INTEGRATED POWER SEMICONDUCTORS, LTD.

Push-Pull Four Channel Driver

Description

The IP293 is a quad push-pull driver capable of delivering output currents to 1 ampere per channel. Each channel is controlled by a TTL compatible logic input and each full-bridge driver is equipped with an enable input for a high impedance output state. A seperate supply input allows the logic to be operated at lower voltages to reduce power dissipation.

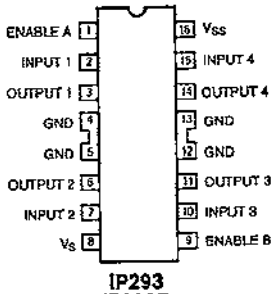
The IP293 is packaged in a plastic power DIP which uses the four center pins to conduct heat to the printed circuit board.

Features

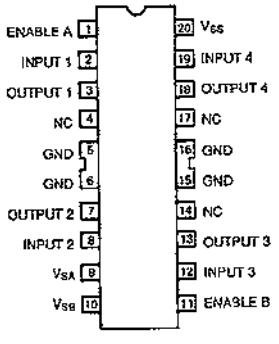
- 1 ampere continuous output current per channel
- 2 ampere peak non-repetitive output current per channel
- Enable facility for dual full-bridge configuration
- TTL compatible logic inputs
- High noise immunity
- Separate logic supply
- Thermal shutdown protection
- Cross-over current protection
- Internal output clamp diodes (IP293D & IP293DA)
- External current sense (IP293E)

Connections

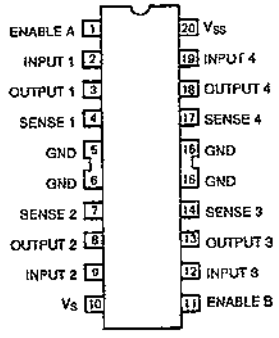
Top View



IP293
IP293D
IP293DA



IP293C
N Package



IP293E

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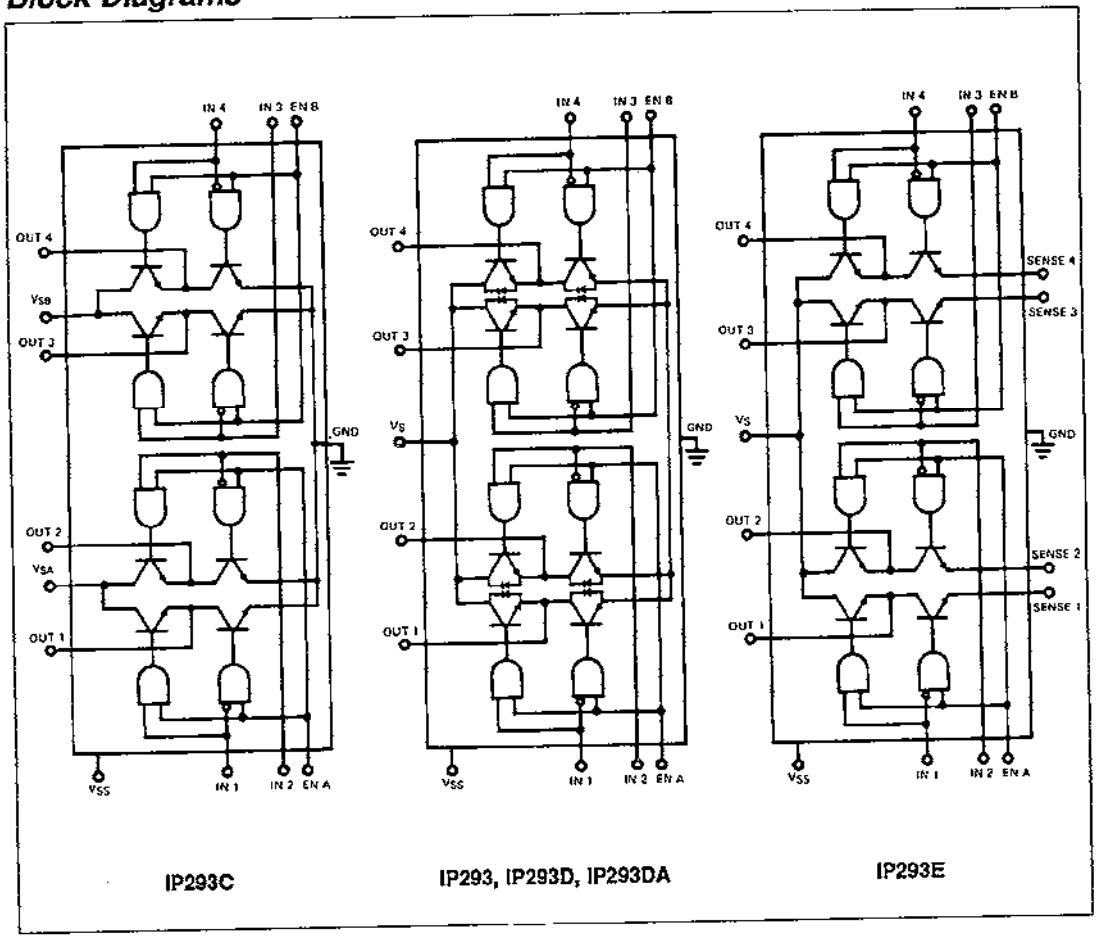
Absolute Maximum Ratings

Supply Voltage	36V	**Junction Temperature**	150°C
Logic Supply Voltage	36V	**Storage Temperature**	-40°C to +150°C
Peak Non-repetitive Output Current ($t \leq 5ms$)	2A	**Continuous Output Current**	
		IP293	1A
		IP293E	1A
Operating Ambient Temperature	0°C to +70°C	IP293D	600mA
		IP293DA	1A
		IP293C	600mA

Absolute maximum ratings are those values beyond which the safety of the device cannot be guaranteed. They are not meant to imply that the device should be operated at these limits. The electrical characteristics provide conditions for actual device operation.

Block Diagrams



IP293C IP293, IP293D, IP293DA IP293E

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Electrical Characteristics

V_S = 24V, V_{SS} = 5V

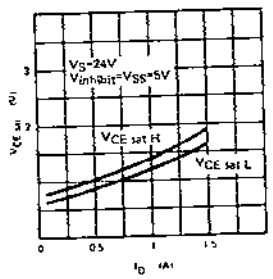
Parameter	Test Conditions		Min	Typ	Max	Units
Supply Voltage		•			36	V
Logic Supply Voltage		•	4.5		36	V
Quiescent Supply Current (per channel)	V_{IN} = L V_{EN} = H I_O = 0	•		2	6	mA
	V_{IN} = H V_{EN} = H I_O = 0	•		10	15	mA
	V_{EN} = L	•			1	mA
Quiescent Logic Supply Current		•		3	6	mA
Logic Input Low Voltage		•	-0.3		0.8	V
Logic Input High Voltage		•	2.0		V_S	V
Logic Input Low Current	Logic Input Voltage ≤ V_{IL} MAX	•		-50	-100	µA
Logic Input High Current	Logic Input Voltage ≥ V_{IH} MIN	•			10	µA
Source Output Saturation Voltage	I_O = I_{MAX} CONTINUOUS	•		1.4	1.8	V
Sink Output Saturation Voltage	I_O = I_{MAX} CONTINUOUS	•		1.2	1.8	V
Diode Forward Voltage	I_D = 1A (IP293DA)	•		1.3	1.8	V
	I_D = 0.6A (IP293D)	•		1.1	1.8	V
External Sense Voltage (IP293E) Note 1		•			2	V

The • denotes the specifications which apply over the full operating ambient temperature range, all others apply at T_A = 25°C unless otherwise specified.

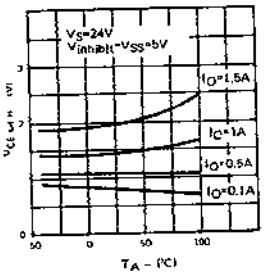
Note 1. For Logic supply voltages (V_{SS}) < 5 volts, maximum recommended external sense voltage (V_{SENSE}) should not exceed 1.5 volts.

Performance Characteristics

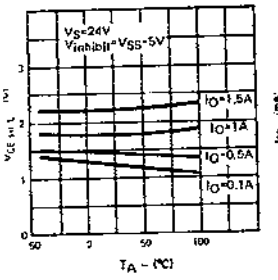
Saturation Voltage vs Output Current



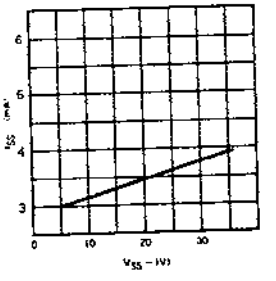
Source Saturation vs Ambient Temperature



Sink Saturation vs Ambient Temperature



Quiescent Logic Supply Current vs Logic Supply Voltage



Switching Characteristics

V_S = 24V, V_{SS} = 5V, f_c = 30 kHz, T_A = 25°C

Parameter	Min	Typ	Max	Unit
Sink Current Turn-on Delay		2000		ns
Sink Current Rise Time		200		ns
Sink Current Turn-off Delay		600		ns
Sink Current Fall Time		200		ns
Source Current Turn-on Delay		2000		ns
Source Current Rise Time		600		ns
Source Current Turn-off Delay		700		ns
Source Current Fall Time		400		ns
Sink to Source Deadtime	0	1000		ns
Source to Sink Deadtime	0	1000		ns

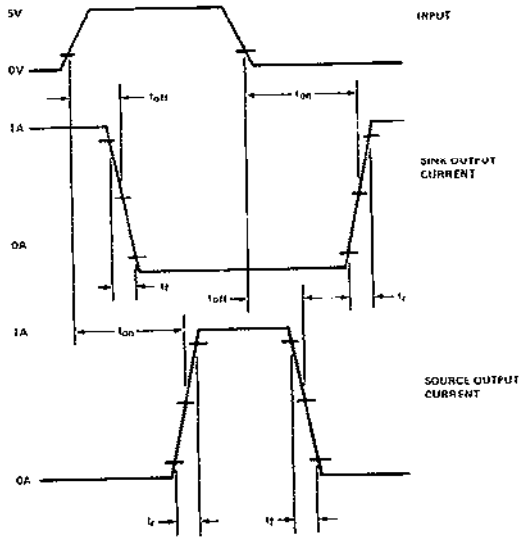
(Note: Switching times apply for resistive loads only)

(per channel)

INPUT	ENABLE*	OUTPUT
H	H	H
L	H	L
H	L	Z
L	L	Z

*relative to the considered channel

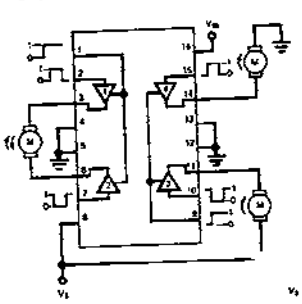
Z = High impedance



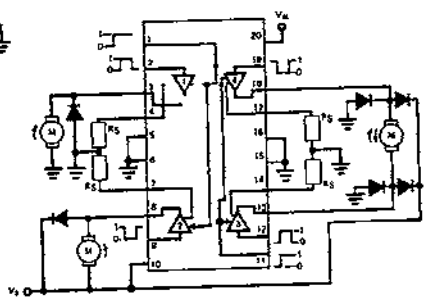
$t_{d1} = (t_{on} - t_r/2)_{source} - (t_{off} + t_f/2)_{sink}$

$t_{d2} = (t_{on} - t_r/2)_{sink} - (t_{off} + t_f/2)_{source}$

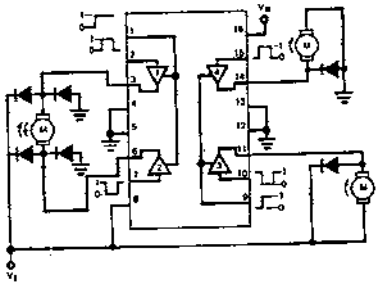
Applications Information



IP293D, IP293DA

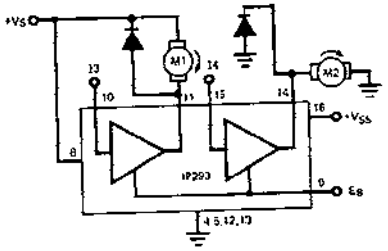


IP293E



IP293

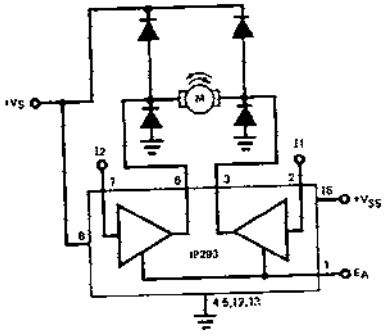
DC motor controls (with connection to ground and to the supply voltage)



E_B	I3	M1	I4	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

Bidirectional DC motor control



INPUTS		FUNCTION
E_A = H	I_2 = H; I_1 = L	Turn Right
	I_1 = L; I_2 = H	Turn Left
	I_1 = I_2	Fast Motor Stop
E_A = L	I_1 = X; I_2 = X	Free Running Motor Stop

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

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Mounting Instructions

The $R_{\Theta JA}$ of the IP293D can be reduced by soldering the GND pins to a suitable copper area of the printed circuit board or to an external heatsink.

The diagram of Figure 3 shows the maximum package power P_{tot} and the Θ_{JA} as a function of the side "λ" of two equal square copper areas having a thickness of 35µ (see figure 1).

In addition, it is possible to use an external heatsink (see figure 2).

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.

Figure 1 - Example of P.C. Board Copper Area which is used as Heatsink

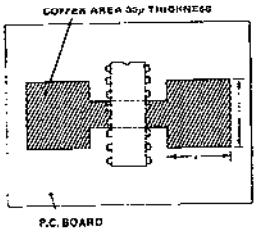


Figure 2 - External Heatsink Mounting Example (θ_{JA} = 25°C/W)

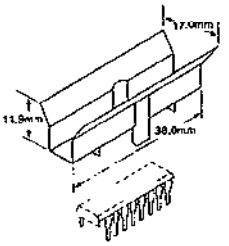


Figure 3 - Maximum Package Power and Junction to Ambient Thermal Resistance vs Size "λ"

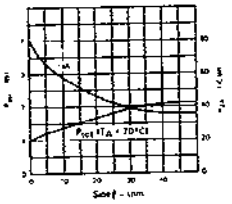
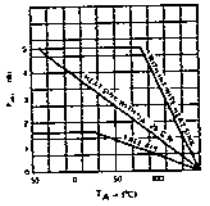


Figure 4 - Maximum Allowable Power Dissipation vs Ambient Temperature



THERMAL DATA

R θJC ..... MAX 14° C/W

R θJA ..... MAX 80° C/W

Order Information

Part Number	Temperature	Package
IP293N	0°C to +70°C	16 Pin Plastic DIP
IP293EN	0°C to +70°C	20 Pin Plastic DIP
IP293DN	0°C to +70°C	16 Pin Plastic DIP
IP293DAN	0°C to +70°C	16 Pin Plastic DIP
IP293CN	0°C to +70°C	20 Pin Plastic DIP

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