

High Performance Stepper Motor Drive Circuit

FEATURES

- Full-Step, Half-Step and Micro-Step Capability.
- Bipolar Output Current up to 2A.
- Wide Range of Motor Supply Voltage: 10–50V
- Low Saturation Voltage
- Wide Range of Current Control: 5mA–2A.
- Current Levels Selected in Steps or Varied Continuously.
- Thermal Protection and Soft Intervention.

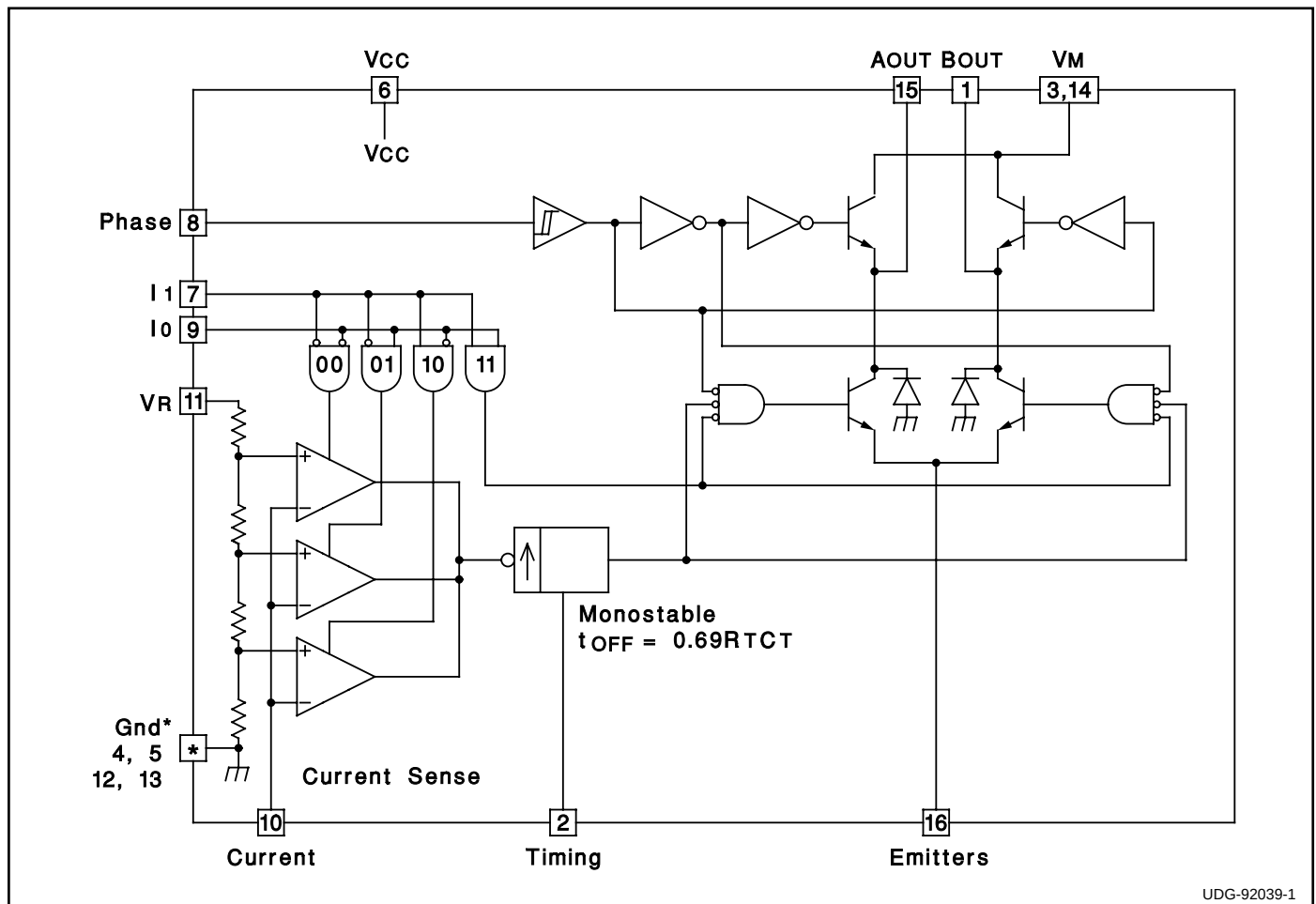
DESCRIPTION

The UC3770A and UC3770B are high-performance full bridge drivers that offer higher current and lower saturation voltage than the UC3717 and the UC3770. Included in these devices are LS-TTL compatible logic inputs, current sense, monostable, thermal shut-down, and a power H-bridge output stage. Two UC3770As or UC3770Bs and a few external components form a complete micro-processor-controllable stepper motor power system.

Unlike the UC3717, the UC3770A and the UC3770B require external high-side clamp diodes. The UC3770A and UC3770B are identical in all regards except for the current sense thresholds. Thresholds for the UC3770A are identical to those of the older UC3717 permitting drop-in replacement in applications where high-side diodes are not required. Thresholds for the UC3770B are tailored for half stepping applications where 50%, 71%, and 100% current levels are desirable.

The UC3770A and UC3770B are specified for operation from 0°C to 70°C ambient.

BLOCK DIAGRAM



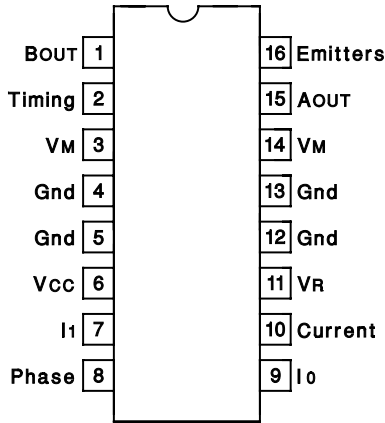
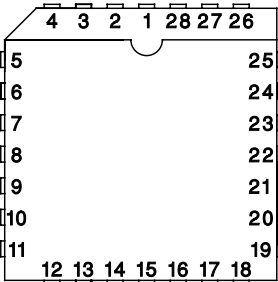
ABSOLUTE MAXIMUM RATINGS

Logic Supply Voltage, V_{CC}	7V
Output Supply Voltage, V_{MM}	50V
Logic Input Voltage (Pins 7, 8, 9)	6V
Analog Input Voltage (Pin 10)	V_{CC}
Reference Input Voltage (Pin 11)	15V
Logic Input Current (Pins 7, 8, 9)	-10mA
Analog Input Current (Pins 10, 11)	-10mA
Output Current (Pins 1, 15)	$\pm 2A$
Junction Temperature, T_J	+150°C

Note 1: All voltages are with respect to Gnd (DIL Pins 4, 5, 12, 13); all currents are positive into, negative out of the specified terminal.

Note 2: Consult Unitrode Integrated Circuits databook for thermal limitations and considerations of packages.

CONNECTION DIAGRAMS

DIL-16 (Top View) J Or N Package		PLCC-28 (Top View) Q Package		PACKAGE PIN FUNCTION	
				FUNCTION	PIN
				Gnd	1-3
				V_M	4
				N/C	5
				AOUT	6
				N/C	7
				Emitters	8
				Gnd	9
				BOUT	10
				Timing	11
				V_M	12
				Gnd	13-17
				V_{CC}	18
				I_1	19
				Phase	20
				I_0	21
				N/C	22
				Current	23
				VR	24
				N/C	25-27
				Gnd	28

ELECTRICAL CHARACTERISTICS: (All tests apply with $V_M = 36V$, $V_{CC} = 5V$, $V_R = 5V$, No Load, and $0^\circ C < T_A < 70^\circ C$, unless otherwise stated, $T_A = T_J$.)

PARAMETER	TEST CONDITIONS	UC3770A			UC3770B			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Supply Voltage V_M (Pins 3, 14)		10		45	10		45	V
Logic Supply Voltage V_{CC} (Pin 6)		4.75	5	5.3	4.75	5	5.3	V
Logic Supply Current I_{CC} (Pin 6)	$I_0 = I_1 = H, I_M = 0$		15	25		15	25	mA
	$I_0 = I_1 = L, I_M = 0$		18	28		18	28	mA
	$I_0 = I_1 = H, I_M = 1.3A$		33	40		33	40	mA
Thermal Shutdown Temperature			+170			+170		°C
Logic Threshold (Pins 7, 8, 9)		0.8		2.0	0.8		2.0	V
Input Current Low (Pin 8)	$V_I = 0.4V$			-100			-100	μA
Input Current Low (Pins 7, 9)	$V_I = 0.4V$			-400			-400	μA
Input Current High (Pins 7, 8, 9)	$V_I = 2.4V$			10			10	μA
Comparator Threshold (Pin 10)	$V_R = 5V, I_0 = L, I_1 = L$	400	415	430	400	415	430	mV
	$V_R = 5V, I_0 = H, I_1 = L$	240	255	265	290	300	315	mV
	$V_R = 5V, I_0 = L, I_1 = H$	70	80	90	195	210	225	mV
Comparator Input Current (Pin 10)				± 20			± 20	μA
Off Time	$R_T = 56k, C_T = 820pF$	25	30	35	25	30	35	ms

ELECTRICAL CHARACTERISTICS (cont.): (All tests apply with $V_M = 36V$, $V_{CC} = 5V$, $V_R = 5V$, No Load, and $0^\circ C < T_A < 70^\circ C$, unless otherwise stated, $T_A = T_J$.)

PARAMETER	TEST CONDITIONS	UC3770A			UC3770B			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Turn Off Delay				2			2	ms
Sink Driver Saturation Voltage	$I_M = 1.0A$			0.8			0.8	V
	$I_M = 1.3A$			1.3			1.3	V
Source Driver Saturation Voltage	$I_M = 1.0A$			1.3			1.3	V
	$I_M = 1.3A$			1.6			1.6	V
Output Leakage Current	$V_M = 45V$			100			100	μA

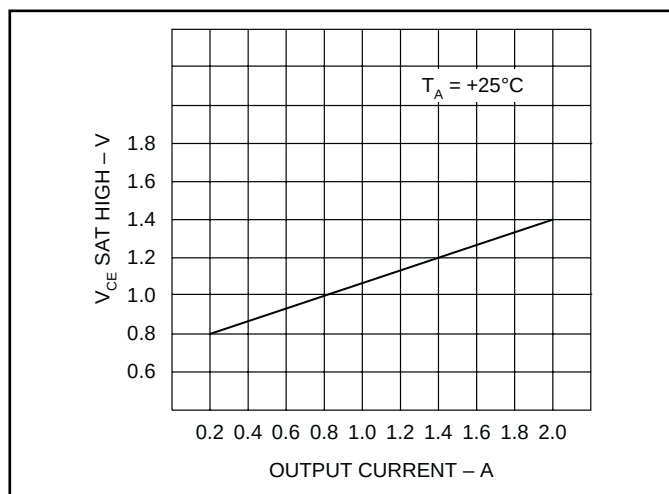


Figure 1. Typical source saturation voltages vs. load current

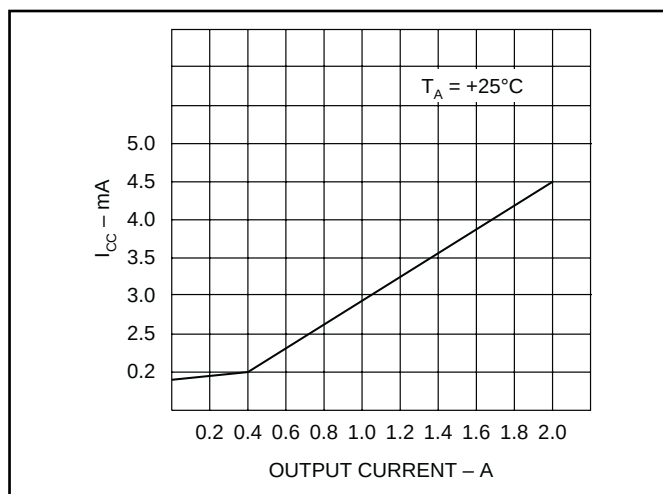


Figure 3. Typical supply current vs. load current.

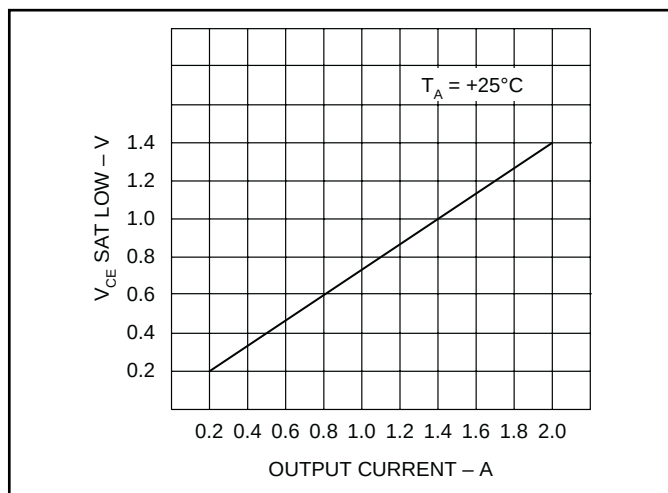


Figure 2. Typical sink saturation voltages vs. load current

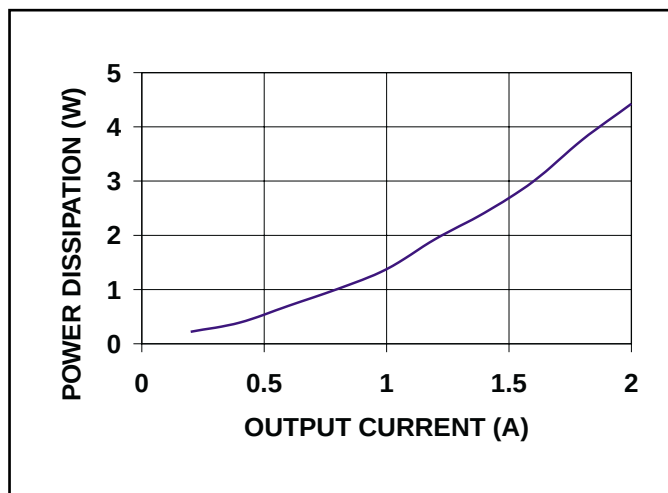


Figure 4. Typical power dissipation vs. output current.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgment, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

Customers are responsible for their applications using TI components.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.