

RCA

**integrated
circuits**



**product
guide**



RADIO CORPORATION OF AMERICA
Electronic Components and Devices, Harrison, N. J. 07029

Trademark(s) ® Registered Marca(s) Registrada(s)

MATURE PRODUCTION FACILITIES

RCA's integrated circuits are manufactured in modern, laminar-flow, super-clean-room facilities at Somerville, N.J. Experienced design, engineering, and manufacturing activities direct every aspect of integrated-circuit production — from the generation of photomasks, to completion and testing of finished circuits



RCA DIGITAL INTEGRATED CIRCUITS

RCA digital integrated circuits are supplied in 14-lead, hermetically sealed, ceramic and metal flat packages.

RCA DIGITAL INTEGRATED CIRCUITS are aimed specifically at the growing number of applications that require either:

- extremely high-speed switching
- or
- extremely low power dissipation

ULTRA-HIGH-SPEED ECCSL[▲] (emitter-coupled current-steered logic) **FAMILY** is specifically designed for 3rd-generation data-processing and scientific computer applications in which high-speed operation is of paramount importance.

HIGH-SPEED ECCSL[▲] FAMILY has been designed for use in military computer and control applications, and high-frequency digital communications equipment where high-speed and high-performance operation must be maintained over a wide temperature range (-55°C to +125°C).

LOW-POWER DTL FAMILY offers extremely low power dissipation in high-performance circuitry of Aerospace, Airborne, and Portable Digital Equipment where high-density equipment packaging requires low heat generation and low power drain.

EMITTER-FOLLOWER OUTPUTS in all the digital circuit families permit driving of relatively high-

capacitance loads. In addition, all ECCSL digital families are capable of driving terminated transmission lines.

COMPREHENSIVE APPLICATION INFORMATION is given in associated application notes. These notes cover features; typical applications; logic functions; effects of power supply, temperature and loading variations; and other significant considerations for equipment designers.

FLAT-PACKAGE CARRIERS. Each RCA integrated circuit in a 14-lead flat package is shipped in an individual carrier. The carrier provides maximum protection against damage in handling and permits electrical testing of the circuit without removal from the carrier. For additional information on these carriers, refer to Technical Bulletin CX3300, CX3301.

▲ Pronounced EXCEL

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BROAD-CAPABILITY LINE

Here is RCA's broad, new line of integrated circuits designed to cover a wide spectrum of your circuit requirements for both digital and linear applications. Built on RCA's strong foundations in application engineering and sophisticated silicon technology, these new integrated circuits offer:

- single-chip, monolithic silicon, passivated, epitaxial construction
- hermetically sealed TO-5 style packaging, and ceramic and metal flat packaging
- digital circuit coverage includes both extremely low power (2.3 mW per gate), and highest commercially available speeds (3.6 ns)
- linear circuit coverage from DC to 100 Mc/s
- all circuits tested on computerized, automatic test equipment with parameter readout



RCA LINEAR INTEGRATED CIRCUITS

RCA linear integrated circuits are supplied in hermetically sealed, low-silhouette TO-5 style metal packages. Operational Amplifier types are available in both TO-5 package and 14-lead ceramic and metal flat package.

DIFFERENTIAL AMPLIFIER CONFIGURATION with built-in controlled constant-current source has been selected as the basic design unit for all RCA linear circuits

APPLICATION VERSATILITY of the basic differential-amplifier configuration makes RCA linear circuits extremely useful in a wide variety of applications —

- Push-pull amplifier
- DC amplifier
- Video amplifier
- RF amplifier
- IF amplifier
- AF amplifier
- Operational amplifier
- Sense amplifier
- Modulator
- Schmitt trigger
- AGC
- Limiter
- Squelch
- One-shot multivibrator
- Phase splitter
- Comparator
- AM detector
- Product detector

• Mixer

BASIC CIRCUIT permits easy access to internal circuit points and external circuit outboarding

INHERENT TEMPERATURE STABILITY of the basic circuit permits operation from -55°C to $+125^{\circ}\text{C}$

TECHNICAL-ECONOMIC COMPATIBILITY of the differential-amplifier construction, and the reliable monolithic silicon epitaxial process, provide excellent performance, excellent economy

INHERENTLY MATCHED PAIRS of components offer excellent output-to-input isolation, no neutralization, and simplify feedback arrangements

COMPREHENSIVE APPLICATION INFORMATION is given in associated application notes. These notes cover operating characteristics at different voltages; effects of temperature and operating point on gain and frequency; detailed analysis of performance characteristics: cross-modulation, distortion, noise, phase compensation, etc.; practical circuit designs for limiters, detectors, 10-Mc/s narrow-band tuned amplifier, 3-stage video amplifier, etc.

WIDE-BAND AMPLIFIER & WIDE-BAND AMPLIFIER-DISCRIMINATOR CIRCUITS.

For sound if-amplifier, AM and noise limiter, FM detector, and AF preamplifier stages in Color and Black-and-White TV Receivers; FM broadcast and communications receivers; instrumentation applications.

- wide frequency capability, 100 Kc/s to > 20 Mc/s
- extremely high-gain amplifier for instrumentation applications

NEW ERA IN CIRCUIT ECONOMICS

RCA linear and digital integrated circuits now offer you the opportunity to enter today's design phase and tomorrow's production at prices competitive with discrete-component circuits.

RCA LINEAR INTEGRATED CIRCUITS

 Type	Equipment Applications	Circuit Applications	MAXIMUM LIMITS		
			Input Signal Voltage V	Device Dissipation mW	Input Offset Voltage mV

OPERATIONAL AMPLIFIERS

CA3008 [•]	Telemetry Data-Processing Instrumentation Communications	Operational Amplifier, Oscillator, Comparator, Feedback Amplifier, Narrow-Band and Bandpass Amplifier, Servo Driver, DC and Video Amplifier, Multivibrator, Balanced Modulator-Driver, Push-Pull Input	+1, -2	30	1.0
CA3010 [□]			+1, -2	30	1.0

RF AMPLIFIERS

CA3004 [□]	Communications	Push-Pull Input and Output, Mixer Limiter, Modulator, AGC, Detector, Wide and Narrow-Band Amplifier, RF, IF, and Video Amplifier. CA3005 and CA3006 may also be used as cascode amplifier	+3.5, -3.5	26	1.7
CA3005 [□]			+3.5, -3.5	26	2.6
CA3006 [□]			+3.5, -3.5	26	0.8

VIDEO AMPLIFIERS

CA3001 [□]	Video Systems Communications	Push-Pull Input and Output, Mixer, AGC, and Schmitt Trigger, Modulator, DC, IF, and Video Amplifier (may be AC coupled)	+2.5, -2.5	60	1.5
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DC AMPLIFIERS

CA3000 [▲]	Telemetry Data-Processing Instrumentation Communications	Push-Pull Input and Output, AGC, Mixer, Sense Amplifier, Modulator, Schmitt Trigger, RC-Coupled Feedback Amplifier, Crystal Oscillator, Comparator	+2, -2	30	1.4
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IF AMPLIFIERS

CA3002 [▲]	Communications	Push-Pull Input, AGC, Product Detector, AM Detector, RC-Coupled Cascaded Amplifier, IF and Video Amplifier (may be AC coupled)	+3.5, -3.5	55	—
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AF AMPLIFIERS

CA3007 [□]	Communications Sound Systems	Audio Amplifier, Audio Driver, Direct Coupling to Class B Audio Output Stage	+2.5, -2.5	30	—
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 Type	Equipment Applications	Circuit Applications	MAXIMUM LIMITS		
			DC Supply Voltage V	Input Signal Voltage V	Device Dissipation mW

WIDE-BAND AMPLIFIERS

CA3011 [▲]	TV and FM Broadcast and Communications, Receivers, Instrumentation	High-Gain, Wide-Band IF Amplifiers For Use with External AM or FM Detector Circuits	10	+3, -3	300
CA3012 [▲]			13	+3, -3	300

WIDE-BAND AMPLIFIER-DISCRIMINATORS

CA3013 [▲]	TV and FM Broadcast and Communications Receivers, Instrumentation	IF Amplifiers, AM and Noise Limiters, FM Detectors, Audio Preamplifiers	10	+3, -3	300
CA3014 [▲]			13	+3, -3	300

• 14-lead flat package

▲ TO-5 10-lead package

□ TO-5 12-lead package

RCA LINEAR INTEGRATED CIRCUITS

TYPICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$						Associated Application Note	 Type
Input Bias Current μA	Gain dB	Common Mode Rejection Ratio at 1 kc/s dB	-3dB Bandwidth	Input Impedance Ω	Output Impedance Ω		

OPERATIONAL AMPLIFIERS

5.3	60 at 1 kc/s	94	300 kc/s	14000 at 1 kc/s	200 at 1 kc/s	ICAN—5015	CA3008 [•]
5.3	60 at 1 kc/s	94	300 kc/s	14000 at 1 kc/s	200 at 1 kc/s		CA3010 [□]

RF AMPLIFIERS

21	12 at 100 Mc/s	98	100 Mc/s	1200 at 100 Mc/s	2200 at 100 Mc/s	ICAN—5022	CA3004 [□]
19	16 at 100 Mc/s	101	100 Mc/s	1400 at 100 Mc/s	2000 at 100 Mc/s		CA3005 [□]
19	16 at 100 Mc/s	101	100 Mc/s	1400 at 100 Mc/s	2000 at 100 Mc/s		CA3006 [□]

VIDEO AMPLIFIERS

10	19 at 1 Mc/s	70	16 Mc/s	60000 at 1.75 Mc/s	60 at 1.75 Mc/s	ICAN—5038	CA3001 [□]
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DC AMPLIFIERS

23	37 at 1 kc/s	98	650 kc/s	195K at 1 kc/s	8000 at 1 kc/s	ICAN—5030	CA3000 [▲]
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IF AMPLIFIERS

20	24.4 at 1.75 Mc/s	—	11 Mc/s	100K at 1.75 Mc/s	.70 at 1.75 Mc/s	ICAN—5036	CA3002 [▲]
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AF AMPLIFIERS

10.5	22 at 1 kc/s	77	20 kc/s	4000 at 1 kc/s	60 at 1 kc/s	ICAN—5037	CA3007 [□]
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TYPICAL CHARACTERISTICS AT $T_A = 25^\circ\text{C}$, and $f = 4.5\text{ Mc/s}$ Unless Otherwise Specified.

DC Supply Voltage $V_{CC}^{\#}$ V	Device Dissipation mW	Voltage Gain-dB @			Input Impedance		Output Impedance		Noise Figure NF dB	Input Limiting Voltage (knee) μV	Recovered AF Voltage $V_o(\text{af})$ mV	AM Rejection AMR dB	Total Harmonic Distortion THD %	 Type
		1 Mc/s	4.5 Mc/s	10.7 Mc/s	R_{IN}^{ϕ} k Ω	C_{IN}^{ϕ} pF	R_{OUT}^{ϕ} k Ω	C_{OUT}^{ϕ} pF						

WIDE-BAND AMPLIFIERS

7.5	120	70	67	61	3	7	31.5	4.2	8.7	300	—	—	—	CA3011 [▲]
7.5	120	70	67	61	3	7	31.5	4.2	8.7	300	—	—	—	CA3012 [▲]
10	190	71	—	—	—	—	—	—	—	—	—	—	—	

WIDE-BAND AMPLIFIER-DISCRIMINATORS

7.5	120	70	67	60	3	7	31.5	4.2	8.7	300	188	50	1.8	CA3013 [▲]
7.5	120	70	67	60	3	7	31.5	4.2	8.7	300	188	50	1.8	CA3014 [▲]
10	190	71	—	—	—	—	—	—	—	—	220	—	—	

ϕ Parallel Components

$\#$ Recommended Minimum DC Supply Voltage (V_{CC}) = 5.5V

RCA DIGITAL INTEGRATED CIRCUITS

Type	Description	Features	Logic		
			Type	Levels	
				"0" V	"1" V
Ultra- High-Speed ECCSL[▲] (OR/NOR — Positive Logic)					
CD2150	DUAL FOUR-INPUT GATE	<ul style="list-style-type: none"> extremely high-speed switching (non-saturated transistor operation)—only 3.6ns av. propagation delay (fan-out 1 + 10 pF) emitter-follower low-impedance outputs—permits large fan-out driving capability integral reference-threshold voltage supply—provides thermal and supply voltage tracking, plus good noise immunity capable of driving terminated 100-ohm transmission line—insures max. signal transmission without distortion 	ECL	-1.6	-0.76
CD2151	DUAL FOUR-INPUT GATE With "Phantom OR" Output Capability		ECL	-1.6	-0.76
CD2152	EIGHT-INPUT GATE With "Phantom OR" Output Capability		ECL	-1.6	-0.76
High-Speed ECCSL[▲] (OR/NOR — Positive Logic)					
CD2100	DUAL FOUR-INPUT GATE	<ul style="list-style-type: none"> high speed (result of non-saturated transistor operation)—6 ns tpd (fan-out 1 + 10 pF) wide operating temperature range -55°C to +125°C integral reference-threshold voltage supply—provides thermal and supply voltage tracking plus good noise immunity emitter-follower low-impedance outputs—permits large fan-out driving capability capable of driving terminated 300-ohm strip line—insures max. signal transmission without distortion 	ECL	-1.55	-0.75
CD2101	QUADRUPLE TWO-INPUT NOR GATE		ECL	-1.55	-0.75
CD2102	J-K FLIP-FLOP With Set-Reset Capability		ECL	Scheduled for Announcement in Mid 1966.	
CD2103	DUAL FOUR-INPUT GATE With "Phantom OR" Output Capability		ECL		
CD2104	EIGHT-INPUT GATE		ECL		
Low-Power DTL (NAND — Positive Logic)					
CD2200	DUAL FOUR-INPUT GATE With Input Expander Node	<ul style="list-style-type: none"> very low device dissipation—2.3 mW per gate wide operating temperature range -55°C to +125°C buffer circuit output—makes possible high capacitive-load driving capability high noise immunity—1.2V typ. at 25°C; 0.7V typ. at 125°C 	DTL	0.1	3.4
CD2201	QUADRUPLE TWO-INPUT GATE		DTL	0.1	3.4
CD2202	DUAL FOUR-INPUT GATE-BUFFER		DTL	Scheduled for Announcement in Mid 1966.	
CD2203	J-K FLIP-FLOP With Set-Reset Capability	<ul style="list-style-type: none"> very low device dissipation—8 mW typ. high noise immunity—clock lines, 1.5V; all other inputs, 1.2V Eight Inputs: 2 DC Set, 2 Split Clock, 2 "J" Clock Steering, 2 "K" Clock Steering 	DTL	0.1	3.4
CD2204	DUAL FOUR-INPUT EXPANDER	Scheduled for Announcement in Mid 1966.			
CD2205	DUAL FOUR-INPUT GATE With "Phantom OR" Output Capability	Scheduled for Announcement in Mid 1966.			

RCA DIGITAL INTEGRATED CIRCUITS

Operating Conditions					Typical Characteristics at T _A = 25°C					Associated Application Note	
Temperature Range °C	Supply Voltage Range V	Max. Fan-Out Per Gate			DC Input Current mA	Noise Immunity V	Device Dissipation mW	Propagation Delay			
		Un-loaded	Loaded with Terminated Transmission Line					Speed ns	Load fan-out		
			No.	Ω							

Ultra- High-Speed ECCSL[▲] (OR/NOR — Positive Logic)

+10 to +60	-4.5 to -5.5	12	6	100	0.1	0.33	220	3.6	1 + 10pF	ICAN-5025	CD2150
+10 to +60	-4.5 to -5.5	12	6	100	0.1	0.33	175	3.6	1 + 10pF	ICAN-5025	CD2151
+10 to +60	-4.5 to -5.5	12	6	100	0.1	0.33	110	3.6	1 + 10pF	ICAN-5025	CD2152

High-Speed ECCSL[▲] (OR/NOR — Positive Logic)

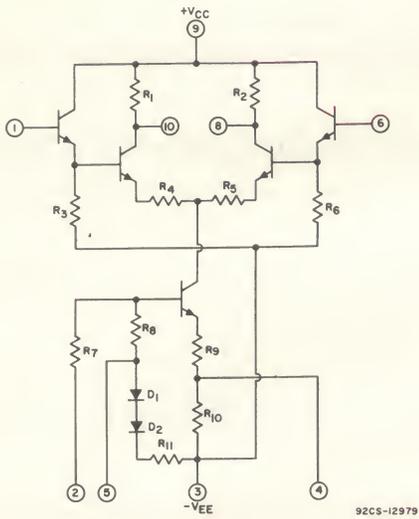
-55 to +125	-4.68 to -5.72	12	6	300	0.05	0.32	88	5.6	1 + 10pF	General Features of ECL discussed in ICAN-5025	CD2100
-55 to +125	-4.68 to -5.72	12	6	300	0.05	0.32	120	5.6	1 + 10pF		CD2101
Scheduled for Announcement in Mid 1966.											CD2102
Scheduled for Announcement in Mid 1966.											CD2103
Scheduled for Announcement in Late 1966.											CD2104

Low-Power DTL (NAND — Positive Logic)

-55 to +125	+3.8 to +6.3	6	—	—	-0.15	1.2	2.3 per gate	100	6 + 60pF	ICAN-5024	CD2200
-55 to +125	+3.8 to +6.3	6	—	—	-0.15	1.2	2.3 per gate	100	6 + 60pF	ICAN-5024	CD2201
Scheduled for Announcement in Mid 1966.											CD2202
-55 to +125	+3.8 to +4.5	5 per Output	—	—	-0.15	1.2	8	175	5 + 50pF	ICAN-5024	CD2203
Scheduled for Announcement in Mid 1966.											CD2204
Scheduled for Announcement in Mid 1966.											CD2205

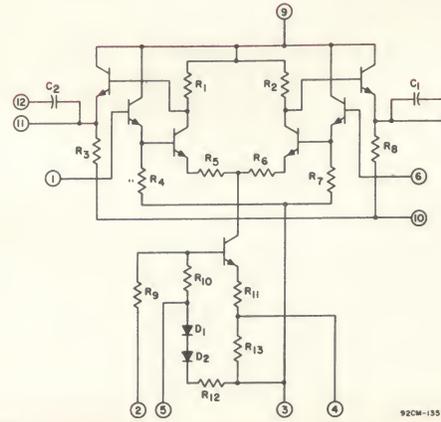
SCHEMATIC DIAGRAMS AND LOGIC DIAGRAMS FOR RCA LINEAR

AND DIGITAL INTEGRATED CIRCUITS



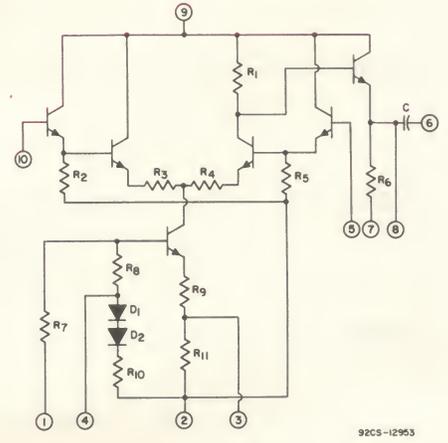
CA3000

92CS-12979



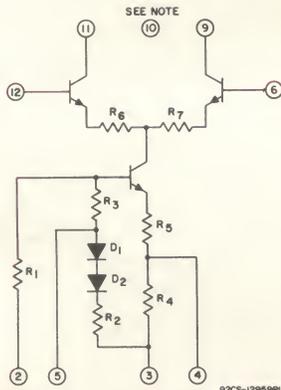
CA3001

92CM-13571



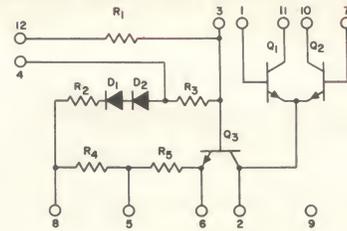
CA3002

92CS-12953



CA3004

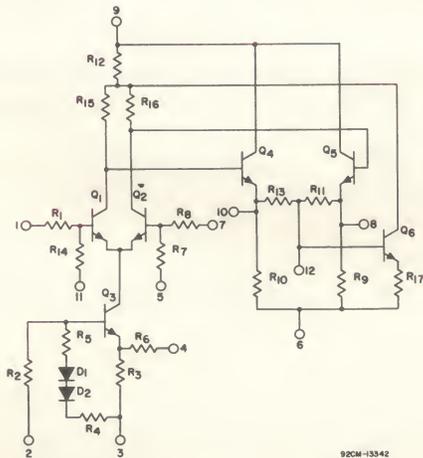
92CS-12959R1



92CS-13343

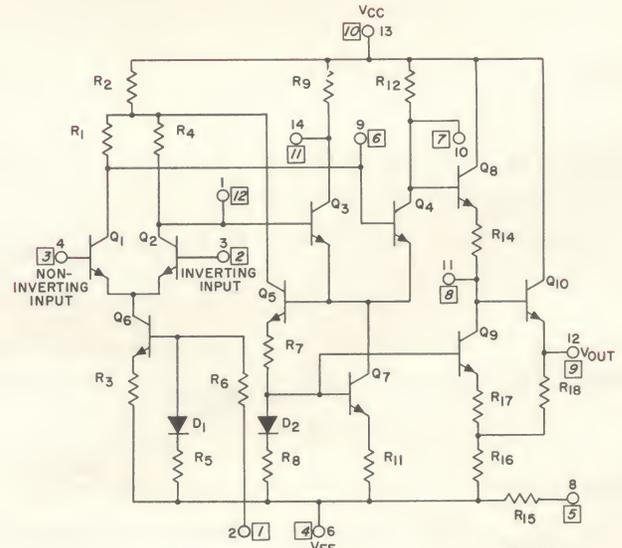
Connect Terminal No. 9 to most positive dc supply voltage used for circuit.

CA3005 CA3006



CA3007

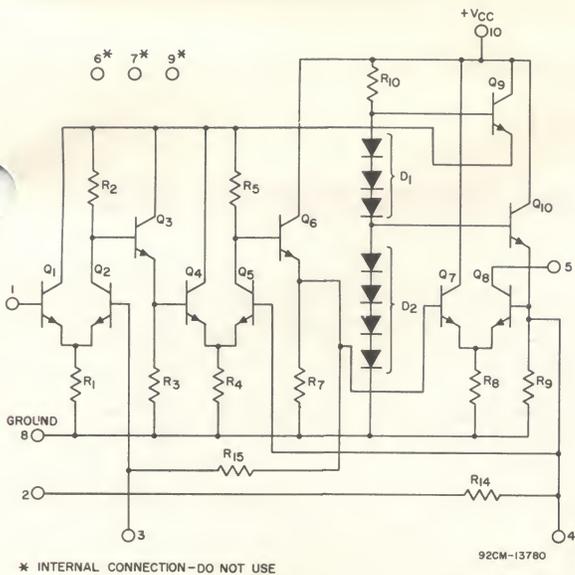
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92CM-13331

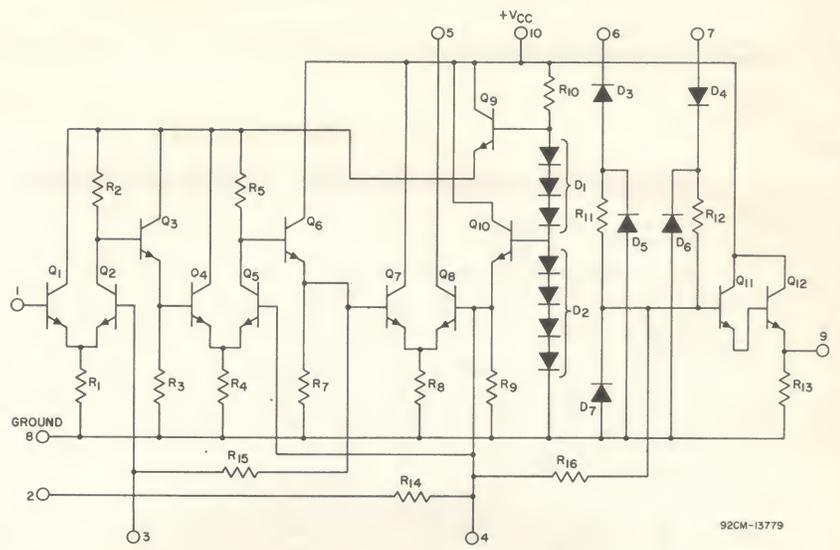
Terminal No's in Block Numerals are for CA3008
Italic No's in Square Boxes are for CA3010

CA3008 CA3010

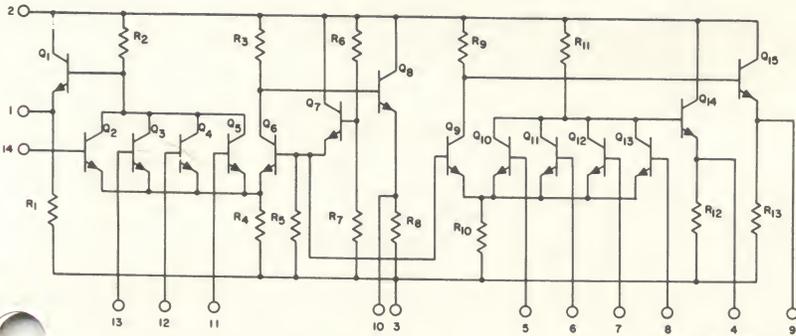


* INTERNAL CONNECTION - DO NOT USE

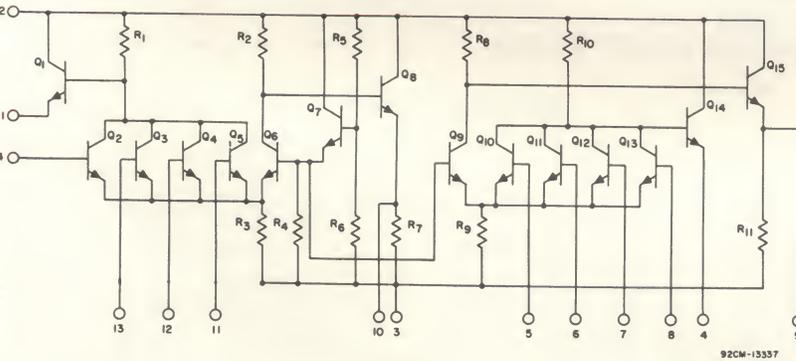
CA3011 CA3012



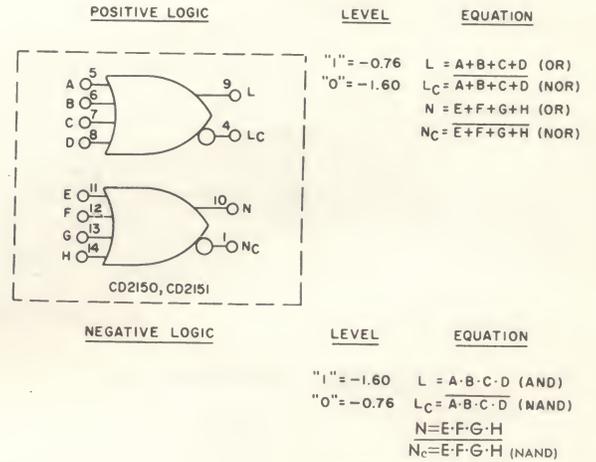
CA3013 CA3014



CD2150

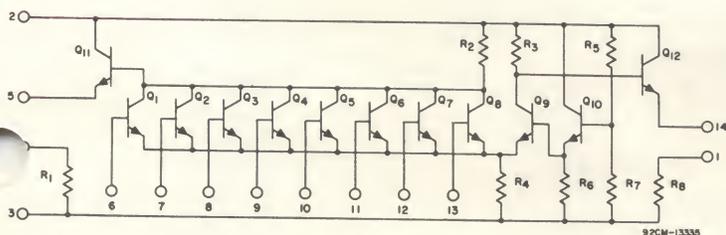


CD2151

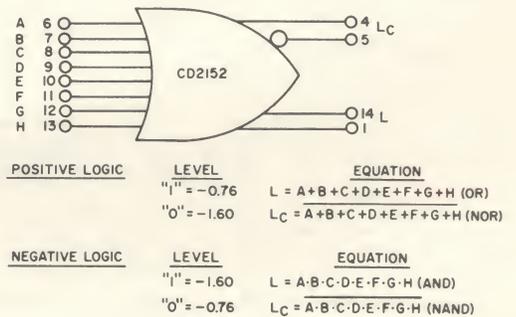


CD2150 CD2151

92CS-13634



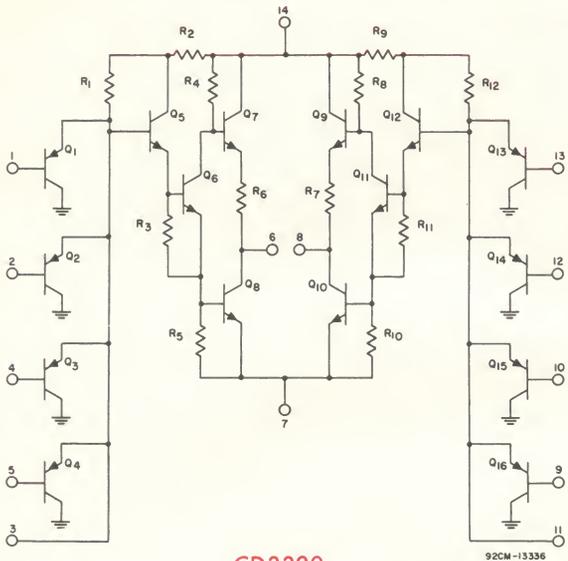
CD2152



CD2152

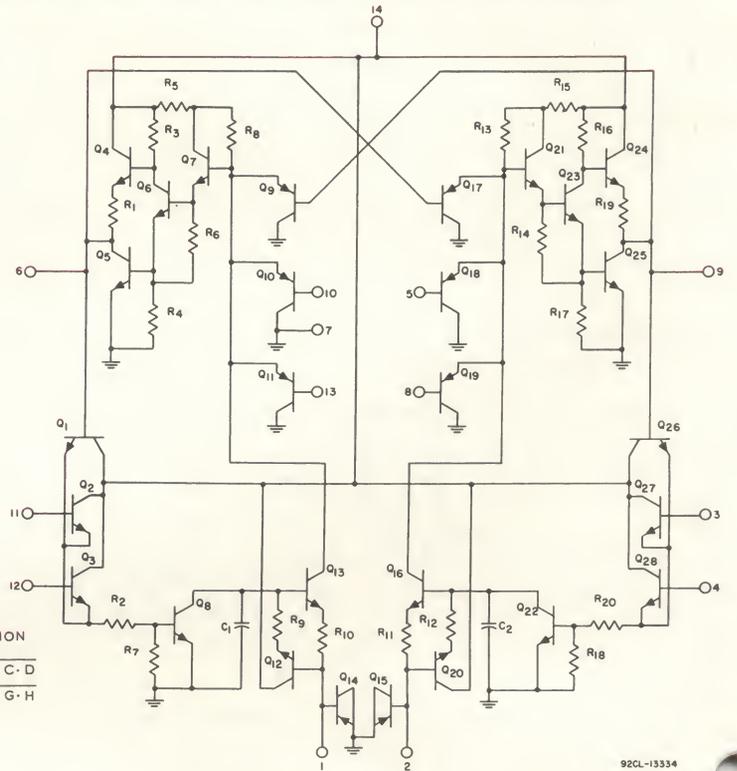
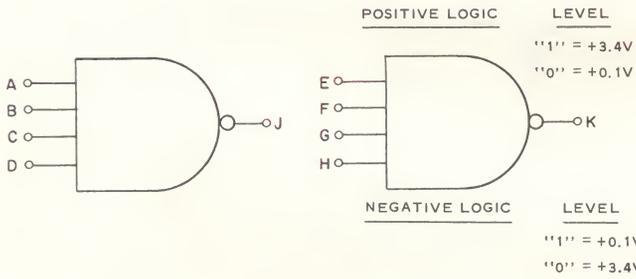
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SCHEMATIC DIAGRAMS AND LOGIC DIAGRAMS FOR RCA DIGITAL INTEGRATED CIRCUITS



CD2200

92CM-13336

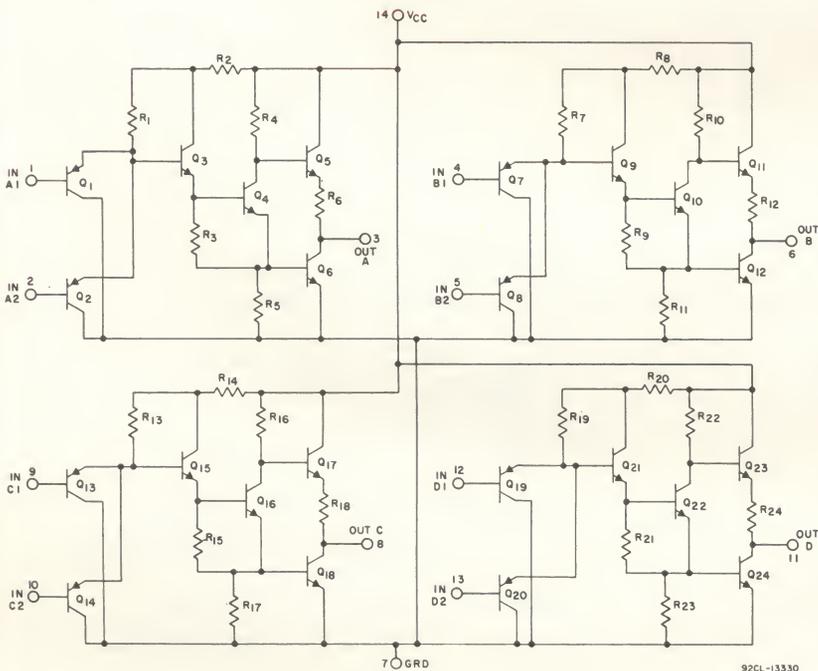


CD2203

92CL-13334

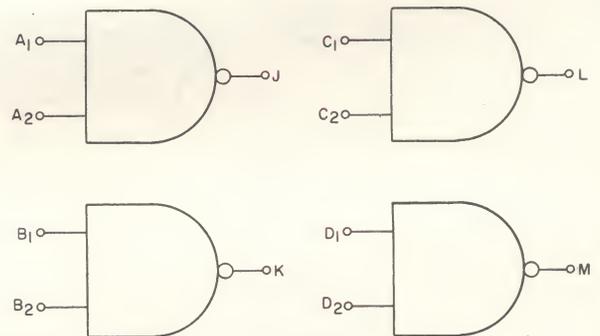
CD2200

92CS-13451



CD2201

92CL-13330



POSITIVE LOGIC
(NAND)

EQUATION

$J = A_1 \cdot A_2$

$K = B_1 \cdot B_2$

$L = C_1 \cdot C_2$

$M = D_1 \cdot D_2$

NEGATIVE LOGIC
(NOR)

EQUATION

$J = A_1 + A_2$

$K = B_1 + B_2$

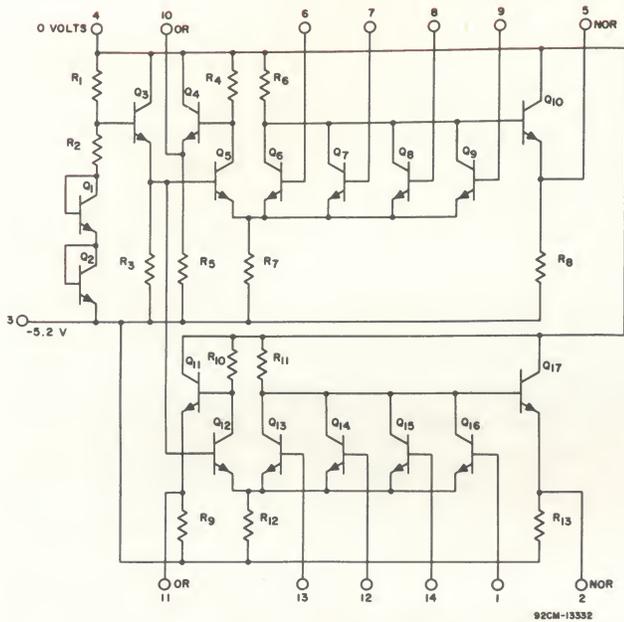
$L = C_1 + C_2$

$M = D_1 + D_2$

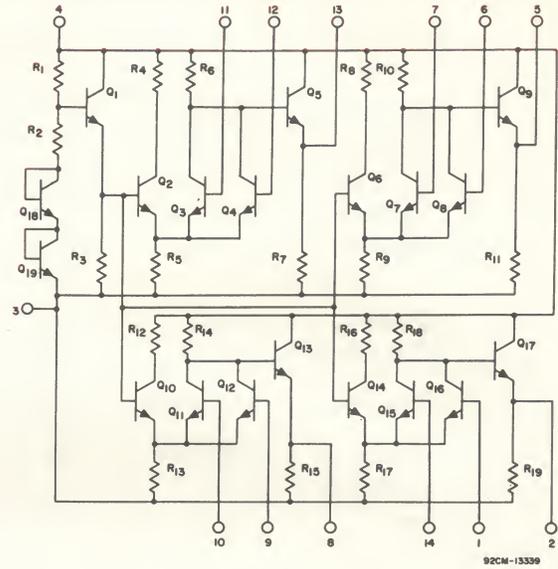
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CD2201

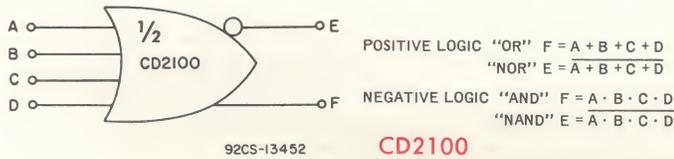
SCHEMATIC DIAGRAMS AND LOGIC DIAGRAMS FOR RCA DIGITAL INTEGRATED CIRCUITS



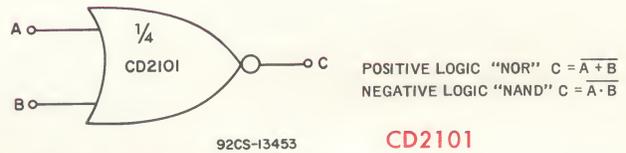
CD2100



CD2101



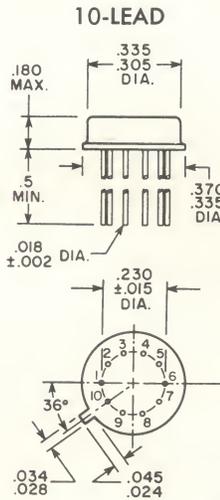
CD2100



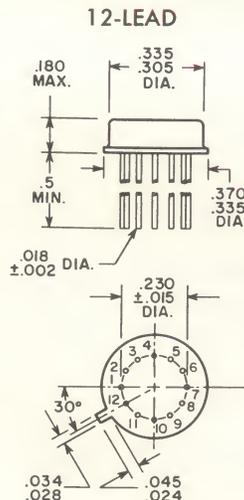
CD2101

DIMENSIONAL OUTLINES

TO-5 STYLE PACKAGE

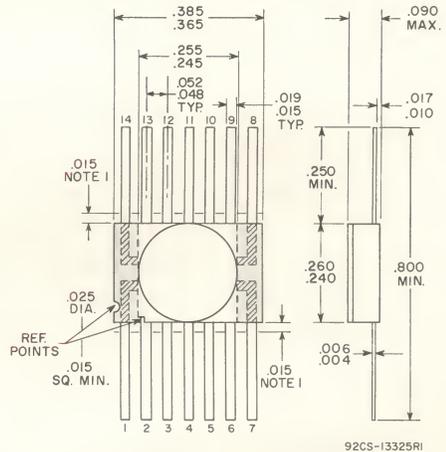


- CA3000
- CA3002
- CA3011
- CA3012
- CA3013
- CA3014



- CA3001
- CA3004
- CA3005
- CA3006
- CA3007
- CA3010

14-LEAD FLAT PACKAGE



- CA3008
- CD2100
- CD2101
- CD2150
- CD2151
- CD2152
- CD2200
- CD2201
- CD2203

NOTE 1: Lead dimensions in this zone are not controlled because of irregularities in body and lead finish.

Lead spacing shall be measured within 0.030" (.762 mm) from the point of emergence from the body or, as in the case of end leads (used in the 1/4" x 1/4" flat package), from the point where the extension of the body outline intersects the end leads.

The dashed lines and cross-hatched areas indicate maximum width and shape of product now in production.

The solid outline indicates final dimensions of product to be available in the fourth quarter of 1966.

For Further Information on **RCA INTEGRATED CIRCUITS** Contact Your Nearest RCA Sales Office

RCA SALES OFFICES

DISTRIBUTOR SALES

Home Office:	<i>Harrison</i>	415 S. Fifth Street, Harrison, N.J. 07029	(201) 485-3900
East:	<i>New York</i>	36 W. 49th Street, New York, N.Y. 10020	(212) 689-7200
North East:	<i>Needham</i>	80 A Street, Needham Heights, Mass. 02194	(617) 444-8492
Mid-East:	<i>Washington</i>	1725 K Street, N.W., Washington, D.C. 20006.	(202) 337-8500
South East:	<i>Atlanta</i>	1121 Rhodes Haverty Building 134 Peachtree Street, N.W., Atlanta, Georgia 30303	(404) 524-7703
Central:	<i>Chicago</i>	446 East Howard Avenue, Des Plaines, Ill. 60018	(312) 827-0033
East Central:	<i>Cleveland</i>	1600 Keith Building 1621 Euclid Ave., Cleveland, Ohio 44115	(216) 241-3450
West Central:	<i>Kansas City</i>	7711 State Line, Suite 112, Kansas City, Mo. 64114	(816) 363-6462
West:	<i>Hollywood</i>	6363 Sunset Blvd., Hollywood, Calif. 90028	(213) 461-9171
South West:	<i>Dallas</i>	210-C Court Terrace, Exchange Park North, Dallas, Texas 75235	(214) 351-5361

EQUIPMENT SALES

East:	<i>Maplewood</i>	2075 Millburn Ave., Maplewood, N.J. 07040	(201) 485-3900
	<i>Syracuse</i>	731 James St., Room 206, Syracuse, N.Y. 13203	(315) 474-5591
	<i>Needham</i>	64 "A" St., Needham Heights, Mass. 02194	(617) 444-7200
Mid-Atlantic:	<i>Haddonfield</i>	605 Marlton Pike, Haddonfield, N.J. 08034	(609) 428-4802
	<i>Riviera Beach</i>	2828 Broadway, Riviera Beach, Fla. 33404	(305) 842-1577
Central:	<i>Chicago</i>	446 East Howard Avenue, Des Plaines, Ill. 60018	(312) 827-0033
	<i>Detroit</i>	28840 Southfield Rd., Lathrup Village, Mich. 48037	(313) 353-9770
	<i>Minneapolis</i>	5805 Excelsior Blvd., Minneapolis, Minn. 55416	(612) 929-0676
Mid-Central:	<i>Indianapolis</i>	2511 East 46th St., Building Q2, Atkinson Square, Indianapolis, Ind. 46205	(317) 546-4001
West:	<i>Hollywood</i>	6363 Sunset Blvd., Hollywood, Calif. 90028	(213) 461-9171
	<i>Los Altos</i>	4546 El Camino Real, Suite P, Los Altos, Calif. 94022	(415) 948-8996
	<i>Dallas</i>	210-C Court Terrace, Exchange Park North, Dallas, Texas 75235	(214) 351-5361
	<i>San Diego</i>	7969 Engineer Road, Suite 216, San Diego, Calif. 92111	(714) 279-0420

GOVERNMENT SALES

East:	<i>Maplewood</i>	2075 Millburn Ave., Maplewood, N.J. 07040	(201) 485-3900
Mid-Atlantic:	<i>Washington</i>	1725 "K" St., N.W., Washington, D.C. 20006	(202) 337-8500
West:	<i>Hollywood</i>	6363 Sunset Blvd., Hollywood, Calif. 90028	(213) 461-9171

INTERNATIONAL SALES

U.S.A.:	<i>Clark</i>	Central & Terminal Aves., Clark, N.J. 07066 Cable: RADIOINTER	(201) 382-1000
Canada:	<i>Montreal</i>	1001 Lenoir Street, Montreal 30, Quebec Cable: VICTORADIO	(514) 933-7551
Europe:	<i>Geneva</i>	118 Rue du Rhone, Geneva, Switzerland Cable: RADIOCORP	35 75 00 to 09
Far East:	<i>Hong Kong</i>	415 Prince's Building, Chater Road, Hong Kong Cable: RADIOINTER	239529, 239522