AUTOMOTIVE GRADE

CS3720

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).

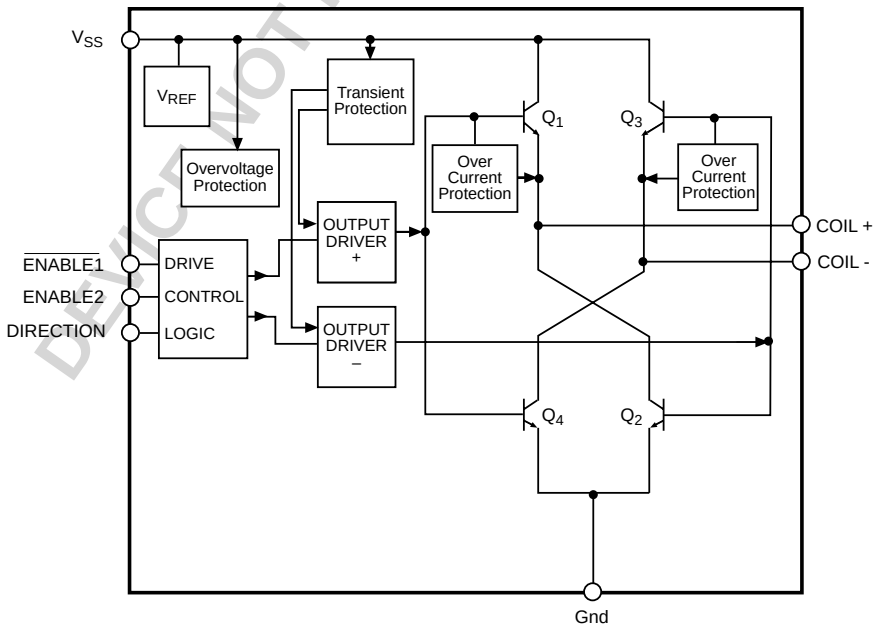
The three TTL compatible inputs, $\overline{\text{ENABLE1}}$, ENABLE2, and DIRECTION control the output stage. When $\overline{\text{ENABLE1}}$ is low and ENABLE2 is high, DIRECTION determines which way current flows through the motor coil. Any other combination of ENABLE settings disables the outputs.

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

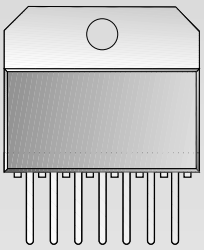


Features

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

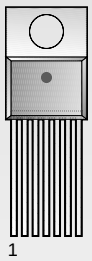
Package Options

7 Lead Power SIP



2	$\overline{\text{ENABLE1}}$
4	DIRECTION
6	COIL+
8	Gnd
10	COIL–
12	V_{SS}
14	ENABLE2

7 Lead TO-220



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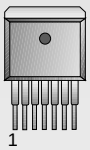
7 Lead D^2PAK



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1	$\overline{\text{ENABLE1}}$
2	DIRECTION
3	COIL+
4	Gnd
5	V_{SS}
6	COIL–
7	ENABLE2

ON Semiconductor
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N. American Technical Support: 800-282-9855
Web Site: www.cherry–semi.com

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

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
■ Output Stage					
Quiescent Current	I_{OUT} = 0mA; ENABLE1 = DIRECTION = High ENABLE2 = Low			10	mA
Output Saturation Voltage	I_{OUT} = 2A I_{OUT} = 500mA			3.2 2.6	V 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} = 30Ω; Coil = 5mH; C_{LOAD} = 15pF		 5	50	µs
Turn off Delay Guaranteed by design	R_{LOAD} = 30Ω; Coil = 5mH; C_{LOAD} = 15pF		 5	50	µs
■ Fault Protection Functions					
Overvoltage Shutdown	I_{OUT} = 500mA	18.0		21.5	V

Package Lead Description

PACKAGE LEAD#			LEAD SYMBOL	FUNCTION
15 Lead Power SIP	**7 Lead TO-220**	**7 Lead D^2PAK**		
2	1	1	$\overline{\text{ENABLE1}}$	Enables output when held low and ENABLE 2 = High
4	2	2	DIRECTION	Determines the direction of current flow through COIL+ and COIL- as long as $\overline{\text{ENABLE1}}$ = Low and ENABLE2 = 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 $\overline{\text{ENABLE 1}}$ = Low

Application Hints

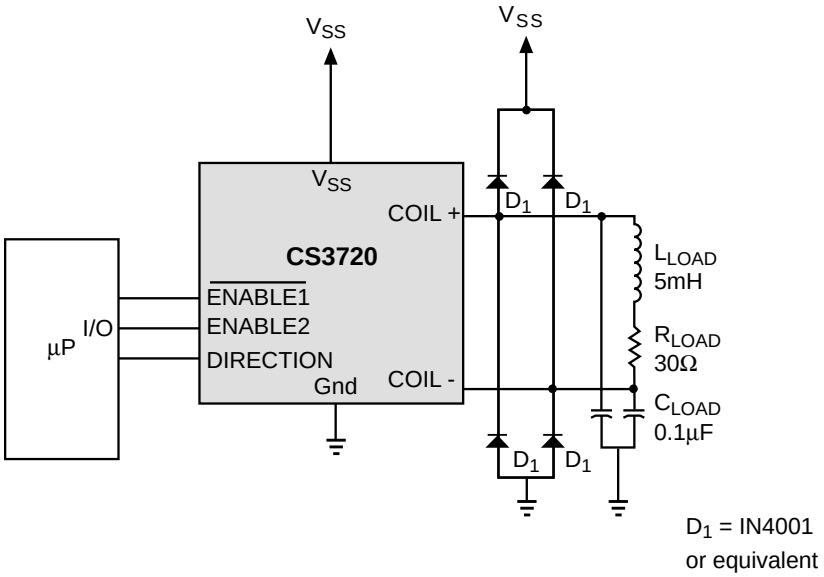
Motor Direction Control

Current flow through the two outputs COIL+ and COIL- is controlled by the combined settings of $\overline{\text{ENABLE1}}$, ENABLE2 and DIRECTION (Table 1). The outputs will be active only when $\overline{\text{ENABLE1}}$ 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.

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

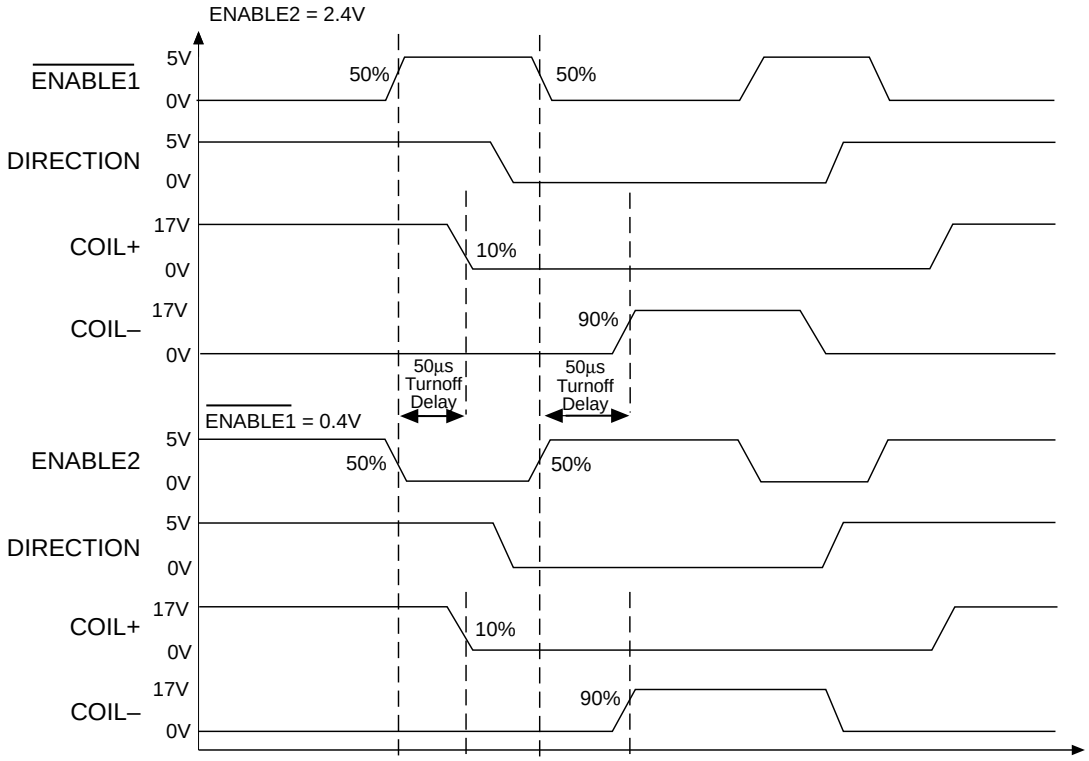
Table 1. Logical Control Diagram

Application and Test Diagram



Note: A heatsink is required for 2A operation.

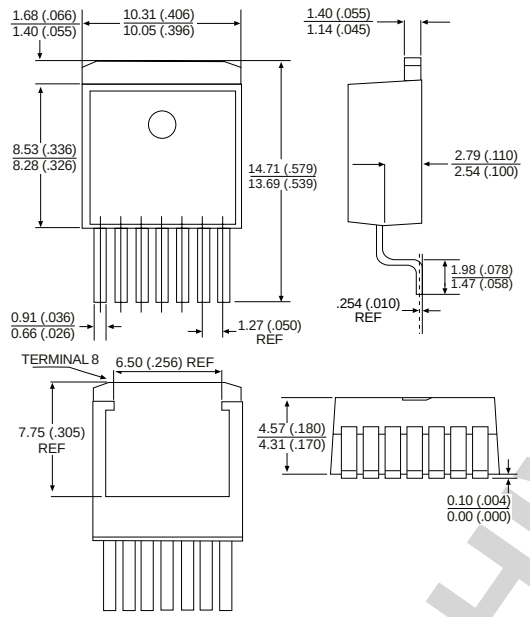
Figure 1. Delay Times for ENABLE and COIL



Package Specification

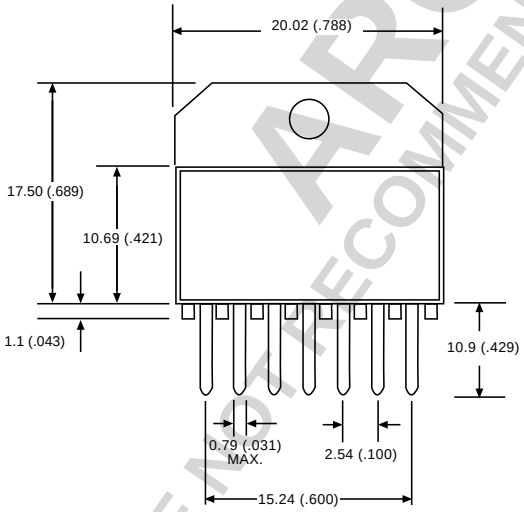
PACKAGE DIMENSIONS IN mm (INCHES)

7 Lead D²PAK (DPS)* Short-Leaded



*ON SEMICONDUCTOR SHORT-LEADED FOOTPRINT

7 Lead Power SIP (M) Straight

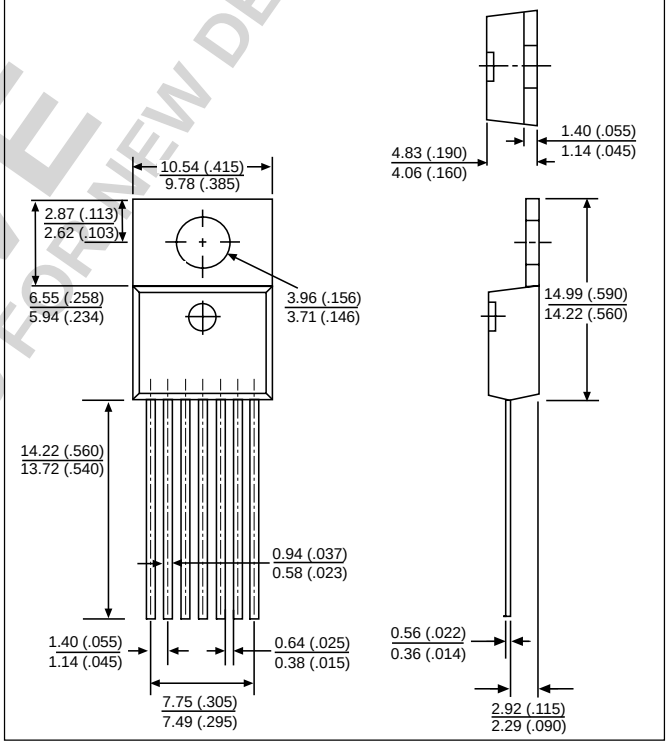


PACKAGE THERMAL DATA

Thermal Data		7L D²PAK	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 D²PAK Short-Leaded
CS3720XDPSR7	7 Lead D²PAK Short-Leaded *(tape & reel)*