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Revision History

Version	Date	Description
1.0	2018-4-12	Initial version
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2.2	2019-03-15	Section 8 – new screen images

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1 Brief Description

The SCT2400 EVM is a compact evaluation board that allows the user to investigate all aspects of the SCT2400 integrated circuit, a high performance 2.4GHz transceiver and baseband processor. The evaluation board also includes additional circuits that can be used to evaluate the system performance of the SCT2400 in a typical radio implementation. These circuits include a 2.4GHz FEM, audio codec and audio power amplifier. The SCT2400 EVM can work independently and also can be controlled via a PC using a USB port.



Figure 1.1 SCT2400 EVM Block Diagram

The board has the facility to be powered either from an external power supply or the USB interface (as the EVM power consumption is lower than the 500mA limit of USB2 interfaces).

2 Hardware Description

Schematics for the SCT2400 EVM are given in Appendix.1.

Figure.2 shows the top view of the SCT2400 EVM silk screen which identifies the major components and connectors.



Figure 2.1 SCT2400 EVM

CH1: Channel switch

SW1: Power switch and volume control

SPK+/-: External speaker $(8 \Omega, 1W)$

J1:	3.5mm earphone socket. The external speaker output will be disconnected when the
	earphone is plugged in
DC5V:	Power supply
CON1:	Micro USB port. This USB interface can work not only as the port for the
	connection between SCT2400 EVM and PC to enable radio programming, but also
	act as the EVM power supply
P3/P4/P6:	SCT2400 GPIO. For pin definition, please refer to silk print on the reverse of the
	board.
P2:	SMA RF test connector. This connector is for evaluation of the RF performance of
	SCT2400 transceiver directly.
P1:	SMA test connector. This connector is for evaluate the RF performance of
	SCT2400 transceiver together with 2.4GHz FEM together.
P7:	Switch the power supply between DC5V and CON1 USB
R_LED:	TX status Red LED, it will be lit if the PTT is pressed
G_LED:	RX status Green LED, it will be lit if the radio receives a call
RA:	LTCC connection, connected by default
RC:	FEM RF performance test, disconnected by default

3 Quick Start

Quick start provides a quick way for users to test SCT2400 EVM. The default frequency is 2400MHz.

3.1 Hardware Connection

Connect an external speaker $(8 \Omega, 1W)$ to the SPK+/- pads or plug an earphone into socket J1. The external speaker output will be disconnected if the earphone is plugged in. **Caution** : When using the earphone ensure that the volume control is set to minimum before the earphone is plugged in, then adjust the volume to a comfortable level. Excessive volume when using the earphone can cause hearing damage.

3.2 Power Supply

The power supply input voltage to the EVM PCB is nominally 3.7V (3.5V to 5.3V is acceptable). On-board voltage regulators are provided to generate all voltage rails used on PCB (3.3V rails are used). The 3.7V supply should be rated at 500 mA. Power supply for this board can be switched between an external supply provided on DC5V and the VBUS pin on CON1 micro USB port by using JP7.

3.3 Operation

Rotate the SW1 clockwise to turn on the EVM board and set the speaker volume. The red and green LED will flicker for a few seconds and a beep sound should be heard in the earphone or external speaker at the same time.

After this has occurred the EVM board is operational and the radio is now in standby mode and is ready to receive a call from another radio.

Pressing the PTT key puts the SCT2400 into TX mode (red LED on the board will illuminate). Other compatible SCT2400 EVM boards set to the same channel can receive the call, when the green LED lights

3.4 Functionality supported when first used

Default EVM settings:
16 channels have been defined starting at 2.4GHz with a step size of 1.2MHz
Channels 1-8 are assigned to Zone 1. Channels 9-16 are unassigned.
Channels 1-4 are set to call G_1 and receive from group G_1 only.
Channels 5-16 are set to call ALL_CALL and have no receive group restrictions.
Contacts Group G_1 is assigned. An example contacts Group, G_2 has been defined with call ID2 but is not assigned.
Group ALL_CALL has been defined to call all contacts.
No scan list has been defined.
Users may further modify the functionality using the Sicomm CPS software (section.5).

4 EVM Test Guide

The SCT2400 EVM features PCB routing options to make networking testing more convenient.

4.1 Small-scale Networking Test

In order to perform small-scale networking testing, the EVM transmit power should be reduced (output 0dBm). The transmit output of the SCT2400 can be disconnected from the PA (remove C102) and connected to the SMA interface (At①shown in the Figure 4.1). This operation can also test the receiving indicator of the SCT2400. However, removing the external LNA will result in a deterioration of sensitivity.



Figure 4.1 SCT2400 EVM

4.2 Antenna Replacement

The SCT2400 EVM is fitted with an standard LTCC 2.4GHz antenna. To test the transmit power (20dBm) or replace the antenna, disconnect the PA (remove inductor RA) from the LTCC antenna and connect the PA to the SMA interface (At ② shown in the Figure 4.1) by fitting a zero ohm resistor RC.

4.3 Channel Switching Notes

The SCT2400 EVM is configured to support 16 radio channels.

The channel select switch CH1 is a rotary encoder, rotating the switch in the clockwise direction increases the channel number, whilst rotating anticlockwise decreases the channel number. A voice annoouncement of the selected channel number is given. An alarm sound will be heard if channel switching exceeds the maximum configured channels (At@shown in the Figure 4.1).

5 CPS Instructions

Sicomm provides the CPS to enable users to access and configure SCT2400 functionality. The CPS program is provided as a compressed file which needs to be extracted to a convenient folder before use.







Figure 5.1 SCT2400 Radio

5.1 CPS Files Path

If the CPS executable is moved to a different folder, a shortcut will need to be created to open it,

otherwise some functions of CPS will not work. The modification steps are as follows.





Figure 5.2 Sicomm CPS Icon

Step 2: Right click on this shortcut -> Properties -> Target:

Name	Date modified	Type	Si	70	
	12/11/2010 02 17		5.		
CVS	13/11/2018 03:47	File folder			
DataFile	16/11/2018 14:49	File folder			
L en	13/11/2018 03:47	File folder	SicommCps.	exe - Shortcut Properti	es >
help doc	13/11/2018 03:47	File folder	Canal Concerning Pro-		
📕 help doc-En	13/11/2018 03:47	File folder	Security	Details	Previous Versions
Images	13/11/2018 03:47	File folder	General	Shortcut	Compatibility
zh-CHS	13/11/2018 03:47	File folder	((()))	income over Obertand	
J zh-CN	13/11/2018 03:47	File folder	₹ omm	icommops.exe - Shoricut	
📕 zh-TW	13/11/2018 03:47	File folder	-		
.#SicommCps.exe.lnk.1.1	07/05/2018 14:13	1 File	l'arget type:	Application	
cps.ini	13/08/2018 18:27	Configurat	Target location	: SICOMM_CPS	
🔜 SicommCps.exe	06/08/2018 15:51	Application	Target:	400\SicommCPS\SICOMM_CPS\SicommCps.ex	
় SicommCps.exe - Shortcut	13/11/2018 03:48	Shortcut			
UserDevice.dll	06/08/2018 15:51	Application	Start in:	ke\Sicomm\SCT2400\SicommCPS\SICOMM_CP	
			Shortcut key:	None	
			Run:	Normal window	~
			Comment:		
			Open File I	ocation Change Ico	an Advanced
			1. 16	Ĵ	
				ОК	Cancel Apply

Sicomm > SCT2400 > SicommCPS > SICOMM_CPS

English characters):

Figure 5.3 Sicomm CPS Shortcut

Step 3: Add a space + "internal" at the end of the target path (space and quotation marks are

Name	Date modified	Туре	Si	ze	
CVS	13/11/2018 03:47	File folder			
DataFile	16/11/2018 14:49	File folder			
en 📃	13/11/2018 03:47	File folder	10 - 10		
📕 help doc	13/11/2018 03:47	File folder	SicommCps.	exe - Shortcut Propert	ies >
📕 help doc-En	13/11/2018 03:47	File folder	Security	Details	Previous Versions
Images	13/11/2018 03:47	File folder	General	Shortcut	Compatibility
zh-CHS	13/11/2018 03:47	File folder	r m sm		
zh-CN	13/11/2018 03:47	File folder	S Comm	icommCps.exe - Shortcu	t
zh-TW	13/11/2018 03:47	File folder			
.#SicommCps.exe.lnk.1.1	07/05/2018 14:13	1 File	Target type:	Application	
cps.ini	13/08/2018 18:27	Configurat	Target location	: SICOMM_CPS	
SicommCps.exe	06/08/2018 15:51	Application	Target:	nmCPS\SICOMM_CPS	S\SicommCps.exe "internal"
SicommCps.exe - Shortcut	13/11/2018 03:48	Shortcut			
JuserDevice.dll	06/08/2018 15:51	Application	Start in: ke\Sicomm\SCT2400\SicommCPS\SI		SicommCPS\SICOMM_CPS
			Shortcut key:	Shortcut key: None	
			Run:	Normal window	~
			Comment:		

Figure 5.4 Modify Path

5.2 EVM Connected With the Host Computer

Step 1: Double-click the shortcut to open CPS.

Step 2: Click the Language tab and select the desired language setting (default is Chinese)

Step 3: Connect the SCT2400 EVM to the computer via a universal USB cable (At ③ shown in Figure 4.1), then turn on the EVM power switch (At ⑤ shown in Figure 4.1) and confirm the USB identification in Device Manager (Shown in Figure 5.5).



Figure 5.5 USB Identification

5.3 CPS Screen Layout

The CPS screen is divided into 5 main sections. At the top is the toolbar, with shortcut buttons beneath. In the left pane is a directory tree allowing various functions to be called and in response the right pane displays settings and programming options. The bottom pane shows context related

information.

👹 Digital Mobile Radio Program Software V1.02.06PL Read Radio	
File(F) Programe(P) ComPort(C) Tools(T) Language(L)	Help(H)
2 12 12 12	
🖃 🛄 Digital Radio	
Radio Info	Radio Info
🔁 🛄 Basic Settings	
E-Cone	Serial Number: 00000000001234
E Channel	
UFK Settings	Model Name: SCT9240
ter Soan List	Model Code: SCT9240
	Model Type: Handheld
	Frequency Range[10fr]: 2400 - 2478
	Base Band Ver: V2.02.02PE
	Software Ver: V1.03.10
	Last Frogrammed 2018.12.5
Device Information	л.
Display some basic information about a radio, such as	s a serial number, models, frequency and version, etc.
The user can read the following basic information, but	cannot modify it.
Serial number Model Name Model Number	
O Type here to search	H 🤒 🐂 ѐ 🕅 隆 🖾 🕼 🦑 🔕 🕅 🛷

Figure 5.6 CPS Screen

Settings can be changed using either radio buttons or drop down boxes, whilst titles for channel

names, zones, etc. can be directly overwritten.

Not all features are currently supported, unsupported features will not respond to selection.

5.4 Initial Functionality

When CPS is first loaded and the EVM is configured, the initial configuration supports the

following functionality:

Feature	Description
Number of channels	16
Call types	Individual, Group, Broadcast (All call)
Group list	G_1
Scan list	Not set up

5.5 Reading Frequency

First, run the CPS software, and connect the EVM to the computer, turn on the EVM power switch (At (5) shown in Figure 4.1). Click "ComPort" and select the appropriate COM port which should show in the drop down list (Shown in Figure 5.7). Click "Program" and find the "Read" icon to implement the reading operation (See Figure 5.8).



Figure 5.7 COM Port



Figure 5.8 Reading Frequency

A confirmation box will open (Figure.5.9), select OK to proceed.

Read Operat	×
Read to Radio, Are you Sure	?
OK Cano	cel

Figure 5.9 Read operation

A progress dialog box then appears

Base Band Ver:	V1.0.0	
Software Ver:	Digital Mobile Radio Program Software	
Last Programmed	Read Process Start!	
	Cancel	

Figure 5.10 Progress Dialog

followed by a confirmation of successful operation

Software Ver: V1.03.10	
Last Programmed 2018.11.16	Remind X
	Read Succestul.
	ОК

Figure 5.11 Read Successful

If the read operation is unsuccessful an alternative dialog box is shown.

ver. V	2.02.0216		
Ver:	Digital Mobile Radio Program	m Software	
nmed [Warning X	
	Read Process Start!	Read Failed.	
		ОК	Cancel

Figure 5.12 Read Failed

5.6 Writing Frequency

There are two methods of writing operating frequencies to the EVM. Firstly after successful frequency reading, the parameters can then be reconfigured (See section 6 as an example), then Click Save icon to save it.



Figure 5.13 Save the Configuration

This action opens a directory screen where the saving location may be selected.



Figure 5.14 Saving location

The second method is to directly open the .dat configuration file (Shown in Figure 5.15 and 5.16),

and then write the frequency.



Figure 5.15 Open Configured File

le(F) Programe(F) ConPort(C) Tools(T) Lam	guage(L) Help(H)					
 □ Digital Radio □ Radio Info □ Bazio Settings □ Zone 		Radio Info	0000000000234			
Zonel		Serial Munder.	000000000001234			
😑 🛄 Channel		Model Name:	SCT9240			
😑 🔛 DFR Channel	🧱 Open					×
IT DFR Channel2	← → × ↑ • « SCT24	100 > SicommCPS > SICOMM_C	PS > DataFile > 🗸	5 Search DataFi	le	P
DFR Settings	Ormanias an Namefaldar				8	
- Mr Basic Settings	Organise New folder	~			8== 🖌	
BFR Contacts	This PC	Name	Date modified	Туре	Size	
B BFR RX Group List	3D Objects	CVS	13/11/2018 03:47	File folder		
- JFREXGroupList1	Desktop	9240_default.dat	03/03/2018 16:41	DAT File		3 KB
Soan List	Documents	9240_default1.dat	14/08/2018 11:58	DAT File		8 KB
- 📷 Scan Listl	🖶 Downloads	9240_defaultdb.dat	10/11/2018 14:30	DAT File		5 ND
	Music					
	E Pictures					
	Videos					
	🏥 Local Disk (C:)					
	🛫 sicommcvs (\\d					
	🗙 LAN files (\\PO\					
	🗙 Public (\\POWE					
	File nam	e 😲		✓ All File (*.*)		~
				Open	Ca	ncel

Figure 5.16 Choose and Open .dat File

EVM parameters can then be reconfigured (See section 6). Click the "Write Frequency" icon (Shown in Figure 5.17) to send the configuration to the EVM.



Figure 5.17 Writing Frequency

A dialog box opens asking for confirmation

ure Ver∶	V1.03.10			
grammed	2018.11.16	Write Onerst		
		Write to Radio, Are you Sure	£?	
		OK Cance	cel	

Figure 5.18 Write confirmation

6 SCT2400 Firmware Upgrading

Step 1:

Press PTT button and turn on the power knob at the same time.

Step 2:

If led is twinkling between red and green, which means it goes into the ISP Upgrade mode.

Step 3:

Go to Tools -> Upgrade ISP-> select the .bin file and upgrade it in CPS

File(F) Programe(P) ComPort(C) To	ools (T) Language (L) Help (H)
🖻 🛅 🏚 🗗 🔽	በ
Digital Radio Radio Info Basic Settings	Radio Info
terender for the second secon	🖷 Host Mcu Firmware Update
DFR Settings	ISP
	Program File:
	click the button to select .bin file
	Software Ver: V1.03.10
	Last Programmed 2019.2.27

Figure 6.1 ISP Upgrade

7 Frequency Modification

After successful frequency reading (Or open local configured .dat file of this EVM), click "Zone" -> "Zone 1". And you will find that there are already four channels (Shown in Figure 7.1), which can be added, removed, or adjusted its order on this window.

Click "Channel" -> "DFR Channel" to see the four channel frequencies (Shown in Figure 7.2) that have been configured. Modifying the frequency point is to change the "TX Frequency", and then click "Copy"(Shown in Figure 7.3) to confirm the same frequency of TX and RX (Note that the

File(F) Programe(P) ComPort(C) Tool	s(T) Language(L) Help(H)		
🖻 💼 🎰 🔽			
Digital Radio Radio Info Basic Settings Zone		7-m Nier 7-mal	
Canal			
	Channel List		1
⊕- 🔛 Scan List	Available Channel:	Channel Hembers:	
B- Parsmoter Settings	Avsilable Channel: Aiss DFR Channel5 DFR Channel6 DFR Channel7 DFR Channel8 DFR Channel9 DFR Channel10 DFR Channel11 DFR Channel13 DFR Channel14 DFR Channel15 DFR Channel16	Channel Henbers: Serial Alias 1 DFR Channell 2 DFR Channel2 3 DFR Channel3 4 DFR Channel4 Add>	Up Down

Figure 7.1 Channel Zone



Figure 7.2 Channel Parameters

DFR Channel	DMR Digital Channel Alias Vocoder Scan List Enable Auto Scan RX Only	: DFR Channel1 : iFengyu : None .		
TX TX Frequency [MHr]: TX Contacts: TX Power Level: TX Admit: Time-out Forbidden Time[s]:	2400.000000 (*) G_1 • High • TX Allow • No Limitation •	Frequency Offset [HHz] 0.000000	RX RX Frequency[MHr] RX Group List	: 2400.00000 *
Time-out Recovery Time[s]:			Encryption Encryption Encrypt Key	:

Figure 7.3 Channel Frequency Setting

8 Other Settings

8.1 Basic Settings

The user can configure some basic settings of the radio, these configurations are generally available globally.

	1 1 1 (m)	
le(<u>r</u>) rrograme(<u>r</u>) comfort(<u>c</u>) loois(<u>r</u>) Language(<u>L</u>)	verb(<u>v</u>)	
🎽 🛅 🗀 🖆 📔		
冒 Digital Radio		
	Basic Settings	
Basic Settings		
🖸 Settings	Radio Alias:	SCT2400EVM
		7 11 1
- () Tone	Language.	English V
H- Zone	Default Boot Zone Select:	Zonel \sim
The DER Settings		OFF
E- Scan List	rower Saving Mode:	
 ∄ Parameter Settings	Enter Low-Power Waiting Time[s]:	3
	Vox Level:	3 ~
	Radio Disable:	
	Remote Monitor:	
	Password	
	Write Password Enable:	
	Write Password:	*00000000
	Write Password Error Times:	Unlimited \sim
	Read Password Enable:	
	Read Password:	100000000
	Read Password Error Times:	Unlimited \sim

Figure 8.1 Basic radio settings

8.2 Buttons

The user can program the programmable keys for some optional functions.

Digital Mobile Radio Program Software V1.02.06PS C:\Users\slitchfield\	Documents\PE0003\Sicomm\SCT2400\CPS_EVM\Datafile\SCT2400_EVM_16CH_EN.dat
$\texttt{File}(\underline{F}) \hspace{0.1in} \left \hspace{0.1in} \texttt{Programe}(\underline{P}) \hspace{0.1in} \right \hspace{0.1in} \texttt{ComPort}(\underline{C}) \hspace{0.1in} \left \hspace{0.1in} \texttt{Tools}(\underline{I}) \hspace{0.1in} \right \hspace{0.1in} \texttt{Language}(\underline{L})$	Help(<u>H</u>)
🔁 🛅 🛍 🖬	
🖃 🔓 Digital Radio	
	Kev's Fucation Configuration
🗗 🛄 Basic Settings	
- 🖸 Settings	Key 1: PTT Call ~
🥅 Buttons	
Tone	Key 2: None 🗸
🗄 🔛 Zone	Key 3: Vocoder Switch 🗸
🗄 🚞 Channel	
⊕ 📄 DFR Settings	
🕀 🛄 Scan List	
🗄 📄 Parameter Settings	4 Pin Channel
	Channel Number: 1
	Cot CV Volue
	When pressing button "Get Ch Value", it A
	correspond to actual channel switch
	number. After completion of channel
	Softing" to make abarnal manning
	CH Mapping Setting
	11 2 6 15
	14 1 5 10
	4 8 13 9

Figure 8.2 Configuring Button Functionality

Note: The channel mapping box is not used. The Channel Switch, CH1, is defined in the SCT2400 and cannot be changed. The selector lines are directly connected to PE14 and PE15 of the SCT2400.

8.3 Tone

On this window, users can set the Tones and LED/Backlight



Figure 8.3 Configuring Tone Functionality

8.4 Zone

A zone is a group of channels, which could help user to manage radio channels easily. If users add several zones, they could switch zone through Menu>Zone or the programmable function key associated with zone switching function.



Figure 8.4 Setting Radio Zones

8.5 Radio Channel

The user can add or delete a channel. And configure the specific parameters for each channel.

🎇 Digital Mobile Radio Program Software V1.02.06PP	
$\texttt{File}(\texttt{F}) \hspace{0.1in} \left \hspace{0.1in} \texttt{Programe}(\texttt{P}) \hspace{0.1in} \right \hspace{0.1in} \texttt{ConPort}(\texttt{C}) \hspace{0.1in} \left \hspace{0.1in} \texttt{Tools}(\texttt{T}) \hspace{0.1in} \right \hspace{0.1in} \texttt{Language}(\texttt{L}) \hspace{0.1in} \right $	Help(H)
2 12 12	
🖃 📋 Digital Radio	
- Radio Info	
🖲 🔛 Basic Settings	DEE Channel
🖲 🚞 Zone	
😑 🚞 Channel	DFK Digital Channel Alias: DFK Channell
- DFR Channel	Vocoder: Option2 🗸
DFR Channel1	Scan Lizt: None 🗸
🖬 🔛 DFR Settings	
🖲 🔛 Scan List	
	TX Frequency Offset EX
	TX Frequency[D0fz]: 2400.000000 ↓ 0.000000 ► EX Frequency[D0fz]: 2400.000000 ↓
	TX Contacts: Userl V Copy>> NX Group List: None V
	TX Admit: TX Allow 🗸
	lime-out Forbidden lime[s]: No Limitation
	Time-out Recovery Time[s]: 0

Figure 8.5 Radio Channel Configurations

8.6 DFR Basic Settings

The user can set the following DFR basic settings based on DFR specification;

👷 Digital Mobile Radio Program Software V1.02.06PS	
$\texttt{File}(\underline{\texttt{P}}) \texttt{Programe}(\underline{\texttt{P}}) \texttt{ComPort}(\underline{\texttt{C}}) \texttt{Tools}(\underline{\texttt{T}}) \texttt{Language}(\underline{\texttt{L}}) $	Help(<u>H</u>)
🙋 🛅 🏛 🕮 🔽	
⊡- 🔓 Digital Radio	
- 📰 Radio Info	IFR Basic Settings
🖶 🧫 Basic Settings	
- 🖸 Settings	Own ID 001
🛄 Buttons	
	Call Rang lime[s]
🕀 🔛 Zone	Voice Pre-Call HeadFrame 2
🗄 🚞 Channel	
🖶 🧰 DFR Settings	Response Preamble Frame 2
- 📝 DFR Basic Settings	Confirm Preamble Frame 2
- 🔝 DFR Contacts	
- DFR RX Group List	
- 💭 DFRRMGroupList1	
🖶 🛄 Scan List	
— 🔣 Scan Listl	
🗄 🚞 Parameter Settings	

Figure 8.6 DFR Basic Settings

8.7 DFR Contacts

Contacts provide "address-book" capabilities of the radio and set a list of call ID for a digital call member. Each entry corresponds to a call alias or call ID that you can use to initiate a call and associates with one of 3 call types (Group Call, Private Call, All Call). The meaning of the call type is explained as follows:

- 1) Group Call This is the ID of the Group that the user wishes to subscribe to.
- 2) Private Call This is the Radio ID of the target radio.
- 3) All Call This has a fixed ID of 255 (value is not editable).



Figure 8.7 Setting Up Contact Lists

8.8 DFR Rx Group List

List all DFR Group IDs, which is a member of (or subscribed to) the channels.

When this list is attached to a digital channel, the radio can receive a group call that is addressed

to anyone of its subscribed groups, and will talk back within the Group Call hang time.





8.9 Scan List

Scanning allows the radio to search the scan list that is attached to the current channel for an eligible channel to receive. All the members on this scan list will be scanned during a scanning operation. Each Scan list should keep at least one channel.



Figure 8.9 Setting Up Scanning

9 Appendix.1 SCT2400 EVM Circuit Schematics





Peripheral Device



Note: The value of RC1 and RC2 is same, 0 ohm.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

CML Micro: SCT2400EVM