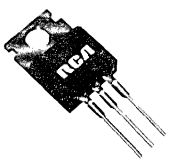
RCA
Solid State
Division

# Power Transistors

## RCA1C07
## RCA1C08



JEDEC TO-220AB H-1535R1

# Silicon Transistors for 40-Watt Full-Complementary-Symmetry Audio Amplifiers

RCA1C07 and RCA1C08 are n-p-n and p-n-p epitaxial-base silicon power transistors, respectively, especially suitable for audio-output applications. These devices are provided in the economical JEDEC TO-220AB version of the VERSAWATT package.

The 40-watt amplifier shown in Figs. 1 and 2 uses the RCA1C07 and RCA1C08 in conjunction with seven TO-39 transistors, ten diodes, and a 64-volt split power supply. The amplifier output is directly coupled to an 8-ohm speaker. The high-frequency performance of this 40-watt amplifier will provide excellent reproduction for the most critical listener.

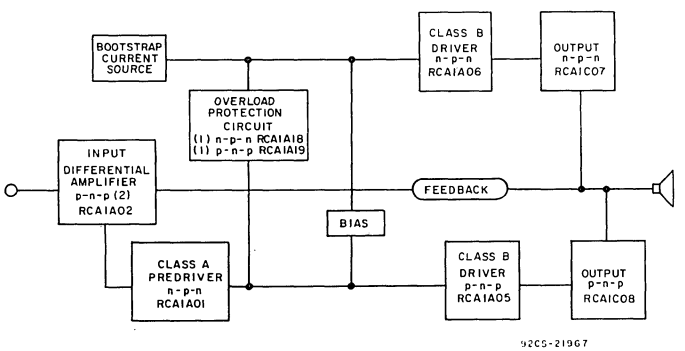



*Fig.1— Block diagram and transistor complement for 40-watt full-complementary-symmetry audio amplifier.*

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

| | | RCA1C07 | RCA1C08 | |
|---|---|---|---|---|
| COLLECTOR-TO-BASE-VOLTAGE | $V_{CBO}$ | 75 | −75 | V |
| COLLECTOR-TO-EMITTER VOLTAGE: | | | | |
| With base open | $V_{CEO}$ | 65 | −65 | V |
| With external base-to-emitter resistance ($R_{BE}$) = 100Ω | $V_{CER}$ | 75 | −75 | V |
| EMITTER-TO-BASE VOLTAGE | $V_{EBO}$ | 5 | −5 | V |
| COLLECTOR CURRENT | $I_C$ | 10 | −10 | A |
| BASE CURRENT | $I_B$ | 4 | −4 | A |
| TRANSISTOR DISSIPATION: | $P_T$ | | | |
| At case temperatures up to 25°C | | 75 | 75 | W |
| At case temperatures above 25°C | | ← *See Fig. 5* → | | |
| 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 |

**Type RCA1C07**
**Package:** JEDEC TO-220AB
**Construction:** Silicon n-p-n, epitaxial base

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

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | LIMITS MIN. | LIMITS MAX. | UNITS |
|---|---|---|---|---|---|
| Collector Cutoff Current: With external base-to-emitter resistance ($R_{BE}$) | $I_{CER}$ | $V_{CE}$ = 65V, $R_{BE}$ = 100Ω | – | 1 | mA |
| Emitter Cutoff Current: With collector open | $I_{EBO}$ | $V_{BE}$ = 5V, $I_C$ = 0 | – | 1 | mA |
| Collector-to-Emitter Voltage: With external base-to-emitter resistance ($R_{BE}$) | $V_{CER}$ | $I_C$ = 0.1A, $R_{BE}$ = 100Ω | 75 | – | V |
| Gain Bandwidth Product | $f_T$ | $I_C$ = 1 A, $V_{CE}$ = 4V | 5 | – | MHz |
| DC Forward-Current Transfer Ratio | $h_{FE}$ | $I_C$ = 4A, $V_{CE}$ = 4V | 20 | 120 | |
| Collector-to-Emitter Saturation Voltage | $V_{CE}(sat)$ | $I_C$ = 4A, $I_B$ = 0.4 A | – | 1 | V |
| Base-to-Emitter Voltage | $V_{BE}$ | $I_C$ = 4A, $V_{CE}$ = 4V | – | 1.5 | V |
| Second-Breakdown Collector Current: With base forward biased | $I_{S/b}$ | $V_{CE}$ = 30V, t = 0.5 s | 2.5 | – | A |

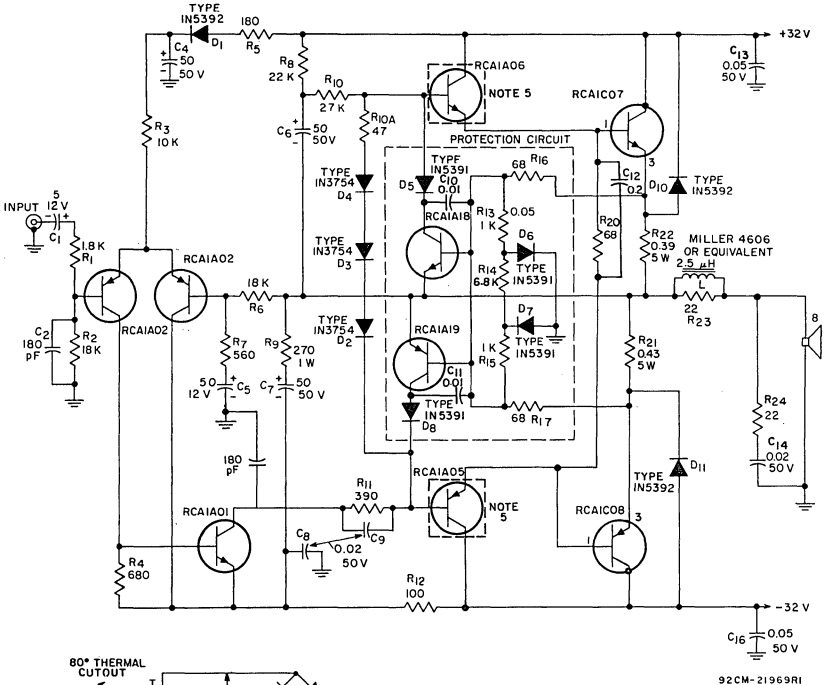
For characteristics curves and test conditions, refer to published data for prototype 2N6488 (File 678).

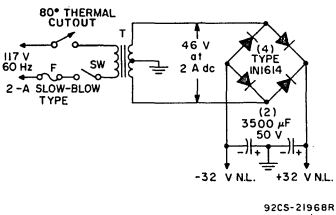
**Type RCA1C08**
**Package:** JEDEC TO-220AB
**Construction:** Silicon p-n-p, epitaxial base

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

| CHARACTERISTIC | SYMBOL | TEST CONDITIONS | LIMITS MIN. | LIMITS MAX. | UNITS |
|---|---|---|---|---|---|
| Collector Cutoff Current: With external base-to-emitter resistance ($R_{BE}$) | $I_{CER}$ | $V_{CE}$ = −65V, $R_{BE}$ = 100Ω | – | −1 | mA |
| Emitter Cutoff Current: With collector open | $I_{EBO}$ | $V_{EB}$ = −5V, $I_C$ = 0 | – | −1 | mA |
| Collector-to-Emitter Voltage: With external base-to-emitter resistance ($R_{BE}$) | $V_{CER}$ | $I_C$ = −0.1A, $R_{BE}$ = 100Ω | −75 | – | V |
| Gain Bandwidth Product | $f_T$ | $I_C$ = −1 A, $V_{CE}$ = −4V | 5 | – | MHz |
| DC Forward-Current Transfer Ratio | $h_{FE}$ | $I_C$ = −4A, $V_{CE}$ = −4V | 20 | 120 | |
| Collector-to-Emitter Saturation Voltage | $V_{CE}(sat)$ | $I_C$ = −4A, $I_B$ = −0.4A | – | −1 | V |
| Base-to-Emitter Voltage | $V_{BE}$ | $I_C$ = −4A, $V_{CE}$ = −4V | – | −1.5 | V |
| Second-Breakdown Collector Current: With base forward biased | $I_{S/b}$ | $V_{CE}$ = −30V, t = 0.5 s | −2.5 | – | A |

For characteristics curves and test conditions, refer to published data for prototype 2N6491 (File 678).




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

*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) | 40 W |
| Typical power (4-Ω load) | 75 W |
| Typical power (16-Ω load) | 25 W |
| Total Harmonic Distortion: | |
| Rated distortion | 1.0% |
| Typical at 20 W | 0.05% |
| IM Distortion: | |
| 10 dB below continuous power output at 60 Hz and 7 kHz (4:1) | 0.1% |
| IHF Power Bandwidth: | |
| 3 dB below rated continuous power at rated distortion | 80 kHz |
| Sensitivity: | |
| At continuous power-output rating | 600 mV |
| Hum and Noise: | |
| Below continuous power output: | |
| Input shorted | 80 dB |
| Input open | 75 dB |
| Input Resistance | 20 kΩ |

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.2– 40-Watt amplifier circuit featuring full-complementary-symmetry output using load line limiting.*

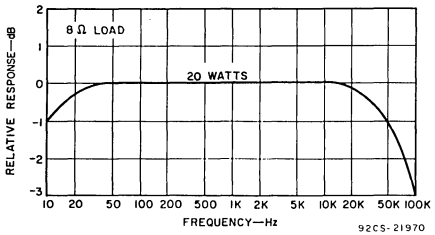



*Fig.3— Response curve.*

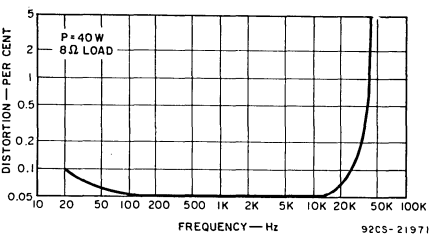



*Fig.4—Typical distortion vs. frequency.*

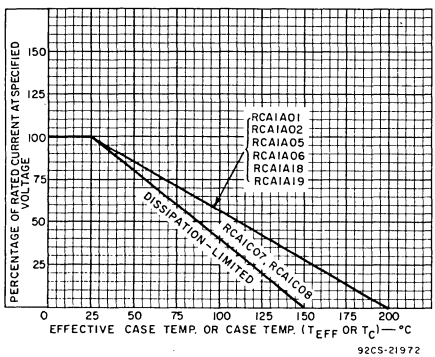



*Fig.5— Derating curve for all types.*

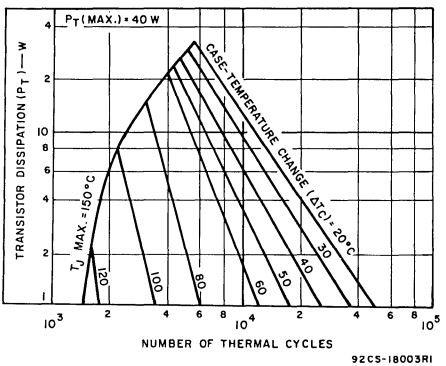



*Fig.6— Thermal-cycling ratings for RCA1C07 and RCA1C08.*

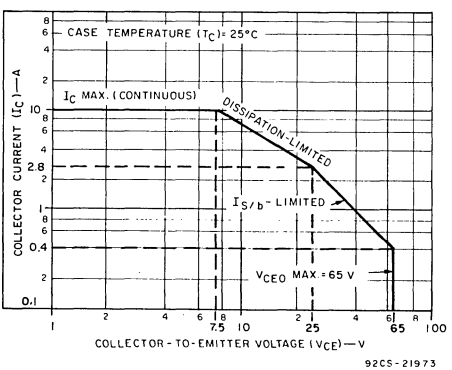



*Fig.7— Maximum operating areas for RCA1C07.*

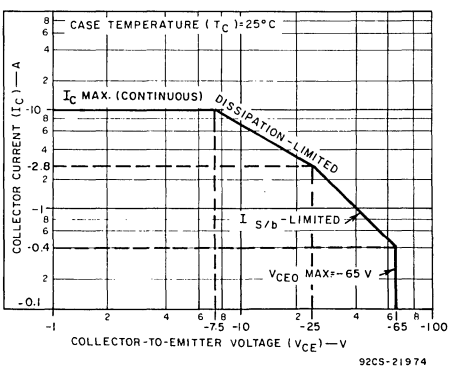



*Fig.8— Maximum operating areas for RCA1C08.*

**TERMINAL CONNECTIONS FOR TYPES RCA1C07, RCA1C08**

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