

The documentation and process conversion measures necessary to comply with this document shall be completed by 30 April 2023.

INCH-POUND

MIL-PRF-19500/645F
w/AMENDMENT 1
30 January 2023
SUPERSEDING
MIL-PRF-19500/645F
4 January 2022

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, DIODE, SILICON, POWER RECTIFIER,
DUAL, COMMON CATHODE OR ANODE CENTER TAP, ULTRAFAST,
TYPES 1N6772, 1N6773, 1N6772R AND 1N6773R
JAN, JANTX, JANTXV, AND JANS

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 silicon, dual ultrafast, power rectifier diodes in a center-tap configuration. Four levels of product assurance (JAN, JANTX, JANTXV, and JANS) are provided for each device type as specified in [MIL-PRF-19500](#).

1.2 Physical dimensions. The device package for the encapsulated device type is as follow: (similar to TO-257AA, isolated) in accordance with [figure 1](#).

1.3 Maximum ratings.

Types	V_{RWM} (1)	I_F (1) (2) $T_C = +100^\circ\text{C}$	I_{FSM} (1) $t_p = 8.3 \text{ ms}$	$R_{\theta JC}$ (1)	$R_{\theta JA}$ (1)	T_{STG} and T_J
1N6772, 1N6772R 1N6773, 1N6773R	V_{dc} 360 540	A_{dc} 8.0 8.0	$A_{(pk)}$ 60 60	$^\circ\text{C/W}$ 2.5 2.5	$^\circ\text{C/W}$ 45 45	$^\circ\text{C}$ -65 to +150 -65 to +150

(1) Each individual diode.

(2) Derate at 160 mA/ $^\circ\text{C}$ above $T_C = +100^\circ\text{C}$.

* 1.4 Primary electrical characteristics. Unless otherwise specified, primary electrical characteristics are at $+25^\circ\text{C}$, and for each diode.

Types	V_{F1} $I_F = 4 \text{ A}$ dc	V_{F2} $I_F = 8 \text{ A}$ dc	I_{R1} (see 1.3) $V_R = V_{RWM}$	I_{R2} $V_R = V_{RWM}$ (see 1.3) $T_C = +100^\circ\text{C}$	t_{rr}	C_J $V_R = 5 \text{ V}$ $f = 1 \text{ MHz}$
1N6772, 1N6772R 1N6773, 1N6773R	V_{dc} 1.45 1.45	V_{dc} 1.60 1.60	μA_{dc} 10 10	μA_{dc} 500 500	ns 60 60	pF 200 200

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AMSC N/A

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FSC 5961



MIL-PRF-19500/645F
w/AMENDMENT 1

1.5 Part or Identifying Number (PIN). The PIN is in accordance with [MIL-PRF-19500](#), and as specified herein. See [6.5](#) for PIN construction example and [6.6](#) for a list of available PINs.

1.5.1 JAN certification mark and quality level for encapsulated devices. The quality level designators for encapsulated devices that are applicable for this specification sheet from the lowest to the highest level are as follows: "JAN", "JANTX", "JANTXV" and "JANS".

1.5.2 Device type. The designation system for the device types of semiconductors covered by this specification sheet are as follows.

1.5.2.1 First number and first letter symbols. The semiconductors of this specification sheet use the first number and letter symbols "1N".

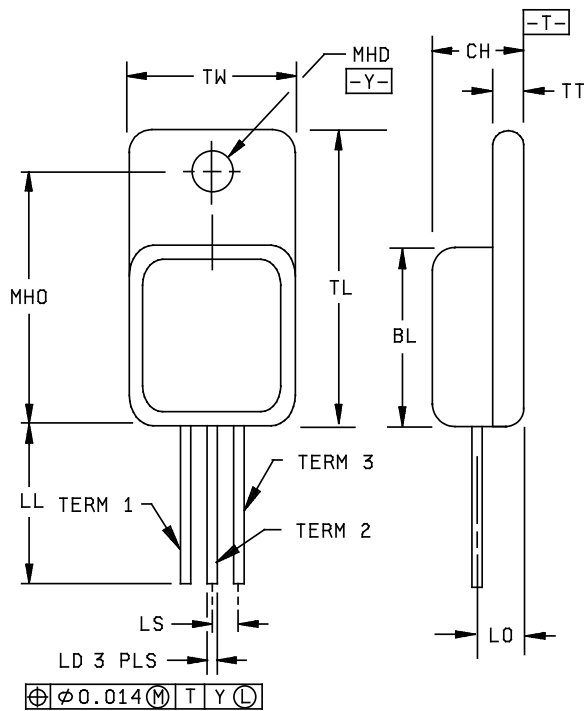
1.5.2.2 Second number symbols. The second number symbols for the semiconductors covered by this specification sheet are as follows: "6772" and "6773".

1.5.3 Suffix symbols. The following suffix letters are incorporated in the PIN in the order listed in the table as applicable:

R	Indicates a reverse bias (see figure 1).
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1.5.4 Lead finish. The lead finishes applicable to this specification sheet are listed on [QPDSIS-19500](#).

MIL-PRF-19500/645F
w/AMENDMENT 1



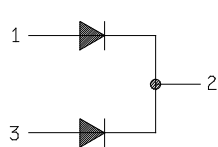
Dimensions				
Symbol	in	in	mm	mm
	Min	Max	Min	Max
BL	.410	.430	10.4	10.9
CH	.190	.200	4.82	5.08
LD	.025	.035	0.64	0.89
LL	.500	.750	12.70	19.05
LO	.120	typ	3.05	typ
LS	.100	bsc	2.54	bsc
MHD	.140	.150	3.55	3.80
MHO	.527	.537	13.4	13.6
TL	.645	.665	16.4	16.9
TT	.035	.045	0.90	1.15
TW	.410	.420	10.4	10.7

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. All terminals are isolated from case.

SCHEMATIC

1N6772, 1N6773



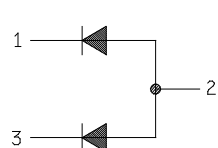
Terminal

1
2
3

Description

Anode 1
Cathode
Anode 2

1N6772R, 1N6773R



Terminal

1
2
3

Description

Cathode 1
Anode
Cathode 2

FIGURE 1. Physical dimensions and configuration (TO-257AA, isolated).

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 of 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 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://quicksearch.dla.mil>.)

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 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-19500](#)) 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](#).

3.4 Interface and physical dimensions. Interface and physical dimensions shall be as specified in [MIL-PRF-19500](#), and on [figure 1](#). When lead formation is performed, as a minimum, the vendor shall perform 100 percent hermetic seal in accordance with screen 14 of E-IV of [MIL-PRF-19500](#) and 100 percent DC testing in accordance with group A, subgroup 2 herein.

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 [6.2](#)).

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 1](#).

3.6 Electrical test requirements. The electrical test requirements shall be group A as specified herein.

3.7 Marking. Marking shall be in accordance with [MIL-PRF-19500](#).

MIL-PRF-19500/645F
w/AMENDMENT 1

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).

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

4.2.1 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 II tests, 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 (JANTX, JANTXV, and JANS levels). Screening shall be in accordance with appendix E, 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	Measurements for JANS level	Measurements for 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} and V_{F1}	I_{R1} and V_{F1}
12	See 4.3.1, $t = 240$ hours	See 4.3.1, $t = 48$ hours
13	Subgroups 2 and 3 of table I herein; V_{F1} and I_{R1} ; $\Delta I_{R1} \leq 100$ percent of initial value or $\pm 2.5 \mu A$, whichever is greater; $\Delta V_{F1} \leq \pm 100$ mV.	Subgroup 2 of table I herein; V_{F1} and I_{R1} ; $\Delta I_{R1} \leq 100$ percent of initial value or $\pm 2.5 \mu A$ whichever is greater; $\Delta V_{F1} \leq \pm 100$ mV.
17	For TO-257AA packages: Method 1081 of MIL-STD-750, endpoints: Subgroup 2 of table I herein.	For TO-257AA packages: Method 1081 of MIL-STD-750, endpoints: Subgroup 2 of table I herein.

(1) Thermal impedance shall be performed any time after temperature cycling, screen 3a, JANTX and JANTXV levels do not need to be repeated in screening requirements.

* 4.3.1 Power burn-in conditions. Power burn-in conditions are as follows: Method 1038 of MIL-STD-750, test condition A. $T_C = +125^\circ C$; $V_R = 0.9$ of rated V_{RWM} (see 1.3).

4.3.2 Thermal impedance. The thermal impedance measurements shall be performed in accordance with method 3101 or 4081 of MIL-STD-750. The thermal impedance conditions and maximum thermal impedance limit shall be derived by each vendor. The chosen thermal impedance measurement and conditions for each device in the qualification lot shall be submitted in the qualification report and a thermal impedance curve shall be plotted (see table II, subgroup 4 herein).

MIL-PRF-19500/645F
w/AMENDMENT 1

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](#), subgroup 2 herein. Delta requirements shall be in accordance with the applicable steps of [table III](#) herein.

4.4.2 Group B inspection. Group B inspection shall be conducted in accordance with the conditions specified for subgroup testing in appendix E, table E-VIa (JANS) and table E-VIb (JANTX and JANTXV) of [MIL-PRF-19500](#) and as follows. Delta requirements shall be in accordance with the applicable steps of [table III](#) herein.

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

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B4	1037	I_F or $I_O = 1.25$ A to 8 A; $\Delta T_J = +85^\circ\text{C}$ minimum.

4.4.2.2 Group B inspection, appendix E, table E-VIb (JANTX and JANTXV) of [MIL-PRF-19500](#).

<u>Subgroup</u>	<u>Method</u>	<u>Condition</u>
B3	1037	I_F or $I_O = 1.25$ A to 8 A; $\Delta T_J = +85^\circ\text{C}$ minimum.
B5		Not applicable.

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. Delta requirements shall be in accordance with the applicable steps of [table III](#) 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	2036	Test condition A, 5 pounds, $t = 15$ seconds ± 3 seconds.
C5	4081	$R_{\theta JC}$ (maximum) = 2.5°C/W .
C6	1037	I_F or $I_O = 1.25$ A to 10 A; $\Delta T_J = +85^\circ\text{C}$ minimum.

4.4.4 Group E inspection. Group E inspection shall be conducted in accordance with the conditions specified for subgroup testing in [table II](#) herein. Delta requirements shall be in accordance with the applicable steps and footnotes of [table III](#) 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](#).

- * 4.5.2 Scope display evaluation. The reverse breakdown characteristics shall be viewed on an oscilloscope with display calibration factors of 2 to 5 $\mu\text{A/division}$ and 50 to 100 V/division. Reverse current over the knee shall be at least 20 - 50 μA . Each device may exhibit a slightly rounded characteristic and any discontinuity or dynamic instability of the trace shall be cause for rejection.

MIL-PRF-19500/645F
w/AMENDMENT 1

* TABLE I. Group A inspection. 1/ 2/

Inspection	MIL-STD-750		Symbol	Limits	Limits	Unit
	Method	Conditions		Min	Max	
<u>Subgroup 1</u>						
Visual and mechanical examination	2071					
<u>Subgroup 2</u>						
Thermal impedance <u>3/</u>	3101	See 4.3.2	$Z_{\theta JX}$			°C/W
* Breakdown voltage	4021	$I_{BR} = 50 \mu A$ dc, pulsed <u>4/</u>	V_{BR}	400		V dc
* 1N6772, 1N6772R				600		
* 1N6773, 1N6773R						
* Forward voltage	4011	Condition B, $I_F = 4$ A dc, pulsed <u>4/</u>	V_{F1}		1.45	V dc
* $I_F = 8$ A dc, pulsed <u>4/</u>			V_{F2}		1.60	V dc
Reverse leakage current	4016	Condition A or B, DC method; pulsed <u>4/</u>	I_{R1}		10	μA dc
* $V_R = V_{RWM}$ (see 1.3)						
<u>Subgroup 3</u>						
High temperature operation:		$T_C = +100^\circ C$				
Reverse leakage Current	4016	Condition A or B, DC method; pulsed <u>4/</u>	I_{R2}		500	μA dc
* $V_R = V_{RWM}$ (see 1.3)						
* Low temperature operation:		$T_A = -55^\circ C$				
Forward voltage	4011	Condition B, $I_F = 8$ A dc, pulsed <u>4/</u>	V_{F3}		1.80	V dc
* <u>Subgroup 4</u>						
Scope display evaluation	4023	See 4.5.2				
Reverse recovery time measurements	4031	Condition B1	t_{rr}		60	ns

See footnotes at end of table.

MIL-PRF-19500/645F
w/AMENDMENT 1

* TABLE I. Group A inspection – Continued. 1/ 2/

Inspection	MIL-STD-750		Symbol	Limits	Limits	Unit
	Method	Conditions		Min	Max	
<u>Subgroups 5 and 6</u> Not applicable						
<u>Subgroup 7</u> Junction capacitance	4001	$V_R = 5 \text{ V dc}; f = 1.0 \text{ MHz}$	C_J		200	pF

1/ For sampling plan, see [MIL-PRF-19500](#).

2/ Each individual diode.

3/ For end-point measurements, this test is required for the following subgroups:

Group B, subgroups 2 and 3 (JAN, JANTX, and JANTXV).

Group C, subgroup 2 and 6.

Group E, subgroup 1

4/ Pulse test: Pulse width = 300 μs , duty cycle ≤ 2 percent.

MIL-PRF-19500/645F
w/AMENDMENT 1

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

Inspection	MIL-STD-750		Sampling plan
	Method	Conditions	
<u>Subgroup 1</u>			45 devices c = 0
Temperature cycling	1051	500 cycles	
Hermetic seal	1071		
Fine leak			
Gross leak			
Electrical measurements		See table III herein, steps 1, 2, 3, and 4.	
<u>Subgroup 2</u>			22 devices c = 0
Steady-state reverse bias	1038	Test condition A t = 1,000 hours, T _C = +125°C V _R = 0.9 of rated V _{RWM} (see 1.3)	
Electrical measurements		See table III herein, steps 1, 2, and 4.	
<u>Subgroup 4</u>			
Thermal impedance curves		See MIL-PRF-19500 .	
<u>Subgroup 5</u>			15 devices c = 0
Barometric pressure (reduced)	1001	V _R = rated V _{RWM} (see 1.3)	
<u>Subgroup 8</u>			11 devices c = 0
Peak reverse power	4065	Peak reverse power (P _{RM}) = shall be characterized by the supplier and the data shall be available to the Government. Test shall be performed on each subplot.	
Electrical measurement		During the P _{RM} test, the voltage (V _{BR}) shall be monitored to verify it has not collapsed. Any collapse in V _{BR} during or after the P _{RM} test or rise in leakage current (I _R) after the test that exceeds I _{R1} in table I , herein shall be considered a failure to that level of applied P _{RM} . Progressively higher levels of P _{RM} shall be applied until failure occurs on all devices within the chosen sample size.	
<u>Subgroup 10</u>			22 devices c = 0
Forward surge	4066	Condition C, I _{FSM} = rated (see 1.3 herein); ten surges of 8.3 ms each at 1 minute intervals superimposed on I _O = 1.0 A (see 1.3 herein); V _{RWM} = rated (see 1.3 herein); T _A = + 55°C.	
Electrical measurement		See table I, subgroup 2.	

MIL-PRF-19500/645F
w/AMENDMENT 1

* TABLE III. Groups A, B, C, and E electrical and delta measurements. 1/ 2/ 3/ 4/

Step	Inspection	MIL-STD-750		Symbol	Limits	Limits	Unit
		Method	Conditions		Min	Max	
1	Forward voltage	4011	Condition B, $I_F = 8$ A dc pulsed	ΔV_{F2}		± 100 mV dc from initial reading	
2	Reverse leakage current	4016	DC method, pulsed Condition A or B, $V_R = V_{RWM}$ (see 1.3)	ΔI_{R1}		100 percent of initial value or ± 2.5 μ A dc whichever is greater.	
3	Thermal impedance	3101	See 4.3.2	$Z_{\theta JX}$		2.3	$^{\circ}\text{C/W}$
4 5/	Reverse recovery time	4031	See table I, subgroup 4 herein.	t_{rr}		60	ns

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

- Subgroup 4, see table III herein, steps 1, 2, 3, and 4.
- Subgroup 5, see table III herein, steps 1, 2, and 4.

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

- Subgroup 2, see table III herein, steps 3 and 4.
- Subgroup 3, see table III herein, steps 1, 2, 3, and 4.

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

- Subgroup 2 see table III herein, step 3 for all levels.
- Subgroup 6, see table III herein, steps 1, 2, 3, and 4 for all levels.

4/ The electrical measurements for table E-IX of MIL-PRF-19500 are as follows:

- Subgroup 1, see table III herein, steps 1, 2, 3, and 4.

* 5/ Step 4 applies to irradiated devices only.

MIL-PRF-19500/645F
w/AMENDMENT 1

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 material 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.

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 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>.

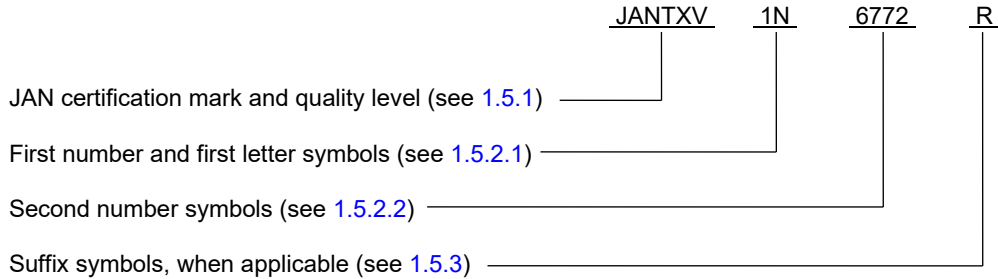
6.4 Cross reference list. Parts covered by this specification may be used to replace the following commercial Part or Identifying Numbers (PIN):

Preferred types	Commercial types
JAN1N6772, JAN1N6772R JANTX1N6772, JANTX1N6772R JANTXV1N6772, JANTXV1N6772R JANS1N6772, JANS1N6772R	1N6772, 1N6772R
JAN1N6773, JAN1N6773R JANTX1N6773, JANTX1N6773R JANTXV1N6773, JANTXV1N6773R JANS1N6773, JANS1N6773R	1N6773, 1N6773R

MIL-PRF-19500/645F
w/AMENDMENT 1

6.5 PIN construction example.

6.5.1 Encapsulated devices The PINs for encapsulated devices are constructed using the following form.



6.6 List of PINs. The following is a list of possible PINs available on this specification sheet.

JAN PINs	JANTX PINs	JANTXV PINs	JANS PINs
JAN1N6772	JANTX1N6772	JANTXV1N6772	JANS1N6772
JAN1N6772R	JANTX1N6772R	JANTXV1N6772R	JANS1N6772R
JAN1N6773	JANTX1N6773	JANTXV1N6773	JANS1N6773
JAN1N6773R	JANTX1N6773R	JANTXV1N6773R	JANS1N6773R

* 6.7 Amendment notations. The margins of this specification are marked with asterisks to indicate modifications generated by this amendment. 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
Navy - SH
Air Force - 85
NASA - NA
DLA - CC

Preparing activity:
DLA - CC
(Project 5961-2023-004)

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