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Pages 1 to 24

# TRANSISTORS, SWITCHING, PNP

# BASED ON TYPES 2N3636 AND 2N3637

# ESA/SCC Detail Specification No. 5208/003

space components
coordination group

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## DOCUMENTATION CHANGE NOTICE

| Rev. Letter | Rev. Date | Reference | CHANGE Item | Approved DCR No. |
|---|---|---|---|---|
| | | This Issue supersedes Issue 1 and incorporates all modifications agreed on the basis of Policy DCR's:- | | |
| | | - Changes due to format changes | | 21022 |
| | | - Incorporation of new Lead Document | | 21025 |
| | | and the following DCR's:- | | |
| | | Cover page | : 2N3636 added to Title | 22331 |
| | | Table of Contents | : Pages renumbered | None |
| | | | : Figure 2 amended | 22331 |
| | | Para. 1.1 | : 2N3636 added | 22331 |
| | | Table 1(a) | : New Variants for TO39 and 2N3636 added | 22331 |
| | | Figure 2 | : Changed to 2(a) | 22331 |
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| | | Para. 4.2.2 | : PIND testing added | 22331 |
| | | Table 2 | : Test Nos. 6 and 7, Limits for new variants added. Note added | 22331 |
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| | | Table 2 a.c. | : Note added | 23202 |
| | | Table 3(b) | : Limits for new variants added. Notes defined | 22331 |
| | | Tables 5(a) and 5(b) | : MIL test methods deleted | 22331 |
| | | Table 6 | : Test No. 6, Limits extended for new variants | 22331 |
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| | | P2A. DCN | : Page added | None |
| | | P5. Para. 1.2 | : Paragraph amended | 21021 |
| | | P12. Para. 2 | : "ESA/SCC Basic Spec. No. 23500" added | 21025 |
| | | Para. 4.2.2 | : Bond Strength and Die Shear Test deviations deleted | 23499 |
| | | | : PIND deviation deleted | 21043 |
| | | Para. 4.2.3 | : H.T.R.B. deviation deleted | 23499 |
| | | | : Radiographic Inspection deviation deleted | 21049 |
| | | Para. 4.2.4 | : Bond Strength and Die Shear Test deviations deleted | 23499 |
| | | P19. Table 3 | : Note X deleted | 21047 |
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| | | P6. Table 1(a) | : Note 1 added for Variants 01 to 08 | 22932 |
| | | | : Variants 09 and 10 added | 22932 |
| | | | : Notes to table added | 22932 |
| | | P13. Para. 4.3.3 | : Test conditions specified | 22932 |
| | | Para. 4.4.2 | : Paragraph standardised | 22932 |
| | | P16. Table 2 | : Nos. 6 and 7, Variants "09 to 10" added to "Variants 01 to 04" | 22932 |
| | | P19. Table 3(b) | : No. 6, Variants "09 to 10" added to "Variants 01 to 04" | 22932 |
| | | P23. Table 6 | : No. 6, Variants "09 to 10" added to "Variants 01 to 04" | 22932 |
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| | | P6. Table 1(a) | : Variants 11 and 12 added | 221157 |
| | | P13. Para. 4.3.2 | : Weight amended to "1.2" grammes | 23648/ 23700 |
| | | P16. Table 2 | : Nos. 6 and 7, in Conditions, "and 11 to 12" added to "05 to 08" | 221157 |
| | | P19. Table 3(b) | : No. 6, in Conditions, "and 11 to 12" added to "05 to 08" | 221157 |
| | | P23. Table 6 | : No. 6, in Conditions, "and 11 to 12" added to "05 to 08" | 221157 |
| | | This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist. | | |

## TABLE OF CONTENTS

## 1. GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Transistor, Switching, PNP, based on Types 2N3636 and 2N3637.

It shall be read in conjunction with ESA/SCC Generic Specification No. 5000, the requirements of which are supplemented herein.

### 1.2 COMPONENT TYPE VARIANTS

See Table 1(a).

### 1.3 MAXIMUM RATINGS

The maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the transistors specified herein are scheduled in Table 1(b).

### 1.4 PARAMETER DERATING INFORMATION

The derating information applicable to the transistors specified herein is shown in Figure 1.

### 1.5 PHYSICAL DIMENSIONS

The physical dimensions of the transistors specified herein are shown in Figure 2.

### 1.6 FUNCTIONAL DIAGRAM

The functional diagram showing lead identification, of the transistors specified herein, is shown in Figure 3.

### 1.7 HIGH TEMPERATURE TEST PRECAUTIONS

For tin-lead plated or solder-dipped lead finish, all tests to be performed at a temperature that exceeds +125°C shall be carried out in a 100% inert atmosphere.

**TABLE 1(a) - TYPE VARIANTS**

| VARIANT | BASED ON TYPE | CASE | FIGURE | LEAD MATERIAL AND FINISH | |
|---|---|---|---|---|---|
| 01 | 2N3637 | TO5 | 2(a) | D2 | (1) |
| 02 | 2N3637 | TO5 | 2(a) | D3 or D4 | (1) |
| 03 | 2N3637 | TO39 | 2(b) | D2 | (1) |
| 04 | 2N3637 | TO39 | 2(b) | D3 or D4 | (1) |
| 05 | 2N3636 | TO5 | 2(a) | D2 | (1) |
| 06 | 2N3636 | TO5 | 2(a) | D3 or D4 | (1) |
| 07 | 2N3636 | TO39 | 2(b) | D2 | (1) |
| 08 | 2N3636 | TO39 | 2(b) | D3 or D4 | (1) |
| 09 | 2N3637 | TO39 | 2(b) | E/B = D2, C = F2 | (2) |
| 10 | 2N3637 | TO39 | 2(b) | E/B = D4, C = F4 | (2) |
| 11 | 2N3636 | TO39 | 2(b) | E/B = D2, C = F2 | (2) |
| 12 | 2N3636 | TO39 | 2(b) | E/B = D4, C = F4 | (2) |

**NOTES**

1. All leads.
2. E = Emitter, B = Base, C = Collector.

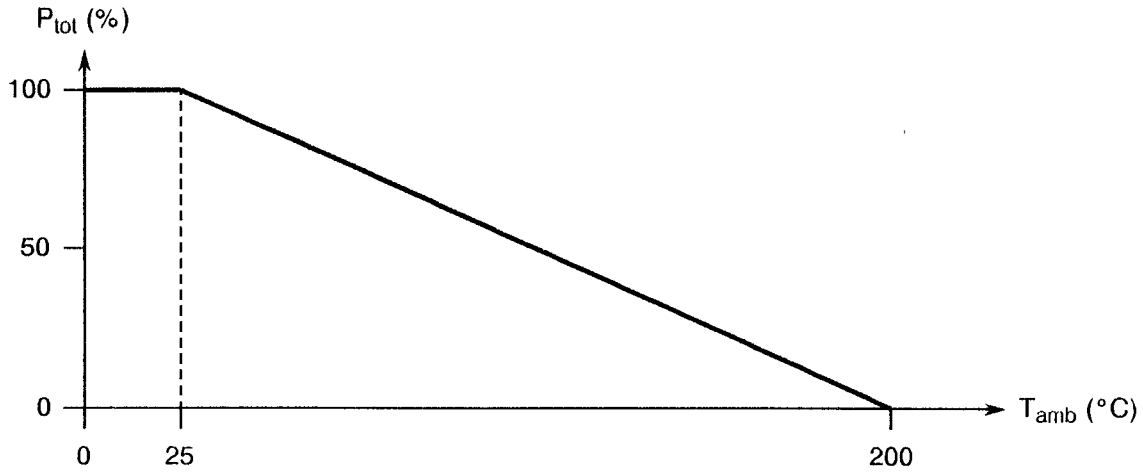
## TABLE 1(b) - MAXIMUM RATINGS

| No. | CHARACTERISTICS | SYMBOL | MAXIMUM RATINGS | UNIT | REMARKS |
|---|---|---|---|---|---|
| 1 | Collector-Emitter Voltage | $V_{CE}$ | −175 | Vdc | |
| 2 | Collector-Base Voltage | $V_{CB}$ | −175 | Vdc | |
| 3 | Emitter-Base Voltage | $V_{EB}$ | −5.0 | Vdc | |
| 4 | Collector Current (Continuous) | $I_C$ | −1.0 | Adc | |
| 5 | Power Dissipation (Continuous) | $P_{tot}$ | 1.0 | W | $T_{amb} \leq +25°C$ Note 1 |
| 6 | Operating Junction Temperature Range | $T_{op}$ | −65 to +200 | °C | |
| 7 | Storage Temperature Range | $T_{stg}$ | −65 to +200 | °C | |
| 8 | Soldering Temperature | $T_{sol}$ | +265 | °C | Note 2 |

**NOTES**

1. For $T_{amb} > +25°C$, derate at 5.71mW/°C. (See Figure 1).
2. Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

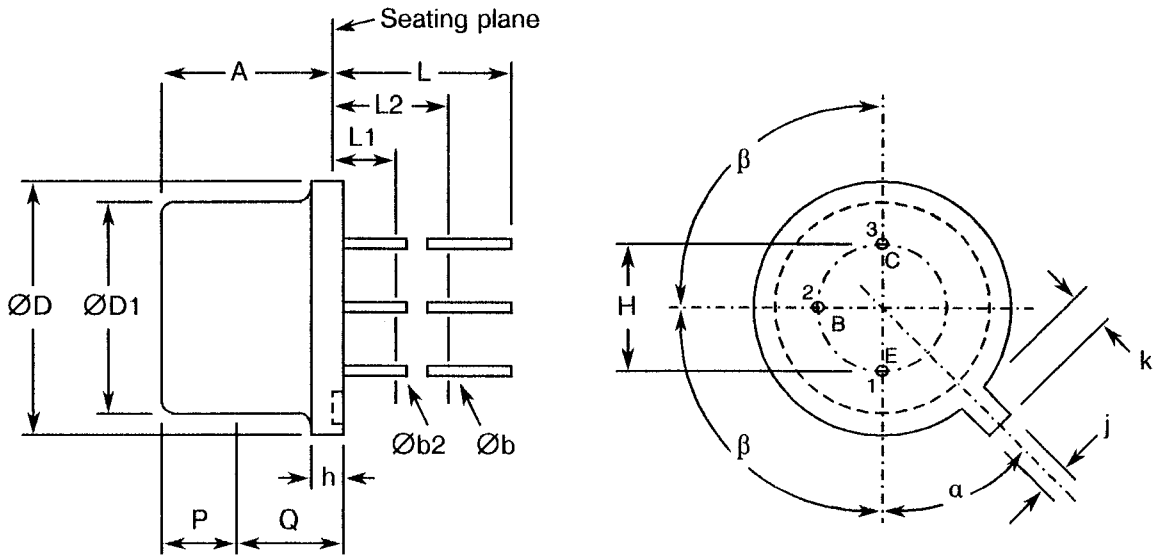
## FIGURE 1 - PARAMETER DERATING INFORMATION




Power Dissipation versus Temperature

## FIGURE 2 - PHYSICAL DIMENSIONS

FIGURE 2(a) - TO5 CASE

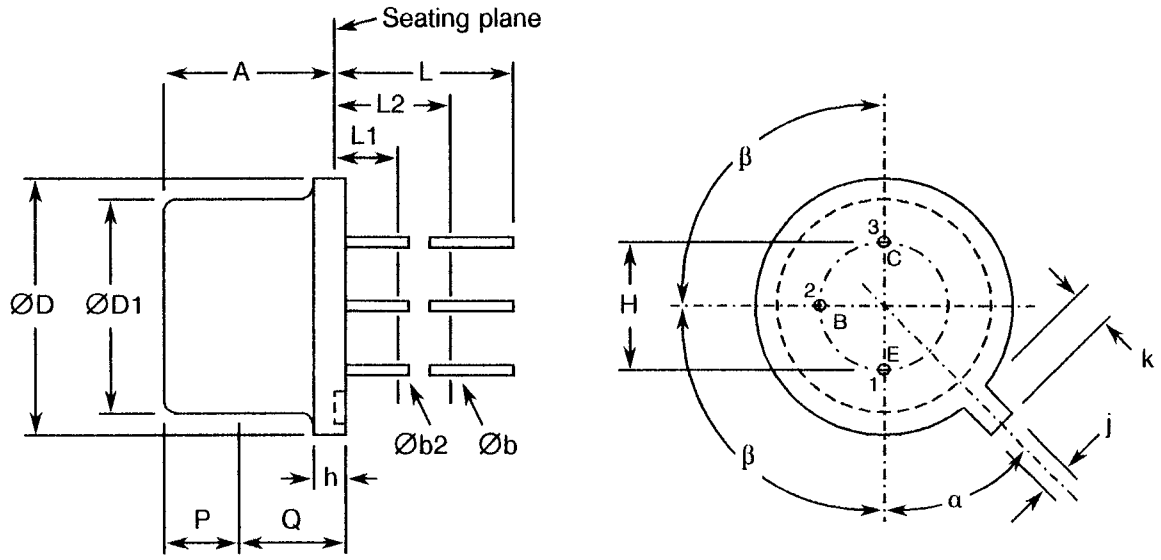



| SYMBOL | INCHES | | MILLIMETRES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 0.240 | 0.260 | 6.10 | 6.60 | |
| Øb | 0.016 | 0.021 | 0.406 | 0.533 | 2 |
| Øb2 | 0.016 | 0.019 | 0.406 | 0.483 | 2 |
| ØD | 0.335 | 0.370 | 8.51 | 9.40 | |
| ØD1 | 0.305 | 0.335 | 7.75 | 8.51 | |
| H | - | 0.200 | - | 5.08 | |
| h | 0.009 | 0.125 | 0.23 | 3.18 | |
| j | 0.028 | 0.034 | 0.71 | 0.86 | |
| k | 0.029 | 0.045 | 0.74 | 1.14 | 3 |
| L | 1.500 | - | 38.10 | - | 2 |
| L1 | - | 0.050 | - | 1.27 | 2 |
| L2 | 0.250 | - | 6.35 | - | 2 |
| P | 0.100 | - | 2.54 | - | 1 |
| Q | - | - | - | - | 4 |
| α | 45° NOM. | | 45° NOM. | | |
| β | 90° NOM. | | 90° NOM. | | |

**NOTES:** See Page 11.

## FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)

FIGURE 2(b) - TO39 CASE




| SYMBOL | INCHES | | MILLIMETRES | | NOTES |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 0.240 | 0.260 | 6.10 | 6.60 | |
| Øb | 0.016 | 0.021 | 0.406 | 0.533 | 2 |
| Øb2 | 0.016 | 0.019 | 0.406 | 0.483 | 2 |
| ØD | 0.350 | 0.370 | 8.89 | 9.40 | |
| ØD1 | 0.315 | 0.335 | 8.00 | 8.51 | |
| H | 0.190 | 0.210 | 4.83 | 5.33 | |
| h | 0.009 | 0.125 | 0.23 | 3.18 | |
| j | 0.028 | 0.034 | 0.71 | 0.86 | |
| k | 0.029 | 0.040 | 0.74 | 1.02 | 3 |
| L | 0.500 | - | 12.70 | - | 2 |
| L1 | - | 0.050 | - | 1.27 | 2 |
| L2 | 0.250 | - | 6.35 | - | 2 |
| P | 0.100 | - | 2.54 | - | 1 |
| Q | - | - | - | - | 4 |
| α | 45° NOM. | | 45° NOM. | | |
| β | 90° NOM. | | 90° NOM. | | |

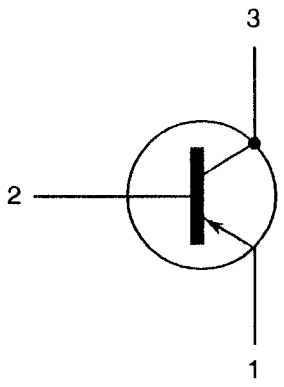
**NOTES:** See Page 11.

**FIGURE 2 - PHYSICAL DIMENSIONS (CONTINUED)**

**NOTES**

1. This zone is controlled for automatic handling. The variation in actual diameter within this zone shall not exceed 0.010 inches (0.254mm).
2. 3 leads. Dimension Øb2 applies between L1 and L2. Dimension Øb applies between L2 and 0.5 inches (12.7mm) from the seating plane. Diameter is uncontrolled in L1 and beyond 0.5 inches (12.7mm) from the seating plane.
3. Measured from maximum diameter of the actual device.
4. Details of outline in this zone is optional.

**FIGURE 3 - FUNCTIONAL DIAGRAM**




1. Emitter.
2. Base.
3. Collector.

**NOTES**

1. The collector is electrically connected to the case.

## 2. APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:-

(a) ESA/SCC Generic Specification No. 5000 for Discrete Semiconductor Components.

(b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices.

(c) ESA/SCC Basic Specification No. 23500, Requirements for Lead Materials and Finishes for Components for Space Application.

## 3. TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESA/SCC Basic Specification No. 21300 shall apply.

## 4. REQUIREMENTS

### 4.1 GENERAL

The complete requirements for procurement of the transistors specified herein are stated in this specification and ESA/SCC Generic Specification No. 5000. Deviations from the Generic Specification, applicable to this specification only, are listed in Para. 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESA/SCC requirements and do not affect the components' reliability, are listed in the appendices attached to this specification.

### 4.2 DEVIATIONS FROM GENERIC SPECIFICATION

#### 4.2.1 Deviations from Special In-process Controls

None.

#### 4.2.2 Deviations from Final Production Tests (Chart II)

None.

#### 4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

None.

#### 4.2.4 Deviations from Qualification Tests (Chart IV)

(a) The electrical measurements referenced Para. 9.9.3 shall be performed as stated in Table 6 of this specification.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) The electrical measurements referenced Para. 9.9.3 shall be performed as stated in Table 6 of this specification.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the transistors specified herein shall be checked. They shall conform to those shown in Figure 2.

4.3.2 Weight

The maximum weight of the transistors specified herein shall be 1.2 grammes.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The test conditions shall be as follows:-

Test Condition: 'E', Lead Fatigue.
Applied Force: $2.5 \pm 0.1$ Newtons, 3 bends at 45°.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as specified herein. Where a definite material is not specified, a material which will enable the transistors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Case

The case shall be hermetically sealed and have a metal body with hard glass seals and the lid shall be welded, brazed or preform soldered.

4.4.2 Lead Material and Finish

The lead material shall be either Type 'D' or Type 'F' with either Type '2', Type '3 or 4' or Type '4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500. (See Table 1(a) for Type Variants).

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700. Each component shall be marked in respect of:-

(a) Lead Identification.

(b) The SCC Component Number.

(c) Traceability Information.

4.5.2 Lead Identification

Lead identification shall be as shown in Figures 2 and 3.

4.5.3 The SCC Component Number

Each component shall bear the SCC Component Number which shall be constituted and marked as follows:-

520800302B

Detail Specification Number
Type Variant (see Table 1(a))
Testing Level (B or C, as applicable)

4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

4.5.5 Marking of Small Components

When it is considered that the component is too small to accommodate the marking as specified above, as much as space permits shall be marked. The order of precedence shall be as follows:-

(a) Lead Identification.

(b) The SCC Component Number.

(c) Traceability Information.

The marking information in full shall accompany each component in its primary package.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, measurements shall be performed at $T_{amb} = +25 \pm 3$ °C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3. The measurements shall be performed at $T_{amb} = -55(+5-0)$ and $+125(+0-5)$ °C respectively.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing the electrical measurements listed in Tables 2 and 3 are shown, where applicable, in MIL-STD-750 and in Figure 4 of this specification.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at $T_{amb} = +25 \pm 3$ °C. The parameter drift values ($\Delta$) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements, the appropriate limit value specified for a given parameter in Table 2 shall not be exceeded.

4.7.2 Conditions for H.T.R.B. and Burn-in

The requirements for H.T.R.B. and burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for H.T.R.B. and burn-in shall be as specified in Tables 5(a) and 5(b) of this specification.

4.7.3 Electrical Circuits for Burn-in

Not applicable.

## TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS

| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN | MAX | |
| 1 | Collector-Base Breakdown Voltage | $BV_{CBO}$ | 3001 Bias Cond. D | $I_C$ = 100µAdc<br>$I_E$ = 0Adc | −175 | - | V |
| 2 | Collector-Emitter Breakdown Voltage | $BV_{CEO}$ | 3011 Bias Cond. D | $I_C$ = 10mAdc<br>$I_B$ = 0Adc<br>Note 1 | −175 | - | V |
| 3 | Emitter-Base Breakdown Voltage | $BV_{EBO}$ | 3026 Bias Cond. D | $I_E$ = 10µAdc<br>$I_C$ = 0Adc | −5.0 | - | V |
| 4 | Collector-Base Cut-off Current | $I_{CBO}$ | 3036 Bias Cond. D | $V_{CB}$ = 100Vdc<br>$I_E$ = 0Adc | - | 100 | nA |
| 5 | Emitter-Base Cut-off Current | $I_{EBO}$ | 3061 Bias Cond. D | $V_{EB}$ = 3.0Vdc<br>$I_C$ = 0Adc | - | 50 | nA |
| 6 | Forward Current Transfer Ratio 1 | $h_{FE1}$ | 3076 | $V_{CE}$ = 10Vdc<br>$I_C$ = 50mAdc, Note 1<br>Variants 01 to 04, 09 to 10<br>Variants 05 to 08, 11 to 12 | <br><br>100<br>50 | <br><br>300<br>150 | - |
| 7 | Forward Current Transfer Ratio 2 | $h_{FE2}$ | 3076 | $V_{CE}$ = 10Vdc<br>$I_C$ = 150mA, Note 1<br>Variants 01 to 04, 09 to 10<br>Variants 05 to 08, 11 to 12 | <br><br>50<br>25 | <br><br>-<br>- | - |
| 8 | Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | 3071 | $I_C$ = 50mAdc<br>$I_B$ = 5.0mAdc<br>Note 1 | - | −0.5 | V |

**NOTES**

1. Pulse measurement: Pulse Width ≤300µs, Duty Cycle ≤2.0%.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - d.c. PARAMETERS (CONT'D)**

| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN | MAX | |
| 9 | Base-Emitter Saturation Voltage | $V_{BE(SAT)}$ | 3066 Cond. B | $I_C$ = 50mAdc<br>$I_B$ = 5.0mAdc<br>Note 1 | 0.65 | − 0.9 | V |

**NOTES**

1. Pulse measurement: Pulse Width ≤ 300μs, Duty Cycle ≤ 2.0%.

## TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - a.c. PARAMETERS

| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST FIG. | TEST CONDITIONS (NOTE 1) | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | | | | MIN | MAX | |
| 10 | Turn On Time | $t_{on}$ | - | 4 | $V_C$ = 100Vdc<br>$V_{BE}$ = 4.0Vdc<br>$I_C$ = 50mAdc<br>$I_B$ = 5.0mAdc | - | 400 | ns |
| 11 | Turn Off Time | $t_{off}$ | - | 4 | $V_C$ = 100Vdc<br>$V_{BE}$ = 4.0Vdc<br>$I_C$ = 50mAdc<br>$I_B$ = 5.0mAdc | - | 600 | ns |

**NOTES**

1. Measurements shall be performed on a sample basis, LTPD7 or less.

## TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

TABLE 3(a) - $T_{amb}$ = +125°C

| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN | MAX | |
| 4 | Collector-Base Cut-off Current | $I_{CBO}$ | 3036 Bias Cond. D | $T_{amb}$ = +125°C<br>$V_{CB}$ = 100Vdc<br>$I_E$ = 0Adc | - | 100 | µA |

TABLE 3(ab - $T_{amb}$ = −55°C

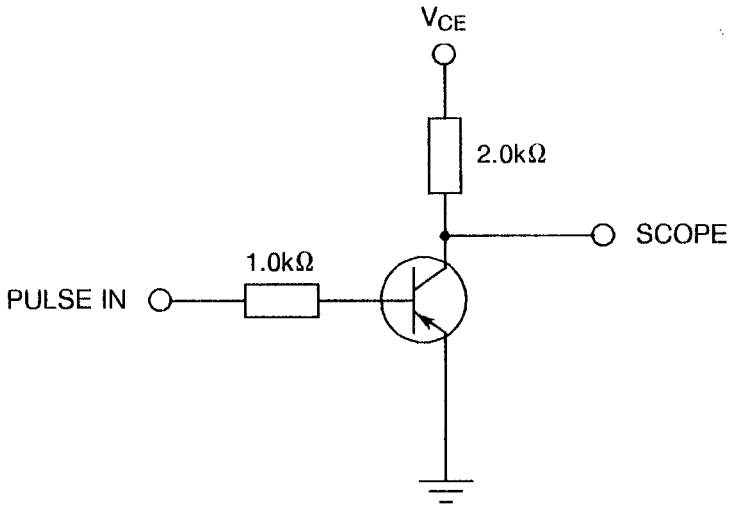
| No. | CHARACTERISTICS | SYMBOL | MIL-STD-750 TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN | MAX | |
| 6 | D.C. Forward Current Transfer Ratio 1 | $h_{FE1}$ | 3076 | $T_{amb}$ = −55°C<br>$I_C$ = 50mAdc<br>$V_{CE}$ = 10Vdc<br>Note 1<br>Variants 01 to 04, 09 to 10<br>Variants 05 to 08, 11 to 12 | <br><br><br><br>50<br>25 | <br><br><br><br>300<br>150 | - |

**NOTES**

1. Pulsed measurement: Pulse Width ≤300µs, Duty Cycle ≤2.0%.

## FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

TURN ON TIME AND TURN OFF TIME




**NOTES**

1. Pulse width~20μs, Duty Cycle ≤ 2.0%, Rise Time ≤ 20ns.

## TABLE 4 - PARAMETER DRIFT VALUES

| No. | CHARACTERISTICS | SYMBOL | SPEC. AND/OR TEST METHOD | TEST CONDITIONS | CHANGE LIMITS (Δ) | UNIT |
|---|---|---|---|---|---|---|
| 4 | Collector-Base Cut-off Current | $I_{CBO}$ | As per Table 2 | As per Table 2 | ±30 or (1) ±100 | nA % |
| 6 | D.C. Forward Current Transfer Ratio 1 | $h_{FE1}$ | As per Table 2 | As per Table 2 | ±15 | % |
| 8 | Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | As per Table 2 | As per Table 2 | ±75 or (1) ±15 | mV % |

**NOTES**

1. Whichever is greater, referred to the initial value.

## TABLE 5(a) - CONDITIONS FOR HIGH TEMPERATURE REVERSE BIAS BURN-IN

| No. | CHARACTERISTICS | SYMBOL | CONDITIONS | UNIT |
|---|---|---|---|---|
| 1 | Ambient Temperature | $T_{amb}$ | +150 | °C |
| 2 | Collector-Emitter Voltage | $V_{CE}$ | 50 | V |
| 3 | Duration | t | 48 | Hrs |

## TABLE 5(b) - CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS

| No. | CHARACTERISTICS | SYMBOL | CONDITIONS | UNIT |
|---|---|---|---|---|
| 1 | Ambient Temperature | $T_{amb}$ | +25 | °C |
| 2 | Collector-Emitter Voltage | $V_{CE}$ | −50 | V |
| 3 | Power Dissipation | $P_{tot}$ | 1.0 | W |

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESA/SCC GENERIC SPECIFICATION NO. 5000)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 6. The measurements shall be performed at $T_{amb} = +25 \pm 3$ °C.

4.8.2 Electrical Measurements at Intermediate Points during Endurance Tests

The parameters to be measured at intermediate points during endurance tests are scheduled in Table 6 of this specification.

4.8.3 Electrical Measurements on Completion of Endurance Tests

The parameters to be measured on completion of endurance testing are scheduled in Table 6 of this specification. The measurements shall be performed at $T_{amb} = +25 \pm 3$ °C.

4.8.4 Conditions for Operating Life Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 5000. The conditions for operating life testing shall be the same as specified in Table 5(b) for the burn-in test.

4.8.5 Electrical Circuits for Operating Life Tests

Not applicable.

4.8.6 Conditions for High Temperature Storage Test (Part of Endurance Testing)

The requirements for the high temperature storage test are specified in ESA/SCC Generic Specification No. 5000. The conditions for high temperature storage shall be $T_{amb} = +200(+0-5)$ °C

**TABLE 6 - ELECTRICAL MEASUREMENTS AFTER ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING**

| No. | CHARACTERISTICS | SYMBOL | SPEC. AND/OR TEST METHOD | TEST CONDITIONS | LIMITS | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | | MIN. | MAX. | |
| 4 | Collector-Base Cut-off Current | $I_{CBO}$ | As per Table 2 | As per Table 2 | - | 100 | nA |
| 6 | D.C. Forward Current Transfer Ratio 1 | $h_{FE1}$ | As per Table 2 | As per Table 2<br>Variants 01 to 04 and 09 to 10<br>Variants 05 to 08 and 11 to 12 | <br>100<br>50 | <br>300<br>150 | - |
| 8 | Collector-Emitter Saturation Voltage | $V_{CE(SAT)}$ | As per Table 2 | As per Table 2 | - | −0.5 | V |

**APPENDIX 'A'**



AGREED DEVIATIONS FOR RAYTHEON (U.S.)

| ITEMS AFFECTED | DESCRIPTION OF DEVIATIONS |
|---|---|
| | The following alternative documents shall be used:-<br>ESA/SCC Specification — Agreed Alternative<br>20400 — MIL-STD-750, Method 2072<br>20500 — MIL-STD-750, Method 2071<br>20900 — MIL-STD-750, Method 2076 |
| Para. 4.2.2 | Deviations from Final Production Tests (Chart II)<br>Para. 9.8.1, Fine Leak Test: Shall be performed according to Condition G of MIL-STD-750, Method 1071. |
| Para. 4.2.3 | Deviations from Burn-in and Electrical Measurements (Chart III)<br>Para. 9.8.1, Fine Leak Test: Shall be performed according to Condition G of MIL-STD-750, Method 1071. |