HX293E-P Push-pull four-channel drive

Description

The HX293E-P is a quad push-pull driver designed to deliver robust output currents up to 1A per channel. Each channel is independently controlled by a TTL-compatible logic input, ensuring precise and reliable operation. Furthermore, each pair of drivers (forming a full bridge) is equipped with an inhibit input, which serves as a master switch to deactivate all four transistors simultaneously. This feature provides enhanced control and safety in various applications.

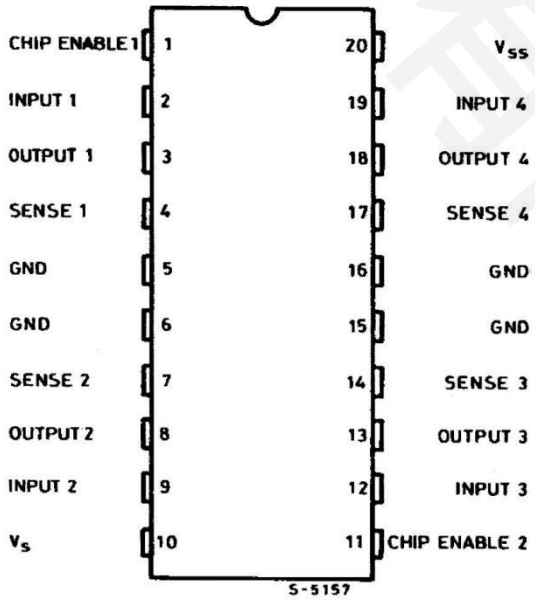
To optimize performance and reduce power consumption, the HX293E-P incorporates a separate supply input for the logic circuitry. This allows the logic to operate at a lower voltage, thereby minimizing dissipation and heat generation. Additionally, the device offers convenient external connections through its PIN CONNECTION layout (viewed from the top), making it easier to integrate into existing systems and circuits.

In summary, the HX293E-P is a versatile and efficient quad push-pull driver with advanced control features, making it suitable for a wide range of electronic applications.

Applications

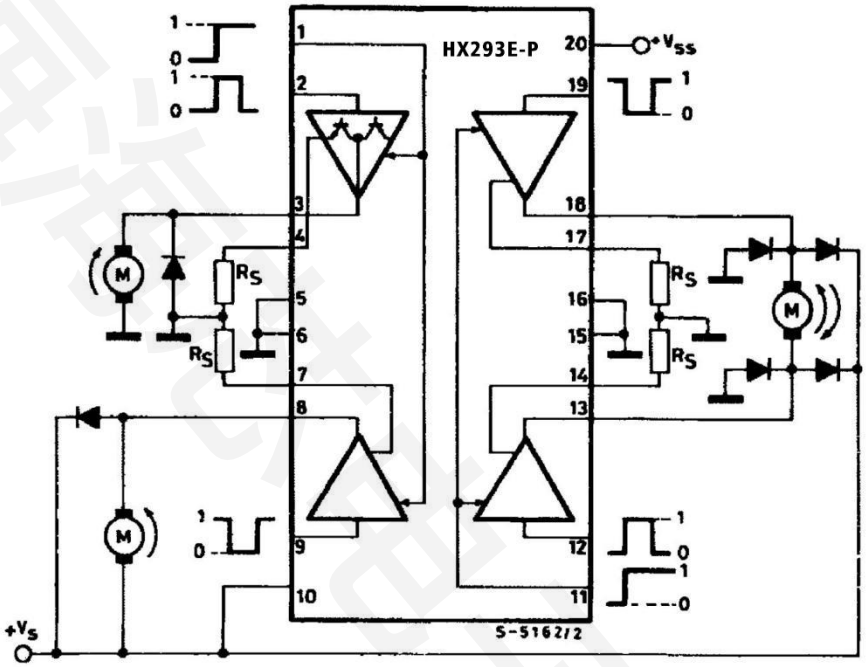
- ★ OUTPUT CURRENT 1A PER CHANNEL
- ★ PEAK OUTPUT CURRENT 2A PER CHANNEL (non repetitive)
- ★ INHIBIT FACILITY
- ★ HIGH NOISE IMMUNITY
- ★ SEPARATE LOGIC SUPPLY
- ★ OVERTEMPERATURE PROTECTION

POWERDIP (16+2+2) - HX293E-P

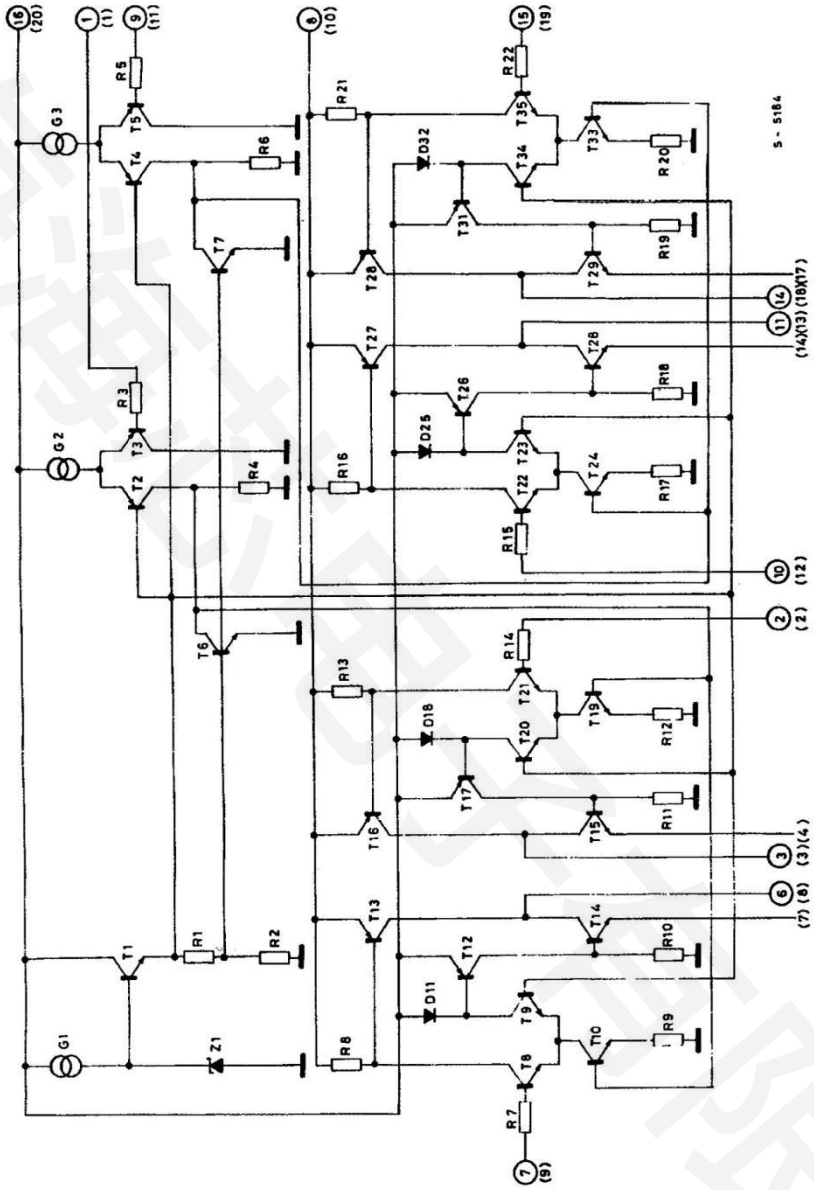


BLOCK DIAGRAMS

POWERDIP (16+2+2) - HX293E-P



SCHEMATIC DIAGRAM



(*) In the HX293E-P these points are not externally available. They are internally connected to the ground (substrate).

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
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 $T_{ground\text{-}pins}$ = 80°C	5	W
T_{stg}, T_j	Storage and Junction Temperature	–40 to +150	°C

THERMAL DATA

Symbol	Parameter		Value	Unit
$R_{th\ j\text{-}case}$	Thermal Resistance Junction-case	Max.	14	°C/W
$R_{th\ j\text{-}amb}$	Thermal Resistance Junction-ambient	Max.	80	°C/W

ELECTRICAL CHARACTERISTCS

Symbol	Parameter	Test Condition	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	mA
		V_{inh} = L			4	mA
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	mA
		V_{inh} = L		16	24	mA
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	V
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	V
I_{inhL}	Low Voltage Inhibit Current	V_{inhL} = 1.5V		-30	-100	μA
I_{inhH}	High Voltage Inhibit Current	$2.3V \leq V_{inhH} \leq$ Vss- 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 figure 1

** Referred to HX293E-P

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

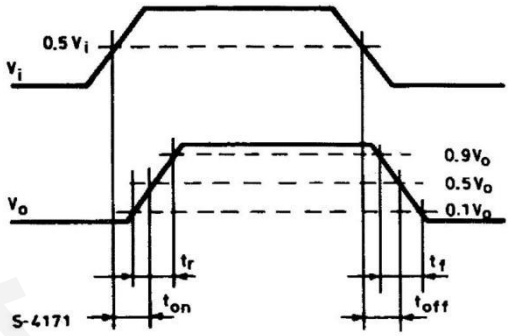


Figure 1. Switching Timers

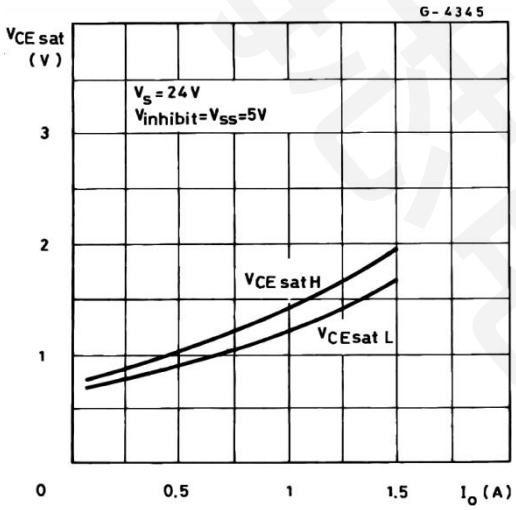


Figure 2. Saturation voltage versus Output Current

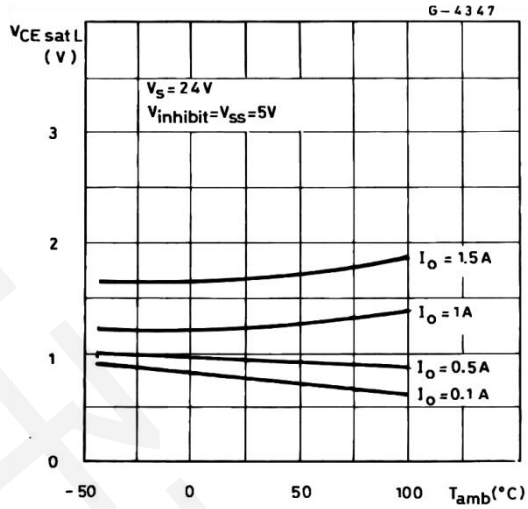


Figure 4. Sink Saturation Voltage versus Ambient Temperature

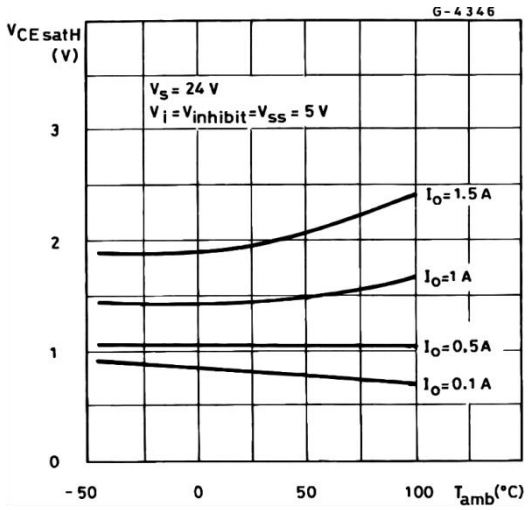


Figure 3. Source Saturation Voltage versus Ambient Temperature

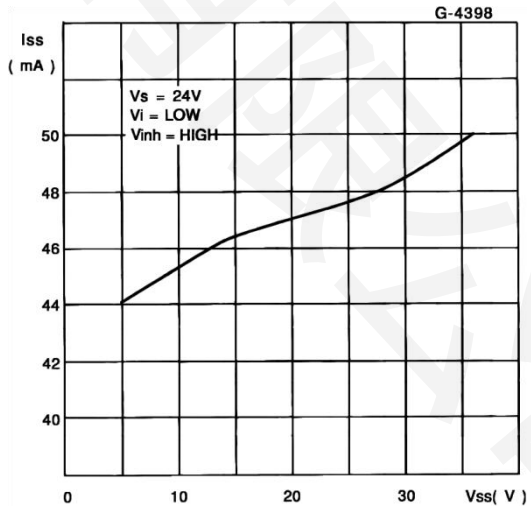


Figure 5. Quiescent Logic Supply Current versus Logic Supply Voltage

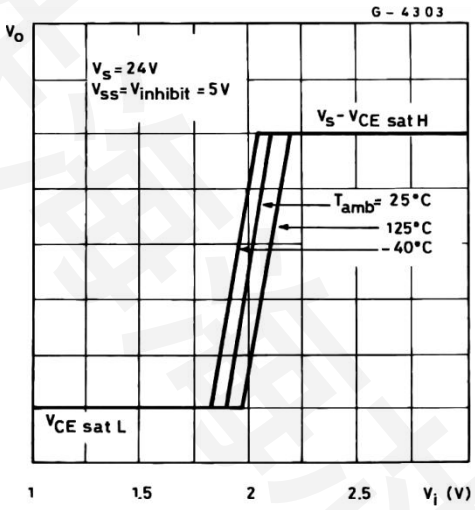


Figure 6. Output Voltage versus Input Voltage

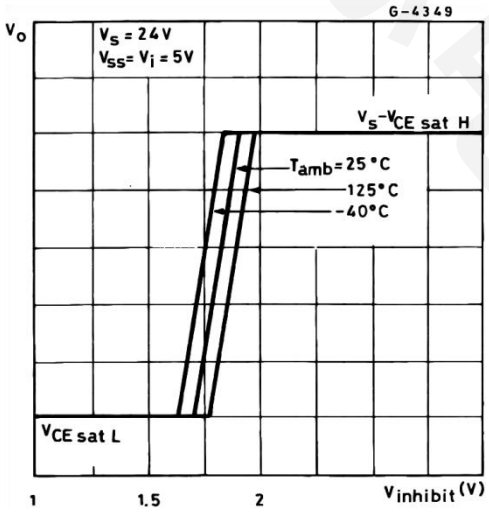


Figure 7. Output Voltage versus Inhibit Voltage

APPLICATION INFORMATION

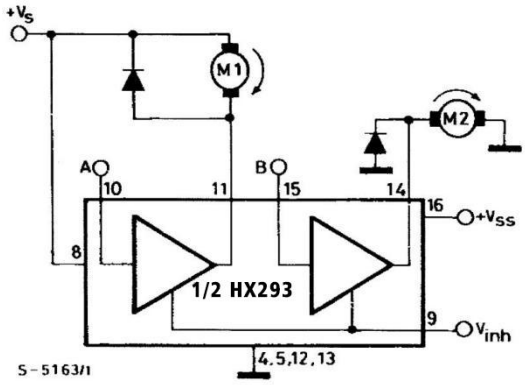


Figure 8. DC Motor Controls
(with connection to ground and to the supply voltage)

V_{inh}	A	M1	B	M2
H	H	Fast Motor Stop	H	Run
H	L	Run	L	Fast Motor Stop
L	X	Free Running	X	Free Running
		Motor Stop		Motor Stop

H = High X = Don't Care

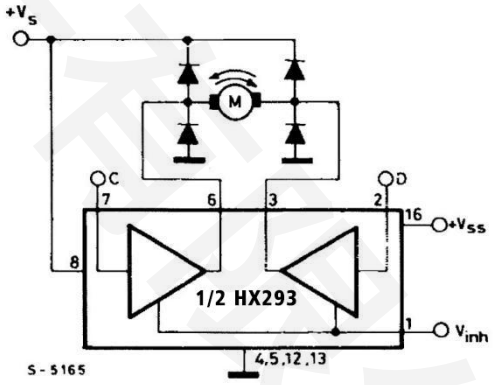


Figure9.BidirectionalDCMotorControl

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

High X = Don't Care

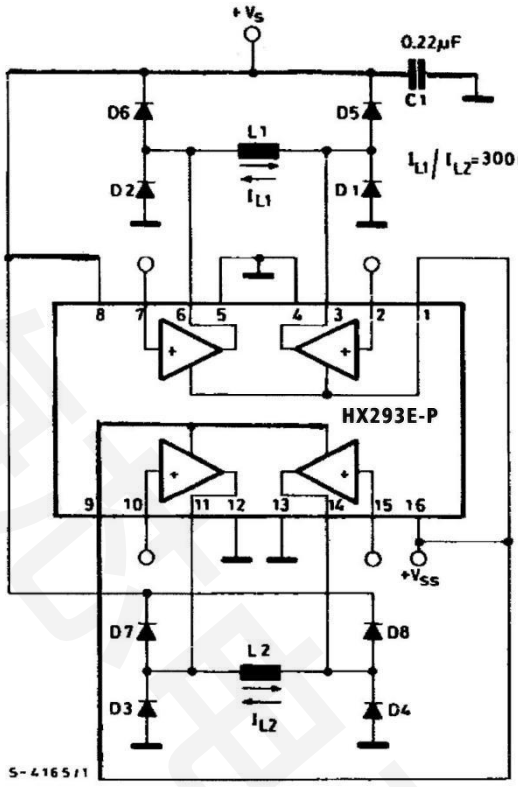


Figure 10. Bipolar Stepping Motor Control

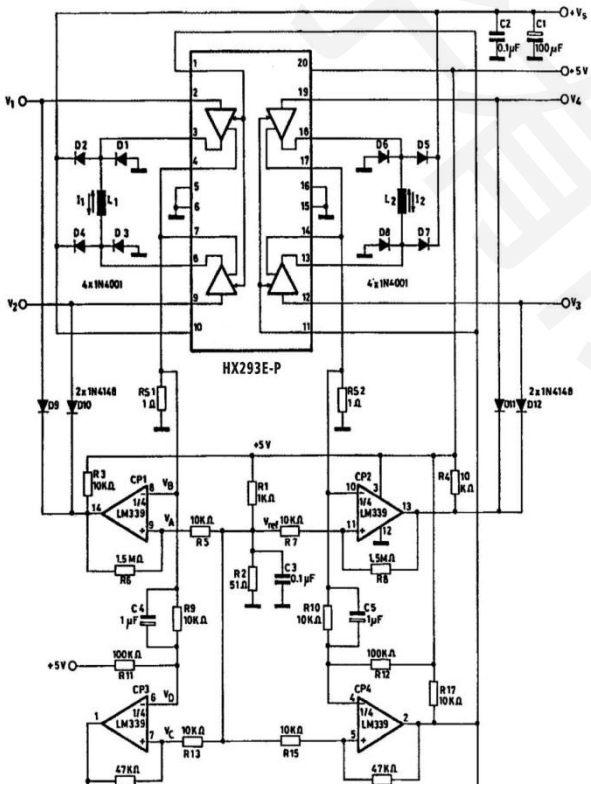


Figure 11. Stepping Motor Driver with Phase Current Control and Short Circuit Protection

MOUNTING INSTRUCTIONS

The $R_{th\ j\text{-}amb}$ of the HX293E-P 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.

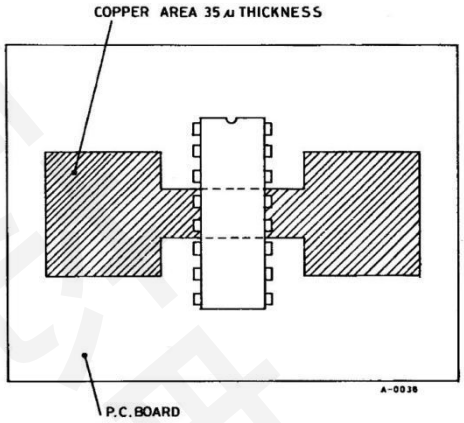


Figure 12. Example of P.C. Board Copper Area which is Used as Heatsink

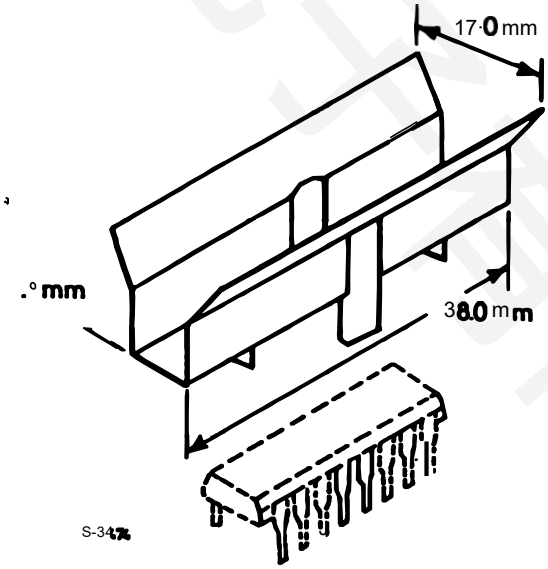
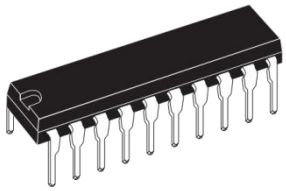


Figure 13. External Heatsink Mounting Example (R_{th} = 30°C/W)

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			24.80			0.976
E		8.80			0.346	
e		2.54			0.100	
e3		22.86			0.900	
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 20