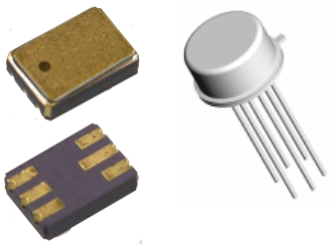
2N2919, 2N2919L, 2N2919U
2N2920, 2N2920L, 2N2920U

NPN Dual Silicon Transistors

Rev. V1

Features

- Available in JAN, JANTX, JANTXV, JANS and JANSR per MIL-PRF-19500/355
- TO-78 and U package types
- Radiation Tolerant Levels M, D, P, L, and R



Electrical Characteristics (T_A = +25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Base Cutoff Current	V_{CB} = 70 V dc	I_{CBO1}	µA dc	—	10
Emitter - Base Cutoff Current	V_{EB} = 6 V dc	I_{EBO1}	µA dc	—	10
Breakdown Voltage, Collector-Emitter	I_C = 10 mA dc	$V_{(BR)CEO}$	V dc	60	—
Collector - Base Cutoff Current	V_{CB} = 45 V dc	I_{CBO2}	nA dc		2
Collector - Emitter Cutoff Current	V_{CE} = 5 V dc	I_{CEO1}	nA dc		2
Emitter - Base Cutoff Current	V_{EB} = 5 V dc	I_{EBO2}	nA dc		2
Forward - Current Transfer Ratio 2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2920U	V_{CE} = 5 V dc; I_C = 10 µA dc	h_{FE1}		60 175	240 600
Forward - Current Transfer Ratio 2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2920U	V_{CE} = 5 V dc; I_C = 100 µA dc	h_{FE2}		100 235	325 800
Forward - Current Transfer Ratio 2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2920U	V_{CE} = 5 V dc; I_C = 1 mA dc	h_{FE3}		150 300	600 1000
Base - Emitter Saturation Voltage	I_C = 1.0 mA dc; I_B = 100 µA dc	$V_{BE(sat)1}$	V dc	0.5	1.0
Collector - Emitter Saturation Voltage	I_C = 1.0 mA dc; I_B = 100 µA dc	$V_{CE(sat)1}$	V dc	—	0.3
Forward-Current Transfer Ratio (Gain Ratio)	V_{CE} = 5 V dc; I_C = 100 µA dc	$\frac{h_{FE2-1}}{h_{FE2-2}}$		0.9	1.1
Absolute Value of Base Emitter-Voltage Differential	V_{CE} = 5 V dc; I_C = 10 µA dc	$\lvert V_{BE1}-V_{BE2}\rvert 1$	mV dc	—	5

Electrical Characteristics (T_A = +25°C unless otherwise specified)

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Absolute Value of Base Emitter-Voltage Differential	V_{CE} = 5 V dc; I_C = 100 µA dc	$\lvert V_{BE1}\text{-}V_{BE2}\rvert 2$	mV dc	—	3
Absolute Value of Base Emitter-Voltage Differential	V_{CE} = 5 V dc; I_C = 1 mA dc	$\lvert V_{BE1}\text{-}V_{BE2}\rvert 3$	mV dc	—	5
Base-Emitter-Voltage (Nonsaturated) (Absolute Value of Differential Change with Temperature)	T_A = +150°C V_{CE} = 500 V dc; Ic = 100 µA dc T_A = +125°C and +25°C	$\lvert \Delta V_{BE1}\text{-}V_{BE2} \Delta T_A \rvert 2$	mV dc	—	1
Collector - Base Cutoff Current	T_A = +150°C V_{CB} = 45 V dc	I_{CBO3}	µA dc	—	2.5
Forward Current Transfer Ratio 2N2919, 2N2919L, 2N2919U 2N2920, 2N2920L, 2N2920U	T_A = -55°C V_{CE} = 5 V dc; I_C = 10 µA dc	h_{FE4}		20 50	
Base-Emitter-Voltage (Nonsaturated) (Absolute Value of Differential Change with Temperature)	T_A = -55°C V_{CE} = 5 V dc; Ic = 100 µA dc T_A = +25°C and -55°C	$\lvert \Delta V_{BE1}\text{-}V_{BE2} \Delta T_A \rvert 1$	mV dc	—	0.8
Small-Signal Short-Circuit Input Impedance	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{ie}	kΩ	3	30
Small-Signal Open-Circuit Reverse Voltage Transfer Ratio	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{re}			1×10^{-3}
Small-Signal Open-Circuit Output Admittance	V_{CE} = 5 V dc; I_C = 1 mA dc; f = 1 kHz	h_{oe}	µmhos	—	60
Small-Signal Short-Circuit Forward Current Transfer Ratio (magnitude h_{fe})	V_{CE} = 5 V dc; I_C = 0.5 mA dc; f = 20 MHz	$\lvert h_{FE} \rvert$		3	20
Open Circuit Output Capacitance	V_{CB} = 5 V dc; I_E = 0 mA; 100 kHz ≤ f ≤ 1 MHz	C_{obo}	pF	—	5
Noise Figure Test 1 Test 2 Test 3	V_{CE} = 5 V dc; I_C = 10 µA dc; R_g = 10kΩ f = 100 Hz f = 1 kHz f = 10 kHz	 F1 F2 F3	 dB dB dB	—	 5 3 3
Collector - Emitter Cutoff Current	V_{CE} = 40 V dc	I_{CES}	nA dc	—	20

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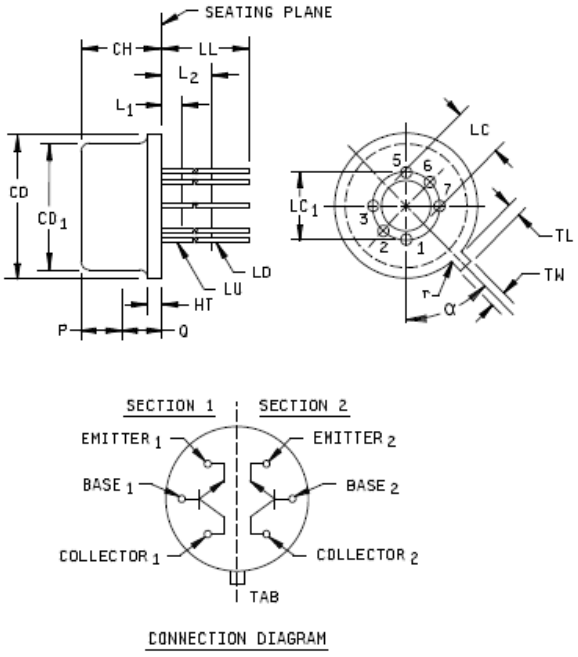
Absolute Maximum Ratings (T_A = +25°C unless otherwise specified)

Ratings	Symbol	Value
Collector - Emitter Voltage	V_{CEO}	60 V dc
Collector - Base Voltage	V_{CBO}	70 V dc
Emitter - Base Voltage	V_{EBO}	6.0 V dc
Collector Current	I_C	30 mA dc
Total Power Dissipation @ T_A = +25°C One Section Both Sections	P_T (1)	 200 mW 350 mW
Total Power Dissipation @ T_C = +25°C One Section Both Sections	P_T (2)	 300 mW 450 mW
Thermal Resistance Junction to Ambient One Section Both Sections	$R_{\theta JA}$	 875°C/W 500°C/W
Thermal Resistance Junction to Case One Section Both Sections	$R_{\theta JC}$	 583°C/W 388°C/W
Operating & Storage Temperature Range	T_J, T_{STG}	-65°C to +175°C

(1) For T_A > +25°C, derate linearly 1.143 mW/°C, one section, 2.000 mW/°C, both sections
(2) For T_C > +25°C, derate linearly 1.714 mW/°C, one section, 2.571 mW/°C, both sections

Outline Drawing (TO-78)



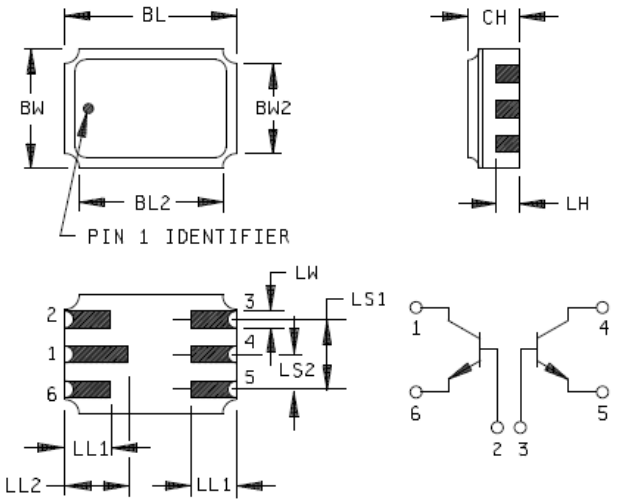
Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.335	.370	8.51	9.40	
CD_1	.305	.335	7.75	8.51	
CH	.140	.260	3.56	6.60	
HT	.009	.041	0.23	1.04	
LC	.140	.160	3.56	4.06	
LC_1	.200 TP		5.08 TP		9
LD	.016	.021	.041	0.53	10
LL	See notes 10, 11, and 12				
LU	.016	.019	0.41	0.48	10
L_1		.050		1.27	10
L_2	.250		6.35		10
P	.100		2.54		8
Q		.050		1.27	7
TL	.029	.045	0.74	1.14	5, 6
TW	.028	.034	0.71	0.86	4, 5
r		.010		0.25	
α	45°TP		45°TP		9

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Tab shown omitted.
4. Lead numbers 4 and 8 are omitted on this variation.
5. Beyond r maximum, TW shall be held to a minimum length of .21 inch (5.33 mm).
6. TL shall be measured from maximum CD.
7. Details of outline in this zone are optional.
8. CD_1 shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
9. Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at a maximum material condition (MMC) relative to the tab at MMC. The device may be measured by direct methods or by the gauge and gauging procedures described on gauge drawing GS-1.
10. LU applies between L_1 and L_2. LD applies between L_2 and LL minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
11. For transistor types 2N2919 and 2N2920, LL is .500 inch (12.70 mm) minimum and .750 inch (19.05 mm) maximum.
12. For transistor type 2N2919L and 2N2920L, LL is 1.500 inches (38.10 mm) minimum and 1.750 inches (44.45 mm) maximum.
13. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 1. Physical dimensions 2N2919, 2N2919L, 2N2920, and 2N2920L (TO-78).

Outline Drawing (U)



Symbol	Dimensions			
	Inches		Millimeters	
	Min	Max	Min	Max
BL	.240	.250	6.10	6.35
BL_2		.250		6.35
BW	.165	.175	4.19	4.44
BW_2		.175		4.44
CH	.044	.080	1.12	2.03
LH	.026	.039	0.66	0.99
LL_1	.060	.070	1.52	1.78
LL_2	.082	.098	2.08	2.49
LS_1	.095	.105	2.41	2.67
LS_2	.045	.055	1.14	1.39
LW	.022	.028	0.56	0.71

Pin no.	Transistor
1	Collector no. 1
2	Base no. 1
3	Base no. 2
4	Collector no. 2
5	Emitter no. 2
6	Emitter no. 1

NOTES:
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 2. Physical dimensions (2N2919U and 2N2920U) surface mount.

Thermal Impedance Curves

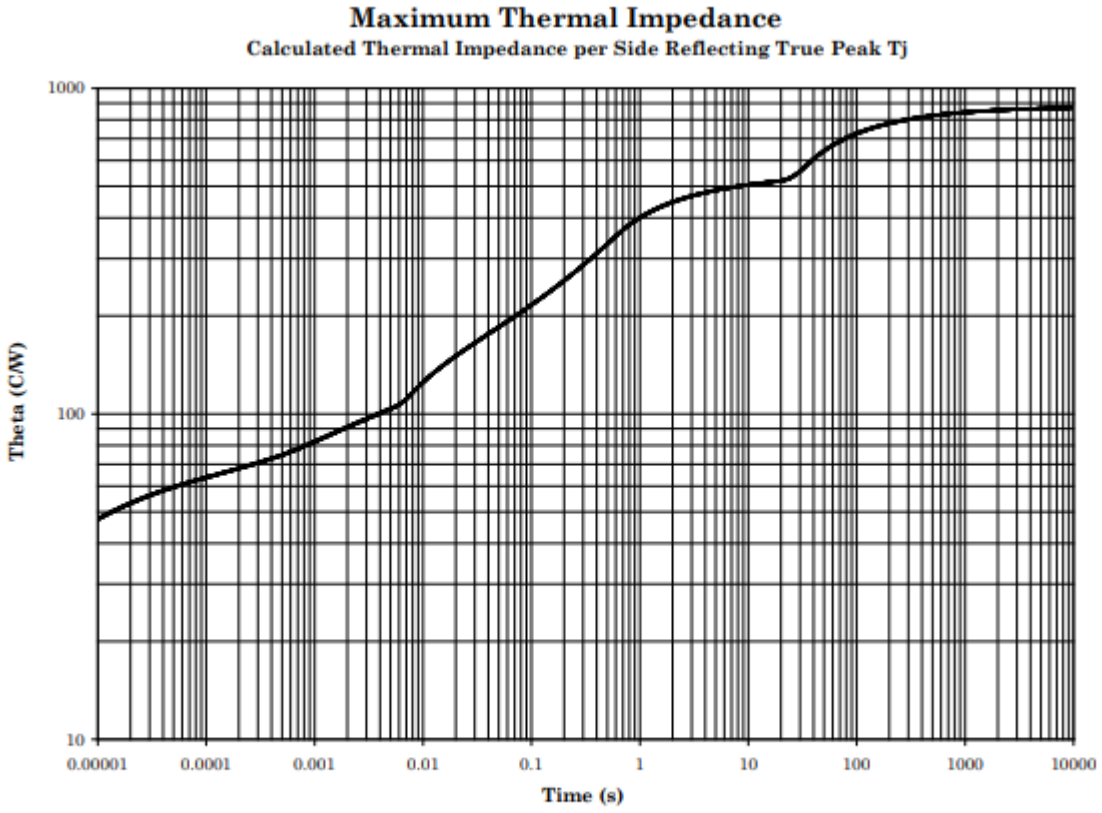


FIGURE 6. For each side: Thermal impedance = 875°C/W, Pt = 200 mW.

Thermal Impedance Curves

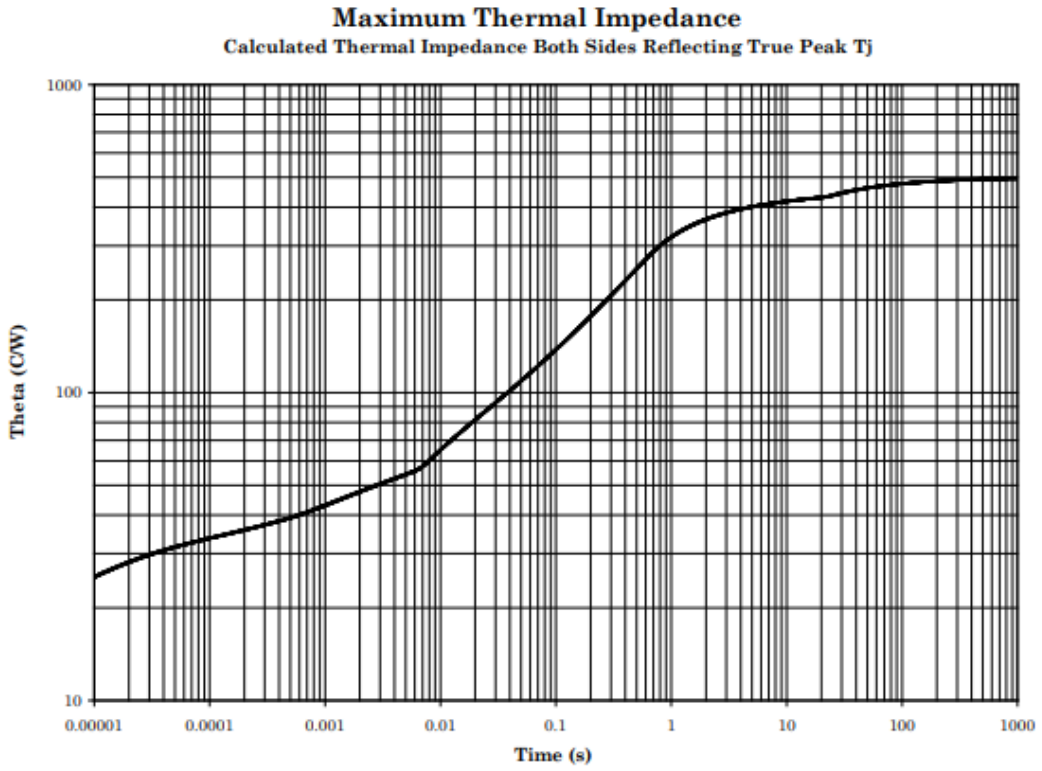


FIGURE 7. Both sides: Thermal impedance = 500°C/W, Pt = 350 mW.