

The documentation and process conversion measures necessary to comply with this revision shall be completed by 21 June 2014.

INCH-POUND

MIL-PRF-19500/521E
21 December 2013
SUPERSEDING
MIL-PRF-19500/521D
1 May 2007

PERFORMANCE SPECIFICATION SHEET

LIGHT EMITTING DIODE, GREEN, JEDEC TYPES JAN1N6094, JANTX1N6094 (DIFFUSED LENS), JAN1N6611, JANTX1N6611 (CLEAR LENS), AND PANEL MOUNT ASSEMBLY, TYPES JANM19500/52101, JANTXM19500/52102 (DIFFUSED LENS), JANM19500/52103 AND JANTXM19500/52104 (CLEAR LENS)

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 hermetically-sealed green discrete and panel mount light emitting diodes. Two levels of product assurance are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Physical dimensions. The device package styles are as follows: TO-46 in accordance with [figure 1](#) and panel mount assembly in accordance with [figure 2](#).

1.3 Maximum ratings.

I_F	I_P (1)	I_{ptr} (2)	$V_{(BR)}$ (3)	P_{FM} (4)	T_{OP} and T_{STG}
<u>mA dc</u>	<u>mA (pk)</u>	<u>A (pk)</u>	<u>V dc</u>	<u>mW (pk)</u>	<u>°C</u>
30	60	1.0	5	120	-65 to +100

- (1) Pulse width maximum 0.5 ms and $P_{FM(AV)}$ less than P_F .
- (2) $I_{ptr} = 1 \mu s$ pulse width, 300 pulses per second (pps).
- (3) $I_R = 10 \mu A$ dc.
- (4) Derate linearly from +50°C at 2.4 mW/°C.

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

Limits	I_{V1} $I_F = 20 \text{ mA dc}$ $\Theta = 0 \text{ degrees}$		I_{V2} $I_F = 20 \text{ mA dc}$ $\Theta = 30 \text{ degrees}$	V_F $I_F = 20 \text{ mA dc}$	λ_V (wave length)	I_R $V_R = 3 \text{ V}$	C $V_R = 0$ $f = 1 \text{ MHz}$	Color
	mcd		mcd	V dc	nm	$\mu\text{A dc}$	pF	Green
Min	3.0 (1)	20.0 (2)	1.5	3.0	525	1	100	
Max					600			

(1) Applies to JAN1N6094, JANTX1N6094, JANM19500/52101, and JANTXM19500/52102.

(2) Applies to JAN1N6611, JANTX1N6611, JANM19500/52103, and JANTXM19500/52104.

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.

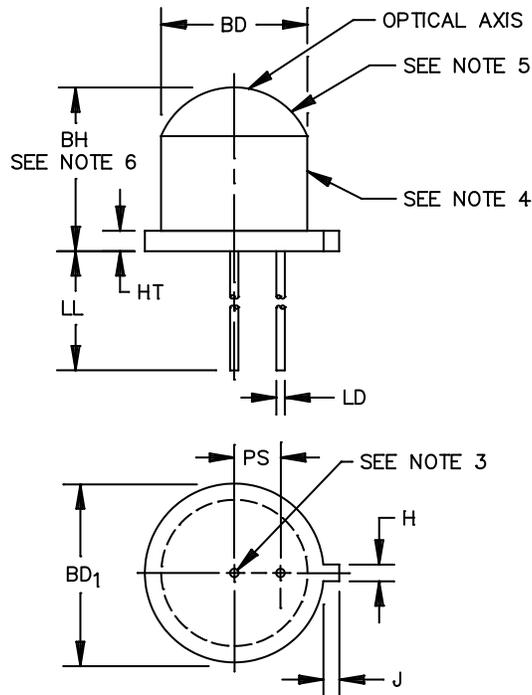
(Copies of these documents are available online at <http://quicksearch.dla.mil> or <https://assist.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

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 manufacturer's list (QML) before contract award (see 4.2 and 6.3).

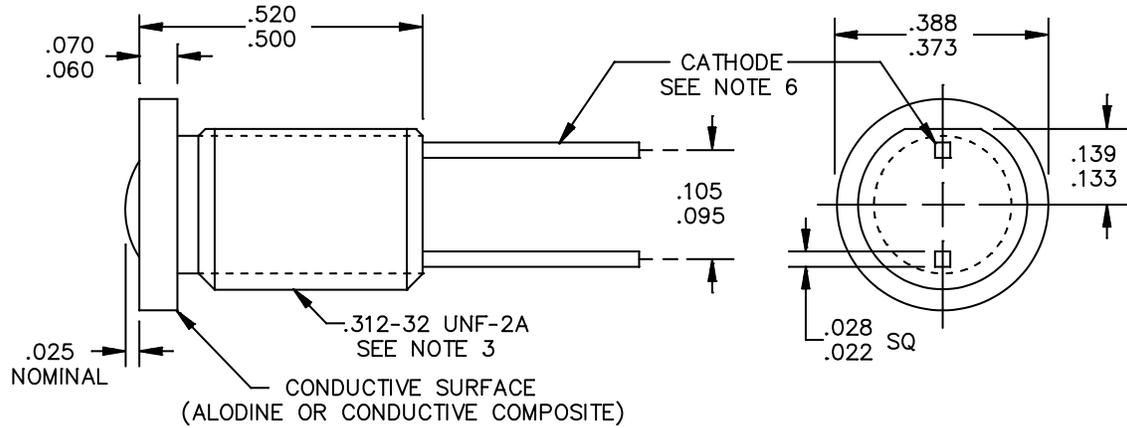


LTR	Dimensions				LTR	Dimensions			
	Inches		Millimeters			Inches		Millimeters	
	Min	Max	Min	Max		Min	Max	Min	Max
BD	.176	.190	4.47	4.83	J	.032	.042	0.81	1.07
BD ₁	.200	.220	5.08	5.59	LD	.016	.019	0.41	0.48
BH	.180	.225	4.57	5.72	LL	.970	1.030	24.64	26.16
H	.035	.045	0.89	1.14	PS	.045	.055	1.14	1.40
HT	.013	.024	0.33	0.61					

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. Cathode lead; both leads isolated from case.
3. Glass/metal hermetic can.
4. Colored lens or clear glass lens (see 6.2).
5. For sunlight viewable LEDs, dimension BH is .213 inch (5.41 mm) minimum and .260 inch (6.60 mm) maximum (see 6.2).
6. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.

FIGURE 1. Physical dimensions for types JAN1N6094, JANTX1N6094, JAN1N661, and JANTX1N6611.



Inches	mm	Inches	mm
.022	0.56	.133	3.38
.025	0.64	.139	3.53
.028	0.71	.373	9.47
.060	1.52	.388	9.86
.070	1.78	.500	12.70
.095	2.41	.520	13.21
.105	2.67	.583	14.81

NOTES:

1. Dimensions are in inches. Millimeters are given for general information only.
2. The panel mount sleeve is either black conductive composite with a tensile strength of 35,000 psi and surface resistivity of 100 ohms per square, black anodized aluminum, or black finished zinc.
3. Mounting hardware, which includes one lock washer and one hex nut, is included with each panel mountable hermetic solid state lamp.
4. Use of metric drill size 8.20 millimeters or letter gauge drill size P (.323 inch, 8.20 mm) is recommended for producing hole in the panel for panel mounting.
5. Both leads are isolated from the panel mount by nonconductive potting. Lead length is .500 inch (12.70 mm) minimum, .583 inch (14.81 mm) maximum.
6. Conductive surface may extend to threaded area.
7. In accordance with ASME Y14.5M, diameters are equivalent to Φ x symbology.

FIGURE 2. Physical dimensions for types JANM19500/52101, JANTX19500/52102, JANM19500/52103, and JANTXM19500/52104 panel mount assemblies.

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

I_P	Peak operating forward pulse current.
I_{ptr}	Peak transient forward current.
I_V	Luminous intensity (the subscript V is used to designate a photometric or visual quantity to differentiate from I as 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.
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. The interface requirements and physical dimensions shall be as specified in [MIL-PRF-19500](#) and on [figures 1](#) and [2](#).

3.4.1 Lead finish. Unless otherwise specified, the lead finish shall be solderable as defined in [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 [6.2](#)).

3.4.2 Polarity. The polarity of the device types shall be as shown on [figures 1](#) and [2](#).

3.4.3 Terminal lead length. Terminal lead lengths other than that specified on [figures 1](#) and [2](#) may be furnished when so stipulated in the acquisition document (see [6.2](#)) where the devices covered herein are required directly for particular equipment-circuit installation or for automatic-assembly-technique programs.

3.5 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in [1.3](#), [1.4](#), and [tables I](#) and [II](#) herein.

3.6 Electrical test requirements. The electrical test requirements shall be the subgroups specified in [tables I](#) and [II](#) herein.

3.7 Marking. Devices shall be marked as specified in [MIL-PRF-19500](#).

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](#)).

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

4.2.2 Group E qualification. Group E inspection 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 request the performance of [table III](#) tests, the tests specified in [table III](#) 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 (JANTX level only). Screening shall be in accordance with table E-IV of MIL-PRF-19500 and as specified herein. The following 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
2	As given, except condition shall be 24 hours minimum at maximum rated storage temperature.
3a	$T_{upper\ extreme} = 100^{\circ}C, +0^{\circ}C, -3^{\circ}C$.
7	As given, except for the fine leak test, condition G, testing 2 hours after pressurization is acceptable and for the gross leak test, the device temperature shall be maintained at $100^{\circ}C \pm 5^{\circ}C$.
9 and 10	Not applicable.
11	I_{V1}, V_F
12	$I_F = 35\text{ mA dc}; T_A = +25^{\circ}C, t = 96\text{ hours}$.
13	Subgroup 2 of table I herein; $\Delta I_{V1} = -20\text{ percent of initial readings}$. $\Delta V_F = \pm 50\text{ mV dc}$.

4.4 Conformance inspection. Conformance inspection shall be in accordance with MIL-PRF-19500 and as follows.

- a. If the manufacturer chooses the following option(s) for testing, the sample units that are to be used in group C inspection shall be designated as such, prior to conducting the referenced group B tests. Moreover, the number of failed diodes to be counted for lot acceptance or rejected as a result of group C test shall be equal to all failed diodes of the test in group B inspection, which were predesignated for use in group C inspection, plus any additional failures occurring group C testing. For each life test in group C inspection, the manufacturer has the option of using all, or a portion of, the sample already subjected to 340 hours of group B life testing for an additional 660 hours of testing to meet the 1,000 hour requirement.
- b. Panel mount assemblies shall be assembled with LEDs that have met the requirements of groups A, B, and C, and the applicable screening requirements specified herein. The quality conformance inspection for panel mount assemblies shall consist of the examinations and inspections specified in table II herein.

4.4.1 Group A inspection. Group A inspection shall be conducted in accordance with table E-V of MIL-PRF-19500, and tables I and II herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table E-VIB of MIL-PRF-19500 and herein. Electrical measurements (end-points) shall be in accordance with the inspections of table I, subgroup 2 herein.

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
B2	1051	Test condition A, except $T_{(high)} = +100^{\circ}\text{C}$ (25 cycles); time at temperature extremes 10 minutes minimum.
B2	1071	Fine leak: Test condition G or H (for condition H, leak testing 1 hour after pressurization shall be acceptable). Gross leak: Test condition A, D, E, or J except that leak indicator fluid shall be maintained at $+100^{\circ}\text{C} \pm 5^{\circ}\text{C}$.
B3	1027	$I_F = 35 \text{ mA dc}$; $T_A = +25^{\circ}\text{C}$; $t = 340 \text{ hours} +72, -24 \text{ hours}$ (see 4.4.a).

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

<u>Subgroup</u>	<u>Method</u>	<u>Conditions</u>
C2	1056	Test condition A.
C2	2036	Test condition E.
C2	1071	Fine leak: Test condition G or H (for condition H, leak testing 1 hour after pressurization shall be acceptable). Gross leak: Test condition A, D, E, or J 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, one minute in each orientation.
C6	1026	$I_F = 35 \text{ mA dc}$; $T_A = +25^{\circ}\text{C}$, 1,000 hours.
C7		Peak forward pulse current (transient); $t_p = 1 \mu\text{s}$, $\text{pps} = 300$, total test time = 5 s, $I_{prt} = 1.0 \text{ A (pk)}$.
C8		$t_p = 0.5 \text{ ms}$, $P_{FM} \leq 120 \text{ mW}$, $T_A = +25^{\circ}\text{C}$, $I_P = 60 \text{ mA}$, 500 hours.

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

4.5.1 Axial 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 3.3 and 4.5.1); $I_F = 20$ mA dc	I_{V1}	<u>2/</u> 3.0 <u>3/</u> 20.0		mcd mcd
Luminous intensity <u>2/</u>		$\Theta = 30$ degrees; $I_F = 20$ mA dc	I_{V2}	1.5		mcd
Reverse current	4016	DC method; $V_R = 3$ V dc	I_R		1.0	μ A dc
Forward voltage	4011	DC method, $I_F = 20$ mA dc	V_F		3.0	V dc
<u>Subgroup 3</u>						
High temperature operation:		$T_A = +100^\circ\text{C}$				
Reverse current	4016	DC method; $V_R = 3$ V dc	I_R		1.0	μ A dc
Forward voltage	4011	DC method, $I_F = 20$ mA dc	V_F		3.0	V dc
Low temperature operation:		$T_A = -55^\circ\text{C}$				
Reverse current	4016	DC method; $V_R = 3$ V dc	I_R		1.0	μ A dc
Forward voltage	4011	DC method, $I_F = 20$ mA dc	V_F		3.0	V dc
<u>Subgroup 4</u>						
Capacitance	4001	$V_R = 0$; $f = 1$ MHz	C		100	pF
<u>Subgroups 5, 6, and 7</u>						
Not applicable						

1/ For sampling plan, see MIL-PRF-19500.

2/ Applies to JAN1N6094 and JANTX1N6094.

3/ Applies to JAN1N6611 and JANTX1N6611.

TABLE II. Group A inspection for panel mount assemblies.

Inspection <u>1/</u>	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
External visual examination	2071					
<u>Subgroup 2</u>						
Luminous intensity		$\Theta = 0$ degrees (see 3.3 and 4.5.1); $I_F = 20$ mA dc	I_{V1}	<u>2/</u> 3.0 <u>3/</u> 20.0		mcd mcd
Luminous intensity <u>2/</u>		$\Theta = 30$ degrees; $I_F = 20$ mA dc	I_{V2}	1.5		mcd
Reverse current	4016	DC method; $V_R = 3$ V dc	I_R		1.0	μ A dc
Forward voltage	4011	DC method, $I_F = 20$ mA dc	V_F		3.0	V dc
<u>Subgroup 3, 4, 5, and 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Solderability <u>4/</u>	2026	15 devices, c = 0				
Resistance to solvents	1022	15 devices, c = 0				
Physical dimensions	2066	See figure 2, 45 devices, c = 0				

1/ For sampling plan, see MIL-PRF-19500.

2/ Applies to JAN19500/52101 and JANTX19500/52102.

3/ Applies to JANM19500/52103 and JANTX19500/52104.

4/ The sample size for solderability test applies to the number of leads inspected except in no case shall less than three leads be used to provide the number of leads required.

TABLE III. Group E inspections (all quality levels) for qualification only.

Inspections	MIL-STD-750		Quality conformance inspection sample size
	Method	Conditions	
<u>Subgroup 1</u>			45 devices, c = 0
Temperature cycling	1051	Test condition A, except that the hot temperature shall be +100°C, +15°C / -0°C, 20 cycles.	
Hermetic seal	1071		
Fine leak			
Gross leak			
Electrical measurements		See tables I and II , subgroup II.	
<u>Subgroup 2</u>			45 devices, c = 0
Intermittent operating life	1037	For all devices with organic material.	
Electrical measurements		See tables I and II , subgroup II.	

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. The complete Part or Identifying Number (PIN), see title and section 1.
- e. Specify the PIN for the LED or panel mount assembly as listed below.

JAN1N6094	JAN LED, green, diffused lens.
JANTX1N6094	JANTX LED, green, diffused lens.
JAN1N6611	JAN LED, green, clear lens, sunlight viewable.
JANTX1N6611	JANTX LED, green, clear lens, green, sunlight viewable.
JANM19500/52101	JAN panel mount, LED, green, diffused lens.
JANTXM19500/52102	JANTX panel mount LED, green, diffused lens.
JANM19500/52103	JAN panel mount, LED, green, clear lens, sunlight viewable.
JANTXM19500/52104	JANTX panel mount LED, green, clear lens, sunlight viewable.

Sunlight viewable – for applications requiring readability in bright sunlight (see 6.5.1).

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.dla.mil>.

6.4 Applications. These light emitting diodes are primarily intended as visible status (ON or OFF) indicators. Intensity is easily modulated by varying the forward current, so the level can be adjusted to suit ambient light conditions. The modulation rate capability can be high enough to accommodate video signals. Diodes may be operated in either direct current or pulsed mode depending upon current availability. Pulsed operation is desirable as a means of linear control of average intensity or of improving the average efficiency (ratio of average intensity to average current). A panel mount configuration, is provided (see figure 2). The panel mount configuration provides precise and consistent mechanical surfaces for mounting and optical alignment.

6.5 Operating considerations. Under normal ambient light conditions (300 to 1,000 lux), a typical forward current of 6 mA is required to produce an adequate on-state luminous intensity. This current level is directly compatible with TTL devices, and only simple buffering is needed when operating from LSTTL, LTTL, CMOS. No consideration of inrush current or keep-alive voltage is necessary. The relative luminous intensity (normalized at 20 mA) is displayed on figures 3 and 4 for diffused and clear (sunlight viewable) lens devices.

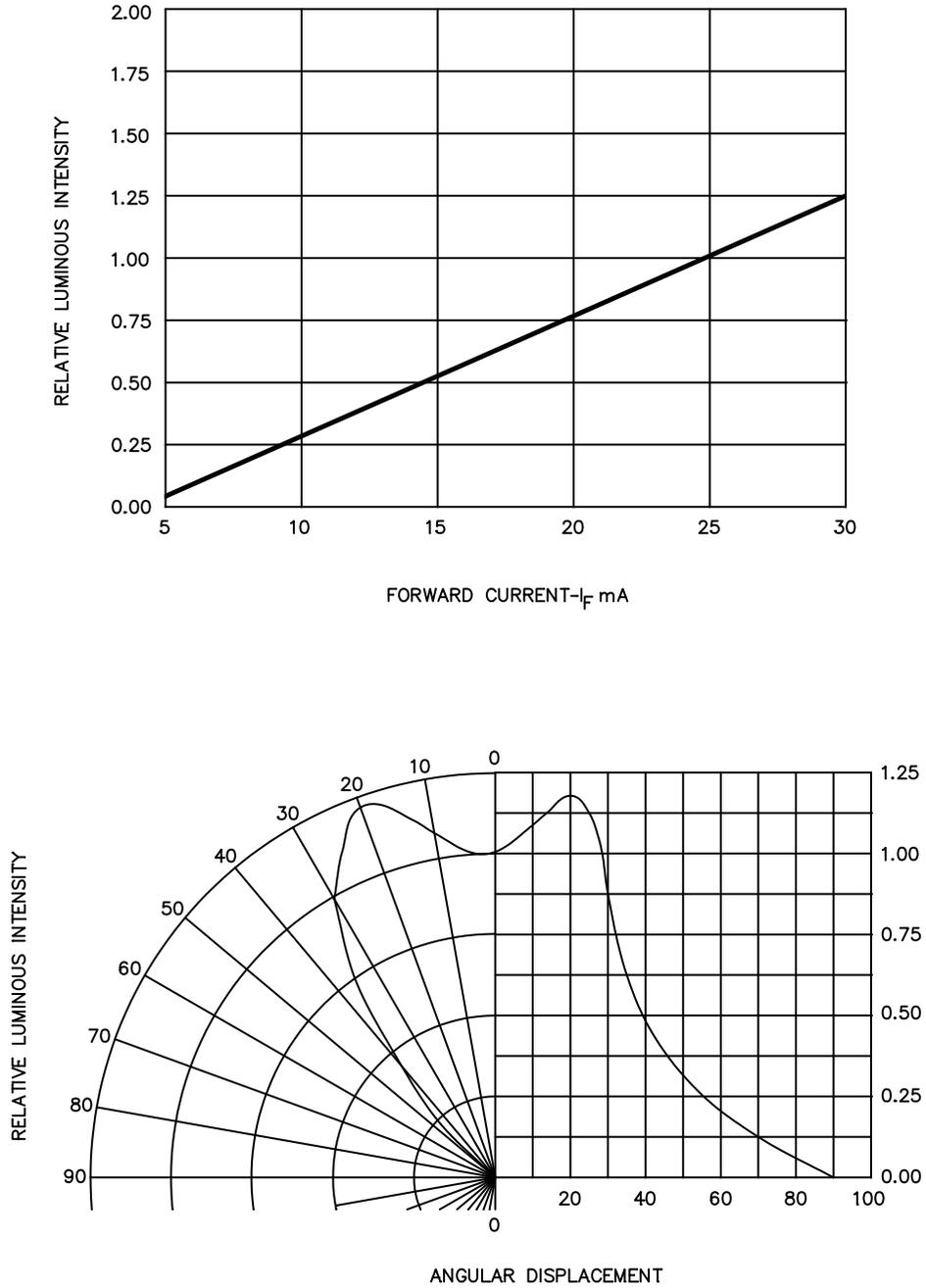


FIGURE 3. Relative luminous intensity, difussed lens devices.

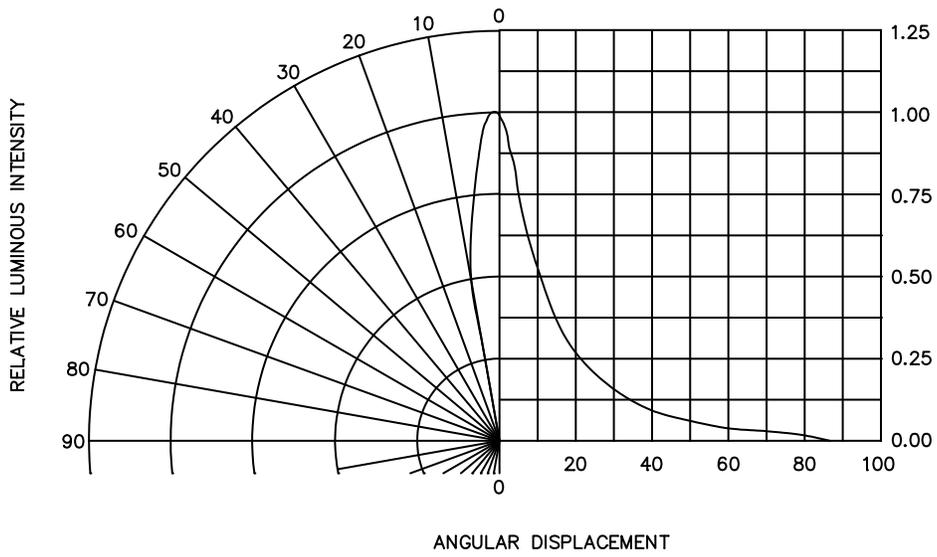
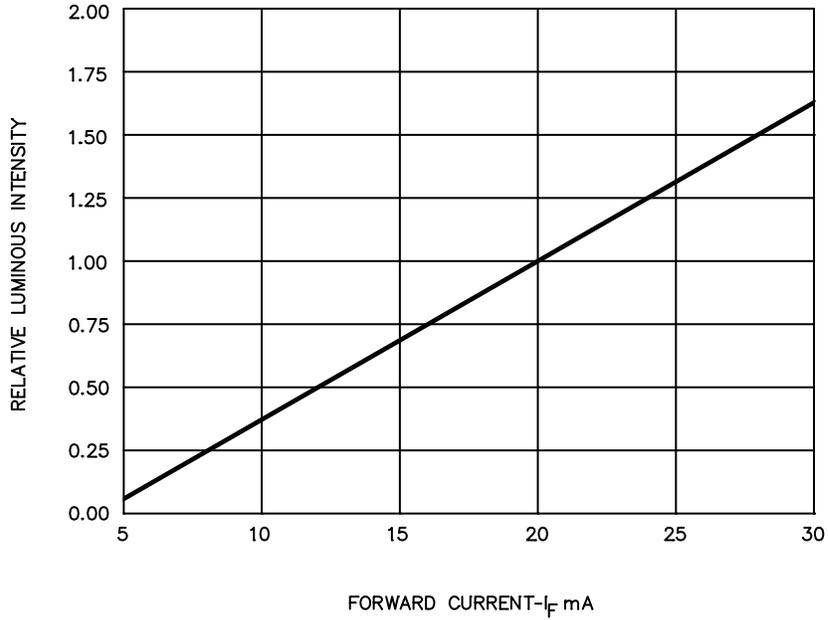


FIGURE 4. Relative luminous intensity, clear lens (sunlight viewable) devices.

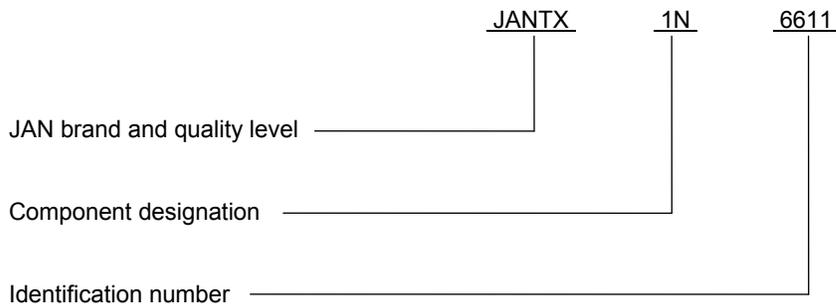
6.5.1 Design considerations. Design consideration should include: Ambient light level and color; viewing background, color and texture; observer, attentiveness, position and operator accessories (glasses, goggles). Where ambient light levels are so high that it is difficult to distinguish between the LED on condition and glint (reflection of light from the surface of the LED lens), a modulated current causing a visible flicker in the LED at 10 Hz is recommended. Color filters, louvered filters, and circular polarizing filters may enhance the desired visual effects of the LED. For applications in bright sunlight, sunlight viewable types are recommended. With the proper enhancement filter, these parts are readable in sunlight ambient conditions.

6.6 Reliability considerations. There is a correlation between LED luminous intensity degradation and operating current levels. To lengthen the useful life of this device, drive current should be held to a minimum consistent with use conditions: Luminous intensity would have to change by more than 50 percent before becoming apparent to the causal observer.

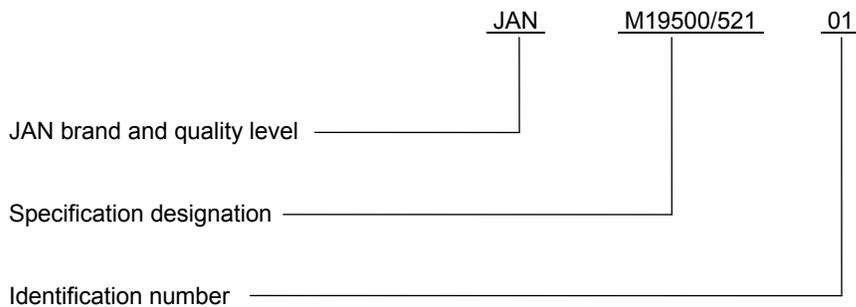
6.7 Replacement data. Device types JANM19500/52101 and JANTXM19500/52102 are direct replacements for device types M19500/521-01 and M19500/521-02, respectively.

6.8 PIN examples.

6.8.1 Through-hole mount devices. The PIN for encapsulated devices are in the following form.



6.8.2 Panel mount assemblies. The PIN for panel mount assemblies are in the following form.



6.9 Changes from previous issue. The margins of this specification are marked with vertical bars 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:
Army – CR
Air Force – 85
DLA – CC

Preparing activity:
DLA - CC

(Project 5980-2013-008)

Review activities:
Army – AR, MI, SM
Air Force – 99

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