

## PNP SILICON LOW POWER TRANSISTOR

Qualified per MIL-PRF-19500/354

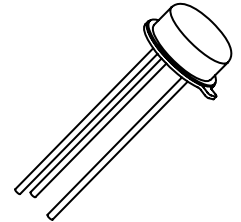
### DEVICES

**2N2604**      **2N2604UB**  
**2N2605**      **2N2605UB**

**LEVELS**  
**JAN**  
**JANTX**  
**JANTXV**

### ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$ unless otherwise noted)

Parameters / Test Conditions	Symbol	2N2604	2N2605	Unit
Collector-Base Voltage	$V_{CBO}$	80	70	Vdc
Collector-Emitter Voltage	$V_{CEO}$	60		Vdc
Emitter-Base Voltage	$V_{EBO}$	6.0		Vdc
Collector Current	$I_C$	30		mAdc
Total Power Dissipation @ $T_A = +25^\circ\text{C}^{(1)}$	$P_T$	400		mW/ $^\circ\text{C}$
Operating & Storage Junction Temperature Range	$T_J, T_{stg}$	-65 to +200		$^\circ\text{C}$



TO-46 (TO-206AB)

### THERMAL CHARACTERISTICS

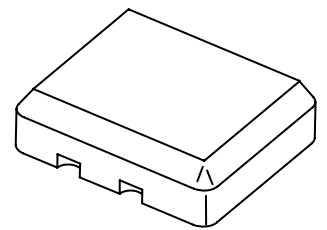
Parameters / Test Conditions	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	437	$^\circ\text{C}/\text{mW}$
UB		275	

**Note:**

1/ Consult 19500/354 for thermal curves

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Base Cutoff Current	$I_{CBO}$			uAdc nAdc uAdc uAdc
$V_{CB} = 80\text{V dc}$ 2N2604, UB				
$V_{CB} = 70\text{V dc}$ 2N2605, UB				
$V_{CB} = 50\text{V dc}$ 2N2604, 2N2605, UB				
$V_{CB} = 50\text{V dc}, T_A = +150^\circ\text{C}$ 2N2604, 2N2605, UB		5.0		
Collector-Emitter Breakdown Current $I_C = 10\text{mAdc}$	$V_{(BR)CEO}$	60		Vdc
Emitter-Base Cutoff Current	$I_{EBO}$			uAdc $\eta\text{Adc}$
$V_{EB} = 6.0\text{Vdc}$				
$V_{EB} = 5.0\text{Vdc}$			10.0 2.0	
Collector-Emitter Cutoff Current $V_{CE} = 50\text{Vdc}$	$I_{CES}$		10	$\eta\text{Adc}$



UB Package

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

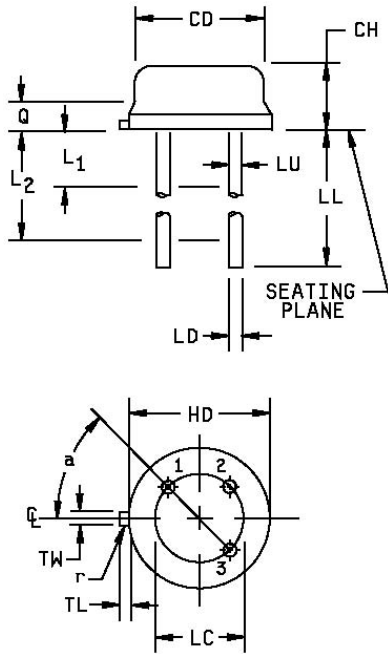
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS <sup>(2)</sup></b>				
Forward-Current Transfer Ratio $I_C = 10\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$	$h_{FE}$	2N2604, UB 2N2605, UB	40 100	120 300
$I_C = 500\mu\text{A}$ , $V_{CE} = 5.0\text{Vdc}$		2N2604, UB 2N2605, UB	60 150	180 450
$I_C = 10\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$		2N2604, UB 2N2605, UB	40 100	160 400
$I_C = 10\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$ , $T_A = -55^\circ\text{C}$		2N2604, UB 2N2605, UB	15 30	
Collector-Emitter Saturation Voltage $I_C = 10\text{mA}$ , $I_B = 500\mu\text{A}$		$V_{CE(sat)}$		0.3
Base-Emitter Saturation Voltage $I_C = 10\text{mA}$ , $I_B = 500\mu\text{A}$	$V_{BE(sat)}$	0.7	0.9	Vdc

## DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Small-Signal Short-Circuit Input Impedance $I_C = 1.0\text{mA}$ , $V_{CB} = 5.0\text{Vdc}$ , $f = 1.0\text{kHz}$	$h_{ie}$	2N2604, UB 2N2605, UB	1.0 2.0	10 20
Small-Signal Open-Circuit Forward Current Output Admittance $I_C = 1.0\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$ , $f = 1.0\text{kHz}$	$h_{oe}$	2N2604, UB 2N2605, UB		40 60
Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 1.0\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$ , $f = 1.0\text{kHz}$	$h_{fe}$	2N2604, UB 2N2605, UB	60 150	180 450
Magnitude of Small-Signal Forward Current Transfer Ratio $I_C = 0.5\text{mA}$ , $V_{CE} = 5.0\text{Vdc}$ , $f = 30\text{MHz}$	$ h_{fe} $		1.0	8.0
Output Capacitance $V_{CB} = 5.0\text{Vdc}$ , $I_E = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$	$C_{obo}$			6.0
Noise Figure $V_{CE} = 5.0\text{Vdc}$ , $I_C = 10\mu\text{A}$ , $R_g = 10\text{k}\Omega$ , $f = 100\text{Hz}$ $V_{CE} = 5.0\text{Vdc}$ , $I_C = 10\mu\text{A}$ , $R_g = 10\text{k}\Omega$ , $f = 1.0\text{kHz}$ $V_{CE} = 5.0\text{Vdc}$ , $I_C = 10\mu\text{A}$ , $R_g = 10\text{k}\Omega$ , $f = 10\text{kHz}$	$F_1$ $F_2$ $F_3$			5.0 3.0 3.0

(2) Pulse Test: Pulse Width = 300 $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$

## PACKAGE DIMENSIONS



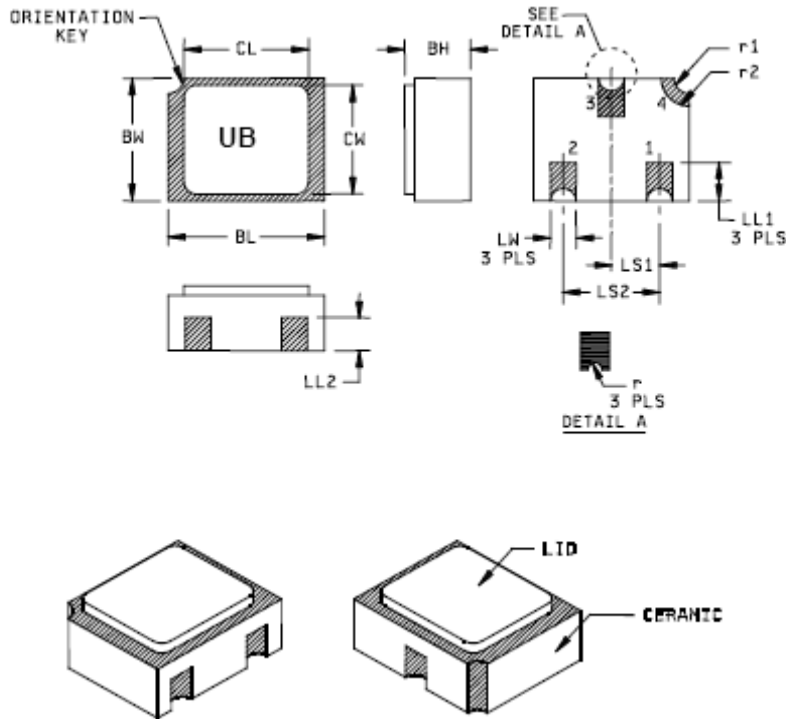
Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.178	.195	4.52	4.95	
CH	.065	.085	1.65	2.16	
HD	.209	.230	5.31	5.84	
LC	.100 TP		2.54 TP		5
LD	.016	.021	0.41	0.53	6
LL	.500	1.750	12.70	44.45	6
LU	.016	.019	0.41	0.48	6
L <sub>1</sub>		.050		1.27	6
L <sub>2</sub>	.250		6.35		6
Q		.040		1.02	4
TL	.028	.048	0.71	1.22	3, 8
TW	.036	.046	0.91	1.17	3, 8
r		.010		0.25	9
α	45° TP		45° TP		5

### NOTES:

- Dimensions are in inches. Lead 1 is emitter, lead 2 is base, and lead 3 is collector.
- Millimeters are given for general information only.
- Symbol TL is measured from HD maximum.
- Details of outline in this zone are optional.
- Leads at gauge plane .054 +.001 -.000 inch (1.37 +0.03 -0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) at maximum material condition (MMC) relative to tab at MMC. The device may be measured by direct methods or by the gauge and gauging procedure.
- Symbol LU applies between L<sub>1</sub> and L<sub>2</sub>. Dimension LD applies between L<sub>2</sub> and LL minimum.
- Lead number three is electrically connected to case.
- Beyond r maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
- Symbol r applied to both inside corners of tab.
- In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.

**FIGURE 1.** Physical dimensions - (TO-46).

## PACKAGE DIMENSIONS



Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
BH	.046	.056	1.17	1.42	
BL	.115	.128	2.92	3.25	
BW	.085	.108	2.16	2.74	
CL		.128		3.25	
CW		.108		2.74	
LL <sub>1</sub>	.022	.038	0.56	0.97	
LL <sub>2</sub>	.017	.035	0.43	0.89	

Symbol	Dimensions				Notes
	Inches		Millimeters		
	Min	Max	Min	Max	
LS <sub>1</sub>	.035	.039	0.89	0.99	
LS <sub>2</sub>	.071	.079	1.80	2.01	
LW	.016	.024	0.41	0.61	
r		.008		0.20	
r <sub>1</sub>		.012		0.31	
r <sub>2</sub>		.022		0.56	

### NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Hatched areas on package denote metallized areas
4. Pad 1 = Base, Pad 2 = Emitter, Pad 3 = Collector, Pad 4 = Shielding connected to the lid.
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\phi \times$  symbology.

**FIGURE 2.** Physical dimensions, surface mount (UB version).