Full Bridge Power Amplifier

FEATURES

- Precision Current Control
- ±800mA Load Current
- 1.25V Total V_{SAT} at 800mA
- Controlled Velocity Head Parking
- Precision Dual Supply Monitor with Indicator
- Limit Input to Force Output Extremes
- Inhibit Input and UVLO
- 4V to 15V operation

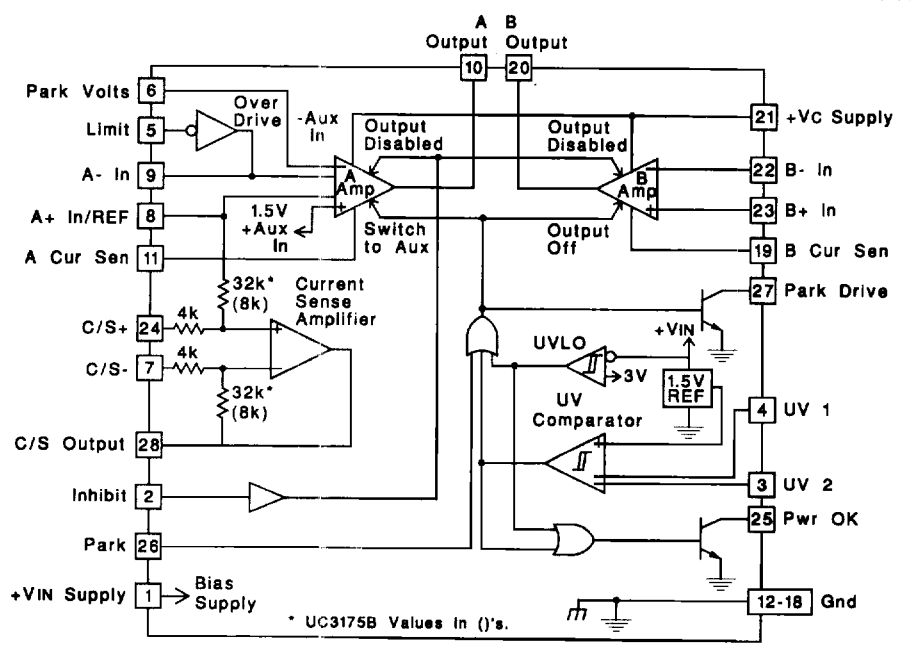
DESCRIPTION

These full-bridge power amplifiers are rated for continuous output current of 0.8 Amperes and are intended for use in demanding servo applications such as head positioning for high-density disk drives. Both of these devices include a precision current sense amplifier that provides accurate control of load current. The UC3174B is designed for ground referenced current sensing using the device's Current Sense pins, while the UC3175B is optimized for sensing current with a single resistor in series with the load. These power amplifiers have a very low output saturation voltage and will operate down to 4V supply levels. Power output stage protection includes current limiting and thermal shutdown.

Auxiliary functions on this device include a dual-input under-voltage comparator, which can monitor two independent supply voltages and force a built-in head park function when either is below minimum. When activated by either the UV comparator, or a command at the separate PARK input, the park circuitry will override the amplifier inputs to convert the power outputs to a programmable constant voltage source which will hold regulation as the supply voltage falls to below 3.0 Volts. Added features include a POWER OK flag output, a LIMIT input to force the drive output to its maximum level in either polarity, and a over-riding INHIBIT input to disable all amplifiers and reduce quiescent supply current.

This device is packaged in a power PLCC surface mount configuration which maintains a standard 28-pin outline, but with 7 pins along one edge allocated to ground for optimum thermal transfer. And is also available in a 24-pin surface mount SOIC package.

BLOCK DIAGRAM



Note: Pin numbers refer to PLCC package.

UDG-92054

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage, (+VIN,+Vc) 20V
UV Comparator, and Digital Inputs
  Maximum forced voltage ..... -0.3V to 10V
  Maximum forced current ..... ±10mA
C/S Inputs
  Maximum forced voltage ..... -0.3V to 20V
  A and B Amplifier Inputs ..... -0.3V to +VIN
Open Collector Output Voltages 20V
A and B Output Currents (continuous)
  Source ..... Internally Limited
  Sink 1.0A
Parking Drive Output Current
  Continuous 150mA
  Pulsed 1A
Output Diode Current (pulsed) 1A
Power OK Output Current(continuous) 30mA
Operating Junction Temperature ..... -55°C to +150°C
Storage Temperature ..... -65°C to +150°C

Note 1: Unless otherwise indicated, voltages are referenced to ground and currents are positive into, negative out of, the specified terminals. "Pulsed" is defined as a less than 10% duty cycle pulse with a maximum duration of 500µs.
Note 2: See Unitrode Integrated Circuits databook for information regarding thermal specifications and limitations of packages.

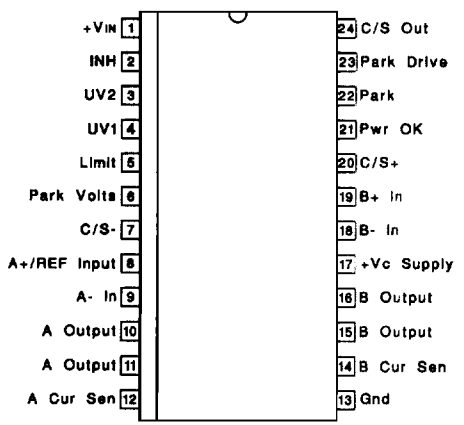
Thermal Data

QP Package:

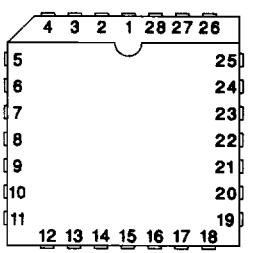
Thermal Resistance Junction to Leads, θJA ..... 15°C/W
Thermal Resistance Junction to Ambient, θJA ..... 40°C/W

CONNECTION DIAGRAMS

SOIC-24 (Top View)
DW Package



PLCC-28 (Top View)
QP Package



PACKAGE PIN FUNCTION	
FUNCTION	PIN
+VIN	1
INH	2
UV2	3
UV1	4
Limit	5
Park Volts	6
C/S-	7
A+/REF Input	8
A- In	9
A Output	10
A Cur Sen	11
Gnd (Heat Dissipation Pins)	12-18
B Cur Sen	19
B Output	20
+Vc Supply	21
B- In	22
B+ In	23
C/S+	24
Pwr OK	25
Park	26
Park Drive	27
C/S Out	28

ELECTRICAL CHARACTERISTICS:

Unless otherwise stated specifications apply for 0°C ≤ TA ≤ 70°C, +VIN = 12V, +Vc = +VIN, A+/REF Input = 6V. TA=TJ.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
INPUT SUPPLY					
+VIN Supply Current	All Amplifier Outputs = 6V		35	42	mA
+Vc Supply Current	IOUT = 0A		1		mA
+VIN UVLO Threshold	Low to High		2.8	3.0	V
UVLO Threshold Hysteresis			200		mV
UNDER VOLTAGE (UV) COMPARATOR					
Input Bias Current		-1.5	-0.5		µA
UV Thresholds	Low to High, Other Input = 5V	1.48	1.50	1.52	V
UV Threshold Hysteresis		15	25	40	mV
Pwr OK VSAT	IOUT = 5mA			0.45	V
Pwr OK Leakage	VOUT = 20V			5	µA

ELECTRICAL CHARACTERISTICS (cont.) Unless otherwise stated specifications apply for 0°C ≤ T_A ≤ 70°C, +V_{IN} = 12V, +V_C = +V_{IN}, A+/REF INPUT = 6V. T_A=T_J.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
POWER AMPLIFIERS A and B					
Input Offset Voltage	V_{CM} = 6V, A Amplifier			8	mV
	B Amplifier			12	mV
Input Offset Drift	Note 1, A Amplifier Only			25	µV/°C
Input Bias Current	V_{CM} = 6V, except A+/REF Input	-500	-150		nA
Input Offset Current	V_{CM} = 6V, B Amplifier Only			200	nA
Input Bias Current at A+/Ref Input	(A+/Ref–C/S+)/36k, T_J = 25°C, UC3174B Only	20	28	35	µA/V
	(A+/Ref–C/S+)/12k, T_J = 25°C, UC3175B Only	60	84	105	µA/V
Differential Sense Error Current	Note 2, I_L = 5mA	-500		500	µA
	I_L = 500mA		3	8	mA
CMRR	1V ≤ V_{CM} ≤ 10V	70	90		dB
PSRR	+V_{IN} = 4V to 15V, V_{CM} = 1.5V	70	90		dB
Large Signal Voltage Gain	V_{OUT} = 1V, Sinking 500mA to V_{OUT} = 11V, Sourcing 500mA	3.0	15.0		V/mV
Slew Rate	1 to 13V, 13 to 1V, T_J = 25°C		1	2.1	V/µs
Unity Gain Bandwidth	Note 1, A Amplifier		2		MHz
	Note 1, B Amplifier		1		MHz
High-Side Current Limit		0.8	1.0		A
Output Saturation Voltage	High-Side, I_{SOURCE} = 250mA		0.7		V
	High-Side, I_{SOURCE} = 800mA		0.85		V
	Low-Side, I_{SINK} = 250mA		0.3		V
	Low-Side, I_{SINK} = 800mA		0.4		V
	Total, I_{OUT} = 250mA		1.0	1.2	V
	Total, I_{OUT} = 800mA		1.25	1.6	V
High Side Diode V_F	I_D = 800mA, Inhibit Activated		1.0		V
Low Side Diode V_F	I_D = 800mA, Inhibit Activated		1.0		V
CURRENT SENSE AMPLIFIER					
Input Offset Voltage	V_{CM} = 6V			2.0	mV
	V_{CM} = 0V, UC3174B Only			5.0	mV
Input Offset Change with Ref Input	2V A+/Ref 10V, UC3174B Only			500	µV/V
Input Offset Change with Common Mode Input	0V ≤ V_{CM} ≤ 12V, UC3175B Only			1500	µV/V
Input Offset Drift	Note 1			8	µV/°C
Voltage Gain	-0.5V ≤ V_{DIFF} ≤ +0.5V, Vcm = 0V, UC3174B Only	7.8	7.9	8.0	V
	-1.0V ≤ V_{DIFF} ≤ +1.0V, V_{CM} = 6V, UC3175B Only	1.95	2.00	2.05	V
Output Saturation Voltage	Low-Side, I_{SINK} = 1.5mA		0.3	0.5	V
	High-Side, I_{SOURCE} = 1.5mA		0.4	0.7	V
Maximum A+/Ref Input	Volts Below +V_{IN}, C/S+ & C/S- = B_{OUTPUT} Max @ 10mA Output Current, +V_{IN} = 4.5V, UC3175B only, C/S VIO ≤ 5mV		2.6	3.0	V
PARKING FUNCTION					
Park Input Threshold		0.7	1.1	1.7	V
Park Input Current	Park Input = 1.7V		60	100	µA
Park Drive Saturation Voltage, PD_{VSAT}	I_{SINK} = 100mA		0.3	0.5	V
Parking Drive Leakage	V_{OUT} = 20V			100	µA

ELECTRICAL CHARACTERISTICS (cont.)

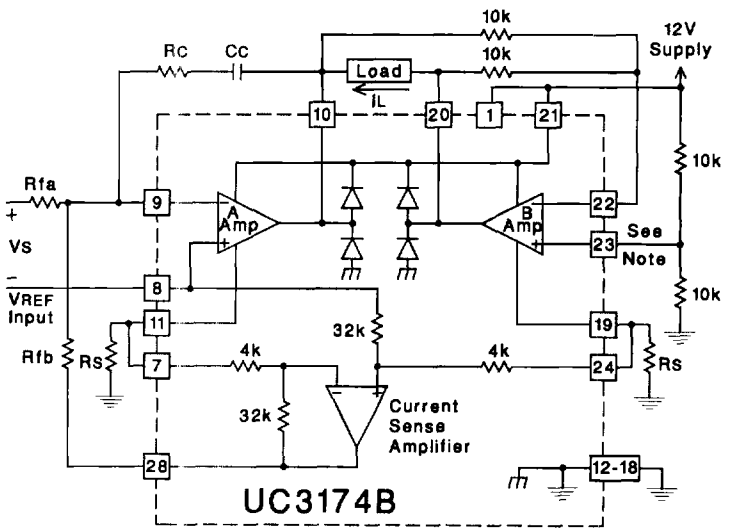
Unless otherwise stated specifications apply for 0°C ≤ TA ≤ 70°C, +VIN = 12V, +Vc = +VIN, A+/REF Input = 6V. TA=TJ.

PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
PARKING FUNCTION (cont.)					
Amplifier A Aux Input Bias Current		-500	-150		nA
Amplifier A Saturation Voltage, AHVSAT	ISOURCE = 50mA, +VIN = 3V		0.65	0.8	V
Regulating Voltage at Park Volts		1.47	1.50	1.53	V
Minimum Parking Supply Voltage	AHVSAT + PDVSAT ≤ 1.3V @ 50mA		1.7	1.9	V
AUXILIARY FUNCTIONS					
Limit Input Low Voltage	A Output Forced Low	0.7	0.8		V
Limit Input High Voltage	A Output Forced High		2.2	2.3	V
Limit Inactive		1.2		1.8	V
Limit Open Circuit Voltage		1.45	1.50	1.55	V
Limit Input Resistance	1.2V ≤ Limit Input ≤ 1.8V		10		kΩ
Inhibit Input Threshold		0.7	1.1	1.7	V
Inhibit Input Current	Inhibit Input = 1.7V		400	700	µA
Supply Current when Inhibited	The sum of +VIN and +Vc currents		2	6	mA
Thermal Shutdown Temperature			165		°C

Note 1: This specification not tested in production.

Note 2: This specification is a measure of the accuracy of the differential current sense scheme using the Current Sense pins of the UC3174B. The error current specified is defined as ICSA - ICSB - IL, where ICSA and ICSB are respectively the currents out of the A and B current sense pins, with load current, IL, flowing out of the B and into the A amplifier outputs. Similarly, the error current is measured as ICSB - ICSA - IL, with IL flowing from A into B.

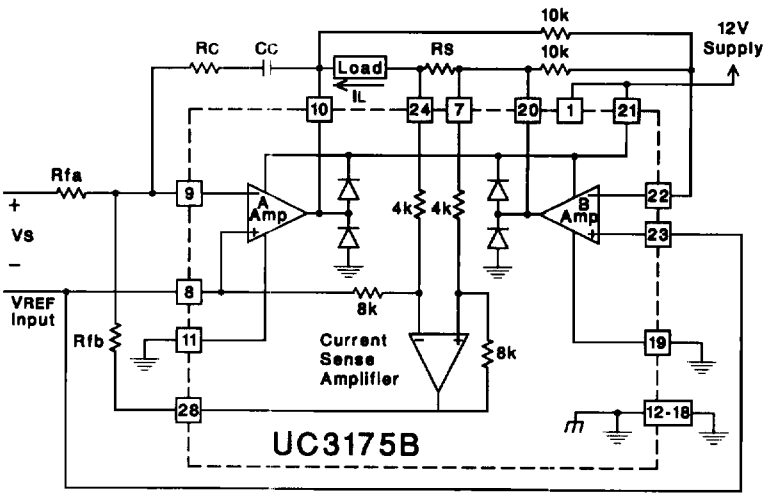
UC3174B Ground-Referenced Current Sensing



For maximum voltage swing, Pin 23 should see +VIN/2. If VREF at Pin 8 is at this level, then the divider is not necessary and Pin 23 can also be connected to the VREF input.

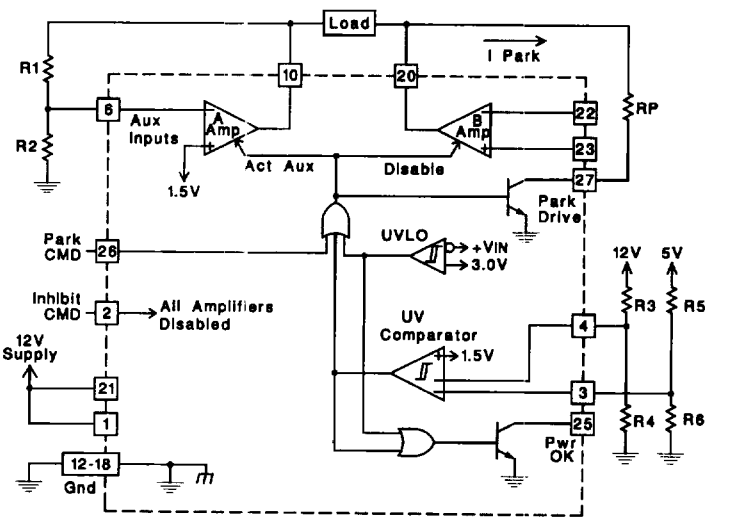
$$Go = \frac{IL}{Vs} = \frac{Rfb}{Rfa \bullet 8 \bullet Rs}$$

UC3175B Series Current Sensing



$$Go = \frac{IL}{Vs} = \frac{Rfb}{Rfa \bullet 2 \bullet Rs}$$

Parking Function



Notes: Parking voltage = 1.5V • (R1 + R2) / R2 - (IL • RP)
RP is optional for current limiting.
Inhibit and Park Inputs are active high.
Pwr OK is low on power failure.

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