

The documentation and process conversion measures necessary to comply with this revision shall be completed by 16 August 2011.

INCH-POUND

MIL-PRF-19500/572C
 16 May 2011
 SUPERSEDING
 MIL-PRF-19500/572B
 30 October 1998

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, LIGHT EMITTING,
 TYPES 1N6493, 1N6494, 1N6495, 1N6500, 1N6501, AND 1N6502,
 JAN AND JANTX

This specification is approved for use by all Departments and Agencies of the Department of Defense.

The requirements for acquiring the product described herein shall consist of this specification sheet and [MIL-PRF-19500](#).

1. SCOPE

1.1 Scope. This specification covers the performance requirements for red, yellow, and green light-emitting diodes (LED). Two levels of product assurance are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Physical dimensions. See [figure 1](#) for 1N6493 through 1N6495 and [figure 2](#) for 1N6500 through 1N6502.

1.3 Maximum ratings.

I _F	I _{FM} (1)	V _(BR) (2)	P _{FM} (3)	T _{op} and T _{stg}
<u>mA dc</u>	<u>mA (pk)</u>	<u>V dc</u>	<u>mW (pk)</u>	<u>°C</u>
35	60	5	105	-65 to +100

- (1) Pulse width ≤ 0.5 ms, PFM(AV) ≤ PF.
- (2) I_R = 10 μA dc.
- (3) Derate linearly from +25°C at 1.4 mW/°C.

1.4 Characteristics, radiometric (physical), and photometric (visual).

Type	Color	I _F	I _V Θ = 0°	V _F	λV		I _R at V _R = 3 V	C at V _R = 0 V
		mA dc	mcd	V dc	Min	Max	μA dc	pF
1N6493, 1N6500	Red	20	1	3	595	695	1	100
1N6494, 1N6501	Yellow	20	1	3	570	595	1	100
1N6495, 1N6502	Green	25	0.8	3	525	580	1	100

Comments, suggestions, or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAC, P.O. Box 3990, Columbus, OH 43218-3990, or emailed to semiconductor@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.daps.dla.mil/>.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks 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.

DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-PRF-19500](#) – Semiconductor Devices, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-750](#) – Test Methods for Semiconductor Devices.

(Copies of these documents are available online at <https://assist.daps.dla.mil/quicksearch> or <https://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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

3. REQUIREMENTS

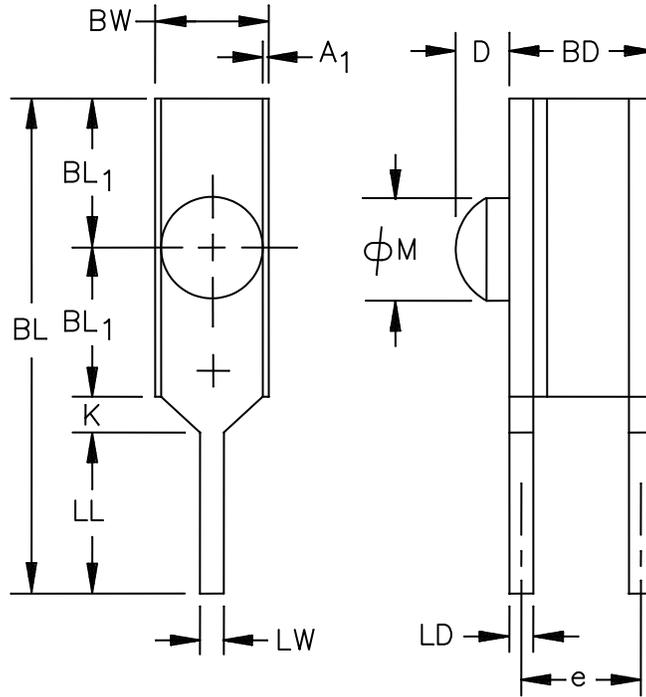
3.1 General. The individual item requirements shall be as specified in [MIL-PRF-19500](#) and as modified herein.

3.2 Qualification. Devices furnished under this specification shall be products that are manufactured by a manufacturer authorized by the qualifying activity for listing on the applicable qualified manufacturers list (QML) before contract award (see 4.2 and 6.3).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in [MIL-PRF-19500](#) and as follows.

IFM	Forward current (subscript M indicates maximum).
I _V	Luminous intensity (the subscript V is used to designate a photometric or visual quantity to differentiate from I used herein for current).
λ _V	Peak radiometric wavelength of diode light emission.
mcd	Milli-candela; the candela is a unit of luminous intensity defined such that the luminance of a blackbody radiator at the temperature of solidification of platinum is 60 candelas per square centimeter.
P _{FM}	Forward power dissipation (the subscript M indicates maximum).
θ	The angle at or off the axis of symmetry of a light source at which luminous intensity is measured.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in [MIL-PRF-19500](#), and on [figures 1](#) and [2](#).

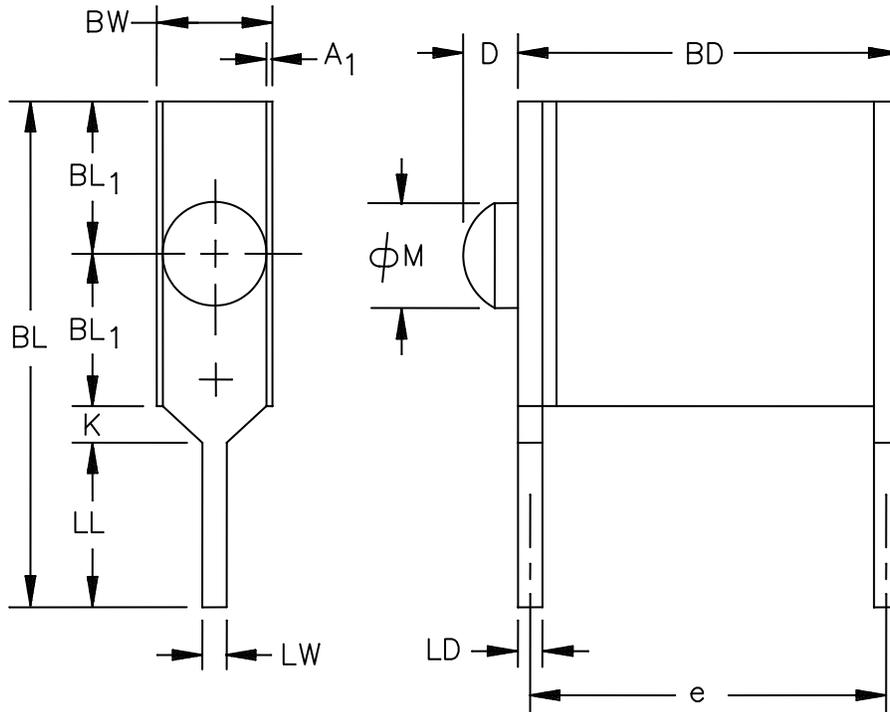


Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A ₁	.003	.005	0.08	0.13	2
BD	.112	.128	2.84	3.25	
BL	.385	.445	9.78	11.30	
BL ₁	.123	.127	3.12	3.23	
BW	.093	.099	2.36	2.51	
D	.045 Nominal		1.14 Nominal		
e	.100 BSC		2.54 BSC		3
K	.015	.045	0.38	1.14	
LD	.018	.022	0.46	0.56	
LL	.125	.145	3.17	3.68	
LW	.020	.022	0.51	0.56	
ØM	.075	.082	1.90	2.08	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. The front and back pins are recessed on the two sides to prevent shorting of an adjacent device.
3. The basic pin spacing is between centerlines.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 1. Physical dimensions for types 1N6493, 1N6494, and 1N6495.



Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
A ₁	.003	.005	0.08	0.13	2
BD	.312	.328	7.92	8.33	
BL	.385	.445	9.78	11.30	
BL ₁	.123	.127	3.12	3.23	
BW	.093	.099	2.36	2.51	
D	.045 Nominal		1.14 Nominal		
e	.300 BSC		7.62 BSC		3
K	.015	.045	0.38	1.14	
LD	.018	.022	0.46	0.56	
LL	.125	.145	3.17	3.68	
LW	.020	.022	0.51	0.56	
ØM	.075	.082	1.90	2.08	

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. The front and back pins are recessed on the two sides to prevent shorting of an adjacent device.
3. The basic pin spacing is between centerlines.
4. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.

FIGURE 2. Physical dimensions for types 1N6500, 1N6501, and 1N6502.

3.4.1 Lead finish. Lead finish shall be solderable in accordance with MIL-PRF-19500, MIL-STD-750, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.3).

3.5 Marking. Marking shall be in accordance with MIL-PRF-19500. Manufacturer's identification and date code shall be marked on the devices. Initial container package marking shall be in accordance with MIL-PRF-19500.

3.6 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in 1.3, 1.4, and table I herein.

3.7 Electrical test requirements. The electrical test requirements shall be as specified in table I herein.

3.8 Workmanship. Semiconductor devices shall be processed in such a manner as to be uniform in quality and shall be free from other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.2).
- b. Screening (see 4.3).
- c. Conformance inspection (see 4.4, and tables I and II herein).

4.2 Qualification inspection. Qualification inspection shall be in accordance with MIL-PRF-19500 and as specified herein.

4.2.1 Group E qualification. The group E inspections of table II herein shall be performed for qualification or re-qualification only. In case qualification was awarded to a prior revision of the specification sheet that did not require the performance of group E inspection, the tests specified in table II herein that were not performed in the prior revision shall be performed on the first inspection lot of this revision to maintain qualification.

4.3 Screening (JANTXV and JANTX levels). Screening shall be in accordance with table E-IV of MIL-PRF-19500 and as specified herein. Specified electrical measurements shall be made in accordance with table I herein. Devices that exceed the limits of table I herein shall not be acceptable.

Screen see table E-IV of MIL-PRF-19500	Measurements
	JANTX level
7	Method 1071 of MIL-STD-750, fine leak, test condition H (leak testing 30 minutes after pressurization is acceptable.) Method 1071 of MIL-STD-750, gross leak, test condition C, except that leak indicator fluid shall be maintained at +100°C ±5°C.
9 and 10	Not applicable.
11	Subgroup 2 of table I herein.
12	I _F = 35 mA dc; T _A = +25°C, t = 168 hours.
13	Subgroup 2 of table I herein; Δ V ₁ = -20 percent of initial readings. ΔV _F = ±50 mV dc.

4.4 Conformance inspection. Conformance inspection shall be in accordance with [MIL-PRF-19500](#) and as specified herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-V of [MIL-PRF-19500](#), [table I](#) herein, and as specified herein. Electrical measurements (end-points) shall be in accordance with subgroup 2 of [table I](#) herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in E-VIb (JAN, JANTX, and JANTXV) of [MIL-PRF-19500](#) and [4.4.2.1](#) herein. Electrical measurements (end-points) shall be in accordance with subgroup 2 of [table I](#) herein.

4.4.2.1 Group B inspection, appendix E, table E-VI of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B2	1051	Test condition A, except $T_{(high)} = +100^{\circ}\text{C}$ (10 cycles); time at temperature extremes 15 minutes minimum.
B2	1071	Fine leak: Test condition H (leak testing 30 minutes after pressurization is acceptable).
		Gross leak: Test condition C, except that leak indicator fluid shall be maintained at $+100^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
B3	1027	$I_F = 25 \text{ mA dc}$; $T_A = +25^{\circ}\text{C}$; $t = 340 \text{ hours}$.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VII of [MIL-PRF-19500](#) and as follows. Electrical measurements (end-points) shall be in accordance with the inspections of subgroup 2 of [table I](#) herein.

4.4.3.1 Group C inspection, appendix E, table E-VII of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
C2	1056	Test condition A.
C2	2036	Test condition E.
C2	1071	Fine leak: Test condition H (leak testing 30 minutes after pressurization is acceptable).
		Gross leak: Test condition C, except that leak indicator fluid shall be maintained at $+100^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
C3	2016	Non-operating; 1,500 G's; $t = 0.5 \text{ ms}$; 5 blows in each orientation: X1, Y1, and Y2.
C3	2056	Non-operating.
C3	2006	Non-operating; 20,000 G's; X1, Y1, and Y2.
C6	1026	$I_F = 35 \text{ mA dc}$; $T_A = +25^{\circ}\text{C}$.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables and as follows.

4.5.1 Luminous intensity. This measurement is made with a photometer.

TABLE I. Group A inspection.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Luminous intensity		$\Theta = 0$ degrees (see 4.5.1)	I_{V1}			
1N6493, 1N6494 1N6500, 1N6501		$I_F = 20$ mA dc		1		mcd
1N6495, 1N6502		$I_F = 25$ mA dc		0.8		mcd
Luminous intensity		$\Theta = 15$ degrees (see 4.5.1)	I_{V2}			
1N6493, 1N6494 1N6500, 1N6501		$I_F = 20$ mA dc		0.5		mcd
1N6495, 1N6502		$I_F = 25$ mA dc		0.4		mcd
Reverse current	4016	DC method; $V_R = 3$ V dc	I_R		1.0	μ A dc
Forward voltage	4011	DC method	V_F			
1N6493, 1N6494 1N6500, 1N6501		$I_F = 20$ mA dc			3	V dc
1N6495, 1N6502		$I_F = 25$ mA dc			3	V dc
<u>Subgroup 3</u>						
High temperature:		$T_A = +100^\circ\text{C}$				
Reverse current	4016	DC method; $V_R = 3$ V dc	I_R		1.0	μ A dc
Forward voltage	4011	DC method	V_F			
1N6493, 1N6494 1N6500, 1N6501		$I_F = 20$ mA dc		1.5		V dc
1N6495, 1N6502		$I_F = 25$ mA dc		1.5		V dc

See footnote at end of table.

TABLE I. Group A inspection – Continued.

Inspection ^{1/}	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 3</u> – Continued						
Low temperature:		$T_A = -55^\circ\text{C}$				
Reverse current	4016	DC method; $V_R = 3\text{ V dc}$	I_R		1.0	$\mu\text{A dc}$
Forward voltage	4011	DC method	V_F			
1N6493, 1N6494 1N6500, 1N6501		$I_F = 20\text{ mA dc}$			3.25	V dc
1N6495, 1N6502		$I_F = 25\text{ mA dc}$			3.25	V dc
<u>Subgroup 4</u>						
Capacitance	4001	$V_R = 0; f = 1\text{ MHz}$	C		100	pF
<u>Subgroups 5, 6, and 7</u>						
Not applicable						

^{1/} For sampling plans, see MIL-PRF-19500.

TABLE II. Group E inspection (all quality levels) for qualification and requalification only.

Inspection	MIL-STD-750		Qualification inspection
	Method	Conditions	
<u>Subgroup 1</u>			n = 45, c = 0
Thermal shock (glass strain)	1056	100 cycles 0°C to 100°C	
Temperature cycling	1051	500 cycles, -65°C to +100°C	
Hermetic seal	1071		
Electrical measurement		See subgroup 2 of table I herein.	
<u>Subgroup 2</u>			
Intermittent operating life	1037	10,000 cycles.	
Electrical measurements		See subgroup 2 of table I herein.	
<u>Subgroups 4 and 5</u>			
Not applicable			
<u>Subgroup 6</u>			n = 11, c = 0
ESD	1020		
<u>Subgroups 7, 8, and 9</u>			
Not applicable			

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the Military Service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory. The notes specified in [MIL-PRF-19500](#) are applicable to this specification.)

6.1 Intended use. Semiconductors conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Packaging requirements (see 5.1).
- c. Lead finish (see 3.4.1).
- d. Product assurance level and type designator.
- e. Destructive physical analysis when requested.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Manufacturers List (QML 19500) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from DLA Land and Maritime, ATTN: VQE, P.O. Box 3990, Columbus, OH 43218-3990 or e-mail vqe.chief@dla.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.daps.dla.mil>.

6.4 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Air Force – 85
DLA – CC

Preparing activity:
DLA – CC

Review activity:
Air Force – 99

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