

MOTOR REGULATOR AND BIAS/ERASE OSCILLATOR CIRCUIT

The TDA1003A is pin for pin compatible with the TDA1003 with an extension of features. The TDA1003A is for use in recording/playback systems. It incorporates capstan motor speed control, an automatic stop circuit, and a bias/erase oscillator.

The motor circuit controls the back e. m. f. and delivers a stabilized voltage to the capstan motor. The motor voltage is corrected for line voltage and torque variations, and temperature variations of the magnetic material and windings. The motor speed control is operative as long as a pulse train, derived from the tape wind spool mechanism via an interrupter, is applied to the automatic stop circuit. The TDA1003A can also be used without stop circuit by connecting pin 16 to ground. An output is available for a "stop" indicator lamp.

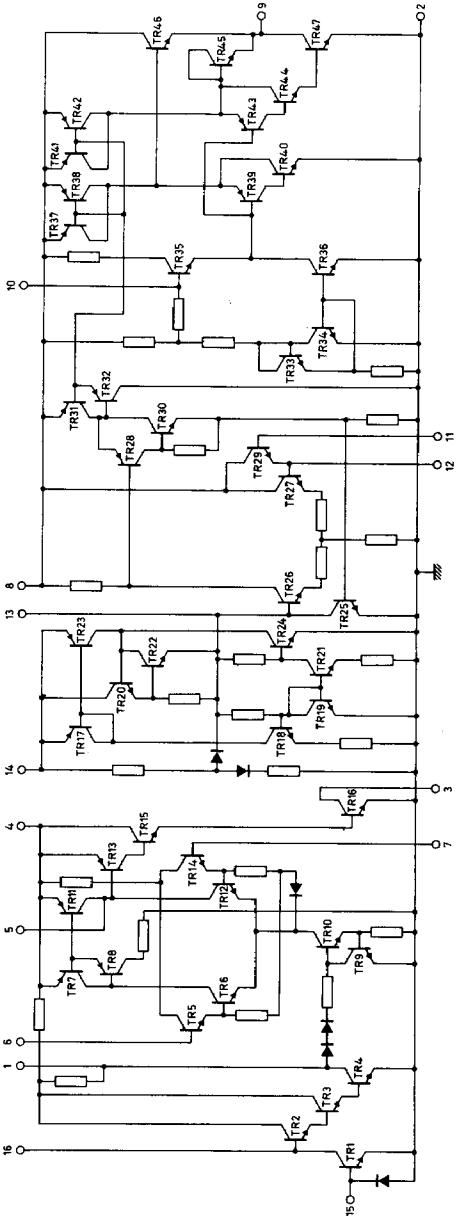
The oscillator section contains a temperature-independent voltage reference source and an a. g. c. circuit controlling the transconductance of a balanced oscillator circuit incorporating the erase head. Any Q variations of the erase head winding are fed back to maintain the oscillator output as a constant undistorted sine-wave so that harmonic products do not cause interference during radio recording.

| QUICK REFERENCE DATA | | | |
|---|---------------------------------|-----------|-----------|
| Supply voltage range | V_p | 3,5 to 18 | V |
| Ambient temperature | T_{amb} | typ. | 25 °C |
| Supply voltage | V_p | typ. | 9 V |
| ----- | | | |
| Motor regulator | | | |
| Current consumption | I_4 | typ. | 1,8 mA |
| Motor starting current | I_3 | < | 1000 mA |
| Operating motor current | I_3 | < | 250 mA |
| Minimum operating voltage at $I_3 = 600$ mA | V_{3-2min} | typ. | 0,9 V |
| Supply voltage rejection | $\Delta V_{3-2}/\Delta V_{4-2}$ | typ. | 1 mV/V |
| Stop circuit | | | |
| Output current for "stop" indicator lamp | I_1 | < | 100 mA |
| Knee voltage at $I_1 = 100$ mA | V_{1-2} | typ. | 0,6 V |
| Input current for $I_1 = 100$ mA | I_{16} | > | 4 μ A |
| Bias and erase oscillator | | | |
| Current consumption at $Q = 40$ | I_8 | typ. | 25 mA |
| Erase head voltage at $Q = 40$ (r. m. s. value) | $V_{erase(rms)}$ | typ. | 16 V |

PACKAGE OUTLINE

16-lead DIL: plastic power (SOT-38N).

CIRCUIT DIAGRAM



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RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

| | | | | |
|--------------------------|------------|------|----|---|
| Supply voltage on: pin 4 | V_{4-2} | max. | 18 | V |
| pin 8 | V_{8-2} | max. | 18 | V |
| pin 14 | V_{14-2} | max. | 18 | V |

Currents

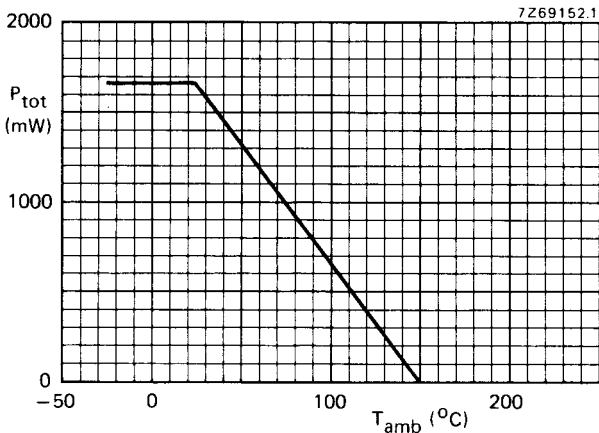
| | | | | |
|---|-------------------|------|------|----|
| Motor current (pin 3: peak-value) | I_{3M} | max. | 1000 | mA |
| "Stop" indicator lamp current (d. c. : pin 1) | I_1 | max. | 100 | mA |
| Maximum input current (pin 15) | $\pm I_{15 \max}$ | max. | 20 | mA |

Temperatures

| | | | |
|--|-----------|-------------|----|
| Storage temperature | T_{stg} | -65 to +150 | °C |
| Operating ambient temperature see also power derating curve below | T_{amb} | -20 to +150 | °C |

Power dissipation

Total power dissipation see derating curve below



CHARACTERISTICS at $V_p = 9\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$ unless otherwise specified: see test circuit on page 6

Supply voltage range (pins 4, 8 and 14) V_p 3,5 to 18 V 1)

Motor regulator

| | | | |
|--|-------------------------|--|--|
| Current consumption | I_4 | typ. | 1,8 mA 1 to 3 mA |
| Operating motor current | I_3 | < | 250 mA |
| Motor starting current (peak-value) | I_{3M} | < | 1000 mA |
| Input offset voltage at $I_3 = 3\text{ mA}$ | $ V_{7-6} $ | typ. < | 2 mV 8 mV |
| Input offset current at $I_3 = 3\text{ mA}$ | $ I_{7-6} $ | typ. | 0,2 μA |
| Input voltage range (common mode) | V_{6-2} V_{7-2} | 2,4 to ($V_p - 0,25$) 2,4 to ($V_p - 0,25$) | V V |
| Input bias current | $I_6; I_7$ | typ. < | 0,1 μA 1,0 μA |
| Input sensitivity (for $\Delta I_3 = 100\text{ mA}$) | ΔV_{7-6} | typ. < | 1 mV 10 mV |
| Minimum operating voltage at $I_3 = 600\text{ mA}$ | $V_{3-2\text{ min}}$ | typ. < | 0,9 V 1,8 V 2) |
| Automatic motor "stop" circuit | | | |
| "Stop" indicator lamp current | I_1 | < | 100 mA |
| Knee voltage at $I_1 = 100\text{ mA}$ | V_{1-2} | typ. < | 0,6 V 1,0 V |
| Input current for $I_1 = 100\text{ mA}$ | I_{16} | > | 4 μA |
| Voltage at pin 1 without external load ($V_{16} = \text{low}$) | V_{1-2} | typ. | 4,1 V 3 to 5,0 V |
| Maximum input current (pin 15) | $\pm I_{15\text{ max}}$ | < | 20 mA |

1) To guarantee proper functioning with $V_p = 3,5\text{ V}$ to 18 V , the external component values as shown in test circuit on page 6 should be modified.

2) The minimum operating voltage is defined as the voltage (V_{3-2}) at which the motor still operates at correct speed.

CHARACTERISTICS (continued)

Bias and erase oscillator

| | | | | |
|--|--------------------|-------------|------------|------------------|
| Current consumption at Q = 40 | I_8 | typ. | 25 | mA |
| at Q = 20 | I_8 | { typ. < | 38 46 | mA |
| Internal current limiting | I_8 | < | 95 | mA ¹⁾ |
| Peak output current | $\pm I_9$ | > | 100 | mA |
| Output voltage swing (peak-to-peak value) | $V_{9-2(p-p)}$ | typ. | V_{p-2} | V |
| Current consumption of reference source | I_{14} | typ. < | 1,8 2,4 | mA |
| Reference voltage (temperature compensated) ²⁾ | V_{13-2} | typ. | 1,7 | V |
| Erase head voltage: Q = 40; L = 620 μ H (r. m. s. value) | $V_{erase(rms)}$ | typ. | 16 | V |
| Change of V_{erase} when Q changes from 20 to 60 | ΔV_{erase} | typ. < | 1 1,8 | V |

APPLICATION INFORMATION measured in circuit on page 7

Motor regulator

| | | | | |
|---|---|------|---|------|
| Supply voltage rejection | $\frac{\Delta V_{3-2}}{\Delta V_{4-2}}$ | typ. | 1 | mV/V |
| Motor speed variation over $T_{amb} = -5$ to $+55$ °C | $\pm \Delta n$ | typ. | 2 | % |

Automatic motor "stop" circuit

| | | | | |
|--|--------------|------|-----|----|
| Input voltage from wind spool supplied via 10 k Ω to pin 15 (peak-to-peak value) | $V_{W(p-p)}$ | typ. | 1,2 | V |
| Input current (pin 15) | $\pm I_{15}$ | < | 20 | mA |

Bias and erase oscillator

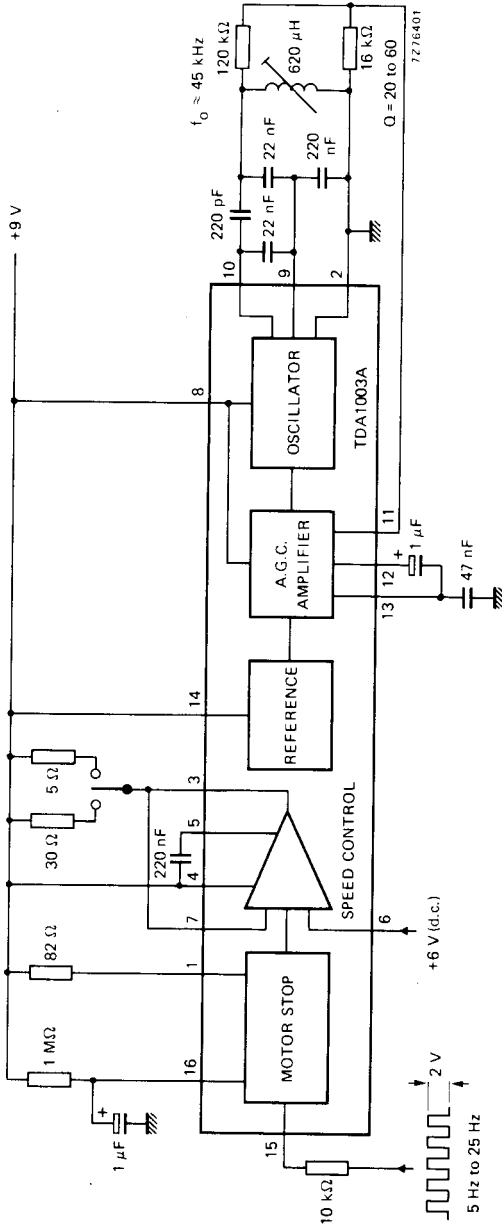
| | | | | |
|--|-----------------------|------|----|------------------|
| Erase head voltage for Q = 40: L = 620 μ H (r. m. s. value) | $V_{erase(rms)}$ | typ. | 16 | V |
| Change of V_{erase} when Q changes from 20 to 60 | ΔV_{erase} | typ. | 1 | V |
| Harmonic distortion (unsaturated erase head) | $-\alpha_{2nd} harm$ | typ. | 55 | dB ³⁾ |
| | $-\alpha_{3rd} harm$ | typ. | 40 | dB |
| | $-\alpha_{>6th} harm$ | > | 80 | dB |

¹⁾ If erase head is defective.

²⁾ Typical value of temperature coefficient 0 mV/°C.

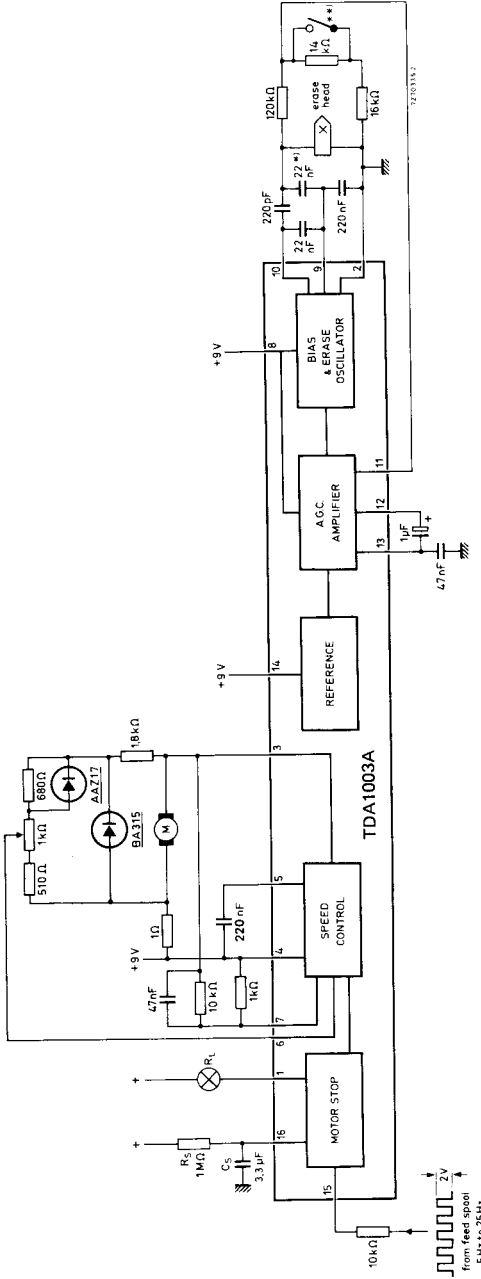
³⁾ At unsaturated erase head, with respect to 45 kHz.

TEST CIRCUIT



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APPLICATION INFORMATION (continued)



Motor (M): $R_a = 14 \Omega$
 $E_n = 2,3 V$ at 1500 r. p. m.
 Erase head: $L = 620 \mu H$
 $Q = 40$
 $f_o = 45 kHz$

Indicator lamp : 9 V; 40 mA

*) Capacitor with low losses required; especially for CrO₂ tape and low battery voltage.

**) Switch closed : suitable for CrO₂ tape
 open : suitable for Fe₂O₃ tape.

