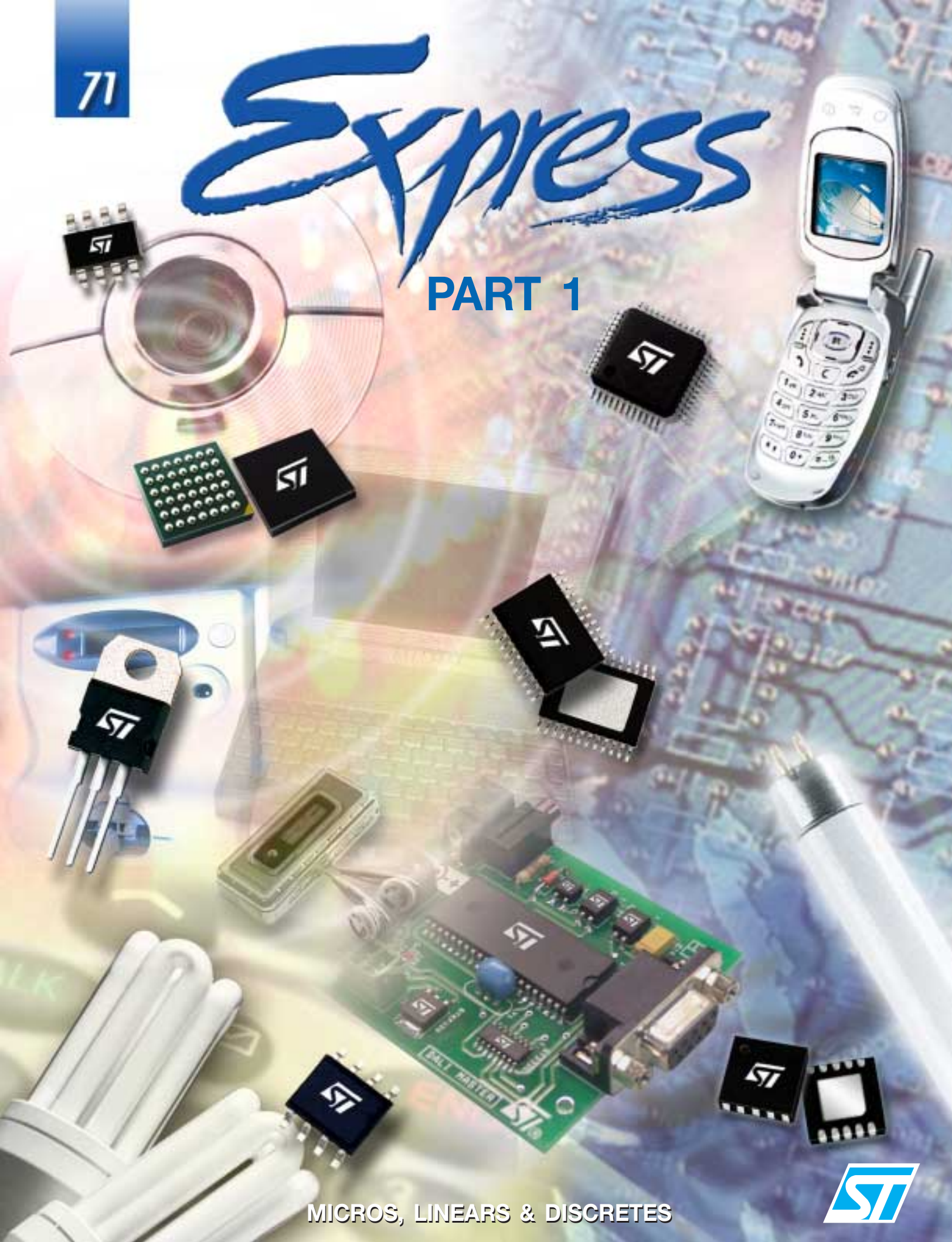
71

Express

PART 1



MICROS, LINEARS & DISCRETES

Contents

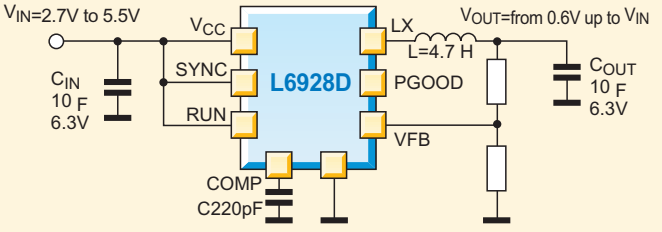
EXPRESS - Anno 14 - Reg. Trib. CT n°759 del 04/10/89
Dir. Resp.: G. SAN BIAGIO
Redazione: Y. CAWTHRAW
Stampa: Tipo-Lito MONFORTE dmonfo@tin.it
Grafica: AUGEN STUDIO info@augenstudio.it

L6928D

By F. Sandrini
Industrial & Power Conversion Mktg

HIGH FREQUENCY SYNCHRONOUS STEP-DOWN CONVERTER FOR PORTABLE APPLICATIONS

All battery powered applications demand a common set of requirements: the final application has to be compact, with the highest efficiency and with a minimum part count, while the battery life has to be maximized. These requests have a one-to-one impact on Power Management ICs: besides the useful power conversion section, they need to have useful embedded features, even though they have a small pin count. Maximizing efficiency and making the input voltage range as large as possible helps in exploiting the battery life as long as possible. L6928D is the latest of a product family designed with specific features to fit portable applications.



L6928D basic connection

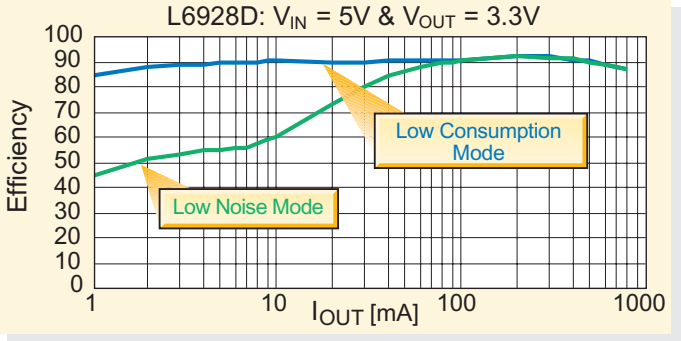
The L6928D is a synchronous monolithic step down converter (2 low $R_{DS\ (ON)}$ MOSFETs integrated), able to work from 1.4MHz up to 2MHz switching frequency. The very high switching frequency allows the use of smaller, low cost passive parts (inductor and capacitors), while additional functions like shut-down, synchronization capability and power good are embedded. The control architecture maximizes efficiency at any load, and the designer can always choose between “low noise” and “low consumption” control mode: this makes the L6928D suitable also for noise sensitive environments.

L692x Synchronous Converter Family

Type	I_{OUT}	V_{IN} [V]	V_{OUT} [V]	F_{SW}
L6920 (Step up)	1A (switch)	0.6 to 5.5	3.3 or 5 or adj.	Variable up to 1MHz
L6925	800mA	2.7 to 5.5	Adj. from 0.6	0.6MHz up to 1.4MHz
L6926	800mA	2 to 5.5	Adj. from 0.6	0.6MHz up to 1.4MHz
L6928	800mA	2 to 5.5	Adj. from 0.6	1.4MHz up to 2MHz

L6928D Features and Benefits

- High Switching Frequency: 1.4MHz up to 2MHZ → smaller passive parts (and PCB area);
- V_{IN} ranges from 2V up to 5.5V → suitable for different batteries and commonest voltage buses (3.3V and 5V);
- High efficiency conversion → up to 800mA DC output in a small MSOP8;
- Thermal shut-down, overcurrent and overvoltage protection → short design time for a safe application;
- V_{OUT} adjustable from as low as 0.6V up to V_{IN} → suitable to supply state-of-the-art ASICs and microprocessors;
- Current mode control → suitable for low cost ceramic capacitors;
- Low consumption and low noise mode selectable on the fly → maximum performance at any time.



L6928D efficiency

L6928D Typical Efficiency

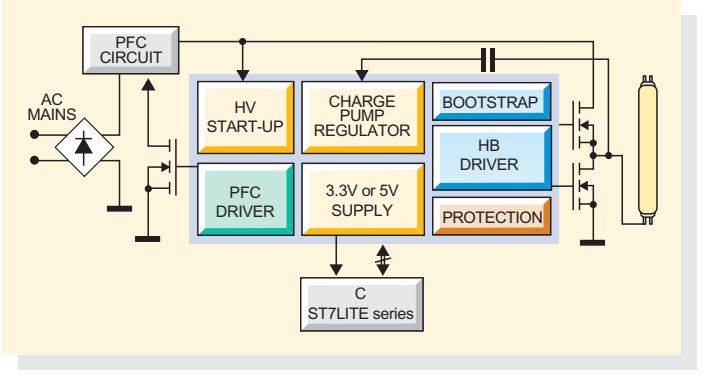
Both the technology performance and control techniques make L6928D a state-of-the-art switching regulator, offering simpler designs with better performance.

L6382Dx

By F. Sandrini & Luca Salati
Industrial & Power Conversion Division

POWER MANAGEMENT UNIT FOR MICROCONTROLLED BALLAST

The electronic ballast market has undergone dramatic changes over the last few years; it has moved from all analog very differentiated applications, made by a collection of drivers and controllers plus a widespread use of custom ASICs, to a couple of standard platforms. Basic building blocks are still the same: a power factor corrector stage plus an inverting high voltage stage. On one hand we now have an analog platform to target low cost/basic performance applications. Its main building blocks are widely used and well known ICs such as Power Factor Corrector (L656x) plus an high voltage ballast controller (L6569x/ L6571x/ L6574). On the other hand a new digital platform concept has gained more acceptance. A microcontroller plus a simple half bridge driver (L638x) have replaced the ballast controller. This platform is used mainly for high-end applications, especially where the µC has to deal with communication tasks (i.e. using Dali protocol).



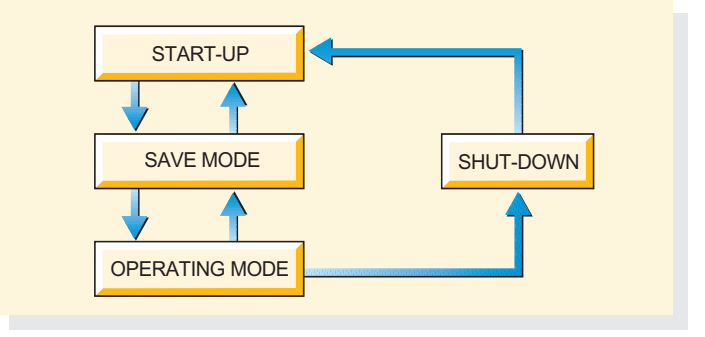
L6382Dx system block diagram

Digital Platform Challanges

New issues concerning the digital platform have arisen. How to power efficiently all the ICs (PFC, µC, driver) in all conditions and how to make the µC drive the MOSFET (both half bridge ones and PFC one) without using too many different drivers. This means how to rationalize the system partitioning. L6382Dx ICs are designed to fulfil these needs: they include 3 MOSFET driving stages (for PFC, for the half bridge, for the preheating MOSFET) plus a power management unit (PMU) able to supply the microcontroller in any condition.

L6382Dx Power Management

L6382Dx manages 4 different states in order to supply the microcontroller in the most efficient way using the proper power source.
These modes are: start-up mode, save mode, operating mode and shut-down. Their names refer to the status of both the microcontroller and the drivers.



L6382Dx power management state diagram

The HV start-up block is the circuitry through which the L6382Dx supplies itself and the µC. However in the operating mode, where the charge pump regulator is preferred (because of efficiency and thermal dissipation issues), the µC supply currents are differentiated according to the different working modes. The PMU implements this mechanism in order to keep the µC alive and able to control the overall application status to ensure a safe application design, and to minimize the overall power dissipation. L6382Dx reduces the application bill of materials because many different tasks (regarding drivers and power management) are performed by a single IC, which of course improves the application reliability.

VIPer for Lighting

By G. Di Stefano
VIPower Industrial Marketing

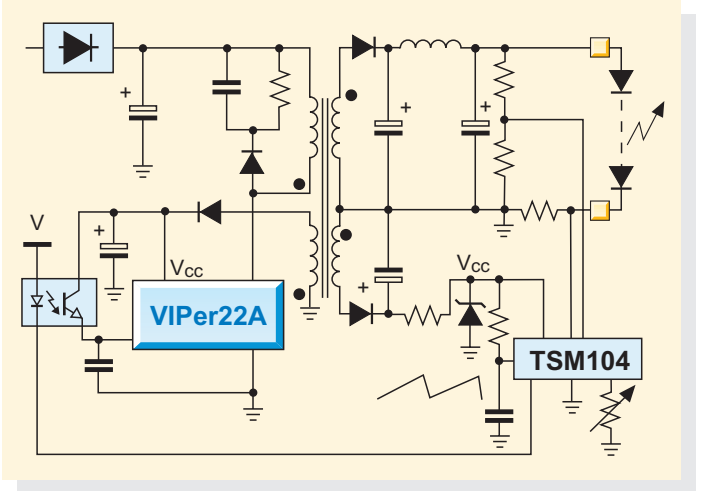
VIPer12A AND VIPer22A THE IDEAL SOULUTION FOR LIGHTING APPLICATIONS

During the current year the VIPer12A and VIPer22A have been extremely successful in the consumer segment in applications such as, stand-by power supplies, digital TV receivers, adaptors and battery chargers. The market has recognized the innovation and quality of these smart power monolithic SMPS in VIPower M0-3 technology. However, it is little known that these devices are also highly suited to the lighting applications.

The VIPer12A and VIPer22A have been validated in basic lighting applications such as, auxiliary power supplies for video projector beamers (H.I.D lamps), emergency lighting battery chargers and power supplies for micro-controller managed lighting. In addition an innovative design has been developed, using both VIPer12A and VIPer22A, to drive and to dim an array of High Brightness (H.B.) LEDs.

VIPer12AS / VIPer22AS Driving HB LEDs

In the proposed schematic showing VIPer22A driving an array of H.B. LEDs both the supply and the dimming of the LEDs array is realized. The choice between VIPer12A and VIPer22A depends strictly on the output power managed. VIPer12A is indicated for an output power in the range of 10W for greater power up to 20W the right device is the VIPer22A.



VIPer22A driving an array of high brightness LEDs

Main Features

- Input voltage range: 85Vac to 130Vac or 185Vac to 265Vac;
- Nominal Output Voltage Range (1 to 8 LEDs): 3.5V to 28V;
- Maximum output voltage at open load: 32V;
- Constant output current: 350mA;
- Dimming range: 0% to 90%;
- EMI compliant with EN55015.

Unlike most VIPer applications in this case the auxiliary winding on the primary side is connected in a forward mode in order to manage an output voltage range from 3.5V up to 28V. The application schematic has been realized for the European voltage mains range (185Vac to 265Vac), but it goes without saying that by modifying the input voltage and realizing a voltage doubler the U.S. voltage range can also be applied. The non-dimmable solution can be realized very easily by eliminating the dimming control circuit and the TSM104 component can be replaced by the simpler TSM1011.

For more information see application note AN2042 *VIPower: Dimmable driver for high brightness LEDs with VIPer22A.*

SuperFREDMesh Technology

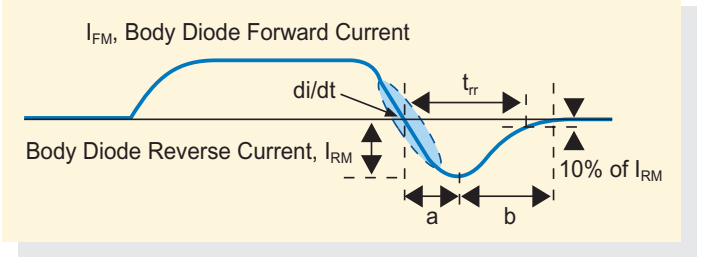
By M. L. Petralia
Power MOSFET Technical MKTG

ADVANCED SuperMESH POWER MOSFETs WITH FAST RECOVERY BODY DIODE

A new advanced high Voltage MOSFET technology has just been introduced. It is directly derived from the well-established high voltage SuperMESH series with a new carrier lifetime control technique. This new technology, called SuperFREDMesh, is the perfect match for HID lamps, high-end ballasts and switch-mode power supplies that use zero-voltage resonant switching.

ZVS Resonant SMPS

The challenge of modern power supplies is to achieve ever-increasing efficiency at higher frequencies. These conflicting requirements can also be seen as a trade-off between thermal issues and noise problems. A special technique, developed to this purpose, utilizes zero-voltage transition to minimize switching losses and radiated noise. The phase-shifted ZVS (zero voltage switching) mode of operation, associated with bridge circuits, is achieved by imposing a resonance in the switching transistor circuit that causes the voltage across it to decrease to almost zero before the switching on of the device; as a result, switching losses are greatly minimized. In particular, in topologies such as bridge converters, it is required that the MOSFETs have a fast body drain diode. In fact, if the reverse recovery charge has not been removed before turning off the MOSFET, the body diode is not be able to block the reverse voltage. Therefore, if the remaining charges are still in the junction during the turning-on of the other MOSFET of the same leg of the bridge, its body diode may be subjected to dv/dt stress. Another failure mode occurs at low or no load conditions due to the loss of the ZVS operation. In this condition the ON-MOSFET is turned-off at hard-switching conditions. Such an occurrence causes a Cdv/dt shoot-through current to create a voltage spike at the gate of the OFF-MOSFET on the same bridge leg leading to device premature failure.



First SuperFREDMesh devices

The first MOSFETs realized utilizing this new high-voltage advanced process show, along with optimal dynamic performance, optimized body diode reverse-recovery time (t_{rr}) and very soft recovery. All these features help reduce switching losses.

These benefits are coupled to a low on-resistance and high dv/dt immunity and cost competitiveness characterizing the whole SuperMesh family. The STW29NK50ZD is a 500V device suitable for high power ZVS bridge SMPS.

The STP9NK60ZD handles 600V and is available in TO-220, TO-220FP and D^2PAK. It handles up to 30W, while the STB9NK60ZD and STP9NK60ZD each handle up to 125W. Its typical application is for notebook adapters in half-bridge configuration.

The STE45NK80ZD and the STE40NK90ZD handle 800V and 900V respectively, and are suitable for welding and very high power ZVS SMPS topologies.

Product Range

P / N	BV_{DSS} [V]	$R_{DS(on)}$ typ [mΩ]	T_{rr}typ [ns]	Package	Production
STW29NK50ZD	500	120	150	TO-247	Q1'05
STP9NK60ZD	600	850	194	TO-220	In production
STE45NK80ZD	800	110	TBD	ISOTOP	Q1'05
STE40NK90ZD	900	140	TBD	ISOTOP	Q1'05

Power MOSFETs in Linear Operation

By G. Bazzano / G. Consentino / R. Gulino
Power MOSFET Marketing

NEW LOW VOLTAGE POWER MOSFETS EXCEL IN LINEAR-MODE APPLICATIONS

It is well known that in some applications Power MOSFETs must operate inside the linear zone, that is the area of the output characteristics I_D vs V_{DS} with high current and voltage values. Such mode of operation differs from the traditional way of using MOSFETs which are normally made to function like "switches", that is, in on-off switching mode.
When used in linear mode, MOSFETs are subject to thermal stresses in low drain current conditions and current crowding phenomena is involved. From a datasheet standpoint, this involves a reduction in the forward-biased safe operating area (FBSOA).

Planar Technology

The MOSFET's ability to overcome a thermal stress related to linear operation is strongly dependent upon its physical structure. It has been observed that the latest competitors' "Trench" technologies designed for ever-decreasing on-resistance are extremely weak when used in the linear zone. ST's planar technologies are much more suitable than Trench variants in yielding robust devices. This statement can be demonstrated by analyzing the variation of the threshold voltage as temperature increases. In ST's planar technology this parameter is less prone to decrease with temperature. This in turn implies that the drain current rise is limited more easily, making the MOSFET less susceptible to thermal runaway.

Applications

Typical applications in linear mode are encountered in automotive applications such as fan motors or in industrial where they can be employed in UPS converters.

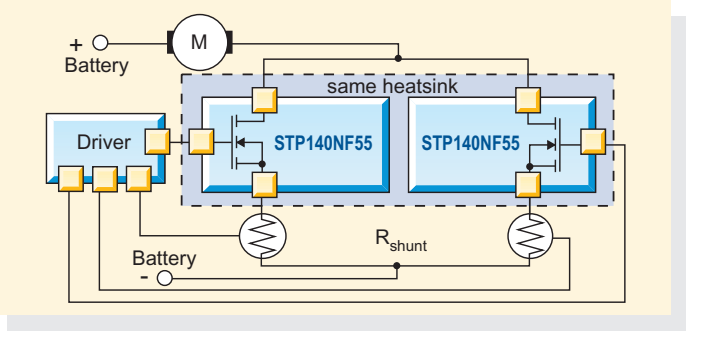
It has been shown that power MOSFET devices like the STP130NS04ZB and the STP140NF55 realized using an optimized version of STripFET behave significantly better than similar devices from competition as proven by a detailed analysis of the thermal coefficient behaviour.

Features

- 175°C as maximum operating temperature;
- Higher current capability;
- Standard threshold devices;
- 100% avalanche tested;
- Optimized for linear mode operation.

Electrical Characteristics

The parameter measuring how well or bad a MOSFET is in linear mode can be identified by the thermal coefficient. It in fact represents the rate of change of drain current caused by an increase in temperature. It is sometimes normalized with respect to the chip area to allow benchmark ing with other devices.



A typical motor control application using STP140NF55

In this schematic, a DC voltage supplied by a battery drives a motor in series with two power MOSFET devices connected in parallel on the same heatsink. The two MOSFETs work in the linear zone and, acting on the gate-source voltage, it is possible to fix the drain-source voltage. Consequently the voltage across the motor terminals is established by the difference between the battery and the drain-source voltages. The regulation is performed by a suitable driver that checks the current flowing in the MOSFETs and establishes the right gate-source voltage.

Product Range

P / N	I_C [A]	BV_{DSS} [V]	R_{THJ-C} [°C/W]	$R_{DS(on)}$ max [mΩ]	Package
STx140NF55	120	55	0.5	< 8	D^2PAK TO-220
STx130NS04ZB	80	Clamped @ 33V	0.5	< 9	D^2PAK TO-220 TO-247

Low Profile MOSFETs for Adaptors

By D. Ifurung
Power MOSFET Product Marketing

HIGH PERFORMANCE SuperMESH IN I²SPAK & TO-220

Over the years power handling capability has been crucial in the evolution of SMPS. In order to meet the requirements of more compactness, higher power and lower profiles, numerous product developments and package innovations have been seen.
Since efficiency, reliability and cost have always played a binding role in all SMPS designs, ST is expanding its SuperMESH HV devices in both TO-220 and I²SPAK packages to meet these requirements. It features SuperMESH's ultimate $R_{DS(on)}$ values which are on a par, or even better than the best TO-220 competition equivalents in the standard technology arena.

SuperMESH "NK" With Best $R_{DS(on)}$

P / N	$V_{(BR)DSS}$ [V]	I_d max [A]	$R_{DS(on)}$ [Ω]	Q_g typ [nC]
STP20NK50Z **STB20NK50Z-S**	500	17	0.27	85
STP16NK60Z **STB16NK60Z-S**	600	14	0.42	86
STP16NK65Z **STB16NK65Z-S**	650	13	0.50	86
STP12NK80Z **STB12NK80Z-S**	800	10.5	0.75	87

Suffix -S indicates I²SPAK

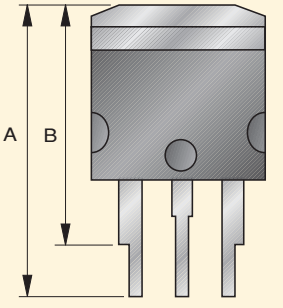
The tables above and below show $R_{DS(on)}$ values of our SuperMESH devices.

SuperMESH Vs Competition

Parameter	Toshiba	Fairchild	Fuji	ST
BV_{dss} (V)	500	500	500	500
$R_{DS(on)}$ (Ω)	0.52	0.265	0.38	0.27
Q_g (nC)	42	42	32	85
BV_{dss} (V)	600	600	600	600
$R_{DS(on)}$ (Ω)	0.75	0.49	0.54	0.42
Q_g (nC)	45	36	33	86
BV_{dss} (V)	-	650	-	650
$R_{DS(on)}$ (Ω)	-	1.4	-	0.50
Q_g (nC)	-	2.8	-	86
BV_{dss} (V)	800	800	800	800
$R_{DS(on)}$ (Ω)	2.2	1.5	1.9	0.75
Q_g (nC)	34	40	25	87

I²SPAK Versus TO-220/FP

Until recently the TO-220/FP was the preferred package for Power MOSFETs in adaptor applications. However, due to the high power density / lower profile adaptor requirements, designers are now looking for alternative solutions. Hence, the new I²SPAK offers a lower profile feature for the designer whenever height becomes a constraint.



I²SPAK

REFERENCE DIMENSION	mm		
	TYP	MIN	MAX
A		16.7	17.5
B		13.82	14.42

I²SPAK Benefits

- I²SPAK height is ~4.93mm less than TO-220's;
- I²SPAK has short leads, thus lead trimming process is not required;
- I²SPAK allows the clip to assure an evenly distributed pressure with the external heatsink that translates into a better thermal contact;
- I²SPAK could become "the package" for high power density / low profile adaptors.

New 200V Power MOSFET Series

By G. Bazzano, M. Micciché & G. Pignataro
Power MOSFET Marketing

NEW MEDIUM VOLTAGE POWER MOSFET TECHNOLOGY IMPROVES SYSTEM EFFICIENCY

The need to provide system designers with a complete product portfolio has led ST to extend its medium voltage product range. A new 200V technology has been specifically developed to match the requests for the lowest $R_{DS(on)}$ and Q_g. This technology represents a turning point when compared with the previous generations. Parts made with this new technology can be identified by the letter "N" inside the salestype.

Greater Overall Efficiency

This new process, is based on ST's successful proprietary planar technology. The silicon design optimization has brought an overall increase in the efficiency due to the reduced conduction and switching losses.
In fact, the $R_{DS(on)}$ is about 42% smaller than the previous technology, while the figure of merit is an outstanding 68%.

Product Comparison

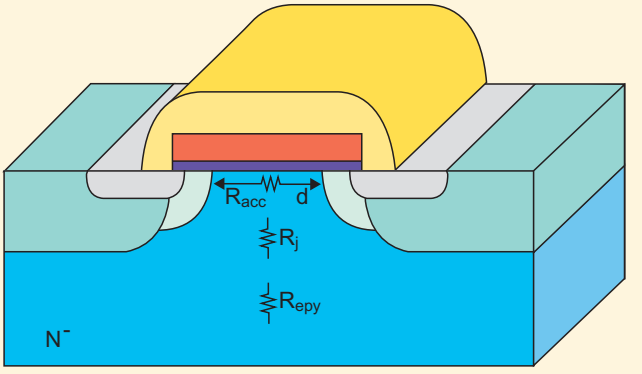
The table below shows a comparison between the traditional 200V STripFET process and the new one.

PARAMETER	Traditional STripFET	NEW STripFET
Channel Per./Area	10.5 m/cm^2	17 m/cm^2
R_{on} * Area	18 mΩ * cm^2 @ 10V	10.4 mΩ * cm^2 @ 10V
R_{on} * Q_g	7614 mΩ * nC @ 10V	2430 typ mΩ * nC @ 10V

The exceptional $R_{DS(on)}$ is obtained through different steps:

- The edge structure optimization with a better epitaxial specification improves $R_{DS(on)}$.
- The JFET optimization implies a modification of the layout in order to enhance the density of the equivalent cells, further reducing the $R_{DS(on)}$.
- The reduced total Q_g makes this device suitable for high frequency switching operation.

At the same time the switching performance has been improved by implementing a new gate oxide structure for a resulting low input capacitance and total gate charge.



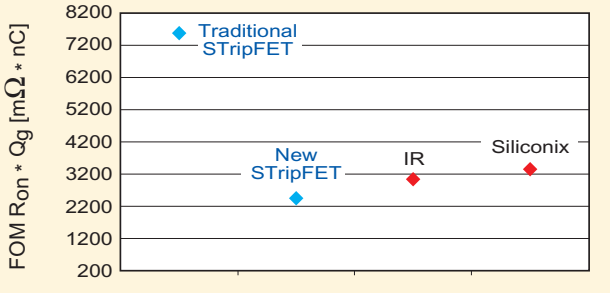
Elementary contributions to the total $R_{DS(on)}$

Applications

The Power MOSFETs created with this new technology are used primarily as primary switches in forward, half-bridge or push-pull power converter topologies for power modules in telecom, datacom and networking systems.
Moreover, the excellent electrical performances also make them ideal for UPS and UHP lamps.

Product Range

P / N	$R_{DS(on)}$ max [mΩ]	Q_g typ [nC]	Package
STD5N20L	800	5 @ 5V	DPAK
STS3N200	130	21	SO-8
STD20N20	120	27	DPAK
STP40N20	45	100	TO-220



New STripFET figure of merit (R_{on} x Q_g) shows a lower value than competition

Power MOSFETs for Power Tools

By M. Sgroi
Power MOSFET Product Marketing

A COMPLETE CHOICE OF PRODUCTS FOR HAND-HELD TOOLS

The power tools market, and in particular that of hand-held tools such as electronic drills, is expanding rapidly. Tool makers continually strive to increase the overall efficiency in terms of space, weight, and power dissipation of their instruments while at the same time keeping the final product at a very low cost.
A key design hint that permits the best trade-off between electrical performance of the power switch and cost competitiveness, is to use low voltage, low current devices that are suitably rugged to meet the stressful working conditions of this application.
ST today offers a product portfolio which includes the well known 'EHD2' technology while offering a new innovative solution that represents the "protected approach".

Brief Application Description

DC motor control in power tool applications, consists of a supplied battery voltage which ranges from 14.5 to 24V, plus a PWM controller that drives the MOSFET. There are two different ways to run the application: with the motor switched ON or OFF.

- ***Motor Switched off;***

In this case there is no connection between the system and the battery.

- ***Motor Switched on;***

In this case the motor has to work at different speeds, with the battery connected to the system and the controller driving the MOSFET so that the rotation speed of the motor can be changed.
Two stressful modes of operation can be identified for the MOSFET:

- ***Full rotation speed;***

When no current is flowing through the transistor.

- ***Blocked rotor;***

When the current intensity through the motor and the transistor is very high, causing large scale power losses due to the conduction status.
Since these severe working conditions could damage the MOSFET the right device must have a rugged technology and a very low $R_{DS(on)}$ in order to minimize the conduction losses.

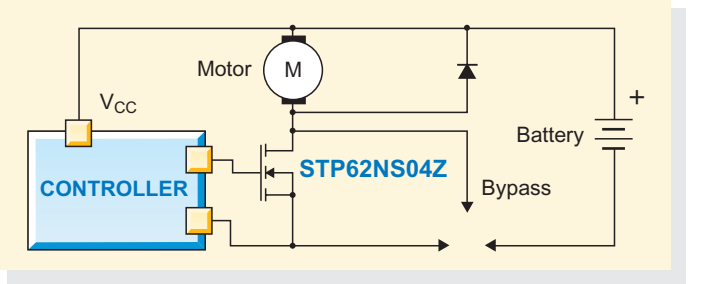
ST's Main Product Portfolio for Power Tools

P / N	BV_{DSS} [V]	I_d [A]	$R_{DS(on)}$ max 10V [Ω]	Q_g typ [nC]
STD150NH02LT4	24	150	0.0035	69
STD100NH02LT4	24	60	0.0048	62
STP62NS04Z	33	62	0.015	34
STP80NF03L-04	30	80	0.004	150
STP80NF55-06	55	80	0.006	140
STP80NF55-08	55	80	0.008	115
STP150NF55	55	120	0.006	140
STP60NF06	60	60	0.016	49
STP60NF06L	60	60	0.014	65
STP45NF06	60	38	0.028	43
STP75NF75	75	75	0.011	117

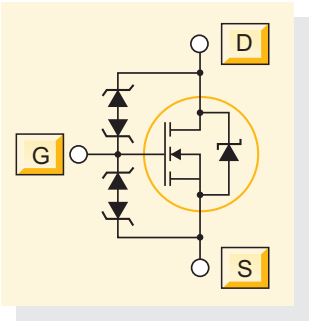
P: indicates TO-220 D: indicates DPAK

The Protected Approach For Harsh Conditions

One of the most severe tests for electronic drills is to evaluate the transistor's performance with the rotor blocked. In this case the rotor remains fixed for a minimum time of 20 seconds, while the MOSFET is running at the maximum duty cycle with very high current and voltage (about 75A, 50V).



Power tool application schematic



The new STP62NS04Z with zener, is produced following the MESH overlay process. It combines a very low $R_{DS(on)}$ with extra ruggedness due to a higher level of gate oxide.

P / N	BV_{dss} [V]	I_d [A]	$R_{DS(on)}$ max 10V [Ω]	Q_g typ [nC]
STP62NS04Z	33	62	0.015	34

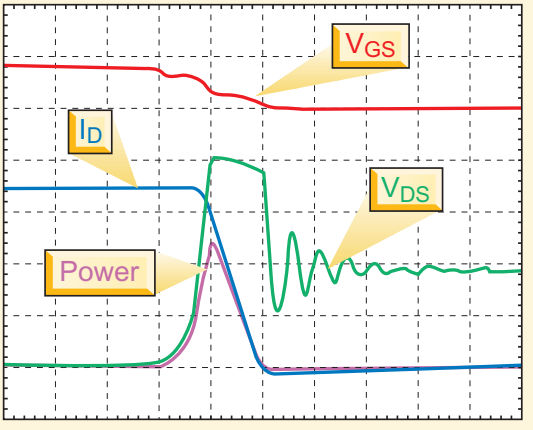
The integrated zener both protects against undesired voltage spikes and actively clamps at turn-off.

The main features are:

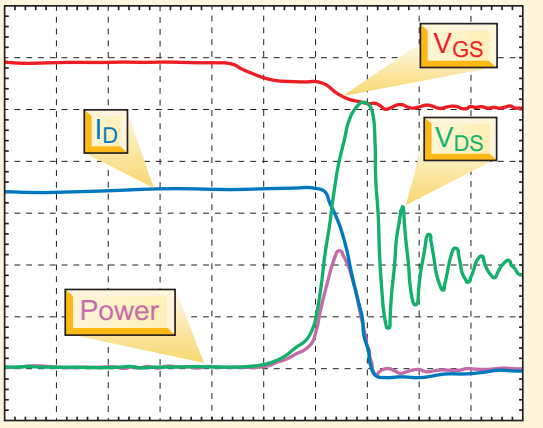
- $R_{DS(on)}$ typ: 0.0125Ω;
- 175°C max junction temperature;
- Low gate charge.

Product Comparison

To compare the performance of the new protected STP62NS04Z with an older product like STP60NF06, a DC motor taken from a common electronic drill was powered at a voltage of 18V at room temperature. The easiest way to evaluate their performance is to consider the energy losses of the MOSFET under working conditions. The stressful condition of a blocked rotor was simulated.



STP62NS04Z turn-off energy with active clamping



STP60NF06 turn-off energy without clamping

From the waveforms related to STP62NS04Z, it is clear that if during the turn-off the device reaches a VDS close to 40V, its active clamp leads to a new turn-on due to the integrated zener diodes. From the energy measured it is easy to evaluate the power losses by consulting the table below. The total power dissipation of the STP62NS04Z, has been reduced by approximately 11%.

Comparison Between MOSFETs in Power Tools

P / N	Turn-off Power [W]	Turn-on Power [W]	Conduction Power [W]	Total Power [W]
STP62NS04Z	13.48	7.84	39.74	61.06
STP60NF06	12.7	4.34	50.96	68

Best Cost-Performace Trade-Off

ST today offers not only a basic product kit for all hand held tools, but also a new protected approach in order to guarantee the best cost-performace trade-off.

In the hand-held tool application the new STP62NS04Z has many benefits:

- Lower cost solution compared to the existing one;
- Total Power losses reduction;
- Lower $R_{DS(on)}$.

HD1xxxx Series

By M.Puglisi
Bipolar Product Marketing

HIGH VOLTAGE TRANSISTORS FOR HORIZONTAL DEFLECTION IN ULTRAHIGH RESOLUTION CRT DISPLAYS

The boom in multimedia activities has brought with it the demand for larger and “real-flat” screen sizes for high quality images. As a result, more and more stringent performance is requested from the switches used in the horizontal deflection stage. A new product range specifically developed to respond to the needs of this high-end market has just been introduced.

The new HD1xxxx series has been designed by adopting a new advanced silicon technology known as Enhanced High Voltage Structure (EHVS1). The new EHVS1 technology represents a step forward in the optimization of the trade-off between the on and switching losses. In fact, thanks to the higher switching frequency and lower on-losses offered by the new products it is now possible to focus on high-end digital TVs, rear-projection TVs, as well as highly-professional monitor displays such as those required for medical applications, or high-resolution CRT displays, working at high horizontal frequencies (over 100kHz).

EHVS1 Technology

The EHVS1 is a planar technology realized by a float-zone collector on a diffused substrate with a re-designed high voltage edge structure. The silicon efficiency has been significantly improved thanks to the reduction of the capacitance in the base-collector junction by adopting a special deep-base process. As a result, devices belonging to the HD1 series are able to sustain very high breakdown voltages and at the same time exhibit both high current capability and high switching speeds.

Main Features of HD1xxxx Series

- Wide range of optimum drive conditions;
- Less sensitivity to the variation of the operating temperature;
- Improved R.B.S.O.A for safer switching performance;
- Reduced saturation voltage at high current;
- High performance 1700V products.

High-End CRT Display Roadmap

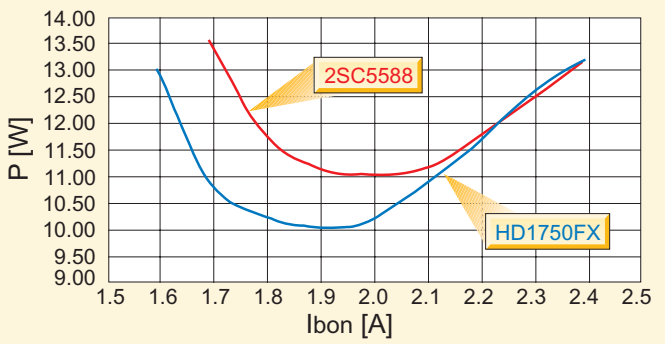
The table below lists the initial product range and the short term road map of this new series.

P / N	V_{CES} [V]	$I_{C(sat)}$ [A]	Target Use	Package	Status
HD1520FX	1500	9	100Hz TV up to 34”	ISOWATT218FX	Pre-Production
HD1750FX	1700	12	100Hz TV up to 42” Rear-project & Digital TV ≈95kHz 19” monitor	ISOWATT218FX	Samples
HD1750JL				TO-264	Samples
HD1530FX	1500	12	100Hz TV up to 42” Rear-project & Digital TV ≈95kHz 19” monitor	ISOWATT218FX	Samples
HD1530JL				TO-264	Samples Q2’ 05
HD1760JL	1700	16	≈130kHz 21” monitor Rear-project & Digital TV	TO-264	Samples Q3’ 05

All products are rated at 1500V and 1700V, and will also be offered in the big “jumbo” TO-264 package that offers higher power dissipation capability than ISOWATT218FX.

Reduced Power Losses

Horizontal deflection requires an application specific characterization to describe the input requirements needed to minimize the power losses. The following graph shows the power losses versus the variation of the base current (I_{Bon}) at a fixed output current of 12A and a switching frequency of 32kHz; these conditions represent the worst case conditions in wide screen 100Hz TVs. A comparison with the most advanced device from competition shows the better performance of HD1750FX (about 1W less).

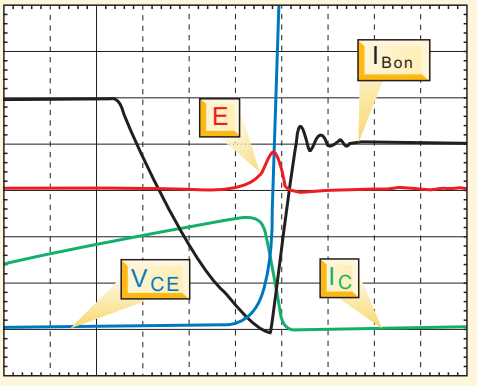


Conditions: f = 32kHz I_C = 12A L_y = 160 H L_{bboff} = 0.8 H V_{cc}=155V
V_{beoff} = -2.7V C_{sn} = 18.2nF V_{fly} = 1320V R_{th} = 5.5¡C/W

Power losses curves comparison

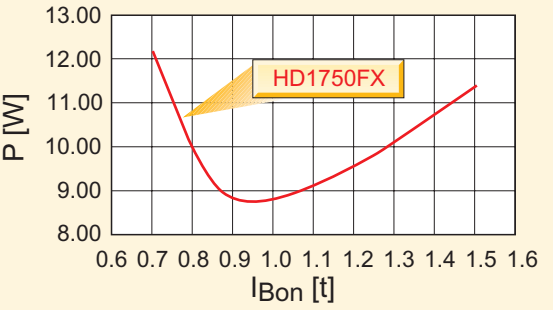
A Cooler More Reliable System

The HD1750FX requires a lower base current thus reducing the power dissipation in the passive components used in the deflection block, this makes the system a lot cooler and more reliable. It is worth noticing also that the HD1750FX can operate with a larger I_{Bon} range to ensure the best driving conditions, minimizing as a result the normal h_{fe} variation with temperature. The figure below shows the switching waveforms during an application test performed on a commercial wide real-flat screen TV working at a switching frequency of 32kHz.



Application oriented switching waveforms

The HD1750FX shows satisfactory performance also at 100kHz confirming its suitability also in high-resolution 19" monitors as shown in the losses behaviour graph. This curve is for the ISOWATT218FX package while even better performance can be achieved with the same device housed in TO-264.

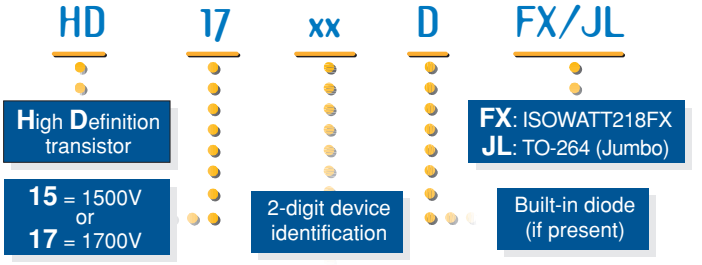


Conditions: f = 100kHz I_C = 6.5A L_y = 90 H L_{bboff} = 0.25 H V_{cc}=155V
V_{beoff} = -2.7V C_{sn} = 13.6 nF V_{fly} = 1220V R_{th} = 3.5¡C/W

HD1750FX power losses behaviour

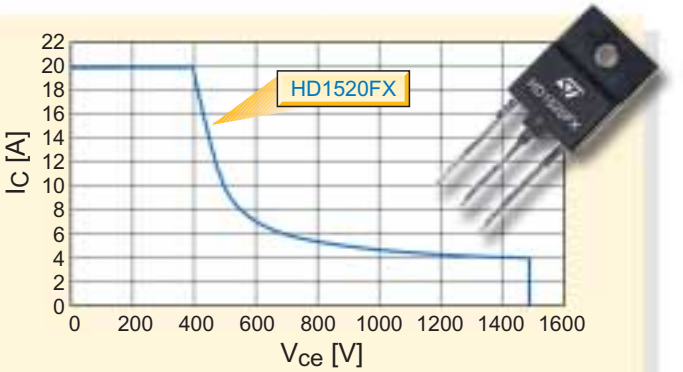
Part Numbering Description

Since the new series has been developed specifically for horizontal deflection, the part numbers follow the scheme below.



R.B.S.O.A

Beside the features that characterize this technology the HDxxxx series also exhibits a larger RBSOA, offering additional security during turn-off, where the device could be overstressed by the high fly-back voltage and the high current which are both present in anomalous conditions.



Conditions: hFE = 5 L_{bboff} = 1.9 H V_{beoff} = -2.5V L = 200 H

Safe operating area of HD1520FX

STCCP27

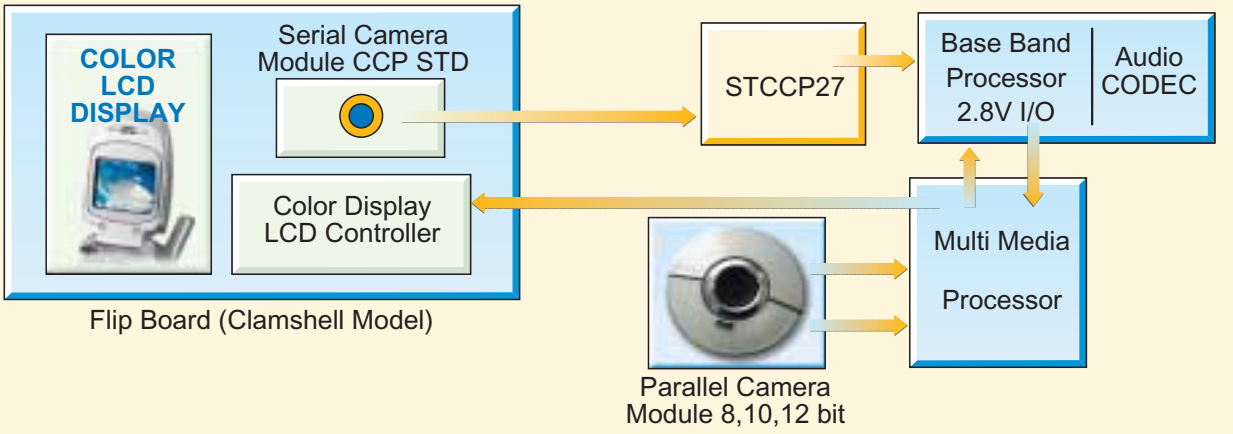
By N. Mythreyi
Marketing Development Digital ICs

VIDEO DE-SERIALIZER FOR SERIAL CMOS CAMERA MODULE

STCCP27 is a low voltage (1.8V), high speed, Compact Camera Port (CCP2.0) decoder with dual differential line receivers. The CCP2.0 decoder includes I^2C control lines.

Compact Camera Port Decoder

The STCCP27TBR receiver converts the SubLVDS clock/data stream (up to 208Mbps throughput bandwidth) back into parallel 8 bits of CMOS/LVTTL.



General application block schematic

The device recognizes the CCP 32 bit start - of - frame (SOF), end-of-frame (EOF), start-of-line (SOL) and end-of-line (EOL) sequences to generate the H-SYNC and V-SYNC signals.

In general, baseband/multimedia processors for mobile phones come with a parallel interface. Two major issues with such parallel interfaces are the excessive generation of noise of the parallel bus, and the large number of wires that have to be routed across the hinges/connectors of the clamshell models. This chip provides an ideal means of overcoming the above constraints and links the camera module with the baseband/multimedia processor with minimal noise and wires.

It is a very useful solution for the new generation of Smart Phones where double sensors are used independently for still pictures and video calls.

Low Power Consumption

In order to minimize static current consumption, it is possible to shut down the device when the interface is not being used by a power-down (EN) pin that reduces the maximum current consumption to 10µA. This low current consumption in power down state is another feature that makes it ideal for portable applications like mobile phones and PDAs.

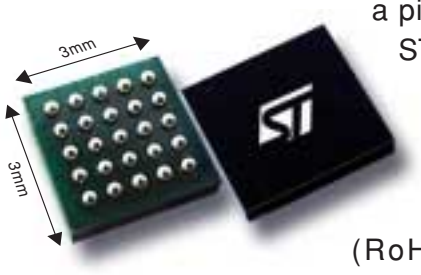
Two dedicated I^2C lines are provided to translate the bidirectional controls from the camera to the processor. In detail, the 1.8V sensor control settings can be driven using the 2.8V I^2C lines coming from the baseband processor without any external discrete components like 10kΩ (typically) pull-up resistors.

ESD Protection

All inputs and outputs are equipped with protection circuits against static discharge, giving them ESD immunity from transient excess voltages. The STCCP27 is characterized for operation over the commercial temperature range of -40°C to + 85°C.

Innovative Package µTFBGA25

The device packaging is especially designed with minimum dimensions to suit the space-constrained implementations in mobile phones. It is packaged in an innovative µTFBGA25 package with a pitch of 500µm. The STCCP27TBR is now available in a 3mm x 3mm, 25 pin, µTFBGA lead-free package (RoHS Compliant – Restriction on Hazardous Substances). It will be shipped in standard 7" reels with 3000pcs per reel.

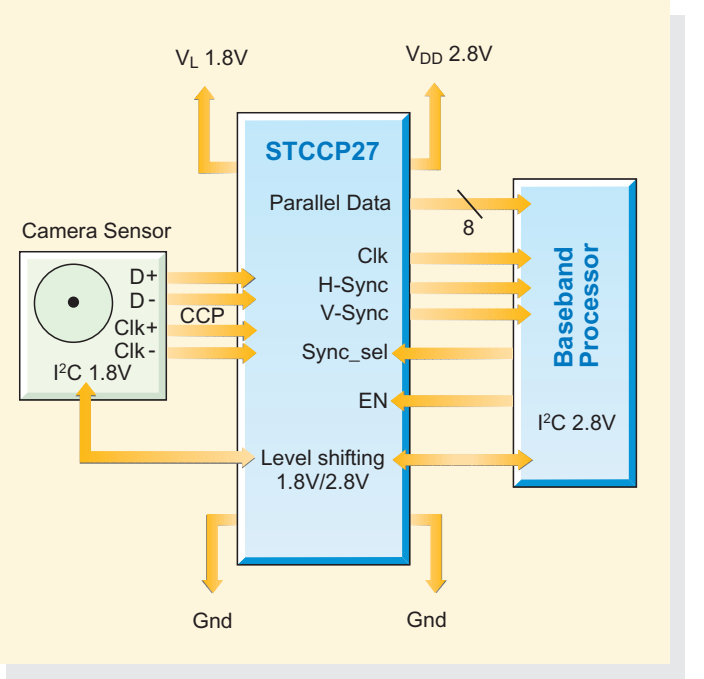


Features

- Sub-Low Voltage Differential Signaling (subLVDS) Inputs: V_D = ±150mV; V_C = 900mV;
- High data rate: D_R=208Mbps, f_{IN-MAX}=416MHz;
- Operating voltage and I/O reference voltage: V_{DD}=2.65V to 3.60V;
- Bidirectional I^2C level Shifter from V_{DD} and V_L: V_L=1.65V to 1.95V;
- Low power consumption: $I_{DD}+I_L$=10µA (disabled);
- Lead-free µTFBGA package.

Functionality Application Details

The device supports two different modes of functioning; formatted (ENABLED_SYNC) and unformatted (DISABLED_SYNC) transmission of data on the data lines based on the selection of the SYNC_SEL control pin by the Baseband processor. The two modes differ in the way the Baseband processor recognises the Image/Video byte positioning.



Application block diagram

In the ENABLED_SYNC mode (SYNC_SEL = VL), the Horizontal Sync and Vertical Sync signals are extracted from the serial input data stream before transmitting the 8-bit video/pixel data on the parallel output, D1-D8 in STCCP27. Instead the extracted Horizontal and Vertical sync signals are then transmitted separately. This mode is meant for simpler baseband/multimedia image processors to make their image processing easier.

In the DISABLED_SYNC mode (SYNC_SEL = Gnd), the timing signals (HSYNC and VSYNC) are not extracted from the input data stream, baseband processor recovers the timing information from the embedded sync words (SOF, EOF, SOL, EOL) in the 8-bit parallel data output.

Ordering Codes

P / N	Datarate	I/O signals	Package
STCCP27TBR	208Mbps	2.65V - 3.6V	µTFBGA25
STSMIA832*	650Mbps	1.65V - 1.95V	

**Under Development*

STPM01

By S. Ranno
Interface Marketing Development

PROGRAMMABLE SINGLE-PHASE ENERGY METERING IC

The STPM01 is designed to be the core of various energy metering architectures. Its flexibility allows the creation of several metering solutions, from low cost to high-end ones.

The advanced BiCMOS technology allows the STPM01 to reach high performance in terms of accuracy, allowing the support of IEC62052-11, IEC62053-2X specifications for single-phase class 0.5 watt meters.

STPM01 Description

The flexible and configurable analog front-end allows the use of different current sensors like Rogowski coils, current transformers and micro-Ω shunts. The STPM01 is provided with two internal low drop voltage regulators, which supply the analog and the digital sections separately, for high precision and stability. An internal DSP computes the sampled signals coming from the analog front-end, and provides all the data (like active, reactive and apparent powers, RMS voltage and current, line frequency) through a SPI which is used also to control, configure and calibrate the device in a very fast way (by means of a one-time-programming block). The computed powers are also provided by the DSP to an internal driving stage which allows direct driving of different kinds of stepper motor displays (electromechanical) for low-cost energy meters. The SPI is used also to connect the device to microcontrollers. In this case it acts like a peripheral device, simply supplying data to the micro which is responsible for data collection and management (high-end meters with implemented features like LCD display driving, date/time event recording, multi-tariff, data transmission, etc.).

STPM01 Features

The STPM01 also has several added features like:

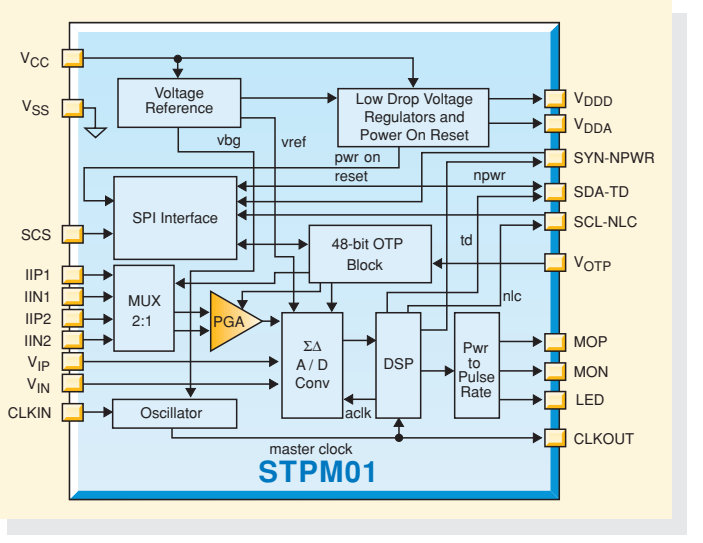
- Live and neutral wires current monitoring for tamper detection for secure energy meters;
- LED driving for visible information about power, tamper detection and no-load conditions;
- Zero-cross sine wave current signal available, allows turn on/off of heavy inductive loads avoiding arcing phenomenon (automatic control applications).

Very Fast And Easy Control

The OTP block has a complete set of configuration and calibration bits. It allows the fast and accurate calibration of voltage and current sensors, phase correction and temperature drift. ST has developed a control software with PC interface, allowing data to be read from the STPM01, controlling, and calibrating data.

Promotional Tools

Two demo boards are also available: one is for the STPM01 as a stand-alone solution for stepper driving; the other is a complete solution with the same stand-alone module coupled via SPI with a control board equipped with ST7 MCU, LCD display and RTC for medium / high-end applications.



STPM01 general block diagram

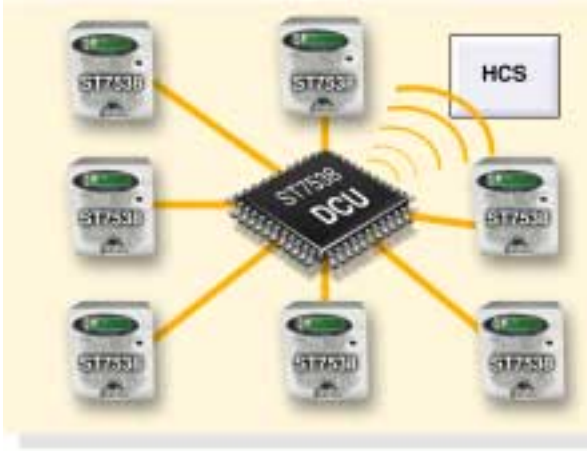
ST7538P

By G. Privitera / L. Rodeschini
Emerging Markets - Industrial & Power Conversion

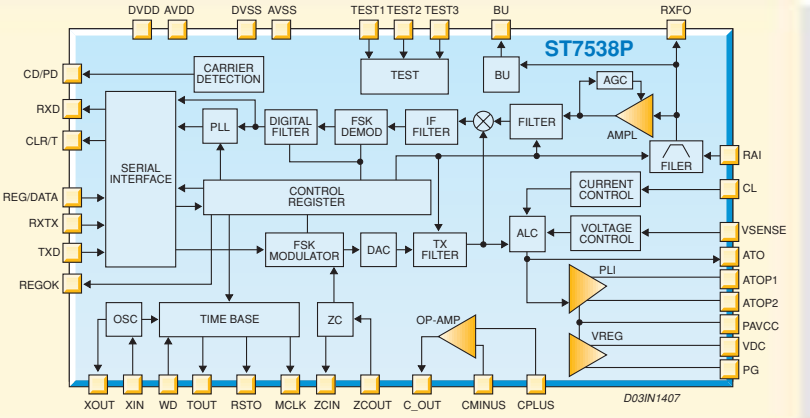
POWER LINE MODEM FOR AUTOMATIC METERS

Automatic meter reading, or AMR, is a rapidly growing sector of the metering industry. It is a host-driven, multi-level network consisting of a Host Central Station (HCS), Data Concentrator Units (DCU) and Meter Interfacing Units (MIU).

the ST7538 offers a broad range of settings to fit the specific requirements of the Physical and Media Access Control -MAC- layer being used. This makes it suitable for a wide variety of industry standards as well as proprietary protocols.



AMR system architecture block diagram



ST7538 internal block diagram

Power Line Modem

With physical media being the power line cable themselves, suitable “communication devices” known as Power Line Modems (PLMs) are required. They actually convert and convey a binary data stream into a sequence of signals with predefined characteristics (frequencies, levels) and can also detect at the receiving end electrical signals and convert them back into the binary data stream.

ST7538P the Newest PLM From ST

The ST7538P, incorporates, a Frequency Shifting Key (FSK), modulation / demodulation circuitry and a very low distortion, high-current power line driver. These are all aimed at helping reduce the part count, board space and overall time to market. The modem can be integrated into an existing static meter main board, by connecting it to a few general purpose I/Os of the microcontroller and to the Power Line, through an inexpensive coupling network. While meeting the requirements set by international regulation bodies, such as CENELEC for Electro Magnetic Compatibility,

Features

- Half duplex Frequency Shift Keying (FSK) transceiver;
- Integrated power line driver with programmable voltage and current control;
- Synchronous or asynchronous microcontroller interface;
- Single 7.5 to 12.5V supply voltage;
- Very low power consumption (Iq=5mA);
- Integrated 5V, 100mA short circuit protected voltage regulators;
- 8 programmable transmission frequencies;
- Programmable BAUD rate from 600 to 4800BPS;
- Receiver sensitivity 1mVRMS;
- Carrier or preamble detection;
- Band-in-use detection;
- Programmable register with security checksum;
- Line voltage zero crossing detection and synchronization;
- Watchdog timer;
- 10x10x1.4mm TQFP44 with copper slug package.

Electricity Metering

By L. Montanaro
Central Market Development
& G. Di Marco
Metering-Golden Application

A COMPREHENSIVE APPROACH TO ELECTRICITY METERING

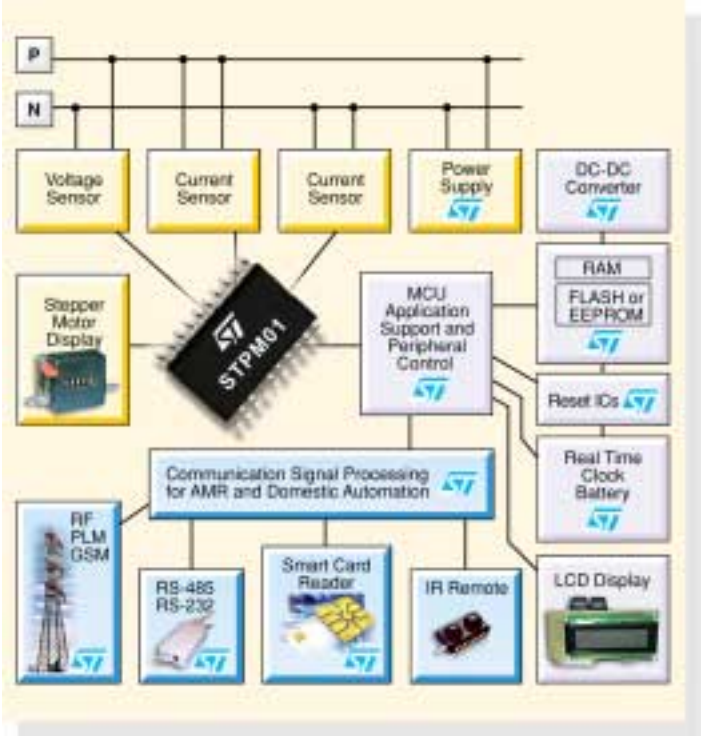
The growing need for metering applications with high accuracy over a wide dynamic range of current, low power consumption, high reliability and robustness explains the trend of moving from the traditional mechanical solution to a solid state one.

A complete solution for energy meters has been developed, taking into account qualities such as accuracy, cost, ease of manufacture, cost of the components, easy calibration and of course reliability. This solution is discussed below, with a special focus on the most interesting products in ST's portfolio. The energy meter described allows new functionalities like Automatic Meter Reading (AMR), tamper proofing, multi-tariff billing and a prepayment module with a smart card reader.

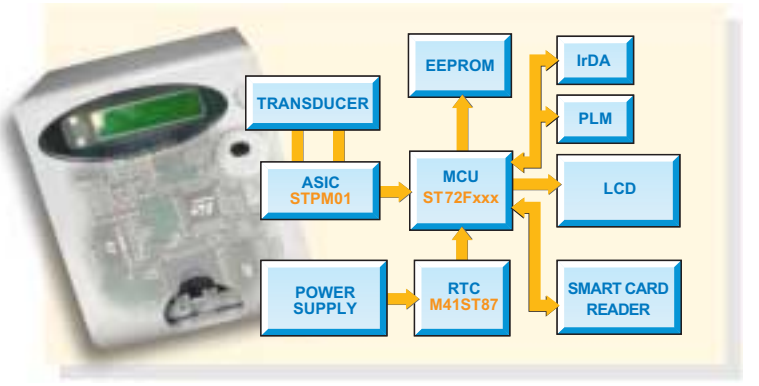
Architecture

Looking at the general functional block diagram of a power metering application 3 different solutions are evident:

- Low-End;
- Medium-End;
- High-End.



General functional block diagram



A complete ST portfolio for meters

- The low-end solution is built only with Voltage and Current sensors, AFE (Analo Front End), ADC (Analog Digital Converter) DSP (Digital Signal Processor) and a stepper display to show the value of the active energy measured in kWh.
- The medium-end solution allows the use of an LCD display and is able to calculate also reactive and apparent power. Other possible features are anti-tampering and statistical information including dates and times. The implementation of such a solution basically requires, in addition to the component used in the low-end solution, a MCU together with RTC, Reset IC and Memory (EEprom, Flash or RAM).
- The high-end solution adds other optional features like automatic meter reading, pre-paid billing and multi-tariffing. For this reason a connectivity section is requested (RF, GSM, PLM, IrDA) as well as a smart card reader.

AFE-ADC-DSP Section

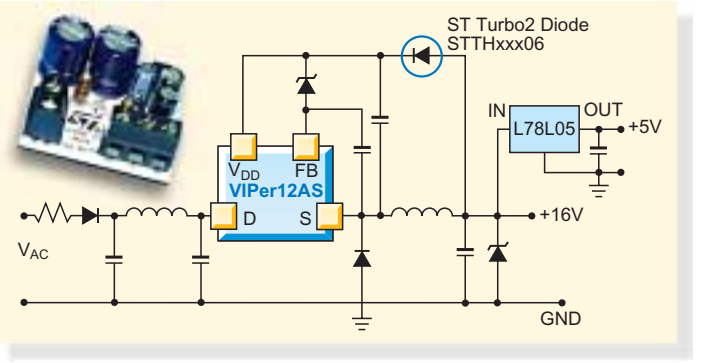
This section is implemented by the STPM01 device that is an IC integrating the analog front-end, the ADC and the DSP. It can be defined as a single chip energy meter IC compliant with IEC 62052, IEC62053-2x specification for class 0.5AC watt meters with antitampering features. It is able to measure the active, reactive and apparent value of energy as well as the RMS values of the voltage and current. It supports all the available sensing methods like the Rogowski coil, current transformer and shunt resistor.

This device can be used as a single chip for the implementation of a 1-phase energy meter or as the measurement peripheral in a microcontroller based 1-phase or 3-phase energy meter.
The tamper detection feature is implemented by monitoring the current of both the live and the neutral wires. The calibration is fast and simple (single point) consequently bringing lower production costs. Its integrated OTP memory prevents modification of the data and calibration program. A complete reference design is available upon request.

Metering reference design

Power Supply Section For 1-Phase Meters

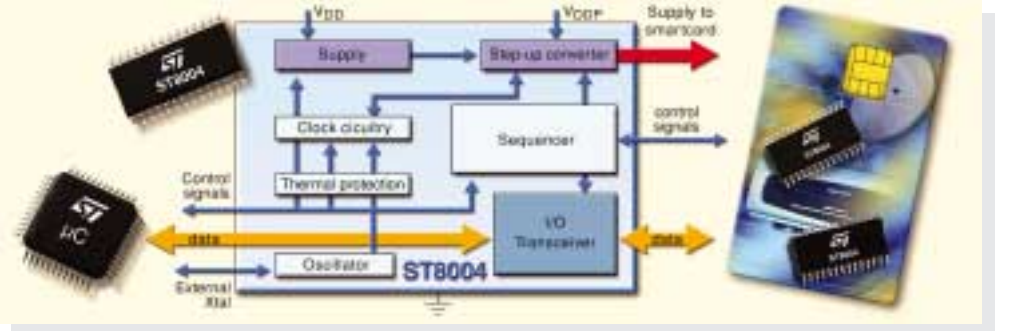
With regards to the power supply section of 1-phase meters, both a non-isolated and an isolated solution are available. Considering the power needs of the application are very low (usually less than 0.5W), the SMPS topologies used are the buck (for the non-isolated solution) and the flyback (for the isolated solution). The ideal solution is a combination of the VIPer12, STTHxxx Rectifiers, and the TLxxx Voltage Reference for the feedback loop, and a positive voltage regulator to get the 5V needed to supply the other devices used inside the application.
See application notes:
AN1357 *VIPower: low cost power supplies using VIPer12A in non isolated applications.*
AN1642 *VIPower: 5V buck smps with VIPer12A.*
A reference design is aviable upon request.
For the 3-phase meters also the discrete solution made with high voltage Power MOSFETs (SuperMESH "NK" series or MDmesh "MD" series) or the new ESBT, Emitter Switched Bipolar Transistors STC03DE170 and STC03DE150 can be used.



Power supply reference design

Smart Card Reader Section

For high-end solutions, pre-paid functionality with smart card readers could be implemented. In such a case ST's wide range of microcontrollers (ST7xxx family) and the ST8004 and ST890 smart card reader interface represent a possible solution for such a section of a power meter.
Similar considerations can be made for the automatic meter reading where one possible solution consists in using ST7538, ST's Power Line Modem.



Smart card reader section using ST8004

Other Sections

Several other smaller functions should also be taken into consideration. For instance the implementation of the "breaker" that blocks the supply of energy after overload, could be made with ST's high voltage Power MOSFETs (SuperMESH "NK" family of 600V, 1A or 800V, 3A devices) connected with an electromechanical switch.

Standard ICs for Wireless Applications

G. Leone – A Soper Mckinnie
Std ICs Product Promotion

Audio Amplifier

The audio block provides audio signal amplification and volume control. The quality of the audio signal is a very important factor in the overall quality of the device, and most devices have pop reduction circuitry that can totally eliminate pop and click.
A variety of audio solutions exist, ranging from single 1W audio amps which can drive either an earpiece or a speaker, to dedicated audio solutions which permit microphone input, speaker or earpiece output and digital volume control via a bus interface (SPI or I^2C).

- 8Ω speaker driver: TS4990, TS4994, TS4984, TS4962
- 16-32Ω speaker driver: TS419, TS421
- Dedicated, complete audio devices: TS4851, TS4855
- Two way audio devices: TS4973
- I^2C bus interface: TS4975

Audio Switch

Most mobile appliances today allow the user to switch from the built-in speaker and microphone to an external source such as an earpiece and clip-on microphone for hands-free operation.
Devices having very low ON-resistance as well as a quad switch in the same package are perfect for use as the switches which control the changeover from melody ring to voice.
Such solutions offer high-speed performance combined with the low power consumption afforded by CMOS technology, and permit the reduction of space and cost. A wide range of devices having different electrical characteristics and very small packages including the innovative QFN16 and Flip-Chip are available:

- Single and Dual Bilateral 10Ω SPST switch: 74V1G66, 74V2G66
- Low Voltage 9Ω single SPDT switch: STG3157
- Low Voltage 5Ω 500mA quad/dual SPDT switch: STG3680, STG3690
- Low Voltage 4Ω single SPDT switch: STG719
- Low Voltage 0.5Ω 500mA quad/dual SPDT switch: STG3684, STG3699, STG3699A, STG3685

Digital

Sometimes, digital chips have specific needs as regards a signal voltage level, or current. For signal quality reasons, controlling the signal voltage and current cannot be performed within large digital chips, and so an interface, called the digital block, is used to adapt the signal levels and control its flow. The digital block can include buffer, level translator and transceiver functions. The devices below have electrical characteristics and packages with small dimensions like µTFBGA42 which are suitable for this application:

- Single and dual gate: 74V1Gxx / 74V2Gxx series
- High speed single gate: 74LX1Gxx series
- 8/16 bit Level Translators: 74LVX3xxx series
- 8/16 bit Bus Buffer: 74LVCxxxA, 74ALVCHxxx, 74VCXxxx, 74VCXHQ163245 series
- 1/4 bit Level Translator: ST1G3234, ST4G3234, ST4G3235

Data Communication

Data communication needs are ever-increasing in wireless applications as more and more media functions (for example, digital cameras, or MP3 players) are integrated to wireless devices, and require interfaces with other external devices.
A wide range of low-voltage interface products satisfies communication requirements and can provide enhanced ESD protection (-E versions).They are suitable in a wide range of small packages including the new µTFBGA25.

- 3V RS-232 Transceiver: ST32xx, ST32xxE series
- SUBLVDS Deserializer: STCCP27
- 8-bit Dual Supply Bidirectional Level Translator: ST2378E
- USB 2 Transceiver: STUSB02E (coming soon)
- 14 bit + I^2C line Level Translator: ST16C32245

Power and System Management

This block provides the various supply voltages required by the other blocks, while aiming to minimize both power dissipation and physical size, and maximizing

battery life. This block also manages the battery charger function. A wide variety of Very Low Drop Voltage Regulators with an inhibit function including multiple output devices is available:

- Low Noise Voltage regulators: LK112/S
- Very-Low Drop Voltage regulators: LD2980, LD2981, LD2982, LD2985
- Very-Low Drop, Low Noise BiCMOS Voltage regulators: LD3985, LD3986
- Battery Charger IC: ST3S01
- BiCMOS voltage regulator for Bluetooth: STC2G15
- Triple output Voltage regulators: ST3M01

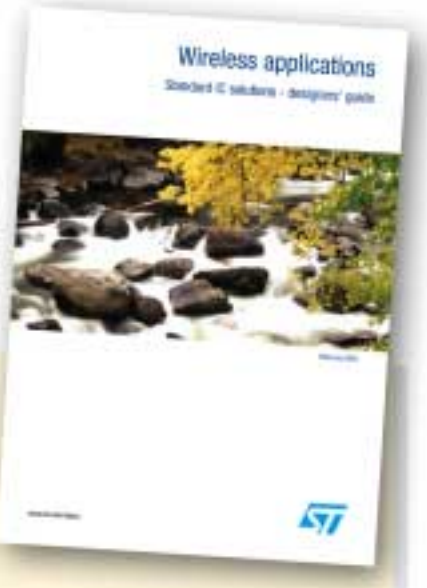
Accessories

These blocks provide the DC Voltage for the battery charger, adapting or converting the mains power supply. The following devices are CC-CV voltage and current controllers designed for this application. Voltage references and regulators are also available.

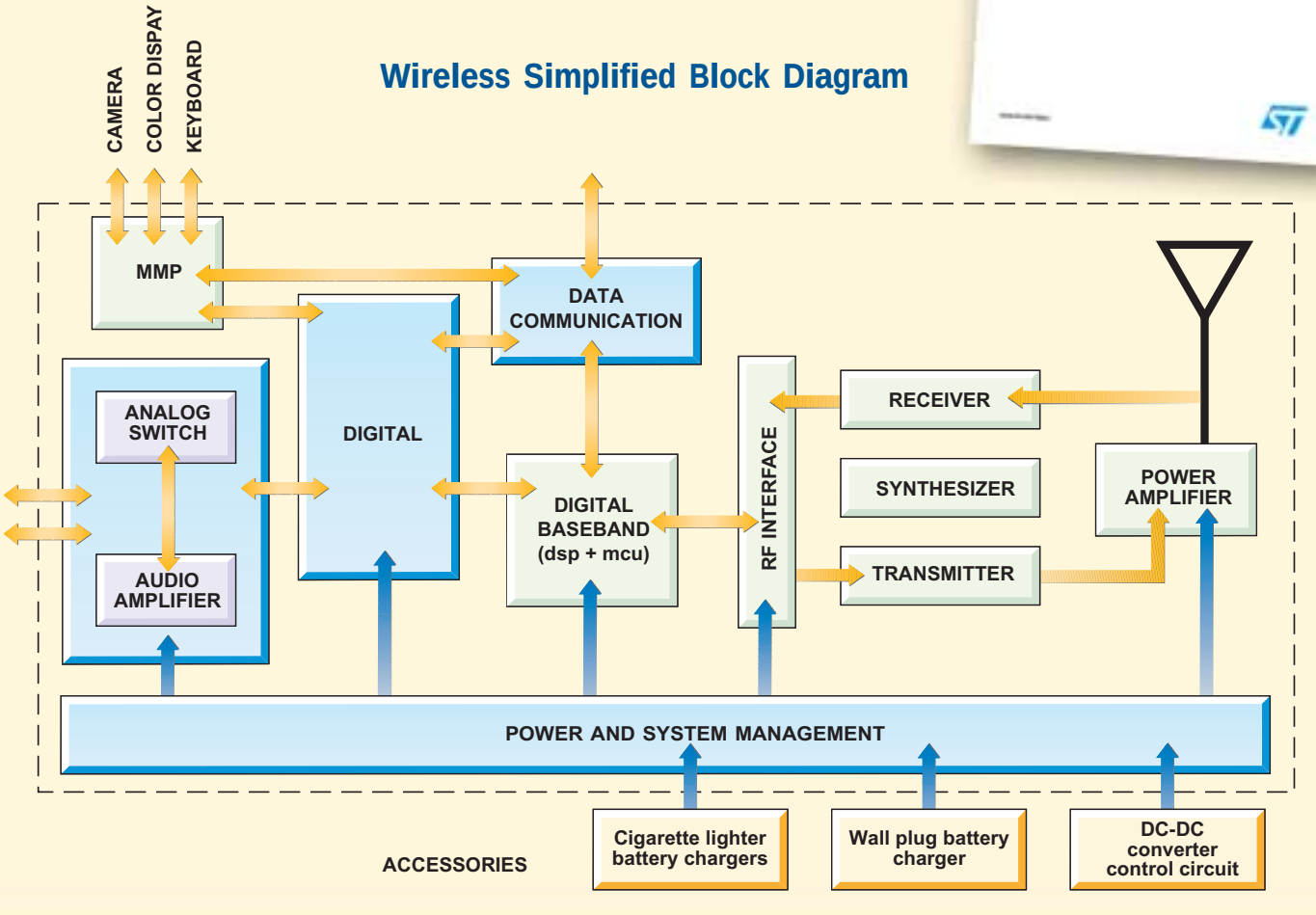
- Cigarette lighter battery charges: TSM108
- Wall plug battery charger: TSM101, TSM1011, TSM102, TSM103W, TSM104W, TSM1051
- DC-DC Converter control circuit: MC34063A

Standard ICs for Wireless Applications Flyer

ST's new Wireless Applications flyer describes ST's Standard IC solutions for many mobile phone application blocks - such as the audio block, data communication block and power management blocks. Order Code: FLWIRELESS/1204



Wireless Simplified Block Diagram



74VCXHQ163245

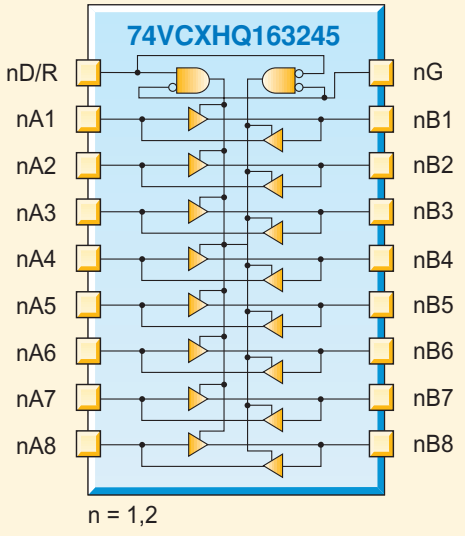
By N. Mythreyi
Marketing Development Standard Logic ICs

LCD LEVEL TRANSLATOR IN TINY PACKAGES FOR SMART PHONE APPLICATIONS

74VCXHQ163245 is a new quiet Level Translator that allows very low EMI, parallel communication between the baseband processor and the colour display.

Display Interface IC

The latest addition to ST's VCX product line is the Level Translator IC, 74VCXHQ163245. It is a dual supply low voltage CMOS 16-bit Bus Transceiver fabricated with sub-micron silicon gate and five-layer metal wiring C^2MOS technology. This IC is intended for two-way asynchronous communication between data buses and the direction of data transmission is determined by nDIR inputs. The enable inputs nG can be used to disable the device so that the buses are effectively isolated. It is designed for use as an interface between a 3.3V bus and a 2.5V or 1.8V bus in a mixed 3.3V/1.8V, 3.3V/2.5V or 2.5V/1.8V supply system.



74VCXHQ163245 logic diagram

All inputs are equipped with protection circuits against static discharge, giving them 2kV ESD immunity against transient excess voltages. All floating bus terminals during high impedance state do not need any external pull-up or pull-down resistors.
74VCXHQ163245 is characterized for operation over the commercial temperature range of -40°C to + 85°C.

Innovative µTFBGA42 Package

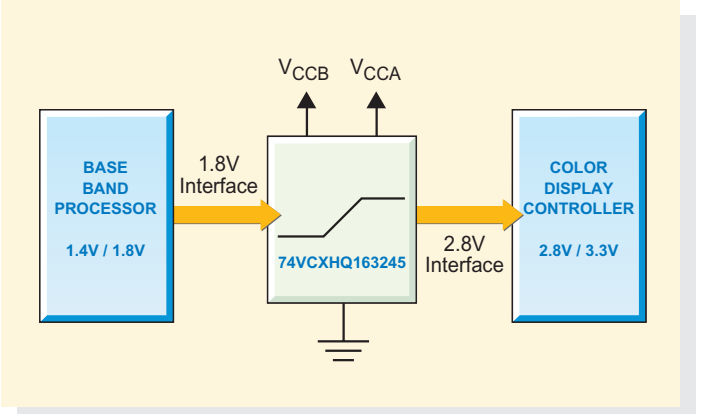
The 74VCXHQ163245 addresses rapidly evolving customer requirements for more circuit integration and board miniaturization with the new lead-free µTFBGA42 package (RoHS Compliant – Restriction on Hazardous Substances). The device packaging is specially designed with minimum dimensions to suit the space-constrained implementation like in mobile phones. It is packaged in an innovative lead-free µTFBGA42 package with a pitch of 500µm and dimensins of 4mm x 3.5mm. It is also available in regular TSSOP48 and TFBGA54 packages. It will be shipped in standard tape and reel form with 3000pcs per reel.

Features

- High speed: t_{PD} = 7.7ns (max) at VCC_A = 2.8V; VCC_B = 1.8V; B_n to A_n;
- Low power dissipation: $ICC_A = ICC_B$ = 20µA (maximum);
- Power down protection on inputs and outputs;
- Series resistor on A side;
- Limited EMI noise: $tr_A \cong t_{fB} \geq$ 4ns at C_L = 10pF;
- Operating Voltage Range:
  V_{CCA}(OPR) = 2.3V to 3.6V;
  V_{CCB}(OPR) = 1.65V to 3.6V;
- Bus Hold provided on data inputs on both sides;
- ESD performance: HBM > 2000V (MIL STD 883 method 3015); MM > 200V;
- Lead-free µTFBGA package.

74VCXHQ163245 Functionality

Applications include a wide variety of systems that must interface with new, lower voltage technologies and legacy designs operating at a higher voltage level. This device provides a bi-directional interface for buses operating at mixed voltage levels in the range of 1.4V to 3.6V, giving true signal translation with very low EMI. This feature makes it suitable as a display interface to connect the baseband processor with the display controller.

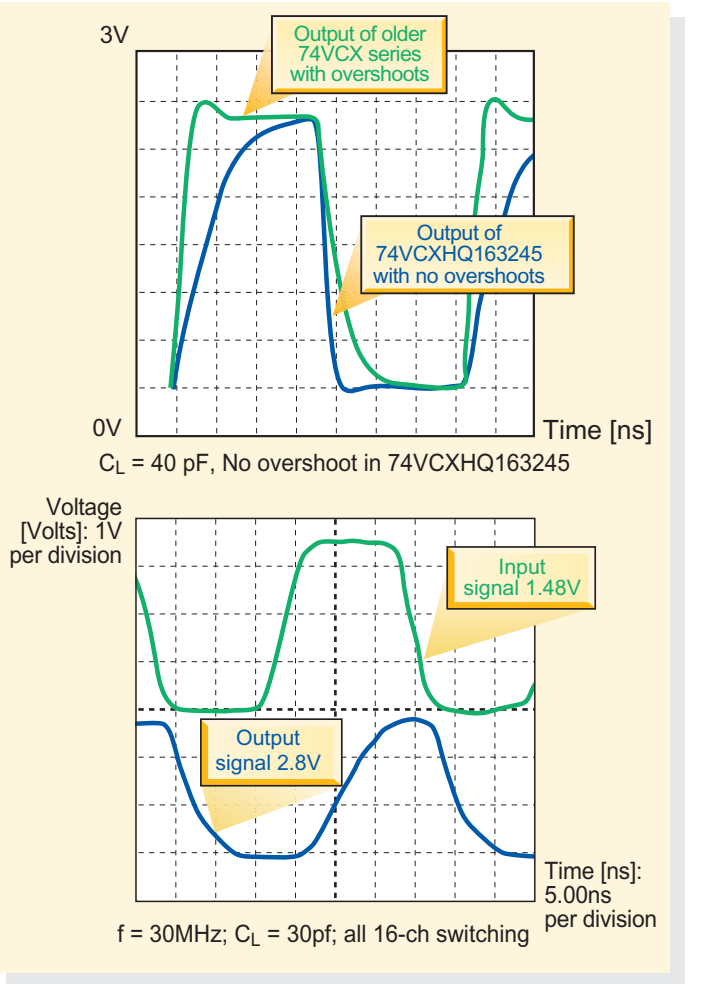


Application block diagram

Such a device is required as the signals of the two end devices are at different voltages. 74VCXHQ163245 supports designs with the A side inputs at a higher voltage potential (3V/2.8V) than the B side (2.8V/1.4V). In this way it provides a quick and easy direct interface between the mixed voltage levels present in the same system. For instance, in the above example it interfaces between the 1.4V baseband processor and the 2.8V display controller.

A need for this device can be found in all forms of telecommunications, portable computers, mobile phones and PDAS. In fact, these applications use mixed voltage levels extensively to maximize power savings by using 1.4V/1.8V wherever possible and 2.5V/3.3V only where necessary.

The series resistor on the higher voltage side, dampens the reflections due to impedance mismatches. This ensures reliability of the signal even when long signal traces are used. Typical ICCA and ICCB are very low (around 2µA at 25°C). This is a very important consideration for mobile phone applications where battery life should be extended as much as possible.



Minimal overshoot even at high speeds

EMI is reduced by controlling the slew rates and also by using minimum-current output drivers. Thus 74VCXHQ163245 achieves high speed operation while maintaining the low CMOS power dissipation and limited rise and fall time (low EMI). This is particularly suited for display interfaces in mobile applications where the EMI at high speeds is a critical issue.

Ordering Codes

Type (T&R)	Package	Dimensions
74VCXHQ163245TTR	TSSOP48	6mm x 12.5mm
74VCXHQ163245LBR	TFBGA54	8mm x 5.5mm
74VCXHQ163245TBR	µTFBGA42	4mm x 3.5mm

TSH310

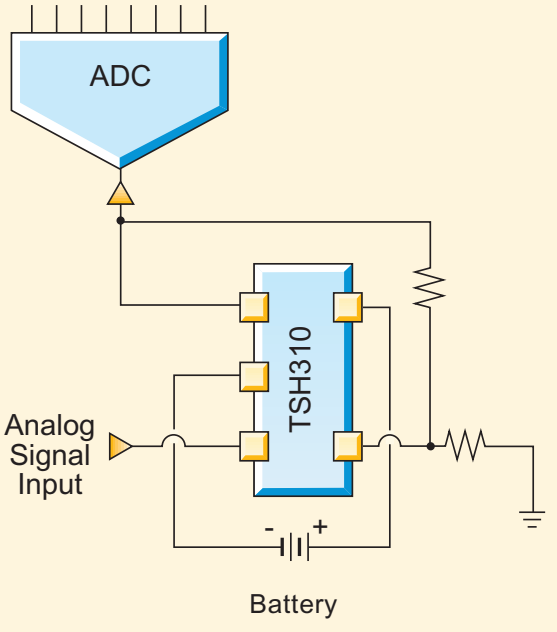
By C. Prugne
Standard Linears Technical Marketing

ULTRA LOW CONSUMPTION HIGH SPEED OP-AMP

In today's world, reducing power consumption has become a primary goal for everybody. This is why ST has included the very low consumption TSH310 in its new TSH3x series of high-speed operational amplifiers.
Designed with an advanced BiCMOS process, it combines the benefits of high performance with the price advantages of high volume production.

Main Features of TSH310

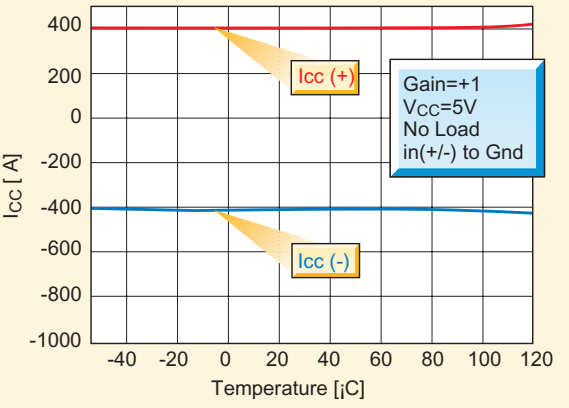
The TSH310 uses a current feedback architecture combined with a very high-speed complementary technology to achieve a large bandwidth of 130MHz and a high slew rate of 115V/µs (85V/µs minimum guaranteed by testing) versus a ultra-low quiescent current of 400µA (470µA maximum guaranteed by testing). A low input voltage noise of 7.5nV/√Hz combined with its output stage optimized for driving high speed ADC input stages with a linearity of 87dBc versus 1MHz/2Vp-p on 1kΩ load and 55dBc versus 10MHz/2Vp-p on 1kΩ.



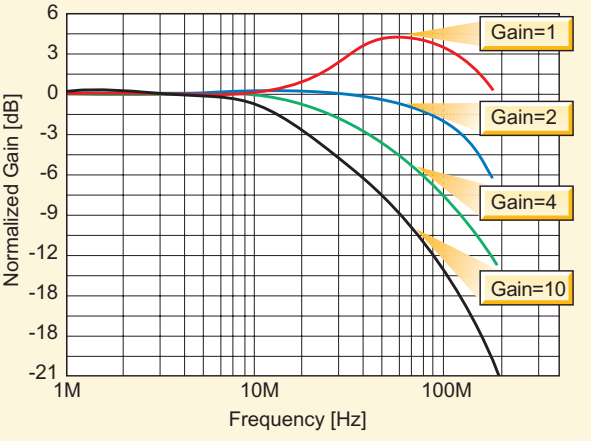
Typical application schematic

Packages

- SOT23-5L plastic package with a standard pin-out in tape and reel (TSH310ILT);
- 8-pins SO-8 plastic package with a standard pin-out in tube and tape and reel (TSH310ID and TSH310IDT).



Consumption versus temperature



Small signal frequency response

Applications

The TSH310 combines high performance at a reasonable price. The main applications for the TSH310 are in portable instrumentation and equipment, such as portable oscilloscopes and analyzers, medical instrumentation, portable sensors and cameras.