
PRODUCT INFORMATION

Vol.103

Single-Chip ETR Controller ICs Developed

Optimal for reducing power

LC72346W, LC72347W, LC72314W, LC72315W, LC72316W

Overview

Total worldwide production of battery-operated portable audio equipment, such as headphone stereo units with built-in radios and portable radios has now reached several tens of millions of units per month. These radios adopt either analog or electronic tuning systems. Currently, between 20 and 30% of these radio products adopt an electronic tuning system, with the ratio increasing every year.

An increasing number of portable audio equipment products that use electronic tuning adopt the use of an ETR (electronic tuning radio) controller, which is a microcontroller that integrates ROM, RAM, a PLL circuit, and an LCD driver on the same chip. As a result, this allows receiver circuits to be constructed easily and contributes to end product miniaturization.

While the adoption of ETR controllers is increasing in new radio products, there are also increasing desires for reduced power consumption in these devices to allow shifting from two-battery operation to single-battery operation. To respond to these needs, Sanyo has now developed five new ETR controller products that are all fabricated in a newly-developed process that supports operating voltages in the range 0.9 to 1.8 V. As a result, these new products can operate easily from a single dry-cell battery.

Sanyo achieved several technological improvements in these products that can contribute to lower total end product costs. First, the LCD driver power supply must maintain a well-stabilized 3.0 V level even though the operating voltage changes over the 0.9 to 1.8 V range. Sanyo developed a unique step-up DC-DC converter technique to provide this stable voltage. Second, although a clock is required to operate normal DC-DC converter circuits, harmonics of this clock frequency may appear in the reception frequency band of the radio and cause interference. However, the DC-DC converter used in these ICs adopts a technique in which the clock frequency is changed with the frequency received so that the harmonics cause no interference. Furthermore, the power supply provided by the DC-DC converter can also be used to power external ICs, such as EEPROMs, and a varactor power supply can be created by using a coil with this DC-DC converter circuit.

The on-chip PLL circuit featured by these products can operate at up to 250 MHz over the whole power supply voltage range of 0.9 to 1.8 V, and the sensitivity of the local input amplifier used for AM and FM reception has been improved. Since these features mean that it is no longer necessary to

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increase the amplitude of the local oscillator, it is easy to meet FCC interference standards even with these devices.

Finally, a Sanyo-original circuit structure significantly increases the memory retention time when a small capacitor is used, thus allowing even further end product cost reductions.

Features

- Increased memory capacity (See section, Specifications, for details)
 - ROM: 8 Kbytes (4096 ×16 bits) LC72346
 - 16 Kbytes (8192 ×16 bits) LC72316
 - RAM: 256 ×4 bits LC72346
 - 512 ×4 bits LC72346/316
- Cycle time
 - 40 μs (all single-word instructions) 75 kHz crystal oscillator
- LCD driver
 - Up to 112 segments
 - 1/4-duty 1/2-bias drive
- Advanced functionality
 - Two external interrupts
 - One timer interrupt
 - 4-input A/D converter
 - Large set of I/O ports
- DC-DC converter
 - LCD stepped-up voltage supply (3 V)
 - Can be used as a tuning voltage generation circuit (12 V)
 - Can be used to power external circuits (3 V)
- Memory retention circuit
 - Provides a long memory retention time even when a small capacitor is used. For example, earlier Sanyo products required a 220 μF capacitor to achieve a 15-minute retention time, whereas these products only require a 3.3 μF capacitor.

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Specifications

	LC72346W	LC72347W	LC72314W	LC72315W	LC72316W
Package	SQFP64	SQFP64	SQFP80	SQFP80	SQFP80
Supply voltage	0.9 to 1.8 V	0.9 to 1.8 V	0.9 to 1.8 V	0.9 to 1.8 V	0.9 to 1.8 V
ROM (×16)	4096	6144	4096	6144	8192
RAM (×14)	256	512	256	512	512
LCD driver	Up to 80 segments		Up to 112 segments		
I/O ports	Up to 33 ports		Up to 38 ports		
DC-DC	3 V system and 12 V system outputs				
ADC	6-bit successive-approximation A/D converter with 4 input channels				
Serial I/O	One serial I/O system				
Evaluation chip	LC72EV346				

Sample Availability

The LC72346 Series will be available in sample quantities in September 2000, while the LC72314 Series will be available in sample quantities in August 2000. Production of 100,000 units per month of each of these device is planned in early 2001.

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