

## NPN SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/312

### Devices

2N708

### Qualified Level

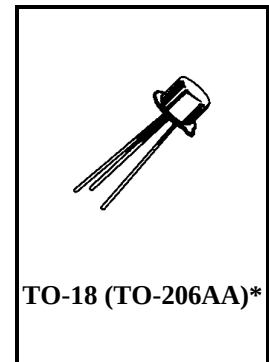
JAN, JANTX

### MAXIMUM RATINGS

| Ratings                                                   | Symbol            | Value       | Units              |
|-----------------------------------------------------------|-------------------|-------------|--------------------|
| Collector-Emitter Voltage                                 | $V_{CEO}$         | 15          | Vdc                |
| Collector-Base Voltage                                    | $V_{CBO}$         | 40          | Vdc                |
| Emitter-Base Voltage                                      | $V_{EBO}$         | 5.0         | Vdc                |
| Collector-Emitter Voltage                                 | $V_{CER}$         | 20          | Vdc                |
| Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$ (1) | $P_T$             | 0.36        | W                  |
| @ $T_C = +25^{\circ}\text{C}$ (2)                         |                   | 1.2         | W                  |
| Operating & Storage Junction Temperature Range            | $T_{op}, T_{stg}$ | -65 to +200 | $^{\circ}\text{C}$ |

1) Derate linearly 2.06 mW/ $^{\circ}\text{C}$  for  $T_A > 25^{\circ}\text{C}$

2) Derate linearly 6.90 mW/ $^{\circ}\text{C}$  for  $T_C > 25^{\circ}\text{C}$



TO-18 (TO-206AA)\*

\*See appendix A for package outline

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

| Characteristics                                                                      | Symbol        | Min. | Max. | Unit             |
|--------------------------------------------------------------------------------------|---------------|------|------|------------------|
| <b>OFF CHARACTERISTICS</b>                                                           |               |      |      |                  |
| Collector-Base Breakdown Voltage<br>$I_C = 1.0 \mu\text{Adc}$                        | $V_{(BR)CBO}$ | 40   |      | Vdc              |
| Emitter-Base Breakdown Voltage<br>$I_E = 10 \mu\text{Adc}$                           | $V_{(BR)EBO}$ | 5.0  |      | Vdc              |
| Collector-Emitter Breakdown Voltage<br>$I_C = 10 \text{mAdc}$                        | $V_{(BR)CEO}$ | 15   |      | Vdc              |
| Collector-Emitter Breakdown Voltage<br>$I_C = 10 \text{mAdc}, R_{BE} \leq 10 \Omega$ | $V_{(BR)CER}$ | 20   |      | Vdc              |
| Collector-Base Cutoff Current<br>$V_{CB} = 20 \text{Vdc}$                            | $I_{CBO}$     |      | 25   | $\eta\text{Adc}$ |
| Emitter-Base Cutoff Current<br>$V_{EB} = 4.0 \text{Vdc}$                             | $I_{EBO}$     |      | 80   | $\eta\text{Adc}$ |

**ELECTRICAL CHARACTERISTICS (con't)**

| Characteristics                                                                                                                                 | Symbol        | Min.     | Max.         | Unit |
|-------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------|--------------|------|
| <b>ON CHARACTERISTICS <sup>(3)</sup></b>                                                                                                        |               |          |              |      |
| Forward-Current Transfer Ratio<br>$I_C = 0.5 \text{ mAdc}$ , $V_{CE} = 1.0 \text{ Vdc}$<br>$I_C = 10 \text{ mAdc}$ , $V_{CE} = 1.0 \text{ Vdc}$ | $h_{FE}$      | 15<br>40 | 120          |      |
| Collector-Emitter Saturation Voltage<br>$I_C = 10 \text{ mAdc}$ , $I_B = 1.0 \text{ mAdc}$                                                      | $V_{CE(sat)}$ |          | 0.40         | Vdc  |
| Base-Emitter Voltage<br>$I_C = 10 \text{ mAdc}$ , $I_B = 1.0 \text{ mAdc}$<br>$I_C = 1.0 \text{ mAdc}$ , $I_B = 0.1 \text{ mAdc}$               | $V_{BE(sat)}$ | 0.72     | 0.80<br>0.72 | Vdc  |

**DYNAMIC CHARACTERISTICS**

|                                                                                                                                          |            |     |     |       |
|------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|-----|-------|
| Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C = 10 \text{ mAdc}$ , $V_{CE} = 10 \text{ Vdc}$ , $f = 100 \text{ MHz}$ | $ h_{fe} $ | 3.0 | 9.0 |       |
| Output Capacitance<br>$V_{CB} = 10 \text{ Vdc}$ , $I_E = 0$ , $f = 1.0 \text{ MHz}$                                                      | $C_{obo}$  |     | 6.0 | $p^f$ |
| Input Capacitance<br>$V_{EB} = 0.5 \text{ Vdc}$ , $I_C = 0$ , $f = 1.0 \text{ MHz}$                                                      | $C_{ibo}$  |     | 9.0 | $p^f$ |

**SWITCHING CHARACTERISTICS**

|                                                                                                                         |           |  |    |          |
|-------------------------------------------------------------------------------------------------------------------------|-----------|--|----|----------|
| Charge Storage Time<br>$I_C = I_{B1} = -I_{B21} = 10 \text{ mAdc}$                                                      | $t_s$     |  | 25 | $\eta s$ |
| Turn-On Time<br>$V_{BE} \approx -2.0 \text{ Vdc}$ ; $I_C \approx 10 \text{ mAdc}$ ; $I_{B1} \approx 3.0 \text{ mAdc}$   | $t_{on}$  |  | 40 | $\eta s$ |
| Turn-Off Time<br>$I_C \approx 10 \text{ mAdc}$ ; $I_{B1} \approx 3.0 \text{ mAdc}$ , $I_{B2} \approx -1.0 \text{ mAdc}$ | $t_{off}$ |  | 75 | $\eta s$ |

(3) Pulse Test: Pulse Width = 300 $\mu s$ , Duty Cycle  $\leq 2.0\%$ .