

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 OR 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 CONFERRING 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. 6323). OTHER MARKING SUCH AS MANUFACTURER'S IDENTIFICATION AND TYPE NUMBER IS PERMISSIBLE.
 - (2) PREPARATION FOR DELIVERY SHALL BE IN ACCORDANCE WITH ND 1002215, CLASS I, CODE 2.
 - (3) 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 1×10^{-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 SEALANT SHALL BE APPLIED TO ALL JOINTS TO PREVENT LEAKAGE. FOR GROSS LEAKS, GLYCERINE SHALL CONSTITUTE A FAILURE.
- 3C. ELECTRICAL CHARACTERISTICS: REFER TO 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
 - (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, & 4 OF TABLE III. SUBGROUPS 1 & 5 MAY USE ELECTRICAL REJECTS FROM THE SAME LOT.

- 1006323
- B. VENDOR SUPPLIED DATA: EACH SHIPMENT OF PARTS SHALL BE ACCOMPANIED BY THE FOLLOWING DOCUMENTATION.
 - (1) CERTIFICATE OF COMPLIANCE WITH HEAD REQUIREMENTS, CLASS 2, REQUIREMENT.
 - (2) CERTIFICATE OF COMPLIANCE WITH ND 1015404, CLASS 2.
 - (3) A 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°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 (θ_{JC}): 50°C/WATT
 - (6) THERMAL RESISTANCE, JUNCTION-AMBIENT (θ_{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 $\pm 25^\circ \pm 3^\circ\text{C}$.

REVISIONS						
SYM	ZONE	DESCRIPTION	DR	CHK	DATE	APPROVED
		INITIAL RELEASE CLASS A 17476 PER TDRR			11/17/65	WPK
A		REVISED PER TDRR 20619			11/17/65	WPK
B		REVISED PER TDRR 24263			11/30/65	WPK

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

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES CAPACITOR VALUES ARE IN μf RESISTOR VALUES ARE IN OHMS TOLERANCES ON FRACTIONS DECIMALS ANGLES \pm \pm \pm DO NOT SCALE THIS DRAWING
NEXT ASSY	USED ON	MATERIAL
APPLICATION		

QTY REQD	PART OR IDENTIFYING NO.	MATERIAL OR NOTES	NOMENCLATURE OR DESCRIPTION	ND NO.
LIST OF MATERIALS				
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS		
DRAWN <i>H. Jones</i> 10/26/65		TRANSISTOR, SILICON, TYPE NPN, SWITCHING		
CHECKED <i>C. Higgins</i> 10 Feb 65				
APPROVED		SPECIFICATION CONTROL DRAWING		
APPROVED <i>Eden C. Hall</i> 19 March				
APPROVED <i>W. Taylor</i> 11/17/65		CODE IDENT NO.	SIZE	DRAWING NO.
APPROVED <i>H. H. H.</i> 2/12/65		80230	C	1006323
		SCALE	SHEET 1 OF 4	

POSTER

1006323

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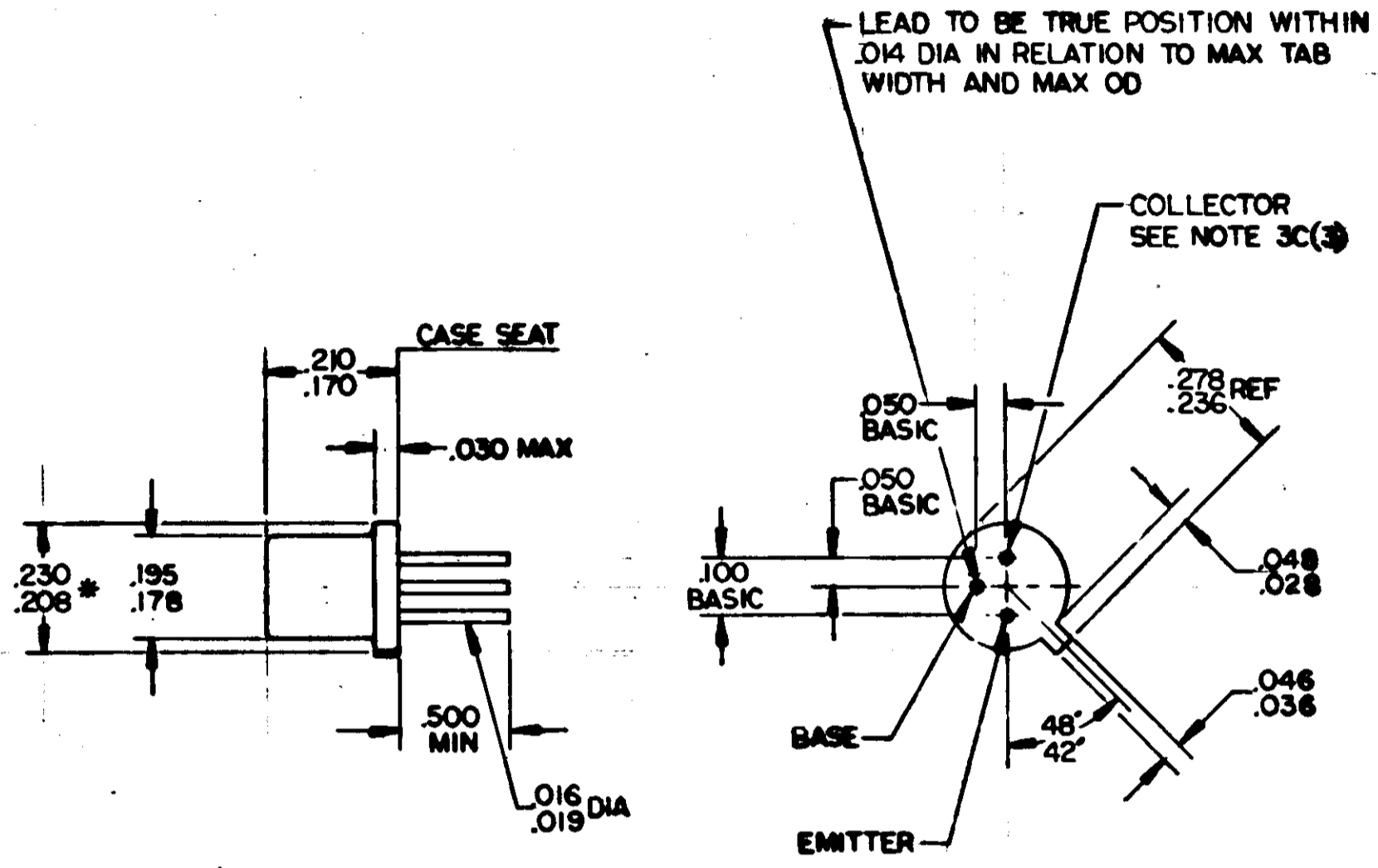
B 1006323

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
-	INITIAL RELEASE CLASS A PER TDRR 17474	1/17/65	WR
A	REVISED PER TDRR 20619	1/17/65	WR
B	REVISED PER TDRR 24263	1/17/65	WR

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 *	SEE NOTE 2.B		

*TEST TO BE PERFORMED IN ORDER INDICATED
 **PULSE ≤ 300μ SECS AT ≤ 2% DUTY CYCLE.
 ***LTPD OR λ PER MIL-S-19500D, 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%



TRANSISTOR

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	
DRAWN <i>[Signature]</i> DATE 2/2/65 CHECKED <i>[Signature]</i> 8/22/65 APPROVAL <i>[Signature]</i> APPROVAL <i>[Signature]</i> 1/19/65		TRANSISTOR, SILICON, TYPE NPN, SWITCHING SPECIFICATION CONTROL DRAWING	
NASA APPROVAL <i>[Signature]</i> 1/14/65 MIT APPROVAL <i>[Signature]</i> 1/16/65 MIT APPROVAL	CODE IDENT NO. 80230	SIZE C	NASA DRAWING NO. 1006323
	SCALE NONE	WT	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 CONFERRING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THEREBY.

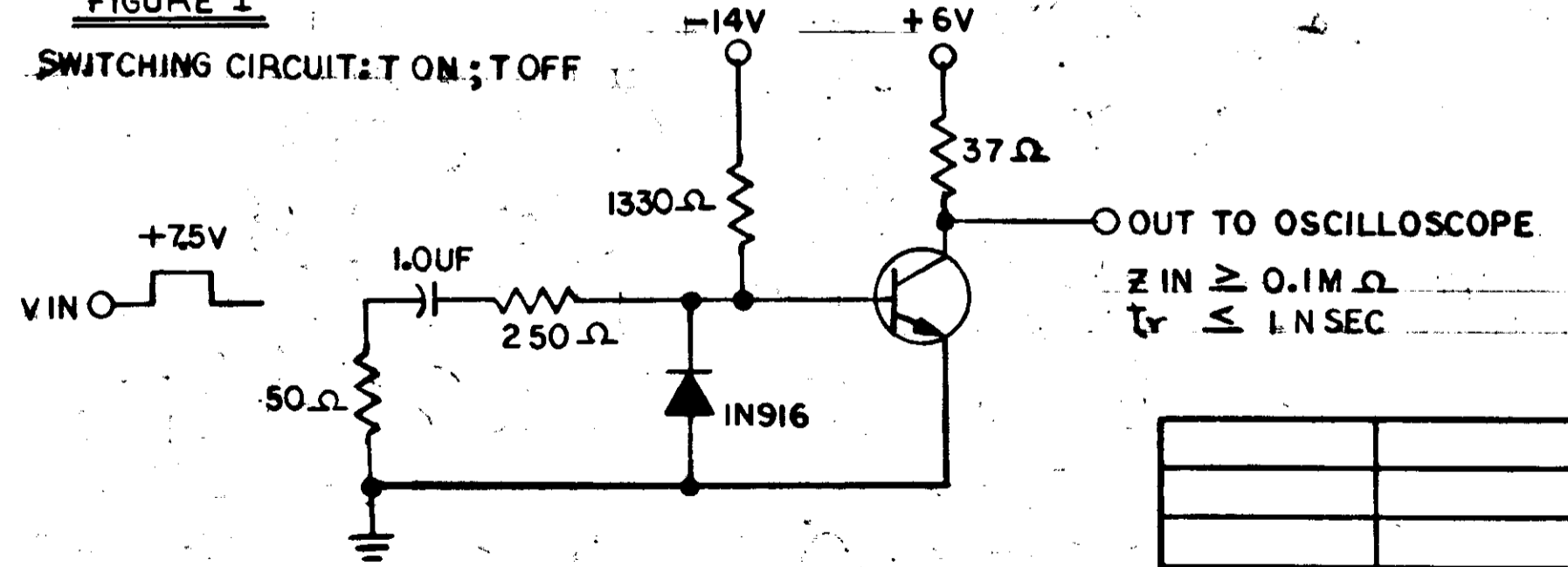
B 1006323

REVISIONS					
SYM	DESCRIPTION	DR	CHK	DATE	APPROVED
-	INITIAL RELEASE CLASS A PER TDRR 17476			8/1/65	WR
A	REVISED PER TDRR 20619			8/1/65	WR
B	REVISED PER TDRR 24263			11/30/65	WR

TABLE II

ACCEPTANCE INSPECTION							
TEST	SYMBOL	MIL-STD-750 TEST CONDITIONS $T_A = 25^\circ \pm 3^\circ C$ UNLESS SPECIFIED	LIMIT		UNITS	LOT	
			MIN	MAX		1 TO 500	OVER 500
SUBGROUP 1							
VISUAL AND MECHANICAL EXAMINATION		METHOD 2071				LTPD*** = 10 MAX ACC NO. = 3	LTPD*** = 10 MAX ACC NO. = 3
SUBGROUP 2							
COLLECTOR CUTOFF CURRENT	I_{CBO}	$V_{CB} = 30 V; I_E = 0$		50	μA	100%	LTPD** = 2 (COMBINED) MAX ACC NO. = 3
COLLECTOR CUTOFF CURRENT 150°C	I_{CBO}	$V_{CB} = 30 V; I_E = 0; T_A = +150^\circ C$		200	μA		
COLLECTOR-BASE BREAKDOWN VOLTAGE	BV_{CBO}	$I_C = 100 \mu A; I_E = 0$	60		V		
EMITTER-BASE REVERSE CURRENT	I_{EBO}	$V_{EB} = 3 V; I_C = 0$		100	μA		
EMITTER-BASE BREAKDOWN VOLTAGE	BV_{EBO}	$I_E = 100 \mu A; I_C = 0$	5		V		
COLLECTOR-EMITTER SUSTAINING VOLTAGE**	$V_{CE(SUST)}$	$I_C = 30 mA$ PULSED $I_B = 0$	35		V		
COLLECTOR-EMITTER CURRENT RES. RETURN	I_{CER}	$V_{CE} = 30 V; R_{FE} = 100 K$		10	μA		
COLLECTOR-EMITTER THRESHOLD CURRENT	I_{CEX}	$V_{BE} = +0.4V; V_{CE} = 40V$		10	μA		
DC CURRENT GAIN **	h_{FE}	$I_C = +500 mA; V_{CE} = +10 V$	25				
DC CURRENT GAIN **	h_{FE}	$I_C = +150 mA; V_{CE} = +10 V$	40	120			
DC CURRENT GAIN **	h_{FE}	$I_C = +10 mA; V_{CE} = +10 V$	30				
BASE-EMITTER SATURATION VOLTAGE **	$V_{BE(SAT)}$	$I_C = 500 mA; I_B = 50 mA$	1.10	1.30	V		
COLLECTOR-EMITTER SATURATION VOLTAGE**	$V_{CE(sat)}$	$I_C = 150 mA; I_B = 15 mA$		0.40	V		
COLLECTOR-EMITTER SATURATION VOLTAGE**	$V_{CE(sat)}$	$I_C = 500 mA; I_B = 50 mA$		1.0	V		
COLLECTOR CAPACITANCE	C_{ob}	$V_{CB} = -10 V; I_E = 0; F = 0.14 mc$		8	PF		
TURN ON TIME	t_{on}	$I_{B1} \approx 15 mA; I_C \approx 150 mA$ $t_w > 400 nsec$ 2% DUTY CYCLE		25	NSEC	LTPD*** = 5 MAX ACC NO = 0	LTPD*** = 5 MAX ACC NO = 0
TURN OFF TIME	t_{off}	$I_{B1} = I_{B2} \approx 15 mA; I_C \approx 150 mA$ $t_w > 400 nsec$ 2% DUTY CYCLE		40	NSEC		

FIGURE I
SWITCHING CIRCUIT: T ON; T OFF



VOLTAGE IN: $V_{IN} = +7.5V$
 PULSE WIDTH: $PW = 0.5 \mu SEC$
 TOTAL RISE, FALL: $\tau_r + \tau_f \leq 6 NSEC$
 IMPEDANCE IN: $Z_{IN} = 50 \Omega$

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MATERIAL
NEXT ASSY
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QTY REQD	PART OR IDENTIFYING NO.	MATERIAL OR NOTES	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS				
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS		
DRAWN <i>[Signature]</i> 9/25/65		TRANSISTOR, SILICON, TYPE NPN, SWITCHING SPECIFICATION CONTROL DRAWING		
CHECKED <i>[Signature]</i> 10/24/65				
APPROVED <i>[Signature]</i> 12/1/65				
APPROVED MIT <i>[Signature]</i> 1/14/66	CODE IDENT NO. 80230	SIZE C	DRAWING NO. 1006323	
APPROVED MSC <i>[Signature]</i> 3/1/66	DATE	SCALE	SHEET 3 OF 4	

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B 1006323

REVISIONS						
SYM	ZONE	DESCRIPTION	DR	CHK	DATE	APPROVED
-		INITIAL RELEASE CLASS A PER TDRR 17476			18 Mar 65	WJH
A		REVISED PER TDRR 20619			8/17/65	WJH
B		REVISED PER TDRR 24263			10/30/65	WJH

TABLE III

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 (+150 °C TO -65 °C, 5 CYCLES)		*** LTPD = 10 (COMBINED) MAX ACC NO. = 3
SEAL TEST	SEE NOTE 2.D		*** LTPD = 10 (COMBINED) MAX ACC NO. = 3
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		*** LTPD = 10 (COMBINED) MAX ACC NO. = 3
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 VCE = +20 VOLTS MINIMUM TA = +22 °C MIN IN FREE AMBIENT AIR t = 1000 HOURS	** = 10 MAX ACC NO. = 3	
SUBGROUP 5* LEAD TENSION (COND. A) LEAD FATIGUE (COND. B)	METHOD 2036.1 4 POUND LOAD FOR 10 SECONDS 5 ARCS	*** LTPD = 20 (COMBINED) MAX ACC NO. = 3	

TABLE III (CONTINUED)

TEST	SYMBOL	TEST CONDITION	LIMIT
END POINTS FOR SUBGROUP 2 COLLECTOR CUTOFF CURRENT	I_{CBO}	$V_{CB} = 30 V, I_E = 0$	±50% ****
EMITTER-BASE REVERSE CURRENT	I_{EB0}	$V_{EB} = 3 V, I_C = 0$	±50% ****
DC CURRENT GAIN	h_{FE}	$V_{CE} = +10 V, I_C = 150 mA$	±100% ****
END POINTS FOR SUBGROUPS 3 & 4 COLLECTOR CUTOFF CURRENT	I_{CBO}	$V_{CB} = 30 V, I_E = 0$	±100% ****
EMITTER-BASE REVERSE CURRENT	I_{EB0}	$V_{EB} = 3 V, I_C = 0$	±100% ****
DC CURRENT GAIN	h_{FE}	$V_{CE} = +10 V, I_C = 150 mA$	±20% ****

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MASTER

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LIST OF MATERIALS				
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS		
DRAWN <i>[Signature]</i> 9 FEB 65		TRANSISTOR, SILICON TYPE NPN, SWITCHING		
CHECKED <i>[Signature]</i> 10 Feb 65				
APPROVED <i>[Signature]</i> 13 Feb 65		SPECIFICATION CONTROL DRAWING		
APPROVED MIT <i>[Signature]</i>		CODE IDENT NO. 80230	SIZE C	DRAWING NO. 1006323
APPROVED MSC <i>[Signature]</i>		DATE 3/17/65	SCALE	SHEET 4 OF 4