

Description

The PSC5415A 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.

The charging parameters and operating modes are programmable through an I²C interface. The charger and boost regulator circuits switch at 1.5MHz to minimize the size of external passive components.

The PSC5415A provides battery charging in three phases: conditioning, constant current, and constant voltage.

To ensure USB compliance and minimize charging time, the input current is limited to the value set through the I²C host. Charge termination is determined by 1/10 of the setting current.

The integrated circuit (IC) automatically restarts the charge cycle when the battery falls below an internal threshold. If the input source is removed, the IC enters a high-impedance mode with leakage from the battery to the input prevented. Charge status is reported back to the host through the I²C port.

The PSC5415A can operate as a boost regulator on command from the system. The boost regulator includes a soft-start that limits inrush current from the battery.

The PSC5415A is available in a 2.0 x 1.7mm, 20-bump, 0.4mm pitch WLCSP package.

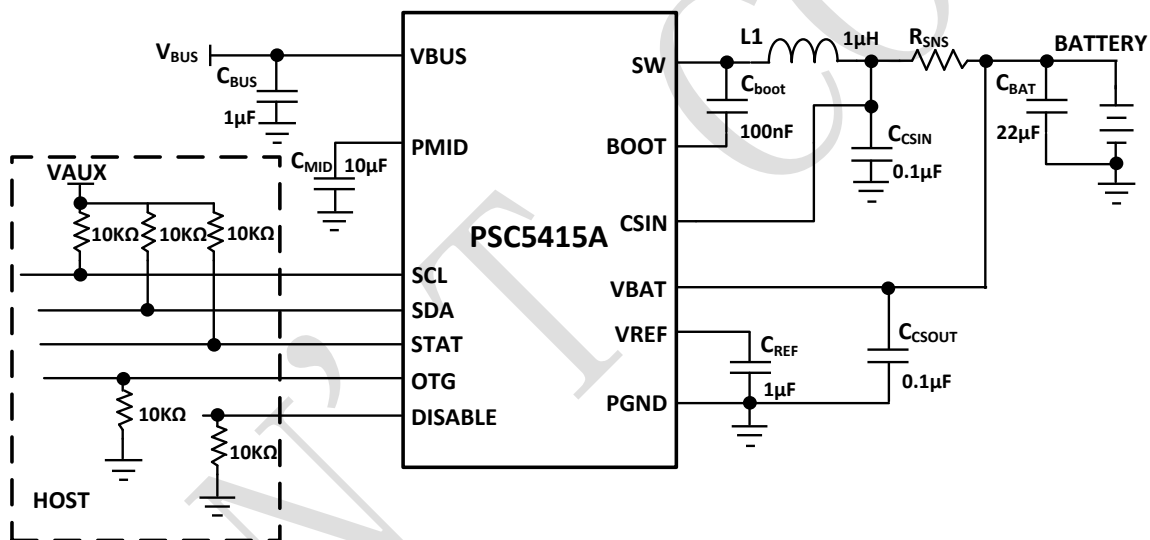


Figure 1: Typical Application

Feature

- Fully Integrated, High-Efficiency Charger for Single-Cell Li-Ion and Li-Polymer Battery Packs
- Faster Charging than Linear
- Charge Voltage Accuracy: $\pm 0.5\%$ 25°C
- $\pm 5\%$ Charge Current Regulation Accuracy
- 20V Absolute Maximum Input Voltage
- 6V Maximum Input Operating Voltage
- 1.5A Maximum Charge Rate

Application

- Cellular Phones, Smart Phones, PDAs
- Tablet, Portable Media Players
- Gaming Device, Digital Cameras

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

- Programmable through I²C Interface:
 - Input Current
 - Fast-Charge/Termination Current
 - Charger Voltage
 - Termination Enable
- 1.5MHz Synchronous Buck PWM Controller with WideDutyCycleRange
- Small Footprint 1μH External Inductor
- Weak Input Sources Accommodated by Reducing Charging Current to Maintain Minimum VBUS Voltage
- Low Reverse Leakage to Prevent Battery Drain to VBUS
- 5V, 500mA Boost Mode for USB OTG for 3.0 to 4.5V Battery Input

Recommended External Components

| Component | Description | Vendor | Parameter | Typ. | Units |
|-------------------------------|---------------------------------------|------------------------|---------------|------|-------|
| L1 (I _{ch} ≤1.5A) | 1.0uH, 20%, 2.3A 2.0mm*1.6mm*0.9mm | Murata:LQM2MPN1R0 | L | 1.0 | μH |
| | | | DCR(Series R) | 80 | mΩ |
| C _{BAT} | 22μF, 10%, 6.3V, X5R, 0603 | Murata: GRM188R60J226M | C | 22 | μF |
| C _{MID} | 10μF, 10%, 6.3V, X5R, 0603 | Murata: GRM185R60J106M | C | 10 | μF |
| C _{BUS} | 1.0μF, 10%, 25V, X5R, 0603 | Murata: GRM188R61E105M | C | 1.0 | μF |

Pin Configuration

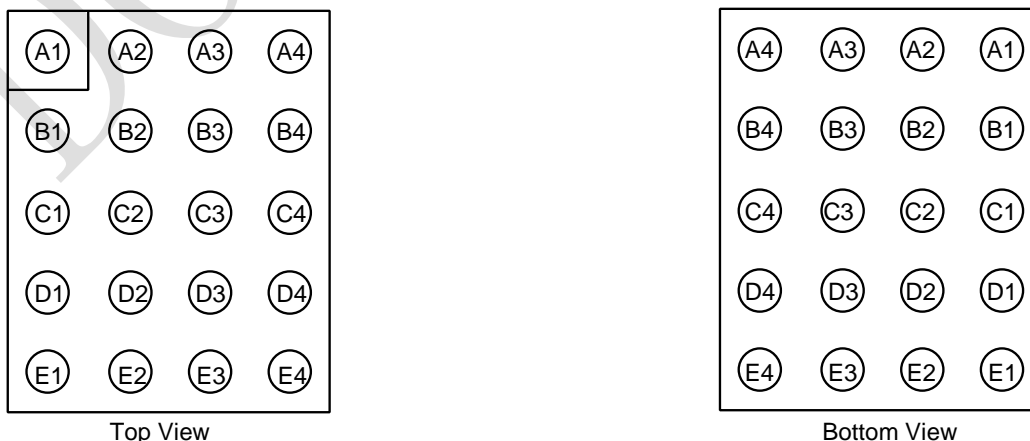


Figure 3: WLCSP-20 Pin Assignments

Pin Definitions

| Pin# | Name | Description |
|-------|---------|---|
| A1,A2 | VBUS | Charger Input Voltage and USB-OTG output voltage. Bypass with a 1 μ F capacitor to PGND |
| A3 | BOOT | Boost strap capacitor connection for high side NMOS gate driver. Connect 33nF~100nF ceramic capacitor (voltage rating \geq 10V) from BOOT to SW pin. |
| A4 | SCL | I²C Interface Serial Clock . This pin should not be left floating. |
| B1-B3 | PMID | Power Input Voltage . Power input to the charger regulator, bypass point for the input current sense, and high-voltage input switch. Bypass with a minimum of 4.7 μ F, 6.3V capacitor to PGND. |
| B4 | SDA | I²C Interface Serial Data . This pin should not be left floating. |
| C1-C3 | SW | Switching Node . Connect to output inductor. |
| C4 | STAT | Status . Open-drain output indicating charge status. The IC pulls this pin LOW when charge is in process. |
| D1-D3 | PGND | Power Ground . Power return for gate drive and power transistors. The connection from this pin to the bottom of C _{MID} should be as short as possible. |
| D4 | OTG | On-The-Go . Enables boost regulator in conjunction with OTG_EN and OTG_PL bits (see Table 16). |
| E1 | CSIN | Current-Sense Input . Connect to the sense resistor in series with the battery. The IC uses this node to sense current into the battery. Bypass this pin with a 0.1 μ F capacitor to PGND. |
| E2 | DISABLE | Charge Disable . If this pin is "1", charging is disabled. When LOW, charging is controlled by I2C registers. |
| E3 | VREF | Bias voltage . Connect to a 1 μ F capacitor to PGND. The output voltage is PMID, which is limited to 6.5V. Any resistor loading to VREF is NOT recommended. |
| E4 | VBAT | Battery Voltage . Connect to the positive (+) terminal of the battery pack. Bypass with a 0.1 μ F capacitor to PGND if the battery is connected through long leads. |

Product dimension

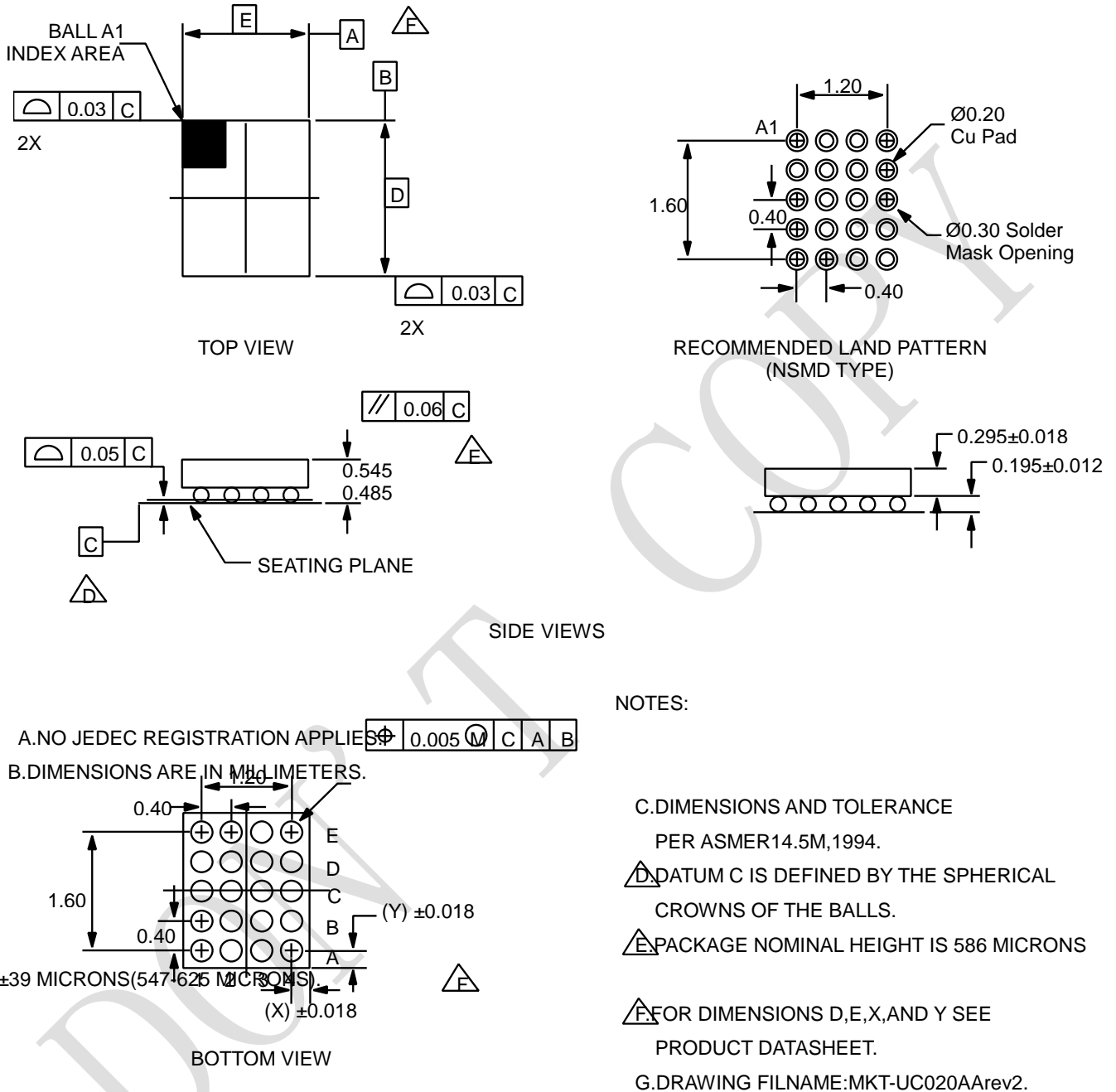



Figure 50. 20-Ball WLCSP, 4x5 Array, 0.4mm Pitch, 250µm Ball

Product-Specific Dimensions (mm)

| Product | D | E | X | Y |
|----------|-------------|-------------|-------|-------|
| PSC5415A | 2.000±0.030 | 1.700±0.030 | 0.250 | 0.200 |


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