

Description

The invention relates to an electrical connector adapted to receive a carrier mounted, integrated circuit package, said connector comprising an insulating plastic housing including an integral housing section having an outside wall portion and an inside wall portion with a lowered carrier seating top ledge, a plurality of cavities being provided in said housing section, each cavity adapted to receive a contact spring having a first contact surface projecting above said top ledge for contact with a contact pad on a carrier when inserted into said connector and a second contact surface at the bottom of said housing section for contact with another electrical device, and a clamping member. Such an electrical connector is known from US patent specification US—A—4 130 327.

Leadless modular circuit packages such as large scale integrated circuit (LSI) packages are finding increasing utility in the electronics industry. It is sometimes necessary to remove the integrated circuit packages from their connector in order to change programs or to repair circuits. Heretofore, the removal of such a package from a conductor, like indicated in above US patent specification, sometimes cause damage to the package because of the frictional forces between the conductive interfaces on the IC contact pads and the mating contact springs in the connector. Furthermore, the clamping member in above known connector is not available in a standby position during the removal or insertion of the integrated circuit package.

Another problem in industry is the buildup of substantial amounts of heat caused by energy flowing through the integrated circuit package and its connector. This heat, if not dissipated, can severely damage the integrated circuit package and the connector.

The present invention solves above problems. This is achieved with a connector of the above indicated type which in accordance with the invention is characterized in that the outside wall portion in its top surface has a valley extending along the longitudinal length of said outside wall portion and bounded by a ramp on each side, the ramp closest to the inside wall portion having a lip on its upper edge; and that the clamping member is movably attached to the outside wall portion, said clamping member having a rib movably attached to the outside wall portion and a latching member movable in the valley, said latching member in the retracted position being retained between the ramps in the valley and being transversely movable over the lip onto the upper surface of said carrier to clamp that carrier to the housing, thereby allowing for insertion and removal of the carrier mounted, integrated circuit package from the connector without frictional forces.

This embodiment of the connector according to the invention allows for zero force in-

section and removal of the integrated circuit package from the connector without causing damage to the package from frictional forces. Furthermore, the connector of this invention provides excellent contact between an integrated circuit package and another electrical device such as a circuit board and at the same time allows for the *conducting away from the connector* of heat generated by the electrical flows.

The connector includes a plurality of clamping latches movable from a ramp of a dielectric housing containing a plurality of contact springs complementary to the number of contact pads in the LSI circuit carrier. Movement of the clamping latch out of the housing valley over a ramp lip allows the clamping latch to press upon the top surface of an inserted LSI chip carrier. As the chip carrier is pressed down, it forcefully engages the spring contacts in the dielectric housing. The springs start to pivot and wipe across the corresponding carrier contact pads, wiping contamination to the edge of the contact area. As the chip carrier continues to press the spring contact down, the spring butts into a plane in the housing. This causes the contact spring to back wipe to a clean contact area. Consequently, the oxides or contaminants wiped aside by the first wipe will not interfere with the electrical connection.

The latch can be made with sufficient spring tension so that the LSI circuit package is pressed by the latch flush with a housing seating ledge. Alternatively, by balancing the force of the clamping latch with a higher contact spring force, a condition can be maintained that will even prevent breakage of a warped carrier. If such a carrier is pressed against a flat mounting surface there is a risk of breakage. Using this embodiment of the invention, the chip carrier will be suspended between the contact spring and the clamping latch.

By stamping the clamping latch out of a conductive metal the electrical heat is conducted out of the connector through the latch.

Brief Description of the Drawings

FIG. 1 is a perspective view showing three sides of an open connector with the LSI circuit package about to be inserted.

FIG. 2 is a perspective view showing three sides of a closed connector with the clamping latches in place on the upper surface of a LSI circuit package.

FIG. 3 is a sectioned perspective view of the connector of this invention latched onto a LSI circuit package. The phantom view of the clamping latch shows it in the open position.

FIG. 4 is a sectioned perspective view of an alternate embodiment of the connector of this invention.

FIG. 5 is an elevation in section of the connector shown in the FIG. 4 embodiment. This view shows one clamping latch and one pair of contact springs.

FIG. 6 is a diagrammatic top view of the contact springs showing their relative positions in the connector of FIG. 4.

FIG. 7 is a plan view of a stamped blank attached to a carrier strip. The blank is bendable into the inside contact spring shown in FIG. 4.

FIG. 8 is a plan view of a stamped blank attached to a carrier strip. This blank is bendable into the outside contact spring shown in FIG. 4.

Description of the Preferred Embodiment

Turning first to FIG. 1, there is shown a connector 10 comprising three one-price housing sections of a dielectric housing 12 and three clamping members 14. Within the body of each dielectric housing section, which comprises an outside wall portion and an inside wall portion, are spring receiving grooves 30 which locate the contact springs 16. These springs have an upper contact and wiping surface 44 which engages the underside of a LSI circuit package and makes electrical contact with the contact pads 40 of the LSI chip carrier 28. The male end 32 of the spring 16 is available for engagement with a circuit board. The male end 32 may project below the housing, at right angles to the housing or may be flush with the bottom of the housing. It may be soldered to the circuit board for permanent attachment. The outside wall portion in its top surface further has a valley 24 extending along the longitudinal length of said outside wall portion and bounded by a ramp on each side. The ramp closest to the inside wall portion comprises a lip 26 on its upper edge. The valley 24 has a shape complimentary to the lower curved or convex portion 22 of the clamping latch 18. In the open position the convex portion 22 of each latch 18 is located in the valley 24.

A typical connector of this invention will have from two to four sections. Since most LSI circuit packages have four sides with contact pads on each side it is expected that in most cases the connector of this invention will have four sections forming a square.

The clamping member further comprises the carrier strip 20 and pilot holes 42 stamped out of the carrier strip 20. The bottom portion of the clamping member 14 has a rib 34 which is received by a notch 36 (not shown in FIG. 1) in the dielectric housing 12. This notch acts as a pivot point for the clamping member 14.

The LSI chip carrier is lowered directly to the chip carrier seating ledge 38 of the connector 10 and is seated so that each contact pad 40 rests on a corresponding contact spring 16. If spring 16 tension is sufficient, the carrier 28 may rest on spring surface 44 without touching the seating ledge 38. The strip 20 is then pushed forward toward the LSI chip carrier 28 and the surface 22 of the clamping latch 18 moves up over the housing ramp lip 26 and snaps in on the top surface of the LSI chip car-

rier 28. The LSI chip carrier is now fully engaged as seen in FIG. 2 and the connector contact springs are in good electrical contact with the respective contact pads of the LSI circuit package 28.

FIG. 3 shows a portion of the connector in greater detail. Each clamping latch 18 is engaging the top surface of a LSI chip carrier 28. The phantom view shows each clamping latch 18A in the unloaded position. In the unloaded position, the clamping member 14A is not flush with the back wall of the dielectric housing 12. After the LSI chip carrier 28 is placed on the top of the seating ledge 38, the springs 16 are slightly depressed. Thereafter, as the clamping latches 18A are moved out of the valley 24 and over the lip of the ramp 26 and then on top of the LSI chip, additional pressure is placed on the springs 16. Additional pressure causes a progressive spring rate to be achieved. As the spring is deflected to a point of contact with a stop 39, further deflection will increase the contact force. This creates a backwipe. As the spring surface 44 backwipes the spring will deflect into an area 41. The movement of the wiping surface 44 on the contact spring 16 along the bottom portion of the LSI chip carrier 18 and in contact with the LSI pads 40 causes the pads to be cleaned. Each clamping member 14 pivots at its ribbed bottom point 34 in the lower receiving notch 36 of the dielectric housing 12 as the clamping member 14 is moved towards and away from the outside surface of the dielectric housing.

The clamping member 14 can be made of brass, aluminum, steel, phosphor bronze, cupro nickel or other conductive metal. It is highly desirable to have a metal which conducts heat easily. Such a clamping member will conduct heat generated by the electrical currents flowing between the LSI carrier pads and the spring contact 16 as well as heat generated by the electronic circuitry on the chip.

The spring contact 16 can be made of brass, cupro nickel, beryllium copper or phosphor bronze to facilitate good electrical contact with the contact pads 40 of the LSI chip carrier 28. The springs are stamped and bent in a conventional manner.

The dielectric housing 12 can be made of any moldable dielectric substance such as polycarbonate, or polyester.

The contact springs can be inserted into the molded housing on 508 to 635 centimeter centers and are specifically centered so as to coincide with the contact pads 40 on the LSI circuit package 28. The clamping member 14 is stamped by conventional processes providing for a cutting and bending out of the clamping latch 18 and a bending of the bottom of the metal constituting the clamping member 14 so that a rib 34 can be formed. Pilot holes are used to guide the metal as it is formed.

FIGS. 4-6 depict an alternate embodiment of the invention in which the single row of con-

tact springs 16A has alternately staggered bottom legs such that one row of bottom legs 32A exit from the outside portion of the dielectric housing 12 and another rows of bottom legs 32B exit from the inside portion of their housing. Serrated edges 48 on the springs hold them within the housing under frictional forces. As the chip carrier presses against the contact springs, the springs start to pivot and wipe across the contact pads wiping off contamination. The carrier continues to press the spring contact surface as the forward radius of the spring meets a camming surface 50. See FIG. 5. This latter surface moves the spring contact in reverse direction causing a backwipe situation. Deflection of the spring increases the contact force. Balancing the spring force of the clamping latch with the higher contact spring force, a condition may be maintained that will not force a warped carrier against a flat mounting surface risking breakage but will allow the chip carrier to be suspended between the contact spring and the clamping latch without giving up wiping, backwipe or high normal force. Conversely, spring contacts can be selected which will immobilize the chip carrier 28 by pressing it firmly against ledge 38A.

The connector shown in FIG. 4 operates similarly to the connector shown in FIG. 2. Movement of the clamping member 14 towards the housing 12 moves the latch 18 out of the valley 24 and onto the upper surface of the LSI circuit package 28. The clamping member 14 pivots on the pivot rib 34A which has a different configuration from the pivot rib 34 of the FIGS. 1-3 connector.

Each spring 16A has a test contact 43 which exits through the outside portion of the housing 12. Each contact can be used to test the electrical system corresponding to the spring attached to it. The legs 32A and 32B are inserted into holes 52 in a printed circuit board 51. The legs may be soldered to the circuit board. Stand off tabs 53 hold the connector slightly above the surface of the circuit board 51.

The springs can be made of the same substances as for the springs employed in the connector of FIG. 3.

FIGS. 7 and 8 show a stamped blank attached to its carrier strip. Each blank is stamped, bent and then cut from the strip to form an inside spring (FIG. 7) or an outside spring (FIG. 8), as used in the connector shown in FIG. 4.

The interior housing 12A of the connector of FIGS. 4-6 is designed to accommodate the two alternately staggered rows of bottom legs 32A, 32B.

The connectors of this invention can be used with LSI circuit packages in various electronic devices including those for automobile package assemblies, computers and electronic toys.

Claims

1. An electrical connector (10) adapted to receive a carrier mounted, integrated circuit package (28), said connector comprising an insulating plastic housing (12) including an integral housing section having an outside wall portion and an inside wall portion with a lowered carrier seating top ledge (38), a plurality of cavities (30) being provided in said housing section, each cavity (30) adapted to receive a contact spring (16, 16A) having a first contact surface (44, 44A) projecting above said top ledge (38) for contact with a contact pad (40) on a carrier (28) when inserted into said connector (10) and a second contact surface (32, 32A, 32B) at the bottom of said housing section for contact with another electrical device, and a clamping member (14), characterized in that the outside wall portion in its top surface has a valley (24) extending along the longitudinal length of said outside wall portion and bounded by a ramp on each side, the ramp closest to the inside wall portion having a lip (26) on its upper edge; and that the clamping member (14) is movably attached to the outside wall portion, said clamping member having a rib movably attached to the outside wall portion and a latching member (18, 18A) movable in the valley, said latching member (18, 18A) in the retracted position being retained between the ramps in the valley (24) and being transversely movable over the lip (26) onto the upper surface of said carrier (28) to clamp that carrier to the housing, thereby allowing for insertion and removal of the carrier mounted, integrated circuit package from the connector without frictional forces.

2. A connector according to claim 1 wherein the housing (12) consists of at least two integral housing sections.

3. A connector according to claim 1 wherein the housing (12) consists of at least three integral housing sections.

4. A connector according to claim 1 wherein the housing (12) consists of four integral housing sections forming a square.

5. A connector according to claim 1 wherein the first contact surface (44, 44A) of the contact spring (16, 16A) wipes and backwipes the contact pad (40) of a carrier (28) upon movements of the clamping member (14) toward said housing section (12).

6. A connector according to claim 1 wherein the clamping member (12) is stamped and formed from a conductive metal.

7. A connector according to claim 1 wherein each contact spring (16, 16A) butts into a stop (39) within said cavity (30) upon moving said latching member (18, 18A) onto the upper surface of a carrier (28) inserted into said connector.

The connectors of this invention can be used with LSI circuit packages in various electronic devices including those for automobile package assemblies, computers and electronic toys.

7. A connector according to claim 1 wherein each contact spring (16, 16A) butts into a stop (39) within said cavity (30) upon moving said latching member (18, 18A) onto the upper surface of a carrier (28) inserted into said connector.



Patentansprüche

1. Elektrischer Verbinder (10) zur Aufnahme eines auf einen Träger angeordneten integrierten Schaltungsbausteins (28), welcher Verbinder ein isolierendes Plastikgehäuse (12) mit einem integralen Gehäuseabschnitt besitzt, das einen äußeren Wandteil und einen inneren Wandteil mit einer Sitzoberkante (38) für den abgesenkten Träger aufweist, wobei in dem Gehäuseabschnitt eine Vielzahl von Hohlräumen (30) vorgesehen ist, von denen jeder eine Kontaktfeder (16, 16A) aufnehmen kann, die eine erste Kontaktfläche (44, 44A) hat, die über die erwähnte Oberkante (38) hinausragt zum Kontakt mit einem Kontaktkissen (40) auf einem Träger (28) beim Einsetzen in den Verbinder (10), und eine zweite Kontaktfläche (32, 32A, 32B) am Boden des erwähnten Gehäuseabschnitts zum Kontakt mit einer weiteren elektrischen Vorrichtung, und einen Klemmteil (14) besitzt, dadurch gekennzeichnet, daß der äußere Wandteil an seiner oberen Fläche eine Einkehlung (24) aufweist, die sich über die Längsrichtungslänge des äußeren Wandteils erstreckt und auf jeder Seite durch eine Rampe begrenzt ist, wobei die dem inneren Wandteil am nächsten liegende Rampe an ihrem oberen Rand eine Lippe (26) aufweist; und daß der Klemmteil (14) an dem äußeren Wandteil beweglich befestigt ist, welcher Klemmteil eine Rippe hat, die am äußeren Wandteil beweglich angebracht ist, und einen Klinkenteil (18, 18A), der in der Einkehlung beweglich ist, welcher Klinkenteil (18, 18A) in der zurückgezogenen Stellung zwischen den Rampen in der Einkehlung (24) gehalten und quer über die Lippe (26) auf die Oberseite des Trägers (28) beweglich, um den Träger am Gehäuse festzuklemmen, wodurch ermöglicht wird das Einsetzen und Entfernen des auf dem Träger angeordneten integrierten Schaltungsbausteins vom Verbinder ohne Reibungskräfte.

2. Verbinder nach Anspruch 1, bei welchem das Gehäuse (12) aus mindestens zwei integralen Gehäuseabschnitten besteht.

3. Verbinder nach Anspruch 1, bei welchem das Gehäuse (12) aus mindestens drei integralen Gehäuseabschnitten besteht.

4. Verbinder nach Anspruch 1, bei welchem das Gehäuse aus vier integralen Gehäuseabschnitten besteht, die ein Vierkant bilden.

5. Verbinder nach Anspruch 1, bei welchem die erste Kontaktfläche (44, 44A) der Kontaktfeder (16, 16A) das Kontaktkissen (40) eines Trägers (28) bei Bewegungen des Klemmteils (14) zu dem erwähnten Gehäuseabschnitt (12) hin- und zurückbestreicht.

6. Verbinder nach Anspruch 1, bei welchem der Klemmteil (14) aus einem leitenden Metall gestanzt und geformt ist.

7. Verbinder nach Anspruch 1, bei welchem jede Kontaktfeder (16, 16A) gegen einen Anschlag (39) innerhalb des Hohlraums (30) anliegt, wenn sich der Klinkenteil (18, 18A) auf die

Oberfläche eines Trägers (28) bewegt, der in den Verbinder eingesetzt ist.

Revendications

1. Connecteur électrique (10) adapté à recevoir un boîtier (28) de circuit intégré monté sur un support, ledit connecteur comprenant une enveloppe en matière plastique isolante (12), laquelle inclut une portion d'enveloppe solidaire comportant une partie à paroi extérieure et une partie à paroi intérieure avec un méplat supérieur (38) d'assise du support abaissé, une multiplicité de cavités (30) étant ménagées dans ladite portion d'enveloppe, chaque cavité (30), adaptée à recevoir un ressort de contact (16, 16A), qui comporte une première surface de contact (44, 44A), faisant saillie au-dessus dudit méplat supérieur (38), pour établir un contact avec une garniture de contact (40) montée sur un support (28) lorsqu'il est inséré dans ledit connecteur (10), et une deuxième surface de contact (32, 32A, 32B) au bas de ladite portion d'enveloppe pour établir un contact avec un autre dispositif électrique, et un organe de serrage (14), ledit connecteur étant caractérisé en ce que la partie à paroi extérieure comporte dans sa surface supérieure un renforcement (24) s'étendant sur toute la longueur de ladite partie à paroi extérieure et limité par une rampe de chaque côté, la rampe située la plus près de la partie à paroi intérieure présentant une lèvre (26) à son bord supérieur et en ce que l'organe de serrage (14) est attaché de façon déplaçable à la partie à paroi extérieure, ledit organe de serrage comportant une nervure attachée de manière déplaçable à la partie à paroi extérieure et un organe de verrouillage (18, 18A) pouvant se déplacer dans le renforcement, ledit organe de verrouillage (18, 18A) étant retenu dans la position rétractée entre les rampes du renforcement (24) et étant déplaçable dans le sens transversal par-dessus la lèvre (26) jusqu'à la surface supérieure dudit support (28) pour serrer ce support contre l'enveloppe, ce qui permet l'insertion et l'enlèvement du boîtier de circuit intégré, monté sur support, relativement au connecteur, sans force de friction.

2. Connecteur selon la revendication 1, dans lequel l'enveloppe (12) est constituée par au moins deux portions d'enveloppe solitaires.

3. Connecteur selon la revendication 1, dans lequel l'enveloppe (12) est constituée par au moins trois portions d'enveloppe solitaires.

4. Connecteur selon la revendication 1, dans lequel l'enveloppe (12) est constituée par quatre portions d'enveloppe solitaires, formant un carré.

5. Connecteur selon la revendication 1, dans lequel la première surface de contact (44, 44A) du ressort de contact (16, 16A) balaie dans un sens et dans l'autre la garniture (40) d'un support (28) lors des mouvements de l'organe de serrage (14) en direction de ladite portion



l'enveloppe (12).

6. Connecteur selon la revendication 1, dans lequel l'organe de serrage (12) est embouti et formé à partir d'un métal conducteur.

7. Connecteur selon la revendication 1, dans lequel chaque ressort de contact (16, 16A) bute

contre un arrêt (39) à l'intérieur de ladite cavité (30) lors du déplacement dudit organe de verrouillage (18, 18A) jusqu'à la surface supérieure d'un support (28) inséré dans ledit connecteur.

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