2N3700HR

Hi-Rel 80 V - 1 A NPN bipolar transistor

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
- 100 krad low dose rate
- Radiation level: lot specific total dose contact marketing for specified level

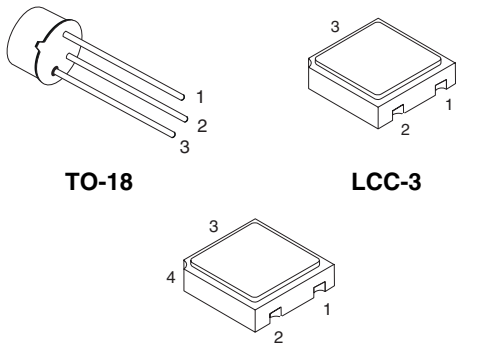
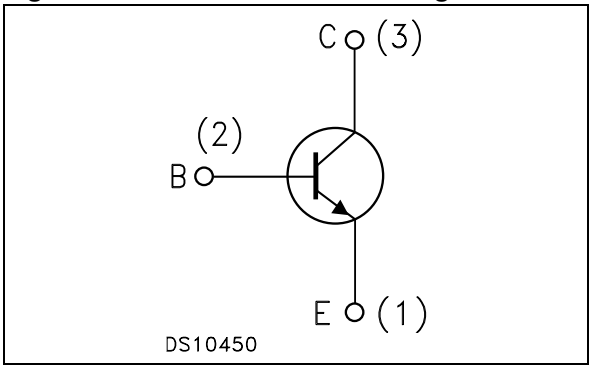


Figure 1. Internal schematic diagram



Description

The 2N3700HR is a silicon planar epitaxial NPN transistor in TO-18 and LCC-3 packages. It is specifically designed for aerospace Hi-Rel applications and ESCC qualified according to the 5201-004 specification. In case of conflict between this datasheet and ESCC detailed specification, the latter prevails.

Table 1. Device summary

Order codes	ESCC part num.	Qual. level	Rad level	Packages	Lead finish	Mass (g)	EPPL
2N37000UB1	-	Eng. model		LCC-3UB	Gold	0.06	-
2N37000UBSW	5201/004/07	ESCC flight	100 krad	LCC-3UB	Solder dip	0.06	Y
2N37000UB06	5201/004/06	ESCC flight		LCC-3UB	Gold	0.06	-
2N37000UB07	5201/004/07	ESCC flight		LCC-3UB	Solder dip	0.06	-
SOC37000	-	Eng. model		LCC-3	Gold	0.06	-
SOC3700SW	5201/004/05	ESCC flight	100 krad	LCC-3	Solder dip	0.06	Y
SOC3700HRB	5201/004/04 or 05	ESCC flight		LCC-3	Gold/Solder dip(1)	0.06	Y
2N3700T1	-	Eng. model		TO-18	Gold	0.40	-
2N3700HR	5201/004/01 or 02	ESCC flight		TO-18	Gold/Solder dip(1)	0.40	-

1. Depending ESCC part number mentioned on the purchase order

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 for 2N3700HR for SOC3700HRB for SOC3700HRB (1) Total dissipation at $T_c \leq 25$ °C for 2N3700HR	 0.5 0.5 0.76 1.8	 W W W W
T_{stg}	Storage temperature	-65 to 200	°C
T_J	Max. operating junction temperature	200	°C

1. When mounted on a 15 x 15 x 0.6 mm ceramic substrate.

Table 3. Thermal data for through-hole package

Symbol	Parameter		TO-18	Unit
R_{thJC}	Thermal resistance junction-case	max	97	°C/W
R_{thJA}	Thermal resistance junction-ambient	max	350	°C/W

Table 4. Thermal data for SMD package

Symbol	Parameter		SOC	Unit
R_{thJA}	Thermal resistance junction-ambient	max	350	°C/W
R_{thJA}	Thermal resistance junction-ambient (1)	max	230	°C/W

1. When mounted on a 15 x 15 x 0.6 mm ceramic substrate.

2 Electrical characteristics

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

Table 5. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cut-off current (I_E = 0)	V_{CB} = 90 V V_{CB} = 90 V T_{amb} = 110 °C V_{CB} = 90 V T_{amb} = 150 °C			10 100 10	nA 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 I_C = 150 mA I_B = 15 mA T_{amb} = 110 °C	0.75 0.65	0.87 0.77	1 0.9	V V
h_{FE} (1)	DC current gain	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 = 150 mA V_{CE} = 10 V T_{amb} = - 55 °C	90 100 50 40		300	
h_{fe}	Small signal current gain	V_{CE} = 10 V I_C = 50 mA f = 20 MHz	5			
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

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

2.1 Electrical characteristics (curves)

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

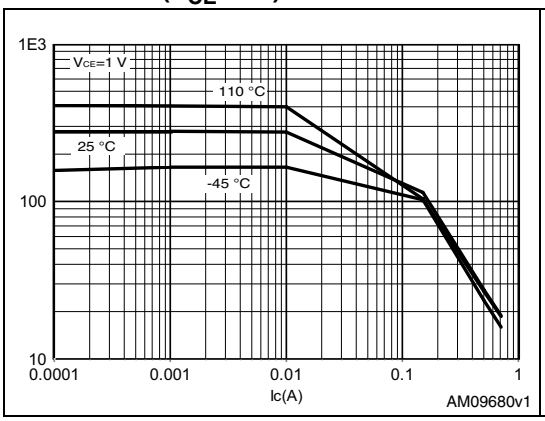


Figure 3. DC current gain (V_{CE}=10 V)

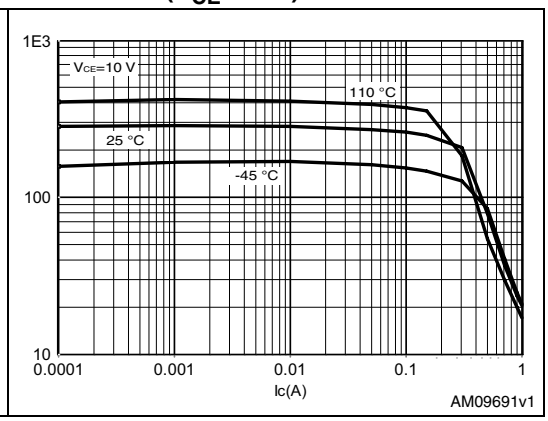


Figure 4. Collector emitter saturation voltage

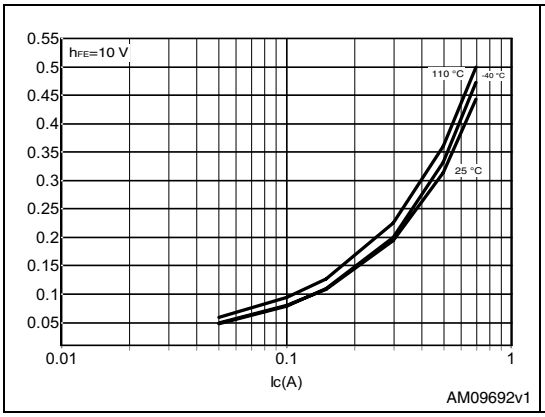
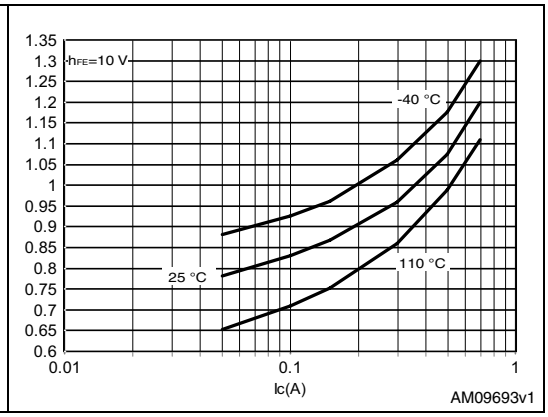
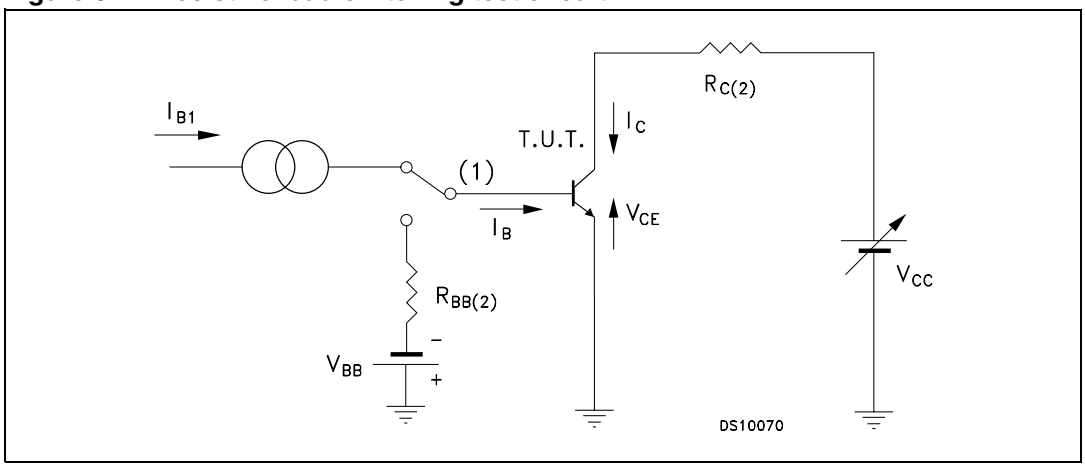


Figure 5. Base emitter saturation voltage



2.2 Test circuit

Figure 6. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

3 Package mechanical data

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Table 6. LCC-3UB mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	1.16		1.42
C	0.46	0.51	0.56
D	0.56	0.76	0.96
E	0.92	1.02	1.12
F	1.95	2.03	2.11
G	2.92	3.05	3.18
I	2.41	2.54	2.67
J	0.42	0.57	0.72
K	1.37	1.52	1.67
L	0.41	0.51	0.61
M	2.46	2.54	2.62
N	1.81	1.91	2.01
r		0.20	
r1		0.30	
r2		0.56	

Figure 7. LCC-3UB drawings

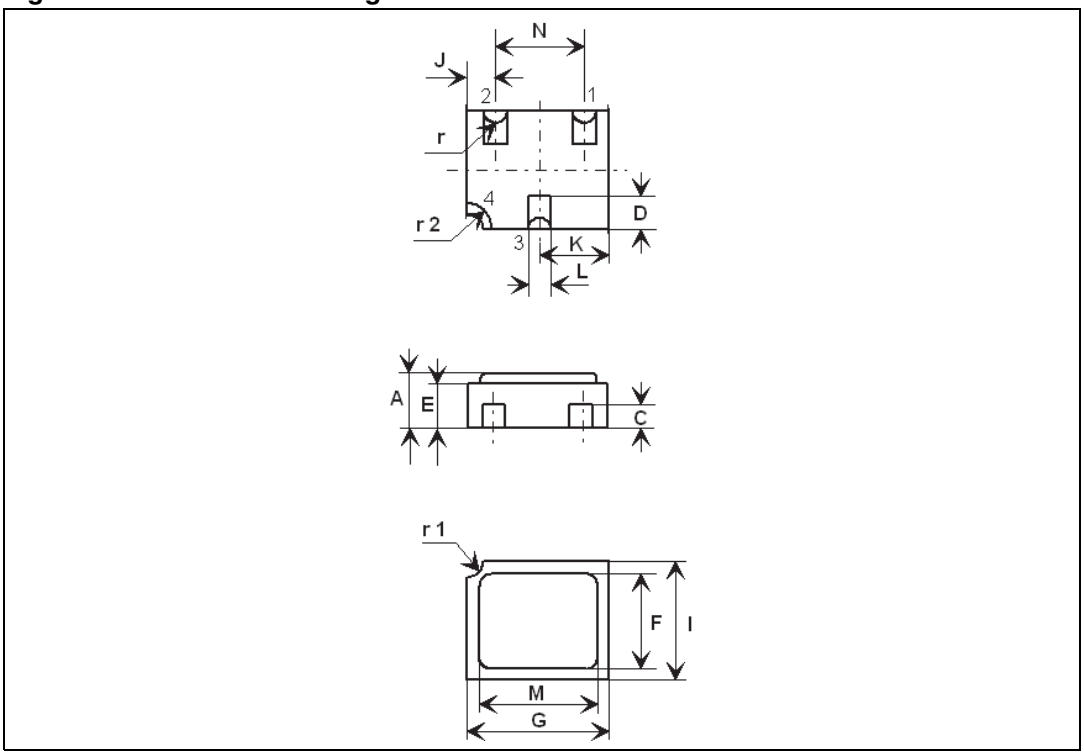


Table 7. LCC-3 mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A	1.16		1.42
C	0.45	0.50	0.56
D	0.60	0.76	0.91
E	0.91	1.01	1.12
F	1.95	2.03	2.11
G	2.92	3.05	3.17
I	2.41	2.54	2.66
J	0.42	0.57	0.72
K	1.37	1.52	1.67
L	0.40	0.50	0.60
M	2.46	2.54	2.62
N	1.80	1.90	2.00
R		0.30	

Figure 8. LCC-3 drawings

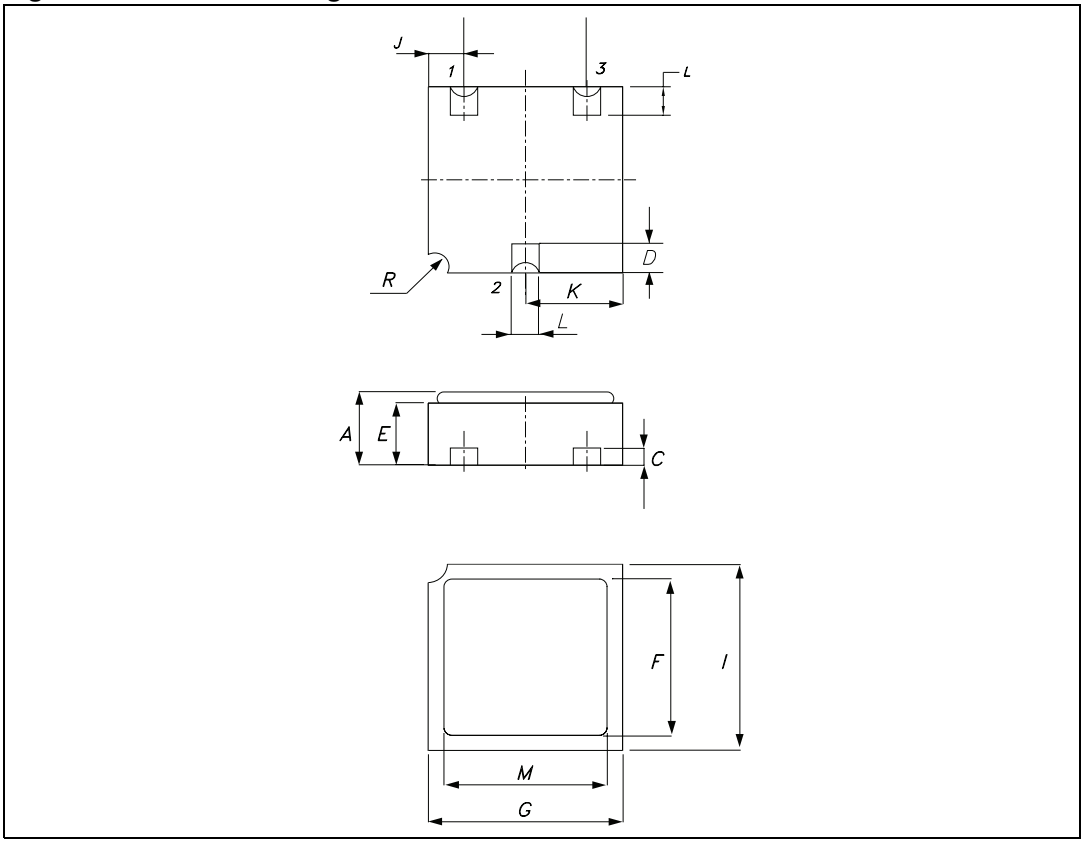
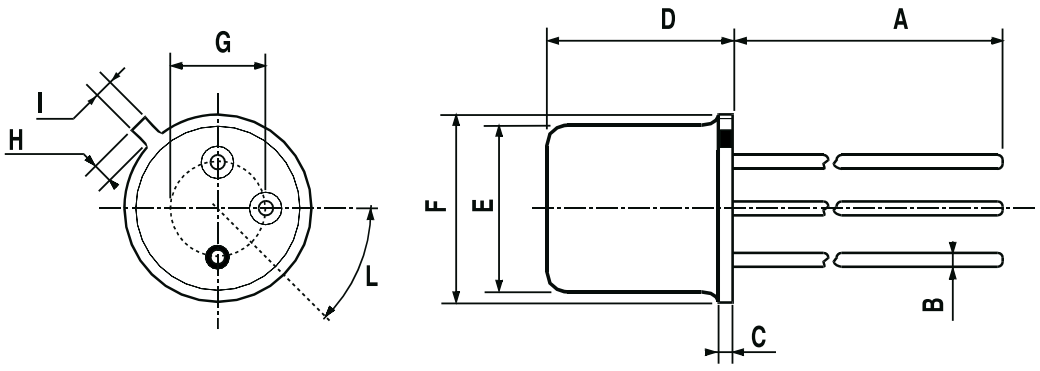


Table 8. TO-18 mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A		12.7	
B			0.49
D			5.3
E			4.9
F			5.8
G	2.54		
H			1.2
I			1.16
L	45°		

Figure 9. TO-18 drawings



4 Order codes

Table 9. Order codes

Order codes	ESCC Part number	Rad level	Packages	Lead Finish	Marking	EPPL	Packing
2N37000UB1	-		LCC-3UB	Gold	2N37000UB1	-	Waffle pack
2N37000UBSW	5201/004/07	100 krad	LCC-3UB	Solder Dip	520100407	Y	Waffle pack
2N37000UB06	5201/004/06		LCC-3UB	Gold	520100406	-	Waffle pack
2N37000UB07	5201/004/07		LCC-3UB	Solder Dip	520100407	-	Waffle pack
SOC37000	-		LCC-3	Gold	SOC3700	-	Waffle pack
SOC3700SW	5201/004/05	100 krad	LCC-3	Solder Dip	520100405	Y	Waffle pack
SOC3700HRB	5201/004/04 or 05		LCC-3	Gold or Solder Dip (1)	520100404 or 05	Y	Waffle pack
2N3700T1	-		TO-18	Gold	2N3700T1	-	Strip pack
2N3700HR	5201/004/01 or 02		TO-18	Gold or Solder Dip (1)	520100401 or 02	-	Strip pack

1. Depending ESCC part number mentioned on the purchase order

Contact ST sales office for information about the specific conditions for:

- Products in die form
- Tape and reel packing

5 Revision history

Table 10. Document revision history

Date	Revision	Changes
10-Jan-2008	1	Initial release
07-Jan-2010	2	Modified *Table 1 on page 1*
26-Jul-2010	3	Modified *Table 1 on page 1*, added *Table 9 on page 10*
30-Nov-2011	4	– Modified: *Table 5 on page 3* – Added: *Section 2.1: Electrical characteristics (curves)* – Minor text change in the document title on the coverpage

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