

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Drawing updated to reflect current requirements. - ro	00-08-31	R. MONNIN
B	Replaced reference to MIL-STD-973 with reference to MIL-PRF-38535. - ro	03-04-14	R. MONNIN

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

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

PMIC N/A	PREPARED BY RICK C. OFFICER	<p align="center">DEFENSE SUPPLY CENTER COLUMBUS COLUMBUS, OHIO 43216 http://www.dsc.dla.mil</p>																	
<p align="center">STANDARD MICROCIRCUIT DRAWING</p> <p>THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE</p> <p align="center">AMSC N/A</p>	CHECKED BY CHARLES E. BESORE																		
	APPROVED BY MICHAEL A. FRYE	<p align="center">MICROCIRCUIT, LINEAR, DUAL POWER SUPPLY SUPERVISORS, MONOLITHIC SILICON</p>																	
	DRAWING APPROVAL DATE 90-12-18																		
	REVISION LEVEL B		SIZE A	CAGE CODE 67268	5962-90932														
		SHEET 1 OF 13																	

DSCC FORM 2233
APR 97

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

5962-E303-03

1.3 Absolute maximum ratings. 1/

Supply voltage (V _{CC})	20 V dc 2/
Input voltage range (V _I): VSU1, VSU2, VS01, VS02	-0.3 V dc to +18 V dc
Low level output current (I _{OL}), ($\overline{\text{RESET1}}$ and $\overline{\text{RESET2}}$)	20 mA
High level output current (I _{OH}), ($\overline{\text{RESET1}}$ and $\overline{\text{RESET2}}$)	-20 mA
Storage temperature range	-65°C to +150°C
Lead temperature soldering, 1.6 mm (0.0625 inch) from case for 10 seconds	260°C
Power dissipation (P _D)	1375 mW 3/
Junction temperature	-55°C to +150°C
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835

1.4 Recommended operating conditions.

Supply voltage (V _{CC})	3.5 V dc minimum, 18 V dc maximum
Input voltage range (V _I): ($\overline{\text{RESIN1}}$, $\overline{\text{RESIN2}}$, VSU1, VSU2, VS01, VS02)	0 V dc minimum, 18 V dc maximum
Output voltage (V _O), (CT1 and CT2)	5 V dc maximum
Output sink current (I _O), (CT1 and CT2)	50 μ A maximum
High level output current (I _{OH}), ($\overline{\text{RESET1}}$ and $\overline{\text{RESET2}}$)	-16 mA maximum
Low level output current (I _{OL}), ($\overline{\text{RESET1}}$ and $\overline{\text{RESET2}}$)	16 mA maximum
Continuous output current (I _O), (SCR1 GATE DRIVE and SCR2 GATE DRIVE)	25 mA maximum
Ambient operating temperature range (T _A)	-55°C to +125°C

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.

SPECIFICATION

DEPARTMENT OF DEFENSE

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

STANDARDS

DEPARTMENT OF DEFENSE

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

- 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/ All voltage values are with respect to the network ground terminal.
3/ Above T_A = +25°C derate at a factor of 12.0 mW/°C.

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HANDBOOKS

DEPARTMENT OF DEFENSE

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

(Unless otherwise indicated, copies of the specification, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 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.

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 outlines. The case outlines shall be in accordance with 1.2.4 herein.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 1.

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

3.2.4 Logic diagram. The logic diagram shall be as specified on figure 3.

3.3 Electrical performance characteristics and post irradiation 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 ambient 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 defined in table I.

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 as listed in MIL-HDBK-103. 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 DSCC-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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C V _{CC} = 3.5 V to 18 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
High level output voltage, RESET	V _{OH}	I _{OH} = -15 mA	1,2,3	All	V _{CC} -1.5		V
High level output voltage, SCR, GATE DRIVER	V _{OH}	I _{OH} = -20 mA	1,2,3	All	V _{CC} -1.5		V
Low level output voltage, $\overline{\text{RESET}}$	V _{OL}	I _{OL} = 15 mA	1,2,3	All		0.4	V
Undervoltage threshold (negative going), VSU1	V _{T-}		1	01	4.50	4.632	V
			2,3		4.40	4.646	
			1	02	10.80	11.07	
			2,3		10.62	11.12	
			1	03	13.50	13.866	
			2,3		13.36	13.916	
Undervoltage threshold (negative going), VSU2	V _{T-}		1	All	1.485	1.527	V
			2,3		1.460	1.542	
Overvoltage threshold	V _{T+}		1	All	2.530	2.630	V
			2,3		2.480	2.680	
Input current, $\overline{\text{RESIN}}$	I _I	V _I = 5.5 V or 0.4 V	1,2,3	All		-10	μA
Input current, VSO	I _I	V _I = 2.4 V	1,2,3	All		2	μA
High level output current, $\overline{\text{RESET}}$	I _{OH}	V _O = V _{CC}	1,2,3	All		50	μA
Low level output current, RESET	I _{OL}	V _O = 1 V	1,2,3	All		-50	μA

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TABLE I. Electrical performance characteristics – Continued.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C V _{CC} = 3.5 V to 18 V unless otherwise specified	Group A subgroups	Device type	Limits <u>2/</u>		Unit
					Min	Max	
Peak output current, SCR GATE DRIVE	I _{OP}	Duration = 1 ms	1,2,3	All	-250		mA
Supply current	I _{CC}	VSU1 and VSU2 at > V _{T+} , <u>RESIN1</u> and <u>RESIN2</u> at V _{CC} , VS01 and VS02 at 0 V	1	All		5	mA
			2,3			6.5	
Functional tests		See 4.4.1c	7,8	All			
Propagation delay <u>1/</u> time, low-to-high level output from <u>RESIN</u> to RESET	t _{PLH}	See figure 4, T _A = +25°C	9	All		500	ns
Propagation delay <u>1/</u> time, high-to-low level output from <u>RESIN</u> to <u>RESET</u>	t _{PHL}	See figure 4, T _A = +25°C	9	All		500	ns
Rise time, <u>1/</u> RESET	t _R	See figure 4, T _A = +25°C	9	All		75	ns
Fall time, <u>1/</u> <u>RESET</u>	t _F	See figure 4, T _A = +25°C	9	All		50	ns

1/ If not tested, shall be guaranteed to the limits specified in table I herein.

3.8 Notification of change for device class M. For device class M, notification to DSCC-VA of change of product (see 6.2 herein) involving devices acquired to this drawing is required for any change as defined in MIL-PRF-38535, appendix A.

3.9 Verification and review for device class M. For device class M, DSCC, DSCC'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 88 (see MIL-PRF-38535, appendix A).

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Device types	01, 02, 03	
Case outlines	E	2
Terminal number	Terminal symbol	
1	$\overline{\text{RESIN}} 1$	NC
2	CT1	$\overline{\text{RESIN}} 1$
3	RESET1	CT1
4	$\overline{\text{RESET}} 1$	RESET1
5	VSU1	$\overline{\text{RESET}} 1$
6	VS01	NC
7	SCR DRIVE1	VSU1
8	GND	VS01
9	SCR DRIVE2	SCR DRIVE1
10	VS02	GND
11	VSU2	NC
12	$\overline{\text{RESET}} 2$	SCR DRIVE2
13	RESET2	VS02
14	CT2	VSU2
15	$\overline{\text{RESIN}} 2$	$\overline{\text{RESET}} 2$
16	V _{CC}	NC
17	---	RESET2
18	---	CT2
19	---	RESIN 2
20	---	V _{CC}

NC = No connection

FIGURE 1. Terminal connections.

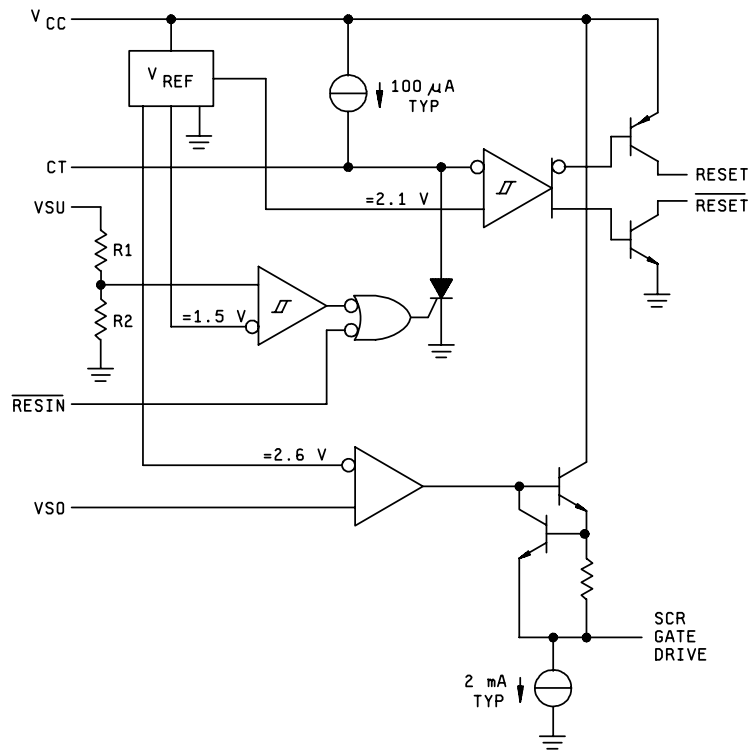
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Input		Output	
VSU	$\overline{\text{RESIN}}$	RESET	$\overline{\text{RESET}}$
X	L	H	L
$< V_{T-}$	H	H	L
$> V_{T+}$	H	L	H

X = Don't care
H = High
L = Low

FIGURE 2. Truth table.

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Device	VSU1		VSU2	
	R1	R2	R1	R2
01	11.66 k Ω	6 k Ω	Short	Open
02	35 k Ω	6 k Ω	Short	Open
03	45 k Ω	6 k Ω	Short	Open

FIGURE 3. Logic diagram.

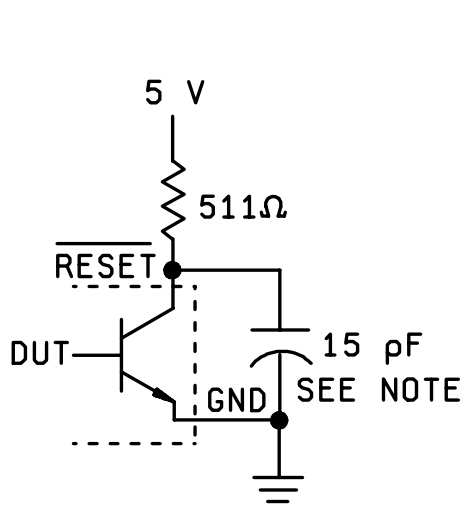
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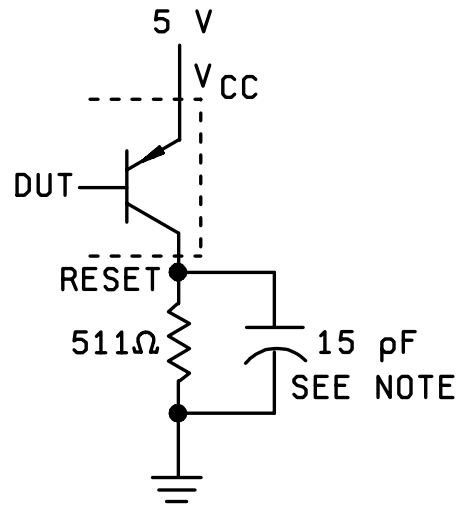
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$\overline{\text{RESET}}$ OUTPUT



RESET OUTPUT

NOTE: Includes jig and probe capacitance.

FIGURE 4. $\overline{\text{RESET}}$ and RESET output test circuits.

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4. QUALITY ASSURANCE PROVISIONS

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 B 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 test method 1015.
 - (2) $T_A = +125^{\circ}\text{C}$, minimum.

- b. Interim and final electrical test parameters shall be as specified in table II 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 test method 1015 of MIL-STD-883.
- b. Interim and final electrical test parameters shall be as specified in table II 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).

4.4.1 Group A inspection.

- a. Tests shall be as specified in table II herein.
- b. Subgroups 4, 5, 6, 10, and 11 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. For device class M, subgroups 7 and 8 tests shall be sufficient to verify the truth table. For device classes Q and V, subgroups 7 and 8 shall include verifying the functionality of the device.

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TABLE II. Electrical test requirements.

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

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

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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 II 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 post irradiation end-point electrical parameter limits as defined in table I at $T_A = +25^{\circ}\text{C} \pm 5^{\circ}\text{C}$, after exposure, to the subgroups specified in table II herein.
- c. When specified in the purchase order or contract, a copy of the RHA delta limits shall be supplied.

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 Defense Supply Center Columbus when a system application requires configuration control and which SMD's are applicable to that system. DSCC 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 DSCC-VA, telephone (614) 692-0544.

6.4 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, 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 DSCC-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 DSCC-VA.

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STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 03-04-14

Approved sources of supply for SMD 5962-90932 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 DSCC-VA. This bulletin is superseded by the next dated revision of MIL-HDBK-103 and QML-38535.

Standard microcircuit drawing PIN <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962-9093201MEA	0C7V7	TL7770-5/MEA
	<u>3/</u>	TL7770-5MJB
5962-9093201M2A	0C7V7	TL7770-5/M2A
	<u>3/</u>	TL7770-5MFKB
5962-9093202MEA	<u>3/</u>	TL7770-12MJB
5962-9093202M2A	<u>3/</u>	TL7770-12MFKB
5962-9093203MEA	<u>3/</u>	TL7770-15MJB
5962-9093203M2A	<u>3/</u>	TL7770-15MFKB

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 approved source of supply.

Vendor CAGE
number

0C7V7

Vendor name
and address

QP Semiconductor
2945 Oakmead Village Court
Santa Clara, CA 95051

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