

INTEGRATED POWER

SEMICONDUCTORS, LTD.

Stepper Motor Drive Circuits

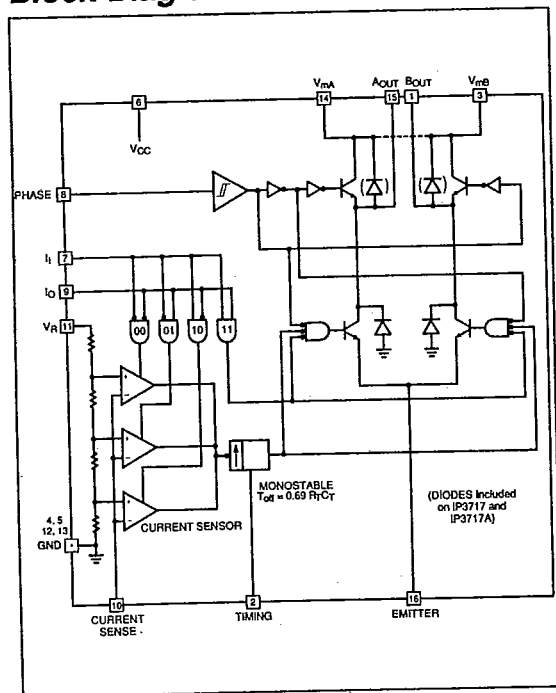
Description

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 $\pm 1A$ and have built-in protection diodes. The IP3770 series delivers $\pm 1.5A$ but does not have flyback diodes across the source transistors.

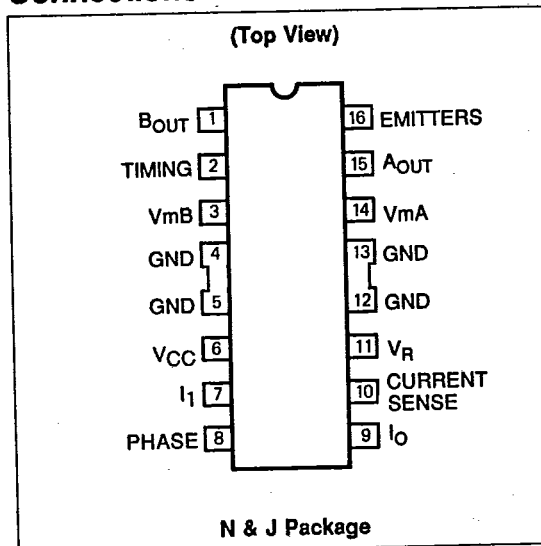
Features

- 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

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

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 $2\mu\text{s max}$.

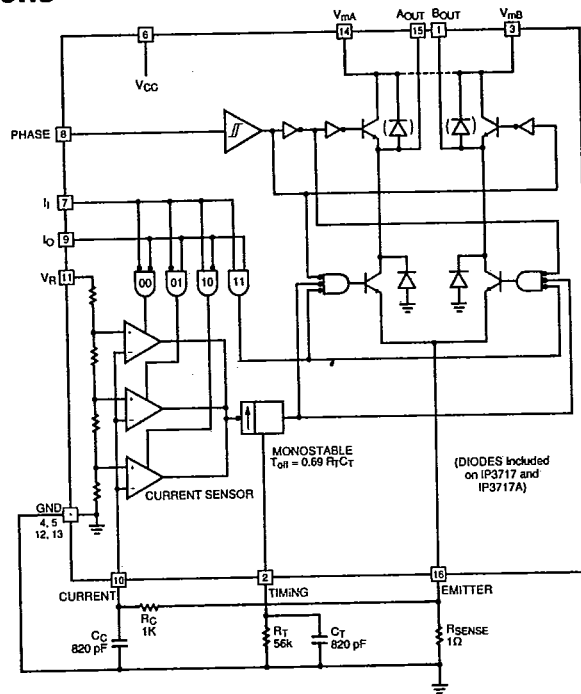
| Parameters | Conditions | IP1717/IP3717 IP1717A/IP3717A | | | IP1770/IP3770 | | | Units | | |
|---------------------------------|--|----------------------------------|------|-----|---------------|-----|-----|---------------|----------------|---------------|
| | | Min | Typ | Max | Min | Typ | Max | | | |
| 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} | $V_m = 10\text{ V}, t_{on} \geq 5\mu\text{ s}$ | • | 25 | 30 | 35 | 25 | 30 | 35 | $\mu\text{ s}$ | |
| Turn-off Delay, t_d | $dV_C/dt \geq 50\text{ mV}/\mu\text{ s}$ | | | 1.6 | 2.0 | | 1.6 | 3.0 | $\mu\text{ s}$ | |
| Thermal Shutdown Junction Temp. | | | 160 | | 180 | 160 | | 180 | °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.

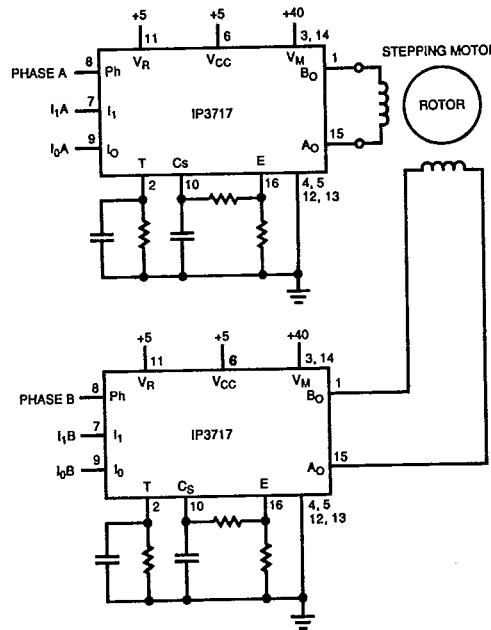
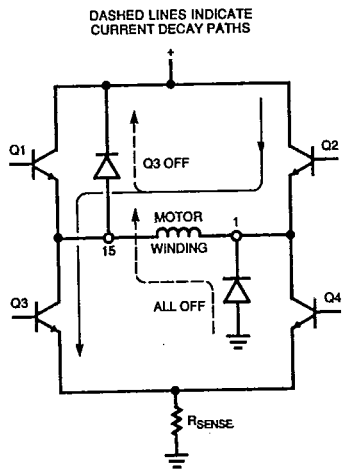
Section 3 - Motor Controllers/Drivers
IP1717, IP1717A, IP1770, IP3717, IP3717A, IP3770



Typical Applications



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



Order Information

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

| 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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