

POWER TRANSISTORS

5 Amp, 80V, Planar NPN

JAN, JANTX, & JANTXV 2N3996
JAN, JANTX, & JANTXV 2N3997
JAN, JANTX, & JANTXV 2N3998
JAN, JANTX, & JANTXV 2N3999

FEATURES

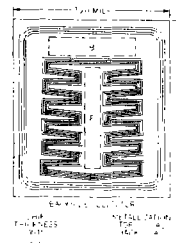
- Meets MIL-S-19500/374*
- Collector-Base Voltage: Up to 100V
- D.C. Collector Current: 5A
- Fast Switching
- Beta Guaranteed at 3 Current Levels

DESCRIPTION

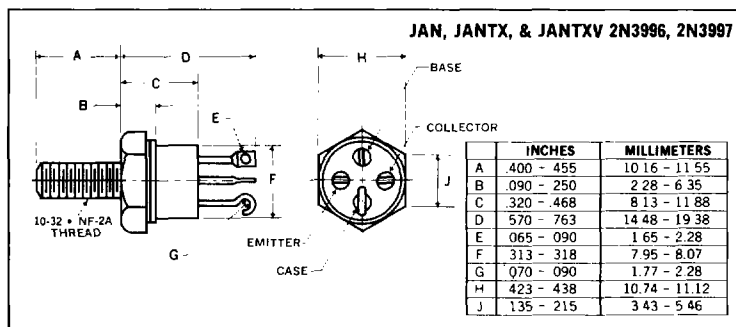
Unitrode power transistors provide a unique combination of low saturation voltage, high gain and fast switching. They are ideally suited for power supply pulse amplifier and similar high efficiency power switching applications.

ABSOLUTE MAXIMUM RATINGS

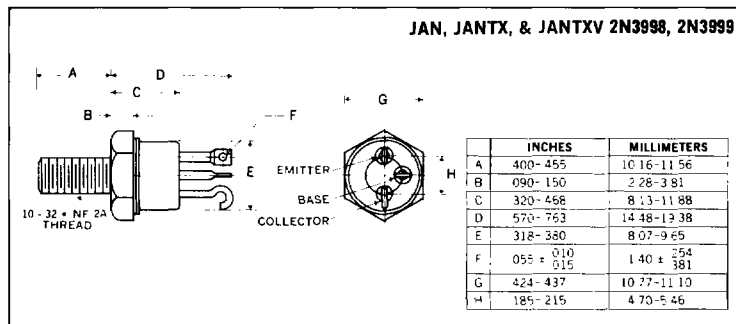
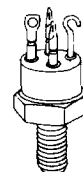
Collector-Base Voltage, V_{CB0}	100V
Collector-Emitter Voltage, V_{CER}	80V
Emitter-Base Voltage, V_{EB0}	8V
D.C. Collector Current, I_C	5A
Peak Collector Current, I_{CP}	10A
Power Dissipation	
25°C Ambient	2W
100°C Case	30W
Operating and Storage Temperature Range	-65°C to 200°C



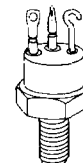
MECHANICAL SPECIFICATIONS



TO-111



TO-59



ELECTRICAL SPECIFICATIONS (at 25°C unless noted)†**2**

Test	Symbol	2N3996* 2N3998*		2N3997* 2N3999*		Units	Test Conditions
		Min.	Max.	Min.	Max.		
D.C. Current Gain	h_{FE}	30	—	60	—	—	$I_C=50\text{ mA}$, $V_{CE}=2\text{V}$
D.C. Current Gain (Note 1)	h_{FE}	40	120	80	240	—	$I_C=1\text{A}$, $V_{CE}=2\text{V}$
D.C. Current Gain (Note 1)	h_{FE}	15	—	20	—	—	$I_C=5\text{A}$, $V_{CE}=5\text{V}$
D.C. Current Gain, —55°C (Note 1)	h_{FE}	10	—	20	—	—	$I_C=1\text{A}$, $V_{CE}=2\text{V}$
Collector Saturation Voltage (Note 1)	$V_{CE}(\text{sat})$	—	0.25	—	0.25	V	$I_C=1\text{A}$, $I_B=100\text{ mA}$
Collector Saturation Voltage (Note 1)	$V_{CE}(\text{sat})$	—	2	—	2	V	$I_C=5\text{A}$, $I_B=500\text{ mA}$
Base Saturation Voltage (Note 1)	$V_{BE}(\text{sat})$	0.6	1.2	0.6	1.2	V	$I_C=1\text{A}$, $I_B=100\text{ mA}$
Base Saturation Voltage (Note 1)	$V_{BE}(\text{sat})$	—	1.6	—	1.6	V	$I_C=5\text{A}$, $I_B=500\text{ mA}$
Collector-Emitter Breakdown Voltage (Note 1)	BV_{CEO}	80	—	80	—	V	$I_C=50\text{ mA}$, $I_E=0$
Emitter-Base Cutoff Current	I_{EBO}	—	0.2	—	0.2	μA	$V_{BE}=5\text{V}$, $I_C=0$
Emitter-Base Cutoff Current	I_{EBO}	—	10	—	10	μA	$V_{BE}=8\text{V}$, $I_C=0$
Collector Cutoff Current	I_{CES}	—	5	—	5	μA	$V_{CE}=90\text{V}$, $R_{BE}=0$
Collector Cutoff Current	I_{CEO}	—	10	—	10	μA	$V_{CE}=60\text{V}$, $I_B=0$
Collector Cutoff Current, 150°C	I_{CES}	—	50	—	50	μA	$V_{CE}=90$, $R_{BE}=0$
Collector Capacitance	C_{JC}	—	150	—	150	pf	$V_{CB}=10\text{V}$, $I_E=0$, $f=1\text{ MHz}$
A.C. Current Gain (High Frequency)	h_{fe}	4	—	4	—	—	$I_C=1\text{A}$, $V_{CE}=5\text{V}$, $f=10\text{ MHz}$
Switching Speeds	Turn-on Time	t_{on}	—	0.3	—	μS	$I_C=1\text{A}$
	Turn-off Time	t_{off}	—	1.5	—	μS	$I_C=100\text{mA}$, $I_{B1}= -100\text{ mA}$

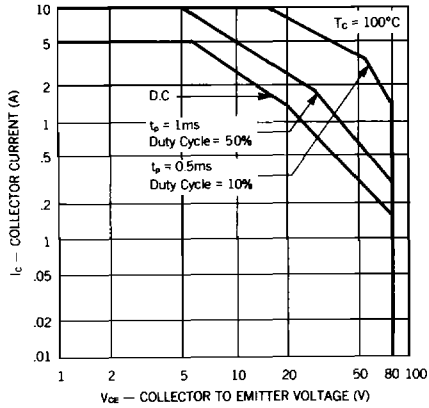
Notes:1. Pulse width = 300 μS ; duty cycle $\leq 2\%$.

† All values in this table are JEDEC registered.

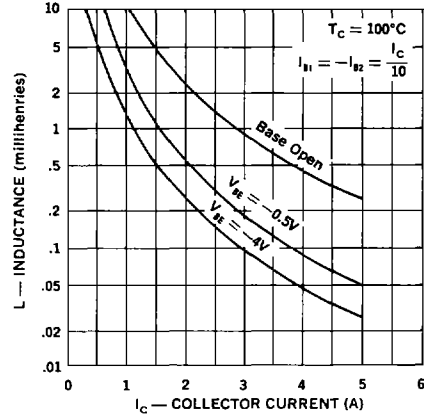
*Also applicable to

JAN and JANTX versions

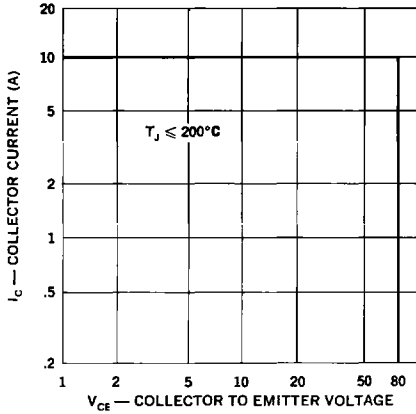
**Forward Bias
Safe Operating Area**



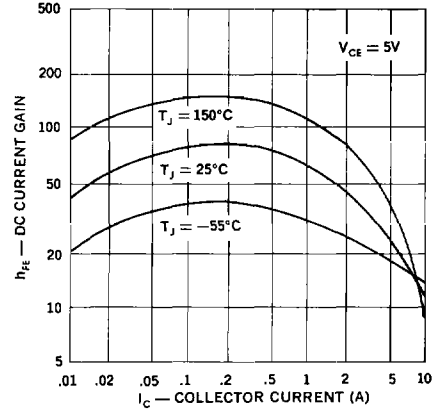
**Unclamped Reverse Bias
Second Breakdown**



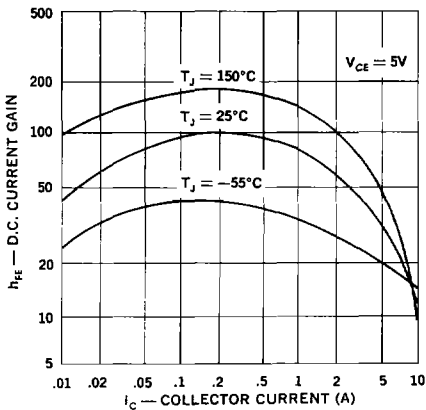
**Reverse Bias
Safe Operating Area
Clamped Inductive Switching**



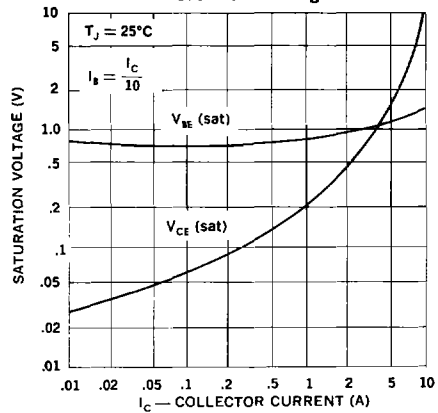
**D.C. Current Gain
2N3996-2N3998**



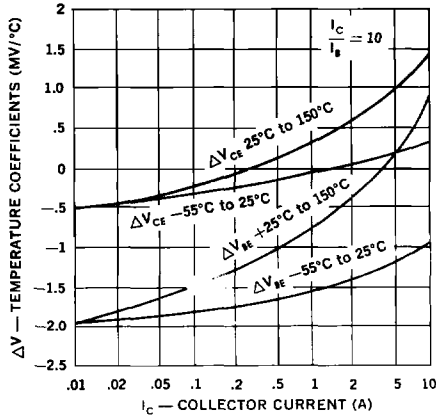
**D.C. Current Gain
2N3997-2N3999**



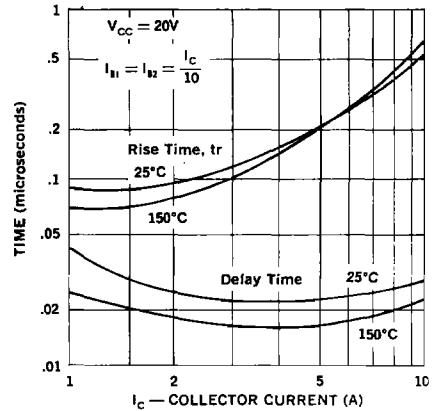
Saturation Voltage



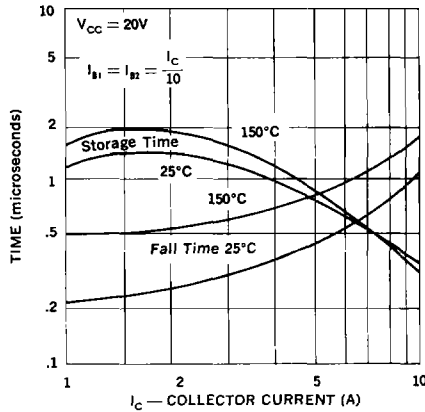
**Saturation Voltage
Temperature Coefficients**



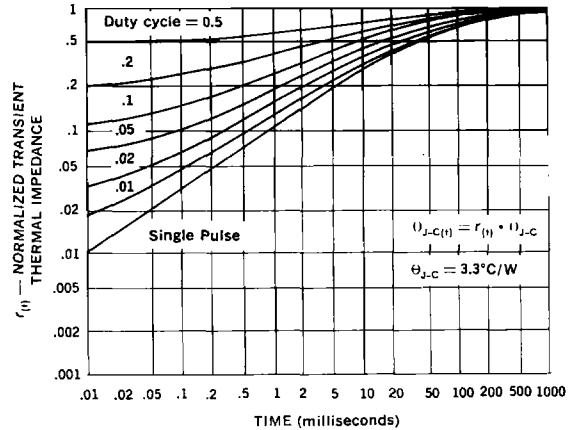
**Switching Speed
Characteristics**



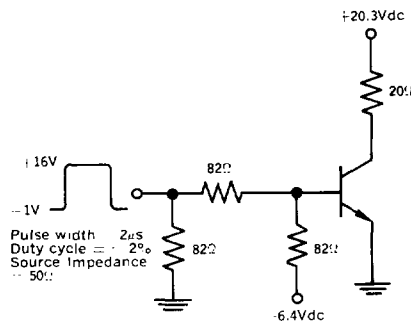
**Switching Speed
Characteristics**



Thermal Response



Switching Speed Circuit



NOTES:

1. $I_C \approx 1A$, $I_{B1} \approx -I_{B2} \approx 100mA$
2. The values of collector current and base current are nominal. The actual values will vary slightly with transistor parameters.