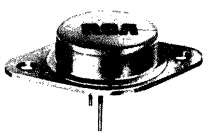
RCA
Solid State
Division

Power Transistors

RCA1B05



JEDEC TO-3 H-1570

Silicon Transistor for 200-Watt Quasi-Complementary-Symmetry Audio Amplifiers with Parallel Output Transistors

RCA1B05 is a silicon n-p-n pi-nu transistor in a JEDEC TO-3 package. This device is especially suitable for applications in audio-amplifier circuits, in which it may be used as either driver or output unit.

The 200-watt amplifier shown in Figs. 1 and 5 uses eight RCA1B05 transistors, two as drivers and six as parallel units in the amplifier output stages. These devices are employed in conjunction with eleven other discrete transistors, twelve diodes, and a 160-volt split power supply. The amplifier output is directly coupled to an 8-ohm speaker. This 200-watt audio amplifier is especially designed to feature ruggedness in combination with high power output and excellent high-fidelity performance.

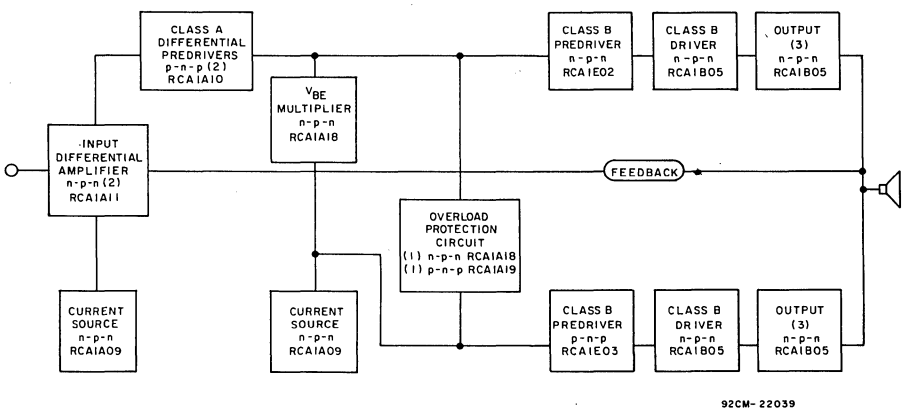


Fig. 1— Block diagram and transistor complement for 200-watt quasi-complementary-symmetry audio amplifier with parallel output transistors.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		RCA1B05	
COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	275	V
COLLECTOR-TO-EMITTER VOLTAGE:			
With base open	V_{CEO}	250	V
With external base-to-emitter resistance (R_{BE}) = 100 Ω	V_{CER}	275	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

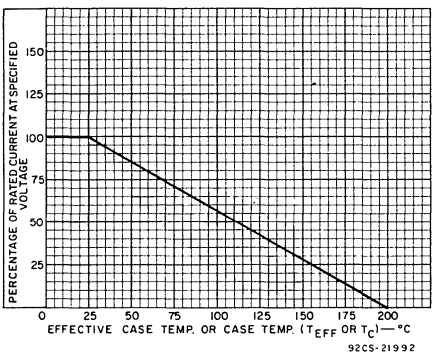


Fig. 2– Derating curves for all types.

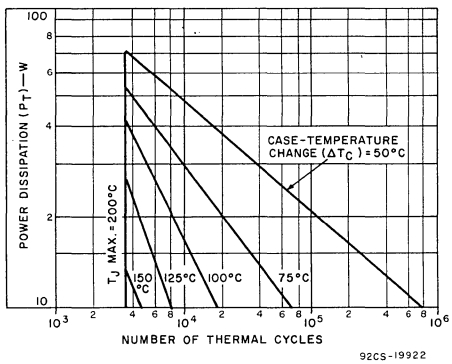


Fig. 3– Thermal-cycling ratings for RCA1B05.

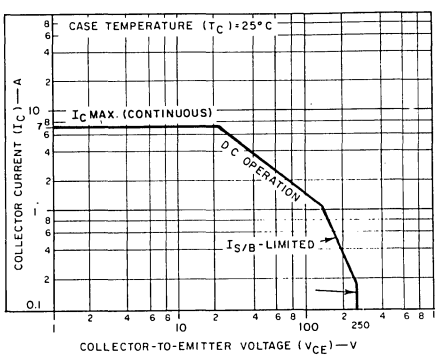


Fig. 4– Maximum operating areas for RCA1B05.

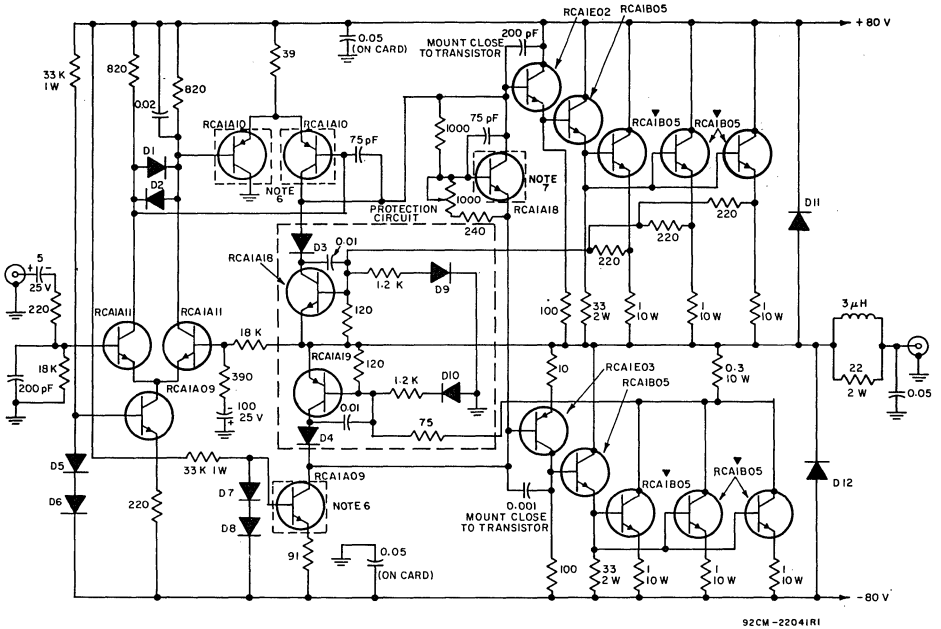
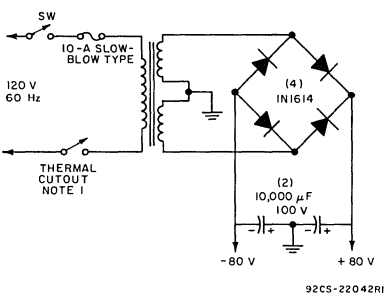


Fig. 5— 120-watt amplifier circuit featuring quasi-complementary-symmetry with parallel output transistors.

NOTES FOR FIG. 5:

1. D1–D8 - 1N5391; D9–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 $T_A = 45^{\circ}C$ 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:

1. 90°C thermal cutout attached to heat sink for output transistors.
2. Power transformer: Signal 120-6(Signal Transformer Co., 1 Junius St., Brooklyn, N.Y. 11212), or equivalent. Use 125-volt primary tap.

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

TYPICAL PERFORMANCE DATA
For 200-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) ..... 200 W
- Typical power (4-Ω load) ..... 300 W
- Typical power (16-Ω load) ..... 130 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 35 kHz

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

Hum and Noise:
- Below continuous power output:
  - Input shorted ..... 96 dB
  - Input open ..... 84 dB
  - With 2 kΩ resistance on 20-ft. cable on input ..... 94 dB

Input Resistance ..... 18 kΩ

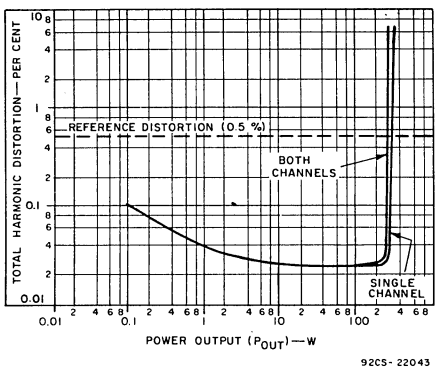


Fig. 7— Typical total harmonic distortion vs. power output for single channel and both channels driven at 1 kHz.

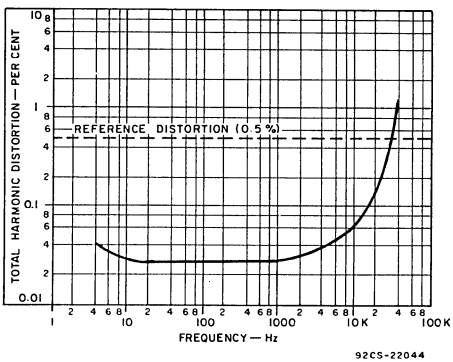


Fig. 8— Typical total harmonic distortion vs. frequency for 100-watt output.

Type RCA1B05
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} = 200 V, R_{BE} = 100 Ω	–	1	mA
Emitter Cutoff Current: With collector open	I_{EBO}	V_{EB} = 50 V, I_C = 0	–	1	mA
Collector-to-Emitter Voltage: With base open	V_{CEO}	I_C = 0.2 A, I_B = 0	250	–	V
Collector-to-Emitter Voltage: With external base-to-emitter resistance (R_{BE})	V_{CER}	I_C = 0.2 A, R_{BE} = 100 Ω	275	–	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} = 140 V, t = 1 s	1.07	–	A

For characteristics curves and test conditions, refer to published data for prototype 2N5240 (File 321).

TERMINAL CONNECTIONS RCA1B05

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