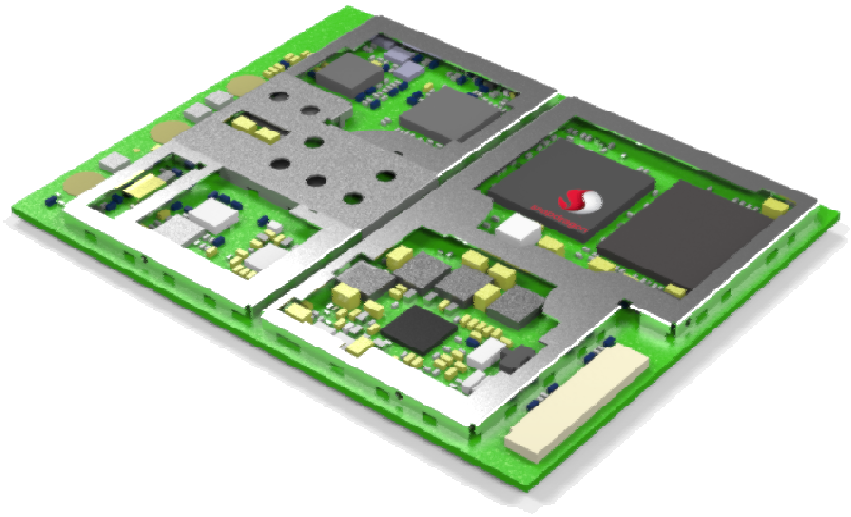
v 1.4

TP825Q Android Solution Module

Touchcom TP series

Product Specification & Customer Design Guide



Copyright

Contact Information

Sales:	Tel: +886-2-6606-3393 Fax: +886-2-6600-8196 Hours: 9:00 am to 5:00 pm (GMT +8:00) Email: sales@touchcom.tw
Address:	Touchcom wireless 10550 Rm. A1, 3F., No.261, Sec. 3, Nanjing East Rd., Songshan Dist., Taipei City Taiwan
Web:	www.touchcom.tw

Revision History

Rev No.	Release Date	Changes
0.9	Sep 10, 2013	• Draft document creation
1.1	Oct 04, 2013	• Updated power supply in chapter 3 • Revised Pin assignment I/O define error
1.2	Oct 31, 2013	• Added on RF chapter • SMT PCB Pads recommends
1.3	Nov 14, 2013	• Pin number final confirmed. • Pin description added 'MDP_VSYNC_P'
1.4	Dec 20, 2013	• Final production release

Contents

1. Introduction

1.1 Product Overview

The TP-825Q SOM (System on Module) is a full featured Android™ 4.1.2 (Jelly Bean) development platform that provides an easy way for creating low-cost, high-performance embedded or handheld devices. Based upon Qualcomm Snapdragon 200 MSM8225Q quad-core processor that integrated PM8029 (PMIC), RTR6285A (RFIC), AR6005 (Wi-Fi), WCN2243 (BT).

The TP-825Q incorporates quad-core high performance up to 1.2GHz CPUs, a powerful multimedia engine support, GSM, GPRS, WCDMA, HSPA, Wi-Fi (802.11 b/g/n), Bluetooth (BT3.0 + A2DP), a full suite GPS, USB connectivity and camera function, etc.

1.2 General Features

Features	Descriptions
Physical features	• Small form factor • Two W.FL RF connector jacks
Electrical features	• Single supply voltage (VCC): 3.6V - 4.2V • Self-shielded - no additional shielding required
RF	• Quad-band GSM/GPRS (850 / 900 / 1800 / 1900 MHz) • Tri-band WCDMA/HSPA (850 / 1900 / 2100 MHz) • Wi-Fi® (2.4 GHz) • Bluetooth (2.4 GHz) • GPS (1575.42MHz)
Operating System	Android™ 4.1.2 (Jelly Bean)
Processor	Qualcomm MSM8225Q (Quad-core Cortex-A5 1.2GHz)
Memory / Storage	1GB LPDDR2 / 4GB eMMC
Camera	Support up to 8MP resolution rear-facing camera with AF Support up to 2MP resolution front-facing camera
Wi-Fi	2.4 GHz IEEE 802.11 b/g/n
Bluetooth	Bluetooth 3.0 support A2DP (HW compliant with BT4.0/BLE)
G-Sensor	Yes

Color Numbers	24Bit RGB (support 800x480, 1024x600, 1024x768, 1280x800) or 24Bit MIPI
Graphic Card	Adreon 203
GPS	• Standalone GPS functionality • A-GPS features • gspOneXTRA™
Environment	Operating temperature range: -30 ℃ to +75 ℃ Storage temperature range: -40 ℃ to +85 ℃ Relative humidity range: 5% to 95%
Charge	300 mA for USB 5V charging 900 mA for DC charging
USB	USB 2.0 (OTG)
Dimension	60 x 46 x 2.6 (mm)

2. Interfaces

2.1 System Design

This chapter describes the TP-825Q module connector interface configuration and supported interfaces. The module includes the following interfaces:

Main Interface	Description
Power Supply	Supplied to the module power
Battery Charging	Battery power charging and temperature monitor
Standard Power	Output power to all external devices (2V8 and 1V8)
Audio	Analog audio interface (Speaker/Microphone/Handset/Earpiece)
PCM	Digital audio interface
SDIO	SDIO standard, T-Flash (microSD) card support Hot swap, Plug & Play
Motor	Vibrating motor support
USB	USB2.0 Slave (support OTG)
SIM	SIM / USIM card support
UART	2-wire serial interface
I^2C	Standard I^2C bus, used for TP or other external devices
GPIO	Digital ON/OFF function (1V8)
Keypad	One power key, two descriptive keys and key backlight support
LCD	Power/Control/Data line to 24Bit LCD display
LED	Two descriptive LEDs
Camera Interface	**Description**
MIPI	Dual MIPI interface, support 8MP (Rear camera) and 2MP (Front camera)
RF Connector	**Description**
Main	GSM / GPRS / WCDMA RF connector
WiFi/BT/GPS	Wi-Fi / BT / GPS RF connector

2.2 Pin Description

2.2.1 Main Interface

Pin#	Signal Name	Description	I/O	Voltage	Type
1	MIC2_P	Handset's Mic Input Positive	I	-	Analog
2	MIC2_M	Handset's Mic Input Negative	I	-	Analog
3	GND	Ground	-	GND	-
4	MSM_MICBIAS	Main Microphone Bias	-	2.2V	Analog
5	GND	Ground	-	GND	-
6	MIC1_M	Main Mic Input Negative	I	-	Analog
7	MIC1_P	Main Mic Input Positive	I	-	Analog
8	GND	Ground	-	GND	-
9	SDC1_CLK	microSD Clock	O	2V8	Digital
10	SDC1_D2	microSD Data 2	I/O	2V8	Digital
11	SDC1_CMD	microSD command	O	2V8	Digital
12	SDC1_D0	microSD Data 0	I/O	2V8	Digital
13	SDC1_D1	microSD Data 1	I/O	2V8	Digital
14	SDC1_D3	microSD Data 3	I/O	2V8	Digital
15	VIB_EN	Vibration Motor	O	2V8	Analog
16	VBATT_TEMP	Battery Temperature Sensor	I	-	Analog
17	GND	Ground	-	GND	-
18	VBATT	Power Supply Input	I	3V6 ~ 4V2	Analog
19	VBATT	Power Supply Input	I	3V6 ~ 4V2	Analog
20	GND	Ground	-	GND	-
21	RESET_VBATT	Module Reset	I	3V3 ~ 4V2	Analog
22	VPH_PWR	Power Supply Output	O	3V6 ~ 4V2	Analog
23	VPH_PWR	Power Supply Output	O	3V6 ~ 4V2	Analog

24	GND	Ground	-	GND	-
25	EAR_P	Earpiece Output Positive	O	-	Analog
26	EAR_N	Earpiece Output Negative	O	-	Analog
27	GND	Ground	-	GND	-
28	PMIC_HPH_R	Earphone Right Channel Output	O		Analog
29	GND	Ground	-	GND	-
30	PMIC_HPH_L	Earphone Left Channel Output	O	-	Analog
31	GND	Ground	-	GND	-
32	SPK_OUT_P	Speaker Output Positive	O	-	Analog
33	SPK_OUT_M	Speaker Output Negative	O	-	Analog
34	GND	Ground	-	GND	-
35	HSED_BIAS1	Headset Mic Bias	-	-	Analog
36	USB_HS_VBUS	USB VBUS	-	5V	Analog
37	VREG_L12	TP VCC Supply	-	2V8	Analog
38	VREG_L13	microSD VCC Supply	-	2V8	Analog
39	VREG_L16	SIM VCC Supply	-	1V8 or 2V8	Analog
40	MB_IN	Handset Button	I	1V8	Analog
41	UIM1_RESET	USIM Reset	O	1V8 or 2V8	Digital
42	UIM1_CARD_RMV_N	USIM Detection	I	1V8 or 2V8	Digital
43	UIM1_CLK	USIM Clock	O	1V8 or 2V8	Digital
44	UIM1_DATA	USIM Data I/O	I/O	1V8 or 2V8	Digital
45	AUX_PCM_SYNC	Auxiliary PCM Sync	O	1V8	Digital
46	TP_RES	TP Reset	O	1V8	Digital
47	DC_DET	DC Charging Detect	I	1V8	Digital
48	AUX_PCM_DOUT	Auxiliary PCM Data Output	O	1V8	Digital
49	PHONE_ON_N	Power Button	I	1V8	Digital

50	KYPD_DRV1	Volume Decrease Key	O	1V8	Digital
51	AUX_PCM_CLK	Auxiliary PCM Clock	O	1V8	Digital
52	AUX_PCM_DIN	Auxiliary PCM Data Input	I	1V8	Digital
53	KYPD_DRV0	Volume Increase Key	O	1V8	Digital
54	KEYSENSE_N1	Keypad	I	1V8	Digital
55	GND	Ground	-	GND	-
56	VREG_S3	VCC_1V8	-	1V8	Analog
57	CAP_TS_INT_N	TP Interrupt	I/O	1V8	Digital
58	I2CI_SDA	I2C Data	I/O	1V8	Digital
59	I2CI_SCL	I2C Clock	O	1V8	Digital
60	PWM_LCD_BLCK	LCD PWM Backlight	O	1V8	Analog
61	GND	Ground	-	GND	-
62	USB_HS_DN	USB Data Negative	I/O	3V3	Digital
63	USB_HS_DP	USB Data Positive	I/O	3V3	Digital
64	GND	Ground	-	GND	-
65	USB_HS_ID	USB OTG ID	I	5V	Digital
66	LCDC_RED0	LCD Red Data 0	I/O	1V8	Digital
67	LCDC_GREEN7	LCD Green Data 7	I/O	1V8	Digital
68	LCDC_PCLK	LCD Clock	O	1V8	Digital
69	UART1_RX	UART1 Rx Data	I	1V8	Digital
70	UART1_TX	UART1 Tx Data	O	1V8	Digital
71	LCDC_GREEN5	LCD Green Data 5	I/O	1V8	Digital
72	LCDC_BLUE2	LCD Blue Data 2	I/O	1V8	Digital
73	LCDC_BLUE6	LCD Blue Data 6	I/O	1V8	Digital
74	LCDC_GREEN4	LCD Green Data 4	I/O	1V8	Digital
75	LCDC_GREEN1	LCD Green Data 1	I/O	1V8	Digital

76	LCDC_RED7	LCD Red Data 7	I/O	1V8	Digital
77	LCDC_VSYNC	LCD VSync	O	1V8	Digital
78	LCDC_GREEN3	LCD Green Data 3	I/O	1V8	Digital
79	MDP_VSYNC_P	Vertical sync to/from MDP	I/O	1V8	Digital
80	LCDC_BLUE4	LCD Blue Data 4	I/O	1V8	Digital
81	LCDC_GREEN0	LCD Green Data 0	I/O	1V8	Digital
82	LCDC_BLUE7	LCD Blue Data 7	I/O	1V8	Digital
83	LCDC_RED6	LCD Red Data 6	I/O	1V8	Digital
84	LCDC_RED5	LCD Red Data 5	I/O	1V8	Digital
85	LCDC_HSYNC	LCD HSync	O	1V8	Digital
86	LCDC_BLUE1	LCD Blue Data 1	I/O	1V8	Digital
87	LCDC_BLUE3	LCD Blue Data 3	I/O	1V8	Digital
88	LCDC_BLUE5	LCD Blue Data 5	I/O	1V8	Digital
89	LCDC_GREEN2	LCD Green Data 2	I/O	1V8	Digital
90	LCDC_BLUE0	LCD Blue Data 0	I/O	1V8	Digital
91	LCDC_GREEN6	LCD Green Data 6	I/O	1V8	Digital
92	LCDC_RED4	LCD Red Data 4	I/O	1V8	Digital
93	LCDC_RED2	LCD Red Data 2	I/O	1V8	Digital
94	LCDC_RED1	LCD Red Data 2	I/O	1V8	Digital
95	LCDC_RED3	LCD Red Data 3	I/O	1V8	Digital
96	GND	Ground	-	GND	-
97	LCDC_DEN	LCD Enable	O	1V8	Digital
98	SDC1_DET	microSD Detection	I	1V8	Digital
99	LCDC_LVS_OE	LCD Voltage Shift	I/O	1V8	Digital
100	HS_DETECT_N	Handset Detection	I	1V8	Digital
101	LCD_RST_N	LCD Reset	O	1V8	Digital

102	EXT_APA_EN	External Amplifier Enable/Disable	O	1V8	Digital
103	GND	Ground	-	GND	-
104	FM_ANT	FM Radio Antenna	I	-	Analog
105	GND	Ground	-	GND	-
106	LCD_LEDPWR_EN	LCD Backlight Enable/Disable	O	1V8	Digital
107	OTG_5V_EN	OTG Enable/Disable	O	1V8	Digital
108	EXT_LCD_PWR_EN	LCD VCC Enable/Disable	O	1V8	Digital
109	LIGIT_P_EN	Keypad/Camera Flash Light	I/O	1V8	Digital
110	LED_GREEN_EN	Green LED Output	O	1V8	Digital
111	LED_RED_EN	Red LED Output	O	1V8	Digital
112	GND	Ground	-	GND	-
113	GND	Ground	-	GND	-

2.2.2 Camera Interface

Pin#	Signal Name	Description	I/O	Voltage	Type
1	GND	Ground	-	GND	-
2	DOVDDF	Front Cam Power Supply	O	1V8	Analog
3	DOVDDF	Front Cam Power Supply	O	1V8	Analog
4	GND	Ground	-	GND	-
5	AVDDF	Front Cam Power Supply	O	2V8	Analog
6	CAM_1MP_PWDN	Front Cam Enable/Disable	O	1V8	Digital
7	CAM_1MP_RESET	Front Cam Reset	O	1V8	Digital
8	GND	Ground	-	GND	-
9	I2C0_SCL_F3	Front Cam I2C Clock	O	1V8	Digital
10	I2C0_SDA_F3	Front Cam I2C Data	I/O	1V8	Digital

11	GND	Ground	-	GND	-
12	MIPI_CSI1_CLK_N	Front Cam MIPI Clock Negative	O	1V8	Digital
13	MIPI_CSI1_CLK_P	Front Cam MIPI Clock Positive	O	1V8	Digital
14	GND	Ground	-	GND	-
15	MIPI_CSI1_LANE0_N	Front Cam Lane 0 Negative	I/O	1V8	Digital
16	MIPI_CSI1_LANE0_P	Front Cam Lane 0 Positive	I/O	1V8	Digital
17	GND	Ground	-	GND	-
18	CAM_MCLK_1MP	Front Cam Main Clock	O	1V8	Digital
19	GND	Ground	-	GND	-
20	NC	-	-	NC	-
21	GND	Ground	-	GND	-
22	AF GND	Rear Cam Auto Focus Ground	-	GND	-
23	AF VDD	Rear Cam Auto Focus Power Supply	O	2V8	Analog
24	CAM_5MP_PWDN_VCM	Rear Cam Power Down	O	1V8	Digital
25	GND	Ground	-	GND	-
26	DOVDDB	Rear Cam Power Supply	O	1V8	Analog
27	GND	Ground	-	GND	-
28	AVDDB	Rear Cam Power Supply	O	2V8	Analog
29	CAM_5MP_RESET	Rear Cam Reset	O	1V8	Digital
30	CAM_5MP_SHDN_N	Rear Cam Enable/Disable	O	1V8	Digital
31	GND	Ground	-	GND	-
32	I2C0_SDA	Rear Cam I2C Data	I/O	1V8	Digital
33	I2C0_SCL	Rear Cam I2C Clock	O	1V8	Digital
34	GND	Ground	-	GND	-
35	CAM_MCLK_5MP	Rear Cam Main Clock	O	1V8	Digital
36	GND	Ground	-	GND	-

37	MIPI_CSI2_CLK_P	Rear Cam MIPI Clock Positive	I/O	1V8	Digital
38	MIPI_CSI2_CLK_N	Rear Cam MIPI Clock Negative	I/O	1V8	Digital
39	GND	Ground	-	GND	-
40	MIPI_CSI2_LANE0_N	Rear Cam Lane 0 Negative	I/O	1V8	Digital
41	MIPI_CSI2_LANE0_P	Rear Cam Lane 0 Positive	I/O	1V8	Digital
42	GND	Ground	-	GND	-
43	MIPI_CSI2_LANE1_N	Rear Cam Lane 1 Negative	I/O	1V8	Digital
44	MIPI_CSI2_LANE1_P	Rear Cam Lane 1 Positive	I/O	1V8	Digital
45	GND	Ground	-	GND	-

***** Connector is **HIROSE FH26-45S-0.3SHW**
More information is also available from http://www.hirose.co.jp/cataloge_hp/e58302093.pdf .

2.2.3 RF Connector

Pin#	Description
M3	GSM + GPRS + WCDMA antenna RF cable connector
m8	GSM + GPRS + WCDMA RF test point
M5	Wi-Fi + BT + GPS antenna RF cable connector
m7	Wi-Fi + BT + GPS RF test point

*** "M3" "M5"** Connector is **HIROSE W.FL2-R-SMT-1(60)**
*** "m7" "m8"** Connector is **MuRata MM8130-2600**
- "m7" and "m8" are the test point for factory, it will break the signal out to "M3" or "M5" when **MuRata MXHS83QE3000** probe. Please contact us to get more information about the connector.

2.3 Electrical Information for Digital I/O

Digital I/O characteristics for VDD = 2.8 Volt

	Parameter	Comments	Min	Typ	Max	Unit
	Internal 2V8 power supply	VCC_2V8	2.7	2.8	3.0	V
V_{IL}	High-level input voltage	CMOS / Schmitt	0.65 * VDD	-	VDD + 0.3	V
V_{IH}	Low-level input voltage	CMOS / Schmitt	-0.3	-	0.35 * VDD	V
V_{OL}	High-level output voltage	CMOS, at rate drive strength	VDD - 0.45	-	VDD	V
V_{OH}	Low-level output voltage	CMOS, at rate drive strength	0	-	0.45	V
I_{IHPD}	Input high leakage current	With pull-down	10	-	60	μA
I_{ILPU}	Input low leakage current	With pull-up	-60	-	-10	μA
C_{IN}	Input capacitance		-	-	5	pF

Digital I/O characteristics for VDD = 1.8 Volt

	Parameter	Comments	Min	Typ	Max	Unit
	Internal 2V8 power supply	VCC_1V8	1.7	1.8	1.9	V
V_{IL}	High-level input voltage	CMOS / Schmitt	0.65 * VDD	-	VDD + 0.3	V
V_{IH}	Low-level input voltage	CMOS / Schmitt	-0.3	-	0.35 * VDD	V
V_{OL}	High-level output voltage	CMOS, at rate drive strength	VDD - 0.45	-	VDD	V
V_{OH}	Low-level output voltage	CMOS, at rate drive strength	0	-	0.45	V
I_{IHPD}	Input high leakage current	With pull-down	5	-	30	μA
I_{ILPU}	Input low leakage current	With pull-up	-30	-	-5	μA
C_{IN}	Input capacitance		-	-	5	pF

3. Power

3.1 Power Supply

Name	Pin #	Description	Min	Typ	Max	Unit
VBATT	18, 19	Module power supply	3.6	3.7	4.2	V
		I_{peak}			2.5	A
VPH_PWR	22, 23	All external device's power supply	3.6	3.7	4.2	V
RESET_VBATT	21	Module reset	3.3	-	4.2	V
GND	3, 5, 8, 17, 20, 24, 27, 29, 31, 34, 55, 61, 64, 96, 103, 105, 112, 113	Ground	-	-	-	-

Since the maximum peak current of module can reach 2.5A, we strongly recommend having a large width and short for the layout of the power supply signal (to avoid voltage loss between the external power supply and the TP-825Q SOM supply).

VPH_PWR is all external device's component power supply totals power form module, generally form 3.6V to 4.2V.

VPH_PWR through the circuits inside P8029 and no external circuits are required to generate
If the battery is used only, VPH_PWR will be generated by the battery. And the voltage is the same as the battery's voltage.

The VPH_PWR to component total maxiuman current supply is 1000mA.

3.2 Battery Charging Interface

Name	Pin #	Description	Min	Typ	Max	Unit
DC_DET	47	DC power detection	1.7	1.8	1.9	V
VBATT_TEMP	16	Battery temperature detection				

The TP-825Q SOM provide two types of charging currents, USB-DC for 300mA and AC-DC for 900mA. It is using DC_DET pin to check what is the charging type using.

1. VBATT_TEMP is the temperature monitor for the Li-Ion battery, it should be connected to battery's TX pin for temperature senose. If your battery don't have it, please connected 100K NTC when layout.
2. If you don't use DC_DET, please connect it with 10K.

3.3 USB 2.0 Interface

Name	Pins	Description	V_{Typ}	Type
USB_HS_VBUS	36	USB VBUS 5V	5V	-
USB_HS_DN	62	USB Data negative	-	IO
USB_HS_DP	63	USB Data positive	-	IO
USB_HS_ID	65	USB OTG ID	5V	I
OTG_5V_EN	107	OTG enable pin	1V8	O

The USB interface is compliant with Version 2.0 of the USB standard for high speed operation. (Maximum signaling rate of 48 Mbps)

USB_HS_ID / OTG_5V_EN For USB OTG using. Must add OTG_5V when using USB OTG.

Provide 5V to USB_VBUS when using USB OTG.

3.4 VCC_2V8 and VCC_1V8 Output

These digital power supplies are used to:

- Act as a voltage reference pin
- Supply the external devices

Name	Pin #	Description	Min	Typ	Max	Unit
VREG_L12	37	TP power supply or other devices	2.7	2.85	3.0	V
					300	mA
VREG_L13	38	MicroSD power supply or other devices	2.7	2.85	3.0	V
					300	mA
VREG_S3	56	1.8V voltage reference	1.7	1.8	1.9	V
					500	mA

4. Audio Interface

4.1 Analog Audio

Name	Pins	Description	V_{Typ}	Type
MIC1_M	6	Main microphone negative input	-	AI
MIC1_P	7	Main microphone positive input	-	AI
MSM_MICBIAS	4	Main microphone bias output voltage	2V2	-
SPKR_OUT_P	32	Speaker positive output	-	AO
SPKR_OUT_M	33	Speaker negative output	-	AO
EXT_APA_EN	102	External audio amplifier enable pin	1V8	-
EAR_P	25	Earpiece positive output	-	AO
EAR_M	26	Earpiece negative output	-	AO

4.1.1 Microphone

Parameter	Comment	Min	Typ	Max	Unit
Microphone inputs only					
Input common mode voltage	DC	1.13	1.25	1.38	V
MIC bias supply voltage	Open circuit DC voltage	1.69	1.80	1.91	V
MIC bias output source current	DC; 1.69 kΩ ± 1% resistive load	1	1.07		mA
Muted MIC attenuation	+3 dBm0, 1.02 kHz sinewave input	80			dB
Common to voice/audio modes					
Input impedance Differential configuration Single-ended configuration	Measurement bandwidth is 22 Hz to $F_s/2$ (F_s = sample rate)	 16 8	 20 10	 24 12	 kΩ kΩ
Input capacitance	At each pin	-	5	-	pF
Input offset voltage	At each pin	-	-	5	mV

Absolute gain error Differential, -10 dBm0 input Single-ended, 0 dBm0 input	All gain settings: MIC1 = 0 or +24 dBl MIC2 = -6 to +25.5 dB in 1.5 dB steps; F_s = 8 or 16 kHz	 -1.0 -1.0	 - -	 1.0 1.0	 dB dB
Gain error +3 dBm0 to -30 dBm0 input -31 dBm0 to -45 dBm0 input -46 dBm0 to -55 dBm0 input	Relative to gain at -10 dBm0 input; F_s = 8 or 16 kHz	 -0.5 -1.0 -1.2	 - - -	 0.5 1.0 1.2	 dB dB dB

4.1.2 Speaker

Parameter	Comment	Min	Typ	Max	Unit
16Ω or 32Ω support					
Input frequency range		0.02	-	20	kHz
Input resistance		15	20.2	27	kΩ
Output power Normal operation (+3.6V, 8Ω) High-power audio (+5V, 8Ω) High-power audio (+5V, 4Ω)		 - - -	 630 1.2 2.4	 - - -	 mW W W
Power efficiency Normal operation (+3.6V 500mW, 8Ω) High-power audio (+5V 1W, 8Ω) High-power audio (+5V 2W, 4Ω)		 85 85 80	 88 90 85	 - - -	 % % %
Amplifier gain, normal operation	Programmable, 2 dB increments	-12	-	+18	dB
Boost gain	Add to normal operation settings	-	6	-	dB
Amplifier gain error		-1	0	+1	dB
Amplifier gain flatness	20 Hz to 20 kHz	-0.5	-	+0.5	dB

4.2 Handset

Name	Pin #	Description	V_{Typ}	Type
MIC2_P	1	Handset's microphone positive input	-	AI
MIC2_M	2	Handset's microphone negative input	-	AI
PMIC_HPH_R	28	Handset's right audio channel output	-	AO
PMIC_HPH_L	30	Handset's left audio channel output	-	AO
HSED_BIAS1	35	Handset's microphone bias output voltage	2V2	-
HS_DETECT_N	100	Handset detection pin	1V8	I
MB_IN	40	Handset button detection	1V8	AI

MB_IN is ADC input, support Talk/Off button and volume control key.

4.3 Digital Audio

Name	Pin #	Description	V_{Typ}	Type
AUX_PCM_SYNC	45	PCM frame synchronization 8 kHz	1V8	O
AUX_PCM_DOUT	48	PCM Data output	1V8	O
AUX_PCM_CLK	51	PCM Data clock	1V8	O
AUX_PCM_DIN	52	PCM Data input	1V8	I

The Digital Audio Interface also features the following:

- IOM-2 compatible device on physical level
- Master mode only with 6 slots by frame, user only on slot 0
- Bit rate single clock mode at 768kHz only
- 16 bits data word MSB first only
- Linear Law only (no compression law)
- Long Frame Synchronization only
- Push-pull configuration on PCM_DOUT and PCM_DIN

5. Interfaces

5.1 SDIO Interface (microSD / TF Card)

Name	Pin #	Description	Min	Typ	Max	Unit
VREG_L13	38	microSD card power supply	2.7	2.85	3.0	V
					300	mA
SDC1_CLK	9	microSD Clock		2.8		V
SDC1_D2	10	microSD Data 2		2.8		V
SDC1_GND	11	microSD Command, Response		2.8		V
SDC1_D0	12	microSD Data 0		2.8		V
SDC1_D1	13	microSD Data 1		2.8		V
SDC1_D3	14	microSD Data 3		2.8		V
SDC1_DET	98	microSD card hot plug detection pin		1.8		V

Support SD 4-bit data transfer mode, clock speed is 25 MHz, burst rate is up to 100 Mbit/s.

SDC1_DET is used for microSD card hot plug detection pin (High: removed, Low: Inserted)

5.2 Vibrating Motor

Name	Pin #	Description	Min	Typ	Max	Unit
VIB_EN #	15	Directly drive the vibrating motor	2.7	2.8	3.0	V
					100	mA

5.3 USIM Interface

The USIM pins provide the connections necessary to interface to a SIM socket located on the host device. Voltage levels over this interface comply with 3GPP standards.

Name	Pins	Description	V_{Typ}	I_{max}	Type
VREG_L16	39	USIM Power Supply	1.8V/2.8V	50mA	O
UIM1_RESET	41	USIM Reset	1.8V/2.8V	-	O
UIM1_CARD_RMV_N	42	USIM Card Detect	1.8V/2.8V	-	I
UIM1_CLK	43	USIM Clock	1.8V/2.8V	-	O
UIM1_DATA	44	USIM Data I/O	1.8V/2.8V	-	IO

The interface support SIM (1.8V), USIM (3.0V) and fully compliant with
(2G) 3GPP TS 51.010-1, section 27.17.
(3G) ETSI TS 102 230 V5.5.0, section 5.2.

UIM1_CARD_RMV_N: Only for detecting SIM Card inserted and didn't support how-swap SIM function.

5.4 UART Interface

Name	Pins	Description	V_{Typ}	Type
UART1_RX	69	UART1 RX Data	1V8	I
UART1_TX	70	UART1 TX Data	1V8	O

The maximum baud rate of UART1 is 115200 8N1 (no HW/SW flow control).

5.5 I^2C Interface

Name	Pins	Description	V_{Typ}	Type
I2C1_SDA	58	I^2C data line	1.8V	IO
I2C1_SCL	59	I^2C clock line	1.8V	O

The I^2C Bus interface includes a clock signal (I2C1_SCL) and a data signal (I2C1_SDA) complying with a 100Kbit/s-standard interface (standard mode: s-mode).

The I^2C bus is always in master mode operation.

The maximum speed transfer is 400Kbit/s (fast mode: f-mode).

For more information on the I^2C bus, see document “I2C Bus Specification”, Version 2.0, Philips Semiconductor 1998.

5.6 TP Interface

Name	Pins	Description	V_{Typ}	Type
CAP_TS_INT_N	57	TP interrupt line	1.8V	IO
TP_RES	46	TP reset	1.8V	O

Connect to the touch panel’s External Interrupt INT and RESET pin. Touch panel IC’s voltage must be 1.8V.

5.7 Keypad Interface

Name	Pins	Description	V_{Typ}	Type
PHONE_ON_N	49	System power On/Off key	1.8V	I
KEYSENSE_N1	54	Keypad sense	1.8V	I
KYPD_DRV0	53	Volume decrease key	1.8V	O
KYPD_DRV1	50	Volume increase key	1.8V	O

5.8 LCD Interface

Name	Pins	Description	V_{Typ}	Type
PWM_LCD_BLCK	60	PWM signal used for dimming the backlight	1.8V	O
LCDC_DEN	97	LCD data/control line enable pin	1.8V	O
LCD_RST_N	101	LCD reset	1.8V	O
LCD_LEDPWR_EN	106	LCD LED backlight enable pin	1.8V	O

EXT_LCD_PWR_EN	108	External LCD power supply enable pin	1.8V	O
LCDC_PCLK	68	LCD clock	1.8V	O
LCDC_VSYNV	77	LCD vsync	1.8V	O
LCDC_HSYNC	85	LCD hsync	1.8V	O
LCDC_RED^{n}	66, 94, 93, 95, 92, 84, 83, 76	LCD red data line	1.8V	I/O
LCDC_GREEN^{n}	81, 75, 89, 78, 74, 71, 91, 67	LCD green data line	1.8V	I/O
LCDC_BLUE^{n}	90, 86, 72, 87, 80, 88, 73, 82	LCD blue data line	1.8V	I/O

PWM_LCD_BLCK Dimming the LCD's backlight and frequency is form 200Hz to 250Hz, most of backlight are using 100Hz ~ 100KHz.
LCDC_DEN Used to enable/disable the LCD display's control/data interface. Please keep it open-drain if don't use.
LCD_RST_N Reset pin to the LCD display.
LCD_LEDPWR_EN Used to trun on/off the LCD's backlight.
EXT_LCD_PWR_EN Supply power to the LCD display.
LCDC_RGB Support 24-bit/18-bit color modes. If you are using LVDS interface, please don't forget to add a voltage-level translation IC. If you are using parallel video (RGB) interface, add or not a voltage-level translation IC depend on your system.

5.9 LED Driver

Name	Pins	Description	V_{Typ}	Type
LED_GREEN_EN	110	Green LED light enable pin	1.8V	O
LED_REG_EN	111	Red LED light enable pin	1.8V	O

5.10 GPIO Interface

Name	Pins	Description	V_{Typ}	Type
MDP_VSYNC_P	79	Configurable general purpose I/O	1.8V	I/O
LCDC_LVS_OE	99	Configurable general purpose I/O	1.8V	I/O

LIGIT_P_EN	109	Configurable general purpose I/O	1.8V	I/O

LIGIT_P_EN: Used to Keyboard Light / Camera Flash Light / Ambient Light & Proximity Sensor interrupt pin, but it connected to control a LED.
LCDC_LVS_OE: Used to control LCD external voltage-level translation IC, but it didn't use on DevKit..
MDP_VSYNC_P: Used to vertical sync to/from MDP, but it didn't use on DevKit.
All pins were not use in DevKit, so you could set it to GPIO in SDK. Please keep it open-drain if didn't use.

6. Camera Interfaces

6.1 System Design

This chapter describes the

7. RF Interfaces

The TP-825Q module supports three antennas (main, wlan and GPS). The RF interface has a 50Ω nominal impedance and a high DC impedance.

7.1 RF Connections

7.1.1 Antenna

Touchcom strongly recommends working with an antenna manufacturer either to develop an antenna adapted to the application or to adapt an existing solution to the application.
Both the mechanical and electrical antenna adaptation is one of the key issues in the design of the GSM/UMTS terminal.

7.1.2 Antenna Connector

There is a main antenna connection for both 2G and 3G; and a Wi-FI/BT/GPS connection.
For the main connection:
• W.FL2 pigtails connection on the module top side RF con

A wide variety of cables fitted with W.FL2 connectors is offered by HIROSE:
• W.FL2 pigtails, Ex: Ref = W.FL-2LP-04N1-A(L)/W.FL-2LP-04N2-A(L)/W.FL-LP-04N1-A(L)/W.FL-LP-04N2-A(L)
• W.FL2 cable assemblies
• Between series cable assemblies
More information is also available from http://www.hirose-connectors.com/.

7.2 GSM + WCDMA Parts

The TP-825Q SOM supports three antennas (main, wlan and GPS). The RF interface has a 50Ω nominal impedance and a high DC impedance.

7.2.1 Frequency support

Band	Frequency	Channel Number
Band 1 WCDMA 2100	Tx: 1920 ~ 1980 MHz Rx: 2110 ~ 2170 MHz	Tx: 9612-9888 Rx: 10562-1083
Band 2 WCDMA 1900	Tx: 1850 ~ 1910 MHz Rx: 1930 ~ 1990 MHz	

Band 5 WCDMA 850	Tx: 824 ~ 849 MHz Rx: 869 ~ 894 MHz	
GSM 850	Tx: 824.2 ~ 849.2 MHz Rx: 869.2 ~ 894.2 MHz	128-251
EGSM 900	Tx: 880.0 ~ 915.0 MHz Rx: 925.0 ~ 960.0 MHz	795-1023, 0-124
DCS 1800	Tx: 1710.2 ~ 1784.8 MHz Rx: 1805.2 ~ 1879.8 MHz	512-885
PCS 1900	Tx: 1850.2 ~ 1909.8 MHz Rx: 1930.2 ~ 1989.8 MHz	512-810

7.2.2 Conducted Tx (Transmit) power tolerances

Band	Frequency	Notes
Band 1 (WCDMA 2100)	+23 dBm	
Band 2 (WCDMA 1900)	+23 dBm	
Band 5 (WCDMA 850)	+23 dBm	
GSM 850	+33 dBm	
EGSM 900	+33 dBm	
DCS 1800	+29 dBm	
PCS 1900	+29 dBm	
Sensitivity	<-104 dBm (FER ≤ 0.5%)	

7.3 Wi-Fi + BT Parts

Name	Description
Wi-Fi	Maximum TX output: >+10 dBm Sensitivity: IEEE 802.11g: 54 Mbps -65 dBm IEEE 802.11b/g: 11 Mbps -76 dBm

	IEEE 802.11n: 20 Mbps -62 dBm
BT	Maximum permitted power (Class 2): -6 dBm < PAV < +4 dBm Modulation characteristics: 140 kHz ≤ Δf1avg ≤ 175 kHz Carrier frequency stability: -75 kHz ≤ ωi ≤ +75 kHz Maximum drift rate: ±20 kHz/50 μs Sensitivity: < -85 dBm (single-slot packet)

7.4 GPS Parts

Characteristic	Description
TTF	Cold Start: 32s Warm Start: 29s Hot Start: 1s
Accuracy	10 m
Sensitivity	Tracking: -130 dB

8. Power Consumption

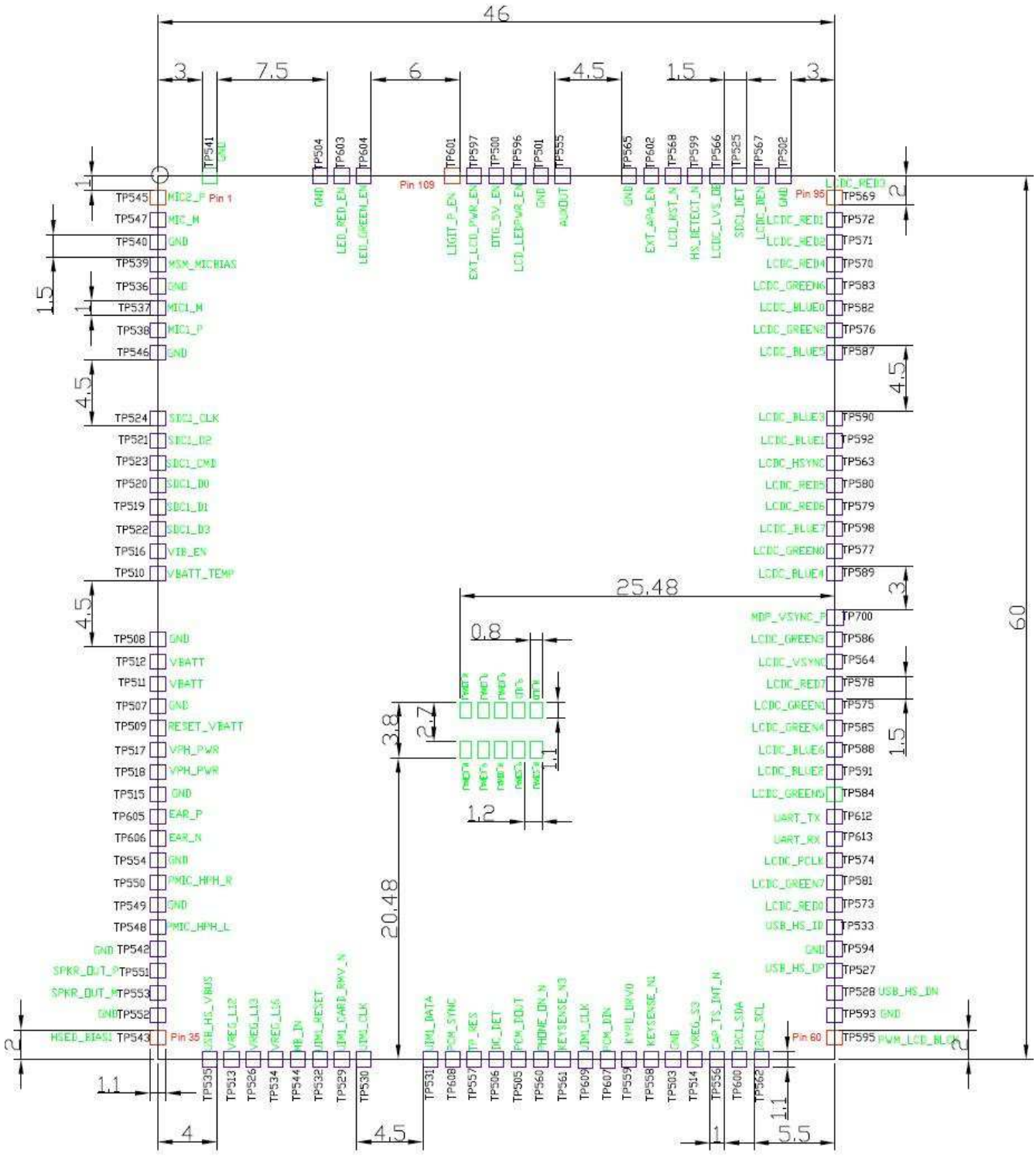
8.1 System Power consumption (with 7.9” TFT LCD)

Operating Mode	Test 1#	Test 2#	Unit
Standby current			
Airplane mode	4.38	4.47	mA
WCDMA On (VBATT = 3.8V)	8.62	8.76	mA
GSM On (VBATT = 3.8V)	6.3	6.5	mA
WiFi Active only	5.35	4.81	mA
Bluetooth Active only	4.72	4.74	mA
Airplane mode (with LCD On)	548.20	548.60	mA
Shutdown current	0.008	0.008	mA
Work current			
WCDMA enable, with Internet Browsing	697.20	702.30	mA
WCDMA enable, with Internet Video Streaming	1002.30	1005.30	mA
Wi-Fi enable, with Internet Browsing	612.00	613.00	mA
Wi-Fi enable, with Internet Video Streaming	861.20	862.30	mA
Play MP3 via Speaker	106.30	89.70	mA
Play MP3 via Earphone	82.10	67.30	mA
Play MP3 via Bluetooth A2DP	80.20	76.30	mA
Voice via Bluetooth	196.40	192.30	mA
Battery voltage display			
~ 100% ~ 85% ~ 71% ~ 57% ~ 43% ~ 28% ~ 15%	4.20 ~ 4.12 4.11 ~ 4.00 3.99 ~ 3.90 3.89 ~ 9.83 3.82 ~ 3.79 3.78 ~ 3.74 3.73 ~ 3.69		V V V V V V V

~ 0%	3.68 ~ 3.48		V
Minimum power on voltage	3.54		V
Minimum power on current	1.03		A
Minimum work voltage	3.48		V

9. Soldered Solution and Mechanical Specifications

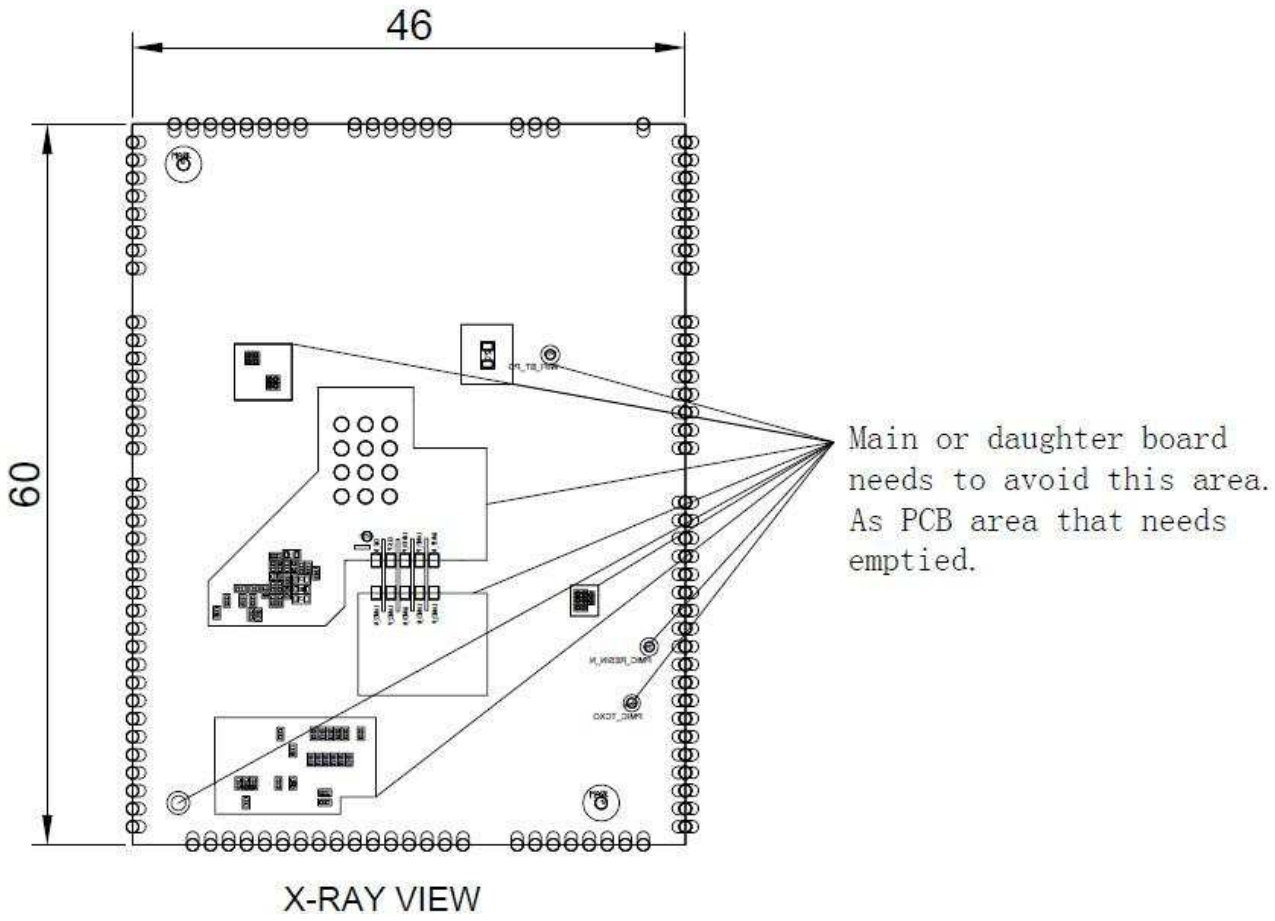
9.1 Recommended foot print for the Main application


46
3
7.5
6
4.5
1.5
3
25.48
20.48
0.8
3.8
2.7
1.1
1.2
60
TP541
TP504
TP603
TP604
TP601
TP597
TP500
TP596
TP501
TP555
TP565
TP602
TP568
TP599
TP566
TP525
TP567
TP502
TP545
TP547
TP540
TP539
TP536
TP537
TP538
TP546
TP524
TP521
TP523
TP520
TP519
TP522
TP516
TP510
TP508
TP512
TP511
TP507
TP509
TP517
TP518
TP515
TP605
TP606
TP554
TP550
TP549
TP548
TP542
TP551
TP553
TP552
TP543
TP535
TP513
TP526
TP534
TP544
TP532
TP529
TP530
TP531
TP608
TP557
TP506
TP505
TP560
TP561
TP609
TP607
TP559
TP558
TP503
TP514
TP556
TP600
TP562
TP569
TP572
TP571
TP570
TP583
TP582
TP576
TP587
TP590
TP592
TP563
TP580
TP579
TP598
TP577
TP589
TP700
TP586
TP564
TP578
TP575
TP585
TP588
TP591
TP584
TP612
TP613
TP574
TP581
TP573
TP533
TP594
TP527
TP528
TP593
TP595
Pin 109
Pin 95
Pin 35
Pin 60

9.2 Recommended foot print for the MIPI application

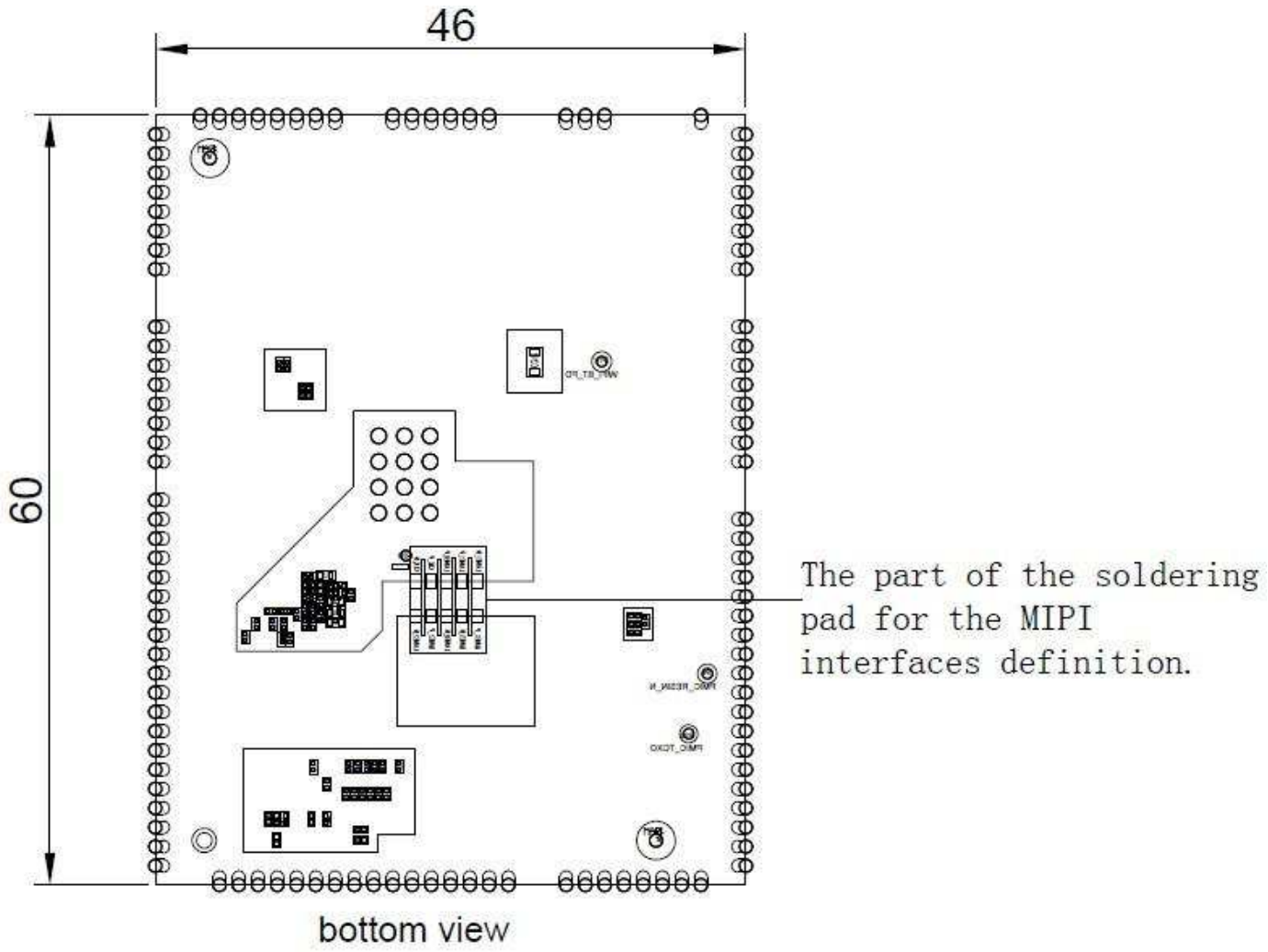
9.2.1 PCB Reserve Area for MIPI interface

This is an area recommended to reserve having a mechanical part on main or daughter PCB of module placement for MIPI interface application in direct contact with the module.



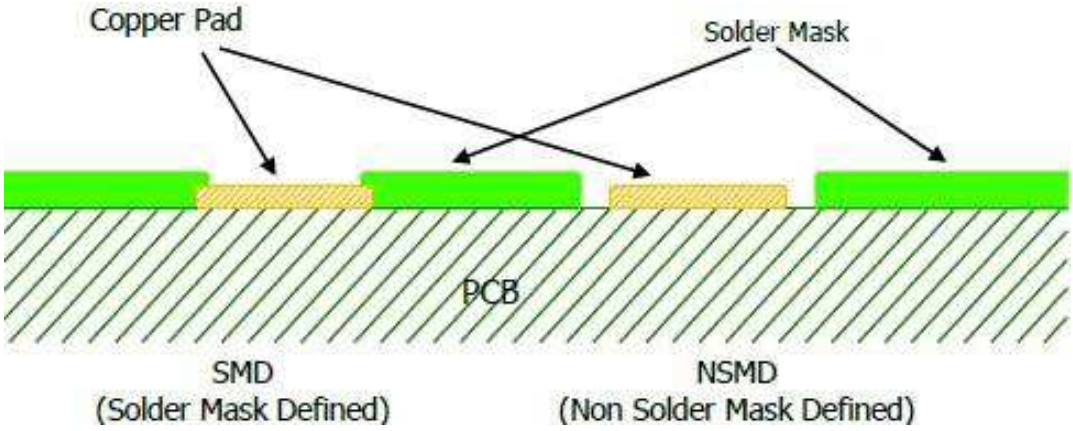
9.2.2 Solder pad design for MIPI application

The solder pad of MIPI interface definition on module:



9.3 PCB pad design

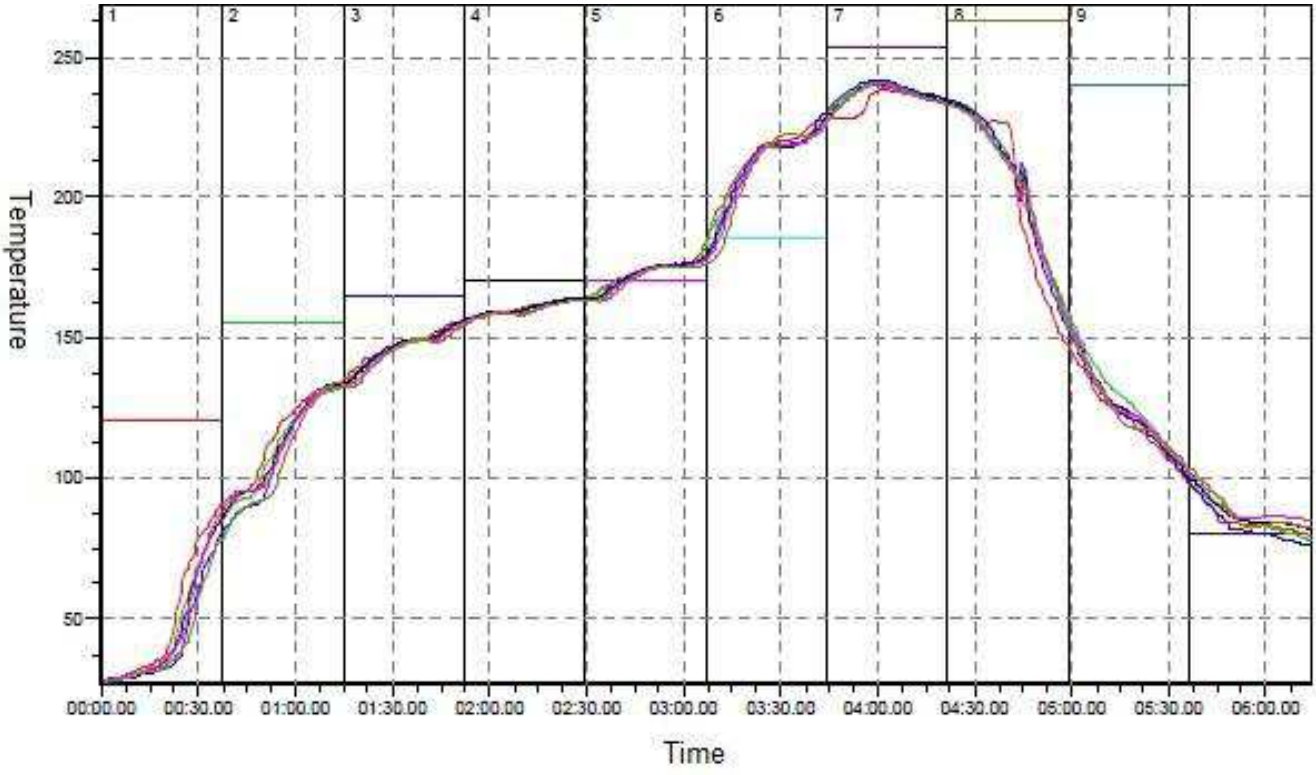
Non solder mask defined (NSMD) type is recommended for the solder pads on the PCB.



For manual soldering production, the proposed design of the edge of each pad will need to add the VIA, in order to prevent the pad tilt off. When connecting the pad to do with copper thermal design to prevent excessive cooling effect due to manual soldering efficiency.

9.4 Solder paste

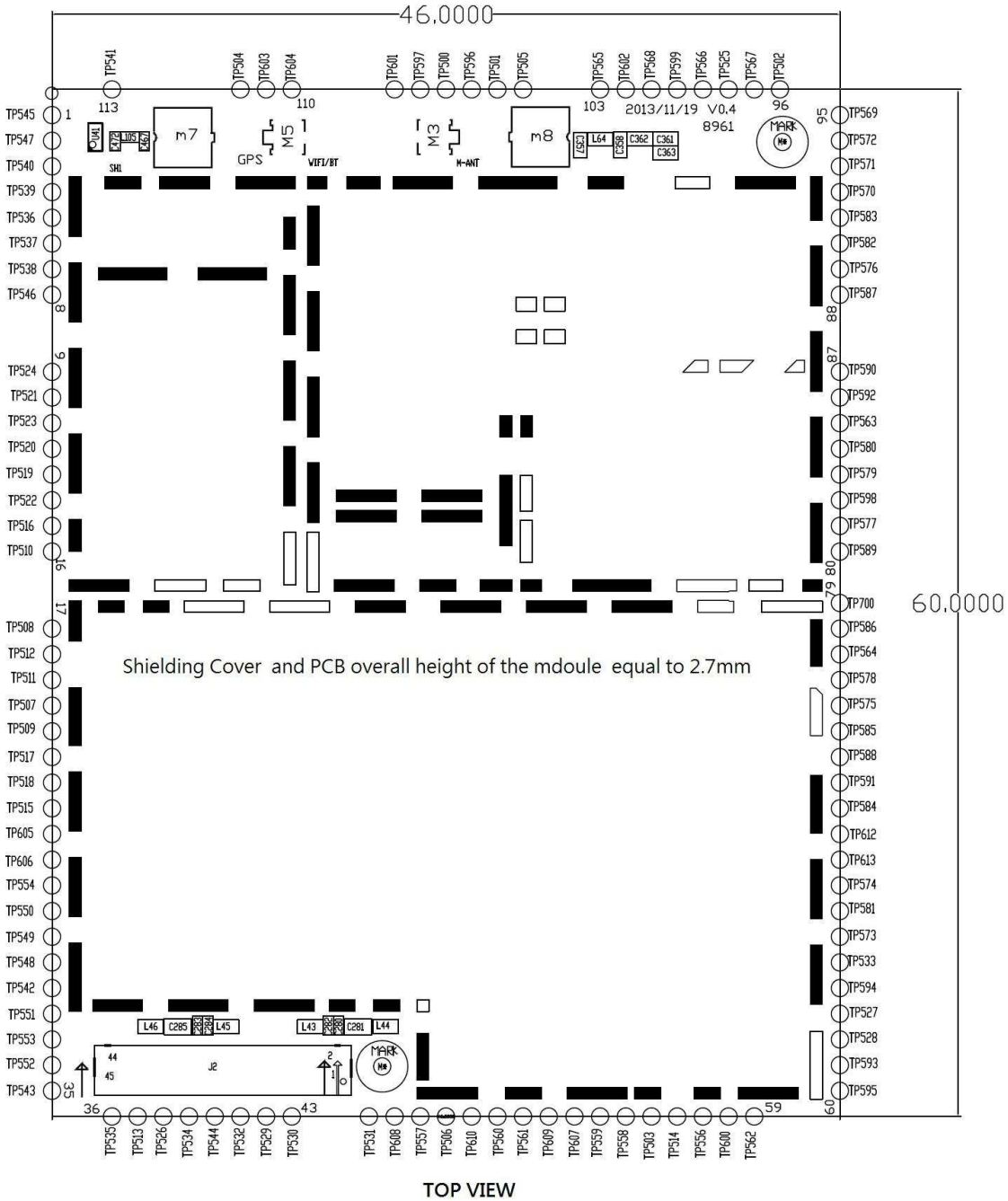
Recommended solder reflow profile:



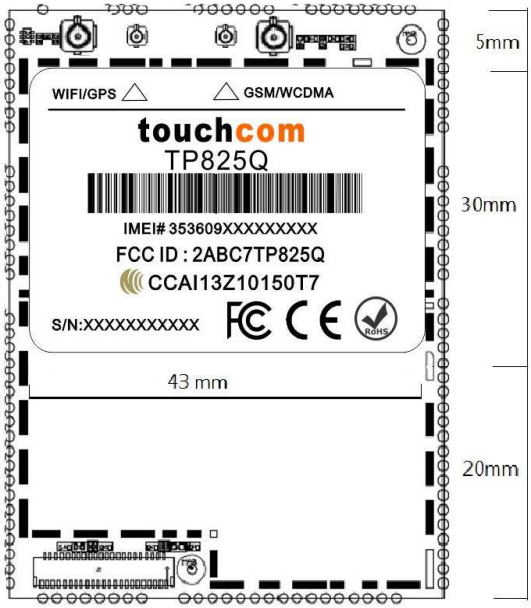
Solde reflow temperature profile reference table:

Profile Feature	Pb-Free Assembly
Average ramp-up rate (T_L to T_P)	
Preheat — Temperature Min (Tsmin) — Temperature Max (Tsmin) — Time (min to max) (ts)	 150℃ 220℃ 70s - 110s
Tsmax to TL — Ramp-up Rate	 3℃/second max.
Time maintained above — Temperature (TL) — Time (tL)	 217℃ 30s-90s
Peak Temperature (Tp)	245 +0/-5℃
Time within 5℃ of actual Peak Temperature (tp)	<40s
Ramp-down Rate	6℃/second max.

9.5 Mechanical dimensions



9.6 Labeling


5mm
WIFI/GPS
GSM/WCDMA
touchcom
TP825Q
IMEI# 353609XXXXXXXXX
FCC ID : 2ABC7TP825Q
CCAI13Z10150T7
S/N:XXXXXXXXXXX
30mm
43 mm
20mm

10. Certification Compliance and Recommended Standards

10.1 Certification Compliance

Domain	Applicable Standard
CE	EN 300 328 EN 300 328 EN 300 440 EN 301 489-1/-3 EN 301 489-1/-7 EN 301 489-1/-24 EN 301 489-1&-17 EN 301 511 En 301 908-1 En 301 908-2 EN 62311
FCC	Part 15B Part 15C Part 22 Part 24
NCC	CNS 13438 CNS 14336 PLMN 01 PLMN 08 LP0002

10.2 Applicable Standards

For queries concerning specific industry standards and certifications not described in this chapter, contact your TOUCHCOM account representative.

10.2.1 Important Notice

Because of the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the TP825Q Embedded Module are used in a normal manner with a well-constructed network, the TP825Q Embedded Module should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. TP825Q Embedded Module and its affiliates accept no responsibility for damages of any kind resulting from delays or errors in

data transmitted or received using the TP825Q Embedded Module, or for failure of the TP825Q Embedded Module to transmit or receive such data.

10.2.2 Safety and Hazards

Do not operate your TP825Q Embedded Module modem:

- In areas where blasting is in progress
- Where explosive atmospheres may be present including refuelling points, fuel depots, and chemical plants
- Near medical equipment, life support equipment, or any equipment which may be susceptible to any form of radio interference. In such areas, the TP825Q modem **MUST BE POWERED OFF**. Otherwise, the TP825Q modem can transmit signals that could interfere with this equipment.

In an aircraft, the TP825Q modem **MUST BE POWERED OFF**. Otherwise, the TP825Q modem can transmit signals that could interfere with various onboard systems and may be dangerous to the operation of the aircraft or disrupt the cellular network. Use of a cellular phone in an aircraft is illegal in some jurisdictions. Failure to observe this instruction may lead to suspension or denial of cellular telephone services to the offender, or legal action or both.

Some airlines may permit the use of cellular phones while the aircraft is on the ground and the door is open. The TP825Q modem may be used normally at this time.

10.2.3 Important Compliance Information for Unite America Users

Federal Communication Commission Interference Statement
This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:
-Reorient or relocate the receiving antenna.
-Increase the separation between the equipment and receiver.
-Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
-Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.

FOR MOBILE DEVICE USAGE (>20cm/low power)
Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users.
2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling
This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: “Contains FCC ID: 2ABC7TP825Q. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

Manual Information To the End User
The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user’s manual of the end product which integrates this module.
The end user manual shall include all required regulatory information/warning as show in this manual.

10.2.4 EU Regulatory Conformity

There is with confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Laws of the Member States relating to Electromagnetic Compatibility of Radio and Telecom device (1995/5/EC).

CE

10.2.5 Important Compliance Information for Taiwan Users

The type approved low power radio, permit, company, firm or user is not allowed to change the frequency, increase the power or change the features and functions of the original design.
Low-power radio-frequency devices shall not influence aircraft security and interfere legal communications; been found to have interference phenomenon, should be discontinued immediately, and until no interference is achieved continued use. In the preceding paragraph legal communications means operated in compliance with the Telecommunications Act radio communications. Low-power radio communications to endure legal or industrial, scientific and medical radio wave radiated interference of electrical equipment.