PRODUCT INFORMATION

Vol.93

Ultraminiature High-Frequency Bipolar Transistor Series Developed

The industry's smallest and thinnest E-CSP™ leadless package adopted.

EC3H01B to EC3H07B, EC3H02C, and EC3H04C

Overview

The market for mobile electronic equipment, such as notebook personal computers and cellular telephones, is growing rapidly due to increasing and diversifying needs for data communication. While it goes without saying that there are desires for improved performance and increased functionality in this equipment, at the same time the demands for the convenience of lighter weight and further miniaturization are increasing rapidly. Although Sanyo and other semiconductor manufacturers have worked towards miniaturizing the semiconductor devices used in this equipment, those efforts have centered on IC products. Now, there are also strong demands for miniaturization in the high-frequency discrete devices used in this area.

In December 1998, Sanyo developed the E-CSP™ (environmentally-considered chip scale package) ultraminiature environmentally friendly leadless package that does not require a lead frame. In addition to eliminating the use of lead in transistor manufacturing, the E-CSP™ reduces the amount of waste epoxy resin to less than 1/30 of that in earlier Sanyo packages. Sanyo has now developed and is releasing as commercial products, the industry's smallest high-frequency bipolar transistor product series by adopting the E-CSP™ package with its environmentally friendly manufacturing process.

This series consists of seven E-CSP 1006 package products (the EC3H01B, EC3H02B, EC3H03B, EC3H04B, EC3H05B, EC3H06B, and EC3H07B) and two E-CSP 1008 package products (the EC3H02C and EC3H04C) for a total of nine products.

While the smallest lead type package under current industry standards is the SC-75A, which has external dimensions of 1.6 × 1.6 × 0.75 mm and a weight of 3 mg, the packages used for this newly-developed bipolar transistor series have dimensions and weights of 1.0 × 0.6 × 0.5 mm and 0.9 mg for the E-CSP 1006 and 1.0 × 0.8 × 0.6 mm and 1.2 mg for the E-CSP 1008. Thus, when compared to earlier Sanyo products (SMCP package products) equivalent to the SC-75A, these new products feature mounting areas of only 1/4 to 1/3 and thicknesses of 2/3 to 4/5 of earlier products. Furthermore, these new products achieve significant weight reductions to a mere 1/3 to 2/5 of the weight of earlier products.

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The actual chips encapsulated in these new packages are manufactured using Sanyo's third and fourth generation ultrahigh frequency bipolar processes and feature not only low-voltage low-power designs, but also high fT values (5 to 12.5 GHz). Furthermore, they assure high reliability by using gold connections.

These devices are optimal for use in the VCO (voltage controlled oscillator) circuit in cellular telephones, a product in which further miniaturization and lighter weights are desired, and in all types of miniature portable equipment that handles high-frequency signals.

Features

E-CSP Package Features

- No lead frame is used. Instead, these products adopt selective resin formation using a ceramic substrate.
- Lead is eliminated from the transistor manufacturing process, the amount of the molding epoxy resin used is reduced to 1/10, and the amount wasted is reduced to 1/30, of that of earlier Sanyo products on a per-package basis, thus achieving a truly environmentally-friendly manufacturing process.

High-Frequency Bipolar Transistor Series Product Features

- Miniaturization and weight reduction achieved by the adoption of the E-CSP 1006 and E-CSP 1008 environmentally-friendly ultraminiature leadless packages, which have dimensional tolerances of ±50 µm. Note that the E-CSP package has a package height of 0.5 mm, placing it in the industry's thinnest package height class.
- Optimal characteristics for oscillators and amplifiers in the 100 MHz to 2 GHz frequency range, as typified by the ultraminiature VCO circuits used in cellular telephones. Gold electrodes (Ti-Pt-Au) are adopted for all chip electrode wiring pattern lines for high reliability. Furthermore, the EC3H07B achieves an fT of 10 GHz at 1 V (and 12.5 GHz at 3 V), due to a 0.5 µm emitter, and a low-voltage, low-power design.

Products and Applications

Products

- High-frequency bipolar transistor series (fT: 5.0 to 12.5 GHz)

  E-CSP 1006 package products: 7 products

  E-CSP 1008 package products: 2 products

Applications

- VCO circuits in cellular telephones and a wide variety of high-frequency miniature portable equipment.

Specifications

E-CSP high-frequency bipolar transistor series

Type No.	Package	VCEO (V)	IC (mA)	OC (mW)	hFE	fT (GHz)
EC3H01B	1006	12	50	100	100 to 180	5.0
EC3H02B	1006	10	70	100	100 to 180	7.0
EC3H03B	1006	12	100	100	100 to 180	7.5
EC3H04B	1006	6	100	100	100 to 180	8.0
EC3H05B	1006	8	50	100	100 to 180	9.0
EC3H06B	1006	10	30	100	100 to 180	11.0
EC3H07B	1006	4	30	100	100 to 160	12.5
EC3H02C	1008	10	70	100	100 to 180	7.0
EC3H04C	1008	6	100	100	100 to 180	8.0

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Sample Availability

These devices will be available in sample quantities in November 1999 and in production quantities in December 1999.

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