

# 2N3634 - 2N3637 Series

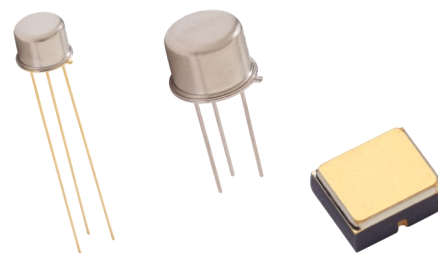


## PNP Radiation Hardened Amplifier

Rev. V1

### Features

- Available in JAN, JANTX, JANTXV, JANS and JANSR 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 <sub>CB</sub> = 140 V dc 2N3634, L, UB, UBN V <sub>CB</sub> = 140 V dc 2N3635, L, UB, UBN V <sub>CB</sub> = 175 V dc 2N3636, L, UB, UBN V <sub>CB</sub> = 175 V dc 2N3637, L, UB, UBN	I <sub>CBO1</sub>	µA dc	—	10
Collector - Emitter Breakdown Voltage	I <sub>C</sub> = 10 mA dc 2N3634, L, UB, UBN 2N3635, L, UB, UBN 2N3636, L, UB, UBN 2N3637, L, UB, UBN	V <sub>(BR)CEO</sub>	V dc	140 140 175 175	—
Collector - Base Cutoff Current	V <sub>CB</sub> = 100 V dc	I <sub>CBO2</sub>	nA dc	—	100
Emitter - Base Cutoff Current	V <sub>EB</sub> = 5 V dc	I <sub>EBO1</sub>	µA dc	—	10
Emitter - Base Cutoff Current	V <sub>EB</sub> = 3 V dc	I <sub>EBO2</sub>	nA dc		50
Collector - Emitter Cutoff Current	V <sub>CE</sub> = 100 V dc	I <sub>CEO</sub>	µA dc		10
On Characteristics <sup>1</sup>					
Forward Current Transfer Ratio	V <sub>CE</sub> = 10 V dc, I <sub>C</sub> = 0.1 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN	h <sub>FE1</sub>	-	25	
	2N3635, L, UB, UBN 2N3637, L, UB, UBN			55	
	V <sub>CE</sub> = 10 V dc, I <sub>C</sub> = 1.0 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN	h <sub>FE2</sub>		45	
	2N3635, L, UB, UBN 2N3637, L, UB, UBN	90			
	V <sub>CE</sub> = 10 V dc, I <sub>C</sub> = 10 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN	h <sub>FE3</sub>		50	
	2N3635, L, UB, UBN 2N3637, L, UB, UBN	100			

1

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# 2N3634 - 2N3637 Series



## PNP Radiation Hardened Amplifier

Rev. V1

### On Characteristics<sup>1</sup>

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	$T_A = +150^\circ\text{C}$ $V_{CB} = -100 \text{ V dc}$	$I_{CBO3}$	$\mu\text{A dc}$		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.
<b>Dynamic Characteristics</b>					
Small-Signal Short-Circuit, Forward-Current Transfer Ratio	$V_{CE} = 30 \text{ V dc}, I_C = 30 \text{ mA dc}, f = 100 \text{ MHz}$ 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	$ h_{FE} $	-	1.5 2.0	8.0 8.5
Small-Signal Short-Circuit, Forward-Current Transfer Ratio	$V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$ 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	$h_{FE}$	-	40 80	160 320
Small-Signal Short-Circuit Input Impedance	$V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$ 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	$h_{ie}$	$\Omega$	100 200	600 1200
Small-Signal Open Circuit Reverse Voltage Transfer Ratio	$V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$	$h_{re}$			$3 \times 10^{-4}$
Small-Signal Open Circuit Output Admittance	$V_{CE} = 10 \text{ V dc}, I_C = 10 \text{ mA dc}, f = 1 \text{ kHz}$	$h_{oe}$	$\mu\text{s}$		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

# 2N3634 - 2N3637 Series



## PNP Radiation Hardened Amplifier

Rev. V1

### 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



## PNP Radiation Hardened Amplifier

Rev. V1

### 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

# 2N3634 - 2N3637 Series



## PNP Radiation Hardened Amplifier

Rev. V1

### 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	$T_J, T_{STG}$	$-65^\circ\text{C}$ 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
Pulse Rise Time	See Figure 13 of MIL-PRF-19500/357	$t_r$	ns
Pulse Storage Time	See Figure 13 of MIL-PRF-19500/357	$t_s$	ns
Pulse Fall Time	See Figure 13 of MIL-PRF-19500/357	$t_f$	ns
$t_{off}$	$t_s$ & $t_f$	$t_{off}$	ns

### 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

# 2N3634 - 2N3637 Series

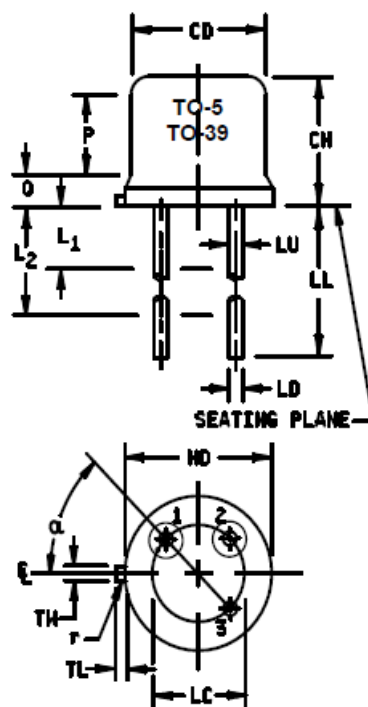


## PNP Radiation Hardened Amplifier

Rev. V1

### 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 <sub>1</sub>		.050		1.27	7
L <sub>2</sub>	.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  $\pm 0.010$  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 L<sub>1</sub> and L<sub>2</sub>. LD applies between L<sub>2</sub> and L minimum. Diameter is uncontrolled in L<sub>1</sub> 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  $\phi$ x symbology.

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

## Outline Drawings UB, UBN

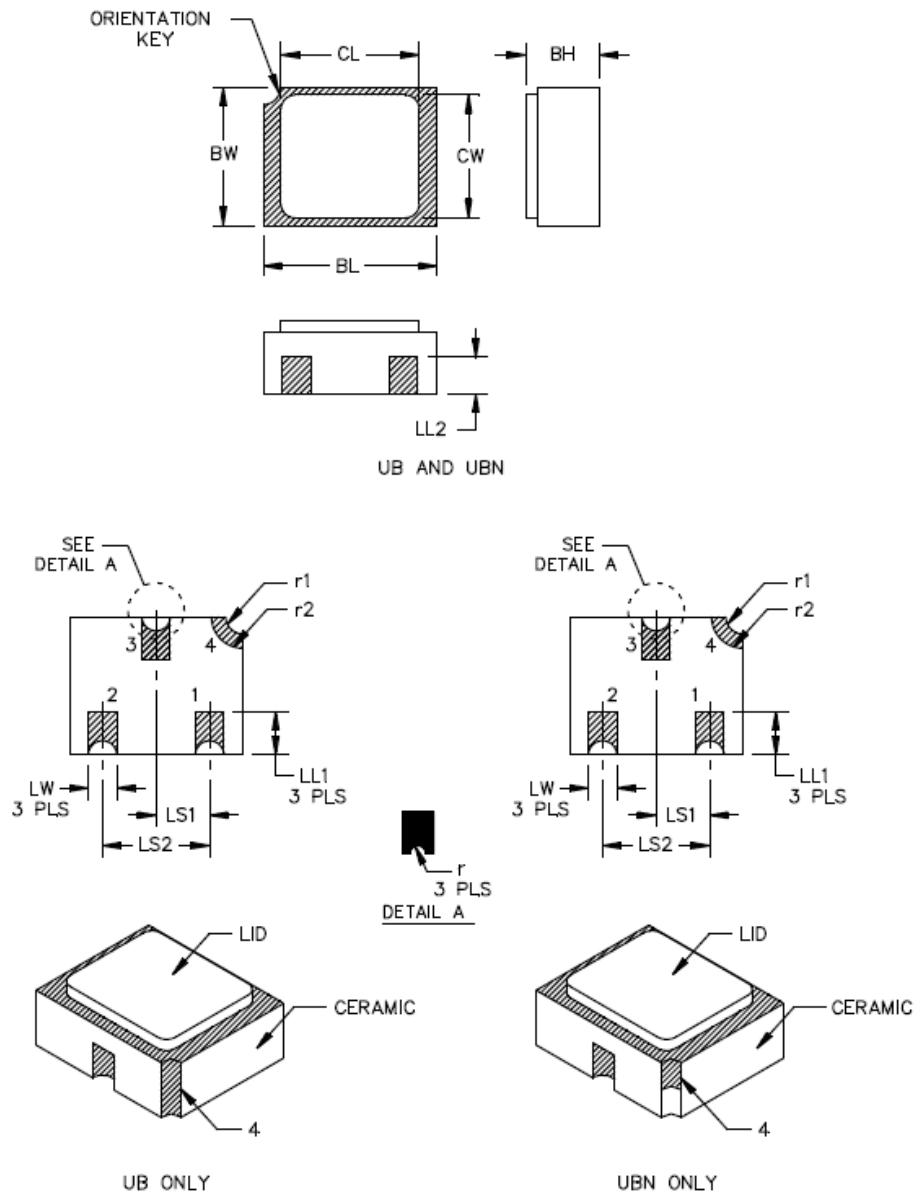


FIGURE 2. Physical dimensions, surface mount 2N3634UB through 2N3637UB (UB and UBN version).



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