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TRANSISTORS, HIGH POWER, NPN

BASED ON TYPE 2N5672

ESCC Detail Specification No. 5203/004

Issue 2 - Draft A	April 2007

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DOCUMENTATION CHANGE NOTICE

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DCR No.	CHANGE DESCRIPTION
187, TBD	Specification up issued to incorporate editorial and technical changes per DCR.

TABLE OF CONTENTS

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: 520300401

- Detail Specification Reference: 5203004
- Component Type Variant Number: 01

1.4.2 Component Type Variants

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	2N5672	TO-3	D2	18
02	2N5672	TO-3	H7	18
03	2N5672	TO-3	H9	18

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.

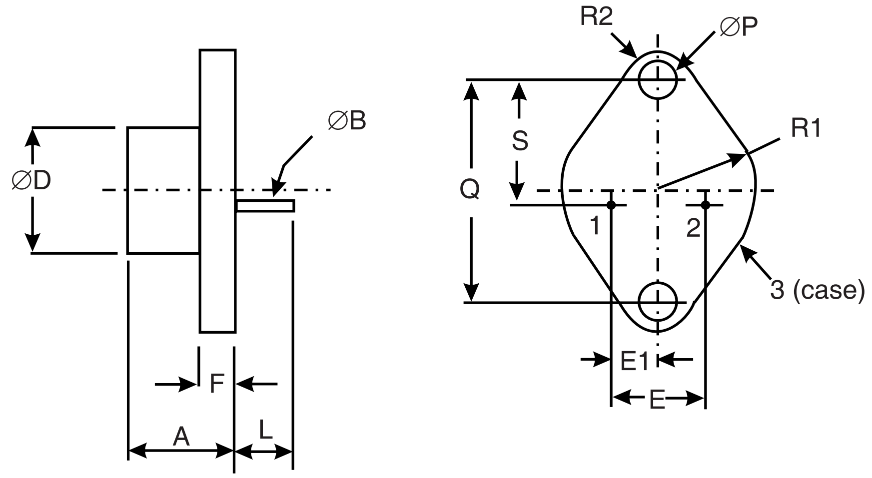
Characteristics	Symbols	Maximum Ratings	Unit	Remarks
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	150	V	Over T_{op}
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	120	V	Over T_{op}
Emitter-Base Breakdown Voltage	$V_{(BR)EBO}$	7	V	Over T_{op}
Collector Current	I_C	30	A	
Base Current	I_B	10	A	
Power Dissipation	P_{tot}	140	W	At $T_{case} \leq +25^\circ C$ Note 1
Operating Temperature Range	T_{op}	-65 to +200	^{o}C	Note 2
Storage Temperature Range	T_{stg}	-65 to +200	^{o}C	Note 2
Soldering Temperature	T_{sol}	+260	^{o}C	Note 3

NOTES:

1. For $T_{case} > +25^{o}C$, derate linearly to 0W at $+200^{o}C$.
2. For Variants with tin-lead plating or hot solder dip lead finish all testing performed at $T_{amb} > +125^{o}C$ shall be carried out in a 100% inert atmosphere.
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.

1.6 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION

Metal Flange Mount Package (TO-3) - 2 lead



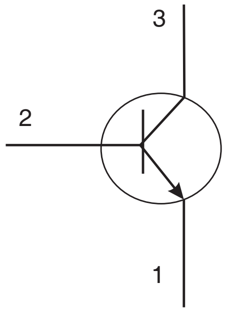
Symbols	Dimensions mm		Notes
	Min	Max	
A	6.35	11.43	
ØB	0.97	1.09	2
ØD	-	22.23	

Symbols	Dimensions mm		Notes
	Min	Max	
E	10.67	11.18	
E1	5.21	5.72	
F	1.27	3.43	
L	7.92	-	
ØP	3.84	4.09	3
Q	29.9	30.4	
R1	12.57	13.34	
R2	3.33	4.78	
S	16.54	17.15	

NOTES:

1. Terminal identification is specified by the component’s geometry where Lead 1 = emitter, Lead 2 = base and Terminal 3 (case) = collector.
2. Applies to both leads.
3. Applies to both mounting holes.

1.7 FUNCTIONAL DIAGRAM



NOTES:

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.

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 Deviations from the Generic Specification

2.1.1.1 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) The ESCC qualified components symbol (for ESCC qualified components only).
(b) The ESCC Component Number.
(c) Traceability information.

2.3 TERMINAL STRENGTH

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

Test condition A, tension, with an applied force of 10N for a duration of 10s.

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

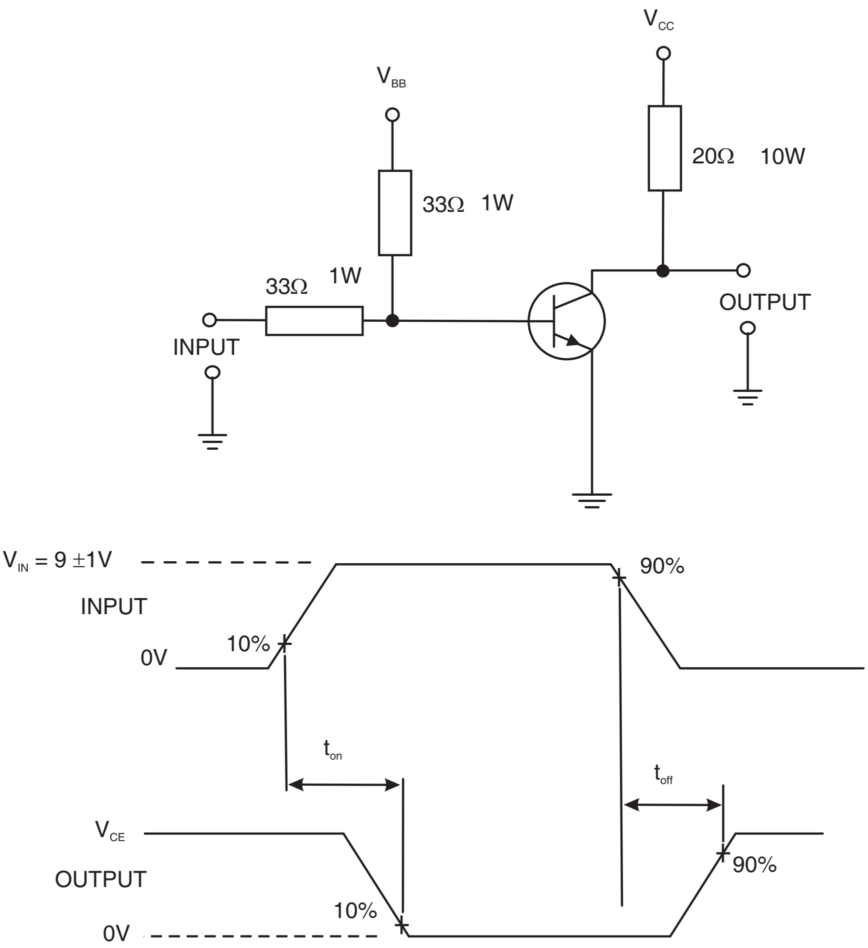
The measurements shall be performed at $T_{amb}=+22 \pm 3^{o}C$.

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Collector-Emitter Breakdown Voltage	$V_{(BR)CEO}$	3011	I_C = 200mA Bias condition D Note 1	120	-	V
	$V_{(BR)CEX}$	3011	I_C = 200mA V_{BE}=-1.5V Bias condition C	150	-	V
	$V_{(BR)CER}$	3011	I_C = 200mA R_{BE}=50Ω Bias condition B	140	-	V
Collector-Emitter Cut-off Current	I_{CEX}	3041	V_{CE}=135V V_{BE}=-1.5V Bias condition A	-	10	mA
	I_{CEO}	3041	V_{CE} =80V Bias condition D	-	10	mA
Emitter-Base Cut-off Current	I_{EBO}	3061	V_{EB} =7V Bias condition D	-	10	mA
Forward-Current Transfer Ratio	h_{FE1}	3076	V_{CE}=5V ; I_C =20A Note 1	20	-	-
	h_{FE2}	3076	V_{CE}=2V ; I_C =15A Note 1	20	100	-
Base-Emitter Voltage	V_{BE}	3020	I_C=15A V_{CE}=5V Note 1	-	1.6	V
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	3071	I_C=15A I_B=1.2A Note 1	-	750	mV
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	3066	I_C=15A I_B=1.2A Test condition A Note 1	-	1.5	V
Magnitude of Small-Signal Short-Circuit Forward-Current Transfer Ratio	$\|h_{fe}\|$	3306	V_{CE}=10V, I_C=2A f=5MHz Note 2	10	-	-
Output Capacitance	C_{obo}	3236	V_{CB}=10V, I_E=0A f=1MHz Note 2	-	900	pF

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions	Limits		Units
				Min	Max	
Turn-on Time	t_{on}	3251	I_C=15A, I_{B1}=1.2A I_{B2}=1.2A V_{CC}=30 ±2V V_{BB}=4 ± 1V V_{IN}=9 ±1V Test condition A Notes 2, 3	-	500	ns
Turn-off Time	t_{off}	3251	I_C=15A, I_{B1}=1.2A I_{B2}=1.2A V_{CC}=30 ±2V V_{BB}=4 ±1V V_{IN}=9 ±1V Test condition A Notes 2, 3	-	1.5	µs

NOTES:

1. Pulsed 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} and t_{off} shall be measured using the following test circuit. The input waveform shall be supplied by a pulse generator with the following characteristics: $t_r=t_f \leq$ 20ns, Pulse Width = 20µs, Duty Cycle = 2%. The output sampling oscilloscope shall have the characteristics $Z_{IN} \geq$ 100kΩ, $C_{IN} \leq$ 50pF and $t_r \leq$ 20ns. Adjustment of V_{IN} shall be made with a suitable current probe to achieve the specified I_{B1} and I_{B2} test conditions, where I_{B1} is the on-state base current and I_{B2} is the post off-state base current.



2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	MIL-STD-750 Test Method	Test Conditions Note 1	Limits		Units
				Min	Max	
Collector-Emitter Cut-off Current	I_{CEX}	3041	T_{case}=+150(+0 -5)^{o}C V_{CE} = 100V V_{BE}=-1.5V Bias condition A	-	10	mA

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 ±3^{o}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_{CEO}	±500 or (1) ±100%	-	10000	µA
Forward-Current Transfer Ratio 2	h_{FE2}	±15%	20	100	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	±15%	-	750	mV

NOTES:

1. Whichever is 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 ±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_{CEO}	-	10	mA
Forward-Current Transfer Ratio 2	h_{FE2}	20	100	-
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	-	750	mV

2.7 POWER BURN-IN CONDITIONS

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