LIM Series: Industrial Lithium Ion Battery:

LIM25H
LIM50EN
LIM40E-13/LIM40E-14
Pursuing new value in energy and the possibilities of the future

**INDEX**

**Line Up**

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<tr>
<th>LIM25H Series</th>
<th>Nominal Voltage(V)</th>
<th>Nominal Capacity(Ah)</th>
<th>The Number of Cells</th>
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</thead>
<tbody>
<tr>
<td>LIM25H-8</td>
<td>28.8</td>
<td>25.0</td>
<td>8</td>
</tr>
<tr>
<td>LIM25H-12</td>
<td>43.2</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LIM50EN Series</th>
<th>Nominal Voltage(V)</th>
<th>Nominal Capacity(Ah)</th>
<th>The Number of Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIM50EN-8</td>
<td>29.6</td>
<td>50.0</td>
<td>8</td>
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<tr>
<td>LIM50EN-12</td>
<td>44.4</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>LIBMII (Battery Management System)</th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>LIM40E Series</th>
<th>Nominal Voltage(V)</th>
<th>Nominal Capacity(Ah)</th>
<th>The Number of Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIM40E-13</td>
<td>48.8</td>
<td>40.0</td>
<td>13</td>
</tr>
<tr>
<td>LIM40E-14</td>
<td>52.5</td>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>

**Installation Record**

- Telecom
- Industrial Machinery
- Energy Storage Systems
Our batteries are manufactured to the highest standards and deliver high quality, long life and superior performance in a wide variety of applications. GS Yuasa’s Battery products deliver reliable battery power for Telecommunications, Renewable Energy, Uninterruptible Power Supply (UPS), Emergency Lighting, and Automotive industries.

Features of the LIM Series

1. Full Range of Applications
   Designed to deliver excellent performance for various applications, such as Telecom, UPS, ESS, EV, and Automatic Guided Vehicle.

2. High Reliability
   These modules are manufactured in Japan using the high quality components and under rigorous Japanese quality control standards.

3. Long Cyclic Life
   Designed to deliver high cycle life and high power.

4. Superior High Rate Performance
   Excellent performance in high-power applications where high charge and discharge rates are required.

5. PSOC (PARTIAL STATE OF CHARGE)
   Not affected by partial state of charge (PSOC) operation. The formation of sulfate crystals that causes early failure in other battery chemistries is not a factor in this battery.
Product

High Power Modules

LIM25H Series

Features

■ 24C Maximum Rate
■ More than 30,000 Cycle Life *
■ Tolerance of cold temperatures down to -20°C (-4°F)

*DOD@100%, Temp 25Deg C
The data is for reference purposes.
Actual performance varies by condition

<table>
<thead>
<tr>
<th></th>
<th>LIM25H-8</th>
<th>LIM25H-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of cells</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Nominal Capacity (Ah)</td>
<td>25</td>
<td>43.2</td>
</tr>
<tr>
<td>Nominal Voltage (V)</td>
<td>28.8</td>
<td>43.2</td>
</tr>
<tr>
<td>Max Charging and Discharging Rate (°C)</td>
<td>24C</td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature (°C)</td>
<td>Charging: -10 Deg C ~ +45 Deg C</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Discharging: -20 Deg C to +45 Deg C</td>
<td></td>
</tr>
<tr>
<td>Weight (kg, lbs)</td>
<td>17.5kg, 38.5 lbs</td>
<td>27.0kg, 59.5 lbs</td>
</tr>
<tr>
<td>Dimension (LxWxH, mm, in)</td>
<td>440 x 219 x 128 mm</td>
<td>617 x 219 x 128 mm</td>
</tr>
<tr>
<td></td>
<td>17.3 x 8.6 x 5.05 in</td>
<td>24.2 x 8.6 x 5.04 in</td>
</tr>
</tbody>
</table>

Applications

• AGV
  *Automatic Guided Vehicle Automatic
• RTG
  *Rubber Tired Gantry Crane
• Diesel Hybrid Train
• UPS

Charging Characteristics

Discharging Characteristics

Condition: Charging: each C, till 4.1V, CCCV, 25°C
Condition: Charging: 1CA, till 4.1V, CCCV, 25°C
Condition: Discharging: 1CA, ending 2.75V, at each Temperatures

The data is for reference purposes.
Actual performance varies by condition
High Energy Modules

LIM50EN Series

Features

■ 6C Discharging Maximum Rate
■ Tolerance of cold temperatures down to -20°C (-4°F)
■ Deliver high cycle life and high power
■ More than 5,000 Cycles*

*IDC@100%, Temp25 Deg C
The data is for reference purposes.
Actual performance varies by condition

<table>
<thead>
<tr>
<th></th>
<th>LIM50EN-8</th>
<th>LIM50EN-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of cells</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>Nominal Capacity (Ah)</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Nominal Voltage (V)</td>
<td>29.6</td>
<td>44.4</td>
</tr>
<tr>
<td>Max Charging and Discharging Rate (C)</td>
<td>Charging:2.5C, Discharging:6C</td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature (C)</td>
<td>-20 Deg C ~ +45 Deg C</td>
<td></td>
</tr>
<tr>
<td>Weight (kg, lbs)</td>
<td>18.0 kg</td>
<td>27.0 kg</td>
</tr>
<tr>
<td></td>
<td>39.68 Lbs</td>
<td>59.2 Lbs</td>
</tr>
<tr>
<td>Dimension (LxWxH/mm, in)</td>
<td>440 x 219 x 128 mm</td>
<td>617 x 219 x 128 mm</td>
</tr>
<tr>
<td></td>
<td>17.32 x 8.62 x 5.05 in</td>
<td>24.29 x 8.62 x 5.04 in</td>
</tr>
</tbody>
</table>

Applications

• UPS
  • Uninterruptible Power System
• ESS
  • Energy Storage System
• AGV
  • Auto Guided Vehicle Automatic
• UPS

Charging Characteristics

Discharging Characteristics

The data is for reference purposes.
Actual performance varies by condition
Product

Battery Management System (LIBM II)

The lithium ion battery requires appropriate battery management to protect the battery from over discharge, over charge, heat up etc. Each battery module is equipped with a battery monitoring PCB which measures and sends signals of cell voltage and module temperature to a battery management PCB (LIBM II) which protects the battery in case of overcharge, overdischarge, over heatup or over current.

Features

- **Balancing Function**
  Automatically adjusts each cell voltage

- **State of Charge(SOC) Calculation**
  Battery SOC is monitored in real time and automatically calculated.

- **Multiple Banks Batch Monitoring**
  Domain LIBM II which is the master of Bank LIBM II for each string, can monitor a large battery system all at once.

- **High Voltage System Specification**
  Max DC1800V (LIBM25H)

### LIBM II Specifications

<table>
<thead>
<tr>
<th></th>
<th>Standard Type</th>
<th>High Voltage Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage (V)</td>
<td>DC21~27</td>
<td></td>
</tr>
<tr>
<td>Max Series Connection (Module)</td>
<td>26</td>
<td>53</td>
</tr>
<tr>
<td>Max Parallel Connection (Bank)</td>
<td>72</td>
<td>36</td>
</tr>
<tr>
<td>Ambient Temperature (°C)</td>
<td>-20 Dec D ~ +65 Deg C</td>
<td></td>
</tr>
<tr>
<td>Mass (g)</td>
<td>210 (Circuit Board), 800 (Touch Panel)</td>
<td></td>
</tr>
</tbody>
</table>

- **Logging Function**
  Can record charging current, cell voltage, SOC and battery temperature. Recorded data can be downloaded by web interface or collected by using USB memory.

- **Modbus/TCP, SNMP Communication**
  Having multiple types of communication makes it possible to interface with various types of customers’ device including remote monitoring systems.
How does Battery Management System work?

LIBM-II collects data from the module monitoring PCB and outputs status of a battery to an external device. In case of an abnormality, LIBM-II will independently send signal to bank MCCB to disconnect battery bank. For a single battery bank application, only one LIBM-II is required. In case of multiple battery banks, one LIBM-II is for each bank and a domain LIBM-II is required to monitor all strings.

**Single Bank System**

LIBM-II has two CAN Channels. Channel 1(ch1) is for monitoring battery status and Channel 2(ch2) is for communication with external device.

**Multi Bank System**
Product

Modules For Cyclic Telecom Applications

LIM40E Series

Features

- 1.25C Charging/Discharging Maximum Rate
- Tolerance of cold temperature down to -20°C (-4°F)
- More than 5,000 Cycles*

*LIM70 100%, Temp 25 Deg C
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 Actual performance varies by condition

<table>
<thead>
<tr>
<th></th>
<th>LIM40E-13</th>
<th>LIM40E-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>The number of cells</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Nominal Capacity (Ah)</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Nominal Voltage (V)</td>
<td>48.8</td>
<td>52.5</td>
</tr>
<tr>
<td>Max Charging and</td>
<td>1.25</td>
<td>1.25</td>
</tr>
<tr>
<td>Discharging Rate (C)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient Temperature (C)</td>
<td>20 Deg C</td>
<td>50 Deg C</td>
</tr>
<tr>
<td>Weight (kg, lbs)</td>
<td>27kg</td>
<td>27kg</td>
</tr>
<tr>
<td>Dimension (LxWxH/mm, in)</td>
<td>362 x 435 (480) x 130 mm</td>
<td>63.9 x 172.8 x 5.11 in</td>
</tr>
<tr>
<td>Multiple Connection</td>
<td>MAX 32 units (*1,280Ah)</td>
<td></td>
</tr>
<tr>
<td>User Interface</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- dry contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- communication 1</td>
<td>3 ch CAN 2.0B 1ch</td>
<td></td>
</tr>
<tr>
<td>- communication 2</td>
<td>3 ch</td>
<td></td>
</tr>
</tbody>
</table>

Charging Characteristics

![Charging Characteristics](image1)

Discharging Characteristics

![Discharging Characteristics](image2)

Applications

- Telecom
- CATV
  - Community Antenna TeleVision
- BTS
  - Base Transceiver Station

*The data is for reference purposes.
*Actual performance varies by condition
System Design

LIM40E-13/14 is a high performance lithium ion battery module designed for Telecom use. LIM40E-13/14 has outstanding cyclic life and can charge at 1.25C thus reducing the Total Cost of Ownership (TCO) in regions with unreliable or unavailable grid conditions.

Installation image

LIM40E-13/14 can be mounted onto a 19 inch rack making installation and maintenance easy. In addition, using LIM40E-13/14 will save space and have less weight compared to lead acid batteries. Battery capacity can be flexibly increased to match customer needs by connecting multiple modules in parallel.
Installation Record

Telecom

Quewave SA / Vodafone Egypt
*End User is Vodafone Egypt. The Batteries have been supplied by our local partner Quewave, SA.
Application: Backup for Base Station
Capacity: 25kWh
Operation Start Date: July, 2016

Industrial Equipment

ZPMC
Application: Automatic Guided Vehicle
Capacity: 316kWh/vehicle
Operation Start Date: Jan, 2017

True Corporation Group
Application: Backup for Cable TV
Capacity: 2kWh
Operation Start Date: October, 2015

Japan Freight Railway Company
Application: Train
Capacity: 67kWh
Operation Start Date: February, 2012

Axiata Group
Application: Backup for Base Station
Capacity: 12kWh
Operation Start Date: September, 2016

Sumitomo Heavy Industries Material Handling Systems. Co., Ltd
Application: Transfer Crane
Capacity: 14kWh/crane
Operation Start Date: July, 2017
Energy Storage

Tokyo Tama Intercity Monorail Co., Ltd.
Application: Regenerative Power Absorption/ Emergency Running
Capacity: 75 kWh (Power Absorption), 202.46 kWh (Emergency Running)
Operation Start Date: July, 2016

Parker Hannifin Corp.
Application: Energy Storage
Capacity: 5 MWh
Operation Start Date: Oct, 2016

Chugoku Electric Power Co., Inc.
Application: Output Fluctuation Regulation for Renewable Energy
Capacity: 1,350 kWh
Operation Start Date: September, 2015

TOBU Railway Co., Ltd
Application: Regenerative Power Absorption
Capacity: 104 kWh
Operation Start Date: October, 2016