

ENGINEERING PRACTICES STUDY

Project Number 5961-2011-089

TITLE: REVIEW THE DIMENSIONS OF THE UA CASE OUTLINE DIMENSIONS

18 May 2012

STUDY PROJECT (SEE ATTACHMENT 1)

FINAL REPORT

Study Conducted by DLA LAND AND MARITIME

Prepared by:

Jason Hochstetler

I. **OBJECTIVES:** An engineering practice study was conducted to review the UA case outline dimensions to ensure the correct dimensions are reflected in MIL-PRF-19500 specification sheets. The purpose of this study is to determine whether the following proposals are acceptable for ensuring compatibility with existing designs.

II. **BACKGROUND:** While performing lot acceptance testing of a UA package, an error in the package dimension requirements was found. The error is with the L3 dimension limits of .003 inch min to .007 inch max on all UA case outlines found in MIL-PRF-19500 specification sheets. A manufacturer of these packages defines the L3 dimension as .004 inches minimum with no maximum dimension limit. Actual parts are measuring in the range of .012 through .013 inches, which is non-compliant to the previously stated L3 dimension requirement. When introducing new case outlines to MIL-PRF-19500 specification sheets, only dimensions specified by the case manufacturer are used. It is unknown if the first original case outline submitted for inclusion in MIL-PRF-19500 specification sheets contained both minimum and maximum dimensions, or only minimum dimensions. Currently all UA case outlines specify both minimum and maximum L3 dimensions.

It has been proposed that the maximum limit for the UA L3 dimension be removed and only require a minimum limit of .003 inches.

See attachment 1 for the proposal to modify the UA case outline.

In addition, another proposal received was to utilize the castellation guidelines already in place in the MIL-STD-883 TM2009. This would ensure that the castellations are not viewed as virtual flat surfaces on the package edge and are not virtual closed vias (holes). Using this requirement would require MIL-STD-750 to be updated with this portion of the external visual test method for castellations.

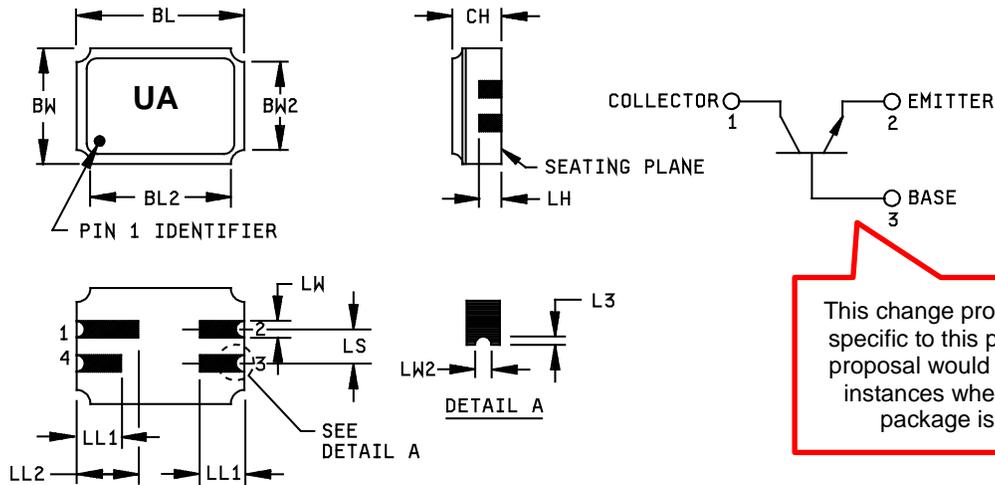
See attachment 2 for the castellation section of TM2009 of MIL-STD-883.

III. **RESULTS:** The comments received by DLA Land and Maritime have been reviewed and indicate that using the castellation radius is the preferred method. If the L3 maximum depth dimension is kept in the case outline dimension table, the radius ratio (1/2 castellation width) will be used to verify the maximum value. In addition, we do not typically specify limits that are not defined by the package manufacturer. The castellation guideline found in MIL-STD-883 was found to be an appropriate addition to MIL-STD-750.

IV. **CONCLUSIONS:** Based on the comments received we will change the way the L3 dimension is specified in the UA case outlines in MIL-PRF-19500 specification sheets.

V. **RECOMMENDATIONS:** DLA Land and Maritime recommends that the accepted proposed changes of this EP Study be incorporated in slash sheets with UA case outlines and the castellation guideline be added to the next draft of MIL-STD-750.

Attachment 1



Symbol	Dimensions				Note
	Inches		Millimeters		
	Min	Max	Min	Max	
BL	.215	.225	5.46	5.72	
BL2		.225		5.72	
BW	.145	.155	3.68	3.93	
BW2		.155		3.94	
CH	.061	.075	1.55	1.91	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	2.24	
LS	.045	.055	1.14	1.40	
LW	.022	.028	0.56	0.71	
LW2	.006	.022	0.15	0.56	5

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, etc.) 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.

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

MIL-STD-883H

* 3.3.8 Package body/lid - leadless devices

- a. Ceramic chip-outs that dimensionally exceed 50% of the distance between terminals in any direction on the affected surface (edge or corner), and exceed a depth of 25% of the thickness of the affected package element (e.g., cover, lid, base, or wall).
- b. Evidence of cracks, delamination, separation, or voiding on any package element.
- c. Castellations to solder pad misalignment. The metal in the castellation, exclusive of the angular ring, shall be within the visually extended boundaries of the solder pad (see figure 2009-1).

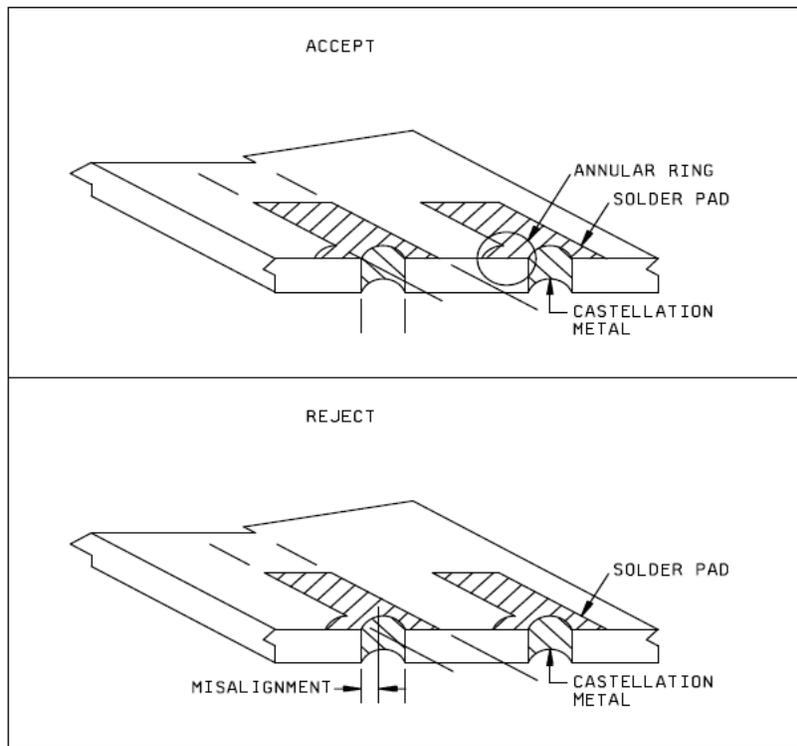
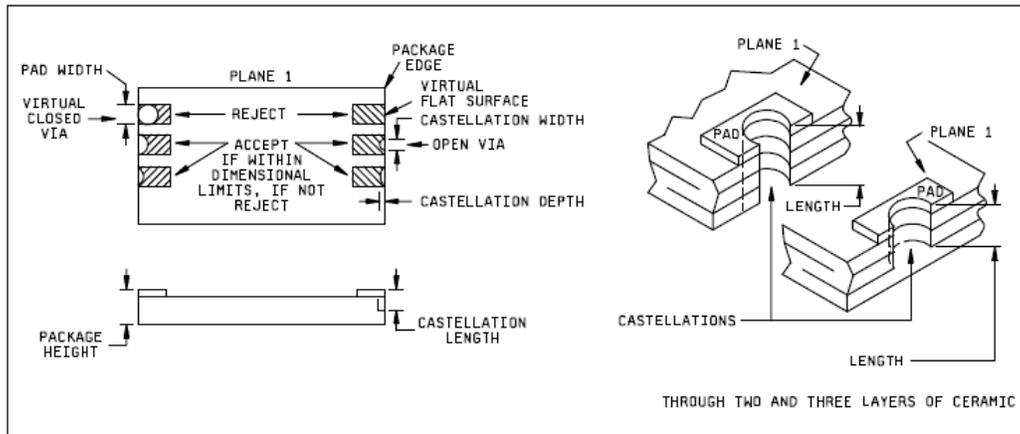


FIGURE 2009-1. Castellations to solder pad misalignment.

- d. Castellation configuration not in accordance with the following (see figure 2009-2). The castellation shall be roughly concave, confined by a 3-dimensional space traversing all castellated ceramic layers at the package edge. The surface of the castellation may be irregular. The "3-dimensional space" has these dimensions:
1. Minimum width $> 1/3$ package terminal pad width.
 2. Minimum depth $> 1/2$ castellation minimum width.
 3. Length = as designed (see figure 2009-2).
 4. Maximum width \leq package terminal pad width.
 5. Maximum depth $\leq 1/2$ castellation maximum width.

These dimensions are an attempt to ensure with some reasonableness that the castellations are not viewed, in the extreme sense, as virtual flat surfaces on the package edge and are not virtual closed vias (holes).



NOTE: Ceramic layers shift, edges are rough after punching, plating buildup is not smooth etc., all of these combine during package manufacture to make the castellation measurement difficult. Therefore, in the event of conflicts in determining castellation acceptance, direct contact measurement shall be made using the limits specified in MIL-STD-1835.

FIGURE 2009-2. Castellation requirements