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RUTRONIK
ELECTRONICS WORLDWIDE

ST Power Management

Selection Guide



Efficient. Robust. Scalable

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
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Our Product Portfolio

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 Passive Components	 Storage Technologies
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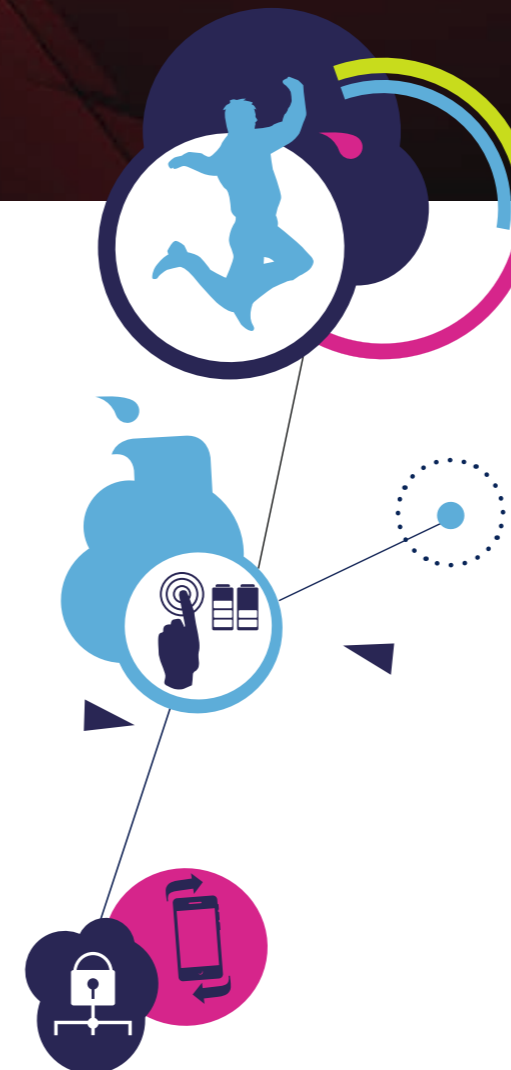
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The integrated management system (IMS) encompasses quality control, environmental protection and occupational health and safety.



Introduction



As one of the world's leading suppliers of both integrated and discrete power conversion semiconductor devices, ST's power management devices enable energy-saving, high-power-density and lower-standby-power design solutions. Moreover they are able to support the migration from analog to digital designs to achieve increased flexibility, smaller form factors and higher efficiency. ST's product portfolio includes highly-integrated AC-DC converters, switching DC-DC converters, silicon and SiC power MOSFETs, IGBTs, silicon and SiC rectifiers, protections, linear voltage regulators, battery management ICs (including wireless battery charger ICs), LED drivers, digital controllers, microcontrollers, photovoltaic ICs and more in a wide range of packages.

Today, optimizing complete solutions in terms of energy efficiency according to market requirements for features and performance is practically mandatory. The key element in developing a successful system is selecting the best silicon device. To help you find the best device for the most common applications (power supplies, LED lighting, renewable energy & harvesting, wireless charging, home appliances, welding, UPS and DC-DC computing), this guide provides a complete mapping of ST's devices and includes information about dedicated system evaluation boards to better test the devices directly in your application and reduce the time to market. Using our eDesignSuite software tool, you can readily simulate power management circuits and choose the best-suited devices quickly and intelligently.



Applications

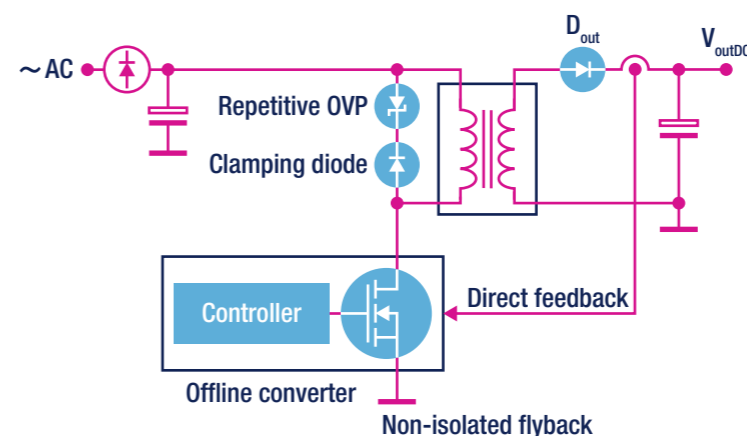
POWER SUPPLIES

Auxiliary SMPS

High-power-density and cost-effective auxiliary power supplies can be designed using a converter (where each IC includes a power MOSFET combined with control and protection circuitry in a single package) at a higher switching frequency to avoid a considerable increase in transformer and output capacitor size. ST offers a wide portfolio of highly-integrated offline converters up to 20 W with an extremely low total standby consumption (less than 4 mW for VIPerOP devices) and high breakdown voltage of 800 V for the VIPerPLUS family and 900 V for the Altair05. To reduce BOM costs, the Altair family works as a constant-voltage primary-side regulator (PSR-CV) avoiding the need for a voltage reference and opto-coupler in the circuit. Discrete solutions consisting of an offline controller plus an external MOSFET are also supported by ST. New STRVS voltage suppressors improve system reliability against repetitive over-voltages. New FERD diodes feature a very low forward voltage and a low leakage reverse current improve the system efficiency. The ST devices best suited for each of the most common topologies are listed in the following table.

	Offline converters	Offline controllers	HV power MOSFETs	Repetitive overvoltage protections	Clamping diodes	Volt. ref.	Output diodes	Linear voltage reg.
Buck							SSTH*06 SSTH*08 SSTH*10 SSTH*12	
Buck-boost	VIPerOP VIPer01 VIPer*6	-	-	-	-	-		
Non-isolated flyback						T*431 T*432		LDF* LD39* LDK* LDL*
Isolated flyback	PSR-CV	-				-		
	Regulation with optocoupler	VIPer*5 VIPer*7 VIPer*8	VIPerOP VIPer01 VIPer*6 ALTAIR*	STCH02 L6566B	ST*N80K5 ST*N95K5 ST*N105K5 ST*N120K5 STW12N150K5 STW21N150K5 ST*3N170	STRVS*	SSTH*06 SSTH*08 SSTH*10 SSTH*12	STPS* FERD*45 FERD*60 FERD*100

Topology example



MAIN EVALUATION BOARDS

-  STEVAL-ISA096V1
2 W, buck-boost
-  STEVAL-ISA113V1
4.2 W, non-isolated flyback
-  STEVAL-ISA116V1
5 W, buck
-  STEVAL-ISA171V1
15 W, isolated flyback

Note: * is used as a wildcard character for related part number

Battery chargers

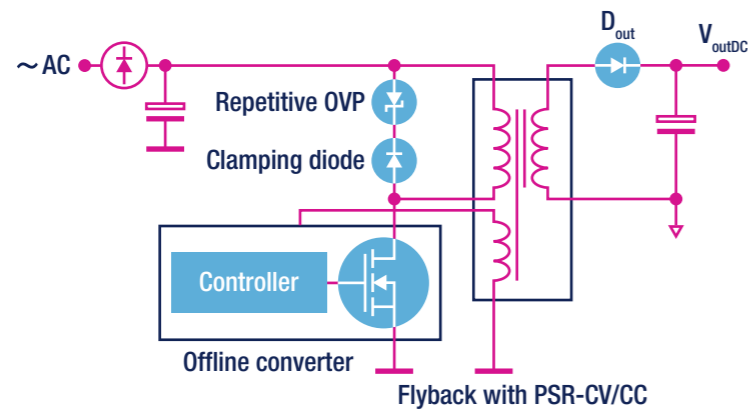
Designing lighter, smaller wall chargers for portable devices is one of the most critical challenges for developers. Excellent standby power consumption, high efficiency in all load conditions, primary-side regulation (PSR) control methods and a set of integrated protections (to minimize the component count on the circuit) are the main market requirements. High performing offline converters (Altair*) (i.e. controllers and MOSFET in the same package) and a new offline controller (STCH02) combined with an external MOSFET can be used for a reliable, efficient and safe battery charger working in PSR (i.e. without using opto-coupler and post current/voltage regulation). New STRVS protections improve the system reliability against repetitive over-voltages. For the application side (portable applications), ST offers a various set of linear and switching battery charger and monitoring ICs integrating functions able to minimize power consumption and save space on PCBs. ST also offers the EnFilm™ thin-film battery, a new concept of extremely thin (220 μm), rechargeable solid-state batteries with fast constant-voltage charging.



		Offline converters	Offline controllers	HV power MOSFETs	Repetitive overvoltage protections	Clamping diodes	Output diodes	CC/CV controllers		
Wall side	Flyback	PSR-CV/CC	ALTAIR*		-	-	-	-		
		PSR-CC	-		-	-	-	-		
		Regulation with optocoupler	VIPer*5 VIPer*7 VIPer*8	VIPer0P VIPer01 VIPer*6	STCH02	ST*N65M2	STRVS*	STTH*06 STTH*08 STTH*10 STTH*12	FERD*45 FERD20U50 FERD20U60D FERD*100 STPS*	TSM10* SEA0*
		PSR-CV	-	-	-	-	-	-	-	

Application side	Battery charger ICs		Battery monitoring ICs	Li-Ion battery
	Linear	Switching		
	STBC02 L6924* STBC08 STC4054 STNS01	STBCFG01	STC3117 STC3115	EFL700A39

Topology example



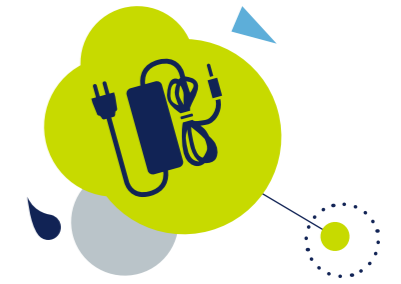
MAIN EVALUATION BOARDS



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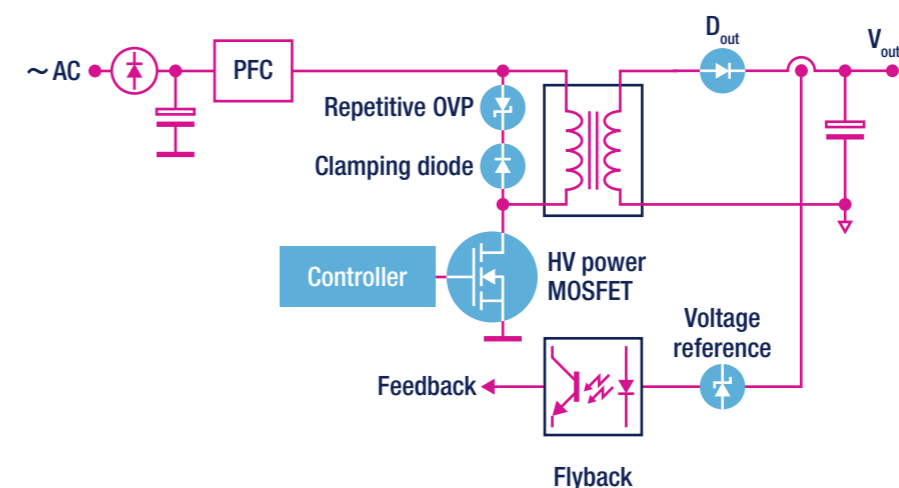
Adapters

The adapter trend goes towards a significantly higher efficiency level, especially in partial load conditions, as well as towards their miniaturization (slimmer and lighter). Adapters require ICs enabling high efficiency with good EMI performance and low standby power, high performance MOSFETs in small packages and protections for high reliability and safety. For this purpose, ST offers a wide portfolio of dedicated ICs including PFC controllers working in Transition Mode (TM), smart analog controllers for HB-LLC resonant circuits as well as for synchronous rectification (dedicated to flyback/forward or HB-LLC circuits). The new combo controller (STCMB1) is able to manage both PFC and DC-DC stages. In addition to the high-voltage MDmesh™ MOSFETs series and the low-voltage STripFET MOSFETs, new FERD diodes, new STRVS protections against repetitive over-voltages and voltage reference complete our silicon offer for adapter needs. ST's DC-DC converters guarantee high power density for post-regulation. The ST devices best suited for each of the most common topologies are listed in the following table.



	Offline converters	Controllers		Power MOSFETs		Repet. overvolt. protect.	Clamping diodes	Output diodes	CC/CV contr.	Volt. ref.	DC-DC conv.		
				HV	LV								
Flyback	Regulation with optocoupler	VIPer*5 VIPer*7 VIPer*8	VIPer0P VIPer01 VIPer*6	L6566B L6566A	STCH02	ST*N80K5 ST*N95K5	-	STRVS*	STTH*06 STTH*08 STTH*10 STTH*12	STPS* FERD*45 FERD*60 FERD*100	TSM10* SEA0*	T*431 T*432	-
		PSR-CV	-	ALTAIR*	-	-	-	-	-	-	-	-	-
PFC Boost	TM	-	-	L6562A* L6563* L6564*	STCMB1	ST*N50M2 ST*N60M2 ST*N65M2 ST*N55M5 ST*N65M5	-	-	STTH*L06 STTH*R06 STTH*06	-	-	-	-
DC-DC stage	HB-LLC	-	-	L6599A* L6699	STCMB1	ST*N50DM2 ST*N60DM2 ST*N60M2 ST*N60M2-EP	-	-	STPS* FERD*45 FERD*60 FERD*100 STTH* (≥200 V series)	TSM10* SEA0*	T*431 T*432	ST1S3*	
Sync rect.	Flyback	-	-	STSR30	-	ST*N110N10F7 ST*N100N10F7	-	-	-	-	-	-	
	Forward	-	-	STSR2*	-	STL*NS3LLH7 ST*N4LF7* STL220N6F7 ST*N6F7 STL130N8F7 ST*N10F7 ST*N6F20D	-	-	-	-	-	-	
	HB-LLC	-	-	SRK2000* SRK2001	-	-	-	-	-	-	-	-	

Topology example



MAIN EVALUATION BOARDS



Note: 1: available in Q3 2016 * is used as a wildcard character for related part number

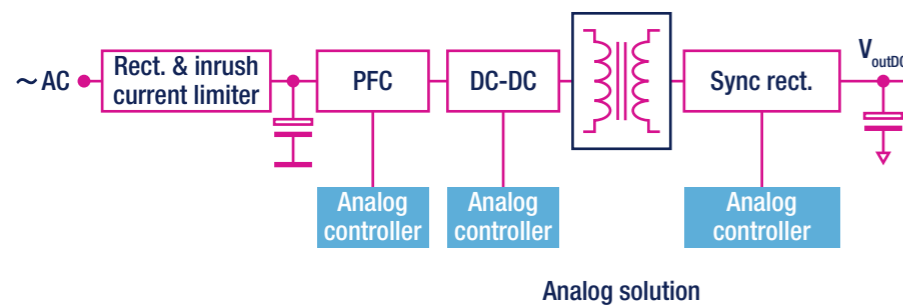
Servers and telecoms (analog solutions)

Increased output power, power density, energy efficiency and reliability are what server and telecom applications require today. ST offers a high-performing product portfolio reducing the total cost of the solution: SiC diodes (STPSC*), high-voltage MDmesh™ MOSFETs (for PFC and DC-DC stages), low-voltage STripFET MOSFETs (for synchronous rectification stage) and smart controllers are available for the mentioned stages. For the post-regulation, ST's new high-voltage DC-DC converters offer input-voltage capability up to 61 V and deliver output currents up to 3 A with high switching frequency. High reliability against the inrush current is ensured by new SCRs in the front end stage. The ST devices best suited for each of the most common topologies are listed in the following table.



	Controllers	Power MOSFETs		Diodes	DC-DC converters		E-fuses	Linear voltage reg.	SCRs
		HV	LV		HV	LV			
Rect. & inrush current limiter	-	-	-	STTH3012 STTH6012	-	-	-	-	TYN6* TYN8* TYN10* TYN12* TN5050H TN2015H
PFC	Boost	L4981* L4984D	ST*N60M2 ST*N65M2 ST*N65M5	STTH*R06 STTH*T06 STPSC*06 STPSC*065	-	-	STEF011 STEF05 STEF12	LDF* LD39* LDK* LDL*	-
	Bridgeless								
DC-DC stage	HB-LLC	L6599A* L6699	ST*N50DM2 ST*N60DM2 ST*N60M2	STPS*150 STPS*200 STTH*02 STTH*03 STTH*04	L698* ST1S14 L7985 L7986 L7987*	ST1S3* ST1S4* ST1S50 L598*			
	Asym HB	L6591							
Sync rect.	HB-LLC	SRK2000* SRK2001	STL*NS3LLH7 ST*N4LF71 STL220N6F7 ST*N6F7 ST*N10F7 ST*N620D	-	-	-	-	-	-
	Asym HB								

Typical configuration



MAIN EVALUATION BOARD

EVL400W-ADP/ATX
400 W, PFC (CCM)
+ HB-LLC + sync rect.

Note: 1: available in Q3 2016 * : is used as a wildcard character for related part number

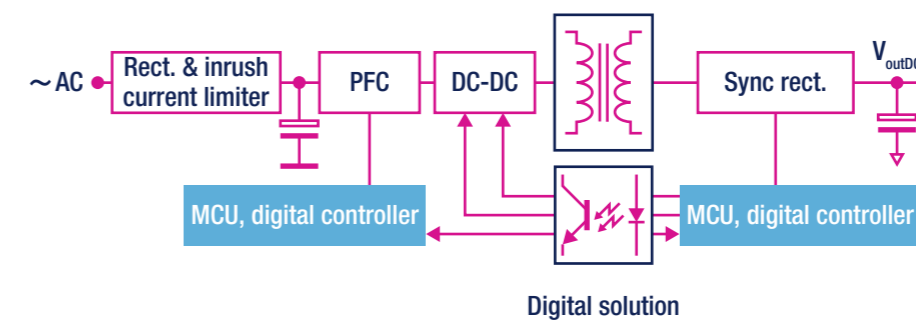
Servers and telecoms (digital solutions)

Stringent international standards require, in Server/Telecom applications, greater efficiency, faster and more reliable protection functions, increased flexibility and monitoring that are only practically achievable using a digital approach. From 500 W to 2 kW, ST's proven digital reference high-efficiency designs are available to help Server/Telecom application designers develop the best possible digital power supply solutions based on STM32 microcontrollers or STNRG digital controllers and advanced MOSFET drivers, including the new STDRIVEsmart advanced gate drivers (L639*, L649*). Very efficient and reliable solutions are ensured by using new high-voltage MDmesh™ MOSFETs series in PFC and DC-DC stages, and the new low-voltage STripFET MOSFETs in the synchronous rectification stage as well as SiC diodes (STPSC*). For post-regulation, ST offers new DC-DC converters able to deliver output currents up to 4 A with high switching frequency. High reliability against the inrush current is ensured by new SCRs in the front end stage.



	MCUs, digital controllers	Gate drivers	Power MOSFETs		Diodes	DC-DC converters	E-fuses	Linear voltage reg.	SCRs
			HV	LV					
Rect. & inrush current limiter	-	-	-	-	STTH3012 STTH6012	-	-	-	TYN6* TYN8* TYN10* TYN12* TN5050H TN2015H
PFC	STM32F0* STM32F301 STM32F334 STNRG*	TD35* PM8841 PM8851 PM8834	ST*N60M2 ST*N65M2 ST*N65M5	-	STTH*R06 STTH*T06 STPSC*06 STPSC*065	-	-	-	-
DC-DC stage	STM32F334 STNRG*	L638* L639* L649*	ST*N50DM2 ST*N60DM2 ST*N60M2	-	STPS*150 STPS*200 STTH*02 STTH*03 STTH*04	ST1S3* ST1S4* ST1S50 L598*	STEF011 STEF05 STEF12	LDF* LD39* LDK* LDL*	-
Sync rect.		PM8834	-	STL*NS3LLH7 ST*N4LF72 STL220N6F7 ST*N6F7 ST*N10F7 ST*N620D	-	-	-	-	-

Typical configuration



MAIN EVALUATION BOARDS

-  **STEVAL-ISA147V1**
500 W, bridgeless PFC
+ HB-LLC conv.
+ sync rect.
-  **EVLSTNRG-1kW**
1 kW, multi-phase interl.
HB-LC conv.
-  **STEVAL-ISA172V1**
2 kW, multi-phase interl.
Boost PFC + FB-PS conv.
-  **STEVAL-ISF003V11**
Up to 7.4 kW, digital
inrush current limiter
based on SCRs

Note: 1: available in Q2 2016 2: available in Q3 2016 * : is used as a wildcard character for related part number

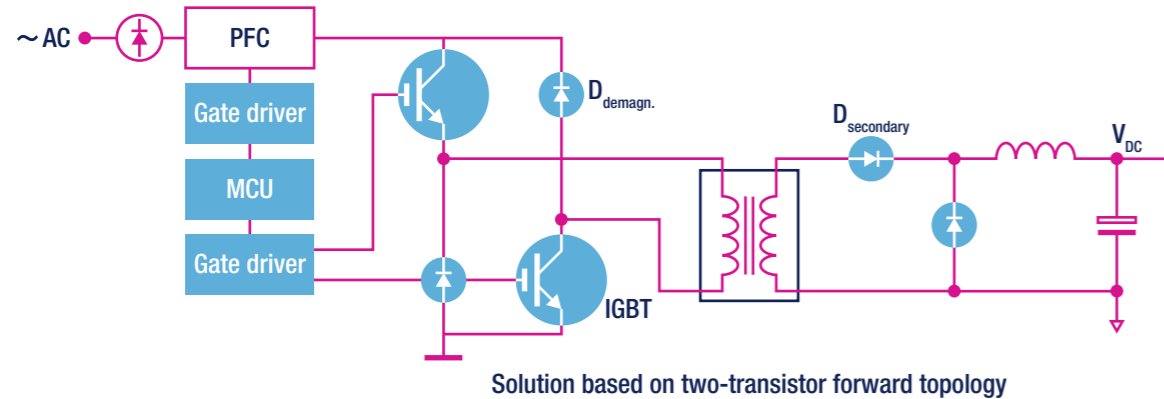
INDUSTRIAL WELDING

High efficiency and high switching frequency as well as reduced size and weight are the main requirements for welding applications. ST's broad power portfolio offers energy and cost-saving products to meet the various welding power ranges. Both PFC and DC-DC stages, phase-shifted full-bridge (PS-FB) as well as two-transistor forward (TTF), can be managed by high-performing STM32 microcontrollers. New high-efficiency and high-power-density SiC MOSFETs (SCT*N120) or the suitable high-frequency series of trench-gate field-stop IGBTs driven by STDRIVEsmart gate drivers (L639*, and L649*) offer optimum performance and reduce cooling requirements and heatsink size while the new STGAP1S galvanically-isolated drivers guarantee high safety and reliability of the welding. Using SiC diodes (STPSC*) further improves system efficiency, taking advantage of silicon carbide's superior physical characteristics over silicon. The ST devices best suited for industrial welding applications are listed in the following table.



	MCUs	Gate drivers	IGBTs	HV power MOSFETs	Diodes			DC-DC converters	
					Boost	Demagn.	Secondary side	HV	LV
PFC Boost	STM32F0* STM32F301 STM32F334	TD35* PM8834 PM8841 PM8851 STGAP1S	STG*H65DFB STG*V60DF STG*H120DF2	SCT*N120	STTH*R06 STTH*T06 STTH*W06 STPSC*065	-	-	-	-
DC-DC stage	STM32F334	L638* L639* L649* STGAP1S	STG*H65FB STG*V60F		-	STTH*R06 STTH*06 STTH*10 STTH*12	STTH*W02 STTH*W03 STTH*W04	L698* L597* L7985 L7986 L7987*	ST1S0* ST1S12 ST1S3* ST1S40 ST1S50 L598*

Typical configuration



LED LIGHTING - GENERAL ILLUMINATION

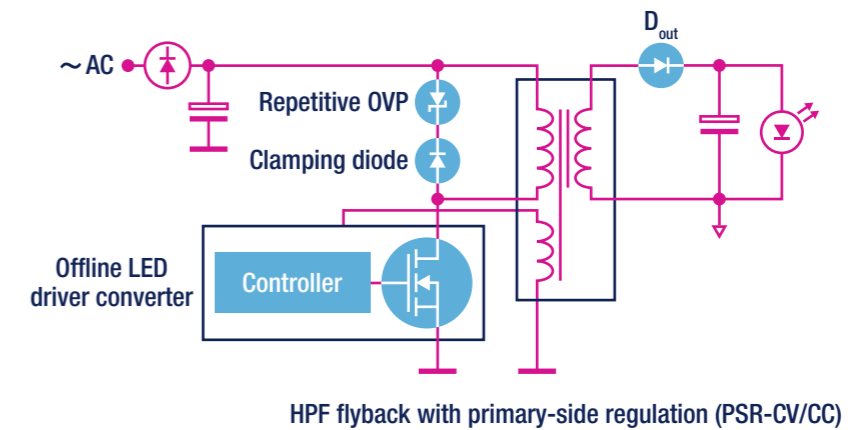
Residential lighting

LED efficacy and driver IC market requirements are constantly evolving. Residential lighting applications need a high integration level, high efficiency, high power factor (PF), long lifetime, and dimming capabilities as well as a low system cost and component count. ST offers a wide portfolio of highly integrated offline converters up to 15 W (each IC includes a power MOSFET combined with control and protection circuitry on a single chip) working with a high breakdown voltage of 800 V. Among these, HVLED805, HVLED807PF and HVLED815PF LED driver converters work with a high PF and in constant-current/constant-voltage mode primary-side regulation (PSR-CC/CV) avoiding the need of secondary side regulation ICs and opto-coupler in the circuit, thus reducing costs. Thanks to its high-power-density DC-DC LED driver converters (controller + MOSFET in the same chip), ST can support MR16 LED replacement lamps for halogen light bulbs.



	Offline LED driver converters	Offline converters suitable for LED driving	CC/CV controllers	Repetitive overvoltage protections	Clamping diodes	Output diodes	DC-DC LED driver converters
MR16 halogen bulb replacement	-	-	-	-	-	BAT20J BAT* BAS*	LED5000 LED6000
Buck, Buck-boost	-	ViperOP Viper01 Viper*6	-	-	-	STTH*	-
HPF Buck-boost	HVLED805 HVLED807PF		-	-	-	-	-
HPF Flyback	PSR-CC/CV HVLED815PF		-	-	-	-	-
Flyback	Regulation with optocoupler	Viper*5 Viper*7 Viper*8	ViperOP Viper01 Viper*6	TSM10* SEA0*	STRVS*	STTH*06 STTH*08 STTH*10 STTH*12	STPS*170AF STPS*4S200UF FERD*
	PSR-CV	-	-	-		-	
	PSR-CC/CV	ALTAIR*		-		-	

Topology example



MAIN EVALUATION BOARDS

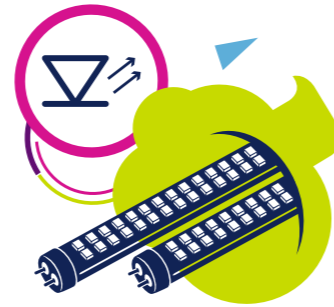


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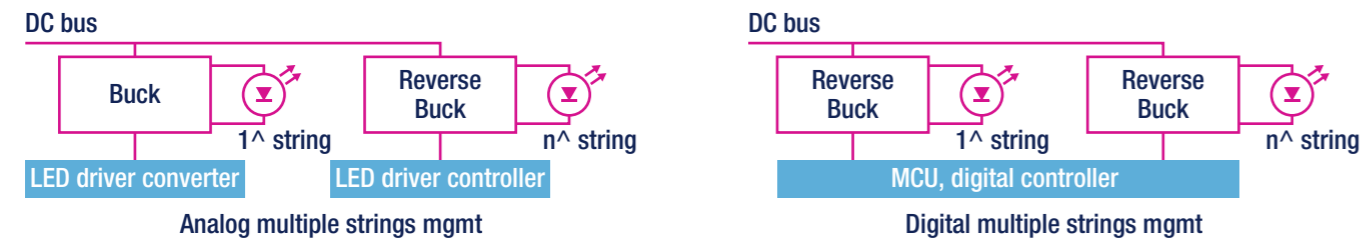
Commercial and architectural lighting

Commercial and architectural lighting applications usually require more than 20 W, a high power factor, high level of efficiency, cost-saving solution and the possibility of using more than one LED string with remote monitoring. In a single string case, working in constant-current primary-side regulation (PSR-CC) mode, ST's new flyback offline LED driver controller (HVLED003D¹) directly drives the single string without having to use an optocoupler and secondary-side controller in the circuit. The multiple strings power supply architecture consists of a main power supply (usually a flyback) providing a constant bus voltage and subsequent multiple strings. ST's offline LED controllers HVLED001* (for flyback) with constant-voltage primary-side regulation (PSR-CV) is available for the main SMPS. Multiple strings can be managed using analog or digital means. High power-density DC-DC LED driver buck converters (LED2000, LED2001, LED5000 and LED6000) or the new HVLED002 controller for reverse buck, are used for an analog implementation. To digitally manage multiple strings stage (reverse buck), ST offers STLUX, a new series of dedicated digital lighting controllers as well as STM32 high-performance microcontrollers. ST's high-voltage MDmesh™ MOSFETs series (suggested for flyback) and the low-voltage STRipFET MOSFET series (used for reverse buck topologies) ensure all solutions are very efficient and reliable.



		Analog controllers	Digital controllers, MCUs	Gate drivers	Power MOSFETs		Clamping diodes	Repetitive overvoltage protections	Output diodes	DC-DC LED driver converters
					HV	LV				
HPF Flyback	PSR-CC	HVLED003D ¹	-	-	ST*N80K5	-	STTH*06 STTH*08 STTH*10 STTH*12	STRVS*	STPS* FERD*	-
	PSR-CV	HVLED001*	-	-	ST*N80K5 ST*N95K5	-	STTH*06 STTH*08 STTH*10 STTH*12	STRVS*	STPS* FERD*	-
Multiple strings mgmt	Buck	-	-	-	-	-	-	-	FERD* STPS*170AF STPS*4S200UF STTH* (≥200 V series)	LED2000 LED2001 LED5000 LED6000
	Reverse buck	HVLED002	STLUX* STM32F334 STM32F301 STM32F0* STM8S*	TD35* PM8834 PM8841 PM8851	-	ST*N6F7 ST*N10F7	-	-	-	-

Typical configurations



MAIN EVALUATION BOARDS

 STEVAL-ILL070V* 35 W, analog single-string LED driver	 STEVAL-ILL069V2 35 W, analog power supply (CV _{out}) for LED driving	 STEVAL-ILL074V1/V2 60 W, analog power supply (CV _{out}) for LED driving
 STEVAL-ILL077V1 60 W, digital multiple-string LED driver	 STEVAL-ILL051V2 18 V-3 A, buck LED driver converter	 STEVAL-ILL054V2 18 V-4 A, buck LED driver converter

Note: 1: available in Q3 2016 * : is used as a wildcard character for related part number

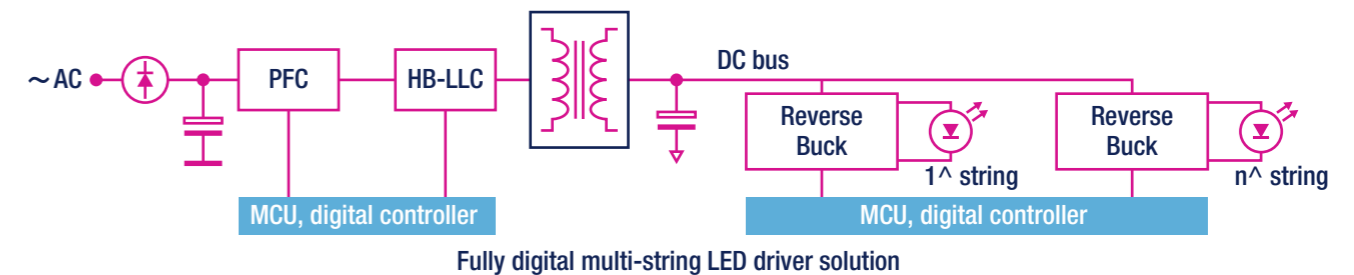
Street lighting

Energy efficiency, long lifetime, remote control, small form factor and extended temperature range (-40 °C) are the main requirements for the LED street lighting market. For single string, it is possible to implement the primary side regulation (PSR-CC) control technique using a digital approach with a PFC regulator followed by a HB-LC resonant stage. The multiple strings power supply architecture consists of a main power supply providing a constant bus voltage and a subsequent multiple strings. Usually the main power stage, consisting of a high power factor (HPF) flyback converter or a power factor correction (PFC) controller combined with an LLC resonant converter, provides the constant voltage bus. The subsequent LED strings control is implemented by multiple buck or reverse buck converters. ST offers analog and digital solutions to cover both stages (power and LED control).



		Analog controllers		Digital controllers, MCUs	Gate drivers	Power MOSFETs		Clamping diodes	Repetitive overvoltage protections	Output diodes	DC-DC LED driver converters	DC-DC Conv.
		PSR-CC	PSR-CV			HV	LV					
HPF Flyback	PSR-CV	HVLED001*	-	-	-	ST*N80K5 ST*N95K5	-	STTH*06 STTH*08 STTH*10 STTH*12	STRVS*	STPS* FERD*	-	-
PFC Boost	CCM	L4981* L4984D	-	-	-	TD35* PM8841 PM8851	ST*N60M2 ST*N65M2	-	-	STTH*R06 STTH*T06 STPSC*	-	-
	TM	L6562A* L6563* L6564*	STCMB1	-	-	-	-	-	-	STTH*L06 STTH*06	-	-
DC-DC stage	HB-LLC	L6599A* L6699	-	STLUX* STM32F0* STM32F301 STM32F334	-	L638* L639* L649*	ST*N50DM2 ST*N60DM2 ST*N60M2	-	-	STPS* FERD* STTH* (≥200 V series)	-	L698* ST1S14 L7985 L7986 L7987*
	HB-LC	-	-	-	-	-	-	-	-	-	-	-
Sync rect.	-	SRK2000* SRK2001	-	-	-	PM8834	-	STL*NS3LLH7 ST*N4LF7 ¹ STL220N6F7 ST*N6F7 ST*N10F7 ST*N10F7	-	-	-	-
Multiple strings mgmt	Buck	-	-	-	-	-	-	-	-	-	LED5000 LED6000	-
	Reverse buck	HVLED002	STLUX* STM32F334 STM32F301 STM32F0* STM8S*	TD35* PM8834 PM8841 PM8851	-	ST*N6F7 ST*N10F7 STL11N6F7	-	-	-	STPS* FERD* STTH* (≥200 V series)	-	-

Typical configuration



Note: 1: available in Q3 2016 * : is used as a wildcard character for related part number

In regard to analog solutions, ST's has a wide offer. The new flyback offline LED controllers (HVLED001*) with constant-voltage primary-side regulation (PSR-CV) does not need an opto-coupler and voltage reference in the circuit (lower costs). The new STCMB1 smart offline combo controller for PFC and HB-LLC resonant circuits, the new HVLED002 led driver controller for reverse buck, and the dedicated high-voltage/ high-current DC-DC LED driver converters (LED5000 and LED6000) for LED strings management ensure easy and efficient analog solutions. For high-efficiency and flexible digital solutions, ST offers STLUX, a new series of dedicated digital lighting controllers, along with high-performance STM32 microcontrollers to manage both power and LED driving (reverse buck) stages. The new high-voltage MDmesh™ MOSFETs series (suggested for flyback, PFC and LLC stages), the low-voltage STripFET MOSFETs series (used in reverse buck topologies) and the SiC diodes (STPSC*) make sure that solutions are very efficient and reliable.

MAIN EVALUATION BOARDS



STEVAL-ILL066V1
100 W, digital single-string PSR-CC LED driver



STEVAL-ILL053V1
130 W, analog power supply (CV_{opt}) for LED driving



STEVAL-ILL074V1/V2
60 W, analog power supply (CV_{opt}) for LED driving



STEVAL-ILL077V1
60 W, digital multiple-string LED driver



STEVAL-ILL056V1
48 V-3 A, buck LED driver converter



STEVAL-ILL078V1
60 V-1 A, buck LED driver converter



MAJOR HOME APPLIANCES

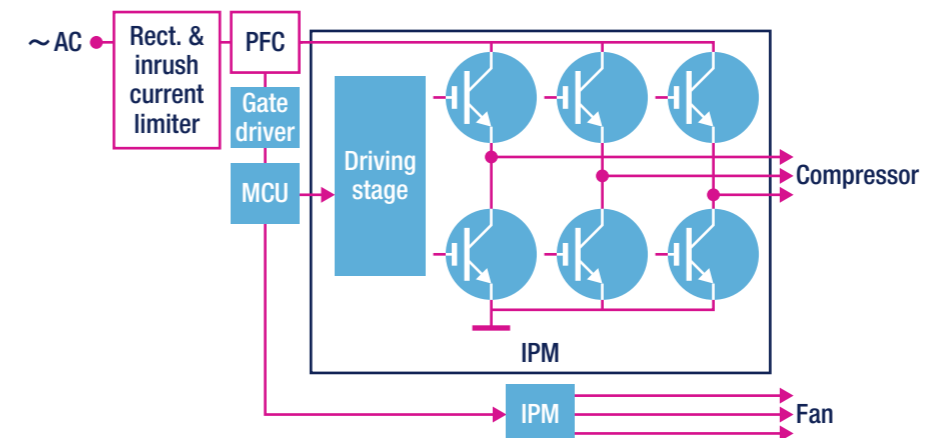
Air conditioning

The air conditioning market requires low-cost and high-energy-efficiency solutions. Thank to its product portfolio, ST is able to satisfy these requirements with suitable, dedicated power products for both power factor correction (PFC) and 3-phase inverter stages managed by high-performing STM32 microcontrollers combined with complementary new STDRIVESmart gate drivers (L639*, and L649*). Using new SiC diodes (STPSC*), high-efficiency PFC is guaranteed by the usage of new high-voltage MDmesh™ MOSFETs or suitable field-stop trench-gate IGBTs. To reduce the 3-phase inverter CTM design time and implementation efforts, ST offers the SLLIMM™ family (small, low-loss, intelligent molded module) of highly-integrated, high-efficiency industrial power modules (IPM) integrating the power stage, driving network and protections and features. Another approach for designing a 3-phase inverter is based on the use of six discrete IGBTs/MOSFETs and gate drivers mentioned before. High- and low-voltage DC-DC converters guarantee high power density for the post-regulation stages. High reliability against the inrush current is ensured by new SCRs in the front-end stage. The ST devices best suited for air conditioning applications are listed in the following table.



	MCUs	Gate drivers	IPM	IGBTs	HV power MOSFETs	Diodes	E-fuses	Linear voltage reg.	DC-DC converters		SCRs	Triacs	LED array drivers
									HV	LV			
Rect. & inrush current limiter	-	-	-	-	-	STTH3012 STTH6012	-	-	-	-	TN*10H-6 TN*15H-6 TYN6* TYN8* TYN10* TYN12*	-	-
	-	-	-	-	-	-	-	-	-	-	-	T1635T	-
PFC	STM32F0* STM32F103 STM32F3* STM32F4*	TD35* PM8841 PM8851 PM8834	-	STGW*V60DF STGW*H65DFB	ST*N65M5 ST*N65M2	STTH*AC06 STTH*R06 STPSC*06 STPSC*065	STEF01* STPW*1	LDF* LD39* LDK* LDL*	-	-	-	-	-
		L638* L639* L649*	STGIB*CH60 STGIB*M60 ¹	STG*H60DF STG*M65DF2	ST*N60DM2	-							
			STGIPN*H60 STGIPO*C60										
3-ph inverter	Compr.	-	-	-	-	-	-	-	-	-	-	-	
	Fan												L698* L597* L7985 L7986 L7987*
LED indicator	-	-	-	-	-	-	-	-	-	-	-	-	STP08 STP16* LED1642GW

Typical configuration



MAIN EVALUATION BOARDS



STEVAL-IHT008V1
1 kW, digital inrush current limiter based on Triac



STEVAL-IHM034V2
1.3 kW, dual motor control with PFC

Note: * is used as a wildcard character for related part number

Note: 1: available in Q2 2016 * is used as a wildcard character for related part number

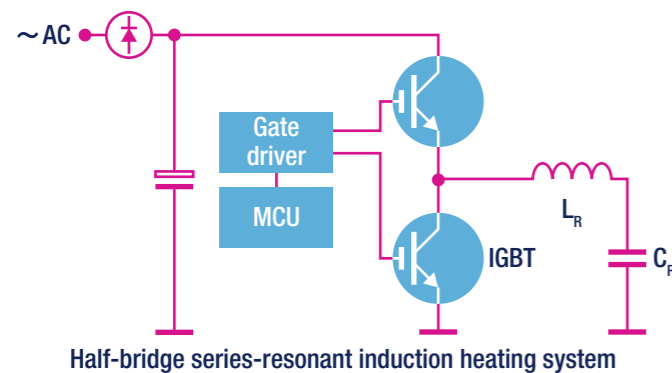
Induction heating

The induction heating market demands cost-effective, energy-efficient and reliable solutions. Resonant-switching topologies, based on voltage or current resonance, are the most adopted and can be managed using high-performing STM32 microcontrollers. To best meet these requirements and fit the selected topologies, ST has developed the dedicated IH (1250 V) and HB (650 V) series of trench-gate field-stop IGBTs. Complementary new STDRIVEsmart gate drivers family (L639*, L649*) improves the reliability (robustness and noise immunity) of the application. Depending on your needs, new 8/16 channels LED array drivers allow to have an user-friendly human interface. ST's complete offer is given in the following table.

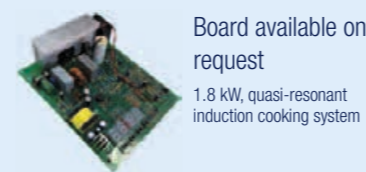


	MCUs	Gate drivers	IGBTs	LED array drivers
Single-switch quasi-resonant (voltage resonance)	STM8* STM32F100	TD35* PM8841 PM8851	STGW*IH125DF	-
HB series resonant (current resonance)	STM32F0* STM32F100	L638* L639* L649*	STGW*H65DFB STGW*H60DLFB	-
User interface (front panel)	STM8* STM32F0* STM32F4*9 STM32F7*	-	-	STP08 STP16* LED1642GW

Topology example



MAIN EVALUATION BOARD



Board available on request
1.8 kW, quasi-resonant induction cooking system

Note: * is used as a wildcard character for related part number

RENEWABLE ENERGY & HARVESTING

Photovoltaic (centralized)

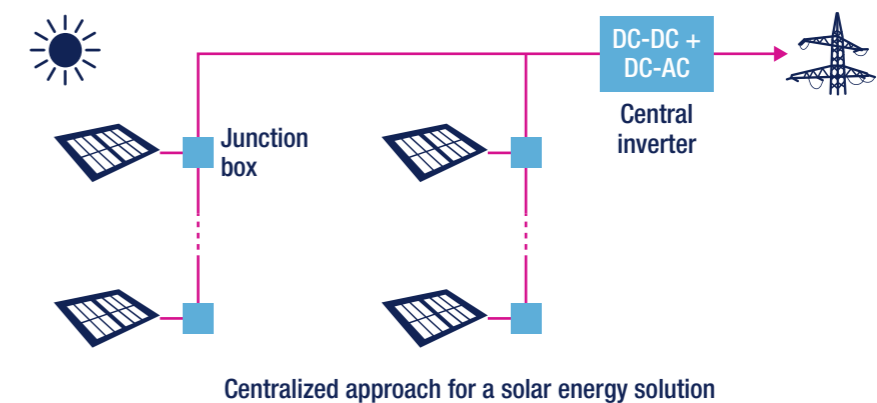
Centralized photovoltaic (PV) energy solutions use a central inverter architecture characterized by a single central inverter (where the entire DC output of a PV array is transformed and connected to the AC grid) and, at the panel level, by a junction box that provides only the bypass function and helps prevent localized hotspots. For the junction box, ST offers two products families with a very low forward voltage and a low leakage reverse current: cool bypass switches (dedicated high-efficiency photovoltaic ICs) and the new FERD diodes. By integrating high-performance STM32 microcontrollers, the new high-efficiency SiC MOSFETs (SCT*N120), the new trench-gate field-stop IGBTs series, the SiC diodes (STPSC*) and the new STGAP1S galvanically-isolated gate drivers, it's possible to guarantee a high-efficiency central inverter implementation.

High- and low-voltage DC-DC converters guarantee high power density for the post-regulation stages. Due to their low per watt costs and the simplicity of design, central inverters are the power conversion systems of choice for large PV power plants.



	MCUs	Gate drivers	HV power MOSFETs	IGBTs	Diodes	Bypass devices		DC-DC converters	
						Diodes	Cool bypass switches	HV	LV
Junction box	-	-	-	-	-	STPS*30 STPS*45 FERD*	SPV15*	-	-
Central inverter	STM32F1* STM32F2* STM32F3* STM32F4* STM32F7*	L638* L639* L649* STGAP1S	ST*60DM2 ST*65DM2 SCT*N120	-	STTH*R06 STTH*06 STTH*S12 STPSC*065 STPSC*12	-	-	L6985F L6986 L597* L7985 L7986 L7987*	ST1S4* ST1S50 L598*
			SCT*N120	STGW*H120DF2 STGW*S120DF3 STGW*M120DF3 STGW*H65DFB STGW*M65DF2	STTH*R06 STPSC*	-	-	-	-

Typical configuration



Note: * is used as a wildcard character for related part number

Photovoltaic (distributed)

A distributed photovoltaic (PV) energy architecture converts power using an embedded maximum power point tracking (MPPT) mechanism at the PV panel level. A partially distributed approach integrates a power optimizer (a DC-DC converter with MPPT and communication capabilities) and a central inverter for the DC-AC conversion and grid connection. In regards to the power optimizer, the bypass function is covered by ST with two products families featuring a very low forward voltage and low leakage reverse current: cool bypass switches (dedicated high-efficiency photovoltaic ICs) and new FERD diodes. The new high-efficiency SiC MOSFETs (SCT*N120) and the new trench-gate field-stop IGBTs series, guarantee a high-efficiency DC-AC central inverter.

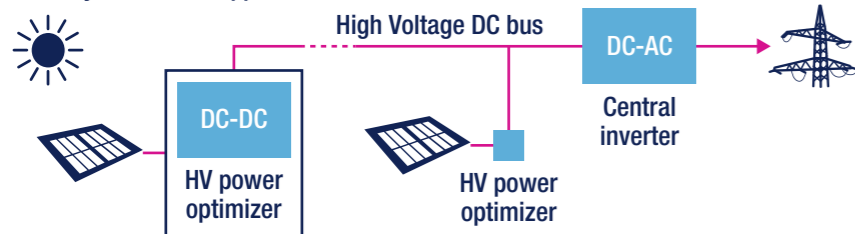
The fully distributed approach integrates, at the PV panel level, a microinverter that includes a complete converter (DC-DC with MPPT as well as DC-AC) and manages the AC grid connection. The high-performing STM32 microcontrollers, the new high-efficiency high-voltage MDmesh™ MOSFET series, the new low-voltage STripFET MOSFET series and the SiC diodes (STPSC*) guarantee a high-efficiency converter while the new STGAP1S galvanically-isolated gate drivers offer high safety and reliability. High- and low-voltage DC-DC converters guarantee high power density for the post-regulation stages.



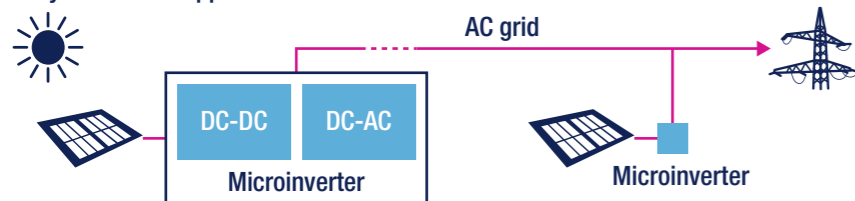
			MCUs	Gate drivers	Power MOSFETs		IGBTs	Diodes	Bypass devices		DC-DC converters	
					HV	LV			Diodes	Cool bypass switches	HV	LV
Power optimizer	DC-DC stage	Isolated FB boost	STM32F103 STM32F3* STM32F4*	L638* L639* L649* STGAP1S	-	STH*N10F7 STH*N6F7	-	STTH*R06 STTH*06	STPS*30 STPS*45 FERD*45	SPV15*	-	-
Central inverter	DC-AC stage	FB mix freq	STM32F103 STM32F2* STM32F3* STM32F4* STM32F7*		SCT*N120	-	STGW*H65DFB	-	-	-	-	L6985F L6986 L597* L7985 L7986 L7987*
		3-level HB	STM32F103 STM32F2* STM32F3* STM32F4* STM32F7*	-	STGW*H120DF2							
Micro inverter	DC-DC Interl. Boost	DC-AC FB mix freq.	STM32F103 STM32F3* STM32F4*	TD35* PM8834 PM8841 PM8851	-	STH*N10F3 STH*N8F7 ST*160N75F3	-	STTH*R06 STTH*06 STPSC*	-	-	-	-
			STM32F103 STM32F3* STM32F4*	L638* L639* L649* STGAP1S	STB*N65M5	-	-	-	-			

Typical configurations

Partially distributed approach



Fully distributed approach



Note: * is used as a wildcard character for related part number

MAIN EVALUATION BOARD

STEVAL-ISV003V2
250 W, microinverter



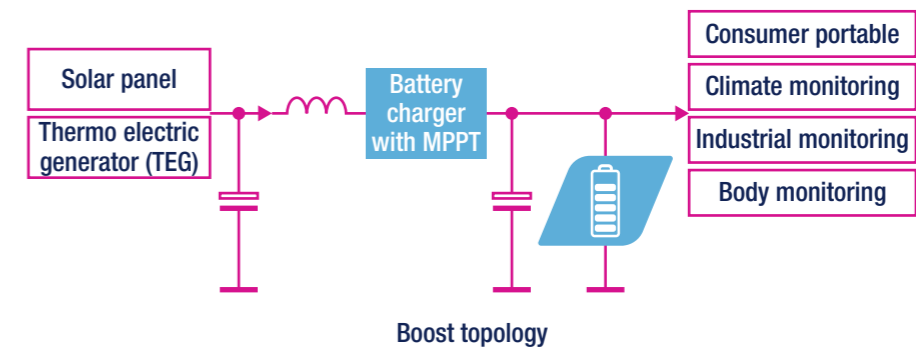
Solar – Thermo electric generator (TEG)

Today's Internet of Things (IoT) is based on the exchange of data among remote sensing units, often in a large number and located in very inaccessible places, necessitating energy-wise and fully autonomous devices to guarantee service continuity and very low maintenance cost. Also consumer portable applications (smartphone, camera, fitness, etc) need more and more continuous autonomous energy sources. This means using a battery charger powered by a harvested or renewable energy source with high conversion efficiency and its proper battery charging management. To meet this demand, ST offers dedicated products like the SPV1040 high-efficiency low-power solar constant-voltage (CV) battery charger with MPPT for outdoor, and the SPV1050 ultra low power solar and TEG energy-harvesting charger for any battery type and supercapacitor in indoor environments with embedded MPPT and LDOs. These requirements involve not only the electronics but also reliable, good-quality Li-Ion batteries. ST also provides ultra-thin, fast recharging Li-Ion batteries with a long cycle life and low capacity loss, making them suitable for renewable energy and harvesting applications. The ST devices best suited for each of the most common topologies are listed in the following table.



		Low-power solar battery chargers with MPPT	Ultra-low-power solar & TEG battery chargers with MPPT	Li-Ion battery	Linear voltage regulators
CV battery charger	Boost	SPV1040	SPV1050	-	STLQ* ST715
	Buck-boost	-			
Charger for any battery type	Boost	-	-	EFL700A39	-
	Buck-boost	-			

Typical configuration



MAIN EVALUATION BOARDS

STEVAL-ISV0019V1
Boost energy harvester battery charger



STEVAL-IDS002V1
Autonomous wireless multisensor node powered by PV cells



STEVAL-IDS003V1
Autonomous wireless multisensor node powered by TEG



Note: * is used as a wildcard character for related part number

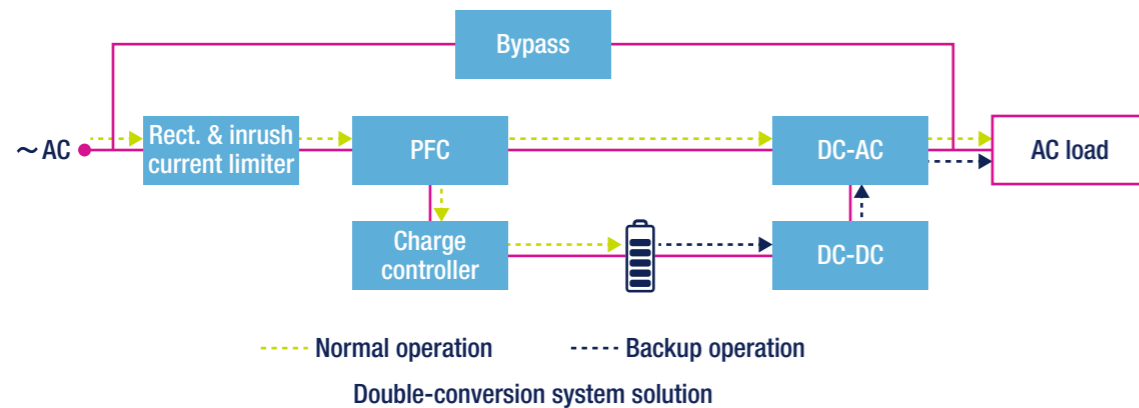
UNINTERRUPTIBLE POWER SUPPLIES (UPS)

Today the vast increase of sensitive loads due to the explosion in digital technology requires a high-quality supply of electrical power. In addition to its primary function of ensuring the continuity of service, an uninterruptible power supply (UPS) improves the quality of the voltage supplied to the load (computer, industrial processes, instrumentation, telecommunication, etc.). The double-conversion configuration usually is used for high-end applications in particular for medium- or high-power UPSs; offline systems are adopted for low power applications. Each stage of these configurations (PFC, charge controller, etc.) is supported by ST's portfolio. SiC diodes (STPSC*), new high-voltage MDmesh™ MOSFETs (M2, DM2, M5 series), new low-voltage STripFET MOSFETs (F6, F7 series), trench-gate field-stop IGBTs, SiC MOSFETs (SCT*N120), new STGAP1S galvanically-isolated gate drivers and high-performance STM32 microcontrollers guarantee high reliability and efficiency.



	MCUs	Gate drivers	IGBTs	Power MOSFETs		Diodes	SCRs	Triacs	Linear voltage regulators	DC-DC Conv.
				HV	LV					
Rect. & inrush current limiter	-	-	-	-	-	SSTH3012 SSTH6012	TYN6* TYN8* TYN10* TYN12* TN*10H-6 TN*15H-6	-	-	-
PFC Boost		PM8834 PM8841 PM8851		ST*N60M2 ST*N65M2 ST*N65M5	-	SSTH*T06 SSTH*R06 SSTH*S12 STPSC*	-	T1635T	-	-
Charge controller										
DC-DC stage										
DC-AC stage										
Bypass										

Example of high-end configuration



Note: * is used as a wildcard character for related part number

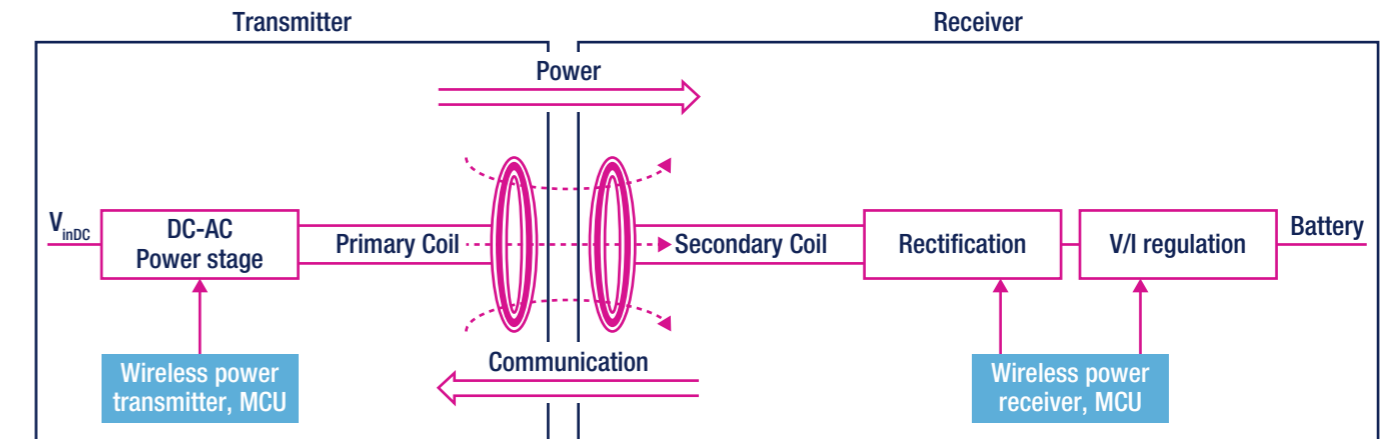
WIRELESS CHARGING

In the coming years, wireless charging applications will become more and more common for a wide range of applications starting with today's smartphone charging. ST already offers dedicated and general-purpose wireless ICs for Transmitter (Tx) and Receiver (Rx) side able to support Qi/PMA market standard and the main topologies: STWBC-WA (Tx) and STWLC04 (Rx) for wearables, STWBC (Tx) and STWLC03 (Rx) for the other mobile applications. The use of new low-voltage STripFET MOSFETs guarantees high-efficiency converters. To reduce the time to market, a complete wireless kit (Tx + Rx) for wearables and a general-purpose wireless evaluation boards are available.



		Wireless charging ICs, MCUs		Gate drivers	Power MOSFETs	Protections	Diodes
Transmitter	DC-AC stage	HB	STWBC STWBC-WA ¹ STM32F0*	L6747* L6749 ¹	STL*NS3LLH7 ST*N2VH5 ST*P2UH7 ST*H3LL	-	-
		FB					
Receiver	Rectification		STWLC03 STWLC04 ¹ STM32F0*	-	-	SMM4F SMA	STPS* FERD*
	Voltage/Current regulation						

Typical configuration



MAIN EVALUATION BOARDS



STEVAL-ISB027V1
Qi A11 Wireless charger transmitter based on STWBC



STEVAL-ISB036V1¹
Wireless charger receiver based on STWLC03



STEVAL-ISB038V1¹
Wireless charging reference design kit for wearables based on STWBC-WA and STWLC04

Note: 1: available in Q2 2016 *: is used as a wildcard character for related part number

Software tools

eDesignSuite

eDesignSuite is an easy-to-use, comprehensive software suite ready to help customers define their needs by transforming their application requirements into satisfactory solutions based on the wide range of ST products. The suite includes a smart simulator and system design engine able to suggest products and topologies for various types of applications (power supply, photovoltaic, battery charger, LED lighting, signal conditioning and RF design); smart selectors to help select the types of products (e.g. diodes) best suited to your application; and configurators to reduce implementation time and efforts for setting product parameters for the specific application (e.g. STLUX & STNRG SMEDs for lighting and power, Workbench for motor control). To discover and test all the features of eDesignSuite, you can visit (after the online registration) <https://my.st.com/analogsimulator/>

eDesignSuite
The smart way to design your application



SMART SIMULATOR AND SYSTEM DESIGN ENGINE

Power conversion and LED lighting

- Automatic proposal for complete solution or fully customizable design
- Fully annotated and interactive schematics
- Complete and interactive bill of materials
- Set of analysis diagrams (main current and voltage simulations, efficiency curves, Bode stability and power-loss data)
- Fully interactive transformer design materials

SMART SELECTOR

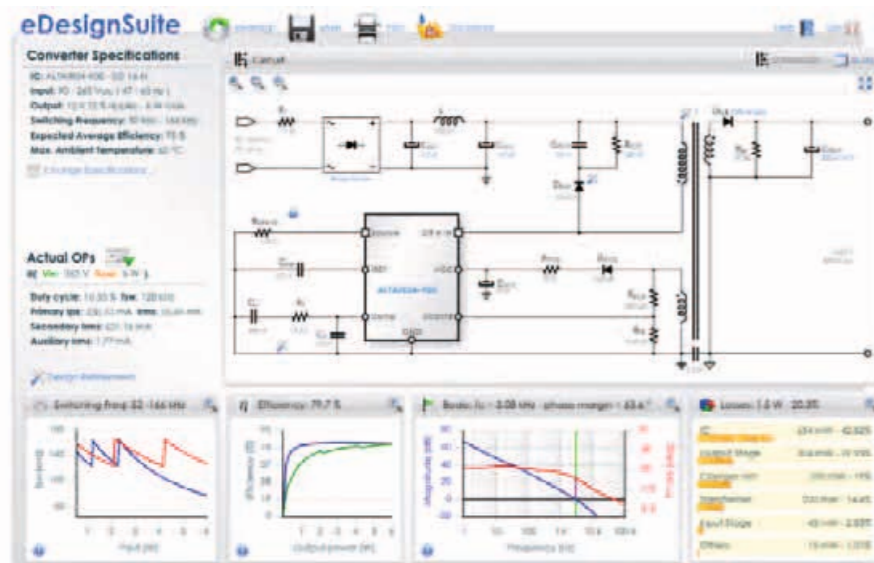
Diodes

- Part numbers proposed based on application electrical specifications
- I-V curves comparison among several part numbers
- Power losses calculated based on voltage/current target application waveforms

CONFIGURATORS

STLUX & STNRG SMEDs configurator

- SMED configurator schemes
- Input configuration
- Clock, comparators and ADC settings
- FSM (finite state machine) configuration
- C code generation
- Load register setting on board in a click



Smart simulator and system design engine view

Products

AC-DC CONVERSION ICs

High-voltage converters

ST's high-voltage AC-DC converters combine an advanced pulse width modulation (PWM) controller with a high-voltage power MOSFET in a single package. This makes them ideally suited for offline switch mode power supplies (SMPS) with output power spanning from a few to a few tens of watts.

The VIPerPlus series (VIPer0P, VIPer01 devices and VIPer*5, VIPer*6, VIPer*7, VIPer*8 families) features an 800 V avalanche-rugged power MOSFET and leading-edge PWM controller and consumes less than 4 mW for VIPer0P, 12 mW for VIPer01 and 30 mW in standby for the others. It also comes with the largest choice of protection schemes and supports different topologies.

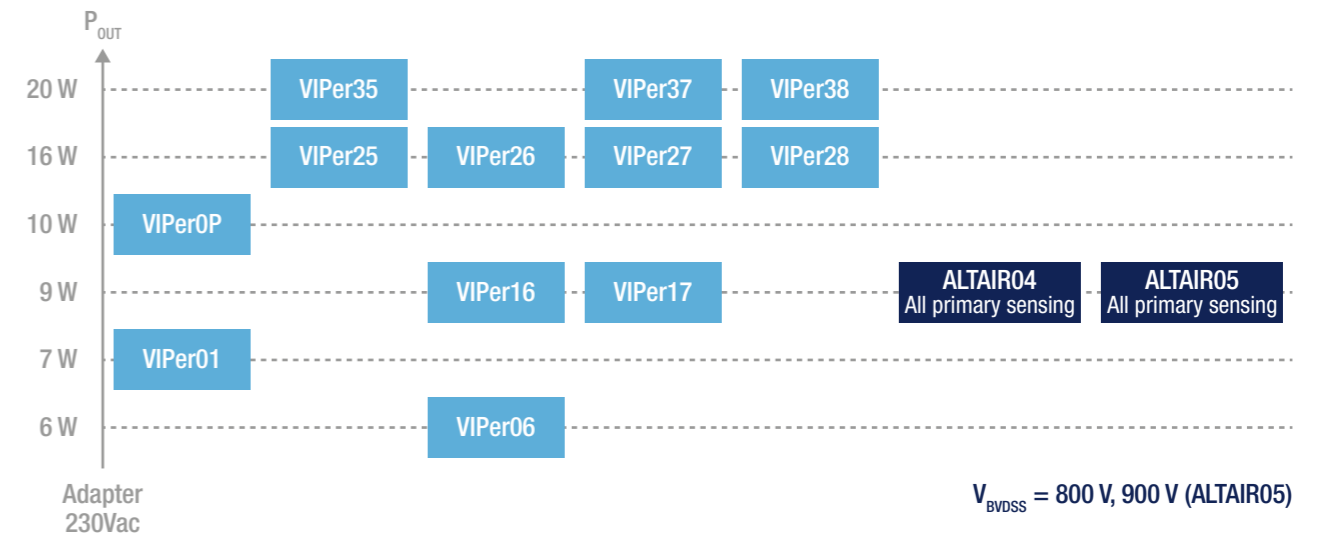
The Altair series has a built-in 800/900 V avalanche-rugged power MOSFET and a PWM controller specifically designed to work in constant-current/constant-voltage primary-side regulation (PSR-CC/CV). It means opto-less implementation, thus significantly reducing component count.



VIPerPLUS & ALTAIR

PWM controller + HV power MOSFET in the same package

- Increased robustness using 800 V AR MOSFET
- Extremely low consumption
- Better integration and minimal BoM
- Flexible and easy to use
- Flyback topology supported
 - Regulation with optocoupler using all ICs
 - PSR-CV using VIPer0P, VIPer01 and VIPer*6
 - PSR-CV/CC and tight tolerance using ALTAIR*
- Buck & buck-boost topologies supported by VIPer0P, VIPer01 and VIPer*6



MAIN APPLICATIONS



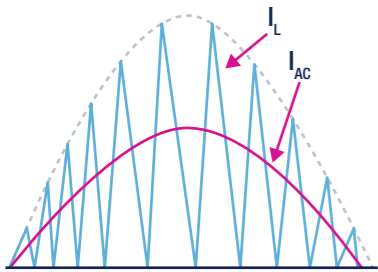
Note: * : is used as a wildcard character for related part number

PFC controllers

ST power factor correction (PFC) controllers operate in transition mode (TM, suitable for $P \leq 250$ W) and continuous current mode (CCM, suitable for $P > 250$ W), and are suitable for a wide-range-mains operation.

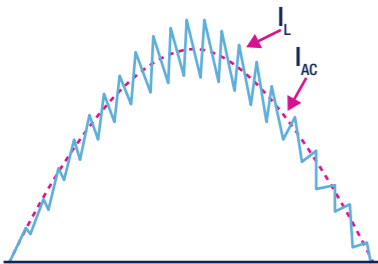
These devices embed advanced protection features, which make SMPS more robust and compact, requiring fewer external components. These features include output overvoltage, brown-out, feedback disconnection and boost inductor saturation protection. The high-voltage start-up capability, present in the L6564H and L6563H, helps improve the SMPS standby efficiency in systems that do not include an auxiliary power supply.

TM PFC controllers



	Basic features	Advanced protections	Remote on/off control	Tracking boost function	Interface for cascaded converter
L6562A*	●				
L6564*	●	●	●		
L6563*	●	●	●	●	●

CCM PFC controllers



L4984D	Line-modulated, fixed-off-time (LM-FOT) control
L4981A	Fixed frequency, average-current mode
L4981B	Line modulated frequency, average-current mode

MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

PWM, resonant and combo controllers

ST's portfolio of advanced controllers includes a variety of primary controllers intended to fit high-performance applications. Very high efficiency is achieved with single-ended topologies at a fixed switching frequency or with quasi-resonant operation; the new STCH02 offline constant-current primary-side regulation controller (PSR-CC) guarantees very low power consumption at no load condition. For high-power, high-current applications, ST offers controllers for half-bridge resonant and asymmetrical half-bridge topologies. The new STCMB1 combo controller including high-voltage start-up, Xcap discharge circuit, PFC and LLC resonant driving stages, guarantees high performance and high integration with a smaller pinout.

Flyback controllers

STCH02

- Offline quasi-resonant controller in SO-8 package
- Constant-current primary-side regulation mode (PSR-CC) or constant-voltage regulation with optocoupler
- Advanced burst mode operation (< 10 mW consumption @ no load)
- 650 V HV start up

L6566*

- Offline fixed-frequency or quasi-resonant controllers
- Suited for SMPS with PFC front-end (A version)
- Suited for SMPS with 3-phase mains (BH version)
- 700 V start up (A/B version), 840 V start up (BH version)

L6565

- Offline quasi-resonant controller
- Constant power vs mains change
- Ultra-low start-up current

Combo controller (PFC+LLC)

STCMB1

- 800 V start-up voltage
- Embedded X-cap discharge circuit
- Transition Mode (TM) PFC control method
- Self-adjusting dead-time and anticapacitive mode for LLC

Asymmetrical half-bridge controller

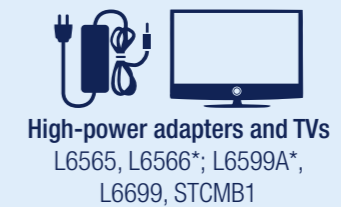
L6591

- PFC interface
- Brown out
- 700 V start-up voltage

HB-LLC resonant controllers

	Basic features	Anti-capacitive protection	Self-adjusting dead-time	Soft burst mode	Smooth Start-up
L6699	●	●	●	●	●
L6599A*	●				

MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

Synchronous rectification controllers

Synchronous rectifiers are used to drive power MOSFETs that replace the rectification diodes in the secondary side of SMPS, thus providing high efficiency especially in low-output-voltage, high-current power supplies. The product portfolio supports the most common flyback, forward and LLC resonant topologies. The main benefits include high efficiency, space saving, cost reduction and high reliability.

SR controllers for Flyback

STSR30

- Possibility to operate in discontinuous mode
- Automatic turn-off for $D < 14\%$

SR controllers for Forward

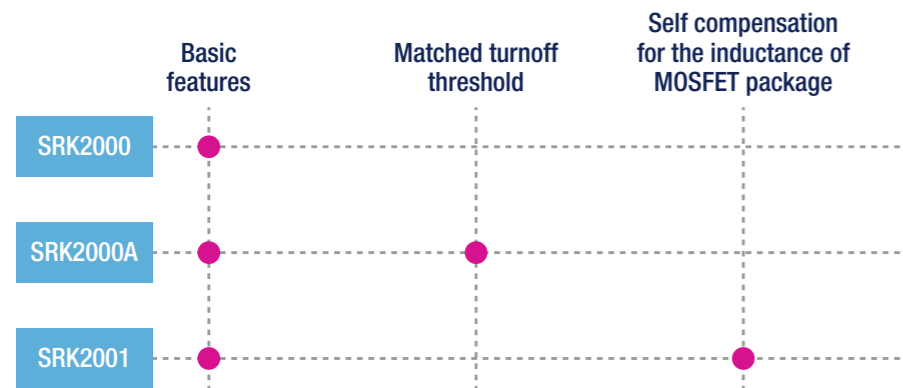
STSR2P*

- Possibility to operate in discontinuous mode
- Smart turn-off anticipation timing

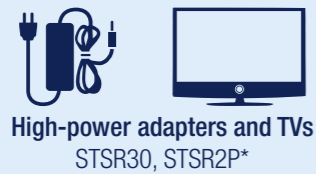
SYNCHRONOUS RECTIFICATION BENEFITS

- Improved efficiency
- Better thermal performance
- High power density
- Increased reliability

SR controllers for LLC resonant



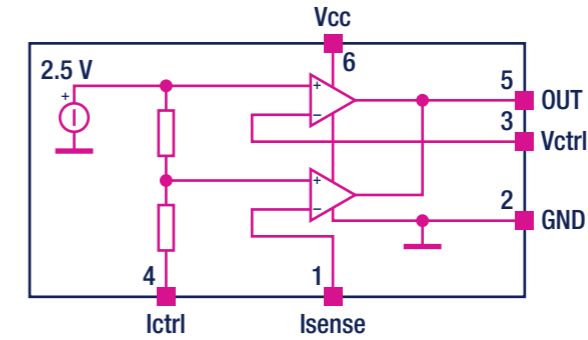
MAIN APPLICATIONS



Voltage and current controllers

ST offers a wide range of highly-integrated voltage controllers for constant-voltage (CV), constant-current (CC) SMPS applications, such as adapters, battery chargers and LED pilot lamps. They enable a more robust design, safer SMPS, very low power dissipation and low stress for secondary-side components.

SEA05 internal block diagram



CC/CV controllers for chargers, adapters and others

SEA01

- Advanced CC/CV controller with online digital trimming
- 0.1% voltage reference precision up to $36 V_{cc}$
- 200 μA low quiescent current

SEA05

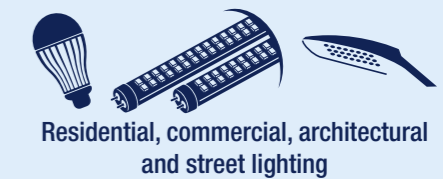
- Advanced CC/CV controller (SEA05)
- Advanced CC/CV controller with efficient LED pilot lamp driver (SEA05L)
- 0.5% voltage reference precision up to $36 V_{cc}$
- Low quiescent current: 200 μA (SEA05), 250 μA (SEA05L)
- Current sense threshold 50 mV (SEA05)
- 4% current loop precision (SEA05L)

SEA05L

TSM10*

- Compact solution
- Easy compensation
- 0.5 and 1% voltage reference precision

MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

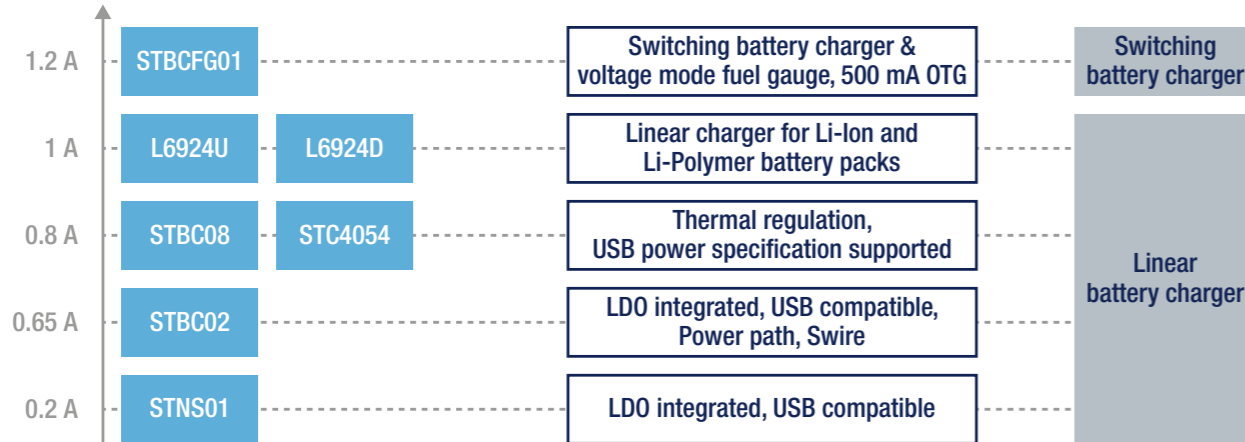
Note: * is used as a wildcard character for related part number

BATTERY MANAGEMENT ICs

Battery chargers and battery monitoring ICs

ST's battery chargers are specifically designed for the portable and mobile markets, and add value to new designs by minimizing power consumption and reducing the space on the PCB. These products offer charge currents from as little as 200 mA up to 1.2 A and can be used for any rechargeable lithium-ion and Li-Polymer battery. Using very simple topologies, some of these devices also feature a power-path function offering instant-on operation and thermal regulation according to the JEITA international standard.

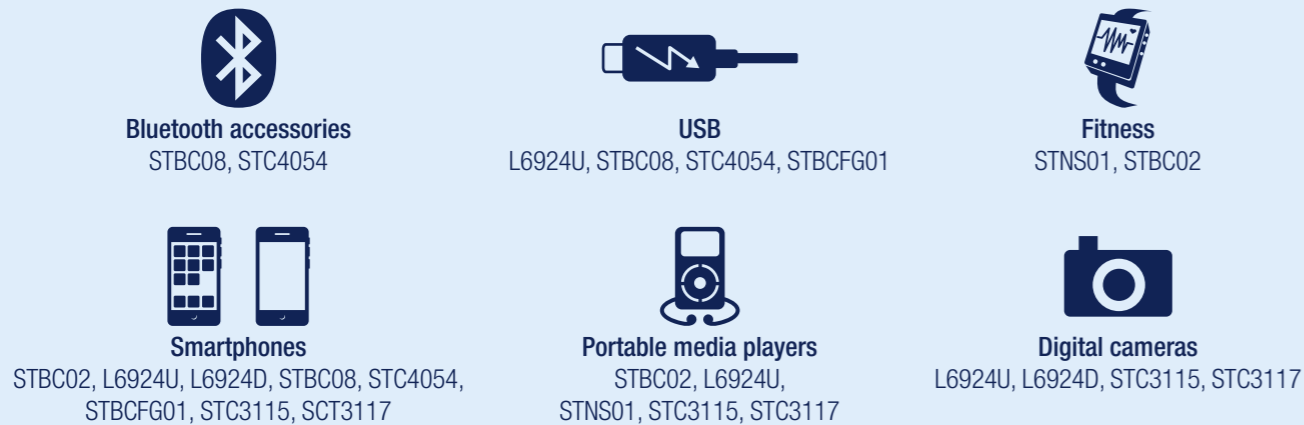
Battery chargers



Battery monitoring

- SCT3115**
 - OptimGauge™ algorithm for STC3115
 - OptimGauge+™ algorithm for SCT3117
- SCT3117**
 - Coulomb counter and voltage gas gauge operations
 - Programmable low battery alarm
 - Internal T sensor

MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

Wireless charging ICs

ST fully covers wireless charging applications with dedicated ICs for both transmitter and receiver sides. The STWBC, compatible with Qi standard, and the STWBC-WA, dedicated to wearable applications, make-up ST's wireless power transmitters (Tx) family. The receiver family (Rx) consists of the STWLC04 dedicated to wearable application and the STWLC03, compliant with both Qi and PMA standards, which is suitable for smartphones, tablets, medical applications.

Wireless power transmitters

- STWBC**
- STWBC-WA¹**

STWBC

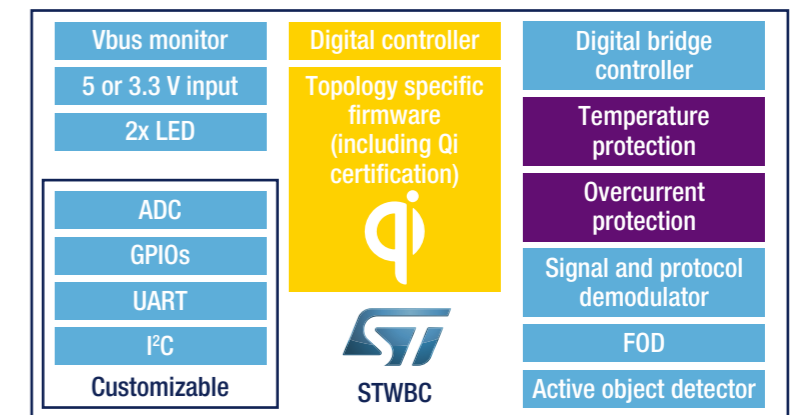
- Supports applications up to 5 W
- Qi A11 certified

STWBC-WA¹

- Supports applications up to 1 W
- Wireless power transmitter dedicated to wearables

Common features

- Digital feedback with foreign object detection (FOD)
- Smart standby (3 mW consumption)
- GUI for configuration and run-time analysis
- Firmware customization via AP



Wireless power receivers

- STWLC03**
- STWLC04¹**

STWLC03

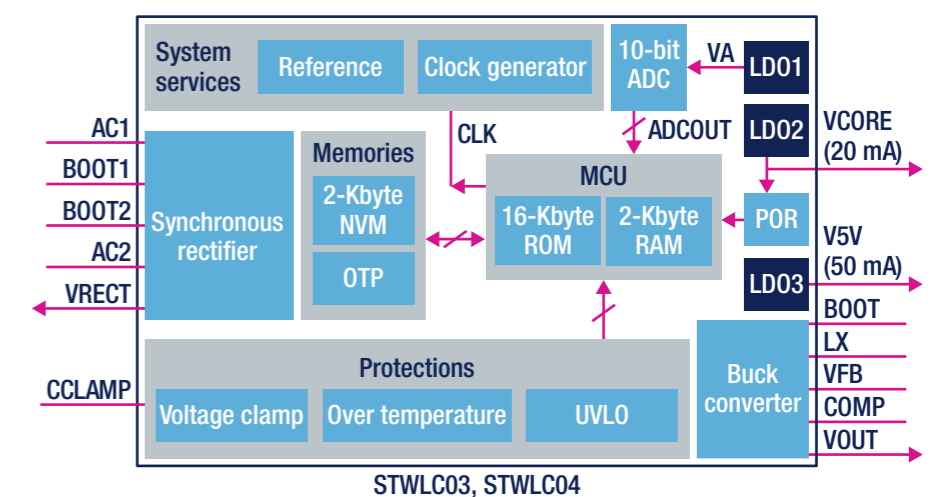
- Supports applications up to 7.5 W
- Multiple Qi and PMA standard compliant

STWLC04¹

- Supports applications up to 1 W
- Wireless power receiver dedicated to wearables

Common features

- 32-bit embedded core
- Integrated buck converter with sync rectifier
- Foreign object detection (FOD) feature for safe operation
- Direct charge of Li-Ion battery support



MAIN APPLICATIONS

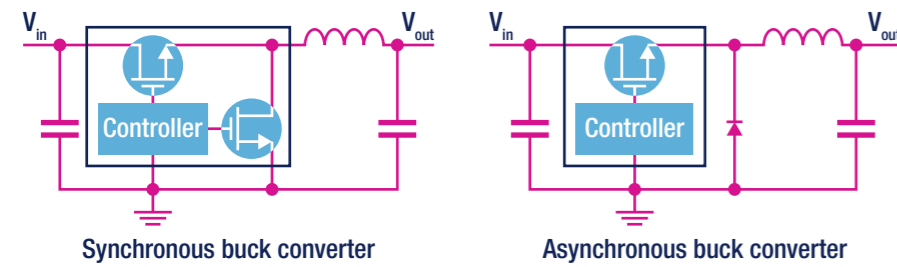


Note: 1: available in Q2 2016 * is used as a wildcard character for related part number

DC-DC CONVERSION ICs

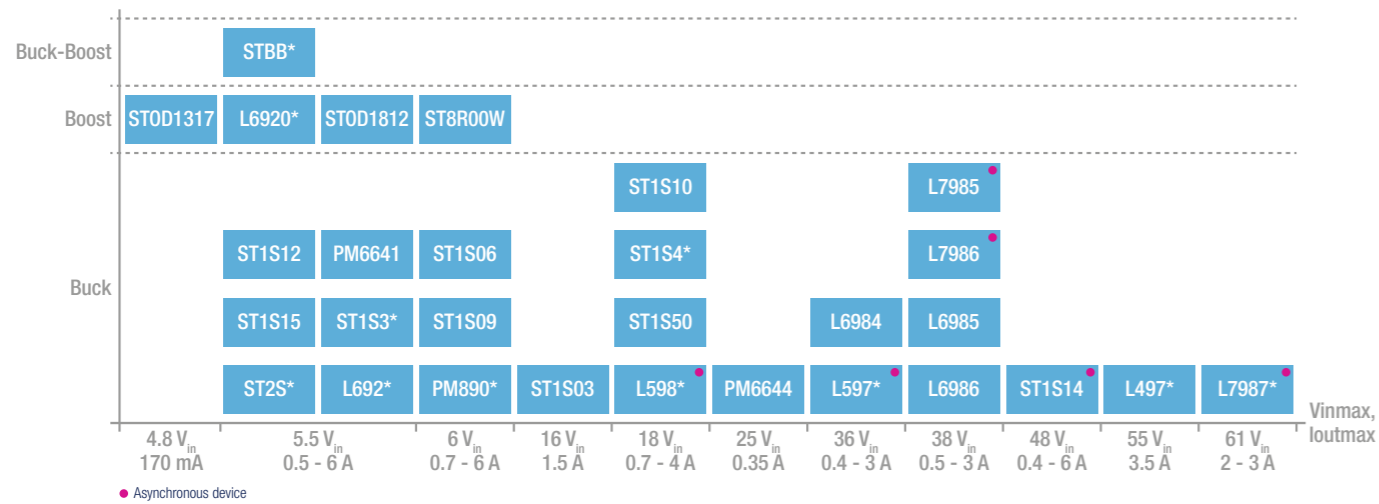
DC-DC converters

ST offers a wide portfolio of monolithic DC-DC switching converters (i.e. controller and MOSFET in the same package). This broad portfolio of ICs is composed of highly-specialized products to meet every market requirement. High reliability and robustness for industrial (factory automation, UPS, solar, home appliances, lighting, etc.) and other high-voltage applications. High efficiency at any load and a high level of performance for consumer (smartphones, digital cameras, portable fitness devices, LED TVs, set top boxes, Blue-ray players, computer & storage, etc) and server/telecom applications.



DC-DC CONVERTERS MAIN FEATURES

- Up to 61 V_{in}/3 A
- Synchronization capability
- Internal compensation
- Low consumption
- Adjustable fsw
- Internal soft start
- Low quiescent current



MAIN APPLICATIONS



Smartphones



TVs



Computing



Solar

UPS

Lighting



Set-top boxes



Wearables



Server/Telecom

ST1S0*, ST1S1*, ST1S3*, ST1S4*, ST1S50, ST2S*, L598*, PM664*, STBB*, L6920*, STOD1812, STOD1317, ST8R00W

PM890*, ST1S1*, ST1S3*, ST1S4*, ST1S50, STBB*, L598*, L698*, L798*



Home appliances



Factory automation

ST1S0*, ST1S1*, ST1S3*, ST1S4*, ST1S50, L497*, L597*, L598*, L698*, L798*

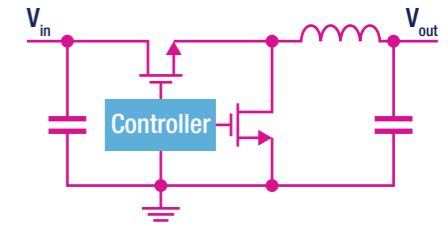
Note: * is used as a wildcard character for related part number

DC-DC controllers

ST offers a wide portfolio of DC-DC switching controllers for server and telecom applications according to market requirements: single-phase controllers with embedded drivers, advanced single-phase controllers with embedded non-volatile memory (NVM), and our newest controllers with or without SPS (Smart Power Stage) compatibility as well as multiphase digital controllers for CPU & DDR memory power supplies.

Single-phase Buck controllers

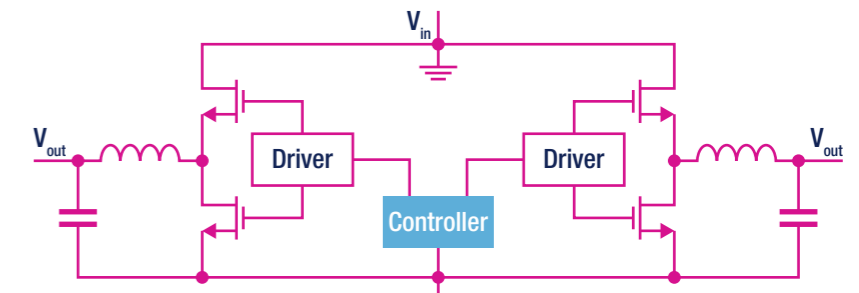
- L672*** Single-phase cost effective PWM controller
- L673*** Single-phase PWM controller with embedded driver and light load efficiency optimization
- L6997** Single-phase PWM controller up to 35V_{in}
- PM7744** Advanced single-phase controller with NVM (non-volatile memory) and telemetry
- PM6697** Analog single-phase controller with SVID with or without SPS compatibility
- PM6680** Dual-output PWM controller up to 36V_{in}



Single-phase buck controller

Multi-phase Buck controllers

- PM676*** Fully digital buck controller with PMBus for CPU/DDR
- PM677*** Fully digital buck controller with PMBus for advanced CPU/DDR



Multi-phase buck controller

MAIN APPLICATIONS



Servers



Microservers



Telecoms

Note: * is used as a wildcard character for related part number

DIGITAL CONTROLLERS/MICROCONTROLLERS

Digital controllers

ST offers a number of advanced digital controllers, featuring innovative solutions to optimize converter efficiency in a wide range of load conditions (especially at light loads) and to have more flexibility. ST offers two main digital controller families tailored for specific applications: STLUX for lighting and STNRG for power conversion. In STLUX and STNRG families, the innovative SMED (state machine, event-driven) digital technology and the integrated microcontroller make STLUX and STNRG easily programmable and versatile. SMED is a hardware state machine triggered by internal or external events.

Digital controllers tailored for power conversion and lighting applications

STNRG* STLUX*

Common features

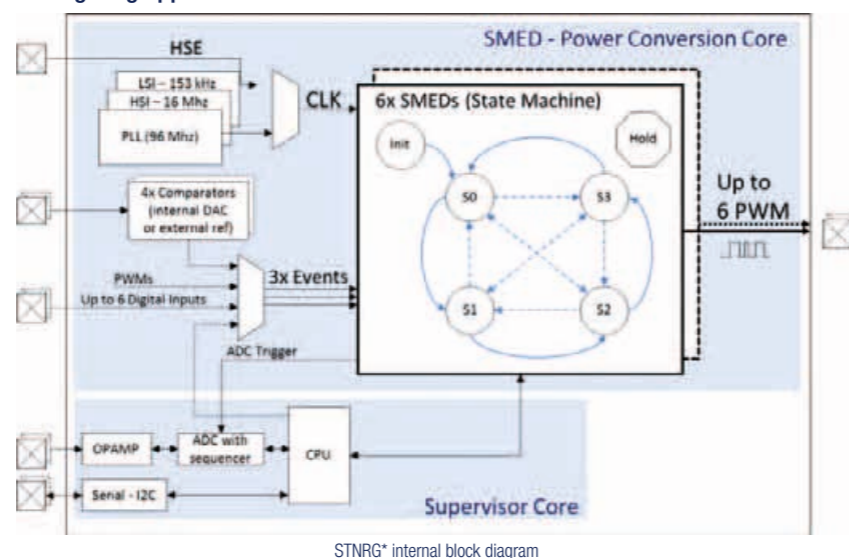
- Innovative digital control technique based on 6 programmable SMEDs with max PWM resolution of 1.3 ns
- Customizable algorithm for higher conversion efficiency
- Internal 96 MHz PLL
- Operating temperature -40 to 105°C
- Serial, I²C and GPIO interfaces

STNRG*

- Digital controller tailored for power conversion
- Up to 4 comparators with external reference

STLUX*

- Digital controller tailored for lighting applications
- Suitable for primary-side regulation and multi-strings lighting applications
- DALI 2.0 for remote control and connectivity



MAIN APPLICATIONS



Microcontrollers

The 32-bit microcontrollers most suitable for power management applications are those of the entry-level STM32F0 series and the STM32F334 MCU from the mixed-signal STM32F3 series.

The STM32F0 series has a 32-bit ARM® Cortex®-M0 core and is particularly well suited for cost-sensitive applications. STM32F0 MCUs combine real-time performance, low-power operation, and the advanced architecture and peripherals of the STM32 platform.

The STM32F334 MCU combines a 32-bit ARM® Cortex®-M4 core (with FPU and DSP instructions) running at 72 MHz with a high-resolution timer (217 ps) and complex waveform builder plus event handler. This MCU specifically addresses digital power conversion applications such as digital switched-mode power supplies, lighting, welding, solar and wireless charging high number of integrated analog peripherals leading to cost reduction at the application level and a simplification of the application design.

STM32F334, the MCU tailored for digital SMPS

STM32F334

- Cortex®-M4 core
- High resolution timer with waveform builder and event handler
- High-speed ADCs for precise and accurate control
- Built-in analog peripherals for signal conditioning and protection (25ns from fault input to PWM stop)

STM32 F0 series, the MCUs for cost sensitive applications

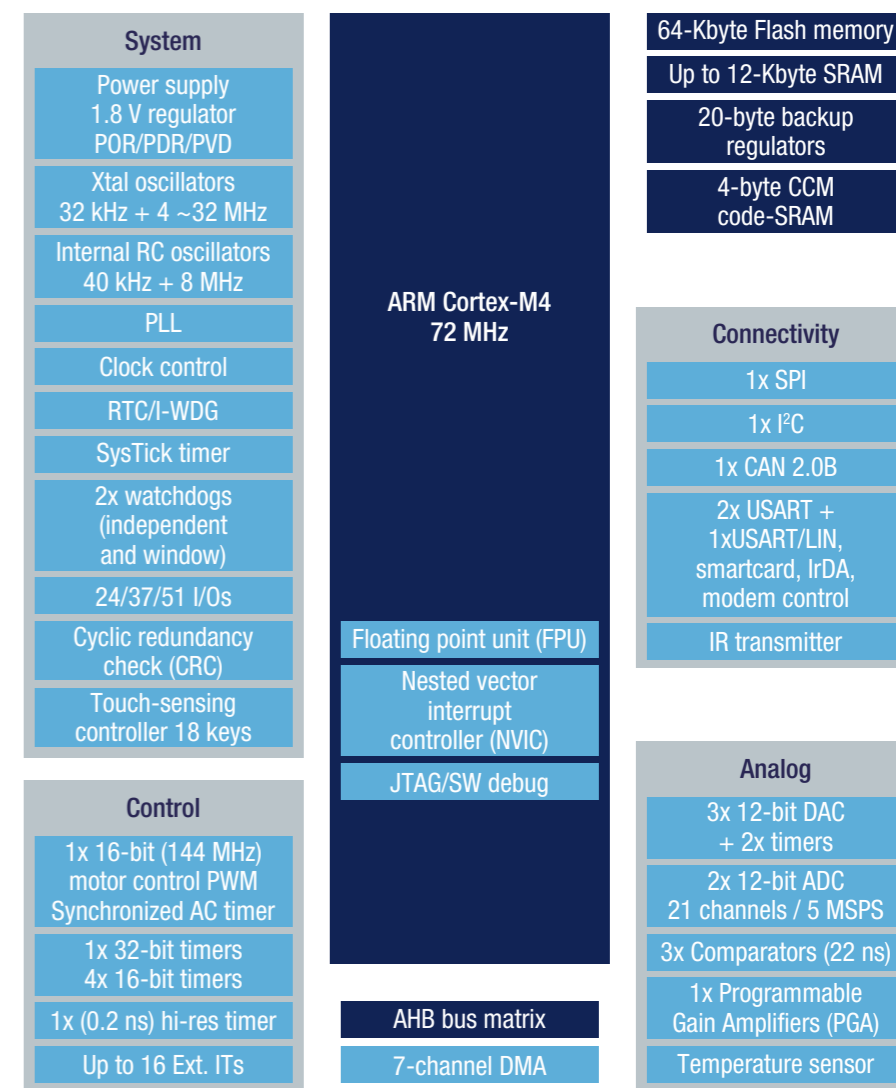
STM32F0*8

STM32F0*2

STM32F0*1

STM32F0*0

- Cortex®-M0 core
- Entry level, from 16 to 256 Kbytes
- USB crystal-less TSSOP20 6 Kbytes, 32-bit
- 8-/16-bit solutions and ecosystem



STM32F334 features

MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

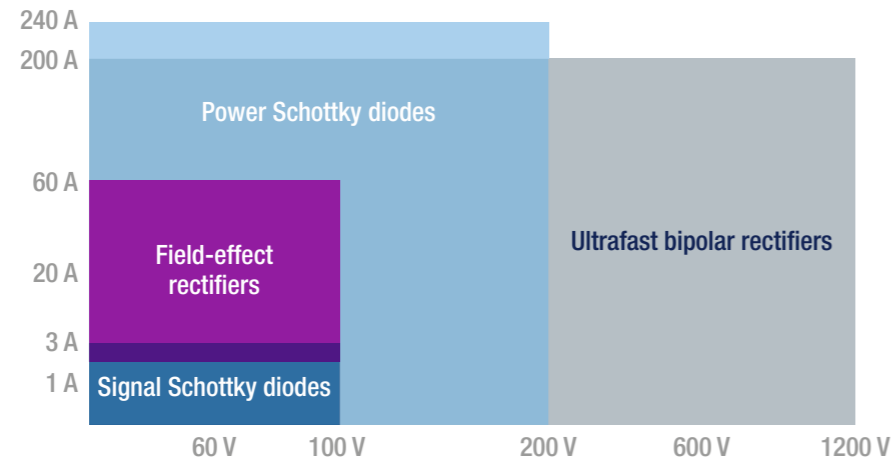
Note: * is used as a wildcard character for related part number

DIODES AND RECTIFIERS

Silicon diodes

ST offers Schottky and ultrafast silicon rectifier solutions for all market requirements. ST's latest developments include M series, based on Schottky technology, with improved avalanche rating and the integration of higher currents in low-profile PowerFLAT™ packages. Our range of small-signal Schottky diodes with flip-chip and SOD-923 devices helps meet the most stringent space-saving requirements, especially for portable communication equipment.

For high-efficiency rectification or freewheeling functions, our new field-effect rectifier diodes, the FERD family, improve the power density capability of the converters.



Field-effect rectifiers (FERD)

- FERD*U* Low V_F
- FERD*M* Low I_R
- FERD*S* Best V_F/I_R trade-off

Power Schottky diodes

- STPS*L* Low V_F
- STPS*M* Best V_F/I_R trade-off

Ultrafast rectifiers

- STTH* Various V_F/t_{RR} trade-off to achieve best performance in any application

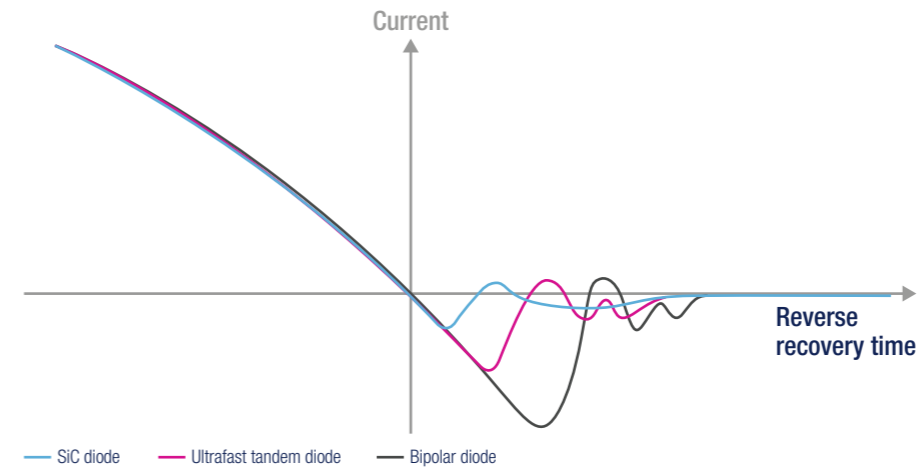
MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

SiC diodes

For power converter applications where silicon diodes reach the limits of their operating temperature and power density, ST's first- and second-generation silicon carbide devices offer optimal reliability. SiC diodes are high-performance power Schottky diodes that feature a silicon-carbide substrate. This wide bandgap material enables the design of high-voltage Schottky diodes, and ST offers rectifiers up to 2 x 650 V (dual diodes in series). They present negligible reverse recovery at turn-off and minimal capacitive turn-off behavior which is independent of temperature. The 1st generation of 600 V diodes offers the best forward and switching characteristics. The 2nd generation of 650 V diodes offers more surge robustness for optimal use in circuits featuring current spikes.



SiC DIODES BENEFITS

- High efficiency adding value to the power converter
- Reduced size and cost of the power converter
- Low EMC impact, simplifying certification and speeding time to market
- High robustness ensuring high reliability of the power converter
- Gain on PCB and mounting cost with the dual diodes

650 V SiC diodes in insulated TO-220 packages: the solution to speed production

STPSC*06

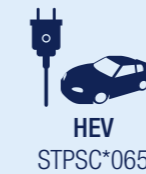
- 600 V
- High efficiency thanks to low forward voltage drop
- Ideal for applications without current surge

STPSC*065

- 650 V (STPSC*065)
- 2 x 650 V (STPSC*13) dual in series diodes
- Best trade-off between efficiency and robustness thanks to the high I_{FSM}
- Ideal for applications with high current surge

STPSC*13

MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

Power breakers & current limiter ICs

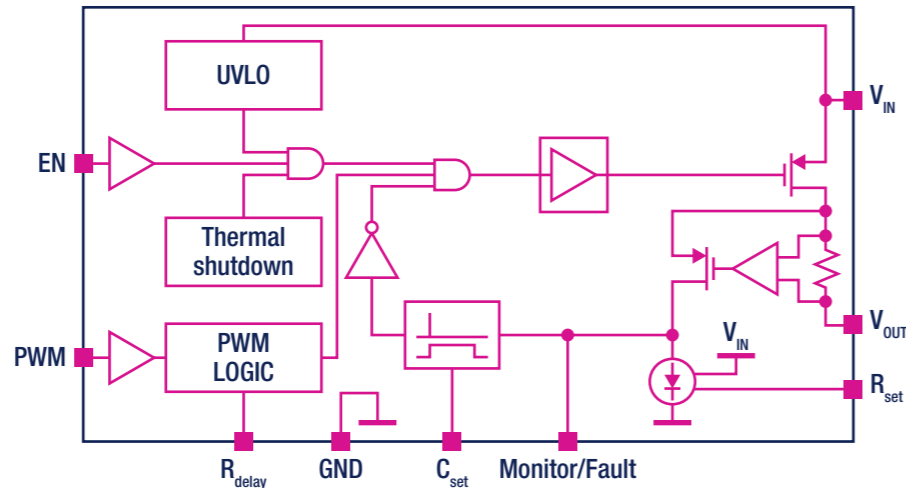
Connected in series to the power rail, ST's power breakers are able to disconnect the electronic circuitry if power consumption exceeds the programmed limit. When this happens, the device automatically opens the integrated power switch, disconnecting the load, and notifies the remote monitoring feature.

Current limiter ICs are designed to work with an external MOSFET to protect power supplies from anomalous external current demands.

Power breakers

STPW05¹ STPW12¹

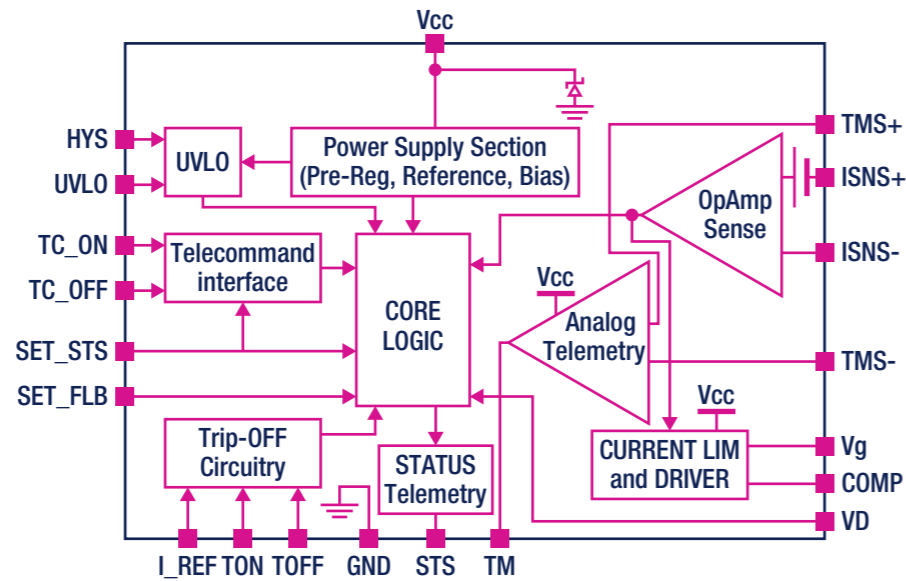
- Auto-retry function with programmable delay
- Adjustable precise power limitation from 11 to 16 W
- 5 V (STPW05) and 12 V (STPW12) rails
- Programmable power limit masking time
- Over-temperature protection
- Integrated N-channel power MOSFET
- Internal undervoltage lockout



Current limiter IC

STFC01

- Wide Vcc range (10 - 48 V)
- Fully programmable current limitation
- P-channel MOSFET driving capability
- Remote On/Off control
- Latch, autoretry or foldback configuration
- Analog and digital current monitoring (status telemetry)
- Undervoltage lockout



MAIN APPLICATIONS



Home appliances
STPW05¹, STPW12¹



Air conditioning
STPW05¹, STPW12¹



Factory automation
STPW05¹, STPW12¹, STFC01

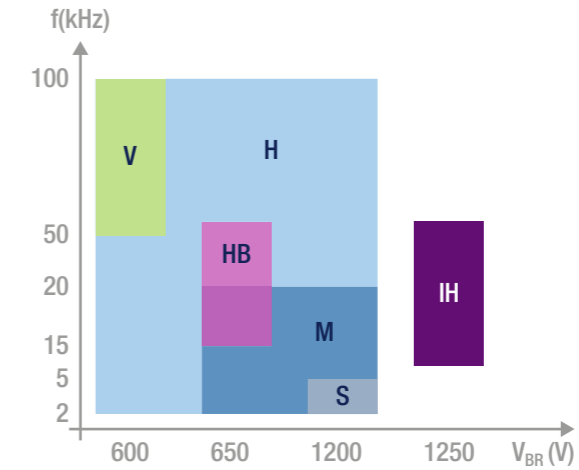


Servers/Telecoms
STFC01

Note: ¹: available in Q3 2016 * : is used as a wildcard character for related part number

IGBTs

ST provides a large portfolio of IGBTs with breakdown voltages between 600 and 1250 V with state-of-the-art trench-gate field-stop technology. ST's IGBTs feature the optimal trade-off between switching performance and on-state behavior due to their proprietary technology and to the 175 °C max operation junction temperature, delivering greater all round energy efficient system designs in applications such as motor control, photovoltaic, UPS, automotive, induction heating, welding, lighting and others.



S series

STG*S*

- 10 μs of short-circuit capability @ starting T_j = 150 °C
- Wide safe operating area (SOA)
- Soft and fast recovery antiparallel diode
- Suited for asymmetric half-bridge topology

HB series

STG*H*B

- Medium f_{sw}
- Very low saturation voltage
- Minimal tail current turn-off time
- Suited for TTF and Boost-CCM topologies

M series

STG*M*

- 6μs/10μs (650 V/1200 V series) short-circuit capability @starting T_j = 150 °C
- Wide safe operation area (SOA)
- Soft and fast recovery antiparallel diode
- Suited for asymmetric half-bridge, 3-level half bridge, 3-phase inverter and full bridge topologies

H series

STG*H*

- | | |
|------------------------------------|---|
| 600 V family | 1200 V family |
| • 3 μs of short-circuit capability | • 5 μs of short-circuit capability @ starting T _j = 150 °C |
| • Low saturation voltage | • Low turn-off losses |
| • Minimal collector turn-off | • Very fast turn-on |

IH series

STG*IH*

- Medium f_{sw}
- Minimized tail current
- Low drop forward voltage diode
- Suited for single-switch quasi-resonant topology

V series

STG*V*

- High f_{sw} series
- Tail less switching off
- Low conduction losses
- Suited for TTF, Boost CCM and FB topologies

MAIN APPLICATIONS



Welding
H, HB, V



Solar
Inverter: S, M - Boost: H, HB



UPS
S, M, H



Home appliances
H, HB



Air conditioning
S, M, H, HB



Motor control
S, M

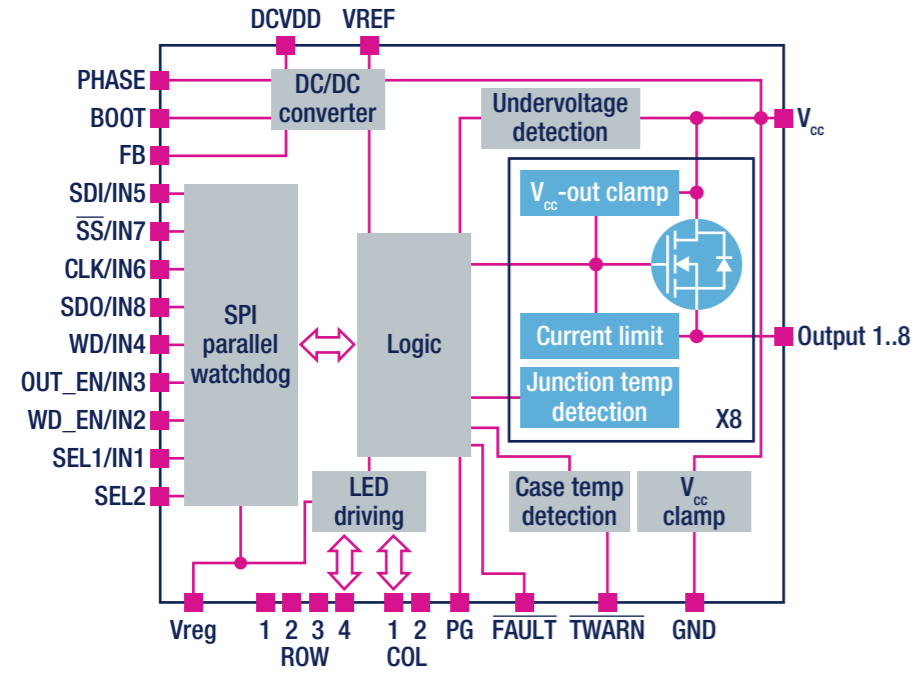


Induction heating
HB, IH

Note: * : is used as a wildcard character for related part number

INTELLIGENT POWER SWITCHES

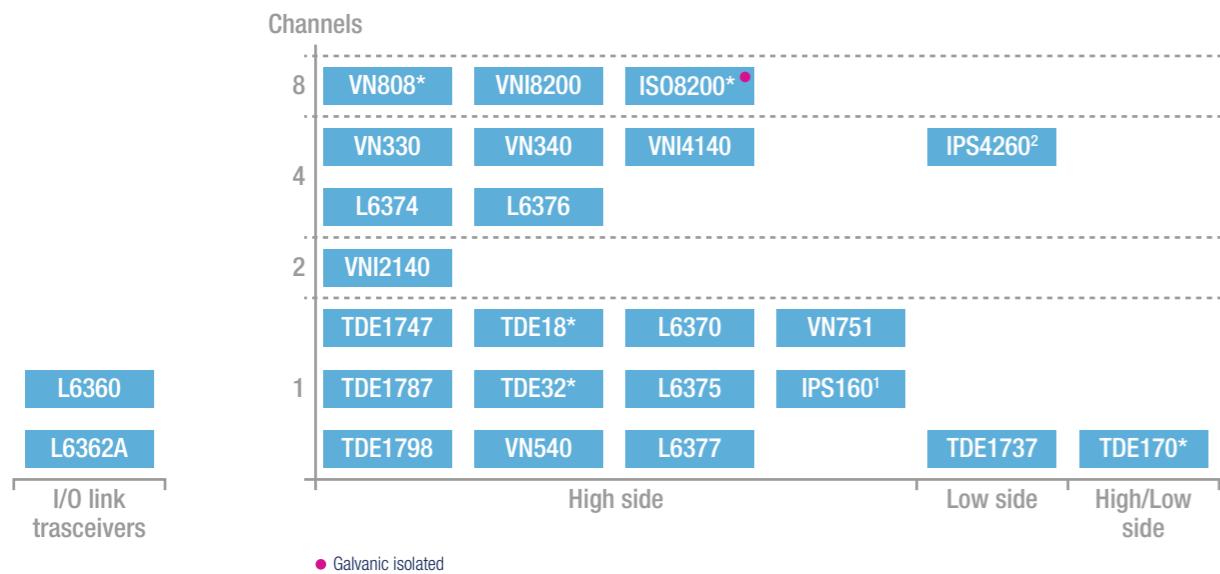
STMicroelectronics offers intelligent power switches (IPS) for low- and high-side configurations. ST's IPS feature a supply voltage range from 6 to 60 V, overload and short-circuit protection, current limitation set for industrial applications, different diagnostic types, high-burst, surge and ESD immunity, very low power dissipation and fast demagnetization of inductive loads. Devices are designed using ST's latest technologies, thus offering state-of-the-art solutions in any application field.



IPS MAIN FEATURES

- Logic
- Driving
- Protections
- Diagnostic
- Power stage
- ...all on a single chip

IS08200*, the galvanic isolated IPS ideal for factory automation



MAIN APPLICATIONS



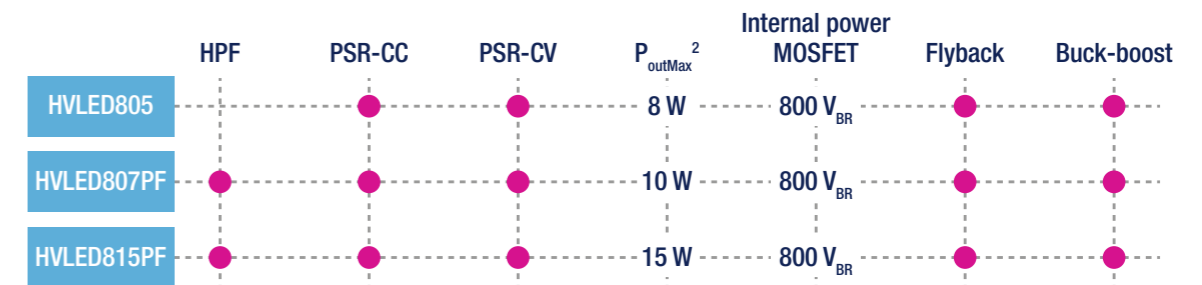
Note: 1: available in Q2 2016 2: available in Q4 2016 *: is used as a wildcard character for related part number

LED DRIVERS

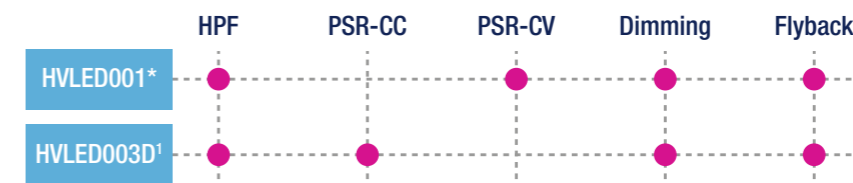
Offline LED drivers

Dedicated LED drivers operating from the AC mains ensure highly-accurate LEDs managing to provide a high level of light quality and avoid flickering. By combining a state-of-the-art low-voltage technology for the controller and an extremely robust 800 V technology for the power MOSFET in the same package, HVLED8* converters (i.e controller + MOSFET in the same package) feature an efficient, compact and cost-effective solution to drive LEDs directly from the rectified mains. This family of converters works in constant-current / constant-voltage primary-side regulation (PSR-CC/CV). HVLEDO* controllers are also available for high power needs working in constant-current (PSR-CC) or constant-voltage (PSR-CV) primary-side regulation; a dimming function is also available. For both families (HVLED converters and controllers), the primary-side regulation cuts bill-of-material costs, while also simplifying design and reducing the space occupied by LED control circuitry.

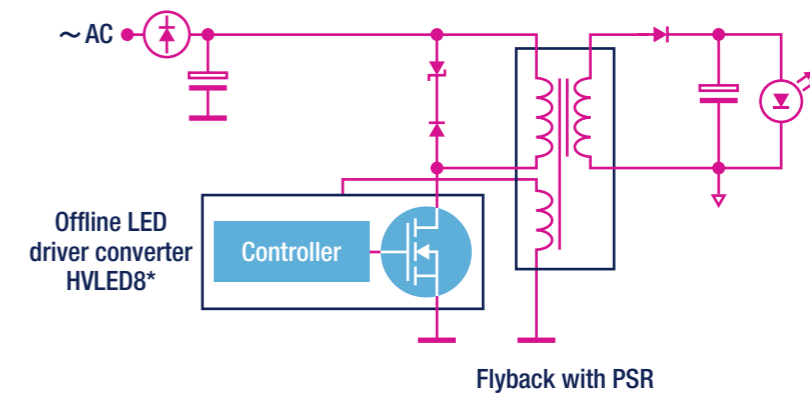
Offline LED converters with PSR



Offline LED controllers with PSR



Topology example



MAIN APPLICATIONS



Residential lighting
HVLED805, HVLED807PF, HVLED815PF



Commercial, architectural, and street lighting
HVLED001*, HVLED003D¹

Note: 1: available in Q3 2016 2: power level @ 230 Vmains *: is used as a wildcard character for related part number

DC-DC LED drivers

ST's monolithic buck switching regulators offer input voltage capability up to 61 V and deliver output currents up to 4 A with high switching frequency. They enable simple, efficient and cost-effective solutions for driving high-brightness LEDs. They also feature dedicated circuitry for dimming. Boost regulators provide the necessary high voltages to drive multiple LEDs in series, guaranteeing accurate LED current matching.

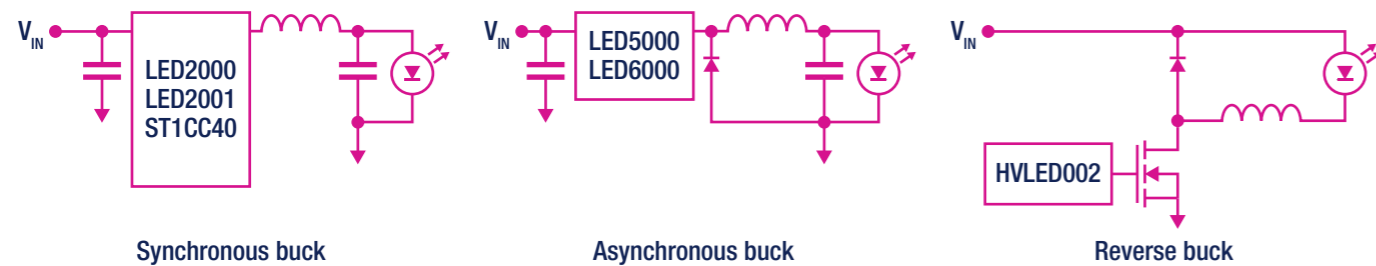
DC-DC LED drivers converters



DC-DC LED drivers controllers

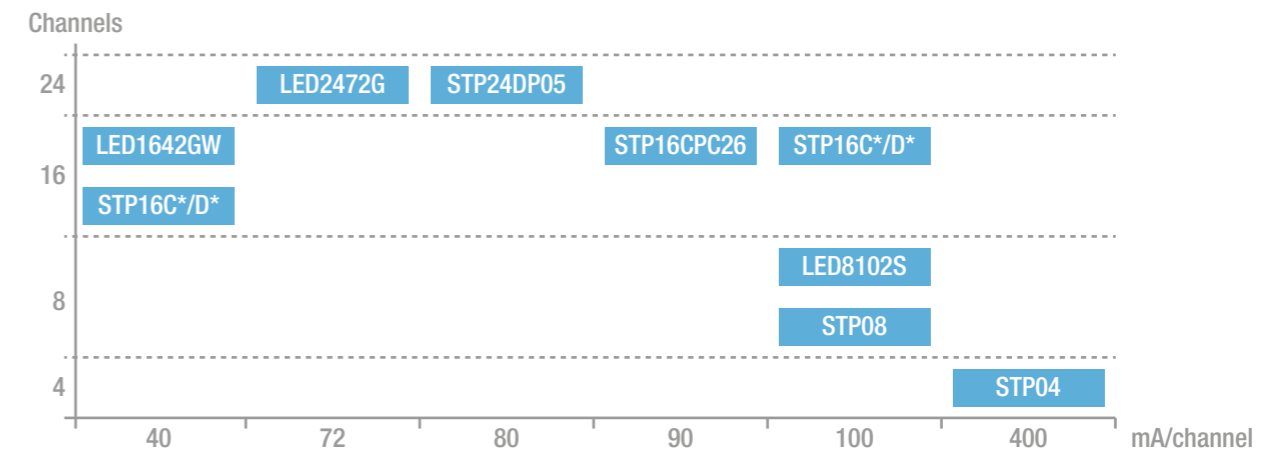


Topology examples



LED array drivers

ST's LED array drivers fully integrate all functions required to drive high-brightness LEDs. These devices allow constant-current control in a single-chip solution. The external parts are reduced to only one resistor that sets the preferred maximum current for all outputs. Devices also come with additional features such as high current, high precision, local and global LED brightness adjustment, thermal shutdown, error detection and auto power-saving functionalities.



24 channel RGB (8x3) drivers

- Current gain control (LED2472G), constant current (STP24DP05)
- Error detection
- Autopower saving (LED2472G)

16 channel drivers

- Current gain control (LED1642GW), constant current (STP16C*/D*)
- Error detection (STP16C*/D*)
- Autopower saving
- Local dimming (LED1642GW), global dimming (STP16C*/D*)

4/8 channel drivers

- Constant current
- Direct I/O (LED8102S)
- Error detection (STP08)
- Global dimming

MAIN APPLICATIONS

<p>Traffic signals LED8102S, LED2472G, STP24DP05, STP04</p>	<p>Large panel signs LED1642GW, LED2472G, STP24DP05, STP16, STP08</p>	<p>Home appliances LED8102S, STP16, STP08, LED1642GW</p>	<p>Special lighting STP04, LED1642GW, LED2472G, LED8102S</p>
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MAIN APPLICATIONS

<p>Halogen bulbs replacements and home appliances LED2000, LED2001</p>	<p>Traffic signals LED2000, LED2001, ST1CC40, LED5000, LED6000</p>	<p>Street lighting LED5000, LED6000, HVLED002</p>	<p>Emergency lighting LED6001, ST1CC40</p>	<p>Commercial and architectural lighting LED5000, LED6000, LED6001, HVLED002</p>
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Note: * is used as a wildcard character for related part number

Note: * is used as a wildcard character for related part number

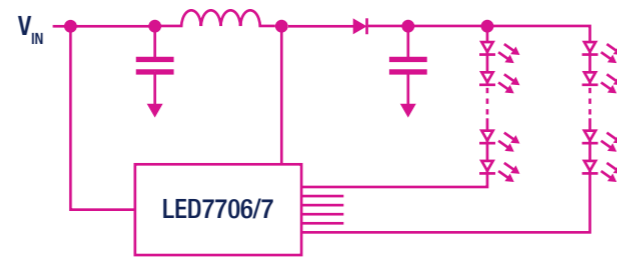
LED row drivers

LED row drivers are essentially boost regulators that provide the necessary high voltages to drive multiple LEDs in series, guaranteeing accurate LED current matching.

ST offers both single- and multi-channel high-efficiency boost LED drivers featuring a wide dimming range, low noise and small footprint. They also embed protection functions such as overvoltage and overcurrent protection, thermal shutdown and LED-array protection.

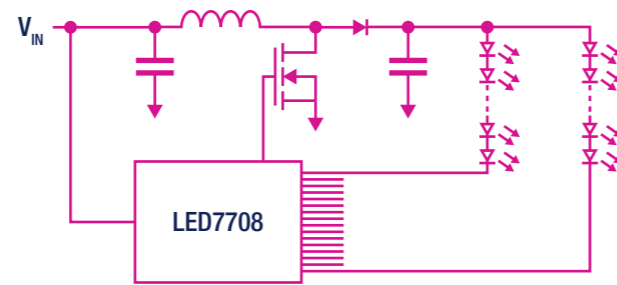
LED row driver converters

Rows	IC	Current	Dimming
6 rows	LED7707	85 mA/row	Global dimming
	LED7706	30 mA/row	
5 rows	STLED25	25 mA/row	
4 rows	STLD41	30 mA/row	
1 row	STLA02*	20 mA/row	
	STLD40D		



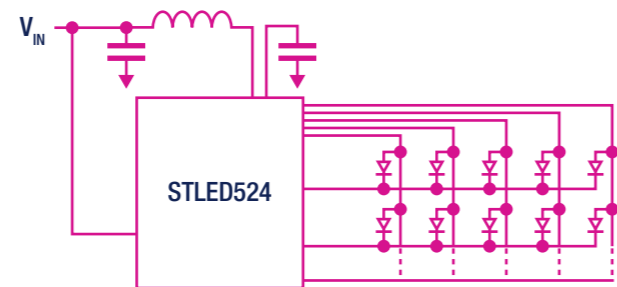
LED row driver controllers

16 rows	LED7708	85 mA/row	Grouped or independent row dimming
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LED matrix driver

5 x 24 matrix	STLED524	20 mA/dot	Adjustable luminance for each LED (dot)
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MAIN APPLICATIONS

Smartphones
STLED25, STLD40D

Game consoles
STLD41

Keyboard and accessories
STLA02*

Home appliances and ATMs
LED7706, LED7707, LED7708

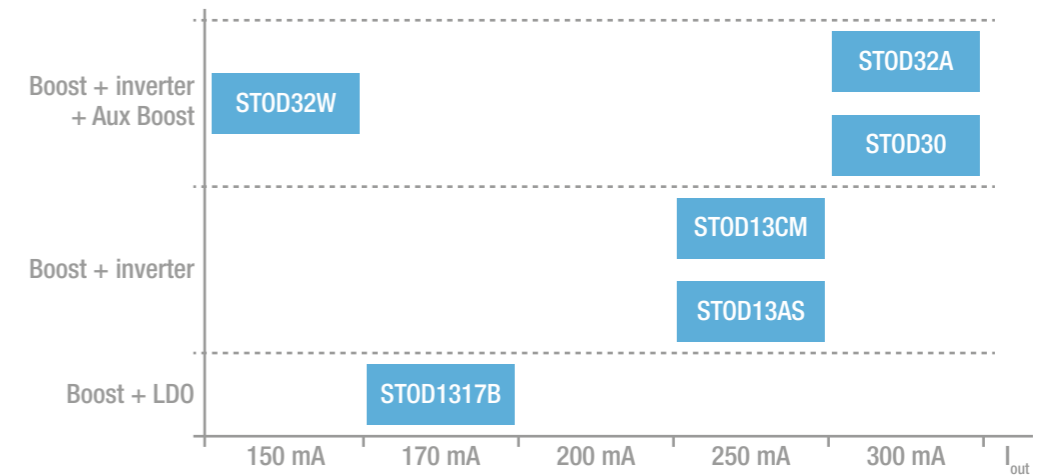
Wearables
STLED524

Note: * is used as a wildcard character for related part number

OLED drivers

ST supplies over 70% of the world's ICs to power AMOLED displays that enable today's advanced handheld devices to deliver high quality web and video experiences on the move.

ST's dedicated AMOLED power ICs add value to new designs by simplifying power supply in the circuitry ensuring outstanding energy efficiency and results in longer battery life. In addition, high immunity to mobile communication noise keeps display consistent and flicker free.



1 channel driver (for displays up to 4")

- STOD1317B
- Wide output range (up to 13 V)
 - Very low output ripple
 - High efficiency
 - 100 mV LDO output drop

2 channel drivers (for displays up to 5")

- STOD13AS
- High efficiency in overall output range
 - Wide output negative range (STOD13AS)
 - External feedback output sense (STOD13CM)

3 channel drivers (for displays up to 6")

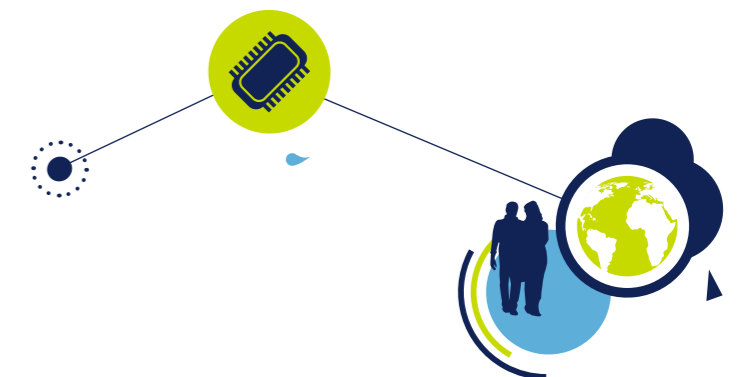
- STOD30, STOD32W
- Programmable auxiliary boost for driver ICs
 - 100 mA output load in flipchip (STOD32W)
 - Wide output negative range (STOD30)

MAIN APPLICATIONS

Fitness and wearables
STOD32W, STOD1317B

Low-end smartphones
STOD1317B,
STOD13AS/CM, STOD30

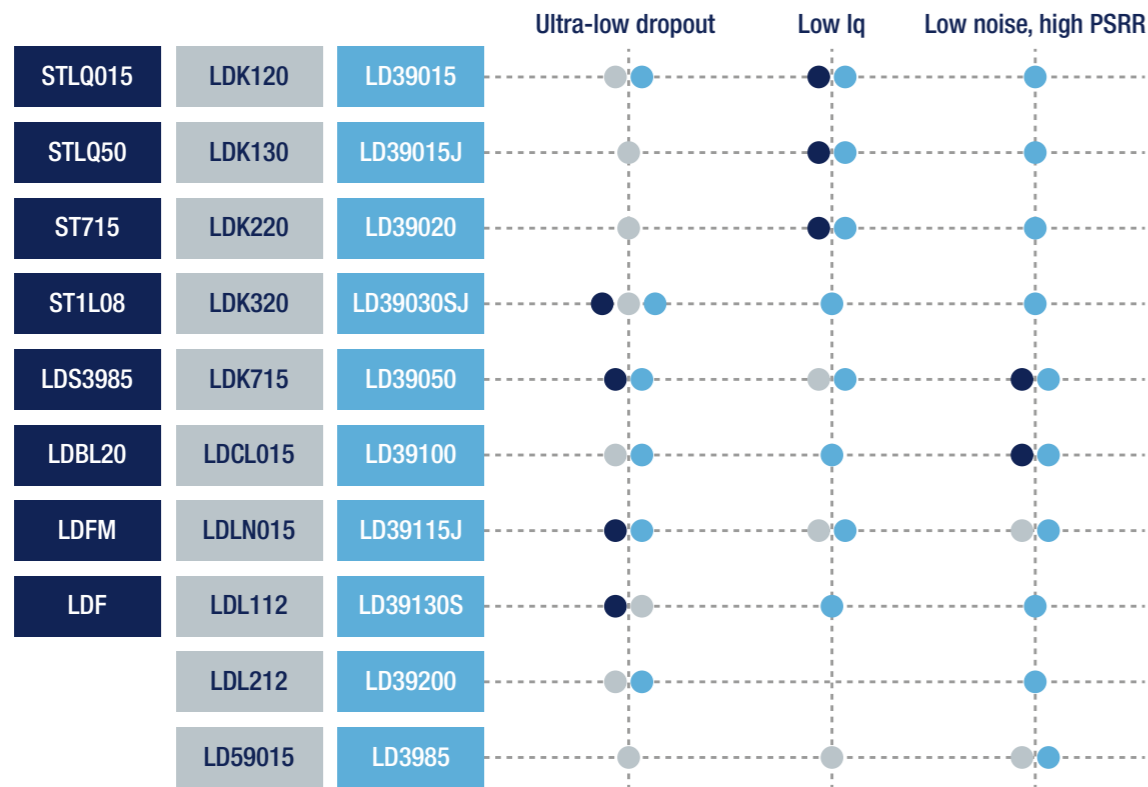
High-end smartphones
STOD30, STOD32A



Note: * is used as a wildcard character for related part number

LINEAR REGULATORS

ST offers a complete portfolio of industry-standard high-performance regulators for both positive and negative outputs. Among our products, you can find the optimal combination of ultra-low dropout voltage (from 50 to 220 mV for 100 mA to 3 A load current) and low quiescent current - for the highest efficiency design - (from 1 to 20 μ A for 50 mA to 2 A) or dynamic performance for the best transient response, power supply ripple rejection (up to 92 dB at 1 kHz) and low noise (as low as 6.3 μ Vrms). All this coupled with a choice of the smallest form factor packages for size-conscious applications such as a 0.47 x 0.47 mm STSTAMP™ package.



Ultra-low dropout

- High efficiency in low-/medium-power applications
- Best cost/performance trade-off
- Large offer for load capability and packaging

Low quiescent current Iq

- Extending battery life
- Suitable for space-constrained battery-powered applications

Low noise, high PSRR

- High signal fidelity
- Reduced size of external filter components

MAIN APPLICATIONS



Tablets, smartphones, and digital camera
LD39115, LD39130, LD39020/30, ST1L08, LDBL20, LD59015



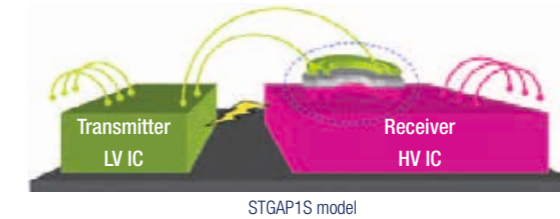
Healthcare
STLQ*, ST715, LD39130



Fitness and wearables
LD39130, LDLN*, LD39115, LD39020, LD39030, LDBL20

MOSFET AND IGBT DRIVERS

ST's power MOSFET and IGBT drivers include integrated high-voltage half-bridge, single and multiple low-voltage gate drivers. The MOSFET/IGBT drivers provide state-of-the-art integration, reducing BOM cost and final application dimensions, while also increasing robustness and noise immunity. In particular the STDRIVEsmart families L639*, L649* and STDRIVEgap STGAP1S offer smart functionalities to protect and simplify application implementation and usage.



Robustness and reliability, system integration and flexibility: that's ST's gate driver offer you



600 V Half bridge gate drivers

- 4 A source/sink driver high current capability (L6491)
- Integrated bootstrap diode
- Adjustable deadtime (L6494L)
- Comparator, op amp integrated, smart SD, interlocking and program. DT (L6390)
- Smart shutdown (L649*, L639*)
- Extended temperature range (A version)

Low side gate drivers

- 2 level turn-off (TD35*)
- Miller clamp (TD35*)
- Pulse transf / opto input (TD35*)
- Dual independent low side driver (PM8834)
- 4 A source/sink driver high current capability (PM8834)

Galvanically-isolated single gate driver

- 4 kV isolation
- High voltage rail up to 1.5 kV
- 5 A source/sink driver current capability
- 2 Level turn-off
- Miller clamp, negative gate supply
- Optimized for SiC MOSFET driving

MAIN APPLICATIONS



Factory automation, home appliances, and motor control
L638*E, TD35*, L639*, L6491, L6494L¹, L6498/L¹, PM8841, PM8851



Commercial, architectural and street lighting
PM8834, PM8841, PM8851



Solar inverters, HEV / EV, and factory automation
STGAP1S, PM8841, PM8851

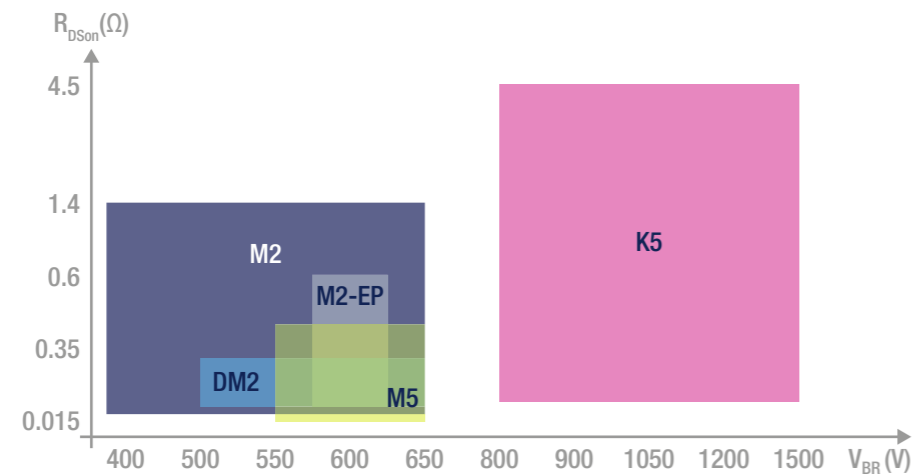
Note: * is used as a wildcard character for related part number

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POWER MOSFETS

High-voltage power MOSFETs (silicon)

ST's HV MOSFET portfolio offers a broad range of breakdown voltages from 400 to 1500 V, with low gate charge and low on-resistance, combined with state-of-the-art packaging. ST's MDmesh™ high-voltage MOSFETs technology has enhanced power-handling capability, resulting in high-efficiency solutions. Supporting applications for a wide voltage range such as switch mode power supplies, lighting, DC-DC converters, motor control and automotive applications, ST has the right MOSFET for your design.



K5 series

ST*N*K5

- Very low $R_{DS(on)}$
- Small Q_g and capacitance
- Small packages available
- Suited for hard switching topologies

M5 series

ST*N*M5

- Extremely low $R_{DS(on)}$
- High switching speed
- Suited for hard switching topologies

M2/M2-EP series

ST*N*M2

ST*N*M2-EP

- Extremely low Q_g
- Optimized for light load conditions
- Tailored for high-frequency applications (M2-EP)
- Suited for hard switching & ZVS/LLC topologies

DM2 series

ST*N*DM2

- Improved trr of intrinsic diode
- High dV/dt capability
- Suited for ZVS/LLC topologies

MAIN APPLICATIONS



Adapters
K5, M5, M2, M2-EP



Solar inverters, welding, HEVs, and UPS
K5, M5, DM2



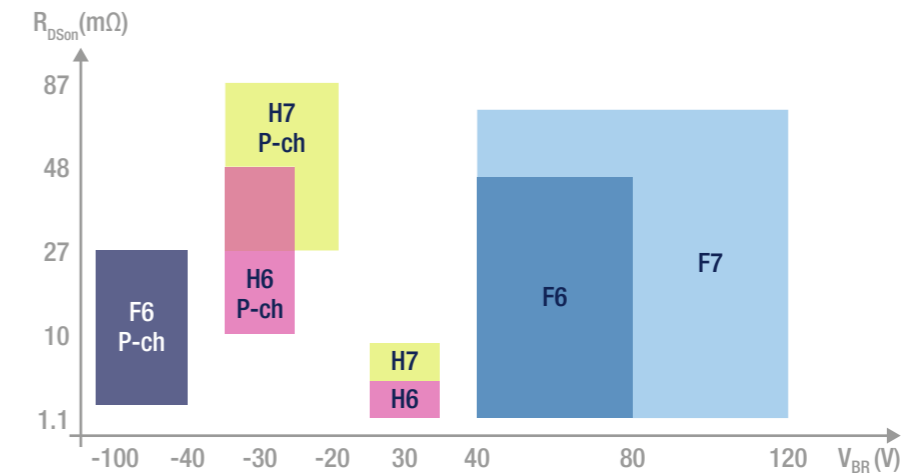
Residential, commercial, architectural and street lighting
K5, M2



Servers/Telecoms
M5, M2, M2-EP, DM2

Low-voltage power MOSFETs (silicon)

ST's LV MOSFET portfolio offers a broad range of breakdown voltages from -100 V to 120 V, with low gate charge and low on-resistance, combined with state-of-the-art packaging. ST's STRIPFET MOSFETs support a wide voltage range for synchronous rectification, UPS, motor control, SMPS, power-over-Ethernet (PoE), inverter, automotive and other applications in a wide range of miniature and high-power packages: DPAK, D²PAK, ISOTOP, Max247, SOT-223, TO-220, TO-220FP, TO-247, PowerFLAT (5 x 6 mm)/(3.3 x 3.3 mm)/(2 x 2 mm), SO-8 and SOT23-6L.



H6 series

ST*N*H6

- Very good $R_{DS(on)}$
- Soft diode recovery
- Suited for OR-ing, square-wave HB, battery mgmt topologies

H7 series

ST*N*H7

- Extremely low $R_{DS(on)}$
- High current capability
- Monolithic Schottky
- Super logic level (P-channel)
- Suited for reverse buck, buck-boost, battery mgmt, forward and buck topologies

F6 series

ST*N*F6

- Wide voltage range
- Soft diode recovery
- Very good $R_{DS(on)}$
- Suited for load-safety switch, buck and sync rectification

F7 series

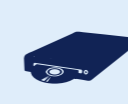
ST*N*F7

- Extremely low $R_{DS(on)}$
- Optimized body diode (low Q_{rr}) and intrinsic capacitance
- Proper Crss/Ciss ratio
- Suited for flyback and sync rectification

MAIN APPLICATIONS



Small motor control and USB battery chargers
F6



HDD, power tools, STB, and game consoles
H6, H7



Servers/Telecoms and SMPS
H6, H7, F6, F7



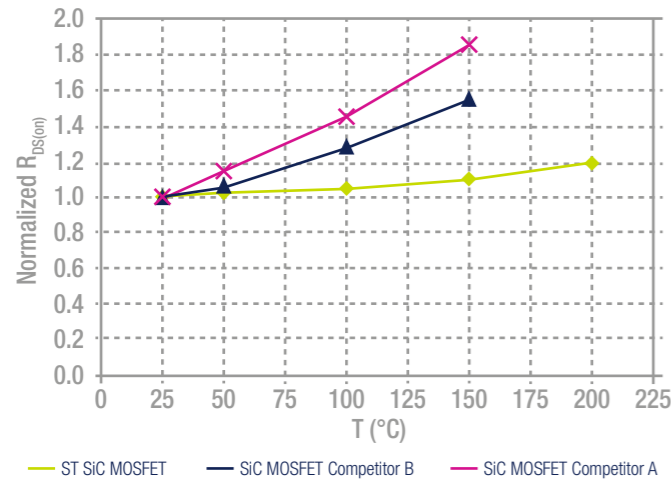
UPS, e-bikes, and fans
F6



Solar inverters, forklifts, and EHV's
F7

SiC MOSFETs

Based on the advanced and innovative properties of wide bandgap materials, ST's silicon carbide (SiC) MOSFETs feature very low $R_{DS(on)}$ per area for the 650 V/1200 V rating combined with excellent switching performance, translating into more efficient and compact designs. ST is among the first companies to produce high-voltage SiC MOSFETs. This new family features the industry's highest temperature rating of 200 °C for improved thermal design of power electronics systems. Compared to silicon MOSFETs, SiC MOSFETs also feature significantly reduced switching losses with minimal variation versus the temperature. These features render the device perfectly suitable for high-efficiency and high power density applications.



SiC MOSFETS MAIN BENEFITS

- Smaller form factor and lighter systems
- Reduced size/cost of passive components
- Higher system efficiency
- Reduced cooling requirements and heatsink size

SiC MOSFETs, the real breakthrough in high voltage switching

SCT*N120 SCT*N65G2*¹ SCT*N65G2V¹

- $V_{BR} = 1200$ V (SCT*N120), 650 V (SCT*N65G2/G2V)
- Low power losses at high temperature
- High operating temperature capability (200 °C)
- Body diode with no recovery losses
- Low power losses at high temperatures
- Easy to drive
- Low gate charge (SCT*N65G2V)

MAIN EVALUATION BOARD



4 kW
Boost inverter evaluation board
Available on request

MAIN APPLICATIONS

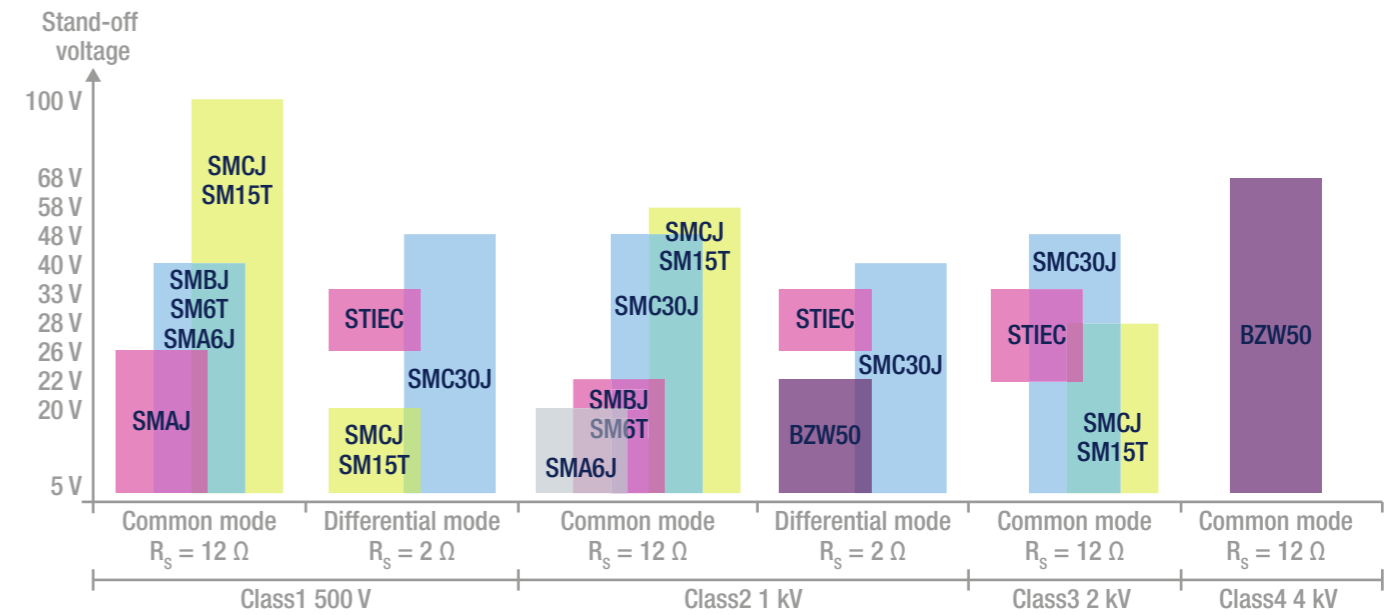


PROTECTIONS

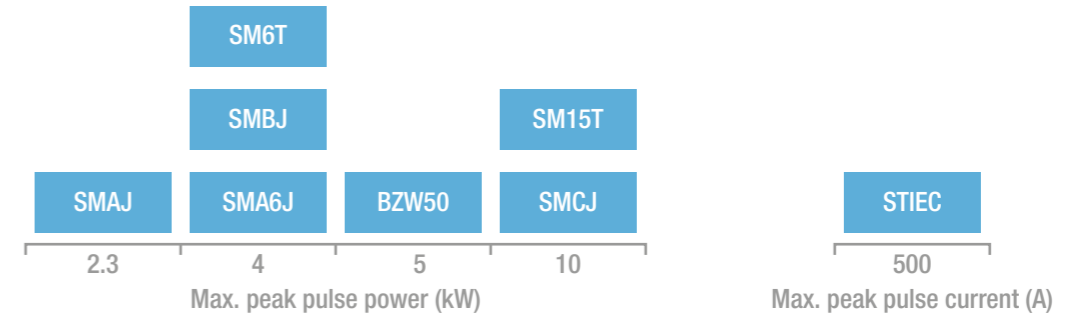
EOS 8/20 μ s surge protection

ST's EOS 8/20 μ s power surge protectors and suppressors comply with the IEC 61000-4-5 surge standard. Including transient voltage surge suppressors, TVS clamping or Transil™ diodes, the EOS 8/20 protections shield against surges related to power/datalines and fully support both power line and dataline application class requirements.

A large choice of packages, from 0402 to SMC packages, is provided to bring flexibility to designers and reliability to the application.



EOS protections, upgraded performance at high application temperature



MAIN APPLICATIONS

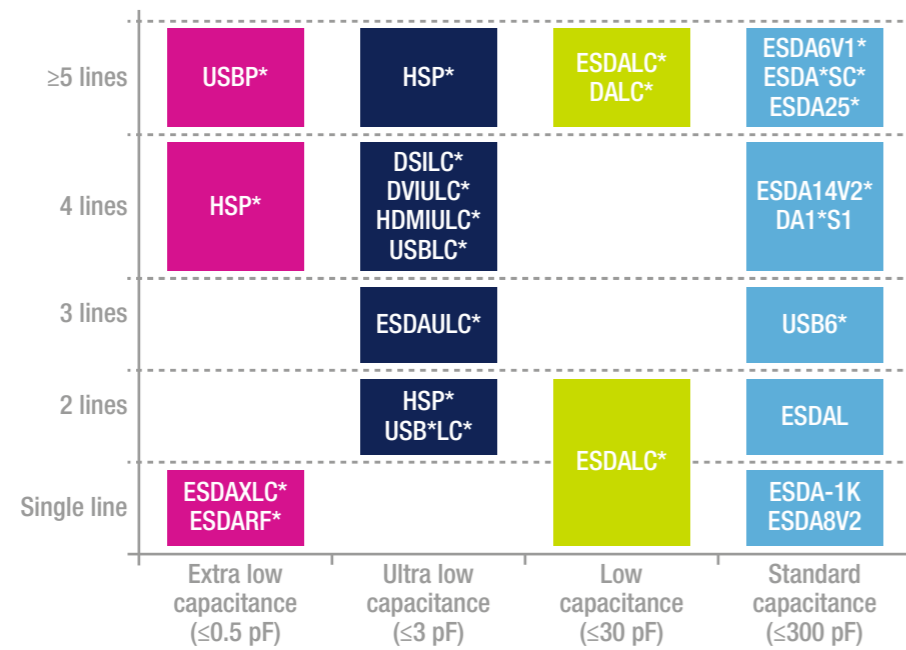


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ESD protection

Driven by market needs, ST's ESD protection devices, including transient voltage surge suppressors (TVS), clamping diodes and arrays, or Transils™, focus on IEC 61000-4-2 compliance, protection efficiency with low clamping voltage, protection reliability with low leakage current and signal integrity with ultra-low capacitance and ultra-wide bandwidth.

Standard packaging options are available, as well as advanced options which include single- and multiple-line, compact, flat, and flow-through versions to optimize space constraints.



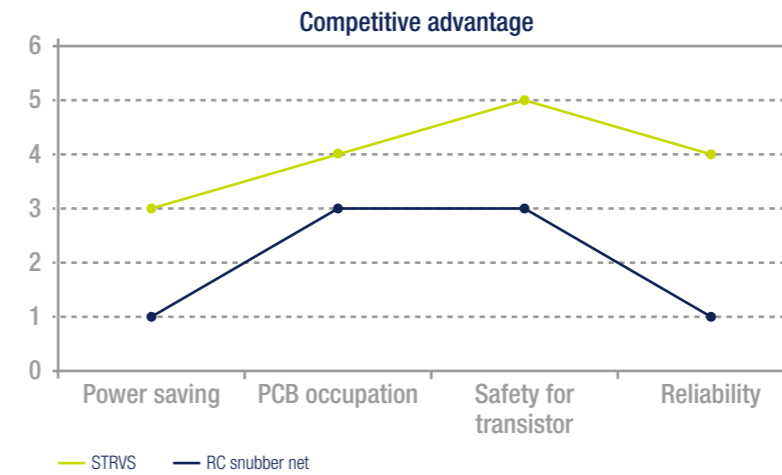
MAIN APPLICATIONS



Note: * is used as a wildcard character for related part number

Repetitive voltage suppressor

In applications, overvoltage constraints may not always come from lightning, electrical overstress or electrostatic discharge, but from the circuit itself. In such cases, standards do not apply. Repetitive surges may raise protection device temperature. The ST's STRVS family is the first TVS series to be specified against repetitive overvoltages in high temperature conditions. Protection devices must be selected according to their power capability at high junction temperatures and their clamping voltage specified at high temperature.



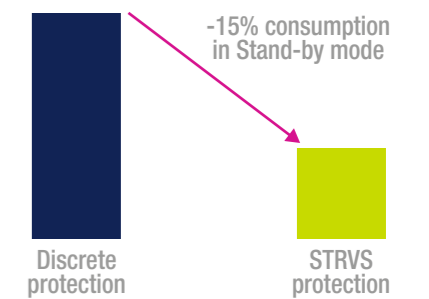
STRVS MAIN BENEFITS

- Better Transil™ selection for cost optimization (oversizing avoided)
- Fixed and reliable clamping voltage
- Reduced power consumption vs discrete protection (RC snubber)
- Customer design effort reduced

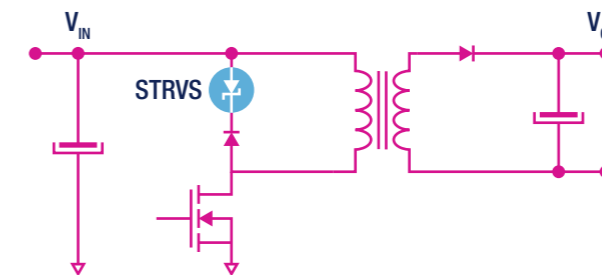
STRVS, the Transil series dedicated against repetitive overvoltage in high temperature conditions

STRVS*

- Clamping voltage characteristics defined at 25 °C, 85 °C and 125 °C
- Stand-off voltage range: from 85 V to 188 V
- Low leakage current: 0.2 μA at 25 °C
- Maximum operating junction temperatures:
 - SMB and SMC: 150 °C
 - DO-15 and DO-201: 175 °C



STRVS topology usage example



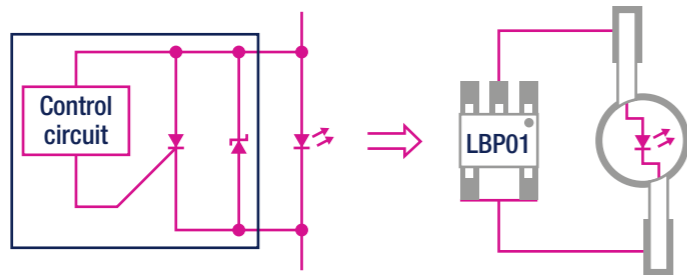
MAIN APPLICATIONS



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LED bypass protection

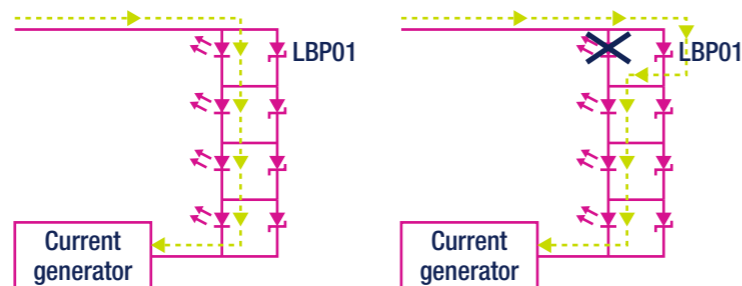
The LBP01 series of LED bypass protection devices are bypass switches that can be connected in parallel with 1 or 2 LEDs. In the event of a LED failure, this device shunts the current through other LEDs. It also provides overvoltage protection against surges as defined in IEC61000-4-2 and IEC61000-4-5.



LBP01 get reliable your led application

LBP01

- Keep LED strings on in case of LED open mode failure
- Reduced maintenance cost
- Increase lifetime of the lighting system



MAIN APPLICATIONS

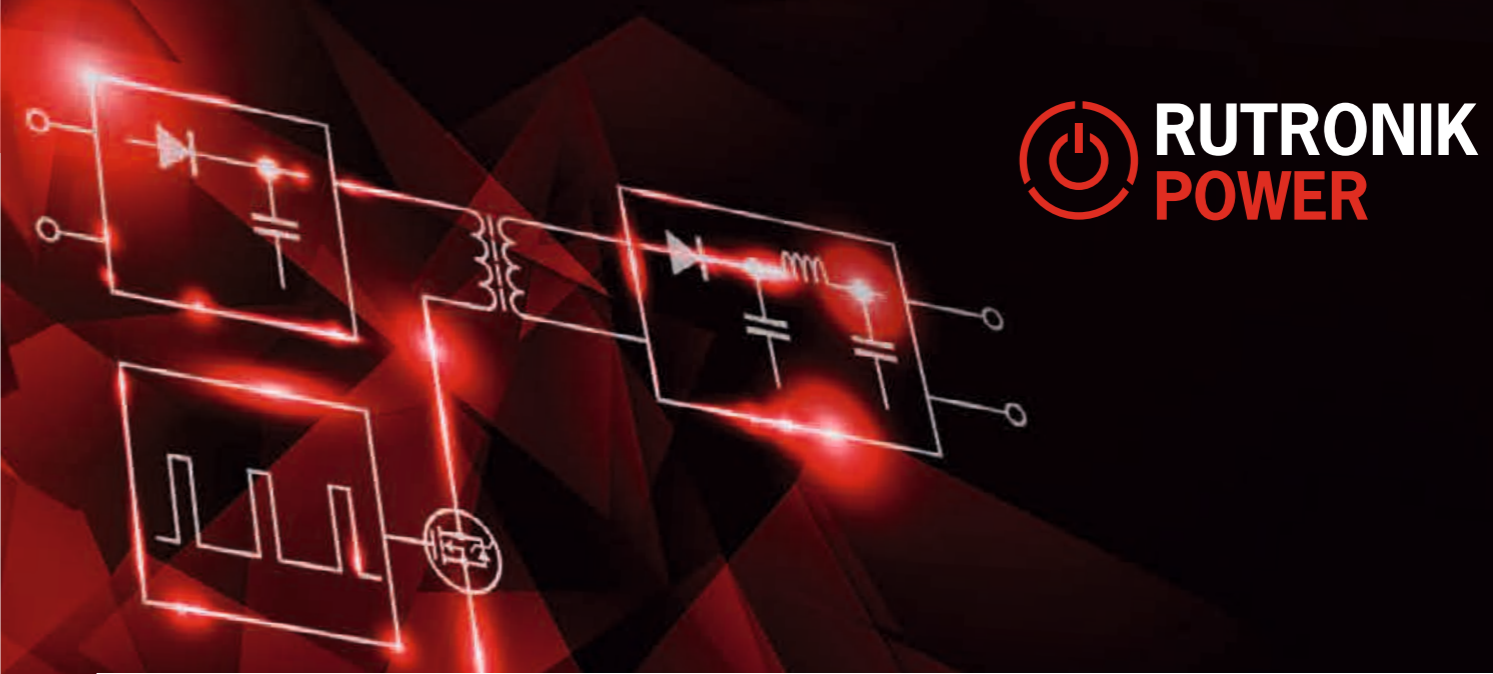


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RUTRONIK POWER

The Markets are Changing

Changing markets demand new solutions. Many markets are saturated, and products are being ever more replaceable and increasingly offering similar functionality thanks to growing standardization. Technological, regulatory and economic challenges along with growing functional complexity are a reality of numerous market segments, particularly for the industrial, automation, automotive and white goods (electronic household appliances for private and commercial use) segments.

Trends in High-Performance Electronics

In addition to the trends in the market segments, there are also developments that are affecting the entire high-performance electronics sector. The most important of these developments are “digital power” also with the related topics of “functional safety” and “robustness”. These have direct effects on operating conditions, technology and manufacturing methods.

Digital Power

One “power future trend” is that of “digital power”, also referred to as “intelligent digital power”. In electrical engineering, this buzzword refers to digitally controlled or monitored power supply units. In conventional switched-mode power supply units, an analog switch controls and monitors the output voltage. In digital power supply units, a microcontroller or DSP handles one or several of these functions. The control process is integrated into the controller at software level. One of the major advantages of digitally-controlled switched power supply units over analog solutions is the option of being able to intervene in the control process at any time and to adapt it to the current needs of the power supply. While this increases the level of effectiveness of the digital PSU compared to an analog variant, this does also increase the amount of technical development work required, which is reflected in the costs. Digital technology aims to satisfy the needs of the now ever more complex power supply systems.

Functional Safety and Robustness

Innovations that do not take safety into account cannot endure, which is why high functional safety and robustness are essential. In a robustness validation, for example, the reliability of electronic components is assessed by comparing the specific product requirements against the actual service life, taking into account the increase in efficiency. The fundamental concept behind functional safety is the strategy for reducing actual risks. The goal is to create a safe system in that every reasonable measure has been taken to avoid damage to property and danger to people, ensuring traditional safety measures.

Impacts

These trends cover many industries and are directly related to operating conditions, technologies and manufacturing processes. In other words, changes to operating conditions or other techniques or manufacturing processes will also mean the involvement of different requirements imposed upon the installed components. This can be more clearly illustrated in the example of energy storage. If the conditions in which a battery is operated or if new technologies or manufacturing processes are implemented, this gives rise to new requirements imposed upon the charging strategy or the battery management system.

The operating parameters are of critical importance to the service life of an energy storage facility within an application. While developers often have no influence on the operating conditions, there is scope for optimization in the battery management system, although this scope is often used inadequately. As a result, operating conditions are changed without implementing the battery management system accordingly. In this connection, the most frequent recorded electrical failures are due to defective or discharged starter batteries. Specifically in the automotive industry, such battery failures were mainly found in luxury vehicles until the year 2000. The main cause was the growth in electronic component use and other electricity consumers in the vehicles, because even in a parked vehicle, the starter battery is constantly being discharged by the monitoring and control electronics. While the currents involved here – referred to as “standby currents” – are low, the battery can suffer from deep discharge if left dormant for long periods of time. For manufacturers, this raises the question of whether this know-how needs to be developed internally or whether the market might offer a suitable solution.

The Answer – RUTRONIK POWER

RUTRONIK POWER is much more than a complete portfolio of power components for various voltage classes and different applications. RUTRONIK POWER also offers a selection of components for a variety of applications suitable for the respective circuit.

This means that under every position in the block diagram, there are products from multiple selected suppliers in the respective product segments. RUTRONIK accommodates as broad a range of requirements as possible here – whether low-cost or high-performance. For example, for a motor control circuit in the power range of 2KW, RUTRONIK offers appropriately designed IGBT modules, gate drivers as well as microcontrollers, driver modules, heatsinks and plug connectors.

For power semiconductors, RUTRONIK caters for everything today, from discrete to high-integration components, power ICs and power modules. As a broadline distributor, RUTRONIK offers all other components in addition to its power semiconductors, not only active but also electromechanical and passive components. The spectrum ranges from simple plug connectors to supercaps. This covers around 98% of the PCB. This also applies to other product segments such as high-current connectors supporting up to 1,000A and supercaps supporting up to 3,400 farad/cell.

But RUTRONIK POWER is much more than a broad selection of components. The decisive difference lies in RUTRONIK compiling relevant expertise, not only for individual products and technologies, but also on their compatibility with one another. This helps to guarantee extensive support – with development at application level by professionally qualified Field Application Engineers (FAEs), Product Managers at component level and supply at the end of a product lifecycle lasting several years. FAEs are particularly important for technical customer support. RUTRONIK’s experts advise and support activities ranging from the design-in process, the product evaluation and application development, the strategic marketing of product groups for which theoretical assistance is necessary, down to the development of logistics solutions with comprehensive system solutions that are optimized to the customer’s needs. RUTRONIK POWER focuses less on individual components and more on the overall solution.

RUTRONIK gives absolute priority not only to reducing the prevailing complexity of the offer-range but also to providing support at the product development stage at application level with relevant technical expertise and vertical system solutions based on suitable components.

The Core Segments are:



Industrial



eMobility

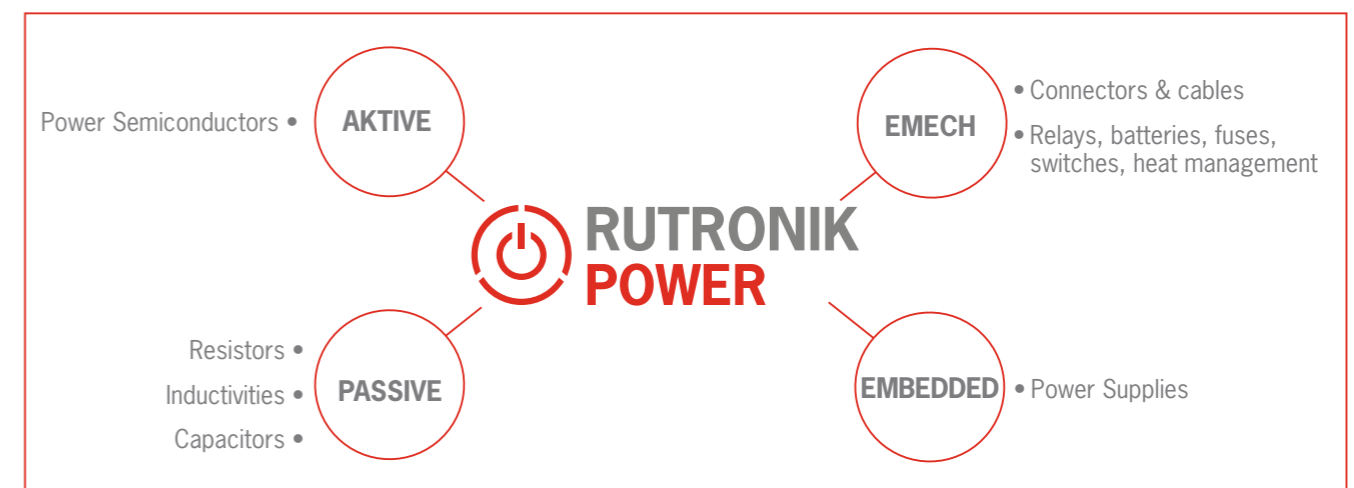


Home Appliance

The Advantages

RUTRONIK POWER serves as a single source for all components, from individual components to a basis for operational applications. But RUTRONIK POWER does not compete with its customers with its own components and applications, because the extensive range is combined into complete, vertically integrated system solutions. The product portfolio consists of decided manufacturers who are leaders in their respective fields and with some of whom the company has worked for decades. This ensures an extensive and consistent transfer of knowledge from the very start, both between the supplier and Rutronik as well as a collective exchange of expertise with the customer, for example concerning seminars, webinars and professional conferences.

The bundling of expertise and experience in the RUTRONIK POWER team guarantees that the customer receives extensive advice in respect of the overall application, the market and its requirements. RUTRONIK’s experts have a profound understanding of all relevant factors, with specialists from a variety of fields supporting each other, enabling the benefit of synergies across teams to be utilized more effectively, because market segments overlap in numerous aspects – and customers benefit from such coordinated consulting. This understanding of not only the customer’s requirements but also the technical options and the market conditions enables a precisely tailored solution to be developed – not off the shelf, but customized specifically to the customer’s needs. The RUTRONIK POWER team consists of specialists from the active power semiconductors, passive, electromechanical and embedded segments, utilizing the company’s extensive product portfolio.



Working with the customer and with its suppliers, RUTRONIK develops forward-looking approaches, thereby contributing to research and development at application level. This is why RUTRONIK provides tools for certified applications that stand out not only with their extraordinary functionality, quality and robustness but also with their energy efficiency. And this is exactly what RUTRONIK POWER is there for.



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