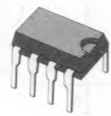
LOW-VOLTAGE DC MOTOR SPEED CONTROLLER

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

The TDA 7274 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.



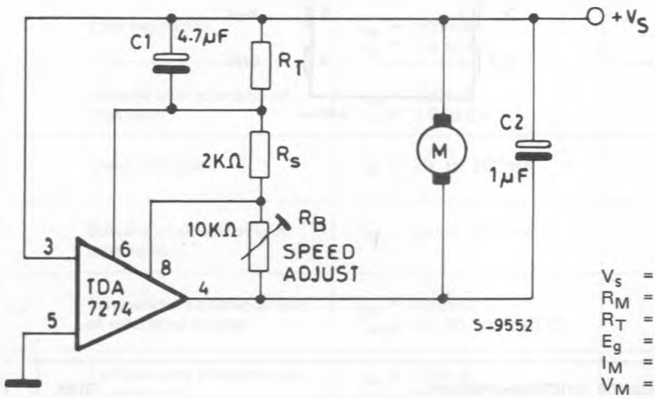
Minidip Plastic

ORDERING NUMBER: TDA 7274

ABSOLUTE MAXIMUM RATINGS

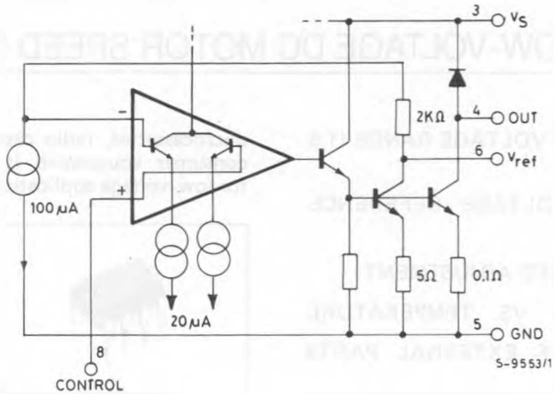
V_s	Supply voltage	6	V
I_M	Motor Current	700	mA
P_{tot}	Power dissipation at $T_{amb} = 25°C$	1.25	W
T_j, T_{stg}	Storage and junction temperature	-40 to +150	°C

APPLICATION CIRCUIT

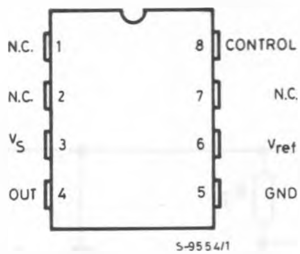


V_s = 3.0V
R_M = 4.9Ω
R_T = 220Ω
E_g = 1.65V
I_M = 100 mA
$V_M = R_M I_M + E_g = 2.14V$

SCHEMATIC DIAGRAM



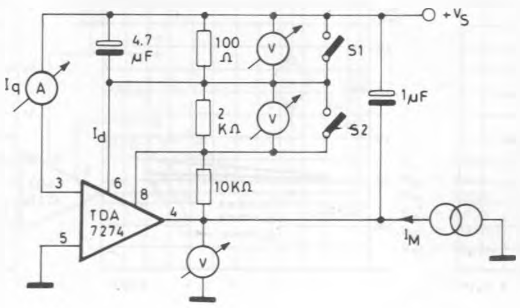
CONNECTION DIAGRAM
(Top view)



THERMAL DATA

$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	100	°C/W

Fig. 1 – Test circuit



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

Parameter		Test Conditions	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	Qiescent 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 V_s = 1.8 to 6V		0.20		%/V
$\frac{\Delta K}{K} / \Delta V_s$	Voltage characteristic of shut ratio	I_M = 100mA 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 T_{amb} = -20 to +60°C		0.04		%/°C
$\frac{\Delta K}{K} / \Delta T_{amb}$	Temperature characteristic of shut ratio	I_M = 100mA T_{amb} = 20 to +60°C		0.02		%/°C

Fig. 2 - Quiescent current vs. supply voltage

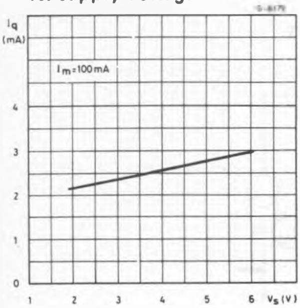


Fig. 3 - Reference voltage vs. supply voltage

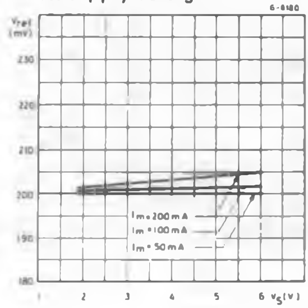


Fig. 4 - Shunt ratio vs. supply voltage

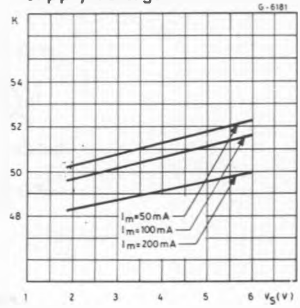


Fig. 5 - Reference voltage vs. load current

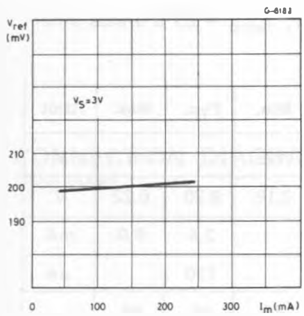


Fig. 6 - Shunt ratio vs. load current

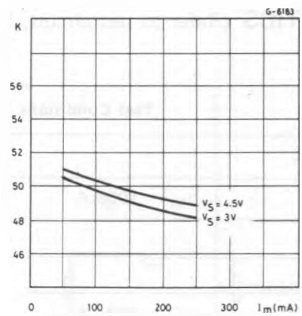


Fig. 7 - Minimum supply voltage (typical) vs. load current

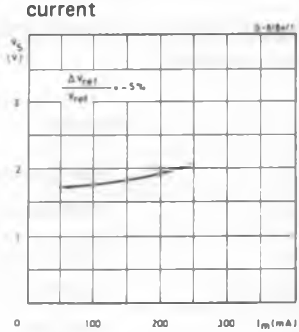


Fig. 8 - Saturation voltage vs. load current

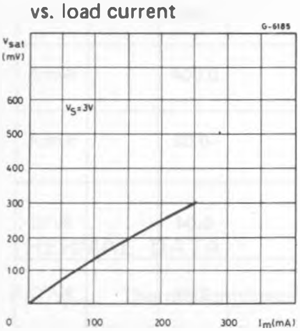


Fig. 9 - Quiescent current vs. ambient temperature

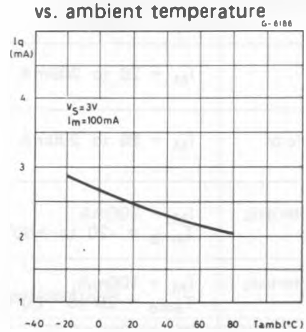


Fig. 10 - Reference voltage vs. ambient temperature

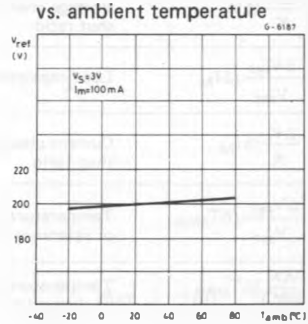


Fig. 11 - Application circuit

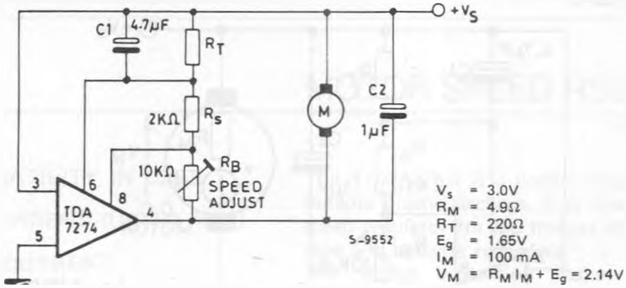


Fig. 12 - P.C. board and components layout of the circuit of fig. 11 (1 : 1 scale)

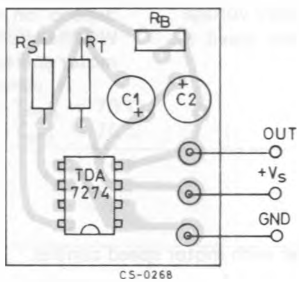


Fig. 13 - Speed variations vs. supply voltage

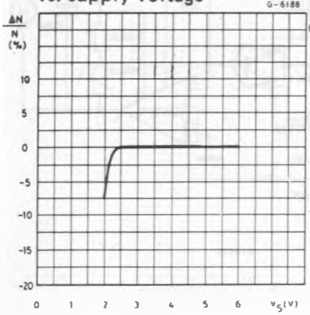


Fig. 14 - Speed variations vs. motor current

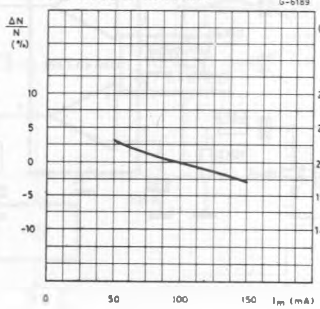
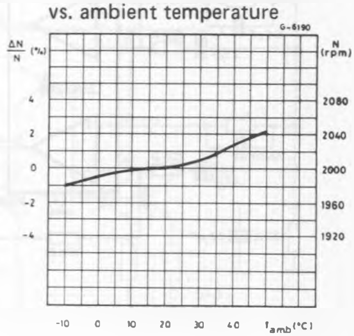
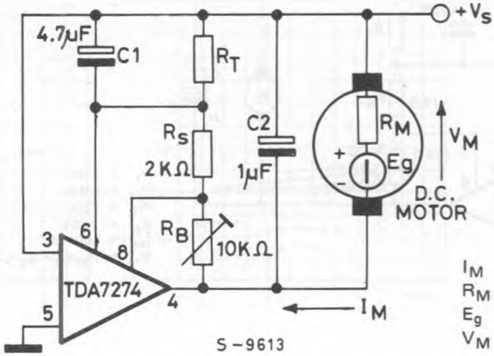


Fig. 15 - Speed variations vs. ambient temperature



APPLICATION INFORMATION

Fig. 16



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

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

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

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

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

If $R_{T\ (max.)} > K \cdot R_M$, 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.

Fig. 17 - 3V stereo cassette miniplayer with motor speed control