RCA
Solid State
Division

Power Transistors

RCA1B04

JEDEC TO-3 H-1570

Silicon Transistor for 120-Watt Quasi-Complementary-Symmetry Audio Amplifiers with Parallel Output Transistors

RCA1B04 is an n-p-n silicon pi-nu transistor in a JEDEC TO-3 package. This device is especially characterized for audio applications, and can be driven by RCA1C12 and RCA1C13 transistors.

The 120-watt amplifier circuit in Figs. 1 and 5 uses the RCA1B04 in conjunction with eleven other discrete transistors, twelve diodes, and a 130-volt split power supply. The amplifier output is directly coupled to an 8-ohm speaker. This RCA 120-watt audio amplifier is especially designed for top-of-the-line quadrasonic use in applications requiring ½ kW of quadrasonic sound with excellent tonal quality.

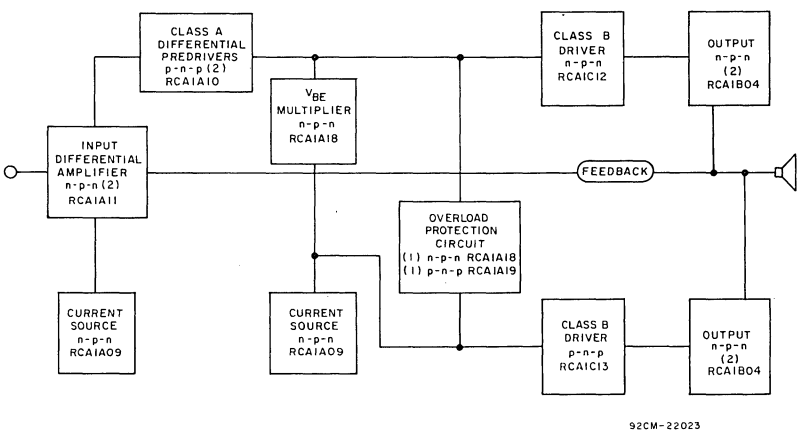


Fig. 1— Block diagram and transistor complement for 120-watt quasi-complementary-symmetry audio amplifier with parallel output transistors.

MAXIMUM RATINGS, *Absolute-Maximum Values:*		RCA1B04	
COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	225	V
COLLECTOR-TO-EMITTER VOLTAGE:			
With base open	V_{CEO}	200	V
With external base-to-emitter resistance (R_{BE}) = 100 Ω	V_{CER}	225	V
EMITTER-TO-BASE VOLTAGE	V_{EBO}	5	V
COLLECTOR CURRENT	I_C	7	A
BASE CURRENT	I_B	2	A
TRANSISTOR DISSIPATION:	P_T		
At case temperatures up to 25°C		150	W
At case temperatures above 25°C		See Fig. 2	
TEMPERATURE RANGE:			
Storage & Operating (Junction)		−65 to 200	°C
PIN TEMPERATURE (During Soldering):			
At distances ≥ 1/32 in. (0.8 mm) from case for 10 s max.		230	°C

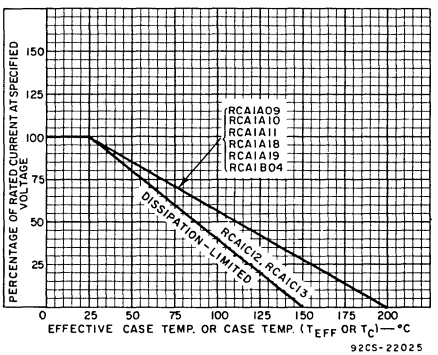


Fig. 2– Derating curves for all types.

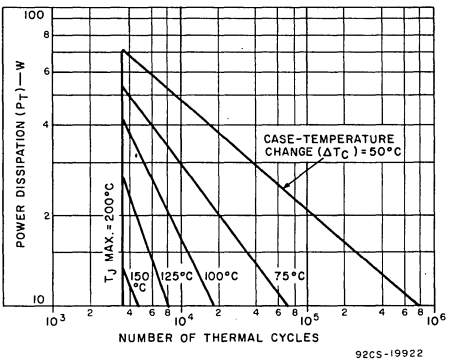


Fig. 3– Thermal-cycling ratings for RCA1B04.

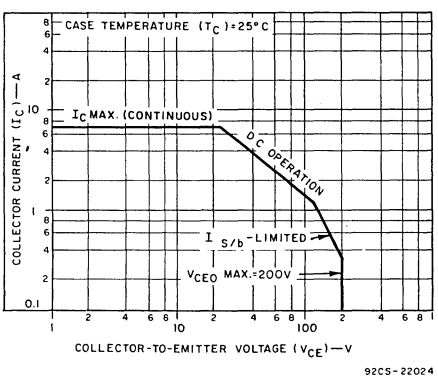


Fig. 4– Maximum operating areas for RCA1B04.

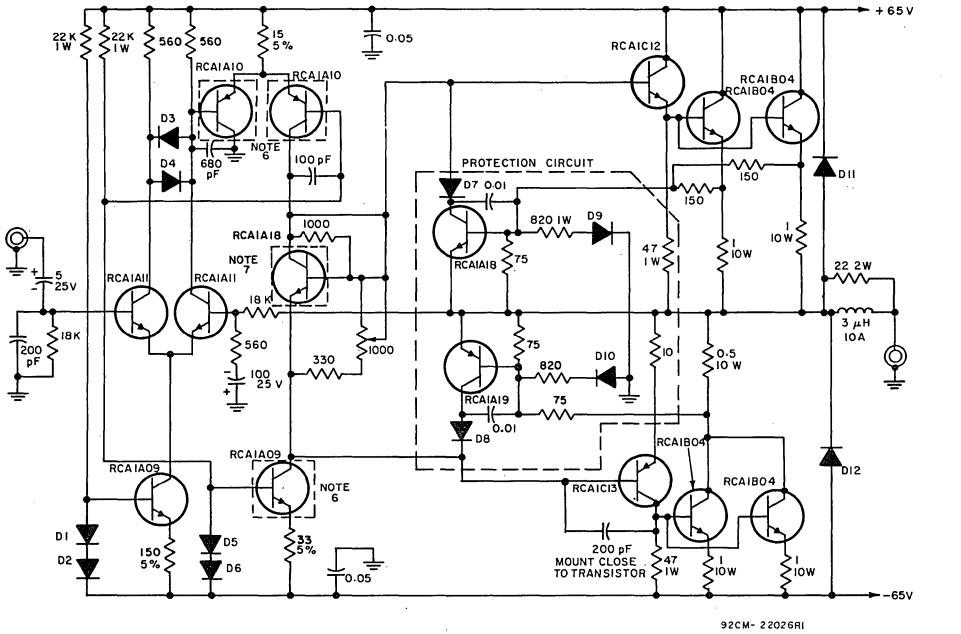
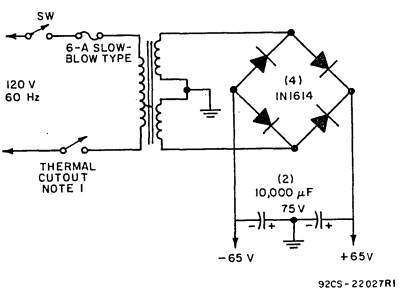


Fig. 5—120-watt amplifier circuit featuring quasi-complementary-symmetry with parallel output transistors.

NOTES FOR FIG. 5:

1. D1—D8 - 1N5391; D9—D10 - 1N914; D11—D12 - 1N5393.
2. Resistors are 1/2-watt, ± 10% unless otherwise specified; values are in ohms.
3. Capacitances are in μF unless otherwise specified.
4. Non-inductive resistors.
5. Provide approx. 1°C/W heat sinking per output device based on mounting with mica washer and ZnO thermal compound (Dow Corning No. 340, or equivalent) with T_A = 45°C max.
6. Mount on heat sink, Wakefield No. 209-AB, or equivalent. (Alternatively, this type may be obtained with a factory-attached integral heat sink.)
7. Attach heat sink cap (Wakefield No. 260-6SH5E, or equivalent.) on device and mount on same heat sink with output transistor.



NOTES FOR FIG. 6:

1. 90°C thermal cutout attached to heat sink for output transistors.
2. Power transformer: Signal 88-6 (Signal Transformer Co., 1 Junius St., Brooklyn, N.Y. 11212), or equivalent.

Fig. 6—Power supply for 120-watt audio amplifier.

TYPICAL PERFORMANCE DATA
For 120-Watt Audio Amplifier

Measured at a line voltage of 120 V, $T_A = 25^oC$, and a frequency of 1 kHz, unless otherwise specified.

Power:
- Rated power (8-Ω load, at rated distortion) ..... 120 W
- Typical power (4-Ω load) ..... 180 W
- Typical power (16-Ω load) ..... 80 W

Total Harmonic Distortion:
- Rated distortion 0.5%

IM Distortion:
- 10 dB below continuous power output at 60 Hz and 7 kHz (4:1) 0.2%

IHF Power Bandwidth:
- 3 dB below rated continuous power at rated distortion ..... 5 Hz to 50 kHz

Sensitivity:
- At continuous power output rating ..... 900 mV

Hum and Noise:
- Below continuous power output:
  - Input shorted ..... 104 dB
  - Input open ..... 88 dB
  - With 2 kΩ resistance on 20-ft. cable on input ..... 104 dB

Input Resistance ..... 18 kΩ

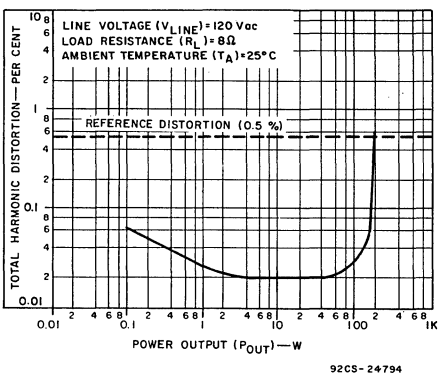


Fig. 7– Typical total harmonic distortion vs. power output for single channel (8 Ω), and both channels driven at 1 kHz.

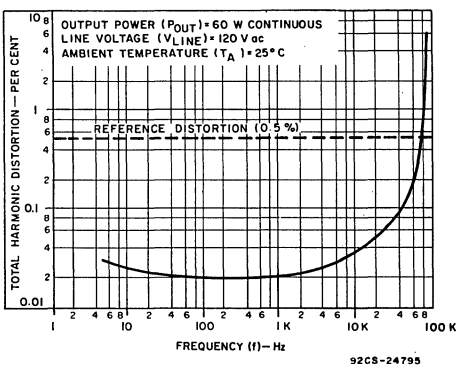


Fig. 8– Typical total harmonic distortion vs. frequency for 60-watt output.

Type RCA1B04
Package: JEDEC TO-3
Construction: Silicon n-p-n, multiple-epitaxial, pi-nu

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS	LIMITS		UNITS
			MIN.	MAX.	
Collector Cutoff Current: With external base-to-emitter resistance (R_{BE})	I_{CER}	V_{CE} = 120 V, R_{BE} = 100 Ω	–	1	mA
Emitter Cutoff Current: With collector open	I_{EBO}	V_{EB} = 5 V, I_B = 0	–	1	mA
Collector-to-Emitter Voltage: With base open	V_{CEO}	I_C = 0.2 A, I_B = 0	200	–	V
Collector-to-Emitter Voltage: With external base-to-emitter resistance (R_{BE})	V_{CER}	I_C = 0.2 A, R_{BE} = 100 Ω	225	–	V
Gain Bandwidth Product	f_T	I_C = 0.2 A, V_{CE} = 10 V	5	–	MHz
DC Forward-Current Transfer Ratio	h_{FE}	I_C = 2 A, V_{CE} = 5 V	15	75	
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	I_C = 2 A, I_B = 0.255 A	–	2	V
Base-to-Emitter Voltage	V_{BE}	I_C = 2 A, V_{CE} = 5 V	1	2	V
Second-Breakdown Collector Current: With base forward biased	$I_{S/b}$	V_{CE} = 120 V, t = 1 s	1.25	–	A

For characteristics curves and test conditions, refer to published data for prototype 2N5239 (File 321).

TERMINAL CONNECTIONS FOR TYPE RCA1B04

Pin 1 – Base
Pin 2 – Emitter
Case – Collector
Mounting Flange – Collector