European Space Components Coordination

Pages 1 to 18

TRANSISTORS, HIGH POWER, NPN

BASED ON TYPE 2N5154

ESCC Detail Specification No. 5203/010

as applicable

Issue ~~3~~ 4 - Draft A	~~April 2007~~

Document Custodian: European Space Agency - see https://escies.org

as applicable

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DOCUMENTATION CHANGE NOTICE

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

DCR No.	CHANGE DESCRIPTION
~~187, 276~~ 429, 447, tbd	Specification up issued to incorporate editorial and technical changes per DCRs.

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: 520301001

- Detail Specification Reference: 5203010
- 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	2N5154	TO-39	D2	1.5
02	2N5154	TO-39	D3 or D4	1.5
03	2N5154	TO-39	D7	1.5
04	2N5154	TO-257	H2	5
05	2N5154	TO-257	H4	5
06	2N5154	SMD.5	Q14	2
07	2N5154	SMD.5	Q14	2

(DCR 429 refers)

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}	100	V	Over T_{op}
Collector-Emitter Voltage	V_{CEO}	80	V	Over T_{op} Note ~~5~~ 4
Emitter-Base Voltage	V_{EBO}	6	V	Over T_{op}
Collector Current	I_C	5	A	Continuous Note ~~5~~ 4
Base Current	I_B	1	A	Continuous
Power Dissipation For TO-39 For TO-257 and SMD.5	P_{tot1}	 1 3.3	W	At $T_{amb} \leq +25^{\circ}C$ ~~Notes 1~~
For TO-39 For TO-257 and SMD.5	P_{tot2}	8.75 35	W	At $T_{case} \leq +25^{\circ}C$ ~~Notes 1~~
Operating Temperature Range	T_{op}	-65 to +200	°C	Note ~~2~~ 1
Storage Temperature Range	T_{stg}	-65 to +200	°C	Note ~~2~~ 1
Soldering Temperature For TO-39 and TO-257 For SMD.5	T_{sol}	 +260 +245	°C	 Note ~~3~~ 2 Note ~~4~~ 3
Thermal Resistance, Junction-to-Case For TO-39 For TO-257 and SMD.5	$R_{th(j-c)}$	 20 5	°C/W	

make ° bigger

NOTES:

~~1. For T_{amb} or $T_{case} \geq +25^{\circ}C$, derate linearly to 0W at +200°C.~~

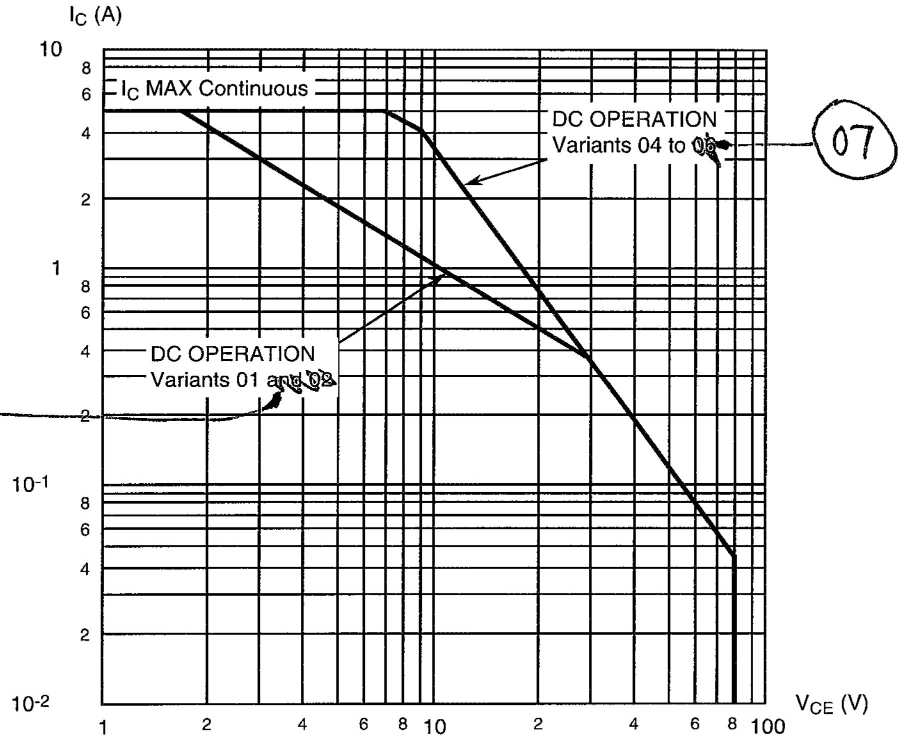
1. ~~2.~~ For Variants with tin-lead plating or hot solder dip lead finish all testing performed at $T_{amb} > +125^{\circ}C$ shall be carried out in a 100% inert atmosphere.
2. ~~3.~~ Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.
3. ~~4.~~ Duration 5 seconds maximum and the same package shall not be resoldered until 3 minutes have

Thermal Resistance, Junction-to-Ambient For TO-39 For TO-257 and SMD.5	$R_{th(j-a)}$	 175 53	°C/W	

elapsed.

4.~~5~~ Safe Operati~~on~~ng Area applies as follows:

Maximum Safe Operating Area Graph



07 } (DCR 429 refers)

to 03

1.6 HANDLING PRECAUTIONS

The TO-257 package contains Beryllium Oxide (BeO) and therefore it must not be ground, machined, sandblasted or subjected to any mechanical operation which will produce dust. The case must not be subjected to any chemical process (e.g. etching) which will produce fumes.

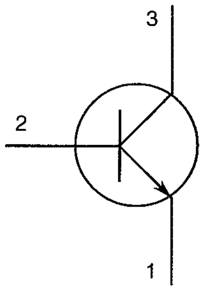
(base for Variant 07)

NOTES:

1. Terminal identification is specified by the components geometry where Terminal 1 = emitter, Terminal 2 = base and Terminal 3 = collector.
2. 2 places.

(emitter for Variant 07)

1.8 FUNCTIONAL DIAGRAM



Variants 01 to 06

1. Emitter.
2. Base.
3. Collector.

~~Base.~~
~~Emitter.~~
~~3. Collector.~~

NOTES:

1. For TO-39, the collector is internally connected to the case.
2. For TO-257, the case is not connected to any lead.
3. For SMD.5, the lid is not connected to any terminal.

1.9 MATERIALS AND FINISHES

Materials and finishes shall be as follows:

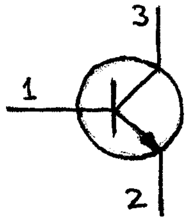
a) Case
For the metal can package the case shall be hermetically sealed and have a metal body with hard glass seals.
For the metal flange mount package the case shall be hermetically sealed and have a metal body. The leads pass through ceramic eyelets brazed into the frame and the lid shall be welded.
For the surface mount 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.



Variant 07

1. Base.
2. Emitter.
3. Collector.

(DCR 429 refers)

allowed. Alternatively a 100% inspection may be performed.

2. Pulse measurement: Pulse Width ≤ 300µs, Duty Cycle ≤ 2%

2.6 PARAMETER DRIFT VALUES

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 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	Limits			Units
		Drift Value Δ	Absolute		
			Min	Max	
Collector-Emitter Cut-off Current	I_{CES}	±100	-	1000	nA
Forward-Current Transfer Ratio 2	h_{FE2}	±25%	70	200	-
Collector-Emitter Saturation Voltage 1	$V_{CE(sat)1}$	±100	-	1500	mV

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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.

Characteristics	Symbols	Limits		Units
		Min	Max	
Collector-Emitter Cut-off Current	I_{CES}	-	1	µA
Forward-Current Transfer Ratio 2	h_{FE2}	70	200	-
Collector-Emitter Saturation Voltage 1	$V_{CE(sat)1}$	-	1.5	V

2.8 POWER BURN-IN CONDITIONS

2.8.1 Power Burn-in Conditions (TO-39)

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+20 to +50 (1)	°C
Power Dissipation	P_{tot}	As per Maximum Ratings. P_{tot1} ~~derated~~ at the chosen T_{amb} using the	W
Collector-Base Voltage	V_{CB}	20	V

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Specified $R_{th(j-a)}$.

NOTES:

1. No heat sink nor forced air directly on the device shall be permitted.

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2.8.2 Power Burn-in Conditions (TO-257 and SMD.5)

Characteristics	Symbols	Conditions	Units
Case Temperature	T_{case}	+100 (+0 -5)	°C
Power Dissipation	P_{tot}	As per Maximum Ratings P_{tot2} ~~derated~~ at the specified T_{case}	W
Collector-Base Voltage	V_{CB}	20	V

2.9 OPERATING LIFE CONDITIONS

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

using the specified $R_{th(j-c)}$

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.
Deviations from Screening Tests - Chart F3	Solderability is not applicable unless specifically stipulated in the Purchase Order.

(Approved DCR 447 refers)