

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 satisfies currently increasingly complex applications processor system to the relatively complex and precise power control requirements.

Internal AXP173 incorporates an adaptive USB-Compatible charger 2 down converters (Buck DC-DC converter), 4 linear regulators (the LDO), the voltage / current / temperature surveillance multiplexer 12-Bit ADC. To ensure security and stability of the power system, AXP173 also integrated over / under voltage (OVP / UVP), over temperature (OTP), the overcurrent (OCP) protection circuit.

AXP173 having external USB adapter and the like, and a three-input battery capacity, their intellectual energy balance (Intelligent Power Select, IPS™) circuit can be safely transparent distribution of power between the USB and the external AC adapter, lithium batteries, and a load application system, and only in the case without external power source for a battery (or a battery discharge / damage) may also be applied to make the system work properly.

AXP173 provides a two-wire serial communication with the host communication interface: Two Wire Serial Interface (TWSI), the processor may apply to open or close certain power output, voltage thereof is provided by this interface, access to internal registers and various measurement data (including Fuel Gauge). High accuracy (0.5%) of the 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 of the default output AXP173, it can also work independently of the application without the intervention of the processor.

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 television broadcast receivers
- Mobile Internet Devices MID
- Digital photo frames, portable DVD players, ultra mobile PCs UMPC and UMPC-like, learning machine
- The application processor circuitry
Application Processor systems
- Other battery systems and

multiple supply applications

V_Q Q_W W_P P_I Q_P W_E C_C

SDA 2
SCK 2
PWROK 4
N_VBUSEN 4

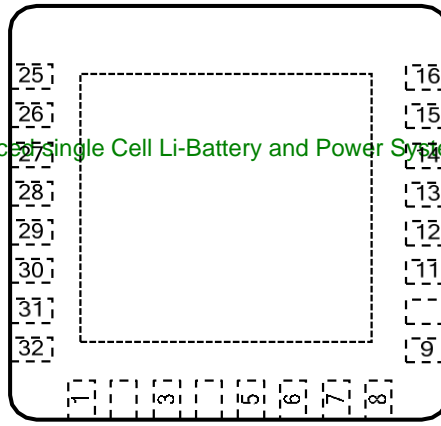
Pin definitions

IPSOUT
IPSOUT
EXTEN
VIN1
LX1
PGND1
DCDC1
IRQ

[24] CHGLED
[23]

22	BAT
21	BAT
20	ACIN
19	
18	LDO
17	VINT

Enhanced Single Cell Li-Battery and Power System Management IC AXP173



VIN2	VREF
LX2	BIAS
PGND2	PWRON
DCDC2	APS
	LDO4
	LDOIN
	10 LDO2
	LDO3

2. Characteristics (Feature)

- **Power Management (IPS)**

- Wide input voltage range:
2.9V ~ 6.3V (AMR: -0.3V ~ 11V)
- Wisdom efficient configurable power balance "IPS™" system
- Adaptive USB or AC adapter current limiting pressure limiting
(4.4V / 500mA / 100mA)
- Equivalent internal resistance is less than ideal diode 100mΩ

Note: VRC, Voltage Ramp Control, voltage slope control.

- **Fully integrated charger (Charger)**

- The maximum charging current of up to 1.4A
- Support battery temperature monitoring
- Full support USB charging, in line with regulatory requirements
- High charging accuracy error is less than 0.5%
- Support 4.1V / 4.15V / 4.2V / 4.36V and other battery
- Automatically controlled charging process
- Direct drive LED indicates the state of charge
- The system automatically adjusts the charging current load

- **2 Road synchronous buck converter (DC-DC)**

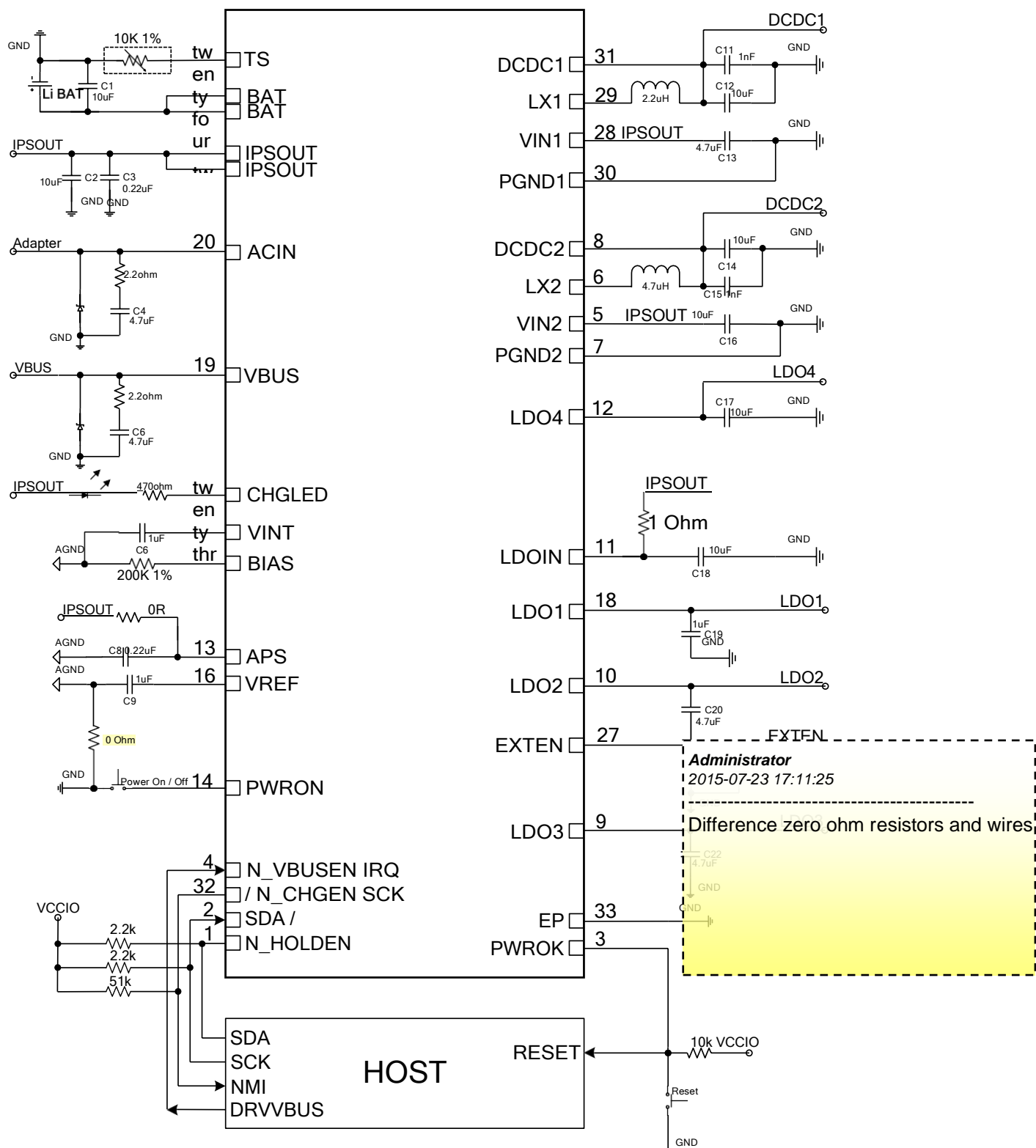
- DC-DC1: can be adjusted between 0.7V ~ 3.5V, 25mV / step, drive capability 1.2A
- DC-DC2: can be adjusted between 0.7-2.275V, 25mV / step, drive capability 1.6A, support VRC

- **4 Linear regulators (LDO)**

- LDO1: 30mA, always effective
- LDO2: Low Noise LDO, 1.8V ~ 3.3V adjustable, 100mV / step, 200mA drive capability
- LDO3: Low Noise LDO, 1.8-3.3V adjustable, 100mV / step, 200mA drive capability
- LDO4: between 0.7-3.5V can be adjusted, 25mV / step, drive capability 0.5A

- **The signal acquisition system (Signal Capture)**
 - Built-in multi-channel 12 Bit ADC
 - Providing a current battery voltage and the number of the external power source according to
 - Built Precision Coulomb Counter and Fuelgauge system
 - Provide a wealth of power management information, such as the instantaneous consumption (mA or mW), the remaining battery charge (% or mAh), the state of charge (%) and the remaining battery time or charging time
 - Low battery warning and protection
 - Provide chip temperature information
- **Application processor interface (Host Interface)**
 - Host data may be exchanged via the interface TWSI
 - Interrupt management can be flexibly configured
 - Built-in timer
 - Provides four registers can be used to shut down the systemData retention
 - Support standalone mode without having to interface control
- **System Management (System Management)**
 - Soft Reset Hard Reset or may
 - Support soft shutdown or a hard shutdown, support external wake openmachine
 - Supports output voltage monitoring, self-diagnosis function
 - A system reset PWROK
 - Detecting an external power source (insertion / removal / insufficient driving capability)
 - All output voltages are supported by soft start
 - Over / under voltage protection (OVP / UVP)
 - Overcurrent protection (OCP)
 - Over-temperature protection (OTP)
 - stand by OTG VBUS power state setting and monitoring
- **High integration (Fully Integration)**
 - Generating an internal precision voltage reference (0.5%)
 - Internal MOSFET
 - 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
TJ	Operating Temperature Range Operating Temperature	-40 to 130	°C
Ts	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
PD	Internal Power Dissipation Internal power consumption tolerance	2100	mW

5. Electrical characteristics (Electrical Characteristics)

VIN = 5V, BAT = 3.8V, TA = 25 °C

SYMBOL	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNITS
ACIN						
V _{IN}	ACIN Input Voltage		3.8		6.3	V
I _{OUT}	VOUT 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}	InternalIdealDiodeOn Resistance	PIN to PIN, ACIN to IPSOUT			200	mΩ
VBUS						
V _{IN}	VBUS Input Voltage		3.8		6.3	V
I _{OUT}	VOUT 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}	InternalIdealDiodeOn 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 _{CHRG}	Charge Current	Internal		780	1320	mA
I _{TRKL}	Trickle Charge Current			10%		I _{CHRG}

						mA
V_{TRKL}	TrickleChargeThreshold Voltage			3.0		V
ΔV_{RECHG}	RechargeBatteryThreshold Voltage	Threshold Voltage Relative to VTARGET		-100		mV
T_{TIMER1}	ChargerSafetyTimer Termination Time	Trickle Mode		40		Min
T_{TIMER2}	ChargerSafetyTimer Termination Time	CC Mode		480		Min
I_{END}	EndofChargeIndication Current Ratio	CV Mode		10%	15%	I_{CHRG} mA
NTC						
V_{TL}	ColdTemperatureFault 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						
$R_{ds(on)}$	InternalIdealDiodeOn Resistance (BAT to IPSOUT)				100	mΩ

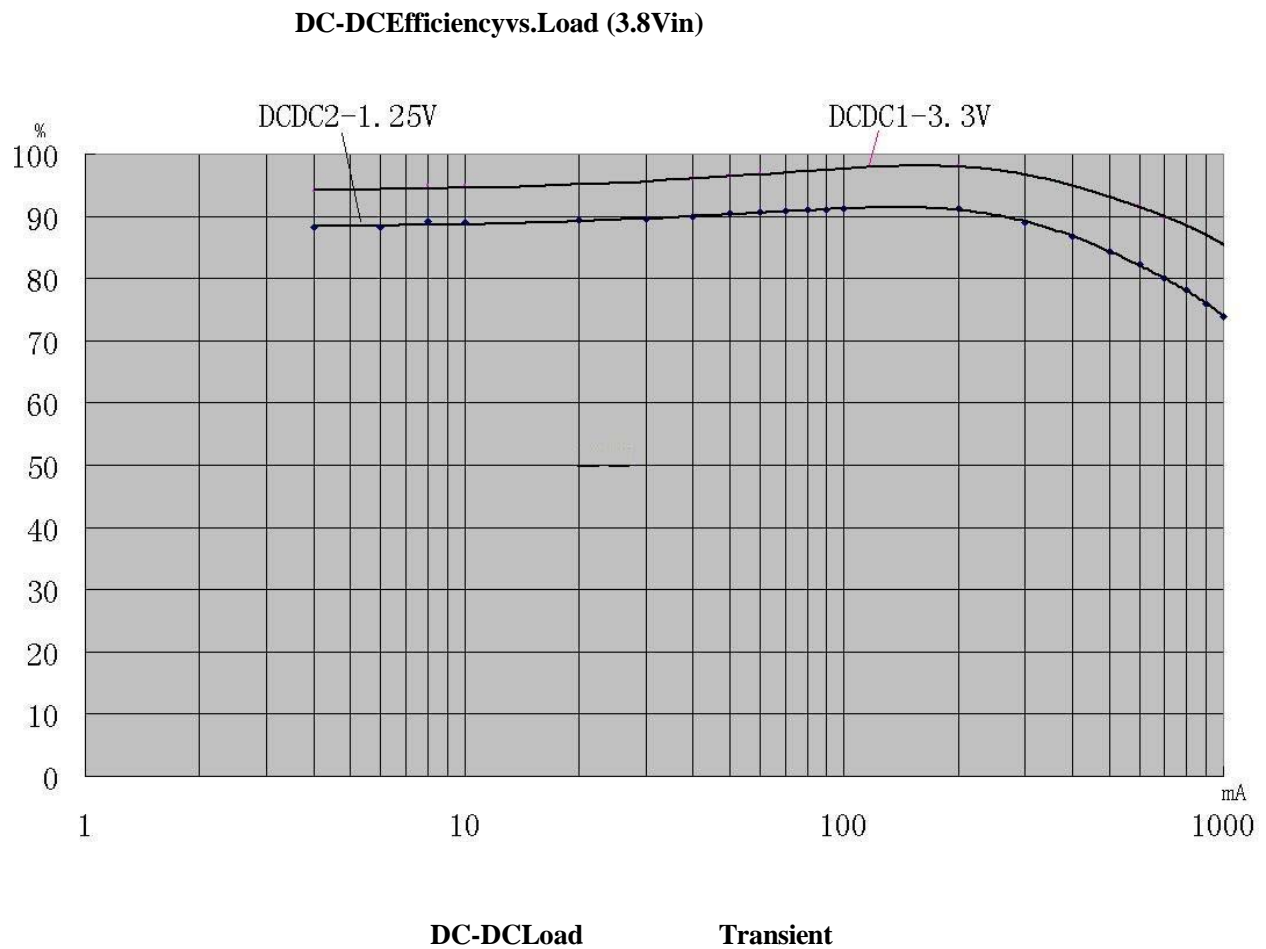
SYMBOL	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNITS
Off Mode Current						
I_{BATOFF}	OFF Mode Current	BAT = 3.8V		27		μA
$I_{SUSPEND}$	USB VBUS suspend Mode current	BAT = 3.8V, VBUS = 5V, N_VBUSEN = 1		86		μA
Logic						
V_{IL}	Logic Low Input Voltage			0.3		V
V_{IH}	Logic High Input Voltage			2		V
TWSI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

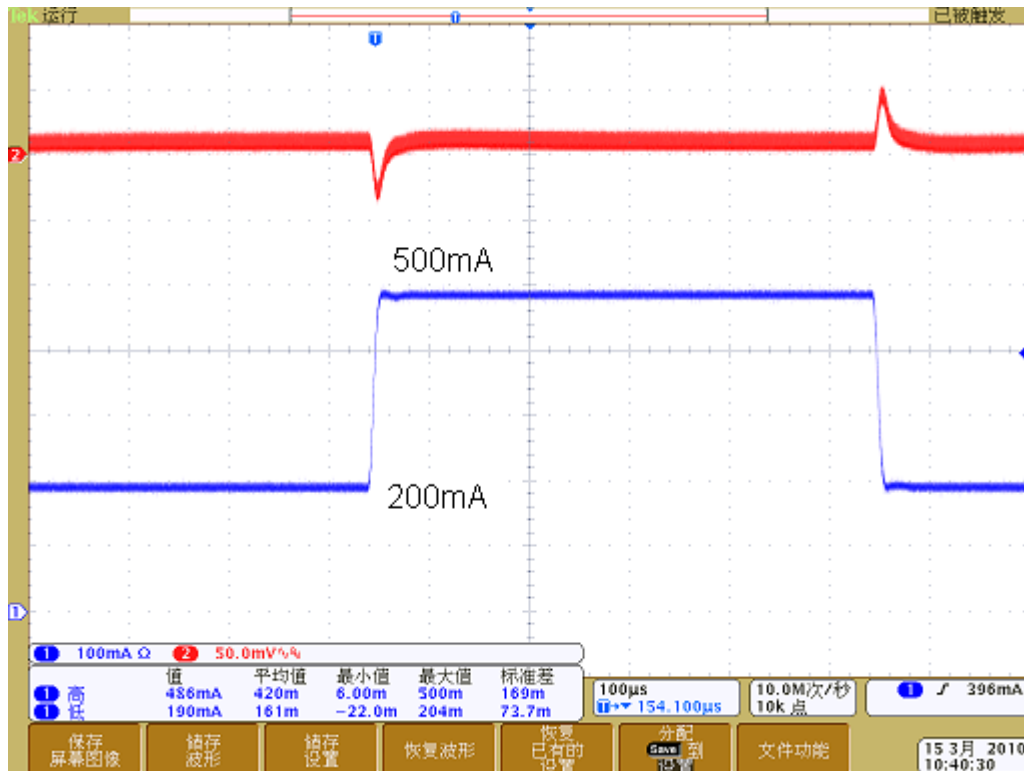
I _{VIN1}	Input Current	PFM Mode		26		μA
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		$I_{DC1OUT} = 0$				
I_{LIM1}	PMOS Switch Current Limit	PWM Mode		1600		mA
I_{DC1OUT}	Available Output Current	PWM Mode		1200		mA
V_{DC1OUT}	Output Voltage	Default	0.7	3.3	3.5	V
DCDC2						
I_{VIN2}	Input 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

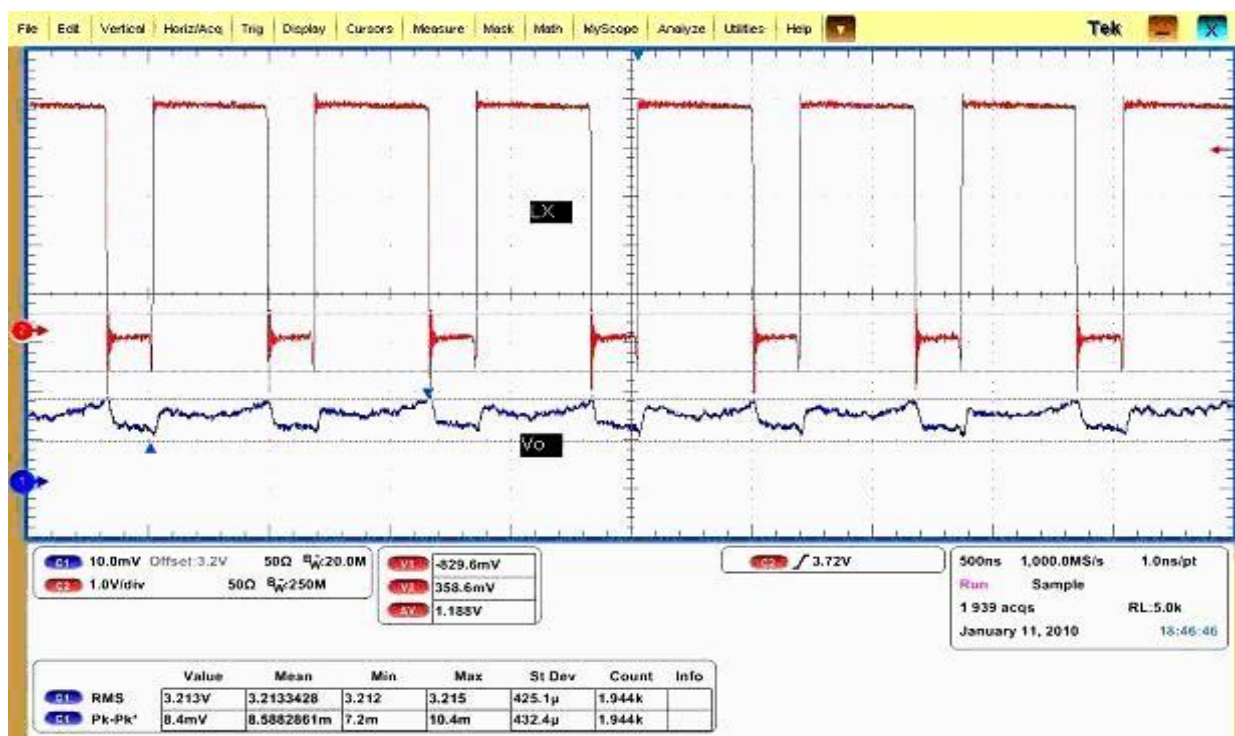
SYMBOL	DESCRIPTION	CONDITIONS	MIN	TYP	MAX	UNITS
LDO1						
V_{LDO1}	Output Voltage	$ILDO1 = 1mA$	-1%	1.25 1.8 2.5 3.3	1%	V
I_{LDO1}	Output Current			30		mA
LDO2						
V_{LDO2}	Output Voltage	$ILDO2 = 1mA$	-1%	3	1%	V
I_{LDO2}	Output Current			200		mA
I_Q	Quiescent Current			100		μA
PSRR	Power Supply Rejection Ratio	$ILDO2 = 60mA, 1KHz$				dB
eN	Output Noise, 20-80KHz	$V_o = 3V, I_o = 150mA$		28		μV_{RMS}
LDO3						
V_{LDO3}	Output Voltage	$ILDO3 = 1mA$	-1%	3.3	1%	V
I_{LDO3}	Output Current			200		mA
I_Q	Quiescent Current			100		μA
PSRR	Power Supply Rejection Ratio	$ILDO3 = 10mA, 1KHz$		TBD		dB
eN	Output Noise, 20-80KHz	$V_o = 1.8V, I_o = 150mA$		18		μV_{RMS}
LDO4						
V_{LDO4}	Output Voltage	$ILDO4 = 1mA$	-1%	2.5	1%	V
I_{LDO4}	Output Current			500		mA
I_Q	Quiescent Current			20		μA
PSRR	Power Supply Rejection Ratio	$ILDO4 = 10mA, 1KHz$		TBD		dB

6. Typical characteristics (Typical Characteristics)

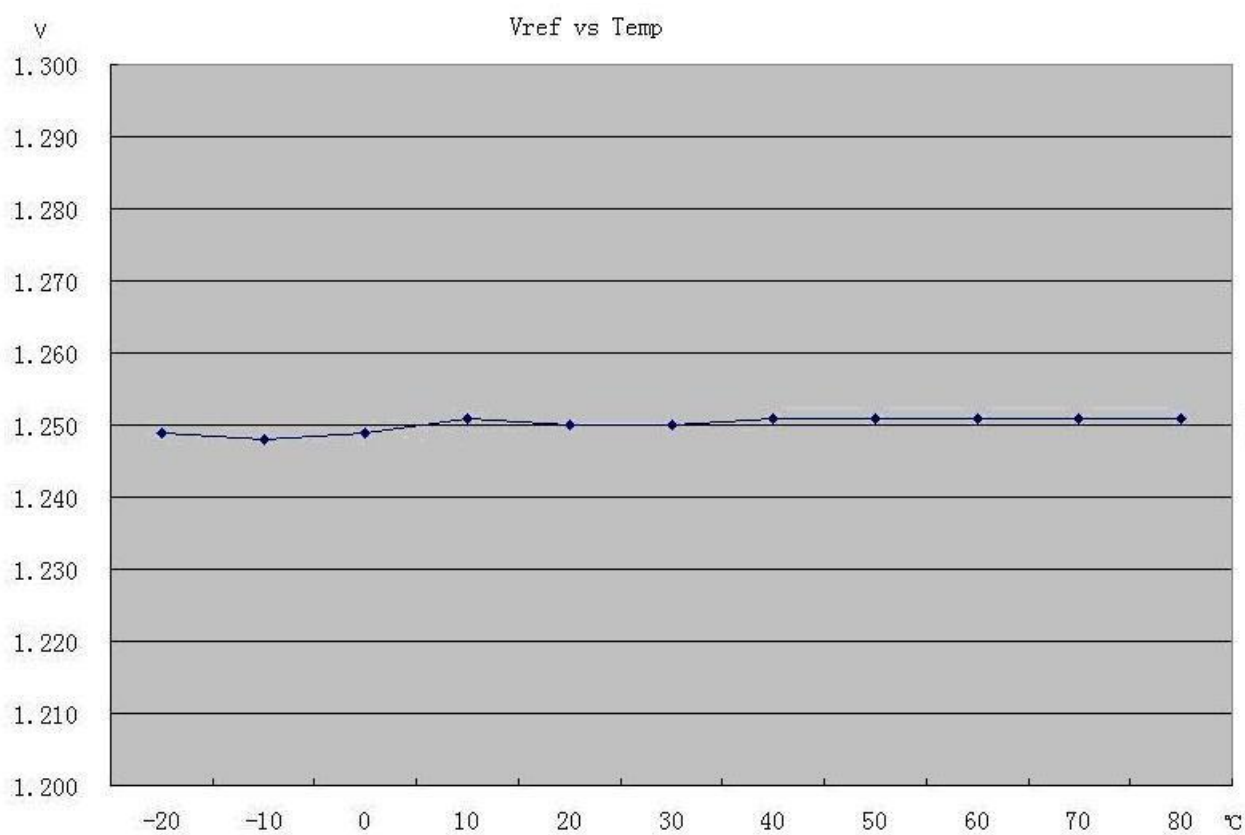




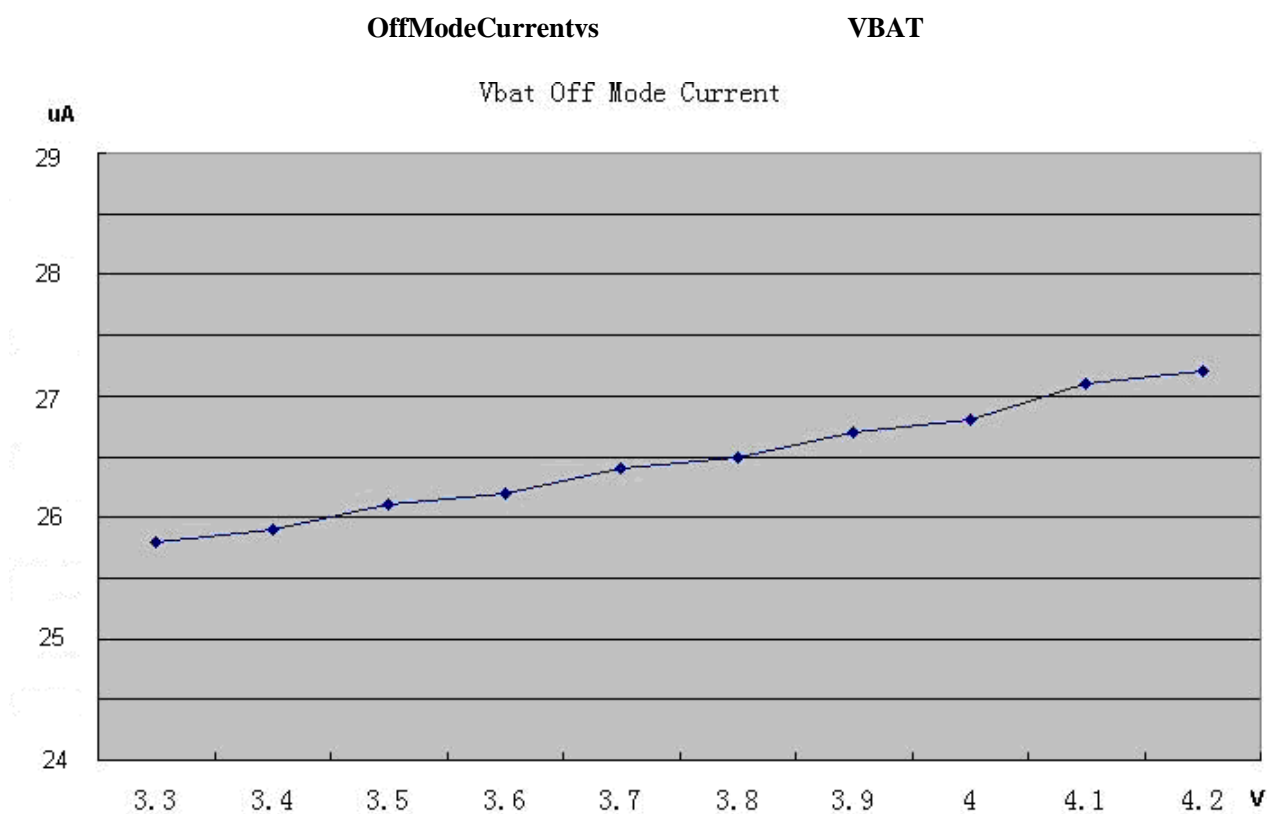
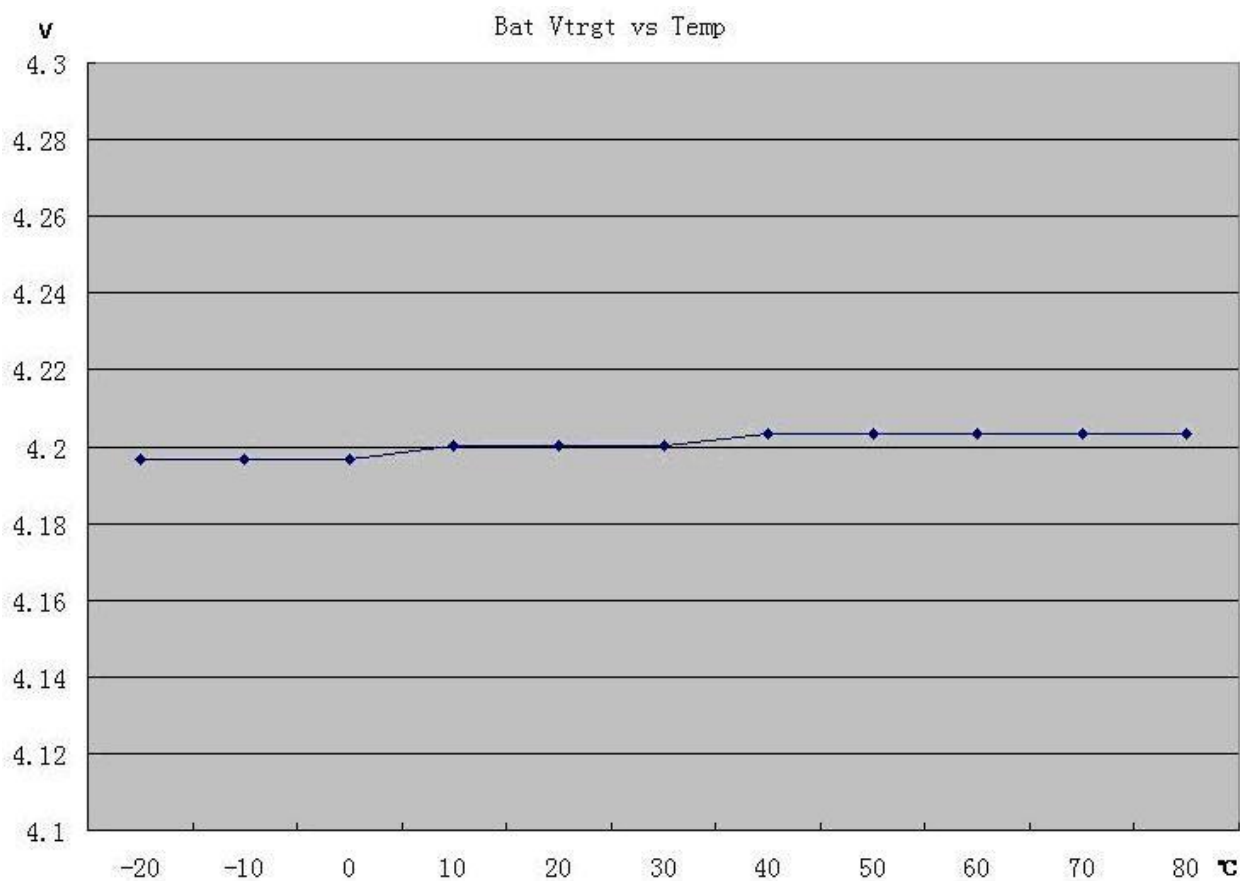
DC-DC Ripple



VREF vs Temperature



VTRGT vs Temperature

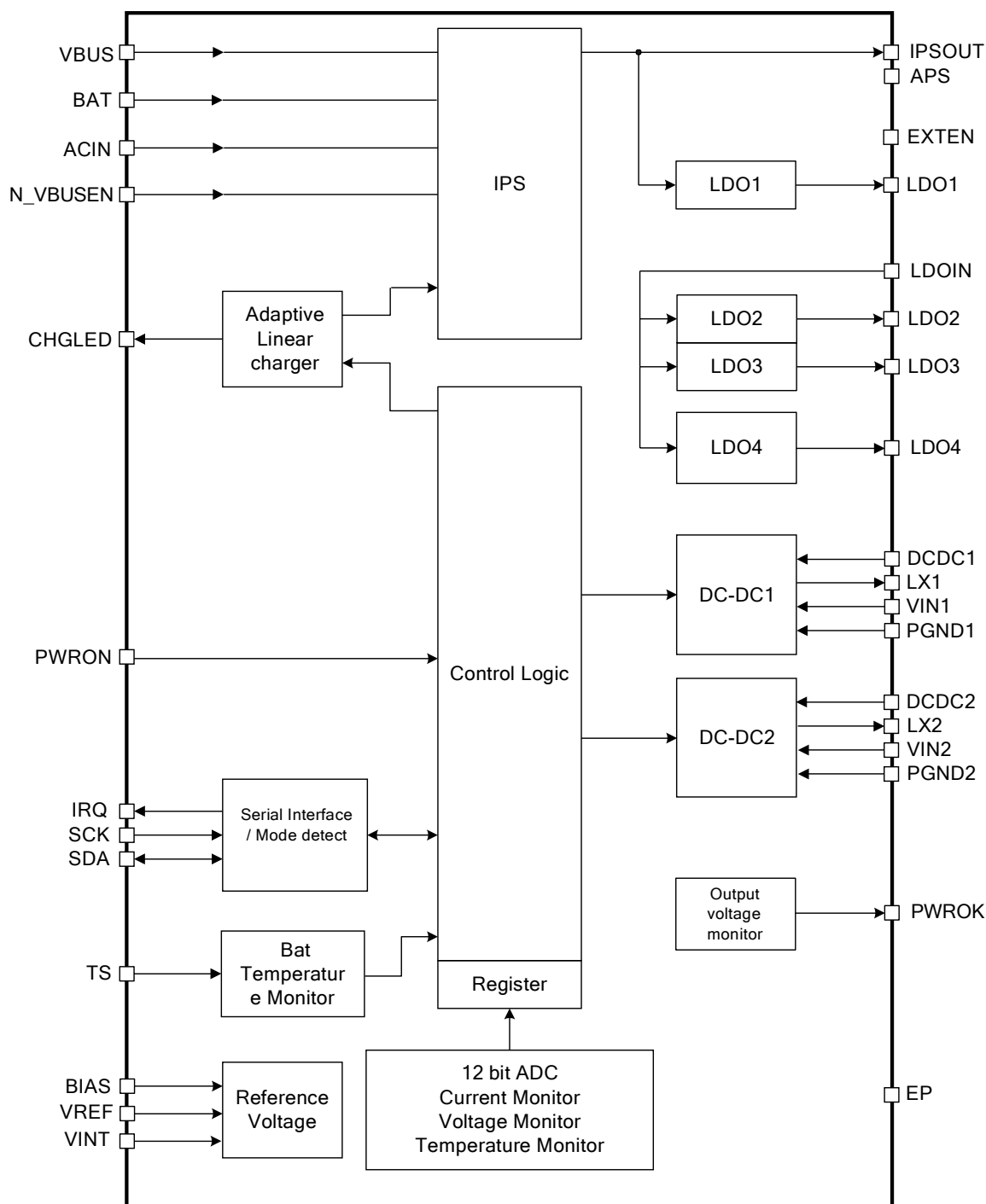


7. Pin definitions (Pin Description)

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 IPSOUT select VBUS High: IPSOUT do not select
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
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
19	VBUS	PI		USB VBUS input
20	ACIN	PI		Adapter input
21,22	BAT	IO		Main Battery
twenty three	CHGLED	O		charger status indication
twenty four	TS	I		Battery Temperature sensor input or an external ADC input
25,26	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 has two operating modes, Host Control mode and a Stand Alone mode, the SCK IPSOUT whether connection setting. When connected to the SCK IPSOUT, working in Stand Alone mode; AXP173 SCK if the pull 3.3V IO power system, the Host Control mode it work. Under Host Control mode, through access to internal registers, Host can be flexible to adjust and monitor the working status AXP173, and to obtain a wealth of information. In Stand Alone mode, AXP173 automatic power path management, charging management, power management of all tasks, without intervention of the Host, all adjustable parameters such as output voltage, charging current, etc., are set to default values.

NOTE: "Host" refers to a host processor application system.

Note: the following referred to "external power supply" comprising an input ACIN and VBUS.

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

Switch button (PEK)

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

Several Power Source (Power on Source)

- 1, ACIN, VBUS and access the battery.
- 2, PEK.

Power (Power On)

AXP173 can boot from the PEK (key longer than "ONLEVEL"). Press equivalent PEK, power may be also AXP173 In practical applications, Host timing (the Alarm) may be connected to the output signal of the PEK PWRON- parallel, the Alarm signal is active (low).

Boot, DC-DC and LDO will follow the chronological order of setting the soft-start, after completion of starting by Host opening / closing the respective power supply.

Shutdown (Power Off)

PEK "long press" time is longer than IRQLEVEL, the interrupt service routine PEK, Host may "register REG32H [7]" write "1" to notify AXP173 into a shutdown state. AXP173 output will turn off all power except when LDO1 into a shutdown state.

In the following cases, AXP173 will automatically shut down:

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AXP173 boot source

- 1.ACIN, VBUS, the battery insertion
- 2.PEK

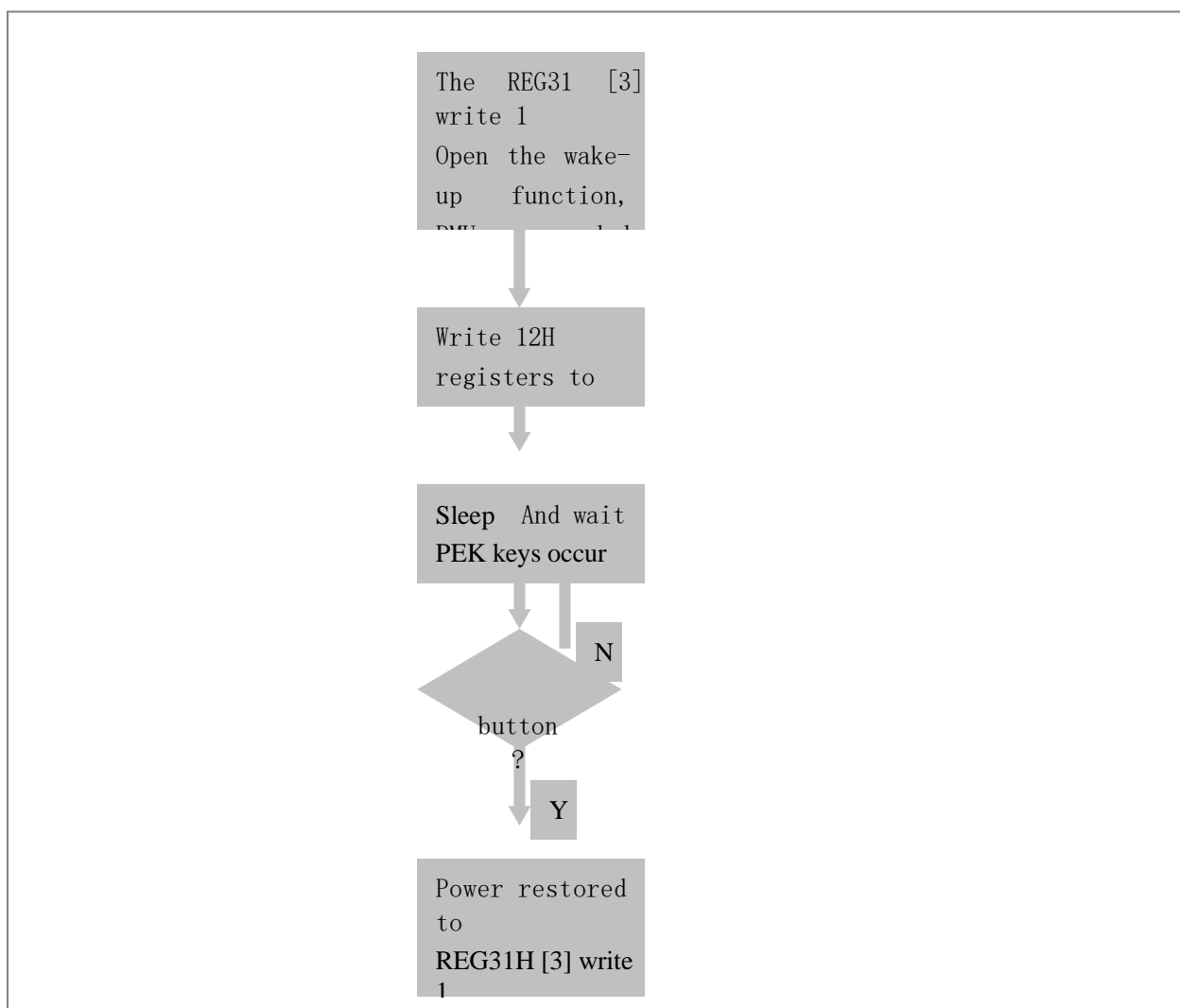
- 1, the input voltage is too low, the low voltage protection;
- 2, the load caused by excessive power supply output voltage is too low, overload protection;
- 3, the input voltage is too high, the overvoltage protection (details see "Power Management passage" section);
- 4, when the PEK greater than offlevel (default 6S) automatically turn off the system except for the other output of LDO1;

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 And boot MannerA case, if the system needs to enter Sleep mode, and wherein one or several passage way power off, can be made REG31 [3] controls to determine whether a signal is triggered by short Wakeup PEK, each output power to the PMU REG31 restored to the state [3] is set to 1, and the brightest the power is turned off sequentially according to a predetermined power-on sequence.

Following which control flow of Sleep and wakeup mode.



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

AXP173 as a reset signal can PWROK application system. In the boot process AXP173, PWROK output low, when the output voltage of each power supply reaches a preset value is stable, achieving the application system reset.

In the application of the system during normal operation, AXP173 PWROK output high, after the success of the power pulled PWROK output low immediately reset applications, prevent possible data errors.

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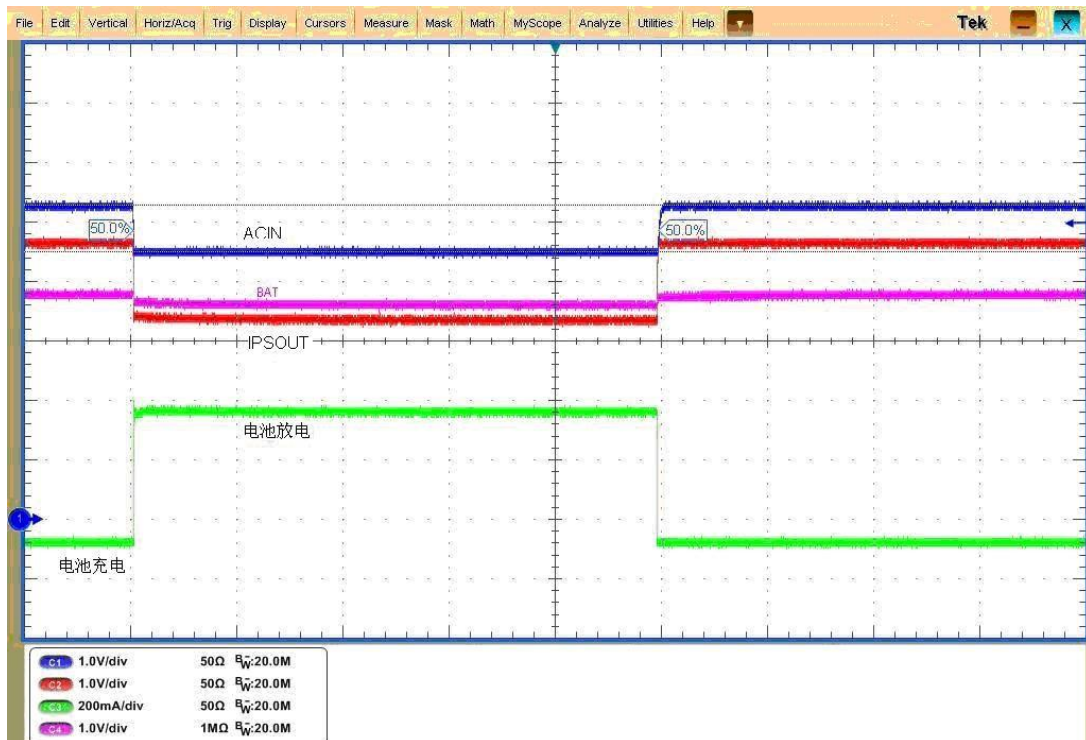
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After the success of the power pulled PWROK output high, after the success of the power pulled PWROK output low immediately reset applications, prevent possible data errors.

9.3 Power Management passage (IPS)

AXP173 power input may be from a lithium battery BAT, USB VBUS input ACIN external power supply (AC adapter, such as AC Adapter), IPS to select the appropriate power distribution in accordance with the state of the external power supply and lithium.

- When only access lithium battery, no external power input, using the lithium battery;
- When an external supply (VBUS or ACIN), preferentially using an external power supply;
- When the battery is connected, the external power is removed, and immediately "seamless" switch lithium battery;
- When simultaneously accessing both VBUS and ACIN preferentially used ACIN power, and charging the lithium battery;
- If at this time When ACIN drive capability is insufficient, the timely passage opens VBUS achieve ACIN / VBUS supply common;
- 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 IPS parameters can be set and read information which is fed back TWSI AXP173 access internal registers.

Limit voltage / current mode and the direct mode

In order not to affect USB communication, VBUS work in the default path "VBUS voltage-limiting mode." In this mode, AXP173 will VBUS voltage is maintained above a set reference voltage VHOLD to satisfy USB specification. VHOLD default is 4.4V, can be [5: 3] in the register Reg30H adjustment.

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

If you only use the system Mind without USB powered USB communication, a USB or a power adapter, can modify the register REG30H [6] set to be AXP173 "through the VBUS mode", when electricity needs AXP173 priority application system. When the driving capability of USB Host system power is too weak or the VBUS voltage is lower than VHOLD, AXP173 the IRQ is issued, to inform Host weak VBUS power supply capacity, indicating a USB communication may be affected by the Host software determines subsequent actions.

The reaction of the external power supply is inserted AXP173

AXP173 insertion operation can automatically detect the external power source. When inserted into the external power AXP173 detected, automatically determining whether an external power source is available, and the result is set in the corresponding registers, also issued the IRQ, notification Host.

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

Status bit register	meaning
Register REG00H [7]	ACIN indicating whether there is an external power supply adapter
Register REG00H [6]	It indicates the external power adapter is available ACIN
Register REG00H [5]	Indicating whether there is an external power source VBUS
Register REG00H [4]	It indicates the external power source is available VBUS
Register REG00H [3]	When indication of an external supply VBUS, is higher than the voltage of VBUS VHOLD
Register REG00H [1]	Indicates the external power supply ACIN / VBUS whether the PCB shorting
Register REG00H [0]	Indicate whether the system is triggered by VBUS Power

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"Indicates an external supply VBUWhen S, is higher than the voltage VBUS VHOLD "This flag allows the Host upon receipt IRQ7 (VBUS supply means weak), because the system load judgment VBUS access is pulled low or because the external power supply voltage is itself less than VHOLD, thus facilitating 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

Whether AXP173 chosen as VBUS input power, and by N_VBUSEN register REG30H [7] to determine:

N_VBUSEN	REG30H [7]	Input Power	meaning
Low	0	VBUS	VBUS and no effective choice when ACIN
Low	1	VBUS	VBUS input power supply can be used as active VBUS
High	1	VBUS	
High	0	ACIN / BAT	Do not use VBUS

Low battery warning and low voltage protection (automatic shutdown)

AXP173 may be provided two low voltage warning and automatic shutdown VWARNING voltage VOFF, and APS compared. Once APS lower than VWARNING, on the issue IRQ19. If the APS is less than VOFF, AXP173 automatically enters shutdown mode, turns off all outputs except the LDO1.

VWARNING default values and VOFF can register REG3AH, REG3BH and REG31H Bit [2: 0] is provided.

Overvoltage protection

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

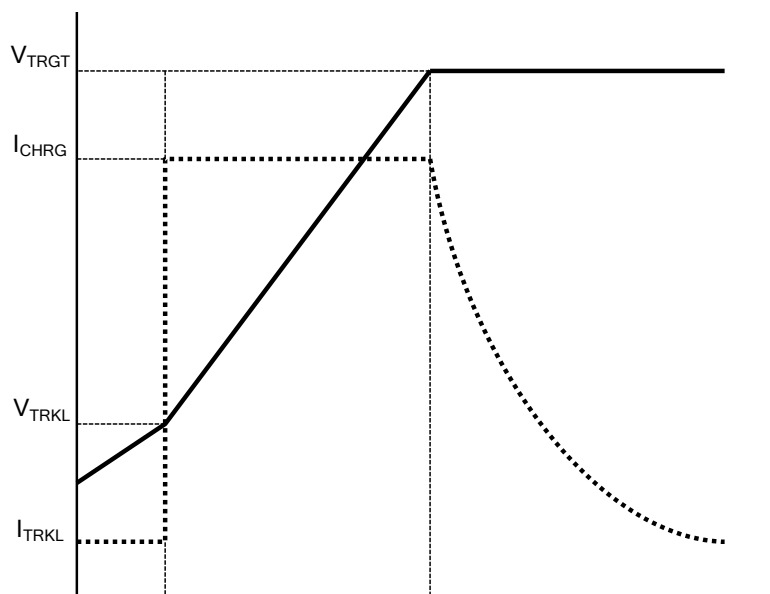
9.4 Adaptive charger (Adaptive Charger)

AXP173 integrates 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 access to an external power source, first determines whether AXP173 be used for charging the external power source, is turned on when the external power source is available to meet the conditions, and this time the charging function, then the charging process begins automatically AXP173, IRQ sent to the Host, it indicates the charging process begins. Meanwhile, 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 decreases, AXP173 will automatically adjust the target charging voltage.

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

recharging current

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

Charging Process

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

Once the battery voltage is higher than 3.0V, the charger entered constant current mode. If the charging current is less than 65% of the preset value, the system sends this notification IRQ17 "external power supply driving capability is insufficient, then the charging current does not reach the set value, the charging time will be extended so that, if a full charge faster, the proposed replacement greater power consumption on or off the function of the big."

When the battery voltage reaches the target voltage V_{TRGT}, 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% (can be set, refer to "Register REG33H"), the charge cycle, the charging is stopped, the end of charge, AXP192 will issue IRQ18,

CHGLED stop pin indicating the state of charge. When the battery voltage drops below the lower VRCH, it will automatically begin recharging, also issued IRQ17.

In the non pre-charging mode, if the 480 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 send IRQ10, indicates that the battery may be damaged.

In the battery active mode, always Charger low current to charge the battery, if the battery voltage reached can be VRCH, exit the active mode, also issued IRQ11.

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

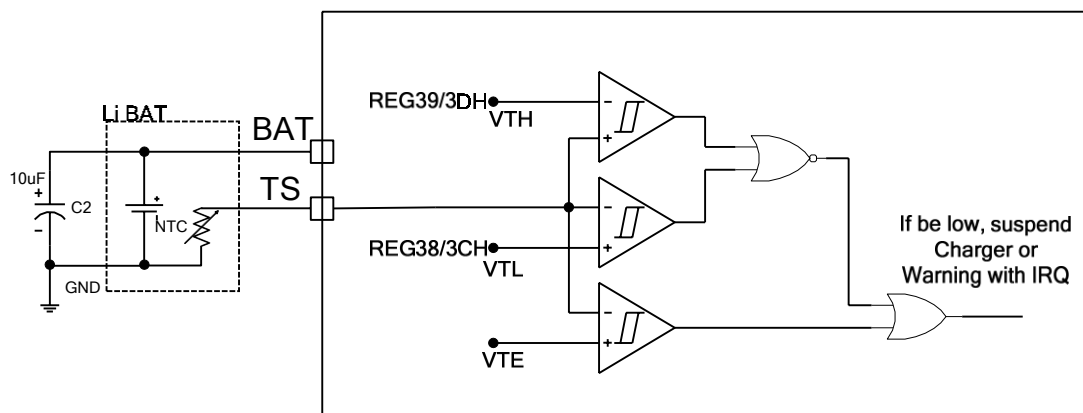
CHGLED

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 are 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	
Not charging	High resistance	
Battery abnormal	25% duty 1Hz hopping	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 / during use, AXP173 TS pin in an external temperature sensitive resistor is monitored by the battery temperature. A schematic circuit of FIG follows:



In the figure above, VTH / VTL respectively high and low temperature threshold is set, respectively, through the register REG38H / 39H / 3CH / 3DH provided, VTE = 0.2V. Recommended temperature sensitive resistance 10Kohm, 1% accuracy of the temperature sensitive resistor NTC selection of 25 °C. The constant current AXP173 out on the TS pin, this current can be set to 20uA, 40uA, 60uA, 80uA four kinds (see Register REG84H), to accommodate different NTC resistor. This current flows through the temperature-sensitive resistor, to obtain a detection voltage, AXP173 voltage value measured by the ADC and compared with the set 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, to expand the detection range. If the battery temperature sensitive resistor, is automatically disabled AXP173 battery temperature monitoring function.

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It does not require temperature TS when the TS can be shorted to ground to the TS pin, the case function.

Battery Testing

AXP173 automatically detects whether the battery is present, and identification (see Register REG01H) in the register and issuing IRQ13, IRQ14. Host cell detection can be opened or closed to control (see register REG32H).

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

SDA / N_VHOLDEN

Operating in the Host Control mode, this pin as TWSI data signal; when operating in STAND ALONE mode selection signal which is valid as a USB VHOLD pressure limiting mode, the effect of registers REG30H [6] opposite.

IRQ / N_CHGEN

Operating in the Host Control mode, this pin as the interrupt state signal, for generating an interrupt to inform Host; when operating in STAND ALONE mode, as the charge enable / disable signal, the effect of registers REG33H [7] In contrast .

9.6 Multiple power output (Multi-Power Outputs)

Output voltage and multiplex AXP173 function list provided below

Output path	Types of	The default voltage	Application examples
DCDC1	BUCK	Can be set	3.3VI / O
DCDC2	BUCK	Can be set	1.25Vcore
LDO1	LDO	Can be set	RTC
LDO2	LDO	Can be set	Analog / FM
LDO3	LDO	Can be set	1.8V HDMI
LDO4	LDO	Can be set	2.5Vddr

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2-way drive capability and application
Buck and LDO examples 4

AXP173 comprising two synchronous buck DC-DC, 4-way LDO, the timing and control various promoters. DC-DC operating frequency of 1.5MHz default, can be adjusted by setting the registers, the peripheral may be the use of small inductive and capacitive elements. Two DC-DC can be set to a PWM mode or automatic mode (automatic switching by the AXP173 The magnitude of the load), refer to "Register REG80H".

DC-DC1 / 2 / LDO4

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

DCDC1 / 2 output capacitance smaller than recommended 10uF X7R ESR ceramic capacitor; when the output voltage is set to 2.5V or more recommended 2.2uH inductance, at 2.5V or less, is recommended 4.7uH inductor, wherein the inductor saturation current greater than this need 50% of the maximum power path the current demand.

The following is a list of recommended LC:

inductance		
model	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, providing a continuous power supply system for the application of real time clock circuit (the RTC), the driving capability of 30mA.

LDO2 / 3

LDO2 / 3 uses a low-noise design can provide power to the analog circuitry of application system, the driving capability of 200mA.

Soft start (Soft Start)

All DC-DC and LDO outputs soft-start support of the establishment of the way, avoiding sudden changes starting current impact on the input path.

Self-diagnosis: load monitoring and limiting protection

All DC-DC and LDO has load monitoring and limiting function, when the drive capability, the output voltages are Down, to protect the internal circuit. A DC-DC And when the output voltage is lower than the setpoint, automatic shutdown. with Internal automatic recording system by which the specific output voltage is too low a shutdown (See Register REG46H [5: 2]) and send the appropriate IRQ.

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2 Buck and 4 have LDO voltage protection 85%

all DC-DC requires no external Schottky diode and the resistor divider feedback circuit. If the application does not require use of a DC-DC, just to correspond to the LX pin floating.

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

AXP173 customizable default voltage of each power supply, the startup sequence and so on.

Promoter sequence: comprising a total of eight starts, i.e. 0-7, wherein the first 7 when the power supply not started by default in this way. Other 0-6 1-7 grade represent the first step to start this way power. Each step can be set from the start time interval, the range of selectable 1,4,16mS.

Default voltage settings: for each channel DCDC / LDO may be selected from the 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 multiplexer 12Bit ADC battery voltage is measured in addition, it can also measure the battery current and the external power supply voltage, current, and battery charge and discharge internal integrated coulometer. Host 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, and the remaining battery time remaining full .

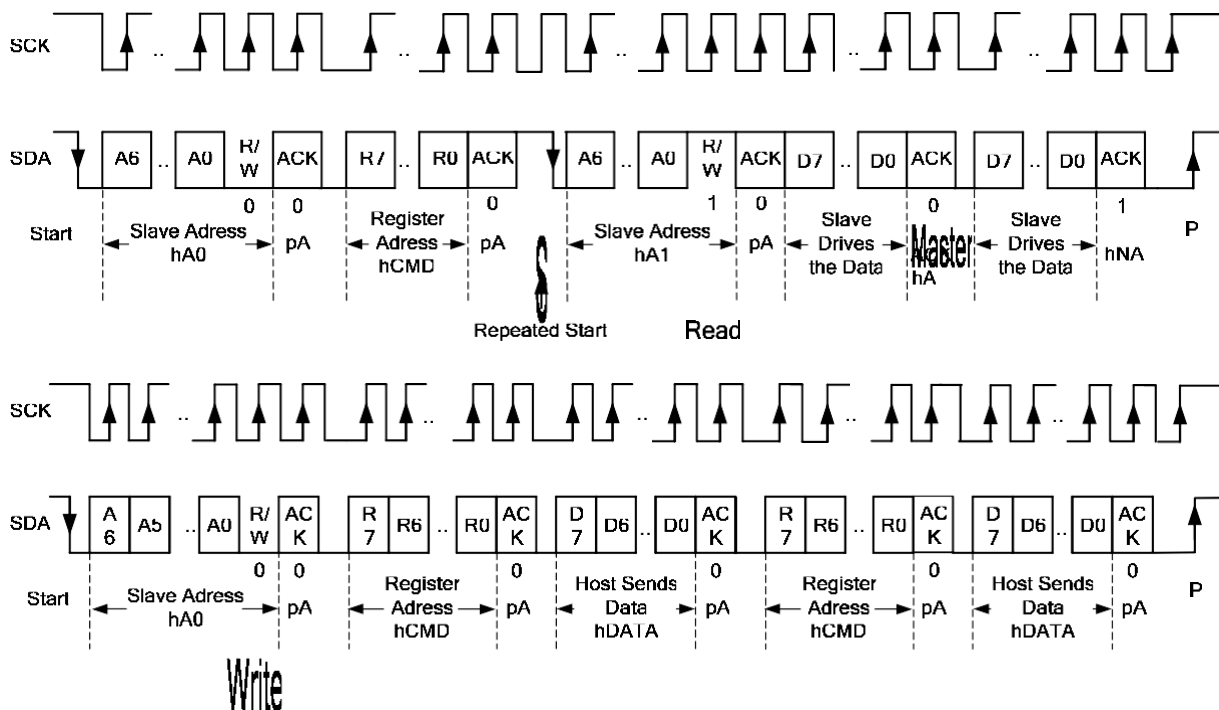
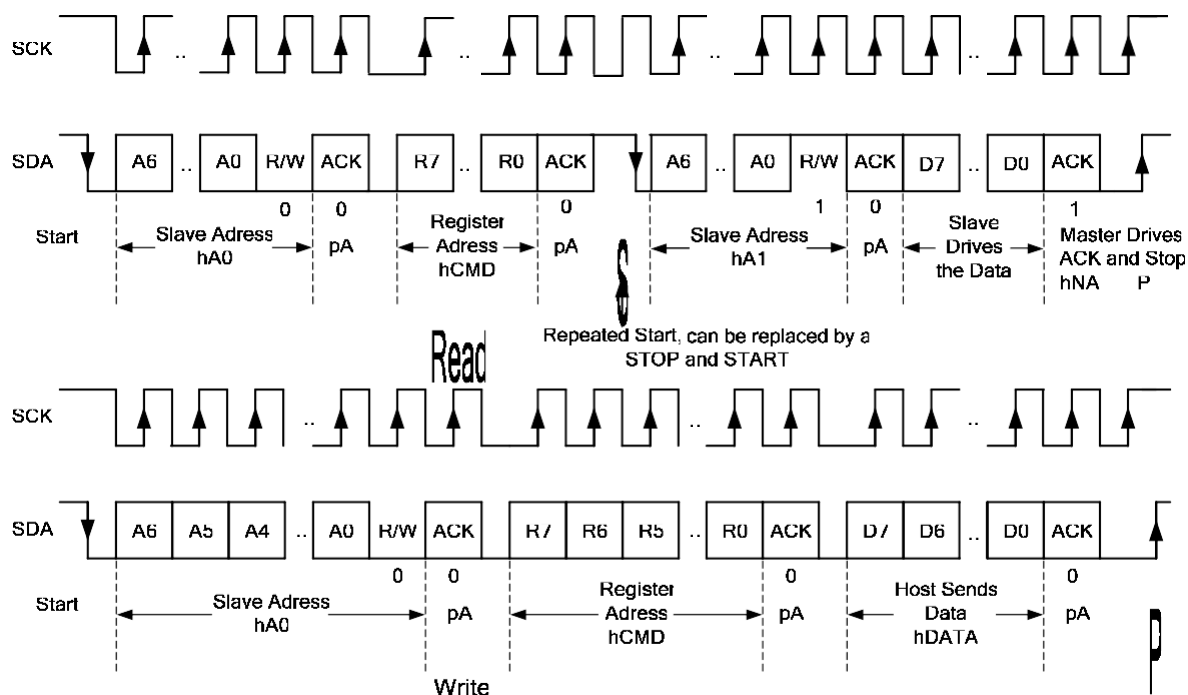
Separate ways Enable control and ADC sampling rate can be set through the register REG82H, 83H, 84H, sampling result stored in the corresponding register, see Data Class ADC register illustration. The battery is charged or discharged current direction [2] are indicated by the register REG00H.

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 comprises an internal timer, by setting register REG8AH [6: 0] can be changed timer value, the minimum resolution min (Minute), set timer expires after REG8AH [7].

9.10 Host port and interrupt (TWSI and IRQ)



Host interface to access via TWSI AXP173 register, the operation timing as shown above, or supports standard 100KHz

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 by pulling IRQ interrupt mechanism to alert Host, and interrupt status stored in the interrupt status register (see Register REG44H, register REG45H, register REG46H, register REG47H), the corresponding status register write a bit clears the corresponding interrupt, when no interrupt event, the IRQ output high (pull-up resistor by the external 51K). Each of the interrupt can be masked (see Register REG40H, register REG41H, register REG42H, register REG43H) by the interrupt control register.

position	Interrupt number	meaning	position	Interrupt number	meaning
Register 44H [7]	IRQ1	Power ACIN overpressure	Register 46H [7]	IRQ16	IC internal overtemperature
Register 44H [6]	IRQ2	Insert supply ACIN	Register 46H [6]	IRQ17	Charging current inadequate
Register 44H [5]	IRQ3	Remove the power ACIN	Register 46H [5]	IRQ18	DCDC1 voltage is too low
Register 44H [4]	IRQ4	VBUS power overpressure	Register 46H [4]	IRQ19	DCDC2 voltage is too low
Register 44H [3]	IRQ5	Insert supply VBUS	Register 46H [3]	IRQ20	LDO4 voltage is too low
Register 44H [2]	IRQ6	VBUS power source is removed	Register 46H [2]	IRQ21	Retention
Register 44H [1]	IRQ7	VBUS voltage is less than V_{HOLD}	Register 46H [1]	IRQ22	PEK Press
Register 44H [0]		Retention	Register 46H [0]	IRQ23	PEK Press
Register 45H [7]	IRQ8	Battery access	Register 47H [7]	Retention	
Register 45H [6]	IRQ9	Battery removal	Register 47H [6]		
Register 45H [5]	IRQ10	Enter the battery activate mode	Register 47H [5]	IRQ26	VBUS valid
Register 45H [4]	IRQ11	Exit Battery mode activated	Register 47H [4]	IRQ27	VBUS invalid
Register 45H [3]	IRQ12	Charging	Register 47H [3]	IRQ28	VBUS SESSION effective
Register 45H [2]	IRQ13	finished charging	Register 47H [2]	IRQ29	VBUS SESSION invalid
Register 45H	IRQ14	Battery	Register 47H	Retention	

[1]		temperature is too high	[1]	ntion n	
Register 45H [0]	IRQ15	Battery temperature is too low	Register 47H [0]	IRQ30	Low battery warning

9.11 Register (Registers)

Group 1, the power control class

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	Voltage setting register LDO4	R / W	48H
28	LDO2 / 3 voltage setting register	R / W	CFH
30	Path setting register VBUS-IPSOUT	R / W	60H
31	Shutdown voltage setting register VOFF	R / W	X3H
32	Off, the battery is detected, CHGLED control register	R / W	46H
33	Charging 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 setting register low Level1	R / W	68H
3B	APS setting register low Level2	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	Operation mode setting register DCDC	R / W	E0H
82	ADC enable setting register 1	R / W	83H
83	ADC enable setting register 2	R / W	80H
84	ADC sampling rate settings, TS pin control register	R / W	32H
8A	Timer control register	R / W	00H
8B	Monitoring setting register VBUS	R / W	00H
8F	Over-temperature shutdown control register	R / W	01H

Group 2, interrupt control based

addr	Register Description	R /	Default
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ess		W	ts
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

Group 3, ADC data class

addr ess	Register Description	R / W
56	ADC voltage ACIN 8 bits of data	R
57	ADC data low voltage ACIN 4	R
58	ACIN current ADC 8 bits of data	R

59	Low current ADC Data ACIN 4	R
5A	ADC VBUS voltage is 8 bits of data	R
5B	ADC data VBUS voltage is lower 4 bits	R
5C	VBUS current ADC 8 bits of data	R
5D	VBUS current ADC Data Low 4	R
5E	AXP173 internal temperature monitor ADC 8 bits of data	R
5F	AXP173 low internal temperature monitor ADC data 4	R
62	High ADC input TS data 8, the default monitoring battery temperature	R
63	Low ADC input TS data 4, the default monitoring battery temperature	R
70	High instantaneous power battery 8	R
71	The instantaneous power of the battery 8	R
72	8 Battery low instantaneous power	R
78	High voltage battery 8	R
79	Low battery 4	R
7A	Battery charging current is high 8	R
7B	5 Low battery charging current	R
7C	Battery discharge current is high 8	R
7D	Low battery discharge current 5	R
7E	High voltage APS 8	R
7F	Low voltage APS 4	R

addr ess	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	Coulometer cell discharge data register 3	R / W	00H
B5	Coulometer cell discharge data register 2	R / W	00H
B6	Coulometer cell discharge data register 1	R / W	00H
B7	Coulometer cell discharge 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 absent; 1: ACIN present	R
6	ACIN is available indicating	R
5	VBUS presence indication	R

	0: VBUS absent; 1: VBUS exists	
4	Indicating VBUS availability	R
3	Before using the access indication VBUS is greater than VHOLD	R
2	Indicates that the battery current direction 0: battery discharge; 1: the battery is charged	R
1	ACIN and VBUS input indicating whether the PCB is shorted	R
0	Start indicating whether the source is ACIN or VBUS 0: Start source is ACIN / VBUS; 1: Source Start non ACIN / VBUS	R

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

Bit	description	R / W
7	Indicates whether AXP173 overtemperature 0: No over-temperature; 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: a battery connected to AXP173	R
4	Retention	R
3	It indicates whether the cell enters active mode 0: No battery enters an active mode; 1: Battery has entered an 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	Indicating VBUS is valid, effective 1 represents	R
1	Indicates VBUS Session A / B is valid, represents an effective 1	R
0	Session End indicating state 1 represents an effective	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

Default value: XXH

Bit	description	R / W	Defaults
7-3	Reservations can not be changed		
2	Switching control EXTEN	0: Off; 1: Open	RW X
1	Reservations can not be changed		
0	DC-DC2 switching control	0: Off; 1: Open	RW X

Note: XCustom represented by the circumstances, the following value XPart with this.

REG 12H: control the power supply output

Default value: XXH

Bit	description	R / W	Defaults
7	Reservations can not be changed	RW	X
6	Switching control EXTEN	0: Off; 1: Open	RW X
5	Reservations can not be changed	RW	X
4	DC-DC2 switching control	0: Off; 1: Open	RW X
3	Switching control LDO3	RW	X
2	Switching control LDO2	RW	X
1	Switching control LDO4	RW	X
0	DC-DC1 switching control	RW	X

NOTE: REG12Hbit6 / 4 respectively REG10Hbit2 / 0.

REG 23H: DC-DC2 output voltage setting

Default value: 16H

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

REG 25H: DC-DC2 dynamic voltage scaling parameters

Default value: 00H

Bit	description		R / W	Default s
7-3	Retention			
2	DC-DC2 VRC enable control 0: open; 1: Close		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

Default value: 68H

Bit	description		R / W	Default s
7	Retention			
6	DC-DC1 output voltage setting Bit6	0.7-3.5V, 25mV / step	RW	X
5	DC-DC1 output voltage setting Bit5		RW	X
4	DC-DC1 output voltage setting Bit4		RW	X
3	DC-DC1 output voltage setting Bit3		RW	X
2	DC-DC1 output voltage setting Bit2		RW	X
1	DC-DC1 output voltage setting Bit1		RW	X
0	DC-DC1 output voltage setting Bit0		RW	X

REG 27H: LDO4 setting the output voltage

Default value: 48H

Bit	description		R / W	Default s
7	Retention			
6	Output voltage setting Bit6 LDO4	0.7-3.5V, 25mV / step	RW	X
5	LDO4 output voltage setting Bit5		RW	X
4	LDO4 output voltage setting Bit4		RW	X
3	LDO4 output voltage setting Bit3		RW	X
2	LDO4 output voltage setting Bit2		RW	X
1	Output voltage setting Bit1 LDO4		RW	X
0	Output voltage setting Bit0 LDO4		RW	X

REG 28H: LDO2 / 3 output voltage setting

Default value: CFH

Bit	description	R / W	Defaults
7	Output voltage setting Bit3 LDO2	RW	X
6	Output voltage setting Bit2 LDO2		
5	Output voltage setting Bit1 LDO2		
4	Output voltage setting Bit0 LDO2		
3	Output voltage setting Bit3 LDO3	RW	X
2	Output voltage setting Bit2 LDO3		
1	Output voltage setting Bit1 LDO3		
0	Output voltage setting Bit0 LDO3		

REG 30H: VBUS-IPSOUT path management

Default value: 60H

Bit	description	R / W	Defaults
7	When VBUS VBUS-IPSOUT available path selection control signal 0: whether to open N_VBUSEN pin is determined by this pathway 1: VBUS-IPSOUT open passage may be selected, regardless of the state of N_VBUSEN	RW	0
6	VBUS VHOLD pressure limiting control 0: Any pressure; 1: pressure limiting	RW	1
5	VHOLD set Bit 2	RW	1
4	Setting Bit 1 VHOLD		
3	Bit 0 is set VHOLD		
2	Retention		
1	VBUS limiting control enable signal 0: Off; 1: Open	RW	X
0	VBUS current limit control to open the stream selection time 0: 500mA; 1: 100mA	RW	0

REG 31H: VOFF voltage setting off

Default value: X3H

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

	0: short press Wake-up close 1: Short open as wake-up function After writing this bit is automatically cleared, and therefore need to write one again before each into Sleep mode				
2	VOFF set Bit2	000-2.6V; 001-2.7V; 010-2.8V;		RW	0
1	VOFF set Bit1	011-2.9V; 100-3.0V; 101-3.1V;		RW	1
0	VOFF Setting Bit0	110-3.2V; 111-3.3V		RW	1

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

Default value: 46H

Bit	description		R / W	Defaults
7	Shutdown Control This bit output will be closed AXP173 1		RW	0
6	Battery monitor function setting: 0: shut down; 1: Open		RW	1
5-4	CHGLED pin function settings	00: High impedance 01: 25% 1Hz flashing 10: 25% 4Hz flicker 11: output low	RW	00
3	CHGLED pin control settings	0: controlled by the charging function 1: [: 45] controlled by the register REG 32HBit	RW	0
2-0	Retention			

REG 33H: charging control 1

Default value: C8H

Bit	description		R / W	Defaults
7	Charging enable control bit 0: Off, 1: Open		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 end of charge is less than 10% of the value of the charging current provided 1: the end of charge is less than 15% of the value of the charging current provided		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
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REG 34H: charging control 2

Default value: 41H

Bit	description		R / W	Default s
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

Default value: 5DH

Bit	description		R / W	Default ts
7	Boot time is set Bit1	00: 128mS; 01: 512mS; 10: 1S; 11: 2S.	RW	0
6	Boot time is set Bit0		RW	1
5	Long time setting key Bit1	00: 1S; 01: 1.5S; 10: 2S; 11: 2.5S.	RW	0
4	Bit0 set time long key		RW	1
3	Automatic shutdown function is set longer than the time duration shutdown button 0: Off; 1: Open		RW	1
2	After the completion of power-up signal delay PWROK 0: 32mS; 1: 64mS		RW	1
1	Set Bit1 long shutdown	00: 4S; 01: 6S; 10: 8S; 11: 10S.	RW	0
0	Setting Bit0 long shutdown		RW	1

REG 37H: DC-DC operating frequency is provided

Default value: 08H

Bit	description		R / W	Default ts
7-4	Retention			
3	DC-DC switching frequency is set Bit 3	Each 5% change a default value of 1.5MHz	RW	1
2	DC-DC switching frequency setting Bit 2		RW	0
1	DC-DC switching frequency setting		RW	0

	Bit 1		
0	DC-DC switching frequency setting Bit 0	RW	0

REG 38H: VLTF-charge battery charge low threshold setting

Default value: A5H

Bit	description		R / W	Defaults
7-0	When charging the battery low threshold setting, M	M * 10H, when Corresponds to 2.112V when M = A5H; can Corresponding to the voltage 0V ~ 3.264V	RW	A5H

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

REG 39H: VHTE-charge battery charging temperature threshold setting

Default value: 1FH

Bit	description		R / W	Defaults
7-0	When charging the battery temperature threshold settings, N	N * 10H, when N = 1FH, corresponding to 0.397V; can Corresponding to the voltage 0V ~ 3.264V	RW	1FH

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

REG 3AH: APS low level 1

Default value: 68H

Bit	description		R / W	Defaults
7-0	APS low setting level 1		RW	68H

REG 3BH: APS low level 2

Default value: 5FH

Bit	description		R / W	Defaults
7-0	APS low setting level 2		RW	5FH

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

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

REG 3CH: VLTF-discharge battery discharge cold threshold setting

Default value: FCH

Bit	description		R / W	Defaults
7-0	When the discharge of the battery low threshold setting, M	M * 10H, when Corresponds to 3.226V when M = FCH; can Corresponding to the voltage 0V ~ 3.264V	RW	FCH

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

REG 3DH: VHTF-discharge battery discharge threshold setting temperature

Default value: 16H

Bit	description		R / W	Defaults
7-0	When the discharge of the battery temperature threshold settings, N	N * 10H, when N = 16H, corresponding to 0.282V; to be Shall voltage 0V ~ 3.264V	RW	16H

$$VLTF\text{-discharge} = N * 10H * 0.0008V$$

REG 80H: DC-DC mode selection

Default value: E0H

Bit	description		R / W	Defaults
7-4	Retention			
3	DC-DC1 operating mode control	0: PFM / PWM automatic switching 1: Fixed PWM	RW	0
2	DC-DC2 operating mode control		RW	0
1-0	Retention			

REG 82H: ADC Enable 1

Default value: 83H

Bit	description		R / W	Defaults
7	Battery voltage ADC Enable	0: Off, 1: Open	RW	1
6	Battery current ADC Enable		RW	0
5	Enable ADC voltage ACIN		RW	0
4	ACIN current ADC Enable		RW	0
3	VBUS voltage ADC Enable		RW	0
2	VBUS current ADC Enable		RW	0
1	APS voltage ADC Enable		RW	1
0	TS ADC function enable pin		RW	1

REG 83H: ADC Enable 2

Default value: 80H

Bit	description	R / W	Defaults
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	ion			
7	AXP173 internal temperature monitoring enable ADC	0: Off, 1: Open	RW	1
6-0	Retention			

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

Default value: 32H

Bit	description		R / W	Defaults
7	ADC sampling rate settings Bit 1	25 × 2n Sampling rates of 25, 50, 100, 200Hz	RW	0
6	ADC sampling rate settings Bit 0		RW	0
5-4	TS pin output current setting: 00: 20uA; 01: 40uA; 10: 60uA; 11: 80uA		RW	11
3	Retention			
2	TS pin function selection 0: battery temperature monitoring function, 1: independent external ADC input path		RW	0
1-0	TS current output pin disposed	00: Close	RW	1
		01: a charging current output 10: input sampling ADC, power can be 11: Always Open	RW	0

REG 8AH: Timer control

Default value: 00H

Bit	description		R / W	Defaults
7	Timer expires. Write clear this state 1		RW	0
6-0	Set the timer time in minutes Write off this whole timer 0		RW	0000000

REG 8BH: VBUS pin function control monitoring SRP

Default value: 00H

Bit	description		R / W	Defaults
7-6	Retention			
5-4	VBUS voltage setting effective 00: 4.0V; 01: 4.15V; 10: 4.45V; 11: 4.55V		RW	00
3	VBUS Valid detection function setting: 0: off, 1: Open		RW	0
2	VBUS Session detection function setting: 0: off, 1: Open		RW	0

1	Discharge VBUS discharge function provided 0: VBUS discharge resistor; 1: Use of a discharge resistor VBUS	RW	0
0	Charge VBUS charging function provided 0: OFF VBUS charge resistance; 1: VBUS VBUS to charge a charging resistor	RW	0

REG 8FH: over-temperature shutdown feature set

Default value: 01H

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

REG 40H: IRQ Enable 1

Default value: D8H

Bit	description	R / W	Defaults
7	ACIN overvoltage IRQ enable	RW	1
6	IRQ enable access ACIN	RW	1
5	IRQ enable removal ACIN	RW	0
4	VBUS enable overvoltage IRQ	RW	1
3	IRQ enable access VBUS	RW	1
2	IRQ enable removal VBUS	RW	0
1	VBUS enable available but less than VHOLDIRQ	RW	0
0	Retention	RW	0

REG 41H: IRQ Enable 2

Default value: FFH

Bit	description	R / W	Defaults
7	IRQ enable access to the battery	RW	1
6	IRQ enable removal of the battery	RW	1
5	Battery active mode enable IRQ	RW	1
4	Exit IRQ enable battery mode is activated	RW	1
3	Charging IRQ enable	RW	1
2	IRQ enable charging completion	RW	1
1	Battery over-temperature IRQ enable	RW	1

0	IRQ enable low-temperature battery	RW	1
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REG 42H: IRQ enable 3

Default value: 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 is enabled	RW	0
5	Output voltage setting value is less than the DC-DC1 IRQ enable	RW	1
4	Output voltage setting value is less than the DC-DC2 IRQ enable	RW	1
3	LDO4 output voltage is less than the set value IRQ is enabled	RW	1
2	Retention	RW	0
1	IRQ enable short key	RW	1
0	IRQ enable long key	RW	1

REG 43H: IRQ enable 4

Default value: C1H

Bit	description	R / W	Defaults
7-6	Retention	RW	1
5	VBUS enable effective IRQ	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	IRQ enable low pressure APS	RW	1

REG 4AH: IRQ enable 5

Default value: 00H

Bit	description	R / W	Defaults
7	Timeout timer IRQ enable	RW	0
6-0	Reservations can not be changed	RW	0

REG 44H: IRQ status 1

Default value: 00H

Bit	description	R / W	Default s
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7	Overvoltage IRQ state ACIN	RW	0
6	Access IRQ state ACIN	RW	0
5	ACIN out of the IRQ status	RW	0
4	Overvoltage IRQ state VBUS	RW	0
3	Access IRQ state VBUS	RW	0
2	VBUS out of the IRQ status	RW	0
1	But less than the available state VBUS VHOLDIRQ	RW	0
0	Retention	RW	0

REG 45H: IRQ state 2

Default value: 00H

Bit	description	R / W	Defaults
7	IRQ battery access state	RW	0
6	IRQ state of the battery is removed	RW	0
5	IRQ active mode state the battery	RW	0
4	Exit Battery active mode IRQ status	RW	0
3	Charging IRQ status	RW	0
2	Charge completion state of IRQ	RW	0
1	IRQ state battery overtemperature	RW	0
0	Battery low temperature IRQ status	RW	0

REG 46H: IRQ status 3

Default value: 00H

Bit	description	R / W	Defaults
7	AXP173 internal over-temperature IRQ status	RW	0
6	The charging current is lower than the set current IRQ state	RW	0
5	DC-DC1 output voltage is less than the set value IRQ state	RW	0
4	DC-DC2 output voltage is smaller than the set value IRQ state	RW	0
3	LDO4 output voltage is less than the set value IRQ state	RW	0
2	Retention	RW	0
1	IRQ state short key	RW	0
0	IRQ state long key	RW	0

Note: All IRQ status register clears the corresponding bit write a corresponding state.

REG 47H: IRQ status 4

Default value: 00H

Bit	description	R / W	Defaults
7-6	Retention	RW	0
5	VBUS valid IRQ status	RW	0
4	VBUS invalid IRQ status	RW	0
3	VBUS Session A / B IRQ state	RW	0
2	VBUS Session End IRQ status	RW	0
1	Retention	RW	0
0	APIRQ S low voltage state, a voltage lower than the APS Warning Level2 Once set, over Warning Level1 Will be cleared	RW	0

REG 4DH: IRQ status 5

Default value: 00H

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

Note: All IRQ status register clears the corresponding bit write a corresponding state.

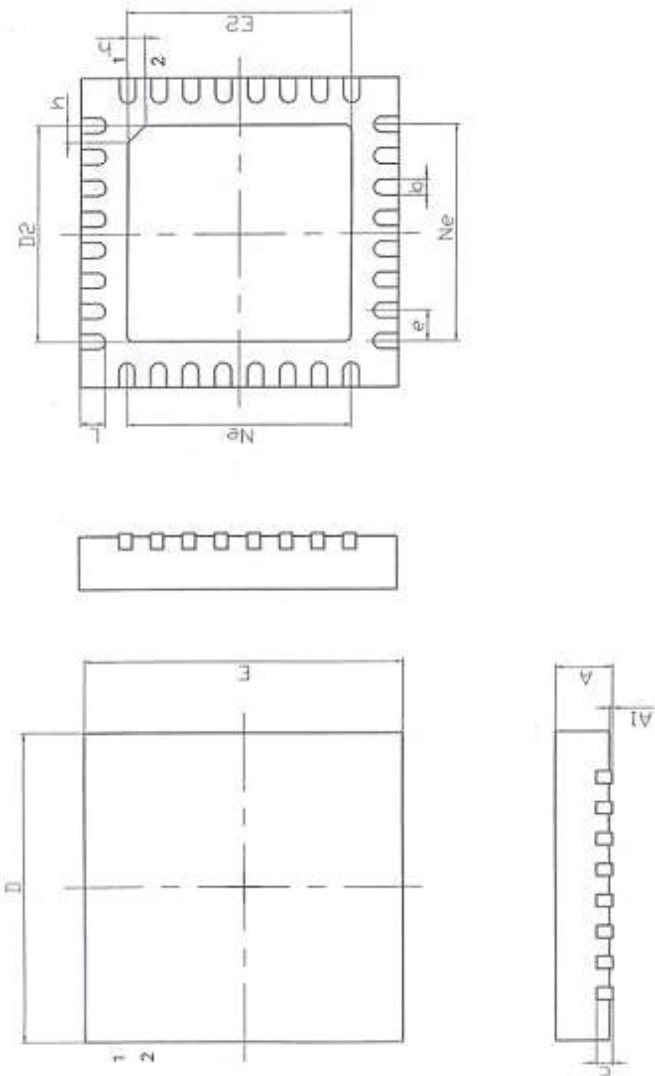
REG B8H: Coulomb gauge control

Default value: 00H

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

10. 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/P载体尺寸	150x150		



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