

24 W BTL OR 2 X 12 WATT STEREO CAR RADIO POWER AMPLIFIER

GENERAL DESCRIPTION

The TDA1516BQ is an integrated class-B output amplifier in a 13-lead single-in-line (SIL) plastic power package. The device is primarily developed for car radio applications.

FEATURES

- Requires very few external components
- Flexibility in use — stereo as well as mono BTL
- High output power (without bootstrap)
- Low offset voltage at output (important for BTL)
- Fixed gain
- Good ripple rejection
- Mute/stand-by switch
- Load dump protection
- A.C. and d.c. short-circuit-safe to ground and V_p
- Thermally protected
- Reverse polarity safe
- Capability to handle high energy on outputs ($V_p = 0$ V)
- No switch-on/switch-off pop
- Flexible leads
- Low thermal resistance
- Identical inputs (inverting and non-inverting)
- Compatible with TDA1518Q (except gain)

QUICK REFERENCE DATA

parameter	conditions	symbol	min.	typ.	max.	unit
Supply voltage range						
operating		V_p	6,0	14,4	18,0	V
non-operating		V_p	—	—	30,0	V
load dump protected		V_p	—	—	45,0	V
Repetitive peak output current		I_{ORM}	—	—	4	A
Total quiescent current		I_{tot}	—	30	—	mA
Stand-by current		I_{sb}	—	0,1	100	μ A
Switch-on current		I_{sw}	—	—	40	μ A
Input impedance						
BTL		$ Z_i $	25	—	—	k Ω
stereo		$ Z_i $	50	—	—	k Ω
Stereo application						
Output power	THD = 10%; 4 Ω THD = 10%; 2 Ω	P_o	—	6	—	W
Channel separation		P_o	—	11	—	W
Noise output voltage		α	40	—	—	dB
		$V_{no(rms)}$	—	50	—	μ V
BTL application						
Output power	THD = 10%; 4 Ω	P_o	—	22	—	W
Supply voltage	$R_S = 0$ Ω ; $f = 100$ Hz to 10 kHz	RR	48	—	—	dB
ripple rejection		$ \Delta V_O $	—	—	100	mV
D.C. output offset voltage						

PACKAGE OUTLINE

13-lead SIL-bent-to-DIL; plastic power (SOT141).

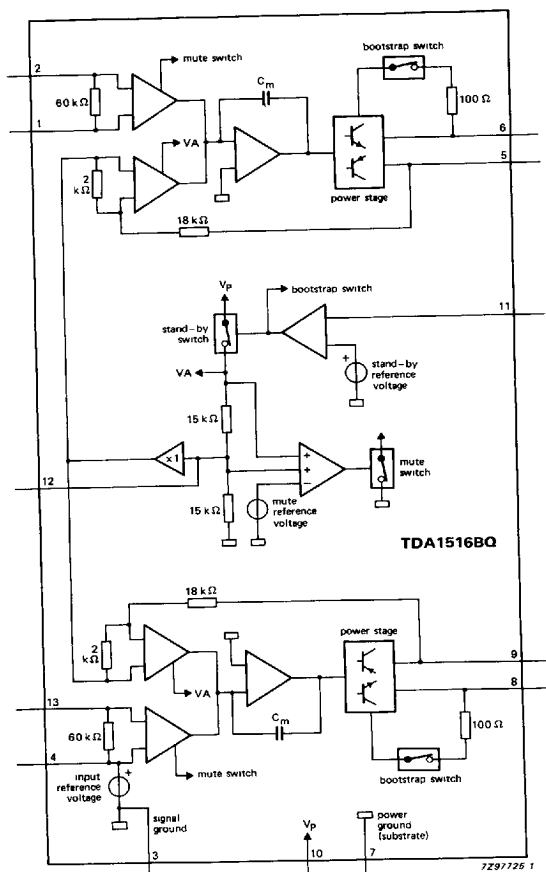


Fig. 1 Block diagram.

PINNING

1	—INV1	non-inverting input 1
2	INV	inverting input
3	GND1	ground (signal)
4	V _{ref}	reference voltage
5	OUT1	output 1
6	BS1	bootstrap 1
7	GND2	ground (substrate)

8	BS2	bootstrap 2
9	OUT2	output 2
10	V _p	supply voltage
11	M/SS	mute/stand-by switch
12	RR	supply voltage ripple rejection
13	—INV2	non-inverting input 2

FUNCTIONAL DESCRIPTION

The TDA1516BQ contains two identical amplifiers with differential input stages. This device can be used for stereo or bridge applications. The gain of each amplifier is fixed at 20 dB. A special feature of this device is the mute/stand-by switch which has the following features:

- low stand-by current ($< 100 \mu\text{A}$)
- low mute/stand-by switching current (low cost supply switch)
- mute condition

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

parameter	conditions	symbol	min.	max.	unit
Supply voltage					
operating		V_P	—	18	V
non-operating		V_P	—	30	V
load dump protected	during 50 ms; $t_r \geq 2,5 \text{ ms}$	V_P	—	45	V
A.C. and d.c. short-circuit- safe voltage		V_{PSC}	—	18	V
Reverse polarity		V_{PR}	—	6	V
Energy handling capability at outputs	$V_P = 0 \text{ V}$		—	200	mJ
Non-repetitive peak output current		I_{OSM}	—	6	A
Repetitive peak output current		I_{ORM}	—	4	A
Total power dissipation	see Fig. 2	P_{tot}	—	25	W
Crystal temperature		T_c	—	150	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	-55	+ 150	$^{\circ}\text{C}$

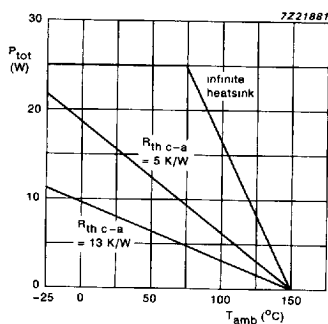


Fig. 2 Power derating curve.

D.C. CHARACTERISTICS (note 1) $V_P = 14,4 \text{ V}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$; unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
Supply						
Supply voltage range	note 2	V_P	6,0	14,4	18,0	V
Quiescent current		I_P	—	40	80	mA
D.C. output voltage at approximately $V_P/2$	note 3	V_O	—	6,8	—	V
D.C. output offset voltage		$ \Delta V_{5-g} $	—	—	100	mV
Mute/stand-by switch						
Switch-on voltage level		V_{ON}	8,5	—	—	V
Mute condition						
Output signal in mute position	$V_I = 1 \text{ V (max.)}$; $f = 20 \text{ Hz to } 15 \text{ kHz}$	V_{mute}	3,0	—	6,4	V
		V_O	—	*	2	mV
D.C. output offset voltage		$ \Delta V_{5-g} $	—	—	100	mV
Stand-by condition						
D.C. current in stand-by condition		V_{sb}	0	—	2	V
		I_{sb}	—	—	100	μA
Switch-on current		I_{sw}	—	12	40	μA

* Value to be fixed.

A.C. CHARACTERISTICS

$V_P = 14,4 \text{ V}$; $R_L = 4 \Omega$; $f = 1 \text{ kHz}$; $T_{amb} = 25 \text{ }^\circ\text{C}$; unless otherwise specified

parameter	conditions	symbol	min.	typ.	max.	unit
Stereo application	note 1					
Output power	note 4; THD = 0,5% THD = 10%	P_O P_O	4 5,5	5 6,0	— —	W W
Output power at $R_L = 2 \Omega$	notes 4 and 5; THD = 10% note 4; THD = 0,5% THD = 10% notes 4 and 5; THD = 10%	P_O P_O P_O P_O P_O	6 7,5 10 10,5	7 8,5 11 12,0	— — — —	W W W W
Low frequency roll-off	note 6; -3 dB	f_L	—	45	—	Hz
High frequency roll-off	-1 dB	f_H	20	—	—	kHz
Closed loop voltage gain		G_V	19	20	21	dB
Supply voltage ripple rejection:	note 7					
ON		RR	48	—	—	dB
mute		RR	48	—	—	dB
stand-by		RR	80	—	—	dB
Input impedance		$ Z_I $	50	60	75	k Ω
Noise output voltage:	note 8;					
ON	$R_S = 0 \Omega$	$V_{no(rms)}$	—	50	—	μV
ON	$R_S = 10 \text{ k}\Omega$	$V_{no(rms)}$	—	70	100	μV
mute	note 9	$V_{no(rms)}$	—	50	—	μV
Channel separation	$R_S = 10 \text{ k}\Omega$	α	40	—	—	dB
Channel balance		G_V	—	—	1	dB

A.C. CHARACTERISTICS (continued)

parameter	conditions	symbol	min.	typ.	max.	unit
BTL application	note 10					
Output power	THD = 0,5%	P_o	15,5	17,0	—	W
	THD = 10%	P_o	20	22	—	W
	note 5; THD = 10%	P_o	21	24	—	W
Output power at V_p = 13,2 V	THD = 0,5%	P_o	—	13,5	—	W
	THD = 10%	P_o	—	17	—	W
	note 5; THD = 10%	P_o	—	19	—	W
Power bandwidth	THD = 0,5% $P_o = 15$ W	B_w	—	20 to 15 000	—	Hz
Low frequency roll-off	note 6; -3 dB	f_L	—	25	—	Hz
High frequency roll-off	-1 dB	f_H	20	—	—	kHz
Closed loop voltage gain		G_v	25	26	27	dB
Supply voltage ripple rejection:	note 7					
ON		RR	48	—	—	dB
mute		RR	48	—	—	dB
stand-by		RR	80	—	—	dB
Input impedance		$ Z_i $	25	30	38	k Ω
Noise output voltage	note 8;					
ON	$R_S = 0 \Omega$	$V_{no(rms)}$	—	70	—	μV
ON	$R_S = 10$ k Ω	$V_{no(rms)}$	—	100	200	μV
mute	note 9	$V_{no(rms)}$	—	60	—	μV

Notes to the characteristics

1. All characteristics, for stereo application are measured using the circuit shown in Fig. 3.
2. The circuit is d.c. adjusted at $V_p = 6$ V to 18 V and a.c. operating at $V_p = 8,5$ to 18 V.
3. At 18 V < V_p < 30 V the d.c. output voltage $\leq V_p/2$.
4. Output power is measured directly at the output pins of the IC.
5. With bootstrap and a 100 k Ω resistor from pin 12 to the positive supply voltage (V_p), value of bootstrap capacitor is 47 μF .
6. Frequency response externally fixed.
7. Ripple rejection measured at the output with a source impedance of 0 Ω (maximum ripple amplitude of 2 V) and a frequency between 1 kHz and 10 kHz.
8. Noise voltage measured in a bandwidth of 20 Hz to 20 kHz.
9. Noise output voltage independent of R_S ($V_i = 0$ V).
10. All characteristics, for BTL application are measured using the circuit shown in Fig. 4.

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