

Spread Spectrum Clock Generator Capable of Freely Setting the Output Clock Frequency

MB88R157A

We have added MB88R157A with built-in FRAM to our lineup of spread spectrum clock generator (SSCG) products that are effective measures against EMI noise. The output frequency can be set at the user's discretion between 1MHz and 134MHz for the input frequency of 10MHz to 50MHz.

* SSCG: Spread Spectrum Clock Generator

* FRAM: Ferroelectric Random Access Memory (nonvolatile memory utilizing ferroelectric)

Introduction

In recent years, electronic devices have adopted higher performance (speed) and smaller sizes (higher density) and, as a result, their noise emission has been growing steadily. Noise problems are often the final challenge to overcome prior to the mass production of a product following the trial and error of product design and evaluation. As electrical signals (the clock frequency that operates a system) and noise are intrinsically the same, it is important to take noise countermeasures into consideration at the board system design stage of a product.

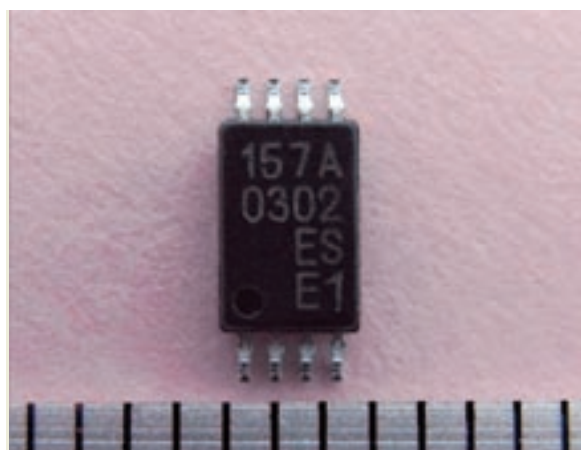
This product not only simplifies noise countermeasures but also dramatically saves on the time spent developing noise countermeasures later, thereby minimizing the cost and evaluation time.

What is SSCG?

SSCG is a product that reduces the emission of unnecessary noise by slightly fluctuating (modulating) the clock frequency that is the source of noise in a range that does not affect the system operation.

Our SSCG controls the clock frequency in an ideal fashion by applying our proprietary digitally controlled (current D/A converter) "frequency modulation technology" and "composite modulation technology." It achieves -19dB (measurement value by FUJITSU, 1.5% modulation degree used), which corresponds

Photo 1 External View



to 1/100 in power.

The noise emitted from electrical devices (EMI) is regulated by various international standards, including CISPR, as it has negative effects (e.g., it can cause other electronic devices to malfunction). Our SSCG digitally controls the clock frequency that is the source of EMI noise. In this way, it is possible to avoid unexpected noise generation and to easily satisfy international standards.

Figure 1 presents a diagram of the spread spectrum, and **Figure 2** the EMI reduction effect on an actual board.

Product Features

MB88R157A we have developed is not dependent on the input frequency and the output frequency can be set at the user's discretion. It is thus possible to generate a unique clock frequency within digital devices such as TVs, DVD players and audio devices that can simultaneously be utilized as a noise countermeasure.

The major advantages of SSCG include the following:

- Our proprietary digital control technology delivers a high noise reduction effect; it is possible to evaluate the actual noise with the product built onto the board.

Figure 1 Spread Spectrum

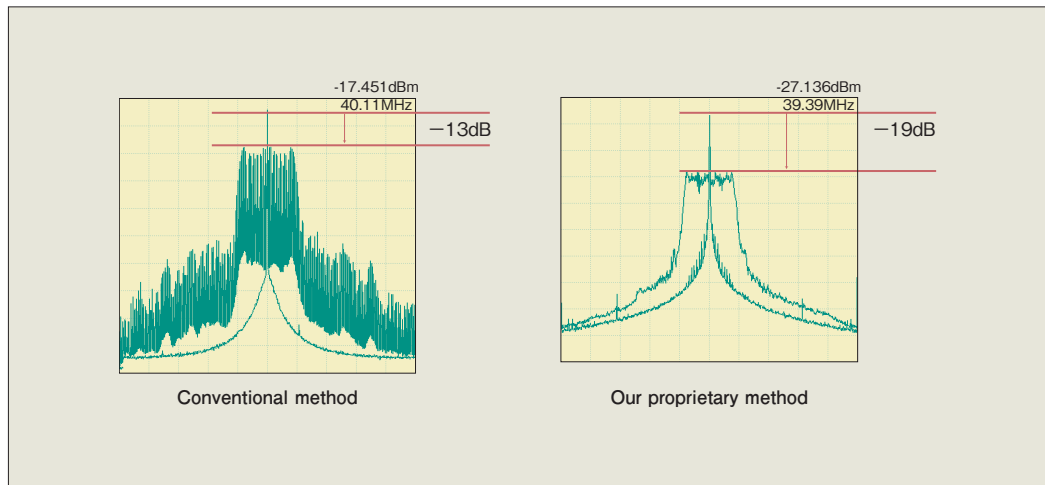


Figure 2 EMI Reduction Effect in Actual Boards

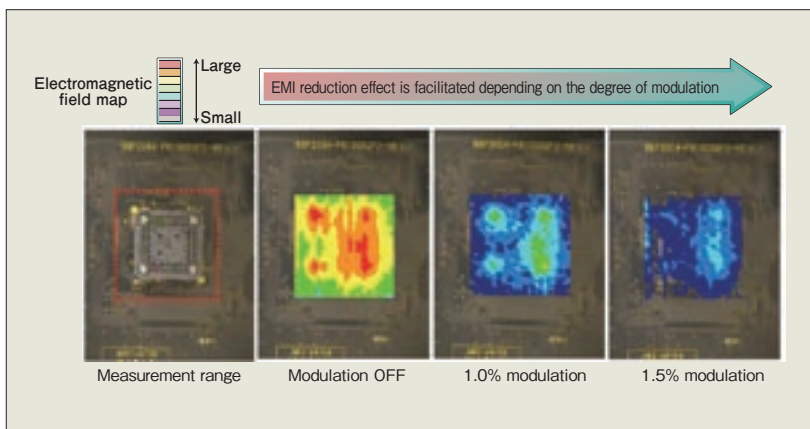
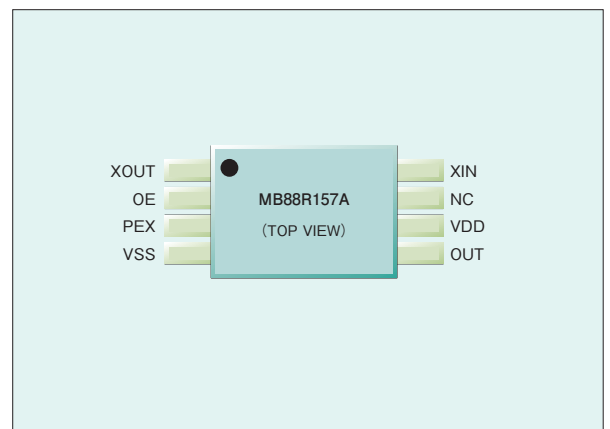


Figure 3 Pin Assignments



- A dramatic reduction in the number of conventional noise countermeasure parts, such as shields, beads and capacitors, can be realized.
- Time and man-hours can be reduced dramatically compared to conventional noise countermeasures that use parts (which require evaluation and measure/layout change/building and re-measurement).

Figure 3 presents the pin assignments, **Table 1** the pin functions and **Table 2** the parameters that can be set through the program.

Evaluation Board and FRAM Writing Environment

For this product, we offer an evaluation board and writing environment with a built-in LSI to simplify single unit evaluation and property check. We also offer a GUI program to enable the simple calculation of the parameter data to be programmed as the FRAM writing environment.

Figure 4 presents an example of a connection to a writing environment.

Table 1 Pin Functions

Pin code	I/O	端子番号	Description of function
XOUT	O	1	Connection terminal for crystal oscillator
OE	I	2	Output enable terminal
SP	I/O	3	Serial program terminal
VSS	—	4	GND terminal
OUT	O	5	Clock output terminal
VF	I	6	Variable function terminal *Modulation enable, power down control, Hi or Low output can be set depending on the setting in the memory.
VDD	—	7	Power supply voltage terminal
XIN	I	8	Connection terminal/clock input for crystal oscillator

Table 2 Main Setup Functions

Functions set by the program	Function details
M/N/K divider parameter	The multiplication rate for output clock frequency can be set.
L divider parameter	Modulation cycle can be set.
Charge pump current/gain	An optimal value can be set for PLL oscillation frequency.
Modulation degree setting	The degree of modulation can be selected in units of 0.25% from modulation off, $\pm 0.25\%$ to $\pm 1.75\%$.
OUT terminal level	OUT terminal status can be set at L output or Hi-Z when OE terminal = L.
Clock output drive capacity	The drive capacity for OUT terminal can be selected (2 stages).
XIN/XOUT terminal oscillation stability capacity value	The built-in oscillation stability capacity can be set in units of 0.039pF from 5pF to 10pF each.
SS/PLL mode	Whether or not SS functions are used or the highly precise PLL mode is used can be selected.

※A PC GUI software program to calculate the optimal parameter values in the table is available.

Lineup

After adding this programmable product (single output) to the existing lineup of single output products, we will continue to expand the lineup in the future to address the needs of our customers.

Figure 5 presents the lineup of our clock generator products. *

Figure 4 Connection Example to a Writing Environment

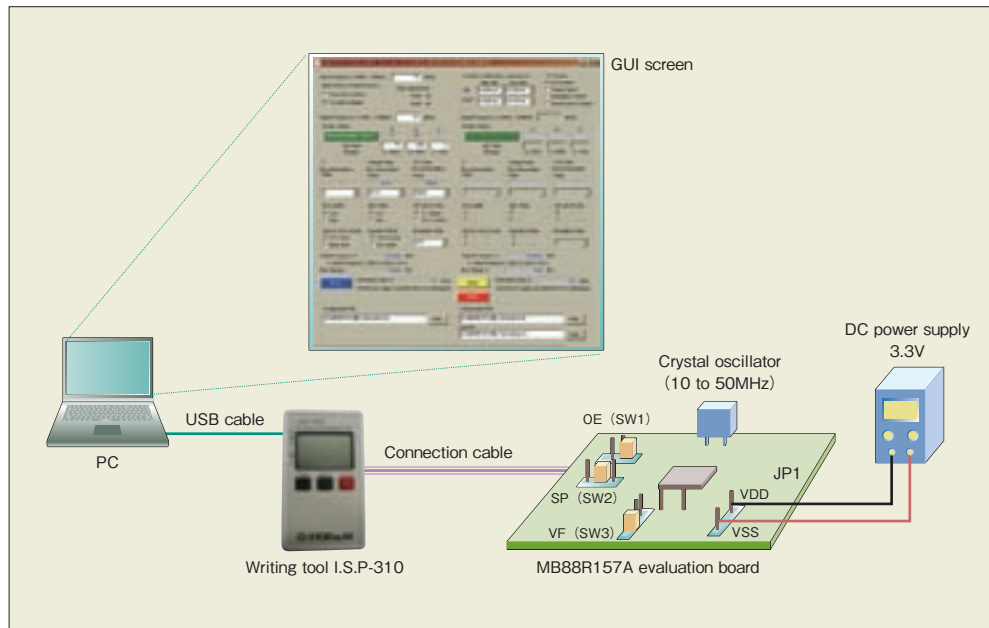


Figure 5 Product Lineup

