

CLAIMS

1. A communication device comprising:
 - a transmission and reception circuitry (21) configured to communicate with an external communication device via a data signal line and a clock signal line, the communication including transmitting and receiving data via the data signal line and transmitting a clock via the clock signal line; and
 - a clear instruction unit(23) configured to instruct the external communication device to release a drive state of the data signal line in order to return control right of the data signal line from the external communication device when the communication with the external communication device becomes unavailable,
 - wherein the clear instruction unit is configured to instruct the external communication device to release a drive state of the data signal line by:
 - driving the clock signal line low;
 - maintaining the clock signal at a low level for a predetermined period of time; and
 - driving the clock signal line to switch from the low level to a high level at a timing after the predetermined period of time has elapsed, and
 - wherein the external communication device is configured to determine whether a predetermined period of time has elapsed since the clock signal line has been driven by the communication device to the low level, and to release the drive state of the data signal line at the timing the communication device switches the clock signal to the high level after the predetermined period has passed,

wherein the transmission and reception circuitry (21) is further configured to instruct the external communication device to release the drive state of the data signal line and reset a predetermined setting value by:

maintaining the clock signal at low level for a first period that is longer than the predetermined period of time and switching the clock signal from the low level to the high level at a timing after the first period has elapsed..

2. The communication device according to claim 1, wherein the transmission and reception circuitry (21) is further configured to instruct the external communication device to release the drive state of the data signal line and reset all settings by:

maintaining the clock signal at low level for a second period that is longer than the first period of time and the predetermined period of time and switching the clock signal line from the low level to the high level at a timing after the second period has elapsed.

3. The communication device according to any one of claims 1 or 2, further comprising a monitoring unit (22) for monitoring communication with the external communication device and determining whether a deadlock has occurred in communication via the data signal line and the clock signal line.

4. The communication device according to any one of the preceding claims, wherein the communication device receives transmission rights from the external communication device before the clock signal line is driven to the H clock level by the transmission and reception circuitry (21).

5. The communication device according to claim 3, wherein the communication device is configured to determine whether the communication with external communication device is available, and

if it is determined that the communication with the external communication device is available, the communication device is configured to cause the transmission and reception circuitry to transmit a stop signal by driving the data signal line to an H data level after the clock signal line is driven to the H clock level; and

upon detection of the stop signal at the external communication device, the external communication device is configured to return the control right of the data signal line to the communication device.

6. The communication device according to claim 1, wherein the communication device is a master and the external communication device is one of a plurality of slaves.

7. A communication device, comprising:

a transmission and reception circuitry (31) configured to communicate with an external communication

device via a data signal line and a clock signal line, the communication including transmitting and receiving data via the data signal line and receiving a clock via the clock signal line; and

a detection unit configured to

detect driving of the clock signal line by the external communication device, wherein the detection unit is a counter (34) that is configured to count a time during which the clock signal line is at a low level in order to determine whether the clock signal is maintained at the low level for a predetermined period of time, and

wherein the communication device is configured to release a drive state of the data signal line and to return control right of the data signal from the communication device when the communication with the external communication device becomes unavailable and when the detection unit determines:

the predetermined period of time since the clock signal line has been driven to the low signal has elapsed, and

the external communication device has switched the clock signal line from the low level to a high level after the predetermined period of time since the clock signal line has been driven to the low signal has elapsed,

wherein the communication device is further configured to release the drive state of the data signal line and reset a predetermined setting value when the detection unit determines:

a first period of time that is longer than the predetermined period of time since the clock signal line

has been driven to the low signal has elapsed, and
the external communication device has switched the
clock signal line from the low level to a high level
after the first period has elapsed.

8. The communication device according to claim 7,
further comprising an error detection unit configured to
determine an error condition of the data signal line or
the clock signal line, and wherein the determination of
the error condition is a detection of an error in one bit
of the data.

9. The communication device according to claim 7 or 8,
wherein the communication device is further
configured to release the drive state of the data
signal line and reset all settings when the detection
unit determines:

a second period of time that is longer than the
first period of time and the predetermined period of time
since the clock signal line has been driven to the low
signal has elapsed, and

the external communication device has switched the
clock signal line from the low level to a high level
after the second period has elapsed.

10. The communication device according to any one of
claims 7 to 9, wherein the external communication device
receives transmission rights from the communication
device before the clock signal line is driven to the H
clock level.

11. The communication device according to claim 10, wherein if it is determined that the communication with the external communication device is available, the communication device is configured to:

receive a stop signal by detecting the data signal line being driven to an H data level after detecting the clock signal line being driven to the H clock level, and upon detection of the stop signal, the communication device is configured to return the control right of the data signal line to the external communication device.

12. The communication device according to claim 7, wherein the communication device is one of a plurality of slaves and the external communication device is a master.

13. A communication system comprising:

a first communication device, including:

a first transmission and reception circuitry configured to communicate via a data signal line and a clock signal line, the communication including transmitting and receiving data via the data signal line and a transmitting a clock via the clock signal line, and

a second communication device, including:

a second transmission and reception circuitry configured to communicate with the first communication device via the data signal line and the clock signal line, the communication including transmitting and receiving data via the data signal line and receiving the

clock via the clock signal line,

wherein the first communication device further comprising a clear instruction unit (23) configured to instruct the second communication device to release a drive state of the data signal line and to return control right of the data signal from the second communication device when the communication with the second communication device becomes unavailable;

wherein the second communication device further comprising a detection unit configured to detect driving of the clock signal line by the first communication device, and the detection unit is a counter (34) that is configured to count a time at which the clock signal is at a Low level in order to determine whether the clock signal is maintained at the low level for a predetermined period of time,

wherein the clear instruction unit is configured to instruct the external communication device to release a drive state of the data signal line by:

driving the clock signal line low;

maintaining the clock signal at the low level for the predetermined period of time; and

driving the clock signal line to switch from the low level to a high level at a timing after the predetermined period of time has elapsed,

wherein the second communication device is configured to release the drive state of the data signal line and to return control right of the data signal line from the second communication device when the communication with the first communication device becomes unavailable and when the detection unit determines:

the predetermined period of time since the clock signal line has been driven to the low signal has elapsed, and

the first communication device has switched the clock signal from the low level to the high level after the predetermined period of time since the clock signal line has been driven to the low signal has elapsed;

wherein the first transmission and reception circuitry (21) is further configured to instruct the second communication device to release the drive state of the data signal line and reset a predetermined setting value by:

maintaining the clock signal at low level for a first period that is longer than the predetermined period of time and switching the clock signal from the low level to the high level at a timing after the first period has elapsed;

wherein the second communication device is further configured to release the drive state of the data signal line and reset a predetermined setting value when the detection unit determines:

a first period of time that is longer than the predetermined period of time since the clock signal line has been driven to the low signal has elapsed, and

the first communication device has switched the clock signal line from the low level to a high level after the first period has elapsed.

14. The communication system of claim 13,

wherein the first transmission and reception

circuitry (21) is configured to maintain the clock signal at low level for a second period longer than the predetermined period of time to release the drive state of the data signal line and to reset all settings when the first transmission and reception circuitry (21) drives the clock signal line to switch from the low level to the high level at a timing after the second period has elapsed, and

wherein the second communication device is further configured to release the drive state of the data signal line and reset all settings when the detection unit determines:

a second period of time that is longer than the first period of time and the predetermined period of time since the clock signal line has been driven to the low signal has elapsed, and

the first communication device has switched the clock signal line from the low level to a high level after the second period has elapsed.

15. The communication system according to claim 13 or 14, wherein the second communication device further comprises an error detection unit configured to determine an error condition of the data signal line or the clock signal line, wherein the determination of the error condition is a detection of an error in one bit of the data.

16. The communication system according to any one of claims 13 to 15, wherein the first communication device further comprises a monitoring unit (22) for monitoring

communication with the second communication device and determining whether a deadlock has occurred in communication via the data signal line and the clock signal line.

17. A communication method in a communication device, the method comprising:

- communicating with an external communication device via a data signal line and a clock signal line, including transmitting and receiving data via the data signal line and transmitting a clock via the clock signal line;

- instructing the external communication device to release a drive state of the data signal line and to return control right of the data signal from the external communication device when the communication with the external communication device becomes unavailable by

 - driving the clock signal line low;

 - maintaining the clock signal at the low level for a predetermined period of time;

 - driving the clock signal line to switch from the low level to a high level at a timing after the predetermined period of time has elapsed; and

 - causing the external communication device to release the drive state of the data signal at the timing the communication device switches the clock signal to the high level after the predetermined period has passed, wherein the method further comprises:

 - maintaining the clock signal at low level for a first period longer than the predetermined period of time; and

 - driving the clock signal line to switch from the

low level to a high level at a timing after the first period has elapsed so as to cause the external communication device to release the drive state of the data signal line and to reset a predetermined setting value when the external communication device detects the data signal line is being switched from the low level to high level at a timing after the first period has elapsed.

18. The method of claim 17, wherein the method comprises:

- maintaining the clock signal at low level for a second period longer than the predetermined period of time; and

- driving the clock signal line to switch from the low level to a high level at a timing after the second period has elapsed so as to cause the external communication device to release the drive state of the data signal line and to reset all settings when the external communication device detects the data signal line is being switched from the low level to high level at a timing after the second period has elapsed.