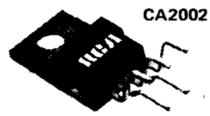
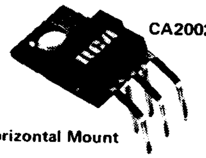
CA2002, CA2002M

CA2002



Vertical Mount H-1893

CA2002M



Horizontal Mount

VERSA-V TO-220-Style Plastic Packages H-1894

8-Watt Audio Power Amplifier

Especially suited for automobile and other mobile applications

FEATURES:

- *Output short-circuit and thermal overload protection*
- *Drives load impedance as low as 1.6Ω*
- *Load dump voltage surge protection*
- *Output current capability of up to 3.5A*
- *Few external components*
- *Versa-V power transistor package-requires no electrical insulation*

The RCA-CA2002 is a monolithic silicon class B audio power amplifier designed for driving loads as low as 1.6Ω. It provides a high output current capability (up to 3.5A), very low harmonic and cross-over distortion, and load-dump voltage-surge protection.

The maximum operating supply-voltage of the CA2002 is 18 V, and internal protection is provided for peaks of up to 40 V, as shown in Fig. 18. Supply-voltage peaks of more than 40 V will require an LC network between the supply and terminal 5. An LC network, such as the one shown in Fig. 18, provides protection against supply-voltage surges of up to 120 V for 2 ms. This type of protection is ON when the supply voltage (pulsed or dc exceeds 18 V).

Thermal shut-down occurs if the output overloads (temporary or permanent), the ambient temperature is excessive, or the junction temperature is excessive. None of these conditions results in device damage. They merely cause a temporary automatic reduction of output power and drain current, as shown in Figs. 16 and 17.

A heater fan motor run-down hysteresis circuit is included for automotive applications. Typical starting voltage is 10 volts; typical drop-out voltage is 6.5 volts.

The CA2002 is supplied in a 5-lead plastic TO-220-style VERSA-V package. All leads (except term. 3) are electrically insulated from the mounting flange, eliminating the need for insulating hardware. The VERSA-V package is available with two lead configurations. The CA2002 has a vertical-mount lead form, and the CA2002M has a horizontal-mount lead form.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

PEAK SUPPLY VOLTAGE (50 ms)	40 V
DC SUPPLY VOLTAGE	28 V
OPERATING SUPPLY VOLTAGE	18 V
OUTPUT PEAK CURRENT:	
REPETITIVE	3.5 A
NON-REPETITIVE	4.5 A
POWER DISSIPATION, P_D at T_A = 90° C	15 W
THERMAL RESISTANCE, JUNCTION TO CASE	4° C/W
AMBIENT-TEMPERATURE RANGE:	
OPERATING	**See Figures 16 & 17**
STORAGE	-40 to +150° C
LEAD TEMPERATURE (DURING SOLDERING):	
At distance 1/16 ± 1/32 inch (1.59 ± 0.79 mm) from case for 12 s max.	260° C

ELECTRICAL CHARACTERISTICS at T_A = 25°C, V^+ = 14.4 V
Unless otherwise specified (See Figure 2)

CHARACTERISTIC	TEST CONDITIONS		LIMITS Min.	Typ.	Max.	UNITS
Supply Voltage, V^+			11	–	18	V
Quiescent Output Voltage, V_O	Measure at Term. 4		6.4	7.2	8	V
Quiescent Drain Current, I_D	Measure at Term. 5		–	45	80	mA
Output Power, P_O	THD = 10%, A = 40 dB, f = 1 KHz					W
	V^+ = 14.4V	R_L = 4 Ω	4.8	5.2	–	
		R_L = 2 Ω	7	8	–	
	V^+ = 16 V	R_L = 4 Ω	–	6.5	–	
		R_L = 2 Ω	–	10	–	
Input Saturation Voltage, $V_{I(RMS)}$			400	–	–	mV
Input Sensitivity, e_I	A = 40 dB, f = 1 KHz					mV
		P_O = 0.5 W, R_L = 4 Ω	–	15	–	
		P_O = 0.5 W, R_L = 2 Ω	–	11	–	
		P_O = 5.2 W, R_L = 4 Ω	–	55	–	
		P_O = 8 W, R_L = 2 Ω	–	50	–	
Frequency Response (–3 dB)	R_L = 4 Ω (See Fig. 19)			25000		Hz
Input Resistance, R_I (Term. 1)	f = 1 KHz		70	150	–	KΩ
Open-Loop Voltage Gain, A_{OL}	R_L = 4 Ω, f = 1 KHz		–	80	–	dB
Closed-Loop Voltage Gain, A	R_L = 4Ω, f = 1 KHz		39.5	40	40.5	dB
Input Noise Voltage, e_N	Freq. Resp. = 40 to 15,000 Hz (–3 dB)		400	4	–	µV
Input Noise Current, i_N	Freq. Resp. = 40 to 15,000 Hz (–3 dB)		–	60	–	pA
Efficiency, η	A = 40 dB, f = 1 KHz					%
		P_O = 5.2 W, R_L = 4 Ω	–	68	–	
		P_O = 8 W, R_L = 2 Ω	–	58	–	
Power Supply Rejection Ratio, PSRR	R_L = 4 Ω, A = 40 dB, Rg = 10 KΩ, f_{ripple} = 100 Hz, V_{ripple} = 0.5 V		30	35	–	dB

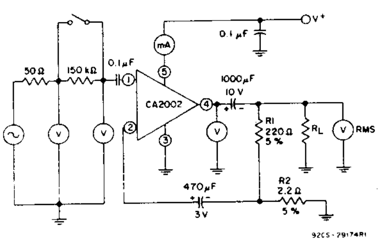


Fig. 1 – Test circuit.

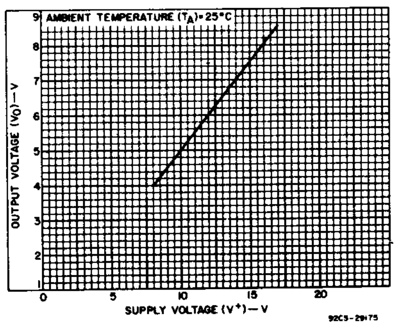


Fig. 2 – Typical quiescent output voltage as a function of supply voltage.

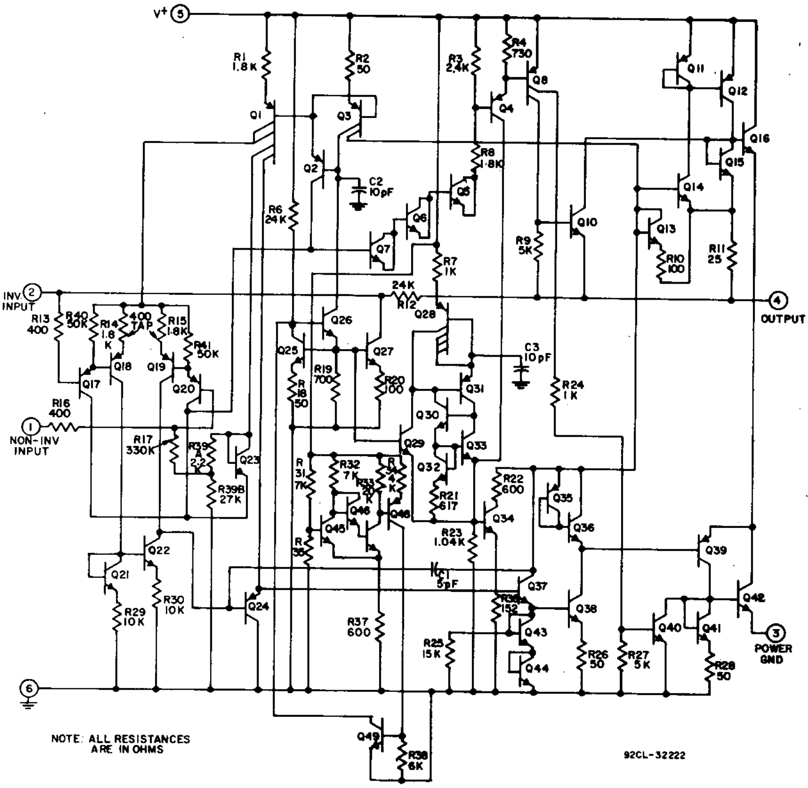


Fig. 3 – Schematic diagram.

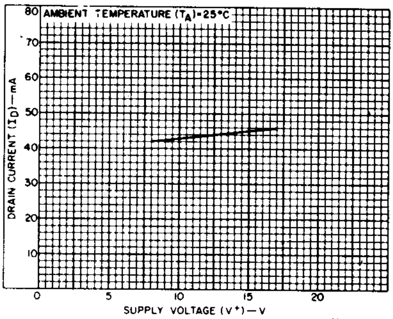


Fig. 4 – Typical quiescent drain current as a function of supply voltage.

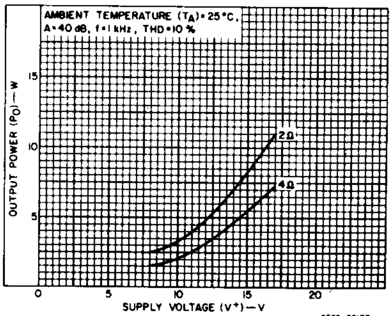


Fig. 5 – Typical output power as a function of supply voltage.

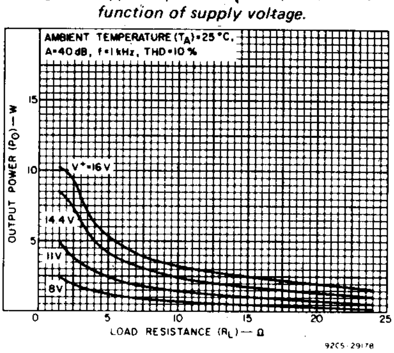


Fig. 6 – Typical output power as a function of load resistance.

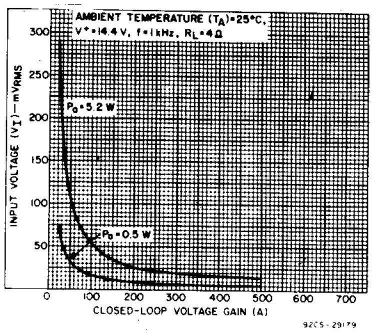


Fig. 7 – Typical input voltage as a function of closed-loop voltage gain.

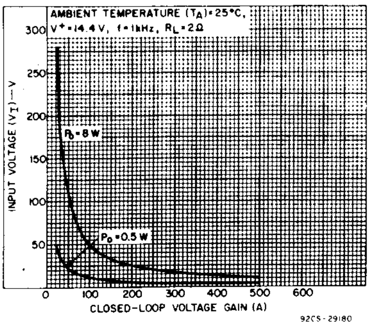


Fig. 8 – Typical input voltage as a function of closed-loop voltage gain.

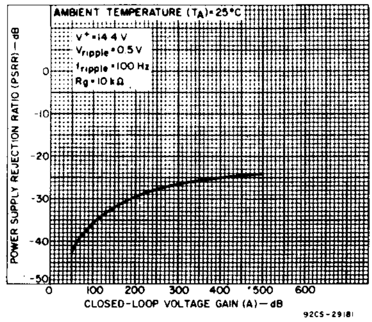


Fig. 9 – Typical power supply rejection ratio as a function of closed-loop voltage gain.

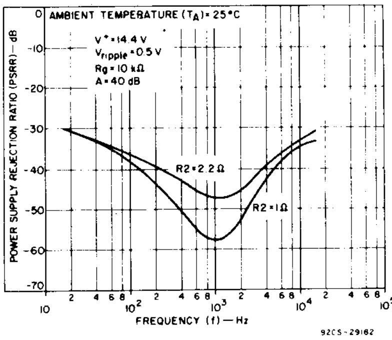


Fig. 10 – Typical power supply rejection ratio as a function of frequency.

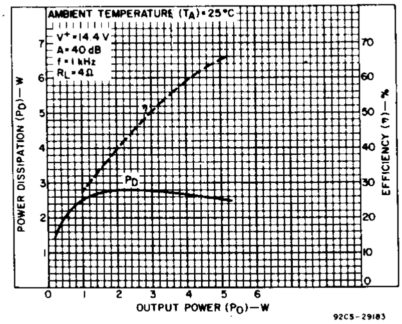


Fig. 11 – Typical power dissipation and efficiency as a function of output power.

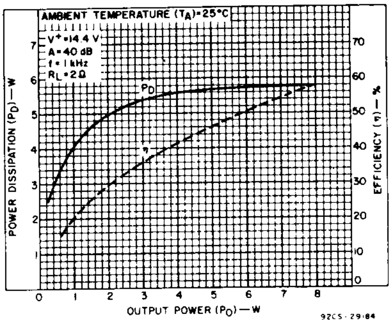


Fig. 12 – Typical power dissipation and efficiency as a function of output power.

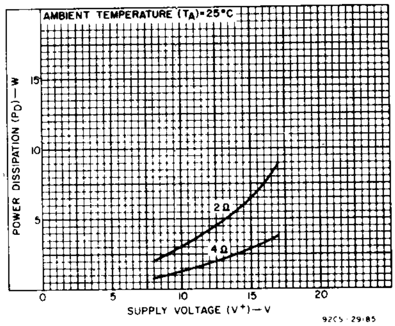


Fig. 13 – Maximum power dissipation as a function of supply voltage (sine-wave operation).

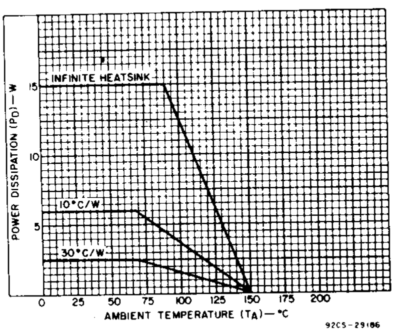


Fig. 14 – Maximum allowable power dissipation as a function of ambient temperature.

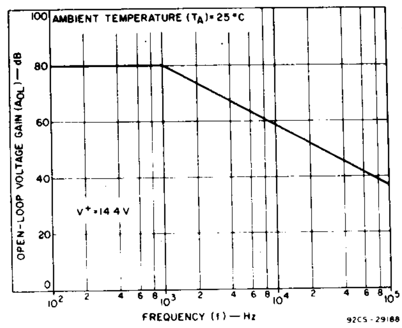


Fig. 15 – Open-loop voltage gain as a function of frequency.

Load-Dump Voltage-Surge Protection

The maximum operating supply-voltage of the CA2002 is 18 V, and internal protection is provided for peaks of up to 40 V, as shown in Fig. 18. Supply-voltage peaks of more than 40 V will require an LC network between the supply and terminal 5. An LC network, such as the one shown in Fig. 18, provides protection against supply-voltage surges of up to 120 V for 2 ms. This type of protection is ON when the supply voltage (pulsed or dc) exceeds 18 V.

Thermal Shut-Down

Thermal shut-down occurs if the output overloads (temporary or permanent), the ambient temperature is excessive, or the junction temperature is excessive. None of these conditions results in device damage. They merely cause a temporary automatic reduction of output power and drain current, as shown in Figs. 16 and 17.

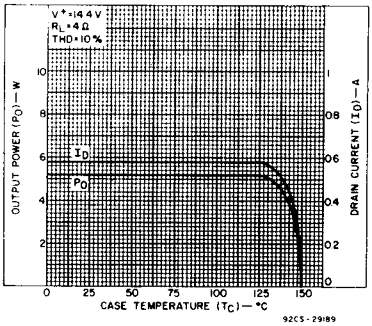


Fig. 16 – Output power and drain current as a function of case temperature.

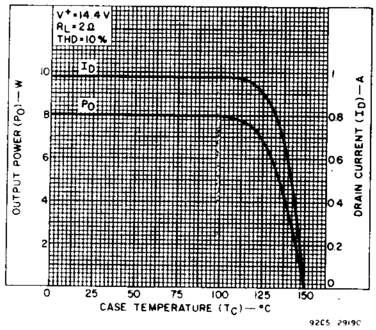


Fig. 17 – Output power and drain current as a function of case temperature.

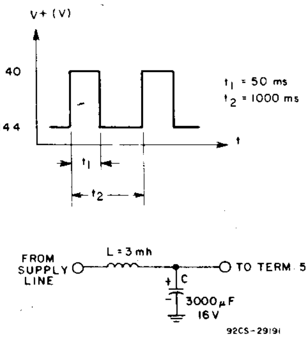


Fig. 18 – Supply-voltage surge protection network and timing diagram.

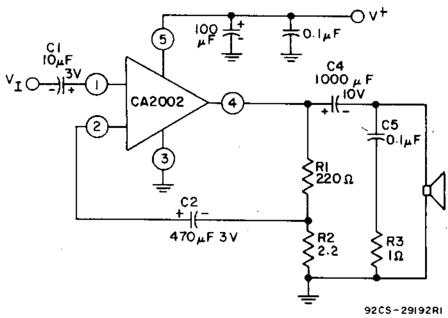


Fig. 19 – Typical application.

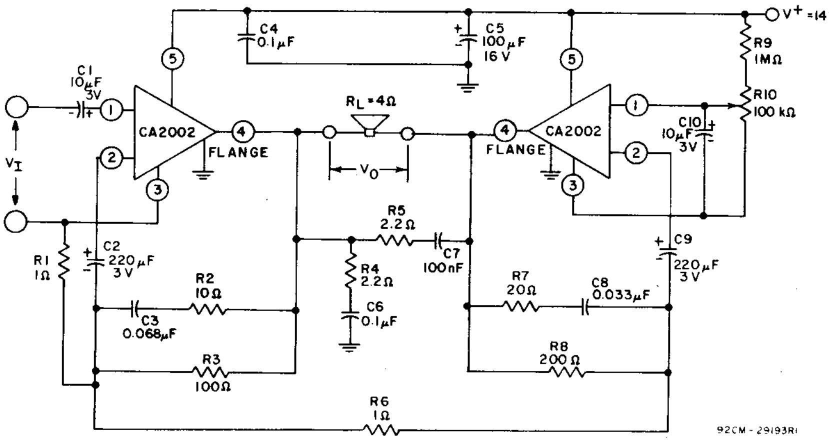


Fig. 20 – 15 W circuit-bridge application.