

# TOSHIBA

Leading Innovation >>>

## Mobile Peripheral Devices

> IO Expander

TC35892XBG

TC35893XBG

TC35894XBG

Enhance system IO functionality

Enable easy keyboard control

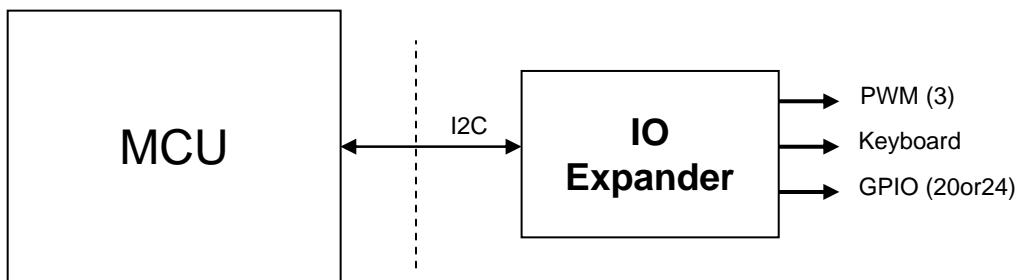
PWM and timer functions

Easy system integration via I2C



# IO Expander - Applications

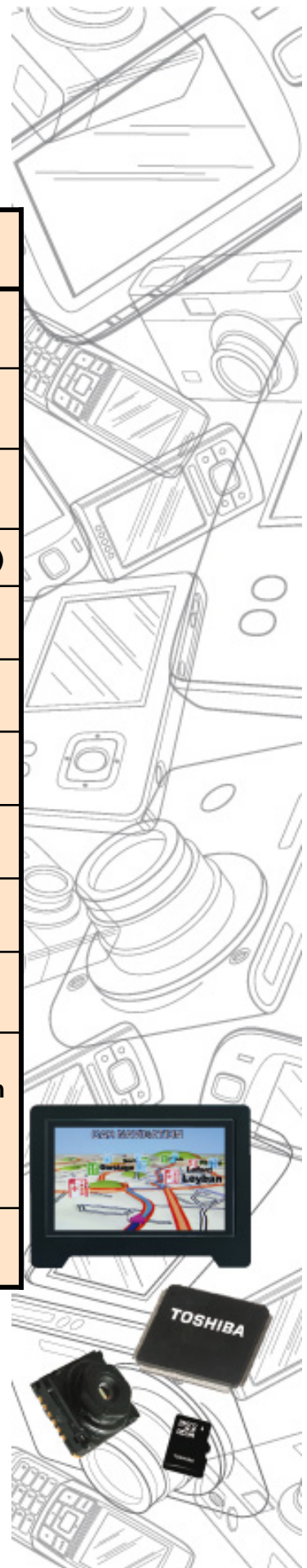
- The TC3589X product family simplifies the extension of systems which suffer from IO constraints or need remote IO. All IOs can generate interrupts.
- Furthermore it enables a safe decoding of a keyboard or single keys without additional software overhead.
- Timer triggered PWM outputs are useful for simple D/A conversion or creation of any pulse pattern e.g. for a simple motor control.
- The system integration happens via a 2-wire I2C connection
- Different power save modes (stand-by 20uA)



# IO Expander - Features

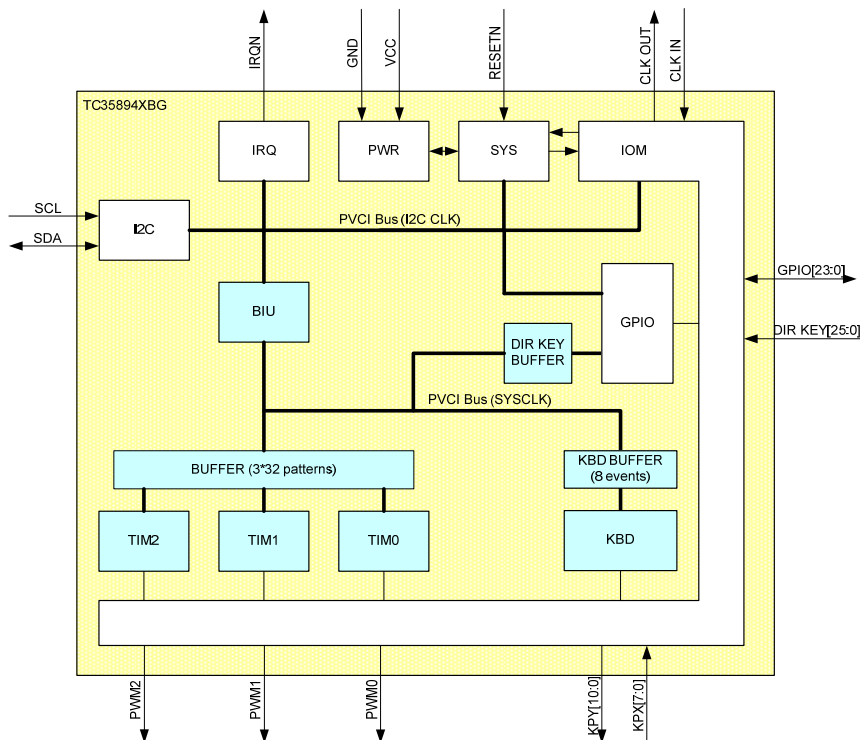
| Items                  | TC35892XBG                              | TC35893XBG                              | TC35894XBG                              |
|------------------------|---|---|---|
| Host interface         | I2C                                     | I2C                                     | I2C                                     |
| GPIO (max number)      | 24 Port                                 | 20 Port                                 | 24 Port                                 |
| De-bouncing            | Configurable                            | Configurable                            | Configurable                            |
| Key Matrix             | Max. 96(8 x 12)                         | Max. 96(8 x 12)                         | Max. 96 (8 x 12)                        |
| Direct Key support     | -                                       | -                                       | Available                               |
| PWM                    | 3ch                                     | 3ch                                     | 3ch                                     |
| I2C address definition | By pin setting                          | Programmable                            | Programmable                            |
| Oscillator             | Internal or External                    | Internal                                | Internal                                |
| Interrupt Output       | 1                                       | 1                                       | 1                                       |
| Power Supply           | 1.62V~2.70V                             | 1.62V~3.6V                              | 1.62V~3.6V                              |
| Package*               | 3.5mm x 3.5mm<br>36pin BGA,<br>0.5pitch | 3.0mm x 3.0mm<br>25pin BGA,<br>0.5pitch | 3.5mm x 3.5mm<br>36pin BGA,<br>0.5pitch |
| Status                 | MP                                      | MP                                      | MP                                      |

\*: additional package options are under development



# IO Expander – Technical

- Technical Data:
  - Operating Voltage: 1.62V to 3.6V
  - Stand-by current: 20uA
  - Clock: from 32KHz up to 20 MHz
  - Power fail watchdog
  - Configurable IO (OD, Pup/Pdown, Schmitt Trigger, Drive Strength)
  - Interrupt function to MCU
  - Three 16bit timer, cascadable
  - PWM output with programmable duty cycle
    - Programming by internal state machine
  - I2C slave up to 400KHz
  - Package: BGA, QON\*, QFN\*



\*: additional package options are under development



# General Information

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- Other Mobile Peripheral Devices
  - TV out controller
  - HDMI out controller
  - MIPI® and MDDI® display controller and interface chips
- You can find further information about Toshiba Mobile Peripheral Devices on <http://www.toshiba-components.com/applications/mobilehandsets/Index.htm>

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