

# 2N2646

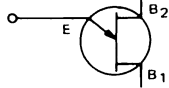
# 2N2647



## SOLID STATE INC.

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### SILICON PN UNIUNCTION TRANSISTORS

... designed for use in pulse and timing circuits, sensing circuits and thyristor trigger circuits. These devices feature:

- Low Peak Point Current – 2.0  $\mu\text{A}$  (Max)
- Low Emitter Reverse Current – 200 nA (Max)
- Passivated Surface for Reliability and Uniformity

### PN UNIUNCTION TRANSISTORS

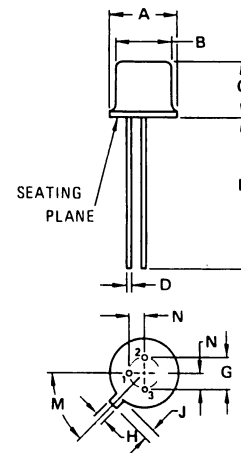


#### \*MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ unless otherwise noted.)

| Rating                               | Symbol            | Value       | Unit             |
|--------------------------------------|-------------------|-------------|------------------|
| Power Dissipation (1)                | $P_D$             | 300         | mW               |
| RMS Emitter Current                  | $I_E(\text{RMS})$ | 50          | mA               |
| Peak Pulse Emitter Current (2)       | $i_E$             | 2.0         | Amp              |
| Emitter Reverse Voltage              | $V_{B2E}$         | 30          | Volts            |
| Interbase Voltage                    | $V_{B2B1}$        | 35          | Volts            |
| Operating Junction Temperature Range | $T_J$             | -65 to +125 | $^\circ\text{C}$ |
| Storage Temperature Range            | $T_{stg}$         | -65 to +150 | $^\circ\text{C}$ |

\* Indicates JEDEC Registered Data.

- (1) Derate 3.0 mW/ $^\circ\text{C}$  increase in ambient temperature. The total power dissipation (available power to Emitter and Base-Two) must be limited by the external circuitry.
- (2) Capacitor discharge – 10  $\mu\text{F}$  or less, 30 volts or less.



STYLE 1:  
PIN 1. EMITTER  
2. BASE 1  
3. BASE 2

Pin 3 Connected to Case.

| DIM | MILLIMETERS     |      | INCHES          |       |
|-----|-----------------|------|-----------------|-------|
|     | MIN             | MAX  | MIN             | MAX   |
| A   | 5.31            | 5.84 | 0.209           | 0.230 |
| B   | 4.52            | 4.95 | 0.178           | 0.195 |
| C   | 4.32            | 5.33 | 0.170           | 0.210 |
| D   | 0.41            | 0.48 | 0.016           | 0.019 |
| G   | 2.54 TYP        |      | 0.100 TYP       |       |
| H   | 0.91            | 1.17 | 0.036           | 0.046 |
| J   | 0.71            | 1.22 | 0.028           | 0.048 |
| K   | 12.70           | —    | 0.500           | —     |
| M   | 45 $^\circ$ TYP |      | 45 $^\circ$ TYP |       |
| N   | 1.27 TYP        |      | 0.050 TYP       |       |

(TO-18 Except for Lead Position)

# 2N2646, 2N2647

## \*ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted.)

| Characteristic  | Symbol                | Min          | Typ            | Max          | Unit                |
|---|-----------------------|--------------|----------------|--------------|---------------------|
| Intrinsic Standoff Ratio<br>( $V_{B2B1} = 10\text{ V}$ ) (Note 1)   | $\eta$                | 0.56<br>0.68 | —<br>—         | 0.75<br>0.82 | —                   |
| Interbase Resistance<br>( $V_{B2B1} = 3.0\text{ V}$ , $I_E = 0$ )   | $r_{BB}$              | 4.7          | 7.0            | 9.1          | k ohms              |
| Interbase Resistance Temperature Coefficient<br>( $V_{B2B1} = 3.0\text{ V}$ , $I_E = 0$ , $T_A = -55^\circ\text{C}$ to $+125^\circ\text{C}$ ) | $\alpha_{r_{BB}}$     | 0.1          | —              | 0.9          | %/ $^\circ\text{C}$ |
| Emitter Saturation Voltage<br>( $V_{B2B1} = 10\text{ V}$ , $I_E = 50\text{ mA}$ ) (Note 2)  | $V_{EB1(\text{sat})}$ | —            | 3.5            | —            | Volts               |
| Modulated Interbase Current<br>( $V_{B2B1} = 10\text{ V}$ , $I_E = 50\text{ mA}$ )  | $I_{B2(\text{mod})}$  | —            | 15             | —            | mA                  |
| Emitter Reverse Current<br>( $V_{B2E} = 30\text{ V}$ , $I_{B1} = 0$ )   | $I_{EB20}$            | —<br>—       | 0.005<br>0.005 | 12<br>0.2    | $\mu\text{A}$       |
| Peak Point Emitter Current<br>( $V_{B2B1} = 25\text{ V}$ )  | $I_P$                 | —<br>—       | 1.0<br>1.0     | 5.0<br>2.0   | $\mu\text{A}$       |
| Valley Point Current<br>( $V_{B2B1} = 20\text{ V}$ , $R_{B2} = 100\text{ ohms}$ ) (Note 2)  | $I_V$                 | 4.0<br>8.0   | 6.0<br>10      | —<br>18      | mA                  |
| Base-One Peak Pulse Voltage<br>(Note 3, Figure 3)   | $V_{OB1}$             | 3.0<br>6.0   | 5.0<br>7.0     | —<br>—       | Volts               |

\*Indicates JEDEC Registered Data.

### Notes:

(1) Intrinsic standoff ratio,  $\eta$ , is defined by equation:

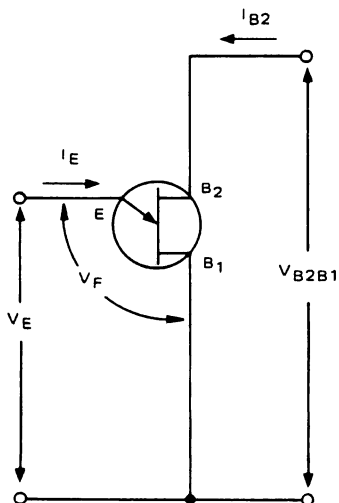
$$\eta = \frac{V_P - V_F}{V_{B2B1}}$$

Where  $V_P$  = Peak Point Emitter Voltage  
 $V_{B2B1}$  = Interbase Voltage  
 $V_F$  = Emitter to Base-One Junction Diode Drop  
 ( $\approx 0.45\text{ V @ }10\ \mu\text{A}$ )

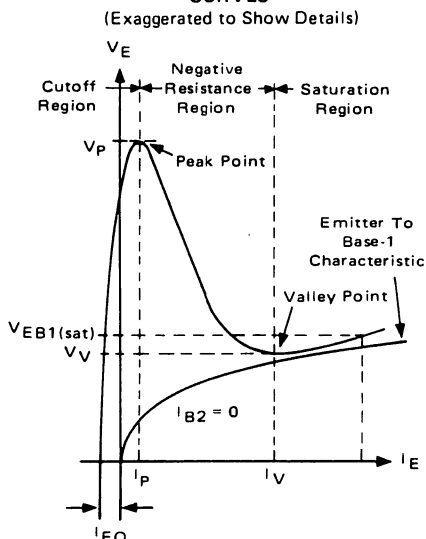
(2) Use pulse techniques:  $PW \approx 300\ \mu\text{s}$ , duty cycle  $\leq 2\%$  to avoid internal heating due to interbase modulation which may result in erroneous readings.

(3) Base-One Peak Pulse Voltage is measured in circuit of Figure 3. This specification is used to ensure minimum pulse amplitude for applications in SCR firing circuits and other types of pulse circuits.

**FIGURE 1**  
UNIUNCTION TRANSISTOR SYMBOL AND NOMENCLATURE



**FIGURE 2**  
STATIC EMITTER CHARACTERISTIC CURVES  
(Exaggerated to Show Details)



**FIGURE 3 -  $V_{OB1}$  TEST CIRCUIT**  
(Typical Relaxation Oscillator)

