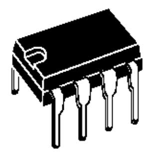
SGS-THOMSON MICROELECTRONICS

# TDA7274

## LOW-VOLTAGE DC MOTOR SPEED CONTROLLER

- WIDE OPERATING VOLTAGE RANGE (1.8 to 6 V)
- BUILT-IN LOW-VOLTAGE REFERENCE (0.2 V)
- LINEARITY IN SPEED ADJUSTMENT
- HIGH STABILITY VS. TEMPERATURE
- LOW NUMBER OF EXTERNAL PARTS



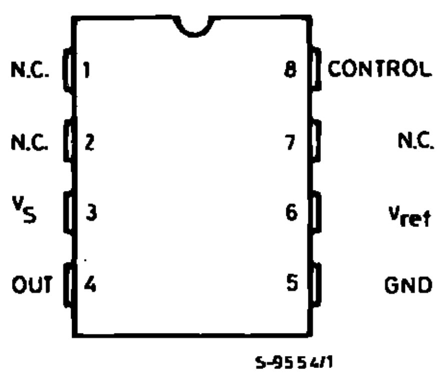
**MINIDIP**

**ORDERING NUMBER :** TDA7274

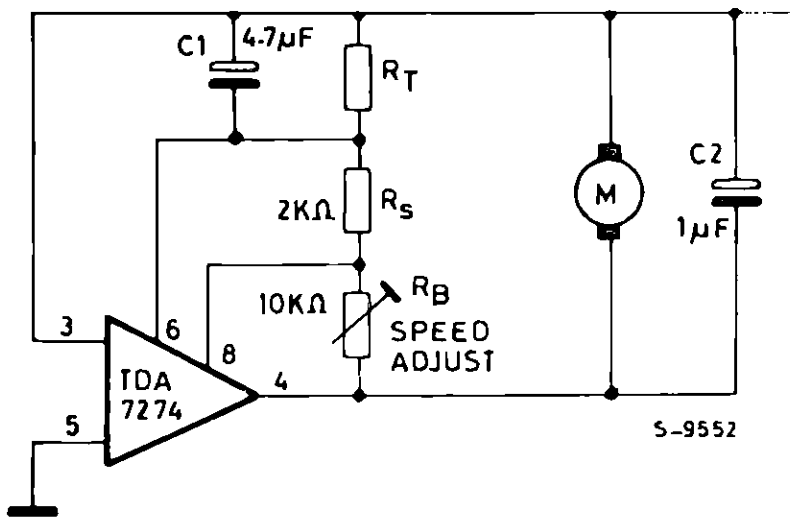
### DESCRIPTION

The TDA7274 is a monolithic integrated circuit DC motor speed controller intended for use in microcassettes, radio cassette players and other consumer equipment. It is particulary suitable for low-voltage applications.

**PIN CONNECTION** (top view)

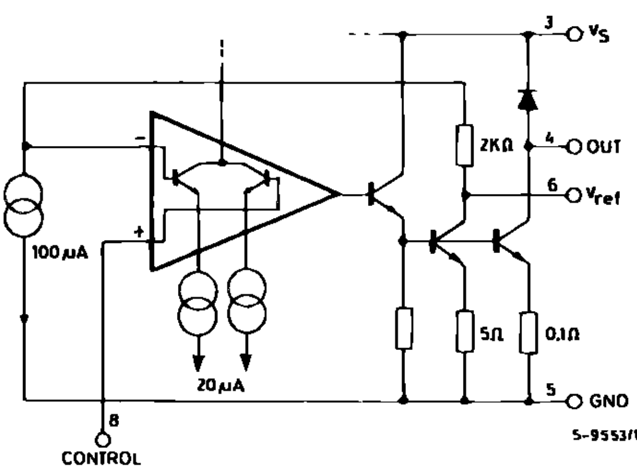


## APPLICATION CIRCUIT




$V_S$ = 3.0V
$R_M$ = 4.9Ω
$R_T$ = 220Ω
$E_g$ = 1.65V
$I_M$ = 100mA
$V_M = R_M\ I_M + E_g$ = 2.14V

## SCHEMATIC DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $V_S$ | Supply Voltage | 6 | V |
| $I_M$ | Motor Current | 700 | mA |
| $P_{tot}$ | Power Dissipation at $T_{amb}$ = 25°C | 1.25 | W |

## THERMAL DATA

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{th\ j\text{-}amb}$ | Thermal Resistance Junction-ambient | Max. | 100 | °C/W |

## ELECTRICAL CHARACTERISTICS (Refer to test circuit, $V_S$ = 3V, $T_{amb}$ = 25°C unless otherwise specified)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_S$ | Supply Voltage Range | | 1.8 | | 6 | V |
| $V_{ref}$ | Reference Voltage | $I_M$ = 100mA | 0.18 | 0.20 | 0.22 | V |
| $I_q$ | Quiescent Current | | | 2.4 | 6.0 | mA |
| $I_d$ (Pin 6) | Quiescent Current | | | 120 | | µA |
| K | Shunt Ratio | $I_M$ = 100mA | 45 | 50 | 55 | – |
| $V_{sat}$ | Residual Voltage | $I_M$ = 100mA | | 0.13 | 0.3 | V |
| $\frac{\Delta V_{ref}}{V_{ref}}/\Delta V_S$ | Line Regulation | $I_M$ = 100mA<br>$V_S$ = 1.8 to 6V | | 0.20 | | %/V |
| $\frac{\Delta K}{K}/\Delta V_S$ | Voltage Characteristic of Shut Ratio | $I_M$ = 100mA<br>$V_S$ = 1.8 to 6V | | 0.80 | | %/V |
| $\frac{\Delta V_{ref}}{V_{ref}}/\Delta I_M$ | Load Regulation | $I_M$ = 20 to 200mA | | 0.004 | | %/mA |
| $\frac{\Delta K}{K}/\Delta I_M$ | Current Characteristic of Shut Ratio | $I_M$ = 20 to 200mA | | –0.03 | | %/mA |
| $\frac{\Delta V_{ref}}{V_{ref}}/\Delta T_{amb}$ | Temperature Characteristic of Reference Voltage | $I_M$ = 100mA<br>Tamb = –20 to +60°C | | 0.04 | | %/°C |
| $\frac{\Delta K}{K}/\Delta T_{amb}$ | Temperature Characteristic of Shut Ratio | $I_M$ = 100mA<br>Tamb = 20 to +60°C | | 0.02 | | %/°C |

**Figure 1 :** Test Circuit.

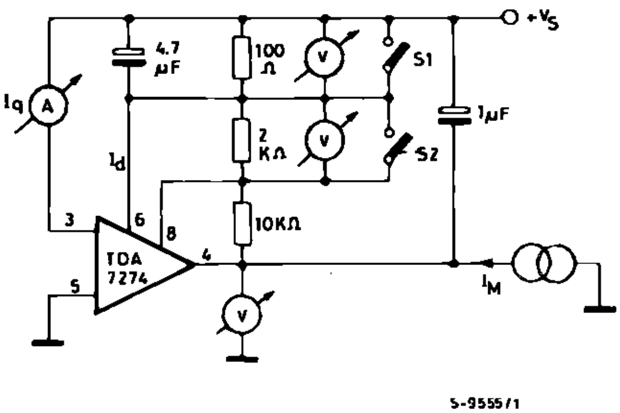



**Figure 2** : Quiescent Current vs. Supply Voltage.

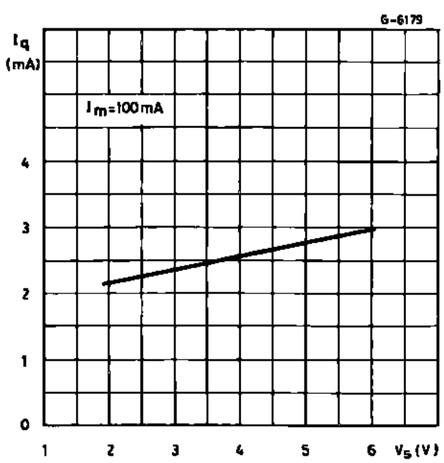



**Figure 3** : Reference Voltage vs. Supply Voltage.

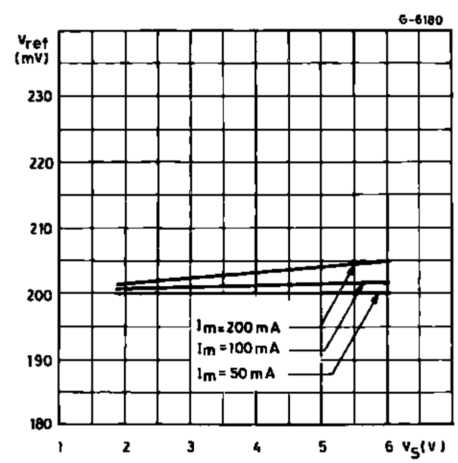


**Figure 4** : Shunt Ratio vs. Supply Voltage.

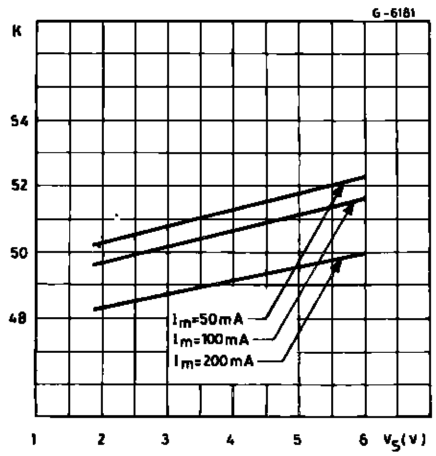



**Figure 5** : Reference Voltage vs. Load Current.

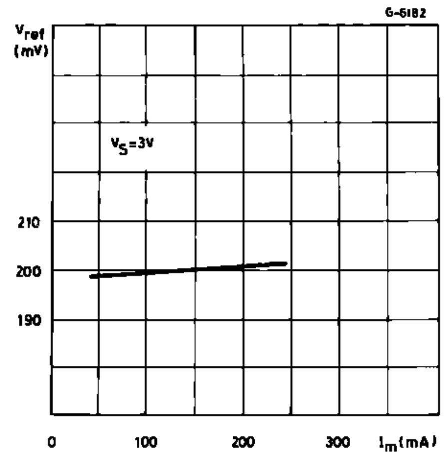



**Figure 6** : Shunt Ratio vs. Load Current.

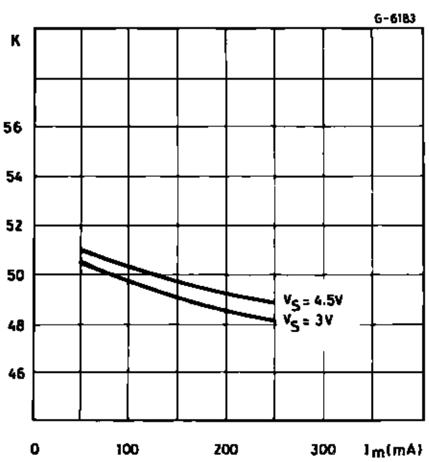



**Figure 7** : Minimum Supply Voltage (typical) vs. Load Current.

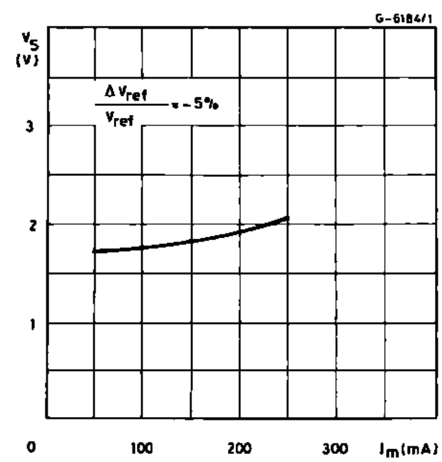



**Figure 8** : Saturation Voltage vs. Load Current.

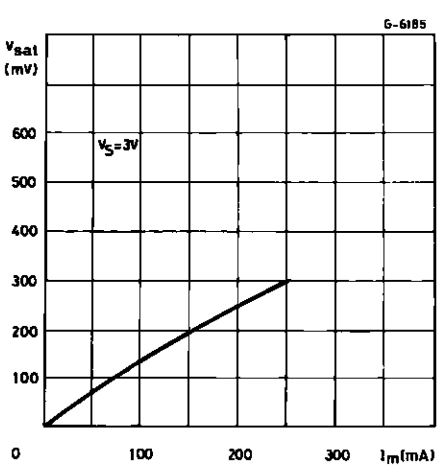



**Figure 9** : Quiescent Current vs. Ambient Temperature.

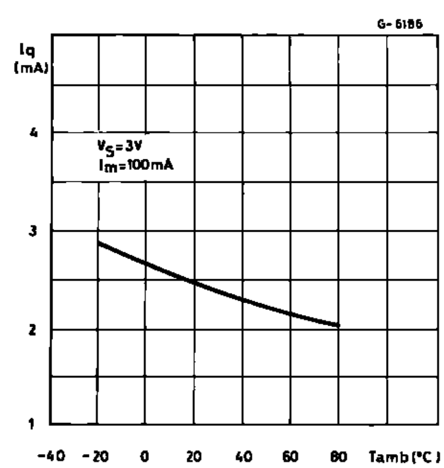


**Figure 10** : Reference Voltage vs. Ambient Temperature.

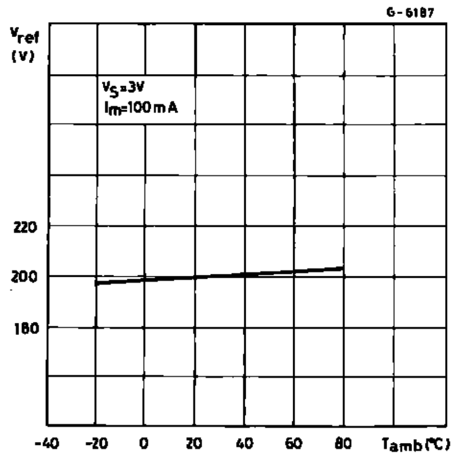
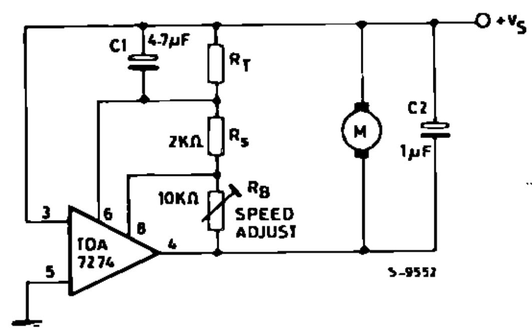



**Figure 11 :** Application Circuit.

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$R_T$ = 220Ω
$E_g$ = 1.65V
$I_M$ = 100mA
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**Figure 12 :** P. C. Board and Components layout of the Circuit of fig. 11 (1 : 1 scale).

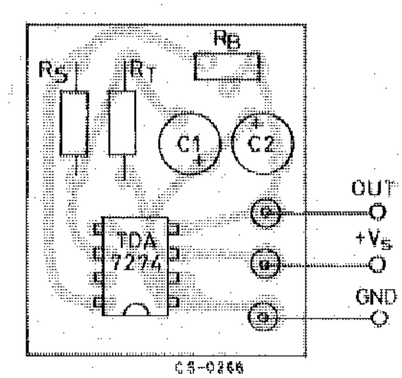



**Figure 13** : Speed Variations vs. Supply Voltage.

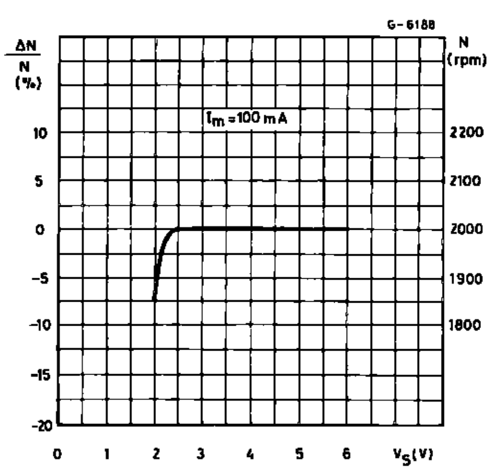



**Figure 14** : Speed Variations vs. Motor Current.

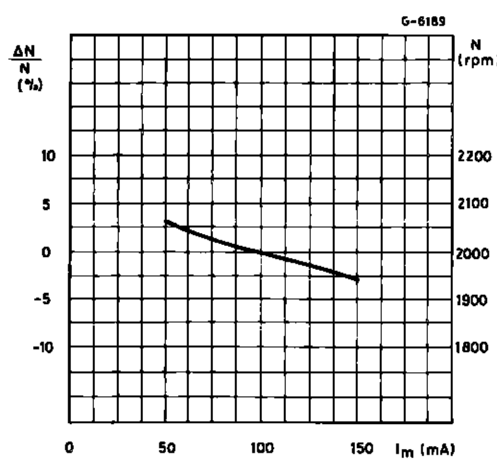
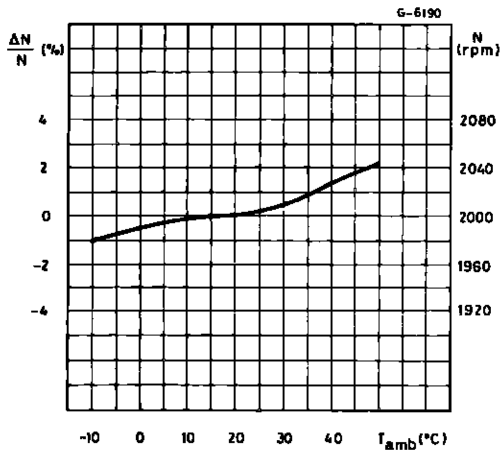
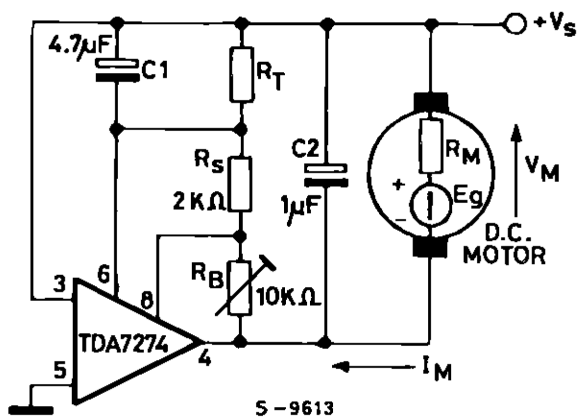


**Figure 15** : Speed Variations vs. Ambient Temperature.




## APPLICATION INFORMATION

**Figure 16.**




$I_M$ = Motor current at rated speed
$R_M$ = Motor resistance
$E_g$ = Back electromotive force
$V_M = I_M . R_M + E_g$

$$E_g = R_T\, I_d + I_M \left( \frac{R_T}{K} - R_M \right) + V_{ref}$$

$$\left[ 1 + \frac{R_B}{R_S} + \frac{R_T}{R_S} (1 + \frac{1}{K}) \right]$$

$R_S$ has to be adjusted so that the applied voltage $V_M$ is suitable for a given motor, the speed is then linearly adjustable varing $R_B$.

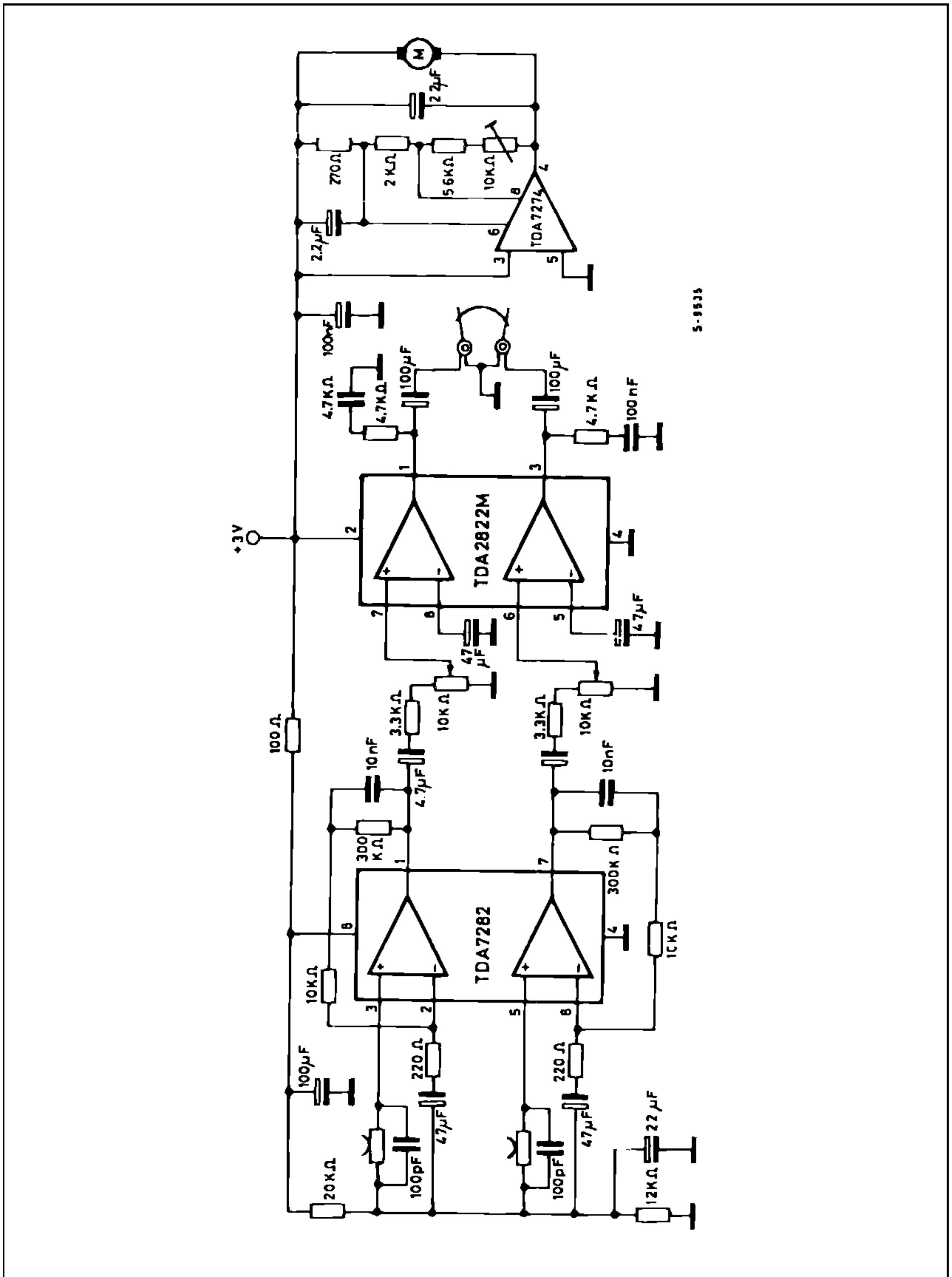
The value of $R_T$ is calculated so that

$$R_{T\ (max.)} < K_{(min.)} \bullet R_{M\ (min.)}$$

If $R_{T\ (max.)} > K \bullet R_M$, instability may occur.

The values of $C_1$ (4.7 µF typ.) and $C_2$ (1 µF typ.) depend on the type of motor used. $C_1$ adjusts WOW and flutter of the system. $C_2$ suppresses motor spikes.

**Figure 17 :** 3V Stereo Cassette Miniplayer with Motor Speed Control.



## MINIDIP PACKAGE MECHANICAL DATA

| DIM. | mm | | | inch | | |
|---|---|---|---|---|---|---|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | 3.32 | | | 0.131 | |
| a1 | 0.51 | | | 0.020 | | |
| B | 1.15 | | 1.65 | 0.045 | | 0.065 |
| b | 0.356 | | 0.55 | 0.014 | | 0.022 |
| b1 | 0.204 | | 0.304 | 0.008 | | 0.012 |
| D | | | 10.92 | | | 0.430 |
| E | 7.95 | | 9.75 | 0.313 | | 0.384 |
| e | | 2.54 | | | 0.100 | |
| e3 | | 7.62 | | | 0.300 | |
| e4 | | 7.62 | | | 0.300 | |
| F | | | 6.6 | | | 0.260 |
| I | | | 5.08 | | | 0.200 |
| L | 3.18 | | 3.81 | 0.125 | | 0.150 |