DATASHEET

AXP192

Enhanced single Cell Li-Battery and Power System Management IC

X-Powers

Table of contents

1. Summary

AXP192It is a highly integrated power system management chip. It provides a simple, easy-to-use and flexibly configurable complete power solution for applications with single-cell lithium batteries (lithium-ion or lithium polymer) that require multiple power conversion outputs, fully meeting the requirements of the increasingly complex application processor system for relatively complex and precise control of power.

AXP192An adaptiveUSB-CompatibleCharger,3Buck Converter(Buck DC-DC converter,4Linear Regulator(LDO), voltage/current/temperature monitoring and other multi-channel12-Bit ADCTo ensure the safety and stability of the power supply system, AXP192Also integrated with over/under voltage (OVP/UVP), Over temperature(OTP)、Overcurrent(OCP)And other protection circuits.

AXP192Smart power balance (Intelligent Power Select (IPS™)The circuit can beUSBIt can safely and transparently distribute power between the external AC adapter, lithium battery and application system load, and enable the application system to work normally when there is only external input power but no battery (or the battery is over-discharged/damaged).

AXP192With external adapter andUSBAnd triple input capability such as battery, supporting rechargeable backup batteries.

AXP192Provides a two-wire serial communication interface to communicate with the host:Two Wire Serial Interface (TWSI)The application processor can use this interface to turn on or off certain power outputs, set their voltages, access internal registers and various measurement data (includingFuel Gauge. High precision (0.5%)'s electricity measurement data allows consumers to more clearly understand the status of electricity usage in real time, giving consumers an unprecedented equipment electricity usage experience.

AXP192supply6mm x 6mm 48-pin QFNEncapsulation.

Application Products

Handheld mobile devices

Smart Phone,PMP/MP4,number

Digital Camera, Handheld Camera

Navigation equipmentGPS, PDA,Handheld digital broadcast television receiver

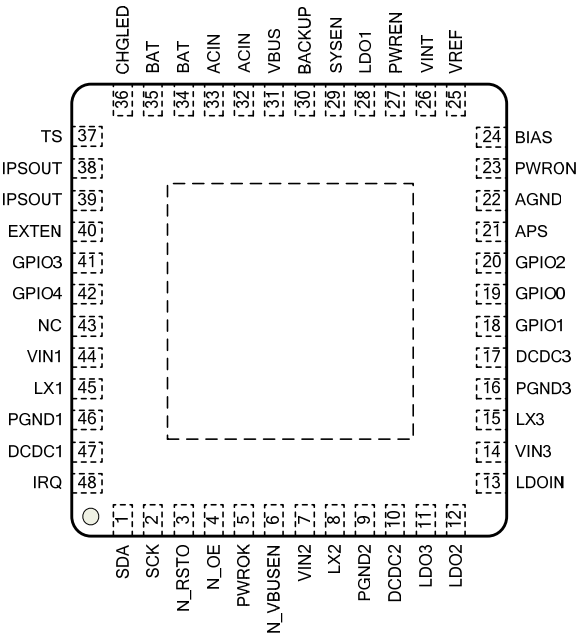
Mobile Internet DevicesMID

Digital photo frame, portableDVDplayer,

Ultra-portable mobile computerUMPC and UMPC-like,leaning machine

Application Processor Circuitry Application Processor systems Other battery and multi-power application systems

Pin Definition



2. Feature

- **Power Management (IPS)**

  oWide Input Voltage Range:

  2.9V~6.3V (AMR:-0.3V~11V)

  oConfigurable efficient intelligent power balanceIPS™system o

  AdaptiveUSBOr AC adapter voltage and current limiting

  (4.4V/500mA/100mA)

  oThe equivalent internal resistance of the internal ideal diode is less than100mΩ

- **Fully integrated charger (Charger**

  obuilt-inMOSFETThe maximum charging current can reach1.4A o

  Support battery temperature monitoring

  oComprehensive supportUSBCharging, in compliance with regulatory

  requirements oHigh charging accuracy, error less than0.5%

  osupport4.1V/4.15V/4.2V/4.36VVarious batteries o

  Automatic charging process control

  oDirect driveledIndicates charging status oAutomatically adjust

  the charging current according to the system load

- **spare battery (Backup Battery)**

  oBackup battery can be used toRTCModule power supply oSupport

  backup battery charging, charging current can be set

- **3Synchronous Buck Converter (DC-DC)**

  oDC-DC1: Available in0.7V~3.5VAdjust between

  25mV/step,Drive capability1.2A

  oDC-DC2: Available in0.7-2.275VAdjust between

  25mV/step,Drive capability1.6A,supportVRC oDC-

  DC3: Available in0.7-3.5VAdjust between

  25mV/step,Drive capability0.7A

- **4Linear Regulator (LDO)** o

  LDO1:30mA, always valid

  oLDO2: Low noiseLDO,1.8V~3.3Vadjustable,

  100mV/step,Drive capability200mA

  oLDO3: Low noiseLDO, 1.8-3.3Vadjustable,

  100mV/step,Drive capability200mA

  oLDOIO0: Low noiseLDO, 1.8-3.3Vadjustable,

  100mV/step,Drive capability50mA

  Note:VRC,Voltage Ramp Control, voltage slope

  control.

- **Signal acquisition system (Signal**

  Capture oBuilt-in16road12-bit ADC o

  accept4External signal input

  oProvides current and voltage data for batteries and external input power

  according to

  oBuilt-in high-precision coulomb counter andFuel gaugesystem oProvides rich power

  management information, such as instantaneous power consumption

  (mA or mW), remaining battery power (%or mAh),

  charging status (%) and remaining battery life or charging

  Electric time, etc.

  oLow battery warning and protection

  oProvide chip temperature information

- **Application Processor Interface (Host Interface)** oHostable

  to passTWSIInterface for data exchange oFlexible

  configurable interrupt management

  oFlexible pin function settings, multipleGPIOCan be

  Set asIO,PWMOther functions

  oBuilt-in timer

  oProvides four groups of registers that can be used when the system is shut down

  Data Retention

- **System Management(System Management** o

  Can be soft reset or hard reset

  oSupport soft shutdown or hard shutdown, support external wake-up switch

  machine

  oSupport output voltage monitoring and self-diagnosis functions

  oPWROKUsed for system reset or shutdown indication

  oExternal power supply detection (insertion/removal/inadequate drive capability)

  oAll output voltages support soft start

  oOver/under voltage protection (OVP/UVP) o

  Overcurrent protection (OCP)

  oOver temperature protection (OTP)

  osupportOTG VBUSPower status setting/monitoring

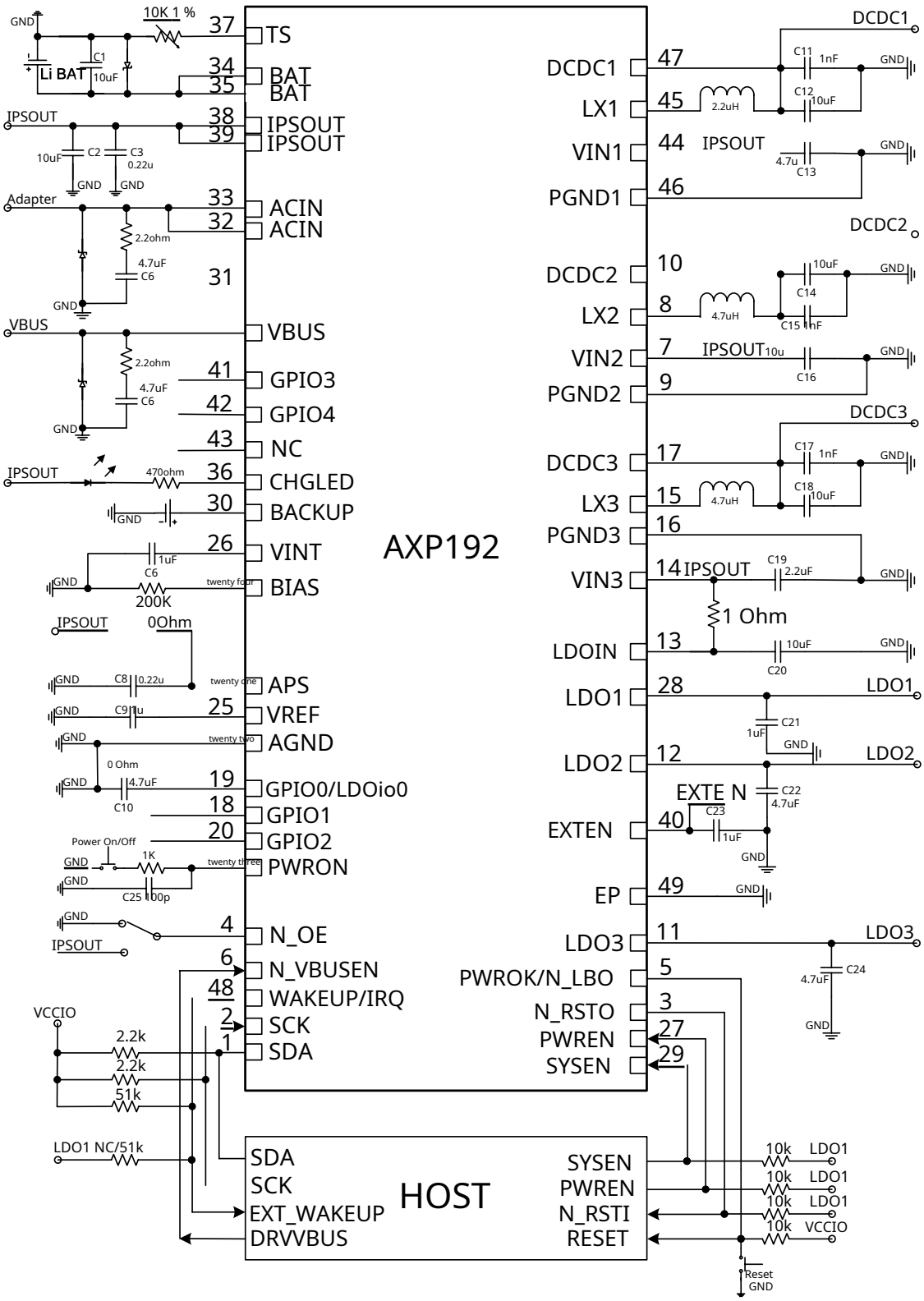
- **High integration (Fully Integration**

  oInternally generated high-precision reference voltage (

  0.5%） obuilt-inMOSFET

  oCustomizable timing and output voltage

3. Typical Application



4. Absolute Maximum Ratings

Symbol	Description	Value	Units
ACIN	Input VoltageInput voltage	- 0.3 to 11	V
VBUS	Input VoltageInput voltage	- 0.3 to 11	V
T_J	Operating Temperature RangeOperating temperature	- 40 to 130	℃
Ts	Storage Temperature RangeStorage and transportation temperature	- 40 to 150	℃
T_{LEAD}	Maximum Soldering Temperature (at leads,10sec) Soldering temperature	300	℃
V_{ESD}	Maximum ESD stress voltage,Human Body Model Antistatic ability	> 4000	V
P_D	Internal Power Dissipation Internal power consumption tolerance	2100	mW

5. Electrical Characteristics

V_{IN}=5V,BAT=3.8V,T_A= 25℃

SYMBOL	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNITS
ACIN						
V_{IN}	ACIN Input Voltage		3.8		6.3	V
I_{OUT}	V_{OUT}Current Available Before Loading BAT	500mV Voltage Drop		2000		mA
V_{UVLO}	ACIN Under Voltage Lockout			3.8		V
V_{OUT}	IPS Output Voltage		2.9		5.0	V
R_{ACIN}	Internal Ideal Diode On Resistance	PIN to PIN, ACIN to IPSOUT			200	mΩ
VBUS						
V_{IN}	VBUS Input Voltage		3.8		6.3	V
I_{OUT}	V_{OUT}Current Available Before Loading BAT	400mV Voltage Drop		500	900	mA
V_{UVLO}	VBUS Under Voltage Lockout			3.8		V
V_{OUT}	IPS Output Voltage		2.9		5.0	V
R_{VBUS}	Internal Ideal Diode On Resistance	PIN to PIN, VBUS to IPSOUT			300	mΩ
Battery Charger						
V_{TRGT}	BAT Charge Target Voltage		- 0.5%	4.2	+ 0.5%	V
I_{CHG}	Charge Current			780	1320	mA
I_{TRKL}	Trickle Charge Current			10%		I_{CHG}

						mA
V_{TRKL}	Trickle Charge Threshold Voltage			3.0		V
ΔV_{RECHG}	Recharge Battery Threshold Voltage	Threshold Voltage Relative to V_{TARGET}		- 100		mV
T_{TIMER1}	Charger Safety Timer Termination Time	Trickle Mode		40		Min
T_{TIMER2}	Charger Safety Timer Termination Time	CC Mode		480		Min
I_{END}	End of Charge Indication Current Ratio	CV Mode		10%	15%	I_{CHG} mA
Backup Battery						
V_{TRGT}	Backup Battery Charge Target Voltage		2.5	3.0	3.1	V
I_{CHG}	Backup Battery Charge Current		50	200	400	uA
I_{Backup}	Current when using Backup Battery			10	15	uA
NTC						
V_{TL}	Cold Temperature Fault Threshold Voltage	Charge	0	2.112	3.264	V
		Discharge		3.226		
V_{TH}	Hot Temperature Fault Threshold Voltage	Charge	0	0.397	3.264	V
		Discharge		0.282		
V_{TE}	NTC Disable Threshold Voltage	Falling Threshold Hysteresis		0.2		V
Ideal Diode						
$R_{ds(on)}$	Internal Ideal Diode On Resistance(BAT to IPSOUT)				100	mΩ

SYMBOL	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNITS
Off Mode Current						
I_{BATOFF}	OFF Mode Current	BAT=3.8V		27		μA
$I_{SUSPEND}$	USB VBUS suspend Mode current	BAT=3.8V, VBUS=5V, N_VBUSEN=1		86		μA
Logic						
V_{IL}	Logic Low Input Voltage			0.3		V
V_{IH}	Logic High Input Voltage			2		V
TWSI						
V_{CC}	Input Supply Voltage			3.3		V
ADDRESS	TWSI Address			0x68		
f_{SCK}	Clock Operating Frequency			400	1200	HkDJ

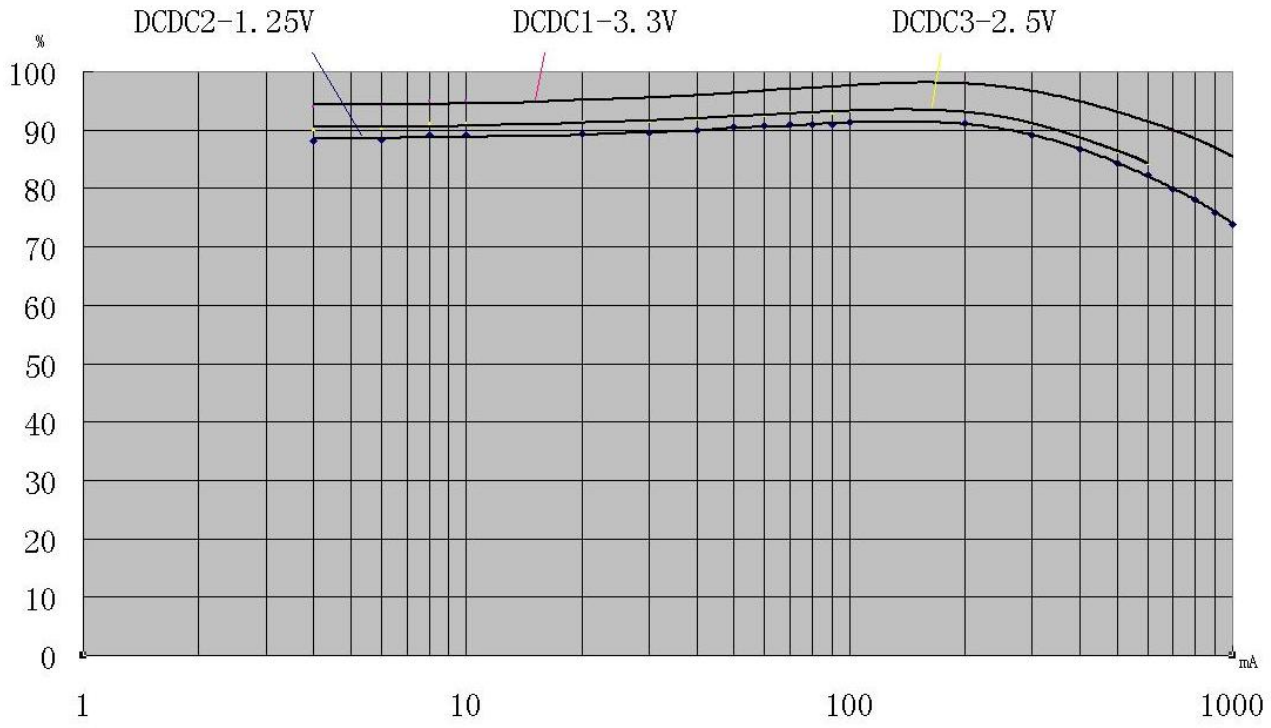
t_f	Clock Data Fall Time	2.2Kohm Pull High		60		ns
t_r	Clock Data Rise Time	2.2Kohm Pull High		100		ns
DCDC						
f_{OSC}	Oscillator Frequency	Default		1.5		MHz
DCDC1						
I_{VIN1}	Input Current	PFM Mode I_{DC1OUT}=0		26		μA
I_{LIM1}	PMOS Switch Current Limit	PWM Mode		1600		mA
I_{DC1OUT}	Available Output Current	PWM Mode		1200		mA
V_{DC1OUT}	Output Voltage	Default	0.7	3.3	3.5	V
DCDC2						
I_{VIN2}	Input Current	PFM Mode I_{DC2OUT}=0		20		μA
I_{LIM2}	PMOS Switch Current Limit	PWM Mode		2300		mA
I_{DC2OUT}	Available Output Current	PWM Mode		1600		mA
V_{DC2OUT}	Output Voltage Range		0.7	1.25	2.275	V
DCDC3						
I_{VIN3}	Input Current	PFM Mode I_{DC3OUT}=0		20		uA
I_{LIM3}	PMOS Switch Current Limit	PWM Mode		1000		mA
I_{DC3OUT}	Available Output Current	PWM Mode		700		mA
V_{DC3OUT}	Output Voltage Range		0.7	2.5	3.5	V

SYMBOL	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNITS
LDO1						
V_{LDO1}	Output Voltage	I_{LDO1}=1mA	- 1%	1.25 1.8 2.5 3.3	1%	V
I_{LDO1}	Output Current			30		mA
LDO2						
V_{LDO2}	Output Voltage	I_{LDO2}=1mA	- 1%	3	1%	V
I_{LDO2}	Output Current			200		mA
I_Q	Quiescent Current			100		μA
PSRR	Power Supply Rejection Ratio	I_{LDO2}=60mA,1KHz		TBD		dB
e_N	Output Noise,20-80KHz	Vo=3V , Io=150mA		28		μV_{RMS}
LDO3						
V_{LDO3}	Output Voltage	I_{LDO3}=1mA	- 1%	3.3	1%	V
I_{LDO3}	Output Current			200		mA
I_Q	Quiescent Current			100		μA
PSRR	Power Supply Rejection Ratio	I_{LDO3}=10mA,1KHz		TBD		dB

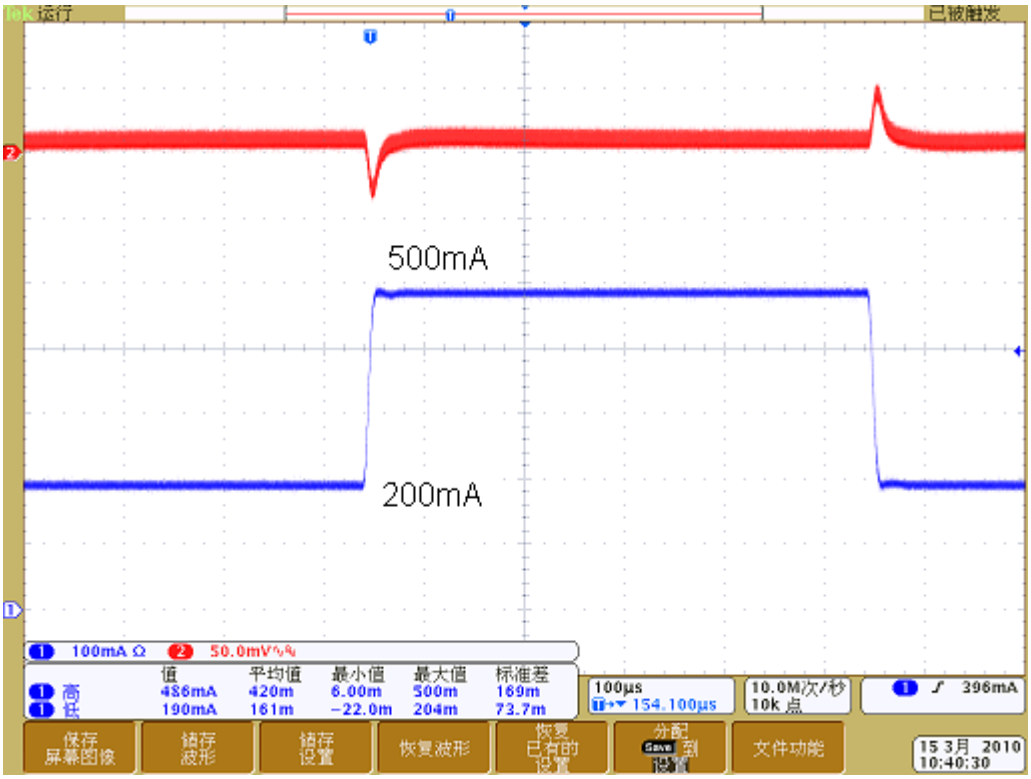
e_N	Output Noise,20-80KHz	Vo=1.8V , Io=150mA		18		μV_{RMS}
LDO$_{IO0}$						
V_{LDOIO0}	Output Voltage	I_{LDOIO0}=1mA	- 1%	3.3	1%	V
I_{LDOIO0}	Output Current			50		mA
I_Q	Quiescent Current			90		μA
PSRR	Power Supply Rejection Ratio	I_{LDOIO0}=10mA,1KHz		TBD		dB
e_N	Output Noise,20-80KHz	Vo=1.8V, Io=30mA		18		μV_{RMS}

6. Typical Characteristics

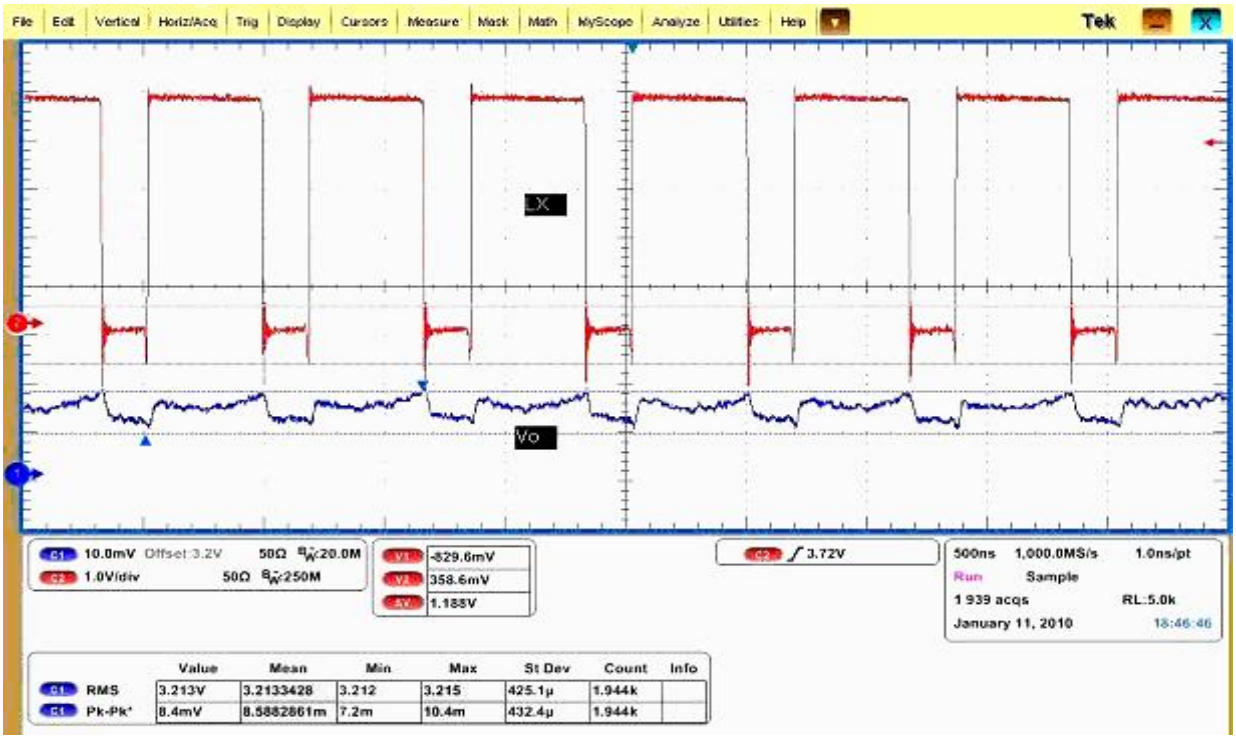
DC-DC Efficiency vs. Load (3.8Vin)



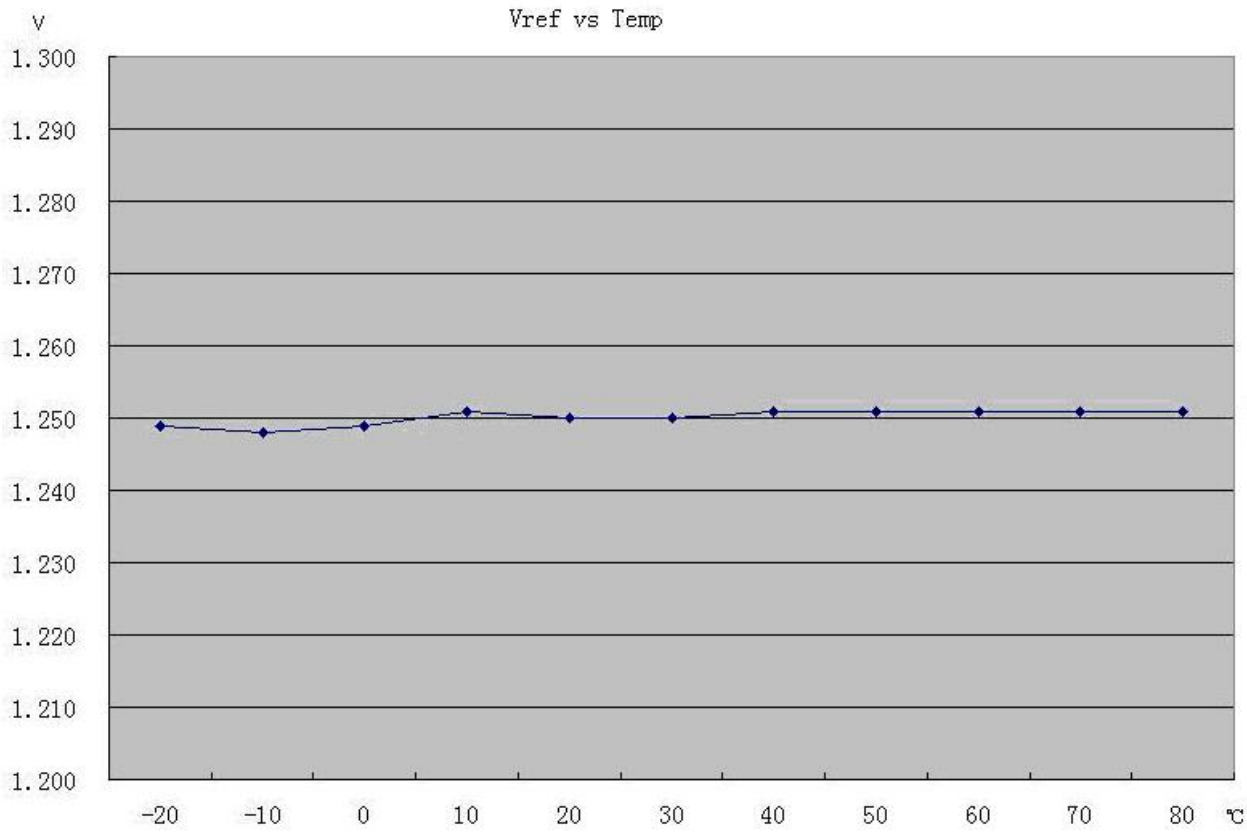
DC-DC Load Transient (Typical)



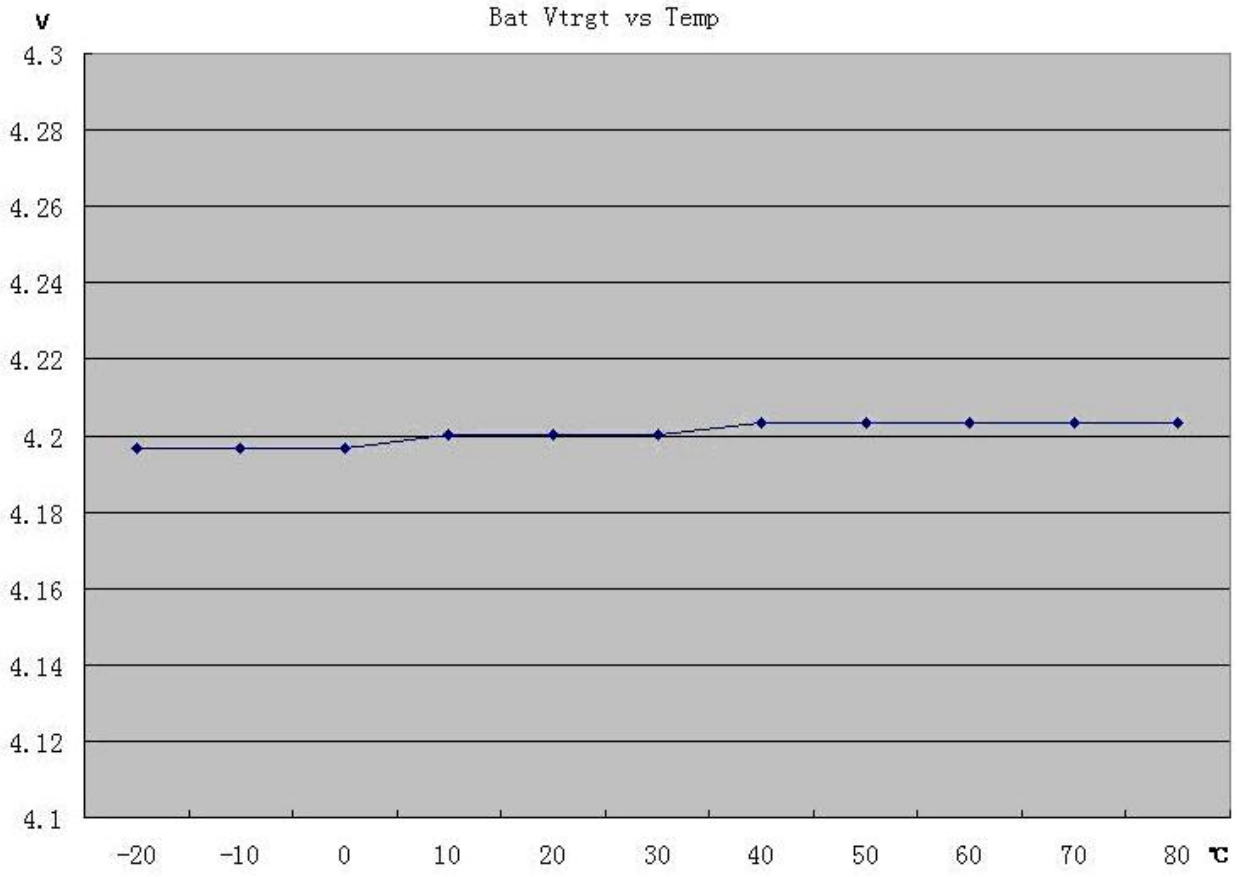
DC-DC Ripple



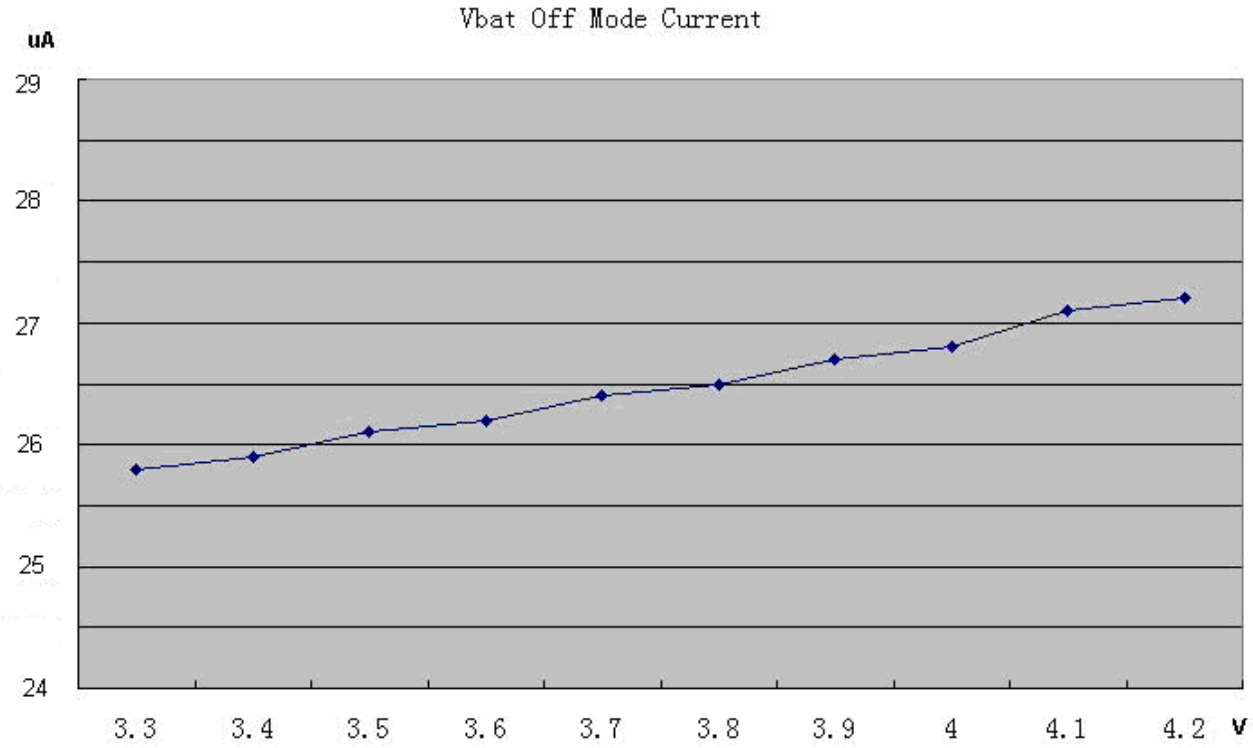
V_{REF} vs Temperature



V_{TRGT}vs Temperature



Off Mode Current vs V_{BAT}

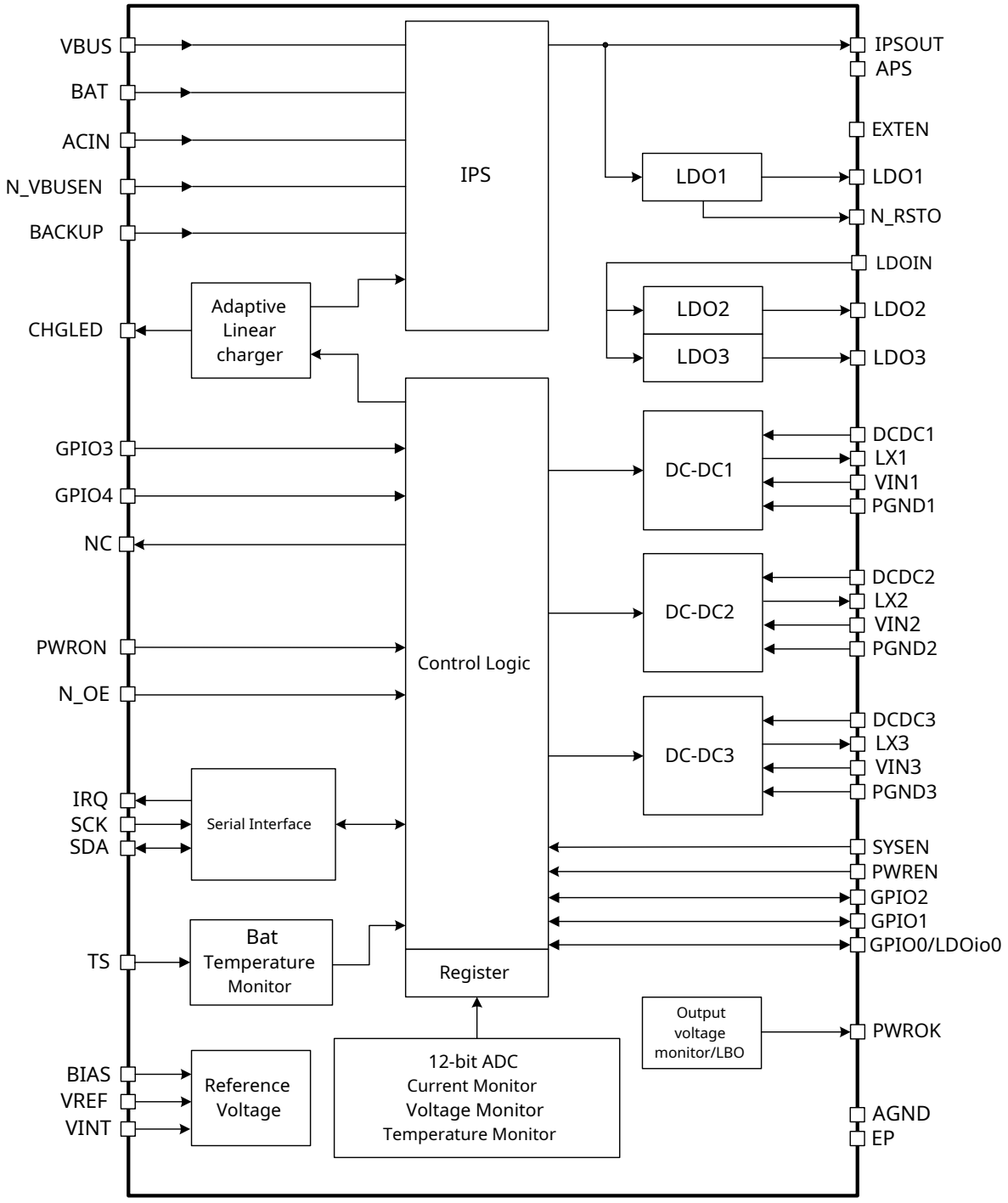


7. Pin Description

Num	Name	Type	Condition	Function Description
1	SDA	IO		Data pin for serial interface, normally it connects a 2.2K resistor to 3.3VI/O power
2	SCK	I		It is the Clock pin for serial interface, normally it connects a 2.2K resistor to 3.3VI/O power
3	N_RSTO	IO	REG9EH[7]	LDO1 Reset output
				GPIO[5]
4	N_OE	I		Power output on/off switch GND:on;IPSOUT:off
5	PWROK/ N_LBO	O	SYSEN=LDO1	Power good indication
				Low power detect output
6	N_VBUSEN	I		VBUS to IPSOUT Selection GND:IPSOUT select VBUS High:IPSOUT do not select VBUS
7	VIN2	PI		DCDC2 input source
8	LX2	IO		Inductor Pin for DCDC2
9	PGND2	G		NMOS Ground for DCDC2
10	DCDC2	I		DC-DC2 feedback pin
11	LDO3	O		Output Pin of LDO3
12	LDO2	O		Output Pin of LDO2
13	LDOIN	PI		Input to LDO2 and LDO3
14	VIN3	PI		DCDC3 input source
15	LX3	IO		Inductor Pin for DCDC3
16	PGND3	G		NMOS GND for DCDC3
17	DCDC3	I		Feed back to DCDC3
18	GPIO1	IO	REG 93H[2:0]	GPIO 2
				PWM 2
				ADC Input
19	GPIO0	IO	REG 90H[2:0]	GPIO 0
				Low noise LDO
				ADC Input
20	GPIO2	IO	REG 92H[2:0]	GPIO 1
				PWM 1
				ADC Input
twenty one	APS	PI		Internal Power Input
twenty two	AGND	G		Analog Ground

twenty three	PWRON	I		Power On-Off key input,Internal 100k pull high to APS
twenty four	BIAS	IO		External 200Kohm 1% resistor
25	VREF	O		Internal reference voltage
26	VINT	PO		Internal logic power, 2.5V
27	PWREN	IO		it is the Low-voltage Power domain enable signal
28	LDO1	O		LDO1 output,for Host RTC block
29	SYSEN	IO		it is the High-voltage Power domain enable signal
30	BACKUP	IO		Backup battery pin
31	VBUS	PI		USB VBUS input
32,33	ACIN	PI		Adapter input
34,35	BAT	IO		Main Battery
36	CHGLED	O		charger status indication
37	TS	I		Battery Temperature sensor input or an external ADC input
38,39	IPSOUT	PO		System power source
40	EXTEN	O		External power module Enable
41	GPIO3	I	REG95H[7]	GPIO3
42	GPIO4	I		GPIO4
43	NC	O		NC
44	VIN1	PI		DCDC1 input source
45	LX1	IO		Inductor Pin for DCDC1
46	PGND1	G		NMOS Ground for DCDC1
47	DCDC1	I		DCDC1 feedback pin
48	IRQ/ WAKEUP	IO		IRQ output or wakeup
49	EP	G		Exposed Pad, need to connect to system ground

8. Functional Block Diagram



9. Control and Operating

whenAXP192in working,TWSIinterfaceSCK/SDAPin pull-up to systemIOPower supply, thenHostThis interface can be used toAXP192 The working status can be flexibly adjusted and monitored, and rich information can be obtained.

Note:"HostRefers to the main processor of the application system. Note: The "external power supply" referred to below includesACINandVBUSenter.

9.1 Working Mode and Reset (Power On/Off & Reset)

Working mode button (PEK)

AXP192ofPWRONPin toGNDA button can be connected between them as an independent power buttonPower Enable Key(PEK) or Sleep/Wake button.AXP192It can automatically recognize "long press" and "short press" of this button and respond accordingly.

Several power on sources

1,ACIN,VBUSAnd battery access. 2,
N_OEFrom high to low.
3,PEK.

Power On—Mode A

whenSYSENPins andLDO1When connected together,AXP192In power on/off modeA.

N_OEWhen the required main power supply (ACINorVBUS>3.8V, the battery voltage is higher than the shutdown voltage) when connected,AXP192 It will automatically start up (whether it will automatically start up when external power is connected can be rewritten according to external needs).

And inN_OEis low and in shutdown state, the startup action needs to bePEKOperation is completed. In the case of external power or battery,N_OEA change from high to low will also causeAXP192Turn on the computer.

AXP192Can bePEK(The key press time exceeds "ONLEVEL")In practical applications,HostTiming(AlarmThe output signal can also be connected toPWRON—andPEKin parallel,AlarmWhen the signal is valid (low level), it is equivalent toPEKPress to alsoAXP192 Turn on the computer.

After booting up,DC-DCandLDOIt will start softly according to the set timing sequence. After the start is completed, it can beHostor throughPWRENThe pin turns the corresponding power supply on/off.

Power Off—Mode A

PEKLong press time is greater thanIRQLEVELWhenPEKIn the interrupt service routine,HostYou can use the "RegisterREG32H[7]" Write "1"To notifyAXP192Enter shutdown mode.AXP192When entering shutdown mode, allLDO1All power outputs except

In the following cases,AXP192Will automatically shut down:

1, input voltage is too low, low power protection;

2, the load is too large, causing the output voltage of the power supply to be too low, overload protection;

3, input voltage is too high, overvoltage protection (see the "Power Path Management" section for details); 4,N_OEChange from low to high without shutting down within the set time;

5,PEKmore than theOFFLEVELWhen (default6S)The system automatically shuts down exceptLDO1Other outputs besides

AXP192The automatic protection mechanism can avoid irreversible damage to the powered devices when the application system is abnormal, thereby protecting the entire system.

Power On—Mode B

whenSYSENPin Not ANDLDO1When connected together,AXP192In power on/off modeB.

In boot modeBUnder this condition, each power supply output isSYSEN/PWRENControl, whenSYSEN/PWRENWhen high, its corresponding power path output is turned on, otherwise the output is turned off.

With the methodAThe difference is that each power-on source will only occur whenWAKEUPA low level pulse is generated on the pin to notifyHOST Pull upSYSEN/PWRENTurn on the computer.

Note: This method is intended forPXAIn applications with processors of similar series and power management methods.

Power Off—Mode B

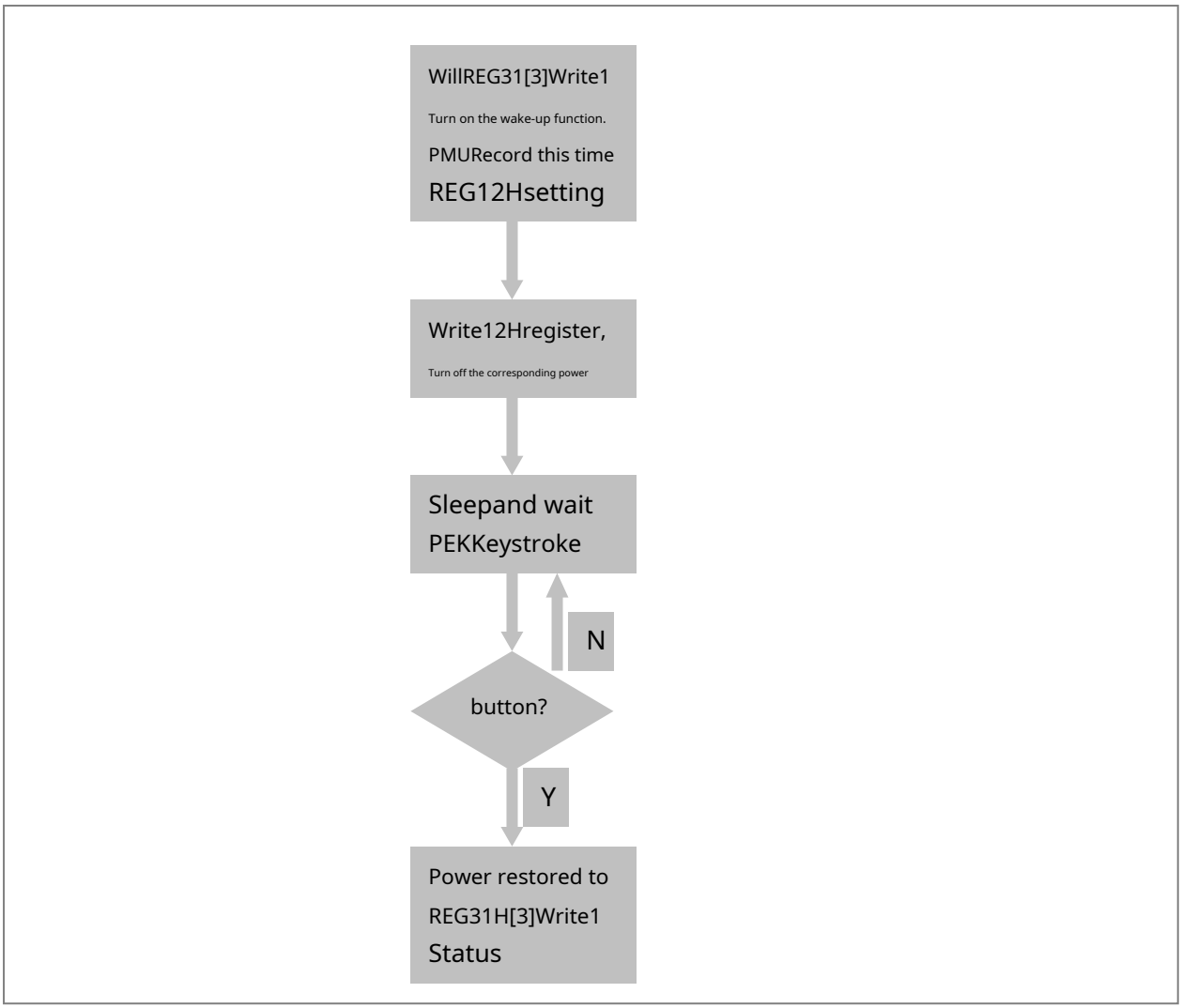
If shutdown modeAThe shutdown source described, each shutdown method will not be shut down directly immediatelyAXP192The output isN_LBOA low level signal is generated on the pin to notify the system to pull downSYSEN/PWRENEnter shutdown mode; if2SThe system is not pulled down SYSEN/PWREN,butAXP192Automatic shutdown; of courseHOSTYou can also directly pull downSYSEN/PWRENEnter the corresponding shutdown mode.

Note: Same as boot modeB, shutdown modeBAlso envisioned forPXANote: Some processors have sleep (Sleep,SYSEN/PWRENall the way low, all the way high) and deep sleep (Deep Sleep, SYSEN/PWRENAll are low, exceptLDO1All outputs are off) in two modes.

Sleep and wakeup

existMannerAAnd when the computer is turned on, if the system needs to enterSleepmode, and turn off one or more of the power supplies, then theREG31[3] Control, decide whetherPEKShort press signal triggerwakeup,letPMURestore the output power of each channel toREG31[3] Placed1When the power is turned off, each power supply is turned on in sequence according to the specified power-on sequence.

As followsSleepandwakeupMode its control flow.



System reset function and output monitoring function (PWROK/N_LBO)

In the on/off modeADown:

AXP192ofPWROKCan be used as a reset signal for the application system.AXP192During the boot process,PWROKOutput low level, when the output voltage of each power supply reaches the preset value stably,PWROKWill be pulled high, thereby achieving a power-on reset of the application system.

During the normal operation of the application system,AXP192The voltage and load conditions of each output are always monitored, and in the case of overload or undervoltage,PWROKOutput low level immediately to reset the application system to prevent malfunction and possible data errors.

In the on/off modeBDown:

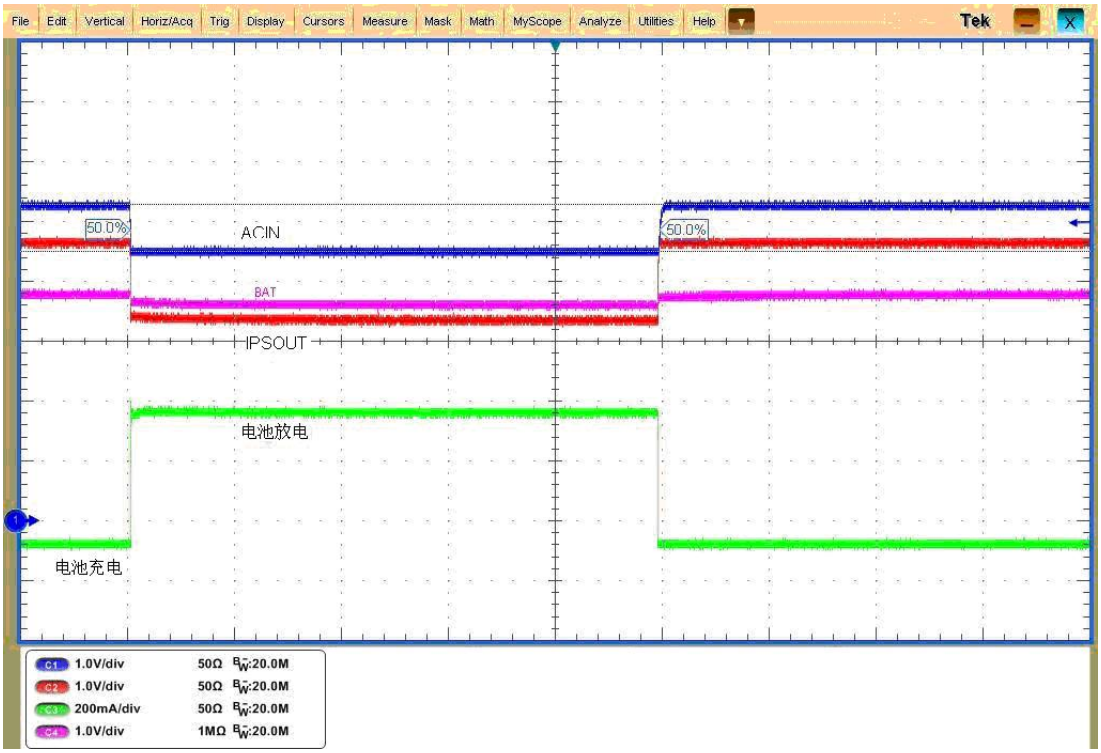
This pin is used asN_LBOSignal, its low level is used to indicate that the system needs to enter shutdown mode. The specific function is the same as the shutdown modeBDescription State.

9.2 Power Path Management (IPS)

AXP192The power input can come from a lithium batteryBAT,USB VBUSInput, external power supplyACIN(Such as AC adapterAC Adapter),IPSSelect the appropriate power distribution method according to the status of the external power supply and the lithium battery.

- When only the lithium battery is connected and no external power is input, the lithium battery is used for power supply; When the external power is connected
- (VBUSorACIN), external power supply is used first; when the battery is connected, when the external power supply is removed, it will immediately and
- "seamlessly" switch to lithium battery power supply; whenVBUSandACINWhen both are connected at the same time, the priority is given toACINPower supply
- and charge the lithium battery; ifACINWhen the driving capacity is insufficient, it will be opened in timeVBUSPathway, realizationACIN/VBUSIf the driving
- capability is still insufficient, the charging current will be reduced until0, and then use batteries to supplement the power supply;
-

See the following diagram:



As shown in the figure above, whenACINWhen the load capacity is insufficient,IPSOUTVoltage drops,BATFrom the original charging to discharging andACIN Together they provide load current.

Hostable to passTWSIaccessAXP192The internal registers are used to setIPSparameters and read their feedback information.

Voltage/current limiting mode and pass-through mode

In order not to affectUSBcommunication,VBUSThe channel works by default in "VBUSVoltage Limiting Mode. In this mode,AXP192WillVBUS The voltage is maintained at a settable reference voltageV_{HOLD}Above, to meetUSBspecification.V_{HOLD}The default is4.4V, can be registered in Reg30H[5:3]Adjustment.

If the systemUSB VBUSIf the current draw is limited, a current limiting mode is available (see register REG30H[1]), current limit value optional500mA/100mA(registerReg30H[0]).

If the system only usesUSBPower supply without mindingUSBCommunication, or useUSBThe power adapter can be modified by register REG30H[6] WillAXP192Set toVBUSDirect mode", at this timeAXP192The power demand of the application system will be met first.USB HostThe driving ability is too weak or the system power consumption is too high.VBUSVoltage belowV_{HOLD},AXP192Will issueIRQ,informHost VBUS Power supply is weak, indicatingUSB Communications may be affected and subsequent actions may beHostSoftware determines.

AXP192's response when external power is plugged in

AXP192The external power supply can be automatically detected.AXP192After detecting that an external power supply is plugged in, it will automatically determine whether the external power supply is available and set the result in the corresponding register.IRQ,notifyHost.

The register status bits and meanings of the external power supply are shown in the following table:

Status bits of registers	meaning
registerREG00H[7]	Indicates external adapter powerACINdoes it exist
registerREG00H[6]	Indicates external adapter powerACINit's usable or not
registerREG00H[5]	Indicates external power supplyVBUSdoes it exist
registerREG00H[4]	Indicates external power supplyVBUSit's usable or not
registerREG00H[3]	Indicates that an external power supply is connectedVBUShour,VBUSIs the voltage higher thanV_{HOLD}
registerREG00H[1]	Indicates external power supplyACIN/VBUSIs it inPCBShort circuit
registerREG00H[0]	Indicates whether the system isACIN/VBUSTrigger boot

"Indicates that external power is connectedVBUShour,VBUSIs the voltage higher thanV_{HOLD}"This flag allowsHostUpon receiptIRQ7 Time (referring toVBUSPower supply capacity is weak), judgeVBUSIs it because the system load is connected and pulled down or because the external power supply voltage itself is lower than V_{HOLD}, so as to facilitateHostThe software decides whether to continue operating in voltage limiting mode or change to pass-through mode.

Whether to use VBUS as the input power supply

AXP192Whether to useVBUSAs the input power supply,N_VBUSENand registersREG30H[7]To decide:

N_VBUSEN	REG30H[7]	Input Power	meaning
Low	0	VBUS	VBUSValid and noACINWhen using
Low	1	VBUS	VBUSWhen validVBUSAs input power
High	1	VBUS	
High	0	ACIN/BAT	Not selectedVBUS

Low battery warning and low battery protection (auto shutdown)

AXP192Two levels of low battery warning voltage can be set$V_{WARNING}$and automatic shutdown voltageV_{OFF}, andAPSOnce you find APSLower than$V_{WARNING}$, then issueIRQ19.ifAPSLower thanV_{OFF},AXP192Automatically enter shutdown mode, turn offLDO1All outputs except

$V_{WARNING}$ConfigurableLEVEL1/LEVEL2,whenAPSThe voltage drops belowLEVEL2Issued laterIRQ30,APSThe voltage rises again toLEVEL1This will be automatically cleared afterIRQ.

VWARNINGandVOFFThe default values are available in registersREG3AH,REG3BHandREG31H Bit[2:0]set up.

Overvoltage protection

When the external power supply voltage exceeds6.3Vhour,APX19xissueIRQ1/4, indicating that the external power supply is over-voltage.7V,AXP192 Automatic shut-down.

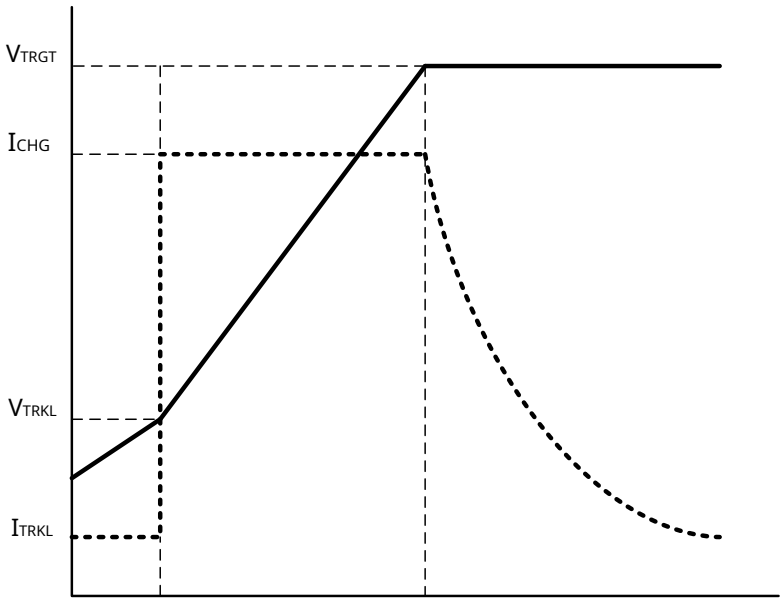
9.3 Adaptive Charger

AXP192An integrated constant current/constant voltage charger can automatically control the charging cycle, and the built-in safety clock can automatically stop charging without processor intervention. This charger can automatically adjust the charging current according to the system power consumption, and also has battery detection, trickle charging and activation functions. The built-in temperature detection circuit can automatically reduce the charging current when the temperature is too high or too low.

Start of the adaptive charging process

The charger is enabled by default (it can be disabled by setting the register, see "RegisterREG33H")When the external power supply is connected,AXP192First, determine whether the external power supply is available for charging. If the external power supply is available and the charging function is turned on,AXP192 Automatically starts charging processHostissueIRQ, indicating that the charging process has started. At the same time,CHGLEDThe pin outputs a low level and can drive an external light-emitting diode to indicate the charging status.

Schematic diagram of voltage and current during charging process



Two marking voltages

V_{TRGT}, charging target voltage.V_{TRGT}Can be set by register, default is4.2V(See RegisterREG33H[6:5]")At the same time, when the external power supply voltage is low,AXP192The charging target voltage will be adjusted automatically.

V_{RCH}, automatic recharge voltage.$V_{RCH}=V_{TRGT}$-0.1V.

recharging current

The charging current can be set by registerREG33H[3:0]The default value is450mAor780mA.

Charging process

If the battery voltage is lower than3.0V, the charger automatically enters the pre-charge mode, and the charging current is the preset value1/10.if40 Minutes (This time is adjustable, see "RegisterREG34H"), the battery voltage still cannot reach3.0V, the charger automatically enters the battery activation mode. For details, see "Battery Activation Mode".

Once the battery voltage is higher than3.0V, the charger starts to enter the constant current mode. If the charging current is less than the preset value65%When IRQ17This notifies you that "the external power supply is insufficient and the charging current has not reached the set value, which will extend the charging time. If you want to charge faster, it is recommended to replace the power supply with a stronger one or turn off the power-intensive functions."

When the battery voltage reaches the target voltageV_{TRGT}After that, the charger enters constant voltage mode from constant current mode, and the charging current decreases.

When the charging current is lower than the preset value10%or15%When (can be set, see "RegisterREG33H"), the charging cycle ends, charging stops, and when charging is finished,AXP192Will issueIRQ18,CHGLEDThe pin stops indicating the charging status.V_{RCH}

When the battery is fully charged, it will automatically start to recharge and sendIRQ17.

In non-precharge mode, if480minutes (this time can be adjusted, see "RegisterREG34H"), the charging cycle has not ended, the charger will automatically enter the battery activation mode.

Battery activation mode

Whether entering the battery activation mode from the pre-charge mode or the constant current charge mode (when the timer times out),AXP192Will issue IRQ10, indicating that the battery may be damaged.

In battery activation mode,ChargerAlways charge the battery with a small current. If the battery voltage can reachV_{RCH}, then exit the activation mode and issueIRQ11.

AXP192In the registerREG01HIndicates whether the charger is in battery activation mode.

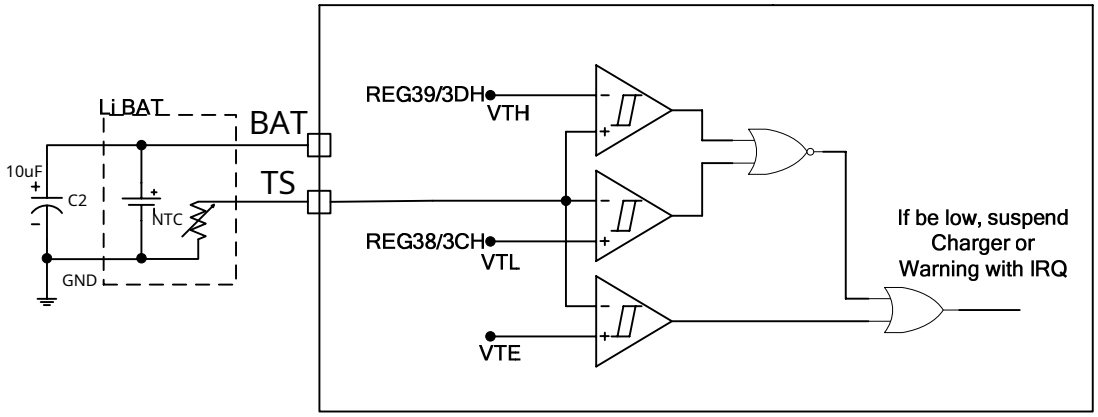
CHGLED

CHGLEDThe pin is used to indicate the charging status and alarm. It has four states: charging, not charging, battery abnormality alarm and external power supply overvoltage alarm.CHGLEDyesNMOS Open Drain(The output of the open drain type can directly drive a light-emitting diode through a current limiting resistor to display these four states. Its performance in each state is shown in the following table:

state	Performance	Notes
Charging	Low level	
Not Charging	High resistance	
Battery abnormality	25% duty 1HzJump	The charger enters battery activation mode, or the battery temperature is too high or too low
Overpressure	25% duty 4HzJump	External power input voltage is too high

Battery temperature detection

During charging/use,AXP192Can be done throughTSThe pin is connected to a thermistor to monitor the battery temperature. The circuit diagram is as follows:



In the above figure,VTH/VTLThey are high temperature and low temperature threshold settings, which can be set through registersREG38H/39H/3CH/3DHset up, VTE=0.2V. It is recommended to use a temperature sensitive resistor25℃10Kohm, Accuracy1%ofNTCThermistor.AXP192will beTSThe pin sends a constant current, which can be set to20uA,40uA,60uA,80uAFour (see registerREG84H), to adapt to differentNTCThis current flows through the thermistor and a detection voltage is obtained.AXP192passADCMeasure the voltage value and compare it with the set value, and then issue the correspondingIRQOr pause charging.

If the resistance of the thermistor is too large or too small, additional resistors can be connected in parallel or series in its path to expand its detection range.

If the battery does not have a thermistor, you canTSThe pin is connected to ground.AXP192Automatically disable the battery temperature monitoring function.

Battery detection

AXP192The presence of a battery is automatically detected and marked in the register (see RegisterREG01H)and issueIRQ13,IRQ14.

The battery detection function can beHostControl open or close (see registerREG32H).

9.4 Backup Battery

AXP192Supports the use and charging of backup batteries when there is no main power supply (BAT/ACIN/VBUS)When it exists,LDO1The input source is a backup battery, and its output is used to maintain the operation of some circuits such as the system real-time clock.

When main power is present, theREG35H[7]To charge the backup battery, the target voltage is by default3.0V(accessible REG35H[6:5]Setting), the default charging current is200uA(You can alsoREG35H[1:0]set up).

9.5 Multi-Power Outputs

AXP192The multiple output voltages and functions provided are listed as follows:

Output Path	type	Default voltage	Application examples	Drive capability
DCDC1	BUCK	Configurable	3.3VI/O	1200 mA
DCDC2	BUCK	Configurable	1.25Vcore	1600 mA
DCDC3	BUCK	Configurable	2.5Vddr	700 mA
LDO1	LDO	Configurable	RTC	30 mA
LDO2	LDO	Configurable	Analog/FM	200 mA
LDO3	LDO	Configurable	1.8V HDMI	200 mA
LDOIO0	LDO	Configurable	Vmic	50 mA

AXP192Include3Synchronous BuckDC-DC,4roadLDO, multiple startup timings and control methods.DC-DCThe default operating frequency is1.5MHz, which can be adjusted by setting registers, and small inductor and capacitor components can be used as peripherals.3indivualDC-DCCan be set toPWM mode or automatic mode (byAXP192Automatically switch according to the load size), see "RegisterREG80H".

DC-DC1/2/3

DCDC1/3The output voltage range is0.7-3.5V,DCDC2The output voltage is0.7-2.275V, which can be set by registers (see "Register REG23H 26H 27H 29H").

DCDC1/2/3Output capacitor recommended10uF X7RAbove smallESRCeramic capacitor; when the output voltage is set to2.5VWhen the above, it is recommended to use2.2uHInductor,2.5VIt is recommended to use the following4.7uHThe inductor saturation current must be greater than the maximum current required by the power path.50%above.

The following is a list of recommended inductors and capacitors:

inductance		
model	Current Specifications	DC internal resistance
Murata LQH55PN2R2NR0	2100mA@2.2uH	30mOhm
Murata LQH55PN4R7NR0	1400mA@4.7uH	60mOhm
Murata LQH44PN2R2MP0	2000mA@2.2uH	49mOhm
Murata LQH44PN4R7MP0	1700mA@2.2uH	80mOhm
TDK VLF5010ST-2R2M2R3	2700mA@2.2uH	41mOhm

TDK VLF5014ST-4R7M1R7	1700mA@4.7uH	98mOhm
TDK SLF6045T-4R7N2R4-3PF	2400mA@4.7uH	27mOhm

capacitance

model	Temperature characteristics	Tolerance
TDK C2012X5R0J475K	X5R/X7R	10%@4.7uF
TDK C2012X5R0J106K	X5R/X7R	10%@10uF
Murata GRM31E71A475K	X7R	10%@4.7uF
Murata GRM21E71A106K	X7R	10%@10uF
Murata GRM31E71A106K	X7R	10%@10uF

LDO1

LDO1Always on, it can be used as the real-time clock circuit of the application system (RTC)Provides uninterrupted power supply with a driving capability of30mA.

LDO2/3

LDO2/3It adopts low noise design and can provide power for the analog circuit of the application system. Its driving capability is200mA.

LDOIO0

LDOIO0It also adopts a low noise design, and the output drive capability is50mA.

Soft Start

allDC-DCandLDOBoth support soft-start output establishment mode to avoid the impact of sudden current changes on the input path during startup.

Self-diagnosis: load monitoring and current limiting protection

allDC-DCandLDOAll of them have load monitoring and current limiting functions. When the load current exceeds its driving capability, each output voltage will drop to protect the internal circuit.DC-DCThe output voltage is lower than the set voltage85%hour,AXP192Automatic shutdown. At the same time, the system automatically records which output voltage is too low to cause shutdown (see registerREG46H[5:2])and issue the correspondingIRQ.

allDC-DCNo external Schottky diode and resistor divider feedback circuit is required.DC-DC, just need to change the correspondingLXJust leave the pin floating.

9.6 Default Voltage/Timing Setting

AXP192The default voltage and startup sequence of each power supply can be customized.

Startup sequence: includes8Level start, that is0-7, among which7Level means that this power supply is not started by default when powered on.0-6Level means1-7Start this power supply step by step. At the same time, you can set the time interval for each step start, the optional range is1,4,16mS.

Default voltage setting: EachDCDC/LDOThe configurable range includes the selection from the lowest voltage to the highest voltage. For more information about this part, please refer to the "Default Configuration Instructions" document.

9.7 Signal Capture

A typical battery charge monitor usually estimates the battery charge by measuring the battery voltage.AXP192Multi-channel12-Bit ADCIn addition to measuring battery voltage, it can also measure battery current and external power supply voltage and current. At the same time, a battery charge and discharge coulomb meter is integrated inside.Host The battery power can be calculated more accurately based on these data. In addition, rich power information such as the system's real-time power consumption, remaining battery power, battery charging progress, remaining battery usage time, and remaining full charge time can also be calculated.

VariousADCThe enable control and sampling speed can be controlled by registerREG82H,83H,84HTo set, the sampling results are stored in the corresponding registers, see the register description.ADCData class.GPIO[3:0]The input range can be set by registerREG85HThe battery current direction is charging or discharging.REG00H[2]To indicate.

Channel	000H	STEP	FFF
Battery Voltage	0mV	1.1mV	4.5045V
Bat discharge current	0mA	0.5mA	4.095A
Bat charge current	0mA	0.5mA	4.095A
ACIN volatge	0mV	1.7mV	6.9615V
ACIN current	0mA	0.625mA	2.5594A
VBUS voltage	0mV	1.7mV	6.9615V
VBUS current	0mA	0.375mA	1.5356A
Internal temperature	- 144.7℃	0.1℃	264.8℃
APS voltage	0mV	1.4mV	5.733V
TS pin input	0mV	0.8mV	3.276V
GPIO0	0/0.7V	0.5mV	2.0475/2.7475V
GPIO1	0/0.7V	0.5mV	2.0475/2.7475V
GPIO2	0/0.7V	0.5mV	2.0475/2.7475V
GPIO3	0/0.7V	0.5mV	2.0475/2.7475V

9.8 Multi-Function Pin Description

GPIO[4:0]

can be used asGPIO[4:0],ADC Input(monitoring external signals),LDO,PWMFor details, seeREG90H-96Hillustrate.

N_RSTO

LDO1Status monitoring signal (pull up toLDO1) orGPIO5, seeREG9Eillustrate.

CHGLED

Charging status indication, over-temperature and over-voltage alarm functions, andGPOFunction, usage seeREG32Hillustrate.

IRQ(WAKEUP)

whenAXP192In power on/off modeAWhen this pin is usedIRQStatus indication pin, when an interrupt occurs, its output is pulled low to notifyHOSTPerform interrupt processing and pull up to the systemIOpower supply.

whenAXP192In power on/off modeBWhen this pin is usedWAKEUPTrigger signal indication, pull up toLDO1For its specific functions, please refer to the startup methodBillustrate.

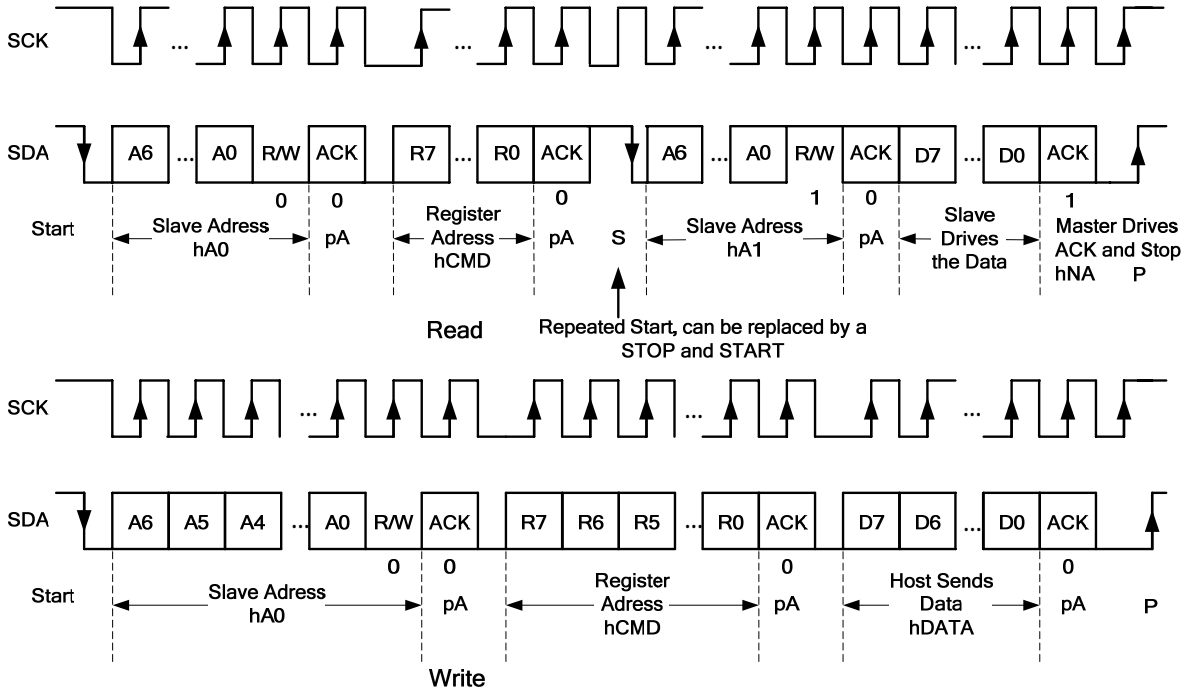
PWROK(N_LBO)

In power on/off mode A, it is the system reset signal (pull up to the system IO power supply) , in the on/off mode B, it is the shutdown indication signal (upper Pull to LDO1), refer to "9.2 Power On, Power Off and Reset" "System Reset Function and Output Monitoring Function".

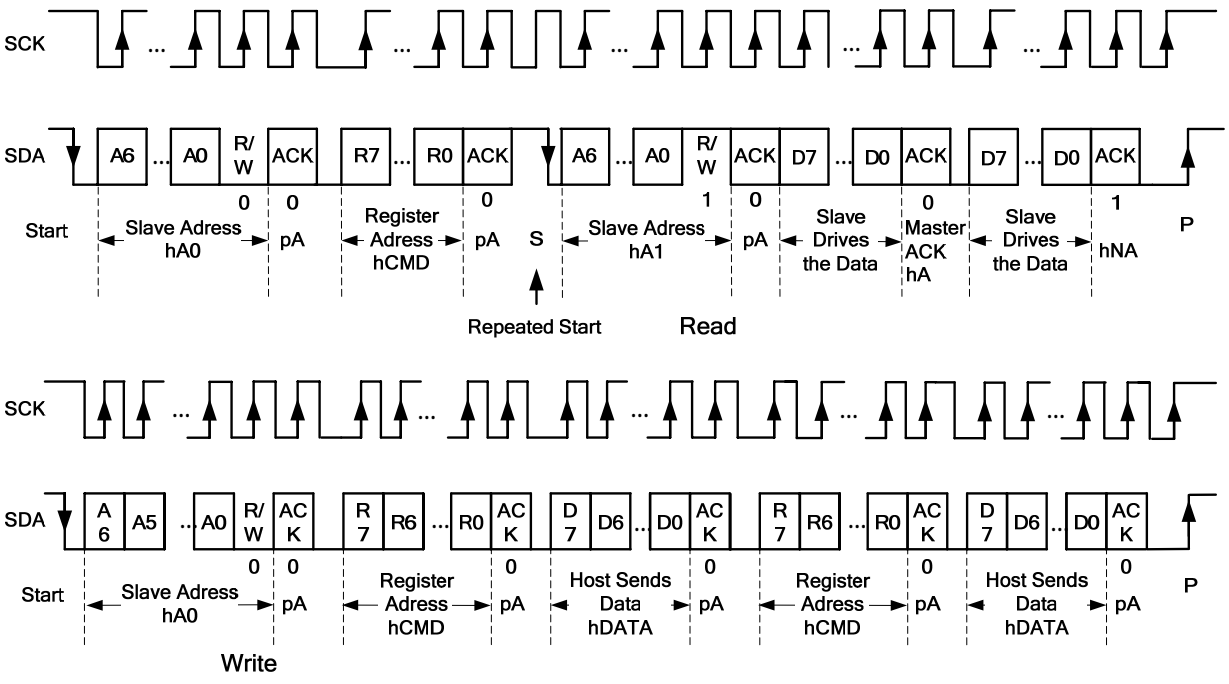
9.9 Timer

AXP192Contains an internal timer that can be set by registerREG8AH[6:0]The timer value can be changed with a minimum resolution of minutes (Minute), the timer will be set after it times outREG8AH[7].

9.10 HOST Interface and Interrupt (TWSI and IRQ)



picture1: Single Read and Write



picture2:Multi Read and Write

Hostable to passTWSIInterface AccessAXP192The registers have the operation sequence shown in the figure above, supporting standard100KHzor

400KHzFrequency, maximum speed can reach1.2MHz, and supports continuous read/write operations. The device address is69H(Read) and68H(Write).

When certain events occur,AXP192By pulling lowIRQThe interrupt mechanism is used to remindHostand save the interrupt status in the interrupt status register (see RegisterREG44H,registerREG45H,registerREG46H,registerREG47H), write to the corresponding status register bit1The corresponding interrupt is cleared. When there is no interrupt event,IRQOutput pulled high (via external pull-up 51KEach interrupt can be masked via the interrupt control register (see RegisterREG40H,registerREG41H,registerREG42H,register REG43H).

Location	Interrupt number	meaning	Location	Interrupt number	meaning
register44H[7]	IRQ1	power supplyACINOverpressure	register46H[7]	IRQ16	ICInternal over temperature
register44H[6]	IRQ2	power supplyACIninsert	register46H[6]	IRQ17	Insufficient charging current
register44H[5]	IRQ3	power supplyACINRemove	register46H[5]	IRQ18	DCDC1Voltage is too low
register44H[4]	IRQ4	power supplyVBUSOverpressure	register46H[4]	IRQ19	DCDC2Voltage is too low
register44H[3]	IRQ5	power supplyVBUSinsert	register46H[3]	IRQ20	DCDC3Voltage is too low
register44H[2]	IRQ6	power supplyVBUSRemove	register46H[2]	reserve	
register44H[1]	IRQ7	VBUSVoltage less than V_{HOLD}	register46H[1]	IRQ22	PEKdog
register44H[0]	reserve		register46H[0]	IRQ23	PEKPress
register45H[7]	IRQ8	Battery access	register47H[7]	IRQ24	N_OEPower on
register45H[6]	IRQ9	Battery Removal	register47H[6]	IRQ25	N_OEShutdown
register45H[5]	IRQ10	Entering battery activation mode	register47H[5]	IRQ26	VBUSefficient
register45H[4]	IRQ11	Exit battery activation mode	register47H[4]	IRQ27	VBUSinvalid
register45H[3]	IRQ12	Charging	register47H[3]	IRQ28	VBUS Session Valid
register45H[2]	IRQ13	finished charging	register47H[2]	IRQ29	VBUS Session End
register45H[1]	IRQ14	Battery temperature is too high	register47H[1]	reserve	
register45H[0]	IRQ15	Battery temperature is too low	register47H[0]	IRQ30	Low battery warning

9.11 Registers

No.1Group, Power Control

address	Register Description	R/W	default value
00	Power Status Register	R	
01	Power Mode/Charge Status Register	R	
04	OTG VBUSStatus Register	R	
06-0B	Data Cache Register0-5	R/W	F0/0F/00/FF/ 00/00
10	EXTEN & DC-DC2Switch Control Register	R/W	X5H
12	DC-DC1/3 & LDO2/3Switch Control Register	R/W	XHf
twenty three	DC-DC2Voltage Setting Register	R/W	16H
25	DC-DC2Voltage slope parameter setting register	R/W	00H

26	DC-DC1Voltage Setting Register	R/W	68H
27	DC-DC3Voltage Setting Register	R/W	48H
28	LDO2/3Voltage Setting Register	R/W	CFH
30	VBUS-IPSOUTPath Setup Register	R/W	60H
31	VOFFShutdown voltage setting register	R/W	X3H
32	Shutdown, battery test,CHGLEDControl Register	R/W	46H
33	Charge Control Register1	R/W	8H
34	Charge Control Register2	R/W	41H
35	Backup Battery Charging Control Register	R/W	22H
36	PEKParameter Setting Register	R/W	5DH
37	DCDCConverter operating frequency setting register	R/W	08H
38	Battery charging low temperature alarm setting register	R/W	A5
39	Battery charging high temperature alarm setting register	R/W	1FH
3A	APSLow batteryLevel1Setting Registers	R/W	68H
3B	APSLow batteryLevel2Setting Registers	R/W	5F
3C	Battery discharge low temperature alarm setting register	R/W	FCH
3D	Battery discharge high temperature alarm setting register	R/W	16H
80	DCDCWorking mode setting register	R/W	E0H
82	ADCEnable setting register1	R/W	83H
83	ADCEnable setting register2	R/W	80H
84	ADCSampling rate setting,TS pinControl Register	R/W	32H
85	GPIO [3:0]Input Range Setting Register	R/W	XOt
86	GPIO1 ADC IRQRising edge threshold setting	R/W	FFH
87	GPIO1 ADC IRQFalling edge threshold setting	R/W	00H
8A	Timer Control Register	R/W	00H
8B	VBUSMonitoring Setting Register	R/W	00H
8F	Over temperature shutdown control register	R/W	01H

No.2Group,GPIOControl

address	Register Description	R/W	default value
90	GPIO0Control Register	R/W	07H
91	GPIO0 LDOMode Output Voltage Setting Register	R/W	A0H
92	GPIO1Control Register	R/W	07H
93	GPIO2Control Register	R/W	07H
94	GPIO[2:0]Signal Status Register	R/W	00H
95	GPIO[4:3]Function Control Register	R/W	00H
96	GPIO[4:3]Signal Status Register	R/W	00H
97	GPIO[2:0]Pull-down control register	R/W	00H
98	PWM1Frequency Setting Register	R/W	00H
99	PWM1Duty cycle setting register1	R/W	16H
9A	PWM1Duty cycle setting register2	R/W	0BH

9B	PWM2Frequency Setting Register	R/W	00H
9C	PWM2Duty cycle setting register1	R/W	16H
9D	PWM2Duty cycle setting register2	R/W	0BH
9E	N_RSTO (GPIO5)Control Register	R/W	20H

No.3Group, Interrupt Control Class

address	Register Description	R/W	default value
40	IRQEnable Control Register1	R/W	8H
41	IRQEnable Control Register2	R/W	FFH
42	IRQEnable Control Register3	R/W	3BH
43	IRQEnable Control Register4	R/W	C1H
4A	IRQEnable Control Register5	R/W	00H
44	IRQStatus Register1	R/W	00H
45	IRQStatus Register2	R/W	00H
46	IRQStatus Register3	R/W	00H
47	IRQStatus Register4	R/W	00H
4D	IRQStatus Register5	R/W	00H

No.4Group,ADCData Class

address	Register Description	R/W
56	ACINVoltageADCData High8Bit	R
57	ACINVoltageADCData low4Bit	R
58	ACINCurrentADCData High8Bit	R
59	ACINCurrentADCData low4Bit	R
5A	VBUSVoltageADCData High8Bit	R
5B	VBUSVoltageADCData low4Bit	R
5C	VBUSCurrentADCData High8Bit	R
5D	VBUSCurrentADCData low4Bit	R
5E	AXP192Internal temperature monitoringADCData High8Bit	R
5F	AXP192Internal temperature monitoringADCData low4Bit	R
62	TSenterADCData High8By default, the battery temperature is monitored.	R
63	TSenterADCData low4By default, the battery temperature is monitored.	R
64	GPIO0VoltageADCData High8Bit	R
65	GPIO0VoltageADCData low4Bit	R
66	GPIO1VoltageADCData High8Bit	R
67	GPIO1VoltageADCData low4Bit	R
68	GPIO2VoltageADCData High8Bit	R
69	GPIO2VoltageADCData low4Bit	R
6A	GPIO3VoltageADCData High8Bit	R
6B	GPIO3VoltageADCData low4Bit	R

70	High instantaneous battery power8Bit	R
71	Battery instantaneous power8Bit	R
72	Battery power is low momentarily8Bit	R
78	High battery voltage8Bit	R
79	Low battery voltage4Bit	R
7A	High battery charging current8Bit	R
7B	Battery charging current is low5Bit	R
7C	High battery discharge current8Bit	R
7D	Battery discharge current is low5Bit	R
7E	APSHigh voltage8Bit	R
7F	APSLow voltage4Bit	R

Note: The battery power calculation method is:

Pbat =Register Value* VoltageLSB*CurrentLSB/1000Among them, the voltage LSBfor1.1mV, currentLSBfor0.5mAThe calculation result unit ismW.

address	Register Description	R/W	default value
B0	Battery Charge Coulomb Counter Data Register [31:24]	R/W	00H
B1	Battery Charge Coulomb Counter Data Register [23:16]	R/W	00H
B2	Battery Charge Coulomb Counter Data Register [15:8]	R/W	00H
B3	Battery Charge Coulomb Counter Data Register [7:0]	R/W	00H
B4	Battery Discharge Coulomb Counter Data Register [31:24]	R/W	00H
B5	Battery Discharge Coulomb Counter Data Register [23:16]	R/W	00H
B6	Battery Discharge Coulomb Counter Data Register [15:8]	R/W	00H
B7	Battery Discharge Coulomb Counter Data Register [7:0]	R/W	00H
B8	Coulomb Counter Control Register	R/W	00H

Coulomb calculation method:C = 65536 *CurrentLSB*(Charging coulomb counter value - discharging coulomb counter value) /3600 / ADCSampling rate. Where:ADCSampling rate referenceREG84HSetting of currentLSBfor0.5mA; The unit of calculation result ismAh.

REG 00H: Input power status

Bit	describe	R/W
7	ACINPresence indication 0:ACINdoes not exist;1:ACINexist	R
6	instructACINit's usable or not	R
5	VBUSPresence indication 0:VBUSdoes not exist;1:VBUSexist	R
4	instructVBUSit's usable or not	R
3	instructVBUSIs the access greater than before use?V_{HOLD}	R
2	Indicates the direction of battery current 0:The battery is discharging;1:The battery is charged	R

1	instructACINandVBUSIs the input inPCBShort-circuited	R
0	Indicates whether the boot source isACINorVBUS 0:Boot source nonACIN/VBUS;1:The startup source isACIN/VBUS	R

REG 01H: Power supply working mode and charging status indication

Bit	describe	R/W
7	instructAXP192Is it overheated? 0:Not overheated;1:Over temperature	R
6	Charging Instructions 0:Not charging or charging is complete;1:Charging	R
5	Battery status indicator 0:No battery connected toAXP192;1:The battery is connected toAXP192	R
4	Reserved, cannot be changed	R
3	Indicates whether the battery has entered activation mode 0:The battery activation mode has not been entered;1:Entered battery activation mode	R
2	Indicates whether the charging current is less than the expected current 0:The actual charging current is equal to the expected current;1:The actual charging current is less than the expected current	R
1	AXP192Power on/off mode indication 0:WayA;1:WayB	R
0	Reserved, cannot be changed	R

REG 02H: USB OTG VBUS status indication

Bit	describe	R/W
7-3	Reserved, cannot be changed	
2	instructVBUSis it effective,1Indicates validity	R
1	instructVBUS Session A/Bis it effective,1Indicates validity	R
0	instructSession Endstate,1Indicates validity	R

REG 06-0BH: Data Cache

Note: As long as the external power supply, battery or backup battery is available, this data will be saved and will not be affected by power on and off. The default value isF0/0F/00/FF/00/00H

REG 10H:EXTEN & DC-DC2 output control

default value:XXH

Bit	describe		R/W	default value
7-3	Reserved, cannot be changed			
2	EXTENSwitch Control	0:closure;1:Open	R W	X
1	Reserved, cannot be changed			
0	DC-DC2Switch Control	0:closure;1:Open	R W	X

Note:XIt depends on the customization. The following values areXThe same applies to the .

REG 12H: Power output control

default value:XXH

Bit	describe		R/W	default value
7	Reserved, cannot be changed		R W	X
6	EXTENSwitch Control	0:closure;1:Open	R W	X
5	Reserved, cannot be changed		R W	X
4	DC-DC2Switch Control	0:closure;1:Open	R W	X
3	LDO3Switch Control		R W	X
2	LDO2Switch Control		R W	X
1	DC-DC3Switch Control		R W	X
0	DC-DC1Switch Control		R W	X

Note:REG12Hbit6/4Corresponding toREG10Hbit2/0.

REG 23H: DC-DC2 output voltage setting

default value:16H

Bit	describe		R/W	default value
7-6	Reserved, cannot be changed			
5	DC-DC2Output voltage settingBit5	0.7-2.275V,25mV/step	R W	X
4	DC-DC2Output voltage settingBit4		R W	X
3	DC-DC2Output voltage settingBit3		R W	X
2	DC-DC2Output voltage settingBit2		R W	X
1	DC-DC2Output voltage settingBit1		R W	X
0	DC-DC2Output voltage settingBit0		R W	X

REG 25H: DC-DC2 dynamic voltage regulation parameter settings

default value:00H

Bit	describe		R/W	default value
7-3	Reserved, cannot be changed			
2	DC-DC2 VRCEnable control 0:Open;1:closure		R W	0
1	Reserved, cannot be changed		R W	0
0	DC-DC2 VRCVoltage rise slope control	0: 25mV/15.625us=1.6mV/us 1: 25mV/31.250us=0.8mV/us	R W	0

REG 26H: DC-DC1 output voltage setting

default value:68H

Bit	describe		R/W	default value
7	Reserved, cannot be changed			
6	DC-DC1Output voltage settingBit6	0.7-3.5V,25mV/step	R W	X
5	DC-DC1Output voltage settingBit5		R W	X
4	DC-DC1Output voltage settingBit4		R W	X
3	DC-DC1Output voltage settingBit3		R W	X
2	DC-DC1Output voltage settingBit2		R W	X
1	DC-DC1Output voltage settingBit1		R W	X
0	DC-DC1Output voltage settingBit0		R W	X

REG 27H: DC-DC3 output voltage setting

default value:48H

Bit	describe		R/W	default value
7	Reserved, cannot be changed			
6	DC-DC3Output voltage settingBit6	0.7-3.5V,25mV/step	R W	X
5	DC-DC3Output voltage settingBit5		R W	X
4	DC-DC3Output voltage settingBit4		R W	X
3	DC-DC3Output voltage settingBit3		R W	X
2	DC-DC3Output voltage settingBit2		R W	X
1	DC-DC3Output voltage settingBit1		R W	X
0	DC-DC3Output voltage settingBit0		R W	X

REG 28H: LDO2/3 output voltage setting

default value:CFH

Bit	describe		R/W	default value
7	LDO2Output voltage settingBit3	1.8-3.3V,100mV/step	R W	X
6	LDO2Output voltage settingBit2		R W	X
5	LDO2Output voltage settingBit1		R W	X
4	LDO2Output voltage settingBit0		R W	X
3	LDO3Output voltage settingBit3	1.8-3.3V,100mV/step	R W	X
2	LDO3Output voltage settingBit2		R W	X
1	LDO3Output voltage settingBit1		R W	X
0	LDO3Output voltage settingBit0		R W	X

REG 30H:VBUS-IPSOUT path management

default value:6X

Bit	describe		R/W	default value
7	VBUSWhen availableVBUS-IPSOUTPath selection control signal 0:Depend onN_VBUSEN pinDecide whether to open this channel 1:VBUS-IPSOUTThe pathway can be selected to be open regardless ofN_VBUSENstatus		R W	0
6	VBUS V_{HOLD}Voltage limiting control 0:No pressure limit;1:Pressure Limit		R W	1
5	V_{HOLD}set upBit 2	000: 4.0V;001: 4.1V;010: 4.2V 011: 4.3V;100: 4.4V;101: 4.5V 110: 4.6V; 111: 4.7V	R W	1
4	V_{HOLD}set upBit 1		R W	0
3	V_{HOLD}set upBit 0		R W	0
2	Reserved, cannot be changed			
1	VBUSCurrent limiting control enable signal 0:closure;1:Open		R W	X
0	VBUSCurrent limit selection when current limit control is turned on 0:500mA;1:100mA		R W	0

REG 31H:V_{OFF}Shutdown voltage setting

default value:X3H

Bit	describe	R/W	default value
7-4	Reserved, cannot be changed		
3	SleepModePWRONShort press wake-up function enable setting:		

	0: Short press wake-up function off 1: Short press to wake up the function thisbitAutomatically clear after writing0, so each time you enterSleepNeed to write again before mode1			
2	VOFFset upBit2	000-2.6V; 001-2.7V; 010-2.8V; 011-2.9V; 100-3.0V; 101-3.1V; 110-3.2V; 111-3.3V	R W	0
1	VOFFset upBit1		R W	1
0	VOFFset upBit0		R W	1

REG 32H: Shutdown setting, battery detection and CHGLED pin control

default value:46H

Bit	describe		R/W	default value
7	WayAShutdown control This bit is written1Will be closedAXP192Output		R W	0
6	Battery monitoring function setting bits:0:closure;1:Open		R W	1
5-4	CHGLEDPin function settings	00:High resistance 01: 25% 1HzFlash 10: 25% 4HzFlash 11:Output low level	R W	00
3	CHGLEDPin Control Settings	0:Controlled by charging function 1:By registerREG 32HBit[5:4]control	R W	0
2	Reserved, cannot be changed			
1-0	N_OEAfter changing from low to highAXP192Shutdown delay time	00: 0.5S;01: 1S; 10: 2S;11: 3S	R W	10

REG 33H: Charging control 1

default value:8H

Bit	describe	R/W	default value
7	Charging function enable control bit, including internal channel and external channel 0:closure,1:Open	R W	1
6:5	Charging target voltage setting 00:4.1V;01:4.15V;10:4.2V;11:4.36V	R W	10
4	End of charge current setting 0:Charging current is less than10%End charging when setting value 1:Charging current is less than15%End charging when setting value	R W	0
3-0	Internal path charging current setting 0000:100mA;0001:190mA; 0010:280mA; 0011:360mA; 0100:450mA;0101:550mA; 0110:630mA; 0111:700mA;	R W	1000

	1000:780mA;1001:880mA;1010:960mA;1011:1000mA; 1100:1080mA;1101:1160mA;1110:1240mA;1111:1320mA		

REG 34H: Charge control 2

default value:41H

Bit	describe		R/W	default value
7	Precharge timeout settingBit1	00: 30 min;01: 40min; 10: 50min;11: 60min	R W	0
6	Precharge timeout settingBit0		R W	1
5-3	External path charging current setting scope300-1000mA,100mA/step, default value300mA		R W	000
2	External path enable setting during charging 0:closure;1:Open		R W	0
1	Timeout setting in constant current modeBit1	00: 7Hours;01: 8Hours; 10: 9Hours;11: 10Hours	R W	0
0	Timeout setting in constant current modeBit0		R W	1

REG 35H: Backup battery charging control

default value:22H

Bit	describe		R/W	default value
7	Backup battery charging enable control 0:closure;1:Open		R W	0
6:5	Backup battery charging target voltage setting 00:3.1V;01:3.0V;10:3.0V;11:2.5V		R W	01
4-2	Reserved, cannot be changed			
1:0	Backup Battery Charge Current Setting	00: 50uA;01: 100uA; 10: 200uA;11: 400uA	R W	10

REG 36H: PEK key parameter setting

default value:5DH

Bit	describe		R/W	default value
7	Power on time settingBit1	00: 128mS;01: 512mS; 10: 1S; 11: 2S.	R W	0
6	Power on time settingBit0		R W	1
5	Long press time settingBit1	00: 1S;01: 1.5S; 10: 2S;11: 2.5S.	R W	0
4	Long press time settingBit0		R W	1

3	Automatic shutdown function setting when the key press time is longer than the shutdown time 0:closure;1:Open		R W	1
2	After power on is completePWROKSignal delay 0:32mS;1:64mS		R W	1
1	Power off time settingBit1	00: 4S;01: 6S; 10:	R W	0
0	Power off time settingBit0	8S;11: 10S.	R W	1

REG 37H: DC-DC operating frequency setting

default value:08H

Bit	describe		R/W	default value
7-4	Reserved, cannot be changed			
3	DC-DCSwitching frequency settingBit 3	Each level changes5%,default value1.5MHz	R W	1
2	DC-DCSwitching frequency settingBit 2		R W	0
1	DC-DCSwitching frequency settingBit 1		R W	0
0	DC-DCSwitching frequency settingBit 0		R W	0

REG 38H:$V_{LTF-charge}$Battery charging low temperature threshold setting

default value:A5

Bit	describe		R/W	default value
7-0	Battery low temperature threshold setting during charging,M	M*10H,whenM=A5HTime Correspondence2.112V; Applicable voltage0V~3.264V	R W	A5

$V_{LTF-charge}$= M * 10H * 0.0008V

REG 39H:$V_{HTF-charge}$Battery charging high temperature threshold setting

default value:1FH

Bit	describe		R/W	default value
7-0	Battery high temperature threshold setting during charging,N	N*10H,whenN=1FH,correspond0.397V; Applicable voltage0V~3.264V	R W	1FH

$V_{HTF-charge}$= N * 10H * 0.0008V

REG 3AH: APS low power level 1

default value:68H

Bit	describe	R/W	default value

7-0	APSLow power setting level1	R W	68H

REG 3BH: APS low power level 2

default value:5F

Bit	describe	R/W	default value
7-0	APSLow power setting level2	R W	5F

REG3AH,REG3BHcorrespondingAPSThe voltage is set to the following relationship (assuming the register value isn): Vwarning = 2.8672 + 1.4mV * n * 4

REG 3CH:$V_{LTF-discharge}$Battery discharge low temperature threshold setting

default value:FCH

Bit	describe		R/W	default value
7-0	Battery low temperature threshold setting during discharge,M	M*10H,whenM=FCHTime Correspondence3.226V; Applicable voltage0V~3.264V	R W	FCH

$V_{LTF-discharge}$= M * 10H * 0.0008V

REG 3DH:$V_{HTF-discharge}$Battery discharge high temperature threshold setting

default value:16H

Bit	describe		R/W	default value
7-0	Battery high temperature threshold setting during discharge,N	N*10H,whenN=16H,correspond0.282V; Applicable voltage0V~3.264V	R W	16H

$V_{LTF-discharge}$= N * 10H * 0.0008V

REG 80H: DC-DC operating mode selection

default value:E0H

Bit	describe		R/W	default value
7-4	Reserved, cannot be changed			
3	DC-DC1Working mode control	0:PFM/PWMAutomatic switching 1:fixedPWM	R W	0
2	DC-DC2Working mode control		R W	0
1	DC-DC3Working mode control		R W	0
0	Reserved, cannot be changed			

REG 82H: ADC enable 1

default value:83H

Bit	describe		R/W	default value
7	battery voltageADCEnable	0:closure,1:Open	R W	1
6	Battery CurrentADCEnable		R W	0
5	ACINVoltageADCEnable		R W	0
4	ACINCurrentADCEnable		R W	0
3	VBUSVoltageADCEnable		R W	0
2	VBUSCurrentADCEnable		R W	0
1	APSVoltageADCEnable		R W	1
0	TSPinsADCFunction Enablement		R W	1

REG 83H: ADC enable 2

default value:80H

Bit	describe		R/W	default value
7	AXP192Internal temperature monitoringADCEnable	0:closure,1:Open	R W	1
6-4	Reserved, cannot be changed			
3	GPIO0 ADCFunction Enablement	0:closure,1:Open	R W	0
2	GPIO1 ADCFunction Enablement		R W	0
1	GPIO2 ADCFunction Enablement		R W	0
0	GPIO[3] ADCFunction Enablement		R W	0

REG 84H: ADC sampling rate setting, TS pin control

default value:32H

Bit	describe		R/W	default value
7	ADCSampling rate settingBit 1	25×2^n	R W	0
6	ADCSampling rate settingBit 0	The sampling rates are25,50,100,200Hz	R W	0
5-4	TSPin output current setting: 00:20uA;01:40uA;10:60uA;11:80uA		R W	11
3	Reserved, cannot be changed			
2	TSPin function selection 0:Battery temperature monitoring function,1:External independentADCInput Path		R W	0
1-0	TSPin current output mode setting	00:closure	R W	1
		01:Output current during charging	R W	0

		10: ADCInput during sampling can save power 11:Always open		

REG 85H: ADC input range

default value:XOt

Bit	describe		R/W	default value
7-4	Reserved, cannot be changed			
3	GPIO3 ADCInput range	0:0-2.0475V 1:0.7-2.7475V	R W	0
2	GPIO2 ADCInput range		R W	0
1	GPIO1 ADCInput range		R W	0
0	GPIO0 ADCInput range		R W	0

REG 86H: GPIO1 ADC IRQ rising edge threshold setting

default value:FFH

Bit	describe	R/W	default value
7-0	oneLSBfor8mV	R W	FF

REG 87H: GPIO1 ADC IRQ falling edge threshold setting

default value:00H

Bit	describe	R/W	default value
7-0	oneLSBfor8mV	R W	00

REG 8AH: Timer control

default value:00H

Bit	describe	R/W	default value
7	Timer timeout Write1Clear this status	R W	0
6-0	Set the timing time in minutes Write full0Then turn off this timer	R W	0000000

REG 8BH: VBUS pin monitoring SRP function control

default value:00H

Bit	describe	R/W	default value
7-6	Reserved, cannot be changed		
5-4	VBUSEffective voltage setting 00:4.0V;01:4.15V;10:4.45V;11:4.55V	R W	00
3	VBUS ValidDetection function settings:0:closure,1:Open	R W	0
2	VBUS SessionDetection function settings:0:closure,1:Open	R W	0
1	Discharge VBUSDischarge function setting 0:closureVBUSThe discharge resistance;1:useVBUSDischarge resistance	R W	0
0	Charge VBUSCharging function settings 0:disconnectVBUSCharging resistor;1:useVBUSCharging resistorVBUSCharge	R W	0

REG 8FH: Over temperature shutdown and other function settings

default value:01H

Bit	describe	R/W	default value
7-3	Reserved, cannot be changed	R W	0
2	AXP192Internal over-temperature shutdown function setting 0:Do not shut down;1:Shutdown	R W	0
1-0	Reserved, cannot be changed		

REG 90H: GPIO0 function setting

default value:07H

Bit	describe		R/W	default value
7-3	Reserved, cannot be changed		R W	0
2	GPIO0Pin function settingsBit 2	000:NMOSOpen-drain output 001:Universal input function 010:Low noiseLDO 011:reserve 100:ADCenter 101:Output Low 11X:Floating	R W	1
1	GPIO0Pin function settingsBit 1		R W	1
0	GPIO0Pin function settingsBit 0		R W	1

REG 91H: Output voltage setting when GPIO0 is in LDO mode

default value:A0H

Bit	describe	R/W	default value
7-4	GPIO0 LDOOutput voltage setting in mode 0000: 1.8V;0001: 1.9V;0010: 2.0V;0011: 2.1V; 0100: 2.2V;0101: 2.3V;0110: 2.4V;0111: 2.5V; 1000: 2.6V; 1001: 2.7V;1010: 2.8V;1011: 2.9V; 1100: 3.0V;1101: 3.1V;1110: 3.2V;1111: 3.3V	R W	1010
3-0	Reserved, cannot be changed		

REG 92H: GPIO1 function setting

default value:07H

Bit	describe		R/W	default value
7-3	Reserved, cannot be changed		R W	0
2	GPIO1Pin function settingsBit 2	000:NMOSOpen-drain output 001:Universal input function 010:PWM1Output, high level isVINT, cannot add less than100KPull-down resistor 011:reserve 100:ADCenter 101:Output Low 11X:Floating	R W	1
1	GPIO1Pin function settingsBit 1		R W	1
0	GPIO1Pin function settingsBit 0		R W	1

REG 93H: GPIO2 function setting

default value:07H

Bit	describe		R/W	default value
7-3	Reserved, cannot be changed		R W	0
2	GPIO2Pin function settingsBit 2	000:NMOSOpen-drain output 001:Universal input function 010:PWM2Output, high level isVINT, cannot add less than100KPull-down resistor 011:reserve 100:ADCenter 101:Output Low 11X:Floating	R W	1
1	GPIO2Pin function settingsBit 1		R W	1
0	GPIO2Pin function settingsBit 0		R W	1

REG 94H: GPIO[2:0] signal status setting and monitoring

default value:00H

Bit	describe		R/W	default value
7	Reserved, cannot be changed		R	
6	GPIO2Input Status	0:Input low level 1:Input high level	R	
5	GPIO1Input Status		R	
4	GPIO0Input Status		R	
3	Reserved, cannot be changed			
2	GPIO2Output Settings	0:Output low level, groundNMOSOpen 1: Output floating, groundedNMOSclosure	R W	0
1	GPIO1Output Settings		R W	0
0	GPIO0Output Settings		R W	0

REG 95H: GPIO[4:3] pin function setting

default value:00H

Bit	describe		R/W	default value
7	GPIO[4:3]control: 1:GPIOFunction		R W	0
6-4	Reserved, cannot be changed		R W	0
3:2	GPIO4Pin function settingsBit 1-0	00:External charging control 01:NMOSOpen drain output port4 10:General purpose input port4 11:Undefined	R W	00
1:0	GPIO3Pin Function SettingBit1-0	00:External charging control 01:NMOSOpen drain output port3 10:General purpose input port3 11: ADCenter	R W	00

REG 96H: GPIO[4:3] signal status setting and monitoring

default value:00H

Bit	describe	R/W	default value
7-6	Reserved, cannot be changed	R	

5	GPIO4Input Status	0:Input low level	R	
4	GPIO3Input Status	1:Input high level	R	
3-2	Reserved, cannot be changed			
1	GPIO4Output Settings	0:Output low level,NMOSOpen 1:	R W	0
0	GPIO3Output Settings	Floating,NMOSclosure	R W	0

REG 97H: Pull-down setting when GPIO[2:0] is used as input

default value:00H

Bit	describe		R/W	default value
7-3	Reserved, cannot be changed			
2	GPIO2Pull-down resistor control when used as input	0:Turn off the pull-down resistor	R W	0
1	GPIO1Pull-down resistor control when used as input	1:Use a pull-down resistor	R W	0
0	GPIO0Pull-down resistor control when used as input		R W	0

REG 98H: PWM1 output frequency setting

default value:00H

Bit	describe	R/W	default value
7-0	PWM1Output frequency settingX	R W	00H

REG 99H: PWM1 duty cycle setting 1

default value:16H

Bit	describe	R/W	default value
7-0	PWM1Duty cycle settingY1	R W	16H

REG 9AH: PWM1 duty cycle setting 2

default value:0BH

Bit	describe	R/W	default value
7-6	PWM1Duty cycle settingY2	R W	0BH

REG 9BH: PWM2 output frequency setting

default value:00H

Bit	describe	R/W	default value
7-0	PWM2Output frequency settingX	R W	00H

REG 9CH: PWM2 duty cycle setting 1

default value:16H

Bit	describe	R/W	default value
7-0	PWM2Duty cycle settingY1	R W	16H

REG 9DH: PWM2 duty cycle setting 2

default value:0BH

Bit	describe	R/W	default value
7-6	PWM2Duty cycle settingY2	R W	0BH

Note:PWMOutput frequency =2.25MHz / (X+1) / Y1

PWMOutput duty cycle =Y2 / Y1

REG 9EH: N_RSTO (GPIO5) pin function setting

default value:20H

Bit	describe	R/W	default value
7	N_RSTOPin function settings 0:N_RSTO,LDO1Condition monitoring;1:General purpose input and output ports5	R W	0
6	N_RSTOAs general purpose input and output port5set up 0:NMOSOpen drain output; 1:Universal input function	R W	0
5	N_RSTOAs output port5Settings 0: Output low level,NMOSOpen; 1:Floating,NMOSclosure	R W	1
4	N_RSTOAs input port5Status 0: Input low level;1:Input high level	R	
3-0	Reserved, cannot be changed	R W	0000

REG 40H: IRQ enable 1

default value:8H

Bit	describe	R/W	default value
7	ACINOverpressureIRQEnable	R W	1
6	ACINAccessIRQEnable	R W	1
5	ACINRemoveIRQEnable	R W	0
4	VBUSOverpressureIRQEnable	R W	1
3	VBUSAccessIRQEnable	R W	1
2	VBUSRemoveIRQEnable	R W	0
1	VBUSAvailable but less thanV_{HOLD}IRQEnable	R W	0
0	Reserved, cannot be changed	R W	0

REG 41H: IRQ enable 2

default value:FFH

Bit	describe	R/W	default value
7	Battery accessIRQEnable	R W	1
6	Battery removalIRQEnable	R W	1
5	Battery activation modeIRQEnable	R W	1
4	Exit battery activation modeIRQEnable	R W	1
3	ChargingIRQEnable	R W	1
2	finished chargingIRQEnable	R W	1
1	Battery overheatingIRQEnable	R W	1
0	Battery low temperatureIRQEnable	R W	1

REG 42H: IRQ enable 3

default value:3BH

Bit	describe	R/W	default value
7	AXP192Internal over temperatureIRQEnable	R W	0
6	The charging current is less than the set currentIRQEnable	R W	0
5	DC-DC1The output voltage is less than the set valueIRQEnable	R W	1
4	DC-DC2The output voltage is less than the set valueIRQEnable	R W	1
3	DC-DC3The output voltage is less than the set valueIRQEnable	R W	1
2	Reserved, cannot be changed		
1	Short keyIRQEnable	R W	1

0	Long pressIRQEnable	R W	1

REG 43H: IRQ enable 4

default value:C1H

Bit	describe	R/W	default value
7	N_OEPower onIRQEnable	R W	1
6	N_OEShutdownIRQEnable	R W	1
5	VBUSefficientIRQEnable	R W	0
4	VBUSinvalidIRQEnable	R W	0
3	VBUS Session A/B IRQEnable	R W	0
2	VBUS Session End IRQEnable	R W	0
1	Reserved, cannot be changed	R W	1
0	APSLow pressureIRQEnable	R W	1

REG 4AH: IRQ enable 5

default value:00H

Bit	describe	R/W	default value
7	Timer timed outIRQEnable	R W	0
6-3	Reserved, cannot be changed	R W	0
2	GPIO2Input edge triggerIRQEnable	R W	0
1	GPIO1Input edge triggerIRQEnable	R W	0
0	GPIO0Input edge triggerIRQEnable	R W	0

REG 44H: IRQ status 1

default value:00H

Bit	describe	R/W	default value
7	ACINOverpressureIRQstate	R W	0
6	ACINAccessIRQstate	R W	0
5	ACINRemoveIRQstate	R W	0
4	VBUSOverpressureIRQstate	R W	0
3	VBUSAccessIRQstate	R W	0
2	VBUSRemoveIRQstate	R W	0
1	VBUSAvailable but less thanV_{HOLD}IRQstate	R W	0
0	Reserved, cannot be changed	R W	0

REG 45H: IRQ status 2

default value:00H

Bit	describe	R/W	default value
7	Battery accessIRQstate	R W	0
6	Battery removalIRQstate	R W	0
5	Battery activation modeIRQstate	R W	0
4	Exit battery activation modeIRQstate	R W	0
3	ChargingIRQstate	R W	0
2	finished chargingIRQstate	R W	0
1	Battery overheatingIRQstate	R W	0
0	Battery low temperatureIRQstate	R W	0

REG 46H: IRQ status 3

default value:00H

Bit	describe	R/W	default value
7	AXP192Internal over temperatureIRQstate	R W	0
6	The charging current is less than the set currentIRQstate	R W	0
5	DC-DC1The output voltage is less than the set valueIRQstate	R W	0
4	DC-DC2The output voltage is less than the set valueIRQstate	R W	0
3	DC-DC3The output voltage is less than the set valueIRQstate	R W	0
2	Reserved, cannot be changed		
1	Short keyIRQstate	R W	0
0	Long pressIRQstate	R W	0

REG 47H: IRQ status 4

default value:00H

Bit	describe	R/W	default value
7	N_OEPower onIRQstate	R W	0
6	N_OEShutdownIRQstate	R W	0
5	VBUSefficientIRQstate	R W	0
4	VBUSinvalidIRQstate	R W	0
3	VBUS Session A/B IRQstate	R W	0
2	VBUS Session End IRQstate	R W	0

1	Reserved, cannot be changed	R W	0
0	APSLow pressureIRQstate,APSVoltage belowWarning Level 2Postposition, exceedingWarning Level 1 Later will be cleared0	R W	0

REG 4DH: IRQ state 5

default value:00H

Bit	describe	R/W	default value
7	Timer timed outIRQstate	R W	0
6-3	Reserved, cannot be changed	R W	0
2	GPIO2Input edge triggerIRQstate	R W	0
1	GPIO1Input edge triggerIRQstate	R W	0
0	GPIO0Input edge triggerIRQstate	R W	0

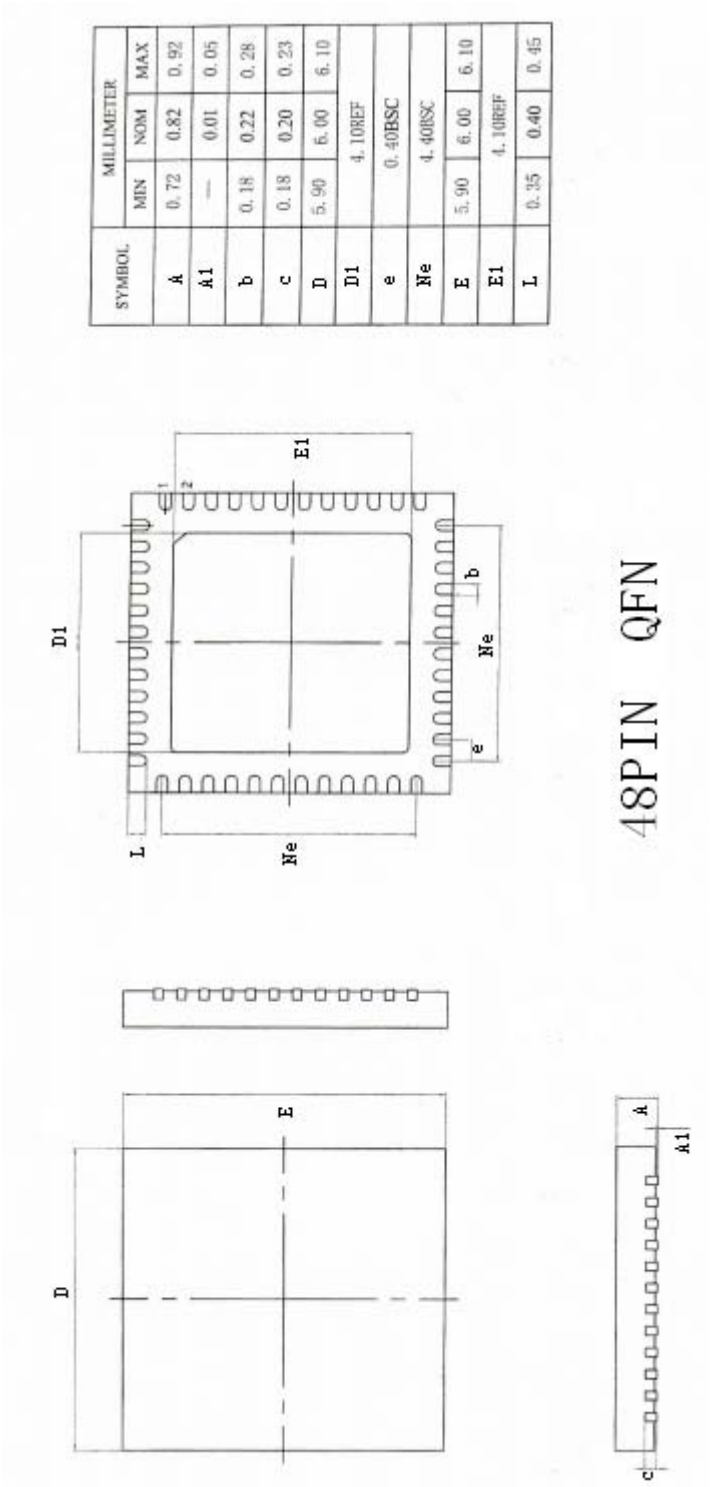
Note: AllIRQThe corresponding bit of the status register is written1The corresponding status will be cleared.

REG B8H: Coulomb meter control

default value:00H

Bit	describe	R/W	default value
7	Coulomb meter switch control	R W	0
6	Coulomb counter pause control, this bit is written1The coulomb counting will be suspended and this bit will self-clear	R W	0
5	Clear the coulomb counter control. This bit is written1The coulomb counter will be cleared and this bit will clear itself	R W	0
4-0	Reserved, cannot be changed	R W	0

10. Package



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.72	0.82	0.92
A1	—	0.01	0.05
b	0.18	0.22	0.28
c	0.18	0.20	0.23
D	5.90	6.00	6.10
D1	4.10REF		
e	0.40BSC		
Ne	4.40BSC		
E	5.90	6.00	6.10
E1	4.10REF		
L	0.35	0.40	0.45