

Dual Channel Power Driver

FEATURES

- Two independent Drivers
- 1.5A Totem Pole Outputs
- Inverting and Non-Inverting Inputs
- 40ns Rise and Fall into 1000pF
- High-Speed, Power MOSFET Compatible
- Low Cross-Conduction Current Spike
- Analog Shutdown with Optional Latch
- Low Quiescent Current
- 5V to 40V Operation
- Thermal Shutdown Protection
- 16-Pin Dual-In-Line Package
- 20-Pin PLCC and CLCC Package

DESCRIPTION

The UC1707 family of power drivers is made with a high-speed Schottky process to interface between low-level control functions and high-power switching devices - particularly power MOSFETs. These devices contain two independent channels, each of which can be activated by either a high or low input logic level signal. Each output can source or sink up to 1.5A as long as power dissipation limits are not exceeded.

Although each output can be activated independently with its own inputs, it can be forced low in common through the action either of a digital high signal at the Shutdown terminal or a differential low-level analog signal. The Shutdown command from either source can either be latching or not, depending on the status of the Latch Disable pin.

Supply voltage for both VIN and VC can independently range from 5V to 40V.

These devices are available in two-watt plastic "bat-wing" DIP for operation over a 0°C to 70°C temperature range and, with reduced power, in a hermetically sealed cerdip for -55°C to +125°C operation. Also available in surface mount DW, Q, L packages.

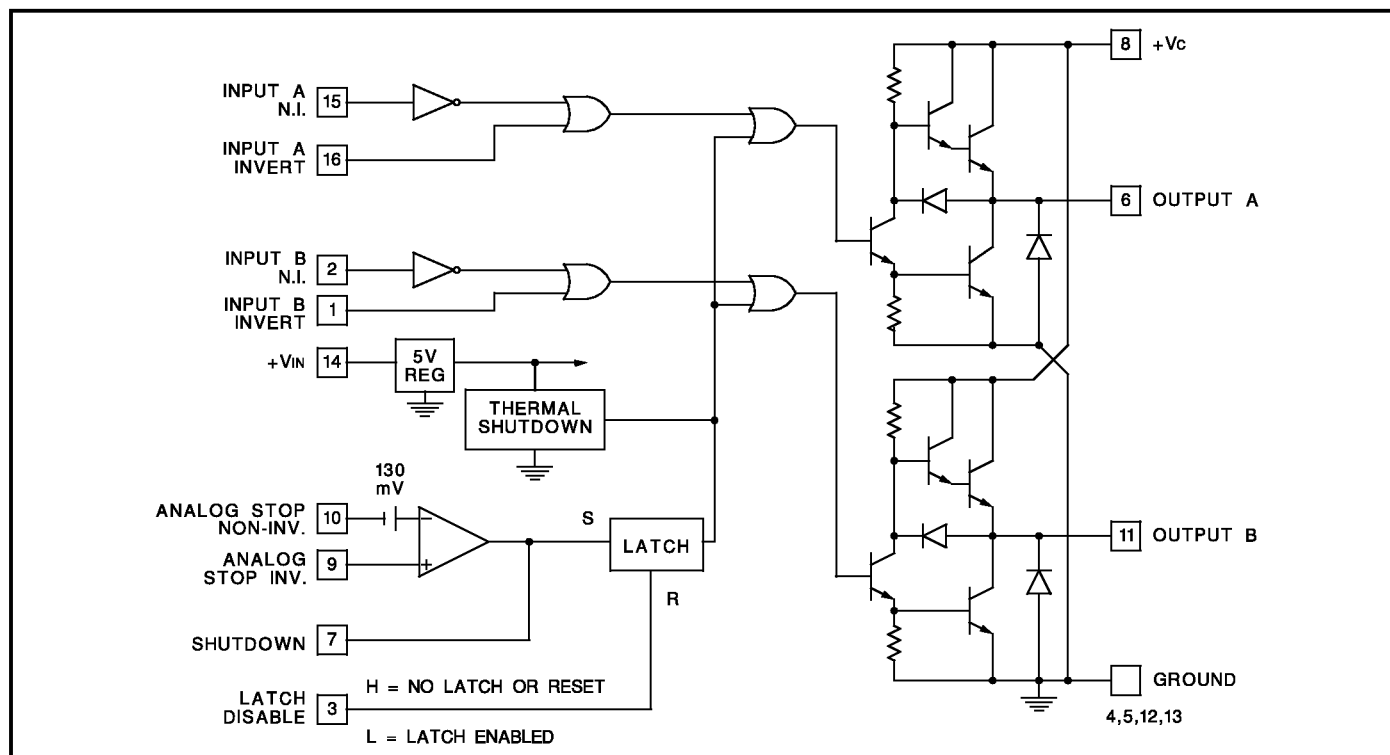
TRUTH TABLE (Each Channel)

| INV. | N.I. | OUT |
|------|------|-----|
| H | H | L |
| L | H | H |
| H | L | L |
| L | L | L |

OUT = $\overline{\text{INV}}$ and N.I.

$\overline{\text{OUT}}$ = INV or N.I.

BLOCK DIAGRAM



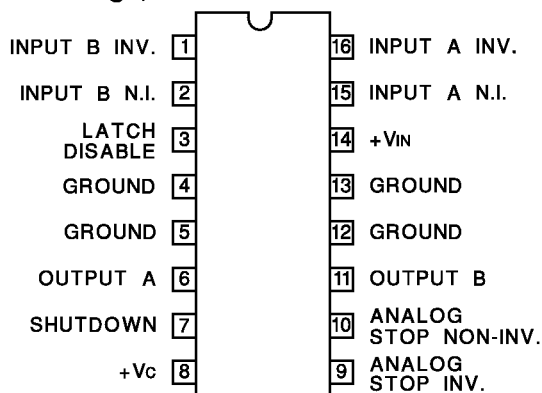
ABSOLUTE MAXIMUM RATINGS

| | |
|---|---|
| Supply Voltage, V_{IN} , N/J-Pkg | 40V |
| Collector Supply Voltage, V_C , N/J-Pkg | 40V |
| Output Current (Each Output, Source or Sink) Steady-State, N/J-Pkg | $\pm 500\text{mA}$ |
| Peak Transient | |
| N-Pkg | $\pm 1.5\text{A}$ |
| J-Pkg | $\pm 1.0\text{A}$ |
| Capacitive Discharge Energy | |
| N-Pkg | 20mJ |
| J-Pkg | 15mJ |
| Digital Inputs (See Note), N/J-Pkg | 5.5V |
| Analog Stop Inputs, N/J-Pkg | V_{IN} |
| Power Dissipation at $T_A = 25^\circ\text{C}$ (See Note) | |
| N-Pkg | 2W |
| J-Pkg | 1W |
| Power Dissipation at T (Leads/Case) = 25°C (See Note) | |
| N-Pkg | 5W |
| J-Pkg | 2W |
| Operating Temperature Range | -55°C to $+125^\circ\text{C}$ |
| Storage Temperature Range | -65°C to $+150^\circ\text{C}$ |
| Lead Temperature (Soldering, 10 Seconds) | 300°C |

Note: All voltages are with respect to the four ground pins which must be connected together. All currents are positive into, negative out of the specified terminal. Digital Drive can exceed 5.5V if input current is limited to 10mA. Consult Packaging section of Databook for thermal limitations and considerations of package.

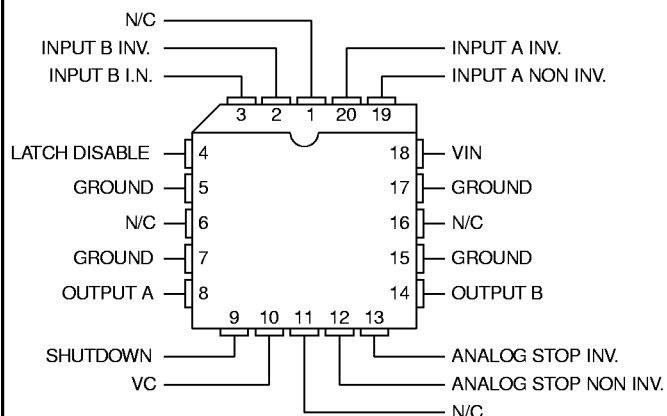
CONNECTION DIAGRAMS

DIL-16, SOIC-16 (TOP VIEW) J or N Package,



Note: All four ground pins must be connected to a common ground.

PLCC-20, LCC-20 (TOP VIEW) Q, L Packages



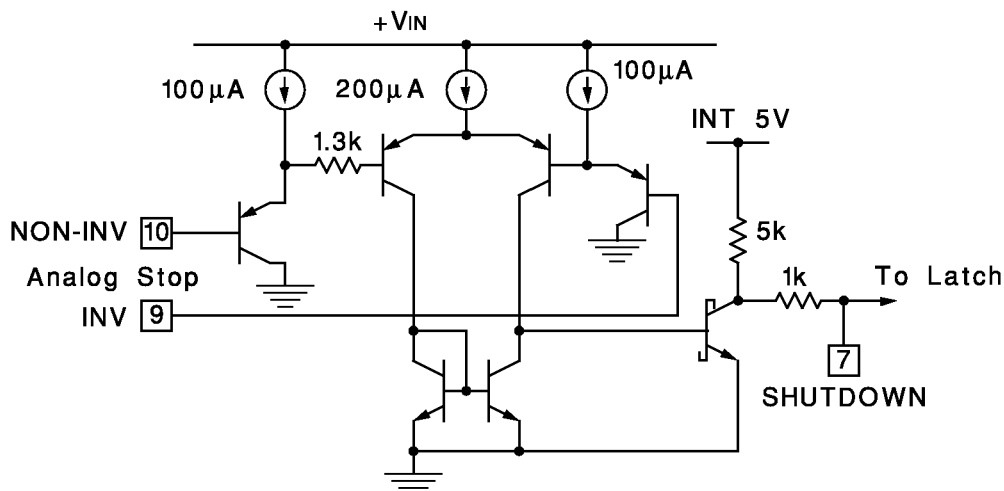
ELECTRICAL CHARACTERISTICS: Unless otherwise stated, these specifications apply for $T_A = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ for the UC1707, -25°C to $+85^{\circ}\text{C}$ for the UC2707 and 0°C to $+70^{\circ}\text{C}$ for the UC3707; $I_M = V_C = 20\text{V}$. $T_A = T_J$.

| PARAMETERS | TEST CONDITIONS | MIN | TYP | MAX | UNITS |
|-------------------------------|---|-----|-------|------|--------------------|
| V_{IN} Supply Current | $V_{IN} = 40\text{V}$ | | 12 | 15 | mA |
| V_C Supply Current | $V_C = 40\text{V}$, Outputs Low | | 5.2 | 7.5 | mA |
| V_C Leakage Current | $V_{IN} = 0$, $V_C = 30\text{V}$, No Load | | .05 | 0.1 | mA |
| Digital Input Low Level | | | | 0.8 | V |
| Digital Input High Level | | 2.2 | | | V |
| Input Current | $V_I = 0$ | | -0.06 | -1.0 | mA |
| Input Leakage | $V_I = 5\text{V}$ | | .05 | 0.1 | mA |
| Output High Sat., $V_C - V_O$ | $I_O = -50\text{mA}$ | | | 2.0 | V |
| | $I_O = -500\text{mA}$ | | | 2.5 | V |
| Output Low Sat., V_O | $I_O = -50\text{mA}$ | | | 0.4 | V |
| | $I_O = -500\text{mA}$ | | | 2.5 | V |
| Analog Threshold | $V_{CM} = 0$ to 15V | 100 | 130 | 160 | mV |
| Input Bias Current | $V_{CM} = 0$ | | -10 | -20 | μA |
| Thermal Shutdown | | | 155 | | $^{\circ}\text{C}$ |
| Shutdown Threshold | Pin 7 Input | 0.4 | 1.0 | 2.2 | V |
| Latch Disable Threshold | Pin 3 Input | 0.8 | 1.2 | 2.2 | V |

TYPICAL SWITCHING CHARACTERISTICS: $V_{IN} = V_C = 20\text{V}$, $T_A = 25^{\circ}\text{C}$. Delays measured to 10% output change.

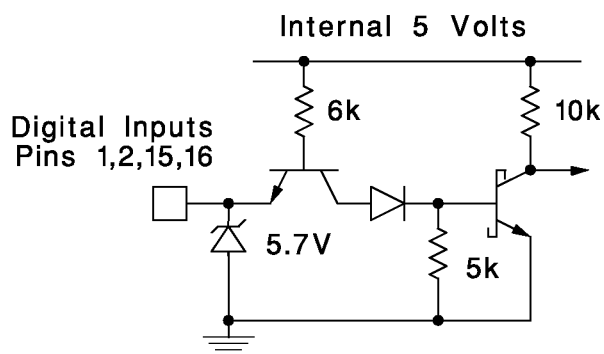
| PARAMETERS | TEST CONDITIONS | OUTPUT CL = | | | UNITS |
|---|-----------------------|-------------|-----|-----|-------|
| From Inv. Input to Output | | open | 1.0 | 2.2 | nF |
| Rise Time Delay | | 40 | 50 | 60 | ns |
| 10% to 90% Rise | | 25 | 40 | 50 | ns |
| Fall Time Delay | | 30 | 40 | 50 | ns |
| 90% to 10% Fall | | 25 | 40 | 50 | ns |
| From N.I. Input to Output | | | | | |
| Rise Time Delay | | 30 | 40 | 50 | ns |
| 10% to 90% Rise | | 25 | 40 | 50 | ns |
| Fall Time Delay | | 45 | 55 | 65 | ns |
| 90% to 10% Fall | | 25 | 40 | 50 | ns |
| V_C Cross-Conduction Current Spike Duration | Output Rise | 25 | | | ns |
| | Output Fall | 0 | | | ns |
| Analog Shutdown Delay | Stop non-Inv. = 0V | 180 | | | ns |
| | Stop Inv. = 0 to 0.5V | 180 | | | ns |
| Digital Shutdown Delay | 2V Input on Pin 7 | 50 | | | ns |

SIMPLIFIED INTERNAL CIRCUITRY



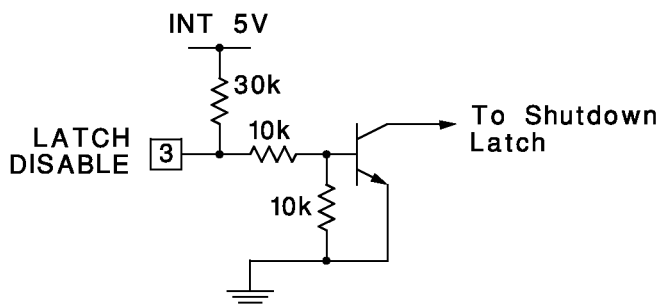
The input common-mode voltage range is from ground to $(V_{IN}-3V)$. When not used both inputs should be grounded. Activate time is a function of overdrive with a typical value of 180ns. Pin 7 serves both as a comparator output and as a common digital shutdown input. A high signal here will accomplish the fastest turn off of both outputs. Note that "OFF" is defined as the outputs low. Pulling shutdown low defeats the latch operation regardless of its status.

Figure 1. Typical digital input gate.



The input zener may be used to clamp input signal voltages higher than 5V as long as the zener current is limited to 10mA max. External pull-up resistors are not required.

Figure 2. Typical digital input gate.



The Shutdown latch is disabled when pin 3 is open. An impedance of 4k or less from pin 3 to ground will allow a shutdown signal to set the latch which can then be reset by either recycling the V_{IN} supply or by momentarily ($>200ns$) raising pin 3 high.

Figure 3. Latch disable.

SIMPLIFIED INTERNAL CIRCUITRY (cont.)

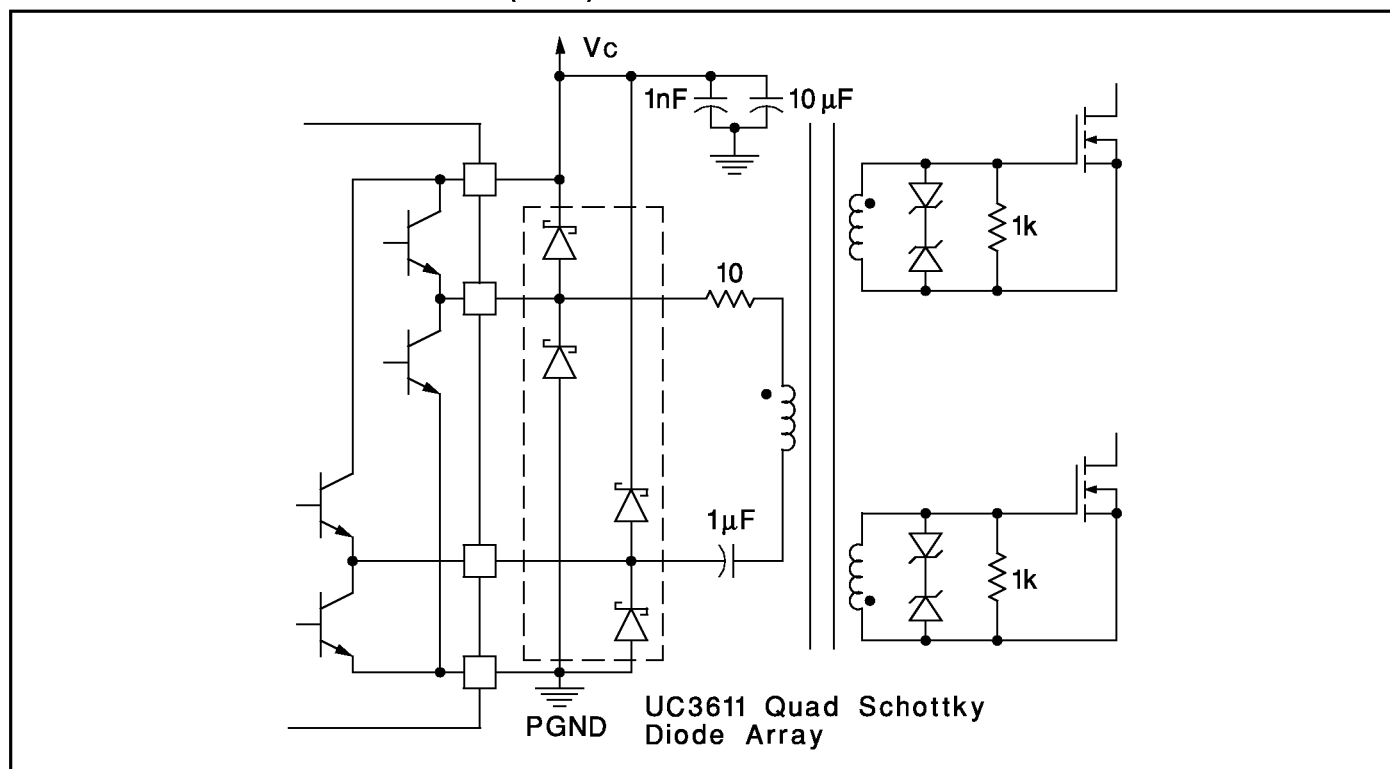
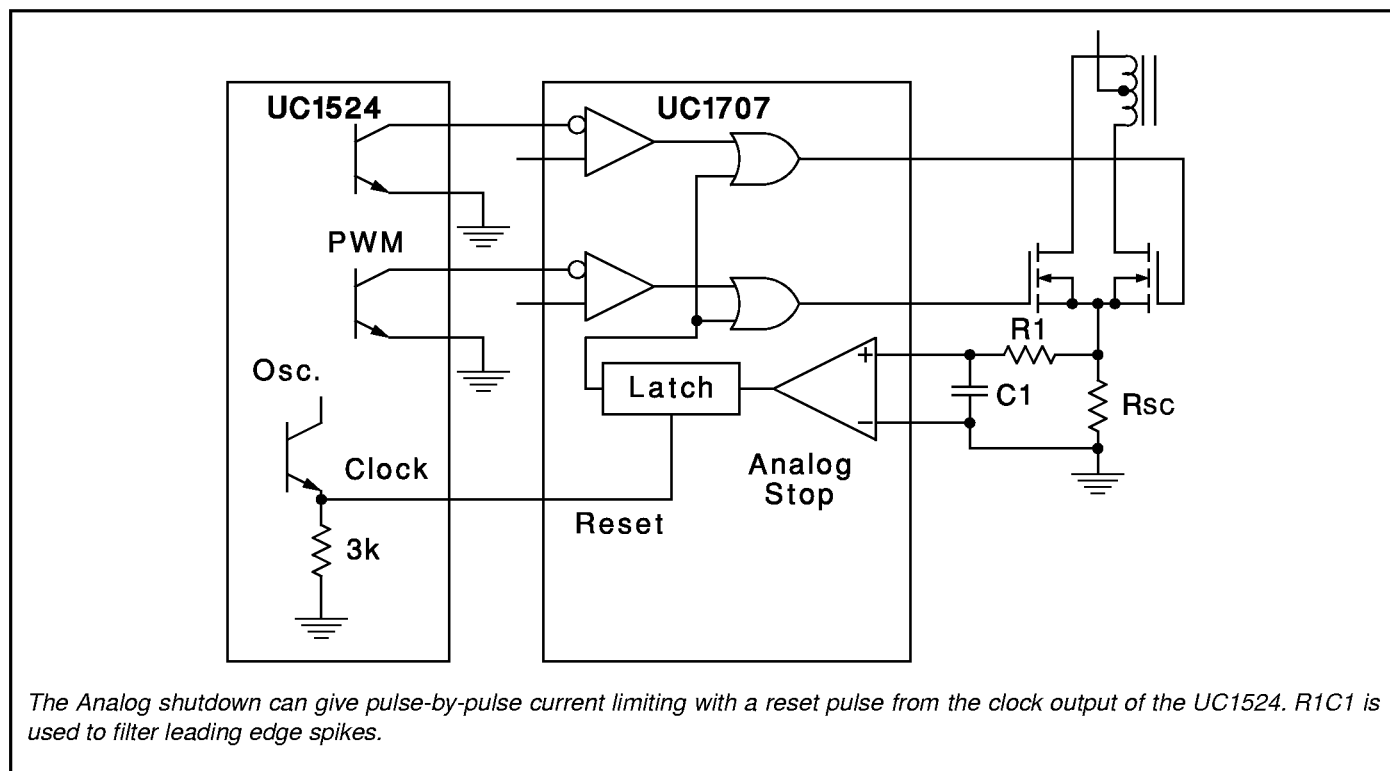


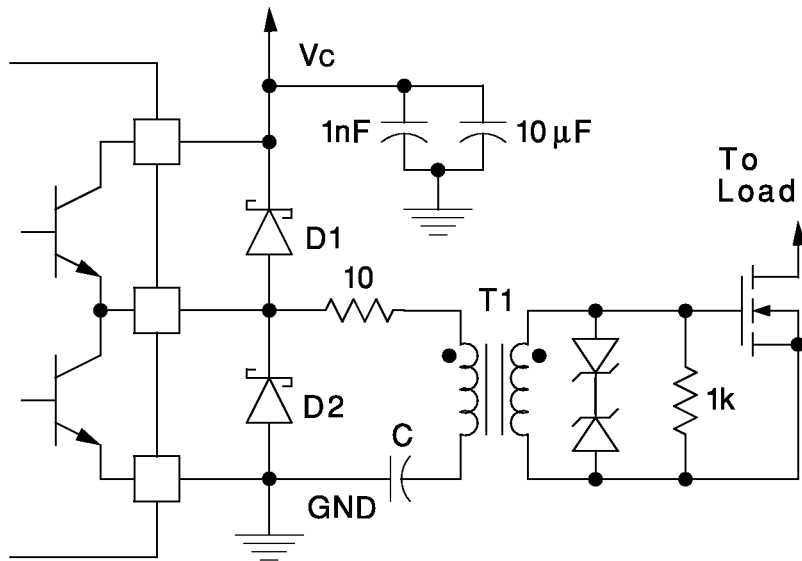
Figure 4. Transformer coupled push-pull MOSFET drive circuit.



The Analog shutdown can give pulse-by-pulse current limiting with a reset pulse from the clock output of the UC1524. R1C1 is used to filter leading edge spikes.

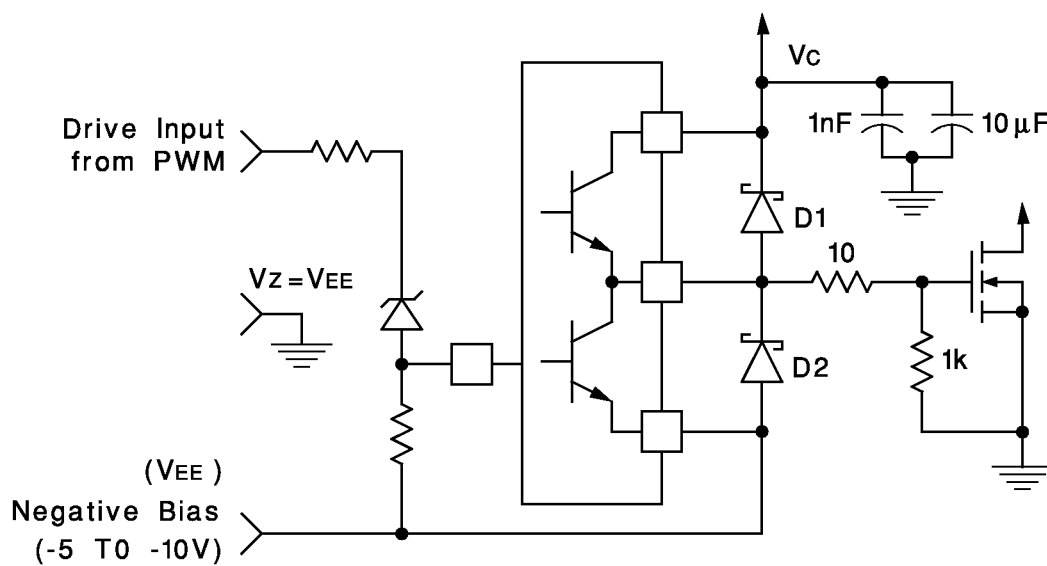
Figure 5. Current limiting.

TRANSFORMER COUPLING



D1, D2: UC3611 Schottky Diode

Figure 10. Transformer coupled MOSFET drive circuit.



D1, D2: UC3611 Schottky Diode

Figure 11. Power MOSFET drive circuit using negative bias voltage and level shifting to ground reference PWM.