

2A H-Bridge Driver

Description

The CS3720 is high current (2A typ) bidirectional DC motor driver. The H-bridge output stage consists of two pairs of power NPN transistors, each with a $V_{SAT}=2.3V$ at $I_{OUT}=2A$ (typ).

The three TTL compatible inputs, **ENABLE1**, **ENABLE2**, and **DIRECTION** control the output stage. When **ENABLE1** is low and

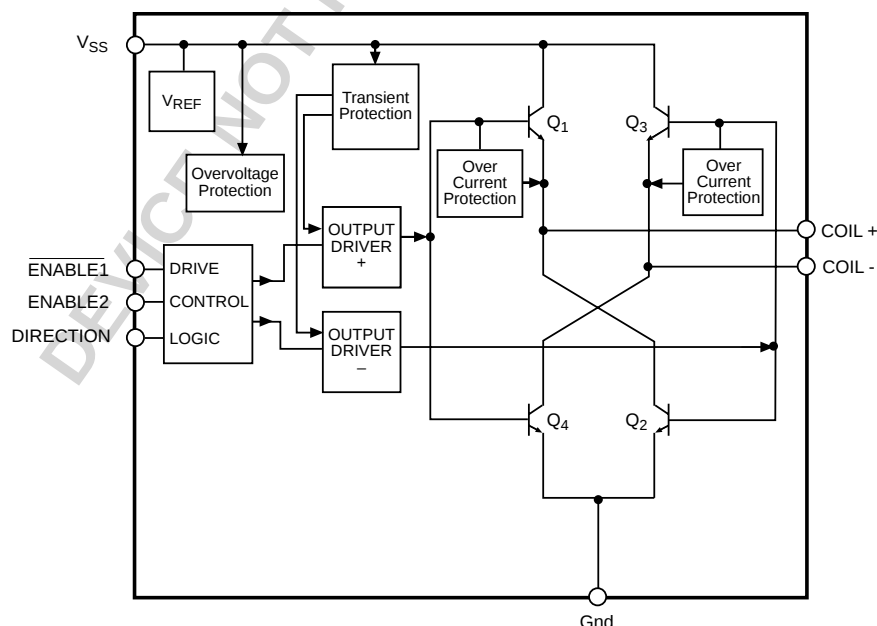
ENABLE2 is high, **DIRECTION** determines which way current flows through the motor coil. Any other combination of **ENABLE** settings disables the outputs.

The CS3720 is protected against overvoltage fault conditions. If a fault condition is detected, the IC shuts down.

Absolute Maximum Ratings

DC Input Voltage	-0.3 to 28V
Transient Input Voltage	-0.3 to 74V
Internal Power Dissipation.....	Internally limited
Junction Temperature Range	-40°C to +150°C
Storage Temperature Range.....	-65°C to +150°C
Lead Temperature Soldering	
Wave Solder (through hole styles only)	10 sec. max, 260°C peak
Reflow (SMD styles only)	60 sec. max above 183°C, 230°C peak
Electrostatic Discharge (Human Body Model).....	2kV

Block Diagram

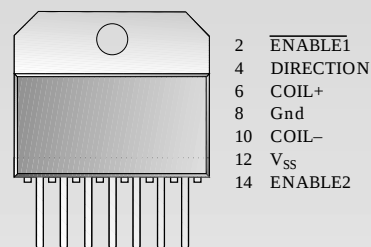


Features

- **High Current (2A typ) Output**
- **TTL compatible DIRECTION Control**
- **Fault Protection**
Overvoltage
Load Dump Protection to 74V

Package Options

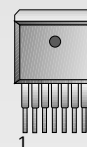
7 Lead Power SIP



7 Lead TO-220



7 Lead D²PAK



Electrical Characteristics: $5.5V \leq V_{CC} \leq 17V$; $-40^{\circ}C \leq T_J \leq +150^{\circ}C$; $-40^{\circ}C \leq T_C \leq +105^{\circ}C$; $-40^{\circ}C \leq T_A \leq 105^{\circ}C$; unless otherwise specified.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
■ Output Stage					
Quiescent Current	$I_{OUT} = 0mA$; $\overline{ENABLE1} = \text{DIRECTION} = \text{High}$ $ENABLE2 = \text{Low}$			10	mA
Output Saturation Voltage	$I_{OUT} = 2A$			3.2	V
	$I_{OUT} = 500mA$			2.6	V
Output Leakage Current	$I_{OUT} = 0mA$			20	μA
Current Limit			3.0		A

■ Logic Control Functions

High Level Input Voltage		2.0			V
Low Level Input Voltage				0.8	V
High Level Input Current				10	μA
Low Level Input Current		-250			μA
Turn on Delay Guaranteed by design	$R_{LOAD} = 30\Omega$; Coil = 5mH; $C_{LOAD} = 15pF$		5	50	μs
Turn off Delay Guaranteed by design	$R_{LOAD} = 30\Omega$; Coil = 5mH; $C_{LOAD} = 15pF$		5	50	μs

■ Fault Protection Functions

Overvoltage Shutdown	$I_{OUT} = 500mA$	18.0		21.5	V
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Package Lead Description

PACKAGE LEAD#			LEAD SYMBOL	FUNCTION
15 Lead Power SIP	7 Lead TO-220	7 Lead D ² PAK		
2	1	1	$\overline{ENABLE1}$	Enables output when held low and $ENABLE2 = \text{High}$
4	2	2	DIRECTION	Determines the direction of current flow through COIL+ and COIL- as long as $\overline{ENABLE1} = \text{Low}$ and $ENABLE2 = \text{High}$
6	3	3	COIL+	Positive Output of H bridge to coil
8	4	4	Gnd	Ground connection
12	5	5	V_{SS}	Supply voltage for IC
10	6	6	COIL-	Negative Output of H bridge to coil
14	7	7	ENABLE2	Enables output when held high and $\overline{ENABLE1} = \text{Low}$

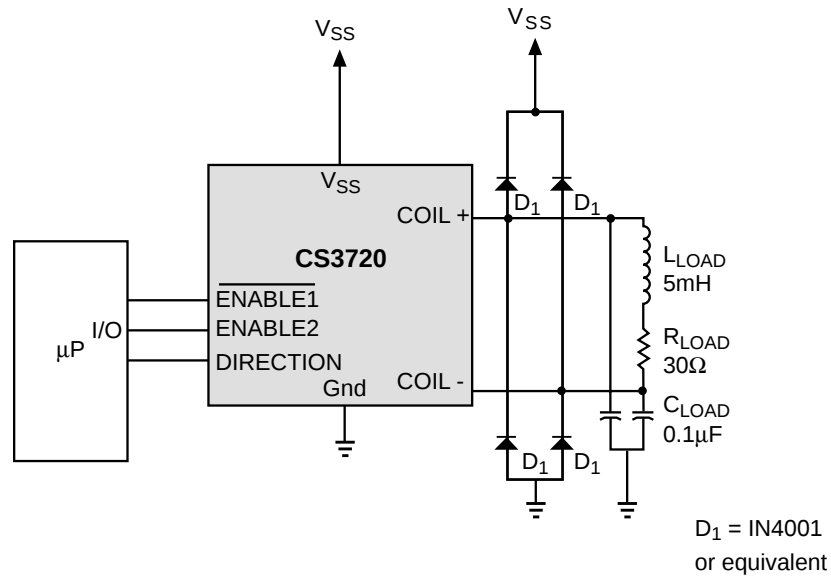
Application Hints

Motor Direction Control

Current flow through the two outputs COIL+ and COIL- is controlled by the combined settings of $\overline{ENABLE1}$, $ENABLE2$ and DIRECTION (Table 1). The outputs will be active only when $\overline{ENABLE1}$ is low and $ENABLE2$ is high. When DIRECTION is high, current flows out of COIL+ and into COIL-. When DIRECTION is low, current flows out of COIL- and into COIL+. For any other combination of ENABLE settings, the outputs are off.

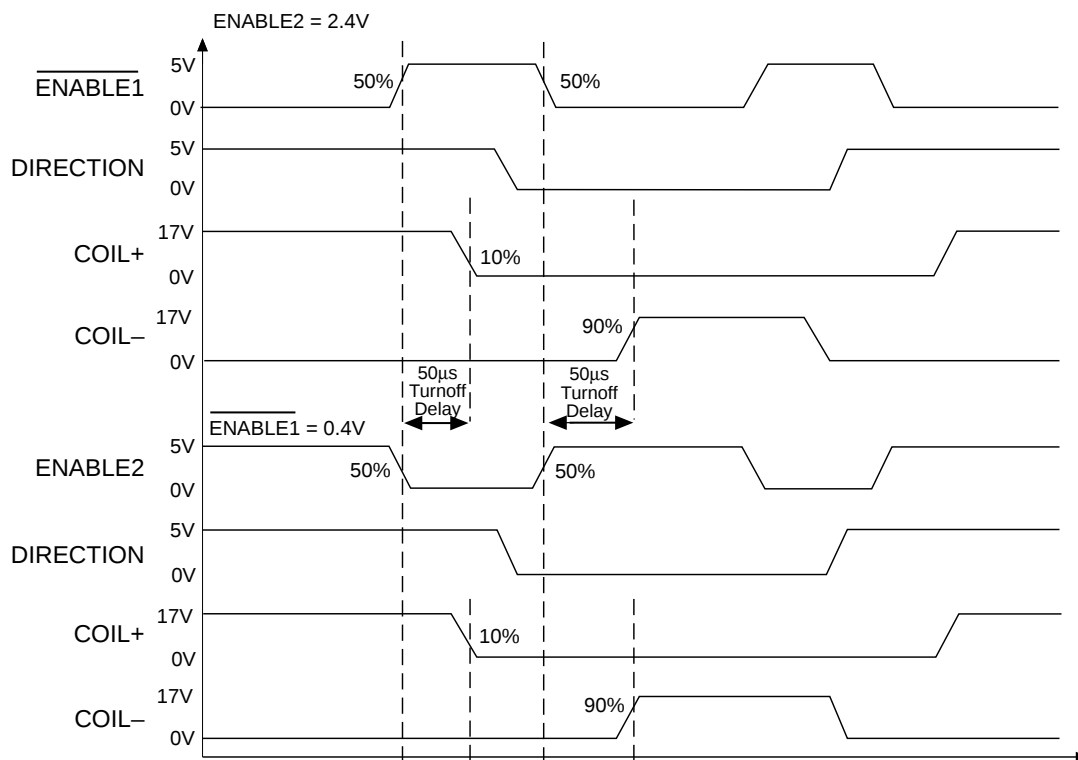
$\overline{ENABLE1}$	ENABLE2	DIRECTION	COIL+	COIL-
Low	High	High	High	Low
Low	High	Low	Low	High
High	X	X	OFF	OFF
X	Low	X	OFF	OFF

Table 1. Logical Control Diagram

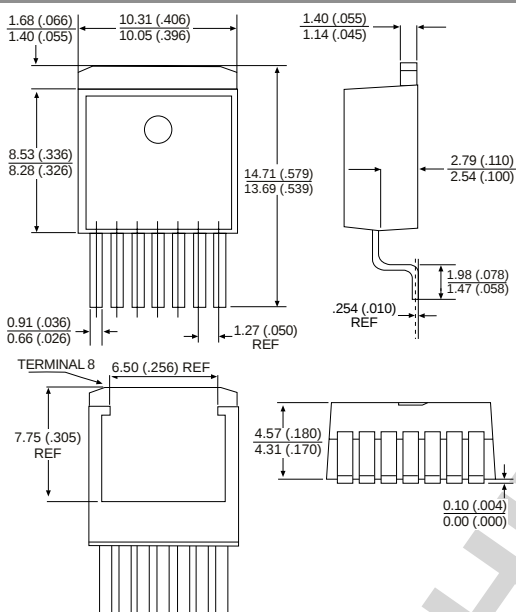


Note: A heatsink is required for 2A operation.

Figure 1. Delay Times for ENABLE and COIL

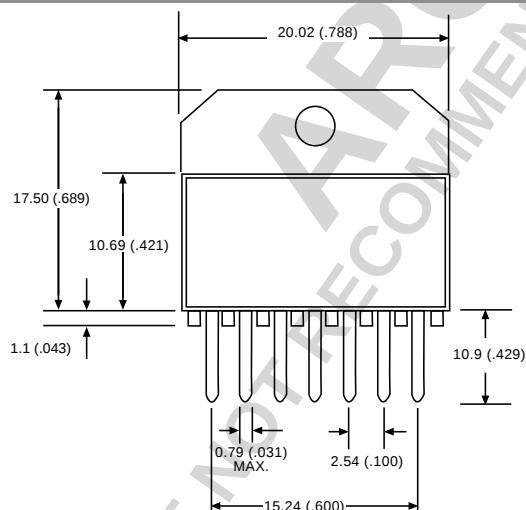


PACKAGE DIMENSIONS IN mm (INCHES)

7 Lead D²PAK (DPS)* Short-Leaded

*ON SEMICONDUCTOR SHORT-LEADED FOOTPRINT

7 Lead Power SIP (M) Straight

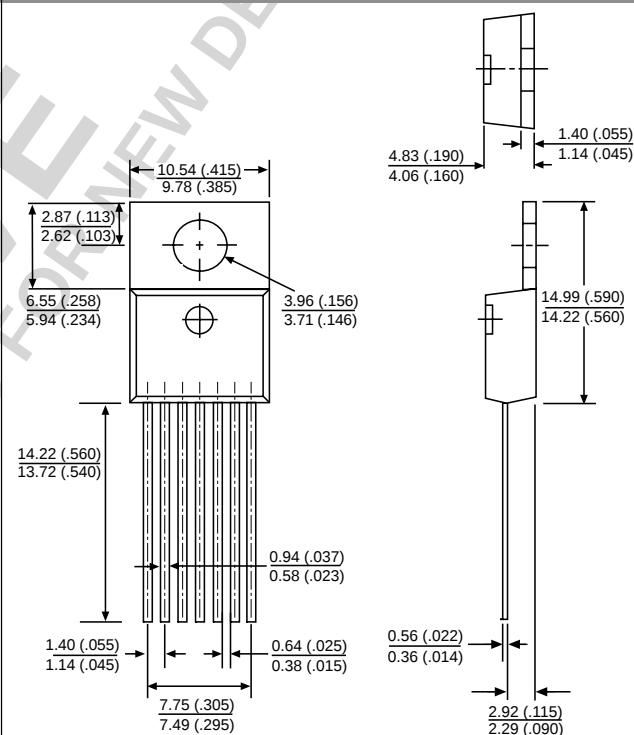


PACKAGE THERMAL DATA

Thermal Data	7L D ² PAK	7L TO-220	7L Power SIP	
$R_{\theta JC}$ typ	2.1	2.1	2.1	°C / W
$R_{\theta JA}$ typ	10-50*	50	35	°C / W

*Depending on thermal properties of substrate. $R_{\theta JA} = R_{\theta JC} + R_{\theta CA}$.

7 Lead TO-220 (T) Straight



Ordering Information

Part Number	Description
CS3720XT7	7 Lead TO-220 Straight
CS3720XTVA7	7 Lead TO-220 Vertical
CS3720XTHA7	7 Lead TO-220 Horizontal
CS3720XM7	7 Lead Power SIP Straight
CS3720XDPS7	7 Lead D ² PAK Short-Leaded
CS3720XDPSR7	7 Lead D ² PAK Short-Leaded (tape & reel)

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