REVISIONS			
SYMBOL	DESCRIPTION	DATE	APPROVAL
---	Released	05-JAN-1995	ELB

SHEET REVISION STATUS

SH	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
REV	--	--	--	--	--	--	--	--	--	--	--	--	--							
SH	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
REV																				
SH	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
REV																				

ORIGINATOR K. Kim / UNISYS K. Kim	DATE 11/25/94	FSC: 5961
APPROVED S. Archer-Davies / UNISYS S. Archer-Davies	11/29/94	PROCUREMENT SPECIFICATION FOR DIODE, LIGHT EMITTING, INFRARED, LPE GaAlAs. (OD-880WJ)
CODE 715 APPROVAL A. Martino / GSFC Anthony J. Martino	12/22/94	
CODE 311 APPROVAL J. M. Lohr / GSFC J. M. Lohr	12-22-94	
CODE 311 SUPERVISORY APVL R. L. Chinnapongse / GSFC R. L. Chinnapongse	1/5/95	S-311-P-790

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND 20771

CAGE CODE: 25306

1. **SCOPE**

1.1 Scope. This source control drawing defines the requirements for a GaAlAs infrared light emitting diode for use in space flight applications.

1.2 Part number. The part number for parts which meet the requirements of this specification shall be G311P790 or supplier's part designation approved by the procuring activity.

1.3 Absolute maximum ratings. 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.

Power Dissipation (P_D) 1/:	190 mW.
Reverse Voltage (V_R):	5 V.
Continuous Forward Current (I_F):	100 mA.
Peak Forward Current (10 µS, 400 Hz) 2/:	3 A.
Soldering temperature:	240 °C.
Thermal Resistance ($R_{\Theta JA}$):	370 °C/W.
Thermal Resistance ($R_{\Theta JC}$):	120 °C/W.
Storage temperature range:	170 K to 423 K.

1/ Derate per thermal derating curve (Figure 2) above 25 °C.

2/ Derate linearly at 24mA/°C above 25 °C.

1.4 Recommended operating conditions.

Operating temperature range: 170 K to 423 K.

2. **APPLICABLE DOCUMENTS**

2.1 Government specification and standards. The following documents form a part of this drawing to the extent specified herein.

SPECIFICATION

MIL-S-19500 Semiconductor Devices, General Specification for

STANDARDS

MIL-STD-750 Test Methods for Semiconductor Devices

MIL-STD-883 Test Methods and Procedures for Microelectronics

2.2 Order of precedence. In the event of a conflict between this drawing and the applicable documents cited herein, the order of precedence shall be this drawing, MIL-S-19500, and the remaining applicable documents.

3. **REQUIREMENTS**

3.1 General. The devices procured to this specification shall be compliant to the requirements of MIL-S-19500, JANTXV level to the degree specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-S-19500, JANTXV and herein.

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

3.2.2 Lead Finish. The lead finish shall be gold plated Kovar.

3.3 Electrical performance specifications. Unless otherwise specified herein, the electrical performance characteristics are as specified in Table I.

3.4 Electrical test requirements. The electrical test requirements shall be as specified in Table I, II and III herein.

3.5 Product assurance requirements. Delivered devices shall be those which have been subjected to and have passed the applicable requirements, tests, and inspections detailed herein and MIL-S-19500 to the extent specified herein.

3.5.1 General. Devices furnished under this specification shall be devices which are designed and fabricated at an approved facility as required herein.

3.5.1.1 Certification and qualification. The device manufacturer shall be certified and qualified to produce Semiconductor devices compliant to MIL-S-19500 for JANTXV level. The procuring activity may perform an audit to determine capability of a manufacturer in lieu of the manufacturer being listed on the QPL-19500.

3.5.1.2 Wafer Lot Acceptance. All wafers used in fabrication of devices delivered to this specification shall have been subjected to and have passed the wafer lot acceptance testing in accordance with section 4.3 herein.

3.5.1.3 Screening. All devices delivered to this specification shall have been subjected to and have passed the screening in accordance with section 4.4 herein.

3.5.1.4 Quality conformance inspection (QCI). All devices delivered to this specification shall be from a lot that have been subjected to and have passed the sample QCI as specified in section 4.5 herein.

3.5.1.5 Traceability. Traceability shall be in accordance with MIL-S-19500, JANTXV level.

3.6 Marking. Each device shall be marked as following:

a. Part number from paragraph 1.2 herein.
b. Manufacturer's name, logo or cage code.
c. Lot date code.
d. Electrostatic Discharge Sensitivity Identifier, per MIL-S-19500.
e. Serial Number.

If device size precludes above marking requirements on the individual part, all of the marking shall be placed on the individual package for each part except that the the serial number must be placed on the individual devices.

3.7 Certificate of compliance. A certificate of compliance shall be submitted with the delivered parts and shall state that the manufacturer's product meets the requirements of MIL-S-19500 to the degree specified herein, and the requirements herein.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in this specification or the purchase order, the manufacturer is responsible for performing all inspections specified herein using their own facilities or an outside laboratory acceptable to the procuring activity. Upon receipt of product, the procuring activity reserves the right to perform any of the inspections set forth in this specification.

4.2 Sampling and inspection. Sampling and inspection procedures shall be as specified in Tables II and III herein.

4.3 Wafer Lot Acceptance. Wafer Lot Acceptance shall be in accordance with MIL-STD-750, Method 5001, Level I, excluding glassivation thickness, for random sample of 5 dice only.

4.4 Screening. Screening shall be in accordance with Table II herein.

4.5 Quality conformance inspection. Quality conformance inspection shall consist of the group B inspection specified in Table III herein, with the following additional criteria:

a. Unless otherwise noted, the samples for group B inspection shall be selected from units that have been subjected and have passed the screening of paragraph 4.4 herein.

4.7 Destructive physical analysis. The supplier shall perform the destructive physical analysis per MIL-STD-883, method 5009 on minimum of 5 samples. Any DPA failures should be notified to the procuring activity as soon as the failure occurs. The procuring activity reserves the right to refuse to take delivery of the parts if the parts are rejectable per the criteria of the test method.

5. **PACKAGING**

5.1 Packaging requirements. The requirements shall be in accordance with MIL-S-19500.

5.2 Unit package identification and marking. The unit package shall be marked with the following:

a. NASA/GSFC H4 identification number (Cage Code)(25306).

b. Device part number per 1.2.

c. Manufacturer's name and H4 code identification number (Cage Code).

d. Date code in accordance with MIL-STD-1285.

e. Inspection lot number.

f. ESD sensitivity warning symbol.

g. Quantity in container

h. Purchase order number.

5.3 Shipping container. The devices shall be packaged and delivered in ESD protective containers. The shipping container shall be legibly marked with the following information.

a. Purchase order number.

b. Device part number.

c. Manufacturer's name and H4 identification number (Cage Code).

5.4 Deliverable data package. The data package for each shipment shall include the following:

a. Cover sheet with traceability information and serial number range.

b. Certificate of conformance.

c. Copies of actual processing and screening travelers.

d. Radiography report.

e. Screening attributes data.

f. Burn-in variables and attributes data reported by device serial number.

g. Burn-in delta variables data.

h. Wafer Lot Acceptance Test Report.

i. Destructive Physical Analysis Report.

j. Waivers, if any.

k. Group B attributes data.

6. **NOTES**

6.1 Notice. When GSFC drawings, specifications, or other data are sent for any purpose other than in connection with a definitely related GSFC procurement operation, the United States government thereby incurs no responsibility nor any obligation whatsoever. The fact that GSFC may have formulated, furnished, or in any way supplied said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any persons or corporations or conveying any rights or permission to manufacture, use, or sell any patented invention that may be in any way related thereto.

6.2 Qualifying activity. The identification and contact address of the qualifying activity shall be as follows:

Custodian
Goddard Space Flight Center
Greenbelt, Maryland 20771

ATTN. QPL Administrator
Code 311.2

6.3 Approved Source.

Opto Diode Corp
750 Mitchell Road
Newbury Park, California 91320.

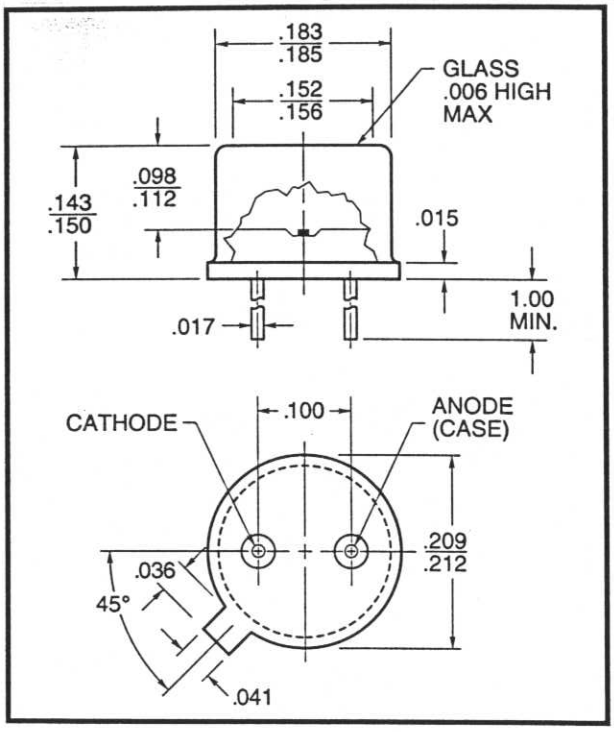

Figure 1. Case Outline

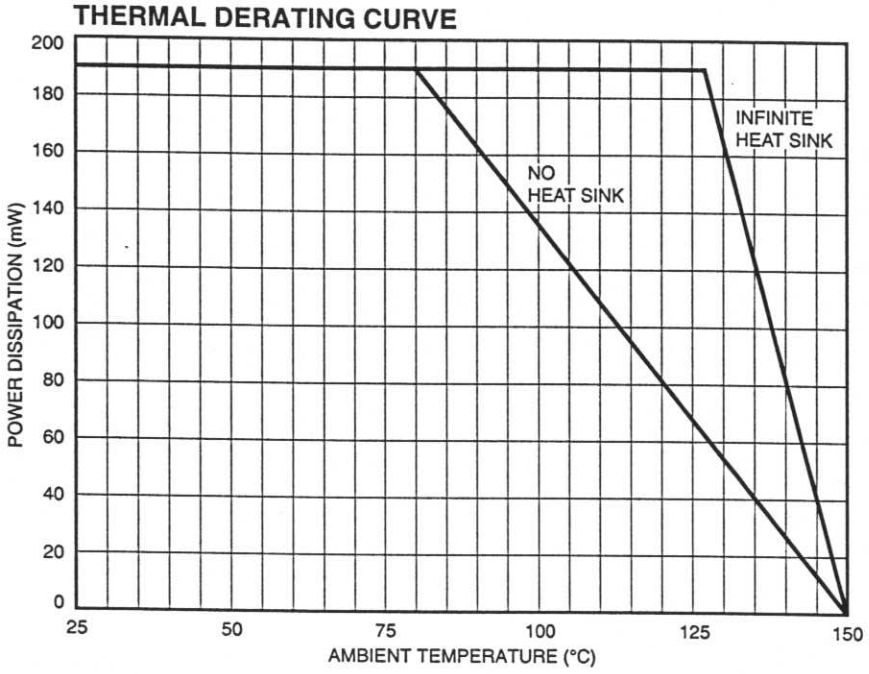

Figure 2. Thermal Derating Curve

Table I. Electrical Characteristics

PARAMETER	Symbol	CONDITION	MIN	TYP	MAX	UNITS
Total Output Power	P_{O1} P_{O2} P_{O3}	I_F = 50 mA, T_A = +25°C T_A = +100°C T_A = -55°C	3.5 2.0 4.7	4.5 2.75 7		mW
Peak Wavelength	λ_p	I_F = 50 mA, T_A = +25°C	870	880	910	nm
Spectral Bandwidth at 50%	$\Delta\lambda$	I_F = 50 mA, T_A = +25°C	60	80	100	nm
Half-Intensity Beam Angle	θhp	I_F = 100 mA, T_A = +25°C			90	Deg.
Foward Voltage	V_{F1} V_{F2} V_{F3}	I_F = 50 mA, T_A = +25°C T_A = +100°C T_A = -55°C		1.65	1.9 1.4 2.8	V
Reverse Breakdown Voltage	V_R	I_R = 10 µA, T_A = +25°C	5	30		V

Table I(a). Delta Limits

PARAMETER	Symbol	Delta Limit
Output Power	ΔP_{O1}	±5 %
Foward Voltage	ΔV_{F1}	±100 mV

Table II. Screening Requirements

Inspection/Test	MIL-STD-750	
	Methods	Conditions
1. High Temperature Bake	1031	T_A = 125 °C, 96 Hr.
2. Temperature Cycling	1051	Cond. B, 20 Cycles, between -65 °C to +125 °C.
3. Constant Acceleration	2006	force = 20,000G, Y_1 Orientation Only.
4. PIND 1/	2052	Cond. A.
5. Hermetic Seal a. Fine Leak b. Gross Leak	1071	 Cond. H. Cond. C.
6. Serialization		
7. Initial Electrical Measurements		Measure P_{O1}, V_{F1}, and V_R of Table I herein, Read and Record Data.
8. Power Burn-In	1026	Cond. B, T_A = +25 °C, I_F = 100 ± 5 mA for 240 hours.
9. Final Electrical Measurements		Measure P_{O1}, V_{F1}, V_R P_{O2}, V_{F2}, P_{O3}, and V_{F3} of Table I herein, Read and Record Data. Caculate delta parameter per Table I(a) herein. PDA = 10%.
10. Radiography	2076	two views
11. External Visual	2071	3 to 10X

1/ The PIND test may be performed after the radiography test at the option of the supplier.

Table III. Group B Inspection

Inspection/Test	MIL-STD-750		Sample Size
	Methods	Conditions	
Subgroup 1 1/			
Marking Permanency 1/	MIL-STD -202, Method 215	Cond. A	22(0)
Hermetic Seal a. Fine Leak b. Gross Leak	1071	 Cond. H Cond. C	
Subgroup 2			
Solderability	2026		22(0)
Thermal Shock	1056	Cond. B,	
Hermetic Seal a. Fine Leak b. Gross Leak	1071	Cond. H Cond. C.	
Moisture Resistance	1021	Omit Initial Conditioning.	
Barometric Pressure	1001	Voltage =0, Pressure = $1X10^{-6}$ Torr, Inspect for physical damage.	

Table III. Group B Inspection (continued)

Inspection/Test	MIL-STD-750		Sample Size
	Methods	Conditions	
Subgroup 3			
Mechanical Shock	2016	Nonoperating, 1500g's, 0.5ms, 5 blows in each orientation: X1, Y1, and Z1.	22(0)
Vibration, Variable Frequency	2056	Non-operating, 50G min.	
Constant Acceleration	2006	Y1 orientation: at 20,000G min.	
Subgroup 4			
Salt Atmosphere	1041		22(0)
Subgroup 5			
Pre-High Temperature Life Electrical Measurements		Read and Record P_{O1} and V_{F1}.	22(0)
High Temperature Life test	1031	T_A = +125 °C, for 340 hours, min.	
Electrical Measurements		Read and Record P_{O1} and V_{F1}.	
Subgroup 6			
Pre-Operating Life Electrical Measurements		Read and Record P_{O1} and V_{F1}.	22(0)
Operating Life test	1026	T_A = +25 °C, for 1,000 hours, min.	
Electrical Measurements		Read and Record P_{O1} and V_{F1}.	

1/ Marking Permanency testing is not required if the parts are bagged and tagged.