–	–	dB
α_{3fsc}	$3f_{sc}$ suppression	C*; V_{36} = 120 mV (p-p)	18	25	–	dB
Playback chrominance input (pin 39)						
V_{39}	DC voltage		1.7	2.0	2.3	V
$V_{i(p-p)}$	input voltage (peak-to-peak value)		–	325	–	mV
V_{th}	threshold level of AGCKP1 (no reaction on copy guard)	record mode	2.6	3.0	3.4	V
CVBS output (pin 41); see Table 7						
V_{41}	DC output voltage	sync tip; R_L = 2.1 kΩ	0.9	1.05	1.2	V
RECORD MODE						
$V_{oREC(p-p)}$	record output voltage (standard output level) (peak-to-peak value)	video/sync = 7/3; R_L = 2.1 kΩ	2.03	2.14	2.25	V
$\Delta V_{oREC(p-p)}$	record output voltage level stability (peak-to-peak value)	ΔV_{CC} = ±0.25 V or T_{amb} = –10 to +70 °C	–40	–	+40	mV
$V_{o(p-p)}$	compressed sync output voltage (200 IRE) (peak-to-peak value)	video/sync = 7.0/1.5	2.13	2.32	2.52	V
G_{CON}	control characteristic of AGC	V_{43} = 0.5 to 2.0 V (p-p)	0	0.2	1.0	dB
ΔV_{CG}	VHS standard (signal amplitude for copy guard tapes)	100% = typical output level; copy guard 7 lines/field	35	–	48	%

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PLAYBACK MODE						
$V_{oPB(p-p)}$	playback output voltage (peak-to-peak value)	video/sync = 7/3; nominal FM signal; R_L = 2.1 kΩ; test: EE without ME, MDE, peaking, YNR	2.03	2.14	2.25	V
$\Delta V_{oPB(p-p)}$	playback output voltage level stability (peak-to-peak value)	ΔV_{CC} = ±0.25 V or T_{amb} = −10 to +70 °C	−40	–	+40	mV
V_{NC}	white noise clip level	black-to-white = 100%; TRICK	115	135	150	%
ΔV_{os}	offset voltage between DOC mode and normal mode		−25	–	+25	mV
α_{ct}	DOC switch crosstalk	0 dB = 2.0 V (p-p); f_i = 1 MHz	–	–	−40	dB
t_{att}	attack time of switching to DOC mode from normal mode		–	0.7	1.0	µs
t_{rec}	recovery time of switching to normal mode from DOC mode		4.0	5.0	6.0	µs
$V_{o(p-p)}$	chrominance output voltage (peak-to-peak value)	V_{30} = 110 mV (p-p)	1.0	1.2	1.4	V
ΔG_{CHROM}	chrominance frequency response	$V_i = V_{39}$; f_i = 5 to 1 MHz	−2	–	+2	dB
VERTICAL SYNCHRONIZATION PULSE/CHARACTER INSERT (RECORD AND PLAYBACK MODES)						
ΔV_{ST}	artificial sync tip level voltage offset	V_{42} = 0 to 5 V; playback mode	−50	0	+50	mV
$\Delta V_{bl(p-p)}$	artificial black level voltage (peak-to-peak value)	V_{42} = 5 to 3 V	0.58	0.68	0.78	V
$\Delta V_{wh(p-p)}$	artificial white level voltage (peak-to-peak value)	V_{42} = 5 to 2 V	1.7	1.9	2.05	V
α_{VIDEO}	suppression of video at character insert		40	–	–	dB
NON-LINEAR DE-EMPHASIS (PLAYBACK MODE); note 7						
S1	response S1	−20 dB; f_i = 500 kHz; SP	−2.9	−1.9	−0.9	dB
S2	response S2	−20 dB; f_i = 2 MHz; SP	−6.5	−5.0	−3.5	dB
L1	response L1	−20 dB; f_i = 500 kHz; LP	−6.5	−4.8	−3.0	dB
L2	response L2	−20 dB; f_i = 2 MHz; LP	−10.2	−8.4	−6.7	dB
L3	response L3	0 dB; f_i = 2 MHz; LP	−4.8	−3.2	−1.8	dB
NOISE CANCELLER (PLAYBACK MODE); note 8						
NC1	response NC1	−30 dB; f_i = 1 MHz; NORMAL	−5.5	−3.5	−1.4	dB
NC2	response NC2	−30 dB; f_i = 2 MHz; NORMAL	−15.0	−11.6	−8.0	dB
NC4	response NC4	0 dB; f_i = 2 MHz; NORMAL	−1.3	−0.3	+0.7	dB
NCED	response NCEDIT	−30 dB; f_i = 2 MHz; EDIT	−5.0	−3.4	−1.8	dB

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
LINE NOISE CANCELLER (YNR WEAK; PLAYBACK MODE); note 9						
LNC1	depth 1	–30 dB non-recursive	–7.0	–5.5	–4.5	dB
LNC2	depth 2	–20 dB non-recursive	–4.3	–3.3	–2.3	dB
LNC3	depth 3	0 dB non-recursive	–1.0	–0.2	0	dB
VERTICAL NOISE CANCELLER (YNR STRONG; PLAYBACK MODE); note 9						
VNC1	depth 1	–30 dB recursive	–10.0	–8.5	–7.5	dB
VNC2	depth 2	–20 dB recursive	–9.0	–7.5	–6.5	dB
VNC3	depth 3	0 dB recursive	–1.8	–0.4	0	dB
PICTURE CONTROL; (note 10)						
PC1	response 1 (sharp)	V_1 = 0 V; f_i = 0.5 MHz	0	0.5	1.0	dB
PC2	response 2 (sharp)	V_1 = 0 V; f_i = 2 MHz	3.7	4.7	5.7	dB
PC3	response 3 (soft)	V_1 = 3.2 V; f_i = 0.5 MHz	–2.3	–1.3	–0.8	dB
PC4	response 4 (soft)	V_1 = 3.2 V; f_i = 2 MHz	–6.8	–5.8	–4.8	dB
PC5	response 5 (centre)	pin 1 open-circuit or > 4.1 V; f_i = 2 MHz	–0.5	+0.0	+0.5	dB
t_d	delay time	pin 1 open-circuit; f_i = 0.1 MHz	185	210	235	ns
Character insert (artificial sync/black/white/through; pin 42)						
R_i	internal resistance to ground	V_{42} = 0 to 1.0 V	40	50	60	kΩ
V_{AS}	input voltage for artificial sync (inserts sync level)		4.0	–	5.0	V
V_{AB}	input voltage for artificial black (inserts black level)		2.75	–	3.5	V
V_{AW}	input voltage for artificial white (inserts white level)		1.5	–	2.25	V
V_{THR}	input voltage for through mode		0	–	1.0	V
CVBS input (pin 43)						
V_{43}	DC voltage		2.35	2.75	3.15	V
$V_{i(p-p)}$	CVBS input voltage (peak-to-peak value)		0.3	1.0	2.0	V
AGC detector (pin 44)						
V_{44}	detector voltage	V_{43} = 1 V (p-p)	1.8	2.5	3.2	V

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Sync separator push-pull output (pin 45)						
$V_{O(H)}$	HIGH level output voltage	R_L = 2 kΩ to ground	4.5	–	–	V
$V_{O(L)}$	LOW level output voltage	R_L = 10 kΩ to V_{CC}	–	–	0.3	V
t_{dFE}	front edge delay time	referenced to sync start pin 48; note 11	600	750	900	ns
t_{dBE}	back edge delay time	referenced to sync end pin 48; note 11	100	350	600	ns
Φ_{sync}	input sensitivity (slicing level for sync)	sync-to-black = 100%	26	33	40	%
Sync separator detector (pin 46)						
V_{46}	detector voltage		2.3	–	3.3	V
YNR switch (pin 47); see Table 11						
R_I	internal resistance to ground		40	50	60	kΩ
V_{47}	input voltage	YNR off mode	3.5	–	5.0	V
		YNR1 mode	1.75	–	3.0	V
		YNR2 mode	0	–	1.25	V
Video input from 1HDL CCD (pin 48)						
V_{48}	DC voltage		1.5	1.9	2.3	V
$V_{i(p-p)}$	input voltage for constant output signal at pin 49 (peak-to-peak value)		178	283	449	mV
Video output to 1HDL CCD (pin 49)						
V_{oST}	sync tip output voltage		0.9	1.4	1.9	V
$V_{o(p-p)}$	output voltage (peak-to-peak value)	CCD with –3 dB (record mode)	380	420	460	mV
Storage capacitor for CCD level AGC (pin 50)						
V_{50}	DC voltage		1.4	2.1	2.8	V
G_{CCD}	CCD gain control range		0	3	6	dB
Low-pass filter input for noise canceller (pin 52)						
V_{52}	DC voltage		1.0	1.2	1.4	V

Notes to the characteristics

1. 50 Hz; rotary transition 8 to 4 lines beyond vertical pulse.
2. Test mode; YNR off; main emphasis off; V_{50} = 1.5 V (minimum gain).
3. Input: V_{48} = 143 mV sync and 0 dB = V_{48} = 333 mV picture. Output: 0 dB = V_5 picture at ≤50 kHz and given input level.
4. Input: V_{43} = 300 mV sync and 0 dB = V_{43} = 700 mV picture. Output: 0 dB = V_5 picture at 1, 2 and 3 × f_H and given input level.
5. Burst gate pulse output with no external components; sandcastle output with 10 kΩ resistor to V_{CC}.
6. Crystal characteristics: TEW 8H:
   f_{nom} = 4.433619 MHz ± 15 × 10^{-6}; R_S ≤ 90 Ω; C_1 = 11 fF; L_1 = 117.14791 mH; C_0 = 2.6 pF.
7. Input: V_8 = 90 mV sync and 0 dB = V_8 = 210 mV picture. Output: 0 dB = V_{41} at ≤50 kHz and given input level. Noise canceller off; picture control centre; YNR off; measured with YLPF.
8. Input: V_8 = 90 mV sync and 0 dB = V_8 = 210 mV picture. Output: 0 dB = V_{41} at 100 kHz and given input level. Picture control centre; NLDE off; YNR off. Pin 52: R = 1.3 kΩ; C = 47 nF (parasitic capacitance: 5 pF from pin 52 to GND).
9. Input: V_8 = 90 mV sync and 0 dB = V_8 = 210 mV picture. Output: 0 dB = V_{41} at 1, 2 and 3 × f_H and given input level. Picture control at centre; NC off; NLDE off.
10. Input: V_8 = 90 mV sync and V_8 = 67 mV picture. Output: 0 dB = V_{41} at 100 kHz referring to YNRMIX signal at pin 3 of the same frequency. Noise canceller off; YNR off; NLDE off.
11. Input: V_{48} = 143 mV sync; V_{50} = 1.5 V; dropout or test mode forced DOC.

CHROMINANCE FILTER CHARACTERISTICS

Table 2 Low-pass filter 630 kHz; frequency response pin 33 to pin 28

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PAL; NTSC/REC						
ΔG1	frequency response 1	G(1 MHz)/G(0.2 MHz)	–4	–3	–2	dB
ΔG2	frequency response 2	G(1.5 MHz)/G(0.2 MHz)	–9	–7	–5	dB
ΔG3	frequency response 3	G(2 MHz)/G(0.2 MHz)	–10	–14	–18	dB
ΔG4	frequency response 4	G(3 MHz)/G(0.2 MHz)	–	–	–25	dB
ΔG5	frequency response 5	G(4.43 MHz)/G(0.2 MHz)	–	–	–40	dB
ΔG7	frequency response 7	G(9.5 MHz)/G(0.2 MHz)	–	–	–35	dB
t_d	group delay 1	f_i = 0.63 MHz	295	335	375	ns
SECAM; REC						
ΔG2	frequency response (2)	G(1.5 MHz)/G(0.2 MHz)	–5	–3	–1	dB

Table 3 Band-pass filter 4.43 MHz at record mode; frequency response pin 43 to pin 35

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PAL; NTSC/REC						
ΔG1	frequency response 1	G(<2.7 MHz)/G(4.43 MHz)	–	–	–22	dB
ΔG2	frequency response 2	G(2.7 MHz)/G(4.43 MHz)	–	–	–30	dB
ΔG3	frequency response 3	G(3.93 MHz)/G(4.43 MHz)	–3.8	–2.8	–1.8	dB
ΔG4	frequency response 4	G(4.93 MHz)/G(4.43 MHz)	–2.5	–1.5	–0.5	dB
ΔG5	frequency response 5	G(6.2 MHz)/G(4.43 MHz)	–	–	–30	dB
ΔG6	frequency response 6	G(>6.2 MHz)/G(4.43 MHz)	–	–	–15	dB
t_d	group delay 1	f_i = 4.43 MHz	410	450	490	ns
SECAM; REC						
ΔG7	frequency response 7	G(5.7 MHz)/G(4.43 MHz)	–	–	–25	dB

Table 4 Band-pass filter 4.43 MHz at playback mode; frequency response pin 33 to pin 35 (test mode)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PAL; NTSC/PB						
ΔG1	frequency response 1	G(<2.7 MHz)/G(4.43 MHz)	–	–	–20	dB
ΔG2	frequency response 2	G(2.9 MHz)/G(4.43 MHz)	–	–	–30	dB
ΔG3	frequency response 3	G(3.93 MHz)/G(4.43 MHz)	–3.7	–2.7	–1.7	dB
ΔG4	frequency response 4	G(4.93 MHz)/G(4.43 MHz)	–3.9	–2.9	–1.9	dB
ΔG5	frequency response 5	G(5.7 MHz)/G(4.43 MHz)	–	–30	–25	dB
ΔG6	frequency response 6	G(6 MHz)/G(4.43 MHz)	–	–	–22	dB
ΔG7	frequency response 7	G(>6 MHz)/G(4.43 MHz)	–	–	–15	dB
t_d	group delay 1	f_i = 4.43 MHz	445	485	525	ns
SECAM; PB						
ΔG8	frequency response 8	G(1.9 MHz)/G(4.43 MHz)	–	–30	–22	dB
ΔG9	frequency response 9	G(5.5 MHz)/G(4.43 MHz)	–	–30	–22	dB

Table 5 Band-pass filter 630 kHz; frequency response pin 30 to pin 32 (test mode)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PB						
ΔG1	frequency response 1	G(<100 Hz)/G(630 kHz)	–	–	–20	dB
ΔG2	frequency response 2	G(100 kHz)/G(630 kHz)	–7	–5	–3	dB
ΔG3	frequency response 3	G(930 kHz)/G(630 kHz)	–3	–2	–1	dB
ΔG4	frequency response 4	G(1.5 MHz)/G(630 kHz)	–	–15	–10	dB
ΔG5	frequency response 5	G(2.3 MHz)/G(630 kHz)	–	–	–40	dB
ΔG6	frequency response 6	G(>2.4 MHz)/G(630 kHz)	–	–	–33	dB
t_d	group delay 1	f_i = 630 kHz; pin 36 normal	710	750	790	ns
Δt_d	group delay 4 difference	V_{36} = 4 to 1 V	–250	–210	–170	ns

Table 6 Low-pass filter C*; frequency response pin 36 to pin 38

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PB; C						
ΔG1	frequency response 1	G(5 MHz)/G(2 MHz)	0	–1.5	–3	dB
ΔG2	frequency response 2	G(13.3 MHz)/G(2 MHz)	–18	–25	–	dB
ΔG3	frequency response 3	G(>13.3 MHz)/G(2 MHz)	–18	–	–	dB
t_d	group delay 1	f_i = 4.43 MHz	65	95	125	ns

LUMINANCE FILTER CHARACTERISTICS

Table 7 Low-pass filter 4.43 MHz; frequency response pin 43 to pin 3 (test mode)

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
REC						
ΔG1	frequency response 1	G(2 MHz)/G(0.2 MHz)	–1.0	+0.5	+1.5	dB
ΔG2	frequency response 2	G(3 MHz)/G(0.2 MHz)	–2.5	–1.0	+0.5	dB
ΔG3	frequency response 3	G(4.43 MHz)/G(0.2 MHz)	–	–40	–30	dB
t_d	group delay 1	f_i = 0.2 MHz	710	750	790	ns

Table 8 Sub-low-pass filter; frequency response from FM demodulator to pin 9

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
ΔG1	frequency response 1	G(3 MHz)/G(0.2 MHz)	–4.5	–2	0	dB
ΔG2	frequency response 2	G(6 MHz)/G(0.2 MHz)	–	–25	–15	dB

Sensitivity

Table 9 Sensitivity of PB APC (multiplication factor for phase detector sensitivity)

PROGRAM	PAL		NTSC/NAP			NTSC4.4		
	SP	LP	SP	LP	EP	SP	LP	EP
NORM	2	1[2]	2[1][2]	2[1][2]	2[1][2]	4[1]	2[1][2]	2[1][2]
TRICK	2	1[1][2]	2[1][2]	2[1][2]	2[1][2]	2[1][2]	2[1][2]	2[1][2]

Notes

1. No alternating reference for APC loop.
2. Comb filter is inside the APC loop.

Burst down logic

Table 10 Burst down logic

MODE	SYSTEM		BURST DOWN
Playback	NTSC	SP	ON (–5.0 dB)
		LP	OFF
		EP	ON (–4.0 dB)
	PAL		OFF
	SECAM		OFF

OPERATION MODE

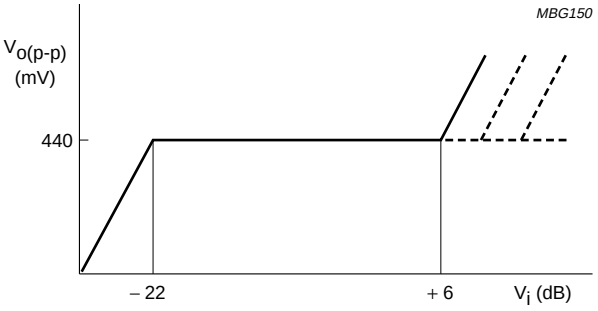
Table 11 Operation mode (PART 1)
For PAL RECORD, SECAM ME RECORD, PAL PLAYBACK, SECAM ME PLAYBACK and NTSC PLAYBACK. EP mode at NTSC PLAYBACK activates the same functions as LP mode.

FILTER	MODE	CONDITIONS	EDIT OFF		EDIT ON	
			SP	LP	SP	LP
YNR	REC	YNR off; pin 47 HIGH	OFF		OFF	
		YNR 1; pin 47 medium	OFF		OFF	
		YNR 2; pin 47 LOW	OFF	vertical emphasis	OFF	
	PB	YNR off; pin 47 HIGH	OFF		OFF	
		YNR 1; pin 47 medium	VNC (strong)	LNC (weak)	OFF	
		YNR 2; pin 47 LOW	LNC (weak)	VNC (strong)	OFF	LNC (weak)
NLE NLDE	REC	YNR off; pin 47 HIGH	NLE(C) + DTE	NLE(D)	NLE(C)	NLE(D)
		YNR 1; pin 47 medium				
		YNR 2; pin 47 LOW				
	PB		NLDE(C)	NLDE(D)	NLDE(C)	NLDE(D)
Noise canceller	PB		ON		WEAK	
Picture control	PB		ON		OFF	
FM carrier interleave			ON		ON	

Table 12 Operation mode (PART 2)

FUNCTION	CONDITIONS		OPERATION
Clamps	REC		ON
	PB	NORM	
		dropout; maximum 128 lines	OFF
Character insert	REC or PB	VIDEO; pin 42 LOW	through
		WHITE; pin 42 = M1	white level (85%)
		BLACK; pin 42 = M2	black level
		SYNC; pin 42 HIGH	sync tip level
Search noise clip	REC		OFF
	PB	NORM	
		TRICK	ON
SQPB	PB	VHS; pin 5 open-circuit	VHS
		SQPB; pin 5 HIGH	SQPB

Automatic chrominance control (ACC) characteristics

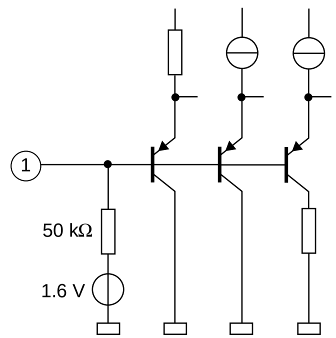
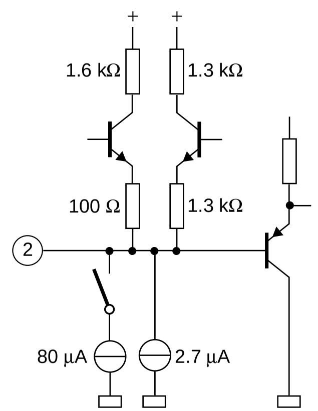


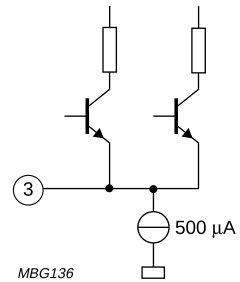
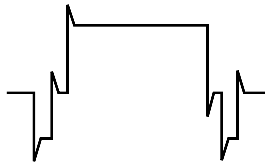
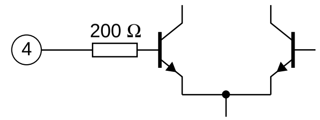
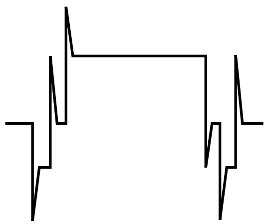
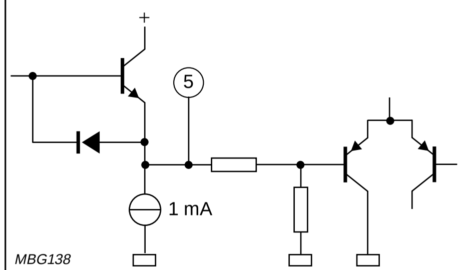
0 dB is equivalent to 110 mv (p-p) at pin 30.

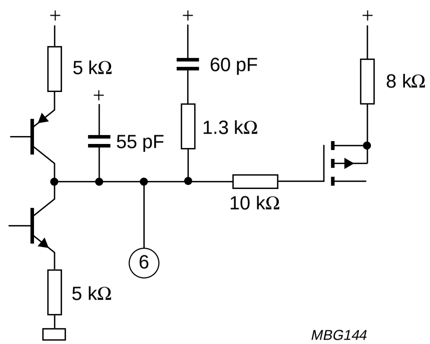
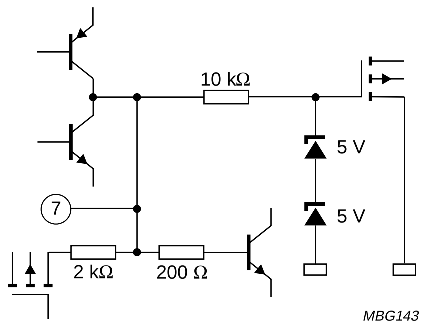
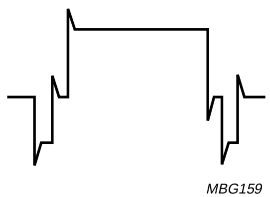
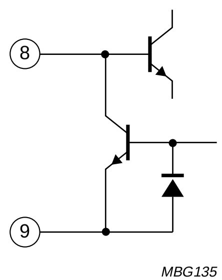
Fig.4 ACC characteristics.

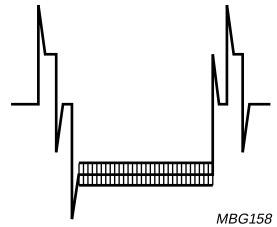
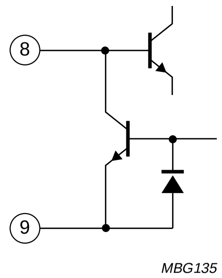
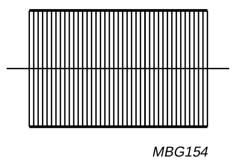
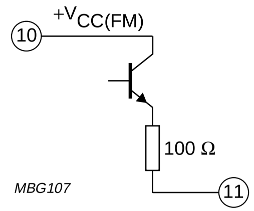
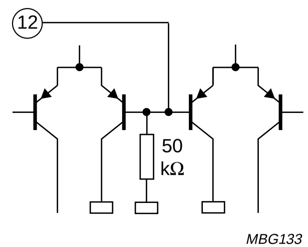
INTERNAL CIRCUITRY

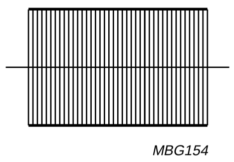
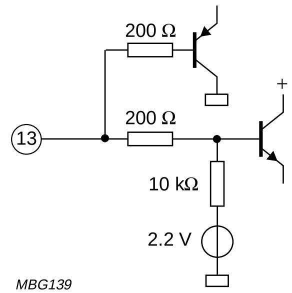
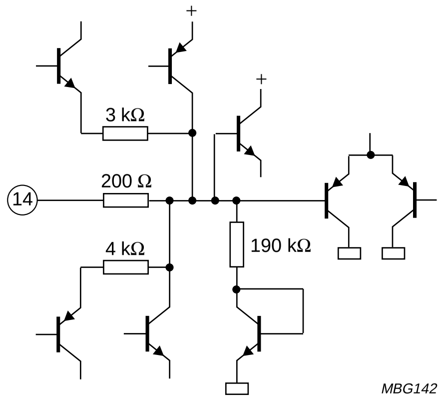
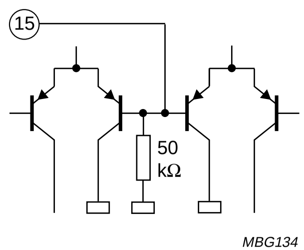
Table 13 Internal circuitry of Figs 1 and 2

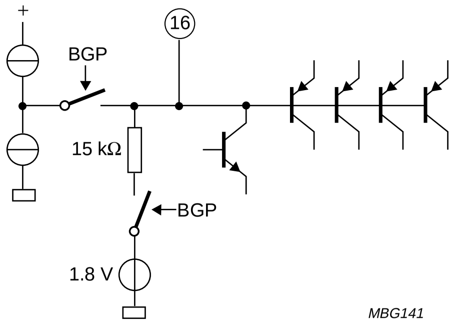
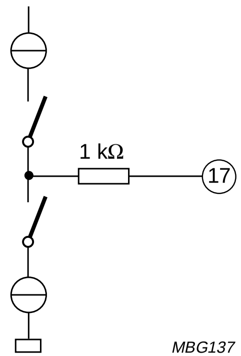
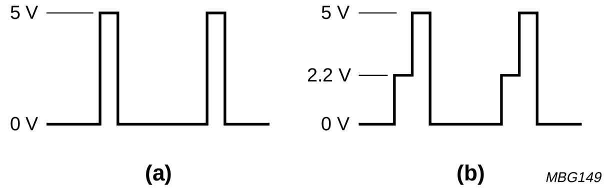
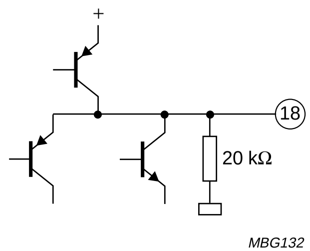
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
1	picture control/EDIT switch	1.6	4.1 V to 5.0 V EDIT	0 V to 1.6 V sharp 1.6 V to 3.2 V soft 4.1 V to 5.0 V EDIT	50 kΩ	 MBG140
2	deviation/playback AGC detector	2.5			V_T/I_E + 100 Ω/ 1.3 kΩ	 MBG145

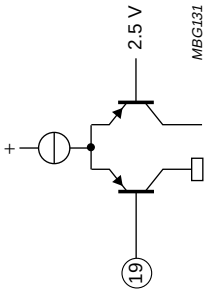
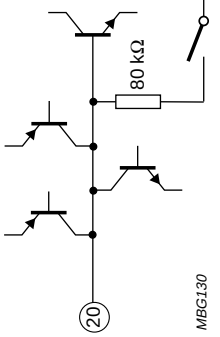
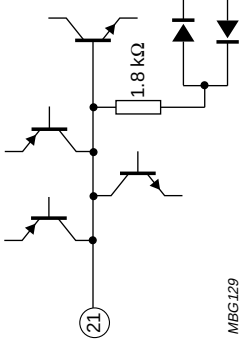
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
3	test pin 2/ correlation detector output		2.1 V = COR	0 V = non-COR	V_T/ 500 µA	 MBG136
4	negative feedback input of main emphasis		1.9 V (sync) 500 mV sync-white  MBG157	0 V	open base	 MBG106
5	main emphasis output/white clip/ modulator input/ SQPB selector		1.9 V (sync) 500 mV sync-white  MBG156	0 V	V_T/1 mA	 MBG138

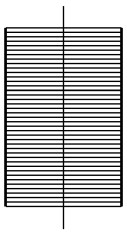
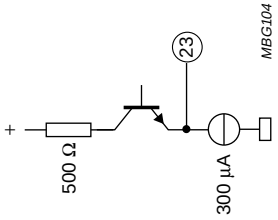
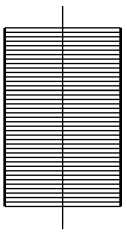
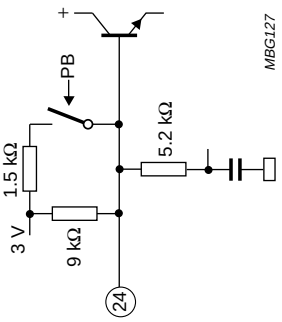
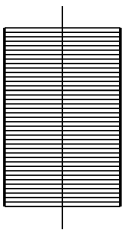
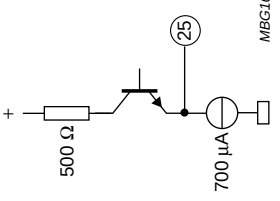
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
6	capacitor for clamp 3				V_T/I_E	
7	storage capacitor for f_0 processor (REC)/ envelope detector (PB)		1.2 V	3.3 V		
8	main de-emphasis output		5 V	3.4 V (sync) 300 mV sync-white 	open collector	

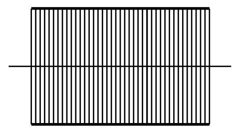
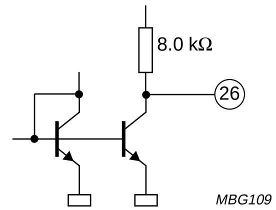
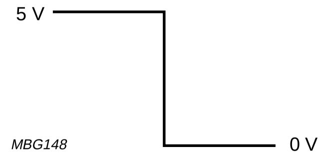
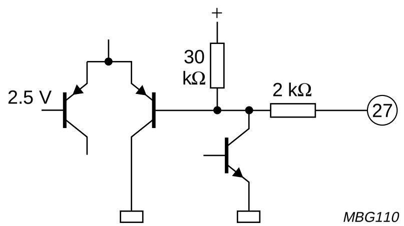
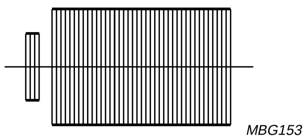
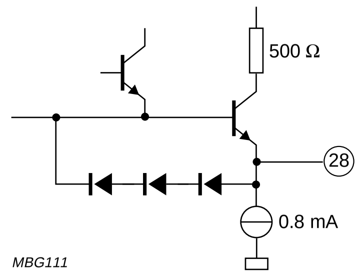
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
9	main de-emphasis and peaking		0 V	1.6 V (sync) 300 mV sync-white 	V_T/I_E	
10	supply voltage for FM parts	5.0				
11	FM output		3.2 V 0.9 V (p-p) rectangle 	3.7 V	V_T/I_E + 100 Ω	
12	switch (PB/TRICK/REC)		0 V to 1.25 V REC	1.75 V to 3 V TRICK 3.5 V to 5 V PB	50 kΩ	

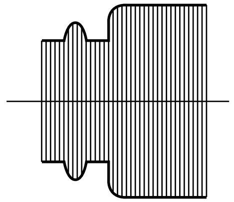
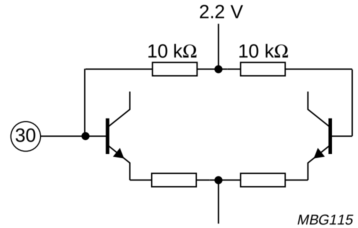
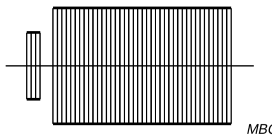
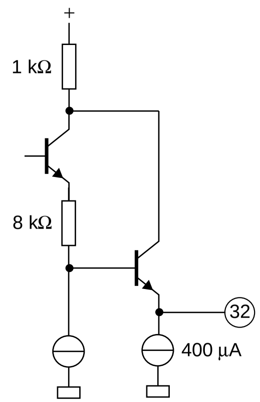
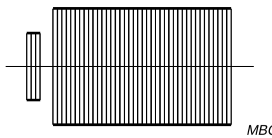
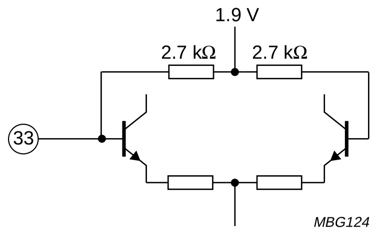
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
13	PB FM input		1.6 V	2.2 V 200 mV (p-p) sinusoidal (350 mV (p-p) if FM AGC off) 	10 kΩ	
14	storage capacitor for FM AGC			3.1 V 4.3 V to 5.0 V FM AGC off		
15	switch (LPC*/LP/SP) at PAL switch (EP/LP/SP) at NTSC	0	0 V to 1.25 V SP 1.75 V to 3.0 V LP 3.5 V to 5.0 V LPC* (PAL) 3.5 V to 5.0 V EP (NTSC)		50 kΩ	

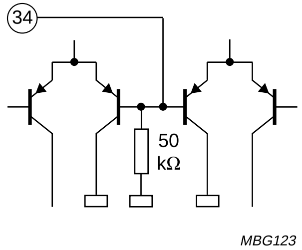
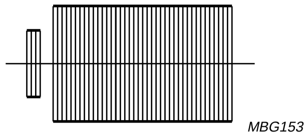
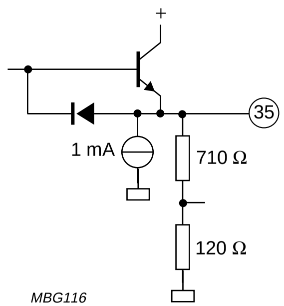
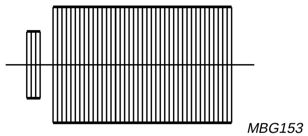
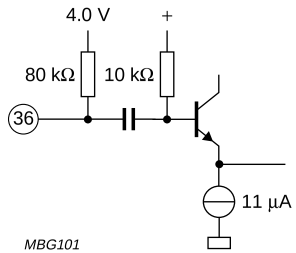
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM EE	WAVEFORM VV	Z	INTERNAL CIRCUIT
16	colour killer terminal	2.8				
17	frequency correction output	2.1				
18	BGP output (HIGH active)		 (a) open circuit (b) with 10 kΩ resistor to V_{CC}			

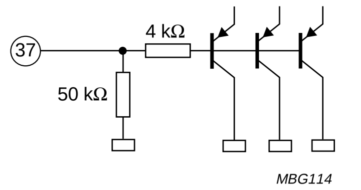
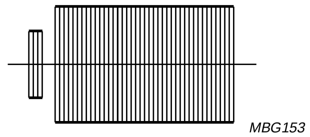
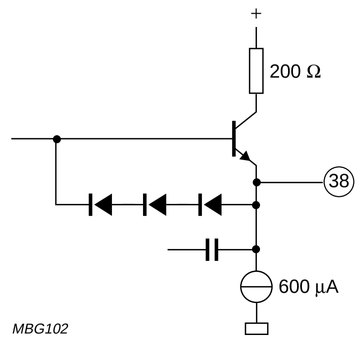
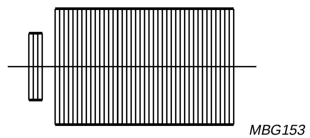
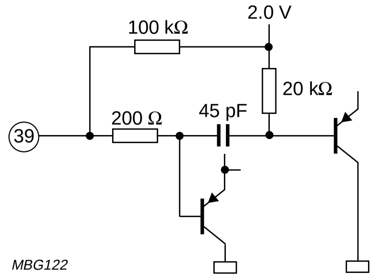
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
19	rotary pulse		0 V to 2.25 V CH2 2.75 V to 5 V CH1		open base	
20	loop filter (REC) VXO	2.4				
21	loop filter VCO	2.1				
22	not connected				HIGH	

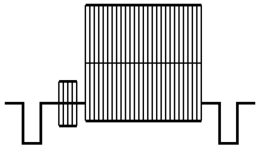
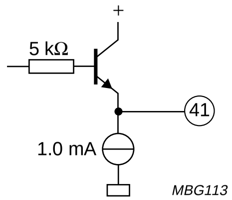
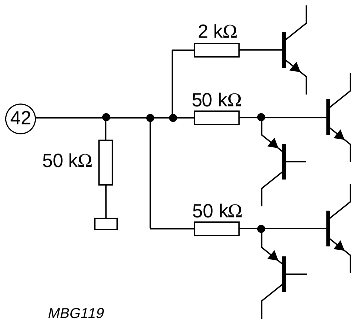
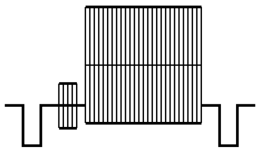
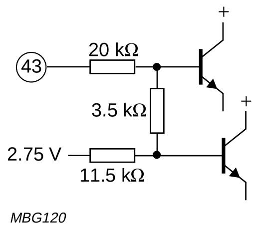
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM EE	WAVEFORM VV	Z	INTERNAL CIRCUIT
23	f_{SC} output	2.3	600 mV (p-p)		V_T/ 300 µA	
24	VXO input from crystal	3.0	250 mV (p-p)		9 kΩ/ 1.3 kΩ	
25	VXO output to crystal	3.3	230 mV (p-p)		V_T/ 700 µA	

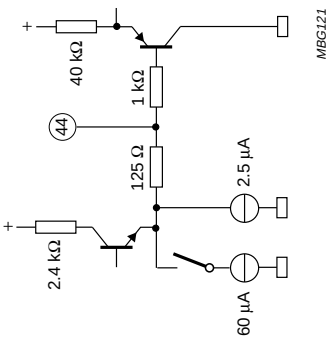
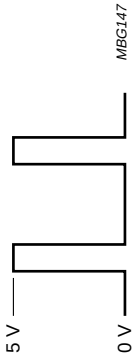
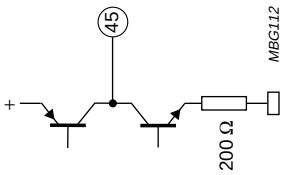
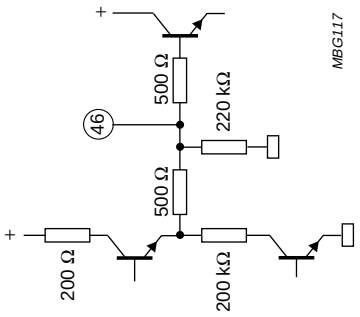
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM EE	WAVEFORM VV	Z	INTERNAL CIRCUIT
26	$2f_{SC}$ output	4.9	550 mV (p-p) 			
27	$f_{H/2}$ output (coupled to burst sequence) NAP/NTSC4.43 switch		PB + REC PB: forced 0 V: NTSC4.43 mode 			
28	chrominance output to tape	2.4	660 mV (p-p) 	2.4 V normal 0 V colour off	V_T/ 0.8 mA	
29	supply voltage chrominance	5.0				

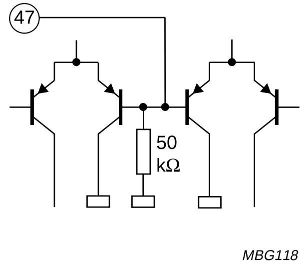
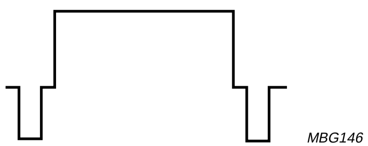
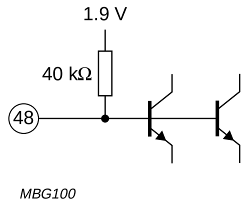
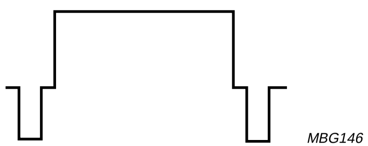
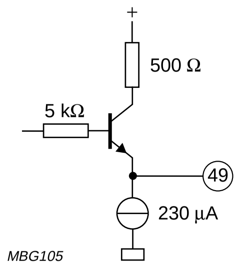
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
30	PB chrominance input from tape	2.2		chrominance 110 mV (p-p) and FM 	10 kΩ	
31	ground	0				
32	ACC output	2.25	440 mV (p-p) 		V_T/ 400 μA	
33	balanced mixer input	1.9	440 mV (p-p) 		2.7 kΩ	

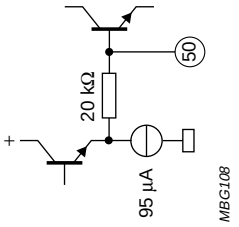
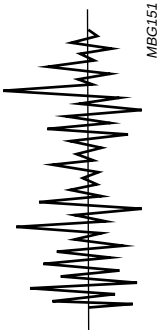
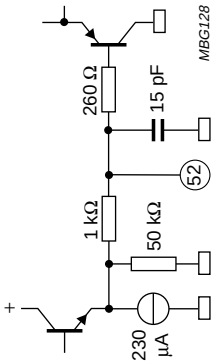
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
34	switch SECAM/NTSC/PAL	0	0 V to 1.25 V PAL 1.75 V to 3.0 V NTSC 3.5 V to 5.0 V SECAM		50 kΩ	
35	comb driver output	2.5	PAL and glass: 675 mV (p-p) NTSC or CCD: 380 mV (p-p)		V_T/1 mA	
36	chrominance input from comb filter	4.0	120 mV (p-p) 4.0 V: glass comb <1.5 V: CCD comb		80 kΩ/ 9 kΩ	

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM EE	WAVEFORM VV	Z	INTERNAL CIRCUIT
37	test pin 1	0			50 kΩ	
38	PB chrominance output	1.6		325 mV (p-p) 	V_T/ 600 µA	
39	PB chrominance input	1.6 (2.0)	>3.4 V: AGCKP1	325 mV (p-p) 	20 kΩ	
40	supply voltage luminance	5.0				

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
41	video output	1.05 sync	sync-white: 2.14 V (p-p) chrominance: 1.2 V (p-p) 		V_T/1 mA	
42	character insert (artificial sync/ black/white/ through)	0.0	0 V to 1.0 V through 1.5 V to 2.25 V white 2.75 V to 3.5 V black 4.0 V to 5.0 V sync		50 kΩ	
43	video input	2.75	sync-white: 1.0 V (p-p) chrominance: 660 mV (p-p) 			

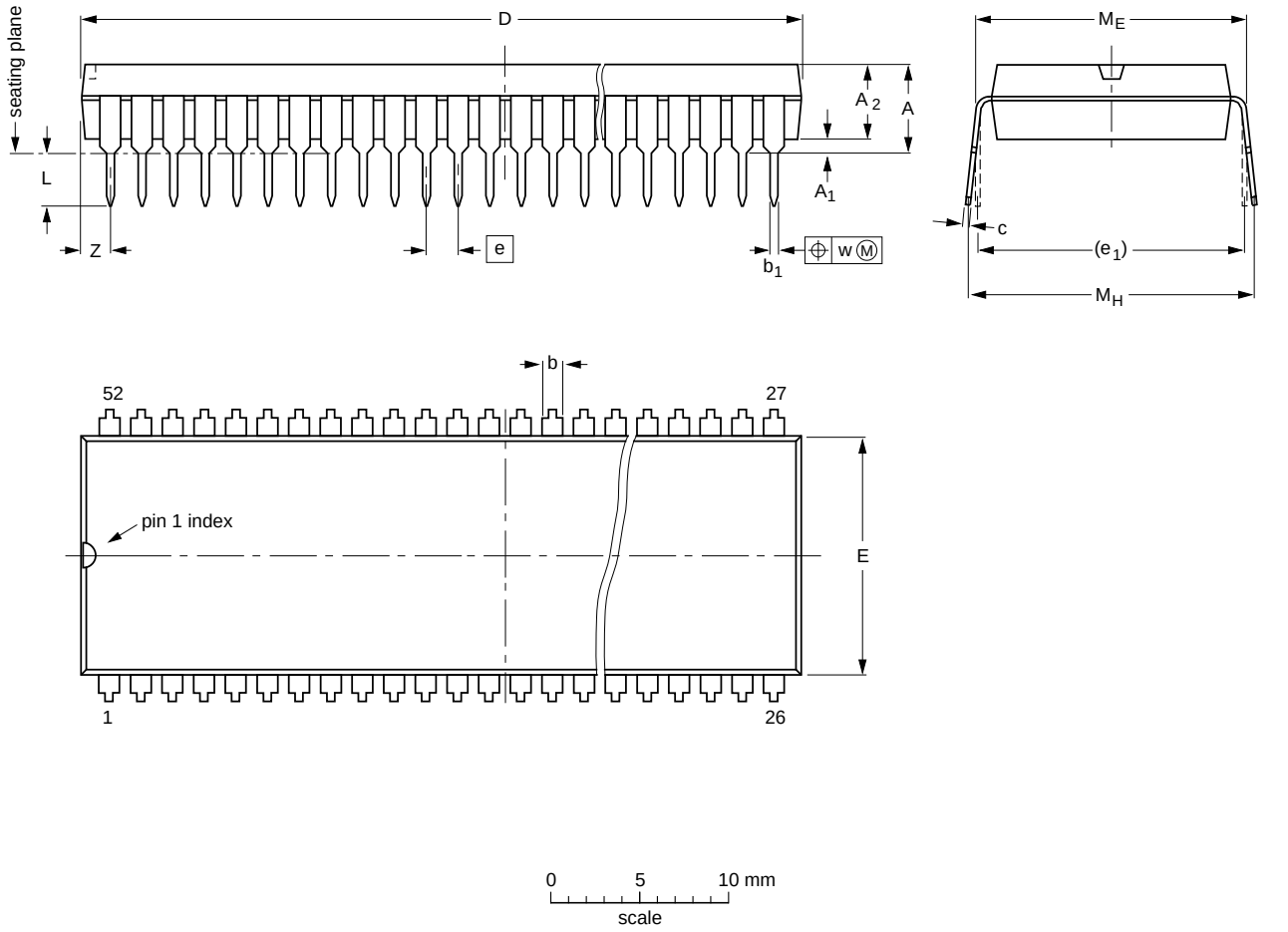
PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
44	AGC detector	2.5			V_T/I_E + 100 Ω	
45	sync separator output					
46	sync separator detector	3.1			V_T/I_E + 500 Ω	

<table>
<tr><th rowspan="2">PIN NO.</th><th rowspan="2">PIN NAME (DESCRIPTION)</th><th rowspan="2">DC (V)</th><th colspan="2">WAVEFORM</th><th rowspan="2">Z</th><th rowspan="2">INTERNAL CIRCUIT</th></tr>
<tr><th>EE</th><th>VV</th></tr>
<tr><td>47</td><td>YNR switch</td><td>0</td><td colspan="2">0 V to 1.25 V YNR2
1.75 V to 3.0 V YNR1
3.5 V to 5.0 V YNR off</td><td>50 kΩ</td><td>  </td></tr>
<tr><td>48</td><td>video input from 1H CCD</td><td>1.9</td><td colspan="2">283 mV (p-p)
  </td><td>40 kΩ</td><td>  </td></tr>
<tr><td>49</td><td>video output to 1H CCD</td><td>1.4 sync</td><td colspan="2">420 mV (p-p)
  </td><td>V_T/ 230 µA</td><td>  </td></tr>
</table>

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
50	storage capacitor for CCD level AGC	2.0				
51	ground luminance	0				
52	low-pass filter for noise canceller	1.2		noise 	1 kΩ	

PACKAGE OUTLINE

SDIP52: plastic shrink dual in-line package; 52 leads (600 mil) **SOT247-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1 min.	A_2 max.	b	b_1	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	5.08	0.51	4.0	1.3 0.8	0.53 0.40	0.32 0.23	47.9 47.1	14.0 13.7	1.778	15.24	3.2 2.8	15.80 15.24	17.15 15.90	0.18	1.73

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT247-1						~~90-01-22~~ 95-03-11

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

Soldering by dipping or by wave

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified storage maximum ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

Repairing soldered joints

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.