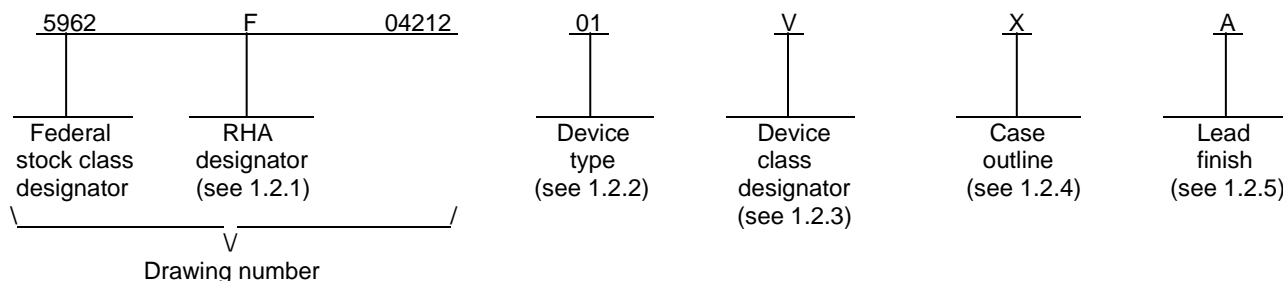




## 1. SCOPE

1.1 Scope. This drawing documents two product assurance class levels consisting of high reliability (device classes Q and M) and space application (device class V). A choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of Radiation Hardness Assurance (RHA) levels is reflected in the PIN.

1.2 PIN. The PIN is as shown in the following example:



1.2.1 RHA designator. Device classes Q and V RHA marked devices meet the MIL-PRF-38535 specified RHA levels and are marked with the appropriate RHA designator. Device class M RHA marked devices meet the MIL-PRF-38535, appendix A specified RHA levels and are marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) identify the circuit function as follows:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	54AC16373	16-bit D-type latch with three-state outputs

1.2.3 Device class designator. The device class designator is a single letter identifying the product assurance level as follows:

<u>Device class</u>	<u>Device requirements documentation</u>
M	Vendor self-certification to the requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A
Q or V	Certification and qualification to MIL-PRF-38535

1.2.4 Case outline(s). The case outline(s) are as designated in MIL-STD-1835 and as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
X	See figure 1	48	Flat pack

1.2.5 Lead finish. The lead finish is as specified in MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

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### 1.3 Absolute maximum ratings. 1/ 2/ 3/

Supply voltage range ( $V_{CC}$ )	-0.5 V dc to +7.0 V dc
DC input voltage range ( $V_{IN}$ )	-0.5 V dc to $V_{CC} + 0.5$ V dc
DC output voltage range ( $V_{OUT}$ )	-0.5 V dc to $V_{CC} + 0.5$ V dc
DC input clamp diode current ( $I_{IK}$ )	$\pm 20$ mA
DC output clamp diode current ( $I_{OK}$ )	$\pm 20$ mA
DC output current ( $I_{OUT}$ )	$\pm 50$ mA
DC $V_{CC}$ or GND current (per output pin)	$\pm 400$ mA
Maximum power dissipation ( $P_D$ )	500 mW
Storage temperature range ( $T_{STG}$ )	-65°C to +150°C
Lead temperature (soldering, 10 seconds)	+260°C
Thermal resistance, junction-to-case ( $\theta_{JC}$ )	22°C/W
Junction temperature ( $T_J$ )	175°C 4/

### 1.4 Recommended operating conditions. 2/ 3/ 5/

Supply voltage range ( $V_{CC}$ )	+2.0 V dc to +6.0 V dc
Input voltage range ( $V_{IN}$ )	0.0 V dc to $V_{CC}$
Output voltage range ( $V_{OUT}$ )	0.0 V dc to $V_{CC}$
Input rise or fall time rate ( $V_{IN}$ from 30% to 70% of $V_{CC}$ ) ( $\Delta t/\Delta v$ ):	
$V_{CC} = 3.0$ V, 45 V, and 5.5 V	0 to 8 ns/V
Case operating temperature range ( $T_C$ )	-55°C to +125°C

### 1.5 Radiation features.

Single event phenomenon (SEP):

Maximum total dose available (dose rate = 50 – 300 rads(Si)/s)	300 krad(Si)
effective LET, no SEL (see 4.4.4.2)	$\leq 93$ MeV-cm <sup>2</sup> /mg 6/
effective LET, no SEU (see 4.4.4.2)	$\leq 93$ MeV-cm <sup>2</sup> /mg 6/

- 1/ Stresses above the absolute maximum rating may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
- 2/ Unless otherwise noted, all voltages are referenced to GND.
- 3/ The limits for the parameters specified herein shall apply over the full specified  $V_{CC}$  range and case temperature range of -55°C to +125°C.
- 4/ Maximum junction temperature shall not be exceeded except for allowable short duration burn-in screening conditions in accordance with method 5004 of MIL-STD-883.
- 5/ Operation from 2.0 V dc to 3.0 V dc is provided for compatibility with data retention and battery back-up systems. Data retention implies no input transition and no stored data loss with the following conditions:  $V_{IH} \geq 70\%$  of  $V_{CC}$ ,  $V_{IL} \leq 30\%$  of  $V_{CC}$ ,  $V_{OH} \geq 70\%$  of  $V_{CC}$  at -20  $\mu$ A,  $V_{OL} \leq 30\%$  of  $V_{CC}$  at 20  $\mu$ A.
- 6/ These limits were obtained during technology characterization and qualification, and are guaranteed by design or process, but not production tested unless specified by the customer through the purchase order or contract.

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## 2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

### DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38535 - Integrated Circuits, Manufacturing, General Specification for.

### DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.  
MIL-STD-1835 - Interface Standard Electronic Component Case Outlines.

### DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.  
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation.

### JEDEC – SOLID STATE TECHNOLOGY ASSOCIATION (JEDEC)

JESD-20 - Standard for Description of 54/74ACXXXX and 54/74ACTXXXX Advanced High-Speed CMOS Devices.

(Copies of these documents are available online at <http://www.jedec.org> or from JEDEC – Solid State Technology Association, 3103 North 10th Street, Suite 240–S, Arlington, VA 22201.)

### ASTM INTERNATIONAL (ASTM)

ASTM F1192- Standard Guide for the Measurement of Single Event Phenomena (SEP) Induced by Heavy Ion Irradiation of Semiconductor Devices.

(Copies of this document is available online at <http://www.astm.org/> or from ASTM International, P. O. Box C700, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959).

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents may also be available in or through libraries or other informational services.)

2.3 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 takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Item requirements. The individual item requirements for device classes Q and V shall be in accordance with MIL-PRF-38535 and as specified herein or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein. The individual item requirements for device class M shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein.

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3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein for device classes Q and V or MIL-PRF-38535, appendix A and herein for device class M.

3.2.1 Case outline. The case outline shall be in accordance with 1.2.4 and figure 1 herein.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Truth table. The truth table shall be as specified on figure 3.

3.2.4 Logic diagram. The logic diagram shall be as specified on figure 4.

3.2.5 Switching waveforms and test circuit. The switching waveforms and test circuit shall be as specified on figure 5.

3.2.6 Radiation exposure circuit. The radiation exposure circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request.

3.3 Electrical performance characteristics and postirradiation parameter limits. Unless otherwise specified herein, the electrical performance characteristics and post irradiation parameter limits are as specified in table I and shall apply over the full case operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table IIA. The electrical tests for each subgroup are defined in table IA.

3.5 Marking. The part shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's PIN may also be marked. For packages where marking of the entire SMD PIN number is not feasible due to space limitations, the manufacturer has the option of not marking the "5962-" on the device. For RHA product using this option, the RHA designator shall still be marked. Marking for device classes Q and V shall be in accordance with MIL-PRF-38535. Marking for device class M shall be in accordance with MIL-PRF-38535, appendix A.

3.5.1 Certification/compliance mark. The certification mark for device classes Q and V shall be a "QML" or "Q" as required in MIL-PRF-38535. The compliance mark for device class M shall be a "C" as required in MIL-PRF-38535, appendix A.

3.6 Certificate of compliance. For device classes Q and V, a certificate of compliance shall be required from a QML-38535 listed manufacturer in order to supply to the requirements of this drawing (see 6.6.1 herein). For device class M, a certificate of compliance shall be required from a manufacturer in order to be listed as an approved source of supply in MIL-HDBK-103 (see 6.6.2 herein). The certificate of compliance submitted to DLA Land and Maritime -VA prior to listing as an approved source of supply for this drawing shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and herein or for device class M, the requirements of MIL-PRF-38535, appendix A and herein.

3.7 Certificate of conformance. A certificate of conformance as required for device classes Q and V in MIL-PRF-38535 or for device class M in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change for device class M. For device class M, notification to DLA Land and Maritime -VA of change of product (see 6.2 herein) involving devices acquired to this drawing is required for any change that affects this drawing.

3.9 Verification and review for device class M. For device class M, DLA Land and Maritime, DLA Land and Maritime '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.

3.10 Microcircuit group assignment for device class M. Device class M devices covered by this drawing shall be in microcircuit group number 38 (see MIL-PRF-38535, appendix A).

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TABLE IA. Electrical performance characteristics.

Test and MIL-STD-883 test method <u>1/</u>	Symbol	Test conditions <u>2/ 3/</u> -55°C ≤ T <sub>C</sub> ≤ +125°C +3.0 V ≤ V <sub>CC</sub> ≤ +5.5 V unless otherwise specified		Device type and device class	V <sub>CC</sub>	Group A subgroups	Limits <u>4/</u>		Unit
							Min	Max	
High level input voltage	V <sub>IH</sub> <u>5/</u>			All All	3.0 V	1, 2, 3	2.1		V
					4.5 V		3.15		
					5.5 V		3.85		
Low level input voltage	V <sub>IL</sub> <u>5/</u>			All All	3.0 V	1, 2, 3		0.9	V
					4.5 V			1.35	
					5.5 V			1.65	
High level output voltage 3006	V <sub>OH</sub>	For all inputs affecting output under test V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> For all other inputs V <sub>IN</sub> = V <sub>CC</sub> or GND	I <sub>OH</sub> = -50 μA	All All	3.0 V	1, 2, 3	2.9		V
			I <sub>OH</sub> = -12 mA		4.5 V	1, 2, 3	4.4		
					5.5 V	1, 2, 3	5.4		
			I <sub>OH</sub> = -24 mA		3.0 V	1	2.56		
					2, 3	2.46			
			4.5 V		1	3.86			
					2, 3	3.76			
			5.5 V		1	4.86			
					2, 3	4.76			
			I <sub>OH</sub> = -50 mA <u>6/</u>		5.5 V	1, 2, 3	3.85		
Low level output voltage 3007	V <sub>OL</sub>	For all inputs affecting output under test V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> For all other inputs V <sub>IN</sub> = V <sub>CC</sub> or GND	I <sub>OL</sub> = 50 μA	All All	3.0 V	1, 2, 3		0.1	V
			I <sub>OL</sub> = 12 mA		4.5 V	1, 2, 3		0.1	
					5.5 V	1, 2, 3		0.1	
			I <sub>OL</sub> = 24 mA		3.0 V	1		0.36	
					2, 3		0.44		
			4.5 V		1		0.36		
					2, 3		0.44		
			5.5 V		1		0.36		
					2, 3		0.44		
			I <sub>OL</sub> = 50 mA <u>6/</u>		5.5 V	1, 2, 3		1.65	
Positive input clamp voltage 3022	V <sub>IC+</sub>	For input under test, I <sub>IN</sub> = 1.0 mA		All Q, V	0.0 V	1	0.4	1.5	V
Negative input clamp voltage 3022	V <sub>IC-</sub>	For input under test, I <sub>IN</sub> = -1.0 mA		All Q, V	Open	1	-0.4	-1.5	V

See footnotes at end of table.

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TABLE IA. Electrical performance characteristics - Continued.

Test and MIL-STD-883 test method <u>1/</u>	Symbol	Test conditions <u>2/ 3/</u> $-55^{\circ}\text{C} \leq T_C \leq +125^{\circ}\text{C}$ $+3.0\text{ V} \leq V_{CC} \leq +5.5\text{ V}$ unless otherwise specified	Device type and device class	$V_{CC}$	Group A subgroups	Limits <u>4/</u>		Unit
						Min	Max	
Input leakage current high 3010	$I_{IH}$	For input under test, $V_{IN} = V_{CC}$ For all other inputs $V_{IN} = V_{CC}$ or GND	All All	5.5 V	1		0.1	$\mu\text{A}$
					2, 3		1.0	
Input leakage current low 3009	$I_{IL}$	For input under test, $V_{IN} = \text{GND}$ For all other inputs $V_{IN} = V_{CC}$ or GND	All All	5.5 V	1		-0.1	$\mu\text{A}$
					2, 3		-1.0	
Three-state output leakage current high 3021	$I_{OZH}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = V_{CC}$	All All	5.5 V	1		0.5	$\mu\text{A}$
					2, 3		5.0	
			M, D, P, L, R, F 01 Q, V		1		10	
Three-state output leakage current low 3020	$I_{OZL}$	$V_{IN} = V_{IH}$ or $V_{IL}$ $V_{OUT} = \text{GND}$	All All	5.5 V	1		-0.5	$\mu\text{A}$
					2, 3		-5.0	
			M, D, P, L, R, F 01 Q, V		1		-10	
Quiescent supply current, output high 3005	$I_{CCH}$	For all inputs, $V_{IN} = V_{CC}$ or GND $I_{OUT} = 0.0\text{ A}$	All All	5.5 V	1		4.0	$\mu\text{A}$
					2, 3		160	
			M, D, P, L, R, F <u>Z/</u>		1		50	
Quiescent supply current, output low 3005	$I_{CCL}$	For all inputs, $V_{IN} = V_{CC}$ or GND $I_{OUT} = 0.0\text{ A}$	All All	5.5 V	1		4.0	$\mu\text{A}$
					2, 3		160	
			M, D, P, L, R, F <u>Z/</u>		1		50	
Quiescent supply current, output three-state 3005	$I_{CCZ}$	For all inputs, $V_{IN} = V_{CC}$ or GND $I_{OUT} = 0.0\text{ A}$	All All	5.5 V	1		4.0	$\mu\text{A}$
					2, 3		160	
			M, D, P, L, R, F <u>Z/</u>		1		50	
Input capacitance 3012	$C_{IN}$	See 4.4.1c $T_C = +25^{\circ}\text{C}$	All All	Open	4		10	pF
Output capacitance 3012	$C_{OUT}$	See 4.4.1c $T_C = +25^{\circ}\text{C}$	All All	Open	4		20	pF
Power dissipation capacitance	$C_{PD}$ <u>g/</u>	See 4.4.1c $T_C = +25^{\circ}\text{C}$ , $f = 10\text{ MHz}$	All All	5.0 V	4		35	pF
Functional tests 3014	<u>g/</u>	For all inputs, $V_{IN} = V_{IH}$ or $V_{IL}$ Verify output $V_{OUT}$ See 4.4.1b	All All	3.0 V	7, 8	L	H	
				4.5 V		L	H	
				5.5 V		L	H	

See footnotes at end of table.

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TABLE IA. Electrical performance characteristics - Continued.

Test and MIL-STD-883 test method <u>1/</u>	Symbol	Test conditions <u>2/ 3/</u> -55°C ≤ T <sub>C</sub> ≤ +125°C +3.0 V ≤ V <sub>CC</sub> ≤ +5.5 V unless otherwise specified	Device type and device class	V <sub>CC</sub>	Group A subgroups	Limits <u>4/</u>		Unit
						Min	Max	
mLE pulse width, high	t <sub>w</sub> <u>10/</u>	C <sub>L</sub> = 50 pF minimum R <sub>L</sub> = 500Ω See figure 5	All All	3.0 V and 3.6 V	9, 10, 11	4.0		ns
			All All	4.5 V and 5.5 V	9, 10, 11	5.0		
Setup time, mDn to mLE, high or low	t <sub>s</sub> <u>10/</u>		All All	3.0 V and 3.6 V	9, 10, 11	1.5		ns
			All All	4.5 V and 5.5 V	9, 10, 11	1.5		
Hold time, mDn to mLE, high or low	t <sub>h</sub> <u>10/</u>		All All	3.0 V and 3.6 V	9, 10, 11	3.0		ns
			All All	4.5 V and 5.5 V	9, 10, 11	2.5		
Propagation delay time, mLE to mQn 3003	t <sub>PHL1</sub> , t <sub>PLH1</sub> <u>11/</u>		All All	3.0 V and 3.6 V  4.5 V and 5.5 V	9	1.0	11.0	ns
					10, 11	1.0	15.0	
					9	1.0	8.5	
					10, 11	1.0	12.0	
Propagation delay time, mDn to mQn 3003	t <sub>PHL2</sub> , t <sub>PLH2</sub> <u>11/</u>	All All	3.0 V and 3.6 V  4.5 V and 5.5 V	9	1.0	11.0	ns	
				10, 11	1.0	15.0		
				9	1.0	9.0		
				10, 11	1.0	13.0		
Propagation delay time, output enable, mOE to mQn 3003	t <sub>PZH</sub> , t <sub>PZL</sub> <u>11/</u>	All All	3.0 V and 3.6 V  4.5 V and 5.5 V	9	1.0	11.0	ns	
				10, 11	1.0	15.0		
				9	1.0	8.0		
				10, 11	1.0	12.0		
Propagation delay time, output disable, mOE to mQn 3003	t <sub>PHZ</sub> , t <sub>PLZ</sub> <u>11/</u>	All All	3.0 V and 3.6 V  4.5 V and 5.5 V	9	1.0	11.0	ns	
				10, 11	1.0	15.0		
				9	1.0	8.5		
				10, 11	1.0	12.0		

See footnotes on next sheet.

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TABLE IA. Electrical performance characteristics - Continued.

- 1/ For tests not listed in the referenced MIL-STD-883, [e.g.  $V_{IH}$ ,  $V_{IL}$ ], utilize the general test procedure under the conditions listed herein.
- 2/ Each input/output, as applicable, shall be tested at the specified temperature, for the specified limits, to the tests in table I herein. Output terminals not designated shall be high level logic, low level logic, or open, except for all  $I_{CC}$  tests, the output terminal shall be open. When performing these tests, the current meter shall be placed in the circuit such that all current flows through the meter.
- 3/ RHA parts for device type 01 meet all levels M, D, P, L, R, and F of irradiation. However, these parts are only tested at the "F" level. Pre and post irradiation values are identical unless otherwise specified in table IA. When performing post irradiation electrical measurements for any RHA level,  $T_A = 25^\circ\text{C}$ .
- 4/ For negative and positive voltage and current values, the sign designates the potential difference in reference to GND and the direction of current flow, respectively; and the absolute value of the magnitude, not the sign, is relative to the minimum and maximum limits, as applicable, listed herein. All devices shall meet or exceed the limits specified in table IA, as applicable, at  $3.0\text{ V} \leq V_{CC} \leq 3.6\text{ V}$  and  $4.5\text{ V} \leq V_{CC} \leq 5.5\text{ V}$ .
- 5/ The  $V_{IH}$  and  $V_{IL}$  tests are not required if applied as forcing functions for  $V_{OH}$  and  $V_{OL}$  tests.
- 6/ Transmission driving tests are performed at  $V_{CC} = 5.5\text{ V}$  dc with a 2 ms duration maximum. This test may be performed using  $V_{IN} = V_{CC}$  or GND. When  $V_{IN} = V_{CC}$  or GND is used, the test is guaranteed for  $V_{IN} = 3.85\text{ V}$  or  $1.65\text{ V}$ .
- 7/ The maximum limit for this parameter at 100 krad (Si) is  $4\text{ }\mu\text{A}$ .
- 8/ Power dissipation capacitance ( $C_{PD}$ ) determines both the power consumption ( $P_D$ ) and dynamic current consumption ( $I_S$ ). Where:  

$$P_D = (C_{PD} + C_L) (V_{CC} \times V_{CC})f + (I_{CC} \times V_{CC})$$

$$I_S = (C_{PD} + C_L) V_{CC}f + I_{CC}$$
For both  $P_D$  and  $I_S$ ,  $f$  is the frequency of the input signal and  $C_L$  is the external output load capacitance.
- 9/ Tests shall be performed in sequence, attributes data only. Functional tests shall include the truth table and other logic patterns used for fault detection. The test vectors used to verify the truth table shall, at a minimum, test all functions of each input and output. All possible input to output logic patterns per function shall be guaranteed, if not tested, to the truth table in figure 3 herein. Functional tests shall be performed in sequence as approved by the qualifying activity on qualified devices. Allowable tolerances in accordance with MIL-STD-883 for the input voltage levels may be incorporated. For outputs,  $L < 0.3 V_{CC}$ ,  $H \geq 0.7 V_{CC}$ .
- 10/ This parameter is guaranteed based on characterization data but not tested.
- 11/ For propagation delay tests, all paths must be tested.

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TABLE IB. SEP test limits. 1/ 2/

Device type	V <sub>CC</sub> = 2.0 V for device type 01 3/	Bias for latch-up test V <sub>CC</sub> = 6.0 V no latch-up 4/ 5/ [MeV/(mg/cm <sup>2</sup> )]
	Effective LET no upsets [MeV/(mg/cm <sup>2</sup> )]	
01	LET ≤ 93 6/	≤ 93

1/ For SEP test conditions, see 4.4.4.2 herein.

2/ Technology characterization and model verification supplemented by in-line data may be used in lieu of end-of-line testing. Test plan must be approved by TRB and qualifying activity.

3/ Tested for upsets at operating temperature, T<sub>A</sub> = +25°C ± 10°C.

4/ Tested at operating temperature, T<sub>A</sub> = +125°C ± 10°C for latch-up.

5/ Tested to a LET ≤ 93 MeV/(mg/cm<sup>2</sup>) with no latch-up (SEL).

6/ Tested to a LET ≤ 93 MeV/(mg/cm<sup>2</sup>) with no single event upsets (SEU).

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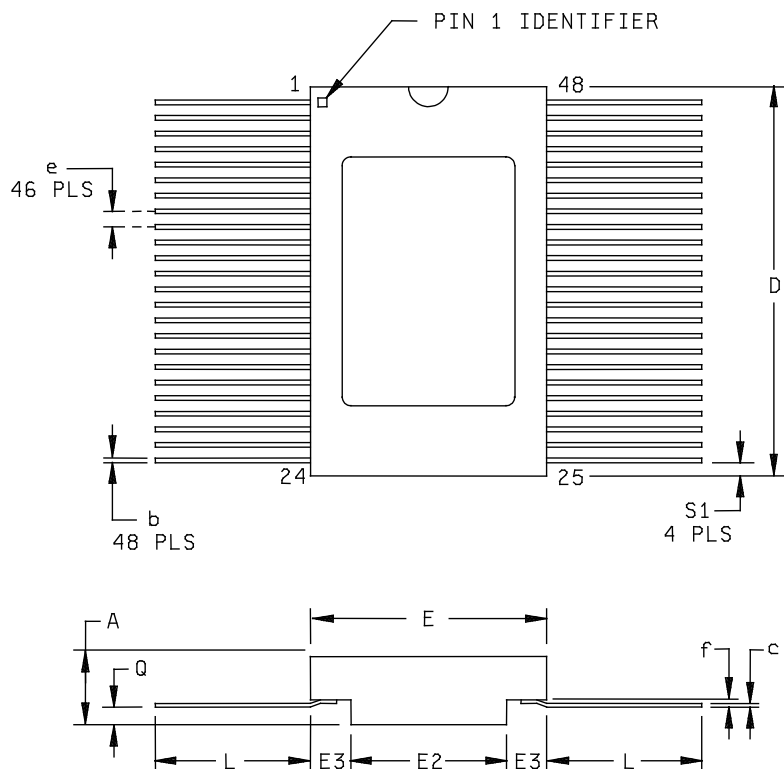
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# Case outline X



Dimensions				
Symbol	Inches		Millimeters	
	Min	Max	Min	Max
A	.086	.107	2.18	2.72
b	.008	.012	0.20	0.30
c	.005	.007	0.12	0.18
D	.613	.627	15.57	15.92
E	.375	.385	9.52	9.78
E2	.245	.255	6.22	6.48
E3	.060	.070	1.52	1.78
e	.025 BSC		0.635 BSC	
f	.008 BSC		0.20 BSC	
L	.270	.370	6.85	9.40
Q	.026	.036	0.66	0.92
S1	.010	.024	0.25	0.61
N	48		48	

FIGURE 1. Case outline.

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Device type	01		
Case outline	X		
Terminal number	Terminal symbol	Terminal number	Terminal symbol
1	$\overline{1OE}$	25	2LE
2	1Q1	26	2D8
3	1Q2	27	2D7
4	GND	28	GND
5	1Q3	29	2D6
6	1Q4	30	2D5
7	V <sub>CC</sub>	31	V <sub>CC</sub>
8	1Q5	32	2D4
9	1Q6	33	2D3
10	GND	34	GND
11	1Q7	35	2D2
12	1Q8	36	2D1
13	2Q1	37	1D8
14	2Q2	38	1D7
15	GND	39	GND
16	2Q3	40	1D6
17	2Q4	41	1D5
18	V <sub>CC</sub>	42	V <sub>CC</sub>
19	2Q5	43	1D4
20	2Q6	44	1D3
21	GND	45	GND
22	2Q7	46	1D2
23	2Q8	47	1D1
24	$\overline{2OE}$	48	1LE

FIGURE 2. Terminal connections.

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Inputs			Output
mOE	mLE	mDn	mQn
L	H	H	H
L	H	L	L
L	L	X	Q0
H	X	X	Z

H = High voltage level  
 L = Low voltage level  
 X = Irrelevant  
 Z = High impedance  
 Q0 = The level of Q before the indicated steady-state input conditions were established

FIGURE 3. Truth table.

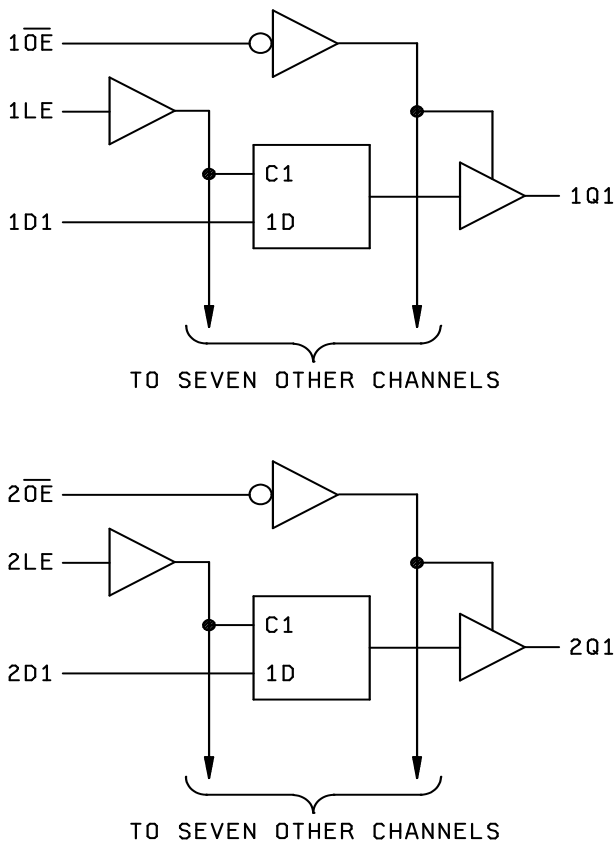


FIGURE 4. Logic diagram.

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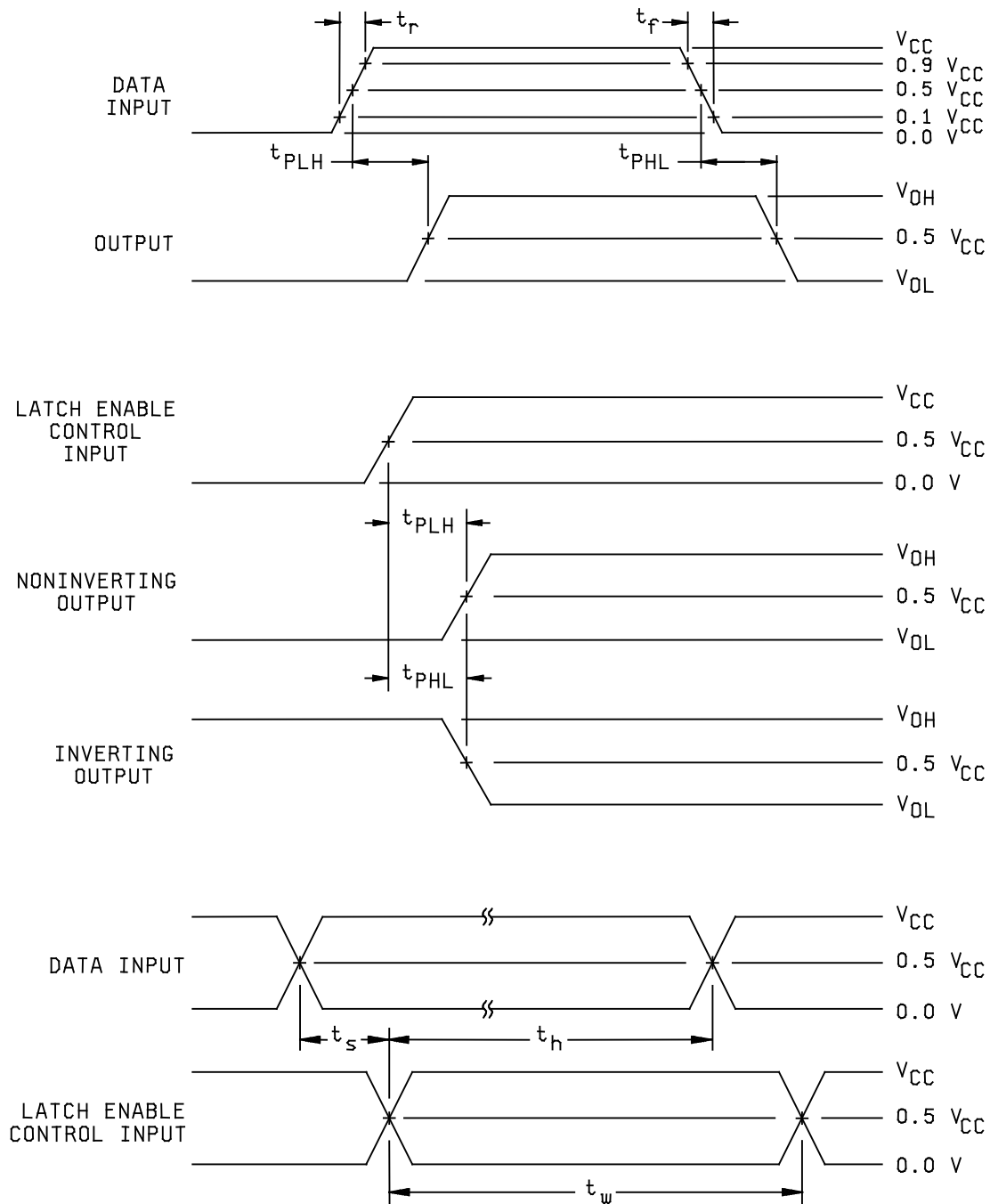


FIGURE 5. Switching waveforms and test circuit.

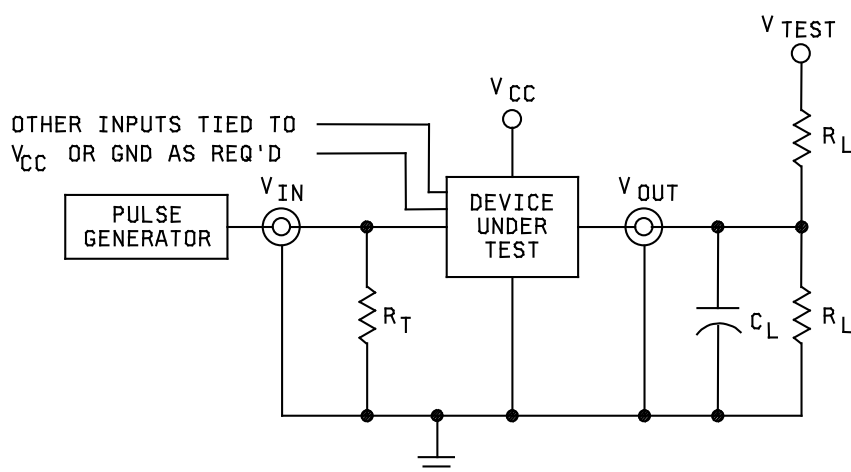
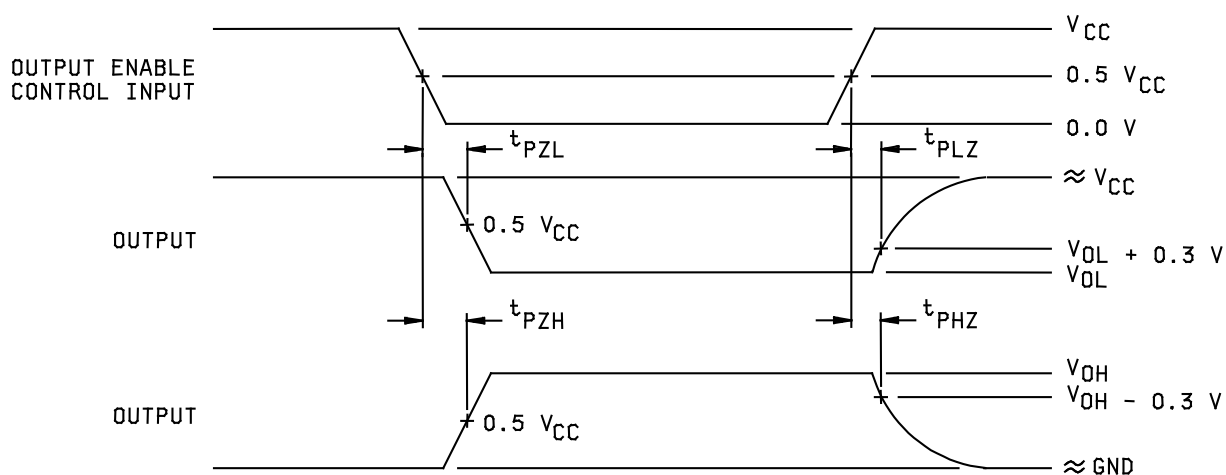
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#### NOTES:

1. When measuring  $t_{PLH}$  and  $t_{PHL}$ :  $V_{TEST} = \text{open}$ .
2. When measuring  $t_{PLZ}$  and  $t_{PZL}$ :  $V_{TEST} = 2 \times V_{CC}$ .
3. When measuring  $t_{PHZ}$  and  $t_{PZH}$ :  $V_{TEST} = \text{GND}$ .
4. The  $t_{PZL}$  and  $t_{PZH}$  reference waveform is for the output under test with internal conditions such that the output is low at  $V_{OL}$  except when disabled by the output enable control. The  $t_{PHZ}$  and  $t_{PHL}$  reference waveform is for the output under test with internal conditions such that the output is high at  $V_{OH}$  except when disabled by the output enable control.
5.  $C_L = 50 \text{ pF}$  minimum or equivalent (includes probe and jig capacitance).
6.  $R_T = 50 \Omega$  or equivalent,  $R_L = 500 \Omega$  or equivalent.
7. Input signal from pulse generator:  $V_{IN} = 0.0 \text{ V}$  to  $V_{CC}$ ;  $\text{PRR} \leq 1 \text{ MHz}$ ;  $t_r \leq 3.0 \text{ ns}$ ;  $t_f \leq 3.0 \text{ ns}$ ;  $t_r$  and  $t_f$  shall be measured from 10% of  $V_{CC}$  to 90% of  $V_{CC}$  and from 90% of  $V_{CC}$  to 10% of  $V_{CC}$ , respectively; duty cycle = 50 percent.
8. Timing parameters shall be tested at a minimum input frequency of 1MHz.
9. The outputs are measured one at a time with one transition per measurement.

FIGURE 5. Switching waveforms and test circuit - Continued.

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#### 4. VERIFICATION

4.1 Sampling and inspection. For device classes Q and V, sampling and inspection procedures shall be in accordance with MIL-PRF-38535 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein. For device class M, sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

4.2 Screening. For device classes Q and V, screening shall be in accordance with MIL-PRF-38535, and shall be conducted on all devices prior to qualification and technology conformance inspection. For device class M, screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to quality conformance inspection.

##### 4.2.1 Additional criteria for device class M.

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

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015.

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

b. Interim and final electrical test parameters shall be as specified in table IIA herein.

##### 4.2.2 Additional criteria for device classes Q and V.

a. The burn-in test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The burn-in test circuit shall be maintained under document revision level control of the device manufacturer's Technology Review Board (TRB) in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table IIA herein.

c. Additional screening for device class V beyond the requirements of device class Q shall be as specified in MIL-PRF-38535, appendix B.

4.3 Qualification inspection for device classes Q and V. Qualification inspection for device classes Q and V shall be in accordance with MIL-PRF-38535. Inspections to be performed shall be those specified in MIL-PRF-38535 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

4.4 Conformance inspection. Technology conformance inspection for classes Q and V shall be in accordance with MIL-PRF-38535 including groups A, B, C, D, and E inspections and as specified herein. Quality conformance inspection for device class M shall be in accordance with MIL-PRF-38535, appendix A and as specified herein. Inspections to be performed for device class M shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, D, and E inspections (see 4.4.1 through 4.4.4).

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#### 4.4.1 Group A inspection

- a. Tests shall be as specified in table IIA herein.
- b. For device class M, subgroups 7 and 8 tests shall be sufficient to verify the truth table in figure 3 herein. The test vectors used to verify the truth table shall, at a minimum, test all functions of each input and output. All possible input to output logic patterns per function shall be guaranteed, if not tested, to the truth table in figure 3, herein. For device classes Q and V, subgroups 7 and 8 shall include verifying the functionality of the device.
- c.  $C_{IN}$ ,  $C_{OUT}$ , and  $C_{PD}$  shall be measured only for initial qualification and after process or design changes which may affect capacitance.  $C_{IN}$  and  $C_{OUT}$  shall be measured between the designated terminal and GND at a frequency of 1 MHz.  $C_{PD}$  shall be tested in accordance with the latest revision of JESD-20 and table IA herein. For  $C_{IN}$ ,  $C_{OUT}$ , and  $C_{PD}$ , test all applicable pins on five devices with zero failures.

4.4.2 Group C inspection. The group C inspection end-point electrical parameters shall be as specified in table IIA herein.

#### 4.4.2.1 Additional criteria for device class M. Steady-state life test conditions, method 1005 of MIL-STD-883:

- a. Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing or acquiring activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.
- b.  $T_A = +125^{\circ}\text{C}$ , minimum.
- c. Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.4.2.2 Additional criteria for device classes Q and V. The steady-state life test duration, test condition and test temperature, or approved alternatives shall be as specified in the device manufacturer's QM plan in accordance with MIL-PRF-38535. The test circuit shall be maintained under document revision level control by the device manufacturer's TRB in accordance with MIL-PRF-38535 and shall be made available to the acquiring or preparing activity upon request. The test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.

4.4.3 Group D inspection. The group D inspection end-point electrical parameters shall be as specified in table IIA herein.

4.4.4 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein).

- a. End-point electrical parameters shall be as specified in table IIA herein.
- b. For device classes Q and V, the devices or test vehicle shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535 for the RHA level being tested. For device class M, the devices shall be subjected to radiation hardness assured tests as specified in MIL-PRF-38535, appendix A for the RHA level being tested. All device classes must meet the postirradiation end-point electrical parameter limits as defined in table IA at  $T_A = +25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , after exposure, to the subgroups specified in table IIA herein.
- c. RHA tests for device classes M, Q, and V for levels M, D, P, L, R, and F shall be performed through each level to determine at what levels the devices meet the RHA requirements. These RHA tests shall be performed for initial qualification and after design or process changes which may affect the RHA performance of the device.
- d. Prior to irradiation, each selected sample shall be assembled in its qualified package. It shall pass the specified group A electrical parameters in table IA for subgroups specified in table IIA herein.

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TABLE IIA. Electrical test requirements.

Test requirements	Subgroups (in accordance with MIL-STD-883, method 5005, table IA)	Subgroups (in accordance with MIL-PRF-38535, table IIB)	
	Device class M	Device class Q	Device class V
Interim electrical parameters (see 4.2)	---	---	1
Final electrical parameters (see 4.2)	<u>1/</u> 1, 2, 3, 7, 8, 9, 10, 11	<u>1/</u> 1, 2, 3, 7, 8, 9, 10, 11	<u>2/ 3/</u> 1, 2, 3, 7, 8, 9, 10, 11
Group A test requirements (see 4.4)	1, 2, 3, 4, 7, 8, 9, 10, 11	1, 2, 3, 4, 7, 8, 9, 10, 11	1, 2, 3, 4, 7, 8, 9, 10, 11
Group C end-point electrical parameters (see 4.4)	1, 2, 3	1, 2, 3	<u>3/</u> 1, 2, 3, 7, 8, 9, 10, 11
Group D end-point electrical parameters (see 4.4)	1, 2, 3	1, 2, 3	1, 2, 3, 7, 9
Group E end-point electrical parameters (see 4.4)	1, 7, 9	1, 7, 9	1, 7, 9

1/ PDA applies to subgroup 1.

2/ PDA applies to subgroups 1, 7, and deltas.

3/ Delta limits, as specified in table IIB, shall be required and the delta limits shall be completed with reference to the zero hour electrical parameters.

TABLE IIB. Burn-in and operating life test, delta parameters (+25°C).

Parameter <u>1/</u>	Symbol	Delta limits
Quiescent supply current	$I_{CCH}, I_{CCL}, I_{CCZ}$	$\pm 150$ nA
Input current low level	$I_{IL}$	$\pm 20$ nA
Input current high level	$I_{IH}$	$\pm 20$ nA
Output voltage low level ( $V_{CC} = 5.5$ V, $I_{OL} = 24$ mA)	$V_{OL}$	$\pm 0.04$ V
Output voltage high level ( $V_{CC} = 5.5$ V, $I_{OH} = -24$ mA)	$V_{OH}$	$\pm 0.20$ V

1/ These parameters shall be recorded before and after the required burn-in and life tests to determined delta limits.

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4.4.4.1 Total dose irradiation testing. Total dose irradiation testing shall be performed in accordance with MIL-STD-883, method 1019, condition A, and as specified herein. Prior to and during total dose irradiation characterization and testing, the devices for characterization shall be biased so that 50 percent are at inputs high and 50 percent are at inputs low, and the devices for testing shall be biased to the worst case condition established during characterization. Devices shall be biased as follows:

- a. Inputs tested high,  $V_{CC} = 5.5 \text{ V dc } \pm 5\%$ ,  $V_{IN} = 5.0 \text{ V dc } +10\%$ ,  $R_{IN} = 1 \text{ k}\Omega \pm 20\%$ , and all outputs are open.
- b. Inputs tested low,  $V_{CC} = 5.5 \text{ V dc } \pm 5\%$ ,  $V_{IN} = 0.0 \text{ V}$ ,  $R_{IN} = 1 \text{ k}\Omega \pm 20\%$ , and all outputs are open.

4.4.4.1.1 Accelerated annealing test. Accelerated annealing shall be performed on classes M, Q, and V devices requiring a RHA level greater than 5K rads (Si). The post-anneal end point electrical parameter limits shall be as specified in table IA herein and shall be the preirradiation end point electrical parameter limit at  $25^\circ\text{C} \pm 5^\circ\text{C}$ . Testing shall be performed at initial qualification and after any design or process changes which may affect the RHA response of the device.

4.4.4.2 Single event phenomena (SEP). SEP testing shall be required on class V devices (see 1.4 herein). SEP testing shall be performed on a technology process on the Standard Evaluation Circuit (SEC) or alternate SEP test vehicle as approved by the qualifying activity at initial qualification and after any design or process changes which may affect the upset or latchup characteristics. The recommended test conditions for SEP are as follows:

- a. The ion beam angle of incidence shall be between normal to the die surface and  $60^\circ$  to the normal, inclusive (i.e.  $0^\circ \leq \text{angle} \leq 60^\circ$ ). No shadowing of the ion beam due to fixturing or package related effects is allowed.
- b. The fluence shall be  $\geq 100$  errors or  $\geq 10^7$  ions/cm<sup>2</sup>.
- c. The flux shall be between  $10^2$  and  $10^5$  ions/cm<sup>2</sup>/s. The cross-section shall be verified to be flux independent by measuring the cross-section at two flux rates that differ by at least an order of magnitude.
- d. The particle range shall be  $\geq 20$  microns in silicon.
- e. The test temperature shall be  $+25^\circ\text{C}$  and the maximum rated operating temperature  $\pm 10^\circ\text{C}$ .
- f. Bias conditions shall be defined by the manufacturer for the latchup measurements.
- g. Test four devices with zero failures.

4.5 Methods of inspection. Methods of inspection shall be specified as follows:

4.5.1 Voltage and current. Unless otherwise specified, all voltages given are referenced to the microcircuit GND terminal. Currents given are conventional current and positive when flowing into the referenced terminal.

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## 5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38535 for device classes Q and V or MIL-PRF-38535, appendix A for device class M.

## 6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

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

6.1.2 Substitutability. Device class Q devices will replace device class M devices.

6.2 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 using DD Form 1692, Engineering Change Proposal.

6.3 Record of users. Military and industrial users should inform DLA land and maritime when a system application requires configuration control and which SMD's are applicable to that system. DLA land and maritime 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 microelectronic devices (FSC 5962) should contact DLA land and maritime -VA, telephone (614) 692-0544.

6.4 Comments. Comments on this drawing should be directed to DLA land and maritime-VA , Columbus, Ohio 43218-3990, or telephone (614) 692-0547.

6.5 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535 and MIL-HDBK-1331.

6.6 Sources of supply.

6.6.1 Sources of supply for device classes Q and V. Sources of supply for device classes Q and V are listed in QML-38535. The vendors listed in QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA land and maritime -VA and have agreed to this drawing.

6.6.2 Approved sources of supply for device class M. Approved sources of supply for class M are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DLA land and maritime -VA.

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## STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 11-04-14

Approved sources of supply for SMD 5962-04212 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38535 during the next revision. MIL-HDBK-103 and QML-38535 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA land and maritime -VA. This information bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535. DLA Land and Maritime maintains an online database of all current sources of supply at <http://www.dscc.dla.mil/Programs/SMCR/>.

Standard microcircuit drawing PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962-0421201QXA	<u>3/</u>	54AC16373
5962-0421201VXA	<u>3/</u>	54AC16373
5962F0421201QXA	F8859	RHFAC16373K02Q
5962F0421201QXC	F8859	RHFAC16373K01Q
5962F0421201VXA	F8859	RHFAC16373K02V
5962F0421201VXC	F8859	RHFAC16373K01V

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine its availability.

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

3/ Not available from an approved source of supply.

Vendor CAGE  
number

F8859

Vendor name  
and address

ST Microelectronics  
3 rue de Suisse  
BP4199  
35041 RENNES cedex2 - France

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