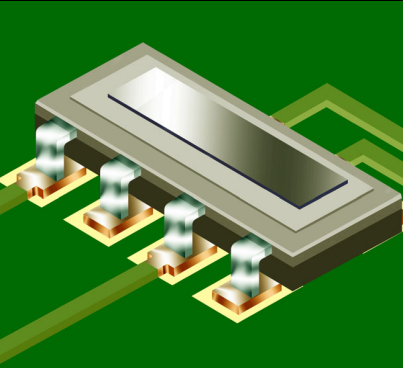


**SURFACE MOUNT TECHNOLOGY (SMT)
BUTT "I" LEADED PACKAGES**

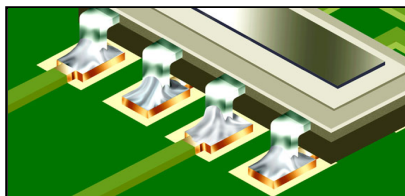


BUTT "I" LEADED PACKAGES

Butt / "I" leaded parts have leads formed and positioned perpendicular to the circuit land.

The use of the Butt / "I" Leaded device termination configuration is not recommended for high reliability / spaceflight applications, due to the limited mechanical reliability of the termination.

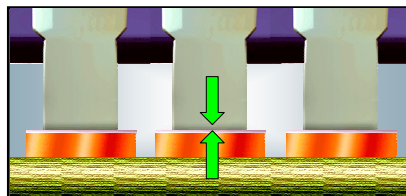
See Section 7.01 "Surface Mount Soldering, General Requirements", for common accept / reject criteria.



PREFERRED

The part is properly oriented to the land pattern, with each lead centered across the width of the land. Leads are planar. Fillets are shiny, concave, and evident on the front and back faces of the lead.

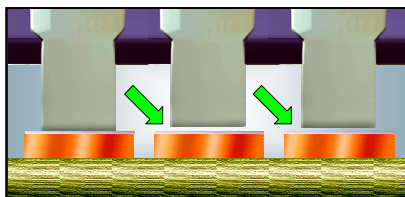
[NASA-STD-8739.2 \[12.8.1 \], \[12.9.5 \]](#)



**PREFERRED
COPLANARITY**

The preferred planarity of the lead to the land pattern area is with the component feet parallel to, and in full contact with, the pad.

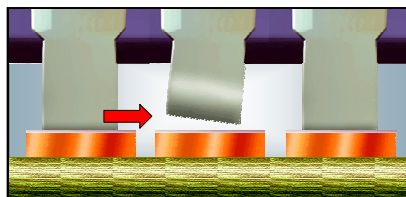
[NASA-STD-8739.2 \[7.1 \]](#)



**ACCEPTABLE
COPLANARITY**

The maximum acceptable non-planarity between any portion of the lead foot and the pad shall not exceed 0.26 mm (0.010").

[NASA-STD-8739.2 \[7.1 \], \[12.9.2.b.3 \]](#)



**UNACCEPTABLE
IMPROPER COPLANARITY**

Excessive non-planarity results in open or mechanically weak solder joints. Improper component lead coplanarity can produce solder bridging and open terminations.

[NASA-STD-8739.2 \[7.1 \], \[12.9.2.b.3 \]](#)

NASA WORKMANSHIP STANDARDS



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHNSON SPACE CENTER
HOUSTON, TEXAS USA 77058

Released: 06.27.2002

Revised:

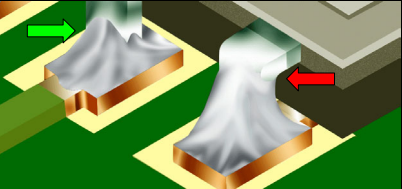
Initials:

Book: 7

Section: 7.08

Page: 1

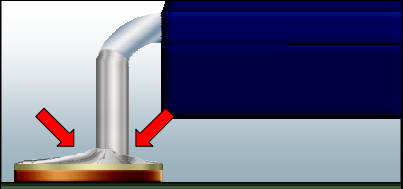
**SURFACE MOUNT TECHNOLOGY (SMT)
BUTT "I" LEADED PACKAGES (cont.)**



**UNACCEPTABLE
EXCESSIVE HEEL / TOE FILLET HEIGHT**

The fillet height shall not exceed 75% of the lead height. The fillet shall be the full width of the contact area, exhibit a positive wetting angle, and the lead contour shall be visible.

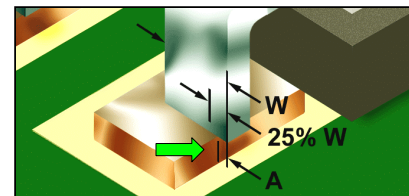
[NASA-STD-8739.2 \[12.9.5.b.3 \]](#)



**UNACCEPTABLE
INSUFFICIENT HEEL / TOE FILLET HEIGHT**

The fillet height shall be sufficient to exhibit evidence of complete wetting.

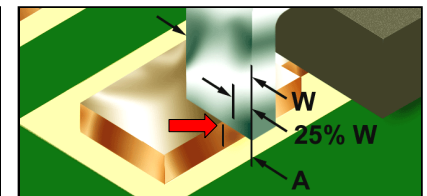
[NASA-STD-8739.2 \[12.9.5.a.1 \]](#)



**ACCEPTABLE
LATERAL / SIDE OVERHANG (A)**

Lateral / side overhang shall not exceed 25% of lead width.

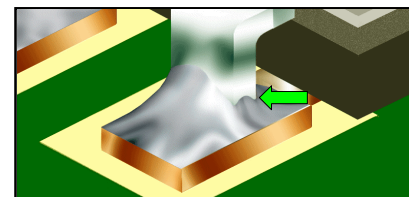
[NASA-STD-8739.2 \[8.7.4.k \]](#)



**UNACCEPTABLE
IMPROPER LATERAL / SIDE OVERHANG**

The lead is overhanging the termination pad in excess of 25% of the lead width.

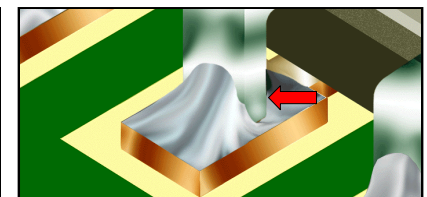
[NASA-STD-8739.2 \[12.6.2.a.7 \], \[12.9.5.b.1 \]](#)



**PREFERRED
SIDE JOINT FILLET ***

The side joint fillet shall exhibit proper wetting to the component lead, a positive contour, and shall extend to the edges of the termination pad. (* See Nonwetting for special exclusion)

[NASA-STD-8739.2 \[12.8.1.b \], \[12.9.5.a.1 \]](#)



**UNACCEPTABLE
INSUFFICIENT SIDE JOINT FILLET (D)***

The side joint fillet does not exhibit proper wetting, or a positive contour. (* See Nonwetting for exclusion)

[NASA-STD-8739.2 \[12.8.2.b.4 \]](#)

NASA WORKMANSHIP STANDARDS



NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
JOHNSON SPACE CENTER
HOUSTON, TEXAS USA 77058

Released: 06.27.2002

Revised:

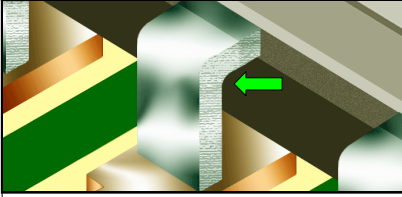
Initials:

Book: 7

Section: 7.08

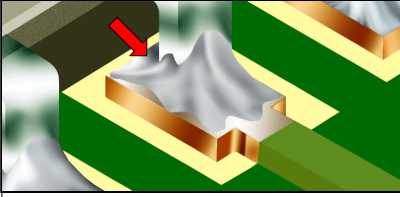
Page: 3

**SURFACE MOUNT TECHNOLOGY (SMT)
BUTT "I" LEADED PACKAGES (cont.)**



**ACCEPTABLE
NONWETTING
(SPECIAL EXCLUSION)**

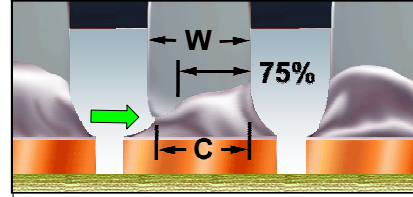
Leads not having wettable sides (edges) by design (such as leads stamped from pre-plated stock) are not required to exhibit side fillets.
[Best Workmanship Practice](#)



**UNACCEPTABLE
IMPROPER WETTING**

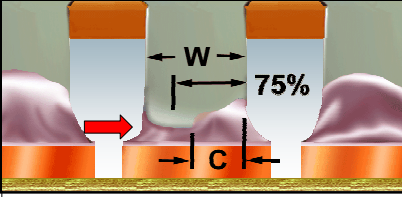
The solder fillet shall exhibit a positive wetting angle, wet all elements of the connection with smooth flow lines, and shall extend to the edge of the pad.
[NASA-STD-8739.2 \[12.9.5.a.1 \], \[12.9.5.b.4 \]](#)

**SURFACE MOUNT TECHNOLOGY (SMT)
BUTT "I" LEADED PACKAGES (cont.)**



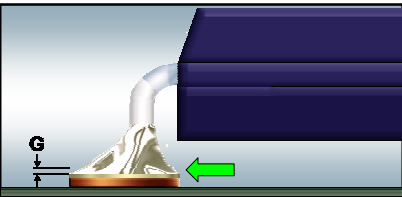
**ACCEPTABLE
END JOINT WIDTH (C)**

The width of the end joint (C) should be equal to or greater than the lead width (W), but shall not be less than 75% of lead width (W).
[Best Workmanship Practice](#)



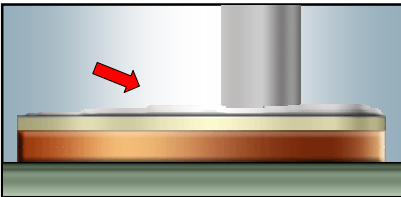
**UNACCEPTABLE
INSUFFICIENT END JOINT WIDTH (C)**

The width of the end joint is less than 75% of the lead width (W).
[Best Workmanship Practice](#)




**PREFERRED
SOLDER THICKNESS (G)**

The solder thickness shall be sufficient to form a properly wetted, concave fillet that extends over the complete periphery of the connection.
[NASA-STD-8739.2 \[12.8.1.b \], \[12.9.5.a \]](#)




**UNACCEPTABLE
INSUFFICIENT SOLDER QUANTITY**

The solder quantity shall be sufficient to form a properly wetted, concave fillet.
[NASA-STD-8739.2 \[12.9.5.a.1 \], \[12.9.5.b.4 \]](#)



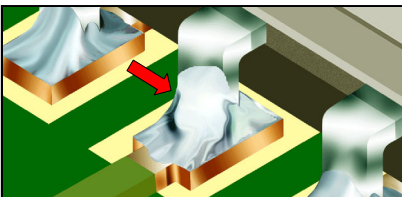
**MANDATORY
HEEL FILLET**

There shall be evidence of complete wetting and a positive wetting angle. The heel fillet shall extend across the entire width of the contact area.
[NASA-STD-8739.2 \[12.9.5.b.2 \]](#)



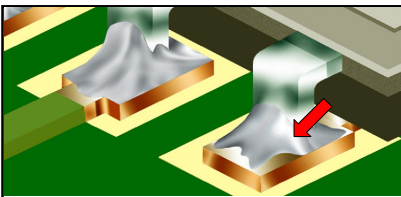
**UNACCEPTABLE
MISSING HEEL FILLET**

There shall be evidence of complete wetting and a positive wetting angle.
[NASA-STD-8739.2 \[12.9.5.b.2 \]](#)



**UNACCEPTABLE
EXCESS SOLDER**

The solder fillet may be convex, but shall exhibit a positive wetting angle, and the lead contour shall be visible.
[NASA-STD-8739.2 \[12.9.5.a.2 \]](#)



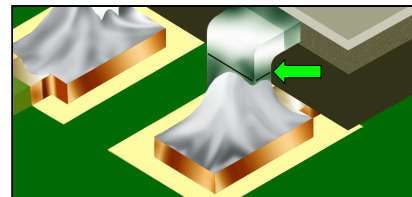
**UNACCEPTABLE
INCOMPLETE SOLDER FILLET**

The solder fillet shall exhibit complete wetting and extend over the complete periphery of the connection.
[NASA-STD-8739.2 \[12.9.5.b.4 \]](#)




**MANDATORY
HEEL FILLET
HEEL OVERHANG**


Heel overhang is prohibited, as it will prevent the formation of the heel fillet (mandatory).
[NASA-STD-8739.2 \[8.8.4 \], \[12.9.5 \]](#)



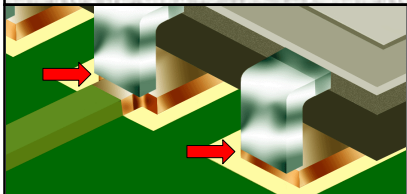
**ACCEPTABLE
HEEL / TOE FILLET HEIGHT**

The fillet height shall not exceed 75% of the lead height. The fillet shall be the full width of the contact area, exhibit a positive wetting angle, and the lead contour shall be visible.
[NASA-STD-8739.2 \[12.9.5.a \], \[12.9.5.b.3 \]](#)

NASA WORKMANSHIP STANDARDS			
	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 06.27.2002	Revised:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 7	Section: 7.08
		Initials:	Page: 4

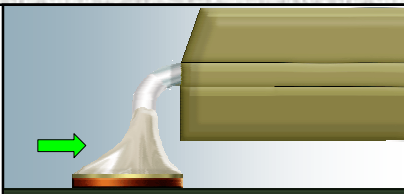
NASA WORKMANSHIP STANDARDS			
	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION	Released: 06.27.2002	Revised:
	JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Book: 7	Section: 7.08
		Initials:	Page: 2

**SURFACE MOUNT TECHNOLOGY (SMT)
BUTT "I" LEADED PACKAGES (cont.)**



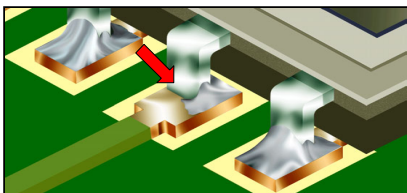
**MANDATORY
TOE OVERHANG**

Toe overhang is prohibited.
[NASA-STD-8739.2 \[8.8.4 \], \[12.9.5 \]](#)



**PREFERRED
TOE FILLET**

There shall be evidence of complete wetting and a positive wetting angle.
[NASA-STD-8739.2 \[12.9.5.a.1 \]](#)



**UNACCEPTABLE
MISSING TOE FILLET**

There shall be evidence of complete wetting and a positive wetting angle that extends over the complete periphery of the connection.
[NASA-STD-8739.2 \[12.8.1.b \], \[12.9.5 \]](#)

NASA WORKMANSHIP STANDARDS



NATIONAL AERONAUTICS AND
SPACE ADMINISTRATION

JOHNSON SPACE CENTER
HOUSTON, TEXAS USA 77058

Released:
06.27.2002

Revised:


Initials:

Book:
7

Section:
7.08

Page:
5

THIS PAGE IS
INTENTIONALLY BLANK.

NASA WORKMANSHIP STANDARDS			
 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION JOHNSON SPACE CENTER HOUSTON, TEXAS USA 77058	Released: 06.27.2002	Revised:	Initials:
	Book: 7	Section: 7.08	Page: 6