



DESC FORM 193
MAY 86

1. SCOPE

1.1 Scope. This drawing describes device requirements for class B microcircuits in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices".

1.2 Part number. The complete part number shall be as shown in the following example:

84089	01	E	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

1.2.1 Device type. The device type shall identify the circuit function as follows:

Device type	Generic number	Circuit
01	54HC175	Quad D-type flip-flop

1.2.2 Case outlines. The case outlines shall be as designated in appendix C of MIL-M-38510, and as follows:

Outline letter	Case outline
E	D-2 (16-lead, 1/4" x 7/8"), dual-in-line package
F	F-5 (16-lead, 1/4" x 3/8"), flat package
2	C-2 (20-terminal, .350" x .350"), square chip carrier package

1.3 Absolute maximum ratings. 1/

Supply voltage range	-0.5 V dc to +7.0 V dc
DC input voltage	-0.5 V dc to $V_{CC} + 0.5$ V dc
DC output voltage	-0.5 V dc to $V_{CC} + 0.5$ V dc
Clamp diode current	± 20 mA
DC output current (per pin)	± 25 mA
DC V_{CC} or GND current (per pin)	± 50 mA
Storage temperature range	-65°C to +150°C
Maximum power dissipation, P_D	500 mW 2/
Lead temperature (soldering 10 seconds)	260°C
Thermal resistance, junction-to-case (θ_{JC}):	
Cases E, F, and 2	(See MIL-M-38510, appendix C)
Junction temperature (T_J)	+175°C

1.4 Recommended operating conditions.

Supply voltage	+2.0 V dc to +6.0 V dc
Case operating temperature range (T_C)	-55°C to +125°C
Input rise or fall time:	
$V_{CC} = 2.0$ V	0 to 1,000 ns
$V_{CC} = 4.5$ V	0 to 500 ns
$V_{CC} = 6.0$ V	0 to 400 ns

1/ Unless otherwise specified, all voltages are referenced to ground.
2/ For $T_C = +100^\circ\text{C}$ to +125°C, derate linearly at 12 mW/°C.

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Minimum recovery time, reset inactive to clock: t_{REC} 3/

At +25°C:	
$V_{CC} = 2.0$ V- - - - -	100 ns
$V_{CC} = 4.5$ V- - - - -	20 ns
$V_{CC} = 6.0$ V- - - - -	17 ns
At -55°C to +125°C:	
$V_{CC} = 2.0$ V- - - - -	150 ns
$V_{CC} = 4.5$ V- - - - -	30 ns
$V_{CC} = 6.0$ V- - - - -	26 ns

Minimum set-up time, data to clock: t_S 3/

At +25°C:	
$V_{CC} = 2.0$ V- - - - -	100 ns
$V_{CC} = 4.5$ V- - - - -	20 ns
$V_{CC} = 6.0$ V- - - - -	17 ns
At -55°C to +125°C:	
$V_{CC} = 2.0$ V- - - - -	150 ns
$V_{CC} = 4.5$ V- - - - -	30 ns
$V_{CC} = 6.0$ V- - - - -	26 ns

Minimum pulse width, reset, or clock: t_W 3/

At +25°C:	
$V_{CC} = 2.0$ V- - - - -	80 ns
$V_{CC} = 4.5$ V- - - - -	16 ns
$V_{CC} = 6.0$ V- - - - -	14 ns
At -55°C to +125°C:	
$V_{CC} = 2.0$ V- - - - -	120 ns
$V_{CC} = 4.5$ V- - - - -	24 ns
$V_{CC} = 6.0$ V- - - - -	21 ns

Minimum hold time, data from clock: t_H 3/

At -55°C to +125°C:	
$V_{CC} = 2.0$ V- - - - -	40 ns
$V_{CC} = 4.5$ V- - - - -	8 ns
$V_{CC} = 6.0$ V- - - - -	7 ns

Maximum clock frequency: f_{MAX} 3/

At +25°C:	
$V_{CC} = 2.0$ V- - - - -	6 MHz
$V_{CC} = 4.5$ V- - - - -	30 MHz
$V_{CC} = 6.0$ V- - - - -	35 MHz
At -55°C to +125°C:	
$V_{CC} = 2.0$ V- - - - -	4 MHz
$V_{CC} = 4.5$ V- - - - -	20 MHz
$V_{CC} = 6.0$ V- - - - -	24 MHz

3/ See figure 3.

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2. APPLICABLE DOCUMENTS

2.1 Government specification and standard. Unless otherwise specified, the following specification and standard, of the issue listed in that issue of the Department of Defense Index of Specifications and Standards specified in the solicitation, form a part of this drawing to the extent specified herein.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Copies of the specification and standard required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing shall take precedence.

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with 1.2.1 of MIL-STD-883, "Provisions for the use of MIL-STD-883 in conjunction with compliant non-JAN devices" and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections and logic diagram. The terminal connections and logic diagram shall be as specified on figure 1.

3.2.2 Truth table. The truth table shall be as specified on figure 2.

3.2.3 Switching waveforms. The switching waveforms shall be as specified on figure 3.

3.2.4 Case outlines. The case outlines shall be in accordance with 1.2.2 herein.

3.3 Electrical performance characteristics. Unless otherwise specified, the electrical performance characteristics are as specified in table I and apply over the full recommended case operating temperature range.

3.4 Marking. Marking shall be in accordance with MIL-STD-883 (see 3.1 herein). The part shall be marked with the part number listed in 1.2 herein. In addition, the manufacturer's part number may also be marked as listed in 6.4 herein.

3.5 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in 6.4. The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall state that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.6 Certificate of conformance. A certificate of conformance as required in MIL-STD-883 (see 3.1 herein) shall be provided with each lot of microcircuits delivered to this drawing.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ -55°C < T _C < +125°C unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
High-level output voltage	V _{OH}	V _{IN} = V _{IH} or V _{IL} I _O ≤ 20 μA	V _{CC} = 2.0 V	1, 2, 3	1.9		V
			V _{CC} = 4.5 V		4.4		
			V _{CC} = 6.0 V		5.9		
		I _O ≤ 4.0 mA	V _{CC} = 4.5 V		3.7		
			V _{CC} = 6.0 V		5.2		
			V _{CC} = 6.0 V		5.2		
Low-level output voltage	V _{OL}	V _{IN} = V _{IH} or V _{IL} I _O ≤ 20 μA	V _{CC} = 2.0 V	1, 2, 3		0.1	V
			V _{CC} = 4.5 V			0.1	
			V _{CC} = 6.0 V			0.1	
		I _O ≤ 4.0 mA	V _{CC} = 4.5 V			0.4	
			V _{CC} = 6.0 V			0.4	
			V _{CC} = 6.0 V			0.4	
High-level input voltage	V _{IH}		V _{CC} = 2.0 V	1, 2, 3	1.5		V
			V _{CC} = 4.5 V		3.15		
			V _{CC} = 6.0 V		4.2		
Low-level input voltage	V _{IL}		V _{CC} = 2.0 V	1, 2, 3		0.3	V
			V _{CC} = 4.5 V			0.9	
			V _{CC} = 6.0 V			1.2	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$ unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Input capacitance	C_{IN}	$V_{IN} = 0\text{ V}$, $T_C = +25^{\circ}\text{C}$ See 4.3.1c	4		10	pF
Quiescent current	I_{CC}	$V_{CC} = 6.0\text{ V}$, $V_{IN} = V_{CC}$ or GND	1, 2, 3		160	μA
Input leakage current	I_{IN}	$V_{CC} = 6.0\text{ V}$, $V_{IN} = V_{CC}$ or GND	1, 2, 3		± 1	μA
Functional tests		See 4.3.1d	7			
Propagation delay time, clock to Q or \bar{Q} 2/	t_{PHL1} t_{PLH1}	$T_C = +25^{\circ}\text{C}$ $C_L = 50\text{ pF} \pm 10\%$ (see figure 3)	9		175	ns
					35	
					30	
		$T_C = -55^{\circ}\text{C}$, $+125^{\circ}\text{C}$ $C_L = 50\text{ pF} \pm 10\%$ (see figure 3)	10, 11		265	ns
					53	
					45	
Propagation delay time, reset to Q or \bar{Q} 2/	t_{PHL2} t_{PLH2}	$T_C = +25^{\circ}\text{C}$ $C_L = 50\text{ pF} \pm 10\%$ (see figure 3)	9		185	ns
					37	
					31	
		$T_C = -55^{\circ}\text{C}$, $+125^{\circ}\text{C}$ $C_L = 50\text{ pF} \pm 10\%$ (see figure 3)	10, 11		280	ns
					56	
					48	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ -55°C < T _C < +125°C unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Transition time 3/ t _{TLH} t _{THL}		T _C = +25°C C _L = 50 pF ±10% (see figure 3)	V _{CC} = 2.0 V	9	75	ns
					15	
					13	
		T _C = -55°C, +125°C C _L = 50 pF ±10% (see figure 3)	V _{CC} = 2.0 V	10, 11	110	ns
					22	
					19	

1/ For a power supply of 5.0 V ±10% the worst case output voltages (V_{OH} and V_{OL}) occur for HC at 4.5 V. Thus the 4.5 V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at V_{CC} = 5.5 V and 4.5 V, respectively. (The V_{IH} value at 5.5 V is 3.85 V.) The worst case leakage current (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0 V values should be used. Power dissipation capacitance (C_{PD}), typically 150 pF, determines the no load dynamic power consumption, P_D = C_{PD} V_{CC}²f + I_{CC} V_{CC}, and the no load dynamic current consumption, I_S = C_{PD} V_{CC} f + I_{CC}.

2/ AC testing at V_{CC} = 2.0 V and V_{CC} = 6.0 V shall be guaranteed, if not tested, to the specified parameters.

3/ Transition times (t_{TLH}, t_{THL}), if not tested, shall be guaranteed to the specified parameters.

3.7 Notification of change. Notification of change to DESC-ECS shall be required in accordance with MIL-STD-883 (see 3.1 herein).

3.8 Verification and review. DESC, DESC's agent, and the acquiring activity retain the option to review the manufacturer's facility and applicable required documentation. Offshore documentation shall be made available onshore at the option of the reviewer.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with section 4 of MIL-M-38510 to the extent specified in MIL-STD-883 (see 3.1 herein).

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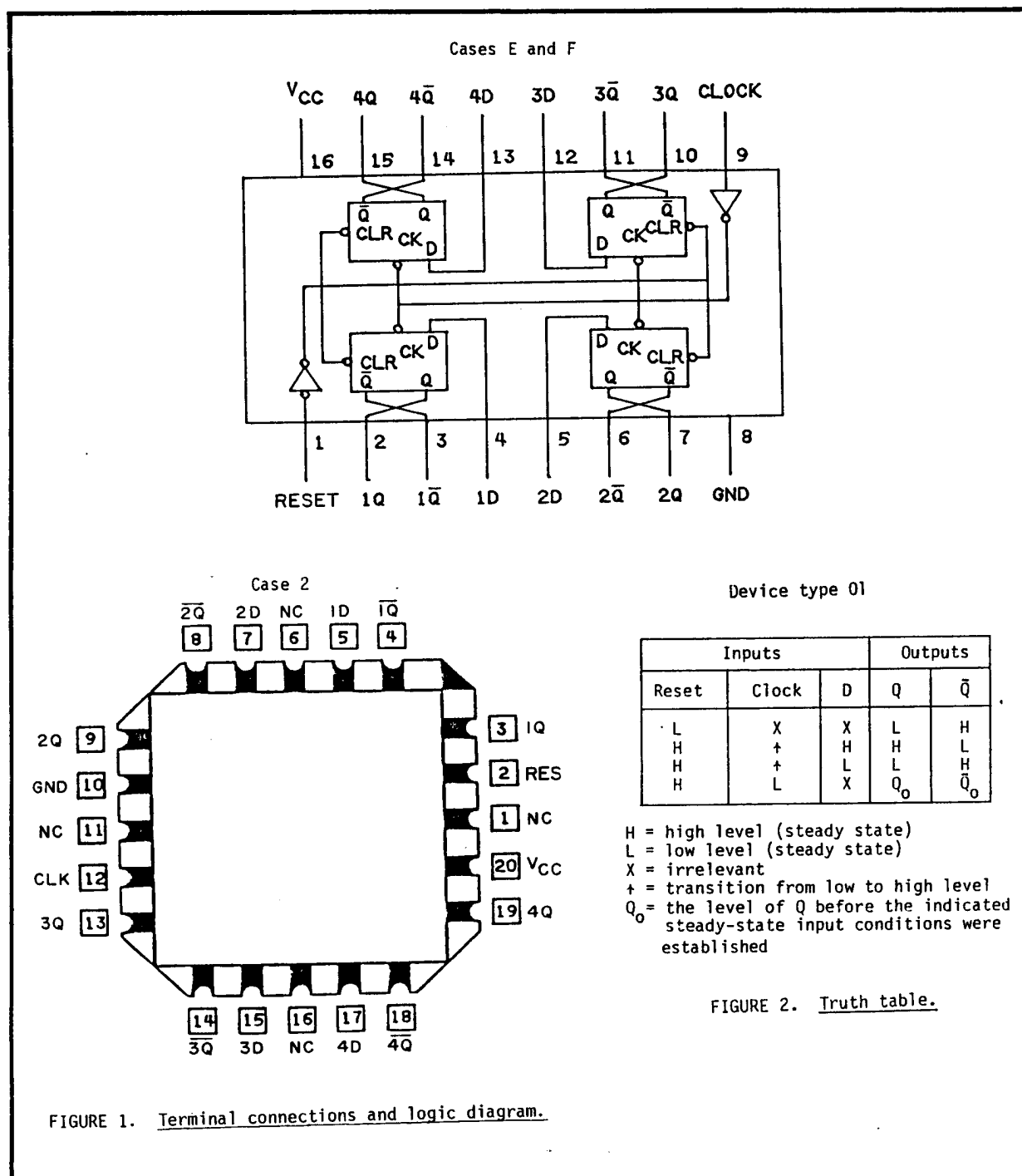
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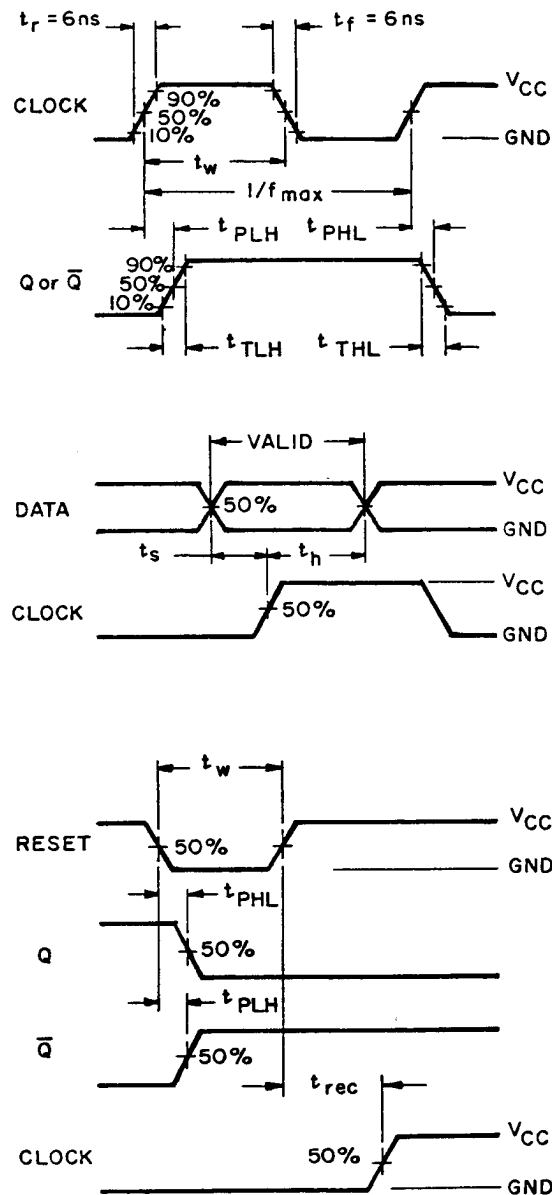


FIGURE 3. Switching waveform.

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4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test (method 1015 of MIL-STD-883).

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) $T_A = +125^\circ\text{C}$, minimum.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Quality conformance inspection. Quality conformance inspection shall be in accordance with method 5005 of MIL-STD-883 including groups A, B, C, and D inspections. The following additional criteria shall apply.

4.3.1 Group A inspection.

a. Tests shall be as specified in table II herein.

b. Subgroups 5, 6, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_{in} measurement) shall be measured only for the initial test and after process or design changes which may affect input capacitance.

d. Subgroup 7 tests sufficient to verify the truth table.

4.3.2 Groups C and D inspections.

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test (method 1005 of MIL-STD-883) conditions:

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.5 herein).

(2) $T_A = +125^\circ\text{C}$, minimum.

(3) Test duration: 1,000 hours, except as permitted by appendix B of MIL-M-38510 and method 1005 of MIL-STD-883.

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TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (per method 5005, table I)
Interim electrical parameters (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 9
Group A test requirements (method 5005)	1,2,3,4,7, 9,10,11**
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3
Additional electrical subgroups for group C periodic inspections	---

* PDA applies to subgroup 1.

** Subgroups 10 and 11, if not tested, shall be guaranteed to the specified limits in table I.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use when military specifications do not exist and qualified military devices that will perform the required function are not available for OEM application. When a military specification exists and the product covered by this drawing has been qualified for listing on QPL-38510, the device specified herein will be inactivated and will not be used for new design. The QPL-38510 product shall be the preferred item for all applications.

6.2 Replaceability. Replaceability is determined as follows:

- Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.
- When a QPL source is established, the part numbered device specified in this drawing will be replaced by the microcircuit identified as part number M38510/65308---

6.3 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone 513-296-5375.

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6.4 Approved sources of supply. Approved sources of supply are listed herein. Additional sources will be added as they become available. The vendors listed herein have agreed to this drawing and a certificate of compliance (see 3.5 herein) has been submitted to DESC-ECS.

Military drawing part number	Vendor CAGE number	Vendor similar part number <u>1/</u>	Replacement military specification part number
8408901EX <u>2/</u>	01295 04713 27014 18714	SNJ54HC175J 54HC175/BEAJC MM54HC175J/883B CD54HC175F/3A	M38510/65308BEX
8408901FX	01295	SNJ54HC175W	M38510/65308BFX
84089012X <u>2/</u>	01295 04713 27014	SNJ54HC175FK 54HC175M/B2CJC MM54HC175E/883	M38510/65308B2X

1/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

2/ Inactive for new design. Use M38510/65308BEX for 8408901EX and use M38510/65308B2X for 84089012X.

Vendor CAGE
number

Vendor name
and address

04713

Motorola Incorporated
7402 S. Price Road
Tempe, AZ 85283

27014

National Semiconductor
2900 Semiconductor Drive
Santa Clara, CA 95051

18714

RCA Corporation
Route 202
Somerville, NJ 08876

01295

Texas Instruments, Incorporated
P.O. Box 6448
Midland, TX 79701

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