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Stepper Motor Drive Circuits

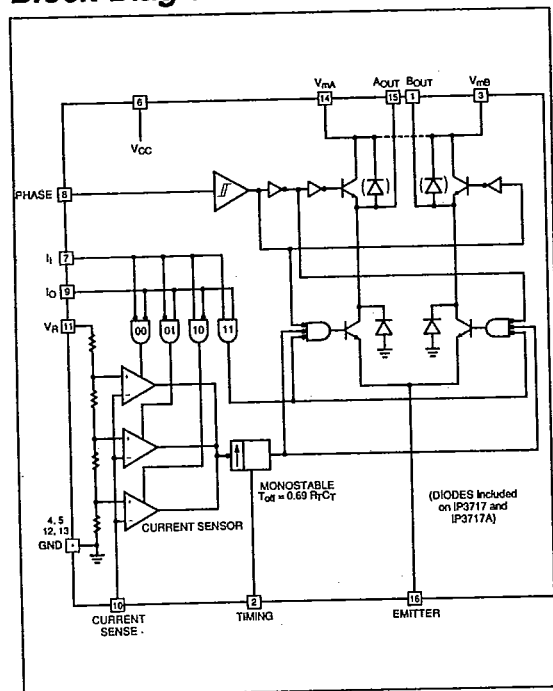
Description

The IP3717, IP3717A and IP3770 series of circuits have been designed to control and drive the current in one winding of a bipolar stepper motor. Functions included are LS-TTL-compatible logic inputs, current sensor, monostable and output stage. The IP3717 and IP3717A series output stages deliver $\pm 1\text{A}$ and have built-in protection diodes. The IP3770 series delivers $\pm 1.5\text{A}$ but does not have flyback diodes across the source transistors.

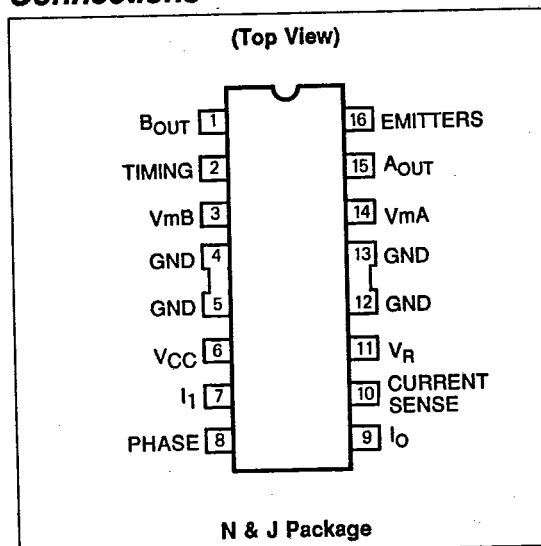
Features

- **Half-step and full step capability**
- **Wide voltage range 10-45 volt**
- **Bipolar constant-current motor drive**
- **Output saturation voltage < 2v (IP3717A & IP3770 Series)**
- **Wide range of current control
5-1000mA (IP3717 & IP3717A Series)
5-1500mA (IP3770 Series)**
- **Designed for unregulated motor supply voltage**
- **Thermal shutdown protection**
- **Current levels can be selected in steps or varied continuously**

Block Diagram



Connections



Section 3 - Motor Controllers/Drivers
IP1717, IP1717A, IP1770, IP3717, IP3717A, IP3770

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Absolute Maximum Ratings

Supply Voltage		Input Current (Pin 7, 8, 9, 10, 11)	-10mA
Logic Supply (V_{CC})	7V	Thermal Resistance θ_{JA}	
Output Supply (V_m)	45V	N Package	45°C/W
		J Package	100°C/W
Input Voltage		Maximum Junction Temperature	+150°C
Logic Inputs (Pins 7, 8, 9)	6V	Operating Ambient Temperature Range	
Analog Input (Pin 10)	V_{CC}	IP1717, IP1717A, IP1770	-55°C to +125°C
Reference Input (Pin 11)	15V	IP3717, IP3717A, IP3770	0°C to +70°C
Output Current		Storage Temperature Range	-65°C to +150°C
IP3770 series	±1.5A	Lead Temperature (Soldering, 10 sec)	+300°C
IP3717, 3717A series	±1A		

Absolute maximum ratings are these 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.

Electrical Characteristics

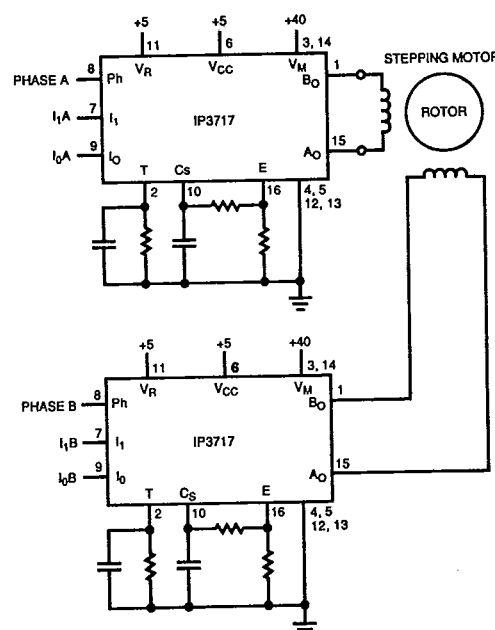
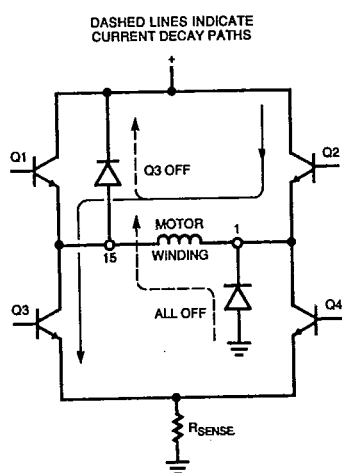
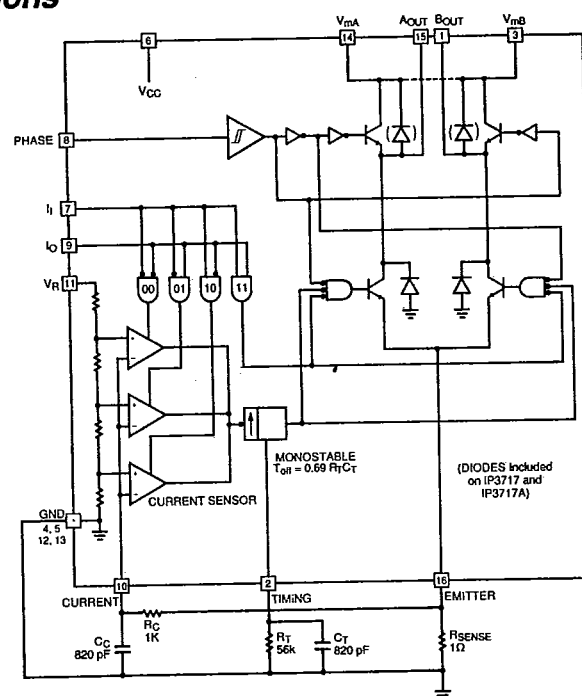
$V_{CC} = 4.75\text{ V to } 5.25\text{ V}$, $V_m = 10\text{ to } 40\text{ V}$, rise and fall time of logic inputs $2\mu\text{s max}$.

Parameters	Conditions			IP1717/IP3717 IP1717A/IP3717A			IP1770/IP3770			Units
				Min	Typ	Max	Min	Typ	Max	
Supply Current	$I_1 = I_0 = 1$		•			25			30	mA
	$I_1 = I_0 = 0$		•			38			55	mA
High-level Input Voltage			•	2.0			2.0			V
Low-level Input Voltage			•			0.8			0.8	V
High-level Input Current	$V_I = 2.4\text{V}$		•			20			20	μA
Low-level Input Current	$V_I = 0.4\text{ V}$		•	-0.4			-0.4			mA
Comparator Threshold Voltage	$V_R = 5.0\text{V}$	$I_0 = 0, I_1 = 0$	•	390	420	440	390	420	440	mV
		$I_0 = 1, I_1 = 0$	•	230	250	270	230	250	270	mV
		$I_0 = 0, I_1 = 1$	•	65	80	90	65	80	90	mV
Comparator Input Current			•	-20		20	-20		20	μA
Output Leakage Current	$I_0 = 1, I_1 = 1$					100			100	μA
Total Saturation Voltage Drop	$I_m = 500\text{mA}$	IP3717A	•			2.5				V
		IP3717	•			4.0				V
	$I_m = 800\text{mA}$		•						2.0	V
Total Power Dissipation	$I_m = 500\text{mA}, f_s = 30\text{kHz}$		•		1.8	2.1				W
	$I_m = 800\text{mA}, f_s = 30\text{ kHz}$		•		2.9	3.1		1.8	2.3	W
Cut-off Time, t_{off}	$V_m = 10\text{V}, t_{\text{on}} \geq 5\mu\text{S}$		•	25	30	35	25	30	35	μS
Turn-off Delay, t_d	$dV_o/dt \geq 50\text{mV}/\mu\text{S}$				1.6	2.0		1.6	3.0	μS
Thermal Shutdown Junction Temp.				160		180	160		180	$^{\circ}\text{C}$

The • denotes specifications which apply over the full operating temperature range, all others apply at $T_A = 25^\circ\text{C}$ unless otherwise specified.

 Section 3 - Motor Controllers/Drivers
 IP1717, IP1717A, IP1770, IP3717, IP3717A, IP3770

Typical Applications



Section 3 - Motor Controllers/Drivers
IP1717, IP1717A, IP1770, IP3717, IP3717A, IP3770

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Order Information

Part Number	Temperature Range	Package
IP1717J	-55°C to +125°C	16 Pin Ceramic DIP
IP1717AJ	-55°C to +125°C	16 Pin Ceramic DIP
IP1770J	-55°C to +125°C	16 Pin Ceramic DIP
IP3717J	0°C to +70°C	16 Pin Ceramic DIP
IP3717AJ	0°C to +70°C	16 Pin Ceramic DIP
IP3770J	0°C to +70°C	16 Pin Ceramic DIP
IP3717N	0°C to +70°C	16 Pin Plastic DIP
IP3717AN	0°C to +70°C	16 Pin Plastic DIP
IP3770N	0°C to +70°C	16 Pin Plastic DIP

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