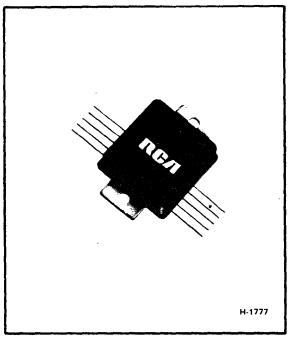
RCA
Solid State
Division

Power Hybrid Circuits

HC2000H



Multi-Purpose 7-Ampere Operational Amplifier

Linear Amplifiers for Applications in Industrial and Commercial Equipment

Features:

- **Bandwidth: 30 kHz at 60 W**
- **High power output: up to 100 W(rms)**
- **High output current: 7 A (peak)**
- **Built-in load-line-limiting circuit to protect amplifiers from accidentally short-circuited output terminals**
- **Stability with resistive or reactive loads**
- **Reactive-load fault protection**
- **Single or split power supply (30 to 75 V, total)**
- **Provision for feedback control**
- **Direct coupling to load**
- **Class B output stage**
- **Rugged package with heavy leads**
- **Light weight: 100 grams**
- **Low crossover distortion**

RCA-HC2000H* is a complete solid-state hybrid operational amplifier in a metal hermetic package. The HC2000H is intended for military and critical industrial applications and can be supplied in accordance with applicable portions of MIL-STD.883.

The amplifier employs a quasi-complementary-symmetry class B output circuit with built-in load-fault protection and hometaxial output transistors. The circuit may be operated from a single or split power supply.

Type HC2000H is recommended for the following applications: servo amplifiers (ac, dc, PWM); deflection amplifiers; power operational amplifiers; audio amplifiers; voltage regulators; and driven inverters.

Additional information on hybrid power amplifiers is contained in RCA Application Notes AN-4474, AN-4483, and AN-4782. Single copies of these publications are available upon request from RCA Solid State Division, Box 3200, Somerville, N.J. 08876.

* Formerly RCA Dev. No. TA7626A.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

SUPPLY VOLTAGE:	
Between leads 1 & 10	75 V
OUTPUT CURRENT (Peak)	7 A
TOTAL DISSIPATION:	
Per Output Device	See Fig. 4 & 5
TEMPERATURE RANGE:	
Storage	−55 to +125°C
Output-Transistor Junction	−55 to +150°C
LEAD TEMPERATURE (During Soldering):	
At distance ≥ 1/8 in. (3.17 mm) from case for 10 s max.	235°C
LEAD-BENDING RADIUS (Min.)	
At distance ≥ 0.075 (1.91 mm) from case	0.04 in. (1.02 mm)

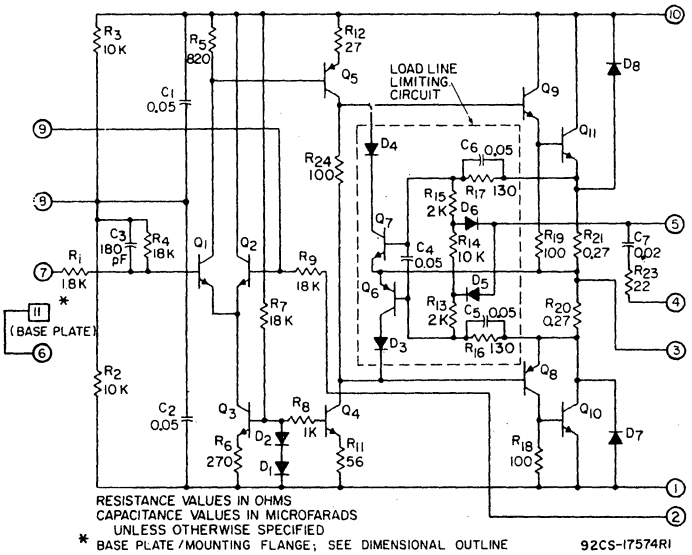


Fig. 1—Schematic diagram of type HC2000H power hybrid circuit operational amplifier.

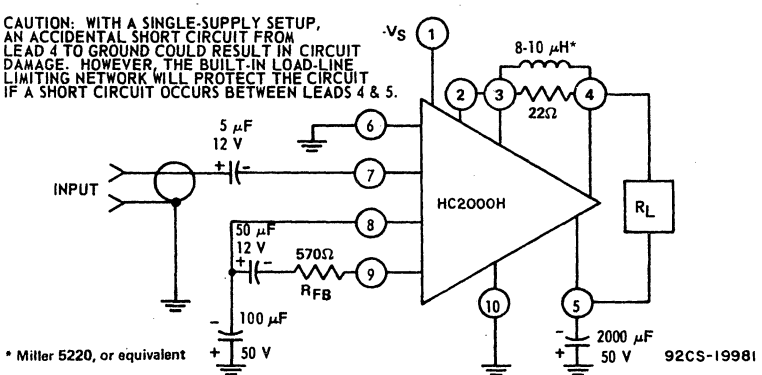


Fig. 2—Type HC2000H power hybrid circuit with external connections for operation with a single power supply.

ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) = 25°C*

CHARACTERISTIC	SYMBOL	TEST CONDITIONS				LIMITS			UNITS
		SUPPLY VOLTAGE (V_S)–V	FREQ. (f)–kHz	OUTPUT POWER (P_O)–W	LOAD RESIST. (R_L)–Ω	MIN.	TYP.	MAX.	
Open-Loop Voltage Gain	$\frac{V_{OUT}}{V_{IN}}$	±37.5	4	25	4	4000	5000	–	–
Closed-Loop Voltage Gain (See Fig. 3)	$\frac{V_{OUT}}{V_{IN}}$	±37.5	1	1	4	26	30	–	–
Input Impedance Measured between leads 7 & 8 (See Fig. 3)	Z_{IN}	–	–	–	0	16	18	–	kΩ
Quiescent Current	I_o	±37.5	–	–	–	15	–	30	mA
Initial Offset Voltage Measured between leads 4 & 5 (See Fig. 3)	V_{offset}	±37.5	–	–	4	0	±30	±250	mV
Offset Voltage Drift with Temperature	$\Delta V_{offset}/\Delta T$	±37.5	–	–	4	–	0.5	0.7	mV/°C
Bandwidth (See Figs. 3 & 8)	f_H	±37.5	–	1	4	43	–	–	kHz
Total Harmonic Distortion (See Figs. 3 & 9)	THD	±37.5	1	60	4	–	0.4	0.5	%
Short-Circuit Current (See Fig. 11)	I_S	±37.5	1	–	0	2	–	3	A
Signal-to-Noise Ratio Signal Source Impedance = 600 Ω	S/N	±37.5	–	–	–	–	+78	–	dB
Slew Rate (Unity gain with peak output current of 4A)	SR	±37.5	1	100	4	10	25	–	V/μs
Thermal Resistance Per Output Device (Junction-to-Case) (See Figs. 4 & 5)	$R_{\theta J\text{-}C}$	–	–	–	–	–	–	2	°C/W

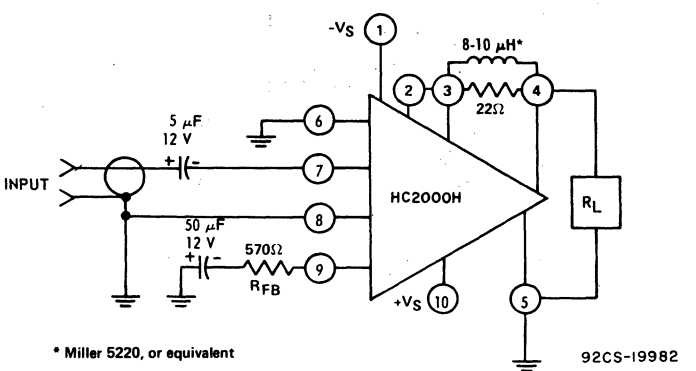


Fig. 3–Type HC2000H power hybrid circuit with external connections (and split power supply) for measuring relative response and distortion; see Figs. 8 & 9.

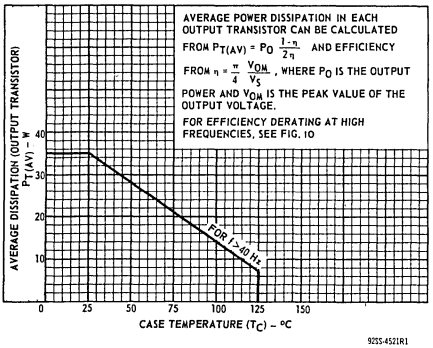


Fig. 4—Dissipation (average) derating curve for each output transistor (for symmetrical waveforms with f > 40 Hz).

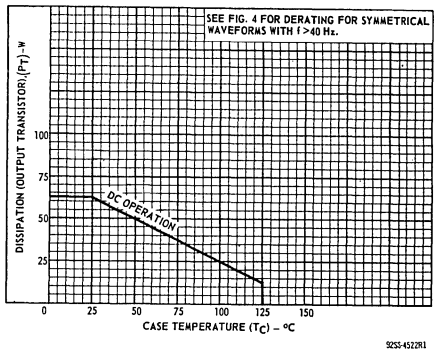


Fig. 5—Dissipation (dc) derating curve for each output transistor.

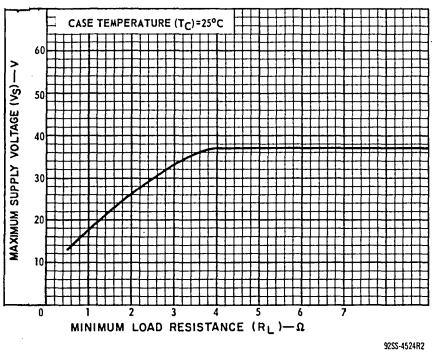


Fig. 6—Maximum allowable supply voltage vs. load resistance.

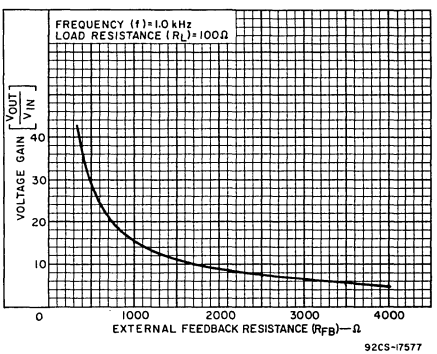


Fig. 7—Closed-loop voltage gain vs. external feedback resistance.

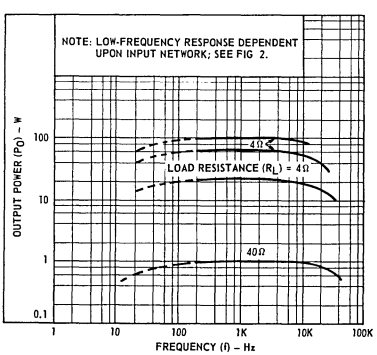


Fig. 8—Output power vs. frequency.

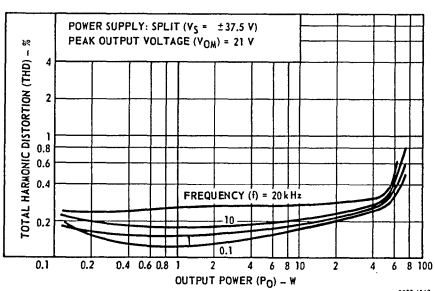


Fig. 9—Total harmonic distortion with split power supply.

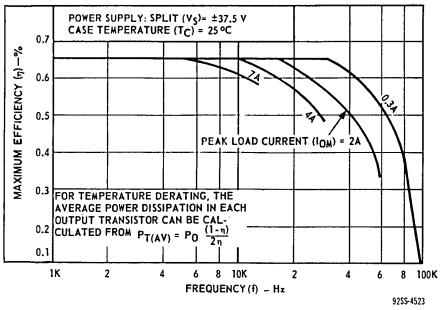


Fig. 10—Maximum efficiency vs. frequency for several values of peak load current.

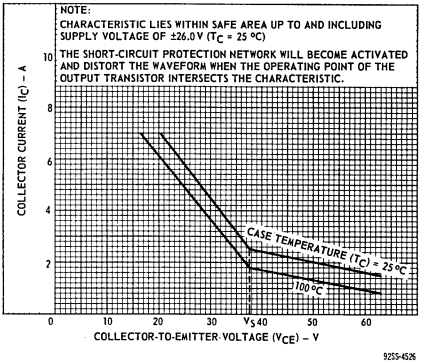


Fig. 11—Characteristics of built-in load-line-limiting circuit.

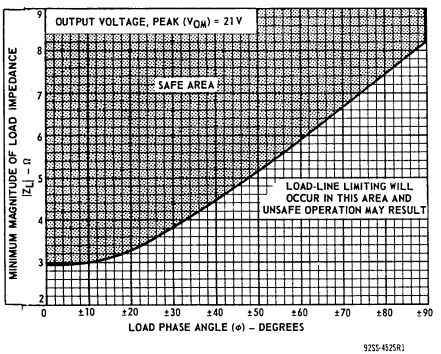


Fig. 12—Minimum load impedance vs. load phase angle and safe area of operation.

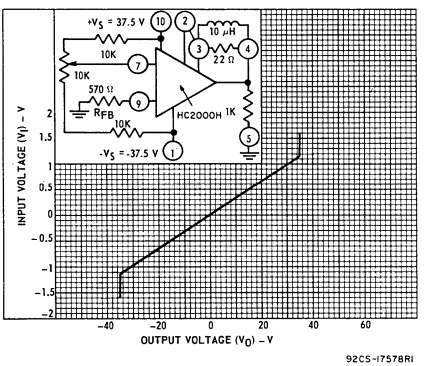


Fig. 13—Gain linearity characteristic.

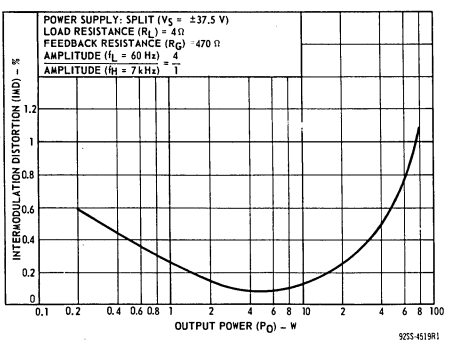


Fig. 14—Intermodulation distortion with split supply and 4-ohm load.

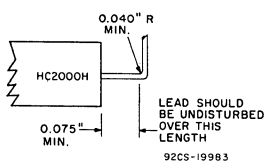


Fig. 15—Recommended lead-bending specification.