

# 2N6211, 2N6212, 2N6213, 2N6213A



## PNP High Power Transistor

Rev. V1

### Features

- Available in JAN, JANTX, JANTXV and JANS per MIL-PRF-19500/461
- Designed for High Speed Switching and High Voltage Amplifier Applications
- Available in TO-66 package



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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Collector - Emitter Breakdown Voltage	$I_C = -200 \text{ mA dc}$ 2N6211 2N6212 2N6213 2N6213A	$V_{(BR)CEO}$	V dc	-225 -300 -350 -450	—
Collector - Emitter Breakdown Voltage	( $L = 10 \text{ mH}$ ; $f = 30\text{-}60 \text{ Hz}$ ) $R_{BE} = 50\Omega$ 2N6211 2N6212 2N6213 2N6213A	$V_{(BR)CER}$	V dc	-250 -325 -375 -475	—
Collector - Emitter Breakdown Voltage	( $L = 10 \text{ mH}$ ; $f = 30\text{-}60 \text{ Hz}$ ) $R_{BE} = 50\Omega$ $V_{BE} = +1.5 \text{ V dc}$ 2N6211 2N6212 2N6213 2N6213A	$V_{(BR)CEX}$	V dc	-275 -350 -400 -500	—
Collector - Emitter Cutoff Current	$V_{CE} = -150 \text{ V dc}$	$I_{CEO}$	mA dc		-5.0
Collector - Emitter Cutoff Current	$V_{BE} = +1.5 \text{ V dc}$ 2N6211 $V_{CE} = -250 \text{ V dc}$ 2N6212 $V_{CE} = -315 \text{ V dc}$ 2N6213 $V_{CE} = -360 \text{ V dc}$ 2N6213A $V_{CE} = -400 \text{ V dc}$	$I_{CEX1}$	mA dc		0.5
Emitter - Base Cutoff Current	$V_{EB} = -6 \text{ V dc}$	$I_{EBO}$	mA dc		-0.5
Collector - Base Cutoff Current	2N6211 $V_{BE} = -275 \text{ V dc}$ 2N6212 $V_{BE} = -350 \text{ V dc}$ 2N6213 $V_{BE} = -400 \text{ V dc}$ 2N6213A $V_{BE} = -500 \text{ V dc}$	$I_{CBO}$	mA dc		-15

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

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Forward - Current Transfer Ratio	$I_C = -1 \text{ A dc}$ 2N6211 $V_{CE} = -2.8 \text{ V dc}$ 2N6212 $V_{CE} = -3.2 \text{ V dc}$ 2N6213 $V_{CE} = -4.0 \text{ V dc}$ 2N6213A $V_{CE} = -4.0 \text{ V dc}$	$h_{FE1}$		10	100
Forward - Current Transfer Ratio	$V_{CE} = -5 \text{ V dc}; I_C = -1 \text{ A dc}$ 2N6211 2N6212 2N6213 2N6213A	$h_{FE2}$		30 30 30 30	175 175 150 150
Collector - Emitter Saturated Voltage	$I_C = -1 \text{ A dc}; I_B = -0.125 \text{ A dc}$ 2N6211 2N6212 2N6213 2N6213A	$V_{CE(sat)}$	V dc		-1.4 -1.6 -2.0 -2.0
Base - Emitter Saturated Voltage	$I_C = -1 \text{ A dc}; I_B = -0.125 \text{ A dc}$	$V_{BE(sat)}$	V dc		1.4
Collector - Emitter Cutoff Current	$T_A = +100^\circ\text{C}$ $V_{BE} = +1.5 \text{ V dc}$ 2N6211 $V_{CE} = -250 \text{ V dc}$ 2N6212 $V_{CE} = -315 \text{ V dc}$ 2N6213 $V_{CE} = -360 \text{ V dc}$ 2N6213A $V_{CE} = -400 \text{ V dc}$	$I_{CEX2}$	mA dc		-5.0
Forward-Current Transfer Ratio	$T_A = -55^\circ\text{C}$ $V_{CE} = -5.0 \text{ V dc}; I_C = -1 \text{ A dc}$	$h_{FE3}$		10	
Turn - On Time	$V_{CC} = -200 \text{ V dc} \pm 10 \text{ V dc}; I_C = 1 \text{ A dc};$ $I_{B1} = -0.125 \text{ A dc}$	$t_{on}$	$\mu\text{s}$	—	0.6
Turn - Off Time	$V_{CC} = -200 \text{ V dc} \pm 10 \text{ V dc}; I_C = -1 \text{ A dc};$ $I_{B1} = -0.125 \text{ A dc}; I_{B2} = -0.125 \text{ A dc}$	$t_{off}$	$\mu\text{s}$	—	3.1
Small-Signal Short-Circuit Forward-Current Transfer Ratio	$V_{CE} = -10 \text{ V dc}; I_C = -0.2 \text{ A dc}; f = 5 \text{ MHz}$ 2N6211, 2N6212, 2N6213 2N6213A	$ h_{fe} $		4 1.5	20 10
Open Circuit Output Capacitance	$V_{CB} = -10 \text{ V dc}; I_E = 0; 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{obo}$	pF		220

### Safe Operating Area (continuous dc)

DC Tests:  $T_c = +25^\circ\text{C}$ , 1 Cycle,  $t = 1.0\text{ s}$  (see figure 4 on page 8)

Test 1:

All device types  $I_C = -2.0\text{ A dc}$ ;  $V_{CE} = -17.5\text{ V dc}$

Test 2:

All device types  $I_C = -0.875\text{ A dc}$ ;  $V_{CE} = -40\text{ V dc}$

Test 3:

2N6211 only  $I_C = -0.034\text{ A dc}$ ;  $V_{CE} = -225\text{ V dc}$

Test 4:

2N6212 only  $I_C = -0.02\text{ A dc}$ ;  $V_{CE} = -300\text{ V dc}$

Test 5:

2N6213, 2N6213A only  $I_C = -0.015\text{ A dc}$ ;  $V_{CE} = -350\text{ V dc}$

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

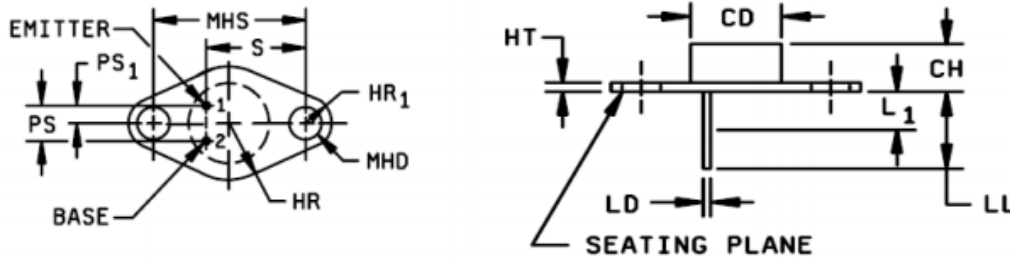
Ratings	Symbol	Value
Collector - Emitter Voltage 2N6211 2N6212 2N6213 2N6213A	$V_{CEO}$	-225 V dc -300 V dc -350 V dc -450 V dc
Collector - Base Voltage 2N6211 2N6212 2N6213 2N6213A	$V_{CBO}$	-275 V dc -350 V dc -400 V dc -500 V dc
Emitter - Base Voltage	$V_{EBO}$	-6.0 V dc
Base Current	$I_B$	-1.0 A dc
Collector Current	$I_C$	-2.0 A dc
Operating & Storage Temperature Range	$T_J, T_{STG}$	$-65^\circ\text{C}$ to $+200^\circ\text{C}$
Total Power Dissipation $T_A = +25^\circ\text{C}$ All device types	$P_T^{(1)}$	3.0 W
Total Power Dissipation $T_C = +25^\circ\text{C}$ All device types	$P_T^{(2)}$	35 W

(1) Derate linearly at 17.1 mW/°C for  $T_A > +25^\circ\text{C}$

(2) Derate linearly at 200 mW/°C for  $T_C > +25^\circ\text{C}$

Thermal Characteristics	Symbol	Max. Value
Thermal Resistance, Junction to Case	$R_{\theta JC (max)}$	5.0°C/W
Thermal Impedance	$Z_{\theta JX}$	1.75°C/W

### Outline Drawing (TO-66)



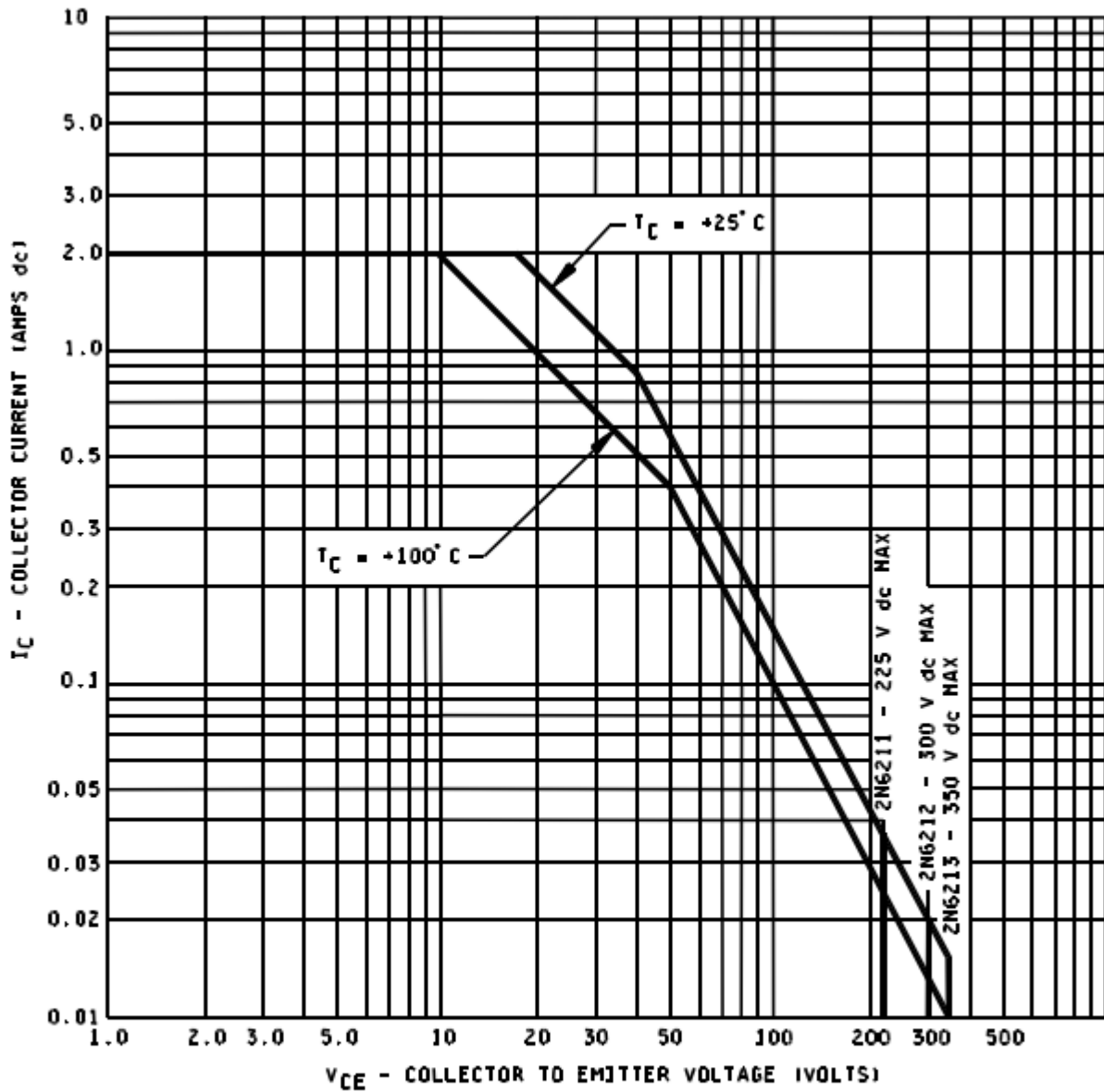
Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CH	.250	.340	6.35	8.64	
LD	.028	.034	0.71	0.86	7,9
CD	.470	.500	11.94	12.70	2
PS	.190	.210	4.83	5.33	3
PS <sub>1</sub>	.093	.107	2.36	2.72	3
HT	.050	.075	1.27	1.91	2, 5
LL	.360	.500	9.14	12.70	7
L <sub>1</sub>		.050		1.27	4
MHD	.142	.152	3.61	3.86	
MHS	.958	.962	24.33	24.43	
HR		.350		8.89	
HR <sub>1</sub>	.115	.145	2.92	3.68	
S	.570	.590	14.48	14.99	3

**NOTES:**

1. Dimensions are in inches. Millimeters are given for general information only.
2. Body contour is optional within zone defined by CD.
3. These dimensions shall be measured at points .050 inch (1.27 mm) to .055 inch (1.40 mm) below seating plane. When gauge is not used, measurement shall be made at seating plane.
4. Within this zone the lead diameter may vary to allow for lead finishes and irregularities.
5. HT dimension does not include sealing flanges.
6. The seating plane of header shall be flat within .001 inch (0.025 mm), concave to .004 inch (0.101 mm), convex inside a .520 inch (13.20 mm) diameter circle on the center of the header, and flat within .001 inch (0.025 mm), concave to .006 inch (0.152 mm), convex overall.
7. Both terminals.
8. The collector shall be electrically connected to the case.
9. LD applies between L<sub>1</sub> and LL. Lead diameter shall not exceed twice LD within L<sub>1</sub>.
10. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi$ x symbology.

FIGURE 1. Physical dimensions.

## Graphs



NOTE: Electrical characteristics for 2N6213A are identical to the 2N6213 unless otherwise noted.

FIGURE 4. Maximum safe operating graph (continuous dc).

## Graphs

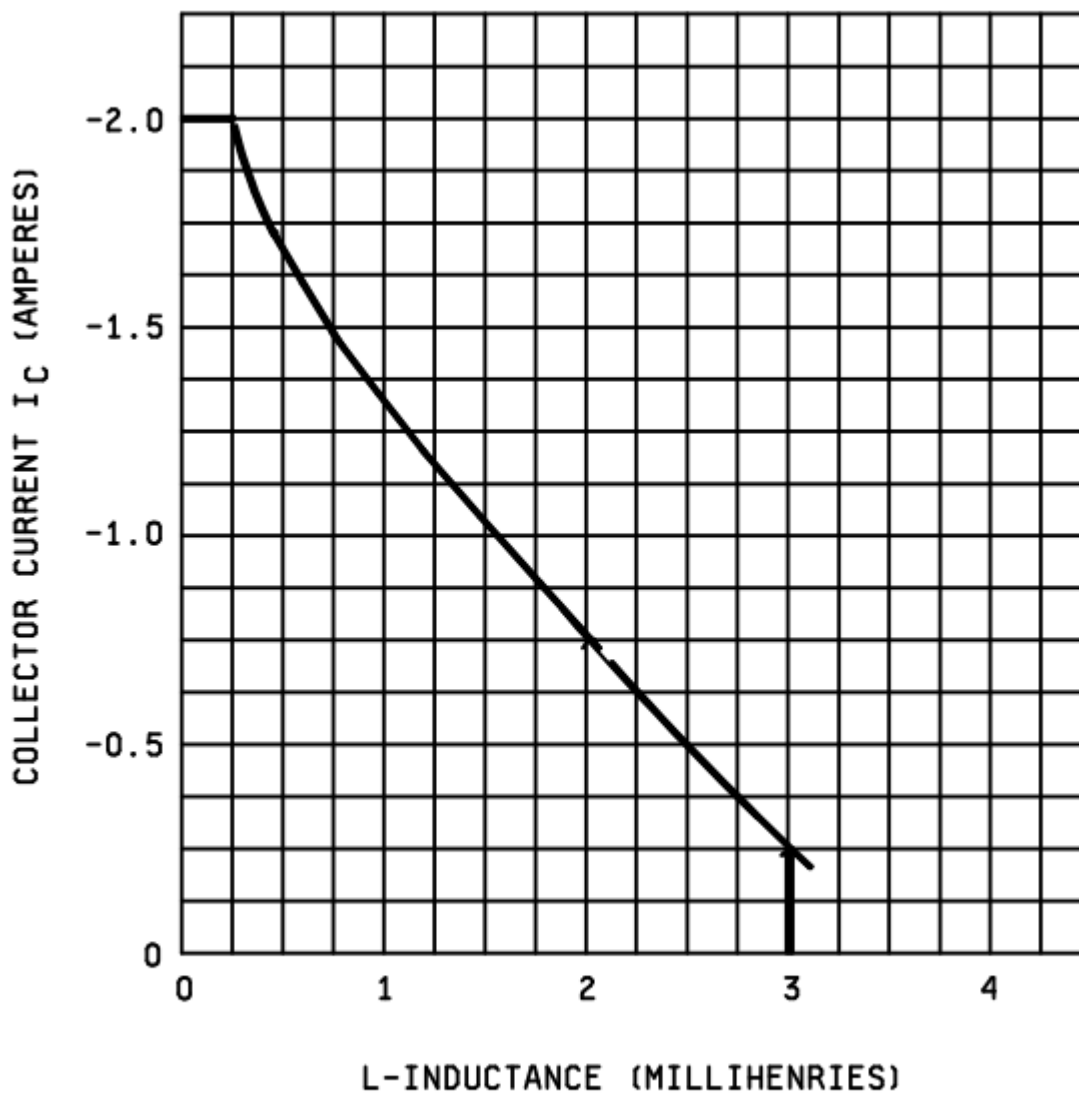
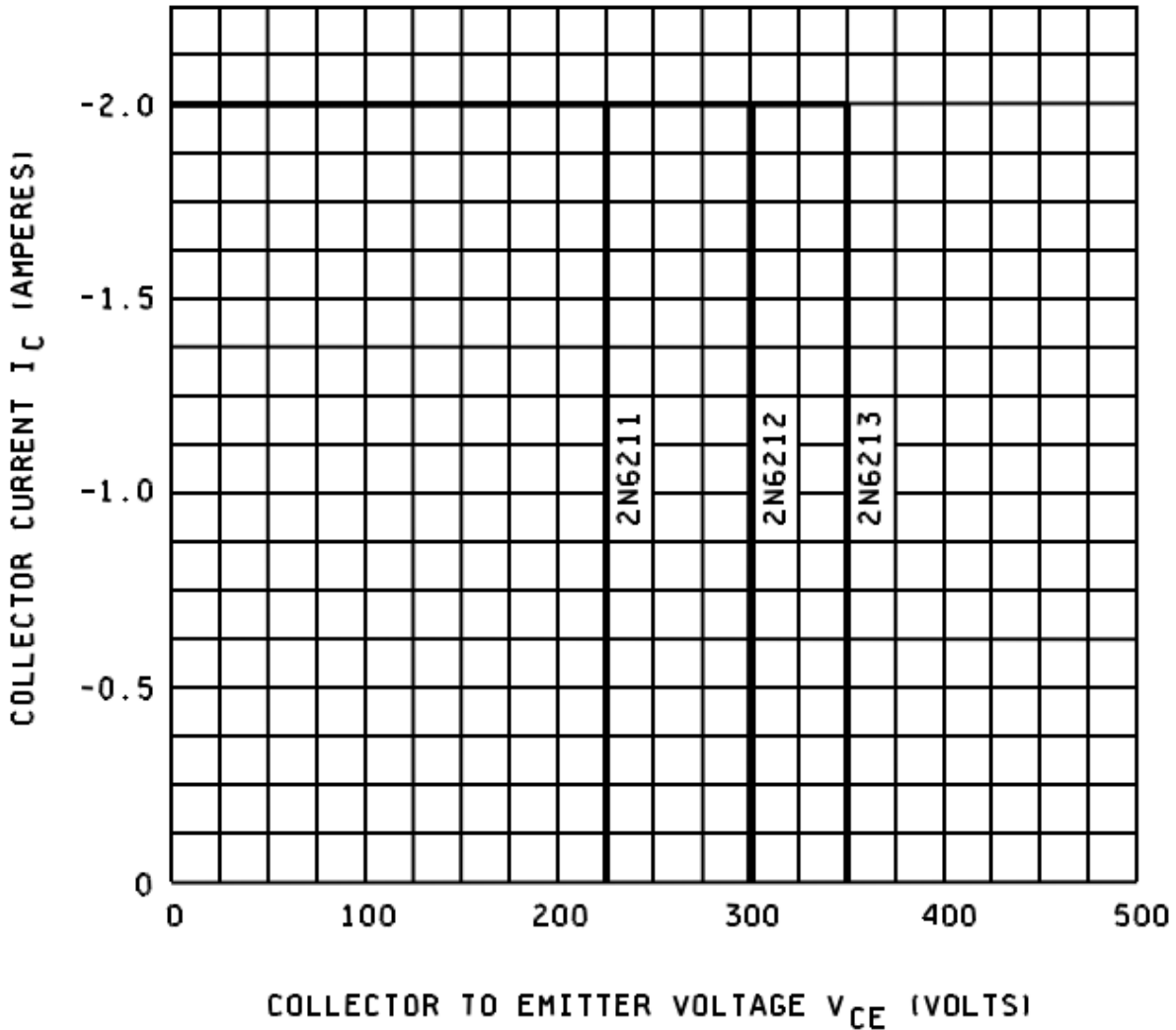


FIGURE 5. Safe operating area for switching between saturation and cutoff (unclamped inductive load).

## Graphs



NOTE: Electrical characteristics for 2N6213A are identical to the 2N6213 unless otherwise noted.

FIGURE 6. Safe operating area for switching between saturation and cutoff (clamped inductive load).



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