40LP  
40nm Process Technology

Enabling Connected Intelligence

GLOBALFOUNDRIES 40LP process technology platform is ideal for power- and price-sensitive mobile and wireless applications with flexible mixed-technology options for RF, low voltage and automotive. 40LP also enables mmWave solutions for applications that require greater than 30GHz operation.

40LP provides up to 40% less power, 60% less area and significantly lower cost compared to 65nm technologies. The 40nm platform supports a wide choice of device component options to meet your exacting low-power product specifications.

Target Applications and Solutions

- mmWave Automotive Radar (40LP+RF+eNVM)
- Single-chip PMIC / motor control (40LP+eNVM)
- Automotive (Body Electronics / Power Train) (40LP+eNVM)
- Wearables (40LP+RF)
- NFC devices (40LP+eNVM)
- Industrial / Smart Meters (40LP)

Highlights

- Single 40nm platform to support logic, analog, RF and eNVM
  + Reusable designs for maximum ROI
  + Manufactured in Singapore
  + High volume production with fully mature D0 (<0.04 def/in²) defect density
- Optimized for mobile and wireless applications
  + Baseband SoC
  + Mobile Multimedia
  + Wireless Consumer
  + Digital TV, STB
  + Automotive MCUs
  + IoT
- Comprehensive design ecosystem
  + Full range of Foundation and Complex IP libraries
  + PDK and reference flows supported by major EDA and IP partners
  + High performance and high reliability eFlash macro (Auto Grade 1)
- Extensive services and supply chain support
  + Regularly scheduled MPWs
  + Layout database consolidation and mask assembly services
  + Advanced packaging and test solutions including 2.5D and 3D
Technology Overview

- 40nm LP with 1.1V CMOS logic
  + 4 core device Vt's
  + 2.5V I/O with Overdrive (3.3V) and Underdrive (1.8V) options, and 1.8V I/O with Underdrive (1.5V) option
- APMOM, MIM and MOS capacitors
- eFuse macro
- Large suite of passive devices
- Wide choice of productized metal stack options
- Standard temperature range: -40°C to +105°C

IP Overview

The 40LP Platform IP portfolio includes a wide range of silicon-proven high performance, power-optimized solutions for a broad set of applications.

### Foundation IP

<table>
<thead>
<tr>
<th>Library</th>
<th>Standard Cell 9T</th>
<th>Standard Cell 12T</th>
<th>SRAM &amp; ROM Compiler</th>
<th>GPIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLL</td>
<td>Temp Sensor</td>
<td>ESD</td>
<td></td>
<td></td>
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</tbody>
</table>

### Interface IP

<table>
<thead>
<tr>
<th>Memory</th>
<th>DDR3/2</th>
<th>LPDDR3/2</th>
<th>HDMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>SATA I/II</td>
<td>PCIe G1/2</td>
<td>USB3.0/2.0</td>
<td></td>
</tr>
<tr>
<td>MIPI D-PHY</td>
<td>SerDes</td>
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</tbody>
</table>

### Memory

<table>
<thead>
<tr>
<th>Memory</th>
<th>eFlash</th>
<th>eFuse</th>
<th>NVM: OTP</th>
<th>ROM</th>
<th>SRAM</th>
</tr>
</thead>
</table>

Contact GF for IP availability.

### 40nm Platform Extensions

The 40nm LP platform offers numerous technology options that enable you to further innovate and differentiate your design.

- **RF**
  - RF models for high frequency wireless connectivity for low power applications
- **eNVM**
  - Consumer and Automotive grade embedded NVM for MCU, IoT
- **Automotive**
  - Grade 2 and 1 for high reliability, AEC-Q100 (Rev.G) qualified process

### 40nm High Performance and High Reliability eFlash solution

- **Fast Speed**
  - Read Access ~10ns
  - Sector Erase time ~10ms
  - Word Program speed ~10μs
- **Small Macro**
  - 0.066μm² bit cell
  - Optimized macro
  - Flexible macro form factor
- **Cost Benefit**
  - 30% smaller bit cell than 55nm
- **High Density**
  - NVM Memory density up to 16Mb
- **Power Efficient**
  - Active $I_{read} < 200\mu A/MHz$ (low-power mode)
- **Reliable**
  - Automotive grade
  - 10 year data retention
- **Endurance**
  - >200k Cycles

### GLOBALSOLUTIONS® Design and Manufacturing Ecosystem

GLOBALSOLUTIONS is the sum of our internal resources and ecosystem partners, combined to efficiently enable the fastest time-to-volume. This ecosystem includes partners in all aspects of design enablement and turnkey services, OPC and mask operations, and advanced capabilities in assembly solutions.

### Libraries

- (Standard Cells, Memories)
- Analog / Mixed-signal
- Processor IP
- High-speed Interfaces

### Full Suite PDK, Reference Flow

- 40nm LP Process Technology
- SoC Packaging
- 2.5D and 3D Packaging

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