Point-of-Sale and Mobile Point-of-Sale equipment solutions

- Consumer electronics
- Mobile and wearables
Point-of-sale (POS) terminals are starting to mimic other commercial & consumer portable battery-powered devices.
Global POS terminal shipments show strong growth

Market trends and drivers

Global POS terminal unit shipments are expected to increase from ~69M units in 2017 to ~144M units in 2022 at a CAGR of 16%.¹

Mobile point-of-sale (mPOS) terminal unit shipments are expected to increase from 18.3M units in 2017 to 40.7M units by 2022 at a CAGR of 17.3%.¹

POS terminals are rapidly adopting cellular connectivity; 26M units (38%) of global POS terminals were shipped with option of cellular connection in 2017.²

The APAC is experiencing its highest POS terminal growth rate at 7.7% (2018–2024), with China leading. The North American market is expected to grow steadily at ~5% (2018–2024), replacing traditional POS terminals with mPOS terminals that use the latest features, such as Bluetooth, USB-C, NFC, and QR code readers.³

mPOS terminals have increasingly adopted USB-C ports for fast charging and data synchronization. Thermal protection is recommended.

mPOS terminals are utilizing Li-ion batteries with increasing capacity (similar to mobile consumer devices) due to larger touchscreens and other features such as camera for scanning, cellular connectivity, Wi-Fi, Bluetooth, etc.

POS terminal growth strong at ~16% CAGR

Source:
1. POS terminal unit shipment (Statista, Nov. 2018)
2. POS terminals and wireless M2M (Berg insight, July 2018)
3. APAC and N.A. POS terminal growth rate (Bloomberg, April 2019)
Component recommendations for mPOS terminals

Battery and Charging:
- Fuse
- TVS diode
- setP™*
- TVS diode array
- PPTC

Power adapter:
- Fuse
- TVS diode
- setP™*
- TVS diode array
- Rectifier diode

Display and Communication:
- TVS diode array
- TVS diode

Acronyms:
- PPTC: polymeric positive temperature coefficient
- TVS: transient voltage suppressor

*For use with a USB type C adapter
mPOS terminal system architecture

Legend:
- Green arrows: Power
- Blue arrows: Signal

A. Power adapter
   - AC/DC conversion

B. Main board
   - LCD/LED display
   - I/O interface

C. Battery pack*
   - Battery management
   - Li-ion cells

*Some POS terminals have a detachable/replaceable battery pack.
Component recommendations for the power adapter

1. **Input protection, rectifier and filter**
2. **High-frequency converter and clamp**
3. **Output protection, rectifier and filter**

**Feedback and PWM oscillator**

- **Technology**
  - **Product series**
  - 1. Fuse
     - 875, 215, 373
  - 2. TVS diode
     - P6KE, P6SMB
  - 3. Schottky diode
     - MBR, DST
  - setP™
     - SETP0805-100-CC

**Legend:**
- Green arrow: Power
- Blue arrow: Signal

**USB POWER ADAPTOR TYPE C**

*The setP™ solution is recommended for USB type C port protection.*
## Power adapter: the benefits and features of Littelfuse components

<table>
<thead>
<tr>
<th>Technology</th>
<th>Function in application</th>
<th>Product series</th>
<th>Benefits</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fuse</td>
<td>Protects the power stage from overcurrent events</td>
<td><strong>875, 215, 373</strong></td>
<td>Reduces customer qualification time by complying with regulatory safety standards, such as UL/IEC</td>
<td>Compliant with UL/IEC standards; low internal resistance; shock safe; vibration resistant</td>
</tr>
<tr>
<td>2. TVS diode</td>
<td>Protects the power unit from voltage transients that are induced by lightning and voltage transient events</td>
<td><strong>P6KE, P6SMB</strong></td>
<td>Improves system reliability by protecting components from transients on power lines</td>
<td>600W peak pulse capability; fast response time (&lt;1ps); compatible with the high reflow temperature profile (260°C, 40s)</td>
</tr>
<tr>
<td>3. Schottky diode</td>
<td>Provides rectification and blocking in power supply units</td>
<td><strong>MBR, DST</strong></td>
<td>Improves power supply efficiency</td>
<td>Low forward voltage drop; high-frequency operation; high junction temperature capability</td>
</tr>
<tr>
<td>4. setP™</td>
<td>Provides an indication signal to help protect USB-C plugs and receptacles from overheating</td>
<td><strong>SETP0805-100-CC</strong></td>
<td>Helps improve reliability and user experience by reducing the risk of thermal damage; simple integration into existing USB-C systems</td>
<td>Fast response to thermal events; small form factor; zero IR loss contribution; protects systems with a 100W or higher power rating</td>
</tr>
</tbody>
</table>

1. The setP™ solution is recommended for USB type C port protection.
Component recommendations for motherboard and battery pack of mPOS or POS equipment

Main board

1a DC input
1b USB-C input
2 Storage (SIM/PSAM/SD/TF)
3 Touch-screen display
4 Wi-Fi

Battery pack

5 Battery management IC

Legend:

Power Signal

Technology | Product series
---|---
1a Fuse | 435, 438GT, 0402SFF
TVS diode | SMCJ, SMF, SMBJ
setP™ | SETP0805-100-CC
TVS diode array | SESD10040 4UG, SP3522, SPHVxx
2 TVS diode | SMAJ, SMF
TVS diode array | SP1012
4 PESD | PGB10603
5 PPTC | LoRho SMD, MGP, LR4

Acronyms:
PPTC: polymeric positive temperature coefficient
TVS: transient voltage suppressor
MPU: microprocessor unit
PESD: polymeric electrostatic discharge suppressor

Notes:
1a: DC jack
1b: The USB-C port; setP™ solution is suitable for USB type C port protection (generally, only one DC-input option is implemented in a given unit).
# Battery pack: component benefits and features

<table>
<thead>
<tr>
<th>Technology</th>
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</thead>
<tbody>
<tr>
<td><strong>1a</strong> Fuse</td>
<td>Protects the power stage from overcurrent events</td>
<td>435, 438GT, 0402SFF</td>
<td>Reduces customer qualification time by complying with UL/IEC; compact design</td>
<td>Surface mountable; compatible with the lead-free solder process, per IEC standards</td>
</tr>
<tr>
<td>TVS Diode</td>
<td>Protects sensitive electronic components from voltage transients</td>
<td>SMF, SMBJ or SMCJ</td>
<td>Improves system reliability by clamping the voltage at safe levels during transients</td>
<td>1500W peak pulse capability; compatible with the lead-free solder reflow temperature profile</td>
</tr>
<tr>
<td><strong>1b</strong> setP™</td>
<td>Thermal indicator to protect USB-C plugs and receptacles from overheating</td>
<td>SETP0805-100-CC</td>
<td>Helps improve reliability and user experience by reducing the risk of thermal damage; simple integration into existing USB-C systems</td>
<td>Fast response to thermal events; small form factor; zero IR loss contribution; protects systems with a 100W or higher power rating</td>
</tr>
<tr>
<td>TVS diode array</td>
<td>Protects the USB-C chipset from ESD events on data lines</td>
<td>SESD1004Q 4UG, SP3522</td>
<td>Compact design; reduces assembly time</td>
<td>Low capacitance; complies with IEC standards; small form factor</td>
</tr>
<tr>
<td></td>
<td>Helps protect equipment from user-induced ESD on the power line</td>
<td>SPHVxx</td>
<td></td>
<td>Low clamping voltage; low leakage current; bidirectional</td>
</tr>
<tr>
<td><strong>2</strong> TVS Diode</td>
<td>Protects sensitive electronic components from voltage transients</td>
<td>SMAJ, SMF</td>
<td>Enables compact design; improves system reliability by protecting downstream components via clamping the voltage at safe levels during transients on power lines</td>
<td>400W peak pulse capability; compatible with the lead-free solder reflow temperature profile</td>
</tr>
<tr>
<td><strong>3</strong> TVS diode array</td>
<td>Protects touchscreen ICs from user-induced ESD events</td>
<td>SP1012</td>
<td>Helps comply with IEC standards (61000-4-2: ±15kV contact, ±3kV air; 61000-4-4: 40A (5/50ns); enables compact design; retains high signal integrity</td>
<td>Low dynamic resistance; five-channel protection in a small 0402 footprint; maintains high signal integrity</td>
</tr>
<tr>
<td><strong>4</strong> PESD</td>
<td>Protects the Wi-Fi chipset from user-induced ESD events</td>
<td>PGB10603</td>
<td>Retains RF signal integrity; enables compact design; improves system reliability by quickly clamping the voltage to safe levels during ESD</td>
<td>Ultra-low capacitance; compact form factor; low leakage current; fast response time</td>
</tr>
<tr>
<td><strong>5</strong> PPTC</td>
<td>Protects the Li-ion battery from overcurrent events</td>
<td>LoRho SMD, MGP, LR4</td>
<td>Low resistance improves efficiency, increases safety by protecting the battery, and reduces customer qualification time by complying with UL/IEC</td>
<td>Ultra-low resistance; compact design with a wide range of form factors; compatible with high-volume electronics assembly</td>
</tr>
</tbody>
</table>
Component recommendations for the POS printer

**Display and Communication:**
- TVS diode array
- TVS diode
- PESD

**Power supply:**
- Fuse
- MOV
- TVS diode
- Rectifier diode

**Acronyms:**
- MOV: metal oxide varistor
- TVS: transient voltage suppressor
- PESD: polymeric electrostatic discharge
Component recommendations for the POS printer’s motherboard

### Technology | Product series
---|---
1 | Fuse 435, 438GT, 0402SFF
2 | TVS Diode SMCJ
3 | TVS diode array SP1012
4 | PESD PGB10603
5 | TVS diode Array SP2555NUTG

**Legend:**
- Power
- Signal

**Adapter output**

**Acronyms:**
- TVS: transient voltage suppressor
- PESD: polymeric electrostatic discharge
## POS printer motherboard: component benefits and features

<table>
<thead>
<tr>
<th>Technology</th>
<th>Function in application</th>
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<th>Benefits</th>
<th>Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuse</strong></td>
<td>Protects the power stage from overcurrent events</td>
<td>435, 438GT, 0402SFF</td>
<td>Reduces customer qualification time by complying with third-party safety standards, such as UL/IEC; SMD form factor allows for a compact design</td>
<td>Surface mountable; compatible with the lead-free solder process, per IEC standards</td>
</tr>
<tr>
<td><strong>TVS Diode</strong></td>
<td>Protects the sensitive electronic component from voltage transients</td>
<td>SMCJ</td>
<td>Improves system reliability by protecting downstream components through clamping the voltage at safe levels during transients on power lines</td>
<td>1500 W peak pulse capability; compatible with the lead-free solder reflow temperature profile</td>
</tr>
<tr>
<td><strong>TVS diode array</strong></td>
<td>Protects touchscreen ICs from user-induced ESD events</td>
<td>SP1012</td>
<td>Helps comply with IEC standards (61000-4-2: ±15kV contact, ±30kV air; 61000-4-4: 40A (5/50nS)); enables a compact design; retains high signal integrity</td>
<td>Low dynamic resistance; five-channel protection in a small 0402 footprint; maintains high signal integrity</td>
</tr>
<tr>
<td><strong>PESD</strong></td>
<td>Protects the Wi-Fi chipset from user-induced ESD events</td>
<td>PGB10603</td>
<td>Retains RF signal integrity; enables a compact design; improves system reliability by quickly clamping the voltage at safe levels during ESD</td>
<td>Ultra-low capacitance; compact form factor; low leakage current; fast response time</td>
</tr>
<tr>
<td><strong>TVS diode array</strong></td>
<td>Provides a high level of protection to sensitive electronics from ESD and EFT events</td>
<td>SP2555NUTG</td>
<td>Enables a compact design; reduces assembly time; retains high signal integrity</td>
<td>Complies with IEC standards; low capacitance of 2pF per I/O; maintains high signal integrity</td>
</tr>
</tbody>
</table>
# Compliance and standards for POS terminals

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
<th>General Scope</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB-IF</td>
<td>Universal Serial Bus specification</td>
<td>Supports advancement and adoption of Universal Serial Bus technology</td>
<td>Global</td>
</tr>
<tr>
<td>IEC/UL 60950-1*</td>
<td>Information technology equipment – Safety</td>
<td>Applicable to mains-powered or battery-powered information technology equipment, with a rated voltage not to exceed 600V</td>
<td>Global</td>
</tr>
<tr>
<td>IEC/UL 62368-1</td>
<td>Audio/video, information, and communication technology equipment – Part 1: Safety requirements</td>
<td>Safety of equipment within the field of audio, video, information, and communication technology (rated voltage not to exceed 600V)</td>
<td>Global</td>
</tr>
<tr>
<td>IEC 61000-4-2</td>
<td>Testing – Electrostatic Discharge (ESD)</td>
<td>Checks the capability of the equipment to survive repetitive electrical fast transients and bursts</td>
<td>Global</td>
</tr>
<tr>
<td>IEC 61000-4-4</td>
<td>Electrical fast transient/burst immunity test</td>
<td>Evaluates the immunity of equipment when subjected to electrical fast transient/bursts on supply, signal, control, and earth ports</td>
<td>Global</td>
</tr>
<tr>
<td>IEC/UL 62133-2</td>
<td>Safety requirements for portable sealed secondary lithium cells</td>
<td>Evaluates protection during various battery fault scenarios</td>
<td>Global</td>
</tr>
<tr>
<td>UL 1642</td>
<td>Lithium batteries</td>
<td>Evaluates protection during various battery fault scenarios</td>
<td>North America</td>
</tr>
<tr>
<td>UL 2054</td>
<td>Household and Commercial Batteries</td>
<td></td>
<td>North America</td>
</tr>
<tr>
<td>UL 1310</td>
<td>Class II Power Units</td>
<td>Can be used in lieu of IEC/UL 62368-1</td>
<td>North America</td>
</tr>
<tr>
<td>UL 1012</td>
<td>Power Units other than Class II</td>
<td></td>
<td>North America</td>
</tr>
</tbody>
</table>

*IEC 62368-1 will replace this standard in Dec. 2020.*
Additional information can be found on Littelfuse.com
Why choose Littelfuse?

- A global leader with a broad product portfolio, covering every aspect of protection, sensing, and control
- Application expertise combined with product designed guidelines to help you determine the best component for your application
- Testing capabilities and assistance to support confirmation of your product selection
- Standards compliance expertise, including product compliance to many standards and approval support
- High-volume manufacturing that is committed to the highest quality standards
- A global company with local support

We are committed to supporting your success!
Local resources for a global market