

Full-Bridge Power Amplifier

PRELIMINARY

FEATURES

- Precision Current Control
- $\pm 800\text{mA}$ 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

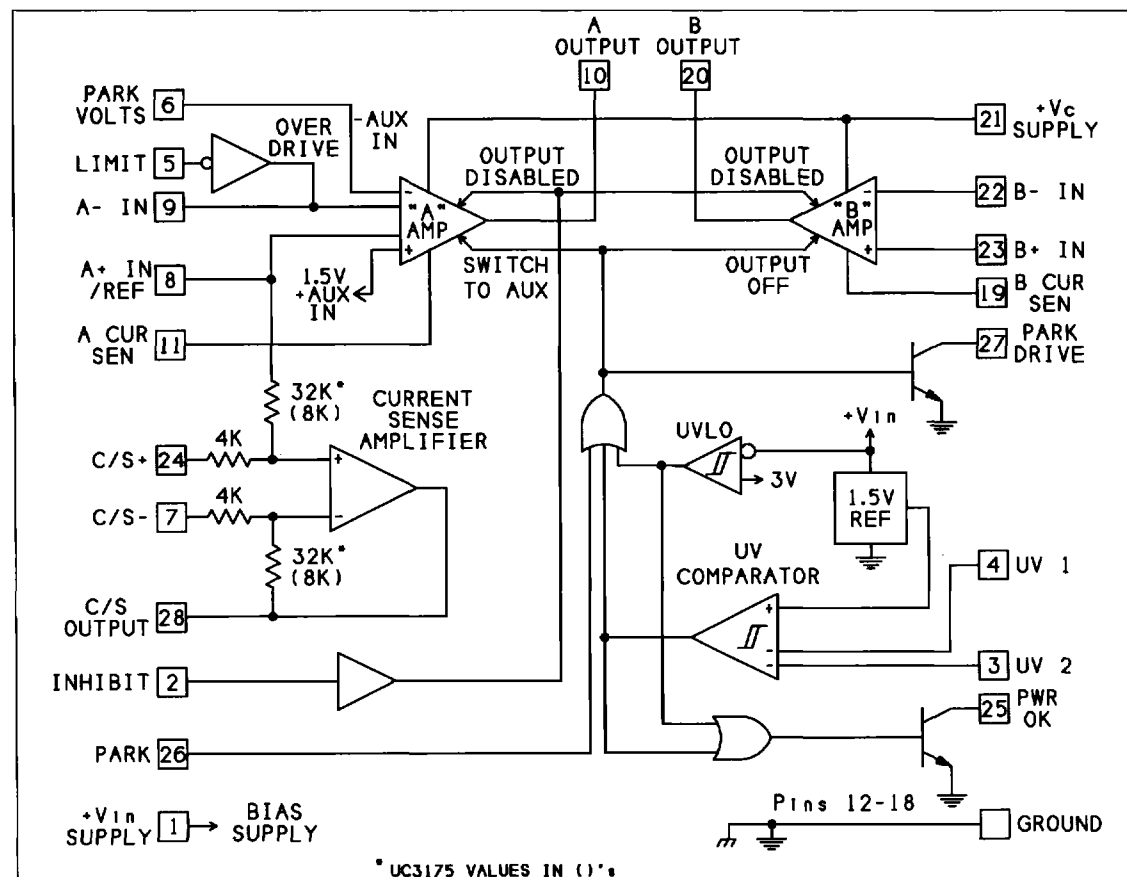
DESCRIPTION

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 UC3174 is designed for ground referenced current sensing using the device's Current Sense pins, while the UC3175 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.

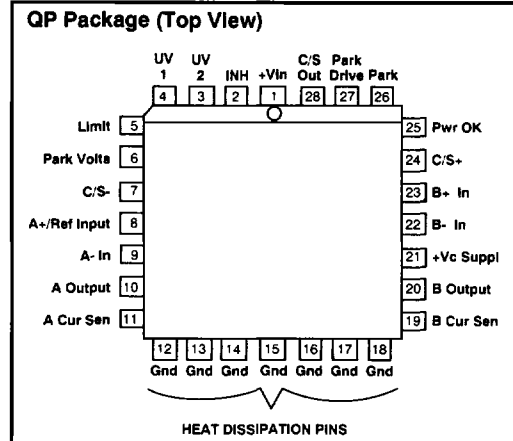
BLOCK DIAGRAM



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: 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 500 μ s.

CONNECTION DIAGRAM**THERMAL DATA****QP Package:**

Thermal Resistance Junction to Leads, θ_{JA} 15°C/W

Thermal Resistance Junction to Ambient, θ_{JA} 40°C/W

(See packaging section of UICC data book for more details on thermal performance)

ELECTRICAL CHARACTERISTICS:

Unless otherwise stated specifications apply for 0°C ≤ T_A ≤ 70°C, +Vin = 12V, +Vc = +Vin, A+/REF INPUT = 6V. T_A = T_J.

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
INPUT SUPPLY					
+Vin Supply Current	All amplifier outputs=6V		35	42	mA
+Vc Supply Current	I _{out} =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		μ A
UV Thresholds	low to high, other input=5V	1.48	1.50	1.52	V
UV Threshold Hysteresis		15	25	40	mV
PWR OK V _{sat}	I _{out} =5mA			0.45	V
PWR OK Leakage	V _{out} =20V			5	μ A
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	μ V/°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, UC3174 Only	23	28	35	μ A/V
	(A+/Ref-C/S+)/12K, T _J =25°C, UC3175 Only	69	84	105	μ A/V
Differential Sense Error Current	Note 2, I _L =5mA	-500		500	μ A
	I _L =500mA		3	8	mA

**ELECTRICAL
CHARACTERISTICS:**

Unless otherwise stated specifications apply for $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$, $V_{\text{in}}=12\text{V}$, $V_{\text{c}}=+V_{\text{in}}$, $A+/\text{REF}$
 $\text{INPUT}=6\text{V}$, $T_A=T_j$

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
POWER AMPLIFIERS A and B (Cont.)					
CMRR	$1\text{V} \leq V_{\text{cm}} \leq 10\text{V}$	70	90		dB
PSRR	$+V_{\text{in}}=4\text{V}$ to 15V , $V_{\text{cm}}=1.5\text{V}$	70	90		dB
Large Signal Voltage Gain	$V_{\text{out}}=1\text{V}$, Sinking 500mA to $V_{\text{out}}=11\text{V}$, Sourcing 500mA	3.0	15.0		V/mV
Slew Rate	Note 1		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, $I_{\text{source}}=250\text{mA}$		0.7		V
	High-Side, $I_{\text{source}}=800\text{mA}$		0.85		V
	Low-Side, $I_{\text{sink}}=250\text{mA}$		0.3		V
	Low-Side, $I_{\text{sink}}=800\text{mA}$		0.4		V
	Total, $I_{\text{out}}=250\text{mA}$		1.0	1.2	V
	Total, $I_{\text{out}}=800\text{mA}$		1.25	1.6	V
High Side Diode V_f	$I_d=800\text{mA}$, Inhibit activated		1.0		V
Low Side Diode V_f	$I_d=800\text{mA}$, Inhibit activated		1.0		V
CURRENT SENSE AMPLIFIER					
Input Offset Voltage	$V_{\text{cm}}=6\text{V}$			2.0	mV
	$V_{\text{cm}}=0\text{V}$, UC3174 only			5.0	mV
Input Offset Change with Ref Input	$2\text{V} \leq A+/\text{Ref} \leq 10\text{V}$, UC3174 only			500	$\mu\text{V/V}$
Input Offset Change with Common Mode Input	$0\text{V} \leq V_{\text{cm}} \leq 12\text{V}$, UC3175 only			1500	$\mu\text{V/V}$
Input Offset Drift	Note 1			8	$\mu\text{V}/^{\circ}\text{C}$
Voltage Gain	$-0.5\text{V} \leq V_{\text{diffs}} \leq +0.5\text{V}$, $V_{\text{cm}}=0\text{V}$, UC3174 only	7.8	7.9	8.0	V
	$-1.0\text{V} \leq V_{\text{diffs}} \leq +1.0\text{V}$, $V_{\text{cm}}=6\text{V}$, UC3175 only	1.95	2.00	2.05	V
Output Saturation Voltage	Low-Side, $I_{\text{sink}}=1.5\text{mA}$		0.3	0.5	V
	High-Side, $I_{\text{source}}=1.5\text{mA}$		0.4	0.7	V
Maximum $A+/\text{Ref}$ Input	Volts below $+V_{\text{in}}$, $C/S+$ & $C/S-$ = Boutput Max @ 10mA output current, $+V_{\text{in}}=4.5\text{V}$, UC3175 only, $C/S \text{ VIO} \leq 5\text{mV}$		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}	$I_{\text{sink}}=50\text{mA}$		0.3	0.5	V
Parking Drive Leakage	$V_{\text{out}}=20\text{V}$			100	μA
Amplifier A Aux Input Bias Current		-500	-150		nA
Amplifier A Saturation Voltage, A_{HVSAT}	$I_{\text{source}}=50\text{mA}$, $+V_{\text{in}}=3\text{V}$		0.65	0.8	V
Regulating Voltage at Park Volts		1.47	1.50	1.53	V
Minimum Parking Supply Voltage	$A_{\text{HVSAT}} + \text{PD}_{\text{VSAT}} \leq 1.3\text{V}$ @ 50mA		1.7	1.9	V

**ELECTRICAL
CHARACTERISTICS:**

Unless otherwise stated specifications apply for $0^{\circ}\text{C} \leq T_A \leq 70^{\circ}\text{C}$, $V_{\text{in}}=12\text{V}$, $V_c=+V_{\text{in}}$, $A+/\text{REF}$ INPUT=6V. $T_A=T_j$

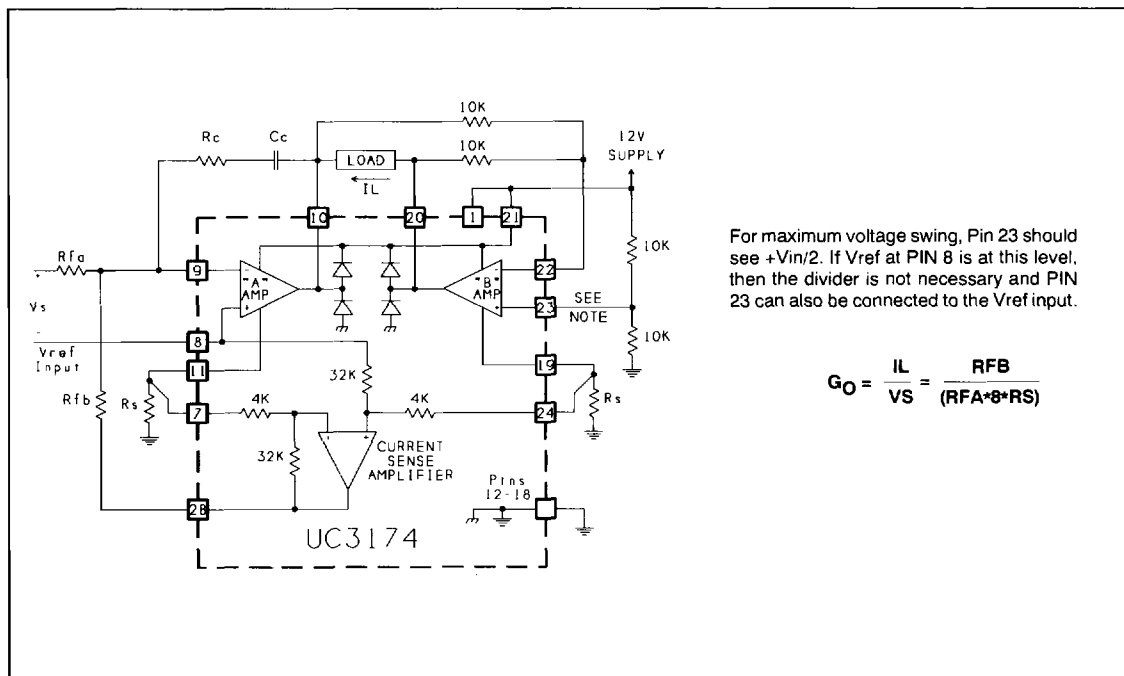
PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
AUXILIARY FUNCTIONS					
Limit Input Low Voltage	A Output Forced Low	0.7	0.8		V
Limit Input High Voltage	A Output Forced High		2.2	2.3	V
Limit Inactive		1.2		1.8	V
Limit Open Circuit Voltage		1.45	1.50	1.55	V
Limit Input Resistance	$1.2\text{V} \leq \text{Limit Inputs} \leq 1.8\text{V}$		10		$\text{K}\Omega$
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 $+V_{\text{in}}$ and $+V_c$ currents		2	6	mA
Thermal Shutdown Temperature			165		$^{\circ}\text{C}$

NOTES:

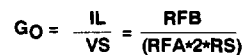
1: This specification not tested in production.

2: This specification is a measure of the accuracy of the differential current sense scheme using the Current Sense pins of the UC3174. The error current specified is defined as $I_{\text{CSA}} - I_{\text{CSB}} - I_L$, where I_{CSA} and I_{CSB} are, respectively, the currents out of the A and B current sense pins, with a load current, I_L , flowing out of the B and into the A amplifier outputs. Similarly, the error current is measured as $I_{\text{CSB}} - I_{\text{CSA}} - I_L$, with I_L flowing from A into B.

UC3174 GROUND-REFERENCED CURRENT SENSING



UC3175 SERIES CURRENT SENSING



PARKING FUNCTION



1. Parking voltage = $1.5V \cdot (R_1 + R_2) / R_2 - (I_L \cdot R_P)$
2. R_P is optional for current limiting.
3. INHIBIT and PARK Inputs are active high.
4. PWR OK is low on power failure.