

JANHCD2N2221A & JANKCD2N2221A JANHCD2N2222A & JANKCD2N2222A



Radiation Hardened NPN Silicon Switching Transistor Die

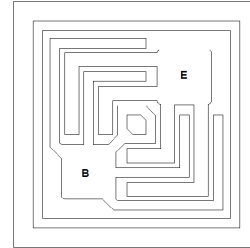
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Features

- Available in JANHC and JANKC per MIL-PRF-19500/255
- Radiation Tolerant Levels M, D, P, L and R

Applications

- Switching and Linear Applications
- DC and VHF Amplifier Applications



Electrical Specifications ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Test Conditions	Symbol	Units	Minimum	Maximum
Collector - Emitter Breakdown	$I_C = 10 \text{ mA dc}$	$V_{(BR)CEO}$	V dc	50	—
Collector - Base Cutoff Current	$V_{CB} = 75 \text{ V dc}$ $V_{CB} = 60 \text{ V dc}$	I_{CBO1} I_{CBO2}	$\mu\text{A dc}$ nA dc	—	10 10
Emitter - Base Cutoff Current	$V_{EB} = 6.0 \text{ V dc}$ $V_{EB} = 4.0 \text{ V dc}$	I_{EBO1} I_{EBO2}	$\mu\text{A dc}$ nA dc	—	10 10
Collector - Emitter Cutoff Current	$V_{CE} = 50 \text{ V dc}$	I_{CES}	nA dc	—	50
Forward Current Transfer Ratio	2N2221A, L, UA, UB $I_C = 0.1 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 1.0 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 10 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 150 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 500 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$	h_{FE}		30 35 40 40 20	— 150 — 120 —
	2N2222A, L, UA, UB $I_C = 0.1 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 1.0 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 10 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 150 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ $I_C = 500 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$			50 75 100 100 30	— 325 — 300 —
Collector - Base Cutoff Current	$I_C = 150 \text{ mA dc}; I_B = 15 \text{ mA dc}$ $I_C = 500 \text{ mA dc}; I_B = 50 \text{ mA dc}$	$V_{CE(sat)1}$ $V_{CE(sat)2}$	V dc	—	0.3 1.0
Base - Emitter Saturation Voltage	$I_C = 150 \text{ mA dc}; I_B = 15 \text{ mA dc}$ $I_C = 500 \text{ mA dc}; I_B = 50 \text{ mA dc}$	$V_{BE(sat)1}$ $V_{BE(sat)2}$	V dc	0.6 —	1.2 2.0
Collector - Base Cutoff Current	$T_A = +150^\circ\text{C}$ $V_{CB} = 60 \text{ V dc}$	I_{CBO3}	$\mu\text{A dc}$		10
Forward Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $V_{CE} = 10 \text{ V dc}; I_C = 10 \text{ mA dc}$ 2N2221A (all types) 2N2222A (all types)	h_{FE6}		15 35	

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Electrical Specifications ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Parameter	Test Conditions	Symbol	Units	Minimum	Maximum
Dynamic Characteristics:					
Small-Signal Short-Circuit Forward Current Transfer Ratio	$V_{CE} = 10\text{ V dc}; I_C = 1\text{ mA dc}; f = 1\text{ kHz}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB	h_{fe}		30 50	—
Magnitude of Small-Signal Short-Circuit, Forward Current Transfer Ratio	$V_{CE} = 20\text{ V dc}; I_C = 20\text{ mA dc}; f = 100\text{ MHz}$	$ h_{fe} $		2.5	—
Output Capacitance	$V_{CB} = 10\text{ V dc}; I_E = 0; 100\text{ kHz} \leq f \leq 1\text{ MHz}$	C_{obo}	pF	—	8
Input Capacitance (Output Open-Circuited)	$V_{EB} = 0.5\text{ V dc}; I_C = 0; 100\text{ kHz} \leq f \leq 1\text{ MHz}$	C_{ibo}	pF	—	25
Switching Characteristics:					
Turn-On Time	(See figure 17 of MIL-PRF-19500/255)	t_{on}	ns	—	35
Turn-Off Time	(See Figure 18 of MIL-PRF-19500/255)	t_{off}	ns	—	300

Absolute Maximum Ratings ($T_A = +25^\circ\text{C}$ unless otherwise specified)

Ratings	Symbol	Value
Collector - Emitter Voltage	V_{CEO}	50 V dc
Collector - Base Voltage	V_{CBO}	75 V dc
Emitter - Base Voltage	V_{EBO}	6 V dc
Collector Current	I_C	800 mA dc
Operating & Storage Temperature Range	T_J, T_{STG}	-65°C to $+200^\circ\text{C}$

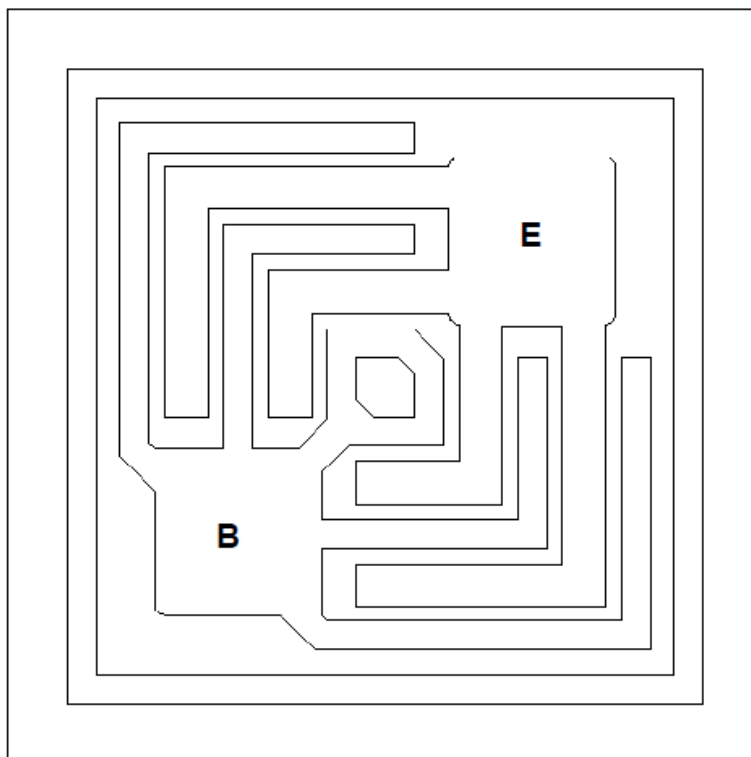
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Outline Drawing (Die)



NOTES:

1. Chip size: .025 x .025 inch \pm .002 inch (0.635 mm x 0.635 mm \pm 0.051 mm).
2. Chip thickness: .010 \pm .0015 inch (0.254 mm \pm 0.038 mm).
3. Top metal: AISiCu 16,260 Å minimum, 20,320 Å nominal for JANHC and JANKC.
4. Back metal: Gold 4,500 Å minimum, 5,000 Å nominal for JANHC and JANKC.
5. Glassivation: SiO₂ 6,500 Å minimum, 8,000 Å nominal for JANHC and JANKC.
6. Backside: Collector.
7. Bonding pad:
B = .0043 x .0043 inch (0.110 mm x 0.110 mm).
E = .0043 x .0043 inch (0.110 mm x 0.110 mm).
8. In accordance with ASME Y14.5M, diameters are equivalent to ϕ x symbology.

FIGURE 6. JANHC and JANKC (D-version) die dimensions.

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