

DATASHEET

AXP173

Enhanced Single Cell Li-Battery and Power System Management IC

X-Powers

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1. Overview (Summary)

AXP173 System is highly integrated power management chip, for single-cell lithium battery (lithium ion or lithium polymer) and requires multiple output power conversion applications, to provide easy to use yet flexible configuration complete power solution that fully meet the current increasingly complex applications processor system to the relatively complex and precise power control requirements.

AXP173 An adaptive internal integration USB-Compatible Charger, 2 Down converters (Buck DC-DC converter) , 4 Linear regulators (LDO) The voltage / current / temperature surveillance multiplexer 12-Bit ADC . To ensure the security and stability of the power system, AXP173 Also incorporates over / under voltage (OVP / UVP) , Over temperature (OTP) , Overcurrent (OCP) Protection circuit.

AXP173 And it has an external adapter USB And a three-input capability such as a battery, its energy balance intelligence (Intelligent Power Select, IPS™) In the circuit may be USB And an external AC adapter, lithium batteries, and application security transparent distribution of electrical energy between the load and only in the case where the external input power source without a battery (or a battery discharge / damage) may also make the system work properly applied.

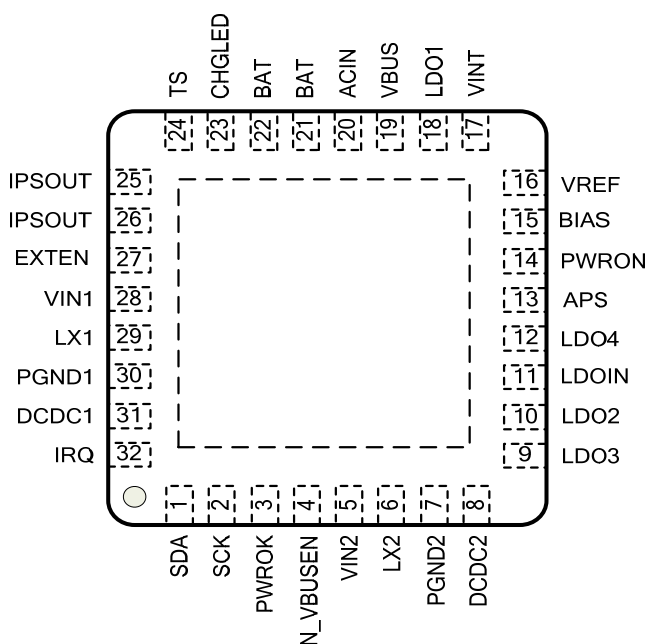
AXP173 It provides a communication with the host two-wire serial communication interface: Two Wire Serial Interface (TWSI) , The application processor may turn on or off some of the power to the output voltage thereof is provided by this interface, access to internal registers and the plurality of measurement data (including Fuel Gauge) . Precision (0.5%) Power measurement data to facilitate consumers a clearer grasp of the real-time power usage, giving consumers unprecedented power equipment experience. When the application system does not require adjustment AXP173 When the default output, it can also work independently without the intervention of the processor applications.

AXP173 provide 5mm x 5mm 32-pin QFN Package.

Applications

- Handheld mobile devices smart mobile phone, PMP
- / MP4, Digital cameras, Digital cameras, handheld navigation devices GPS, PDA, Handheld digital broadcast television receiver mobile Internet devices MID
- Digital photo frames, portable DVD Players, ultra mobile PCs UMPC and UMPC-like , Machine learning application processor circuitry
- Application Processor systems
- Other battery systems and multiple supply applications

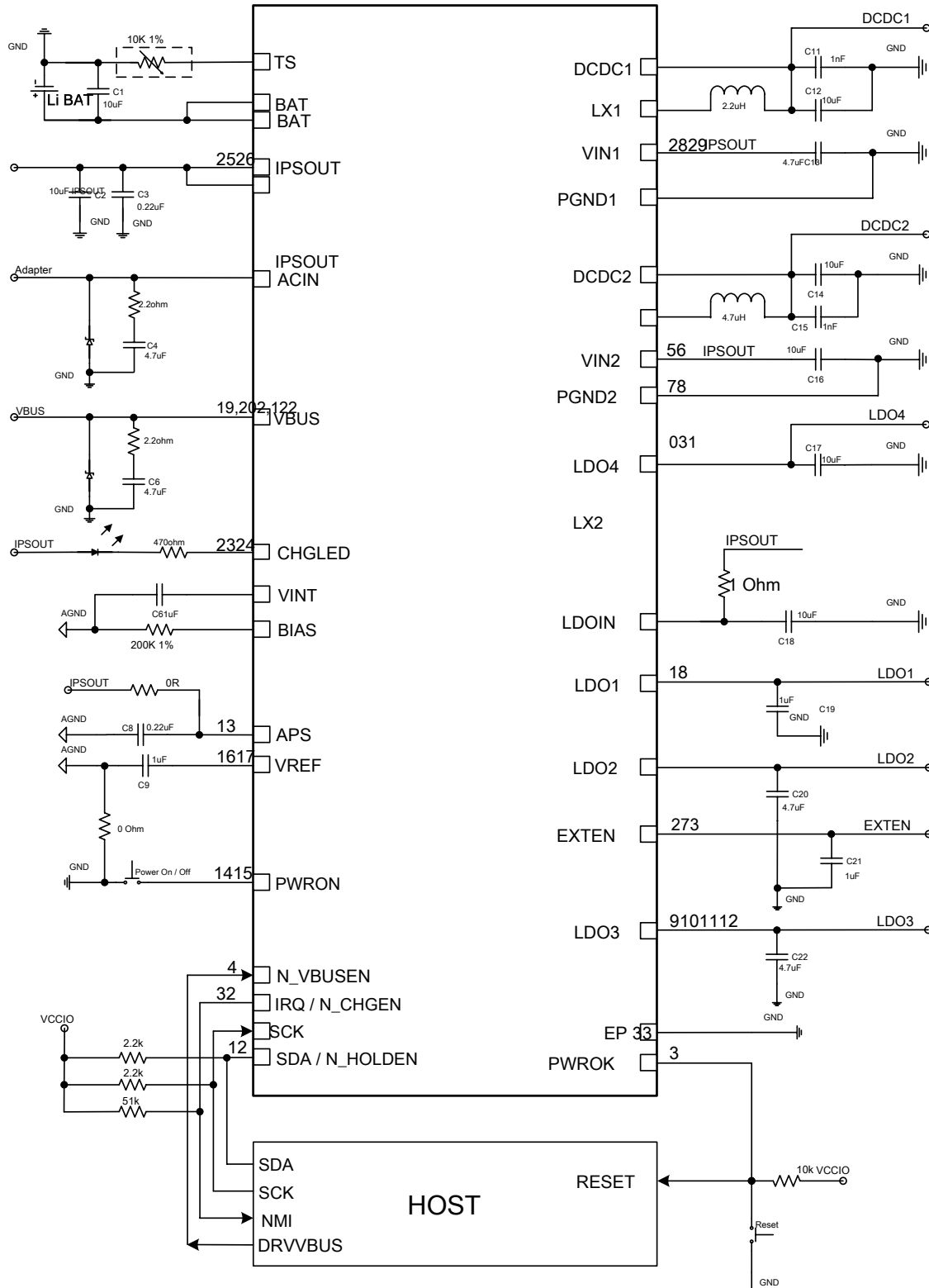
Pin definitions



2. Characteristics (Feature)

- **Power Management (IPS)**
 - o Wide input voltage range:
2.9V ~ 6.3V (AMR : - 0.3V ~ 11V)
 - o Configurable efficient power balance wisdom "IPS™" system
 - o Adaptive USB Or AC adapter current limiting pressure limiting
(4.4V / 500mA / 100mA)
 - o Equivalent internal resistance is less than ideal diode 100mΩ
 - **Fully integrated charger (Charger)**
 - o The maximum charging current of up to 1.4A
 - o Support battery temperature monitoring
 - o Full support USB Charging, with the specification
 - o High charging accuracy error is less than 0.5%
 - o stand by 4.1V / 4.15V / 4.2V / 4.36V Other battery
 - o Automatically controlled charging process
 - o Direct drive led Indicating the state of charge
 - o The system automatically adjusts the charging current load
 - **2 Road synchronous buck converter (DC-DC)**
 - o DC-DC1 : Can 0.7V ~ 3.5V Between regulation,
25mV / step, Drive capability 1.2A
 - o DC-DC2 : Can 0.7-2.275V Between regulation,
25mV / step, Drive capability 1.6A, stand by VRC
 - **4 Linear regulators (LDO)**
 - o LDO1 : 30mA Always Effective
 - o LDO2 : Low Noise LDO , 1.8V ~ 3.3V adjustable,
100mV / step, Drive capability 200mA
 - o LDO3 : Low Noise LDO, 1.8-3.3V adjustable,
100mV / step, Drive capability 200mA
 - o LDO4 : Can 0.7-3.5V Between regulation,
25mV / step, Drive capability 0.5A
- Note:** VRC , Voltage Ramp Control , Voltage slope control.
- **The signal acquisition system (Signal Capture)**
 - o Built-in multi-channel 12 Bit ADC
 - o Providing a battery and the external input supply current and voltage data
 - o Built Precision Coulomb Counter and Fuelgauge system
 - o Power management provides a wealth of information, such as instantaneous power (MA or mW) , Remaining battery power (% or mAh) , charging(%) And the remaining battery time or charging time
 - o Low battery warning and protection
 - o Provide chip temperature information
 - **Application Processor Interface (Host Interface)**
 - o Host able to pass TWSI Interface for data exchange
 - o Interrupt management can be flexibly configured
 - o Built-in timer
 - o Provides four registers can be used for data storage during the system shutdown
 - o Support standalone mode without having to interface control
 - **System Management(System Management)**
 - o Soft Reset Hard Reset or may
 - o Support soft shutdown or a hard shutdown, support external wake-up boot
 - o It supports output voltage monitoring, self-diagnosis function
 - o PWROK A system reset
 - o Detecting an external power source (insertion / removal / insufficient driving capability)
 - o All output voltages are supported by soft start
 - o Over / under voltage protection (OVP / UVP)
 - o Overcurrent protection (OCP)
 - o Over-temperature protection (OTP)
 - o stand by OTG VBUS Power status and monitoring
 - **High integration (Fully Integration)**
 - o Generating an internal precision voltage reference (0.5%)
 - o Internal MOSFET
 - o The timing and the output voltage can be customized

3. Typical applications (Typical Application)



4. Limit parameter (Absolute Maximum Ratings)

Symbol	Description	Value	Units
ACIN	Input Voltage Input voltage	-0.3 to 11	V
VBUS	Input Voltage Input voltage	-0.3 to 11	V
T _J	Operating Temperature Range Operating temperature	- 40 to 130	°C
T _S	Storage Temperature Range Storage temperature	- 40 to 150	°C
T _{LEAD}	Maximum Soldering Temperature (at leads , 10sec) Soldering temperature	300	°C
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 (Electrical Characteristics)

V_{IN} = 5V , BAT = 3.8V , T_A = 25 °C

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	500mV 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		<u>-0.5%</u>	4.2	<u>+0.5%</u>	V
I _{CHRG}	Charge Current	Internal		780	<u>1320</u>	mA
I _{TRKL}	Trickle Charge Current			<u>10%</u>		I _{CHRG}

								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 Current Ratio	Indication CV Mode			10% 15%			I _{CHRG} mA
NTC								
V _{TL}	Cold Temperature Fault Threshold Voltage	Charge	0		<u>2.112</u>	3.264		V
		Discharge						
V _{TH}	Hot Temperature Fault Threshold Voltage	Charge	0		<u>0.397</u>	3.264		V
		Discharge						
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

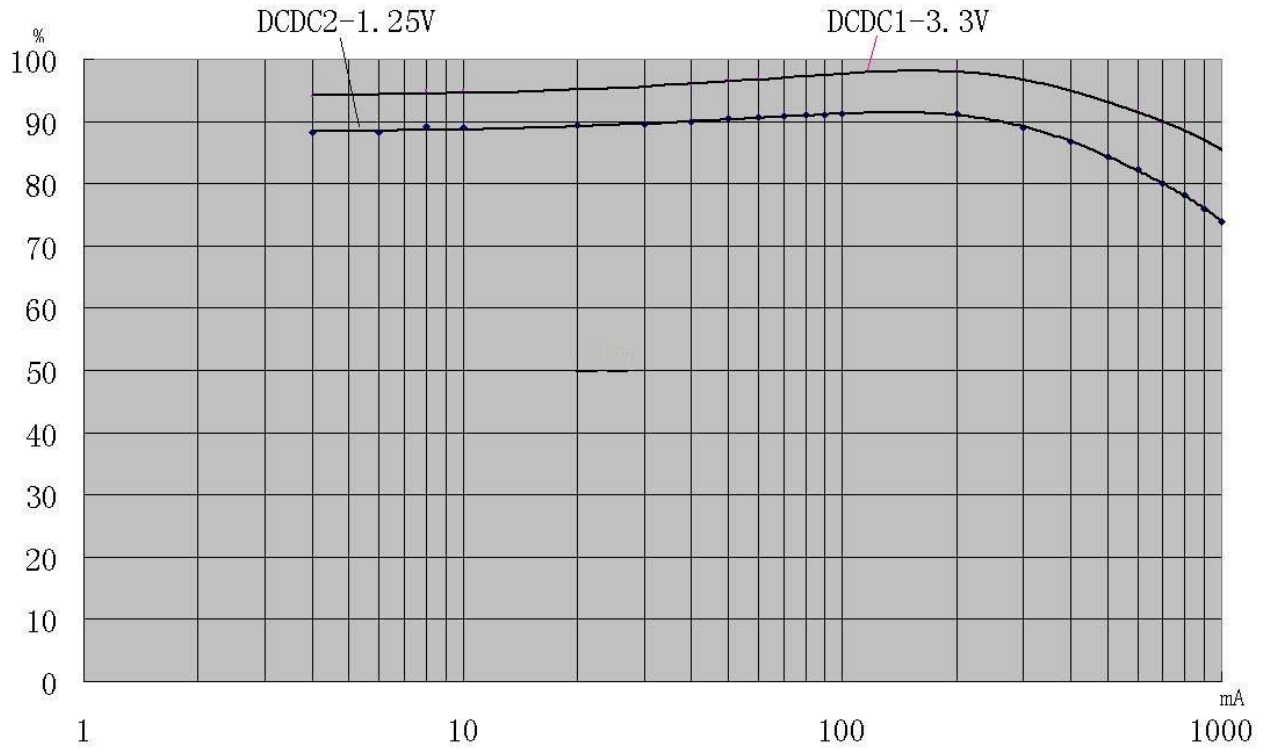
SYMBOL	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNITS
Off Mode Current						
I _{BATOFF}	OFF Mode Current	BAT = 3.8V			27	μA
I _{SUSPEND}	USB VBUS suspend Mode current	BAT = 3.8V , VBUS = 5V , N_VBUSEN = 1			86	μA
Logic						
V _{IL}	Logic Low Input Voltage				0.3	V
V _{IH}	Logic High Input Voltage				2	V
TWSI						
V _{CC}	Input Supply Voltage				3.3	V
ADDRESS TWSI Address					<u>0x68</u>	
f _{sck}	Clock Operating Frequency				400	<u>1200</u> 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
DCDC						
f _{osc}	Oscillator Frequency	Default			1.5	MHz
DCDC1						
I _{VIN1}	Input Current	PFM Mode			26	μA

		I _{DC1OUT} = 0				
I _{LIM1}	PMOS Switch Current Limit	PWM Mode		<u>1600</u>		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		<u>2300</u>		mA
I _{DC2OUT}	Available Output Current	PWM Mode		<u>1600</u>		mA
V _{DC2OUT}	Output Voltage Range		0.7	1.25	<u>2.275</u>	V

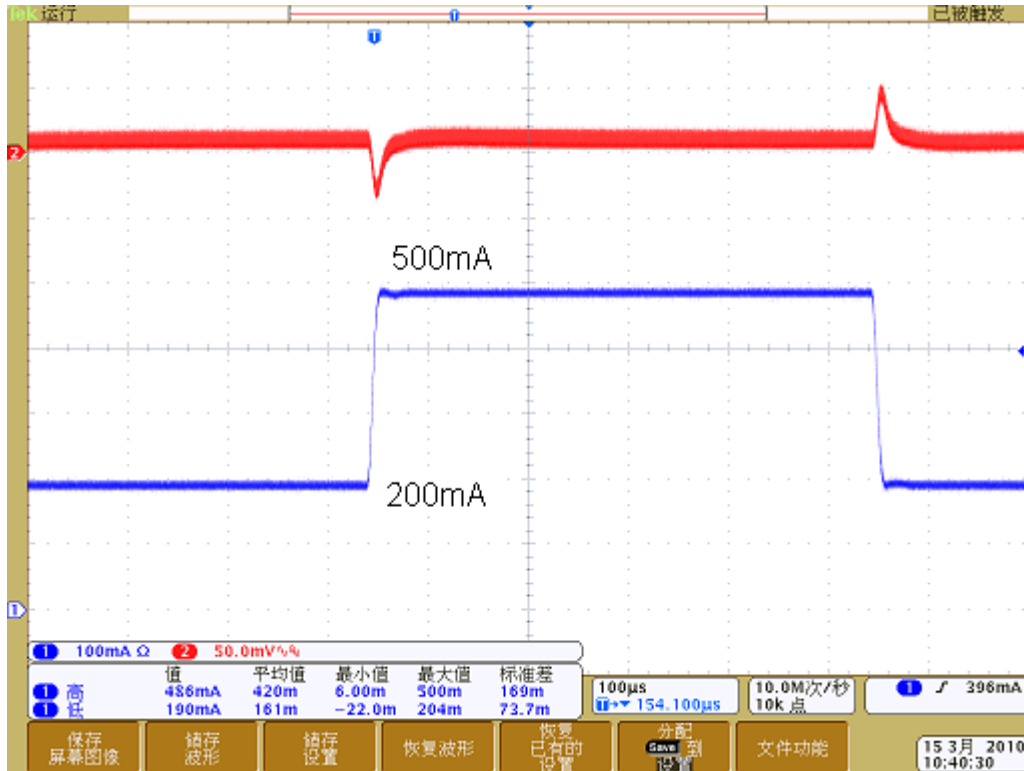
SYMBOL DESCRIPTION		CONDITIONS	MIN	TYP	MAX	UNITS
LDO1						
V _{LDO1}	Output Voltage	I _{LDO1} = 1mA			1.25 1.8 2.5 3.3 1%	V
I _{LDO1}	Output Current				30	mA
LDO2						
V _{LDO2}	Output Voltage	I _{LDO2} = 1mA	- 1%		3	1% V
I _{LDO2}	Output Current				200	mA
I _Q	Quiescent Current				100	μA
PSRR	Power Supply Rejection Ratio	I _{LDO2} = 60mA , 1KHz				dB
e _N	Output Noise, 20-80KHz	V _o = 3V, I _o = 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	V _o = 1.8V, I _o = 150mA			18	μV _{RMS}
LDO4						
V _{LDO4}	Output Voltage	I _{LDO4} = 1mA	- 1%		2.5 1%	V
I _{LDO4}	Output Current				500	mA
I _Q	Quiescent Current				20	μA
PSRR	Power Supply Rejection Ratio	<u>I_{LDO4} = 10mA , 1KHz</u>			<u>TBD</u>	dB

6. Typical characteristics (Typical Characteristics)

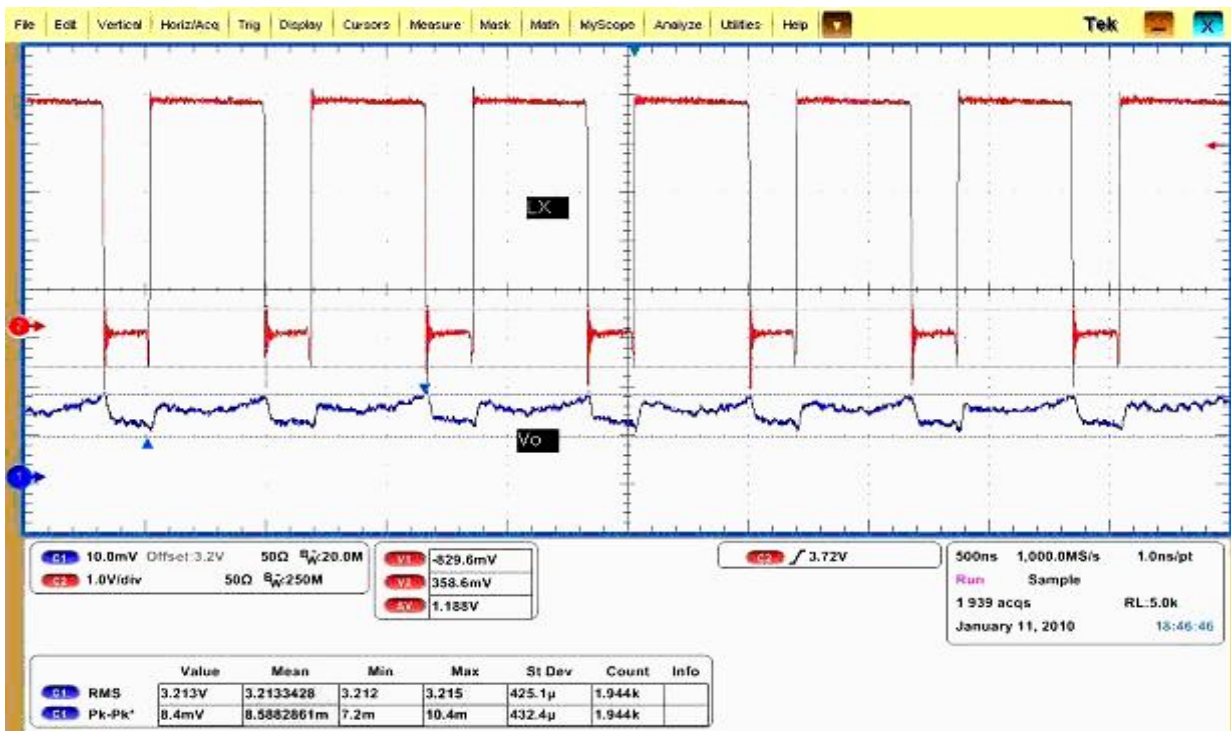
DC-DC Efficiency vs. Load (3.8V_{in})



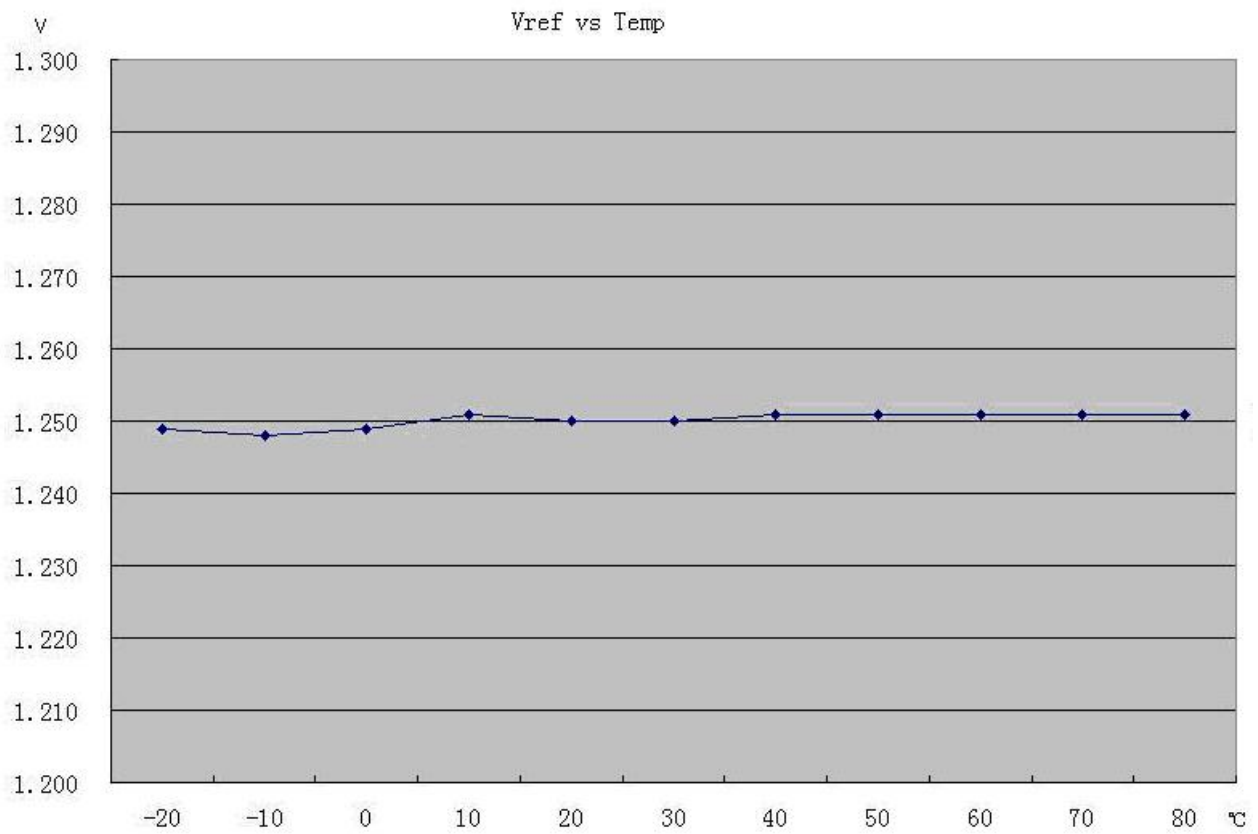
DC-DC Load Transient



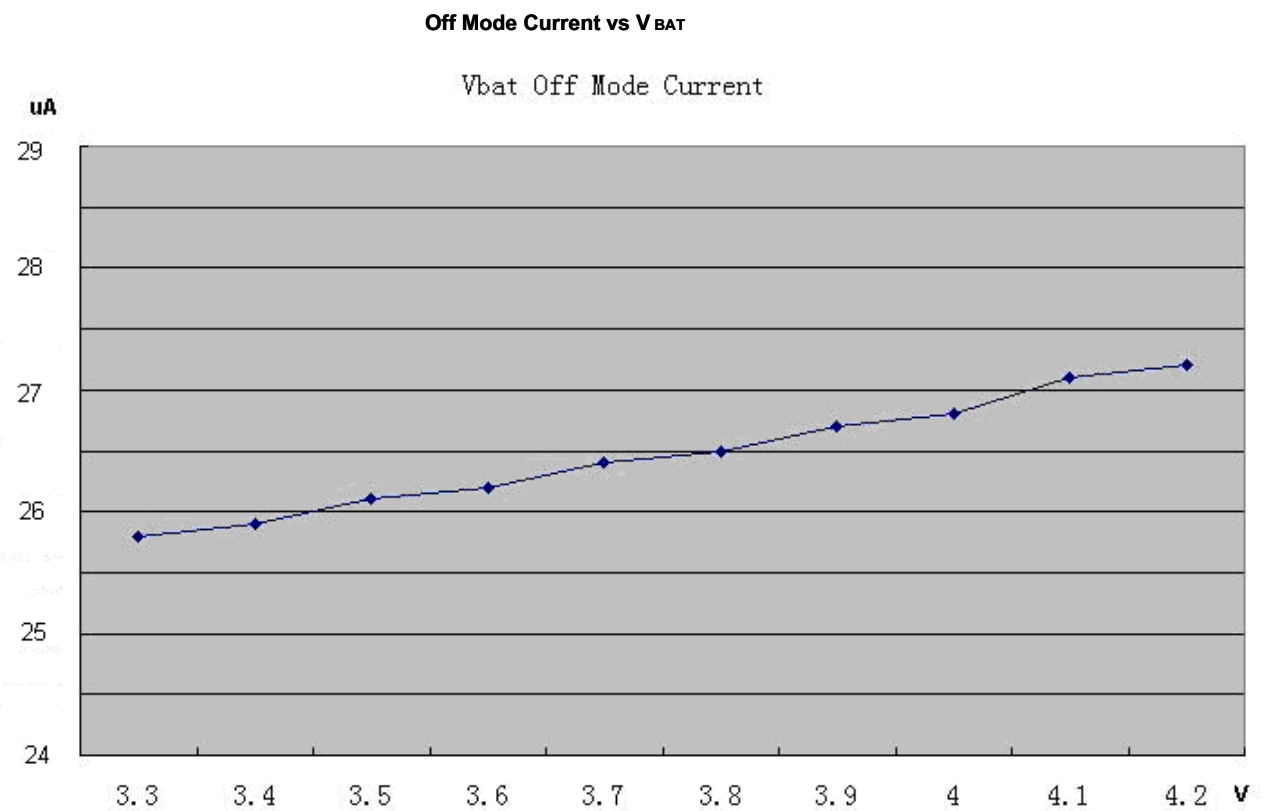
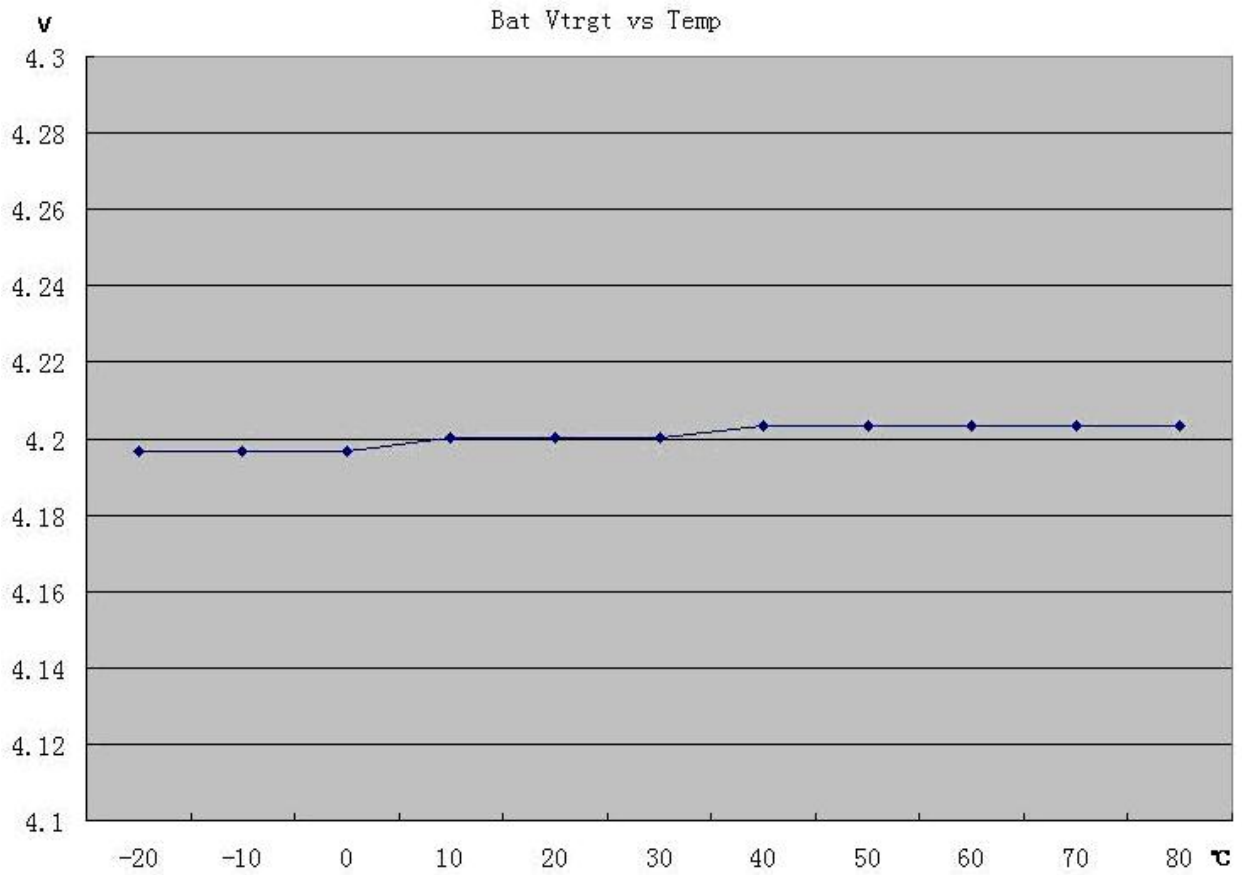
DC-DC Ripple



V_{REF} vs Temperature



V_{TRGT} vs Temperature

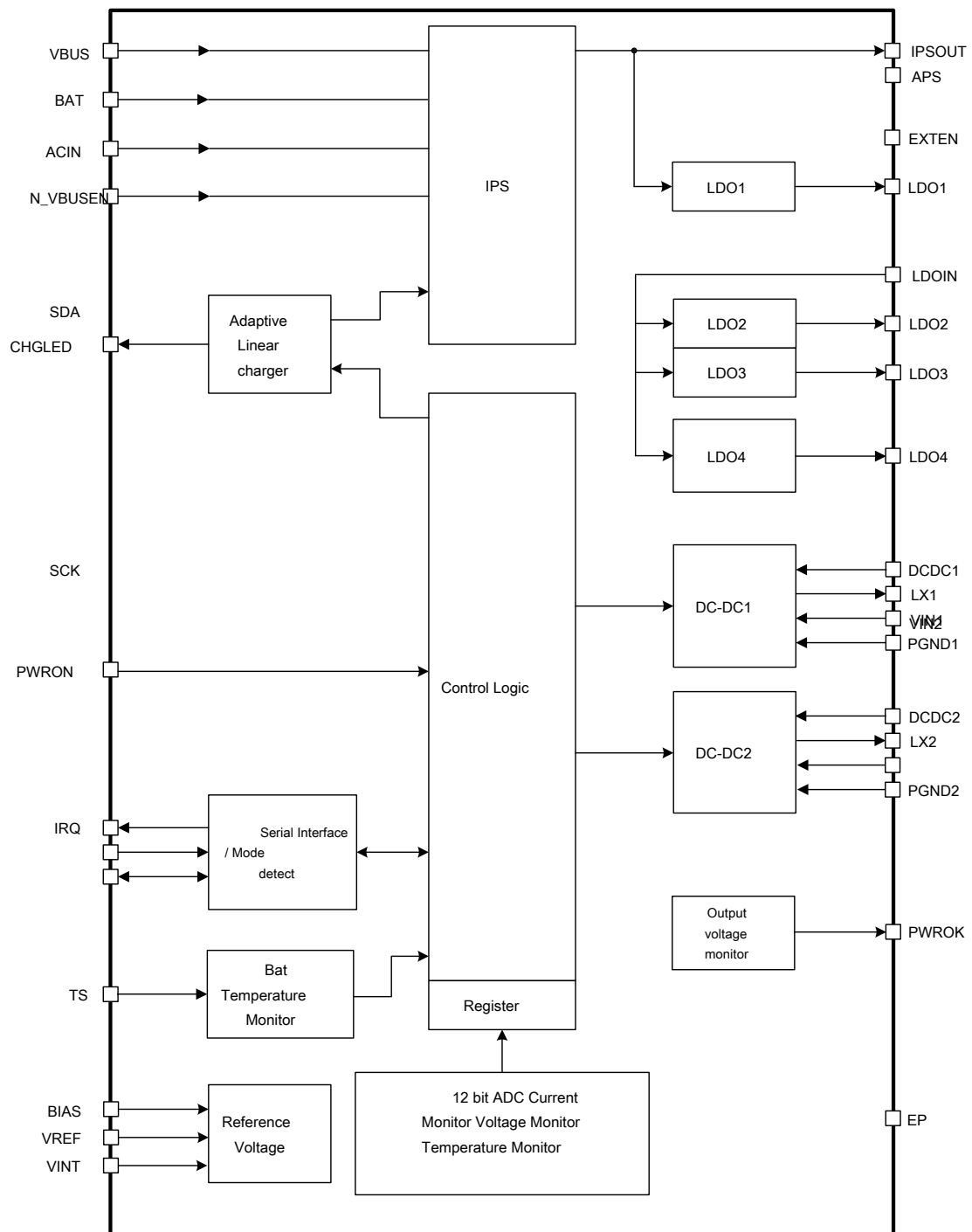


7. Pin definitions (Pin Description)

Num	Name	Type	Condition	Function Description
1	SDA / N_HOLDEN	IO	Host Control Mode	TWSI Data Signal, pull high to 3.3V IO Power through an 2.2K Resistor
		I	Stand Alone Mode	N_HOLDEN: GND-Hold enable; High-not hold
2	SCK	I		TWSI Clock Signal, pull high to 3.3V IO Power through an 2.2K Resistor
3	PWROK	O		Power good indication
4	N_VBUSEN	I		VBUS to IPSOUT Selection GND: IPSOUT select VBUS High: IPSOUT do not select VBUS
5	VIN2	PI		DCDC2 input source
6	LX2	IO		Inductor Pin for DCDC2
7	PGND2	G		NMOS Ground for DCDC2
8	DCDC2	I		DC-DC2 feedback pin
9	LDO3	O		Output Pin of LDO3
10	LDO2	O		Output Pin of LDO2
11	LDOIN	PI		Input to LDO2 and LDO3
12	LDO4	I		Output Pin of LDO4
13	APS	PI		Internal Power Input
14	PWRON	I		Power On-Off key input , Internal 100k pull high to APS
15	BIAS	IO		External 200Kohm 1% resistor
16	VREF	O		Internal reference voltage
17	VINT	PO		Internal logic power, 2.5V
18	LDO1	O		LDO1 output , for Host RTC block
19	VBUS	PI		USB VBUS input
20	ACIN	PI		Adapter input
<u>21,22</u>	BAT	IO		Main Battery
twenty three	CHGLED	O		charger status indication
twenty four	TS	I		<u>Battery Temperature sensor input or an external ADC input</u>
<u>25,26</u>	IPSOUT	PO		System power source
27	EXTEN	O		External power module enable
28	VIN1	PI		DCDC1 input source
29	LX1	IO		Inductor Pin for DCDC1
30	PGND1	G		NMOS Ground for DCDC1
31	DCDC1	I		DCDC1 feedback pin
32	IRQ /	O	Host Control	IRQ output

	N_CHGEN		Mode	
		I	Stand Alone Mode	It is charger enable pin GND -charger enable; High-charger disable
33	EP	G		Exposed Pad, need to connect to the system ground

8. Functional Block Diagram (Functional Block Diagram)



9. Operation and control (Control and Operating)

9.1 two operating modes (Mode Description)

AXP173 There are two modes of operation, Host Control Mode and Stand Alone Mode, the SCK Whether IPSOUT Connection settings.

SCK Connected to IPSOUT When working in Stand Alone Mode; if AXP173 SCK Pulled up system 3.3V IO Power supply, its work in Host Control mode. in Host Control Mode, by accessing the internal register, Host Can AXP173 Flexible working state of adjustment and monitoring, and to get a wealth of information. in Stand Alone Mode, AXP173 Automatic power path management, charging management and all power management tasks without Host Intervention, all of the adjustable parameters such as output voltage, charging current, etc., are set to default values.

Note: Host "Refers to a host processor application system NOTE: as meaning" external power supply "comprising ACIN and VBUS Input.

9.2, and a reset switch (Power On / Off & Reset)

Switch button (PEK)

AXP173 of PWRON To pin GND It can be connected between a key, as an independent key switch Power Enable Key (PEK) . AXP173 This key can automatically identify the "long press" and a "short press" and react accordingly.

Several Power Source (Power on Source)

- 1 , ACIN , VBUS And a battery access.
- 2 , PEK .

Power (Power On)

AXP173 It can be made PEK (Button for more than " ONLEVEL ") Is switched on. In practical applications, Host Timing(Alarm) The output signal may also be connected to PWRON -versus PEK in parallel, Alarm When equivalent is active (low) signal PEK Press, can also AXP173 Boot.

When turned on, DC-DC with LDO The soft-start in time series is set after startup is completed by Host Opening / closing the respective power supply.

Shutdown (Power Off)

PEK "Long press" time is greater than IRQLEVEL When, in PEK The interrupt service routine, Host Can "register REG32H [7] "Write" 1 "To inform AXP173 Into shutdown state. AXP173 It will be turned off except when entering shutdown state LDO1 All power output beyond.

In the following cases, AXP173 It will automatically shut down:

- 1 , Input voltage is too low, the low voltage protection;
- 2 , Overload due to low power supply output voltage, overload protection;
- 3 , Input voltage is too high, the overvoltage protection (details see "Power Management passage" section);
- 4 , PEK more than the OFFLEVEL (Default 6S) In addition to the system automatically shut down LDO1 Other than the output;

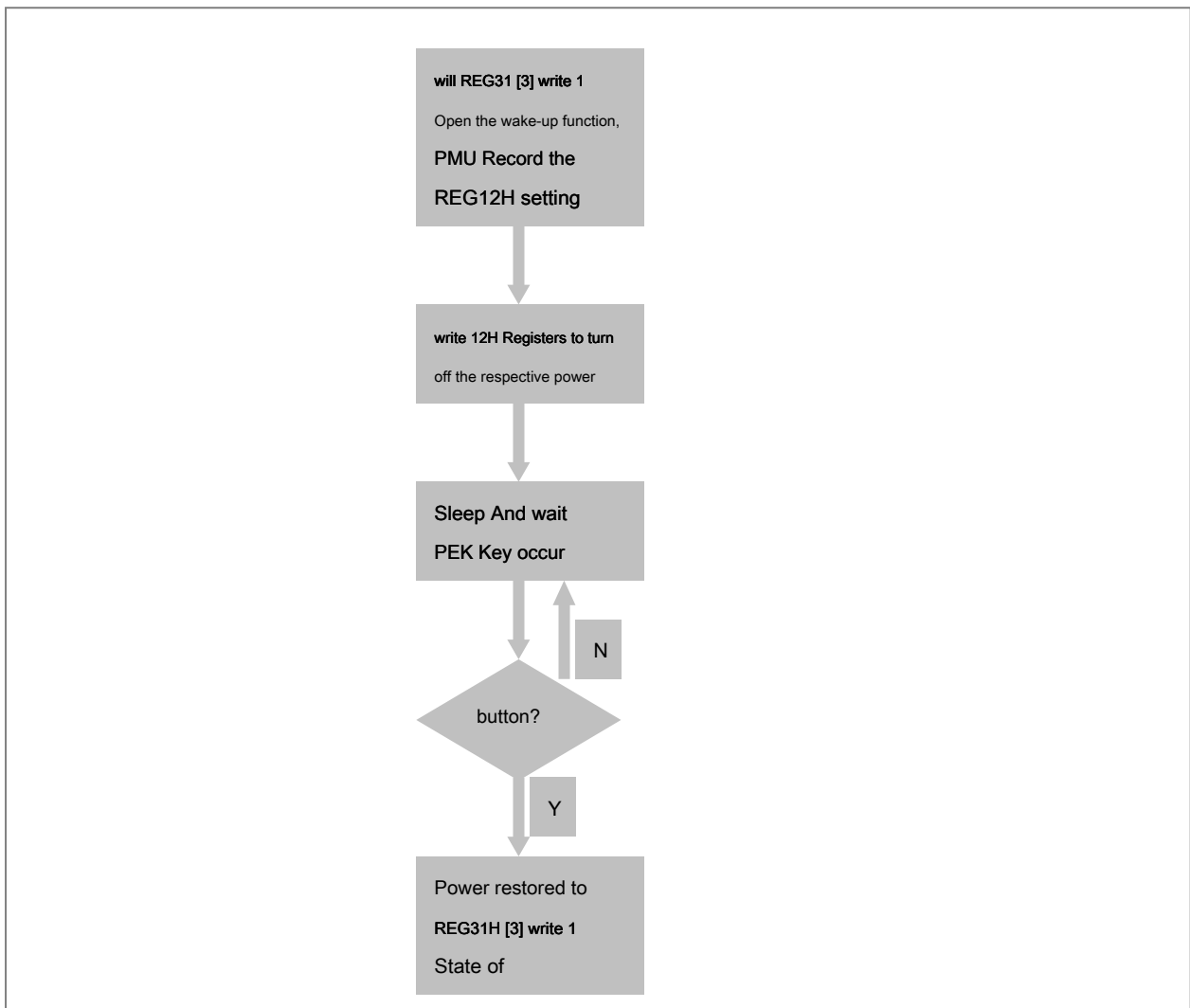
AXP173 Automatic protection mechanism to avoid the occurrence of abnormal applications are irretrievably damaged when the power supply device, thereby protecting the entire system.

Sleep and wake (Sleep and wakeup)

in MannerA And with the power on, if the system needs to enter Sleep Mode, and wherein one or several passage way power off, it can be made REG31 [3] Control, decide whether the PEK Press the trigger signal wakeup ,Let PMU Each output power is restored to the REG31 [3]

It is set 1 State, and the brightest the power is turned off on power-up timing sequence according to stipulated.

As follows Sleep with wakeup Mode control flow thereof.



The system reset function and an output monitoring function (PWROK)

AXP173 of PWROK It can be applied as a reset signal system. in AXP173 Boot process, PWROK Output low, when the output voltage of each power supply reaches a preset value is stable, PWROK It will be pulled in order to achieve power-on reset applications.

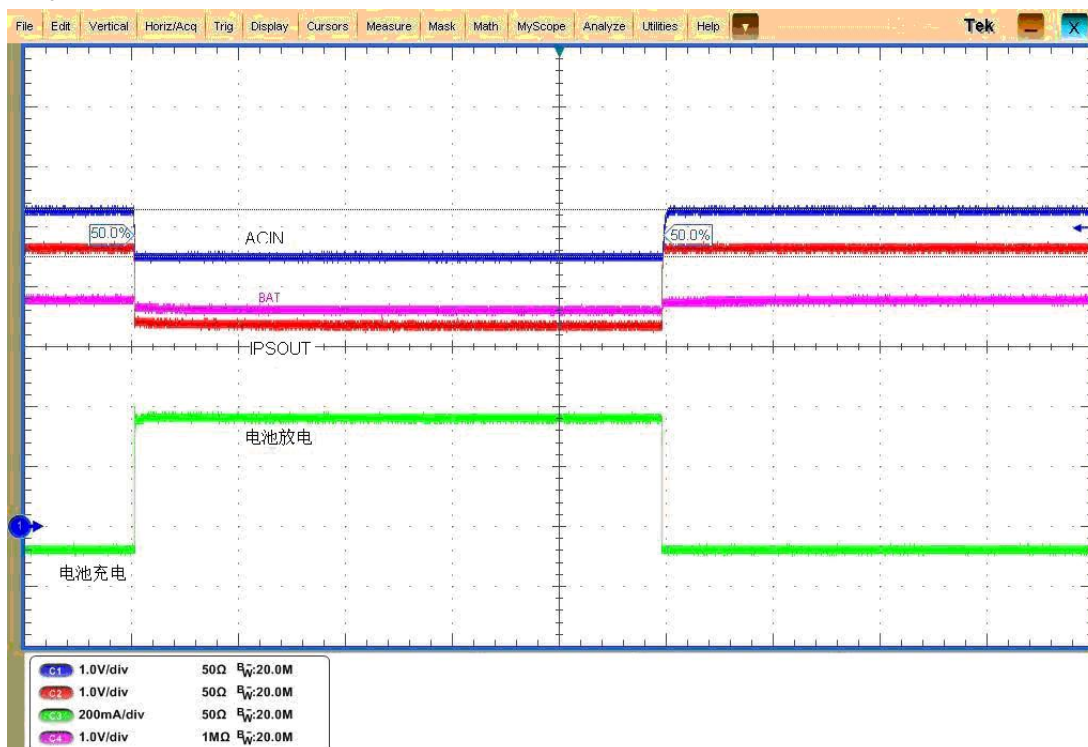
During normal operation of the application system, AXP173 Constantly monitors the output voltage from various quarters and load conditions, and in the case of overload or under-voltage, PWROK Output low immediately reset applications, prevent malfunction and possible data errors.

9.3 Power Management passage (IPS)

AXP173 Power input from the lithium battery can be BAT , USB VBUS Input, the external power source ACIN (For example, AC adapter AC Adapter) , IPS The state of the external power source and to select the appropriate lithium battery power distribution.

- o When only access lithium battery, no external power input, using the lithium battery;
- o When an external supply (VBUS or ACIN) , Preferentially using an external power supply;
- o When the battery is connected, the external power is removed, and immediately "seamless" switch lithium battery;
- o when VBUS with ACIN Both the access priority use ACIN Power supply, and charging the lithium battery;
- o If at this time ACIN When driving ability is not enough, will timely open VBUS Path, to achieve ACIN / VBUS Common power supply;
- o If the drive capacity is still insufficient, the charging current will be reduced until 0 And then supplemented with a battery-powered; see

the following illustration:



Host able to pass TWSI access AXP173 The internal register set IPS Its parameters and reading information feedback.

Limit voltage / current mode and the direct mode

In order not to affect USB communication, VBUS The default path work " VBUS Pressure limiting mode. "In this mode, AXP173 Will VBUS Voltage is maintained at a reference voltage can be set V_{HOLD} Above, in order to meet USB specification. V_{HOLD} The default is 4.4V , May register Reg30H [5: 3] Adjustment.

If the system from USB VBUS The magnitude of the current drawn is limited demand, provides a current limiting modes to choose from (see Register REG30H [1]) The current limit optional 500mA / 100mA (register Reg30H [0]) .

If you only use the system USB Power supply and do not mind USB Communications, or use USB Power adapter, can modify registers REG30H [6] will AXP173 Set to " VBUS Thru Mode ", this time AXP173 It will give priority to meet the electricity needs of the application system. when USB Host A drive system power too weak or too strong, the VBUS Voltage is lower than V_{HOLD} , AXP173 Will be issued IRQ ,inform Host VBUS Weak power, indicating USB Communication may be affected by subsequent action Host Software decision.

The reaction of the external power supply is inserted AXP173

AXP173 Insertion operation can automatically detect the external power source. when AXP173 Detected after insertion into an external power, the external power supply will automatically determine whether or not available, and the result is set in the corresponding registers, also issued IRQ ,Notice Host .

And the meanings of the status is the external power supply as follows:

Status bit register	meaning
register REG00H [7]	Indicates an external power supply adapter ACIN does it exist
register REG00H [6]	Indicates an external power supply adapter ACIN it's usable or not
register REG00H [5]	Indicates the external power source VBUS does it exist
register REG00H [4]	Indicates the external power source VBUS it's usable or not
register REG00H [3]	Indicates an external supply VBUS Time, VBUS The voltage is higher than V_{HOLD}
register REG00H [1]	Indicates the external power source ACIN / VBUS Whether PCB Shorting
register REG00H [0]	Indicate whether the system by the ACIN / VBUS Trigger Power

"Indicates an external supply VBUS Time, VBUS The voltage is higher than V_{HOLD} "This flag allows Host Receipt IRQ7

When (finger VBUS Weak power supply), it is determined VBUS Because the system load or access is pulled low because the voltage is lower than the external power supply itself V_{HOLD} So easy Host Software decide whether to continue to work in the voltage-limiting mode or changed through mode.

That the choice of an input power source VBUS

AXP173 Whether the choice VBUS As the input power, by N_VBUSEN And register REG30H [7] To decide:

N_VBUSEN	REG30H [7] Input Power		meaning
Low	0	VBUS	VBUS Can be effective when VBUS As the input power
Low	1	VBUS	
High	1	VBUS	
High	0	ACIN / BAT	Do not use VBUS

Low battery warning and low voltage protection (automatic shutdown)

AXP173 You can set two low voltage warning $V_{WARNING}$ And automatic shutdown voltage V_{OFF} And APS Compared. Once found APS Lower than $V_{WARNING}$, On the issue of IRQ19 . in case APS Lower than V_{OFF} , AXP173 Automatically enters shutdown mode, in addition to close LDO1 All output outside.

$V_{WARNING}$ with V_{OFF} Default values may register REG3AH , REG3BH with REG31H Bit [2: 0] Settings.

Overvoltage protection

When the external power supply voltage exceeds 6.3V Time, APX19x issue IRQ1 / 4 , Suggesting an external power supply overvoltage. When the external power source exceeds 7V , AXP173 Automatic shut-down.

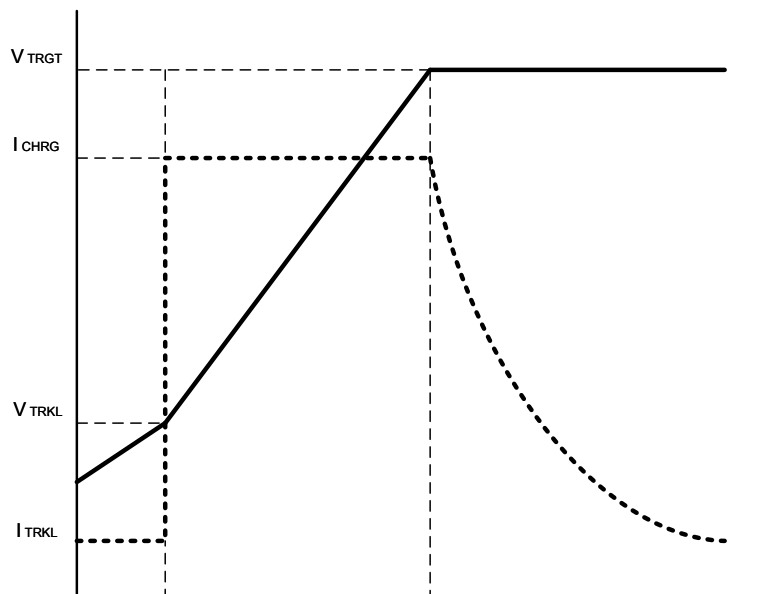
9.4 adaptive charger (Adaptive Charger)

AXP173 Incorporates a constant-current / constant-voltage charger, the charge cycle can be automatically controlled, secure clocks can be built automatically stop charging without processor intervention. This can automatically adjust the power consumption of the charger system charging current, battery detection, activation and trickle charge, built-in temperature detection circuit may automatically reduce the charging current when the temperature is too high or too low.

Start adaptive charging process

The default state of the charger is enabled (can be disabled by setting the register, refer to "Register REG33H "). When the external access after the power supply, AXP173 is first determined whether the external power source for charging, when the external power source is available to meet the conditions, and at this time the charging function is turned on, AXP173 Automatically start the charging process, the Host issue IRQ Indicating the charging process begins. Simultaneously, CHGLED Pin output low, may drive an external LED indicates the state of charge.

A schematic view of the charging voltage and current process



Two voltage sign

V_{TRGT} , The target charging voltage. V_{TRGT} By a register set, the default is 4.2V (See "Register REG33H [6: 5] "). When the external power supply voltage is lowered, AXP173 Automatically adjusting the charging target voltage.

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

recharging current

The charging current can register REG33H [3: 0] Set the default value 450mA or 780mA .

Charging Process

If the battery voltage is below 3.0V , Charger automatically enters the pre-charging mode, charging current to the preset value 1/10 . in case 40 Within minutes (this time is adjustable, see "Register REG34H "), The battery voltage can not reach 3.0V , Battery charger automatically enter the active mode. Specific details see "Battery active mode."

Once the battery voltage is higher than 3.0V , Entered the charger constant current mode. If the charging current is less than the preset value 65% When the system issues IRQ17 This is a confirmation "insufficient ability to drive an external power source, when the charge current has not reached the set value, which will extend the charging time, if you want faster fully charged, the proposed replacement of a stronger power supply or turn off the power-hungry functions."

When the battery voltage reaches the target voltage V_{TRGT} After the charger enters the constant voltage mode from the constant current mode, the charge current decreases.

When the charging current below a predetermined value 10% or 15% When (can be set, refer to "Register REG33H "), The end of the charge cycle, the charging is stopped, the end of charge, AXP192 Will be issued IRQ18 , CHGLED Stop pin indicates the state of charge. When the battery voltage drops below the lower V_{RCH} When, it will automatically begin recharging, also issued IRQ17 .

In the non pre-charging mode, if the 480 Within minutes (this time can be adjusted, refer to "Register REG34H "), The charge cycle is not over, the battery charger will automatically enter the active mode.

Battery mode is activated

Whether from the pre-charging mode or the battery enters an active mode from the constant current charging mode (the timer has timed out), AXP173 Will be issued IRQ10 Indicating that the battery may be damaged.

In the active mode the battery, Charger Always a small charging current to the battery, if the battery voltage reached can be V_{RCH} , Then exit the active mode, also issued IRQ11

AXP173 In the register REG01H It indicates the battery charger is in the active mode.

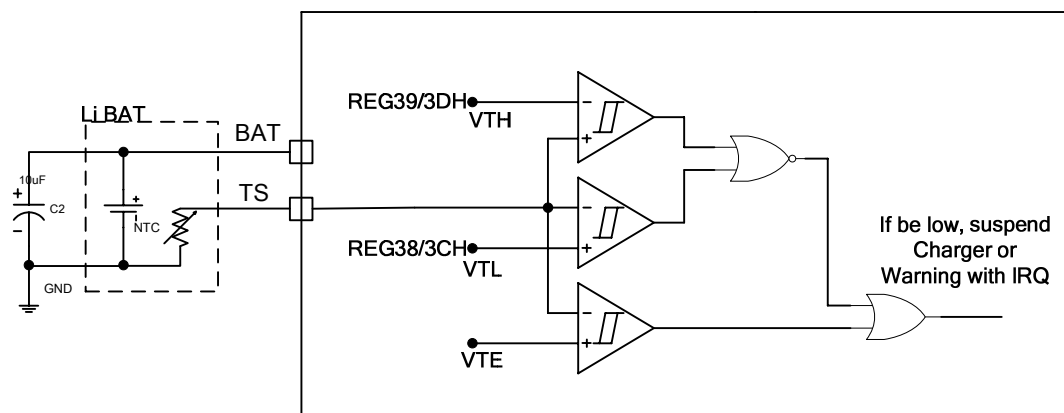
CHGLED

CHGLED Pin indicates the state of charge and alarm, it has four states: charging, not charging, the battery and the external power supply abnormality alarm overvoltage alarm. CHGLED Yes NMOS Open Drain (Open drain type) output, four states may be displayed by a current limiting resistor to directly drive a light emitting diode. Its performance in each state shown in the following table:

status	which performed	Note
Charging Low battery error is not charging a high resistance		25% duty 1Hz Jump Battery charger enters the active mode, the battery temperature is
too high or too low overvoltage		
	25% duty 4Hz Jump External power supply input voltage is too high	

Battery temperature detection

In the charging / use, AXP173 By the TS A pin external temperature sensitive resistor to monitor the temperature of the battery. A schematic circuit of FIG follows:



In the figure above, VTH / VTL High and low temperature thresholds are set, respectively, through the register REG38H / 39H / 3CH / 3DH Set, VTE = 0.2V . Recommended temperature sensitive resistor selection 25 When °C is 10Kohm , Precision 1% of NTC Temperature sensitive resistor. AXP173 will be TS The constant current feeding pin, this current can be set 20uA , 40uA , 60uA , 80uA Four kinds (see register REG84H) To adapt to different NTC resistance. This current flows through the temperature-sensitive resistor, to obtain a detection voltage, AXP173 by ADC And the measured voltage value is compared with the setting value, to emit a corresponding IRQ Or be suspended.

If the temperature sensitive resistor is too large or too small, it can be connected in parallel or in series with the additional resistor on its path, in order to expand the detection range.

If the battery temperature sensitive resistor, can TS Pin to ground at this time AXP173 Battery temperature monitoring function is automatically disabled.

Battery Testing

AXP173 Automatically detects whether the battery is present and the identity register (see Register REG01H) And issued IRQ13 , IRQ14 .

Battery detection function can be Host Control opened or closed (see Register REG32H) .

9.5 Pin function difference between different operating modes (Mode Difference)

SDA / N_VHOLDEN

work at Host Control When mode, this pin as TWSI Data signal; when working in STAND ALONE When mode, as V_{HOLD} Is valid USB Pressure limiting mode selection signal, the effect of registers REG30H [6] in contrast.

IRQ / N_CHGEN

work at Host Control When mode, this pin as the interrupt status signal for informing Host An interrupt is generated; when working in STAND ALONE When mode, as the charge enable / disable signal, the effect of registers REG33H [7] in contrast.

Over 9.6 channel power output (Multi-Power Outputs)

AXP173 Output voltage and multi-channel feature list provides as follows:

Output path	Types of	Application examples	default voltage drive	capability
DCDC1	BUCK	Can be set	3.3V _{I/O}	1200 mA
DCDC2	BUCK	Can be set	1.25V _{core}	1600 mA
LDO1	LDO	Can be set	RTC	30 mA
LDO2	LDO	Can be set	Analog / FM	200 mA
LDO3	LDO	Can be set	1.8V HDMI	200 mA
LDO4	LDO	Can be set	2.5V _{ddr}	500 mA

AXP173 contain 2 Road synchronous buck DC-DC , 4 road LDO , Various promoters timing and control. DC-DC The operating frequency of default 1.5MHz , Can be adjusted by setting the registers, the peripheral may be the use of small inductive and capacitive elements. 2 More DC-DC It can be set to PWM Mode or automatic mode (by the AXP173 Automatic switching), see "The size of the load register REG80H . "

DC-DC1 / 2 / LDO4

DCDC1 / LDO4 Output voltage range 0.7-3.5V , DCDC2 Output voltage 0.7-2.275V , May register set (see "Register REG23H 26H 27H 29H ").

DCDC1 / 2 The output capacitor is recommended 10uF X7R Little more than ESR Ceramic capacitors; when the output voltage is set to 2.5V When the above recommended 2.2uH Inductance, in 2.5V When the following is recommended 4.7uH Inductor, wherein the inductor saturation current greater than this required power demand for the maximum current path 50% the above.

The following is a list of recommended LC:

Inductor		
models	Current specifications	DC 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

LDO1 Always on, you can use the system for the real time clock circuit (RTC) Provide uninterrupted power supply, its drive capability 30mA .

LDO2 / 3

LDO2 / 3 Using a low-noise design can provide power to analog circuitry applications, which drive capability 200mA .

Soft start (Soft Start)

all DC-DC with LDO Support the establishment of output soft-start mode, avoid sudden changes starting current impact on the input path.

Self-diagnosis: load monitoring and limiting protection

all DC-DC with LDO It has load monitoring and limiting function, when the load current exceeds the drive capability, output voltages are lowered to protect the internal circuitry. 2 More DC-DC with LDO4 Output voltage is lower than the set voltage 85% Time, AXP173 Automatic shut-down. DETAILED while the internal system automatically records which output voltage is too low due to a shutdown (see Register REG46H [5: 2]) And issue the appropriate IRQ .

all DC-DC No external Schottky diode and the resistor divider feedback circuit. If the application does not require use of a DC-DC , Just to corresponding LX Pin not connected to.

The default setting voltage 9.7 / start timing (Default Voltage / Timing Setting)

AXP173 Customizable default voltage of each power supply, start-up sequence and so on.

Start timing: contains 8 Class started, namely 0-7 , The first of which 7 The default level when the power supply does not start this way. other 0-6 The first level, respectively 1-7 Step start this way power. Each step can be set from the start time interval, the range of selectable 1 , 4 , 16mS .

The default voltage setting: each channel DCDC / LDO May be selected from a set range including the lowest voltage to the highest voltage. About this part, see "Default Configuration instructions" document.

9.8 The signal acquisition system (Signal Capture)

General battery monitor battery power is typically estimated by measuring the battery voltage, and AXP173 Multi-channel 12Bit ADC In addition to measuring the battery voltage, it can also measure the battery current and the external power supply voltage, current, and battery charge and discharge internal integrated coulometer. Host It can be more accurately calculated based on these data the battery, in addition, may also be calculated out extensive real-time system power consumption information, remaining battery capacity, the battery charged, remaining battery life and the remaining fill time.

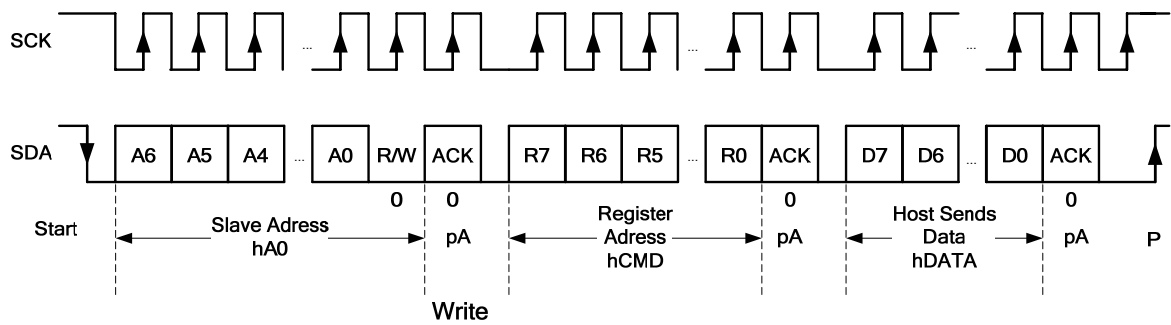
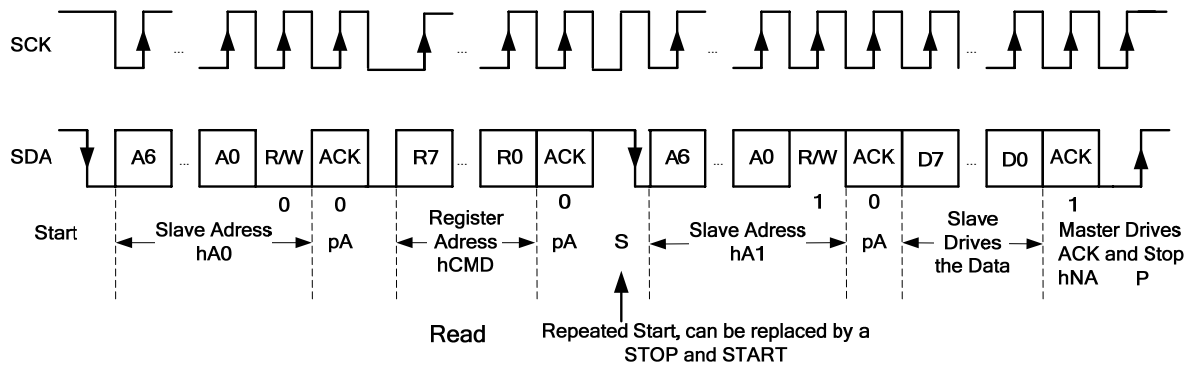
Separate ways ADC It enables control register and the sampling rate can be REG82H , 83H , 84H Set in the corresponding registers, the register descriptions refer to the sampling result is stored ADC Data class. Battery current flow is charged or discharged by the register REG00H [2] Indicated.

Channel	000H	STEP	FFFH
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 °C	0.1 °C	264.8 °C
APS voltage	0mV	1.4mV	5.733V
TS pin input	0mV	0.8mV	3.276V

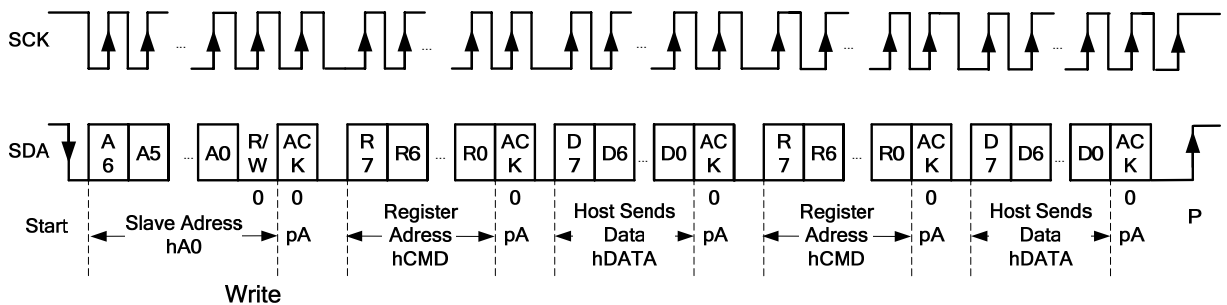
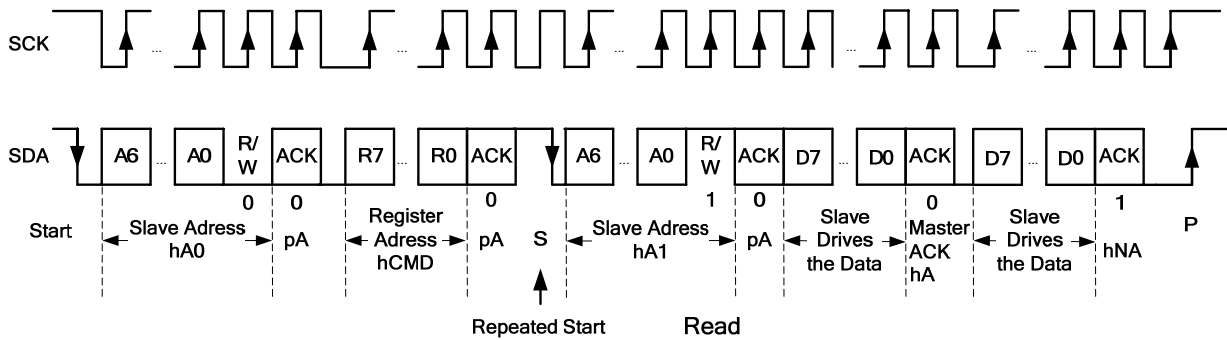
9.9 Timer (Timer)

AXP173 It comprises an internal timer, by setting register REG8AH [6: 0] It may change timer value, the minimum resolution of minutes (Minute) , Will set the timer expires REG8AH [7] .

9.10 Host Interface and interrupt (TWSI and IRQ)



Map 1: Single Read and Write



Map 2: Multi Read and Write

Host able to pass TWSI Access Interface AXP173 Register, the operation timing shown above, supports standard 100KHz or

400KHz Frequency at speeds up to 1.2MHz, While supporting read/write operation, the device address 69H (Read) and 68H (Write).

When certain events occur, AXP173 uses the IRQ interrupt mechanism to alert the host and interrupt status is stored in the interrupt status register (see Register REG44H, register REG45H, register REG46H, register REG47H). To write the corresponding status register bit 1, clear the corresponding interrupt, when there is no interruption event, the IRQ output is pulled (by an external pull-up 51K resistance). Each of the interrupts can be masked (see registers Interrupt Control Register REG40H, register REG41H, register REG42H, register REG43H).

position	Interrupt number	meaning	position	Interrupt number	meaning
register 44H [7]	<u>IRQ1</u>	power supply ACIN Overpressure	register 46H [7]	<u>IRQ16</u>	IC Internal over-temperature
register 44H [6]	<u>IRQ2</u>	power supply ACIN Insert	register 46H [6]	<u>IRQ17</u>	Charging current inadequate
register 44H [5]	<u>IRQ3</u>	power supply ACIN Removing	register 46H [5]	<u>IRQ18</u>	DCDC1 Voltage is too low
register 44H [4]	<u>IRQ4</u>	power supply VBUS Overpressure	register 46H [4]	<u>IRQ19</u>	DCDC2 Voltage is too low
register 44H [3]	<u>IRQ5</u>	power supply VBUS Insert	register 46H [3]	<u>IRQ20</u>	LDO4 Voltage is too low
register 44H [2]	<u>IRQ6</u>	power supply VBUS Removing	register 46H [2]	<u>IRQ21</u>	Retention
register 44H [1]	<u>IRQ7</u>	VBUS Voltage is less than V HOLD	register 46H [1]	<u>IRQ22</u>	PEK dog
register 44H [0]		Retention	register 46H [0]	<u>IRQ23</u>	PEK Press
register 45H [7]	<u>IRQ8</u>	Battery access	register 47H [7]		Retention
register 45H [6]	<u>IRQ9</u>	Battery removal	register 47H [6]		
register 45H [5]	<u>IRQ10</u>	Battery enters active mode	register 47H [5]	<u>IRQ26</u>	VBUS effective
register 45H [4]	<u>IRQ11</u>	Battery exit active mode	register 47H [4]	<u>IRQ27</u>	VBUS invalid
register 45H [3]	<u>IRQ12</u>	Charging	register 47H [3]	<u>IRQ28</u>	VBUS SESSION effective
register 45H [2]	<u>IRQ13</u>	finished charging	register 47H [2]	<u>IRQ29</u>	VBUS SESSION invalid
register 45H [1]	<u>IRQ14</u>	Battery temperature	register 47H [1]		Retention
register 45H [0]	<u>IRQ15</u>	The battery temperature is too low	register 47H [0]	<u>IRQ30</u>	Low battery warning

9.11 register (Registers)

The first 1 Group, based power control

address	Register Description	R / W	Defaults
00	Power Status Register	R	
01	Mode power / charge status register	R	
04	OTG VBUS Status Register	R	
06-0B	Data buffer register 0-5	R / W	F0 / 0F / 00 / FF / 00/00
10	EXTEN & DC-DC2 Switch control register	R / W	X5H
12	DC-DC1 / LDO4 & LDO2 / 3 Switch control register	R / W	XFH
twenty three	DC-DC2 Voltage setting register	R / W	16H
25	DC-DC2 Voltage slope parameter setting register	R / W	00H

26	DC-DC1 Voltage setting register	R / W	68H
27	LDO4 Voltage setting register	R / W	48H
28	LDO2 / 3 Voltage setting register	R / W	CFH
30	VBUS-IPSOUT Path setting register	R / W	60H
31	V _{OFF} Shutdown voltage setting register	R / W	X3H
32	Off, battery detection, CHGLED Control register	R / W	46H
33	Charge control register 1	R / W	C8H
34	Charge control register 2	R / W	41H
36	PEK Parameter setting register	R / W	5DH
37	DCDC Converter operating frequency setting register	R / W	08H
38	Low battery charge warning setting register	R / W	A5H
39	Battery charging high temperature alarm setting register	R / W	1FH
3A	APS Low Level1 Setting register	R / W	68H
3B	APS Low Level2 Setting register	R / W	5FH
3C	Low battery discharge alarm setting register	R / W	FCH
3D	Battery discharge high temperature alarm setting register	R / W	16H
80	DCDC Operation mode setting register	R / W	E0H
82	ADC Enable setting register 1	R / W	83H
83	ADC Enable setting register 2	R / W	80H
84	ADC Sample rate, TS pin Control register	R / W	32H
8A	Timer control register	R / W	00H
8B	VBUS Monitoring setting register	R / W	00H
8F	Over-temperature shutdown control register	R / W	01H

The first 2 Group, interrupt control class

address	Register Description	R / W	Defaults
40	IRQ Enable Control Register 1	R / W	D8H
41	IRQ Enable Control Register 2	R / W	FFH
42	IRQ Enable Control Register 3	R / W	3BH
43	IRQ Enable Control Register 4	R / W	C1H
44	IRQ Status Register 1	R / W	00H
45	IRQ Status Register 2	R / W	00H
46	IRQ Status Register 3	R / W	00H
47	IRQ Status Register 4	R / W	00H

The first 3 group, ADC Data Class

address	Register Description	R / W
56	ACIN Voltage ADC High data 8 Place	R
57	ACIN Voltage ADC Low data 4 Place	R
58	ACIN Electric current ADC High data 8 Place	R

59	ACIN Electric current ADC Low data 4 Place	R
5A	VBUS Voltage ADC High data 8 Place	R
5B	VBUS Voltage ADC Low data 4 Place	R
5C	VBUS Electric current ADC High data 8 Place	R
5D	VBUS Electric current ADC Low data 4 Place	R
5E	AXP173 Internal temperature monitoring ADC High data 8 Place	R
5F	AXP173 Internal temperature monitoring ADC Low data 4 Place	R
62	TS Entry ADC High data 8 Bits, the default monitoring battery temperature	R
63	TS Entry ADC Low data 4 Bits, the default monitoring battery temperature	R
70	High instantaneous power battery 8 Place	R
71	Instantaneous power in the battery 8 Place	R
72	Low battery instantaneous power 8 Place	R
78	The battery voltage is high 8 Place	R
79	Low battery voltage 4 Place	R
7A	Battery charging current is high 8 Place	R
7B	Low battery charging current 5 Place	R
7C	Battery discharge current is high 8 Place	R
7D	Battery discharge current is low 5 Place	R
7E	APS High Voltage 8 Place	R
7F	APS Low voltage 4 Place	R

address	Register Description	R / W	Defaults
B0	Battery charging coulomb counter data register 3	R / W	00H
B1	Battery charging coulomb counter data register 2	R / W	00H
B2	Battery charging coulomb counter data register 1	R / W	00H
B3	Battery charging coulomb counter data register 0	R / W	00H
B4	Battery discharge coulomb counter data register 3	R / W	00H
B5	Battery discharge coulomb counter data register 2	R / W	00H
B6	Battery discharge coulomb counter data register 1	R / W	00H
B7	Battery discharge coulomb counter data register 0	R / W	00H
B8	Coulomb Counter Control Register	R / W	00H

REG 00H: Input power status

Bit	description	R / W
7	ACIN There is an indication 0: ACIN does not exist; 1: ACIN presence	R
6 Instruction	ACIN it's usable or not	R
5	VBUS There is an indication	R

	0: VBUS does not exist; 1: VBUS presence	
4 Instruction	VBUS it's usable or not	R
3 Instruction	VBUS Before using the access is greater than V _{HOLD}	R
2 Indicates	that the battery current direction 0: In the discharge cell; 1: The battery is charged	R
1 Instruction	ACIN with VBUS Whether the input PCB Shorted	R
0 Indicating	whether the source start ACIN or VBUS 0: Start source ACIN / VBUS ; 1: Non-source start ACIN / VBUS	R

REG 01H: power mode of operation and the state of charge indication

Bit	description	R / W
7 Instruction	AXP173 Whether over-temperature 0: Not too warm; 1: Overtemperature	R
6 Charging	indicator 0: No charging or charging has been completed; 1: Charging	R
5 Battery	status indication exists 0: No battery is connected to AXP173 ; 1: Connected to the battery AXP173	R
4 Retention		R
3 It indicates	whether the cell enters active mode 0: The battery does not enter an active mode; 1: Battery has entered the active mode	R
2 Indicating	whether the charging current is less than desired current 0: The actual charge current is equal to the desired current; 1: The actual charge current is less than desired current	R
1-0 Retention		R

REG 04H: USB OTG VBUS status indicator

Bit	description	R / W
7-3 Retention		
2 Instruction	VBUS is it effective, 1 Effective representation	R
1 Instruction	VBUS Session A / B is it effective, 1 Effective representation	R
0 Instruction	Session End status, 1 Effective representation	R

REG 06-0BH: data cache

NOTE: As long as an external power source, a battery power sources exist, the four bytes of data would have been stored, without influence of the switching machine. Defaults

F0 / 0F / 00 / FF / 00 / 00H

REG 10H: EXTEN & DC-DC2 output control

Defaults: XXH

Bit	description		R / W	Defaults
7-3	Reservations can not be changed			
2	EXTEN Switch control	0: shut down; 1: turn on	RW	X
1	Reservations can not be changed			
0	DC-DC2 Switch control	0: shut down; 1: turn on	RW	X

Note: X Custom represented by the circumstances, the following value X Part with this.

REG 12H: control the power supply output

Defaults: XXH

Bit	description		R / W	Defaults
7	Reservations can not be changed		RW	X
6	EXTEN Switch control	0: shut down; 1: turn on	RW	X
5	Reservations can not be changed		RW	X
4	DC-DC2 Switch control	0: shut down; 1: turn on	RW	X
3	LDO3 Switch control		RW	X
2	LDO2 Switch control		RW	X
1	LDO4 Switch control		RW	X
0	DC-DC1 Switch control		RW	X

Note: REG12Hbit6 / 4 Respectively REG10Hbit2 / 0 .

REG 23H: DC-DC2 output voltage setting

Defaults: 16H

Bit	description		R / W	Defaults
7-6	Retention			
5	DC-DC2 Setting the output voltage Bit5	0.7-2.275V , 25mV / step	RW	X
4	DC-DC2 Setting the output voltage Bit4		RW	X
3	DC-DC2 Setting the output voltage Bit3		RW	X
2	DC-DC2 Setting the output voltage Bit2		RW	X
1	DC-DC2 Setting the output voltage Bit1		RW	X
0	DC-DC2 Setting the output voltage Bit0		RW	X

REG 25H: DC-DC2 dynamic voltage scaling parameters

Defaults: 00H

Bit	description	R / W	Defaults
7-3	Retention		
2	DC-DC2 VRC Enable Control 0: turn on; 1: shut down	RW	0
1	Retention		
0	DC-DC2 VRC Voltage rising slope control 0: 25mV / 15.625us = 1.6mV / us 1: 25mV / 31.250us = 0.8mV / us	RW	0

REG 26H: DC-DC1 setting the output voltage

Defaults: 68H

Bit	description	R / W	Defaults
7	Retention		
6	DC-DC1 Setting the output voltage Bit6	RW	X
5	DC-DC1 Setting the output voltage Bit5		
4	DC-DC1 Setting the output voltage Bit4		
3	DC-DC1 Setting the output voltage Bit3		
2	DC-DC1 Setting the output voltage Bit2		
1	DC-DC1 Setting the output voltage Bit1		
0	DC-DC1 Setting the output voltage Bit0		

0.7-3.5V , 25mV / step

REG 27H: LDO4 setting the output voltage

Defaults: 48H

Bit	description	R / W	Defaults
7	Retention		
6	LDO4 Setting the output voltage Bit6	RW	X
5	LDO4 Setting the output voltage Bit5		
4	LDO4 Setting the output voltage Bit4		
3	LDO4 Setting the output voltage Bit3		
2	LDO4 Setting the output voltage Bit2		
1	LDO4 Setting the output voltage Bit1		
0	LDO4 Setting the output voltage Bit0		

0.7-3.5V , 25mV / step

REG 28H: LDO2 / 3 output voltage setting

Defaults: CFH

Bit	description		R / W Defaults	
7	LDO2 Setting the output voltage Bit3	1.8-3.3V , 100mV / step	RW	X
6	LDO2 Setting the output voltage Bit2		RW	X
5	LDO2 Setting the output voltage Bit1		RW	X
4	LDO2 Setting the output voltage Bit0		RW	X
3	LDO3 Setting the output voltage Bit3	1.8-3.3V , 100mV / step	RW	X
2	LDO3 Setting the output voltage Bit2		RW	X
1	LDO3 Setting the output voltage Bit1		RW	X
0	LDO3 Setting the output voltage Bit0		RW	X

REG 30H: VBUS-IPSOUT path management

Defaults: 60H

Bit	description		R / W Defaults	
7	VBUS Available VBUS-IPSOUT Channel selection control signal 0: by N_VBUSEN pin Decide whether to open this path 1: VBUS-IPSOUT Open access can be selected, regardless of N_VBUSEN status		RW	0
6	VBUS V _{HOLD} Pressure limiting control 0: Any pressure; 1: Pressure limiting		RW	1
5	V _{HOLD} Set up Bit 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	RW	1
4	V _{HOLD} Set up Bit 1		RW	0
3	V _{HOLD} Set up Bit 0		RW	0
2	Retention			
1	VBUS Limiting control enable signal 0: shut down; 1: turn on		RW	X
0	VBUS Limit control open time stream selection 0: 500mA ; 1: 100mA		RW	0

REG 31H: V_{OFF} Off voltage setting

Defaults: X3H

Bit	description		R / W Defaults	
7-4	Reservations can not be changed			
3	Sleep Mode PWRON Press wakeup enable settings:			

	0 : Short press to wake up close function 1 : Short press Open this wake-up function bit Automatic Clearing After writing 0 , So each into Sleep Former mode needs to write again 12		
	V _{OFF} Set up Bit2	000-2.6V ; 001-2.7V ; 010-2.8V ;	RW 0
1	V _{OFF} Set up Bit1	011-2.9V ; 100-3.0V ; 101-3.1V ;	RW 1
0	V _{OFF} Set up Bit0	110-3.2V ; 111-3.3V	RW 1

REG 32H: set off, and the battery detection control pin CHGLED

Defaults: 46H

Bit	description	R / W	Defaults
7	Shutdown Control This bit 1 Closes AXP173 Output	RW	0
6	Battery monitoring Set bit: 0: shut down; 1: turn on	RW	1
5-4	CHGLED Pin feature set 00: High resistance 01: 25% 1Hz flicker 10: 25% 4Hz flicker 11: Output low	RW	00
3	CHGLED Pin control settings 0: Controlled by the charging function 1: From the register REG 32HBit [5: 4] control	RW	0
2-0	Retention		

REG 33H: charging control 1

Defaults: C8H

Bit	description	R / W	Defaults
7	Charging enable control bit 0: shut down, 1: turn on	RW	1
6: 5	Charging the target voltage setting 00: 4.1V ; 01: 4.15V ; 10: 4.2V ; 11: 4.36V	RW	10
4	Charging end current setting 0: The charging current is less than 10% When the end of charging set value 1: The charging current is less than 15% When the end of charging set value	RW	0
3-0	Charging current setting 0000: 100mA ; 0001: 190mA ; 0010: 280mA ; 0011: 360mA ; 0100: 450mA ; 0101: 550mA ; 0110: 630mA ; 0111: 700mA ; 1000: 780mA ; 1001: 880mA ; 1010: 960mA ; 1011: 1000mA ; 1100: 1080mA ; 1101: 1160mA ; 1110: 1240mA ; 1111: 1320mA	RW	1000

REG 34H: charging control 2

Defaults: 41H

Bit	description	R / W	Defaults
7 Precharge timeout setting Bit1	00: 30 min ; 01: 40min ; 10: 50min ; 11: 60min.	RW	0
6 Precharge timeout setting Bit0		RW	1
5-2 Retention			
1 Timeout setting the constant current mode Bit1	00: 7Hours ; 01: 8Hours ; 10: 9Hours ; 11: 10Hours.	RW	0
0 Timeout setting the constant current mode Bit0		RW	1

REG 36H: PEK Key parameters

Defaults: 5DH

Bit	description	R / W	Defaults
7 Boot time settings Bit1	00: 128mS ; 01: 512mS ; 10: 1S ; 11: 2S.	RW	0
6 Boot time settings Bit0		RW	1
5 Long time setting key Bit1	00: 1S ; 01: 1.5S ; 10: 2S ; 11: 2.5S.	RW	0
4 Long time setting key Bit0		RW	1
3 Automatic shutdown function is set longer than the time duration shutdown button 0: shut down; 1: turn on		RW	1
2 After power-up complete PWROK Signal Delay 0: 32mS ; 1: 64mS		RW	1
1 Long set off Bit1	00: 4S ; 01: 6S ; 10: 8S ; 11: 10S.	RW	0
0 Long set off Bit0		RW	1

REG 37H: DC-DC operating frequency is provided

Defaults: 08H

Bit	description	R / W	Defaults
7-4	Retention		
3 DC-DC Switching frequency setting Bit 3	Each level change 5% ,Defaults 1.5MHz	RW	1
2 DC-DC Switching frequency setting Bit 2		RW	0
1 DC-DC Switching frequency setting Bit 1		RW	0
0 DC-DC Switching frequency setting Bit 0		RW	0

REG 38H: $V_{LTF\text{-}charge}$ Low battery charge threshold setting

Defaults: A5H

Bit	description		R / W	Defaults
7-0	When charging the battery low threshold setting, M	$M * 10H$, when $M = A5H$ When the corresponding 2.112V ; Voltage may correspond to 0V ~ 3.264V	RW	A5H

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

REG 39H: $V_{HTF\text{-}charge}$ Charging the battery temperature threshold setting

Defaults: 1FH

Bit	description		R / W	Defaults
7-0	When charging the battery temperature threshold setting, N	$N * 10H$, when $N = 1FH$, correspond 0.397V ; Voltage may correspond to 0V ~ 3.264V	RW	1FH

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

REG 3AH: APS low level 1

Defaults: 68H

Bit	description		R / W	Defaults
7-0	APS Low-level settings 1		RW	68H

REG 3BH: APS low level 2

Defaults: 5FH

Bit	description		R / W	Defaults
7-0	APS Low-level settings 2		RW	5FH

REG3AH , REG3BH corresponding APS Voltage is set to the following relationship (assumed that the register value n):

$$V_{warning} = 2.8672 + 1.4mV * n * 4$$

REG 3CH: $V_{LTF\text{-}discharge}$ Battery discharge cold threshold setting

Defaults: FCH

Bit	description		R / W	Defaults
7-0	When the discharge of the battery low threshold setting, M	$M * 10H$, when $M = FCH$ When the corresponding 3.226V ; Voltage may correspond to 0V ~ 3.264V	RW	FCH

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

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

Defaults: 16H

Bit	description		R / W	Defaults
7-0	When the discharge of the battery temperature threshold setting, N	N * 10H , when N = 16H ,correspond 0.282V ; Voltage may correspond to 0V ~ 3.264V	RW	16H

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

REG 80H: DC-DC mode selection

Defaults: E0H

Bit	description		R / W	Defaults
7-4 Retention				
3	DC-DC1 Operating mode control	0: PFM / PWM Automatically switch	RW	0
2	DC-DC2 Operating mode control	1: fixed PWM	RW	0
1-0 Retention				

REG 82H: ADC Enable 1

Defaults: 83H

Bit	description		R / W	Defaults
7	battery voltage ADC Enable	0: shut down, 1: turn on	RW	1
6	Battery current ADC Enable		RW	0
5	ACIN Voltage ADC Enable		RW	0
4	ACIN Electric current ADC Enable		RW	0
3	VBUS Voltage ADC Enable		RW	0
2	VBUS Electric current ADC Enable		RW	0
1	APS Voltage ADC Enable		RW	1
0	TS Pin ADC Enable function		RW	1

REG 83H: ADC Enable 2

Defaults: 80H

Bit	description		R / W	Defaults
7	AXP173 Internal temperature monitoring ADC Enable 0: shut down, 1: turn on		RW	1
6-0 Retention				

REG 84H: ADC setting the sample rate, TS pin control

Defaults: 32H

Bit	description		R / W	Defaults
7	ADC Setting the sample rate Bit 1	25 × 2 _n Sampling rates were 25 , 50 , 100 , 200Hz	RW	0
6	ADC Setting the sample rate Bit 0		RW	0
5-4	Output current setting pin: 00: 20uA ; 01: 40uA ; 10: 60uA ; 11: 80uA		RW	11
3	Retention			
2	TS Pin function selection 0: Battery temperature monitoring function, 1: External independent ADC Input path		RW	0
1-0	TS Current output pin disposed	00: shut down	RW	1
		01: Output current charging 10: ADC Input samples, can power 11: Has been opened	RW	0

REG 8AH: Timer control

Defaults: 00H

Bit	description		R / W	Defaults
7	Timer expires.		RW	0
	write 1 Clear this state			
6-0	Set the timer time in minutes		RW	0000000
	Write all 0 This timer is turned off			

REG 8BH: VBUS pin function control monitoring SRP

Defaults: 00H

Bit	description		R / W	Defaults
7-6	Retention			
5-4	The effective voltage setting 00: 4.0V ; 01: 4.15V ; 10: 4.45V ; 11: 4.55V		RW	00
3	VBUS Valid Detection feature set: 0: shut down, 1: turn on		RW	0
2	VBUS Session Detection feature set: 0: shut down, 1: turn on		RW	0
1	Discharge VBUS Discharge function provided 0: shut down VBUS A discharging resistor; 1: use VBUS A discharging resistor		RW	0
0	Charge VBUS Charging function provided 0: disconnect VBUS A charging resistor; 1: use VBUS A charging resistor VBUS Charging		RW	0

REG 8FH: over-temperature shutdown feature set

Defaults: 01H

Bit	description	R / W	Defaults
7-3 Retention		RW	0
2	AXP173 Internal over-temperature shutdown feature set 0: Do not shut down; 1: Shutdown	RW	0
1-0 Retention			

REG 40H: IRQ Enable 1

Defaults: D8H

Bit	description	R / W	Defaults
7	ACIN Overvoltage IRQ Enable	RW	1
6	ACIN Access IRQ Enable	RW	1
5	ACIN Out of IRQ Enable	RW	0
4	VBUS Overvoltage IRQ Enable	RW	1
3	VBUS Access IRQ Enable	RW	1
2	VBUS Out of IRQ Enable	RW	0
1	VBUS But less than the available V _{HOLD} IRQ Enable	RW	0
0	Retention	RW	0

REG 41H: IRQ Enable 2

Defaults: FFH

Bit	description	R / W	Defaults
7	Battery access IRQ Enable	RW	1
6	Battery removal IRQ Enable	RW	1
5	Battery mode is activated IRQ Enable	RW	1
4	Exit Battery mode activated IRQ Enable	RW	1
3	Charging IRQ Enable	RW	1
2	finished charging IRQ Enable	RW	1
1	Battery over-temperature IRQ Enable	RW	1
0	Battery low temperatures IRQ Enable	RW	1

REG 42H: IRQ enable 3

Defaults: 3BH

Bit	description	R / W	Defaults
7	AXP173 Internal over-temperature IRQ Enable	RW	0
6	The charging current is less than a set current IRQ Enable	RW	0
5	DC-DC1 Output voltage is less than the set value IRQ Enable	RW	1
4	DC-DC2 Output voltage is less than the set value IRQ Enable	RW	1
3	LDO4 Output voltage is less than the set value IRQ Enable	RW	1
2	Retention	RW	0
1	Short keys IRQ Enable	RW	1
0	Long Key IRQ Enable	RW	1

REG 43H: IRQ enable 4

Defaults: C1H

Bit	description	R / W	Defaults
7-6	Retention	RW	1
5	VBUS effective IRQ Enable	RW	0
4	VBUS invalid IRQ Enable	RW	0
3	VBUS Session A / B IRQ Enable	RW	0
2	VBUS Session End IRQ Enable	RW	0
1	Retention	RW	1
0	APS Low pressure IRQ Enable	RW	1

REG 4AH: IRQ enable 5

Defaults: 00H

Bit	description	R / W	Defaults
7	Timer expires IRQ Enable	RW	0
6-0	Reservations can not be changed	RW	0

REG 44H: IRQ status 1

Defaults: 00H

Bit	description	R / W	Defaults
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7	ACIN Overvoltage IRQ status	RW	0
6	ACIN Access IRQ status	RW	0
5	ACIN Out of IRQ status	RW	0
4	VBUS Overvoltage IRQ status	RW	0
3	VBUS Access IRQ status	RW	0
2	VBUS Out of IRQ status	RW	0
1	VBUS But less than the available V _{HOLD} IRQ status	RW	0
0	Retention	RW	0

REG 45H: IRQ state 2

Defaults: 00H

Bit	description	R / W	Defaults
7	Battery access IRQ status	RW	0
6	Battery removal IRQ status	RW	0
5	Battery mode is activated IRQ status	RW	0
4	Exit Battery mode activated IRQ status	RW	0
3	Charging IRQ status	RW	0
2	finished charging IRQ status	RW	0
1	Battery over-temperature IRQ status	RW	0
0	Battery low temperatures IRQ status	RW	0

REG 46H: IRQ status 3

Defaults: 00H

Bit	description	R / W	Defaults
7	AXP173 Internal over-temperature IRQ status	RW	0
6	The charging current is less than a set current IRQ status	RW	0
5	DC-DC1 Output voltage is less than the set value IRQ status	RW	0
4	DC-DC2 Output voltage is less than the set value IRQ status	RW	0
3	LDO4 Output voltage is less than the set value IRQ status	RW	0
2	Retention	RW	0
1	Short keys IRQ status	RW	0
0	Long Key IRQ status	RW	0

Note: All IRQ Write the corresponding status register bit 1 Clears the corresponding status.

REG 47H: IRQ status 4

Defaults: 00H

Bit	description	R / W	Defaults
7-6	Retention	RW	0
5	VBUS effective IRQ status	RW	0
4	VBUS invalid IRQ status	RW	0
3	VBUS Session A / B IRQ status	RW	0
2	VBUS Session End IRQ status	RW	0
1	Retention	RW	0
0	APS Low pressure IRQ status, APS Voltage is lower than Warning Level2 After the set, more than Warning Level1 After clearing 0	RW	0

REG 4DH: IRQ status 5

Defaults: 00H

Bit	description	R / W	Defaults
7	Timer expires IRQ status	RW	0
6-0	Reservations can not be changed	RW	0

Note: All IRQ Write the corresponding status register bit 1 Clears the corresponding status.

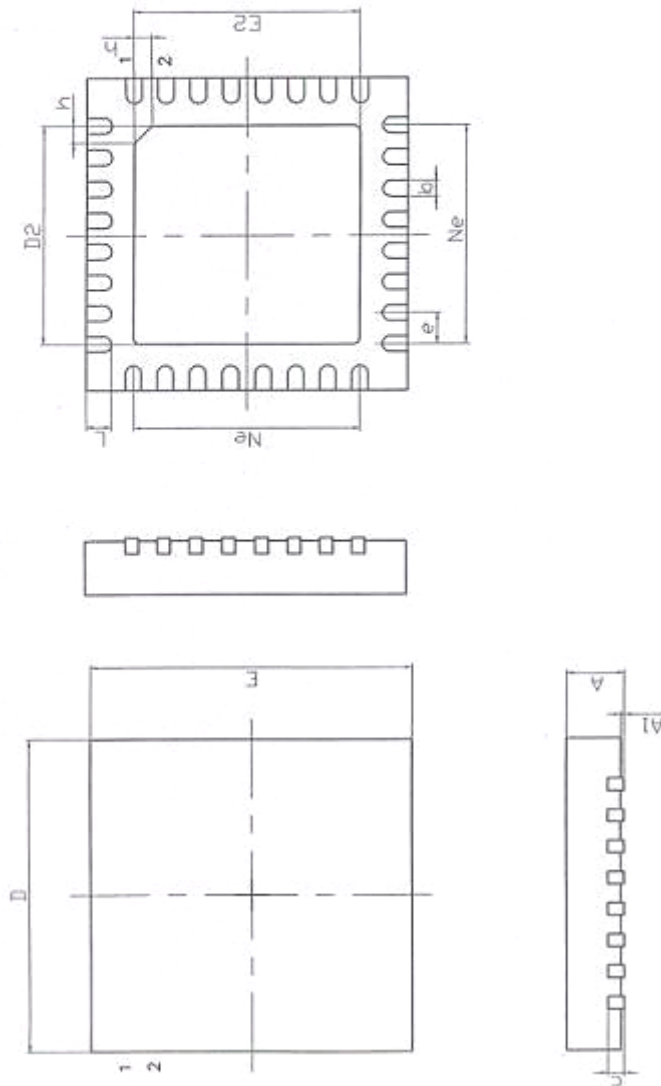
REG B8H: Coulomb gauge control

Defaults: 00H

Bit	description	R / W	Defaults
7	Switching control coulometer	RW	0
6	Coulometer pause control, this bit 1 Coulomb counting will be suspended while this bit is self-clearing	RW	0
5	Clear Coulomb meter control, this bit 1 It will coulometer cleared and this bit is self-clearing	RW	0
4-0	Retention	RW	0

10. The package (Package)

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	—	0.01	0.05
b	0.18	0.25	0.30
c	0.18	0.20	0.25
D	4.90	5.00	5.10
D1	3.50REF		
e	0.50BSC		
Ne	3.50BSC		
E	4.90	5.00	5.10
E1	3.50REF		
L	0.35	0.40	0.45
h	0.30	0.35	0.40
L ₁ 载体尺寸	150x150		



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