Micrel New Product Highlights

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**MIC22705 — 1MHz, 7A Integrated Switch High-Efficiency Synchronous Buck Regulator Featuring Pre-Biased Start-Up**

The Micrel MIC22705 is a high-efficiency, 7A integrated switch synchronous buck (step-down) regulator. The MIC22705 is optimized for highest efficiency, achieving more than 95% efficiency while still switching at 1MHz. The ultra-high speed control loop keeps the output voltage within regulation even under the extreme transient load swings commonly found in FPGAs and low-voltage ASICs. The output voltage is pre-bias safe and can be adjusted down to 0.7V to address all low-voltage power needs.

The MIC22705 offers a full range of sequencing and tracking options. The Enable/Delay (EN/DLY) pin, combined with the Power Good (PG) pin, allows multiple outputs to be sequenced in any way during turn-on and turn-off. The Ramp Control™ (RC) pin allows the device to be connected to another product in the MIC22xxx and/or MIC68xxx family, to keep the output voltages within a certain ΔV on start-up.

**MIC22705 Typical Application**

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**MIC25400 — 2A Dual Output PWM Synchronous Buck Regulator IC**

The MIC25400 is a synchronous PWM dual output step down converter with internal 2A high-side switches. The MIC25400 has an integrated low-side gate driver for synchronous step-down conversion by connecting an external N-channel MOSFET to achieve high efficiencies in low duty-cycle applications. The IC’s switching frequency is 1MHz. A patented control scheme allows the use of a wide range of output capacitance from small ceramic capacitors to large electrolytic types with only one compensation component. A 2% output voltage tolerance over the temperature range allows the maximum level of system performance. The MIC25400 power good signal allows full control for sequencing the output voltages with minimum external components.

An adjustable current limit allows the use of smaller inductors in lower current applications.

The MIC25400 is available in the ePAD 24-pin (4mm x 4mm) MLF® package, and has an operating junction temperature range of −40°C to +125°C.

**Applications**

- Multi-output power supplies with sequencing
- DSP, FPGA, CPU and ASIC power supplies
- Telecom and networking equipment, servers

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**Features**

- Input voltage range: 4.5V to 13.2V
- Adjustable output voltages down to 0.7V
- 2A per channel
- 180° out-of-phase operation
- Low-side driver for synchronous operation
- 2% output voltage accuracy (over temperature)
- 1MHz switching frequency
- Output voltage sequencing
- Programmable max current-limit
- Power good output
- Ramp Control™ provides soft-start
- Low-side current sensing allows very low duty-cycle
- Works with ceramic output capacitors
- Available in a 24-pin (4mm x 4mm) MLF® package
MIC2267 — Input Current Limiting Synchronous Buck Regulator, USB Power Maximizer™

The MIC2267 is a USB Power Maximizer™ which transfers the maximum power from the limited USB current source by shaping the input current limit profile. It incorporates a high efficiency, integrated synchronous step down regulator. Internal 150mΩ switches and adjustable operating frequency allows the MIC2267 to achieve greater than 90% efficiency across a broad load range. It replaces the USB current limit switch, 5V buck regulator and minimizes capacitance for many USB applications. The adjustable frequency control can be utilized to move harmonics away from sensitive frequency bands.

The MIC2267 allows the input current limit profile to be shaped for various applications. With a current mode control with external compensation, the MIC2267 transient response can be optimized over load and output capacitance making it highly flexible for many applications.

Features
- Input voltage range: 3.0V to 5.5V
- Output voltage adjustable down to 1.0V
- Up to 96% efficiency at 500mA output
- Efficiency >90% across a broad load range
- Fast transient response
- Adjustable frequency from 400kHz to 1.5MHz
- Adjustable input current limiting 100mA to over 1A
- 100% maximum duty cycle
- Fully integrated MOSFET switches
- Micropower shutdown
- Thermal shutdown and output current limit protection
- Available in a 12-pin (3mm x 3mm) MLF® package

Applications
- USB power
- Wireless router cards
- General buck converter applications

Applications
- USB power
- Wireless router cards
- General buck converter applications

MIC4811 & MIC4812 — High Current 6 Channel Linear WLED Driver with DAM™ and Ultra Fast PWM™ Control

The MIC4811 and MIC4812 are high efficiency linear White LED (WLED) drivers designed to drive up to six high current WLEDs for signage. Both devices provide the highest possible efficiency as this architecture has no switching losses present in traditional charge pumps or inductive boost circuits. They also provide six linear drivers which maintain constant current for up to six WLEDs. The MIC4811 features a typical dropout of 100mV at 50mA, while the MIC4812 features a typical dropout of 190mV at 100mA.

The MIC4811 and MIC4812 feature Dynamic Average Matching™ (DAM™) which is specifically designed to provide optimum matching across all WLEDs. The high accuracy (±1% typical) current regulated WLED channels ensure uniform display illumination under all conditions. The brightness is controlled through an Ultra Fast PWM™ interface operating down to less than 1% duty cycle.

Features
- High efficiency (no Voltage Boost losses)
- Ultra fast PWM™ control (200Hz to 500kHz)
- Input voltage range: 3.0V to 5.5V
- LED current range up to 100mA per channel
- Programmable LED current with external resistor
- Dropout of 190mV at 100mA
- Matching better than ±1% (typical)
- Current Accuracy better than ±1% (typical)
- Maintains proper regulation regardless of how many channels are utilized
- Available in a 10-pin MSOP package (MIC4811)
- Available in a 10-pin ePad MSOP package (MIC4812)

Applications
- Billboard displays
- Marquee displays
- Instrument displays
- LCD display modules

MIC4812 Typical Application
The MIC5356 also incorporates an active discharge feature when the part is disabled that switches in a 30Ω load to pull down the output of the regulator. The MIC5167 will source 6A and sink up to 6A.

A window comparator monitors the output voltage and controls the power good output. If the output voltage is outside ±15% limit of V_{REF} the power good is driven low.

MIC5355/6 — Dual 500mA µCap Low Dropout, Micropower Linear Regulator

The MIC5355/6 is an advanced dual, micropower, low dropout linear regulator. The MIC5355/6 provides low quiescent current operation, using only 70µA with both outputs enabled making it ideal for battery-powered systems. In shutdown, the quiescent current drops less than 1µA. The MIC5355/6 provides two independently-controlled high-performance 500mA LDOs with typical dropout voltage of 350mV at rated load. In addition, the MIC5355/6 is optimized to provide fast load and line transient performance with low-ESR ceramic output capacitors, requiring a minimum of only 2.2µF.

The MIC5356 also incorporates an active discharge feature when the part is disabled that switches in a 30Ω load to pull down the output of the regulator. The MIC5355/6 is available in fixed output voltages in a thermally-enhanced 8-pin ePad MSOP package.

MIC5357 — High Performance, Low Noise Dual 500mA ULDO™

The MIC5357 is a tiny Dual Ultra Low Dropout (ULDO™) linear regulator ideally suited for portable electronics due to its low output noise. The MIC5357 provides two independently controlled high performance 500mA LDOs with typical dropout voltage of 130mV at rated load. In addition, the MIC5357 provides a bypass pin to reduce the output noise.

The MIC5357 is designed to be stable with small ceramic output capacitors thereby reducing required board space and component cost. The two 500mA outputs with very low dropout voltage and output noise makes the MIC5357 ideal for powering cellular phone camera modules and other functions in PDAs, MP3 players and WebCam applications.

The MIC5357 ULDO™ is available in fixed output voltages in the small 8-pin ePad MSOP package.
MIC803 — 3-Pin Microprocessor Supervisor Circuit with Open-Drain Reset Output

The MIC803 is a single-voltage supervisor with open-drain reset output that provides accurate power supply monitoring and reset generation in microprocessor based systems. The function of the device is to assert a reset signal if the power supply voltage drops below the Reset Threshold Voltage, and retain this reset for the Reset Timeout Period once the power supply increases above the Reset Threshold Voltage.

The MIC803 consumes only 4.5μA of supply current and offers three reset delay periods of: 20ms, 140ms and 1120ms (min). It features factory programmed reset threshold levels from 2.63V to 4.63V to accommodate 3.0V, 3.3V, and 5.0V power supplies. It is available in the compact 3-pin SC-70 and SOT-23 package options.

**Applications**
- Critical microcomputer power monitoring
- Portable equipment
- Solid state drives
- Printers/computers
- Embedded controllers

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SY84113BU — Low Power 2.5V 1.25Gbps Limiting Post Amplifier with Ultra Wide LOS Range

The SY84113BU low power limiting post amplifier is designed for use in fiber-optic optical modules for multirate applications up to 1.25Gbps. The device connects to a typical transimpedance amplifier (TIA) and can produce output signals to CML-level waveforms. Intended for use in GbE and Fibre Channel applications, the SY84113BU offers a wide LOS range. It is able to detect input signals for as low as 5mVpp and as high as 100mVpp. The SY84113BU is intended to be used in AC-coupled input applications.

The SY84113BU generates a Loss-of-Signal (LOS) open-collector TTL output. A programmable Loss-of-Signal level set pin (LOSLVL) sets the sensitivity of the input amplitude detection. LOS asserts high if the input amplitude falls below the threshold set by LOSVL and de-asserts low otherwise. The enable input (/EN) de-asserts the true output signal without removing the input signal. The LOS output can be fed back to the /EN input to implement the squelch function that maintains output stability under a loss-of-signal condition.

The SY84113BU operates on a single 2.5V power supply and offers ultra low power consumption. This device is perfectly suited to meet the stringent power requirements of the CSFP/SFP/SFF optical modules.

**Features**
- Ultra wide LOS Range (5mVpp to 100mVpp)
- Single 2.5V power supply
- Ultra low power consumption (55mW typical)
- 125Mbps to 1.25Gbps operation
- Low-noise CML data outputs
- TTL /EN input
- Programmable LOS level (LOSLVL)
- Internal 50Ω termination
- Available in a tiny 16-pin (3mm x 3mm) QFN package

**Applications**
- Gigabit Ethernet
- Fibre Channel
- Compact SFP

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SY84782U — Low Power 2.5V 1.25Gbps FP/DFB Laser Diode Driver

The SY84782U is a single 2.5V supply, ultra-low power, small form factor laser diode driver for telecom/datacom applications. Intended to drive FP/DFB lasers at data rates up to 1.25Gbps, it is especially useful for Compact SFP, SFP and SFF modules where power requirements are quite stringent. The driver can deliver modulation current up to 90mA and offers a high compliance voltage, all of which make the SY84782U suitable for high current operations in both AC- and DC-coupled applications.

The SY84782U is intended to be used with Micrel’s MIC3003 Optical Transceiver Management IC, which allows for both modulation and bias current control and monitoring. Furthermore, the MIC3003 offers power control and temperature compensation.

**Features**
- 2.5V power supply option
- Ultra low power consumption (63mW typical)
- Multirate up to 1.25Gbps
- Fast rise and fall time
- Modulation current up to 90mA
- Laser may be DC- or AC-coupled
- Operation over −40°C to +85°C temperature range
- MIC3003G Compatible
- Available in a tiny 16-pin (3mm x 3mm) QFN package

**Applications**
- Multirate LAN, MAN applications: Fibre Channel, GbE, SONET OC3/12/24 and SDH STM1/4/8
- CSFP/SFF/SFP Optical Modules
**SM802108 — ClockWorks™ Quad-Output 10GbE 156.25MHz & GbE 125MHz Ultra-Low Jitter, LVPECL Frequency Synthesizer**

The SM802108 is a member of the ClockWorks™ family of devices from Micrel and provides an extremely low-noise timing solution for GbE and 10GbE Ethernet clock signals. It is based upon a unique patented Rotary-Wave® architecture that provides very low phase noise.

The device operates from a 3.3V or 2.5V power supply and synthesizes two LVPECL output clocks at 156.25MHz and another two at 125MHz. The SM802108 accepts a 25 MHz crystal or LVCMOS reference clock.

**Features**
- Generates two LVPECL clock outputs at 156.25MHz and two LVPECL clock outputs at 125MHz
- 2.5V or 3.3V operating range
- Typical phase jitter @ 156.25MHz — (1.875MHz to 20MHz): 110fs (typical) at 3.3V
- Industrial temperature range
- Green, RoHS, and PFOS compliant
- Available in 24-pin (4mm x 4mm) QFN package

**Applications**
- 10Gigabit Ethernet
- Gigabit Ethernet

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**SM802110 — ClockWorks™ CPRI 153.6MHz Ultra-Low Jitter, LVPECL Frequency Synthesizer**

The SM802110 is a member of the ClockWorks™ family of devices from Micrel and provides an extremely low-noise timing solution for CPRI clock signals. It is based upon a unique patented RotaryWave® architecture that provides very low phase noise.

The device operates from a 3.3V or 2.5V power supply and synthesizes an LVPECL output clock at 153.6MHz. The SM802110 accepts a 30.72MHz LVCMOS reference clock.

**Features**
- Generates an LVPECL clock outputs at 153.6MHz
- 2.5V or 3.3V operating range
- Typical phase jitter @ 153.6MHz — (2MHz to 20MHz): 99fs (typical) at 3.3V
- Industrial temperature range
- Green, RoHS, and PFOS compliant
- Available in 24-pin (4mm x 4mm) QFN package

**Applications**
- CPRI
- OBSAI

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**KSZ8864RMN — Integrated 4-Port 10/100 Managed Switch with Two MII/RMII MAC Interfaces**

The KSZ8864RMN is a highly-integrated, Layer 2 managed 4-port switch with an optimized design, plentiful features and the smallest package size. It is designed for cost-sensitive 10/100Mbps 4-port switch systems with on-chip termination, lowest-power consumption, and small package to save system cost. It has 2.8Gbps high-performance memory bandwidth, shared memory-based switch fabric with a full non-blocking configuration. It also provides an extensive feature set such as the power management, programmable rate limiting and priority ratio, tag/port-based VLAN, packet filtering, quality of service (QoS), four queue prioritization, management interface, and MIB counters. Port 3 and Port 4 support either MII or RMII interfaces with SW3-MII/RMII and SW4-MII/RMII (see Functional Diagram) for KSZ8864RMN data interface.

The KSZ8864RMN provides multiple CPU control/data interfaces to effectively address both current and emerging fast Ethernet applications.

The KSZ8864RMN consists of 10/100 fast Ethernet PHYs with patented and enhanced mixed-signal technology, media access control (MAC) units, a high-speed non-blocking switch fabric, a dedicated address lookup engine, and an on-chip frame buffer memory.

The KSZ8864RMN contains four MACs and two PHYs. The two PHYs support the 10/100Base-T/TX.

All registers of MACs and PHYs units can be managed by the control interface of SPI or the SMI. MIIM registers of the PHYs can be accessed through the MDC/MDIO interface. EEPROM can set all control registers by I2C controller interface for the unmanaged mode.

**Applications**

- **Industrial control / automation**
- **3G / WiMAX base station, outdoor router / AP, surveillance system**

**Features**

- IEEE 802.1q VLAN support for up to 128 VLAN groups (full-range 4096 of VLAN IDs)
- Static MAC table supports up to 32 entries
- VLAN ID tag/untag options, per port basis
- IEEE 802.1p/q tag insertion or removal on a per port basis based on ingress port (egress)
- Jitter-free per packet based rate limiting support
- Broadcast storm protection with percentage control (global and per port basis)
- Serial management interface (MDC/MDIO) to all PHYs registers and SMI interface (MDC/MDIO) to all registers
- High-speed SPI (up to 25MHz) and I2C master Interface to all internal registers
- Per port, 802.1p and DiffServ-based
- New generation switch with five MACs and five PHYs that are fully compliant with the IEEE 802.3u standard
- Non-blocking switch fabric assures fast packet delivery by utilizing an 1K MAC address lookup table and a store-and-forward architecture
- On-chip 64Kbyte memory for frame buffering (not shared with 1K unicast address table)
- Port mirroring/monitoring/sniffing: ingress and/or egress traffic to any port or MII/RMII
- Full-chip hardware and software power-down
- Available in 64-pin (8mm x 8mm) QFN package

**Applications**

- **IPTV**
- **Industrial control / Automotive**

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**KSZ8021RNLI & KSZ9021GQI — Gigabit Ethernet Transceiver with GMII / MII Support (Industrial Temperature)**

**Features**

- Single-chip 10/100/1000Mbps IEEE 802.3 compliant Ethernet Transceiver
- GMII/MII standard compliant interface
- Auto-negotiation to automatically select the highest link up speed (10/100/1000Mbps) and duplex (half/full)
- On-chip termination resistors for the differential pairs
- On-chip LDO controller to support single 3.3V supply operation – requires only external FET to generate 1.2V for the core
- Jumbo frame support up to 16KB
- 125MHz Reference Clock Output
- Programmable LED outputs for link, activity and speed
- Baseline Wander Correction
- LinkMD® TDR-based cable diagnostics for identification of faulty copper cabling
- Parametric NAND Tree support for fault detection between chip I/Os and board
- Automatic MDI/MDI-X crossover for detection and correction of pair swap at all speeds of operation
- Available in 64-pin (8mm x 8mm) PQFN package (KSZ9021GNI)
- Available in 128-pin (14mm x 20mm) PQFN package (KSZ9021GQI)

**Applications**

- **Industrial control / automation**
- **3G / WiMAX base station, outdoor router / AP, surveillance system**

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**KSZ8031RNL1 — 10Base-T/100Base-TX PHY with RMII Support (Industrial Temperature)**

**Features**

- Single-chip 10Base-T/100Base-TX IEEE 802.3 compliant Ethernet Transceiver
- RMII v1.2 Interface support with 50MHz reference clock output to MAC, and option to input 50MHz reference clock
- RMII back-to-back mode support for 100Mbps copper repeater or media converter
- MDC/MDIO Management Interface for PHY register configuration
- Programmable interrupt output
- LED outputs for link and activity status indication
- On-chip termination resistors for the differential pairs
- HP Auto MDI/MDI-X for reliable detection and correction for straight-through and crossover cables with disable and enable option
- Power down and power saving modes
- LinkMD® TDR-based cable diagnostics for identification of faulty copper cabling
- Parametric NAND Tree support for fault detection between chip I/Os and board
- Loopback modes for diagnostics
- Single 3.3V power supply with VDD I/O options for 1.8V, 2.5V, or 3.3V
- Built-in 1.2V regulator for core
- Available in 24-pin (4mm x 4mm) QFN package

**Applications**

- **Industrial control / automation**
- **3G / WiMAX base station, outdoor router / AP, surveillance system**
## Analog Products - Quarter Releases

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<th>Package(s)</th>
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<td>MIC2287</td>
<td>Input Current Limiting Synchronous Buck Regulator, USB Power Maximizer™</td>
<td>Yes</td>
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<td>12-Pin (3mm x 3mm) MLF®</td>
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<td>MIC22705</td>
<td>1MHz, 7A Integrated Switch, High Efficiency Synchronous Buck Regulator</td>
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## LDGs

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<td>MC5355/6</td>
<td>Dual 500mA μCap Low Dropout, Micropower Linear Regulator</td>
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<td>MC5357</td>
<td>High Performance, Low Noise Dual 500mA ULDO™</td>
<td>Yes</td>
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## DDR Terminators

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## RotatingWaves

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<td>3-Pin SC70</td>
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## Microprocessor Supervisors

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<td>High Efficiency 600mA Single Channel Linear WLED driver with Ultra Fast PWM™ Control</td>
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<td>MIC4802</td>
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<td>MIC4812</td>
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## Ethernet Products - Quarter Releases

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<td>KSZ884RXMN</td>
<td>Integrated 4-Port 10/100 Managed Switch with two MACs MII or RMII Interfaces</td>
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<td>64-Pin (8mm x 8mm) QFN</td>
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## Contact Micrel, Inc.

**Location**

<table>
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<tr>
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<td>4F Manzo 2 Building, 198-47, Gunnae-dong, Bundang-ku, Seongnam-City</td>
<td>Kyungki-do, 463-470, Korea</td>
<td></td>
</tr>
<tr>
<td>Singapore/India</td>
<td>+65 6291 1318</td>
<td>+65 6291 1332</td>
</tr>
<tr>
<td>7500A Beach Road, #07-324 The Plaza</td>
<td>Singapore 199591</td>
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<tr>
<td>Taiwan</td>
<td>+886 2 8751 0600</td>
<td>+886 2 8751 0746</td>
</tr>
<tr>
<td>4F, No. 43 Lane 188, Rueiguang Road, Nei-Hu District</td>
<td>Taipei 11491 Taiwan, R.O.C</td>
<td></td>
</tr>
<tr>
<td>UK/EMEA</td>
<td>+44 1635 524455</td>
<td>+44 1635 524466</td>
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<tr>
<td>1 Floor, 3 Lockside Place, Mill Lane, Newbury, Berks</td>
<td>United Kingdom RG14 5QS</td>
<td></td>
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<tr>
<td>France/Southern Europe</td>
<td>+33 (0) 1 6092 4190</td>
<td>+33 (0) 1 6092 4189</td>
</tr>
<tr>
<td>Les Laurentides - Bâtiment Ontario, 3 Avenue du Quebec</td>
<td>91140 Villebon sur Yvette, France</td>
<td></td>
</tr>
</tbody>
</table>