Mixed-Signal/RFCMOS
Mixed-Signal and RFCMOS applications have become major requirements for system-on-chip designs. UMC provides a logic compatible process for Mixed-Signal/RF solutions and offers many advanced features to optimize the passive devices such as inductors and capacitors. The frequency range of UMC’s scalable models range up to 20GHz. In addition, UMC works very closely with industry leading EDA vendors to deliver seamless design flows to help accelerate time-to-silicon.

**Solutions for Mixed-Signal/RFCMOS Applications**

**RF/Wireless Landscape**

- **PAN** (Personal Area Network)
  - 802.11ay
  - 802.11ad
- **LAN** (Local Area Network)
  - 802.11ax
  - 802.11ac
  - 802.11n
  - 802.11a/g
  - 802.11b
- **WAN** (Wide Area Network)
  - 5G
  - 4G
  - 3G
  - 2.5G

PAN: Personal Area Network, LAN: Local Area Network, WAN: Wide Area Network
## Technology and Performance

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▲ Developing

## Key Features
- High Q inductors on the thicker top copper metal
- High density MIM capacitors
- Cost effective Metal Oxide Metal capacitors (MOM)
- Precision poly resistors
- Deep Nwell for noise isolation
- Multiple Vt devices for optimized circuit performance
- Wide tuning range Varactors
- Diodes
**Comprehensive MS/RF Platform**

UMC’s MS/RF technology solutions offer optimum speed and performance. UMC’s superior $f_t$ and low $NF_{min}$ satisfy most commercial applications. For portable and consumer applications, UMC provides comprehensive processes in accordance with customers’ particular product requirements.

**UMC MS/RFCMOS Offerings**

- **Active**
  - MOS
  - Native MOS
  - Bipolar

- **Passive**
  - MOM
  - Inductor
  - Resistor
  - Diode
  - MIM
  - Transformer
  - Varactor

**UMC RFCMOS Process Platform**

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<th>LP</th>
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**Note:**
- VIL/VCL/VTL is Virtual Inductor/Capacitor/Transformer Library
- FDK is Foundry Design Kit

**FDK**

- Device Symbols
  - Models
  - P Cells
  - VIL/VCL/VTL
  - Rule decks / Tech Files
MS/RF Technology Platform

Active and Passive Devices

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<th>LT30E</th>
<th>LT10AE</th>
<th>90LL</th>
<th>90SP</th>
<th>L65LL</th>
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<th>28HLP</th>
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<th>Active Devices</th>
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*: RF Model Support

*: Please Contact Account Managers for I/O Options of Each Node

Available
**Foundry's First Virtual Inductor/Transformer/Capacitor Libraries**

UMC works with its EDA tool partners to deliver the industry's first parameterized design kits. Full wave simulation has been performed on all kits within the Virtual Inductor / Transformer / Capacitor Libraries. The virtual libraries enable RFCMOS designers to create and simulate custom inductor geometries that are based on UMC's processes. These libraries are built upon UMC's Electromagnetic Design Methodology (EMDM), which allows engineers to easily and accurately create any RF structure. EMDM gives designers the flexibility to innovate new geometries simply by editing parameters such as diameter, number of turns or width.

---

**Foundry's First Virtual Library**

**VIL**
- Spiral
- Differential w/o center tap
- Differential with center tap
- Stack

**VTL**
- W/O center tap
- CT on primary coil
- CT on secondary coil
- Octagon

**VCL**
- Symmetry
- Asymmetry

Note: The Virtual library can be used to simulate all types of RF inductors and capacitors.
CT: Center Tap

---

**MS/RF Design Flow and FDK**

The FDK (Foundry Design Kit) provides IC designers with an automatic design environment. The methodology provides access to circuit-level design and simulation, circuit layout, and layout verification using RF device models. In the front-end, fundamental components of UMC's MS/RF process are implemented in common design environments and simulation tools. The back-end includes parameterized cells (P Cell), which includes a schematic driven layout to provide an automatic and complete design flow. Callback functions are also provided in the design flow to minimize data entry. EDA tools for MS/RF designs are also supported.
Optimum Inductor/Capacitor/Transformer Finder (OIF/OCF/OTF)

UMC offers the Optimum Inductor Finder (OIF) in the FDK package. The OIF gives designers the ability to quickly access a large library of inductors accurately calibrated to UMC’s silicon. It also allows users to perform inductor optimization through just a few simple steps using the user-friendly interface. For instance, customers can define a desired inductor and make trade-offs between Q-factor and area. The OIF will select a design that best fits the specifications in a matter of seconds.

In addition, UMC offers the Optimum Capacitor Finder (OCF) in the FDK package. The OCF gives designers the ability to quickly access a large library of capacitors accurately calibrated to UMC’s silicon. It also allows users to perform capacitor optimization through just a few simple steps using the user-friendly interface. For instance, customers can define a desired capacitor and make trade-offs between Q-factor and area. The OCF will select a design that best fits the specifications in a matter of seconds.

UMC also offers the Optimum Transformer Finder (OTF) in the FDK package. The OTF gives designers the ability to quickly access a large library of transformers accurately calibrated to UMC’s silicon. It also allows users to perform transformer optimization through just a few simple steps using the user-friendly interface. For instance, customers can define a desired transformer and make trade-offs between impedance and area. The OTF will select a design that best fits the specifications in a matter of seconds.

FDK EDA Supported Tools

MS/RF Design Flow

<table>
<thead>
<tr>
<th>Schematic Entry</th>
<th>Pre-simulation</th>
<th>Hspice/Spectre Models</th>
<th>Physical Design</th>
<th>Physical Verification (DRC/LVS/RCX)</th>
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Note: * is available by request.
New Customers
For new customer inquiries, please direct all questions to sales@umc.com

Worldwide Contacts
Headquarters:
UMC
No. 3, Li-Hsin 2nd Road, Hsinchu Science Park, Hsinchu, Taiwan, R.O.C.
Tel: 886-3-578-2258
Fax: 886-3-577-9392
Email: foundry@umc.com

In China:
United Semiconductor (Xiamen)
No. 899, Wan Jia Chun Road, Xiang An, Xiamen, Fujian 36101, China
Tel: 86-592-7687888
HeJian Technology (Suzhou)
No. 333, Xinghua Street, Suzhou Industrial Park, Suzhou, Jiangsu Province 215025, China
Tel: 86-512-65931299
Fax: 86-512-62530172

In Japan:
UMC Group Japan
15F Akihabara Centerplace Bldg., 1 Kanda Aiol-Chi Chiyoda-Ku
Tokyo 101-0029 Japan
Tel: 81-3-5294-2701
Fax: 81-3-5294-2707

In Singapore:
UMC-SG
No. 3, Pasir Ris Drive 12, Singapore 515528
Tel: 65-6213-0018
Fax: 65-6213-0005

In Korea:
UMC Korea
1117, Hanshin Intervally24, 322, Teheran-ro, Gangnam-gu, Seoul, Korea
Tel: 82-2-2183-7790
Fax: 82-2-2183-1794
Email:korea@umc.com

In North America:
UMC USA
488 De Guigne Drive, Sunnyvale, CA 94085, USA
Tel: 1-408-523-7800
Fax: 1-408-733-8090

In Europe:
UMC Europe BV
De entree 77
1101 BH Amsterdam Zuidoost
The Netherlands
Tel: 31-(o)20-5640950
Fax: 31-(o)20-6977826