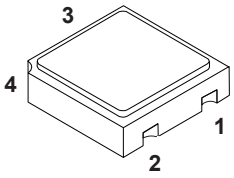
JANS2N2222A

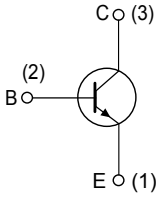
Datasheet

Rad-Hard 50 V, 0.8 A NPN transistor



UB

Pin 4 in UB is connected to the metallic lid.



DS10450

Product status link
JANS2N2222A

Features

V_{ceo}	I_C(max.)	H_{FE} at 10 V, 150 mA	T_j(max.)
50 V	0.8 A	> 100	200 °C

- Hermetic package
- Qualified as per MIL-PRF-19500/255
- 100 krad

Description

This bipolar transistor is qualified as per MIL-PRF19500/255, JANS and JANSR levels and available in UB hermetic package.

Able to operate under critical environment and radiation exposure, it provides high reliability performance and immunity to the total ionizing dose (TID) at high and low dose rate conditions.

Specifically recommended for space and harsh environment applications it is suitable for low current and high precision circuits such preamplifiers, oscillators, current mirror configuration.

In case of discrepancies between this datasheet and the relevant agency specification, the latter takes precedence.

Product summary

Product summary				
Part-number	Qualification system	Agency specification	Package	Radiation level
JANSR2N2222AUBx	JANSR	MIL-PRF-19500/255	UB	100 krad
JANS2N2222AUBx	JANS	MIL-PRF-19500/255	UB	-

Note: See Table 1 for ordering information.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base voltage (I_E = 0)	75	V
V_{CEO}	Collector-emitter voltage (I_B = 0)	50	V
V_{EBO}	Emitter-base voltage (I_C = 0)	6	V
I_C	Collector current	0.8	A
P_{TOT}	Total dissipation at $T_{amb} \leq 25$ °C	0.5	W
	Total dissipation at $T_{SP(IS)}$ = 25 °C	1	W
T_{OP}	Operating temperature range	-65 to 200	°C
T_J	Max. operating junction temperature	200	°C

Table 2. Thermal data

Symbol	Parameter	LCC-3 and UB Value	Unit
$R_{thJSP(IS)}$	Thermal resistance junction-solder pad (infinite sink) (max) for JANS	90	°C/W
RthJA	Thermal resistance junction-ambient (max)	325	

2 Electrical characteristics

Table 3. Electrical characteristics (T_{amb} = 25 °C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Max.	Unit
I_{CBO}	Collector-base cut-off current (I_E = 0)	V_{CB} = 75 V		10	µA
		V_{CB} = 60 V		10	nA
		V_{CB} = 60 V, T_{amb} = 150 °C		10	µA
I_{CES}	Collector-base cut-off current (I_E = 0)	V_{CE} = 50 V		50	nA
I_{EBO}	Emitter-base cut-off current (I_C = 0)	V_{EB} = 6 V		10	µA
		V_{EB} = 4 V		10	nA
$V_{(BR)CEO}$ (1)	Collector-emitter breakdown voltage (I_B = 0)	I_C = 10 mA	50		V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 150 mA, I_B = 15 mA		0.3	V
		I_C = 500 mA, I_B = 50 mA		1	V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 150 mA, I_B = 15 mA	0.6	1.2	V
		I_C = 500 mA, I_B = 50 mA		2	V
h_{FE} (1)	DC current gain	I_C = 0.1 mA, V_{CE} = 10 V	50		
		I_C = 1 mA, V_{CE} = 10 V	75	325	
		I_C = 10 mA, V_{CE} = 10 V	100		
		I_C = 150 mA, V_{CE} = 10 V	100	300	
		I_C = 500 mA, V_{CE} = 10 V	30		
		I_C = 10 mA, T_{amb} = -55 °C, V_{CE} = 10 V	35		
h_{fe}	Small signal current gain	I_C = 20 mA, f = 100 MHz, V_{CE} = 20 V	2.5		
		I_C = 1 mA, f = 1 kHz, V_{CE} = 10 V	50		
C_{OBO}	Output capacitance, (I_E = 0)	100 kHz ≤ f ≤ 1 MHz, V_{CB} = 10 V		8	pF
C_{IBO}	Input capacitance, (I_C = 0)	100 kHz ≤ f ≤ 1 MHz, V_{EB} = 0.5 V		25	pF
t_{on}	Turn-on time	I_{CC} = 150 mA, I_{B1} = 15 mA, V_{CC} = 30 V		35	ns
t_{off}	Turn-off time	I_{CC} = 150 mA, I_{B1} = I_{B2} = 15 mA, V_{CC} = 30 V		300	ns

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

2.1 Radiation assurance

JANSR2N2222A is guaranteed at 100 krad in compliance with the MIL-PRF-19500 Group D between 50 and 300 rad/s and 0.1 rad/s as per ESCC 22900. Post radiation electrical characteristics are described in Table 4.

Table 4. MIL-PRF-19500 post radiation electrical characteristics (T_{amb} = 25 °C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Max	Unit
I_{CBO}	Collector cut-off current (I_E = 0)	V_{CB}= 75 V		20	µA
		V_{CB}= 60 V		20	nA
I_{EBO}	Emitter cut-off current (I_C= 0)	V_{EB} = 6 V		20	µA
		V_{EB} = 4 V		20	µA
$V_{(BR)CEO}$(1)	Collector-emitter breakdown voltage (I_B = 0)	I_C = 10 mA	50		V
I_{CES}	Collector to emitter cut-off current	V_{CE} = 50 V		100	nA
$V_{CE(sat)}$	Collector-emitter saturation voltage	I_C = 150 mA, I_B = 15 mA		0.35	V
		I_C= 500 mA, I_B = 50 mA		1.15	
$V_{BE(sat)}$	Base-emitter saturation voltage	I_C = 150 mA, I_B = 15 mA	0.6	1.38	V
		I_C= 500 mA, I_B = 50 mA		2.3	
[h_{FE}]	Post irradiation gain calculation	I_C= 0.1 mA, V_{CE}= 10 V	[25](2)		
		I_C= 1.0 mA, V_{CE}= 10 V	[37.5](2)	325	
		I_C= 10 mA, V_{CE}= 10 V	[50](2)		
		I_C= 150 mA, V_{CE}= 10 V	[50](2)	300	
		I_C= 500 mA, V_{CE}= 10 V	[15](2)		

1. *Pulsed duration = 300 µs, duty cycle ≥ 2 %*
2. *See method 1019 of MIL-STD-750 for how to determine [hFE] by first calculating the delta (1/hFE) from the pre- and Post-radiation hFE. Notice the [hFE] is not the same as hFE and cannot be measured directly. The [hFE] value can never exceed the pre-radiation minimum hFE that it is based upon.*

2.2 Electrical characteristics (curves)

Figure 1. DC current gain

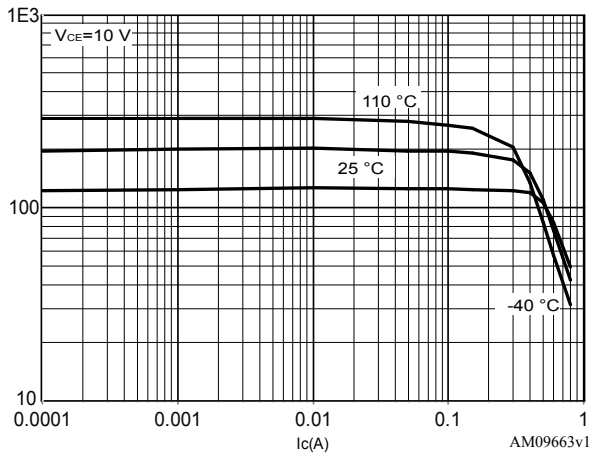


Figure 2. Collector emitter saturation voltage

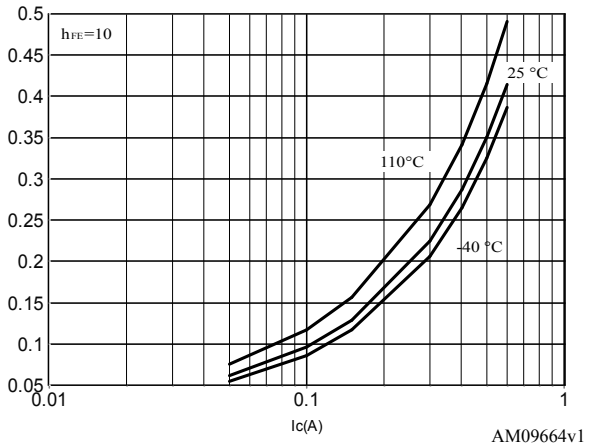
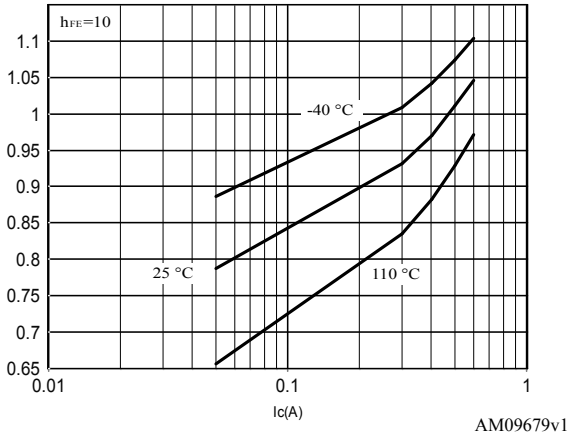
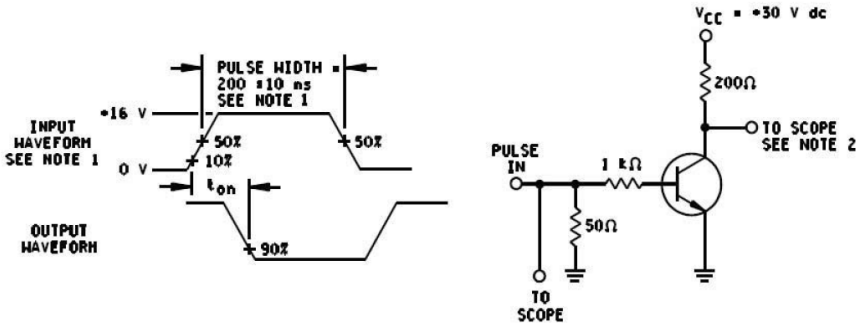


Figure 3. Base emitter saturation voltage



2.3 Test circuits

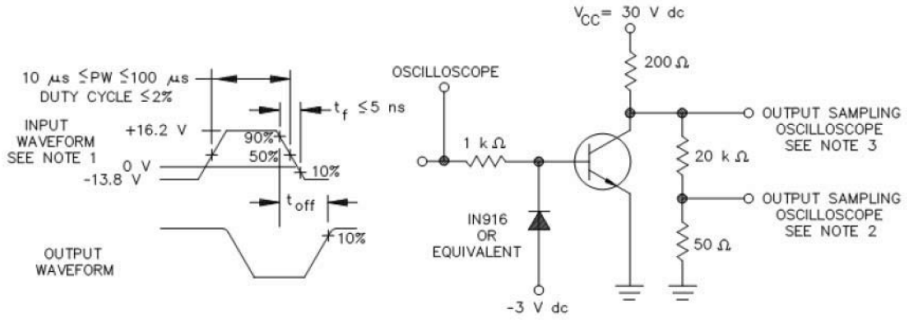
Figure 4. Saturated turn-on switching time test circuit



Note: (1) The rise time (t_r) of the applied pulse should be ≤ 2.0 ns, duty cycle ≤ 2 percent, and the generator source impedance shall be50 Ω.

Note: (2) Sampling oscilloscope: Z_{IN} ≥ 100 kΩ, C_{IN} ≤ 12 pF, rise time ≤ 5ns.

Figure 5. Saturated turn-off switching time test circuit



Note: (1) The rise time (t_r) of the applied pulse should be ≤ 2.0 ns, duty cycle ≤ 2 percent, and the generator source impedance shall be50 Ω.

Note: (2) Sampling oscilloscope: Z_{IN} ≥ 100 kΩ, C_{IN} ≤ 12 pF, rise time ≤ 5ns.

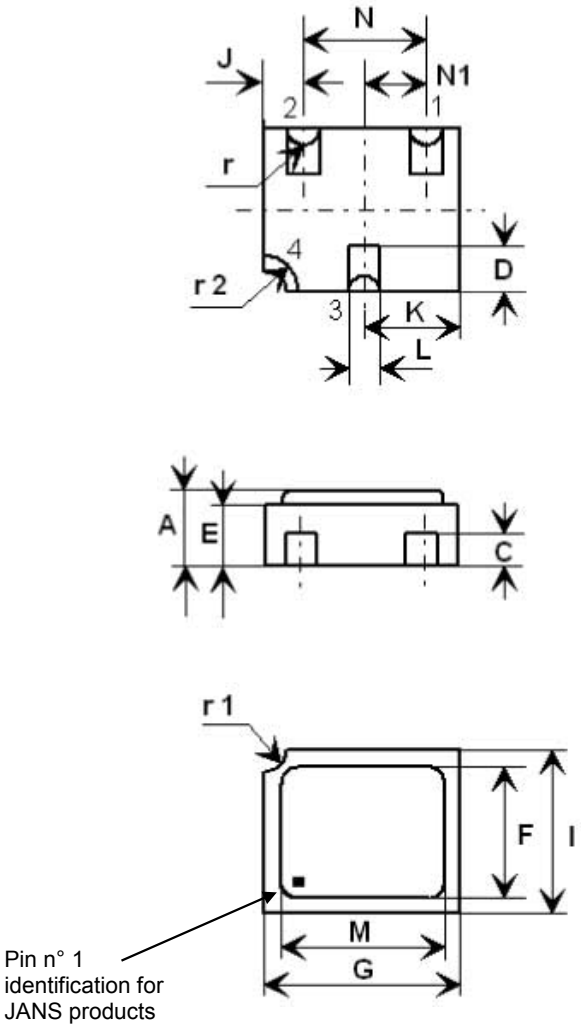
Note: (3) Alternate test point for high impedance attenuating probe.

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 UB package information

Figure 6. UB package outline



Pad 1: Emitter

Pad 2: Base

Pad 3: Collector

Pad 4: Shielding connected to the lid

8206487 rev.6

Note: For JANS products: the pin out numbering for emitter and base is inverted (base is designated pin 1 and emitter pin 2)

Table 5. **UB package mechanical data**

Symbols	Dimensions in mm			Dimensions in inches (for reference only)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	1.16		1.42	0.045		0.056
C	0.46	0.51	0.56	0.018	0.020	0.022
D	0.56	0.76	0.96	0.024	0.030	0.036
E	0.92	1.02	1.12	0.036	0.040	0.044
F	1.95	2.03	2.11	0.077	0.080	0.083
G	2.92	3.05	3.18	0.115	0.120	0.125
I	2.41	2.54	2.67	0.095	0.100	0.105
J	0.42	0.57	0.72	0.0165	0.0225	0.0285
K	1.37	1.52	1.67	0.054	0.060	0.066
L	0.41	0.51	0.61	0.016	0.020	0.024
M	2.46	2.54	2.62	0.097	0.100	0.103
N	1.81	1.91	2.01	0.071	0.075	0.079
N1	0.91	0.96	1.02	0.036	0.038	0.040
r		0.20			0.008	
r1		0.30			0.012	
r2		0.56			0.022	

4 Ordering information

Table 6. Ordering information

Part number	Agency specification	Quality level	Radiation level	Package	Weight	Lead finish	Marking[1]	Packing
J2N2222AUB1	-	Engineering model	-	UB	0.6 g	Gold	J2222AUB1	WafflePack
JANSR2N2222AUBC	- MIL-PRF-19500/255	JANSR	100 krad			Gold	JSR2222	
JANSR2N2222AUBA		JANSR	100 krad			Solder dip	JSR2222	
JANS2N2222AUBC		JANS	-			Gold	JS2222	
JANS2N2222AUBA		JANS	-			Solder dip	JS2222	

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.*

5 Other information

5.1 Traceability information

The date code in formation is structured as described in the table below.

Table 7. Date codes

Model	Date code[1]
EM	3yywwN
JANS/ JANSR	WyywwN

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
JANS	-	Certificate of conformance
JANSR	100 krad	Certificate of conformance RVT report (50 rad/s and 0.1 rad/s)
Engineering model	-	Certificate of conformance

Revision history

Table 9. **Document revision history**

Date	Revision	Changes
11-Oct-2021	1	Initial release.

Contents