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°C unless otherwise specified)

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

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

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

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Safe Operating Area (continuous dc)	
DC Tests: T_C = +25°C, I Cycle, t = 1.0 s (see figure 4 on page 8)	
Test 1:	
All device types	I_C = -2.0 A dc; V_{CE} = -17.5 V dc
Test 2:	
All device types	I_C = -0.875 A dc; V_{CE} = -40 V dc
Test 3:	
2N6211 only	I_C = -0.034 A dc; V_{CE} = -225 V dc
Test 4:	
2N6212 only	I_C = -0.02 A dc; V_{CE} = -300 V dc
Test 5:	
2N6213, 2N6213A only	I_C = -0.015 A dc; V_{CE} = -350 V dc

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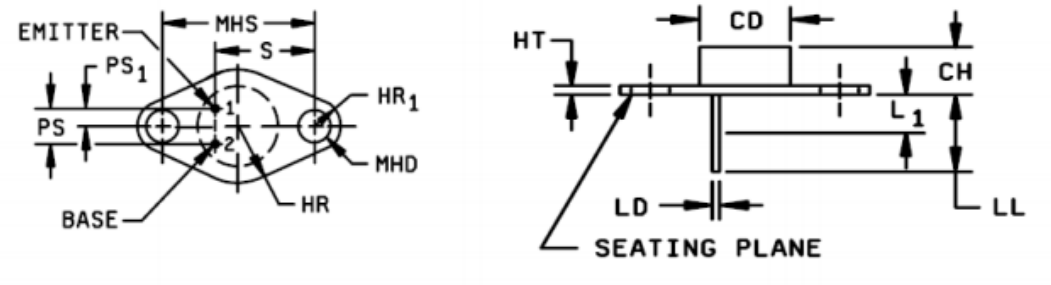
Absolute Maximum Ratings (T_C = +25°C unless otherwise specified)

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°C to +200°C
Total Power Dissipation T_A = +25°C All device types	P_T (1)	3.0 W
Total Power Dissipation T_C = +25°C All device types	P_T (2)	35 W

(1) Derate linearly at 17.1 mW/°C for T_A > +25°C
(2) Derate linearly at 200 mW/°C for T_C > +25°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)

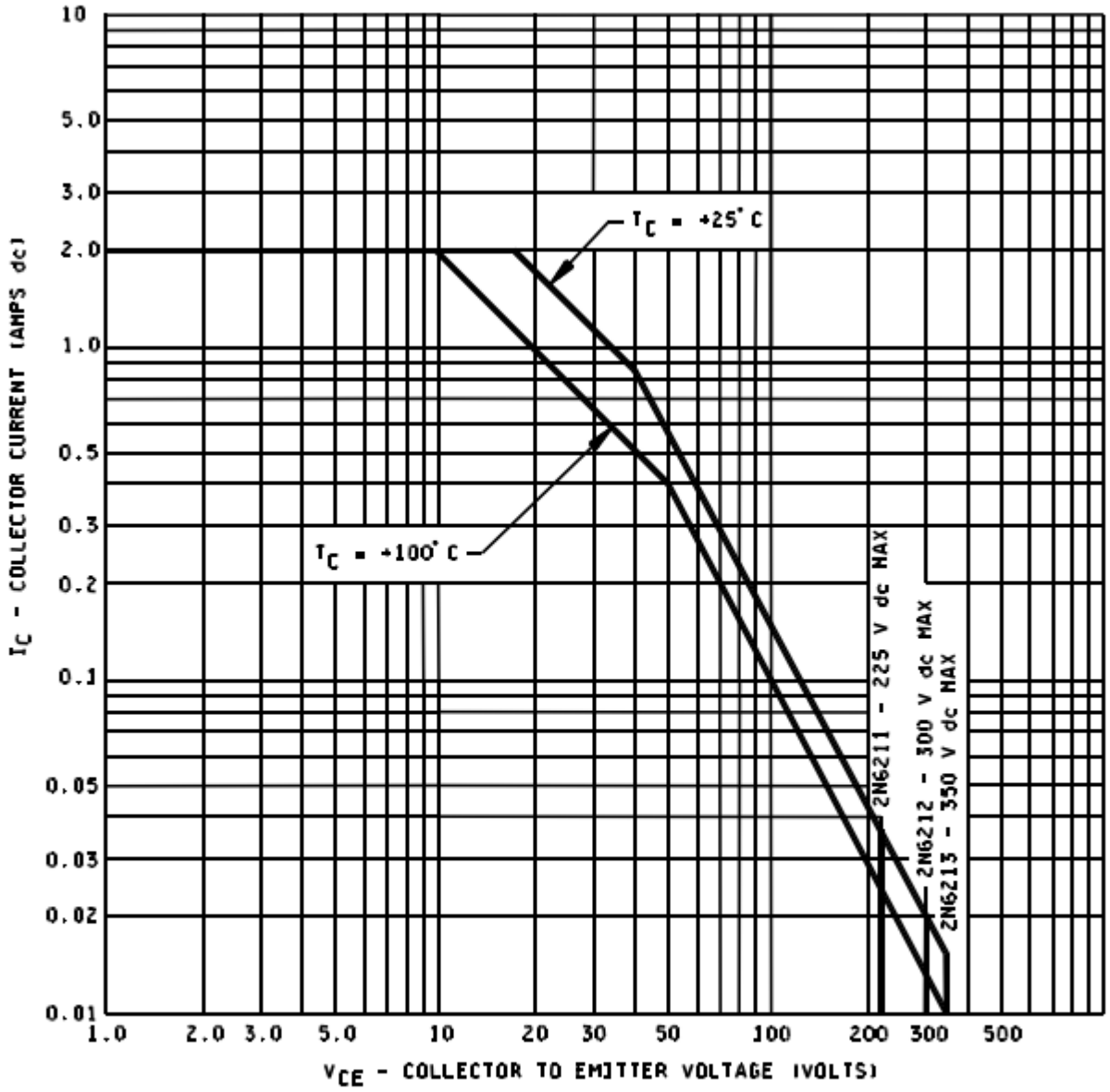


Ltr	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
CH	.250	.340	6.35	8.64	
LD	.028	.034	0.71	0.86	7,9
CD	.470	.500	11.94	12.70	2
PS	.190	.210	4.83	5.33	3
PS_1	.093	.107	2.36	2.72	3
HT	.050	.075	1.27	1.91	2, 5
LL	.360	.500	9.14	12.70	7
L_1		.050		1.27	4
MHD	.142	.152	3.61	3.86	
MHS	.958	.962	24.33	24.43	
HR		.350		8.89	
HR_1	.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_1 and LL. Lead diameter shall not exceed twice LD within L_1.
10. In accordance with ASME Y14.5M, diameters are equivalent to ϕx 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

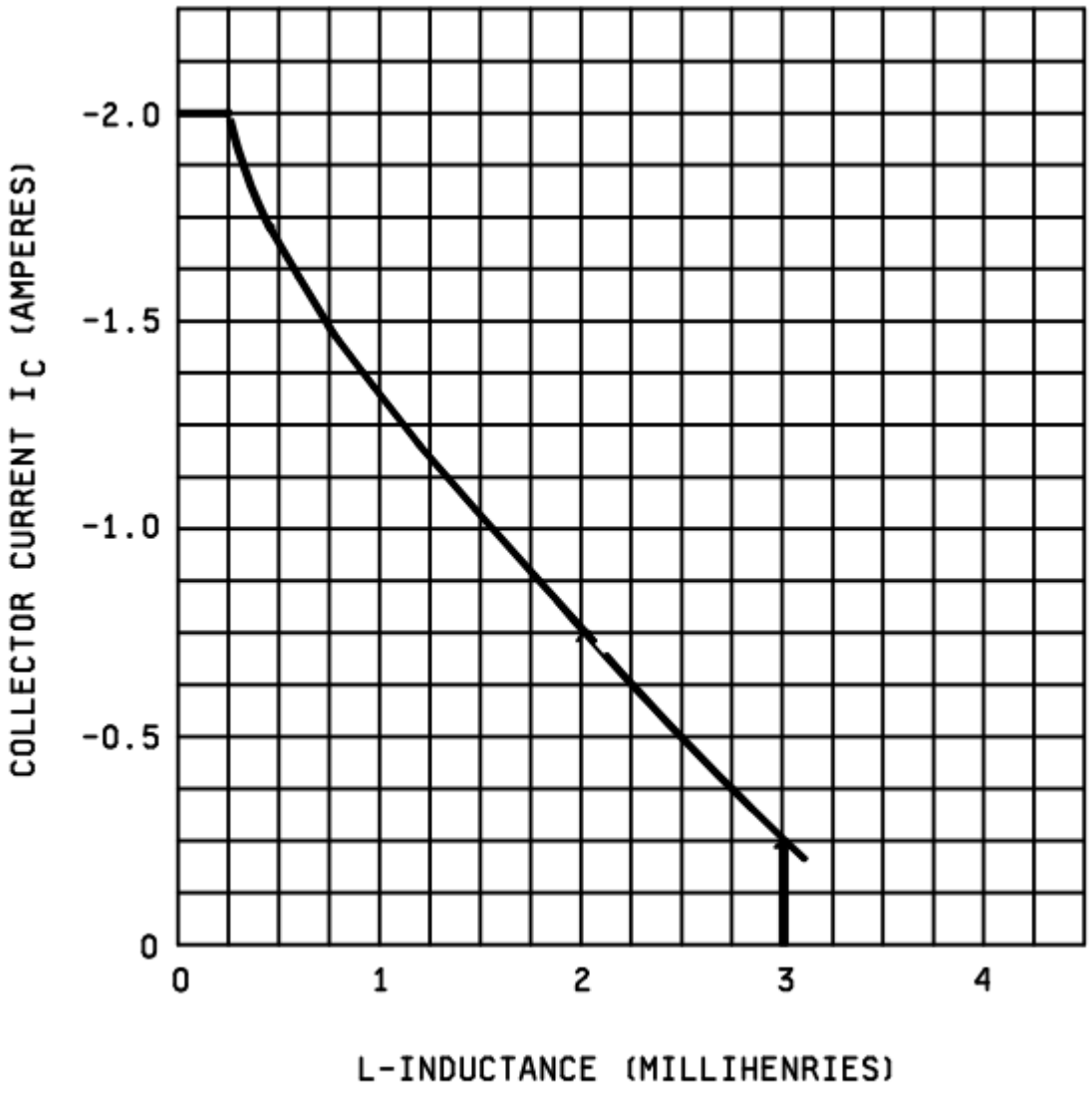
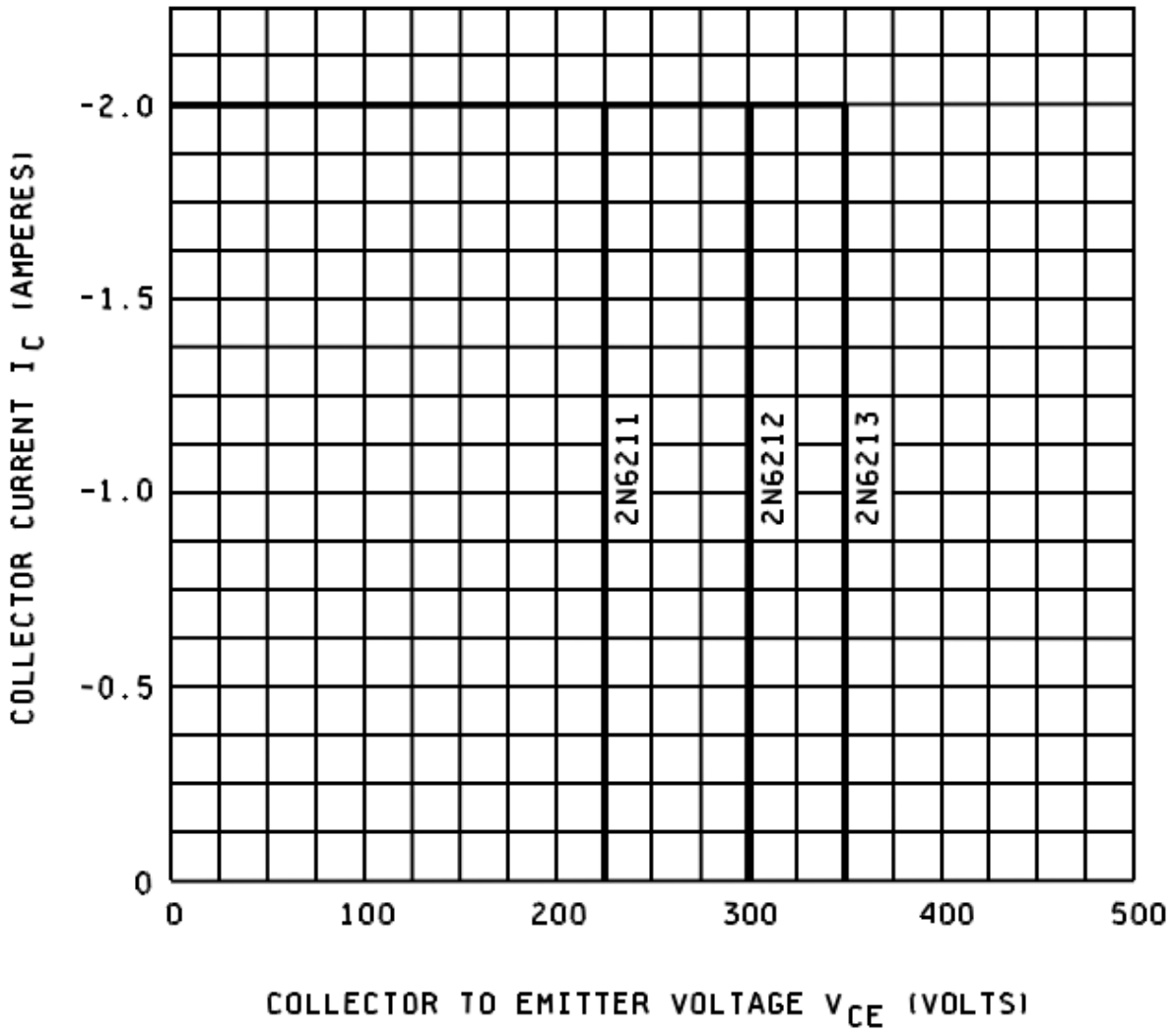


FIGURE 5. Safe operating area for switching between saturation and cutoff (unclamped inductive load).

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).