REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add vendor CAGE 92527. Page 5: Changes to electricals in table I. Editorial changes throughout.	88 MAR 28	M. A. Frye
B	Add vendor CAGE 75569 for device type 01. Add device type 02. Delete vendor CAGE 92527. Add case outline S for device types 01 and 02. Editorial changes throughout. Technical changes in Figure 2.	89 JAN 03	M. A. Frye
C	Technical changes in table I. Add vendor CAGE 27014 and 9Z527 for device type 01. Add vendor CAGE 75569 for device type 02 and 01SX. Editorial changes throughout.	89 NOV 29	M. A. Frye

REV																								
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SHEET																								
REV STATUS OF SHEETS	REV	C	B	C	C	C	C		B	B	C	C	C	C										
	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13										

PMIC N/A

STANDARDIZED MILITARY DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

PREPARED BY: Marcia B Kelleher

CHECKED BY: Ray Monnin

APPROVED BY: M. A. Frye

DRAWING APPROVAL DATE: 30 NOVEMBER 1987

REVISION LEVEL: C

DEFENSE ELECTRONICS SUPPLY CENTER
DAYTON, OHIO 45444

MICROCIRCUIT, DIGITAL, FAST CMOS, NONINVERTING D-TYPE FLIP-FLOP, THREE-STATE, MONOLITHIC SILICON

SIZE	CAGE CODE	5962-87628
A	67268	

SHEET 1 OF

DESC FORM 193
SEP 87

* U.S. GOVERNMENT PRINTING OFFICE: 1987 — 748-129/60911

5962-E1483

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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:

5962-87628	01	R	X
Drawing number	Device type (1.2.1)	Case outline (1.2.2)	Lead finish per MIL-M-38510

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

Device type	Generic number	Circuit function
01	54FCT374	Noninverting octal D-type flip-flop, three-state outputs, TTL compatible
02	54FCT374A	Noninverting octal D-type flip-flop, three-state outputs, TTL compatible

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
R	D-8 (20-lead, 1.060" x .310" x .200"), dual-in-line package
S	F-9 (20-lead, .540" x .300" x .100"), flat package
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package

1.3 Absolute maximum ratings. 1/

Supply voltage range (V_{CC})	-0.5 V dc to +6.0 V dc
Input voltage range	-0.5 V dc to V_{CC} + 0.5 V dc
Output voltage range	-0.5 V dc to V_{CC} + 0.5 V dc
DC input diode current (I_{IK})	-20 mA
DC output diode current (I_{OK})	-50 mA
DC output current	±100 mA
Maximum power dissipation (P_D) 2/	500 mW
Thermal resistance, junction-to-case (θ_{JC})	See MIL-M-38510, appendix C
Storage temperature range	-65°C to +150°C
Junction temperature (T_J)	+175°C
Lead temperature (soldering, 10 seconds)	+300°C

1.4 Recommended operating conditions.

Supply voltage range (V_{CC})	+4.5 V dc to +5.5 V dc
Maximum low level input voltage (V_{IL})	0.8 V dc
Minimum high level input voltage (V_{IH})	2.0 V dc
Case operating temperature range (T_C)	-55°C to +125°C
Minimum setup time, D_n to CP (t_s)	2.5 ns
Minimum hold time, D_n to CP (t_h)	2.5 ns
Minimum pulse width (t_w)	7.0 ns

1/ All voltages referenced to GND.
2/ Must withstand the added P_D due to short circuit test; e.g., I_{OS}.

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2. APPLICABLE DOCUMENTS

2.1 Government specification, standard, and bulletin. Unless otherwise specified, the following specification, standard, and bulletin 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.

BULLETIN

MILITARY

MIL-BUL-103 - List of Standardized Military Drawings (SMD's).

(Copies of the specification, standard, and bulletin 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. The terminal connections 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 Logic diagram. The logic diagram 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 herein, the electrical performance characteristics are as specified in table I and apply over the full case operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are described in table I.

3.5 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 MIL-BUL-103 (see 6.6 herein).

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ $V_{CC} = 5.0$ V dc ±10% unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
High level output voltage	V_{OH}	V_{CC} = 4.5 V, V_{IL} = 0.8 V, V_{IH} = 2.0 V	I_O = -300 µA	1, 2, 3	4.3		V
			I_O = -12 mA	1, 2, 3	2.4		V
Low level output voltage	V_{OL}	V_{CC} = 4.5 V, V_{IL} = 0.8 V, V_{IH} = 2.0 V	I_O = 300 µA	1, 2, 3		0.2	V
			I_O = 32 mA	1, 2, 3		0.5	V
Input clamp voltage	V_{IK}	V_{CC} = 4.5 V, I_{IN} = -18 mA		1, 2, 3		-1.2	V
High level input current	I_{IH}	V_{CC} = 5.5 V, V_{IN} = 5.5 V		1, 2, 3		5	µA
Low level input current	I_{IL}	V_{CC} = 5.5 V, V_{IN} = GND		1, 2, 3		-5	µA
High impedence output current	I_{OZH}	V_{CC} = 5.5 V, V_{IN} = 5.5 V		1, 2, 3		10	µA
	I_{OZL}	V_{CC} = 5.5 V, V_{IN} = GND				-10	µA
Short circuit output current	I_{OS}	V_{CC} = 5.5 V 1/		1, 2, 3	-60		mA
Quiescent power supply current (CMOS inputs)	I_{CCQ}	$V_{IN} \le 0.2$ V or $V_{IN} \ge 5.3$ V V_{CC} = 5.5 V, f_I = 0 MHz		1, 2, 3		1.5	mA
Quiescent power supply current (TTL inputs)	ΔI_{CC}	V_{CC} = 5.5 V, V_{IN} = 3.4 V 2/		1, 2, 3		2.0	mA
Dynamic power supply current	I_{CCD}	V_{CC} = 5.5 V, Outputs open, $\overline{OE}$ = GND One bit toggling - 50% duty cycle $V_{IN} \ge 5.3$ V or $V_{IN} \le 0.2$ V		3/		0.4	mA/MHz

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_C \le +125°C$ V_{CC} = 5.0 V dc ±10% unless otherwise specified		Group A subgroups	Limits		Unit
					Min	Max	
Total power supply current 4/	I_{CC}	$V_{IN} \ge 5.3$ V or $V_{IN} \le 0.2$ V, V_{CC} = 5.5 V, f_{CP} = 10 MHz, Outputs open, $\overline{OE}$ = GND One bit toggling at f_I = 5 MHz, 50% duty cycle		1, 2, 3		5.5	mA
		V_{IN} = 3.4 V or V_{IN} = GND, V_{CC} = 5.5 V, f_{CP} = 10 MHz, Outputs open, $\overline{OE}$ = GND One bit toggling at f_I = 5 MHz, 50% duty cycle				6.0	mA
Functional tests		See 4.3.1d		7, 8			
Input capacitance	C_{IN}	See 4.3.1c		4		10	pF
Output capacitance	C_{OUT}	See 4.3.1c		4		12	pF
Propagation delay time, CP to On	t_{PLH}, t_{PHL}	C_L = 50 pF R_L = 500Ω See figure 4 5/	Device type 01	9,10,11	2.0	11.0	ns
			Device type 02	9,10,11	2.0	7.2	
Output enable time, $\overline{OE}$ to On	t_{PZH}, t_{PZL}		Device type 01	9,10,11	1.5	14.0	ns
			Device type 02	9,10,11	1.5	7.5	
Output disable time, $\overline{OE}$ to On	t_{PHZ}, t_{PLZ}		Device type 01	9,10,11	1.5	8.0	ns
			Device type 02	9,10,11	1.5	6.5	

1/ Not more than one output should be shorted at one time, and the duration of the short circuit condition should not exceed 1 second.

2/ For TTL driven inputs, V_{IN} = 3.4 V; all other inputs are equal to V_{CC} or GND.

3/ This parameter is not directly testable, but is derived for use in total power supply calculations.

4/ $I_{CC} = I_{CCQ} + (\Delta I_{CC} \times D_H \times N_T) + I_{CCD} (f_{CP}/2 + f_I \times N_I)$
where D_H = Duty cycle for TTL inputs high
N_T = Number of TTL inputs at D_H
f_I = Input frequency in MHz
N_I = Number of inputs at f_I.

5/ The minimum limits are guaranteed, if not tested, to the specified limits in table I.

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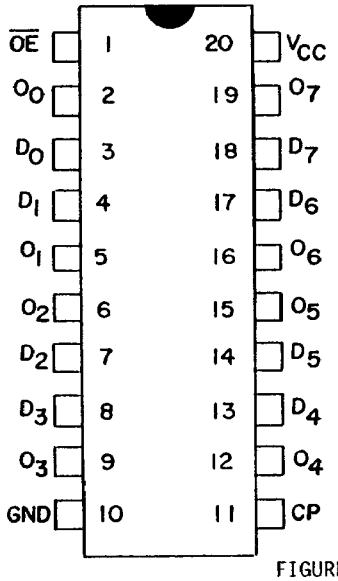
Device types 01 and 02

Cases R and S



Device types 01 and 02

Case 2

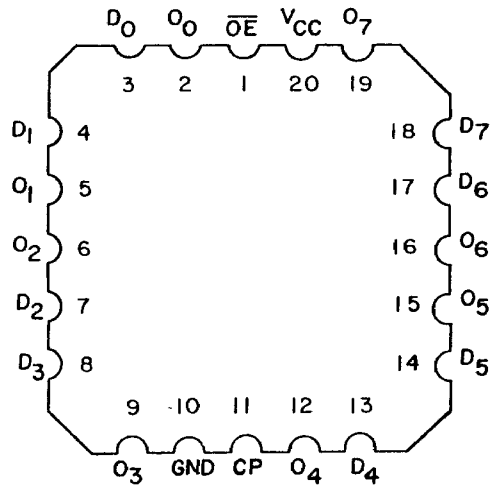


FIGURE 1. Terminal connections.

Function	Inputs			Output
	$\overline{OE}$	CP	D_n	O_n
Hi-Z	H	L	X	Z
	H	H	X	Z
Load register	L	↑	L	L
	L	↑	H	H
	H	↑	L	Z
	H	↑	H	Z

H = HIGH voltage level
L = LOW voltage level
Z = HIGH impedance state
X = Logic "don't care" state
↑ = LOW to HIGH transition

FIGURE 2. Truth table.

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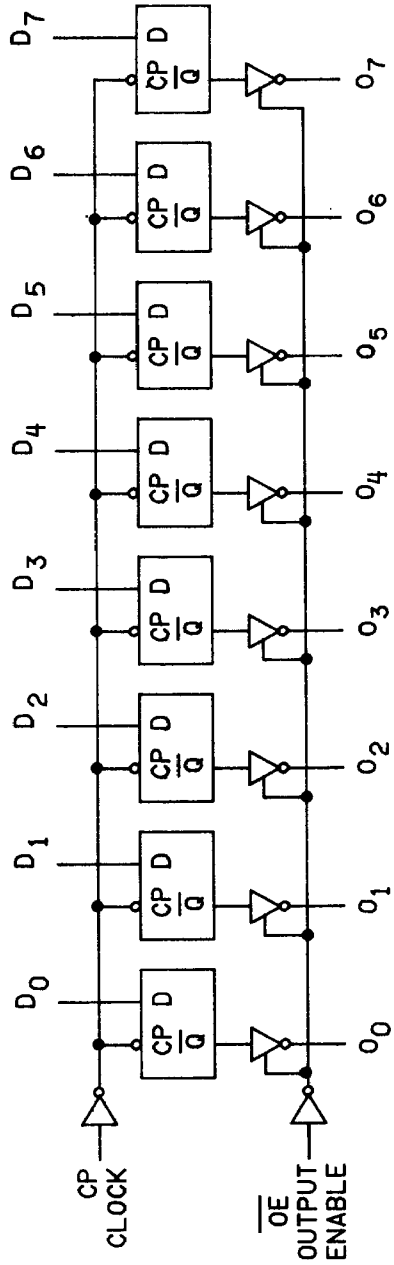

FIGURE 3. Logic diagram.

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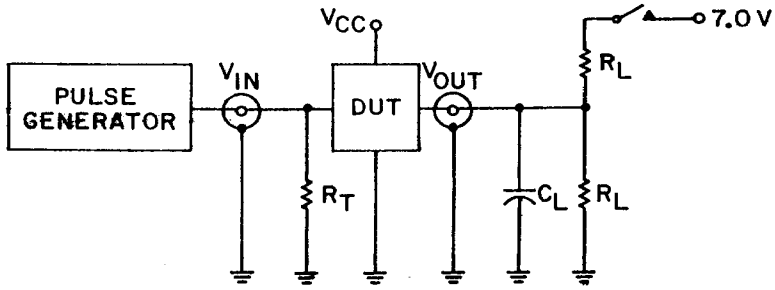
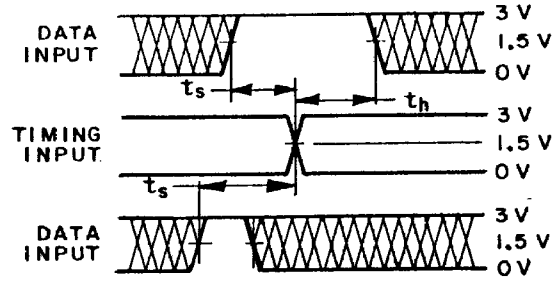


NOTE: R_L = 500Ω, R_T = 50Ω, C_L = 50 pF, or equivalent.

SETUP, HOLD, AND RELEASE TIMES



PROPAGATION DELAY

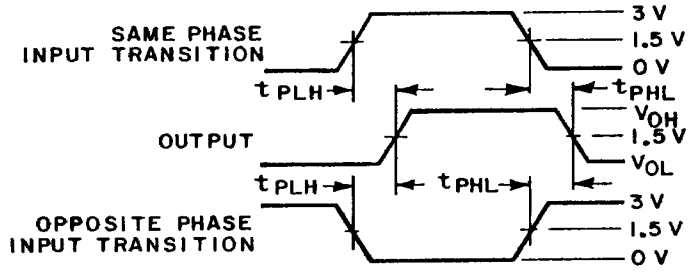


FIGURE 4. Switching waveforms and test circuit.

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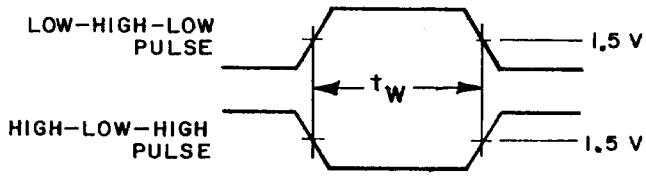
Switch position

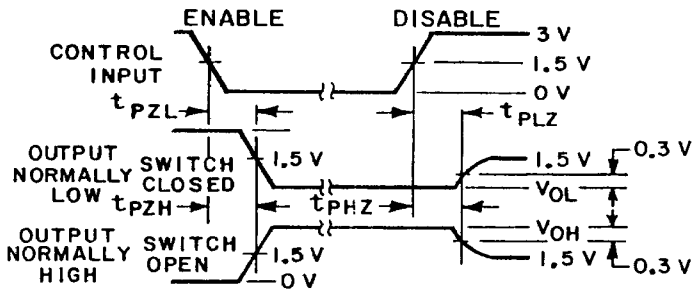
Test	Switch
t_{PLZ}	Closed
t_{PZL}	Closed
All other	Open

Definitions:
R_L = Load resistor.
C_L = Load capacitance includes jig and probe capacitance.
R_T = Termination should be equal to Z_{OUT} of pulse generators.

PULSE WIDTH



ENABLE AND DISABLE TIMES



NOTES:
1. Diagram shown for input control enable LOW and input control disable HIGH.
2. Pulse generator for all pulses: $t_f \leq 2.5$ ns; $t_r \leq 2.5$ ns.

FIGURE 4. Switching waveforms and test circuit - Continued.

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3.6 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 MIL-BUL-103 (see 6.6 herein). The certificate of compliance submitted to DESC-ECS prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-STD-883 (see 3.1 herein) and the requirements herein.

3.7 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.

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

3.9 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).

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 3.6 herein).

(2) T_A = +125°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 and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. Subgroup 4 (C_{IN} and C_{OUT} measurements) shall be measured only for the initial test and after process or design changes which may affect capacitance. Test all applicable pins on five devices with zero failures.

d. Subgroup 7 and 8 tests shall verify the truth table as specified on figure 2.

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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, 3, 7, 8, 9, 10, 11
Group A test requirements (method 5005)	1, 2, 3, 4, 7, 8, 9, 10, 11
Groups C and D end-point electrical parameters (method 5005)	1, 2, 3

* PDA applies to subgroup 1.

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 conditions, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D using the circuit submitted with the certificate of compliance (see 3.6 herein).

(2) T_A = +125°C, minimum.

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

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. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated with the users of record for the individual documents. This coordination will be accomplished in accordance with MIL-STD-481 using DD Form 1693, Engineering Change Proposal (Short Form).

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6.4 Record of users. Military and industrial users shall inform Defense Electronics Supply Center when a system application requires configuration control and the applicable SMD. DESC will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronics devices (FSC 5962) should contact DESC-ECS, telephone (513) 296-6022.

6.5 Comments. Comments on this drawing should be directed to DESC-ECS, Dayton, Ohio 45444, or telephone (513) 296-8525.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-BUL-103. Additional sources will be added to MIL-BUL-103 as they become available. The vendors listed in MIL-BUL-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DESC-ECS. The approved sources of supply listed below are for information purposes only and are current only to the date of the last action of this document.

Military drawing part number	Vendor CAGE number	Vendor similar part number 1/
5962-8762801RX	27014	54FCT374DMQB
	61772	IDT54FCT374DB
	75569	P54PCT374DMB
	9Z527	VJ54FCT374D
5962-8762801SX	27014	54FCT374FMQB
	61772	IDT54FCT374EB
	75569	P54PCT374FMB
5962-87628012X	27014	54FCT374LMQB
	61772	IDT54FCT374LB
	75569	P54PCT374LMB
	9Z527	VJ54FCT374DL
5962-8762802RX	61772	IDT54FCT374ADB
	75569	P54PCT374ADMB
5962-8762802SX	61772	IDT54FCT374AEB
	75569	P54PCT374AFMB
5962-87628022X	61772	IDT54FCT374ALB
	75569	P54PCT374ALMB

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

Vendor CAGE number	Vendor name and address
27014	National Semiconductor 2900 Semiconductor Drive P.O. Box 58090 Santa Clara, CA 95052-8090
Point of contact:	333 Western Avenue South Portland, ME 04106
61772	Integrated Device Technology 1566 Moffett Boulevard Salinas, CA 93905
Point of contact:	3236 Scott Boulevard Santa Clara, CA 95054
75569	Performance Semiconductor Corporation 610 E. Weddell Drive Sunnyvale, CA 94089
9Z527	VTC, Incorporated 2401 E. 86th Street Bloomington, MN 55425

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