



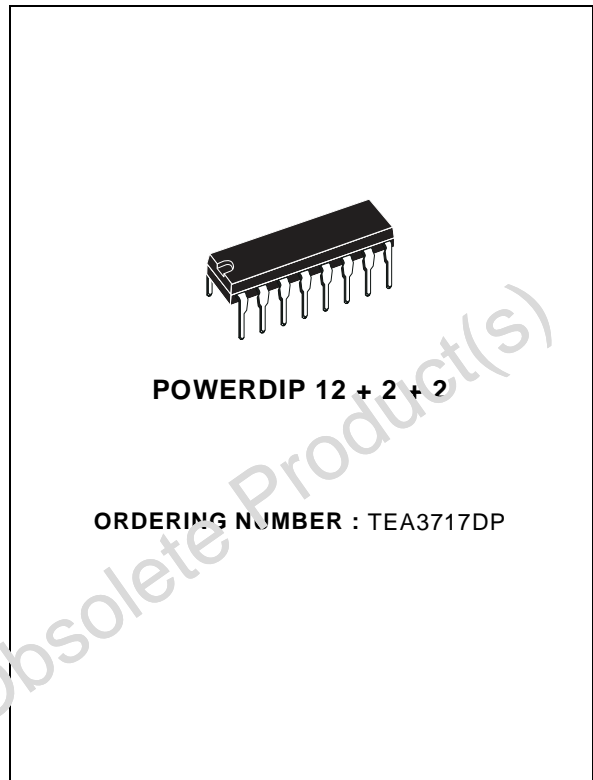
TEA3717

STEPPER MOTOR DRIVER

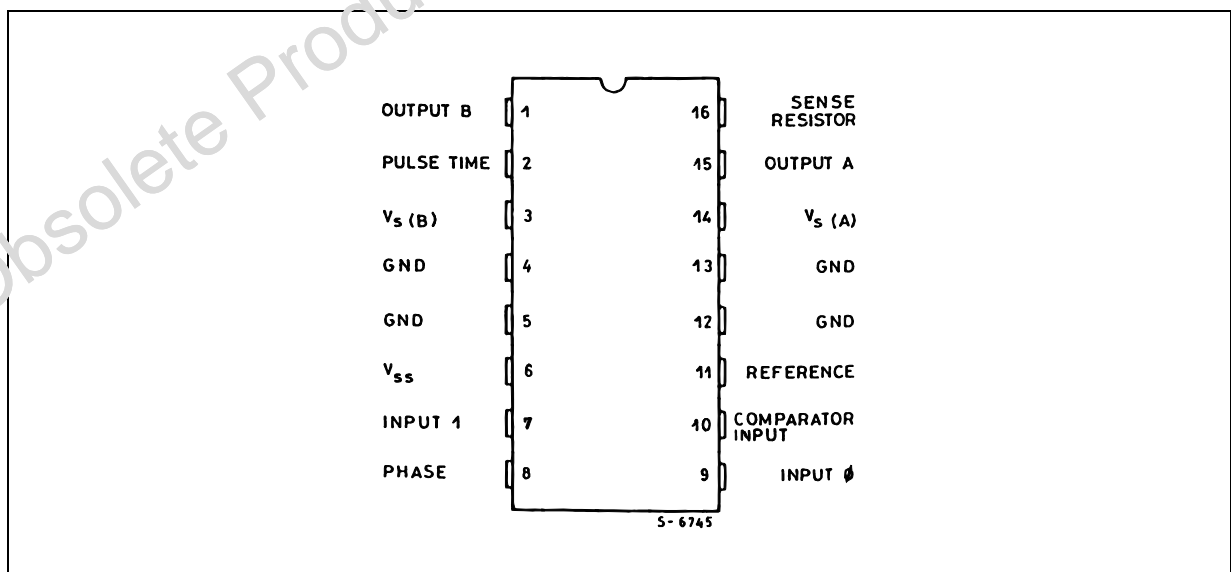
- HALF-STEP AND FULL-STEP MODE
- BIPOLAR DRIVE OF STEPPER MOTOR FOR MAXIMUM MOTOR PERFORMANCE
- BUILT-IN PROTECTION DIODES
- WIDE RANGE OF CURRENT CONTROL 5 TO 1000 mA
- WIDE VOLTAGE RANGE 10 TO 45 V
- DESIGNED FOR UNSTABILIZED MOTOR SUPPLY VOLTAGE
- CURRENT LEVELS CAN BE SELECTED IN STEPS OR VARIED CONTINUOUSLY

DESCRIPTION

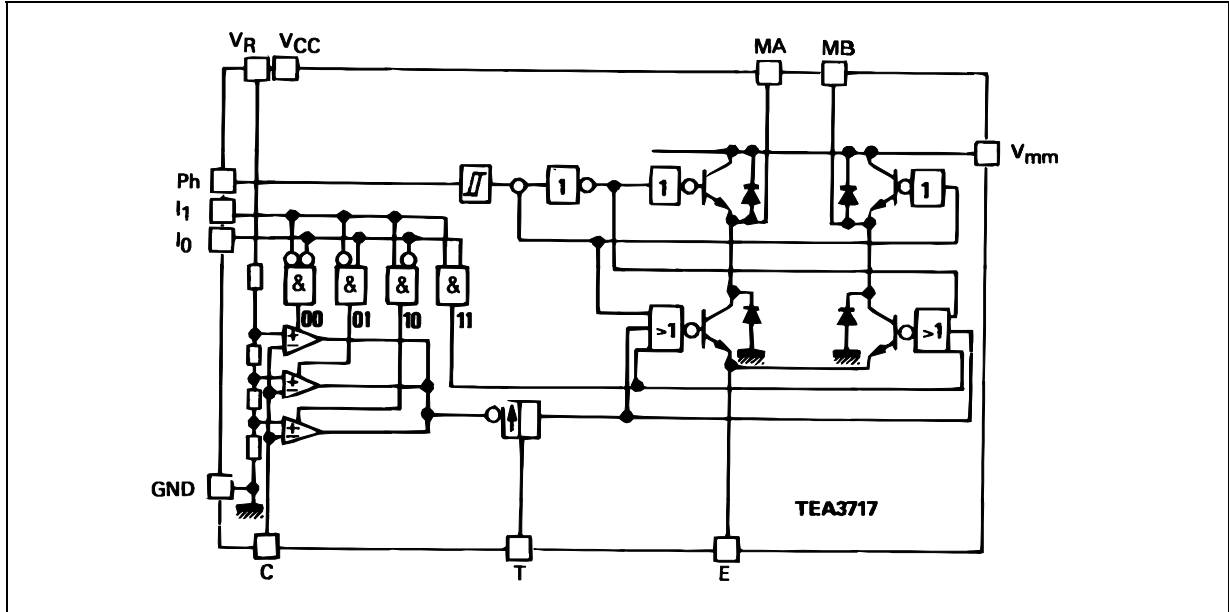
The TEA3717 is a bipolar monolithic integrated circuit intended to control and drive the current in one winding of a bipolar stepper motor. The circuit consists of an LS-TTL compatible logic input, a current sensor, a monostable and an output stage with built-in protection diodes. Two TEA3717 and a few external components form a complete control and drive unit for LS-TTL or microprocessor-controlled stepper motor systems.



PIN CONNECTION (top view)



SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{mm}	Power Supply Voltage (pins 14, 3)	45	V
V_{CC}	Logic Supply Voltage (pin 6)	7	V
V_{in} V_{in} V_V	Input Voltage Logic Inputs Analog Inputs Reference Input	- 0.5 to 6 V_{CC} 15	V
I_{in} I_{in}	Input Current Logic Inputs Analog Inputs	- 10 - 10	mA
I_o	Output Current	± 1	A
T_j	Junction Temperature	+ 150	$^{\circ}C$
T_{stg}	Storage Temperature Range	- 55 to + 150	$^{\circ}C$
T_{oper}	Operating Ambient Temperature Range	0 to + 70	$^{\circ}C$

THERMAL DATA

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Maximum Junction-pins Thermal Resistance	11	$^{\circ}C/W$
$R_{th(j-a)}$	Maximum Junction-ambient Thermal Resistance	45*	$^{\circ}C/W$

* Soldered on a 35 mm thick 20 cm³ PC board copper area

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{CC}	Supply Voltage	4.75	5	5.25	V
V_{mm}	Supply Voltage	10	-	40	V
I_o	Output Current	0.020	-	0.8	A
T_{amb}	Ambient Temperature	0	-	70	$^{\circ}C$
t_r	Rise Time, Logic Inputs	-	-	3	μs
t_f	Fall Time, Logic Inputs	-	-	3	μs

FUNCTIONAL DESCRIPTION

The circuit is intended to drive a bipolar constant current through one motor winding. The constant current is generated through switch mode regulation.

There is a choice of three different current levels with the two logic inputs I_0 and I_1 . The current can also be switched off completely.

INPUT LOGIC

If any of the logic inputs is left open, the circuit will treat it as a high level input.

I_0	I_1	Current Level
H	H	No Current
L	H	Low Current
H	L	Medium Current
L	L	Maximum Current

PHASE – This input determines the direction of current flow in the winding, depending on the motor connections. The signal is fed through a Schmidt-trigger for noise immunity, and through a time delay in order to guarantee that no short-circuit occurs in the output stage during phase-shift. High level on the PHASE-input causes the motor current flow from M_A through the winding to M_B .

I_0 and I_1 – The current level in the motor winding is selected with these inputs. The values of the different current levels are determined by the reference voltage V_R together with the value of the sensing resistor R_S .

CURRENT SENSOR

This part contains a current sensing resistor (R_S), a low pass filter (R_C , C_C) and three comparators. Only one comparator is active at a time. It is activated by the input logic according to the current level chosen with signals I_0 and I_1 . The motor current flows through the sensing resistor R_S . When the current has increased so that the voltage across R_S becomes higher than the reference voltage on the

Note : $R_S = 1 \Omega$, inductance free
 $R_C = 1 \text{ k}\Omega$
 $C_C = 820 \text{ pF}$, ceramic
 $R_t = 56 \text{ k}\Omega$

other comparator input, the comparator output goes high, which triggers the pulse generator and its output goes high during a fixed pulse time (t_{off}), thus switching off the power feed to the motor winding, and causing the motor current to decrease during t_{off} .

SINGLE-PULSE GENERATOR

The pulse generator is a monostable triggered on the positive going edge of the comparator output. The monostable output is high during the pulse time, t_{off} , which is determined by the timing components R_t and C_t .

$$t_{off} = 0.69 \cdot R_t \cdot C_t$$

The single pulse switches off the power feed to the motor winding, causing the winding current to decrease during t_{off} .

If a new trigger signal should occur during t_{off} , it is ignored.

OUTPUT STAGE

The output stage contains four Darlington transistors and four diodes, connected in an H-bridge. The two sinking transistors are used to switch the power supplied to the motor winding, thus driving a constant current through the winding.

It should be noted however, that it is not permitted to short circuit the outputs.

V_{CC} , V_{mm} , V_R

The circuit will stand any order of turn-on or turn-off of the supply voltages V_{SS} and V_S . Normal dV/dt values are then assumed.

Preferably, V_R should be tracking V_{CC} during power-on and power-off.

ANALOG CONTROL

The current levels can be varied continuously either if V_R is varied or with a circuit varying the voltage fed into the comparator terminal (see fig.1).

Figure 3

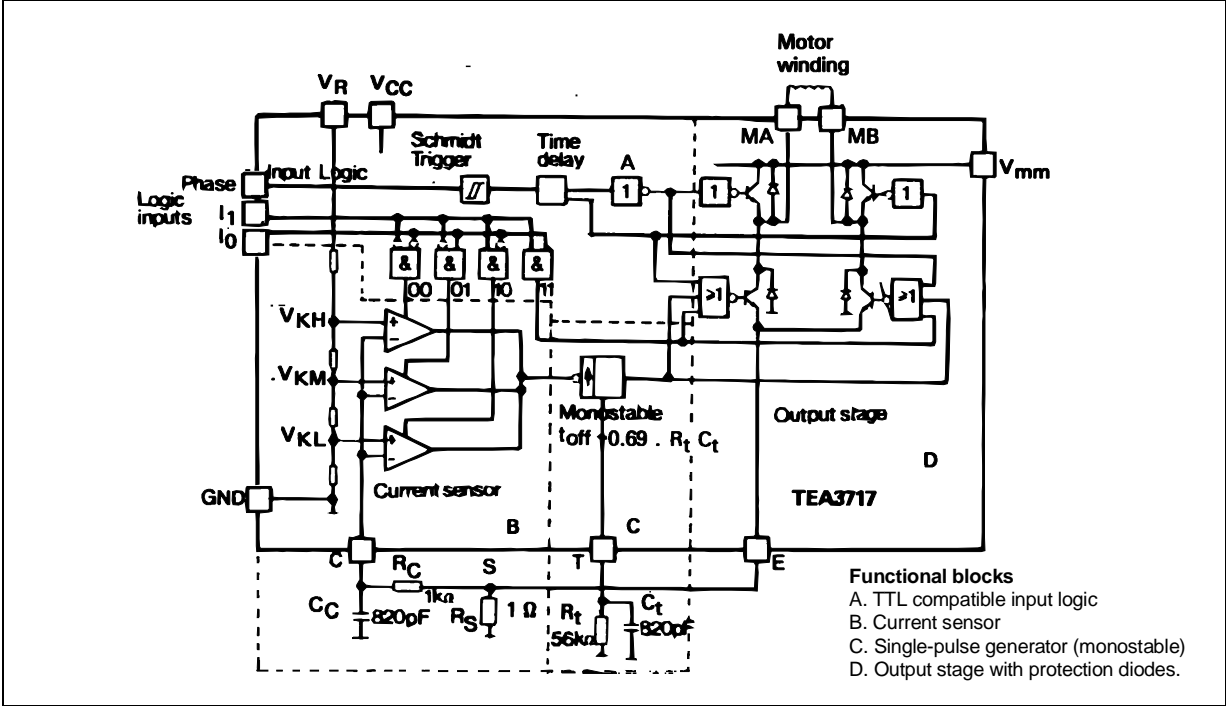


Figure 4 : Typical Sink Saturation Voltage versus Output Current

Figure 5 : Typical Source Saturation Voltage versus Output Current

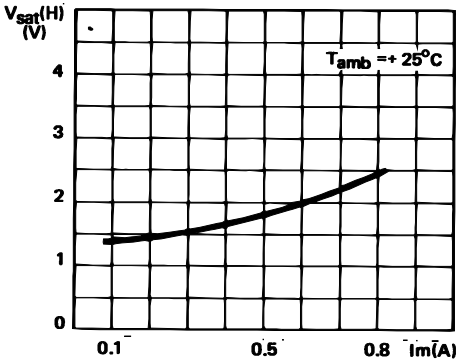
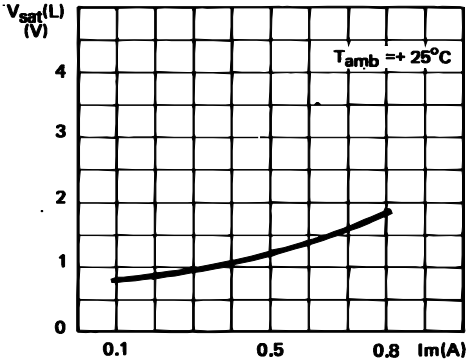
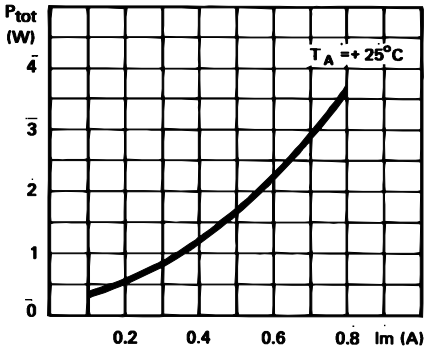


Figure 6 : Typical Power Losses versus Output Current



TYPICAL APPLICATION

Figure 7 : Serial Printer Carriage Drive.

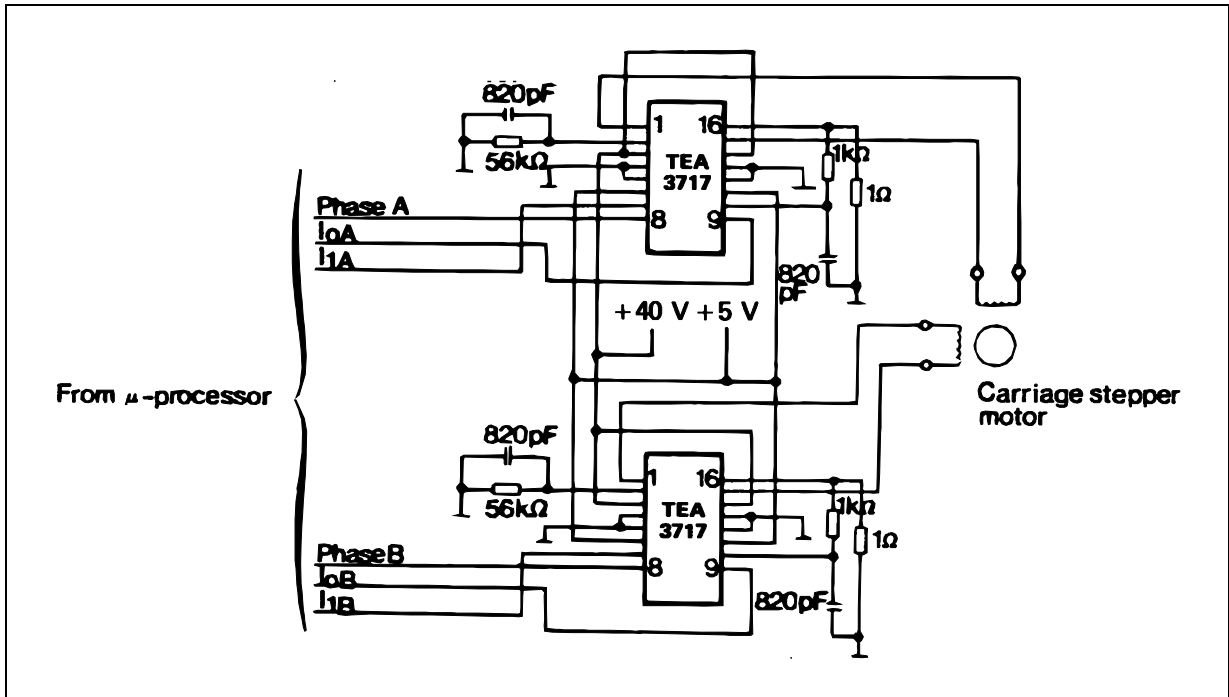
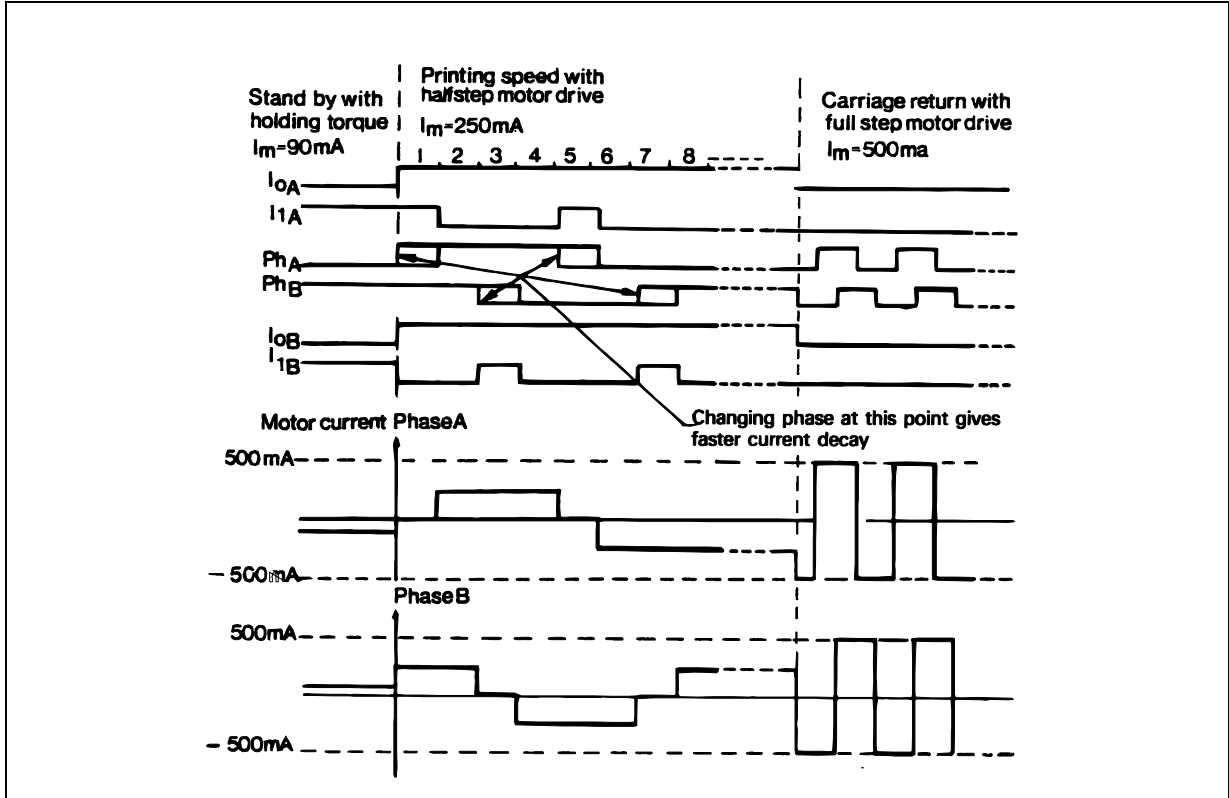
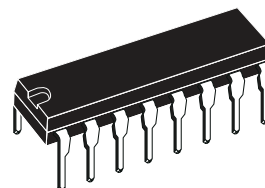


Figure 8 : Principal Operating Sequence.

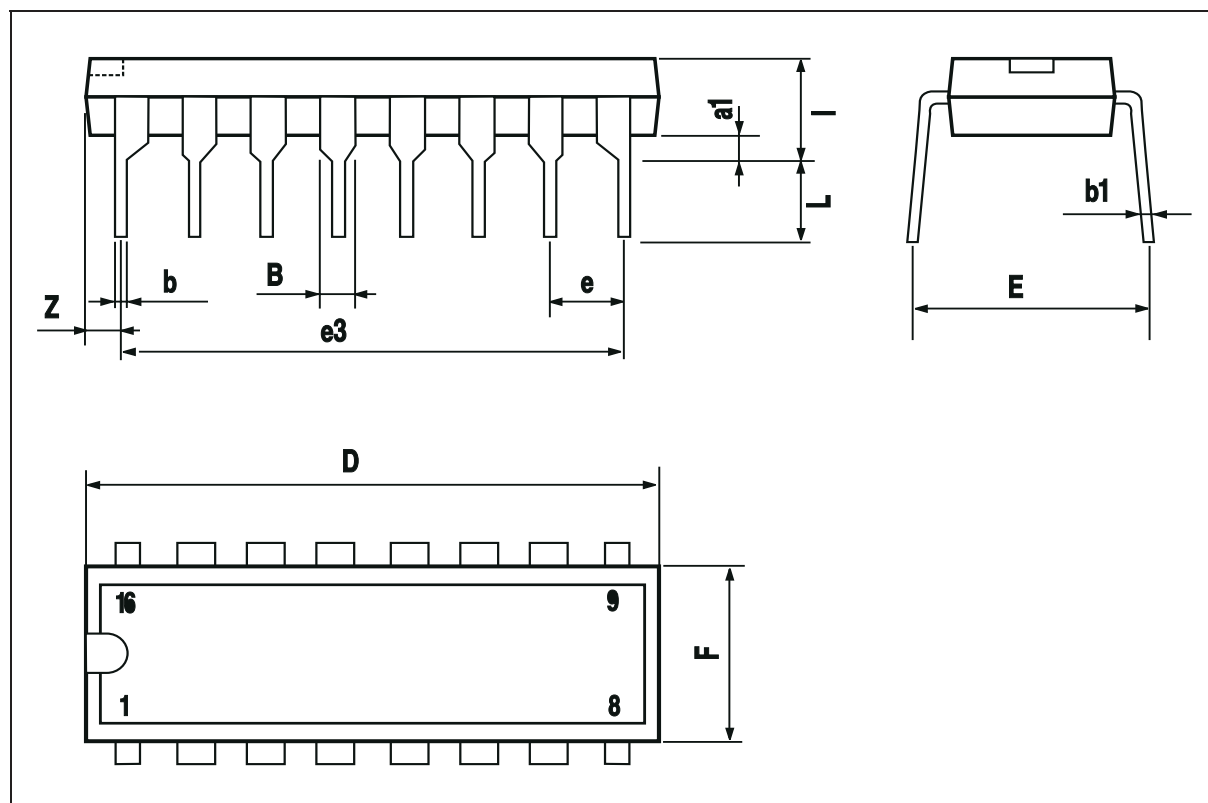


DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.85		1.40	0.033		0.055
b		0.50			0.020	
b1	0.38		0.50	0.015		0.020
D			20.0			0.787
E		8.80			0.346	
e		2.54			0.100	
e3		17.78			0.700	
F			7.10			0.280
I			5.10			0.201
L		3.30			0.130	
Z			1.27			0.050

OUTLINE AND MECHANICAL DATA



Powerdip 16



Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specification mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

The ST logo is a registered trademark of STMicroelectronics
© 2003 STMicroelectronics – Printed in Italy – All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - Canada - China - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States.
<http://www.st.com>