6 Lake Street, Lawrence, MA 01841
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Website: http: //www.microsemi.com

TECHNICAL DATA SHEET

NPN SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/255

DEVICES

2N2221A	**2N2222A**
2N2221AL	**2N2222AL**
2N2221AUA	**2N2222AUA**
2N2221AUB	**2N2222AUB**
2N2221AUBC *	**2N2222AUBC ***

LEVELS

JAN
JANTX
JANTXV
JANS

*** Available to JANS quality level only.**

ABSOLUTE MAXIMUM RATINGS ***(T_C = +25°C unless otherwise noted)***

Parameters / Test Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector-Base Voltage	V_{CBO}	75	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current	I_C	800	mAdc
Total Power Dissipation @ T_A = +25°C	P_T	0.5	W
Operating & Storage Junction Temperature Range	T_{op}, T_{stg}	-65 to +200	°C

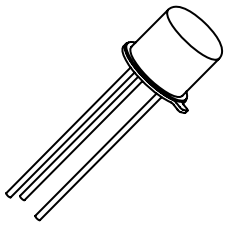
THERMAL CHARACTERISTICS

Parameters / Test Conditions		Symbol	Max.	Unit
Thermal Resistance, Junction-to-Ambient		$R_{\theta JA}$		°C/W
2N2221A, L	2N2222A, L		325	
2N2221AUA	2N2222AUA		210	
2N2221AUB, UBC	2N2222AUB, UBC		325	

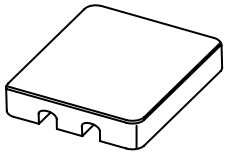
Note: Consult 19500/255 for thermal performance curves.
1. Derate linearly 3.08mW/°C above T_A > +37.5°C
2. Derate linearly 4.76mW/°C above T_A > +63.5°C

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

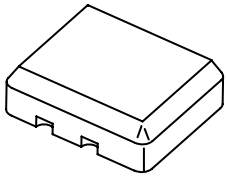
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERTICS				
Collector-Emitter Breakdown Voltage I_C = 10mAdc	$V_{(BR)CEO}$	50		Vdc
Collector-Base Cutoff Current V_{CB} = 75Vdc V_{CB} = 60Vdc	I_{CBO}		10 10	µAdc ηAdc
Emitter-Base Cutoff Current V_{EB} = 6.0Vdc V_{EB} = 4.0Vdc	I_{EBO}		10 10	µAdc ηAdc
Collector-Emitter Cutoff Current V_{CE} = 50Vdc	I_{CES}		50	ηAdc



TO-18 (TO-206AA)
2N2221A, 2N2222A



4 PIN
2N2221AUA, 2N2222AUA



3 PIN
2N2221AUB, 2N2222AUB
2N2221AUBC, 2N2222AUBC
(UBC = Ceramic Lid Version)

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

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
ON CHARACTERISTICS (2)					
Forward-Current Transfer Ratio					
I_C = 0.1mAdc, V_{CE} = 10Vdc	2N2221A, L, UA, UB, UBC	h_{FE}	30		
	2N2222A, L, UA, UB, UBC		50		
I_C = 1.0mAdc, V_{CE} = 10Vdc	2N2221A, L, UA, UB, UBC		35	150	
	2N2222A, L, UA, UB, UBC		75	325	
I_C = 10mAdc, V_{CE} = 10Vdc	2N2221A, L, UA, UB, UBC		40		
	2N2222A, L, UA, UB, UBC		100		
I_C = 150mAdc, V_{CE} = 10Vdc	2N2221A, L, UA, UB, UBC		40	120	
	2N2222A, L, UA, UB, UBC		100	300	
I_C = 500mAdc, V_{CE} = 10Vdc	2N2221A, L, UA, UB, UBC		20		
	2N2222A, L, UA, UB, UBC		30		
Collector-Emitter Saturation Voltage					
I_C = 150mAdc, I_B = 15mAdc		$V_{CE(sat)}$		0.3	Vdc
I_C = 500mAdc, I_B = 50mAdc				1.0	
Base-Emitter Voltage					
I_C = 150mAdc, I_B = 15mAdc		$V_{BE(sat)}$	0.6	1.2	Vdc
I_C = 500mAdc, I_B = 50mAdc				2.0	

DYNAMIC CHARACTERISTICS

Parameters / Test Conditions		Symbol	Min.	Max.	Unit
Small-Signal Short-Circuit Forward Current Transfer Ratio					
I_C = 1.0mAdc, V_{CE} = 10Vdc, f = 1.0kHz	2N2221A, L, UA, UB, UBC	h_{fe}	30		
	2N2222A, L, UA, UB, UBC		50		
Magnitude of Small–Signal Short-Circuit Forward Current Transfer Ratio		$\|h_{fe}\|$			
I_C = 20mAdc, V_{CE} = 20Vdc, f = 100MHz			2.5		
Output Capacitance					
V_{CB} = 10Vdc, I_E = 0, 100kHz ≤ f ≤ 1.0MHz		C_{obo}		8.0	pF
Input Capacitance					
V_{EB} = 0.5Vdc, I_C = 0, 100kHz ≤ f ≤ 1.0MHz		C_{ibo}		25	pF

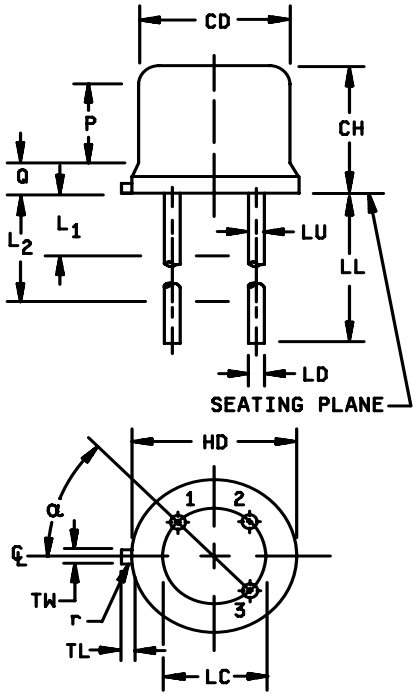
SWITCHING CHARACTERISTICS

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
Turn-On Time See figure 8 of MIL-PRF-19500/255	t_{on}		35	ηs
Turn-Off Time See Figure 9 of MIL-PRF-19500/255	t_{off}		300	ηs

(2) Pulse Test: Pulse Width = 300μs, Duty Cycle ≤ 2.0%.

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PACKAGE DIMENSIONS



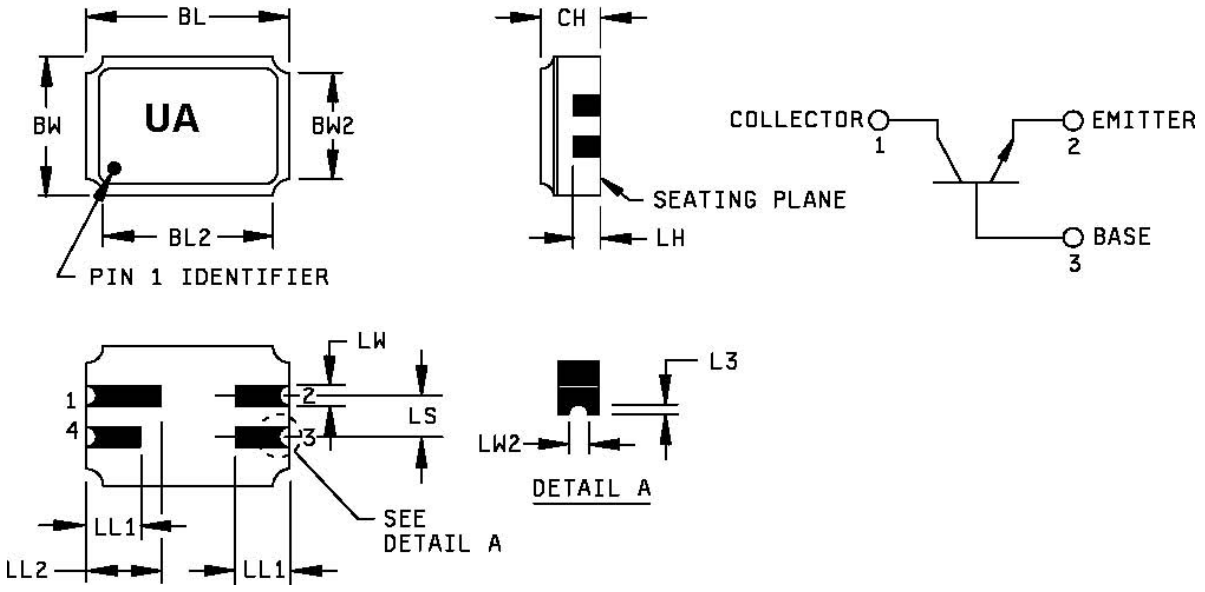
NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Beyond r (radius) maximum, TL shall be held for a minimum length of .011 inch (0.28 mm).
4. Dimension TL measured from maximum HD.
5. Body contour optional within zone defined by HD, CD, and Q.
6. 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.
7. Dimension LU applies between L_1 and L_2. Dimension LD applies between L_2 and LL minimum. Diameter is uncontrolled in L_1 and beyond LL minimum.
8. All three leads.
9. The collector shall be internally connected to the case.
10. Dimension r (radius) applies to both inside corners of tab.
11. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.
12. Lead 1 = emitter, lead 2 = base, lead 3 = collector.
13. For L suffix devices, dimension LL = 1.5 inches (38.10 mm) min. and 1.75 inches (44.45 mm) max.

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	7,8
LL	.500	.750	12.70	19.05	7,8,13
LU	.016	.019	0.41	0.48	7,8
L_1		.050		1.27	7,8
L_2	.250		6.35		7,8
P	.100		2.54		
Q		.030		0.76	5
TL	.028	.048	0.71	1.22	3,4
TW	.036	.046	0.91	1.17	3
r		.010		0.25	10
α	45° TP		45° TP		6
1, 2, 9, 11, 12, 13					

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

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NOTES:

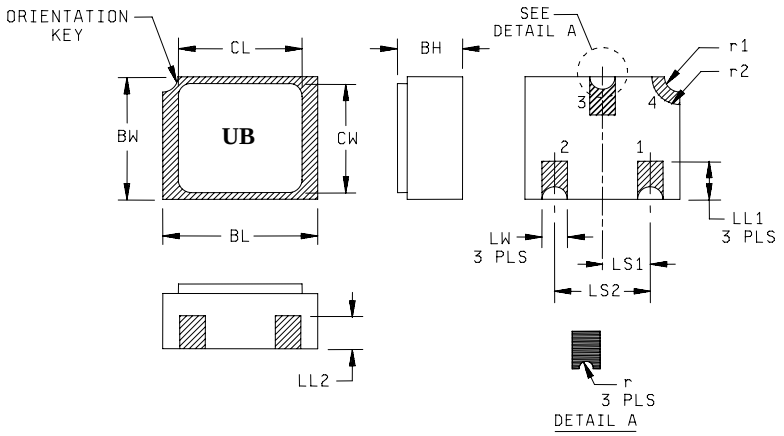
1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimension CH controls the overall package thickness. When a window lid is used, dimension CH must increase by a minimum of .010 inch (0.254 mm) and a maximum of .040 inch (1.020 mm).
4. The corner shape (square, notch, radius) may vary at the manufacturer's option, from that shown on the drawing.
5. Dimensions LW2 minimum and L3 minimum and the appropriate castellation length define an unobstructed three-dimensional space traversing all of the ceramic layers in which a castellation was designed. (Castellations are required on the bottom two layers, optional on the top ceramic layer.) Dimension LW2 maximum and L3 maximum define the maximum width and depth of the castellation at any point on its surface. Measurement of these dimensions may be made prior to solder dipping.
6. The co-planarity deviation of all terminal contact points, as defined by the device seating plane, shall not exceed .006 inch (0.15mm) for solder dipped leadless chip carriers.
7. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

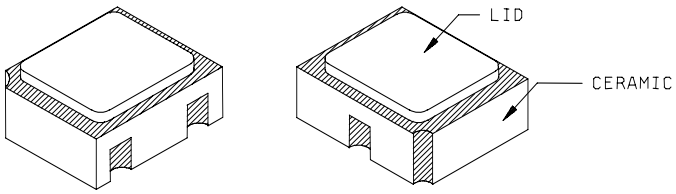
Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
BL	.215	.225	5.46	5.71	
BL2		.225		5.71	
BW	.145	.155	3.68	3.93	
BW2		.155		3.93	
CH	.061	.075	1.55	1.90	3
L3	.003	.007	0.08	0.18	5
LH	.029	.042	0.74	1.07	
LL1	.032	.048	0.81	1.22	
LL2	.072	.088	1.83	2.23	
LS	.045	.055	1.14	1.39	
LW	.022	.028	0.56	0.71	
LW2	.006	.022	0.15	0.56	5

Pin no.	1	2	3	4
Transistor	Collector	Emitter	Base	N/C

FIGURE 2. Physical dimensions, surface mount (UA version).

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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	
LL1	.022	.038	0.56	0.96	
LL2	.017	.035	0.43	0.89	

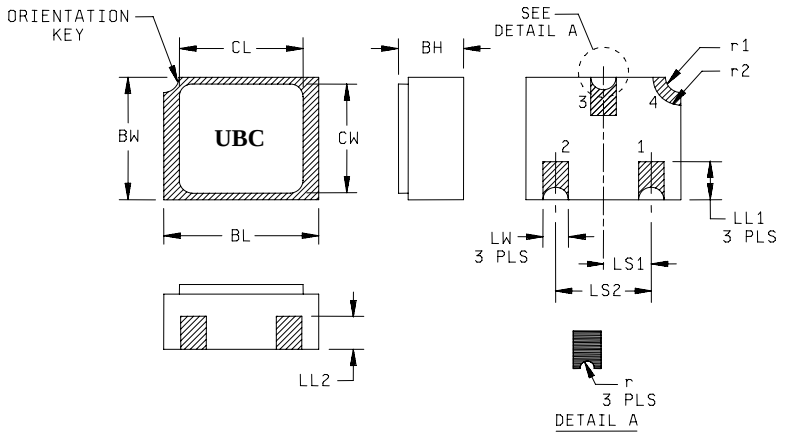
Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
LS_1	.036	.040	0.91	1.02	
LS_2	.071	.079	1.81	2.01	
LW	.016	.024	0.41	0.61	
r		.008		.203	
r_1		.012		.305	
r_2		.022		.559	

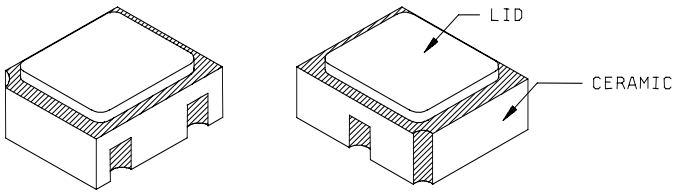
NOTES:

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Hatched areas on package denote metalized areas.
4. 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 ϕx symbology.

FIGURE 3. Physical dimensions, surface mount (UB version)

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Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
BH	.046	.071	1.17	1.80	
BL	.115	.128	2.92	3.25	
BW	.085	.108	2.16	2.74	
CL		.128		3.25	
CW		.108		2.74	
LL1	.022	.038	0.56	0.96	
LL2	.017	.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		.305	
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. Pad 1 = Base, Pad 2 = Emitter, Pad 3 = Collector, Pad 4 = Connected to the lid braze ring.
5. In accordance with ASME Y14.5M, diameters are equivalent to ϕx symbology.

FIGURE 4. Physical dimensions, surface mount (UBC version, ceramic lid)