

## NPN SILICON TRANSISTOR

Qualified per MIL-PRF-19500/727

**DEVICES**

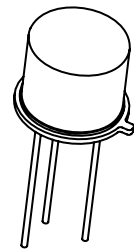
<b>2N5010</b>	<b>2N5013</b>	<b>2N5010S</b>	<b>2N5013S</b>
<b>2N5011</b>	<b>2N5014</b>	<b>2N5011S</b>	<b>2N5014S</b>
<b>2N5012</b>	<b>2N5015</b>	<b>2N5012S</b>	<b>2N5015S</b>

**LEVELS**

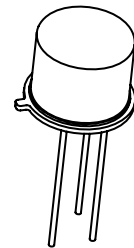
**JAN**  
**JANTX**  
**JANTXV**

**ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$  unless otherwise noted)**

Parameters / Test Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{\text{CER}}$	2N5010	500 Vdc
		2N5011	600 Vdc
		2N5012	700 Vdc
		2N5013	800 Vdc
		2N5014	900 Vdc
		2N5015	1000 Vdc
Collector-Base Voltage	$V_{\text{CBO}}$	2N5010	500 Vdc
		2N5011	600 Vdc
		2N5012	700 Vdc
		2N5013	800 Vdc
		2N5014	900 Vdc
		2N5015	1000 Vdc
Emitter-Base Voltage	$V_{\text{EBO}}$	5	Vdc
Collector Current	$I_{\text{C}}$	200	mAdc
Base Current	$I_{\text{B}}$	20	mAdc
Total Power Dissipation	$P_{\text{t}}$	@ $T_{\text{A}} = +25^\circ\text{C}$	1.0 W
		@ $T_{\text{C}} = +25^\circ\text{C}$	7.0 W
Thermal Resistance, Junction to Case 1/	$R_{\theta\text{JC}}$	20	$^\circ\text{C}/\text{W}$
Operating & Storage Junction Temperature Range	$T_{\text{j}}, T_{\text{stg}}$	-65 to +200	$^\circ\text{C}$



**TO-5**  
**2N5010 thru 2N5015**



**TO-39**  
**2N5010S thru 2N5015S**

**Note:**

1/ See 19500/727 for Thermal Derating Curves.

**ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$ , unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Collector to Base Cutoff Current $V_{CB} = 400\text{V}$ 2N5010 $V_{CB} = 500\text{V}$ 2N5011 $V_{CB} = 580\text{V}$ 2N5012 $V_{CB} = 650\text{V}$ 2N5013 $V_{CB} = 700\text{V}$ 2N5014 $V_{CB} = 760\text{V}$ 2N5015	$I_{CBO1}$		10 10 10 10 10 10	nAdc nAdc nAdc nAdc nAdc nAdc
$V_{CB} = 400\text{V}$ 2N5010 $V_{CB} = 500\text{V}$ 2N5011 $V_{CB} = 588\text{V}$ 2N5012 $V_{CB} = 650\text{V}$ 2N5013 $V_{CB} = 700\text{V}$ 2N5014 $V_{CB} = 760\text{V}$ 2N5015 @ $T_A = +150^\circ\text{C}$	$I_{CBO2}$		10 10 10 10 10 10	$\mu\text{Adc}$ $\mu\text{Adc}$ $\mu\text{Adc}$ $\mu\text{Adc}$ $\mu\text{Adc}$ $\mu\text{Adc}$
Emitter to Base Cutoff Current $V_{EB} = 4\text{V}$	$I_{EBO}$		20	$\mu\text{Adc}$
Collector to Base Breakdown Voltage $I_C = 0.1\text{mA}$ 2N5010 $I_C = 0.1\text{mA}$ 2N5011 $I_C = 0.1\text{mA}$ 2N5012 $I_C = 0.2\text{mA}$ 2N5013 $I_C = 0.2\text{mA}$ 2N5014 $I_C = 0.2\text{mA}$ 2N5015	$V_{(BR)CBO}$	500 600 700 800 900 1000		Vdc Vdc Vdc Vdc Vdc Vdc
Emitter to Base Breakdown Voltage $I_C = 0\text{mA}$ $I_E = 0.05\text{mA}$	$V_{(BR)EBO}$	5		Vdc
Collector to Emitter Breakdown Voltage $R_{BE} = 1\text{K}\Omega$ 2N5010 $I_C = 0.2\text{mA}$ , Pulsed 2N5011 2N5012 2N5013 2N5014 2N5015	$V_{(BR)CER}$	500 600 700 800 900 1000		Vdc Vdc Vdc Vdc Vdc Vdc
Forward-Current Transfer Ratio $I_C = 25\text{mA}$ 2N5010, 2N5011, 2N5012 $I_C = 20\text{mA}$ 2N5013, 2N5014, 2N5015 $V_{CE} = 10\text{V}$	$h_{FE1}$	30 30	180 180	
$V_{CE} = 10\text{V}$ $I_C = 5\text{mA}$	$h_{FE2}$	10		
$V_{CE} = 10\text{V}$ $I_C = 20\text{mA}$ @ $T_A = -55^\circ\text{C}$	$h_{FE3}$	10		

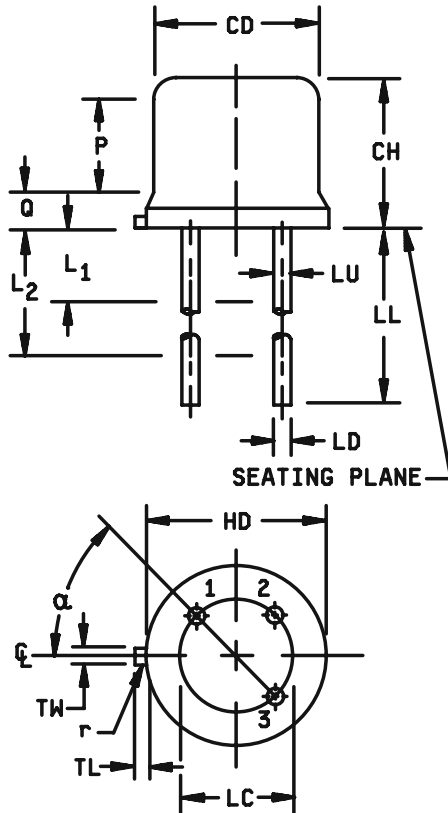
**ELECTRICAL CHARACTERISTICS** ( $T_A = +25^\circ\text{C}$ , unless otherwise noted) (Cont.)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Base-Emitter Saturation Voltage $I_C = 25\text{mA}$ 2N5010, 2N5011, 2N5012 $I_C = 20\text{mA}$ 2N5013, 2N5014, 2N5015 $I_B = 5\text{mA}$ , Pulsed	$V_{BE(SAT)}$		1.0 1.0	Vdc Vdc
Collector-Emitter Saturation Voltage $I_C = 25\text{mA}$ 2N5010 $I_C = 25\text{mA}$ 2N5011 $I_C = 25\text{mA}$ 2N5012 $I_C = 20\text{mA}$ 2N5013 $I_C = 20\text{mA}$ 2N5014 $I_C = 20\text{mA}$ 2N5015 $I_B = 5\text{mA}$ , Pulsed	$V_{CE(SAT)}$		1.4 1.5 1.6 1.6 1.6 1.8	Vdc Vdc Vdc Vdc Vdc Vdc

**DYNAMIC CHARACTERISTICS**

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of small signal short-circuit forward current transfer ratio $V_{CE} = 10\text{Vdc}$ , $I_C = 25\text{mA}$ , $f = 10\text{MHz}$ 2N5010, 2N5011, 2N5012 $V_{CE} = 10\text{Vdc}$ , $I_C = 20\text{mA}$ , $f = 10\text{MHz}$ 2N5013, 2N5014, 2N5015	$ h_{fe} $	1.0 1.0		
Open circuit output capacitance $V_{CB} = 10\text{V}$ , $I_E = 0$ , $f = 2\text{MHz}$	$C_{obo}$		30	pF

## PACKAGE DIMENSIONS



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.305	.335	7.75	8.51	6
CH	.240	.260	6.10	6.60	
HD	.335	.370	8.51	9.40	
LC	.200 TP		5.08 TP		7
LD	.016	.019	0.41	0.48	8,9
LL	See note 14				
LU	.016	.019	0.41	0.48	8,9
L <sub>1</sub>		.050		1.27	8,9
L <sub>2</sub>	.250		6.35		8,9
P	.100		2.54		7
Q		.030		0.76	5
TL	.029	.045	0.74	1.14	3,4
TW	.028	.034	0.71	0.86	3
r		.010		0.25	10
α	45° TP		45° TP		7
1, 2, 10, 12, 13, 14					

**NOTE:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TW shall be held for a minimum length of .011 (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
7. Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC. The device may be measured by direct methods or by gauging procedure.
8. Dimension 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 and beyond LL minimum.
9. All three leads.
10. The collector shall be internally connected to the case.
11. Dimension r (radius) applies to both inside corners of tab.
12. In accordance with ASME Y14.5M, diameters are equivalent to Φx symbology.
13. Lead 1 = emitter, lead 2 = base, lead 3 = collector.
14. For non-S-suffix devices (TO-5), dimension LL = 1.5 inches (38.10 mm) min. and 1.75 inches (44.45 mm) max. For S-suffix types (TO-39), dimension LL = .5 inch (12.70 mm) min. and .750 inch (19.05 mm) max.