

## Hi-Rel NPN bipolar transistor 60 V - 50 mA

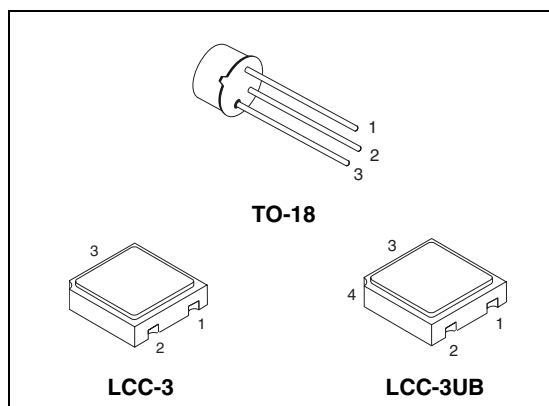
### Features

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

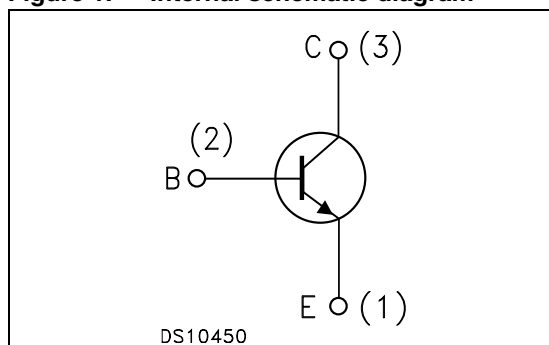
- Linear gain characteristics
- Hermetic packages
- ESCC qualified
- European preferred part list - EPPL

### 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.



**Figure 1. Internal schematic diagram**



Pin 4 in LCC-3UB connected to the lid (for ground contact)

**Table 1. Device summary**

Order codes	ESCC Part number	Quality Level	Packages	Lead Finish	Mass (g)	EPPL
2N2484UB1	-	Engineering Model	LCC-3UB	Gold	0.06	-
2N2484UB06	5201/001/06	ESCC Flight	LCC-3UB	Gold	0.06	-
2N2484UB07	5201/001/07	ESCC Flight	LCC-3UB	Solder Dip	0.06	-
SOC2484	-	Engineering Model	LCC-3	Gold	0.06	-
SOC2484HRB	5201/001/01 or 02	ESCC Flight	LCC-3	Gold / Solder Dip <sup>(1)</sup>	0.06	-
2N2484HR	5201/001/04 or 05	ESCC Flight	TO-18	Gold / Solder Dip <sup>(1)</sup>	0.40	Y

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 ( $I_E = 0$ )	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 <sup>(1)</sup>	0.73	W
	Total dissipation at $T_c \leq 25\text{ °C}$ for 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 <sup>(1)</sup> max	239	

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

## 2 Electrical characteristics

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

**Table 5. Electrical characteristics**

Symbol	Parameter	Test conditions <sup>(1)</sup>	Min.	Typ.	Max.	Unit
$V_{(\text{BR})\text{CBO}}$	Collector-base breakdown voltage	$I_{\text{C}} = 10\text{ }\mu\text{A}$	60	-		V
$V_{(\text{BR})\text{CEO}}^{(2)}$	Collector-emitter breakdown voltage	$I_{\text{C}} = 10\text{ mA}$	60	-		V
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage	$I_{\text{E}} = 10\text{ }\mu\text{A}$	6	-		V
$I_{\text{CBO}}$	Collector-base cut-off current	$V_{\text{CB}} = 45\text{ V}$		-	10	nA
$I_{\text{CBO}}$	Emitter-base cut-off current	$V_{\text{EB}} = 5\text{ V}$		-	10	nA
$V_{\text{CE}(\text{SAT})}^{(2)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{ mA}$ $I_{\text{B}} = 0.1\text{ mA}$		-	0.35	V
$h_{\text{FE}}^{(2)}$	DC forward current transfer ratio	$I_{\text{C}} = 1\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$	30			
		$I_{\text{C}} = 10\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$	100		500	
		$I_{\text{C}} = 100\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$	175	-	550	
		$I_{\text{C}} = 1\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$	250		650	
		$I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$			800	
$h_{\text{fe}}$	High frequency current Gain 1	$V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 50\text{ }\mu\text{A}$ $f = 5\text{ MHz}$	3	-		
	High frequency current Gain 2	$V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 500\text{ }\mu\text{A}$ $f = 30\text{ MHz}$	2	-		
$C_{\text{obo}}$	Output capacitance	$V_{\text{CB}} = 5\text{ V}$ $I_{\text{E}} = 0$ $f = 1\text{ MHz}$		-	6	pF
$C_{\text{ibo}}$	Input capacitance	$V_{\text{EB}} = 0.5\text{ V}$ $I_{\text{C}} = 0$ $f = 1\text{ MHz}$		-	6	pF
$h_{\text{FE}}$	Small signal current gain	$I_{\text{C}} = 1\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ $f = 1\text{ kHz}$	150	-	900	
$h_{\text{ie}}$	Small signal input impedance	$I_{\text{C}} = 1\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ $f = 1\text{ kHz}$	3.5	-	24	k $\Omega$
$h_{\text{oc}}$	Small signal output impedance	$I_{\text{C}} = 1\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ $f = 1\text{ kHz}$		-	40	$\mu\text{mho}$
$h_{\text{re}}$	Small signal reverse voltage transfer ratio	$I_{\text{C}} = 1\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ $f = 1\text{ kHz}$		-	800	$10^{-6}$
$N_{\text{FW}}$	Wide-Band noise	$V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 10\text{ }\mu\text{A}$ $R_{\text{S}} = 10\text{ k}\Omega$		-	3	dB

Table 5. Electrical characteristics

Symbol	Parameter	Test conditions <sup>(1)</sup>	Min.	Typ.	Max.	Unit
NF <sub>N1</sub>	Spot noise figure	V <sub>CE</sub> = 5 V      I <sub>C</sub> = 10 μA R <sub>S</sub> = 10 kΩ      f = 100 Hz Power BW = 200 Hz		-	3	dB
NF <sub>N2</sub>		V <sub>CE</sub> = 5 V      I <sub>C</sub> = 10 μA R <sub>S</sub> = 10 kΩ      f = 1 kHz Power BW = 20 Hz		-	10	
NF <sub>N3</sub>		V <sub>CE</sub> = 5 V      I <sub>C</sub> = 10 μA R <sub>S</sub> = 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 <sub>CBO</sub>	Collector-base cut-off current	V <sub>CB</sub> = 45 V      T <sub>amb</sub> = 150 °C		-	10	μA
h <sub>FE2</sub>	DC forward current transfer ratio	I <sub>C</sub> = 10 μA      V <sub>CE</sub> = 5 V T <sub>amb</sub> = - 55 °C	20	-		

### 3 Test circuit

Figure 2. Circuit for electrical measurements

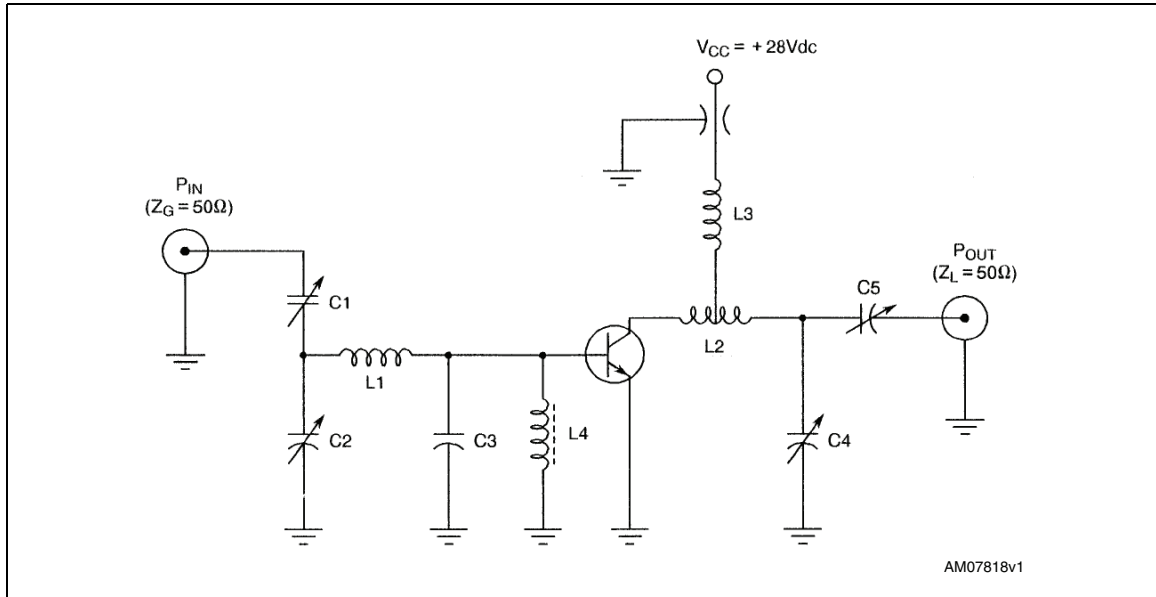


Table 7. List of components

Component	Description
C1, C2, C5	3.0 - 35 pF
C3 <sup>(1)</sup>	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

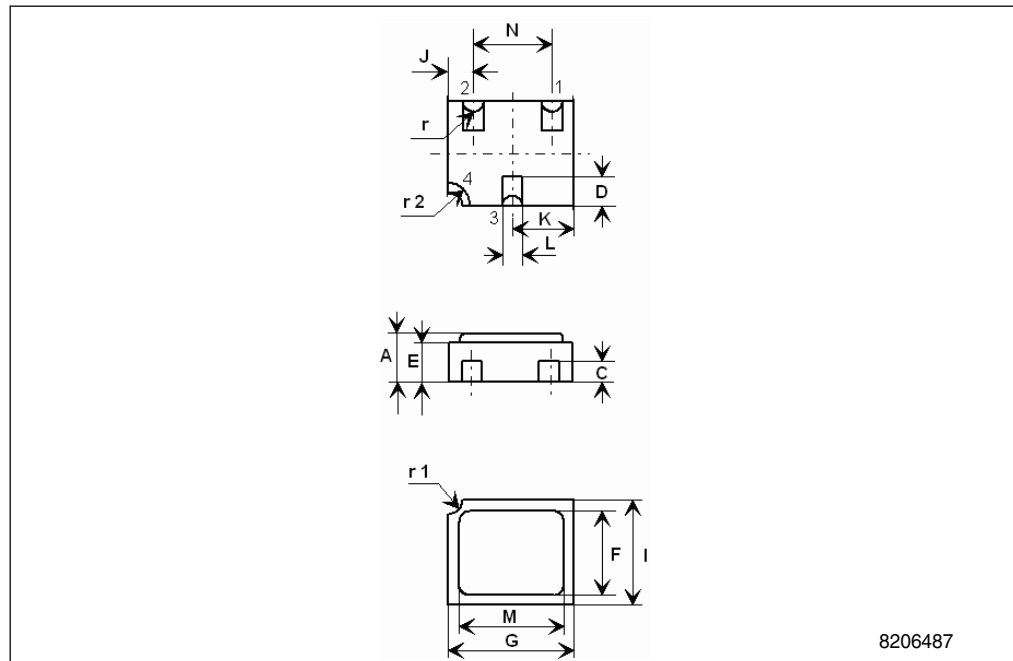
1. For optimum performance, C3 should be mounted as close as possible to the base lead.

## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<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.

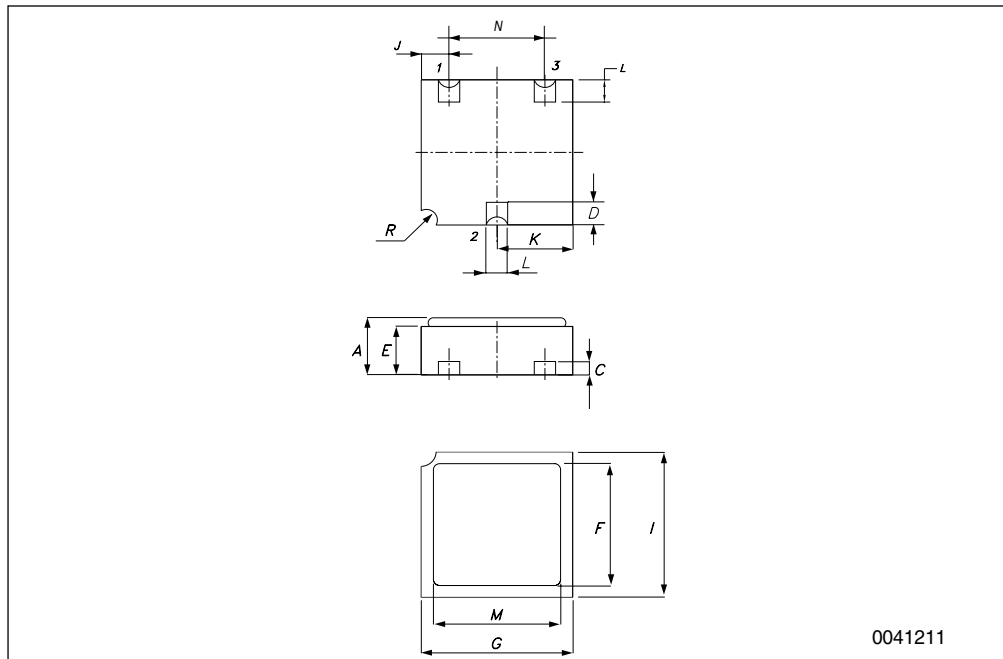
## LCC-3UB mechanical data

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	



**LCC-3 mechanical data**

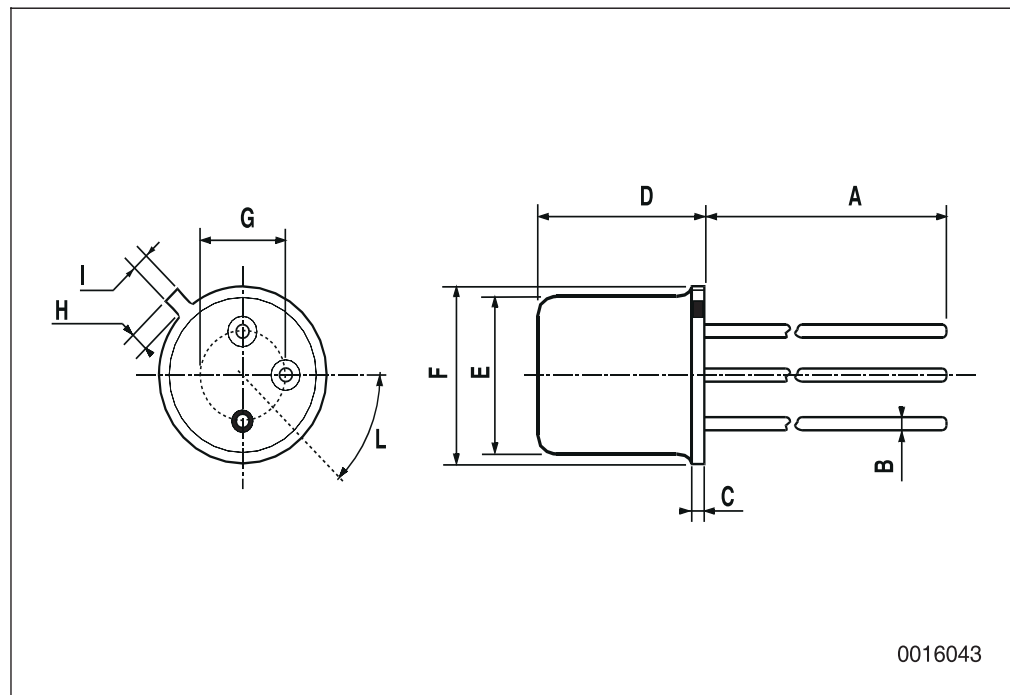
Dim.	mm.		
	Min.	Typ.	Max.
A	1.16		1.42
C	0.45	0.50	0.56
D	0.60	0.76	0.91
E	0.91	1.01	1.12
F	1.95	2.03	2.11
G	2.92	3.05	3.17
I	2.41	2.54	2.66
J	0.42	0.57	0.72
K	1.37	1.52	1.67
L	0.40	0.50	0.60
M	2.46	2.54	2.62
N	1.80	1.90	2.00
R		0.30	





## TO-18 Mechanical data

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		12.7			0.500	
B			0.49			0.019
D			5.3			0.208
E			4.9			0.193
F			5.8			0.228
G	2.54			0.100		
H			1.2			0.047
I			1.16			0.045
L	45°			45°		



0016043

## 5 Order codes

**Table 8. Order codes**

Order codes	ESCC Part number	Packages	Lead Finish	Marking	EPPL	Packing
2N2484UB1	-	LCC-3UB	Gold	2N2484UB1	-	Waffle pack
2N2484UB06	5201/001/06	LCC-3UB	Gold	520100106	-	Waffle pack
2N2484UB07	5201/001/07	LCC-3UB	Solder Dip	520100107	-	Waffle pack
SOC2484	-	LCC-3	Gold	SOC2484	-	Waffle pack
SOC2484HRB	5201/001/01 or 02	LCC-3	Gold or Solder Dip <sup>(1)</sup>	520100101 or 02	-	Waffle pack
2N2484HR	5201/001/04 or 05	TO-18	Gold or Solder Dip <sup>(1)</sup>	520100104 or 05	Y	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 & reel packing

## 6 Revision history

Table 9. Document revision history

Date	Revision	Changes
09-Jul-2010	1	Initial release

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