SY6923D1

High Integrated 1-Cell Switching Charger With USB Compliance and USB-OTG Function

General Description

SY6923D1 is a high efficiency Buck mode switching charger for 1-cell Li-ion and Li-polymer battery. The SY6923D1 provides a high integrated solution for the portable device. It integrates the blocking FET, the power FETs, the input current sensing circuits and the charger controller. It is fully USB compliant to minimize the charging time when it is supplied from a USB port. SY6923D1 also support USB OTG with the integrated Boost regulator.

Three internal DACs are used as the reference of battery voltage and battery charge current and adapter input current limit, and programmed by host using I^2C. The adaptive input current limit allows the maximum charge current to minimize the charge time and keep the input supply from being overloaded.

The SY6923D1 is available in CSP1.93x2.05-20 package to allow small PCB footprint.

Ordering Information

SY6923 □(□□)□
- Temperature Code
- Package Code
- Optional Spec Code

Ordering Number	Package type	Note
SY6923D1PPC	CSP1.93x2.05-20	

Applications

- PADs
- Smart Phones
- Portable Equipment with Rechargeable Batteries
- Battery Back-up Systems

Features

- High Integrated and High Efficiency
- Up to 1.25A Charge Current (68mΩ R_{SENSE})
- Up to 1.55A Charge Current (55mΩ R_{SENSE})
- Up to 18V Absolute Maximum Input Voltage
- 6V Maximum Operating Input Voltage
- Adaptive Input Current Limit
- ±5% Input Current Limit Accuracy@500mA
- ±0.5% Charge Voltage Accuracy
- ±3.5% Charge Current Accuracy when I_{CHG} Higher than 550mA
- I^2C Controls(up to 3.4Mbps)
  - -- Battery Charge Voltage (3.5V – 4.44V)
  - -- Battery Charge Current (550mA – 1.25A)
  - -- Termination Current (50mA – 400mA)
  - -- Battery Weak Voltage (3.4V – 3.7V)
  - -- Input Current Limit
  - -- VBUS Threshold for Adaptive Input Current
  - -- Low Charge Current Mode Enable and Disable
  - -- Termination Enable and Disable
- Integrated Loop Compensation
- Internal Soft-start
- Bad adapter Detection and Rejection
- 3MHz Frequency PWM
- Automatic High Impedance Mode for Low Power Consumption
- 5V, Boost Mode for USB OTG
- CSP1.93x2.05-20 Package
- Spread Spectrum Frequency Control for Improved EMI Performance
- Factory Test-Mode for GSM Calibration Without a Battery

Typical Applications

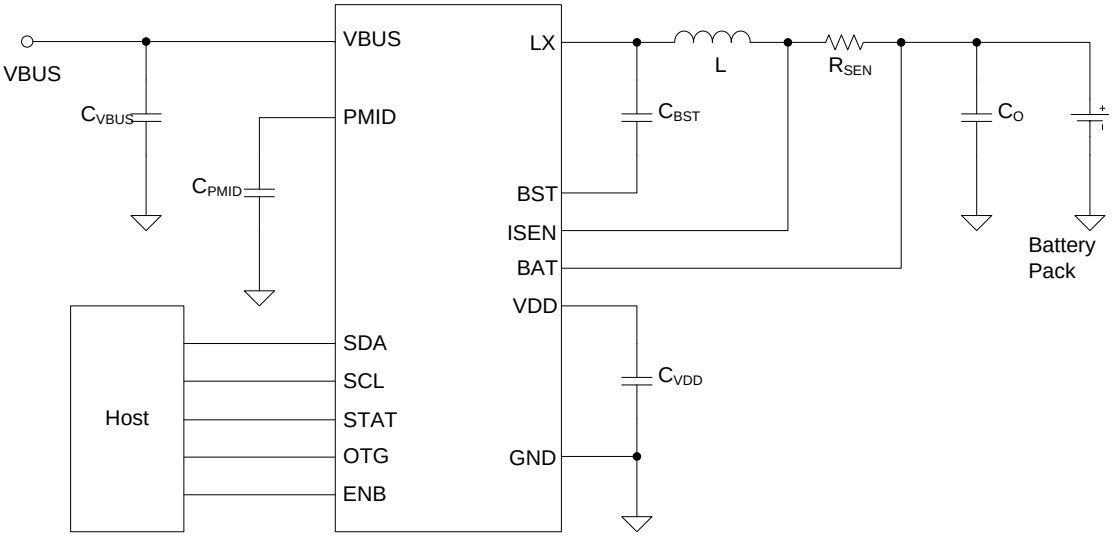
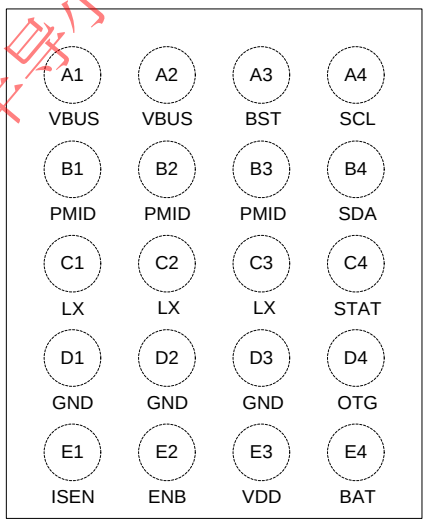


Figure1. SY6923D1 Schematic Diagram

Pinout (top view)



(CSP1.93x2.05-20)

Top Mark: BOT*xyz* (device code: **BOT**, ***x=year code, y=week code, z= lot number code)***

Pin Name	Pin NO.	Pin Description
VBUS	A1,A2	Charger input voltage.
BST	A3	High side power MOSFET driver power supply.
SCL	A4	I^2C clock input. Connect an external pull-up resistor according to I^2C specification.
PMID	B1,B2,B3	Buck converter input point. Bypass it with a minimum of 4.7μF ceramic capacitor to GND.

SDA	B4	I²C data I/O. Open-drain output. Connect an external pull-up resistor according to I²C specification.
LX	C1,C2,C3	Switching node.
STAT	C4	Open drain output for charge status indicator. Pull low during charging.
GND	D1,D2,D3	Ground pins.
OTG	D4	Enable boost regulator with OTG_Enable and OTG_Level_Select bits. During faults, a 128μs pulse is sent out. On VBUS POR, this pin sets the input current limit in default mode.
ISEN	E1	Battery charging current sense positive input.
ENB	E2	Charge enable pin. Active low enables the charger.
VDD	E3	LDO output for converter power MOSFETs driver. Connect a 1μF ceramic capacitor at least to GND.
BAT	E4	Battery charging current sense negative input and battery voltage sense input.

Absolute Maximum Ratings (Note 1)

VBUS, PMID, STAT, SCL, SDA, OTG, ENB, ISEN, BAT ---------- -0.3V to 18V
LX ---------- -2V to 18V
VDD, BST-LX ---------- -0.3V to 3.6V
ISEN-BAT ---------- -0.5V to 0.5V
Package Thermal Resistance (Notes 2)
CSP1.93x2.05, θ_{JA} ---------- 85 ℃/W
Junction Temperature Range ---------- -40 ℃ to 150 ℃
Storage Temperature ---------- -65 ℃ to 150 ℃
Lead Temperature (Soldering, 10s) ---------- 260 ℃

Recommended Operating Conditions (Note 3)

VBUS, PMID, STAT, SCL, SDA, OTG, ENB, ISEN, BAT, LX ---------- -0.3V to 6V
VDD, BST-LX ---------- -0.3V to 3.3V
ISEN-BAT ---------- -0.5V to 0.5V
Junction Temperature Range ---------- -40 ℃ to 125 ℃
Ambient Temperature Range ---------- -40 ℃ to 85 ℃

Note 1: Stresses beyond the "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only. Functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Note 2: θ_{JA} is measured in the natural convection at T_A = 25 ℃ on a low effective four layer thermal conductivity test board of JEDEC 51-3 thermal measurement standard.

Note 3: The device is not guaranteed to function outside its operating conditions.

Electrical Characteristics

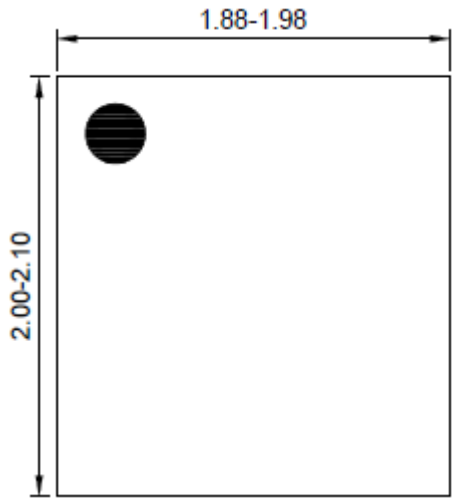
(V_{VBUS} = 5V, ENB=0, R_{SENSE}=68mΩ, T_J=25 ℃, unless otherwise noted)

Parameter	Symbol	Test Conditions	Min	Typ	Max	Unit
Charge Operating Conditions						
VBUS Input Voltage Range	V_{VBUS}		4		6	V
VBUS Under Voltage Lockout	V_{VBUSUV}	VBUS rising edge	3.05	3.3	3.55	V
VBUS Under Voltage Lockout Hysteresis	V_{VBUSUV_HYS}	VBUS falling edge		150		mV
Input Over Voltage	V_{INOV}	VBUS rising edge		6.5		V
Input Over Voltage Hysteresis	V_{INOV_HYS}	VBUS falling edge		170		mV
VBUS Supply Current Control	I_{VBUS}	V_{VBUS} = 5V, PWM not switching			1.5	mA
Charge Regulation Range and Accuracy						
Charge Voltage Regulation Range	V_{BAT_REG}	BAT voltage	3.5		4.44	V
Charge Voltage Regulation Accuracy	$V_{BAT\_REG\_ACC}$	T_A=25 ℃	-0.5		0.5	%
Charge Current Regulation Range	I_{CHG_REG}	V_{ISEN} –V_{BAT}, 68mΩ sense resistor	550		1250	mA
		V_{ISEN} –V_{BAT},55mΩ sense resistor	608		1550	mA
Low Charge Current	I_{CC_LOW}	V_{SHORT}≤V_{BAT}≤V_{CV}, Low_Charge=1		325	350	mA
Charge Current Reference Voltage	V_{CHG}	Low_Charge=0, I_{CHG}_Reference=000	36.8		39.4	mV
		Low_Charge=0, I_{CHG}_Reference=011	57.2		60.5	mV
Battery Voltage Drop for Recharge Threshold	V_{RCH}	V_{RCH} =V_{CV_REG}-V_{BAT}	90	120	150	mV
Recharge Deglitch Time	t_{RCH}	V_{BAT} falls below threshold		130		ms
Input Current Limit Accuracy	I_{IN_LIM}	USB 100mA	83		97	mA
		USB 500mA	450	475	500	mA
VBUS Range for Adaptive Input Current Limit	V_{IIN_LIM}		4.2		4.76	V
VBUS Voltage Regulation Accuracy	$V_{IIN\_LIM\_ACC}$	Adaptive_IIN_Threshold=100	4.4		4.58	V
Charge Termination						
Termination Charge Current Range	I_{TERM}	V_{BAT}>V_{RCH}, V_{BUS}-V_{BAT}>V_{ASD}	50		400	mA
Deglitch Time for Charge Termination	t_{TERM}			30		ms
Termination Current Accuracy	I_{TERM_ACC}	I_{TERM}=100mA	-15		15	%
		I_{TERM}=250mA	-10		10	%

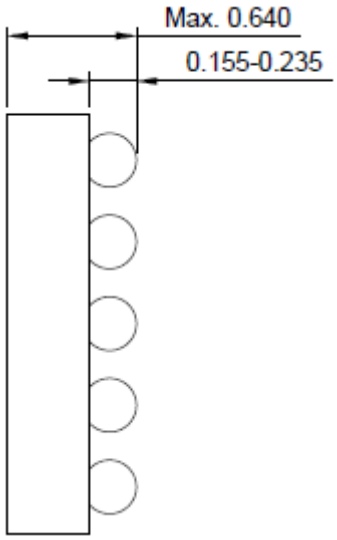
Weak Battery Detection						
Weak Battery Voltage Threshold Range	V_{LOWV}		3.4		3.7	V
Weak Battery Voltage Accuracy	V_{LOWV_ACC}		-5		5	%
Weak Battery Voltage Hysteresis	V_{LOWV_HYS}	Battery voltage falling edge		100		mV
Input Source Qualification						
Poor Input Source Voltage	V_{INUV}	VBUS falling edge	3.6	3.8	4.0	V
Poor Input Source Voltage Hysteresis	V_{INUV_HYS}	VBUS rising edge		200		mV
Current Source to GND for Input Source Qualification	I_{IN_QUA}	During input source qualification		30		mA
Qualification Interval	t_{IN_QUA}	During input source qualification		2		s
Battery Detection						
Battery Detection Current Before Charge Done	I_{BAT_DET}	Begins after termination detected		-0.5		mA
Battery Detection Time	t_{BAT_DET}			260		ms
Auto Shutdown						
Auto Shutdown Threshold	V_{ASD}	V_{VBUS}-V_{BAT} falling edge	0	80	100	mV
Exit Auto Shutdown Threshold	V_{ASD_EXIT}	V_{VBUS}-V_{BAT} rising edge	120	200	280	mV
VDD						
Internal Bias LDO Output	V_{VDD}	I_{VREF}=1mA, C_{VREF}=1μF		3.3		V
VDD Short Circuit Current Limit	I_{VDD}			100		mA
PWM Converter						
Blocking FET $R_{DS(ON)}$	$R_{ON(BLKFET)}$			180	250	mΩ
High Side FET $R_{DS(ON)}$	$R_{ON(HSFET)}$			120	250	mΩ
Low Side FET $R_{DS(ON)}$	$R_{ON(LSFET)}$			110	210	mΩ
Swtching Frequency	f_{SW}			3.0		MHz
Charge Mode Protection						
Battery OVP	V_{BAT_OVP}	VBAT rising edge	110	117	121	%
Battery OVP Hysteresis	$V_{BAT\_OVP\_HYS}$	VBAT falling edge		11		%
Cycle-by-cycle Current Limit	I_{LIM}			2.7		A
Battery Short Threshold	V_{SHORT}	VBAT falling edge	1.85	1.95	2.05	V
Battery Short Hysteresis	V_{SHORT_HYS}	VBAT rising edge		100		mV
Short Mode Charge Current	I_{SHORT}	V_{BAT}<V_{SHORT}		30		mA
Boost Regulation and Accuracy						
OTG Output on VBUS	V_{VBUS_OTG}		4.90	5.05	5.20	V
Maximum OTG Output Current	I_{VBUS_OTG}	V_{VBUS_OTG}=5.05V	350			mA

Cycle-by-cycle Current Limit	I_{OTG_LIM}	V_{VBUS_OTG}=5.05V, 3V<V_{BAT}<4.5V		1		A
OTG Output OVP	V_{OTG_OVP}	VBUS rising edge	5.60	5.75	5.90	V
OTG Output OVP Hysteresis	$V_{OTG\_OVP\_HYS}$	VBUS falling edge		160		mV
Battery Voltage Input OVP	V_{BAT_OVP}	VBAT rising edge	4.75	4.9	5.05	V
Battery Voltage Input OVP Hysteresis	$V_{BAT\_OVP\_HYS}$	VBAT falling edge		200		mV
Battery Voltage Input UVP	V_{BAT_UVP}	VBAT rising edge		2.9	3.05	V
Battery Voltage Input UVP Hysteresis	V_{BAT_UVP}	VBAT falling edge		400		mV
Boost Output Resistance at HI-Z Mode		ENB=1 or HZ_Mode=1	300			kΩ
Thermal Regulation and Thermal Shutdown						
Thermal Shutdown Temperature	T_{SD}	Junction temperature rising edge		155		℃
Thermal Shutdown Temperature Hysteresis	T_{SD_HYS}	Junction temperature falling edge		20		℃
Thermal Regulation Threshold	T_{REG}			120		℃
STAT Output						
Low Level Output Voltage		Sink 10mA current			0.55	V
Leakage Current		5V on STAT pin			1	μA
Logic Level and Timing						
ENB, OTG,SCL,SDA Low Level Threshold	V_{LOW}				0.4	V
ENB, OTG,SCL,SDA High Level Threshold	V_{HIGH}		1.2			V
I^2C Operating Frequency	f_{SCL}				3.4	MHz

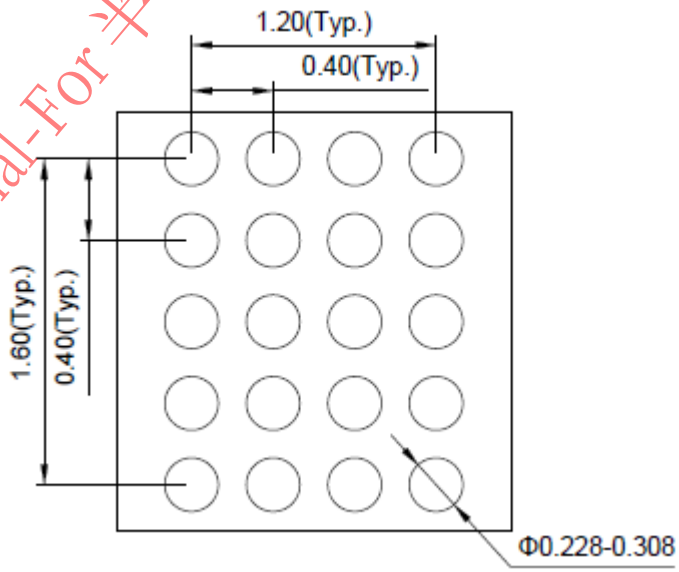
CSP1.93x2.05-20 Package Outline Drawing



Top view



Side view

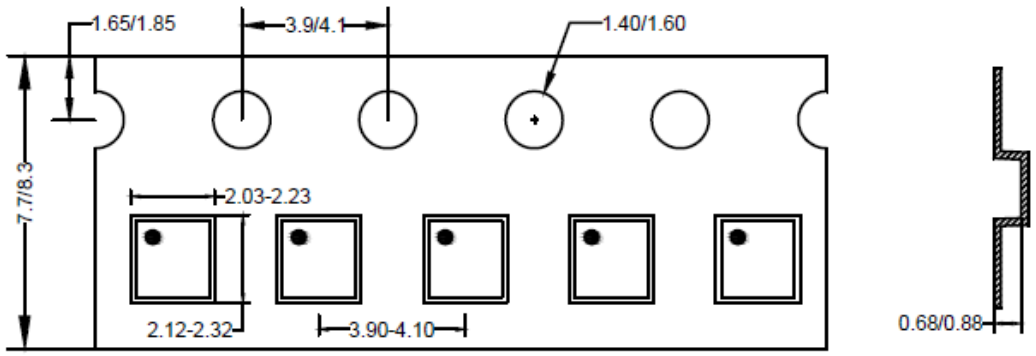


Bottom view

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

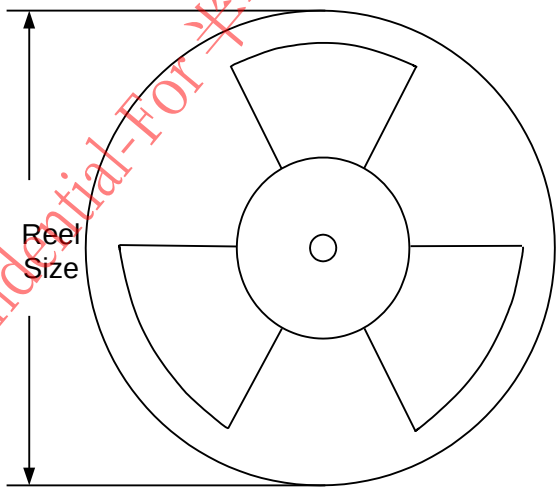
Taping & Reel Specification

1. CSP1.93x2.05



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
CSP1.93*2.05	8	4	7"	400	160	3000

3. Others: NA

单击下面可查看定价，库存，交付和生命周期等信息

>>SILERGY(矽力杰)