2N3019HR

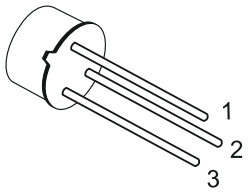
Hi-Rel NPN bipolar transistor 80 V, 1 A

Datasheet — production data

Features

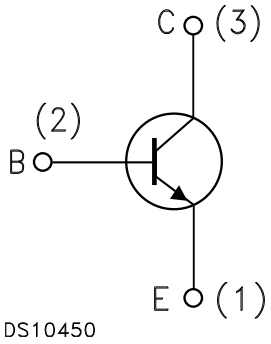
BV_{CEO}	80 V
I_C (max)	1 A
H_{FE} at 10 V - 150 mA	> 100
Operating temperature range	-65°C to +200°C

- 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



TO-39

Figure 1. Internal schematic diagram



Description

The 2N3019HR 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.

Table 1. Device summary

Order codes	Package	Lead finish	Marking	Type	EPPL	Packaging
2N3019HR	TO-39	Gold Solder Dip	520101103 520101104	ESCC Flight	Yes	Strip pack

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base voltage (I_E = 0)	140	V
V_{CEO}	Collector-emitter voltage (I_B = 0)	80	V
V_{EBO}	Emitter-base voltage (I_C = 0)	7	V
I_C	Collector current	1	A
P_{TOT}	Total dissipation at $T_{amb} \leq 25$ °C Total dissipation at $T_c \leq 25$ °C	0.8 5	W W
T_{STG}	Storage temperature	-65 to 200	°C
T_J	Max. operating junction temperature	200	°C

Table 3. Thermal data

Symbol	Parameter		Value	Unit
R_{thJC}	Thermal resistance junction-case	max	35	°C/W
R_{thJA}	Thermal resistance junction-ambient	max	218	°C/W

2 Electrical characteristics

T_{case} = 25 °C unless otherwise specified

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current (I_E = 0)	V_{CB} = 90 V V_{CB} = 90 V, T_{amb} = 150 °C		-	10 10	nA µA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 5 V		-	10	nA
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E = 0)	I_C = 100 µA	140	-		V
$V_{(BR)CEO}$ (1)	Collector-emitter breakdown voltage (I_B = 0)	I_C = 30 mA	80	-		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C = 0)	I_E = 100 µA	7	-		V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA		-	0.2 0.5	V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 150 mA, I_B = 15 mA		-	1.1	V
h_{FE} (1)	DC current gain	I_C = 0.1 mA, V_{CE} = 10 V I_C = 10 mA, V_{CE} = 10 V I_C = 150 mA, V_{CE} = 10 V I_C = 500 mA, V_{CE} = 10 V I_C = 1 A, V_{CE} = 10 V I_C = 150 mA, V_{CE} = 10 V T_{amb} = -65 °C	50 90 100 50 15 40	-	200 300 200	
h_{fe}	Small signal current gain	V_{CE} = 10 V, I_C = 50 mA f = 20 MHz	5	-	20	
h_{fe}	Small signal short circuit forward current transfer ratio	V_{CE} = 5 V, I_C = 1 mA	80	-	400	
C_{CBO}	Output capacitance (I_E = 0)	V_{CB} = 10 V, f = 1 MHz		-	12	pF
C_{IBO}	Input capacitance (I_C = 0)	V_{EB} = 0.5 V, f = 1 MHz		-	60	pF
NF	Noise figure	V_{CE} = 10 V, I_C = 100 µA R_G = 1 kΩ Bandwidth = 200 Hz		-	4	dB
$t_{C(CB)}$	Collector- base constant time	V_{CE} = 10 V, I_C = 10 mA f = 79.8 MHz		-	400	ps
$t_{on} + t_{off}$	Pulse response	V_{CC} = 20 V, see *Figure 8*		-	30	ns

1. Pulsed duration = 300 µs, duty cycle ≤2 %

2.1 Electrical characteristics (curves)

Figure 2. DC current gain (V_{CE}=1 V)

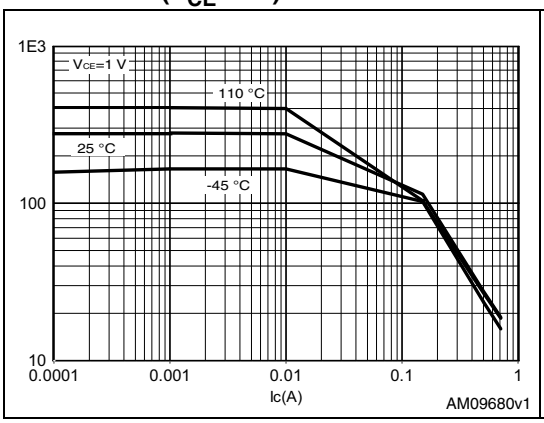


Figure 3. DC current gain (V_{CE}=10 V)

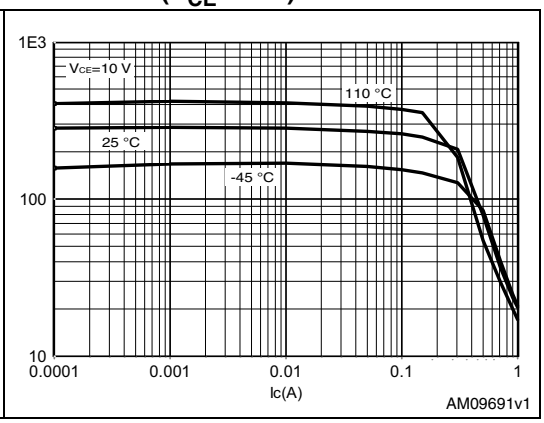


Figure 4. Collector emitter saturation voltage

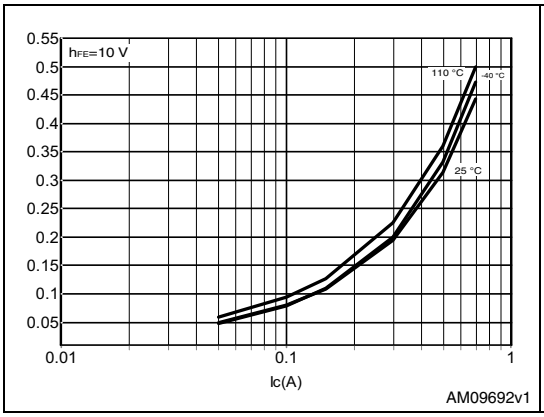
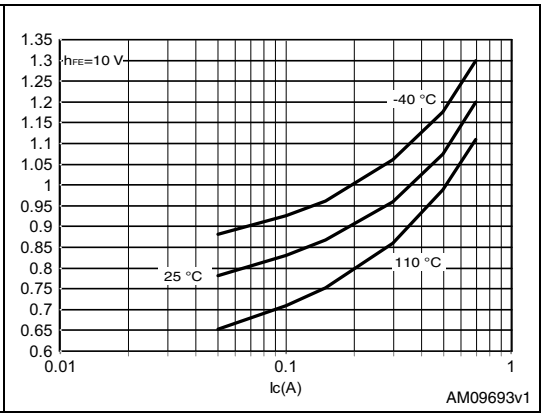
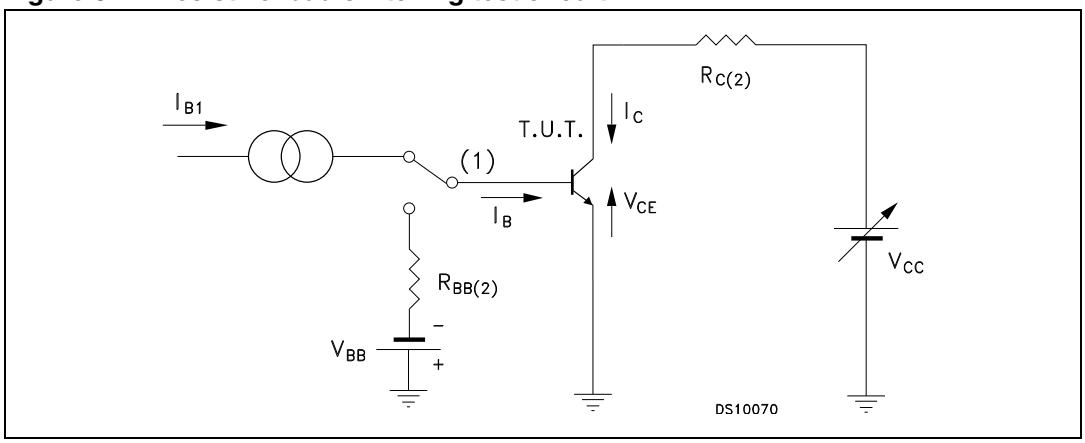


Figure 5. Base emitter saturation voltage



2.2 Test circuits

Figure 6. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

Figure 7. Circuit for electrical measurement

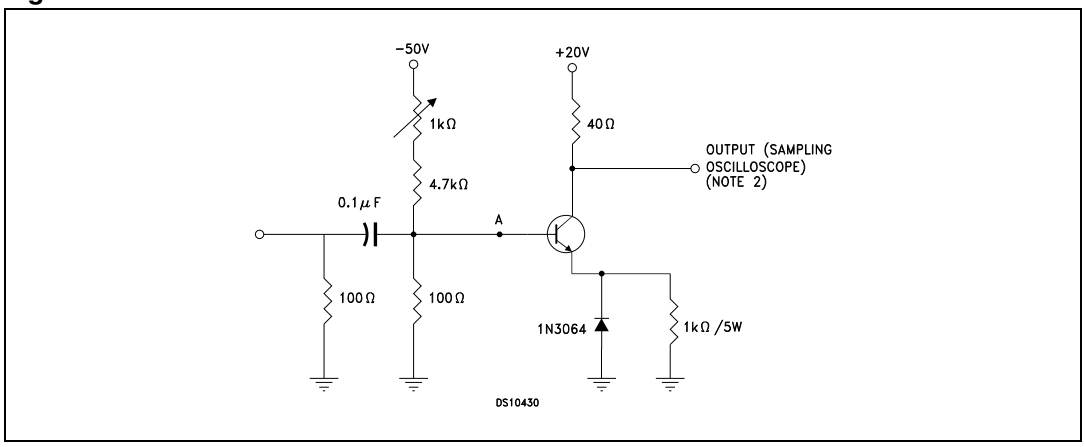
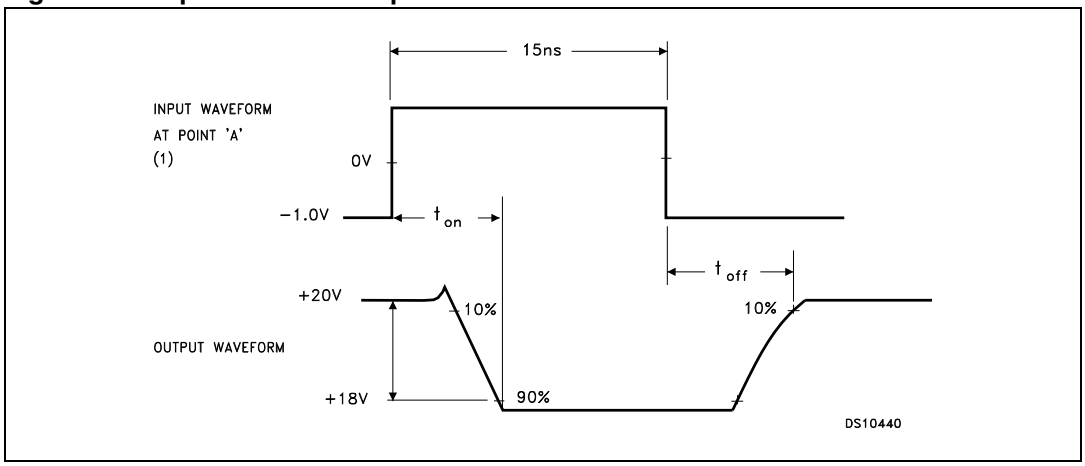


Figure 8. Input waveform at point “A”



1. $t_r \leq 2$ ns, duty cycle ≤2 %, $Z_{IN} = 50\ \Omega$
2. Sampling oscilloscope: $Z_{IN} \geq 100$ kΩ, $C_{IN} \leq 12$ pF, $t_r \leq 5$ ns

3 Package mechanical data

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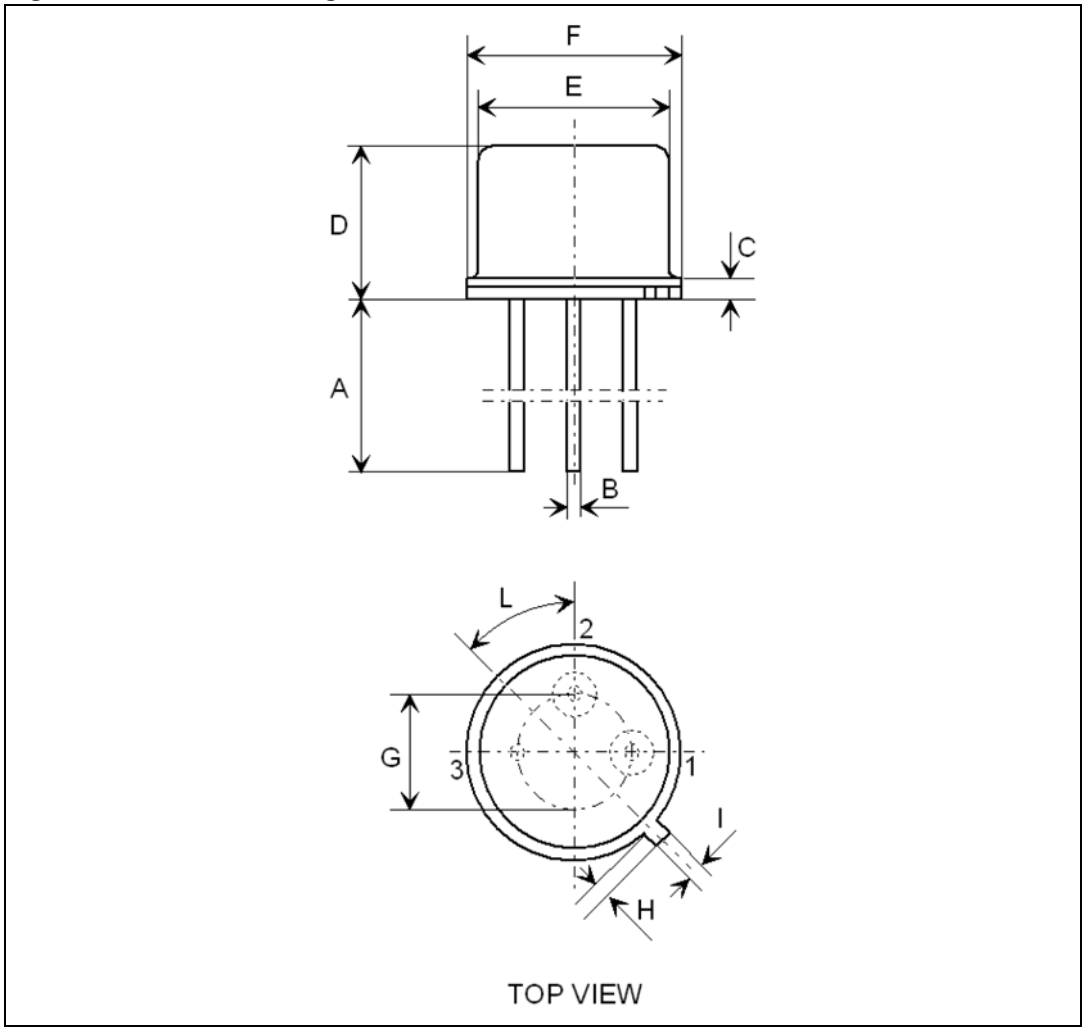
Table 5. TO-39 mechanical data

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 9. TO-39 drawing



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
09-Feb-2009	1	Initial release
07-Jan-2010	2	Modified *Table 1 on page 1*
05-Oct-2012	3	Minor text changes. *Section 2.1: Electrical characteristics (curves)* has been added.

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