

Hi-Rel NPN bipolar transistor 60 V, 50 mA

Datasheet - production data

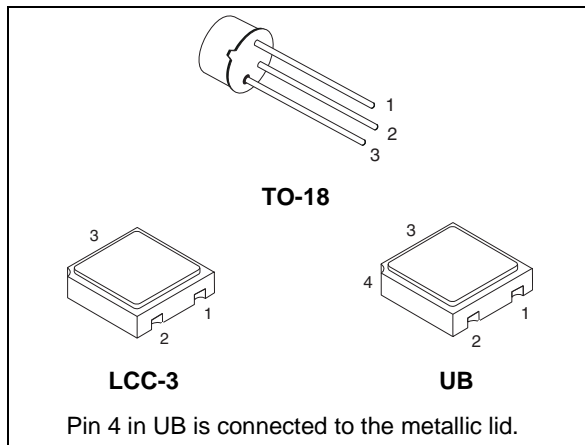
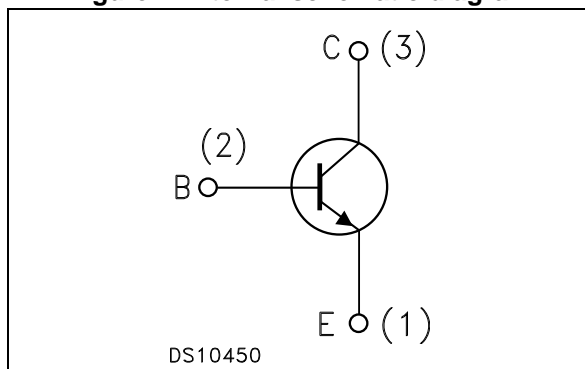


Figure 1. Internal schematic diagram



Features

Parameter	Value
BV_{CEO}	60 V
I_C (max)	50 mA
h_{FE} at 10 V - 150 mA	> 250
Operating temperature range	- 65 °C to + 200 °C

- Linear gain characteristics
- Hermetic packages
- ESCC qualified
- European preferred part list - EPPL

Description

The 2N2484HR is a silicon planar epitaxial NPN transistor specifically designed for aerospace Hi-Rel applications and housed in hermetic packages. It complies with the ESCC 5000 qualification standard. It is ESCC qualified according to the 5201-001 specification. In case of conflict between this datasheet and ESCC detailed specification, the latter prevails.

Table 1. Device summary

Device	Qualification system	Agency specification	Package	Radiation level	EPPL
2N2484UBx	ESCC	5201/001	UB	-	-
SOC2484HRx	ESCC	5201/001	LCC-3	-	Yes
2N2484HRx	ESCC	5201/001	TO-18	-	-

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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 ($I_C = 0$)		6	V
I_C	Collector current		50	mA
P_{TOT}	Total dissipation at $T_{amb} \leq 25\text{ °C}$	2N2484HR	0.36	W
		2N2484UB1 / SOC2484HRB	0.36	W
		2N2484UB1 / SOC2484HRB ⁽¹⁾	0.73	W
P_{TOT}	Total dissipation at $T_C \leq 25\text{ °C}$	2N2484HR	1.2	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	146	°C/W
R_{thJA}	Thermal resistance junction-ambient max	486	°C/W

Table 4. Thermal data for SMD package

Symbol	Parameter	LCC-3 LCC-3UB	Unit
R_{thJA}	Thermal resistance junction-ambient max	486	°C/W
	Thermal resistance junction-ambient ⁽¹⁾ max	239	

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

2 Electrical characteristics

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

Table 5. Electrical characteristics

Symbol	Parameter	Test conditions ⁽¹⁾	Min.	Typ.	Max.	Unit
$V_{(BR)CBO}$	Collector-base breakdown voltage	$I_C = 10\text{ }\mu\text{A}$	60	-		V
$V_{(BR)CEO}$ ⁽²⁾	Collector-emitter breakdown voltage	$I_C = 10\text{ mA}$	60	-		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	$I_E = 10\text{ }\mu\text{A}$	6	-		V
I_{CBO}	Collector-base cut-off current	$V_{CB} = 45\text{ V}$		-	10	nA
I_{CBO}	Emitter-base cut-off current	$V_{EB} = 5\text{ V}$		-	10	nA
$V_{CE(sat)}$ ⁽²⁾	Collector-emitter saturation voltage	$I_C = 1\text{ mA}, I_B = 0.1\text{ mA}$		-	0.35	V
h_{FE} ⁽²⁾	DC forward current transfer ratio	$I_C = 1\text{ }\mu\text{A}, V_{CE} = 5\text{ V}$	30	-	500	
		$I_C = 10\text{ }\mu\text{A}, V_{CE} = 5\text{ V}$	100			
		$I_C = 100\text{ }\mu\text{A}, V_{CE} = 5\text{ V}$	175			
		$I_C = 1\text{ mA}, V_{CE} = 5\text{ V}$	250			
		$I_C = 10\text{ mA}, V_{CE} = 5\text{ V}$				
h_{fe}	High frequency current Gain 1	$V_{CE} = 5\text{ V}, I_C = 50\text{ }\mu\text{A}, f = 5\text{ MHz}$	3	-		
	High frequency current Gain 2	$V_{CE} = 5\text{ V}, I_C = 500\text{ }\mu\text{A}, f = 30\text{ MHz}$	2			
C_{obo}	Output capacitance	$V_{CB} = 5\text{ V}, I_E = 0, f = 1\text{ MHz}$		-	6	pF
C_{ibo}	Input capacitance	$V_{EB} = 0.5\text{ V}, I_C = 0, f = 1\text{ MHz}$		-	6	pF
h_{FE}	Small signal current gain	$I_C = 1\text{ mA}, V_{CE} = 5\text{ V}, f = 1\text{ kHz}$	150	-	900	
h_{ie}	Small signal input impedance	$I_C = 1\text{ mA}, V_{CE} = 5\text{ V}, f = 1\text{ kHz}$	3.5	-	24	k Ω
h_{oc}	Small signal output impedance	$I_C = 1\text{ mA}, V_{CE} = 5\text{ V}, f = 1\text{ kHz}$		-	40	$\mu\Omega$
h_{re}	Small signal reverse voltage transfer ratio	$I_C = 1\text{ mA}, V_{CE} = 5\text{ V}, f = 1\text{ kHz}$		-	800	10^{-6}
N_{FW}	Wide-Band noise	$V_{CE} = 5\text{ V}, I_C = 10\text{ }\mu\text{A}, R_S = 10\text{ k}\Omega$		-	3	dB

Table 5. Electrical characteristics (continued)

Symbol	Parameter	Test conditions ⁽¹⁾	Min.	Typ.	Max.	Unit
NF _{N1}	Spot noise figure	V _{CE} = 5 V, I _C = 10 μA R _S = 10 kΩ, f = 100 Hz Power BW = 200 Hz	-	-	3	dB
NF _{N2}		V _{CE} = 5 V, I _C = 10 μA R _S = 10 kΩ, f = 1 kHz Power BW = 20 Hz	-	-	10	
NF _{N3}		V _{CE} = 5 V, I _C = 10 μA R _S = 10 kΩ, f = 10 kHz Power BW = 2 Hz	-	-	2	

1. Measurement performed on a sample basis, LTPD 7 or less.
2. Pulse measurement: Pulse width ≤ 300 μs, duty cycle ≤ 1.0 %

Table 6. Electrical characteristics at high and low temperatures

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I _{CBO}	Collector-base cut-off current	V _{CB} = 45 V, T _{amb} = 150 °C		-	10	μA
h _{FE2}	DC forward current transfer ratio	I _C = 10 μA, V _{CE} = 5 V T _{amb} = - 55 °C	20	-		

3 Test circuit

Figure 2. Circuit for electrical measurements

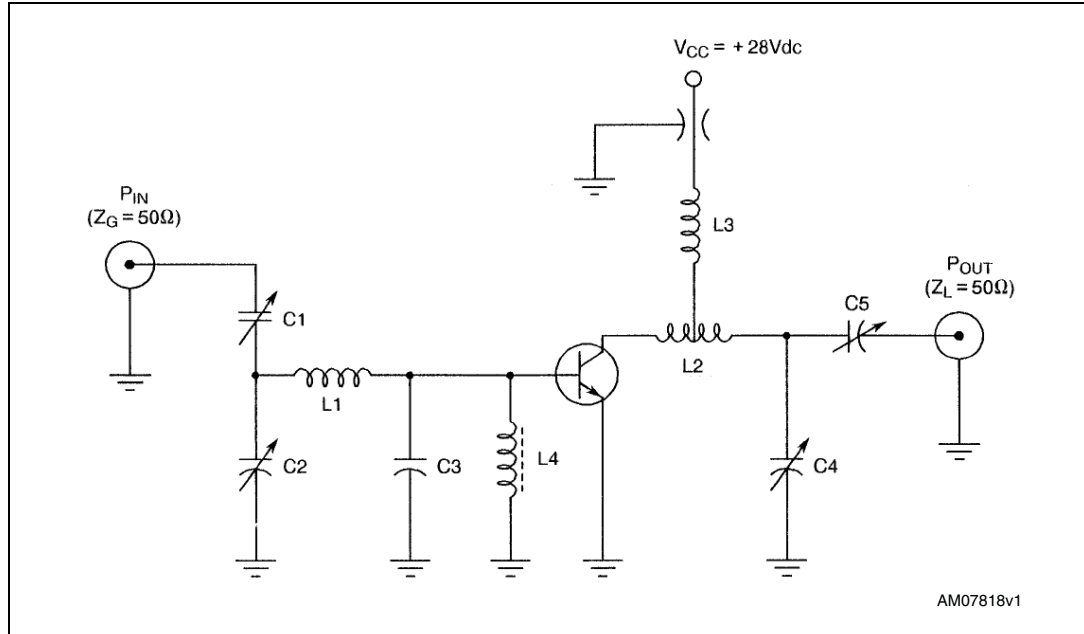


Table 7. List of components

Component	Description
C1, C2, C5	3.0 - 35 pF
C3 ⁽¹⁾	24 pF
C4	0.4 - 7.0 pF
L1	Straight piece n° 16 bare tin wire, 5/8 inch long
L2	3 turns n° 16 wire, 1/4 inch ID, 5/16 inch long
L3	1 turn n° 18 wire, 1/4 inch ID, 1/4 inch long
L4	Ferrite rf choke, Z = 450 Ω

1. For optimum performance, C3 should be mounted as close as possible to the base lead.

4 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.

4.1 LCC-3

Figure 3. LCC-3 drawings

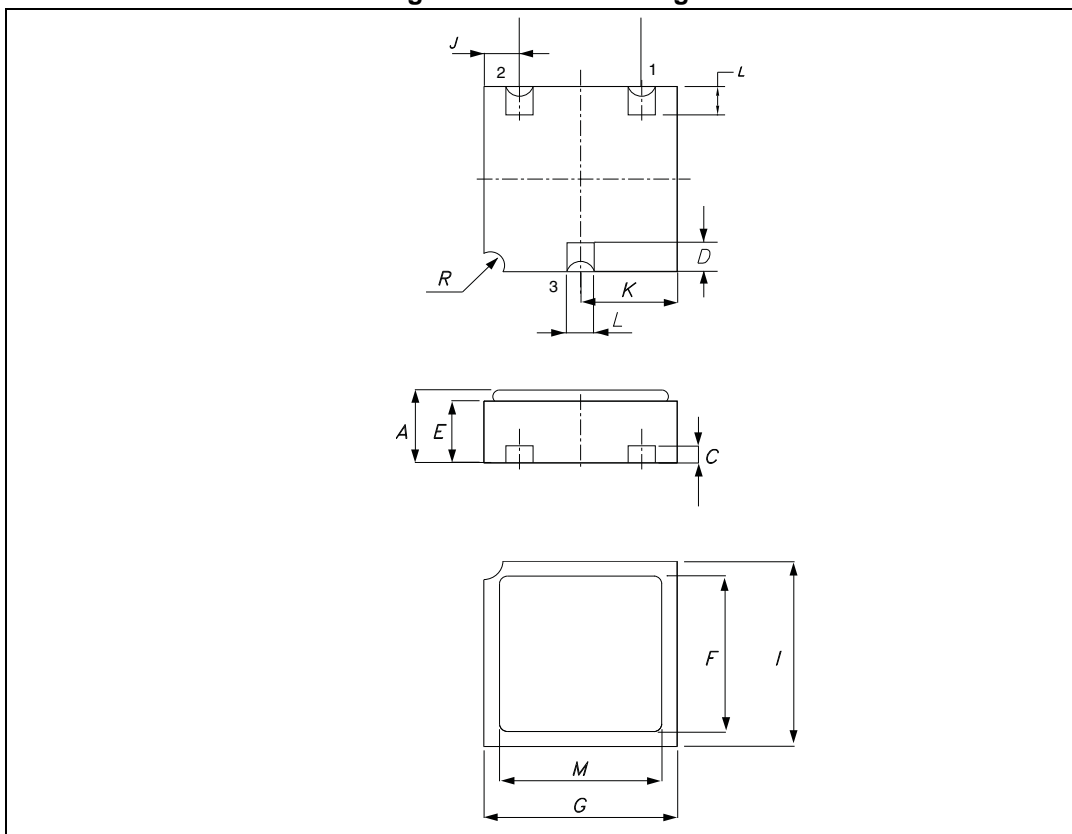


Table 8. LCC-3 mechanical data

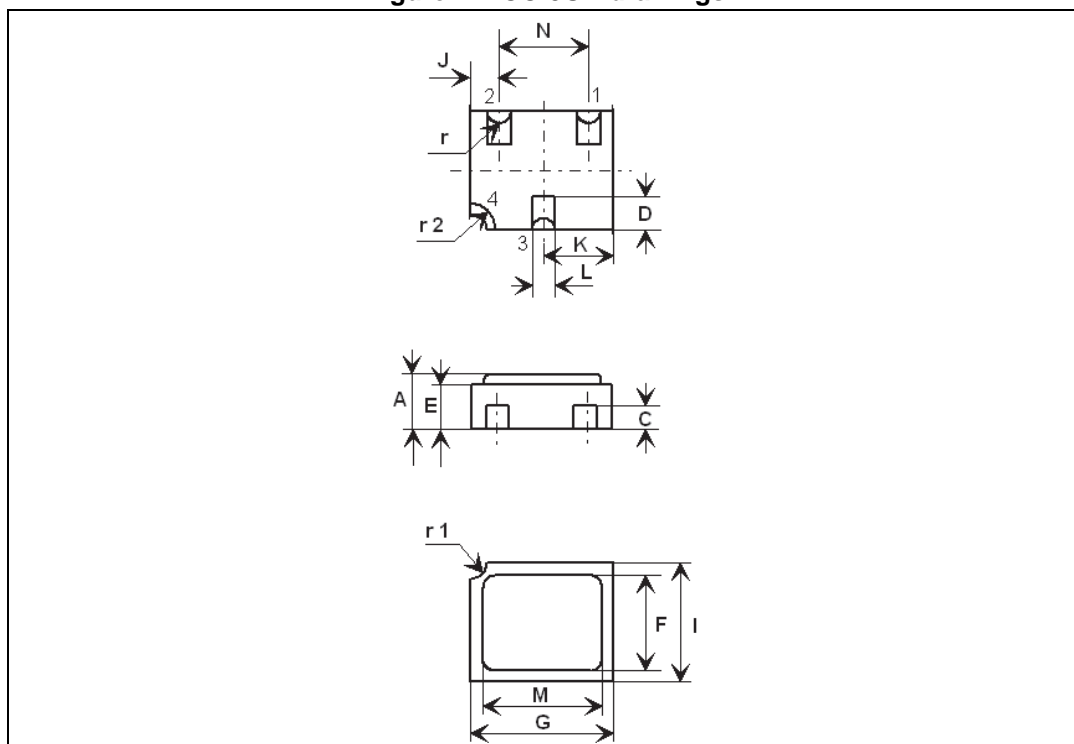
Dim.	mm.		
	Min.	Typ.	Max.
A	1.16		1.42
C	0.45	0.50	0.56
D	0.60	0.76	0.91
E	0.91	1.01	1.12
F	1.95	2.03	2.11
G	2.92	3.05	3.17
I	2.41	2.54	2.66
J	0.42	0.57	0.72
K	1.37	1.52	1.67
L	0.40	0.50	0.60
M	2.46	2.54	2.62
N	1.80	1.90	2.00
R		0.30	

4.2 UB

Table 9. UB 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 4. LCC-3UB drawings

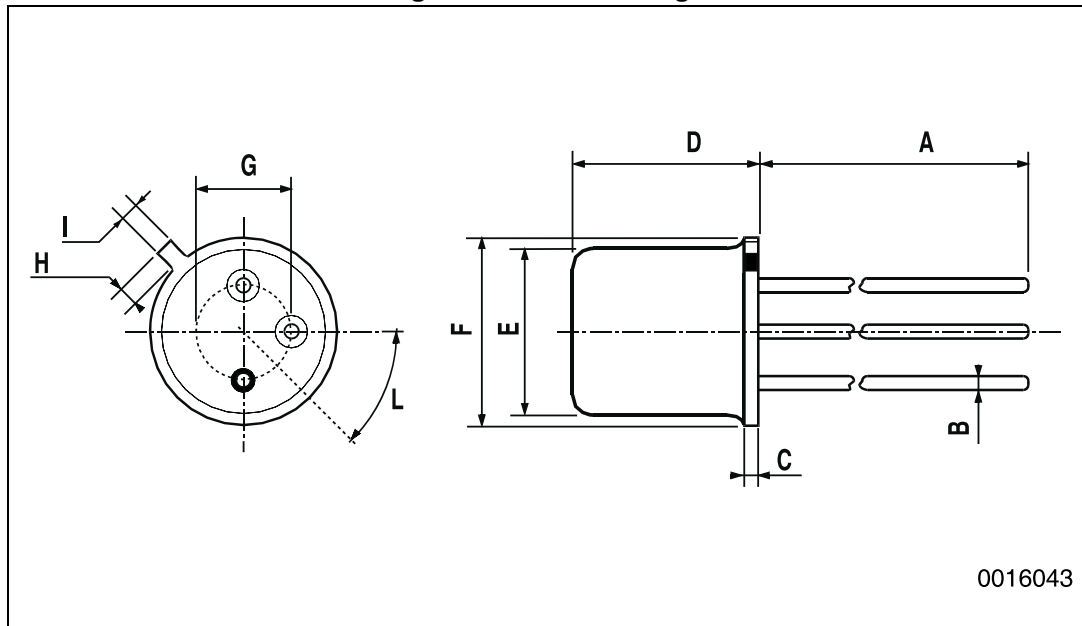


4.3 TO-18

Table 10. 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 5. TO-18 drawings



0016043

5 Order codes

Table 11. Order codes

CPN	Agency specification	EPPL	Quality level	Radiation level	Package	Lead finish	Marking ⁽¹⁾	Packing
2N2484UB1	-	-	Engineering model ESCC	-	UB	Gold	2N2484UB1	WafflePack
SOC24841	-	-	Engineering model ESCC	-	LCC-3	Gold	SOC24841	WafflePack
2N2484UBG	5201/001/06	-	ESCC	-	UB	Gold	520100106	WafflePack
2N2484UBT	5201/001/07	-	ESCC	-	UB	Solder Dip	520100107	WafflePack
SOC2484HRG	5201/001/04	-	ESCC	-	LCC-3	Gold	520100104	WafflePack
SOC2484HRT	5201/001/05	Yes	ESCC	-	LCC-3	Solder Dip	520100105	WafflePack
2N2484HRG	5201/001/01	-	ESCC	-	TO-18	Gold	520100101	Strip Pack
2N2484HRT	5201/001/02	-	ESCC	-	TO-18	Solder Dip	520100102	Strip Pack

1. Specific marking only. The full marking includes in addition:
 For the Engineering Models: ST logo, date code; country of origin (FR).
 For ESCC flight parts: ST logo, date code, country of origin (FR), ESA logo, serial number of the part within the assembly lot.

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

- Products in die form
- Tape and reel packing

6 Revision history

Table 12. Document revision history

Date	Revision	Changes
09-Jul-2010	1	Initial release.
26-Feb-2013	2	Updated: Table 1: Device summary and Table 11: Order codes .
01-Apr-2014	3	Updated: Table 1: Device summary and Table 11: Order codes . Minor text changes.

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