

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED
	D	REPLACES REV C WITH CHANGE PER TDRR 32570	FEB 67	JWS RCA

REQUIREMENTS:

1. GENERAL:

- A. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.
- B. UNITS SHALL MEET THE REQUIREMENTS OF MIL-S-19500 EXCEPT AS, AND IN ADDITION TO THE REQUIREMENTS, SPECIFIED HEREIN.
- C. SUPPLIER SHALL CONFORM TO THE QUALITY ASSURANCE PROVISIONS CONTAINED IN ND 1015404, CLASS 2.
- D. UNITS SHALL BE CAPABLE OF MEETING THE QUALIFICATION REQUIREMENTS OF ND 1002051.
- E. PROCESSED LOTS MUST MEET THE ACCEPTANCE REQUIREMENTS OF ND 1002313. PROCESSING IN ACCORDANCE WITH ND 1002313 SHALL BE PERFORMED AT LOCATION SPECIFIED BY THE BUYER.
- F. MARKING:
  - (1) PARTS SHALL BE PERMANENTLY AND LEGIBLY MARKED, IN ACCORDANCE WITH ND 1002019, WITH THE NASA PART NUMBER (DRAWING NUMBER AND REVISION LETTER) OR AS MANY SIGNIFICANT DIGITS AS POSSIBLE (E.G. 6323). OTHER MARKING SUCH AS MANUFACTURER'S IDENTIFICATION AND TYPE NUMBER IS PERMISSIBLE.
- G. PREPARATION FOR DELIVERY SHALL BE IN ACCORDANCE WITH ND 1002215, CLASS 1, CODE 2.
  - (1) MARKING OF SHIPPING CONTAINERS SHALL CONFORM TO THE MARKING OF UNIT AND INTERMEDIATE PACKAGES AND THE METHODS OF MARKING AS SPECIFIED IN ND 1002215.

2. ACCEPTANCE AND INSPECTION:

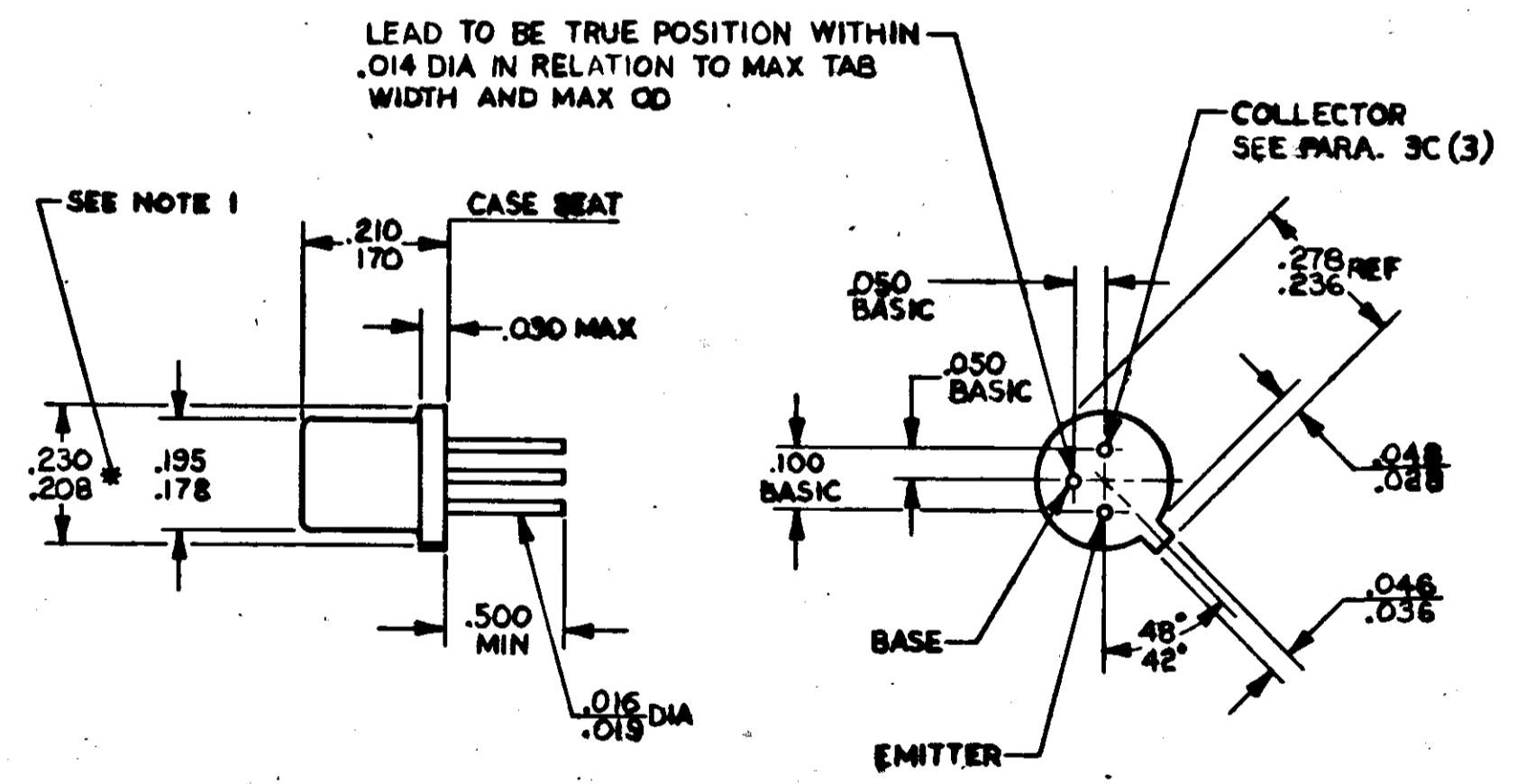
A. MECHANICAL PROPERTIES:

(1) DIMENSIONS: AS DELINEATED HEREIN.

B. SEAL TEST: THE UNITS SHALL BE SUBJECTED TO A HELIUM OR RADIFLO LEAK DETECTION TEST WITH A SENSITIVITY OF AT LEAST  $1 \times 10^{-8}$  CC/ATM/SEC AND A HOT GLYCERINE BUBBLE TEST FOR GROSS LEAKS. THE LEAK TEST SHALL BE PERFORMED IN ACCORDANCE WITH MIL-STD-202C METHOD 112. TEST CONDITION C SHALL BE USED FOR THE HELIUM OR RADIFLO TEST. TEST CONDITION A SHALL BE USED FOR THE GROSS LEAK TEST EXCEPT THAT GLYCERINE SHALL REPLACE THE MINERAL OIL. A LEAKAGE RATE OF  $1 \times 10^{-8}$  CC-ATM-SEC OR GREATER SHALL CONSTITUTE A FAILURE.

C. ELECTRICAL CHARACTERISTICS: PER TABLE I, AS LISTED BELOW:

- (1) ELECTRICAL TESTING: THE TESTS LISTED IN TABLE I SHALL BE PERFORMED AS LISTED BELOW:
  - COLLECTOR CUTOFF CURRENT
  - COLLECTOR-BASE BREAKDOWN VOLTAGE
  - EMITTER-BASE BREAKDOWN VOLTAGE
  - EMITTER-BASE REVERSE CURRENT
  - COLLECTOR-EMITTER SUSTAINING VOLTAGE
  - COLLECTOR-EMITTER CURRENT
  - COLLECTOR-EMITTER THRESHOLD CURRENT
  - DIRECT CURRENT GAIN
  - BASE-EMITTER SATURATION VOLTAGE
  - COLLECTOR-EMITTER SATURATION VOLTAGE
  - COLLECTOR CAPACITANCE
  - TURN-ON AND TURN-OFF TIME



PROCURE ONLY FROM APPROVED SOURCES LISTED IN ND 1002034 FOR THIS DRAWING.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON 2 PLACE 3 PLACE DECIMALS DECIMALS ANGLES + - + - - - - -	MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
	DRAWN H. JONES	DATE 10 FEB 65	TRANSISTOR, SILICON, TYPE NPN, SWITCHING	
DO NOT SCALE THIS DRAWING	CHECKED A. CAGGIANO	DATE 10 FEB 65	SPECIFICATION CONTROL DRAWING	
MATERIAL SEE REQUIREMENTS	APPROVAL ELDON C. HALL	DATE 18 MAR 65	CONTRACT NAS 9-87	
APPROVAL	NASA APPROVAL J. MICHAELS	DATE 18 MAR 65	MIT APPROVAL W. KUPFER	DATE 18 MAR 65
	SIZE	CODE IDENT NO.	SCALE NONE	SHEET 1 of 3
		80230		1006323

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D REQUIREMENTS: (CONTINUED)

- D. VENDOR SUPPLIED DATA: EACH SHIPMENT OF PARTS SHALL BE ACCOMPANIED BY THE FOLLOWING DOCUMENTATION.
- (1) CERTIFICATE OF COMPLIANCE WITH LEAD MATERIAL REQUIREMENT.
  - (2) CERTIFICATE OF COMPLIANCE WITH ND 1015404, CLASS 2.

3. DESIGN:

- A. STORAGE LIFE: INDEFINITE WHEN STORED AT TEMPERATURES BETWEEN -65°C AND +150°C.
- B. ABSOLUTE MAXIMUM RATINGS AT 25°C AMBIENT.
  - (1) COLLECTOR-EMITTER VOLTAGE ( $V_{CE0}$ ): 35 VDC.
  - (2) COLLECTOR-BASE VOLTAGE ( $V_{CB0}$ ): 60 VDC.
  - (3) EMITTER-BASE VOLTAGE ( $V_{EB0}$ ): 5 VDC.
  - (4) COLLECTOR CURRENT ( $I_C$ ): 600 MILLIAMPERES.
  - (5) THERMAL RESISTANCE, JUNCTION-CASE ( $\theta_{JC}$ ): 50°C/WATT.
  - (6) THERMAL RESISTANCE, JUNCTION-AMBIENT ( $\theta_{JA}$ ): 350°C/WATT.
  - (7) TEMP. RANGE, JUNCTION, OPERATING: -65°C TO +150°C.
  - (8) TEMP. RANGE, STORAGE: -65°C TO +150°C.

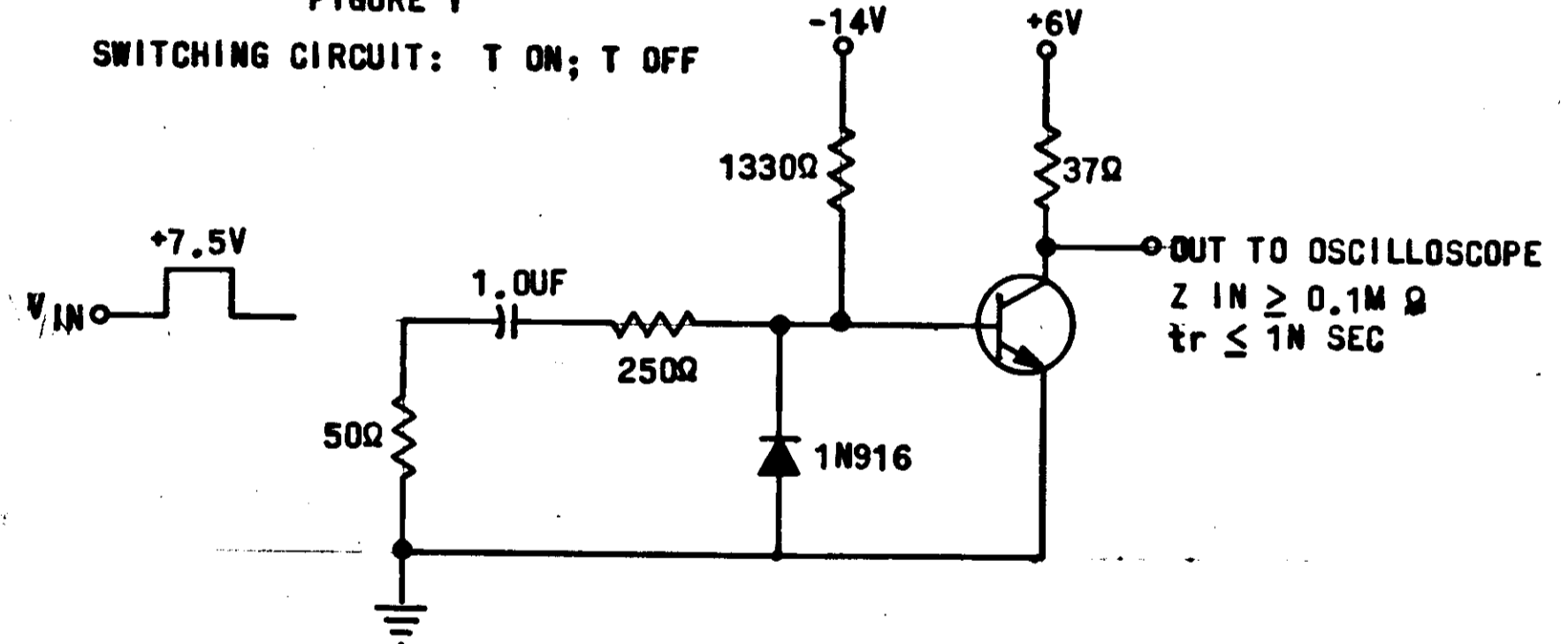
C. CONSTRUCTION:

- (1) SEMICONDUCTOR: SILICON PLANAR EPITAXIAL NPN.
- (2) CASE: METAL CASE AND METAL HEADER HERMETICALLY SEALED (JEDEC TO -18).
- (3) COLLECTOR SHALL BE ELECTRICALLY CONNECTED TO THE CASE INTERNALLY.
- (4) LEAD MATERIAL: WELDABLE, GOLD PLATED, ANNEALED IRON-NICKEL-COBALT (KOVAR) ALLOY IN ACCORDANCE WITH ND 1015402.

D. QUALITY ASSURANCE REQUIREMENTS:

- (1) LOT DEFINITION: A GROUP OF PARTS IN A SINGLE PROCUREMENT SELECTED FROM A SINGLE CONTINUOUS PRODUCTION RUN USING LIKE MATERIALS WHICH ARE CONTROLLED USING A PROCESS WHICH IS THE SAME FROM THE BEGINNING TO THE END OF THE RUN.
- (2) INSPECTION CONDITIONS: UNLESS OTHERWISE SPECIFIED, ALL INSPECTIONS SHALL BE MADE AT AN AMBIENT TEMPERATURE OF +25°C ± 3°C.

FIGURE 1 SWITCHING CIRCUIT: T ON; T OFF



VOLTAGE IN:  $V_{IN} = +7.5V$   
 PULSE WIDTH:  $PW = 0.5U SEC$   
 TOTAL RISE, FALL:  $t_r + t_f \leq 6N SEC$   
 IMPEDANCE IN:  $Z_{IN} = 50\Omega$

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON	MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
	2 PLACE DECIMALS	3 PLACE DECIMALS	ANGLES	
+	+	+	DRAWN <u>H. JONES</u> DATE <u>10 FEB 65</u>	
-	-	-	CHECKED <u>A. CAGGIANO</u> <u>10 FEB 65</u>	
DO NOT SCALE THIS DRAWING	CONTRACT <u>NAS 9-697</u>		APPROVAL <u>ELDON C. HALL</u> <u>10 FEB 65</u>	
MATERIAL	NASA APPROVAL <u>J. MICHAELS</u> <u>18 MAR 65</u>		SIZE	CODE IDENT NO.
SEE REQUIREMENTS	MIT APPROVAL <u>W. KUPFER</u> <u>18 MAR 65</u>			80230
APPROVAL			SCALE NONE	1006323
				SHEET 2 of

REVISIONS				
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TABLE I  
ACCEPTANCE INSPECTION

TEST	SYMBOL	MIL-STD-750 TEST CONDITIONS T <sub>A</sub> = 25° ± 3°C UNLESS SPECIFIED	LIMIT		UNITS	TESTING REQUIRED
			MIN	MAX		
<b>SUBGROUP 1</b>						
VISUAL AND MECHANICAL EXAMINATION		METHOD 2071				LTPD = 10 (NOTE 1) MAX ACC NO. = 3
<b>SUBGROUP 2</b>						
COLLECTOR CUTOFF CURRENT	I <sub>CBO</sub>	V <sub>CB</sub> =30 V; I <sub>E</sub> =0		100	NA	100%
COLLECTOR CUTOFF CURRENT 150°C	I <sub>CBO</sub>	V <sub>CB</sub> =30 V; I <sub>E</sub> =0, T <sub>A</sub> =+150°C		200	μA	
COLLECTOR-BASE BREAKDOWN VOLTAGE	BV <sub>CBO</sub>	I <sub>C</sub> =100μA; I <sub>E</sub> =0	60		V	
EMITTER-BASE REVERSE CURRENT	I <sub>EBO</sub>	V <sub>EB</sub> =3 V; I <sub>C</sub> =0		100	NA	
EMITTER-BASE BREAKDOWN VOLTAGE	BV <sub>EBO</sub>	I <sub>E</sub> =100μA; I <sub>C</sub> =0	5		V	
COLLECTOR-EMITTER SUSTAINING VOLTAGE (NOTE 2)	V <sub>CEO</sub> SUST	I <sub>C</sub> =30 mA PULSED; I <sub>B</sub> =0	35		V	
COLLECTOR-EMITTER CURRENT RES. RETURN	I <sub>CER</sub>	V <sub>CE</sub> =30 V; R <sub>BE</sub> =100 K		10	μA	
COLLECTOR-EMITTER THRESHOLD CURRENT	I <sub>CEX</sub>	V <sub>BE</sub> =+0.4V; V <sub>CE</sub> =40V		10	μA	
DC CURRENT GAIN (NOTE 2)	h <sub>FE</sub>	I <sub>C</sub> =+500 mA; V <sub>CE</sub> =+10V	25			
DC CURRENT GAIN (NOTE 2)	h <sub>FE</sub>	I <sub>C</sub> =+150 mA; V <sub>CE</sub> =+10V	40	120		
DC CURRENT GAIN (NOTE 2)	h <sub>FE</sub>	I <sub>C</sub> =+10 mA; V <sub>CE</sub> =+10V	30			
BASE-EMITTER SATURATION VOLTAGE (NOTE 2)	V <sub>BE(SAT)</sub>	I <sub>C</sub> =500 mA; I <sub>B</sub> =50 mA	1.00	1.30	V	
COLLECTOR-EMITTER SATURATION VOLTAGE (NOTE 2)	V <sub>CE(sat)</sub>	I <sub>C</sub> =150 mA; I <sub>B</sub> =15 mA		0.40	V	
COLLECTOR-EMITTER SATURATION VOLTAGE (NOTE 2)	V <sub>CE(sat)</sub>	I <sub>C</sub> =500 mA; I <sub>B</sub> =50 mA		1.0	V	
COLLECTOR CAPACITANCE	C <sub>ob</sub>	V <sub>CB</sub> =-10V; I <sub>E</sub> =0; F=0.14 mc		8	PF	
TURN ON TIME	t <sub>on</sub>	I <sub>B1</sub> ≈ 15 mA (NOTE 4); I <sub>C</sub> ≈ 150 mA (NOTE 4) t <sub>v</sub> > 400 nsec		25	NSEC	
TURN OFF TIME	t <sub>off</sub>	2% DUTY CYCLE I <sub>B1</sub> = I <sub>B2</sub> ≈ 15mA (NOTE 4); I <sub>C</sub> ≈ 150mA (NOTE 4) t <sub>v</sub> > 400 nsec 2% DUTY CYCLE		40	NSEC	

TEST IN CIRCUIT OF FIGURE 1

NOTES:

1. LTPD = 5, MAXIMUM ACCEPT NO. = 1, REJECT = 2.
2. PULSE ≤ 300 μSECS. AT ≤ 2% DUTY CYCLE.
3. LTPD OR λ PER MIL-S-19500 D, TABLE C1 OR C11.
4. CURRENTS TO WITHIN ±10%.

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	DRAWN <u>H. JONES</u> DATE <u>FEB 67</u> CHECKED <u>A. CAGGIANO</u> DATE <u>FEB 67</u> APPROVAL <u>ELDON C. HALL</u> DATE <u>MAR 67</u>	TRANSISTOR, SILICON, TYPE NPN, SWITCHING
DO NOT SCALE THIS DRAWING	CONTRACT <u>NAS 9-497</u>	SPECIFICATION CONTROL DRAWING
MATERIAL SEE REQUIREMENTS	NASA APPROVAL <u>J. MICHAELS</u> DATE <u>MAR 65</u> MIT APPROVAL <u>W. KUPFER</u> DATE <u>MAR 65</u>	SIZE <b>C</b> CODE IDENT NO. <b>80230</b>
APPROVAL	SCALE <u>NONE</u>	<b>1006323</b> SHEET 3 of

1006323

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