

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

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. 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. 6310). OTHER MARKING SUCH AS MANUFACTURER'S IDENTIFICATION AND TYPE NUMBER IS PERMISSIBLE.
- F. PREPARATION FOR DELIVERY SHALL BE IN ACCORDANCE WITH ND 1002215, CLASS I, 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.
- (2) SEAL TEST: THE UNITS SHALL BE SUBJECTED TO A HELIUM OR RADIFLO LEAK DETECTION TEST WITH A SENSITIVITY OF AT LEAST 1×10^{-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.

ELECTRICAL CHARACTERISTICS: PER TABLES I, II, AND III AS LISTED BELOW:

- (1) PRE-ELECTRICAL TEST PROCESSING: ON LOTS OF 500 OR LESS, THE TESTS OF TABLE I SHALL BE PERFORMED IN THE SEQUENCE INDICATED BEFORE THE TESTS OF TABLE II.
- (2) ELECTRICAL TESTING: THE TESTS LISTED IN TABLE II 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.

- (3) QUALITY DEMONSTRATION TESTING: PER TABLE III ON LOTS MORE THAN 500 UNITS USING ACCEPTABLE UNITS FROM SUBGROUP 2 OF TABLE II FOR SUBGROUP 2, 3, AND 4 OF TABLE III. SUBGROUPS 1 AND 5 MAY USE ELECTRICAL REJECTS FROM THE SAME LOT.

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) CERTIFICATE OF COMPLIANCE WITH PARA. 2.C(1) OR 2.C(3). UNITS USED IN QUALITY DEMONSTRATION TESTS OF TABLE III WILL NOT BE SHIPPED AS PART OF THE DELIVERY SCHEDULE BUT WILL BE FORWARDED UNDER SEPARATE COVER WITH TEST DATA FOR EACH LOT SHIPMENT.

3. DESIGN:

A. STORAGE LIFE: INDEFINITE WHEN STORED AT TEMPERATURES BETWEEN -65°C AND $+150^{\circ}\text{C}$.B. ABSOLUTE MAXIMUM RATINGS AT 25°C AMBIENT.

- (1) COLLECTOR-EMITTER VOLTAGE (V_{CE0}): 40 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 (θ_{JC}): $50^{\circ}\text{C}/\text{WATT}$
- (6) THERMAL RESISTANCE, JUNCTION-AMBIENT (θ_{JA}): $350^{\circ}\text{C}/\text{WATT}$
- (7) TEMPERATURE RANGE, JUNCTION, OPERATING: -65°C TO $+150^{\circ}\text{C}$.
- (8) TEMPERATURE RANGE, STORAGE: -65°C TO $+150^{\circ}\text{C}$

C. CONSTRUCTION:

- (1) SEMICONDUCTOR: SILICON PLANAR EPITAXIAL PNP
- (2) CASE: METAL CAN 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.

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 $+25^{\circ} \pm 3^{\circ}\text{C}$.

01E9001

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	UPGRADED TO CLASS A WITH CHANGE PER TDRR 17369	11/1/65	WK
B	REVISED PER TDRR 20618	11/1/65	WK
C	REVISED PER TDRR 24264	11/1/65	WK

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DRAWN <i>[Signature]</i> CHECKED <i>[Signature]</i> APPROVAL <i>[Signature]</i>		TRANSISTOR, SILICON, TYPE PNP, SWITCHING SPECIFICATION CONTROL DRAWING	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES $\pm \pm \pm$ DO NOT SCALE THIS DRAWING MATERIAL SEE NOTE		CODE IDENT NO. 80230 SIZE C SCALE NONE WT	
HEAT TREATMENT NONE FINAL FINISH NONE		NASA DRAWING NO. 1006310	
NEXT ASSY	USED ON	SHEET 1 OF 4	
APPLICATION			

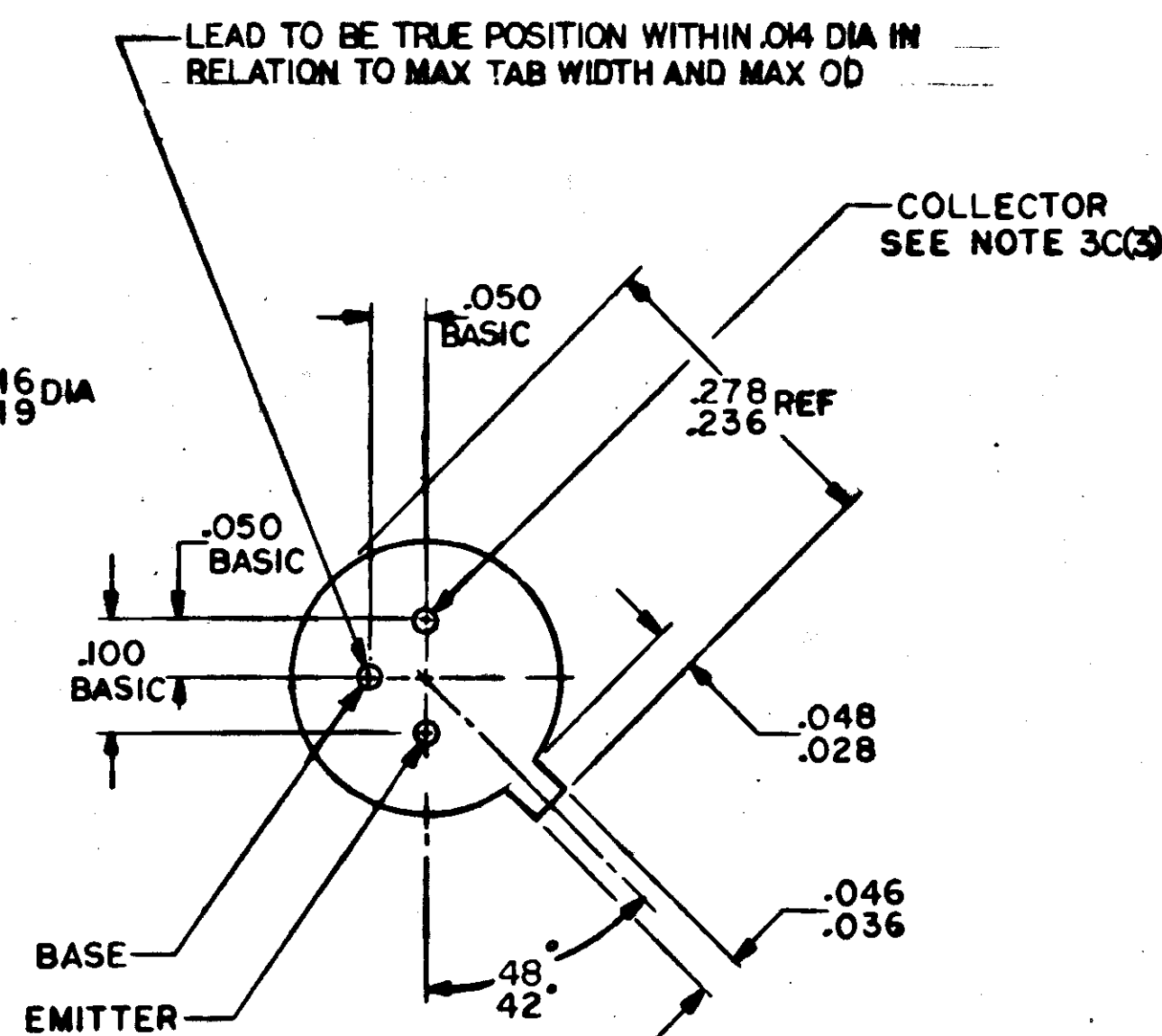
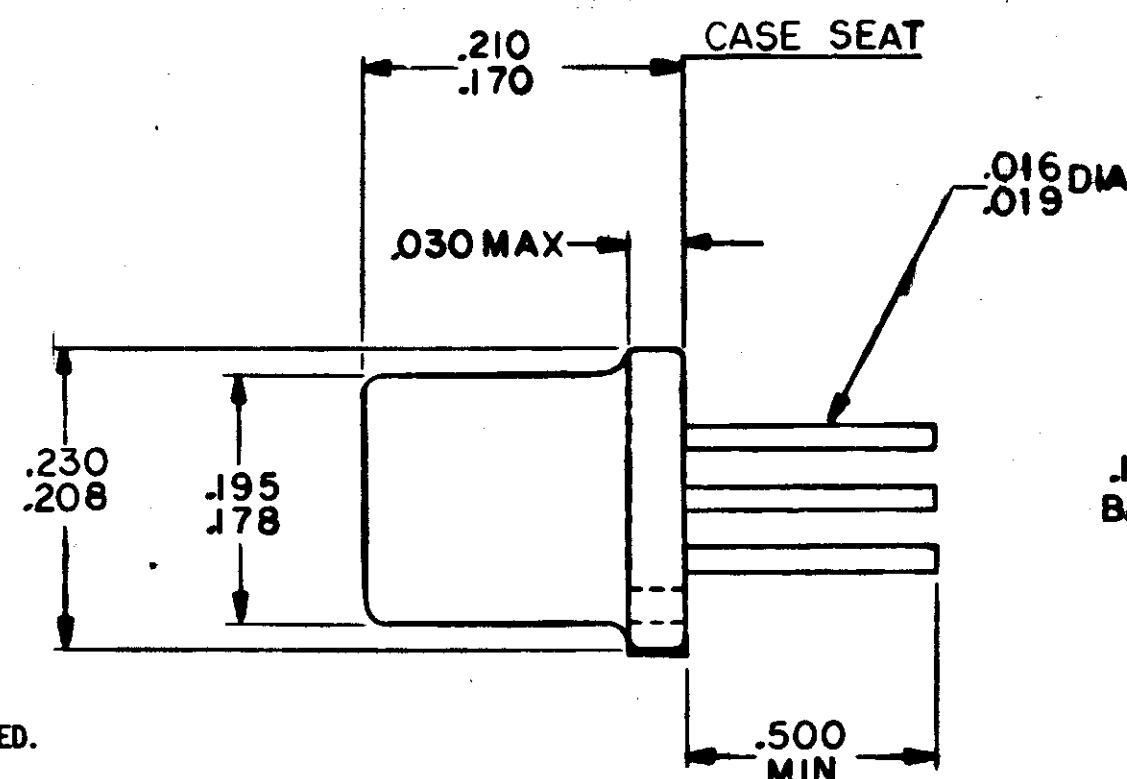
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0129001

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
A	UPGRADED TO CLASS A WITH CHANGE PER TDRR 17369	1/16/65	WJL
B	REVISED PER TDRR 20618	7/27/65	WJL
C	REVISED PER TDRR 24264	11/30/65	WJL

TABLE I

PRE-ELECTRICAL TEST PROCESSING			
TEST	MIL-STD-750 TEST CONDITIONS	LOT	
		1 TO 500	OVER 500
THERMAL SHOCK*	METHOD 1056, CONDITION B (+150°C TO -65°C, 3 CYCLES)	100%	NO REQUIREMENT
STORAGE LIFE* (HIGH TEMPERATURE STABILIZATION)	METHOD 1031, Tstg = 150° ± 5°C, 72 ⁺⁸ ₋₄ HOURS		
CONSTANT ACCELERATION*	METHOD 2006 (20,000 G) Y AXIS		
POWER, BURN-IN*	METHOD 1026 P = 350 MILLIWATTS V _{CE} = -20.0 VOLTS MINIMUM T _A = +22°C MIN IN FREE AMBIENT AIR t = 168 ⁺¹² ₋₆ HOURS		
SEAL TEST*	MIL-STD-202C, METHOD 112, CONDITION C 10 ⁻⁸ ATM CC/SEC MAX = ACCEPTANCE		



- * TESTS TO BE PERFORMED IN ORDER INDICATED.
- ** PULSE ≤ 300 U SECS AT ≤ 2% DUTY CYCLE.
- *** LTPD OR PER MIL-S-195000, TABLE CI OR CII
- **** THE PARAMETER MEASURED MAY NOT CHANGE ANY GREATER THAN THE PERCENTAGE SPECIFIED BETWEEN THE INITIAL VALUE AND THE END OF TEST VALUE. VALUES OF COLLECTOR AND EMITTER CUTOFF CURRENTS LESS THAN 10 NANOAMPERES MAY BE CONSIDERED TO BE 10 NANOAMPERES FOR CALCULATING PERCENTAGE CHANGE.

- CURRENTS TO WITHIN ± 10%.

POSTER

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± DO NOT SCALE THIS DRAWING MATERIAL SEE NOTE HEAT TREATMENT NONE FINAL FINISH NONE
NEXT ASSY	USED ON	
APPLICATION		

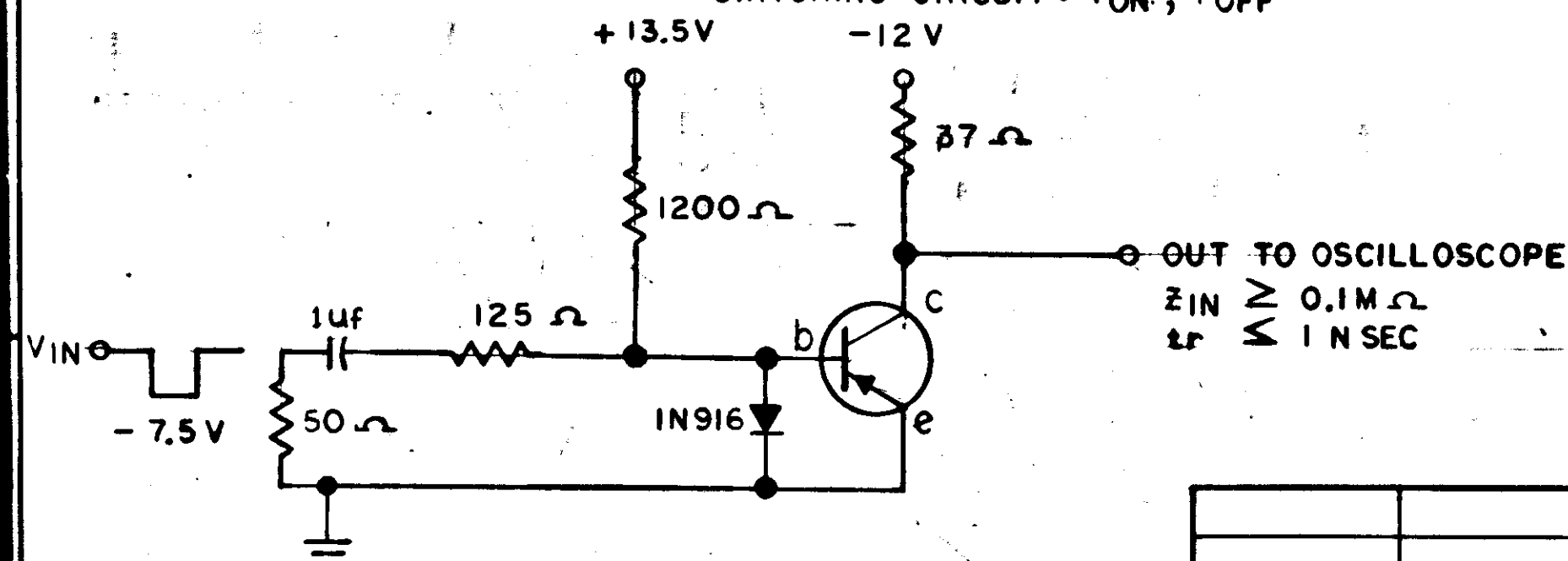
QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
		LIST OF MATERIALS	
	MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.	MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
	CONTRACT DATE 10 DEC 64 CHECKED R.T. Dumas 10 DEC 64 APPROVAL APPROVAL E. C. Hall 22 Jan 65	TRANSISTOR, SILICON, TYPE PNP, SWITCHING SPECIFICATION CONTROL DRAWING	
	NASA APPROVAL G. L. Hall 11 Feb 65 MIT APPROVAL MIT APPROVAL W. J. Hall 26 Jan 65	CODE IDENT NO. 80230 SIZE C SCALE NONE WT	NASA DRAWING NO. 1006310 SHEET 2 OF 4

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

TABLE II

ACCEPTANCE INSPECTION							
TEST	SYMBOL	MIL-STD-750 TEST CONDITIONS	LIMIT		UNITS	LOT	
			MIN	MAX		1 TO 500	OVER 500
SUBGROUP 1 VISUAL AND MECHANICAL EXAMINATION		METHOD 2071 (SEE NOTE 2 A (3))				LTPD*** = 10 MAX ACC NO. = 3	LTPD*** = 10 MAX ACC NO. = 3
SUBGROUP 2							
COLLECTOR CUTOFF CURRENT	ICBO	V _{CB} = -50 V; I _E = 0		10	NA	100%	LTPD*** = 2 (COMBINED) MAX ACC NO. = 3
COLLECTOR CUTOFF CURRENT 150°C	ICBO	V _{CB} = -50 V; I _E = 0		10	uA		
COLLECTOR-BASE BREAKDOWN VOLTAGE	BV _{CB0}	I _C = -10 uA; I _E = 0	60		V		
EMITTER-BASE REVERSE CURRENT	IEBO	V _{EB} = -3 V; I _C = 0		0.1	uA		
EMITTER-BASE BREAKDOWN VOLTAGE	BVEBO	I _E = -10 uA; I _C = 0	5		V		
COLLECTOR-EMITTER SUSTAINING VOLTAGE**	V _{CEO} SUST	I _C = -10 mA PULSED I _B = 0	60				
COLLECTOR-EMITTER CURRENT RES. RETURN	ICER	V _{CE} = -20 V; R _{BE} = 100 K		10	uA		
COLLECTOR-EMITTER THRESHOLD CURRENT	ICES	V _{BE} = -0; V _{CE} = -50 V		10	NA		
DC CURRENT GAIN**	h _{FE}	I _C = -150 mA; V _{CE} = -10 V	80	240			
DC CURRENT GAIN**	h _{FE}	I _C = -10 mA; V _{CE} = -10 V	100				
DC CURRENT GAIN**	h _{FE}	I _C = -1 mA; V _{CE} = -10 V	100				
DC CURRENT GAIN**	h _{FE}	I _C = -500 mA; V _{CE} = -10 V	30				
BASE-EMITTER SATURATION VOLTAGE**	V _{BE} (sat)	I _C = -50 mA; I _B = -2.5 mA	0.7	-1.0	V		
COLLECTOR-EMITTER SATURATION VOLTAGE**	V _{CE} (sat)	I _C = -50 mA; I _B = -2.5 mA		0.25	V		
COLLECTOR-EMITTER SATURATION VOLTAGE**	V _{CE} (sat)	I _C = -150 mA; I _B = -15 mA		0.4	V		
COLLECTOR CAPACITANCE	C _{ob}	V _{CB} = -10 V; I _E = 0; F = 0.14 mc		8	PF		
TURN ON TIME	t _{on}	I _{B1} ≈ 30 ⁰ mA; I _C ≈ 300 ⁰ mA t _w > 400 nsec 2% DUTY CYCLE		40	NSEC	LTPD*** = 5 MAX ACC = 0	LTPD*** = 5 MAX ACC = 0
TURN OFF TIME	t _{off}	I _{B1} = I _{B2} ≈ 30 ⁰ mA; I _C ≈ 300 ⁰ mA t _w > 400 nsec 2% DUTY CYCLE		120	NSEC		

SWITCHING CIRCUIT : TON; T_{OFF}



VOLTAGE IN : V_{IN} = 7.5V
PULSE WIDTH : P_W = 0.5 μSEC
TOTAL RISE, FALL : t_r + t_f ≤ 6 N SEC
IMPEDANCE IN : Z_{IN} = 50 Ω

FIGURE I

0129001

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
-	INITIAL RELEASE CLASS B		
A	UPGRADED TO CLASS A WITH CHANGE PER TDRR 17369	6/14/65	WHL
B	REVISED PER TDRR 20618	7/27/65	WHL
C	REVISED PER TDRR 24264	11/30/65	WHL

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DRAWN <i>[Signature]</i> DATE 1/24/66 CHECKED <i>[Signature]</i> DATE 1/24/66 APPROVAL <i>[Signature]</i> APPROVAL <i>[Signature]</i>		TRANSISTOR, SILICON, TYPE PNP, SWITCHING SPECIFICATION CONTROL DRAWING	
HEAT TREATMENT NONE		NASA APPROVAL <i>[Signature]</i>	CODE IDENT NO. 80230
FINAL FINISH NONE		MIT APPROVAL <i>[Signature]</i>	SIZE C
APPLICATION		MIT APPROVAL <i>[Signature]</i>	NASA DRAWING NO. 1006310
		SCALE NONE	WT
		SHEET 3 OF 4	

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TABLE III

QUALITY DEMONSTRATION TESTS

QUALITY DEMONSTRATION TESTS			
TEST	MIL-STD-750 TEST CONDITIONS	LOT	
		1 TO 500	OVER 500
SUBGROUP 1 PHYSICAL DIMENSIONS	METHOD 2066	NO REQUIREMENTS	*** LTPD = 20 MAX ACC NO.= 1
SUBGROUP 2* THERMAL SHOCK	METHOD 1056.1 CONDITION B (+150°C TO -65°C, 5 CYCLES)		*** LTPD = 10 (COMBINED) MAX ACC NO.= 3
SEAL TEST			
SUBGROUP 3* STORAGE LIFE	METHOD 1031.1 Tstg = 150° ± 5°C, 1000 HOURS		*** LTPD = 10 (COMBINED) MAX ACC NO.= 3
SHOCK	METHOD 2016.1 1500 G, 0.5 MSEC 5 BLOWS EACH IN X1, Y1, Y2, Z1 DIRECTIONS, 20 BLOWS TOTAL		
VIBRATION VARIABLE FREQUENCY	METHOD 2056, 30 G FROM 5 TO 2000 CPS LIMITED TO 0.12 DOUBLE AMPLITUDE, 3 CYCLES, 15 MINUTES PER CYCLE MINIMUM.		
CONSTANT ACCELERATION	METHOD 2006, 20,000 G Y-AXIS		
SUBGROUP 4 OPERATION LIFE	METHOD 1026.1 P = 350 MILLIWATTS V _{CE} = -20 VOLTS MINIMUM T _A = +22°C MIN IN FREE AMBIENT AIR t = 1000 HOURS		λ*** = 10 MAX ACC NO.= 3
SUBGROUP 5* LEAD TENSION (COND A) LEAD FATIGUE (COND E)	METHOD 2036 4 POUND LOAD FOR 10 SECONDS 3 ARCS		*** LTPD = 20 (COMBINED) MAX ACC NO.= 3

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	UPGRADED TO CLASS A WITH CHANGE PER TDRR 17369	1/16/65	WJL
B	REVISED PER TDRR 20618	7/27/65	WJL
C	REVISED PER TDRR 24264	11/30/65	WJL

TABLE III (CONTINUED)

TEST	SYMBOL	TEST CONDITION	LIMIT
END POINTS FOR SUBGROUP 2			
COLLECTOR CUTOFF CURRENT	ICBO	VCB = -50V, IC = 0	±50% ****
EMITTER-BASE REVERSE CURRENT	IEBO	VEB = -3 V, IC = 0	±50% ****
DC CURRENT GAIN	hFE	VCE = -10V, IC = -10 mA	±10% ****
END POINTS FOR SUBGROUPS 3 AND 4			
COLLECTOR CUTOFF CURRENT	ICBO	VCB = -50V, IE = 0	±100% ****
EMITTER-BASE REVERSE CURRENT	IEBO	VEB = -3 V, IC = 0	±100% ****
DC CURRENT GAIN	hFE	VCE = -10V, IC = -10 mA	±20% ****

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POSTER

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
CONTRACT NO. <u>DM3</u> DRAWN <u>R.T. Dumas</u> DATE <u>2/2/65</u> CHECKED <u>R.T. Dumas</u> DATE <u>2/2/65</u> APPROVAL <u>R.T. Dumas</u> APPROVAL <u>R.T. Dumas</u>		TRANSISTOR, SILICON, TYPE PNP, SWITCHING SPECIFICATION CONTROL DRAWING	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ± DO NOT SCALE THIS DRAWING MATERIAL SEE NOTE		CODE IDENT NO. <u>80230</u> SIZE <u>C</u>	NASA DRAWING NO. <u>1006310</u>
HEAT TREATMENT NONE		MIT APPROVAL <u>W. K. Rupp</u>	SCALE <u>NONE</u> WT <u>-</u> SHEET <u>4</u> OF <u>4</u>
NEXT ASSY <u>-</u> USED ON <u>-</u>		MIT APPROVAL <u>W. K. Rupp</u>	
APPLICATION <u>-</u>			
FINAL FINISH NONE			