OPTO COUPLERS,

BASED ON TYPE CNY18

ESCC Detail Specification No. 5401/005

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Pages 1 to 18

OPTO-COUPLERS

BASED ON TYPE CNY18

ESA/SCC Detail Specification No. 5401/005

space components
coordination group

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		SCCG Chairman	ESA Director General or his Deputy
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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:-		
		- Addition of Appendix requirements		21019
		- Addition of Type Variants		21021
		- Changes due to format amendments		21022
		- Incorporation of new Lead Document		21025
		and the following DCR's:-		
		Cover page		None
		DCN		None
		Table of Contents	: Figures 4 through 7 renumbered	22339
		Table 1(b)	: Format change of Nos. 7, 8 and 9	22339
			: Note 1 related to Nos. 3 and 6 added	22339
		Figure 2	: Addition of dimensions in inches	22339
			: Deletion of "inside" identification of electrode	22339
		Para. 2	: MIL-STD-202 and IEC No. 68-2-30 added	22339
		Para. 4.2.2	: PIND test added	22339
		Para. 4.2.3	: Leakage Current test redefined	22339
		Para. 4.3.3	: In first line, Section No. changed to "9"	22339
		Para. 4.4.1	: TO72 added	22339
		Para. 4.6.3	: Nos. of referenced Figures changed	22339
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		Table 6	: Format change	22339
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'A'	Feb. '92	P1. Cover page		None
		P2. DCN		None
		P5. Para. 1.2	: Paragraph amended	21021
		P8. 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, subsequent deviation renumbered	21043
		P9. Para. 4.2.3	: Radiographic Inspection deviation deleted, subsequent deviation renumbered	21049
		Para. 4.2.4	: Bond Strength and Die Shear Test deviations deleted, subsequent deviation renumbered	23499
		P15. Table 3	: Note deleted	21047
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.		

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APPENDICES (Applicable to specific Manufacturers only)
None.

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for an Opto-Coupler, based on Type CNY18. 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 opto-coupler specified herein, are scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

The applicable derating information for the opto-coupler specified herein is shown in Figure 1.

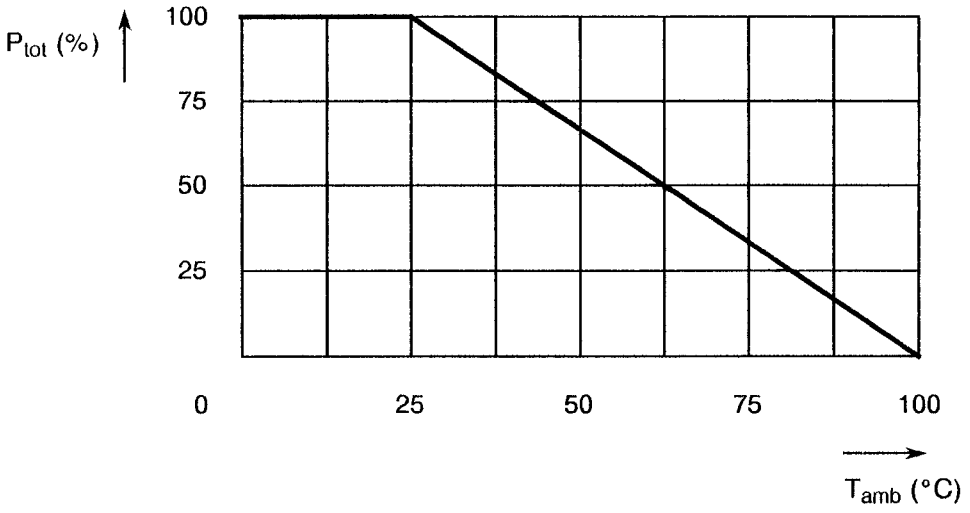
1.5 PHYSICAL DIMENSIONS

The physical dimensions of the opto-coupler specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

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

FIGURE 1 - PARAMETER DERATING INFORMATION



Rated Power Dissipation versus Temperature

TABLE 1(a) - COMPONENT TYPE VARIANTS

VARIANT	CASE	LEAD MATERIAL AND FINISH
01	TO72	D2

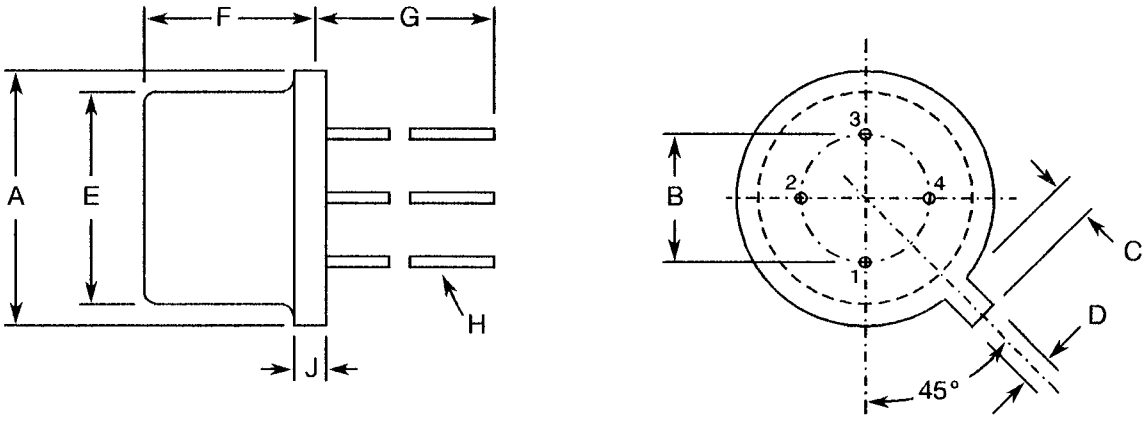
TABLE 1(b) - MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS	UNIT	REMARKS
1	Reverse Voltage	V_R	3.0	V	Opto-emitter
2	Flow Current	I_F	60	mA	Opto-emitter
3	Power Dissipation	P_{tot}	100	mW	Opto-emitter (Note 1)
4	Collector-Emitter Voltage	V_{CE}	32	V	Opto-detector
5	Collector Current	I_C	150	mA	Opto-detector
6	Power Dissipation	P_{tot}	150	mW	Opto-detector (Note 1)
7	Operating Temperature Range	T_{amb}	−55 to +100	°C	
8	Storage Temperature Range	T_{stg}	−55 to +100	°C	
9	Soldering Temperature	T_{sol}	+230	°C	Time: ≤10 sec. Distance from can: ≥2.0mm

NOTES

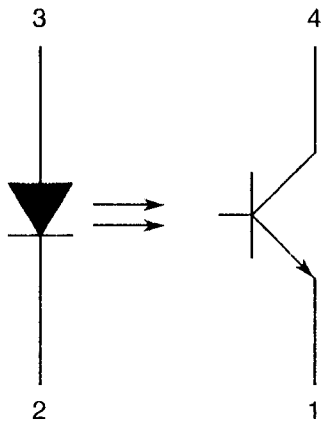
1. At $T_{amb} \leq +25°C$. For derating at $T_{amb} > +25°C$, see Figure 1.

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	MILLIMETRES		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	5.30	5.80	0.21	0.23	
B	-	2.50	-	0.10	
C	0.70	1.20	0.03	0.05	
D	0.90	1.20	0.04	0.05	
E	4.50	5.00	0.18	0.20	
F	4.30	5.30	0.17	0.21	
G	12.70	-	0.50	-	
H	0.41	0.53	0.016	0.021	
J	-	0.80	-	0.03	

FIGURE 3 - FUNCTIONAL DIAGRAM



1. Emitter Transistor.
2. Cathode Diode.
3. Anode Diode.
4. Collector Transistor.

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) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

(d) IEC Publication No. 68-2-30, Damp Heat Cyclic (12 + 12 hour cycle).

(e) 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 opto-couplers specified herein shall be as stated in this specification and ESA/SCC Generic Specification No. 5000 for Discrete Semiconductors. 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

The following deviations from ESA/SCC Generic Specification No. 5000 shall apply:-

4.2.1 Deviations from Special In-process Controls

None.

4.2.2 Deviations from Final Production Tests (Chart II)

(a) Thermal Shock Test: Test Condition 'A' shall be used.

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

(a) H.T.R.B. Test: Shall not be performed.

(b) Leakage Current (Insulation Resistance) Test: Subsequent to the Para. 9.9.3 Electrical Measurements, the leakage current shall be measured on a sample basis (LTPD7 or less, see Annex I of ESA/SCC Generic Specification No. 5000) in accordance with Method 302, Condition B of MIL-STD-202 and Figure 4(a) herein. The condition shall be t = 1 to 2 minutes and the maximum limit 5.0μA.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Thermal Shock Test: Test condition 'A' shall be used.

(b) Moisture Resistance Test: May be substituted by 6 cycles of damp heat in accordance with IEC Publication No. 68-2-30.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Thermal Shock Test: Test condition 'A' shall be used.

(b) Moisture Resistance Test: May be substituted by 6 cycles of damp heat in accordance with IEC Publication No. 68-2-30.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

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

4.3.2 Weight

The maximum weight of the opto-coupler specified herein shall be 0.5 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: 5.0 Newtons.

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 opto-couplers 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

Metal, hermetically sealed, TO72.

4.4.2 Header

Kovar, gold plated.

4.4.3 Lead Material and Finish

The lead material shall be Type 'D' with Type '2' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

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.

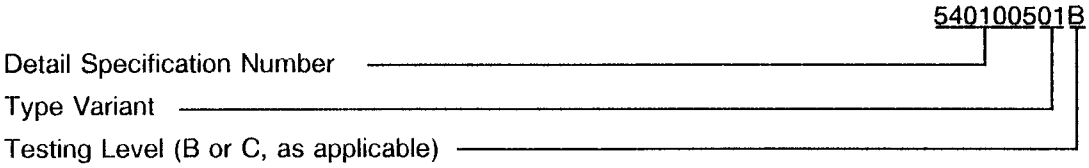
(c) Traceability Information.

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:



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. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °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.

4.6.3 Circuits for Electrical Measurements

The circuits for use in performing the electrical measurements listed in Tables 2 and 3 are shown in Figure 4.

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 $T_{amb} = +22 \pm 3$ °C. The parameter drift values (Δ) 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 Burn-in

The requirements for burn-in are specified in Section 7 of ESA/SCC Generic Specification No. 5000. The conditions for burn-in shall be as specified in Table 5 of this specification.

4.7.3 Electrical Circuits for Burn-in

Circuits used in performing the burn-in tests are shown in Figure 5 of this specification.

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

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST FIG.	TEST CONDITIONS	LIMITS		UNIT
						MIN.	MAX.	
1	Forward Voltage	V_F	4011	-	$I_F = 60mA$	-	1.6	V
2	Reverse Current	I_R	4016	-	$V_R = 3.0V$	-	10	µA
3	Collector-Emitter Breakdown Voltage	V_{CEO}	3011	-	$I_C = 1.0mA$ $I_F = 0mA$	32	-	V
4	Collector-Emitter Cut-off Voltage	I_{CEO}	3041	-	$V_{CE} = 10V$ $I_F = 0mA$	-	0.1	µA
5	Collector-Emitter Saturation Voltage	V_{CEsat}	-	4(b)	$I_F = 10mA$ $I_C = 1.0mA$	-	0.2	V
6	Current Transfer Ratio	I_C/I_F	-	4(b)	$I_F = 10mA$ $V_{CE} = 5.0V$	0.4	-	-

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

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST FIG.	TEST CONDITIONS	LIMITS		UNIT
						MIN.	MAX.	
7	Anode-Cathode Capacitance	C_{AK}	4001	-	$V_R = 0V$ Note 1	-	500	pF
8	Output Capacitance	C_{OE}	3236	-	$V_{CE} = 10V$ $f = 470kHz$ Note 1	-	4.5	pF
9	Coupling Capacitance	C_K	-	4(a)	$f = 1.0MHz$ Note 1	-	1.5	pF
10	Turn-on Time	t_{on}	-	4(c)	$I_F = 10mA$ $V_{CE} = 5.0V$ Note 1	-	5.0	µs
11	Turn-off Time	t_{off}	-	4(c)	$I_F = 10mA$ $V_{CE} = 5.0V$ Note 1	-	3.0	µs

NOTES

1. Measurements performed on a sample basis, LTPD = 7 or less (see Annex I of ESA/SCC Generic Specification No. 5000).

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

FIGURE 4(a) - TEST CIRCUIT FOR MEASUREMENT OF COUPLING CAPACITANCE AND LEAKAGE CURRENT

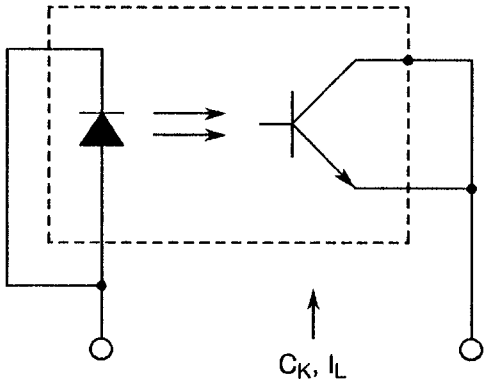


FIGURE 4(b) - TEST CIRCUIT FOR MEASUREMENT OF $V_{CE(sat)}$ and I_C/I_F

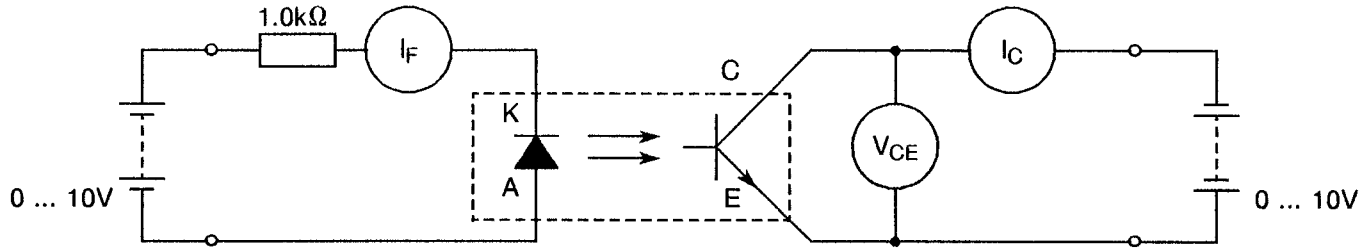


FIGURE 4(c) - TEST CIRCUIT FOR MEASUREMENT OF SWITCHING TIMES

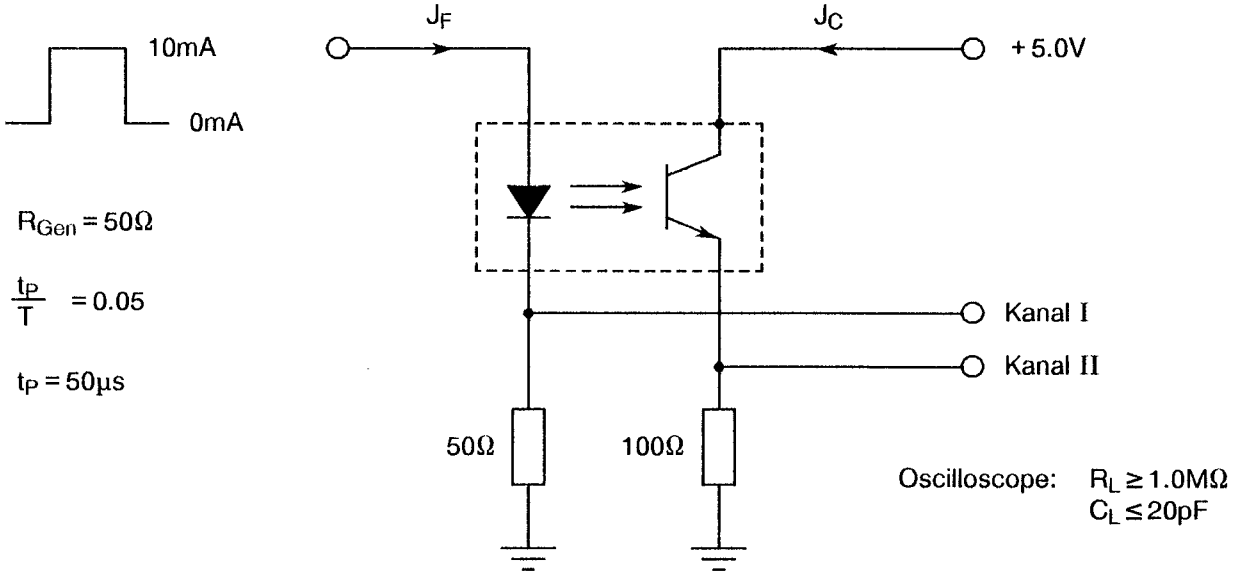


TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	MIL-STD-750 TEST METHOD	TEST FIG.	TEST CONDITIONS	LIMITS		UNIT
						MIN.	MAX.	
2	Reverse Current	I_R	4016	-	$V_R = 3.0V$ $T_{amb} = +75°C$	-	1.0	mA
4	Collector-Emitter Cut-off Current	I_{CEO}	3041	-	$V_{CE} = 10V$ $I_F = 0mA$ $T_{amb} = +75°C$	-	5.0	µA
6	Current Transfer Ratio	I_C/I_F	-	4(b)	$I_F = 10mA$ $V_{CE} = 5.0V$ $T_{amb} = -55°C$	0.2	-	-
					$I_F = 10mA$ $V_{CE} = 5.0V$ $T_{amb} = +75°C$			

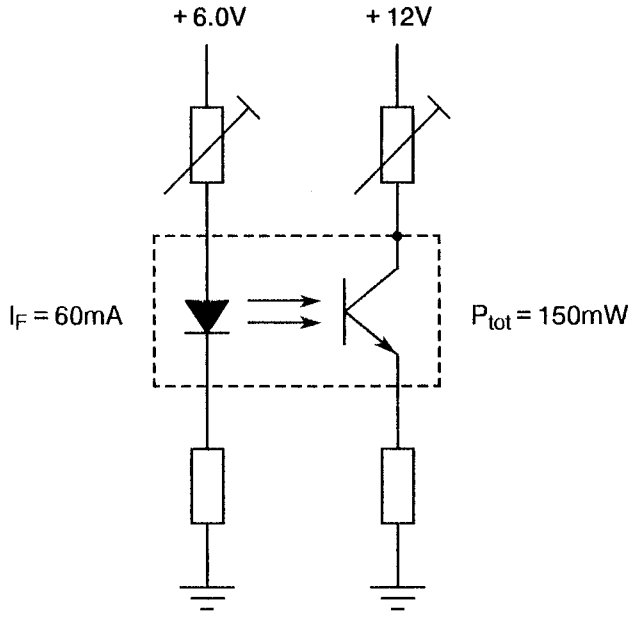
TABLE 4 - PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
2	Reverse Current	I_R	As per Table 2	As per Table 2	±2.0	µA
4	Collector-Emitter Cut-off Current	I_{CEO}	As per Table 2	As per Table 2	±30	nA
6	Current Transfer Ratio	I_C/I_F	As per Table 2	As per Table 2	±30	%

TABLE 5 - CONDITIONS FOR BURN-IN

No.	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Diode Forward Current	I_F	60(+0−3)	mA
2	Transistor Power Dissipation	P_{tot}	150(+0−10)	mW
3	Ambient Temperature	T_{amb}	+22 ± 3	°C

FIGURE 5 - TEST CIRCUIT FOR BURN-IN



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 $T_{amb} = +22 \pm 3$ °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 2. The measurements shall be performed at $T_{amb} = +22 \pm 3$ °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 as specified in Table 5 for the burn-in tests.

4.8.5 Electrical Circuits for Operating Life Tests

The circuit for use in performing the operating life tests is shown in Figure 5 of this specification.

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 temperature to be applied shall be the maximum storage temperature specified in Table 1(a) of this specification.

TABLE 6 - ELECTRICAL MEASUREMENTS AFTER ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS DURING ENDURANCE TESTING

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
2	Reverse Current	I_R	As per Table 2	As per Table 2	-	10	µA
4	Collector-Emitter Cut-off Current	I_{CEO}	As per Table 2	As per Table 2	-	0.1	µA
6	Current Transfer Ratio	I_C/I_F	As per Table 2	As per Table 2	0.4	-	-