2 x 22 W or 4 x 11 W single-ended car radio power amplifier

TDA1558Q

FEATURES

- Requires very few external components
- Flexibility in use Quad single-ended or stereo BTL
- High output power
- Low offset voltage at output (important for BTL)
- Fixed gain
- Good ripple rejection
- Mute/stand-by switch
- Load dump protection
- AC and DC short-circuit-safe to ground and V_P
- Thermally protected
- Reverse polarity safe
- Capability to handle high energy on outputs (V_P = 0)
- Protected against electrostatic discharge
- No switch-on/switch-off plop
- Flexible leads
- Low thermal resistance
- Identical inputs (inverting and non-inverting).

GENERAL DESCRIPTION

The TDA1558Q is a monolithic integrated class-B output amplifier in a 17-lead single-in-line (SIL) plastic power package. The device contains 4 x 11 W single-ended or 2 x 22 W BTL amplifiers and has been primarily developed for car radio applications.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	positive supply voltage range	operating	6.0	14.4	18	V
I_{ORM}	repetitive peak output current		–	–	4	A
I_{tot}	total quiescent current		–	80	–	mA
I_{sb}	stand-by current		–	0.1	100	μA
Stereo BTL application						
P_O	output power	THD = 10%; 4 Ω	–	22	–	W
SVRR	supply voltage ripple rejection		45	–	–	dB
V_{no}	noise output voltage	R_S = 0	–	200	–	μV
$\|Z_i\|$	input impedance		25	–	–	kΩ
$\|\Delta V_{os}\|$	DC output offset voltage		–	–	250	mV
G_v	closed loop voltage gain		45	46	47	dB
Quad single-ended application						
P_O	output power	THD = 10%; 4 Ω THD = 10%; 2 Ω	– –	6 11	– –	W W
SVRR	supply voltage ripple rejection		44	–	–	dB
V_{no}	noise output voltage	R_S = 0	–	150	–	μV
$\|Z_i\|$	input impedance		50	–	–	kΩ
G_v	closed loop voltage gain		39	40	41	dB

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TDA1558Q	17	DIL	plastic	SOT243R

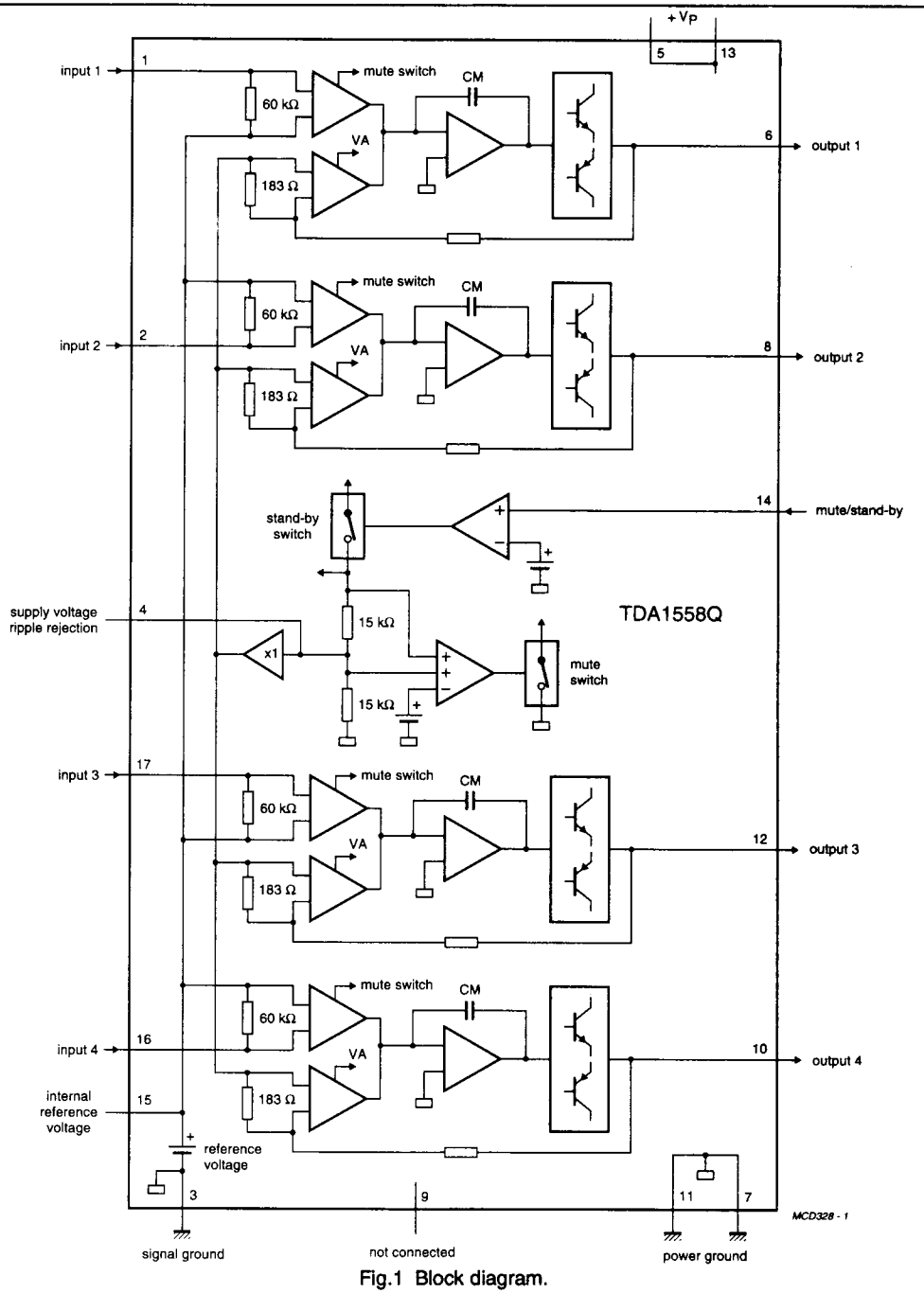

Fig.1 Block diagram.

2 x 22 W or 4 x 11 W single-ended car radio power amplifier

TDA1558Q

PINNING

SYMBOL	PIN	DESCRIPTION
–INV1	1	non-inverting input 1
INV2	2	inverting input 2
GND	3	ground (signal)
SVRR	4	supply voltage ripple rejection
V_{P1}	5	supply voltage
OUT1	6	output 1
GND1	7	power ground 1
OUT2	8	output 2
n.c.	9	not connected
OUT4	10	output 4
GND2	11	power ground 2
OUT3	12	output 3
V_{P2}	13	supply voltage
M/SS	14	mute/stand-by switch
V_{ref}	15	internal reference voltage
INV3	16	inverting input 3
–INV4	17	non-inverting input 4

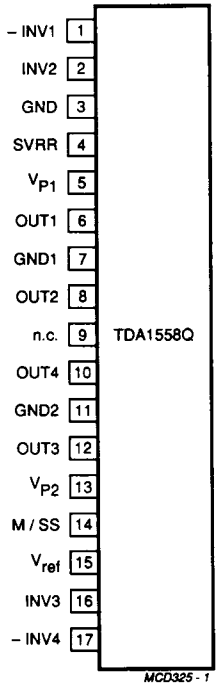

Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

The TDA1558Q contains four identical amplifiers with differential input stages (two inverting and two non-inverting), and can be used for single-ended or BTL applications. The gain of each amplifier is fixed at 40 dB (46 dB in BTL). Special features of this device are:

a. mute/stand-by switch

   low stand-by current (< 100 μA)

   low mute/stand-by switching current (low cost supply switch)

   mute facility.

b. the harmonic distortion at low frequencies can be decreased by connecting two diodes at pin 15 to ground or a zener diode of 1.5 V.

LIMITING VALUES

In accordance with the Absolute maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_P	positive supply voltage				
		operating	–	18	V
		non-operating	–	30	V
		load dump protected; during 50 ms; rise time ≥ 2.5 ms	–	45	V
V_{PSC}	AC and DC short-circuit safe voltage		–	18	V
V_{PR}	reverse polarity		–	6	V
	energy handling capability at outputs	$V_P = 0$	–	200	mJ
I_{OSM}	non-repetitive peak output current		–	6	A
I_{ORM}	repetitive peak output current		–	4	A
P_{tot}	total power dissipation		–	60	W
T_{stg}	storage temperature range		–55	+150	°C
T_j	junction temperature		–	+150	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ vj-a}$	from virtual junction to ambient in free air	40 K/W
$R_{th\ vj-c}$	from virtual junction to case (see Fig.3)	1.5 K/W

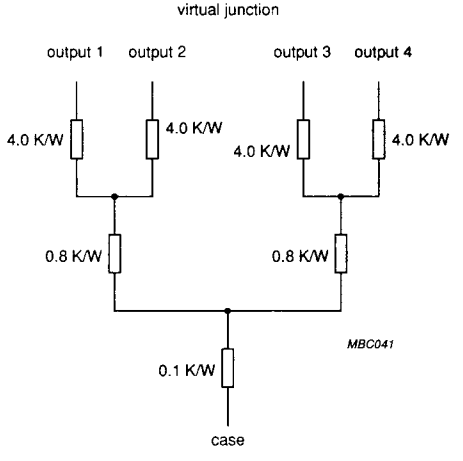

Fig.3 Equivalent thermal resistance network.

DC CHARACTERISTICS

V_P = 14.4 V, T_{amb} = 25 °C, unless otherwise specified. See note 1.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply						
V_P	positive supply voltage range	note 2	6.0	14.4	18	V
I_P	quiescent current		–	80	160	mA
V_O	DC output voltage	note 3	–	6.9	–	V
$\lvert\Delta V_{os}\rvert$	DC output offset voltage		–	–	250	mV
Mute/stand-by switch						
V_{ON}	switch-on voltage level		8.5	–	–	V
MUTE CONDITION						
V_{mute}	mute voltage		3.3	–	6.4	V
V_O	output signal in mute position	V_I = 1 V (max); f = 1 kHz	–	–	20	mV
$\lvert\Delta V_{os}\rvert$	DC output offset voltage	between pins 6-8 and pins 10-12	–	–	250	mV
STAND-BY CONDITION						
V_{sb}	stand-by voltage		0	–	2	V
I_{sb}	DC current in stand-by condition		–	–	100	µA
I_{sw}	switch-on current		–	12	40	µA

AC CHARACTERISTICS

V_P = 14.4 V, R_L = 4 Ω, f = 1 kHz, T_{amb} = 25 °C, unless otherwise specified. See note 1.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
P_O	output power	THD = 0.5%	15	17	–	W
		THD = 10%	20	22	–	W
		V_P = 13.2 V; THD = 0.5%	–	12	–	W
		V_P = 13.2 V; THD = 10%	–	17	–	W
THD	total harmonic distortion	P_O = 1 W	–	0.1	–	%
B	power bandwidth	THD = 0.5%; P_O = –1 dB with respect to 15 W	–	20 to 15 000	–	Hz
f_{low}	low frequency roll-off	–1 dB; note 4	–	45	–	Hz
f_{high}	high frequency roll-off	–1 dB	20	–	–	kHz
G_v	closed loop voltage gain		45	46	47	dB
SVRR	supply voltage ripple rejection					
		ON; note 5	45	–	–	dB
		MUTE; note 5	45	–	–	dB
		stand-by; note 5	80	–	–	dB

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$\|Z_I\|$	input impedance		25	30	38	kΩ
V_{no}	noise output voltage					
		ON; R_S = 0; note 6	–	200	300	μV
		R_S = 10 kΩ; note 6	–	350	–	μV
		MUTE; notes 6 and 7	–	180	–	μV
α	channel separation	R_S = 10 kΩ	40	–	–	dB
$\|\Delta G_v\|$	channel unbalance		–	–	1	dB
Quad single-ended application (see Fig.5)						
P_O	output power	note 8				
		THD = 0.5%	4	5	–	W
		THD = 10%	5.5	6	–	W
		R_L = 2 Ω; THD = 0.5%	7.5	8.5	–	W
		R_L = 2 Ω; THD = 10%	10	11	–	W
THD	total harmonic distortion	P_O = 1 W	–	0.1	–	%
f_{low}	low frequency roll-off	–3 dB; note 4	–	45	–	Hz
f_{high}	high frequency roll-off	–1 dB	20	–	–	kHz
G_v	closed loop voltage gain		39	40	41	dB
SVRR	supply voltage ripple rejection	note 5				
		ON	44	–	–	dB
		MUTE	44	–	–	dB
		stand-by	80	–	–	dB
$\|Z_I\|$	input impedance		50	60	75	kΩ
V_{no}	noise output voltage					
		ON; R_S = 0; note 6	–	150	230	μV
		R_S = 10 kΩ; note 6	–	250	–	μV
		MUTE; notes 6 and 7	–	120	–	μV
α	channel separation	R_S = 10 kΩ	40	–	–	dB
$\|\Delta G_v\|$	channel unbalance		–	–	1	dB

Notes to the characteristics

1. All characteristics are measured using the circuit shown in Fig.4
2. The circuit is DC adjusted at V_P = 6 to 18 V and AC operating at V_P = 8.5 to 18 V.
3. At 18 V < V_P < 30 V, the DC output voltage ≤ V_P/2.
4. Frequency response externally fixed.
5. Ripple rejection measured at the output with a source-impedance of 0 Ω (max. ripple amplitude of 2 V) and a frequency between 100 Hz and 10 kHz.
6. Noise voltage measured in a bandwidth of 20 Hz to 20 kHz.
7. Noise output voltage independent of R_S (V_{in} = 0).
8. Output power is measured directly at the output pins of the IC.

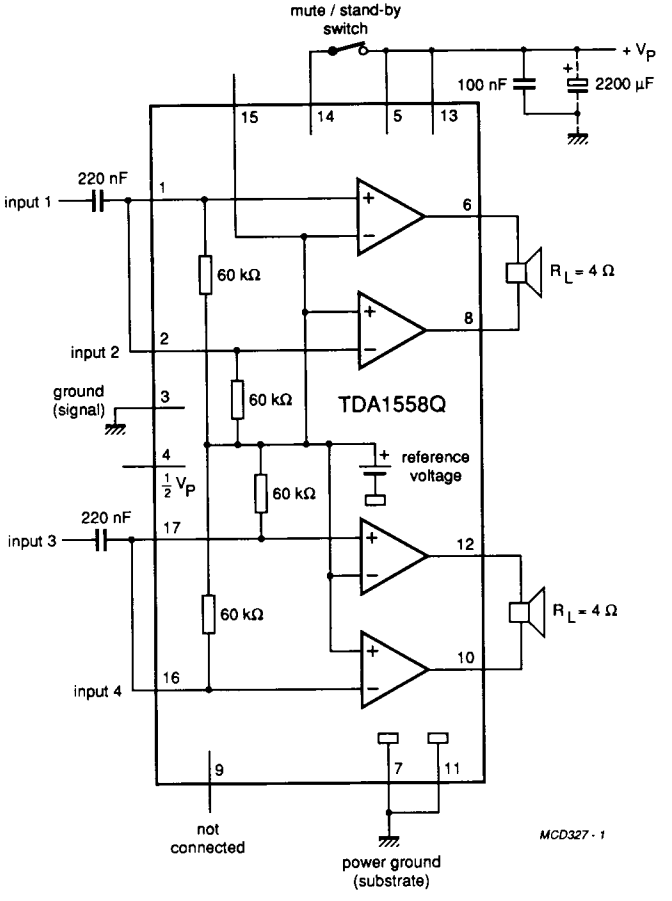

Fig.4 Stereo BTL application.

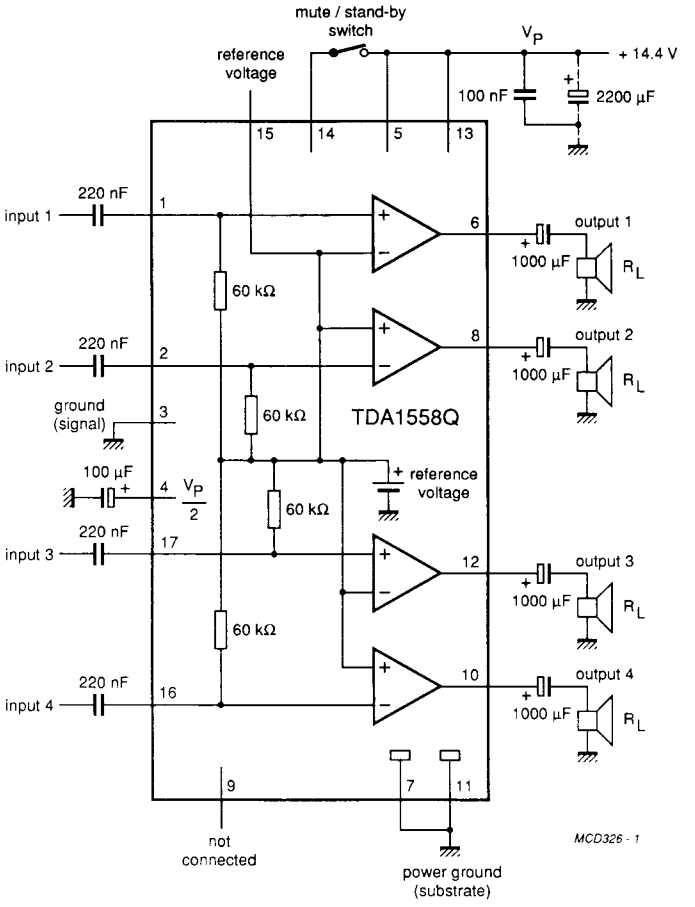

Fig.5 Quad single-ended application.