CAN transmission

CAN peripheral configuration

- Enable the clock for the CAN module. (**RCC_APB1ENR) .** Set the CAN1EN and CAN2EN with logical 1 according to your test mode.

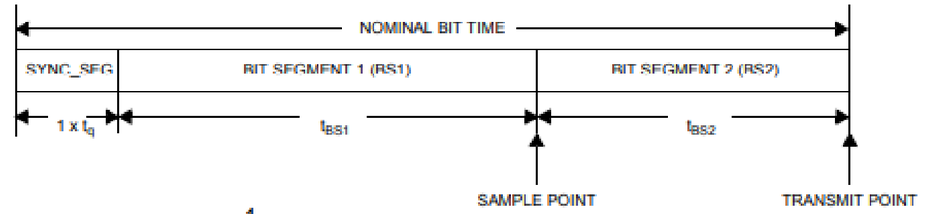
31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
UART8 EN	UART7 EN	DAC EN	PWR EN	Reser-ved	CAN2 EN	CAN1 EN	Reser-ved	I2C3 EN	I2C2 EN	I2C1 EN	UART5 EN	UART4 EN	USART 3 EN	USART 2 EN	Reser-ved
rw	rw	rw	rw		rw	rw		rw	rw	rw	rw	rw	rw	rw	

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
SPI3 EN	SPI2 EN	Reserved		WWDG EN	Reserved		TIM14 EN	TIM13 EN	TIM12 EN	TIM7 EN	TIM6 EN	TIM5 EN	TIM4 EN	TIM3 EN	TIM2 EN
rw	rw			rw			rw	rw	rw	rw	rw	rw	rw	rw	rw

CAN peripheral configuration

- Calculate the bitrate through the BTR registers. (*Bit Timing Register)* Doing some calculations according to our datasheet.

Figure 346. Bit timing



$$BaudRate = \frac{1}{NominalBitTime}$$

$$NominalBitTime = 1 \times t_q + t_{BS1} + t_{BS2}$$

with:

$t_{BS1} = t_q$ x (TS1[3:0] + 1),

$t_{BS2} = t_q$ x (TS2[2:0] + 1),

$t_q = (BRP[9:0] + 1)$ x t_{PCLK}

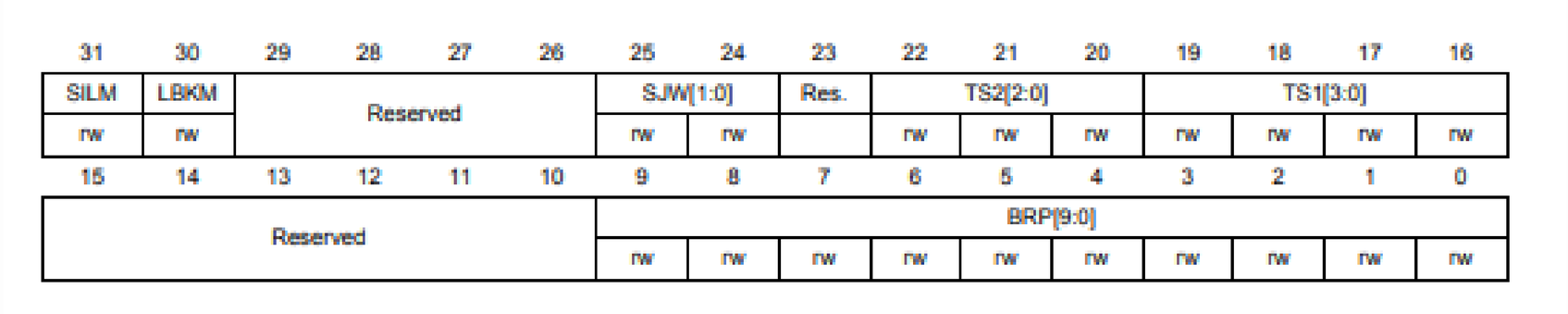
where t_q refers to the Time quantum

t_{PCLK} = time period of the APB clock,

BRP[9:0], TS1[3:0] and TS2[2:0] are defined in the CAN_BTR register.

CAN peripheral configuration

- Configurate the mode test of the CAN controller. It could be: ***normal, loopback, sleep.***

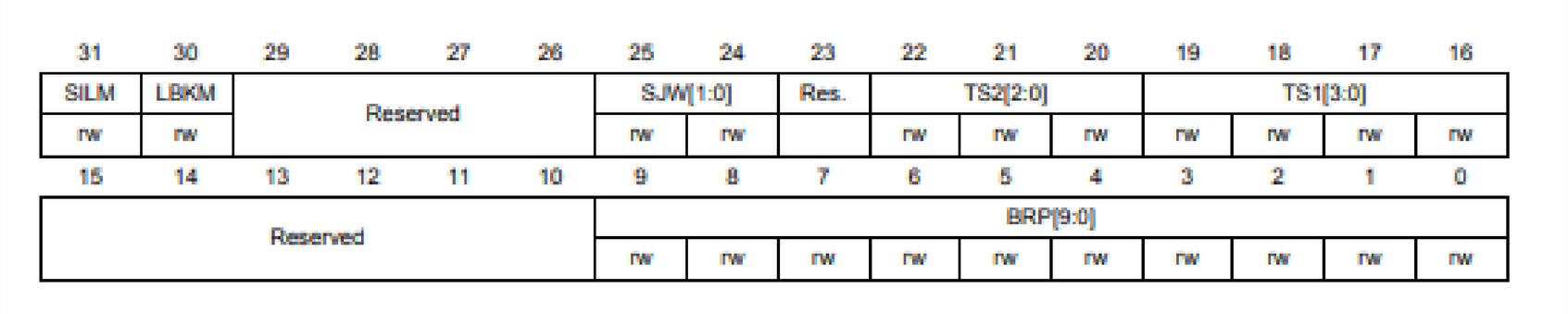


31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
SILM	LBKM	Reserved				SJW[1:0]		Res.	TS2[2:0]			TS1[3:0]			
rw	rw					rw	rw		rw	rw	rw	rw	rw	rw	rw

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved						BRP[9:0]									
						rw	rw	rw	rw	rw	rw	rw	rw	rw	rw

CAN peripheral configuration

- Configurate the mode test of the CAN controller. It could be: ***normal, loopback, sleep.***

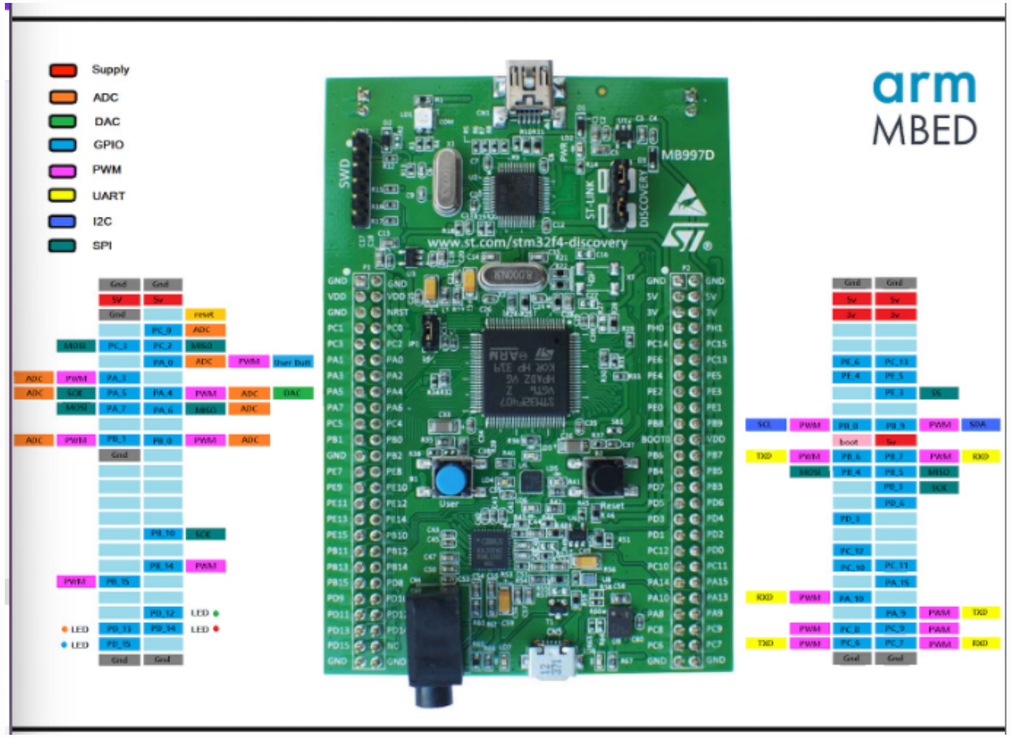


31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
SILM	LBKM	Reserved				SJW[1:0]		Res.	TS2[2:0]			TS1[3:0]			
rw	rw					rw	rw		rw	rw	rw	rw	rw	rw	rw

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved						BRP[9:0]									
						rw	rw	rw	rw	rw	rw	rw	rw	rw	rw

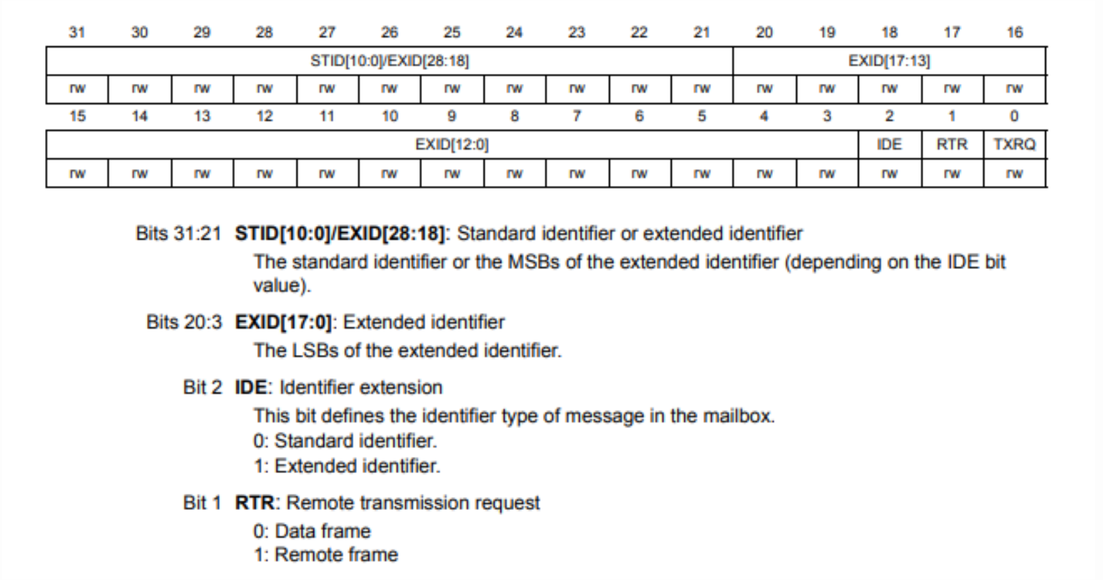
CAN peripheral configuration

- Configure the pin associated with CAN. Basically, we have to see the pinout of our model and find the RX and TX pines.



Frame prepare

- Prepare the data that is going to be sent in the frame.
- Configure the ID of the frame, determine the priority of CAN bus.



31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
STID[10:0]/EXID[28:18]											EXID[17:13]				
rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
EXID[12:0]													IDE	RTR	TXRQ
rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw

Bits 31:21 **STID[10:0]/EXID[28:18]**: Standard identifier or extended identifier
The standard identifier or the MSBs of the extended identifier (depending on the IDE bit value).

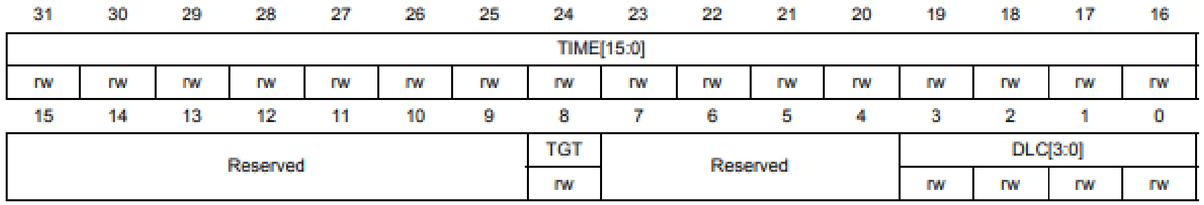
Bits 20:3 **EXID[17:0]**: Extended identifier
The LSBs of the extended identifier.

Bit 2 **IDE**: Identifier extension
This bit defines the identifier type of message in the mailbox.
0: Standard identifier.
1: Extended identifier.

Bit 1 **RTR**: Remote transmission request
0: Data frame
1: Remote frame

Frame transmission

- Write the register data that is suitable for the CAN controller
- Configure the length of the frame.
- Configure the ID frame.
- Initialize the transmission.



31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
TIME[15:0]															
rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw	rw
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Reserved							TGT	Reserved				DLC[3:0]			
							rw					rw	rw	rw	rw

Bits 31:16 **TIME[15:0]**: Message time stamp
This field contains the 16-bit timer value captured at the SOF transmission.

Bits 15:9 Reserved, must be kept at reset value.

Bit 8 **TGT**: Transmit global time
This bit is active only when the hardware is in the Time Trigger Communication mode, TTCM bit of the CAN_MCR register is set.
0: Time stamp TIME[15:0] is not sent.
1: Time stamp TIME[15:0] value is sent in the last two data bytes of the 8-byte message: TIME[7:0] in data byte 7 and TIME[15:8] in data byte 6, replacing the data written in CAN_TDHxR[31:16] register (DATA6[7:0] and DATA7[7:0]). DLC must be programmed as 8 in order these two bytes to be sent over the CAN bus.

Bits 7:4 Reserved, must be kept at reset value.

Bits 3:0 **DLC[3:0]**: Data length code
This field defines the number of data bytes a data frame contains or a remote frame request. A message can contain from 0 to 8 data bytes, depending on the value in the DLC field.

Data transmission

- Uses a lossless bitwise arbitration method of contention resolution.
- CAN specifications use the terms *dominant* (0) and *recessive* (1) bits.

	Start bit	ID bits											The rest of the frame
		10	9	8	7	6	5	4	3	2	1	0	
Node 15	0	0	0	0	0	0	0	0	1	1	1	1	
Node 16	0	0	0	0	0	0	0	1	Stopped Transmitting				
CAN data	0	0	0	0	0	0	0	0	1	1	1	1	