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DCR TBD



Pages 1 to 15

**TRANSISTORS, LOW POWER, NPN**

**BASED ON TYPE 2N2484**

**ESCC Detail Specification No. 5201/001**

<i>B</i> Issue 3 - Draft <i>A</i>	<i>September.</i> January 2005
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DCR No.	CHANGE DESCRIPTION
TBD	Specification up issued to incorporate editorial and technical changes per DCR.

154, 187, TBD

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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: 520100101

- Detail Specification Reference: 5201001
- 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/or Finish	Weight max g
01	2N2484	TO-18	D2	0.4
02	2N2484	TO-18	D3 or D4	0.4
04	2N2484	CCP	2	0.06
05	2N2484	CCP	4	0.06

The lead/terminal material and/or 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.

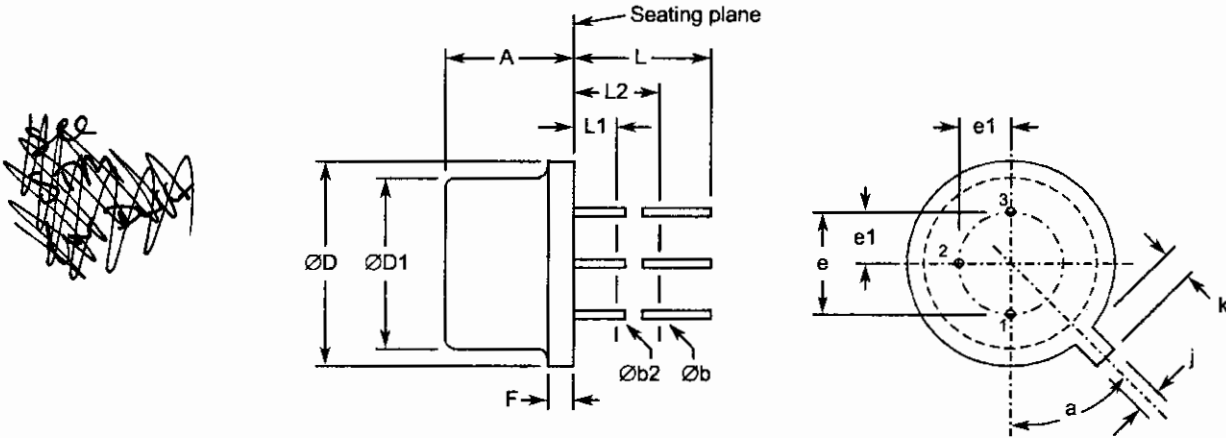
Characteristics	Symbols	Maximum Ratings	Unit	Remarks
Collector-Base Voltage	$V_{CBO}$	60	V	Over entire operating temperature range
Collector-Emitter Voltage	$V_{CEO}$	60	V	
Emitter-Base Voltage	$V_{EBO}$	6	V	
Collector Current <i>(Continuous)</i>	$I_C$	50	mA	<i>Continuous</i>
Power Dissipation For TO-18 and CCP For CCP For TO-18	$P_{tot1}$	0.36	W	At $T_{amb} \leq +25^\circ C$ Note 1
	$P_{tot2}$	0.73 (Note 2)	W	
	$P_{tot3}$	1.2	W	At $T_{case} \leq +25^\circ C$ Note 1
Operating Temperature Range	$T_{op}$	-65 to +200	$^\circ C$	Note 3
Storage Temperature Range	$T_{stg}$	-65 to + 200	$^\circ C$	Note 3
Soldering Temperature For TO-18 For CCP	$T_{sol}$	+260 +245	$^\circ C$	Note 4 Note 5

**NOTES:**

1. For  $T_{amb}$  or  $T_{case} > +25^\circ C$ , derate linearly to 0W at +200 $^\circ C$ .
2. When mounted on a 15 x 15 x 0.6mm ceramic substrate.
3. 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.
4. 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.
5. Duration 5 seconds maximum and the same terminal shall not be resoldered until 3 minutes have elapsed.

1.6 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

1.6.1 Metal Can Package (TO-18) - 3 lead



Symbols	Dimensions mm		Notes
	Min	Max	
A	4.32	5.33	
Øb	0.406	0.533	# 2, 3
Øb2	0.406	0.483	# 2, 3
ØD	5.31	5.84	
ØD1	4.52	4.95	
e	2.54 TYPICAL		2 4
e1	1.27 TYPICAL		2 4
F	-	0.762	
j	0.914	1.17	
k	0.711	1.22	# 5
L	12.7	-	# 2
L1	-	1.27	+ 3
L2	6.35	-	+ 3
a	45° TYPICAL		# 4, 6

BSC

45° BSC

make 'o' bigger

NOTES:

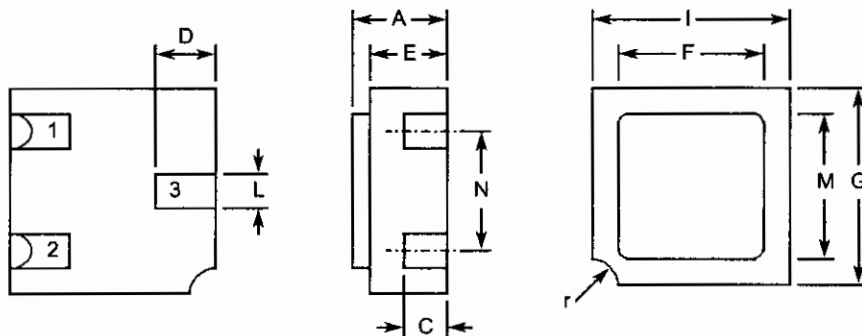
1. ~~Øb2~~ Øb2 applies between L1 and L2. Øb applies between L2 and 12.7mm from the seating plane. Diameter is uncontrolled within L1 and beyond 12.7mm from the seating plane.
2. Leads having maximum diameter 0.483mm measured in the gauging plane 1.37(+0.025,-0)mm below the seating plane of the device shall be within 0.178mm of their true position relative to a

- 1 Terminal identification is specified by reference to the tab position where lead 1 = emitter, lead 2 = base, lead 3 = collector.
2. Applies to all leads.

5, 9, 3.  
6, 8, 4.

maximum-width-tab.  
Measured from the maximum diameter of the actual device.  
Tab centreline.

1.6.2 Chip Carrier Package (CCP) - 3 terminal



Symbols	Dimensions mm		Notes
	Min	Max	
A	1.15	1.5	<p>+ 2</p> <p>+ 2</p> <p>+ 2</p> <p>1</p>
C	0.45	0.56	
D	0.6	0.91	
E	0.91	1.12	
F	1.9	2.15	
G	2.9	3.25	
I	2.4	2.85	
L	0.4	0.6	
M	2.4	2.65	
N	1.8	2	
r	0.3 TYPICAL		

**NOTES:**

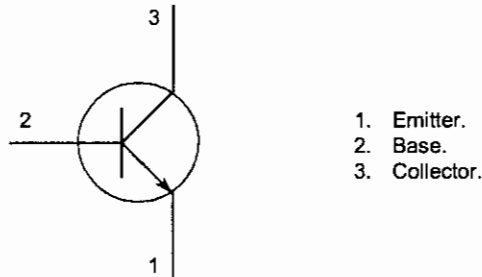
2 The three terminals have the same dimensions.

*Applies to all terminals*

1 Terminal identification is specified by reference to the corner notch position where terminal 1 = emitter, terminal 2 = base, terminal 3 = collector.



## 1.7 FUNCTIONAL DIAGRAM



### NOTES:

1. For TO-18, the collector is internally connected to the case.

2. For CCP, the lid is not connected to any terminal.

(DCR187)

## 1.8 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

### a) Case

For the metal can package the case shall be hermetically sealed and have a metal body with hard glass seals.

For the chip carrier package the case shall be hermetically sealed and have a ceramic body with a Kovar lid.

### 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

##### (a) Deviation from Screening Tests - Chart F3

High Temperature Reverse Bias Burn-in and the subsequent Final Measurements for HTRB shall be omitted.

## 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) Terminal identification.~~
- (a) (b) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) (a) The ESCC Component Number.
- (c) (d) Traceability information.

### 2.3 TERMINAL STRENGTH

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

For TO-18, 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	60	-	V
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	3011	$I_C = 10mA$ , Bias Note 1 condition D,	60	-	V
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	3026	$I_E = 10\mu A$ , Bias condition D	6	-	V
Collector-Base Cut-off Current	$I_{CBO}$	3036	$V_{CB} = 45V$ , Bias condition D	-	10	nA
Emitter-Base Cut-off Current	$I_{EBO}$	3061	$V_{EB} = 5V$ , Bias condition D	-	10	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$ sat	3071	$I_C = 1mA$ $I_B = 0.1mA$ Note 1	-	350	mV
Forward Current Transfer Ratio	$h_{FE1}$	3076	$V_{CE} = 5V$ ; $I_C = 1\mu A$	30	-	-
	$h_{FE2}$	3076	$V_{CE} = 5V$ ; $I_C = 10\mu A$	100	500	-
	$h_{FE3}$	3076	$V_{CE} = 5V$ ; $I_C = 100\mu A$	175	550	-
	$h_{FE4}$	3076	$V_{CE} = 5V$ ; $I_C = 1mA$	250	650	-
	$h_{FE5}$	3076	$V_{CE} = 5V$ ; $I_C = 10mA$ Note 1	-	800	-
High Frequency Small Signal Current Gain	$h_{fe1}$	3306	$V_{CE} = 5V$ , $I_C = 50\mu A$ $f = 5MHz$ Note 2	3	-	-
	$h_{fe2}$	3306	$V_{CE} = 5V$ , $I_C = 500\mu A$ $f = 30MHz$ Note 2	2	-	-
Small Signal Current Gain	$h_{fe3}$	3206	$V_{CE} = 5V$ , $I_C = 1mA$ $f = 1kHz$ Note 2	150	900	-
Output Capacitance	$C_{obo}$	3236	$V_{CB} = 5V$ , $I_E = 0A$ $f = 1MHz$ Note 2	-	6	pF
Input Capacitance	$C_{ibo}$	3240	$V_{EB} = 500mV$ $I_C = 0A$ $f = 1MHz$ Note 2	-	6	pF

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Small Signal Input Impedance	$h_{ie}$	3201	$V_{CE}=5V$ , $I_C=1mA$ $f=1kHz$ Note 2	3.5	24	$k\Omega$
Small Signal Output Admittance	$h_{oe}$	3216	$V_{CE}=5V$ , $I_C=1mA$ $f=1kHz$ Note 2	-	40	$\mu mho$
Small Signal Reverse Voltage Transfer Ratio	$h_{re}$	3211	$V_{CE}=5V$ , $I_C=1mA$ $f=1kHz$ Note 2	-	$8 \times 10^{-4}$	-
Wide-Band Noise Figure	$NF_W$	3246	$f=10Hz$ to $10kHz$ $V_{CE}=5V$ , $I_C=10\mu A$ $R_S=10k\Omega$ Note 2	-	3	dB
Spot Noise Figure	NF1 NF2 NF3	3246	$V_{CE}=5V$ , $I_C=10\mu A$ $R_S=10k\Omega$ $BW=f \pm 10\%$ $f=100Hz$ $f=1kHz$ $f=10kHz$ Note 2	- - -	10 3 2	dB

**NOTES:**

1. Pulse measurement: Pulse Width  $\leq 300\mu s$ , 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.

2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	MIL-STD-883 Test Method	Test Conditions Note 1	Limits		Units
				Min	Max	
Collector-Base Cut-off Current	$I_{CBO}$	3036	$T_{amb}=+150(+0-5)^{\circ}C$ $V_{CB}=45V$ , Bias Condition D	-	10	$\mu A$
Forward Current Transfer Ratio 2	$h_{FE2}$	3076	$T_{amb}=-55(+5-0)^{\circ}C$ $V_{CE}=5V$ $I_C=10\mu A$	20	-	-

**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 ( $\Delta$ ) 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	$I_{CBO}$	$\pm 5$ or (1) $\pm 100\%$	-	10	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$\pm 30$ or (1) $\pm 15\%$	-	350	mV
Forward Current Transfer Ratio 4	$h_{FE4}$	$\pm 15\%$	250	650	-

**NOTES:**

1. Whichever is the greater referred to the 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	$I_{CBO}$	-	10	nA
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	-	350	mV
Forward Current Transfer Ratio 4	$h_{FE4}$	250	650	-

2.7 POWER BURN-IN CONDITIONS

Characteristics	Symbols	Limits	Units
Ambient Temperature	$T_{amb}$	+20 to +50	°C
Power Dissipation	$P_{tot}$	As per Maximum Ratings $P_{tot}$ derated at the chosen $T_{amb}$	W
Collector-Base Voltage	$V_{CB}$	27	V

2.8 OPERATING LIFE CONDITIONS

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

**APPENDIX 'A'**

**AGREED DEVIATIONS FOR STMICROELECTRONICS (F)**

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS					
Deviations from Production Control-Chart F2	<p>Special In-process Control Internal Visual Inspection.            For CCP packages the criteria specified for voids in the fillet and minimum die mounting material around the visible die perimeter for die mounting defects may be omitted providing that a radiographic inspection to verify the die-attach process is performed on a sample basis in accordance with STMicroelectronics procedure 0076637.</p>					
Deviations from Room Temperature Electrical Measurements	<p>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.</p> <p>A summary of the pilot lot testing shall be provided if required by the Purchase Order.</p> <p>Characteristics <math>h_{fe1}</math>, and <math>C_{ibo}</math>, shall be as follows:</p>					
Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min.	Max.	
High Frequency Small Signal Current Gain 1	$h_{fe1}$	3306	$V_{CE}=5V$ $I_C=50\mu A$ $f=5MHz$ Note 2	1	-	-
Input Capacitance	$C_{ibo}$	3240	$V_{EB}=500mV$ $I_C=0A$ $f=1MHz$ Note 2	-	15	pF



Deviations from High and Low Temperatures Electrical Measurements	<p>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.</p>
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