

MILITARY SPECIFICATION

SEMICONDUCTOR DIODE, SILICON, VOLTAGE REFERENCE (TEMPERATURE-STABLE)
TYPES 1N430A, 1N430B

1. SCOPE

1.1 Scope, - This specification covers the detail requirements for silicon, low-voltage, temperature compensated, semiconductor diodes designed for application in equipment circuits where a high degree of voltage stability relative to the operating temperature range is required.

1.2 Classification. -

1.2.1 Identification (voltage-temperature stability factors). -

	Reference Voltage ^{1/}	Oper. Temp. Range	Max. Change In Oper. Volt. ^{2/}	Operating Current
1N430A	8.4±5% Vdc	-65° to +100°C	±.007 Vdc	10 mAdc
1N430B	8.4±1% Vdc	-65° to +100°C	±.007 Vdc	10 mAdc

^{1/}At: T_A = +25°C.

^{2/}The indicated value represents an average temperature coefficient of ±.001%/°C.

1.2.2 Design-and-polarity application factors. - (See 3.3.2 and 6.2 herein.)

1.3 Outline and dimensions. - (See Figure 1 herein.)

1.4 Characteristics. - (See 1.2.1 herein.):

	BV ^{1/}		Z _K ^{2/}		ΔBV ^{3/}		T _{oper}		T _{stg}	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	Vdc	Vdc	ohms	ohms	Vdc	Vdc	°C	°C	°C	°C
1N430A	8.0	8.8	---	15	---	.007	-65	+100	-65	+150
1N430B	8.316	8.484	---	15	---	.007	-65	+100	-65	+150

^{1/}At: I_Z = 10 mAdc.

^{2/}At: I_Z = 10 mAdc, I_{sig} = 10% I_Z.

^{3/}Voltage-temperature stability.

1.5 Maximum ratings. - (See 1.2.1 herein.):

P _T	Power derating ^{1/}	Oper. Alt.
mW 250	$\frac{\text{mW}}{^{\circ}\text{C}}$ 1.0	$\frac{\text{ft}}$ Any

^{1/}At T_A > +25°C, up to +100°C.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

MILITARY

MIL-S-19500

Semiconductor Devices, General
Specification For

STANDARDS

MILITARY

MIL-STD-750

Test Methods For Semiconductor Devices

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer. Both the title and number or symbol should be stipulated when requesting copies.)

3. REQUIREMENTS

3.1 General.- Requirements for the semiconductor diodes shall be in accordance with Specification MIL-S-19500, and as otherwise specified herein.

3.2 Abbreviations and Symbols.- The abbreviations and symbols used herein are defined in Specification MIL-S-19500 and as follows:

Δ amount of change: difference between a given (reference) or determined value, and a newly-measured value

I_{sig} a-c signal-input current level

3.3 Design and construction.- The semiconductor diodes shall be of the design, construction, and physical dimensions specified in Figure 1 herein. Each semiconductor diode shall be furnished with suitable mounting hardware.

3.3.1 Operating position.- The semiconductor diodes shall be capable of proper operation in any position.

3.3.2 Polarity indication.- (See Figure 1 herein.) A (contrasting) colored dot shall be permanently marked on the device so that the terminal adjacent to the colored dot will be distinguished as the positive terminal (with respect to the other terminal) for directivity of current flow through the semiconductor diode.

3.4 Performance characteristics.- The semiconductor diode performance characteristics shall be as specified in Tables I and II herein. Except where specifically differentiated for respective diode types (see 1.2, and Tables I and II herein), the performance requirements, including characteristics, ratings, and test conditions, apply equally to both diode types covered herein.

3.5 Marking.- Unless otherwise specified herein, marking shall be in accordance with Specification MIL-S-19500. If any specification-requirements waiver has been granted, the product-identification marking shall consist of the "classification" type-designation only.

4. QUALITY ASSURANCE PROVISIONS

4.1 General.- Except as otherwise specified herein, the responsibility for inspection, general procedures for acceptance, classification of inspection, and inspection conditions and methods of test shall be in accordance with Specification MIL-S-19500, Quality Assurance Provisions.

4.1.1 Inspection lot.- Applicable to the semiconductor device(s) covered herein, the term "inspection lot" shall be as defined in paragraph 4.3.2.1 of Specification MIL-S-19500 except that the 6-week-period time limitation stipulated therein shall be considered as not compulsory.

4.1.1.1 Preconditioned-unit constituency of inspection lots.- All semiconductor devices covered herein, in each inspection lot presented for Quality Conformance inspection, shall have been subjected to the following preconditioning:

(a) Maintained at $T_A = +100^\circ\text{C}$ minimum, for 100 hours minimum.

4.2 Qualification and Acceptance Inspection.- Qualification and Quality Conformance inspection shall be in accordance with Specification MIL-S-19500, Quality Assurance Provisions, and as otherwise specified herein. Groups A and B inspection shall consist of the examinations and tests specified in Tables I and II, respectively, herein. Quality Conformance inspection shall include inspection of Preparation For Delivery (see 5.1 herein).

4.2.1 Specified LTPD for subgroups.- The LTPD specified for a subgroup in Tables I and II herein shall apply for all of the tests, combined, in the subgroup.

4.2.2 Group A sampling-acceptance criteria for Qualification Inspection.- For Qualification Inspection, only 1 failure will be permitted for all Group A tests combined. Upon occurrence of one such failure, the Chief, Components And Materials Division, Procurement And Production Directorate, Fort Monmouth, New Jersey 07703, ATTN: AMSEL-PP-E-CMD-2 shall be notified immediately. Further Qualification inspection shall not be continued until so authorized from the above-mentioned Government agency.

4.2.3 Disposition of sample units.- Sample units that have been subjected to and have passed Group A and Group B tests may be delivered on the contract or order provided that, after Group B inspection is terminated, those sample units are subjected to and pass Group A inspection. Defective units, from any sample group that may have passed group inspection shall not be delivered on the contract or order until the defect(s) has been remedied to the satisfaction of the Government.

4.3 Particular examination and test procedures.-

4.3.1 Special electrical conditions.- (See 1.2 and 3.3.2 herein relative to reference voltage and polarity, respectively.)

4.3.2 Interval for End-Point Test measurements.- All applicable End-Point Test measurements shall be performed, after sample units have been subjected to required physical-mechanical or environmental test(s), in accordance with the following time-delay limitations:

(a) For Qualification inspection: within 16 hours.

(b) For Quality Conformance inspection: within 72 hours; however, at discretion of the Government inspector, a more protracted interval may be allowed.

4.3.3 Sweep-Frequency Vibration test.- The unit(s), normally mounted, shall be vibrated at room temperature conditions as follows: at simple harmonic motion with an amplitude of 0.20 in. (0.40 in. max. total excursion), over a frequency range of 10 to 300 cps, for a period of 30 minutes along each mutually-perpendicular axis. The frequency, during the entire sweep, shall be varied uniformly and gradually, and resonance shall be monitored throughout as follows: at each resonant frequency noted, the unit shall be vibrated in each plane for 15 minutes at that frequency before continuing the sweep-vibration and resonance monitoring to the end of the specified frequency range.

4.3.4 Surge Current test.- The specified surge current shall be superimposed, in the reverse direction, on the specified test current for a total of 10 surges, at one-minute intervals. Each individual surge shall be a 1/2-square wave, or equivalent sine wave pulse, of 1/120-second duration. (Method 4066 in Standard MIL-STD-750 may be referred to for additional guidance for this test.)

Table I. Group A inspection.

Test Method per MIL-STD-750	Examination or test	Conditions $\frac{1}{/}$	LTPD	Symbol	Limits		Unit
					Min.	Max.	
	<u>Subgroup 1</u>		10				
2071	Visual and mechanical examination	---					
	<u>Subgroup 2</u>		15				
4021	Breakdown voltage: 1N430A 1N430B	$I_Z = 10 \pm 0.01 \text{ mA dc}$		BV BV	8.0 8.316	8.8 8.484	Vdc Vdc
4051	Knee impedance	$I_Z = 10 \pm 0.01 \text{ mA dc}$ $I_{sig} = 10\% I_Z$		ZK	---	15	ohms
---	Voltage-temperature stability:	$I_Z = 10 \pm 0.01 \text{ mA dc}$ $T_A(\text{ref}) = +25^\circ \text{C}$					
$\frac{2}{/}$	Low-temp. extreme High-temp. extreme	$T_A = -65^\circ \text{ to } +0^\circ \text{C}$ $T_A = +100^\circ \text{ to } +2^\circ \text{C}$ -0°		Δ BV Δ BV	---	0.007 0.007	Vdc Vdc

$\frac{1}{/}$ See 4.3.1 herein.

$\frac{2}{/}$ See 3.2 herein.

Table II. Group B inspection.

Test Method per MIL-STD-750	Examination or test 1/	Conditions 2/	LTPD	Symbol	Limits		Unit
					Min.	Max.	
	<u>Subgroup 1</u>		20				
2066	Physical dimensions	---		---	---	---	---
	<u>Subgroup 2</u>		15				
2026	Solderability	Immersion depth: to within 0.1 in. of body		---	---	---	---
1051	Temperature cycling	Test Cond.C, except: $T_{(high)} = +175^{\circ} + 3^{\circ} C$ $-0^{\circ} C$		---	---	---	---
1056	Thermal shock (glass strain)	Test Cond.A		---	---	---	---
1021	Moisture resistance	No initial conditioning		---	---	---	---
	<u>End-Point tests:</u>						
4021	Breakdown voltage: 1N430A 1N430B	$I_Z = 10 \pm 0.01 \text{ mAdc}$		BV BV	8.0 8.316	8.8 8.484	Vdc Vdc
4051	Knee impedance	$I_Z = 10 \pm 0.01 \text{ mAdc}$ $I_{sig} = 10\% I_Z$		Z_K	---	15	ohms
---	Voltage-Temperature stability:	$I_Z = 10 \pm 0.01 \text{ mAdc}$ $T_A (ref) = +25^{\circ} C$					
3/	Low-temp. extreme	$T_A = -65^{\circ} - 2^{\circ} C$ $+0^{\circ} C$		ΔBV	---	0.007	Vdc
3/	High-temp. extreme	$T_A = +100^{\circ} + 2^{\circ} C$ $-0^{\circ} C$		ΔBV	---	0.007	Vdc

Table II. Group B inspection.- (Continued)

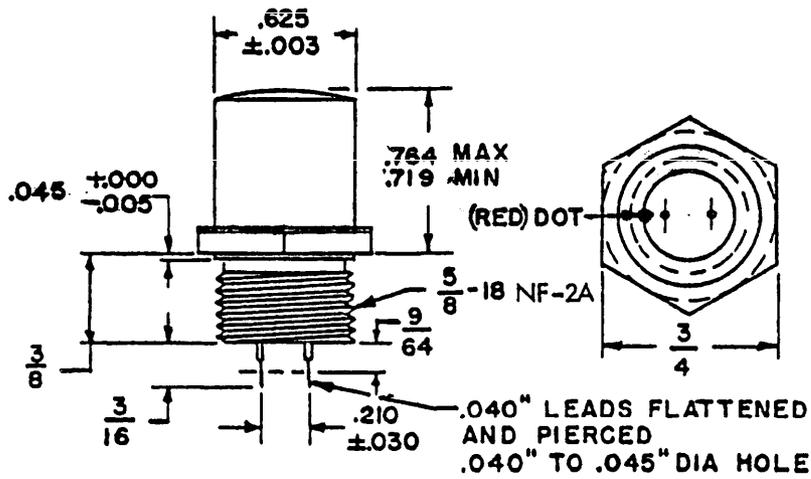
Test Method per MIL-STD-750	Examination or test 1/	Conditions 2/	LTPD	Symbol	Limits		Unit
					Min.	Max.	
2016	<u>Subgroup 3</u> Shock	No voltages 500 G 5 blows of 1 msec ea. in orientations X1, Y1, Y2 (total = 15 blows)	15	---	---	---	---
4/	Vibration, sweep-frequency	---		---	---	---	---
2046	Vibration fatigue	---		---	---	---	---
2006	Constant acceleration (centrifugal)	5,000 G Orientations X1, Y1, Y2		---	---	---	---
5/	<u>Subgroup 4</u> Surge current	$i_r(\text{surge})=50 \text{ mA}$ $I_T=10\pm 0.01 \text{ mAdc}$ $T_A = +100^\circ\text{C}$ Test Cond. A Weight= 2 lbs. $t = 15 \text{ sec}$	15	---	---	---	---
2036	Tension			---	---	---	---
	<u>End-Point tests:</u> Same as for Subgroup 2 above						
	<u>Subgroup 4</u> Surge current						
	<u>End-Point tests:</u> Same as for Subgroup 2 above						

Table II. Group B inspection.- (Continued).

Test Method per MIL-STD-750	Examination or test	Conditions	LTPD	Symbol	Limits		Unit
					Min.	Max.	
	<u>1/</u>	<u>2/</u>					
	<u>Subgroup 5</u>		15				
1041	Salt atmosphere (corrosion)	---		---	---	---	---
	<u>End-Point tests:</u> Same as for Subgroup 2 above						
	<u>Subgroup 6</u>		$\lambda = 10$				
1031	High-temperature life (non-operating)	$T_{stg} = +150 \text{ } ^\circ\text{C}$ $-0^\circ \text{ } ^\circ\text{C}$					
	<u>End-Point tests:</u> Same as for Subgroup 2 above						
∞	<u>Subgroup 7</u>		$\lambda = 10$				
1026	Steady-state operation life	$I_Z = 10 \pm 0.01 \text{ mAdc}$ $T_A = +100^\circ\text{C}, \text{ min}$					
	<u>End-Point tests:</u> Same as for Subgroup 2 above						

1/ See 4.3.2 herein. 2/ See 4.3.1 herein. 3/ See 3.2 herein.

4/ See 4.3.3 herein. 5/ See 4.3.4 herein.



NOTES:

1. All dimensions in inches.
2. Tolerances are $\pm 1/64$ on fractional dimensions, and ± 0.005 on decimal dimensions, unless otherwise specified.

Figure 1. Outline and dimensions.

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery.- Preparation for delivery and the inspection of preparation for delivery shall be in accordance with Specification MIL-S-19500.

6. NOTES

6.1 Notes.- The notes included in Specification MIL-S-19500, with the following additions or exceptions, are applicable to this specification.

6.2 Intended use.- The types 1N430A and 1N430B covered herein conform to the design-and-performance requirements for this class (Voltage Reference, Temperature Compensating) and style of semiconductor diode established in Army Ordnance Drawings 8083775, 9175629, 10004704 and 10015659 for use in existing equipments under jurisdiction of Missile Command, Department of Army. For new equipment-circuit applications of this class of semiconductor diode(s), and where equal or better characteristic-performance is required (relative to the 1N430A, 1N430B diodes), it is recommended that Semiconductor Diode Type 1N3154, 1N3155, 1N3156, or 1N3157 (according to level of voltage stability desired) be used. The latter diodes, covered by Specification MIL-S-19500/158(NAVY), are listed in Standard MIL-STD-701, and are of appreciably smaller and more compact construction, and are of a design conducive to more ready incorporation in equipment circuits.

6.3 Qualification.- With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List (QPL)-19500, whether or not such products have actually been so listed by that date. Information pertaining to qualification of products covered by this specification should be requested from the Chief, Components And Materials Standardization Division, Procurement And Production Directorate, Fort Monmouth, New Jersey 07703, ATTN: AMSEL-PP-E-CMD-2.

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Project No. 5960-A558