25W Wireless Power MPP Transmitter Module

Descriptions

SM232A module is a 25W wireless power transmitter which supports multiple QI wireless power profiles. Including basic power profile (BPP) and magnetic power profile (MPP).

The module integrates a powerful Qi protocol SOC- SC96019 which integrates high resolution full bridge controller, full bridge power MOSFETs, multiple channels ASK demodulation circuit, multiple channels ADCs, multiple GPIO ports, Q value detection circuit and so on.

The module supports multiple power source, such as DC source, USB-PD and HVDCP. And integrates a Buck-boost converter 'SC8723B' for inverter voltage adjustment to meet different power requirements.

The module supports I2C interface and can be easily connected to other system as a submodule for control.

The module integrates multiple protection function, such as foreign object detection (FOD), over current protection (OCP), over temperature protection (OTP) and low voltage protection (LVP).

Features

- 5V~20V input voltage range

- Support USB PD3.0

- Support HVDCP interface

- 25W maxpower output

- Compliant WPC QI2.2 protocol

- Support BPP/MPP 15Watt/ MPP 25Watt protocol

- Support I2C slaver interface

- Integrated Buck-boost converter

- Integrated foreign object detection (FOD)

- Over current protection (OCP)

- Integrated over temperature protection (OTP)

- Integrated low voltage protection (LVP)
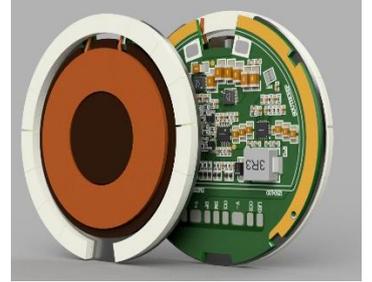
Application Circuit
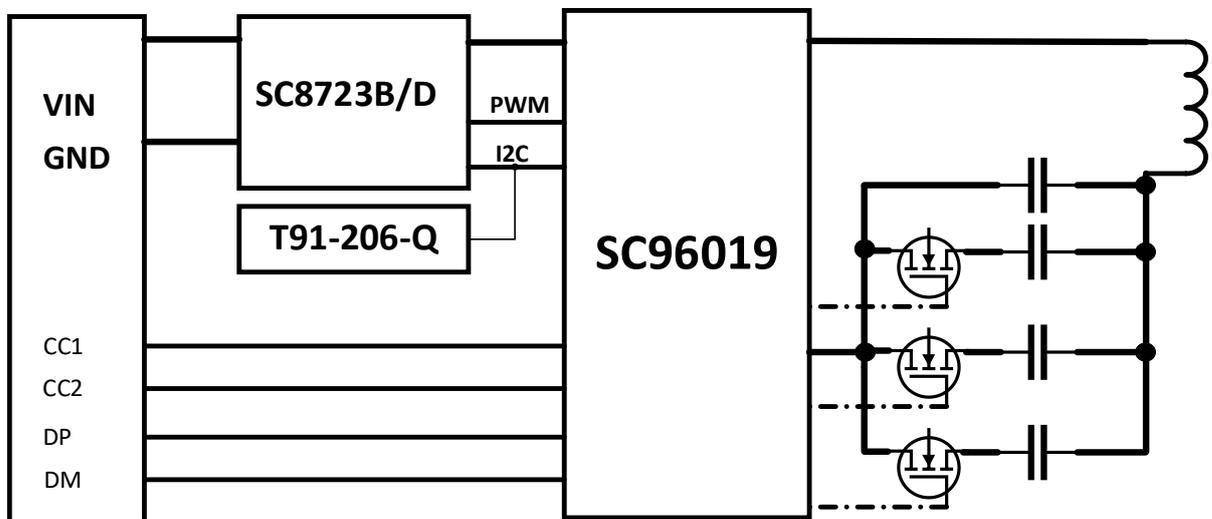
1.0   System parameter

1.1 Input voltage

SM232A module supports 5V/ 9V / 15V / 20V input voltage. Besides, USB-PD and HVDCP quick charge protocol adapter input can also be detected. Output mode will be decided by input capability.

For DC source, input voltage can be set to 9V~20V and for HVDCP, 15V is also the preferred voltage for this module:

Parameter	Test condition	MIN	TYP	MAX	UNIT
Input type	DC source	4.2	15	20	V
	Adapter 5V only		5		V
	HVDCP	5	15	20	V
	USB-PD	5	15	20	V

Note: The DC/DC input current is limited to 5A, 5V input is hard to support 25Watt output.

1.2 Ping parameter

SM232A module's coil type is TPT#MPP1-coil. In idle mode, it will take turns performing DIGITAL PING and foreign object detection. The inverter voltage is set to 127.8KHZ. The PING duty ramps up from 5% to 25% in 6ms and keeps operating for 70ms.

PING parameter	Test condition	MIN	TYP	MAX	UNIT
PING keeps time	Idle mode		70		ms
PING frequency	Idle mode		127.8		KHz
PING duty	Idle mode		25		%
PING bridge	Idle mode		half bridge		

1.3 Power transfer parameter

SM232A module supports Qi2.2 protocol and integrates multiple power profiles. They are BPP and MPP. The Max power is up to 25W in MPP mode. The ping frequency is 127.8Khz in BPP and MPP mode; then 360Khz in MPP mode Power transmission phase.

Parameter	Test condition	MIN	TYP	MAX	UNIT
Maxpower	BPP mode			5	W
	MPP 15Watt mode			15	W
	MPP 25Watt mode			25	W

Working frequency	BPP mode	127.8	KHz
	MPP mode	360	KHz

1.4 Protection parameter

SM232A module integrates multiple protection functions. Default configurations as below:

| Parameter	Protect action	MIN	TYP	MAX	UNIT
INPUT OVP	Stop Charging		21		V
INPUT DPL	limit Output Power		4.6		V
OCP	Stop charging		3		A
OTP	Stop charging		95		℃
OTP_PING				65	℃
OTP_PING_HYS			20		℃
PRE_FOD	Stop Digital PING				
PTR_FOD	Stop Charging				

1.5 Module Pinout and connection guidance

SM232A module external Pinout definition is as below:

| Pin	Name	USB-C Cable Connection	USB-C Receptacle Connection	USB-A Connection	DC Jack Connection
1	LED	NC	NC	NC	NC
2	CC2	NC	USB CC2	NC	NC
3	V-	GND	GND	GND	GND
4	CC1	USB CC1	USB CC1	NC	NC
5	DM	USB DM	USB DM	USB DP	NC
6	DP	USB DP	USB DP	USB DP	NC
7	V+	USB VBUS	USB VBUS	USB VBUS	USB VBUS
8	SCL	NC	NC	NC	NC
9	SDA	NC	NC	NC	NC

2.0   Performance

2.1 System startup

BPP mode
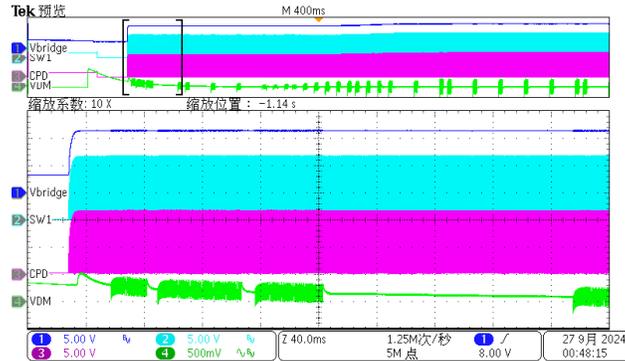
In BPP mode progresses through three fundamental phases: Ping, Configuration, and Power Transfer.

MPP mode
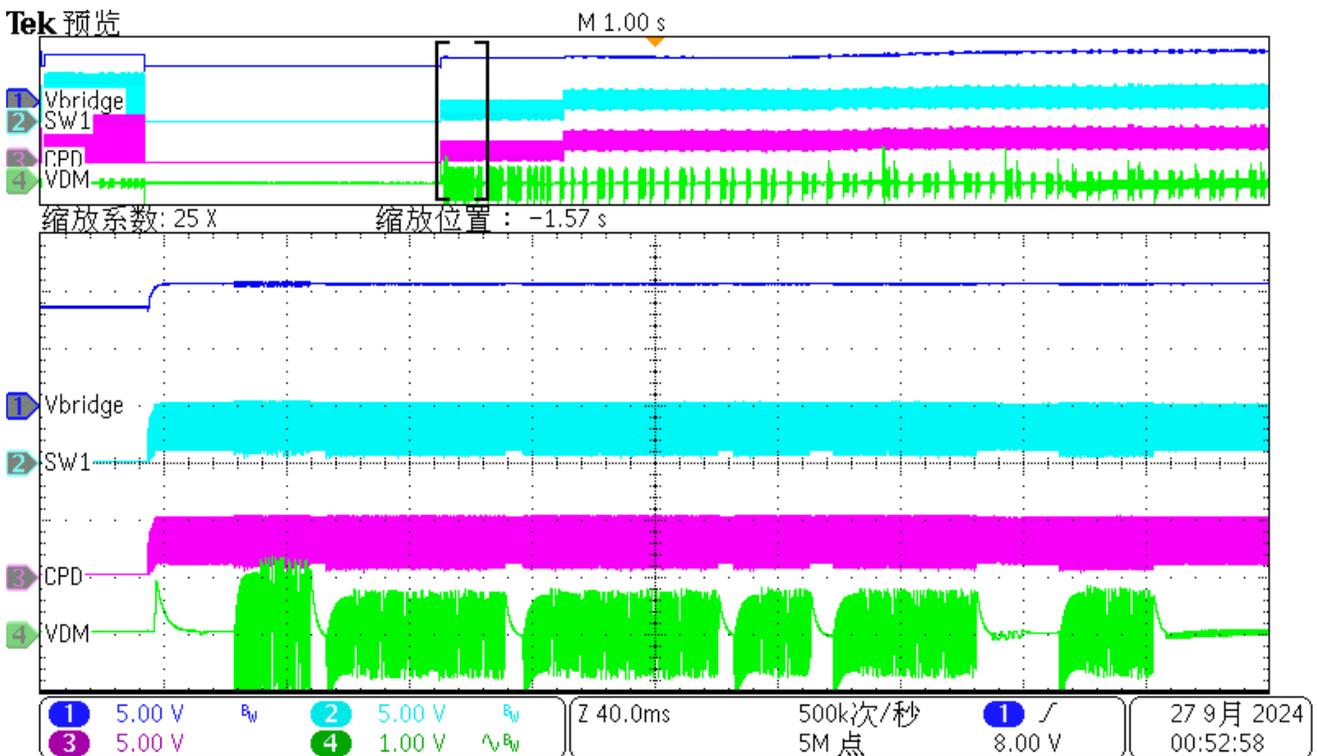
In MPP mode, the charging sequence begins with negotiation at 128kHz, followed by a subsequent series of phases at 360kHz, including Ping, Configuration, Negotiation, and Power Transfer.

2.2 Efficiency

SM232A module as power transfer, supporting modes are BPP, MPP Restricted, and MPP Full. To get more accurate wireless charging efficiency testing, this test sense input voltage and input current in full bridge of power transmitter and sense output power in VOUT of the receiver.
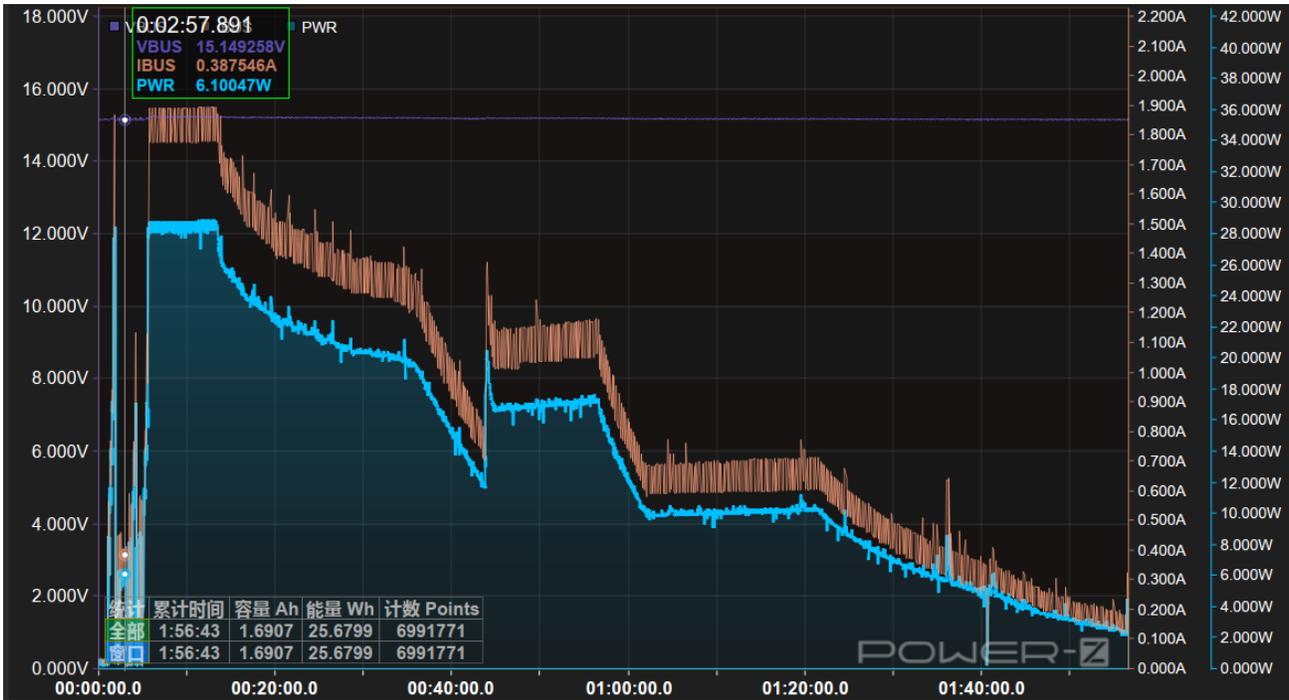
System block
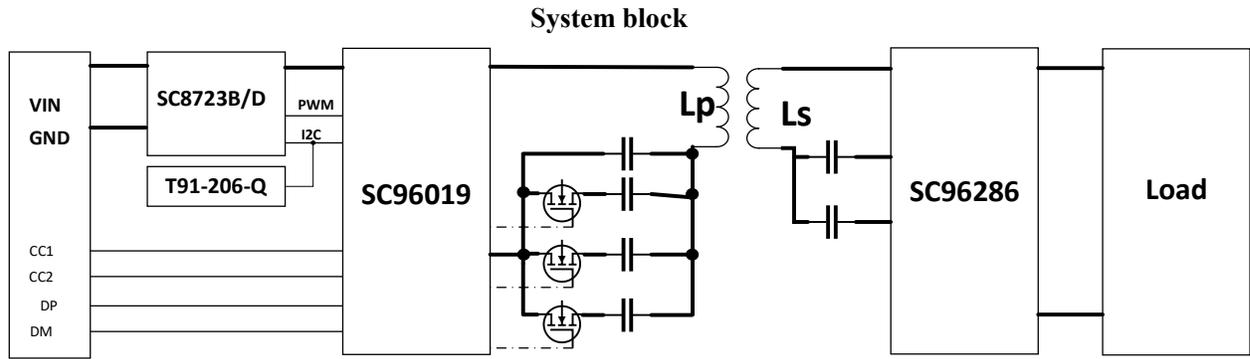
System efficiency curve

Note: Test result in the Southchip lab.

2.3 Charge curve diagram

Iphone16 plus charging curve (0%~100%, @25℃)

Note: Test result in the Southchip lab.

2.4 Thermal

Test conditions: room temperature 26 degrees, no air convection, rated load for 5 minutes.

25W MPP temperature rise，   DCDC die temperature is 73.4 degrees (Maximum value)

3.0   Annex

3.1 User interface

SM232A module integrates IIC slaver interface. Rich interface can be used to configure the module and read working state, including the configuration of protection parameters, working state control etc. The slaver address is 0x36(7bit) and register map start address is 0x20000000.

<table>
<tr><td colspan="7" align="center"><i>SC232A MPP Module Registers</i></td></tr>
<tr><td align="center">Version</td><td colspan="6" align="center"><i>V0.5</i></td></tr>
<tr><td align="center">Interface</td><td colspan="6" align="center"><i>SCLink-I2C</i></td></tr>
<tr><td align="center">Speed</td><td colspan="6" align="center"><i>100</i></td></tr>
<tr><td align="center">Device Address</td><td colspan="6" align="center"><i>0x36</i></td></tr>
<tr><td align="center">Base Address</td><td colspan="6" align="center"><i>0X2000_0000</i></td></tr>
<tr><td align="center">Byte Order</td><td colspan="6" align="center"><i>little-endian</i></td></tr>
<tr><td align="center">Register Name</td><td align="center">Offset</td><td colspan="5" align="center">Bit Field</td></tr>
<tr><td rowspan="4"><i>REG00</i></td><td rowspan="4"><i>0x0000</i></td><td>Bits</td><td>Field Name</td><td>Access</td><td><i>Value(hex)</i></td><td>Description</td></tr>
<tr><td><i>15:0</i></td><td align="center"><i>ChipID</i></td><td><i>R</i></td><td><i>0x6018</i></td><td><i>Chip part number: 06018 = SC96018</i></td></tr>
<tr><td>Bits</td><td>Field Name</td><td>Access</td><td><i>Value(hex)</i></td><td>Description</td></tr>
<tr><td><i>31:16</i></td><td align="center"><i>rsv0</i></td><td><i>W</i></td><td><i>0</i></td><td><i>reserve</i></td></tr>
<tr><td rowspan="2"><i>REG04</i></td><td rowspan="2"><i>0x0004</i></td><td>Bits</td><td>Field Name</td><td>Access</td><td><i>Value(hex)</i></td><td>Description</td></tr>
<tr><td><i>31:0</i></td><td align="center"><i>GitVer</i></td><td><i>R</i></td><td><i>0</i></td><td><i>Gitlab revision number</i></td></tr>
<tr><td rowspan="4"><i>REG08</i></td><td rowspan="2"><i>0x0008</i></td><td>Bits</td><td>Field Name</td><td>Access</td><td><i>Value(hex)</i></td><td>Description</td></tr>
<tr><td><i>15:0</i></td><td align="center"><i>HwRev</i></td><td><i>R</i></td><td><i>0</i></td><td><i>Hardware revision number</i></td></tr>
<tr><td rowspan="2"><i>0x0008</i></td><td>Bits</td><td>Field Name</td><td>Access</td><td><i>Value(hex)</i></td><td>Description</td></tr>
<tr><td><i>31:16</i></td><td align="center"><i>FwRev</i></td><td><i>R</i></td><td><i>0</i></td><td><i>Gitlab revision number</i></td></tr>
<tr><td rowspan="2"><i>REG0C</i></td><td rowspan="2"><i>0x000C</i></td><td>Bits</td><td>Field Name</td><td>Access</td><td><i>Value(hex)</i></td><td>Description</td></tr>
<tr><td><i>15:0</i></td><td align="center"><i>mCode</i></td><td><i>R</i></td><td><i>0</i></td><td><i>WPC Manufacturer Code, this code will be sent to</i></td></tr>
</table>

		Bits	Field Name	Access	Value(hex)	Description
						the Transimitter in the ID packet during the "identification and configuration" phase stated in WPC
		Bits	Field Name	Access	Value(hex)	Description
		31:16	rsv1	RW	0	
REG10	0x0010	Bits	Field Name	Access	Value(hex)	Description
		7:0	max_pwr_5V	RW	0	Unit:1[W]@Ordinary 5V adapter
		Bits	Field Name	Access	Value(hex)	Description
		15:8	max_pwr_9V	RW	0	Unit:1[W]@AFCP fast charging adapter, default 9V output
		Bits	Field Name	Access	Value(hex)	Description
		23:16	max_pwr_12V	RW	0	Unit:1[W]@12V DC power input
		Bits	Field Name	Access	Value(hex)	Description
		31:24	max_pwr_qc3p0	RW	0	Unit:1[W]@QC3.0 adapter default 5V output, output voltage regulation 5V~12V
REG14	0x0014	Bits	Field Name	Access	Value(hex)	Description
		15:0	ping_freq_5v	RW	0	Unit:100[Hz]@Ping frequency, frequency range determined by Fmin and Fmax
	0x0014	Bits	Field Name	Access	Value(hex)	Description
		23:16	ping_duty_5v	RW	0	Ping duty cycle (half bridge)/phase (full bridge), range: 100-255

	0x0014	Bits	Field Name	Access	Value(hex)	Description
		31:24	ping_brg_5v	RW	0	Ping bridge status:<0: Half bridge><1: Full bridge>
REG18	0x0018	Bits	Field Name	Access	Value(hex)	Description
		15:0	ping_freq_9v	RW	0	Unit:100[Hz]@Ping frequency, frequency range determined by Fmin and Fmax
	0x0018	Bits	Field Name	Access	Value(hex)	Description
		23:16	ping_duty_9v	RW	0	Ping duty cycle (half bridge)/phase (full bridge), range: 100-255
	0x0018	Bits	Field Name	Access	Value(hex)	Description
		31:24	ping_brg_9v	RW	0	Ping bridge status:<0: Half bridge><1: Full bridge>
REG1C	0x001C	Bits	Field Name	Access	Value(hex)	Description
		15:0	ping_freq_12v	RW	0	Unit:100[Hz]@Ping frequency, frequency range determined by Fmin and Fmax
	0x001C	Bits	Field Name	Access	Value(hex)	Description
		23:16	ping_duty_12v	RW	0	Ping duty cycle (half bridge)/phase (full bridge), range: 100-255
	0x001C	Bits	Field Name	Access	Value(hex)	Description
		31:24	ping_brg_12v	RW	0	Ping bridge status:<0: Half bridge><1: Full bridge>
REG20	0x0020	Bits	Field Name	Access	Value(hex)	Description

		Bits	Field Name	Access	Value(hex)	Description
		15:0	ping_freq_qc3p0	RW	0	Unit:100[Hz]@Ping frequency, frequency range determined by Fmin and Fmax
		Bits	Field Name	Access	Value(hex)	Description
		23:16	ping_duty_qc3p0	RW	0	Ping duty cycle (half bridge)/phase (full bridge), range: 100-255
		Bits	Field Name	Access	Value(hex)	Description
		31:24	ping_brg_qc3p0	RW	0	Ping bridge status:<0: Half bridge><1: Full bridge>
REG24	0x0024	Bits	Field Name	Access	Value(hex)	Description
		15:0	MinFreq	RW	0	Current frequency adjustment range lower limit * 10
	0x0024	Bits	Field Name	Access	Value(hex)	Description
		31:16	MaxFreq	RW	0	Current frequency adjustment range upper limit * 10
REG28	0x0028	Bits	Field Name	Access	Value(hex)	Description
		7:0	isen_r	RW	0	Selection of current sampling resistor:< 0:10mR><1:20mR>
		Bits	Field Name	Access	Value(hex)	Description
		15:8	print_en	RW	0	NTC pin function selection:< 0 UART><1:NTC>
		Bits	Field Name	Access	Value(hex)	Description
		23:16	ntc_cc	RW	0	NTC constant current source current selection:<

		Bits	Field Name	Access	Value(hex)	Description
						O:OFF><4:uA><20:uA><100:uA>
		31:24	t_die_otp_en	RW	0	Enable over temperature protection inside the chip:<0: off><1: on>
REG2C	0x002C	Bits	Field Name	Access	Value(hex)	Description
		31:0	baud_rate	RW	0	Serial port printing baud rate
REG30	0x0030	Bits	Field Name	Access	Value(hex)	Description
		15:0	ntc_min	RW	0	NTC protection voltage
		Bits	Field Name	Access	Value(hex)	Description
		31:16	ntc_max	RW	0	NTC exit protection voltage
REG34	0x0034	Bits	Field Name	Access	Value(hex)	Description
		15:0	otp	RW	0	Internal overheating protection temperature of the chip
		Bits	Field Name	Access	Value(hex)	Description
		31:16	utr	RW	0	The chip exits the over temperature protection temperature inside
REG38	0x0038	Bits	Field Name	Access	Value(hex)	Description
		15:0	i_ocp	RW	0	Enter OCP, default 3000mA
		Bits	Field Name	Access	Value(hex)	Description
		31:16	v_ovp	RW	0	MV input OVP, 22V maximum
REG3C	0x003C	Bits	Field Name	Access	Value(hex)	Description

SOUTHCHIP SEMICONDUCTOR

		Bits	Field Name	Access	Value(hex)	Description
		7:0	dpl_en	RW	0	Dynamic power limit function enable control:<0: off><1: on>
		Bits	Field Name	Access	Value(hex)	Description
		15:8	rsv2	RW	0	reserved
		Bits	Field Name	Access	Value(hex)	Description
		31:16	v_dpl	RW	0	Dynamic power limit triggering voltage setting
REG40	0x0040	Bits	Field Name	Access	Value(hex)	Description
		7:0	ptr_fod_en	RW	0	FOD enable switch during power transmission phase:<0: off><1: on>
		Bits	Field Name	Access	Value(hex)	Description
		15:8	pre_fod_en	RW	0	Q-value detection switch:<0: off><1: on>
		Bits	Field Name	Access	Value(hex)	Description
		23:16	pre_fod_thr	RW	0	Q-value detection threshold, below which FOD will be reported
		Bits	Field Name	Access	Value(hex)	Description
		31:24	rsv3	RW	0	reserved
REG44	0x0044	Bits	Field Name	Access	Value(hex)	Description
		15:0	ptr_fod_ploss_thr	RW	0	Ploss threshold
REG50	0x0050	Bits	Field Name	Access	Value(hex)	Description
		15:0	die_temp_protect1	RW	0	Threshold for over temperature protection recovery (75 degrees)
		Bits	Field Name	Access	Value(hex)	Description

		Bits	Field Name	Access	Value(hex)	Description
		31:16	die_temp_protect2	RW	0	Threshold for power limitation (default 80 degrees)
REG54	0x0054	Bits	Field Name	Access	Value(hex)	Description
		15:0	die_temp_protect3	RW	0	Threshold for disconnection of charging (default 95 degrees)
		Bits	Field Name	Access	Value(hex)	Description
		31:16	rsv0	RW	0	reserved
REG58	0x0058	Bits	Field Name	Access	Value(hex)	Description
		31:0	rsv1	RW	0	reserved
REG5C	0x005C	Bits	Field Name	Access	Value(hex)	Description
		15:0	q_value	RW	0	Q value calibrated under air conditions
		Bits	Field Name	Access	Value(hex)	Description
		31:16	q_ccz	RW	0	The number of zero crossings for q-value calibration under air conditions
Cmd	0x0060	Bits	Field Name	Access	Value(hex)	Description
		30	PRO_CM1	RW	0	Project reservation function, implemented separately in the project
		25	FOD_DISABLE	RW	0	Disable foreign object detection function
		24	FOD_ENABLE	RW	0	Enable foreign object detection function
		21	FPWM_CONFIG	RW	0	Configure PWM operating parameters in open-loop mode

		Bits	Field Name	Access	Value(hex)	Description
		20	FPWM_UPDATE	RW	0	Update PWM working parameters: Digital ping frequency and frequency adjustment range
		19	FPWM_MANUAL	RW	0	Full half bridge external control switching
		18	FPWM_AUTO	RW	0	Full half bridge automatic switching
		17	OPEN_LOOP	RW	0	Open-loop
		12	RESET	RW	0	Chip reset
		5	OCP_CHANGE	RW	0	Modify overvoltage protection
		4	OVP_CHANGE	RW	0	Modify overvoltage protection
		2	CHANGE_VIN	RW	0	Adjust input voltage
		1	SEND_PPP	RW	0	Sending FSK data
		0	INT_CLR	RW	0	Clear specified interrupt
IntEn	0x0064	**Bits**	**Field Name**	**Access**	**Value(hex)**	**Description**
		19	FOD	RW	0	Detected foreign object
		18	POWER_TRANS	RW	0	Enter charging state
		17	REMOVE_POWER	RW	0	Exit charging state
		16	RX_DET	RW	0	RX detected, generated after receiving SS
		13	PKT_RECV	RW	0	Received private ASK data
		11	EPP_DET	RW	0	Detected RX supporting EPP
		10	AFC_DET	RW	0	Detected RX that supports wireless AFC protocol
		7	DPL	RW	0	Dynamic power protection
		6	OTP_160c	RW	0	Internal DIE 160 degrees Celsius over temperature
		5	OTP	RW	0	Over Temperature
		4	LVP	RW	0	Undervoltage
		2	POVP	RW	0	Bridge overvoltage
		1	OVP	RW	0	Overvoltage

		Bits	Field Name	Access	Value(hex)	Description
		0	OCP	RW	0	Overcurrent
IntFlag	0x0068	19	FOD	RW	0	Detected foreign object
		18	POWER_TRANS	RW	0	Enter charging state
		17	REMOVE_POWER	RW	0	Exit charging state
		16	RX_DET	RW	0	RX detected, generated after receiving SS
		13	PKT_RECV	RW	0	Received private ASK data
		11	EPP_DET	RW	0	Detected RX supporting EPP
		10	AFC_DET	RW	0	Detected RX that supports wireless AFC protocol
		7	DPL	RW	0	Dynamic power protection
		6	OTP_160c	RW	0	Internal DIE 160 degrees Celsius over temperature
		5	OTP	RW	0	Over Temperature
		4	LVP	RW	0	Undervoltage
		2	POVP	RW	0	Bridge overvoltage
		1	OVP	RW	0	Overvoltage
		0	OCP	RW	0	Overcurrent
IntClr	0x006C	Bits	Field Name	Access	Value(hex)	Description
		19	FOD	RW	0	Detected foreign object
		18	POWER_TRANS	RW	0	Enter charging state
		17	REMOVE_POWER	RW	0	Exit charging state
		16	RX_DET	RW	0	RX detected, generated after receiving SS
		13	PKT_RECV	RW	0	Received private ASK data
		11	EPP_DET	RW	0	Detected RX supporting EPP
		10	AFC_DET	RW	0	Detected RX that supports wireless AFC protocol

		Bits	Field Name	Access	Value(hex)	Description
		7	DPL	RW	0	Dynamic power protection
		6	OTP_160c	RW	0	Internal DIE 160 degrees Celsius over temperature
		5	OTP	RW	0	Over Temperature
		4	LVP	RW	0	Undervoltage
		2	POVP	RW	0	Bridge overvoltage
		1	OVP	RW	0	Overvoltage
		0	OCP	RW	0	Overcurrent
CEPCnt	0x0070	Bits	Field Name	Access	Value(hex)	Description
		31:0	Count	RW	0	Received CEP count
MODE	0x0074	Bits	Field Name	Access	Value(hex)	Description
		4	PRIVATE	RW	0	Private mode
		3	MPP_FULL_MODE	RW	0	mpp full mode
		2	MPP_RSTC_MODE	RW	0	mpp restrict mode
		1	EPP	RW	0	EPP mode
		0	BPP	RW	0	BPP mode
REG78	0x0078	Bits	Field Name	Access	Value(hex)	Description
		31:0	CRC_CHECK	RW	0	CRC value
REG7C	0x007C	Bits	Field Name	Access	Value(hex)	Description
		31:0	RPP	RW	0	received power
REG80	0x0080	Bits	Field Name	Access	Value(hex)	Description
		15:0	OverPowerThreshold1	RW	0	Threshold for overcharging due to excessive power
		Bits	Field Name	Access	Value(hex)	Description
		31:16	OverPowerThreshold2	RW	0	Threshold for power over limit
REG84	0x0084	Bits	Field Name	Access	Value(hex)	Description
		15:0	MaxPVINVoltageLimit	RW	0	Maximum PVIN input voltage limit

		Bits	Field Name	Access	Value(hex)	Description
		31:16	*MinPVINVoltageLimit*	RW	0	*Minimum PVIN input voltage limit*
REG88	*0x0088*	Bits	Field Name	Access	Value(hex)	Description
		15:0	*OverPowerProtectionTempThreshold*	RW	0	*Overpower protection temperature threshold*
		Bits	Field Name	Access	Value(hex)	Description
		31:16	*OverPowerProtectionRepingDelay*	RW	0	*Overpower protection re ping delay*
REG8C	*0x008C*	Bits	Field Name	Access	Value(hex)	Description
		15:0	*AVin1_Threshold_L*	RW	0	*AVIN1 input mode low voltage threshold*
		Bits	Field Name	Access	Value(hex)	Description
		31:16	*AVin1_Threshold_H*	RW	0	*AVIN1 input mode high voltage threshold*
REG90	*0x0090*	Bits	Field Name	Access	Value(hex)	Description
		7:0	*ASK_cstate*	RW	0	*ASK data checksum status*
		Bits	Field Name	Access	Value(hex)	Description
		15:8	*ASK_chx*	RW	0	*The demodulation channel of ASK data*
		Bits	Field Name	Access	Value(hex)	Description
		23:16	*ASKHDR*	RW	0	*Received private ASK data header*
		Bits	Field Name	Access	Value(hex)	Description
		31:24	*ASKMSG_L*	RW	0	*Received private ASK data message*
REG94	*0x0094*	Bits	Field Name	Access	Value(hex)	Description

		Bits	Field Name	Access	Value(hex)	Description
		31:0	ASKMSG_H[7]	RW	0	Received private ASK data message
REGB0	0x00B0	Bits	Field Name	Access	Value(hex)	Description
		7:0	FSKHDR	RW	0	FSK header for sending data
	0x00B0	Bits	Field Name	Access	Value(hex)	Description
		31:8	FSKMSG_L	RW	0	FSK message for sending data
REGB4	0x00B4	Bits	Field Name	Access	Value(hex)	Description
		31:0	FSKMSG_H[7]	RW	0	FSK message for sending data
REGD0	0x00D0	Bits	Field Name	Access	Value(hex)	Description
		15:0	SetVin	RW	0	Modify the input voltage in mV
		Bits	Field Name	Access	Value(hex)	Description
		31:16	Vin	RW	0	The input voltage sampled by the current ADC is mV
REGD4	0x00D4	Bits	Field Name	Access	Value(hex)	Description
		15:0	Vbrg	RW	0	The bridge voltage sampled by the current ADC is mV
		Bits	Field Name	Access	Value(hex)	Description
		31:16	Iin	RW	0	The current input current sampled by the ADC is in mA
REGD8	0x00D8	Bits	Field Name	Access	Value(hex)	Description
		15:0	Power	RW	0	Calculate the power mW based on the current received RX RPP

		Bits	Field Name	Access	Value(hex)	Description
		31:16	Frequency	RW	0	Current operating frequency kHz * 10
REGDC	0x00DC	Bits	Field Name	Access	Value(hex)	Description
		15:0	Tdie	RW	0	The internal DIE temperature of the chip sampled by the current ADC
		Bits	Field Name	Access	Value(hex)	Description
		31:16	tx_pwr	RW	0	Current Tx power
REGE0	0x00E0	Bits	Field Name	Access	Value(hex)	Description
		15:0	fod_cnt	RW	0	
		Bits	Field Name	Access	Value(hex)	Description
		31:16	fod_thr	RW	0	
REGE4	0x00E4	Bits	Field Name	Access	Value(hex)	Description
		7:0	charging_falg	RW	0	
		Bits	Field Name	Access	Value(hex)	Description
		15:8	rsv6	RW	0	
		Bits	Field Name	Access	Value(hex)	Description

Bits	Field Name	Access	Value(hex)	Description
_23:16_	_TAType_	_RW_	_0_	Adapter Type: 0: unknow 1: DC Source 2: SDP 500mA 3: CDP 1.1A 4: DCP 1.5A 5: QC2.0 6: QC3.0 7: PD 8: PD PPS 9: FCP 10: SCP 11: AFC
Bits	**Field Name**	**Access**	**Value(hex)**	**Description**
_31:24_	_EPTReson_	_RW_	_0_	End Power Transfer values: 　0x00: Unknown 　0x01: Charge Complete 　0x02: Internal Fault 　0x03: Over Temperature 　0x04: Over Voltage 　0x05: Over Current 　0x06: Battery Failure 　0x07: Reserved 　0x08: No Response 　0x09: Reserved 　0x0a: Negotiation Failure(Extended Power Profile only) 　0x0b: Restart Power Transfer(Extended Power Profile only) 　0x0c to 0xff: Reserved
REGE8 _0x00E8_	**Bits**	**Field Name**	**Access**	**Value(hex)**	**Description**

|		7:0	Duty	RW	0	Current PWM operating duty cycle.
		Bits	**Field Name**	**Access**	**Value(hex)**	**Description**
		15:8	SS	RW	0	This value will be written into the signal strength packet as stated in the WPC protocol. This value indicates the degree of coupling between the primary cell and the secondary coil
		Bits	**Field Name**	**Access**	**Value(hex)**	**Description**
		23:16	CEP	RW	0	The (two's complement) signed integer value contained in this field ranges between −128…+127 (inclusive), and provides input to the Operating Point controller of the Power Transmitter
		Bits	**Field Name**	**Access**	**Value(hex)**	**Description**
		31:24	RSV7	RW	0	
REGEC	0x00EC	**Bits**	**Field Name**	**Access**	**Value(hex)**	**Description**
		15:0	AVin2_Threshold_H	RW	0	AVIN2 input mode high voltage threshold
		Bits	**Field Name**	**Access**	**Value(hex)**	**Description**
		31:16	AVin2_Threshold_L	RW	0	AVIN2 input mode low voltage threshold

3.2 Schematic
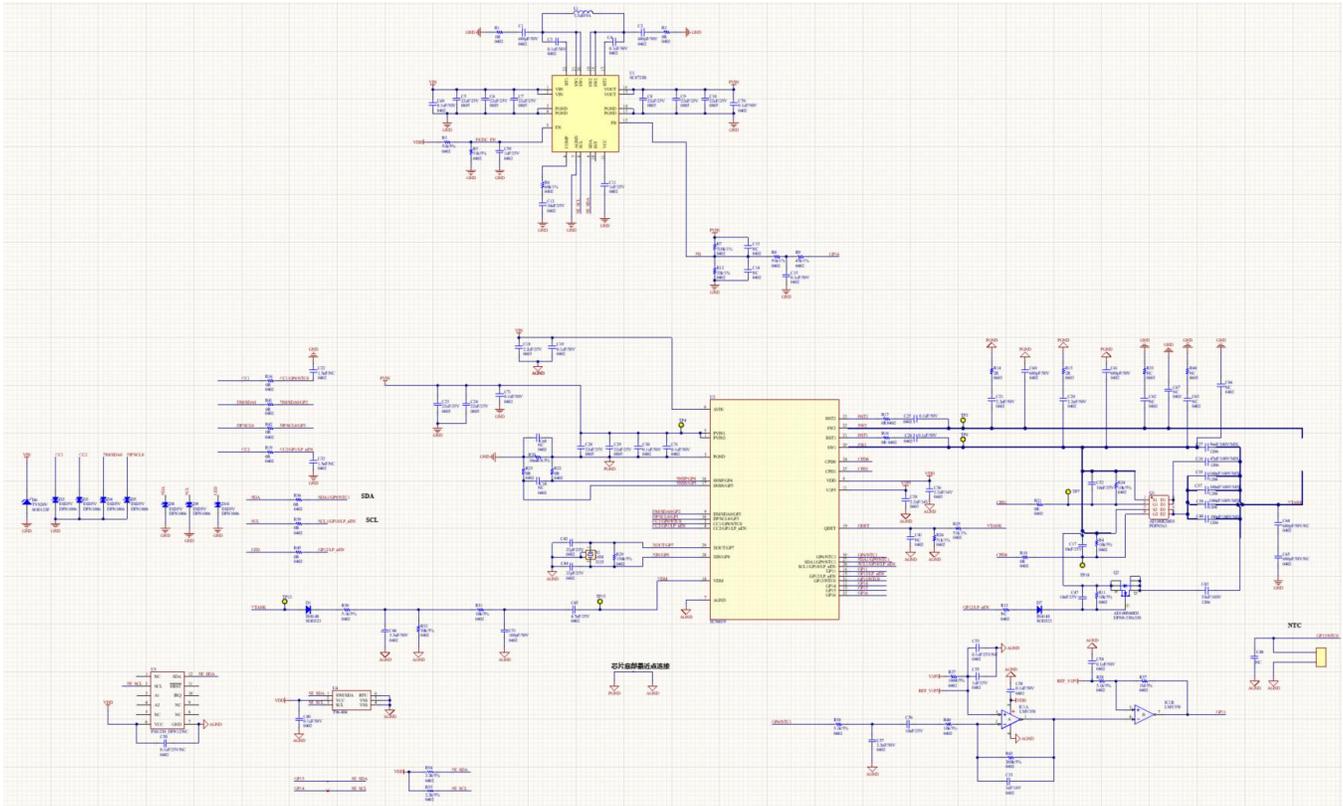
3.3 PCB Layout

EVM adopts four‑layer design, the outer size D=53mm or (53mm*53mm).
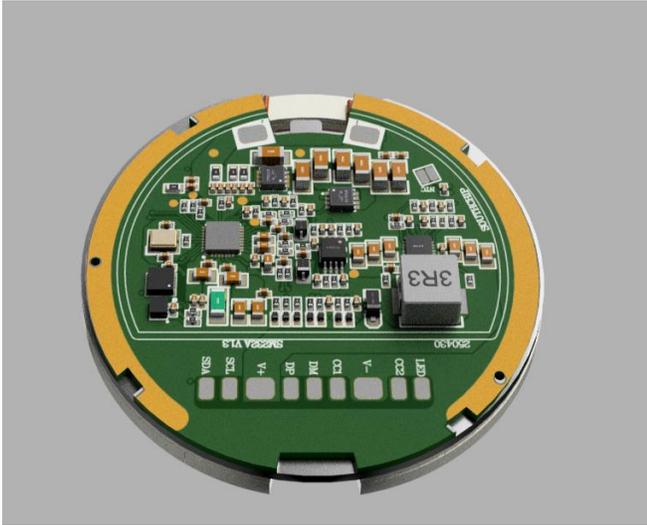
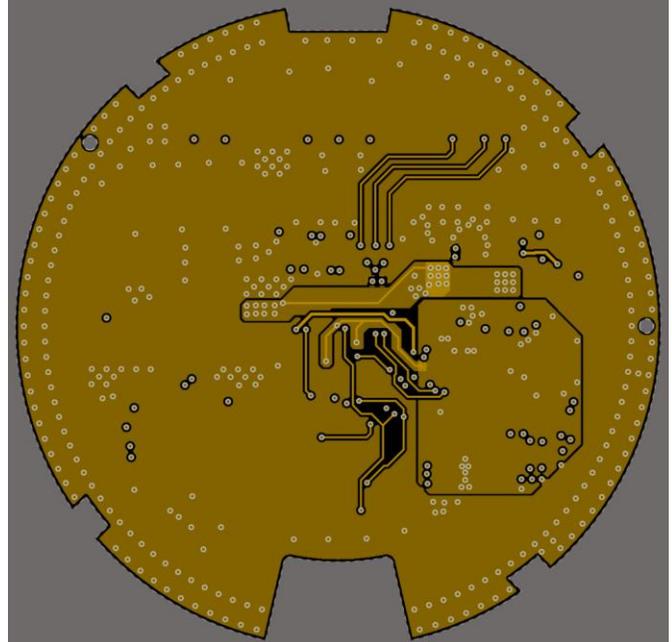3D module
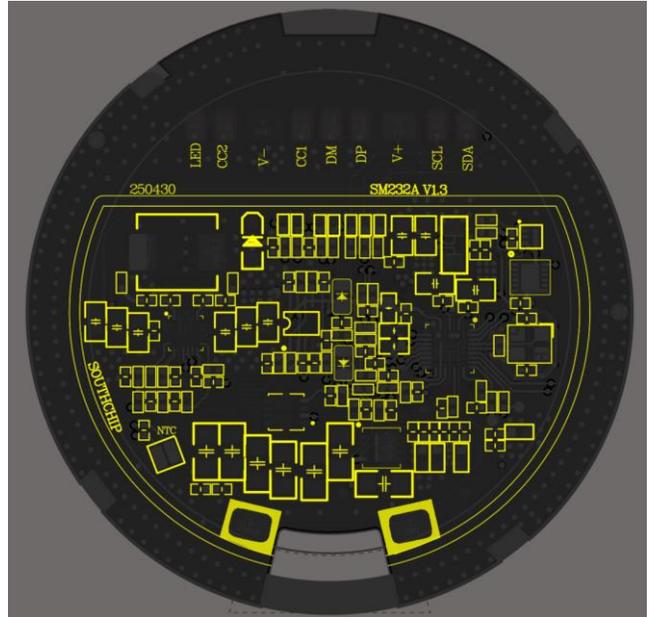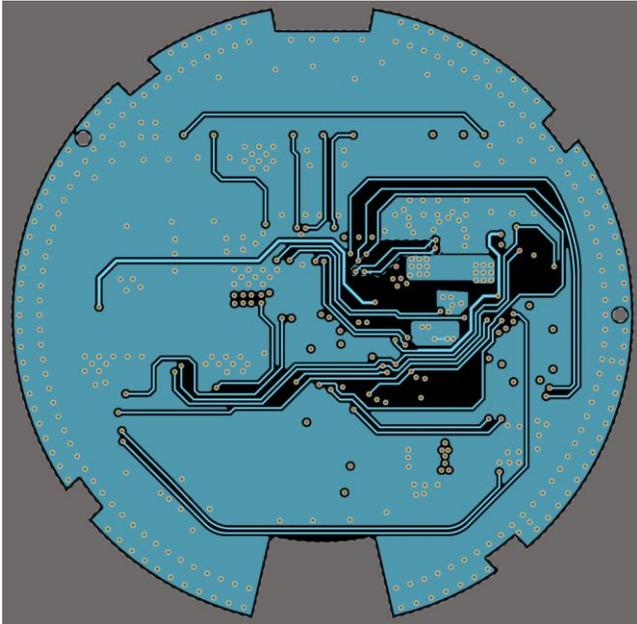

Silkscreen layer
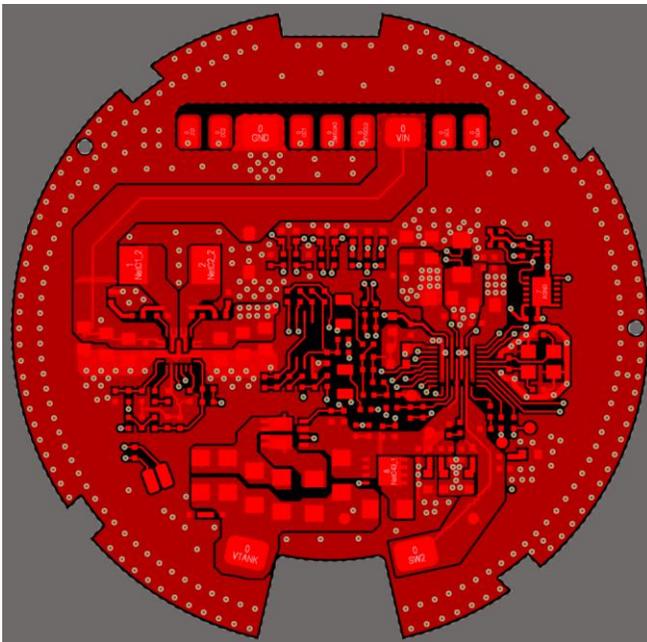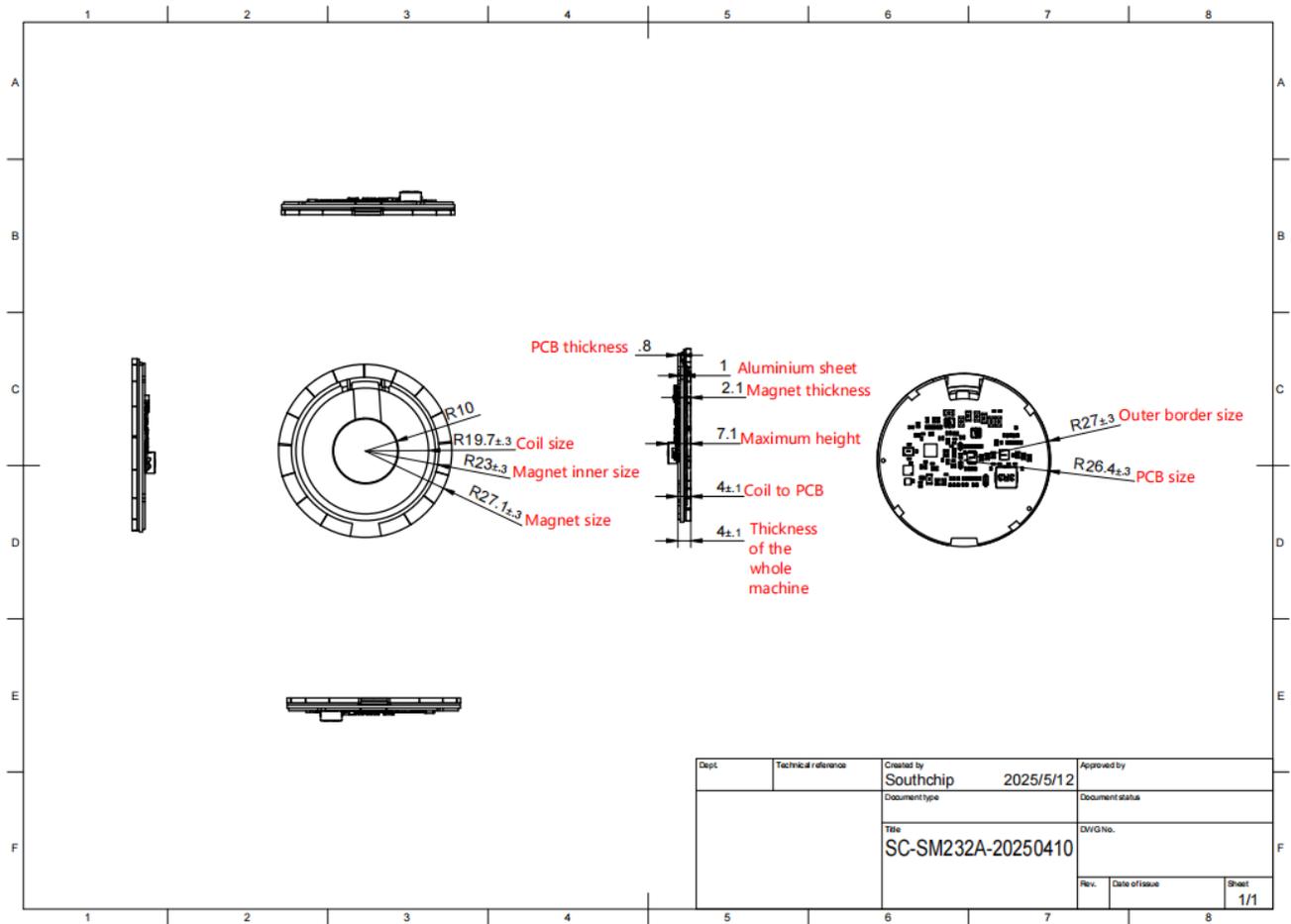

Top layer

Inner gnd layer

Inner signal layer
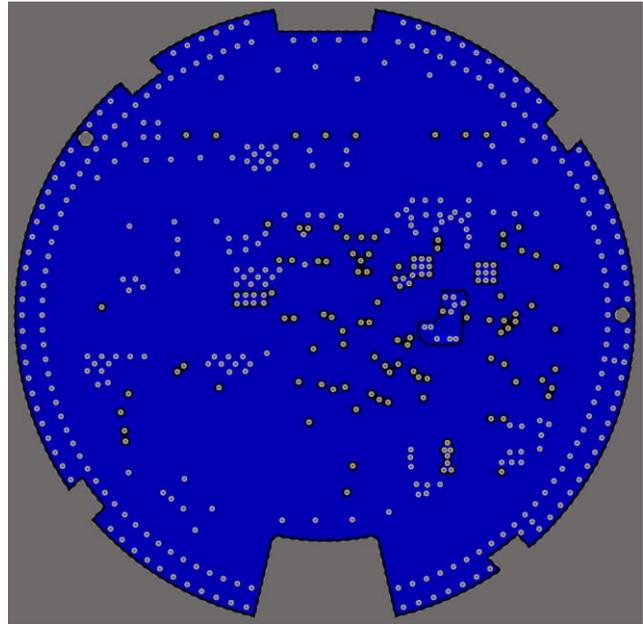
Bottom layer

3.4 BOM

Num	Designator	Quantity	Description
1	C1, C2, C60, C61	4	680PF ±10% 50V X7R 0402 SMD ROHS
2	C3, C4, C15, C19, C25, C26, C30, C31, C49, C54, C58, C69, C70, C71	14	100NF ±10% 50V X7R 0402 SMD ROHS
3	C5, C6, C7, C8, C9, C10, C23, C24, C28, C29	10	22UF ±20% 25V X5R 0805 SMD ROHS
4	C11, C55, C59	3	1uF ±10% 25V X5R 0402 SMD ROHS
5	C12, C17, C47, C52, C56	5	10NF ±10% 25V X7R 0402 SMD ROHS
6	C16	1	CCTC 47NF ±5% 100V M3L 1206 SMD ROHS
7	C18	1	2.2UF ±10% 25V X5R 0603 SMD ROHS
8	C20, C21	2	2.2NF ±10% 50V X7R 0402 SMD ROHS
9	C27	1	CCTC 56NF ±5% 100V M3L 1206 SMD ROHS
10	C33	1	1NF ±20% 16V X7R 0402 SMD ROHS
11	C35, C37, C39, C40	4	CCTC 100NF ±5% 100V M3L 1206 SMD ROHS
12	C36, C38	2	2.2UF ±10% 16V X5R 0603 SMD ROHS
13	C42, C44	2	22PF ±5% 50V NPO 0402 SMD ROHS
14	C43	1	CCTC 33NF ±5% 100V M3L 1206 SMD ROHS
15	C45	1	4.7NF ±10% 50V X7R 0402 SMD ROHS
16	C46, C57	2	3.3NF ±10% 50V X7R 0402 SMD ROHS
17	C51	1	100PF ±5% 50V NPO 0402 SMD ROHS
18	D1, D7	2	JUXINTONG 1N4148WS SOD-323 SMD ROHS
19	D2, D3, D4, D5, D8, D9, D10	7	GTW ESD-5V-DS_GESD0501CM_C DFN1006 SMD ROHS
20	D6	1	GTW TVS 22V SMF22A SOD-123FL SMD ROHS
21	IC1	1	LMV358 TSSOP8_L
22	L1	1	JKZ PSPMAA1040-3R3M-ANP 3.3UH± 20%11A 11MΩ SMD RHOS
23	Q1	1	AD100K20D3 PDFN-8_L3.2-W3.1-P0.65-LS3.4-BL-EP2
24	Q2	1	AD100N40D3 DFN8P330x330
25	R1, R2, R10, R16, R17, R18, R19, R21, R22, R23, R36, R39, R41, R42, R45	15	0Ω 5% 1/16W 0402 SMD ROHS

26	R3, R5	2	51KΩ 1% 1/16W 0402 SMD ROHS
27	R4, R11, R24, R31, R40	5	10KΩ 5% 1/16W 0402 SMD ROHS
28	R6	1	68KΩ 1% 1/16W 0402 SMD ROHS
29	R7	1	510KΩ 1% 1/16W 0402 SMD ROHS
30	R8	1	91KΩ 1% 1/16W 0402 SMD ROHS
31	R9	1	47KΩ 1% 1/16W 0402 SMD ROHS
32	R12	1	33KΩ 1% 1/16W 0402 SMD ROHS
33	R14, R15	2	2Ω 1% 1/10W 0603 SMD ROHS
34	R20	1	GOLDEN-WAVE 0.01Ω 1% 1W 1206 SMD ROHS ±50PPM ALLOY
35	R25, R26	2	51KΩ 1% 1/16W 0402 SMD ROHS
36	R27	1	100Ω 1% 1/16W 0402 SMD ROHS
37	R28, R30, R38	3	5.1KΩ 5% 1/16W 0402 SMD ROHS
38	R29	1	150KΩ 1% 1/16W 0402 SMD ROHS
39	R32	1	30KΩ 5% 1/16W 0402 SMD ROHS
40	R34, R35	2	2.2KΩ 5% 1/16W 0402 SMD ROHS
41	R37	1	1MΩ 5% 1/16W 0402 SMD ROHS
42	R43	1	200KΩ 5% 1/16W 0402 SMD ROHS
43	U1	1	SC8723B/D
44	U2	1	SC96019
45	U4	1	T91-206-Q
46	X1	1	16MHz 9pf 10ppm 3225_4 SMD ROHS
47	MPP coil	1	MPP Coil with Magnet
48	PCB	1	PCB

4.0   CONTACT INFORMATION

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