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STM32 MCU Family

By S. Haddad
32-bit MCU Marketing

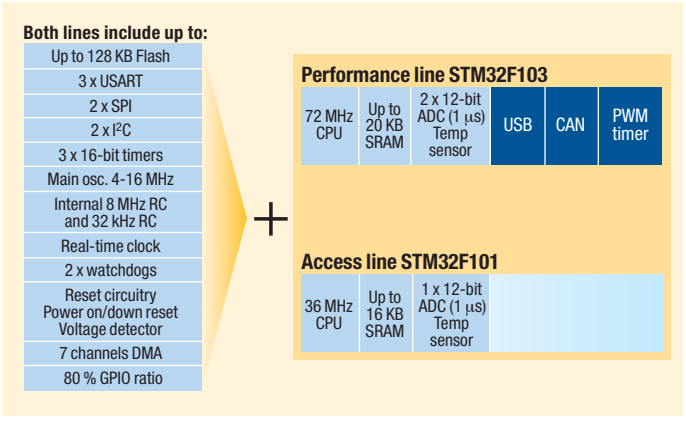
MICROCONTROLLERS POWERED BY ARM® Cortex™- M3 RESHAPE THE MARKET

The STM32 family of 32-bit Flash microcontrollers is based on the breakthrough ARM Cortex-M3 core which was specifically developed for embedded applications. The STM32 family benefits from the Cortex-M3 architectural enhancements, including the Thumb-2® instruction set to deliver improved performance combined with better code density, and significantly faster response to interrupts, all combined with industry-leading power consumption.

Releasing Your Creativity

ST was a strong partner in developing the Cortex-M3 core and is now the first leading MCU supplier to introduce a product family based on the core. The STM32 family is built to offer new degrees of freedom to MCU users. It offers a complete 32-bit product range that combines high performance, real time, low power and low voltage, while maintaining full integration and ease of development.

STM32, More Choice With Two Lines



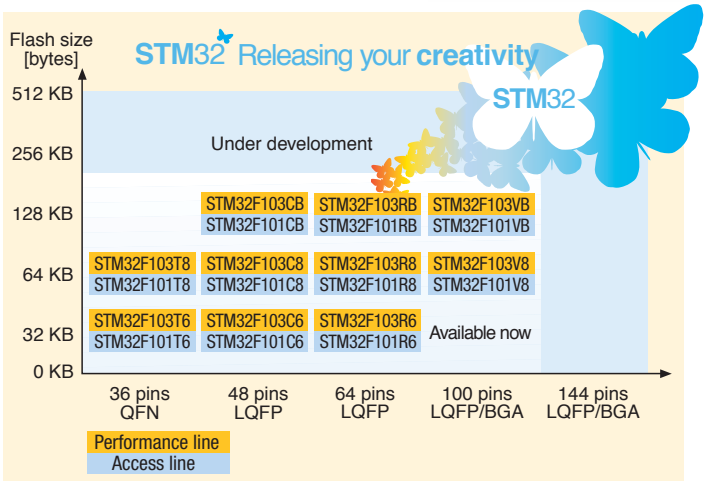
The Performance line, STM32F103, operates at 72 MHz, with more on-chip RAM and peripherals. It takes the 32-bit MCU world to new levels of performance and energy efficiency and is able to perform high-end computation. Its peripheral set brings superior control and connectivity. The Access line, STM32F101, operates at 36 MHz. It is the entry point of the STM32 family. It has the power of the 32-bit MCU but at a 16-bit MCU cost. Both lines are pin-to-pin and software-compatible, and offer the same embedded Flash options.

STM32 Drives The Market Convergence

Thanks to its high level of integration, its ease of use, its low power capability and cost-effectiveness, STM32 accelerate the migration from 16-bit solutions. STM32 will lead the obvious convergence of the 16-bit and 32-bit MCU markets.

The STM32 Key Benefits

- Leading-edge architecture with the latest Cortex-M3 core from ARM
- Excellent real-time behavior
- Outstanding power efficiency
- Superior, innovative peripherals
- Maximum integration
- Easy development, fast time to market



STM32F10x portfolio

Leading-Edge Architecture With Cortex-M3 Core

- Harvard architecture
- 1.25 DMIPS/MHz and 0.19 mW/MHz
- Thumb-2 instruction set brings 32-bit performance with 16-bit code density
- Single cycle multiply and hardware division
- Embedded, fast interrupt controller is now inside the core allowing:
  - Low latency down to six CPU cycles inter-interrupt
  - Six CPU cycles wake-up time from low power mode
- Up to 35 % faster and up to 45 % less code than ARM7TDMI®

STM32, The Optimal Platform Choice

The STM32 is an optimal choice to support many applications with the same platform:

- From reduced memory and pin requirements to larger needs
- From performance demanding to battery operated
- From simple cost-sensitive to complex high-value

The high level of pin-to-pin, peripheral and software compatibility across the family gives full flexibility. It is possible to upgrade to a higher or downgrade to a lower memory size, or use different packages without changing the initial layout or software.

Software And Tools

The STM32 benefit from the ARM tools and software ecosystem,with easy-to-use, high performance IDE, compilers, debugger, RTOS, low cost evaluation boards and starter kits. A complete firmware library and USB developer kits are provided free of charge by ST.

Internet Support

The latest news, downloads and documentation for STM32 microcontrollers can be found at:
www.st.com/stm32

Here, you will also find:

- A complete selection guide for ST microcontrollers and development tools
- Downloads of free software and documentation
- Microcontroller and application-specific online forums and FAQs

Development Tools

A complete range of high-end and low-cost development tools are available, including complete development tool solutions, easy-to-use starter kits, and embedded operating systems, all tailored to the STM32 ARM Cortex-M3-based MCUs.

Low-cost And Application Specific Starter Kits

Low-cost starter kits based on proven solutions make it easy to evaluate standard and application specific peripherals, and start application development for STM32.

Evaluation Board STM3210B-EVAL

Complete hardware evaluation platform with the STM32F103, implementing the full range of device peripherals and features.

STM32 (ARM Cortex-M3) - 32-bit Microcontrollers Summary

Pins	Part number	Program memory type	Prog. (bytes) [K]	RAM (bytes) [K]	Timer functions		Serial interface	I/Os (high current 2)	Packages	Supply voltage [V]
		Flash			12 or 16-bit (IC/OC/PWM)	Others				
36	STM32F101T6	■	32	6	2x16-bit (8/8/8)	2xWDG, RTC, 24-bit down counter	1xSPI/1xI^{2}C/2xUSART*	26(26)	QFN36	2 to 3.6
	STM32F101T8	■	64	10	3x16-bit (12/12/12)		2xSPI/2xI^{2}C/3xUSART*	26(26)	QFN36	2 to 3.6
48	STM32F101C6	■	32	6	2x16-bit (8/8/8)		1xSPI/1xI^{2}C/2xUSART*	36(36)	LQFP48	2 to 3.6
	STM32F101C8	■	64	10	2x16-bit (8/8/8)		2xSPI/2xI^{2}C/3xUSART*	36(36)	LQFP48	2 to 3.6
	STM32F101CB	■	128	16	3x16-bit (12/12/12)		2xSPI/2xI^{2}C/3xUSART*	36(36)	LQFP48	2 to 3.6
64	STM32F101R6	■	32	6	2x16-bit (8/8/8)		1xSPI/1xI^{2}C/2xUSART*	51(51)	LQFP64	2 to 3.6
	STM32F101R8	■	64	10	3x16-bit (12/12/12)		2xSPI/2xI^{2}C/3xUSART*	51(51)	LQFP64	2 to 3.6
	STM32F101RB	■	128	16	3x16-bit (12/12/12)		2xSPI/2xI^{2}C/3xUSART*	51(51)	LQFP64	2 to 3.6
100	STM32F101V8	■	64	10	3x16-bit (12/12/12)		2xSPI/2xI^{2}C/3xUSART*	80(80)	LQFP100	2 to 3.6
	STM32F101VB	■	128	16	3x16-bit (12/12/12)		2xSPI/2xI^{2}C/3xUSART*	80(80)	LQFP100	2 to 3.6
36	STM32F103T6	■	32	10	3x16-bit (12/12/14)		1xSPI/1xI^{2}C/2xUSART*/USB/CAN	26(26)	QFN36	2 to 3.6
	STM32F103T8	■	64	20	4x16-bit (16/16/18)		2xSPI/2xI^{2}C/3xUSART*/USB,/CAN	26(26)	QFN36	2 to 3.6
48	STM32F103C6	■	32	10	3x16-bit (12/12/14)		1xSPI/1xI^{2}C/2xUSART*/USB/CAN	36(36)	LQFP48	2 to 3.6
	STM32F103C8	■	64	20	4x16-bit (16/16/18)		2xSPI/2xI^{2}C/3xUSART*/USB/CAN	36(36)	LQFP48	2 to 3.6
	STM32F103CB	■	128	20	4x16-bit (16/16/18)		2xSPI/2xI_C/3xUSART*/USB,/CAN	36(36)	LQFP48	2 to 3.6
64	STM32F103R6	■	32	10	3x16-bit (12/12/14)		1xSPI/1xI^{2}C/2xUSART*/USB/CAN	51(51)	LQFP64	2 to 3.6
	STM32F103R8	■	64	20	4x16-bit (16/16/18)		2xSPI/2xI^{2}C/3xUSART*/USB/CAN	51(51)	LQFP64	2 to 3.6
	STM32F103RB	■	128	20	4x16-bit (16/16/18)		2xSPI/2xI^{2}C/3xUSART*/USB/CAN	51(51)	LQFP64	2 to 3.6
100	STM32F103V8	■	64	20	4x16-bit (16/16/18)		2xSPI/2xI^{2}C/3xUSART*/USB/CAN	80(80)	LQFP100/BGA100	2 to 3.6
	STM32F103VB	■	128	20	4x16-bit (16/16/18)		2xSPI/2xI^{2}C/3xUSART*/USB/CAN	80(80)	LQFP100/BGA100	2 to 3.6

*(IrDA/ SO7816/LIN Master/Slave)

ST7 GEM Firmware

By L. Rabiej
8-bit MCU Marketing

ST AND GEMALTO TEAM UP TO OFFER READY-TO-USE CHIPSET FEATURED IN REFERENCE DESIGN

Enhanced security for data transfer and access relies more and more on smartcard technology in an increasing number of consumer, telecom and personal computer applications. As a consequence smartcard interfacing and controlling functionality is required in many commercial, professional, or personal electronic devices. In reality many of the design teams implementing this solution have very little time or desire to invest in R&D for this specific field of technology. Consequently, they often search for a ready-to-use and reliable solution to be integrated in their system. ST partnered up with Gemalto readers division to offer such a "turnkey" solution with proven records of reliability and leadership.

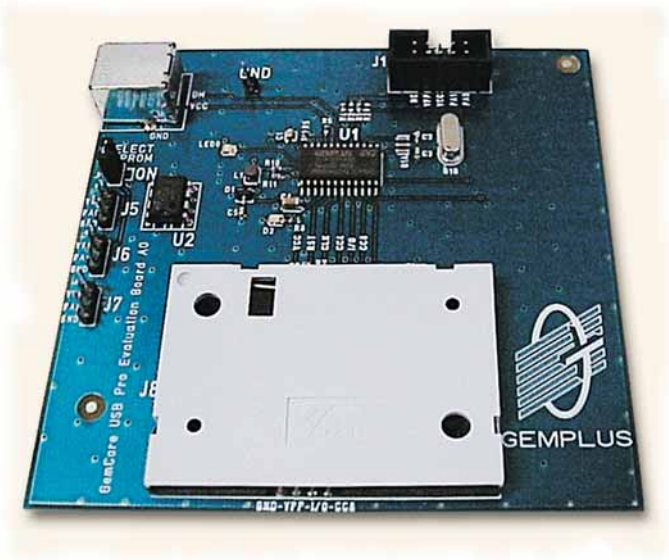
The ST7GEM chipset is the result of a teaming-up and co-marketing activity. Pre-programmed with Gemalto software and supported with a reference design, ST7GEM firmware is designed to be the core of smartcard reading function.

ST7GEM Key Features And Benefits

- Single integrated circuit solution with very few external passive components. Optimized PCB space and bill of materials
- EMVCo certification and PC/SC compliance. Quick EMVCo/EMV2000 type approval process and Microsoft WHQL agreement
- Performance and specifications developed in partnership with industry leader in readers
- Robust solution with proven track record in the industry for many years
- Fast development and rapid time-to-market
- Engineering expertise in system integration and PCB design. Easy to develop and full turnkey solution supported by a team of experts
- Packaged in SO, QFN or die form to meet all types of PCB real estate issues

ST7GEM Commercial Products

Part number	Memory	I/O	Package
ST7GEME4M1	16 K ROM	4	SO-24
ST7GEME4U1			QFN24



Coordinated Marketing With Gemalto

Our software licensing and co-marketing agreement with Gemalto's reader division, focus on selected emerging market geographical areas. However, other specific markets and customers could be addressed in a coordinated approach with Gemalto.

Typical Application Field

The application range is wide, however the most promising ones are:

- Stand-alone PC-linked readers
- Integrated readers in laptop computers
- POS terminals
- PIN pads
- Mobile phones
- Set-top boxes
- PDAs
- Home routers

Support Tools

- Product flyer
- Reference design and user manual: UM0414
- Online application forum tool

Supported OS And Certifications

- Windows
- PCSC
- Linux
- Debian
- MacOS X
- EMVCo

EMIF06-SD02F3

By M. Saadna
ASD & IPAD Marketing

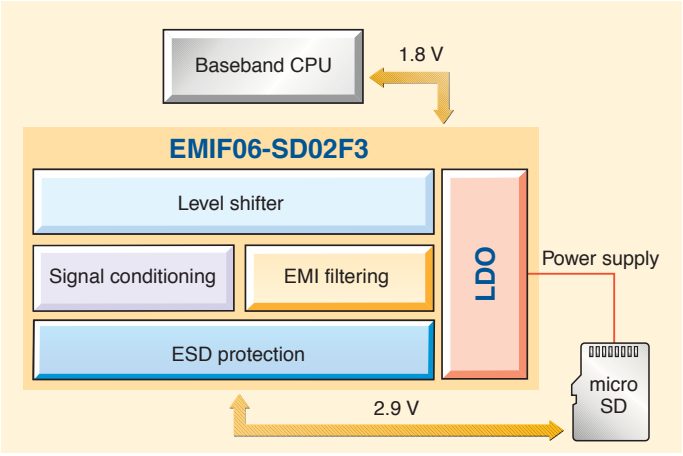
SPACE SAVING SINGLE CHIP IPAD MEMORY CARD TRANSCEIVER IN Flip-Chip

An increasing number of mobile phones now include removable memory cards. Feature-rich phones often need external memory storage to transfer data to printers, computers or other mobile phones. These memory cards are called SD (Secure Digital) or MMC (Multi Media Card) and exist in various formats: Mini-SD, µSD, SD, MMC, Trans-flash, etc.
The design of the interface between these memory cards and the CPU must provide:

- High ESD protection due to the exposure of the external memory card slot to the outside world
- Efficient EMI filtering to protect data lines against disturbances from RF frequencies
- Smart signal conditioning which consists of resistors in pull-up or pull-down to avoid data line bus floating
- Fast level translator to shift the 1.8 V CPU data to 2.9 V memory card data, in both directions (either when reading or writing the memory), without slowing-down the data rate
- Accurate and stable power supply to the memory card, that can be powered-off for low-power devices

Single Chip Solution

The EMIF06-SD02F3 is an IPAD™ that interfaces 4-bit data signals between SD or MMC memory cards and the baseband CPU.
All the required features of the memory interface are integrated into a single-monolithic chip.



Application diagram showing that only EMIF06-SD02F3 is needed to interface the memory card and the baseband CPU

Space Saving Package

The EMIF06-SD02F3 is in an RoHS compliant, Flip-Chip lead-free package, using a 400 µm pitch in 5 x 5 bump matrix. Since the die-size equals that of the package, the space consumption on a printed wired board for EMIF06-SD02F3 is 6.6 mm^2. The equivalent space consumption using discrete components is 30 mm^2.

Targeted Applications

Electronic consumer goods with a removable memory card slot, such as:

- Mobile phones
- Cameras
- Portable navigation devices

EMIF06-SD02F3 Main Features

- Compliant with the most stringent ESD protection standards (IEC 61000-4-2 ± 15 kV air discharge) on memory card side
- Low-pass EMI filter (800 MHz to 3 GHz) to reject RF phone frequencies
- Integrated pull-up and pull-down resistors to prevent bus floating
- Level translator propagation delay of 3 ns typ,
- 50 MHz clock frequency to be compliant with MMC, Trans-Flash, SD and High-Speed SD standard
- Several memory card formats supported: Mini-SD, µSD, SD, MMC, Trans-Flash
- Low drop-out regulator (LDO) with 200 mA output current
- LDO switch-off pin control for low power consumption
- LDO-rich features: thermal shutdown, under voltage lockout, short-circuit limitation
- LDO settling time: 30 µs typ
- Housed in space saving Flip-Chip package

ACST2 Series

By B. Cheron
ASD & IPAD Marketing

NEW HIGH IMMUNITY, ROBUST 800 VOLT AC SWITCHES

The home appliance industry is shifting towards electronic control on a worldwide basis. Together with this trend, electronics can now cope with AC mains constraints where high voltage robustness and transient voltage compatibility are the key challenges. ST has designed the ACS™ and ACTS devices to control the numerous AC loads necessary for the appliance process. These AC switches meet the requirements of reliability, compactness and mass production capability.

The new ACST2 series belongs to the AC power switch family built around the ASD technology. These high performance devices are adapted to home appliances or industrial systems and drive loads up to 2 A such as pumps, fans or solenoids. ACST2 embeds a Triac structure with a high voltage clamping device to absorb the inductive turn-off energy. Thanks to its crowbar auto-protection technology it withstands line transients such as those described in the IEC 61000-4-5 standards. This component needs a low gate current to be activated (I_{GT} < 10 mA) while providing a high electrical noise immunity such as those described in the IEC 61000-4-4 standards.

Key Markets And Applications

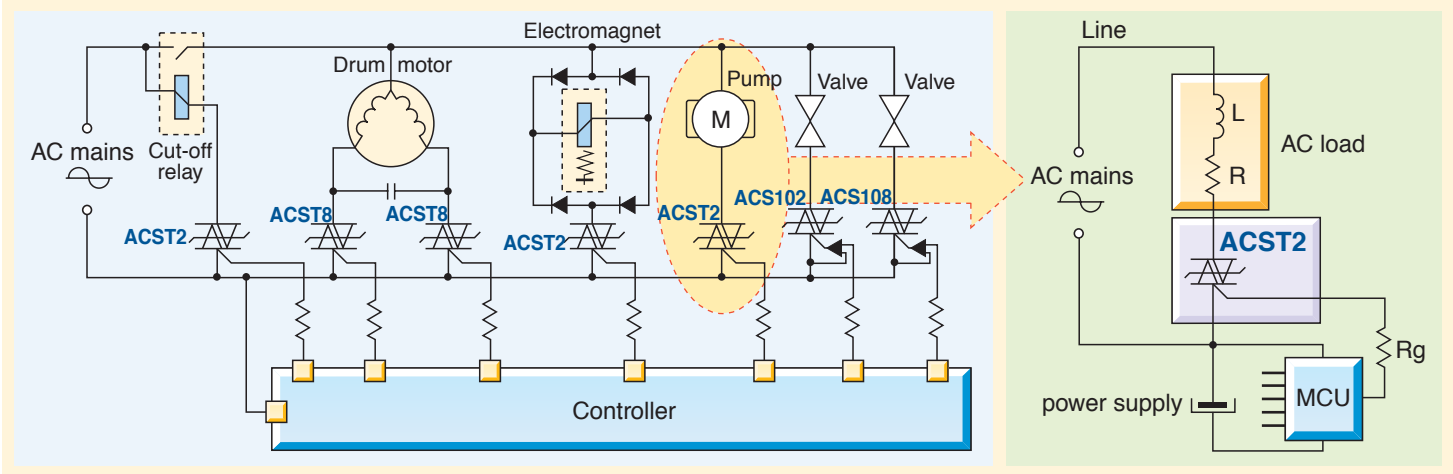
- AC ON/OFF static switching in appliances and industrial control systems
- Drive of low power highly resistive or inductive loads like solenoids, pumps, fans and micro-motors

Features And Benefits

- Overvoltage crowbar technology
- Needs no external overvoltage protection
- 800 V to avoid premature firing
- Best in class trade-off: static dV/dt > 500 V/µs: I_{GT} < 10 mA
- I_H < 10 mA for inductive load compatibility
- Standards approval: immunity and robustness designed for IEC 61000-4-x and IEC 60335-1
- Interfaces directly through simple resistor with the microcontroller
- Reduces component count

Main Characteristics

Part number	ACST2-8SFP	ACST2-8SB
$I_{T(RMS)}$	2 A	
V_{RRM} / V_{DRM}	800 V	
I_{GT} max	10 mA	
(dI/dt)c @ T_j = 125 °C	0.5 A / ms	
dV/dt @ T_j = 125 °C	500 V / µs	
Package	TO-220FPAB	DPAK



ACST2 typical application diagram

ESDAVLC6V1-1BM2

By R. Renard
ASD & IPAD Marketing

THE LOWEST LINE CAPACITANCE BI-DIRECTIONAL TRANSIENT VOLTAGE SUPPRESSOR DIODE AVAILABLE

The introduction of high bandwidth functions in portable applications has drastically increased the need for very low capacitance ESD protection devices. As an example, new cellular phones are now embedding such features as high resolution displays, high sensitivity keypads and USB and video interfaces. Such interfaces require a high level of ESD protection together with a low impact on signal integrity. In fact very low capacitance protection diodes are required.

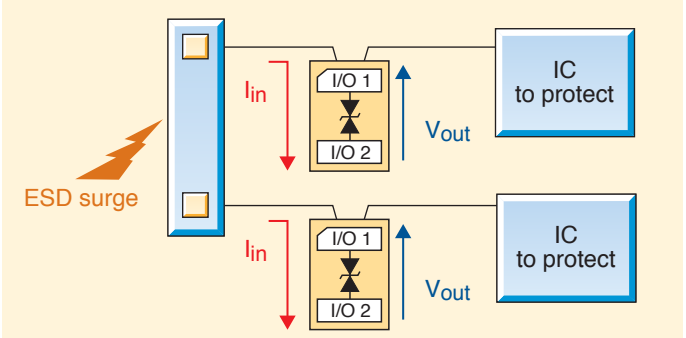
Lowest On The Market

To support this high demand on very low capacitance ESD protection, ST has recently introduced the ESDAVLC6V1-1BM2, a single Transient Voltage Suppressor (TVS) diode with only 7 pF line capacitance. This is the lowest line capacitance ESD protection diode available on the market today.

The ESDAVLC6V1-1BM2 is available in a bi-directional configuration with a working voltage of 5 V and a minimum breakdown voltage of 6.1 V. With a capacitance of 7 pF, this device is appropriate for transient protection of high frequency data lines and signal interfaces. Designed to protect against the transient environments of IEC 61000-4-2 (ESD), all devices are tested up to 15 kV ESD contact and air discharge.

Key Features

- VBR min = 6.1 V
- ±15 kV ESD protection (IEC 61000-4-2)
- Very low capacitance: 7 pF max @ 0 V
- Very low leakage current (100 nA max @ 3 V)
- Standard SOD882 package



Protection of sensitive ICs

Key Benefits

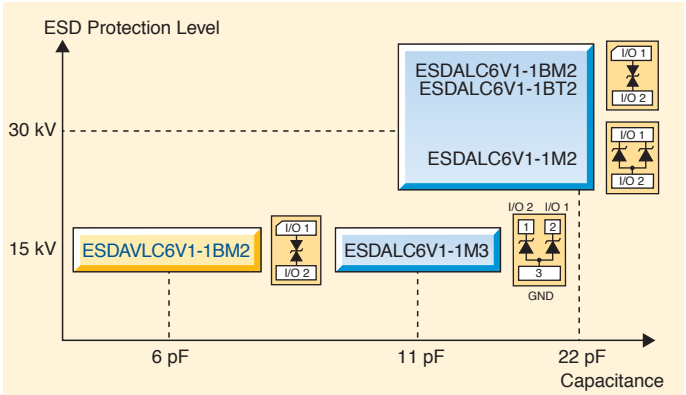
- High ESD protection (±15 kV in IEC61000-4-2)
- Supports high bandwidth applications
- Ultra small package - only 0.6 mm^2

Standard SOD882 Package

In addition to being cost-effective, using the surface mount SOD882 package for transient protection reduces the space required for ESD protection components.

Packaged in the standard SOD882 plastic case, this device can substitute similar 0402 outline configurations.

The ESDAVLC6V1-1BM2 should be placed as close as possible to a connector or a sensitive IC component.



ESDAVLC6V1-1BM2 positioning within existing range

Product Characteristics

Part number	Tipology	C @ 0V typ	V_{BR}	Package
ESDAVLC6V1-1BM2	Bi-directional	6 pF	6.1 V	SOD882

DSL01-008SC5 /-016SC5

By P. Rabier
ASD & IPAD Marketing

ADSL2+ AND VDSL COMPLETE MODEM PROTECTION IN ONE TINY PACKAGE

With the increase in the use of video phones it has become critical to further increase the bandwidth of telecommunication lines. When using ADSL2+ (2.2 MHz) or VDSL (12 MHz) it is mandatory to minimize losses and distortion on twisted pairs. Whatever the signal, equipment must comply with various surge standards that simulate lightning and power faults, such as ITU-T-K20/21, TIA/EIA-IS-968 or UL60950. Protected error-free data transmission is the main objective.

State-Of-The-Art Solutions

Protection is generally implemented using gas discharge tubes (GDT) or a Trisil on the primary side. However, the reliability of GDTs is subject to question and the capacitance of the Trisil is quite often a problem. This results in designers trying to include the protection after the DSL transformer. In this case requirements are different, and the key point is to keep the surge voltage below the maximum voltage of the line drivers and not to disturb transmission. Current solutions are either, Metal Oxide Varistors (MOV), zener diodes or small rail to rail diodes.

Current Solutions And DSL01 Comparison

Key value	MOV	Zener	Rail-to-rail	DSL
Surge capability	High	Low	Low	Low
Max voltage	Too High	Too High	Too High	Low
Capacitance	Medium	Low	Very Low	Low
Technology	ZNo grain between 2 pins	Monolithic small planar wire bonding	Dual dice small signal bipolar planar wire bonding	Monolithic planar on single frame wire bonding
Quality	Deteriorates	Good	Good	Very good
Ageing	Yes	No	No	No

MOVs provide poor protection after several surges and a degradation of performance can affect transmission.

Zener diodes are not protection devices and are unable to avoid high voltage online driver output.

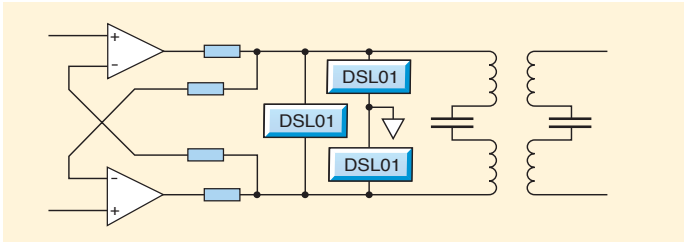
Rail-to-rail diodes have too high dynamic forward voltage to limit voltage across line drivers.

The DSL01 Family Provides The Solution

DSL01 does not generate signal distortion and is compliant with GR1089, ITU-T K20/21 when located after the DSL transformer. DSL01 is a reliable planar technology device, with no ageing, and guarantees drivers running to avoid field failure returns. The key added-value of the DSL01 are:

- High surge capability (I_{PP}) to withstand GR-1089 and ITU-T K20/21 after the DSL transformer
- Low voltage during surge (V_{CL}) to avoid line driver damage
- Low capacitance to ensure data integrity

The ASD technology which combines two main functions on one chip: clamping and crowbar protection. A Transil ensures low energy surges while a Trisil short circuits high energy surges to ensure low voltages. DSL01 has been developed in 8 V and 16 V versions to be used in tripolar protection while some modems require only common or differential modes (other voltages are in development).



Tripolar protection for DSL line drivers

Product Range

Part number	Package	Leakage current	Breakdown voltage	C max at 0 V bias
DSL01-008SC5	SOD23-5L	Ir<500 nA at 8 V	Vbr>9.5 V at 1 mA	20 pF
DSL01-016SC5		Ir<500 nA at 16 V	Vbr>18 V at 1 mA	15 pF

STD55NH2LL Power MOSFET

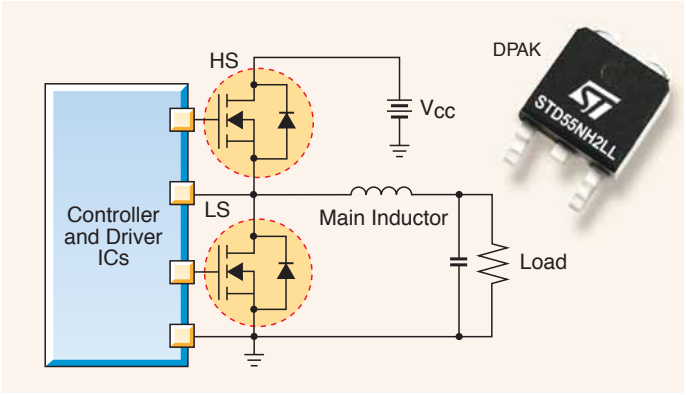
By F. Criscione
Power MOSFET Marketing

HIGH SIDE SOLUTION TO BOOST SYNCHRONOUS BUCK CONVERTER EFFICIENCY

The increasing demand for greater power from the latest CPUs means that synchronous buck converters used in Voltage Regulator Modules (VRM) and POLs must have very high performance in terms of overall electrical behavior during switching transients and ON state. This demand may be satisfied by using low voltage Power MOSFETs in VRMs with very low gate charge (Qg) and low on-resistance $R_{DS(on)}$. The efficiency of the overall system can be improved with STD55NH2LL, ST's new high side Power MOSFET, in the synchronous buck converter.

STD55NH2LL General Features

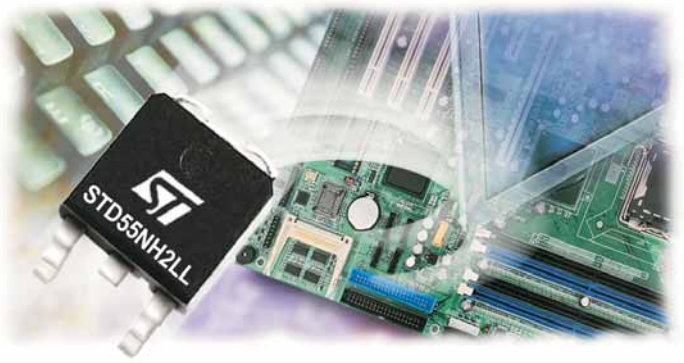
- $R_{DS(on)}$ * Qg industry' benchmark
- Conduction losses reduced
- Switching losses reduced
- Low threshold device
- High avalanche ruggedness
- Low gate drive power losses



Synchronous buck converter circuit used to provide high current, low voltage power for CPUs, chipsets and peripherals etc.

Lower Power Losses

The majority of the power lost in power conversion is due to losses in the Power MOSFET switches. The loss profiles for the high side and low side Power MOSFET are quite different. The main parameters that impact on the high side losses are given by Ciss and Qg. Instead the main parameter that impacts on the low-side switch is give by the $R_{DS(on)}$.

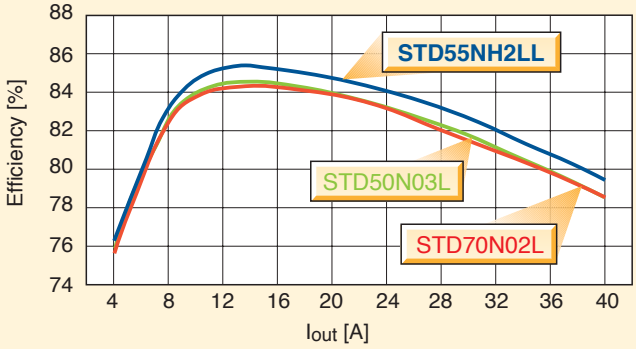


Device Comparison

In order to demonstrate the benefits of using STD55NH2LL, a test was performed on the L6710 controller demoboard assuming the same low side switching and the following conditions:

- V_{in} = 12 V
- V_{out} = 1.5 V
- 2 phase: 1xHS, 2xLS
- T_{amb} = 25 °C
- f_{sw} = 440 kHz

The comparison made against two similar high side Power MOSFETs in DPAK, shows that the STD55NH2LL is an optimum solution to boost the efficiency by 1% in synchronous buck converters.



Efficiency comparison showing the 1 % higher efficiency shown by STD55NH2LL

Devices Under Test

Part number	BV_{DSS} [V]	Ciss [pF]	$R_{DS(on)}$ @ 10 V max [Ω]	Q_g @ 5 V typ [nC]
STD55NH2LL	24	990	0.011*	8.7*
STD70N02L	24	1400	0.008	12
STD50N03L	30	1434	0.001	10

* *values @ 4.5V*

STS9D8NH3LL Power MOSFET

By F. Criscione
Power MOSFET Marketing

NEW HIGH PERFORMING POWER MOSFET FOR NOTEBOOK SYSTEM POWER MANAGEMENT

The market's tendency to move towards smaller notebooks and telecom systems, coupled with the increasing demand for high efficiency in synchronous buck converters used in Voltage Regulator Modules (VRMs) and POLs, has created a demand for Power MOSFETs in a dual package with very high performance in terms of overall electrical behavior (during switching transients and ON state).
The new STS9D8NH3LL housed in SO-8 dual package, easily meets these requirements.

STS9D8NH3LL has two die, one dedicated to high side switching, optimized to reduce switching losses, and another dedicated to the low side, optimized to reduce conduction losses in the synchronous buck converter.

STS9D8NH3LL Features

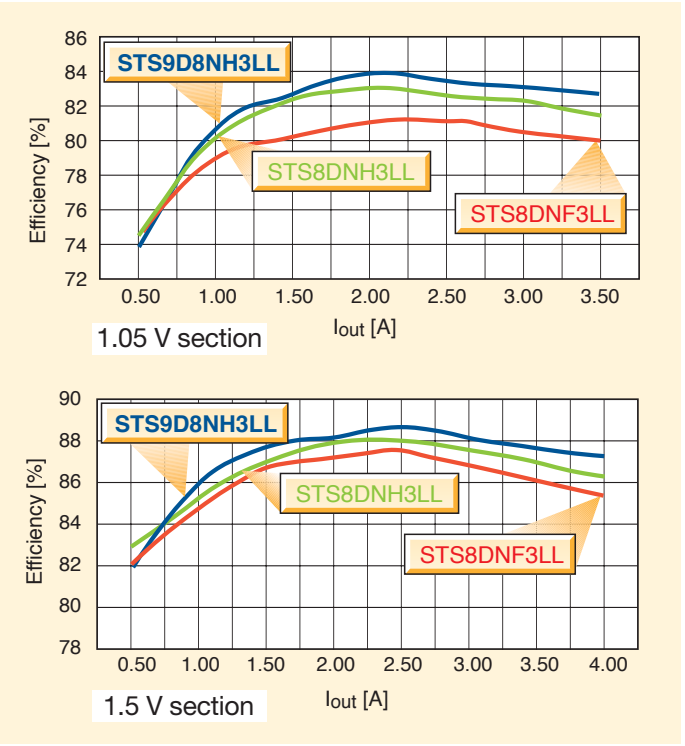
- Optimal $R_{DS(on)}$ x Qg trade-off @ 4.5 V
- Conduction losses reduced
- Switching losses reduced
- Double island SO-8 package
- This application specific Power MOSFET has been designed to replace two SO-8 packages in DC-DC converters.

Device Comparison

In order to demonstrate the benefits obtained by using the STS9D8NH3LL, a test was performed on the PM6680 demoboard assuming the following conditions:

- V_{in} = 12 V
- $V_{PHASE-1}$ = 1.5 V
- $V_{PHASE-2}$ = 1.05 V
- T_{amb} = 25 °C
- f_{sw} = 380 kHz

PM6680 is a dual step-down controller (1.5 V and 1.05 V); each section is a single phase DC/DC converter, with a Schottky diode in parallel with the low-sides. As demonstrated by the tests, the STS9D8NH3LL has the highest efficiency in the overall current range, in both converter sections (1.5 V and 1.05 V) due to the lower high side Qg and lower low side $R_{DS(on)}$.



STS9D8NH3LL shows a higher efficiency level in both 1.5V and 1.05V sections

STSxD8Nx3LL Product Range

The STSxD8Nx3LL range of devices in a dual SO-8 package, represent the best choice for notebook and server applications. The current product range will soon be enlarged to include other devices from the new STripFET V technology.

Part number	BV_{DSS} [V]	$R_{DS(on)}$ max @ 10 V [Ω]		Q_g typ @ 4.5 V [nC]	
		Q1	Q2	Q1	Q2
STS8DNH3LL	30	0.022	0.022	7	7
STS8DNF3LL	30	0.020	0.020	12.5	12.5
STS9D8NH3LL	30	0.022	0.015	7	9

650 V & 800 V MDmesh™

By C. G. Stella / S. La Mantia
Power MOSFET Marketing

IMPROVED Power MOSFET $R_{DS(on)}$ BOOSTS ADAPTER EFFICIENCY

ST has recently introduced the new 650 V MDmesh II and the 800 V MDmesh I series as a response to the increasing demand for higher efficiency adapters in the 75 W up to 230 W power ranges.

The types of Power MOSFETs chosen by adapter designers differentiate themselves in breakdown voltage and maximum on-resistance depending on the topology and the range of power involved. In fly-back single switch adapters designers may use 600 V to 800 V Power MOSFETs.

Most Popular Topologies Used

Type	Power range [W]	Topology	Operating mode	Voltage [V]
Low power adapters	up to 50	Flyback	DCM	600 / 800
Medium power adapters	up to 75	Flyback	QR	650 / 800
	up to 120	Active clamp flyback	CCM	650 / 800
High power adapters	up to 230 and over	Half bridge	PWM / ZVS	500 / 600
		Half bridge	Resonant LLC	500 / 600

Depending on the winding ratio of the transformer, voltage and current capability of the diode used on the secondary side, designers may improve the efficiency of their applications by using a 650 V Power MOSFET instead of a 600 V device.

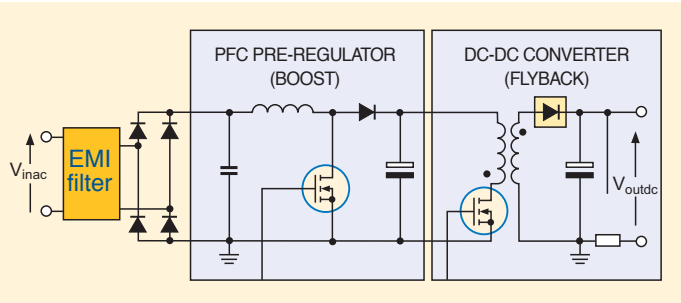
When designers require higher breakdown voltage levels, the 800 V MDmesh devices are the right choice for the most demanding high efficiency adapters. In fact, thanks to STs' Super-junction technology 800 V devices greatly reduce switching losses.

650 V MDmesh II Key Features

- Standard packages TO-220, D^2PAK, I^2PAK, TO-220FP and TO-247
- Avalanche ruggedness
- Gate charge minimized
- Very low intrinsic capacitance
- Very high speed switching
- Extreme dv/dt rated
- Exceptionally low $R_{DS(on)}$

650 V MDmesh II Main Benefits

The range of V_{GS} used to drive the 650 V devices has been lowered (threshold voltage range Vth: 2 V<Vth < 4 V) keeping the same threshold spread (2 V), ensuring high noise immunity that prevents the circuit from accidentally switching.
An energy-optimized driver circuit enables the Power MOSFET to drive higher currents at a lower voltage gate threshold.



Typical adapter schematic using a DC-DC converter in flyback topology

650 V and 800 V MDmesh Product Range

Part number	BV_{DSS}	$R_{DS(on)}$ max	I_D (cont)	Package
STx10NM65N*	650 V	480 mΩ	12 A	DPAK, IPAK, D^2PAK, TO-220/FP
STx11NM65N		380 mΩ	11.9 A	D^2PAK, I^2PAK, TO-220/FP, TO-247
STx15NM65N		270 mΩ	15.5 A	
STx20NM65N		190 mΩ	19 A	
STx7NM80	800 V	1.05 Ω	6.5 A	TO-220/FP, DPAK, IPAK
STx11NM80		0.4 Ω	11 A	TO-220/FP, D^2PAK, TO-247

Note: 650 V devices = MDmesh II technology, 800 V devices = MDmesh I
*Q1 2008

800 V MDmesh I Main Benefits

Thanks to its extremely low on-resistance per area, the 800 V device is recommended for PFC in lighting, adapters and the most high efficiency converters for switching applications. The wide variety of packages allow the designers maximum flexibility in their applications.

800 V MDmesh I Key Features

- 100 % avalanche tested
- Low input capacitance
- Low gate input resistance
- 3 V < Vth < 5 V
- Low gate charge

MDxxx Series

By M. Viola
Power Bipolar Marketing

NEW SERIES OF HIGH VOLTAGE BIPOLAR TRANSISTORS FOR SLIM CRT DISPLAYS

Although traditional CRT (Cathode Ray Tube) displays have lost ground in recent years to flat screen displays based on LCD (Liquid Crystal Display) or PDP (Plasma Display Panel) technologies, CRT technology continues to offer the best trade-off between picture quality and cost. ST's new MDx family of high voltage power bipolar transistors is specifically designed to meet the challenging requirements for horizontal deflection in slim CRT displays.

Because these new displays employ picture tubes of significantly reduced depth, the angle through which the electron beam must be deflected during each horizontal scan has increased from 110° to typically 124°. This obviously places stringent new demands on the bipolar power transistors that control the flow of current through the horizontal deflection coils. To meet this requirement, the MDx devices are built with the EHVS1 state-of-the-art technology.

EHVS1 Technology And Features

EHVS1 is a planar technology realized by a float-zone collector on a diffused substrate, with a redesigned high voltage edge structure. The silicon efficiency has been improved thanks to the reduction of the capacitance in the base-collector junction by adopting a special deep-base process.

As a result, MD devices offer:

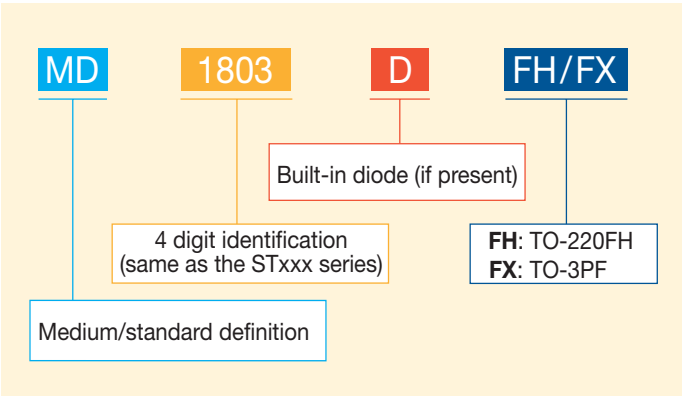
- Both high current capability and high switching speed
- A wider range of optimum drive conditions
- A reduced saturation voltage at high current

Benefits

Major benefits for MD products are:

- Tighter hFE range
- Improved R.B.S.O.A. for safer switching performance
- Reliable very high-voltage breakdown
- Very low leakage current
- Low power dissipation
- Cool working temperature
- Stable thermal performance vs driving variation
- Better compatibility for easy replacement

Part Numbering Description



MDxxx series nomenclature

MD Series Product Range In TO-3PF

Part number	Diode	V_{CES} [V]	I_C [A]	Target use
MD2103DFX	■	1500	6	up to 21"
MD1802FX			10	up to 29"
MD1803DFX	■			
MD2001FX			12	up to 32"
MD2009DFX	■			
MD2310FX			14	up to 36"

N.B. These parts are also available in TO-220FH, identified by last digit H, instead of X (i.e. MD2103DFH)

Applications

Besides being primarily aimed at horizontal deflection in slim CRT displays, both MD1802FX/– FH part numbers are also very cost effective in TV power supply applications (RCC topology). They are suitable for TVs with screen sizes in the range 14" to 25".

STGxL6NC60D IGBTs

By F. Fisichella
Power Bipolar & IGBT Marketing

NEW HYPER-FAST 600 V PowerMESH™ IGBTs FOR HIGH FREQUENCY APPLICATIONS

This new extremely fast switching IGBT (20 ns @ 100 °C has) been designed specifically for very high frequency applications such as high frequency ballasts, SMPS and PFC (also hard switching). Based on ST's proprietary PowerMESH technology and benefiting from a new lifetime control technique, this new device exhibits very low turn-off energy (4.5 μJ @ 1.5 A, snubber capacitor 2.7 nF). An optimum trade-off between on-state voltage and switching losses allow very high operating frequencies. It represents an ideal solution in hard switching and in resonant topologies where high performance is as essential as cost. Four package options are available for this device:

- DPAK - STGDL6NC60D
- D^2PAK - STGBL6NC60DT4
- TO-220 - STGPL6NC60D
- TO-220FP - STGFL6NC60D

STGPL6NC60D Main Features And Benefits

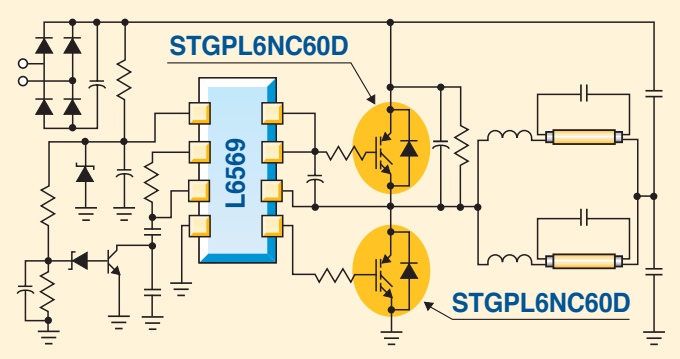
- I_C @ 100 °C = 8 A
- Low C_{res} / C_{ies} ratio
- V_{CES} = 600 V (min)
- $V_{CE(sat)}$ @ 125 °C = 2.1 V (typical)
- Co-packaged diode
- Low conduction losses
- Low turn-off switching losses
- Very high operating frequencies
- No cross-conduction susceptibility
- Trade-off between cost and performance

STGPL6NC60D vs. Power MOSFETs

In order to evaluate the performance of the new device, a preliminary comparison was made between the new STGPL6NC60D and two standard technology (non superjunction) Power MOSFETs.

Device	I_C @ 100 °C [A]	V_{CES} / V_{DS} [V]	$R_{DS(on)}$ @ V_{GS} = 10 V [Ω]	$V_{CE(sat)}$ @ T_C = 25 °C V_{GE} = 10 V I_C = 3 A [V]
STGPL6NC60D	8	600	-	2.1
Power MOSFET #1	4.4	500	1.22	-
Power MOSFET #2	5.6	500	0.93	-

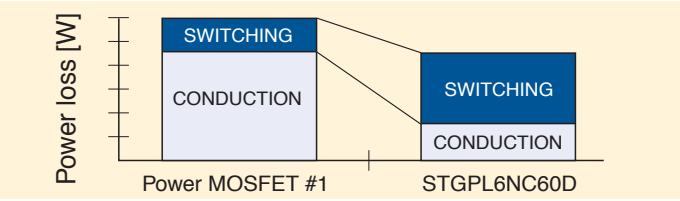
Performance comparison between STGPL6NC60D and standard technology Power MOSFETs



High frequency ballast 2x54 W schematic

The system used in the analysis was a 2 x 54 W (with T5 tube) high frequency ballast typical to lighting applications. The switching frequency was 43 kHz, and the inverter topology was realized with a half bridge configuration. In this application by only increasing the snubber capacitor (Cs), STGPL6NC60D showed much better thermal behavior. By increasing Cs, the junction temperature (Tj) decreases. Since the power dissipation is proportional to Tj, lower temperatures mean lower power dissipation.

STGPL6NC60D's total power dissipation is much lower than that of MOSFET #1. STGPL6NC60D shows lower on-state power losses, but being slower than the MOSFET, STGPL6NC60D shows higher switching losses. Since MOSFET #2 has a much bigger die area than STGPL6NC60D, the same thermal behavior was seen.



Comparison between the total power dissipation, (conduction and switching losses) of STGPL6NC60D and Power MOSFET #1 (similar die area)

Excellent Cost Performance Trade-off

Experimental data shows that STGPL6NC60D realizes the best trade-off between cost and performance; in other words, it is able to offer better performance than MOSFETs with the same silicon area, and similar performance to bigger MOSFETs.

Tiny EEPROMs

By Y. Bahout
Memory Applications Marketing

M24 AND M95 SERIES: MARKET'S FIRST LOW DENSITY SERIAL EEPROMS IN 2x3 mm PACKAGE

As a direct result of ST's extensive program of process technology shrinking for EEPROMs, SPI and I^2C products are today manufactured with a new advanced technology process. In this way, serial EEPROMs from 2 to 64 Kbit density, for both the M95 SPI and M24 I^2C interface series, are now available in the tiny 2x3 mm MLP8 package, enabling significant space and cost savings for portable consumer and communication products.

Hugely Compact, Massively Dense

ST is the first on the market to offer a comprehensive 'low-density' serial EEPROM range in such a small package. The ultra-thin (0.6 mm), fine-pitch, dual flat 2x3 mm Micro Leadframe Package (MLP) delivers important improvements compared to other packages, and the MLP offers footprint compatibility throughout the range from 2 to 64 Kbit density.

The tiny memory chips, in the M24 (I^2C bus interface) and M95 (SPI bus interface) families, operate over a wide supply-voltage range, from 1.8 V to 5.5 V, and are specified to operate for more than one million write cycles and to retain data for more than 40 years.

Features

- Byte and page write (up to 32 bytes)
- Adjustable size read-only area (SPI products)
- Self-timed programming cycle (5 ms)
- Enhanced ESD/latch-up protection
- More than 1 million write cycles
- More than 40-year data retention
- ECOPACK® packages (RoHS compliant)

MLP8 Package Dimensions

MLP8 [2 x 3 mm]	Body width	Body length	Total height	Pitch
Max. value	2.1 mm	3.1 mm	0.6 mm	0.5 mm

Market Applications

The M24 and M95 series are ideal for compact consumer electronics applications, such as:

- Digital cameras, camcorders
- MP3 players
- Remote controls
- Games consoles

as well as in communication applications like:

- Cellphones
- Handsets, and Wi-Fi
- Bluetooth and wireless-LAN cards

Low Voltage Serial EEPROM - MLP8 (2x3) Portfolio

Part number I^2C	Part number SPI	Part number Microwire	DIMM serial presence detect	Size [Kb]	V_{CC} [V]	Temperature range [°C]
M24C02-RMB6G	M95020-RMB6G		M34C02-RMB6G	2	1.8 to 5.5	-40 to +85
			M34E02-FMB1G		1.7 to 3.6	0 to +70
M24C04-RMB6G	M95040-RMB6G	M93C66-RMB6TG		4	1.8 to 5.5	-40 to +85
M24C08-RMB6G	M95080-RMB6G			8		
M24C16-RMB6G	M95160-RMB6G			16		
M24C32-RMB6G	M95320-RMB6G			32		
M24C32-FMB5G					1.7 to 5.5	-20 to +85
M24C64-RMB6G	M95640-RMB6G			64	1.8 to 5.5	-40 to +85

LRI2K / LRIS2K

By C. Mani
Memory RFID Applications

2 Kbit LONG RANGE RFID CHIPS FOR MULTI-PURPOSE ASSET TRACKING

Fully compliant with ISO/IEC 15693 and 18000, the new low-cost 2048 bit memory Radio Frequency Identification (RFID) chips offer high-speed data-rate capability and provide unrivaled reading range for multi-purpose asset tracking applications, with a password security option for sensitive products.

Functional Description

Both the LRI2K and LRIS2K provide 2 Kbits of electrically erasable user memory (EEPROM), with an on-chip RF interface operating at the standard HF (high-frequency) 13.56 MHz carrier frequency. Offering high-speed data-rate capability, an application reading range of up to 1.5 m and the advantages offered by 13.56 MHz-based RFID technology, such as high reliability and low RFID reader cost, the two devices are highly suitable for item-level tagging, whenever security, inventory speed and tag size are relevant requirements.

Additionally, due to their high on-chip tuning capacitance, the LRI2K and LRIS2K allow the design of very small antennas, thus saving space and making them suitable for use with small objects such as medicine bottles in the pharmaceutical industry.

Market Applications

The use of 2048 bit memories in the LRI2K and LRIS2K has been driven by the demand for increased memory in cost-sensitive general-purpose RFID applications requiring both data storage and security. The new devices are particularly suitable for market segments such as access control, library automation and supply-chain management, as well as for anti-counterfeiting of sensitive products such as pharmaceuticals and high-value items.

LRI2K And LRIS2K Product Characteristics

Protocol	P/N	User memory	Unique ID	Anti-collision	E.A.S.	Pass prot	Packaging
ISO 15693 Long range	LRI2K	2048b EEPROM	64b	■	■		Inlays, wafers (plain and sawn / bumped), packages
	LRIS2K			■	■	■	

8 Good Reasons To Choose LRI2K / LRIS2K

- Fit with a very wide range of inlay sizes including tiny item-level tags
- Kill function
- High speed mode
- Word granularity, password protection (LRIS2K)
- High reliability - non volatile memory
- Outstanding read/write ranges
- EAS capable (software controlled)
- Available in various formats including thin un-sawn wafers, sawn and bumped wafers, ultra-thin MLP8 2x3 mm package, or as inlays.

Key Features

- Fully compliant with ISO15693 and ISO18000-3 mode1 standard
- 13.56 MHz ±7 kHz carrier frequency
- 2048 bits user EEPROM with block lock feature
- 64 bits Unique Identifier (UID)
- Electrical article surveillance capable (software controlled)
- KILL function
- READ & WRITE (Block of 32 bits)
- 5 ms programming time
- To tag: 10 % or 100 % ASK modulation using 1/4 (26 Kbit/s) or 1/256 (1.6 Kbit/s) pulse position coding
- From tag: load modulation using manchester coding with 423 kHz and 484 kHz sub-carrier in low (6.6 Kbit/s) or high (26 Kbit/s). Support the 53 Kbit/s data rate with fast commands
- Internal tuning capacitor (21 pF, 24 pF, 28.5 pF, 97 pF)
- 1.000.000 erase/write cycles (minimum)
- 40 year data retention (minimum)

L6566 Multi-Mode Controller

By C. Menescardi
Industrial and Power Conversion Marketing

VERSATILE CURRENT-MODE PRIMARY CONTROLLER IC FOR HIGH-END ADAPTERS AND FLAT TVs

L6566 is a new, extremely versatile current-mode primary controller IC specifically designed for high-performance offline flyback converters. Both Fixed-Frequency (FF) and Quasi-Resonant (QR) operation are supported by the same product; the user can pick either depending on the application requirements. L6566 is a multi-die product, including a high voltage section (HV start-up) in BCD off-line technology and a low voltage section (the core of the controller) in BCD6 technology, mounted together in a small, standard SO-16N plastic package.

Functional Description

The device features an externally programmable oscillator which defines the converter's switching frequency in FF mode and the maximum allowed switching frequency in QR mode. When FF operation is selected, the IC works like a standard current-mode controller (UC384x-like) with a maximum duty cycle limited at 70 % min. QR operation, when selected, occurs at heavy load and is achieved through a transformer demagnetization sensing input that triggers the Power MOSFET's turn-on. With a very small load, in FF or QR operation the IC enters controlled burst-mode operation that, along with the built-in non-dissipative high-voltage start-up circuit and a reduced quiescent current, helps keep the consumption from the mains low while meeting the most demanding energy saving regulations.

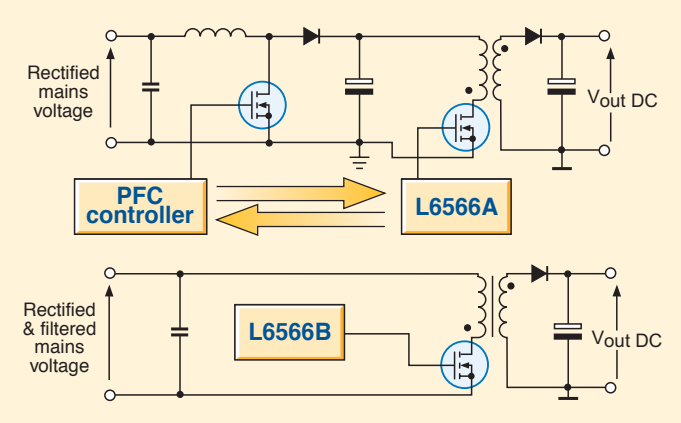
L6566A And L6566B

L6566 is supplied in two orderable versions, L6566A and L6566B.

- L6566A is specifically designed for offline flyback converters operating from a front-end Power Factor Corrector. The L6566A provides an interface with the PFC controller that turns-off the pre-regulator at light load.
- L6566B is designed for offline flyback converters where a front-end PFC is not expected. L6566B has a frequency modulation input that modulates the oscillator frequency. This modulation is used to reduce the peak value of EMI emissions.

Main Features And Benefits

- Selectable multi-mode operation
- On-board high-voltage start-up
- Low quiescent current (< 3 mA)
- Adaptive UVLO
- Line feed-forward
- Pulse-by-pulse OCP
- Transformer saturation detection
- Latched or autorestart OVP
- Brown-out protection
- Component count minimization
- Fits all world-wide energy regulations



System block diagram

Typical Applications

- Hi-end AC-DC adapter / charger
- LCD/CRT monitor, LCD / CRT TV
- Digital consumer
- Single-stage PFC

Evaluation Boards

EVAL6566A-75WADP	AC-DC adapter with PFC
EVAL6566B-60WADP	AC-DC adapter without PFC

L598x DC-DC Converters

By A. Maggioni
Industrial & Power Conversion Marketing

NEW COMPACT MONOLITHIC STEP-DOWN REGULATORS DELIVER UP TO 2 A OUTPUT CURRENT

The new L598x family of step-down monolithic power switching regulators is capable of delivering an output current in excess of 2 A, for a wide range of applications in industrial, consumer, computer and data communication segments. This family easily fits the required specifications in terms of size, weight and cost of these market segments.

L598x Device Description

The L598x is a new family of step-down monolithic power switching regulators. Thanks to their wide input voltage range, from 2.9 V up to 18 V, and the output voltage range down to 0.6 V, these devices feature great flexibility.

The embedded low $R_{DS(on)}$ P-channel MOSFET (150 mΩ typ) means the device can manage up to 100 % duty cycle. Another important feature is the switching frequency that can be adjusted from 250 kHz to 1 MHz by an external resistor.

The L598x is also suitable for MLCCs (Multi Layer Ceramic Capacitors) as an output filter. Additional monitoring and protection functions such as overcurrent, UVLO, thermal shutdown and internal digital soft-start combined with the thermally performing DFN3x3-8L package, allow the realization of a robust and compact application with a minimum number of external components.

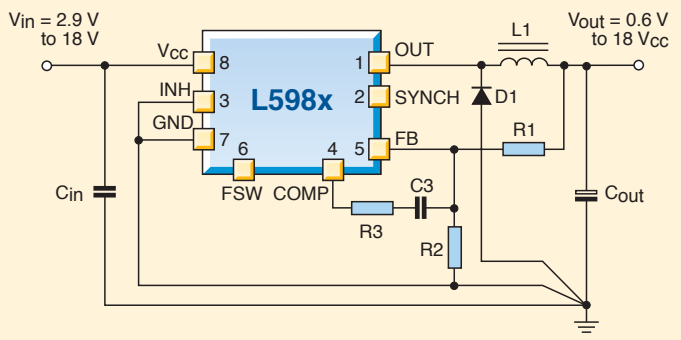
The devices can also be synchronized with an external signal, or together in a MASTER/SLAVE configuration, with a phase shift of 180 °C.

Main Features

- Up to 2 A DC output current
- 2.9 V to 18 V input voltage
- Output voltage adjustable from 0.6 V
- 250 kHz switching frequency, programmable up to 1 MHz
- Internal soft-start
- Inhibit for zero current consumption
- 100 % duty cycle
- Voltage feed-forward
- Zero load current operation
- Over current and thermal protection
- DFN3x3-8L package

Applications

- Consumer:
  STBs, DVDs, DVD recorders, car audio, LCD TVs and monitors
- Industrial:
  Chargers, car batteries, PLD, PLA, FPGA
- Networking:
  XDSL, modems, DC-DC modules
- Computer:
  Optical storage, hard disk drives, printers, audio / graphic cards



L598x application schematic

Order Codes

Part number	I_{out} DC [A]	V_{out} [V]	F_{sw}	Package
L5980	0.7	Adj from 0.6	From 250 kHz up to 1 MHz	DFN 3x3-8L
L5981	1			
L5983	1.5			
L5985	2			

PM8800

By N. Moschini
Industrial and Power Conversion Marketing

INTEGRATED SOLUTION FOR STANDARD AND HIGH POWER PoE POWERED DEVICES

The design of power supply sections of all powered devices can be greatly simplified with the new PM8800, which Integrates a standard Power over Ethernet (PoE) interface and a current mode PWM controller.

The PoE interface incorporates all the functions required by the IEEE 802.3af, including detection, classification, under-voltage lockout (UVLO) and in-rush current limitation.

PM8800 specifically targets PDs with extended power requirements with respect to the limit imposed by the 802.3af standard, embedding a hot-swap Power MOSFET capable of sustaining twice the current of the 802.3af standard with a programmable DC current limit.

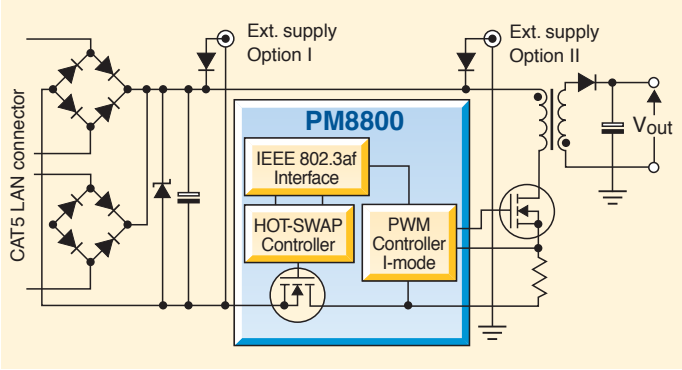
The integrated switching regulator of the PM8800 is designed to work with power, either from the Ethernet cable connection or from an external power source such as an AC adapter. The DC/DC section of the PM8800 features a programmable oscillator frequency, soft-start, slope compensation and embeds a voltage output error amplifier allowing use in both isolated and non isolated configurations.

PM8800 Features And Benefits

- IEEE 802.3af compliant powered device interface
- Works with power supplied from ethernet LAN cables or from local auxiliary sources
- Configurable priority of the auxiliary source vs. PoE line
- Integrated 100 V, 0.5 Ω, 800 mA hot-swap MOSFET
- Programmable in-rush current limit
- Integrated signature resistor
- Power good indication
- Programmable DC current limit up to 800 mA
- High voltage start-up bias regulator
- Thermal shutdown protection
- Current mode pulse width modulator
- Programmable oscillator frequency
- Programmable soft-start
- 80 % maximum duty cycle with programmable slope compensation
- Supports both isolated and non-isolated applications

Device Characteristics

Part number	Input voltage range [V]	Hot swap current [mA]	Max duty cycle [%]	Package
PM8800A	0÷57VDC	800	80	HTSSOP16



Simplified application schematic

Typical Applications

- VoIP phones
- WLAN access points
- Security cameras
- WiMAX CPEs
- High power (>12.95 W) powered devices

Numerous Topologies Supported

PM8800 works in both isolated and non isolated configuration, supporting flyback, forward and buck topologies. It can be used in a wide range of applications, from standard PoE(<15 W) with diode rectification to higher power (up to 35 W) applications with synchronous rectification.

L674x For CPU Supply

By R. Barbon
Computing & Networking Power Management

AMD HYBRID PLATFORM: THE COMPLETE SOLUTION FOR POWER MANAGEMENT

The L6740L dual PWM multi-phase controller, together with the Power MOSFET driver L6741, L6743 or L6743Q, realizes the first "hybrid" solution on the market for the power management of the new AMD desktop and server processors.

Compliant with dual-plane supply and serial communication interface (SVI) of next platforms, the controller is also compatible with actual CPUs using single-plane supply and parallel interface (PVI), allowing the design of hybrid motherboards. The drivers are compatible with the existing standard controllers, allowing them to be used in a wider range of applications.

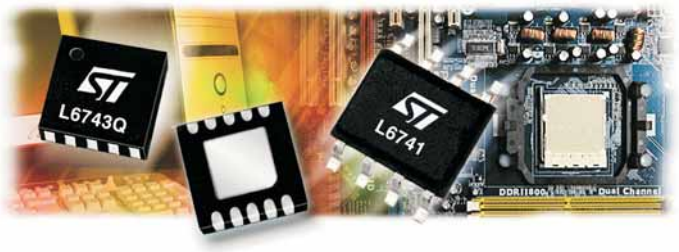
Advanced Features And High Flexibility

L6740L embeds two independent controllers for the CPU core and the integrated North-Bridge, each one with its own set of protection. The device performs single-phase control for the NB section and up to 4 phase control for the core section. Its architecture allows a fast load-transient response, reducing the output filter, and consequently minimizing the total cost. New patent pending PWM techniques, together with a full set of features covering the CPU specifications and fulfilling the new trend in power saving, make this device ideal for computing, datacom, telecom and storage markets.

L6741, L6743 and L6743Q offer a selection of MOSFET drivers, in SO-8 and DFN10 3x3 mm packages, suitable for use in desktop computers, servers, low voltage power conversions, suitable for thermally enhanced applications. Their high current driving capability allows applications from just a few Amps to over 35 Amps per phase, from both 5 V and 12 V buses. Since the bootstrap diode is embedded, the external part count is lowered. The adaptive dead-time control minimizes the low-side body diode conduction time, improving the system efficiency. The preliminary OV protection saves the load in case of high-side Power MOSFET failures.

Drivers' Key Characteristics

Part number	Package	Enable pin
L6741	SO-8	No (automatic)
L6743		Yes
L6743Q	DFN10 3x3 mm	

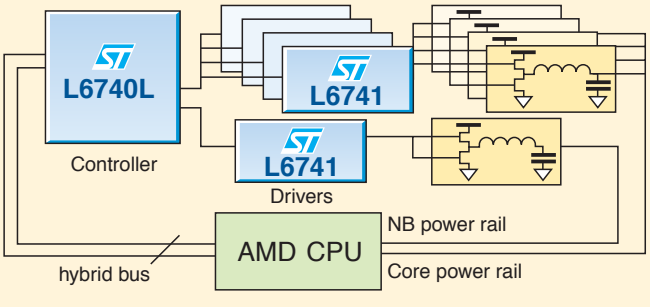


Typical Applications

- Microprocessors and Digital Signal Processors
- Memories and terminations
- High density DC-DC converters

Main Features

- PVI and SVI automatic compatibility
- 2 to 4 phases for CPU core, 1 phase for NB
- High current Power MOSFET drivers, with adaptive dead-time management and preliminary OV protection
- Dual-edge asynchronous architecture with Load Transient Boost Technology™
- PSI flag management to increase efficiency in light-load conditions
- Dual over-current protection: Average and Per-phase
- Load indicators
- Load-line voltage positioning
- Dual differential remote sense
- Adjustable independent reference offset
- Feedback disconnection protection
- Programmable OV protection
- Adjustable switching frequency, up to 1 MHz
- Pre-biased load management



L674x simplified application schematic

GS-R12/24 Modules

By F. Corazzo
Subsystem Product Marketing

FLEXIBLE LOW COST DC-DC CONVERTER MODULES FOR HIGH VOLUME APPLICATIONS

The new GS-R12 and GS-R24 DC-DC converter modules provide a wide range of non-isolated 2 Amp current standard solutions for power systems. The products are grouped into two families depending on the input V_{DC} value, namely the GS-R12 for 12 V_{DC} input and GS-R24 for 24 V_{DC} input.

Both families provide solutions for THT and SMT board assembly technologies. The SMT solutions are available with 2 different aspect ratio footprints. Each solution is identified by the specific part number, and datasheets provide system designers with all the necessary data, including electrical characteristics, mechanical data, footprints and pin layouts.

GS-R12 and GS-R24 DC-DC converters share a number of key features and provide a solution for 1.8, 2.5, 3.3 and 5.0 output voltages. Each product family also includes a flexible programmable solution so that designers can select the output voltage value just by connecting a resistor between two pins.

Cost Effective, High Volume Solutions

No heatsinks are required for any of these modules, and thanks to advanced silicon technology and to the relatively high switching frequency adopted these DC-DC converter modules present cost effective open-frame solutions suitable for high volume applications.

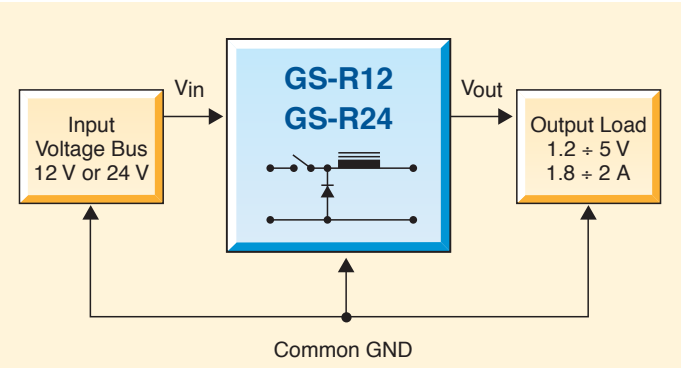
Thanks to their ease of use and repeatable design this portfolio of DC-DC converters is tailored for distributed power supply architectures.
Their compact size and state-of-the-art performance make them attractive for numerous applications ranging from gateways and routers to set-top boxes in the consumer market.

Main Features

- MTBF 1 M hours at T_A = 25 °C
- 2 A max output power
- 16 (35) max Input voltage
- Efficiency >80 % (fixed V_{DC} output)
- 1.5 max drop-out voltage
- Remote logic inhibit/enable
- Synchronization function
- Non-latching overload and short circuit protection
- Thermal shutdown
- Operating temperature range -25 °C to 85 °C
- Stand-by mode possible through inhibit features
- Switching frequency synchronization in multiple module applications
- Current limitation possible through pulse by pulse, and frequency fold back methods

Selected DC-DC Converter Order Codes

Part number	V_{in} [V]	V_{out}	I_{out} [A]	Package
GS-R12FV0001.9	12	Programmable	1.9	THT
GS-R24FV0001.9	24			
GS-R12F0002.0	12		2.0	SMT
GS-R24F0002.0	24			



GSR application example

PM6600 LED DRIVER

By V. Contin
Industrial & Power Conversion

MONOLITHIC DRIVER FOR UP TO 60 WHITE LEDs FOR MOBILE PC LCD PANEL BACKLIGHTING

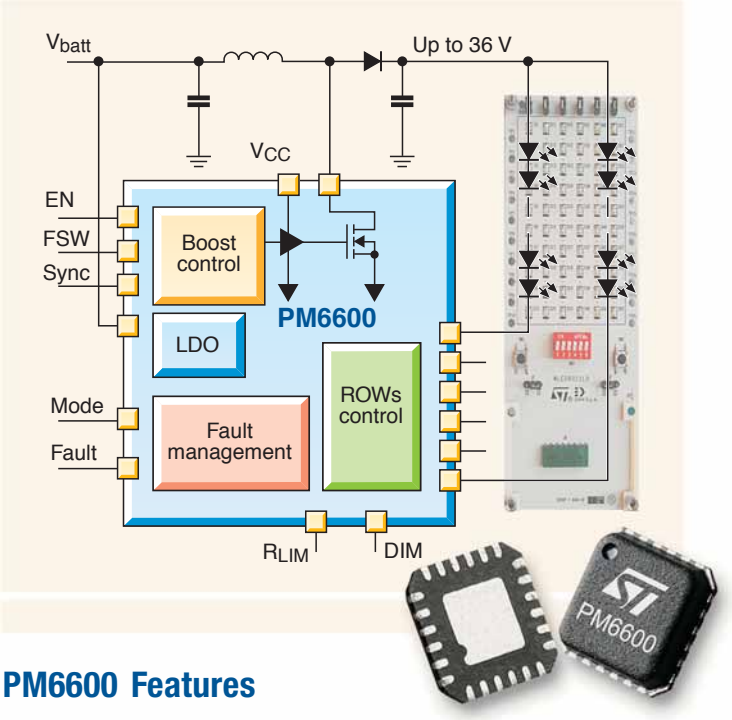
The new PM6600 is a monolithic white LED driver specifically designed to supply LED arrays used to backlight mobile PC LCD panels. It consists of a highly efficient boost converter integrating a Power MOSFET and six controlled current generators (ROWs). The device can manage an output voltage able to supply up to ten white LEDs per ROW.

PM6600 Functional Description

The boost section is based on a constant switching frequency peak current-mode architecture. The boost output voltage is controlled so that the lowest voltage of the ROW, referred to as SGND, is equal to an internal reference voltage (400 mV typ.). The typical input voltage range is from 4.7 V up to 28 V. In addition, the PM6600 has an internal 5 V LDO regulator that supplies the internal circuitry of the device and is capable of delivering up to 40 mA. The input of the LDO is the main input voltage (V_{batt}).

The boost section switching frequency can be externally adjusted from 200 kHz to 1 MHz, it also has an internal fixed value of 600 kHz (typ.), which eliminates the need for a resistor, an important feature in minimum component-count applications.

The frequency pin (FSW) can also be used as the synchronization input, allowing the PM6600 to operate both as the master or the slave. The generators can be externally programmed to sink from 16 mA up to 30 mA and can be dimmed via a PWM signal (1 % dimming duty-cycle at 20 kHz can be managed). The device is able to detect and manage the open and shorted LED faults. If some ROWs are not used, during the start-up the device is able to self-detect and automatically disconnect the ROWs without any fault detection. Output over-voltage, internal Power MOSFET over-current and thermal shutdown are provided as protection.



PM6600 Features

- Constant frequency peak current control
- Internal Power MOSFET
- External sync for multi-device applications
- Pulse-skip power saving mode at light load
- Programmable soft-start
- Programmable OVP protection
- Ceramic output capacitor
- 6 ROWs with 30 mA max current capability (adj.)
- Up to 10 white LEDs per ROW
- ROW disable option
- ±1.5 % current matching between ROWs
- LED failure (open and short circuit) detection
- Housed in VFQFPN 24L space-saving package

Typical Applications

The PM6600 is designed for backlighting in LCD panels for battery/AC adapter supplied equipment, such as:

- Notebook panel backlighting
- Ultra mobile PC panel backlighting
- Tablet PC panel backlighting

PM6600 Product Summary

Part number	N. of outputs	Main application	LED max capability	Regulated voltage	Regulated LDO voltage	LDO current	IC supply voltage	ROW current range	Package
PM6600	2	Mobile PC LCD backlighting panel	60 W LEDs 6 ROWs x 10	Up to 36 V	5 V	40 mA	4.7 V to 28 V	16 to 30 mA	VFQFPN 24pin 4X4

TS507 Op Amp

By B. Micheau
Standard Linear ICs Marketing

HIGH PRECISION ULTRA-LOW INPUT OFFSET VOLTAGE RAIL-TO-RAIL OP AMP

The TS507 is a new high precision, single-channel op-amp featuring an ultra-low input offset voltage of only 25 µV typical and 100 µV maximum. This high precision is obtained by trimming after packaging, using a patented adjustment technique. One main advantage of adjustment after packaging is the avoidance of offset voltage drift due to encapsulation.

In addition to a low offset voltage, the TS507 demonstrates excellent DC parameters, an open-loop gain of 131 dB (typ.) on a 5 V supply, and a PSRR of 105 dB (typ.).

Operating at low supply voltages from 2.7 to 5.5 V, the TS507 has a rail-to-rail configuration on both its input and output. It can also deliver high output current -up to 130 mA in a short circuit configuration- and can drive high capacitive loads. It consumes 850 µA and has a gain bandwidth product of 1.9 MHz.

The TS507, like the recent TSV91x and TSV99x, has an exceptional ESD tolerance of above 5 kV in HBM.

Two Temperature Ranges

Two different temperature ranges are offered: 0 to 85 °C (C suffix) and -40 °C to 125 °C (I suffix). It is available in SOT23-5L and SO-8 packages.

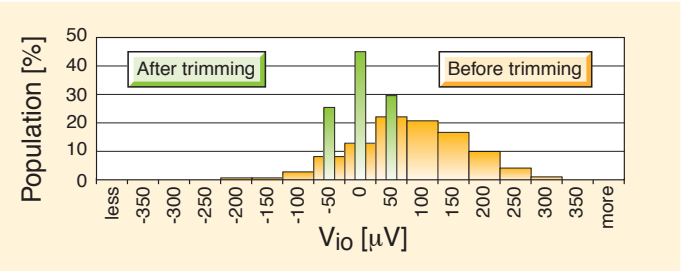
Typical Applications

The TS507 benefits applications requiring high precision to amplify low-level signals delivered by low-source impedance sensors. The low supply voltage makes it perfect for battery-powered applications, portable medical instrumentation and devices, test equipment and factory automation applications.

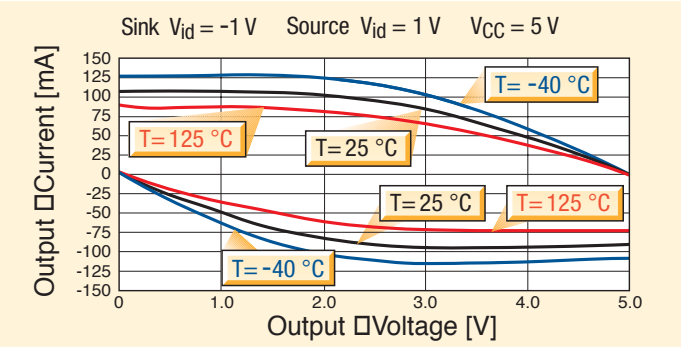
The TS507 is also qualified for automotive use.

Key Features

- Very low offset voltage: 25 µV typ, 100 µV max
- Low V_{io} drift in temperature: 1 µV/°C typ
- Lower drift after reliability tests than competitive products
- Rail-to-rail input/output
- Operating from 2.7 V to 5.5 V
- Very large open loop gain: 131 dB
- High PSRR: 105 dB
- Low noise: 12 nV/√Hz at 1 kHz
- ESD tolerance ≥ 5 kV (HBM)



The effect of after-packaging trimming on V_{io}



High output current

TS507 Main Electrical Characteristics

Part number	V_{CC} Range [V]	I_{CC} typ [µA]	V_{io} max [µV]	V_{io} /T typ [µV/°C]	I_{ib} max [nA]	GBP typ [MHz, C_L=100pF]	SR [V/µs, C_L=100pF]	E_n typ [nV/√Hz]	Package
TS507	2.7 to 5.5	850	100	1	70	1.9	0.6	12	SOT23-L, SO-8

TS4997

By M. Bendridi
Standard Linear ICs Marketing

2x1 W STEREO AUDIO AMPLIFIER WITH PROGRAMMABLE 3D EFFECTS IN 4x4 mm PACKAGE

Mobile handset designs are evolving from custom multi-chip designs to standard highly integrated solutions. Targeting new growth in telecom segments for mixed-analog integrated circuits, ST has introduced a new-style 3D integrated stereo audio amplifier system for portable applications. The TS4997 is part of a new line of products focused on handset architectures which are moving to increase quality of mobile music and help create more immersive games for the latest generation of portable applications such as smartphones, multimedia devices, PDAs and personal navigators.

Device Description

The TS4997 is intended for mobile phones and for other portable audio products. It creates 3D audio effects in the stereo speaker outputs to add impact and a surround-sound feel to MP3 and video files.

Designed with an advanced BICMOS process, the TS4997 can deliver 1.2 W per channel for stereo loudspeaker configurations. It features an advanced pop and clickless reduction circuitry. The 3D effect enhancement is programmed through a dual digital-input-pin interface that allows more flexibility in each output audio sound channel.

The device also offers a low supply current of 10 nA in standby mode and excellent power supply rejection ratio.

Thanks to its reduced die dimension, cost structure, and good thermal performance, the TS4997 comes in a 16-pin QFN 4 x 4 mm package ideally tailored for portable electronics.

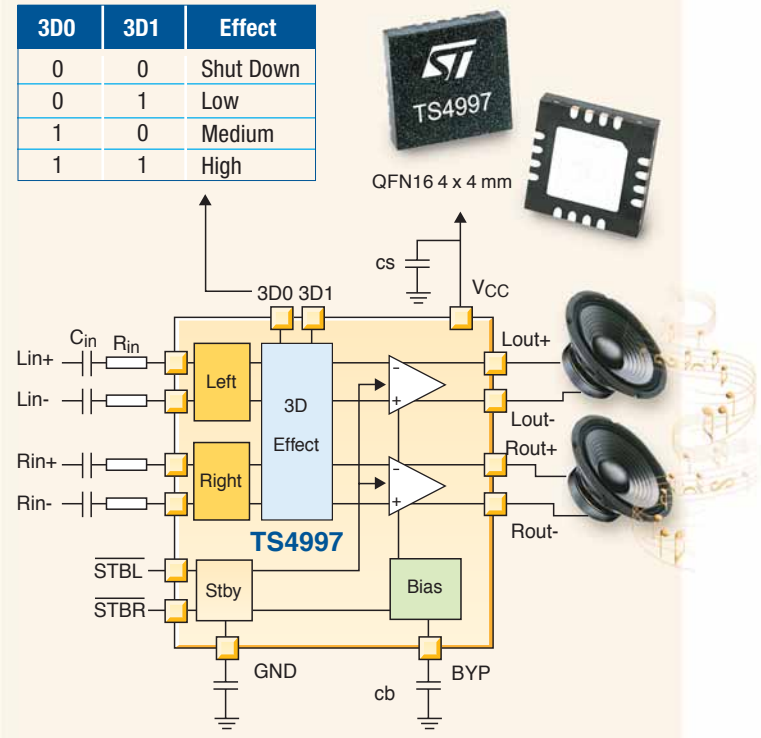
Features

- Operating range from V_{CC} = 2.7 V to 5.5 V
- 1 W output power per channel @ V_{CC} = 5 V, THD+N=1 %, RL = 8Ω
- Ultra low standby consumption: 10 nA typ
- 80 dB PSRR @ 217 Hz with grounded inputs
- High SNR: 106 dB(A) typ
- Fast startup time: 45 ms typ
- Pop and click-free circuit
- Dedicated standby pin per channel
- Lead-free QFN16 4x4 mm package

Competitive Advantages

The TS4997 delivers excellent stereo analog audio performance while providing the simplest 3D feature in the market. It requires no signal pre-processing, and no external components need to be added. In addition, it reduces end-product form factors for portable products due to reduced size and power constraints.

3D0	3D1	Effect
0	0	Shut Down
0	1	Low
1	0	Medium
1	1	High



Typical internal circuit topology

STLQ50 Voltage Regulator

By G. Valvo
Voltage Regulator & Interface Marketing

50 mA, 3 µA SUPPLY CURRENT LOW DROP LINEAR REGULATOR EXTENDS BATTERY LIFE

The optimization of the low quiescent current in power supply designs has become of great importance. A long battery life is essential and depends on the consumption of the power supply at a given load. One way to decrease the consumption especially at low output loads is to minimize the quiescent current of the power regulator IC. There are portable applications where the device is required to work at full load for a very short time only, while it has a very long stand-by time. In this case a very low quiescent current helps.

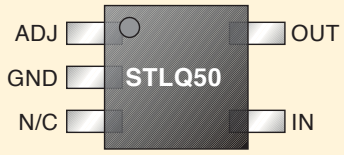
STLQ50 Description

As a result of this market demand, ST has developed the STLQ50, a BiCMOS linear regulator specifically designed for operating in environments with very low power consumption constraints. Due to the very low quiescent current (3 µA) the device extends the battery life in applications with a very long stand-by time.

The Power MOSFET pass element also allows a very good drop-out figure (200 mV at 25 mA I_{out} and 350 mV at full load) without affecting the consumption characteristics.

Small Packages

Housed in the very small SOT323-5L (SC-70) and SOT23-5L packages, the device fulfils the space saving requirements of battery powered equipment.



Pin configuration

Applications

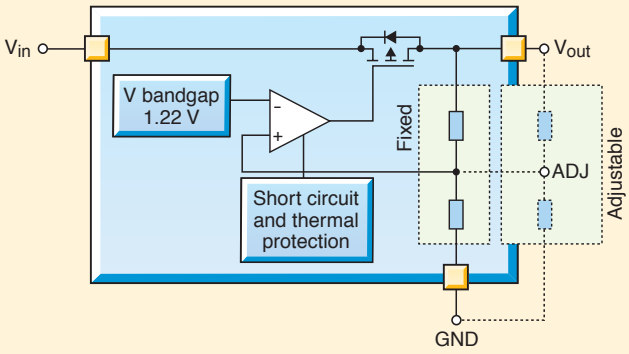
- Portable medical instruments
- Real-time clock backup power
- Alarm systems
- Sensors

Order Codes

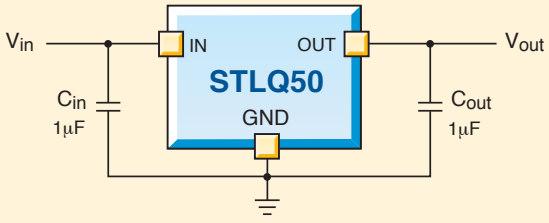
Package		Output voltage
SOT323-5L (T&R)	SOT23-5L (T&R)	
STLQ50C18R	STLQ50M18R	Fixed V_O = 1.8 V
STLQ50C25R	STLQ50M25R	Fixed V_O = 2.5 V
STLQ50C33R	STLQ50M33R	Fixed V_O = 3.3 V
STLQ50C50R	STLQ50M50R	Fixed V_O = 5.0 V
STLQ50C-R	STLQ50M-R	Adjustable

Main Features

- 2.3 V to 12 V input voltage range
- 50 mA maximum output current
- 3 µA quiescent current
- Available in 1.8 V, 2.5 V, 3.3 V, 5.0 V fixed output voltage and in adjustable version
- 200 mV dropout voltage at 25 mA output current
- Internal thermal protection
- Small SOT323-5L and SOT23-5L packages



Internal block diagram



Typical application schematic (fixed V_{out})

ST2S06 DC-DC Converter

By G. Zuppardo / V. Caruso
Voltage Regulator & Interface Marketing

DUAL STEP-DOWN CONVERTER WITH RESET AND ENABLE FOR COST EFFECTIVE PORTABLE APPLICATIONS

The new ST2S06 is an innovative dual step-down converter able to satisfy the ever increasing demand for highly integrated devices, reducing the PCB area in budget-minded portable applications. Two versions of ST2S06 are currently available with the twofold purpose of supplying an entire optical disk drive power board and to provide a highly compact point of load solution for medium power loads.

Customization And Commodity All In One

ST2S06A has been specifically designed and tailored for high-end optical storage devices. It is able to supply the read channel LSI and the DSP / RF amplifier using only switching regulators. This minimizes the electrical losses for which linear regulators are definitely not the best in class solution. The ST2S06A integrates a reset block to avoid system malfunctioning that could occur if the input supply voltage extended out of the allowable range. Channel 1 output voltage is fixed to 3.3 V (2.5, 1.8, 1.5, 1.2 V under request) while channel 2 is adjustable from 0.8 V to 5 V.

Complete Solution With ST8R00

An ideal partner of this device in high definition optical drives is the step-up converter ST8R00 which is designed to supply the blue laser diode. Together with ST2S06 it provides the application with a complete solution for the main board power management.
ST2S06B replaces the reset with the enable feature making the device suitable for a wide range of applications especially where the power dissipation and the consumption current are critical concerns for a proper and optimum functionality of the whole system. The highest application flexibility is guaranteed with the programmability of both output channels, starting from 0.8 V, by means of external resistor dividers.

ST2S06 Common Features

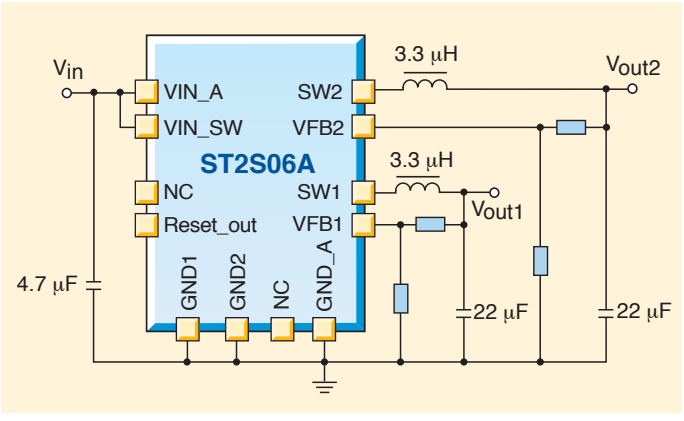
Because of the integrated synchronous rectification, the 1.5 MHz switching frequency, the intrinsic stability and the low output ripple, the external passive components can be small, low cost SMD inductors and capacitors.

Main Features

- Dual step-down, PWM controller with embedded synchronous rectifier
- Enable function (“B”)
- Reset output flag monitoring the input (“A”)
- High efficiency (Typ. 90 % @V_{out} = 1.2 V)
- Very low ripple in all operating conditions
- Fully integrated compensation network
- Very small QFN12-4x4 mm package

Main Applications

- Medium power step-down points of load
- Stand-alone DVD player / recorder
- Half height and slim DVD-RW, HD-DVD, Blu-ray Disc



ST2S06 application schematic

Main Characteristics

Part number	I_{out} [A]	PWM f_S [MHz]	Key features	V_{out} Range [V]	V_{in} [V]
ST2S06A	0.5 + 0.5	1.5	reset	0.8 to 5	6
ST2S06B			inhibit		

STCF03 Voltage Regulator

By F. Macina
Voltage Regulator & Interface Marketing

BRIGHTER PHOTOS WITH THE NEW HIGH-POWER CAMERA FLASH LED DRIVER WITH I²C

STCF03 is a dual mode DC-DC converter specifically designed to drive a high-current white LED used for flash illumination. Still pictures and video recording in the latest generation of portable imaging equipment such as mobile phones, digital still cameras and PDAs can benefit from this powerful driver. The main benefits brought to the application are the flash intensity and duration, which means higher quality pictures even in the worst lighting conditions.

Extra features supported are torch mode for video recording, autofocus and red-eye reduction. All the device functions are controlled by the I²C bus interface, reducing both logic pins on the package and PCB traces on the board. The current intensity in flash and torch mode can be programmed separately using exponential steps. An auxiliary output can control an optional red LED to be used as a recording indicator.

STCF03 Features

- Dual mode buck-boost DC-DC converter
- 1.8 MHz PWM control scheme
- QFN version delivers up to 800 mA over an input voltage range from 2.7 V to 5.5 V
- µTFBGA version delivers:
  - up to 600mA from 2.7 to 3.3 V
  - 800 mA from 3.3 V to 5.5 V
- Flash intensity and duration easily programmable through I²C
- Soft and hard flash triggering
- Flash and torch dimming in 16 exponential values
- Dimmable red LED indicator auxiliary output
- Full set of protection features including LED over-heating
- Two package options: QFN 4x4 and µTFBGA 3x3

Order Codes

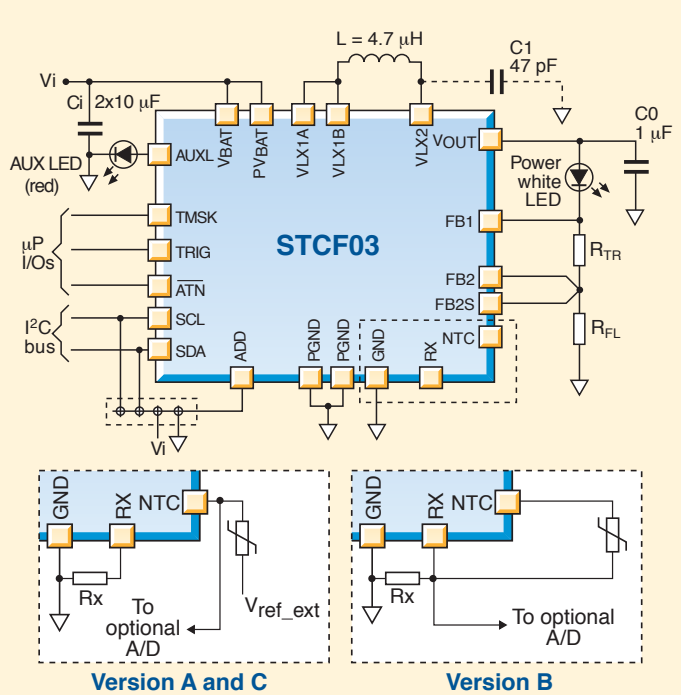
Part number	Package [mm]	Version
STCF03PNR	QFN 20L 4x4	A: external reference for NTC protection
STCF03ITBR	µTFBGA25 3x3	B: internal reference for NTC protection
STCF03TBR	µTFBGA25 3x3	C: external reference for NTC protection

STCF03 Functional Description

This highly integrated buck-boost converter guarantees a proper LED current control over both battery voltage and output voltage conditions. The output current control ensures an excellent current regulation over the forward voltage spread characteristics of the flash LED. The current in torch mode is adjustable from 15 mA to 200 mA. Current is adjustable up to 800 mA, the Ball Grid Array (BGA) version is able to deliver 600 mA with a battery voltage range from 2.7 to 3.3 V while 800 mA from 3.3 V to 5.5 V. The Aux LED current can be programmed up to 20 mA. The device could use an external NTC resistor to sense the temperature of the white LED. Since Aux LED and NTC protection are optional functions, their relevant external components may be omitted when not required.

Dedicated Demo Kits

To help with the design-in of STCF03, three different demo kits in versions A, B and C are available. A dedicated application note is also available: *AN 2507: STCF03 LED driver for a single flash with I²C Interface*



Typical application circuit showing different versions

STULPI01 Transceiver

By S. Lupo
Voltage Regulator & Interface Marketing

ULPI COMPLIANT, USB2.0 HIGH SPEED TRANSCEIVER WITH OTG FUNCTIONALITY

STULPI01 is a stand-alone solution able to add a high speed USB connection in Application-Specific-Integrated-Circuits and System-on-Chips where fast data exchange rate, complexity and low power consumption are a main concern.
The STULPI01 is a high speed (480 Mbps) USB 2.0 transceiver which is compliant with ULPI (UTMI+ Low Pin Interface) and OTG (On-The-Go) specifications, providing a complete physical layer solution for any high speed USB host, device or OTG dual role core. STULPI01 is optimized for low power consumption, and minimal die/package dimensions.

OTG Functionality: The Intelligent Solution

STULPI01 is compliant with OTG specifications providing point-to-point communication, supporting dual role features between portable devices such as mobile handsets, PDAs, digital still cameras, digital video cameras and MP3 players. This means information from a PC could be downloaded onto OTG equipment such as a PDA and then the PDA could be taken on the road and serve as the host to support printing or music downloading to another device.

DDR Or SDR Mode Supported

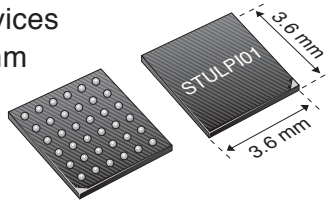
Unlike full- and low-speed USB systems which utilize serial interfaces, the high-speed STULPI01 solution requires a parallel interface between the controller and the PHY in order to run the bus at 480 Mbps. This leads to a corresponding increase in complexity and pin count. ULPI keeps this down to only 8 or 12 signals because it combines just three control signals, plus clock, with a 4 or 8-bit bi-directional data bus. The 4 and 8-bit modes are known as double (DDR) and single data rate (SDR) respectively.

ULPI Standard Minimizes Pin Count

ULPI stands for UTMI+ low pin interface and is designed specifically to reduce the pin count of discrete high-speed USB PHYs. Pin count reductions minimize the cost and footprint of the PHY chip on the PCB and reduce the number of pins dedicated to USBs for the link controller. As a result of these capabilities, ULPI is quickly becoming the new interface standard among system and chip designers.

STULPI01 Main Features

- Supports 480 Mbit/s high-speed, 12 Mbit/s full-speed and 1.5 Mbit/s low-speed modes of operation.
- On request, 26 MHz or 19.2 MHz oscillator frequency with external crystal, can be provided
- Supports 2.7 V UART mode
- Ability to control external charge pump for higher V_{BUS} currents
- Single supply, +3 V to +4.5 V voltage range
- Integrated dual voltage regulator to supply internal circuits with stable 3.3 V and 1.2 V.
- Integrated over current detector
- Integrated HS termination and FS/LS/OTG pull-up/pull-down resistors
- Power down mode with very low power consumption for battery-powered devices
- µTFBGA36 (3.6 x 3.6 mm typ) RoHS package



STULPI01 Applications

STULPI01 is recommended wherever a fast data exchange is needed with plug and play features and system supply voltages are not able to satisfy USB requirements. Low power consumption and power down operating mode make this transceiver suitable for every mobile application and in particular battery powered devices where battery life is a concern.

Two Versions Available*

Part number	Key differences [MHz]	Package
STULPI01A TBR	f_{OSC_DIG} = 19.2	µTFBGA36 3000 parts per reel
STULPI01B TBR	f_{OSC_DIG} = 26	

STLED316S Panel Controller

By R. Bhatia
Advanced Logic and
Mixed Signal Technical Marketing

LED DISPLAY CONTROLLER WITH KEY-SCAN FOR COST EFFECTIVE DESIGNS

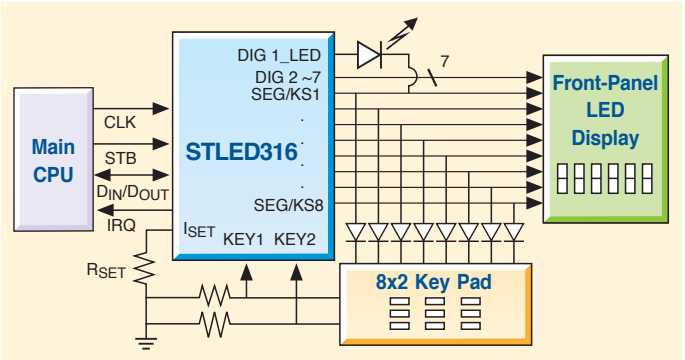
Due to the extremely competitive market, today's consumer electronics or home appliance producers, are under constant pressure to reduce costs. ST has recently introduced the STLED316S, an integrated LED driver to help designers achieve a more efficient and simplified design for front panels, such as those found on set-top boxes, DVD players, washing machines, dryers and microwave ovens.

The STLED316 is an integrated LED driver which controls front-panel activities. A typical front panel consists of a key-pad, an LED display panel and various discrete LEDs. The device employs a unique time-multiplexing scheme to drive displays together with key-scans with a limited number of I/Os.

The combination of display driving and key-scanning allows a single device like STLED316S for the complete front panel solution eliminating the use of sub-CPU and other logics plus discrete devices, reducing BOM count and lowering the final cost.

STLED316 Main Features

- Common anode LED driver
- Drives 56 outputs (7 grids and 8 segments)
- Drive capability of up to 40 mA per output
- Capable of driving red, green and blue LEDs
- Maximum segment current for the display can be set through one external resistor
- Continuous key-scanning up to 16 keys
- 3-wire serial SPI interface to MCU
- 8-step dimming capability for each digit
- Drives additional 8 LEDs with dimming control
- Available in pin-count optimized SO-24 package



STLED316S application diagram

STLED316 Main Benefits

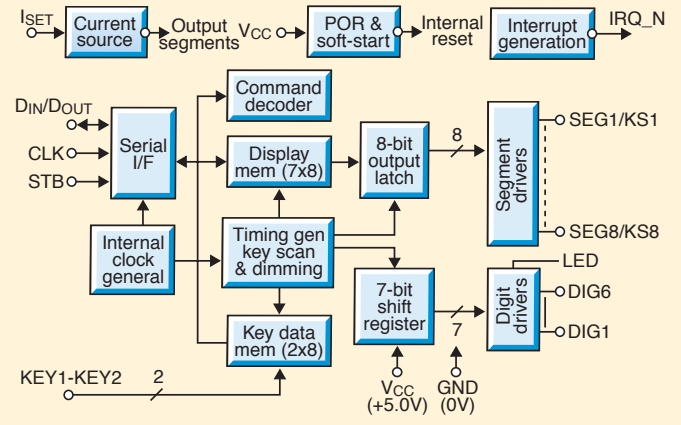
- Interrupt output to main CPU upon key-press does not need the CPU to poll the device continuously
- Low power consumption during standby
- Flexibility means that devices can be connected in parallel when more digits/segments are needed
- Minimizes the peripheral component count

Traditional Solutions

The current solutions implemented by most customers consist of two main architectures:

- Shift register logic device with a main MCU
- Sub-CPU and darlington current array

There are certain drawbacks to these solutions. The precious I/Os of the MCU need to be used for key-scan and for driving interfaces. These methods increase the BOM cost and also complicate the PCB routing. In home appliances where a main board is far from the front panel, the cost of the cable for wiring increases reliability risk and cost.



STLED316S block diagram

Applications

This device can be used in a variety of applications where a front panel interface is present with LED display and key-scanning. The applications range from white goods such as washers, dryers, microwave ovens, refrigerators to consumer devices like DVD players and set-top boxes to gaming machines and even industrial equipment and instrumentation.

STP16CPS05 Power Logic

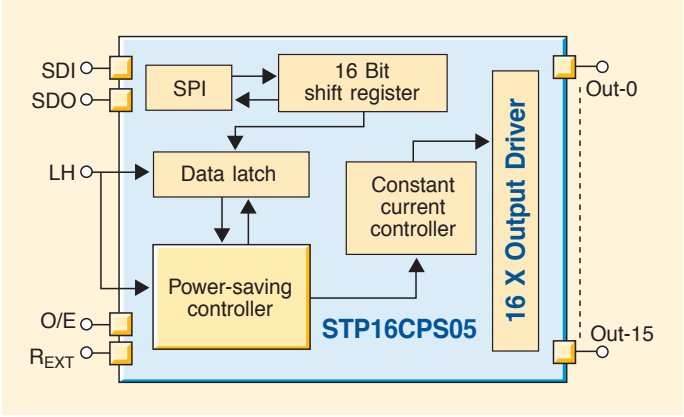
By Kurt Lim
Advanced Logic & Mixed Signal Marketing

80 % ENERGY SAVINGS, ULTRA EFFICIENT 16-BIT AUTO-SHUTDOWN LED DRIVERS

ST's recently introduced Power Logic family has now been enhanced by the addition of the STP16CPS05 series. These 16-bit LED drivers are the first on the market to include auto-power-saving features, allowing manufacturers to meet the high power efficiency requirements of industrial lighting, signage and transport applications with an energy saving of around 80 % compared to the standard solution.

STP16CPS05 Features

An evolutionary advantage over the previous STP16Cx596 Power Logic series, the new constant current LED drivers allow individual ICs to go into shutdown mode when no active inputs are detected. As a result, STP16CPS05 can save power without any external intervention, making it the ideal solution to support the numerous worldwide energy-saving programs.



STP16CPS05 Power Logic LED driver block diagram

Functional Description

The STP16CPS05 Power Logic series features a clock and data re-synchronization function, which is useful when the devices are connected in cascade. STP16CPS05 can work with a power supply from 3.3 V up to 5 V; their output current is programmable from 5 mA to 100 mA to suit applications requiring mid-current range. This high-precision LED control guarantees the industry's best output precision of ±1.5 % Bit-to-Bit and ±5 % Chip-to-Chip over the output current range from 20 mA to 100 mA, and covers the full wide temperature range of -40 °C to +125 °C.

The ICs also have the market's highest V_{out} of 20 V. When it comes to protection, these ICs are ESD protected at 2.5 kV(HBM) and 200 V(MM), and in addition are thermally-protected by in-built automatic thermal-shutdown circuitry.

Three Package Options

The STP16CPS05 series are available in three package types, one of which, the thermally efficient exposed-pad TSSOP, comes with outstanding heat dissipation features of R_{thJC} = 37.5 °C/W.

Features And Benefits

- Low voltage power supply down to 3 V
- 16 constant current output channels
- Adjustable output current through external resistor
- Serial data IN/parallel data OUT
- Auto power-saving feature minimizes the quiescent current if no active data is detected on the latches
- Can be driven by a 3.3 V microcontroller
- Output current: 5 to 100 mA
- 30 MHz clock frequency

Applications

- Solar-powered LED applications
- Battery-powered LED applications
- Architectural lighting
- Special Illumination
- Full color LED matrix displays
- Traffic LED displays
- White goods displays and lighting

Order Codes

Part number	Package	Remarks
STP16CPS05MTR	SO-24	Surface-Mount
STP16CPS05TTR	TSSOP24	
STP16CPS05XTTR	TSSOP24 Exposed Pad	High heat dissipation

STMPE S-Touch Family

By E. Chang
Advanced Logic Marketing

SIMPLE LOW COST SOLUTION FOR TOUCH SENSING

To address the rapidly growing market of low power touch screens, ST has introduced S-Touch, a new range of touch sensor controllers that can offer simple and highly efficient solutions for capacitive and resistive touch-sensor functions in ultra small packages.

S-Touch implements highly innovative signal processing techniques for both capacitive and resistive technology to correctly detect, process and pass the touch information to the CPU. In addition, the sensor lines from the device to the application's touch pads do not require any external RC (resistor capacitor) networks which are typically required in other solutions, resulting in a highly cost-competitive solution.

Tiny Packages

S-Touch devices are housed in the tiny QFN16 and QFN40 packages, 80 % smaller than existing equivalent solutions, ensuring a very compact and efficient design.

STMPE S-Touch Portfolio

Technology	Part number	Package	Features
Resistive	STMPE811	QFN16	8 GPIOs and 4 additional ADC
Capacitive	STMPE1208	QFN40	12 keys and 12 GPIOs standalone
	STMPE821	QFN16	8 keys or 8 GPIOs multiplex

Resistive S-Touch Controllers

S-Touch resistive touch-screen controllers use a 4-wire resistive methodology with built-in ADC to offer both ease of design and greater flexibility to touch screen applications.

STMPE811 Controller Features:

- Fast I²C (400 kHz) or SPI (1 MHz) serial interface
- 12-bit ADC for high-resolution resistive touch-screens
- 128-depth data buffering/filtering
- Advanced movement tracking to reduce CPU/bus usage
- Window masking allows intelligent use of screen
- Ultra low power consumption (Active <1 mA; Idle < 100 µA)

Capacitive S-Touch Controllers

S-Touch capacitive touch-key controllers use a hardwired finite state machine approach with fully digital architecture. This results in very low power consumption, five to ten times lower than the conventional touch sensor solution, and ultra fast sampling time, typically 2 ms. S-Touch capacitive touch-key controllers are suitable for a wide range of touch-key sensing applications, such as keypads, rotators or buttons.

STMEP1208 and STMPE821 Controller Features:

- Fast 400 kHz I²C interface
- Ultra fast sampling time (typ. 2 ms)
- Highly innovative self-auto calibration method enables high tolerance to environmental changes such as temperature or PCB variations, RF noise, water drops
- Highly sensitive impedance change detection engine to ensure reliable operation even with thick isolation coating (ΔC~60 fF)
- Built-in data filtering technology with 100 levels of touch strength detection
- Ultra low power consumption (< 5 µA per key; active < 98 µA; Idle < 60 µA)

Application Areas

- Mobile phones, PDAs, notebooks
- Portable media players, game consoles
- Home appliances, instrumentation
- Medical, security devices
- Factory automation equipment

www.st.com/stouch

STMUX3040

By Ng Chee Yu
Advanced Logic & Mixed Signal Marketing

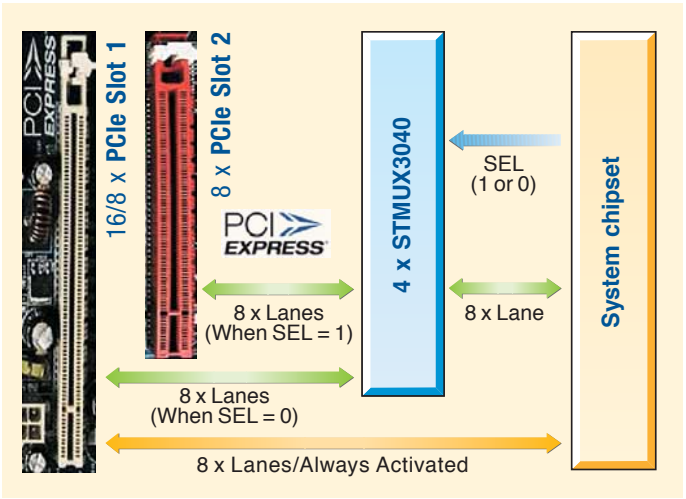
FIRST OCTAL SPDT HIGH SPEED BI-DIRECTIONAL PCIe SWITCH WITH INTEGRATED VOLTAGE REGULATOR

ST's new STMUX3040 is a differential Single Pole Double Throw (SPDT) 2 to 1, low R_{on}, bi-directional signal switch designed for PCIe (Peripheral Component Interconnect Express) signaling.

Providing very low cross-talk, low bit-to-bit skew, high channel-to-channel noise isolation and low I/O capacitance, this switch offers very little or practically no attenuation of the high-speed signals at the outputs, thus preserving the signal integrity.

An integrated voltage regulator allows operation at a 3.3 V power supply if necessary. The integrated voltage regulator is bypassed automatically if supply voltage is 1.8 V.

Using STMUX3040 as a PCIe signal switch, systems are able to dynamically reallocate PCIe lanes to the slots that require higher bandwidth, giving the system the ability of optimize performance of different PCIe peripherals.

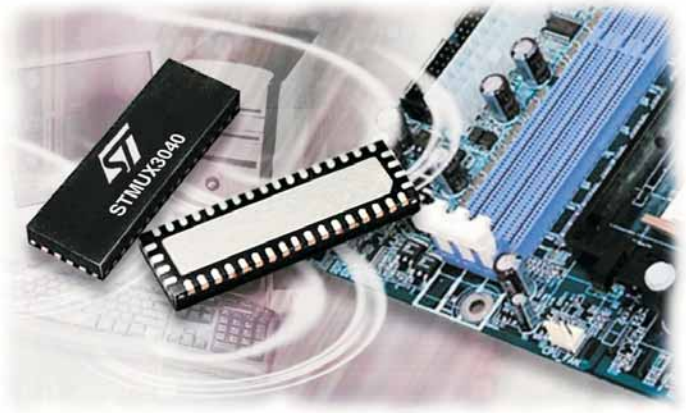


PCIe resource allocations

STMUX3040 could be used as a general purpose high-speed low resistance signal switch. For example, the LVDS connection between multiple GPU and a single LCD in high performance notebooks.

Ordering Code

Part number	Package
STMUX3040QTTR	TQFN42



STMUX3040 Key Features

- Supports PCI Express signaling at 2.5 Gbps
- Supports 3.0 Gbps generic data rate
- OCTAL SPDT switch to support 2 PCI lanes
- Low R_{on}: 5.5 Ω typical
- Internal voltage regulator
- V_{CC} operating range
  - 1.65 to 2.0 V (Internal Regulator Bypassed)
  - 2.7 to 3.6 V (Internal Regulator Active)
- Low current consumption: 150 µA
- ESD HBM Model : 2 kV
- Channel on capacitance: 6 pF typical
- Switching time speed: 9 ns
- Propagation delay: 250 ps
- Bandwidth: -3 dB at 1200 MHz
- Low crosstalk: -20 dB at 1200 MHz
- Bit to bit skew: 50 ps typical
- Data and control inputs provide undershoot clamp diode
- Wide bandwidth minimizes skew and jitter
- Supports bi-directional operation
- -40 °C to 85 °C operating temperature range
- TQFN42 package

Targeted Applications

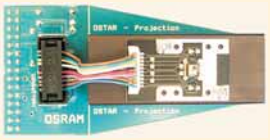
STMUX3040 is designed for systems that require switching of high speed signals:

- Performance PC motherboards
- Workstations
- LVDS lines switching

Lighting Boards

DEDICATED EVALUATION BOARDS AVAILABLE THROUGH www.st.com/evalboards

Sales code	Board	Description	Core products	Document
EVAL6585D-230V		Evaluation board to drive a 54 W linear T5 fluorescent lamp. The ballast control is through the L6585D that integrates PFC and half-bridge control circuits.	COMBO IC for PFC and ballast control: L6585D	AN2524
EVAL6574B		CFL/TL ballast driver preheat and dimming evaluation board.	Ballast driver: L6574 PFC: L6561/2	AN993
EVAL6569		High voltage half bridge driver with oscillator for electronic lamp ballast evaluation board.	Ballast driver: L6569	AN880
STEVAL-ILB001V2		36 W - 220 Vac low cost HF ballast using the bipolar solution for PFC.	Diodes: X02 series 1.25A SCRs	AN2349
STEVAL-ILB002V1		This board implements a digital lighting electronic ballast using an 8-bit microcontroller to control both the power factor corrector and the tube lamp.	8 bit micro: ST7FLIT19BF1B6 Power Supply: L6382D5	AN2459
STEVAL-ILC001V1		High performance half bridge solution for CCFL backlighting based on ST's control IC, L6574.	Driver IC: L6574	Datasheet
STEVAL-ILL001V1		Dimmable driver for high brightness LEDs using VIPer22A in flyback configuration with output current control.	VIPer: VIPer22A	AN2042
STEVAL-ILL002V3		Complete solution for driving a HB LED array (40 Osram Blue LEDs)based on the STP08DP05 power logic driver with diagnostic features.	Advanced Logic: STP08DP05	AN2415
STEVAL-ILL002V4		Complete solution for driving a HB LED Array (40 Toshiba Green LEDs) based on the STP08DP05 power logic driver with diagnostic features.	Advanced Logic: STP08DP05	AN2415
STEVAL-ILL003V1		Cost effective solution to drive an array of high brightness LEDs based on STP16CP596 driver without diagnostic.	Advanced Logic: STP16CP596	AN2141
STEVAL-ILL004V2		Phase control dimmer driver for lamp or motor based on 8 pin microcontroller and AC switch.	8 bit micro: ST7FLITEUS5B6 AC switch: ACST76S	AN2425

Sales code	Board	Description	Core products	Document
STEVAL-ILL005V1		Low cost, high efficiency, high brightness multiple LED driver based on the integrated off-line switching regulator VIPer12A.	VIPer: VIPer12A	AN1916
STEVAL-ILL006V1		Constant current off-line power supply driver for high brightness LEDs based on VIPer22A.	VIPer: VIPer22A	AN1916
STEVAL-ILL007V1		High Brightness LED Driver based on L5973D monolithic step-down converter configured to drive a series string of LEDs in a constant current mode.	Power Supply: L5973D	AN2259
STEVAL-ILL008V1		DC-DC power supplies based on ST's L6920D boost converter. Drives 1 high intensity LED for a flash light application.	Power Supply: L6920D	AN1941
STEVAL-ILL009V1		RGB color control board based on STP04CM596 high-power LED driver.	Advanced Logic: STP04CM596	AN2531
STEVAL-ILL009V3		This board should be connected to the STEVAL-ILL009V1 control board to evaluate the light features. OSTAR projection module is used as light source.	Advanced Logic: STP04CM596	AN2531
STEVAL-ILL009V4		This board is an option to the STEVAL-ILL009V3. As a light source, there are four Golden Dragon LEDs used with a maximum forward current of 350 mA.	Advanced Logic: STP04CM596	AN2531
STEVAL-ILL011V1		Stand-alone evaluation kit for the light ambient sensor VM6101. The board is based on a ST72F264G2 microcontroller which processes the information about the color detected by the sensor and reproduces the color using the STP08C596 which drives the RGB LEDs.	Advanced Logic: STP08C596MTR Micro: ST72F264G2	UM0419
STEVAL-TLL001V1		White LED power supply for large display backlighting based on STLD40 boost converter.	Voltage Regulator: STLD40D	AN2333
STEVAL-TLL002V1		Camera flash driver based on STCF01 step-up converter.	Voltage Regulator: STCF01	AN2243
STEVAL-TLL003V1		Flash LED driver based on STCF02 high-power white LED driver.	Voltage Regulator: STCF02	AN2304

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