TX-S2730 Datasheet

Zigbee + BLE5.1 Combo SIP

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Revision History

Revision	Date	Description
0.1	2022.02.14	Initial release

Table of Contents

1. Scope

The TX-S2730 is Bluetooth LE + IEEE 802.15.4 multi-standard wireless solution with internal Flash and audio support, which combines the features and functions needed for all 2.4 GHz IoT standards into a SIP. The TX-S2730 supports standards and industrial alliance specifications including Bluetooth Low Energy (up to Bluetooth 5.1), BLE Mesh, Zigbee, RF4CE, ANT and 2.4 GHz proprietary standard.

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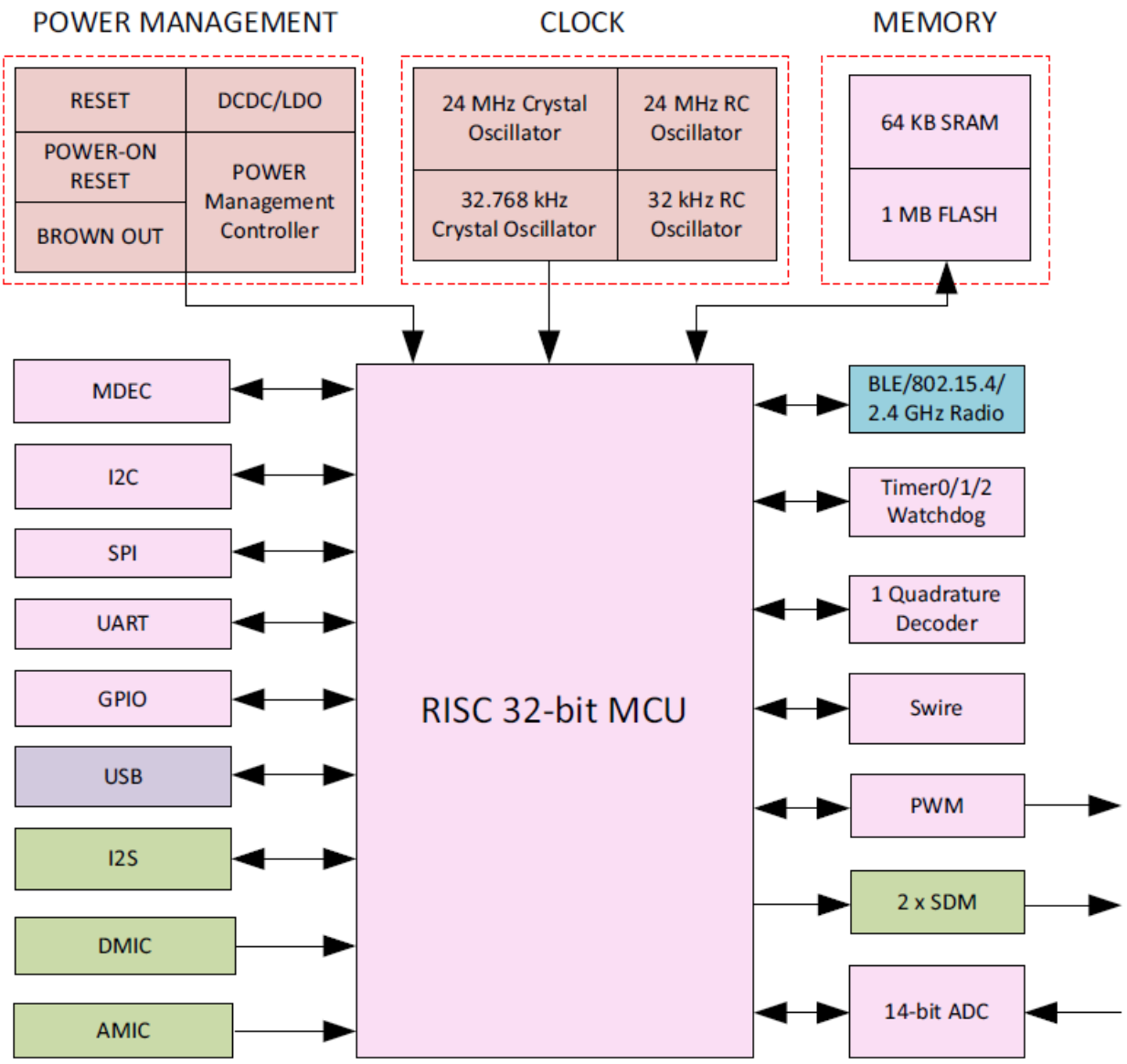
Application :

- Smartphone and tablet accessories
- Remote control and 3D glasses
- Sports and fitness tracking
- Wearable devices

2. Features

- Embedded32-bit high performance MCU with clock up to 48MHz.
- Program memory: internal 1M Flash
- Data memory: 64KB on-chip SRAM.
- 24MHz & 32.768KHz Crystal and 32KHz/24MHz embedded RC oscillator.
- Up to +10dBm TX power.
- RX sensitivity: -96 dBm @ BLE 1 Mbps, -99.5 dBm @ IEEE 802.15.4 250 kbps mode
- Up to 32 GPIOs depending on package option
- DMIC (Digital Mic).
- AMIC (Analog Mic)
- Stereo audio output.
- UART with hardware flow control
- SPI/ I2C/ I2S/ USB/ Debug Interface.
- Up to 6 channels of PWM, 1-channel IR.
- Sensor: 14-bit 10-channel (only GPIO input) SAR ADC / Temperature sensor.
- One quadrature decoder.
- Embedded hardware AES.

3. Block Diagram



4. Product Information

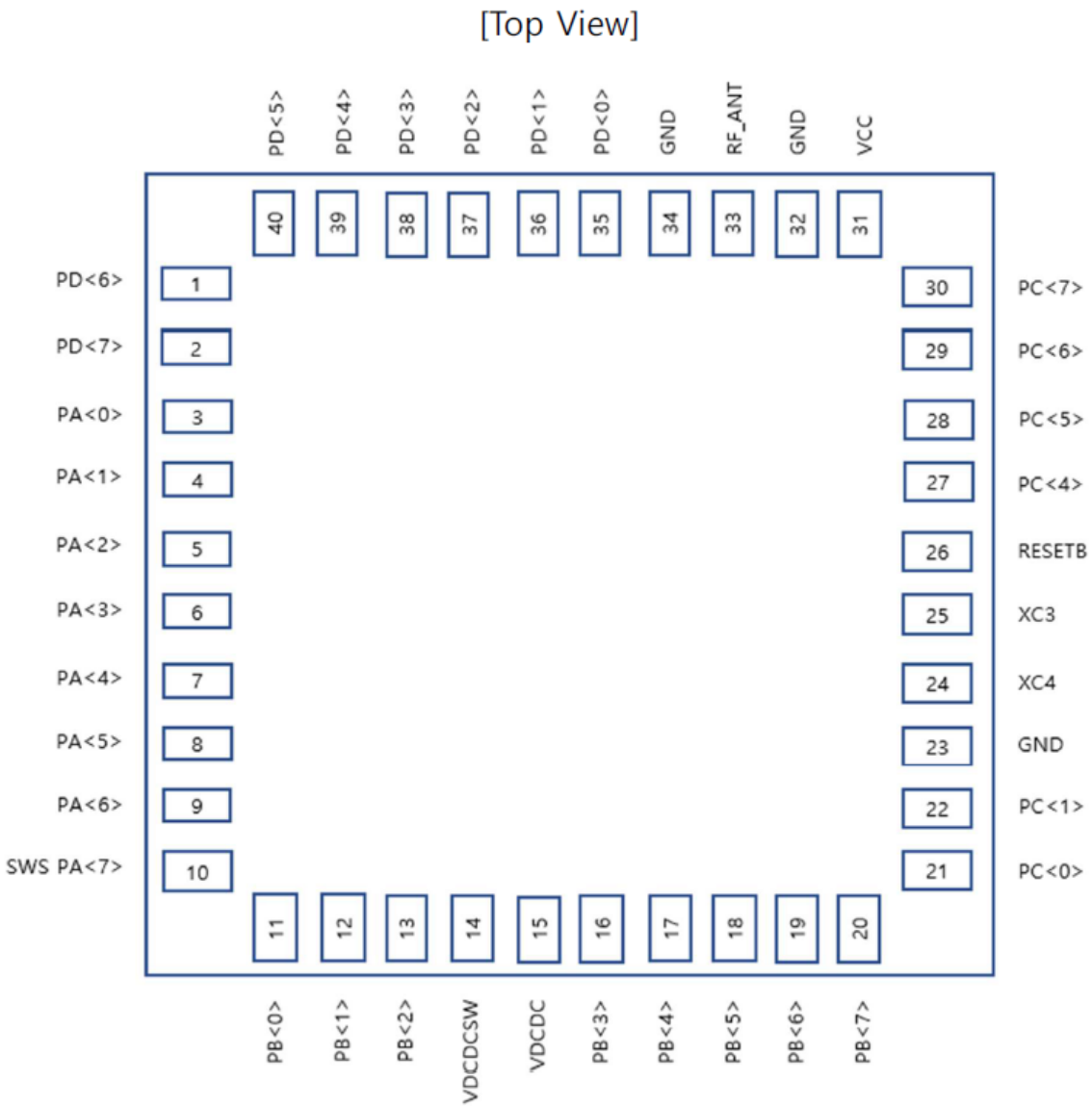
4.1 Mechanical Information

- Length	7	mm
- Width	7	mm
- Height	1.4	mm
- Weight	0.47	g

4.2 Temperature Information

- Operating temperature	-40℃ ~ +85℃
- Storage temperature	-40℃ ~ +125℃

5. Pin Description



Pin	Name	Type	Description
1	PD[6]	GPIO	GPIO PD[6], refer to below table for pin mux function
2	PD[7]	GPIO	GPIO PD[7], refer to below table for pin mux function
3	PA[0]	GPIO	GPIO PA[0], refer to below table for pin mux function
4	PA[1]	GPIO	GPIO PA[1], refer to below table for pin mux function
5	PA[2]	GPIO	GPIO PA[2], refer to below table for pin mux function
6	PA[3]	GPIO	GPIO PA[3], refer to below table for pin mux function
7	PA[4]	GPIO	GPIO PA[4], refer to below table for pin mux function
8	PA[5]	GPIO	GPIO PA[5], refer to below table for pin mux function
9	PA[6]	GPIO	GPIO PA[6], refer to below table for pin mux function
10	PA[7]	GPIO	GPIO PA[7], refer to below table for pin mux function
11	PB[0]	GPIO	GPIO PB[0], refer to below table for pin mux function
12	PB[1]	GPIO	GPIO PB[1], refer to below table for pin mux function
13	PB[2]	GPIO	GPIO PB[2], refer to below table for pin mux function
14	VDCDC SW	GPIO	Connected with VDCDC_SW via external inductor
15	VDCDC	GPIO	Connected with VDCDC_SW via external inductor
16	PB[3]	GPIO	GPIO PB[3], refer to below table for pin mux function
17	PB[4]	Analog	GPIO PB[4], refer to below table for pin mux function
18	PB[5]	Analog	GPIO PB[5], refer to below table for pin mux function
19	PB[6]	PWR	GPIO PB[6], refer to below table for pin mux function
20	PB[7]	PWR	GPIO PB[7], refer to below table for pin mux function
21	PC[0]	GPIO	GPIO PC[0], refer to below table for pin mux function
22	PC[1]	GPIO	GPIO PC[1], refer to below table for pin mux function.
23	GND	GPIO	Ground.
24	XC4	GPIO	32.768 KHz Crystal oscillator pin.
25	XC3	GPIO	32.768 KHz Crystal oscillator pin.
26	RESETB	PWR	RESETB
27	PC[4]	GPIO	GPIO PC[4], refer to below table for pin mux function.
28	PC[5]	GPIO	GPIO PC[5], refer to below table for pin mux function.
29	PC[6]	GPIO	GPIO PC[6], refer to below table for pin mux function.
30	PC[7]	GPIO	GPIO PC[7], refer to below table for pin mux function.
31	VCC	GPIO	3.3V
32	GND	Analog	Ground
33	RF ANT	Analog	RF output
34	GND	Analog	Ground
35	PD[0]	GPIO	GPIO PD[0], refer to below table for pin mux function.

Pin	Name	Type	Description
36	PD[1]	GPIO	GPIO PD[1], refer to below table for pin mux function
37	PD[2]	GPIO	GPIO PD[2], refer to below table for pin mux function
38	PD[3]	GPIO	GPIO PD[3], refer to below table for pin mux function
39	PD[4]	GPIO	GPIO PD[4], refer to below table for pin mux function
40	PD[5]	GPIO	GPIO PD[5], refer to below table for pin mux function

GPIO pin mux functions of TX-S2730 are shown below.

Pad	Default	Func1	Func2	Func3	Func4
PA[0]	GPIO	UART_RX	PWM0_N	DMIC_DI	PS_PE<0> / MDEC
PA[1]	GPIO	I2S_CLK	7816_CLK	DIMIC_CLK	-
PA[2]	GPIO	PWM0	UART_TX	DO	-
PA[3]	GPIO	PWM1	UART_CTS	DI/SDA	-
PA[4]	GPIO	PWM2	UART_RTS	CK/SCL	-
PA[5]	GPIO	-	-	DM	-
PA[6]	GPIO	-	-	DP	-
PA[7]	SWS	-	UART_RTS	SWS	-
PB[0]	GPIO	ATSEL1	UARAT_RX	PWM3	lc_comp_ain<0>/sar_aio<0>
PB[1]	GPIO	ATSEL2	UART_TX	PWM4	lc_comp_ain<1>/sar_aio<1>
PB[2]	GPIO	RX_CYC2LNA	UART_CTS	PWM5	lc_comp_ain<2>/sar_aio<2>
PB[3]	GPIO	TX_CYC2PA	UART_RTS	PWM0_N	lc_comp_ain<3>/sar_aio<3>
PB[4]	GPIO	-	PWM4	SDM_P0	lc_comp_ain<4>/sar_aio<4>
PB[5]	GPIO	-	PWM5	SDM_N0	lc_comp_ain<5>/sar_aio<5>
PB[6]	GPIO	UART_RTS	SPI_DI / SDA	SDM_P1	lc_comp_ain<6>/sar_aio<6>
PB[7]	GPIO	UART_RX	SPI_DO	SDM_N1	lc_comp_ain<7>/sar_aio<7> / MDEC
PC[0]	GPIO	UART_RTS	PWM4_N	I2C_SDA	-
PC[1]	GPIO	PWM0	PWM1_N	I2C_SCK	audio_in
PC[2]	GPIO	I2C_SDA	7816_TRX /UART_TX	PWM0	xtl_32k_out
PC[3]	GPIO	I2C_SCK	UART_RX	PWM1	xtl_32k_in
PC[4]	GPIO	PWM0	UART_CTS	PWM2	sar_aio<8>/MDEC
PC[5]	GPIO	ATSEL0	UART_RX	PWM3_N	sar_aio<9>
PC[6]	GPIO	PWM4_N	ATSEL1	RX_CYC2LNA	-
PC[7]	GPIO	PWM5_N	ATSEL2	TX_CYC2PA	-

Pad	Default	Func1	Func2	Func3	Func4
PD[0]	GPIO	7816_TRX / UART_TX	-	RX_CYC2LNA	PS_PE<1> / MDEC
PD[1]	GPIO	UART_CTS	-	TX_CYC2PA	PS_PE<2>
PD[2]	GPIO	PWM3	I2S_LR	SPI_CN	-
PD[3]	GPIO	7816_TRX / UART_TX	I2S_SDI	PWM1_N	-
PD[4]	GPIO	PWM2_N	I2S_SDO	SWM	-
PD[5]	GPIO	PWM0_N	-	PWM0	-
PD[6]	GPIO	ATSEL0	UART_RX	CN	-
PD[7]	GPIO	7816_TRX / UART_TX	I2S_BCK	SPI_CK / SCL	PS_PE<3>

6. Electrical Specification

6.1 Absolute Maximum Rating

Item	Min	Max	Unit
Supply Voltage	-0.3	3.6	V
Voltage on input Pin	-0.3	VDD+0.3	V
Output Voltage	0	VDD	V
Storage temperature Range	-65	150	℃

CAUTION: Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

6.2 Recommended Operating condition

Item	Min	Typ	Max	unit	Condition
Power Supply Voltage	1.8	3.3	3.6	V	
Supply rise time (from 1.6V to 2.8V)			10	ms	
Operating temperature range	-40		85	℃	

6.3 Current Consumption

Item	Min	Typ	Max	unit	Condition
Tx	-	4.9	-	mA	Whole chip @ 0 dBm with DCDC
Rx	-	4.6	-	mA	Whole chip
Deep sleep with 16 KB SRAM retention	-	0.8	-	uA	Without 32K RC @ 0.6 V
Deep sleep with 32 KB SRAM retention	-	1.0	-	uA	
Deep sleep without SRAM retention	-	0.4	-	uA	
Deep sleep with 16 KB SRAM retention	-	1.3	-	uA	With 32K RC @ 0.6 V
Deep sleep with 32 KB SRAM retention	-	1.5	-	uA	
Deep sleep without SRAM retention	-	0.8	-	uA	

6.4 AC characteristics

6.4.1 Digital inputs/outputs

Item	Min	Typ	Max	unit	Condition
Input high voltage	0.7VDD	-	VDD	V	
Input low voltage	VSS	-	0.3VDD	V	
Output high voltage	VDD-0.3	-	VDD	V	
Output low voltage	VSS	-	0.3	V	

6.4.2 USB Characteristics

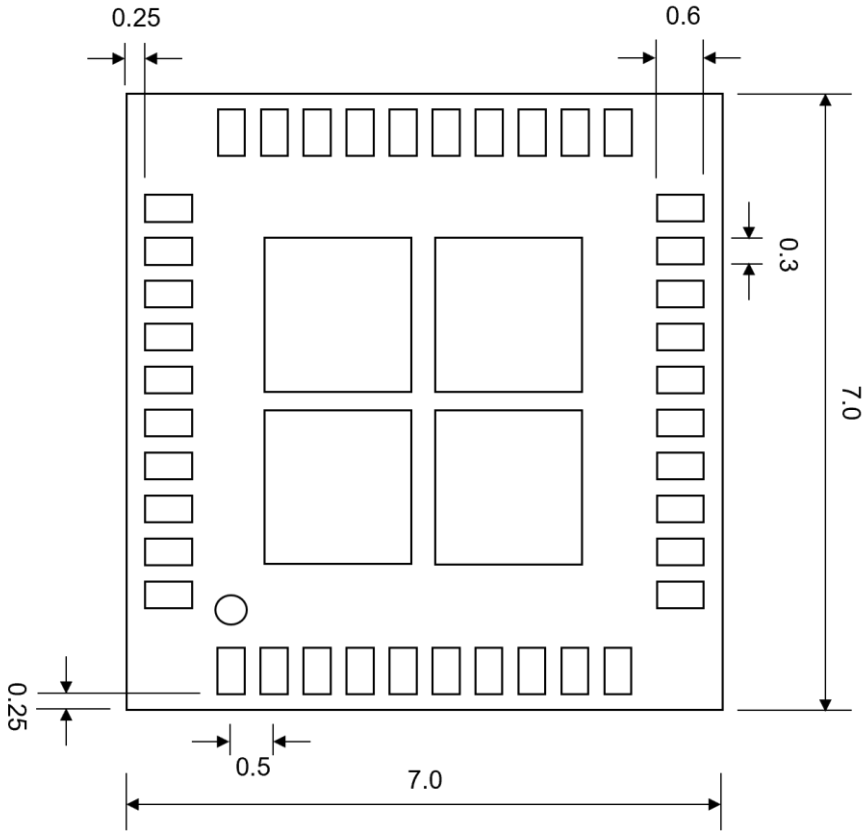
Item	Min	Typ	Max	unit	Condition
USB Output Signal Cross-over Voltage	1.3	-	2.0	V	

7. RF Specification

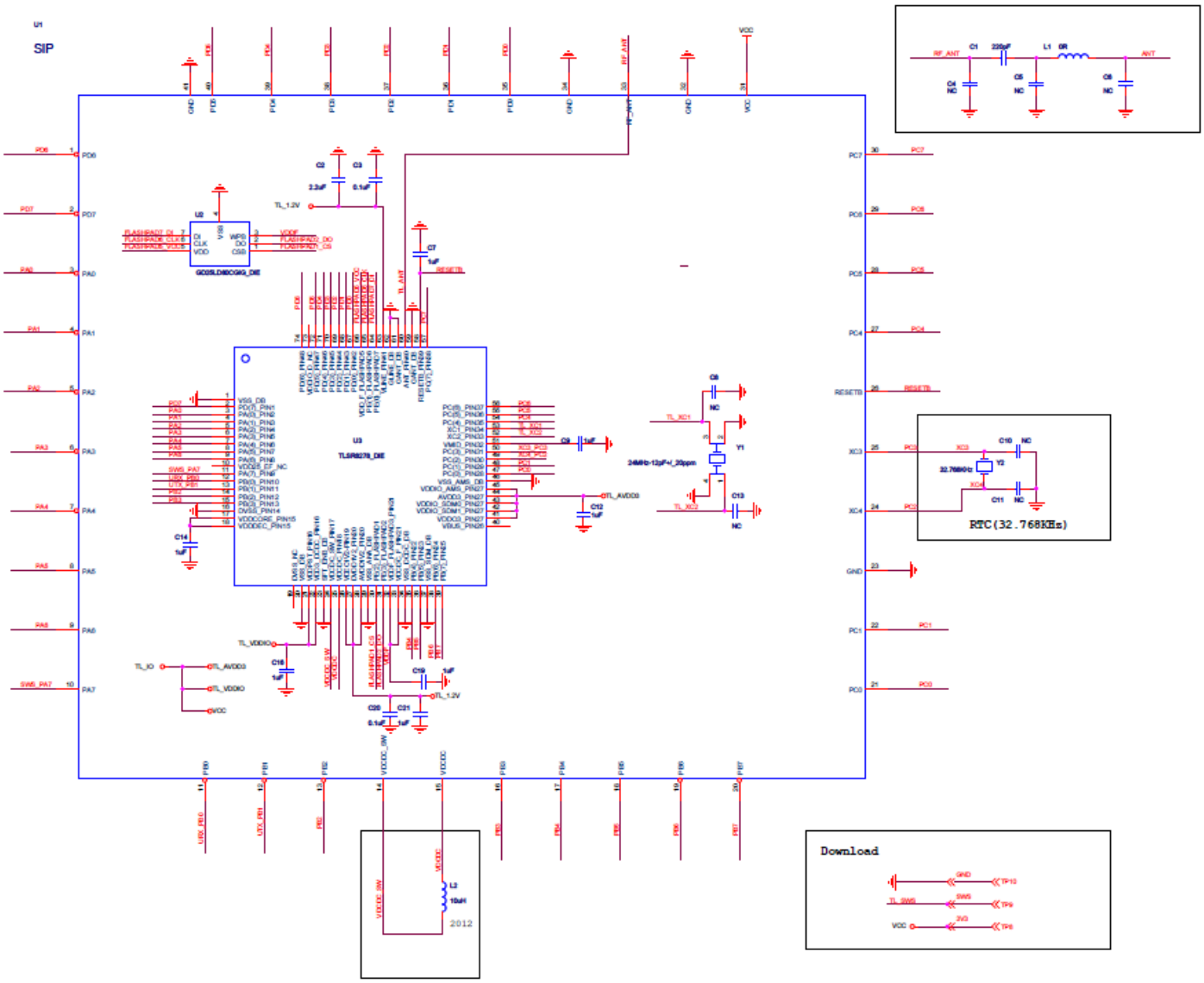
Nomal Condition : T=25℃, VDD=3.3V

Item		Min	Typ	Max	unit	Condition
RF frequency range		2400		2483.5	MHz	Programmable in 1MHz step
Data rate		BLE/2.4G proprietary 1Mbps, ±250kHz deviation BLE/2.4G proprietary 2Mbps, ±500kHz deviation BLE 125kbps, ±250kHz deviation BLE 500kbps, ±250kHz deviation IEEE 802.15.4 250kbps, ±500kHz deviation 2.4G proprietary 500kbps, ±125kHz deviation 2.4G proprietary 250kbps, ±62.5kHz deviation				
BLE 1Mbps RF_Rx Performance (±250kHz Deviation)						
Sensitivity	1Mbps		-96		dBm	
Frequency offset tolerance		-250		+300	kHz	
Co-channel rejection			8		dB	Wanted signal at -67dBm
In-band blocking rejection (equal modulation interference)	+1/-1MHz offset		-4/-2		dB	Wanted signal at -67dBm
	+2/-2MHz offset		-41/-32		dB	
	≥3MHz offset		-42		dB	
Image rejection			-32		dB	Wanted signal at -67dBm
BLE 1Mbps RF_Tx Performance						
Output power, maximum setting			10		dBm	
Output power, minimum setting			-45		dBm	
Programmable output power range		55			dB	
Modulation 20dB bandwidth			1.4		MHz	
IEEE 802.15.4 250kbps RF_Rx Performance (±500kHz Deviation)						
Sensitivity	250kbps		-99.5		dBm	
Frequency offset tolerance		-300		+300	kHz	
Adjacent channel rejection (-1/+1 channel)			-42/-42		dB	Wanted signal at -82dBm
Adjacent channel rejection (-2/+2 channel)			-42/-42		dB	Wanted signal at -82dBm
IEEE 802.15.4 250kbps RF_Tx Performance						
Output power, maximum setting			10		dBm	
Output power, minimum setting (resolution)			-45		dBm	
Programmable output power range		55			dB	
Modulation 20dB bandwidth			2.7		MHz	
Error vector magnitude (EVM)				2	%	Max(10dBm) power output

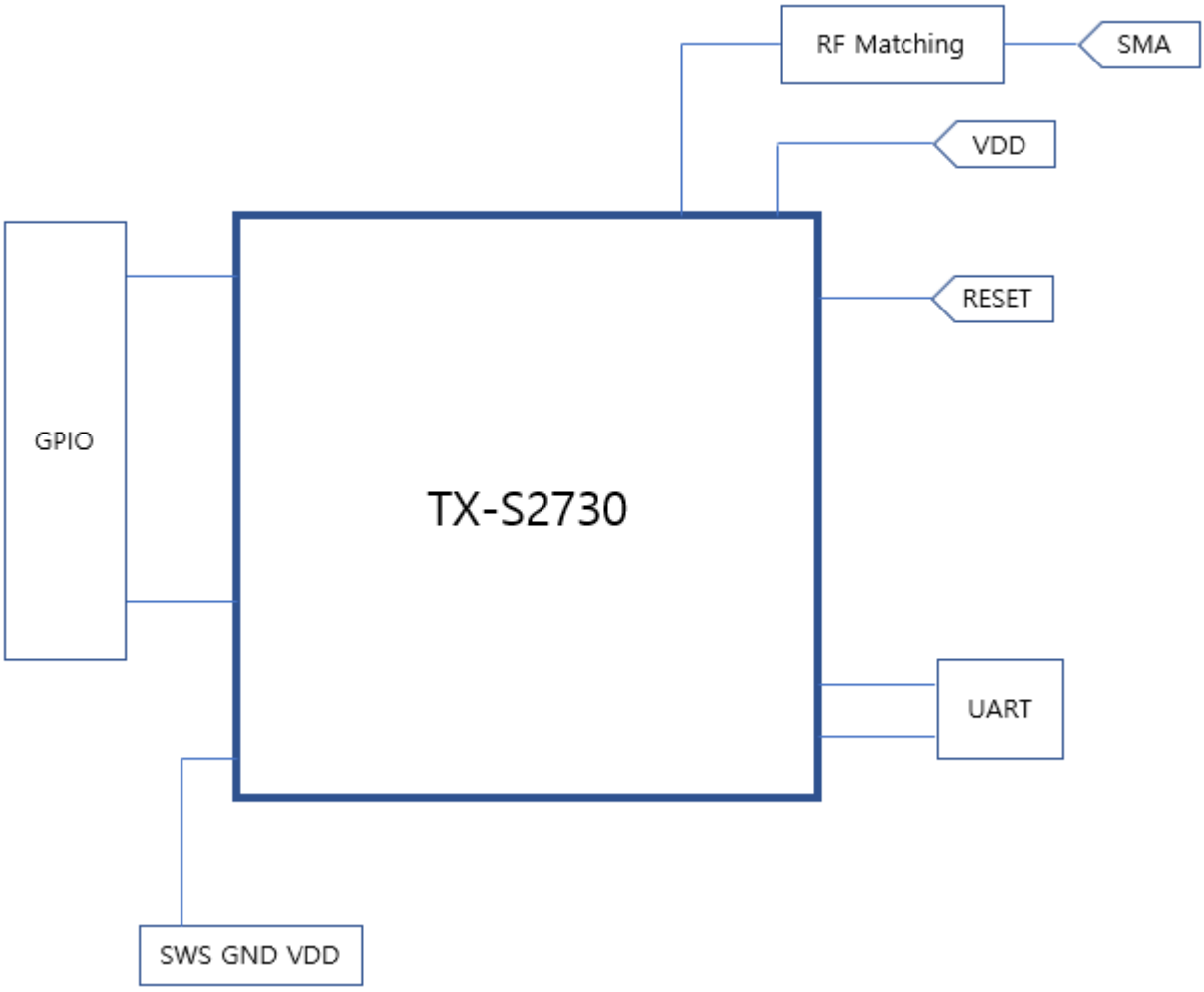
8. Mechanical Information



9. Schematic



10. Reference Peripheral Circuit

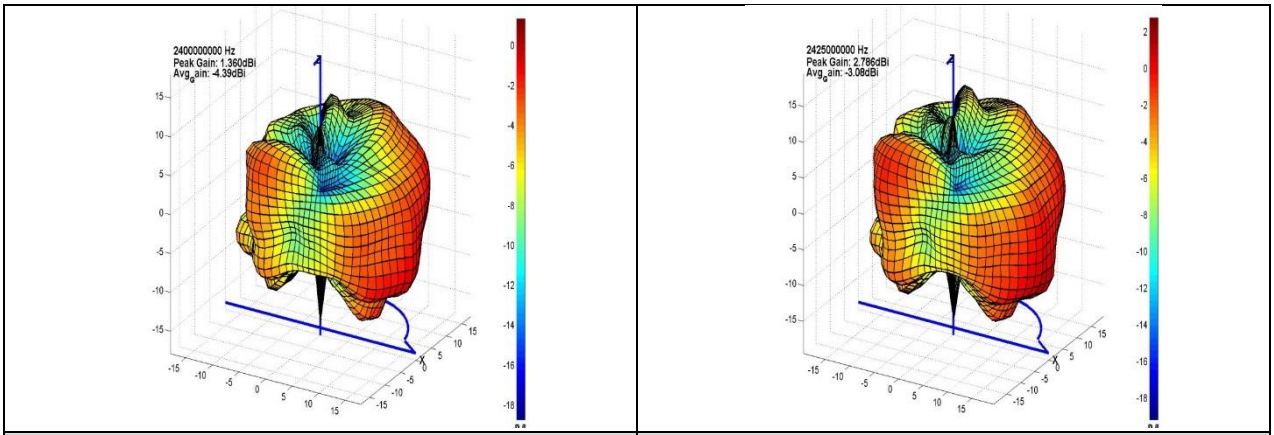


11. SIP Module Internal PCB Antenna Specification

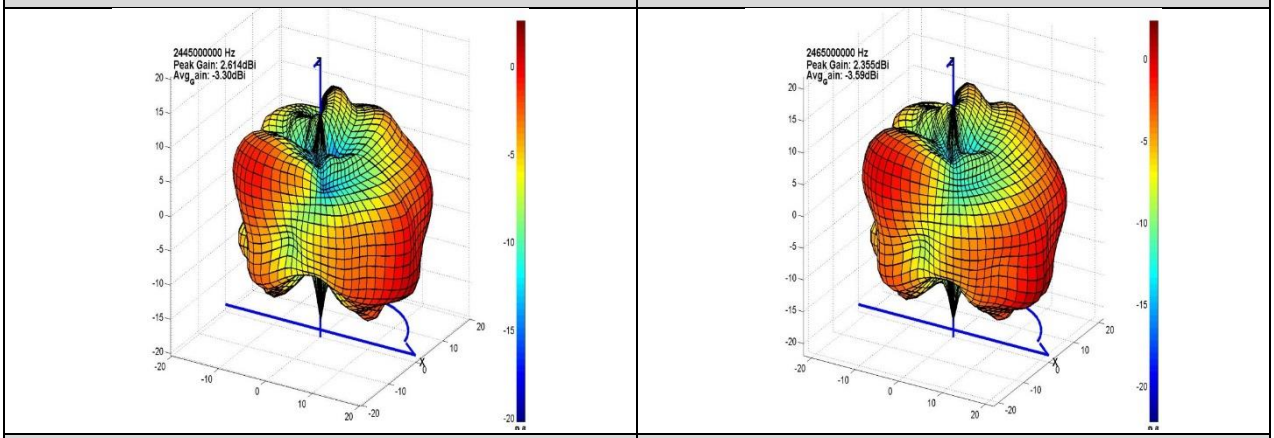
11.1 Antenna Gain

Frequency	Efficiency	Average Gain	Max Gain	Max Position
2400MHz	36.4 %	-4.4 dBi	1.4 dBi	Theta105/Pie60
2425MHz	49.1 %	-3.1 dBi	2.8 dBi	Theta105/Pie60
2445MHz	46.7 %	-3.3 dBi	2.6 dBi	Theta105/Pie60
2465MHz	43.7 %	-3.6 dBi	2.4 dBi	Theta105/Pie60
2485MHz	34.5 %	-4.6 dBi	1.4 dBi	Theta105/Pie240

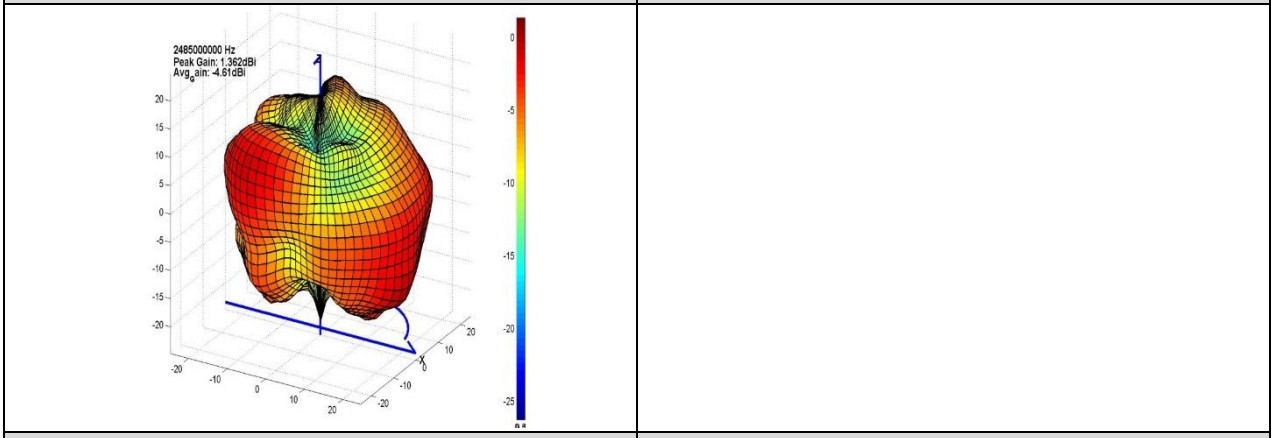
11.2 Antenna 3D Radiation Pattern



2400MHz Pattern | 2425MHz Pattern

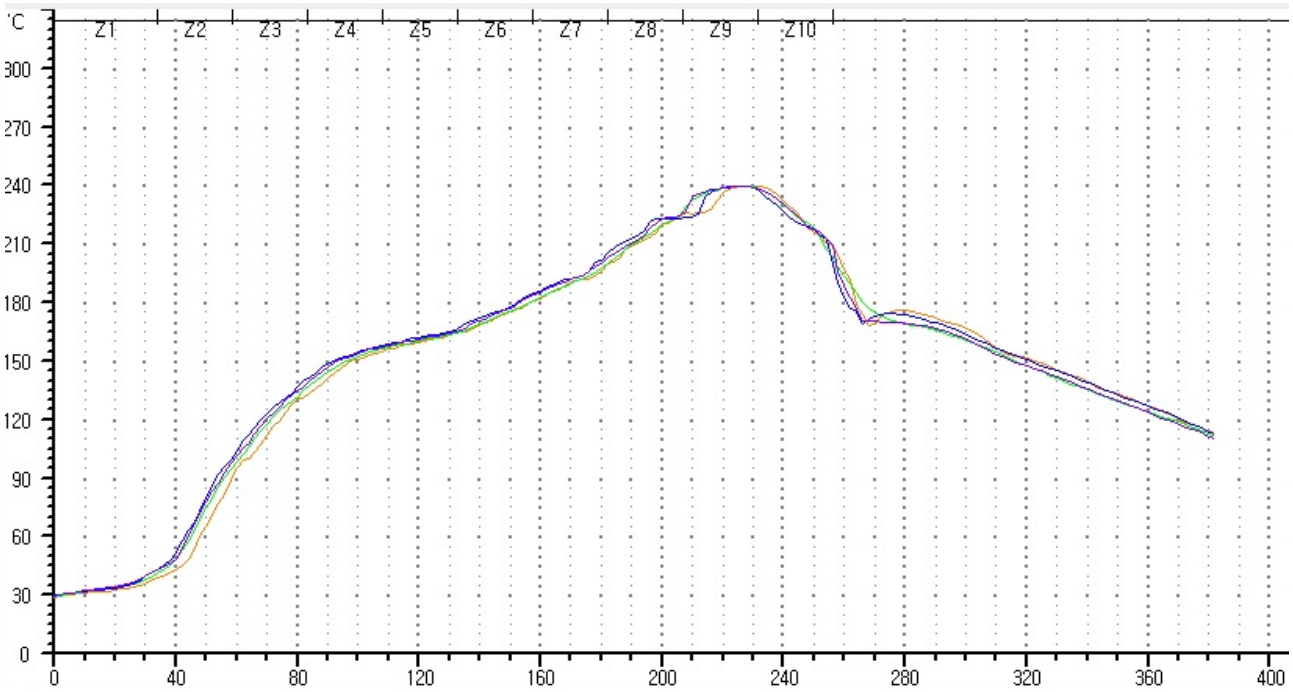


2445MHz Pattern | 2465MHz Pattern



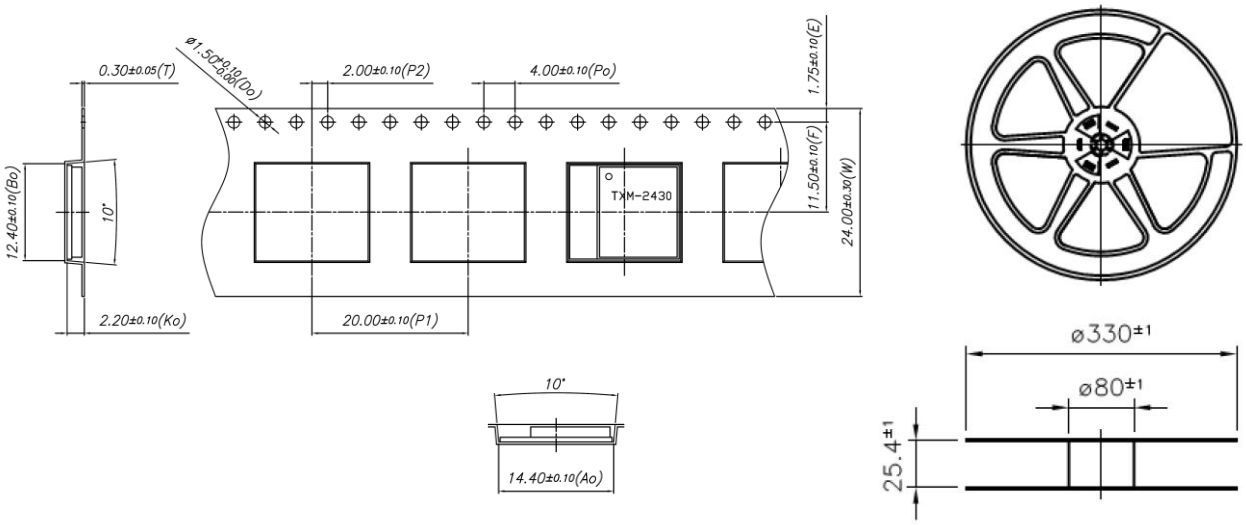
2485MHz Pattern |

12. SMT Temperature Sequence (Pb-free)

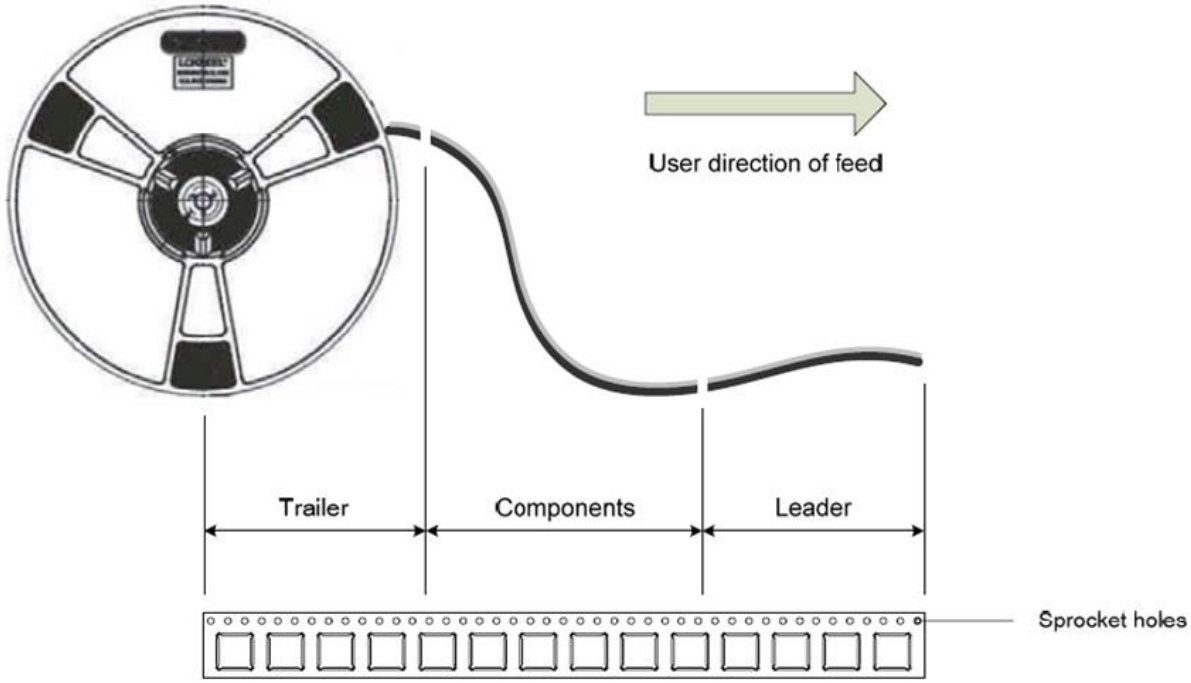


13. Packing Information

13.1 Carrier Tape and Reel Information



13.2 Leader and Trailer length



Leader (Empty carrier tape)	Components	Trailer (Empty carrier tape)	Reel / Hub size (mm)
Min. 500mm	1,400 pcs / Reel	Min. 500mm	330 / 25.4