

1. Description

PSC2725 combines a highly integrated switch-mode charger, to minimize single-cell Lithium-ion (Li-ion) charging time from a USB power source, and a boost regulator to power a USB peripheral from the battery.

Its low impedance power path optimizes switch-mode operation efficiency, reduces battery charge time and extends battery life during discharging phase. The I2C serial interface with charging and system settings makes the device a truly flexible solution. The device supports 3.5-6.0V input voltage sources, including standard USB host port and USB charging port with 6.1V over-voltage protection. The device also supports USB On-the-Go operation by providing on the VBUS with an accurate current limit.

The power path management regulates the system slightly above battery voltage but does not drop below 3.5-V minimum system voltage (programmable). With this feature, the system keeps operating even when the battery is completely depleted or removed. When the input source current or voltage limit is reached, the power path management automatically reduces the charge current to zero and then starts discharges the battery until the system power requirement is met. This supplement mode operation keeps the input source from getting overloaded.

The device initiates and completes a charging cycle when host control is not available. It automatically charges the battery in three phases: pre-conditioning, constant current, and constant voltage. In the end, the charger automatically terminates when the charge current is below a preset limit in the constant voltage phase. Later on, when the battery voltage falls below the recharge threshold, the charger automatically starts another charging cycle.

The charge device provides various safety features for battery charging and system operation, including charging safety timer, and over-voltage/over-current protections.

The STAT output reports the charging status and also can be used to notify the host when a fault occurs.

The PSC2725 is available in a 24-pin, 4mm x 4mm x 0.55mm QFN package.

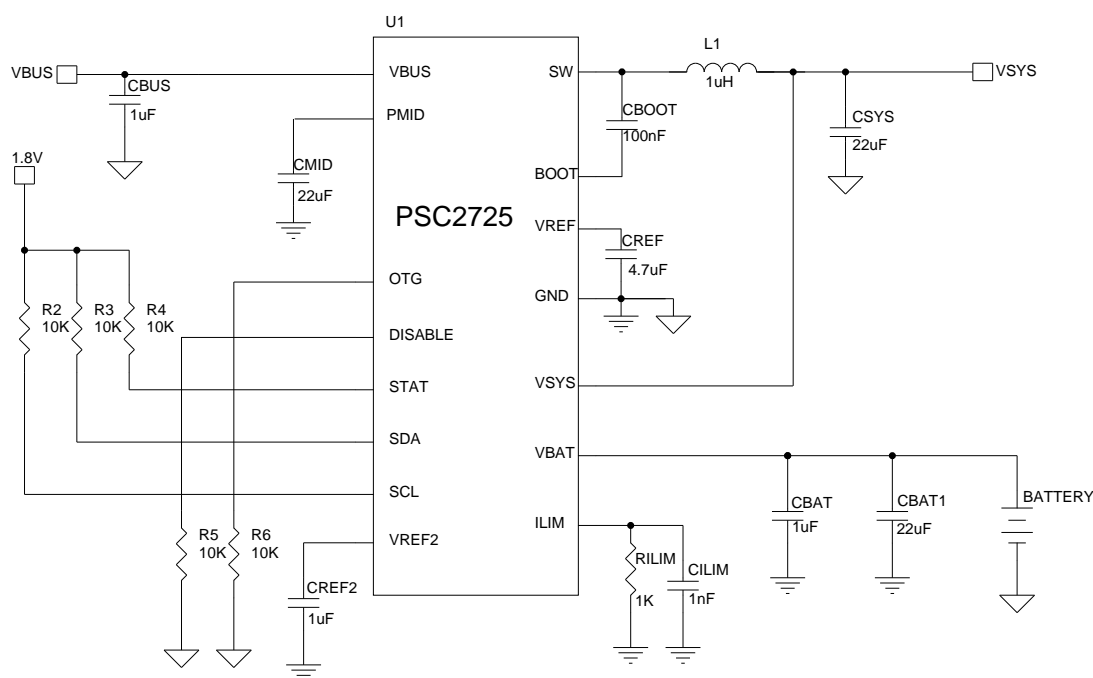


Figure 1.1: Typical Application

2. Features

- Fully Integrated, High-Efficiency Switching Mode 2.5A Charger.
 - ◆ -Charge Voltage Accuracy: $\pm 0.5\%$ 25°C
 - ◆ - $\pm 5\%$ Charge Current Regulation Accuracy
 - ◆ -Input Current Limit: 100mA, 500mA, 750mA, 1A, 1.5A, 1.9A, 3A
 - ◆ -20V Absolute Maximum Input Voltage
 - ◆ -6V Maximum Input Operating Voltage
 - ◆ -Weak Input Sources Accommodated by Reducing Charging Current to Maintain Minimum VBUS Voltage
- Power Path Management
 - ◆ -Instant system on with NO battery or deeply discharged battery
 - ◆ -Battery can be completely turned off after Charging Done
- ◆ -Supports low leakage ship mode
- Programmable through I2C Interface:
 - ◆ -Input Current limit
 - ◆ -Fast-Charge/Termination Current
 - ◆ -Charger Voltage
 - ◆ -Termination Enable
- Small Footprint 1-2.2 μ H External Inductor
- Low Reverse Leakage to Prevent Battery Drain to VBUS
- 5V, 1A Boost Mode for USB OTG for 3.0 to 4.5V Battery Input.
 - ◆ -~90% efficiency at 5V/500mA
 - ◆ -Fast response to loading
- 18 μ A low battery leakage current
- QFN24L-4x4mm² package

3. Applications

- Cellular Phones, Smart Phones, PDAs
- Tablet, Portable Media Players

Key Components	Recommended specification
L1(I _{charge} ≤1.5A)	Inductor, 1.0-2.2 μ H, $\pm 20\%$, I _{sat} >2.5A
L1(I _{charge} ≤ 2.5A)	Inductor, 1.0-2.2 μ H, $\pm 20\%$, I _{sat} >3.5A
C _{MID}	Capacitor, 22 μ F, $\pm 10\%$, >6V
C _{REF}	Capacitor, 4.7 μ F, $\pm 10\%$, >6V
C _{BUS}	Capacitor, 1.0 μ F, $\pm 10\%$, >20V
C _{BOOT}	Capacitor, 100nF, $\pm 10\%$, >6V

4. Pin Configuration and Descriptions

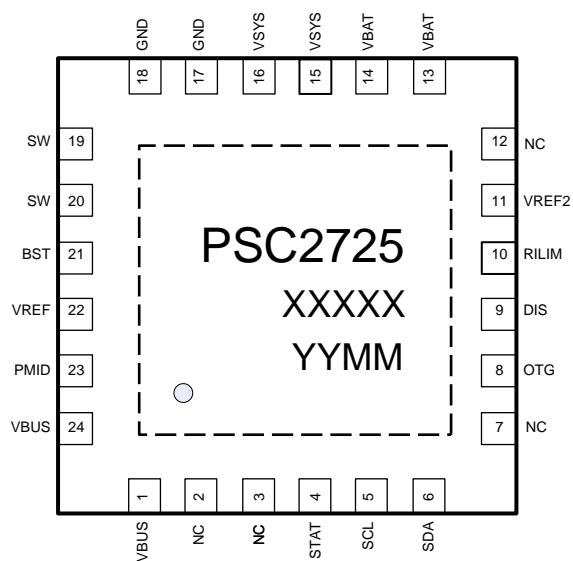


Figure 5.1. QFN4X4-24L TOP view

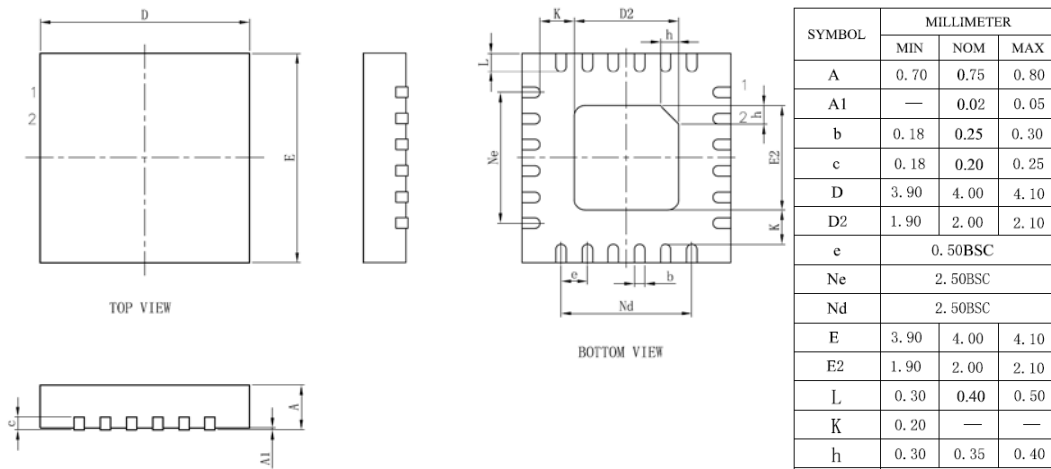
Pin functions

Name	Pin #	Type	Description
VBUS	1,24	P	Charger Input Voltage. Place a 1- μ F ceramic capacitor from VBUS to GND and place it as close as possible to IC.
STAT	4	O	Open drain charge status output to indicate charger operation. Connect to the pullup rail via a 10-k Ω resistor. LOW indicates charge in progress. HIGH indicates charge complete or charged disabled.
SCL	5	I	I ² C Interface clock. Connect SCL to the logic rail through a 10-k Ω resistor.
SDA	6	I/O	I ² C Interface data. Connect SDA to the logic rail through a 10-k Ω resistor.
OTG	8	I	Connect to VBAT, or VREF, or GND via 10-k Ω resistor. Never leave it floating.


USB-Compliant Single-Cell Li-Ion Switching Charger with USB-OTG Boost Regulator

DISABLE	9	I	ActiveLowChargeEnablepin. Batterychargingisenabledwhendisablepin=Low.
RILIM	10	A	Aresistoris connectedfromLILIMpintoGND. The resistance sets the fast charge current, termination current and pre-charge current together with i2c register settings.
VREF2	11	A	Reference biased voltage. Connect a 1uF to GND.
VBAT	13,14	P	Batteryconnectionpointtothepositivepinofthebattery pack.TheinternalQ4isconnecte d between VBATand VSYS.Connect22μF x2closelytothe VBATpin.
VSYS	15,16	P	System power supply.
GND	17,18	G	Powergroundconnectionforhigh-currentpowerconverternode.OnPCBlayout,conne ct <u>directlyto</u> groundconnectionofinputand <u>outputcapacitors</u> ofthecharger.Asinglepointconnectionisrecommendedbetweenpow erPGNDand theanalogGNDneartheICPGNDpin.
SW	19,20	O	Switchingnodeconnectingtooutputinductor.InternallySWisconnectedtothesourceoft hen-channel HSFETandthedrainofthen-channelLSFET.Connectthe0.1-μFbootstrapcapacitorfro
BST	21	P	PWMhighsidedriverpositivesupply.Internally,theBTSTisconnectedtotheanodeofthe boost-strap diode.Connectthe0.1-μFbootstrapcapacitorfromSWtoBTST.
VREG	22	P	PWMlowsidedriverpositivesupplyoutput.Internally,VREGisconnectedtothecathode oftheboost- strapdiode.Connecta10-μF(10-Vrating)ceramiccapacitorfromREGNtoanalogGND.
PMID	23	O	ConnectedtothedrainofthereverseblockingMOSFETandthedrainofHSFET.Giventhe totalinput capacitance,connecta1-μFcapacitoronVBUSToGND,andtherecommended22μFor
Thermal PAD	Thermal PAD	P	Exposedpadforheatdissipation.Always solderthermalpadtotheboard,andhavevias onthethermalpadplanestair-connectingtoGNDandgroundplaneforhigh-currentpowe rconverter.
NC	2,3,7,12	-	No connections.

8. Package Information



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