# TYPES A5T4026 THRU A5T4029, A8T4026 THRU A8T4029
# P-N-P SILICON TRANSISTORS

BULLETIN NO. DL-S 7312002, MARCH 1973

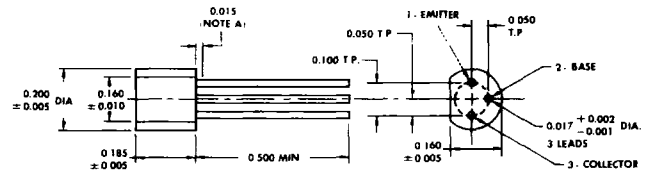
## SILECT† TRANSISTORS‡
## FOR GENERAL PURPOSE APPLICATIONS

- **High $V_{(BR)CEO}$ . . . 80 V Min (A5T4027, A5T4029, A8T4027, A8T4029)**
- **High Current Capability . . . 1 A**
- **Rugged One-Piece Construction with In-Line Leads or Standard TO-18 100-mil Pin-Circule Configuration**

### mechanical data

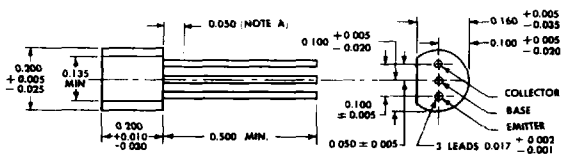
These transistors are encapsulated in a plastic compound specifically designed for this purpose, using a highly mechanized process developed by Texas Instruments. This case will withstand soldering temperatures without deformation. These devices exhibit stable characteristics under high-humidity conditions and are capable of meeting MIL-STD-202C, Method 106B. The transistors are insensitive to light.

**A5T4026 THRU A5T4029**




NOTES: A. Lead diameter is not controlled in this area.
B. Leads having maximum diameter (0.019) shall be within 0.007 of their true positions measured in the gaging plane 0.054 below the seating plane of the device relative to a maximum-diameter package.
C. All dimensions are in inches.

**A8T4026 THRU A8T4028**




ALL JEDEC TO-92 DIMENSIONS AND NOTES ARE APPLICABLE

EBC

NOTES: A. Lead diameter is not controlled in this area.
B. All dimensions are in inches.

### absolute maximum ratings at 25°C free-air temperature (unless otherwise noted)

| | A5T4026 A5T4028 A8T4026 A8T4028 | A5T4027 A5T4029 A8T4027 A8T4029 |
|---|---|---|
| Collector-Base Voltage | −60 V | −80 V |
| Collector-Emitter Voltage (See Note 1) | −60 V | −80 V |
| Emitter-Base Voltage | −5 V | −5 V |
| Continuous Collector Current | ←——— −1 A ———→ | |
| Continuous Device Dissipation at (or below) 25°C Free-Air Temperature (See Note 2) | ←——— 625 mW ———→ | |
| Continuous Device Dissipation at (or below) 25°C Lead Temperature (See Note 3) | ←——— 1.25 W ———→ | |
| Storage Temperature Range | ←— −65°C to 150°C —→ | |
| Lead Temperature 1/16 Inch from Case for 10 Seconds | ←——— 260°C ———→ | |

NOTES: 1. These values apply between 0 and 10 mA collector current when the base-emitter diode is open-circuited.
2. Derate linearly to 150°C free-air temperature at the rate of 5 mW/°C.
3. Derate linearly to 150°C lead temperature at the rate of 10 mW/°C. Lead temperature is measured on the collector lead 1/16 inch from the case.

†Trademark of Texas Instruments
‡U.S. Patent No. 3,439,238

**USES CHIP P16**



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## electrical characteristics at 25°C free-air temperature (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | | A5T4026 A8T4026 MIN | A5T4026 A8T4026 MAX | A5T4027 A8T4027 MIN | A5T4027 A8T4027 MAX | A5T4028 A8T4028 MIN | A5T4028 A8T4028 MAX | A5T4029 A8T4029 MIN | A5T4029 A8T4029 MAX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $V_{(BR)CBO}$ | Collector-Base Breakdown Voltage | $I_C = -10\ \mu A$, $I_E = 0$ | | −60 | | −80 | | −60 | | −80 | | V |
| $V_{(BR)CEO}$ | Collector-Emitter Breakdown Voltage | $I_C = -10$ mA, See Note 4 | $I_B = 0$, | −60 | | −80 | | −60 | | −80 | | V |
| $V_{(BR)EBO}$ | Emitter-Base Breakdown Voltage | $I_E = -10\ \mu A$, $I_C = 0$ | | −5 | | −5 | | −5 | | −5 | | V |
| $I_{CBO}$ | Collector Cutoff Current | $V_{CB} = -50$ V, $I_E = 0$ | | | −50 | | | | −50 | | | nA |
| | | $V_{CB} = -60$ V, $I_E = 0$ | | | | | −50 | | | | −50 | |
| | | $V_{CB} = -50$ V, $I_E = 0$, $T_A = 100°C$ | | | −5 | | | | −5 | | | μA |
| | | $V_{CB} = -60$ V, $I_E = 0$, $T_A = 100°C$ | | | | | −5 | | | | −5 | |
| $I_{EBO}$ | Emitter Cutoff Current | $V_{EB} = -5$ V, $I_C = 0$ | | | −10 | | −10 | | −10 | | −10 | μA |
| $h_{FE}$ | Static Forward Current Transfer Ratio | $V_{CE} = -5$ V, $I_C = -100\ \mu A$ | | 30 | | 30 | | 75 | | 75 | | |
| | | $V_{CE} = -5$ V, $I_C = -100$ mA | See Note 4 | 40 | 120 | 40 | 120 | 100 | 300 | 100 | 300 | |
| | | $V_{CE} = -5$ V, $I_C = -100$ mA, $T_A = -55°C$ | | 15 | | 15 | | 40 | | 40 | | |
| | | $V_{CE} = -5$ V, $I_C = -500$ mA | | 25 | | 25 | | 70 | | 70 | | |
| | | $V_{CE} = -5$ V, $I_C = -1$ A | | 15 | | 10 | | 40 | | 25 | | |
| $V_{BE}$ | Base-Emitter Voltage | $I_B = -15$ mA, $I_C = -150$ mA | See Note 4 | | −0.9 | | −0.9 | | −0.9 | | −0.9 | V |
| | | $V_{CE} = -0.5$ V, $I_C = -500$ mA | | | −1.1 | | −1.1 | | −1.1 | | −1.1 | |
| | | $V_{CE} = -1$ V, $I_C = -1$ A | | | −1.2 | | | | −1.2 | | | |
| $V_{CE(sat)}$ | Collector-Emitter Saturation Voltage | $I_B = -15$ mA, $I_C = -150$ mA | See Note 4 | | −0.15 | | −0.15 | | −0.15 | | −0.15 | V |
| | | $I_B = -50$ mA, $I_C = -500$ mA | | | −0.5 | | −0.5 | | −0.5 | | −0.5 | |
| | | $I_B = -100$ mA, $I_C = -1$ A | | | −1 | | | | −1 | | | |
| $\lvert h_{fe} \rvert$ | Small-Signal Common-Emitter Forward Current Transfer Ratio | $V_{CE} = -10$ V, $I_C = -50$ mA, f = 100 MHz | | 1 | 4 | 1 | 4 | 1.5 | 5 | 1.5 | 5 | |
| $C_{cb}$ | Collector-Base Capacitance | $V_{CB} = -10$ V, $I_E = 0$, f = 1 MHz, See Note 5 | | | 20 | | 20 | | 20 | | 20 | pF |
| $C_{ibo}$ | Common-Base Open-Circuit Input Capacitance | $V_{EB} = -0.5$ V, $I_C = 0$, f = 1 MHz | | | 110 | | 110 | | 110 | | 110 | pF |

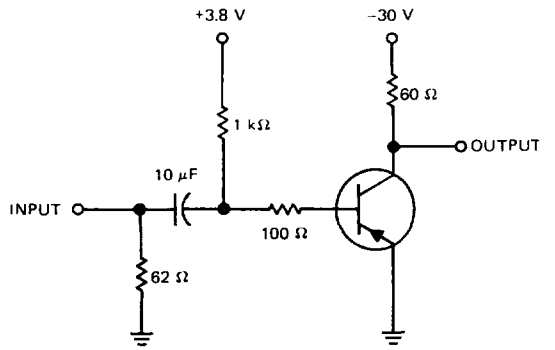
NOTES: 4. These parameters must be measured using pulse techniques. $t_w = 300\ \mu s$, duty cycle ≤ 2%.
5. $C_{cb}$ measurement employs a three-terminal capacitance bridge incorporating a guard circuit. The emitter is connected to the guard terminal of the bridge.

### switching characteristics at 25°C free-air temperature

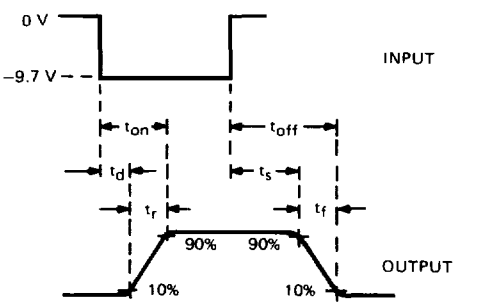
| PARAMETER | | TEST CONDITIONS† | | MAX | UNIT |
|---|---|---|---|---|---|
| $t_{on}$ | Turn-On Time | $V_{CC}$ = −30 V, | $I_C$ = −500 mA, | 100 | ns |
| $t_s$ | Storage Time | $I_{B(1)}$ = −50 mA, | $I_{B(2)}$ = 50 mA, | 350 | ns |
| $t_f$ | Fall Time | $V_{BE(off)}$ = 3.8 V, | See Figure 1 | 50 | ns |

†Voltage and current values shown are nominal; exact values vary slightly with transistor parameters.

## PARAMETER MEASUREMENT INFORMATION




TEST CIRCUIT




(See Notes a and b)
VOLTAGE WAVEFORMS

NOTES: a. The input waveform is supplied by a generator with the following characteristics: $Z_{out}$ = 50 Ω, $t_r \leq 20$ ns, $t_f \leq 20$ ns, $t_w \approx 10$ μs, duty cycle ≤ 2%.
b. Waveforms are monitored on an oscilloscope with the following characteristics: $t_r \approx 10$ ns, $R_{in} \geq 100$ kΩ.

**FIGURE 1–500-mA SWITCHING TIMES**

## THERMAL INFORMATION

FREE-AIR TEMPERATURE
DISSIPATION DERATING CURVE

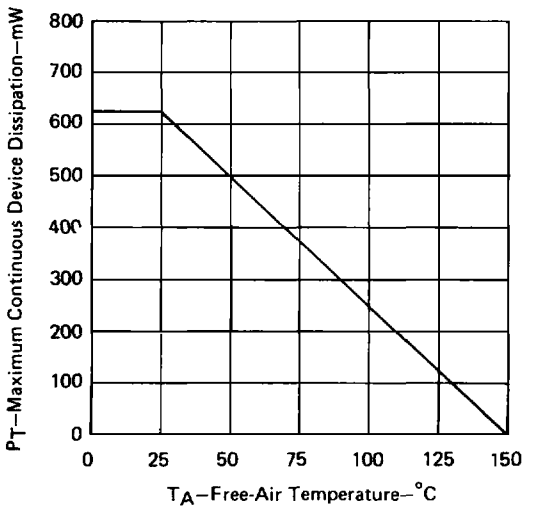



**FIGURE 2**

LEAD TEMPERATURE
DISSIPATION DERATING CURVE

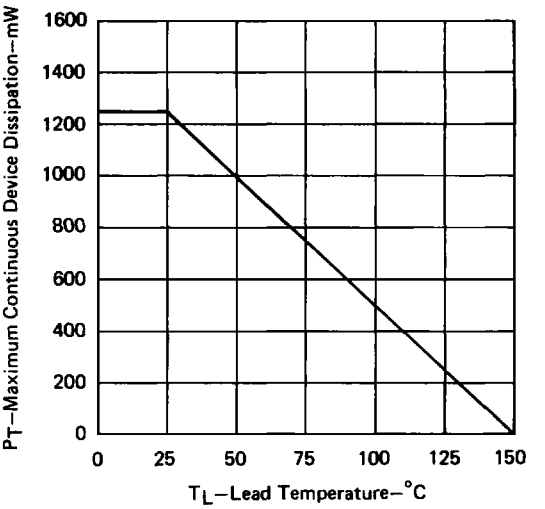



**FIGURE 3**



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