AXP2585 Single Cell NVDC BMU with E-gauge

1. Features

- 3.9V–5.5 Input Operating Range and Support single Cell Battery
- Battery charge and discharge coulomb counter & E-gauge 2.x
- Support TWSI(Two Wire Serial Interface) and RSB(Reduced Serial Bus)
- High efficiency 3A, 1uH inductor buck mode switch charger
- Boost mode operation with adjustable output from 4.5V to 5.5V, and with current limit
- Integrated control to switch between charge and boost mode
- Single input to support USB input
- Resistance compensation(IRCOMP) from charger output to cell terminal
- High battery discharge efficiency with 11mohm battery discharge MOSFET up to 6A
- BATFET control to support shipping mode, wake up and full system reset
- Flexible autonomous and TWSI mode for optimal system performance
- High integration includes all MOSFETS, current sensing and loop compensation
- Support BC1.2 and CC logic
- Protection
  - Input Over-Voltage Protection
  - Battery Thermistor Sense Hot/Cold Charge Suspend
  - Programmable Safety Timer for Charger
  - Die Thermal Balance for Charger
  - Thermal Shutdown

2. Applications

- Portable devices
- Wireless bluetooth speaker

3. Description

AXP2585 is a highly integrated BMU with NVDC power path management and E-gauge for single cell Li-battery. AXP2585 can be used with other PMU together to provide an easy and flexible power management solution for SOC. AXP2585 also can be used independently to provide battery management solutions for various portable devices

AXP2585 supports high output current up to 3A for fast charging. Besides, AXP2585 supports OTG mode with current limit. To ensure the security and stability of the system, AXP2585 provides multiple channels 12-bit ADC for voltage/current/temperature monitor and integrates protection circuits such as over-voltage protection(OVP), over-current protection(OCP) and over-temperature protection(OTP). Moreover, AXP2585 features a unique E-Gauge™(Fuel Gauge) system, making power gauge easy and exact.

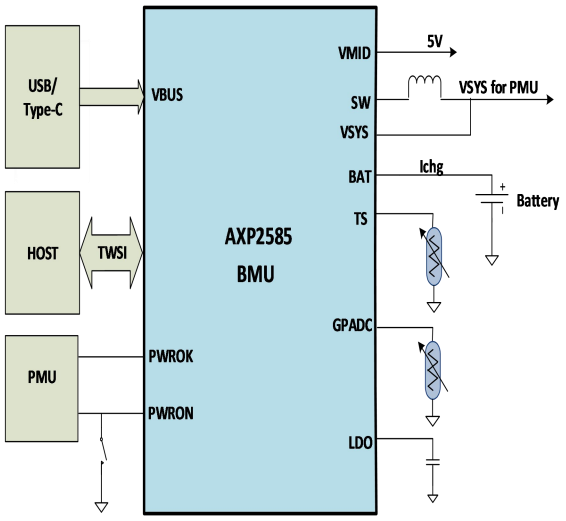
AXP2585 supports type-C cc logic and BC1.2 protocol. It can automatically detect different adapters and adjust the input current limit.

AXP2585 supports TWSI and RSB for system to dynamically adjust output voltages, charge current and configurate interrupt condition.

Device Information

Part Number	Package	Body Size
AXP2585	QFN-32	5mm * 5mm

Simplified Application Diagram



AXP2585单电池NVDC BMU与E-gauge

1. 特性

- 3.9V–5.5V 输入工作范围，支持单电池电池
- 电池充放电库仑计数器 & E-gauge 2.x
- 支持TWSI（双线串行接口）和RSB（简化串行总线）
- 高效率3A，1uH电感降压模式开关充电器
- 升压模式操作，输出可调从4.5V到5.5V，并带有电流限制
- 集成控制在充电和升压模式之间切换
- 单输入支持USB输入
- 充电器输出到电池端子的电阻补偿(IRCOMP)
- 高电池放电效率，11毫欧电池放电MOSFET可达6A
- BATFET控制支持运输模式，唤醒和全系统重置
- 灵活的自主和TWSI模式以优化系统性能
- 高集成度包括所有MOSFET、当前检测和环路补偿
- 支持BC1.2和CC逻辑
- 保护
  - 输入过压保护
  - 电池热敏电阻感应高温/低温充电暂停
  - 可编程安全定时器用于充电器
  - 充电器的芯片热平衡
  - 热关断

2. 应用

- 便携设备
- 无线蓝牙音箱

3. 描述

AXP2585是一款高度集成的电池管理单元，具有NVDC电源路径管理和单电池锂电池的E-gauge。AXP2585可以与其他电源管理单元一起使用，为SOC提供简单灵活的电源管理解决方案。AXP2585也可以独立使用，为各种便携设备提供电池管理解决方案

AXP2585支持高达3A的输出电流以实现快速充电。此外，AXP2585支持带电流限制的OTG模式。为了确保系统的安全性和稳定性，AXP2585提供多个通道的12位ADC用于电压/电流/温度监测，并集成了过压保护（OVP）、过流保护（OCP）和过温保护等保护电路。

保护(OTP)。 此外，AXP2585具有独特的E-Gauge™（燃料计）系统，使得电量测量简单而准确。

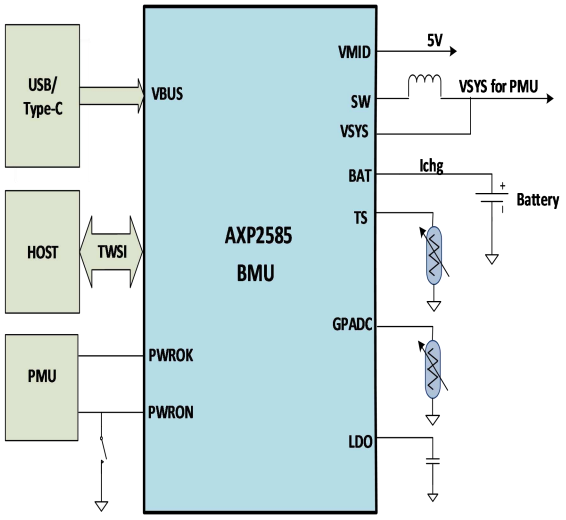
AXP2585支持Type-C cc逻辑和BC1.2协议。它可以自动检测不同的适配器并调整输入电流限制。

AXP2585支持TWSI和RSB，使系统能够动态调整输出电压、充电电流和配置中断条件。

设备信息

部件编号 封装		外形尺寸
AXP2585	QFN-32	5毫米*5毫米

简化应用图



4. Revision History

Revision	Date	Description
V 1.0	May 10,2018	Initial version
V 1.1	Aug.7,2018	1. Add ESD Ratings, Recommended Operating Conditions, Thermal Information, Application Information , PCB Layout Guideline, Storage and Baking.
V 1.2	Mar.18,2019	1. Update Electrical Characteristics and Register.

4. 修订历史

修订	日期	描述
V 1.0	2018年5月10日	初始版本
版本1.1	2018年8月7日	1. 添加ESD评级、推荐工作条件、热信息、 应用信息、PCB布局指南、存储和烘焙。
版本1.2	2019年3月18日	1. 更新电气特性和寄存器。

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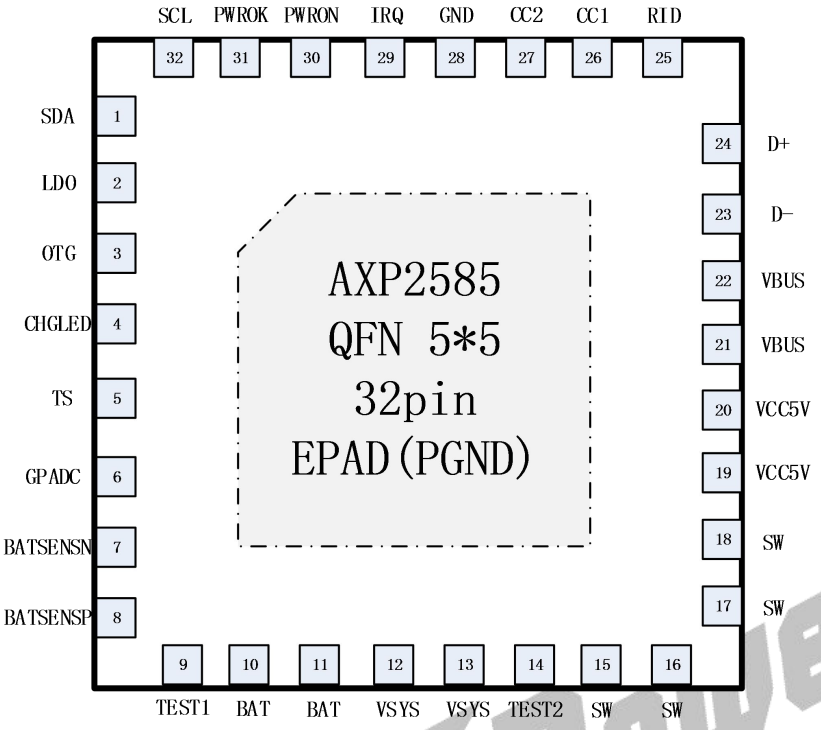
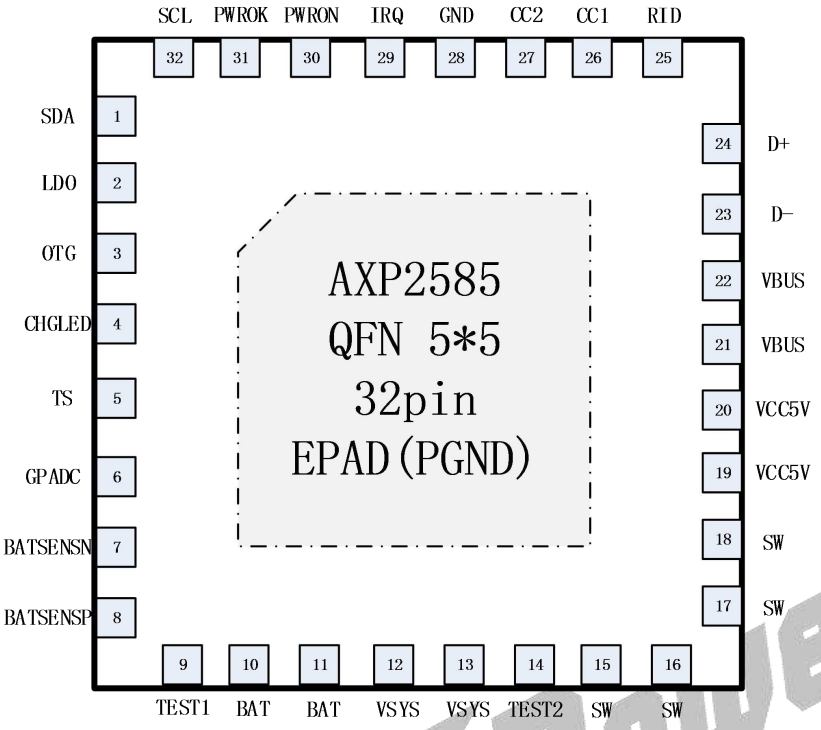


Pin Description

Pin		I/O[1]	Description
NO.	Name		
1	SDA	DIO	Data pin for serial interface. Connect SDA to the logic rail through a 4.7kΩ resistor.
2	LDO	PO	LDO output. It is used to provide power for RTC and so on. Voltage can be customized as 1.8V,2.5V,2.8V and 3.3V.
3	OTG	DI	Active high enable pin during boost mode. The boost mode is activated when BOOST_EN =1 and OTG pin is high.
4	CHGLED	DO	Charge status output to indicate various charger operation.
5	TS	AI	Temperature qualification voltage input. Connect a negative temperature coefficient thermistor from TS to GND. A current source is injected to TS pin and convert TS voltage to a digital code. Charging suspends when TS pin is out of range. Besides, TS can be connected to external input signal. Refer to REG81H.
6	GPADC	AI	General purpose ADC input. A current source is injected to GPADC pin and convert voltage to a digital code. If not used, it can be floating.

5.引脚配置和功能



引脚描述

引脚		输入/输出(1)	描述
编号	名称		
1	SDA	DIO	数据引脚用于串行接口。 通过4.7kΩ电阻将SDA连接到逻辑电源轨。
2	LDO	PO	LDO输出。 它用于为RTC等提供电源。电压可以定制为1.8V、2.5V、2.8V和3.3V。
3	OTG	DI	在升压模式下，启用引脚为高电平。 当BOOST_EN=1且OTG引脚为高时，激活升压模式。
4	CHGLED		充电状态输出以指示各种充电器操作。
5	TS	AI	温度合格电压输入。 将负温度系数热敏电阻从TS连接到GND。 一个电流源被注入到TS引脚并将TS电压转换为数字代码。当TS引脚超出范围时，充电会暂停。此外，TS可以连接到 外部输入信号。请参阅REG81H。
6	通用ADC	AI	通用ADC输入。 一个电流源被注入到GPADC引脚并将电压转换为数字代码。如果不使用，它可以是浮动的。

7	BATSENSN	AI	Current sense input. It is connected to one terminal of 10mohm current sense resistor and battery.
8	BATSENSP	AI	Current sense input. It is connected to the other terminal of 10mohm current sense resistor and BAT pin.
9,14	TEST	/	Test pin.Be connected to GND.
10,11	BAT	P	Battery connection point. The internal BATFET is connected between BAT and SYS. Connect a 10uF capacitor closely to the BAT pin.
12,13	VSYS	P	System connection point. The internal BATFET is connected between BAT and SYS. When the battery falls below the minimum system voltage, switch-mode converter keeps SYS above the minimum system voltage. Connect two 22uF capacitors closely to the SYS pin.
15,16,17,18	SW	P	Switching node connecting to output inductor.
19,20	VCC5V	P	Boost mode output.
21,22	VBUS	P	Charger Input.
23	D-	DIO	Negative line of the USB data line pair. D+/D- based USB host/charging port detection. The detection includes data contact detection (DCD), primary and secondary detection in BC1.2
24	D+	DIO	Positive line of the USB data line pair. D+/D- based USB host/charging port detection. The detection includes data contact detection (DCD), primary and secondary detection in BC1.2
25	RID	DI	The ID pin of USB port.
26	CC1	DIO	Type-C connector configuration channel pin.
27	CC2	DIO	Type-C connector configuration channel pin.
28	GND	G	Analog ground for interrupt analog and digital circuits.
29	IRQ	DIO	Open-drain interrupt Output. Connect the IRQ to a logic rail via a 4.7kΩ resistor. The IRQ pin sends a low level signal to host to report charger device status and fault.
30	PWRON	DIO	BATFET enable/BMU reset control input. Connect a key between PWRON and GND. The pin contains an interrupt pull-up to maintain default high logic.
31	PWROK	DI	Used for system power ON/OFF management. It can be connected to PWROK pin of PMU or directly pulled up to above 1.8V.
32	SCL	DI	Clock pin for serial interface. Connect SCL to the logic rail through a 4.7kΩ resistor.
EP	EP	G	Exposed PAD. Be connected to the power ground.

(1)**O** for output, **I** for input, **IO** for input/output, **D** for digital, **A** for analog, **P** for power, and **G** for ground.

7	电池传感器负	AI	电流传感器输入。 它连接到10毫欧电流传感器电阻器和电池的一个端子。
8	电池传感器正	AI	电流传感器输入。 它连接到10毫欧电流传感器电阻器和BAT引脚的另一个端子。
9,14	测试	/	测试引脚.连接到接地.
10,11	电池	P	电池连接点。 内部电池场效应管连接在BAT和SYS之间。 在BAT引脚附近连接一个10uF电容器。
12,13	VSYS	P	系统连接点。 内部电池场效应管连接在电池和系统之间。当电池电压低于最低系统电压时，开关模式转换器保持系统电压高于最低系统电压。将两个22uF电容器紧靠系统引脚连接。
15,16,17,18	开关	P	连接到输出电感的开关节点。
19,20	VCC5V	P	升压模式输出。
21,22	VBUS	P	充电器输入。
23	D-	DIO	USB数据线对的负极线。 D+/D- 基于USB主机/充电端口检测。检测包括数据接触检测（DCD）、BC1.2中的主次检测。
24	D+	DIO	USB数据线对的正极线。 D+/D- 基于USB主机/充电端口检测。检测包括数据接触检测（DCD）、BC1.2中的主次检测。
25	RID	DI	USB端口的ID引脚。
26	CC1	DIO	Type-C连接器配置通道引脚。
27	CC2	DIO	Type-C连接器配置通道引脚。
28	接地	G	模拟地用于中断模拟和数字电路。
29	中断请求	DIO	开漏中断输出。 将IRQ连接到逻辑电源轨，通过4.7kΩ电阻。IRQ引脚向主机发送低电平信号以报告充电器设备状态和故障。
30	电源开启数字输入		电池场效应管使能/电池管理单元复位控制输入。 在PWRON和接地之间连接一个按键。该引脚包含一个中断上拉以维持默认高逻辑。
31	电源正常	数字输入	用于系统电源开/关管理。 可以连接到PMU的PWROK引脚或直接拉高至1.8V以上。
32	时钟线	数字输入	串行接口的时钟引脚。 通过4.7kΩ电阻将SCL连接到逻辑电源轨。
暴露焊盘	暴露焊盘	G	暴露焊盘。应连接到电源接地。

(1)**O** 表示输出， **I**表示输入， **IO**表示输入/输出， **D**表示数字， **A**表示模拟， **P**表示电源， **G**表示接地。

6. Specifications

6.1 Absolute Maximum Ratings(1)

Over operating free-air temperature range(unless otherwise noted)

SYMBOL	DESCRIPTION	MIN	MAX	UNIT
VBUS	Voltage range(with respect to GND)	-0.3	12	V
VCC5V,BAT,VSYS		-0.3	7	V
SW,SDA,SCL,IRQ,OTG,LDO, TS,GPADC,PWRON,PWROK, D+,D-,RID,CC1,CC2,CHGLED, BATSENSN,BATSENSP		-0.3	7	V
PGND to GND		-0.3	0.3	V
Ta	Operating Temperature Range	-40	85	℃
T_J	Junction Temperature Range	-40	125	℃
Ts	Storage Temperature Range	-65	150	℃
T_{LEAD}	Maximum Soldering Temperature (at leads，10sec)		300	℃

(1)Stresses beyond those listed under absolute maximum ratings may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated under recommended operating conditions is not implied. Exposure to absolute maximum rated conditions for extended periods may affect device reliability.

6.2 ESD Ratings

		VALUE	UNIT
V_{ESD}	Human body model(HBM)(1)	±4000	V
	Charged device model(CDM)(2)	±750	V

(1) Reference:ESDA/JEDEC JS-001-2014. JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.

(2) Reference:ESDA/JEDEC JS-002-2014. JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

6.3 Recommended Operating Conditions

SYMBOL	DESCRIPTION	MIN	MAX	UNIT
V_{IN}	Input voltage(VBUS)	3.9	5.5	V
I_{IN}	Input current(VBUS)		3.25	A
I_{SYS}	Output current		3	A
V_{BAT}	Battery voltage		4.608	V
I_{BAT}	Fast charging current		3	A

6.4 Thermal Information

Thermal Metric(1)		VALUE	UNIT
θ_{JA}	Junction-to-ambient thermal resistance	20.1	℃/W
θ_{JB}	Junction-to-board thermal resistance	10.8	

6.规格

6.1绝对最大额定值(1)

过载自由空气温度范围（除非另有说明）

符号	描述	最小值	最大值	单位
VBUS	电压范围（相对于GND）	-0.3	12	伏特
VCC5V, 电池, VSYS		-0.3	7	伏特
开关, SDA, SCL, IRQ, OTG, LDO, 温度传感器, GPADC, PWRON, PWROK, D+, D-, RID, CC1, CC2, 充电指示灯, 电池传感器负, 电池传感器正		-0.3	7	伏特
PGND到GND		-0.3	0.3	伏特
Ta	工作温度范围	-40	85	℃
T_J	结温范围	-40	125	℃
Ts	储存温度范围	-65	150	℃
$T_{引脚}$	最大焊接温度（在引脚，10秒）		300	℃

(1) 超过绝对最大额定值的应力可能会导致设备永久损坏。这些仅仅是应力额定值。在推荐的操作条件之外的这些或任何其他条件下，设备的功能操作并不意味着是可行的。在绝对最大额定条件下长时间暴露可能会影响设备的可靠性。

6.2 ESD 额定值

		值	单位
V_{ESD}	人体模型 (HBM)(1)	±4000	伏特
	带电设备模型 (CDM)(2)	±750	

V (1) 参考文献：ESDA/JEDEC JS-001-2014。JEDEC 文档 JEP155 指出，500-V HBM 允许在标准 ESD 控制流程下安全制造。

(2) 参考文献：ESDA/JEDEC JS-002-2014。JEDEC 文档 JEP157 指出，250-V CDM 允许在标准 ESD 控制流程下安全制造。

6.3 推荐操作条件

符号	描述	最小值	最大值	单位
V_{IN}	输入电压(VBUS)	3.9	5.5	伏特
I_{IN}	输入电流(VBUS)		3.25	A
I_{SYS}	输出电流		3	A
V_{BAT}	电池电压		4.608	伏特
I_{BAT}	快速充电电流		3	A

6.4热信息

热指标(1)		值	单位
θ_{JA}	结点到环境的热阻	20.1	℃/W
θ_{JB}	接头到板的热阻	10.8	

θ_{JC}	Junction-to-case(top) thermal resistance	22.8	

(1)Thermal metrics are calculated refer to JEDEC document JESD51.

6.5 Electrical Characteristics

V_{VBUS_UVLOZ} < V_{VBUS} < V_{ACOV} and V_{VBUS} > V_{BAT} > V_{SLEEP}, T_J = –40°C to 125°C and T_J = 25°C for typical values (unless otherwise noted)

Parameters		Test Conditions	MIN	TYP	MAX	UNIT
QUIESCENT CURRENTS						
I_{BAT}	Battery discharge current (BAT, SW, SYS) in buck mode	V_{BAT} = 4.2V, VBUS =0V, leakage between BAT and VBUS			5	uA
		no VBUS, BATFET Disabled, Battery detection Disabled, T_j<85°C		35		uA
		no VBUS, BATFET Enabled, Battery detection Disabled, T_j<85°C		85		uA
I_{VBUS}	Input supply current (VBUS) in buck mode	VBUS = 5V, BAT = 3.8V, converter switching, BATFET Disabled, I_{SYS} = 0A		1.2		mA
I_{BOOST}	Battery discharge current in boost mode	V_{BAT}=4.2V, boost mode, I_{VBUS}= 0A, converter switching		1		mA
VBUS/BAT POWER UP						
V_{VBUS_OP}	VBUS operating range		3.9		5.5	V
V_{VBUS_UVLOZ}	VBUS for active TWSI, no battery		3.4	3.8	4.1	V
V_{SLEEP}	Sleep mode falling threshold		75	85	90	mV
V_{SLEEPZ}	Sleep mode rising threshold		220	251	273	mV
V_{ACOV}	VBUS over-voltage rising threshold		6.3	6.4	6.5	V
V_{ACOV}	VBUS over-voltage falling threshold		180	189	207	mV
V_{BAT_UVLOZ}	Battery for active TWSI, no VBUS		2.2	2.5	2.7	V
V_{BAT_DPL}	Battery depletion falling threshold		2.0	2.3	2.5	V
V_{BAT_DPLZ}	Battery depletion rising threshold		2.1	2.5	2.7	V
$V_{VBUSMIN}$	Bad adapter detection threshold		3.7	3.7	3.8	V
I_{BADBUS}	Bad adapter detection current source		20	30	44	mA
T_{BADSRC}	Bad adapter detection current source pull down duration			28		ms
POWER-PATH MANAGEMENT						
V_{SYS}	Typical system regulation	Isys = 0A, V_{BAT}> V_{SYS_MIN}, BATFET Disabled		V_{BAT}+		V

θ_{JC}	结到外壳（顶部）热阻	22.8	

(1) 热性能参数参考JEDEC文档JESD51计算。

6.5 电气特性

$V_{VBUS\_UVLOZ} < V_{VBUS} < V_{ACOV}$ 且 $V_{VBUS} > V_{BAT} > V_{SLEEP}$，$T_J$ = –40°C 到 125°C 和 T_J = 25°C 的典型值（除非另有说明）

参数		测试条件	最小值	典型值	最大	单位
静态电流						
I_{BAT}	电池放电电流（BAT, SW,SYS）在降压模式下	V_{BAT} = 4.2V, VBUS =0V, BAT与VBUS之间的泄漏			5	微安
		无VBUS，电池场效应管禁用，电池检测禁用，T_J<85°C		35		微安
		无VBUS，电池场效应管启用，电池检测禁用，T_J<85°C		85		微安
I_{VBUS}	输入供电电流 (VBUS) 在降压模式下	VBUS = 5V, BAT = 3.8V, 转换器开关, BATFET禁用 ,I_{SYS} = 0A		1.2		毫安
I_{BOOST}	电池放电电流在升压模式下	V_{BAT}=4.2V, 升压模式, I_{VBUS}= 0A, 转换器开关		1		毫安
VBUS/BAT电源启动						
V_{VBUS_OP}	VBUS工作范围		3.9		5.5	伏特
V_{VBUS_UVLOZ}	VBUS用于活动 TWSI, 无电池		3.4	3.8	4.1	伏特
V_{SLEEP}	睡眠模式下降阈值		75	85	90	毫伏
V_{SLEEPZ}	睡眠模式上升阈值		220	251	273	毫伏
V_{ACOV}	VBUS 过电压 上升阈值		6.3	6.4	6.5	伏特
V_{ACOV}	VBUS 过压下降阈值		180	189	207	毫伏
V_{BAT_UVLOZ}	用于主动 TWSI的电池，无VBUS		2.2	2.5	2.7	伏特
V_{BAT_DPL}	电池 耗尽 下降阈值		2.0	2.3	2.5	伏特
V_{BAT_DPLZ}	电池 耗尽 上升阈值		2.1	2.5	2.7	伏特
$V_{VBUSMIN}$	坏的 适配器 检测阈值		3.7	3.7	3.8	伏特
I_{BADBUS}	坏适配器检测电流源		20	30	44	毫安
T_{BADSRC}	坏适配器检测电流源下拉持续时间			28		毫秒
电源-路径管理						
V_{SYS}	典型 系统 调节 Isys=0A,V_{BAT}>V_{SYS_MIN},BATFET禁用			V_{BAT}+		伏特

	voltage			50mV		
		Isys= 0A, V_{BAT}<V_{SYS_MIN}, BATFET Disabled		Vsys_min +150mV		V
V_{SYS_min}	Minimum DC System Voltage Output	V_{BAT}< V_{SYS_MIN}, V_{SYS_MIN} = 3.5V, I_{SYS}= 0A		3.65		V
V_{SYS_max}	Maximum DC System Voltage Output	V_{BAT}=4.25V, V_{SYS_MIN} = 3.5V, I_{SYS}= 0A		4.3		V
$R_{ON(RBFET)}$	Top reverse blocking MOSFET(RBFET) on-resistance between VBUS and VMID	TJ = -40°C - 85°C		60.2		mΩ
		TJ = -40°C - 125°C		60.2		mΩ
$R_{ON(HSFET)}$	Top switching MOSFET (HSFET) on-resistance between VMID and SW	TJ = -40°C - 85°C	25	36	40	mΩ
		TJ = -40°C - 125°C	25	36	42	mΩ
$R_{ON(LSFET)}$	Bottom switching MOSFET (LSFET) on-resistance between SW and GND	TJ = -40°C - 85°C	20	36	41	mΩ
		TJ = -40°C - 125°C	20	36	46	mΩ
V_{FWD}	BATFET forward voltage in supplement mode	BATFET forward voltage in supplement mode		22		mV
V_{BATGD}	Battery good comparator falling threshold	V_{BAT} falling	3.7	3.8	3.8	V
V_{BATGD_HYST}	Battery good comparator rising threshold	V_{BAT} rising	3.8	3.9	4	mV
Battery Charger						
V_{BATREG_RANGE}	Typical Charge voltage range		3.84		4.608	V
V_{BATREG_STEP}	Typical charge voltage step			16		mV
V_{BATREG}	Charge voltage resolution accuracy	V_{BAT} = 4.208V (REG8C[7:2]=010111) or V_{BAT} = 4.352V (REG8C[7:2]=100000) TJ = -40°C - 85°C	-0.5%		0.5%	
$I_{CHG\_REG\_RANGE}$	Typical Fast charge current regulation range		0		3072	mA
$I_{CHG\_REG\_STEP}$	Typical Fast charge current regulation step			64		mA
$I_{CHG\_REG\_ACC}$	Fast charge current regulation accuracy	V_{BAT} = 3.1V or 3.8V, I_{CHG}=256mA,TJ = -40°C-85°C	-40%		40%	
		V_{BAT} = 3.1V or 3.8V, I_{CHG}=1792mA,TJ = -40°C-85°C	-10%		10%	
$V_{BATLOWV}$	Battery LOWV falling threshold	Fast charge to precharge, BATLOWV(REG06[1])=1	2.5	2.8	3.1	V
	Battery LOWV rising threshold	Precharge to fast charge, BATLOWV(REG8C[1])=1 (Typical 200-mV hysteresis)	2.7	3.0	3.3	V
I_{PRECHG_RANGE}	Precharge current range		64		1024	mA
I_{PRECHG_STEP}	Typical precharge current step			64		mA
I_{PRECHG_ACC}	Precharge current accuracy	V_{BAT}=2.6V, I_{PRECHG} = 256mA	-40%		40%	
I_{TERM_RANGE}	Termination current range		64		1024	mA
I_{TERM_STEP}	Typical Termination current			64		mA

	电压			50毫伏		
		Isys= 0A, V_{BAT}<V_{SYS_MIN},BATFET禁用		Vsys_min +150毫伏		V
V_{SYS_min}	最小直流系统电压输出	V_{BAT}< V_{SYS_MIN}, V_{SYS_MIN} = 3.5V, I_{SYS}= 0A		3.65		伏特
V_{SYS_max}	最大直流系统电压输出	V_{BAT}=4.25V, V_{SYS_MIN} = 3.5V, I_{SYS}= 0A		4.3		伏特
$R_{ON(RBFET)}$	顶部 反向 阻断MOSFET(RBFET)的导通电阻在VBUS和VMID之间	TJ = -40°C - 85°C		60.2		mΩ
		TJ = -40°C - 125°C		60.2		mΩ
$R_{ON(HSFET)}$	顶级开关MOSFET (HSFET) 在VMID和SW之间的导通电阻	TJ = -40°C - 85°C	25	36	40	mΩ
		TJ = -40°C - 125°C	25	36	42	mΩ
$R_{ON(LSFET)}$	底部开关MOSFET (LSFET) 在SW和接地之间的导通电阻	TJ = -40°C - 85°C	20	36	41	mΩ
		TJ = -40°C - 125°C	20	36	46	mΩ
V_{FWD}	BATFET正向电压在补充模式下	BATFET正向电压在补充模式下		22		毫伏
V_{BATGD}	电池良好比较器下降阈值	V_{BAT} 下降	3.7	3.8	3.8	伏特
V_{BATGD_HYST}	电池良好比较器上升阈值	V_{BAT} 上升	3.8	3.9	4	毫伏
电池充电器						
V_{BATREG_RANGE}	典型充电电压范围		3.84		4.608	伏特
V_{BATREG_STEP}	典型充电电压步长			16		毫伏
V_{BATREG}	充电电压分辨率精度	V_{BAT} = 4.208V (REG8C[7:2]=010111) 或 V_{BAT} = 4.352V (REG8C[7:2]=100000) TJ = -40°C - 85°C	-0.5%		0.5%	
$I_{CHG\_REG\_RANGE}$	典型快速充电电流调节范围		0		3072	毫安
$I_{CHG\_REG\_STEP}$	典型快速充电电流调节步骤			64		毫安
$I_{CHG\_REG\_ACC}$	快速充电电流调节精度	V_{BAT} =3.1V或 3.8V,I_{CHG} =256mA,TJ=-40 °C-85°C	-40%		40%	
		V_{BAT} =3.1V或 3.8V,I_{CHG} =1792mA,TJ=-40 °C-85°C	-10%		10%	
$V_{BATLOWV}$	电池 LOWV下降阈值 快速充电到预充电 ,BATLOWV(REG06[1])=1 2.5			2.8	3.1	伏特
	电池LOWV上升阈值	预充电到快速充电，BATLOWV(REG8C[1])=1 (典型200-mV滞后)	2.7	3.0	3.3	伏特
I_{PRECHG_RANGE}	预充电电流范围		64		1024	毫安
I_{PRECHG_STEP}	典型预充电电流步骤			64		毫安
I_{PRECHG_ACC}	预充电电流精度 V_{BAT}=2.6V,I_{PRECHG} =256mA		-40%		40%	
I_{TERM_RANGE}	终止电流范围		64		1024	毫安
I_{TERM_STEP}	典型终止电流			64		毫安

	step					
I_{TERM_ACC}	Termination current accuracy	I_{TERM} = 128mA	-40%		40%	
V_{SHORT}	Battery short voltage	V_{BAT} falling		2		V
I_{SHORT}	Battery short current	V_{BAT} < 2.2 V		10		mA
V_{RECHG}	Recharge Threshold below VBATREG	V_{BAT} falling, V_{RECHG} (REG8C[0]=0) = 0		138		mV
		V_{BAT} falling, V_{RECHG} (REG8C[0]=1) = 1		234		mV
FSW	PWM Switching Frequency, and digital clock	Oscillator frequency	1.2	1.5	1.87	MHz
$I_{BATLOAD}$	Battery Discharge Load Current	V_{BAT} = 4.2V	3			mA
I_{PFM}	PWM TO PFM transition threshold			416		mA
$R_{ON(BATFET)}$	SYS-BAT MOSFET (BATFET) on-resistance	TJ = 25°C		18		mΩ
		TJ = -40°C - 125°C		18		mΩ
Input Voltage / Current Regulation						
V_{INDPM_RANGE}	Typical Input voltage regulation range		3.88		5.08	V
V_{INDPM_STEP}	Typical Input voltage regulation step			80		mV
V_{INDPM_ACC}	Input voltage regulation accuracy		-4%		4%	
I_{INDPM_RANGE}	Typical Input current regulation range		100		3250	mA
I_{INDPM_STEP}	Typical Input current regulation step			50		mA
I_{INDPM_ACC}	Input current regulation accuracy V_{BAT} = 5V, current pulled from SW	USB500, I_{INLIM} =500mA	400		500	mA
		USB900, I_{INLIM} =900mA	750		900	mA
		Adapter 1.5A, I_{INLIM} =1500mA	1300		1500	mA
I_{IN_START}	Input Current regulation during system start up	V_{SYS} = 2.2V, I_{INLIM} (REG10[5:0])>=200mA		200		mA
D+/D- DETECTION						
V_{0P6_VSRC}	D+/D- voltage source (0.6V)		0.5	0.6	0.7	V
I_{10UA_ISRC}	D+ connection check current source		7	10	14	uA
I_{100UA_ISINK}	D+/D- current sink (100μA)		50	100	150	uA
I_{DPDM_LKG}	D+/D- Leakage current	D–, switch open	-1		1	uA
		D+, switch open	-1		1	uA
V_{0P4_VTH}	D+/D- low comparator threshold		250		400	mV
V_{0P8_VTH}	D+ low comparator threshold				0.8	V
R_{D-_DWN}	D– pulldown for connection check		14.25		24.8	kΩ

	步骤					
I_{TERM_ACC}	终止电流精度 I_{TERM} =128mA		-40%		40%	
V_{SHORT}	电池短路电压	V_{BAT} 下降		2		伏特
I_{SHORT}	电池短路电流	V_{BAT} < 2.2 V		10		毫安
$V_{充电}$	充电阈值低于VBATREG	V电池下降,V充电(REG8C[0]=0)=0		138		毫伏
		V电池下降,V充电(REG8C[0]=1)=1		234		毫伏
开关频率	PWM开关频率，和digital clock	振荡器频率	1.2	1.5	1.87	MHz
$I_{电池负载}$	电池放电负载电流 V电池 =4.2V		3			毫安
I_{PFM}	PWM到PFM转换阈值			416		毫安
$R_{导通(BATFET)}$	SYS-BAT MOSFET (BATFET)导通电阻	TJ = 25°C		18		毫欧
		TJ = -40°C - 125°C		18		毫欧
输入电压/电流调节						
电压输入范围	典型输入电压调节范围		3.88		5.08	伏特
电压输入步长	典型输入电压调节步长			80		毫伏
电压输入精度	输入电压调节精度		-4%		4%	
电流输入范围	典型输入电流调节范围		100		3250	毫安
电流输入步长	典型输入电流调节步长			50		毫安
电流输入精度	输入电流调节精度 V电池 = 5V, 电流从开关拉取	USB500, I输入限制 =500mA	400		500	毫安
		USB900, I输入限制 =900mA	750		900	毫安
		适配器 1.5A, I输入限制 =1500mA	1300		1500	毫安
电流启动输入	系统启动期间的输入电流调节	V系统 =2.2V, I输入限制 (REG10[5:0])>=200mA		200		毫安
D+/D-检测						
V_{0P6_VSRC}	D+/D-电压源(0.6V)		0.5	0.6	0.7	伏特
I_{10UA_ISRC}	D+连接检查电流源		7	10	14	微安
I_{100UA_ISINK}	D+/D-电流源(100μA)		50	100	150	微安
I_{DPDM_LKG}	D+/D-泄漏电流	D–，开关打开	-1		1	微安
		D+，开关打开	-1		1	微安
V_{0P4_VTH}	D+/D- 低 比较器阈值		250		400	毫伏
V_{0P8_VTH}	D+低比较器阈值				0.8	伏特
R_{D-_DWN}	D–下拉用于连接检查		14.25		24.8	千欧

BAT OVER-VOLTAGE/CURRENT PROTECTION						
V_{BATOVP}	Battery over-voltage threshold	V_{BAT} rising, as percentage of V_{BAT_REG}		104%* V_{BAT_REG}		V
V_{BATOVP_HYST}	Battery over-voltage hysteresis	V_{BAT} falling, as percentage of V_{BAT_REG}		2%		V
THERMAL REGULATION AND THERMAL SHUTDOWN						
T_{REG}	Junction temperature regulation accuracy	REG18[7:6] = 10		100		°C
T_{SHUT}	Thermal Shutdown Rising Temperature	Temperature rising	135	140	146	°C
T_{SHUT_HYS}	Thermal Shutdown Hysteresis	Temperature falling		20		°C
Boost Mode Operation						
$V_{BST\_REG\_RANGE}$	Typical Boost mode regulation voltage range		4.58		5.48	V
$V_{BST\_REG\_STEP}$	Typical Boost Mode Regulation voltage step			60		mV
$V_{BST\_REG\_ACC}$	Boost mode regulation voltage accuracy	$I_{(VMID)}$ = 0A, V_{BST}=5.126V (REG13[7:4] = 1001)	-3%		3%	
$V_{BST\_BAT\_LOWV}$	Battery voltage exiting boost mode	BAT falling	2.5	2.8	3.0	V
I_{BST}	Boost mode output current range				1.5	A
V_{BST_OVP}	Boost mode over-voltage threshold	Rising threshold	5.9	6	6.0	V
$V_{BST\_OVP\_HYS}$	Boost mode over-voltage threshold hysteresis	Falling threshold	185	215	240	mV
V_{BST_OCP}	Boost mode over-current threshold	Rising threshold	2.1	2.5	3.1	A
FSW	PWM Switching Frequency, and digital clock	Oscillator frequency	1.2	1.5	1.87	MHz
D_{MAX}	Maximum PWM Duty Cycle					
Analog-to-Digital Converter (ADC)						
RES	Resolution	Rising threshold		12		bits
V_{BAT_RANGE}	Typical battery voltage range	V_{VBUS} > V_{BAT} + V_{SLEEP} or boost mode is enabled			4.914	V
		V_{VBUS} < V_{BAT} + V_{SLEEP} and boost mode is disabled			4.914	V
V_{BAT_RES}	Typical battery voltage resolution			1.2		mV
I_{BAT_RANGE}	Typical battery charge current range	V_{VBUS} > V_{BAT} + V_{SLEEP} and V_{BAT} > $V_{BATSHORT}$			4.08	A
I_{BAT_RES}	Typical battery charge current resolution			1		mA
T_{jRANGE}	Typical IC Tj range		-267.7		167.4	℃
T_{jRES}	Typical IC Tj resolution			0.10625		℃

电池过电压/电流保护						
$V_{电池过电压}$	电池过电压阈值 V电池上升，作为 V电池$_{REG}$ 的百分比			104%* $V_{电池\_REG}$		伏特
V电池过电压滞后电池过电压下降，作为 V电池$_{REG}$ 的百分比				2%		伏特
热管理和热关断						
$T_{管理}$	结点温度调节精度	REG18[7:6] = 10		100		°C
$T_{关断}$	热关断上升温度	温度上升	135	140	146	°C
$T_{关断滞后}$	热关断滞后 温度下降			20		°C
升压模式操作						
$V_{BST\_REG\_RANGE}$	典型升压模式调节电压范围		4.58		5.48	伏特
$V_{BST\_REG\_STEP}$	典型升压模式调节电压步进			60		毫伏
$V_{BST\_REG\_ACC}$	升压模式调节电压精度	$I_{(VMID)}$ = 0A, V_{BST}=5.126V (REG13[7:4] = 1001)	-3%		3%	
$V_{BST\_BAT\_LOWV}$	电池电压退出升压模式	电池下降	2.5	2.8	3.0	伏特
I_{BST}	升压模式输出电流范围				1.5	A
V_{BST_OVP}	升压模式过电压阈值	上升阈值	5.9	6	6.0	伏特
$V_{BST\_OVP\_HYS}$	升压模式过电压阈值滞后	下降阈值	185	215	240	毫伏
V_{BST_OCP}	升压模式过电流阈值	上升阈值	2.1	2.5	3.1	A
开关频率	PWM开关频率，和 digital clock	振荡器频率	1.2	1.5	1.87	MHz
D_{MAX}	最大PWM占空比					
模拟到数字转换器(ADC)						
分辨率	分辨率	上升阈值		12		位
V_{BAT_RANGE}	典型电池电压范围	$V_{VBUS} > V_{BAT} + V_{SLEEP}$ 或升压模式已启用			4.914	伏特
		$V_{VBUS} < V_{BAT} + V_{SLEEP}$ 并且升压模式已禁用			4.914	伏特
V_{BAT_RES}	典型电池电压分辨率			1.2		毫伏
I_{BAT_RANGE}	典型电池充电电流范围	$V_{VBUS} > V_{BAT} + V_{SLEEP}$ 并且 $V_{BAT} > V_{BATSHORT}$			4.08	A
I_{BAT_RES}	典型电池充电电流分辨率			1		毫安
$T_{j范围}$	典型ICTj范围		-267.7		167.4	℃
$T_{j分辨率}$	典型ICTj分辨率			0.10625		℃

V_{GPADC_RANGE}	Typical GPADC voltage range			3.276		V
V_{GPADC_RES}	Typical GPADC voltage resolution			0.8		mV
V_{TS_RANGE}	Typical TS voltage range			3.276		V
V_{TS_RES}	Typical TS voltage resolution			0.8		mV
Logic I/O pin Characteristics (OTG/IRQ/PWRON/PWROK)						
V_{IH}	Input high threshold level			1.3		V
V_{IL}	Input low threshold level			0.8		V
I_{IN_BIAS}	High Level Leakage Current	Pull-up rail 1.8V		1		uA
TWSI INTERFACE (SCL, SDA)						
V_{CC}	Input Supply Voltage			3.3		V
ADDRESS	TWSI Slave Address (7 bits)			0x34		
f_{SCK}	Clock Operating Frequency			400		kHZ
t_f	Clock Data Fall Time	2.2Kohm Pull High		60		ns
t_r	Clock Data Rise Time	2.2Kohm Pull High		100		ns
V_{IH}	Input high threshold level, SCL and SDA	Pull-up rail 1.8V		1.3		V
V_{IL}	Input low threshold level	Pull-up rail 1.8V		0.8		V
V_{OL}	Output low threshold level	Sink Current = 5mA, sink current		0.8		V
I_{BIAS}	High Level Leakage Current	Pull-up rail 1.8V		1		uA
RSB						
ADDRESS	Slave Address			0x01D1		

$V_{GPADC范围 典型}$	GPADC电压范围			3.276		伏特
$V_{GPADC分辨率}$	典型 通用ADC 电压分辨率			0.8		毫伏
$V_{TS范围}$	典型TS电压范围			3.276		伏特
$V_{TS分辨率}$	典型TS电压分辨率			0.8		毫伏
逻辑I/Opin特性(OTG/IRQ/PWRON/PWROK)						
V_{IH}	输入高阈值电平			1.3		伏特
V_{IL}	输入低阈值电平			0.8		伏特
I_{IN_BIAS}	高电平泄漏电流	上拉电压1.8V		1		微安
TWSI接口(SCL,SDA)						
V_{CC}	输入供电电压			3.3		伏特
地址 TWSI	从设备地址 (7位)			0x34		
f_{SCK}	时钟工作频率			400		kHZ
t_f	时钟数据下降时间	2.2K欧姆上拉		60		纳秒
t_r	时钟数据上升时间	2.2K欧姆上拉		100		纳秒
V_{IH}	输入高阈值电平，SCL和SDA	上拉电压1.8V		1.3		伏特
V_{IL}	输入低阈值电平	上拉电压1.8V		0.8		伏特
V_{OL}	输出低阈值电平	Sink Current = 5mA, sink current		0.8		伏特
$I_{偏置}$	高电平泄漏电流	上拉电压1.8V		1		微安
RSB						
地址从地址				0x01D1		

6.6 Typical Characteristics

Table 6-1 Typical Characteristics

BUCK Efficiency VS System Load Current	Figure 6-1
Charger Efficiency VS Charger Current	Figure 6-2
BOOST Mode Efficiency VS VMID Load Current	Figure 6-3

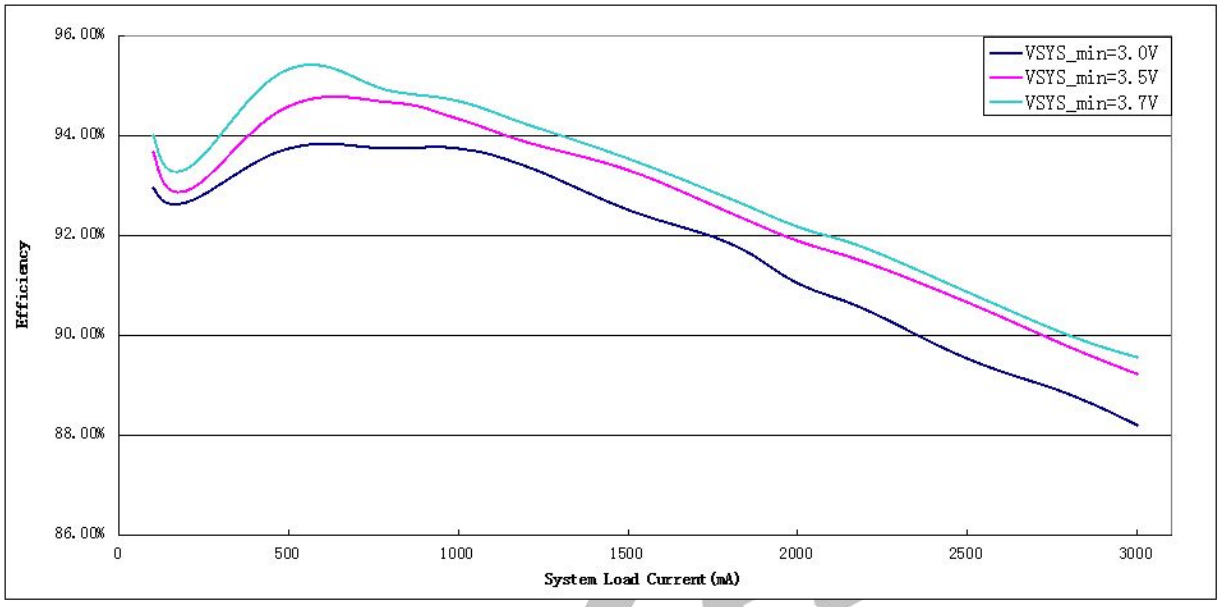


Figure 6-1.BUCK Efficiency VS System Load Current （VBUS=5V）

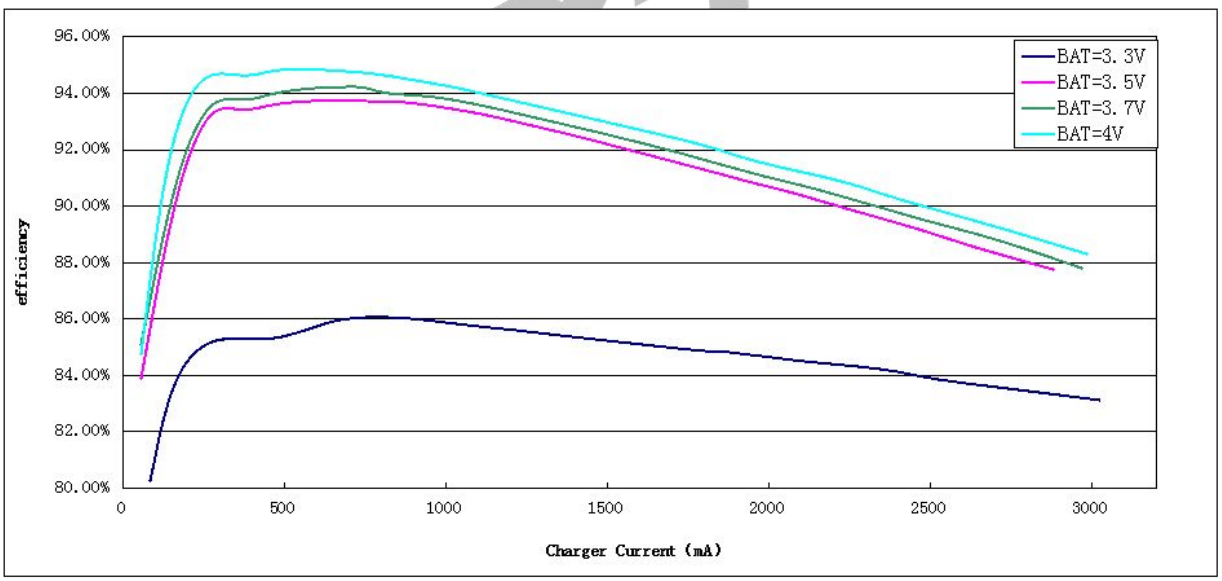


Figure 6-2.Charger Efficiency VS Charger Current （VBUS=5V）

6.6典型特性

表6-1 典型特性

BUCK效率与系统负载电流	图6-1
充电器效率与充电器电流	图6-2
BOOST模式效率与VMID负载电流	图6-3

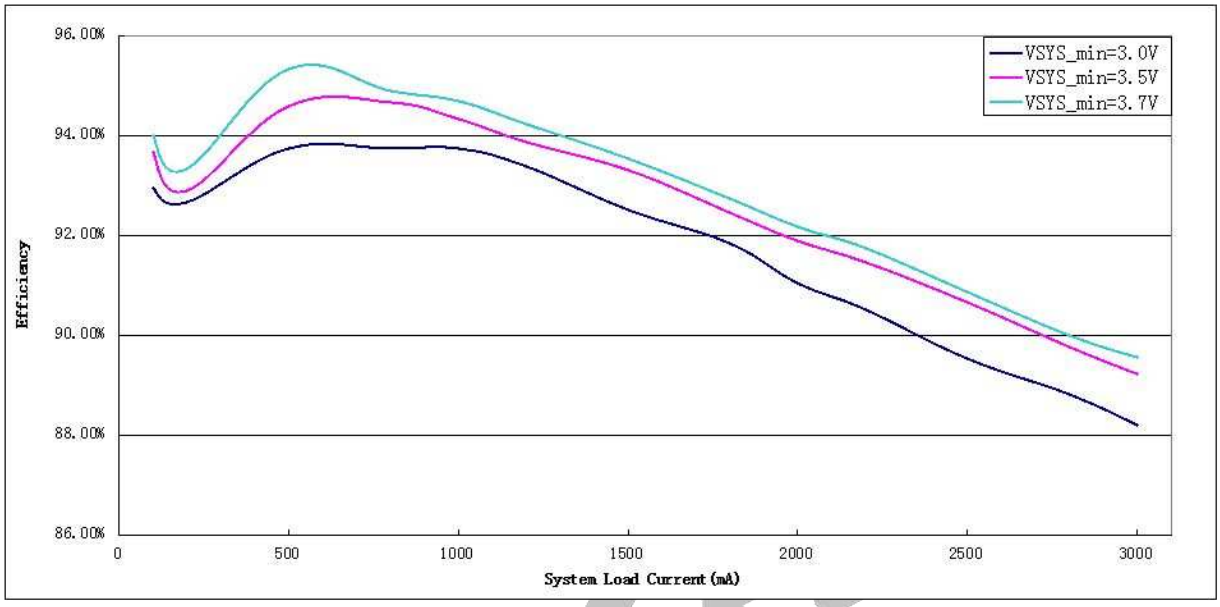


图 6-1.BUCK效率与系统负载电流 （VBUS=5V）

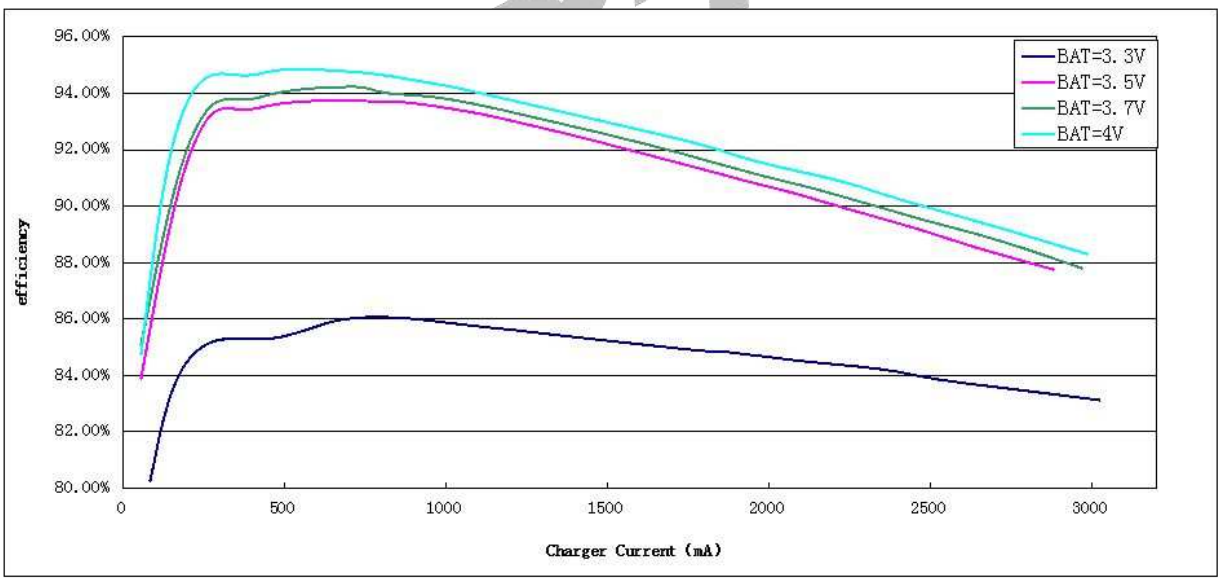


图 6-2.充电器效率与充电器电流 （VBUS=5V）

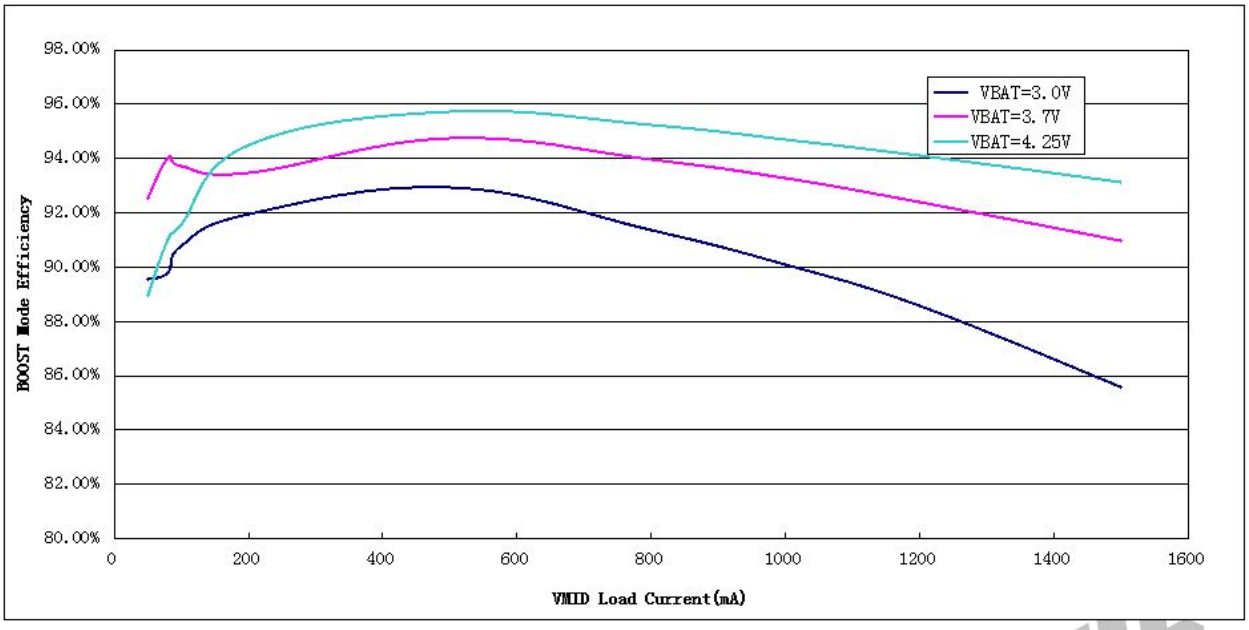


Figure 6-3. BOOST Mode Efficiency VS VMID Load Current （VMID=5V）

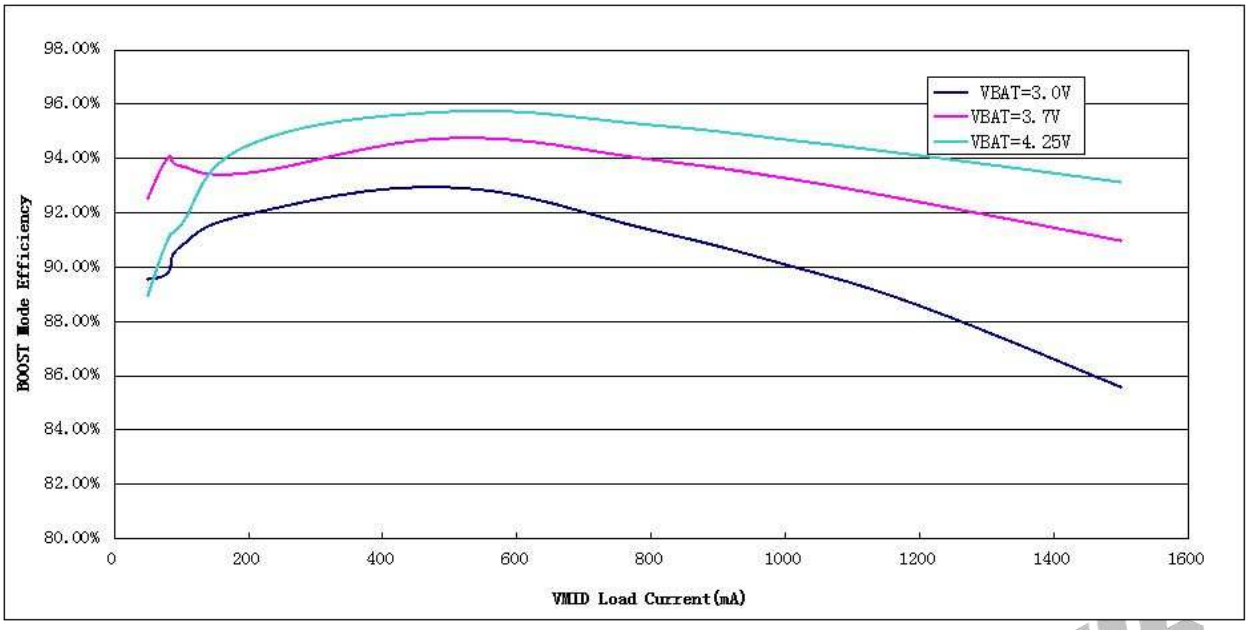


图 6-3.BOOST模式效率与 VMID负载电流 （VMID=5V）

7. Detail Description

7.1 Overview

AXP2585 is a highly integrated BMU with NVDC power path management and E-gauge for single cell Li-battery. AXP2585 can be used with other PMU together to provide an easy and flexible power management solution for SOC. AXP2585 also can be used independently to provide battery management solutions for various portable devices

AXP2585 supports high output current up to 3A for fast charging. Besides, AXP2585 supports OTG mode with current limit. To ensure the security and stability of the system, AXP2585 provides multiple channels 12-bit ADC for voltage/current/temperature monitor and integrates protection circuits such as over-voltage protection(OVP), over-current protection(OCP) and over-temperature protection(OTP). Moreover, AXP2585 features a unique E-Gauge™(Fuel Gauge) system, making power gauge easy and exact.

AXP2585 supports type-C cc logic and BC1.2 protocol. It can automatically detect different adapters and adjust the input current limit.

AXP2585 provides a fast interface(Two Wire Serial Interface, TWSI) for system to dynamically adjust output voltages, charge current and configure interrupt condition.

AXP2585 is available in 5mm x 5mm 32-pin QFN package.

7.详细描述

7.1 概述

AXP2585是一款高度集成的BMU，具有NVDC电源路径管理和E-gauge，用于单电池锂电池。AXP2585可以与其他PMU一起使用，提供简单灵活的SOC电源管理解决方案。AXP2585也可以独立使用，为各种便携设备提供电池管理解决方案。

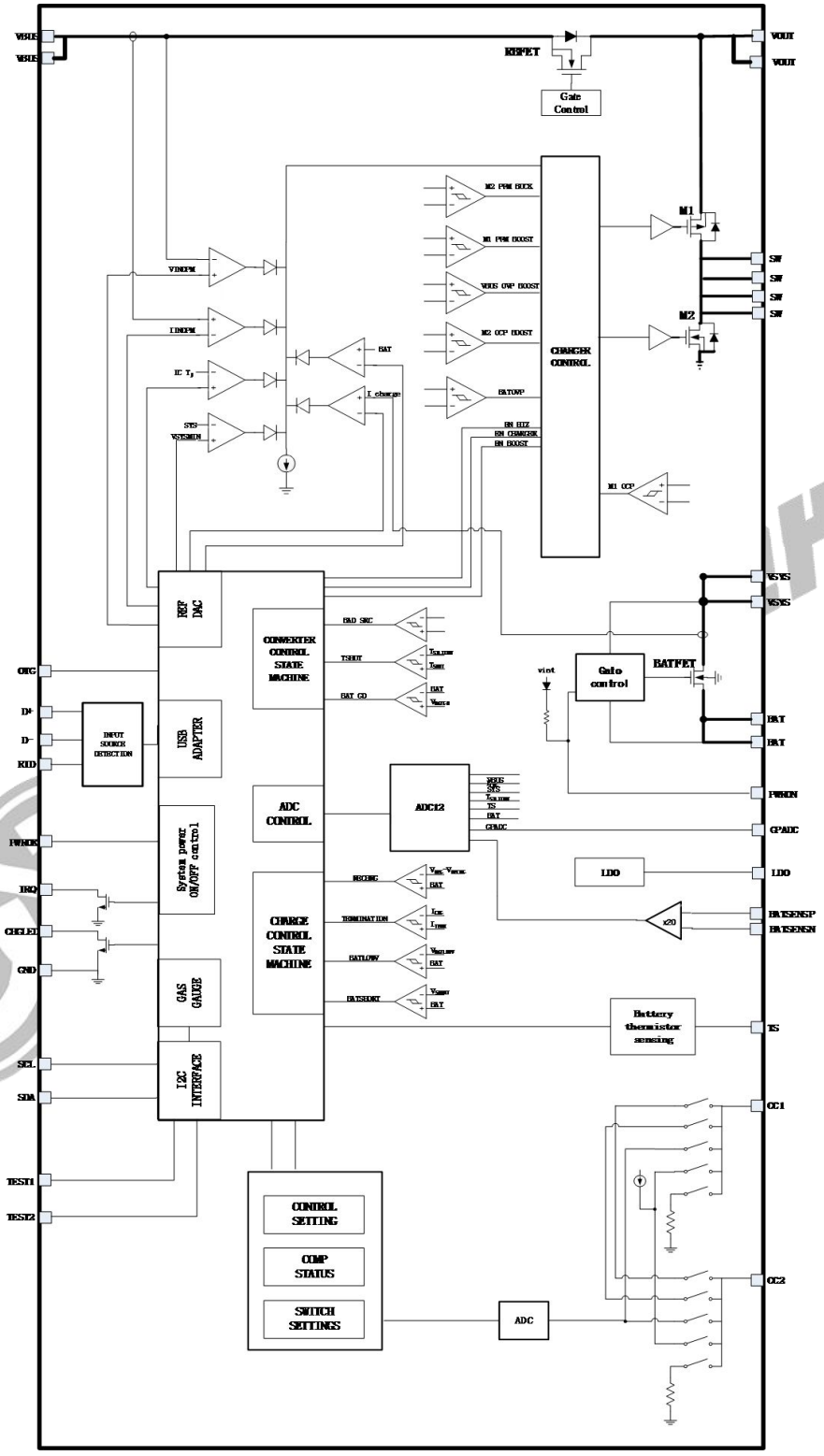
AXP2585支持高达3A的输出电流以实现快速充电。此外，AXP2585支持带电流限制的OTG模式。为了确保系统的安全性和稳定性，AXP2585提供多个通道的12位ADC用于电压/电流/温度监测，并集成了过电压保护（OVP）、过电流保护（OCP）和过温保护（OTP）等保护电路。此外，AXP2585具有独特的E-Gauge™（燃料计）系统，使电量计易于使用且准确。

AXP2585支持Type-Ccc逻辑和BC1.2协议。它可以自动检测不同的适配器并调整输入电流限制。

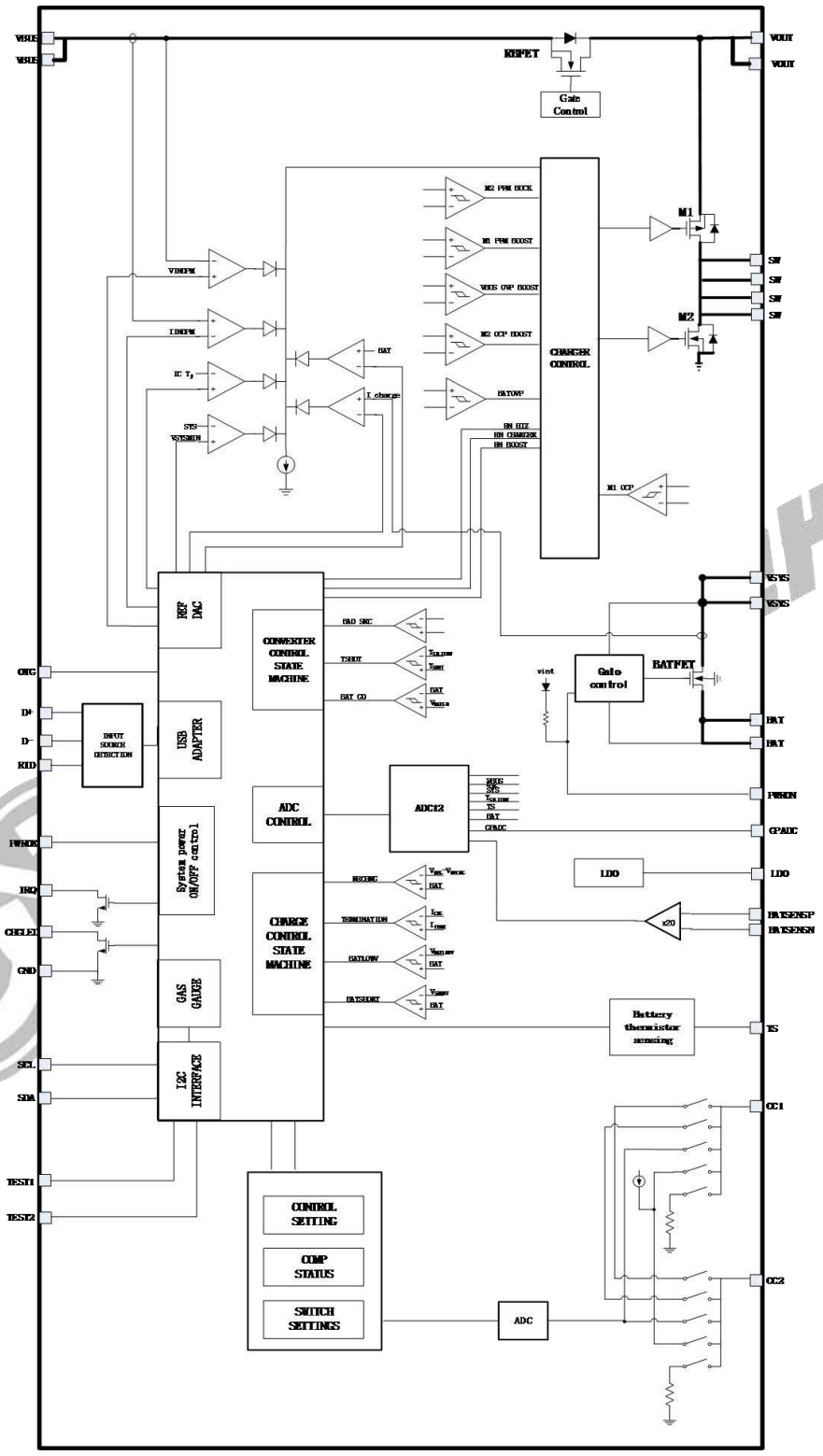
AXP2585提供快速接口（双线串行接口，TWSI），以便系统动态调整输出电压、充电电流并配置中断条件。

AXP2585采用5mm x 5mm 32引脚QFN封装。

7.2 Function Block Diagram



7.2功能框图



7.3 Serial Interface Communication

AXP2585 supports TWSI protocol and performs as a TWSI slave device with default address 0x68/0x69. When AXP2585 powers on, SCK/SDA pin of TWSI will be pulled up to IO Power and then Host can adjust and monitor AXP2585 with rich feedback information.
Besides, AXP2585 supports RSB for Allwinner platform with address 0x01D1 or 0x0273 by customer.
Note: "Host" here refers to system processor.

7.4 NVDC

AXP2585 uses Narrow VDC(NVDC) architecture with BATFET connecting system and battery.

VBUS as the charger input, connecting to VSYS pin through a switch mode buck charger, provides power to system and charges battery through BATFET. Charge current can be adjusted automatically according to the feedback current which is detected with an external 10mΩ resistor. When system current(I_{SYS}) changes, the detected current will change, and then the current change signal will feed back to charge loop to adjust the charge current to the setting value.

AXP2585 starts up when an adapter is inserted and the input voltage meets the condition. System voltage(V_{SYS}) will rise up to minimum system voltage(V_{SYS_min}). if V_{SYS} does not reach V_{SYS_min}, the charging process does not start up. V_{SYS_min} can be configured by reg12H[2:0]. When V_{SYS} is higher than V_{SYS_min}, charger enabled signal will be sent.

When it is charging, if battery voltage is below V_{SYS_min}, BATFET operates in linear mode(LDO mode) to keep V_{SYS} at V_{SYS_min}. As battery voltage rises above V_{SYS_min}, BATFET is fully on.

When battery voltage is above V_{SYS}, BATFET is turned on and BMU enters supplement mode. When in supplement mode, if the discharge current is lower than 2A, BMU controls the voltage(V_{DS}) between system and battery and keeps V_{DS} at 20mV to avoid entering and exiting supplement mode repeatedly. As discharge current increases, BMU adjusts BATFET to be fully on and V_{DS} increases linearly. If an adapter is not inserted, system current is provided only by battery. At this time, BATFET is at fully on state.

7.5 Power On/Off and reset

7.5.1 Power on reset(POR)

AXP2585 is powered from the higher voltage between VBUS and BAT. When VBUS voltage(V_{VBUS}) is higher than V_{VBUS_UVLOZ} or BAT voltage(V_{BAT}) is higher than V_{BAT_UVLOZ}, the sleep comparator, battery depletion comparator and BATFET driver are active. All registers are reset to the default value. TWSI communication is active and Host can communicate with BMU.

7.5.2 Power up from BAT

If only battery is present and V_{BAT} is higher than depletion threshold(V_{BAT_DPLZ}), BATFET, connecting battery to system, is off by default and need to be turned on by pressing the PWRON key or inserting an adapter.

7.3 串行接口通信

AXP2585支持TWSI协议，并作为TWSI从设备，默认地址为0x68/0x69。当AXP2585上电时，TWSI的SCK/SDA引脚将被拉高至IO电源，然后主机可以调整和监控AXP2585，并提供丰富的反馈信息。

此外，AXP2585支持RSB用于Allwinner平台，地址为0x01D1或0x0273，由客户指定。
注意：“主机”在这里指的是系统处理器。

7.4 NVDC

AXP2585使用窄直流（NVDC）架构，将BATFET连接到系统和电池。

VBUS作为充电器输入，通过开关模式降压充电器连接到VSYS引脚，为系统提供电源并通过BATFET给电池充电。充电电流可以根据通过外部10mΩ电阻检测到的反馈电流自动调整。当系统电流（I_{SYS}）变化时，检测到的电流也会变化，然后电流变化信号将反馈到充电回路，以调整充电电流至设定值。

当插入适配器并且输入电压满足条件时，AXP2585启动。系统电压(V_{SYS})将上升到最低系统电压(V_{SYS_min})。如果V_{SYS}未达到V_{SYS_min}，充电过程将不会启动。V_{SYS_min}可以通过reg12H[2:0]进行配置。当V_{SYS}高于V_{SYS_min}时，将发送充电使能信号。

当充电时，如果电池电压低于V_{SYS_min}，BATFET将在线性模式（LDO模式）下工作，以保持V_{SYS}在V_{SYS_min}。随着电池电压上升到V_{SYS_min}以上，BATFET将完全开启。

当电池电压高于V_{SYS}时，BATFET被打开，BMU进入补充模式。在补充模式下，如果放电电流低于2A，BMU控制系统与电池之间的电压(V_{DS})，并保持V_{DS}在20mV，以避免重复进入和退出补充模式。随着放电电流的增加，BMU 调整 BATFET 使其完全导通，V_{DS}线性增加。如果没有插入适配器，系统电流仅由电池提供。此时，BATFET 处于完全导通状态。

7.5 开/关电源和复位

7.5.1 上电复位 (POR)

AXP2585 从 VBUS 和 BAT 之间的较高电压供电。当 VBUS 电压 (V_{VBUS}) 高于 V_{VBUS_UVLOZ} 或 BAT 电压 (V_{BAT}) 高于 V_{BAT_UVLOZ} 时，睡眠比较器、电池耗尽比较器和 BATFET 驱动器处于活动状态。所有寄存器都重置为默认值。TWSI 通信处于活动状态，主机可以与 BMU 通信。

7.5.2 从电池上电

如果仅有电池存在且 V_{BAT} 高于耗尽阈值 (V_{BAT_DPLZ})，则 BATFET 连接电池到系统，默认情况下是关闭的，需要通过按下 PWRON 键或插入适配器来打开。

7.5.3 Power up from VBUS

When VBUS is inserted, BMU detects the input voltage to start up the reference voltage and the bias circuit. When V_{VBUS} is higher than V_{VBUS_UVLOZ}, the VBUS insertion IRQ is sent and the register bit reg02H[1] is set to 1 to indicate VBUS is inserted. Then BMU detects the input source whether it is good or not. If D+/D- automatic detection enabled bit(AUTO_DPDM_EN,reg23H[6]) is active, BMU detects the input source type and set the input current limit(I_{INLIM}) automatically, and then the buck converter starts up.

7.5.3.1 Good source condition

BMU needs to check the current capability of the input source. Only when the input source meets the following requirements can it start the buck converter.

a. VBUS voltage lower than V_{ACOV}
b. VBUS voltage higher than $V_{VBUSMIN}$ when pulling I_{BADBUS}(typical 30mA)

Once the input source meets the requirements above,the register bit reg00H[1](VBUS_GD) is set to 1 to indicate the input source is good. If the input source does not meet the requirements, detection will be done repeatedly every 2 seconds.

7.5.3.2 Input source type detection

AXP2585 integrates USB Charging Specification 1.2(BC1.2) and Type C(cc logic) detection. The type and the power supply capability of the input source can be detected and I_{INLIM} can be set automatically.

After the VBUS_GD bit is set to 1, if D+/D- automatic detection enabled bit (AUTO_DPDM_EN, reg23H[6]) or CC pin automatic detection enabled bit (AUTO_CC_EN,reg23H[4]) is active, BMU starts input source type detection automatically. BC1.2 detection and CC logic detection are independent and they work in parallel, but the detection result of CC logic has higher priority level than that of BC1.2. When the two kinds of detection are both under way, if CC logic detection finishes first and I_{INLIM} is set, I_{INLIM} can not be changed by the BC1.2 detection result. However, if BC1.2 detection finishes first and I_{INLIM} is set, I_{INLIM} can be changed by the CC logic detection result.

After input source type detection finishes, BMU sends IRQ to Host and sets the register bits reg00H[5:0] to set I_{INLIM} according to the detection result.

7.5.3.3 Set input voltage limit(V_{INDPM})

AXP2585 supports wide range of input voltage(3.9V~5.5V). V_{INDPM} can be set through reg11H[3:0]. The range of V_{INDPM} is from 3.88V to 5.08V and the step is 80mV.

When VBUS voltage reaches V_{INDPM}, the charge current will decrease automatically until the current is zero. If I_{SYS} is over the input power supply capability, V_{SYS} will drop. If V_{BAT} is above V_{SYS}, BMU will enter the supplement mode.

7.5.3.4 Buck converter start up

After I_{INLIM} is set, the buck converter is enabled. If battery charging is disabled,BATFET is in off state. Otherwise BATFET is in on state and the buck converter charges the battery.

AXP2585 integrates soft-start function.When V_{SYS} is lower than 2.2V, I_{INLIM} is forced to the lower one between 200mA and I_{INLIM} register value. When V_{SYS} is higher than 2.2V, I_{INLIM} is set through register value. The working

7.5.3从VBUS启动

当VBUS插入时，BMU检测输入电压以启动参考电压和偏置电路。当V_{VBUS}高于V_{VBUS_UVLOZ}时，发送VBUS插入中断请求，并将寄存器位reg02H[1]设置为1，以指示VBUS已插入。然后BMU检测输入源是否良好。如果D+/D-自动检测使能位(AUTO_DPDM_EN, reg23H[6])处于激活状态，BMU将检测输入源类型并自动设置输入电流限制(I_{INLIM})，然后降压转换器启动。

7.5.3.1良好源条件

BMU需要检查输入源的电流能力。只有当输入源满足以下要求时，才能启动降压转换器。

a.VBUS电压低于 V_{ACOV}
b.VBUS电压高于 $V_{VBUSMIN}$在拉动 I_{BADBUS}时（典型 30mA）

一旦输入源满足上述要求，寄存器位reg00H[1](VBUS_GD)被设置为1，以指示输入源良好。如果输入源不满足要求，将每2秒重复进行检测。

7 .5.3.2输入源类型检测

AXP2585集成了USB充电规范1.2（BC1.2）和Type C（cc逻辑）检测。输入源的类型和供电能力可以被检测，I_{INLIM}可以自动设置。

在VBUS_GD位被设置为1后，如果D+/D-自动检测使能位（AUTO_DPDM_EN, reg23H[6]）或CC引脚自动检测使能位（AUTO_CC_EN, reg23H[4]）处于激活状态，BMU将自动开始输入源类型检测。BC1.2检测和CC逻辑检测是独立的，并且它们并行工作，但CC逻辑的检测结果优先级高于BC1.2。当这两种检测同时进行时，如果CC逻辑检测先完成并且I_{INLIM}被设置，I_{INLIM}将不能被BC1.2检测结果更改。然而，如果BC1.2检测先完成并且I_{INLIM}被设置，我$_{INLIM}$可以通过CC逻辑检测结果进行更改。

在输入源类型检测完成后，BMU向主机发送中断请求并设置寄存器位reg00H[5:0]以根据检测结果设置I_{INLIM}。

7.5.3.3 设置输入电压限制 (V $_{INDPM}$)

AXP2585支持宽范围的输入电压（3.9V~5.5V）。V_{INDPM}可以通过reg11H[3:0]进行设置。V_{INDPM}的范围是从3.88V到5.08V，步进为80mV。

当VBUS电压达到V_{INDPM}时，充电电流将自动减少，直到电流为零。如果I_{SYS}超过输入电源供应能力，V_{SYS}将下降。如果V_{BAT}高于V_{SYS}，BMU将进入补充模式。

7.5.3.4降压转换器启动

在设置 I_{INLIM}后，降压转换器被启用。如果电池充电被禁用，BATFET处于关闭状态。否则BATFET处于开启状态，降压转换器为电池充电。

AXP2585集成了软启动功能。当V_{SYS}低于2.2V时，I_{INLIM}被强制设置为200mA和I_{INLIM}寄存器值之间的较小值。当V_{SYS}高于2.2V时，I_{INLIM}通过寄存器值设置。降压转换器的工作

condition of buck converter can switch between PWM and PFM automatically according to the load.

7.5.4 System power on/off management

AXP2585 has system power on/off management function. It can be used with other PMU together to complete the function through PWRON pin and PWROK pin. PWRON pin is an IO pin. When it is as input, BMU can detect the status of the external key through it to send IRQ and realize power on reset. When it is as output, BMU can sent power on signals to the behind PMU through PWRON pin. PWROK pin is connected to the PWROK signal of the behind PMU to judge the PMU status.

System status is saved in register bit reg14H[0]. BMU sends power on/off signals according to system status and trigger events.

7.5.4.1 PWRON pin

A Key can be connected between PWRON pin and GND. When PWRON pin is as input, its function is as described below:

- If BMU is in shipping mode, when PWRON key is low for longer than ONLEVEL(reg15H[3:2]), BMU exits shipping mode.
- If BMU is not in shipping mode, when PWRON key is pressed, the negative edge is detected and IRQ is sent. When PWRON key is low for less than IRQLEVEL(reg15H[7:6]), BMU sends a short press IRQ and a positive edge IRQ. When PWRON key is low for longer than IRQLEVEL and less than PORLEVEL(reg15H[5:4]), BMU sends a long press IRQ and a positive edge IRQ. When PWRON key is low for longer than PORLEVEL, power on reset(POR) will be done.

7.5.4.2 System power on

When system is power off and one of power on sources is detected , BMU sends power on signal to the behind PMU to power on system.

Power on sources include:

- VBUS insertion(V_{VBU}>V_{VBUS_UVLOZ} & V_{VBUS}<V_{ACOV} & V_{SYS}>3.0V & reg17H[7]=1)
- BAT insertion(V_{BAT}>V_{BAT_UVLOZ} & V_{SYS}>3.0V & reg17H[6]=1)
- BAT is charged to normal(V_{BAT}>3.6V & Is charging & reg17H[5]=1)
- IRQ Low level(IRQ pin is low level for more than 16ms & reg17H[4]=1)

Once one of the power on sources above is detected, BMU sends power on signal. Power on signal has three forms, including low level pulse, special sequence and high/low level, which can be configured by customization.

After the power on signal is sent, BMU monitors the status of PWROK pin. If PWROK pin is high level, it means system is powered on successfully and the system status bit(reg14H[0]) is set to 1. If PWROK pin is low level, it means system is powered on unsuccessfully and the system status bit(reg14H[0]) is set to 0.

When high/low level is chose as power on signal, if the system is powered on unsuccessfully or the system is powered off abnormally, the PWROK pin will be low, the system status bit will be set to 0 and the active level will be changed to unactive level.

7.5.4.3 System power off

When system is power on and one of power off sources is detected , BMU sends power off signal to the behind

条件可以根据负载自动在PWM和PFM之间切换。

7.5.4系统电源开/关管理

AXP2585具有系统电源开/关管理功能。它可以与其他PMU一起使用，通过PWRON引脚和PWROK引脚完成该功能。PWRON引脚是一个IO引脚。当它作为输入时，BMU可以通过它检测外部按键的状态，以发送IRQ并实现上电复位。当BMU作为输出时，可以通过PWRON引脚向后面的PMU发送上电信号。PWROK引脚连接到后面PMU的PWROK信号，以判断PMU状态。

系统状态保存在寄存器位reg14H[0]中。BMU根据系统状态和触发事件发送上电/断电信号。

7.5.4.1 PWRON引脚

可以在PWRON引脚和接地之间连接一个按键。当PWRON引脚作为输入时，其功能如下所述：

- 如果BMU处于运输模式，当PWRON按键低于ONLEVEL(reg15H[3:2])的时间超过时，BMU将退出运输模式。
- 如果BMU不在运输模式，当按下PWRON按键时，将检测到负边缘并发送IRQ。
  当PWRON按键低于IRQLEVEL(reg15H[7:6])的时间不足时，BMU发送短按IRQ和正边缘IRQ。当PWRON按键低于IRQLEVEL且低于PORLEVEL(reg15H[5:4])的时间超过时，BMU发送长按IRQ和正边缘IRQ。当PWRON按键低于PORLEVEL的时间超过时，将进行上电复位(POR)。

7.5.4.2系统开机

当系统关闭且检测到其中一个开机源时，BMU会向后面的PMU发送开机信号以启动系统。

开机源包括：

- VBUS插入(V_{VBU}>V_{VBUS_UVLOZ} & V_{VBUS}<V_{ACOV} & V_{SYS}>3.0V & reg17H[7]=1)
- 电池插入(V_{BAT}>V_{BAT_UVLOZ} & V_{SYS}>3.0V & reg17H[6]=1)
- 电池充电到正常 (V_{BAT}>3.6V&Ischarging&reg17H[5]=1)
- 中断请求低电平(IRQ引脚低电平持续超过16毫秒&reg17H[4]=1)

一旦检测到上述任一开机源，BMU会发送开机信号。开机信号有三种形式，包括低电平脉冲、特殊序列和高/低电平，可以通过定制进行配置。

在发送电源开启信号后，BMU监测PWROK引脚的状态。如果PWROK引脚为高电平，则表示系统成功上电，系统状态位（reg14H[0]）被设置为1。如果PWROK引脚为低电平，则表示系统上电不成功，系统状态位（reg14H[0]）被设置为0。

当选择高/低电平作为电源开启信号时，如果系统上电不成功或系统异常关机，PWROK引脚将为低电平，系统状态位将被设置为0，活动电平将被更改为非活动电平。

7.5.4.3 系统关机

当系统上电并检测到某个关机源时，BMU向后端发送关机信号

PMU to power off system.

Power off sources include:

- Software power off(Write “1” to reg17H[0])
- Watchdog timer out(Watchdog time out & reg17H[2]=1)

Once one of the power off sources above is detected, BMU sends power off signal. Power off signal has two forms, including low level pulse and high/low level. If power on signal is low level pulse or special sequence, power off signal will be low level pulse. If power on signal is high/low level, power off signal will be the opposite level. The system status bit(reg14H[0]) is set to 0 when PWROK signal changes from high level to low level.

7.5.5 Power off

- When VBUS is removed, BMU disables the charger, RBFET and all the bias circuits. The system is supplied by the battery. If the start-up conditions are meet, the associated circuits are enabled again.
- When the die or the battery is over temperature, BMU disables the buck converter, OTG and BATFET.

7.5.6 System reset

AXP2585 has power on reset and system reset.

1. Power on reset(POR)

There are two ways of power on reset.

- VBUS or battery inserts and the voltage meets the start-up conditions.
- PWRON key is low for longer than PORLEVEL(PORLEVEL is set by reg15H[5:4] and the default value is 12s).

2. System reset

System reset method just resets some associated registers. There are three ways of system reset.

- System power off. When the system status bit(reg14H[0]) is set to 0, BMU implements system reset.
- Software reset. Write “1” to reg14H[3].
- Watchdog time out to reset. The function is disabled by default.

7.6 Charger

7.6.1 Characteristics

- Range of input voltage:3.9V~5.5V, PWM charger, supports single cell Li-battery
- High charge efficiency in fast charging mode:>90% @5V(VIN)_2A(I_{CHG})
- Pre-charge current settable($I_{PRE-CHG}$, reg8A[4:1]), default:128mA, range: 64mA~1024mA,step:64mA
- Fast charge current settable(I_{CHG}, reg8B[5:0]), default:1024mA, range: 0mA~3072mA,step:64mA
- Target charge voltage settable(V_{REG}, reg8C[7:2]), default:4.25V, range: 3.840V~4.608V, step:16mV
- Accuracy of target voltage:±0.5%(testing ambient temperature:25℃,target voltage:4.256V)

7.6.2 Charging condition

- VBUS is present and available, $V_{VBUS}>V_{BAT}+V_{SLEEPZ}$

PMU以关机系统。
关机源包括：

- 软件关机（写入“1”到reg17H[0]）
- 看门狗超时(看门狗超时&reg17H[2]=1)

一旦检测到上述任一电源关闭信号，BMU将发送关机信号。关机信号有两种形式，包括低电平脉冲和高/低电平。如果电源开启信号为低电平脉冲或特殊序列，关机信号将为低电平脉冲。如果电源开启信号为高/低电平，关机信号将为相反电平。当PWROK信号从高电平变为低电平时，系统状态位(reg14H[0])被设置为0。

7.5.5关机

- 当VBUS被移除时，BMU禁用充电器、RBFET和所有偏置电路。系统由电池供电。如果启动条件满足，相关电路将再次启用。
- 当芯片或电池过温时，BMU禁用降压转换器、OTG和BATFET。

7.5.6系统复位

AXP2585具有上电复位和系统复位功能。
1.上电复位（POR）
有两种上电复位的方法。

- VBUS或电池插入并且电压满足启动条件。
- PWRON键保持低电平超过PORLEVEL（PORLEVEL由reg15H[5:4]设置，默认值为12秒）。

2. 系统复位
系统复位方法仅重置一些相关寄存器。有三种系统复位的方法。

- 系统断电。当系统状态位（reg14H[0]）被设置为0时，BMU执行系统复位。
- 软件复位。向reg14H[3]写入“1”。
- 看门狗超时复位。该功能默认禁用。

7.6 充电器

7.6.1 特性

- 输入电压范围：3.9V~5.5V， PWM充电器，支持单电池锂电池
- 快速充电模式下高充电效率： >90%@5V(VIN)_2A(I_{CHG})
- 预充电电流可设定 ($I_{PRE-CHG}$,reg8A[4:1]),默认 :128mA,范围 :64mA~1024mA,步长 :64mA
- 快速充电电流可设定 (I_{CHG},reg8B[5:0]),默认 :1024mA,范围 :0mA~3072mA,步长 :64mA
- 目标充电电压可设定 (V_{REG},reg8C[7:2]),默认 :4.25V,范围 :3.840V~4.608V,步长 :16mV
- 目标电压的准确度 :±0.5%(测试环境温度 :25℃,目标电压:4.256V)

7.6.2充电条件

- VBUS存在且可用 ,$V_{VBUS}>V_{BAT}+V_{SLEEPZ}$

- Input source detection finishes(reg00H[1]=1)
- Charging is enabled(reg8AH[7]=1)
- Die temperature is lower than T_{SHUT}
- When TS pin is used to detect battery temperature, battery temperature is within the chargeable range
- V_{BAT} is lower than V_{BAT_OVP}
- No charger safety timer fault
- BATFET is not forced to be off (BATFET_DIS bit, reg10H[7]=0)

7.6.3 Charging process

When BMU meets all charging conditions, it can complete the whole charging process without the participation of Host. The charging status can be known from the register bits reg00H[4:2]. The default values of charging parameters are shown as following. Host can modify registers to optimize the values through TWSI.

Table 7-1

Parameter	Default value
Charging voltage	4.208V
Charging current	1.024A
Pre-charging current	128mA
Termination current	128mA
Temperature profile	Cold/hot
Safety timer	12hours

1. Pre-charge

When V_{BAT} is lower than $V_{BATLOWV}$(reg8CH[1]), the charger is under pre-charge mode where charging current is limited to a value of $I_{PRE-CHG}$. Safety time is set through reg8EH[6:5] and its default value is 50 minutes. If pre-charge process times out, BMU will stop charging and send a corresponding IRQ to Host. The function of safety timer can be disabled through reg8EH[7].

2. Constant current charge

Once V_{BAT} is higher than $V_{BATLOWV}$ and lower than V_{REG}, the charger is under constant current charge mode. It will charge with constant current I_{CHG}.

3. Constant voltage charge

When V_{BAT} reaches target voltage(V_{REG}), the charger enters constant voltage charge mode. In this stage, the charger keeps the output voltage constant and step down charging current gradually, in order to fully charge battery.

When V_{BAT} is above V_{RECHG} and the charging current reduces under termination current(I_{TERM}), AXP2585 reports charger done, stops charging(charger enable bit is still 1) and turns off BATFET. Meanwhile, IRQ is sent to Host. After the charging process is completed, a charging cycle can be started again by writing 0 to reg8AH[7] first and then writing 1.

When AXP2585 is in regulation of input current, input voltage or temperature, the function of charging termination configured through reg8DH[7] is temporarily disabled and the speed of safety timer slows down. Whether to set safety timer during DPM or thermal regulation depends on reg8EH[4].

4. Re-charge

After charge done, if V_{BAT} falls below V_{RECHG}, BMU will automatically enable charger without reinserting adapter.

- 输入源检测完成(reg00H[1]=1)
- 充电已启用(reg8AH[7]=1)
- 温度低于 T_{SHUT}
- 当TS引脚用于检测电池温度时，电池温度在可充电范围内
- V_{BAT} 低于 V_{BAT_OVP}
- 没有充电器安全定时器故障
- BATFET未强制关闭（BATFET_DIS位，reg10H[7]=0）

7.6.3充电过程

当BMU满足所有充电条件时，可以在不需要主机参与的情况下完成整个充电过程。充电状态可以从寄存器位reg00H[4:2]中得知。充电参数的默认值如下所示。主机可以通过TWSI修改寄存器以优化这些值。表7-1

参数	默认值
充电电压	4.208V
充电电流	1.024A
预充电电流	128mA
终止电流	128mA
温度曲线	冷/热
安全计时器	12小时

1. 预充电

当 V_{BAT}低于 $V_{BATLOWV}$（reg8CH[1]）时，充电器处于预充电模式，充电电流限制为 $I_{PRE-CHG}$。安全时间通过 reg8EH[6:5] 设置，默认值为 50 分钟。如果预充电过程超时，BMU 将停止充电并向主机发送相应的中断请求。安全计时器功能可以通过 reg8EH[7] 禁用。

2. 恒流充电

一旦 V_{BAT}高于 $V_{BATLOWV}$且低于 V_{REG}，充电器处于恒流充电模式。它将以恒定电流 I_{CHG} 充电。

3. 恒压充电

当 V_{BAT}达到目标电压 (V_{REG}) 时，充电器进入恒压充电模式。在此阶段，充电器保持输出电压恒定，并逐渐降低充电电流，以便完全充电电池。

当 V_{BAT}高于 V_{RECHG}且充电电流降低到终止电流 (I_{TERM}) 以下时，AXP2585 报告充电完成，停止充电（充电器使能位仍为 1）并关闭 BATFET。同时，IRQ 被发送到主机。充电过程完成后，可以通过先将 0 写入 reg8AH[7]，然后再写入 1 来重新开始充电周期。

当 AXP2585 处于输入电流、输入电压或温度的调节状态时，通过 reg8DH[7] 配置的充电终止功能会暂时禁用，安全计时器的速度会减慢。

在 DPM 或热调节期间是否设置安全计时器取决于 reg8EH[4]。

4. 重新充电

充电完成后，如果 V_{BAT} 降低到 V_{RECHG} 以下， BMU 将自动启用充电器，而无需重新插入适配器。

No matter whether V_{BAT} is above V_{RECHG} or not, the charger is enabled when an adapter is inserted.

5. Battery detection

As long as an AC adapter is present and usable, battery detection will be enabled to detect whether battery is connected. Battery detection function is enabled by default and can be disabled through reg8EH[3]. If the function is disabled, BMU considers that battery is always present. The detection result is saved in reg02H[4:3.]

7.6.4 Charging protection

1. charger safety timer

Once starting pre-charge mode, BMU will enable timer1. If BMU can not enter constant current charge mode from pre-charge within 50min(set through reg8EH[6:5]), BMU will enter battery safe mode and send IRQ to indicate the battery may be damaged.

When the charger enters into constant current charge mode, BMU will enable timer2. If BMU can not finish the whole charge cycle within 12 hours(set through reg8DH[2:1]), BMU will enter battery safe mode and send IRQ to indicate the battery may be damaged.

Timing speed of timer1 or timer2 is relevant with actual charge current. The smaller the actual charge current, the slower timing speed is.

2. Battery safe mode

In battery safe mode, the charger always charges with 10mA current. BMU can quit battery safe mode with one of the following methods:

- $V_{BAT}>V_{RECHG}$
- Adapter removal
- Charger enable bit(reg8AH[7]) is set to 0
- Safety timer1 enable bit(reg8EH[7]) or safety timer2 enable bit(reg8DH[0])is set to 0

3. BMU die temperature protection

AXP2585 has built-in temperature protection function through ADC to monitor internal temperature.

Under charging mode, the temperature point of thermal regulation can be set through reg18H[7:6]. When die temperature rises up to the setting point, the charging current will be decreased to decrease heat. When thermal regulation works, actual charge current is lower than the setting value and thermal regulation status(reg02H[2]) is set to 1. If die temperature rises up to T_{SHUT}(140℃), the buck converter is disabled and BATFET is turned off. Then charge fault status(reg04H[5:4]) is set to "10" to indicate over temperature protection and IRQ is sent . When die temperature falls below hysteretic threshold(120℃), BATFET will not be turned on automatically.

4. Battery temperature protection

AXP2585 can monitor battery temperature, when TS pin is used to detect battery temperature and parallel with charger(reg81H[7]=0). The battery temperature sensitive resistor is connected between TS pin and GND. The suggestion resistance should be 10Kohm at 25℃ ambient temperature. Through TS pin, BMU outputs constant current which can set through reg81H[2:1] to adapt different resistance. When the resistance is 10Kohm, the current should be set to 60uA. The enable bit of TS current source is configured through reg81H[4:3]. When current passes through the temperature sensitive resistor, BMU gets a detected voltage and calculates its value through ADC circuit. Take for example, TH11-3H103F temperature sensitive resistor of Mitsubishi Company. Using 60uA current source, the relationship among temperature, equivalent resistance, detected voltage and ADC data is as following.

无论V_{BAT}是否高于V_{RECHG}，插入适配器时充电器将被启用。

5. 电池检测

只要有可用的交流适配器，电池检测将被启用以检测电池是否连接。电池检测功能默认启用，可以通过reg8EH[3]禁用。如果该功能被禁用，BMU将认为电池始终存在。检测结果保存在reg02H[4:3]中。

7.6.4 充电保护

1. 充电器安全定时器

一旦进入预充电模式，BMU将启用定时器1。如果BMU无法在50分钟内（通过reg8EH[6:5]设置）从预充电模式进入恒流充电模式，BMU将进入电池安全模式并发送中断请求以指示电池可能已损坏。

当充电器进入恒流充电模式时，BMU将启用定时器2。如果BMU无法在12小时内完成整个充电周期（通过reg8DH[2:1]设置），BMU将进入电池安全模式并发送中断请求以指示电池可能已损坏。

定时器1或定时器2的计时速度与实际充电电流相关。实际充电电流越小，计时速度越慢。

2.电池安全模式

在电池安全模式下，充电器始终以10mA的电流充电。BMU可以通过以下方法之一退出电池安全模式：

- $V_{BAT}>V_{RECHG}$
- 适配器移除
- 充电使能位（reg8AH[7]）设置为0
- 安全定时器1使能位（reg8EH[7]）或安全定时器2使能位（reg8DH[0]）设置为0

3.BMU温度保护

AXP2585通过ADC内置温度保护功能以监测内部温度。

在充电模式下，热调节的温度点可以通过reg18H[7:6]设置。当芯片温度上升到设定点时，充电电流将减少以降低热量。当热调节工作时，实际充电电流低于设定值，热调节状态(reg02H[2])被设置为1。如果芯片温度上升到T_{SHUT}(140℃)，降压转换器将被禁用，BATFET将关闭。然后充电故障状态(reg04H[5:4])被设置为“10”以指示过温保护，并发送IRQ。当芯片温度降到滞后阈值(120℃)以下时，BATFET将不会自动开启。

4.电池温度保护

AXP2585可以监测电池温度，当TS引脚用于检测电池温度并与充电器并联时(reg81H[7]=0)。电池温度敏感电阻连接在TS引脚和接地之间。建议的电阻值在25℃环境温度下应为10Kohm。通过TS引脚，BMU输出的恒定电流可以通过reg81H[2:1]设置，以适应不同的电阻。当电阻为10Kohm时，电流应设置为60uA。TS电流源的使能位通过reg81H[4:3]配置。当电流通过温度敏感电阻时，BMU获取检测电压并通过ADC电路计算其值。以三菱公司的TH11-3H103F温度敏感电阻为例。使用60uA电流源，温度、等效电阻、检测电压和ADC数据之间的关系如下。

Table 7-2

Temperature	equivalent resistance	detected voltage	ADC 12bit data
-16~-17℃	54.60Kohm	3.276V	FFFH
-15℃	50.15Hohm	3.009V	EB1H
-10℃	40.26Kohm	2.416V	BCCH
-5℃	32.55Kohm	1.953V	989H
0℃	26.49Kohm	1.481V	73BH
5℃	21.68Kohm	1.301V	65AH
10℃	17.78Kohm	1.067V	42AH
25℃	10.00Kohm	0.600V	2EEH
40℃	5.839Kohm	0.350V	1B5H
45℃	4.924Kohm	0.295V	170H
50℃	4.171Kohm	0.250V	138H
55℃	3.549Kohm	0.213V	10AH
60℃	3.032Kohm	0.182V	0E3H

During battery charging process, if TS pin voltage is lower than VHTF-CHG or higher than VLTF-CHG(VHTF-CHG and VLTF-CHG can be set through reg84H and reg85H. The default value of VLTF-CHG is set around 0℃ and VHTF-CHG around 45℃), which indicates battery temperature is too high or too low, then the charger is paused and IRQ is sent to notify Host. When battery temperature is back to the normal range, the charger will recovery automatically.

During boost mode, if TS pin voltage is lower than VHTF-WORK or higher than VLTF-WORK(VHTF-WORK and VLTF-WORK can be set through reg86H and reg87H. The default value of VLTF-WORK is set around -10℃ and VHTF-WORK around 55℃), which indicates battery temperature is too high or too low, then the boost is paused and IRQ is sent to notify Host. When battery temperature is back to the normal range, the boost will recovery automatically.

High temperature protection threshold hysteresis for VHTF-CHG and VHTF-WORK can be set through reg83H(default 50mV, ADC data 40H). Low temperature protection threshold hysteresis for VLTF-CHG and VLTF-WORK can be set through reg82H(default 300mV, ADC data 180H). The range of temperature detection can be expanded by adding more resistors.

Some battery may have no temperature sensitive resistor. Under this situation, TS pin can be pulled down to GND with a 10Kohm resistor externally or set as external input of ADC through register.

Use TS pin current source and obtain TS pin data according to the following table:

Table 7-3

Usage condition	setting
Not need temperature protection	reg81H[7]=1
Temperature protection when in charger	reg81H[7]=0, reg81H[4:3]=01
Temperature protection when in charging and discharging	reg81H[7]=0, reg81H[4:3]=10
Use TS pin current source to drive other device	reg81H[4:3]=11 when need current source reg81H[4:3]=00 when not need current source

表7-2

温度	等效电阻	检测电压	ADC12位数据
-16~-17℃	54.60Kohm	3.276V	FFFH
-15℃	50.15Hohm	3.009V	EB1H
-10℃	40.26Kohm	2.416V	BCCH
-5℃	32.55Kohm	1.953V	989H
0℃	26.49Kohm	1.481V	73BH
5℃	21.68Kohm	1.301V	65AH
10℃	17.78Kohm	1.067V	42AH
25℃	10.00KΩ	0.600V	2EEH
40℃	5.839KΩ	0.350V	1B5H
45℃	4.924KΩ	0.295V	170H
50℃	4.171KΩ	0.250V	138H
55℃	3.549KΩ	0.213V	10AH
60℃	3.032KΩ	0.182V	在电

池充电过程中，如果 TS 引脚电压低于 VHTF-充电或高于 VLTF-充电（VHTF-充电和 VLTF-充电可以通过 reg84H 和 reg85H 设置。VLTF-充电的默认值设置在大约 0℃，VHTF-充电的默认值设置在大约 45℃），这表明电池温度过高或过低，则充电器会暂停，并发送中断请求以通知主机。当电池温度恢复到正常范围时，充电器将自动恢复。

在升压模式下，如果 TS 引脚电压低于 VHTF-工作或高于 VLTF-工作（VHTF-工作和 VLTF-工作可以通过 reg86H 和 reg87H 设置。VLTF-工作的默认值设置在大约 -10℃，VHTF-工作的默认值设置在大约 55℃），这表明电池温度过高或过低，则升压会暂停，并发送中断请求以通知主机。当电池温度恢复到正常范围时，升压将自动恢复。

VHTF-充电和VHTF-工作高温保护阈值滞后可以通过reg83H设置（默认50mV，ADC数据40H）。VLTF-充电和VLTF-工作低温保护阈值滞后可以通过reg82H设置（默认300mV，ADC数据180H）。温度检测范围可以通过添加更多电阻器来扩展。

某些电池可能没有温度敏感电阻。在这种情况下，TS引脚可以通过外部10K欧姆电阻拉低到接地，或通过寄存器设置为ADC的外部输入。

使用TS引脚电流源并根据下表获取TS引脚数据：

表7-3

使用条件	设置
不需要温度保护	reg81H[7]=1
充电时温度保护	reg81H[7]=0, reg81H[4:3]=01
充电和放电时的温度保护	reg81H[7]=0, reg81H[4:3]=10
使用TS引脚电流源驱动其他设备	当需要电流源时，reg81H[4:3]=11 当不需要电流源时，reg81H[4:3]=00

7.6.5 Charging indication

CHGLED pin uses open-drain/push-pull output method. It is internally pulled up to LDO. Its output drive capability is above 10mA. Detail function control is shown as the following table.

Table 7-4

REG90H[2:0]= 000 (Type A CHGLED) Open Drain	Hi-Z	No charging(conditions are not met or battery charged)
	25% 1Hz pull low/Hi-Z jump	Charger internal abnormal alarm(including timer out、 die temperature over temperature、 battery temperature out of charging range)
	25% 4Hz pull low/Hi-Z jump	Input source or battery over voltage
	Pull low	Charging
REG90H[2:0]= 001 (Type B CHGLED) Open Drain	Hi-Z	No VBUS, and power supply by battery
	25% 1Hz pull low/Hi-Z jump	Charging
	25% 4Hz pull low/Hi-Z jump	Alarm, including input source or battery over voltage, battery temperature out of charging range, timer out,die temperature over temperature
	Pull low	No battery or charge finished, and power supply by VBUS
REG90H[2:0]= 010 (Breath CHGLED) Open Drain	Hi-Z	No VBUS, and power supply by battery
	Breath LED output(*note1)	Charging
	Pull low	No battery or charge finished, and power supply by VBUS
REG90H[2:0]= 011 (Breath Lamp) Open Drain	Breath LED output, enable bit: REG90H[6] Breath frequency and luminance are controlled by REG91H~REG9AH	
REG90H[2:0]= 100 (Tri-state CHGLED) Push Pull	Hi-Z	No VBUS, and power supply by battery
	Pull high	Charging
	Pull low	No battery or charge finished, and power supply by VBUS
REG90H[2:0]= 101 (PWM function) Push Pull	PWM output, enable bit: REG90H[6] The frequency and duty-cycle are controlled by REG95H~99H	
REG90H[2:0]=110/111 (GPO) Push Pull	The output status is controlled by REG90H[5:3]	

Note: LED is on when CHGLED is low.

7.7 BATFET

BATFET connects system and battery. The on-resistance is low to 30mohm(point to point).

7.6.5充电指示

CHGLED引脚使用开漏/推挽输出方式。它内部上拉到LDO。其输出驱动能力超过10mA。详细功能控制如下表所示。

表7-4

REG90H[2:0]= 000 (类型ACHGLED) 开漏	高阻抗	不充电（条件不满足或电池已充满）
	25%1Hz拉低/高阻抗跳变	充电器内部异常报警（包括超时 、芯片温度过高 、电池温度超出充电范围）25%4Hz拉低/高阻抗跳变 输入源或电池过电压拉低
		充电
REG90H[2:0]= 001 (类型BCHGLED) 开漏	高阻抗	无VBUS，电源由电池供电
	25% 1Hz拉低/高阻跳充电	
	25% 4Hz拉低/高阻跳警报，	包括输入源或电池过电压、电池温度超出充电范围 、超时、环境温度过高
	拉低	无电池或充电完成，电源由VBUS供电
REG90H[2:0]= 010 (呼吸CHGLED) 开漏	高阻抗	无VBUS，电源由电池供电
	呼吸LED输出(*注1) 充电	
	拉低	无电池或充电完成，电源由VBUS供电
REG90H[2:0]= 011 (呼吸灯) 开漏	呼吸LED输出，启用位:REG90H[6] 呼吸频率和亮度由REG91H~REG9AH控制	
REG90H[2:0]= 100 (三态CHGLED) 推挽	高阻抗	无VBUS，电源由电池供电
	拉高	充电
	拉低	无电池或充电完成，电源由VBUS供电
REG90H[2:0]= 101 （PWM功能） 推挽	PWM输出，启用位：REG90H[6] 频率和占空比由REG95H~99H控制	
REG90H[2:0]=110/111 (GPO) 推挽	输出状态由REG90H[5:3]控制	

注意：当CHGLED为低时，LED亮。

7.7电池FET

电池FET连接系统和电池。导通电阻低至30毫欧（点对点）。

7.7.1 Enter shipping mode

In order to increase the life of battery and reduce consumption during transportation, system is allowed to turn off BATFET automatically. When BMU is supplied by only battery, V_{SYS} is 0 after BATFET is turned off, which can make the leakage voltage minimum. There are some ways to turn off BATFET to enter shipping mode. Reg00[0] can indicate BATFET status.

BATFET off sources:

- Write "1" to reg10H[7]. Force BATFET off, highest priority.
- Charge done
- VBUS present but charger disabled(reg8AH[7]=0)

7.7.2 Exit shipping mode

BATFT can be enabled again with the following method.

- PWRON key is low for longer than ONLEVEL

7.8 Boost mode

AXP2585 supports boost mode which can provide current from battery to VBUS pin. The boost mode can be enabled when the following conditions are met.

- V_{BAT} is higher than $V_{BATLOWV}$.
- V_{VBUS} is lower than $V_{BAT}+V_{SLEEP}$.
- Boost enable register, (reg12H[7]]=1)||(reg23H[5]=1 & OTG device plugs in).
- OTG pin is high level.
- Battery temperature is in charging range.
- Die temperature is below T_{SHUT}.

In boost mode, the output voltage can be set through reg13H[7:4]. Moreover, output current limit function can be realized through RBFET. The current limit value is set through reg13H[1:0]. The switch frequency of boost converter is 1.5MHz which can not be changed. The maximum output current is up to 1.5A. The efficiency is 90% @3.5V_5V_1A.

There are OCP function and OVP function in boost mode. When over current or over voltage occurs, boost converter will be turned off and IRQ will be sent to Host.

In boost mode, if reg11H[6] is set to 0, BMU pulls down VBUS to avoid VBUS voltage rising due to electric leakage. If reg11H[6] is set to 1, it means the path from VMID and VBUS is available and it is prohibited to pull down VBUS. When charging conditions are met, boost converter will be disabled and then charger will be enabled

7.9 RBFET

RBFET connects VMID and VBUS. The on-resistance is low to 30mohm(point to point). It supports input and output current limit function. In charger mode, the input current limit value of RBFET is set through reg10H[5:0]. In boost mode, the output current limit value of RBFET is set through reg13H[1:0].

7.7.1进入运输模式

为了延长电池寿命并减少运输过程中的消耗，系统允许自动关闭电池FET。当BMU仅由电池供电时，关闭电池FET后V_{SYS}为0，这可以使漏电压降到最低。有几种方法可以关闭电池FET以进入运输模式。Reg00[0]可以指示BATFET状态。

BATFET的关闭源：

- 写入“1”到reg10H[7]。强制关闭BATFET，优先级最高。
- 充电完成
- VBUS存在但充电器禁用（reg8AH[7]=0）

7.7.2 退出运输模式

BATFT可以通过以下方法重新启用。

- PWRON键保持低电平时间超过ONLEVEL

7.8 升压模式

AXP2585支持升压模式，可以将电池的电流提供给VBUS引脚。升压模式可以在满足以下条件时启用。

- V_{BAT} 高于 $V_{BATLOWV}$。
- V_{VBUS} 低于 $V_{BAT}+V_{SLEEP}$。
- 升压使能寄存器，（reg12H[7]=1）||(reg23H[5]=1&OTG设备插入）。
- OTG引脚为高电平。
- 电池温度在充电范围内。
- 温度低于T关闭。

在升压模式下，输出电压可以通过reg13H[7:4]设置。此外，输出电流限制功能可以通过RBFET实现。电流限制值通过reg13H[1:0]设置。升压转换器的开关频率为1.5MHz，无法更改。最大输出电流可达1.5A，效率为90%@3.5V_5V_1A。

在升压模式下，有过流保护（OCP）和过电压保护（OVP）功能。当发生过流或过电压时，升压转换器将被关闭，并向主机发送中断请求（IRQ）。

在升压模式下，如果reg11H[6]设置为0，BMU将拉低VBUS，以避免由于电流泄漏导致VBUS电压上升。
如果reg11H[6]设置为1，则表示VMID和VBUS之间的路径可用，并禁止拉低VBUS。
当充电条件满足时，升压转换器将被禁用，然后充电器将被启用

7.9 RBFET

RBFET连接VMID和VBUS。导通电阻低至30毫欧（点对点）。它支持输入和输出电流限制功能。在充电模式下，RBFET的输入电流限制值通过reg10H[5:0]设置。
在升压模式下，RBFET的输出电流限制值通过reg13H[1:0]设置。

7.10 ADC

AXP2585 has a low speed 12Bit SAR ADC for measuring BAT voltage, BAT charge current and BAT discharge current, TS voltage, GPADC voltage and die temperature. No IRQ for ADC output. The ADC sampling frequency can be set to 800/400/200/100Hz. Channel 2 is fixed to 25Hz.

Table 7-5

No.	Channel function	000H	001H	002H	…	FFFH
0	BAT voltage	0mV	1.2mV	2.4mV	…	4.914V
1	Reserved					
2	Die temperature	-267.7℃	+0.10625*xxxH (℃)			167.4℃
3	BAT charge current	0mA	2mA	4mA	…	8.160A
4	BAT discharge current	0mA	2mA	4mA	…	8.160A
5	TS pin input	0mV	0.8mV	1.6mV	…	3.276V
6	GPADC pin Input	0mV	0.8mV	1.6mV	…	3.276V

Note: ADC data is 12 bits. In order to get the complete data, TWSI must read the high 8 bits firstly and then the low 4 bits.

7.11 E-Gauge

The Fuel Gauge comprises of 3 modules: Rdc calculation module; OCV (Open Circuit Voltage) and Coulomb counter module; and calibration module. The Fuel Gauge system is able to export information about battery such as Battery capacity percentage (regB9H), Battery Voltage (reg78H, reg79H), Battery charging current (reg7AH, reg7BH), Battery discharge current (reg7CH, reg7DH), Battery maximum capacity (regE0H, regE1H), Battery Rdc value (regBAH, regBBH). The Fuel Gauge can be enabled or disabled through regB8H. The Battery low warning level can be set in regE6H, and IRQ will be sent out to alert the platform when the battery capacity percentage is lower than the warning level set in regE6H.

Once a default battery is selected for a particular design, it is highly recommended to calibrate the battery to achieve better Fuel Gauge accuracy. Once the calibration data are available, user can write the calibration information to regC0H ~regDFH (OCV percentage table) on each boot. Or user can choose not to do the calibration and use the default OCV percentage value. Additionally, the Fuel Gauge system is capable to learn the battery characteristic on each full charge cycle.Information such as battery maximum capacity (regE0H, regE1H) and Rdc (regBAH, regBBH) will be updated automatically over time.

7.12 IRQ, GPADC, LDO

7.12.1 IRQ

AXP2585 has an IRQ pin which is used to indicate whether there interrupt events occur.
BMU Interrupt Controller monitors the trigger events such as over voltage, over current, PWRON pin signal, over temperature and so on. When the events occur and their IRQ enabled bits are set to 1 (Refer to registers reg40H/41H/42H/43H/44H/45H), corresponding IRQ status will be set to 1 (Refer to registers reg48H/49H/4AH/4BH/4CH/4DH), and IRQ pin will be pulled down. When Host detects triggered IRQ signal, Host

7.10 ADC

AXP2585具有低速12位SAR ADC，用于测量电池电压、电池充电电流和电池放电电流、温度传感器电压、通用ADC电压和芯片温度。ADC输出没有中断请求。ADC采样频率可以设置为800/400/200/100Hz。通道2固定为25Hz。

表7-5

否	通道功能	000H	001H	002H	...	FFFH
0	电池电压	0毫伏	1.2毫伏	2.4毫伏	...	4.914伏
1	保留					
2	环境温度	-267.7℃	+0.10625*xxxH (℃)			167.4℃
3	电池充电电流	0毫安	2毫安	4毫安	...	8.160安
4	电池放电电流	0毫安	2毫安	4毫安	...	8.160安
5	TS引脚输入	0毫伏	0.8毫伏	1.6毫伏	...	3.276V
6	通用ADC引脚输入	0毫伏	0.8毫伏	1.6毫伏	...	3.276V

注意：ADC数据为12位。为了获取完整数据，TWSI必须首先读取高8位，然后读取低4位。

7.11 E-Gauge

燃料计由三个模块组成：Rdc计算模块；OCV（开路电压）和库仑计模块；以及校准模块。燃料计系统能够导出有关电池的信息，例如电池容量百分比（regB9H）、电池电压（reg78H，reg79H）、电池充电电流（reg7AH，reg7BH）、电池放电电流（reg7CH，reg7DH）、电池最大容量（regE0H，regE1H）、电池Rdc值（regBAH，regBBH）。燃料计可以通过regB8H启用或禁用。电池低警告级别可以在regE6H中设置，当电池容量百分比低于在regE6H中设置的警告级别时，将发送IRQ以提醒平台。

一旦为特定设计选择了默认电池，强烈建议对电池进行校准，以实现更好的燃料计量准确性。一旦校准数据可用，用户可以在每次启动时将校准信息写入regC0H~regDFH（OCV百分比表）。或者用户可以选择不进行校准，而使用默认的OCV百分比值。此外，燃料计量系统能够在每个完整充电周期中学习电池特性。信息如电池最大容量（regE0H，regE1H）和Rdc（regBAH，regBBH）将随着时间的推移自动更新。

7.12中断请求，通用ADC，LDO

7.12.1中断请求

AXP2585具有一个中断请求引脚，用于指示是否发生了中断事件。
BMU中断控制器监控触发事件，如过电压、过电流、PWRON引脚信号、过温等。当事件发生且其IRQ使能位被设置为1（参考寄存器reg40H/41H/42H/43H/44H/45H）时，相应的IRQ状态将被设置为1（参考寄存器reg48H/49H/4AH/4BH/4CH/4DH），并且IRQ引脚将被拉低。当主机检测到触发的中断请求信号时，主机

will scan through the IRQ Status registers and respond accordingly. Meanwhile, Host will reset the IRQ status by writing “1” to status bit.

When reg17H[4] is set to 1, IRQ pin can be used as power on source.

7.12.2 GPADC

GPADC pin is a general purpose input pin for ADC. Its circuit realization is the same as that of TS pin.

7.12.3 LDO

AXP2585 has a LDO output. Its features are shown as follows.

- Output voltage range: 1.8V(default)/2.5V/2.8V/3.3V, can be configure by customization.
- IMAX=20mA, Vdropout=0.4V

7.13 Type-C

AXP2585 supports Type-C cc logic and DRP. The function is customizable and is disabled by default.

When BMU is powered from battery, if type-c device is inserted, BMU set in DRP mode can detect device insertion through CC pin and distinguish each side of plug. The detection result is saved in reg37H[3:0] and IRQ is sent to Host.

If the type-c device is DFP, BMU will switch to UFP mode and set I_{INDPM}, waiting for VBUS.

If the type-c device is UFP, BMU will switch to DFP mode, and then enable boost converter and turn on RBFET to supply power to VBUS. When UFP device is removed, BMU can detect device removal through CC pin and turn off RBFET. Whether to disable boost mode depends on application scenarios. Function of automatically turning on boost converter and RBFET can be disabled through reg23H[5].

7.14 Register

7.14.1 Register List

Address	Description	R/W	Default
00	BMU status1	R	
01	BMU status2	R	
02	BMU status3	R	
04	BMU status4	R	
05	BMU status5	R	
06	System power on/off source indication	RW	00H
10	BATFET & input current limit control	RW	48H
11	BATFET & RBFET & input voltage limit control	RW	06H
12	Boost & minimum system voltage control	RW	2DH
13	Boost voltage & RBFET current limit control	RW	94H
14	WATCHDOG timer setting & register reset & system status	RW	00H

将扫描中断请求状态寄存器并做出相应的响应。同时，主机将通过写入“1”来重置中断请求状态位。

当reg17H[4]被设置为1时，中断请求引脚可以用作电源源。

7.12.2通用ADC

通用ADC引脚是一个用于ADC的通用输入引脚。其电路实现与TS引脚相同。

7.12.3低压差稳压器

AXP2585具有低压差稳压器输出。其特性如下所示。

- 输出电压范围：1.8V（默认）/2.5V/2.8V/3.3V，可以通过定制进行配置。
- IMAX=20mA，V压降=0.4V

7.13 Type-C

AXP2585支持Type-C ccc逻辑和DRP。该功能是可定制的，默认情况下是禁用的。

当BMU由电池供电时，如果插入Type-C设备，设置为DRP模式的BMU可以通过CC引脚检测设备插入并区分插头的每一侧。检测结果保存在reg37H[3:0]中，并向主机发送中断请求。

如果T ype-C设备是 DFP， BMU将切换到 UFP模式并设置 I_{INDPM}，等待 VBUS。

如果Type-C设备是UFP，BMU将切换到DFP模式，然后启用升压转换器并打开RBFET为VBUS供电。当UFP设备被移除时，BMU可以通过CC引脚检测设备移除并关闭RBFET。是否禁用升压模式取决于应用场景。自动开启升压转换器和RBFET的功能可以通过reg23H[5]禁用。

7.14寄存器

7.14.1寄存器列表

地址	描述	读/写	默认
00	BMU状态1	读	
01	BMU状态2	读	
02	BMU状态3	读	
04	BMU状态4	读	
05	BMU状态5	读	
06	系统电源开/关源指示	读/写	00H
10	电池FET和输入电流限制控制	读/写	48小时
11	电池FET&RBFET&输入电压限制控制	读/写	06小时
12	升压&最低系统电压控制	读/写	2DH
13	升压电压&RBFET电流限制控制	读/写	94小时
14	看门狗定时器设置&寄存器重置&系统状态	读/写	00小时

Address	Description	R/W	Default
15	POK setting	RW	69H
16	System power on/off control1	RW	10H
17	System power on/off control2	RW	00H
18	Thermal regulation threshold setting	RW	89H
20	BC1.2 detection control1	RW	20H
21	BC1.2 detection control2	RW	20H
22	BC1.2 detection control3	RW	00H
23	DPDM & OTG & CC enable control	RW	70H
31	CC_GLOBAL_CTRL	RW	09H
33	CC_MODE_CTRL	RW	11H
34	CC_TOGGLE_CTRL	RW	00H
37	CC_Status0	R	00H
3A	CC_Status1	R	00H
3E	Interface mode select	RW	00H
40	IRQ Enable1	RW	06H
41	IRQ Enable2	RW	FFH
42	IRQ Enable3	RW	FFH
43	IRQ Enable4	RW	00H
44	IRQ Enable5	RW	F4H
45	IRQ Enable6	RW	C6H
48	IRQ Status1	RW	00H
49	IRQ Status2	RW	00H
4A	IRQ Status3	RW	00H
4B	IRQ Status4	RW	00H
4C	IRQ Status5	RW	00H
4D	IRQ Status6	RW	00H
56	BMU Internal temperature ADC data, high 8 bits	R	00H
57	BMU Internal temperature ADC data, low 4 bits	R	00H
58	Ts pin ADC data, high 8bits	R	00H
59	Ts pin ADC data, low 4 bits	R	00H
5A	GPADC pin ADC data, high 8bits	R	00H
5B	GPADC pin ADC data, low 4 bits	R	00H
78	Average data bit[11:4] for Battery voltage	R	00H
79	Average data bit[3:0] for Battery voltage	R	00H
7A	Average data bit[11:4] for Battery charge current	R	00H
7B	Average data bit[3:0] for Battery charge current	R	00H
7C	Average data bit[11:4] for Battery discharge current	R	00H
7D	Average data bit[3:0] for Battery discharge current	R	00H
80	ADC Enable	RW	F2H
81	TS pin CTRL & ADC speed setting & GPADC mode CTRL	RW	0CH
82	TS/GPADC_HYSL2H setting	RW	18H

地址	描述	读/写	默认
15	电源监测设置	读/写	69小时
16	系统电源开/关控制1	读/写	10小时
17	系统电源开/关控制2	读/写	00H
18	热调节阈值设置	读/写	89小时
20	BC1.2检测控制1	读/写	20小时
21	BC1.2检测控制2	读/写	20小时
22	BC1.2检测控制3	读/写	00H
23	DPDM&OTG&CC使能控制	读/写	70H
31	CC_GLOBAL_CTRL	读/写	09小时
33	CC_MODE_CTRL	读/写	11H
34	CC_TOGGLE_CTRL	读/写	00H
37	CC_Status0	读	00H
3A	CC_Status1	读	00H
3E	接口模式选择	读/写	00H
40	IRQ使能1	读/写	06小时
41	IRQ使能2	读/写	FFH
42	IRQ使能3	读/写	FFH
43	IRQ使能4	读/写	00H
44	IRQ使能5	读/写	F4H
45	IRQ Enable6	读/写	C6H
48	IRQ状态1	读/写	00H
49	IRQ状态2	读/写	00H
4A	IRQ状态3	读/写	00H
4B	IRQ状态4	读/写	00H
4C	IRQ状态5	读/写	00H
4D	IRQ状态6	读/写	00H
56	BMU内部温度ADC数据，高8位	读	00H
57	BMU内部温度ADC数据，低4位	读	00H
58	TspinADC数据，高8位	读	00H
59	TspinADC数据，低4位	读	00H
5A	通用ADC引脚ADC数据，高8位	读	00H
5B	通用ADC引脚ADC数据，低4位	读	00H
78	电池电压的平均数据位[11:4]	读	00H
79	电池电压的平均数据位[3:0]	读	00H
7A	电池充电电流的平均数据位[11:4]	读	00H
7B	电池充电电流的平均数据位[3:0]	读	00H
7C	电池放电电流的平均数据位[11:4]	读	00H
7D	电池放电电流的平均数据位[3:0]	读	00H
80	ADC使能	读/写	F2H
81	TS引脚控制&ADC速度设置&通用ADC模式控制	读/写	0CH
82	TS/通用ADC_HYSL2H设置	读/写	18小时

Address	Description	R/W	Default
83	TS/GPAC_HYSH2L setting	RW	04H
84	VLTF_CHG setting	RW	74H
85	VHTF_CHG setting	RW	17H
86	VLTF_WORK setting	RW	BDH
87	VHTF_WORK setting	RW	11H
88	VLTF_GPADC setting	RW	BDH
89	VHTF_GPADC setting	RW	0EH
8A	Charger control1	RW	82H
8B	Charger control2	RW	10H
8C	Charger control3	RW	6AH
8D	Charger control4	RW	8DH
8E	Charger control5	RW	B8H
90	CHGLED pin function setting	RW	00H
91	Breath function control1	RW	64H
92	Breath function control2	RW	01H
93	Breath function control3	RW	06H
94	Breath function control4	RW	01H
95	Breath function control5	RW	64H
96	Breath function control6	RW	00H
97	PWM output frequency setting	RW	64H
98	Breath function control7 & Input clock frequency for PWM output	RW	16H
99	PWM function duty setting	RW	32H
9A	CHGLED breath time unit option	RW	65H
B8	Fuel Gauge Control	RW	C0H
B9	Battery capacity percentage for indication	R	64H
BA	RDC 1	RW	80H
BB	RDC 0	RW	55H
BC	OCV 1	R	00H
BD	OCV 0	R	00H
C0	OCV percentage table	RW	00H
C1	OCV percentage table	RW	00H
C2	OCV percentage table	RW	01H
C3	OCV percentage table	RW	02H
C4	OCV percentage table	RW	04H
C5	OCV percentage table	RW	06H
C6	OCV percentage table	RW	08H
C7	OCV percentage table	RW	0AH
C8	OCV percentage table	RW	0CH
C9	OCV percentage table	RW	0FH
CA	OCV percentage table	RW	12H
CB	OCV percentage table	RW	17H

地址	描述	读/写	默认
83	TS/GPAC_HYSH2L设置	读/写	04小时
84	VLTF_CHG设置	读/写	74小时
85	VHTF_CHG设置	读/写	17小时
86	VLTF_WORK设置	读/写	BDH
87	VHTF_WORK设置	读/写	11H
88	VLTF_GPADC设置	读/写	BDH
89	VHTF_GPADC设置	读/写	0EH
8A	充电器控制1	读/写	82H
8B	充电器控制2	读/写	10H
8C	充电控制3	读/写	6AH
8D	充电控制4	读/写	8DH
8E	充电控制5	读/写	B8H
90	CHGLED引脚功能设置	读/写	00H
91	呼吸功能控制1	读/写	64H
92	呼吸功能控制2	读/写	01H
93	呼吸功能控制3	读/写	06小时
94	呼吸功能控制4	读/写	01H
95	呼吸功能控制5	读/写	64H
96	呼吸功能控制6	读/写	00H
97	PWM输出频率设置	读/写	64H
98	呼吸功能控制7&PWM输出的输入时钟频率 RW		16小时
99	PWM功能占空比设置	读/写	32小时
9安	充电指示灯呼吸时间单位选项	读/写	65小时
B8	燃料计控制	读/写	C0H
B9	指示用电池容量百分比	读	64H
BA	RDC 1	读/写	80H
BB	RDC 0	读/写	55H
BC	OCV 1	读	00H
BD	OCV 0	读	00H
C0	OCV百分比表	读/写	00H
C1	OCV百分比表	读/写	00H
C2	OCV百分比表	读/写	01H
C3	OCV百分比表	读/写	02H
C4	OCV百分比表	读/写	04H
C5	OCV百分比表	读/写	06H
C6	OCV百分比表	读/写	08H
C7	OCV百分比表	读/写	0AH
C8	OCV百分比表	读/写	0CH
C9	OCV百分比表	读/写	0FH
CA	OCV百分比表	读/写	12H
CB	OCV百分比表	读/写	17H

Address	Description	R/W	Default
CC	OCV percentage table	RW	1DH
CD	OCV percentage table	RW	23H
CE	OCV percentage table	RW	29H
CF	OCV percentage table	RW	2FH
D0	OCV percentage table	RW	34H
D1	OCV percentage table	RW	38H
D2	OCV percentage table	RW	3FH
D3	OCV percentage table	RW	46H
D4	OCV percentage table	RW	4CH
D5	OCV percentage table	RW	4FH
D6	OCV percentage table	RW	52H
D7	OCV percentage table	RW	55H
D8	OCV percentage table	RW	57H
D9	OCV percentage table	RW	59H
DA	OCV percentage table	RW	5BH
DB	OCV percentage table	RW	5DH
DC	OCV percentage table	RW	5FH
DD	OCV percentage table	RW	61H
DE	OCV percentage table	RW	62H
DF	OCV percentage table	RW	63H
E0	Battery maximum capacity	RW	00H
E1	Battery maximum capacity	RW	00H
E2	Coulomb meter counter	RW	00H
E3	Coulomb meter counter	RW	00H
E4	OCV Percentage of battery capacity	R	64H
E5	Coulombmeter percentage of battery capacity	R	64H
E6	Battery capacity percentage warning level	RW	A0H
E7	OCV_SOC curve setting	RW	0FH
E8	Fuel gauge tuning control 0	RW	00H
E9	Fuel gauge tuning control 1	RW	00H
EA	Fuel gauge tuning control 2	RW	00H
EB	Fuel gauge tuning control 3	RW	00H
EC	Fuel gauge tuning control 4	RW	00H
ED	Fuel gauge tuning control 5	RW	00H
EE	Fuel gauge tuning control 6	RW	01H
EF	Fuel gauge tuning control 7	RW	00H

7.14.2 Register Description

REG 00H: BMU status1

Reset: power on reset

地址	描述	读/写	默认
CC	OCV百分比表	读/写	1DH
CD	OCV百分比表	读/写	23H
CE	OCV百分比表	读/写	29H
CF	OCV百分比表	读/写	2FH
D0	OCV百分比表	读/写	34H
D1	OCV百分比表	读/写	38H
D2	OCV百分比表	读/写	3FH
D3	OCV百分比表	读/写	46H
D4	OCV百分比表	读/写	4CH
D5	OCV百分比表	读/写	4FH
D6	OCV百分比表	读/写	52H
D7	OCV百分比表	读/写	55H
D8	OCV百分比表	读/写	57H
D9	OCV百分比表	读/写	59H
DA	OCV百分比表	读/写	5BH
DB	OCV百分比表	读/写	5DH
DC	OCV百分比表	读/写	5FH
DD	OCV百分比表	读/写	61H
DE	OCV百分比表	读/写	62H
DF	OCV百分比表	读/写	63H
E0	电池最大容量	读/写	00H
E1	电池最大容量	读/写	00H
E2	库仑计计数器	读/写	00H
E3	库仑计计数器	读/写	00H
E4	电池容量的OCV百分比	读	64H
E5	库仑计电池容量的百分比	读	64H
E6	电池容量百分比警告级别	读/写	A0H
E7	OCV_SOC曲线设置	读/写	0FH
E8	燃料计调节控制 0	读/写	00H
E9	燃料计调节控制 1	读/写	00H
EA	燃料计调节控制 2	读/写	00H
EB	燃料计调节控制 3	读/写	00H
EC	燃料计调节控制 4	读/写	00H
ED	燃料计调节控制 5	读/写	00H
EE	燃料计调节控制 6	读/写	01H
EF	燃料计调节控制 7	读/写	00H

7.14.2寄存器描述

REG00H:BMU状态1

复位:上电复位

Bit	Description	R/W
7-5	Reserved	R
4-2	Charging status 000: not charging 001: tri_charge 010: pre_charge 011: fast charging 100: constant voltage(CV) 101: charge termination done others: not used	R
1	VBUS good status(VBUS_GD) 0: not power good 1: power good	R
0	BATFET status 0: BATFET is off state 1: BATFET is on state	R

REG 01H: BMU status2

Reset： Power on reset

Bit	Description	R/W
7-5	USB BC1.2 Detection result 000 : Reserved 001 : SDP 010 : CDP 011 : DCP 100 : ACA – Dock 101 : ACA-A 110 : ACA-B 111 : ACA-C	R
4-0	RID detection result Bit [4] = 1 : rid is float Bit [3] = 1 : rid is Rgnd Bit [2] = 1 : rid is Ra Bit [1] = 1 : rid is Rb Bit [0] = 1 : rid is Rc	R

REG 02H: BMU status3

Reset: Power on reset

Bit	Description	R/W
7	VINDPM status 0: not in VINDPM 1: VINDPM	R
6	IINLIM status 0: Not in current limit	R

位	描述	读/写
7-5	保留	读
4-2	充电状态 000:未充电 001:三重充电 010:预充电 011:快速充电 100:恒压充电(CV) 101:充电终止完成 其他:未使用	读
1	VBUS良好状态(VBUS_GD) 0:未供电良好 1:供电良好	读
0	BATFET状态 0:BATFET处于关闭状态 1:BATFET处于开启状态	读

REG01H:BMU状态2

复位：上电复位

位	描述	读/写
7-5	USBBC1.2检测结果 000:保留 001 : SDP 010 : CDP 011 : DCP 100 : ACA – Dock 101 : ACA-A 110 : ACA-B 111 : ACA-C	读
4-0	RID检测结果 位[4]= 1 : rid为浮动 位[3]= 1 : rid为Rgnd 位[2]= 1 : rid为Ra 位[1]= 1 : rid为Rb 位[0]= 1 : rid为Rc	读

REG02H:BMU状态3

复位:上电复位

位	描述	读/写
7	VINDPM状态 0:不在VINDPM 1: VINDPM	读
6	IINLIM状态 0:不在电流限制	读

	1: In current limit	
5	charge system voltage status 0: Not over voltage 1: over voltage	R
4	battery detection result valid status : 0: Battery detection result is invalid; 1: Battery detection result is valid.	R
3	battery detection result: 0: Battery is absent; 1: Battery is present.	R
2	thermal regulation status 0: Normal 1: In thermal regulation	R
1	VBUS good status (indicate whether VBUS attached or not). 0: Not VBUS attached 1: VBUS attached	R
0	Battery current direction 0: Discharging 1: Charging	R

REG 04H: BMU status4

Reset: Power on reset

Bit	Description	R/W
7	Watchdog fault status 0: Normal 1: Watchdog timer expiration	R
6	Boost mode fault status 0: Normal 1: VBUS overload in OTG, or VBUS OVP, or battery is too low in boost mode	R
5-4	Charge fault status 00: Normal 01: Input fault(VBUS>VACOV or VBAT<VBUS<VBUSMIN(typical 3.8V) 10: Thermal shutdown 11: Charge safety timer expiration	R
3	Battery fault status(OVP) 0: Normal 1: BATOVP(VBAT>VBATOVP)	R
2-0	NTC fault status buck mode: 000: Normal 001: TS cold 010: TS hot boost mode: 000: Normal	R

	1:输入电流限制	
5	充电系统电压状态 0:没有过电压 1:过电压	读
4	电池检测结果有效状态: 0:电池检测结果无效; 1:电池检测结果有效.	读
3	电池检测结果: 0:电池缺失; 1:电池存在.	读
2	热管理状态 0:正常 1:在热管理中	读
1	VBUS良好状态（指示VBUS是否连接）。 0:未连接VBUS 1:已连接VBUS	读
0	电池电流方向 0:放电 1:充电	读

REG04H:BMU状态4

复位:上电复位

位	描述	读/写
7	看门狗故障状态 0:正常 1:看门狗定时器过期	读
6	升压模式故障状态 0:正常 1:OTG中的VBUS过载，或VBUS过压，或电池在升压模式下过低	读
5-4	充电故障状态 00:正常 01:输入故障(VBUS>VACOV或VBAT<VBUS<VBUSMIN（典型值3.8V） 10:热关断 11:充电安全定时器过期	读
3	电池故障状态(过压) 0:正常 1:电池过压(VBAT>VBATOVP)	读
2-0	NTC故障状态 降压模式: 000:正常 001:温度过低 010:温度过高 升压模式: 000:正常	读

	101: TS cold 110: TS hot	

REG 05H: BMU status5

Reset: Power on reset

Bit	Description	R/W
7	PMIC have calibrated the OCV-percentage curve 0: have not calibrated 1: have calibrated	R
6	PMIC have calibrated the total battery capacity 0: have not calibrated 1: have calibrated	R
5-0	Reserved	R

REG 06H: System power on/off source indication

Reset: Power on reset

Bit	Description	R/W
7	System power on from VBUS insertion status indication. 0: Negative 1: Active	R
6	System power on from Battery insertion status indication 0: Negative 1: Active	R
5	System power on from Battery charge to normal status indication 0: Negative 1: Active	R
4	System power on from IRQ pin status indication 0: Negative 1: Active	R
3	Reserved	R
2	System power off from watch dog timeout status indication 0: Negative 1: Active	R/W
1	Reserved	R
0	System power off from software status indication 0: Negative 1: Active	R/W

REG 10H: BATFET & input current limit control

Default: 48H

Reset: power on reset

Bit	Description	R/W	Default
7	Force BATFET off to enable ship mode 0: allow BATFET turn on	RW	0

	101:温度过低 110:温度过高	

REG05H:BMU状态5

复位:上电复位

位	描述	读/写
7	PMIC已校准OCV-百分比曲线 0:未校准 1:已校准	读
6	PMIC已校准总电池容量 0:未校准 1:已校准	读
5-0	保留	读

REG06H:系统上电/关机源指示

复位:上电复位

位	描述	读/写
7	系统上电来自VBUS插入状态指示。 0:负 1:激活	读
6	系统上电来自电池插入状态指示 0:负 1:激活	读
5	系统上电来自电池充电到正常状态指示 0:负 1:激活	读
4	系统上电来自IRQ引脚状态指示 0:负 1:激活	读
3	保留	读
2	系统关机来自看门狗超时状态指示 0:负 1:激活	读/写
1	保留	读
0	系统关机来自软件状态指示 0:负 1:激活	读/写

REG10H:电池FET和输入电流限制控制

默认:48H

复位:上电复位

位	描述	读/写	默认
7	强制电池FET关闭以启用船舶模式 0:允许电池FET开启	读/写	0

	1: force BATFET off		
6	Reserved	R	1
5-0	Input current limit(I_{INLIM}) offset: 100mA range:100mA(000000)--3.25A(111111) default:001000(500mA) step:50mA IINLIM bits are changed automatically after input source type detection is completed USB Host SDP & OTG=Hi(USB500)=500mA USB Host SDP & OTG=Lo(USB100)=100mA USB CDP/DCP=1.5A USB Type-C Current@3.0A = 3.0A USB Type-C Current@1.5A = 1.5A Others=1.5A	RW	001000

REG 11H: BATFET & RBFET & input voltage limit control

Default: 06H

Reset: bit[6]&[4] are system reset, others are power on reset

Bit	Description	R/W	Default
7	Set BATFET to forced on state. 0: allow BATFE to turn off. 1: force BATFE on.	RW	0
6	Set RBFET to forced on state in OTG mode 0: RBFET at off state, used for power bank 1: RBFET at on state, used for type-C VBUS power output	RW	0
5	Adjust VBUS over-voltage threshold setting(manual setting for apple adapter) 0: VBUS_OV=6.4V 1: VBUS_OV=6.8V	RW	0
4	OTG path can be selected or not: 0: OTG path can not be selected by software. 1: OTG path can be selected whatever, disable VBUS path.	RW	0
3-0	VINDPM threshold offset: 3.88V range: 3.88V(0000)--5.08V(1111) default: 4.36V(0110) step: 80mV	RW	0110

REG 12H: Boost & minimum system voltage control

Default: 2DH

Reset: bit[3] is power on reset, others are system reset

Bit	Description	R/W	Default
7	Boost(OTG)mode configuration(BOOST_EN)	RW	0

	1:强制电池FET关闭		
6	保留	读	1
5-0	输入电流限制(I INLIM) 偏移:100mA 范围:100mA(000000)--3.25A(111111) 默认:001000(500mA) 步长:50mA IINLIM位在输入源类型检测完成后自动更改 USBHostSDP&OTG=高(USB500)=500mA USBHostSDP&OTG=低(USB100)=100mA USB CDP/DCP=1.5A USB Type-C Current@3.0A = 3.0A USB Type-C Current@1.5A = 1.5A 其他=1.5A	读/写	001000

REG11H:BATFET&RBFET&输入电压限制控制

默认:06H

复位:位[6]&[4]为系统复位，其他为上电复位

位	描述	读/写	默认
7	将BATFET设置为强制开启状态。 0:允许BATFET关闭。 1:强制BATFET开启。	读/写	0
6	在OTG模式下将RBFET设置为强制开启状态 0:RBFET为关闭状态，用于移动电源 1:RBFET为开启状态，用于Type-C VBUS电源输出	读/写	0
5	调整VBUS过电压阈值设置（苹果适配器的手动设置）0:VBUS_OV=6.4V 1: VBUS_OV=6.8V	读/写	0
4	OTG路径是否可以选择： 0:OTG路径不能通过软件选择。 1:OTG路径可以选择，无论如何，禁用VBUS路径。	读/写	0
3-0	VINDPM阈值偏移 ：3.88V 范围：3.88V(0000)--5.08V(1111) 默认：4.36V(0110) 步长：80mV	读/写	0110

REG12H：升压和最小系统电压控制

默认：2DH

复位：位[3]是上电复位，其他是系统复位

位	描述	读/写	默认
7	升压（OTG）模式配置（BOOST_EN）	读/写	0

	0: OTG disable 1: OTG enable		
6	Reserved	R	0
5	Whether disable boost or not when VOUT is over voltage in boost mode. 0: Not disable boost mode 1: Disable boost mode	RW	1
4	Whether disable boost or not when VOUT is over current in boost mode. 0: Not disable boost mode 1: Disable boost mode	RW	0
3	The output voltage when RBFET is working in LDO mode. 0: 5.2V 1: 5.5V		1
2-0	minimum system voltage limit(VSYS_min) offset: 3.0V range: 3.0V--3.7V default: 3.5V step: 0.1V	RW	101

REG 13H: Boost voltage & RBFET current limit control

Default: 94H

Reset: bit[3-2] are power on reset, others are system reset

Bit	Description	R/W	Default
7-4	Boost mode voltage regulation(low voltage range) offset: 4.55V range: 4.55V--5.51V default: 5.126V step: 64mV	RW	1001
3-2	Boost mode disable threshold(Vbat_low) 00: 2.4V 01: 2.6V 10: 2.8V 11: 3.0V	RW	01
1-0	RBFET current limit in BOOST mode. 00: 500mA 01: 900mA 10:1500mA 11: Disable current limit	RW	00

REG 14H: WATCHDOG timer setting & register reset & system status

Default: 00H

Reset: bit[3-0] are power on reset, others are system reset

Bit	Description	R/W	Default
7	Watchdog timer reset 0: normal	RW	0

	0:禁用OTG 1:启用OTG		
6	保留	读	0
5	当VOUT在升压模式下过电压时，是否禁用升压。 0:不禁用升压模式 1:禁用升压模式	读/写	1
4	当VOUT在升压模式下过流时，是否禁用升压。 0:不禁用升压模式 1:禁用升压模式	读/写	0
3	RBFET在LDO模式下工作时的输出电压。 0: 5.2V 1: 5.5V		1
2-0	最低系统电压限制（VSYS_min） 偏移:3.0V 范围:3.0V--3.7V 默认:3.5V 步进:0.1V	读/写	101

REG13H:升压电压&RBFET电流限制控制

默认:94H

复位:位[3-2]为上电复位，其他为系统复位

位	描述	读/写	默认
7-4	升压模式电压调节（低电压范围） 偏移:4.55V 范围:4.55V--5.51V 默认:5.126V 步进:64mV	读/写	1001
3-2	升压模式禁用阈值（Vbat_low） 00: 2.4V 01: 2.6V 10: 2.8V 11: 3.0V	读/写	01
1-0	在升压模式下的RBFET电流限制。 00: 500mA 01: 900mA 10:1500mA 11:禁用电流限制	读/写	00

REG14H:看门狗时间设置&寄存器复位&系统状态

默认:00H

复位:位[3-0]为上电复位，其他为系统复位

位	描述	读/写	默认
7	看门狗定时器复位 0:正常	读/写	0

	1: reset(back to 0 after timer reset)		
6-4	Watchdog timer setting 000: disable watchdog timer 001: 1s 010: 2s 011: 4s 100: 8s 101: 40 110: 80s	RW	000
3	Register reset 0: keep current register setting 1: reset to default register value and reset safety timer note: the bit will reset to 0 after register reset is completed	RW	0
2-1	Reserved		
0	System status indication: 0: System is power off. 1: System is power on.	R	0

REG 15H: POK setting

Default: 69H

Reset: power on reset

Bit	Description	R/W	Default
7-6	IRQLEVEL setting 00 : 1s 01 : 1.5s 10 : 2s 11 : 2.5s	RW	01
5-4	PORELVEL setting 00 : 4s 01 : 8s 10 : 12s 11 : 16s	RW	10
3-2	ONLEVEL setting 00: 128ms 01 : 512ms 10 : 1s 11 : 2s	RW	10
1-0	OFFLEVEL setting 00 : 4.5s 01 : 6.5s 10 : 8.5s 11 : 10.5s	RW	01

	1:复位（在定时器复位后返回0）		
6-4	看门狗定时器设置 000:禁用看门狗定时器 001:1秒 010:2秒 011:4秒 100:8秒 101: 40 110:80秒	读/写	000
3	寄存器复位 0:保持当前寄存器设置 1:重置为默认寄存器值并重置安全定时器 注意:该位将在寄存器复位完成后重置为0	读/写	0
2-1	保留		
0	系统状态指示: 0:系统已关闭。 1:系统已开启。	读	0

REG15H:POK设置

默认:6　9

H复位：上电复位位

	描述	读/写	默认
7-6	中断级别设置 00:1秒 01:1.5秒 10：2秒 11：2.5秒	读/写	01
5-4	电源级别设置 00:4秒 01:8秒 10:12秒 11：16秒	读/写	10
3-2	开启级别设置 00:128毫秒 01:512毫秒 10:1秒 11：2秒	读/写	10
1-0	关闭级别设置 00:4.5秒 01:6.5秒 10:8.5秒 11：10.5秒	读/写	01

REG 16H: System power on/off control1

Default: 10H

Reset: power on reset

Bit	Description	R/W	Default
7-6	PWRON output type setting: 00: Pull down for ONLEVEL 01:Special sequence 10: High/Low level(inhibit PWRON input function),active level depend on REG16[2]. 11: Inhibit output function	RW	00
5-4	Delay time to turn off BATFET through BATET_DIS function 00:0ms 01:8ms 10:16ms 11:32ms	RW	01
3	Reserved	R	0
2	Active level when PWRON is set as high/low level output: 0: Low level active 1: High level active	RW	0
1	Reserved	R	0
0	System power off clear the IRQ signal enable 0: Does not clear the IRQ signal 1: Clear the IRQ signal	RW	0

REG 17H: System power on/off control2

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	VBUS insertion send power on signal enable: 0: Does not send power on signal 1: Send power on signal	RW	0
6	Battery insertion send power on signal enable: 0: Does not send power on signal 1: Send power on signal	RW	0
5	Battery charge to normal send power on signal enable: 0: Does not send power on signal 1: Send power on signal	RW	0
4	IRQ pin low level send power on signal enable 0: Do not send power on signal 1: Send power on signal	RW	0
3	Reserved	R	0
2	Watch dog time out send power off signal enable 0: Does not send power off signal 1: Send power off signal	RW	0

REG16H:系统上电/关控制1

默认:10H

重置:上电复位

位	描述	读/写	默认
7-6	上电输出类型设置: 00:下拉以获得ONLEVEL 01:特殊序列 10: 高/低电平（禁止PWRON输入功能），有效电平取决于REG16[2]。 11:禁止输出功能	读写 00	
5-4	通过BATET_DIS功能关闭BATFET的延迟时间 00:0毫秒 01:8毫秒 10:16毫秒 11:32毫秒	读写 01	
3	保留	读	0
2	当PWRON设置为高/低电平输出时的有效电平： 0:低电平有效 1:高电平有效	读/写	0
1	保留	读	0
0	系统断电清除IRQ信号使能 0:不清除IRQ信号 1:清除IRQ信号	读/写	0

REG17H:系统上电/断电控制2

默认:00H

复位:上电复位

位	描述	读/写	默认
7	VBUS插入发送上电信号使能： 0:不发送上电信号 1:发送上电信号	读/写	0
6	电池插入发送上电信号使能: 0:不发送上电信号 1:发送上电信号	读/写	0
5	电池充电到正常发送上电信号使能: 0:不发送上电信号 1:发送上电信号	读/写	0
4	IRQ引脚低电平发送上电信号使能 0:不发送上电信号 1:发送上电信号	读/写	0
3	保留	读	0
2	看门狗超时发送断电信号使能 0:不发送断电信号 1:发送断电信号	读/写	0

1	Reserved	R	0
0	Software send power off signal enable 0: Does not send power off signal 1: Send power off signal, then clear itself automatically.	RW	0

REG 18H: Thermal regulation threshold setting

Default: 89H

Reset: power on reset

Bit	Description	R/W	Default
7-6	Thermal regulation threshold 00: 60deg 01: 80deg 10: 100deg 11: 120deg	RW	10
5-0	Reserved	R	001001

REG 20H: BC1.2 detection control1

Default: 20H

Reset: power on reset

Bit	Description	R/W	Default
7	DCD Detection enable during BC detect. 0 : disable 1 : enable	RW	0
6-5	DCD Detection time setting when DCD function enable 00 : 100ms 01 : 300ms 10 : 500ms 11 : 900ms	RW	01
4	The D- VLGC Compare enable during the BC Detect in primary detection 0 : disable 1 : enable	RW	0
3	The BC stays in dead battery status timeout enable when the battery voltage below the dead threshold. 0 : disable 1 : enable Note : the time is 45 min	RW	0
2	BC detection status indication 0 : detect finish 1 : in detecting	R	0
1-0	Reserved	R	0

REG 21H: BC1.2 detection control2

Default: 20H

Reset: power on reset

1	保留	读	0
0	软件发送断电信号使能 0:不发送断电信号 1:发送断电信号，然后自动清除自身。	读/写	0

REG18H:热调节阈值设置

默认:89H

复位:上电复位

位	描述	读/写	默认
7-6	热调节阈值 00:60度 01:80度 10:100度 11:120度	读写 10	
5-0	保留	读	001001

REG20H:BC1.2检测控制1

默认:20H

复位:上电复位

位	描述	读/写	默认
7	在BC检测期间启用DCD检测。 0 : 禁用 1 : 启用	读/写	0
6-5	当DCD功能启用时DCD检测时间设置 00:100毫秒 01:300毫秒 10:500毫秒 11:900毫秒	读写 01	
4	在主检测期间启用D-VLGC比较 0 :禁用 1 : 启用	读/写	0
3	当电池电压低于死电阈值时，BC保持在死电池状态超时启用。 0 :禁用 1 : 启用 注意：时间为45分钟	读/写	0
2	BC检测状态指示 0 :检测完成 1 : 正在检测	读	0
1-0	保留	读	0

REG21H:BC1.2检测控制2

默认:20H

复位:上电复位

Bit	Description	R/W	Default
7-6	Reserved	R	0
5	DP/DM floating Detection enable when BC detection is not DCP and CDP. 0 : disable 1 : enable	RW	1
4-0	Reserved	R	0

REG 22H: BC1.2 detection control3

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Reserved	R	0
6	Dead Battery detection enable. 0 : disable 1 : enable. Note : if the battery is not connect, this function will disable.	RW	0
5	Reserved	R	0
4	The control bit for pull up the DP to 0.6V when detection result is DCP 0 : disable 1 : enable	RW	0
3	The detection result can be change when the rid is change after the bc detect finish. 0 : disable 1 : enable	RW	0
2	Reserved	R	0
1	Control bit for CC clock 0 : disable 1 : enable	RW	0
0	Reserved	R	0

REG 23H: DPDM & OTG & CC enable control

Default: 70H

Reset: power on reset

Bit	Description	R/W	Default
7	Force D+/D- detection 0: Not in D+/D- 1: Force D+/D- detection Note : This bit will clear itself.	RW	0
6	automatic D+/D- detection enable(AUTO_DPDM_EN) 0: disable D+/D- when VBUS is plugged-in 1: enable D+/D- when VBUS is plugged-in	RW	1
5	Automatic enable boost and RBFET control: 0: Disable auto control 1: Enable auto control	RW	1

位	描述	读/写	默认
7-6	保留	读	0
5	当BC检测不是DCP和CDP时启用DP/DM浮动检测。 0 : 禁用 1 : 启用	读/写	1
4-0	保留	读	0

REG22H:BC1.2检测控制3

默认:00H

复位:上电复位

位	描述	读/写	默认
7	保留	读	0
6	启用死电池检测。 0 :禁用 1 : 启用。 注意：如果电池未连接，此功能将禁用。	读/写	0
5	保留	读	0
4	当检测结果为DCP时，控制位用于将DP拉高至0.6V 0 :禁用 1 : 启用	读/写	0
3	当RID在bc detectfinish之后改变时，检测结果可能会改变。 0 :禁用 1 : 启用	读/写	0
2	保留	读	0
1	控制位用于CC时钟 0 :禁用 1 : 启用	读/写	0
0	保留	读	0

REG23H:DPDM&OTG&CC使能控制

默认:70H

复位:上电复位

位	描述	读/写	默认
7	强制D+/D-检测 0:不在D+/D- 1:强制D+/D-检测 注意:此位将自清除。	读/写	0
6	自动D+/D-检测使能(AUTO_DPDM_EN) 0:当VBUS插入时禁用D+/D- 1:当VBUS插入时启用D+/D-	读/写	1
5	自动启用升压和RBFET控制: 0:禁用自动控制 1:启用自动控制	读/写	1

4	automatic CC PIN detection enable(AUTO_CC_EN) 0: disable CC PIN detection when VBUS is plugged-in 1: enable CC PIN detection when VBUS is plugged-in(default)	RW	1
3-0	Reserved	R	0

REG 31H: CC_GLOBAL_CTRL

Default: 09H

Reset: power on reset

Bit	Description	R/W	Default
7-6	Reserved	R	0
5	Audio Accessory Enable. 0: disable 1: enable	RW	0
4	Reserved	RW	0
3	The Configuration Reset for CC Logic. 0: reset 1: disable	RW	1
2-0	Reserved	R	001

REG 33H:CC_MODE_CTRL

Default: 11H

Reset: power on reset

Bit	Description	R/W	Default
7	Reserved	R	0
6	The Current mode of UFP support 0: UFP support current mode of def/1.5A/3.0A 1: UFP only support current mode of def	RW	0
5	DRP port prefer to be SRC. 0: unactive 1: active	RW	0
4	DRP port prefer to be SNK. 0: unactive 1: active	RW	1
3-2	The Current Mode Control. 0x: Default Mode 10: 1.5A Mode 11: 3.0A Mode	RW	00
1-0	The Port Mode Control. 00: Disable 01: SINK 10: SOURCE 11: DRP	RW	01

4	自动CCPIN检测使能(AUTO_CC_EN) 0:当VBUS插入时禁用CCPIN检测 1:当VBUS插入时启用CCPIN检测(默认)	读/写	1
3-0	保留	读	0

REG 31H: CC_GLOBAL_CTRL

默认:09H

复位:上电复位

位	描述	读/写	默认
7-6	保留	读	0
5	音频配件启用。 0:禁用 1:启用	读/写	0
4	保留	读/写	0
3	CC逻辑的配置重置。 0:重置 1:禁用	读/写	1
2-0	保留	读	001

REG 33H:CC_MODE_CTRL

默认:11H

重置:上电复位

位	描述	读/写	默认
7	保留	读	0
6	UFP支持的当前模式 0:UFP支持默认电流模式/1.5A/3.0A 1:仅支持UFP的电流模式	读/写	0
5	DRP端口偏好为SRC。 0:未激活 1:激活	读/写	0
4	DRP端口偏好为SNK。 0:未激活 1:激活	读/写	1
3-2	当前模式控制。 0x:默认模式 10:1.5A模式 11:3.0A模式	读/写	00
1-0	端口模式控制。 00:禁用 01:接收 10:源 11:双向	读/写	01

REG 34H: CC_TOGGLE_CTRL

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-1	Reserved	R	0
0	Toggle Function Enable 0: disable 1: enable	RW	0

REG 37H: CC_Status0

Default: 00H

Reset: power on reset

Bit	Description	R/W
7-6	Reserved	R
5-4	The Power State of Source of CC Logic in HW mode 00: POWER IDLE 01: POWER_DEF 10: POWER_1P5A 11: POWER_3P0A	R
3-0	The State of CC Logic in HW mode 0000: DISABLE 0001: UNATTACH_SNK 0010: ATTACHWAIT_SNK 0011: ATTACH_SNK 0100: UNATTACH_SRC 0101: ATTACHWAIT 0110: ATTACH_SRC 0111: AUDIO_ACSY 1000: Reserved 1001: TRY_SRC 1010: TRYWAIT_SNK 1011: TRY_SNK 1100: TRYWAIT_SRC 1101: Reserved 1110: ERROR_RECOVERY 1111: Reserved	R

REG 3AH: CC_Status1

Default: 00H

Reset: power on reset

Bit	Description	R/W
7	Reserved	R
6	Awake Mode Status in HW mode 0: SINK or DRP in SINK	R

REG 34H: CC_TOGGLE_CTRL

默认:00H

复位:上电复位

位	描述	读/写	默认
7-1	保留	读	0
0	切换功能启用 0:禁用 1:启用	读/写	0

REG 37H: CC_Status0

默认:00H

复位:上电复位

位	描述	读/写
7-6	保留	读
5-4	CC逻辑在硬件模式下的源电源状态 00:电源空闲 01:电源定义 10:电源1.5A 11:电源3.0A	读
3-0	CC逻辑在硬件模式下的状态 0000:禁用 0001:未连接接收 0010:等待连接接收 0011:连接接收 0100:未连接源 0101:等待连接 0110:连接源 0111:音频交流 1000:保留 1001:尝试源 1010:等待接收 1011:尝试接收 1100:等待源 1101:保留 1110:错误恢复 1111:保留	读

REG 3AH: CC_Status1

默认:00H

复位:上电复位

位	描述	读/写
7	保留	读
6	硬件模式下的唤醒模式状态 0:接收或DRP为接收	读

	1: SOURCE or DRP in SOURCE	
5	Awake Finish Flag in HW mode 0: unactive 1: active	R
4-0	Reserved	R

REG 3EH: Interface mode select

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Interface mode select 8'H7C : select RSB Others : select TWSI	RW	00H

REG 40H: IRQ Enable1

Default: 06H

Reset: power on reset

Bit	Description	R/W	Default
7	Battery capacity percentage drop to warning level2 IRQ(WL2IRQ) enable	RW	0
6	Battery capacity percentage drop to warning level1 IRQ(WL1IRQ) enable	RW	0
5	Battery capacity percentage change IRQ enable	RW	0
4	Gauge calculation complete IRQ enable	RW	0
3	battery detection complete IRQ enable	RW	0
2	Boost mode over voltage protection IRQ enable	RW	1
1	Boost mode over current protection IRQ enable	RW	1
0	Reserved	RW	0

REG 41H: IRQ Enable2

Default: FFH

Reset: power on reset

Bit	Description	R/W	Default
7	Battery over temperature in charge mode IRQ (BCOTIRQ) enable	RW	1
6	Quit Battery over temperature in charge mode IRQ (QBCOTIRQ) enable	RW	1
5	Battery under temperature in charge mode IRQ (BCUTIRQ) enable	RW	1
4	Quit Battery under temperature in charge mode IRQ (QBCUTIRQ) enable	RW	1
3	Battery over temperature in work mode IRQ (BWOTIRQ) enable	RW	1
2	Quit Battery over temperature in work mode IRQ (QBWOTIRQ) enable	RW	1
1	Battery under temperature in work mode IRQ (BWUTIRQ) enable	RW	1
0	Quit Battery under temperature in work mode IRQ (QBWUTIRQ) enable	RW	1

REG 42H: IRQ Enable3

Default: FFH

Reset: power on reset

	1:源或DRP为源	
5	硬件模式下的唤醒完成标志 0:未激活 1:激活	读
4-0	保留	读

REG3EH:接口模式选择

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	接口模式选择 8'H7C :选择RSB 其他:选择TWSI	读/写	0小时

REG40H:IRQ使能1

默认:06H

复位:上电复位

位	描述	读/写	默认
7	电池容量百分比下降到警告级别2中断请求(WL2IRQ)使能	读/写	0
6	电池容量百分比下降到警告级别1中断请求(WL1IRQ)使能	读/写	0
5	电池容量百分比变化中断请求使能	读/写	0
4	电量计算完成中断请求使能	读/写	0
3	电池检测完成中断请求使能	读/写	0
2	升压模式过电压保护中断请求使能	读/写	1
1	升压模式过电流保护中断请求使能	读/写	1
0	保留	读/写	0

REG41H:中断请求使能2

默认:FFH

复位:上电复位

位	描述	读/写	默认
7	充电模式下电池过温中断请求(BCOTIRQ)使能	读/写	1
6	退出充电模式下电池过温中断请求(QBCOTIRQ)使能	读/写	1
5	充电模式下电池欠温中断请求(BCUTIRQ)使能	读/写	1
4	退出充电模式下电池欠温中断请求(QBCUTIRQ)使能	读/写	1
3	工作模式下电池过温中断请求(BWOTIRQ)使能	读/写	1
2	退出工作模式下电池过温中断请求(QBWOTIRQ)使能	读/写	1
1	工作模式下电池欠温中断请求(BWUTIRQ)使能	读/写	1
0	退出工作模式下电池欠温中断请求(QBWUTIRQ)使能	读/写	1

REG42H:中断请求使能3

默认:FFH

复位:上电复位

Bit	Description	R/W	Default
7	VBUS insertion IRQ enable	RW	1
6	VBUS removal IRQ enable	RW	1
5	Battery insertion IRQ enable	RW	1
4	Battery removal IRQ enable	RW	1
3	Dead/Weak Battery charge to normal IRQ enable(The voltage threshold is as same as VSYS_min)	RW	1
2	Die over temperature IRQ enable	RW	1
1	Charger safety timer1/2 timeout and battery enters safe mode IRQ enable	RW	1
0	VBUS over voltage protection IRQ enable	RW	1

REG 43H: IRQ Enable4

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	PWRON short press IRQ enable(PWRON push down longer than 32ms, and less than IRQLEVEL)	RW	0
6	PRWON long press IRQ enable(PWRON push down longer than IRQLEVEL, and less than Power-on-reset time)	RW	0
5	PWRON negative edge IRQ enable(PWRON from high go low)	RW	0
4	PWRON positive edge IRQ enable(PWRON from low go high)	RW	0
3	GPADC over temperature IRQ enable	RW	0
2	Quit GPADC over temperature IRQ enable	RW	0
1	GPADC under temperature IRQ enable	RW	0
0	Quit GPADC under temperature IRQ enable	RW	0

REG 44H: IRQ Enable5

Default: F4H

Reset: power on reset

Bit	Description	R/W	Default
7	Charger begin charging IRQ enable	RW	1
6	Battery charge done IRQ enable	RW	1
5	BC1.2 detect finished IRQ enable	RW	1
4	BC1.2 detect result change IRQ enable	RW	1
3	RID detect result change IRQ enable	RW	0
2	BAT over voltage protection IRQ enable	RW	1
1-0	Reserved	R	0

REG 45H: IRQ Enable6

Default: C6H

Reset: power on reset

Bit	Description	R/W	Default
7	Type-C device removed (unattached) IRQ enable	RW	1

位	描述	读/写	默认
7	VBUS插入中断请求使能	读/写	1
6	VBUS移除中断请求使能	读/写	1
5	电池插入中断请求使能	读/写	1
4	电池移除中断请求使能	读/写	1
3	死/弱电池充电至正常中断请求使能(电压阈值与VSYS_min相同)	读/写	1
2	芯片过温中断请求使能	读/写	1
1	充电器安全定时器1/2超时并且电池进入安全模式中断请求使能	读/写	1
0	VBUS过电压保护中断请求使能	读/写	1

REG43H:中断请求使能4

默认:00H

复位:上电复位

位	描述	读/写	默认
7	PWRON短按中断请求使能（PWRON按下超过32毫秒，且少于中断请求电平）	读/写	0
6	PWRON长按中断请求使能（PWRON按下超过中断请求电平，且少于上电复位时间）	读/写	0
5	PWRON负边缘中断请求使能（PWRON从高到低）	读/写	0
4	PWRON正边缘中断请求使能（PWRON从低到高）	读/写	0
3	通用ADC过温中断请求使能	读/写	0
2	退出通用ADC过温中断请求使能	读/写	0
1	通用ADC欠温中断请求使能	读/写	0
0	退出通用ADC欠温中断请求使能	读/写	0

REG44H:中断请求使能5

默认:F4H

复位:上电复位

位	描述	读/写	默认
7	充电器开始充电中断请求使能	读/写	1
6	电池充电完成中断请求使能	读/写	1
5	BC1.2检测完成中断请求使能	读/写	1
4	BC1.2检测结果变化中断请求使能	读/写	1
3	RID检测结果变化中断请求使能	读/写	0
2	电池过电压保护中断请求使能	读/写	1
1-0	保留	读	0

REG45H:中断使能6

默认:C6H

复位:上电复位

位	描述	读/写	默认
7	Type-C设备移除（未连接）中断请求使能	读/写	1

6	Type-C device insert and detection finished IRQ enable	RW	1
5-3	Reserved	R	000
2	Type-C error generated IRQ enable	RW	1
1	Type-C power state changed IRQ enable	RW	1
0	Reserved	R	0

REG 48H: IRQ Status1

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Battery capacity percentage drop to warning level2 IRQ(WL2IRQ) status. Writing 1 to this bit ,or percentage rise up the level2, or no battery connect will clear it.	RW	0
6	Battery capacity percentage drop to warning level1 IRQ(WL1IRQ) status. Writing 1 to this bit , or percentage rise up the level1, or no battery connect will clear it.	RW	0
5	Battery capacity percentage change IRQ status. Writing 1 to this bit, or no battery connect will clear it.	RW	0
4	Gauge calculation complete IRQ status. Writing 1 to this bit, or no battery connect, or Gauge disable will clear it.	RW	0
3	battery detection complete IRQ status. Writing 1 to this bit will clear it.	RW	0
2	Boost mode over voltage protection IRQ status. "1" is active, writing 1 to this bit will clear it.	RW	0
1	Boost mode over current protection IRQ status. "1" is active, writing 1 to this bit will clear it.	RW	0
0	Reserved	RW	0

REG 49H: IRQ Status2

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Battery over temperature in charge mode IRQ (BCOTIRQ) status. Writing 1 to this bit, or temperature go to normal will clear it.	RW	0
6	Quit Battery over temperature in charge mode IRQ (QBCOTIRQ) status. Writing 1 to this bit, or battery temperature rise to over temperature will clear it.	RW	0
5	Battery under temperature in charge mode IRQ (BCUTIRQ) status. Writing 1 to this bit, or temperature go to normal will clear it.	RW	0
4	Quit Battery under temperature in charge mode IRQ (QBCUTIRQ) status. Writing 1 to this bit, or battery temperature drop to under temperature will clear it.	RW	0
3	Battery over temperature in work mode IRQ (BWOTIRQ) status. Writing 1 to this bit, or temperature go to normal will clear it.	RW	0

6	Type-C设备插入和检测完成中断请求使能	读/写	1
5-3	保留	读	000
2	Type-C错误生成中断请求使能	读/写	1
1	Type-C电源状态改变中断请求使能	读/写	1
0	保留	读	0

REG48H:中断状态1

默认:00H

复位:上电复位

位	描述	读/写	默认
7	电池容量百分比下降到警告级别2中断（WL2IRQ）状态。 写入 1 此位，或百分比上升到级别2，或无电池连接 将清除它。	读写 0	
6	电池容量百分比下降到警告级别1中断（WL1IRQ）状态。 写入 1 此位，或百分比上升到级别1，或无电池连接 将清除它。	读写 0	
5	电池容量百分比变化中断请求状态。 写入 1 连接到此位，或无电池连接将清除它。	读写 0	
4	电量计算完成中断请求状态。 写入 1 连接到此位，或电量禁用将清除它。	读写 0	
3	电池检测完成中断请求状态。 写入 1 连接到此位将清除它。	读写 0	
2	升压模式过电压保护中断请求状态。 "1"是活动的，写入1到此位将清除它。	读写 0	
1	升压模式过流保护中断状态。 "1"是活动的，写入1到此位将清除它。	读写 0	
0	保留	读/写	0

REG49H:中断状态2

默认:00H

复位:上电复位

位	描述	读/写	默认
7	充电模式下电池过温中断(BCOTIRQ)状态。 写入 1 到此位，或温度恢复正常将清除它。	读写 0	
6	退出充电模式下电池过温中断(QBCOTIRQ)状态。 写入 1 到此位，或电池温度恢复到过温将清除它。 。	读写 0	
5	充电模式下电池欠温中断(BCUTIRQ)状态。 写入 1 到此位，或温度恢复正常将清除它。	读写 0	
4	退出充电模式下电池欠温中断(QBCUTIRQ)状态。 写入 1 写入此位，或电池温度下降到欠温将清除它。	读/写	0
3	工作模式下电池过温中断请求(BWOTIRQ)状态。 写入 1 到此位，或温度恢复正常将清除它。	读/写	0

2	Quit Battery over temperature in work mode IRQ (QBWOTIRQ) status. Writing 1 to this bit, or battery temperature rise to over temperature will clear it	RW	0
1	Battery under temperature in work mode IRQ (BWUTIRQ) status. Writing 1 to this bit, or temperature go to normal will clear it.	RW	0
0	Quit Battery under temperature in work mode IRQ (QBWUTIRQ) status. Writing 1 to this bit, or battery temperature drop to under temperature will clear it.	RW	0

REG 4AH: IRQ Status3

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	VBUS insertion IRQ status, Writing 1 to this bit , or VBUS Remove will clear it.	RW	0
6	VBUS removal IRQ status. Writing 1 to this bit, or VBUS insert will clear it.	RW	0
5	Battery insertion IRQ status. Writing 1 to this bit, or Battery remove will clear it.	RW	0
4	Battery removal IRQ status. Writing 1 to this bit, or Battery insert will clear it.	RW	0
3	Dead/Weak Battery charge to normal IRQ(The voltage threshold is as same as VSYS_min) status.Writing 1 to this bit, or no battery connect will clear it.	RW	0
2	Die over temperature IRQ status. Writing "1" , or the temperature drop to the normal will clear it.	RW	0
1	Charger safety timer1/2 timeout and battery enters safe mode IRQ status. Writing "1" will clear it.	RW	0
0	VBUS over voltage protection IRQ status. Writing "1" or VBUS turn to normal will clear it.	RW	0

REG 4BH: IRQ Status4

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	PWRON short press IRQ status. Writing 1 to this bit, or system shutdown will clear it	RW	0
6	PWRON long press IRQ status. Writing 1 to this bit, or system shutdown will clear it	RW	0
5	PWRON negative edge IRQ status. Writing 1 to this bit , or system shutdown will clear it.	RW	0
4	PWRON positive edge IRQ status. Writing 1 to this bit, or system shutdown , or QON negative will clear it.	RW	0
3	GPADC over temperature IRQ status. Writing 1 to this bit, or temperature go to normal will clear it.	RW	0
2	Quit GPADC over temperature IRQ status. Writing 1 to this bit, or Battery temperature rise to over temperature will clear it.	RW	0
1	GPADC under temperature IRQ status. Writing 1 to this bit, or temperature go	RW	0

2	退出工作模式下电池过温中断请求(QBWOTIRQ)状态。 写入此位，或电池温度重置为过温将清除它。	读/写	0
1	工作模式下电池欠温中断请求(BWUTIRQ)状态。 写入此位，或温度恢复正常将清除它。	读/写	0
0	退出工作模式下电池欠温中断请求(QBWUTIRQ)状态。 写入此位，或电池温度下降到欠温将清除它。	读/写	0

REG4AH:中断状态3

默认:00H

复位:上电复位

位	描述	读/写	默认
7	VBUS插入中断状态，写入此位，或VBUS移除将清除它。 读写		0
6	VBUS移除中断状态。写入此位，或VBUS插入将清除它。	读/写	0
5	电池插入中断请求状态。写入1到此位，或电池移除将清除它。	读/写	0
4	电池移除中断请求状态。写入 1到此位，或电池插入将清除它。 读写		0
3	电池电量不足/弱电池充电到正常中断请求（电压阈值与VSYS_min相同） 状态。写入1到此位，或无电池连接将清除它。	读/写	0
2	芯片过温中断请求状态。写入"1"，或温度恢复到正常将清除它。	读/写	0
1	充电器安全定时器1/2超时，电池进入安全模式中断请求状态。 写入"1"将清除它。	读/写	0
0	VBUS过电压保护中断请求状态。写入"1"或VBUS恢复到正常 将清除它。	读/写	0

REG4BH:中断请求状态4

默认:00H

复位:上电复位

位	描述	读/写	默认
7	短按PWRON中断请求状态。写入1到此位，或系统关机将清除它。	读/写	0
6	PWRON长按中断状态。写入1到此位，或系统关机将清除它	读/写	0
5	PWRON负边缘中断状态。写入1到此位，或系统关机 将清除它。	读/写	0
4	PWRON正边缘中断状态。写入1到此位，或系统关机，或 QON负将清除它。	读/写	0
3	通用ADC过温中断状态。写入1到此位，或温度恢复正常将清除它。	读/写	0
2	退出通用ADC过温中断状态。写入1到此位，或电池温度恢复到过温 将清除它。	读/写	0
1	通用ADC欠温中断状态。写入 1到此位，或温度恢复到正常		0

	to normal will clear it.		
0	Quit GPADC under temperature IRQ status. Writing 1 to this bit, or temperature drop to under temperature will clear it.	RW	0

REG 4CH: IRQ Status5

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Charger begin charging IRQ status. Writing 1 to this bit, or charger charge done, or charging stop will clear it.	RW	0
6	Battery charge done IRQ status. Writing 1 to this bit, or charger charging will clear it.	RW	0
5	BC1.2 detect finished IRQ status. Writing 1 to this bit , or VBUS remove , or bc1.2 detect again will clear it.	RW	0
4	BC1.2 detect result change IRQ status. Writing 1 to this bit , or VBUS remove will clear it.	RW	0
3	RID detect result change IRQ status. Writing 1 to this bit will clear it.	RW	0
2	BAT over voltage protection IRQ status. Writing "1" or VBAT turn to normal will clear it.	RW	0
1-0	Reserved	R	0

REG 4DH: IRQ Status6

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Type-C device removed (unattached) IRQ status. Writing 1 to this bit , or type C insert will clear it.	RW	0
6	Type-C device insert and detection finished IRQ status. Writing 1 to this bit , or type C remove will clear it.	RW	0
5-3	Reserved	R	0
2	Type-C error generated IRQ status. Writing 1 to this bit will clear it.	RW	0
1	Type-C power state changed IRQ status. Writing 1 to this bit will clear it.	RW	0
0	Reserved	R	0

REG 56H: BMU Internal temperature ADC data, high 8 bits

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	BMU Internal temperature ADC data high 8 bits	RW	0

REG 57H: BMU Internal temperature ADC data, low 4 bits

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default

	将清除它。		
0	退出通用ADC欠温中断状态。写入1到此位，或温度下降到欠温将清除它。	读/写	0

REG4CH:中断状态5

默认:00H

复位:上电复位

位	描述	读/写	默认
7	充电器开始充电中断状态。写入1到此位，或充电器充电完成，或充电停止将清除它。	读/写	0
6	电池充电完成中断请求状态。写入1到此位，或充电器充电将清除它。	读/写	0
5	BC1.2检测完成中断请求状态。写入1到此位，或VBUS移除，或再次检测bc1.2将清除它。	读/写	0
4	BC1.2检测结果变化中断请求状态。写入1到此位，或VBUS移除将清除它。	读/写	0
3	RID检测结果变化中断请求状态。写入1到此位将清除它。	读/写	0
2	电池过电压保护中断请求状态。写入"1"或VBAT恢复正常将清除它。	读/写	0
1-0	保留	读	0

REG4DH:中断请求状态6

默认:00H

复位:上电复位

位	描述	读/写	默认
7	Type-C设备移除（未连接）中断请求状态。写入1到此位，或Type-C插入将清除它。	读/写	0
6	Type-C设备插入并检测完成中断请求状态。写入1到此位，或Type-C移除将清除它。	读/写	0
5-3	保留	读	0
2	Type-C错误生成中断请求状态。写入1到此位将清除它。	读/写	0
1	Type-C电源状态改变中断状态。写入1到此位将清除它。	读/写	0
0	保留	读	0

REG56H:BMU内部温度ADC数据，高8位

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	BMU内部温度ADC数据高8位	读/写	0

REG57H:BMU内部温度ADC数据，低4位

默认:00H

复位:上电复位

位	描述	读/写	默认

7-0	BMU Internal temperature ADC data low 4 bits (Unit: 0.10625℃， temp=-267.7℃+0.10625℃*xxxH)	RW	0

REG 58H: Ts pin ADC data, high 8bits

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Ts pin ADC data high 8bits	RW	0

REG 59H: Ts pin ADC data, low 4 bits

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Ts pin ADC data low 4 bits (Unit: 0.8mV)	RW	0

REG 5AH: GPADC pin ADC data, high 8bits

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	GPADC pin ADC data high 8bits	RW	0

REG 5BH: GPADC pin ADC data, low 4 bits

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	GPADC pin ADC data low 4 bits (Unit: 0.8mV)	RW	0

REG 78H: Average data bit[11:4] for Battery voltage

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Average data bit[11:4] for Battery voltage	RW	0

REG 79H: Average data bit[3:0] for Battery voltage

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Average data bit[3:0] for Battery voltage (Unit: 1.2mV)	RW	0

REG 7AH: Average data bit[11:4] for Battery charge current

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Average data bit[11:4] for Battery charge current	RW	0

7-0	BMU内部温度ADC数据低4位 (单位:0.10625℃， temp=-267.7℃+0.10625℃*xxxH)	读/写	0

REG58H:TS引脚ADC数据，高8位

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	TS引脚ADC数据高8位	读/写	0

REG59H:TS引脚ADC数据，低4位

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	TS引脚ADC数据低4位(单位:0.8mV)	读/写	0

REG5AH:通用ADC引脚ADC数据，高8位

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	通用ADC引脚ADC数据高8位	读/写	0

REG5BH:通用ADC引脚ADC数据，低4位

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	通用ADC引脚ADC数据低4位(单位:0.8mV)	读/写	0

REG78H:电池电压的平均数据位[11:4]

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	电池电压的平均数据位[11:4]	读/写	0

REG79H:电池电压的平均数据位[3:0]

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	电池电压的平均数据位[3:0](单位:1.2mV)	读/写	0

REG7AH:电池充电电流的平均数据位[11:4]

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	电池充电电流的平均数据位[11:4]	读/写	0

REG 7BH: Average data bit[3:0] for Battery charge current

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Average data bit[3:0] for Battery charge current (Unit:2mA)	RW	0

REG 7CH: Average data bit[11:4] for Battery discharge current

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Average data bit[11:4] for Battery discharge current	RW	0

REG 7DH: Average data bit[3:0] for Battery discharge current

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Average data bit[3:0] for Battery discharge current (Unit:2mA)	RW	0

REG 80H: ADC Enable

Default: F2H

Reset: power on reset

Bit	Description	R/W	Default
7	Die temperature measure ADC channel enable 0: disable 1: enable	RW	1
6	BATFET current measure ADC channel enable 0: disable 1: enable	RW	1
5	TS pin voltage measure ADC channel enable 0: disable 1: enable	RW	1
4	battery voltage measure ADC channel enable 0: disable 1: enable	RW	1
3-2	Reserved	R	0
1	BATFET discharge current measure ADC channel enable 0: disable 1: enable	RW	1
0	GPADC pin voltage measure ADC channel enable 0: disable 1: enable	RW	0

REG7BH:电池充电电流的平均数据位[3:0]

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	电池充电电流的平均数据位[3:0](单位:2mA)	读/写	0

REG7CH: 电池放电电流的平均数据位[11:4]

默认: 00H

复位: 上电复位

位	描述	读/写	默认
7-0	电池放电电流的平均数据位[11:4]	读/写	0

REG7DH: 电池放电电流的平均数据位[3:0]

默认: 00H

复位: 上电复位

位	描述	读/写	默认
7-0	电池放电电流的平均数据位[3:0]（单位: 2mA）	读/写	0

REG80H: ADC使能

默认: F2H

复位: 上电复位

位	描述	读/写	默认
7	温度测量ADC通道使能 0: 禁用 1: 启用	读/写	1
6	BATFET电流测量ADC通道使能 0:禁用 1: 启用	读/写	1
5	TS引脚电压测量ADC通道使能 0:禁用 1: 启用	读/写	1
4	电池电压测量ADC通道使能 0:禁用 1: 启用	读/写	1
3-2	保留	读	0
1	BATFET放电电流测量ADC通道使能 0:禁用 1: 启用	读/写	1
0	GPADC引脚电压测量ADC通道使能 0:禁用 1: 启用	读写 0	

REG 81H: TS pin CTRL & ADC speed setting & GPADC mode CTRL

Default: 0CH

Reset: power on reset

Bit	Description	R/W	Default
7	TS PIN function select: 0 : TS pin is the battery temperature sensor input and will affect the charger 1 : TS pin is the external input for ADC and doesn't affect the charger	RW	0
6-5	ADC conversion clock selection 00: 100Hz 01: 200Hz 10: 400Hz 11: 800Hz	RW	00
4-3	TS current source on/off enable bit 00: off 01: always on when TS input ADC is enabled, not affected by ADC phase or charger 10: on in the ADC phase and off when ADC is off 11: always on	RW	01
2-1	current source to TS pin setting 00: 20uA 01: 40uA 10: 60uA 11: 80uA	RW	10
0	GPADC work mode: 0: output current 1:not output current	RW	0

REG 82H: TS/GPADC_HYSL2H setting

Default: 18H

Reset: power on reset

Bit	Description		R/W	Default
7-0	TS/GPADC_HYSL2H setting, M	hysteresis set for TS from low temperature go to normal, M*10H*0.8mV,default 307.2mV, ADC data 18h	RW	18H

REG 83H: TS/GPADC_HYSH2L setting

Default: 04H

Reset: power on reset

Bit	Description		R/W	Default
7-0	TS/GPADC_HYSH2L setting, M	hysteresis set for TS from high temperature go to normal, M*10H*0.8mV,default 51.2mV, ADC data 04h	RW	04H

REG 84H: VLTF_CHG setting

Default: 74H

Reset: power on reset

REG81H: TS引脚控制&ADC速度设置&GPADC模式控制

默认: 0CH

复位: 上电复位

位	描述	读/写	默认
7	TS引脚功能选择: 0 : TS引脚是电池温度传感器输入，会影响充电器 1 : TS引脚是ADC的外部输入，不会影响充电器	读/写	0
6-5	ADC转换时钟选择 00: 100Hz 01: 200Hz 10: 400Hz 11: 800Hz	读/写	00
4-3	TS电流源开/关使能位 00:关闭 01:当TS输入ADC启用时始终开启，不受ADC阶段或充电器影响 10:在ADC阶段开启，ADC关闭时关闭 11: 始终开启	读/写	01
2-1	电流源到TS引脚设置 00: 20uA 01: 40uA 10: 60uA 11: 80uA	读/写	10
0	通用ADC工作模式: 0:输出电流 1:不输出电流	读/写	0

REG82H:TS/通用ADC_HYSL2H设置

默认:18H

复位:上电复位

位	描述		读/写	默认
7-0	TS/通用ADC_HYSL2H设置,M	从低温到正常的TS滞后设置， M*10H*0.8mV，默认307.2mV，ADC数据18h	读/写	18小时

REG83H:TS/通用ADC_HYSH2L设置

默认:04H

复位:上电复位

位	描述		读/写	默认
7-0	TS/通用ADC_HYSH2L设置,M	从高温到正常的TS滞后设置， M*10H*0.8mV，默认51.2mV，ADC数据04h	读/写	04小时

REG84H:VLTF_CHG设置

默认:74H

复位:上电复位

Bit	Description		R/W	Default
7-0	VLTF_CHG setting, M	VLTF setting, M*10H*0.8mV, M=74h when VTS=1.485V(about 0deg)	RW	74H

REG 85H: VHTF_CHG setting

Default: 17H

Reset: power on reset

Bit	Description		R/W	Default
7-0	VHTF_CHG setting, M	VHTF setting, M*10H*0.8mV, M=17h when VTS=0.294V(about 45deg)	RW	17H

REG 86H: VLTF_WORK setting

Default: BDH

Reset: power on reset

Bit	Description		R/W	Default
7-0	VLTF_WORK setting, M	VLTF setting, M*10H*0.8mV, M=BDh when VTS=2.419V(about -10deg)	RW	BDH

REG 87H: VHTF_WORK setting

Default: 11H

Reset: power on reset

Bit	Description		R/W	Default
7-0	VHTF_WORK setting, M	VHTF setting, M*10H*0.8mV, M=11h when VTS=0.218V(about 55deg)	RW	11H

REG 88H: VLTF_GPADC setting

Default: BDH

Reset: power on reset

Bit	Description		R/W	Default
7-0	VLTF_GPAD setting, M	VLTF_GPADC, M*10H*0.8mV,M=BDh when VTS=2.419V(about -10deg)	RW	BDH

REG 89H: VHTF_GPADC setting

Default: 0EH

Reset: power on reset

Bit	Description		R/W	Default
7-0	VHTF_GPADC setting, M	VHTF_GPADC, M*10H*0.8mV, M=0Eh when VTS=0.179V(about 60deg)	RW	0EH

REG 8AH: Charger control1

Default: 82H

Reset: bit[7] is system reset, others are power on reset

Bit	Description	R/W	Default
7	Charger enable configuration	RW	1

位	描述		读/写	默认
7-0	VLTF_CHG设置， M	VLTF设置， M*10H*0.8mV，当VTS=1.485V（约0度）时，M=74h	读/写	74小时

寄存器 **85H:VHTF_CHG设置**

默认:17H

复位:上电复位

位	描述		读/写	默认
7-0	VHTF_CHG设置, M	VHTF设置, M*10H*0.8mV,M=17h当VTS=0.294V时(约45度)	读/写	17小时

寄存器 **86H:VLTF_WORK设置**

默认:BDH

复位:上电复位

位	描述		读/写	默认
7-0	VLTF_WORK 设置,M	VLTF设置， M*10H*0.8mV,M=BDh当VTS=2.419V时(约-10度)	读/写	BDH

寄存器 **87H:VHTF_WORK设置**

默认:11H

复位:上电复位

位	描述		读/写	默认
7-0	VHTF_WORK 设置,M	VHTF设置, M*10H*0.8mV,M=11h当VTS=0.218V时(约55度)	读/写	11H

寄存器 **88H:VLTF_GPADC设置**

默认:BDH

复位:上电复位

位	描述		读/写	默认
7-0	VLTF_GPAD设置, M	VLTF_GPADC, M*10H*0.8mV,M=BDh当VTS=2.419V时(约-10度)	读/写	BDH

寄存器 **89H:VHTF_GPADC设置**

默认:0EH

复位:上电复位

位	描述		读/写	默认
7-0	VHTF_GPADC 设置,M	VHTF_GPADC, M*10H*0.8mV,M=0Eh当VTS=0.179V时(约60度)	读/写	0EH

REG8AH:充电控制1

默认:82H

复位:位[7]是系统复位，其他是上电复位

位	描述	读/写	默认
7	充电使能配置	读/写	1

	0: charge disable 1: charge enable		
6-5	charge mode frequency selection 00: 1.5MHz 01: 1.0MHz 10: 2.5MHz 11: 2.0MHz	RW	00
4-1	Pre_charge current limit offset:64mA range: 64mA--1024mA default:128mA step: 64mA	RW	0001
0	Reserved	R	0

REG 8BH: Charger control2

Default: 10H

Reset: power on reset

Bit	Description	R/W	Default
7	Reserved	R	0
6	After charge done, then enter 10mA current charge process. 0:disable 1:enable	RW	0
5-0	Fast charge current limit offset: 0mA range: 0mA(000000)--3072mA(101111) default: 1024mA(010000) step: 64mA note: ICHG=000000(0mA) disables charge ICHG>101111(3072mA)is clamped to register value 101111(3072mA)	RW	010000

REG 8CH: Charger control3

Default: 6AH

Reset: power on reset

Bit	Description	R/W	Default
7-2	Charge voltage limit offset:3.840V range:3.840V--4.608V(110000) default:4.256V(011010) step: 16mV note: VREG>110000(4.608V)is clamped to register value 110000(4.608V)	RW	011010
1	battery pre_charge to fast charge threshold 0: 2.8V 1: 3.0V(default)	RW	1

	0:禁用充电 1:启用充电		
6-5	充电模式频率选择 00: 1.5MHz 01: 1.0MHz 10: 2.5MHz 11: 2.0MHz	读/写	00
4-1	预充电电流限制偏移 ：64mA 范 围：64mA--1024mA 默认：128mA 步长：64m	读/写	0001
0	保留	读	0

REG8BH:充电控制2

默认:10H

复位:上电复位

位	描述	读/写	默认
7	保留	读	0
6	充电完成后，进入10mA电流充电过程。 0:禁用 1:启用	读/写	0
5-0	快速充电电流限制偏 移：0mA 范围:0mA(000000)--3072mA(101111) 默认:1024mA(010000) 步长:64mA 注意: ICHG=000000(0mA)禁用放电 ICHG>101111(3072mA)被限制为寄存器值101111(3072mA)	读/写	010000

REG8CH:充电控制3

默认:6AH

复位:上电复位

位	描述	读/写	默认
7-2	充电电压限制 offset:3.840V 范围:3.840V--4.608V(110000) 默认:4.256V(011010) 步长:16mV 注意:VREG>110000(4.608V)被限制为寄存器值110000(4.608V)	读/写	011010
1	电池预充电到快速充电阈值 0: 2.8V 1:3.0V(默认)	读/写	1

0	battery recharge threshold offset(below charge voltage limit) 0: 100mV(VRECHG)below VREG(REG8C[7:2]) 1: 200mV(VRECHG)below VREG(REG8C[7:2])	RW	0

REG 8DH: Charger control4

Default: 8DH

Reset: bit[6-3] are power on reset, others are system reset

Bit	Description	R/W	Default
7	Charging termination enable 0: disable 1: enable	RW	1
6-3	Termination current limit offset:64mA range: 64mA--1024mA default:128mA(0001) step: 64mA	RW	0001
2-1	Timer 2 setting 00: 5hrs 01: 8hrs 10: 12hrs 11: 20hrs	RW	10
0	Safety timer2 enable 0: disable 1: enable	RW	1

REG 8EH: Charger control5

Default: B8H

Reset: bit[1-0] are power on reset, others are system reset

Bit	Description	R/W	Default
7	pre_charger safe timer enable 0: timer disabled 1: timer enabled	RW	1
6-5	pre_charger timer setting 00: 40min 01: 50min 10: 60min 11: 70min	RW	01
4	safety timer1/2 setting during DPM or thermal regulation 0: safety timer not showed during input DPM or thermal regulation 1: safety timer showed during input DPM or thermal regulation	RW	1
3	battery detection enable 0: disable battery detection function 1: enable battery detection function	RW	1
2	Battery Load($I_{batload}$)enable	RW	0

0	电池重新充电阈值偏移(低于充电电压限制) 0: 100mV(VRECHG)低于VREG(REG8C[7:2]) 1: 200mV(VRECHG)低于VREG(REG8C[7:2])	读/写	0

REG8DH:充电控制4

默认:8DH

复位:位[6-3]为上电复位，其他为系统复位

位	描述	读/写	默认
7	充电终止使能 0:禁用 1: 启用	读/写	1
6-3	终止电流限制偏移：64 mA 范围： 64mA--1024mA 默认 ：128mA(0001) 步 长：64mA	读写	0001
2-1	定时器2设置 00:5小时 01:8小时 10: 12小时 11: 20小时	读写	10
0	安全定时器2使能 0:禁用 1: 启用	读/写	1

REG8EH:充电控制5

默认:B8H

复位:位[1-0]为上电复位，其他为系统复位

位	描述	读/写	默认
7	预充电安全定时器使能 0:定时器禁用 1: 定时器启用	读/写	1
6-5	预充电定时器设置 00:40分钟 01:50分钟 10:60分钟 11: 70分钟	读写	01
4	在DPM或热调节期间的安全定时器1/2设置 0:在输入DPM或热管理期间未显示安全计时器 1: 在输入DPM或热管理期间显示安全计时器	读/写	1
3	电池检测启用 0:禁用电池检测功能 1: 启用电池检测功能	读/写	1
2	电池负载 (I电池负载)启用	读/写	0

	0: Disabled 1: Enabled		
1	Battery detection charge/discharge current time: 0: 1s 1:128ms	RW	0
0	Reserved	R	0

REG 90H: CHGLED pin function setting

Default: 00H

Reset: bit[2-0] are power on reset, others are system reset

Bit	Description	R/W	Default
7	CHGLED pin disable 0: enable CHGLED pin function 1: disable CHGLED pin function	RW	0
6	Breath and PWM function enable control when reg90[2:0] is set to 011 or 101 0 : disable 1 : enable	RW	0
5-3	CHGLED pin output when reg90[2:0] is set to 110-111; 000 : Hiz; 001 : high level 25% duty 1Hz; 010 : high level 25% duty 4Hz; 011 : drive low; 100 : drive high; 101-111 : Hiz.	RW	000
2-0	CHGLED pin display function setting 000 : display with type A function, OD; 001 : display with type B function, OD; 010 : display with breath function controlled by charger, OD; 011 : display with breath function not controlled by charger, OD; 100 : display with three state(low/high/Hiz) controlled by charger, Push Pull; 101 : display with PWM function, PushPull; 110-111 : output controlled by reg90[5:3], PushPull.	RW	000

REG 91H: Breath function control1

Default: 64H

Reset: power on reset

Bit	Description	R/W	Default
7-0	CL (the time unit count set for breath function stay in DMIN, the time unit is TUL.) So, TL = CL*TUL, TL should larger than PWM period, and default is 1.6s.	RW	64H

REG 92H: Breath function control2

Default: 01H

	0: 已禁用 1: 已启用		
1	电池检测充放电电流时间: 0:1秒 1:128毫秒	读/写	0
0	保留	读	0

REG90H:充电LED引脚功能设置

默认:00H

复位:位[2-0]为上电复位，其他为系统复位

位	描述	读/写	默认
7	CHGLED引脚禁用 0:启用CHGLED引脚功能 1: 禁用CHGLED引脚功能	读/写	0
6	当reg90[2:0]设置为011或101时，启用呼吸和PWM功能控制 :禁用 1 : 启用	读/写	0
5-3	当reg90[2:0]设置为110-111时，CHGLED引脚输出； 000:高阻抗； 001:高电平25%duty1Hz； 010:高电平25%duty4Hz； 011:驱动低电平； 100 : 驱动高电平； 101-111:高阻抗。	读/写	000
2-0	CHGLED引脚显示功能设置 000:显示类型A功能，OD； 001:显示类型B功能，OD； 010:显示由充电器控制的呼吸功能，OD； 011:显示不由充电器控制的呼吸功能，OD； 100 : 显示由充电器控制的三态（低/高/高阻抗），推挽； 101 : 显示PWM功能，推挽； 110-111:由reg90[5:3]控制的输出，推挽。	读/写	000

REG91H:呼吸功能控制1

默认:64H

复位:上电复位

位	描述	读/写	默认
7-0	CL（设置用于呼吸功能保持在DMIN的时间单位计数，时间单位为TUL 。） 所以，TL=CL*TUL，TL应大于PWM周期，默认值为1.6秒。	读/写	64H

REG92H： 呼吸功能控制2

默认值：01H

Reset: power on reset

Bit	Description	R/W	Default
7-0	CSR (the time unit count set for breath function stay in every step from DMIN rise to DMAX, the time unit is TUS.) So, TSR = TUS*CSR , TSR should larger than PWM period, and default is 16ms. And the total rise time, TR = TSR * NC, default is 1.6s.	RW	01H

REG 93H: Breath function control3

Default: 06H

Reset: power on reset

Bit	Description	R/W	Default
7-0	CH (the time unit count set for breath function stay in DMAX,the time unit is TUH.) So, TH = CH*TUH, TL should larger than PWM period, and default is 96ms.	RW	06H

REG 94H: Breath function control4

Default: 01H

Reset: power on reset

Bit	Description	R/W	Default
7-0	CSF (the time unit count set for breath function stay in every step from DMAX fall to DMIN, the time unit is TUS.) So, TSF =TUS*CSF, TSF should larger than PWM period, and default is 16ms. And the total rise time, TF = TSF * NC, default is 1.6s.	RW	01H

REG 95H: Breath function control5

Default: 64H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Breath function total duty step count setting between DMIN and DMAX, NS. So, the breath Maximal duty(DMAX) is (NMIN+NS)/M, default is 100%. Note: (NMIN+NS) <= M	RW	64H

REG 96H: Breath function control6

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	For breath function Minimal duty setting, NMIN (the high level clock number in every PWM period, the clock frequency is f0). So, the breath Minimal duty(DMIN) is NMIN/M, default is 0%.	RW	00H

REG 97H: Breath function control7

Default: 64H

Reset: power on reset

Bit	Description	R/W	Default

复位：上电复位

位	描述	读/写	默认
7-0	CSR（设置用于呼吸功能在每一步从DMIN上升到DMAX的时间单位计数，时间单位为TUS。） 所以，TSR=TUS*CSR，TSR应大于PWM周期，默认值为16毫秒。 总上升时间，TR=TSR*NC，默认值为1.6秒。	读/写	01H

寄存器 93H：呼吸功能控制3

默认值：06H

复位：上电复位

位	描述	读/写	默认
7-0	CH（在DMAX中设置用于呼吸功能的时间单位计数，时间单位为TUH。） 所以，TH=CH*TUH，TL应大于PWM周期，默认值为96毫秒。	读/写	06小时

寄存器 94H:呼吸功能控制4

默认:01H

复位:上电复位

位	描述	读/写	默认
7-0	CSF（呼吸功能在每个步骤中保持的时间单位计数，从DMAX降到DMIN，时间单位为TUS。） 所以，TSF=TUS*CSF，TSF应大于PWM周期，默认值为16毫秒。 总上升时间，TF=TSF*NC，默认值为1.6秒。	读/写	01H

寄存器 95H:呼吸功能控制5

默认:64H

复位:上电复位

位	描述	读/写	默认
7-0	呼吸功能在DMIN和DMAX之间的总占空比步骤计数设置，NS。 所以，呼吸最大占空比（DMAX）是（NMIN+NS）/M，默认值为100%。 注意：（NMIN+NS）<=M	读/写	64H

寄存器 96H:呼吸功能控制6

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	对于呼吸功能最小占空比设置，NMIN（每个PWM周期中的高电平时钟数，时钟频率为f0）。所以，呼吸最小占空 比（DMIN）是NMIN/M，默认值为0%。	读/写	00H

寄存器 97H:呼吸功能控制7

默认:64H

复位:上电复位

位	描述	读/写	默认

7-0	M(the total clock number in every PWM output period, the clock frequency is f0). So f_{PWM}(the PWM output frequency) is f0/M, default is 5KHz.	RW	64H

REG 98H: Breath function control7 & Input clock frequency for PWM output

Default: 16H

Reset: power on reset

Bit	Description	R/W	Default
7	The CHGLED pin breath step time and the stay high time unit setting selection 0 : the time unit setting by REG98[3:0]; 1 : the time unit setting by REG9A.	RW	0
6-4	f0 (The input clock frequency) setting for PWM output 000 : 1MHz 001 :500KHz 010 : 250KHz 011 : 125KHz 100 : 62.5KHz 101 : 31.2KHz 110 :15.6KHz 111 : 7.8KHz		001
3-0	The CHGLED pin breath time unit for stay at DMIN/DMAX, or every change step between DMIN and DMAX. TUL = TUH = TUS = 2^(n-2) ms, default is 16ms; n <= 8;		0110

REG 99H: PWM function duty setting

Default: 32H

Reset: power on reset

Bit	Description	R/W	Default
7-0	For PWM function duty setting, NPWM (the high level clock number in every PWM period, the clock frequency is f0). So, the PWM function duty DPWM = NPWM/M, default is 50%. Note: NPWM <= M	RW	32H

REG 9AH: CHGLED breath time unit option

Default: 65H

Reset: power on reset

Bit	Description	R/W	Default
7-4	The CHGLED breath time unit option for stay at DMAX; TUH = 2^(n-2) ms; n <= 8;	RW	0110
3-0	The CHGLED breath time unit option for every rise or fall step time; TUS = 2^(n-2) ms; n <= 8;	RW	0101

REG B8H: Fuel Gauge Control

Default: C0H

Reset: power on reset

Bit	Description	R/W	Default
7	Fuel gauge enable control(including OCV and coulombmeter) 0 : disable 1 : enable	RW	1
6	Coulombmeter enable control 0 : disable 1 : enable	RW	1
5	Battery maximum capacity calibration enable control	RW	0

7-0	M(每个PWM输出周期内的总时钟数，时钟频率为f0). PWM(PWM输出频率)为f0/M，默认值为5KHz。	读写 64H	

REG98H:呼吸功能控制7&PWM输出的输入时钟频率

默认:16H

复位:上电复位

位	描述	读/写	默认
7	CHGLED引脚的呼吸时间和保持高电平时间单位设置选择 0 :由REG98[3:0]设置的时间单位; 1 :由REG9A设置的时间单位。	读写 0	
6-4	f0(PWM输出的输入时钟频率)设置 000 : 1MHz 001 :500KHz 010 : 250KHz 011 : 125KHz 100 : 62.5KHz 101 : 31.2KHz 110 :15.6KHz 111 : 7.8KHz		001
3-0	CHGLED引脚的呼吸时间单位在DMIN/DMAX之间保持，或每次在DMIN和DMAX之间的变化步骤。 TUL=TUH=TUS=2^(n-2)毫秒，默认值为16毫秒； n<=8；		0110

REG99H: PWM功能占空比设置

默认值：32H

复位：上电复位

位	描述	读/写	默认
7-0	对于PWM功能占空比设置，NPWM（每个PWM周期中的高电平时钟数，时钟频率为f0）。 因此，PWM功能占空比DPWM=NPWM/M，默认值为50%。 注意：NPWM<=M	读写 32H	

REG9AH: CHGLED呼吸时间单位选项

默认值：65H

复位：上电复位

位	描述	读/写	默认
7-4	CHGLED呼吸时间单位选项在DMAX保持； TUH=2^(n-2)毫秒； n<=8；	读写 0110	
3-0	CHGLED呼吸时间单位选项用于每次上升或下降的时间步骤； TUS=2^(n-2)毫秒； n<=8；	读写 0101	

寄存器B8H:燃料计控制

默认:C0H

复位:上电复位

位	描述	读/写	默认
7	燃料计使能控制（包括OCV和库仑计） 0 :禁用 1 :使能	读写 1	
6	库仑计使能控制 0 :禁用 1 :使能	读写 1	
5	电池最大容量校准使能控制	读/写	0

	0 : disable 1 : enable		
4	Battery maximum capacity calibration status 0: not calibrating 1: is calibrating	R	0
3-2	Reserved	R	0
1	Old coulombmeter enable control 0 : disable 1 : enable	RW	0
0	Old coulombmeter clear control 0 : Write 0 to this bit will do nothing 1 : Write 1 to this bit will clear old coulombmeter and then this bit will be cleared automatically	RW	0

REG B9H: Battery capacity percentage for indication

Default: 64H

Reset: power on reset

Bit	Description	R/W	Default
7	Indicating if battery capacity percentage for indication is valid: 0 : is not valid 1 : is valid	R	0
6-0	Battery capacity percentage for indication	R	64H

REG BAH: RDC 1

Default: 80H

Reset: power on reset

Bit	Description	R/W	Default
7	RDC calculation control 0 : disable 1 : enable	RW	1
6	RDC was right detected or not flag: 1: Yes 0: Not	RW	0
5	Reserved	R	0
4-0	RDC value high 5 bits (Unit:1.17mΩ)	RW	00000

REG BBH: RDC 0

Default: 55H

Reset: power on reset

Bit	Description	R/W	Default
7-0	RDC value low 8 bits (Unit:1.17mΩ)	RW	55H

REG BCH: OCV 1

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	OCV value high 8 bits	R	00H

	0 :禁用 1 :使能		
4	电池最大容量校准状态 0:未校准 1:正在校准	读	0
3-2	保留	读	0
1	旧库仑计使能控制 0 :禁用 1 :使能	读/写	0
0	旧库仑计清除控制 0 :写入0到此位将无效 1 :写入1到此位将清除旧库仑计，然后此位将自动清除	读/写	0

寄存器B9H:电池容量百分比指示

默认:64H

复位:上电复位

位	描述	读/写	默认
7	指示电池容量百分比指示是否有效: 0 :无效 1 :有效	读	0
6-0	指示用电池容量百分比	读	64H

寄存器BAH:RDC1

默认:80H

复位:上电复位

位	描述	读/写	默认
7	RDC计算控制 0 :禁用 1 :使能	读/写	1
6	RDC是否被正确检测标志： 1:是 0:否	读/写	0
5	保留	读	0
4-0	RDC值高5位(单位:1.17mΩ)	读/写	00000

REG BBH: RDC 0

默认:55H

复位:上电复位

位	描述	读/写	默认
7-0	RDC值低8位(单位:1.17mΩ)	读/写	55H

REG BCH: OCV 1

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	OCV值高8位	读	00H

REG BDH: OCV 0

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-4	Reserved	R	0
3-0	OCV value low 4 bits	R	0000

REG C0H~DFH: OCV percentage table

REG E0H: Battery maximum capacity

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Indicating if battery maximum capacity is valid 0 : Not valid 1 : Is valid	RW	0
6-0	Battery maximum capacity bit[14:8]	RW	00H

REG E1H: Battery maximum capacity

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	battery maximum capacity bit[7:0](Unit: 1.456mAh)	RW	00H

REG E2H: Coulomb meter counter

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Indicating if coulombmeter counter is valid 0 : Not valid 1 : Is valid	RW	0
6-0	Coulombmeter counter[14:8]	RW	00H

REG E3H: Coulomb meter counter

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-0	Coulombmeter counter[7:0] (Unit: 1.456mAh)	RW	00H

REG E4H: OCV Percentage of battery capacity

Default: 64H

Reset: power on reset

Bit	Description	R/W	Default
7	Indicating if OCV percentage of battery capacity is valid 0 : Not valid 1 : Is valid	R	0
6-0	OCV percentage of battery capacity	R	64H

REG BDH: OCV 0

默认:00H

复位:上电复位

位	描述	读/写	默认
7-4	保留	读	0
3-0	OCV值低4位	读	0000

REGC0H~DFH:OCV百分比表

REGE0H:电池最大容量

默认:00H

复位:上电复位

位	描述	读/写	默认
7	指示电池最大容量是否有效 0 :无效 1 :有效	读/写	0
6-0	电池最大容量位[14:8]	读/写	00H

REGE1H:电池最大容量

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	电池最大容量位[7:0](单位:1.456mAh)	读/写	00H

REGE2H:库仑计计数器

默认:00H

复位:上电复位

位	描述	读/写	默认
7	指示库仑计计数器是否有效 0 :无效 1 :有效	读/写	0
6-0	库仑计计数器[14:8]	读/写	00H

REGE3H:库仑计计数器

默认:00H

复位:上电复位

位	描述	读/写	默认
7-0	库仑计计数器[7:0](单位:1.456mAh)	读/写	00H

REGE4H:电池容量的OCV百分比

默认:64H

复位:上电复位

位	描述	读/写	默认
7	指示电池容量的OCV百分比是否有效 0 :无效 1 :有效	读	0
6-0	电池容量的OCV百分比	读	64H

REG E5H: Coulombmeter percentage of battery capacity

Default: 64H

Reset: power on reset

Bit	Description	R/W	Default
7	Indicating if coulombmeter percentage of battery capacity is valid: 0 : Not valid 1 : Is valid	R	0
6-0	Coulombmeter percentage of battery capacity	R	64H

REG E6H: Battery capacity percentage warning level

Default: A0H

Reset: power on reset

Bit	Description	R/W	Default
7-4	Warning level 1: Warning threshold, 5-20%, 1% per step	RW	1010
3-0	Warning level 2: Shutting down threshold, 0-15%, 1% per step	RW	0000

REG E7H: OCV_SOC curve setting

Default: 0FH

Reset: power on reset

Bit	Description	R/W	Default
7-5	Reserved	R	0
4	The battery voltage limit control bit in the battery internal resistor calculation stop charge status. 0 : no limit 1 : limit as the charge status(setting in regEC[4:3])	RW	0
3-0	The OCV VS Battery SOC curve setting 0000 : Selection the charge voltage target 4.10V curve. 0001 : Selection the charge voltage target 4.15V curve. 0010 : Selection the charge voltage target 4.20V curve. 0011 : Selection the charge voltage target 4.25V curve. 0100 : Selection the charge voltage target 4.35V curve. 0101 : Selection the charge voltage target 4.40V curve. 0110 : Selection the charge voltage target 4.45V curve. 0111 : Selection the charge voltage target 4.50V curve. 1000 : Selection the charge voltage target 4.60V curve. 1001 ~1111 : Depend on the charge voltage target setting Vtarget <= 4.112V Selection the charge voltage target 4.10V curve. 4.112V <Vtarget <= 4.160V,Selection the charge voltage target 4.15V curve. 4.160V <Vtarget <= 4.208V,Selection the charge voltage target 4.20V curve. 4.208V <Vtarget <= 4.256V,Selection the charge voltage target 4.25V curve. 4.256V <Vtarget <= 4.352V,Selection the charge voltage target 4.35V curve. 4.352V <Vtarget <= 4.416V,Selection the charge voltage target 4.40V curve. 4.416V <Vtarget <= 4.464V,Selection the charge voltage target 4.45V curve. 4.464V <Vtarget <= 4.512V,Selection the charge voltage target 4.50V curve.	RW	1111

REGE5H:电池容量的库仑计百分比

默认:64H

复位:上电复位

位	描述	读/写	默认
7	指示电池容量的库仑计百分比是否有效: 0 : 无效 1 :有效	读	0
6-0	库仑计电池容量的百分比	读	64H

REGE6H：电池容量百分比警告级别

默认：A0H

复位：上电复位

位	描述	读/写	默认
7-4	警告级别1：警告阈值，5-20%，每步1%	读/写	1010
3-0	警告级别2：关机阈值，0-15%，每步1%	读/写	0000

REGE7H：OCV_SOC曲线设置

默认：0FH

复位：上电复位

位	描述	读/写	默认
7-5	保留	读	0
4	电池内部电阻计算中的电池电压限制控制位 停止充电状态。 0 : 无限制 1 : 限制为充电状态（在regEC[4:3]中设置）	读/写	0
3-0	OCVV电池SOC曲线设置 0000：选择充电电压目标4.10V曲线。 0001：选择充电电压目标4.15V曲线。 0010：选择充电电压目标4.20V曲线。 0011：选择充电电压目标4.25V曲线。 0100：选择充电电压目标4.35V曲线。 0101：选择充电电压目标4.40V曲线。 0110：选择充电电压目标4.45V曲线。 0111：选择充电电压目标4.50V曲线。 1000： 选择充电电压目标4.60V曲线。 1001 ~1111:依赖于充电电压目标设置 Vtarget <= 4.112V 选择充电电压目标4.10V曲线。 4.112V<Vtarget<=4.160V，选择充电电压目标4.15V曲线。 4.160V<Vtarget<=4.208V，选择充电电压目标4.20V曲线。 4.208V<Vtarget<=4.256V，选择充电电压目标4.25V曲线。 4.256V<Vtarget<=4.352V，选择充电电压目标4.35V曲线。 4.352V<Vtarget<=4.416V，选择充电电压目标4.40V曲线。 4.416V<Vtarget<=4.464V，选择充电电压目标4.45V曲线。 4.464V<Vtarget<=4.512V，选择充电电压目标4.50V曲线。	读/写	1111

	4.512V <Vtarget Selection the charge voltage target 4.60V curve.		

REG E8H: Fuel gauge tuning control 0

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	When the available signal of external power supply is changed or not, reset ADC filter or not 0: Yes, reset the ADC filter 1: No	RW	0
6	When the charging circuit on or off, reset ADC filter or not 0: Yes, reset the ADC filter 1: No	RW	0
5	When the battery voltage ADC channels open or closed, reset ADC filter or not 0: Yes, reset the ADC filter 1: No	RW	0
4	When the battery rechargeable battery ADC channels open or closed, reset ADC filter or not 0: Yes, reset the ADC filter 1: No	RW	0
3	When the battery discharge current ADC channels open or closed, reset ADC filter or not 0: Yes, reset the ADC filter 1: No	RW	0
2-0	Battery capacity percentage for indication update minimum interval 000: 30s 001: 60s 010: 120s 011: 164s 100: immediately update when changed 101: 5s 110: 10s 111: 20s	RW	000

REG E9H: Fuel gauge tuning control 1

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-6	OCV Percentage calibrate the Coulomb meter percentage, maximum time interval 00: 60s 01: 120s 10: 15s	RW	00

	4.512V <Vtarget	选择充电电压目标4.60V曲线。		

REGE8H: 燃料计调节控制0

默认: 00H

复位: 上电复位

位	描述	读/写	默认
7	当外部电源供应的可用信号发生变化时，是否重置ADC滤波器 0: 是，重置ADC滤波 器 1: 否	读/写	0
6	当充电电路开启或关闭时，是否重置ADC滤波器 0: 是，重置ADC滤波器 1: 否	读/写	0
5	当电池电压 ADC通道开启或关闭时，是否重置 ADC滤波器或不重置 0: 是，重置ADC滤波器 1: 否	读/写	0
4	当可充电电池ADC通道开启或关闭时，是否重置ADC滤波器 0: 是，重置ADC滤波器 1: 否	读/写	0
3	当电池放电电流ADC通道开启或关闭时，是否重置ADC滤波器 0: 是，重置ADC滤 波器 1: 否	读/写	0
2-0	电池容量百分比指示更新的最小间隔 000: 30秒 001: 60秒 010: 120秒 011: 164秒 100:更改时立即更新 101:5秒 110:10秒 111:20秒	读/写	000

REGE9H:燃料计调校控制1

默认:00H

重置:上电复位

位	描述	读/写	默认
7-6	OCV百分比校准库仑计百分比，最大时间间隔00:60秒 01:120秒 10:15秒	读/写	00

	11: 30s		
5-3	Wait for the stability for charge when in RDC calculation 000: 180s 001: 240s 010: 300s 011: 600s 100: 30s 101: 60s 110: 90s 111: 120s	RW	000
2-0	Wait for the stability for discharge when in RDC calculation 000: 180s 001: 240s 010: 300s 011: 600s 100: 30s 101: 60s 110: 90s 111: 120s	RW	000

REG EAH: Fuel gauge tuning control 2

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7-6	OCV Percentage Debounce setting(only when the change continuous the same direction as more than N times, then the ocv percentage increase or decrease)N: 00: 4 01: 8 10: 1 11: 2	RW	00
5-4	Coulomb meter Percentage Debounce setting(only when the change continuous the same direction as more than N times, then the ocv percentage increase or decrease)N: 00: 4 01: 8 10: 1 11: 2	RW	00
3	Battery maximum capacity and OCV-SoC curve calibration start condition: 0: OCV percentage < (REG E6H[3:0] + 3) 1: OCV percentage < (REG E6H[3:0] + 6)	RW	0
2	Battery maximum capacity calibration end condition 0 0: OCV percentage ≥ 95% 1: OCV percentage = 100%	RW	0

	11:30秒		
5-3	在RDC计算时等待充电稳定性 000:180秒 001:240秒 010:300秒 011:600秒 100:30秒 101:60秒 110:90秒 111:120秒	读/写	000
2-0	在RDC计算时等待放电稳定性 000:180秒 001:240秒 010:300秒 011:600秒 100:30秒 101:60秒 110:90秒 111:120秒	读/写	000

REGEAH:燃料计调校控制2

默认:00H

重置:上电复位

位	描述	读/写	默认
7-6	OCV百分比去抖动设置（仅当变化连续同一方向超过N次时，OCV百分比才会增加或减少）N: 00: 4 01: 8 10: 1 11: 2	读/写	00
5-4	库仑计百分比去抖动设置（仅当变化连续同一方向超过N次时，OCV百分比才会增加或减少）N: 00: 4 01: 8 10: 1 11: 2	读/写	00
3	电池最大容量和OCV-SoC曲线校准开始条件: 0: OCV百分比 < (REGE6H[3:0] + 3) 1: OCV百分比 < (REGE6H[3:0] + 6)	读/写	0
2	电池最大容量校准结束条件0 0: OCV百分比 ≥ 95% 1: OCV百分比 = 100%	读/写	0

1	Battery maximum capacity calibration end condition 1 0: wait for charge finished 1: do not wait for charge finished	RW	0
0	Battery maximum capacity calibration end condition 2 (wait N ms for the charge finished indication signal after REG 01H[6] clear to 0,N: 0: 68 1: 120	RW	0

REG EBH: Fuel gauge tuning control 3

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	When charge status bit REG 01H[6] = 1,the percentage of indication can be decrease or not 0: decrease enable 1: decrease disable	RW	0
6-4	When REG 01H[6] = 1， percentage of indication decrease hysteresis(N) setting 000: 4% 001: 5% 010: 6% 011: 7% 100: 0% 101: 1% 110: 2% 111: 3%	RW	000
3	Calculation RDC current condition setting 0: ≥300mA 1: ≥150mA	RW	0
2-0	Calibrate RDC percentage changed threshold setting 000: 4% 001: 5% 010: 6% 011: 7% 100: 0% 101: 1% 110: 2% 111: 3% calibration： △OCVPCT > N	RW	000

REG ECH: Fuel gauge tuning control 4

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default

1	电池最大容量校准结束条件1 0: 等待充电完成 1: 不等待充电完成	读/写	0
0	电池最大容量校准结束条件2 (在REG 01H[6]清零后，等待N毫秒以获取充电完成指示信号，N: 0: 68 1: 120	读/写	0

REGEBH: 燃料计调节控制3

默认: 00H

复位: 上电复位

位	描述	读/写	默认
7	当充电状态位 REG 01H[6] = 1 时，指示百分比可以 减少或不减少 0: 减少使能 1: 减少禁用	读/写	0
6-4	当 REG 01H[6] = 1，指示百分比减少滞后(N)设置 000: 4% 001: 5% 010: 6% 011: 7% 100: 0% 101: 1% 110: 2% 111: 3%	读/写	000
3	计算 RDC 电流条件设置 0: ≥300mA 1: ≥150mA	读/写	0
2-0	校准 RDC 百分比变化阈值设置 000: 4% 001: 5% 010: 6% 011: 7% 100: 0% 101: 1% 110: 2% 111: 3% 校准：△OCVPCT>N	读/写	000

REGECH: 燃料计调节控制4

默认: 00H

复位: 上电复位

位	描述	读/写	默认

7-5	Reserved	R	0
4-3	The minimum battery voltage for RDC calculation 00: 3.5V 01: 3.6V 10: 3.7V 11: 3.4V	RW	00
2-0	Coulomb counter calibration threshold， relative with REG_E6_[3:0] 000: REG_E6H[3:0]+7(default) 001: REG_E6H[3:0]+8 010: REG_E6H[3:0]+9 011: REG_E6H[3:0]+10 100: REG_E6H[3:0]+3 101: REG_E6H[3:0]+4 110: REG_E6H[3:0]+5 111: REG_E6H[3:0]+6	RW	000

REG EDH: Fuel gauge tuning control 5

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	OCV percentage relative with the charge/discharge rate control 0: Disable 1: Enable	RW	0
6	Update time when rate > 0.5C 0: 30S 1: 15S	RW	0
5-4	Update time when rate < 0.5C and rate > 0.1C 00: 60S 01: 75S 10: 30S 11: 45S	RW	00
3-2	Update time when rate < 0.1C 00: 120S 01: 180S 10: 240S 11: 60S	RW	00
1-0	Fixed update time 00: 30S 01: 45S 10: 60S 11: 15S	RW	00

REG EEH: Fuel gauge tuning control 6

Default: 01H

7-5	保留	读	0
4-3	RDC计算的最小电池电压 00: 3.5V 01: 3.6V 10: 3.7V 11: 3.4V	读/写	00
2-0	库仑计校准阈值，相对于REG_E6_[3:0] 000:REG_E6H[3:0]+7(默认) 001: REG_E6H[3:0]+8 010: REG_E6H[3:0]+9 011: REG_E6H[3:0]+10 100: REG_E6H[3:0]+3 101: REG_E6H[3:0]+4 110: REG_E6H[3:0]+5 111: REG_E6H[3:0]+6	读/写	000

REGEDH:燃料计调节控制5

默认:00H

复位:上电复位

位	描述	读/写	默认
7	OCV百分比相对于充放电速率控制 0:禁用 1:启用	读/写	0
6	当速率>0.5C时更新时间 0: 30S 1: 15S	读/写	0
5-4	当速率<0.5C且速率>0.1C时更新时间 00: 60S 01: 75S 10: 30S 11: 45S	读/写	00
3-2	当速率<0.1C时更新时间 00: 120S 01: 180S 10: 240S 11: 60S	读/写	00
1-0	固定更新时间 00: 30S 01: 45S 10: 60S 11: 15S	读/写	00

REGEEH: 燃料计调节控制6

默认:01H

Reset: power on reset

Bit	Description	R/W	Default
7	OCV capacity curve and battery capacity calibration control in charge or discharge status 0: Charging calibration 1: Discharging calibration	RW	0
6-5	Reserved	R	0
4	The debounce number of battery OCV reached 0 0: 3 1:4	RW	0
3	Whether hold charge accumulation or regressive when Coulometer value in 100% or OCV in 0%, or OCV curve in calibration period 0: Normal accumulation or regressive 1: Hold, do not accumulation or regressive	RW	0
2	OCVPCT update control 0: Old ocvpct update which not depend on charge ratio 1: New ocvpct update which depend on charge ratio	RW	0
1-0	The OCV debounce time setting at every OCV level during the BMU doing OCV percent curve calibration 00: 2s 01: 4s 10: 6s 11: 8s	RW	01

REG EFH: Fuel gauge tuning control 7

Default: 00H

Reset: power on reset

Bit	Description	R/W	Default
7	Reserved	R	0
6	In the charging state, the smooth ocv-percentage less than coulomb calibration threshold and the instantaneous ocv-percentage equal 0%, then it will clear the coulomb counter or not. 0 : clear the coulomb 1 : not clear the coulomb	RW	0
5	The battery total calibration has completely and the ocv percent calibration doesn't complete , the ocv percent calibration processing will stop or not. 0 : stop 1 : don't stop	RW	0
4	The indication of battery charge percentage can go to 100% or not before charge done 0 : disable 1 : enable	RW	0
3	Reserved	R	0
2	The battery charge percent for ocv percent curve calibration selection. 0 : the instantaneous charge percent 1 : the smooth charge percent	RW	0
1	The battery charge percent for battery capacity calibration selection.	RW	0

复位：上电复位

位	描述	读/写	默认
7	OCV容量曲线和电池容量校准控制在充电或放电状态 0:充电校准 1:放电校准	读/写	0
6-5	保留	读	0
4	电池OCV的去抖动次数达到0 0: 3 1:4	读/写	0
3	当库仑计值为100%或OCV为0%时，是否保持充电积累或回归，或在校准期间OCV曲线0:正常积累或回归 1:保持，不进行积累或回归	读/写	0
2	OCVPCT更新控制 0:旧的ocvpct更新，不依赖于充电比 1:新的ocvpct更新，依赖于充电比	读/写	0
1-0	在BMU进行OCV百分比曲线校准时，每个OCV级别的OCV去抖动时间设置为00:2秒 01:4秒 10:6秒 11:8秒	读/写	01

REGEFH: 燃料计调节控制7

默认:0　0

H复位：上电复位位

	描述	读/写	默认
7	保留	读	0
6	在充电状态下，平滑的ocv百分比低于库仑校准阈值且瞬时ocv百分比等于0%，则是否清除库仑计。 0 : 清除库仑　　1 :不清除库仑	读/写	0
5	电池总校准已完成，但OCV百分比校准未完成，OCV百分比校准处理将停止或不。 0 : 停止　　1 :不要停止	读/写	0
4	电池电量百分比的指示可以在充电完成之前达到100%或不达到 0 : 禁用　　1 :使能	读/写	0
3	保留	读	0
2	电池电量百分比用于开路电压百分比曲线校准选择。 0 : 瞬时电量百分比 1 : 平滑电量百分比	读/写	0
1	电池电量百分比用于电池容量校准选择。	读/写	0

	0 : the instantaneous charge percent 1 : the smooth charge percent		
0	The battery charge percent for the battery discharge ocv percent curve and capacity calibration start. 0 : must equal 100% 1 : no limit	RW	0

	0 :瞬时电量百分比 1 :平滑电量百分比		
0	电池电量百分比用于电池放电开路电压百分比曲线和 容量校准开始。 0 :必须等于100% 1 : no limit	读/写	0

8. Application Information

8.1 Charger

1. A 10mohm resistor is used to sample current. Accuracy of the resistor is 1% at least.
2. 1uF capacitor parallel with the sampling resistor can not be omitted, and must be close to the resistor in layout.
3. BATSENSP and BATSENSN should be differential lines to avoid interference.
4. TS pin is used to detect battery temperature. It is recommended to use 10K NTC resistor. If TS pin is not used, the function can be disabled by software.
5. CHGLED pin is used to indicate charging status. If CHGLED is set to be push-pull output, just connect indicator light between this pin and GND. If CHGLED is set to be open drain output, connect indicator light between this pin and VBUS by a pull-up resistor. If CHGLED pin is not used, it just stays floating.
6. Use 1uH inductor. Its saturation current should be 50% higher than the setting value and its internal resistance should be less than 30mohm.
7. Place battery to BAT connection points as close as possible to reduce wire length. Use thick line to reduce line impedance and voltage drop.

8.2 BUCK/LDO

1. Connect two 22uF capacitors to VSYS pin.
2. Output capacitance of LDO is not smaller than 4.7uF.
3. Input capacitance of VBUS is not smaller than 10uF.
4. Layout: Inductor is close to BMU, output capacitors are close to inductors and input capacitors are close to input pin of BMU.

8.3 BOOST

1. If only battery is present and V_{BAT} is higher than depletion threshold(V_{BAT_DPLZ}), BATFET, connecting battery to system, is off by default and need to be turned on by pressing the PWRON key.
2. If only battery is present and BATFET is on, the output voltage of VMID has two possibilities:(1) BOOST enable. In BOOST mode, the output voltage of VMID is 5V by default. (2)BOOST disable. Because of the HS-MOS body diode, the output voltage of VMID is equal to the result of the subtraction of VSYS and Vdiode. The BOOST mode can be enabled or disabled by Host.
3. In BOOST mode, OTG pin must be high.
4. Connect a 22uF capacitor to VMID pin.
5. When BMU is powered by battery, if the insertion of OTG device is detected through RID pin(USB2.0) or CC pin(type-c), BOOST mode will be enabled automatically and RBFET is turned on to supply power to VBUS. The whole process can be controlled by Host.
6. if the removal of OTG device is detected through RID pin(USB2.0) or CC pin(type-c), RBFET will be turned off

8.应用信息

8.1充电器

1. 使用10毫欧电阻来采样电流。该电阻的准确度至少为1%。
2. 与采样电阻并联的1μF电容不能省略，并且在布局中必须靠近电阻。
3. BATSENSP和BATSENSN应为差分线以避免干扰。
4. TS引脚用于检测电池温度。建议使用10K NTC电阻。如果不使用TS引脚，

可以通过软件禁用该功能。

5. CHGLED引脚用于指示充电状态。如果CHGLED设置为推挽输出，只需将指示灯连接在此引脚和接地之间。如果CHGLED设置为开漏输出，则将指示灯通过上拉电阻连接在此引脚和VBUS之间。如果不使用CHGLED引脚，它将保持浮空状态。
6. 使用1uH电感。其饱和电流应比设定值高50%，且其内阻应小于30毫欧。

7. 将电池尽可能靠近BAT连接点放置，以减少导线长度。使用粗线以减少线路阻抗和电压降。

8.2 BUCK/LDO

1.将两个22uF电容连接到VSYSpin。

2.LDO的输出电容不得小于4.7uF。

3.VBUS的输入电容不得小于10uF。

4.布局：电感靠近BMU，输出电容靠近电感，输入电容靠近BMU的输入引脚。

8.3 BOOST

1.如果仅有电池存在且V_{BAT}高于耗尽阈值(V_{BAT_DPLZ})，则BATFET（将电池连接到系统）默认关闭，需要通过按下PWRON键来打开。

2.如果仅有电池存在且BATFET开启，则VMID的输出电压有两种可能性：（1）启用BOOST。

在升压模式下，VMID的输出电压默认是5V。（2）禁用BOOST。由于HS-MOS体二极管，VMID的输出电压等于VSYS和Vdiode的差值。升压模式可以由主机启用或禁用。

3.在升压模式下，OTG引脚必须为高电平。

4.将22uF电容连接到VMID引脚。

5.当BMU由电池供电时，如果通过RID引脚（USB2.0）或CC引脚（Type-C）检测到OTG设备的插入，升压模式将自动启用，RBFET被打开以向VBUS供电。整个过程可以由主机控制。

6.如果通过RID引脚（USB2.0）或CC引脚（Type-C）检测到OTG设备的移除，RBFET将被关闭

automatically, and whether to disable boost mode depends on application scenarios. The whole process can be controlled by Host.

8.4 IO

1. TWSI: Pull up SDA/SCK to a source, such as LDO.
2. Pull up IRQ with a 4.7kΩ resistor to a source, such as LDO.
3. When operating with PMIC, the PWROK pin of AXP2585 is connected to the PWROK signal of PMIC to detect the PMIC's power on/off status.
4. Connect the PWRON key between PWRON pin and GND directly.
5. As a general purpose ADC input pin, GPADC pin can be used to detect board-level temperature. Its circuit implementation is the same as that of TS pin.
6. If connected to Host, DP/DM should be differential lines and a impedance matching is needed.

自动，并且是否禁用升压模式取决于应用场景。整个过程可以由主机控制。

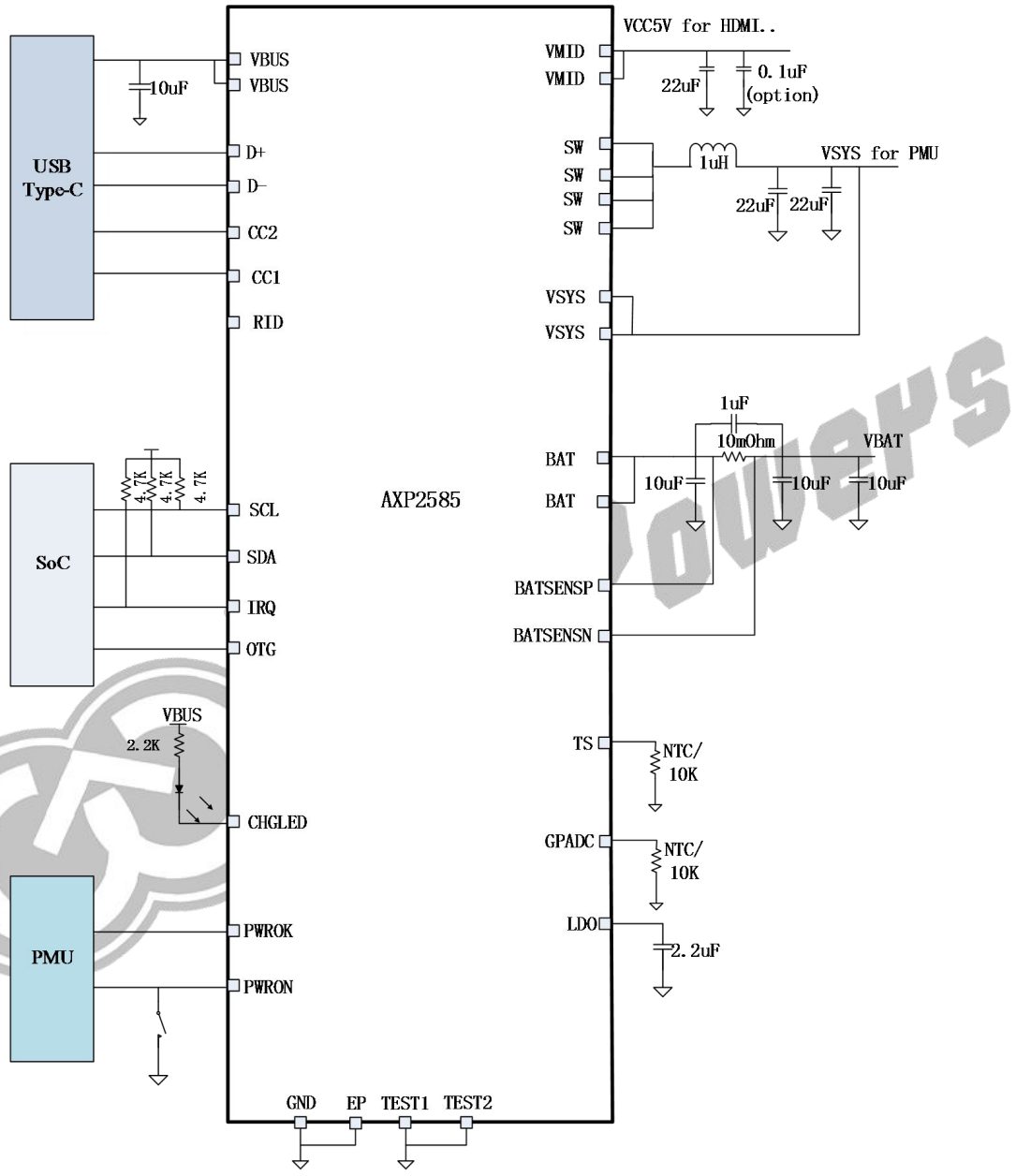
8.4 IO

1. TWSI：将SDA/SCK上拉到电源，例如LDO。
2. 将IRQ上拉到4.7kΩ电阻到电源，例如LDO。
3. 在与PMIC操作时，AXP2585的PWROK引脚连接到PMIC的PWROK信号，以检测PMIC的电源开/关状态。

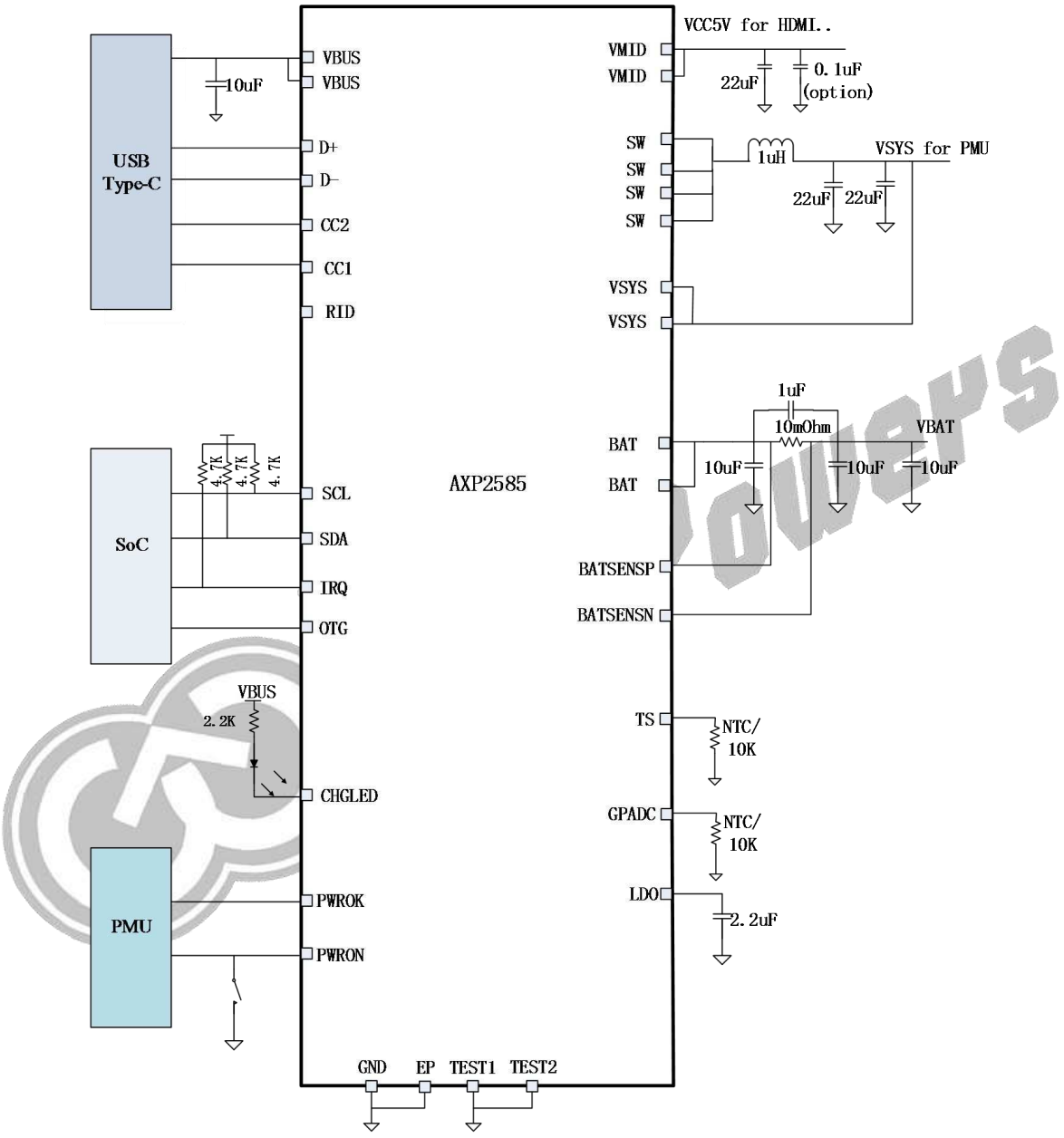
4. 将PWRON键直接连接在PWRON引脚和接地之间。
5. 作为通用ADC输入引脚，GPADC引脚可用于检测板级温度。其电路实现与TS引脚相同。

6. 如果连接到主机，DP/DM应为差分线，并需要阻抗匹配。

8.5 Typical Application



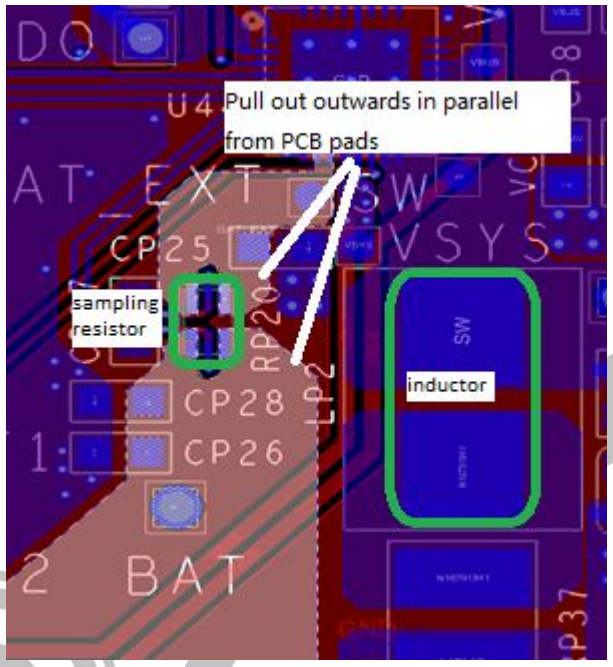
8.5典型应用



9. PCB Layout Guideline

9.1 Charging and Discharging Part

1、BAT charging path: VBUS->VMID->SW->inductor->VSYS->sampling resistor->battery, line width>=200mil; BAT discharging path: battery->sampling resistor->VSYS->inductor->SW->VMID, line width>=200mil. Lead wire of sampling resistor must be pulled out outwards in parallel from PCB pads. Place battery to BMU as close as possible, as shown in the following figure.

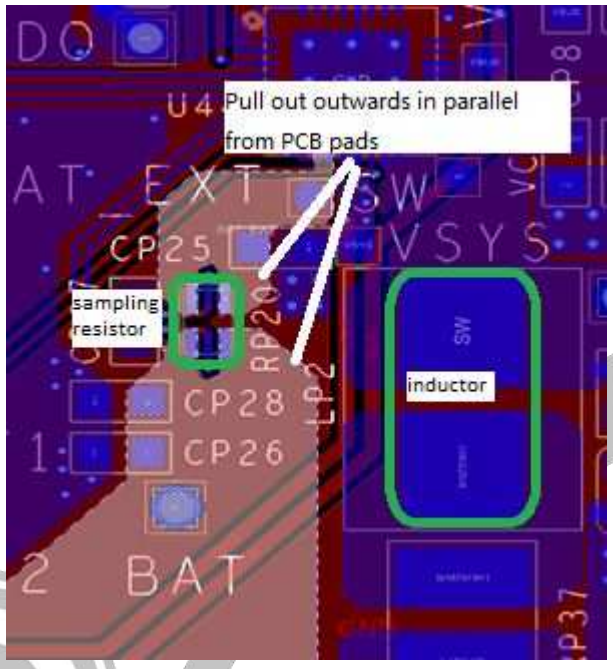


2、Wire between BATSENSN/BATSENSP and sampling resistor uses 8-10mil. Lead wire of sampling resistor must be pulled out inwards in parallel from PCB pads, as shown in the following figure.

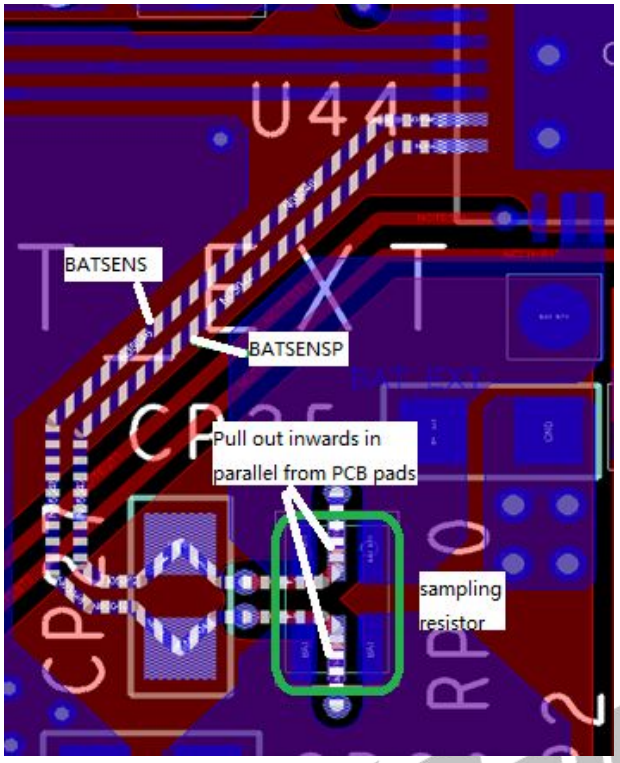
9.PCB布局指南

9.1充电和放电部分

1、 电池充电路径：VBUS->VMID->SW->电感->VSYS->采样电阻->电池，线宽>=200mil；电池放电路径：电池->采样电阻->VSYS->电感->SW->VMID，线宽>=200mil。采样电阻的引线必须从PCB焊盘向外平行拉出。将电池尽可能靠近BMU，如下图所示。



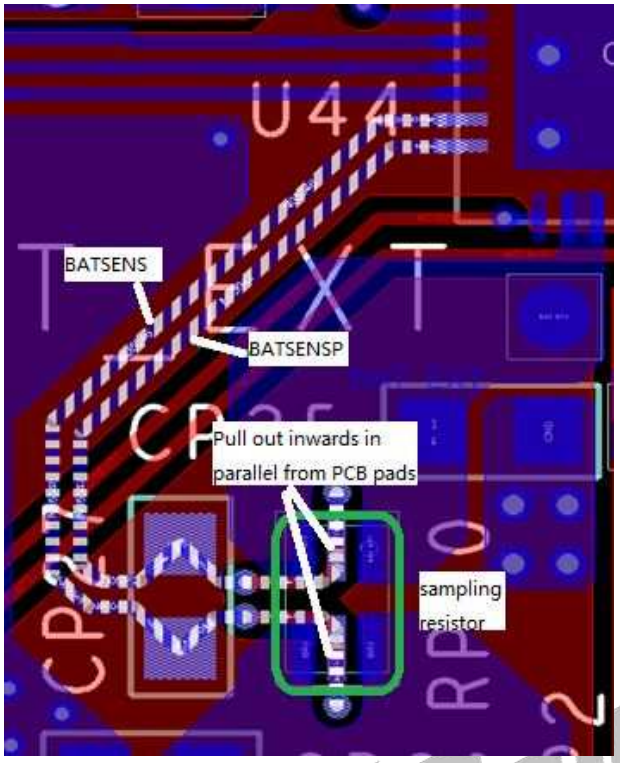
2、 BATSENSN/BATSENSP引脚与采样电阻之间的导线使用8-10mil。采样电阻的引线必须从PCB焊盘向内平行拉出，如下图所示。



9.2 High Current Path

Line width of high current path such as power input and output need to be widened to reduce line impedance, voltage drop and loss.

1. Line width of VBUS, VSYS,VMID: >=200mil；
2. Line width of LDO output depends on load current.
3. Place battery to BAT connection points as close as possible to reduce wire length. Use thick line to reduce line impedance and voltage drop.



9.2高电流路径

高电流路径的线宽，如电源输入和输出，需要加宽以减少线路阻抗、电压降和损耗。

1.VBUS、 VSYS、 VMID的线宽： >=200mil ；

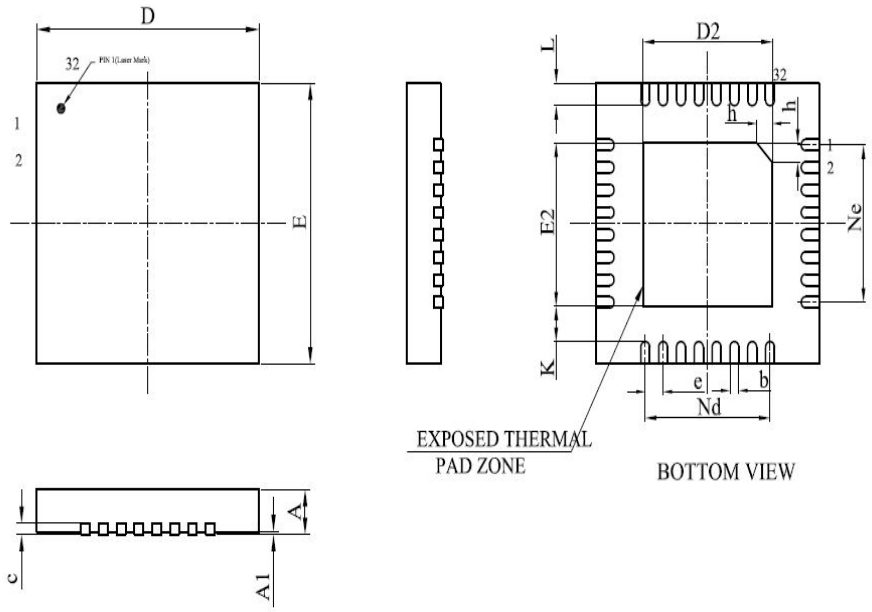
2.LDO输出的线宽取决于负载电流。

3.将电池尽可能靠近BAT连接点放置，以减少导线长度。使用粗线以减少线路阻抗和电压降。

10. Package and Ordering Information

10.1 Package Information

AXP2585 package is QFN5*5, 32-pin. Figure 10-1 shows AXP2585 package.



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	4.90	5.00	5.10
D2	2.80	2.90	3.00
e	0.40BSC		
Nd	2.80BSC		
E	4.90	5.00	5.10
E2	2.80	2.90	3.00
Ne	2.80BSC		
L	0.35	0.40	0.45
K	0.20	--	--
h	0.30	0.35	0.40
载体尺寸 (Mil)	150*150		

Figure 10-1 Package Information

10.2 Marking information

Figure 10-2 shows AXP2585 marking.

Figure 10-2 AXP2585 Marking

Table 10-1 describes AXP2585 marking information.

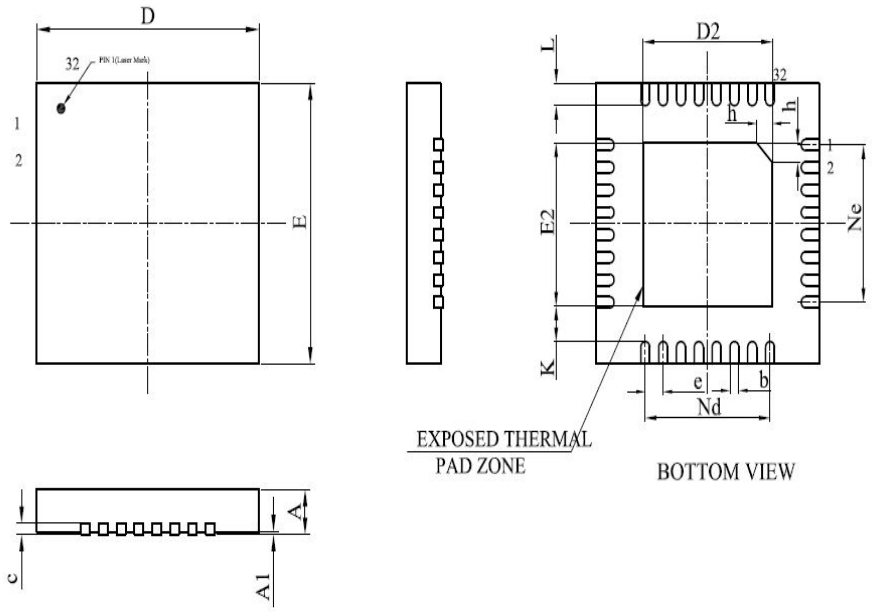
Table 10-1 AXP2585 Marking Definitions

No.	Marking	Description	Fixed/Dynamic
1	AXP2585	Product name	Fixed
2	LLLLLCB	Lot number	Dynamic
3	XXX1	Date code	Dynamic
4		X-POWERS logo	Fixed
5	White dot	Package pin 1	Fixed

10.封装和订购信息

10.1封装信息

AXP2585的封装为QFN5*5，32引脚。图10-1显示AXP2585的封装。



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.02	0.05
b	0.15	0.20	0.25
c	0.18	0.20	0.25
D	4.90	5.00	5.10
D2	2.80	2.90	3.00
e	0.40BSC		
Nd	2.80BSC		
E	4.90	5.00	5.10
E2	2.80	2.90	3.00
Ne	2.80BSC		
L	0.35	0.40	0.45
K	0.20	--	--
h	0.30	0.35	0.40
L/F载体尺寸 (Mil)	150*150		

图10-1封装信息

10.2标记信息

图10-2显示AXP2585的标记。

图10-2 AXP2585标记

表10-1描述AXP2585的标记信息。

表10-1 AXP2585标记定义

否	标记	描述	固定/动态
1	AXP2585	产品名称	固定
2	LLLLLCB	批号	动态
3	XXX1	日期代码	动态
4		X-POWERS标志	固定
5	白点	封装引脚1	固定

10.3 Carrier

Table 10-2 shows AXP2585 tray carrier information

Table 10-2 Tray Carrier Information

Item	Color	Size
Aluminum foil bags	Silvery white	540mm x 300mm x 0.14mm
Pearl cotton cushion(Vacuum bag)	White	12mm x 680mm x 185mm
Pearl cotton cushion (The Gap between vacuum bag and inside box)	White	Left-Right:12mm x 180mm x 85mm Front-Back:12mm x 350mm x 70mm
Inside Box	White	396mm x 196mm x 96mm
Outside Box	White	420mm x 410mm x 320mm

Figure 10-3 shows tray dimension drawing of AXP2585.

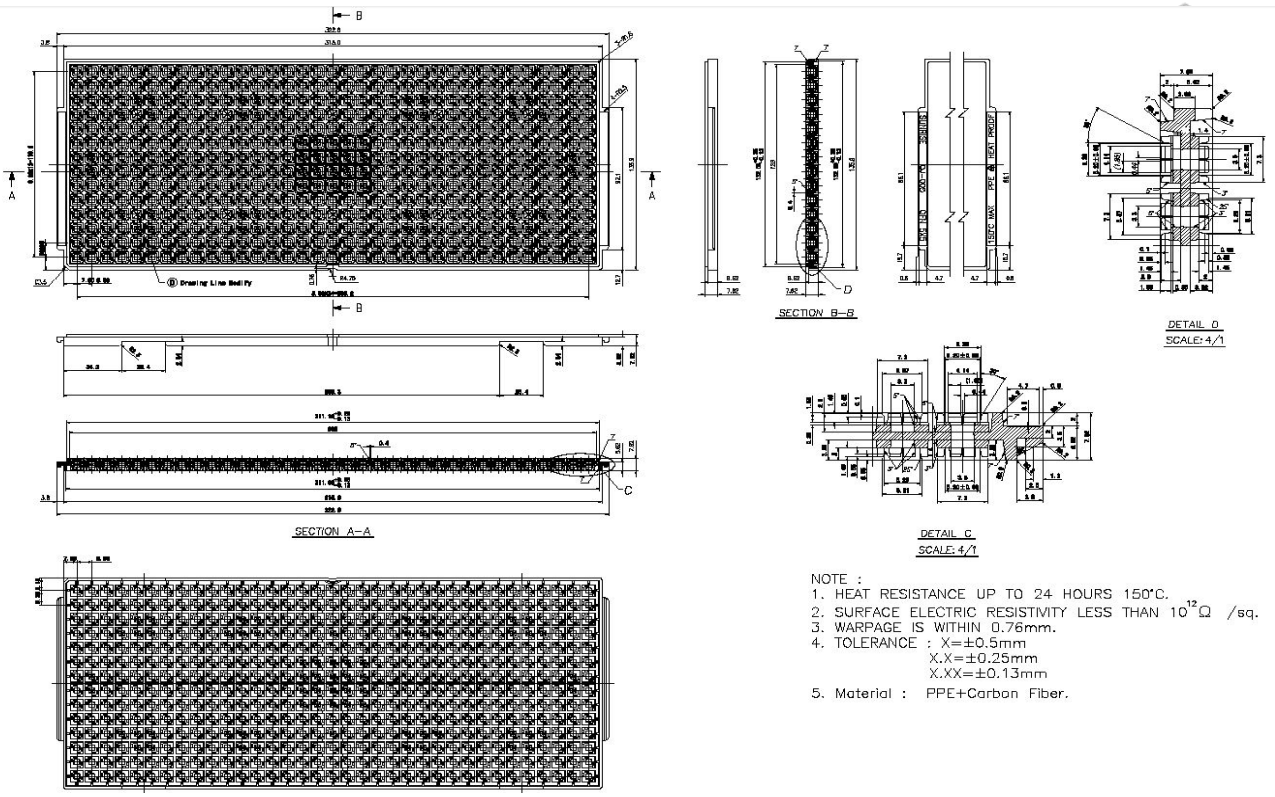


Figure 10-3 Tray Dimension Drawing

Table 10-3 shows AXP2585 packing quantity.

Table 10-3 Packing Quantity Information

Type	Quantity	Part Number
Tray	490pcs/Tray 10Trays/package	AXP2585

10.4 Storage

10.4.1 Moisture Sensitivity Level(MSL)

A package's MSL indicates its ability to withstand exposure after it is removed from its shipment bag, a low MSL device sample can be exposed on the factor floor longer than a high MSL device sample. ALL MSL are defined in

10.3载体

表10-2显示AXP2585托盘载体信息

表10-2托盘载体信息

项目	颜色	尺寸
铝箔袋	银白色	540mm x 300mm x 0.14mm
珍珠棉垫（真空袋）	白色	12mm x 680mm x 185mm
珍珠棉垫（真空袋与内部盒子之间的间隙）	白色	左右：12mmx180mmx85mm 前后：12mmx350mmx70mm
内部盒子	白色	396mm x 196mm x 96mm
外部盒子	白色	420mm x 410mm x 320mm

图10-3显示AXP2585的托盘尺寸图。

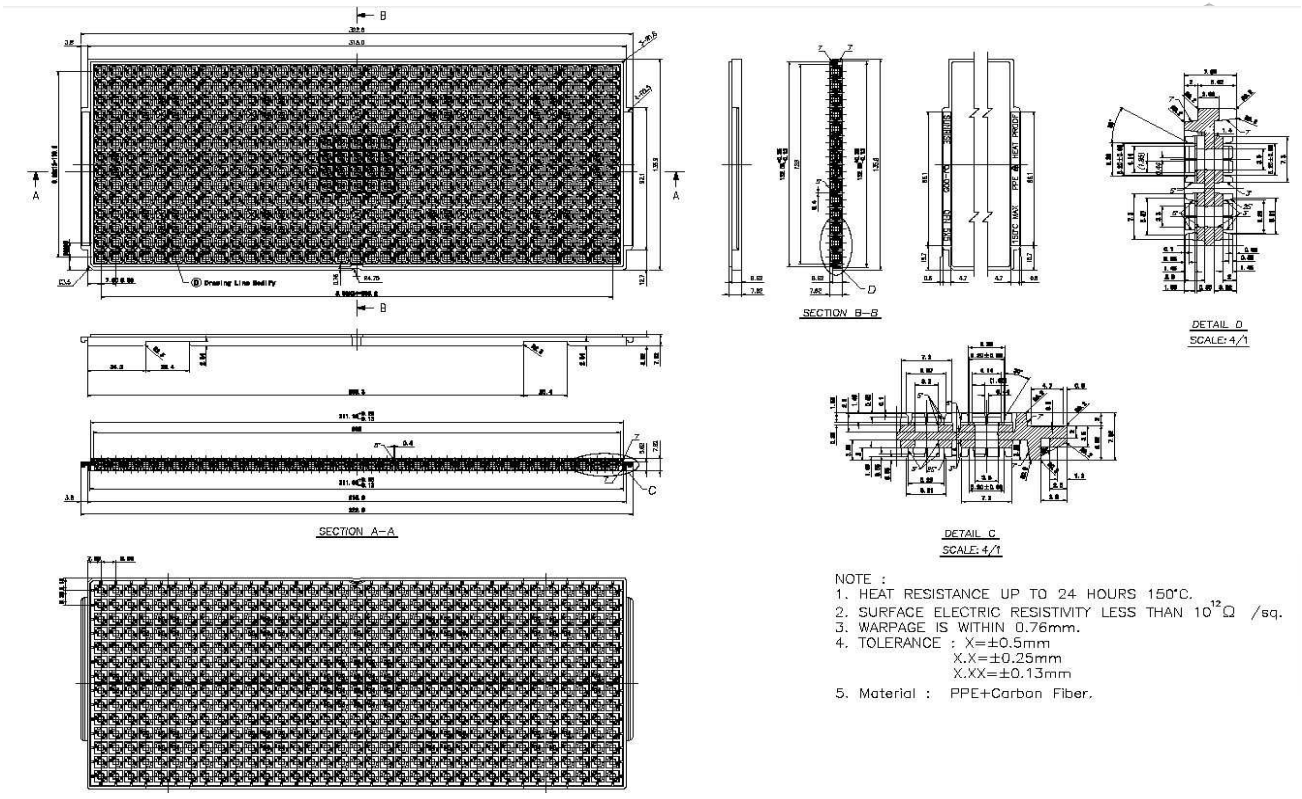


图10-3托盘尺寸图

表10-3显示AXP2585的包装数量。

表10-3包装数量信息

类型	数量	部件编号
托盘	490个/托盘 10托盘/包装	AXP2585

10.4存储

10.4.1湿度敏感等级(MSL)

一个封装的MSL指示其在从运输袋中取出后抵御暴露的能力，低MSL设备样本可以在工厂地面上暴露的时间比高MSL设备样本更长。所有MSL均在

Table 10-4.

Table 10-4 MSL Summary

MSL	Out-of-bag floor life	Comments
1	Unlimited	≤30℃/85%RH
2	1 year	≤30℃/60%RH
2a	4 weeks	≤30℃/60%RH
3	168 hours	≤30℃/60%RH
4	72 hours	≤30℃/60%RH
5	48 hours	≤30℃/60%RH
5a	24 hours	≤30℃/60%RH
6	Time on Label(TOL)	≤30℃/60%RH

AXP2585 device samples are classified as MSL3.

10.4.2 Bagged Storage Conditions

The shelf life of AXP2585 are defined in Table 10-5.

Table 10-5

Packing mode	Vacuum packing
Storage temperature	20℃~26℃
Storage humidity	40%~60%RH
Shelf life	6 months

10.4.3 Out-of-bag Duration

It is defined by the device MSL rating. The out-of-bag duration of AXP2585 is as follows.

Table 10-6 Out-of-bag Duration

Storage temperature	20℃~26℃
Storage humidity	40%~60%RH
Moisture Sensitivity Level(MSL)	3
Floor life	168 hours

For no mention of storage rules in this document, please refer to the latest ***IPC/JEDEC J-STD-020C***.

10.5 Baking

It is not necessary to bake AXP2585 if the conditions specified in Section 10.4.2 and Section 10.4.3 have not been exceeded. It is necessary to bake AXP2585 if any condition specified in Section 10.4.2 and Section 10.4.3 have been exceeded.

It is necessary to bake AXP2585 if the storage humidity condition has been exceeded. We recommend that the device sample removed from its vacuum bag more than 2 days should be baked to guarantee production.

Table 10-7 Baking Conditions

Surrounding	Bake@125℃	Note
Nitrogen	8 hours	Recommended condition. Not exceed 3 times.
Air	2 hours	Acceptable condition. Not exceed 3 times.
CAUTION： If baking is required, the devices must be transferred into trays that can be baked to at least 125°C. Devices should not be baked in tape and reel carriers at any temperature		

表10-4中定义。

表10-4 MSL摘要

MSL	出袋后存放寿命	备注
1	无限制	≤30℃/85%RH
2	1 年	≤30℃/60%RH
2a	4 周	≤30℃/60%RH
3	168小时	≤30℃/60%RH
4	72小时	≤30℃/60%RH
5	48小时	≤30℃/60%RH
5安	24小时	≤30℃/60%RH
6	标签上的时间(TOL)	≤30℃/60%RH

AXP2585设备样本被分类为MSL3。

10.4.2袋装储存条件

AXP2585的保质期在表10-5中定义。

表10-5

包装模式	真空包装
储存温度	20℃~26℃
储存湿度	40%~60%RH
保质期	6 个月

10.4.3袋外持续时间

由设备的MSL等级定义。AXP2585的袋外持续时间如下。

表10-6 袋外持续时间

储存温度	20℃~26℃
储存湿度	40%~60%RH
湿度敏感等级(MSL)	3
地板寿命	168小时

有关本文件中存储规则的说明，请参阅最新的 ***IPC/JEDEC J-STD-020C***。

10.5 烘烤

如果未超过第10.4.2节和第10.4.3节中规定的条件，则不需要对AXP2585进行烘烤。如果超过第10.4.2节和第10.4.3节中规定的任何条件，则需要对AXP2585进行烘烤。

如果存储湿度条件已超过，则需要对AXP2585进行烘烤。我们建议从真空袋中取出的设备样品在超过2天后应进行烘烤以保证生产。

表10-7 烘烤条件

周围环境	在125℃下烘烤	注意
氮气	8小时	推荐条件。不得超过3次。
空气	2 小时	可接受条件。不得超过3次。注意：如果
需要烘烤，设备必须转移到可以在至少125°C下烘烤的托盘中。设备不应在任何温度下在带胶带的卷筒中烘烤。		

11. Reflow Profile

The reflow profile recommended in this document is a lead-free reflow profile that is suitable for pure lead-free technology of lead-free solder paste.

Figure 11-1 shows the typical reflow profile of AXP2585 device sample.

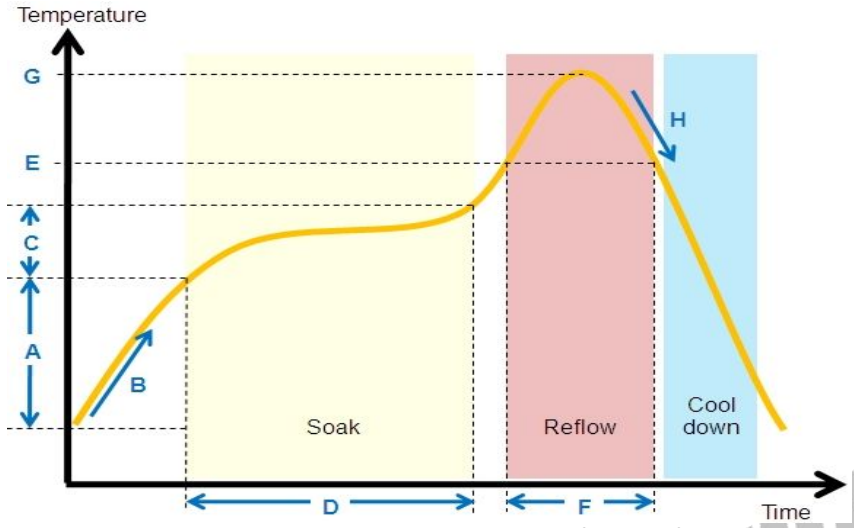


Figure 11-1 AXP2585 Typical Reflow Profile

Reflow profile conditions of AXP2585 device sample is given in Table 11-1.

Table 11-1 AXP2585 Reflow Profile Conditions

	QTI typical SMT reflow profile conditions (for reference only)	
	Step	Reflow condition
Environment	N2 purge reflow usage (yes/no)	Yes, N2 purge used
	If yes, O2 ppm level	O2 < 1500 ppm
A	Preheat ramp up temperature range	25℃ -> 150℃
B	Preheat ramp up rate	1.5~2.5 ℃/sec
C	Soak temperature range	150℃ -> 190℃
D	Soak time	80~110 sec
E	Liquidus temperature	217℃
F	Time above liquidus	60-90 sec
G	Peak temperature	240-250℃
H	Cool down temperature rate	≤4℃/sec

11. 回流曲线

本文件推荐的回流曲线是适用于纯无铅技术的无铅回流曲线，适合无铅焊膏。

图11-1显示了AXP2585设备样品的典型回流曲线。

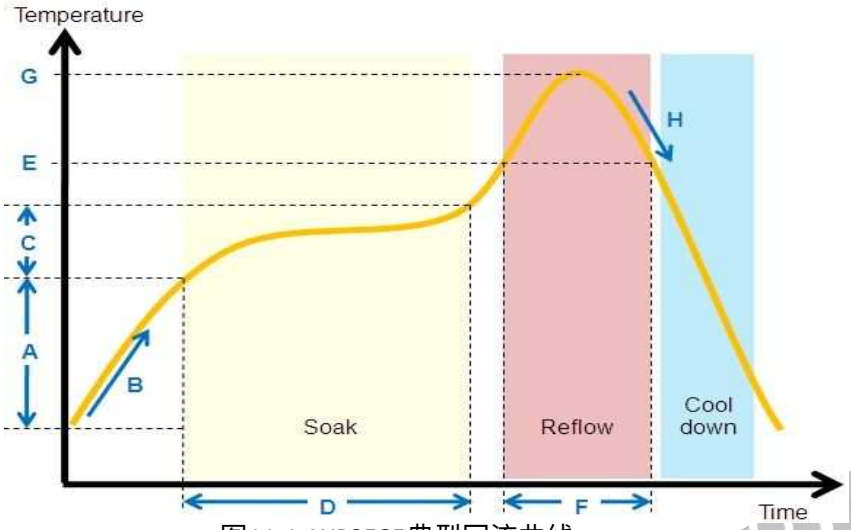


图11-1 AXP2585典型回流曲线

AXP2585设备样品的回流曲线条件见表11-1。

表11-1 AXP2585回流曲线条件

	QTI典型SMT回流曲线条件（仅供参考）	
	步骤	回流条件
环境	N2气氛回流使用（是/否）	是，使用N2气氛
	如果是，O2 ppm水平	O2 < 1500 ppm
A	预热升温范围	25℃ -> 150℃
B	预热升温速率	1.5~2.5 ℃/秒
C	浸泡温度范围	150℃ -> 190℃
D	浸泡时间	80~110秒
E	液相温度	217℃
华氏度	液相以上时间	60-90秒
G	峰值温度	240-250℃
H	冷却温度变化率	≤4℃/秒

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