

Full Bridge Power Amplifier

FEATURES

- Dual Power Operational Amplifiers
- $\pm 2A$ Output Current Guaranteed
- Precision Current Sense Amplifier
- Two Supply Monitoring Inputs
- Parking Function and Under-Voltage Lockout
- Safe Operating Area Protection
- 3V to 35V Operation

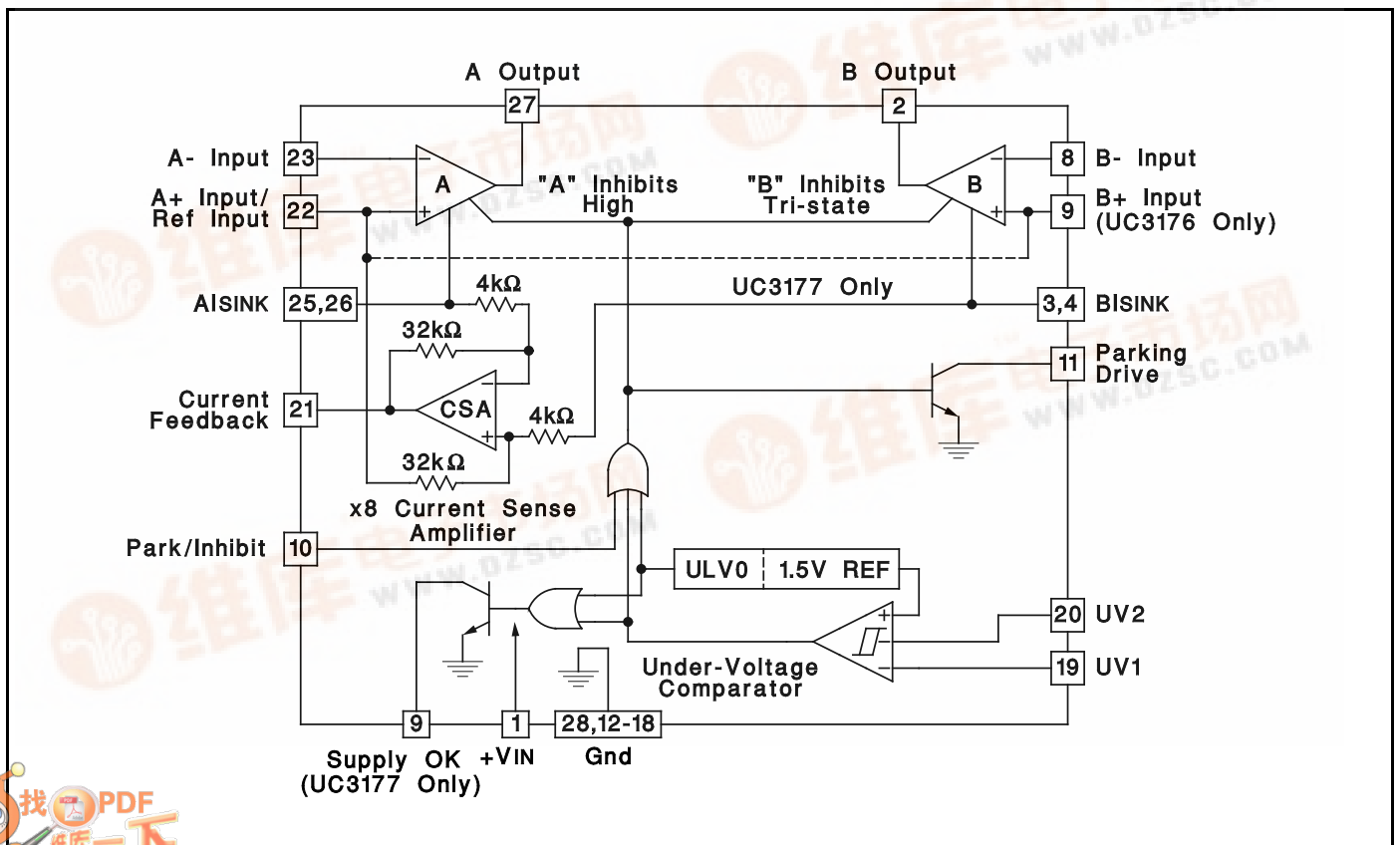
DESCRIPTION

The UC3176/7 family of full bridge power amplifiers is rated for a continuous output current of 2A. Intended for use in demanding servo applications such as disk head positioning, the onboard current sense amplifier can be used to obtain precision control of load current, or where voltage mode drive is required, a standard voltage feedback scheme can be used. Output stage protection includes foldback current limiting and thermal shut-down, resulting in a very rugged device.

Auxiliary functions on this device include a dual input under-voltage comparator that can be programmed to respond to low voltage conditions on two independent supplies. In response to an under-voltage condition the power Op-Amps are inhibited and a high current, 100mA, open collector drive output is activated. A separate Park/Inhibit command input.

The devices are operational over a 3V to 35V supply range. Internal under-voltage lockout provides predictable power-up and power-down characteristics.

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (Note 1)

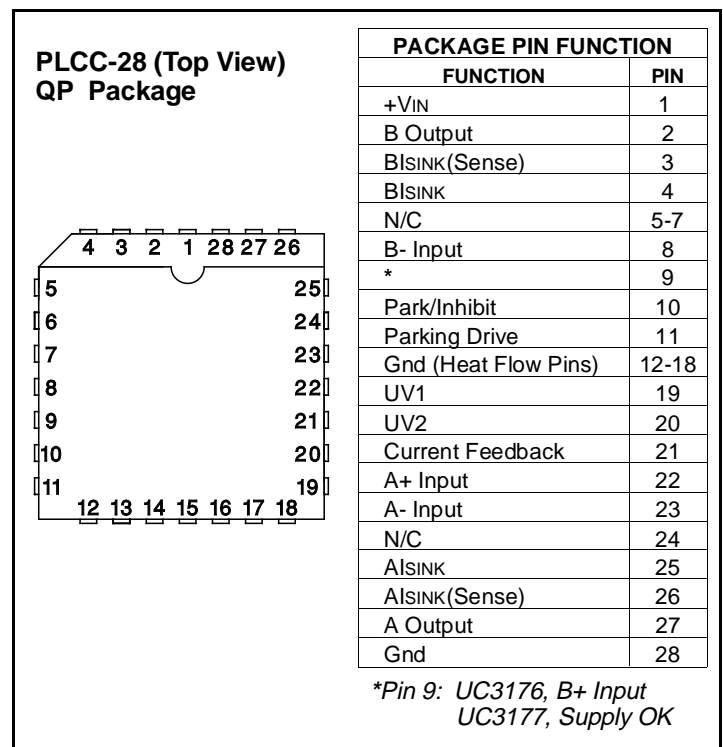
Input Supply voltage, (+VIN) 40V
 Park/Inhibit, UV1 and UV2 inputs (zener clamped)
 Maximum forced voltage -0.3V to 10V
 Maximum forced current. ±10mA
 Other Input Voltages. -0.3V to +VIN
 ALSINK and BLSINK Voltages. -0.3V to 6V
 Open Collector Output Voltages. 40V
 A and B Output Currents (Continuous)
 Source Internally Limited
 Sink. 2.5A
 Total Supply Current (Continuous). 4A
 Parking Drive Output Current (Continuous). 200mA
 Supply OK Output Current, UC3177 (Continuous) . . . 30mA
 Operating Junction Temperature -55°C to +150°C
 Power Dissipation at TC = +75°C
 QP package. 4W
 Storage Temperature -65°C to +150°C

Note 1: Unless otherwise indicated, voltages are reference to ground and currents are positive into, negative out of, the specified terminals.

THERMAL DATA

QP package:
 Thermal Resistance Junction to Leads, θ_{JL} 15°C/W
 Thermal Resistance Junction to Ambient, θ_{JA} 50°C/W

CONNECTION DIAGRAM



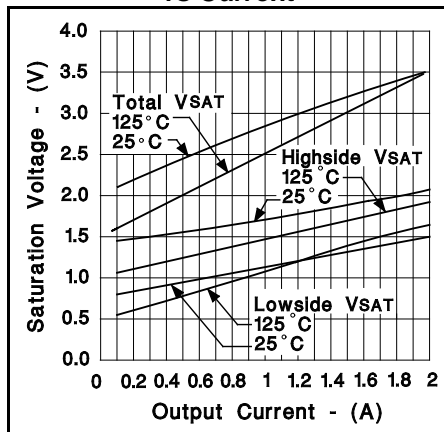
ELECTRICAL CHARACTERISTICS: Unless otherwise stated, specifications hold for $T_A = 0$ to 70°C , $+V_{IN} = 12\text{V}$, $T_A = T_J$.

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Input Supply					
Supply Current	+VIN = 12V		18	25	mA
	+VIN = 35V		21	30	mA
UVOL Threshold	+VIN low to high		2.8	3.0	V
	Threshold Hysteresis		220	300	mV
Power, Amplifier, A and B					
Input Offset Voltage	VCM = 6V, VOUT = 6V			8	mV
Input Bias Current	VCM = 6V, Except A+ Input	-500	-100		nA
Input Bias Current at A+/Reference Input	(A+/Ref - BLSINK)/36kohms; TJ = 25°C	23	28	35	µA/V
Input Offset Current B Amp (UC3176 Only)	VCM = 6V			200	nA
CMRR	VCM = 1 to 33V, +VIN = 35V, VOUT = 6V	70	100		dB
PSRR	+VIN = 5 to 35V, VCM = 2.5V	70	100		dB
Large Signal Voltage Gain	VOUT = 3V, w/IOUT = 1A to VOUT = 9V, w/IOUT = -1A	1.5	4		V/mV
Thermal Feedback	+VIN = 20V, Pd = 20W at opposite output		25	200	µV/W
Saturation Voltage	IOUT = -2A, High Side, TJ = 25°C		1.9		V
	ClOUT = 2A, Low Side, TJ = 25°C		1.6		V
	Total VSAT at 2A, TJ = 25°C		3.5	3.7	V
Unity Gain Bandwidth			1		MHz
Slew Rate			1		V/µs
Differential IOUT Sense Error Current in Bridge Configuration	IOUT(A) = -IOUT(B), /IOUT/- /ALSINK - BLSINK/				
	IOUT ≤ 200mA		3.0	6.0	mA
	IOUT ≤ 2A		5.0	10	mA
High Side Current Limiting	=VIN - VOUT < 12V		-2.7	-2.0	A

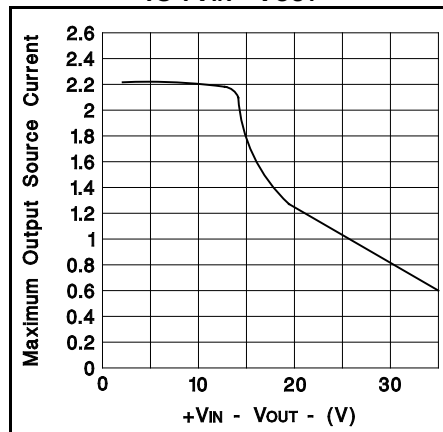
ELECTRICAL CHARACTERISTICS: Unless otherwise stated, specifications hold for $T_A = 0$ to 70°C , $+V_{IN} = 12\text{V}$, $T_A = T_J$.

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Current Sense Amplifier					
Input Offset Voltage	$V_{CM} = 0\text{V}$, A+/Ref at 6V			3	mV
	Ref = 2V to 20V, $+V_{IN} = 35$, change with Ref input voltage			600	$\mu\text{V/V}$
Thermal Gradient Sensitivity	$+V_{IN} = 20\text{V}$, Ref = 10V Pd = 20W @ A or B output		5.0	75	$\mu\text{V/W}$
PSRR	Ref = 2.5V, $+V_{IN} = 5$ to 35V	70	100		dB
Gain	$ A_{SINK} - B_{SINK} \leq 0.5\text{V}$	7.8	8	8.1	V/V
Slew Rate			2		$\text{V}/\mu\text{S}$
3dB Bandwidth			1		MHz
Max Output Current	$I_{SOURCE} = +V_{IN} - V_{OUT} = 0.5\text{V}$	2.5	3.5		mA
Output Saturation Voltage	$I_{SOURCE} = 1.5\text{mA}$, High Side		0.15	0.30	V
	$I_{SINK} = 5\text{mA}$, Low Side		1.4	1.7	V
Under-Voltage Comparator					
Threshold Voltage	Low to High, other input at 5V	1.44	1.50	1.56	V
	Threshold Hysteresis	50	70	80	mV
Input Current	Input = 2V, other input at 5V	-2	-0.05		μA
Supply OK V_{SAT} (UC3177 Only)	$I_{OUT} = 5\text{mA}$			0.45	V
Supply OK Leakage (UC3177 Only)	$V_{OUT} = 35\text{V}$			5	μA
Park/Inhibit					
Park/Inhibit Thld		1.1	1.3	1.7	V
Park/Inhibit Input Current	At threshold		60	100	μA
Parking Drive Saturation Voltage	$I_{OUT} = 100\text{mA}$		0.3	0.7	V
Parking Drive Leakage	$V_{OUT} = 35\text{V}$			15	μA
Thermal Shutdown					
Shutdown Temperature			165		$^\circ\text{C}$

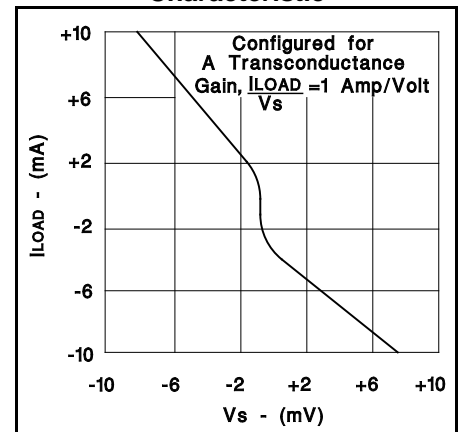
Output Saturation Voltage vs Current



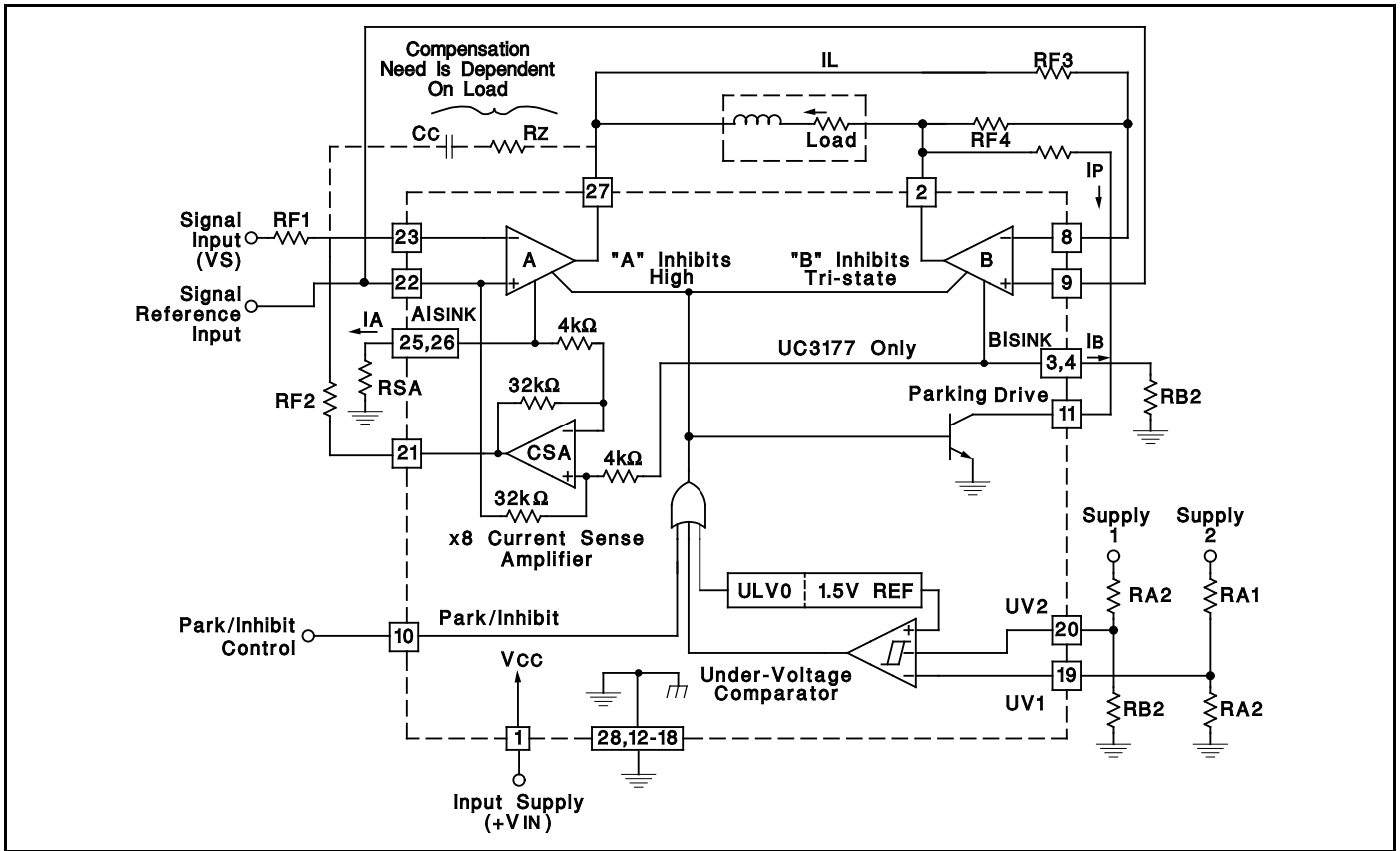
Maximum Source Current vs $+V_{IN} - V_{OUT}$



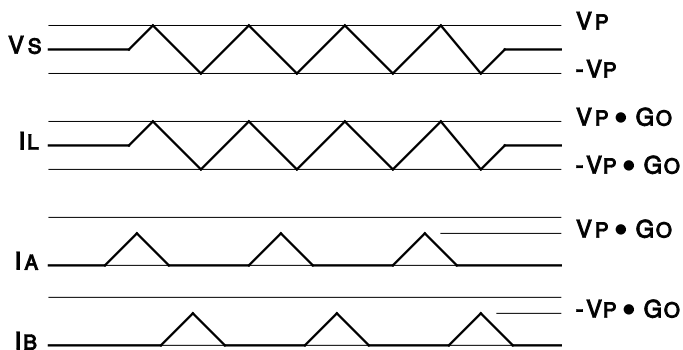
Crossover Current Error Characteristic



APPLICATION AND OPERATION INFORMATION



WAVEFORMS FOR ABOVE APPLICATION



DESIGN EQUATIONS

$$\text{Transconductance } (G_O) = \frac{I_L}{V_S} = \frac{R_{F2}}{R_{F1}} \times \left(\frac{1}{8R_S} \right)$$

with: $R_{SA} = R_{SB}$ and $R_{F3} = R_{F4}$

$$\text{Parking Current } (I_P) = \frac{V_{IN} - 1.5}{R_P + R_L}$$

where: R_L = load resistance

Under-Voltage Thresholds, at Supplies
 High to Low Threshold, $(V_{LH}) = 1.425 (R_A + R_B) / R_B$
 Low to High Threshold, $(V_{HL}) = 1.5 (R_A + R_B) / R_B$

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