

# General Description of Micro QR Code

## 1. The Background of its Development

Recently, requests are mounting for traceability to guarantee reassurance and safety for the target product. To enable tracing management of components and products, the target component or product would need to have identification codes attached to it. Extremely small components and products have limited space for having identification codes attached. If these identification codes are attached by using labels, they may fall off across the ages or due to the conditions in its usage environment. The solution for this is to utilize direct marking. Especially by the development of laser markers, extremely small identification codes have become able to be directly marked upon electronic components, printed circuit boards, and automotive components to ensure production management or traceability. Direct marking by laser markers enables highly accurate, fine markings. It also requires less cost than having labels attached, and can be semipermanently used since they would not be erased even when they are heat- or wash-treated during the manufacturing process. Direct marking is rapidly becoming popular due to the launch of matrix-type two-dimensional symbols and the performance improvement of the laser markers. Due to this popularity of direct marking, an extremely-small symbol containing approx. 10 digits of numerical characters has become required. Traditionally, small products such as cosmetics, medical goods, medical material, stationeries, and precious metals did not have enough space for marking linear symbols, and therefore were difficult to inspect the goods or to implement the POS system. This had led the development of micro QR code which handles small-volume data and prioritizes data efficiency. The relationship between the data volume and code size for linear symbols, QR Codes, and Micro QR Codes are described in Fig.1.

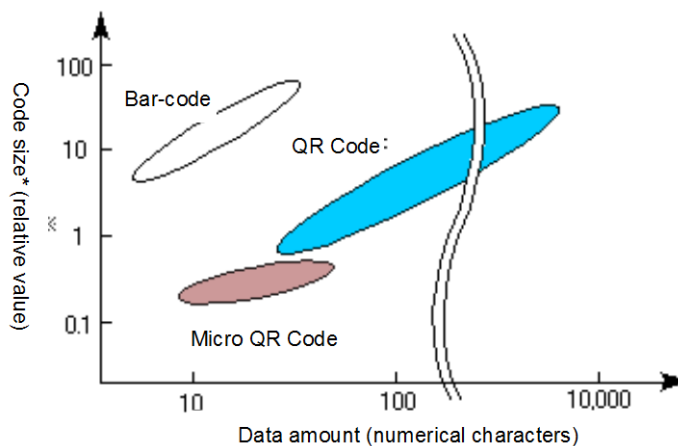


Fig. 1 Relationship between Micro QR Code and QR Code

## 2. Characteristics of the Micro QR Code

Micro QR Code is designed to have the symbol size smaller than QR Code targeting applications with smaller printing area and not requiring data with many digits. Many of the other characteristics such as the encoding method for data characters and error correction methods are the same with those for QR Code.

### 2-1. Requiring Less Space

By having the minimum required functionality cell for reading (1 cut out symbol and

timing cell along 2 sides), and having only 2 cells allocated for the quiet zone, the symbol has become to require less space. In case where the data is consisted of 10 digits of numerical characters, the total area for the Micro QR Code will be approx. 25% of that for a QR Code.

### 2-2. Error Correction Functionality

Micro QR Code has 3 different levels of error correction level (7%, 15%, and 25% per symbol area) using Reed-Solomon, as is the case for QR Code. The user according to the usage environment can select the error correction level.

### 2-3. Masking Process

As in the case for QR Codes, Micro QR Codes are also mask processed. Since Micro QR Codes have only 1 finder pattern, the code borderline between the 2 sides having no timing cells (the side on the right and at the bottom in Fig.2) are difficult to be distinguished. As a result, the assessment criteria for the masking process is to identify the masking patterns with more black cells on the cell line along the 2 sides with no timing cell to distinguish the code borderline easier.

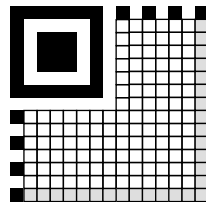


Fig. 2 Masking Process

## 3. The Micro QR Code Structure

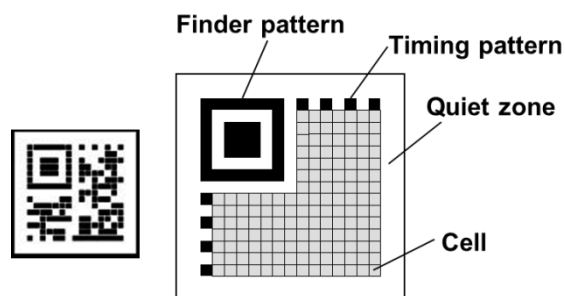
Micro QR Code is a two-dimensional symbol, which had been created by improving the data storage efficiency of a QR Code. To enable high-speed reading, there is only 1 finder pattern and therefore the data storage efficiency has been improved. Micro QR code has functionality patterns of finder pattern, timing pattern, and quiet zone. An example symbol of a Micro QR Code is shown in Fig.3.

### 3-1. Finder Pattern

The Finder pattern is for detecting the position of the Micro QR Code. Where QR Code has this finder pattern arranged in 3 of its corners, Micro QR Code has this pattern arranged at only 1 corner to increase the data area. Even if the finder pattern is placed at only 1 corner, the position and the angle of the code can be detected.

### 3-2. Timing Pattern

A pattern for identifying the central coordinate of the Micro QR Code cell, and black and white patterns are arranged alternately. It will be used for correcting the central coordinate of the data cell when the symbol is distorted or some error is occurred for the cell pitch. It is arranged along 2 sides surrounding the finder pattern in a structure to enable correction on both vertical and horizontal direction.



**Fig. 3 Micro QR Code Structure**

**3-3. Quiet Zone**

The quiet zone is necessary for identifying the symbol when reading the QR Code. This quiet zone makes it easier to detect the symbol borderline. Micro QR Code requires a quiet zone consisted of 2 or more cells.

**3-4. Data Area**

The data for Micro QR Code will be encoded into the data area. The part not included in the finder pattern, timing pattern, and the quiet zone (the grey zone) is the data area. The data will be encoded into '0' and '1' to be converted into black and white and will be arranged into a symbol. The data area contains the stored data and the Reed-Solomon Code for enabling the error correction functionality as in the case for QR Codes.

**4. Specifications of the Micro QR Code**

The rough specifications of the Micro QR Code are as described in Table 1.

**Table.1 Specifications of the Micro QR Code**

Symbol size	11x11 cells, 13x13 cells, 15x15 cells, and 17x17 cells (2 cells for the quiet zone)	
Information type and volume	Numerical characters	35 characters at maximum
	Alphabets, signs	21 characters at maximum
	Binary (8 bit)	15 characters at maximum
	Kanji characters	9 characters at maximum
Error correction levels	Level L	Approx. 7% of the symbol area restored at maximum
	Level M	Approx. 15% of the symbol area restored at maximum
	Level Q	Approx. 25% of the symbol area restored at maximum

**5. Standardizing the Micro QR Code**

Micro QR Code has been proposed to ISO/IEC JTC1SC31 separately from QR Code. It had been approved during the deliberation stage for SC31 to be added to the QR Code standard (ISO/IEC 18004), and in 2006, ISO/IEC 18004 was revised to a standard containing that for Micro QR Codes.