

2N3634 - 2N3637 Series

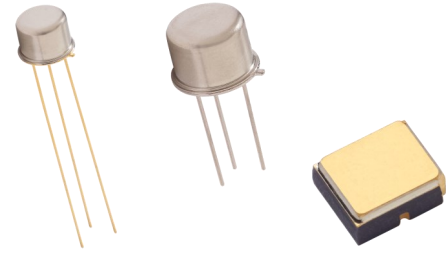


PNP Radiation Hardened Amplifier

Rev. V2

Features

- Available in JAN, JANTX, JANTXV and JANS per MIL-PRF-19500/357
- Ideal for General Purpose Switching and Amplifier Applications
- Available in TO-5, TO-39, UB and UBN packages



Electrical Characteristics

| Parameter | Test Conditions | Symbol | Units | Min. | Max. |
|--|--|---------------|------------|--------------------------|------|
| Off Characteristics | | | | | |
| Collector - Base Cutoff Current Voltage | $V_{CB} = 140$ V dc 2N3634, L, UB, UBN $V_{CB} = 140$ V dc 2N3635, L, UB, UBN $V_{CB} = 175$ V dc 2N3636, L, UB, UBN $V_{CB} = 175$ V dc 2N3637, L, UB, UBN | I_{CBO1} | μ A dc | — | 10 |
| Collector - Emitter Breakdown Voltage | $I_C = 10$ mA dc 2N3634, L, UB, UBN 2N3635, L, UB, UBN 2N3636, L, UB, UBN 2N3637, L, UB, UBN | $V_{(BR)CEO}$ | V dc | 140 140 175 175 | — |
| Collector - Base Cutoff Current | $V_{CB} = 100$ V dc | I_{CBO2} | nA dc | — | 100 |
| Emitter - Base Cutoff Current | $V_{EB} = 5$ V dc | I_{EBO1} | μ A dc | — | 10 |
| Emitter - Base Cutoff Current | $V_{EB} = 3$ V dc | I_{EBO2} | nA dc | — | 50 |
| Collector - Emitter Cutoff Current | $V_{CE} = 100$ V dc | I_{CEO} | μ A dc | — | 10 |
| On Characteristics¹ | | | | | |
| Forward Current Transfer Ratio | $V_{CE} = 10$ V dc, $I_C = 0.1$ mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN | h_{FE1} | - | 25 | |
| | 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | | 55 | |
| | $V_{CE} = 10$ V dc, $I_C = 1.0$ mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN | h_{FE2} | | 45 | |
| | 2N3635, L, UB, UBN 2N3637, L, UB, UBN | 90 | | | |
| | $V_{CE} = 10$ V dc, $I_C = 10$ mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN | h_{FE3} | | 50 | |
| 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | 100 | | | |

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On Characteristics¹

| | | | | | |
|---|---|----------------------------------|------------------|------|-------------|
| Forward Current Transfer Ratio | $V_{CE} = 10 \text{ V dc}, I_C = 50 \text{ mA dc}$ 2N3634, L, UB, UBN 2N3636, L, UB, UBN | h_{FE4} | | 50 | 150 |
| | 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | | 100 | 300 |
| | $V_{CE} = 10 \text{ V dc}, I_C = 150 \text{ mA dc}$ 2N3634, L, UB, UBN 2N3636, L, UB, UBN | h_{FE5} | - | 30 | |
| | 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | | 60 | |
| Collector - Emitter Voltage (saturated) | $I_C = 10 \text{ mA dc}, I_B = 1 \text{ mA dc}$ $I_C = 50 \text{ mA dc}, I_B = 5 \text{ mA dc}$ | $V_{CE(SAT)1}$ $V_{CE(SAT)2}$ | V dc | — | 0.3 0.6 |
| Base - Emitter Voltage (saturated) | $I_C = 10 \text{ mA dc}, I_B = 1.0 \text{ mA dc}$ $I_C = 50 \text{ mA dc}, I_B = 5.0 \text{ mA dc}$ | $V_{BE(SAT)1}$ $V_{BE(SAT)2}$ | Vdc | 0.65 | 0.8 0.90 |
| Collector-Base Cutoff Current | $T_A = +150^\circ\text{C}$ $V_{CB} = -100 \text{ V dc}$ | I_{CB03} | $\mu\text{A dc}$ | | 10 |
| Forward-Current Transfer Ratio | $T_A = -55^\circ\text{C}$ $V_{CE} = 10 \text{ V dc}, I_C = 50 \text{ mA dc}$ 2N3634, L, UB, UBN 2N3636, L, UB, UBN | h_{FE6} | | 25 | |
| | 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | | 50 | |

Electrical Characteristics

| Parameter | Test Conditions | Symbol | Units | Min. | Max. |
|--|--|-----------|---------------|------|--------------------|
| Dynamic Characteristics | | | | | |
| Small-Signal Short-Circuit, Forward-Current Transfer Ratio | $V_{CE} = 30 \text{ V dc}, I_C = 30 \text{ mA dc}, f = 100 \text{ MHz}$ | h_{FE} | - | 1.5 | 8.0 |
| | 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | | 2.0 | 8.5 |
| Small-Signal Short-Circuit, Forward-Current Transfer Ratio | $V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$ | h_{FE} | - | 40 | 160 |
| | 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | | 80 | 320 |
| Small-Signal Short-Circuit Input Impedance | $V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$ | h_{ie} | Ω | 100 | 600 |
| | 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN | | | 200 | 1200 |
| Small-Signal Open Circuit Reverse Voltage Transfer Ratio | $V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$ | h_{re} | | | 3×10^{-4} |
| Small-Signal Open Circuit Output Admittance | $V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$ | h_{oe} | μs | | 200 |
| Open Circuit Output Capacitance | $V_{CB} = 20 \text{ V dc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1 \text{ MHz}$ | C_{obo} | pF | — | 10 |
| Input Capacitance (Output Open Circuited) | $V_{EB} = 1 \text{ V dc}, I_C = 0, 100 \text{ kHz} \leq f \leq 1 \text{ MHz}$ | C_{ibo} | pF | — | 75 |
| Noise Figure | $V_{CE} = 10 \text{ V dc}, I_C = 0.5 \text{ mA dc}, R_G = 1 \text{ k}\Omega,$ $f = 100 \text{ Hz},$ $f = 10 \text{ kHz},$ $f = 1 \text{ kHz}$ | NF | dB | — | 5 3 3 |

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Absolute Maximum Ratings ($T_A = +25^\circ\text{C}$ unless otherwise specified)

| Thermal Characteristics | Symbol | Max. Value |
|---|------------------------|------------|
| Thermal Resistance, Junction to Ambient 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L | $R_{\theta JA}^{(4)}$ | 175°C/W |
| Thermal Resistance, Junction to Ambient 2N3634UB, UBN 2N3635UB, UBN 2N3636UB, UBN 2N3637UB, UBN | $R_{\theta JA}^{(4)}$ | 325°C/W |
| Thermal Resistance, Junction to Case 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L | $R_{\theta JC}^{(4)}$ | 35°C/W |
| Thermal Resistance, Junction to Solder Pad 2N3634UB, UBN 2N3635UB, UBN 2N3636UB, UBN 2N3637UB, UBN | $R_{\theta JSP}^{(4)}$ | 90°C/W |

(4) See figures 10, 11, and 12 of MIL-PRF-19500/357

2N3634 - 2N3637 Series



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Absolute Maximum Ratings ($T_A = +25^\circ\text{C}$ unless otherwise specified)

| Characteristics | Symbol | Max. Value |
|---|-------------|------------|
| $T_A = +25^\circ\text{C}$ 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L | $P_T^{(1)}$ | 1W |
| $T_A = +25^\circ\text{C}$ 2N3634UB, UBN 2N3635UB, UBN 2N3636UB, UBN 2N3637UB, UBN | $P_T^{(1)}$ | 0.5 W |
| $T_C = +25^\circ\text{C}$ 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L | $P_T^{(2)}$ | 5W |
| $T_{SP} = +25^\circ\text{C}$ 2N3634UB, UBN 2N3635UB, UBN 2N3636UB, UBN 2N3637UB, UBN | $P_T^{(3)}$ | 1.5W |

(1) See figure 6 and 7 of MIL-PRF-19500/357

(2) See figure 8 of MIL-PRF-19500/357

(3) See figure 9 of MIL-PRF-19500/357

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PNP Radiation Hardened Amplifier

Rev. V2

Absolute Maximum Ratings ($T_A = +25^\circ\text{C}$ unless otherwise specified)

| Ratings | Symbol | Value |
|---|----------------|---|
| Collector - Emitter Voltage 2N3634, 2N3635 2N3636, 2N3637 | V_{CEO} | 140 V dc 175 V dc |
| Collector - Base Voltage 2N3634, 2N3635 2N3636, 2N3637 | V_{CBO} | 140 V dc 175 V dc |
| Emitter - Base Voltage | V_{EBO} | 5 V dc |
| Collector Current | I_C | 1 A dc |
| Operating & Storage Temperature Range | T_J, T_{STG} | -65°C to $+200^\circ\text{C}$ |

| Switching Characteristics | Test Conditions | Symbol | | | Max Value |
|---------------------------|------------------------------------|-----------|----|---|-----------|
| Pulse Delay Time | See Figure 13 of MIL-PRF-19500/357 | t_d | ns | — | 100 |
| Pulse Rise Time | See Figure 13 of MIL-PRF-19500/357 | t_r | ns | — | 100 |
| Pulse Storage Time | See Figure 13 of MIL-PRF-19500/357 | t_s | ns | — | 500 |
| Pulse Fall Time | See Figure 13 of MIL-PRF-19500/357 | t_f | ns | — | 150 |
| t_{off} | t_s & t_f | t_{off} | ns | — | 600 |

Safe Operating Area

DC Tests: TO-39 $T_C = +25^\circ\text{C}$, 1 Cycle, $t = 1.0$ s

Test 1:
2N3634, 2N3634L
2N3635, 2N3635L

$V_{CE} = 100$ V dc, $I_C = 30$ mA dc

2N3636, 2N3636L
2N3637, 2N3637L

$V_{CE} = 130$ V dc, $I_C = 20$ mA dc

Test 2:
Test 3:

$V_{CE} = 50$ V dc, $I_C = 95$ mA dc
 $V_{CE} = 5$ V dc, $I_C = 1$ A dc

DC Tests: UB $T_C = +25^\circ\text{C}$, 1 Cycle, $t = 100$ ms

Test 1:
2N3634UB, 2N3635UB
2N3634UBN, 2N3635UBN

$V_{CE} = 85$ V dc, $I_C = 30$ mA dc

2N3636UB, 2N3637UB
2N3636BN, 2N3637UBN

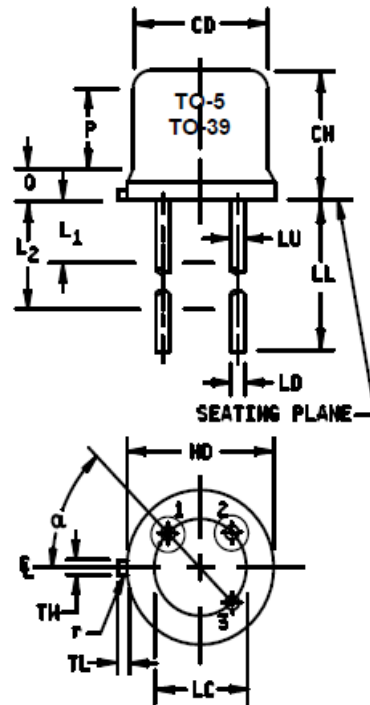
$V_{CE} = 125$ V dc, $I_C = 20$ mA dc

Test 2:
Test 3:

$V_{CE} = 50$ V dc, $I_C = 50$ mA dc
 $V_{CE} = 5$ V dc, $I_C = 500$ mA dc

Outline Drawings TO-5, TO-39

| Ltr | Dimensions | | | | Notes |
|----------------|------------------------|------|-------------|-------|-------|
| | Inches | | Millimeters | | |
| | Min | Max | Min | Max | |
| CD | .305 | .335 | 7.75 | 8.51 | |
| CH | .240 | .260 | 6.10 | 6.60 | |
| HD | .335 | .370 | 8.51 | 9.40 | |
| LC | .200 TYP | | 5.08 TYP | | 7 |
| LD | .016 | .021 | 0.41 | 0.53 | 6 |
| LL | See notes 7, 9, and 10 | | | | |
| LU | .016 | .019 | 0.41 | 0.48 | 7 |
| L ₁ | | .050 | | 1.27 | 7 |
| L ₂ | .250 | | 6.35 | | 7 |
| P | .100 | | 2.54 | | 5 |
| Q | | .050 | | 1.27 | |
| r | | .010 | | 0.254 | 8 |
| TL | .029 | .045 | 0.74 | 1.14 | 4 |
| TW | .028 | .034 | 0.71 | 0.86 | 3 |
| α | 45° TP | | 45° TP | | 6 |
| Term 1 | Emitter | | | | |
| Term 2 | Base | | | | |
| Term 3 | Collector | | | | |



NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r maximum, TW must be held to a minimum length of .021 inch (0.53 mm).
4. TL measured from maximum HD.
5. CD shall not vary more than ±.010 inch (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 - .055 inch (1.37 - 1.40 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at a maximum material condition (MMC) relative to the tab at MMC. The device may be measured by direct methods or by gauge and gauging procedure.
7. LU applies between L₁ and L₂. LD applies between L₂ and L minimum. Diameter is uncontrolled in L₁ and beyond LL minimum.
8. r (radius) applies to both inside corners of tab.
9. For transistor types 2N3634 through 2N3637, LL is .500 inch (12.70 mm) minimum, and .750 inch (19.05 mm) maximum (TO-39).
10. For transistor types 2N3634L through 2N3637L, LL is 1.500 inches (38.10 mm) minimum, and 1.750 inches (44.45 mm) maximum (TO-5).
11. In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.

FIGURE 1. Physical dimensions (TO-5 and TO-39).

Outline Drawings UB, UBN

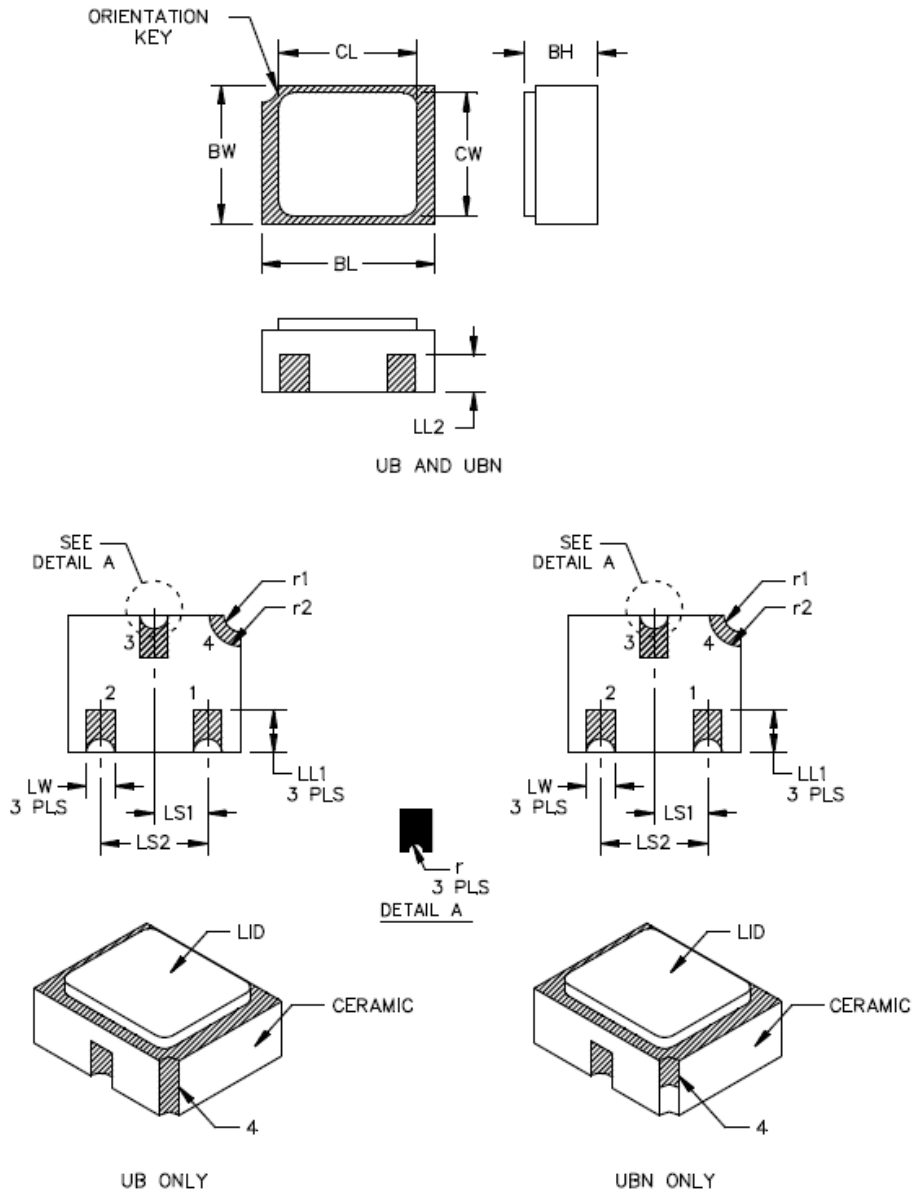


FIGURE 2. Physical dimensions, surface mount 2N3634UB through 2N3637UB (UB and UBN version).

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