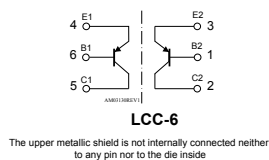
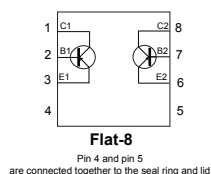
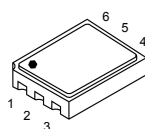
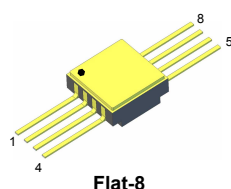


Rad-Hard 60 V, 0.03 A, dual NPN matched transistor



Product status link

[2N2920AHR](#)

Features

V_{CE0}	$I_C(\text{max.})$	H_{FE} at 10 V, 150 mA	$T_j(\text{max.})$
60 V	0.03 A	> 300	200 °C

- Hermetic packages
- ESCC qualified

Description

2N2920AK and SOC2920AHR are silicon planar NPN dual matched transistors packaged in Flat-8 and LCC-6 respectively and specifically designed for aerospace Hi-Rel applications and qualified as per ESCC 5207/002 specification. In case of discrepancies between this datasheet and the relevant agency specification, the latter takes precedence.

Product summary

Product summary			
Device	Qualification system	Agency specification	Package
2N2920AKx	ESCC Flight	5207/002	Flat-8
SOC2920AHRx			LCC-6

Note: See [Table 6](#) for ordering information.

1 Electrical ratings

Table 1. 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 $T_{amb} \leq 25\text{ °C}$	for Flat-8 ⁽¹⁾⁽³⁾	1.3	W
		for Flat-8 ⁽²⁾⁽³⁾	1.5	
		for LCC-6 ⁽¹⁾	0.3	
		for LCC-6 ⁽²⁾	0.5	
T_{STG}	Storage temperature range		-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 2. Thermal data

Symbol	Parameter		Value	Unit
R_{thJA}	Thermal resistance junction-to-ambient	for Flat-8 ⁽¹⁾⁽³⁾	135	°C/W
		for Flat-8 ⁽²⁾⁽³⁾	117	
		for LCC-6 ⁽¹⁾	291	
		for LCC-6 ⁽²⁾	175	

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

2 Electrical characteristics

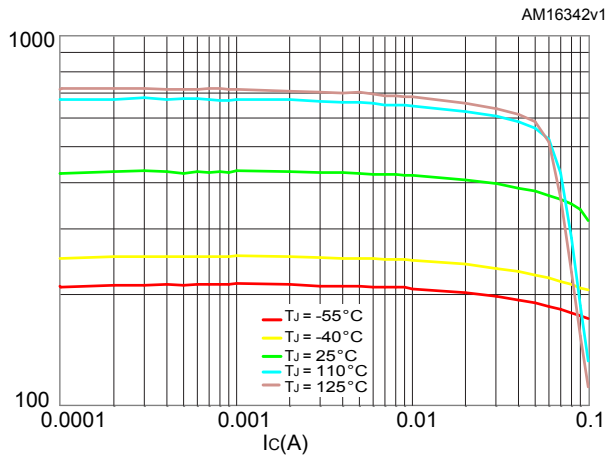
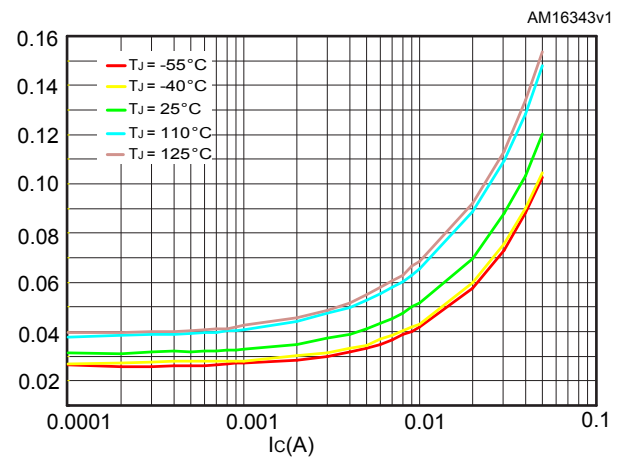
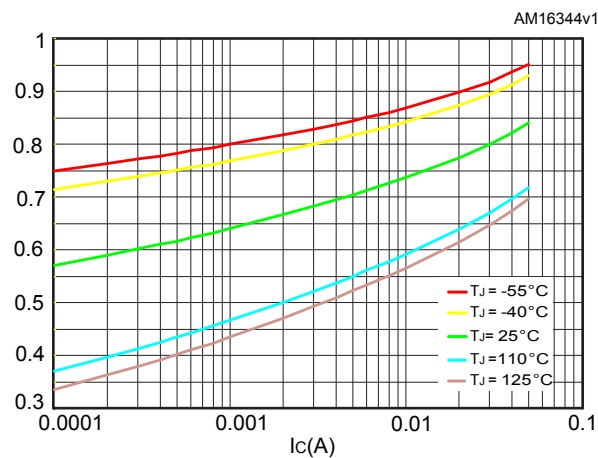
$T_{\text{case}} = 25\text{ °C}$ unless otherwise specified.

Table 3. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Max.	Unit
I_{CBO}	Collector-base cut-off current ($I_{\text{E}} = 0$)	$V_{\text{CB}} = 45\text{ V}$		2	nA
		$V_{\text{CB}} = 45\text{ V}$, $T_{\text{C}} = 150\text{ °C}$		10	μA
I_{CEO}	Collector cut-off current ($I_{\text{B}} = 0$)	$V_{\text{CE}} = 5\text{ V}$		2	
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
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 1\text{ mA}$, $I_{\text{B}} = 0.1\text{ mA}$		0.35	V
$V_{\text{BE(sat)}}^{(1)}$	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	$I_{\text{C}} = 10\text{ }\mu\text{A}$, $V_{\text{CE}} = 5\text{ V}$	150	600	
		$I_{\text{C}} = 100\text{ }\mu\text{A}$, $V_{\text{CE}} = 5\text{ V}$	225		
		$I_{\text{C}} = 1\text{ mA}$, $V_{\text{CE}} = 5\text{ V}$	300		
		$I_{\text{C}} = 10\text{ }\mu\text{A}$, $V_{\text{CE}} = 5\text{ V}$, $T_{\text{amb}} = -55\text{ °C}$	50		
$h_{\text{FE2-1}} / h_{\text{FE2-2}}$	DC current 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	
$h_{\text{FE2-1}} / h_{\text{FE2-2}}$	DC current 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{BE1}} - V_{\text{BE2}} $	Base-emitter voltage differential	$V_{\text{CE}} = 5\text{ V}$, $I_{\text{C}} = 10\text{ }\mu\text{A}$		2	mV
		$V_{\text{CE}} = 5\text{ V}$, $I_{\text{C}} = 100\text{ }\mu\text{A}$		1.5	mV
		$V_{\text{CE}} = 5\text{ V}$, $I_{\text{C}} = 1\text{ mA}$		2	mV
$\Delta V_{\text{BE1}} - V_{\text{BE2}} $	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 $+25\text{ °C}$		0.4	mV
		$T_{\text{amb}} = +25\text{ °C}$ to $+125\text{ °C}$		0.5	mV
I_{Lk}	Leakage current between sections	$V = 50\text{ V}$ to E_2 , B_2 , C_2 $V = 0\text{ V}$ to E_1 , B_1 , C_1		5	μA
f_{T}	Transition frequency	$I_{\text{C}} = 0.5\text{ mA}$, $V_{\text{CE}} = -5\text{ V}$	60	500	MHz
h_{ob}	Output admittance	$I_{\text{C}} = 1\text{ mA}$, $V_{\text{CE}} = 5\text{ V}$, $f = 1\text{ kHz}$		1	μmho
h_{ib}	Input impedance	$I_{\text{C}} = 1\text{ mA}$, $V_{\text{CE}} = 5\text{ V}$, $f = 1\text{ kHz}$	25	32	Ω
C_{OBO}	Output capacitance ($I_{\text{E}} = 0$)	$V_{\text{CB}} = 5\text{ V}$, $100\text{ kHz} \leq f \leq 1\text{ MHz}$		6	pF
NF	Noise figure	$V_{\text{CE}} = 5\text{ V}$, $I_{\text{C}} = 10\text{ }\mu\text{A}$, $R_{\text{S}} = 10\text{ k}\Omega$, $f = 1\text{ kHz}$, $\text{BW} = 200\text{ Hz}$		3	dB
NF	Noise figure	$V_{\text{CE}} = 5\text{ V}$, $I_{\text{C}} = 10\text{ }\mu\text{A}$, $R_{\text{S}} = 10\text{ k}\Omega$, $10\text{ kHz} \leq f \leq 15.7\text{ kHz}$, $\text{BW} = 200\text{ Hz}$		3	dB

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

2.1 Electrical characteristics (curves)

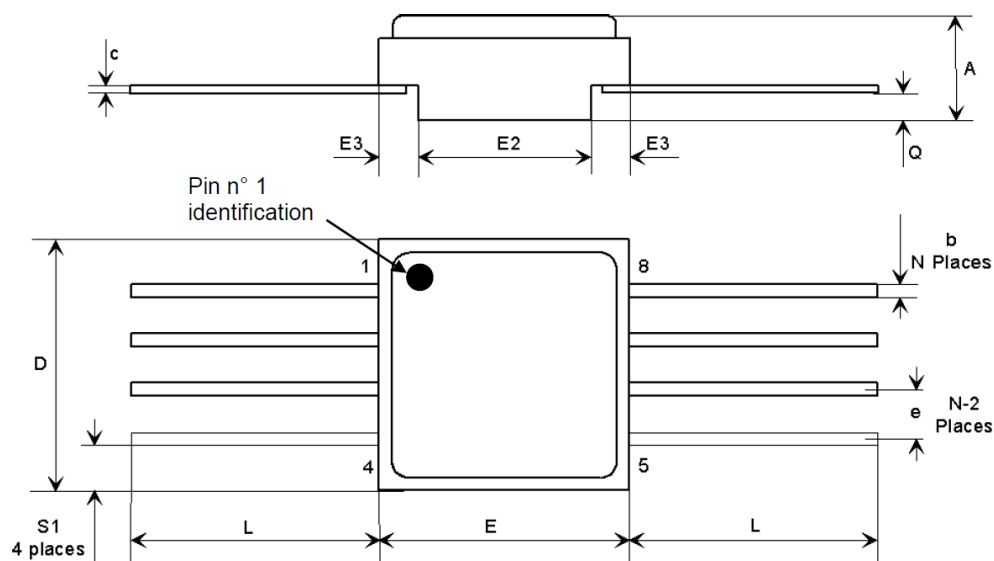
Figure 1. h_{FE} at $V_{CE} = 5\text{ V}$

Figure 2. $V_{CE(sat)}$ at $h_{FE} = 10$

Figure 3. $V_{BE(sat)}$ at $h_{FE} = 10$


3 Package information

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.

3.1 Flat-8 package information

Figure 4. Flat-8 package outline



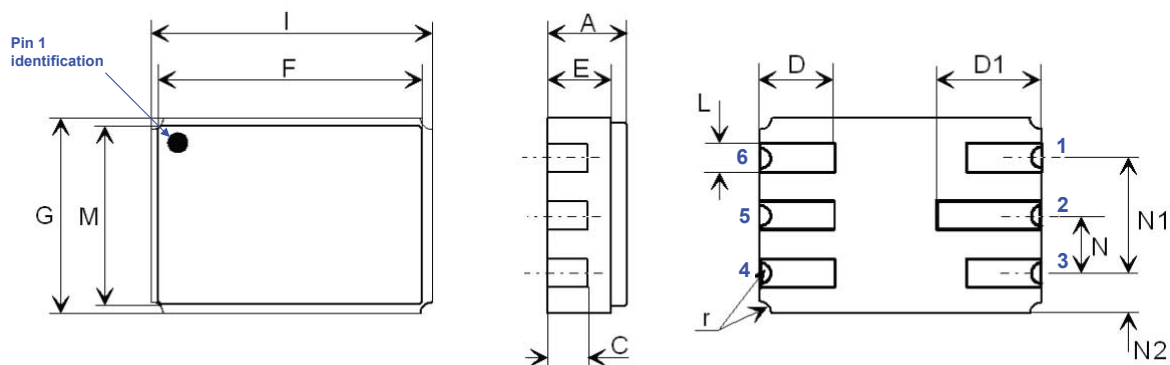
7939278_6

Table 4. Flat-8 mechanical data

Symbol	Millimeters			Inches		
	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		

3.2 LCC-6 package information

Figure 5. LCC-6 package outline



7098021_6

Table 5. LCC-6 mechanical data

Dim.	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.53		1.96	0.060		0.077
C	0.78	0.89	0.99	0.031	0.035	0.039
D	1.52	1.65	1.78	0.060	0.065	0.070
D1	2.08	2.28	2.49	0.082	0.090	0.098
E	1.24	1.40	1.55	0.049	0.055	0.059
G	4.19	4.31	4.45	0.165	0.170	0.175
I	6.10	6.22	6.35	0.240	0.245	0.250
L	0.56	0.63	0.71	0.022	0.025	0.028
M	3.86	3.94	4.01	0.152	0.155	0.158
N	1.14	1.27	1.40	0.045	0.050	0.055
N1	2.41	2.54	2.67	0.095	0.100	0.105
N2	0.64	0.89	1.14	0.025	0.035	0.045
r		0.23			0.009	

4 Ordering information

Table 6. Ordering information

Part number	Agency specification	Quality level	Package	Mass	Lead finish	Marking ⁽¹⁾	Packing
2N2920AK1	-	Engineering model	Flat-8	0.7 g	Gold	2N2920AK1	Waffle pack
2N2920AKG	5207/002/16	ESCC flight			Gold	520700216	
2N2920AKT	5207/002/17	ESCC flight			Solder dip	520700217	
SOC2920A1	-	Engineering model	LCC-6	0.2 g	Gold	SOC2920A1	
SOC2920AHRG	5207/002/12	ESCC flight			Gold	520700212	
SOC2920AHRT	5207/002/15	ESCC flight			Solder dip	520700215	

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.



5 Other information

5.1 Traceability information

Date code information is described in the table below.

Table 7. Date codes

Model	Date code ¹
EM	3yywwN
ESCC	yywwN

1. yy = year, ww = week number, N = lot index in the week.

5.2 Documentation

Table 8. Documentation provided for each type of product

Quality level	Radiation level	Documentation
Engineering model	-	Certificate of conformance
ESCC	-	Certificate of conformance ESCC qualification maintenance lot reference

Revision history

Table 9. Document revision history

Date	Revision	Changes
10-Dec-2008	1	Initial release
05-Jan-2010	2	Modified Table 1 on page 1
15-Nov-2012	3	Added: Section 2.1: Electrical characteristics (curves) Updated: Section 3: Package information
04-Apr-2014	4	Updated: Table 1: Device summary and Table 2: Absolute maximum ratings. Minor text changes.
14-May-2014	5	Updated Section 3.2: LCC-6, package information.
16-Mar-2016	6	Updated Section 3.1: TO-77 package information and Section 3.2: LCC-6 package information. Minor text changes.
06-Apr-2021	7	Removed TO-77 package information. Added Flat-8 package information. Minor text changes.

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