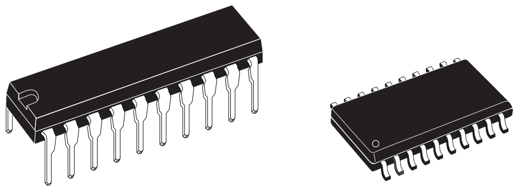
SGS-THOMSON MICROELECTRONICS

TDA7285

STEREO CASSETTE PLAYER AND MOTOR SPEED CONTROLLER

- WIDE OPERATING SUPPLY VOLTAGE (1.8V to 6V)
- HIGH OUTPUT POWER (30mW/32Ω/3V)
- LOW DISTORTION DC VOLUME CONTROL
- NO BOUCHEROT CELL
- LOW QUIESCENT CURRENT (15mA)
- NO INPUT CAPACITORS FOR PREAMPLIFIERS
- LOW MOTOR REFERENCE VOLTAGE (200mV)



DIP20 **SO20**

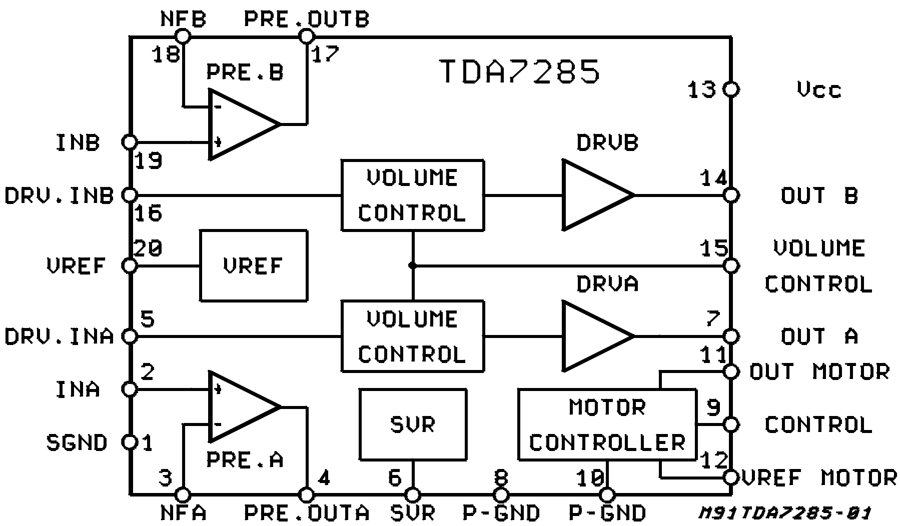
ORDERING NUMBERS:

TDA7285 TDA7285D

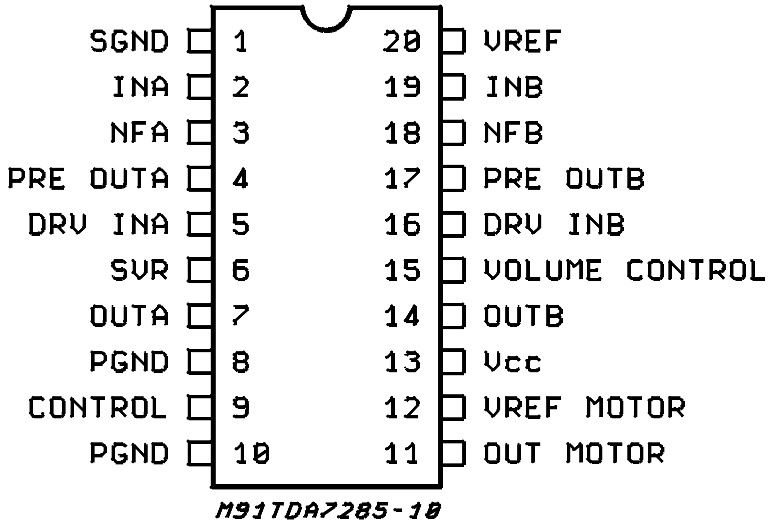
DESCRIPTION

The TDA7285 is a monolithic integrated circuit designed for the portable players market and assembled in a plastic DIP20 and SO20. The internal functions are: preamplifier, DC volume control, headphone driver and motor speed controller.

BLOCK DIAGRAM



PIN CONNECTION (Top view)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_S	Supply Voltage	8	V
I_{Omax}	Maximum Output Current	70	mA
$I_{m\ max}$	Maximum Motor Current	700	mA
P_{tot}	Total Power Dissipation T_{amb} = 90°C	0.9	W
T_{op}	Operating Temperature	-20 to +70	°C
T_{stg}, T_j	Storage and Junction Temperature	-40 to 150	°C

THERMAL DATA

Symbol	Description	SO20	DIP20	Unit
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	150	100	°C/W

DC CHARACTERISTICS (T_{amb} = 25°C; V_S = 3V; R_L = 32Ω (Headphone) and R_L = 10KΩ (Preamplifier); V_i = 0; VOL. Control = V_{ref}).

Terminal No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Term. Volt. (V)	0	1.5	1.5	1.5	1.5	2.7	1.4	0	2.8	0	1.6	3	3	1.4	1.5	1.5	1.5	1.5	1.5	1.5

ELECTRICAL CHARACTERISTICS (V_S = 3V; R_L = 32Ω, Vol. Control = 2/3 $V_{ref\ (pin\ 20)}$; T_{amb} = 25°C; f = 1KHz; unless otherwise specified

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_S	Supply Range		1.8		6	V
I_d	Total Quiescent Drain Current			15	22	mA

PLAYBACK AMPLIFIER

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
G_{vo}	Open Loop Gain			70		dB
G_v	Close Loop Gain			33		dB
V_O	Output Voltage	THD = 1%	600	750		mV
THD	Total Harmonic Distortion	V_O = 330mVrms		0.05	0.25	%
I_b	Bias Current			3		µA
C_t	Cross Talk	R_S = 2.2KΩ; V_O = 330mVrms		74		dB
e_n	Total Input Noise	R_S = 2.2KΩ; B = 22Hz to 22KHz		1.2		µV
SVR1	Ripple Rejection	R_S = 2.2KΩ; Vr = 100mVrms f = 100Hz; C_{SVR} = 100µF		50		dB

HEADPHONE DRIVER

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{DC}	Output DC Voltage			1.4		V
P_O	Output Power	THD = 10%	20	30		mW
P_{O1}	Transient Output Power	THD = 10% R_L = 16Ω		50		mW
G_V	Close Loop Gain	P_O = 5mW		31		dB
	Volume Control range		66	75		dB
THD	Total Harmonic Distortion	P_O = 5mW		0.3	1	%
C_t	Cross Talk	P_O = 5mW; R_S = 10KΩ		50		dB
SVR2	Ripple Rejection	R_S = 600Ω; Vr = 100mV f = 100Hz; C_{SVR} = 100µF		47		dB

MOTOR SPEED CONTROL

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
V_{ref}	Motor Reference Voltage (pin 12)		0.18	0.20	0.22	V
K	Shunt Ratio	I_m = 100mA	45	50	55	-
V_{sat}	Residual Voltage	I_m = 100mA		0.13	0.30	V
$\frac{\Delta V_{ref}}{V_{ref}} / \Delta V_S$	Line Regulation	I_m = 100mA; V_S = 1.8 to 6V		0.20	0.8	%/V
$\frac{\Delta K}{K} / \Delta V_S$	Voltage Characteristics of Shunt Ratio	I_m = 100mA; V_S = 1.8 to 6V		0.80	3	%/V
$\frac{\Delta V_{ref}}{V_{ref}} / \Delta I_m$	Load Regulation	I_m = 30 to 200mA		0.015	0.08	%/mA
$\frac{\Delta K}{K} / \Delta I_m$	Current Characteristics of Shunt Ratio	I_m = 30 to 200mA		0.03	0.1	%/mA
$\frac{\Delta V_{ref}}{V_{ref}} / \Delta T_{amb}$	Temperature Characteristics of Reference Voltage	I_m = 100mA T_{amb} = -20 to +60°C		0.04		%/°C
$\frac{\Delta K}{K} / \Delta T_{amb}$	Temperature Characteristics of Shunt Ratio	I_m = 100mA T_{amb} = -20 to +60°C		0.02		%/°C

Figure 1: Test and Application Circuit

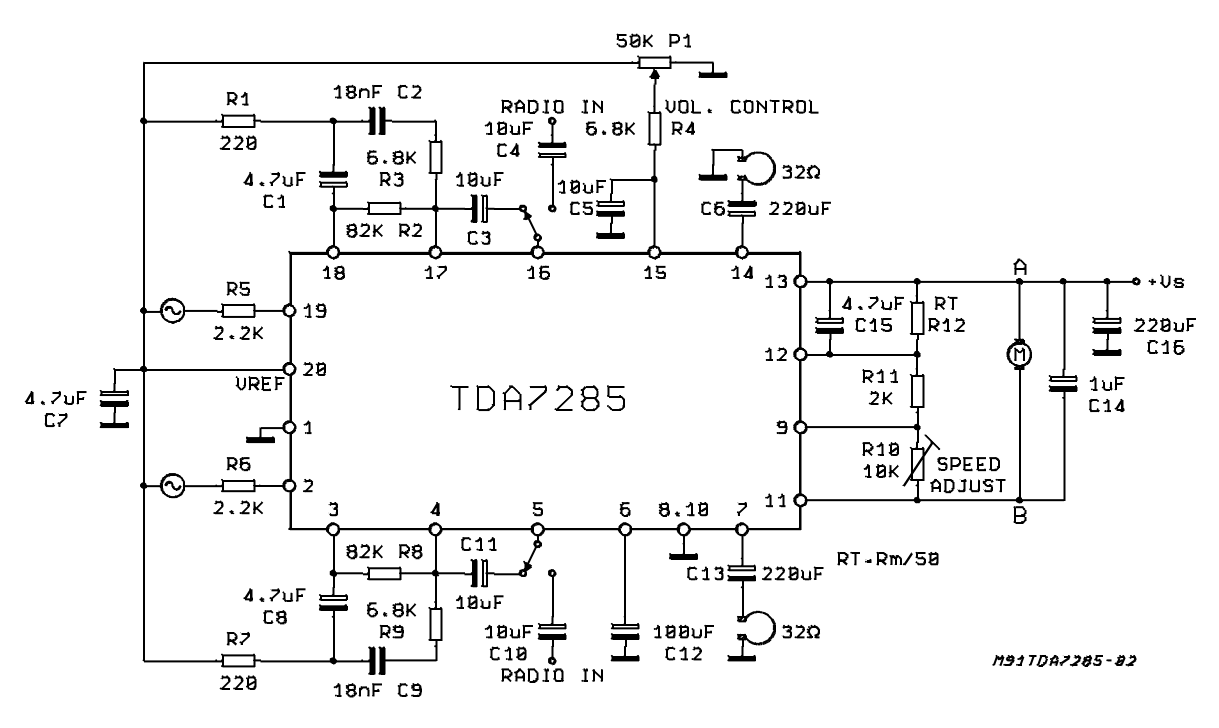


Figure 2: P.C. Board and Component Layout of the Circuit of Figure 2 (1:1 scale)

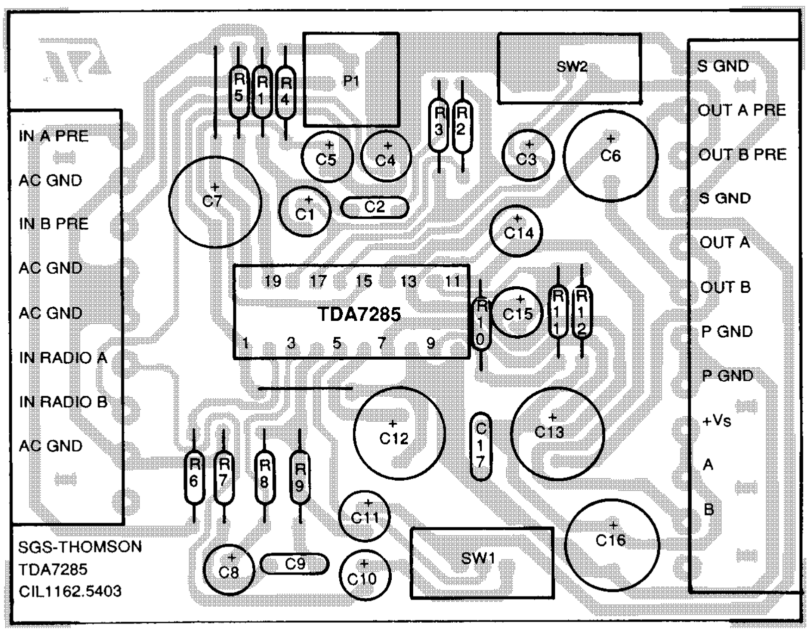


Figure 3: Quiescent Drain Current vs. Supply Voltage

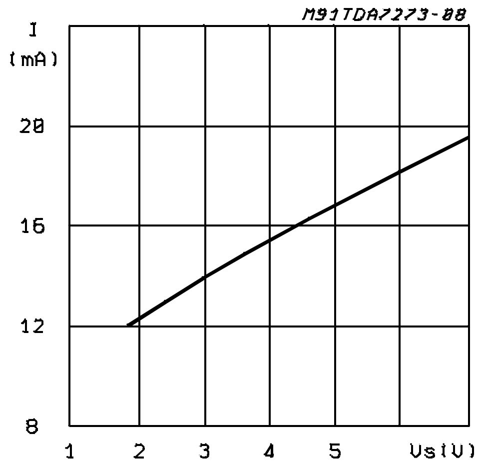


Figure 4: Reference voltage $V_S/2$ (pin 20) vs. Supply Voltage

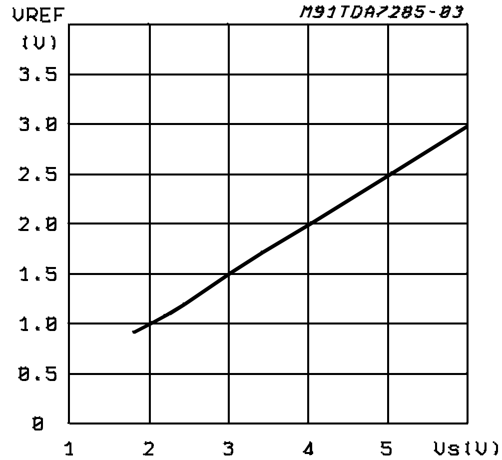


Figure 5: Closed Loop Gain vs. Frequency (PREAMPLIFIER)

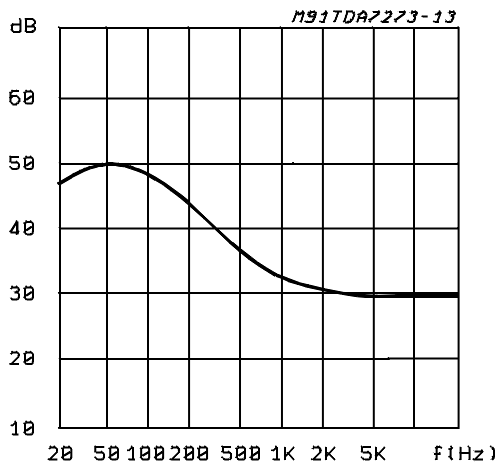


Figure 6: Distortion vs. Frequency (PREAMPLIFIER)

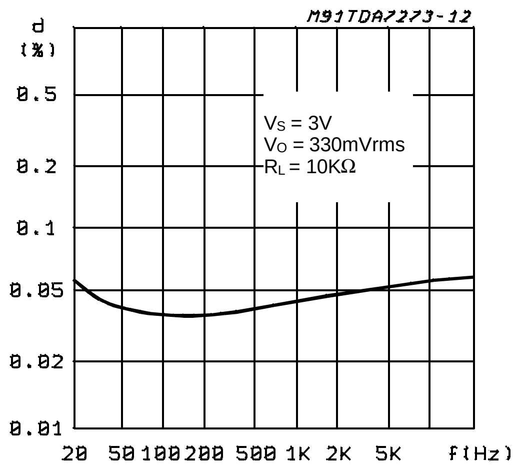


Figure 7: Supply Voltage Rejection vs. Frequency (PREAMPLIFIER)

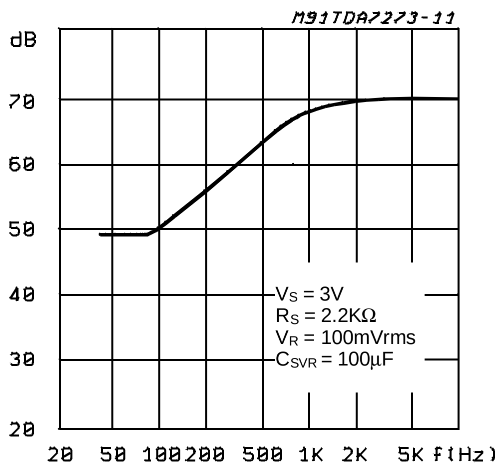


Figure 8: Quiescent Output Voltage vs. Supply Voltage (DRIVER)

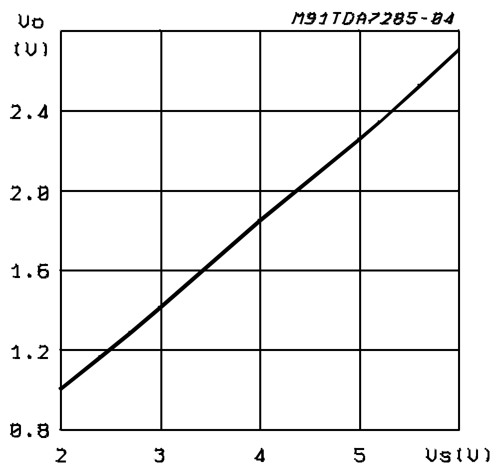


Figure 9: Closed Loop Gain vs. Frequency (DRIVER)

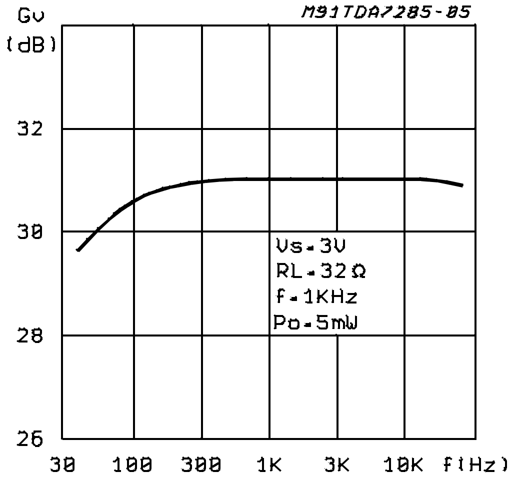


Figure 10: Output Power vs. Supply Voltage (DRIVER)

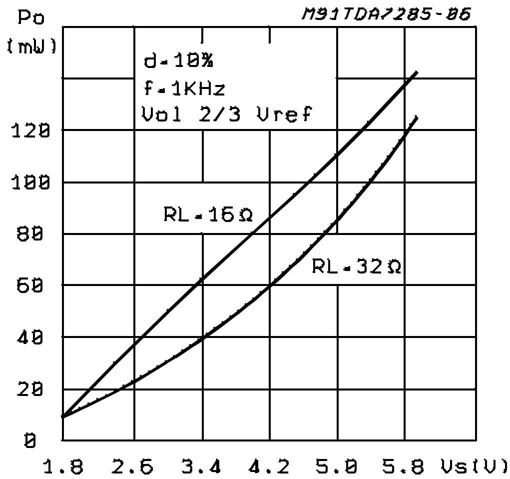


Figure 11: Distortion vs. Output Power (DRIVER)

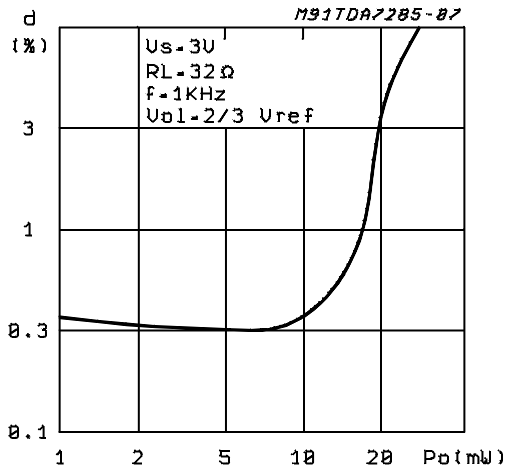


Figure 12: Distortion vs. Frequency (DRIVER)

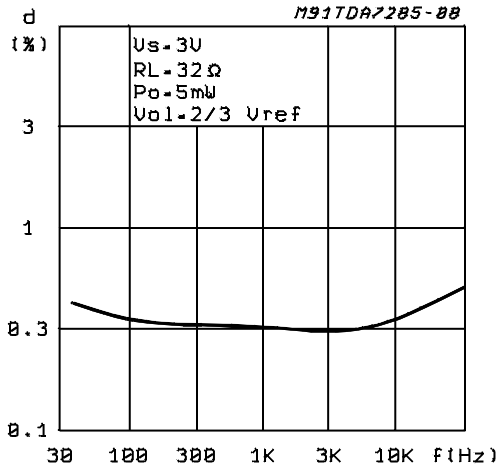


Figure 13: Supply Voltage Rejection vs. Frequency (DRIVER

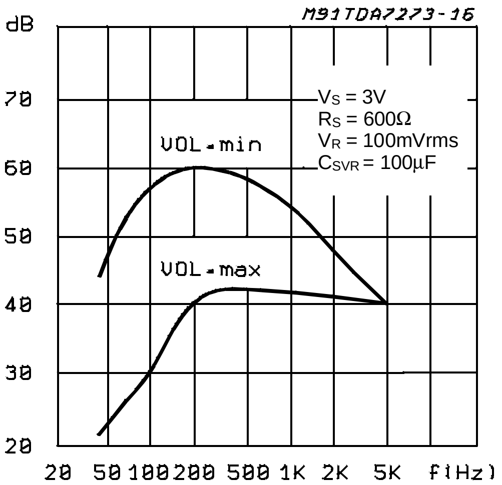


Figure 14: Volume Control (0dB = 10mW; V_S = 3V; R_{VOL} = 50KΩ; R_L = 32Ω; f = 1KHz) (DRIVER)

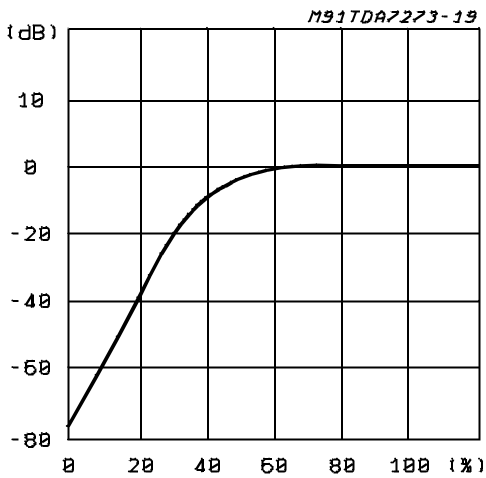


Figure 15: Reference Voltage (Pin 12) vs. Supply Voltage (MOTOR)

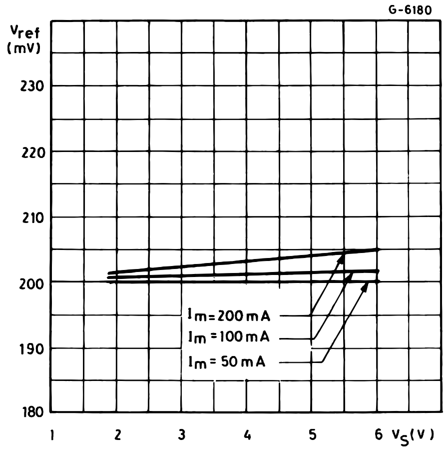


Figure 16: Shunt Ratio vs. Supply Voltage (MOTOR)

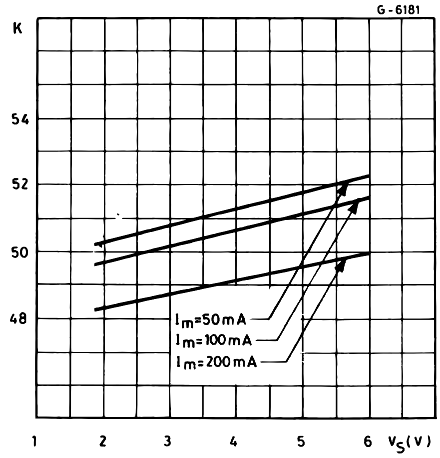


Figure 17: Sunt Ratio vs. Load Current (MOTOR)

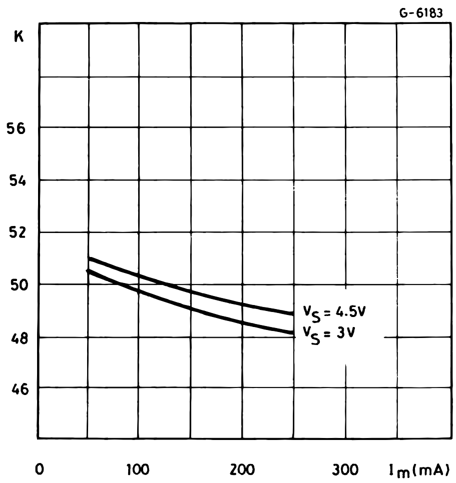


Figure 18: Saturation Voltage vs. Load Current (MOTOR)

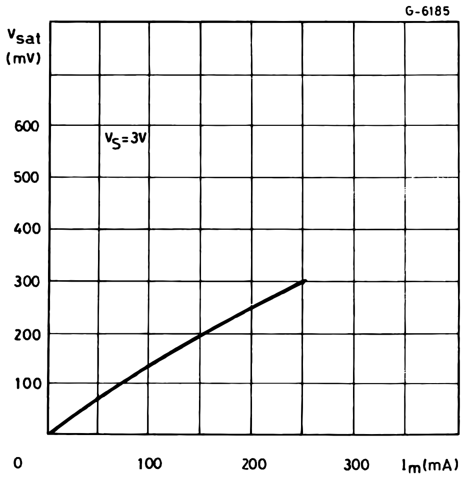


Figure 19: Speed Variations vs. Supply Voltage (MOTOR)

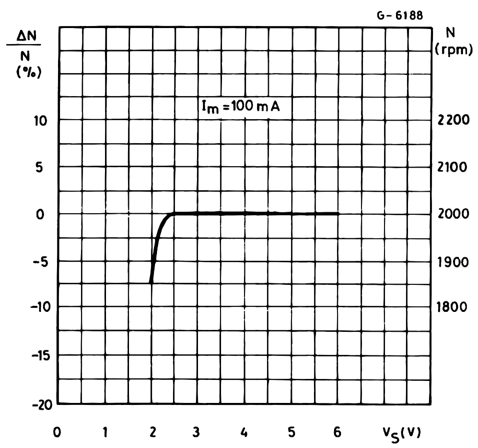
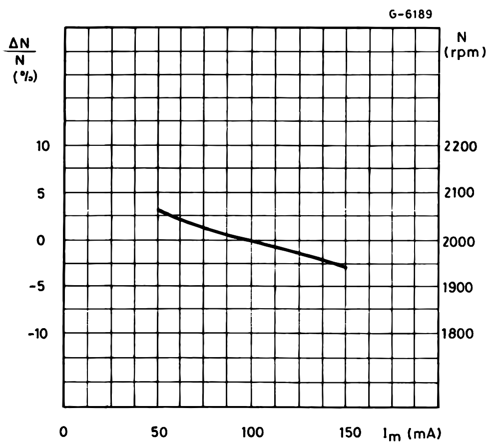
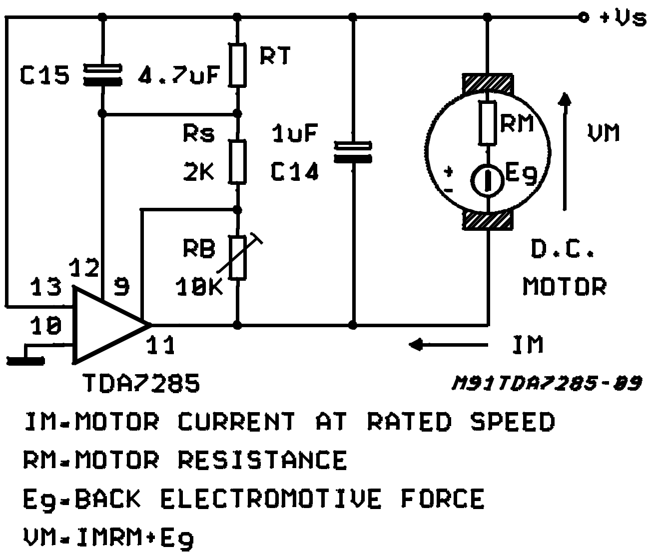


Figure 20: Speed Variations vs. Motor Current (MOTOR)



APPLICATION INFORMATION

Figure 21.



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

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 R_T is calculated so that

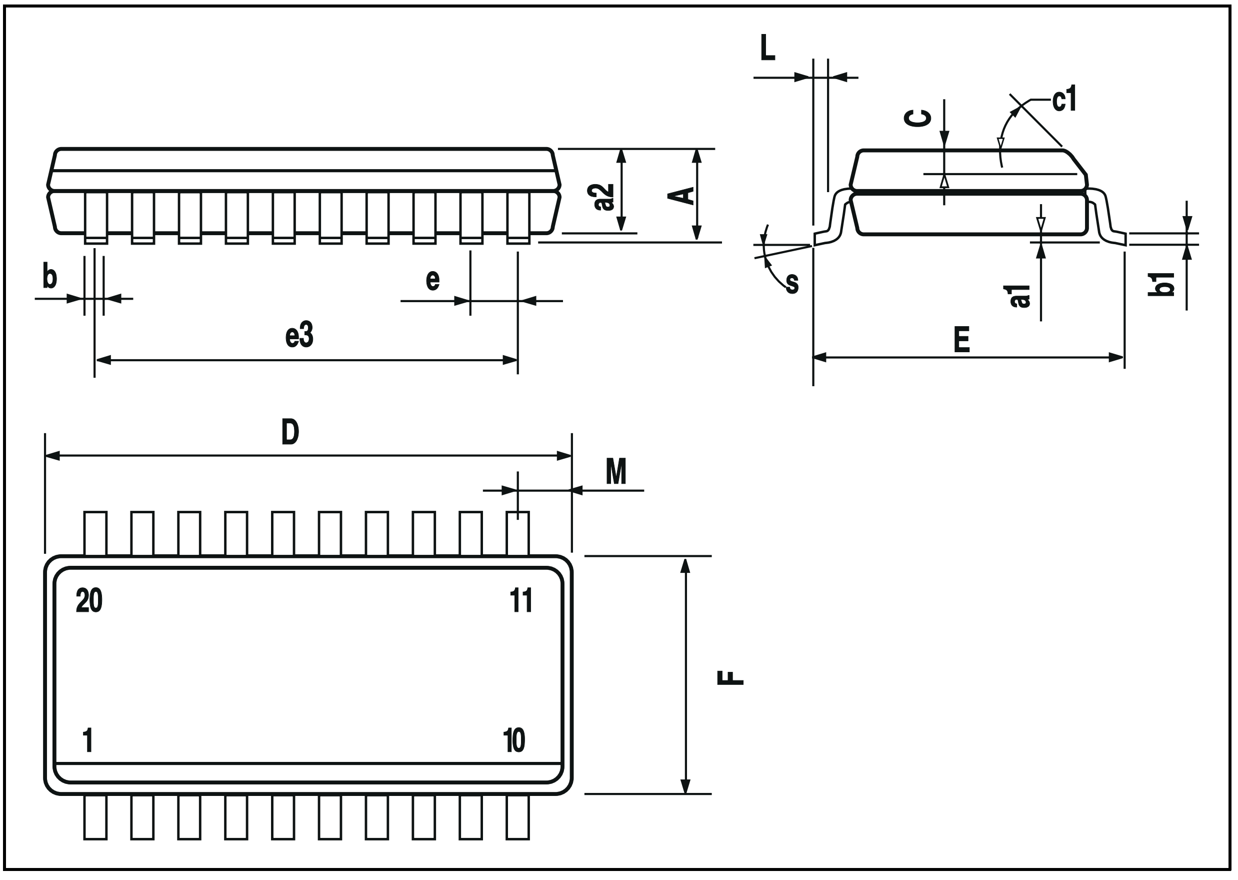
$R_{T\,(max.)} > K_{(min.)} * R_{M\,(min.)}$

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

The values of C15 (4.7µF typ.) and C14 (1µF typ.) depend on the type of motor used. C15 adjusts WOW and flutter of the system. C14 suppresses motor spikes.

SO20 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.1		0.3	0.004		0.012
a2			2.45			0.096
b	0.35		0.49	0.014		0.019
b1	0.23		0.32	0.009		0.013
C		0.5			0.020	
c1	45 (typ.)					
D	12.6		13.0	0.496		0.512
E	10		10.65	0.394		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.4		7.6	0.291		0.299
L	0.5		1.27	0.020		0.050
M			0.75			0.030
S	8 (max.)					



DIP20 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053