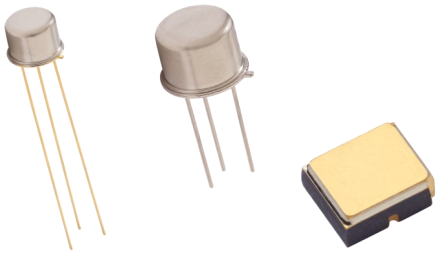
2N3634 - 2N3637 Series

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_{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}	µA 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}	µA 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}	µA dc		10
On Characteristics[1]					
Forward Current Transfer Ratio	V_{CE} = 10 V dc, I_C = 0.1 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN V_{CE} = 10 V dc, I_C = 1.0 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN V_{CE} = 10 V dc, I_C = 10 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	 h_{FE1} h_{FE2} h_{FE3} 	 - 	 25 55 45 90 50 100	

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On Characteristics[1]					
Forward Current Transfer Ratio	V_{CE} = 10 V dc, I_C = 50 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN V_{CE} = 10 V dc, I_C = 150 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	h_{FE4} h_{FE5}	- -	50 100 30 60	150 300
Collector - Emitter Voltage (saturated)	I_C = 10 mA dc, I_B = 1 mA dc I_C = 50 mA dc, I_B = 5 mA dc	$V_{CE(SAT)1}$ $V_{CE(SAT)2}$	V dc	—	0.3 0.6
Base - Emitter Voltage (saturated)	I_C = 10 mA dc, I_B = 1.0 mA dc I_C = 50 mA dc, I_B = 5.0 mA dc	$V_{BE(SAT)1}$ $V_{BE(SAT)2}$	Vdc	0.65	0.8 0.90
Collector-Base Cutoff Current	T_A = +150°C V_{CB} = -100 V dc	I_{CBO3}	µA dc		10
Forward-Current Transfer Ratio	T_A = -55°C V_{CE} = 10 V dc, I_C = 50 mA dc 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	h_{FE6}	25 50		

Electrical Characteristics

Parameter	Test Conditions	Symbol	Units	Min.	Max.
Dynamic Characteristics					
Small-Signal Short-Circuit, Forward-Current Transfer Ratio	V_{CE} = 30 V dc, I_C = 30 mA dc, f = 100 MHz 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	$\lvert h_{FE} \rvert$	-	1.5 2.0	8.0 8.5
Small-Signal Short-Circuit, Forward-Current Transfer Ratio	V_{CE} = 10 V dc, I_C = 10 mA dc, f = 1 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 V dc, I_C = 10 mA dc, f = 1 kHz 2N3634, L, UB, UBN 2N3636, L, UB, UBN 2N3635, L, UB, UBN 2N3637, L, UB, UBN	h_{ie}	Ω	100 200	600 1200
Small-Signal Open Circuit Reverse Voltage Transfer Ratio	V_{CE} = 10 V dc, I_C = 10 mA dc, f = 1 kHz	h_{re}			$3x10^{-4}$
Small-Signal Open Circuit Output Admittance	V_{CE} = 10 V dc, I_C = 10 mA dc, f = 1 kHz	h_{oe}	µs		200
Open Circuit Output Capacitance	V_{CB} = 20 V dc, I_E = 0, 100 kHz ≤ f ≤ 1 MHz	C_{obo}	pF	—	10
Input Capacitance (Output Open Circuited)	V_{EB} = 1 V dc, I_C = 0, 100 kHz ≤ f ≤ 1 MHz	C_{ibo}	pF	—	75
Noise Figure	V_{CE} = 10 V dc, I_C = 0.5 mA dc, R_G = 1 kΩ, f = 100 Hz, f = 10 kHz, f = 1 kHz	NF	dB	–	5 3 3

Absolute Maximum Ratings (T_A = +25°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

Absolute Maximum Ratings (T_A = +25°C unless otherwise specified)

Characteristics	Symbol	Max. Value
T_A = +25°C 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L	P_T (1)	1W
T_A = +25°C 2N3634UB, UBN 2N3635UB, UBN 2N3636UB, UBN 2N3637UB, UBN	P_T (1)	0.5 W
T_C = +25°C 2N3634, 2N3634L 2N3635, 2N3635L 2N3636, 2N3636L 2N3637, 2N3637L	P_T (2)	5W
T_{SP} = +25°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

Absolute Maximum Ratings (T_A = +25°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°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°C, I 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: V_{CE} = 50 V dc, I_C = 95 mA dc
Test 3: V_{CE} = 5 V dc, I_C = 1 A dc

DC Tests: UB **T_C = +25°C, I Cycle, t = 100 ms**

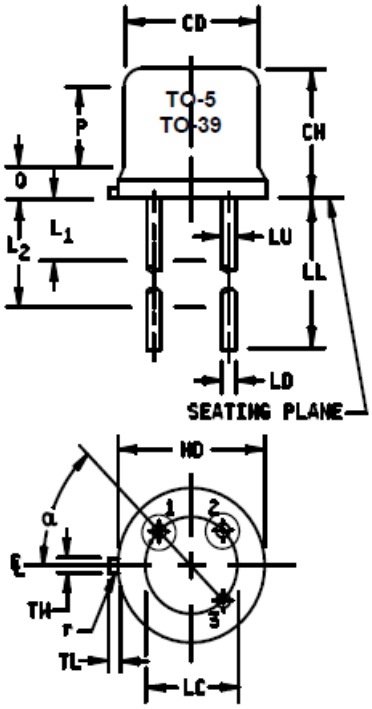
Test 1:
2N3634UB, 2N3635UB
2N3634UBN, 2N3635UBN — V_{CE} = 85 V dc, I_C = 30 mA dc

2N3636UB, 2N3637UB
2N3636BN, 2N3637UBN — V_{CE} = 125 V dc, I_C = 20 mA dc

Test 2: V_{CE} = 50 V dc, I_C = 50 mA dc
Test 3: V_{CE} = 5 V dc, I_C = 500 mA dc

Outline Drawings TO-5, TO-39

Ltr	Dimensions				
	Inches		Millimeters		Notes
	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 L_1 and L_2. LD applies between L_2 and L minimum. Diameter is uncontrolled in L_1 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

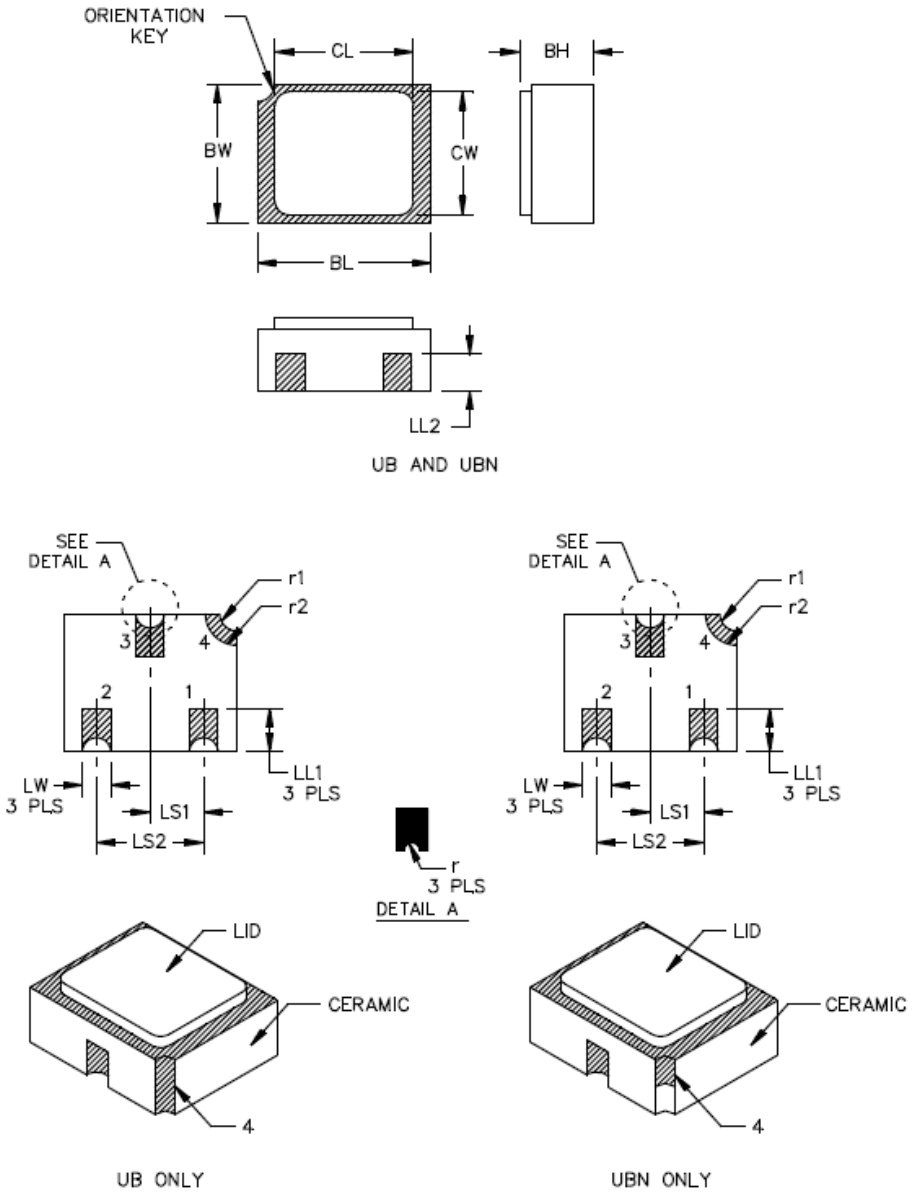


FIGURE 2. Physical dimensions, surface mount 2N3634UB through 2N3637UB (UB and UBN version).