**NOT RECOMMENDED FOR NEW DESIGNS**

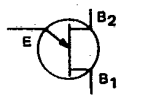
# PN Unijunction Transistors
## Silicon Unijunction Transistors

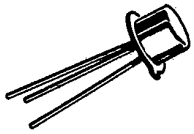
**2N4851 thru 2N4853**

**PN UJTs**

... designed for pulse and timing circuits, sensing circuits, and thyristor trigger circuits.

- Low Peak-Point Current — $I_P$ = 0.4 μA Max
- Low Emitter Reverse Current — $I_{EO}$ = 50 nA Max
- Fast Switching



CASE 22A-01
STYLE 1

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***MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise noted.)

| Rating | Symbol | Value | Unit |
|---|---|---|---|
| RMS Power Dissipation, Note 1 | $P_D$ | 300 | mW |
| RMS Emitter Current | $I_e$ | 50 | mA |
| Peak-Pulse Emitter Current, Note 2 | $I_e$ | 1.5 | Amp |
| Emitter Reverse Voltage | $V_{B2E}$ | 30 | Volts |
| Interbase Voltage, Note 3 | $V_{B2B1}$ | 35 | Volts |
| Operating Junction Temperature Range | $T_J$ | −65 to +125 | °C |
| Storage Temperature Range | $T_{stg}$ | −65 to +200 | °C |

*Indicates JEDEC Registered Data.
Notes: 1. Derate 3 mW/°C increase in ambient temperature.
2. Duty cycle ≤ 1%, PRR = (see Figure 6).
3. Based upon power dissipation at $T_A$ = 25°C.

## 2N4851 thru 2N4853

T-37-21

**ELECTRICAL CHARACTERISTICS** ($T_A$ = 25°C unless otherwise noted.)

| Rating | | Fig. No. | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| *Intrinsic Standoff Ratio, Note 1 ($V_{B2B1}$ = 10 V) | 2N4851<br>2N4852, 2N4853 | 4, 8 | $\eta$ | <br>0.56<br>0.70 | <br>—<br>— | <br>0.75<br>0.85 | — |
| *Interbase Resistance ($V_{B2B1}$ = 3 V, $I_E$ = 0) | | 11, 12 | $r_{BB}$ | 4.7 | — | 9.1 | k ohms |
| *Interbase Resistance Temperature Coefficient ($V_{B2B1}$ = 3 V, $I_E$ = 0, $T_A$ = −65 to +125°C) | | 12 | $\alpha_{BB}$ | 0.2 | — | 0.8 | %/°C |
| Emitter Saturation Voltage, Note 2 ($V_{B2B1}$ = 10 V, $I_E$ = 50 mA) | | | $V_{EB1(sat)}$ | — | 2.5 | — | Volts |
| Modulated Interbase Current ($V_{B2B1}$ = 10 V, $I_E$ = 50 mA) | | | $I_{B2(mod)}$ | — | 15 | — | mA |
| *Emitter Reverse Current ($V_{B2E}$ = 30 V, $I_{B1}$ = 0) | 2N4851, 2N4852<br>2N4853 | 7 | $I_{EB2O}$ | <br>— | <br>— | 0.1<br>0.05 | μA |
| *Peak-Point Emitter Current ($V_{B2B1}$ = 25 V) | 2N4851, 2N4852<br>2N4853 | 9, 10 | $I_P$ | <br>— | <br>— | 2<br>0.4 | μA |
| *Valley-Point Current, Note 2 ($V_{B2B1}$ = 20 V, $R_{B2}$ = 100 ohms) | 2N4851<br>2N4852<br>2N4853 | 13, 14 | $I_V$ | 2<br>4<br>6 | —<br>—<br>— | —<br>—<br>— | mA |
| *Base-One Peak Pulse Voltage | 2N4851<br>2N4852<br>2N4853 | 3, 17 | $V_{OB1}$ | 3<br>5<br>6 | —<br>—<br>— | —<br>—<br>— | Volts |
| *Maximum Frequency of Oscillation | | 5 | $f_{(max)}$ | — | 0.25 | — | MHz |

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*Indicates JEDEC Registered Data.

Notes: 1. $\eta$, Intrinsic standoff ratio, is defined in terms of the peak-point voltage, $V_P$, by means of the equation: $V_P = \eta V_{B2B1} + V_F$, where $V_F$ is about 0.49 volt at 25°C @ $I_F$ = 10 μA and decreases with temperature at about 2.5 mV/°C. The test circuit is shown in Figure 4. Components $R_1$, $C_1$, and the UJT form a relaxation oscillator; the remaining circuitry serves as a peak-voltage detector. The forward drop of Diode $D_1$ compensates for $V_F$. To use, the "cal" button is pushed, and $R_3$ is adjusted to make the current meter, $M_1$, read full scale. When the "cal" button is released, the value of $\eta$ is read directly from the meter, if full scale on the meter reads 1.

2. Use pulse techniques: PW ≈ 300 μs, duty cycle ≤ 2% to avoid internal heating, which may result in erroneous readings.

**FIGURE 1 – UNIJUNCTION TRANSISTOR SYMBOL AND NOMENCLATURE**

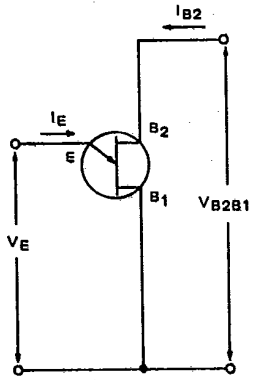



**FIGURE 2 – STATIC EMITTER CHARACTERISTICS CURVES**

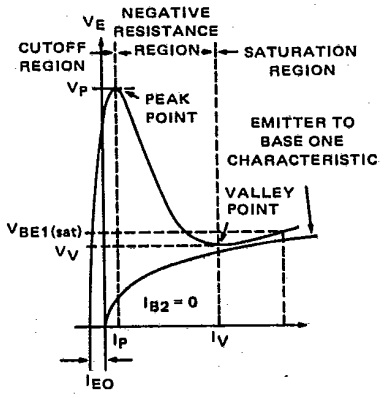


FIGURE 3 – $V_{OB1}$ TEST CIRCUIT

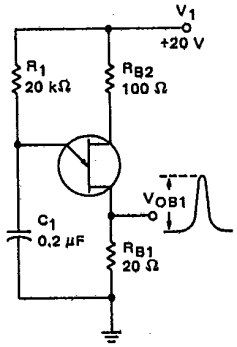
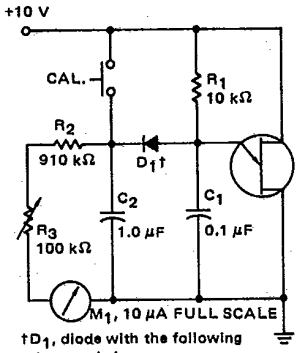



FIGURE 4 – η TEST CIRCUIT




†$D_1$, diode with the following characteristics:
$V_F = 0.49$ V @ $I_F = 10$ μA
$I_R \leq 2.0$ μA @ $V_R = 20$ V

FIGURE 5 – $f_{(max)}$ TEST CIRCUIT

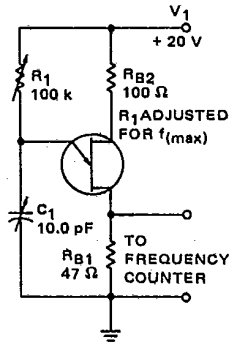
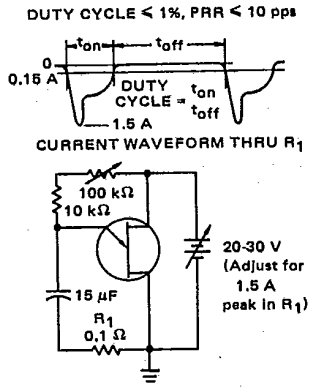



FIGURE 6 – PRR TEST CIRCUIT AND WAVEFORM

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## TYPICAL CHARACTERISTICS

FIGURE 7 – EMITTER REVERSE CURRENT

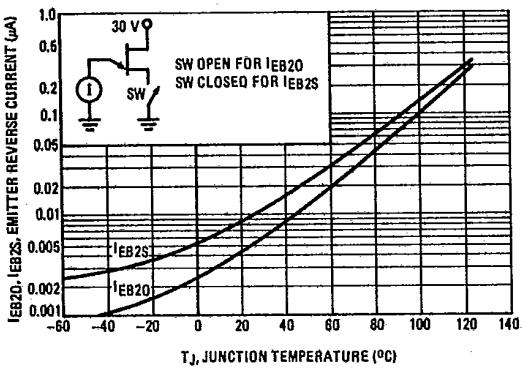
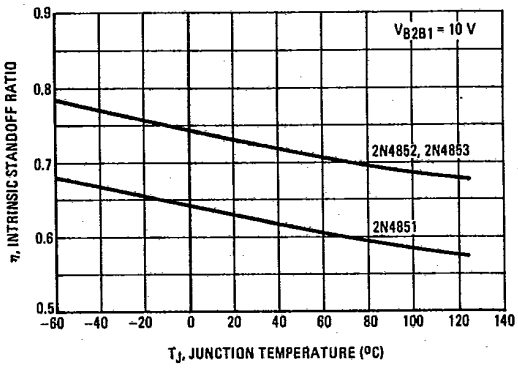



FIGURE 8 – INTRINSIC STANDOFF RATIO



## PEAK POINT CURRENT

FIGURE 9 – EFFECT OF VOLTAGE

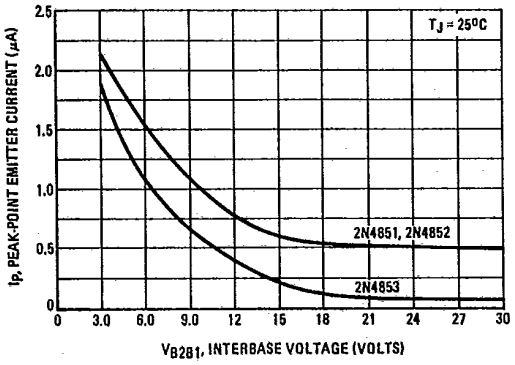
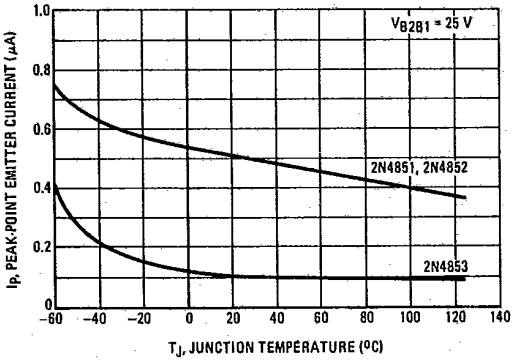



FIGURE 10 – EFFECT OF TEMPERATURE




## INTERBASE RESISTANCE

FIGURE 11 – EFFECT OF VOLTAGE

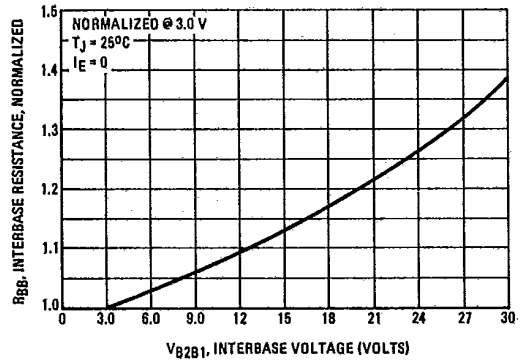
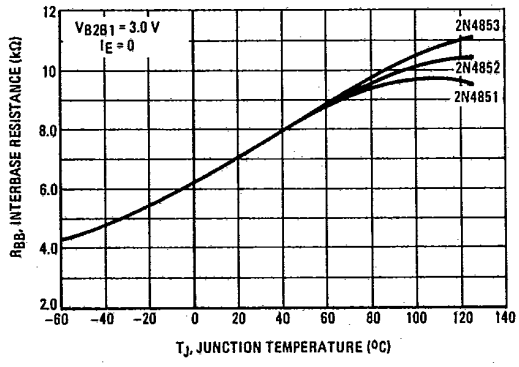



FIGURE 12 – EFFECT OF TEMPERATURE




## TYPICAL CHARACTERISTICS

## VALLEY CURRENT

FIGURE 13 – EFFECT OF VOLTAGE

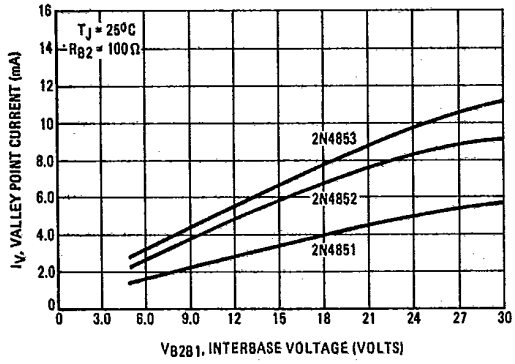
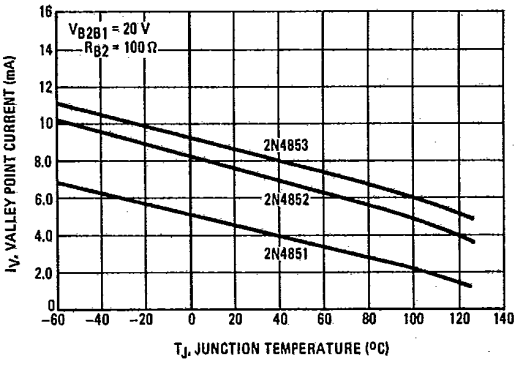



FIGURE 14 – EFFECT OF TEMPERATURE

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## VALLEY VOLTAGE

FIGURE 15 – EFFECT OF VOLTAGE

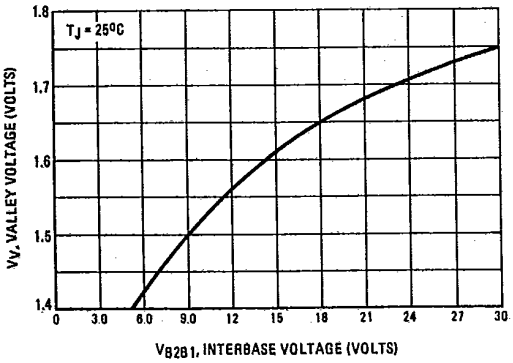



FIGURE 16 – EFFECT OF TEMPERATURE

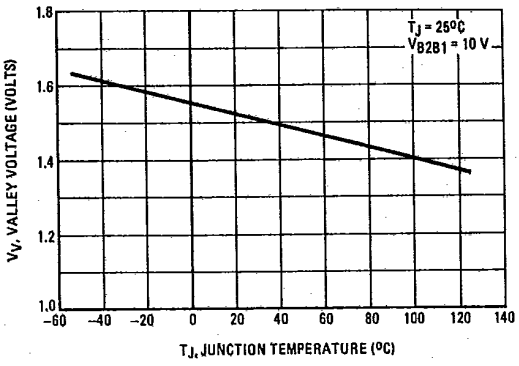
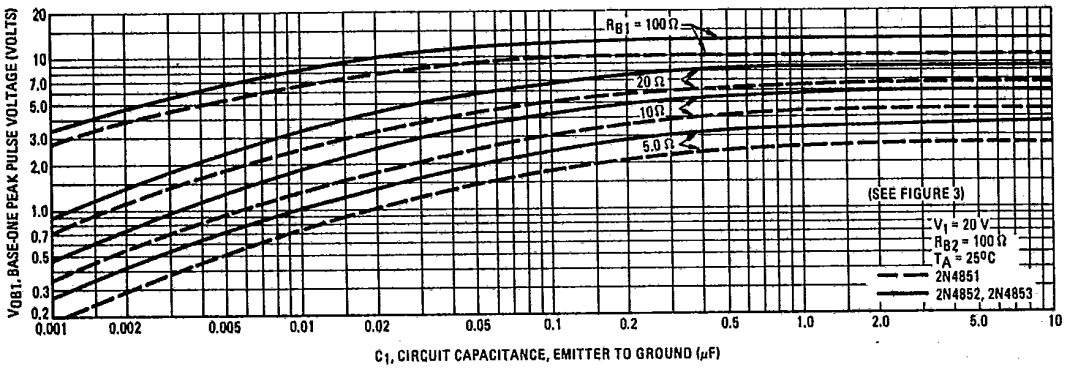



FIGURE 17 – OUTPUT VOLTAGE

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