2N3810HR

Hi-Rel PNP dual matched bipolar transistor 60 V, 0.05 A

Datasheet — production data

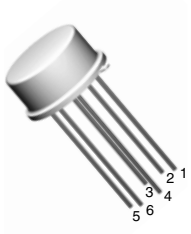
Features

BV_{CEO}	60 V
I_C (max)	0.05 A
H_{FE} at 10 V - 150 mA	> 150
Operating temperature range	-65°C to +200°C

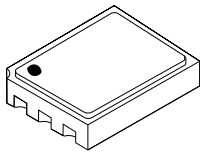
- Hi-Rel PNP dual matched bipolar transistor
- Linear gain characteristics
- ESCC qualified
- European preferred part list - EPPL
- Radiation level: lot specific total dose contact marketing for specified level

Description

The 2N3810HR is a silicon planar epitaxial PNP transistor in TO-78 and LCC-6 packages. It is specifically designed for aerospace Hi-Rel applications and ESCC qualified according to the 5207-005 specification. In case of conflict between this datasheet and ESCC detailed specification, the latter prevails.



TO-78



LCC-6

Figure 1. Internal schematic diagram

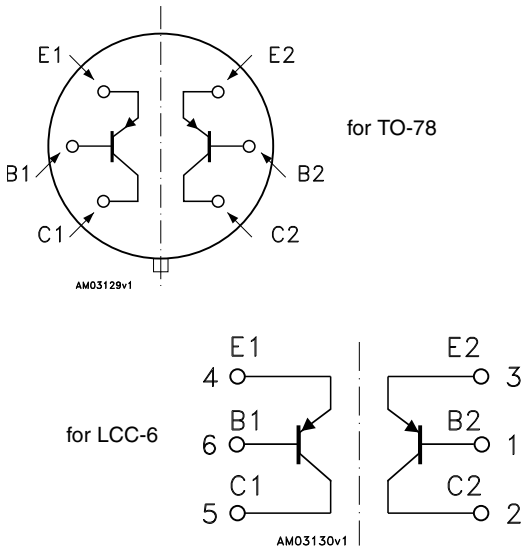


Table 1. Device summary

Order codes	Packages	Lead finish	Marking	Type	EPPL	Packaging
2N3810HR	TO-78	Gold Solder Dip	520700501 520700502	ESCC Flight		Strip pack
2N3810T1	TO-78	Gold	2N3810T1	Engineering model		Strip pack
SOC3810	LCC-6	Gold	SOC3810	Engineering model		Waffle pack
SOC3810HRB	LCC-6	Gold Solder Dip	520700507 520700509	ESCC Flight	Yes	Waffle pack

This is information on a product in full production. www.st.com

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base voltage (I_E = 0)	-60	V
V_{CEO}	Collector-emitter voltage (I_B = 0)	-60	V
V_{EBO}	Emitter-base voltage (I_C = 0)	-5	V
I_C	Collector current	-50	mA
P_{TOT}	Total dissipation at $T_{amb} \leq 25$ °C		
	for 2N3810HR (1)	0.5	W
	for 2N3810HR (2)	0.6	W
	for SOC3810HRB (1) (3)	0.6	W
	for SOC3810HRB (2) (3)	1.2	W
	Total dissipation at $T_c \leq 25$ °C		
	for 2N3810HR (1)	0.5	W
	for 2N3810HR (2)	0.6	W
T_{STG}	Storage temperature	-65 to 200	°C
T_J	Max. operating junction temperature	200	°C

1. One section.
2. Both sections.
3. When mounted on a 15 x 15 x 0.6 mm ceramic substrate.

Table 3. Thermal data for through-hole package

Symbol	Parameter		Value	Unit
R_{thJC}	Thermal resistance junction-case (1)	max	350	°C/W
	Thermal resistance junction-case (2)	max	292	°C/W
R_{thJA}	Thermal resistance junction-ambient (1)	max	350	°C/W
	Thermal resistance junction-ambient (2)	max	292	°C/W

1. One section.
2. Both sections.

Table 4. Thermal data for SMD package

Symbol	Parameter		Value	Unit
R_{thJA}	Thermal resistance junction-ambient (1)(3)	max	292	°C/W
	Thermal resistance junction-ambient (2)(3)	max	146	°C/W

1. One section.
2. Both sections.
3. 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-base cut-off current (I_E = 0)	V_{CB} = -50 V V_{CB} = -50 V T_C = 150 °C		-	-10 -10	nA µA
I_{EBO}	Emitter-base cut-off current (I_C = 0)	V_{EB} = -4 V		-	-20	nA
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E = 0)	I_C = -10 µA	-60	-		V
$V_{(BR)CEO}$ (1)	Collector-emitter breakdown voltage (I_B = 0)	I_C = -10 mA	-60	-		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C = 0)	I_E = -10 µA	-5	-		V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = -100 µA I_B = -10 µA I_C = -1 mA I_B = -100 µA		-	-0.2 -0.25	V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = -100 µA I_B = -10 µA I_C = -1 mA I_B = -100 µA		-	-0.7 -0.8	V V
h_{FE} (1)	DC current gain	I_C = -10 µA V_{CE} = -5 V I_C = -100 µA V_{CE} = -5 V I_C = -500 µA V_{CE} = -5 V I_C = -1 mA V_{CE} = -5 V I_C = -10 mA V_{CE} = -5 V I_C = -100 µA V_{CE} = -5 V T_{amb} = -55 °C	100 150 150 150 125 60	-	 450 450 450	
h_{FE2-1} / h_{FE2-2}	DC current ratio comparison	I_C = -100 µA V_{CE} = -5 V	0.91	-	1.1	
h_{FE2-1} / h_{FE2-2}	DC current ratio comparison	I_C = -100 µA V_{CE} = -5 V T_{amb} = -55 °C to +125 °C	0.85	-	1.18	
$\Delta \lvert V_{BE1} - V_{BE2} \rvert$	Base-emitter voltage differential	V_{CE} = -5 V I_C = -10 µA V_{CE} = -5 V I_C = -100 µA V_{CE} = -5 V I_C = -10 mA		-	5 3 5	mV mV mV
$\Delta \lvert V_{BE1} - V_{BE2} \rvert$	Base-emitter voltage differential	V_{CE} = -5 V I_C = -100 µA T_{amb} = -55 °C to +25 °C T_{amb} = +25 °C to +125 °C		-	0.8 1	mV mV
I_{Lk}	Leakage current between active devices	V = -50 V to E_2, B_2, C_2 V = 0 V to E_1, B_1, C_1		-	-5	µA

Table 5. Electrical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
h_{fe}	Small signal current gain	V_{CE} = -5 V I_C = -10 mA f = 1 kHz	125	-		
h_{fe}	Small signal current gain	V_{CE} = -10 V I_C = -10 mA f = 1 kHz	150	-	600	
f_T	Transition frequency	I_C = -1 mA V_{CE} = -5 V	80	-	500	MHz
C_{obo}	Output capacitance (I_E = 0)	V_{CB} = -5 V 100 kHz ≤f ≤1 MHz		-	6	pF
C_{ibo}	Input capacitance (I_C = 0)	V_{EB} = -0.5 V 100 kHz ≤f ≤1 MHz		-	15	pF
h_{ie}	Input impedance	I_C = -1 mA V_{CE} = -10 V f = 1 kHz	3	-	30	kΩ
NF	Noise figure	V_{CE} = -5 V I_C = -200 µA R_S = 2 kΩ f = 100 Hz		-	7	dB
NF	Noise figure	V_{CE} = -5 V I_C = -200 µA R_S = 2 kΩ f = 1 kHz		-	3	dB
NF	Noise figure	V_{CE} = -5 V I_C = -200 µA R_S = 2 kΩ Bandwidth = 10 Hz to 15.7 kHz		-	3.5	dB

1. Pulsed duration = 300 µs, duty cycle ≤1.5%

2.1 Electrical characteristics (curves)

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

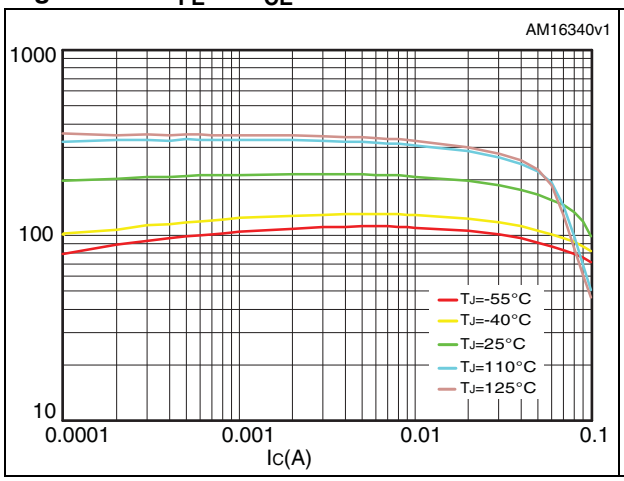


Figure 3. $V_{CE(sat)}$ @ h_{FE} =10

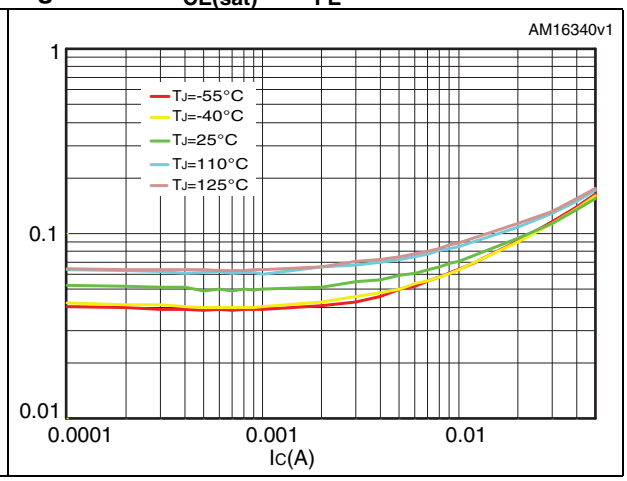
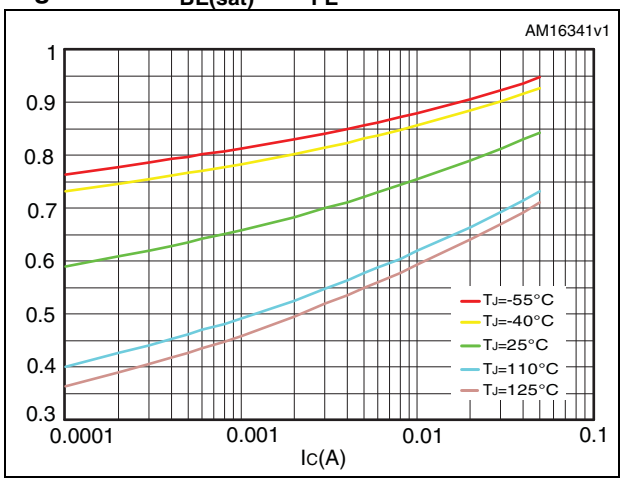


Figure 4. $V_{BE(sat)}$ @ h_{FE} =10



3 Package mechanical data

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

Table 6. TO-78 mechanical data

Dim.	mm			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	12.70		13.70	0.500		0.539
B	0.40		0.47	0.016		0.019
C	0.55		0.76	0.022		0.030
D	4.26		4.57	0.168		0.180
E	8.15		8.25	0.321		0.325
F	9.05		9.25	0.356		0.364
G	4.85	5.08	5.31	0.191	0.200	0.209
H	0.71		0.85	0.028		0.034
I	0.90		1.00	0.035		0.040
L	42°		48°			

Figure 5. TO-78 drawing

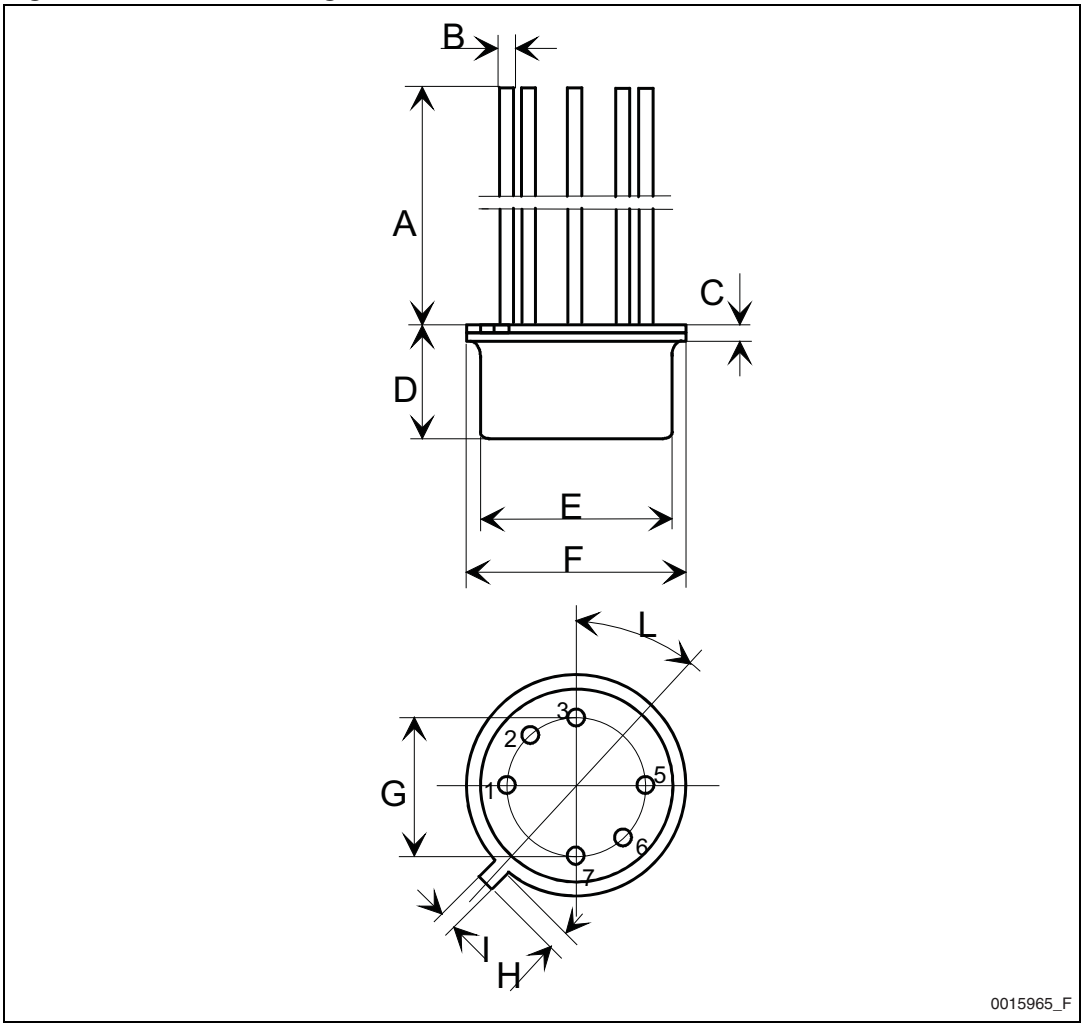
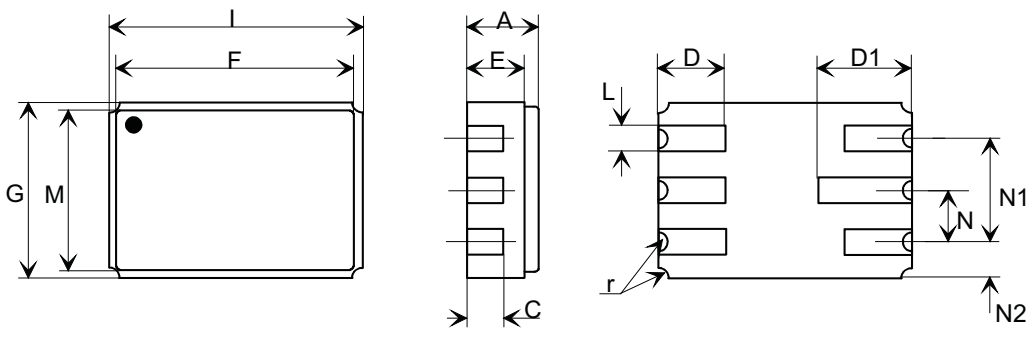


Table 7. LCC-6 mechanical data

Dim.	mm		
	Min.	Typ.	Max.
A	1.53		1.96
C	0.78	0.89	0.99
D	1.52	1.65	1.78
E	12.4	1.40	1.55
F	5.77	5.84	5.92
G	4.19	4.31	4.45
I	6.10	6.22	6.35
L	0.56	0.63	0.71
M	3.86	3.94	4.01
N	1.14	1.27	1.40
N1	2.41	2.54	2.67
N2	0.64	0.89	1.14
r		0.23	
D1	2.08	2.28	2.49

Figure 6. LCC-6 drawing



4 Revision history

Table 8. Document revision history

Date	Revision	Changes
10-Dec-2008	1	Initial release
08-Jan-2010	2	Modified *Table 1 on page 1*
14-Nov-2012	3	Added: *Section 2.1: Electrical characteristics (curves)* Updated: *Section 3: Package mechanical data*

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