

TDA2003 10W Audio Power Amplifier Circuit

Overview

TDA2003 is used as audio power amplifier in car radios and recorders.

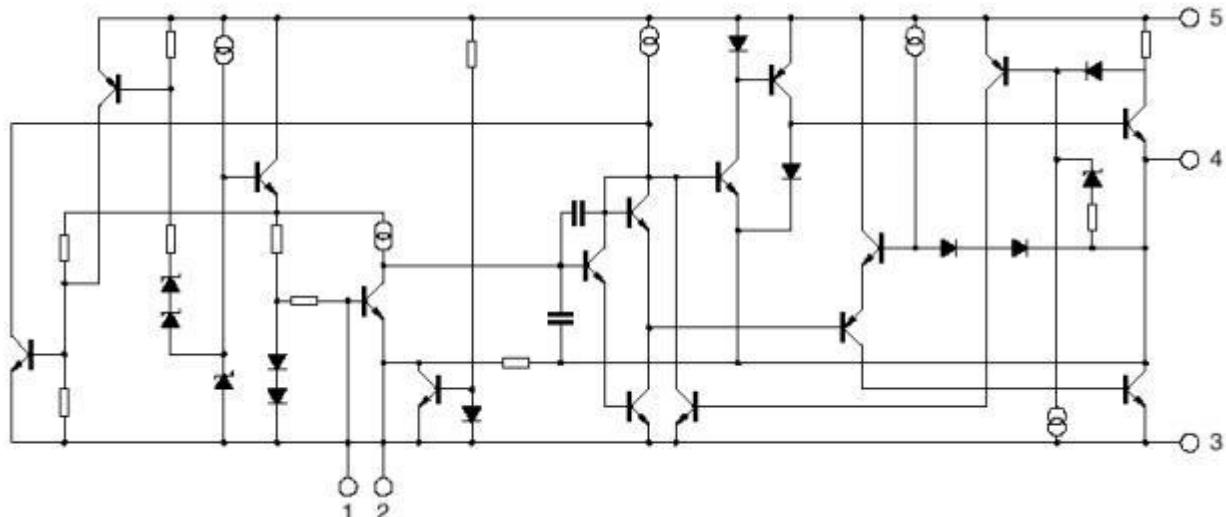
Available in TO-220B package.

Main features

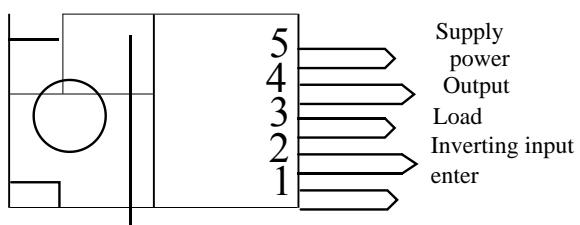
● It has short circuit protection and overheat protection inside.

- There are protection circuits such as ground wire open circuit, reverse power supply polarity and load discharge voltage kickback.
- The output current is large.
- Load resistance can be as low as 1.6.
- Low harmonic distortion.
- Crossover distortion is small.
- Few external components, small size, etc.

Internal block diagram



Pin Description



Limit parameters

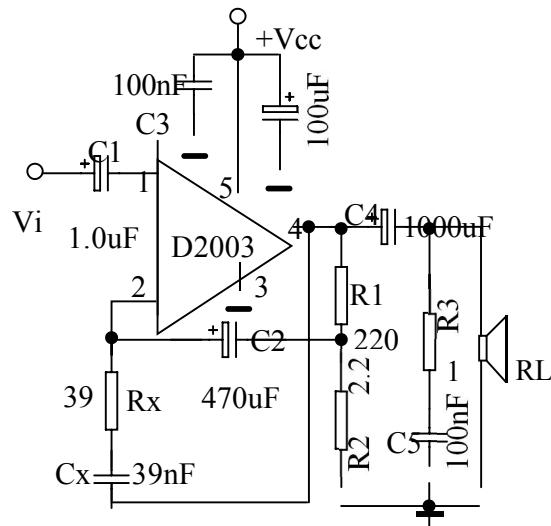
Parameter	Symbol	Value		Unit
		Min	Max	
Peak Supply Voltage (50mS)	Vcc		40	V
DC supply voltage	Vcc		28	V
Working power voltage	Vcc		18	V
output peak current	Repeated	Io	3.5	A
	non-repeating		4.5	A
Power consumption ($T_{case}=90^{\circ}\text{C}$)	PD		20	W
Storage temperature	Tstg	-40	150	°C

Electrical CharacteristicsConditions: (If there is no other regulation, $\text{Vcc}=14.4\text{V}$, $\text{Tamb}=25^{\circ}\text{C}$)

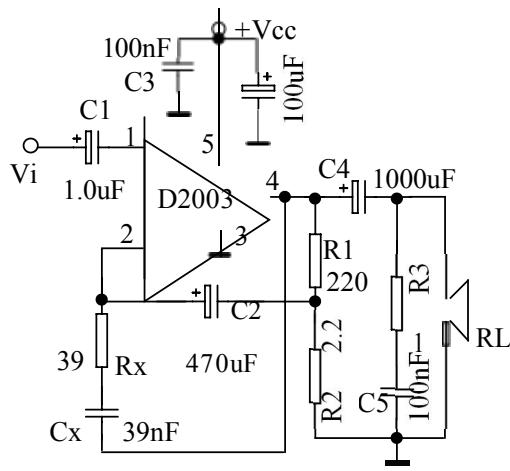
Parameter	logo	Test condition		Min	Typ	Max	Unit
DC static characteristics							
voltage	Vcc			8		18	V
Quiescent output voltage (pin 4)	Vo			6.1	6.9	7.7	V
Quiescent current (pin 5)	Icc				44	50	mA
AC dynamic characteristics ($\text{Gv}=40\text{dB}$)							
Output Power	Po	THD=10%, $f=1\text{kHz}$	$\text{RL}=4\Omega$	5.5	6		W
			$\text{RL}=2\Omega$	9	10		
			$\text{RL}=3.2\Omega$		7.5		
			$\text{RL}=1.6\Omega$		12		
Input saturation voltage	Vsat				300		mV
Input sensitivity	Vi	$f=1\text{kHz}$	$\text{Po}=0.5\text{W}; \text{RL}=8\Omega$		14		mV
			$\text{Po}=0.5\text{W}; \text{RL}=2\Omega$		10		
			$\text{Po}=6\text{W}; \text{RL}=4\Omega$		55		
			$\text{Po}=10\text{W}; \text{RL}=2\Omega$		50		
Bandwidth (-3dB)	BW	$\text{Po}=1\text{W}; \text{RL}=4$		40		15000	Hz
Harmonic Distortion	THD	$0.05\text{W} \leq \text{Po} \leq 4.5\text{W}; \text{RL}=4\Omega; f=1\text{kHz}$			0.15		%
		$0.05\text{W} \leq \text{Po} \leq 7.5\text{W}; \text{RL}=2\Omega; f=1\text{kHz}$			0.15		
input resistance	Ri	$f=1\text{kHz}; 1\text{ pin}$		70	150		kΩ
Voltage gain	Gv	open loop; $f=1\text{kHz}; \text{RL}=4\Omega$			80		dB
		closed loop; $f=1\text{kHz}; \text{RL}=4\Omega$		39.5	40	40.5	
Input noise voltage	Vn	$\text{BW } (-3\text{dB})=10\sim25000\text{Hz}$ $\text{BW } (-20\text{dB})=4\sim27000\text{Hz}$			1	5	uV
Input noise current	In	$\text{BW } (-3\text{dB})=10\sim25000\text{Hz}$ $\text{BW } (-20\text{dB})=4\sim27000\text{Hz}$			60	200	pA

Parameter	logo	Test condition	Min	Typ	Max	Unit
efficiency	η	Po=6W; RL=4Ω; f=1kHz		69		%
		Po=10W; RL=2Ω; f=1kHz		65		
Supply Voltage Rejection Ratio	SVR	Vripple=0.5V; Rg=10k; RL=4; f=100Hz	30	36		dB

Test schematic



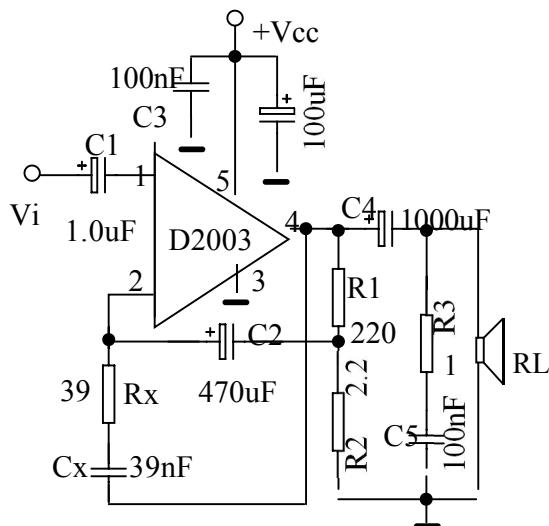
DC Test Chart



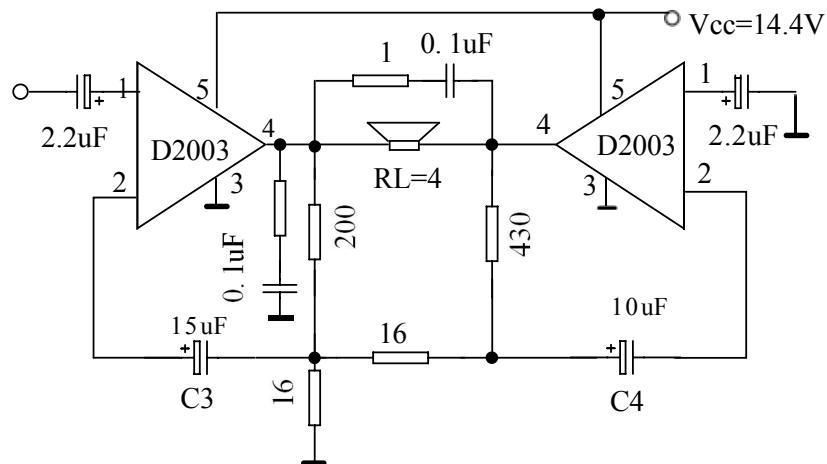
$$Rx = 20 * R2 \quad Cx = 1 / (2 \pi b * R1)$$

AC Test Chart

Application diagram

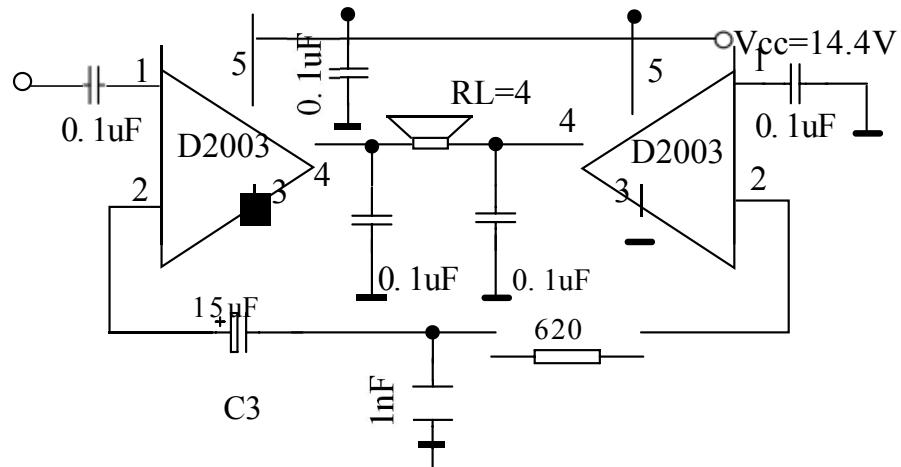


$$Rx = 20 * R2 \quad Cx = 1 / (2 \pi b * R1)$$



20W Bridge Connection Application Diagram

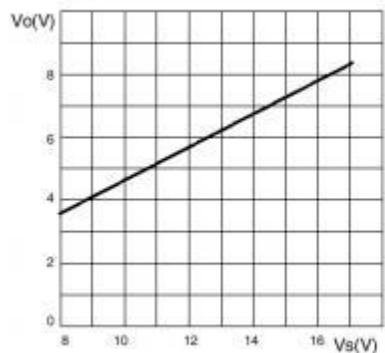
Capacitors C3 and C4 can be adjusted to optimize the supply voltage rejection ratio (SVR Typ is 40dB)



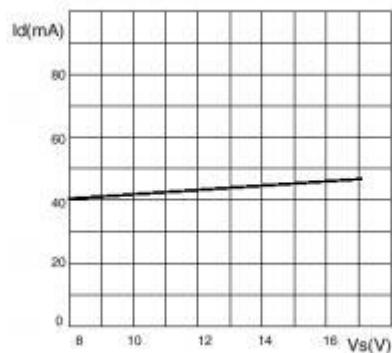
Low cost bridge application diagram(Po=18W)

Typical performance

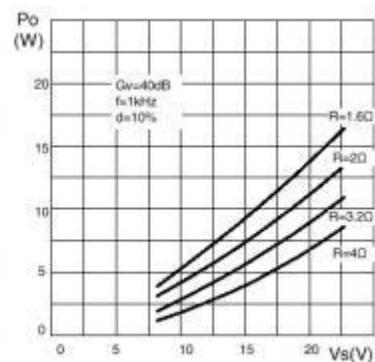
Static working voltage and electrical voltage characteristic curve



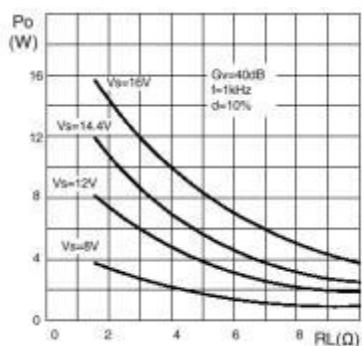
Quiescent Current and Power Voltage characteristic curve



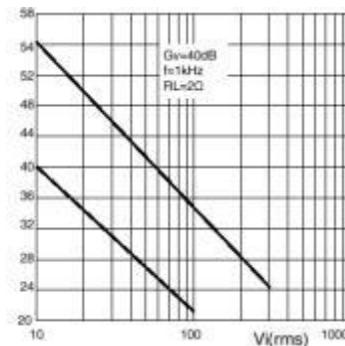
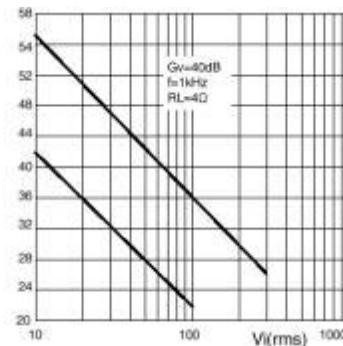
Output power vs. supply voltage characteristic curve



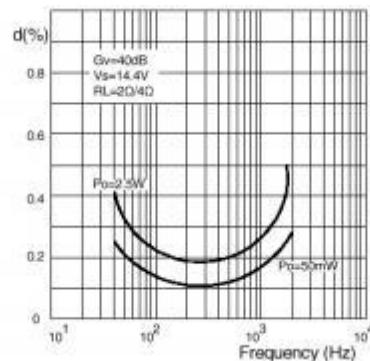
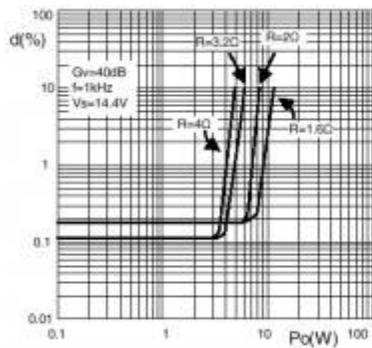
Output power and load characteristic curve



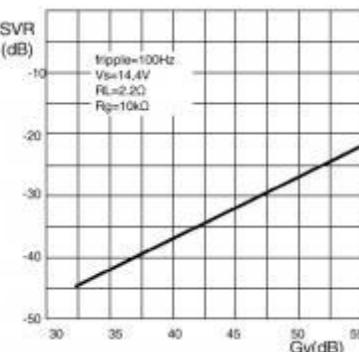
Gain vs. Input Sensitivity Characteristic Curve



Distortion and output power characteristic curve

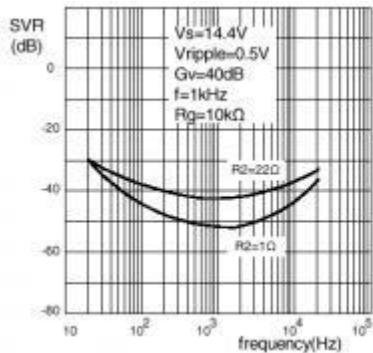


Power Supply Voltage Rejection Ratio vs. Voltage Gain Characteristic Curve



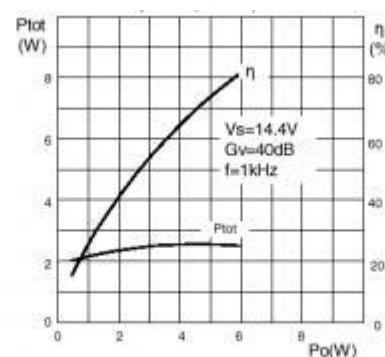
Power Supply Voltage

Rejection Ratio vs
Frequency Characteristic
Curve



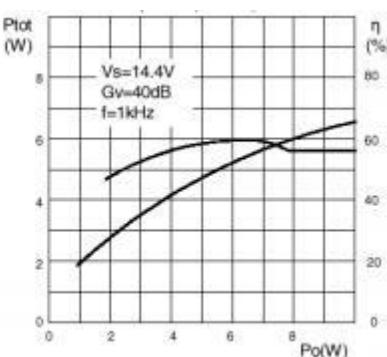
Power Consumption and Efficiency vs Output Power

characteristic curve($R_L = 4\Omega$)

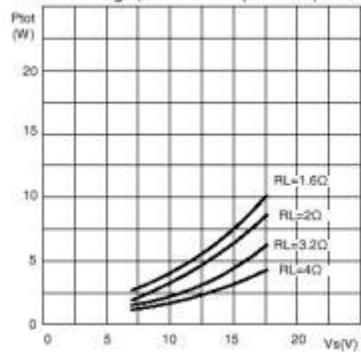


Power Consumption and Efficiency vs Output Power

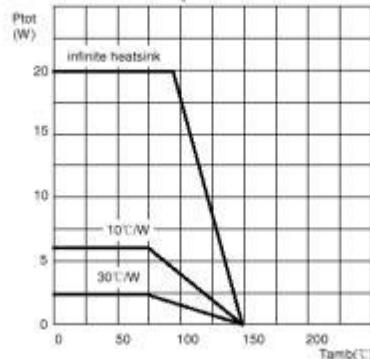
characteristic curve($R_L = 2\Omega$)



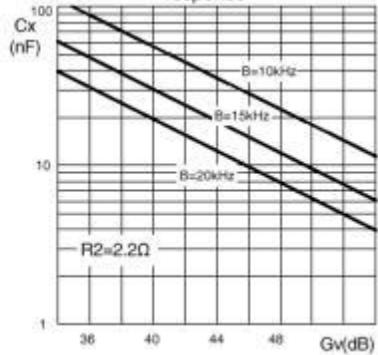
Maximum power consumption vs. supply voltage characteristic curve



Maximum Allowable Distortion vs. Ambient Temperature Characteristic Curve

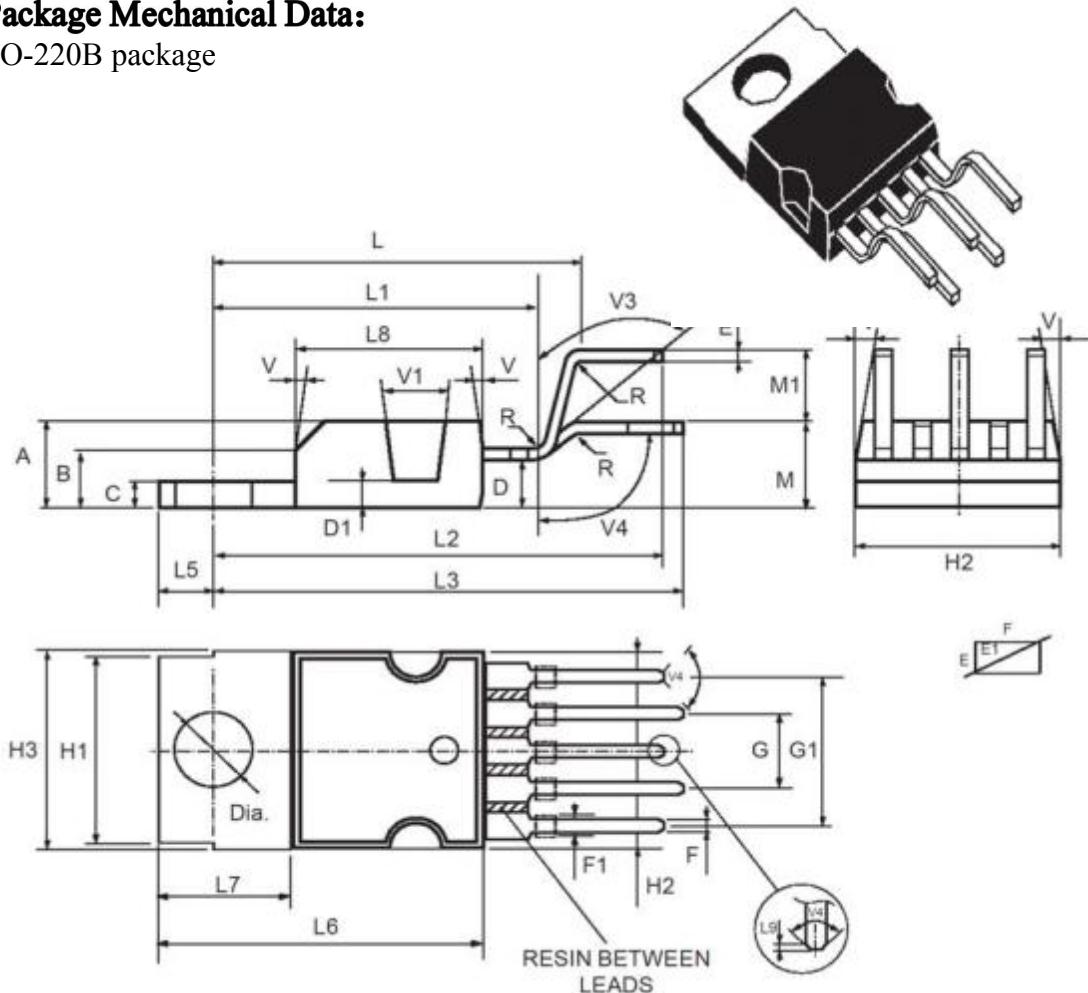


(Cx) Capacitance Typ and frequency response characteristic curve



Package Mechanical Data:

TO-220B package



Logo	MM			Inch		
	MIN	TYP	MAX	MIN	TYP	MAX
A			4.8			0.189

C			1.37			0.054
D	2.4		2.8	0.094		0.11
D1	1.2		1.35	0.047		0.053
E	0.35		0.55	0.014		0.022
E1	0.76		1.19	0.03		0.047
F	0.8		1.05	0.031		0.041
F1	1		1.4	0.039		0.055
G	3.2	3.4	3.6	0.126	0.134	0.142
G1	6.6	6.8	7	0.26	0.268	0.276
H2			10.4			0.409
H3	10.05		10.4	0.396		0.409
L	17.55	17.85	18.15	0.691	0.703	0.715
L1	15.55	15.75	15.95	0.612	0.62	0.628
L2	21.2	21.4	21.6	0.831	0.843	0.85
L3	22.3	22.5	22.7	0.878	0.886	0.894
L4			1.29			
L5	2.6		3	0.102		0.118
L6	15.1		15.8	0.594		0.622
L7	6		6.6	0.236		0.26
L9		0.2			0.008	
M	4.23	4.5	4.75	0.167	0.177	0.187
M1	3.75	4	4.25	0.148	0.157	0.167
V4			40° (typ.)			