

### Features

$BV_{CEO}$	80 V
$I_C$ (max)	5 A
$H_{FE}$ at 10 V - 150 mA	> 70
Operating temperature range	-65°C to +200°C

- Hi-Rel PNP bipolar transistor
- Linear gain characteristics
- ESCC qualified
- European preferred part list - EPPL
- Radiation level: lot specific total dose contact marketing for specified level

### Description

The 2N5153HR is a silicon planar epitaxial PNP transistor in TO-39, TO-257 and SMD.5 packages. It is specifically designed for aerospace Hi-Rel applications and ESCC qualified according to the 5204-002 specification. In case of conflict between this datasheet and ESCC detailed specification, the latter prevails.

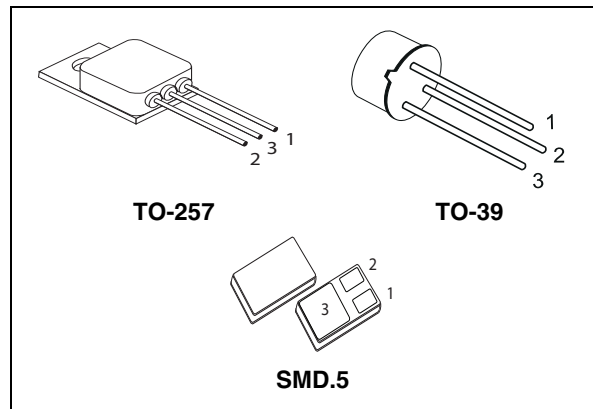


Figure 1. Internal schematic diagram

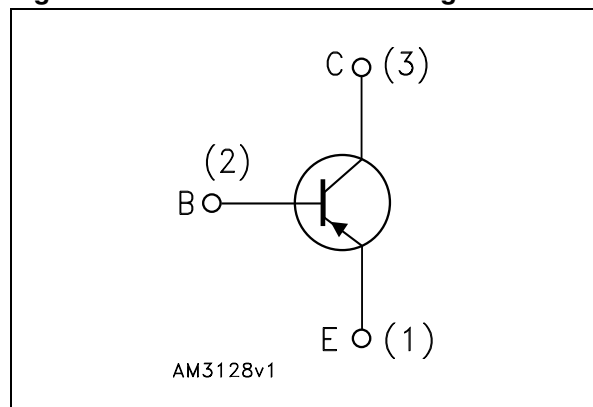


Table 1. Device summary

Order codes	Packages	Lead finish	Marking	Type	EPPL	Packaging
2N5153HR	TO-39	Gold Solder Dip	520400201 520400202	ESCC Flight		Strip pack
2N5153SHR	SMD.5	Gold	520400206	ESCC Flight	Yes	Strip pack
2N5153ESYHR	TO-257	Gold Solder Dip	520400204 520400205	ESCC Flight		Strip pack
2N5153T1	TO-39	Gold	2N5153T1	Engineering model		Strip pack
2N5153S1	SMD.5	Gold	2N5153S1	Engineering model		Strip pack
2N5153ESY	TO-257	Gold	2N5153ESY	Engineering model		Strip pack

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	-100	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	-80	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	-5.5	V
$I_C$	Collector current	-5	A
$P_{TOT}$	Total dissipation at $T_{amb} \leq 25\text{ °C}$		
	for 2N5153HR	1	W
	for 2N5153ESYHRB	3.3	W
	for Root part number 2	3.3	W
	$T_C \leq 25\text{ °C}$		
	for 2N5153HR	10	W
for 2N5153ESYHRB	35	W	
for Root part number 2	35	W	
$T_{STG}$	Storage temperature	-65 to 200	°C
$T_J$	Max. operating junction temperature	200	°C

**Table 3. Thermal data for through-hole packages**

Symbol	Parameter	TO-39	TO-257	Unit
$R_{thJC}$	Thermal resistance junction-case max	17.5	5	°C/W
$R_{thJA}$	Thermal resistance junction-ambient max	175	53	°C/W

**Table 4. Thermal data for SMD package**

Symbol	Parameter	SMD.5	Unit
$R_{thJC}$	Thermal resistance junction-case max	5	°C/W

## 2 Electrical characteristics

$T_{\text{case}} = 25\text{ °C}$  unless otherwise specified

**Table 5. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = -60\text{ V}$ $V_{\text{CB}} = -60\text{ V}$ $T_{\text{amb}} = 150\text{ °C}$			-1 -10	$\mu\text{A}$ $\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = -4\text{ V}$ $V_{\text{EB}} = -5.5\text{ V}$			-1 -1	$\mu\text{A}$ $\text{mA}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = -40\text{ V}$			-50	$\mu\text{A}$
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = -100\text{ mA}$	-80			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = -5\text{ A}$ $I_{\text{B}} = -0.5\text{ A}$			-1.5	V
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = -2.5\text{ A}$ $I_{\text{B}} = -0.25\text{ A}$ $I_{\text{C}} = -5\text{ A}$ $I_{\text{B}} = -0.5\text{ A}$			-1.45 -2.2	V V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = -50\text{ mA}$ $V_{\text{CE}} = -5\text{ V}$ $I_{\text{C}} = -2.5\text{ A}$ $V_{\text{CE}} = -5\text{ V}$ $I_{\text{C}} = -5\text{ A}$ $V_{\text{CE}} = -5\text{ V}$ $I_{\text{C}} = -2.5\text{ A}$ $V_{\text{CE}} = -5\text{ V}$ $T_{\text{amb}} = -55\text{ °C}$	50 70 40 35		200	
$h_{\text{fe}}$	AC forward current transfer ratio	$V_{\text{CE}} = -5\text{ V}$ $I_{\text{C}} = -500\text{ mA}$ $f = 20\text{ MHz}$	3.5			
$C_{\text{OBO}}$	Output capacitance	$I_{\text{E}} = 0$ $V_{\text{CB}} = -10\text{ V}$ $f = 1\text{ MHz}$			250	pF
$t_{\text{on}}$	Turn-on time	$V_{\text{CC}} = -30\text{ V}$ $V_{\text{BB}} = -4\text{ V}$ $V_{\text{in}} \cong -51\text{ V}$ $I_{\text{C}} = 5\text{ A}$ $I_{\text{B1}} = -I_{\text{B2}} = -0.5\text{ A}$			0.5	$\mu\text{s}$
$t_{\text{off}}$	Turn-off time	$V_{\text{CC}} = -30\text{ V}$ $V_{\text{BB}} = -4\text{ V}$ $V_{\text{in}} \cong -51\text{ V}$ $I_{\text{C}} = -5\text{ A}$ $I_{\text{B1}} = -I_{\text{B2}} = -0.5\text{ A}$			1.3	$\mu\text{s}$

1. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2.  $h_{FE} @ V_{CE} = 5 V$

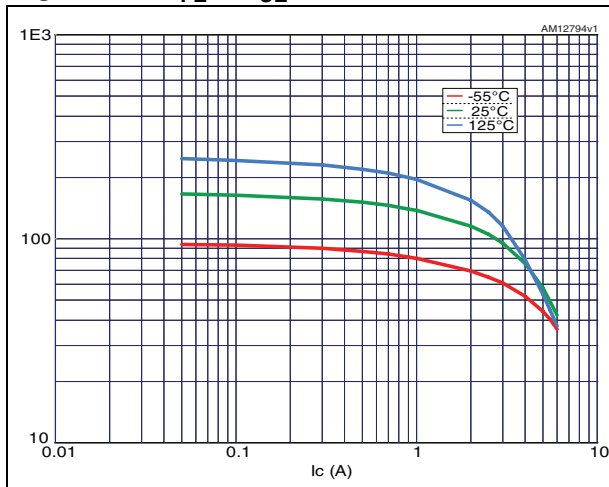


Figure 3.  $V_{CEsat} @ h_{FE} = 10$

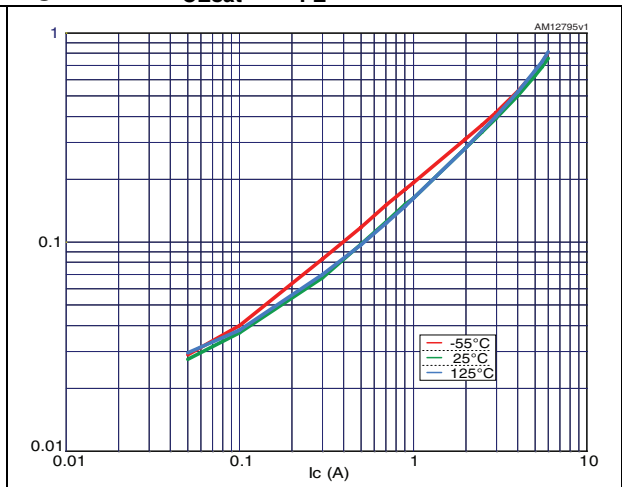


Figure 4.  $V_{BEsat} @ h_{FE} = 10$

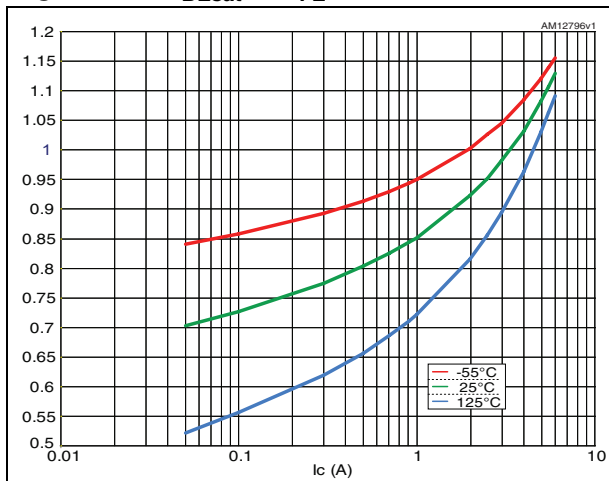
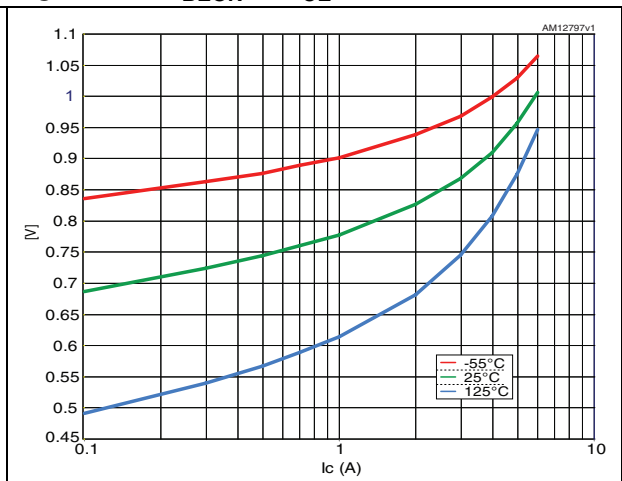
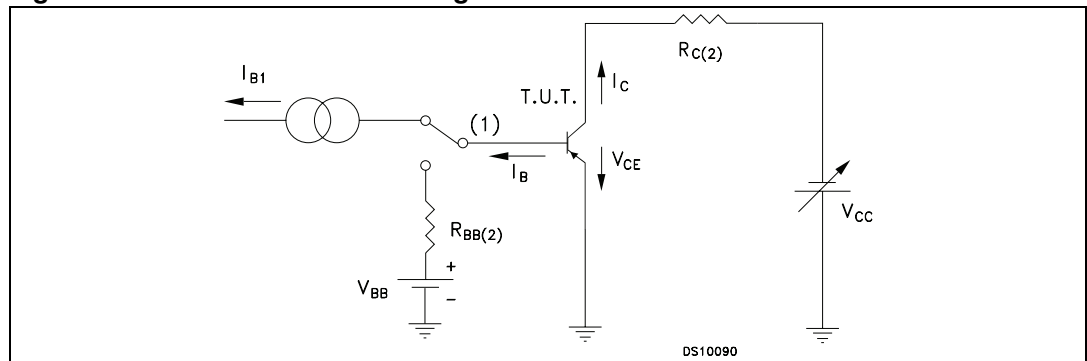


Figure 5.  $V_{BEON} @ V_{CE} = 5 V$



## 2.2 Test circuit

Figure 6. Resistive load switching test circuit



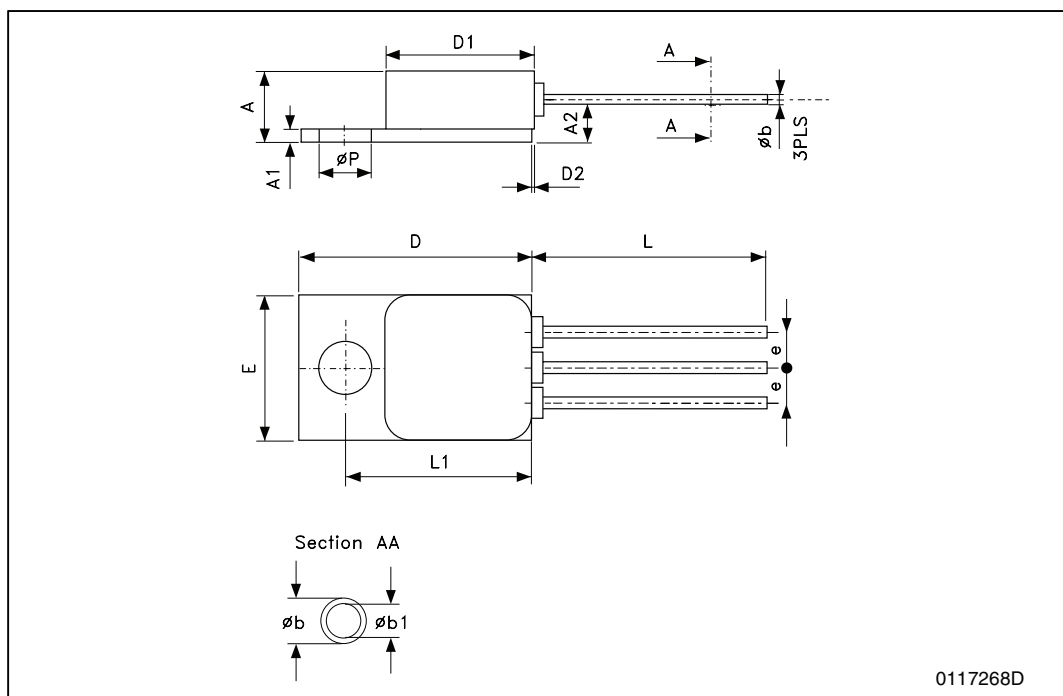
1. Fast electronic switch
2. Non-inductive resistor

### 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

**TO-257 mechanical data**

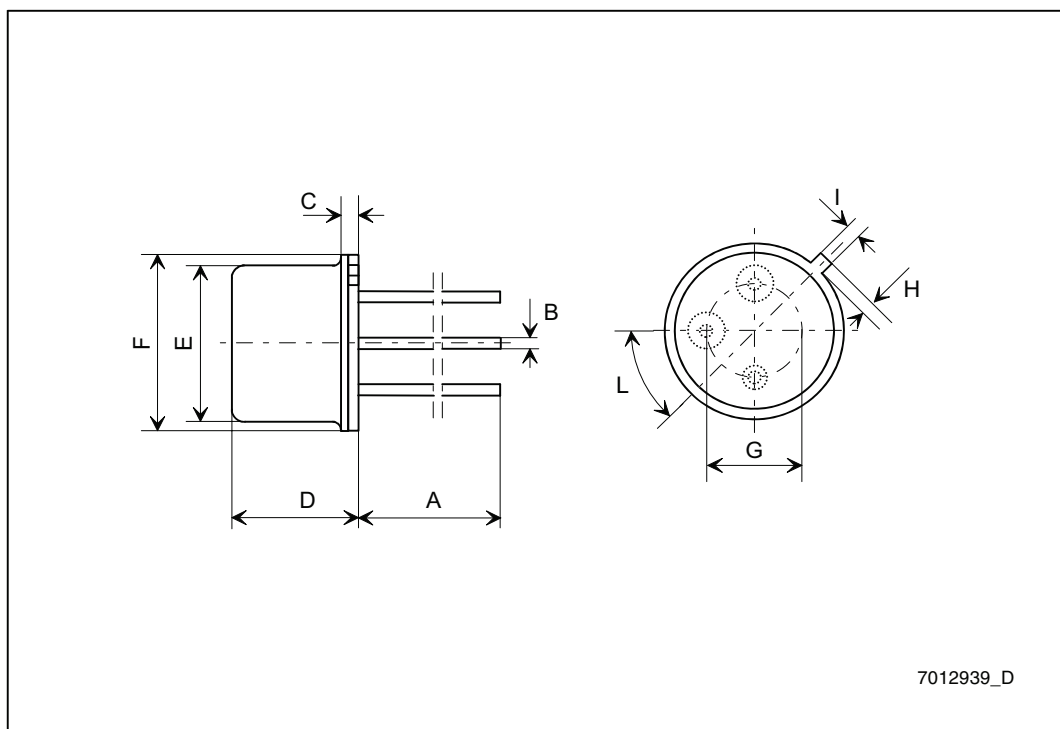
DIM.	mm.		
	Min.	Typ.	Max.
A	4.83		5.08
A1	0.89		1.14
A2		3.05	
b	0.64		1.02
b1	0.64	0.76	0.89
D	16.38		16.89
D1	10.41		10.92
D2			0.97
e		2.54	
E	10.41		10.67
L	12.70		19.05
L1	13.39		13.64
P	3.56		3.81



0117268D

**TO-39 mechanical data**

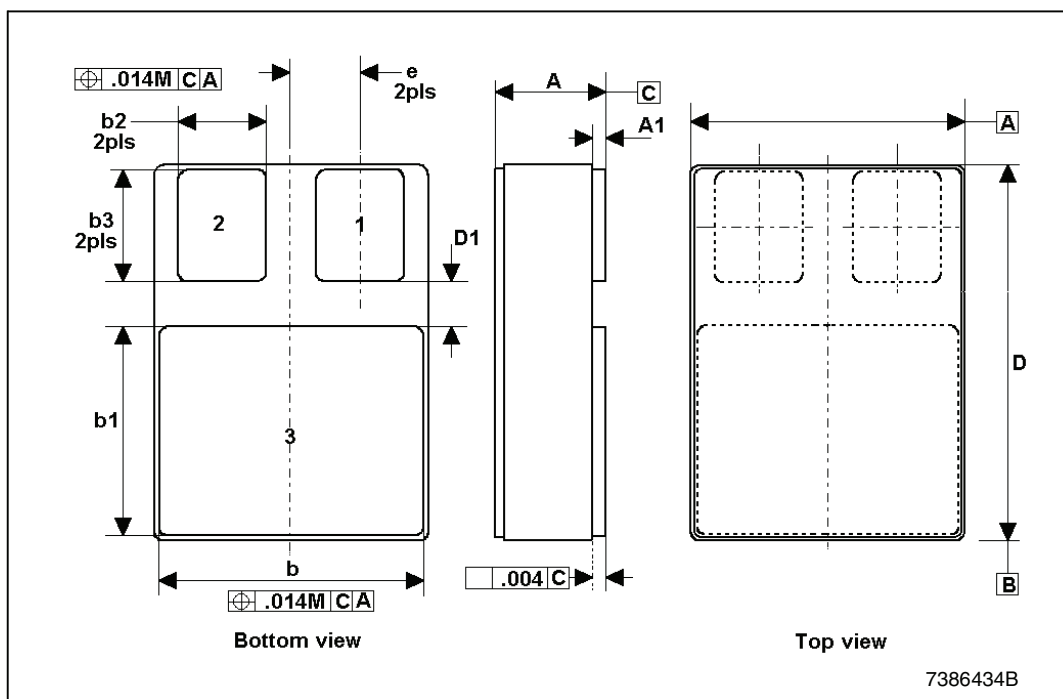
DIM.	mm.		
	Min.	Typ.	Max.
A	12.70		
B			0.49
D			6.60
E			8.51
F			9.40
G		5.08	
H			1.02
I			0.86
L		45°	



7012939\_D

**SMD.5 mechanical data**

Dim.	mm.		
	Min.	Typ.	Max.
A	2.84	3.00	3.15
A1	0.25	0.38	0.51
b	7.13	7.26	7.39
b1	5.58	5.72	5.84
b2	2.28	2.41	2.54
b3	2.92	3.05	3.18
D	10.03	10.16	10.28
D1		0.76	
E	7.39	7.52	7.64
e		1.91	



## 4 Revision history

**Table 6. Document revision history**

Date	Revision	Changes
10-Dec-2008	1	Initial release
08-Jan-2010	2	Modified <a href="#">Table 1 on page 1</a>
12-Sep-2012	3	Added: <a href="#">Section 2.1: Electrical characteristics (curves) on page 4</a>

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