

# 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  $V_{IN}$  and  $V_C$  can independently range from 5V to 40V.

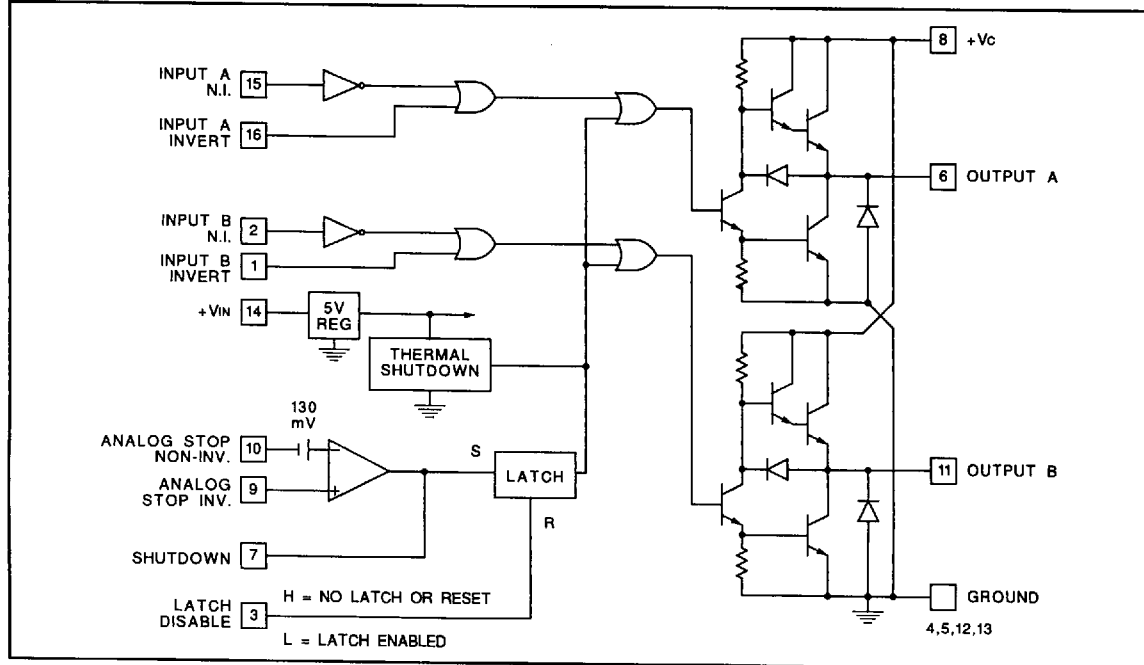
These devices are available in two-watt plastic "bat-wing" DIP for operation over a 0°C to 70°C temperature range and, with reduced power, in a hermetically sealed cerdip for -55°C to +125°C operation. Also available in surface mount DW, Q, L packages.

## TRUTH TABLE (Each Channel)

INV.	N.I.	OUT
H	H	L
L	H	H
H	L	L
L	L	L

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

## BLOCK DIAGRAM



## ABSOLUTE MAXIMUM RATINGS

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

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.

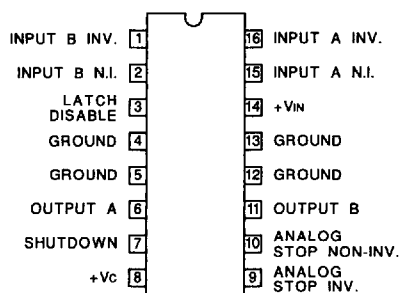
Digital Drive can exceed 5.5V if input current is limited to 10mA.

Consult Packaging section of Databook for thermal limitations and considerations of package.

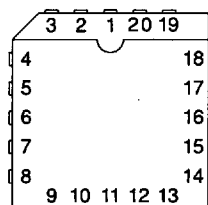
## CONNECTION DIAGRAMS

DIL-16, SOIC-16  
(TOP VIEW)

J or N Package, DW Package



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

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

PACKAGE PIN FUNCTION	
FUNCTION	PIN
N/C	1
INPUT B INV.	2
INPUT B N.I.	3
LATCH DISABLE	4
GROUND	5
N/C	6
GROUND	7
OUTPUT A	8
SHUTDOWN	9
$V_C$	10
N/C	11
ANALOG STOP NON INV.	12
ANALOG STOP INV.	13
OUTPUT B	14
GROUND	15
N/C	16
GROUND	17
$V_{IN}$	18
INPUT A NON INV.	19
INPUT A INV.	20

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

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	$V_I = 0$		-0.6	-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

# ELECTRICAL CHARACTERISTICS (cont.):

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

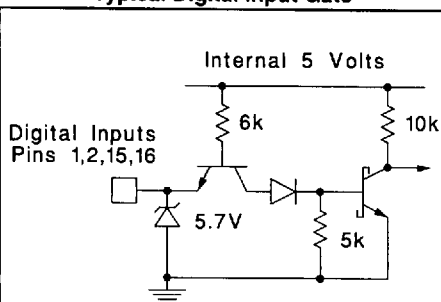
PARAMETERS	TEST CONDITIONS	MIN	TYP	MAX	UNITS
Output Low Sat., $V_o$	$I_o = 50\text{mA}$			0.4	V
	$I_o = 500\text{mA}$			2.5	V
Analog Threshold	$V_{CM} = 0$ to $15\text{V}$	100	130	150	mV
Input Bias Current	$V_{CM} = 0$		-10	-20	$\mu\text{A}$
Thermal Shutdown			155		$^{\circ}\text{C}$
Shutdown Threshold	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 $C_L =$			UNIT
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	Output Rise	25			ns
Current Spike Duration	Output Fall	0			ns
Analog Shutdown Delay	Stop Non-Inv. = $0\text{V}$ Stop Inv. = $0$ to $0.5\text{V}$	180			ns
Digital Shutdown Delay	$2\text{V}$ Input on Pin 7	50			ns

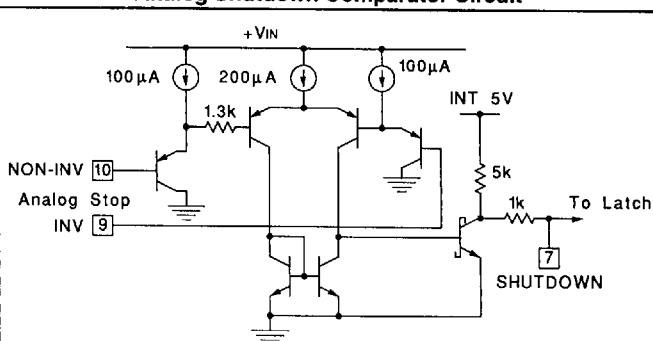
## SIMPLIFIED INTERNAL CIRCUITRY

Typical Digital Input Gate



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

Analog Shutdown Comparator Circuit

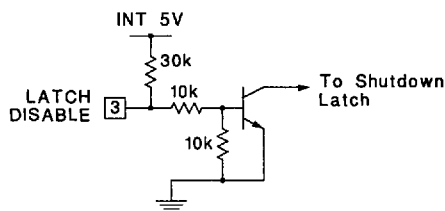


The input common-mode voltage range is from ground to  $(V_{IN}-3\text{V})$ . When not used both inputs should be grounded. Activate time is a function of overdrive with a typical value of  $180\text{ns}$ . Pin 7 serves both as a comparator output and as a common digital shutdown input. A high signal 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.

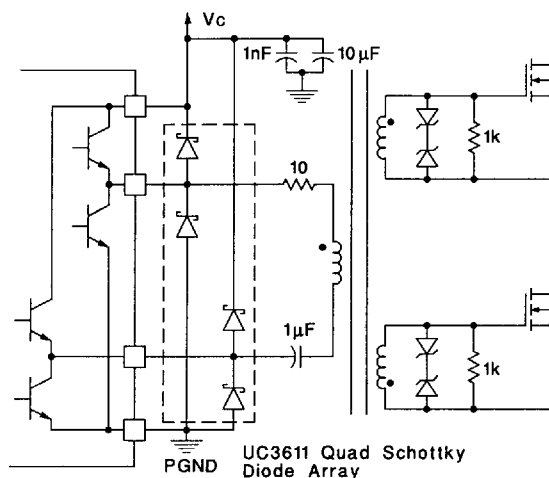
## SIMPLIFIED INTERNAL CIRCUITRY (continued)

### Latch Disable

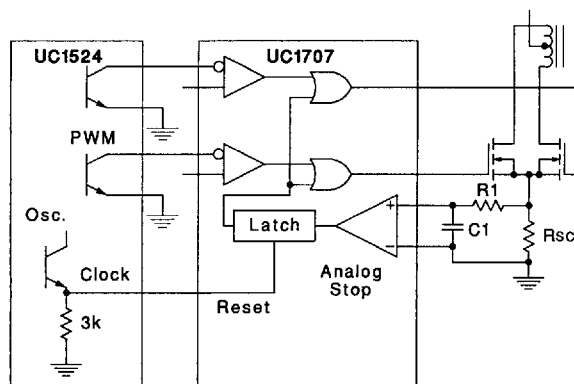
The Shutdown latch is disabled when pin 3 is open. An impedance of 4k or less from pin 3 to ground will allow a shutdown signal to set the latch which can then be reset by either recycling the  $V_{IN}$  supply or by momentarily (>200ns) raising pin 3 high.



### Transformer Coupled Push-pull MOSFET Drive Circuit



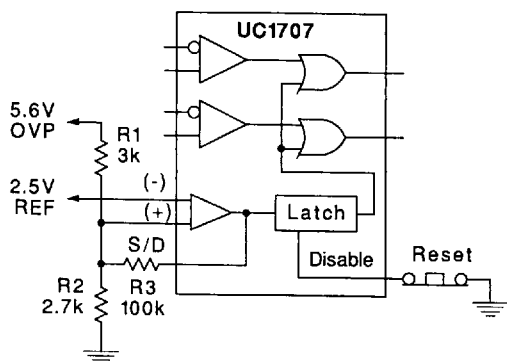
### Current Limiting



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.

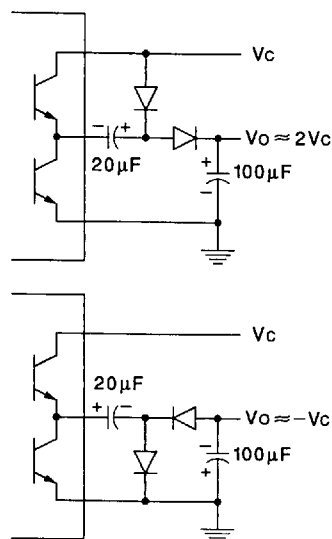
# APPLICATIONS (continued)

## Over-Voltage Protection



With an external reference, the shutdown comparator can be used for over-voltage protection. R1 and R2 set the shutdown level while R3 adds positive feedback for hysteresis.

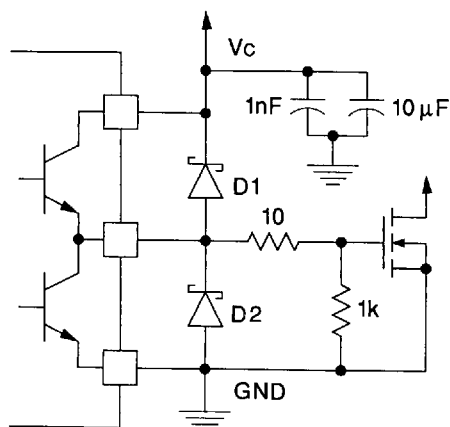
## Charge Pump Circuits



When driven with a TTL square wave drive, the low output impedance of the UC1707 allows ready implementation of charge pump voltage converters.

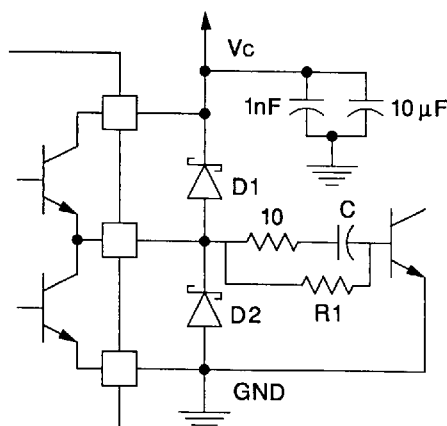
# OUTPUT STAGE COUPLING

## Power MOSFET Drive Circuit



D1, D2: UC3611 Schottky Diodes

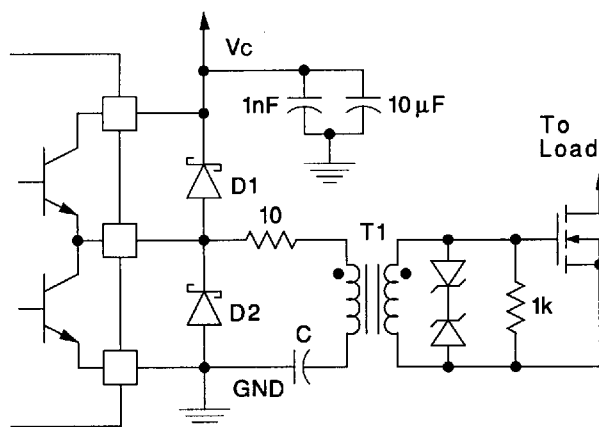
## Power Bipolar Drive Circuit



D1, D2: UC3611 Schottky Diodes

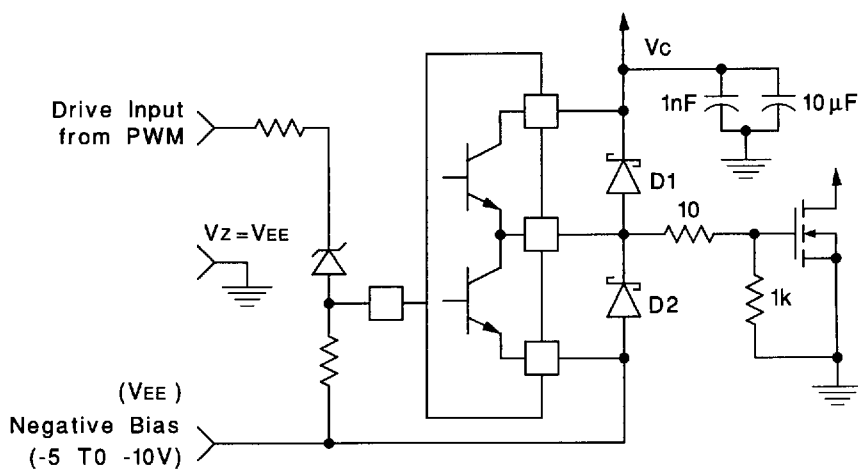
## TRANSFORMER COUPLING

Transformer Coupled MOSFET Drive Circuit



D1, D2: UC3611 Schottky Diodes

Power MOSFET Drive Circuit Using Negative Bias Voltage and Level Shifting To Ground Reference PWM



D1, D2: UC3611 Schottky Diodes