REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Add outline letter "H". Power dissipation = 935 mW, derate at 6.6 mW/°C above T_A = +25°C. Lead temperature for outline letter H with soldering at 10 seconds is +265°C. Add case outline H terminal connections to figure 1. Changes in accordance with N.O.R. 5962-R001-92.	91-10-08	M. A. Frye
B	Table I. Input resistance test, R_{IN}; add test conditions "Untested input = 0 V, V_I = 12 V and -7 V, guaranteed by "line input current"." Changes in accordance with N.O.R. 5962-R222-94.	94-06-29	M. A. Frye
C	Add case outline X. Change format for device classes Q and V. Changes to 1.3, 1.4, and table I. Redrawn. - drw	98-07-09	R. Monnin
D	Add radiation hardened information. - drw	99-02-01	R. Monnin
E	Make change to 3.2.4. Delete figure 1 and figure 4. Add new footnote five to table I. - ro	01-04-20	R. Monnin
F	Add paragraph 3.1.1 and Appendix A for microcircuit die. Delete footnote 3/ from paragraph 1.5 and footnote 2/ from Table I. Delete paragraphs 4.4.4.1.1 and 4.4.4.2. - ro	11-03-22	C. Saffle
G	Redrawn. Update paragraphs to MIL-PRF-38535 requirements. - drw	18-02-26	Charles F. Saffle
H	Update document paragraphs to current requirements. - ro	23-05-04	J. Eschmeyer

THE ORIGINAL FIRST SHEET OF THIS DRAWING HAS BEEN REPLACED.

Revision Status of Sheets																							
REV	H	H																					
SHEET	23	24																					
REV	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H
SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

PMIC N/A

STANDARD MICROCIRCUIT DRAWING

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

PREPARED BY
Rick C. Officer

CHECKED BY
Charles E. Besore

APPROVED BY
Michael A. Frye

DRAWING APPROVAL DATE
90-10-18

DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990
https://www.dla.mil/LandandMaritime

MICROCIRCUIT, LINEAR, RS-485 DIFFERENTIAL BUS TRANSCEIVER, MONOLITHIC SILICON

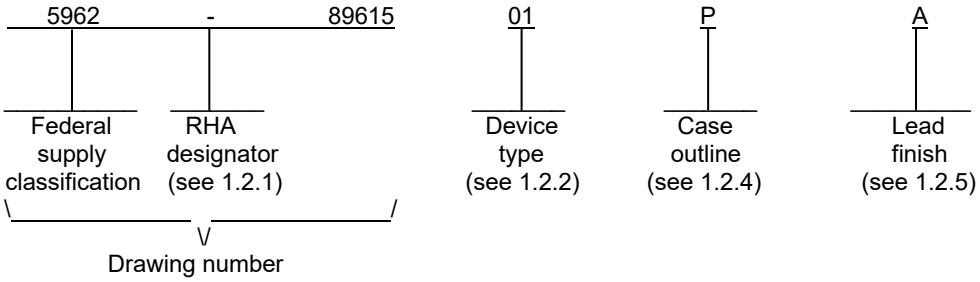
AMSC N/A	REVISION LEVEL H	SIZE A	CAGE CODE **67268**	**5962-89615**
		SHEET	1 OF 24	

1. SCOPE

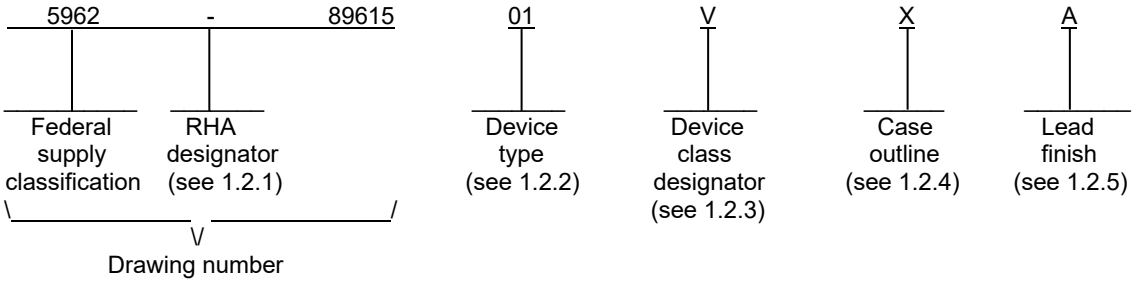
1.1 Scope. This drawing documents two product assurance class levels consisting of high reliability (device class Q and M) and space application (device class V). A choice of case outlines and lead finishes are available and are reflected in the Part or Identifying Number (PIN). When available, a choice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

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

For device classes M and Q:



For device class V:



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

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

Device type	Generic number	Circuit function
01	DS16F95	RS-485 differential bus transceiver

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

Device class	Device requirements documentation
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 outlines. The case outlines are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
H	GDFP1-F10 or CDFP2-F10	10	Flat pack
P	GDIP1-T8 or CDIP2-T8	8	Dual-in-line
X	GDFP1-G10	10	Flat pack with gullwing leads
2	CQCC1-N20	20	Square leadless chip carrier

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.

1.3 Absolute maximum ratings. 1/

Supply voltage (V_{CC}) ..... +7.0 V dc
Differential input voltage ..... -10 V/+15 V dc
Enable input voltage ..... 5.5 V dc
Lead temperature:
  Case P (soldering, 60 seconds) ..... +300°C
  Case 2, H and X (soldering, 10 seconds) ..... +260°C
Storage temperature ..... -65°C to +175°C
Junction temperature (T_J) ..... +175°C
Power dissipation (P_D): 2/
  Case P ..... 1274 mW
  Case 2 ..... 1800 mW
  Case H and X ..... 725 mW
Thermal resistance, junction-to-case (θ_{JC}):
  Case P ..... 14°C/W
  Case 2 ..... 17°C/W
  Case H and X ..... 18°C/W
Thermal resistance, junction-to-ambient (θ_{JA}):
  Case P at 1 W ..... 118°C/W
  Case 2 ..... 83°C/W
  Case H and X at 0.5 W ..... 207°C/W

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
Voltage at any bus terminal:
  (separately or common mode, V_I or V_{CM}) ..... -7.0 V to +12 V dc
Differential input voltage (V_{ID}) ..... -7.0 V to +12 V dc
Output current HIGH (I_{OH}) :
  Driver ..... -60 mA
  Receiver ..... -400 μA
Output current LOW (I_{OL}) :
  Driver ..... 60 mA
  Receiver ..... 16 mA

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/ Must withstand the added P_D due to short circuit test, e.g., I_{OS}. Derate above T_A = +25°C, 8.5 mW/°C for case P, 12.1 mW/°C for case 2, 4.8 mW/°C for cases H and X.

1.5 Radiation features.

Maximum total dose available (dose rate = 50 - 300 rads (Si)/s) ..... 300 krads(Si)

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 https://quicksearch.dla.mil/.)

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.

3.1.1 Microcircuit die. For the requirements of microcircuit die, see appendix A to this document.

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 tables. The truth tables shall be as specified on figure 2.

3.2.4 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 and acquiring activity upon request.

3.3 Electrical performance characteristics and postirradiation parameter limits. Unless otherwise specified herein, the electrical performance characteristics and postirradiation 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.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5.5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Electrical characteristics for driver.						
Differential output voltage	V_{OD1}	V_{CC} = 5.5 V, I_O = 0 A, V_{IN} = 0.8 V	1, 2, 3		6	V
		M, D, P, L, R, F, V_{CC} = 5.5 V, I_O = 0 A, V_{IN} = 0.8 V	1		6	
		V_{CC} = 5.5 V, I_O = 0 A, V_{IN} = 2.0 V	1, 2, 3		6	
		M, D, P, L, R, F, V_{CC} = 5.5 V, I_O = 0 A, V_{IN} = 2.0 V	1		6	
	V_{OD2}	V_{CC} = 4.5 V, R_L = 100Ω	1, 2, 3	2		
		M, D, P, L, R, F, V_{CC} = 4.5 V, R_L = 100Ω	1	2		
		V_{CC} = 4.5 V, R_L = 54Ω	1, 2, 3	1.5		
		M, D, P, L, R, F, V_{CC} = 4.5 V, R_L = 54Ω	1	1.5		
	V_{OD3}	V_{CC} = -7 V to 12 V	1, 2, 3	1		
		M, D, P, L, R, F, V_{CC} = -7 V to 12 V	1	1		
Change in differential 2/ output voltage	ΔV_{OD}	V_{CC} = 4.5 V, R_L = 100Ω	1, 2, 3		±200	mV
		M, D, P, L, R, F, V_{CC} = 4.5 V, R_L = 100Ω	1		±200	
		V_{CC} = 4.5 V, R_L = 54Ω	1,2,3		±200	
		M, D, P, L, R, F V_{CC} = 4.5 V, R_L = 54Ω	1		±200	
Change in common 2/ mode output voltage	ΔV_{OC}	V_{CC} = 4.5 V, R_L = 100Ω	1, 2, 3		±200	mV
		M, D, P, L, R, F, V_{CC} = 4.5 V, R_L = 100Ω	1		±200	
		V_{CC} = 4.5 V, R_L = 54Ω	1, 2, 3		±200	
		M, D, P, L, R, F, V_{CC} = 4.5 V, R_L = 54Ω	1		±200	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5.5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Electrical characteristics for driver - continued.						
Common mode output voltage	V_{OC}	R_L = 100Ω	1, 2, 3		3	V
		M, D, P, L, R, F, R_L = 100Ω	1		3	
		R_L = 54Ω	1, 2, 3		3	
		M, D, P, L, R, F, R_L = 54Ω	1		3	
Logical "1" input current	I_{IH}	V_I = 2.4 V	1, 2, 3		20	µA
		M, D, P, L, R, F, V_I = 2.4 V	1		20	
Output current	I_O	Output disable, V_{OUT} = 12 V	1, 2, 3		1	mA
		M, D, P, L, R, F, Output disable, V_{OUT} = 12 V	1		1	
		Output disable, V_{OUT} = 12 V, V_{CC} = 0 V	1, 2, 3		1	
		M, D, P, L, R, F, Output disable, V_{OUT} = 12 V, V_{CC} = 0 V	1		1	
		Output disable, V_{OUT} = -7 V 3/	1, 2, 3		-0.8	
		M, D, P, L, R, F, Output disable, V_{OUT} = -7 V 3/	1		-0.8	
		Output disable, V_{OUT} = -7 V, V_{CC} = 0 V	1,2,3		-0.8	
		M, D, P, L, R, F, Output disable, V_{OUT} = -7 V, V_{CC} = 0 V	1		-0.8	
Output short circuit current	I_{OS}	V_{IN} = 3 V, V_{OUT} = V_{CC}	1, 2, 3		150	mA
		M, D, P, L, R, F, V_{IN} = 3 V, V_{OUT} = V_{CC}	1		150	
		V_{IN} = 0 V, V_{OUT} = V_{CC}	1,2,3		150	
		M, D, P, L, R, F, V_{IN} = 0 V, V_{OUT} = V_{CC}	1		150	
		V_{IN} = 3 V, V_{OUT} = -7 V 3/	1, 2, 3		-250	
		M, D, P, L, R, F, V_{IN} = 3 V, V_{OUT} = -7 V 3/	1		-250	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5.5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Electrical characteristics for driver - continued.						
Output short circuit current	I_{OS}	V_{IN} = 0 V, V_{OUT} = -7 V 3/	1, 2, 3		-250	mA
		M, D, P, L, R, F, V_{IN} = 0 V, V_{OUT} = -7 V 3/	1		-250	
		V_{IN} = 3 V, V_{OUT} = 0 V 3/	1, 2, 3		-150	
		M, D, P, L, R, F, V_{IN} = 3 V, V_{OUT} = 0 V 3/	1		-150	
		V_{IN} = 0 V, V_{OUT} = 0 V 3/	1, 2, 3		-150	
		M, D, P, L, R, F, V_{IN} = 0 V, V_{OUT} = 0 V 3/	1		-150	
		V_{IN} = 0 V, V_{OUT} = 12 V	1, 2, 3		250	
		M, D, P, L, R, F, V_{IN} = 0 V, V_{OUT} = 12 V	1		250	
		V_{IN} = 3 V, V_{OUT} = 12 V	1, 2, 3		250	
		M, D, P, L, R, F, V_{IN} = 3 V, V_{OUT} = 12 V	1		250	
Logical "1" output voltage	V_{OH}	V_{CC} = 4.5 V, I_O = -20 mA	1, 2, 3	3		V
		M, D, P, L, R, F, V_{CC} = 4.5 V, I_O = -20 mA	1	3		
Logical "0" output voltage	V_{OL}	V_{CC} = 4.5 V, I_O = 20 mA	1, 2, 3		2	V
		M, D, P, L, R, F, V_{CC} = 4.5 V, I_O = 20 mA	1		2	
Electrical characteristics for receiver.						
Logical "1" output voltage	V_{OH}	V_{CC} = 4.5 V, V_{id} = 200 mV, I_{OH} = -400 µA	1, 2, 3	2.5		V
		M, D, P, L, R, F	1	2.5		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5.5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Electrical characteristics for receiver - continued.						
Logical "0" output voltage	V_{OL}	V_{CC} = 4.5 V, V_{id} = -200 mV, I_{OL} = 8 mA	1, 2, 3		0.45	V
		M, D, P, L, R, F, V_{CC} = 4.5 V, V_{id} = -200 mV, I_{OL} = 8 mA	1		0.45	
		V_{CC} = 4.5 V, V_{id} = -200 mV, I_{OL} = 16 mA	1, 2, 3		0.5	
		M, D, P, L, R, F, V_{CC} = 4.5 V, V_{id} = -200 mV, I_{OL} = 16 mA	1		0.5	
Line input current	I_I	Untested input = 0 V, V_I = 12 V	1, 2, 3		1	mA
		M, D, P, L, R, F, Untested input = 0 V, V_I = 12 V	1		1	
		Untested input = 0 V, V_I = 12 V, V_{CC} = 0 V	1, 2, 3		1	
		M, D, P, L, R, F, Untested input = 0 V, V_I = 12 V, V_{CC} = 0 V	1		1	
		Untested input = 0 V, V_I = -7 V 3/	1, 2, 3	-0.8		
		M, D, P, L, R, F, Untested input = 0 V, V_I = -7 V 3/	1	-0.8		
		Untested input = 0 V, V_I = -7 V, 3/ V_{CC} = 0 V	1, 2, 3	-0.8		
		M, D, P, L, R, F, Untested input = 0 V, V_I = -7 V, 3/ V_{CC} = 0 V	1	-0.8		
Logical "1" input current	I_{IH}	V_I = 2.7 V (receiver)	1, 2, 3		20	µA
		M, D, P, L, R, F, V_I = 2.7 V (receiver)	1		20	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5.5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Electrical characteristics for receiver - continued.						
Input resistance	R_{IN}	V_{CC} = 0 V and 5.5 V, untested input = 0 V, V_I = 12 V and -7 V, guaranteed by line input current	1, 2, 3	10		kΩ
		M, D, P, L, R, F, V_{CC} = 0 V and 5.5 V, untested input = 0 V, V_I = 12 V and -7 V, guaranteed by line input current	1	10		
High impedance state output current	I_{OZ}	V_{OUT} = 0.4 V to 2.4 V	1, 2, 3		±20	µA
		M, D, P, L, R, F, V_{OUT} = 0.4 V to 2.4 V	1		±20	
Output short circuit current	I_{OS}	V_{IN} = 1 V, V_{OUT} = 0 V	1, 2, 3	-85	-15	mA
		M, D, P, L, R, F, V_{IN} = 1 V, V_{OUT} = 0 V	1	-85	-15	
Differential input high threshold voltage	V_{TH}	V_{CC} = 4.5 V, V_{OUT} = 2.5 V, I_O = -0.4 mA, V_{CM} = 12 V, 0 V, and -7 V	1, 2, 3		0.2	V
		M, D, P, L, R, F, V_{CC} = 4.5 V, V_{OUT} = 2.5 V, I_O = -0.4 mA, V_{CM} = 12 V, 0 V, and -7 V	1		0.2	
		V_{CC} = 5.5 V, V_{OUT} = 2.5 V, I_O = -0.4 mA, V_{CM} = 12 V, 0 V, and -7 V	1, 2, 3		0.2	
		M, D, P, L, R, F, V_{CC} = 5.5 V, V_{OUT} = 2.5 V, I_O = -0.4 mA, V_{CM} = 12 V, 0 V, and -7 V	1		0.2	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Electrical characteristics for receiver - continued.						
Differential input low threshold voltage	V_{TL}	V_{CC} = 4.5 V, V_{OUT} = 0.5 V, I_O = 8 mA, V_{CM} = 12 V, 0 V, and –7 V	1, 2, 3	-0.2		V
		M, D, P, L, R, F, V_{CC} = 4.5 V, V_{OUT} = 0.5 V, I_O = 8 mA, V_{CM} = 12 V, 0 V, and –7 V	1	-0.2		
		V_{CC} = 5.5 V, V_{OUT} = 0.5 V, I_O = 8 mA, V_{CM} = 12 V, 0 V, and –7 V	1, 2, 3	-0.2		
		M, D, P, L, R, F, V_{CC} = 5.5 V, V_{OUT} = 0.5 V, I_O = 8 mA, V_{CM} = 12 V, 0 V, and –7 V	1	-0.2		
Hysteresis	V_{TH+} - (V_{TH-})	V_{CC} = 4.5 V, V_{CM} = 0 V	1, 2, 3	35		mV
		M, D, P, L, R, F, V_{CC} = 4.5 V, V_{CM} = 0 V	1	35		
		V_{CC} = 5.5 V, V_{CM} = 0 V	1, 2, 3	35		
		M, D, P, L, R, F, V_{CC} = 5.5 V, V_{CM} = 0 V	1	35		
Electrical characteristics for both driver and receiver.						
Supply current I_{CC} both disable	I_{CC}	$\overline{RE}$ = 2 V, DE = 0.8 V	1, 2, 3		25	mA
		M, D, P, L, R, F, $\overline{RE}$ = 2 V, DE = 0.8 V	1		25	
Supply current I_{CC} both enable	I_{CC}	$\overline{RE}$ = 0.8 V, DE = 2 V	1, 2, 3		28	mA
		M, D, P, L, R, F, $\overline{RE}$ = 0.8 V, DE = 2 V	1		28	
Input clamp voltage	V_{IC}	I_I = -18 mA	1, 2, 3		-1.3	V
		M, D, P, L, R, F, I_I = -18 mA	1		-1.3	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Electrical characteristics for both driver and receiver – continued.						
Logical "1" input voltage	V_{IH}		1, 2, 3	2		V
		M, D, P, L, R, F	1	2		
Logical “0” input voltage	V_{IL}		1, 2, 3		0.8	V
		M, D, P, L, R, F	1		0.8	
Logical "1" enable input voltage	V_{IH}		1, 2, 3	2		V
		M, D, P, L, R, F	1	2		
Logical “0” enable input voltage	V_{IL}		1, 2, 3		0.8	V
		M, D, P, L, R, F	1		0.8	
Logical “0” input current	I_{IL}	V_I = 0.4 V 3/	1, 2, 3		-50	µA
		M, D, P, L, R, F, V_I = 0.4 V 3/	1		-50	
Timing characteristics of driver. 4/						
Differential output delay time	t_{dd}	R_L = 60Ω 5/	9	8	25	ns
			10, 11	8	30	
Differential output transition time	t_{TD}	R_L = 60Ω 5/, 6/	9	8	25	ns
			10, 11	8	30	
Propagation delay time low to high	t_{PLH}	R_L = 27Ω	9	6	18	ns
			10, 11	6	25	
Propagation delay time high to low	t_{PHL}	R_L = 27Ω	9	6	18	ns
			10, 11	6	25	
Output enable time to high	t_{PZH}	R_L = 110Ω	9		35	ns
			10, 11		45	
Output enable time to low	t_{PZL}	R_L = 110Ω	9		40	ns
			10, 11		50	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

Test	Symbol	Conditions 1/ $-55°C \le T_A \le +125°C$ V_{CC} = 5 V unless otherwise specified	Group A subgroups	Limits		Unit
				Min	Max	
Timing characteristics of driver - continued. 4/						
Output disable time from high	t_{PHZ}	R_L = 110Ω	9		30	ns
			10, 11		40	
Output disable time from low	t_{PLZ}	R_L = 110Ω	9		30	ns
			10, 11		40	
Differential output skew time	t_{skew}		9		6	ns
			10, 11		12	
Timing characteristics of receiver. 4/						
Propagation delay time low to high	t_{PLH}	C_L = 15 pF	9	10	27	ns
			10, 11	10	38	
Propagation delay time high to low	t_{PHL}	C_L = 15 pF	9	10	27	ns
			10, 11	10	38	
Output enable time to high	t_{PZH}	C_L = 15 pF	9		20	ns
			10,11		30	
Output enable time to low	t_{PZL}	C_L = 15 pF	9		20	ns
			10, 11		30	
Output to output delay time	t_{PLH} - t_{PHL}		9		8	ns
			10, 11		16	
Output disable time from high	t_{PHZ}	C_L = 20 pF	9		30	ns
			10, 11		40	
		C_L = 5 pF 7/	9		20	
			10, 11		30	
Output disable time from low	t_{PLZ}	C_L = 5 pF	9		20	ns
			10, 11		30	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - continued.

1/ Devices supplied to this drawing will meet all levels M, D, P, L, R, F of irradiation. However, this device is only tested at the 'F' level. Pre and post irradiation values are identical unless otherwise specified in table I. When performing post irradiation electrical measurements for any RHA level, T_A = +25°C.

2/ ΔV_{OD} and ΔV_{OC} are the changes in magnitude of V_{OD} and V_{OC}.

3/ Negative sign of the limits indicates the direction of the current flow only.

4/ Unless otherwise specified, P_{RR} = 1 MHz, $T_r \leq T_f \leq 6$ ns, V_{LO} = 0 V, Z_{OUT} = 50Ω, AMP = 3 V, and 50 % duty cycle.

5/ Rise time 20 percent to 80 percent, fall time 80 percent to 20 percent.

6/ t_{TD} = (noninverting output rise time + inverting output fall time) / 2,
(noninverting output fall time + inverting output rise time) / 2.

7/ Tested at 20 pF, guaranteed at 5 pF.

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 53 (see MIL-PRF-38535, appendix A).

Device type	01		
Case outlines	H and X	P	2
Terminal number	Terminal number		
1	R	R	NC
2	$\overline{RE}$	$\overline{RE}$	R
3	DE	DE	NC
4	D	D	NC
5	GND	GND	$\overline{RE}$
6	A IN/OUT BUS PORT	A IN/OUT BUS PORT	NC
7	B IN/OUT BUS PORT	B IN/OUT BUS PORT	DE
8	NC	V_{CC}	NC
9	NC	---	NC
10	V_{CC}	---	D
11	---	---	NC
12	---	---	GND
13	---	---	NC
14	---	---	NC
15	---	---	A IN/OUT BUS PORT
16	---	---	NC
17	---	---	B IN/OUT BUS PORT
18	---	---	NC
19	---	---	NC
20	---	---	V_{CC}

NC = No connection

FIGURE 1. Terminal connections.

Differential input	Enable	Outputs	
D	DE	A	B
H	H	H	L
L	H	L	H
X	L	Z	Z

Differential inputs A - B	Enable $\overline{RE}$	Output R
$V_{ID} \geq 0.2$ V	L	H
$V_{ID} \leq -0.2$ V	L	L
X	H	Z

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

FIGURE 2. Truth tables.

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 C. 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°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 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. 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, 7, and 8 in table I, method 5005 of MIL-STD-883 shall be omitted.

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 1/	1, 2, 3 1/	1, 2, 3 1/
Group A test requirements (see 4.4)	1, 2, 3, 9, 10, 11	1, 2, 3, 9, 10, 11	1, 2, 3, 9, 10, 11
Group C end-point electrical parameters (see 4.4)	1, 2, 3	1, 2, 3	1, 2, 3
Group D end-point electrical parameters (see 4.4)	1, 2, 3	1, 2, 3	1, 2, 3
Group E end-point electrical parameters (see 4.4)	1	1	1

1/ PDA applies to subgroup 1.

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 C. 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°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 II 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 II herein.

b. For device classes Q and V, the devices or test vehicle shall be subjected to radiation hardness assured tests as specifiedin 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 I at T_A = +25°C ±5°C, after exposure, to the subgroups specified in table II herein.

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.

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.

6.2 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, or email communication.

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) 692-8108.

6.4 Comments. Comments on this drawing should be directed to DLA Land and Maritime-VA, Columbus, Ohio 43218-3990, or telephone (614) 692-0591.

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 MIL-HDBK-103 and QML-38535. The vendors listed in MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see 3.6 herein) to DLA Land and Maritime-VA and have agreed to this drawing.

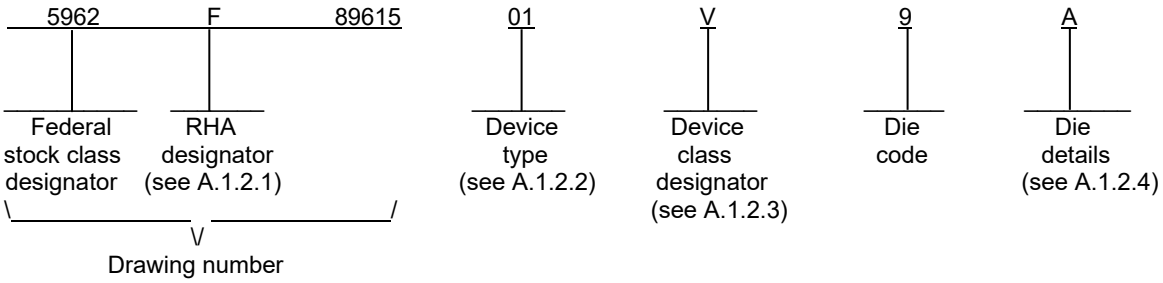
6.6.2 Approved sources of supply for device class M. Approved sources of supply for class M are listed in MIL-HDBK-103. The vendors listed in MIL-HDBK-103 have agreed to this drawing and a certificate of compliance (see 3.6 herein) has been submitted to and accepted by DLA Land and Maritime-VA.

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-89615

A.1 SCOPE

A.1.1 Scope. This appendix establishes minimum requirements for microcircuit die to be supplied under the Qualified Manufacturers List (QML) Program. QML microcircuit die meeting the requirements of MIL-PRF-38535 and the manufacturers approved QM plan for use in monolithic microcircuits, multi-chip modules (MCMs), hybrids, electronic modules, or devices using chip and wire designs in accordance with MIL-PRF-38534 are specified herein. Two product assurance classes consisting of military high reliability (device class Q) and space application (device class V) are reflected in the Part or Identification Number (PIN). When available, a choice of Radiation Hardiness Assurance (RHA) levels are reflected in the PIN.

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



A.1.2.1 RHA designator. Device classes Q and V RHA identified die meet the MIL-PRF-38535 specified RHA levels. A dash (-) indicates a non-RHA die.

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

Device type	Generic number	Circuit function
01	DS16F95	RS-485 differential bus transceiver

A.1.2.3 Device class designator.

Device class	Device requirements documentation
Q or V	Certification and qualification to the die requirements of MIL-PRF-38535

A.1.2.4 Die details. The die details designation is a unique letter which designates the die's physical dimensions, bonding pad location(s) and related electrical function(s), interface materials, and other assembly related information, for each product and variant supplied to this appendix.

A.1.2.4.1 Die physical dimensions.

Die type	Figure number
01	A-1

A.1.2.4.2 Die bonding pad locations and electrical functions.

Die type	Figure number
01	A-1

A.1.2.4.3 Interface materials.

Die type	Figure number
01	A-1

A.1.2.4.4 Assembly related information.

Die type	Figure number
01	A-1

A.1.3 Absolute maximum ratings. See paragraph 1.3 herein for details.

A.1.4 Recommended operating conditions. See paragraph 1.4 herein for details.

A.2 APPLICABLE DOCUMENTS.

A.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.

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://quicksearch.dla.mil/.)

A.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.

A.3 REQUIREMENTS

A.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.

A.3.2 Design, construction and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38535 and herein and the manufacturer's QM plan for device classes Q and V.

A.3.2.1 Die physical dimensions. The die physical dimensions shall be as specified in A.1.2.4.1 and on figure A-1.

A.3.2.2 Die bonding pad locations and electrical functions. The die bonding pad locations and electrical functions shall be as specified in A.1.2.4.2 and on figure A-1.

A.3.2.3 Interface materials. The interface materials for the die shall be as specified in A.1.2.4.3 and on figure A-1.

A.3.2.4 Assembly related information. The assembly related information shall be as specified in A.1.2.4.4 and on figure A-1.

A.3.2.5 Truth tables. The truth tables shall be as defined in paragraph 3.2.3 herein.

A.3.2.6 Radiation exposure circuit. The radiation exposure circuit shall be as defined in paragraph 3.2.4 herein.

A.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 of the body of this document.

A.3.4 Electrical test requirements. The wafer probe test requirements shall include functional and parametric testing sufficient to make the packaged die capable of meeting the electrical performance requirements in table I.

A.3.5 Marking. As a minimum, each unique lot of die, loaded in single or multiple stack of carriers, for shipment to a customer, shall be identified with the wafer lot number, the certification mark, the manufacturer's identification and the PIN listed in A.1.2 herein. The certification mark shall be a "QML" or "Q" as required by MIL-PRF-38535.

A.3.6 Certification 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 A.6.4 herein). The certificate of compliance submitted to DLA Land and Maritime -VA prior to listing as an approved source of supply for this appendix shall affirm that the manufacturer's product meets, for device classes Q and V, the requirements of MIL-PRF-38535 and the requirements herein.

A.3.7 Certificate of conformance. A certificate of conformance as required for device classes Q and V in MIL-PRF-38535 shall be provided with each lot of microcircuit die delivered to this drawing.

A.4 VERIFICATION

A.4.1 Sampling and inspection. For device classes Q and V, die 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 modifications in the QM plan shall not affect the form, fit, or function as described herein.

A.4.2 Screening. For device classes Q and V, screening shall be in accordance with MIL-PRF-38535, and as defined in the manufacturer's QM plan. As a minimum, it shall consist of:

a. Wafer lot acceptance for class V product using the criteria defined in MIL-STD-883, method 5007.

b. 100% wafer probe (see paragraph A.3.4 herein).

c. 100% internal visual inspection to the applicable class Q or V criteria defined in MIL-STD-883, method 2010 or the alternate procedures allowed in MIL-STD-883, method 5004.

A.4.3 Conformance inspection.

A.4.3.1 Group E inspection. Group E inspection is required only for parts intended to be identified as radiation assured (see A.3.5 herein). RHA levels for device classes Q and V shall be as specified in MIL-PRF-38535. End point electrical testing of packaged die shall be as specified in table II herein. Group E tests and conditions are as specified in paragraphs 4.4.4 and 4.4.4.1 herein.

A.5 DIE CARRIER

A.5.1 Die carrier requirements. The requirements for the die carrier shall be accordance with the manufacturer's QM plan or as specified in the purchase order by the acquiring activity. The die carrier shall provide adequate physical, mechanical and electrostatic protection.

A.6 NOTES

A.6.1 Intended use. Microcircuit die conforming to this drawing are intended for use in microcircuits built in accordance with MIL-PRF-38535 or MIL-PRF-38534 for government microcircuit applications (original equipment), design applications, and logistics purposes.

A.6.2 Comments. Comments on this appendix should be directed to DLA Land and Maritime -VA, Columbus, Ohio, 43218-3990 or telephone (614)-692-0591.

A.6.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-PRF-38535 and MIL-HDBK-1331.

A.6.4 Sources of supply for device classes Q and V. Sources of supply for device classes Q and V are listed in MIL-HDBK-103 and QML-38535. The vendors listed within MIL-HDBK-103 and QML-38535 have submitted a certificate of compliance (see A.3.6 herein) to DLA Land and Maritime -VA and have agreed to this drawing.

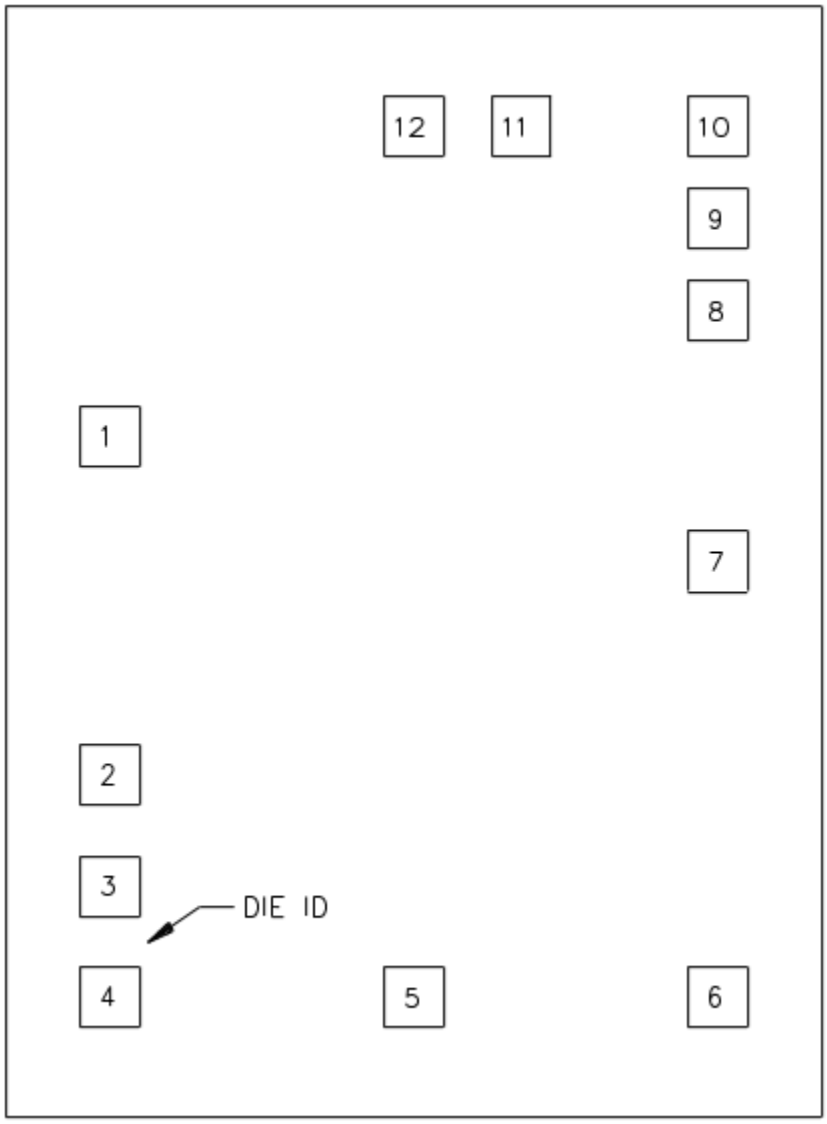


FIGURE A-1. Die bonding pad locations and electrical functions.

Die bond pad coordinate locations (Z step)						
(Referenced to die center, coordinates in μm) NC = no connection, NU not used						
Signal name	Pad number	X / Y coordinates		Pad size		
		X	Y	X		Y
R	1	-596	285	114	x	114
$\overline{RE}$	2	-593	-420	114	x	114
DE	3	-602	-637	114	x	114
D	4	-596	-853	114	x	114
GND	5	-110	-916	114	x	114
IN/OUT A	6	563	-883	114	x	114
IN/OUT B	7	563	-85	114	x	114
NC	8	615	628	89	x	89
NC	9	615	755	89	x	89
NC	10	602	895	114	x	114
NC	11	211	894	114	x	114
V_{CC}	12	9	916	114	x	114

Die bonding pad locations and electrical functions

Die physical dimensions.
Wafer diameter: 125 mm
Die size: 1600 μm x 2184 μm
Die thickness: 330 μm nominal
Minimum pitch: 215 μm

Interface materials.
Top metallization: Al
Backside metallization: Bare back

Glassivation.
Type: Nitride
Thickness: 12.87 kÅ to 13.13 kÅ

Substrate: Silicon

Assembly related information.
Substrate potential: Floating
Special assembly instructions: Actual die size is rounded to the nearest micron.

FIGURE A-1. Die bonding pad locations and electrical functions - continued.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 23-05-04

Approved sources of supply for SMD 5962-89615 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 https://landandmaritimeapps.dla.mil/programs/smcr/.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-89615012A	01295	DS16F95E/883
5962-8961501HA	3/	DS16F95W/883
5962-8961501PA	01295	DS16F95J/883
5962-8961501QXA	3/	DS16F95WG/883
5962-8961501VHA	3/	DS16F95W-QMLV
5962-8961501VPA	3/	DS16F95J-QMLV
5962-8961501VXA	3/	DS16F95WG-QMLV
5962F8961501QHA	3/	DS16F95WFQML
5962F8961501QPA	3/	DS16F95JFQML
5962F8961501QXA	3/	DS16F95WGQML
5962F8961501VHA	01295	DS16F95WFQMLV
5962F8961501VPA	3/	DS16F95JFQMLV
5962F8961501VXA	3/	DS16F95WGFQMLV
5962F8961501V9A	01295	DS16F95 MDR

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	Vendor name and address
01295	Texas Instruments, Inc. Semiconductor Group 8505 Forest Ln. PO Box 660199 Dallas, TX 75243