

REVISIONS			
LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Drawing updated to reflect current requirements. - gt	02-06-17	Raymond Monnin
B	Remove class M requirements throughout. Update paragraphs to current MIL-PRF-38535 requirements. - drw	14-07-07	Charles F. Saffle
C	Add device type 03 and 04. Delete figure 4 radiation exposure circuit and paragraph 4.4.4.2 Single event phenomena (SEP). Delete device class M references. Add paragraph 3.2.5. - ro	15-04-14	Charles F. Saffle
D	Make changes to the I _{IL} and I _{IH} maximum test limits for device types 01 and 02 as specified under Table I. - ro	15-06-02	Charles F. Saffle
E	Add device type 05. Make change to Supply voltage (V _S) limit and footnote 4/ as specified under paragraph 1.3. Make change to θ _{JC} and θ _{JA} limits and test measurement. - ro	15-09-03	Charles F. Saffle
F	Add device type 06. - ro	16-04-21	Charles F. Saffle
G	Add device type 07, case outlines Y and Z, single event phenomena (SEP) paragraphs, and figure A-2. - ro	17-02-17	Charles F. Saffle



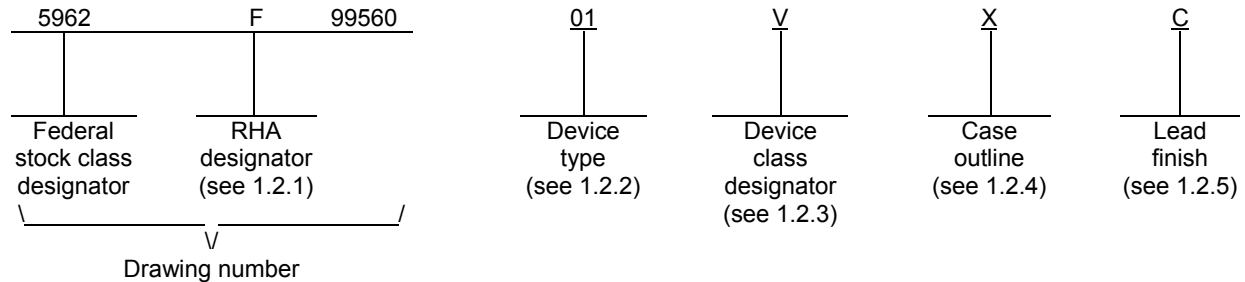
REV																				
SHEET																				
REV	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G	G				
SHEET	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29					
REV STATUS OF SHEETS				REV			G	G	G	G	G	G	G	G	G	G	G	G	G	G
				SHEET			1	2	3	4	5	6	7	8	9	10	11	12	13	14

PMIC N/A	PREPARED BY RICK OFFICER		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 RAJESH PITHADIA																		
	APPROVED BY RAYMOND MONNIN																		
	DRAWING APPROVAL DATE 99-06-02																		
	REVISION LEVEL G																		
		SIZE A	CAGE CODE 67268	5962-99560															
		SHEET 1 OF 29																	

1. SCOPE

1.1 Scope. This drawing documents three product assurance class levels consisting of high reliability (device class Q), space application (device class V) and for appropriate satellite and similar applications (device class T). 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. For device class T, the user is encouraged to review the manufacturer's Quality Management (QM) plan as part of their evaluation of these parts and their acceptability in the intended application.

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



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

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	HS-4424RH	Radiation hardened dual non-inverting MOSFET drivers with < 10 V lockout voltage
02	HS-4424BRH	Radiation hardened dual non-inverting MOSFET drivers with < 7.5 V lockout voltage
03	HS-4424EH	Radiation hardened dual non-inverting MOSFET drivers with < 10 V lockout voltage
04	HS-4424BEH	Radiation hardened dual non-inverting MOSFET drivers with < 7.5 V lockout voltage
05	HS-4424DRH	Radiation hardened dual non-inverting MOSFET drivers with < 8.0 V lockout voltage
06	HS-4424DEH	Radiation hardened dual non-inverting MOSFET drivers with < 8.0 V lockout voltage
07	RH-PM4424	Radiation hardened 4.5 A dual low side MOSFET driver

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

<u>Device class</u>	<u>Device requirements documentation</u>
Q, V	Certification and qualification to MIL-PRF-38535
T	Certification and qualification to MIL-PRF-38535 with performance as specified in the device manufacturers approved quality management plan.

**STANDARD
MICROCIRCUIT DRAWING**
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990

SIZE
A

5962-99560

REVISION LEVEL
G

SHEET
2

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

<u>Outline letter</u>	<u>Descriptive designator</u>	<u>Terminals</u>	<u>Package style</u>
X	CDFP4-F16	16	Flat pack
Y	CDFP4-F16	16	Flat pack <u>1/</u>
Z	See figure 1	10	Flat pack <u>2/ 3/</u>

1.2.5 Lead finish. The lead finish is as specified in MIL-PRF-38535 for device classes Q, T and V.

1.3 Absolute maximum ratings. 4/

Device types 01 to 06:

Supply voltage (Vs)	20 V
Input voltage range (VIN)	-0.3 V to +V <u>5/</u>
Output short circuit duration (single supply)	Continuous <u>6/</u>
Maximum junction temperature (TJ)	175°C
Maximum storage temperature	-65°C to +150°C
Maximum lead temperature (soldering 10 seconds)	265°C
Thermal resistance, junction-to-case (θJC)	5°C/W <u>7/</u>
Thermal resistance, junction-to-ambient (θJA)	34°C/W <u>7/</u>

Device type 07:

Supply voltage (Vs)	PGND – 0.3 V to PGND + 20 V
Signal ground (SGND)	PGND – 5 V to PGND + 5 V
Input voltage (PWM_1 and PWM_2)	SGND – 0.3 V to VS + 0.3 V
Driver output voltage (OUT_1 and OUT_2)	PGND – 0.3 V to VS + 0.3 V
DC output current (for each driver)	750 mA
Storage temperature range	-65°C to +150°C
Maximum junction temperature (TJ)	+150°C
Lead temperature (soldering 10 seconds)	+260°C <u>8/</u>
Thermal resistance, junction-to-case (θJC):	
Case outline Y	8°C/W
Case outline Z	25°C/W
Thermal resistance, junction-to-ambient (θJA):	
Case outline Y	70°C/W <u>9/</u>
Case outline Z	117°C/W <u>9/</u>

- 1/ AlN ceramic header with metalized bottom side and pullback of 0.01 inch x 0.02 inch.
- 2/ Al2O3 ceramic header with metalized bottom side and pullback of 0.01 inch x 0.02 inch.
- 3/ The lid is connected to the seal ring (the pin 4 of the package).
- 4/ 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.
- 5/ Inputs must not go more negative than -0.3 V.
- 6/ Short circuit from the output to VS can cause excessive heating and eventual destruction.
- 7/ θJA is measured in free air with the component mounted on a high effective thermal conductivity test board with “direct attach” features. For θJC, the “case temperature” location is the center of the package underside.
- 8/ Distance not less than 1.5 mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.
- 9/ Measured on 2s2p board as per standard JEDEC JESD51-7 in natural convection.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 3

1.3 Absolute maximum ratings - continued. 4/

Device type 07 - continued:

Maximum power dissipation (PD) at +70°C:

Case outline Y	1.10 W
Case outline Z	0.7 W

Maximum power dissipation (PD) at +125°C:

Case outline Y	0.36 W
Case outline Z	0.21 W

1.4 Recommended operating conditions.

Supply voltage range (Vs) :

Device types 01, 02, 03, 04	12 V to 18 V
Device types 05 and 06	8 V to 18 V
Device type 07	4.65 V to 18 V

Low voltage lockout voltage:

Device types 01 and 03	< 10.0 V
Device types 02 and 04	< 7.5 V
Device types 05 and 06	< 8.0 V

Operating temperature range -55°C to +125°C

1.5 Radiation features.

Maximum total dose available (high dose rate = 50 – 300 rad(Si)/s):

Device types 01 and 02:

Device classes Q and V	300 krad(Si) <u>10/</u>
Device class T	100 krad(Si) <u>10/</u>
Device types 03, 04, and 06	300 krad(Si) <u>11/</u>
Device type 05	300 krad(Si) <u>10/</u>
Device type 07	100 krad(Si) <u>12/</u>

Maximum total dose available (low dose rate ≤ 0.01 rad(Si)/s):

Device types 03, 04, and 06	50 krad(Si) <u>11/</u>
Device type 07	100 krad(Si) <u>12/</u>

Single event phenomena (SEP):

For device type 07:

No SEL occurs at normal LET (see 4.4.4.3)	≤ 60 MeV·cm ² /mg <u>13/</u>
SET observed at LET (see 4.4.4.3)	≥ 18 MeV·cm ² /mg <u>13/</u>
(saturated cross section = 1.1 x 10 ⁻⁶ cm ²)	

10/ Device types 01, 02, and 05 may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Device types 01, 02, and 05 radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A to a maximum total dose of 300 krad(Si) for class Q or V and 100 krad(Si) for class T.

11/ Device types 03, 04, and 06 radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A to a maximum total dose of 300 krad(Si), and condition D to a maximum total dose of 50 krad(Si).

12/ The manufacturer supplying device type 07 has performed characterization testing in accordance with MIL-STD-883 method 1019 condition A and condition D to a dose level of 100 krad(Si). Manufacturer also performed accelerated annealing 1.5x over test and observed no time dependent effects. The post irradiation of HDR and LDR test parametric values falls within the specification limits as specified in Table IA. The radiation end point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition A and D.

13/ Limits are characterized at initial qualification and after any design or process changes which may affect the SEP characteristics, but are not production tested unless specified by the customer through the purchase order or contract. For more information on SEP test results, customers are requested to contact the manufacturer.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 4

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 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

ASTM INTERNATIONAL (ASTM)

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

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

JEDEC Solid State Technology Association

JEDEC PUB 95 - Registered and Standard Outlines for Semiconductor Devices

(Copies of these documents are available online at <http://www.jedec.org> or from JEDEC – Solid State Technology Association, 3103 North 10th Street, Suite 240–S, Arlington, VA 22201-2107).

EIA/JEDEC 51-7 - High Effective Thermal Conductivity Test Board for Leaded Surface Mount Packages

2.3 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 5

3. REQUIREMENTS

3.1 Item requirements. The individual item requirements for device classes Q, T and V shall be in accordance with MIL-PRF-38535 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.

3.1.1 Microcircuit die. For the requirements for 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, T and V.

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

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

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

3.2.4 Block diagram. The block diagram shall be as specified in figure 4.

3.2.5 Truth table. The truth table shall be as specified in figure 5.

3.2.6 Radiation exposure circuit. The radiation exposure circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing 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 case operating temperature range.

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

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

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

3.6 Certificate of compliance. For device classes Q, T 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). 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, T and V, the requirements of MIL-PRF-38535 and herein.

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

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 6

TABLE IA. Electrical performance characteristics.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T _C ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Power supply current, low	ICCSB low	V _S = 18 V, inputs = 0 V	1	01,02, 03,04, 05,06		3.5	mA
			2,3			4.0	
			M,D,P,L,R,F <u>2/</u>		1		
		V _S = 8 V, inputs = 0 V	1	05,06		3.5	
			2,3			4.0	
			M,D,P,L,R,F <u>2/</u>		1		
Power supply current, high	ICCSB high	V _S = 18 V, inputs = 18 V	1	01,02, 03,04, 05,06		3.5	mA
			2,3			4.0	
			M,D,P,L,R,F <u>2/</u>		1		
		V _S = 8 V, inputs = 8 V	1	05,06		3.5	
			2,3			4.0	
			M,D,P,L,R,F <u>2/</u>		1		
Input current, low	I _{IL}	V _S = 18 V	1	01,02, 03,04, 05,06		±5	μA
			2,3			±10	
			M,D,P,L,R,F <u>2/</u>		1		
		V _S = 8 V	1	05,06		±5	
			2,3			±10	
			M,D,P,L,R,F <u>2/</u>		1		
Input current, high	I _{IH}	V _S = 18 V	1	01,02, 03,04, 05,06		±5	μA
			2,3			±10	
			M,D,P,L,R,F <u>2/</u>		1		
		V _S = 8 V	1	05,06		±5	
			2,3			±10	
			M,D,P,L,R,F <u>2/</u>		1		
Voltage output	VOL, VOH	V _S = 12 V	1	01,02, 03,04	V _S - 0.75	0.8	V
			2,3		V _S - 0.75	0.8	
			M,D,P,L,R,F <u>2/</u>		1	V _S - 0.75	

See footnotes at end of table.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 7

TABLE IA. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1</u> / -55°C ≤ T _C ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Voltage output high	V _{OH}	V _S = 8 V, I _{OUT} = 5 mA	1	05,06	V _S - 0.75		V
			2,3		V _S - 0.90		
		M,D,P,L,R,F <u>2</u>	1		V _S - 0.90		
		V _S = 12 V, I _{OUT} = 5 mA, V _S = 18 V, I _{OUT} = 5 mA	1		V _S - 0.75		
			2,3		V _S - 0.75		
		M,D,P,L,R,F <u>2</u>	1		V _S - 0.75		
		V _S = 8 V, I _{OUT} = 50 mA, V _S = 12 V, I _{OUT} = 50 mA, V _S = 18 V, I _{OUT} = 50 mA	1		V _S - 0.95		
			2,3		V _S - 1.1		
			M,D,P,L,R,F <u>2</u>		1	V _S - 1.1	
		Voltage output low	V _{OL}		V _S = 8 V, I _{OUT} = 5 mA, V _S = 12 V, I _{OUT} = 5 mA, V _S = 18 V, I _{OUT} = 5 mA	1,2,3	
M,D,P,L,R,F <u>2</u>	1					0.8	
V _S = 8 V, I _{OUT} = 50 mA, V _S = 12 V, I _{OUT} = 50 mA, V _S = 18 V, I _{OUT} = 50 mA	1				0.95		
	2,3				1.1		
M,D,P,L,R,F <u>2</u>	1				1.1		
Input voltage	V _{IL} , V _{IH}	V _S = 12 V, limits applied during functional test	1	01,02, 03,04	3.0	0.4	V
			2,3		3.5	0.4	
			M,D,P,L,R,F <u>2</u>		1	3.5	

See footnotes at end of table.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 8

TABLE IA. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ TC ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input voltage high threshold	VIH	VS = 8 V, VS = 12 V, VS = 18 V M,D,P,L,R,F <u>2/</u>	1	05,06	3.0		V
			2,3		3.1		
			1		3.1		
Input voltage low threshold	VIL	VS = 8 V, VS = 12 V, VS = 18 V M,D,P,L,R,F <u>2/</u>	1,2,3	05,06		0.8	V
			1			0.8	
Input voltage threshold hysteresis	VIHYS	VS = 8 V, VS = 12 V, VS = 18 V	1	05,06	100		mV
Functional test	FT	VS = 12 V, VS = 18 V, See 4.4.1c M,D,P,L,R,F <u>2/</u>	7,8A,8B	01, 02, 03, 04			
			7				
Rising undervoltage lockout	UVLOR	M,D,P,L,R,F <u>2/</u>	1	05,06	7.2	7.8	V
			2,3		6.9	7.95	
			1		6.9	7.95	
Falling undervoltage lockout	UVLOF	M,D,P,L,R,F <u>2/</u>	1	05,06	7.1	7.75	V
			2,3		6.8	7.9	
			1		6.8	7.9	
Propagation delay, low	tPHL	VS = 12 V, CL = 4300 pF M,D,P,L,R,F <u>2/</u>	9	01,02, 03,04		250	ns
			10,11			350	
			9			350	

See footnotes at end of table.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 9

TABLE IA. Electrical performance characteristics – Continued.

Test	Symbol	Conditions ^{1/} -55°C ≤ T _C ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit					
					Min	Max						
Propagation delay, low	tPHL	V _S = 8 V, C _L = 4300 pF	9	05,06		300	ns					
			10,11			400						
			M,D,P,L,R,F ^{2/}		9			400				
			V _S = 12 V, C _L = 4300 pF		9			250				
					10,11			350				
					M,D,P,L,R,F ^{2/}	9			350			
		V _S = 18 V, C _L = 4300 pF	9			200						
			10,11			300						
			M,D,P,L,R,F ^{2/}		9			300				
			Propagation delay, high		tPLH	V _S = 12 V, C _L = 4300 pF		9	01,02, 03,04		250	ns
								10,11			350	
								M,D,P,L,R,F ^{2/}		9		
V _S = 8 V, C _L = 4300 pF	9	05,06					300					
	10,11						400					
	M,D,P,L,R,F ^{2/}			9				400				
V _S = 12 V, C _L = 4300 pF	9					250						
	10,11					350						
	M,D,P,L,R,F ^{2/}			9			350					
V _S = 18 V, C _L = 4300 pF	9			200								
	10,11			300								
	M,D,P,L,R,F ^{2/}	9				300						
	Response time, rise	TR	V _S = 12 V, C _L = 4300 pF	9	01,02, 03,04		75	ns				
				10,11			95					
				M,D,P,L,R,F ^{2/}		9			95			
V _S = 8 V, C _L = 4300 pF, V _S = 12 V, C _L = 4300 pF, V _S = 18 V, C _L = 4300 pF				9		05,06			75			
				10,11					95			
				M,D,P,L,R,F ^{2/}			9			95		

See footnotes at end of table.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 10

TABLE IA. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/</u> -55°C ≤ T _C ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Response time, fall	TF	V _S = 12 V, C _L = 4300 pF M,D,P,L,R,F <u>2/</u>	9	01,02, 03,04		75	ns
			10,11			95	
			9			95	
		V _S = 8 V, C _L = 4300 pF, V _S = 12 V, C _L = 4300 pF, V _S = 18 V, C _L = 4300 pF M,D,P,L,R,F <u>2/</u>	9	05,06		75	
			10,11			95	
			9			95	

See footnotes at end of table.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 11

TABLE IA. Electrical performance characteristics – Continued.

Test	Symbol	Conditions <u>1/2/</u> -55°C ≤ TC ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Power supply current, low	ICCSB low = ICC_L	VS = 4.65 V, inputs = 0 V	1	07		1.5	mA
			2			1.7	
			3			1.4	
		VS = 18 V, inputs = 0 V	1			2.1	
			2			2.4	
			3			2	
Power supply current, high	ICCSB high = ICC_H	VS = 4.65 V, inputs = 3.3 V	1	07		1.5	mA
			2			1.7	
			3			1.4	
		VS = 18 V, inputs = 3.3 V	1			2.1	
			2			2.4	
			3			2	
Input current, low and <u>3/</u> high	IPWM = I _{IL} and I _{IH}	VS = 4.65 V and 18 V, PWMx = 0 V	1,2,3	07	-1	+1	μA
		VS = 4.65 V and 18 V, PWMx = 3.3 V			0	+2	
		VS = 4.65 V and 18 V, PWMx = 17.5 V			0	+5	
High level output voltage	VOH	VS = 4.65 V and 18 V, Inputs = 3.3 V, Outputs = 1 mA	1,2,3	07	VS – 0.01		V
Low level output voltage	VOL	VS = 4.65 V and 18 V, Inputs = 0 V, Outputs = 1 mA	1,2,3	07		10	mV

See footnotes at end of table.

**STANDARD
MICROCIRCUIT DRAWING**
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990

SIZE
A

REVISION LEVEL
G

5962-99560

SHEET
12

TABLE IA. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/ 2/</u> -55°C ≤ TC ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Input voltage high PWMx	V _{IH}	V _S = 4.65 V and 18 V, inputs = rise ramp	1,2,3	07	2		V
Input voltage low PWMx	V _{IL}	V _S = 4.65 V and 18 V, inputs = fall ramp	1,2,3	07		0.8	V
Under voltage lockout <u>3/</u> threshold turn on	UVLO(on)	V _S rising (rise ramp), PWMx = 3.3 V	1,2,3	07		4.65	V
Under voltage lockout <u>3/</u> threshold turn off	UVLO(off)	V _S falling (fall ramp), PWMx = 3.3 V	1,2,3	07	3.6		V
Under voltage lock out <u>3/</u> hysteresis	UVLO(hyst)	UVLOhyst = turn on – turn off	1,2,3	07		0.4	V
Source resistance	RHI	V _S = 10 V, inputs = 3.3 V, outputs = 100 mA	1	07		1.1	Ω
			2			1.4	
			3			1.0	
Sink resistance	RLO	V _S = 10 V, inputs = 0 V, outputs = 100 mA	1	07		1.4	Ω
			2			1.9	
			3			1.2	
Propagation delay, low	t _{PHL}	V _S = 10 V, C _{OUT} to GND = 10 nF	9, 10	07		175	ns
			11			300	
Propagation delay, high	t _{PLH}	V _S = 10 V, C _{OUT} to GND = 10 nF	9, 10	07		175	ns
			11			300	

See footnotes at end of table.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 13

TABLE IA. Electrical performance characteristics - Continued.

Test	Symbol	Conditions <u>1/</u> <u>2/</u> -55°C ≤ T _C ≤ +125°C unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Response time, rise <u>3/</u>	TR	V _S = 10 V, C _{OUT} = 10 nF	9,10,11	07		60	ns
Response time, fall <u>3/</u>	TF	V _S = 10 V, C _{OUT} = 10 nF	9,10,11	07		60	ns

1/ V_S = 12 V to 18 V for device types 01, 02, 03, and 04. V_S = 8 V to 18 V for device types 05 and 06.
V_S = 4.65 V to 18 V for device type 07.

2/ RHA device types 01, 02, and 05 supplied to this drawing will meet all levels M, D, P, L, R and F of irradiation for device class Q or V and levels M, D, P, L, and R of irradiation for device class T. However, device types 01, 02 and 05 are only tested at the "F" level for device class Q or V and the "R" level for device class T in accordance with MIL-STD-883 method 1019 condition A (see 1.5 herein).

RHA device types 03, 04, and 06 supplied to this drawing will meet all levels M, D, P, L, R, and F of irradiation for condition A and irradiation of M, D, P, and L levels for condition D. However, device types 03, 04, and 06 are only tested at the "F" level in accordance with MIL-STD-883, method 1019, condition A, and tested at the "L" level in condition D (see 1.5 herein).

RHA device type 07 has been characterized through all levels M, D, P, L, and R of irradiation. However, this device is tested at the "R" level.

Pre and post irradiation values are identical unless otherwise specified in table IA. When performing post irradiation electrical measurements for any RHA level, T_A = +25°C.

3/ Go no go test.

TABLE IB. SEP test limits. 1/ 2/

Device type	V _S = 4.65 V and 18 V		Bias V _S = 18 V, For latch-up test No latch-up (SEL) occurs at incident angle effective LET <u>4/</u>
	SET observed threshold LET <u>3/</u>	Maximum device cross section	
07	LET = 18 MeV/(mg/cm ²)	1.1 X10 ⁻⁶ cm ²	LET ≤ 60 MeV/(mg/cm ²)

1/ For single event phenomena (SEP) test conditions, see 4.4.4.3 herein.

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

3/ SET was observed at LET= 18 MeV/(mg/cm²) with cross section 1.1 x 10⁻⁶cm².

4/ No single-event latch up (SEL) was observed when irradiated with Xe ions at normal incidence angle corresponding to a surface LET of 60 MeV·cm²/mg.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 14

Case outline Z

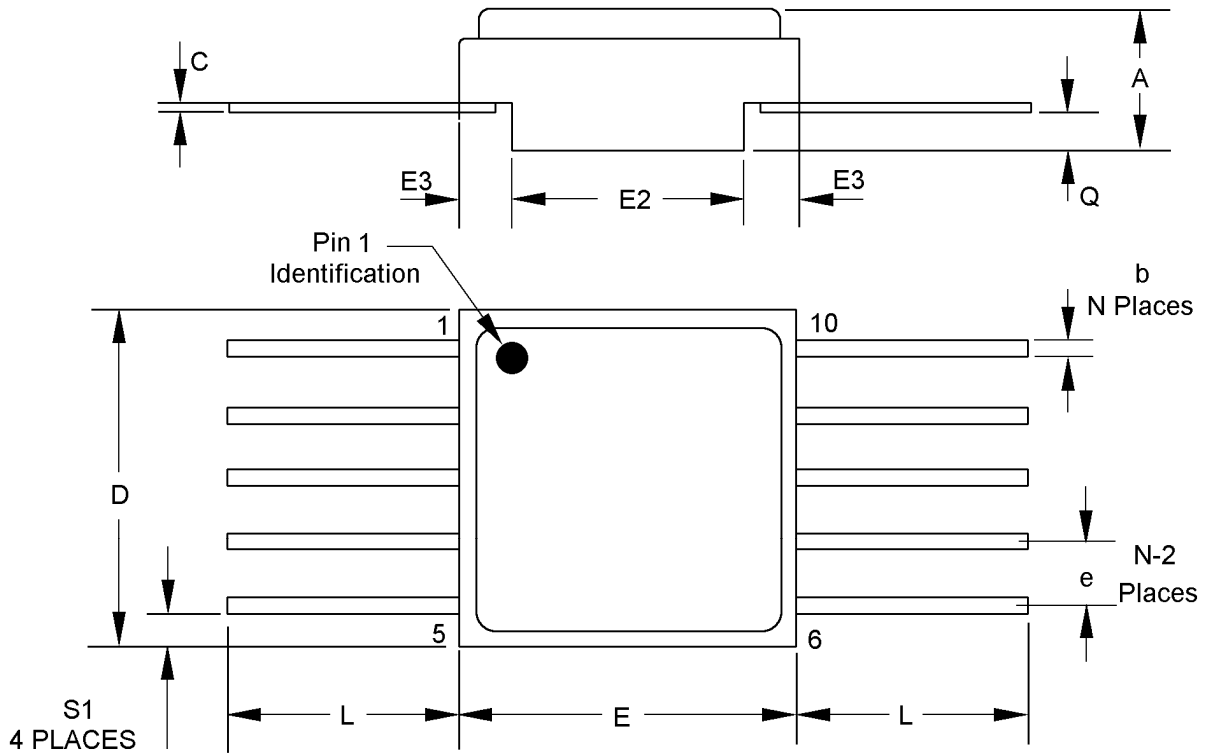


FIGURE 1. Case outline.

**STANDARD
MICROCIRCUIT DRAWING**
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990

SIZE
A

5962-99560

REVISION LEVEL
G

SHEET
15

Case outline Z – continued.

Symbol	Dimensions					
	Inches			Millimeters		
	Minimum	Medium	Maximum	Minimum	Medium	Maximum
A	.089	.096	.103	2.26	2.44	2.62
b	.015	.017	.019	0.38	0.43	0.48
c	.004	.005	.006	0.102	0.127	0.152
D	.250	.255	.260	6.35	6.48	6.60
E	.250	.255	.260	6.35	6.48	6.60
E2	.170	.175	.180	4.32	4.45	4.58
E3	.035	.040	.045	0.88	1.01	1.14
e	.050 BSC			1.27 BSC		
L	.250	---	.370	6.35	---	9.40
Q	.026	.031	.036	0.66	0.79	0.92
S1	.006	.019	.032	0.16	0.485	0.81
N	10			10		

NOTES:

1. The US government preferred system of measurement is the metric SI system. However, since this item was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch pounds units, the inch pound units shall take precedence
2. N is the maximum number of terminals positions.

FIGURE 1. Case outline - continued.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 16

Device types	01, 02, 03, 04, 05, and 06	07	07
Case outlines	X	Y	Z
Terminal number	Terminal symbol		
1	NC	NC	PWM_1
2	INPUT A	PWM_1	SGND
3	NC	NC	PGND
4	GND	SGND	CONNECTED TO THE SEAL RING
5	GND	PGND	PWM_2
6	NC	NC	OUTL_2
7	INPUT B	PWM_2	OUTH_2
8	NC	NC	Vs
9	NC	NC	OUTH_1
10	OUTPUT B	OUTL_2	OUTL_1
11	OUTPUT B	OUTH_2	---
12	Vs	Vs	---
13	Vs	Vs	---
14	OUTPUT A	OUTH_1	---
15	OUTPUT A	OUTL_1	---
16	NC	NC	---

FIGURE 2. Terminal connections.

Device types 01, 02, 03, 04, 05, and 06

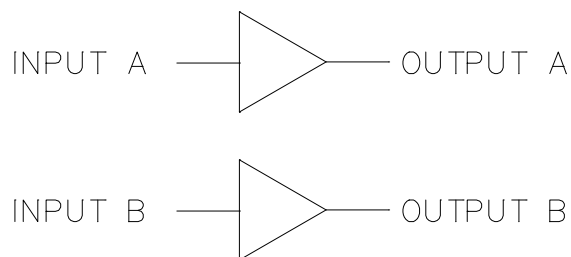


FIGURE 3. Logic diagram.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 17

Device type 07

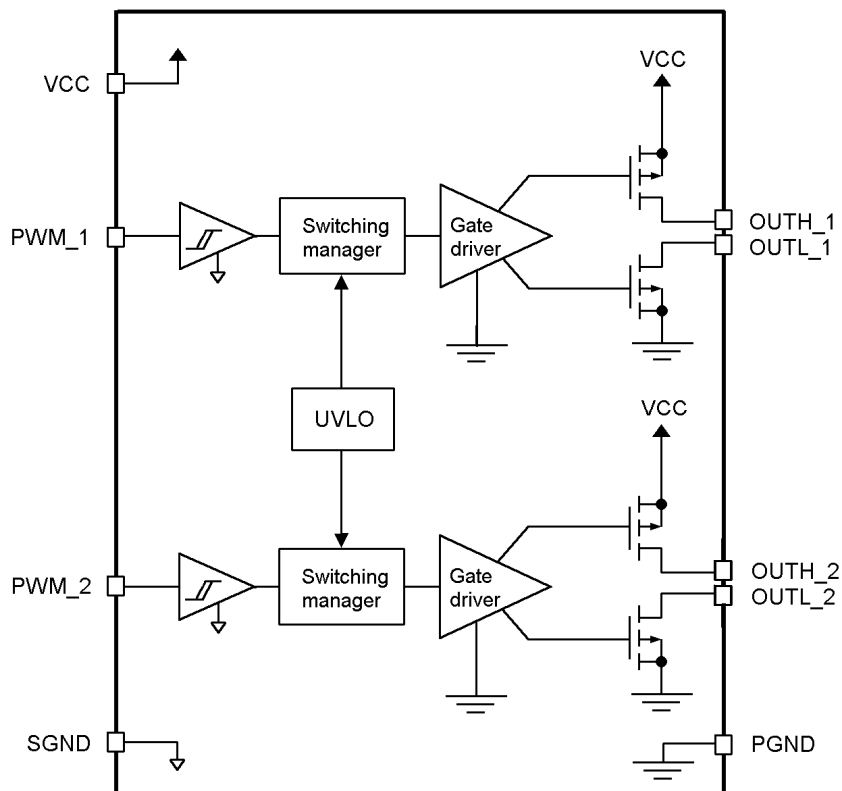


FIGURE 4. Block diagram.

Device types 01, 02, 03, 04, 05, and 06	
INPUT A	OUTPUT A
1	1
0	0
INPUT B	OUTPUT B
1	1
0	0

Device type 07	SEE NOTE 1
PWM_1	OUTH_1 = OUTL_1
0	0
1	1
PWM_2	OUTH_2 = OUTL_2
0	0
1	1

NOTE:

- For device type 07 only, OUTH_X shorted to OUTL_X.

FIGURE 5. Truth tables.

**STANDARD
MICROCIRCUIT DRAWING**
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990

SIZE
A

REVISION LEVEL
G

5962-99560

SHEET
18

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, including screening (4.2), qualification (4.3), and conformance inspection (4.4). The modification in the QM plan shall not affect the form, fit, or function as described herein. For device class T, sampling and inspection procedures shall be in accordance with MIL-PRF-38535 and the device manufacturer's QM plan including screening, qualification, and conformance inspection. The performance envelope and reliability information shall be as specified in the manufacturer's QM plan.

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 T, screening shall be in accordance with the device manufacturer's Quality Management (QM) plan, and shall be conducted on all devices prior to qualification and technology conformance inspection.

4.2.1 Additional criteria for device classes Q, T 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. For device classes Q, T and V interim and final electrical test parameters shall be as specified in table IIA herein.
- c. Additional screening for device class V beyond the requirements of device class Q shall be as specified in MIL-PRF-38535, Appendix B.

4.3 Qualification inspection for device classes Q, T and V. Qualification inspection for device classes Q and V shall be in accordance with MIL-PRF-38535. Qualification inspection for device class T shall be in accordance with the device manufacturer's Quality Management (QM) plan. 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. Technology conformance inspection for class T shall be in accordance with the device manufacturer's Quality Management (QM) plan.

4.4.1 Group A inspection.

- a. Tests shall be as specified in table IIA herein.
- b. Subgroups 4, 5, and 6 in table I, method 5005 of MIL-STD-883 shall be omitted.
- c. For device classes Q and V, subgroups 7 and 8 shall include verifying the functionality of the device.

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

4.4.2.1 Additional criteria for device classes Q, T 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.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 19

TABLE IIA. Electrical test requirements.

Test requirements	Subgroups (in accordance with MIL-PRF-38535, table III)		
	Device class Q	Device class V	Device class T
Interim electrical parameters (see 4.2)	1,7	1,7	As specified in QM plan
Final electrical parameters (see 4.2)	1,2,3,7,8A, <u>1/</u> 8B,9,10,11	1,2,3, <u>2/ 3/</u> 7,8A,8B,9,10, 11	As specified in QM plan
Group A test requirements (see 4.4)	1,2,3,7,8A,8B, 9,10,11	1,2,3,7,8A, 8B,9,10,11	As specified in QM plan
Group C end-point electrical parameters (see 4.4)	1,2,3,7,8A,8B, 9,10,11	1,2,3,7,8A, 8B,9,10,11	As specified in QM plan
Group D end-point electrical parameters (see 4.4)	1,7,9	1,7,9	As specified in QM plan
Group E end-point electrical parameters (see 4.4)	1,7,9	1,7,9	As specified in QM plan

1/ PDA applies to subgroup 1 and 7.

2/ PDA applies to subgroups 1, 7, and Δ's.

3/ Delta limits (see table IIB) shall be required and the delta values shall be computed with reference to the zero hour electrical parameters (see table IA).

TABLE IIB. Burn-in delta parameters TA = +25°C

Parameters	Symbol	Device types	Min	Max	Units
Power supply current	ICCSB low	01, 02, 03, 04, 05, 06		175	μA
	ICCSB high	01, 02, 03, 04, 05, 06		175	μA
	ICCH and ICCL	07	-75	+75	μA
Input current	IIL	01, 02, 03, 04, 05, 06		1	μA
	IIH	01, 02, 03, 04, 05, 06		1	μA
Source resistance	RHI	07	-100	+100	mΩ
Sink resistance	RLO	07	-100	+100	mΩ

**STANDARD
MICROCIRCUIT DRAWING**
DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990

SIZE
A

REVISION LEVEL
G

5962-99560

SHEET
20

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

4.4.4 Group E inspection. Group E inspection is required only for parts intended to be marked as radiation hardness assured (see 3.5 herein). RHA levels for device classes M, Q and V shall be as specified in MIL-PRF-38535 and the end-point electrical parameters shall be as specified in table IIA herein.

4.4.4.1 Group E inspection for device class T. For device class T, the RHA requirements shall be in accordance with the class T radiation requirements of MIL-PRF-38535. End-point electrical parameters shall be as specified in table IIA herein.

4.4.4.2 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 for device types 01, 02, 03, 04, 05, 06, and 07. In addition, for device types 03, 04, 06, and 07, a low dose rate test shall be performed in accordance with MIL-STD-883 method 1019, condition D and as specified herein.

4.4.4.2.1 Accelerated anneal test. Accelerated anneal test shall be performed on classes M, Q, and V devices requiring an RHA level greater than 5 krad (Si). The post-anneal end-point electrical parameter limits shall be as specified in table IA herein and shall be the pre-irradiation end-point electrical parameter limit at 25°C ±5°C. Testing shall be performed at initial qualification and after any design or process changes which may affect the RHA response of the device.

4.4.4.3 Single event phenomena (SEP). When specified in the purchase order or contract, SEP testing shall be performed on class V devices. SEP testing shall be performed on the Standard Evaluation Circuit (SEC) or alternate SEP test vehicle as approved by the qualifying activity at initial qualification and after any design or process changes which may affect the upset or latchup characteristics. Test four devices with zero failures. ASTM F1192 may be used as a guideline when performing SEP testing. The test conditions for SEP are as follows:

- a. The ion beam angle of incidence shall be normal to the die surface. No shadowing of the ion beam due to fixturing or package related effects is allowed.
- b. The fluence shall be ≥ 100 errors or $\geq 10^7$ ions/cm².
- c. The flux shall be between 10^2 and 10^5 ions/cm²/s. The cross-section shall be verified to be flux independent by measuring the cross-section at two flux rates which differ by at least an order of magnitude.
- d. The particle range shall be ≥ 20 micron in silicon.
- e. The test temperature shall be +25°C and the maximum rated operating temperature ±10°C.
- f. Bias conditions shall be defined by the manufacturer for the latchup measurements.
- g. For SEP test limits, see Table IB herein.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38535 for device classes Q, T and V.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 21

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.

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) 692-0540.

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, T and V. Sources of supply for device classes Q, T 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.

6.7 Additional information. When applicable, a copy of the following additional data shall be maintained and available from the device manufacturer:

- a. RHA test conditions of SEP.
- b. Number of transients (SET).
- c. Occurrence of latch up(SEL)

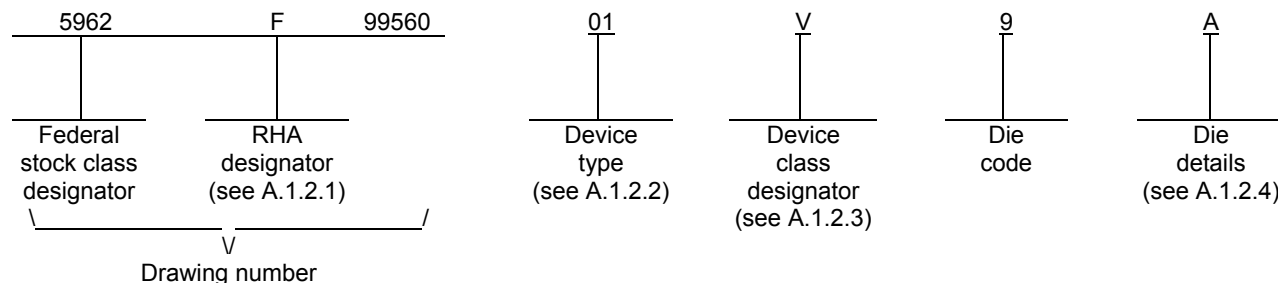
STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 22

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99560

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:

<u>Device type</u>	<u>Generic number</u>	<u>Circuit function</u>
01	HS-4424RH	Radiation hardened dual non-inverting MOSFET driver with < 10 V lockout voltage
02	HS-4424BRH	Radiation hardened dual non-inverting MOSFET driver with < 7.5 V lockout voltage
03	HS-4424EH	Radiation hardened dual non-inverting MOSFET driver with < 10 V lockout voltage
04	HS-4424BEH	Radiation hardened dual non-inverting MOSFET driver with < 7.5 V lockout voltage
05	HS-4424DRH	Radiation hardened dual non-inverting MOSFET driver with < 8.0 V lockout voltage
06	HS-4424DEH	Radiation hardened dual non-inverting MOSFET driver with < 8.0 V lockout voltage
07	RH-PM4424	Radiation hardened 4.5 A dual low side MOSFET driver

A.1.2.3 Device class designator.

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

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 23

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99560

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.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1
03	A-1
04	A-1
05	A-1
06	A-1
07	A-2

A.1.2.4.2 Die bonding pad locations and electrical functions.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1
03	A-1
04	A-1
05	A-1
06	A-1
07	A-2

A.1.2.4.3 Interface materials.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1
03	A-1
04	A-1
05	A-1
06	A-1
07	A-2

A.1.2.4.4 Assembly related information.

<u>Die type</u>	<u>Figure number</u>
01	A-1
02	A-1
03	A-1
04	A-1
05	A-1
06	A-1
07	A-2

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.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A	5962-99560
	REVISION LEVEL G	SHEET 24

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99560

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 STANDARD

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 <http://quicksearch.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 figures A-1 and A-2.

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 figures A-1 and A-2.

A.3.2.3 Interface materials. The interface materials for the die shall be as specified in A.1.2.4.3 and on figures A-1 and A-2.

A.3.2.4 Assembly related information. The assembly related information shall be as specified in A.1.2.4.4 and figures A-1 and A-2.

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

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

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 25

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99560

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 IIA herein. Group E tests and conditions are as specified in paragraphs 4.4.4, 4.4.4.1, 4.4.4.2, 4.4.4.2.1, and 4.4.4.3 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.

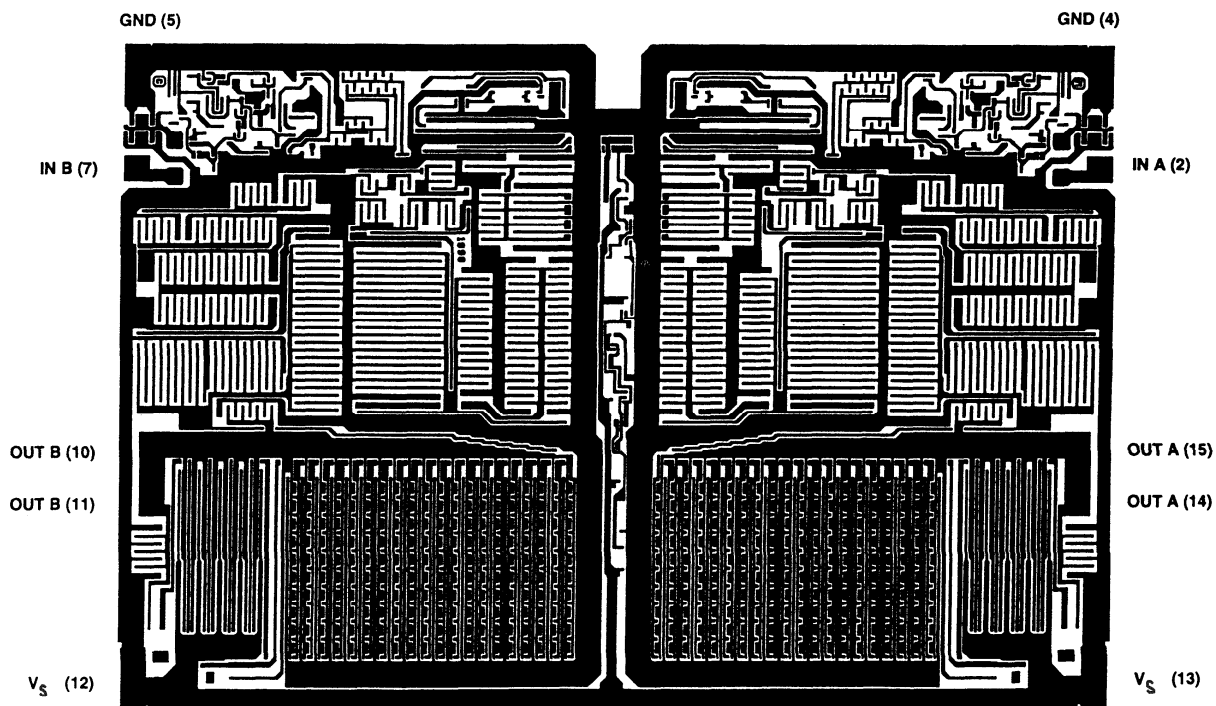
A.6.2 Comments. Comments on this appendix should be directed to DLA Land and Maritime -VA, Columbus, Ohio, 43218-3990 or telephone (614)-692-0540.

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.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 26

APPENDIX A
 APPENDIX A FORMS A PART OF SMD 5962-99560



NOTE: Pad numbers reflect terminal numbers when placed in case outline X (see figure 1).

Die physical dimensions.

Die size: 3370 microns x 4890 microns.
 Die thickness: 19 ± 1 mils.

Interface materials.

Top metallization: Al Si Cu 16.0 kÅ ±2 kÅ
 Backside metallization: None

Glassivation.

Type: PSG
 Thickness: 8.0 kÅ ±1.0 kÅ

Substrate: DI (dielectric isolation)

Assembly related information.

Substrate potential: Unbiased
 Special assembly instructions: None

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

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 27

APPENDIX A
 APPENDIX A FORMS A PART OF SMD 5962-99560

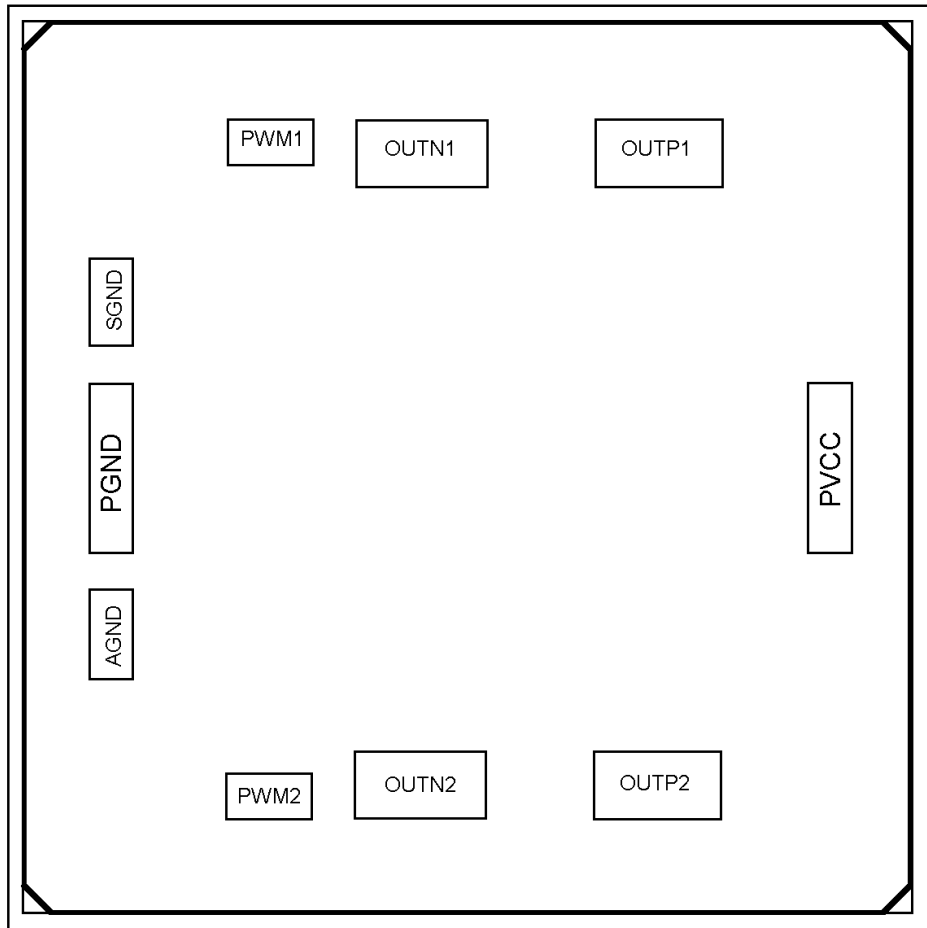


FIGURE A-2. Die bonding pad locations and electrical functions.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 28

APPENDIX A
APPENDIX A FORMS A PART OF SMD 5962-99560

Pad size	
PGND = PVCC	360 μm x 90 μm
OUT_A = OUT_B	270 μm x 138 μm
PWM 1 = PWM2 = AGND = SGND	180 μm x 90 μm

Die bonding pad locations and electrical functions

Die physical dimensions.

Die size: 78 mils x 78 mils

Die thickness: 375 μm ($\pm 25 \mu\text{m}$) or 15 mil (± 1 mil)

Interface materials.

Top metallization: Metal 1: Ti//AlCu/TiN = 0.425 μm ($\pm 0.0425 \mu\text{m}$)

Metal 2: Ti//AlCu/TiN = 0.575 μm ($\pm 0.0575 \mu\text{m}$)

Metal 3: Ti//AlCu/TiN = 0.905 μm ($\pm 0.0905 \mu\text{m}$)

Metal 4: Ti//AlCu/TiN = 3.175 μm ($\pm 0.4725 \mu\text{m}$)

Top passivation: TEOS = 500 nm (± 50 nm)

SiN = 550 nm (± 55 nm)

Polymide = 5000 nm (± 1000 nm)

Backside metallization: bare silicon

Glassivation.

Type: See top passivation

Thickness: See top passivation

Substrate: Silicon

Special assembly instructions: AGND bonded with PGND

Pad layout coordinates					
Pad symbol	X center	Y center	Pad symbol	X center	Y center
PGND	-815.7	+0.3	PVCC	+825.45	+0.3
SGND	-815.7	+380	OUTP2	+435.525	-725.05
PWM1	-455.95	+751.725	OUTN2	-110.6	-725.05
OUTN1	-110.6	+725.65	PWM2	-455.95	-751.725
OUTP1	+431.525	+725.65	AGND	-815.7	-379.4

NOTES:

1. Units are in μm .
2. AGND bonded with PGND.

FIGURE A-2. Die bonding pad locations and electrical functions - continued.

STANDARD MICROCIRCUIT DRAWING DLA LAND AND MARITIME COLUMBUS, OHIO 43218-3990	SIZE A		5962-99560
		REVISION LEVEL G	SHEET 29

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 17-02-17

Approved sources of supply for SMD 5962-99560 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 <u>1/</u>	Vendor CAGE number	Vendor similar PIN <u>2/</u>
5962F9956001VXC	34371	HS9-4424RH-Q
5962F9956001QXC	34371	HS9-4424RH-8
5952R9956001TXC	34371	HS9-4424RH-T
5962F9956001V9A	34371	HS0-4424RH-Q
5962F9956002VXC	34371	HS9-4424BRH-Q
5962F9956002QXC	34371	HS9-4424BRH-8
5962R9956002TXC	34371	HS9-4424BRH-T
5962F9956002V9A	34371	HS0-4424BRH-Q
5962F9956003VXC	34371	HS9-4424EH-Q
5962F9956003V9A	34371	HS0-4424EH-Q
5962F9956004VXC	34371	HS9-4424BEH-Q
5962F9956004V9A	34371	HS0-4424BEH-Q
5962F9956005VXC	34371	HS9-4424DRH-Q
5962F9956005V9A	34371	HS0-4424DRH-Q
5962F9956006VXC	34371	HS9-4424DEH-Q
5962F9956006V9A	34371	HS0-4424DEH-Q
5962R9956007VYC	F8859	RHRPM4424K01V
5962R9956007VYA	F8859	RHRPM4424K02V
5962R9956007VZC	F8859	RHRPM4424LK01V
5962R9956007VZA	F8859	RHRPM4424LK02V
5962R9956007V9A	F8859	RHRPM4424D2V

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.

STANDARD MICROCIRCUIT DRAWING BULLETIN – CONTINUED.

DATE: 17-02-17

<u>Vendor CAGE number</u>	<u>Vendor name and address</u>
34371	Intersil Corporation 1650 Robert J. Conlan Blvd. NE Palm Bay, FL 32905-3406
F8859	ST Microelectronics 3 rue de Suisse CS 60816 35208 RENNES cedex2-FRANCE

The information contained herein is disseminated for convenience only and the Government assumes no liability whatsoever for any inaccuracies in the information bulletin.