# PNP SWITCHING SILICON TRANSISTOR
*Qualified per MIL-PRF-19500/350*

| *Devices* | | *Qualified Level* |
|---|---|---|
| **2N3867** | **2N3868** | **JAN** |
| **2N3867S** | **2N3868S** | **JANTX** |
| | | **JANTXV** |

## MAXIMUM RATINGS

| Ratings | Symbol | 2N3867 2N3867S | 2N3868 2N3868S | Unit |
|---|---|---|---|---|
| Collector-Emitter Voltage | $V_{CEO}$ | 40 | 60 | Vdc |
| Collector-Base Voltage | $V_{CBO}$ | 40 | 60 | Vdc |
| Emitter-Base Voltage | $V_{EBO}$ | 4.0 | | Vdc |
| Collector Current -- Continuous | $I_C$ | 3.0 | | Adc |
| Total Power Dissipation @ $T_A = 25^0C^{(1)}$ @ $T_C = 25^0C^{(2)}$ | $P_T$ | 1.0 10 | | W W |
| Operating & Storage Temperature Range | $T_{OP, TSTG}$ | -55 to +200 | | $^0C$ |

## THERMAL CHARACTERISTICS

| Characteristics | Symbol | Max. | Unit |
|---|---|---|---|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 17.5 | $^0C/W$ |

1) Derate linearly 5.71 mW/$^0C$ for $T_A > +25^0C$
2) Derate linearly 57.1 mW/$^0C$ for $T_C > +25^0C$

TO-5*
2N3867, 2N3868

TO-39*
(TO-205AD)
2N3867S, 2N3868S
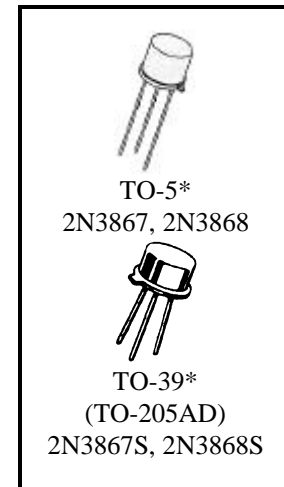
*See Appendix A for Package Outline

## ELECTRICAL CHARACTERISTICS ($T_A = 25^0C$ unless otherwise noted)

| Characteristics | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | |
| Collector-Base Breakdown Voltage $I_C = 100$ µAdc | 2N3867, S 2N3868, S | $V_{(BR)CBO}$ | 40 60 | | Vdc |
| Collector-Emitter Breakdown Voltage $I_C = 20$ mAdc | 2N3867, S 2N3868, S | $V_{(BR)CEO}$ | 40 60 | | Vdc |
| Emitter-Base Breakdown Voltage $I_E = 100$ µAdc | | $V_{(BR)EBO}$ | 4.0 | | Vdc |
| Collector-Emitter Cutoff Current $V_{EB} = 2.0$ Vdc, $V_{CE} = 40$ Vdc $V_{EB} = 2.0$ Vdc, $V_{CE} = 60$ Vdc | 2N3867, S 2N3868, S | $I_{CEX}$ | | 1.0 1.0 | µAdc |
| Collector-Base Cutoff Current $V_{CB} = 40$ Vdc $V_{CB} = 60$ Vdc | 2N3867, S 2N3868, S | $I_{CBO}$ | | 100 | µAdc |
| Emitter-Base Cutoff Current $V_{EB} = 4$ Vdc | | $I_{EBO}$ | | 100 | µAdc |

## ELECTRICAL CHARACTERISTICS (con't)

| Characteristics | | Symbol | Min. | Max. | Unit |
|---|---|---|---|---|---|
| **ON CHARACTERISTICS** [3] | | | | | |
| Forward-Current Transfer Ratio | | | | | |
| $I_C$ = 500 mAdc, $V_{CE}$ = 1.0 Vdc | 2N3867, S | | 50 | | |
| | 2N3868, S | | 35 | | |
| $I_C$ = 1.5 Adc, $V_{CE}$ = 2.0 Vdc | 2N3867, S | $h_{FE}$ | 40 | 200 | |
| | 2N3868, S | | 30 | 150 | |
| $I_C$ = 2.5 Adc, $V_{CE}$ = 3.0 Vdc | 2N3867, S | | 25 | | |
| | 2N3868, S | | 20 | | |
| $I_C$ = 3.0 Adc, $V_{CE}$ = 5.0 Vdc | All Types | | 20 | | |
| Collector-Emitter Saturation Voltage | | | | | |
| $I_C$ = 500 mAdc, $I_B$ = 50 mAdc | | | | 0.5 | |
| $I_C$ = 1.5 Adc, $I_B$ = 150 mAdc | | $V_{CE(sat)}$ | | 0.75 | Vdc |
| $I_C$ = 2.5 Adc, $I_B$ = 250 mAdc | | | | 1.5 | |
| Base-Emitter Saturation Voltage | | | | | |
| $I_C$ = 500 mAdc, $I_B$ = 50 mAdc | | | | 1.0 | |
| $I_C$ = 1.5 Adc, $I_B$ = 150 mAdc | | $V_{BE(sat)}$ | 0.9 | 1.4 | Vdc |
| $I_C$ = 2.5 Adc, $I_B$ = 250 mAdc | | | | 2.0 | |
| **DYNAMIC CHARACTERISTICS** | | | | | |
| Magnitude of Common Emitter Small-Signal Short Circuit Forward Current Transfer Ratio <br> $I_C$ = 100 mAdc, $V_{CE}$ = 5.0 Vdc,  f = 20 MHz | | $\lvert h_{fe} \rvert$ | 3.0 | 12 | |
| Output Capacitance <br> $V_{CB}$ = 10 Vdc, $I_E$ = 0, 100 kHz ≤ f ≤ 1.0 MHz | | $C_{obo}$ | | 120 | pF |
| Input Capacitance <br> $V_{EB}$ = 3.0 Vdc, $I_C$ = 0, 100 kHz ≤ f ≤ 1.0 MHz | | $C_{ibo}$ | | 800 | pF |
| **SWITCHING CHARACTERISTICS** | | | | | |
| Delay Time | $V_{CC}$ = -30 Vdc, $V_{EB}$ = 0, | $t_d$ | | 35 | ηs |
| Rise Time | $I_C$ = 1.5 Adc,  $I_{B1}$ = 150 mAdc | $t_r$ | | 65 | ηs |
| Storage Time | $V_{CC}$ = -30 Vdc, $V_{EB}$ = 0, | $t_s$ | | 500 | ηs |
| Fall Time | $I_C$ = 1.5Adc, $I_{B1}$ = $I_{B2}$ = 150 mAdc | $t_f$ | | 100 | ηs |
| Turn-On Time <br> $V_{CC}$ = 30, $I_C$ = 1.5 Adc, $I_B$ = 150 mAdc | | $t_{on}$ | | 100 | ηs |
| Turn-Off Time <br> $V_{CC}$ = 30, $I_C$ = 1.5 Adc, $I_B$ = 150 mAdc | | $t_{off}$ | | 600 | ηs |

### SAFE OPERATING AREA

**DC Tests**
  $T_C$ = 25⁰C, 1 Cycle, t = 1.0 s
**Test 1**
  $V_{CE}$ = 3.33 Vdc, $I_C$ = 3.0 Adc
**Test 2**
  $V_{CE}$ = 40 Vdc, $I_C$ = 160 mAdc       2N3867, S
  $V_{CE}$ = 60 Vdc, $I_C$ = 80 mAdc        2N3868, S

(3) Pulse Test: Pulse Width = 300µs, Duty Cycle ≤ 2.0%.

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