

September 2008

Dear Customer

## **Important Notices**

Thank you for your continued patronage of Toshiba microcontrollers.

This page gives you important information on using Toshiba microcontrollers. Please be sure to check each item for proper use of our products.

▶ **Caution in Setting the UART Noise Rejection Time** (September 2008)

\* If your datasheet is dated 1 July 2008 or earlier, please download the latest datasheet or request it from your local Toshiba office.

▶ **Datasheet Correction regarding the Absolute Maximum Rating (Output Voltage)** (September 2007)

\* If your datasheet is dated 2 March 2007 or earlier, please download the latest datasheet or request it from your local Toshiba office.

▶ **Note on Using the Serial Expansion Interface (SEI)** (November 2006)

\* If your datasheet is dated 19 September 2006 or earlier, please download the latest datasheet or request it from your local Toshiba office.

▶ **Announcement of Restrictions on Use of 16-bit Timer** (December 2005)

\* If your datasheet is dated 26 October 2005 or earlier, please download the latest datasheet or request it from your local Toshiba office.

## TOSHIBA Microcontrollers TLCS-870 Family

### TLCS-870/X Series

|           |            |            |           |            |           |           |
|-----------|------------|------------|-----------|------------|-----------|-----------|
| TMP88CH40 | TMP88CH40I | TMP88PH40  | TMP88CH41 | TMP88PH41  | TMP88FH41 | TMP88CS42 |
| TMP88PS42 | TMP88CS43  | TMP88FW44  | TMP88FW45 | TMP88FW45A | TMP88F846 | TMP88CH47 |
| TMP88CK48 | TMP88CM48  | TMP88CS48A | TMP88CK49 | TMP88CM49  | TMP88C060 |           |

### TLCS-870/C Series

|            |             |            |            |            |            |            |
|------------|-------------|------------|------------|------------|------------|------------|
| TMP86P202  | TMP86P203   | TMP86CH06  | TMP86CH06A | TMP86PH06  | TMP86C906  | TMP86C407  |
| TMP86C407I | TMP86C407S  | TMP86C807  | TMP86C807I | TMP86C807S | TMP86F807  | TMP86P807  |
| TMP86C408  | TMP86C408I  | TMP86C408S | TMP86C808  | TMP86C808I | TMP86C808S | TMP86F808  |
| TMP86P808  | TMP86C908   | TMP86C809  | TMP86CH09  | TMP86F409  | TMP86F809  | TMP86FH09  |
| TMP86FH09A | TMP86C909   | TMP86C912  | TMP86CH12  | TMP86FH12  | TMP86C420  | TMP86C820  |
| TMP86P820  | TMP86CH21   | TMP86CH21A | TMP86C822  | TMP86CH22  | TMP86PH22  | TMP86CP23  |
| TMP86CP23A | TMP86CM23   | TMP86CM23A | TMP86FS23  | TMP86PM23  | TMP86PS23  | TMP86C923  |
| TMP86FP24  | TMP86CM25   | TMP86CM25A | TMP86CS25  | TMP86CS25A | TMP86FM25  | TMP86PS25  |
| TMP86C925  | TMP86FM26   | TMP86CM27  | TMP86CP27A | TMP86FS27  | TMP86PS27  | TMP86C927  |
| TMP86CS28  | TMP86FS28   | TMP86C829  | TMP86C829A | TMP86C829B | TMP86CH29  | TMP86CH29A |
| TMP86CH29B | TMP86CM29   | TMP86CM29A | TMP86CM29B | TMP86CM29L | TMP86FM29  | TMP86PM29  |
| TMP86PM29A | TMP86PM29B  | TMP86C929A | TMP86CS41  | TMP86CS43  | TMP86CS44  | TMP86PS44  |
| TMP86C944  | TMP86C845   | TMP86C846  | TMP86CH46A | TMP86CM46A | TMP86FH46  | TMP86FH46A |
| TMP86PH46  | TMP86PM46   | TMP86C847  | TMP86C847I | TMP86C847S | TMP86CH47A | TMP86CH47I |
| TMP86CH47S | TMP86CM47A  | TMP86FH47  | TMP86FH47A | TMP86PH47  | TMP86PM47  | TMP86PM47A |
| TMP86C947  | TMP86FM48   | TMP86C948  | TMP86CH49  | TMP86CM49  | TMP86CS49  | TMP86FS49  |
| TMP86FS49  | TMP86FS49AI | TMP86FS49B | TMP86PM49  | TMP86C949  | TMP86CS64  | TMP86CS64A |
| TMP86FS64  | TMP86PS64   | TMP86C964  | TMP86CH72  | TMP86CM72  | TMP86PM72  | TMP86C972  |
| TMP86CK74A | TMP86CM74A  | TMP86PM74A | TMP86C974  | TMP86CH87R | TMP86CM87R | TMP86PM87R |
| TMP86C987  | TMP86C989   | TMP86CH92I | TMP86CH92S | TMP86FH92  | TMP86FH92I | TMP86FH93  |
| TMP86C993  |             |            |            |            |            |            |

### TLCS-870 Series

|           |           |           |           |           |            |           |
|-----------|-----------|-----------|-----------|-----------|------------|-----------|
| TMP87CH29 | TMP87CK29 | TMP87CM29 | TMP87PM29 | TMP87CH48 | TMP87CH48I | TMP87CM48 |
| TMP87PH48 | TMP87PM48 | TMP87CM53 | TMP87PM53 | TMP87CS68 | TMP87PS68  |           |

\*Applicable products include all TLCS-870 Family microcontrollers with the UART function including custom products and products supplied as bare chips that are not listed above. If you have any questions, please contact your local Toshiba sales representative.

September 2008

## Caution in Setting the UART Noise Rejection Time

With regard to the TLCS-870, TLCS-870/X and TLCS-870/C Series of Toshiba's 8-bit microcontrollers listed above, please be informed that certain combinations of transfer clock frequency and noise rejection time should not be used in the UART (asynchronous serial interface) as explained below. If you need further information, please contact your local Toshiba sales representative.

### [Applicable Usage Conditions]

This caution applies when the timer/counter interrupt is selected as a transfer clock of the UART and the transfer clock frequency (fc) and the RXD input noise rejection time are set to one of the combinations shown in the table below. Under any other conditions, the noise rejection can be used without any problem.

| Communication mode setting | Transfer clock select             | Transfer clock frequency [Hz] (Note) | RXD input noise rejection time setting                | fc frequency [MHz] | Communication speed [bps] |
|----------------------------|-----------------------------------|--------------------------------------|---|--------------------|---------------------------|
| Receive operation (RXE=1)  | Timer/counter interrupt (BRG=110) | fc/8                                 | Reject pulses shorter than 31/fc as noise (RXDNC=01)  | 1.229              | 9600                      |
|                            |                                   |                                      |   | 2.458              | 19200                     |
|                            |                                   |                                      |   | 4.915              | 38400                     |
|                            |                                   |                                      |   | 9.830              | 76800                     |
|                            |                                   | fc/16                                | Reject pulses shorter than 63/fc as noise (RXDNC=10)  | 1.229              | 4800                      |
|                            |                                   |                                      |   | 2.458              | 9600                      |
|                            |                                   |                                      |   | 4.915              | 19200                     |
|                            |                                   |                                      |   | 9.830              | 38400                     |
|                            |                                   | fc/32                                | Reject pulses shorter than 127/fc as noise (RXDNC=11) | 1.229              | 2400                      |
|                            |                                   |                                      |   | 2.458              | 4800                      |
|                            |                                   |                                      |   | 4.915              | 9600                      |
|                            |                                   |                                      |   | 9.830              | 19200                     |
|                            |                                   |                                      |   | 19.661             | 38400                     |

Note: The transfer clock is calculated by the following equation:

$$\text{Transfer clock [Hz]} = \text{Timer/counter source clock [Hz]} \div \text{TREG set value}$$

**[Problem]** In receive operation (RXE=1), input data on the RXD pin may not be received properly.

**[Workaround]** If you are using the UART with one of the above noise rejection time settings, disable the noise rejection or change the noise rejection time to a shorter period.

**TOSHIBA Microcontrollers TLCS-870/C Family****TLCS-870/C Series**TMP86C407/I/S  
TMP86C808/I/S  
TMP86PM87RTMP86C807/I/S  
TMP86P808  
JT5BR6TMP86P807  
TMP86CM87R  
JT5V97TMP86C408/I/S  
TMP86CH87R

November 2007

Dear Customer,

**Datasheet Correction regarding the Absolute Maximum Rating (Output Voltage)**

The following correction will be made to the technical datasheets in the next revision. We would therefore like to inform customers about it. If you have any questions or require any further information, please contact your local sales office.

**[Correction to be made]**

- **The absolute maximum rating for the output voltage should be corrected to "-0.3 to  $V_{DD}+0.3$  (V)" at all ports, as shown below.**

Before correction

| Parameter      | Symbol     | Pins                      | Rating               | Unit |
|----------------|------------|---------------------------|----------------------|------|
| Output Voltage | $V_{OUT1}$ | P21, P22, Tri-state Port  | -0.3 to $V_{DD}+0.3$ | V    |
|                | $V_{OUT2}$ | P20, Sink Open Drain Port | -0.3 to 5.5          | V    |

After correction

| Parameter      | Symbol    | Pins | Rating               | Unit |
|----------------|-----------|------|----------------------|------|
| Output Voltage | $V_{OUT}$ |      | -0.3 to $V_{DD}+0.3$ | V    |

**TOSHIBA Microcontrollers TLCS-870 Family**  
**TLCS-870/C Series**

|               |               |           |           |               |
|---------------|---------------|-----------|-----------|---------------|
| TMP86C407/I/S | TMP86C807/I/S | TMP86F807 | TMP86P807 | TMP86C408/I/S |
| TMP86C808/I/S | TMP86F808     | TMP86P808 | JT5BR6    | TMP86FH09     |
| TMP86F809     | TMP86F409     | TMP86CH09 | TMP86C809 | TMP86CH87R    |
| TMP86CM87R    | TMP86PM87R    |           |           |               |

November 2006

Dear Customer

## Note on Using the Serial Expansion Interface (SEI)

We would like to inform you of the following note on using the Serial Expansion Interface (SEI) incorporated in some of Toshiba's TLCS-870/C Series 8-bit microcontrollers. If you need any further information, please contact your local Toshiba sales representative.

### [ Note on using the SEI ]

The MISO pin of a slave device is set as an output when the SEE bit in the SECR register is set to 1 (enable SEI operation) regardless of the /SS pin state.

The MISO pin is not put in a high-impedance state even if the /SS pin of the slave device is driven high. To place the MISO pin in a high-impedance state, the SEE bit must be cleared to 0 (disable SEI operation).

In a system in which the MISO pins of more than one slave device are interconnected, the SEE bit of each inactive slave device must be cleared to 0 to prevent the MISO bus from being occupied by inactive slave devices. The measures to be taken are explained below.

### [ Measures to be taken in a system comprising multiple slave devices ]

#### **Slave device**

- Each slave device should set the SEE bit to 1 only when the /SS pin is low.
- As soon as the /SS pin is driven high, each slave device must clear the SEE bit to 0 to release the MISO pin.

#### **Master device**

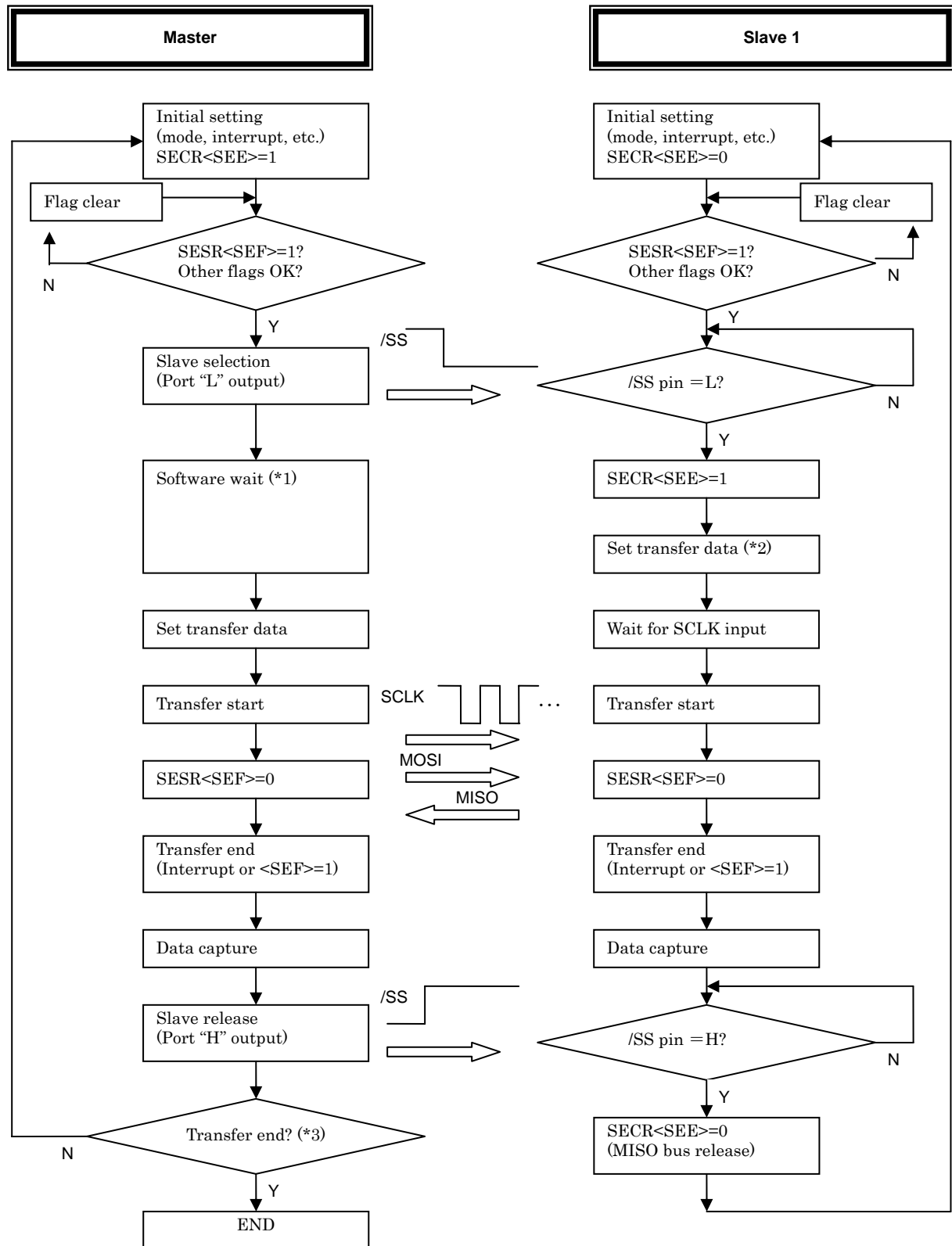
After the master device drives the /SS pin of the selected slave device low, a wait period must be inserted by software to allow the slave device to set up for communications with the master device.

The master device should start transferring data to the slave device by giving careful consideration to the setup time of the slave device.

If the master device wants to communicate with another slave device after completing an SEI transfer, a wait period must be inserted by software to allow the current active slave device to release the MISO bus. Careful consideration should be given to transfer intervals.

## [Processing example for a system comprising one master and multiple slaves]

(SECR<CPHA>=1, <CPOL>=1, active slave = slave 1)



- \*1, The master device should insert a wait period by software. The master device should start transferring data by giving careful consideration to the setup time of the slave device.
- \*2, When the device is configured as a slave with SECR<CPHA>=0, transfer data must be set in the SEDR register while the /SS pin is high. We recommend setting SECR<CPHA>=1, in which case transfer data can be written regardless of the /SS pin state.
- \*3, If the master wants to communicate with another slave device, a wait period is required to allow the current active slave device to release the bus. Careful consideration should be given to transfer intervals.

**TOSHIBA Microcontrollers 870 Family**  
**TLCS-870/C Series**

|               |               |             |               |                 |
|---------------|---------------|-------------|---------------|-----------------|
| TMP86C407/I/S | TMP86C807/I/S | TMP86F807   | TMP86P807     | TMP86C408/I/S   |
| TMP86C808/I/S | TMP86F808     | TMP86P808   | TMP86CP24     | TMP86FP24       |
| TMP86CM41     | TMP86CS41     | TMP86FS41   | TMP86CS43     | TMP86PS43       |
| TMP86CS44     | TMP86PS44     | TMP86C846   | TMP86CH46/A   | TMP86CM46       |
| TMP86FH46/A   | TMP86PH46     | TMP86PM46   | TMP86C847/I/S | TMP86CH47/A/I/S |
| TMP86CM47/A   | TMP86FH47/A   | TMP86PH47   | TMP86PM47/A   | TMP86FM48       |
| TMP86CH49     | TMP86CM49     | TMP86CS49   | TMP86FS49/A   | TMP86PM49       |
| TMP86CS64/A   | TMP86FS64     | TMP86PS64   | TMP86CK74A    | TMP86CM74A      |
| TMP86PM74A    | TMP86CH87/R   | TMP86CM87/R | TMP86PM87/R   |                 |

**TLCS-870/X Series**

|             |           |            |            |            |
|-------------|-----------|------------|------------|------------|
| TMP88CH40/I | TMP88PH40 | TMP88CH41  | TMP88PH41  | TMP88CS42  |
| TMP88PS42   | TMP88CS43 | TMP88PS43  | TMP88CU74  | TMP88PU74  |
| TMP88CP77   | TMP88CS77 | TMP88CU77  | TMP88PU77  | TMP88CP34  |
| TMP88CS34   | TMP88PS34 | TMP88CM38A | TMP88CM38B | TMP88CP38A |
| TMP88CP38B  | TMP88CS38 | TMP88CS38B | TMP88PS38B |            |

Dear Customer

December 2005

## **Announcement of Restrictions on Use of 16-bit Timer**

With regards to our 8-bit microcontroller TLCS870/C series and TLCS/870X series, we have found restrictions on use of 16-bit timers. We would therefore like to inform customers about them. If you have any questions or require any further information, please contact your local Toshiba sales office.

### **[Operation of a 16-bit timer TC1]**

#### **Automatic capture function**

1. Please use the auto-capture function in the operative condition of TC1.  
A captured value may not be fixed if it's read after the execution of the timer stop or auto-capture disable. Please read the capture value in a capture enabled condition.
2. Since the up-counter value is captured into TC1DRB by the source clock of up-counter after setting TC1CR<ACAP1> to "1". Therefore, wait at least one cycle of the internal source clock before reading TC1DRB for the first time.

#### **Pulse width measuring mode**

The first captured value after the timer starts may be read incorrectly, therefore, ignore the first captured value.