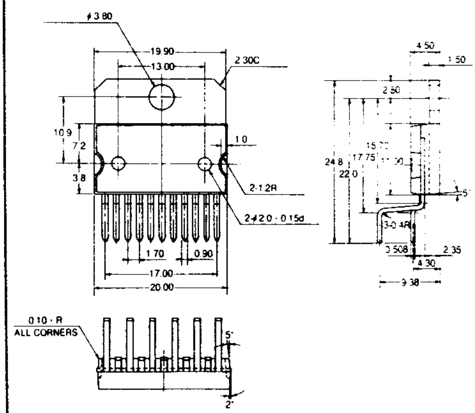
DBL 1032-D

20W BRIDGE AMPLIFIER

11 ZIP/HS	Unit: mm



The DBL 1032-D is a class B dual audio power amplifier and easily designed for power booster amplifier that provides a high current capability(up to 3.5A) and that can drive very low impedance loads(down to 1.6Ω in stereo applications).

☐ FEATURES

- ○ High output power :
  - P_{OUT} =10+10W at R_L =2Ω, THD=10%,Dual
  - P_{OUT} =20W at R_L =4Ω, THD=10%, BTL
- ○ Very few external parts.
- ○ Flexibility in use for Dual and BTL mode.
- ○ No damage for polarity reverse insertion on the PCB.
- ○ Built in several protection circuits.
  - — Thermal protection.
  - — Load dump protection.
  - — Output DC and AC short protection.
  - — Fortuitous open GND protection.

☐ APPLICATION

- ○ Car radio and cassette.

☐ MAXIMUM RATINGS

Characteristic	Symbol	Rating	Unit
Peak Supply Voltage(for 50ms)	V_{CC} (peak)	40	V
Supply Voltage	V_{CC}	28	V
Operating Supply Voltage	V_{CC} (opr)	18	V
Output Peak Current	I_{OUT} (peak)	4.5	A
Power Dissipation at T_{case} =60°C	P_D	30	W
Storage Temperature	T_{stg}	−40∼+150	°C

☐ ELECTRICAL CHARACTERISTICS

(Unless otherwise specified, f = 1KHz, R_g = 600 Ω, Ta = 25°C)

1. BTL Mode.

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	—		8	—	18	V
Output Offset Voltage	V_{OS}	V_{CC} = 14.4V		—	—	150	mV
		V_{CC} = 13.2V		—	—	150	mV
Quiescent Current	I_{CCQ}	V_{CC} = 14.4V, R_L = 4 Ω		—	75	150	mA
		V_{CC} = 13.2V, R_L = 3.2 Ω		—	70	160	mA
Output Power	P_{OUT}	V_{CC} = 14.4V THD = 10%	R_L = 4 Ω	18	20	—	w
			R_L = 3.2 Ω	20	22	—	W
		V_{CC} = 13.2V, R_L = 3.2 Ω, THD = 10%		17	19	—	W
Total Harmonic Distortion	THD	V_{CC} = 14.4V, R_L = 4 Ω 50mW ≦ P_{OUT} ≦ 5W		—	—	1	%
		V_{CC} = 13.2V, R_L = 3.2 Ω 50mW ≦ P_{OUT} ≦ 13W		—	—	1	%
Input Sensitivity	S_i	P_{OUT} = 2W, R_L = 4 Ω		—	9	—	mV_{rms}
		P_{OUT} = 2W, R_L = 3.2 Ω		—	8	—	mV_{rms}
Input Resistance	R_{IN}	—		70	—	—	KΩ
Closed Loop Voltage Gain	G_V	V_{OUT} = 0dBm		—	50	—	dB
Input Noise Voltage	V_{NI}	R_g = 10K Ω, BPF = 22Hz ~ 22KHz		—	3	10	μV
Ripple Rejection Ratio	R.R.	R_g = 10K Ω, f_r = 100Hz, V_r = 0.5V_{rms}		45	55	—	dB
Low Frequency Roll Off(-3dB)	f_L	R_L = 3.2 Ω		—	—	40	Hz
High Frequency Roll Off(-3dB)	f_H	R_L = 3.2 Ω		20	—	—	KHz
Output Voltage with one side of the speaker shorted to ground	V_{OSH}	V_{CC} = 14.4V, R_L = 4 Ω		—	—	2	V
		V_{CC} = 13.2V, R_L = 3.2 Ω		—	—	2	V
Efficiency	Eff.	V_{CC} = 14.4V	P_{OUT} = 20W, R_L = 4 Ω	—	60	—	%
			P_{OUT} = 22W, R_L = 3.2 Ω	—	60	—	%
		V_{CC} = 13.2V, P_{OUT} = 19W, R_L = 3.2 Ω		—	58	—	%

☐ ELECTRICAL CHARACTERISTICS (continued)

2. Dual Mode

Characteristic	Symbol	Test Condition		Min.	Typ.	Max.	Unit
Supply Voltage	V_{CC}	—		8	—	18	V
Quiescent Current	I_{CCQ}	V_{CC} = 14.4V		—	65	120	mA
		V_{CC} = 13.2V		—	62	120	mA
Quiescent Output Voltage	V_{CC}	V_{CC} = 14.4V		6.6	7.2	7.8	V
		V_{CC} = 13.2V		6	6.6	7.2	V
Output Power	P_{OUT}	V_{CC} = 14.4V, THD = 10%	R_L = 4 Ω	6	6.5	—	W
			R_L = 3.2 Ω	7	8	—	W
			R_L = 2 Ω	9	10	—	W
			R_L = 1.6 Ω	10	11	—	W
		V_{CC} = 13.2V, THD = 10%	R_L = 3.2 Ω	6	6.5	—	W
			R_L = 1.6 Ω	9	10	—	W
		V_{CC} = 16V, THD = 10%, R_L = 2 Ω		—	12	—	W
Total Harmonic Distortion	THD	V_{CC} = 14.4V	R_L = 4Ω, 50mW ≦ P_{OUT} ≦ 4W	—	0.2	1	%
			R_L = 2 Ω, 50mW ≦ P_{OUT} ≦ 6W	—	0.3	1	%
		V_{CC} = 13.2V	R_L = 3.2 Ω, 50mW ≦ P_{OUT} ≦ 3W	—	0.2	1	%
			R_L = 1.6 Ω, 40mW ≦ P_{OUT} ≦ 6W	—	0.3	1	%
Cross Talk	C.T.	V_{CC} = 14.4V, R_L = 4 Ω, R_g = 5K Ω, V_{OUT} = 4V_{rms}	f = 1KHz	—	60	—	dB
			f = 10KHz	—	45	—	dB
Input Sensitivity	S_i	P_{OUT} = 1W	R_L = 4 Ω	—	6	—	mV_{rms}
			R_L = 3.2 Ω	—	5.5	—	mV_{rms}

Characteristic	Symbol	Test Condition	Min.	Typ.	Max.	Unit.
Input Resistance	R_{IN}	Non inverting Input	70	200	—	KΩ
		Inverting Input	—	10	—	KΩ
Open Loop Voltage Gain	G_{VO}	V_{OUT} = 0dBm	—	90	—	dB
Closed Loop Voltage Gain	G_V	V_{OUT} = 0dBm	48	50	51	dB
Voltage Gain Ratio	$\triangle G_V$	V_{OUT} = 0dBm	—	0.5	—	dB
Input Noise Voltage	V_{NI}	R_g = 10KΩ, B.P.F. = 22Hz~22KHz	—	1.5	5	μV
Low Frequency Roll Off(-3dB)	f_L	R_L = 2Ω	—	—	50	Hz
High Frequency Roll Off(-3dB)	f_H	R_L = 2Ω	15	—	—	KHz
Ripple Rejection	R.R.	R_g = 10KΩ, f_r = 100Hz, V_r = 0.5V_{rms}	0.5	45	—	dB

TEST AND APPLICATION CIRCUITS

1. B T L Amplifier

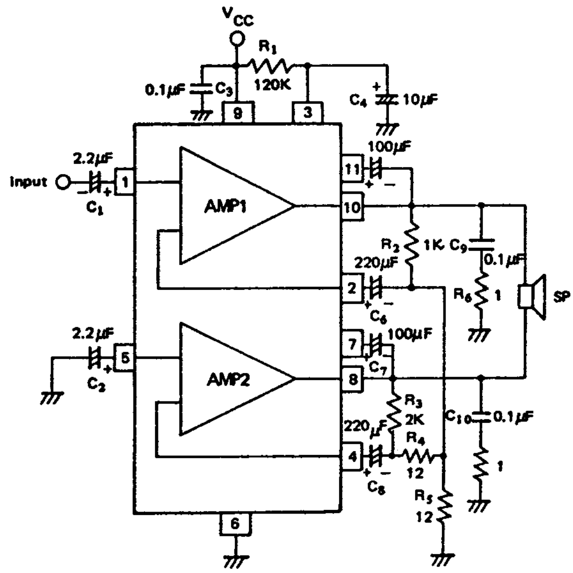


Fig. 1

2. Dual Amplifier

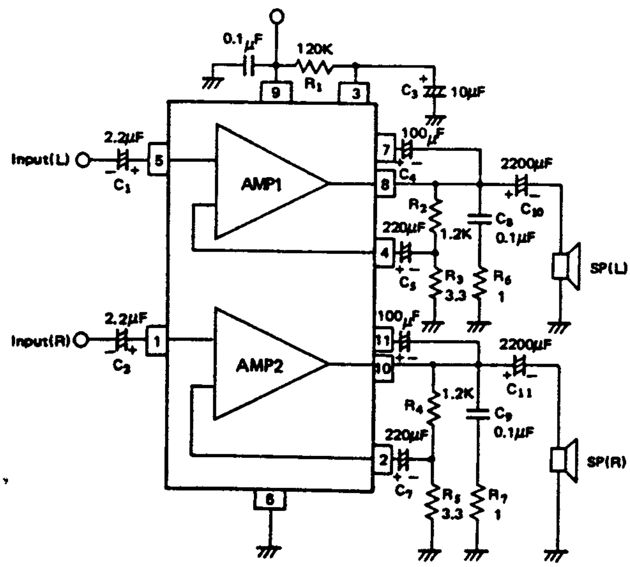


Fig. 2

APPLICATION INFORMATION

1. B T L Amplifier Design.

Voltage and current swigns are twice for a B T L amplifier in comparison with one channel of dual amplifier. Care must be taken when selecting V_{CC} and R_L in order to aviod an output peak current maximum rating.

The following considerations can be useful when designing a bridge amplifier.

Parameter(before clipping)	Symbol	One Channel of Dual	BTL
Peak Output Voltage	V_{OUT} (Max.)	$\frac{1}{2}(V_{CC}-2V_{CE}(SAT))$	$V_{CC}-2V_{CE}(SAT)$
Peak Output Current	I_{OUT} (Max.)	$\frac{1}{2}\frac{V_{CC}-2V_{CE}(SAT)}{R_L}$	$\frac{1}{2}\frac{V_{CC}-2V_{CE}(SAT)}{R_L}$
Output Power(rms)	P_{OUT} (Max.)	$\frac{1}{4}\frac{(V_{CC}-2V_{CE}(SAT))^2}{2R_L}$	$\frac{(V_{CC}-2V_{CE}(SAT))^2}{2R_L}$

The closed loop voltage gain of BTL configuration is given by (See Fig.3)

$$G_V = \frac{V_{OUT}}{V_{IN}} = 1 + \frac{R_1}{\left(\frac{R_2 \cdot R_4}{R_2 + R_4}\right)} + \frac{R_3}{R_4}$$

G_V(dB)	$R_1(\Omega)$	$R_2=R_4(\Omega)$	$R_3(\Omega)$
40	1000	39	2000
50	1000	12	2000

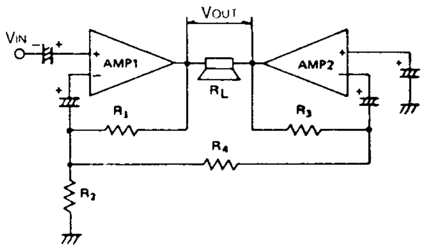


Fig. 3.

2. Built-in Protection Circuits

1) Load dump protection.

The DBL1032-D can withstand a voltage pulse train, on pin 9, of the type shown in Fig 4. If the supply voltage peaks to more than 40V, then an IC filter must be inserted between the supply and pin 9 in order to assure that the pulses at pin 9 will be held within the limits shown. A suggested LC network is shown in fig 5. With this network, a train of pulses with amplitude up to 120V and width of 2ms can be applied at point A. The maximum operating supply voltage is 18V because this type of protection is ON when the supply voltage(pulse or DC)exceeds 18V.

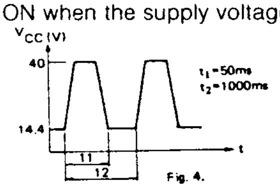


Fig. 4.

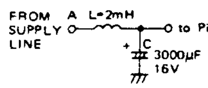


Fig. 5.

2) Short circuit protection.

The DBL1032-D can withstand a permanent short-circuit on the output for a supply voltage up to 16V.

3) Reverse insertion protection.

The device can handle high current (up to 10A) with no damage for a longer period than the blow-out time of quick 2A fuse(nomally connected in series with the supply.)

4) Open ground protection.

The DBL1032-D protection diodes avoid any damage when the device is in the ON condition and ground is accidentally opened.

5) DC Voltage Protection.

The DBL1032-D can withstand a DC Voltage up to 28V with damage.

6) Thermal Protection.

The DBL1032-D can withstand an excessive ambient temperature of an overload on the output.

7) Loud speaker protection.

The circuit offers loud speaker protection during short circuit for one wire to ground.

☐ APPLICATION INFORMATION(continued)

3. External Parts Suggestion
   The recommended values of the components are those shown on BTL application circuit.

Component	Recommended Value	Purpose	Larger Value	Smaller Value
R_1	120KΩ	Maximum P_{OUT}	Smaller P_{OUT} (Max.)	Smaller P_{OUT} (Max.)
R_2	1KΩ	Closed loop gain setting	—	—
R_3	2KΩ			
R_4 and R_5	12Ω			
R_6 and R_7	1Ω	Frequency stability	Danger of oscillation at high frequency with inductive load	—
C_1	2.2μF	Input DC decoupling	High turn on delay	Higher turn on pop, Higher low frequency cutoff, Increase of noise
C_2	2.2μF	Cancelling turn on pop and optimizing turn on delay		
C_3	0.1μF	Supply bypass	—	Danger of oscillation.
C_4	10μF	Ripple Rejection	Increase of R.R and switch on time	Degradation of R.R
C_5 and C_7	100μF	Bootstrapping	—	Increase of THD at low frequency
C_6 and C_8	220μF	Feedback input DC decoupling, low freq-uency cutoff.	—	Higher low frequency cutoff
C_9 and C_{10}	0.1μF	Frequency stability	—	Danger of oscillation

DBL 1032-D

☐ TYPICAL PERFORMANCE CHARACTERISTICS