

REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
C	Redrawn with changes. Table I changes. Delete vendor CAGE 15818. Add vendor CAGE 1ES66 for device types 01, 02, and 03. Add vendor CAGE 60496 for device types 01 through 09. - sbr	92-10-22	M. A. Frye
D	Changes in accordance with NOR 5962-R015-93. - sbr	92-12-04	M. A. Frye
E	Changes in accordance with NOR 5962-R154-94. - drw	93-05-04	M. A. Frye
F	Changes in accordance with NOR 5962-R267-94 - sbr	94-08-29	M. A. Frye
G	Redraw. Incorporate NOR's. Editorial changes throughout. - drw	00-04-12	Raymond Monnin
H	Add device type 10. Add case outline "X". Editorial changes throughout. - drw	03-06-03	Raymond Monnin
J	Change latch-up test limit in table I for device type 10. - drw	03-07-28	Raymond Monnin
K	Redrawn. Update paragraphs to MIL-PRF-38535 requirements. - drw	15-10-15	Charles F. Saffle

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.



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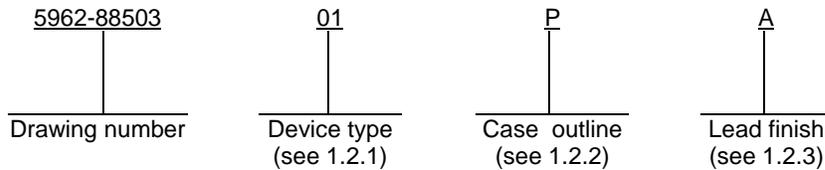
REV STATUS OF SHEETS	REV	K	K	K	K	K	K	K	K	K	K	K	K		
	SHEET	1	2	3	4	5	6	7	8	9	10	11			

PMIC N/A	PREPARED BY Marcia B. Kelleher	DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990 http://www.landandmaritime.dla.mil									
STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY Ray Monnin										
	APPROVED BY D. A. DiCenzo	MICROCIRCUIT, LINEAR, DUAL MOSFET DRIVERS, MONOLITHIC SILICON									
	DRAWING APPROVAL DATE 88-07-25										
	REVISION LEVEL K	SIZE A	CAGE CODE 67268	5962-88503							
		SHEET 1 OF 11									

1. SCOPE

1.1 Scope. This drawing describes device requirements for MIL-STD-883 compliant, non-JAN class level B microcircuits in accordance with MIL-PRF-38535, appendix A.

1.2 Part or Identifying Number (PIN). The complete PIN is as shown in the following example:



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>	<u>Output current</u>
01	TSC426, MIC426	Dual power MOSFET driver	1.5 A dc
02	TSC427, MIC427	Dual power MOSFET driver	1.5 A dc
03	TSC428, MIC428	Dual power MOSFET driver	1.5 A dc
04	MIC4423	Dual high power MOSFET driver	3.0 A dc
05	MIC4424	Dual high power MOSFET driver	3.0 A dc
06	MIC4425	Dual high power MOSFET driver	3.0 A dc
07	MIC4426	Dual power MOSFET driver with latch proof output for inductive loads	1.5 A dc
08	MIC4427	Dual power MOSFET driver with latch proof output for inductive loads	1.5 A dc
09	MIC4428	Dual power MOSFET driver with latch proof output for inductive loads	1.5 A dc
10	AS404	Dual high power MOSFET driver	2.0 A dc

1.2.2 Case outlines. The case outlines are as designated in MIL-STD-1835 as follows:

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
2	CQCC1-N20	20	Square leadless chip carrier
H	GFP1-F10 or CDFP2-F10	10	Flat pack
P	GDIP1-T8 or CDIP2-T8	8	Dual-in-line
X	CDFP3-F10	10	Flat pack

1.2.3 Lead finish. The lead finish is as specified in MIL-PRF-38535, appendix A.

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1.3 Absolute maximum ratings.

Supply voltage (V _S):	
Device types 01 through 03	20 V dc
Device types 04 through 10	22 V dc
Input voltage (V _{IN}):	
Device types 01 through 03	V _S + 0.3 V dc to GND – 0.3 V dc
Device types 04 through 10	V _S + 0.5 V dc to GND – 5.0 V dc
Output current (per pin, capacitance load):	
Device types 01, 02, 03, 07, 08, and 09	1.5 A dc
Device type 10	2.0 A dc
Device types 04, 05, and 06	3.0 A dc
Peak supply current or GND current (per pin)	3.0 A dc
Storage temperature range	-55°C to +150°C
Maximum power dissipation (P _D):	
Case P and X	800 mW <u>1/</u>
Case 2	1.8 W <u>2/</u>
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T _J)	+150°C
Thermal resistance, junction-to-case (θ _{JC})	See MIL-STD-1835

1.4 Recommended operating conditions.

Supply voltage range	4.5 V dc ≤ V _S ≤ 18 V dc
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 cited in the solicitation or contract.

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 <http://quicksearch.dla.mil> or 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.

1/ Derate linearly at 6.4 mW/°C above T_A = +25°C.
2/ Derate linearly at 14.4 mW/°C above T_A = +25°C.

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3. REQUIREMENTS

3.1 Item requirements. The individual item requirements shall be in accordance with MIL-PRF-38535, appendix A for non-JAN class level B devices and as specified herein. Product built to this drawing that is produced by a Qualified Manufacturer Listing (QML) certified and qualified manufacturer or a manufacturer who has been granted transitional certification to MIL-PRF-38535 may be processed as QML product in accordance with the manufacturers approved program plan and qualifying activity approval in accordance with MIL-PRF-38535. This QML flow as documented in the Quality Management (QM) plan may make modifications to the requirements herein. These modifications shall not affect form, fit, or function of the device. These modifications shall not affect the PIN as described herein. A "Q" or "QML" certification mark in accordance with MIL-PRF-38535 is required to identify when the QML flow option is used.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535, appendix A and herein.

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

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

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics 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 described in table I.

3.5 Marking. Marking shall be in accordance with MIL-PRF-38535, appendix A. 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.

3.5.1 Certification/compliance mark. A compliance indicator "C" shall be marked on all non-JAN devices built in compliance to MIL-PRF-38535, appendix A. The compliance indicator "C" shall be replaced with a "Q" or "QML" certification mark in accordance with MIL-PRF-38535 to identify when the QML flow option is used.

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-HDBK-103 (see 6.6 herein). The certificate of compliance submitted to DLA Land and Maritime -VA prior to listing as an approved source of supply shall affirm that the manufacturer's product meets the requirements of MIL-PRF-38535, appendix A and the requirements herein.

3.7 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38535, appendix A shall be provided with each lot of microcircuits delivered to this drawing.

3.8 Notification of change. Notification of change to DLA Land and Maritime -VA shall be required for any change that affects this drawing.

3.9 Verification and review. 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.

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TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C 4.5 V ≤ V _S ≤ 18 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Logic "1" input voltage	V _{IH}		1, 2, 3	All	2.4		V
Logic "0" input voltage	V _{IL}		1, 2, 3	All		0.8	V
Input voltage range	V _{IN} (max)		1, 2, 3	01, 02, 03	0	V _S	V
				04, 05, 06, 07, 08, 09, 10	-5	V _S + 0.5	
Input current	I _{IN}	0 V ≤ V _{IN} ≤ V _S	1	01, 02, 03		±1	μA
			2, 3			±10	
			1	04, 05, 06, 07, 08, 09, 10		±1	
			2, 3			±10	
		-5 V ≤ V _{IN} ≤ 0V	1, 2, 3	04, 05, 06, 07, 08, 09, 10		±10	mA
High output voltage	V _{OH}	R _L = ∞, 1/	1, 2, 3	All	V _S - 25mV		V
Low output voltage	V _{OL}	R _L = ∞, 1/	1, 2, 3	All		25	mV
Output resistance	R _{O1}	Apply V _{IN} to force V _{OUT} high, I _{OUT} = 10 mA, V _S = 18 V	1, 2, 3	01, 02, 03		20	Ω
				04, 05, 06, 10		8	
				07, 08, 09		15	
		R _{O2}	Apply V _{IN} to force V _{OUT} low, I _{OUT} = 10 mA, V _S = 18 V	1, 2, 3	01, 02, 03, 07, 08, 09		15
				04, 05, 06, 10		8	
Power supply current	I _{S1}	V _{IN} = 3.0 V (both inputs)	1	01, 02, 03,		8.0	mA
			2, 3		07, 08, 09		
			1	04, 05, 06, 10			
			2, 3			4.0	
	I _{S2}	V _{IN} = 0.0 V (both inputs)	1	01, 02, 03,		0.4	
			2, 3		07, 08, 09		0.6
			1	04, 05, 06, 10			0.25
			2, 3			0.40	

See footnotes at end of table.

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TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions -55°C ≤ T _A ≤ +125°C 4.5 V ≤ V _S ≤ 18 V unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Latch-up protection	I	2/		04, 05, 06, 07, 08, 09	-500	500	mA
				10	-100	100	
Rise time	t _R	V _S = 18 V 3/, 4/	9, 10, 11	01, 02, 03		60	ns
			9	04, 05, 06,		35	
			10, 11	10		60	
			9	07, 08, 09		30	
			10, 11			40	
Fall time	t _F	V _S = 18 V 3/, 4/	9, 10, 11	01, 02, 03 07, 08, 09		40	ns
			9	04, 05, 06,		35	
			10, 11	10		60	
Delay time	t _{D1}	V _S = 18 V 3/, 4/	9, 10, 11	01, 02, 03		60	ns
			9	04, 05, 06,		75	
			10, 11	10		100	
			9	07, 08, 09		30	
	10, 11				40		
	t _{D2}		9, 10, 11	01, 02, 03		120	
			9	04, 05, 06,		75	
			10, 11	10		100	
			9	07, 08, 09		50	
10, 11				60			

1/ Guaranteed by design.

2/ Tested initially and after any design changes which may affect the performance of the device.

3/ Subgroups 10 and 11 are guaranteed if not tested to the limits as specified in table I herein.

4/ For device types 01, 04, and 07, see figure 2.
 For device types 02, 05, and 08, see figure 3.
 For device types 03, 06, 09, and 10, inverting drivers, see figure 2.
 For device types 03, 06, 09, and 10, noninverting drivers, see figure 3.

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Device types	01, 04, and 07		02, 05, and 08		03, 06, and 09		06	08	10
Case outlines	P	2	P	2	P	2	H	H	X
Terminal number	Terminal symbol		Terminal symbol		Terminal symbol		Terminal symbol		
1	NC	NC	NC	NC	NC	NC	NC	NC	NC
2	IN A	NC	IN A	NC	IN A	NC	IN A	IN A	IN A
3	GND	NC	GND	NC	GND	NC	GND	GND	GND
4	IN B	IN A	IN B	IN A	IN B	IN A	IN B	IN B	IN B
5	OUT B	NC	OUT B	NC	OUT B	NC	NC	NC	NC
6	V _s	GND	V _s	GND	V _s	GND	NC	NC	NC
7	OUT A	NC	OUT A	NC	OUT A	NC	OUT B	OUT B	OUT B
8	NC	IN B	NC	IN B	NC	IN B	V _s	V _s	V _s
9	---	NC	---	NC	---	NC	OUT A	OUT A	OUT A
10	---	NC	---	NC	---	NC	NC	NC	NC
11	---	NC	---	NC	---	NC	---	---	---
12	---	NC	---	NC	---	NC	---	---	---
13	---	NC	---	NC	---	NC	---	---	---
14	---	OUT B	---	OUT B	---	OUT B	---	---	---
15	---	NC	---	NC	---	NC	---	---	---
16	---	V _s	---	V _s	---	V _s	---	---	---
17	---	NC	---	NC	---	NC	---	---	---
18	---	OUT A	---	OUT A	---	OUT A	---	---	---
19	---	NC	---	NC	---	NC	---	---	---
20	---	NC	---	NC	---	NC	---	---	---

NC = No connection

FIGURE 1. Terminal connections.

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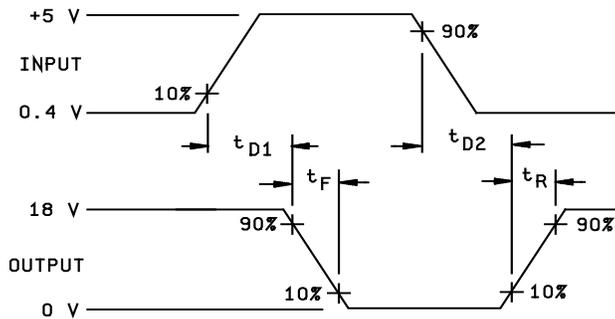
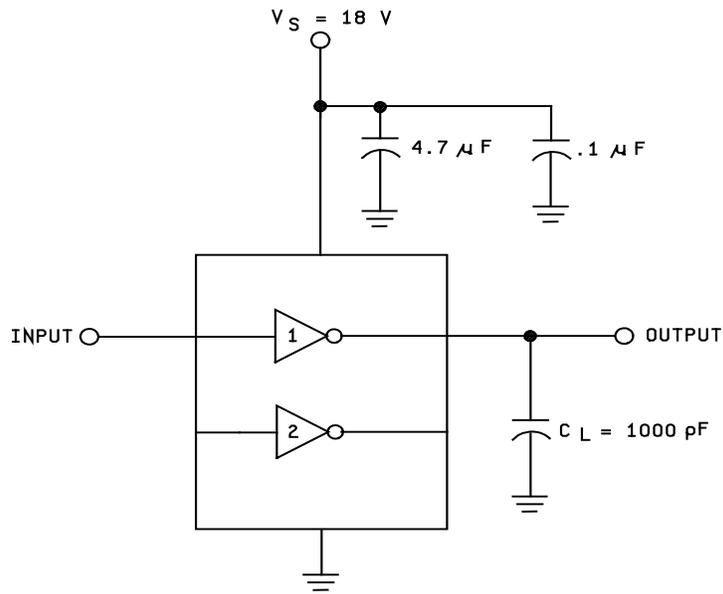


FIGURE 2. Inverting driver switching time.

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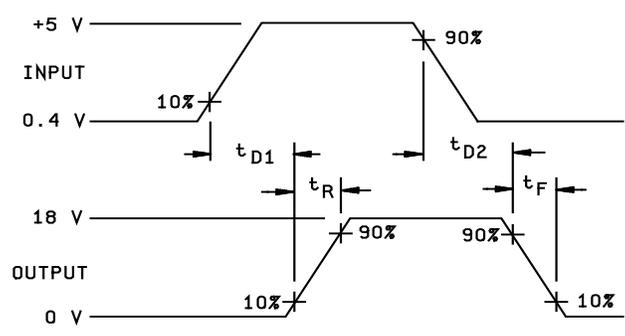
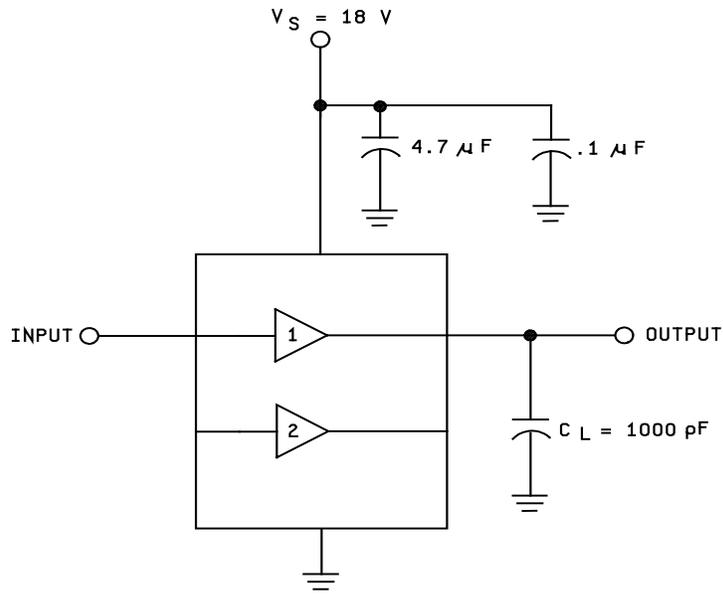


FIGURE 3. Noninverting driver switching time.

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4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38535, appendix A.

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. 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 of MIL-STD-883.

(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.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (in accordance with MIL-STD-883, method 5005, table I)
Interim electrical parameters (method 5004)	---
Final electrical test parameters (method 5004)	1*, 2, 3
Group A test requirements (method 5005)	1, 2, 3, 9, 10**, 11**
Groups C and D end-point electrical parameters (method 5005)	1

* PDA applies to subgroup 1.

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

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 4, 5, 6, 7, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

c. O/V (latch-up) tests shall be measured only for initial qualification and after process or design changes which may affect the performance of the device. Latch-up tests shall be considered destructive. Test all applicable pins on three devices with zero failures.

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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. 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.
 - (2) $T_A = +125^{\circ}\text{C}$, 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-PRF-38535, appendix A.

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.

6.2 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 using DD Form 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform DLA Land and Maritime when a system application requires configuration control and the applicable SMD 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 microelectronics devices (FSC 5962) should contact DLA Land and Maritime-VA, telephone (614) 692-8108.

6.5 Comments. Comments on this drawing should be directed to DLA Land and Maritime-VA, Columbus, Ohio 43218-3990, or telephone (614) 692-0540.

6.6 Approved sources of supply. Approved sources of supply are listed in MIL-HDBK-103 and QML-38535. The vendors listed in MIL-HDBK-103 and QML-38535 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: 15-10-15

Approved sources of supply for SMD 5962-88503 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.landandmaritime.dla.mil/Programs/Smcr/>.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-88503012C	1ES66	TSC426MNP/883B
5962-8850301PA	1ES66	TSC426MJA/883B
	<u>3/</u>	MIC426AJBQ
5962-88503022C	1ES66	TSC427MNP/883B
5962-8850302PA	1ES66	TSC427MJA/883B
	<u>3/</u>	MIC427AJBQ
5962-88503032C	<u>3/</u>	TSC428MNP/883B
5962-8850303PA	1ES66	TSC428MJA/883B
	<u>3/</u>	MIC428AJBQ
5962-88503042A	<u>3/</u>	TSC4423MNP/883
5962-8850304PA	<u>3/</u>	TSC4423MJA/883
	<u>3/</u>	MIC4423AJBQ
5962-88503052A	<u>3/</u>	TSC4424MNP/883
5962-8850305PA	60496	MIC4424AJBQ
	<u>3/</u>	TSC4424MJA/883
5962-88503062A	<u>3/</u>	TSC4425MNP/883
5962-8850306HA	<u>3/</u>	MIC4425AWBQ
5962-8850306PA	<u>3/</u>	MIC4425AJBQ
5962-88503072A	<u>3/</u>	TSC4426MNP/883
5962-8850307PA	60496	MIC4426AJBQ
5962-88503082A	<u>3/</u>	TSC4427MNP/883
5962-8850308HA	<u>3/</u>	MIC4427AWBQ
5962-8850308PA	60496	MIC4427AJBQ
5962-88503092A	<u>3/</u>	TSC4428MNP/883
5962-8850309PA	60496	MIC4428AJBQ
5962-8850310XA	57300	AS404F10

- 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.

STANDARD MICROCIRCUIT DRAWING BULLETIN - continued

DATE: 15-10-15

<u>Vendor CAGE number</u>	<u>Vendor name and address</u>
1ES66	Maxim Integrated 160 Rio Robles San Jose, CA 95134
60496	Micrel, Inc. 1849 Fortune Drive San Jose, CA 95131-1724
57300	Micross Components 7725 N. Orange Blossom Trail Orlando, FL 32810-2696

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