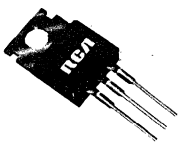
RCA Solid State Division

Power Transistors

RCA1C09



JEDEC TO-220AB H-1535R1

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

RCA1C09 is an n-p-n hometaxial-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.

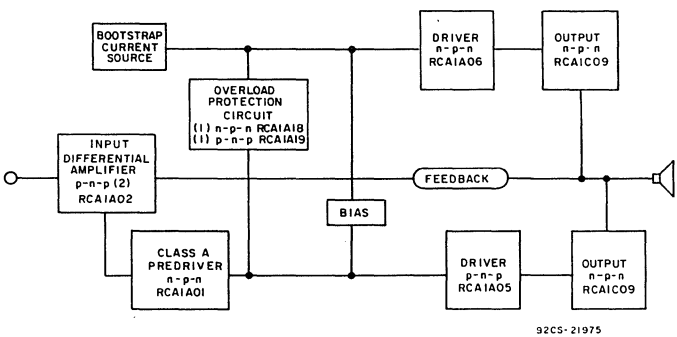


Fig. 1— Block diagram and transistor complement for 40-watt quasi-complementary-symmetry audio amplifier.

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}) = 100Ω	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 ≥1/32 in. (0.8 mm) from case for 10 s max.		230	°C

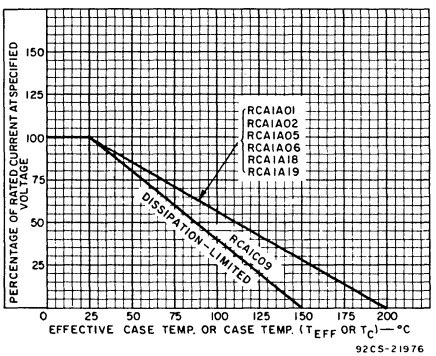


Fig.2— Derating curves for all types.

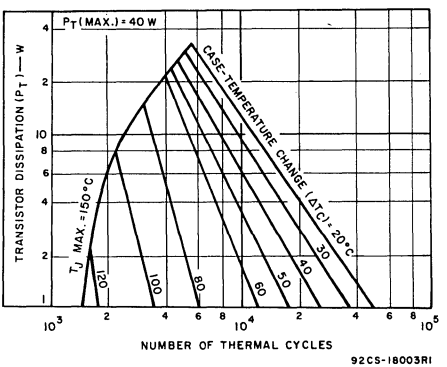


Fig.3— Thermal-cycling ratings for RCA1C09.

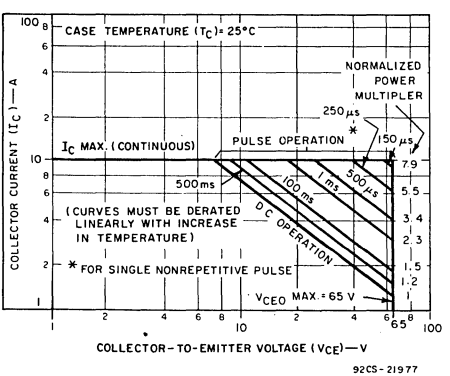
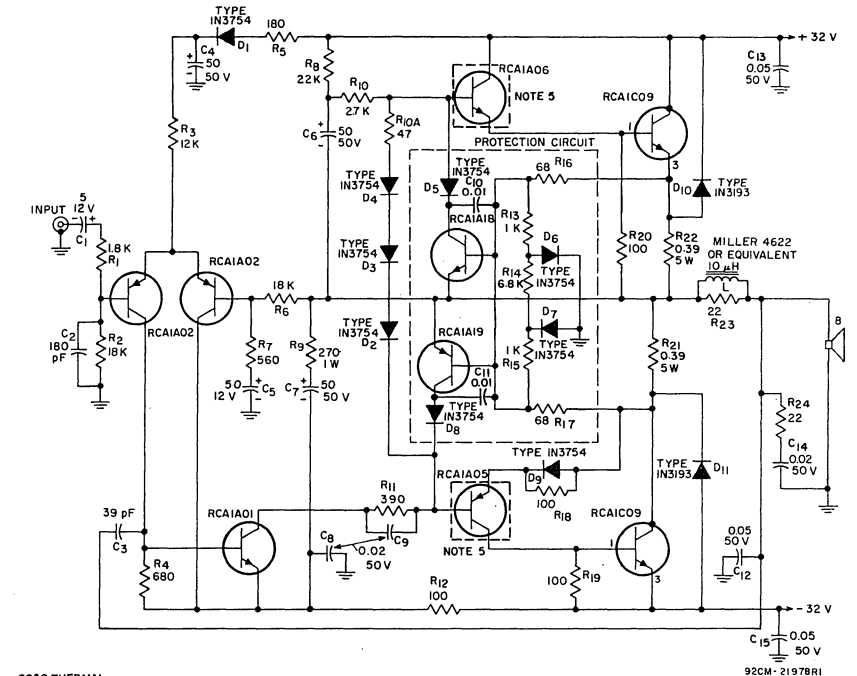
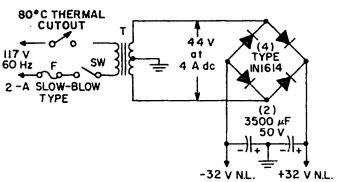


Fig.4— Maximum operating areas for RCA1C09.





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 μF 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°C/W heat sinking per output device.

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

TYPICAL PERFORMANCE DATA
For 40-Watt Audio Amplifier Circuit

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

Power:	
Rated power (8-Ω load, at rated distortion)	40 W
Typical power (4-Ω load)	55 W
Typical power (16-Ω load)	25 W
Music power (8-Ω load, at 5% THD with regulated supply)	55 W
Dynamic power (8-Ω load, at 1% THD with regulated supply)	50 W
Total Harmonic Distortion:	
Rated distortion	1.0%
IM Distortion:	
10 dB below continuous power output at 60 Hz and 7 kHz (4:1)	0.1%
Sensitivity:	
At continuous power-output rating	600 mV
Hum and Noise:	
Below continuous power output:	
Input shorted	80 dB
With 2 kΩ resistance on 20-ft. cable on input	75 dB
Input Resistance	20 kΩ

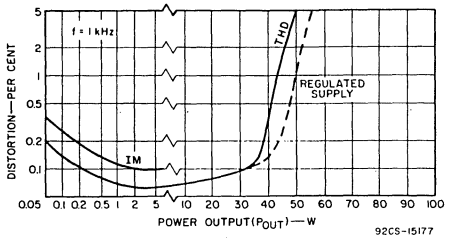


Fig.6– Distortion vs. power output.

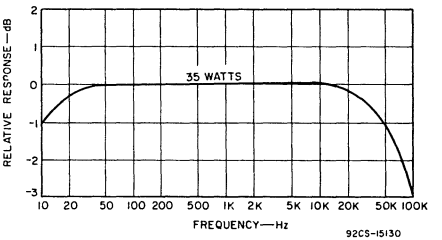


Fig.7– Response curve.

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