

NPN SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/399

DEVICES

2N3960

2N3960UB

LEVELS

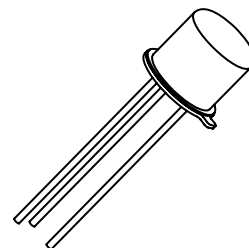
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ABSOLUTE MAXIMUM RATINGS ($T_C = +25^\circ\text{C}$ unless otherwise noted)

Parameters / Test Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	12	Vdc
Collector-Base Voltage	V_{CBO}	20	Vdc
Emitter-Base Voltage	V_{EBO}	4.5	Vdc
Total Power Dissipation @ $T_A = +25^\circ\text{C}$	$P_T^{(1)}$	0.4	W
Operating & Storage Junction Temperature Range	T_{op}, T_{stg}	-65 to +200	$^\circ\text{C}$



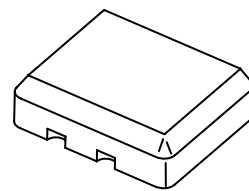
TO-18 – 2N3960

Note:

Derate linearly 2.3mW/ $^\circ\text{C}$ above $T_A = +25^\circ\text{C}$

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
Collector-Emitter Breakdown Voltage $I_C = 10\mu\text{A}$	$V_{(BR)CEO}$	12		Vdc
Collector-Base Cutoff Current $V_{CB} = 20\text{Vdc}$	I_{CBO}		10	μA
Emitter-Base Cutoff Current $V_{EB} = 4.5\text{Vdc}$	I_{EBO}		10	μA
Collector-Emitter Cutoff Current $V_{CE} = 10\text{Vdc}, V_{BE} = 0.4\text{Vdc}$ $V_{CE} = 10\text{Vdc}, V_{BE} = 2.0\text{Vdc}$	I_{CEX1} I_{CEX2}		1 5	μA ηA



UB – 2N3960UB

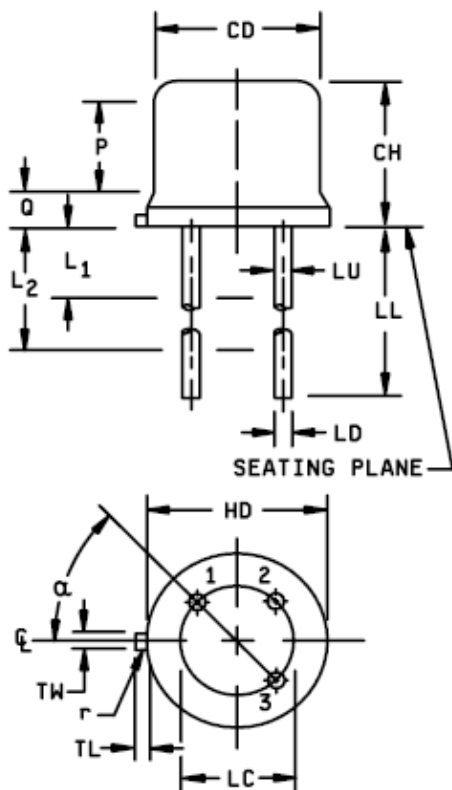
ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise noted)

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS				
Forward-Current Transfer Ratio $I_C = 1\text{mA}_{dc}$, $V_{CE} = 1\text{V}_{dc}$ $I_C = 10\text{mA}_{dc}$, $V_{CE} = 1\text{V}_{dc}$ $I_C = 30\text{mA}_{dc}$, $V_{CE} = 1\text{V}_{dc}$	h_{FE}	40 60 30	300	
Collector-Emitter Saturation Voltage $I_C = 1.0\text{mA}_{dc}$, $I_B = 0.1\text{mA}_{dc}$ $I_C = 30\text{mA}_{dc}$, $I_B = 3.0\text{mA}_{dc}$	$V_{CE(sat)}$		0.2 0.3	Vdc
Base-Emitter Saturation Voltage $V_{CE} = 1.0\text{V}_{dc}$, $I_C = 1.0\text{mA}_{dc}$ $V_{CE} = 1.0\text{V}_{dc}$, $I_C = 3.0\text{mA}_{dc}$	$V_{BE(sat)}$		0.8 1.0	Vdc

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Magnitude of Small – Signal Short – Circuit - Forward Current Transfer Ratio $I_C = 5.0\text{mA}_{dc}$, $V_{CE} = 4\text{V}_{dc}$, $f = 100\text{MHz}$ $I_C = 10.0\text{mA}_{dc}$, $V_{CE} = 4\text{V}_{dc}$, $f = 100\text{MHz}$ $I_C = 30.0\text{mA}_{dc}$, $V_{CE} = 4\text{V}_{dc}$, $f = 100\text{MHz}$	$ h_{fe} $	13 14 12		
Output Capacitance $V_{CB} = 4\text{V}_{dc}$, $I_E = 0$, $100\text{kHz} \leq f \leq 1.0\text{MHz}$	C_{obo}		2.5	pF
Input Capacitance $V_{EB} = 0.5\text{V}_{dc}$, $I_C = 0$, $100\text{kHz} \leq f \leq 1.0\text{MHz}$	C_{ibo}		2.5	pF

PACKAGE DIMENSIONS

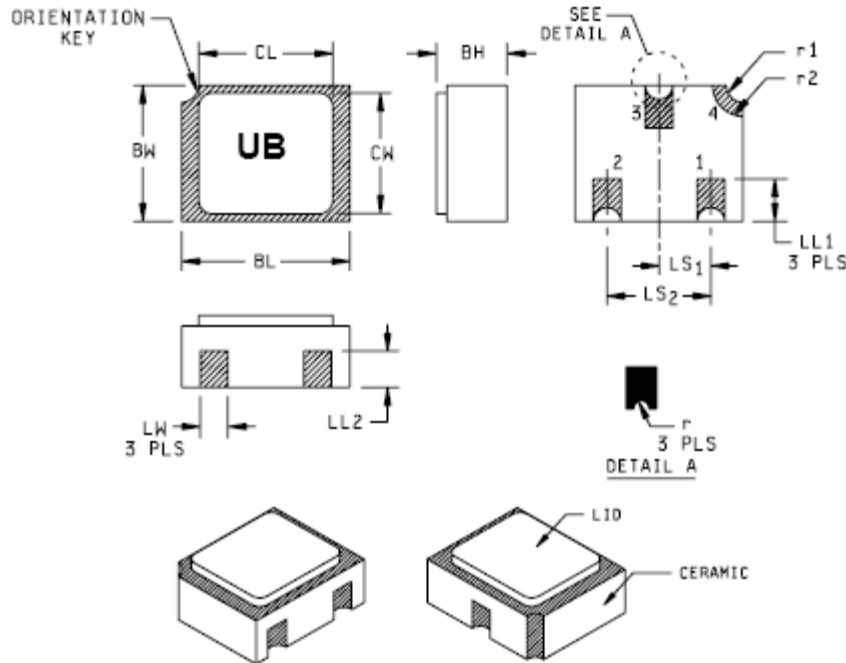


Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
CD	.178	.195	4.52	4.95	
CH	.170	.210	4.32	5.33	
HD	.209	.230	5.31	5.84	
LC	.100 TP		2.54 TP		6
LD	.016	.021	0.41	0.53	7,11
LL	.500	.750	12.70	19.05	7
LU	.016	.019	0.41	0.48	12
L ₁		.050		1.27	7
L ₂	.250		6.35		7
P	.100		2.54		5
Q		.040		1.02	4
TL	.028	.048	0.71	1.22	3
TW	.036	.046	0.91	1.17	9
r		.010		0.25	10
α	45° TP		45° TP		6

NOTES:

1. Dimensions are in inches.
- * 2. Millimeters are given for general information only.
3. Symbol TL is measured from HD maximum.
4. Details of outline in this zone are optional.
5. Symbol CD shall not vary more than .010 (0.25 mm) in zone P. This zone is controlled for automatic handling.
6. Leads at gauge plane .054 (1.37 mm) +.001 inch (0.03 mm) -.000 inch (0.00 mm) below seating plane shall be within .007 inch (0.18 mm) radius of true position (TP) relative to tab. Device may be measured by direct methods or by gauge.
7. Symbol LD applies between L₁ and L₂. Dimension LD applies between L₂ and LL minimum.
8. Lead number three is electrically connected to case.
9. Beyond r maximum, TW shall be held for a minimum length of .011 inch (0.28 mm).
10. Symbol r applied to both inside corners of tab.
11. Measured in a zone beyond .250 (6.35 mm) from the seating plane.
12. Measured in the zone between .050 (1.27 mm) and .250 (6.35mm) from the seating plane.
- * 13. In accordance with ASME Y14.5M, diameters are equivalent to φx symbology.
- * 14. Lead 1 = emitter, lead 2 = base, and case is collector.

***FIGURE 1. Physical dimensions (similar to TO-18)**



Symbol	Dimensions				Note
	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 ₁	.022	.038	0.56	0.96	
LL ₂	0.17	.035	0.43	0.89	

Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
LS ₁	.036	.040	0.91	1.02	
LS ₂	.071	.079	1.81	2.01	
LW	.016	.024	0.41	0.61	
r		.008		.203	
r ₁		.012		.306	
r ₂		.022		.559	

NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Hatched areas on package denote metalized areas.
4. Lid material: Kovar.
5. Pad 1 = Base, Pad 2 = Emitter, Pad 3 = Collector, Pad 4 = Shielding connected to the lid.
6. In accordance with ASME Y14.5M, diameters are equivalent to ϕ x symbology.

FIGURE 2. Physical dimensions, 2N3960UB, surface mount