

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 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-19500/290 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.
- F. PREPARATION FOR DELIVERY SHALL BE IN ACCORDANCE WITH ND 1002215, CLASS I, CODE 2.
- G. 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 LEAKAGE RATE OF 1×10^{-8} CC/ATM/SEC OR GREATER SHALL CONSTITUTE A FAILURE.
- C. ELECTRICAL CHARACTERISTICS: FOR 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.

D. VENDOR SUPPLIED DATA: EACH SHIPMENT OF PARTS SHALL BE ACCOMPANIED BY THE FOLLOWING DOCUMENTATION:
1006323

- B. VENDOR SUPPLIED DATA: EACH SHIPMENT OF PARTS SHALL BE ACCOMPANIED BY THE FOLLOWING DOCUMENTATION.
 - (1) CERTIFICATE OF COMPLIANCE WITH HEAD MATERIAL, 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 +200°C.
- B. ABSOLUTE MAXIMUM RATINGS AT 25°C AMBIENT.
 - (1) COLLECTOR-EMITTER VOLTAGE (V_{CE0}): 30 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) POWER DISSIPATION (PT)
 - 0.4 WATTS AT 25°C AMBIENT TEMPERATURE
 - 1.8 WATTS AT 25°C CASE TEMPERATURE

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

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 MATERIAL
NEXT ASSY	USED ON	
APPLICATION		

MIT
INSTRUMENTATION LAB
CAMBRIDGE, MASS.

DRAWN *[Signature]* 10 Feb 65
CHECKED *[Signature]* 10 Feb 65
APPROVED *[Signature]*
APPROVED *[Signature]* 19 Mar 65

APPROVED MIT *[Signature]* 10 Feb 65
APPROVED MSC *[Signature]* 11/1/65

DATE SCALE

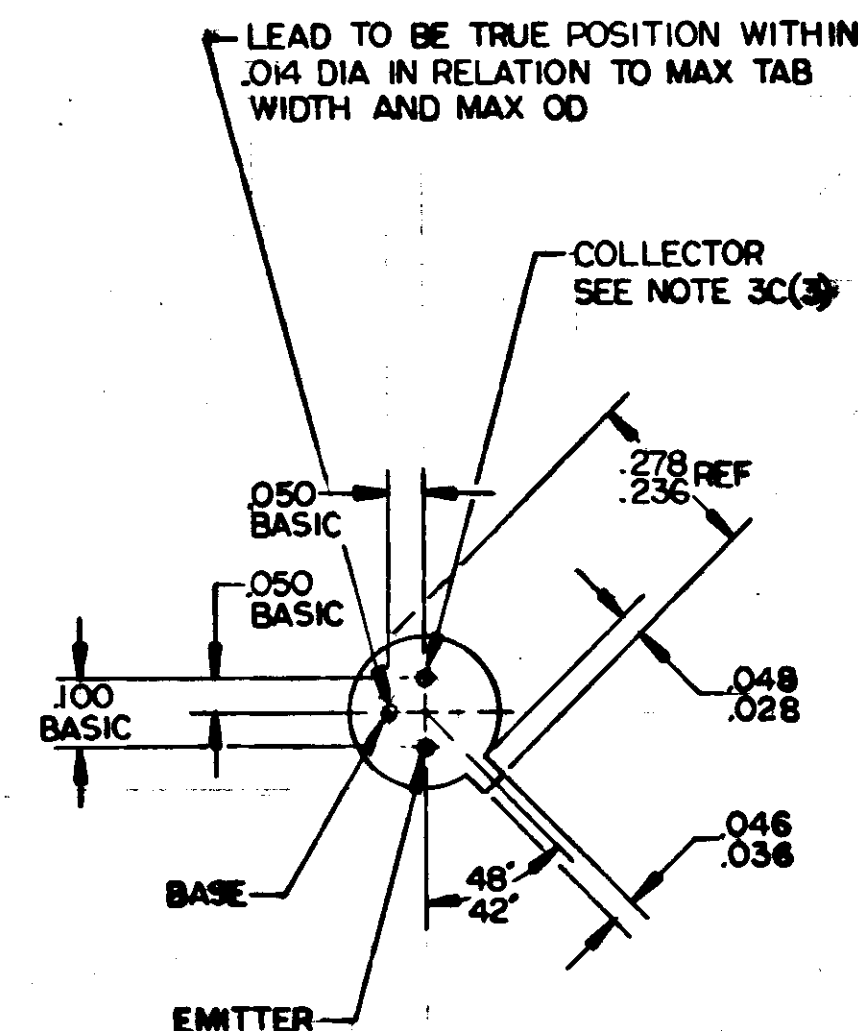
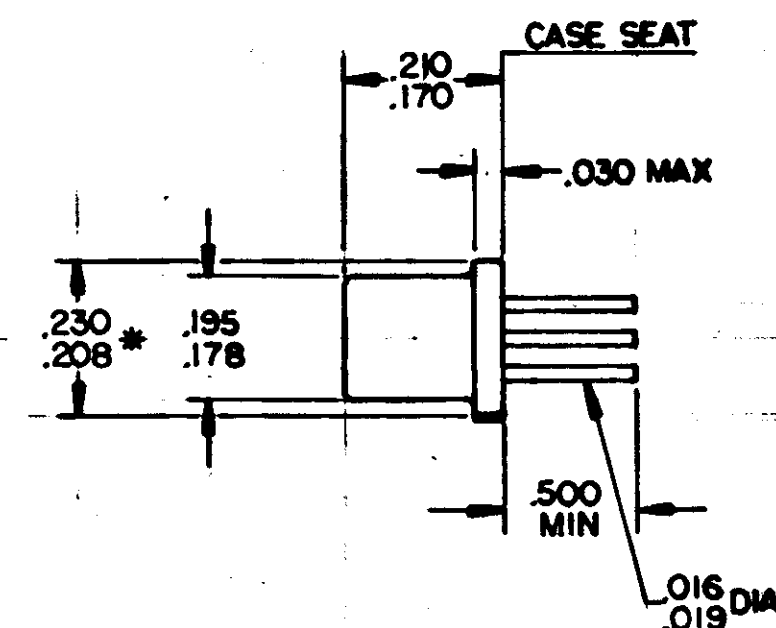
QTY REQD	PART OR IDENTIFYING NO.	MATERIAL OR NOTES	NOMENCLATURE OR DESCRIPTION	FIND NO.			
LIST OF MATERIALS							
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS					
TRANSISTOR, SILICON, TYPE NPN, SWITCHING							
SPECIFICATION CONTROL DRAWING							
APPROVED MIT	CODE IDENT NO.	SIZE	DRAWING NO.				
APPROVED MSC		C	1006323				
DATE	SCALE	SHEET 1 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 THEREBY.

TABLE I

PRE-ELECTRICAL TEST PROCESSING

TEST	MIL-STD-750 TEST CONDITIONS	LOT	
		1 TO 500	OVER 500
THERMAL SHOCK	METHOD 1056, CONDITION B (+200°C TO -65°C, 3 CYCLES)	100%	NO REQUIREMENT
STORAGE LIFE (HIGH TEMPERATURE STABILIZATION)	METHOD 1031, Tstg = 300° ± 5°C, 72 +8 -4 HOURS		
CONSTANT ACCELERATION	METHOD 2006 (20,000 G)		
POWER, BURN-IN	METHOD 1026 P = 270 MILLIWATTS V _{CE} = +11.0 VOLTS MINIMUM T _A = +22°C MIN IN FREE AMBIENT AIR t = 168 +12 -6 HOURS		
SEAL TEST	SEE NOTE 2.B		



PASTER

		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
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		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
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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 <i>3/1/66</i> CHECKED <i>[Signature]</i> DATE <i>3/1/66</i> APPROVAL <i>[Signature]</i> APPROVAL <i>[Signature]</i>		TRANSISTOR, SILICON, TYPE NPN, SWITCHING SPECIFICATION CONTROL DRAWING	
NASA APPROVAL <i>[Signature]</i> MIT APPROVAL <i>[Signature]</i> MIT APPROVAL		CODE IDENT NO. — SCALE NONE	SIZE C SHEET 2 OF 4

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REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
—	INITIAL RELEASE CLASS A PER TDRR	17476	WK

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1006323

REVISIONS

SYM	DESCRIPTION	DR	CHK	DATE	APPROVED
-	INITIAL RELEASE CLASS A PER TDOR			17476	

TABLE II

ACCEPTANCE INSPECTION							
TEST	SYMBOL	MIL-STD-750 TEST CONDITIONS T _A = 25° ± 3°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	ICBO	V _{CB} = 30 V; I _E = 0		100	mA	100%	LTPD* = 2 (COMBINED) MAX ACC NO. = 3
COLLECTOR CUTOFF CURRENT 150°C	ICBO	V _{CB} = 30 V; I _E = 0; T _A = +150°C		200	uA		
COLLECTOR-BASE BREAKDOWN VOLTAGE	BVCBO	I _C = 100uA; I _E = 0	60		V		
EMITTER-BASE REVERSE CURRENT	IEBO	V _{EB} = 3 V; I _C = 0		100	mA		
EMITTER-BASE BREAKDOWN VOLTAGE	BVEBO	I _E = 100uA; I _C = 0	5		V		
COLLECTOR-EMITTER SUSTAINING VOLTAGE	V _{CEO} SUST	I _C = 30mA PULSED I _B = 0	30		V		
COLLECTOR-EMITTER CURRENT RES. RETURN	I _{CER}	V _{CE} = 30 V; R _{BE} = 100 K		10	uA		
COLLECTOR-EMITTER THRESHOLD CURRENT	I _{CEX}	V _{BE} = +0.4V; V _{CE} = 30 V		10	uA		
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	1.05	1.25	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 _{obo}	V _{CB} = -10 V; I _E = 0; F = 0.14 mc		8	PF		
TURN ON TIME	t _{on}	I _{B1} = I _{B2} ≈ 15 mA; I _C ≈ 150 mA t _w > 400 nsec 2% DUTY CYCLE		25	NSEC		
TURN OFF TIME	t _{off}	I _{B1} = I _{B2} ≈ 15 mA; I _C ≈ 150 mA t _w > 400 nsec 2% DUTY CYCLE		25	NSEC		

* LTPD PER MIL-S-19500D, TABLE CI OR II

MASTER

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		MATERIAL
NEXT ASSY	USED ON	
APPLICATION		

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	9MS	9/2/65	TRANSISTOR, SILICON, TYPE NPN, SWITCHING SPECIFICATION CONTROL DRAWING	
CHECKED	9MS	10/24/65		
APPROVED				
APPROVED				
APPROVED MIT	W/10/1/65	10/1/65	CODE IDENT NO.	SIZE
APPROVED MSC	W/10/1/65	3/1/65		C
DATE		SCALE	DRAWING NO. 1006323	
			SHEET 3 OF 4	

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REVISIONS					
SYM	ZONE	DESCRIPTION	DR	CHK	DATE
-		INITIAL RELEASE CLASS A PER TDRR			17476

TABLE III			
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 (+200°C TO +65°C, 5 CYCLES)		LTPD = 10 (COMBINED) MAX ACC NO. = 3
SEAL TEST	SEE NOTE 2.B		
SUBGROUP 3** STORAGE LIFE	METHOD 1031.1 Tstg = 200° ± 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		
SUBGROUP 4 OPERATION LIFE	METHOD 1026.1 P = 270 MILLIWATTS VCE = +11 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 6 ARCS		LTPD = 20 (COMBINED) MAX ACC NO. = 3

* PER MIL-S-19500D TABLE CI OR II
** TESTS TO BE PERFORMED IN ORDER INDICATED

TABLE III (CONTINUED)

TEST	SYMBOL	TEST CONDITION	LIMIT
END POINTS FOR SUBGROUP 2			
COLLECTOR CUTOFF CURRENT	ICBO	VCB = 40 V, IE = 0	±50% *
EMITTER CUTOFF CURRENT	IEBO	VEB = +3 V, IC = 0	±50% *
DC CURRENT GAIN	hFE	VCE = +10 V, IC = 150 mA	±10% *
END POINTS FOR SUBGROUPS 3 AND 4			
COLLECTOR CUTOFF CURRENT	ICBO	VCB = +40 V, IE = 0	±100% *
EMITTER CUTOFF CURRENT	IEBO	VEB = +3 V, IC = 0	±100% *
DC CURRENT GAIN	hFE	VCE = +10 V, IC = 150 mA	±20% *

* 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 5 NANOAMPERES MAY BE CONSIDERED TO BE 5 NANOAMPERES FOR CALCULATING PERCENTAGE CHANGE.

POSTER

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

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LIST OF MATERIALS				
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS		
DRAWN	9 FEB 65	TRANSISTOR, SILICON TYPE NPN, SWITCHING		
CHECKED	10 FEB 65			
APPROVED				
APPROVED	15 MAR 65			
APPROVED MIT	31 MAR 65	CODE IDENT NO.	SIZE	DRAWING NO.
APPROVED MSC	DATE	SCALE		1006323
				SHEET 4 OF 4