INTEGRATED CIRCUITS
UNITRODE

UC3175B

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

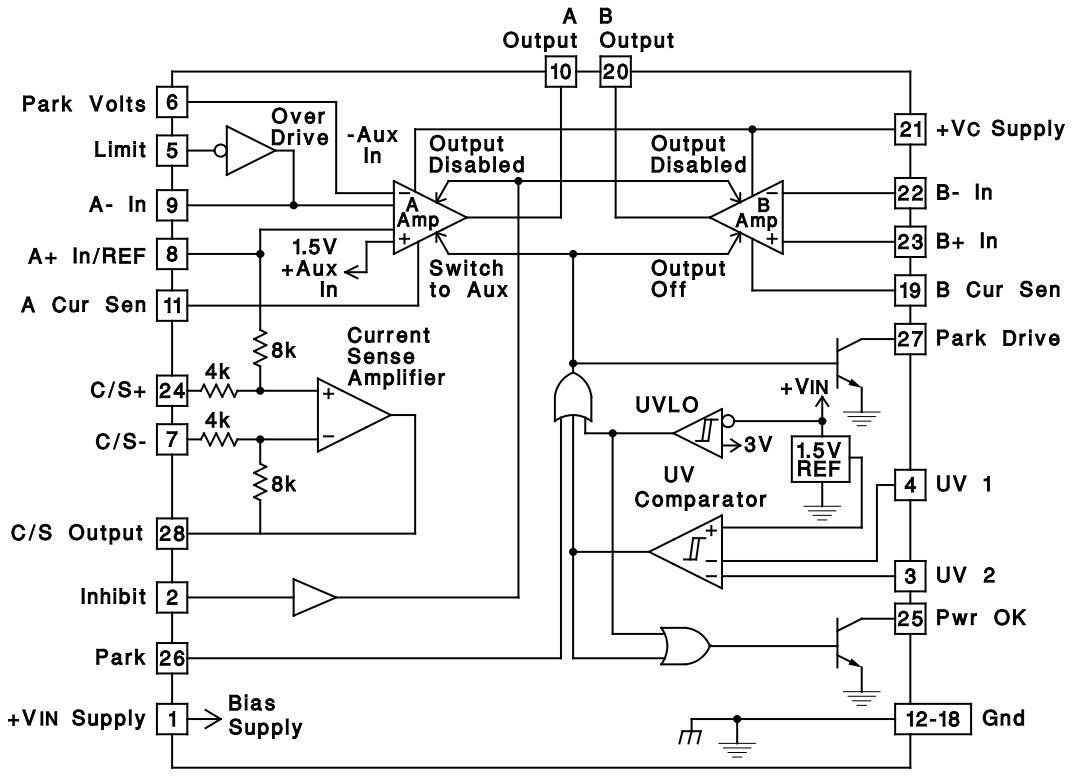
DESCRIPTION

This full-bridge power amplifier is rated for continuous output current of 0.8 Amperes and is intended for use in demanding servo applications such as head positioning for high-density disk drives. The device includes a precision current sense amplifier that provides accurate control of load current. Current is sensed with a single resistor in series with the load. The power amplifier has 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-92054-1

ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage, (+V_{IN},+V_C) 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 +V_{IN}
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

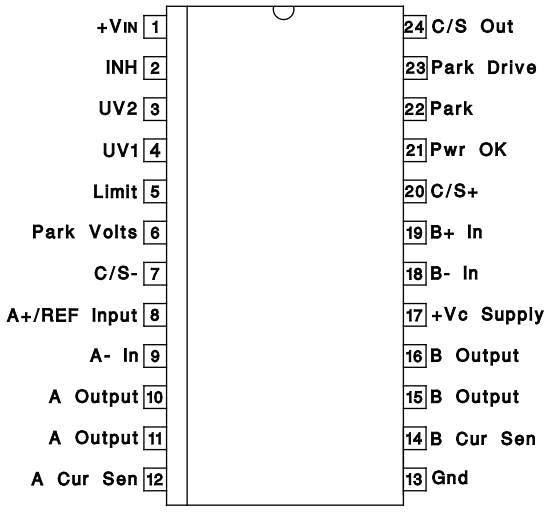
Note 1: Unless otherwise indicated, voltages are referenced to ground and currents are positive into, negative out of, the specified terminals. "Pulsed" is defined as a less than 10% duty cycle pulse with a maximum duration of 500µs.
Note 2: See Unitrode Integrated Circuits databook for information regarding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

Thermal Data

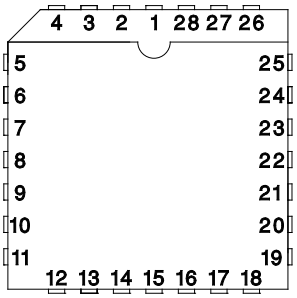
QP Package:
Thermal Resistance Junction to Leads,
  θ_{JL} . . . . . 15°C/W
Thermal Resistance Junction to Ambient,
  θ_{JA} . . . . . 40°C/W

CONNECTION DIAGRAMS

SOIC-24 (Top View)
DW Package



PLCC-28 (Top View)
QP Package



PACKAGE PIN FUNCTION	
FUNCTION	**PIN**
+V_{IN}	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 ≤ 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
INPUT SUPPLY					
+V_{IN} Supply Current	All Amplifier Outputs = 6V		35	42	mA
+V_C Supply Current	I_{OUT} = 0A		1		mA
+V_{IN} UVLO Threshold	Low to High		2.8	3.0	V
UVLO Threshold Hysteresis			200		mV

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.

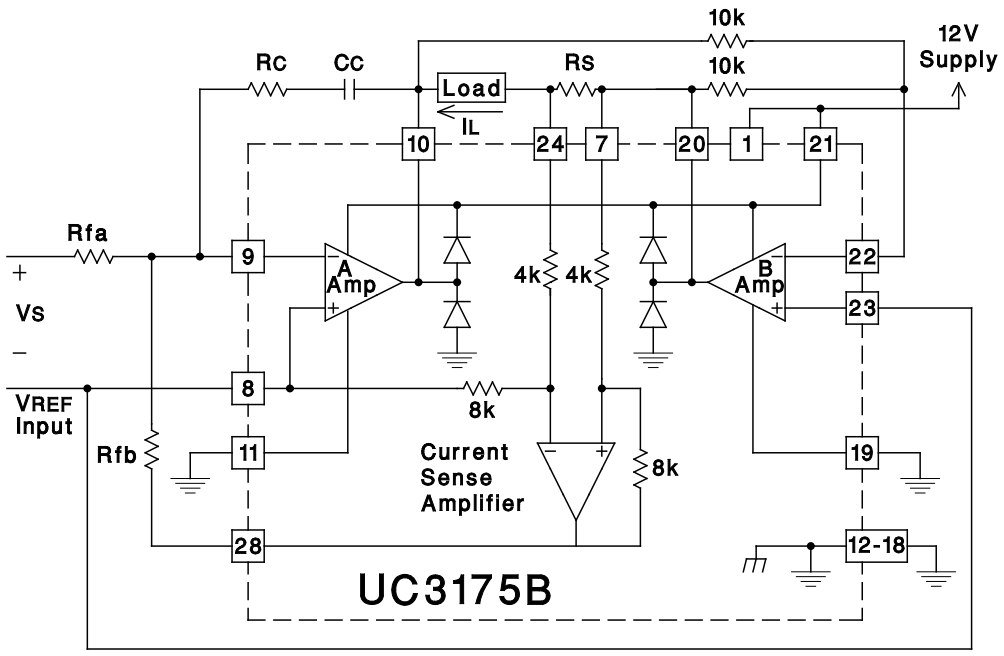
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNITS
UNDER VOLTAGE (UV) COMPARATOR					
Input Bias Current		-1.5	-0.5		µA
UV Thresholds	Low to High, Other Input = 5V	1.48	1.50	1.52	V
UV Threshold Hysteresis		15	25	40	mV
Pwr OK V_{SAT}	I_{OUT} = 5mA			0.45	V
Pwr OK Leakage	V_{OUT} = 20V			5	µA
POWER AMPLIFIERS 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+)/12k, T_J = 25°C	60	84	105	µA/V
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
Input Offset Change with Common Mode Input	0V ≤ V_{CM} ≤ 12V			1500	µV/V
Input Offset Drift	Note 1			8	µV/°C
Voltage Gain	-1.0V ≤ V_{DIFF} ≤ +1.0V, V_{CM} = 6V	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, 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
Amplifier A Aux Input Bias Current		-500	-150		nA

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
PARKING FUNCTIONS (cont.)					
Amplifier A Saturation Voltage, A_{HVSAT}	I_{SOURCE} = 50mA, +V_{IN} = 3V		0.65	0.8	V
Regulating Voltage at Park Volts		1.47	1.50	1.53	V
Minimum Parking Supply Voltage	A_{HVSAT} + PD_{VSAT} ≤ 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 +V_{IN} and +V_C currents		2	6	mA
Thermal Shutdown Temperature			165		°C

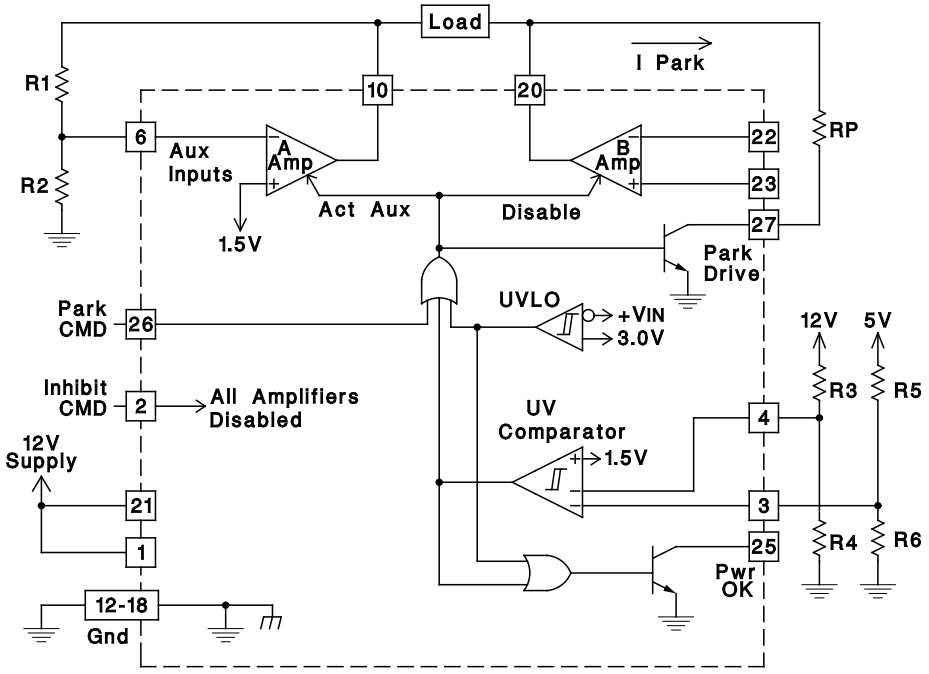
Note 1: This specification not tested in production.

UC3175B Series Current Sensing



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

Parking Function



Notes: *Parking voltage* $= \dfrac{1.5V \bullet R1 + R2}{R2 - (I_L \bullet RP)}$

RP is optional for current limiting.
Inhibit and Park Inputs are active high.
Pwr OK is low on power failure.

UNITRODE INTEGRATED CIRCUITS
7 CONTINENTAL BLVD. • MERRIMACK, NH 03054
TEL. (603) 424-2410 • FAX (603) 424-3460

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