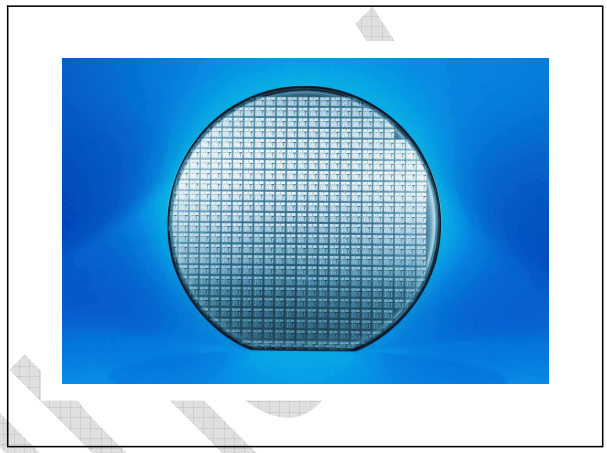
Power Management Unit

Features

- 3 low quiescent current LDO
- 5V input, 1.6V output buck converter
- Extra low operating current voltage source output
- Programmable current source, 150mA max.
- Serial Bus control
- Over current protection on LDO
- Switch between adaptor and battery as power supply
- Ship in wafer form



Description

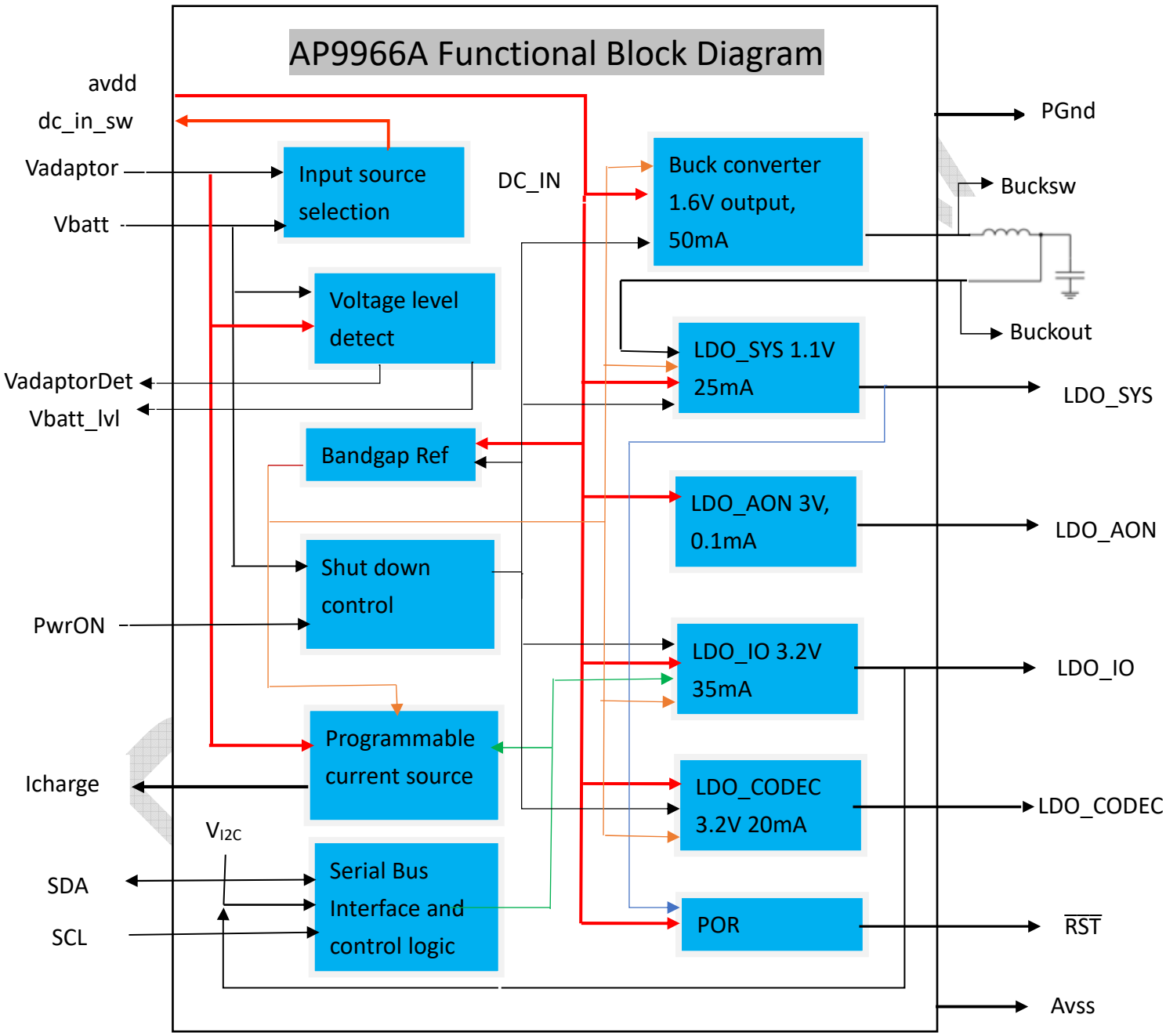
The AP9966A is a power management unit containing high efficiency bulk converter (DC-DC step down) and low quiescent current Low Drop Out (LDO) regulators. A programmable current source output to be used in conjunction with external MCU will enable Lithium battery charging with no external component.

Outputs of selected LDOs are protected from short-circuit by limiting current to be delivered.

Output voltages of specific LDOs and current source can be altered through serial bus connected between the chip and the external MCU.

Units will be shipped in 8” wafer form.

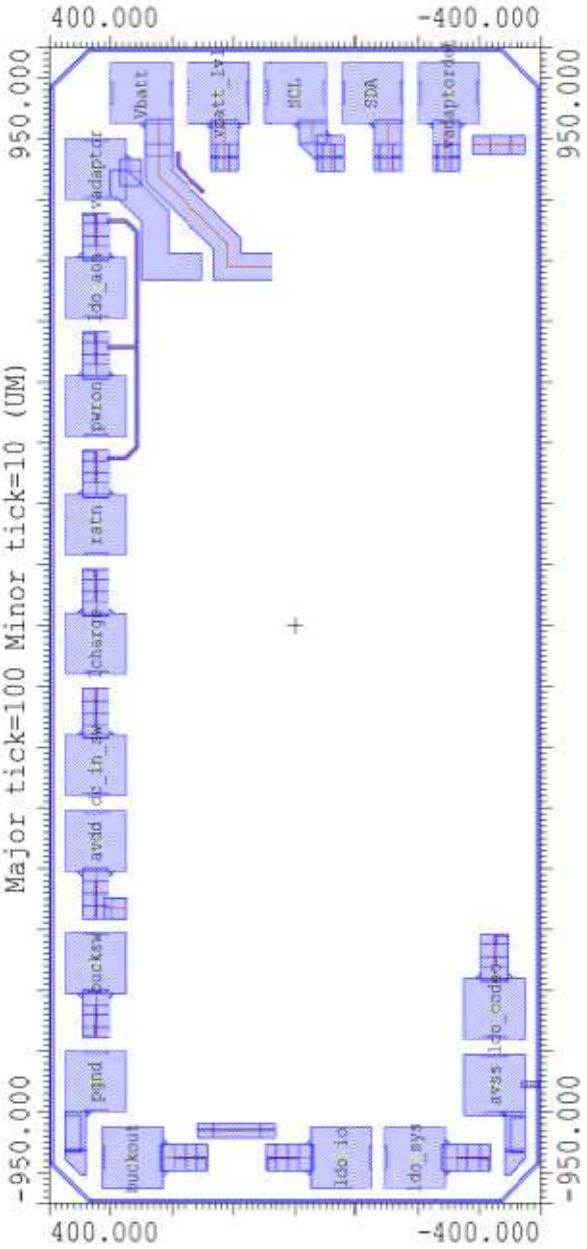
1 Device block diagram



2 Pin description

2.1 Pin out

There are 19 bonding pads on the chip. See below for the pad assignment.



3 Electrical specifications

3.1 Absolute maximum ratings

Table 3. Absolute maximum ratings

Symbol	Parameter	Value	Unit
VDD	DC supply voltage	5.75	V
T_{op}	Operating temperature	0 to 85	°C
T_j	Junction temperature	–40 to 150	°C
T_{stg}	Storage temperature	–40 to 150	°C
HBM	ESD Susceptibility	2000	V
MM	ESD Susceptibility	200	V

3.2 Thermal data

Table 4. Thermal data

Symbol	Parameter	Min	Typ	Max	Unit
			N/A		°C/W

3.3 Electrical specifications

Unless otherwise stated, the results in *Table 5* below are given for the conditions: Vadaptor = 5V, and T_A = 25 °C.

Table 5. Electrical specifications

Symbol	Parameter	Condition	Min	Typ	Max	Unit
POWER SUPPLY						
$V_{adaptor}$	Supply voltage for pin $V_{adaptor}$		4.75	5	5.5	V
I_{CC}	Total quiescent current	No load, all devices turned on		900		µA
$I_{Shutdown}$	Shut down current	PwrON=0; Reg_{01}=0x00, No adaptor power		4		µA
BUCK CONVERTER						
V_{Buck6}	1.5V buck converter output	No load	1.47	1.6	1.73	V
	1.5V buck line regulation	No load Vdc_in=5.5V to 3V		15	20	mV
	1.5V buck load regulation	I_{load}=1mA to 50mA Vdc_in=5V		15		mV
f_{Buck}	Buck converter operating frequency	Temperature range 0°C to 85°C	0.8	1	1.35	MHz
V_{ripple}	Peak to peak ripple voltage	I_{load}=50mA		25		mV
η	Efficiency	I_{load}=5mA		83		%

Symbol	Parameter	Condition	Min	Typ	Max	Unit
LDO_SYS						
V_{LDO_SYS}	1.1V regulator output	No load	1.02	1.1	1.18	V
	line regulation	No load Vdc=5.5V to 3.3V		14		mV
	load regulation	I_{load}= 1mA to 25mA		33		mV
$PSRR_{Ldo}$	Supply rejection	AC input 0.1V pk-pk at Vdc; Vdc=5V DC f=1kHz f=DC		 45 60		dB
Ignd	Ground current without load	No Load		10*		µA
Vdrop-out	Drop out voltage (Vin – Vout)	I_{load}= 25mA		200		mV
LDO_IO						
V_{LDO_IO}	3.2V regulator output	No load	2.94	3.2	3.46	V
	line regulation	No load Vdc=5.5V to 3.35V		30	50	mV
	load regulation	I_{load}= 1mA to 35mA		30		mV
$PSRR_{Ldo}$	Supply rejection	AC input 0.1V pk-pk at Vdc; Vdc=5V DC f=1kHz f=DC		 45 60		dB
Ignd	Ground current without load	No Load		10*		µA
Vdrop-out	Drop out voltage (Vin – Vout)	I_{load}= 35mA, V_{LDO_IO} =3.2V		200		mV
LDO_CODEC						
V_{LDO_CODEC}	3.2V regulator output	No load	2.94	3.2	3.46	V
	line regulation	No load Vdc=5.5V to 3.35V		30	50	mV
	load regulation	I_{load}= 1mA to 20mA		30		mV
$PSRR_{Ldo}$	Supply rejection	AC input 0.1V pk-pk at Vdc; Vdc=5V DC f=1kHz f=DC		 45 60		dB
Ignd	Ground current without load	No Load		10*		µA
Vdrop-out	Drop out voltage (Vin – Vout)	I_{load}= 20mA, V_{LDO_CODEC}=3.2V		200		mV
LDO_AON						
V_{LDO_AON}	Low power regulator output			3		V
I_{LDO_OUT}	Maximum output current			100		µA
$I_{q\_LDO\_AON}$	Quiescent operating current	No load		4		µA

Symbol	Parameter	Condition	Min	Typ	Max	Unit
SERIAL INTERFACE (SDA, SCL I/O Characteristics; Pull-up resistors on SDA and SCL is 4.7kohm)						
V_{I2C}	I^2C power supply	$V_{I2C} = V_{LDO\_IO}$	2.94	3.2	3.46	V
V_{IH}	High input level; SCL, SDA		$0.7V_{I2C}$			V
V_{IL}	Low input level; SCL, SDA				$0.3V_{I2C}$	V
V_{OL}	Low output level, SDA	Sink current=3mA			0.4	V
I2C clock	Maximum clock on SCL	Internal pull up only			100	KHz
Charging current						
Vadaptor	Operating voltage		4.75		5.5	V
Icharge	Output current	Reg_{01}=0x07		150		mA
Icharge	Output current	Reg_{01}=0x00		0		mA
	Refer to table 7 of Section 4 for register bit assignment					
I_{OFF}	RSTn	Output leakage current, tied to 3V			1	µA
V_{OL}	RSTn	Iout = -500µA; current going into the pin	0.2			V
TSD	Thermal Shut Down	Active mode, 15degC hysteresis		150		degC
Power condition signals						
Vadaptor_Det	Logic signal to MCU	% of Vadaptor		50		%
Vbatt_lvl	Analog signal to MCU	% of V_{Batt}, output = 3V when battery voltage is 4.2V		70		%

*** data obtained from design simulation, cannot be measured at chip or wafer level. The current consumption will be reflected on the quiescent operating current.**