TV Stereo Matrix with Earphone and VTR Connection

TDA 4941

Bipolar IC

Type	Ordering code	Package
TDA 4941	Q67000-A1952	DIP 22

Switchable matrix, CCIR VTR input/output, analog switches, AF output with balance control, earphone amplifier with independent volume and balance control, LED driver.

Features

- Switchable matrix
- Stereo VTR input/output
- All outputs are short-circuit resistant

Maximum ratings

Supply voltage	V_S	16.0	V
Junction temperature	T_j	150	°C
Storage temperature range	T_{stg}	−40 to 125	°C
Thermal resistance (system-air)	$R_{th\ SA}$	70	K/W

Operating range

Supply voltage	V_S	10 to 15.8	V
Frequency	f_i	20 to 20 000	Hz
Ambient temperature	T_A	0 to 70	°C

Characteristics

$V_S = 12$ V; $T_A = 25$ °C

		min	typ	max	
Total current consumption (without LED)	I_S		20	35	mA
LED driver current (each LED)	$I_{3,4}$	10	15	23	mA
Inverse current (LEDs OFF)	$I_{3,4}$			50	µA
Reference voltage	$V_{REF\,5}$	4.5	4.8	5.2	V
Input resistance audio I	$R_{i\,2}$	11	15	20	kΩ
Input resistance audio II	$R_{i\,22}$	22	30	40	kΩ
Input resistance VTR	$R_{i\,17,19}$	40	51	64	kΩ
Input current of the adjustable inputs balance AF	$I_{ad\,7}$		3	10	µA
Input current of the adjustable inputs balance EP	$I_{ad\,8}$	± 20	± 45	± 70	µA
Input current of the adjustable inputs volume EP	$I_{ad\,11}$	20	45	70	µA
Input current of the switches k 1/2, VTR stereo	$I_{6,14,15}$		20	30	µA
VTR P/R	I_{20}			300	µA
Input voltage audio I $THD = 0.7\%$	$V_{i\,2\,rms}$		150	600	mV
Input voltage audio II $THD = 0.7\%$	$V_{i\,22\,rms}$		300	1200	mV
Input voltage VTR playback	$V_{i\,17,19\,rms}$		0.5	2	V
Output voltage VTR					
$V_{i\,2} = 150$ mV	$V_{q\,17,19\,rms}$	400	500	650	mV
$V_{i\,22} = 300$ mV	$V_{q\,17,19\,rms}$	400	500	650	mV
AF output voltage					
$V_{i\,2} = 150$ mV	$V_{q\,12,13\,rms}$	200	300	400	mV
$V_{i\,22} = 300$ mV	$V_{q\,12,13\,rms}$	200	300	400	mV
Output voltage earphone (EP)					
$V_{i\,2} = 150$ mV	$V_{q\,9,10\,rms}$	200	300	400	mV
$V_{i\,22} = 300$ mV	$V_{q\,9,10\,rms}$	200	300	400	mV
AF output voltage					
$V_{17} = V_{19} = 500$ mV	$V_{q\,12,13\,rms}$	200	300	400	mV
Output voltage earphone (EP)					
$V_{17} = V_{19} = 500$ mV	$V_{q\,9,10\,rms}$	200	300	400	mV
Control range balance	$G_{B\,max}$	3	5	6	dB
$V_{7,8} = 0 \ldots V_5$	$G_{B\,min}$	−15	−12	−9	dB

Characteristics

$V_S = 12$ V; $T_A = 25$ °C

		min	typ	max	
Control voltage balance					
V_{qR} = max; V_{qL} = min	$V_{7,8}$		0		V
V_{qL} = max; V_{qR} = min			V_{REF}		V
Voltage balance center	$V_{7,8}$	0.48	0.5 V_5	0.52	V
$V_R = V_L$					
Control range volume	G_{vol}	85			dB
$V_{11} = 0 \ldots V_5$					
Output resistance AF output	$R_{q12,13}$		0.2	0.4	kΩ
Output resistance VTR output	$R_{q17,19}$		0.2	0.4	kΩ
Output resistance earphone output	$R_{q9,10}$		0.2	0.4	kΩ
Total harmonic distortion					
$V_{i2} = 0.5$ V	$THD_{9,13,17}$			0.5	%
$V_{i22} = 1$ V	$THD_{10,12,19}$			0.5	%
Channel separation	$a_{L/R}$	60			dB
AF, EP, VTR; $f = 1$ kHz					
Flutter and wow	$a_{L/R}$			2	dB
mono; volume = max					
volume = −30 dB					
Disturbance voltage spacing (all outputs)	$a_{S/N}$	60	70		dB
V_i = 300/150 mV = 0 dB					
volume = max;					
f_i = 20 Hz to 20 kHz					
Noise voltage at AF output	$V_{n12,13}$		100	300	µV
RF/VTR operation; balance center					
Noise voltage at earphone output	$V_{n9,10}$		10	30	µV
volume = min					
f_i = 20 Hz to 20 kHz					
Cross-talk rejection VTR/AF/EP	$a_{9,10,12,13}$	60			dB
$V_{17} = V_{19} = 2$ V_{rms}					
$V_{20} = 0$; $V_{11} = V_5$					
Cross-talk rejection matrix	$a_{9,10}$	60			dB
$V_2 = 600$ mV					
AF/EP during VTR playback	$a_{12,13}$	60			dB
$V_{22} = 1200$ mV					
Switching input audio I/audio II					
H-input voltage = audio I	$V_{H6,14}$	4		V_S	V
or open					
L-input voltage = audio II	$V_{L6,14}$	0		2.8	V

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Characteristics (cont'd)
$V_S = 12$ V; $T_A = 25$ °C

		min	typ	max	
Stereo input VTR stereo					
H input voltage = stereo or open	V_{iH15}	4		V_S	V
L input voltage = stereo	V_{iL15}	0		2.8	V
Switching input VTR-P/R					
H input voltage = VTR-P	V_{iH20}	8		V_S	V
L input voltage = VTR-R or open	V_{iL20}	0		5	V
Switching voltage matrix					
Dual audio	V_{sw21}	0		1/6 V_S	V
Mono	V_{sw21}	1/3 V_S		2/3 V_S	V
Stereo	V_{sw21}	5/6 V_S		V_S	V

Truth table

Pin 14	Pin 6	Pin 15	Pin 20	Pin 21	Pin 4	Pin 3	
S1/AF	S2/KH	S3/VTR stereo	S4/VTR play/record	Tristate input	LED 1	LED 2	
X	X	X	open ≙ L	Stereo = V_S	ON	ON	VTR recording
X	X	X	L	Mono = $V_S/2$	OFF	OFF	VTR recording
Open H	X	X	L	2 tone = 0 V	ON	OFF	VTR recording
GND L	X	X	L	2 tone = 0 V	OFF	ON	VTR recording
X	X	Stereo H ≙ V_S	V_S ≙ H	–	OFF	OFF	VTR playback
X	X	H	H	–	OFF	OFF	VTR playback
Open H	X	Mono L	H	–	ON	OFF	VTR playback
GND L	X	L	H	–	OFF	ON	VTR playback

X = undetermined

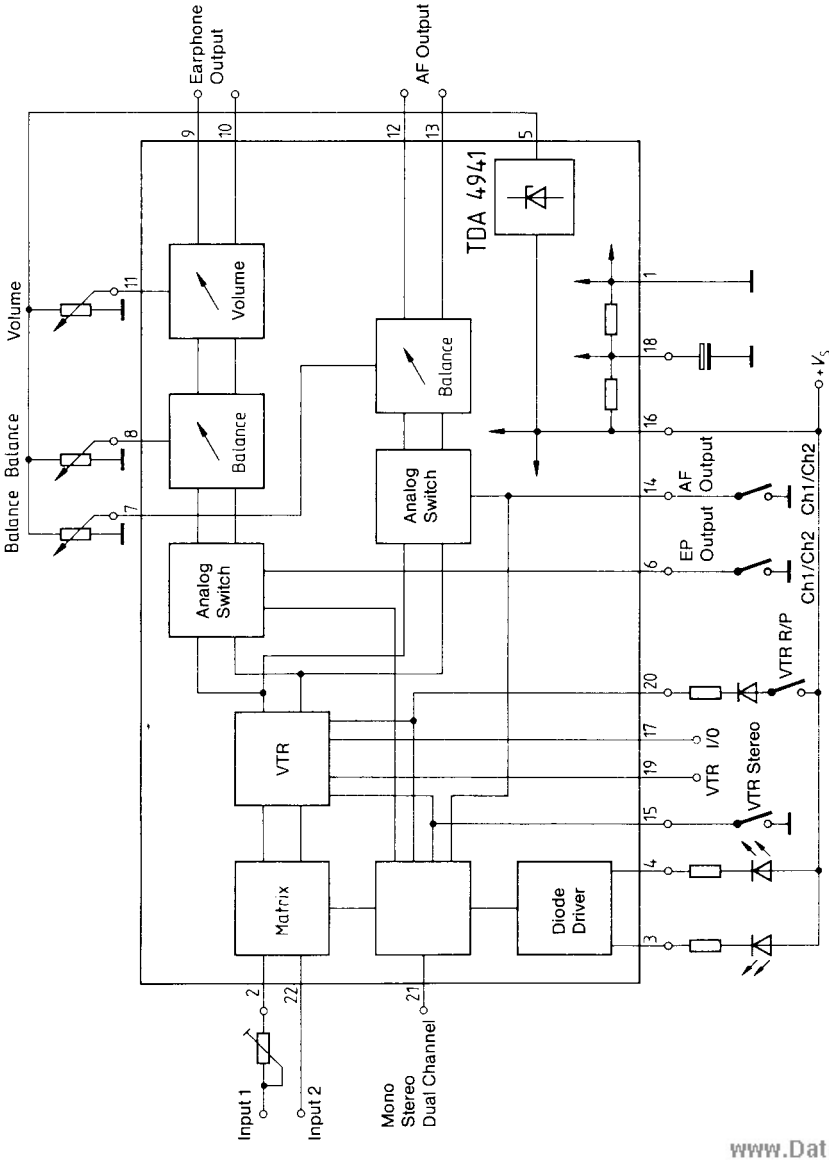
Circuit description

The TDA 4941 contains a switchable matrix with tristate input to provide the necessary L-R information. The switch input is controlled by the preceding pilot tone decoding integrated circuit. The stereo input/output enables connection of a standardized VTR device. During dual audio operations, analog switches enable the selection of audio I or audio II respectively. Analog switch I affects the AF output via a DC voltage controlled balance control. The LED driver displays the position of analog switch I and/or stereo or mono operations. The separately switchable analog switch II controls the earphone output, which is equipped with a DC voltage controlled volume and balance control. All outputs are short-circuit resistant. The switch inputs for the analog switches are effective during two-channel operations only and not during stereo or mono modes. A standard VTR device can be connected to the stereo VTR input/output.

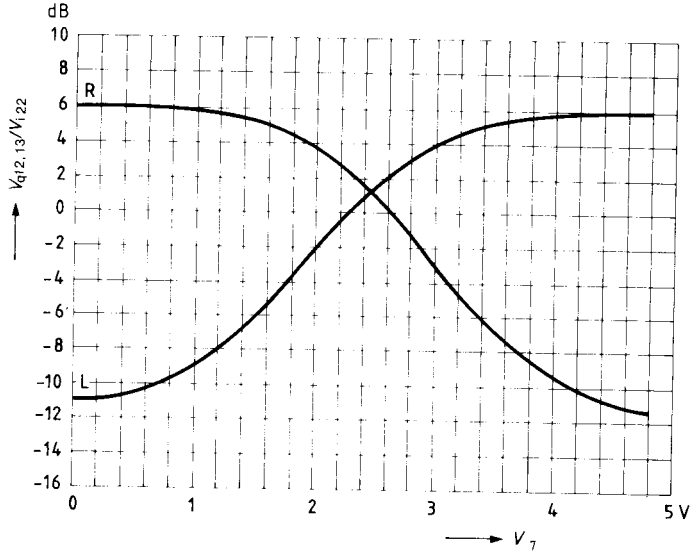
Pin description

Pin	Function
1	GND
2	Audio I 5.5 MHz demodulator
3	LED driver audio II
4	LED driver audio I
5	Stabilized voltage
6	Audio I/audio II – change-over switch headset output
7	Balance control AF output
8	Balance control earphone output
9	Earphone output left
10	Earphone output right
11	Earphone volume control
12	AF output right
13	AF output left
14	Audio I/audio II – interchange AF switch
15	VTR stereo switch
16	Supply voltage
17	VTR input/output left/audio I
18	Decoupling
19	VTR input/output right/audio II
20	VTR recording/playback change-over switch
21	Mono-stereo dual audio switch-over
22	Audio II 5.75 MHz demodulator

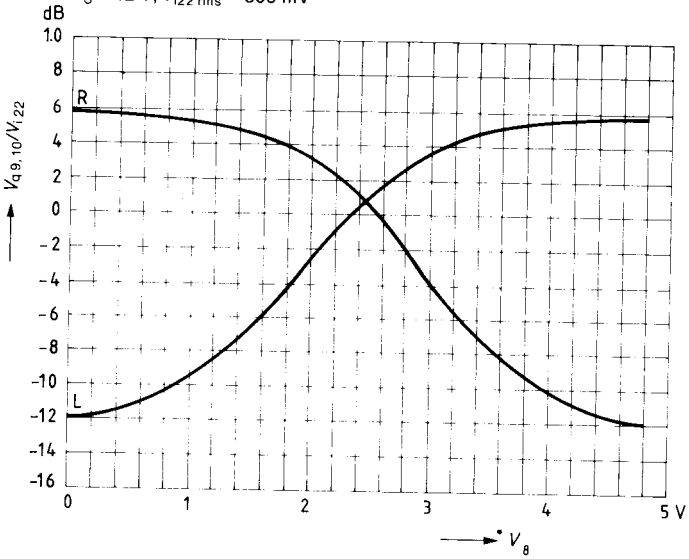
Block diagram



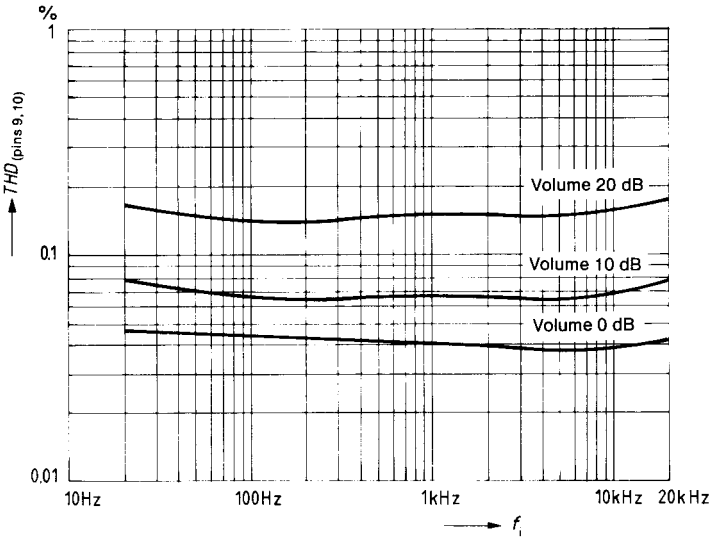
Balance AF output versus V_7
$V_S = 15$ V; $V_{i22\,rms} = 500$ mV



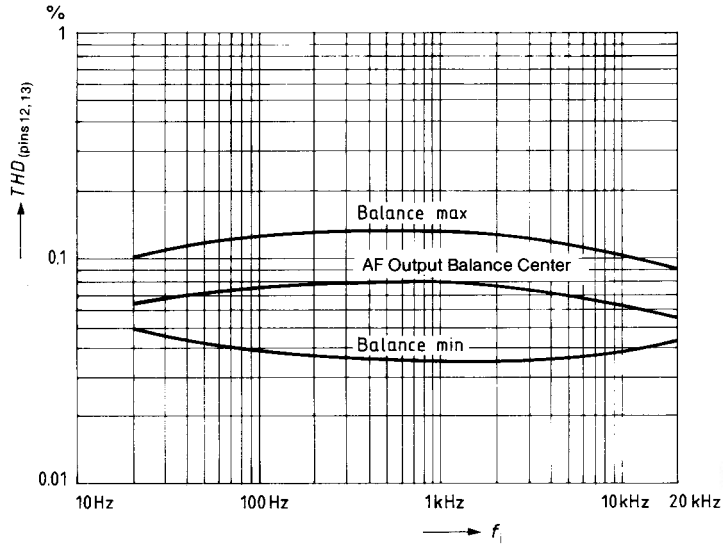
Balance earphone output versus V_8
$V_S = 12$ V; $V_{i22\,rms} = 500$ mV



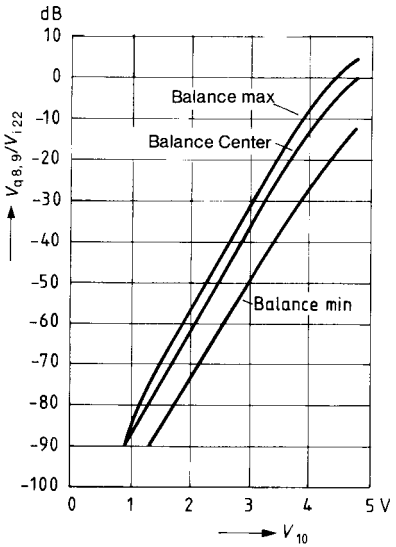
Total harmonic distortion versus input frequency
$V_S = 12$ V; $V_{i22\,rms} = 300$ mV



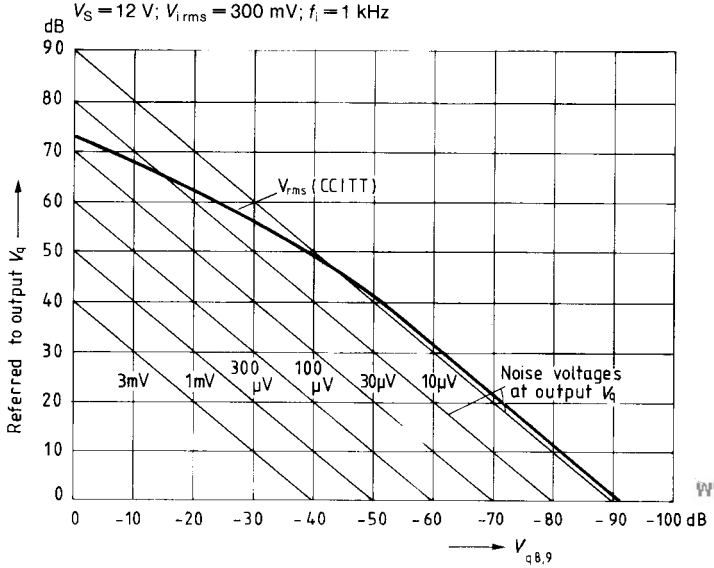
Total harmonic distortion versus input frequency
$V_S = 12$ V; $V_{irms} = 300$ mV



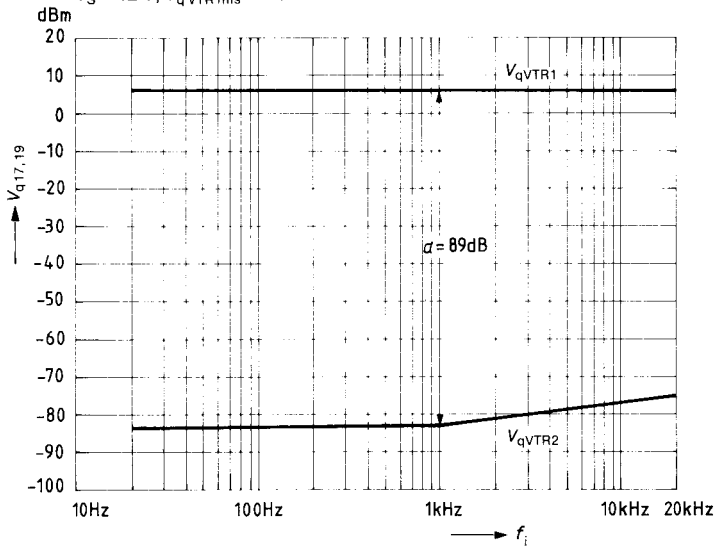
Volume control earphone output verus V_{11}
$V_S = 12$ V



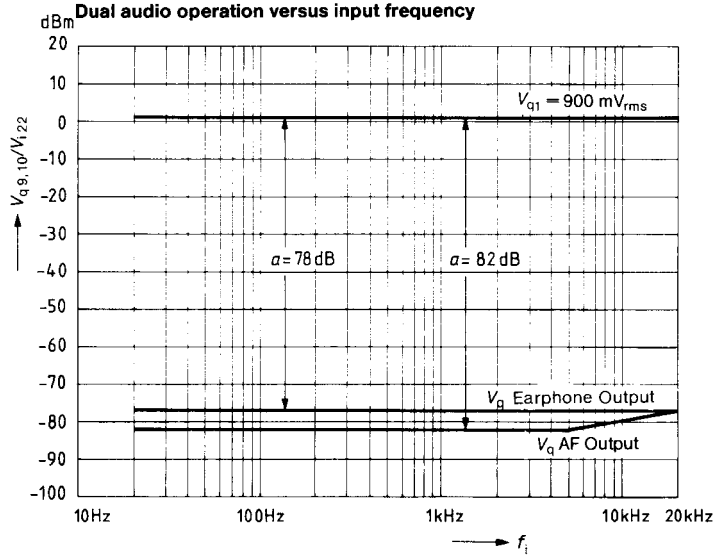
Disturbance voltage spacing versus attenuation
$V_S = 12$ V; $V_{i\,rms} = 300$ mV; $f_i = 1$ kHz



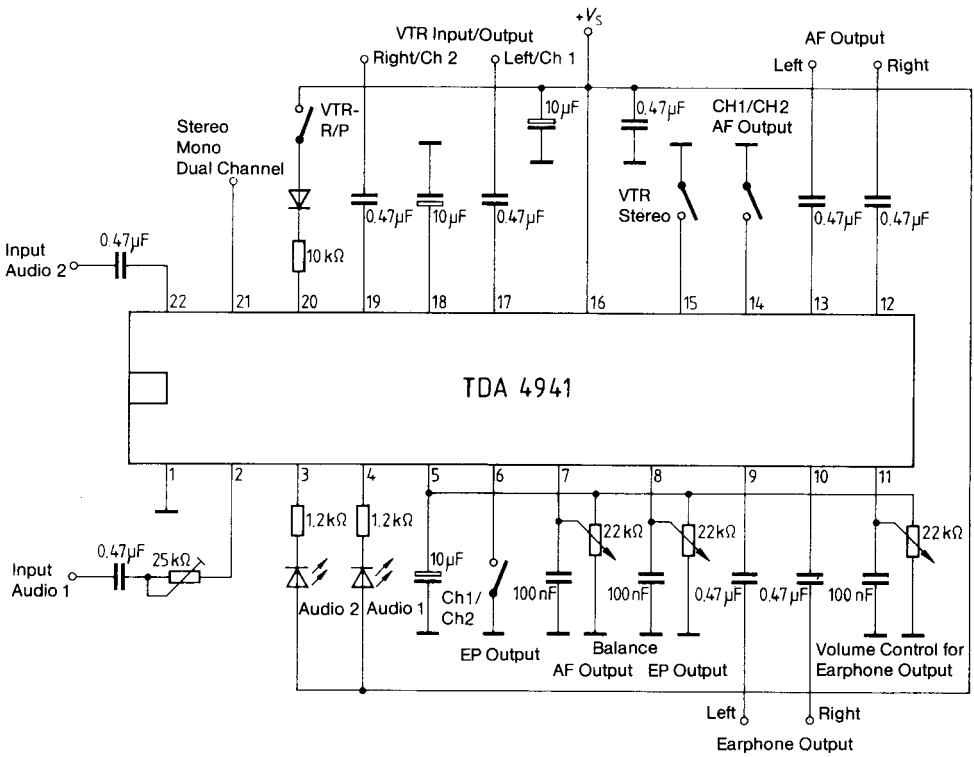
Cross-talk rejection
VTR output (pins 17, 19) versus input frequency
$V_S = 12$ V; $V_{q\,VTR\,rms} = 1.5$ V



Cross-talk rejection
Dual audio operation versus input frequency



Application circuit



Application circuit