

# Silicon NPN Transistor

## **RCA1C09**

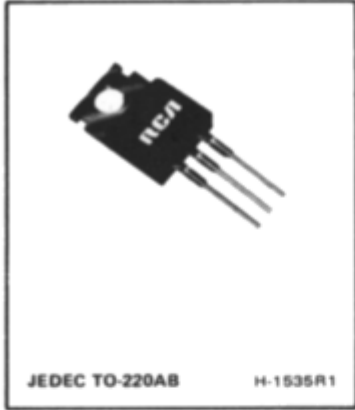
Power Transistor

75V / 10A

# DATASHEET

OEM –RCA

Source: RCA Databook 1975



## Silicon Transistor for 40-Watt Quasi-Complementary-Symmetry Audio Amplifiers

RCA1C09 is an n-p-n homotaxial-base silicon power transistor packaged in the JEDEC TO-220AB (VERSAWATT) case. Two of these devices, driven in the class-B mode by the RCA1A06 and RCA1A05 silicon n-p-n and p-n-p transistors, can be used as output devices in audio-amplifier applications.

The 40-watt amplifier shown in Figs. 1 and 5 uses two RCA1C09 transistors as output units in conjunction with seven TO-39 transistors, 11 diodes, and a 64-volt split power supply. The amplifier output is directly coupled to an 8-ohm speaker. This 40-watt amplifier features ruggedness and economy in the mid-power range.

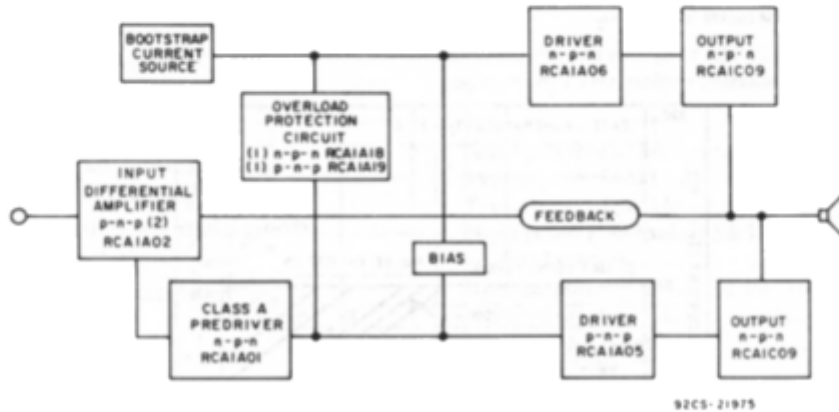


Fig. 1— Block diagram and transistor complement for 40-watt quasi-complementary-symmetry audio amplifier.

RCA1C09

File No. 645

**MAXIMUM RATINGS, Absolute-Maximum Values:**

	RCA1C09		
COLLECTOR-TO-BASE VOLTAGE .....	$V_{CBO}$	75	V
COLLECTOR-TO-EMITTER VOLTAGE:			
With base open .....	$V_{CEO}$	65	V
With external base-to-emitter resistance ( $R_{BE}$ ) = 100 $\Omega$ .....	$V_{CER}$	75	V
EMITTER-TO-BASE VOLTAGE .....	$V_{EBO}$	5	V
COLLECTOR CURRENT .....	$I_C$	10	A
BASE CURRENT .....	$I_B$	4	A
TRANSISTOR DISSIPATION:	$P_T$		
At case temperatures up to 25°C .....		75	W
At case temperatures above 25°C .....		See Fig. 2	
TEMPERATURE RANGE:			
Storage & Operating (Junction) .....		-65 to 150	°C
PIN TEMPERATURE (During Soldering):			
At distances $\geq 1/32$ in. (0.8 mm) from case for 10 s max. ....		230	°C

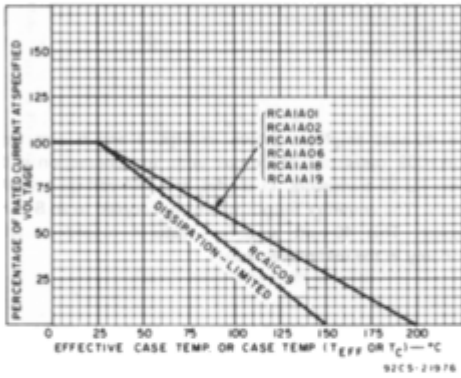


Fig. 2— Derating curves for all types.

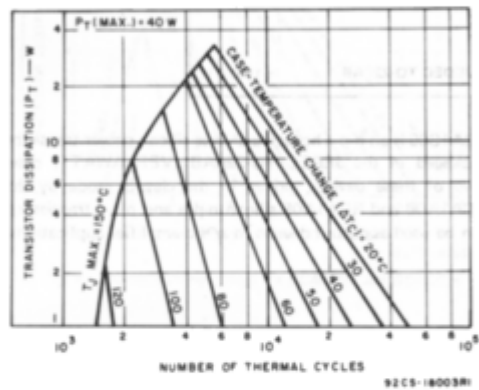


Fig. 3— Thermal-cycling ratings for RCA1C09.

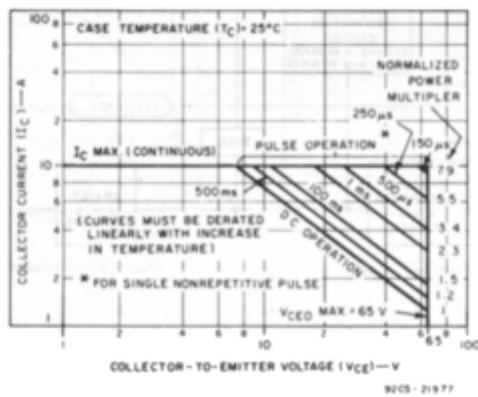
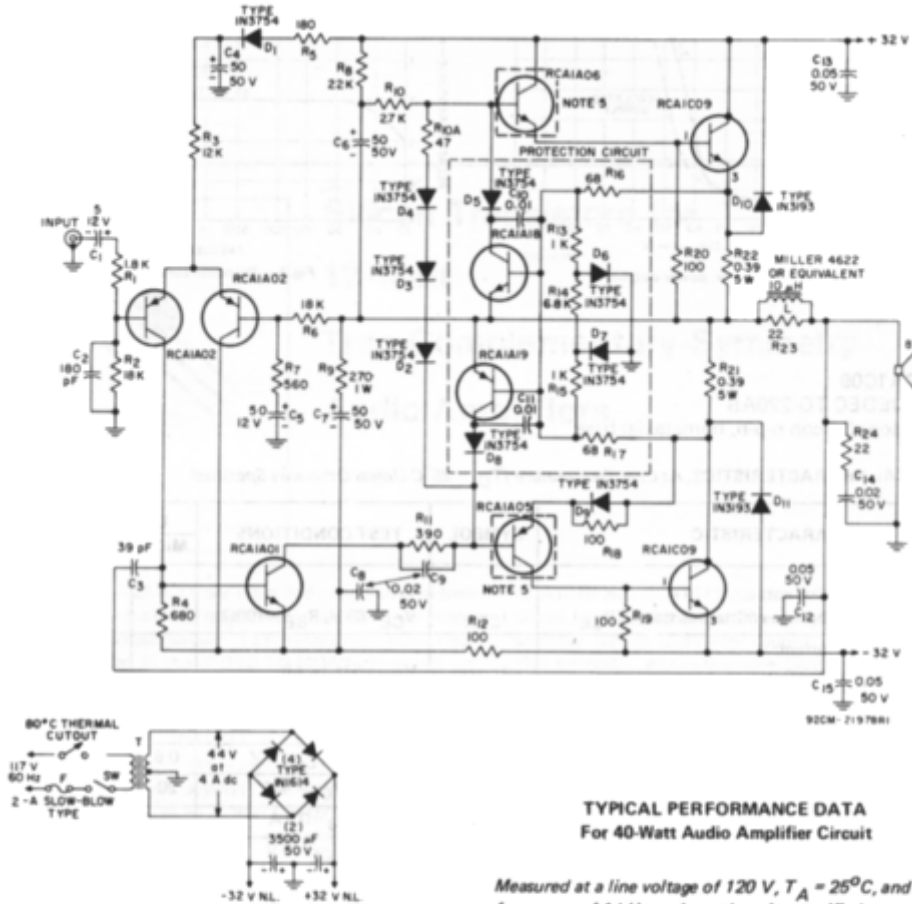


Fig. 4— Maximum operating areas for RCA1C09.



**TYPICAL PERFORMANCE DATA**  
For 40-Watt Audio Amplifier Circuit

Measured at a line voltage of 120 V,  $T_A = 25^\circ\text{C}$ , and a frequency of 1 kHz, unless otherwise specified.

Power:

Rated power (8- $\Omega$ load, at rated distortion) . . . . .	40 W
Typical power (4- $\Omega$ load) . . . . .	55 W
Typical power (16- $\Omega$ load) . . . . .	25 W
Music power (8- $\Omega$ load, at 5% THD with regulated supply) . . . . .	55 W
Dynamic power (8- $\Omega$ load, at 1% THD with regulated supply) . . . . .	50 W

Total Harmonic Distortion:

Rated distortion . . . . .	1.0%
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IM Distortion:

10 dB below continuous power output at 60 Hz and 7 kHz (4:1) . . . . .	0.1%
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Sensitivity:

At continuous power-output rating . . . . .	600 mV
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Hum and Noise:

Below continuous power output:	
Input shorted . . . . .	80 dB
With 2 k $\Omega$ resistance on 20-ft. cable on input . . . . .	75 dB
Input Resistance . . . . .	20 k $\Omega$

**NOTES:**

1. T: Signal 88-2 (parallel secondary), Signal Transformer Co., 1 Junius St., Brooklyn, N.Y. 11212, or equivalent.
2. Resistors are 1/2-watt unless otherwise specified; values are in ohms.
3. Capacitances are in  $\mu\text{F}$  unless otherwise specified.
4. Non-inductive resistors.
5. Mount driver transistors on heat sink, Wakefield No. 209-AB, or equivalent. Alternatively, these types may be obtained with a factory-attached integral heat sink.
6. Provide approximately 1.3 $^\circ\text{C}/\text{W}$  heat sinking per output device.

Fig. 5—40-watt amplifier circuit featuring quasi-complementary-symmetry output.

RCA1C09

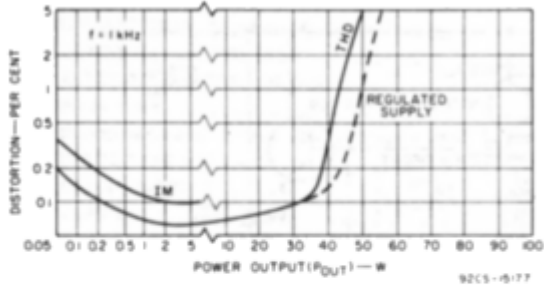


Fig. 6— Distortion vs. power output.

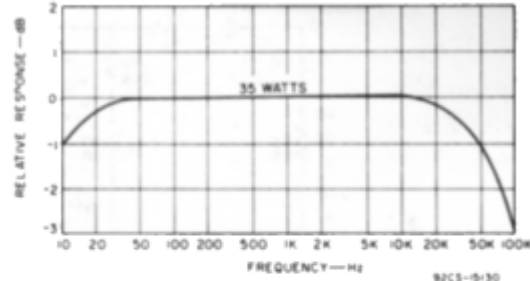


Fig. 7— Response curve.

Type RCA1C09

Package: JEDEC TO-220AB

Construction: Silicon n-p-n, hometaxial base

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 ( $R_{BE}$ )	$I_{CER}$	$V_{CE} = 65 \text{ V}, R_{BE} = 100\Omega$	—	1	mA
Emitter Cutoff Current: With collector open	$I_{EBO}$	$V_{EB} = 5 \text{ V}, I_C = 0$	—	1	mA
Collector-to-Emitter Voltage: With external base-to-emitter resistance ( $R_{BE}$ )	$V_{CER}$	$I_C = 0.2 \text{ A}, R_{BE} = 100\Omega$	75	—	V
Gain Bandwidth Product	$f_T$	$I_C = 0.5 \text{ A}, V_{CE} = 4 \text{ V}$	0.8	—	MHz
DC Forward-Current Transfer Ratio	$h_{FE}$	$I_C = 4 \text{ A}, V_{CE} = 4 \text{ V}$	20	120	
Collector-to-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_C = 4 \text{ A}, I_B = 0.4 \text{ A}$	—	1	V
Base-to-Emitter Voltage	$V_{BE}$	$I_C = 4 \text{ A}, V_{CE} = 4 \text{ V}$	—	1.5	V
Second-Breakdown Collector Current: With base forward biased	$I_{S/b}$	$V_{CE} = 40 \text{ V}, t = 0.5 \text{ s}$	1.87	—	A

For characteristics curves and test conditions, refer to published data for prototype 2N6103 (File 485).

TERMINAL CONNECTIONS FOR TYPE RCA1C09

- Lead 1 — Base
- Lead 2 — Collector
- Lead 3 — Emitter
- Lead 4 — Collector