SGS-THOMSON MICROELECTRONICS

L293B
L293E

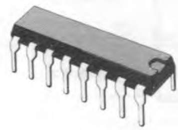
PUSH-PULL FOUR CHANNEL DRIVERS

- OUTPUT CURRENT 1A PER CHANNEL
- PEAK OUTPUT CURRENT 2A PER CHANNEL (NON REPETITIVE)
- INHIBIT FACILITY
- HIGH NOISE IMMUNITY
- SEPARATE LOGIC SUPPLY
- OVERTEMPERATURE PROTECTION

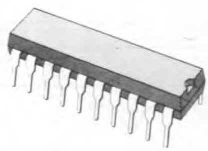
The L293B and L293E are quad push-pull drivers capable of delivering output currents to 1A per channel. Each channel is controlled by a TTL-compatible logic input and each pair of drivers (a full bridge) is equipped with an inhibit input which turns off all four transistors. A separate supply input is provided for the logic so that it may be run off a lower voltage to reduce dissipation.

Additionally, the L293E has external connection of sensing resistors, for switchmode control.

The L293B and L293E are packaged in 16 and 20-pin plastic DIPs respectively; both use the four center pins to conduct heat to the printed circuit board.



DIP-16 Plastic
(0.4)



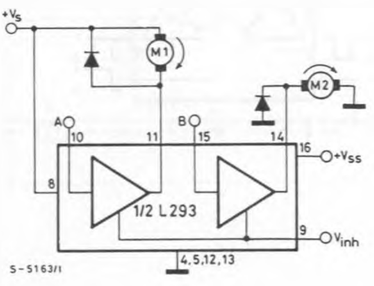
Powerdip
16+2+2

ORDERING NUMBERS: L293B (16 leads)
L293E (20 leads)

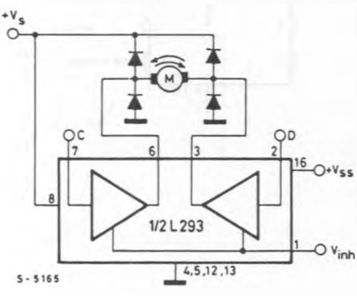
ABSOLUTE MAXIMUM RATINGS

V_s	Supply voltage	36	V
V_{ss}	Logic supply voltage	36	V
V_i	Input voltage	7	V
V_{inh}	Inhibit voltage	7	V
I_{out}	Peak output current (non-repetitive t = 5ms)	2	A
P_{tot}	Total power dissipation at $T_{ground-pins} = 80°C$	5	W
T_{stg}, T_j	Storage and junction temperature	-40 to 150	°C

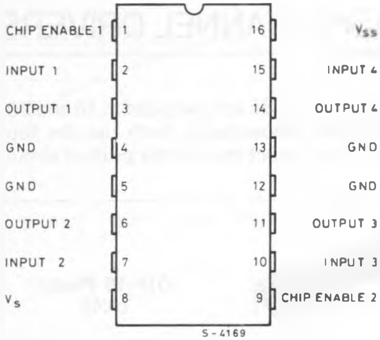
DC motor control

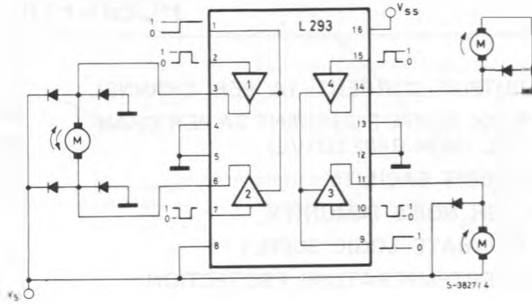


Bidirectional DC motor control

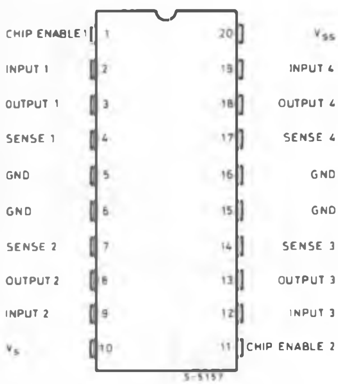


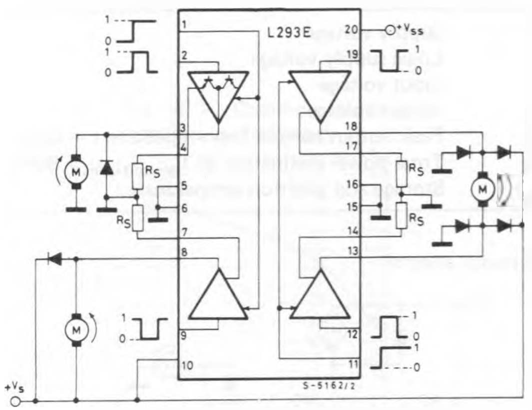
CONNECTION AND BLOCK DIAGRAM (L293)
(top view)



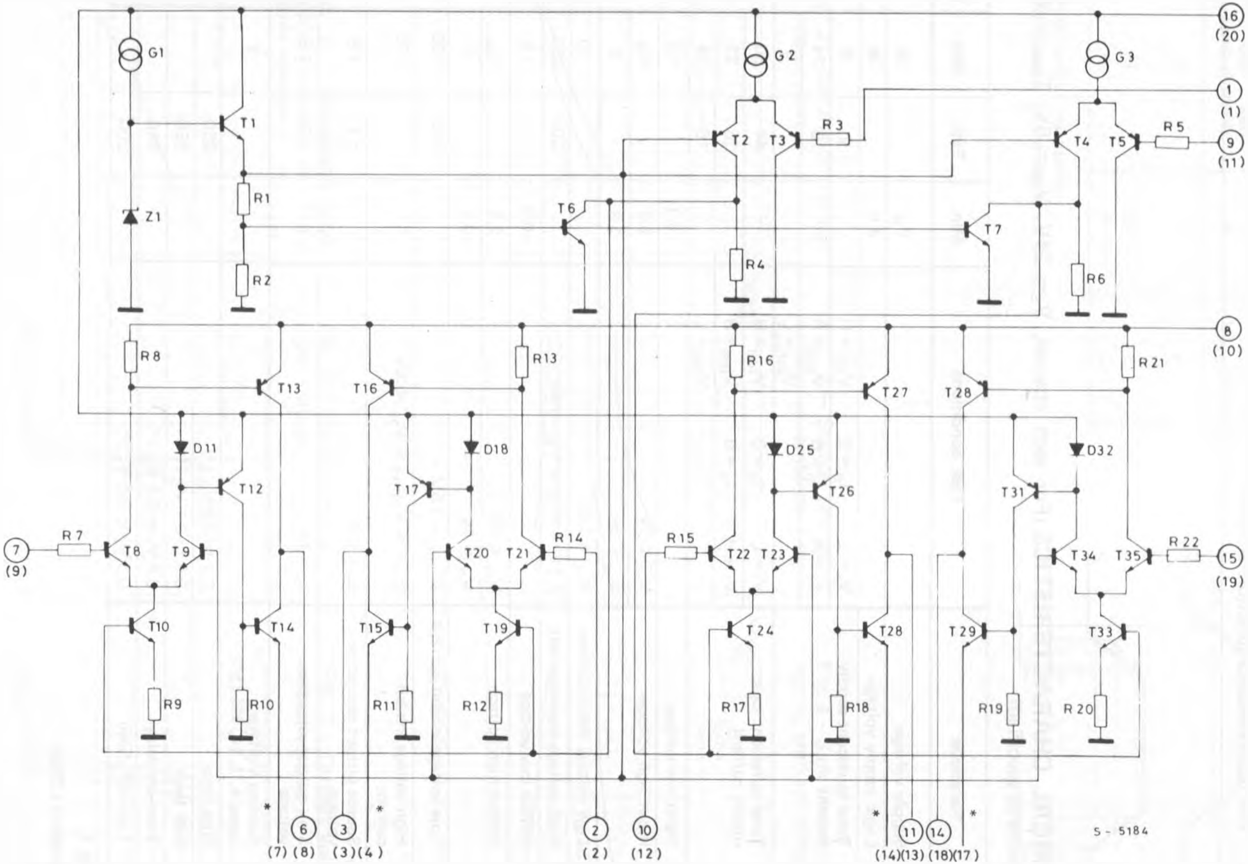


CONNECTION AND BLOCK DIAGRAM (L293E)
(top view)





SCHEMATIC DIAGRAM



(*) In the L293 these points are not externally available. They are internally connected to the ground (substrate).
○ Pins of L293 ( ) Pins of L293E

THERMAL DATA

$R_{th\ j\text{-}case}$	Thermal resistance junction-case	max	14	°C/W
$R_{th\ j\text{-}amb}$	Thermal resistance junction-ambient	max	80	°C/W

ELECTRICAL CHARACTERISTICS (For each channel, V_S = 24V, V_{SS} = 5V, T_{amb} = 25°C, unless otherwise specified)

Parameter		Test conditions	Min.	Typ.	Max.	Unit
V_s	Supply voltage		V_{ss}		36	V
V_{ss}	Logic supply voltage		4.5		36	V
I_s	Total quiescent supply current	V_i = L I_o = 0 V_{inh} = H		2	6	mA
		V_i = H I_o = 0 V_{inh} = H		16	24	
		V_{inh} = L			4	
I_{ss}	Total quiescent logic supply current	V_i = L I_o = 0 V_{inh} = H		44	60	mA
		V_i = H I_o = 0 V_{inh} = H		16	22	
		V_{inh} = L		16	24	
V_{iL}	Input low voltage		-0.3		1.5	V
V_{iH}	Input high voltage	$V_{ss} \leq 7V$	2.3		V_{ss}	V
		$V_{ss} > 7V$	2.3		7	
I_{iL}	Low voltage input current	V_{iL} = 1.5V			-10	μA
I_{iH}	High voltage input current	$2.3V \leq V_{iH} \leq V_{ss}$ -0.6V		30	100	μA
V_{inhL}	Inhibit low voltage		-0.3		1.5	V
V_{inhH}	Inhibit high voltage	$V_{ss} \leq 7V$	2.3		V_{ss}	V
		$V_{ss} > 7V$	2.3		7	
I_{inhL}	Low voltage inhibit current	V_{inhL} = 1.5V		-30	-100	μA
I_{inhH}	High voltage inhibit current	$2.3V \leq V_{inhH} \leq V_{ss}$ -0.6V			± 10	μA
V_{CEsatH}	Source output saturation voltage	I_o = -1A		1.4	1.8	V
V_{CEsatL}	Sink output saturation voltage	I_o = 1A		1.2	1.8	V
V_{SENS}	Sensing Voltage (pins 4, 7, 14, 17) (**)				2	V
t_r	Rise time	0.1 to 0.9 V_o (*)		250		ns
t_f	Fall time	0.9 to 0.1 V_o (*)		250		ns
t_{on}	Turn-on delay	0.5 V_i to 0.5 V_o (*)		750		ns
t_{off}	Turn-off delay	0.5 V_i to 0.5 V_o (*)		200		ns

(*) See fig. 1.

(**) Referred to L293E.

TRUTH TABLE

V_I (each channel)	V_O	$V_{inh.}$ (°°)
H	H	H
L	L	H
H	X (°)	L
L	X (°)	L

(°) High output impedance.
(°°) Relative to the considerate channel.

Fig. 1 - Switching times

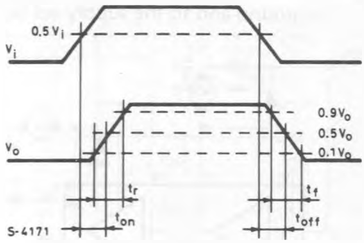


Fig. 2 - Saturation voltage vs. output current

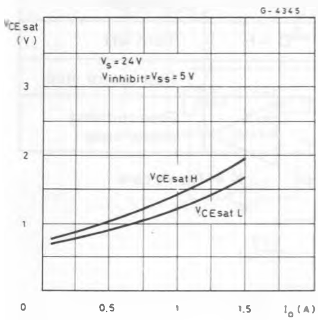


Fig. 3 - Source saturation voltage vs. ambient temperature

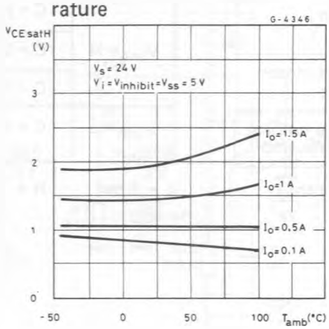


Fig. 4 - Sink saturation voltage vs. ambient temperature

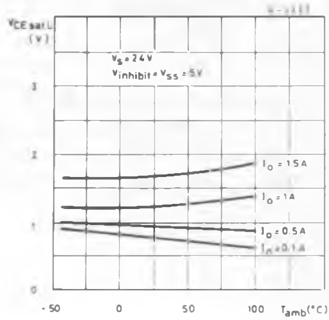


Fig. 5 - Quiescent logic supply current vs. logic supply voltage

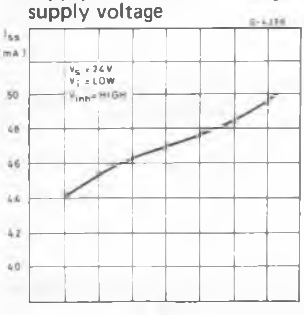


Fig. 6 - Output voltage vs. input voltage

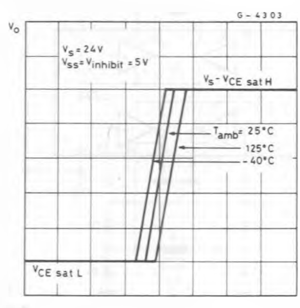
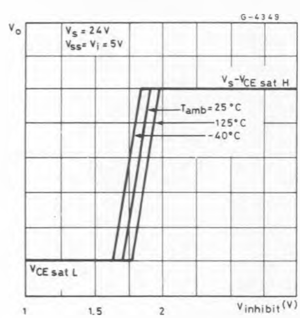


Fig. 7 - Output voltage vs. inhibit voltage



APPLICATION INFORMATION

Fig. 8 - DC motor controls (with connection to ground and to the supply voltage)

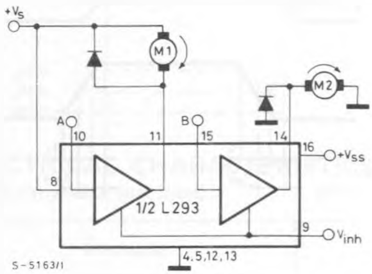
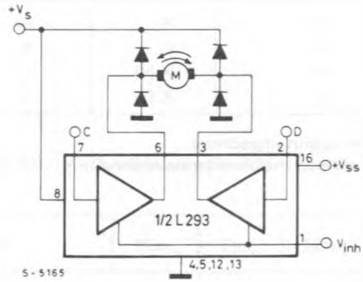


Fig. 9 - Bidirectional DC motor control



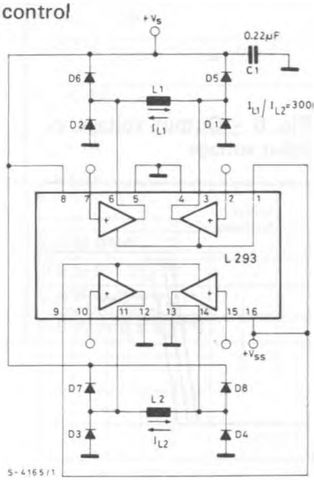
V_{inh}	A	M1	B	M2
H	H	Fast motor stop	H	Run
H	L	Run	L	Fast motor stop
L	X	Free running motor stop	X	Free running motor stop

L = Low H = High X = Don't care

INPUTS		FUNCTION
V_{inh} = H	C = H; D = L	Turn right
	C = L; D = H	Turn left
	C = D	Fast motor stop
V_{inh} = L	C = X; D = X	Free running motor stop

L = Low H = High X = Don't care

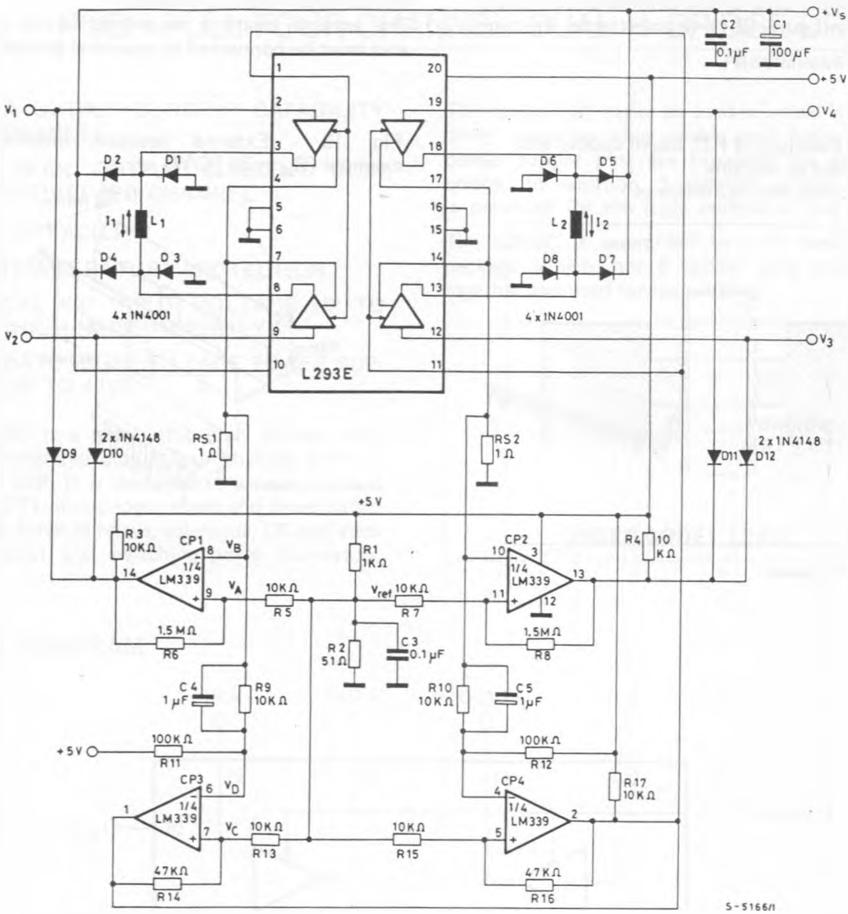
Fig. 10 - Bipolar stepping motor control



D1 - D8 = { $V_F \leq 1.2V$ @ I = 300 mA; trr $\leq$ 500 ns

APPLICATION INFORMATION (continued)

Fig. 11 - Stepping motor driver with phase current control and short circuit protection



D1 to D8 : $V_F \leq 1.2V$ @ $I = 300$ mA
trr $\leq$ 200 ns

MOUNTING INSTRUCTIONS

The $R_{th\ j\text{-}amb}$ of the L293 and the L293E can be reduced by soldering the GND pins to a suitable copper area of the printed circuit board as shown in figure 12 or to an external heatsink (figure 13).

During soldering the pins temperature must not exceed 260°C and the soldering time must not be longer than 12 seconds.

The external heatsink or printed circuit copper area must be connected to electrical ground.

Fig. 12 - Example of P.C. board copper area which is used as heatsink

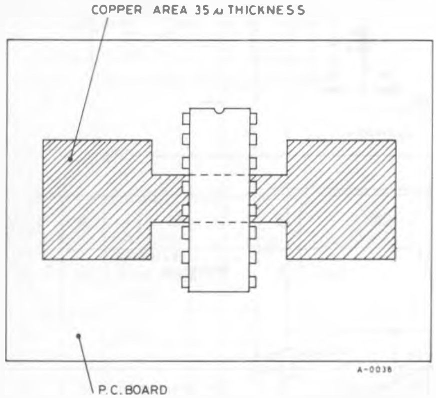


Fig. 13 - External heatsink mounting example (R_{th} = 30 °C/W)