



SY62510

Fully Integrated Single Series Lithium-ion/Li-Pol Battery Gauge

1 General Description

The SY62510 is a fully integrated 1-series Lithium-ion/Li-Pol battery gauge with authentication. The device communicates via an I²C compatible interface and combines a low-power, high-speed micro-controller, integrated flash memory, peripherals and proprietary algorithm for accurate capacity gauging. The device is suitable for using on the host-side or can be integrated in battery packs.

The SY62510 provides the battery information such as: remaining battery capacity (mAh), state-of-charge (%), SOC), state-of-health (%), SOH), battery voltage (mV), battery current (mA) and battery temperature (°C).

2 Features

- Operating Voltage: 2.2V to 5.5V
- Operating Current: 50 μ A (Typ.)
- Sleep Mode Current: 12 μ A (Typ.)
- Patented gauge algorithm: accurate SOC, SOH
- Automatic compensation for temperature, age, rate and self-discharge
- Dual ADC for Simultaneous Current and Voltage Measurements
- On-chip temperature sensor for monitoring system temperature
- External temperature-measurement network
- Low-side current sense
- Supports min 1m Ω current sense resistors
- SHA-256 and SHA1 authentication
- Diagnostic lifetime data monitor
- 400-kHz I²C bus communications interface
- Package: CSP 1.655mm $\times$ 1.802mm-9PIN
DFN 2.5mm $\times$ 4mm-12PIN

3 Applications

- Portable Multimedia Players
- Handheld Terminals
- Portable Medical Device

4 Typical Applications

4.1 SY62510VXS (CSP)

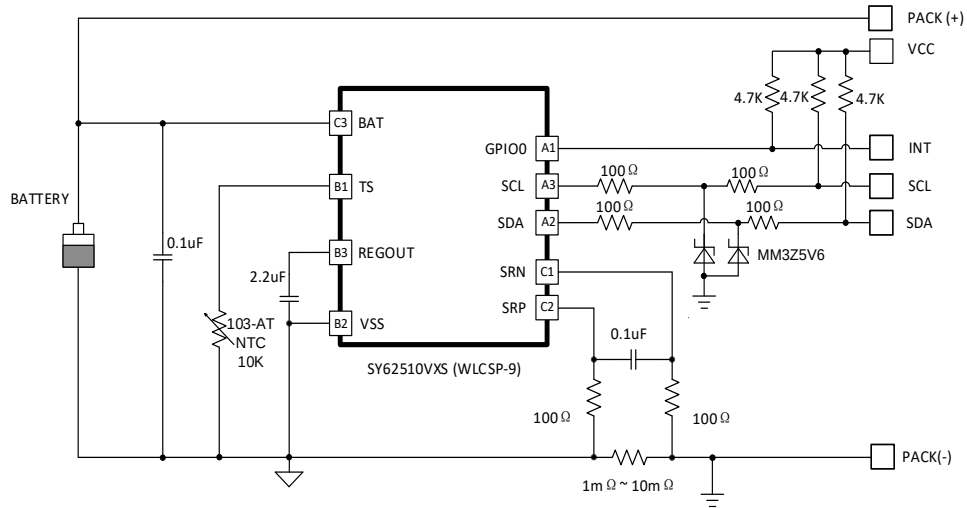


Figure 1. 1S Gauge Application Circuit ---- Pack's side

4.2 SY62510SZD (DFN)

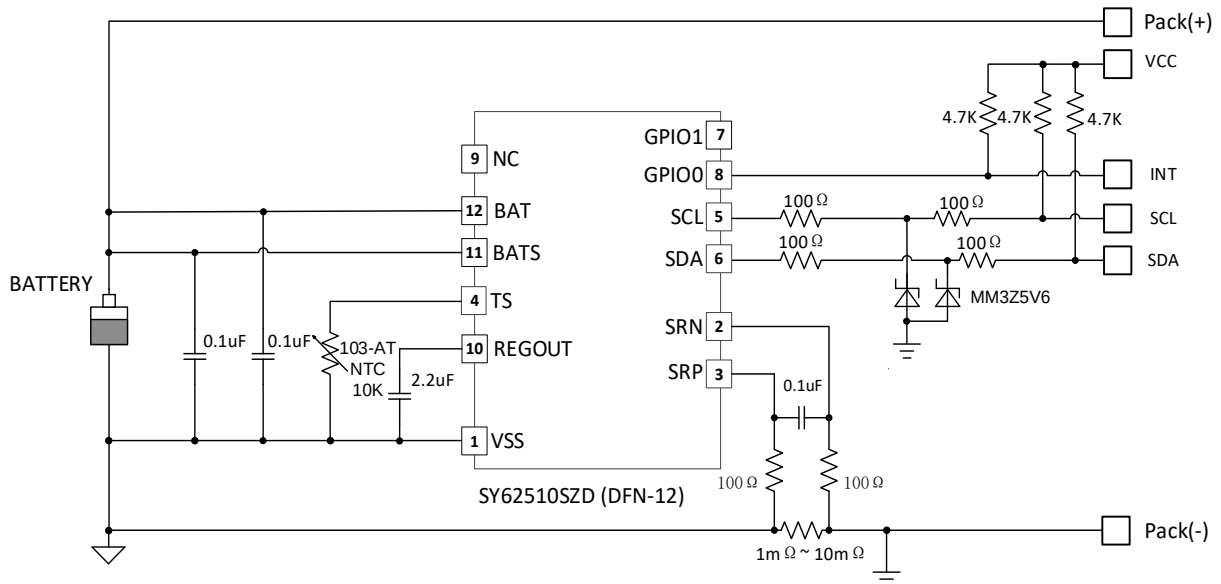


Figure 2. 1S Gauge Application Circuit ---- Pack's side

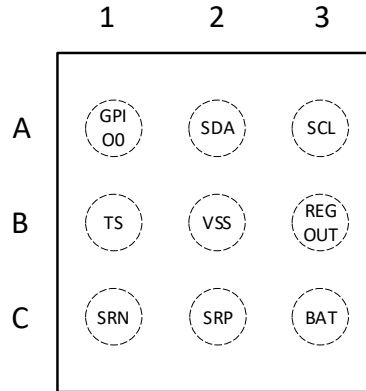
5 Ordering Information

Ordering Number	Package type	Top Mark
SY62510VXS	CSP1.655×1.802-9	EYQxyz
SY62510SZD	DFN2.5×4-12	EYRxyz

x=year code, y=week code, z= lot number code

6 Pin Configuration and Functions

6.1 SY62510VXS (CSP)



WLCSP-9 Package (Top View)

Figure 3. Package Type

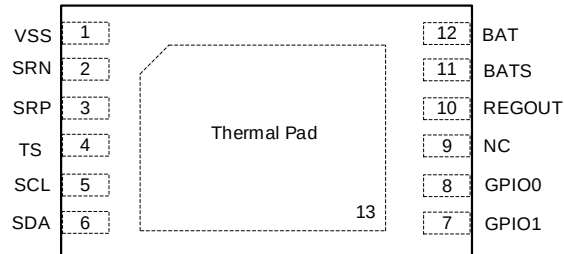
Table 1. CSP Package Pin Functions

Pin No.	Pin Name	Type	Description
A1	GPIO0	I/O	General purpose IO.
A2	SDA	I/O	Slave I2C serial communication data line. Open-drain I/O. Pull-up with 1.5kΩ ~ 4.7kΩ resistor.
A3	SCL	I	Slave I2C serial communication clock line. Open-drain I/O. Pull-up with 1.5kΩ ~ 4.7kΩ resistor.
B1	TS	AI	Pack thermistor voltage sense input.
B2	VSS	P	Device ground
B3	REGOUT	P	LDO output. Decouple with 2.2μF ceramic capacitor to VSS
C1	SRN(SRP)	AI	<p>Analog input pin connected to the current sensing (negative side). Connect to 1mΩ ~ 10mΩ sense resistor.</p> <p>Note: SRN and SRP pins can be configurable to SRP and SRN by firmware. Default: Pin C1: SRN, Pin C2: SRP Low side current sensing and Pack's side Charging: $V_{SRP}-V_{SRN}>0$ Discharging: $V_{SRP}-V_{SRN}<0$</p>
C2	SRP(SRN)	AI	<p>Analog input pin connected to the current sensing (positive side). Connect to 1mΩ ~ 10mΩ sense resistor.</p> <p>Note: SRN and SRP pins can be configurable to SRP and SRN by firmware. Default: Pin C1: SRN, Pin C2: SRP Low side current sensing and Pack's side Charging: $V_{SRP}-V_{SRN}>0$ Discharging: $V_{SRP}-V_{SRN}<0$</p>

C3	BAT	P, AI	Power supply and cell-voltage measurement input. Connected to a minimum 0.1μF ceramic capacitor.
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P = Power Connection, O = Digital Output, AI = Analog Input, I = Digital Input, I/O = Digital Input/ Output

6.2 SY62510SZD (DFN)



DFN2.5x4-12 Package (Top View)

Figure 4. Package Type

Table 2. DFN Package Pin Functions

Pin No.	Pin Name	Type	Description
1	VSS	P	Device ground
2	SRN(SRP)	AI	Analog input pin connected to the current sensing (negative side). Connect to 1mΩ to 10mΩ sense resistor. Note: SRN and SRP pins can be configurable to SRP and SRN by firmware. Default: Pin 2: SRN, Pin 3: SRP Low side current sensing and Pack's side Charging: $V_{SRP}-V_{SRN}>0$ Discharging: $V_{SRP}-V_{SRN}<0$
3	SRP(SRN)	AI	Analog input pin connected to the current sensing (positive side). Connect to 1mΩ to 10mΩ sense resistor. Note: SRN and SRP pins can be configurable to SRP and SRN by firmware. Default: Pin 2: SRN, Pin 3: SRP Low side current sensing and Pack's side Charging: $V_{SRP}-V_{SRN}>0$ Discharging: $V_{SRP}-V_{SRN}<0$
4	TS	AI,	Pack thermistor voltage sense input.
5	SCL	I	Slave I2C serial communication clock line. Open-drain I/O. Requires an external 1.5kΩ ~ 4.7kΩ pull-up resistor.
6	SDA	I/O	Slave I2C serial communication data line. Open-drain I/O. Requires an external 1.5kΩ ~ 4.7kΩ pull-up resistor.
7	GPIO1	I/O	General purpose IO, open-drain.
8	GPIO0	I/O	General purpose IO, open-drain.
9	NC	NC	No connection. This pin should be left floating.

10	REGOUT	P	LDO output. Decouple with 2.2μF ceramic capacitor to VSS
11	BATS	AI	Cell voltage measurement input. Decouple with 0.1μF ceramic capacitor.
12	BAT	P	Power supply input. Decouple with a minimum 0.1μF ceramic capacitor.
13	PWPD	-	Exposed Pad, electrically connected to VSS (external trace)

P = Power Connection, O = Digital Output, AI = Analog Input, I = Digital Input, I/O = Digital Input/Output

7 Block Diagram

7.1 SY62510VXS (CSP)

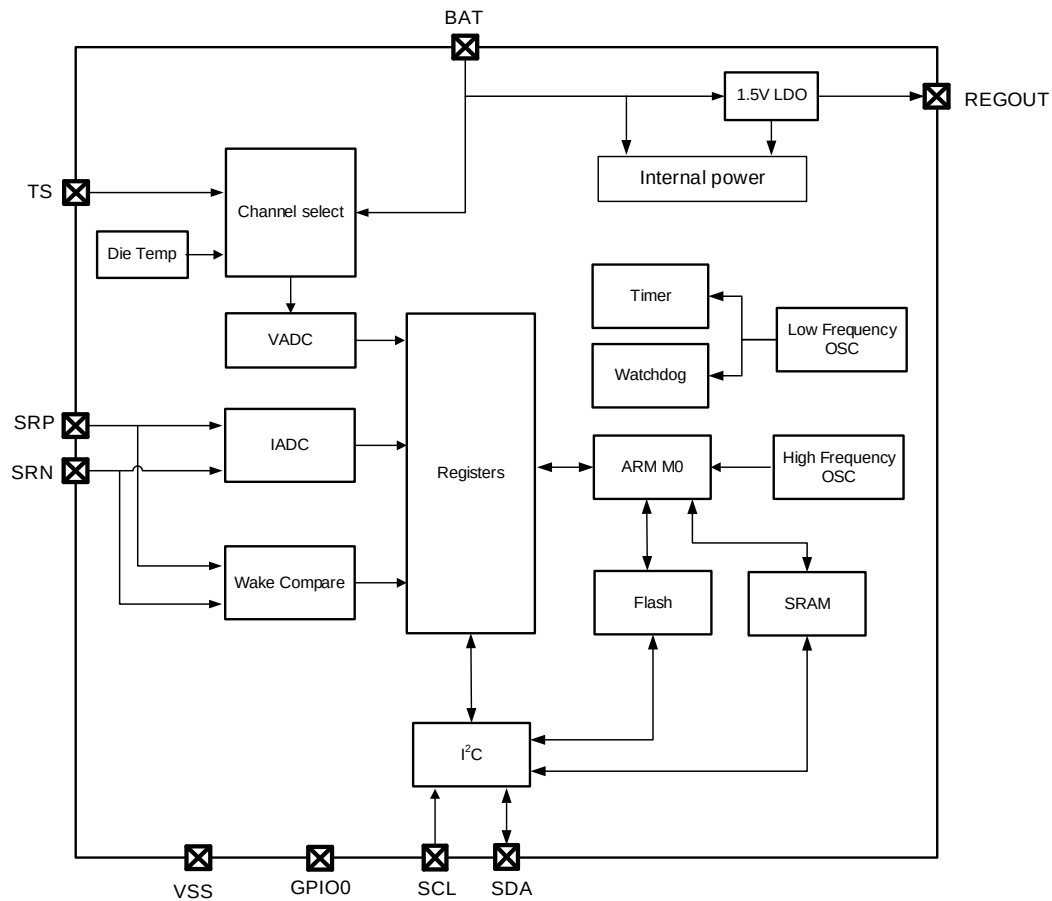


Figure 5. Functional Block Diagram

7.2 SY62510SZD (DFN)

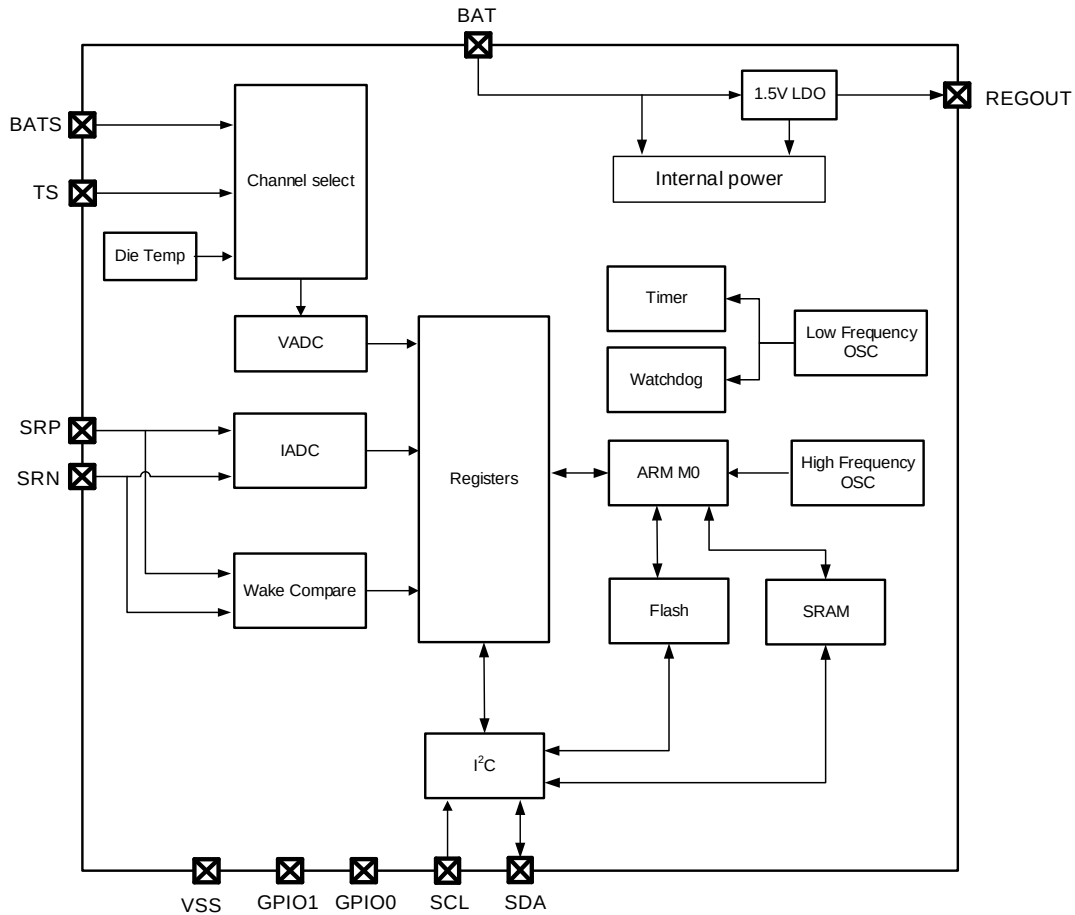


Figure 6. Functional Block Diagram

8 Specifications

8.1 Absolute Maximum Ratings

Parameter	Symbol	Test Conditions	Min	Max	Unit
Supply voltage	V _{POWER}	BAT	-0.3	6	V
Input voltage range	V _{INBATS}	BATS (DFN package only)	-0.3	6	V
	V _{INSR}	SRP, SRN	-0.3	6	
	V _{INGPIO}	GPIO0, GPIO1(DFN package only)	-0.3	6	
	V _{INI2C}	SCL, SDA	-0.3	6	
	V _{INTS}	TS	-0.3	6	
Output voltage range	V _{REGO}	REGOUT	-0.3	2	V
Functional Temperature	T _{FUNC}		-40	105	°C
Lead Temperature (soldering, 10s)	T _{SOLDER}			300	°C
Junction Temperature	T _{Junc}		-40	125	°C

Range					
Storage Temperature Range	T_{STG}		-65	150	°C
ESD Human Body Mode	V_{HBM}			2000	V
ESD Charge Device Mode	V_{CDM}			500	V

8.2 Thermal Resistance Information (CSP package)

Junction-to-ambient Thermal Resistance	Θ_{JA}		110.3	°C/W
Junction-to-case Thermal Resistance	Θ_{JC}		0.64	
Power Dissipation $T_A = 25^\circ\text{C}$	PD		0.55	W

8.3 Thermal Resistance Information (DFN package)

Junction-to-ambient Thermal Resistance	Θ_{JA}		33	°C/W
Junction-to-case Thermal Resistance	Θ_{JC}		2.4	
Power Dissipation $T_A = 25^\circ\text{C}$	PD		1.82	W

8.4 Recommended Operating Conditions

Parameter	Symbol	Test Conditions	Min	Max	Unit
Operation voltage	V_{POWER}	BAT	2.2	5.5	V
Input voltage range	V_{INBATS}	BATS (DFN package only) Same with BAT Pin	2.2	5.5	V
	V_{INSR}	SRP, SRN	-0.05	0.05	
	V_{INGPIO}	GPIO0, GPIO1 (DFN package only)	0	5.0	
	V_{INI2C}	SCL, SDA	0	5	
	V_{INTS}	TS	0	1.5	
Output voltage range	V_{OLDO}	REGOUT	0	1.5	V
Functional Temperature	T_{FUNC}		-40	85	°C

9 Electrical Characteristics

9.1 Supply Current

Typical values state where $T_A = +25^\circ\text{C}$ and $V_{BAT} = 3.6\text{V}$, Min/Max values state where $T_A = -40^\circ\text{C}$ to 85°C and $V_{BAT} = 2.2\text{V}$ to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Normal mode current ^{(1)(2) (3)}	I_{CC}	Standard operating conditions		50		μA
Sleep mode current ⁽¹⁾⁽²⁾	I_{SLEEP}	$I_{LOAD} < \text{Sleep Current(adjustable)}$		12		μA
Shutdown current	$I_{SHUTDOWN}$	wake from GPIO0 pin raised high for at least 200us		1.5		μA

(1) Dependent on Firmware code and related GUI setting

(2) CHG = ON, DSG = ON, No Flash Write

(3) Highly recommend flash erase and loading FW work in room temperature

9.2 External I/O (SCL, SDA, GPIO0, GPIO1)

Typical values state where $T_A = +25^\circ\text{C}$ and $V_{BAT} = 3.6\text{V}$, Min/Max values state where $T_A = -40^\circ\text{C}$ to 85°C and $V_{BAT} = 2.2\text{V}$ to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
External pull-up voltage	V_{EPU}		1.8		5	V
High-level input voltage	V_{IH1}	1.2V, IO_VOLTAGE bit =1	0.89			V
Low-level input voltage	V_{IL1}	1.2V, IO_VOLTAGE bit =1			0.41	V
High-level input voltage	V_{IH2}	1.8V/3.3V, IO_VOLTAGE bit	1.3			V
Low-level input voltage	V_{IL2}	1.8V/3.3V, IO_VOLTAGE bit			0.46	V
Low-level output voltage	V_{OL}	$I_{OL} = 3\text{mA}$			0.3	V
Pull-down resistance	R_{PD}	Only for SDA pin		300		k Ω

SCL, SDA, GPIO0, GPIO1 are all open-drain pins and the external pull-up resistor is from 1.5k Ω to 4.7k Ω

9.3 LDO Regulator, Wake-up, and Auto-Shutdown

Typical values state where $T_A = +25^\circ\text{C}$ and $V_{BAT} = 3.6\text{V}$, Min/Max values state where $T_A = -40^\circ\text{C}$ to 85°C and $V_{BAT} = 2.2\text{V}$ to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
BAT pin regulator input	V_{BAT}		2.2		5.5	V
Regulator output voltage	V_{REGOUT}		1.35	1.5	1.65	V
V_{BAT} under voltage lock-out LDO wake-up rising threshold	V_{UVLO+}			2.7		V
V_{BAT} under voltage lock-out LDO auto-shutdown falling threshold	V_{UVLO-}			2.1		V
REGOUT positive-going voltage input	V_{POR+}			1.35		V
REGOUT power-on reset hysteresis	V_{PORHYS}			0.1		V

GPIO0 (input) wake-up rising edge threshold ⁽¹⁾	V _{WU+}	Wake-up from SHUTDOWN mode	1.2			V
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(1) If the device is commanded to SHUTDOWN via I2C with V_{BAT} > V_{UVLO+}, a wake-up rising edge trigger is required on GPIO0

9.4 Internal Temperature Sensor

Typical values state where T_A = +25°C and V_{BAT} = 3.6V, Min/Max values state where T_A = -40°C to 85°C and V_{BAT} = 2.2V to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Measurement accuracy	T _{INTER}		-3		3	°C

9.5 NTC Thermistor Measurement

Typical values state where T_A = +25°C and V_{BAT} = 3.6V, Min/Max values state where T_A = -40°C to 85°C and V_{BAT} = 2.2V to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
TS Input voltage range	V _{TSADCIN}		0		1.25	V
Internal pull-up resistance	R _{NTCPU}		35	50	65	kΩ
NTC measurement accuracy	T _{NTCER}		-3		3	°C

The thermistor use 10k NTC and beta 3435k, default is SEMITEC 103KT1608T.

9.6 Oscillators

Typical values state where T_A = +25°C and V_{BAT} = 3.6V, Min/Max values state where T_A = -40°C to 85°C and V_{BAT} = 2.2V to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
HF oscillator operating frequency	F _{HFO}	T _A = 25°C		8.192		MHz
HF oscillator start-up time	t _{HFO}				20	μs
HF oscillator frequency drift	D _{HFO}	T _A = -10°C ~ 55°C	-2.2		2.2	%
		T _A = -40°C ~ 85°C	-3.3		3.3	%
LF oscillator operating frequency	F _{LFO}	T _A = 25°C		73		kHz
LF oscillator start-up time	t _{LFO}				150	μs
LF oscillator frequency drift	D _{LFO}	T _A = -10°C ~ 55°C	-2		2	%
		T _A = -40°C ~ 85°C	-3.5		3.5	%

9.7 Current Wake Comparator

Typical values state where T_A = +25°C and V_{BAT} = 3.6V, Min/Max values state where T_A = -40°C to 85°C and V_{BAT} = 2.2V to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Wake voltage threshold	V _{WAKE1}	V _{WAKE} = V _{SRP} - V _{SRN} CUR_WAKE[2:1]=00	±0.2 2	±0.3 1	±0.5 7	mV

	V _{WAKE2}	V _{WAKE} = V _{SRP} – V _{SRN} CUR_WAKE[2:1]=01	±0.4 5	±0.6 2	±1.1 5	mV
	V _{WAKE3}	V _{WAKE} = V _{SRP} – V _{SRN} CUR_WAKE[2:1]=10	±0.9 0	±1.2 5	±2.3	mV
	V _{WAKE4}	V _{WAKE} = V _{SRP} – V _{SRN} CUR_WAKE[2:1]=11	±1.8	±2.5	±4.6	mV
Wake up voltage Temperature Drift	V _{WAKE(DRIFT)}			0.5%		°C

9.8 Voltage ADC

Typical values state where T_A = +25°C and V_{BAT} = 3.6V, Min/Max values state where T_A = –40°C to 85°C and V_{BAT} = 2.2V to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
BATS Input voltage range	V _{VADCINB}	input voltage	0		5	V
Conversion time	t _{VADC}	VADC_CTRL1[1:0]=00		78.1 μs		ms
		VADC_CTRL1[1:0]=01		39.0 μs		ms
		VADC_CTRL1[1:0]=10		19.5 μs		ms
		VADC_CTRL1[1:0]=11		9.76 μs		ms
Resolution	R _{VADC}	No missing codes		16		bits
ENOB	E _{VADC}	VADC_CTRL1[1:0]=00	14	15		bits
		VADC_CTRL1[1:0]=01	13	14		bits
		VADC_CTRL1[1:0]=10	12	13		bits
		VADC_CTRL1[1:0]=11	11	12		bits
Voltage error	E _{VADCER}	5V input, post calibration		1		mV

9.9 Current ADC

Typical values state where T_A = +25°C and V_{BAT} = 3.6V, Min/Max values state where T_A = –40°C to 85°C and V_{BAT} = 2.2V to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input voltage range	V _{IADCIN1}	INPUT_RANGE bit=0	-50		50	mV
	V _{IADCIN2}	INPUT_RANGE bit=1	-25		25	mV
Conversion time	t _{IADC}			78.1 μs		ms
Resolution	R _{IADC}			16		bits
ENOB	E _{IADC}		14	15		bits
Offset error	Offset _{IADC}	16bit		±1.3		LSB

9.10 I2C Compatible Interface

Typical values state where $T_A = +25^\circ\text{C}$ and $V_{BAT} = 3.6\text{V}$, Min/Max values state where $T_A = -40^\circ\text{C}$ to 85°C and $V_{BAT} = 2.2\text{V}$ to 5.5V (unless otherwise specified)

Parameter	Symbol	Conditio	Min	Typ	Max	Unit
SCL Clock Frequency	F_{I2C}		10		400	kHz
Pull-up Voltage	V_{I2CPUV}		1.1		3.6	V
External Pull-up Resistor	R_{I2CPUR}		1.5		4.7	k Ω
SCL Clock Low Time	$t_{w(SCLL)}$		1.3			μs
SCL Clock High Time	$t_{w(SCLH)}$		0.6			μs
SDA Setup Time	$t_{su(SDA)}$		1000			ns
SDA Data Hold Time	$t_h(SDA)$		0			μs
SDA Rise Time	$t_r(SDA)$		25		300	ns
SCL Rise Time	$t_r(SCL)$		25		300	ns
SDA Fall Time	$t_f(SDA)$		25		300	ns
SCL Fall Time	$t_f(SCL)$		25		300	ns
START Condition Hold Time	$t_h(ST)$		0.6			μs
Repeated START Condition Setup Time	$t_{su(SR)}$		0.6			μs
STOP Condition Setup Time	$t_{su(SP)}$		0.6			μs
Bus Free Time Between STOP and START Condition	$t_w(SP:SR)$		1.3			μs

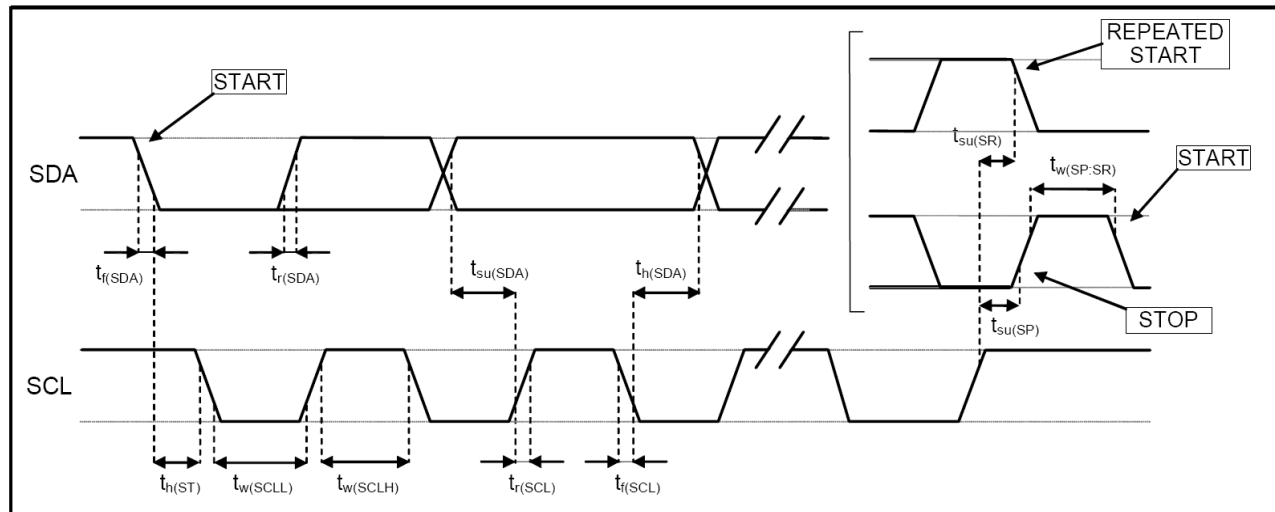


Figure 7. I²C-Compatible Timing Diagram

10 Functional Description

10.1 Temperature Measurement

SY62510 includes internal and external temperature sensing module. The TS pin is typically connected to an external NTC placed close the battery cells and it is used for the battery temperature measurement. An internal resistor is used for SY62510 internal temperature sensing.

10.2 Coulomb Counter ADC

SY62510 includes a separate high accuracy coulomb counter ADC, which is used to measure current flowing through a sense resistor connected between the SRP and SRN pins. The device supports Rsense values between 1mohm to 10mohm. Refer to the EC table for the detailed specifications.

10.3 Voltage ADC

SY62510 includes a separate high accuracy voltage ADC, used to sample voltage levels on the BAT. The NTC measurement is also performed using the voltage ADC. Refer to the EC table for the detailed specifications.

10.4 Operation Modes

10.4.1 NORMAL Mode

In NORMAL mode, the device measures voltage, current, and temperature, runs the fuel gauge algorithm, updates the protection as needed, and updates register data every one second. Between periods of activity, the device is placed a reduced power state to reduce power consumption.

10.4.2 SLEEP Mode

When the sleep conditions are met by either receiving a command or gauge algorithm decision, the device goes into SLEEP mode with periodic wake-up in adjustable time intervals to reduce the power consumption. The default sampling time interval for this mode is 20 sec, and the sampling time is adjustable through GUI/CMD. The device returns to NORMAL mode if an exit sleep condition is met.

10.4.3 SHUTDOWN Mode

This is the lowest power mode for the device. This mode can be entered by sending a shutdown command.

In this mode, the device is completely disabled, and all non-volatile memory and register data is lost; thus, the mode should only be entered when no charging or discharging of the battery is expected (for instance, when the battery pack is removed from the system). The device exits shutdown mode, when GPIO0 is pulled high at least 200us.

11 Operation Flowchart

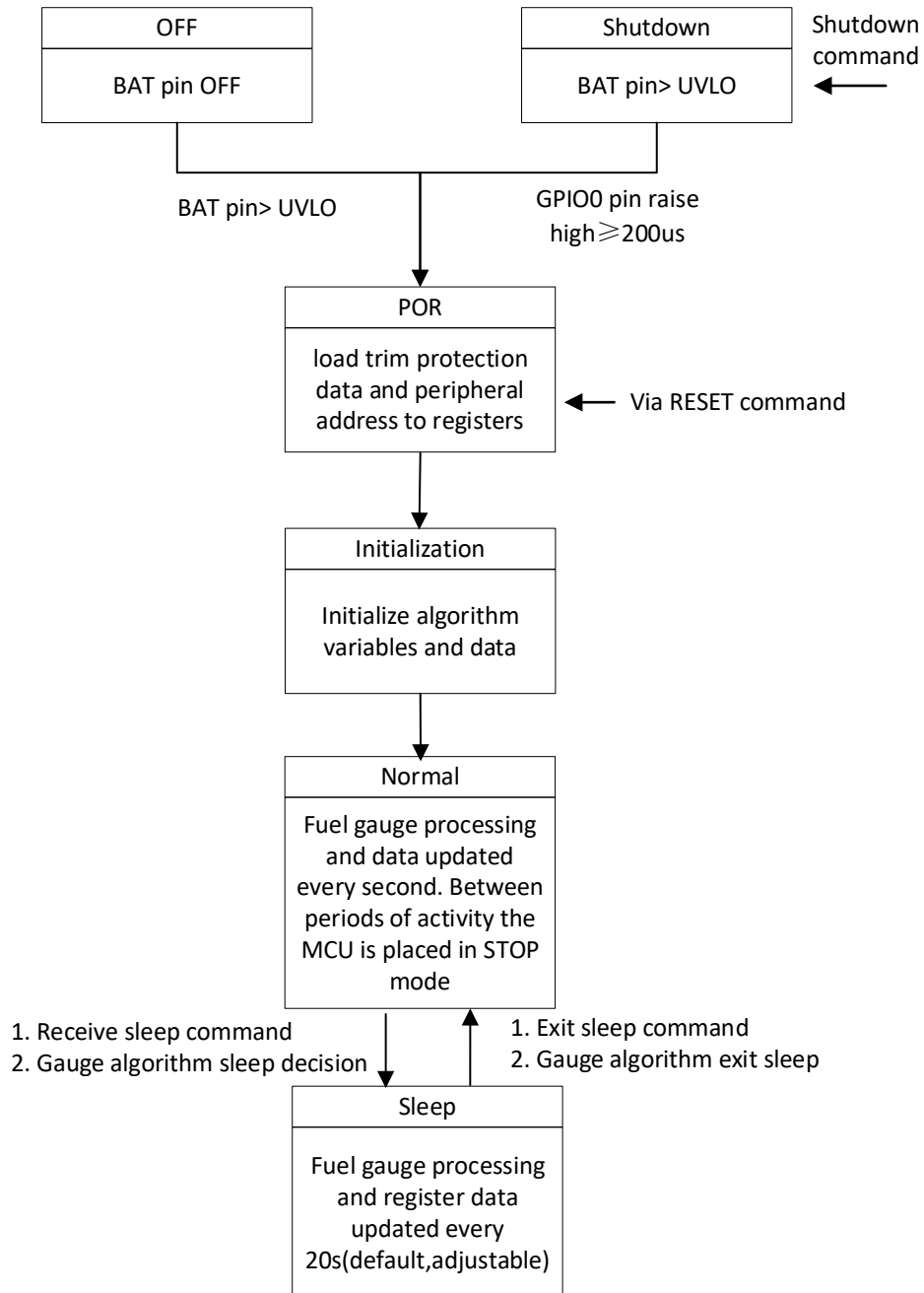


Figure 8. Operation Flowchart

12 I2C Control

The 7-bit peripheral address is set to 7'b101_0101. The 8-bit peripheral address is 0xAB(=8'b1010_1011) for read commands (R=1) or 0xAA(=8'b1010_1010) for write commands (W=0). The handshaking between controller and the peripheral device consists of START(S) , Repeated START(Sr), ACKNOWLEDGE(A), NOT ACKNOWLEDGE(N), and STOP(P) sequences as defined in the I2C protocol. The following command types are supported:

- (1) 1-byte read
- (2) incremental read
- (3) 1-byte write
- (4) incremental write

(1) 1-byte read



(2) Incremental read



(3) 1-byte write



(4) Incremental write



(S = Start, Sr = Repeated Start, A = Acknowledge, N = No Acknowledge, and P = Stop).



(Non-shadow area) Controller /Host generated



(Shadow area) Peripheral device generated

13 I2C Register Map

Register Name	I2C Address	I2C Bit	I2C R/W	Default	Description
ManufacturerAccess	00	[7:0]	R/W	00HEX	Received I2C command from AP.
	01	[15:8]	R/W	00HEX	
AtRate	02	[7:0]	R/W	00HEX	Unit: mA
	03	[15:8]	R/W	00HEX	
AtRateTimeToEmpty	04	[7:0]	R	00HEX	Unit: min
	05	[15:8]	R	00HEX	
Temperature	06	[7:0]	R	00HEX	Indicates NTC temperature. Unit: 0.1°K
	07	[15:8]	R	00HEX	
Voltage	08	[7:0]	R	00HEX	Indicates battery pack voltage Unit: mV
	09	[15:8]	R	00HEX	
Battery Status	0A	[7:0]	R	00HEX	
	0B	[15:8]	R	00HEX	
Current	0C	[7:0]	R	00HEX	The battery charge/ discharge current Unit: mA
	0D	[15:8]	R	00HEX	
MaxError	0E	[7:0]	R	00HEX	Unit: %
	0F	[15:8]	R	00HEX	
RemainingCapacity	10	[7:0]	R	00HEX	Unit: mAh
	11	[15:8]	R	00HEX	
FullChargeCapacity	12	[7:0]	R	00HEX	Unit: mAh
	13	[15:8]	R	00HEX	
AverageCurrent	14	[7:0]	R	00HEX	Unit: mA
	15	[15:8]	R	00HEX	
AverageTimeToEmpty	16	[7:0]	R	00HEX	Unit: min
	17	[15:8]	R	00HEX	

		]			
AverageTimeToFull	18	[7:0]	R	00HEX	Unit: min
	19	[15:8]	R	00HEX	
StandbyCurrent	1A	[7:0]	R	00HEX	Unit: mA
	1B	[15:8]	R	00HEX	
StandbyTimeToEmpty	1C	[7:0]	R	00HEX	Unit: min
	1D	[15:8]	R	00HEX	
MaxLoadCurrent	1E	[7:0]	R	00HEX	Unit: mA
	1F	[15:8]	R	00HEX	
MaxLoadTimeToEmpty	20	[7:0]	R	00HEX	Unit: min
	21	[15:8]	R	00HEX	
AveragePower	22	[7:0]	R	00HEX	Unit: mW
	23	[15:8]	R	00HEX	
Reserved	24	[7:0]	R/W	00HEX	
Reserved	25	[7:0]	R/W	00HEX	
Reserved	26	[7:0]	R/W	00HEX	
Reserved	27	[7:0]	R/W	00HEX	
InternalTemperature	28	[7:0]	R	00HEX	Indicates internal temperature. Unit: 0.1°K
	29	[15:8]	R	00HEX	
Cycle Count	2A	[7:0]	R	00HEX	The count number of battery charge and discharge cycles
	2B	[15:8]	R	00HEX	
RelativeStateOfCharge	2C	[7:0]	R	00HEX	Unit: 0.01%
	2D	[15:8]	R	00HEX	
State-Of-Health	2E	[7:0]	R	00HEX	Unit: 0.01%
	2F	[15:8]	R	00HEX	
ChargingVoltage	30	[7:0]	R	00HEX	This read-word function returns the desired charging voltage Unit: mV
	31	[15:8]	R	00HEX	
ChargingCurrent	32	[7:0]	R	00HEX	This read-word function returns the desired charging current Unit: mA
	33	[15:8]	R	00HEX	

DesignCapacity	3C	[7:0]	R	00HEX	Unit: mAh
	3D	[15:8]	R	00HEX	
AltManufacturerAccess	3E	[7:0]	R	00HEX	
	3F	[15:8]	R	00HEX	
MACData	40~5F	[7:0]	R	00HEX	
MACDataCheckSum	60	[7:0]	R	00HEX	
MACDataLength	61	[7:0]	R	00HEX	
FWUpdateStatus	62	[7:0]	R	00HEX	
	63	[15:8]	R	00HEX	
FUVersion	64	[7:0]	R	00HEX	
	65	[15:8]	R	00HEX	

14 Layout

14.1 Layout Guideline

- Kelvin connects the BAT or BATS pin to the battery terminal. Place a 0.1uF capacitors in series between BAT pin and VSS, as well as between BATS pin and VSS. In order to minimize the impact of noise, capacitors should be placed as close to the chip as possible.
- REGOUT is an internal LDO output pin. Decouple to VSS with a 2.2 μ F ceramic capacitor.
- The routing between SRP and SRN to Rsense needs to be parallel and symmetrical to ensure impedance continuity. The input side of SRP and SRN requires a filter circuit to reduce noise interference, where a 100 Ω resistor is connected between SRP and Rsense, and the same applies to SRN. SRP and SRN are connected through a 0.1uF capacitor. The layout of capacitors should be kept short and wide to reduce the inductance effect in the path. Ground shielding needs to be added around the filter circuit. Place the filter components as close to the chip as possible.

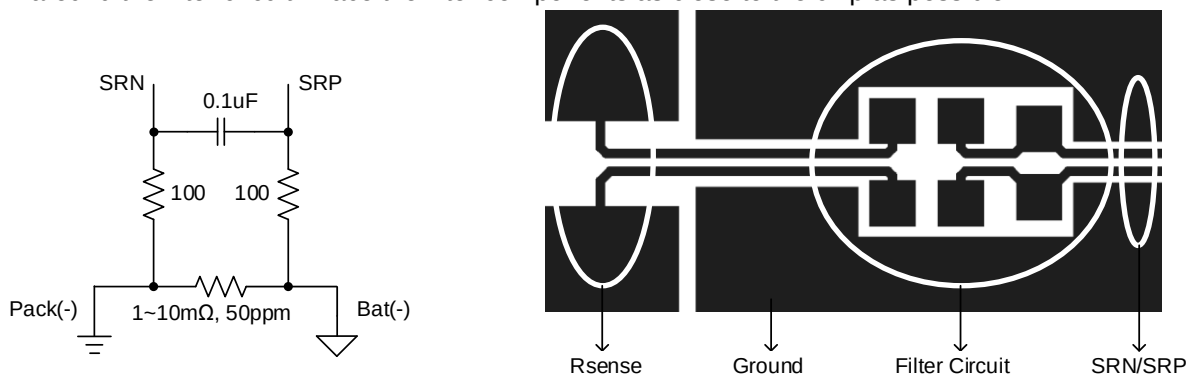


Figure 9. Current Sampling Filter Circuit

- Around the SCL and SDA pins, recommending several components to improve ESD performance, connecting with a pair of series resistors and a diode on each pin. Of course, in order to minimize board size or cost, this I2C related peripheral components could be removed.

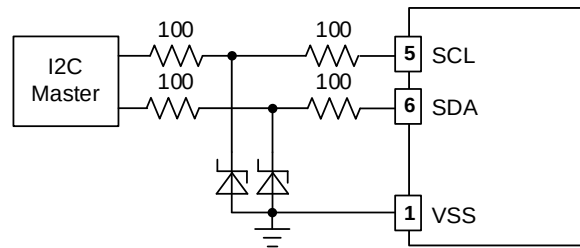


Figure 10. I2C Protection Circuit

14.2 Layout Example

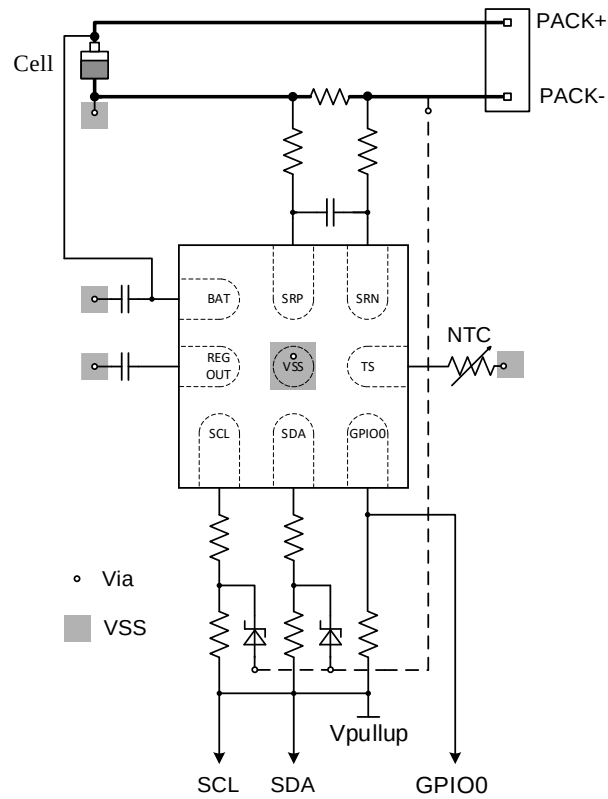


Figure 11. SY62510VXS Layout Example

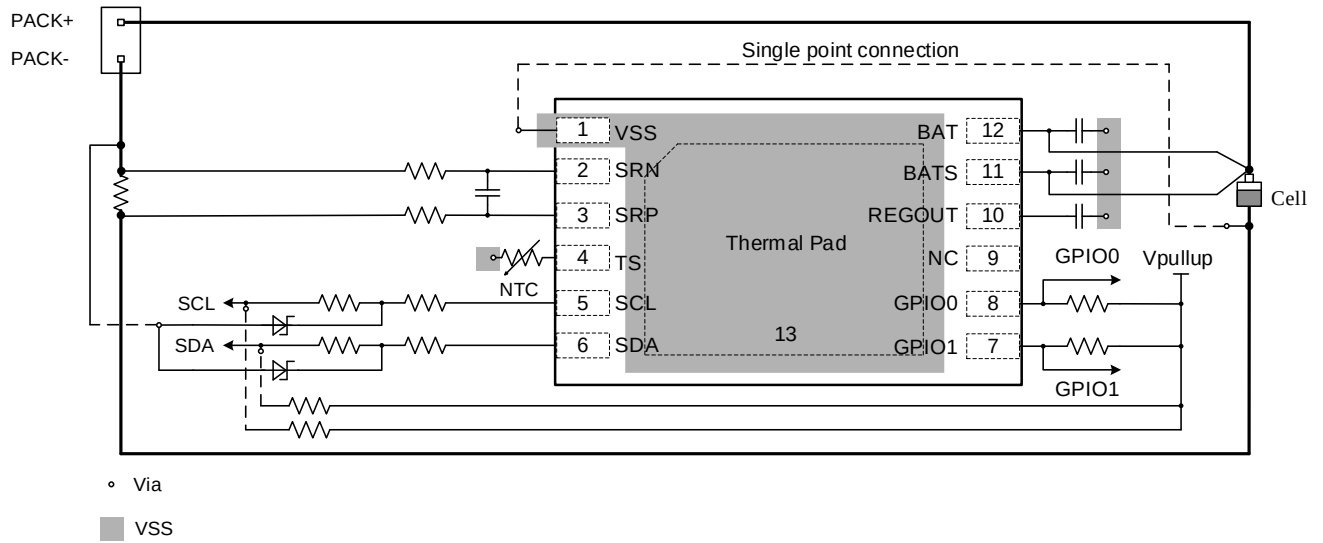
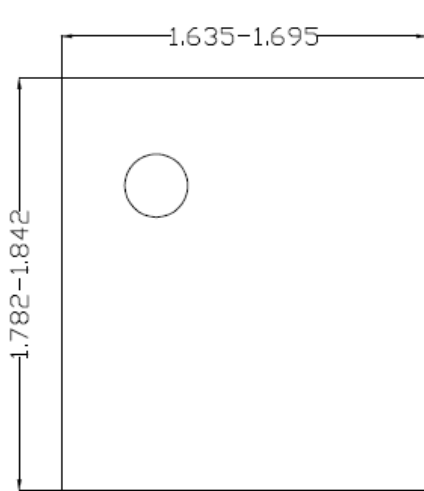
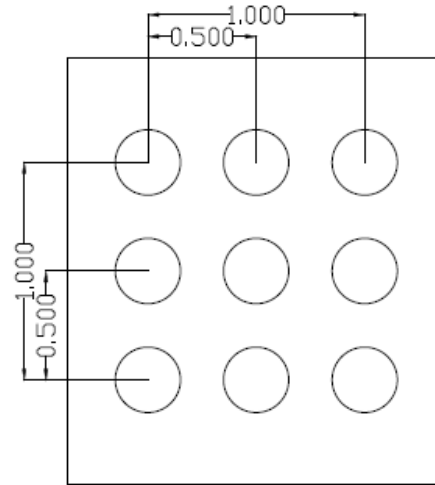


Figure 12. SY62510S2D Layout Example

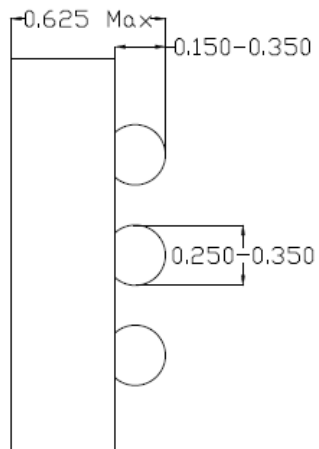
WLCSP-9 Package Outline Drawing for SY62510VXS



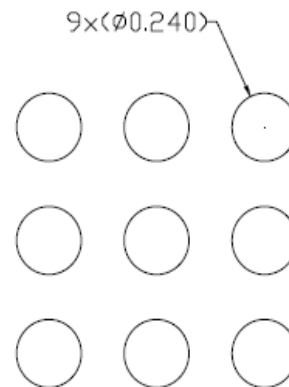
TOP VIEW



Bottom View



Front View

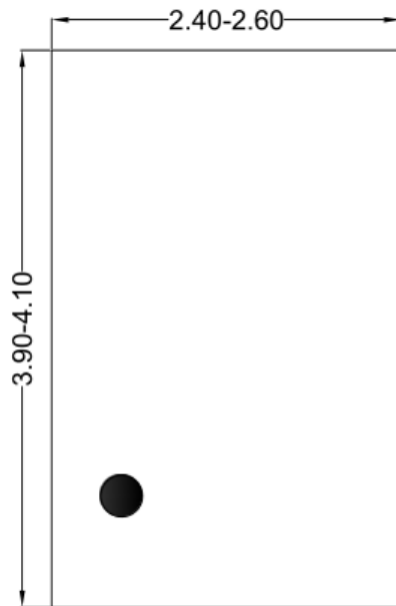


Recommended PCB land

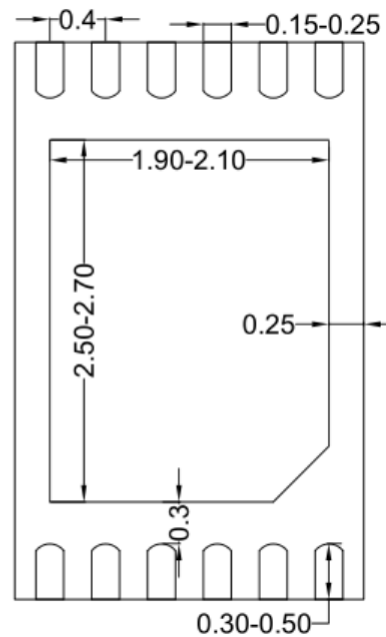
(Reference only)

Notes: All dimension in millimeter and exclude mold flash & metal burr.

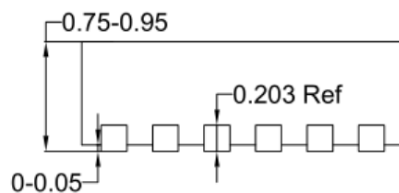
DFN 2.5×4-12 Package Outline Drawing SY62510SZD



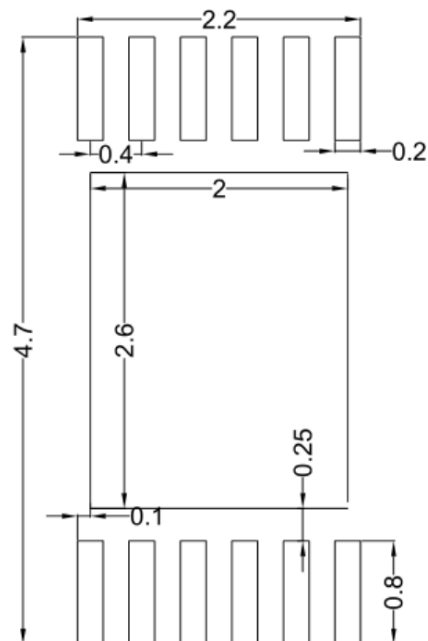
Top View



Bottom View



Front View



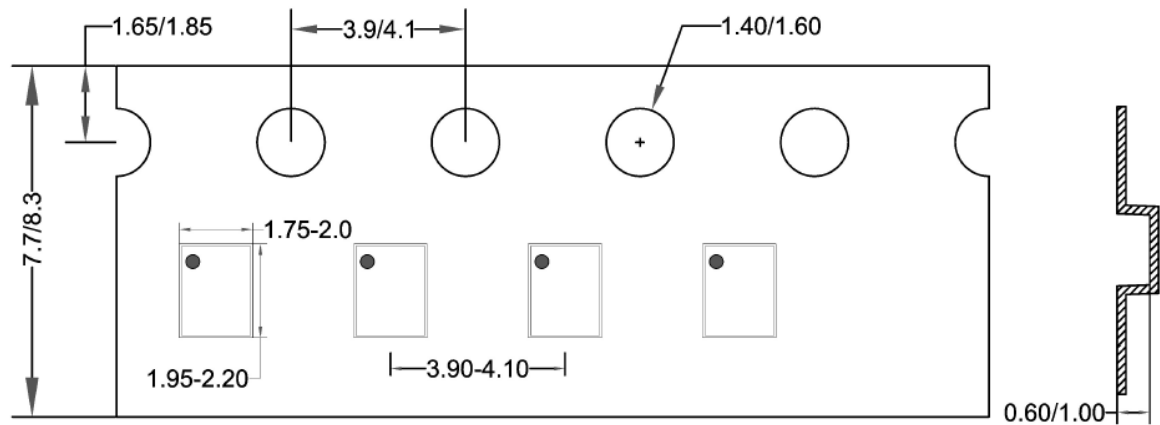
**Recommended PCB layout
(Reference only)**

Notes: All dimension in millimeter and exclude mold flash & metal burr.

Taping & Reel Specification for SY62510VXS

1. Taping Orientation

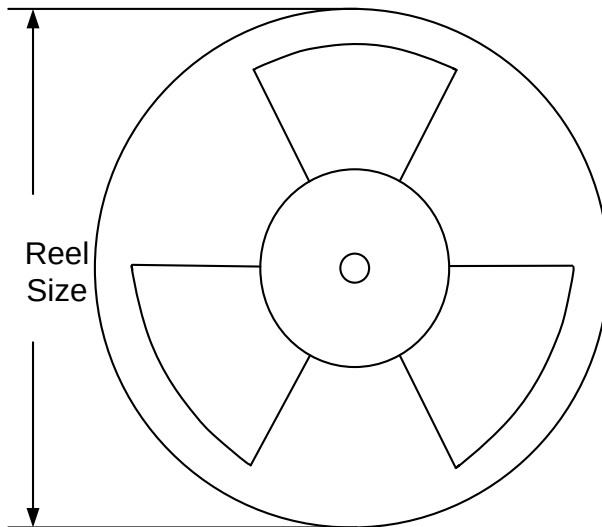
CSP1.65x1.80



Feeding Direction



2. Carrier Tape & Reel specification for packages

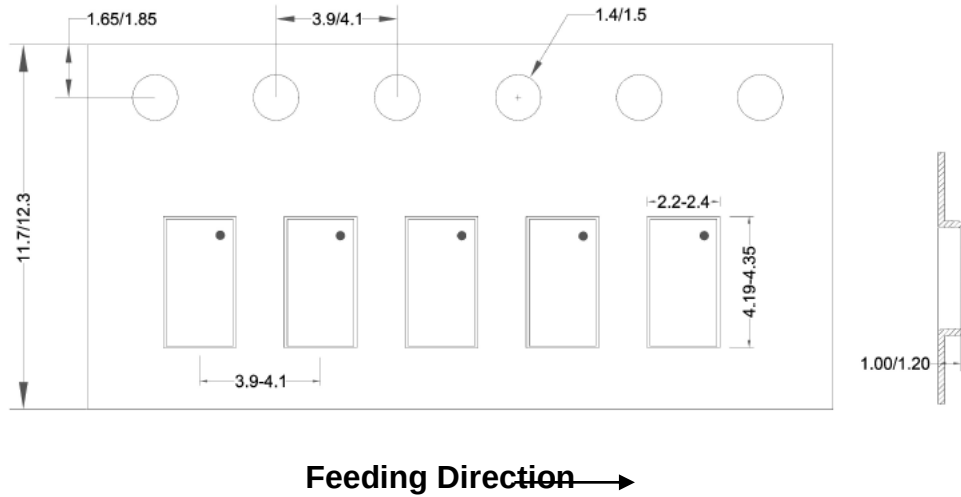


Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer * length(mm)	Leader * length (mm)	Qty per reel (pcs)
CSP1.65x1.80	8	4	7"	400	160	3000

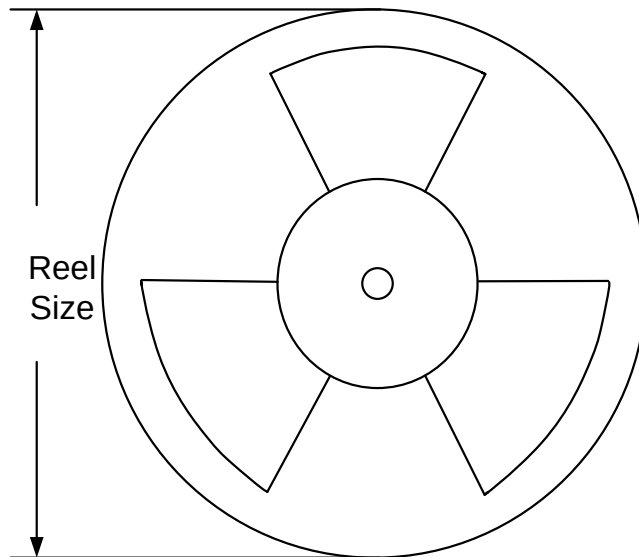
Taping & Reel Specification for SY62510SZD

1. Taping Orientation

DFN2.5x4.0-12



2. Carrier Tape & Reel specification for packages



Package types	Tape width (mm)	Pocket pitch(mm)	Reel size (Inch)	Trailer * length(mm)	Leader * length (mm)	Qty per reel
						(pcs)
DFN2.5x4.0-12	12	4	13"	400	400	5000

Revision History

The revision history provided is for informational purposes only and is believed to be accurate, however, not warranted. Please make sure that you have the latest revision.

Date	Revision	Change
2022/9/8	0.0	Initial Release
2024/6/25	1.0	Product Release

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