Preliminary data **Bipolar IC**

Type	Ordering code	Package
TDA 5650	Q67000-A2357	DIP 28

The integrated circuit TDA 5650 includes the essential features for sound processing in video tapes, which are:

Features

- Amplification and adjustment of levels
- Setting of the required input and output impedances
- Switch-over between 4 signal sources
- Switch-over from recording to playback mode
- Muting pulse
- Adjustment of the switching signal (point 3-5) to bus-compatible control level
- Automatic level control
- Setting of the recording and playback frequency response through external negative feedback
- Dynamic noise suppression (DNS)
  Compander function for largely improved signal-to-noise ratio (approx. 6-10 dB). The transmission bandwidth is signal-dependent in accordance with the sliding band method and reciprocally controlled for the recording and playback mode.

Maximum ratings

		min	max	
Input microphone amplifier	V_M		V_{REF}	V
Input playback amplifier	$V_{I\,p\,amp}$		V_{REF}	V
Output playback amplifier	$I_{Q\,p\,amp}$	−5		mA
Output playback amplifier	$V_{Q\,p\,amp}$		6	V
Input AF signal	$V_{I\,AF}$	0	$+V_S$	V
Time constant muting pulse	V_τ	0	$V_{REF}+5$	V
Logic input	$V_{L\,7}$	0	V_S	V
Output AF signal	$V_{Q\,AF}$	0		V
Output AF signal	$I_{Q\,AF}$		5	mA
Expander feedback	$V_{f\,exp}$	0	$+V_S$	V
Input expander	$V_{I\,exp}$	0	$+V_S$	V
DNS control voltage	$V_{c\,DNS}$	−5		mA
DNS control voltage	$V_{c\,DNS}$		12	V
DNS feedback	$I_{f\,DNS}$		5	mA
Input DNS	$V_{I\,DNS}$	0	$+V_S$	V
DNS setting resistor	$V_{set\,DNS}$	0	$+V_S$	V
Reference current	$I_{Q\,I\,REF}$	−1		mA
Reference voltage	$V_{Q\,I\,REF}$		$V_{REF}+5$	V
DNS time constant	$V_{\tau\,DNS}$	0	6	V
DNS control input	$V_{I\,c\,DNS}$	0	$V_{REF}+5$	V
Supply voltage	V_S	0	20	V
Output compressor	$V_{Q\,com}$	0		V
Output compressor	$I_{Q\,com}$		5	mA
Input AF amlifier	$V_{I\,AF\,amp}$	0	$V_{REF}+5$	V
Input recording amplifier	$V_{I\,rec\,amp}$	0	$+V_S$	V
Output recording amplifier	$I_{Q\,rec\,amp}$	−5	5	mA
Logic input	$V_{L\,23}$	0	$+V_S$	V
Logic input	$V_{L\,24}$	0	$+V_S$	V
Input/Output AV signal	$V_{I/Q\,AV}$	0	$+V_S$	V
Time constant level control	$V_{\tau\,LC}$	0	$+V_S$	V
Output level control	$V_{Q\,LC}$	0	7	V
Reference voltage blocking	$I_{Q\,REF}$	−5		mA
Reference voltage blocking	V_{REF}		7	V
Junction temperature	T_j		150	°C
Storage temperature	T_{stg}	−40	125	°C
Thermal resistance (system-ambient)	$R_{th\,SA}$		65	K/W

Operating range

Supply voltage	V_S	9.8 to 12		V
Frequency range	f_{max}	15		kHz
0 dB		10		kHz
Ambient temperature	T_A	0 to 60		°C

Characteristics

$V_S = 12$ V; $T_A = 25$ °C

		min	typ	max	
Current consumption $V_S = 12$ V, AF, without signal	I_S		20	27.5	mA
Recording mode					
Microphone input					
Input impedance	R_{iM}	−25%	10	+25%	kΩ
Input signal 1 kHz	$V_{iM\,rms}$	1.0		50	mV
Signal-to-noise ratio, microphone according to plot A, $V_{i\,rms} = 1$ mV		40[1) 2)]			dB
AV input					
Input impedance	R_{iAV}	10			kΩ
Input signal 1 kHz	$V_{iAV\,rms}$	0.15	1.0	2	V
AV signal-to-noise ratio according to plot A, $V_{i\,rms} = 100$ mV		60[1)]			dB
AF input					
Input impedance	R_{iAF}	50			kΩ
Input signal 1 kHz	$V_{iAF\,rms}$	0.15	0.3	2	V
AF signal-to-noise ratio according to plot A, $V_{i\,rms} = 100$ mV		60[1)]			dB
AF output (monitor)					
Output impedance	R_{q8}			0.1	kΩ
Output signal	$V_{q8\,rms}$		1		V
Total harmonic distortion with 1 kHz	THD			1.5	%
$V_i = 1$ V at AF output	THD_3			0.5	%
Playback mode					
Playback head input					
Input current	I_3			100	nA
Input signal at 330 Hz	V_{ip}		60[3)]		μV
AV output					
Output impedance	R_{q25}			1	kΩ
Output signal 1 V_{rms} at pin 8	$V_{q25\,rms}$		1		V
Playback gain at 330 Hz	G_p		84[3)]		dB
Signal-to-noise ratio referred to playback head $V_{ip} = 60$ μV according to plot, A, $R_{ip} = 10$ Ω	N_p	56[3)]			dB
Total harmonic distortion factor	THD			1.5	%
$V_{ip} = 200$ μV	THD_3			0.5	%

[1)] Measurement performed without compression
[2)] Objective is 46 dB
[3)] including preamplifier and circuitry; refer to figure/measurement with expansion

Characteristics

$V_S = 12$ V; $T_A = 25$ °C

		min	typ	max	
Recording head output					
Output impedance	R_{q22}			0.1	kΩ
Output signal	$V_{q22\,pp}$	−20%	5	+20%	V
$V_{iAF\,rms} = 1$ V (1 kHz)					
Automatic level control					
Gain $f = 1$ kHz					
Microphone input up to AF output	V_8/V_{iM}	26		60	dB
AV input up to AF output	V_8/V_{iAV}	−6		16	dB
AF input up to AF output	V_8/V_{iAF}	−6		16	dB
Playback amplifier output up to AF output	V_8/V_4	0		22	dB
Charging current for AGC	$+I_{26}$	1			mA
Discharging current for AGC	$-I_{26}$	0.3	0.5	0.65	µA
Time period for 34 to 66 dB	t_1		4		min
Time period for 66 to 34 dB	t_2		100		ms
Time period for control deviation of 40 dB at 40 Hz	t_3			200	ms
Cross-talk of switched-off inputs			40		dB
Switching inputs A, B, C					
Input control current	$I_{7/23/24}$	−20		0	µA
$V_{7/23/24} = 0$ V					
Low voltage "0"	$V_{L7/23/24}$	0		1.2	V
High voltage "1"	$V_{H7/23/24}$	2		V_S	V
DNS time constant for gain increase at 10 kHz from −20 to 0 dB			2		ms
DNS time constant for gain decrease at 10 kHz from 0 to −20 dB			60		ms
Charging current for DNS	$+I_{16}$	1			mA
Discharging current without external resistor	$-I_{16}$	10	15	20	µA
Level compression 5 kHz, $R_p = 39$ kΩ			8		dB
Achievable level compression 5 kHz, $R_p = 6.8$ kΩ		15			dB

Switching times

Muting response time via pin A	$t_{7/8}$		20		ms
Total switch-over time via pin B, C	$t_{23/8}$				
	$t_{24/8}$		2		s
Time delay for sound recurrence after muting pulse	$t_{7/8}$		1		s

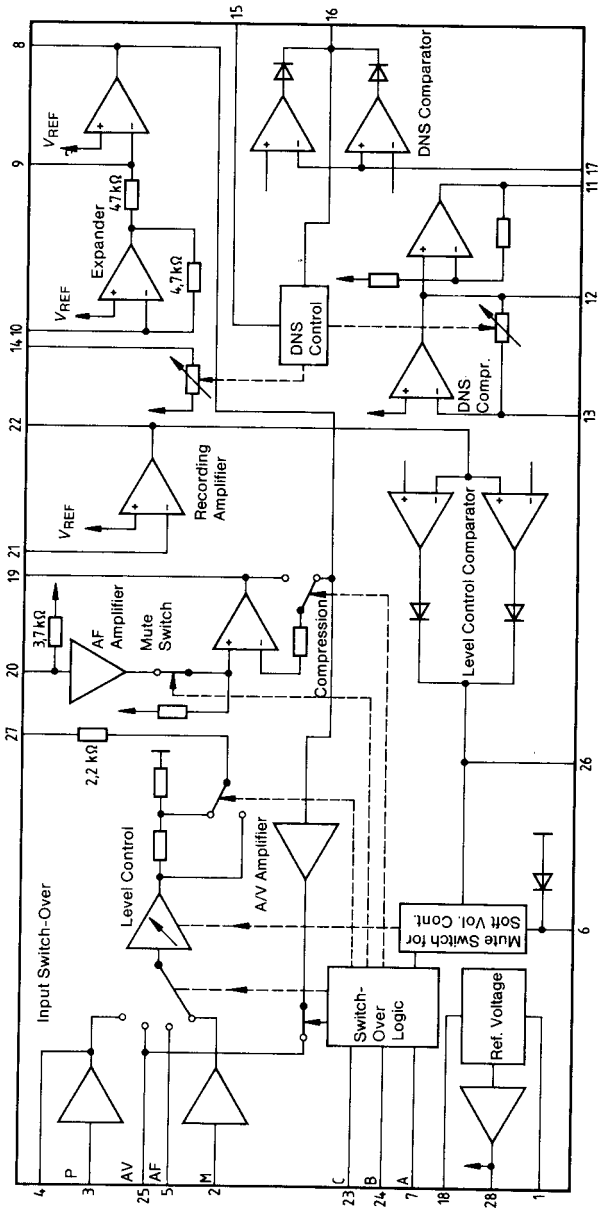
Truth table

		Switching inputs		
		A	B	C
Recording, microphone	M	1	0	0
Recording A/V	A/V	1	0	1
Playback	P	1	1	0
Recording AF	AF	1	1	1
Mute mode	S	0	X	X

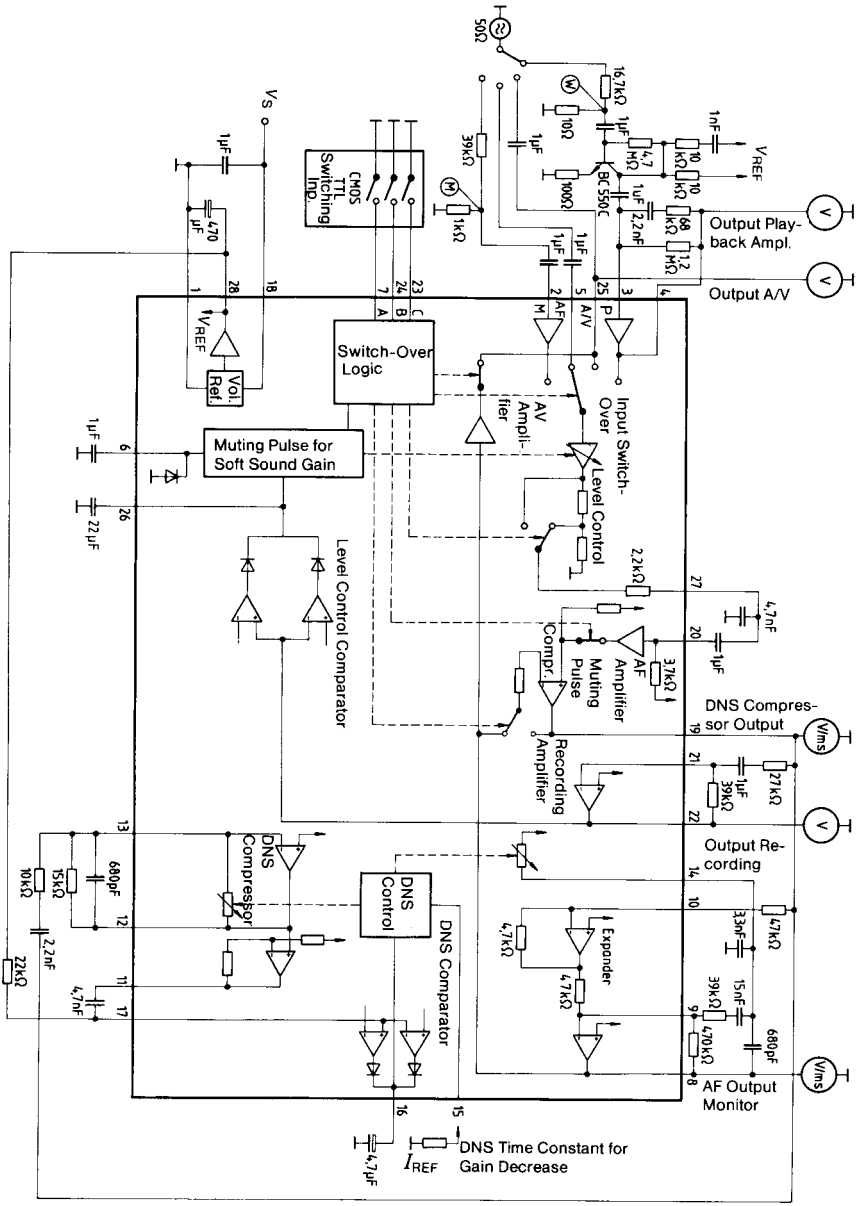
Pin description

Pin	Function
1	GND
2	Input recording microphone
3	Input playback + frequency response playback
4	Output playback amplifier
5	Input recording AF (IF)
6	Time constant for switch-over + soft sound gain control
7	Logic input (muting pulse)
8	Output AF (monitor)
9	DNS expander feedback
10	DNS expander input
11	DNS control voltage
12	DNS feedback control voltage generation
13	DNS input control voltage generation
14	DNS setting resistor
15	Reference current
16	DNS timeconstant
17	DNS control input
18	Supply voltage
19	DNS compressor output
20	Line stop filter
21	Frequency response, recording
22	Output recording (head)
23	Logic input (switch-over)
24	Logic input (switch-over)
25	Input recording AV
26	Time constant level control
27	Line stop filter (output level control)
28	Capacitive support C V_{REF}

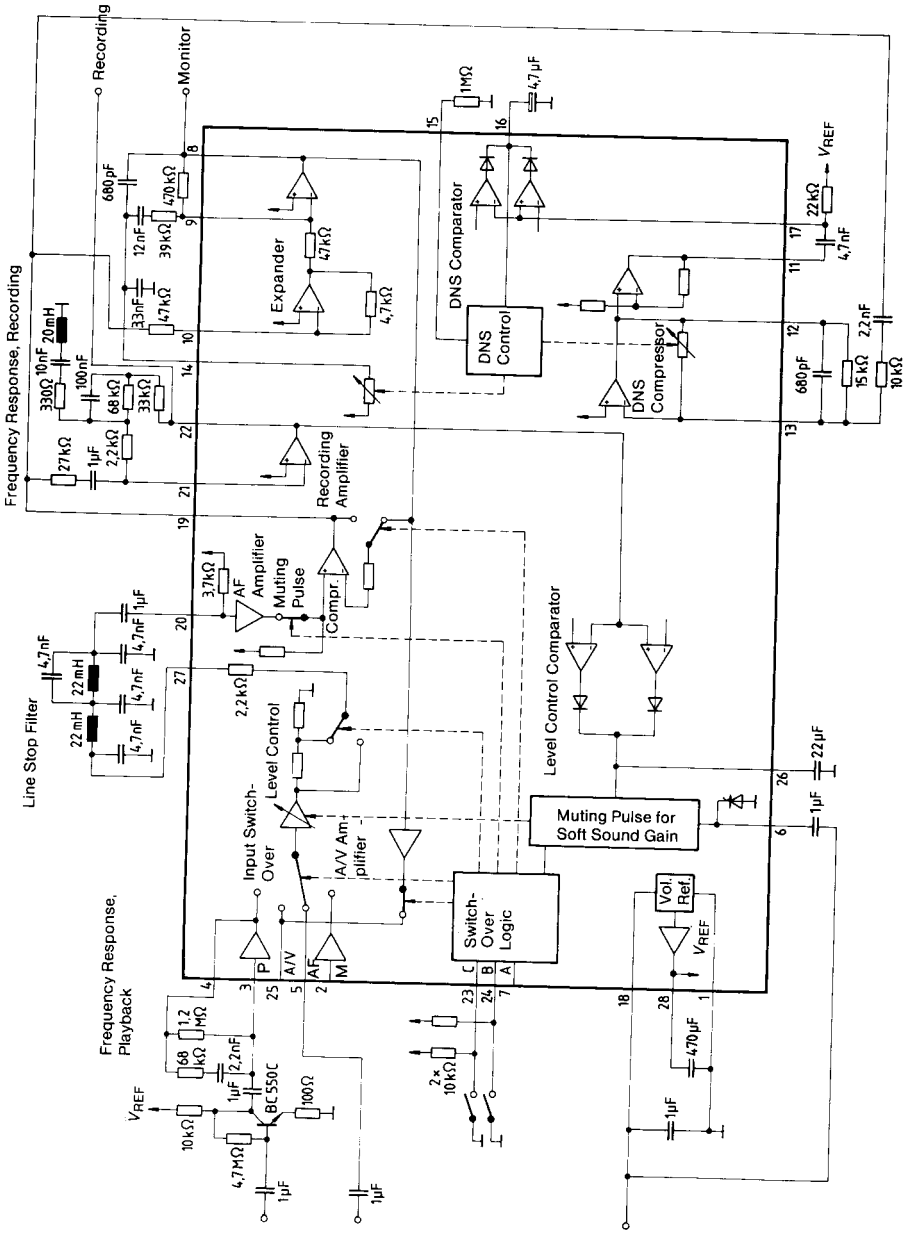
Block diagram



Test and measurement circuit

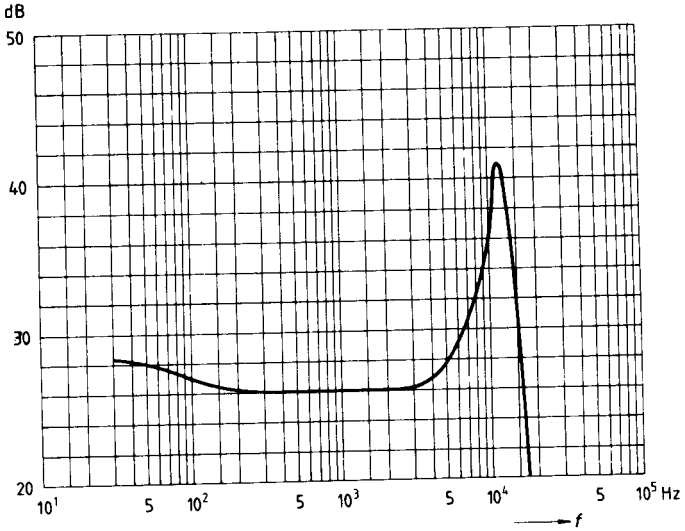


Application circuit

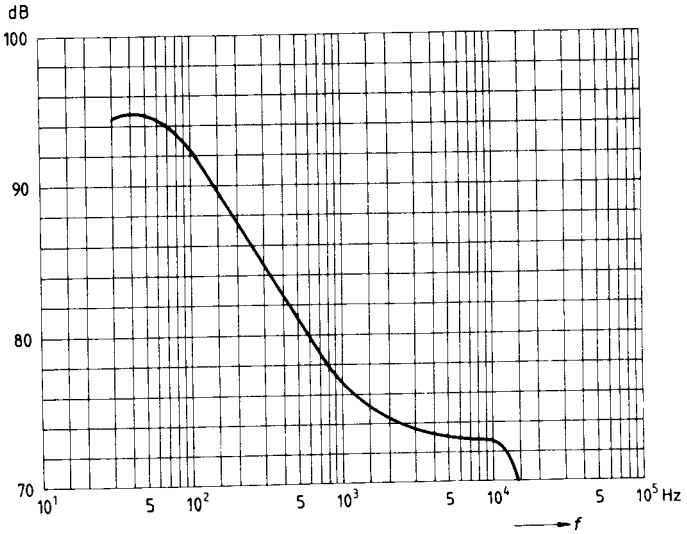


Frequency responses

Recording mode (AF input – recording output)
realizable frequency response

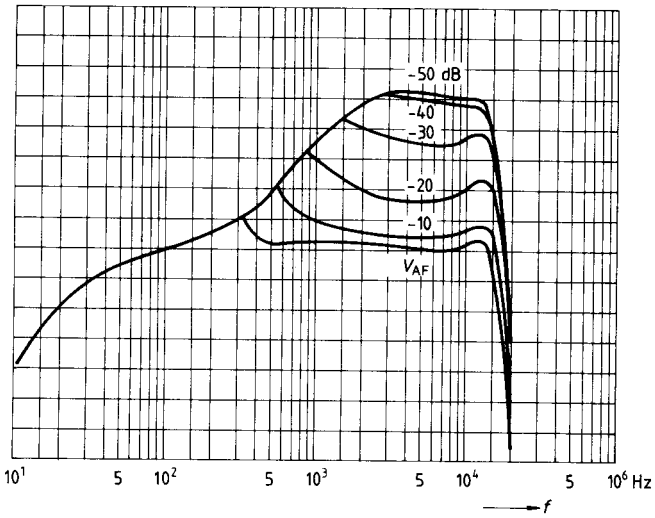


Playback mode (preamplifier input – recording output)
realizable frequency response



Recording compression

0 dB : 1 V_{rms} at monitor output at 1 kHz



Recording mode: DNS control voltage at dc voltage values in accordance with the frequencies listed at level o dB