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TRANSISTORS, LOW POWER, PNP

BASED ON TYPE 2N2905A

ESCC Detail Specification No. 5202/002

Issue 2 - Draft A June 2006





ISSUE 2 - Draft A

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187, TBD	Specification up issued to incorporate editorial and technical changes per DCR.



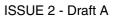




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1. **GENERAL**

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 <u>APPLICABLE DOCUMENTS</u>

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 <u>The ESCC Component Number</u>

The ESCC Component Number shall be constituted as follows:

Example: 520200201

Detail Specification Reference: 5202002

Component Type Variant Number: 01 (as required)

1.4.2 <u>Component Type Variants</u>

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

Variant Number	Based on Type	Case	Lead Material and Finish	Weight max g
01	2N2905A	TO-39	D2	1.2
02	2N2905A	TO-39	D3 or D4	1.2

The lead 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.

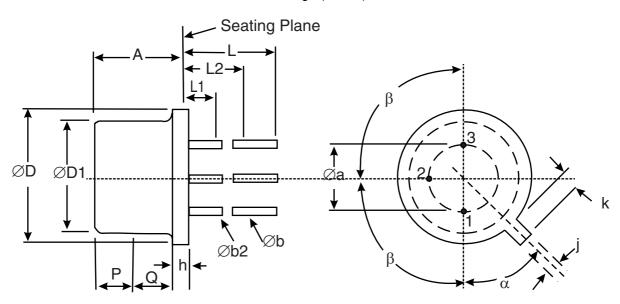
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.



Characteristics	Symbols	Maximum Ratings	Unit	Remarks
Collector-Base Voltage	V _{CBO}	-60	V	Over entire
Collector-Emitter Voltage	V _{CEO}	-60	V	operating temperature
Emitter-Base Voltage	V _{EBO}	-5	V	range
Collector Current	I _C	-600	mA	Continuous
Power Dissipation	P _{tot1}	0.6	W	At T _{amb} ≤ +25°C Note 1
	P _{tot2}	3	W	At T _{case} ≤ +25°C Note 1
Operating Temperature Range	T _{op}	-65 to +200	°C	Note 2
Storage Temperature Range	T _{stg}	-65 to +200	°C	Note 2
Soldering Temperature	T _{sol}	+260	°C	Note 3

- For T_{amb} or $T_{case} > +25^{\circ}$ C, derate linearly to 0W at +200°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.

PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION 1.6 Metal Can Package (TO-39) - 3 lead



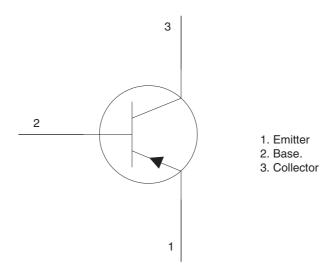
Symbols	Dimensi	Notes	
Symbols	Min	Max	Notes
Øa	4.83	5.35	
Α	6	6.6	
Øb	0.4	0.533	2, 3



Symbols	Dimension	Notes	
Symbols	Min	Max	Notes
Øb2	0.4	0.483	2, 3
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
Р	2.54	-	5
Q	-	-	6
α	45° E	1, 7	
β	90° E	BSC	1

- 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 <u>FUNCTIONAL DIAGRAM</u>





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

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 <u>Deviations from the Generic Specification</u>

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 <u>TERMINAL STRENGTH</u>

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 <u>ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES</u>

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



2.4.1 Room Temperature Electrical Measurements

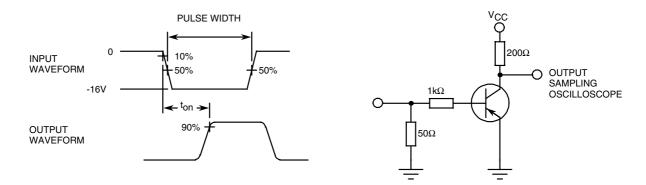
The measurements shall be performed at T_{amb} =+22 ±3°C.

Characteristics	Symbols	MIL-STD-750	Test Conditions	Lin	nits	Units
		Test Method		Min	Max	
Collector-Base Breakdown Voltage	V _{(BR)CBO}	3001	I _E = -10μA Bias condition D	-60	-	V
Collector-Emitter Breakdown Voltage	V _{(BR)CEO}	3011	I _C = -10mA Bias condition D Note 1	-60	-	V
Emitter-Base Breakdown Voltage	V _{(BR)EBO}	3026	I _E = -10μA Bias condition D	-5	-	V
Collector-Base Cut-off Current	I _{CBO}	3036	V _{CB} = -50V Bias condition D	-	-10	nA
Forward-Current	h _{FE1}	3076	V_{CE} =-10V ; I_{C} =-100 μ A	75	-	-
Transfer Ratio	h _{FE2}	3076	V _{CE} =-10V ; I _C =-1mA	100	-	-
	h _{FE3}	3076	V _{CE} =-10V ; I _C =-150mA Note 1	100	300	-
	h _{FE4}	3076	V _{CE} =-10V ; I _C =-500mA Note 1	50	-	-
Collector-Emitter Saturation Voltage	V _{CE(sat)}	3071	I _C =-150mA I _B =-15mA Note 1	-	-400	mV
Base-Emitter Saturation Voltage	V _{BE(sat)}	3066	I _C =-150mA I _B =-15mA Test condition A Note 1	-	-1.3	V
Magnitude of Small-Signal Short-Circuit Forward-Current Transfer Ratio	lh _{fe} l	3306	V _{CE} =-20V, I _C =-50mA f=100MHz Note 2	2	-	-
Output Capacitance	C _{obo}	3236	V _{CB} =-10V, I _E =0A 100kHz≤f≤1MHz Note 2	-	8	pF
Turn-on Time	t _{on}	-	V _{CC} =-30V I _C =-150mA I _B =-15mA Notes 2, 3	-	45	ns

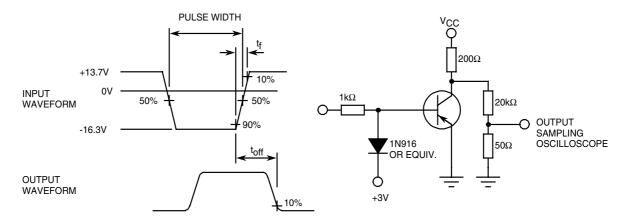


Characteristics	Symbols	MIL-STD-750 Test Conditions	Limits		Units	
		Test Method		Min	Max	
Turn-off Time	t _{off}	-1	V_{CC} =-30V I_{C} =-150mA I_{B} =-15mA Notes 2, 4	-	300	ns

- Pulse measurement: Pulse Width ≤ 300µs, Duty Cycle ≤ 2%
- 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_{on} shall be measured using the following test circuit. The input waveform shall be supplied by a pulse generator with the following characteristics: $Z_{OUT} = 50\Omega$, $t_r \le 2$ ns, Pulse Width = 200 ± 10 ns, Duty Cycle $\le 2\%$. The output waveform shall be monitored on an oscilloscope with the following characteristics: $Z_{IN} \ge 100$ k Ω , input capacitance ≤ 12 pF, $t_r \le 5$ ns.



4. t_{off} shall be measured using the following test circuit. The input waveform shall be supplied by a pulse generator with the following characteristics: $Z_{OUT} = 50\Omega$, $t_f \le 2$ ns, Pulse Width = 10 to 100 μ s, Duty Cycle ≤ 2 %. The output waveform shall be monitored on an oscilloscope with the following characteristics: $Z_{IN} \ge 100$ k Ω , input capacitance ≤ 12 pF, $t_r \le 5$ ns.





2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols MIL-STD-750 Test Conditions		Lin	nits	Units	
		Test Method	Note 1	Min	Max	
Collector-Base Cut-off Current	I _{CBO}	3036	T _{amb} =+150 (+0 -5)°C V _{CB} =-50V Bias condition D	-	-10	μА

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.

2.5 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 (Δ) shall not be exceeded for each characteristic specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols		Units			
	Drift				olute	
		Value Δ	Min	Max		
Collector-Base Cut-off Current	Ісво	±2 or (1) ±100%	-	-10	nA	
Forward-Current Transfer Ratio 3	h _{FE3}	±15%	100	300	-	
Collector-Emitter Saturation Voltage	V _{CE(sat)}	±50 or (1) ±15%	-	-400	mV	

NOTES:

Whichever is the greater referred to initial value.

2.6 <u>INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS</u>

Unless otherwise specified, the measurements shall be performed at T_{amb} =+22 ±3°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.



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Characteristics	Symbols	Lin	nits	Units
		Min	Max	
Collector-Base Cut-off Current	I _{CBO}	-	-10	nA
Forward-Current Transfer Ratio 3	h _{FE3}	100	300	-
Collector-Emitter Saturation Voltage	V _{CE(sat)}	-	-400	mV

2.7 <u>HIGH TEMPERATURE REVERSE BIAS BURN-IN CONDITIONS</u>

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T _{amb}	+150 (+0 -5)	°C
Collector-Base Voltage	V _{CB}	50	V
Duration	t	72 minimum	Hours

2.8 <u>POWER BURN-IN CONDITIONS</u>

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T _{amb}	+20 to +50	°C
Power Dissipation	P _{tot}	As per Maximum Ratings P _{tot1} derated at the chosen T _{amb}	W
Collector-Base Voltage	V _{CB}	-40	V

2.9 <u>OPERATING LIFE CONDITIONS</u>

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



APPENDIX 'A'

AGREED DEVIATIONS FOR STMICROELECTRONICS (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Deviations from Room Temperature Electrical Measurements	All AC characteristics (Room Temperature Electrical Measurement Note 2) may be considered guaranteed but not tested if successful pilot lot testing has been performed on the wafer lot which includes AC characteristic measurements per the Detail Specification. A summary of the pilot lot testing shall be provided if required by the Purchase Order.
Deviations from High and Low Temperatures Electrical Measurements	All characteristics specified may be considered guaranteed but not tested if successful pilot lot testing has been performed on the wafer lot which includes characteristic measurements at high and low temperatures per the Detail Specification. A summary of the pilot lot testing shall be provided if required by the Purchase Order.