RCA Solid State Division

Power Transistors

RCA1B07
RCA1B08

JEDEC TO-3 H-1570

Silicon Transistors for 40-Watt Full-Complementary-Symmetry Audio Amplifiers with Darlington Output Transistors

RCA1B07 and RCA1B08 are n-p-n and p-n-p Darlington silicon transistors respectively. They are especially characterized for use as output devices in audio applications, and are provided in the JEDEC TO-3 package.

The 40-watt audio amplifiers shown in Figs. 5 and 6 use RCA1B07 and RCA1B08 transistors as output devices in conjunction with nine TO-39 discrete transistors, and ten diodes. The amplifier shown in Fig. 5 uses a 64-volt split power supply with the output directly coupled to an 8-ohm speaker. Fig. 6 shows an amplifier with a 58-volt split supply with the output directly coupled to a 4-ohm speaker. These 40-watt Darlington full-complementary-symmetry amplifiers combine excellent performance with economy.

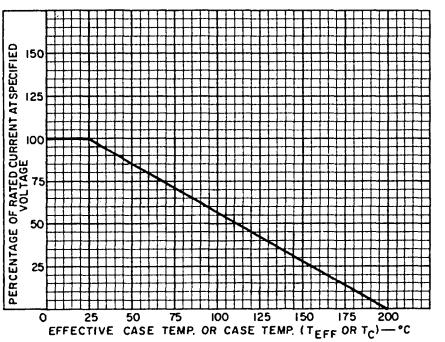


Fig. 1—Derating curves for all types.

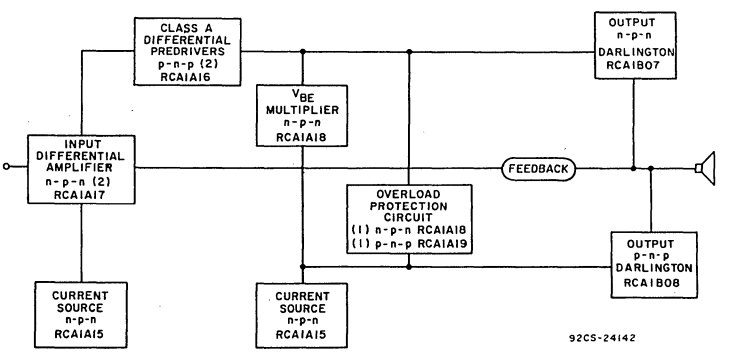


Fig. 2—Block diagram and transistor complement for 40-watt full-complementary-symmetry audio amplifier with Darlington output transistors.

MAXIMUM RATINGS, *Absolute-Maximum Values:*

		RCA1B07	RCA1B08	
COLLECTOR-TO-BASE VOLTAGE	V_{CBO}	80	−80	V
COLLECTOR-TO-EMITTER VOLTAGE:				
With base open	V_{CEO}	80	−80	V
With external base-to-emitter resistance (R_{BE}) = 100 Ω	V_{CER}	80	−80	V
EMITTER-TO-BASE VOLTAGE	V_{EBO}	5	−5	V
COLLECTOR CURRENT	I_C	10	−10	A
BASE CURRENT	I_B	0.25	−0.25	A
TRANSISTOR DISSIPATION:	P_T			
At case temperatures up to 25°C		100	100	W
At case temperatures above 25°C		*See Fig. 1*		
TEMPERATURE RANGE:				
Storage and 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

Type RCA1B07
Package: JEDEC TO-3
Construction: Silicon n-p-n, Darlington

Type RCA1B08*
Package: JEDEC TO-3
Construction: Silicon p-n-p, Darlington

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

CHARACTERISTIC	SYMBOL	TEST CONDITIONS*	LIMITS		UNITS
			Min.	Max.	
Collector-to-Emitter Voltage: With base open	V_{CEO}	I_C = 200 mA, I_B = 0	80	–	V
DC Forward-Current Transfer Ratio	h_{FE}	I_C = 5 A, V_{CE} = 3 V	1000	15000	
Collector Cutoff Current: With base open	I_{CEO}	V_{CE} = 80 V, I_B = 0; T_C = 150°C	–	10	mA
Collector-to-Emitter Saturation Voltage	$V_{CE}(sat)$	I_C = 5 A, I_B = 10 mA	–	2	V
Base-to-Emitter Voltage	V_{BE}	I_C = 5 A, V_{CE} = 3 V	–	2.8	V
Second-Breakdown Collector Current: With base forward biased	$I_{S/b}$	V_{CE} = 70 V, t = 1 s	0.25	–	A

*For RCA1B08, voltage and current values are negative.

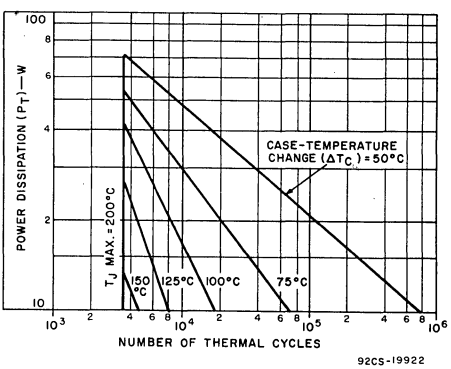


Fig. 3—Thermal-cycling rating chart for RCA1B07 and RCA1B08.

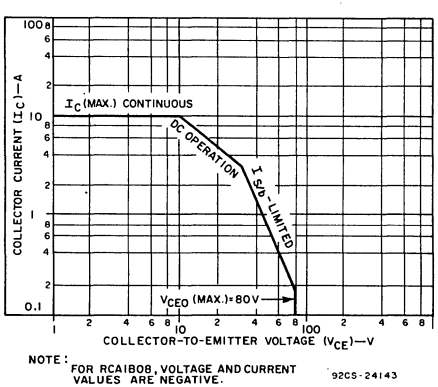
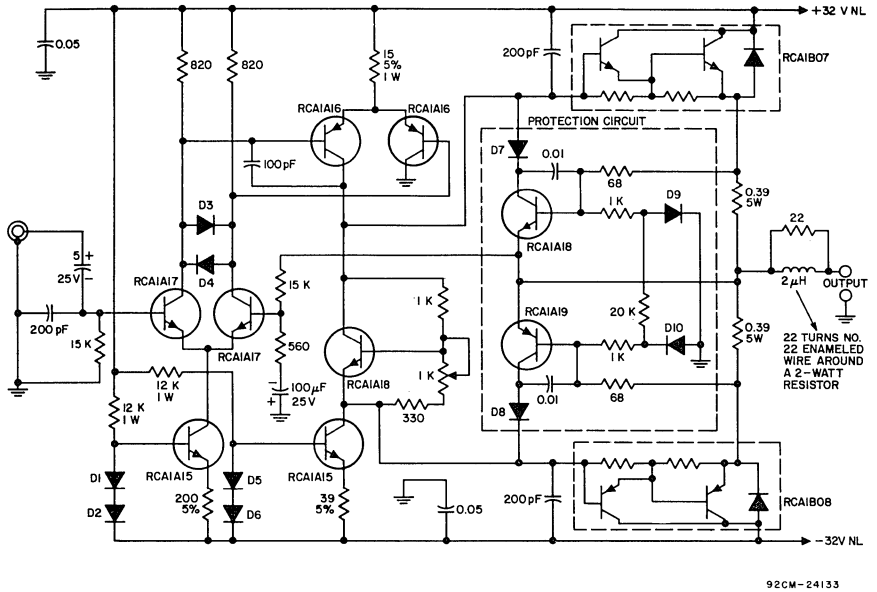
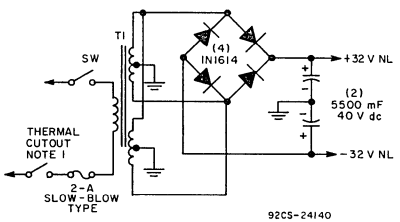


Fig. 4—Maximum operating areas for RCA1B07 and RCA1B08.





NOTES:

1. Provide approximately 1.3°C/W heat sinking per output device, based on mounting with a mica washer and ZnO thermal compound (Dow-Corning No. 340, or equivalent) with T_A = 45°C max.
2. 90°C thermal cutout attached to heat sink for output transistors.
3. Power transformer: Signal 88-2 (parallel secondary), Signal Transformer Co., 1 Junius St., Brooklyn, N.Y. 11212, or equivalent.
4. Resistors are 1/2-watt unless otherwise specified; values are in ohms.
5. Capacitances are in μF unless otherwise specified.
6. Non-inductive resistors.
7. D1–D10: 1N5391.

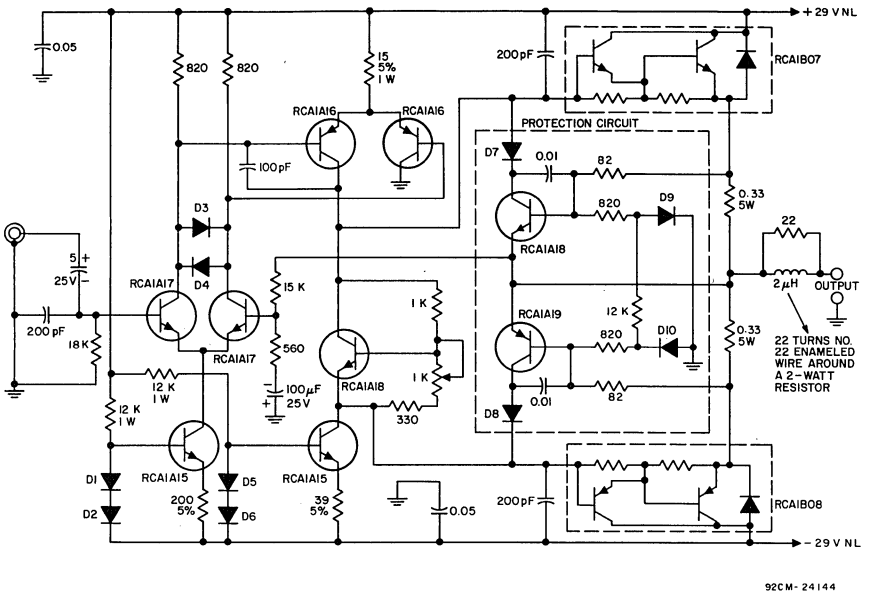
Fig. 5—40-watt amplifier circuit featuring full-complementary-symmetry output employing Darlington output transistors.

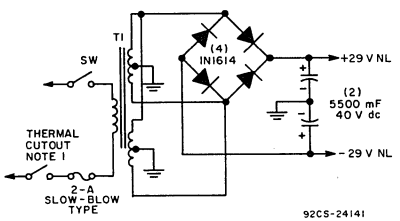
TYPICAL PERFORMANCE DATA

For 40-Watt Audio Amplifier

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
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
Bandwidth at 1 W	5 Hz to 100 kHz
Sensitivity:	
At continuous power-output rating	700 mV
Hum and Noise:	
Below continuous power output:	
Input shorted	100 dB
Input open	85 dB
With 2 kΩ resistance on 20-ft. cable on input	97 dB
Input Resistance	18 kΩ





NOTES:

1. Provide approximately 1.3°C/W heat sinking per output device, based on mounting with a mica washer and ZnO thermal compound (Dow-Corning No. 340, or equivalent) with T_A = 45°C max.
2. 90°C thermal cutout attached to heat sink for output transistors.
3. Power transformer: Signal 80-4 (parallel secondary). Signal Transformer Co., 1 Junius St., Brooklyn, N.Y. 11212, or equivalent.
4. Resistors are 1/2-watt unless otherwise specified; values are in ohms.
5. Capacitances are in μF unless otherwise specified.
6. Non-inductive resistors.
7. D1–D10: 1N5391.

Fig. 6—40-watt amplifier circuit featuring full-complementary-symmetry output employing Darlington output transistors.

TYPICAL PERFORMANCE DATA

For 40-Watt Audio Amplifier

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

Power:	
Rated power (4-Ω load, at rated distortion)	40 W
Typical power (8-Ω load)	30 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
Bandwidth at 1 W	5 Hz to 100 kHz
Sensitivity:	
At continuous power-output rating	500 mV
Hum and Noise:	
Below continuous power output:	
Input shorted	100 dB
Input open	85 dB
With 2 kΩ resistance on 20-ft. cable on input	97 dB
Input Resistance	18 kΩ

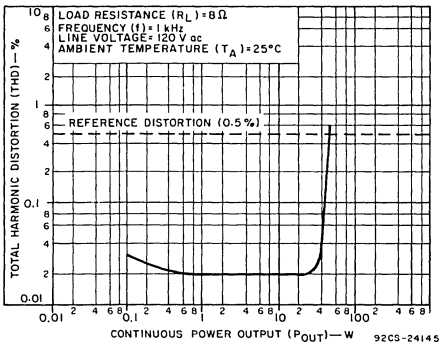


Fig. 7—Typical distortion vs. power output for 40-watt amplifier with 64-volt supply.

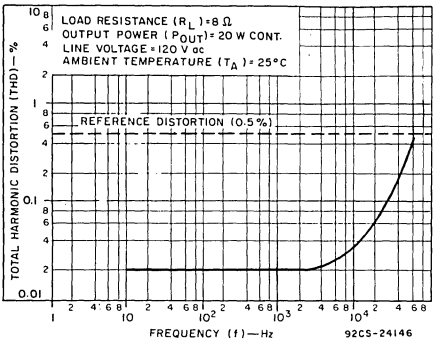


Fig. 8—Typical distortion vs. frequency for 40-watt amplifier with 64-volt supply.

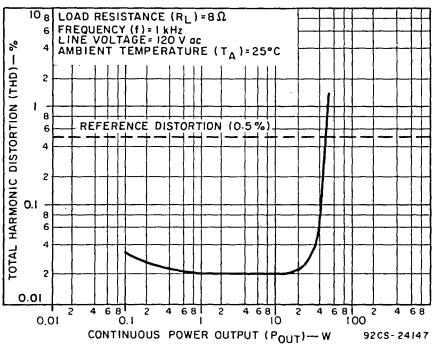


Fig. 9—Typical distortion vs. power output for 40-watt amplifier with 58-volt supply.

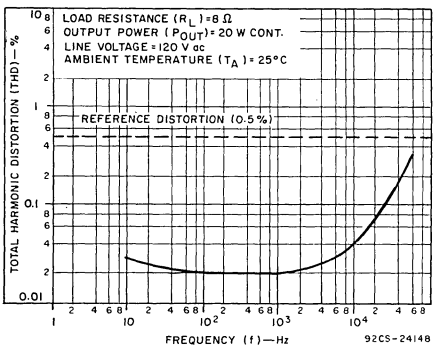


Fig. 10—Typical distortion vs. frequency for 40-watt amplifier with 58-volt supply.

TERMINAL CONNECTIONS

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