

DATA SHEET

TDA9725

Y/C automatic adjustment
processor (VHS standard)

Product specification
Supersedes data of 1995 Dec 06
File under Integrated Circuits, IC02

1996 Oct 14

Y/C automatic adjustment processor (VHS standard)

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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	$V_{CC} = 5\text{ V}$; 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)	$R_L = 1\text{ k}\Omega$	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

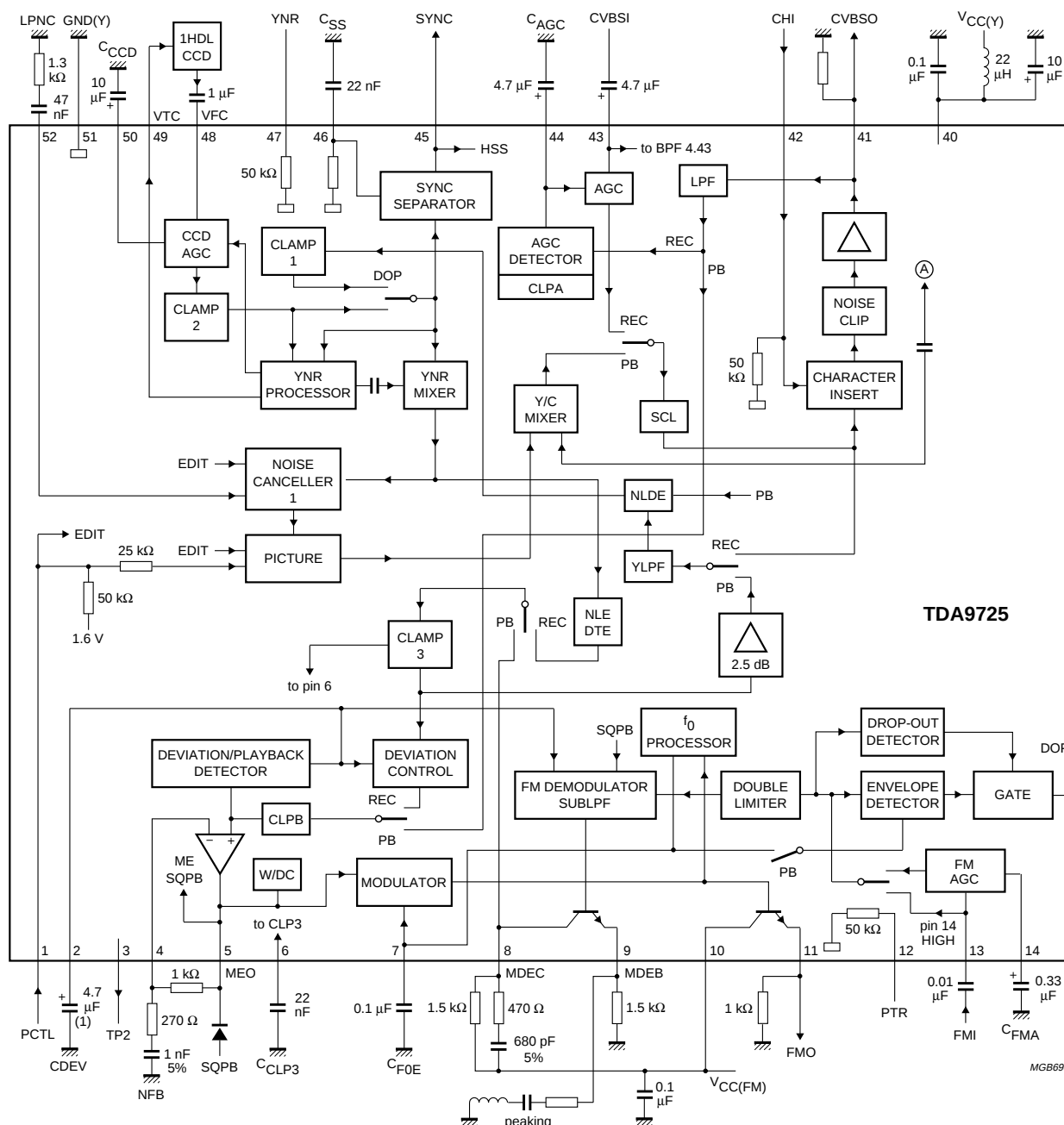
ORDERING INFORMATION

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

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BLOCK DIAGRAM



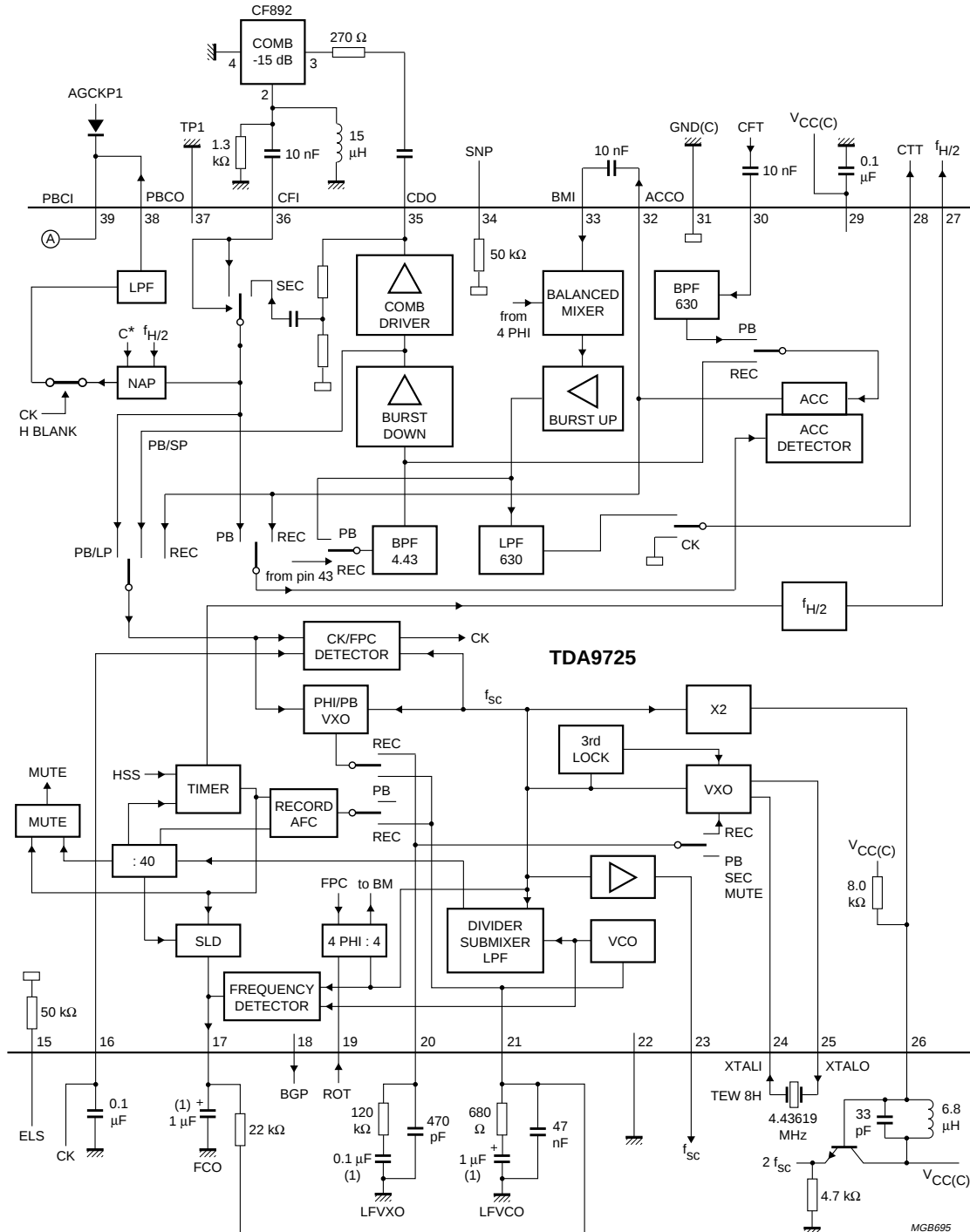
(1) Low leakage current.

All capacitors for loop filter $\pm 10\%$; all other capacitors $+10\%/-50\%$; all resistors $\pm 5\%$; all inductors $\pm 10\%$; unless otherwise specified.

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

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(1) Low leakage current.

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

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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_{FOE}	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

SYMBOL	PIN	DESCRIPTION
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.

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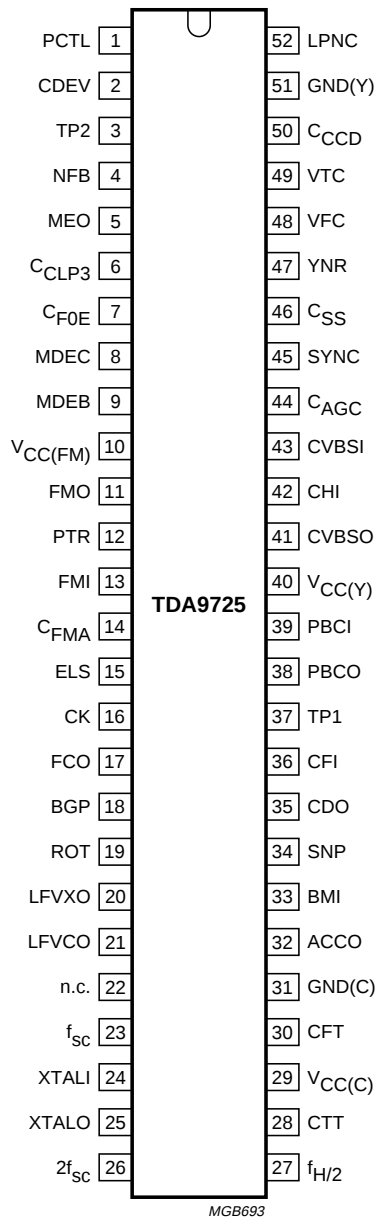


Fig.3 Pin configuration.

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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

- 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-a}	thermal resistance from junction to ambient in free air	43	K/W

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CHARACTERISTICS

$V_{CC} = 5\text{ V}$; $T_{amb} = +25\text{ }^{\circ}\text{C}$ 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 ≥ 10 kΩ	1.5	2.1	3.0	V
V _{OL}	LOW level output voltage	non-correlation of Y signal	—	0.1	0.5	V

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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; $\Delta V_{CC} = \pm 0.25$ 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 f₀ 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

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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 $\frac{V_0(5\text{ MHz}) - V_0(4\text{ MHz})}{V_0(4\text{ MHz}) - V_0(3\text{ MHz})}$	VHS mode	0.97	1.0	1.03	
LIN2	demodulator linearity 2 $\frac{V_0(9\text{ MHz}) - V_0(7\text{ MHz})}{V_0(7\text{ MHz}) - V_0(5\text{ MHz})}$	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	

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SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Switch: PB/TRICK/REC (pin 12)						
R_I	internal resistance to ground		40	50	60	$k\Omega$
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	$k\Omega$
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

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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

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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

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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 × 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

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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 ₀	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
ΔG _{BD(S)}	burst down	playback mode; NTSC; SP	–6.0	–5.0	–4.0	dB
ΔG _{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

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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)	$V_{30} = 110 \text{ mV (p-p)}$	270	325	420	mV
H_2	second harmonic distortion	$V_{30} = 110 \text{ mV (p-p)}$	–	–	–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^* ; $V_{36} = 120 \text{ mV (p-p)}$	–1.5	0	+1.5	dB
$\Delta \phi_{C^*}$	output phase deviation	C to C^* or NAP line n to n + 1	–15	0	+15	°
$\Delta \phi_{NAP}$	phase for NAP burst	NAP burst to $-(B - Y)$ axis	± 30	± 45	± 60	°
$\alpha_{2f_{sc}}$	$2f_{sc}$ suppression	C^* ; $V_{36} = 120 \text{ mV (p-p)}$	35	–	–	dB
$\alpha_{3f_{sc}}$	$3f_{sc}$ suppression	C^* ; $V_{36} = 120 \text{ mV (p-p)}$	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; $R_L = 2.1 \text{ k}\Omega$	0.9	1.05	1.2	V
RECORD MODE						
$V_{0REC(p-p)}$	record output voltage (standard output level) (peak-to-peak value)	video/sync = 7/3; $R_L = 2.1 \text{ k}\Omega$	2.03	2.14	2.25	V
$\Delta V_{0REC(p-p)}$	record output voltage level stability (peak-to-peak value)	$\Delta V_{CC} = \pm 0.25 \text{ V}$ or $T_{amb} = -10 \text{ to } +70 \text{ }^\circ\text{C}$	–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	$V_{43} = 0.5 \text{ to } 2.0 \text{ V (p-p)}$	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	%

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SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
PLAYBACK MODE						
$V_{0PB(p-p)}$	playback output voltage (peak-to-peak value)	video/sync = 7/3; nominal FM signal; $R_L = 2.1\text{ k}\Omega$; test: EE without ME, MDE, peaking, YNR	2.03	2.14	2.25	V
$\Delta V_{0PB(p-p)}$	playback output voltage level stability (peak-to-peak value)	$\Delta V_{CC} = \pm 0.25\text{ V}$ or $T_{amb} = -10\text{ to }+70\text{ }^\circ\text{C}$	-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); $f_i = 1\text{ MHz}$	—	—	-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)	$V_{30} = 110\text{ mV (p-p)}$	1.0	1.2	1.4	V
ΔG_{CHROM}	chrominance frequency response	$V_i = V_{39}$; $f_i = 5\text{ to }1\text{ MHz}$	-2	—	+2	dB
VERTICAL SYNCHRONIZATION PULSE/CHARACTER INSERT (RECORD AND PLAYBACK MODES)						
ΔV_{ST}	artificial sync tip level voltage offset	$V_{42} = 0\text{ to }5\text{ V}$; playback mode	-50	0	+50	mV
$\Delta V_{bl(p-p)}$	artificial black level voltage (peak-to-peak value)	$V_{42} = 5\text{ to }3\text{ V}$	0.58	0.68	0.78	V
$\Delta V_{wh(p-p)}$	artificial white level voltage (peak-to-peak value)	$V_{42} = 5\text{ to }2\text{ V}$	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; $f_i = 500\text{ kHz}$; SP	-2.9	-1.9	-0.9	dB
S2	response S2	-20 dB; $f_i = 2\text{ MHz}$; SP	-6.5	-5.0	-3.5	dB
L1	response L1	-20 dB; $f_i = 500\text{ kHz}$; LP	-6.5	-4.8	-3.0	dB
L2	response L2	-20 dB; $f_i = 2\text{ MHz}$; LP	-10.2	-8.4	-6.7	dB
L3	response L3	0 dB; $f_i = 2\text{ MHz}$; LP	-4.8	-3.2	-1.8	dB
NOISE CANCELLER (PLAYBACK MODE); note 8						
NC1	response NC1	-30 dB; $f_i = 1\text{ MHz}$; NORMAL	-5.5	-3.5	-1.4	dB
NC2	response NC2	-30 dB; $f_i = 2\text{ MHz}$; NORMAL	-15.0	-11.6	-8.0	dB
NC4	response NC4	0 dB; $f_i = 2\text{ MHz}$; NORMAL	-1.3	-0.3	+0.7	dB
NCED	response NCEDIT	-30 dB; $f_i = 2\text{ MHz}$; EDIT	-5.0	-3.4	-1.8	dB

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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)	$V_1 = 0 \text{ V}$; $f_i = 0.5 \text{ MHz}$	0	0.5	1.0	dB
PC2	response 2 (sharp)	$V_1 = 0 \text{ V}$; $f_i = 2 \text{ MHz}$	3.7	4.7	5.7	dB
PC3	response 3 (soft)	$V_1 = 3.2 \text{ V}$; $f_i = 0.5 \text{ MHz}$	−2.3	−1.3	−0.8	dB
PC4	response 4 (soft)	$V_1 = 3.2 \text{ V}$; $f_i = 2 \text{ MHz}$	−6.8	−5.8	−4.8	dB
PC5	response 5 (centre)	pin 1 open-circuit or $> 4.1 \text{ V}$; $f_i = 2 \text{ MHz}$	−0.5	+0.0	+0.5	dB
t_d	delay time	pin 1 open-circuit; $f_i = 0.1 \text{ MHz}$	185	210	235	ns
Character insert (artificial sync/black/white/through; pin 42)						
R_i	internal resistance to ground	$V_{42} = 0 \text{ to } 1.0 \text{ V}$	40	50	60	k Ω
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	$V_{43} = 1 \text{ V (p-p)}$	1.8	2.5	3.2	V

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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

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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 $3 \times f_H$ and given input level.
5. Burst gate pulse output with no external components; sandcastle output with 10 k Ω resistor to V_{CC} .
6. Crystal characteristics: TEW 8H:
 $f_{nom} = 4.433619$ MHz $\pm 15 \times 10^{-6}$; $R_S \leq 90$ 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: $R = 1.3$ k Ω ; $C = 47$ 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 $3 \times f_H$ 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.

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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						
$\Delta G1$	frequency response 1	$G(1 \text{ MHz})/G(0.2 \text{ MHz})$	-4	-3	-2	dB
$\Delta G2$	frequency response 2	$G(1.5 \text{ MHz})/G(0.2 \text{ MHz})$	-9	-7	-5	dB
$\Delta G3$	frequency response 3	$G(2 \text{ MHz})/G(0.2 \text{ MHz})$	-10	-14	-18	dB
$\Delta G4$	frequency response 4	$G(3 \text{ MHz})/G(0.2 \text{ MHz})$	-	-	-25	dB
$\Delta G5$	frequency response 5	$G(4.43 \text{ MHz})/G(0.2 \text{ MHz})$	-	-	-40	dB
$\Delta G7$	frequency response 7	$G(9.5 \text{ MHz})/G(0.2 \text{ MHz})$	-	-	-35	dB
t_d	group delay 1	$f_i = 0.63 \text{ MHz}$	295	335	375	ns
SECAM; REC						
$\Delta G2$	frequency response (2)	$G(1.5 \text{ MHz})/G(0.2 \text{ MHz})$	-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						
$\Delta G1$	frequency response 1	$G(<2.7 \text{ MHz})/G(4.43 \text{ MHz})$	-	-	-22	dB
$\Delta G2$	frequency response 2	$G(2.7 \text{ MHz})/G(4.43 \text{ MHz})$	-	-	-30	dB
$\Delta G3$	frequency response 3	$G(3.93 \text{ MHz})/G(4.43 \text{ MHz})$	-3.8	-2.8	-1.8	dB
$\Delta G4$	frequency response 4	$G(4.93 \text{ MHz})/G(4.43 \text{ MHz})$	-2.5	-1.5	-0.5	dB
$\Delta G5$	frequency response 5	$G(6.2 \text{ MHz})/G(4.43 \text{ MHz})$	-	-	-30	dB
$\Delta G6$	frequency response 6	$G(>6.2 \text{ MHz})/G(4.43 \text{ MHz})$	-	-	-15	dB
t_d	group delay 1	$f_i = 4.43 \text{ MHz}$	410	450	490	ns
SECAM; REC						
$\Delta G7$	frequency response 7	$G(5.7 \text{ MHz})/G(4.43 \text{ MHz})$	-	-	-25	dB

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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						
$\Delta G1$	frequency response 1	$G(<2.7 \text{ MHz})/G(4.43 \text{ MHz})$	–	–	–20	dB
$\Delta G2$	frequency response 2	$G(2.9 \text{ MHz})/G(4.43 \text{ MHz})$	–	–	–30	dB
$\Delta G3$	frequency response 3	$G(3.93 \text{ MHz})/G(4.43 \text{ MHz})$	–3.7	–2.7	–1.7	dB
$\Delta G4$	frequency response 4	$G(4.93 \text{ MHz})/G(4.43 \text{ MHz})$	–3.9	–2.9	–1.9	dB
$\Delta G5$	frequency response 5	$G(5.7 \text{ MHz})/G(4.43 \text{ MHz})$	–	–30	–25	dB
$\Delta G6$	frequency response 6	$G(6 \text{ MHz})/G(4.43 \text{ MHz})$	–	–	–22	dB
$\Delta G7$	frequency response 7	$G(>6 \text{ MHz})/G(4.43 \text{ MHz})$	–	–	–15	dB
t_d	group delay 1	$f_i = 4.43 \text{ MHz}$	445	485	525	ns
SECAM; PB						
$\Delta G8$	frequency response 8	$G(1.9 \text{ MHz})/G(4.43 \text{ MHz})$	–	–30	–22	dB
$\Delta G9$	frequency response 9	$G(5.5 \text{ MHz})/G(4.43 \text{ MHz})$	–	–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						
$\Delta G1$	frequency response 1	$G(<100 \text{ Hz})/G(630 \text{ kHz})$	–	–	–20	dB
$\Delta G2$	frequency response 2	$G(100 \text{ kHz})/G(630 \text{ kHz})$	–7	–5	–3	dB
$\Delta G3$	frequency response 3	$G(930 \text{ kHz})/G(630 \text{ kHz})$	–3	–2	–1	dB
$\Delta G4$	frequency response 4	$G(1.5 \text{ MHz})/G(630 \text{ kHz})$	–	–15	–10	dB
$\Delta G5$	frequency response 5	$G(2.3 \text{ MHz})/G(630 \text{ kHz})$	–	–	–40	dB
$\Delta G6$	frequency response 6	$G(>2.4 \text{ MHz})/G(630 \text{ kHz})$	–	–	–33	dB
t_d	group delay 1	$f_i = 630 \text{ kHz}$; pin 36 normal	710	750	790	ns
Δt_d	group delay 4 difference	$V_{36} = 4 \text{ to } 1 \text{ V}$	–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						
$\Delta G1$	frequency response 1	$G(5 \text{ MHz})/G(2 \text{ MHz})$	0	–1.5	–3	dB
$\Delta G2$	frequency response 2	$G(13.3 \text{ MHz})/G(2 \text{ MHz})$	–18	–25	–	dB
$\Delta G3$	frequency response 3	$G(>13.3 \text{ MHz})/G(2 \text{ MHz})$	–18	–	–	dB
t_d	group delay 1	$f_i = 4.43 \text{ MHz}$	65	95	125	ns

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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						
$\Delta G1$	frequency response 1	G(2 MHz)/G(0.2 MHz)	-1.0	+0.5	+1.5	dB
$\Delta G2$	frequency response 2	G(3 MHz)/G(0.2 MHz)	-2.5	-1.0	+0.5	dB
$\Delta G3$	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
$\Delta G1$	frequency response 1	G(3 MHz)/G(0.2 MHz)	-4.5	-2	0	dB
$\Delta G2$	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

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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	

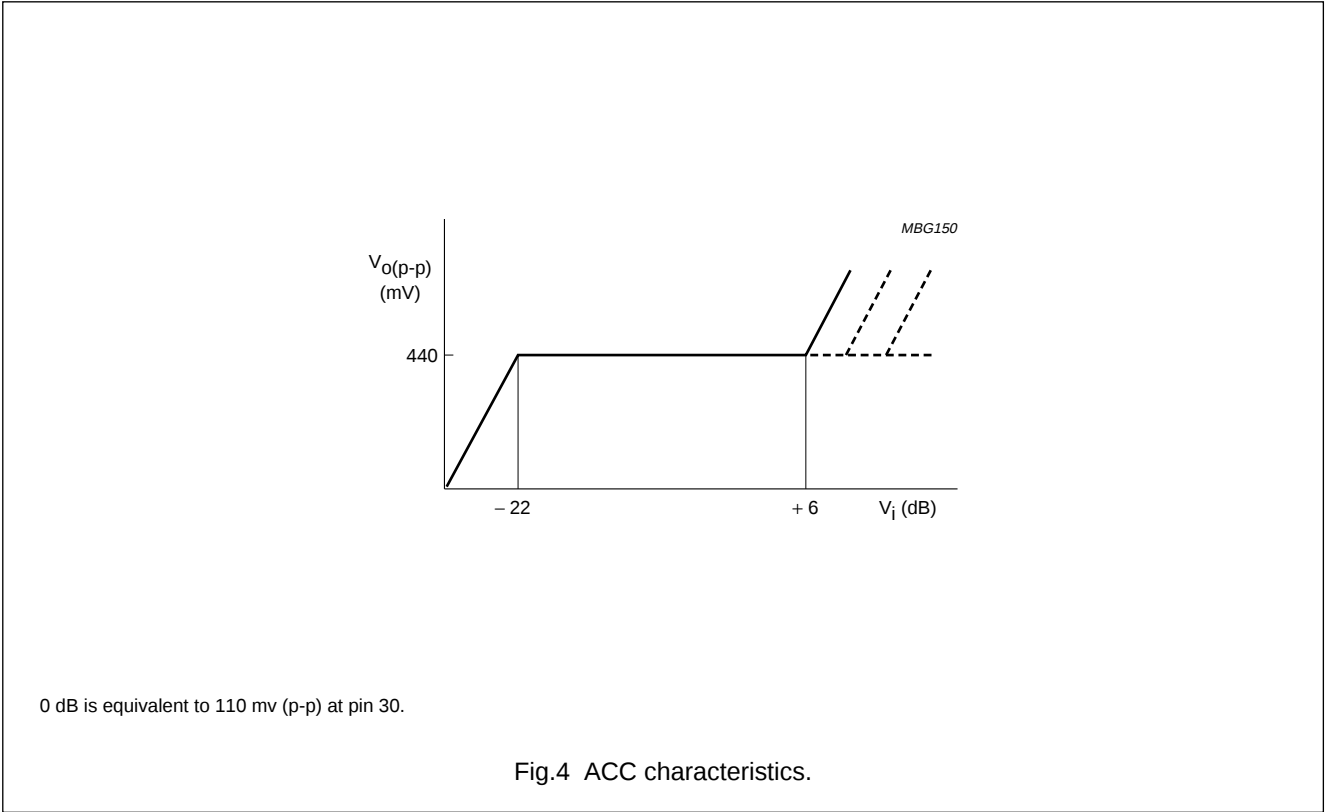
Table 12 Operation mode (PART 2)

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

Y/C automatic adjustment processor
(VHS standard)

TDA9725

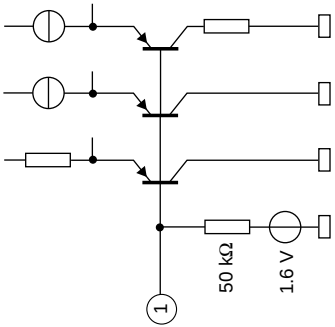
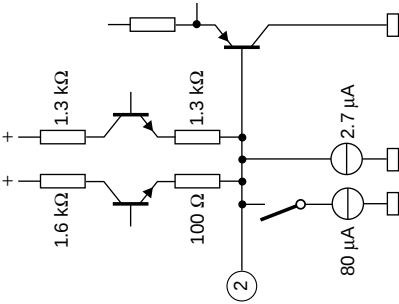
Automatic chrominance control (ACC) characteristics



Y/C automatic adjustment processor
(VHS standard)

TDA9725

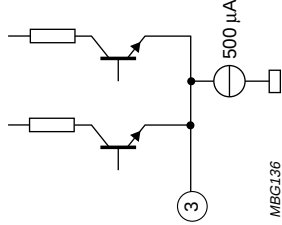
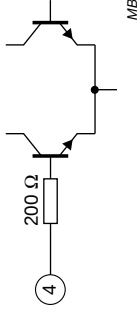
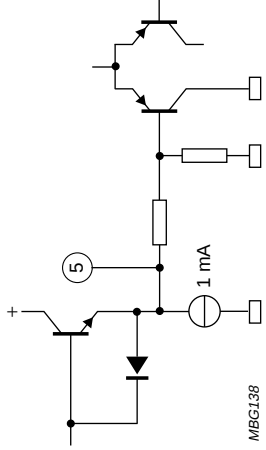
INTERNAL CIRCUITRY
Table 13 Internal circuitry of Figs 1 and 2

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
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	
2	deviation/playback AGC detector	2.5			$V_T/I_E + 100\ \Omega / 1.3\ \text{k}\Omega$	

Y/C automatic adjustment processor

(VHS standard)

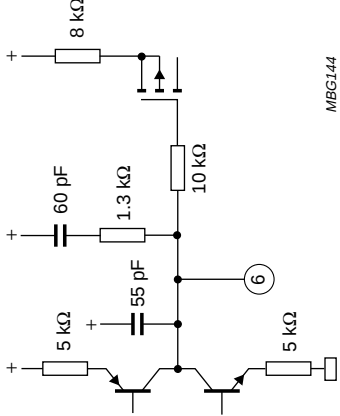
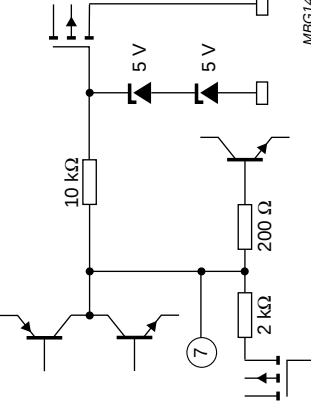
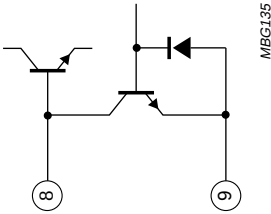
TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
3	test pin 2/ correlation detector output		2.1 V = COR	0 V = non-COR	$V_T/500\text{ }\mu\text{A}$	
4	negative feedback input of main emphasis		1.9 V (sync) 500 mV sync-white	0 V	open base	
5	main emphasis output/white clip/ modulator input/ SQPB selector		1.9 V (sync) 500 mV sync-white	0 V	$V_T/1\text{ mA}$	

Y/C automatic adjustment processor

(VHS standard)

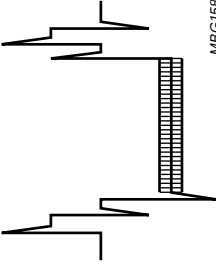
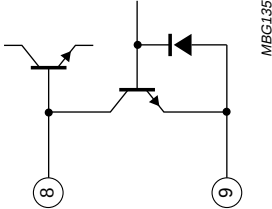
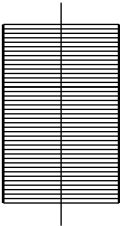
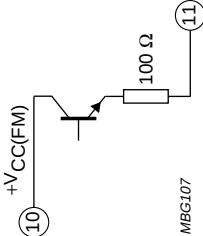
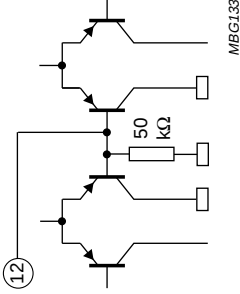
TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
6	capacitor for clamp 3				V_T/I_E	
7	storage capacitor for f ₀ processor (REC)/ envelope detector (PB)	1.2 V				
8	main de-emphasis output	5 V		3.4 V (sync) 300 mV sync-white	open collector	

Y/C automatic adjustment processor

(VHS standard)

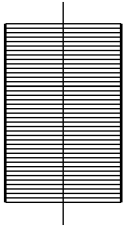
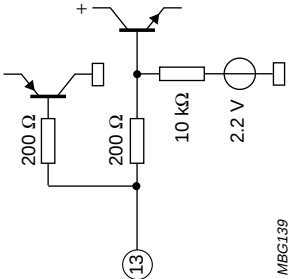
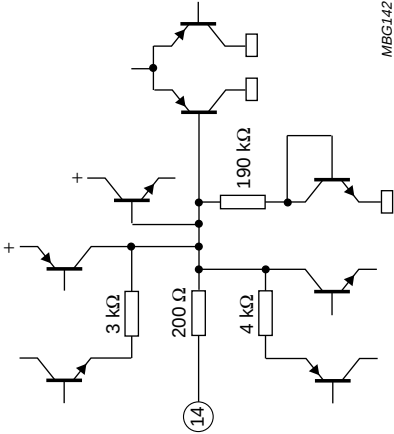
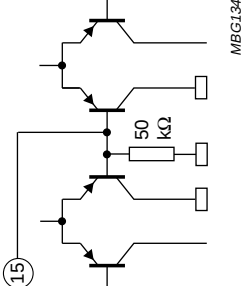
TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
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	$V_T/I_E + 100 \Omega$	
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 k Ω	

Y/C automatic adjustment processor

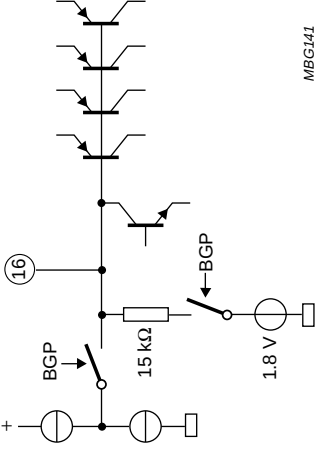
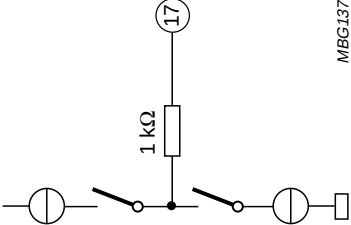
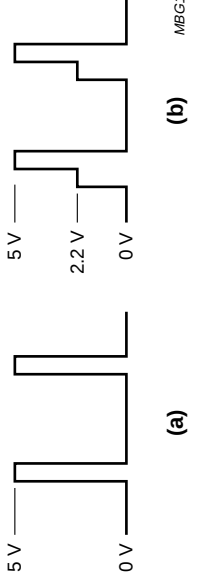
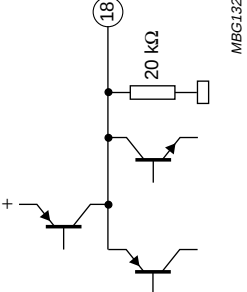
(VHS standard)

TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	WV		
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	

Y/C automatic adjustment processor
(VHS standard)

TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
16	colour killer terminal	2.8				
17	frequency correction output	2.1				
18	BGP output (HIGH active)					

Y/C automatic adjustment processor
(VHS standard)

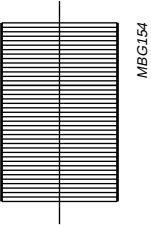
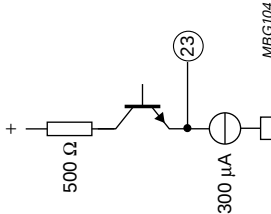
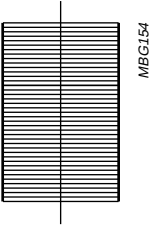
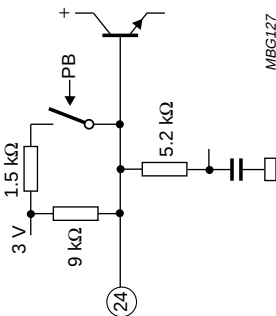
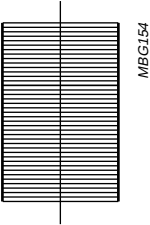
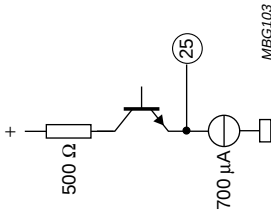
TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
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	

Y/C automatic adjustment processor

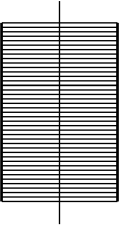
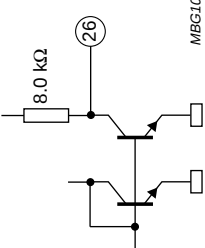
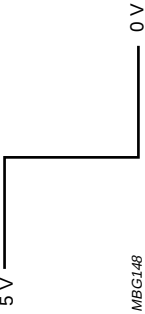
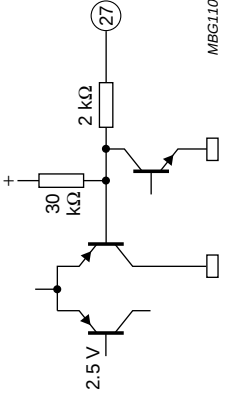
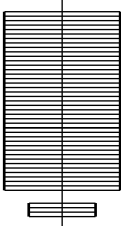
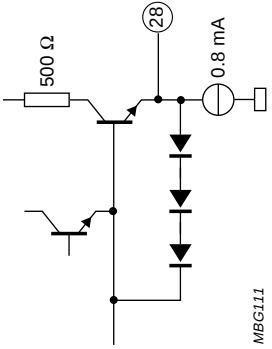
(VHS standard)

TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		INTERNAL CIRCUIT
			EE	VV	
23	f _{SC} output	2.3	600 mV (p-p)		
24	VXO input from crystal	3.0	250 mV (p-p)		
25	VXO output to crystal	3.3	230 mV (p-p)		

Y/C automatic adjustment processor
(VHS standard)

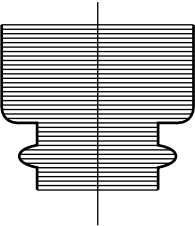
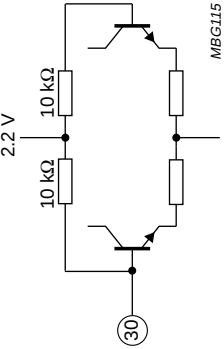
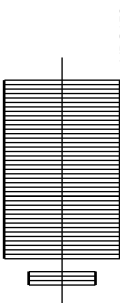
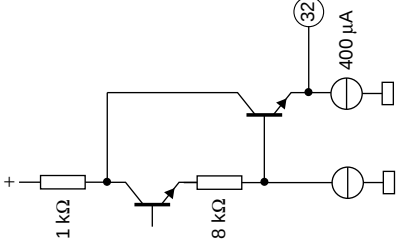
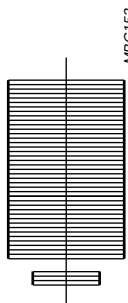
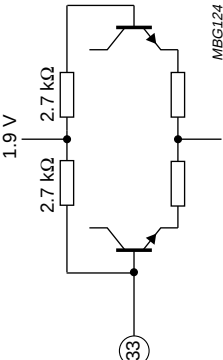
TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
26	2f _{SC} output	4.9	 MBG154			 MBG109
27	f _{H/2} output (coupled to burst sequence) NAP/NTSC4.43 switch		 MBG148			 MBG110
28	chrominance output to tape	2.4	660 mV (p-p)  MBG153	2.4 V normal 0 V colour off	V _T / 0.8 mA	 MBG111
29	supply voltage chrominance	5.0				

Y/C automatic adjustment processor

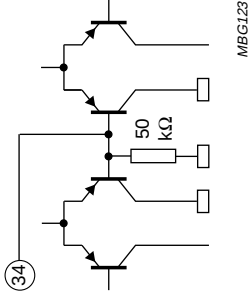
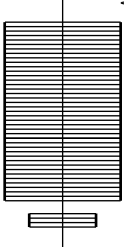
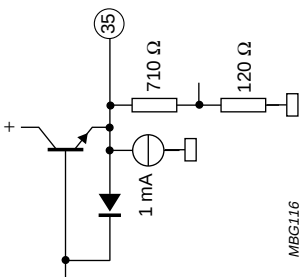
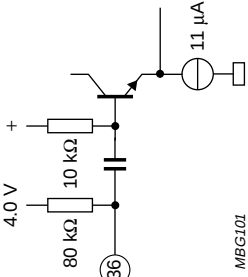
(VHS standard)

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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) 		$V_T / 400 \mu A$	
33	balanced mixer input	1.9	440 mV (p-p) 		2.7 kΩ	

Y/C automatic adjustment processor
(VHS standard)

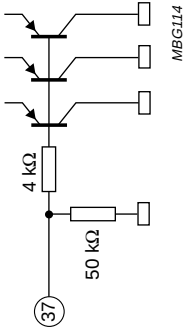
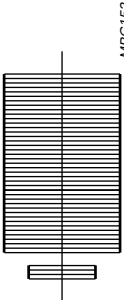
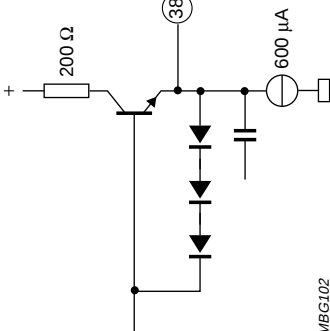
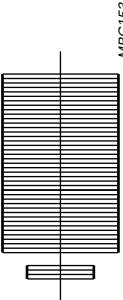
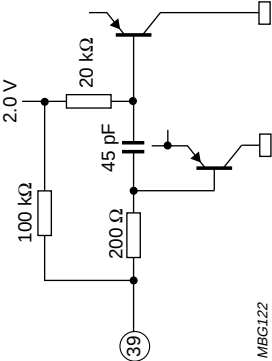
TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VW		
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			$V_T/1 \text{ mA}$	
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	

Y/C automatic adjustment processor

(VHS standard)

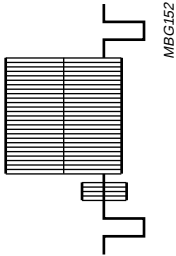
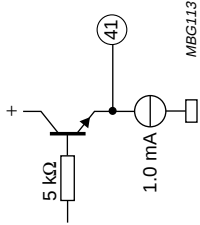
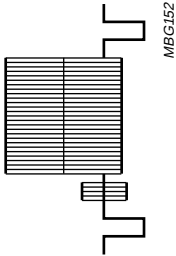
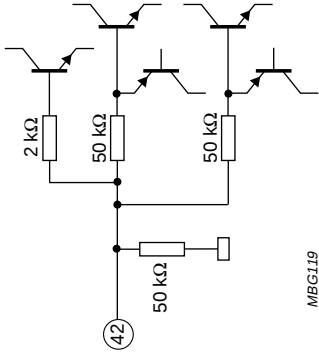
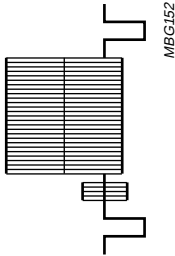
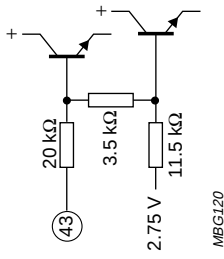
TDA9725

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

Y/C automatic adjustment processor

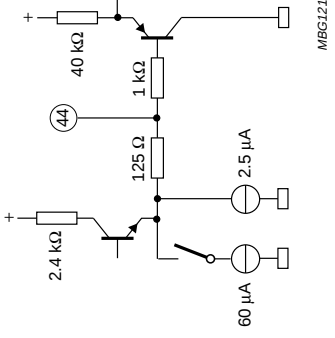
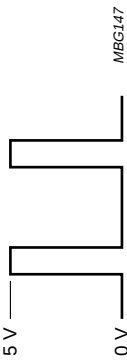
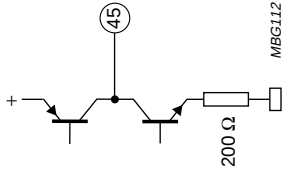
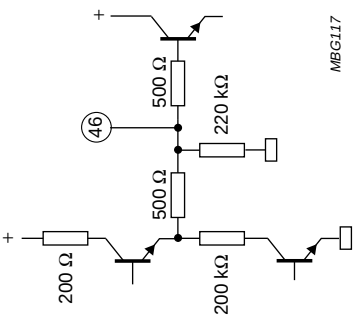
(VHS standard)

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PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VW		
41	video output	1.05 sync	 sync-white: 2.14 V (p-p) chrominance: 1.2 V (p-p)		$V_T/1\text{ mA}$	 MBG113
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 k Ω	 MBG119
43	video input	2.75	 sync-white: 1.0 V (p-p) chrominance: 660 mV (p-p)			 MBG120

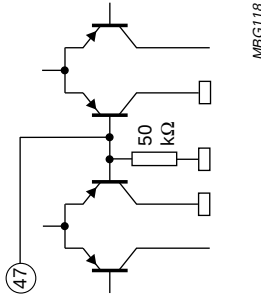
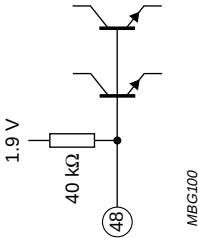
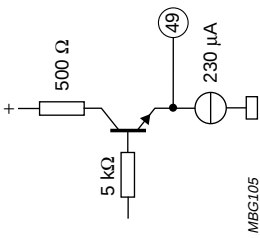
Y/C automatic adjustment processor
(VHS standard)

TDA9725

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

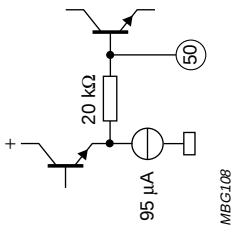
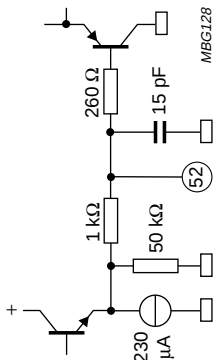
Y/C automatic adjustment processor
(VHS standard)

TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	VV		
47	YNR switch	0	0 V to 1.25 V YNR2 1.75 V to 3.0 V YNR1 3.5 V to 5.0 V YNR off		50 kΩ	
48	video input from 1H CCD	1.9			40 kΩ	
49	video output to 1H CCD	1.4 sync			V_T / 230 μA	

Y/C automatic adjustment processor
(VHS standard)

TDA9725

PIN NO.	PIN NAME (DESCRIPTION)	DC (V)	WAVEFORM		Z	INTERNAL CIRCUIT
			EE	W		
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	

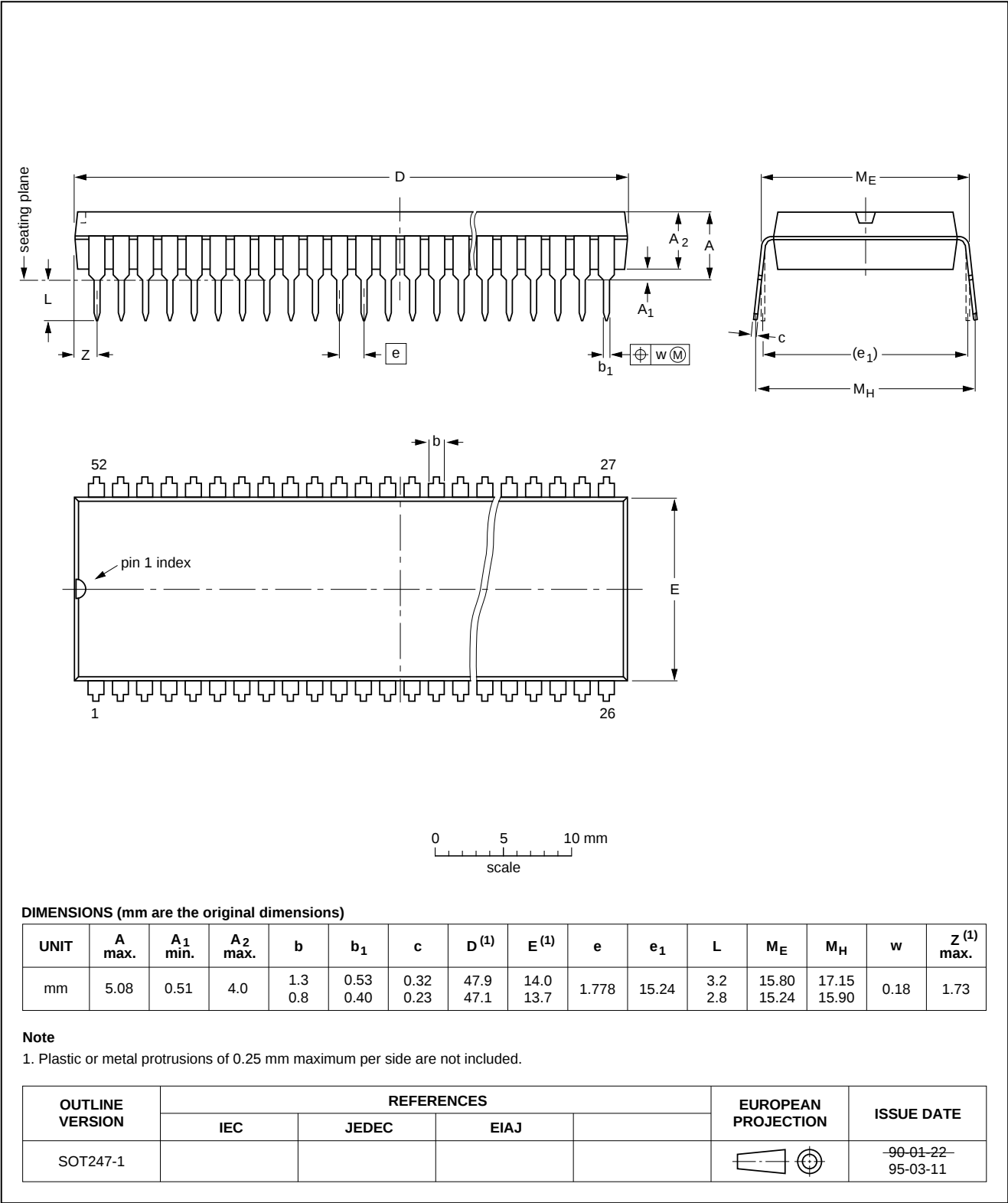
Y/C automatic adjustment processor
(VHS standard)

TDA9725

PACKAGE OUTLINE

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

SOT247-1



Y/C automatic adjustment processor (VHS standard)

TDA9725

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 ($T_{\text{stg max}}$). 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

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