CURRENT AND VOLTAGE DYNAMIC POWER MANAGEMENT OF MULTI-CELL CHARGE CONTROLLERS

Input Current Dynamic Power Management

- Limits the input current with the system load as high priority
- Charger sets the current reference

**Benefit:**
Maximizes the utilization of adaptor capability without overloading
System requirements

Convenient & universal

Input source
Adaptor or USB Input current / Voltage

Control interface
Standalone I2C SMBus

Performance vs. budget
safe charging

Mobile device

System
- Min Voltage
- Current

Battery
- Voltage, Charge Current
- Chemistry Configuration
- Capacity

Battery run time & life time

Packaging

Safe charging

Small solution size and cost effective

Performance vs. budget

Battery run time & life time

Convenient & universal

Input source
Adaptor or USB Input current / Voltage

Control interface
Standalone I2C SMBus

Performance vs. budget
safe charging

Mobile device

System
- Min Voltage
- Current

Battery
- Voltage, Charge Current
- Chemistry Configuration
- Capacity

Battery run time & life time

Packaging

Safe charging

Small solution size and cost effective
Universal Charging

• **Challenge**: many adapters / charging ports with *known* and *unknown* current capacity
  – *Known* current capability: Input Current DPM to maximize utilization without overloading
  – *Unknown* current capability: Input Voltage DPM to maximize utilization with limited overloading
USB Power Delivery (PD) over USB Type-C™

<table>
<thead>
<tr>
<th>Precedence</th>
<th>Mode of operation</th>
<th>Nominal voltage</th>
<th>Maximum current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest</td>
<td>USB PD</td>
<td>Up to 20 V</td>
<td>Up to 5 A</td>
</tr>
<tr>
<td></td>
<td>USB Type-C current @ 3A</td>
<td>5 V</td>
<td>3 A</td>
</tr>
<tr>
<td></td>
<td>USB Type-C current @ 1.5A</td>
<td>5 V</td>
<td>1.5 A</td>
</tr>
<tr>
<td></td>
<td>USB BC1.2</td>
<td>5 V</td>
<td>Up to 1.5 A</td>
</tr>
<tr>
<td></td>
<td>USB 3.1</td>
<td>5 V</td>
<td>900 mA</td>
</tr>
<tr>
<td>Lowest</td>
<td>USB 2.0</td>
<td>5 V</td>
<td>500 mA</td>
</tr>
</tbody>
</table>

• What is USB Power Delivery (PD)?
  – USB Power Delivery is a charging technology. It uses USB-C cables and connectors to deliver higher levels of power to your devices.
  – With USB PD, the charging device negotiates a known voltage and current limit with the source.
  – Perfect application for Input Current Dynamic Power Management
Input current dynamic power management

- Limits the input current with the system load as high priority
- Charger sets the current reference

**Benefit:**
Maximizes the utilization of adaptor capability *without* overloading
Input voltage DPM for unknown current capability

• Barrel-jack adapters are still a very common power source

• Barrel size indicates voltage, but no standard mechanism for communicating current limit.

Question: How do you keep from overloading an adapter when the current limit is unknown?
Input voltage dynamic power management

- Limits the input voltage with the system load as high priority

**Benefit:**
Maximize the utilization of adaptor capability *with* limited overloading
Getting started with TI charger solutions

• **E2E forums**
• **Application specific system design pages**
• **Reference designs**
• **Training videos**
• All accessible from our homepage