SUPERSEDES DATA OF MARCH 1990

DUAL FM MODEM FOR VHS HIFI AUDIO SYSTEM

GENERAL DESCRIPTION

The TDA2515 is a dual FM modulator/demodulator for processing the FM audio signal (stereo or bilingual) in VHS video recorders. The device has two channels, A and B, which are tested at 1.4 and 1.8 MHz respectively.

Features

The following features (in sequence) are used for recording and apply to both channels.

- An AF buffer amplifier
- An adjustable AF limiter
- An AF driven Current Controlled Oscillator (CCO)
- An HF output buffer

The following features (in sequence) are used for playback and also apply to both channels.

- An HF amplifier limiter
- A Phase Locked Loop (PLL) detector with CCO and filter section
- A voltage to current converter
- An AF amplifier with Sample and Hold (S & H) circuit

Further features are:

- An internal voltage stabilizer
- An HF level detector (in channel A)
- A mute timing and delay circuit (in channel A)
- A record/playback switch (connected to channels A and B)
- A logic circuit for mute and mute enable
- A pulse shaper, driven by the Head Identification (HID) signal, to generate the hold pulse for the S & H circuits (channels A and B)

QUICK REFERENCE DATA

parameter	condition	symbol	min.	typ.	max.	unit
Operating supply voltage		V_P	4.75	5	5.25	V
Supply current						
playback	$V_{22} \leqslant 1.5$ V	I_P	–	50	60	mA
recording	$V_{22} \geqslant 3.5$ V	I_P	–	35	40	mA

PACKAGE OUTLINE

40-lead DIL; plastic (SOT129).

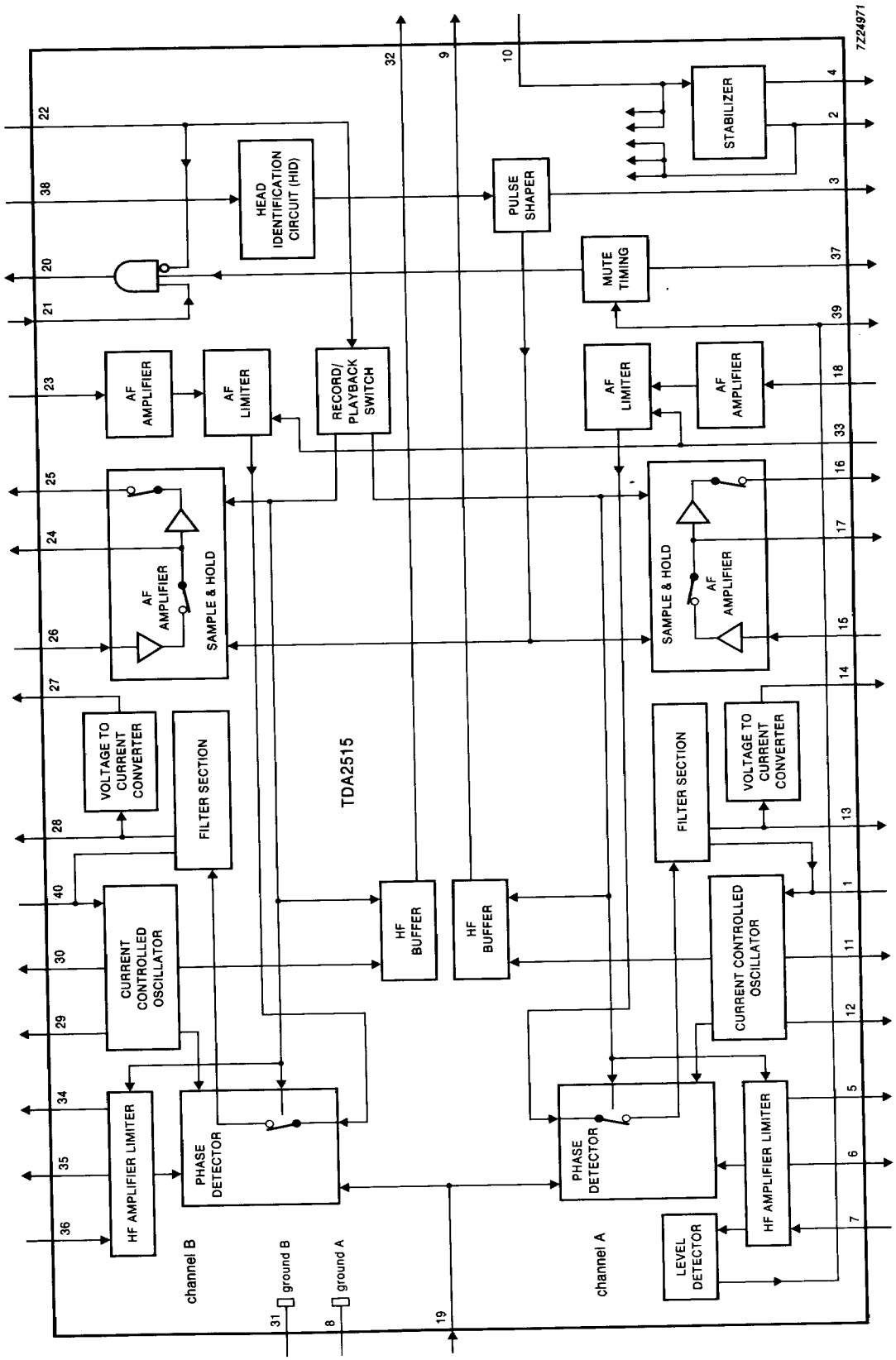


Fig.1 Block diagram.

PINNING

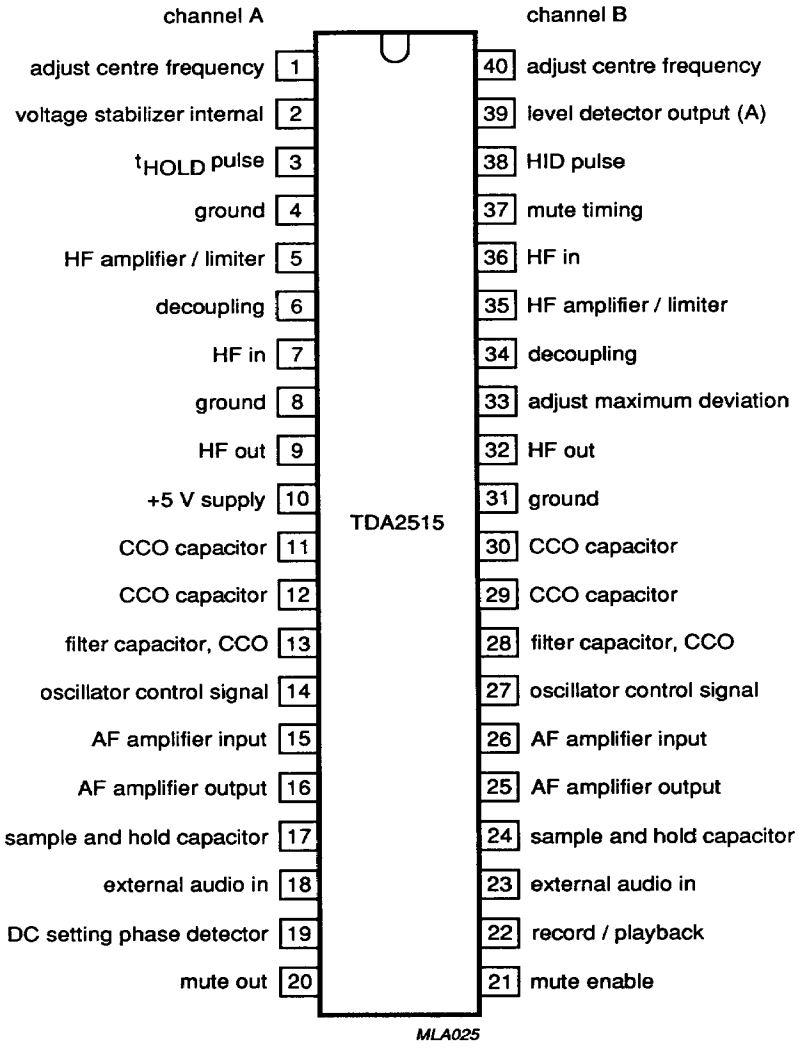


Fig.2 Pinning diagram.

RATINGS

Limiting values in accordance with Absolute Maximum System (IEC 134). All voltages with reference to pin 8; all currents positive into the device.

parameter	symbol	min.	typ.	max.	unit
Supply voltage (pin 10)	V_P	0	–	6	V
Voltage on all pins	V	0	–	V_P	V
Total power dissipation	P_{tot}		see Fig.3		
Operating ambient temperature range	T_{amb}	−20	–	+70	°C
Storage temperature range	T_{stg}	−65	–	+150	°C

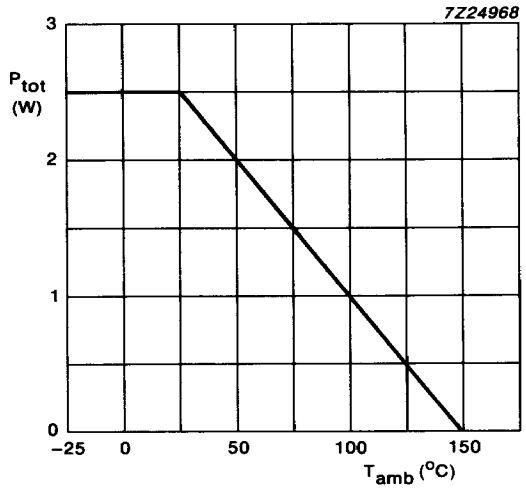


Fig.3 Power derating curve.

DC CHARACTERISTICS

According to the test set-up illustrated by Fig.4; V_P = 5 V; T_{amb} = 25 °C; unless otherwise specified; pins 31 and 4 connected to pin 8. All voltages with respect to pin 8.

parameter	conditions	symbol	min.	typ.	max.	unit
Operating supply voltage		V_P	4.75	5	5.25	V
Supply current						
playback	V_{22} ± 1.5 V	I_P	–	50	60	mA
record	V_{22} ± 3.5 V	I_P	–	35	40	mA
difference playback/recording		$\|\Delta I_P\|$	–	15	25	mA
Total power dissipation						
playback	V_{22} ± 1.5 V	P_{tot}	–	250	–	mW
record	V_{22} ± 3.5 V	P_{tot}	–	175	–	mW
Voltage on pins 1 and 40		$V_{1,40}$	–	1.9	–	V
Voltage on pin 2	note 1	V_2	2.4	2.5	2.6	V
Voltage on pins 5 and 34	note 2	$V_{5,34}$	–	3.3	–	V
Voltage on pins 6 and 35	note 2	$V_{6,35}$	–	3.3	–	V
Voltage on pins 13 and 28		$V_{13,28}$	–	1.9	–	V
Voltage on pins 15 and 26		$V_{15,26}$	–	2.5	–	V
Voltage on pins 16 and 25	note 2	$V_{16,25}$	–	2.4	–	V
Voltage on pins 18 and 23		$V_{18,23}$	–	2.5	–	V
Voltage on pin 19		V_{19}	–	1.9	–	V
Voltage on pins 14 and 27		$V_{14,27}$	–	1.2	–	V
Voltage on pin 33		V_{33}	–	2.5	–	V
Current supplied from pin 2		$-I_2$	–	–	1	mA

Notes to DC characteristics

1. Temperature drift V_{ref} = typically 50 μV/°C.
2. Playback ($V_{22} \leqslant 1.5$ V).

AC CHARACTERISTICS

All voltages with reference to pin 8.

parameter	conditions	symbol	min.	typ.	max.	unit
Recording circuit	AF input frequency = 1 kHz; $V_{22} \geqslant 3.5$ V					
Overall performance						
Total harmonic distortion of HF	Δf = 50 kHz	THD	–	0.2	–	%
	Δf = 150 kHz; note 1	THD	–	0.4	0.6	%
External audio current (pins 18 and 23)	Δf = 150 kHz	I_I	25	30	33	μA
Maximum deviation setting (pin 33)	$R13 = V_{ref}/I_I$	Δf	–	150	–	kHz
difference (in channel)		$\pm\Delta f$	–	–	7.5	kHz
difference of channels A and B		$\pm\Delta f$	–	–	7.5	kHz
High frequency output stage						
Output voltage (pin 9) (peak-to-peak)		V_O	0.43	0.5	0.57	V
Output voltage (pin 32) (peak-to-peak)		V_O	1.3	1.51	1.73	V
Current difference	$I_{32}/I_9 = 3\ (1 + \Delta)$	$\lvert\Delta\rvert$	–	–	6	%
Output resistance (pin 9)		$R_{9\text{-}10}$	400	500	600	Ω
Output resistance (pin 32)		$R_{32\text{-}10}$	400	500	600	Ω
Second harmonic suppression			–	48	–	dB
Intermodulation						
channel B to A		IM	–	–40	–	dB
channel A to B		IM	–	–40	–	dB
Ripple rejection	note 2	RR	–	40	–	dB
Playback circuit	input frequency = 1.4 or 1.8 MHz; Δf = 150 kHz and f_{mod} = 1 kHz; $V_{22} \leqslant 1.5$ V					
HF amplifier/limiter/PLL						
Input conductance		g_{ie}	–	1	–	μS
Input capacitance		C_{ie}	–	4	–	pF
Sensitivity	PLL locked	V_{IHF}	–	100	300	μV

parameter	conditions	symbol	min.	typ.	max.	unit
Signal-to-noise ratio	note 3					
	V_{IHF} = 300 μV	S/N	–	50	–	dB
	V_{IHF} = 10 mV	S/N	–	60	–	dB
AM rejection	note 4					
	V_{IHF} = 1 mV	AMR	–	53	–	dB
	V_{IHF} = 10 mV	AMR	–	58	–	dB
Current controlled oscillator (CCO)						
CCO frequency (adjustable)	note 5	f_{CCO}	–	1.4	–	MHz
		f_{CCO}	–	1.8	–	MHz
Input current (internal)	Δf = 150 kHz	I_{p-p}	25	30	33	μA
Lock range (deviation from f_{CCO}, channels A and B)	V_I = 10 mV	Δf_{CCO}	–	±550	–	kHz
Temperature coefficient		TC	–	–250	–	10^{-6}/°C
PLL demodulator circuit						
Phase response time	Δφ = 90 deg	t_s	–	4.5	–	μs
Phase detector current		$\|I_{PD}\|$	–	106	–	μA
Ratio of $+I_{PD}$/(sum of loop filter resistors)			6	10	14	nA/Ω
Output voltage at pins 14 and 27 (RMS value)	±Δf = 150 kHz	V_O	–	105	–	mV
Buffer amplifier and sample and hold circuit						
Input resistance		$R_{15,26}$	–	50	–	kΩ
Load resistor		$R_{16,25}$	2.5	–	–	kΩ
Voltage gain		G_v	–	20	–	dB
DC shift during hold pulse		V_{DCpeak}	–	3	8	mV
Hold time pulse from pulse shaper	note 6;Fig.5	t_{HOLD}	3.8	4.5	5.2	μs
Delay of HID pulse to hold pulse	Fig.5	t_D	0.35	1	1.2	μs
HID crosstalk $V_{38-16,25}$		$V_{(p-p)}$	–	0.4	–	mV
Overall performance	without S & H; V_{IHF} = 10 mV					
Output voltage (RMS value)		$V_{16,25}$	0.75	0.85	1.0	V
Signal-to-noise ratio	note 3	S/N	50	60	–	dB
Total harmonic distortion + noise		THD + N	–	0.2	0.6	%

AC CHARACTERISTICS (continued)

parameter	conditions	symbol	min.	typ.	max.	unit
Level detector circuit						
Level detector output	V_{IHF} = 1 mV	V_{odc}	1.2	1.8	2.8	V
	V_{IHF} = 10 mV	V_{odc}	2.4	3.0	3.7	V
	V_{IHF} = 100 mV	V_{odc}	3.8	4.4	4.9	V
Mute activated		V_{IHF}	1.25	2.2	3.75	mV
Output resistance (internal)		R_{39-8}	–	10	–	kΩ
Head identification circuit	HID pulse = 25 Hz 50% duty factor					
Input voltage (pin 38)						
HIGH		V_{IH}	2.75	–	–	V
LOW		V_{IL}	–	–	2.25	V
Input current (pin 38)						
HIGH	V_I = 5 V	I_{IH}	–	–	0.2	μA
LOW	V_I = 0.3 V	I_{IL}	–	–	10	μA
Logic circuit						
Record, playback (pin 22)						
Playback voltage		V_{IL}	–	–	1.5	V
Playback current	V_I = 0 V	I_{IL}	65	–	400	μA
Record voltage		V_{IH}	3.5	–	–	V
Record current	V_I = 5 V	I_{IH}	–	–	14	μA
Mute enable FM (pin 21)						
HIGH (mute enabled)		V_I	1	–	–	V
Input current	V_I = 1 V	I_I	20	37	60	μA
LOW (mute disabled)	I_I = 0 A	V_I	–	–	0.5	V
Mute output (pin 20)						
HIGH	I_O = –0.4 mA	V_O	4	–	–	V
LOW	I_O = 0.4 mA	V_O	–	–	0.5	V
Level detector mute	$V_{IHF} < 1.25$ mV; V_{21} = 1 V	V_O	4	–	–	V
Mute delay (pin 37)	$V_{21} \geqslant 1$ V; $V_{22} \leqslant 1.5$ V					
Switch off (signal to no signal)		t_{OFF}	–	15	–	ms
Switch on (no signal to signal)		t_{ON}	–	400	–	ms

Notes to AC characteristics

1. Maximum deviation adjusted for 165 kHz.
2. V_{ripple} = 10 mV; with respect to Δf = 150 kHz.
3. AF bandwidth of 300 Hz to 15 kHz.
4. FM: f_{mod} = 1 kHz; Δf = 150 kHz
   AM: f_{mod} = 400 Hz; m = 0.3
5. For f_{CCO} = 1.4 MHz, R5 = 5.6 kΩ ± 5%;
   RT = R5 + R7 = 7.7 kΩ (nom.)
   For f_{CCO} = 1.8 MHz, R6 = 3.3 kΩ ± 5%;
   RT = R6 + R8 = 5.8 kΩ (nom.)
   with C7 and C8 = 470 pF ± 5%; R7 and R8 = 4.7 kΩ (potentiometers).
6. With fixed resistor and fixed capacitor (R15 = 10 kΩ; C23 = 680 pF; 1% tolerance).

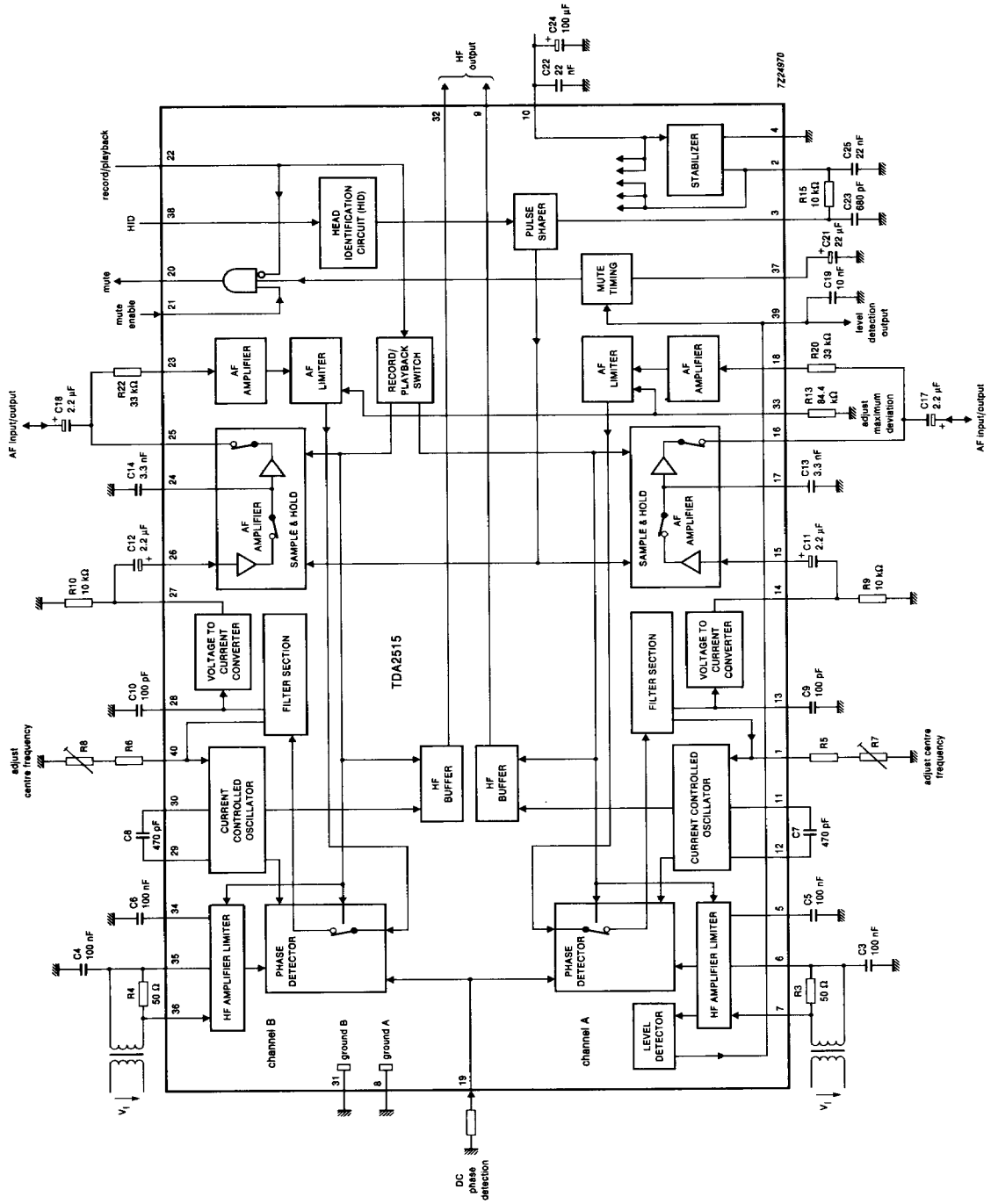


Fig.4 Test set-up diagram.

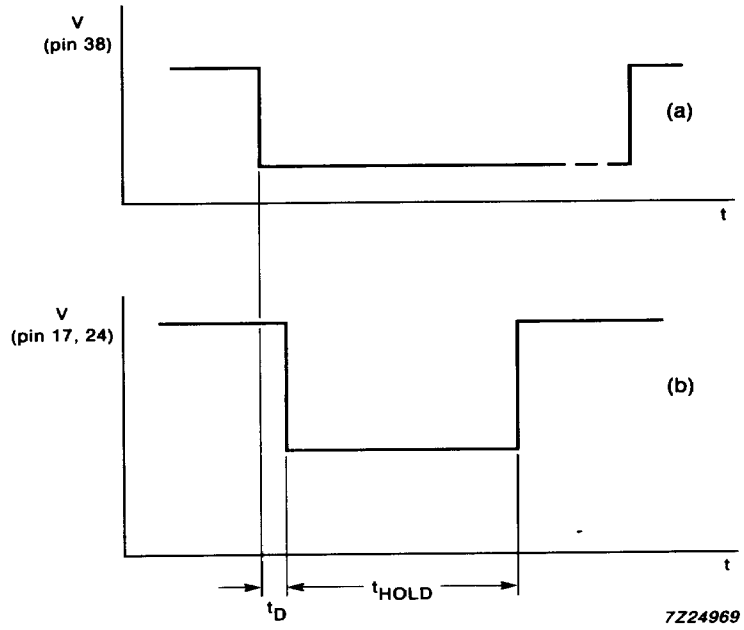
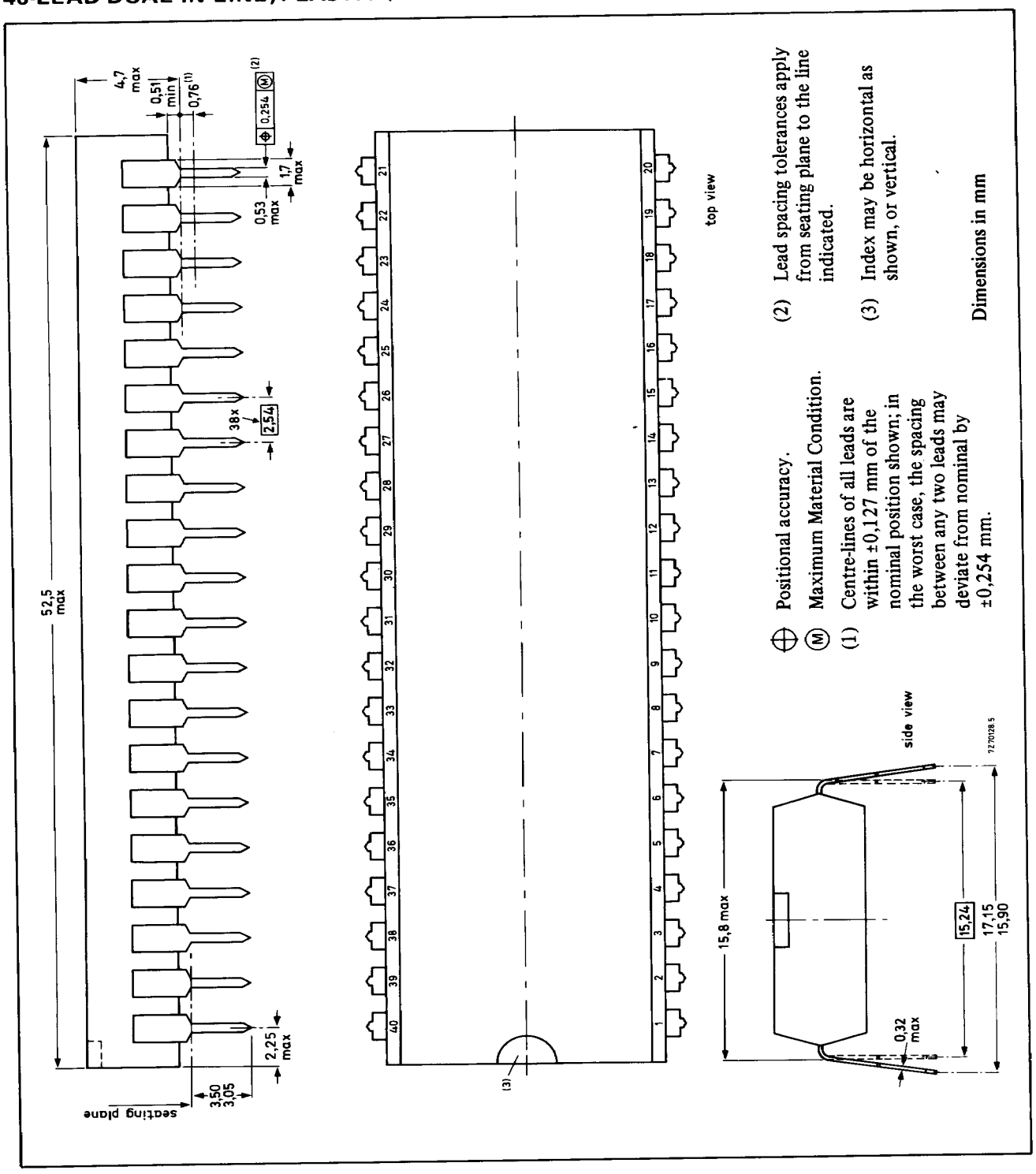


Fig.5 (a) Head identification pulse (HID) (b) Hold pulse.

40-LEAD DUAL IN-LINE; PLASTIC (SOT129)



⊕ Positional accuracy.

Ⓜ Maximum Material Condition.

(1) Centre-lines of all leads are within ±0,127 mm of the nominal position shown; in the worst case, the spacing between any two leads may deviate from nominal by ±0,254 mm.

(2) Lead spacing tolerances apply from seating plane to the line indicated.

(3) Index may be horizontal as shown, or vertical.

Dimensions in mm

SOLDERING PLASTIC DUAL IN-LINE PACKAGES

1. By hand

Apply the soldering iron below the seating plane (or not more than 2 mm above it). If its temperature is below 300 °C it must not be in contact for more than 10 seconds; if between 300 and 400 °C, for not more than 5 seconds.

2. By dip or wave

The maximum permissible temperature of the solder is 260 °C; 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. 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.

3. Repairing soldered joints

The same precautions and limits apply as in (1) above.