

2N5681 & 2N5682



NPN Power Silicon Transistor

Rev. V3

Features

- Available in JAN, JANTX, and JANTXV per MIL-PRF-19500/583
- TO-39 (TO-205AD) Package
- Ideal for General Purpose High Voltage Amplifier and Switching Applications



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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Breakdown Voltage	$I_C = 10 \text{ mA dc}$, 2N5681 $I_C = 10 \text{ mA dc}$, 2N5682	$V_{(BR)CEO}$	V dc	100 120	—
Collector - Emitter Cutoff Current	$V_{CE} = 70 \text{ V dc}$, 2N5681 $V_{CE} = 80 \text{ V dc}$, 2N5682	I_{CEO}	$\mu\text{A dc}$	—	10
Collector - Emitter Cutoff Current	$V_{CE} = 100 \text{ V dc}$, $V_{BE} = 1.5 \text{ V dc}$, 2N5681 $V_{CE} = 120 \text{ V dc}$, $V_{BE} = 1.5 \text{ V dc}$, 2N5682	I_{CEX1}	nA dc	—	100
Collector - Base Cutoff Current	$V_{CB} = 100 \text{ V dc}$, 2N5681 $V_{CB} = 120 \text{ V dc}$, 2N5682	I_{CBO}	nA dc	—	100
Emitter - Base Cutoff Current	$V_{EB} = 4.0 \text{ Vdc}$	I_{EBO}	$\mu\text{A dc}$	—	1
Forward Current Transfer Ratio	$I_C = 250 \text{ mA dc}$, $V_{CE} = 2 \text{ V dc}$ $I_C = 500 \text{ mA dc}$, $V_{CE} = 2 \text{ V dc}$ $I_C = 1 \text{ A dc}$, $V_{CE} = 2 \text{ V dc}$	h_{FE}	-	40 20 5	150
Collector - Emitter Saturation Voltage	$I_C = 250 \text{ mA dc}$, $I_B = 25 \text{ mA dc}$ $I_C = 500 \text{ mA dc}$, $I_B = 50 \text{ mA dc}$	$V_{CE(sat)1}$ $V_{CE(sat)2}$	V dc	—	0.6 1.0
Emitter - Base Saturation Voltage	$I_C = 250 \text{ mA dc}$, $I_B = 25 \text{ mA dc}$ $I_C = 500 \text{ mA dc}$, $I_B = 50 \text{ mA dc}$	$V_{BE(sat)1}$ $V_{BE(sat)2}$	V dc	—	1.1 1.3
Collector - Emitter Cutoff Current	$T_A = +150^\circ\text{C}$ $V_{CE} = 100 \text{ V dc}$, $V_{BE} = 1.5 \text{ V dc}$, 2N5681 $V_{CE} = 120 \text{ V dc}$, $V_{BE} = 1.5 \text{ V dc}$, 2N5682	I_{CEX2}	mA dc	—	1.0
Forward - Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $I_C = 250 \text{ mA dc}$, $V_{CE} = 2.0 \text{ V dc}$	h_{FE4}	-	20	
Dynamic Characteristics					
Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio	$I_C = 100 \text{ mA dc}$, $V_{CE} = 1.5 \text{ Vdc}$, $f = 1 \text{ MHz}$	$ h_{FE} $	-	3	
Small-Signal Short-Circuit Forward Current Transfer Ratio	$I_C = 0.2 \text{ A dc}$, $V_{CE} = 1.5 \text{ Vdc}$, $f = 1 \text{ kHz}$	h_{FE}	-	40	
Output Capacitance	$V_{CB} = 20 \text{ Vdc}$, $I_E = 0$, $f = 1 \text{ MHz}$	C_{obo}	pF	—	50

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

Ratings	Symbol	Value
Collector - Emitter Voltage 2N5681 2N5682	V_{CEO}	100 V dc 120 V dc
Collector - Base Voltage 2N5681 2N5682	V_{CBO}	100 V dc 120 Vdc
Emitter - Base Voltage	V_{EBO}	4.0 V dc
Collector Current	I_C	1.0 A dc
Base Current	I_B	0.5 A dc
Total Power Dissipation @ $T_A = 25^\circ\text{C}^1$ @ $T_C = 25^\circ\text{C}^2$	P_T	1 W 10 W
Operating & Storage Temperature Range	T_{OP}, T_{STG}	-65°C to $+200^\circ\text{C}$

(1) Derate linearly @ 5.7 mW/ $^\circ\text{C}$ for $T_A > +25^\circ\text{C}$.

(2) Derate linearly @ 57 mW/ $^\circ\text{C}$ for $T_C > +75^\circ\text{C}$.

Thermal Characteristics

Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case	$R_{\theta JC}$	17.5 $^\circ\text{C/W}$

Safe Operating Area

DC Tests: $T_C = +25^\circ\text{C}$, 1 Cycle, $t \geq 0.5$ s

Test 1: $V_{CE} = 2$ Vdc, $I_C = 1$ A dc

Test 2: $V_{CE} = 10$ Vdc, $I_C = 1$ A dc

Test 3: $V_{CE} = 90$ Vdc, $I_C = 10$ mA dc

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Outline Drawing (TO-39)

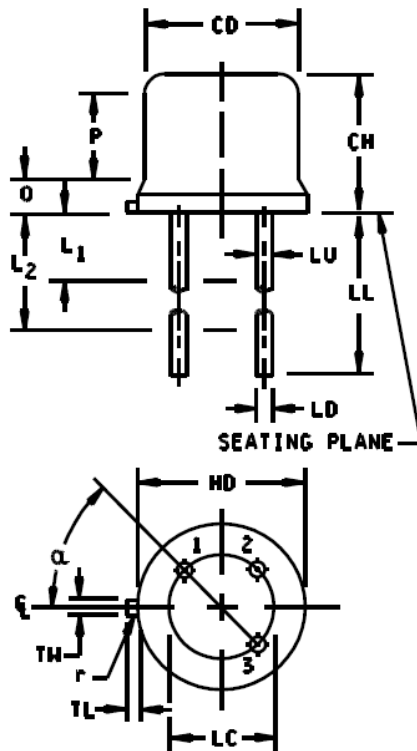


FIGURE 1. Physical dimensions for (TO-39).

Symbol (see note 3)	Dimensions				Notes
	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	9.39	
LC	.200 BSC		5.08 BSC		10
LD	.016	.021	0.41	0.53	10, 11
LL	.500	.750	12.70	19.05	11, 12
LU	.016	.019	0.41	0.48	11, 12
L ₁		.050		1.27	11, 12
L ₂	.250		6.35		11, 12
P	.100		2.54		9
Q		.050		1.27	8
R		.010		0.25	13
TL	.029	.045	0.74	1.14	7
TW	.028	.034	0.72	0.86	6
α	45° BSC				10
Term 1	Emitter				
Term 2	Base				
Term 3	Collector				

NOTES:

- Dimensions are in inches.
- Millimeters are given for general information only.
- Refer to applicable symbol list.
- In accordance with ASME Y14.5M, diameters are equivalent to ϕ x symbology.
- Lead number 1 is the emitter, lead number 2 is the base, lead number 4 is omitted from this outline. The collector is number 3 and is electrically connected to the case.
- Beyond r (radius) max, TW shall be held for a minimum length of .011 inch (0.28 mm).
- TL measured from maximum HD.
- Outline in this zone is not controlled.
- CD shall not vary more than .010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling
- 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.
- LU applies between L₁ and L₂. LD applies between L₂ and LL minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
- All three leads.
- r (radius) applies to both inside corners of tab.

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