REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add device types 02-08. Table I changes.	94-10-24	M. A. Frye
B	Add case outline X. – drw	99-06-02	Raymond Monnin

THE ORIGINAL FIRST PAGE OF THIS DRAWING HAS BEEN REPLACED.

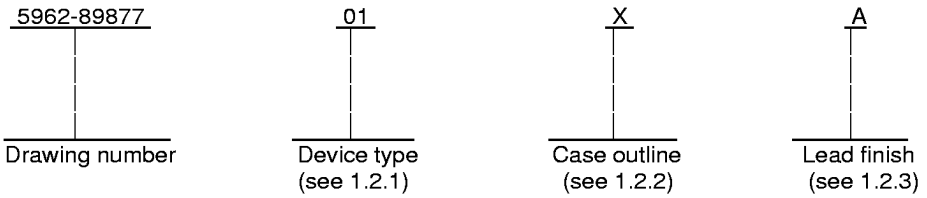
REV																			
SHEET																			
REV																			
SHEET																			
REV STATUS				REV			B	B	B	B	B	B	B	B	B				
OF SHEETS				SHEET			1	2	3	4	5	6	7	8	9				

PMIC N/A	PREPARED BY Rick C. Officer	**DEFENSE SUPPLY CENTER COLUMBUS** **COLUMBUS, OHIO 43216**
STANDARD MICROCIRCUIT DRAWING THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE AMSC N/A	CHECKED BY Charles E. Besore	
	APPROVED BY Michael A. Frye	MICROCIRCUIT, LINEAR, CMOS, DUAL, RS232, TRANSCEIVER, MONOLITHIC SILICON
	DRAWING APPROVAL DATE 90-02-10	
	REVISION LEVEL B	SIZE A CAGE CODE **67268** **5962-89877** SHEET 1 OF 9

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

Device type	Generic number	Circuit function
01	MAX232	Dual CMOS transceivers
02	MAX230	5 CMOS transceivers with power shutdown
03	MAX231	5 V/12 V dual CMOS transceivers
04	MAX234	Quad CMOS transceivers
05	MAX236	CMOS RS-232 4 transmitter, 3 receiver with power shutdown and receiver three state enable
06	MAX237	CMOS RS-232 5 transmitter, 3 receiver
07	MAX238	CMOS RS-232 4 transmitter, 4 receiver
08	MAX239	5 V/12 V CMOS RS-232 3 transmitter, 5 receiver with three state receiver enable

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

Outline letter	Descriptive designator	Terminals	Package style
C	GDIP1-T14 or CDIP-T14	14	Dual-in-line
E	GDIP1-T16 or CDIP-T16	16	Dual-in-line
R	GDIP1-T20 or CDIP-T20	20	Dual-in-line
J	GDIP1-T24 or CDIP-T24	24	Dual-in-line
2	CQCC1-N20	20	Square leadless chip carrier
X	CDFP4-F16	16	Flatpack

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

1.3 Absolute maximum ratings.

Supply voltage (V_{CC})	-0.3 V dc to +6 V dc
Positive power supply voltage (+V)	(V_{CC} - 0.3 V dc) to +14 V dc
Negative power supply voltage (-V)	+0.3 V dc to -14 V dc
Driver input voltage	-0.3 V dc to (V_{CC} + 0.3 V dc)
Receiver input voltage	-30 V dc to +30 V dc
Driver output voltage	(V+ + 0.3 V dc) to (V- - 0.3 V dc)
Receiver output voltage	-0.3 V dc to (V_{CC} + 0.3 V dc)
Short circuit duration, driver outputs	Continuous
Power dissipation at T_A = +70°C (P_D): 1/ 2/	
Case outlines C and 2	727 mW
Case outline E	800 mW
Case outline J	1000 mW
Case outline R	889 mW
Thermal resistance, junction-to-case (θ_{JC})	See MIL-STD-1835
Thermal resistance, junction-to-ambient (θ_{JA}):	
Case outlines C and 2	110°C/W
Case outline E	100°C/W
Case outline J	80°C/W
Case outline R	90°C/W
Maximum junction temperature (T_J)	+150°C
Storage temperature range	-65°C to +160°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
Ambient operating temperature range (T_A)	-55°C to +125°C
Maximum receiver output enable time 3/	400 ns
Maximum receiver output disable time 3/	250 ns

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-973 - Configuration Management.
MIL-STD-1835 - Interface Standard For Microcircuit Case Outlines.

1/ Must withstand the added P_D due to short circuit test (e.g., I_{OS}).
2/ Above T_A = +70°C, cases C and 2 derate at 9.09 mW/°C, case E derates at 10 mW/°C, case R derates at 11.11 mW/°C, and case J derates at 12.5 mW/°C.
3/ These typical values for device types 05 and 08 only.

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 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 as listed in MIL-HDBK-103 (see 6.6 herein). 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.

3.6 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 DSCC-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 DSCC-VA shall be required in accordance with MIL-PRF-38535, appendix A.

3.9 Verification and review. 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage swing	V_{OUT}	All transmitter outputs loaded with 3 kΩ to GND	1, 2, 3	All	-5.0	+5.0	V
V_{CC} power supply current	I_{CC}	No load	1	01		10	mA
		No load		02,04 05,06 07		15	
		No load		03,08		1	
V+ power supply current	I+	No load	1	03		5	
		No load		08		15	
Shutdown supply current	I_{SHDN}		1	02,05		10	µA
RS-232 TRANSMITTERS							
Low level input voltage	V_{IL}	T_{IN}	1, 2, 3	All		0.8	V
		$\overline{EN}$		05,08		0.8	
		SHDN		02,05		0.8	
High level input voltage	V_{IH}	T_{IN}	1, 2, 3	All	2.0		
		$\overline{EN}$		05,08	2.4		
		SHDN		02,05	2.4		
Logic pullup current low	I_{IL}	T_{IN} = 0 V	1, 2, 3	All		200	µA
Output short circuit current	I_{OST}	V_{OUT} = 0 V Sourcing current V_{OUT} = 0 V Sinking current	1	01		±25	mA
				02,03 04,05 06,07 08		±45	
Transmitter output resistance	R_{TOUT}	V_{CC} = V+ = V- = 0 V V_{OUT} = ±2 V	1, 2, 3	All	300		Ω

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions $-55°C \le T_A \le +125°C$ unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
RS-232 RECEIVERS							
Receiver input voltage operating range	V_R		1, 2, 3	01,03 05,06 07,08	-30	+30	V
RS-232 input threshold low	V_{TL}	Normal operation V_{CC} = 5 V	1	01,03 05,06 07,08	0.8		V
			2, 3		0.4		
RS-232 input threshold high	V_{TH}		1			2.4	
			2, 3			3.0	
RS-232 input hysteresis	V_H	V_{CC} = 5 V	1, 2, 3	01,03 05,06 07,08	0.2	1.0	
Receiver input resistance	R_I	V_{CC} = 5 V, T_A = +25°C	1	01,03 05,06 07,08	3.0	7.0	kΩ
Receiver output high voltage	V_{OH}	I_{OUT} = -1.0 mA	1, 2, 3	01,03 05,06 07,08	3.5		V
Receiver output low voltage	V_{OL}	I_{OUT} = 3.2 mA	1, 2, 3	01,03		0.4	
		I_{OUT} = 1.6 mA		05,06 07,08		0.4	
TTL/CMOS output leakage current	I_L	$0 V \le R_{OUT} \le V_{CC}$, $\overline{EN} = V_{CC}$	1, 2, 3	05,08		±10	µA
AC TESTS							
Propagation delay time	t_P	RS-232 IN to TTL/CMOS OUT C_L = 150 pF	9, 10, 11	01,03 05,06 07,08		+10	µs
Transition region slew rate	t_{SR}	C_L = 50 pF to 2500 pF R_L = 3 kΩ - 7 kΩ V_{CC} = +5 V Measure from +3.0 V to -3.0 V or -3.0 V to +3.0 V	9	02,04 05,06 07,08	3.0	30	V/µs
				01,03	1.5	30	

1/ V_{CC} = +5 V ±10% for device types 01, 02, 04, 05, 06, and 07. V_{CC} = +5 V ±10%, V+ = 9.0 V to 13.2 V for device types 03 and 08.

Device type	01		02	03	04	05	06	07	08
Case outlines	E, X	2	R	C	E	J	J	J	J
Terminal number	Terminal symbol								
1	+C1	NC	$T3_{OUT}$	+C	$T1_{OUT}$	$T3_{OUT}$	$T3_{OUT}$	$T2_{OUT}$	$R1_{OUT}$
2	+V	+C1	$T1_{OUT}$	-C	$T2_{OUT}$	$T1_{OUT}$	$T1_{OUT}$	$T1_{OUT}$	$R1_{IN}$
3	-C1	+V	$T2_{OUT}$	-V	$T2_{IN}$	$T2_{OUT}$	$T2_{OUT}$	$R2_{IN}$	GND
4	+C2	-C1	$T2_{IN}$	$T2_{OUT}$	$T1_{IN}$	$R1_{IN}$	$R1_{IN}$	$R2_{OUT}$	V_{CC}
5	-C2	+C2	$T1_{IN}$	$R2_{IN}$	GND	$R1_{OUT}$	$R1_{OUT}$	$T1_{IN}$	+V
6	-V	NC	GND	$R2_{OUT}$	V_{CC}	$T2_{IN}$	$T2_{IN}$	$R1_{OUT}$	+C
7	$T2_{OUT}$	-C2	V_{CC}	$T2_{IN}$	+C1	$T1_{IN}$	$T1_{IN}$	$R1_{IN}$	-C
8	$R2_{IN}$	-V	+C1	$T1_{IN}$	+V	GND	GND	GND	-V
9	$R2_{OUT}$	$T2_{OUT}$	+V	$R1_{OUT}$	-C1	V_{CC}	V_{CC}	V_{CC}	$R5_{IN}$
10	$T2_{IN}$	$R2_{IN}$	-C1	$R1_{IN}$	+C2	+C1	+C1	+C1	$R5_{OUT}$
11	$T1_{IN}$	NC	+C2	$T1_{OUT}$	-C2	+V	+V	+V	$R4_{OUT}$
12	$R1_{OUT}$	$R2_{OUT}$	-C2	GND	-V	-C1	-C1	-C1	$R4_{IN}$
13	$R1_{IN}$	$T2_{IN}$	-V	V_{CC}	$T3_{IN}$	+C2	+C2	+C2	$T3_{OUT}$
14	$T1_{OUT}$	$T1_{IN}$	$T3_{IN}$	+V	$T4_{IN}$	-C2	-C2	-C2	$\overline{EN}$
15	GND	$R1_{OUT}$	$T4_{IN}$	---	$T4_{OUT}$	-V	-V	-V	NC
16	V_{CC}	NC	$T5_{OUT}$	---	$T3_{OUT}$	$R3_{IN}$	$R3_{IN}$	$R4_{IN}$	$T3_{IN}$
17	---	$R1_{IN}$	SHDN	---	---	$R3_{OUT}$	$R3_{OUT}$	$R4_{OUT}$	$R3_{OUT}$
18	---	$T1_{OUT}$	NC	---	---	$T3_{IN}$	$T3_{IN}$	$T2_{IN}$	$R3_{IN}$
19	---	GND	$T5_{IN}$	---	---	$T4_{IN}$	$T4_{IN}$	$T3_{IN}$	$T1_{OUT}$
20	---	V_{CC}	$T4_{OUT}$	---	---	$\overline{EN}$	$T5_{OUT}$	$T4_{OUT}$	$T2_{OUT}$
21	---	---	---	---	---	SHDN	$T5_{IN}$	$T4_{IN}$	$R2_{IN}$
22	---	---	---	---	---	$R2_{OUT}$	$R2_{OUT}$	$R3_{OUT}$	$R2_{OUT}$
23	---	---	---	---	---	$R2_{IN}$	$R2_{IN}$	$R3_{IN}$	$T2_{IN}$
24	---	---	---	---	---	$T4_{OUT}$	$T4_{OUT}$	$T3_{OUT}$	$T1_{IN}$

FIGURE 1. Terminal connections.

4. QUALITY ASSURANCE PROVISIONS

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 test method 1015 of MIL-STD-883.

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

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 test method 1005 of MIL-STD-883.

(2) T_A = +125°C, minimum.

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

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)	1
Final electrical test parameters (method 5004)	1*, 2, 3, 9, 10, 11
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.

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 in accordance with MIL-STD-973 using DDForm 1692, Engineering Change Proposal.

6.4 Record of users. Military and industrial users shall inform Defense Supply Center Columbus when a system application requires configuration control and the applicable SMD. 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 microelectronics devices (FSC 5962) should contact DSCC-VA, telephone (614) 692-0525.

6.5 Comments. Comments on this drawing should be directed to DSCC-VA, Columbus, Ohio 43216-5000, or telephone (614) 692-0674.

6.6 Approved sources of supply. Approved sources of supply 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.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 99-06-02

Approved sources of supply for SMD 5962-89877 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 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-8987701XA	0EU86	AS232F16/883C
5962-8987701EA	1ES66	MAX232MJE/883B
5962-89877012C	1ES66	MAX232MLP/883B
5962-8987702RA	1ES66	MAX230MJP/883B
5962-8987703CA	1ES66	MAX231MJD/883B
5962-8987704EA	1ES66	MAX234MJE/883B
5962-8987705JA	1ES66	MAX236MRG/883B
5962-8987706JA	1ES66	MAX237MRG/883B
5962-8987707JA	1ES66	MAX238MRG/883B
5962-8987708JA	1ES66	MAX239MRG/883B

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.

Vendor CAGE number	Vendor name and address
1ES66	Maxim Integrated Products, Inc. 120 San Gabriel Dr. Sunnyvale, CA 94086
0EU86	Austin Semiconductor, Inc, 8701 Cross Park Dr. Austin, TX 78754-4566