

Hi-Rel NPN dual matched bipolar transistor 60 V - 0.03 A

Datasheet - preliminary data

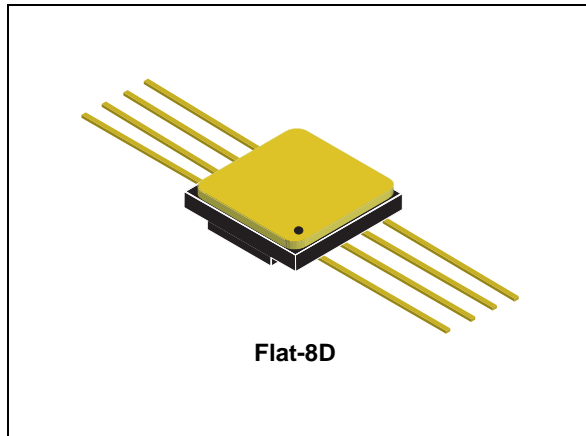
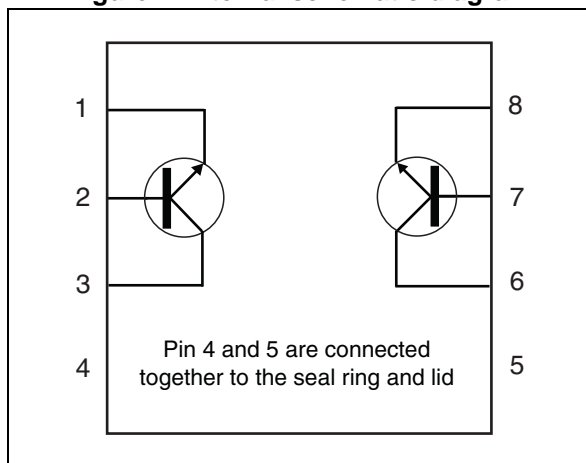


Figure 1. Internal schematic diagram



Features

BV_{CEO}	60 V
I_C (max)	0.03 A
H_{FE} at 10 V - 150 mA	> 300
Operating temperature range	-65°C to +200°C

- Hi-Rel NPN dual matched bipolar transistor
- Linear gain characteristics
- Manufactured according to ESCC 5000 specifications

Description

The 2N2920AK is a silicon planar epitaxial NPN transistor in a Flat-8D package. It is specifically designed for aerospace Hi-Rel applications and ESCC qualified according to the 5207-002 specification. In case of conflict between this datasheet and ESCC detailed specification, the latter prevails.

Table 1. Device summary

Order codes	Marking	Packages	Lead finish	Quality level	Packaging	Mass
2N2920AK1	2N2920AK1	Flat-8D	Gold	EM	Strip pack	0.2 g
2N2920AKT	2N2920AKT		Solder Dip	Flight according to ESCC		
2N2920AKG	2N2920AKG		Gold			

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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	30	mA
P_{TOT}	Total dissipation at $T_{amb} \leq 25\text{ °C}$ ^{(1),(3)}	1.3	W
	Total dissipation at $T_{amb} \leq 25\text{ °C}$ ^{(2),(3)}	1.5	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

Symbol	Parameter	Value	Unit
R_{thJA}	Thermal resistance junction-ambient ⁽¹⁾⁽³⁾ max.	135	°C/W
	Thermal resistance junction-ambient ⁽²⁾⁽³⁾ max.	117	°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

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector-base cut-off current ($I_{\text{E}} = 0$)	$V_{\text{CB}} = 45\text{ V}$ $V_{\text{CB}} = 45\text{ V}$ $T_{\text{C}} = 150\text{ °C}$		-	2 10	nA μA
I_{CEO}	Collector cut-off current ($I_{\text{B}} = 0$)	$V_{\text{CE}} = 5\text{ V}$		-	2	nA
I_{EBO}	Emitter-base cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 5\text{ V}$		-	2	nA
$V_{(\text{BR})\text{CBO}}$	Collector-base breakdown voltage ($I_{\text{E}} = 0$)	$I_{\text{C}} = 10\text{ }\mu\text{A}$	60	-		V
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ($I_{\text{B}} = 0$)	$I_{\text{C}} = 10\text{ mA}$	60	-		V
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ($I_{\text{C}} = 0$)	$I_{\text{E}} = 10\text{ }\mu\text{A}$	6	-		V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{ mA}$ $I_{\text{B}} = 0.1\text{ mA}$		-	0.35	V
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{ mA}$ $I_{\text{B}} = 0.1\text{ mA}$	0.5	-	1	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 10\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 100\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 1\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 10\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$ $T_{\text{amb}} = -55\text{ °C}$	150 225 300 50	-	600	
$h_{\text{FE}2-1} / h_{\text{FE}2-2}$	DC current transfer ratio comparison	$I_{\text{C}} = 100\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$ $T_{\text{amb}} = -55\text{ °C to }+25\text{ °C}$	0.91	-	1.1	
$h_{\text{FE}2-1} / h_{\text{FE}2-2}$	DC current transfer ratio comparison	$I_{\text{C}} = 100\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$ $T_{\text{amb}} = -55\text{ °C to }+125\text{ °C}$	0.85	-	1.18	
$\Delta V_{\text{BE}1} - V_{\text{BE}2} $	Base-emitter voltage differential	$V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 10\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 100\text{ }\mu\text{A}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 1\text{ mA}$		-	2 1.5 2	mV mV mV
$\Delta V_{\text{BE}1} - V_{\text{BE}2} $	Base-emitter voltage differential	$V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 100\text{ }\mu\text{A}$ $T_{\text{amb}} = -55\text{ °C to }+25\text{ °C}$ $T_{\text{amb}} = +25\text{ °C to }+125\text{ °C}$		-	0.4 0.5	mV mV

Table 4. Electrical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{Lk}	Leakage current between active devices	$V = 50\text{ V}$ to E_2, B_2, C_2 $V = 0\text{ V}$ to E_1, B_1, C_1		-	5	μA
f_T	Transition frequency	$I_C = 0.5\text{ mA}$ $V_{CE} = 5\text{ V}$	60	-		MHz
h_{ob}	Output admittance	$V_{CE} = 5\text{ V}$ $I_C = 1\text{ mA}$ $f = 1\text{ kHz}$		-	1	μmho
h_{ib}	Input impedance	$V_{CB} = 5\text{ V}$ $I_C = 1\text{ mA}$ $f = 1\text{ kHz}$	25	-	32	Ω
C_{obo}	Output capacitance ($I_E = 0$)	$V_{CB} = 5\text{ V}$ $100\text{ kHz} \leq f \leq 1\text{ MHz}$		-	6	pF
NF	Noise figure	$V_{CE} = 5\text{ V}$ $I_C = 10\text{ }\mu\text{A}$ $R_S = 10\text{ k}\Omega$ $f = 1\text{ kHz}$ Bandwidth = 200 Hz		-	3	dB
NF	Noise figure	$V_{CE} = 5\text{ V}$ $I_C = 10\text{ }\mu\text{A}$ $R_S = 10\text{ k}\Omega$ $10\text{ Hz} \leq f \leq 15.7\text{ kHz}$ Bandwidth = 200 Hz		-	3	dB

1. Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$

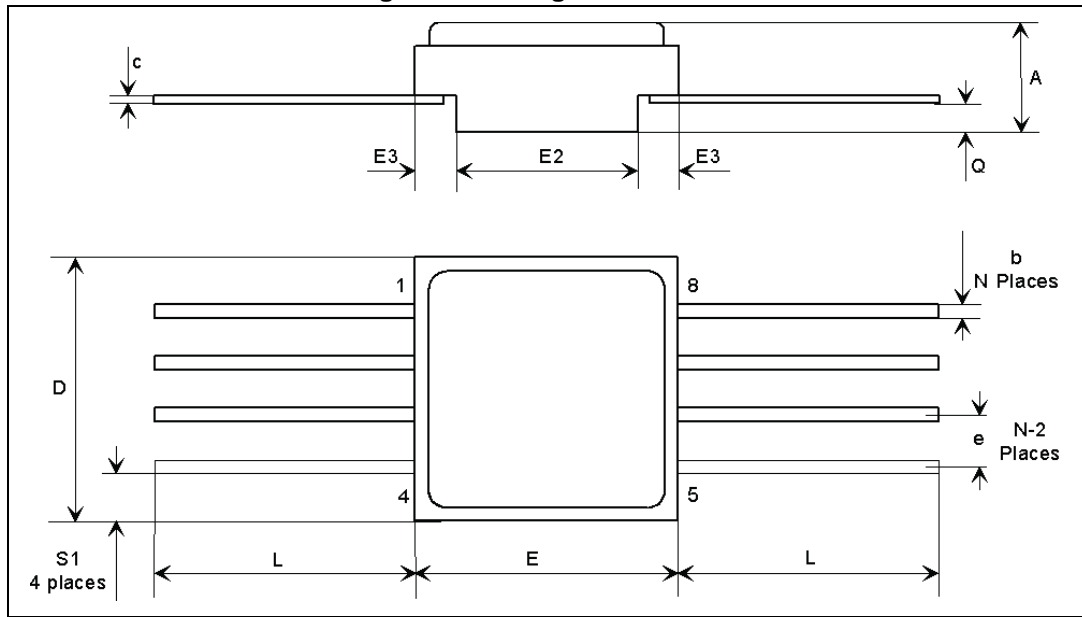
3 Package mechanical data

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Table 5. Flat-8D mechanical data

Dim.	mm.			inch		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.24	2.44	2.64	0.088	0.096	0.104
b	0.38	0.43	0.48	0.015	0.017	0.019
c	0.10	0.13	0.16	0.004	0.005	0.006
D	6.35	6.48	6.61	0.250	0.255	0.260
E	6.35	6.48	6.61	0.250	0.255	0.260
E2	4.32	4.45	4.58	0.170	0.175	0.180
E3	0.88	1.01	1.14	0.035	0.040	0.045
e		1.27			0.050	
L	6.51	-	7.38	0.256	-	0.291
Q	0.66	0.79	0.92	0.026	0.031	0.036
S1	0.92	1.12	1.32	0.036	0.044	0.052
N	08			08		

Figure 2. Package dimensions



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
18-Apr-2013	1	Initial release

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