



## DOCUMENT CHANGE REQUEST

DCR number 380 Changes required for: General

Date: 2007/10/16

Date sent: 2007/10/16

Originator: S Jeffery

Organisation: ESA/ESTEC

Status: IMPLEMENTED

Title: Transistors Silicon Switching PNP, based on type 2N3467

Number: 5208/009

Issue: 1

Other documents affected:

Page:

Total re-write.

Paragraph:

Total re-write.

Original wording:

Proposed wording:

Total reformat of this specification as part of the ongoing conversion to the ESCC format. See below for summary of changes and attached Issue 2 Draft A of the specification.

Note: Known support for active procurement against this specification includes the following manufacturers:

SEMELAB/UK (not ESCC qualified but are currently willing to support the procurement of Variants 01 and 02).

Summary of changes to the current format, layout and content is as follows:

1. Rewording and restructuring of various sections and paragraphs of the specification, plus other editorial changes based on the layout and editorial content of other Detail Specifications already converted to ESCC format.
2. Deletion of redundant paragraphs and information such as Mechanical Requirements.
3. Title amended ("SILICON" deleted).
4. Para. 1.7 High Temperature Test Precautions requirements moved to be a note (Note 2) to the Maximum Ratings table.
5. Maximum Ratings table: Remark "Over entire operating temperature range" added for Collector-Emitter, Collector-Base and Emitter-Base voltages and Symbols corrected to VCEO, VCBO and VEBO respectively.
6. Maximum Ratings table, Characteristic "Power Dissipation (Continuous)": "(Continuous)" deleted.



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7. Maximum Ratings table: Characteristic "Operating Junction Temperature Range" re-named "Operating Temperature Range".
8. Figure 1 Parameter Derating Information moved to be a note to the Maximum Ratings table ("Note 1" amended).
9. Para. 4.3.2 Weight requirements moved to Component Type Variants table.
10. Figure 2 re-named "Physical Dimensions and Terminal Identification" and amended (standardisation of the TO-39 package) and consolidated notes added.
11. Figure 3, Functional Diagram: Note amended ("electrically" replaced by "internally").
12. Para. 4.2 Deviations from Generic Specification: Deviations From Chart IV have been deleted (no longer applicable for latest ESCC Generic Specification).
13. Para. 4.3.3 Terminal Strength: Erroneous text "Applied Force : 2.5+/-0.1 Newtons." deleted.
14. Para. 4.4.1 Case requirements corrected to reflect the TO39 metal can package.
15. Para. 4.4.2 Lead Material and Finish replaced by a reference to the Component Type Variants Para.
16. Para. 4.5.1 Required part marking corrected: Lead Identification deleted (not applicable to "TO-" packages) and ESCC qualified components symbol added.
17. Delete requirement for marking of the test level letter from the ESCC Component Number as per latest ESCC No. 21700.
18. Room Ambient test temperature (electrical measurements) changed from +25+/-3deg.C to +22+/-3deg.C.
19. Table 2, Characteristic "Collector-Base Breakdown Voltage": Symbol amended from BVCBO to V(BR)CBO.
20. Table 2, Characteristic "Collector-Emitter Breakdown Voltage": Symbol corrected from BVCEO to V(BR)CEO.
21. Table 2, Characteristic "Emitter-Base Breakdown Voltage": Symbol corrected from BVEBO to V(BR)EBO; MIL-STD-750 Test Method corrected (was 3066, now 3026).
22. Table 2, Characteristics "D.C. Forward Current Transfer Ratio 1", "D.C. Forward Current Transfer Ratio 2" and "D.C. Forward Current Transfer Ratio 3" combined and re-named "Forward-Current Transfer Ratio".
23. Table 2, Characteristics "Collector-Emitter Saturation Voltage 1", "Collector-Emitter Saturation Voltage 2" and "Collector-Emitter Saturation Voltage 3" combined and re-named "Collector-Emitter Saturation Voltage".
24. Table 2, Characteristics "Base-Emitter Saturation Voltage 1", "Base-Emitter Saturation Voltage 2" and "Base-Emitter



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Saturation Voltage 3" combined and re-named "Base-Emitter Saturation Voltage".

25. Table 2, Characteristic "A.C. Forward Current Transfer Ratio" re-named "Small-Signal Short-Circuit Forward-Current Transfer Ratio".

26. Table 2, Characteristic "Output Capacitance": Symbol amended to Cobo.

27. Table 2, Characteristic "Input Capacitance": Symbol amended to Cibo.

28. Table 2: Replace LTPD7 sampling for AC parameters tests (designated by "Note 2") with an equivalent fixed sample of 32 components with 0 failures (or 100%).

29. Figures 4(a) and 4(b) amended and moved to be notes (Notes 3 and 4) to Room Temperature Electrical Measurements.

30. Table 3, Characteristic "Collector-Base Cut-off Current": Tolerance added to test temperature.

31. Table 3, Characteristic "D.C. Forward Current Transfer Ratio 1" re-named "Forward-Current Transfer Ratio"; Tolerance added to test temperature.

32. Table 3 (High and Low Temperature Electrical Measurements): 100% inspection has been replaced by a sample of 5 components with 0 failures, or 100%, in line with the new Generic 5000 Issue 3.

33. Table 4: Absolute limits have been added for information.

34. Table 4, Characteristic "D.C. Forward Current Transfer Ratio 2" re-named "Forward-Current Transfer Ratio 2".

35. Tables 2, 3 and 4 - Test Conditions column: addition of Test, or Bias, Conditions for referenced MIL-STD-750 Test Methods as and where applicable.

36. Table 5(a): Tolerance added to Ambient Temperature conditions; "Minimum" added to Duration conditions.

37. Table 5(b): Ambient Temperature conditions amended (was +25deg.C, now +22+/-3deg.C).

38. Table 6, Characteristic "D.C. Forward Current Transfer Ratio 2" re-named "Forward-Current Transfer Ratio 2".

39. Appendix 'A' deleted (redundant information as manufacturer Motorola no longer manufactures these part types to this specification).

Justification:

(see also change details for each item above)

1. Part of the ongoing activity of conversion of cover-sheeted ESA/SCC Specifications to the ESCC format.



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2. To make the format and presentation consistent with the various other ESCC Detail Specifications already converted to ESCC format.

3. To make the content consistent with ESCC Generic Specification No. 5000 Issue 3.

4. To make corrections to technical errors in the previous issue.

5. Standardisation of the TO-39 package in all applicable ESCC Detail Specifications.

Attachments:

DCR380att.pdf, null

Modifications:

N/A

Approval signature:

Date signed:

2007-10-16



Pages 1 to 13

## **TRANSISTORS, SWITCHING, PNP**

**BASED ON TYPE 2N3467**

**ESCC Detail Specification No. 5208/009**

Issue 2 - Draft A	August 2007
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**DOCUMENTATION CHANGE NOTICE**

(Refer to <https://escies.org> for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
TBD	Specification up issued to incorporate editorial and technical changes per DCR.

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## 1. GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

### 1.2 APPLICABLE DOCUMENTS

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

- (a) ESCC Generic Specification No. 5000
- (b) MIL-STD-750, Test Methods and Procedures for Semiconductor Devices

### 1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

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

### 1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

#### 1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 520800901

- Detail Specification Reference: 5208009
- Component Type Variant Number: 01 (as required)

#### 1.4.2 Component Type Variants

The component type variants applicable to this specification are as follows:

Variant Number	Based on Type	Case	Lead/Terminal Material and Finish	Weight max g
01	2N3467	TO-39	D2	1.2
02	2N3467	TO-39	D3 or D4	1.2

The lead/terminal material and finish shall be in accordance with the requirements of ESCC Basic Specification No. 23500.

### 1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage. Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

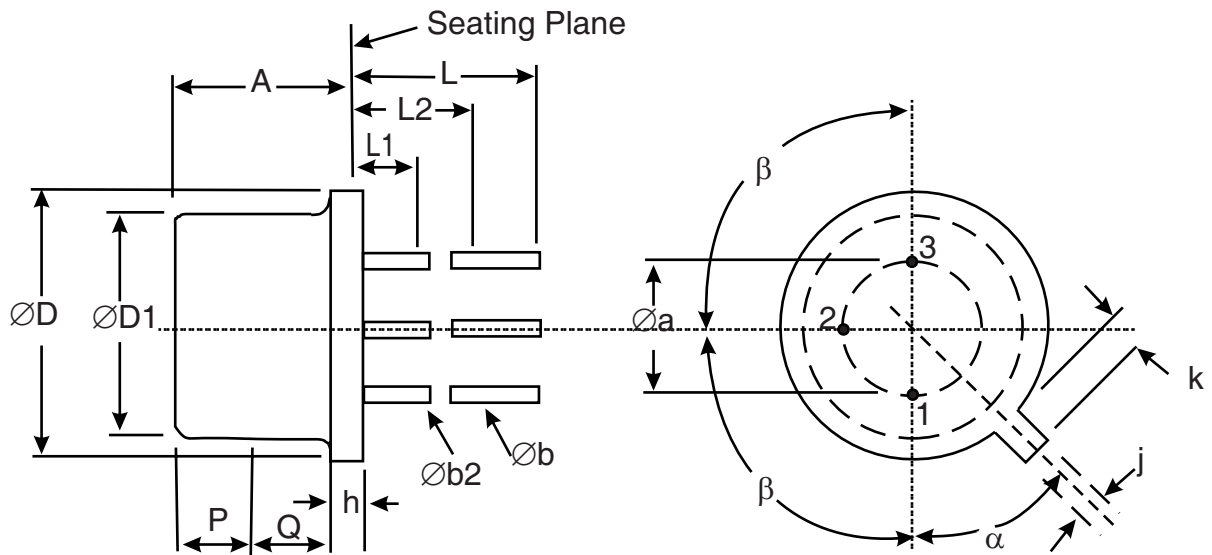
Characteristics	Symbols	Maximum Ratings	Unit	Remarks
Collector-Base Voltage	$V_{CBO}$	-40	V	Over entire operating temperature range
Collector-Emitter Voltage	$V_{CEO}$	-40	V	
Emitter-Base Voltage	$V_{EBO}$	-5	V	
Collector Current	$I_C$	-1	A	Continuous
Power Dissipation	$P_{tot}$	1	W	At $T_{amb} \leq +25^{\circ}C$ Note 1
Operating Temperature Range	$T_{op}$	-65 to +200	$^{\circ}C$	Note 2
Storage Temperature Range	$T_{stg}$	-65 to +200	$^{\circ}C$	Note 2
Soldering Temperature	$T_{sol}$	+265	$^{\circ}C$	Note 3

**NOTES:**

- For  $T_{amb} > +25^{\circ}C$ , derate linearly to 0W at  $+200^{\circ}C$ .
- For Variants with tin-lead plating or hot solder dip lead finish all testing performed at  $T_{amb} > +125^{\circ}C$  shall be carried out in a 100% inert atmosphere.
- 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.

1.6 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

1.6.1 Metal Can Package (TO-39) - 3 lead



Symbols	Dimensions mm		Notes
	Min	Max	
$\varnothing a$	4.83	5.35	
A	6	6.6	
$\varnothing b$	0.4	0.533	2, 3
$\varnothing b2$	0.4	0.483	2, 3

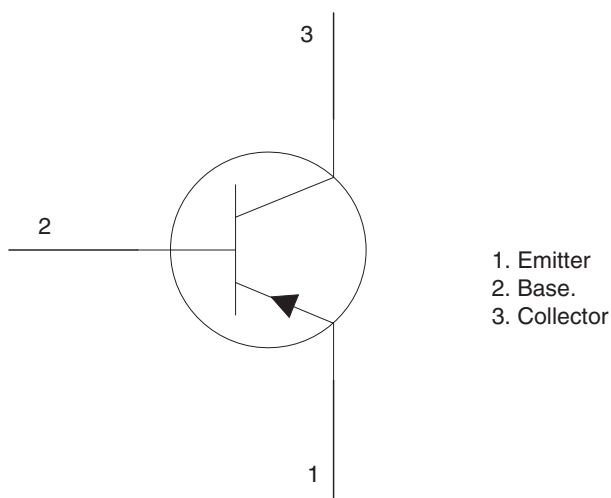
Symbols	Dimensions mm		Notes
	Min	Max	
ØD	8.31	9.4	
ØD1	7.75	8.51	
h	0.229	3.18	
j	0.71	0.864	
k	0.737	1.14	4
L	12.7	19	2
L1	-	1.27	2, 3
L2	6.35	-	2, 3
P	2.54	-	5
Q	-	-	6
$\alpha$	45° BSC		1, 7
$\beta$	90° BSC		1

**NOTES:**

1. Terminal identification is specified by reference to the tab position where Lead 1 = emitter, Lead 2 = base and Lead 3 = collector.
2. Applies to all leads.
3. Øb2 applies between L1 and L2. Øb applies between L1 and 12.7mm from the seating plane. Diameter is uncontrolled within L1 and beyond 12.7mm from the seating plane.
4. Measured from the maximum diameter of the actual device.
5. This zone is controlled for automatic handling. The variation in actual diameter within this zone shall not exceed 0.254mm.
6. The details of outline in this zone are optional.
7. Measured from the Tab Centreline.

1.7

FUNCTIONAL DIAGRAM



**NOTES:**

1. The collector is internally connected to the case.

## 1.8 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

- a) Case  
The case shall be hermetically sealed and have a metal body with hard glass seals.
- b) Leads/Terminals  
As specified in Component Type Variants.

## 2. REQUIREMENTS

### 2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

#### 2.1.1 Deviations from the Generic Specification

None.

### 2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and as follows.

The information to be marked on the component shall be:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number.
- (c) Traceability information.

### 2.3 TERMINAL STRENGTH

The test conditions for terminal strength, tested as specified in the ESCC Generic Specification, shall be as follows:

Test Condition: E, lead fatigue.

### 2.4 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures.

#### 2.4.1 Room Temperature Electrical Measurements

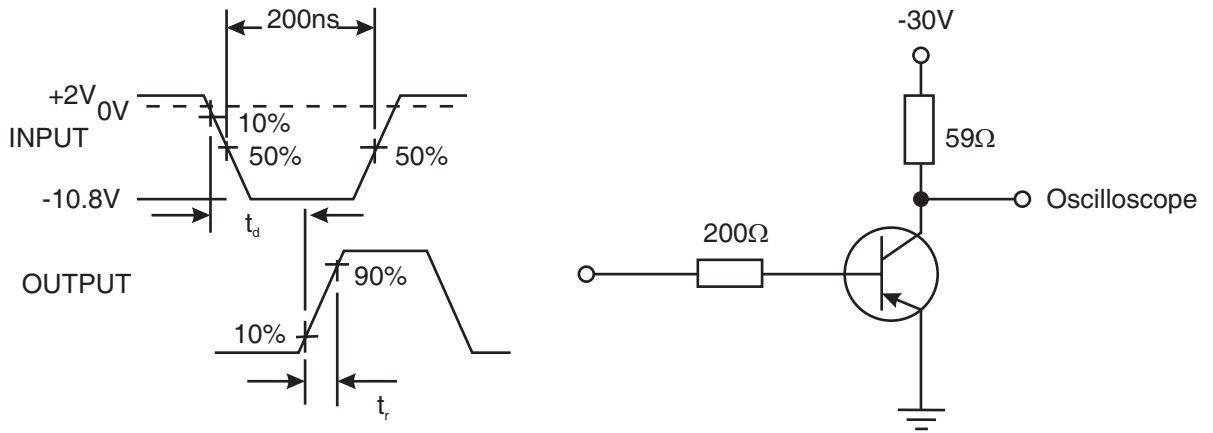
The measurements shall be performed at  $T_{amb}=+22 \pm 3^{\circ}\text{C}$ .

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	3001	$I_C = -10\mu A$ Bias condition D	-40	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	3011	$I_C = -10mA$ Bias condition D Note 1	-40	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	3026	$I_E = -10\mu A$ Bias condition D	-5	-	V
Collector-Emitter Cut-off Current	$I_{CEX}$	3041	$V_{BE} = -3V$ $V_{CE} = -30V$ Bias condition A	-	-100	nA
Collector-Base Cut-off Current	$I_{CBO}$	3036	$V_{CB} = -30V$ Bias condition D	-	-100	nA
Forward-Current Transfer Ratio	$h_{FE1}$	3076	$V_{CE} = -1V$ ; $I_C = -150mA$ Note 1	40	-	-
	$h_{FE2}$	3076	$V_{CE} = -1V$ ; $I_C = -500mA$ Note 1	40	120	-
	$h_{FE3}$	3076	$V_{CE} = -5V$ ; $I_C = -1A$ Note 1	40	-	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)1}$	3071	$I_C = -150mA$ $I_B = -15mA$ Note 1	-	-350	mV
	$V_{CE(sat)2}$	3071	$I_C = -500mA$ $I_B = -50mA$ Note 1	-	-600	mV
	$V_{CE(sat)3}$	3071	$I_C = -1mA$ $I_B = -100mA$ Note 1	-	-1.2	V
Base-Emitter Saturation Voltage	$V_{BE(sat)1}$	3066	$I_C = -150mA$ $I_B = -15mA$ Test Condition A Note 1	-	-1	V
	$V_{BE(sat)2}$	3066	$I_C = -500mA$ $I_B = -50mA$ Test Condition A Note 1	-	-1.2	V
	$V_{BE(sat)3}$	3066	$I_C = -1A$ $I_B = -100mA$ Test Condition A Note 1	-	-1.6	V

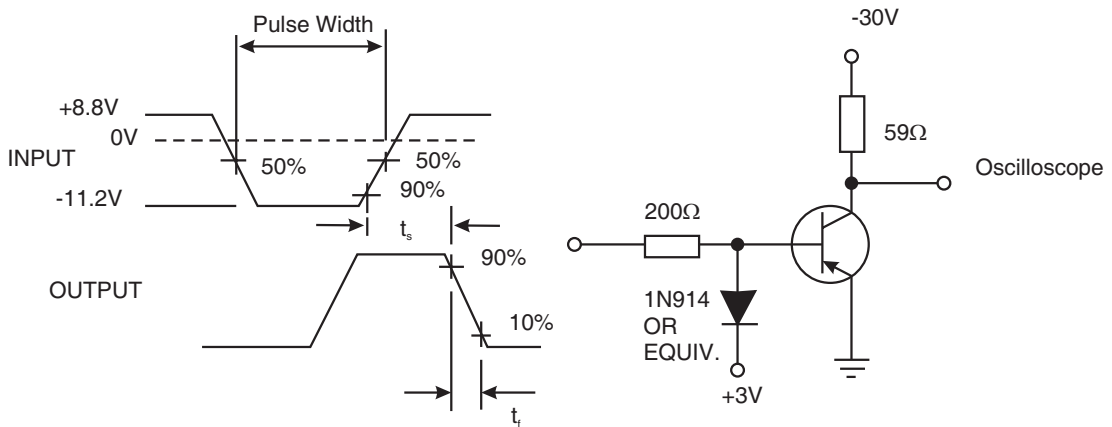
Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Small-Signal Short-Circuit Forward-Current Transfer Ratio	$h_{fe}$	3306	$I_C = -50\text{mA}$ , $V_{CE} = -10\text{V}$ $f = 100\text{MHz}$ Note 2	1.8	-	-
Output Capacitance	$C_{obo}$	3236	$V_{CB} = -10\text{V}$ , $I_E = 0\text{A}$ $f = 100\text{kHz}$ Note 2	-	25	pF
Input Capacitance	$C_{ibo}$	3240	$V_{EB} = -500\text{mV}$ , $I_C = 0\text{A}$ $f = 100\text{kHz}$ Note 2	-	100	pF
Delay Time	$t_d$	-	$I_C = -500\text{mA}$ $I_{B1} = -50\text{mA}$ $V_{BE} = -2\text{V}$ $V_{CE} = -30\text{V}$ Notes 2, 3	-	10	ns
Rise Time	$t_r$	-	$I_C = -500\text{mA}$ $I_{B1} = -50\text{mA}$ $V_{BE} = -2\text{V}$ $V_{CE} = -30\text{V}$ Notes 2, 3	-	30	ns
Storage Time	$t_s$	-	$I_C = -500\text{mA}$ $I_{B1} = I_{B2} = -50\text{mA}$ $V_{CC} = -30\text{V}$ Notes 2, 4	-	60	ns
Fall Time	$t_f$	-	$I_C = -500\text{mA}$ $I_{B1} = I_{B2} = -50\text{mA}$ $V_{CC} = -30\text{V}$ Notes 2, 4	-	30	ns

**NOTES:**

1. Pulsed measurement: Pulse Width  $\leq 2\mu\text{s}$ , Duty Cycle  $\leq 1\%$ .
2. For AC characteristics read and record measurements shall be performed on a sample of 32 components with 0 failures allowed. Alternatively a 100% inspection may be performed.
3.  $t_d$  and  $t_r$  shall be measured using the following test circuit. The input waveform shall be supplied by a pulse generator with the following characteristics:  $Z_{OUT} = 50\Omega$ ,  $t_r = t_f \leq 2\text{ns}$ , Pulse Width = 200ns, Duty Cycle = 2%. The output waveform shall be monitored on an oscilloscope with the following characteristics:  $Z_{IN} \geq 100\text{k}\Omega$ ,  $t_r \leq 200\text{ps}$ ,  $C_{IN} \leq 12\text{pF}$ .



4.  $t_s$  and  $t_f$  shall be measured using the following test circuit. The input waveform shall be supplied by a pulse generator with the following characteristics:  $Z_{OUT} = 50\Omega$ ,  $10\mu s \leq \text{Pulse Width} \leq 500\mu s$ ,  $t_r = t_f \leq 2ns$ , Duty Cycle = 2%. The output waveform shall be monitored on an oscilloscope with the following characteristics:  $Z_{IN} \geq 100k\Omega$ ,  $t_r \leq 200ps$ ,  $C_{in} \leq 12pF$ .



2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 1	Limits		Units
				Min	Max	
Collector-Base Cut-off Current	$I_{CBO}$	3036	$T_{amb} = +150 (+0 -5)^{\circ}C$ $V_{CB} = -30V$ Bias condition D	-	-50	$\mu A$
Forward-Current Transfer Ratio 1	$h_{FE1}$	3076	$T_{amb} = -55 (+5 -0)^{\circ}C$ $V_{CE} = -1V$ ; $I_C = -150mA$ Note 2	16	-	-

**NOTES:**

1. Read and record measurements shall be performed on a sample of 5 components with 0 failures allowed. Alternatively a 100% inspection may be performed.
2. Pulsed measurement: Pulse Width  $\leq 2\mu s$ , Duty Cycle  $\leq 1\%$ .

**2.5 PARAMETER DRIFT VALUES**

Unless otherwise specified, the measurements shall be performed at  $T_{amb}=+22 \pm 3^{\circ}C$ .

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The drift values ( $\Delta$ ) shall not be exceeded for each characteristic specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits			Units
		Drift Value $\Delta$	Absolute		
			Min	Max	
Collector-Base Cut-off Current	$I_{CBO}$	$\pm 30$ or (1) $\pm 100\%$	-	-100	nA
Forward-Current Transfer Ratio 2	$h_{FE2}$	$\pm 15\%$	40	120	-
Collector-Emitter Saturation Voltage 1	$V_{CE(sat)1}$	$\pm 50$ or (1) $\pm 15\%$	-	-350	mV

**NOTES:**

1. Whichever is the greater referred to initial value.

**2.6 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS**

Unless otherwise specified, the measurements shall be performed at  $T_{amb}=+22 \pm 3^{\circ}C$ .

The test methods and test conditions shall be as per the corresponding test defined in Room Temperature Electrical Measurements.

The limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits		Units
		Min	Max	
Collector-Base Cut-off Current	$I_{CBO}$	-	-100	nA
Forward-Current Transfer Ratio 2	$h_{FE2}$	40	120	-
Collector-Emitter Saturation Voltage 2	$V_{CE(sat)2}$	-	-600	mV

**2.7 HIGH TEMPERATURE REVERSE BIAS BURN-IN CONDITIONS**

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	$T_{amb}$	+150 (+0 -5)	$^{\circ}C$
Collector-Base Voltage	$V_{CB}$	-30	V



Characteristics	Symbols	Test Conditions	Units
Duration	t	48 minimum	Hours

## 2.8 POWER BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	$T_{amb}$	+22 ±3	°C
Power Dissipation	$P_{tot}$	1	W
Collector-Base Voltage	$V_{CB}$	-30	V

## 2.9 OPERATING LIFE CONDITIONS

The conditions shall be as specified for Power Burn-in.