SGS-THOMSON MICROELECTRONICS

TDA7276

SPEED REGULATOR FOR SMALL DC MOTOR

PRELIMINARY DATA

The TDA7276 is a monolithic integrated circuit in 4 + 4 lead minidip plastic package designed for DC motors speed regulation in tape and cassette recorders, toys, etc.

It offers speed regulation versus supply voltage temperature and load changes better than conventional circuits built with discrete components.

Main features are:

- Excellent versatility in use
- High output current (up to 1A)
- Low reference voltage (1.25V)
- High temperature stability
- High power capability
- Low number of external parts

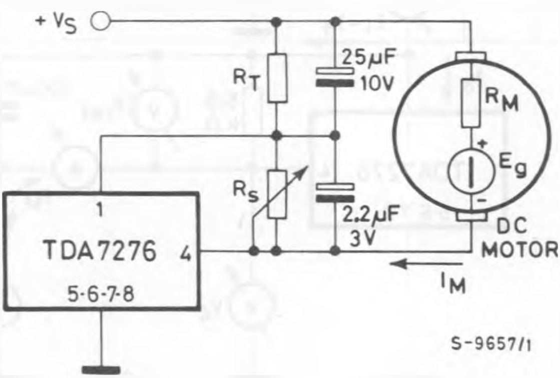
Minidip (4 + 4)

ORDERING NUMBER: TDA7276

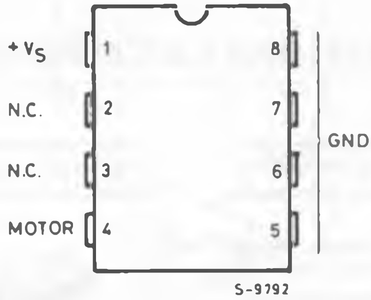
ABSOLUTE MAXIMUM RATINGS

V_s	Supply voltage	20	V
I_o	Output current	1.2	A
P_{tot}	Total power dissipation at $T_{amb} = 70°C$	1	W
P_{tot}	Total power dissipation at $T_{pins} = 70°C$	4	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	°C

APPLICATION CIRCUIT



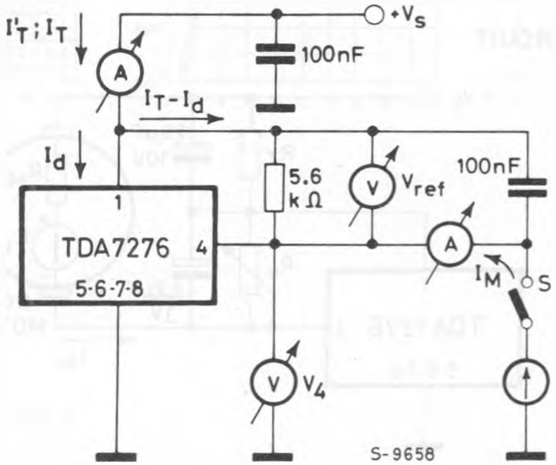
CONNECTION DIAGRAM
(Top view)



THERMAL DATA

$R_{th\ j\text{-}pins}$	Thermal resistance junction-pins	max	20	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	80	°C/W

TEST CIRCUIT



ELECTRICAL CHARACTERISTICS (Refer to the test circuit, $T_{amb} = 25°C$, $V_s = 6V$)

Parameter		Test Conditions		Min.	Typ.	Max.	Unit
V_{in}	Supply voltage range	$I_M = 0.1A$	$\Delta V_{ref}/V_{ref} = -5\%$	2.5		18	V
V_{ref}	Reference voltage (between pins 1 and 4)	$I_M = 0.1A$		1.1	1.25	1.35	V
I_d	Quiescent drain current	$I_M = 100\mu A$			1.1	2.1	mA
I_{MS}	Starting current	$V_s = 2.5V$	$\Delta V_{ref}/V_{ref} = -50\%$	0.5	0.8		A
I_{MS}	Starting current	$V_s = 5V$	$\Delta V_{ref}/V_{ref} = -50\%$	1.0			A
$K = I_M/I_T$	Reflection coefficient	$I_M = 0.1A$		18	20	22	–
$\frac{\Delta K}{K}/\Delta V_s$		$V_s = 6V$ to $18V$	$I_M = 0.1A$		0.45		%/V
$\frac{\Delta K}{K}/\Delta I_M$		$I_M = 25$ to $400mA$			0.005		%/mA
$\frac{\Delta K}{K}/\Delta T$		$T_{amb} = -20$ to $70°C$	$I_M = 0.1A$		0.02		%/°C
$\frac{\Delta V_{ref}}{V_{ref}}/\Delta V_s$	Line regulation	$V_s = 6V$ to $18V$	$I_M = 0.1A$		0.02		%/V
$\frac{\Delta V_{ref}}{V_{ref}}/\Delta I_M$	Load regulation	$I_M = 25$ to $400mA$			0.009		%/mA
$\frac{\Delta V_{ref}}{V_{ref}}/\Delta T$	Temperature coefficient	$T_{amb} = -20$ to $70°C$	$I_M = 0.1A$		0.02		%/°C

PRINCIPLE OF OPERATION

The device acts an emf speed regulator providing correction for the internal losses of the motor. The voltage across R_S is kept constant by the IC and equal to V_{ref} = 1.25V typ. (see application circuit).

The current through the resistance R_T is:

$$I_{RT} = I_{RS} + I_d + \frac{I_M + I_{RS}}{K}$$

where:

$$I_{RS} = \frac{V_{ref}}{R_S}$$

I_d = quiescent drain current (1.1mA typ.)
I_M = motor current
K = reflection coefficient (20 typ.)

E_g being the motor's back electromotive force and R_M its internal resistance; the voltage across the motor itself will be:

$$E_g + R_M I_M = R_T I_{RT} + V_{ref}$$

therefore:

$$E_g = I_M \left(\frac{R_T}{K} - R_M \right) + V_{ref} \cdot \left[\frac{R_T}{R_S} \left(1 + \frac{1}{K}\right) + 1 \right] + R_T I_d$$

Motor's speed will be independent from resisting torque if E_g doesn't depend on I_M, then will do:

$R_T = K R_M$ (if $R_T > K_{min} R_{M\,min}$ oscillations may occur) - Back emf rated to the wanted speed can be selected acting to R_S - R_S variations will lead to an hyperbolic adjustment of the speed:

$$R_S = R_T \frac{V_{ref} (1 + 1/K)}{E_g - V_{ref} - R_T I_d}$$