TRANSISTORS, MICROWAVE, SMALL SIGNAL,

SILICON, BIPOLAR

BASED ON TYPES BFY180 THRU BFY183,

BFY193, BFY193C, BFY196 AND BFY280

ESCC Detail Specification No. 5611/006

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DCR No.	CHANGE DESCRIPTION
772	Specification upissued to incorporate editorial changes per DCR.

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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Transistor, Microwave, Small Signal, Silicon, Bipolar, based on Types BFY180 thru BFY183, BFY193, BFY193C, BFY196 and BFY280. It shall be read in conjunction with ESCC Generic Specification No. 5010, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS

Variants of the basic type components specified herein, which are also covered by this specification, are given in 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 components specified herein, are as scheduled in Table 1(b).

1.4 PARAMETER DERATING INFORMATION

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

1.5 PHYSICAL DIMENSIONS

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

1.6 FUNCTIONAL DIAGRAM

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

1.7 HANDLING PRECAUTIONS

These devices are susceptible to damage by electrostatic discharge. Therefore suitable precautions shall be employed for protection during all phases of manufacture test, packaging, shipping and handling.

These components are categorised as Class 1 with a Minimum Critical Path Failure Voltage of 500V for Variants 01 to 03 and 1000V for Variants 04 to 08.

2 APPLICABLE DOCUMENTS

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

(a) ESCC Generic Specification No. 5010 for Discrete Microwave Semiconductor Components.
(b) MIL-STD-750, Test Methods for Semiconductor Devices.

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. In addition, the following abbreviations are used:

MAG = Maximum Available Gain.
MSG = Maximum Stable Gain
R_B = External Base Resistor
R_E = External Emitter Resistor
$R_{TH(J-A)}$ = Thermal Resistance, Junction to Ambient.
$R_{TH(J-S)}$ = Thermal Resistance, Junction to Soldering Point.
$R_{TH(S-A)}$ = Thermal Resistance, Soldering Point to Ambient
V_{CC} = Output Voltage from Collector Power Supply.
V_{BB} = Output Voltage from Collector Power Supply

TABLE 1(a) - TYPE VARIANTS

(1) Variant	(2) Type	(3) Case	(4) Figure	(5) Lead Material And Finish
01	BFY180	MICRO-X1	2	02
02	BFY280	MICRO-X1	2	02
03	BFY181	MICRO-X1	2	02
04	BFY182	MICRO-X1	2	02
05	BFY183	MICRO-X1	2	02
06	BFY193	MICRO-X1	2	02
07	BFY196	MICRO-X1	2	02
08	BFY193C	MICRO-X1	2	02

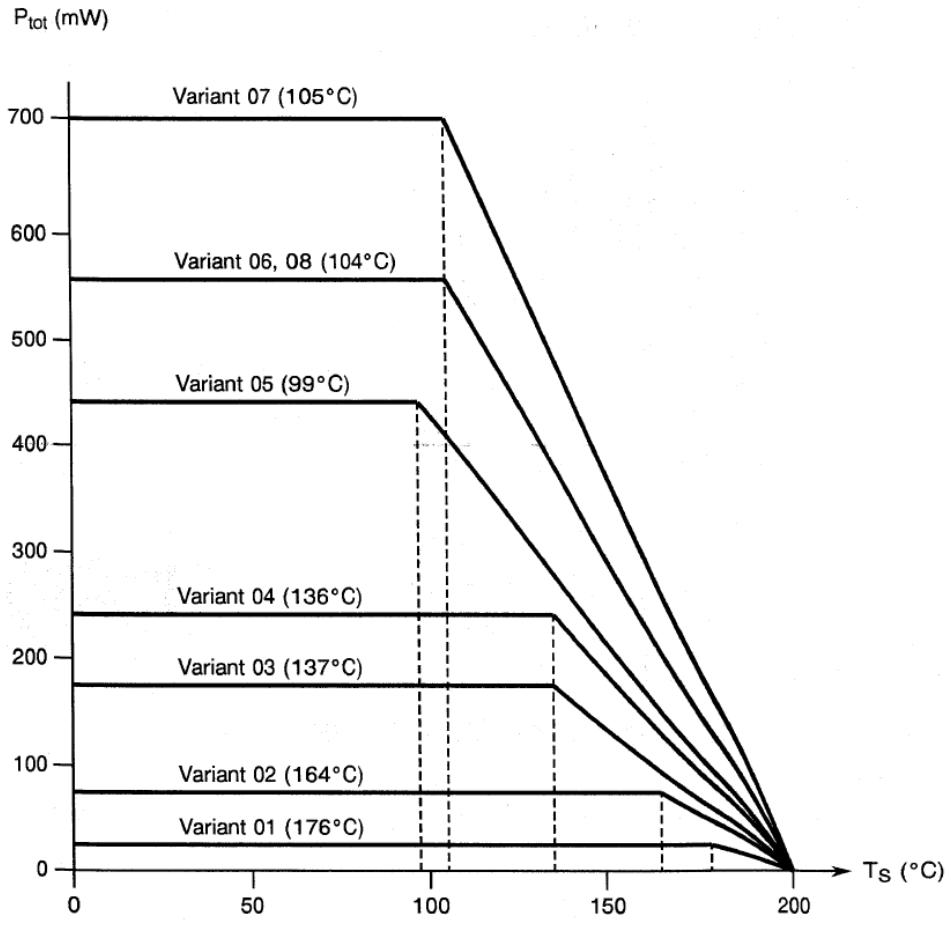
TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Maximum Ratings	Unit	Remarks
1	Collector-Emitter Voltage Variants 01 and 02 Variants 03 to 08	V_{CEO}	 8 12	V	
2	Collector-Emitter Voltage Variants 01 and 02 Variants 03 to 08	V_{CES}	 15 20	V	
3	Collector-Base Voltage Variants 01 and 02 Variants 03 to 08	V_{CBO}	 15 20	V	
4	Emitter-Base Voltage	V_{EBO}	2	V	
5	Collector Current Variant 01 Variant 02 Variant 03 Variant 04 Variant 05 Variant 06, 08 Variant 07	I_C	 4 10 20 35 65 80 100	mA	
6	Base Current Variant 01 Variant 02 Variant 03 Variant 04 Variant 05 Variant 06, 08 Variant 07	I_B	 0.5 1.2 2 4 5 10 12	mA	Note 1
6	Power Dissipation Variant 01 Variant 02 Variant 03 Variant 04 Variant 05 Variant 06, 08 Variant 07	P_{tot}	 30 ($T_S \leq 176°C$) 80 ($T_S \leq 164°C$) 175 ($T_S \leq 137°C$) 250 ($T_S \leq 136°C$) 450 ($T_S \leq 99°C$) 580 ($T_S \leq 104°C$) 700 ($T_S \leq 105°C$)	mW	Notes 2 and 3
8	Operating Temperature Range	T_{op}	-65 to +200	ºC	T_{amb}
9	Storage Temperature Range	T_{stg}	-65 to +200	ºC	
10	Soldering Temperature	T_{sol}	+250	ºC	Note 4
11	Junction Temperature	T_J	+200	ºC	

NOTES

1. Maximum ratings must not be exceeded under any combination of DC ratings and RF voltage/current swings, except that the maximum base current can be exceeded for the purpose of Base-Emitter-Forward Voltage pulsed measurement provided that the pulse duration < 1s and I_C = 0A.
2. T_S is measured on the collector lead at the soldering point to the PCB.
3. At the T_S specified. For derating at T_S greater than specified, see Figure 1.
4. Duration 5 seconds maximum at a distance of not less than 0.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



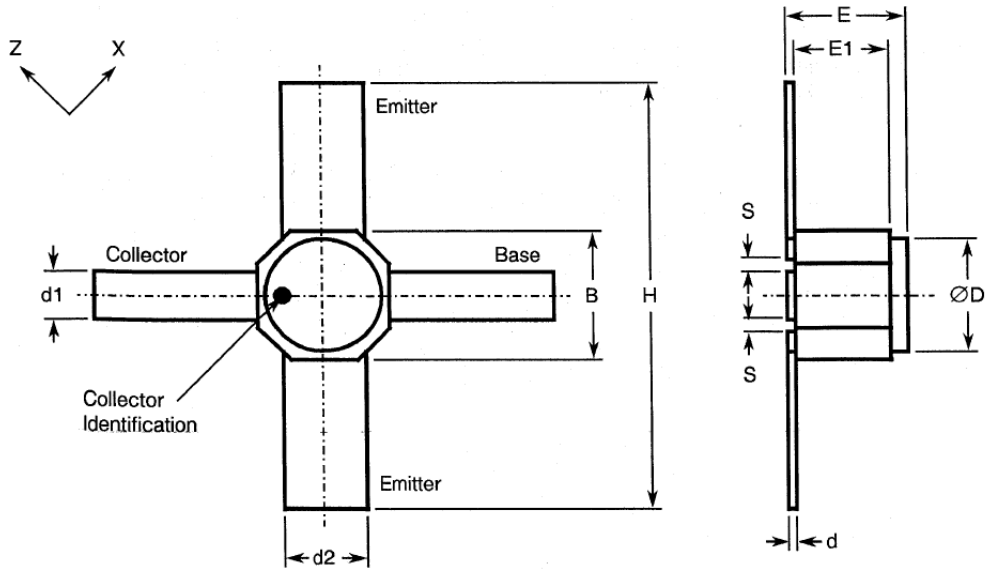
Power Dissipation versus Solder-Point Temperature

NOTES

Thermal Resistance, Junction to Soldering Point $R_{TH(J-S)}$:

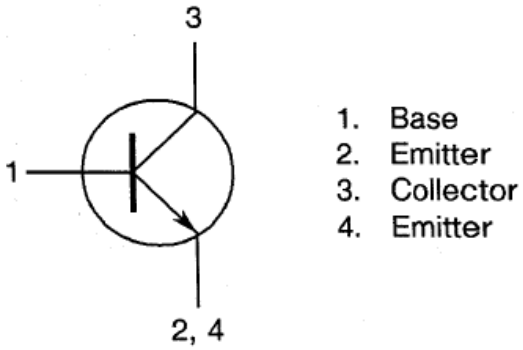
- Variant 01: 805°C/W
- Variant 02: 450°C/W
- Variant 03: 360°C/W
- Variant 04: 255°C/W
- Variant 05: 225°C/W
- Variant 06: 165°C/W
- Variant 07: 135°C/W
- Variant 08: 165°C/W

FIGURE 2 - PHYSICAL DIMENSIONS



Symbol	Millimetres	
	Min	Max
B	1.68	1.88
d	0.07	0.15
d1	0.4	0.6
d2	0.92	1.12
ØD	1.55	1.85
E	0.85	1.25
E1	0.66	0.86
H	4	4.4
S	0.08	0.3

FIGURE 3 - FUNCTIONAL DIAGRAM



NOTES

1. The collector is marked with a black dot.

4 REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the transistors specified herein shall be as stated in this specification and ESCC Generic Specification No. 5010 for Discrete Microwave Semiconductor Components. 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 ESCC 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 Production Control

None.

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

(a) Para. 9.5, Thermal Shock: May also be performed in accordance with MIL-STD-883, Test Method 1010, Test Condition C.
(b) Para. 9.7, Particle Impact Noise Detection (PIND) test: May be performed at any point after the position indicated in Chart II(b), but before final seal test, gross leak and fine leak.

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

(a) Para. 9.9.2, Table 3 measurements: May be performed at any stage after power burn-in.
(b) Para. 9.9.3, Table 2 measurements: May be performed at any stage after power burn-in.
(c) Para. 9.12, Radiographic Inspection: Shall be performed in X and Z axes only.

4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Paras. 9.8.1 and 9.8.2, Seal Test: The tests following Para. 9.15, Constant Acceleration, shall not be performed.
(b) Para. 9.13, Shock Test: Shall not be performed.
(c) Para. 9.14, Vibration Test: Shall not be performed.
(d) Para. 9.15, Constant Acceleration: Shall not be performed.
(e) Para. 9.23, Special Testing: Shall not be performed.
(f) Assembly/Capability tests (Subgroup II): In addition to the permitted electrical rejects, components rejected from radiographic inspection, seal test or external visual inspection may also be used for these tests, if they are considered capable of passing the Assembly/Capability test sequence.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Paras. 9.8.1 and 9.8.2, Seal Test: The tests following Para. 9.15, Constant Acceleration, shall not be performed.
(b) Para. 9.9.2 in Electrical Measurements Subgroup: Table 3(b) measurements shall not be performed.
(c) Para. 9.13, Shock Test: Shall not be performed.
(d) Para. 9.14, Vibration Test: Shall not be performed.
(e) Para. 9.15, Constant Acceleration: Shall not be performed.
(f) Para. 9.23, Special Testing: Shall not be performed.

(g) Assembly/Capability tests (Subgroup II): In addition to the permitted electrical rejects, components rejected from radiographic inspection, seal test or external visual inspection may also be used for these tests, if they are considered capable of passing the Assembly/Capability test sequence.

4.3 MECHANICAL REQUIREMENTS

4.3.1 Dimension Check

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

4.3.2 Weight

The maximum weight of the components specified herein shall be 0.03 grammes.

4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESCC Generic Specification No. 5010. The test conditions shall be as follows:

(a) Condition: 'A' (Tension).
(b) Force: 2.2N.
(c) Duration: 5 seconds.

4.3.4 Bond Strength

The requirements for bond strength are specified in Section 9 of ESCC Generic Specification No. 5010. The test conditions shall be as follows:

(a) Condition: 'A' (Tension).
(b) Bond Strengths:
Variants 01 to 05: 0.015N force minimum at pre-seal tests, 0.012N force minimum at post-seal tests.
Variants 06 to 08: 0.03N force minimum at pre-seal tests, 0.025N force minimum at post-seal tests.

4.3.5 Die Shear

The requirements for die shear are specified in Section 9 of ESCC Generic Specification No. 5010. The test conditions shall be alternatively as follows:

(a) Minimum acceptable die shear strengths:
Variants 01 to 06 and 08: 0.5N.
Variant 07: 0.7N.
(b) In those cases where the clearances in the package do not allow application of the die shear force with a suitable tool, the chip shall be pushed away with a suitable tool and the die attach area inspected afterwards.
Sufficient die attach quality is achieved if objective evidence for sufficient mechanical and thermal contact is found: i.e. more than 50% semiconductor material remains.

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 components specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material shall not guarantee acceptance of the finished product.

4.4.1 Case
The case shall be hermetically sealed and have a ceramic body.

4.4.2 Lead Materials and Finish
The lead material shall be Type 'D' with Type '2' finish in accordance with the requirements of ESCC Basic Specification No. 23500.

4.5 MARKING

4.5.1 General
The marking of components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:

(a) Terminal Identification.
(b) The ESCC Component Number.
(c) Traceability Information.

The primary package shall bear an "ESD Sensitive" label.

4.5.2 Terminal Identification
Collector identification shall be as shown in Figures 2 and 3 of this specification.

4.5.3 The ESCC Component Number
Each component shall bear the ESCC Component Number which shall be constituted and marked as follows:

Example: 561100601B

- Detail Specification Number: 5611006
- Type Variant (see Table 1(a)): 01
- Testing Level (B or C, as applicable): B

4.5.4 Traceability Information
Each component shall be marked in respect of traceability information in accordance with the requirements of ESCC Basic Specification No. 21700.

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 ±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. Unless otherwise specified, the measurements shall be performed at T_{amb} = +150 (+0 -5)ºC and -55 (+5 -0)ºC.

4.6.3 Circuits for Electrical Measurements

Circuits for use in performing electrical measurements listed in Table 2 of this specification are shown in Figure 4.

4.7 BURN-IN TESTS

Burn-in shall be to Chart III(b) of ESCC Generic Specification No. 5010.

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, the measurements shall be performed at T_{amb} = +25 ±3°C. The parameter drift values (Δ) applicable to the scheduled parameters shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

4.7.2 Conditions for High Temperature Reverse Bias Burn-in

The requirements for the high temperature reverse bias burn-in are specified in Section 9 of ESCC Generic Specification No. 5010. The conditions for high temperature reverse bias burn-in shall be as specified in Table 5(a) of this specification.

4.7.3 Conditions for Power Burn-in

The requirements for power burn-in are specified in Section 9 of ESCC Generic Specification No. 5010. The conditions for power burn-in shall be as specified in Table 5(b) of this specification.

4.7.4 Electrical Circuit for High Temperature Reverse Bias Burn-in

The circuit for use in performing the high temperature reverse bias burn-in test is shown in Figure 5 of this specification.

4.7.5 Electrical Circuits for Power Burn-in

The circuit for use in performing the power burn-in test is shown in Figure 5 of this specification.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - DC PARAMETERS

No.	Characteristics	Symbol	Test Fig.	Test Conditions	LIMITS		Unit
					Min.	Max.	
1	Collector Cut-off Current 1	I_{CBO1}	4(a)	I_E = 0mA Variants 01, 02: V_{CB} = 15V Variants 03 to 08: V_{CB} = 20V	-	100	µA
2	Collector Cut-off Current 2	I_{CBO2}	4(a)	I_E = 0mA Variants 01, 02: V_{CB} = 8V Variants 03 to 08: V_{CB} = 10V	-	50	nA
3	Emitter Cut-off Current 1	I_{EBO1}	4(a)	V_{EB} = 2V, I_C = 0mA	-	25	µA
4	Emitter Cut-off Current 2	I_{EBO2}	4(a)	V_{EB} = 1V, I_C = 0mA	-	0.5	µA
5	Collector-Emitter Cut-off Current	I_{CEX}	4(a)	V_{CE} = 8V Variant 01: I_B = 0.05µA Variant 02: I_B = 0.1µA V_{CE} = 12V Variant 03: I_B = 0.1µA Variant 04: I_B = 0.2 µA Variant 05: I_B = 0.3 µA Variant 06, 08: I_B = 0.5 µA Variant 07: I_B = 1 µA Note 1	 - - - - - - -	 50 100 100 200 300 600 1000	µA
6	DC Forward current Transfer Ratio	h_{FE}	4(a)	V_{CE} = 1V, I_C = 0.25mA Variants 01, 02: V_{CE} = 6V, I_C = 5mA Variant 03: Variant 04: Variant 05: V_{CE} = 8V, I_C = 30mA Variant 06, 08: V_{CE} = 5V, I_C = 50mA Variant 07:	 30 55 55 55 50 50	 175 175 170 160 175 175	
7	Base-Emitter Forward Voltage	V_{FBE}	4(a)	I_C = 0mA Variant 01: I_E = 3mA Variant 02: I_E = 5mA Variant 03: I_E = 15mA Variant 04: I_E = 20mA Variants 05, 06, 08: I_E = 30mA Variant 07: I_E = 50mA Note 2	-	1	V

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE - AC PARAMETERS

No.	Characteristics	Symbol	Test Fig.	Test Conditions	Limits		Unit
					Min.	Max.	
8	Collector-Base Capacitance	C_{CB}	4(a)	I_E = 0mA, f=1MHz			pF
				Variant 01: V_{CB} = 5V	-	0.24	
				Variant 02: V_{CB} = 5V	-	0.27	
				Variant 03: V_{CB} = 10V	-	0.29	
				Variant 04: V_{CB} = 10V	-	0.36	
				Variant 05: V_{CB} = 10V	-	0.44	
				Variant 06, 08: V_{CB}= 10V	-	0.75	
				Variant 07: V_{CB} = 10V	-	1.3	
				Note 3			
9	Emitter-Base Capacitance	C_{EB}	4(a)	V_{EB} = 0.5V, I_C = 0mA, f = 1MHz			pF
				Variant 01	-	0.4	
				Variant 02	-	0.5	
				Variant 03	-	0.6	
				Variant 04	-	1.1	
				Variant 05	-	1.4	
				Variant 06, 08	-	2.4	
				Variant 07	-	4.3	
				Note 4			
10	Insertion Power Gain	$\|S21\|^2$	4(b)	f = 2GHz, V_{CE} = 5V			dB
				Variant 01: I_C = 2mA	6.5	-	
				Variant 02: I_C = 6mA	9.5	-	
				Variant 03: I_C = 10mA	10	-	
				Variant 04: I_C = 15mA	10	-	
				Variant 05: I_C = 20mA	9	-	
				Variant 06, 08: I_C = 40mA	8	-	
				Variant 07: I_C = 70mA	4	-	
				Notes 5 and 6			
11	Noise Figure	NF	4(c)	f = 2GHz, V_{CE} = 5V			dB
				Variant 01: I_C = 2mA	-	3.2	
				Variant 02: I_C = 2mA	-	2.9	
				Variant 03: I_C = 4mA	-	2.9	
				Variant 04: I_C = 5mA	-	2.9	
				Variant 05: I_C = 8mA	-	2.9	
				Variant 06, 08: I_C = 15mA	-	2.9	
				Variant 07: I_C = 20mA	-	3.5	
				Notes 7 and 10			
12	Maximum Available / Stable Gain	MAG/MSG	4(b)	f = 2GHz, V_{CE} = 5V			dB
				Variant 01: I_C = 2mA	12	-	
				Variant 02: I_C = 6mA	13	-	
				Variant 03: I_C = 10mA	13.5	-	
				Variant 04: I_C = 15mA	13.5	-	
				Variant 05: I_C = 20mA	12.5	-	
				Variant 06, 08: I_C = 40mA	12.5	-	
				Variant 07: I_C = 70mA	10	-	
				Notes 5 and 8			

No.	Characteristics	Symbol	Test Fig.	Test Conditions	Limits		Unit
					Min.	Max.	
13	Gain Band-Width Product	f_T	4(b)	f = 500MHz, V_{CE} = 5V Variant 01: I_C = 2mA Variant 02: I_C = 6mA Variant 03: I_C = 10mA Variant 04: I_C = 15mA Variant 05: I_C = 20mA Variant 06, 08: I_C = 40mA Variant 07: I_C = 70mA Notes 5 and 9	 5.5 6.5 6.5 6.5 6.5 6.5 6	 - - - - - - -	GHz
14	Output Power	P_{OUT}	4(b)	f = 2GHz, V_{CE} = 5V Variant 05: I_C = 30mA, P_{IN} = 7dBm Variant 06, 08: I_C = 50mA, P_{IN} = 10dBm Variant 07: I_C = 80mA, P_{IN} = 15d8m Notes 5 and 11	 13.5 16.5 18.5	 - - -	dBm
15	1/f Noise	F_{10Hz}	-	f = 10Hz, V_{CE} = 3V, I_C = 8mA, R = 2kΩ Variant 08 Notes 12, 13	-	300	nV/√Hz

NOTES

1. This is an alternative method of establishing $V_{(BR)CEO}$ and assures that $V_{(BR)CEO}$ for Variants 01 and 02 is > 8V and for Variants 03 to 08 is > 12V, if the stated base current is not exceeded.
2. Pulsed measurement Pulse Duration, < 1 second. For the purpose of V_{FBE} measurement, I_{Bmax} may be exceeded during a pulsed measurement provided that the pulse length duration < 1 second and I_C = 0mA.
3. The emitter is connected to the ground terminal.
4. The collector is connected to the ground terminal.
5. Measured in a 50Ω system.
6. Small signal measurement.
7. Input tuned for NF_{min}
8. MAG if K ≥ 1; MSG if K < 1.
9. $f_T = f \times |h_{21}|$, $h_{21} = \frac{-2.S_{21}}{(1-S_{11})(1+S_{22})+S_{12}.S_{21}}$
10. LTPD15 sample testing with the maximum allowed limit reduced by 0.2dB. In case of failure, 100% testing shall be applied.
11. LTPD15 sample testing with the minimum allowed limit increased by 0.5dB. In case of failure, 100% testing shall be applied.
12. Measured using a suitable noise analyser.
13. LTPD15 per wafer, sample testing. In case of failure, 100% testing shall be applied.

TABLE 3(a) - ELECTRICAL MEASUREMENTS AT HIGH TEMPERATURE

No.	Characteristics	Symbol	Test Fig.	Test Conditions	Limits		Unit
					Min.	Max.	
2	Collector Cut-off Current 2	I_{CBO2}	4(a)	I_E = 0mA Variants 01, 02: V_{CB} = 8.0V Variants 03 to 08: V_{CB} = 10V	-	10	µA

TABLE 3(b) - ELECTRICAL MEASUREMENTS AT LOW TEMPERATURE

No.	Characteristics	Symbol	Test Fig.	Test Conditions	Limits		Unit
					Min.	Max.	
6	DC Forward Current Transfer Ratio Note 1	h_{FE}	4(a)	Variants 01, 02: V_{CE} = 1V, I_C = 0.25mA Variants 03 to 05: V_{CE} = 6V, I_C = 5mA Variant 06, 08: V_{CE} = 8V, I_C = 30mA Variant 07: V_{CE} = 5V, I_C=50mA	10 30 30 30	- - - -	-

NOTES

This test shall be performed on 5 assembled samples per wafer. If a failure occurs, 100% measurements shall be performed.

FIGURE 4 - TEST CIRCUIT ELECTRICAL MEASUREMENTS

FIGURE 4(a) - TEST CIRCUIT FOR DC PARAMETERS

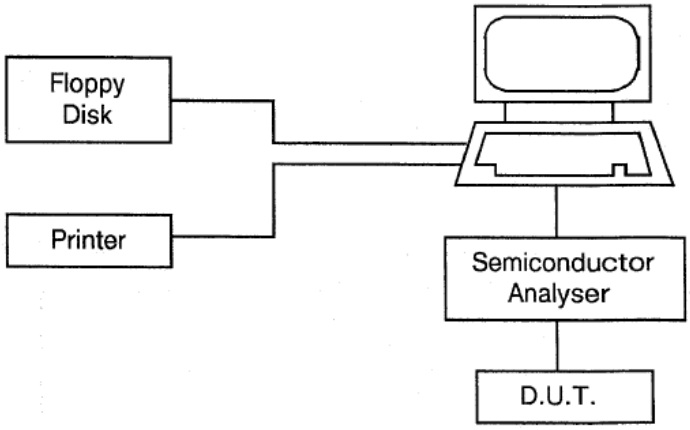


FIGURE 4(b) -TEST SET-UP FOR S-PARAMETER MEASUREMENT

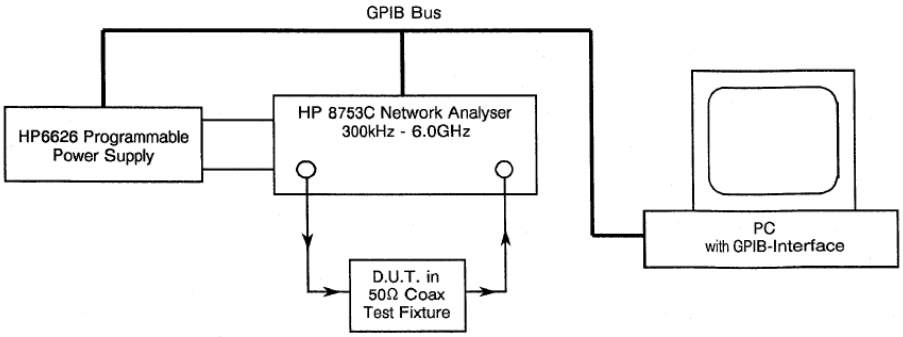


FIGURE 4(c) - TEST SET-UP FOR NOISE FIGURE MEASUREMENT

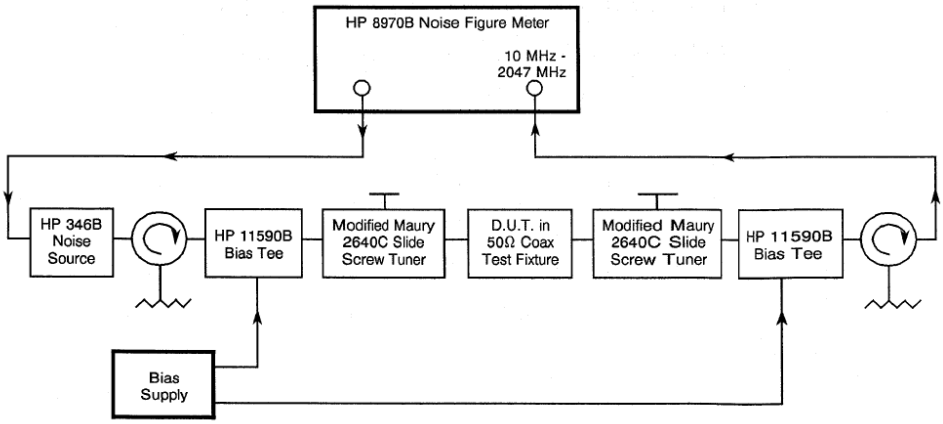


TABLE 4 - PARAMETER DRIFT VALUES

No.	Characteristics	Symbol	Spec. And/Or Test Method	Test Conditions	Change Limits (Δ)	Unit
2	Collector Cut-off Current 2	I_{CBO2}	As per Table 2	As per Table 2	±10 or (2) +100 / -50	nA % (3)
4	Emitter Cut-off Current 2	I_{EBO2}	As per Table 2	As per Table 2	±10 or (2) +100 / -50	nA % (3)
6	DC Forward Current Transfer Ratio	h_{FE}	As per Table 2	As per Table 2	±10	% (3)
7	Base-Emitter Forward Voltage	V_{FBE}	As per Table 2	As per Table 2	±10	% (3)

NOTES

1. Δ1 = Δ2.
2. Whichever is greater.
3. Referred to the initial measurement

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

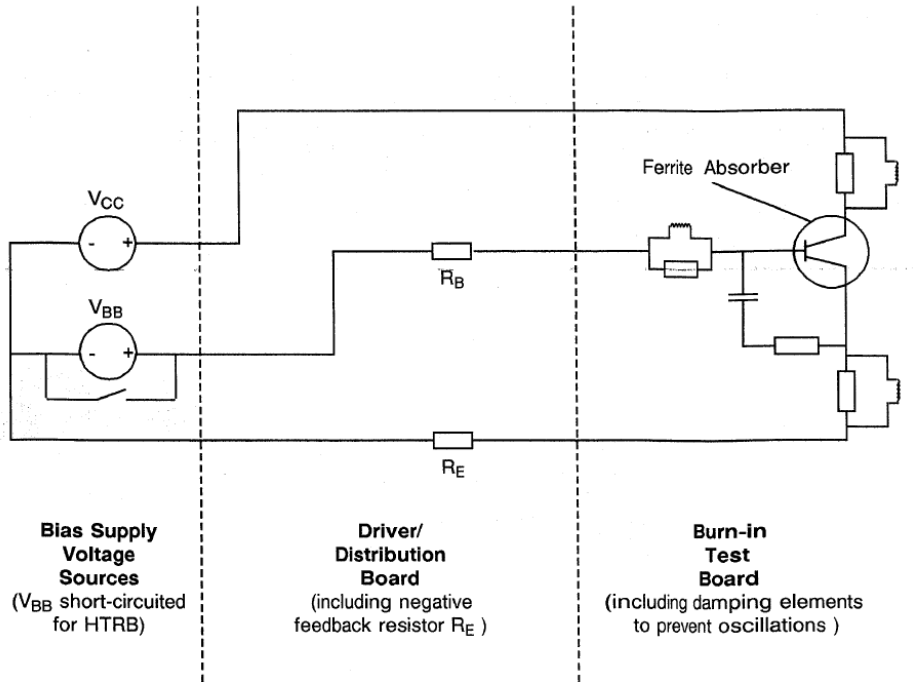
No.	Characteristics	Symbol	Conditions	Unit
1	Case Temperature	T_{case}	+150 (+0 -5)	ºC
2	Collector-Emitter Voltage	V_{CES}	Variants 01, 02: 12 Variants 03 to 08: 16	V

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

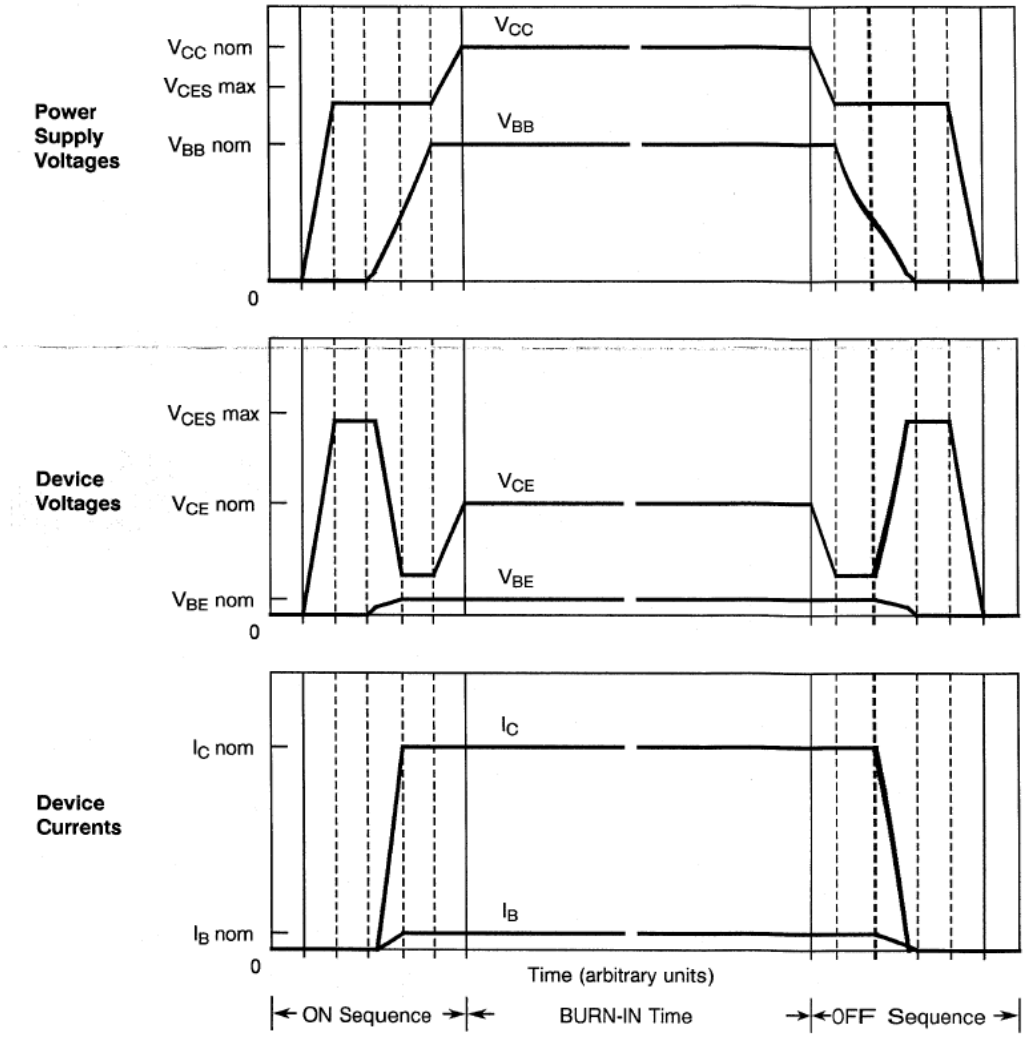
No.	Characteristics	Symbol	Conditions	Unit
1	Ambient Temperature	T_{amb}	Variants 01, 02: +175 Variant 03: +125 Variants 04 to 08: +100 (Note 1)	ºC
2	Junction Temperature	T_J	+200 (+0 -5)	ºC
3	Power Dissipation	P_{tot}	Variant 01: 26.2 Variant 02: 41.7 Variant 03: 147 Variant 04: 247 Variant 05: 267 Variant 06, 08: 317 Variant 07: 350	mW
4	Collector-Emitter Voltage	V_{CE}	Variants 01, 02: 6.4 Variants 03 to 08: 9.6	V

NOTES

1. Because the components are mechanically clamped within the Burn-in fixture, an additional thermal resistance soldering point to ambient, e.g. $R_{TH(S-A)}$ = 150 ºC/W must be considered for the calculation of T_J. T_{amb} shall be adjusted to provide the required T_J.


Ferrite Absorber
V_{CC}
V_{BB}
R_B
R_E
Bias Supply Voltage Sources (V_{BB} short-circuited for HTRB)
Driver/ Distribution Board (including negative feedback resistor R_E)
Burn-in Test Board (including damping elements to prevent oscillations)

TIMING SEQUENCE FOR POWER BURN-IN ON/OFF BIASING



NOTES

1. The maximum ratings shall not be exceeded during the ON- and OFF-sequence. The sketched ON- and OFF-sequence timing is regarding V_{CC} performed in two steps for the case that V_{CCnom} (= V_{CEnom} + I_{Enom} x R_E) exceeds the maximum ratings for V_{CES} (V_{CESmax})· In case that V_{CCnom} does not exceed V_{CESmax} a single step ON- and OFF-sequence may be used.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO. 5010)

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured on completion of environmental tests are scheduled in Table 2. Unless otherwise stated, the measurements shall be performed at T_{amb} = +25 ±3ºC.

4.8.2 Electrical Measurements at Intermediate Points and on Completion of Endurance Tests

The parameters to be measured at intermediate points and on completion of endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at T_{amb} = +25 ±3°C.

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

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 5010. The conditions for operating life testing are specified in Table 5(b) of this specification.

4.8.4 Electrical Circuits for Operating Life Tests

The circuit to be used for performance of the operating life test shall be the same as shown in Figure 5 of this specification for Burn-in.

4.9 TOTAL DOSE IRRADIATION TESTING

Not applicable.

4.10 SPECIAL TESTING

Not applicable.

TABLE 6 - ELECTRICAL MEASUREMENTS AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	CHARACTERISTICS	SYMBOL	TEST FIG.	TEST CONDITIONS	LIMITS		UNIT
					MIN.	MAX.	
1	Collector Cut-off Current 1	I_{CBO1}	As per Table 2	As per Table 2	-	120	µA
2	Collector Cut-off Current 2	I_{CBO2}	As per Table 2	As per Table 2	-	60	nA
4	Emitter Cut-off Current 2	I_{EBO2}	As per Table 2	As per Table 2	-	0.6	µA
6	DC Forward Current Transfer Ratio	h_{FE}	As per Table 2	As per Table 2 Variants 01, 02: Variant 03: Variant 04: Variant 05: Variant 06, 08: Variant 07:	 27 50 50 50 45 45	 190 190 185 175 190 190	-
7	Base-Emitter Forward Voltage	V_{FBE}	As per Table 2	As per Table 2	-	1.1	V

FIGURE 6 - BIAS CONDITIONS FOR IRRADIATION TESTING

Not applicable.

TABLE 7 - ELECTRICAL MEASUREMENTS DURING AND ON COMPLETION OF IRRADIATION TESTING

Not applicable.

APPENDIX A

AGREED DEVIATIONS FOR INFINEON TECHNOLOGIES (D)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.1	Paras. 5.2.4 and 10.5: If Wafer Lot Acceptance Test Data is specified in the purchase order, such data will not be delivered but will be available for review at Infineon Technologies.
Para. 4.2.3	Para. 9.12, Radiographic Inspection: Exposure 100kV, duration 5 minutes may be used.
Para. 4.2.5	Para. 8.2.3(e): Witnessing of LA3 testing by the Orderer shall be limited to Electrical Measurements at Room Temperature - DC Parameters. Notification of the Orderer shall be made 5 working days before the commencement of this testing.