6 Lake Street, Lawrence, MA 01841
1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803
Website: http: //www.microsemi.com

TECHNICAL DATA SHEET

NPN SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/399

DEVICES

2N3960 **2N3960UB**

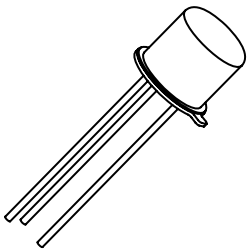
LEVELS

JAN
JANTX
JANTXV

ABSOLUTE MAXIMUM RATINGS ***(T_C = +25°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°C	P_T (1)	0.4	W
Operating & Storage Junction Temperature Range	T_{op}, T_{stg}	-65 to +200	°C

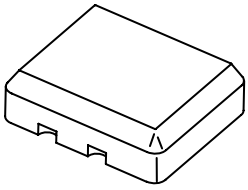
Note:
Derate linearly 2.3mW/°C above T_A = +25°C



TO-18 – 2N3960

ELECTRICAL CHARACTERISTICS ***(T_A = +25°C, unless otherwise noted)***

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



UB – 2N3960UB

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ELECTRICAL CHARACTERISTICS ***(T_A = +25°C, unless otherwise noted)***

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS				
Forward-Current Transfer Ratio I_C = 1mAdc, V_{CE} = 1Vdc I_C = 10mAdc, V_{CE} = 1Vdc I_C = 30mAdc, V_{CE} = 1Vdc	h_{FE}	 40 60 30	 300	
Collector-Emitter Saturation Voltage I_C = 1.0mAdc, I_B = 0.1mAdc I_C = 30mAdc, I_B = 3.0mAdc	$V_{CE(sat)}$		 0.2 0.3	Vdc
Base-Emitter Saturation Voltage V_{CE} = 1.0Vdc, I_C = 1.0mAdc V_{CE} = 1.0Vdc, I_C = 3.0mAdc	$V_{BE(sat)}$		 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 = 5.0mAdc, V_{CE} = 4Vdc, f = 100MHz I_C = 10.0mAdc, V_{CE} = 4Vdc, f = 100MHz I_C = 30.0mAdc, V_{CE} = 4Vdc, f = 100MHz	$\lvert h_{fe} \rvert$	 13 14 12		
Output Capacitance V_{CB} = 4Vdc, I_E = 0, 100kHz ≤ f ≤ 1.0MHz	C_{obo}		2.5	pF
Input Capacitance V_{EB} = 0.5Vdc, I_C = 0, 100kHz ≤ f ≤ 1.0MHz	C_{ibo}		2.5	pF

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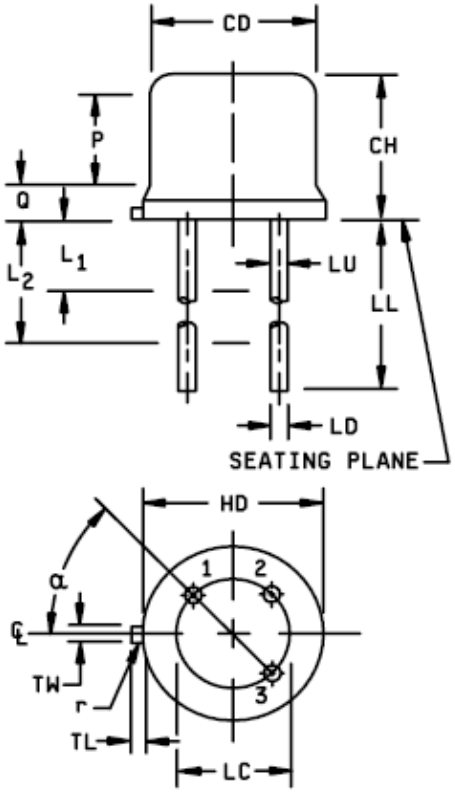
PACKAGE DIMENSIONS



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 L_1 and L_2. Dimension LD applies between L_2 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)**

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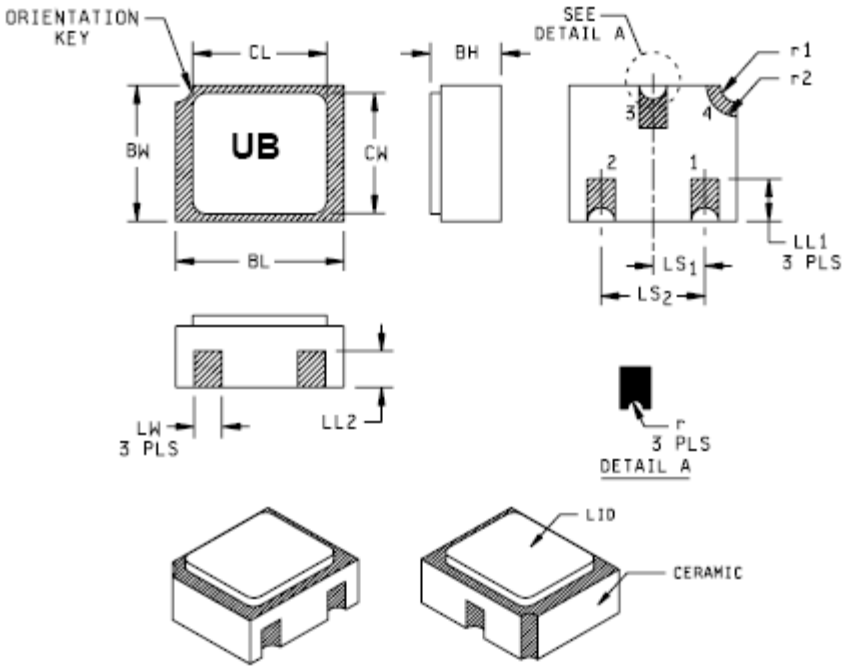

Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
BH	.046	.056	1.17	1.42	
BL	.115	.128	2.92	3.25	
BW	.085	.108	2.16	2.74	
CL		.128		3.25	
CW		.108		2.74	
LL_1	.022	.038	0.56	0.96	
LL_2	0.17	.035	0.43	0.89	

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 ϕx symbology.

FIGURE 2. Physical dimensions, 2N3960UB, surface mount