

MILITARY SPECIFICATION

SEMICONDUCTOR DEVICE, TRIODE THYRISTOR (BI-DIRECTIONAL), SILICON,

TYPES 2N5806 THROUGH 2N5809

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

1. SCOPE

1.1 Scope. This specification covers the detail requirements for silicon bi-directional triode thyristors (see 3.2.1) for use at frequencies up to 400 Hz, and shall be in accordance with MIL-S-19500 except as otherwise specified herein.

1.2 Physical dimensions. (See figure 1.)

1.3 Characteristics common to all types.

Limit	V_{TM}	I_H	V_{GT} 1/ 2/	I_{GT} 1/ 2/	$dv/dt(c)$ 1/	dv/dt 1/
	(v)	(mAdc)	(Vdc)	(mAdc)	(v/ μ sec)	(v/ μ sec)
Minimum	---	---	0.25	---	5.0	20
Maximum	1.6	100	4.0	120	---	---

1/ $T_C = -40^\circ C$ to $115^\circ C$.

2/ MT_2+ , $G+$, and MT_2- , $G-$ (For other triggering modes, see tables I, II, and III.).

1.4 Ratings common to all types.

Limit	$I_{T(RMS)}$ 1/	I_{TSM} 2/	T_{op} (case)	T_{stg}
	(A)	(A)	($^\circ C$)	($^\circ C$)
Minimum	---	---	-40 to	-55 to
Maximum	25	200	+115	+125

1/ This RMS on-state current is for a maximum-case temperature of $80^\circ C$ and 360-electrical degrees of conduction. (For other maximum operating conditions, see figure 8.)

2/ Surge rating is non-recurrent and applies only with the device in the "ON" state. The rate of rise of the peak-surge current must not exceed 40 amperes/microsecond during the first 10-microseconds of either main-terminal polarity after switching from the "OFF" to the "ON" state. This time is measured from the point where the thyristor voltage has decayed to 90% of its initial-blocking value.

BAROMETRIC PRESSURE, REDUCED (high altitude operation):

2N5806 - - - - - 8 mm Hg
 2N5807 - - - - - 15 mm Hg
 2N5808 - - - - - 21 mm Hg
 2N5809 - - - - - 30 mm Hg

1.4.1 Individual ratings.

Types	V _{DRM} ^{1/}
2N5806	200V
2N5807	400V
2N5808	500V
2N5909	600V

^{1/} Values apply for either polarity of main terminal 2. Voltage is in reference to main terminal 1.

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:

SPECIFICATION

MILITARY

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

STANDARD

MILITARY

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

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

NATIONAL BUREAU OF STANDARDS

Handbook H28 - Part I - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C. 20360.)

3. REQUIREMENTS.

3.1 General. Requirements for thyristors shall be in accordance with MIL-S-19500 and as specified herein.

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

$dv/dt(c)$	-----	Commutating dv/dt .
I_{DRM}	-----	Repetitive peak off-state current.
I_H	-----	Minimum principal current required to maintain the thyristor in the on-state, following conduction of steady-state on-state current.
$I_T(RMS)$	-----	Total RMS value of the on-state current.
I_{TM}	-----	Maximum (peak) value of on-state forward current.
I_{TSM}	-----	Maximum (peak) value of on-state forward current having a single half-cycle (8.3 milliseconds) duration for a 60 Hz single phase resistive load.
MT_1	-----	Main terminal 1 (cathode).
MT_2	-----	Main terminal 2 (anode).
$P_{G(AV)}$	-----	Value of maximum gate power averaged over a full cycle permitted between gate and cathode.
P_{GM}	-----	Maximum instantaneous value of gate power dissipation permitted between anode and cathode.
V_{DRM}	-----	Repetitive peak off-state voltage (see 3.2.6).
V_{TM}	-----	Total peak on-state voltage.
$V_T(RMS)$	-----	Total RMS value of the on-state voltage.

3.2.1 Bi-directional triode thyristor. A three-terminal thyristor having substantially the same switching behavior in the first and third quadrants of the principal voltage-current characteristics.

3.2.2 Commutation voltage $dv/dt(c)$. Commutation voltage is the minimum value of the rate of rise of anode-cathode voltage which will cause switching from the off-state to the on-state immediately following on-state current-conduction in the opposite quadrant.

3.2.3 Main terminals. The main terminals are the terminals through which the principal current flows.

3.2.4 Off-state current. The off-state current is that value of current when the thyristor is in the "off" state.

3.2.5 On-state voltage. The on-state voltage is the principal voltage when the thyristor is in the "on" state.

3.2.6 Repetitive peak off-state voltage. The repetitive peak off-state voltage is the maximum-instantaneous value of the off-state voltage which occurs across a thyristor, including all repetitive-transient voltages, but excluding all nonrepetitive transient voltages.

3.3 Marking. The following marking specified in MIL-S-19500 may be omitted at the option of the manufacturer:

- (a) Country of origin.
- (b) Manufacturer's identification.

3.3.1 Graphic symbol. The thyristor graphic symbol shall not be used.

3.4 Design, construction, and physical dimensions. The devices shall be of the design, construction, and physical dimensions shown on figure.1.

3.5 Performance characteristics. The performance characteristics of the thyristors shall be as specified in tables I, II, and III.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection shall be in accordance with MIL-S-19500 and as specified herein. The devices covered by this detail specification shall be considered to be structurally similar for the purpose of inspection, if manufactured by the same process.

4.2 Qualification inspection. Qualification inspection shall consist of the examinations and tests specified in tables I, II, and III.

4.2.1 Subgroup 1 of group B inspection and subgroups 3 and 7 of group C inspection shall be performed on a subplot-basis on the highest-voltage type to qualify that type and all lower-voltage types. Subgroup 4 of group B inspection shall be performed on a subplot-basis for all voltage-types.

4.2.2 Subgroup 2 of group B (and subgroup 4 of group C) inspection shall be performed on a lot-basis for each type being qualified.

4.2.3 Subgroup 3 of group B inspection and subgroups 1, 2, 5, and 6 of group C inspection may be performed in accordance with MIL-S-19500 or may be performed on a lot-basis for any type to qualify all types.

4.3 Quality conformance inspection. Quality conformance inspection shall consist of the examinations and tests specified in groups A, B, and C inspections (tables I, II, and III). When specified in the contract or order, one copy of the quality conformance inspection data, pertinent to the device inspection lot, shall be supplied with each shipment by the device manufacturer.

4.3.1 Group C inspection. Group C inspection shall consist of the tests specified in table III. Group C inspection shall be conducted on the first lot every 6 months. Successful completion of the group C inspection shall permit acceptance of lots for the period specified on the basis of completion of group A and group B inspection. If a group C failure occurs, inspection for the failed subgroup shall revert to a lot-basis until three-consecutive lots have passed.

4.3.2 Inspection procedure.

4.3.2.1 Subgroups 1 and 2 of group B inspection and subgroup 4 of group C inspection shall be performed on a lot-basis. Subgroup 3 of group C inspection shall be performed on a subplot-basis for all voltage types. In the event subsequent lots contain voltage-types other than those previously accepted under subgroup 3 of group C inspection (in the current 6-month period), the additional types shall be subjected to subgroup 3 of group C inspection.

4.3.2.2 Subgroup 3 of group B inspection and subgroups 1, 2, 5, and 6 of group C inspection may be performed in accordance with MIL-S-19500 or may be performed on a subplot-basis for any type within the lot to accept all types in the lot.

4.3.2.3 Subgroup 4 of group B inspection shall be performed on a subplot-basis of the highest-voltage type to accept all types.

4.3.2.4 Subgroup 7 of group C inspection shall be performed on a subplot-basis of the highest-voltage type to accept that voltage-type and all lower-voltage types for the specified period. Subsequent acceptance of voltage-types which are higher than those previously subjected to subgroup 7 of group C (within the current specified period) requires retesting of subgroup 7 of group C to include the higher-voltage type. (Provisions of MIL-S-19500 early-acceptance procedures do not apply to this specification.)

4.3.2.5 Inspection lot. Inspection lot shall be as defined in MIL-S-19500 except that lot-accumulation-period requirements shall be 6-months in lieu of 6-weeks.

4.4 Disposition of sample units. Sample units, which have been subjected to and have passed subgroups 1, 2, and 4 of group B, and subgroups 1, 2, 3, 4, and 7 of group C inspection, may be delivered on the contract or order provided that: after the inspection is completed, these sample units are subjected to and have passed group A inspection. (Subgroup 3 of group B and subgroups 5 and 6 of group C are considered destructive tests.)

4.5 Methods of examination and test. Methods of examination and test shall be as specified in tables I, II, and III, the referenced figures herein, and in accordance with MIL-STD-750 thyristor test methods, except that: The "bi-directional-triode-thyristor designation" shall be substituted for the "triode-thyristor designation", with MT_1 as the cathode-terminal. For measurements requiring MT_2 negative and gate-negative potentials, the polarities of the anode and gate-source voltages shall be reversed from those shown in MIL-STD-750.

4.5.1 End-point mounting torque. The device shall be mounted on a 1/16-inch thick flat copper plate having a mounting hole diameter of 0.255-inch (minimum), 0.320-inch (maximum), by means of a 0.438-inch brass nut. The device shall be held by its hex and the specified torque of 30 in-lbs. gradually applied to the nut without shock.

4.5.2 Inspection conditions. Unless otherwise specified herein, all inspection shall be made at case temperature (T_C) of $25^\circ \pm 3^\circ C$.

4.5.3 Time-limit for end points. End-point tests for qualification and quality conformance inspection shall be completed within 96-hours except for subgroup 4 of group B which shall be completed within 24-hours after completion of the last test in the subgroup.

TABLE I. Group A inspection

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 1</u> Visual and mechanical inspection	2071		10	---	---	---	---
<u>Subgroup 2</u> Off-state current (MT_{2+}) and (MT_{2-})	4206	DC method; bias cond. D	5	I_{DRM}			
2N5806		VDRM = 200 Vdc			---	1.0	mAdc
2N5807		VDRM = 400 Vdc			---	1.0	mAdc
2N5808		VDRM = 500 Vdc			---	1.0	mAdc
2N5809		VDRM = 600 Vdc			---	1.0	mAdc
<u>Subgroup 3</u> Off-state current (MT_{2+}) and (MT_{2-})	4206	DC method; bias cond. D; $T_C = 115^\circ C$	7	I_{DRM}			
2N5806		VDRM = 200 Vdc			---	2.0	mAdc
2N5807		VDRM = 400 Vdc			---	2.0	mAdc
2N5808		VDRM = 500 Vdc			---	2.0	mAdc
2N5809		VDRM = 600 Vdc			---	2.0	mAdc

TABLE I. Group A Inspection - Continued

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		
	Method	Details			min	max	Unit
Subgroup 3 - Continued							
Exponential rate of voltage rise	4231	Bias cond. D; dv/dt = 20 v/ μ sec; test duration = 15 sec; repetition rate = 60 pps; T _C = 115°C; C = 0.1 μ f; R _L = 50 ohms		V _{DRM}			
2N5806 (MT ₂ +).(MT ₂ -)		V _{AA} = 200 Vdc			190	---	Vdc
2N5807 (MT ₂ -).(MT ₂ -)		V _{AA} = 400 Vdc			380	---	Vdc
2N5808 (MT ₂ -).(MT ₂ -)		V _{AA} = 500 Vdc			475	---	Vdc
2N5809 (MT ₂ -).(MT ₂ -)		V _{AA} = 600 Vdc			570	---	Vdc
Gate-trigger voltage	4221	T _C = 115°C; R _L = 1,000 ohms; R _e = 100 ohms		V _{GT}			
2N5806							
MT ₂ +, Gate-		V _{MT2} = V _{DRM} = 200 Vdc			0.25	---	Vdc
MT ₂ +, Gate+		V _{MT2} = V _{DRM} = 200 Vdc			0.25	---	Vdc
MT ₂ -, Gate+		V _{MT2} = V _{DRM} = 200 Vdc			0.25	---	Vdc
MT ₂ -, Gate-		V _{MT2} = V _{DRM} = 200 Vdc			0.25	---	Vdc
2N5807							
MT ₂ +, Gate+		V _{MT2} = V _{DRM} = 400 Vdc			0.25	---	Vdc
MT ₂ +, Gate-		V _{MT2} = V _{DRM} = 400 Vdc			0.25	---	Vdc
MT ₂ -, Gate+		V _{MT2} = V _{DRM} = 400 Vdc			0.25	---	Vdc
MT ₂ -, Gate-		V _{MT2} = V _{DRM} = 400 Vdc			0.25	---	Vdc
2N5808							
MT ₂ +, Gate+		V _{MT2} = V _{DRM} = 500 Vdc			0.25	---	Vdc
MT ₂ +, Gate-		V _{MT2} = V _{DRM} = 500 Vdc			0.25	---	Vdc
MT ₂ -, Gate+		V _{MT2} = V _{DRM} = 500 Vdc			0.25	---	Vdc
MT ₂ -, Gate-		V _{MT2} = V _{DRM} = 500 Vdc			0.25	---	Vdc
2N5809							
MT ₂ +, Gate+		V _{MT2} = V _{DRM} = 600 Vdc			0.25	---	Vdc
MT ₂ +, Gate-		V _{MT2} = V _{DRM} = 600 Vdc			0.25	---	Vdc
MT ₂ -, Gate+		V _{MT2} = V _{DRM} = 600 Vdc			0.25	---	Vdc
MT ₂ -, Gate-		V _{MT2} = V _{DRM} = 600 Vdc			0.25	---	Vdc
Subgroup 4							
Gate trigger voltage and current	4221	R _L = 50 ohms; R _e = 100 ohms					
MT ₂ +, Gate+		V _{MT2} = 12 Vdc		V _{GT} I _{GT}	---	2.5 80.0	Vdc mAdc
MT ₂ +, Gate-		V _{MT2} = 12 Vdc		V _{GT} I _{GT}	---	2.5 80.0	Vdc mAdc
MT ₂ -, Gate-		V _{MT2} = 12 Vdc		V _{GT} I _{GT}	---	2.5 80.0	Vdc mAdc
MT ₂ -, Gate+		V _{MT2} = 12 Vdc		V _{GT} I _{GT}	---	4.0 150.0	Vdc mAdc

TABLE I. Group A Inspection - Continued

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
Subgroup 4 - Continued							
On-state voltage	4226	$I_{TM} = 35$ a (pk) (pulse); pulse width = 8.5 msec (max); duty cycle = 2% (max)		V_{TM}	---	1.6	v(pk)
MT ₂ + MT ₂ -					---	1.6	v(pk)
Holding current	4201	Bias cond. D; $I_{TM1} = 0.5$ Adc; $I_{TM2} = 0.2$ Adc; trigger voltage source = 7 V; 0.1 msec \leq trigger; pulse width \leq 10 msec; $R_2 = 20$ ohms		I_H			
MT ₂ + MT ₂ -		VAA = 24 Vdc (max) VAA = 24 Vdc (max)			---	75	mAdc
					---	75	mAdc

TABLE II. Group B Inspection

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
Subgroup 1			10				
Surge current	---	(See figure 2) $I_{TSM} = 200$ A; $I_{T(RMS)} = 25$ A; 10 surges at 1 minute, $T_C = 80^\circ\text{C}$; $f = 60$ Hz; surge duration = 7 msec (minimum) each half-cycle		---	---	---	---
End points: (See 4.5.3.)							
Off-state current (MT ₂ +) and (MT ₂ -)	4206	DC method; bias cond. D		I_{DRM}			
2N5806		VDRM = 200 Vdc			---	1.0	mAdc
2N5807		VDRM = 400 Vdc			---	1.0	mAdc
2N5808		VDRM = 500 Vdc			---	1.0	mAdc
2N5809		VDRM = 600 Vdc			---	1.0	mAdc
Off-state current at high temperature (MT ₂ +) and (MT ₂ -)	4206	$T_C = 115^\circ\text{C}$; DC method; bias cond. D		I_{DRM}			
2N5806		VDRM = 200 Vdc			---	2.0	mAdc
2N5807		VDRM = 400 Vdc			---	2.0	mAdc
2N5808		VDRM = 500 Vdc			---	2.0	mAdc
2N5809		VDRM = 600 Vdc			---	2.0	mAdc

TABLE II. Group B Inspection - Continued

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 1 - Continued</u>							
End points: (Continued)							
Gate trigger voltage and current	4221	$R_L = 50$ ohms; $R_e = 100$ ohms					
MT ₂₊ , Gate-		$V_{MT_2} = 12$ Vdc		VGT IGT	--- ---	2.5 80.0	Vdc mAdc
MT ₂₋ , Gate-		$V_{MT_2} = 12$ Vdc		VGT IGT	--- ---	2.5 80.0	Vdc mAdc
On-state voltage	4226	$I_{TM} = 35$ a (pk) (pulse); pulse width = 8.5 msec (max); duty cycle = 2% (max)		V _{TM}			
MT ₂₊					---	1.6	v(pk)
MT ₂₋					---	1.6	v(pk)
<u>Subgroup 2</u>							
Off-state current (MT ₂₊) and (MT ₂₋)	4206	DC method; bias cond. D $T_C = -40^\circ\text{C}$	10	I _{DRM}			
2N5806		$V_{DRM} = 200$ Vdc			---	1.0	mAdc
2N5807		$V_{DRM} = 400$ Vdc			---	1.0	mAdc
2N5808		$V_{DRM} = 500$ Vdc			---	1.0	mAdc
2N5809		$V_{DRM} = 600$ Vdc			---	1.0	mAdc
Gate-trigger voltage and current	4221	$R_L = 25$ ohms; $R_e = 100$ ohms; $T_C = -40^\circ\text{C}$					
MT ₂₊ , Gate+		$V_{MT_2} = 12$ Vdc		VGT IGT	--- ---	4.0 120	Vdc mAdc
MT ₂₊ , Gate-		$V_{MT_2} = 12$ Vdc		VGT IGT	--- ---	4.0 170	Vdc mAdc
MT ₂₋ , Gate-		$V_{MT_2} = 12$ Vdc		VGT IGT	--- ---	4.0 120	Vdc mAdc
MT ₂₋ , Gate+		$V_{MT_2} = 12$ Vdc		VGT IGT	--- ---	5.0 250	Vdc mAdc
<u>Subgroup 3</u>							
Thermal shock (temperature cycling)	1051	Test cond. B except $T_{Low} = -55^\circ\text{C}$, 10 cycles			---	---	---
Thermal shock (glass strain)	1056	Test cond. B			---	---	---
Terminal strength (terminal torque)	2036	Test cond. D1; 20 oz-in, 15-sec for MT ₁ terminal; 10 oz-in, 15 sec for gate terminal			---	---	---

TABLE II. Group B inspection - Continued

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 3 - Continued</u>							
Hermetic seal	1071	Test cond. G or H for fine leaks; test cond. D or F for gross leaks		---	---	5×10^{-7}	atm cc/sec
Moisture resistance	1021			---	---	---	---
End points: (See 4.5.3.) (Same as subgroup 1)			10				
<u>Subgroup 4</u>							
Off-state voltage life test	---	(See figure 3) TC = 115°C; t = 170 hours		---			
2N5806		V _{DRM} = 200 v(pk)			---	---	---
2N5807		V _{DRM} = 400 v(pk)			---	---	---
2N5808		V _{DRM} = 500 v(pk)			---	---	---
2N5809		V _{DRM} = 600 v(pk)			---	---	---
End points: (See 4.5.3.)							
Off-state current (MT ₂₊) and (MT ₂₋)	4206	DC method; bias cond. D		I _{DRM}			
2N5806		V _{DRM} = 200 Vdc			---	2.0	mAdc
2N5807		V _{DRM} = 400 Vdc			---	2.0	mAdc
2N5808		V _{DRM} = 500 Vdc			---	2.0	mAdc
2N5809		V _{DRM} = 600 Vdc			---	2.0	mAdc
Off-state current at high temperature (MT ₂₊) and (MT ₂₋)	4206	TC = 115°C; DC method; bias cond. D.		I _{DRM}			
2N5806		V _{DRM} = 200 Vdc			---	5.0	mAdc
2N5807		V _{DRM} = 400 Vdc			---	5.0	mAdc
2N5808		V _{DRM} = 500 Vdc			---	5.0	mAdc
2N5809		V _{DRM} = 600 Vdc			---	5.0	mAdc
Gate trigger voltage and current	4221	R _L = 50 ohms; R _e = 100 ohms					
MT ₂₊ , Gate+		V _{MT₂} = 12 Vdc		V _{GT} I _{GT}	---	2.5 80.0	Vdc mAdc
MT ₂₋ , Gate-		V _{MT₂} = 12 Vdc		V _{GT} I _{GT}	---	2.5 80.0	Vdc mAdc
On-state voltage	4226	I _{TM} = 35 a (pk) (pulse); pulse width = 8.5 msec (max); duty cycle = 2% (max)		V _{TM}			
MT ₂₊					---	1.6	v(pk)
MT ₂₋					---	1.6	v(pk)

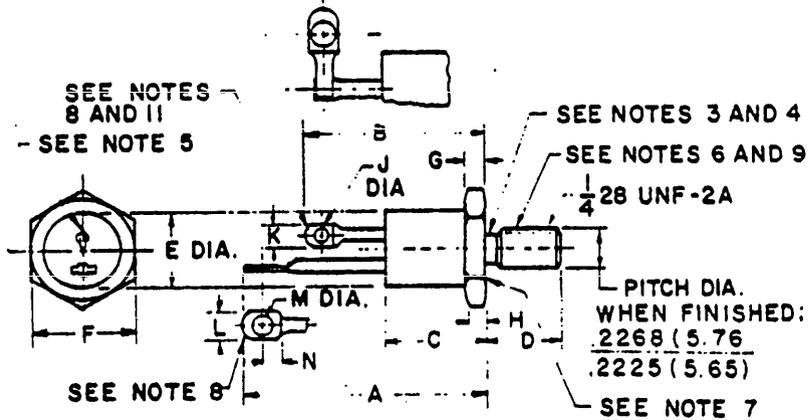
TABLE III. Group C inspection

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 1</u>			20				
Physical dimensions	2066	(See figure 1)		---	---	---	---
<u>Subgroup 2</u>			10				
Shock	2016	Nonoperating; 500 G; 1.0 msec. 5 blows each in orientations: X ₁ , Y ₂ , and Y ₁		---	---	---	---
Vibration, variable frequency	2056			---	---	---	---
Constant acceleration	2006	5.000 G. in orientations: X ₁ , Y ₁ , and Y ₂ (terminals supported)		---	---	---	---
End points: (See 4.5.3.) (Same as subgroup 1 of group B.)							
<u>Subgroup 3</u>			15				
Barometric pressure, reduced	1001	t = 60 sec		---			
2N5806		VDRM = 200 Vdc (8 mm Hg)			---	---	---
2N5807		VDRM = 400 Vdc (15 mm Hg)			---	---	---
2N5808		VDRM = 500 Vdc (21 mm Hg)			---	---	---
2N5809		VDRM = 600 Vdc (30 mm Hg)			---	---	---
<u>Subgroup 4</u>			10				
Commutating dv/dt	---	(See figures 4 and 5.)		dv/dt(c)			
2N5806					5.0	---	v/μsec
MT ₂ ⁺		VDRM = 200 Vdc			5.0	---	v/μsec
MT ₂ ⁻		VDRM = 200 Vdc					
2N5807					5.0	---	v/μsec
MT ₂ ⁺		VDRM = 400 Vdc			5.0	---	v/μsec
MT ₂ ⁻		VDRM = 400 Vdc					
2N5808					5.0	---	v/μsec
MT ₂ ⁺		VDRM = 500 Vdc			5.0	---	v/μsec
MT ₂ ⁻		VDRM = 500 Vdc					
2N5809					5.0	---	v/μsec
MT ₂ ⁺		VDRM = 600 Vdc			5.0	---	v/μsec
MT ₂ ⁻		VDRM = 600 Vdc					
<u>Subgroup 5</u>			15				
Salt atmosphere (corrosion)	1041			---	---	---	---
End points: (See 4.5.3.) (Same as subgroup 1 of group B.)							

TABLE III. Group C inspection - Continued

Examination or test	MIL-STD-750 (See 4.5.)		LTPD	Symbol	Limits		Unit
	Method	Details			Min	Max	
<u>Subgroup 6</u>			15				
Solderability	2026	MT ₁ and gate terminals; dwell time = 10 ± 1 sec (cover flat portions of terminals)		---	---	---	---
Terminal strength (bending stress) (MT ₁ terminal)	2036	Test cond. F, method B; 1 lb; t = 15 sec		---	---	---	---
Terminal strength (bending stress) (gate terminal)	2036	Test cond. F, method B; 8 oz; t = 15 sec		---	---	---	---
Terminal strength (stud torque)	2036	Test cond. D ₂ . 30 in-lbs; t = 15 sec		---	---	---	---
End points: (See 4.5.3.) (Same as subgroup 1 of group B.)							
<u>Subgroup 7</u>			λ = 20				
Intermittent-operating life		(See figure 6 or 7, optional) I _T (RMS) = 25 amps at 80°C case or 12.5 amps at 100°C case; VDRM = rated values		---	---	---	---
End points: (See 4.5.3.) (Same as subgroup 4 of group B.)							

L-SHAPED LUG (SEE NOTE 13)

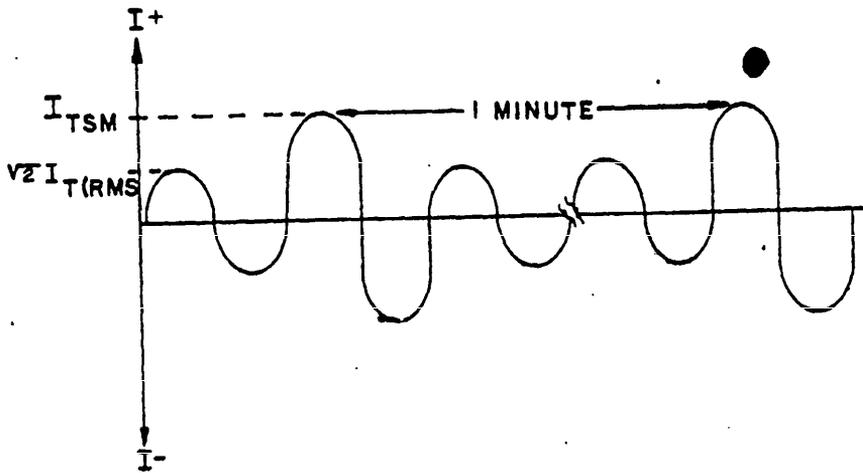


Dimensions		
Ltr	Minimum	Maximum
A		1.193 (30.30)
B		.875 (22.23)
C	.330 (8.38)	.505 (12.83)
D	.422 (10.72)	.453 (11.51)
E		.544 (13.82)
F	.544 (13.82)	.562 (14.27)
G	.086 (2.18)	.200 (5.08)
H	.026 (.66)	
J	.035 (.89)	.075 (1.91)
K	.085 (2.16)	.140 (3.56)
L	.210 (5.33)	.300 (7.62)
M	.125 (3.18)	.165 (4.19)
N	.100 (2.54)	

NOTES:

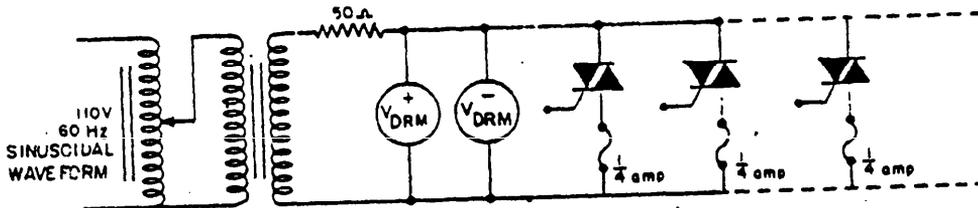
1. Metric equivalents (to the nearest .01 mm) are given for general information only and are based upon 1 inch = 25.4 mm.
2. Millimeters are in parentheses.
3. Complete threads to extend to within 2-1/2 threads of head.
4. Diameter of unthreaded portion .249 (6.32 mm) maximum, .220 (5.59) minimum.
5. Angular orientation of these terminals to each other and to the hexagon is undefined.
6. Maximum pitch diameter of plated threads shall be basic pitch diameter .2268 (5.76). Ref: Screw-Thread Standards for Federal Services - 1957; Handbook H28, Part 1.
7. A chamfer (or undercut) on one or both ends of hexagonal portions is optional.
8. Square or radius on end of terminal is optional.
9. Stud is MT2 connection.
10. Large terminal is MT1 connection.
11. Small terminal is gate connection.
12. Dimensions are in inches.
13. The terminals may be constructed L-shaped. The end of the lugs shall not protrude beyond the .562/.544 (14.27/13.82) hex dimension.

FIGURE 1. Semiconductor device, triode thyristor (bi-directional) silicon, types 2N5806 through 2N5809.



Procedure. The above waveform shall be applied to the devices under test. The device shall be operated at the specified RMS on-state current and specified case temperature in a single phase circuit with a 60 Hz sinusoidal supply and a resistive load. The total peak device current during the surge shall be 200A.

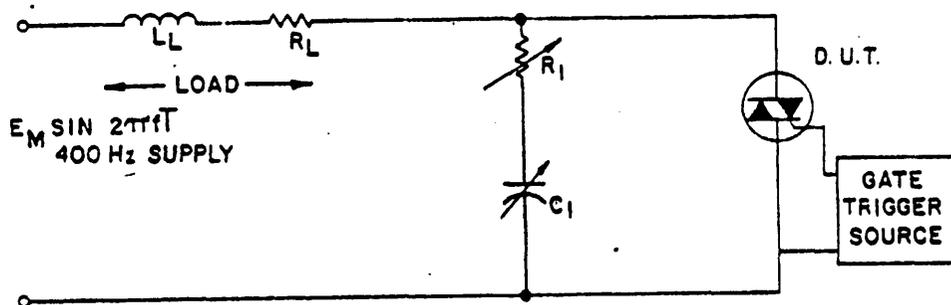
FIGURE 2. Surge current waveform.



Procedure. Adjust V_{DRM} to the specified value for the device under test.

NOTE: Rate of rise of voltage must be limited to values specified in group A inspection. A resistor in series with each device in each leg is optional. If a resistor is used, the voltage across each device shall be monitored.

FIGURE 3. Off-state voltage life-test test circuit.



NOTE: The X/R for the entire test circuit shall be ≥ 10 so that the supply voltage and current are essentially in-quadrature.

Test conditions.

The following limits shall apply for each half-cycle of the test voltage and current:

1. Frequency of single phase sinusoidal A. C. supply - - - - - 400 Hz
2. Peak on-state current ($I_{TM} \approx \frac{EM}{Z_L}$) - - - - - 35 a (pk)
3. On-state current duration
(90% of half cycle recommended) - - - - - 1.1 msec (minimum)
4. Rate of reversal of on-state current (di/dt)
(The slope of the line connecting the 50% and 0% I_{TM} points; $di/dt \approx 2\pi f I_{TM}$) - - - - - 88 a/msec
5. Peak off-state voltage (V_{DRM}) - - - - - rated voltage
6. Off-state voltage duration (200 μ s (min))
starting at time V_{DRM} is attained) - - - - - 40 μ sec (minimum)
7. Gate bias conditions (between current pulses):
 Gate source voltage - - - - - 0
 Gate source resistance - - - - - ∞ ohms (gate open)
 or Gate bias resistance - - - - - ∞ ohms
8. Case temperature - - - - - 80°C
9. Critical rate of rise of commutation voltage
(The slope of the line connecting the 10% and 63% test voltage points) - - - - - 5.0 v/ μ sec

FIGURE 4. Commutation voltage test circuit.

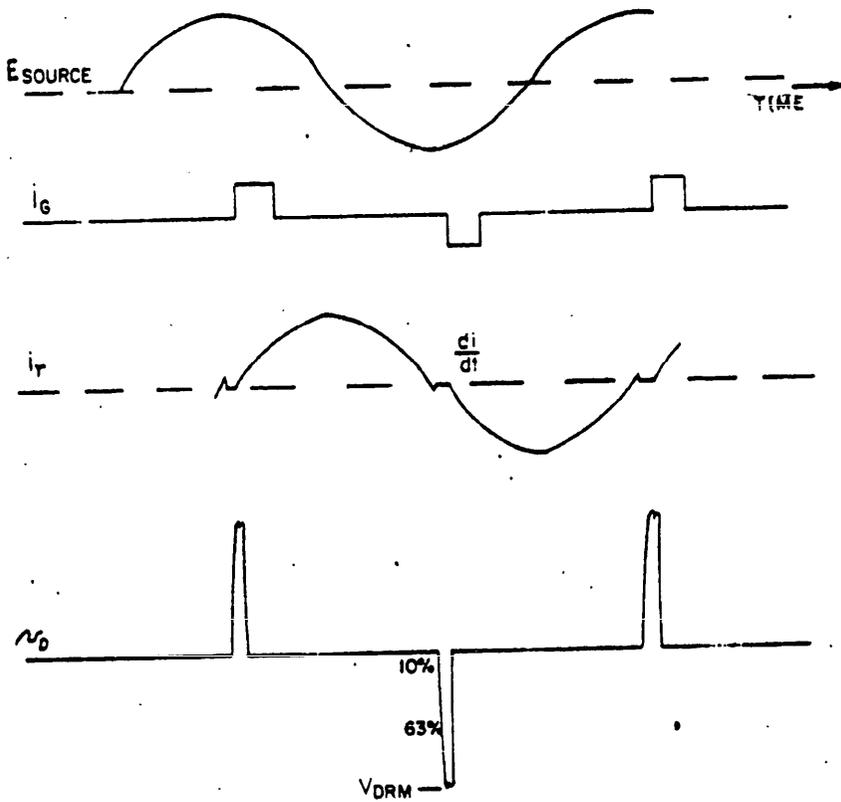
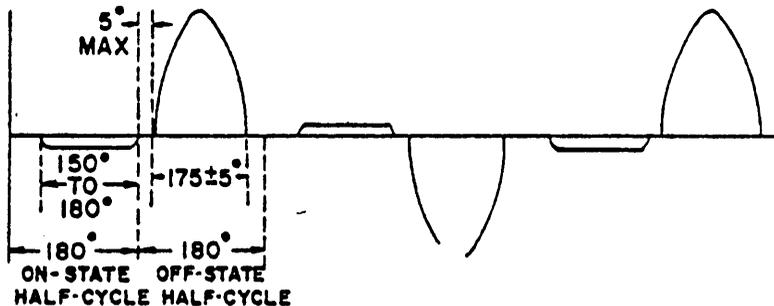
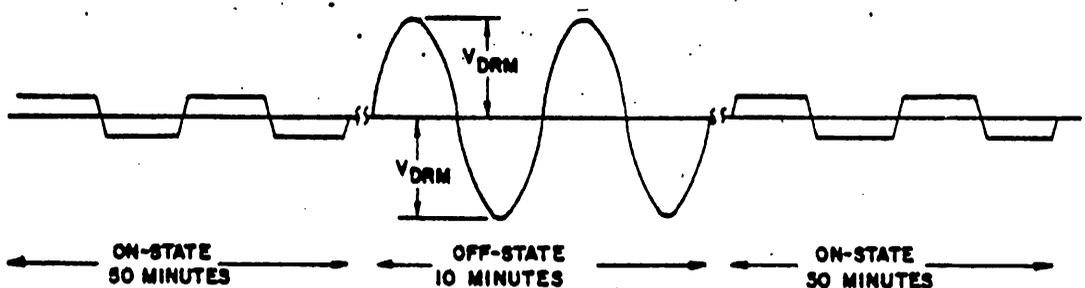


FIGURE 5. Commutation voltage and current test waveforms.



Procedure. The device shall be made to conduct in one chosen direction a half-cycle of current of peak value equal to twice its rated RMS current at rated T_{op} . Following the next half-cycle interval in which there is no current flow, the device shall be made to conduct the test current in the opposite direction. The conduction angle of the test current shall be 150° to 180° . Rated half-sinewave peak off-state voltage shall be applied during the nonconducting half-cycles starting no later than 5° after conduction has ceased. The half-cycle off-state voltage shall always be applied in the opposite direction from that of the current flow during the preceding half-cycle. The duration of the off-state voltage shall be $175^\circ \pm 5^\circ$. Power sources shall be 60-Hz sinusoidal-waveform sources.

FIGURE 6. Intermittent-operating life test and waveform (test method A).



Procedure. The device shall be made to conduct 25 amps RMS at 80°C Case or 12.5 amps RMS at 100°C Case symmetrically in both directions for 50-minutes, followed by application of rated off-state voltage V_{DRM} in both directions for 10-minutes. This intermittent-operating cycle shall be repeated for the duration of the life test. The conduction angle during on-state shall be 150° to 180° . The test frequency for on-state and off-state shall be 60-Hz sinusoidal-waveform source.

FIGURE 7. Intermittent-operating life test and waveform (test method B).

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery. Preparation for delivery shall be in accordance with MIL-S-19500.

6. NOTES

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

6.2 Application notes. The following values may be used as application guidelines:

$$P_{G(AV)} = 0.5 \text{ W (max)}; P_{GM} = 10 \text{ W (max)}$$

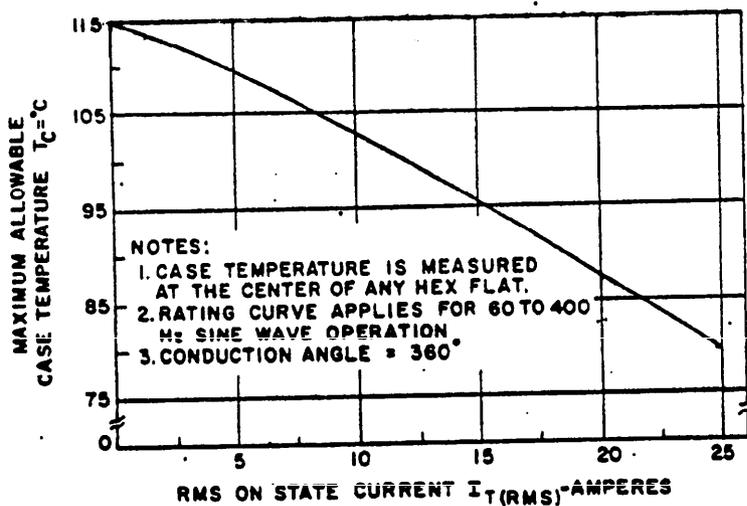


FIGURE 8: Maximum allowable case temperature vs. rms on-state current.

Custodians:

Army - EL
 Navy - EC
 Air Force - 17

Preparing activity:

Navy - EC

Agent:

DSA - ES

Review activities:

Army - MU, MI
 Navy -
 Air Force - 11, 70, 80, 85
 DSA - ES

(Project 5961-0168)

User activities:

Army - SM
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This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).

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QUANTITY OF ITEMS PROCURED

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SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
A. GIVE PARAGRAPH NUMBER AND WORDING.

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