

**PERFORMANCE SPECIFICATION**

**SEMICONDUCTOR DEVICE, DIODE, GALLIUM ARSENIDE, POWER RECTIFIER,  
TYPE 1N6757, JANTX, JANTXV, AND JANS**

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

**1. SCOPE**

1.1 Scope. This specification covers the performance requirements for Gallium arsenide rectifier diodes. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figure 1 (similar to TO-257AA).

1.3 Maximum ratings.

Type	V <sub>RRM</sub>	V <sub>RWM</sub>	I <sub>O</sub> (1)	I <sub>FSM</sub> (2)	T <sub>STG</sub>	T <sub>OP</sub>	R <sub>θJC</sub>	R <sub>θJC</sub>
	<u>V(pk)</u>	<u>V(pk)</u>	<u>A</u>	<u>A(pk)</u>	<u>°C</u>	<u>°C</u>	<u>°C/W</u>	<u>°C/W</u>
1N6757	250	250	9	35	-55 to +175	-55 to +175	5.4	65

**NOTES:**

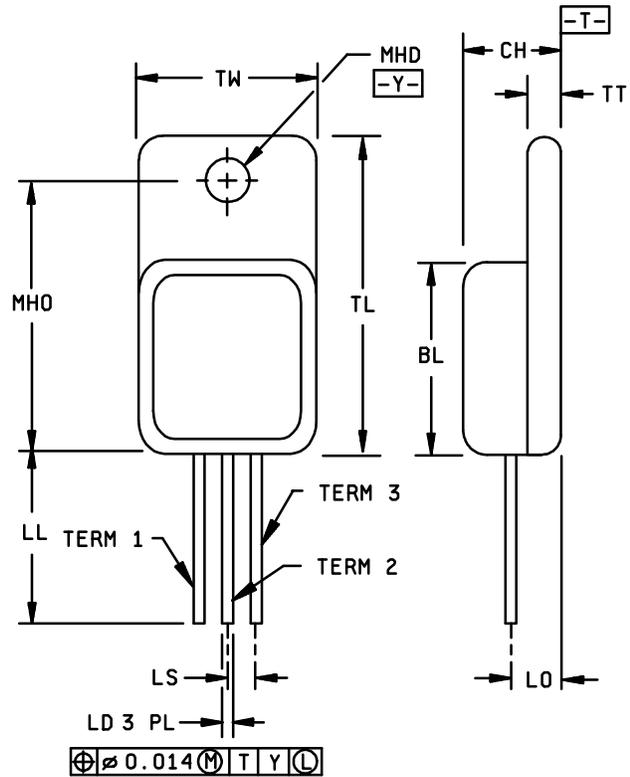
- (1) Derate at 82 mA/°C above T<sub>C</sub> = +65°C.
- (2) Surge applied at rated load conditions, half wave, 1Φ 60 Hz.

1.4 Primary electrical characteristics.

Type	V <sub>F1</sub> I <sub>FM</sub> = I <sub>O</sub> (see 1.3)	V <sub>F2</sub> I <sub>FM</sub> = 5A	I <sub>R1</sub> V <sub>R</sub> = 125 V	I <sub>R2</sub> V <sub>R</sub> = 250 V	I <sub>R3</sub> V <sub>R</sub> = 125 V T <sub>A</sub> = +125°C	I <sub>R4</sub> V <sub>R</sub> = 250 V T <sub>A</sub> = +125°C	I <sub>RM</sub>	t <sub>rr</sub>	C <sub>J</sub> V <sub>R</sub> = 5 V
							V <sub>R</sub> = 200 V, I <sub>F</sub> = 5 A, di/dt = 200 A/μs		
	<u>V dc</u>	<u>V dc</u>	<u>μA dc</u>	<u>μA dc</u>	<u>μA dc</u>	<u>μA dc</u>	<u>A</u>	<u>ns</u>	<u>pF</u>
1N6757	2.30	1.60	2.0	30	130	450	1.50	12.0	150

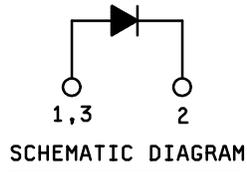
Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Supply Center, Columbus, ATTN: DSCC-VAC, P.O. Box 3990, Columbus, OH 43216-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

Dimensions <u>1/ 2/</u>				
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
BL	10.4	10.90	0.410	0.430
CH	4.82	5.10	0.190	0.200
LD	0.63	0.90	0.025	0.035
LO	3.05 typ		0.120 typ	
LS	2.50 typ		0.100 typ	
MHD	3.55	3.80	0.140	0.150
MHO	13.4	13.6	0.527	0.537
TL	16.4	16.9	0.645	0.655
TT	0.90	1.15	0.035	0.045
TW	10.4	10.7	0.410	0.420



Configuration 3/ 4/

<u>Terminal</u>	<u>Description</u>
1	Anode
2	Cathode
3	Anode



NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only (see 3.3).
3. All terminals are isolated from case.
4. Terminal 4 is the case.

FIGURE 1. Physical dimensions (TO-257AA).

## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 documents cited in sections 3 and 4 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

#### SPECIFICATION

##### DEPARTMENT OF DEFENSE

MIL-PRF-19500 - Semiconductor Devices, General Specification for.

#### STANDARD

##### DEPARTMENT OF DEFENSE

MIL-STD-750 - Test Methods for Semiconductor Devices.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Document Automation and Production Services (DAPS), Building 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.3 Order of precedence. 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 requirements for acquiring the product described herein shall consist of this document and MIL-PRF-19500.

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).

3.3 Abbreviations, symbols, and definitions. Abbreviations, symbols, and definitions used herein shall be as specified in MIL-PRF-19500 and as follows.

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in MIL-PRF-19500, and on figure 1 herein. Methods used for electrical isolation of the terminal feedthroughs shall employ materials that contain a minimum of 90 percent  $Al_2O_3$ (ceramic). Examples of such construction techniques are metallized ceramic eyelets or ceramic walled packages. The preferred system of measurement used herein is the metric SI system. However, since this item was designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.

3.4.1 Lead finish. Unless otherwise specified, 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 6.2).

3.4.2 Polarity. Polarity and terminal configuration shall be in accordance with figure 1 herein.

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

3.6 Marking. Marking shall be in accordance with MIL-PRF-19500. At the option of the manufacturer, marking may be omitted from the body, but shall be retained on the initial container.

3.7 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).

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

4.3 Screening (JANS, JANTX, and JANTXV levels only). Screening shall be in accordance with table 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 IV of MIL-PRF-19500)	Measurement	
	JANS level	JANTX and JANTXV levels
(1) 3C	Thermal impedance (see 4.3.2)	Thermal impedance (see 4.3.2)
9 and 10	Not applicable	Not applicable
11	$I_{R1}$ , $V_{F1}$	$I_{R1}$ and $V_{F1}$
12	See 4.3.1, $t = 240$ hours	See 4.3.1, $t = 48$ hours
(2) 13	Subgroups 2 and 3 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial value or 15 nA, whichever is greater. $\Delta V_{F1} \leq \pm 50$ mV.	Subgroup 2 of table I herein; $\Delta I_{R1} \leq 100$ percent of initial value or 250 nA dc, whichever is greater. $\Delta V_{F1} \leq \pm 50$ mV.

- (1) Thermal impedance shall be performed any time after screen 3.
- (2)  $Z_{\theta JX}$  is not required in screen 13 if already performed.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: Method 1038 of MIL-STD-750, test condition A.  $T_C = +125^\circ\text{C}$ ;  $V_R = 80$  percent of rated  $V_{RRM}$  dc (see 3.1).

4.3.2 Thermal impedance measurements for screening. The thermal impedance ( $Z_{\theta JX}$ ) measurements shall be performed in accordance with method 3101 of MIL-STD-750. The maximum limit (not to exceed the group A, subgroup 2 limit) for  $Z_{\theta JX}$  in screening (table IV of MIL-PRF-19500) shall be derived by each vendor by means of statistical process control. When the process has exhibited control and capability, the capability data shall be used to establish the fixed screening limit. In addition to screening, once a fixed limit has been established, monitor all future sealing lots using a random five piece sample from each lot to be plotted on the applicable X, R chart. If a lot exhibits an out of control condition, the entire lot shall be removed from the line and held for engineering evaluation and disposition.

4.3.3 Thermal impedance measurements for initial qualification or requalification. The  $Z_{\theta JX}$  measurements shall be performed in accordance with method 3101 of MIL-STD-750 (read and record data  $Z_{\theta JX}$ ). Derived conditions limits and thermal response curve shall be supplied to the qualifying activity on the qualification lot prior to qualification approval.

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 MIL-PRF-19500 and table I herein. The following test conditions shall be used for  $Z_{\theta JX}$ , group A inspection.

- a.  $I_H = 9 \text{ A}$ .
- b.  $t_H = 50 \text{ ms}$ .
- c.  $I_M = 10 \text{ mA}$ .
- d.  $t_{MD} = 100 \mu\text{s}$  minimum.

The maximum limit for under these test conditions are  $Z_{\theta JX} (\text{max}) \leq 5.4^\circ\text{C/W}$  (isolated);  $Z_{\theta JX} (\text{max}) \leq 4.3^\circ\text{C/W}$  (non-isolated).

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VIa (JANS) and table VIb (JANTX and JANTXV) of MIL-PRF-19500 and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.2.1 Group B inspection, table VIa (JANS) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Inspection</u>
3	4066	$T_A = 25^\circ\text{C} \pm 5^\circ\text{C}$ . See table I, subgroup 6 herein.

4.4.2.2 Group B inspection, table VIb (JANTX and JANTXV) of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Inspection</u>
2	4066	$T_A = 25^\circ\text{C} \pm 5^\circ\text{C}$ . See table I, subgroup 6 herein.

4.4.3 Group C inspection. Group C inspection shall be conducted in accordance with the conditions specified for subgroup testing in table VII of MIL-PRF-19500 and as follows. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps of table II herein.

4.4.3.1 Group C inspection, table VII of MIL-PRF-19500.

<u>Subgroup</u>	<u>Method</u>	<u>Inspection</u>
2	2036	Test condition A, $t = 15 \text{ s} \pm 3 \text{ s}$ .

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in table III herein. Electrical measurements (end-points) and delta requirements shall be in accordance with the applicable steps and footnotes of table II herein.

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

4.5.1 Pulse measurements. Conditions for pulse measurement shall be as specified in section 4 of MIL-STD-750.

MIL-PRF-19500/641A

TABLE I. Group A inspection.

Inspection	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance 1N6757	3101	See 4.4.1	$Z_{\theta JX}$		5.4	°C/W
Forward voltage	4011	Pulse test <u>1</u> / $I_F = I_O$ (see 1.3) $I_F = 5$ A	$V_{F1}$ $V_{F2}$		2.30 1.60	V dc V dc
Reverse current	4016	DC method $V_R = 125$ V dc $V_R = 250$ V dc	$I_{R1}$ $I_{R2}$		2.0 30	$\mu$ A dc $\mu$ A dc
<u>Subgroup 3</u>						
High temperature operation		$T_A = 125^\circ\text{C}$				
Reverse current	4016	DC method $V_R = 125$ V dc $V_R = 250$ V dc	$I_{R3}$ $I_{R4}$		130 450	$\mu$ A dc $\mu$ A dc
Forward voltage	4011	Pulse test <u>1</u> / $I_F = I_O$ (see 1.3)	$V_{F3}$		2.60	V dc
Low temperature operation		$T_A = -55^\circ\text{C}$				
Forward voltage	4011	Pulse test <u>1</u> / $I_F = I_O$ (see 3.1)	$V_{F4}$		2.30	V dc
<u>Subgroup 4</u>						
Reverse recovery time	4031	Condition A $V_R = 200$ V, $I_F = 5$ A $di/dt = 200$ A/ $\mu$ s	$t_{rr}$		12.0	ns
<u>Subgroup 5</u>						
Not applicable						

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection	MIL-STD-750		Symbol	Limits		Unit
	Method	Conditions		Min	Max	
<u>Subgroup 6</u> Surge current	4066	$I_{fsm}$ = see 3.1 $V_{RM}$ = 250 V(pk) $I_O$ = see 3.1 Ten surges of 8.3 ms each at 1 minute intervals				
Electrical measurements		See table II herein				
<u>Subgroup 7</u> Capacitance	4001	$V_R$ = 5 V dc $f$ = 1 MHz	$C_J$		150	pF

1/ Pulse test: Pulse width = 300  $\mu$ s duty cycle  $\leq$  2 percent.

TABLE II. Groups A, B, C, and E electrical measurements. 1/ 2/ 3/

Step	Inspection	MIL-STD-750		Symbol	Limits		Unit
		Method	Conditions		Min	Max	
1.	Forward voltage	4011	$I_F = I_O$ (see 3.1) pulsed	$V_{F1}$		2.30	
2.	Reverse leakage current	4016	$V_R = 125$ V dc pulsed, DC method	$I_{R1}$		2.0	
3.	Forward voltage	4011	$I_F = I_O$ (see 3.1) pulsed	$\Delta V_{F1}$		$\pm 50$ mV dc from initial reading.	
4.	Reverse leakage current	4016	$V_R = 125$ V dc pulsed, DC method	$\Delta I_{R1}$		100 percent or $\pm 250$ nA dc whichever is greater.	
5.	Thermal impedance 1N6757	3101	See 4.4.1	$Z_{\theta JX}$		5.4	

1/ The electrical measurements for table VIa (JANS) of MIL-PRF-19500 are as follows:

- a. Subgroup 3, see table II herein, steps 1 and 2.
- b. Subgroup 4, see table II herein, steps 1, 2, 3, 4, and 5.
- c. Subgroup 5, see table II herein, steps 1, 2, 3, and 4.

2/ The electrical measurements for table VIb (JANTX and JANTXV) of MIL-PRF-19500 are as follows:

- a. Subgroup 2, see table II herein, steps 1 and 2.
- b. Subgroup 3, see table II herein, steps 1, 2, and 5.
- c. Subgroup 6, see table II herein, steps 1 and 2.

3/ The electrical measurements for table VII of MIL-PRF-19500 are as follows:

- a. Subgroups 2 and 3, see table II herein, steps 1 and 2 for all levels.
- b. Subgroup 6, see table II herein, steps 1, 2, and 5 for all levels.

TABLE III. Group E inspection (all quality levels) for qualification only. <sup>1/</sup>

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			
Thermal shock (temperature cycling)	1051	500 cycles	22 devices c = 0
Hermetic seal	1071		
Fine leak		Test condition H 5 x 10 <sup>-7</sup> atm cc/s	
Gross leak		Test condition C or K	
Electrical measurement		See table II herein, steps 1 and 2	
<u>Subgroup 2</u>			
Steady-state reverse bias	1038	Test condition A; 1,000 hours, V <sub>R</sub> = 200 V	22 devices c = 0
Electrical measurement		See table II herein, steps 1 and 2	
<u>Subgroup 3</u>			
Destructive physical analysis			3 devices c = 0
<u>Subgroup 4</u>			
Thermal resistance	3101	See 4.4.1	22 devices c = 0
<u>Subgroup 5</u>			
Not applicable			

<sup>1/</sup> For initial design and process change verification only (one time testing).

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. 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.)

6.1 Intended use. The notes specified in MIL-PRF-19500 are applicable to this specification.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.\_).
- c. Packaging requirements (see 5.1).
- d. Lead finish (see 3.3.1).
- e. Type designation and product assurance level.

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) 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 Defense Supply Center, Columbus, ATTN: DSCC/VQE, P.O. Box 3990, Columbus, OH 43216-5000.

6.4 Substitution information. Devices covered by this specification are substitutable for the manufacturer's and user's Part or Identifying Number (PIN).

Preferred types	Commercial PIN
JANTX1N6757	1N6757
JANTXV1N6757	1N6757

Custodians:  
 Army - CR  
 Navy - EC  
 Air Force - 11  
 NASA - NA  
 DLA - CC

Preparing activity:  
 DLA - CC  
 (Project 5961-1888)

**STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL**

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

<b>I RECOMMEND A CHANGE:</b>	1. DOCUMENT NUMBER MIL-PRF-19500/641	2. DOCUMENT DATE 1 April 1997
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<b>3. DOCUMENT TITLE</b> SEMICONDUCTOR DEVICE, DIODE, GALLIUM ARSENIDE, POWER RECTIFIER, TYPE 1N6757, JANTX, JANTXV, AND JANS
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4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)
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5. REASON FOR RECOMMENDATION
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6. SUBMITTER
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a. NAME (Last, First, Middle initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) COMMERCIAL DSN FAX EMAIL	7. DATE SUBMITTED

8. PREPARING ACTIVITY
-----------------------

a. Point of Contact ALAN BARONE	b. TELEPHONE Commercial      DSN      FAX      EMAIL (614) 692-0510      850-0510		
c. ADDRESS Defense Supply Center Columbus, ATTN: DSCC-VAC P.O. Box 3990 Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Standardization Program Office (DLSC-LM) 8725 John J. Kingman, Suite 2533 Fort Belvoir, VA 22060-6221 Telephone (703) 767-6888      DSN 427-6888		