

## Hi-Rel NPN bipolar transistor 40 V, 0.8 A

Datasheet — production data

### Features

$BV_{CEO}$	40 V
$I_C$ (max)	0.8 A
$H_{FE}$ at 10 V - 150 m	> 100
Operating temperature range	- 65 °C to + 200 °C

- Hi-Rel NPN 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 2N2219AHR is a silicon planar epitaxial NPN transistor in a TO-39 package. It is specifically designed for aerospace Hi-Rel applications, and ESCC qualified in accordance with the 5201-003 specification. In case of discrepancies between this datasheet and ESCC detailed specification, the latter prevails.

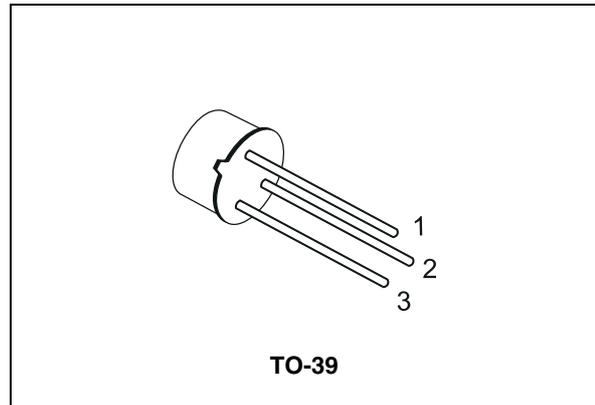


Figure 1. Internal schematic diagram

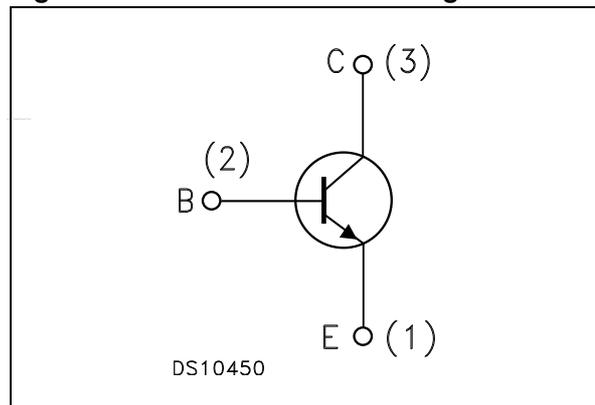


Table 1. Device summary

Order codes	Package	Lead finish	Marking	Type	EPPL	Packaging
2N2219AHR	TO-39	Gold Solder Dip	520100301 520100302	ESCC Flight	Yes	Strip pack
2N2219AT1	TO-39	Gold	2N2219AT1	Engineering model		Strip pack

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	75	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	40	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	6	V
$I_C$	Collector current	0.8	A
$P_{TOT}$	Total dissipation at $T_{amb} \leq 25^\circ\text{C}$	0.8	W
	Total dissipation at $T_c \leq 25^\circ\text{C}$	3	W
$T_{STG}$	Storage temperature	-65 to 200	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	200	$^\circ\text{C}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thJC}$	Thermal resistance junction-case	max 58	$^\circ\text{C}/\text{W}$
$R_{thJA}$	Thermal resistance junction-ambient	max 218	$^\circ\text{C}/\text{W}$

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 60\text{ V}$ $V_{\text{CB}} = 60\text{ V}, T_{\text{amb}} = 150\text{ °C}$		-	10 10	nA $\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 3\text{ V}$		-	10	nA
$V_{(\text{BR})\text{CBO}}$	Collector-base breakdown voltage ( $I_{\text{E}} = 0$ )	$I_{\text{C}} = 10\text{ }\mu\text{A}$	75	-		V
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{ mA}$	40	-		V
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 10\text{ }\mu\text{A}$	6	-		V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 150\text{ mA}, I_{\text{B}} = 15\text{ mA}$ $I_{\text{C}} = 500\text{ mA}, I_{\text{B}} = 50\text{ mA}$		-	0.3 1	V V
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 150\text{ mA}, I_{\text{B}} = 15\text{ mA}$		-	1.2	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 10\text{ mA}, V_{\text{CE}} = 10\text{ V}$ $I_{\text{C}} = 150\text{ mA}, V_{\text{CE}} = 10\text{ V}$ $I_{\text{C}} = 500\text{ mA}, V_{\text{CE}} = 10\text{ V}$ $I_{\text{C}} = 10\text{ mA}, V_{\text{CE}} = 10\text{ V}$ $T_{\text{amb}} = -55\text{ °C}$	75 100 40 35	-	300	
$h_{\text{fe}}$	Small signal current gain	$V_{\text{CE}} = 20\text{ V}, I_{\text{C}} = 20\text{ mA}$ $f = 100\text{ MHz}$	2.5	-		
$C_{\text{CBO}}$	Output capacitance ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 10\text{ V}$ $100\text{ kHz} \leq f \leq 1\text{ MHz}$		-	8	pF
$t_{\text{on}}$	Turn-on time	$V_{\text{CC}} = 30\text{ V}, I_{\text{C}} = 150\text{ mA}$ $I_{\text{B1}} = 15\text{ mA}$		-	35	ns
$t_{\text{off}}$	Turn-off time	$V_{\text{CC}} = 30\text{ V}, I_{\text{C}} = 150\text{ mA}$ $I_{\text{B1}} = -I_{\text{B2}} = 15\text{ mA}$		-	300	ns

1. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 2\%$

## 2.1 Electrical characteristics (curves)

Figure 2. DC current gain

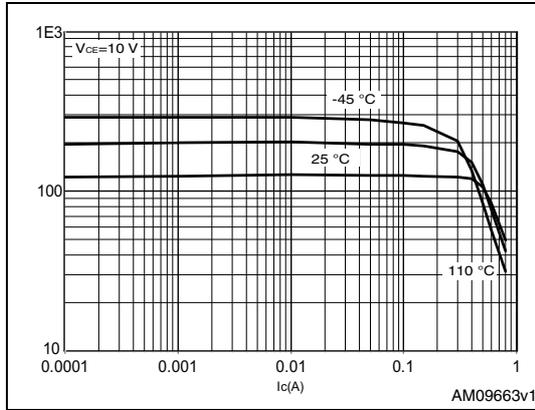


Figure 3. Collector emitter saturation voltage

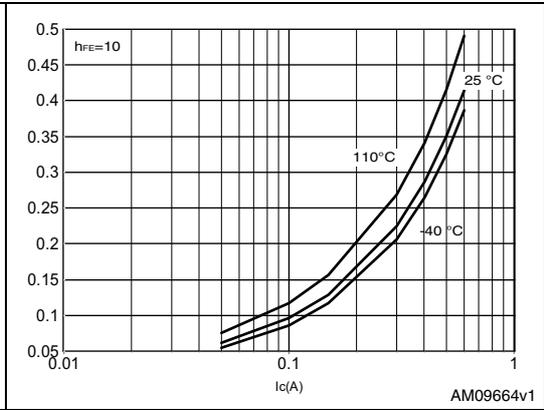
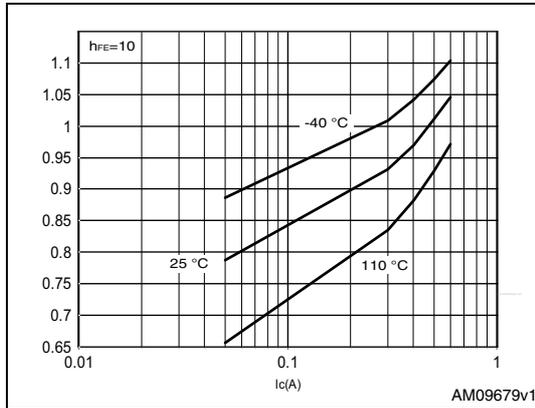
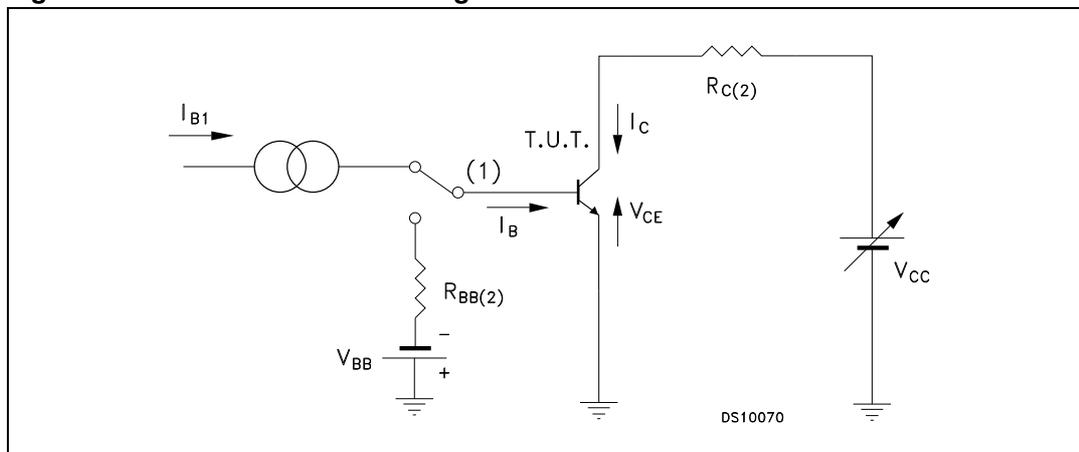


Figure 4. Base emitter saturation voltage



## 2.2 Test circuit

Figure 5. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

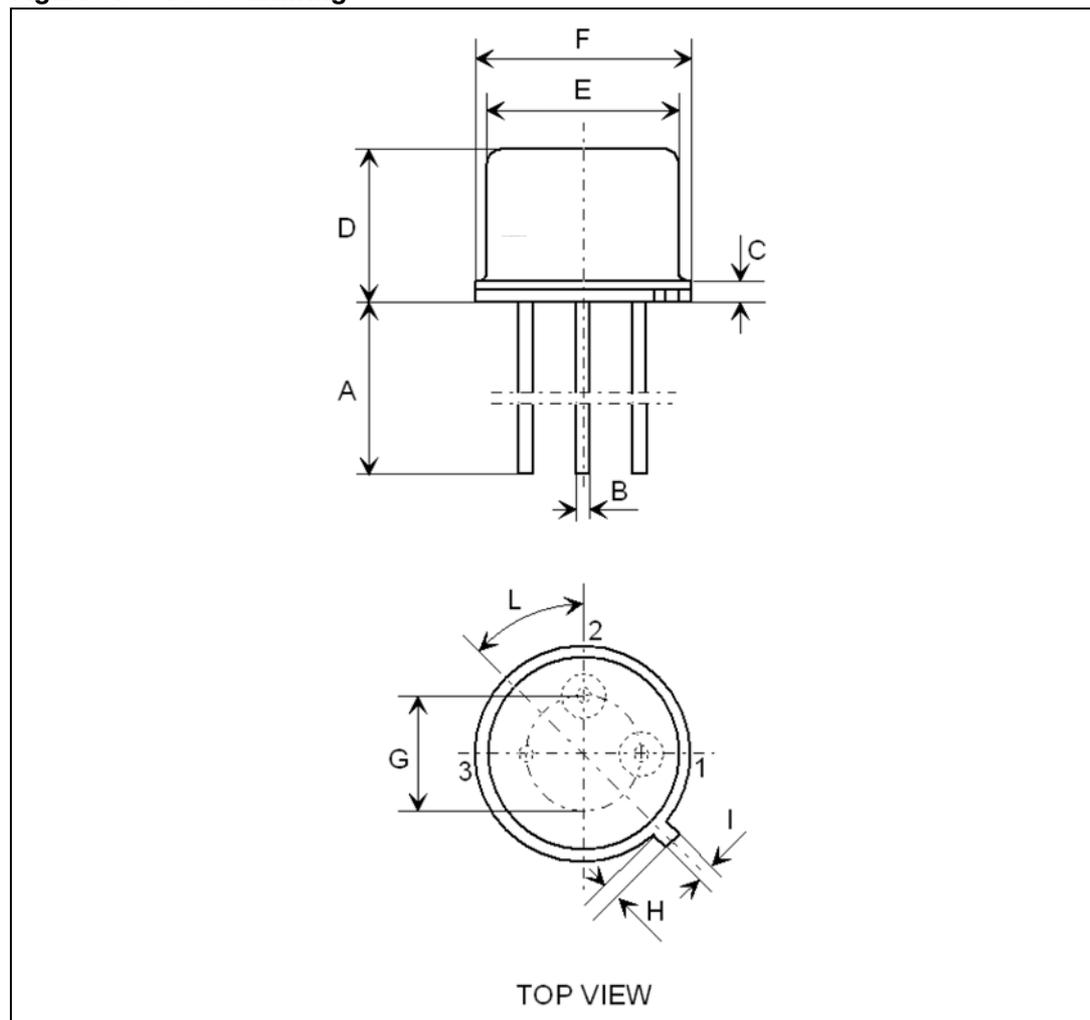
### 3 Package mechanical data

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.

Table 5. TO-39 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	-	12.70	14.20
B		0.40	0.49
C		0.58	0.74
D		6.00	6.40
E		8.15	8.25
F		9.10	9.20
G		4.93	5.23
H		0.85	0.95
I		0.75	0.85
L		42°	48°

Figure 6. TO-39 drawing



## 4 Revision history

**Table 6. Document revision history**

Date	Revision	Changes
09-Jan-2009	1	Initial release
05-Jan-2010	2	Modified <a href="#">Table 1 on page 1</a>
04-Oct-2012	3	Minor text changes. <a href="#">Section 2.1: Electrical characteristics (curves)</a> has been added.

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