

The documentation process conversion measures necessary to comply with this revision shall be completed by 15 December 1998

INCH-POUND

MIL-PRF-19500/496B
 15 September 1998
 SUPERSEDING
 MIL-S-19500/496A(USAF)
 1 June 1993

PERFORMANCE SPECIFICATION SHEET

SEMICONDUCTOR DEVICE, TRANSISTOR, DUAL, PNP, UNITIZED,
 SILICON, TYPES 2N5795 2N5796, AND 2N5796U, JAN, JANTX AND JANTXV

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 two electrically isolated, unmatched PNP silicon transistors as one dual unit for HI-speed saturated switching applications. Three levels of product assurance are provided for each device type as specified in MIL-PRF-19500.

1.2 Physical dimensions. See figures 1 and 2 (similar to TO - 99).

1.3 Maximum ratings. Unless otherwise specified, $T_A = +25^\circ\text{C}$.

P_T 1/ $T_A = +25^\circ\text{C}$		I_C	V_{CBO}	V_{CEO}	V_{EB0}	T_J and T_{STG}
one section	total device					
<u>W</u>	<u>W</u>	<u>mA dc</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>	<u>°C</u>
0.5	0.6	600	60	60	5.0	-65 to +175

1/ For $T_A \geq 25^\circ\text{C}$, Derate linearly 2.86 mW/°C one section, 3.43 mW/°C total.

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

1.4 Primary electrical characteristics. Unless otherwise specified, $T_A = +25^\circ\text{C}$.

	C_{obo} $V_{CB} = 10 \text{ V dc}$ $I_E = 0$ $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	$ h_{fe} $ $V_{CE} = 20 \text{ V dc}$ $I_C = 20 \text{ mA dc}$ $f = 100 \text{ MHz}$	Switching	
			t_{on}	t_{off}
Minimum	pF		ns	ns
Maximum	8.0	2.0 10.0	50	140

Limits	h_{FE1}		$h_{FE4} \ 1/$		$V_{CE(SAT)1} \ 1/$	$V_{CE(SAT)2} \ 1/$	$V_{BE(SAT)1} \ 1/$
	$V_{CE} = 10 \text{ V dc}$ $I_C = 100 \ \mu\text{A dc}$		$V_{CE} = 10 \text{ V dc}$ $I_C = 150 \text{ mA dc}$		$I_C = 150 \text{ mA dc}$ $I_B = 15 \text{ mA dc}$	$I_C = 500 \text{ ma dc}$ $I_B = 50 \text{ mA dc}$	$I_C = 150 \text{ mA dc}$ $I_B = 15 \text{ mA dc}$
	<u>Min</u>	<u>Max</u>	<u>Min</u>	<u>Max</u>	<u>V dc</u>	<u>V dc</u>	<u>V dc</u>
2N5795	40		40	150			
2N5796	75		100	300	0.4	1.6	1.3

1/ Pulsed (see 4.5.1).

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.

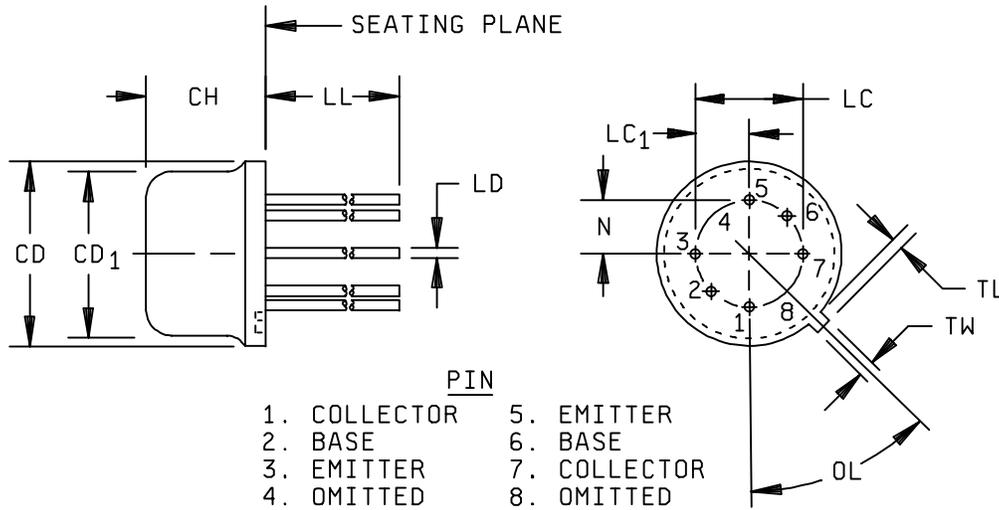
STANDARD

MILITARY

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

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, 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 (except for related associated specifications or specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

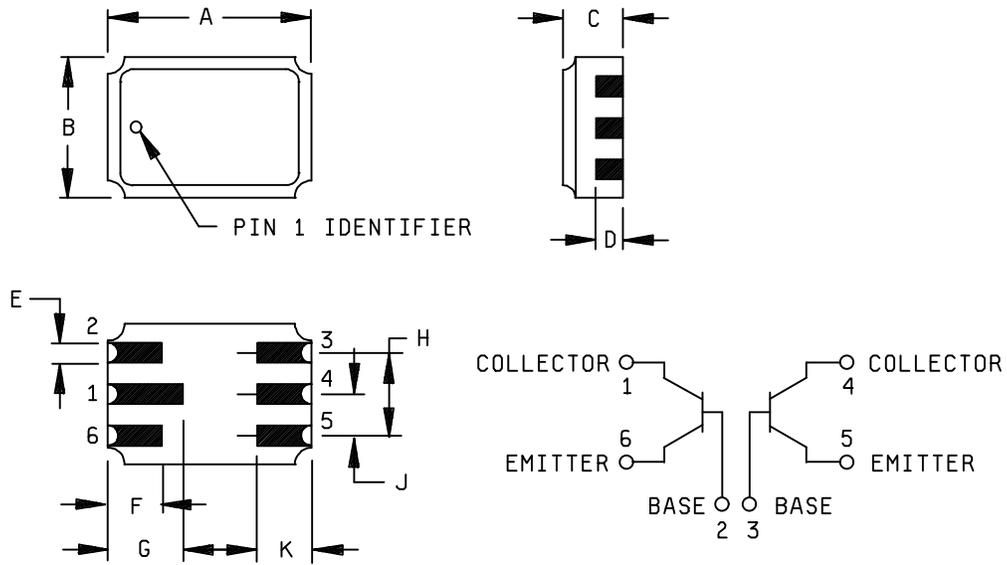


Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.335	.370	8.51	9.40	
CD ₁	.305	.335	.335	8.51	
CH	.150	.185	3.81	4.70	
LD	.016	.021	0.41	0.53	
LC	200 BSC		5.08 BSC		4
TW	.028	.034	0.71	0.86	
TL	.029	.045	0.74	1.14	3
LL	.500		12.70		
α	45° BSC		45° BSC		6
N	.100 BSC		2.54 BSC		

NOTES:

1. Dimension are in inches.
2. Metric equivalentents are given for general information only.
3. Measured from maximum diameter of the product.
4. Leads having maximum diameter .019 inch (.483 mm) measured in gaging plan .054 inch (1.37 mm) + .001 inch (.025 mm) - .000 inch (.000 mm) below the seating plane of the product shall be within .007 inch (.178 mm) of their true position relative to a maximum width tab.
5. The product may be measured by direct methods or by gauge.
6. Tab centerline.

FIGURE 1. Physical dimensions.



Ltr	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
A	.240	.250	6.10	6.35
B	.165	.175	4.19	4.44
C	.066	.080	1.68	2.03
D	.026	.039	0.66	0.99
E	.022	.028	0.56	0.71
F	.060	.070	1.52	1.78
G	.082	.098	2.08	2.49
H	.095	.105	2.41	2.67
J	.045	.055	1.14	1.39
K	.060	.070	1.52	1.78

FIGURE 2. Physical dimensions, 2N5796U.

3. REQUIREMENTS

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

3.2 Associated specification. The individual item requirements shall be in accordance with MIL-PRF-19500 and as specified herein.

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

3.4 Interface requirements and physical dimensions. The interface requirements and physical dimensions shall be as specified in MIL-PRF-19500 and on figures 1 and 2 herein.

3.4.1 Lead finish. Lead finish shall be solderable as defined in MIL-STD-750, MIL-PRF-19500, and herein. Where a choice of lead finish is desired, it shall be specified in the acquisition document (see 6.2).

3.5 Marking. 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 the subgroups specified in 4.4.2 and 4.4.3 herein.

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 herein.

4.3 Screening (JANTX and JANTXV levels only). Screening shall be in accordance with appendix E, 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 appendix E of MIL-PRF-19500)	Measurement
	JANTX and JANTXV levels
3c	Thermal impedance (see 4.3.2)
11	I_{CBO2} and h_{FE4}
12	See 4.3.1, 80 hours
13	Subgroup 2 of table I herein; ΔI_{CBO2} = 100 percent of initial value or 5 nA dc; whichever is greater. Δh_{FE4} = \pm 25 percent of initial value.

4.3.1 Power burn-in conditions. Power burn-in conditions are as follows:

T_A = Room ambient as defined in the general requirements of MIL-STD-750, 4.5;
 V_{CB} = 10 - 30 V dc; P_T = 300 mW each section (600 mW total device)

NOTE: No heat sink or forced air cooling on the devices shall be permitted.

4.3.2 Thermal impedance ($Z_{\theta JX}$ measurements). The $Z_{\theta JX}$ measurements shall be performed in accordance with MIL-STD-750, Method 3131.

- a. I_M measurement current 5 mA.
- b. I_H forward heating current 200 mA (minimum).
- c. t_H heating time 25 - 30 ms.
- d. t_{md} measurement delay time 60 μ s maximum.
- e. V_{CE} collector-emitter voltage 10 V dc minimum.

The maximum limit for $Z_{\theta JX}$ under these test conditions are $Z_{\theta JX}(\text{max}) = 72^\circ\text{C/W}$.

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.

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 VIb (JAN, JANTX and JANTXV) of MIL-PRF-19500. (Endpoint electrical measurements shall be in accordance with the applicable tests of table I, subgroup 2 and 4.5.2 herein). ^{1/}

Step	Method	Condition
1	1039	Steady-state life: Test condition B, 340 hours, $V_{CB} = 10 - 30$ V dc, $T_J = +150^\circ\text{C}$ minimum. No heat sink or forced- air cooling on devices shall be permitted. $n = 45$, $C = 0$.
2	1039	The steady state life test of step 1 shall be extended to 1,000 hrs for each die design. Samples shall be selected from a wafer lot every twelve months of wafer production. Group B step 2 shall not be required more than once for any single wafer lot. $n = 45$, $c = 0$.
3	1032	High-temperature life (non-operating), $T_A = +200^\circ\text{C}$. $n = 22$, $c = 0$, $t = 340$ hours.

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 in 4.4.3.1 herein for group C testing. Electrical measurements (end points) and delta requirements shall be in accordance with the applicable tests of table I, subgroup 2 and 4.5.2 herein).

4.4.3.1 Group C inspection, table VII (JAN, JANTX, and JANTXV) of MIL-PRF-19500.

Subgroup	Method	Condition
C2	2036	Test condition E, not applicable for "UA" designated devices.
C6		Not applicable.

^{1/} Separate samples may be used for each step. In the event of a group B failure, the manufacturer may pull a new sample at double size from either the failed assembly lot or from another assembly lot from the same wafer lot. If the new "assembly lot" option is exercised, the failed assembly lot shall be scrapped.

4.4.3.2 Group C sample selection. Samples for subgroups in group C shall be chosen at random from any inspection lot containing the intended package type and lead finish procured to the same specification which is submitted to and passes group A tests for conformance inspection. Testing of a subgroup using a single device type enclosed in the intended package type shall be considered as complying with the requirements for that subgroup.

4.4.3.3 Group E inspection. Group E inspection shall be performed for qualification or requalification only. The tests specified in table II herein must be performed to maintain qualification.

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

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

4.5.2 Delta requirements. Delta requirements shall be as specified below:

Step	Inspection	MIL-STD-750		Symbol	Limit	Unit
		Method	Conditions			
1	Collector-base cutoff current	3036	Bias condition D, $V_{CB} = 50$ V dc	ΔI_{CB02} 1/	100 percent of initial value or ± 5 nA dc, whichever is greater.	
2	Forward current transfer ratio	3076	$V_{CE} = 10$ V dc; $I_C = 150$ mA dc; pulsed see 4.5.1	Δh_{FE4} 1/	± 25 percent change from initial reading.	

1/ Devices which exceed the group A limits for this test shall not be accepted.

TABLE I. Group A inspection.

Inspection <u>1/</u>	Method	MIL-STD-750	Symbol	Limits		Unit
		Conditions		Min	Max	
<u>Subgroup 1 2/</u>						
Visual and mechanical inspection <u>3/</u>	2071	n = 45 devices, c = 0				
Solderability <u>3/</u>	2026	n = 15 leads, c = 0				
Resistance to solvents <u>3/ 4/</u>	1022	n = 15 devices, c = 0				
Temp cycling <u>3/</u>	1051	Test condition C, 25 cycles. n = 22 devices, c = 0				
Hermetic seal Fine leak Gross leak	1071	n = 22 devices, c = 0				
Electrical measurements		Group A, subgroup 2				
Bond strength <u>3/</u>	2037	Precondition T _A = + 250°C at t = 24 hours or T _A = + 300°C at t = 2 hours n = 11 wires, c = 0				
<u>Subgroup 2</u>						
Collector to base cutoff current	3036	Bias condition D; V _{CB0} = 60 V dc	I _{CB01}		10	μA dc
Collector to emitter breakdown voltage	3011	Bias condition D; I _C = 10 mA dc; pulsed (see 4.5.1)	V _{(BR)CEO}	60		V dc
Emitter to base cutoff current	3061	Bias condition D; V _{EB} = 5 V dc	I _{EBO1}		10	μA dc
Collector to base cutoff current	3036	Bias condition D; V _{CB} = 50 V dc	I _{CB02}		10	nA dc
Emitter to base cutoff current	3061	Bias condition D; V _{EB} = 3 V dc	I _{EBO2}		100	nA dc
Forward-current transfer ratio 2N5795 2N5796, 2N5796U	3076	V _{CE} = 10 V dc; I _C = 100 μA dc	h _{FE1}	40 75		
Forward-current transfer ratio 2N5795 2N5796, 2N5796U	3076	V _{CE} = 10 V dc; I _C = 1.0 mA dc	h _{FE2}	40 100		

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/	Method	MIL-STD-750	Symbol	Limits		Unit
		Conditions		Min	Max	
<u>Subgroup 2</u> - Continued						
Forward-current transfer ratio 2N5795 2N5796, 2N5796U	3076	$V_{CE} = 10 \text{ V dc}; I_C = 10 \text{ mA dc};$ pulsed (see 4.5.1)	h_{FE3}	40 100		
Forward-current transfer ratio 2N5795 2N5796, 2N5796U	3076	$V_{CE} = 10 \text{ V dc}; I_C = 150 \text{ mA dc};$ pulsed (see 4.5.1)	h_{FE4}	40 100	150 300	
Forward-current transfer ratio 2N5795 2N5796, 2N5796U	3076	$V_{CE} = 10 \text{ V dc}; I_C = 300 \text{ mA dc};$ pulsed (see 4.5.1)	h_{FE5}	20 50		
Forward-current transfer ratio 2N5795 2N5796, 2N5796U	3076	$V_{CE} = 1.0 \text{ V dc}; I_C = 150 \text{ mA dc};$ pulsed (see 4.5.1)	h_{FE6}	20 50		
Collector to emitter saturation voltage	3071	$I_C = 150 \text{ mA dc}; I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)1}$		0.4	V dc
Collector to emitter saturation voltage	3071	$I_C = 500 \text{ mA dc}; I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{CE(sat)2}$		1.6	V dc
Base to emitter saturation voltage	3066	Test condition A; $I_C = 150 \text{ mA dc};$ $I_B = 15 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)1}$		1.3	V dc
Base to emitter saturation voltage	3066	Test condition A; $I_C = 500 \text{ mA dc};$ $I_B = 50 \text{ mA dc};$ pulsed (see 4.5.1)	$V_{BE(sat)2}$		2.6	V dc
<u>Subgroup 3</u>						
High temperature operation		$T_A = +150^\circ\text{C}$				
Collector to base cutoff current	3041	Bias condition D; $V_{CB} = 50 \text{ V dc}$	I_{CBO3}		10	$\mu\text{A dc}$
Low temperature operation		$T_A = -55^\circ\text{C}$				
Forward-current transfer ratio 2N5795 2N5796, 2N5796U	3076	$V_{CE} = 10 \text{ V dc}; I_C = 150 \text{ mA dc};$ pulsed (see 4.5.1)	h_{FE7}	16 40		

See footnote at end of table.

TABLE I. Group A inspection - Continued.

Inspection 1/ Method	MIL-STD-750 Conditions	Symbol	Limits		Unit	
			Min	Max		
<u>Subgroup 4</u>						
Magnitude of small-signal short-circuit forward current transfer ratio	3306	$V_{CE} = 20 \text{ V dc}; I_C = 20 \text{ mA dc}; f = 100 \text{ MHz}$	$ h_{fe} $	2	10	
Open circuit output capacitance	3236	$V_{CB} = 10 \text{ V dc}; I_E = 0;$ $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{obo}		8	pF
Input capacitance (output open - circuited)	3240	$V_{EB} = 0.5 \text{ V dc}; I_C = 0;$ $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	C_{ibo}		25	pF
Pulse response:	3251	Test condition A, (see figure 3)				
Turn-on time		$V_{CC} = 30 \text{ V dc}; I_C = 150 \text{ mA dc};$ $I_{B1} = 15 \text{ mA dc}; V_{BE(OFF)} = 0.5 \text{ V dc}$	t_{on}		50	ns
Turn-off time		$V_{CC} = 30 \text{ V dc}; I_C = 150 \text{ mA dc};$ $I_{B1} = I_{B2} = 15 \text{ ma dc}$	t_{off}		140	ns
<u>Subgroup 5</u>						
Collector one to Collector two leakage current		$V_{(1C-2C)} = \pm 50 \text{ V dc}$ (This test applies only to devices of Monolithic construction)	$I_{(1C-2C)}$		± 1.0	nA dc
<u>Subgroup 6</u>						
Not applicable						
<u>Subgroup 7</u>						
Decap internal visual (design verification)	2075	$n = 1 \text{ device}, c = 0$				

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

2/ For resubmission of failed subgroup A1, double the sample size of the failed test or sequence of tests. A failure in group A, subgroup 1 shall not require retest of the entire subgroup. Only the failed test shall be rerun upon submission.

3/ Separate samples may be used.

4/ Not required for laser marked devices.

TABLE II. Group E inspection (all quality levels) - For qualification only

Inspection	MIL-STD-750		Qualification
	Method	Conditions	
<u>Subgroup 1</u>			12 devices c = 0
Temperature cycling (air to air)	1051	Test condition C, 500 cycles	
Hermetic seal	1071		
Fine leak			
Gross leak			
Electrical measurements		See group A, subgroup 2 and 4.5.2 herein.	
<u>Subgroup 2</u>			45 devices c = 0
Intermittent life	1037	Intermittent operation life: $V_{CB} = 10 \text{ V dc}$, 6,000 cycles, $\Delta T_J \geq +100^\circ\text{C}$; forced air cooling allowed on cooling cycle only.	
Electrical measurements		See group A, subgroup 2 and 4.5.2 herein.	
<u>Subgroup 3, 4, and 5</u>			
Not applicable			

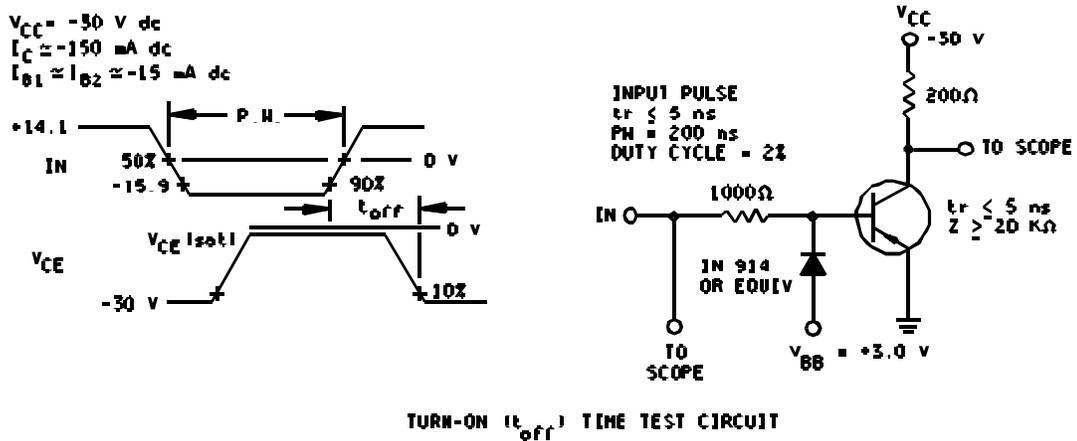
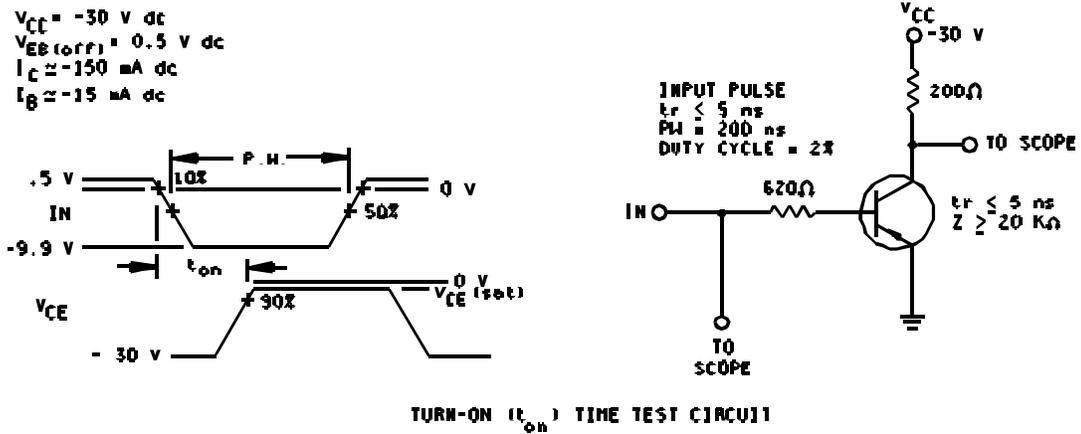


FIGURE 3. Switching time test circuits.

5. PACKAGING

5.1 Packaging. Packaging shall prevent mechanical damage of the devices during shipping and handling and shall not be detrimental to the device. When actual packaging of material 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 Points' packaging activity within the Military Department or Defense Agency, or within the Military Departments' System Command. Packaging data retrieval is available from the managing Military Departments' or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

5.2 Marking. Unless otherwise specified (see 6.2), marking shall be in accordance with MIL-PRF-19500.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

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

6.2 Acquisition requirements. See MIL- PRF-19500.

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 Products List QPL No.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 purchase 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, 3990 East Broad Street, Columbus, OH 43216-5000.

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodians:

Army - CR
Navy - EC
Air Force - 17
NASA - NA

Preparing activity:

DLA - CC

(Project 5961-2049-03)

Review activities:

Army - AR, MI, SM
Navy - AS, CG, MC, OS
Air Force - 13, 19, 85, 99

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.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-PRF-19500/496B	2. DOCUMENT DATE (YYMMDD) 980915
3. DOCUMENT TITLE SEMICONDUCTOR DEVICE, UNITIZED, DUAL TRANSISTOR, PNP, SILICON, TYPES 2N5795 2N5796, AND 2N5796U, JAN, JANTX AND JANTXV		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		
5. REASON FOR RECOMMENDATION		
6. SUBMITTER		
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 (YYMMDD)
8. PREPARING ACTIVITY		
a. Point of contact: Alan Barone	b. TELEPHONE Commercial DSN FAX EMAIL 614-692-0510 850-0510 614-692-6939 alan_barone@dsccl.dla.mil	
c. ADDRESS: Defense Supply Center Columbus, ATTN: DSCC-VAT, 3990 East Broad Street, Columbus, OH 43216-5000	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 DSN 289-2340	