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

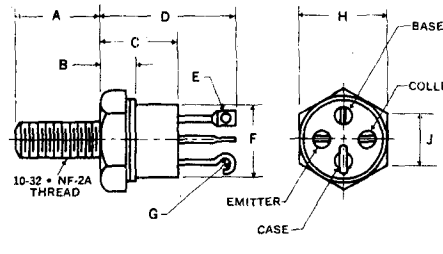
Unitrode power transistors provide a unique combination of low saturation voltage, high gain and fast switching. They are ideally suited for power supply pulse amplifier and similar high efficiency power switching applications.

ABSOLUTE MAXIMUM RATINGS

Collector-Base Voltage, V_{CBO}	100V
Collector-Emitter Voltage, V_{CER}	80V
Emitter-Base Voltage, V_{EBO}	8V
D.C. Collector Current, I_C	5V
Power Dissipation	
25°C Ambient	2W
100°C Case	30W
Operating and Storage Temperature Range	−65°C to 200°C

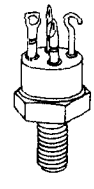
MECHANICAL SPECIFICATIONS

JAN, JANTX, & JANTXV 2N3996, 2N3997

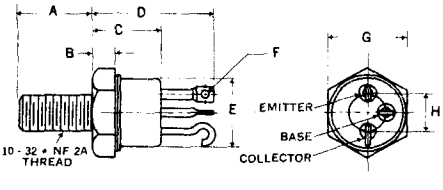


	INCHES	MILLIMETERS
A	.400 - .455	10.16 - 11.55
B	.090 - .250	2.28 - 6.35
C	.320 - .468	8.13 - 11.88
D	.570 - .763	14.48 - 19.38
E	.065 - .090	1.65 - 2.28
F	.313 - .318	7.95 - 8.07
G	.070 - .090	1.77 - 2.28
H	.423 - .438	10.74 - 11.12
J	.135 - .215	3.43 - 5.46

TO-111

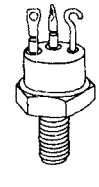


JAN, JANTX, & JANTXV 2N3998, 2N3999



	INCHES	MILLIMETERS
A	.400-.455	10.16-11.56
B	.090-.150	2.28-3.81
C	.320-.468	8.13-11.88
D	.570-.763	14.48-19.38
E	.318-.380	8.07-9.65
F	$.055 \pm \frac{.010}{.015}$	$1.40 \pm \frac{.254}{.381}$
G	.424-.437	10.77-11.10
H	.185-.215	4.70-5.46

TO-59



UNITRODE

ELECTRICAL SPECIFICATIONS (at 25°C unless noted)†

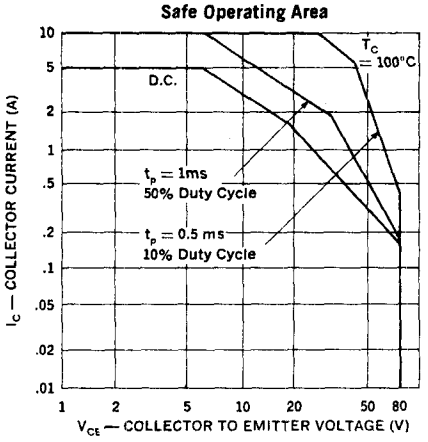
Test	Symbol	2N3996* 2N3998* Min.	2N3996* 2N3998* Max.	2N3997* 2N3999* Min.	2N3997* 2N3999* Max.	Units	Test Conditions
D.C. Current Gain	h_{FE}	30	—	60	—	—	I_C=50 mA, V_{CE}=2V
D.C. Current Gain (Note 1)	h_{FE}	40	120	80	240	—	I_C=1A, V_{CE}=2V
D.C. Current Gain (Note 1)	h_{FE}	15	—	20	—	—	I_C=5A, V_{CE}=5V
D.C. Current Gain, −55°C (Note 1)	h_{FE}	10	—	20	—	—	I_C=1A, V_{CE}=2V
Collector Saturation Voltage (Note 1)	V_{CE} (sat)	—	0.25	—	0.25	V	I_C=1A, I_B=100 mA
Collector Saturation Voltage (Note 1)	V_{CE} (sat)	—	2	—	2	V	I_C=5A, I_B=500 mA
Base Saturation Voltage (Note 1)	V_{BE} (sat)	0.6	1.2	0.6	1.2	V	I_C=1A, I_B=100 mA
Base Saturation Voltage (Note 1)	V_{BE} (sat)	—	1.6	—	1.6	V	I_C=5A, I_B=500 mA
Collector-Emitter Breakdown Voltage (Note 1)	BV_{CEO}	80	—	80	—	V	I_C=50 mA, I_B=0
Emitter-Base Cutoff Current	I_{EBO}	—	0.5	—	0.5	μA	V_{BE}=5V, I_C=0
Emitter-Base Cutoff Current	I_{EBO}	—	10	—	10	μA	V_{BE}=8V, I_C=0
Collector Cutoff Current	I_{CES}	—	5	—	5	μA	V_{CE}=90V, R_{BE}=0
Collector Cutoff Current	I_{CEO}	—	10	—	10	μA	V_{CE}=60V, I_B=0
Collector Cutoff Current, 150°C	I_{CES}	—	50	—	50	μA	V_{CE}=90, R_{BE}=0
Collector Capacitance	C_{ob}	—	150	—	150	pf	V_{CB}=10V, I_E=0, f=1 MHz
A.C. Current Gain (High Frequency)	h_{fe}	4	—	4	—	—	I_C=1A, V_{CE}=5V, f=10 MHz
Switching Speeds Turn-on Time	t_{on}	—	0.3	—	0.3	μs	I_C=1A
Switching Speeds Turn-off Time	t_{off}	—	1.5	—	2	μs	I_{b1}=100mA, I_{b2}= −100 mA

Notes:
1. Pulse width = 300μS; duty cycle ≤2%.
† All values in this table are JEDEC registered.

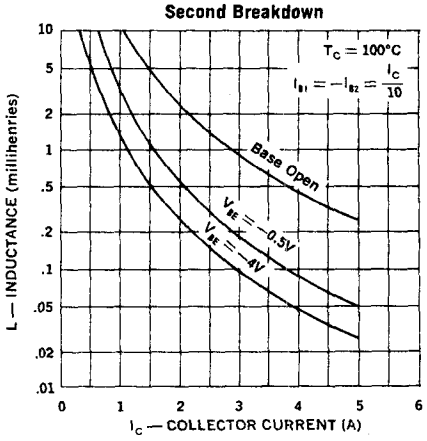
*Also applicable to JAN and JANTX versions

IV

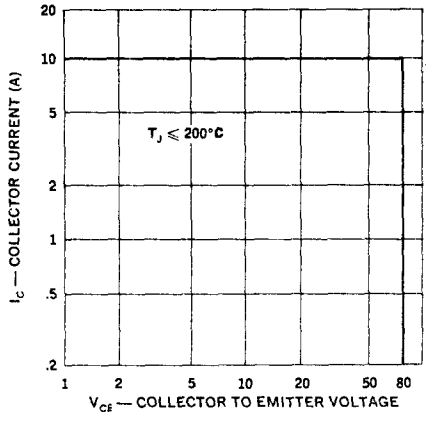
Forward Bias
Safe Operating Area



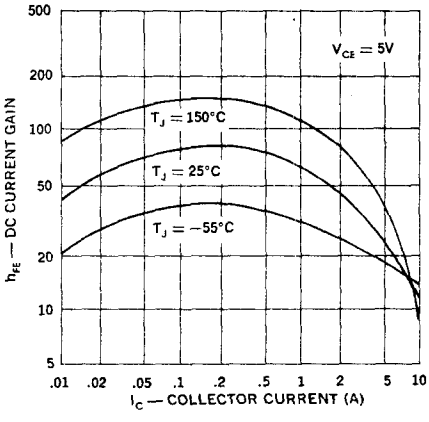
Unclamped Reverse Bias
Second Breakdown



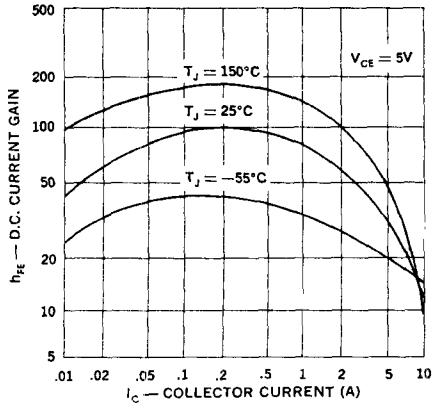
Reverse Bias
Safe Operating Area
Clamped Inductive Switching



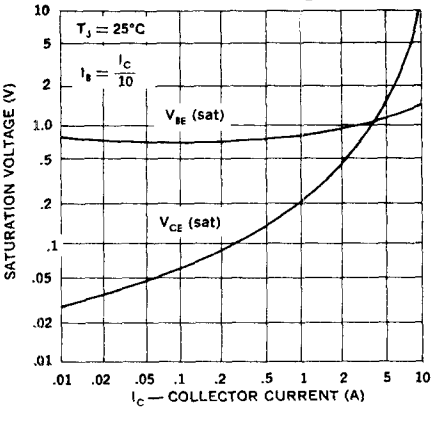
D.C. Current Gain
2N3996-2N3998



D.C. Current Gain
2N3997-2N3999



Saturation Voltage



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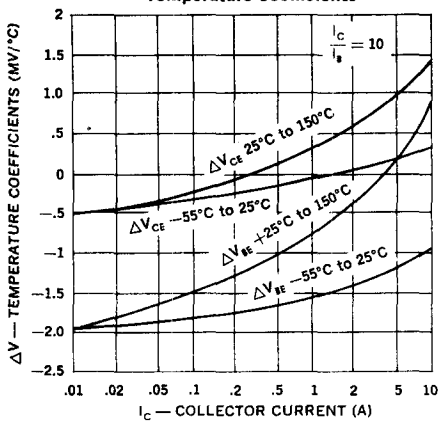
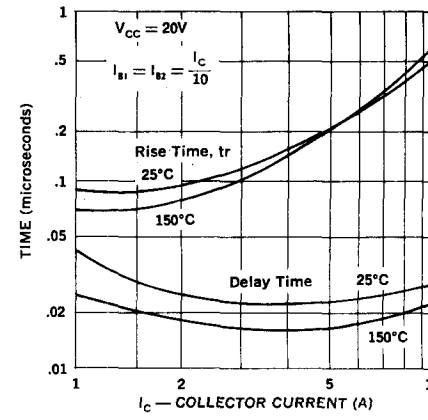
Saturation Voltage Temperature Coefficients

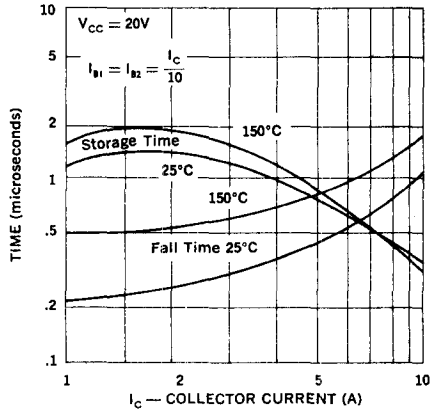


Switching Speed Characteristics

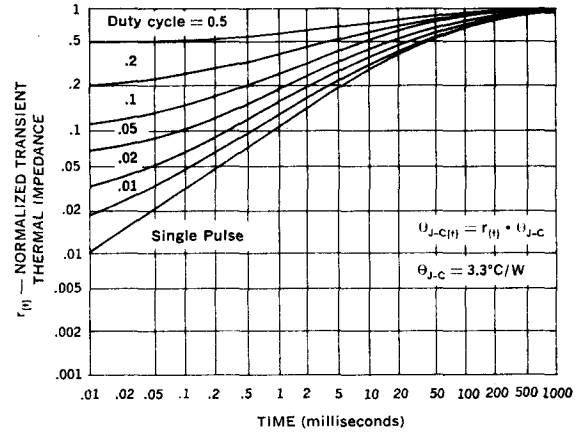


IV

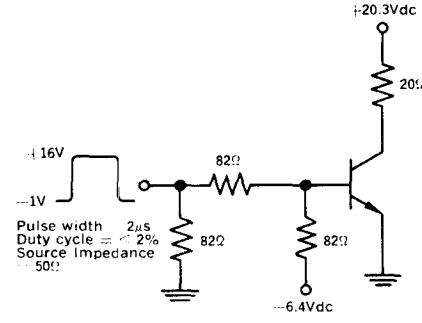
Switching Speed Characteristics



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.