Application Note

TMPM4GR User Guide

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1. Preface

This application note can be used as a reference of use environment when the sample program is operated on the TMPM4GR.
When other MCU's than TMPM4GR are selected, a compilation error may occur due to source shortage of pins or IP channels. When the error occurs, the program should be fixed, then the operation should be checked.

2. Technical Term

Term/Abbreviation	Definition
BSP	Board Support Package
UART	Universal Asynchronous Receiver Transmitter
FUART	Full Universal Asynchronous Receiver Transmitter
LED	Light-Emitting Diode
TSPI	Toshiba Serial Peripheral Interface
TSSI	Toshiba Synchronous Serial Interface
I2C	Inter-Integrated Circuit
EI2C	Enhanced Inter-Integrated Circuit

3. Reference Document

Document	Notes
TMPM4G Group(1) Data sheet	-
Reference manual	Refer to the reference manual of each IP to be used.
Application note	Refer to the application note of sample software to be used.

4. Operation Confirmation Condition

Item	Name	Version
Used Microcontroller	TMPM4GRF20FG	-
Used Board	AdBun-M4GR	-
Unified Development Environment	IAR Embedded Workbench for ARM	8.50.1.24811
Unified Development Environment	Arm® Keil® MDK	5.29.00
Sample Program	TMPM4GR_v130	V1.3.0

5. Used Channel and Port Assignment

5.1. User Interface

5.1.1. Push-Switch

Channel	Function	Port
BSP_PSW_0	INPUT	PL4
BSP_PSW_1	INPUT	PL5
BSP_PSW_2	INPUT	PV0
BSP_PSW_3	INPUT	PV1
BSP_PSW_4	INPUT	PL0

5.1.2. LED

Channel	Function	Port
BSP_LED_0	OUTPUT	PE4
BSP_LED_1	OUTPUT	PE5
BSP_LED_2	OUTPUT	PE6
BSP_LED_3	OUTPUT	PE7

5.1.3. DIO

Channel	Function	Port
BSP_DIAGNOSIS_DIGITALIO	Input	PA0

5.2. Communication

5.2.1. UART Communication

Channel	Peripheral Channel	Function	Port
BSP_UART_0	ch0	UT0TXD	PE3
		UT0RXD	PE2
		UT0CTS	―
		UT0RTS	―
BSP_UART_1	ch4	UT4TXD	PM0
		UT4RXD	PM1
		UT4CTS	―
		UT4RTS	―
BSP_UART_2	ch1	UT1TXD	PH0
		UT1RXD	PH1
		UT1CTS	―
		UT1RTS	―

5.2.2. FUART Communication

Channel	Peripheral Channel	Function	Port
BSP_FUART_0	ch0	FUT0TXD	PG4
		FUT0RXD	PG5
		FUT0CTS	―
		FUT0RTS	―
		FUT0IROUT	―
		FUT0IRIN	―

5.2.3. TSSI Communication

Channel	Peripheral Channel	Function	Port
BSP_TSSI_0	ch0	TSSI0TCK	PD2
		TSSI0TFS	PD3
		TSSI0TXD	PD4
		TSSI0RCK	―
		TSSI0RFS	―
		TSSI0RXD	―
BSP_TSSI_1	ch1	TSSI1TCK	―
		TSSI1TFS	―
		TSSI1TXD	―
		TSSI1RCK	PU7
		TSSI1RFS	PU6
		TSSI1RXD	PU5

5.2.4. TSPI Communication

Channel	Peripheral Channel	Function	Port
BSP_TSPI_0	ch2	TSPI2CSIN	―
		TSPI2CS0	PA7
		TSPI2CS1	―
		TSPI2CS2	―
		TSPI2CS3	―
		TSPI2RXD	PA5
		TSPI2TXD	PA4
		TSPI2SCK	PA6
BSP_TSPI_1	ch4	TSPI4CSIN	PD0
		TSPI4CS0	―
		TSPI4CS1	―
		TSPI4CS2	―
		TSPI4CS3	―
		TSPI4RXD	PD2
		TSPI4TXD	―
		TSPI4SCK	PD1
BSP_TSPI_2	ch8	TSPI8CSIN	―
		TSPI8CS0	PW0
		TSPI8CS1	―
		TSPI8CS2	―
		TSPI8CS3	―
		TSPI8RXD	PW2
		TSPI8TXD	PW3
		TSPI8SCK	PW1

5.2.5. I2C Communication

Channel	Peripheral Channel	Function	Port
BSP_I2C_0	ch3	I2C3SDA	PJ6
		I2C3SCL	PJ7

5.2.6. EI2C Communication

Channel	Peripheral Channel	Function	Port
BSP_EI2C_0	ch3	EI2C3SDA	PJ6
		EI2C3SCL	PJ7

5.2.7. I2S Communication

Channel	Peripheral Channel	Function	Port
BSP_I2S_0	ch0	I2S0BCK	PD5
		I2S0LRCK	PD4
		I2S0D0	PD7

5.2.8. SMIF Communication

Channel	Peripheral Channel	Function	Port
BSP_SMIF_0	ch0	SMI0D0	PK2
		SMI0D1	PK3
		SMI0D2	PK4
		SMI0D3	PK5
		SMI0SCK	PK6
		SMI0CS0_N	PK7

5.3. Timer

Channel	Peripheral Channel	Function	Port
BSP_TIMER_1MS	ch0	1ms timer	―
BSP_OUT_PULSE_SAMPLE_A	ch3	PPG output	PB4
BSP_T32A_REFIN	ch8	Reference signal input(TRM)	PB0

5.4. DAC

Channel	Peripheral Channel	Function	Port
BSP_DAC_0	ch0	DAC0	PT0

5.5. ADC

Channel	Peripheral Channel	Function	Port
BSP_ADC_0	AINA8	Variable resistance voltage	PP0
BSP_ADC_1	AINA16	Thermistor output	PR0

*ADC_UART and ADC_MONITOR do sample A operation.

5.6. RMC

Channel	Peripheral Channel	Function	Port
BSP_RMC_0	ch0	RXIN0	PT3

5.7. HDMAC

Channel	Peripheral Channel	Function	Port
BSP_HDMAC_0	ch0	High-speed DMA controller	―

5.8. MDMAC

Channel	Peripheral Channel	Function	Port
BSP_MDMAC_0	ch7	Multifunctional DMA controller	―
BSP_MDMAC_1	ch9	Multifunctional DMA controller	―

5.9. ISD

Channel	Peripheral Channel	Function	Port
BSP_ISD_0	UNIT A	Interval Sensor Detection Circuit	―

6. System Setting

Clock	Function	MHz	Notes
fEHOSC	External oscillator	12	-
fIHOSC	Internal oscillator	10	-
fs	Low-speed oscillator	0.032768	-
fc	High-speed clock	192	-
fsys	System clock	192	-
φT0	φT0	120	-

*It’s basic setting. Settings change depending on the sample software.

7. Communication Setting

7.1. UART Communication Setting

Item	Setting Value	Notes
Baud Rate	115200 bps	-
Data Length	8 bits	-
Parity	None	-
Stop Bit	1 bit	-
Flow Control	None	-

7.2. I2C Communication Setting

Item	Setting Value	Notes
I2C Clock	400 kHz	In Master operation
Data Length	8 bits	-
Acknowledge	Available.	-
Start/Stop Condition	Generated.	-

7.3. SPI Communication Setting

Item	Setting Value	Notes
SPI Clock	24 MHz	-
Data Length	8 bits	-
Parity	None	-
Data Transfer Direction	MSB	-

7.4. EI2C

Item	Setting Value	Notes
Communication Speed	400kHz	

7.5. FUART

Item	Setting Value	Notes
Baud Rate	115200 bps	―
Data Length	8 bits	―
Parity	None	―
Stop Bit	1 bit	―
Flow Control	None	―

7.6. I2S

Item	Setting Value	Notes
Master Clock	1.548MHz	62 division
Bit Clock	1.548MHz	―

7.7. TSPI

Item	Setting Value	Notes
TSPI Clock	24MHz	―

7.8. TSSI

Item	Setting Value	Notes
Clock	1MHz	Frequency Divider＝1/96 fixed

8. Precautions for use

Please confirm the operation sufficiently if use in an environment other than the operation check environment.

9. Revision History

Revision	Date	Description
1.0	2021-11-05	First release

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