

# 2N3418(S) - 2N3421(S) Series

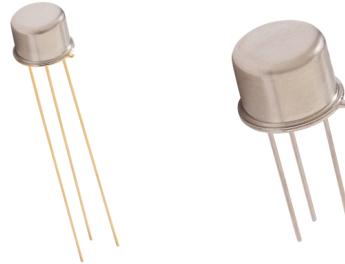


## NPN Medium Power Silicon Transistor

Rev. V4

### Features

- Available in JAN, JANTX, JANTXV, JANS and JANSR 100K rads(Si) per MIL-PRF-19500/393
- TO-5 & TO-39 (TO-205AD) Packages
- Ideal for Medium Power Applications Requiring High Frequency Switching



### Electrical Characteristics ( $T_A = +25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Units	Min.	Max.
<b>Off Characteristics</b>					
Collector - Emitter Breakdown Voltage	$I_C = 50 \text{ mA dc}$ 2N3418, S, 2N3420, S 2N3419, S, 2N3421, S	$V_{(\text{BR})\text{CEO}}$	V dc	60 80	—
Collector - Emitter Cutoff Current	$V_{\text{CE}} = 80 \text{ Vdc}$ , $V_{\text{BE}} = -0.5 \text{ Vdc}$ 2N3418, S, 2N3420, S $V_{\text{CE}} = 120 \text{ Vdc}$ , $V_{\text{BE}} = -0.5 \text{ Vdc}$ 2N3419, S, 2N3421, S	$I_{\text{CEX1}}$	$\mu\text{A dc}$	—	0.3 0.3
Collector - Emitter Cutoff Current	$V_{\text{CE}} = 45$ 2N3418, S, 2N3420, S $V_{\text{CE}} = 60$ 2N3419, S, 2N3421, S	$I_{\text{CEO}}$	$\mu\text{A dc}$	—	5.0 5.0
Emitter - Base Cutoff Current	$V_{\text{EB}} = 6 \text{ Vdc}$ , $I_C = 0$ $V_{\text{EB}} = 8 \text{ Vdc}$ , $I_C = 0$	$I_{\text{EBO}}$	$\mu\text{A dc}$	—	0.5 10.0
<b>On Characteristics<sup>1</sup></b>					
Forward Current Transfer Ratio	$I_C = 100 \text{ mA dc}$ , $V_{\text{CE}} = 2 \text{ V dc}$ 2N3418, S, 2N3419, S 2N3420, S, 2N3421, S $I_C = 1 \text{ A dc}$ , $V_{\text{CE}} = 2 \text{ V dc}$ 2N3418, S, 2N3419, S 2N3420, S, 2N3421, S $I_C = 2 \text{ A dc}$ , $V_{\text{CE}} = 2 \text{ V dc}$ 2N3418, S, 2N3419, S 2N3420, S, 2N3421, S $I_C = 5 \text{ A dc}$ , $V_{\text{CE}} = 5 \text{ V dc}$ 2N3418, S, 2N3419, S 2N3420, S, 2N3421, S	$H_{\text{FE}}$	-	20 40 20 40 15 30 10 15	— — 60 120 — — — —
Base - Emitter Voltage	$I_C = 1 \text{ A dc}$ , $I_B = 0.1 \text{ A dc}$ $I_C = 2 \text{ A dc}$ , $I_B = 0.2 \text{ A dc}$	$V_{\text{BE}(\text{SAT})}$	Vdc	0.6 0.7	1.2 1.4
Collector - Emitter Saturation Voltage	$I_C = 1 \text{ A dc}$ , $I_B = 0.1 \text{ A dc}$ $I_C = 2 \text{ A dc}$ , $I_B = 0.2 \text{ A dc}$	$V_{\text{CE}(\text{SAT})}$	Vdc	—	0.25 0.50

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Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Cutoff Current	$T_A = +150^\circ\text{C}$ $V_{CE} = 80 \text{ Vdc}, V_{BE} = -0.5 \text{ Vdc}$ 2N3418, S, 2N3420, S $V_{CE} = 120 \text{ Vdc}, V_{BE} = -0.5 \text{ Vdc}$ 2N3419, S, 2N3421, S	$I_{CEX2}$	$\mu\text{A dc}$	—	16 16
Forward Current Transfer Ratio	$T_A = -55^\circ\text{C}$	$h_{fe5}$		10	

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### Electrical Characteristics ( $T_A = +25^\circ\text{C}$ unless otherwise noted)

Parameter	Test Conditions	Symbol	Units	Min.	Max.
<b>Dynamic Characteristics</b>					
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio	$I_C = 0.1 \text{ A dc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 20 \text{ MHz}$	$ h_{fe} $	-	1.3	8.0
Output Capacitance	$V_{CB} = 10 \text{ Vdc}$ , $I_E = 0$ , $100 \text{ kHz} \leq f \leq 1 \text{ MHz}$	$C_{obo}$	pF	—	150
<b>Switching Characteristics</b>					
Delay Time	$V_{BE(\text{off})} = -3.7 \text{ Vdc}$	$t_d$	$\mu\text{s}$	—	0.08
Rise Time	$I_C = 1 \text{ A dc}$ , $I_{B2} = 100 \text{ mA dc}$	$t_r$	$\mu\text{s}$	—	0.22
Storage Time	$V_{BE(\text{off})} = -3.7 \text{ Vdc}$	$t_s$	$\mu\text{s}$	—	1.10
Fall Time	$I_C = 1 \text{ A dc}$ , $I_{B2} = 100 \text{ mA dc}$	$t_f$	$\mu\text{s}$	—	0.20
<b>Safe Operating Area</b>					
DC Tests:	$T_C = +100^\circ\text{C}$ , 1 Cycle, $t = 1.0 \text{ s}$				
Test 1:	$V_{CE} = 5 \text{ Vdc}$ , $I_C = 3.0 \text{ A dc}$				
Test 2:	$V_{CE} = 37 \text{ Vdc}$ , $I_C = 0.4 \text{ A dc}$				
Test 3:	$V_{CE} = 60 \text{ Vdc}$ , $I_C = 0.185 \text{ mA dc}$ 2N3418, S; 2N3420, S $V_{CE} = 80 \text{ Vdc}$ , $I_C = 0.120 \text{ mA dc}$ 2N3419, S; 2N3421, S				

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

Ratings	Symbol	Value 2N3418, S 2N3420, S	Value 2N3419, S 2N3421, S
Collector - Emitter Voltage	$V_{CEO}$	60 Vdc	80 Vdc
Collector - Base Voltage	$V_{CBO}$	85 Vdc	125 Vdc
Emitter - Base Voltage	$V_{EBO}$	8 Vdc	
Collector Current $T_p \leq 1 \text{ ms}$ , duty cycle $\leq 50\%$	$I_C$	3 Adc 5 Adc	
Total Power Dissipation $\text{@ } T_A = 25^\circ\text{C}^1$ $\text{@ } T_C = 100^\circ\text{C}^1$	$P_T$	1 W 5 W	
Operating & Storage Temperature Range	$T_J, T_{STG}$	-65°C to +200°C	
Thermal Resistance Junction to Ambient	$R_{\theta JA}^3$	175 °C/W	
Thermal Resistance Junction to Case	$R_{\theta JC}^3$	18 °C/W	

(1) For derating, see figures 4, 5 and 6 of MIL-PRF-19500/393

(2) This value applies for  $t_p \leq 1 \text{ ms}$ , duty cycle  $\leq 50$  percent

(3) For thermal impedance curves see figures 7, 8 and 9 of MIL-PRF-19500/393

### Outline Drawing (TO-5 & TO-39)

Symbol	Dimensions				Note	
	Inches		Millimeters			
	Min	Max	Min	Max		
CD	.305	.335	7.75	8.51		
CH	.240	.260	6.10	6.60		
HD	.335	.370	8.51	9.40		
LC	.200	TP	5.08	TP	6	
LD	.016	.021	0.41	0.53		
LL	.500	.750	12.7	19.05	7	
LU	See notes 7, 13, 14					
L <sub>1</sub>		.050		1.27	7	
L <sub>2</sub>	.250		6.35		7	
P	.100		2.54		5	
Q		.040		1.02	4	
TL	.029	.045	0.74	1.14	3,10	
TW	.028	.034	0.71	.86	9,10	
r		.010		0.25	11	
α	45° TP		45° TP		6	

#### NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Symbol TL is measured from HD maximum.
4. Details of outline in this zone are optional.
5. Symbol CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 inch (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of TP relative to tab. Device may be measured by direct methods or by gauge.
7. Symbol LU applies between L<sub>1</sub> and L<sub>2</sub>. Dimension LD applies between L<sub>2</sub> and LL minimum. Diameter is uncontrolled in L<sub>1</sub> and beyond LL minimum.
8. Lead number 3 is electrically connected to case.
9. Beyond r maximum, TW shall be held for a minimum length of .021 inch (0.53 mm).
10. Lead number 4 omitted on this variation.
11. Symbol r applied to both inside corners of tab.
12. For transistor types 2N3418S, 2N3419S, 2N3420S, 2N3421S, LL is .500 (12.70 mm) minimum and .750 (19.05 mm) maximum (short leads).
13. For transistor types 2N3418, 2N3419, 2N3420, 2N3421, LL is 1.500 (38.10 mm) minimum, and 1.750 (44.45 mm) maximum (long leads).
14. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi x$  symbology.
15. Lead 1 is emitter, lead 2 is base, and lead 3 is collector.

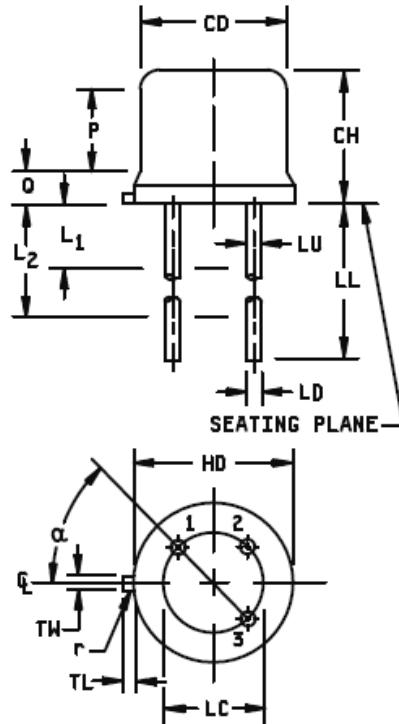


FIGURE 1. Physical dimensions.

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