CMOSTEK

CMT2150/57L

315/433/868/915 MHz Single-chip OOK Transmitter with Encoder

Features

- Operating frequency for CMT2150L: 240 to 480 MHz
- Operating frequency for CMT2157L: 240 to 960 MHz
- Built-in EEPROM
- Easy development with RFPDK
- All features configurable
- Data rate: 0.5 - 40 kbps
- Output power: 0 - +13 dBm
- Operating current: 7.5 mA @ +10 dBm
- Sleep current: < 20 nA
- Single chip operation with no need for external MCU control
- Support for 527, 1527 packet format
- 3 independent pins supporting up to 6 press-keys with key value configurable
- Transmission indication LED
- Compliance with FCC/ETSI standards
- RoHS compliance
- SOP8 packaging

Application

- Low-cost consumer electronics applications
- Automatic control of homes and buildings
- Fan remote control
- IR transmitter replacement
- Industrial monitoring and control
- Wireless lighting control system
- Wireless alarm and security system
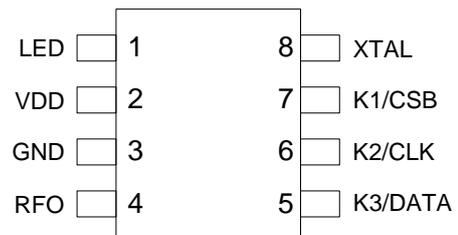- Remote Keyless Entry (RKE)

Ordering Information

Product Model	Frequency	Package	Minimum Order Quantity
CMT2150L-ESR	433.92 MHz	SOP8/Tape	2,500 pcs
CMT2157L-ESR	868.35 MHz	SOP8/Tape	2,500 pcs
Refer to Section 6 for more ordering information.			

Description

As a highly flexible, ultra-low power and encoder-equipped OOK RF single-chip transmitter, the CMT2150L/CMT2157L is ideal for wireless applications with the frequency range of 240 - 960 MHz. (The CMT2150L supports a 240 - 480 MHz band). The chip is fully compatible with the most commonly used encoding formats such as 527 and 1527. It supports 3 independent keys or up to 6 combination keys with no need for diode isolation between combined keys. In addition, the key value of each key can be configured separately. When shipped from the factory, the chip applies the 1527 encoding mode with incremental ID sequence by default. The CMT2150L is configured to operate at 433.92 MHz and the CMT2157L at 868.35 MHz. Users can operate the visual UI interface RFPDK provided by CMOSTEK and the matching programming tool to configure the customized parameters into the EEPROM inside the chip to fulfill differentiated applications. As part of the CMOSTEK NextGenRF^{TM} product family, the CMT2150L/ CMT2157L, cooperating with the CMT221x transmission chips, can help users fulfill low cost, low power and high performance applications excellently.

SOP8 Packaging

LED	1	8	XTAL
VDD	2	7	K1/CSB
GND	3	6	K2/CLK
RFO	4	5	K3/DATA

CMT2150/57L Pin Arrangement

Terminology

The terminologies used in this document are described below:

AN	Application note	PA	Power amplifier
BOM	Bill of material	PC	Personal computer
BSC	Basic Spacing between Centers	PCB	Printed circuit board
BW	Bandwidth	PLL	Phase-locked loop
DC	Direct current	PN	Phase noise
EEPROM	Electrically erasable programmable （read-only）	RBW	Resolution bandwidth
ESD	Electro-Static discharge	RCLK	Reference clock
ESR	Equivalent series resistance	RF	Radio frequency
GUI	Graphical user interface	RFPDK	RF product development kit
IC	Integrated circuit	RSSI	Received signal strength indicator
LDO	Low Dropout Regulator	Rx	Receiving, Receiver
Max	Maximum	SOP	Small outline package
MCU	Microcontroller unit	Tx	Transmitting, Transmitter
Min	Minimum	Typ	Typical
MOQ	Minimum order quantity	XOSC	Crystal oscillator
NP0	Temperature compensation characteristic	XTAL/Xtal	Crystal
OBW	Occupied bandwidth		
OOK	On-off keying		

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1 Electrical Specifications

When V$_{DD}$= 3.3V，T$_{OP}$= 25 °C，F$_{RF}$ = 433.92 MHz，the output power is +10 dBm. The matching impedance is 50 Ω. All results are tested on the CMT215xL-EM unless otherwise stated.

1.1 Recommended Operating Conditions

Table 1. Recommended Operating Conditions

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating supply voltage	V$_{DD}$		2.0		3.6	V
Operating temperature	T$_{OP}$		- 40		85	℃
Supply voltage slope			1			mV/us

1.2 Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings[1]

Parameter	Symbol	Condition	Min.	Typ.	Max.
Supply voltage	V$_{DD}$		-0.3	3.6	V
Interface voltage	V$_{IN}$		-0.3	V$_{DD}$ + 0.3	V
Junction temperature	T$_{J}$		-40	125	℃
Storage temperature	T$_{STG}$		-50	150	℃
Welding temperature	T$_{SDR}$	Last at least 30 seconds		255	℃
ESD rating		Human Body Model	(HBM)	2	kV
Latching current		@ 85 ℃	-100	100	mA

Notes:

[1]. Exceeding *the Absolute Maximum Ratings* may cause permanent damage to the equipment. This value is a pressure rating and does not imply that the function of the equipment is affected under this pressure condition, but if it is exposed to absolute maximum ratings for extended periods of time, it may affect equipment reliability.
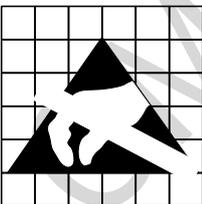
Caution! ESD sensitive device. Precaution should be used when handling the device in order to prevent performance degradation or loss of functionality.

1.3 Transmitter Specification

Table 3. Transmitter Specification

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Frequency range [1]	F_{RF}	CMT2150L and CMT2157L	240		480	MHz
		CMT2157L	630		960	MHz
Maximum output power	$P_{OUT(Max)}$			+13		dBm
Minimum output power	$P_{OUT(Min)}$			0		dBm
Output power step	P_{STEP}			1		dB
Operating current [2] @ 315 MHz	I_{DD-315}	0 dBm		3.2		mA
		+10 dBm		7.0		mA
		+13 dBm		8.0		mA
Operating current [2] @ 433.92 MHz	$I_{DD-433.92}$	0 dBm,		3.5		mA
		+10 dBm		7.5		mA
		+13 dBm		8.5		mA
Operating current [2] @ 868 MHz	I_{DD-868}	0 dBm		4.3		mA
		+10 dBm		8.7		mA
		+13 dBm		10.2		mA
Sleep current	$I_{SLEEP-Push}$	Push-key mode		20		nA
	$I_{SLEEP-Scan}$	Scan-key mode		1		uA
Data rate	DR		0.5		40	kbps
Phase noise @ 433.92 MHz	$PN4_{33.92}$	100 kHz frequency deviation		80		dBc/Hz
		200 kHz frequency deviation		83		dBc/Hz
		400 kHz frequency deviation		91		dBc/Hz
		600 kHz frequency deviation		96		dBc/Hz
		1.2 MHz frequency deviation		105		dBc/Hz
Phase noise @ 868 MHz	PN_{868}	100 kHz frequency deviation		-76		dBc/Hz
		200 kHz frequency deviation		-78		dBc/Hz
		400 kHz frequency deviation		-85		dBc/Hz
		600 kHz frequency deviation		-92		dBc/Hz
		1.2 MHz frequency deviation		-101		dBc/Hz
Harmonic output [3] @ 433 MHz 315	$H2_{315}$	2nd harmonic @ 630 MHz, +13 dBm P_{OUT}		< -45		dBm
	$H3_{315}$	3nd harmonic @ 945 MHz, +13 dBm P_{OUT}		< -45		dBm
Harmonic output [3] @ 433.92 MHz	$H2_{433.92}$	2nd harmonic @ 867.84 MHz, +13 dBm P_{OUT}		< -45		dBm
	$H3_{433.92}$	3nd harmonic @ 1301.76 MHz, +13 dBm P_{OUT}		< -45		dBm
Harmonic output [3] @868 MHz	$H2_{868}$	2nd harmonic @ 1736 MHz, +13 dBm P_{OUT}		< -45		dBm
	$H3_{868}$	3nd harmonic @ 2604 MHz, +13 dBm P_{OUT}		< -45		dBm
OOK extinction ratio				60		dB

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Occupied bandwidth @315 MHz	F_{OBW315}	Tested at -20 dBc, RBW = 1 kHz, DR = 1.2 kbps		6		kHz
Occupied bandwidth @433.92 MHz	$F_{OBW433.92}$	Tested at -20 dBc, RBW = 1 kHz, DR = 1.2 kbps		7		kHz
Occupied bandwidth @868 MHz	F_{OBW868}	Tested at -20 dBc, RBW = 1 kHz, DR = 1.2 kbps		9		kHz

Notes:

[1]. The frequency range is continuous within the specified range, and the frequency change depends on the crystal. The CMT2157L supports both 240 - 480 MHz and 630 - 960 MHz frequency ranges. RF frequency switching is fulfilled by replacing the crystal of the corresponding frequency. The crystal frequency is selected by reading the value showed on RFPDK UI after inputting the required RF frequency point on the RFPDK UI.

[2]. The test conditions for operating current are as follows: 1527 packet format, independent key mode, 3 press-keys, Sync ID = 0x35AC6 (logic 1 and logic 0, each account for half), no LED.

[3]. Harmonic output is measured by using the CMT215xL-EM evaluation board.

1.4 Crystal Oscillator

Table 4. Crystal Oscillator Specification

Parameter	Symbol	Condition	Min.	Typ.	Max.	Units
Crystal frequency [1]	F_{XTAL}	F_{RF} = 315 MHz		26.2500		MHz
		F_{RF} = 433.92 MHz		26.2982		MHz
		F_{RF} = 868.35 MHz		26.3136		MHz
		F_{RF} = 915 MHz		26.1429		MHz
Crystal frequency accuracy [2]				±20		ppm
Load capacitance [3]	C_{LOAD}	SMD32*25 mm packaging		15		pF
		49USSMD or 49S packaging		22		pF
Crystal equivalent resistance	Rm				60	Ω
Crystal start-up time [4]	T_{XTAL}			400		us

Notes:

[1]. The CMT2150/57L can use the external reference clock to drive the XIN pin through the coupling capacitor. The peak value of the external clock signal is between 0.3 and 0.7V. The typical value is based on the reference prototype of 6MHz or 13MHz. The specific crystal frequency depends on the operating RF frequency, which needs to be figured out through the RFPDK tool.

[2]. The values include: (1) initial error, (2) crystal load, (3) ageing and (4) the acceptable crystal frequency error with temperature. It is limited by the receiver's bandwidth and the RF frequency deviation between the transmitter and the receiver.

[3]. The required crystal load capacitance is integrated inside the chip, so as to reduce the number of external components. As the parasitic capacitance changes according to different crystal packages, it is recommended to select crystals with different load capacitance values according to the used packaging.

[4]. The parameter is largely related to the crystal.
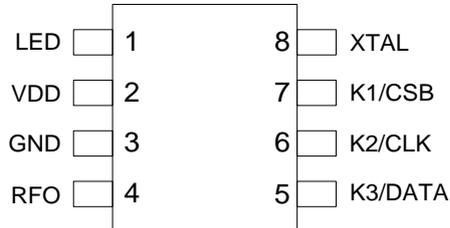
2   Pin Description

Figure 1. CMT2150/57L Pin Arrangement

Table 5. CMT2150/57L Pin Description

| Pin #	Name	I/O	Description
1	LED	IO	LED driving pin. Programming port function enabling pin.
2	VDD	I	Supply voltage input.
3	GND	I	Ground.
4	RFO	O	RF output.
5	K3	I	Press-key 3. DATA pin of programming port. Used for EEPROM programming.
6	K2	I	Press-key 2. CLK pin of programming port. Used for EEPROM programming.
7	K1	I	Press-key 1. CSB pin of programming port. Used for EEPROM programming.
8	XTAL	I	Crystal pin. Connect the crystal oscillator with 15 PF load capacitor to ground or connect a suitable external clock source.

3 Typical Performance
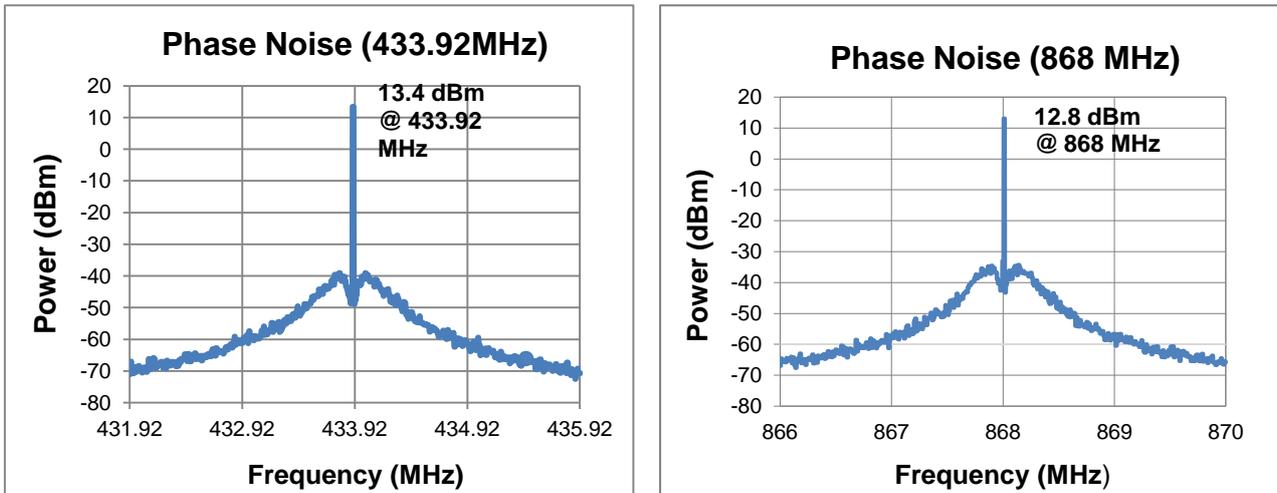
Figure 2. Phase Noise, F_{RF} = 433.92 MHz (Left) and F_{RF} = 868 MHz (Right), P_{OUT} = +13 dBm, Carrier only
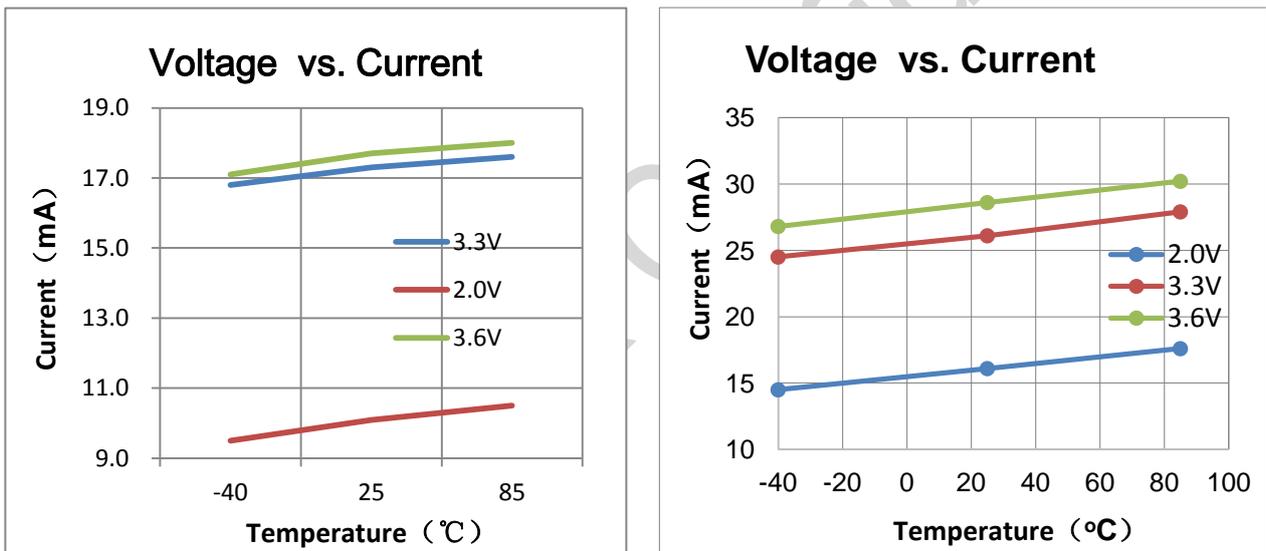

Figure 3. Tx power-Current-Voltage Characteristic Diagram

F_{RF} = 433.92 MHz (Left), F_{RF} = 868 MHz (Right), P_{OUT} = +13 dBm, Carrier only
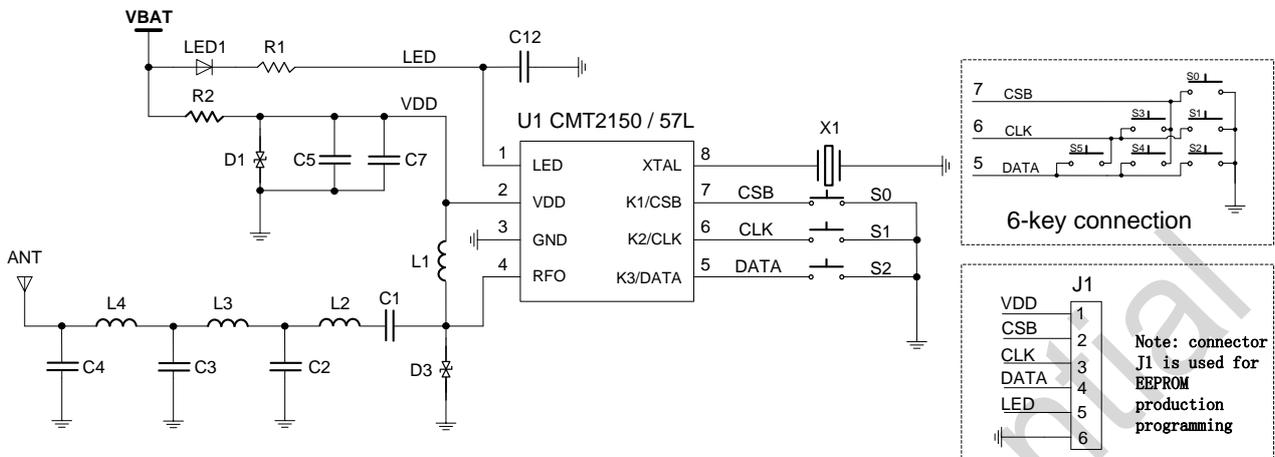
4   Typical Application

Figure 4. CMT2150/57L Typical Application Schematic Diagram

Special Notes:

1. When the CMT2150L and CMT2157L is used in handheld remote control applications, improving the ESD protection capability of remote control units is one of the most critical things for enhancing product reliability,.

2. To improve the ESD protection capability of a remote control unit, the first thing is to refine the structure design of the remote control like support for waterproof outer casing at least and silicone-blocking keys and gaps, no metal leakage into the vicinity of PCBA, and sufficient space between PCBA and the casing.

3. In addition, please pay more attention to PCB design and component placement. Please See *AN175 CMT215x Electrostatic Protection Design Guide* for more details on special considerations when the CMT2150L and CMT2157L is used in handheld remote control applications.

Table 6. Typical Application BOM of CMT2150/57L

Label	Description	Component Value				Unit	Supplier
		315MHz	433.92MHz	868.35MHz	915MHz		
X1	±20 ppm, SMD32*25 mm crystal, load capacitance of 15 pF	26.250	26.2982	26.3136	26.1429	MHz	EPSON
L1	±5%, 0603 multilayer chip inductor	220	180	100	100	nH	Sunlord
L2	±5%, 0603 multilayer chip inductor	75	51	12	15	nH	Sunlord
L3	±5%, 0603 multilayer chip inductor	75	47	15	18	nH	Sunlord
L4	±5%, 0603 multilayer chip inductor	56	36	15	15	nH	Sunlord
C1	±5%, 0402 NP0, 50 V	33	18	15	12	pF	-
C2	±5%, 0402 NP0, 50 V	3.6	4.3	4.3	3.6	pF	-
C3	±5%, 0402 NP0, 50 V	5.6	4.3	2.2	2.7	pF	-
C4		NC	NC	NC	NC	-	-
C5	±20%, 0402 X7R, 25 V	100				nF	-
C7	±20%, 0402 X7R, 25 V	470				pF	-
C12	±20%, 0402 X7R, 25 V	27				pF	-
D1	XE5D5VB, ESD protection Diode	-				-	-
D3	XE5D5VB, ESD Protection Diode	-				-	-
LED1	D0603, red LED	-				-	-
R1	Resistance	1k				Ω	-
R2	Resistance	0				Ω	-
S[5:0]	Press-key	-				-	-
U1	CMT2150/57L, 240 – 960 MHz OOK single-chip transmitter with encoder	-				-	CMOSTEK

Applications considerations:

1. The connector J1 is required for EEPROM programming during development and production.

2. The general layout guidelines are as follows:

    ▪   Try to place areas of ground plane as large and continuous as possible.

    ▪   Try to use as many ground vias as possible (especially near the GND pin) to reduce the series parasitic inductance between the GND pin and ground.

    ▪   Try to avoid connecting the components with long and/or thin transmission lines.

    ▪   Adjacent inductors should be placed vertically to each other to reduce mutual coupling.

    ▪   Place C0 as close as possible to the CMT2150/57L for better filtering.

    ▪   Place the crystal X1 as close as possible to the chip, and make the metal case grounded and make it as far away as possible from the RF output signal and digital signal.

3. Please refer to *AN155 CMT2157B/CMT215xL Schematic and PCB Layout Design Guide* for more design details.
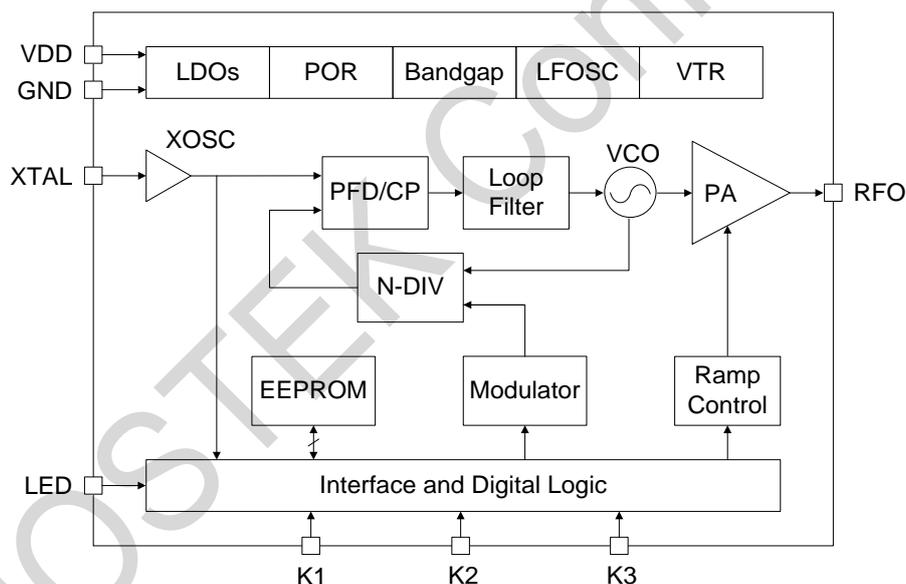
5   Function Description

Figure 5. Functional Block Diagram

5.1   Overview

As a highly flexible, ultra-low power and encoder-equipped OOK RF single-chip transmitter, the CMT2150L/ CMT2157L is ideal for wireless applications with the frequency range of 240 - 960 MHz. The CMT2150L/ CMT2157L is a part of the CMOSTEK NextGenRF™ product family, which covers a full product series including transmitters, receivers and transceivers. The chip is fully compatible with the most commonly used encoding formats such as 527 and 1527, making it the ideal solution to replace the widely used encoding chips like xx527, xx1527, xx2240, etc. The high integration and low-power features of the chip make it excellently feasible for low-cost, low-power and battery-driven wireless applications.

The functional block diagram of CMT2150/57L is shown in Figure 6. The CMT2150/57L fulfills wireless transmission by using a PLL + PA structure which uses a single-pin crystal oscillator circuit. To reduce the number of external components, the load capacitance required for crystal oscillation is integrated inside the chip. A self-calibration process is performed on each analog module upon chip power-on reset (POR). This calibration allows the chip to operate more reliably at different temperatures and voltages. The data transmission is triggered by a key press action and the target data is transmitted through modulating an efficient power amplifier. The transmission power can be set from 0 to +13 dBm in a step of 1 dB. During the product development phase, users can use tools such as USB Programmer and RFPDK, which are provided by CMOSTEK, to program the frequency, output power and other customized parameters into the built-in EEPROM for fast function verification. In the mass production phase, users can use the offline programming tools provided by CMOSTEK to achieve low-cost and fast programming. As an alternative, users can select using the CMT2150L (default frequency is 433.92 MHz) and CMT2157L (the default frequency is 868.35 MHz) inventories with default parameters to save the production programming step. The CMT2150/57L operates well in the voltage range of 2.0 - 3.6 V until the battery voltage is exhausted.

5.2   Modulation, Frequency and Data Rate

The CMT2150/57L supports the OOK modulation data rates up to 40 kbps. The CMT2150L can cover a frequency range of 240 - 480 MHz continuously, including the free ISM band near 315 MHz and 433.92 MHz. The CMT2157L can cover frequency ranges of 240 - 480 MHz and 630 - 960 MHz continuously, including the free ISM band around 868 MHz and 915 MHz. The specifications such as modulation method, frequency and data rate are listed in the below table.

Table 7. Modulation, Frequency and Data Rate

Parameter	Value	Unit
Modulation Mode	OOK	-
CMT2150L frequency range	240 - 480	MHz
CMT2157L frequency range	240 - 480 630 - 960	MHz
Data rate	0.5 - 40	kbps

5.3   RFPDK and Built-in EEPROM

RFPDK (RF Products Development Kit) is a user friendly software. It allows users to configure CMT2150/57L in a visible way. Users only need to fill in or select the appropriate value for each parameter, and then click the *Burn* button to complete the chip configuration. It's required to access and control any registers in user applications. The way to access EEPROM is shown in the below figure. All the configurable parameters of CMT2150/57L on RFPDK are listed in the below table.
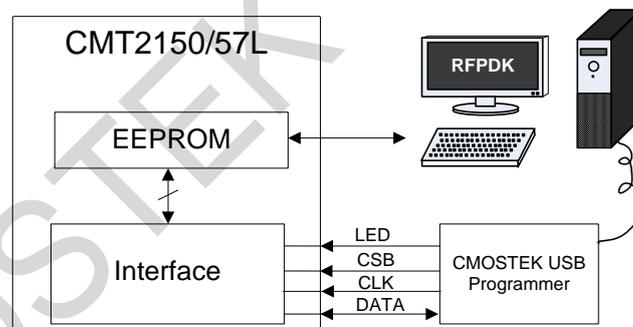

Figure 6. Access Built-in EEPROM

For details about the CMT2150/57L configuration, users can refer to *AN153 CMT2150/57L configuration guideline*.

Table 8. Configurable Parameters in RFPDK

Classification	Parameter	Description	Default
RF Settings	Frequency	Input the required RF frequency, ranging from 240 to 960 MHz for the CMT2150L (433.92 MHz as default value) and 240 to 480 MHz & 630 to 960 MHz for the CMT2157L (868.35 MHz as default value) , with an accuracy of 0.001 MHz.	433.92 MHz for CMT2150L. 868.35 MHz for CMT2157L.
	Xtal freq. type	Select the high frequency crystal (26 MHz) or the low frequency crystal (13 MHz).	High Freq.
	Xtal freq.	Calculate the recommended crystal frequency according to the settings of Frequency and Xtal freq. type.	26.2982 MHz for CMT2150L. 26.3136 MHz for CMT2157L.
	Tx power	Select the right output power, ranging from 0 to +14 dBm (Leave 1 dB margin above +13 dBm).	+13 dBm
	Date rate	Set the data rate to be transmitted, from 0.5 kbps to 40 kbps.	4.8
Baseband Settings	LED	The LED indicator shows on or off	On
	LED output Mode	LED output mode：PWM Signal - output PWM waveform to drive LED, Tx Data - output the data stream synchronized with data to drive LED.	PWM Signal
	PWM rate	Valid when the LED output mode is PWM. It is 3.34KHz or 6.68KHz.	6.68 kHz
	PWM ratio	It is valid when the LED output mode is PWM. It sets the PWM ratio, ranging from 0 to 100%	100%
	Tx overtime	Exit the setting when users press the key for a long time. Users can set: 8 s, 16 s, 32 s and 64 s.	8 s
	LBD output Status	Low battery detection output status	Disable
	LBD threshold	It sets the low voltage detection threshold. The configurable range is 2.0 to 3.6 V with a resolution of 0.1 V.	2.4 V
Key Settings	Key mode	Select the key mode. Scan Key - scan key. Push Key - independent key.	Scan key
	Key value format	Input key value format: Hex (hexadecimal) or Dec (decimal).	Hex
	SWn	Each key value.	

5.4   Power Amplifier

The CMT2150/57L integrates a high-efficiency Class-E power amplifier. The RFPDK setting allows the PA to go from   0 to +13 dBm with a step of 1 dB. For the peripheral matching of this PA, please refer to the *AN155 CMT2157B/CMT2150L Schematic and PCB Layout Design Guideline.*

5.5   Operating State

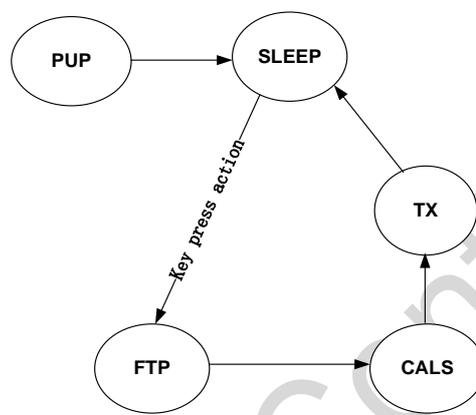Upon power-up, the CMT2150/57L follows the operating state transition as below.

Figure 7. Operating State

Power-up state

Upon chip power-up, the chip will complete the power up (PUP) process including the release of power on reset (POR), the opening of the crystal circuit and the calibration of the internal circuitry. PUP will take about 6 ms.

Sleep state

In this state, all the internal circuit modules are closed (the scan-key mode is enabled and the scanning circuit is still operating). In sleep, the chip consumes about 20 nA in push-key mode and 1 uA in scan-key mode

FTP state

When a valid key-press is detected, the chip leaves the sleep state and starts the crystal circuit then wait for the stable crystal oscillation. After then it   starts to perform the EEPROM copy action to operate according to the set parameters. The time required from the crystal circuit startup to its stable operating is approximately 200 us.

Calibration (CALS) state

The chip performs configuration and calibration according to the EEPROM setup parameters, which takes approximately 550 us It usually takes about 800 us for the chip to wake up from the sleep state to the CALS state.

Tx State

After the calibration is completed, the chip enters the Tx state.

After the preset data transmission is completed, the chip exits the TX state and enters the sleep state, waiting for the next valid key-press occurring, and then to repeat the process.

6   Ordering Information

Table 9. CMT2150/57L Ordering Information

Model	Description	Packaging	Packaging Option	Operating Condition	Minimum Order Quantity
CMT2150L-ESR[1]	240 - 480 MHz single-chip OOK transmitter with encoder	SOP8	Tape and tray	1.8 to 3.6 V, - 40 to 85 °C	2,500
CMT2150L-ESB[1]	240 - 480 MHz single-chip OOK transmitter with encoder	SOP8	Tube	1.8 to 3.6 V, - 40 to 85 °C	1,000
CMT2157L-ESR[1]	240 - 960 MHz single-chip OOK transmitter with encoder	SOP8	Tape and tray	1.8 to 3.6 V, - 40 to 85 °C	2,500
CMT2157L-ESB[1]	240 - 960 MHz single-chip OOK transmitter with encoder	SOP8	Tube	1.8 to 3.6 V, - 40 to 85 °C	1,000

Notes:

[1].   E refers to extended Industrial product rating, which supports temperature range from -40 to +85 °C.

S stands for the package type of SOP8.

R refers to tape and tray type, and the minimum order quantity (MOQ) is 2,500 pieces. B stands for the tube type and the minimum order quantity is 1,000. If the CMT2150/57L-ESR does not meet the application requirements, customers can order the CMT2150/57L and customize parameter configuration with RFPDK then.

Please visit www.cmostek.com for more product/product line information.
Please contact sales@cmostek.com or your local sales representative for sales or pricing requirements.

7   Packaging Information

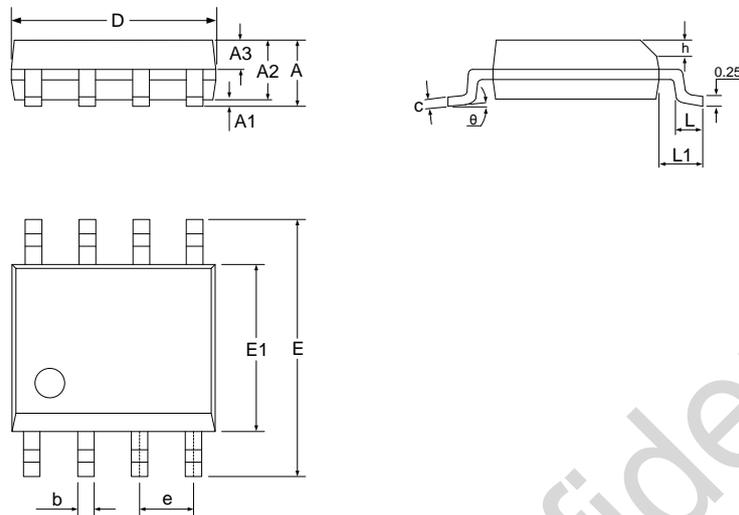The packaging information of the CMT2150/57L is shown in the below figure.

Figure 8. SOP8 Packaging

Table 10. SOP8 Packaging Scale

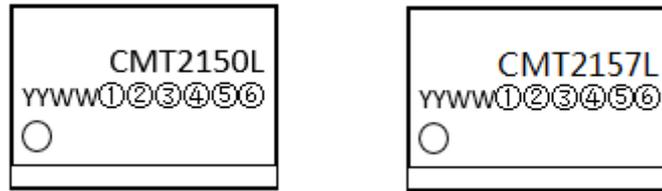| Symbol	Scale (mm)		
	Min.	Typ.	Max.
A	-	-	1.75
A1	0.10	-	0.225
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	-	0.48
c	0.21	-	0.26
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.27 BSC		
h	0.25	-	0.50
L	0.50	-	0.80
L1	1.05 BSC		
θ	0	-	8°

8 Top Marking

Figure 9. CMT2150L and CMT2157L Top Marking

Table 11. CMT2150L and CMT2157L Top Marking Information

Marking Method	Laser
Pin 1 Mark	Diameter of the circle = 0.5 mm
Font Height	0.6 mm, align right
Font Width	0.3 mm
Line 1 Marking	CMT2150L refers to model CMT2150L; CMT2157L refers to model CMT2157L
Line 2 Marking	YYWW is the date code assigned by the packaging factory. YY is the 2 last digits of the year. WW is the working week. ①②③④⑤⑥ is the internal tracing code.

9   Related Documents

Table 12. Related Documents

Doc. No.	Name	Description
AN153	CMT215xL Configuration Guideline	Configuring CMT215xL through RFPDK is described in detail.
AN155	CMT2157B/2150L Schematic and PCB Layout Guideline	CMT2157B and CMT22150L PCB schematics and the layout design rules, RF matching networks and other layout design considerations.
AN159	CMT2157B/2150L Matching Guideline	RF matching network guideline for the CMT2157B/2150L.
AN175	CMT215x Application Electrostatic Protection Design Guideline	Reference for electrostatic protection design for handheld applications

10 Revise History

Table 13. Revise History Records

Version No.	Chapter	Description	Date
0.1	All	Initial release	2017-08-09
0.2	All	Correct some typos	2017-09-04
0.9	All	Add CMT2157L related information	2018-08-31

11   Contacts

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