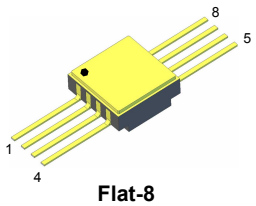
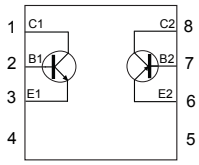
JANS2ST3360K

Datasheet

Rad-Hard 60 V, 0.8 A NPN and PNP complementary transistors



Flat-8



Flat-8

Pin 4 and pin 5
are connected together to the seal ring and lid

Features

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

- Hermetic package
- Qualified as per MIL-PRF-M19500/773
- 100 krad

Description

The JANS2ST3360K is dual complementary (NPN and PNP) bipolar transistor in a single Flat-8 hermetic package. Qualified as per MIL-PRF-M19500/773 it is available in JANS and JANSR screening options.

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 and high peak current required in power MOSFET driver circuits.

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

Product summary

Product summary				
Part-number	**Screening options**	**Agency specification**	**Package**	**Radiation level**
J2ST3360K1	Engineering model	-	Flat-8	-
JANS2ST3360Kx	JANS	MIL-PRF-M19500/773		-
JANSR2ST3360Kx	JANSR			100 krad

Note: See Table 8 for ordering information.

1 Electrical ratings

Table 1. Absolute maximum ratings

Symbol	Parameter	Value		Unit
		NPN	PNP	
V_{CBO}	Collector-base voltage (I_E = 0)	60	-60	V
V_{CEO}	Collector-emitter voltage (I_B = 0)	60	-60	V
V_{EBO}	Emitter-base voltage (I_C = 0)	6	-6	V
I_C	Collector current	0.8	-0.8	A
I_{CM}	Collector peak current (t_P < 5 ms)	4	-4	A
I_B	Base current	0.2	-0.2	A
I_{BM}	Base peak current (t_P < 5 ms)	0.4	-0.4	A
P_{TOT}	Total dissipation at T_{amb} ≤ 25 °C	1.4(1)		W
		0.8(2)		
	Total dissipation at T_c ≤ 25 °C	7(1)		W
		5(2)		
T_{STG}	Storage temperature range	-65 to 200		°C
T_J	Operating junction temperature range			°C

1. *Both sections.*
2. *One section.*

Table 2. Thermal data

Symbol	Parameter	Value	Unit
R_{thJA}	Thermal resistance junction-to-ambient max.	125(1)	°C/W
		180(2)	
R_{thJC}	Thermal resistance junction-to-case max.	25(1)	
		35(2)	

1. *Both sections.*
2. *One section.*

2 Electrical characteristics

Note: For PNP transistor voltage and current polarity is reversed.

Table 3. Electrical characteristics for NPN (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} = 60 V		100	nA
		V_{CB} = 60 V, T_{amb} = 150 °C		10	µA
I_{EBO}	Emitter-base cut-off current (I_C = 0)	V_{EB} = 6 V		100	nA
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E = 0)	I_C = 100 µA	60		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage (I_B = 0)	I_C = 1 mA	60		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	I_E = 10 µA	6		V
$V_{BE(on)}$	Base-emitter on voltage	V_{CE} = 2 V, I_C = 100 mA	600	720	mV
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 0.8 A, I_B = 40 mA		160	mV
		I_C = 2 A I_B = 100 mA		380	mV
h_{FE} (1)	DC current gain	I_C = 100 mA, V_{CE} = 2 V	100		
		I_C = 100 mA, V_{CE} = 2 V, T_{amb} = -55 °C	40		
		I_C = 1 A, V_{CE} = 2 V	160	400	
t_{on}	Turn on-time	V_{CC} = 10 V, I_C = 0.8 A, I_{bon} = 80 mA, I_{boff} = -80 mA(2)		175	ns
t_{off}	Turn off-time			2.5	µs
C_{OBO}	Output capacitance	V_{CB} = 10 V, I_E = 0 A, f = 1 MHz		45	pF

1. *Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2%.*
2. *Resistive load*

Table 4. Electrical characteristics for PNP (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} = 60 V		100	nA
		V_{CB} = 60 V, T_{amb} = 150 °C		10	µA
I_{EBO}	Emitter-base cut-off current (I_C = 0)	V_{EB} = 6 V		100	nA
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E = 0)	I_C = 100 µA	60		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage (I_B = 0)	I_C = 1 mA	60		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage	I_E = 10 µA	6		V
$V_{BE(on)}$	Base-emitter on voltage	V_{CE} = 2 V, I_C = 100 mA	600	720	mV
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 0.8 A, I_B = 40 mA		180	mV
		I_C = 2 A I_B = 100 mA		440	mV
h_{FE} (1)	DC current gain	I_C = 100 mA, V_{CE} = 2 V	100		
		I_C = 100 mA, V_{CE} = 2 V, T_{amb} = -55 °C	40		
		I_C = 1 A, V_{CE} = 2 V	160	400	
t_{on}	Turn on-time	V_{CC} = 10 V, I_C = 0.8 A, I_{bon} = 80 mA, I_{boff} = -80 mA(2)		150	ns
t_{off}	Turn off-time			1	µs
C_{OBO}	Output capacitance	V_{CB} = 10 V, I_E = 0 A, f = 1 MHz		60	pF

1. *Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2%.*
2. *Resistive load*

2.1 Test circuits

Figure 1. **Resistive load switching for NPN**

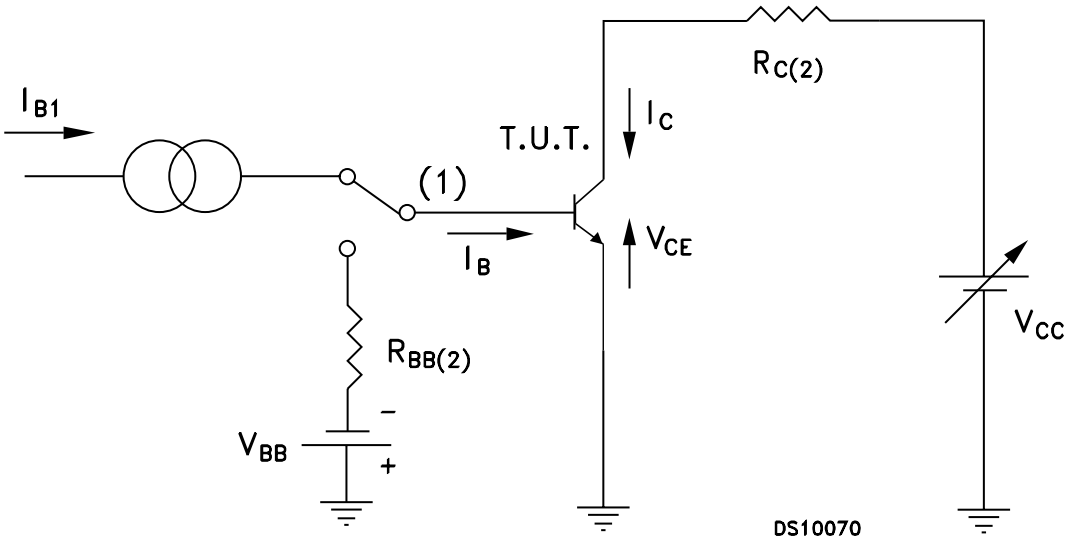
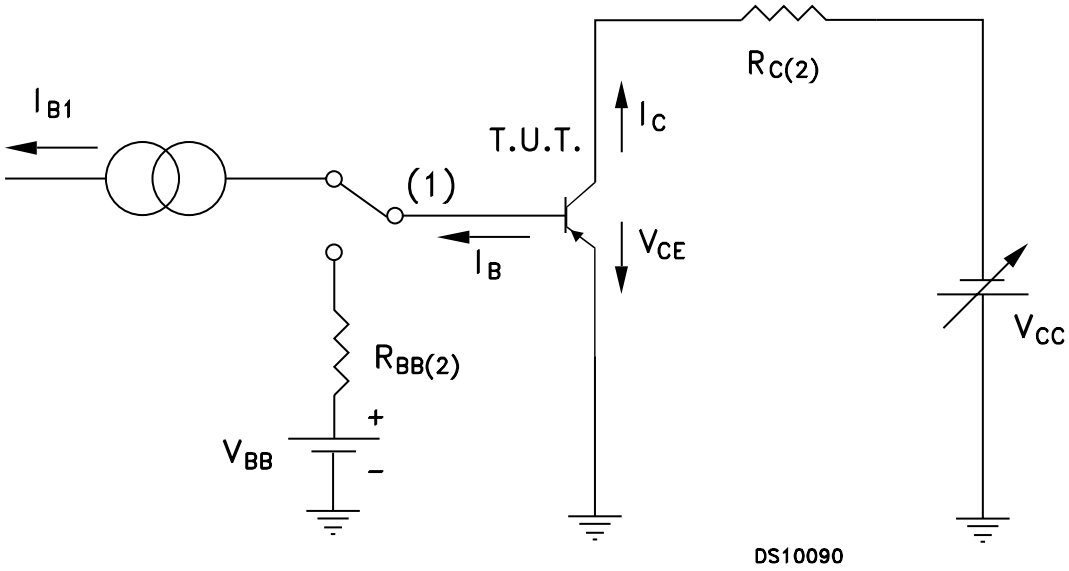


Figure 2. **Resistive load switching for PNP**



3 Radiation hardness assurance

JANSR2ST3360K 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 5 and Table 6.

Table 5. MIL-PRF-19500 post radiation electrical characteristics for NPN (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}= 60 V		200	nA
I_{EBO}	Emitter cut-off current (I_C= 0)	V_{EB} = 6 V		200	nA
$V_{BE(on)}$	VBE(on) Base-emitter on voltage	V_{CE} = 2 V, I_C = 100 mA	600	828	mV
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E= 0)	I_C=100 µA	60		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage (I_B = 0)	I_C = 1 mA	60		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C= 0)	I_E = 10 µA	6		V
$V_{CE(sat)}$(1)	Collector-emitter saturation voltage	I_C=0.8 A, I_B = 40 mA		184	mV
		I_C= 2 A, I_B = 100 mA		437	
h_{FE}(1)	DC current gain	I_C= 100 mA, V_{CE}= 2 V	[50](2)		
		I_C= 1 A, V_{CE}= 2 V	[80](2)	400	

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

Table 6. MIL-PRF-19500 post radiation electrical characteristics for PNP (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}= 60 V		200	nA
I_{EBO}	Emitter cut-off current (I_C= 0)	V_{EB} = 6 V		200	nA
$V_{BE(on)}$	Base-emitter on voltage	V_{CE} = 2 V, I_C = 100 mA	600	828	mV
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E= 0)	I_C= 100 µA	60		V
$V_{(BR)CEO}$	Collector-emitter breakdown voltage (I_B = 0)	I_C = 1 mA	60		V
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C= 0)	I_E = 10 µA	6		V
$V_{CE(sat)}$(1)	Collector-emitter saturation voltage	I_C=0.8 A, I_B = 40 mA		207	mV
		I_C= 2 A, I_B = 100 mA		506	
h_{FE}(2)	DC current gain	I_C= 100 mA, V_{CE}= 2 V	[50](3)		
		I_C= 1 A, V_{CE}= 2 V	[80](3)	400	

1. *Pulsed duration = 300 µs, duty cycle ≥ 2 %*
2. *For PNP type, voltage and current values are negative.*
3. *See method 1019 of MIL-STD-750 about how to determine [h_{FE}] by first calculating the delta (1/h_{FE}) from the pre- and post-radiation h_{FE}. Note that the [h_{FE}] is not the same as h_{FE} and cannot be measured directly. The [h_{FE}] value can never exceed the pre-radiation minimum h_{FE}, which is based upon.*

4 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.

4.1 Flat-8 package information

Figure 3. **Flat-8 package outline**

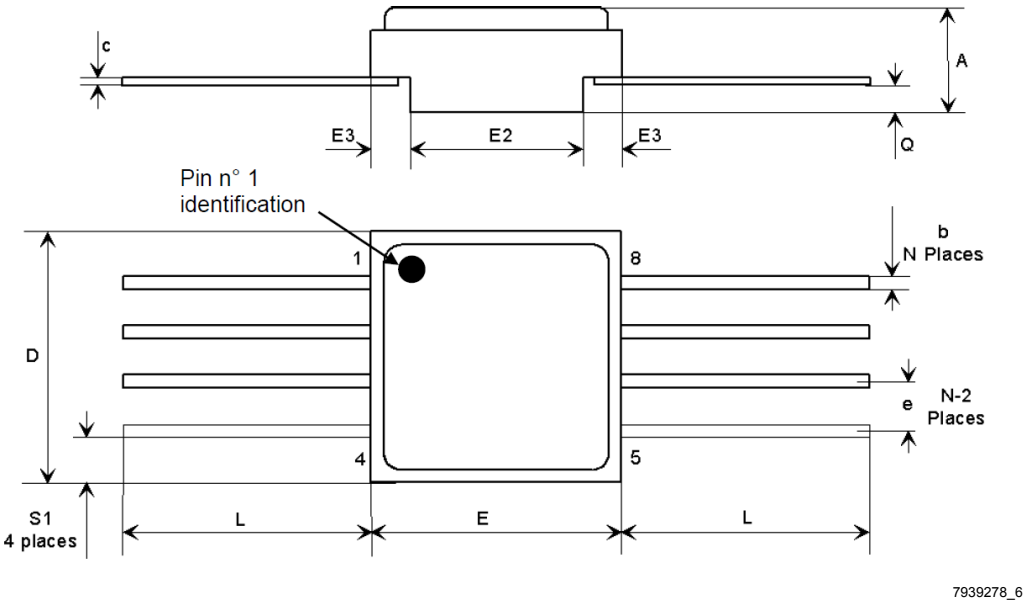


Table 7. **Flat-8 mechanical data**

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		

5 Ordering information

Table 8. Ordering information

Part number	Agency specification	Screening options	Radiation level	Package	Weight	Lead finish	Marking[1]	Packing
J2ST3360K1	-	Engineering model	-	Flat-8	0.7 g	Gold	J2ST3360K1	Strip pack
JANS2ST3360KG	MIL-PRF-M19500/773	Flight model	-				JANSM19500/773-01	
JANS2ST3360KT			-			Solder dip	JANSM19500/773-01	
JANSR2ST3360KG			100 krad			Gold	JANSRM19500/773-01	
JANSR2ST3360KT						Solder dip	JANSRM19500/773-01	

1. *Specific marking only. The full marking includes in addition: For the engineering models: ST logo, date code; country of origin (FR). For JANS and JANSR: ST logo, date code, country of origin (FR), ESA logo, serial number of the part within the assembly lot.*

6 Other information

6.1 Traceability information

Table 9. Date codes

Model	Date code[1]
EM	3yywwN
JANS / JANSR	PyywwN [2]

1. *yy = year, ww = week number, N = lot index in the week.*
2. *P = country of the wafer fab.*

6.2 Documentation

Table 10. Documentation provided for each type of product

Screening options	Radiation level	Documentation
Engineering model		Certificate of conformance.
JANS		Certificate of conformance.
JANSR	100 krad	Certificate of conformance. Radiation verification test (RVT) report at 30 / 50 / 70 / 100 krad at 50 rad/s and 0.1 rad/s.

Revision history

Table 11. **Document revision history**

Date	Version	Changes
30-Sep-2015	1	Initial release.
14-Sep-2016	2	Updated Table 1: Device summary, Table 2: Absolute maximum ratings, Table 3: Thermal data, Table 4: Electrical characteristics for NPN, Table 5: Electrical characteristics for PNP, Table 9: Ordering information and Figure 4: Flat-8 package outline. Minor text changes.
09-Feb-2022	3	Updated Description, Features, Product summary, Section 3 , Table 8, Table 9 and Table 10.

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