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 and concave, and heel fillet is evident.
NASA-STD-8739.2 [8.7.4.h], [12.6.2], [12.8]

GULL-WING / “L” LEADED PACKAGES
Gull-Wing IC package leads are formed in a profile very similar to the outline of a seagull’s wings. The Gull-Wing is considered one of the most reliable terminations for fine-pitch, high pin-count packages.

“L” leded IC packages have leads formed in a configuration very similar to the outline of the letter “L”. The leads are shorter (length and height) than the “Gull-Wing” and tend to be much stiffer (hardened).

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

PREFERRED COPLANARITY
The preferred planarity of the lead to the land pattern area is with the foot parallel 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
The maximum acceptable non-planarity between any portion of the lead foot and the pad shall not exceed 0.26 mm (0.010”). This may result in a weakened solder termination.
NASA-STD-8739.2 [12.9.2.b.3]

MINIMUM HEEL FILLET HEIGHT (F)
The fillet height shall be equal to or greater than the minimum solder thickness (G), plus one (1) lead thickness (T). Best Workmanship Practice
NASA-STD-8739.2 [12.9.2.b.3]

UNACCEPTABLE INSUFFICIENT HEEL FILLET HEIGHT (F)
The heel fillet height is less than the minimum solder thickness (G), plus one (1) lead thickness (T). This may result in a weakened solder termination. Best Workmanship Practice

MAXIMUM HEEL FILLET HEIGHT (E)
Solder may extend through the stress relief bend, but not contact the lead seal. Solder shall exhibit a concave fillet and the lead contour shall be visible.
NASA-STD-8739.2 [12.8.1.b], [12.8.2.b.16]

UNACCEPTABLE EXCESS solder
The lead contour is not discernable; the solder extends through the stress-relief bends; and, the solder contacts the component body and seal.
NASA-STD-8739.2 [12.9.2.b.12], [12.9.2.b.16], [12.9.2.a.2]

NASA WORKMANSHIP STANDARDS
**GULL-WING / “L” LEADED PACKAGES (cont.)**

**ACCEPTABLE SIDE JOINT FILLET (D)**
The side joint fillet (D) shall be present, equal to the lead length (L) plus the heel fillet, or equal to a minimum of 75% of lead length (L) plus the heel fillet, whichever is less, and exhibit complete wetting and a positive contour.  
Best Workmanship Practice

**UNACCEPTABLE SIDE JOINT FILLET (D)**
The side joint fillet shall be present, equal to the lead length (L) plus the heel fillet, and exhibit a positive contour.  
NASA-STD-8739.2 [12.9.2.b.5]

**PREFERRED SOLDER THICKNESS (G)**
The solder thickness shall be sufficient to form a properly wetted, concave fillet which extends over the complete periphery of the connection.  
NASA-STD-8739.2 [12.8.1.b], [12.9.2.a]

**ACCEPTABLE MAXIMUM SOLDER**
Solder quantity is at maximum, with the fillet extending up to the lead bend and completely covering the lead. The connection exhibits a well-wetted concave fillet on all sides, and the lead contour is discernable.  
NASA-STD-8739.2 [12.8.1.b], [12.9.2.a]

**UNACCEPTABLE MINIMUM SOLDER**
Solder quantity is minimum, but the connection is well wetted on all sides, with a concave fillet between the lead and the land. A heel fillet is evident and properly formed.  
NASA-STD-8739.2 [12.8.1.b], [12.9.2.a]

**UNACCEPTABLE INSUFFICIENT SOLDER**
The solder quantity shall be sufficient to form a properly wetted fillet.  
NASA-STD-8739.2 [12.8.2.b.6]

**PREFERRED END JOINT WIDTH (C)**
The width of the end joint (C) should be greater than or equal to the lead width (W).  
Best Workmanship Practice

**ACCEPTABLE MAXIMUM END JOINT WIDTH (C)**
The width of the end joint shall be greater than or equal to 75% of the lead width (W).  
Best Workmanship Practice

**UNACCEPTABLE INSUFFICIENT END JOINT WIDTH (C)**
The width of the end joint (C) is less than 75% of the lead width (W).  
Best Workmanship Practice

**Mandatory Heel Fillet**
A heel fillet is mandatory and the contour shall be positive.  
NASA-STD-8739.2 [12.9.2.b.5]

**Preferred Lateral / Side Overhang (A)**
The target condition is no lateral / side overhang (A), with the component lead centered on the land.  
NASA-STD-8739.2 [8.7.4.h], [12.6.2]

**Acceptable Lateral / Side Overhang (A)**
The target condition is no lateral / side overhang (A), with the component lead centered on the land.  
NASA-STD-8739.2 [8.7.4.h], [12.6.2]

**NASA WORKMANSHIP STANDARDS**

**NASA WORKMANSHIP STANDARDS**

**NASA WORKMANSHIP STANDARDS**
UNACCEPTABLE HEEL OVERHANG

Heel overhang is prohibited.

Best Workmanship Practice

NASA WORKMANSHIP STANDARDS

SURFACE MOUNT TECHNOLOGY (SMT)
GULL-WING / “L” 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, and shall extend to the edge of the pad.

NASA-STD-8739.2 [12.9.2.a.1], [12.9.2.b.4]

SURFACE MOUNT TECHNOLOGY (SMT)
GULL-WING / “L” LEADED PACKAGES (cont.)

ACCEPTABLE TOE OVERHANG (B)

Toe overhang (B) shall not exceed 25% of the lead width (W), and shall not violate minimum electrical spacing (e) requirements.

NASA-STD-8739.2 [8.7.4.h.2], [12.6.2.a.5]

UNACCEPTABLE EXCESSIVE TOE OVERHANG (B)

Toe overhang (B) shall not exceed 25% of the lead width (W), and shall not violate minimum electrical spacing (e) requirements.

NASA-STD-8739.2 [12.6.2.a.4], [12.9.2.b.2]

UNACCEPTABLE NONWETTING

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

NASA WORKMANSHIP STANDARDS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. 20546

JOHNSON SPACE CENTER
HOUSTON, TEXAS USA 77058

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