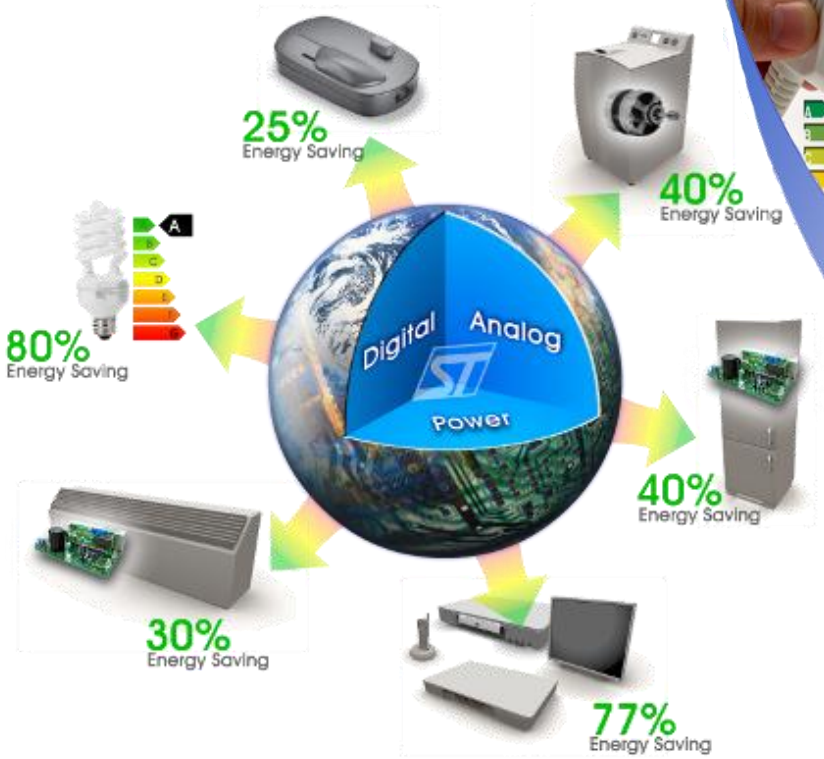
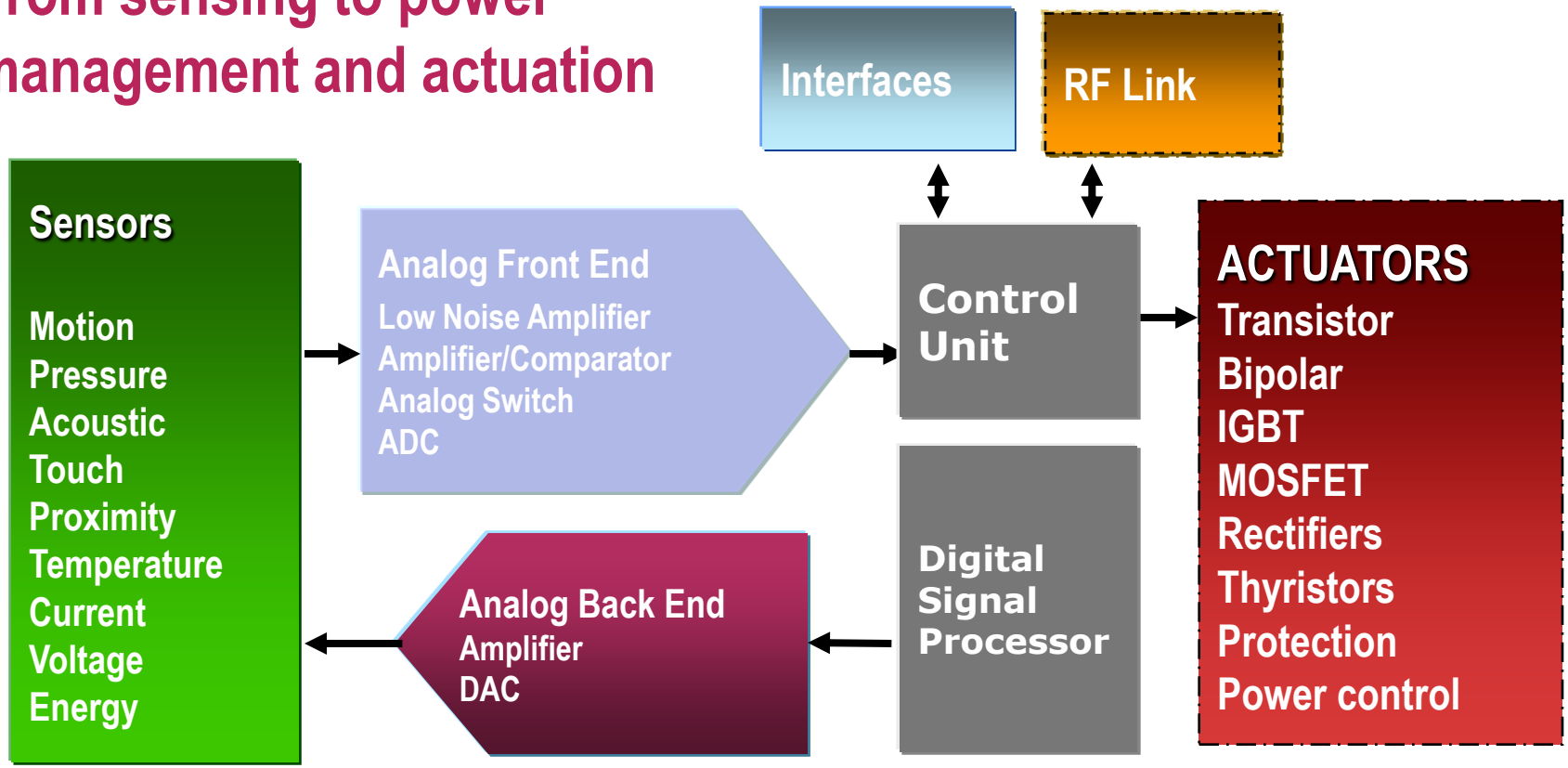


Microelectronics

From sensing to power management and actuation



Power Management ICs
Linear and Switching regulators, Voltage reference

A world of Analog

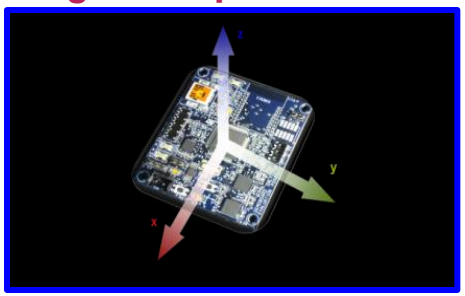
SILICA An Avnet Company

Pwr conversion

Solar

Motor control

Signal acq & Mems



Lighting

Industrial automation

Automotive

WEB Site

WEB SITE Support

STMicroelectronics

Analog

Home » Sense & Power » Analog

- Amplifiers & Comparators
- ASSP for Industrial
- Clocks & Timing Circuits
- Interface, Filtering & Signal ..
- Power Management
- Sensors & MEMS

Highlights | Search

- ST introduces a new family of single- and two-axis MEMS gyroscopes
- ST's MEMS enables motion sensing in Openmoko mobile handsets
- ST promotes green power for electronics
- Faster broadband amplifiers from ST accelerate multimedia networking
- ST increases power output of

Overview | Design

From signal to power Analog ICs, ST's portfolio covers practically all Analog functions.

Our World of Analog products include sensors and MEMS, amplifiers, interfaces, analog front-end and back end, and power management devices, among many others.

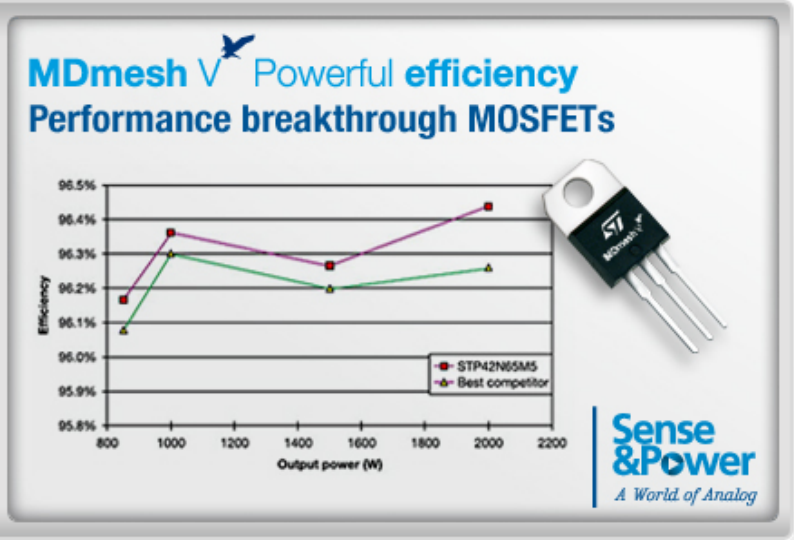
WEB SITE Support

STMicroelectronics

Power

Home » Sense & Power » Power

- Diodes
- Power Conversion Modules
- Protection Devices
- Thyristors & AC Switches
- Transistors



Highlights | Search

STs' MDmesh™ V power-MOSFET technology achieves the industry's best on-resistance per area for the high..

New power AC switches featuring built-in surge protection deliver the competitive edge for appliances

ST advances IGBT switching performance and reduces size in energy-saving ballasts and converters

Overview | Design

STMicroelectronics continues its history of leadership in power semiconductors, with one of the industry's most extensive portfolios. A rich array of energy-efficient power products and solutions reflects ST's commitment to be at the forefront of this field through innovation.

MOSFETs: the new performance breakthrough offered by the latest with its latest MDmesh™ V technology achieves the best on-resistance with substantial cost advantages.

IGBT: the latest series of ignition products achieves unrivalled low voltage drop combined with high energy capability for a more efficient system design.

WEB SITE Support
www.st.com/edesignstudio

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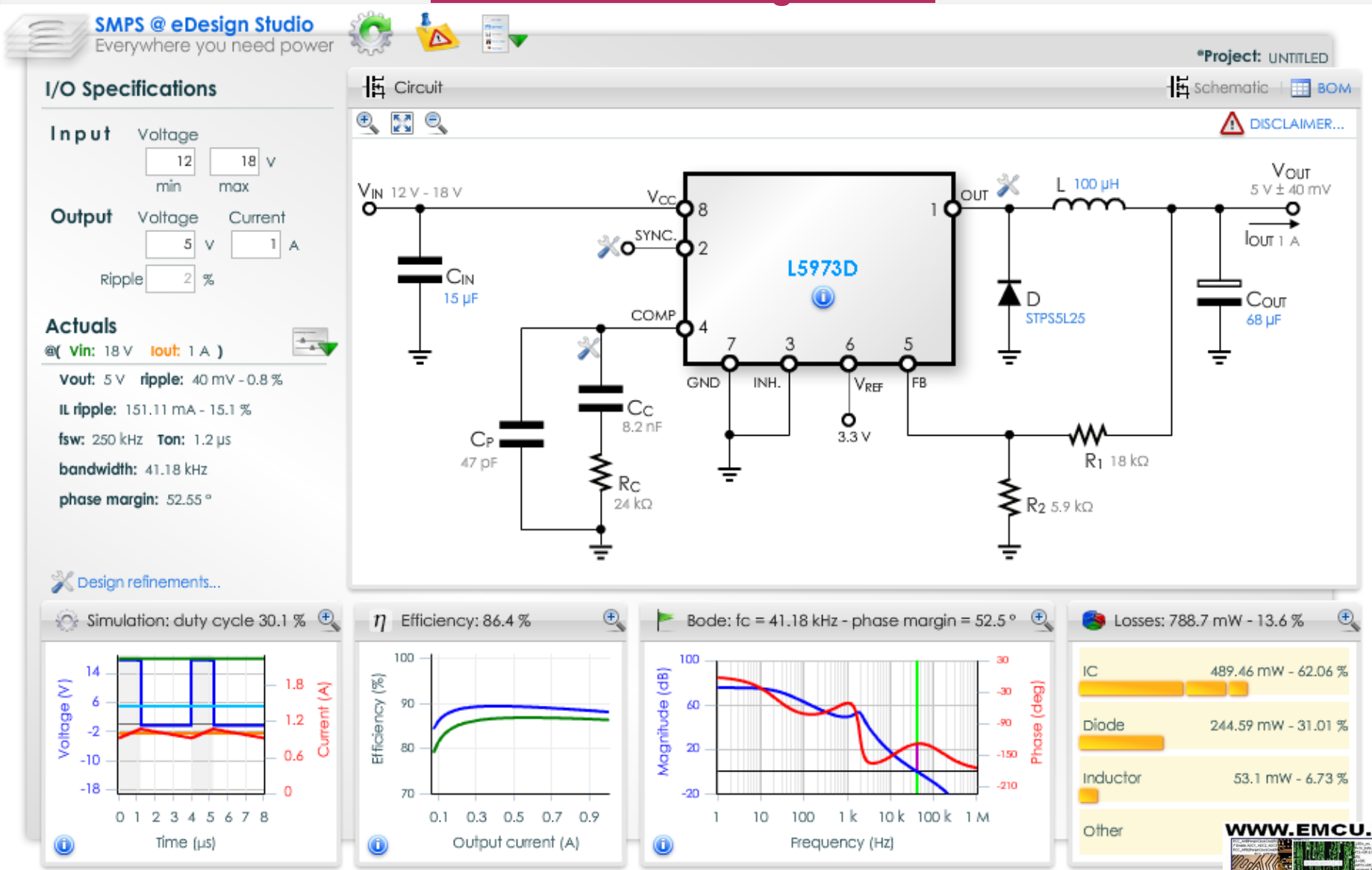
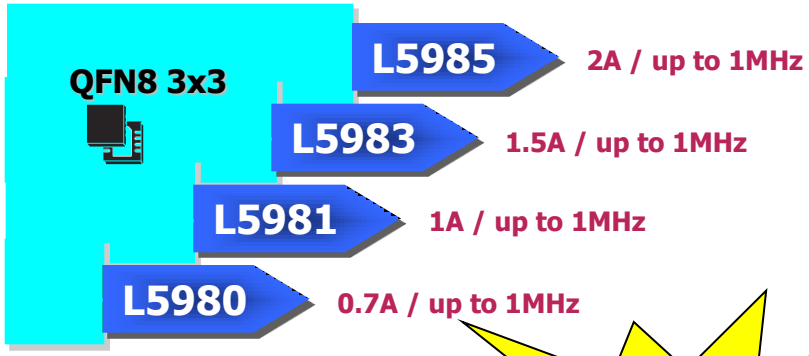


DC/DC CONVERTER

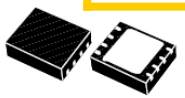
Power Management BUCK - L598x

- Up to 3A in small QFN3x3-8L or HSOP8 package with min external component count
- P-channel power MOS: no bootstrap capacitor
- Wide input voltage range (2.9V up to 18V)
- High switching frequency (250KHz, adjustable up to 1MHz) with Synchronization capability (180° out of phase)
- Internal Soft-start
- Inhibit pin
- Embedded protection features
- Suitable for MLCC output filter
- Typ RDSon=140mΩ



Vin<18V

Device	Package	Ipk [A]	Iout [A]	Vin [V]	Vout [V]	Fsw [kHz]	Ex Fun ns
L5980	QFN3x3-8L	1	0.7	2.9V to 18V	0.6V to Vin	250	Inh, AdjFsw, Sync
L5981	QFN3x3-8L	1.5	1	2.9V to 18V	0.6V to Vin	250	Inh, AdjFsw, Sync
L5983	QFN3x3-8L	2	1.5	2.9V to 18V	0.6V to Vin	250	Inh, AdjFsw, Sync
L5985	QFN3x3-8L	2.5	2	2.9V to 18V	0.6V to Vin	250	Inh, AdjFsw, Sync
L5986/A	QFN3x3-8L / HSOP8	3	2.5	2.9V to 18V	0.6V to Vin	250	Inh, AdjFsw, Sync
L5987/A	QFN3x3-8L / HSOP8	3.5	3	2.9V to 18V	0.6V to Vin	250	Inh, AdjFsw, Sync



QFN 3x3 8L - Rth j-amb 60°C/W

HSO8 - Rth j-amb 40° C/W

Power Management BUCK - L5988-9D

- Up to 4A in small HTSSOP 16 package with minimum external component count
- Synchronous rectification with P-channel power MOS: no bootstrap capacitor
- Wide input voltage range (2.9V up to 18V)
- High switching frequency (400KHz, adjustable up to 1MHz)
- Adjustable Soft-start and Inhibit function
- Embedded over current (adjustable threshold), over voltage and thermal protection
- PGood signal (L5989D) Synchronization capability(18 of phase) (L5988D)
- Pre-bias start-up capability
- Multifunction pin (adjustable UVLO, latched/no latched OVP and sink-mode capability)
- Suitable for MLCC output filter
- Typ RDSon=75mΩ for HS and 65mΩ for the LS

Vin<18V

HTSSOP 16 – Rth j-amb 40° C/W

HTSSOP16

L5989D

L5988D

up to 4A / up to 1MHz

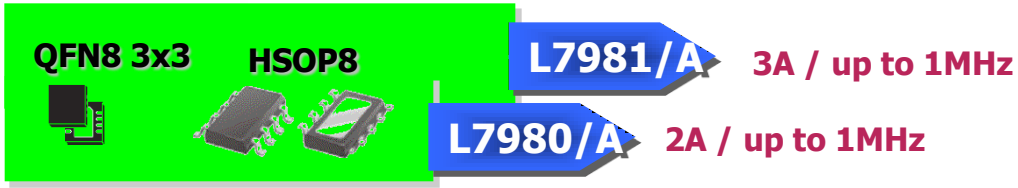
For an higher EFFICIENCY
SYNCH. RECT.

Device	Package	Ipk [A]	Iout [A]	Vin (V)	Vout (V)	Fsw [KHz]	Extra functions
L5988D	HTSSOP 16	5	4	2.9V to 18V	0.6V to Vin	400	Synchronization
L5989D	HTSSOP 16	5	4	2.9V to 18V	0.6V to Vin	400	Pgood

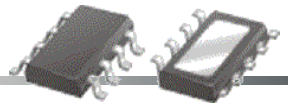
Power Management BUCK - L7980/1 (A)

- More than 3A in both small QFN3x3-8L and HSOP8 packages with minimum external component count
- P-channel power MOS: no bootstrap capacitor
- Wide input voltage range (4.5V up to 28V)
- High switching frequency (250KHz, adjustable up to 1MHz) with Synchronization capability (180° out of phase)
- Internal Soft-start
- Enable pin
- Embedded protection features
- Suitable for MLCC output filter
- Typ RDSon=180mΩ

Vin<28V



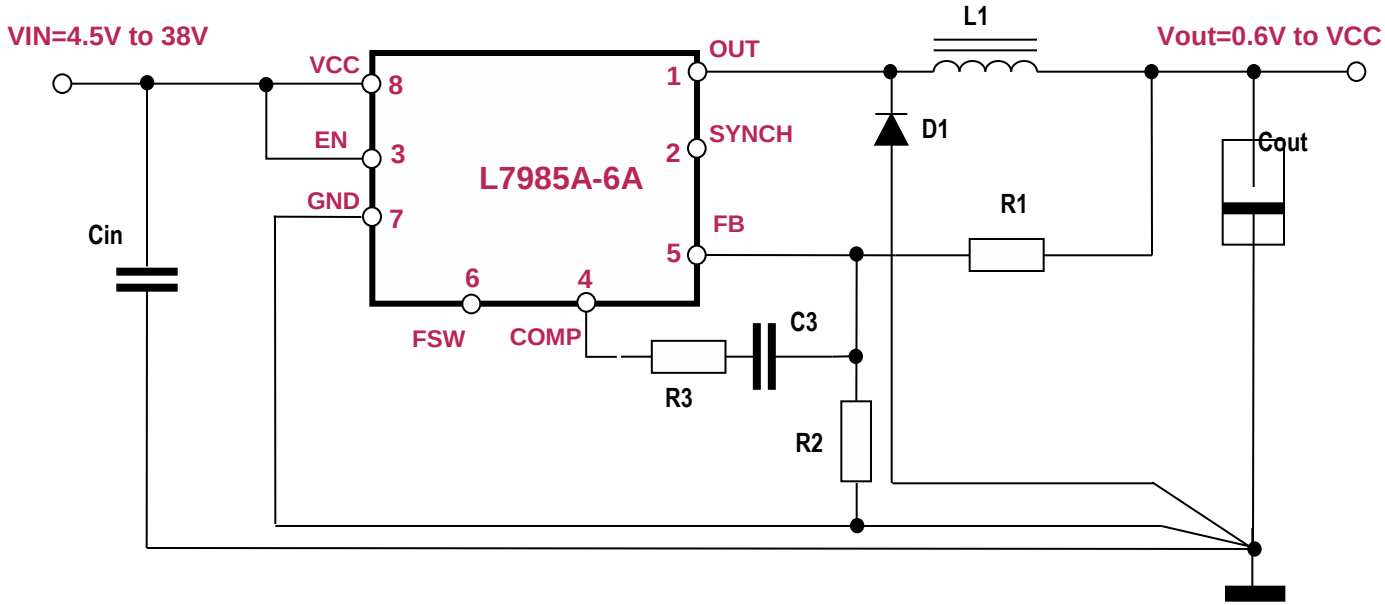
Device	Package	Ipk (A)	Iout (A)	Vin (V)	Vout (V)	Fsw (kHz)	Extra Functions
L7980/A	QFN3x3-8L/HSOP8	2.5	2	4.5V to 28V	0.6V to Vin	250	En, AdjFsw, Sync
L7981/A	QFN3x3-8L/HSOP8	3.5	3	4.5V to 28V	0.6V to Vin	250	En, AdjFsw, Sync



HSO8 - Rth j-amb 40° C/W

QFN 3x3 8L - Rth j-amb 60°C/W

L7985/A-6/A Application Test Circuit



Comparison table

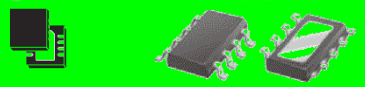
Feature \ Device	L597x	L598x	L5988-9D	L7980/1	L7985/6
Input Voltage (V)	4.4 to 36	2.9 to 18	2.9 to 18	4.5 to 28	4.5 to 38
Iout (A)	Up to 2	Up to 3	4	Up to 3	Up to 3
Package	SO-8/HSOP8	DFN3x3-8L	HTSSOP16	DFN3x3-8L/ HSOP-8L	DFN3x3-10L/ HSOP-8L
Synch rect.	--	--	Yes	--	--
Rdson (typ. mΩ)	250	140	75 (HS)-65 (LS)	180	150
Fsw (kHz)	250	250 Adj up to 1000	400 Adj 200 to 1000	250 Adj up to 1000	250 Adj up to 1000
Soft Start	--	Internal digital	Adj	Internal digital	Internal digital
Synchronization	Yes	with phase shift 180°	with phase shift 180°	with phase shift 180°	with phase shift 180°
MLCC as Cout	--	Yes	Yes	Yes	Yes
Enable/INH	Yes	Yes	Yes	Yes	Yes
Vref	Yes	--	Yes	--	--

Power Management DC-DC - L7985/6 (A)

- More than 3A in both small QFN3x3-10L and HSOP8 packages with minimum external component count
- P-channel power MOS: no bootstrap capacitor
- Wide input voltage range (4.5V up to 38V)
- High switching frequency (250KHz, adjustable up to 1MHz) with Synchronization capability (180° out of phase)
- Internal Soft-start
- Enable pin
- Embedded protection features
- Suitable for MLCC output filter
- Typ RDSon=150mΩ

Vin<38V

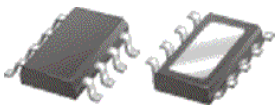
QFN10 3x3 HSOP8



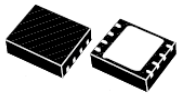
L7986/A 3A / up to 1MHz

L7985/A 2A / up to 1MHz

Device	Package	Ipk (A)	Iout (A)	Vin (V)	Vout (V)	Fsw (kHz)	Extra Functions
L7985/A	QFN3x3-10L/HSOP8	2.5	2	4.5V to 38V	0.6V to Vin	250	En, AdjFsw, Sync
L7986/A	QFN3x3-10L/HSOP8	3.5	3	4.5V to 38V	0.6V to Vin	250	En, AdjFsw, Sync



HSO8 - Rth j-amb 40° C/W

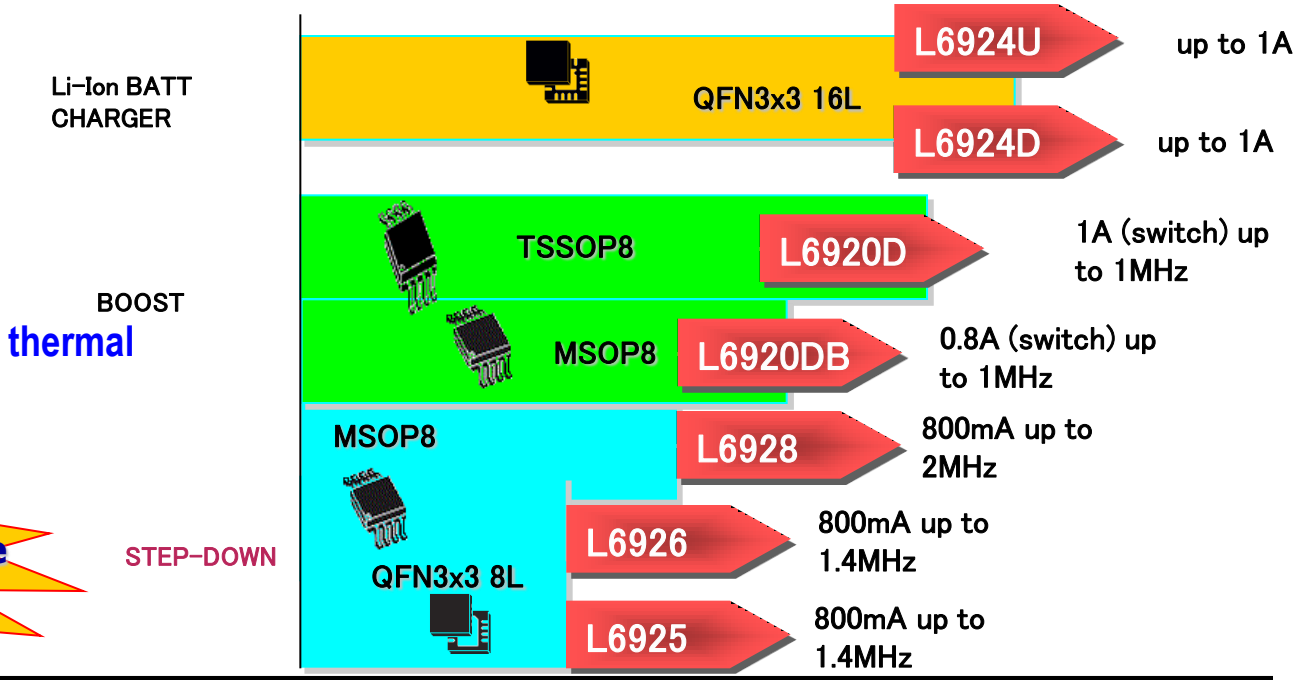


QFN 3x3 10L - Rth j-amb 60°C/W

L692x Key Features

- Very small packages
- Internal synchronous switch
- Small number of external components
- Micro power consumption
- High efficiency
- Short circuit protection, OVP, thermal shutdown
- Battery detection

Suggested for Portable application



Device	Package	Type	Ipk [A]	Iout [A]	Vin [V]	Vout [V]	Fsw [KHz]	Extra functions
L6920D	TSSOP8	SU	1	0.5	0.6 - 5.5	2 - 5.2	up to 1000	LBI&LBO, Vref, SHDN
L6920DB	MSOP8	SU	0.8	0.4	0.6 - 5.5	1.8- 5.2	up to 1000	LBI&LBO, Vref, SHDN
L6925D	MSOP8	SD	1.2	0.8	2.7 - 5.5	0.6 - Vin	600	UVLO2.7V, LBI&LBO
L6926	MSOP8	SD	1.2	0.8	2 - 5.5	0.6 - Vin	600	PGOOD, RUN, SYNC
L6926Q1	QFN3x3-8L	SD	1.2	0.8	2 - 5.5	0.6 - Vin	600	PGOOD, RUN, SYNC
L6928D	MSOP8	SD	1.2	0.8	2 - 5.5	0.6 - Vin	1400	PGOOD, RUN, SYNC
L6928Q1	QFN3x3-8L	SD	1.2	0.8	2 - 5.5	0.6 - Vin	1400	PGOOD, RUN, SYNC

Power Management BUCK DC-DC

DEVICE	I_{OUT}(A)	V_{OUT} (V)	V_{IN}(V)	Fsw(MHz)	Note
ST1S03	1.5	Adj from 0.8V to 12V	3 to 16V	1.5	
ST1S03A	1.5	Adj from 0.8V to 5.5V	2.5 to 7V	1.5	I
ST1S06 ST1S06A	1.5	Adj from 0.8V to 5.5V	2.5 to 7V	1.5	SR I + SR
ST1S09 ST1S09I	2	Adj from 0.8 to 5V	4.5 to 5.5V 2.7 to 5.5V	1.5	PG + SR I + SR
ST1S10	3	Adj from 0.8 to 15V	2.5 to 16V	0.9	Ext Synch from 0.4Mhz to 1.2MHz + SR+I
ST1S12	0.7	Adj from 0.6V	2.5 to 6V	1.7MHz	I + SR

I= Inhibit PG= Power Good SR = Synchronous Rectification

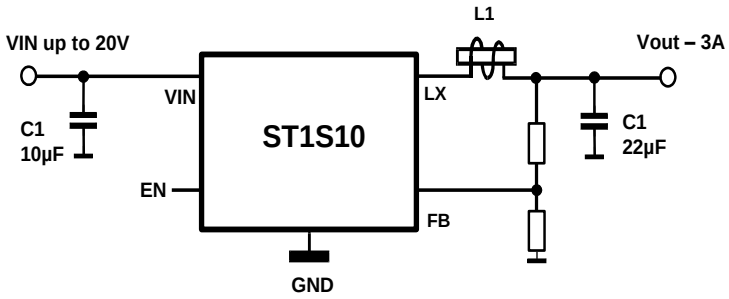
3A Step-Down DC-DC with Synchronous Rectification

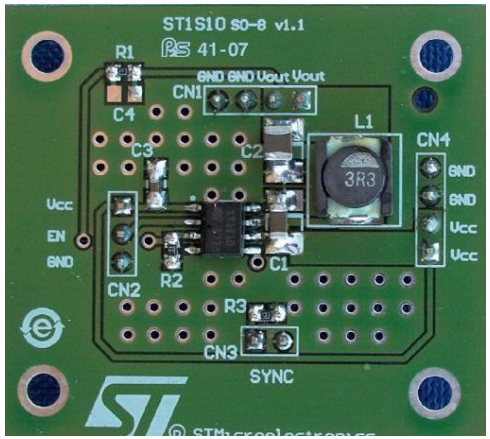
Main Characteristics:

DFN – 8L
4x4mm

SO-8 Exposed Pad

- PWM fixed frequency 900KHz. It can be ext synch from 0.4 to 1.2MHz
- Output Current Capability: 3A max over all operating conditions
- Output Voltage: Adjustable from 0.8V feedback voltage
- Ceramic Capacitors and small Inductor
- 3.3V, 5V Fixed Output Voltages under customer request
- Max Operating Input voltage up to 18V
- Soft-Start circuit to reduce inrush current
- Efficiency: up to 90%
- Fast Transient Response
- Available with logic control Electronic Shutdown
- PPAK and DFN Packages



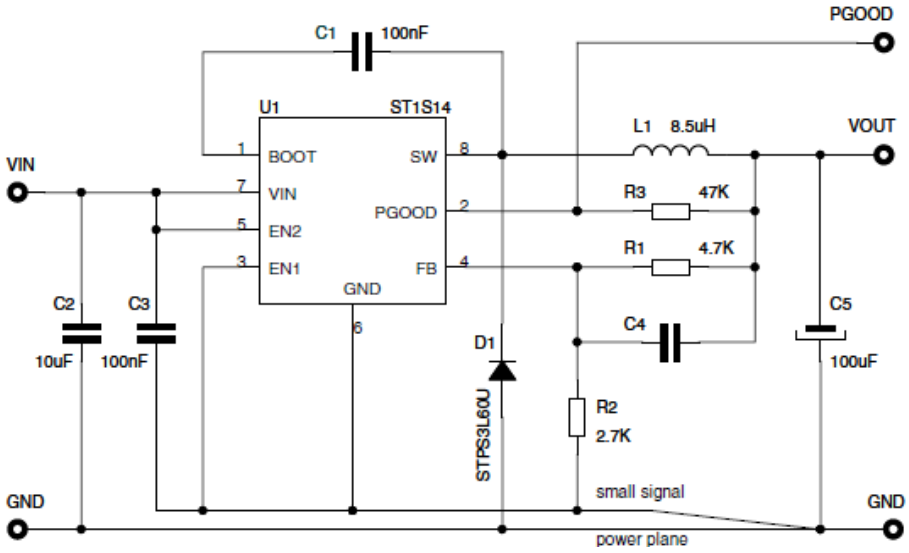


STEVAL-ISA044V1
STEVAL-ISA044V2

ST1S14
48Vin -3A Step-Down DC-DC conv

Main Characteristics:

- 3 A DC output current
- Operating input voltage from 5.5 V to 48 V
- 850 kHz internally fixed switching frequency
- Internal soft start
- Power good open collector output
- Current mode architecture
- Embedded compensation network
- Zero load current operation
- Internal current limiting
- Inhibit for zero current consumption
- 2 mA maximum quiescent current over temperature range
- 250 mΩ typical RDS(on)
- Thermal shutdown

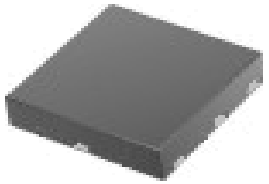


SO-8 Exposed Pad

1.5A, 1.5MHz, ADJ, Step-Down DC-DC Converter

Main Characteristics:

- Switching Frequency: 1.5MHz
- Output Current Capability: 1.5A max over all operating conditions
- Output Voltage: Adjustable from 0.8V feedback voltage
- Absolute max Input Voltage: 16V
- Soft-Start circuit to reduce inrush current
- Efficiency: up to 85%
- Load Transient Response: overshoot or undershoot <7%VO
- Short Circuit Removal Response: overshoot <5% VO
- Temperature Range: from 0 to 125°C
- Short Circuit and Thermal Protection
- Power-on Delay (50-100µs)
- Technology: BCD6
- VFN 3x3mm Package Type



DFN 3x3 – 6L

STEVAL-ISA042V1
STEVAL-ISA042V2

1A, DC-DC , Synchronous Step-Up Converter

Main Characteristics:

- Adjustable Output Voltage: from 6V to 12V
- Vin_max =6V
- DC-DC Switching Frequency: 1.2MHz or 600Khz
- Output Current: up to 1A
- Internal Synchronous Rectification
- Efficiency up to 90% (Output set to 9V)
- Logic Control Electronic Shutdown
- Output Current CUT-OFF when in shutdown

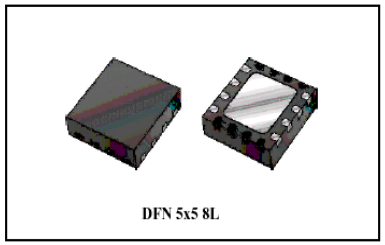
QFN 4X4MM -8L

ST8R00

MICROPOWER 1A DC/DC CONVERTER
SYNCRONOUS STEP UP

DRAFT SPECIFICATION

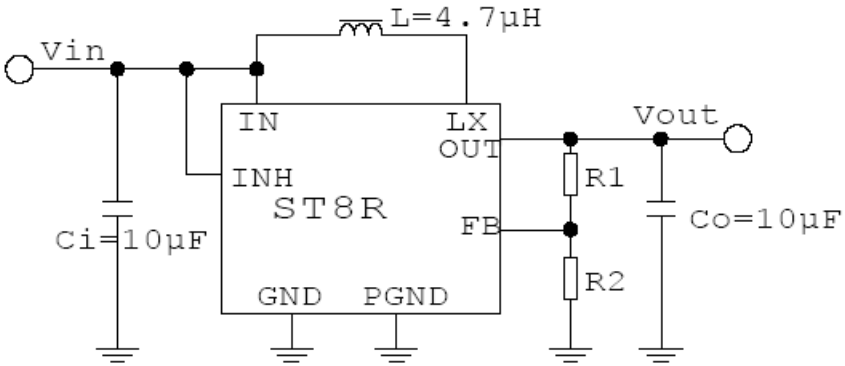
- VERY LOW SUPPLY CURRENT
- REGULATED OUTPUT VOLTAGE
- WIDE RANGE OF OUTPUT VOLTAGE ADJUSTABLE FROM 6V TO 12V
- OUTPUT VOLTAGE ACCURACY ±2%
- OUTPUT CURRENT UP TO 1A
- LOW RIPPLE AND LOW NOISE
- SYNCRONOUS RECTIIFICATION
- HIGH EFFICIENCY (V_{OUT} = 9V TYP. 90%)
- FEW EXTERNAL COMPONENTS
- VERY SMALL PACKAGE DFN 5x5 8L



DESCRIPTION

The ST8R00 is a synchronous high efficiency PWM

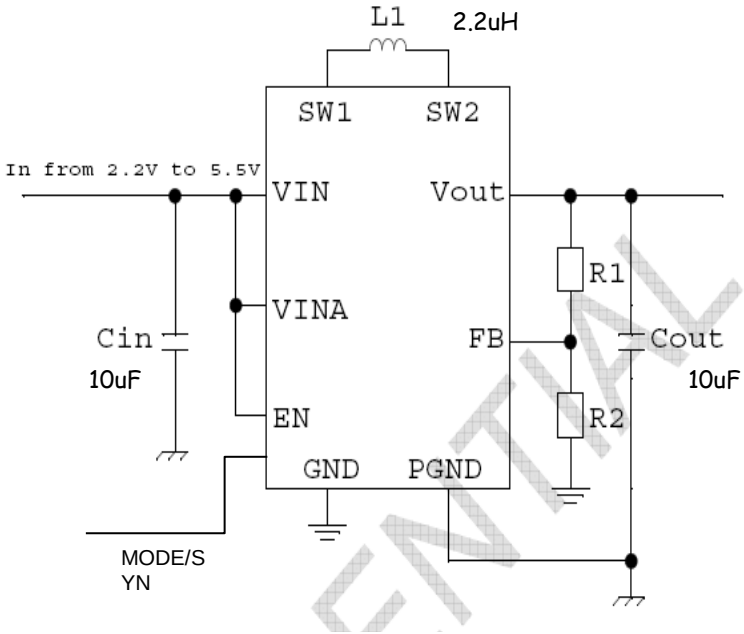
The ST8R00 is suitable to be used in equipment where low noise, low ripple and low supply current are required. The ST8R00 is available in a very small packages: DFN5x5 -8L.



STBB1-Axx
Buck-Boost DC-DC CONVERTER

Main Characteristics:

- High efficiency (94%) single inductor Buck-Boost Switching Regulator
- Operating input voltage range from 2.2V to 5.5 V
- Adjustable output voltage from 1.2V to 5.5 V
- Synchronous rectification
- 1A output current
- Switching frequency 1.5MHz
- Enable function
- Quiescent current less than 1mA in shutdown condition, 120uA max over all the temperature range
- MLP3x3-10L package



Demo board available on request

DC/DC CONVERTER FOR MULTIPLE SOLUTIONS

PM6670A: PWM ctrl for DDR2-3

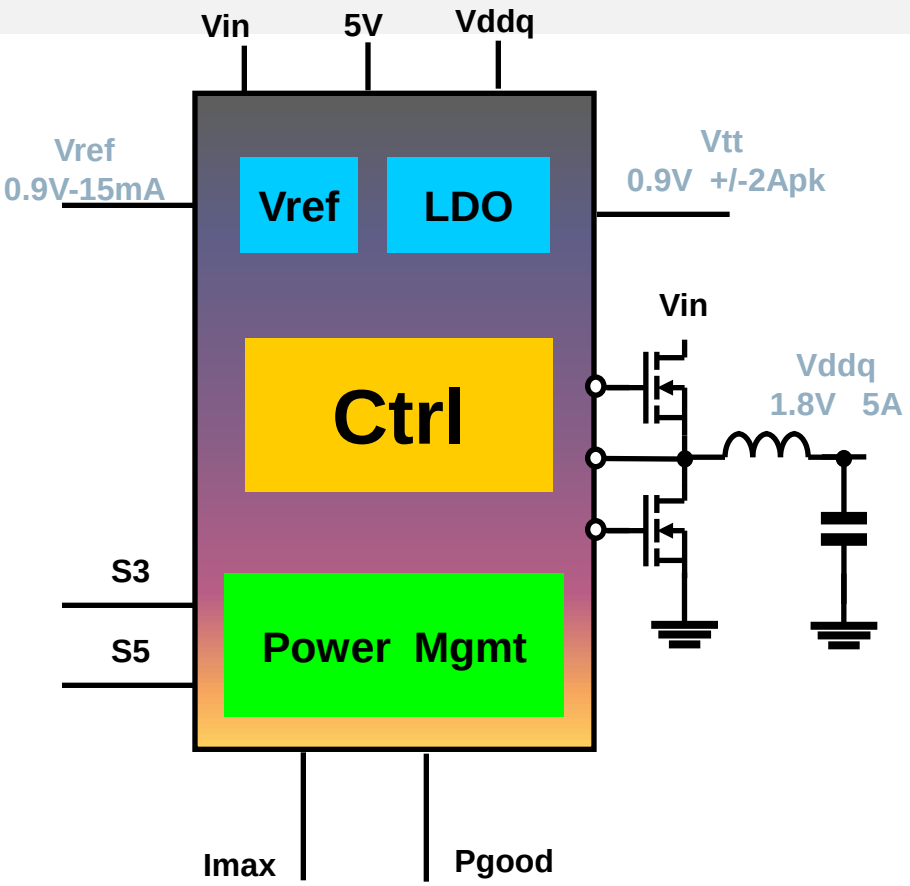
VDDQ Sync Buck Controller

- Wide-Input Voltage Range: 3.0V to 36V
- Supports Ceramic Output Capacitors
- Supports Soft-Off in S4/S5 States
- Current Sensisng from RDS(on)
- Output voltage 1.8V (DDR2) or 1.5V (DDR3) or adj.

VTT 2-Apk LDO

VREF Buffered Reference

- Capable to Sink and Source 2A
- Requires only 20uF Ceramic Output Capacitor
- Buffered Low Noise 15-mA Reference
- Accuracy ±18 mV for both VREF and VTT
- Supports High-Z in S3 and Soft-Off in S4/S5
- Tracking with Vddq



PM6670S
DDR2-3 power supply controller

VDDQ C.O.T. Buck Controller

- Wide-Input Voltage Range: 4.5V to 28V
- 200kHz to 500kHz switching frequency
- Supports Ceramic Output Capacitors
- Supports Soft-Off in S4/S5 States
- Current Sensing from RDSON
- Output voltage 1.8V (DDR2) or 1.5V (DDR3) or adj

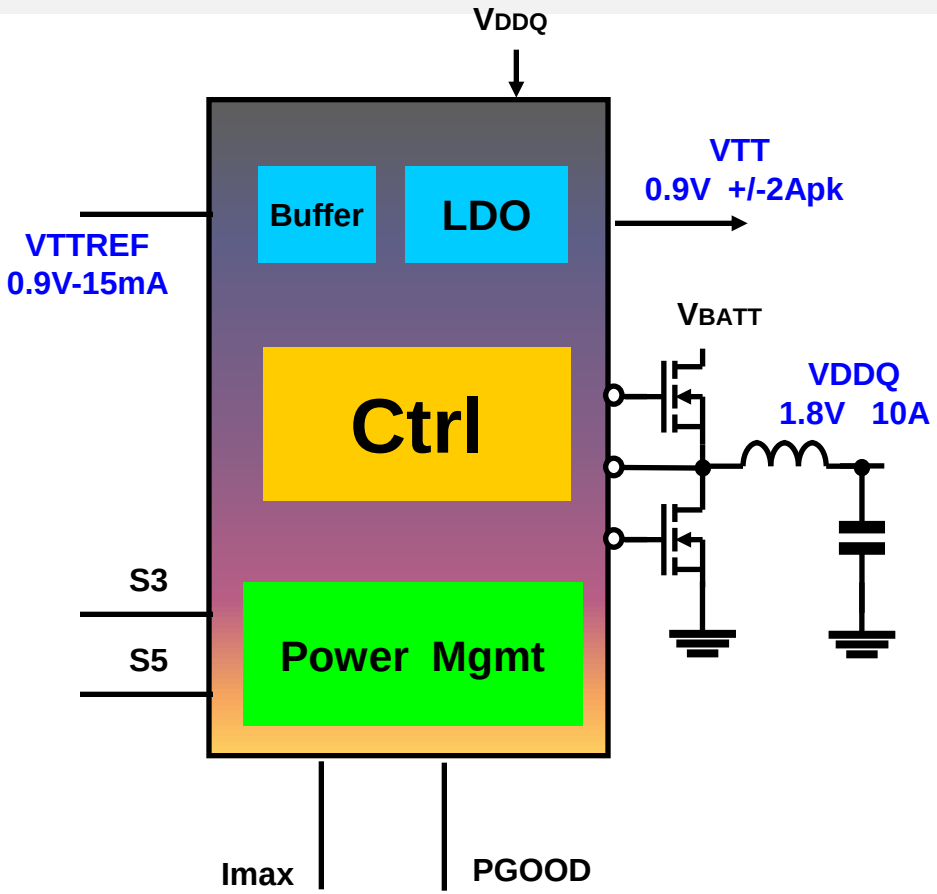
VTTREF Buffered Reference

- ±15mA Low Noise Output
- ±2% Accuracy respect to VDDQ/2

VTT ±2Apk LDO

- Capable to Sink and Source 2A
- Requires only 20uF Ceramic Output Capacitor
- Output Current Foldback
- Supports High-Z in S3 and Soft-Off in S4/S5

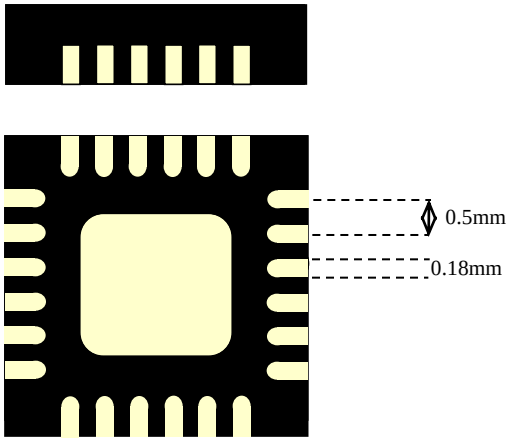
- Package VFQFPN 4x4 - 24pin

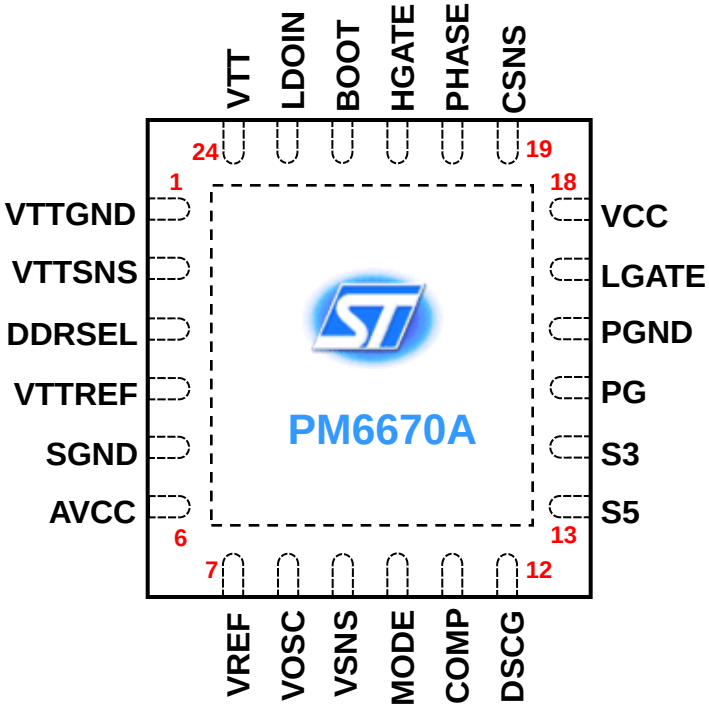


VFQFPN 4x4- 24

PM6670A: PACKAGE & Pin Out

VFQFPN 4x4x1mm 24pin (TQFN)





Rth j/a = 42 °C/W

4-layer JEDEC board

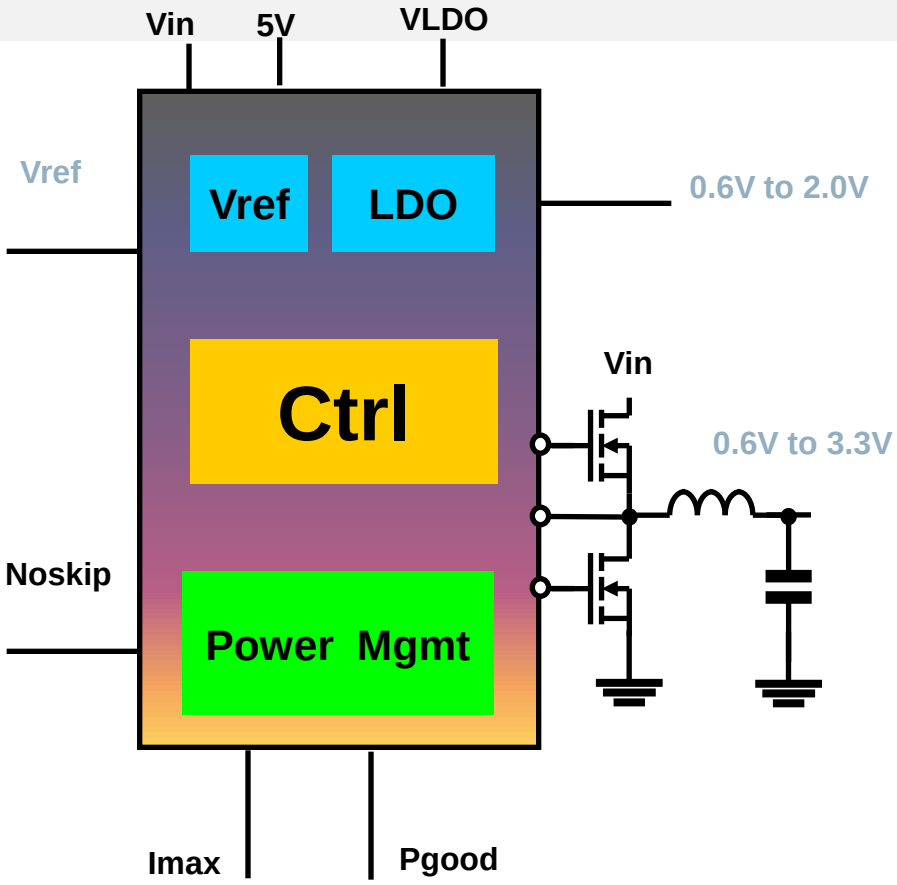
PM6675A: PWM ctrl for GDDR3-4

Sync Buck Controller

- Wide-Input Voltage Range: 3.0V to 36V
- Supports Ceramic Output Capacitors
- Supports Soft-Off
- Current Sensing from RDS(on)
- Output voltage adj from 0.6V to 3.3V

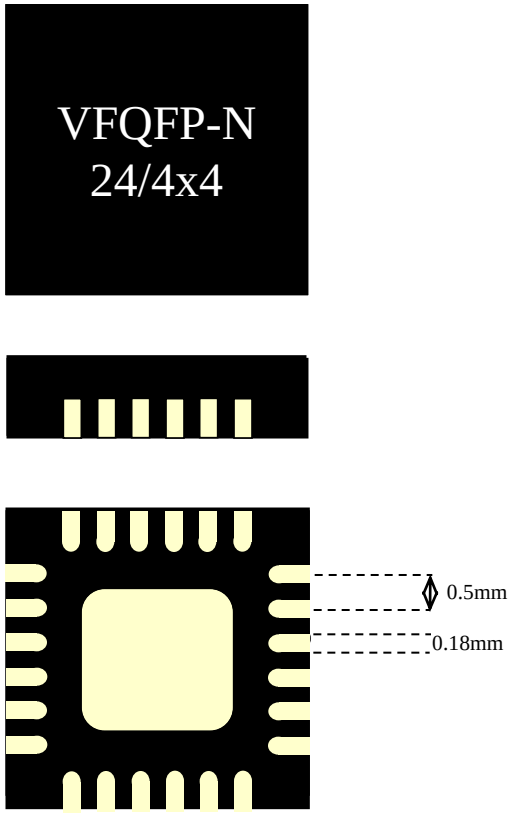
2-Apk LDO

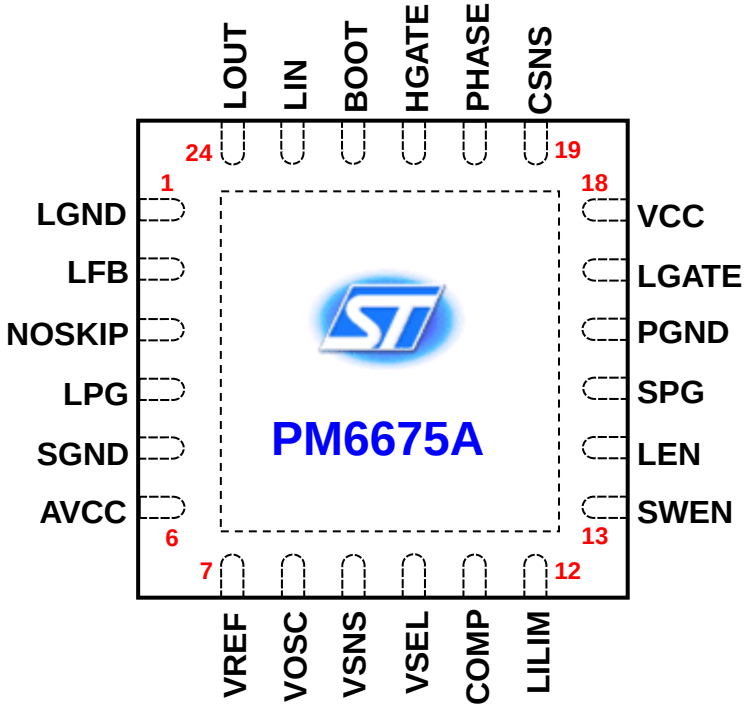
- Capable to Sink and Source 2A
- Requires only 20uF Ceramic Output Capacitor
- Output voltage adj from 0.6V to 2.0V



PM6675A: PACKAGE & Pin Out

VFQFPN 4x4x1mm 24pin (TQFN)



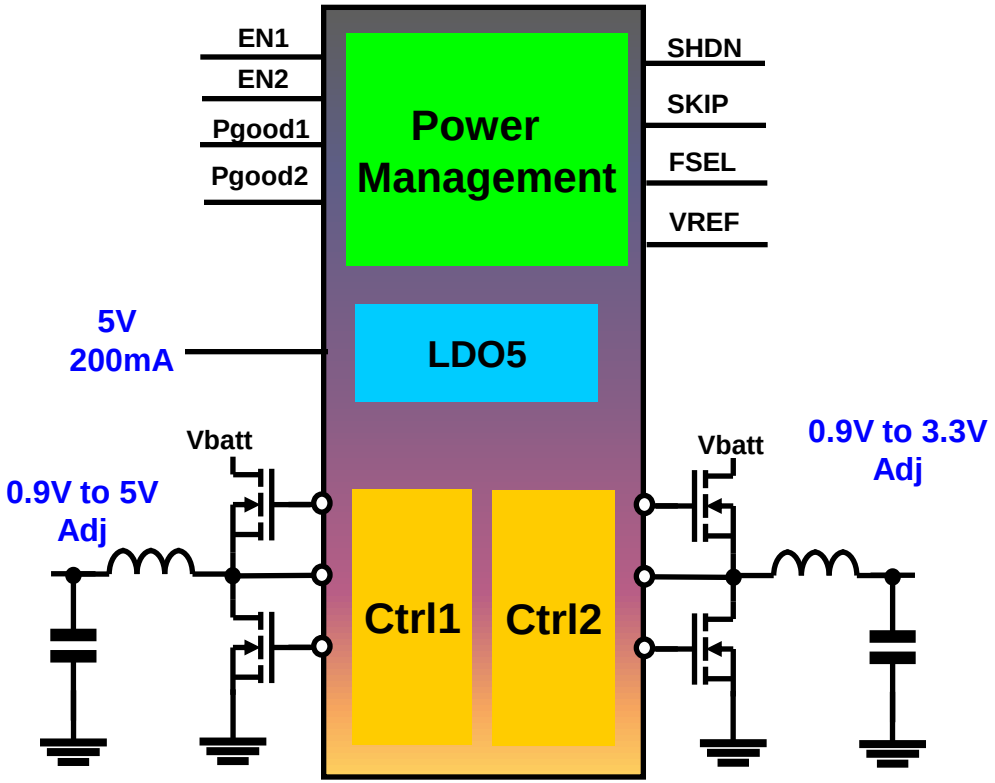


Rth j/a = 42 °C/W

4-layer JEDEC board

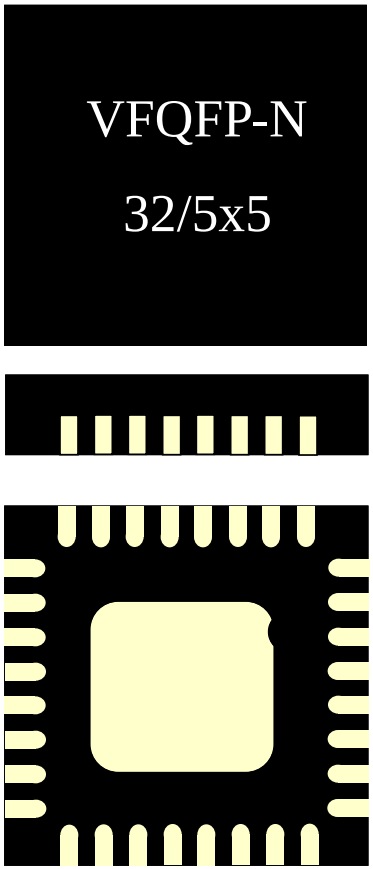
PM6680A: DUAL CTRL Adj MCU/FPGA Power

❑Controller	Constant ON TIME
❑Vin Range	4.5V to 36V Battery Input
❑Vo Precision	1.0% Over Line and Load
	0.9V to 3.3V, 0.9 to 5V adj
❑Linear	5V - 100mA (200mA peak)
❑Current Limit	Current-Sense on Rdson LS
❑Protections	UVL, OVP, Ilim, Pgood
❑Soft Start	Fixed internal at 2ms
❑Frequency	Selectable 200kHz to 500kHz
❑Vref	1.25V ±1% Reference Output
❑Light load	Pulse skip
❑Package	VFQFPN(5x5) 32 pin
❑Others	Fsw min 33kHz at light load
	Soft Off discharge output cap



PM6680A: PACKAGE & Pin Out

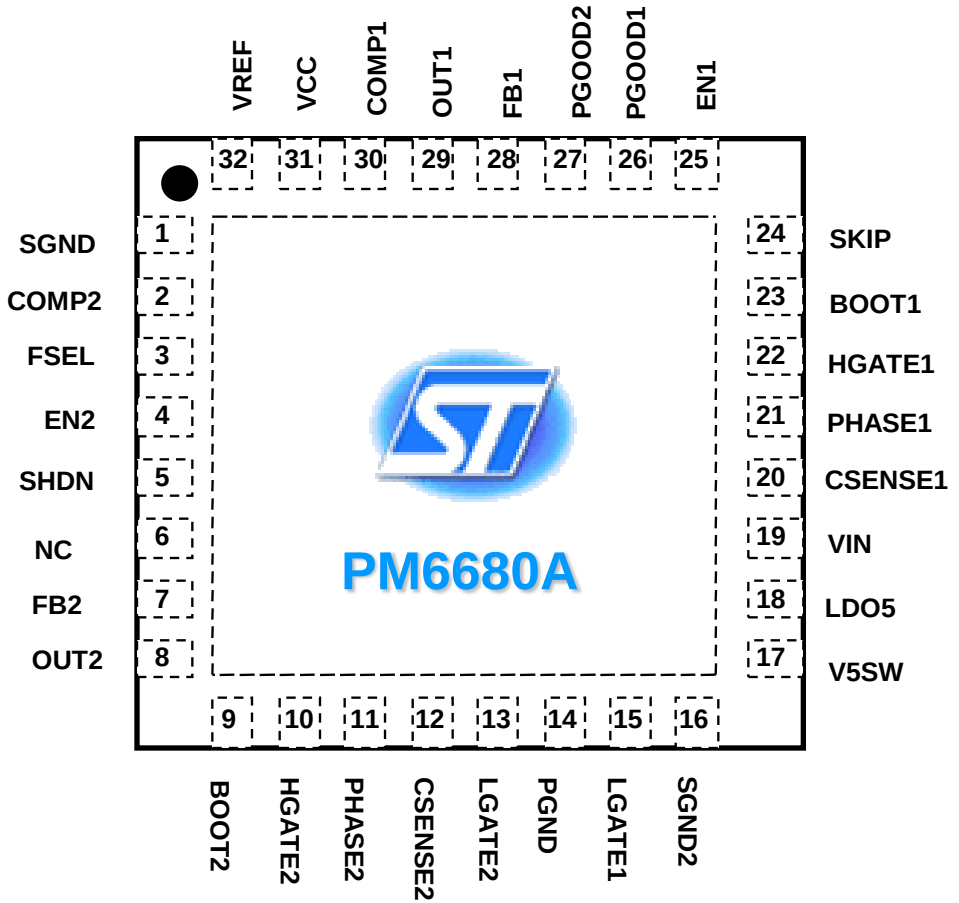
VFQFPN 5x5x1mm 32pin (TQFN)



TOP VIEW

SIDE VIEW

BOTTOM VIEW

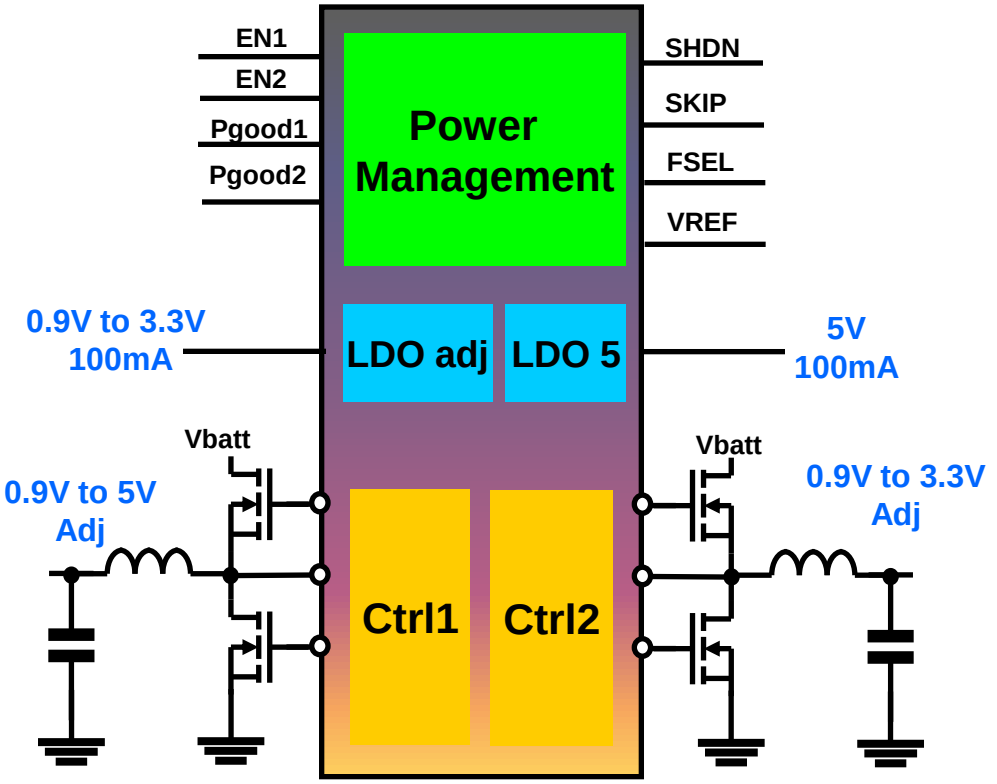


Rth j/a = 35 °C/W

4-layer JEDEC board

PM6681A: DUAL CTRL+LDO adj MCU/FPGA Power

❑Controller	Constant ON TIME
❑Vin Range	4.5V to 36V Battery Input
❑Vo Precision	1.0% Over Line and Load
	0.9V to 3.3V, 0.9 to 5V adj
❑Linear	adj. 0.9V to 3.3V and 5V - 50mA
	❑ (100mA peak)
❑Current Limit	Current-Sense on Rdson LS
❑Protections	UVL, OVP, Ilim, Pgood
❑Soft Start	Fixed internal at 2ms
❑Frequency	Selectable 200kHz to 500kHz
❑Vref	1.25V ±1% Reference Output
❑Light load	Pulse skip
❑Package	VFQFPN(5x5) 32 pin
❑Others	Fsw min 33kHz at light load
	Soft Off discharge output cap

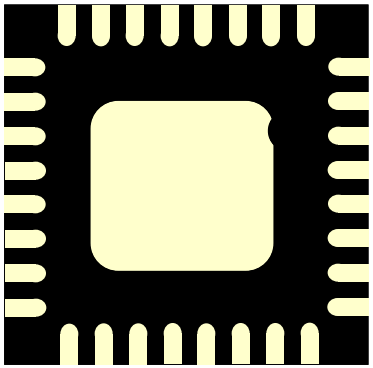


PM6681A: PACKAGE & Pin Out

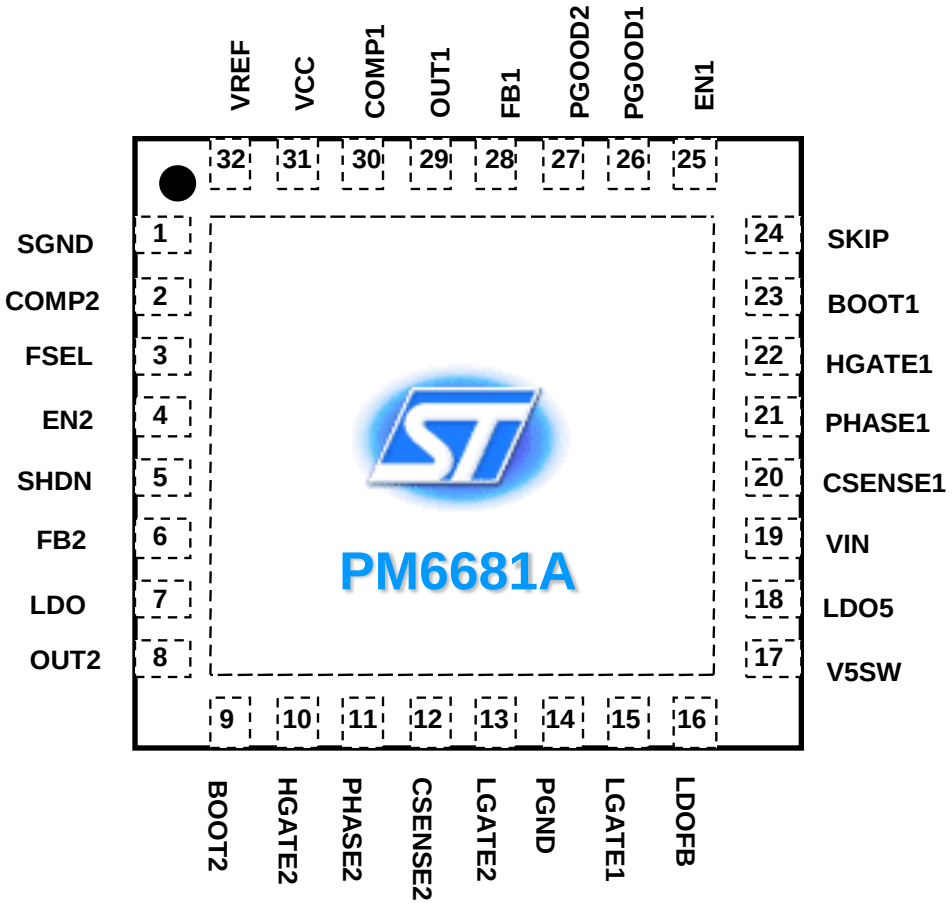
VFQFPN 5x5x1mm 32pin (TQFN)

TOP VIEW

SIDE VIEW



BOTTOM VIEW



Rth j/a = 35 °C/W

4-layer JEDEC board

Monolithic Complete Solution for System Power

DDR2/3 (VDDQ) and Chipset Supply

- Three Out-Of-Phase, independent SMPS
- Input Voltage Range: 2.7V to 5.5V
- Fast Response, Constant Frequency CM Control
- Pulse-Skipping at light loads
- 500kHz to 1MHz Switching Frequency
- 0.8V to 4.7V Adjustable Outputs Voltage
- Supports Ceramic Output Capacitors
- S3/S5 States-Compliant DDR Section
- Selectable Tracking-Discharge for VDDQ
- Programmable Current Limit and SS
- Active Soft-End for all Outputs
- Latched UVP and OVP
- Thermal Protection

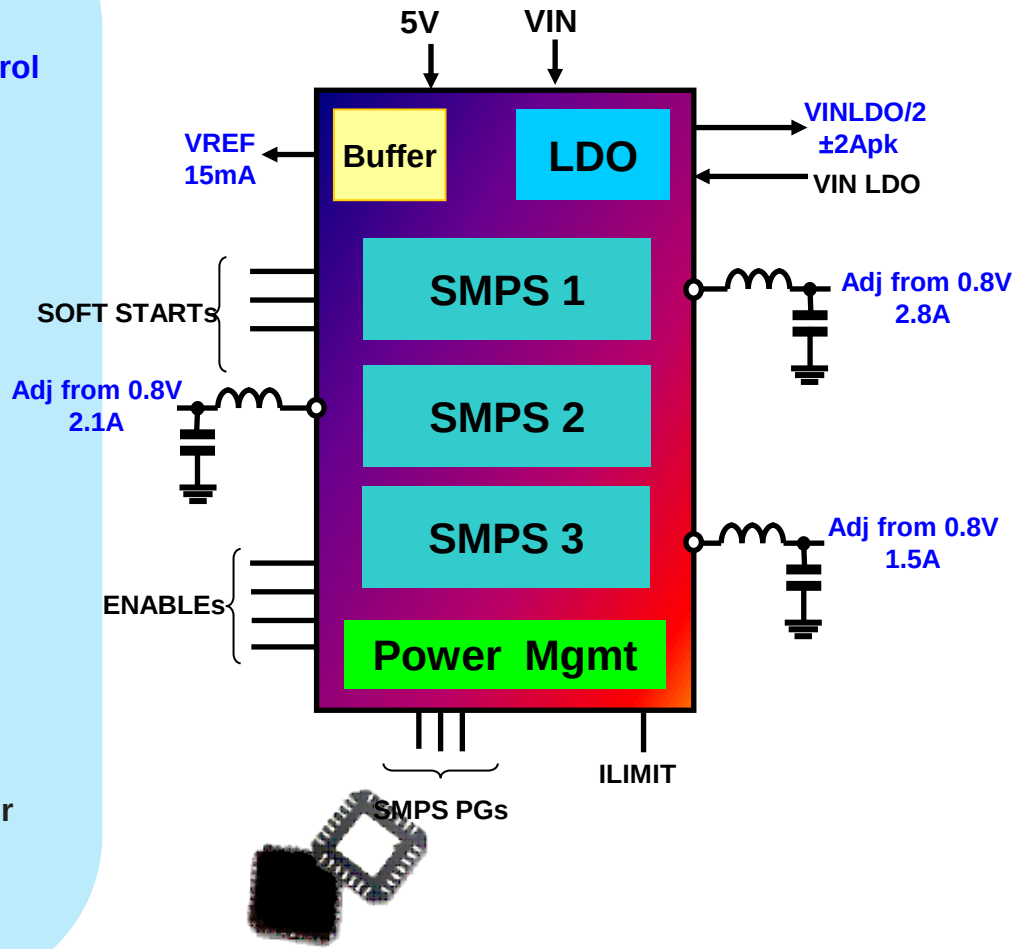
DDR2/3 Reference (VTTREF)

- ±15mA Low Noise Buffered Output
- ±2% Accuracy respect to VDDQ/2

DDR2/3 Termination Voltage (VTT)

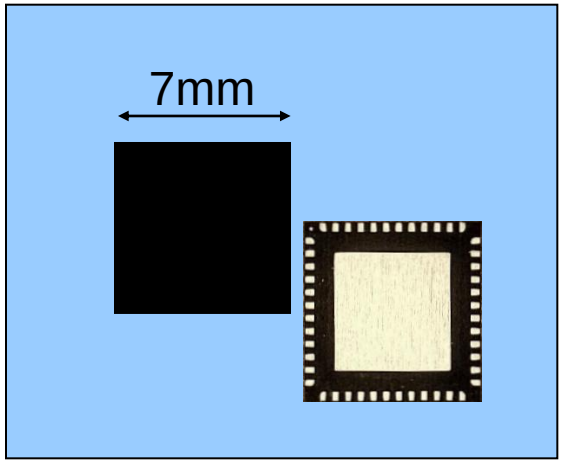
- Up to ±2A LDO Linear Regulator
- Requires only 20uF Ceramic Output Capacitor
- Output Current Foldback
- Supports High-Z in S3 and Soft-Off in S4/S5

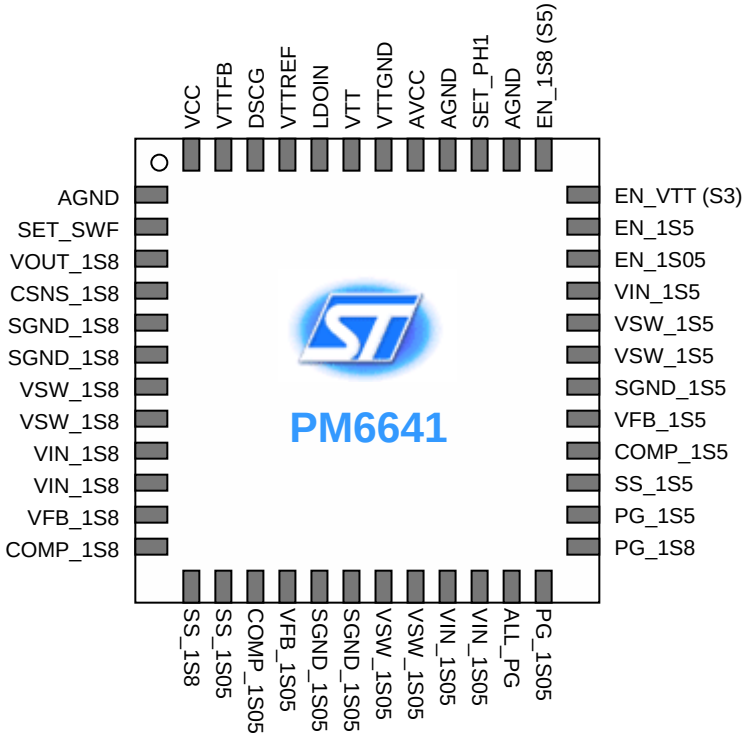
- Small Package: VFQFPN 7x7 - 48pin



VFQFPN 7x7- 48

PM6641: Pinout and Package



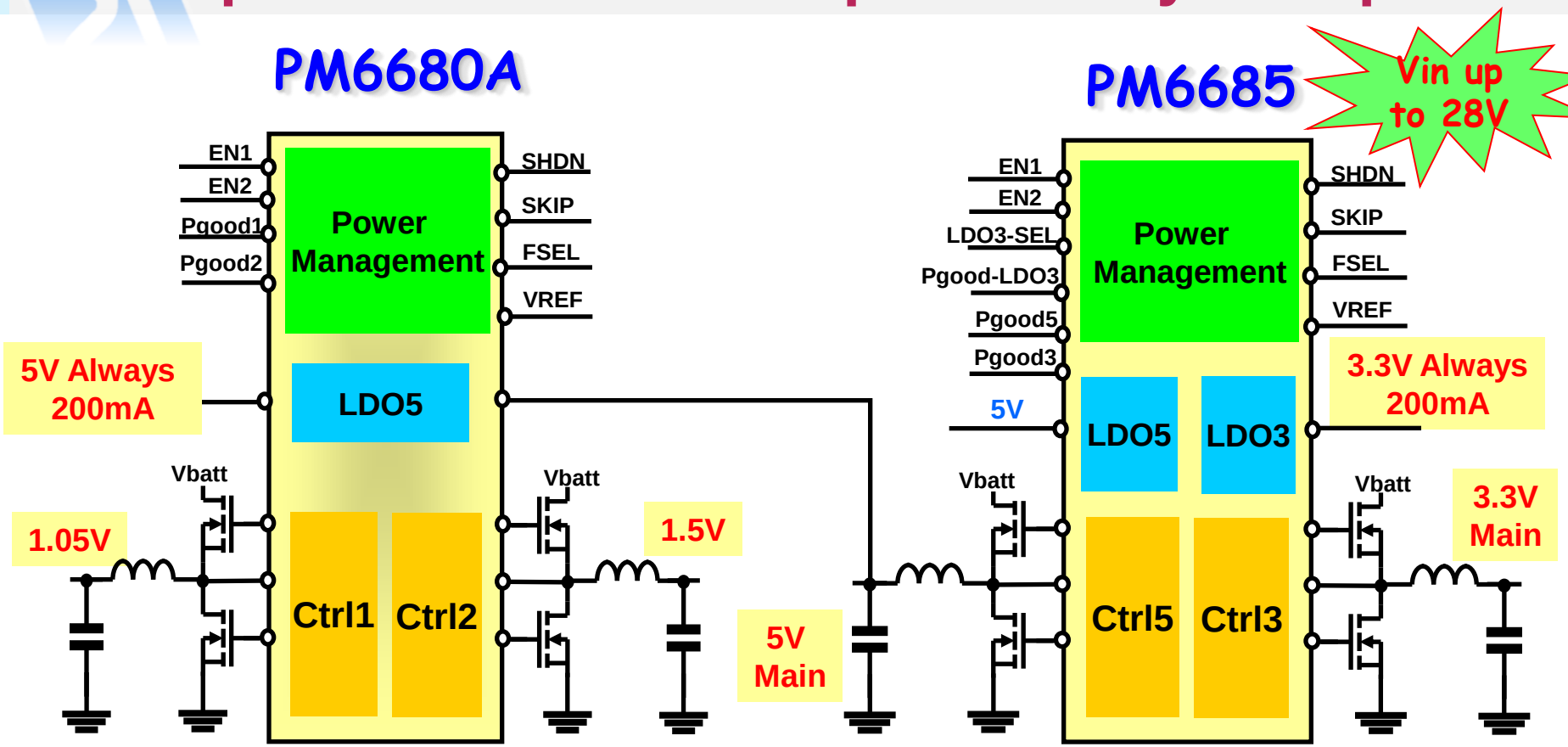


VFQFPN 7x7 – 48

$R_{Th_{j-a}} = 25\ °C/W$

(4layer JEDEC board)

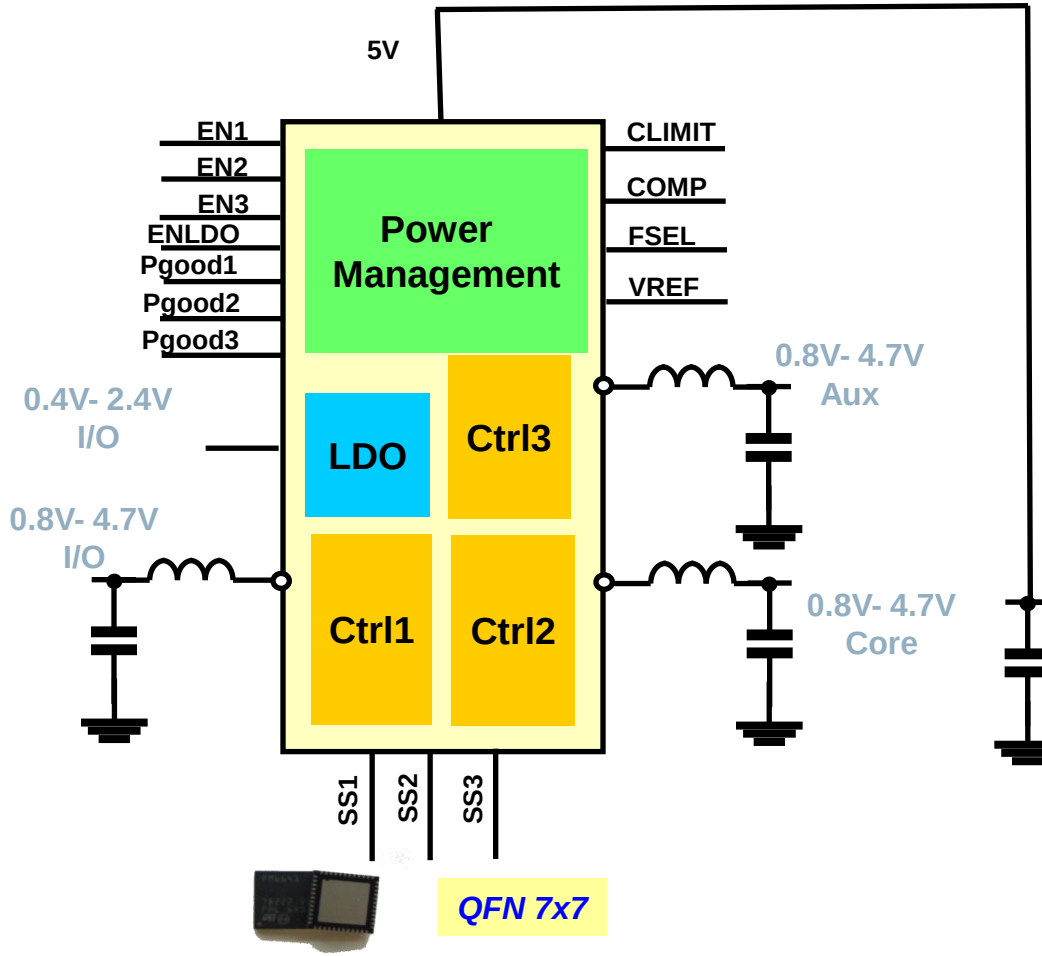
Complete solution for chipset and system power



Flexible and Complete Solution

24V BUS for FPGA/MCU Power Supply

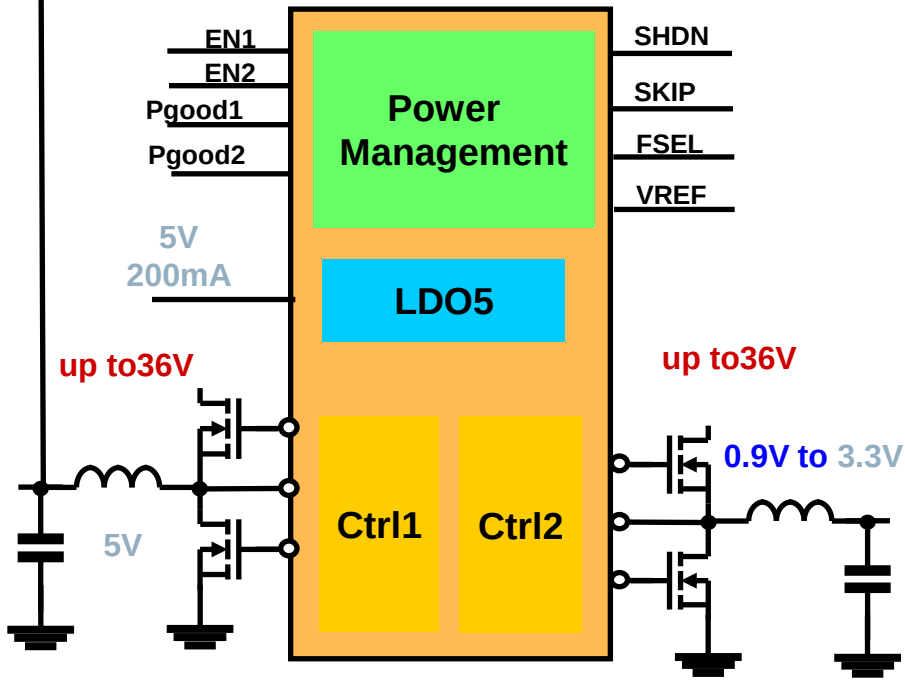
PM6641



QFN 7x7

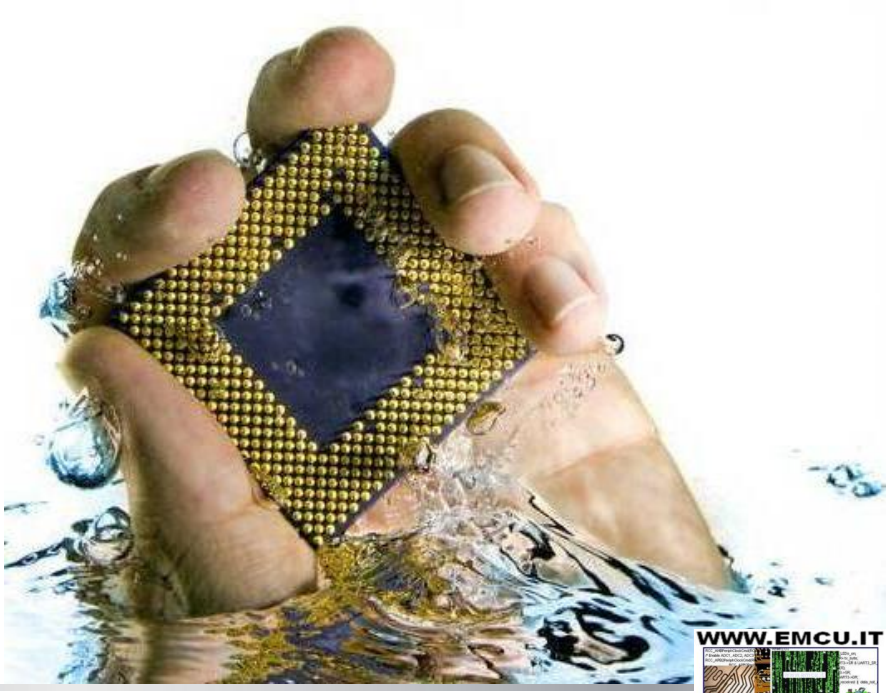
PM6680A

Vin up to 36V



QFN 5x5

AC / DC



AC DC Road map

	Typ output Power range	ST's Differentiations
Viperxx	*High Voltage Converters Flyback 0-25W*	Robust power section, high efficiency under all load conditions, ultra-low standby consumption
L6562A L6564,L6563H	*Power Factor Correctors 0-400W*	Meeting energy efficiency regulations, mains harmonics in compliance with EN61000-3-2 and EIDA-MITI specifications
L6566A/B	Pwm controller Flyback 25W 100W	High efficiency under all load conditions, design flexibility, high voltage capability
L6599A, L6699	*Resonant Primary PWM Controllers 50W -400W*	High efficiency under all load conditions, allowing ultra-thin form factor, EMI reduction
ALTAIRxx HVLED8xx	*All Primary Sensing PWM Controllers Flyback 0- 15W*	Robust power section, optoless, reduced components count and increased MTBF, very low standby consumption
SEA05, TSM10xx	*Constant Voltage & Current Controllers*	Very low quiescent current and extended operating range, few external components, precise internal voltage reference
SRK2000	*Resonant Synchronous Rectification*	High efficiency under all load conditions, safe management of load transient, simple design with few external components

OFF-LINE
PWM CONTROLLERS

L6566A/B: Block Diagram

5V Reference

Programmable soft-start

Feedback

Voltage feed-fwd

Pulse-by-Pulse OCP & Hiccup mode

HV start-up current generator

2.6mA typ quiescent current Adaptive UVLO

PFC management or Freq. modulation

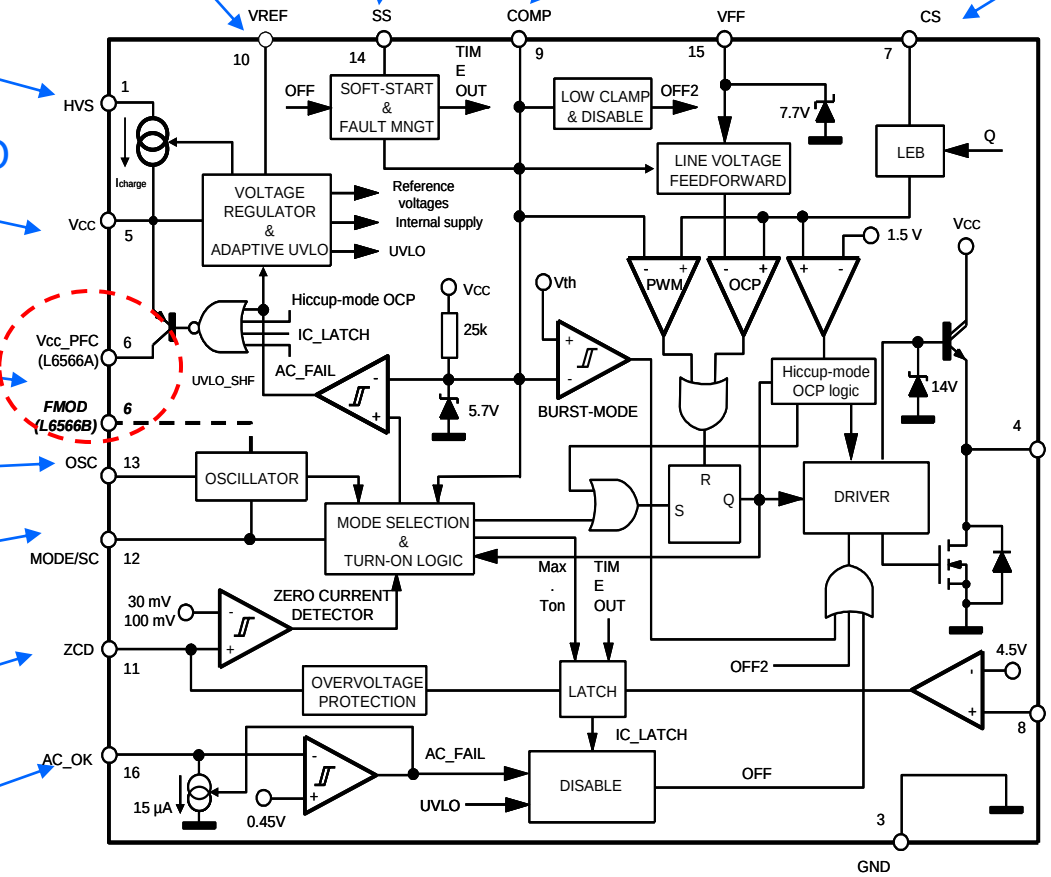
Oscillator

QR or FF setting

Slope comp.

ZCD & OVP

Brown-out

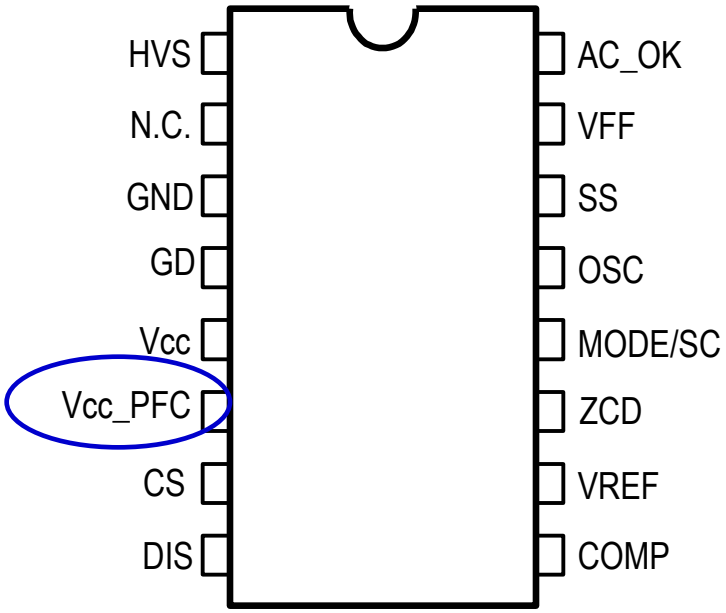


Gate driver

Latched device protection

L6566A/B/BH: General informations

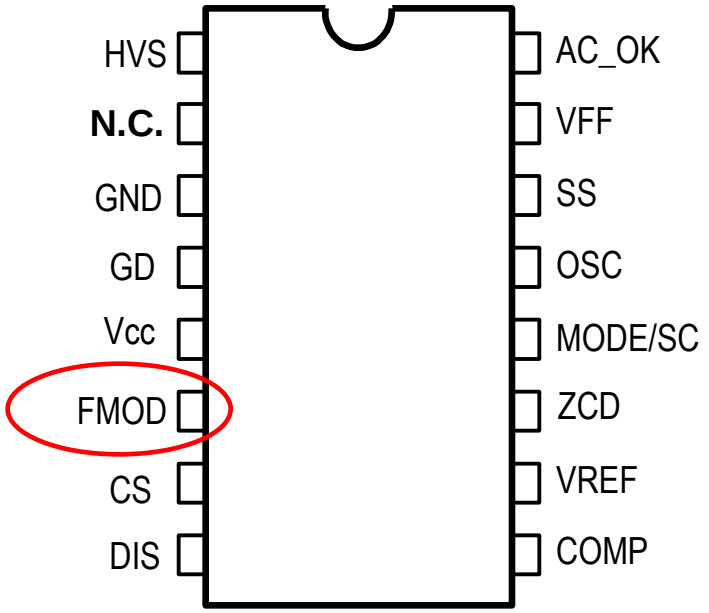
L6566A: FOR SMPS WITH PFC FRONT-END



MAIN APPLICATIONS

- High End AC-DC adapter/Charger
- Printer, TV
- LCD monitor, Low-end LCD TV

L6566B: FOR SINGLE STAGE SMPS



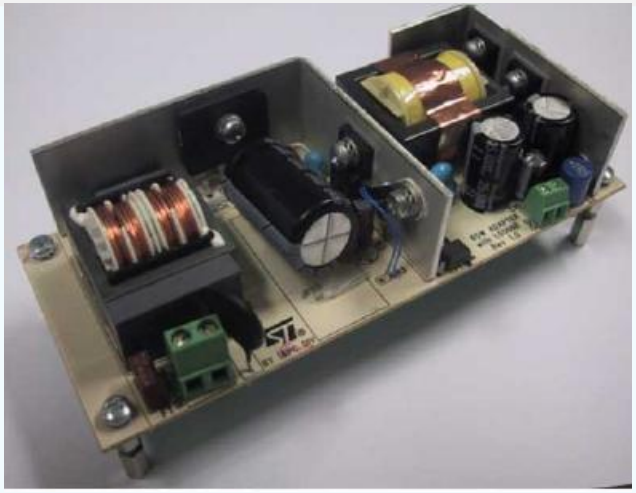
MAIN APPLICATIONS

- Single-stage PFC
- Printer, Digital Consumer
- CRT TV
- LCD monitor, Low-end LCD TV

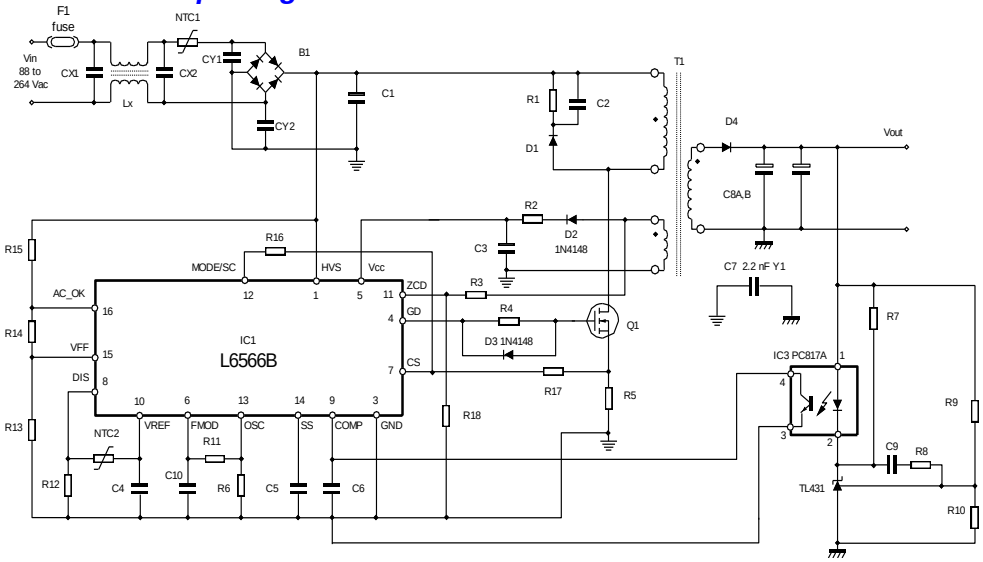
L6566A/B/BH

Pwm flyback 20W-100W

- *Selectable multi-mode operation: fixed frequency or quasi-resonant*
- *On-board 700 V high-voltage start-up*
- *Advanced light load management*
- *Low quiescent current (< 3 mA)*
- *Adaptive UVLO*
- *Line feedforward for constant power capability vs. mains voltage*
- *Pulse-by-pulse OCP, shutdown on overload (latched or autorestart)*
- *Transformer saturation detection*
- *Programmable frequency modulation for EMI reduction*
- *Latched or autorestart OVP*
- *Brownout protection*
- *-600/+800 mA totem pole gate driver with active pull-down during UVLO*
- *SO16N package*



EVL6566B-65W-QR

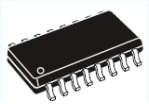


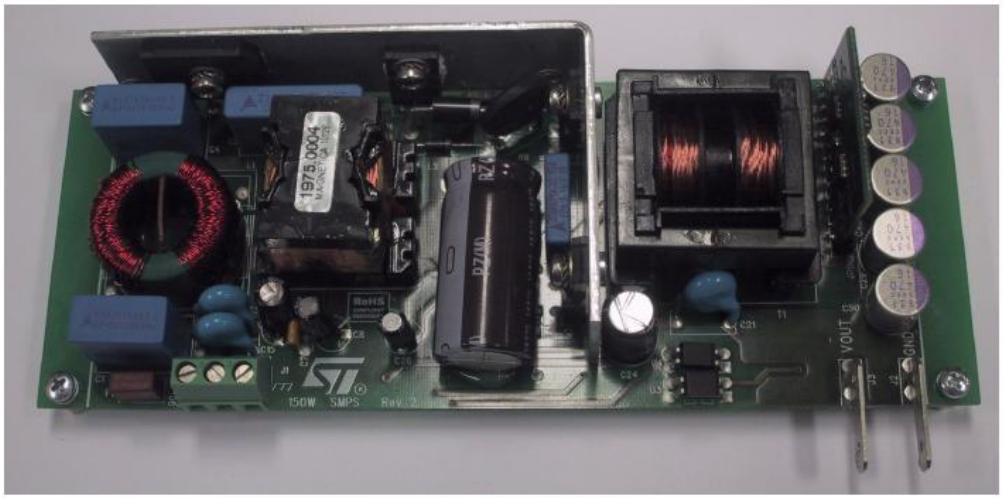
EVL6565B-40WSTB
EVL6566A-75WES4
EVL6566A-75WADP

L6599A

Resonant Controller 50W 400W

50% duty cycle, variable frequency control of resonant half-bridge
High-accuracy oscillator
Up to 500 kHz operating frequency
Two-level OCP: frequency-shift and latched shutdown
Interface with PFC controller
Latched disable input
Burst-mode operation at light load
Input for power-ON/OFF sequencing or brownout protection
Non-linear soft-start for monotonic output voltage rise
600 V-rail compatible high-side gate driver with integrated bootstrap diode and high dv/dt immunity
-300/800 mA high-side and low-side gate drivers with UVLO pull-down
DIP16, SO16N package

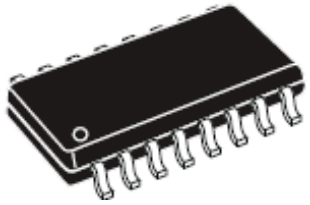


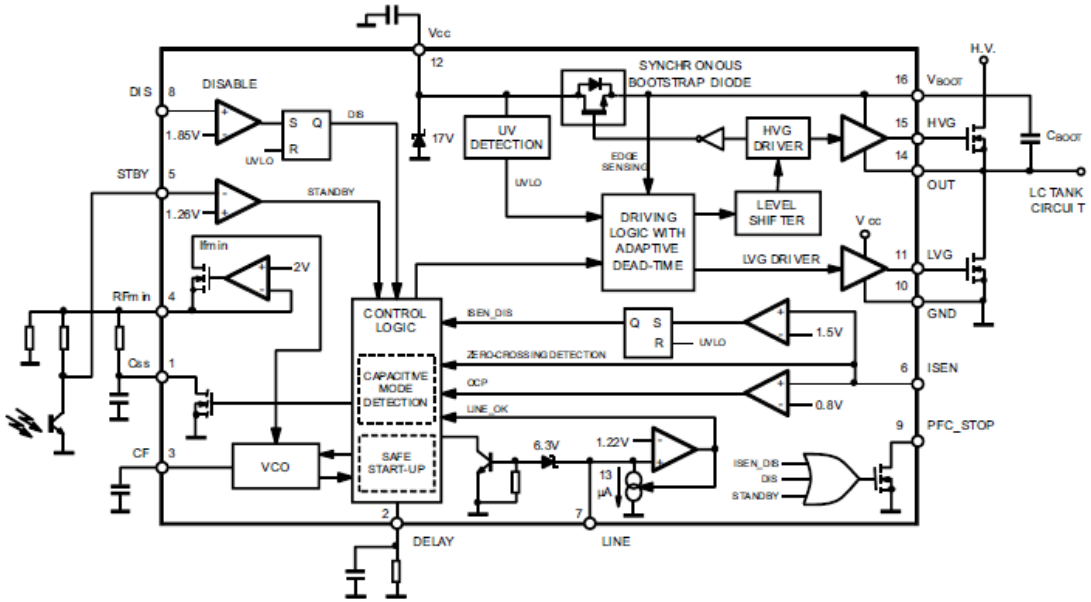


EVL150W-ADP-SR 150W With secondary synchronous rectification using L6599A + L6563H +SRK2000

NEW Resonant Controller 50W 400W

- *Symmetrical duty cycle, variable frequency control of resonant half bridge*
- *Self-adjusting adaptive deadtime*
- *High-accuracy oscillator*
- *2-level OCP: frequency-shift and immediate shutdown*
- *Interface with PFC controller*
- *Anti-capacitive-mode protection*
- *Burst-mode operation at light load*
- *Input for brownout protection or power-on/off sequencing*
- *"Safe-start" procedure prevents hard switching at startup*
- *600 V rail compatible high-side gate driver with integrated bootstrap diode and high dv/dt immunity*
- *-300/800 mA high-side and low-side gate drivers with UVLO pull-down*
- *SO16N package*





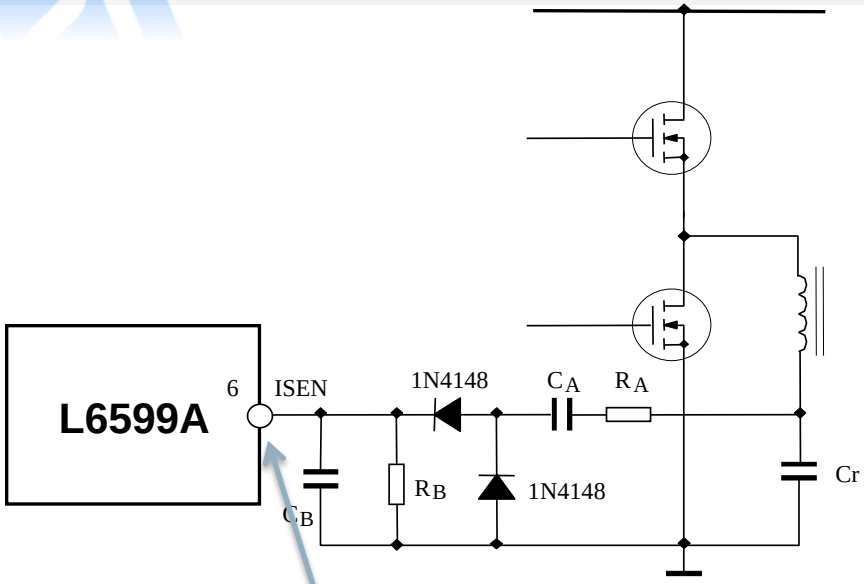
L6699 vs. L6599A

Feature	L6699	L6599A
Anti-capacitive protection*	YES	NO
Smooth Start-up*	YES	NO
Dead-time*	Self adjusting between 200ns and 700ns	Internally fixed at 350ns (typ)
Over Current Protection	Autorestart or Latch-mode	Latch-mode
Soft burst-mode*	YES	NO
MAX Quiescent Current (I_{Q_MAX})	1.3 mA	2.5 mA
Suggested Max F_{SW}	300 kHz	> 500 kHz

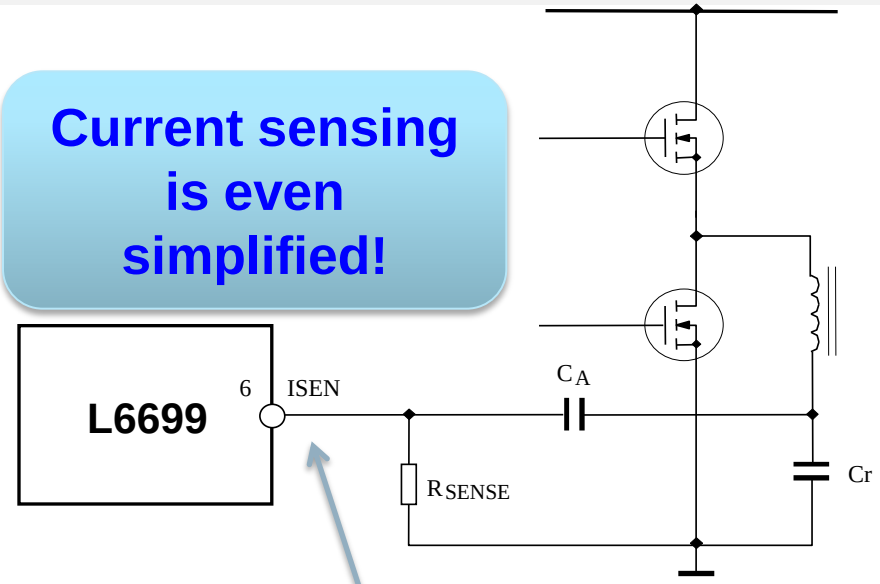
(*) ST patent

L6699 Additional Features	Benefits
Self-adjustable Dead Time	Improved Efficiency even at Light Load Optimized Transformer Design
Anti-capacitive Protection	Higher System Reliability
Extra-smooth Startup	Higher System Reliability
Soft Burst Mode	No Audible Noise at Light Load

L6699 vs. L6599A: Anti-Capacitive Protection



Current sensing is even simplified!



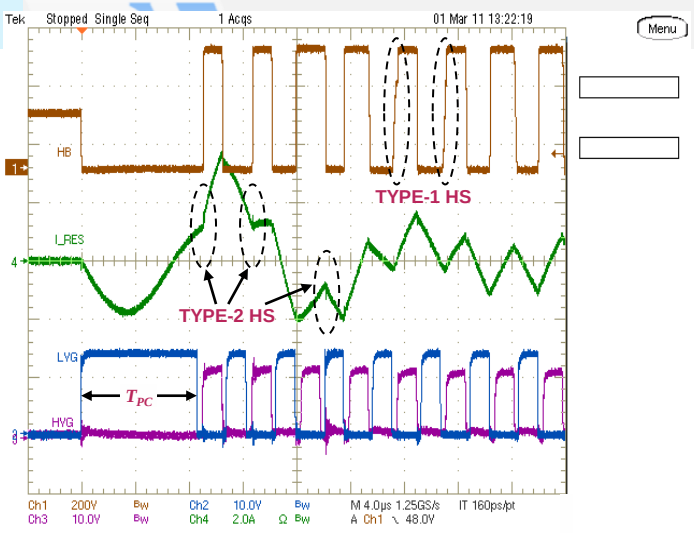
Sensing the average value

Sensing the instantaneous current

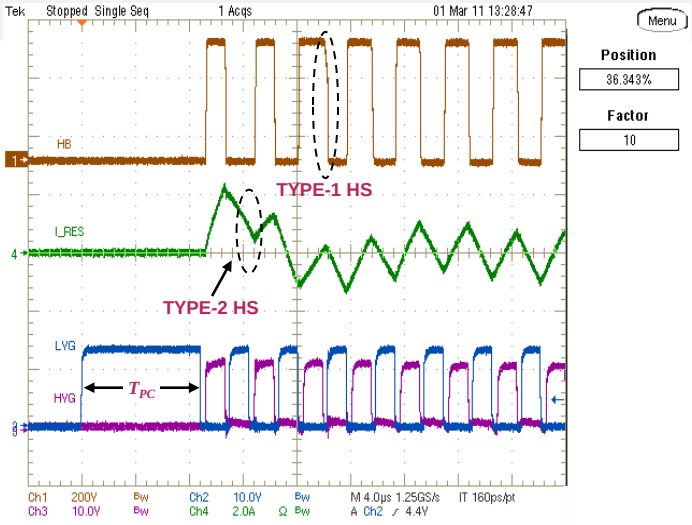
- IC checks that tank current is lagging behind applied voltage (positive phase-shift)
- Pushes frequency up if phase-shift gets too close to zero
- Stops switching for 50 µs and then soft-restarts if phase-shift suddenly becomes negative
- During this idle period the PFC_STOP pin is pulled low to stop the PFC stage as well.

Pin-to-Pin Compatible with L6599A

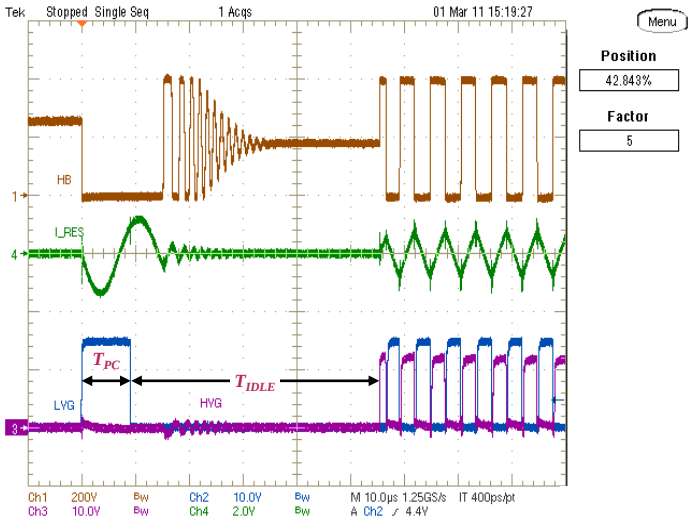
Safe-start in L6699

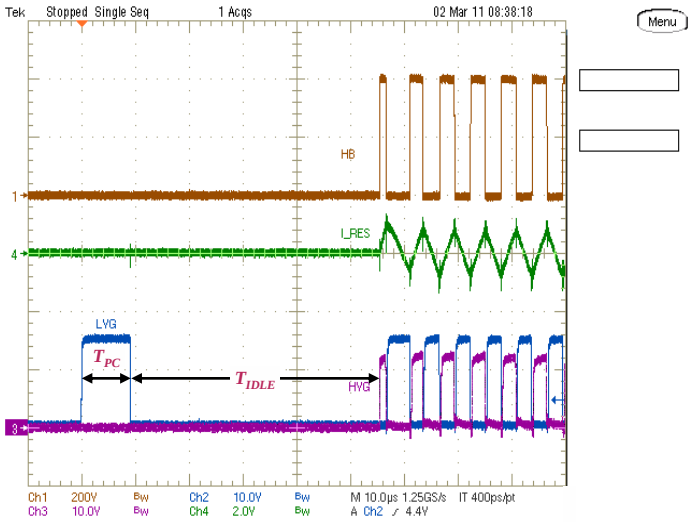


Resonant cap initially charged



Resonant cap initially discharged





Start-up with L6599A

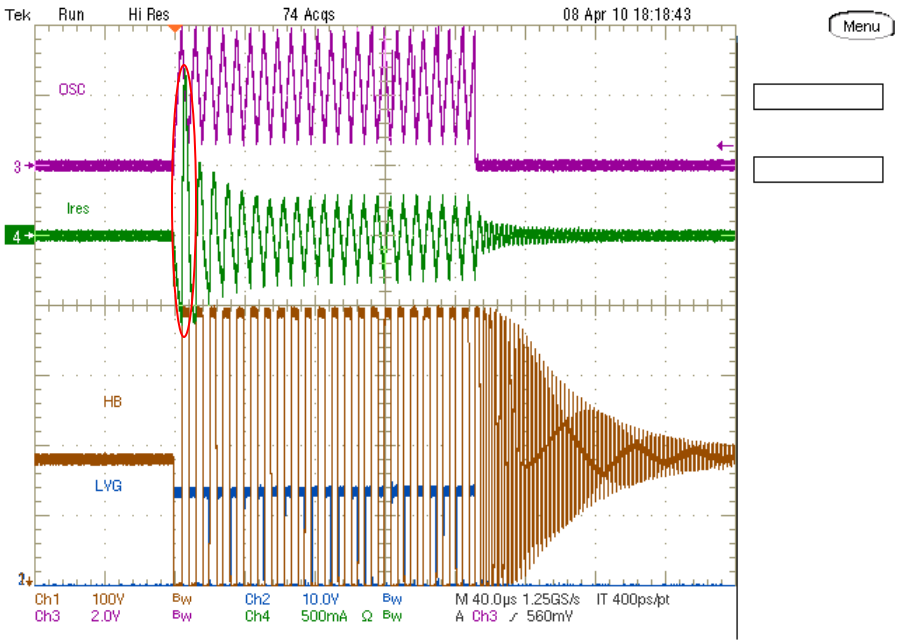
Body diode recovery like in CAPACITIVE MODE

Safe-start with L6699

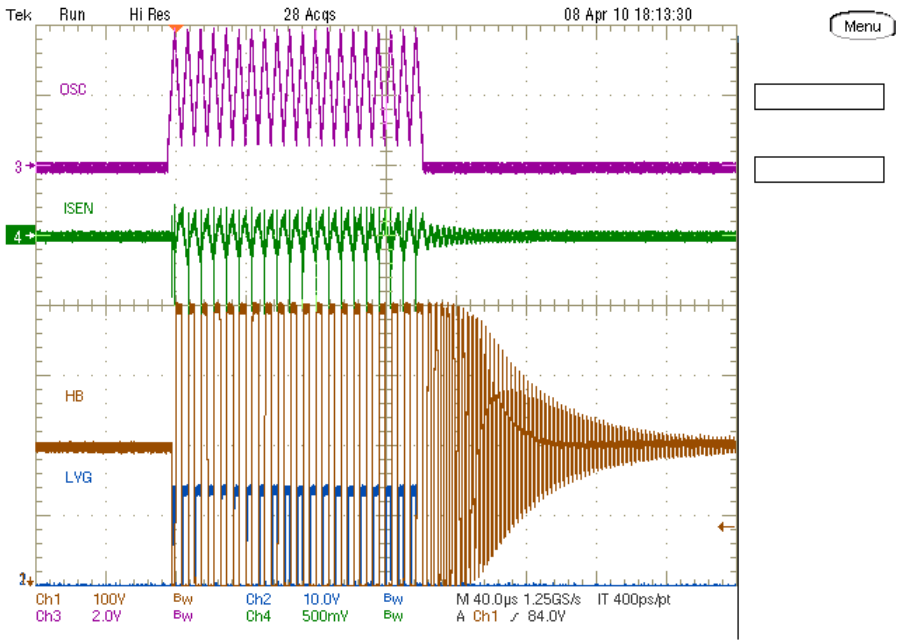
No body diode recovery

Burst-mode in L6699

Burst mode with L6599A



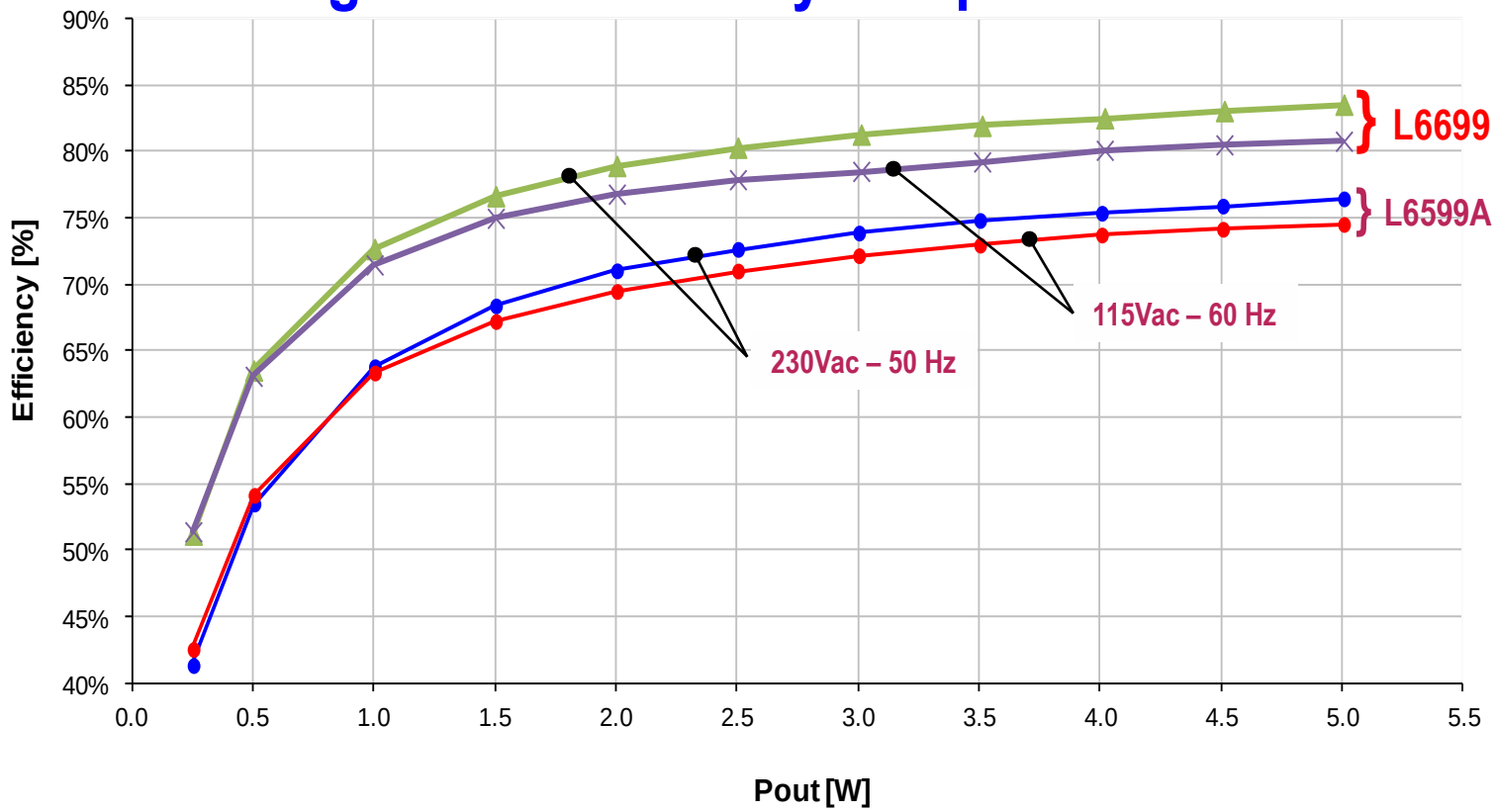
Burst mode with L6699



- ***First pulse length is shorter to avoid initial current peak***
- ***Last pulse is not truncated***
- ***Smooth restart prevents audible noise***

L6699: Adaptive Dead-time

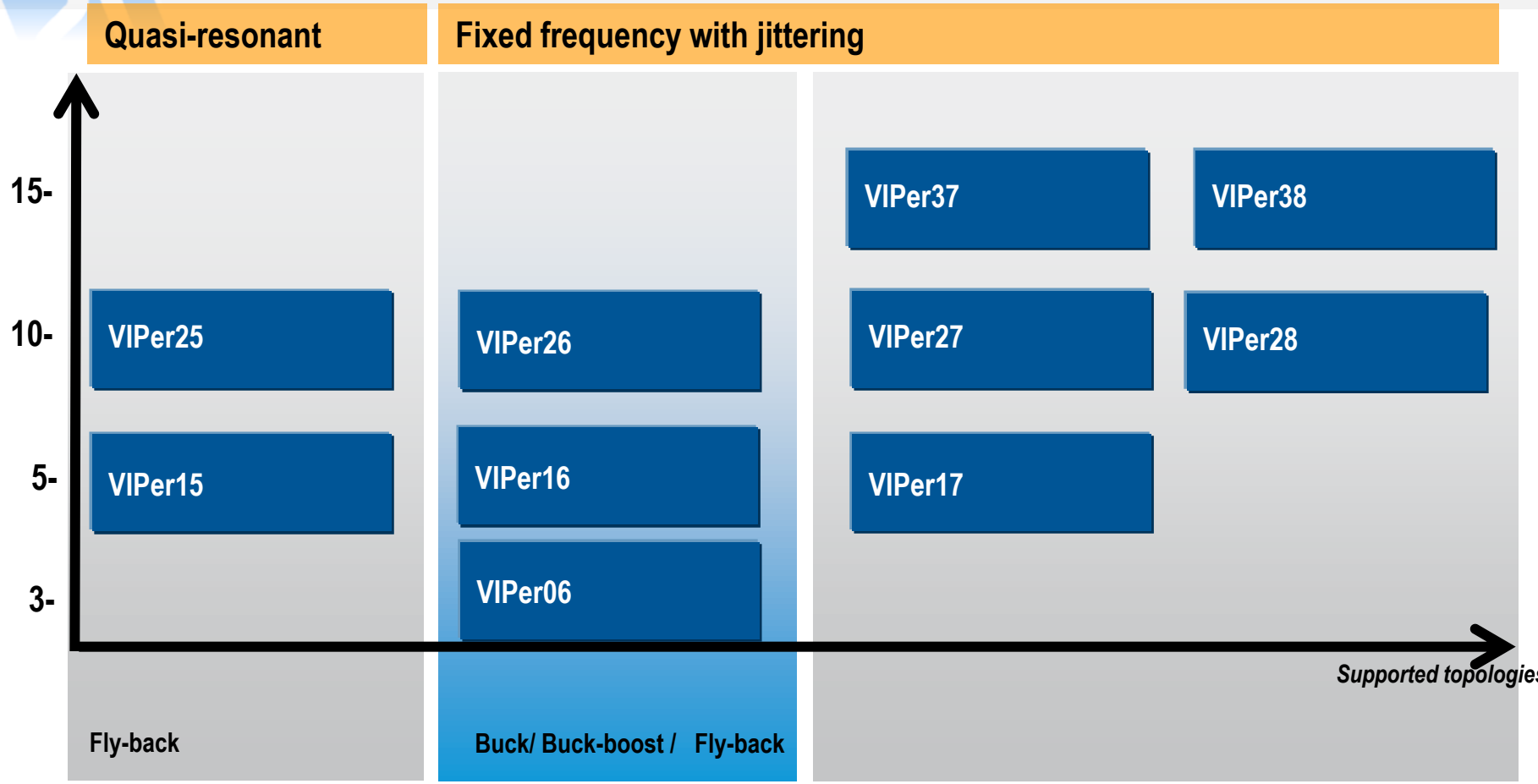
Light-load efficiency comparison(*)



(*) Experimental data taken on same 150W demo board with PFC front-end

VIPER FAMILY

0W-25W European range

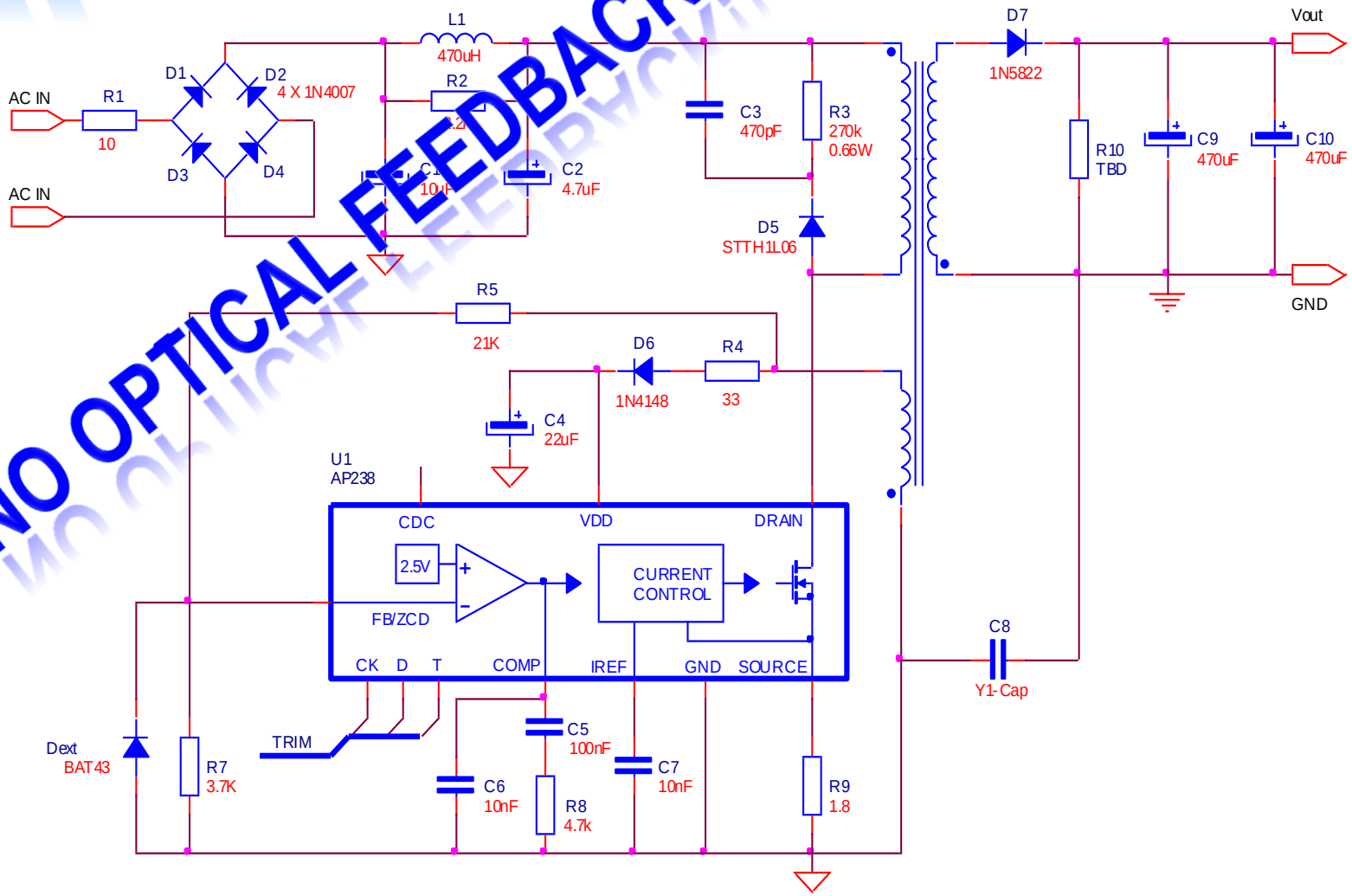


In full production

POWER (W) with universal mains

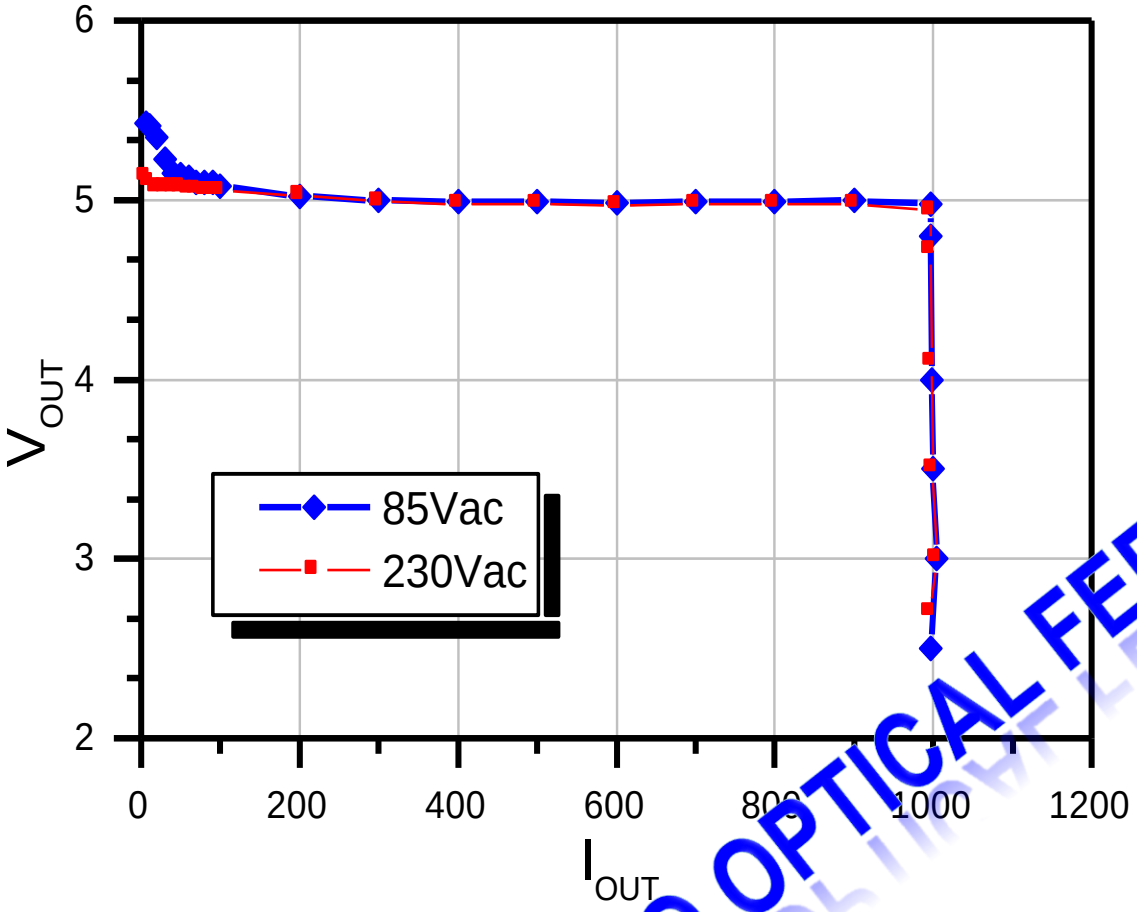
ALTAIR05
Off-line All-Primary Battery Charger & LED Pwr supply

Application Design – INSULATED!!!



Application Design

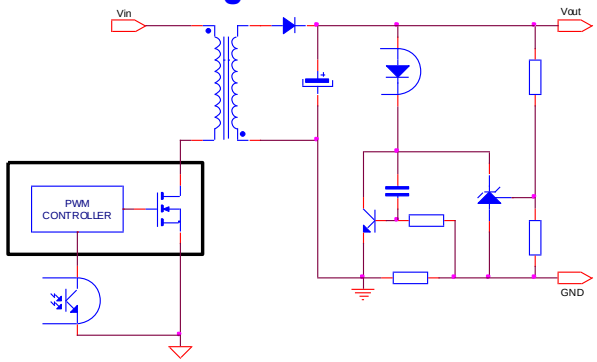
Load Regulation



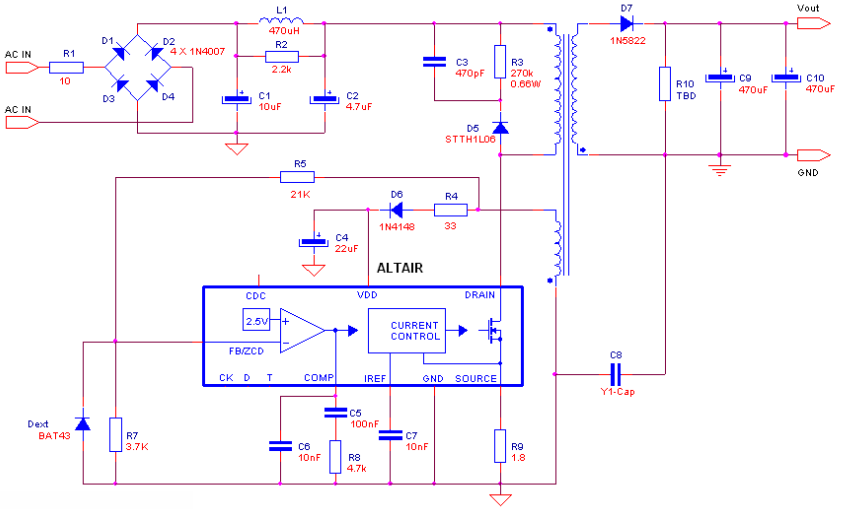
NO OPTICAL FEEDBACK!!

Flyback with current and voltage primary control

Conventional flyback with Secondary current and voltage control



Altair flyback with Primary current and voltage control



EVLALTAIR900-M1(7.5W double output wide range for PLM)

EVLALTAIR05T-5W(5W 5V Single output wide range)

- ***Control of output voltage and current entirely from primary side***
- ***Accuracy 5% the best in primary control***
- ***Benefit: NO! secondary regulation components (voltage reference, error amplifier(s), optocoupler, sense resistor)***

High Voltage Converters

High Voltage Converters

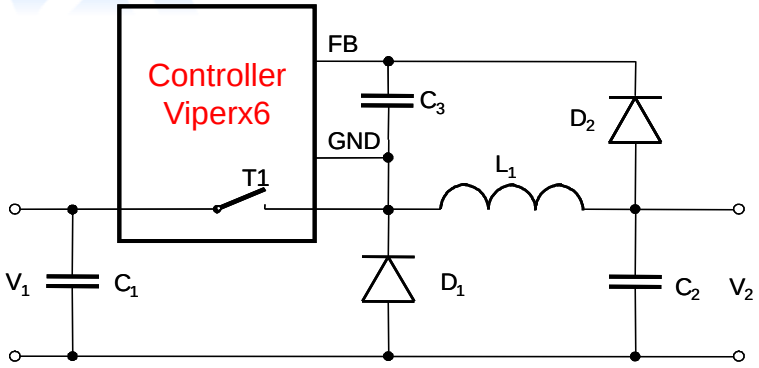
- HV Power MOSFET
- Avalanche Ruggedness
- 800V.break down voltage
- On Resistance from 30Ω to 1Ω
- Integrated HV start-up
- Integrated thermal shutdown

Off Line Controller

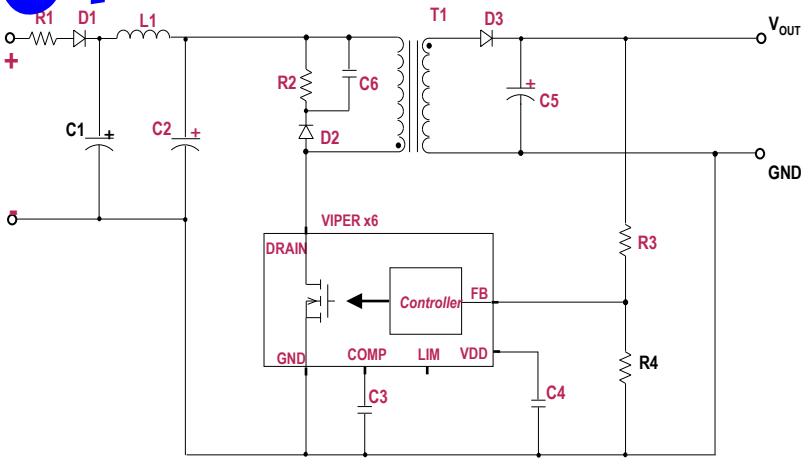
- PWM current mode controller with drain current limitation
- Easily meet current no-load consumption and efficiency standards
- Oscillator with Fixed Frequency with Jittering or Quasi Resonant
- Advanced Protection

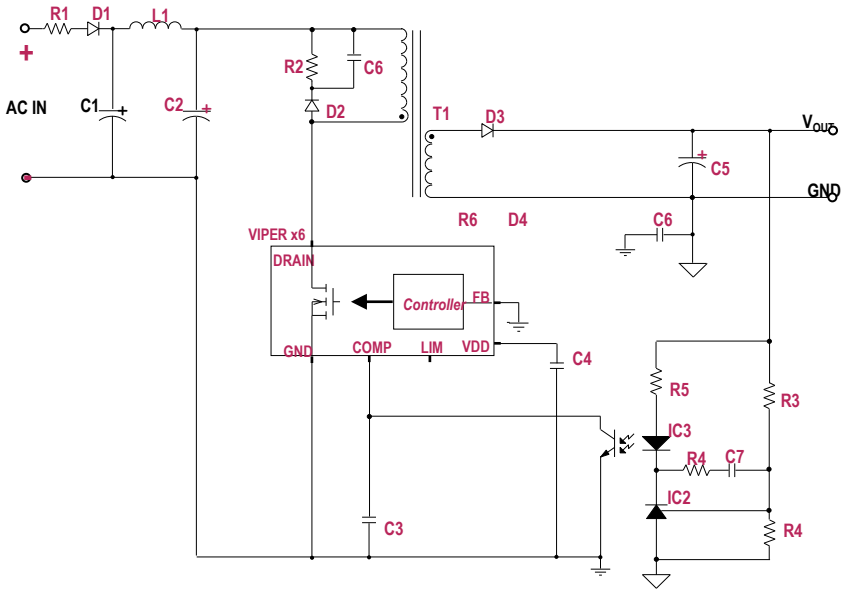
High efficiency solution for Power Supply with minimized components count

Monolitich Solution



NOT INSULATED





INSULATED

High Voltage Converters

portfolio

30 Ω	18 Ω	5.5 Ω	3 Ω	1 Ω
VIPer12	VIPer22 VIPer20	VIPer50	VIPer100	VIPer53

800V Avalanche Ruggedness

	30 Ω	24 Ω	7 Ω	4.5 Ω	3 Ω	1 Ω	0.5 Ω
Controller x7		VIPer17	VIPer27	VIPer37			
Controller x5		VIPer15	VIPer25	VIPer35			
Controller x8			VIPer28	VIPer38			
Controller x6	VIPer06	VIPer16	VIPer26				
	4W(1) / 8W(2)	6W(1) / 12W(2)	12W(1) / 24W(2)	15W(1) / 30W(2)			

(1) Open frame, V_{IN} = 85 - 264V_{AC} ,
(2) Open frame, V_{IN} = 230V_{AC} ±15%,
(3) Achievable consumption at no load with Vin 264V_{AC}

under development, SOP planned within Q1 2012

High Voltage Converters

controller differentiations

Common features	Controller x7	Controller x8	Controller x5	Controller x6
PWM operations with settable(1) I_{DLIM} *to limit the maximum power*	Fixed Frequency (60 or 115kHz) with Jittering		Quasi Resonant	Fixed Frequency (30[2] or 60 or 115kHz) with Jittering
Burst Mode *for light load management*	Brown out	Extra Power Timer	Brown out	Integrated op amp for simplified non Isolated loop
Hysteretic Over Temperature Protection *improves the reliability*	Over Voltage			No auxiliary
Current soft start *for limited stress during the start-up phase*	Delayed Over Load Protection			Feedback disconnection detection
	High OCP (transformer saturation, secondary diode short circuit)			over load timer (50ms) before protection
	Automatic auto restart after fault (1 sec. fixed time for VIPer x6)			

(1) I_{DLIM} settable only on VIPer
(2) 30kHz available only for VIPer06

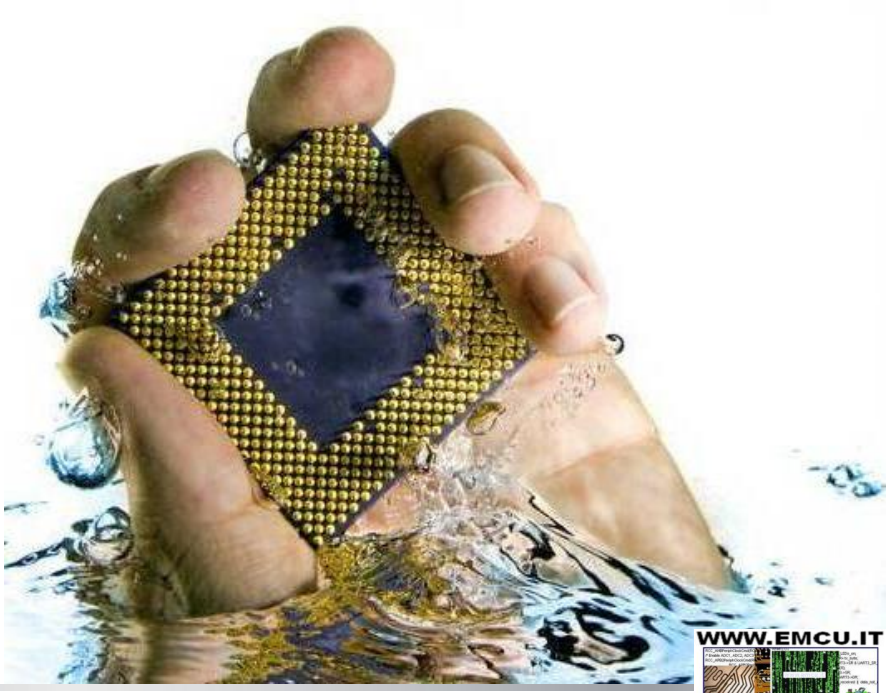
High Voltage Converters

selection by topologies and power

ISOLATED POWER SUPPLY			NON ISOLATED POWER SUPPLY		
Fly Back			Fly Back	Buck	Buck Boost
High Features		Basic Features	Controller x6	Controller x6	Controller x6
Fixed Frequency	Quasi Resonant	Controller x6			
Peak Power	Brown out	Brown out			
Controller x8	Controller x7	Controller x5			

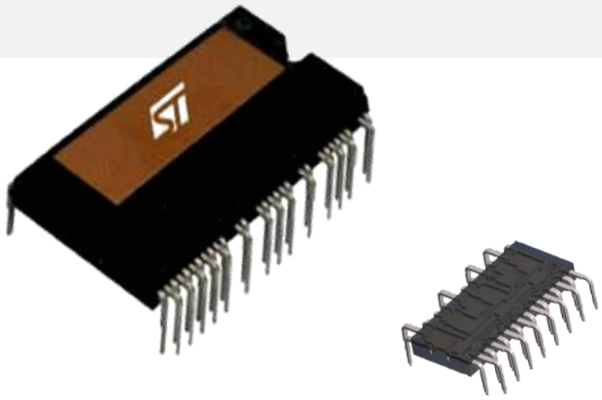
V_{IN} = 85-264 V_{AC}	4W	6W	12W	15W
	VIPer06	VIPer15 VIPer16 VIPer17	VIPer25 VIPer26 VIPer27 VIPer28	VIPer35 VIPer37 VIPer38
V_{IN} = 230 V_{AC} ±15%	8W	12W	24W	30W

High Voltage Motor Control ICs



SLLIMM™ family

Small Low Loss Intelligent Molded Module



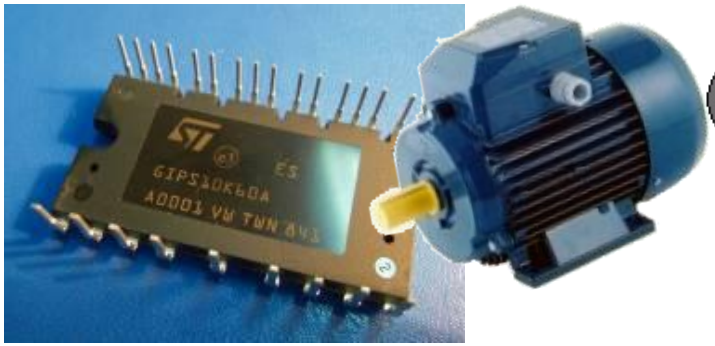
SLLIMM™ proposal for

simple and compact solution

for motor drive up to 2kW

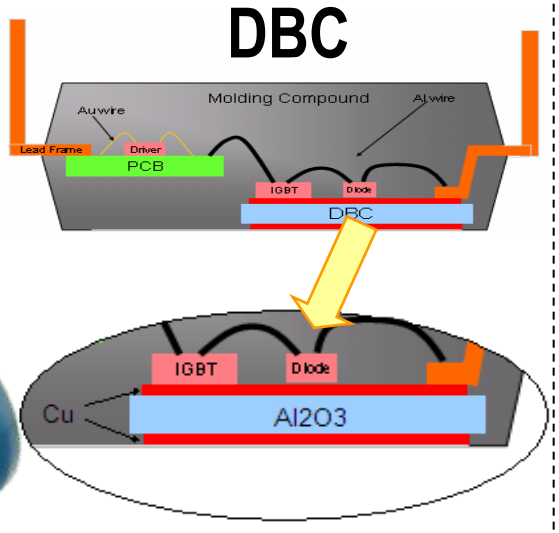
IPM Intelligent Power Module Package Technology (DBC vs. Ceramic)

Highest Integration Level Driving powerful BLDC motors



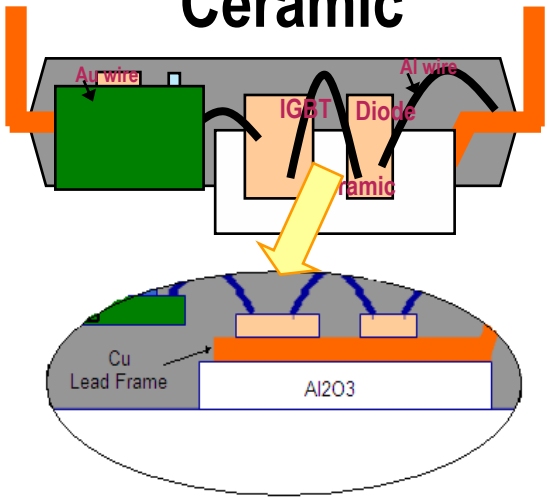
6 IGBT &
3 Drivers inside
with thermal management
Integrated Op-Amp and Comparator for sensing & protection

DBC



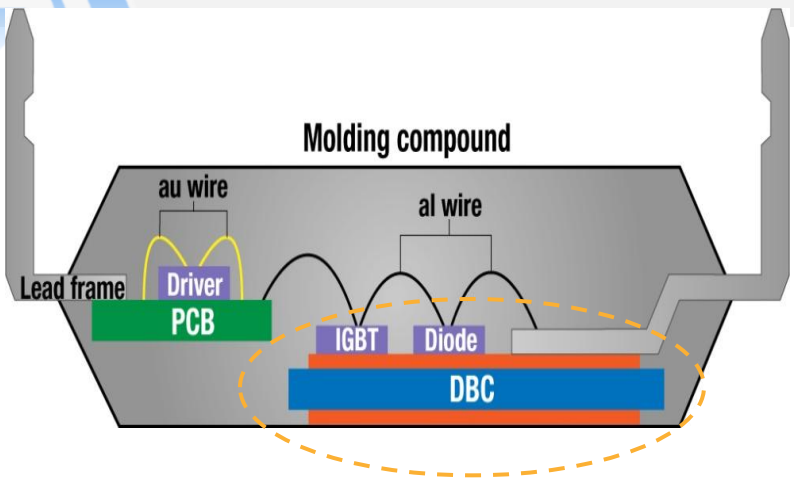
- DIP Molded Package
- PCB for drivers & SMD
- DBC (Direct Bond Copper) for power stage (copper surface exposed)

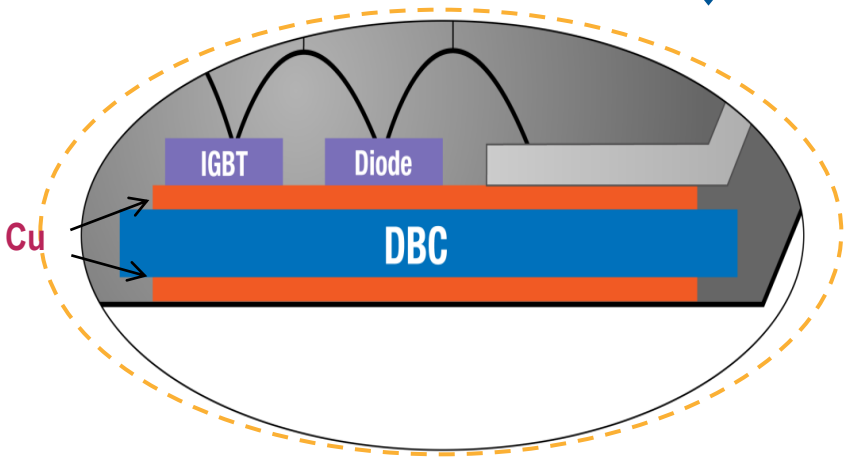
Ceramic



- DIP Molded Package
- PCB for drivers & SMD
- Lead frame and exposed ceramic sink for power stage

DBC package technology





ST's dual in line (DIP) molded packages have:

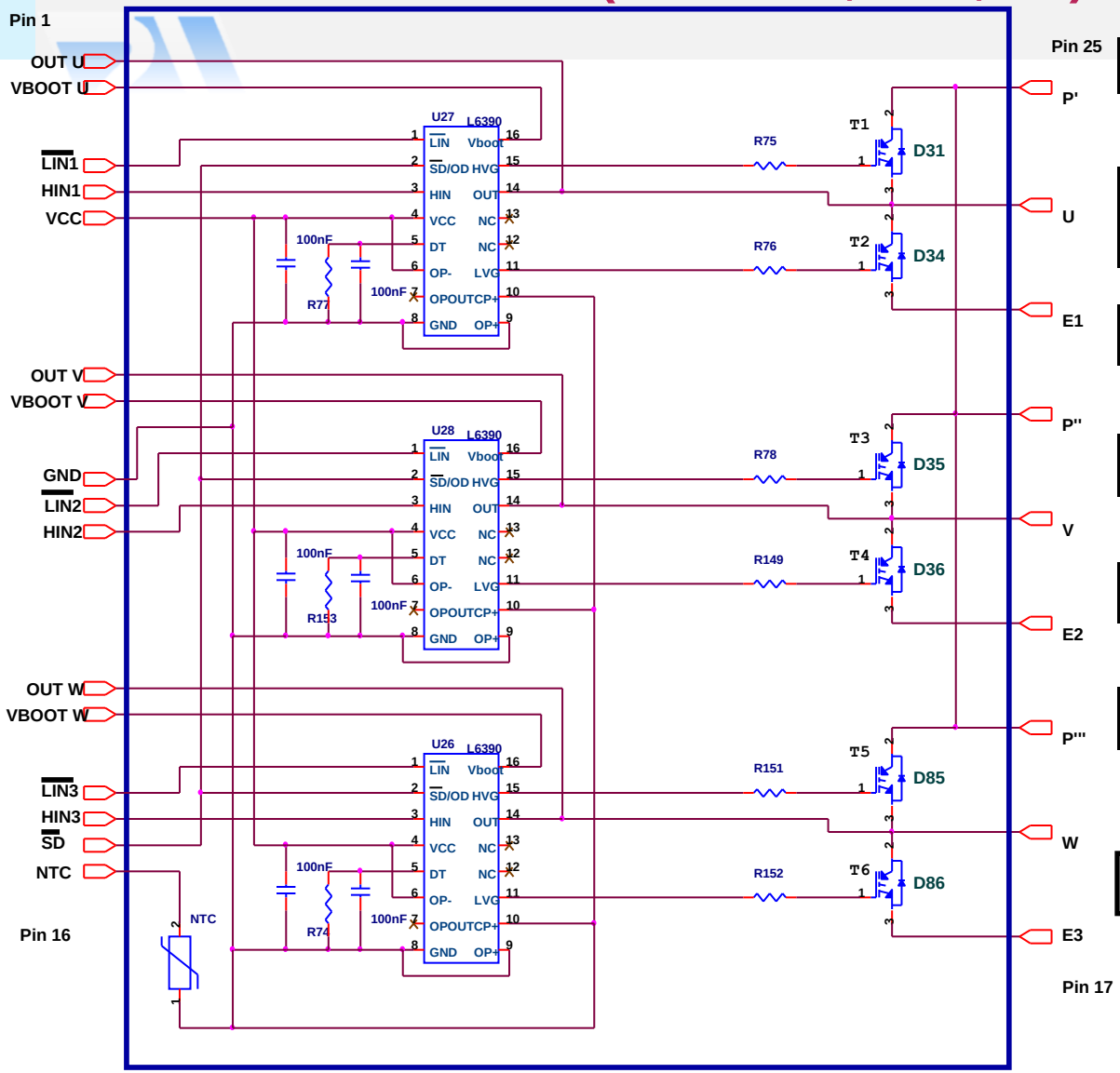
- **a PCB layer for gate drivers and SMD**
- **a DBC (direct bonded copper) technology for power stage for better heat dissipation**

A vacuum soldering process is used to avoid any gas inclusion (voids) during the soldering process that could cause potential hot spots. It results in a further increase in the reliability of ST's IPMs due to the improved thermal and electrical conductivity.

This technology gives ST's IPMs low thermal resistance values, so ensuring stability in thermal cycling.

Part number	R_{TH} (C/W)
STGIPS10K60A	3.8
STGIPS14K60	3
STGIPL14K60	2.4
STGIPS20K60	2.8

New STGIPSxxK60T 600V, 10-14A IPM (Vcc = 21V, NTC, SD)



Driver: L6390

Pin To Pin compatible vs STGIPS10K60A

NTC co-packed

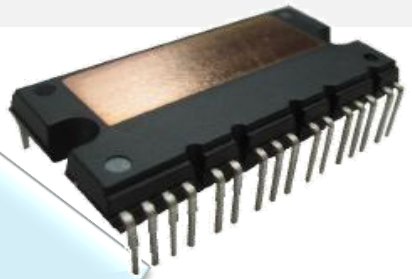
SD PIN

44.4 x 22.0 x 5.4 mm

DBC

Tj = -40 to 150 °C

IPM Road Map



STGIPS20K60

STGIPL20K60

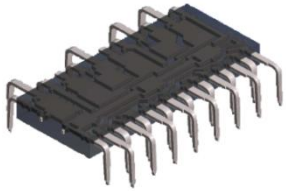
STGIPL14K60

STGIPS14K60

STGIPS14K60T

STGIPS10K60A

STGIPS10K60T



Nano SLIMM 100W !!

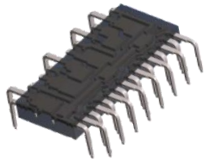
1kW

1.5kW

2kW

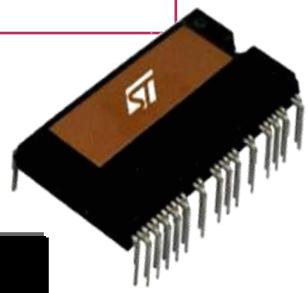
Output Power

SLLIMM™ family

POWER MODULE proposal		
3 A DC @25° C	10 – 15A DC @25° C	18 – 20A DC @25° C
STGIPN3H60	STGIPS10K60A	STGIPS20K60
STGIPN3H60A	STGIPS14K60	STGIPL20K60
	STGIPL14K60	STGIPS20K60T
	STGIPS10K60T	
	STGIPS14K60T	

Samples NOW

Full Pruduction



Package type:
S = Small DIP 25 Leads molded;
L = Small DIP 38 Leads molded
N = Nano 26L

TECHNOLOGY INFORMATION:
K = Short circuit rated
H = Tailored for low power app.

G = IGBT Device

ST	G	IP	z	ii	K	vv	T

IP = 3 phase IPM

Current rating

Voltage / 10

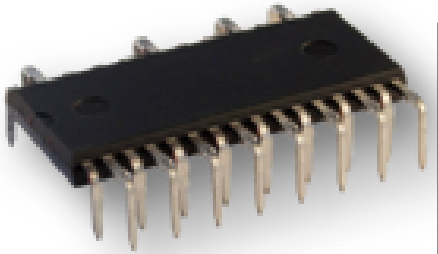
A,T = embedded NTC
Blank = no NTC

IPM Road Map and Features

PART NUMBER	STGIPS10K60A	STGIPS10K60T	STGIPS14K60T	STGIPS14K60	STGIPL14K60	STGIPS20K60	STGIPL20K60
Pin Count	25	25	25	25	38	25	38
Pkg Size [mm]	44.4*22.0*5.4	44.4*22.0*5.4	44.4*22.0*5.4	44.4*22.0*5.4	49.6*24.5*5.4	44.4*22.0*5.4	49.6*24.5*5.4
DBC substrate	yes	yes	yes	yes	yes	yes	yes
Voltage [V]	600	600	600	600	600	600	600
Current @ Tc=25° C [A]	10	10	14	14	15	18	20
Rth (max) [ºC/W]	3.8	3.8	3	3	2.8	2.4	2.2
NTC	yes	yes	yes	no	yes	no	yes
Integrated Bootstrap diode	yes	yes	yes	yes	yes	yes	yes
Smart shutdown function	no	no	no	yes	yes	yes	yes
SD function	no	yes	yes	yes	yes	yes	yes
Op-amps for Advanced current sensing	no	no	no	no	yes	no	yes
Comparator for fault protection	no	no	no	yes (1pin)	yes (3pin)	yes (1pin)	yes (3pin)

Tj = -40 to 150 °C

SLIMM NANO FEATURES



	Basic	Fully featured
Feature \ Part Number	STGIPN3H60A	STGIPN3H60
Pin Count	26	26
Package Size [mm]	29,5x12.5X3.1	29,5x12.5X3.1
Voltage [V]	600	600
Current @ Tc=25 C [A]	3	3
$R_{th(J-A)}$ [C/W]	50	50
Integrated bootstrap diode	Yes	Yes
Smart shutdown function	No	Yes
SD function	No	Yes
Op-amps for advanced current sensing	No	Yes
Comparator for fault protection	No	Yes
3.3/5V input interface compatibility	Yes	Yes
Interlocking function	Yes	Yes
Under Voltage Lockout	Yes	Yes

SLIMM COMPLETE ROAD MAP

BV_{CES}	I_{CN} [1)]	PN	Package	NTC	Bootstrap Diode	Rth (ºC/W)	Eng samples
600 V	3 A	STGIPN3H60A	nDIP-26L	No	Yes	50(*)	MP
	3 A	STGIPN3H60	nDIP-26L	No	Yes	50(*)	MP
	10 A	STGIPS10K60A	SDIP-25L	Yes	Yes	3.8	MP
	10 A	STGIPS10K60T	SDIP-25L	Yes	Yes	3.8	MP
	14 A	STGIPS14K60	SDIP-25L	No	Yes	3	MP
	14 A	STGIPS14K60T	SDIP-25L	Yes	Yes	3	MP
	15 A	STGIPL14K60	SDIP-38L	Yes	Yes	2.8	MP
	18 A	STGIPS20K60	SDIP-25L	No	Yes	2.4	MP
	20 A	STGIPL20K60	SDIP-38L	Yes	Yes	2.2	MP
	20 A	STGIPS20C60	SDIP-25L	No	Yes	2.6	Sep ’12
	30 A	STGIPS30C60	SDIP-25L	No	Yes	2.2	Sep ’12

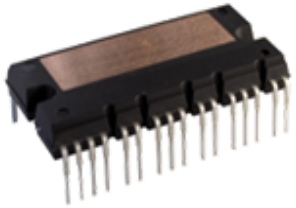
1) I_{CN} = continuous I_C @ 25°C

(*) Values are referred to Junction - Ambient

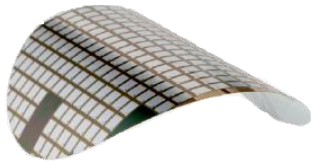
SLLIMM-nano

nDIP-26L

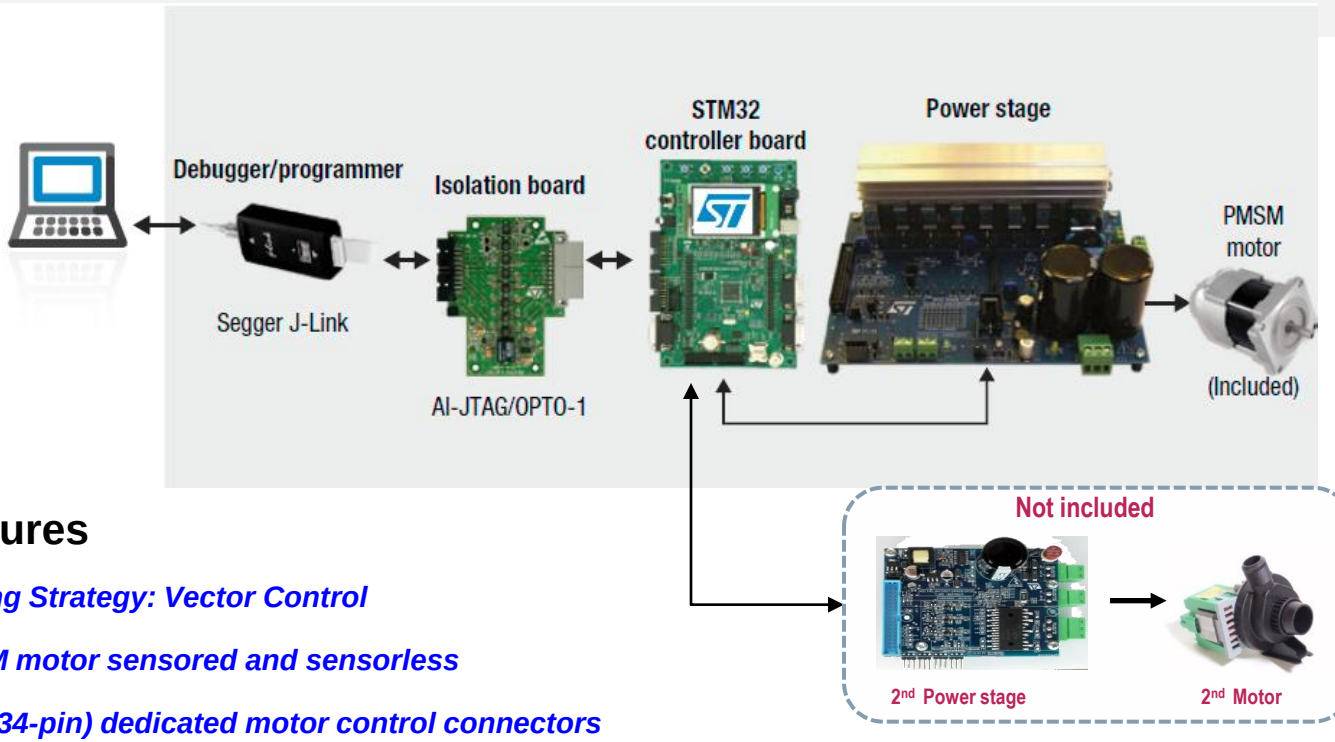
SLLIMM



SDIP-25L



STM32FXX MC KIT



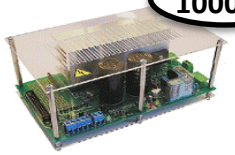
Main Features

- *Driving Strategy: Vector Control*
- *PMSM motor sensored and sensorless*
- *Two (34-pin) dedicated motor control connectors*
- *Encoder sensor input*
- *Hall sensor input*
- *Tachometer sensor input*
- *Current sensing mode:*
  - *3 shunt resistors*
  - *Single shunt*

Key Component

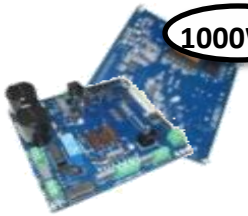
- L6390D (Gate Drivers)
- VIPer16LD (Power Supply down converter)
- L7815ABV, L78M05CDT, LD1117S33TR (Voltage regulators)
- STGP10NC60KD (IGBT)
- TS391ILT, (Comparator)
- M74HC14TTR (Logic)

Complementing MC Starter Kits



STEVAL-IHM025V1

- 1 x IGBT SLLIMM™ STGIPL14K60
- 1 converter based on Viper16
- 1 x IGBT STGP10NC60KD



STEVAL-IHM027V1

- 1 x IGBT SLLIMM™ STGIPS10K60A
- 1 converter based on Viper16
- 1 x IGBT STGP10NC60KD

STEVAL-IHM028V1

- 1 x IGBT SLLIMM™ STGIPS20K60
- 1 x PWM SMPS VIPer26LD
- 1 x IGBT STGW35NB60SD

STEVAL-IHM035V1

- 1 x IGBT SLLIMM™ STGIPN3H60
- 1 x PWM SMPS VIPer16L

Coming soon

STEVAL-IHM023V2

- 3 x PWM smart driver L6390
- 1 converter based on Viper16
- 7 x IGBT power switch STGP10NC60KD

STEVAL-IHM021V2

- 3 x PWM smart driver L6390
- 1 converter based on Viper12
- 6 x MOSFET power switch STD5N52U

STEVAL-IHM032V1

- 3 x PWM smart driver: 2xL6392D and 1x L6391D
- 1 converter based on Viper12
- 6 x IGBT power switch: STGD3HF60HD

SLLIMM™ (ST IPMs) based

Gate drivers & Power Transistors based

Please visit http://www.st.com/evalboards or contact a Silica office

Complementing MC Starter Kits

STEVAL-IHM031V1

Power stage up to 12/24V

- 3 x dual PowerMOSFETs STS8dnh3l
- 2 x PWM smart driver L6387E
- 1x step down converter L4976D

STEVAL-IEM003V1

Power stage up to 48V

- 3 x PWM smart driver L6388
- 6x LV Power MOSFET STV250N55F3
- 1x step down converter L4978D

Please visit http://www.st.com/evalboards or contact a Silica office

Complete 3ph Motor Drive solutions

45w

STEVAL-IFN003V1

PMSM FOC Motor Drive

- 1 x 32bit Micro STM32F103C
- 1 x Motor Drive Ic L6230PD

35w

STEVAL-IFN004V1

BLDC Six-Steps Motor Drive

- 1 x 8bit-Micro STM8S
- 1 x Motor Drive Ic L6230Q

Low voltage drives

100w

STEVAL-IHM036V1

PMSM FOC Motor Drive

- 1 x 32bit Micro STM32F100C6
- 1 x IGBT SLLIMM™ STGIPN3H60
- 1 converter based on Viper16

1300W

STEVAL-IHM034V1

Dual motor drive + digital PFC

- 1 x 32bit Micro STM32F103C8T6
- 1 x IGBT SLLIMM™ STGIPS20K60
- 1 converter based on Viper16L

Coming soon

40W

STEVAL-IHM038V1

FAN Drive + PFC + IrDA

- 1 x 32bit Micro STM32F100C6
- 1 x IGBT SLLIMM™ STGIPN3H60
- 1 PFC controller L6562A

Coming soon

High voltage drives

Please visit http://www.st.com/evalboards or contact a Silica office

STM8/32 Eval Board

STM8 MC library v1.0

Scalar Control

STM8/128-EVAL

STM32 PMSM FOC SDK v3.2

FOC

STM32F100x

STM32100B-EVAL

STEVAL-IHM033V1

FOC

Dual FOC

STM32F103, F2xx, F4xx

STM32-EVAL

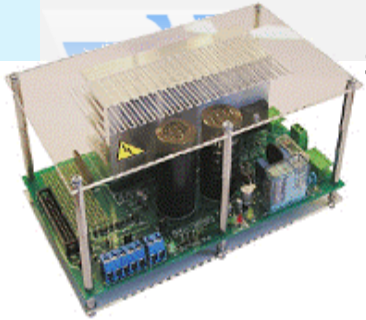
STEVAL-IHM022V1

MC connector

Power Stages

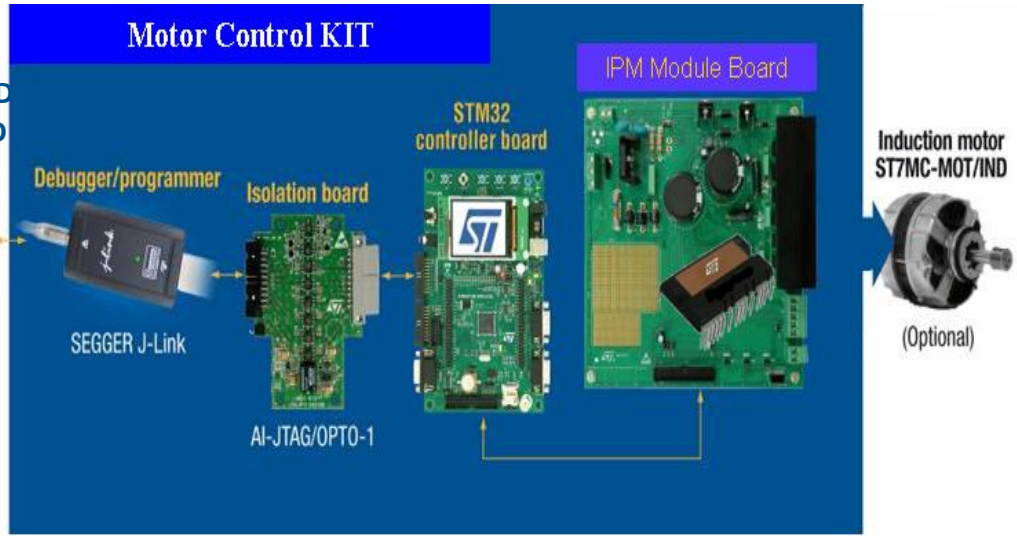
Please visit http://www.st.com/evalboards or contact a Silica office

IPM demo-board complementing the STM32 kit



STEVAL-IHM025V1

- 1 x IGBT IPM STGIPL14K60
- 1 x PWM SMPS smart driver VIPer16LD
- 1 x IGBT power switch STGP10NC60KD

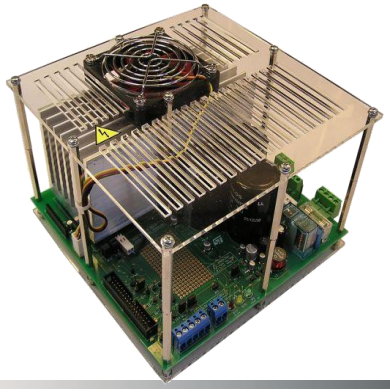


STEVAL-IHM027V1

- 1 x IGBT IPM STGIPS10K60A
- 1 x buck converter based on Viper16
- 1 x IGBT power switch STGP10NC60KD

- Three-phase power stage with shunt-based current reading
- Complete source files software libraries for 3-PH Induction and PMSM motors provided

COMING SOON



STEVAL-IHM028V1

- 1 x IGBT IPM STGIPS20K60
- 1 x PWM SMPS smart driver VIPer26LD
- 1 x IGBT power switch STGW35NB60SD

1KW Power Inverter complete solution

- Single phase connecting - supply voltage from 125VDC to 400VDC
- Possibility to use PMAC motors, 3-phase asynchronous motors, bi-phase AC motors or BLDC motors
- Input in-rush limiter with by-passing relay
- Brake switch with over-voltage comparator
- Hall sensor or encoder input feature, tachometer input feature
- Over-temperature and over-current hardware protection
- Compact and safety design

- 1 x IGBT IPM **STGIPL14K60**
- 1 x PWM SMPS smart driver **VIPer16LD**
- 1 x IGBT power switch **STGP10NC60KD**

Ordering code: STEVAL-IHM025V1

Evaluation boards available at: http://www.st.com/evalboards

3 Φ Inverter up to 1KW

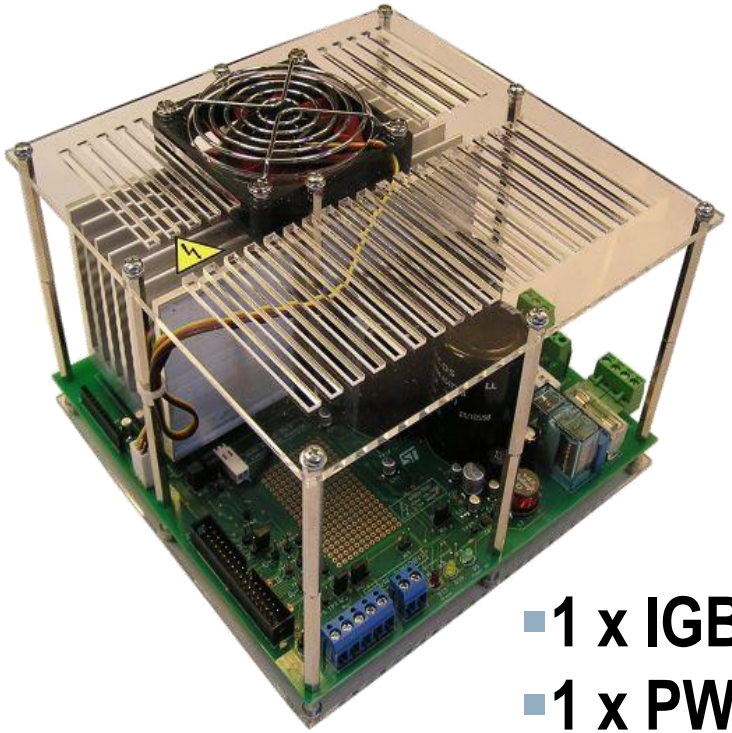
- Single phase connecting - supply voltage from 125VDC to 350VDC
- Motor control connector for interface with STM3210B-EVAL board
- Possibility to use induction motor or PMSM motors up to 1000 W
- Regenerative brake control feature
- Input inrush limitation with bypassing relay
- Hall\Encoder inputs
- Possibility to connect BEMF daughter board for sensor-less six-step control of BLDC motors
- Tachometer input
- Compact and safety design

- 1 x IGBT IPM **STGIPS10K60A**
- 1 x buck converter based on **Viper16**
- 1 x Low Voltage Bipolar **2STR1230**

Ordering code: STEVAL-IHM027V1

Evaluation boards available at: http://www.st.com/evalboards

2KW Power Inverter complete solution



- HV supply mode -voltage 90VAC to 285VAC or direct DC line 125VDC to 400VDC
- Input voltage range extended to +400V to be compliant with PFC
- Input inrush limiter with bypassing relay
- Brake feature with over-voltage comparator
- Single or three shunt resistors current sensing method
- Hall sensor or encoder input feature
- Tachometer input feature
- Over-temperature and over-current hardware protection
- Active fan with automatic over-temperature switching
- Relative compact and safety design

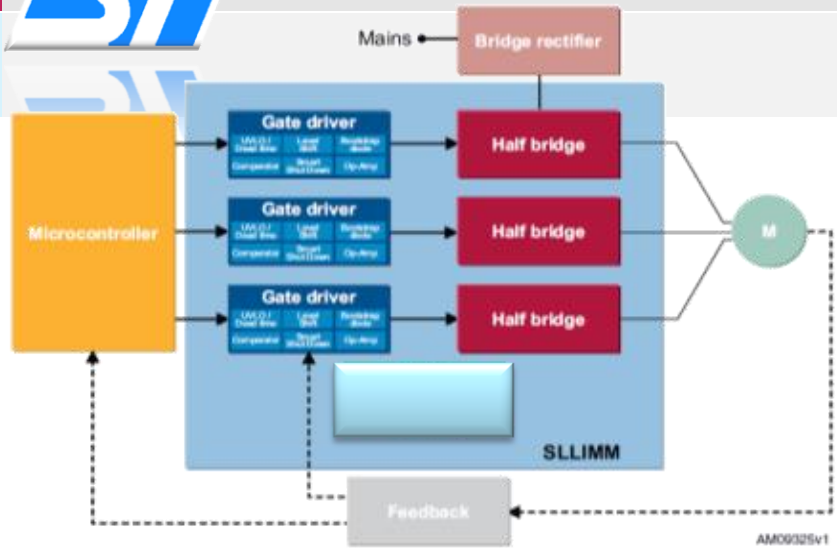
- 1 x IGBT IPM STGIPS20K60
- 1 x PWM SMPS smart driver VIPer26LD
- 1 x IGBT power switch STGW35NB60SD

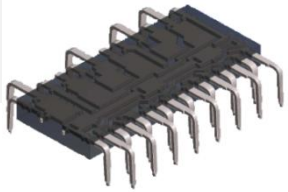
COMING SOON

Ordering code: STEVAL-IHM028V1

Evaluation boards available at: http://www.st.com/evalboards

SLIMM Nano





Tj = from -40ºC to 150ºC

Benefits

- High quality and Reliability
- Advanced protection function
- Improved efficiency
- Reduce EMI and noise
- Reduce total system cost
- Easy Layout

Main features and integrated functions

- 600 V, 3 A ratings
- 3-phase IGBT inverter bridge including:
  - 6 low-loss and short-circuit protected IGBTs
  - 6 low forward voltage drop and soft recovery freewheeling diodes
- Three control ICs for gate driving and protection including:
  - smart shutdown function
  - comparator for fault protection against overcurrent and short-circuit
  - op amp for advanced current sensing
  - three integrated bootstrap diodes
  - interlocking function
  - undervoltage lockout

Main Applications

- General purpose Low power motor drives
- Dish washers
- Compressor drives
- Refrigerators
- Pumps
- Air Con
- Fans

STGIPN3H60 & STGIPN3H60A

SLIMM NANO Applications

Dish washers

Refrigerators

Pumps

Compressor

Fan

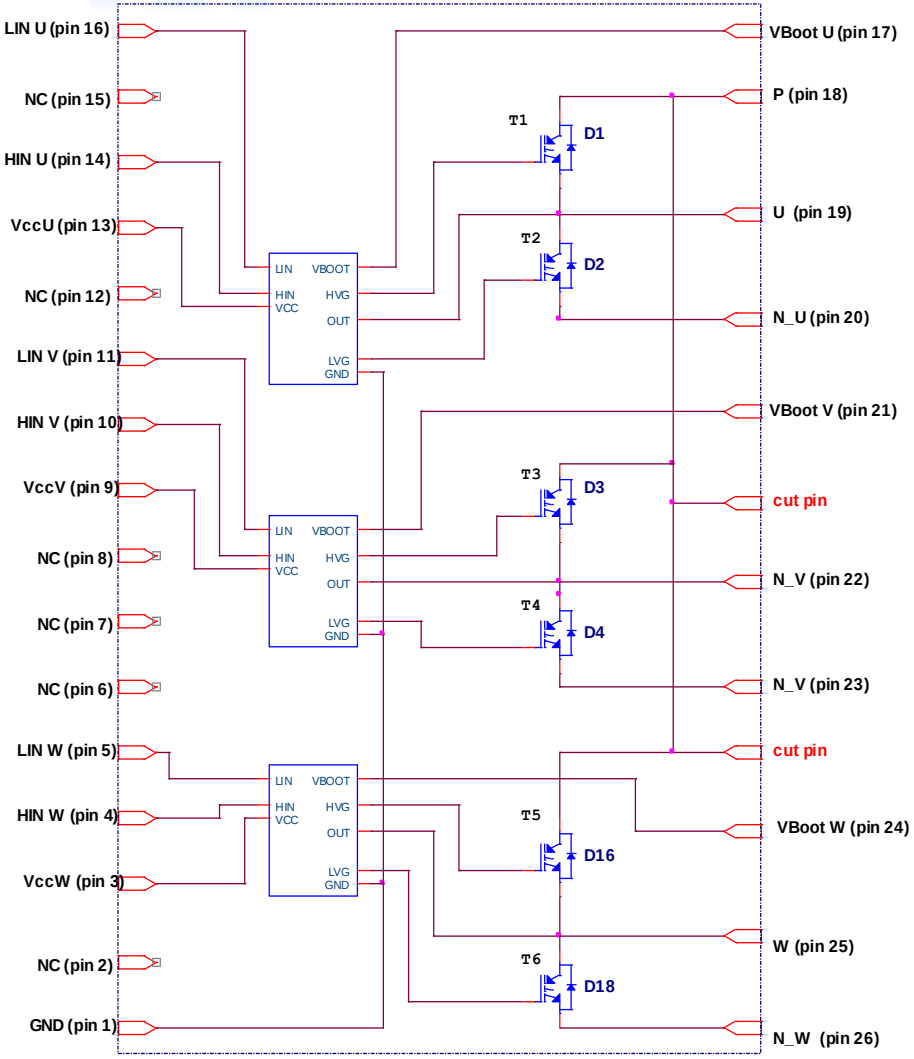
Power range up to 100W (free air)

SLLIMM™-nano at glance Vs main competitor

Main Features	STGIPN3H60A	STGIPN3H60	Main Competitor
Pin Count	26	26	23
Pkg Size [mm]	29,5x12.5X3.1	29,5x12.5X3.1	29x12x3.5
Voltage [V]	600	600	500
Current @ Tc=25° C [A]	3	3	3
Rth [° C/W]	< 9	< 9	8.9
Integrated Bootstrap diode	yes	yes	no
Smart shutdown function	no	yes	no
SD function	no	yes	no
Op-amps for Advanced current sensing	no	yes	no
Comparator for fault protection	no	yes	no
3.3/5V input interface compatibility	yes	yes	yes
Interlocking Function	yes	yes	no
Under Voltage lockout (on Vcc and Vboot)	yes	yes	yes

Tj = -40 to 150 °C

STGIPN3H60A pin-out (basic features)

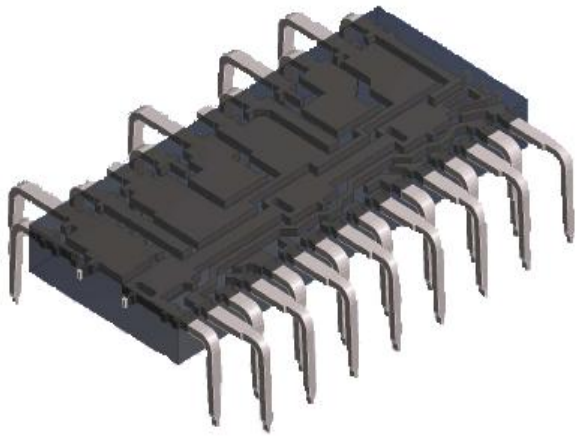


6x 4A/600V IGBTs with ultra- soft fast recovery diode.

3x L6388 (High voltage gate driver)

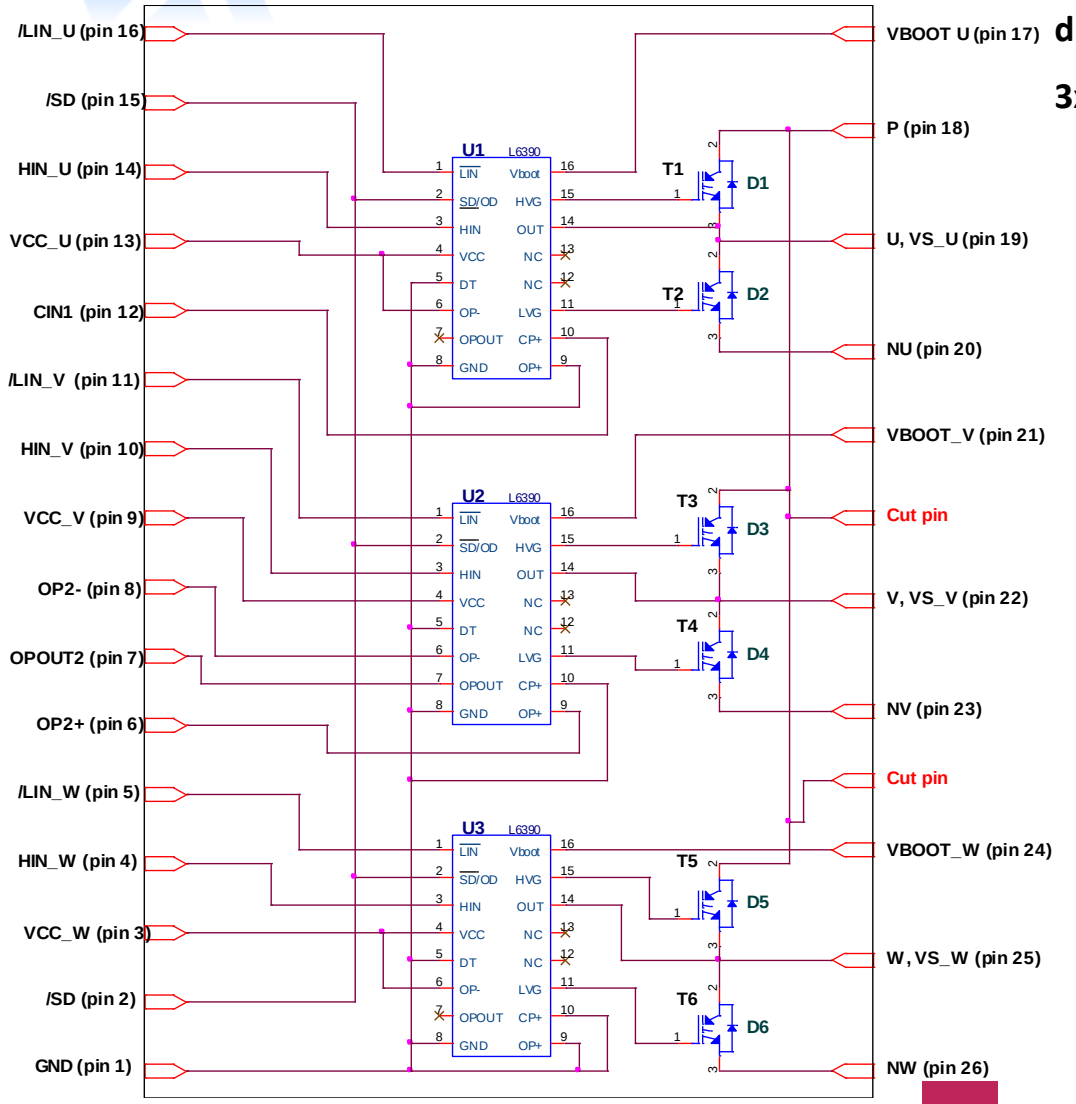
- ✓ Dead time and interlocking function
- ✓ Internal bootstrap diode
- ✓ 3.3V, 5V and 15V CMOS/TTL compatible inputs

Tj = -40 to 150 °C



L6388 based

STGIPN3H60 Pin-out (full features)

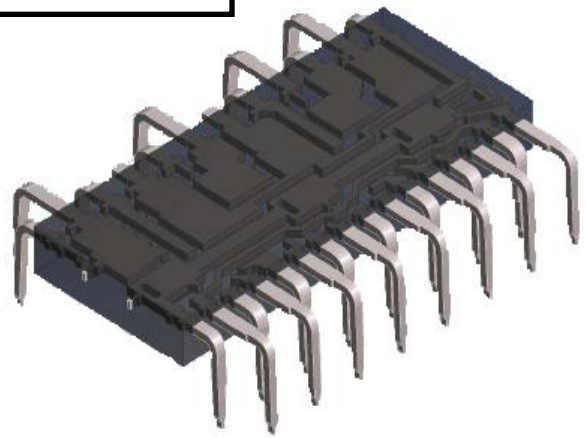


6x 4A/600V IGBTs with ultra-soft fast recovery diode.

3x L6390 (High voltage gate driver)

- ✓ **L6388 features plus:**
- ✓ **Shutdown pin and Smart shutdown**
- ✓ **Comparator for fault detection**
- ✓ **OpAmp for advanced current sensing**

Tj = -40 to 150 °C



L6390 based

High Voltage Drivers ICs

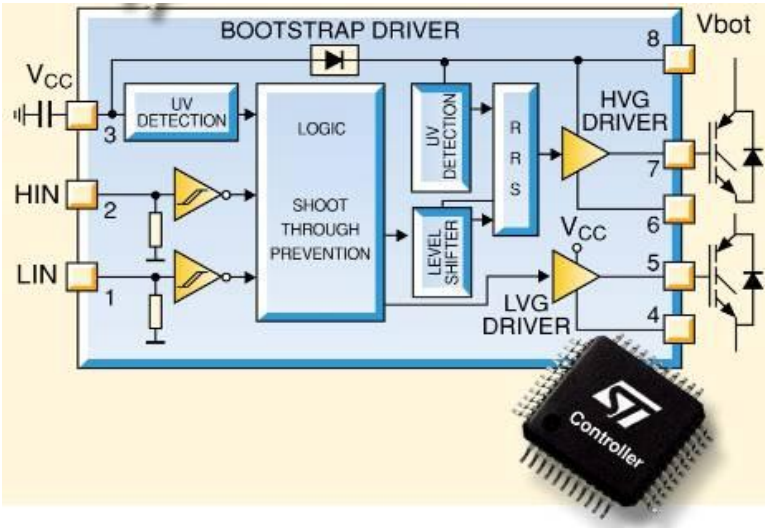
DRIVERS
Half bridge L638XE Short Form

600V Applications:

Feature / Part	L6384E	L6385E	L6386E	L6387E	L6388E
Peak current +/- (min.)	400mA / 600mA	400mA / 600mA	400mA / 600mA	400mA / 600mA	400mA / 600mA
Asymmetric H.B.	no	yes	yes	no	no
Symmetric H.B.	yes	yes	yes	yes	yes
Shut Down	yes	no	yes	no	no
Internal Comparator	no	no	yes	no	no
UVLO on Vcc	Yes ON 12V OFF 10V	Yes ON 9.6V OFF 8.3V	Yes ON 12V OFF 10V	Yes ON 6V OFF 5.5V	Yes ON 9.6V OFF 8.3V
UVLO on Vboot	no	Yes ON 9.5V OFF 8.2V	Yes ON 11.9V OFF 9.9V	no	Yes ON 9.5V OFF 8.2V

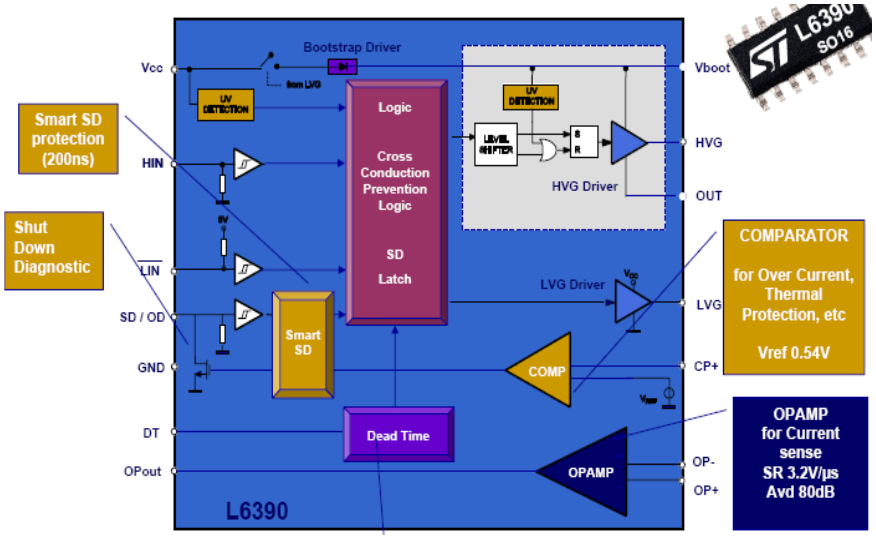
NEW INTELLIGENT POWER MODULE DRIVERS

STGIPS10K60A
HVGD



- *Dual Input*
- *CMOS/TTL Schmitt Trigger Inputs*
- *Shoot Through Protection*
- *Under Voltage Lock Out*
- *3.3V Input Logic*

STGIPS14K60 / STGIPL14K60
HVGD



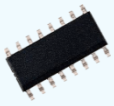
- *Dual Input*
- *Under Voltage Lock Out*
- *OPAMP*
- *Comparator*
- *Dedicated pin for ShutDown*
- *Smart ShutDown*
- *Dead Time*

DRIVERS
Half bridge L639x main features

Full Feature

Single Input
Comparator
Dedicated pin for SD
Adjustable DT
Dedicated pin for OCD
Auxiliary Input

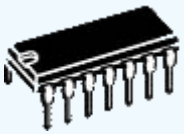
L6393



SO14
narrow

Dual Input
OPAMP
Dedicated pin for SD
Adjustable DT
One input out of phase

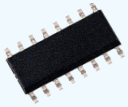
L6392



DIP14

Dual Input
OPAMP
Comparator
Dedicated pin for SD
Adjustable DT
Two non connected lead

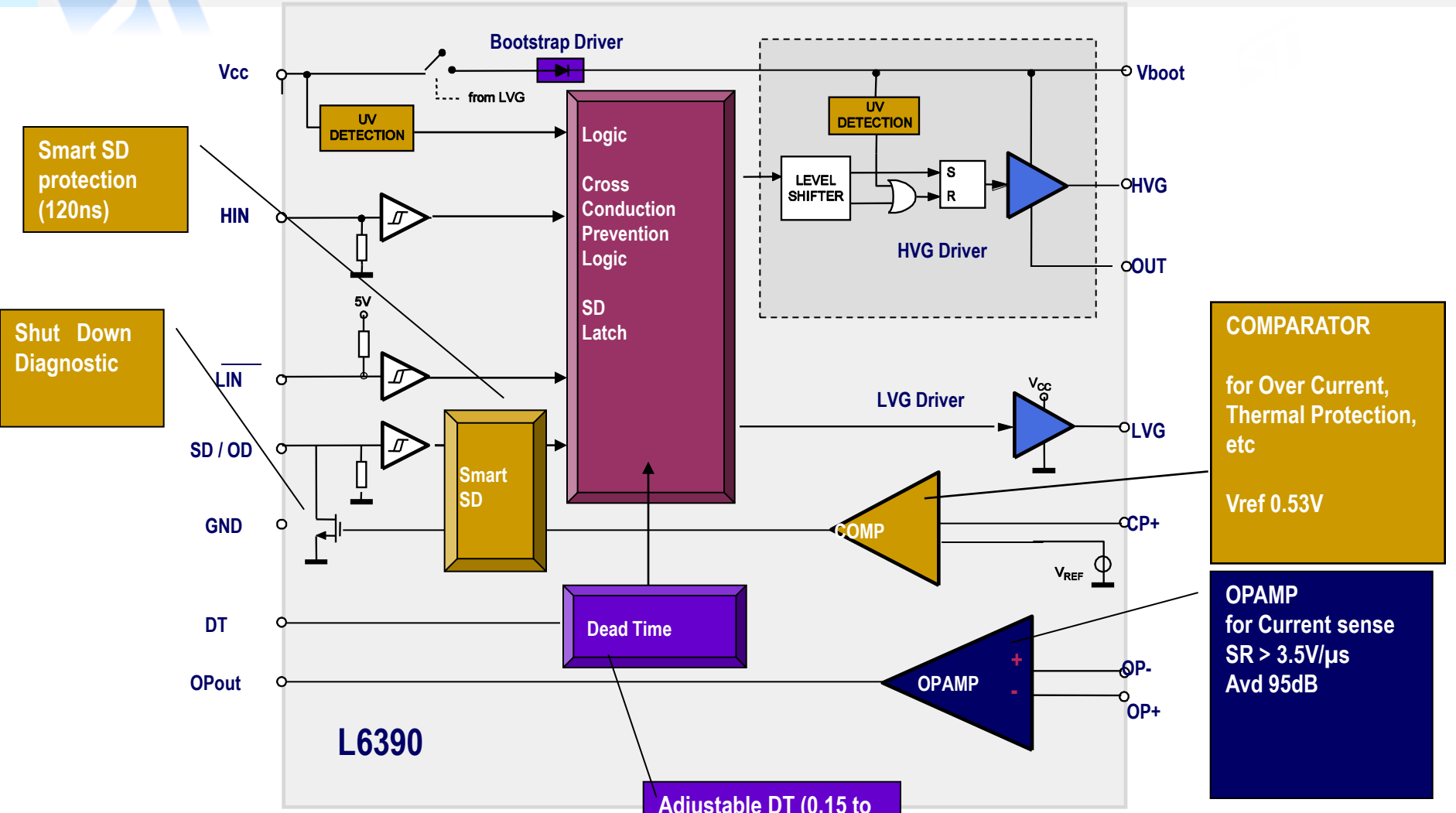
L6390



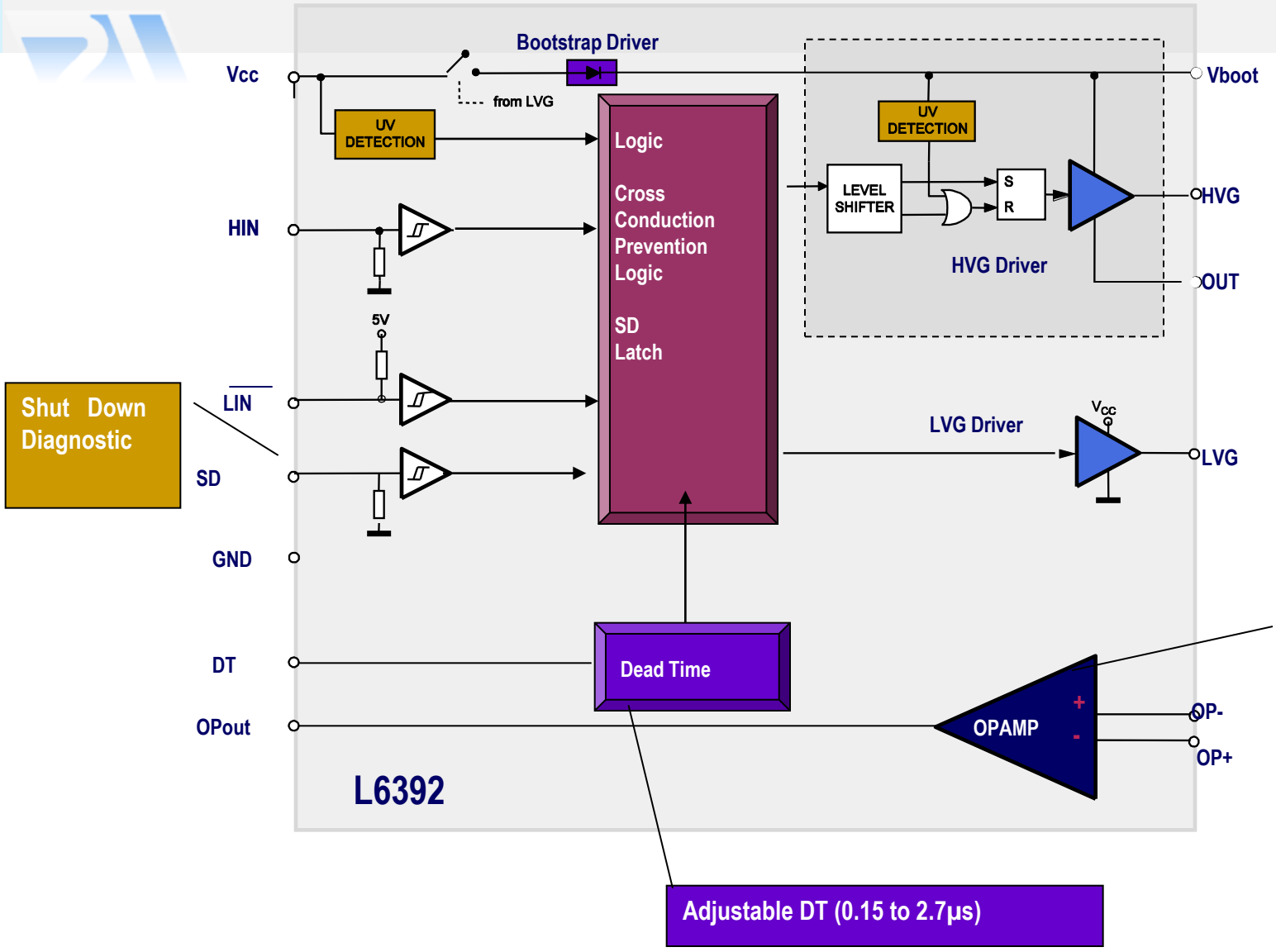
SO16
narrow

DIP16

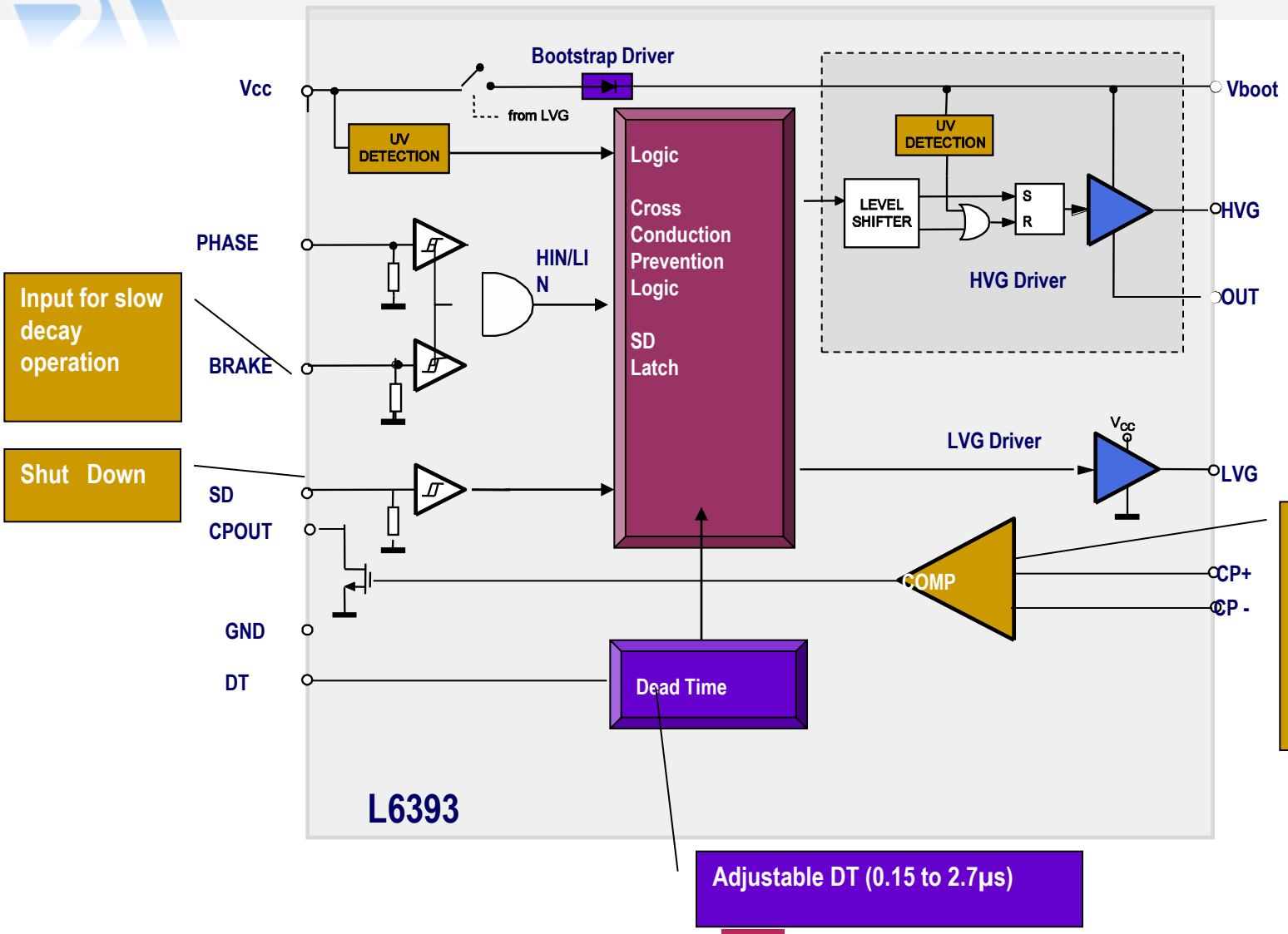
DRIVERS
Half bridge L6390 main features



DRIVERS
Half bridge L6392 main features



DRIVERS
Half bridge L6393 main features

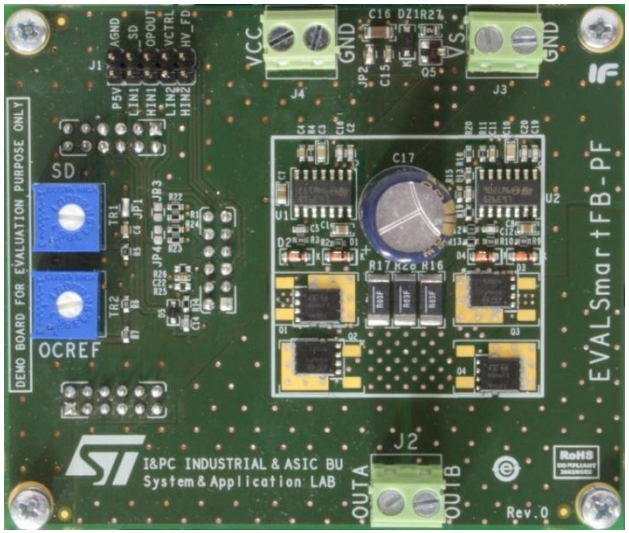


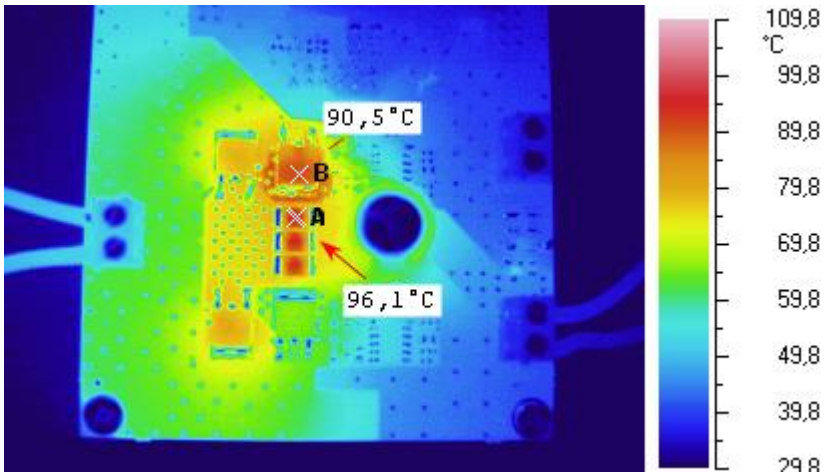
DC Motor Voltage Driver

Gate Opener DC Motor Control 60V-10A
DC motor NEW evalboard

L6391 + L6392
+4 STD60NF06

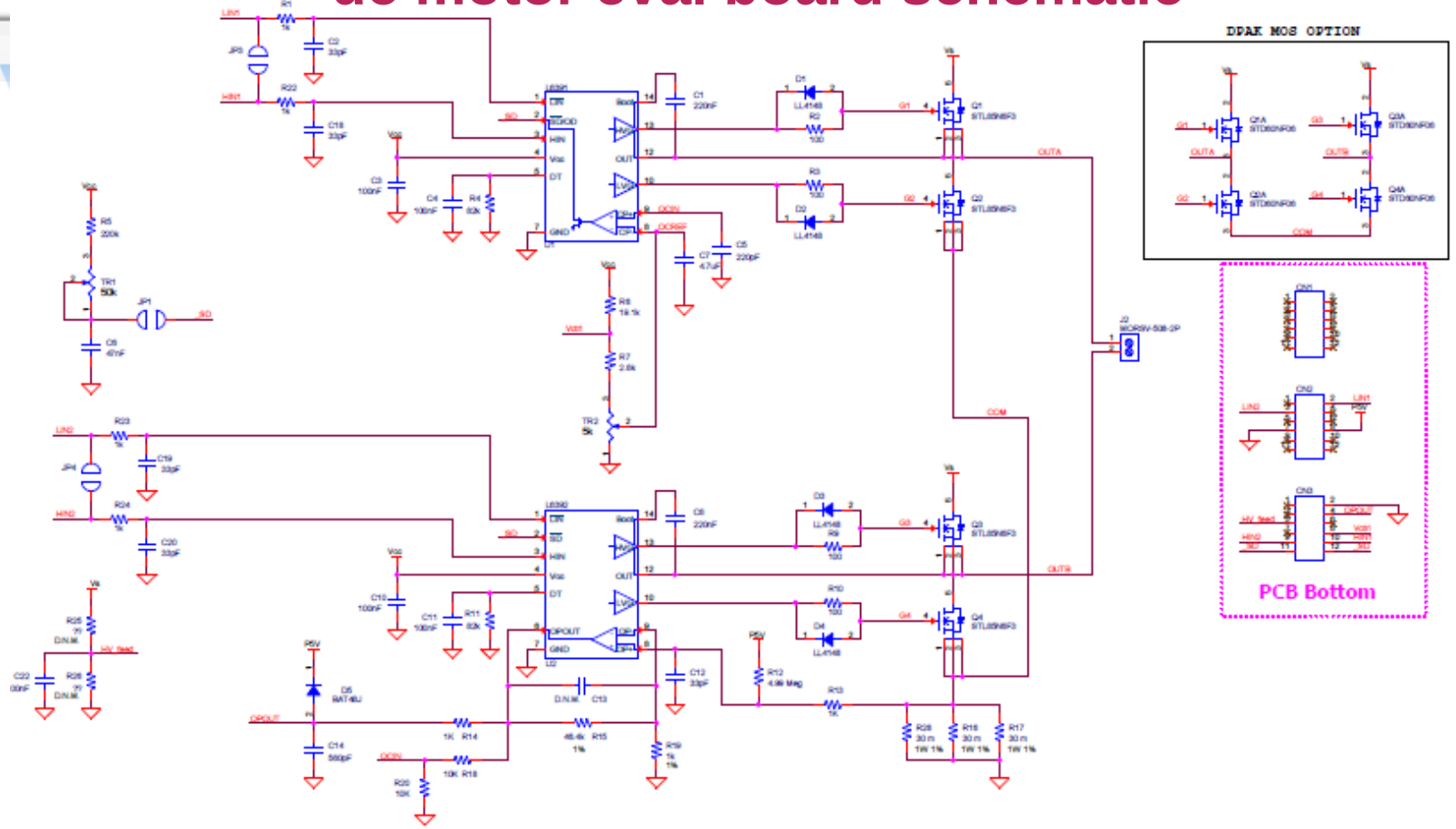
T amb 30°C 10 A
Thermal Measure





Amplified Current monitoring and short circuit protection

Gate Opener DC Motor Control 60V-10A dc motor eval board schematic

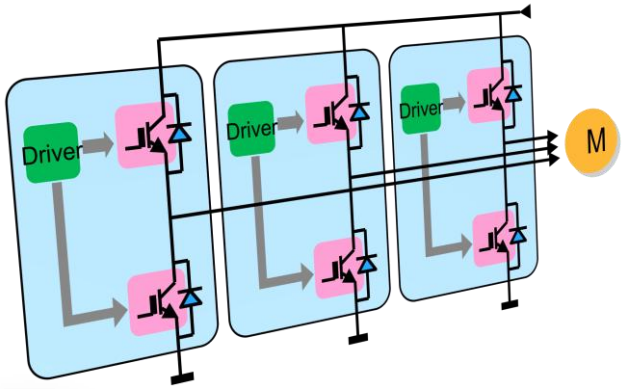


REVISION DATE	DESCRIPTION		SYMBOL
	Full-Bridge with overcurrent protection L6391 and L6392 High-Voltage gate drivers		EVALL639192FB
Industrial & LI. AGRATE B. ITALY			GROUP
ALL RIGHTS STRICTLY RESERVED. REPRODUCTION OR ISSUE TO THIRD PARTIES IN ANY FORM WHATSOEVER IS NOT PERMITTED WITHOUT WRITTEN AUTHORIZATION FROM	TOLERANCE UNLESS NOTED UNIT=MM	ISO	SCALE / REV
STMicroelectronics	LINEAR: 0 ±10; >10 ≤60; >60 ≤300; >300; Ang. Lim.	Sheet 1 of 1	1.1
DRAWN DATE February 13, 2012	MIDDLE: ±0.1; ±0.3; ±0.3; ±0.5; ±1°	MATERIAL	
APPROVED DATE	ACCURATE: ±0.05; ±0.1; ±0.15; ±0.35; ±30'	TREATMENT AND SURFACE FINISHING	

SLLIMM Single Leg

SLIMM Single Leg: Modular Half-Bridge IPM

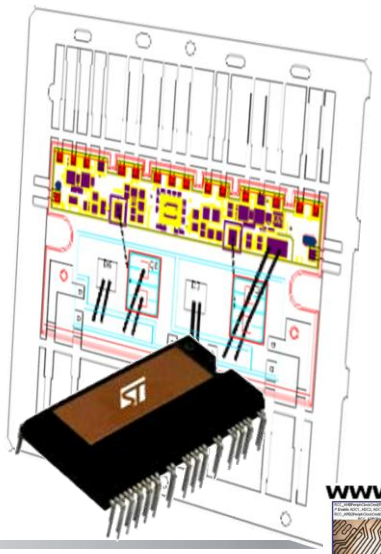
Target: A complete leg (high side and low side high power switches) including the relative driving in a SLLIMM package for a modular approach



It includes several innovative features:

- Modular and expandable solution
- Better Thermal behavior than a complete six-pack solution in a unique molded module
- More flexible customer board design
- Several “smart” functions embedded
- Silicon options offered for both PFC (W) and Motor Control (K)

PN	BV_{CES}	I_C @ 25° C	Features	NTC	Package	Samples
STGIPS35K60L1	600 V	35 A	L6390 based	Y	SDIP 22L	Available
STGIPS40W60L1		40 A	L6390 based	Y	SDIP 22L	Available
STGIPL35K120L1	1200V	35 A	TD350 based	Y	SDIP 18L	Available



Modular Half-Bridge IPM Driver Features

L6390 Driver available features	35A 600V
Pkg Size [mm]	49.6*24.5*5.4
DBC substrate	yes
Voltage [V]	600
Current @ Tc=25° C [A]	35
Rth (max) [ºC/W]	1.25
Embedded Thermal Resistor (NTC)	Yes
Integrated Bootstrap diode	Yes
Smart shutdown function	Yes
SD function	Yes
Op-amps for Advanced current sensing	Yes (3 pins)
Comparator for fault protection	Yes
3.3/5V input interface compatibility	Yes
Interlocking Function	Yes
Under Voltage lockout (on Vcc and Vboot)	yes

Integrated bootstrap diodes mean:

- component cost saving

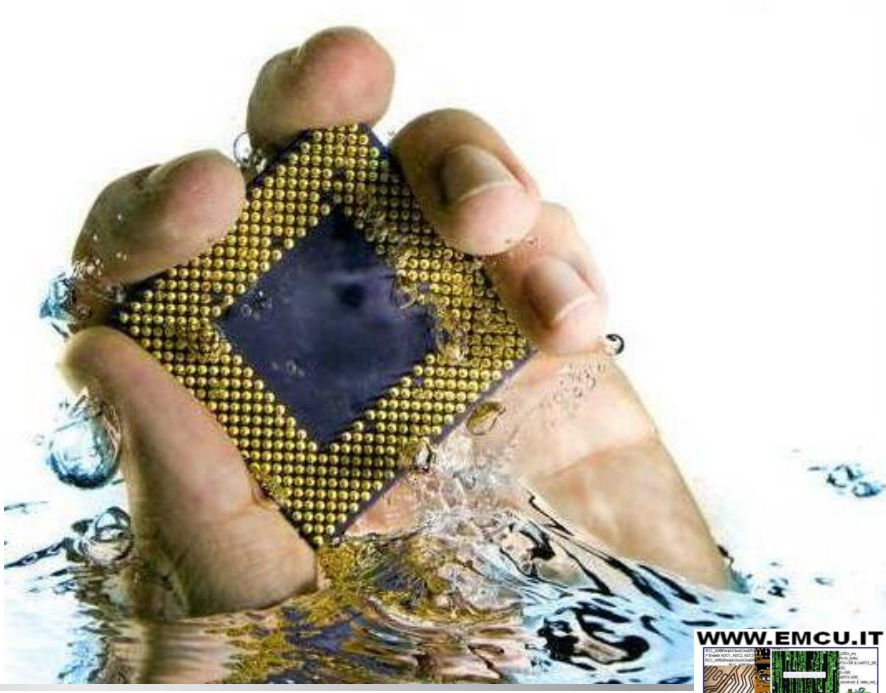
- easy layout

Thanks to Smart Shutdown function, ST HV gate driver can turn off the IPM in a faster (T:200ns) and safer way during abnormal state (Over Current or Over Temperature)

SD function available for an efficient connection with micro-controller

Integrated interlocking function can avoid any malfunctioning coming from overlapped input signals

Stepper Driver ICs



Motor Control Ics
Low Voltage

Power SPIN™

PowerSpin evolutionary revolutions

- L620x & L622X
- PWM Control
- Open Scalable

Controller & Driver for Stepper & DC Motors

*d*SPIN™ Digital Micro Stepping Driver

- L6470 Truly Innovative Digital Architecture conceived to enable wide variety of Implementations

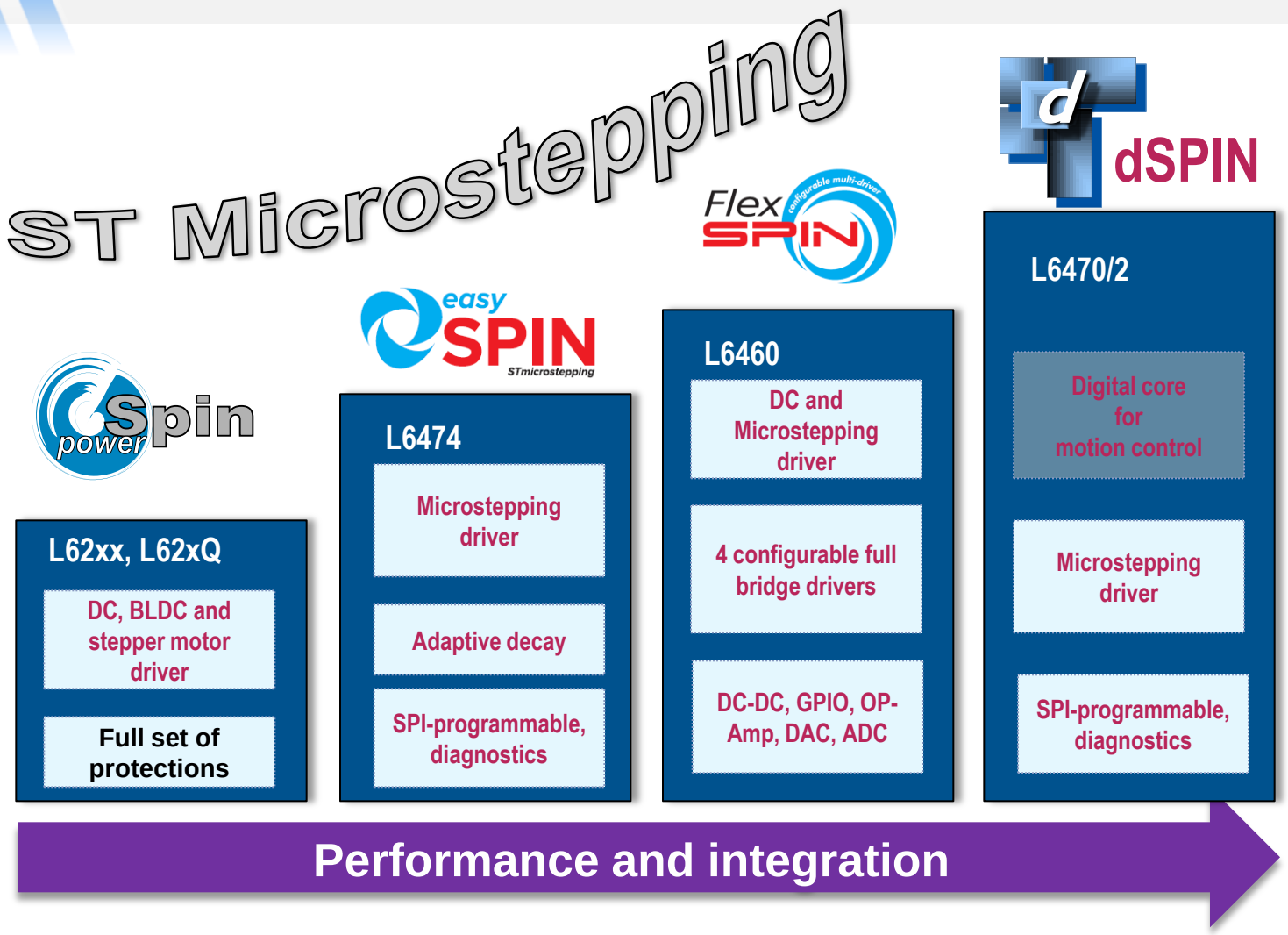
SPI Digital Driver for µStepper Motors

FlexSPIN™ Digital Micro Stepping Driver

- L6460 Flexible configurable Multi Motors Driving & Control

SPI Digital Driver For µStepper & DC Motors

Stepper Motor control Road Map



Stepper: Road map and features

product	Peculiar features	Operating range	Integrated mosFET	Common features
L6470	**Up to 128 microsteps** **Extreme smoothness thanks to voltage mode control** Sensorless Stall Detection	8V – 45V	**3Arms** (7A peak) **$R_{DS,ON}$ = 0.28 Ω** **Integrated Current Sensing** (no ext.shut)	• **Programmable speed profile (*)** • **Programmable positioning (*)** • **SPI interface** for **configurability** and **diagnostics** (Daisy Chain compatible) • Integrated 16MHz oscillator • **Integrated 5bit ADC** • **Integrated 3V voltage regulator** • Over Current (non dissipative), Over Temperature and Under Voltage protections • PowerSO (ES) and HTSSOP
L6472	**Up to 16 microsteps** **Predictive current control (ST patented) with adaptive decay**			
L6474	**Up to 16 microsteps** **urrent mode with adaptive decay**			
L6480 Coming soon	**Up to 128 microsteps** **Extreme smoothness thanks to voltage mode control** Sensorless Stall Detection Integrated 15V/7.5V voltage regulator Fully programmable gate driving Embedded miller clamp	7.5V – 85V	EXT MOSFET	

(*) available in L6470, L6472, L6480

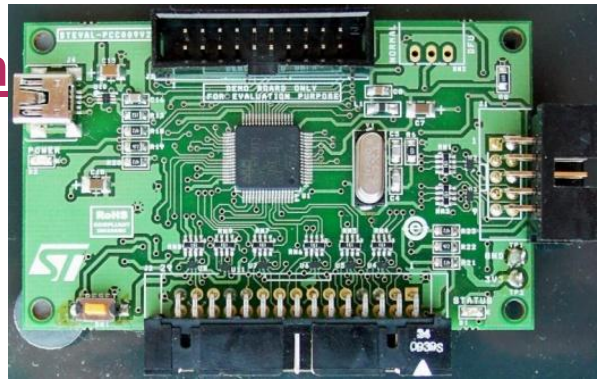
L6470 Demo Board

Sales Codes

- L6470H -Tray
- L6470HTR -Tape&Reel
- ES available on L6470PD

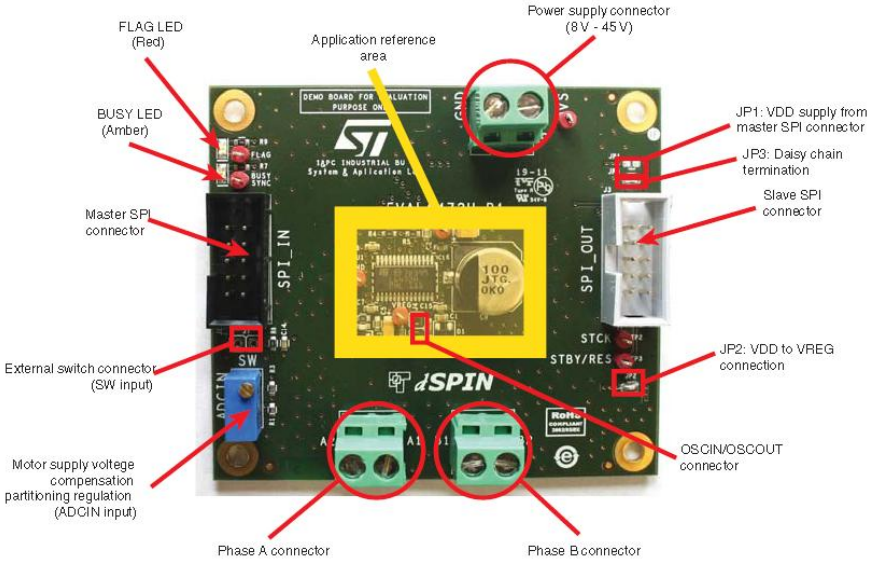
Product Page http://www.st.com/dspin

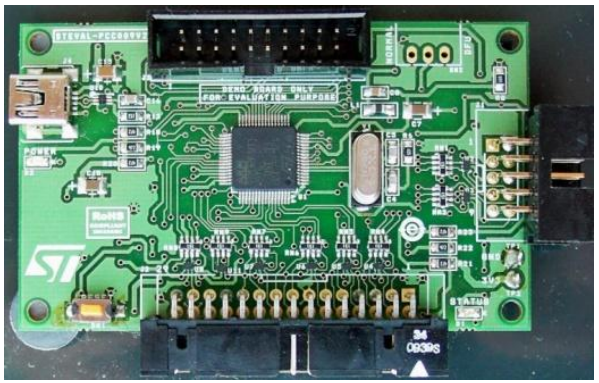
- Data Sheet
- Application Note (AN3103)
- d SPIN Evaluation Tool Software
- Evaluation Board: EVAL6470H
- Control boards STEVAL-PCC009V2 (and –V1)
- d SPIN Firmware Library
  - Available on http://www.st.com/dspin



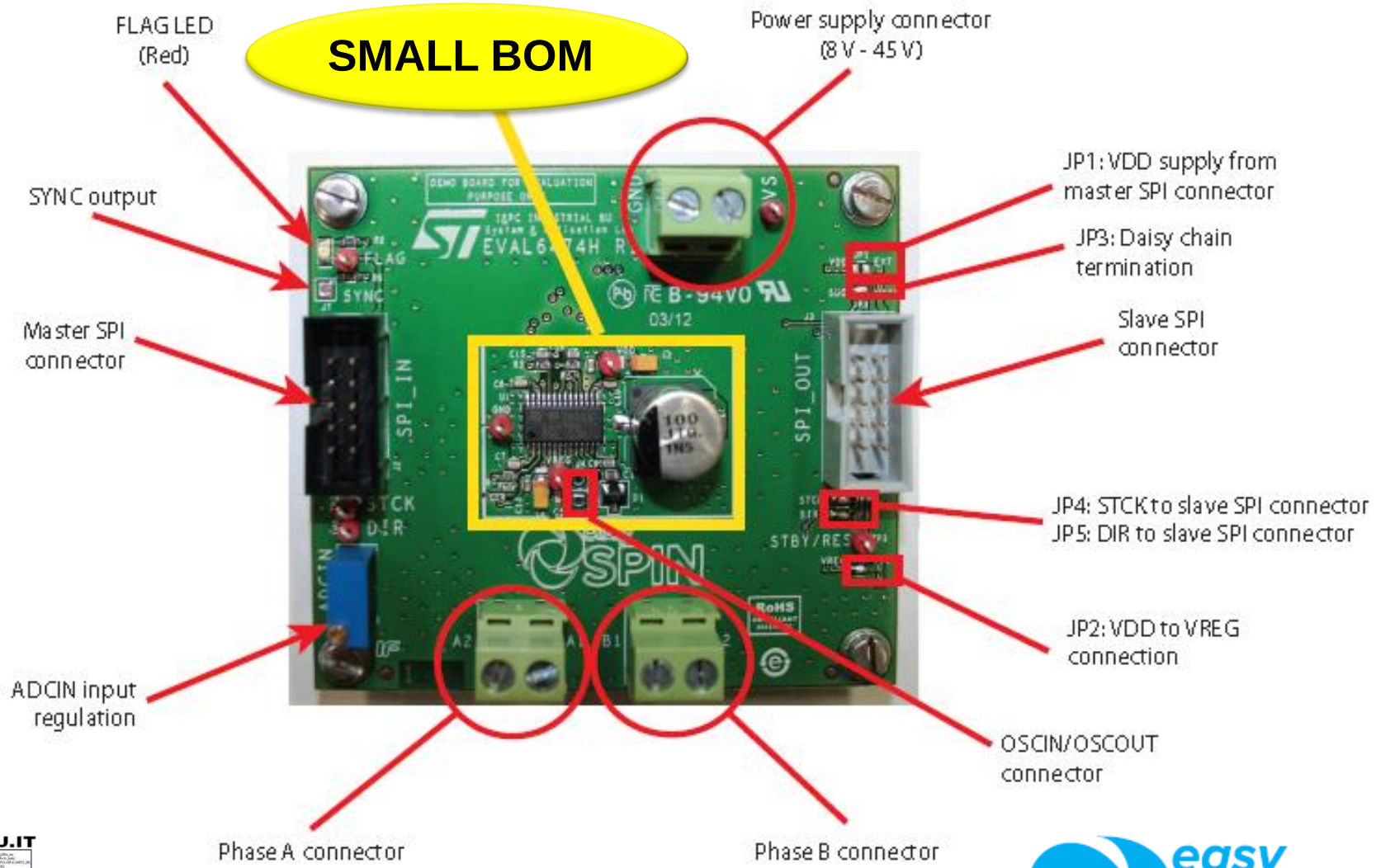
L6472 Demo Board

- **Sales Codes**
  - **L6472H -Tray**
  - **L6472HTR -Tape&Reel**
  - **ES available on L6472PD**
- **Product Page http://www.st.com/dspin**
  - **Data Sheet**
  - **Application Note**
  - **d SPIN Evaluation Tool Software**
  - **Evaluation Board: EVAL6472H**
  - **Control boards STEVAL-PCC009V2 (and –V1)**
  - **d SPIN Firmware Library**
    - **Available on http://www.st.com/dspin**





L6474 Demo Board



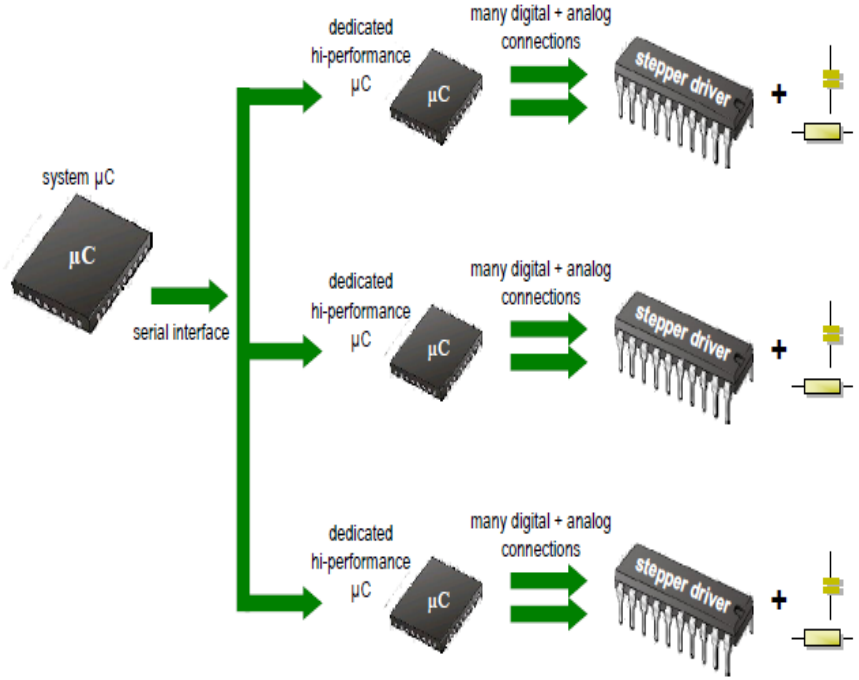
L6470

dSpin

128 microsteps 2 Bridge for motor control

L6470 *dSPIN*

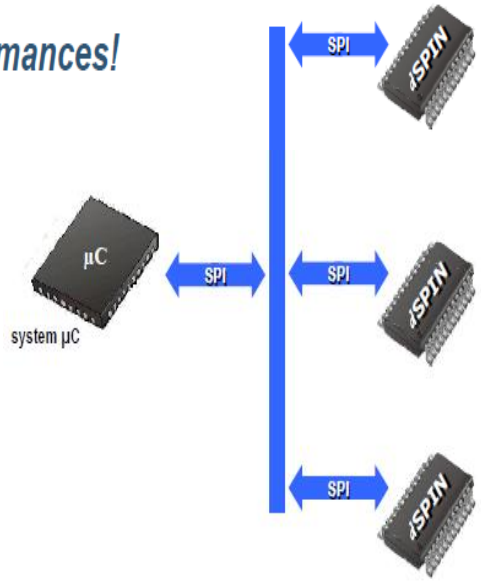
before dSPIN...



...after dSPIN !

- ✓ System is heavily simplified
- ✓ No more dedicated µC to perform speed profile and positioning calculations
- ✓ A lot less passive components

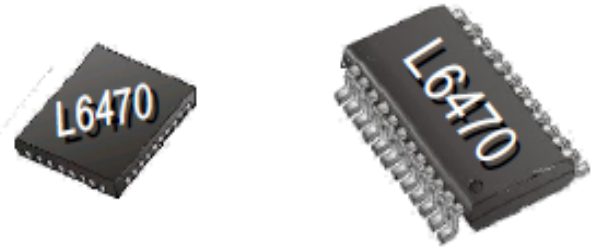
and... ***far better performances!***

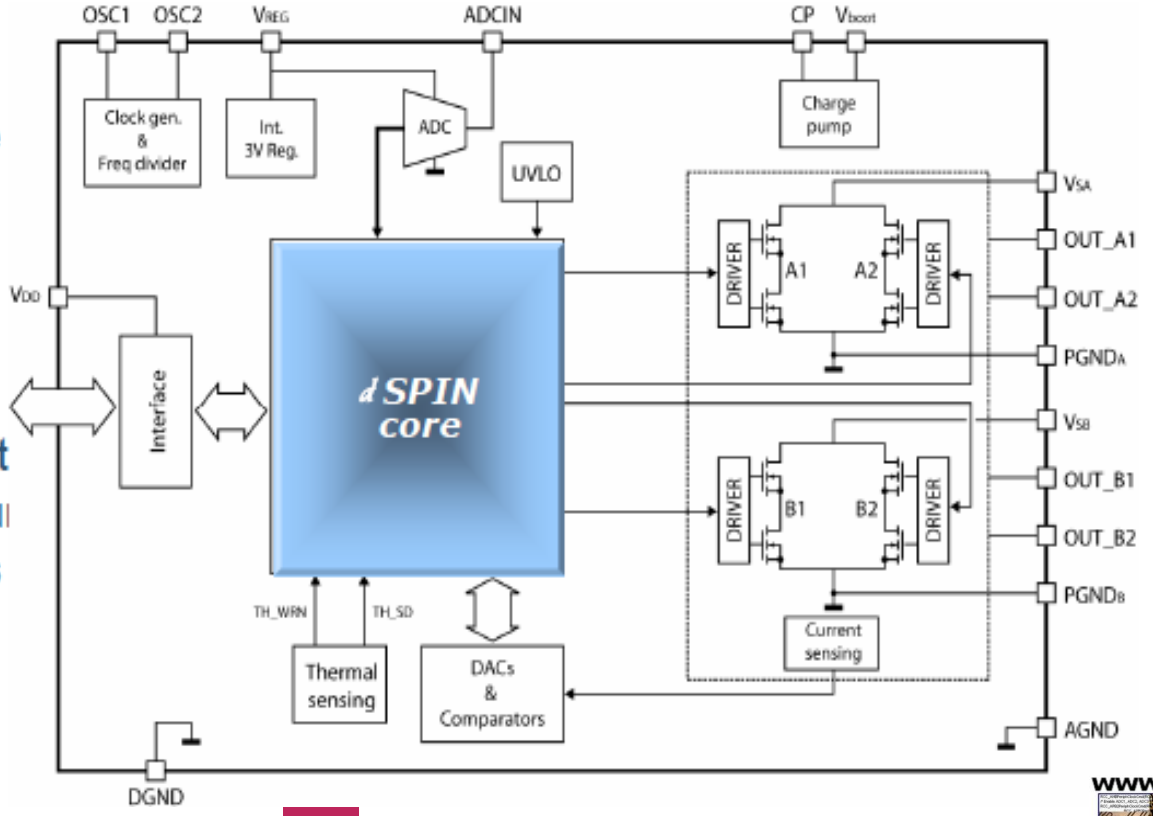


L6470 DSPIN

Monolithic Digital µ stepping Driver

- ✓ Supply voltage 8V – 45V
- ✓ 3Arms (7A peak)
- ✓ $R_{DS,ON}$ = 0.28 Ω
- ✓ Integrated Current Sensing (no external shunt)
- ✓ **Up to 128 microsteps**
- ✓ **Voltage mode operation**
- ✓ Sensorless Stall Detection
- ✓ **Programmable speed profile**
- ✓ **Programmable positioning**
- ✓ 8bit 5Mhz **SPI interface** (Daisy Chain compatible)
- ✓ Integrated 16MHz oscillator
- ✓ **Integrated 5bit ADC**
- ✓ **Integrated 3V voltage regulat**
- ✓ Over Current, Over Temperatu and Under Voltage protections
- ✓ QFN and HTSSOP package

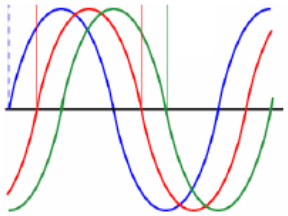


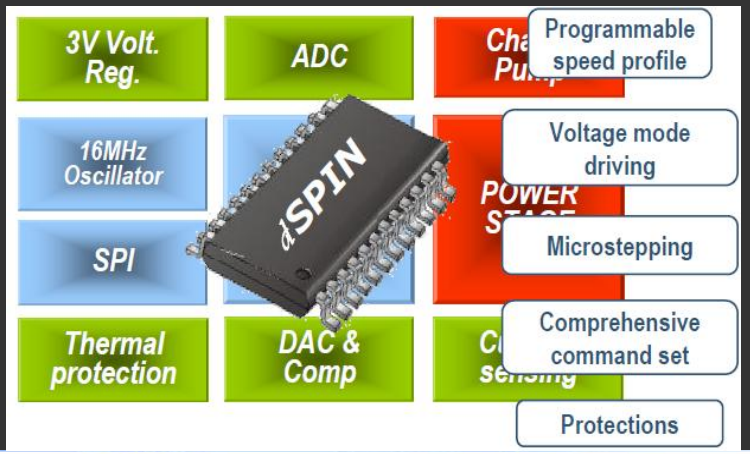


L6470 DSPIN advantages

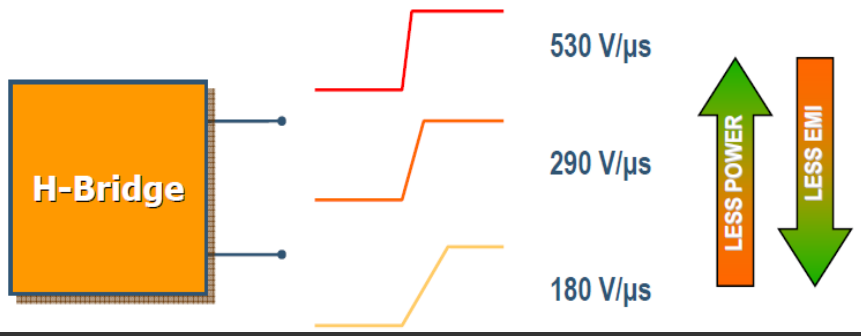
"Out of the Box" Driving Solution

- ✓ "Voltage Mode" brings *Outstanding* Performances
- ✓ Fully ***digital*** implementation
- ✓ Sine-Wave profile is achieved much more accurately than in current mode
- ✓ ***128*** µsteps/step beats 16 µsteps of competition
- ✓ ***Higher*** position resolution
- ✓ Reduced resonances (instability, pole slipping), mechanical noise and vibrations at low speed
- ✓ Reduced torque & speed ripple at low speeds
- ✓ in a word… ***smoother*** operation

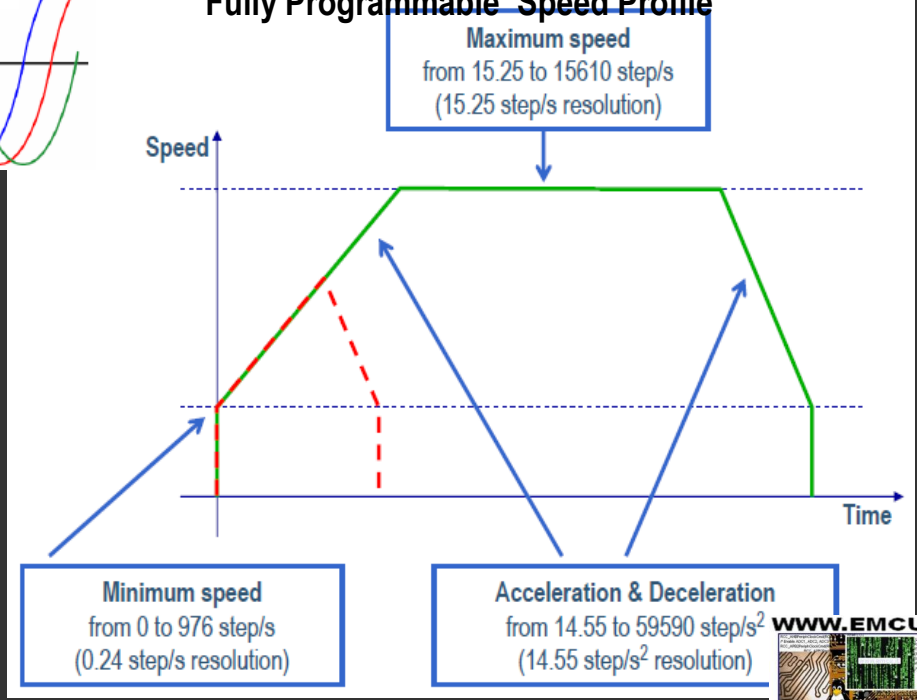




Three output slew-rate values can be selected via SPI in order to fit the application EMI / Power dissipation tradeoff.



Fully Programmable Speed Profile



L6480

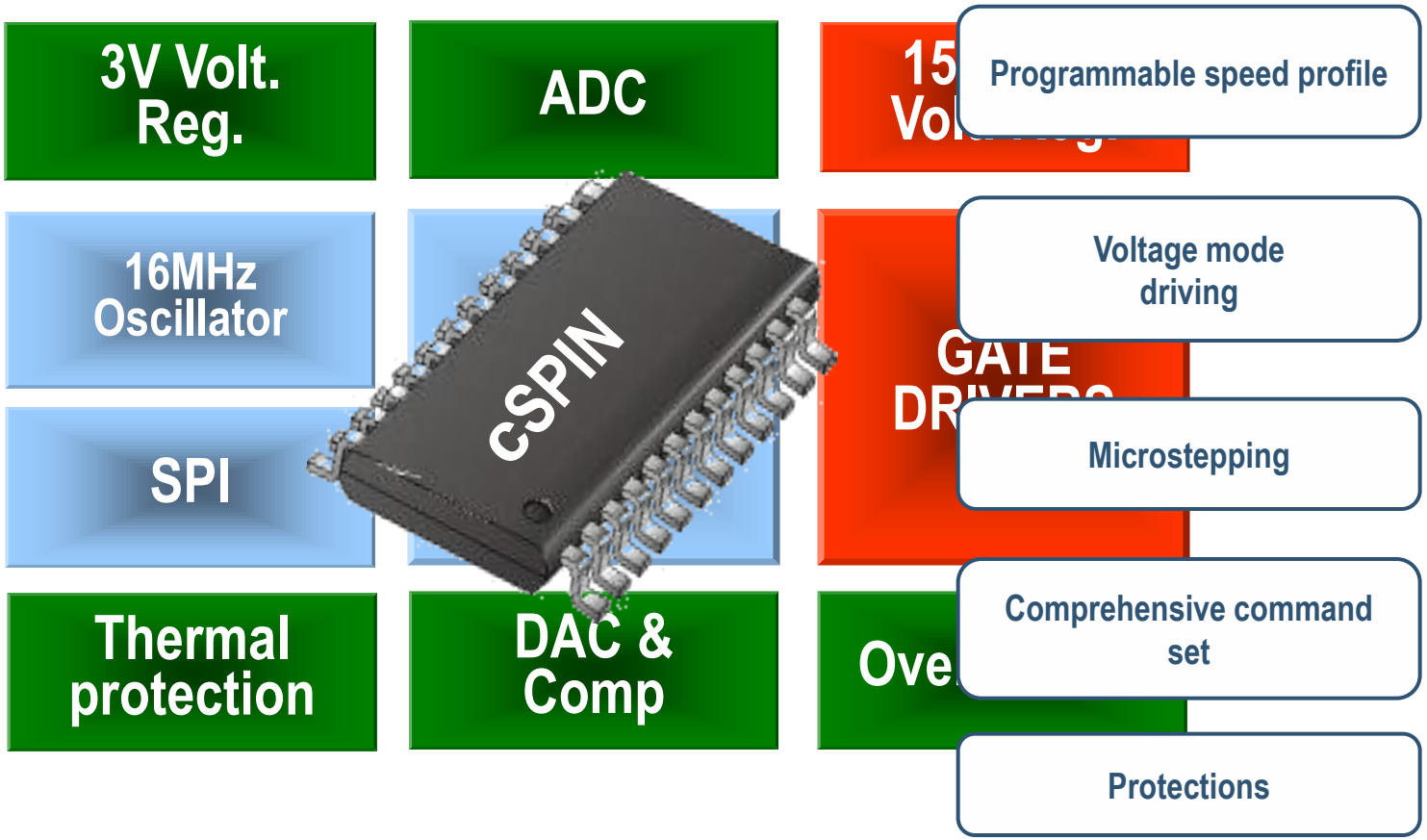
cSpin

ST motor Drivers are moving the future

L6480 cSPIN

Digital. Accurate. Versatile.

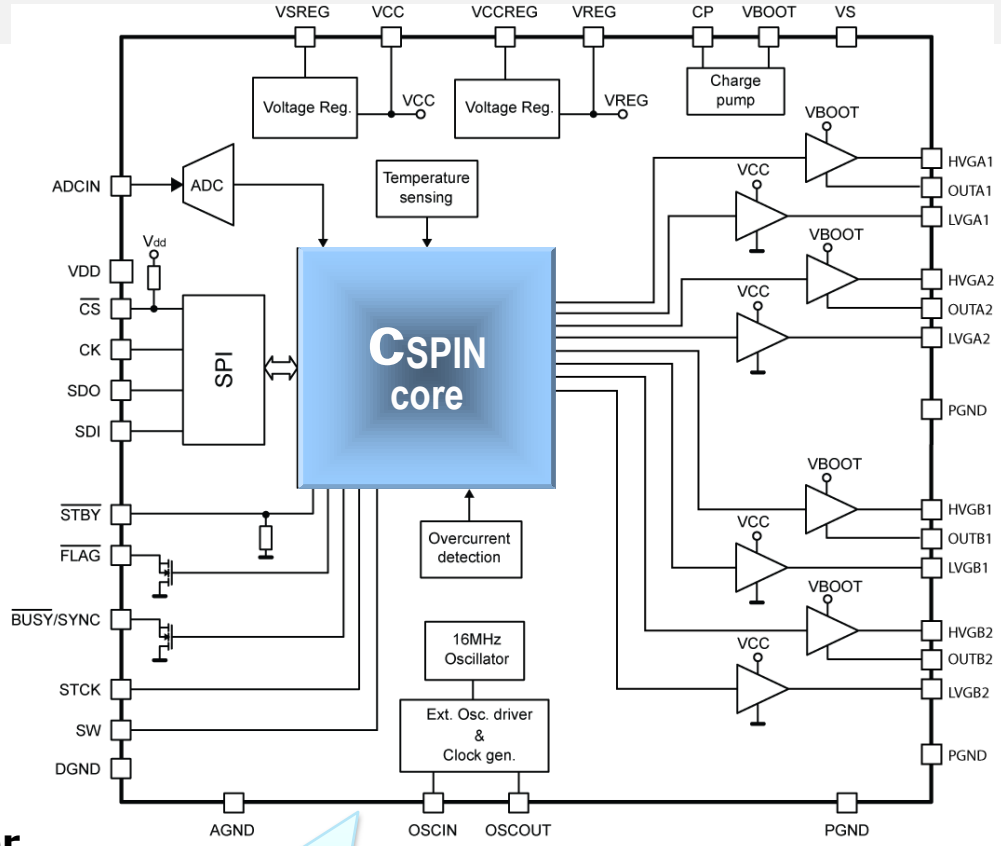
L6480: advanced motor controller with integrated gate drivers



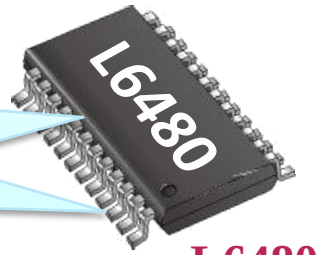
cSPIN - L6480

Ultimate microstepping motor controller

- Supply voltage 7.5V – 85V
- Dual full-bridge gate drivers
- Fully programmable gate driving
- Embedded miller clamp
- Up to 128 microsteps
- Voltage mode operation
- Sensorless Stall Detection
- Programmable speed profile
- Programmable positioning
- 8bit 5Mhz SPI interface (Daisy Chain compatible)
- Integrated 16MHz oscillator
- Integrated 5bit ADC
- Integrated 3.3V voltage regulator
- Integrated 15V/7.5V voltage regulator
- Full set of protection
  - Over Current
  - Over Temperature
  - Under Voltage protection



ES available
SOP H1 2012

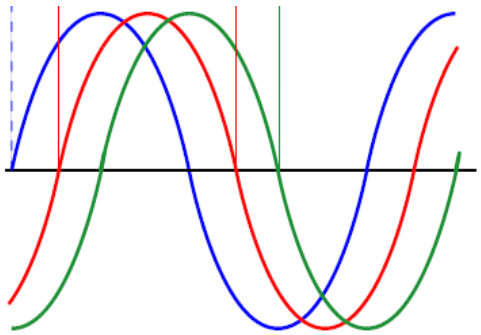


L6480H

CSPIN advantages: Architecture

“Out of the Box” Driving Solution

- “Voltage Mode” brings Outstanding Performances
- Fully digital implementation
- Sine-Wave profile is achieved much more accurately than in current mode
- 128 µsteps/step beats 16 µsteps of competition
- Higher position resolution
- Reduced resonances (instability, pole slipping), mechanical noise and vibrations at low speed
- Reduced torque & speed ripple at low speeds
- in a word… smoother operation



cSPIN advantages: Integration

Intelligence integration

☹ Speed and position profiles required complex MCU routines

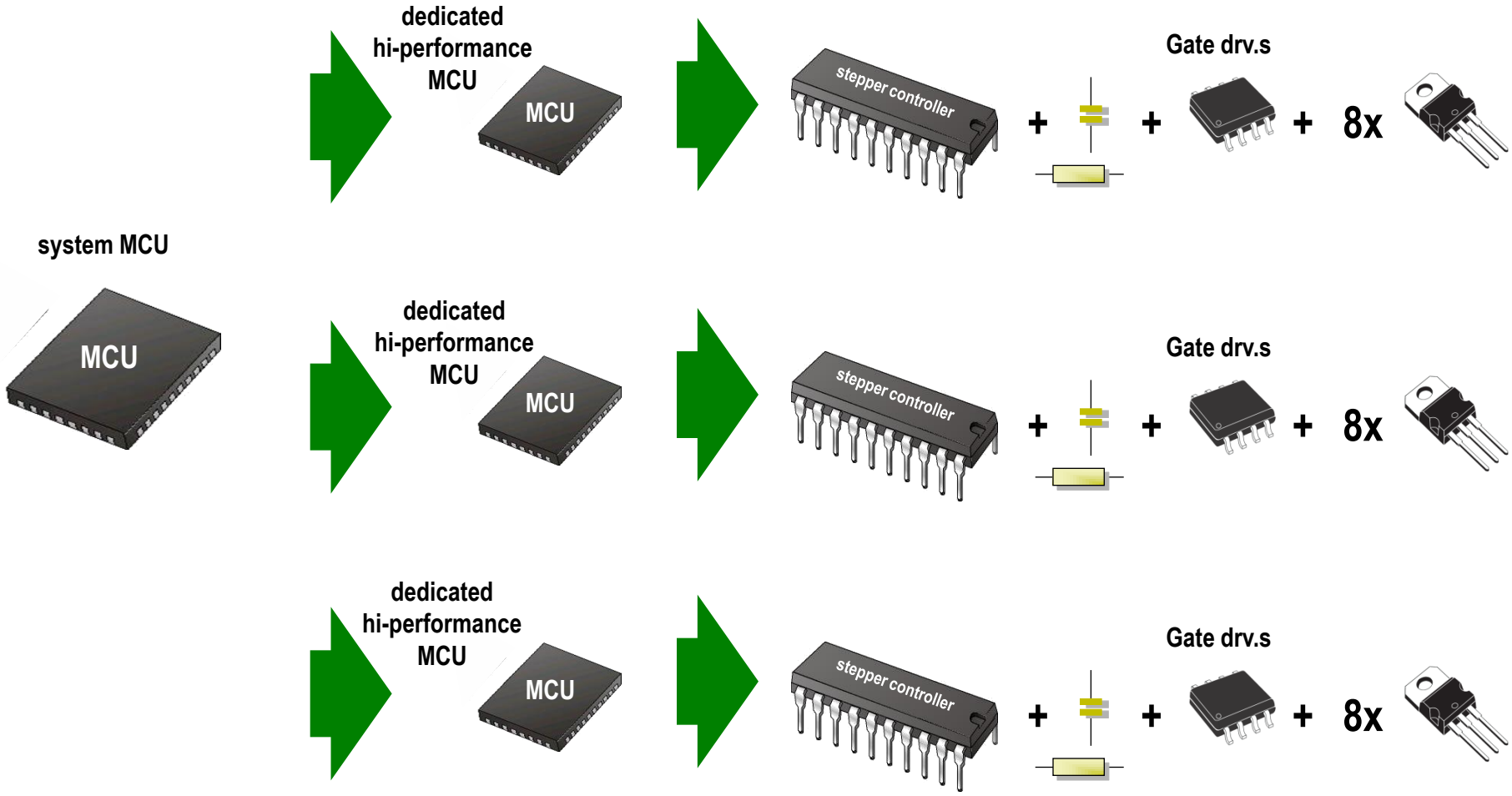
☺ ***cSPIN*** does the whole tricky job, listening to simple high level SPI commands

Gate driving integration

☹ Driving high power stepper motors require external power MOS and related gate driving circuitry

☺ ***cSPIN*** integrates eight fully programmable gate drivers suitable for driving a wide variety of gates

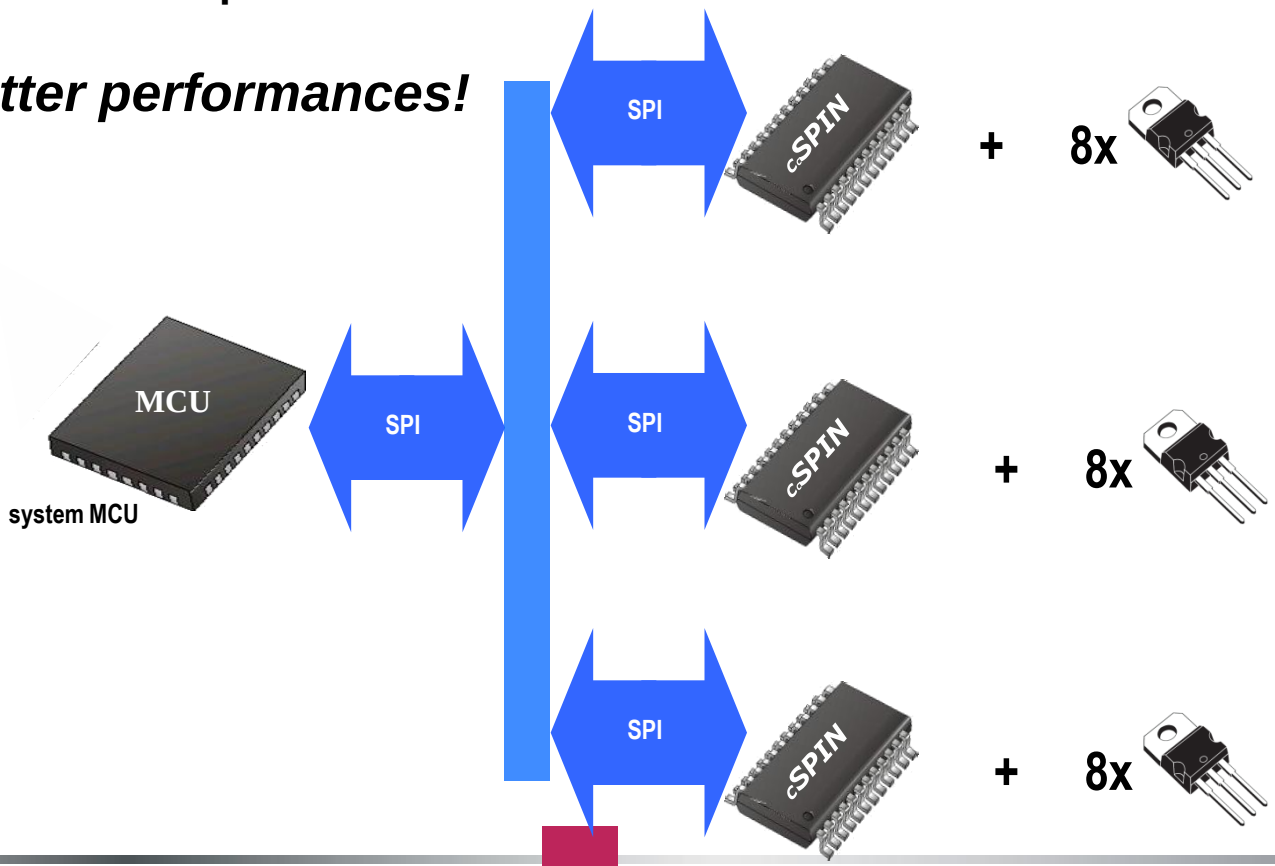
Integration before cSPIN...



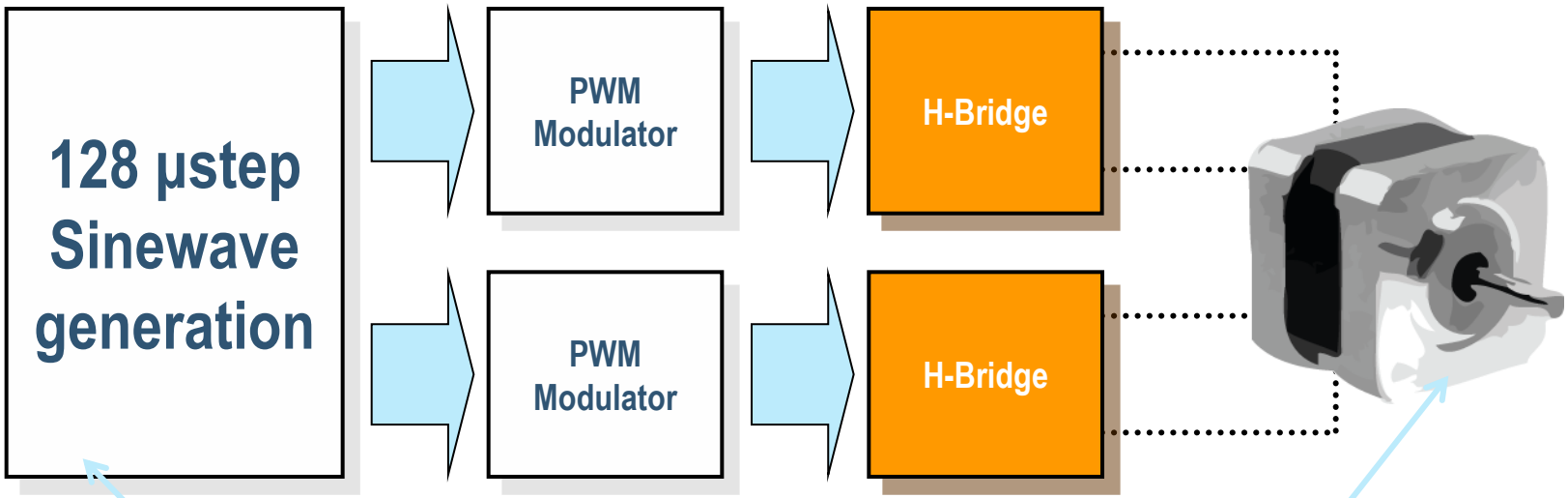
Integration with cSPIN...

- System is heavily simplified
- No more dedicated MCU to perform speed profile and positioning calculations
- No more external gate driving circuitry
- A lot less passive components

and... *far better performances!*

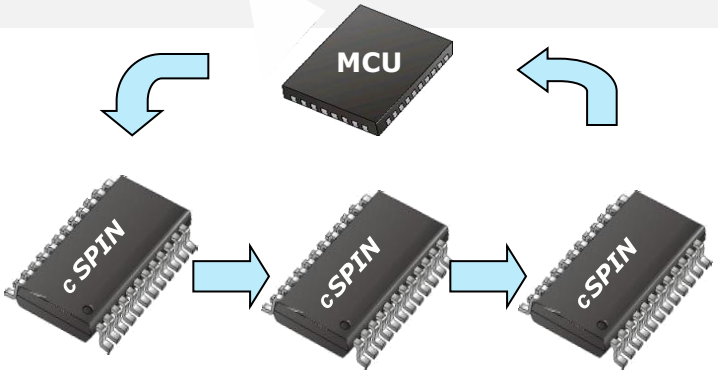


Technical details



Complete digital interface to MCU

- The fast SPI interface with daisy-chain capability allows a single MCU to manage multiple devices



- Programmable alarm FLAG open drain output for interrupt-based FW
  In daisy-chain configuration, FLAG pins of different devices can be or-wired to save host controller GPIOs

- BUSY open drain output allows the MCU to known when the last command has been performed
  In daisy-chain configuration, BUSY pins of different devices can be or-wired to save host controller GPIOs

- BUSY Can be used to feedback the µstep clock to the µC (programmable # of µsteps)

Positioning and speed profiles:

Leave them to *cSPIN*!

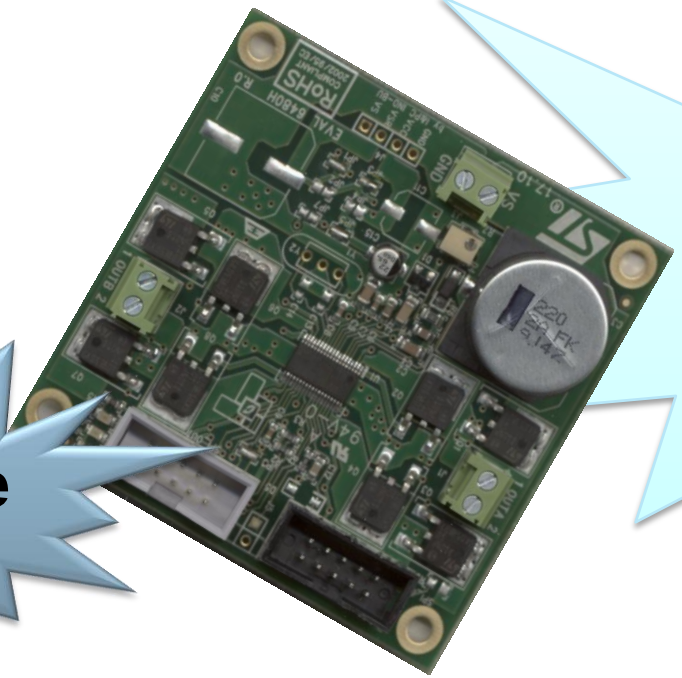
MCU sends cSPIN high level commands…

Free-run → run at constant speed
Positioning → reach the desired position

… and cSPIN does the tricky job!

Evaluation tools available!

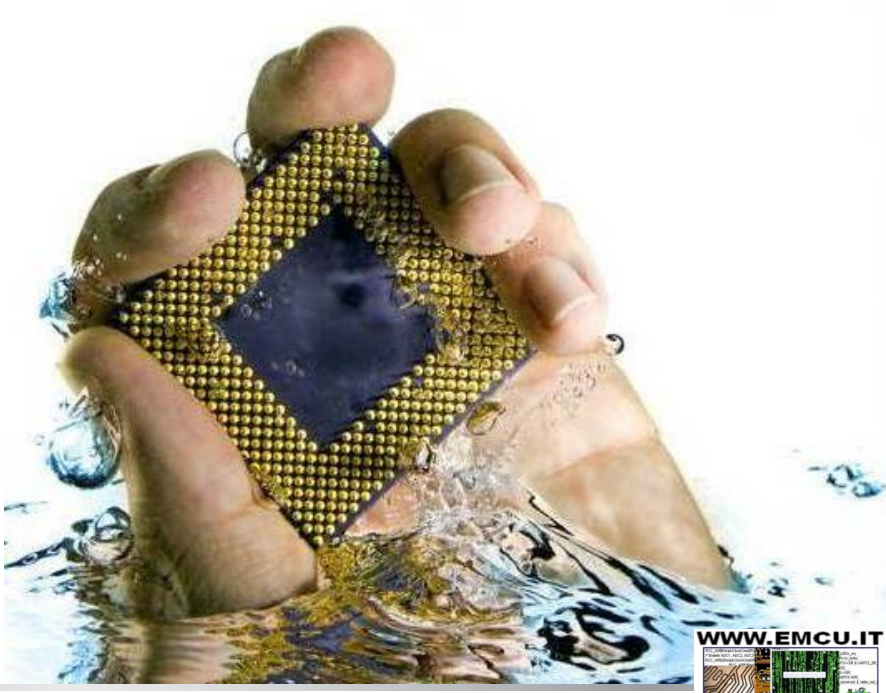
Try the new eSPIN with our demonstration board!



Available NOW!

L6480 +
STD10NF10
Up to 85 V
Up to 10 A

LIGHTING ICs

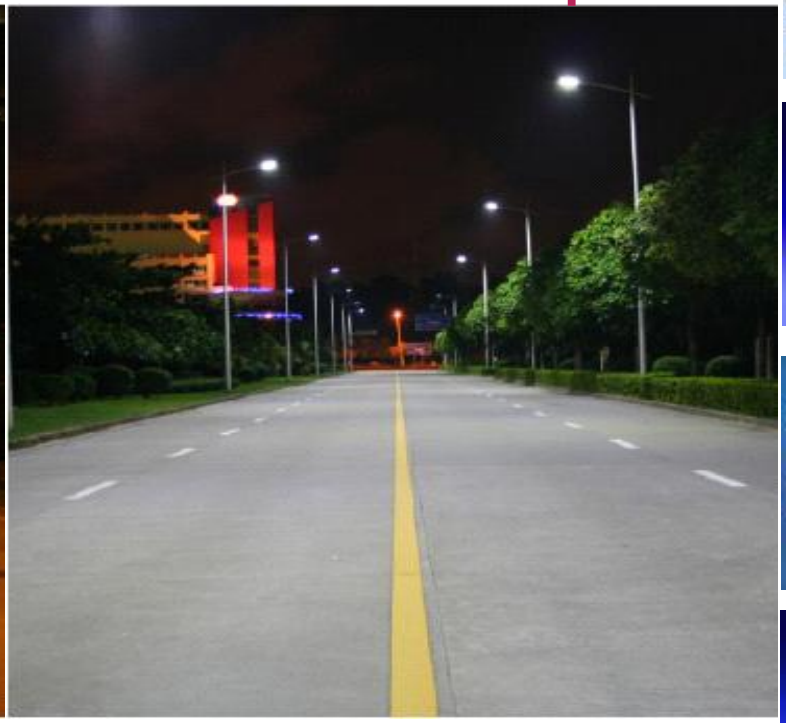


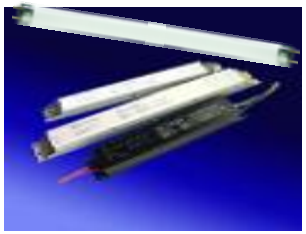
Products for Lighting

ST Offers innovative solutions for Lighting
"Energy Saving & Digital Control"

250W HPS Lamps

108W LED Lamps





LIGHTING LED DC/DC MICROCONTROLLER

LED DC DC	PRODOTTI	NOTE
Soluzione micro 8BIT + mosfets esterni. DC DC sino a 4 righe	STM8S208RB MOSFETs: STS4DNF60L(bus 48V) STD7NM50N(bus 400V)	Freq ck 24MHZ consente una freq max di 60khz con dimming possibile sino all'1% . Non e' possibile realizzare un dimming differente fra le singole righe. Applicazioni:STREET LIGHT.
Soluzione micro 32BIT + mosfets esterni. DC DC sino a 6 righe	STM32F103T6 MOSFETs: STS4DNF60L(bus 48V) STD7NM50N(bus 400V)	Freq ck 72MHZ consente una freq max di 150khz con dimming PWM possibile < 1%. E' possibile realizzare un dimming differente fra le singole righe. Appicazioni: STREET LIGHT, LED RGB.

LIGHTING LED DC/DC MICROCONTROLLER SOLUTIONS

Title: Digital Constant Current Controller for multi-string LED driving - inverted Buck Constant Current (CC)
Key products: STM8S208RB, STPS1L60, STN3NF06
Status: Validation (Q1/ ’10)
Note : patent STM

Title: Digital Constant Current Controller for multi-string LED driving - inverted Buck Constant Current (CC)
Key products: STM32F103T6, STPS1L60, STN3NF06
Status: PROJECT (Q2/ ’10)
Note : patent STM

STEVAL-ILL031V1

Digital constant-current controller for LED driving based on the STM8S208x

Features

- DC input voltage: 48 V
- Buck stage adapts output voltage to drive LEDs with selected current
- Four DC-DC buck converters allow driving of 4 LED strings, managing up to 120 W
- Employs 3 W LEDs to obtain 30 W-per-string (10 LEDs in series in each string)
- Low voltage-sensing circuitry
- Logic level MOSFETs driven by the microcontroller without gate driver (ground referred)
- High efficiency (up to 98%)

STEVAL-ILL031V1

LIGHTING LED LINEAR SOLUTIONS

LED LINEAR	PRODOTTI	NOTE
Soluzione RGB 4 Righe lineari da 80mA a 400mA. Il dimming avviene modulando in PWM con un protocollo seriale.	STP04CM05	4 BIT DATA LATCH con CK 30MHZ PER DIMMING Precisione 1% Applicazioni: GEN LIGHTING,ARCHITTETTURAL LIGHTING,LIGHT TERAPHIE,SHOP LIGHTING,ADVERTISEMENT
Soluzione RGB 24 righe lineari da 30mA. Il dimming avviene modulando in PWM con un protocollo seriale.	STP24DP05	Applicazioni: GEN LIGHTING,ARCHITTETTURAL LIGHTING,LIGHT TERAPHIE,SHOP LIGHTING,ADVERTISEMENT
Regolatore lineare di potenza singola riga Dimming PWM	STCS1 STCS1A	VIN 4.5V to 40V IOUT 1.5A Pwm dimming,Shut down,Diagnostic. Slope Control(Only STCS1A) Applicazioni: AUTOMOTIVE LIGHTING GEN LIGHTING,ARCHITTETTURAL LIGHTING,LIGHT TERAPHIE,SHOP LIGHTING,ADVERTISEMENT

DC DC Converter LED DRIVER

LED2000

Product Info

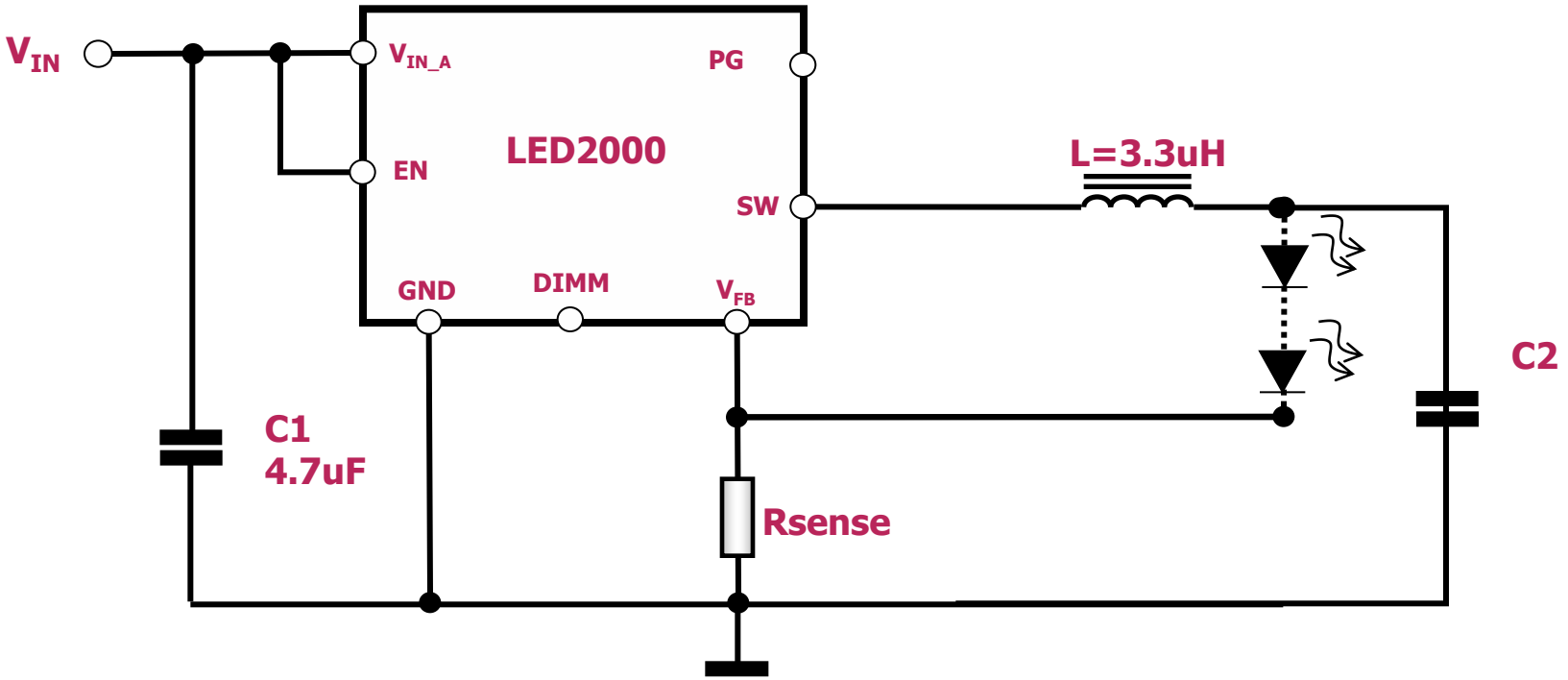
- BCD6s 20V technology
- Up to 3A in a small DFN 4x4 and HSOP8 packages
- Low FB voltage for low power losses
- PWM Dimming pin
- Wide input voltage range (4V up to 18V)
- High Fsw

Key Applications

LED LIGHTING

- **STREET LIGHT**
- **GENERAL LIGHTING**
- **TORCH**

LED2000
Application Test Circuit



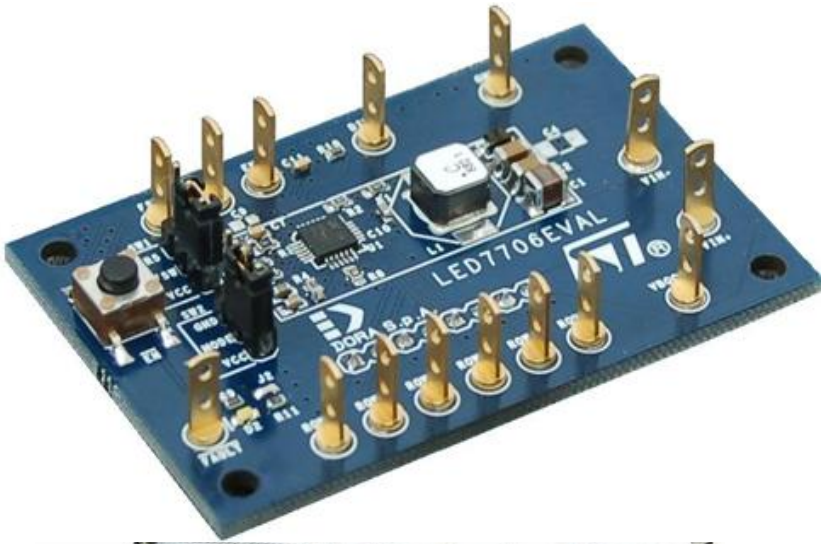
LED770x family

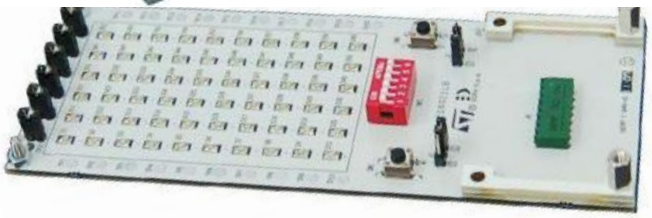
VIN from 4.5V to 36V

BOOST

QFN4x4 24L — **LED7707**: **2A (switch) up to 85mA for each row up to 1MHz**

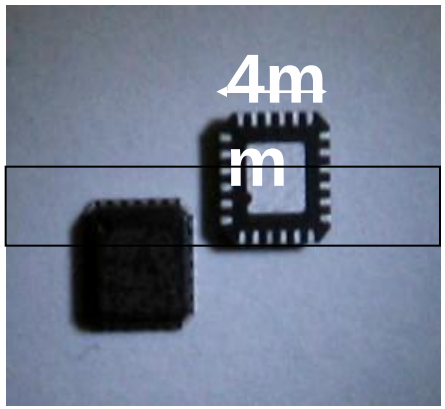
QFN4x4 24L — **LED7706**: **2A (switch) up to 30mA for each row up to 1MHz**

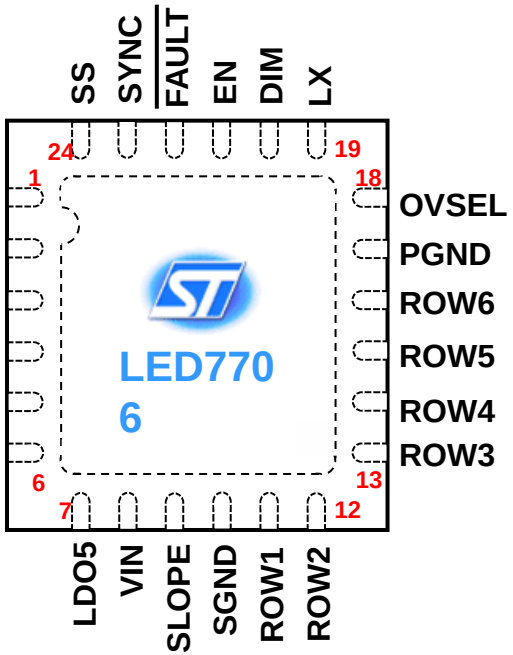




Example of LED load board

VFQFPN 4x4 – 24



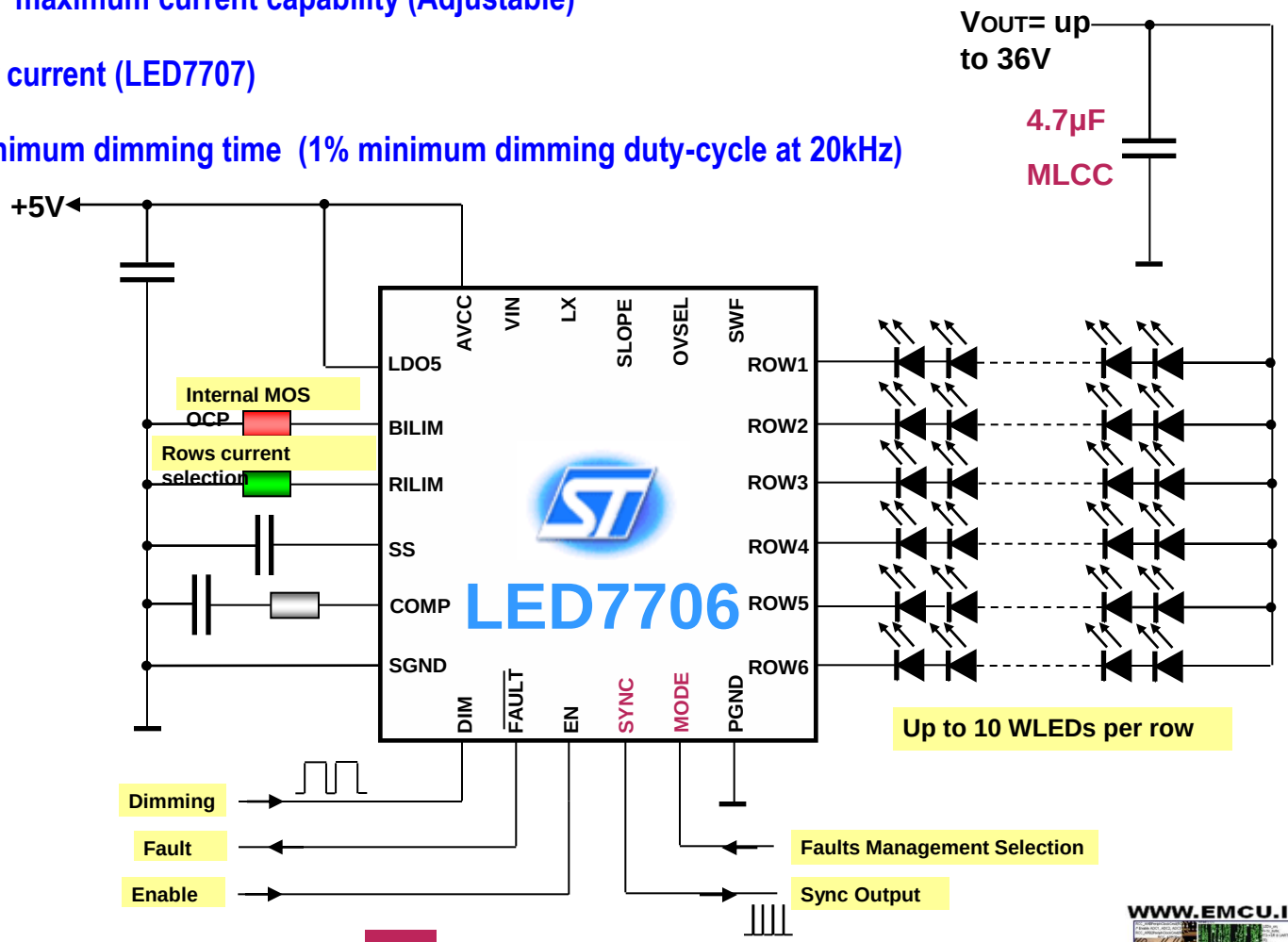


Top view

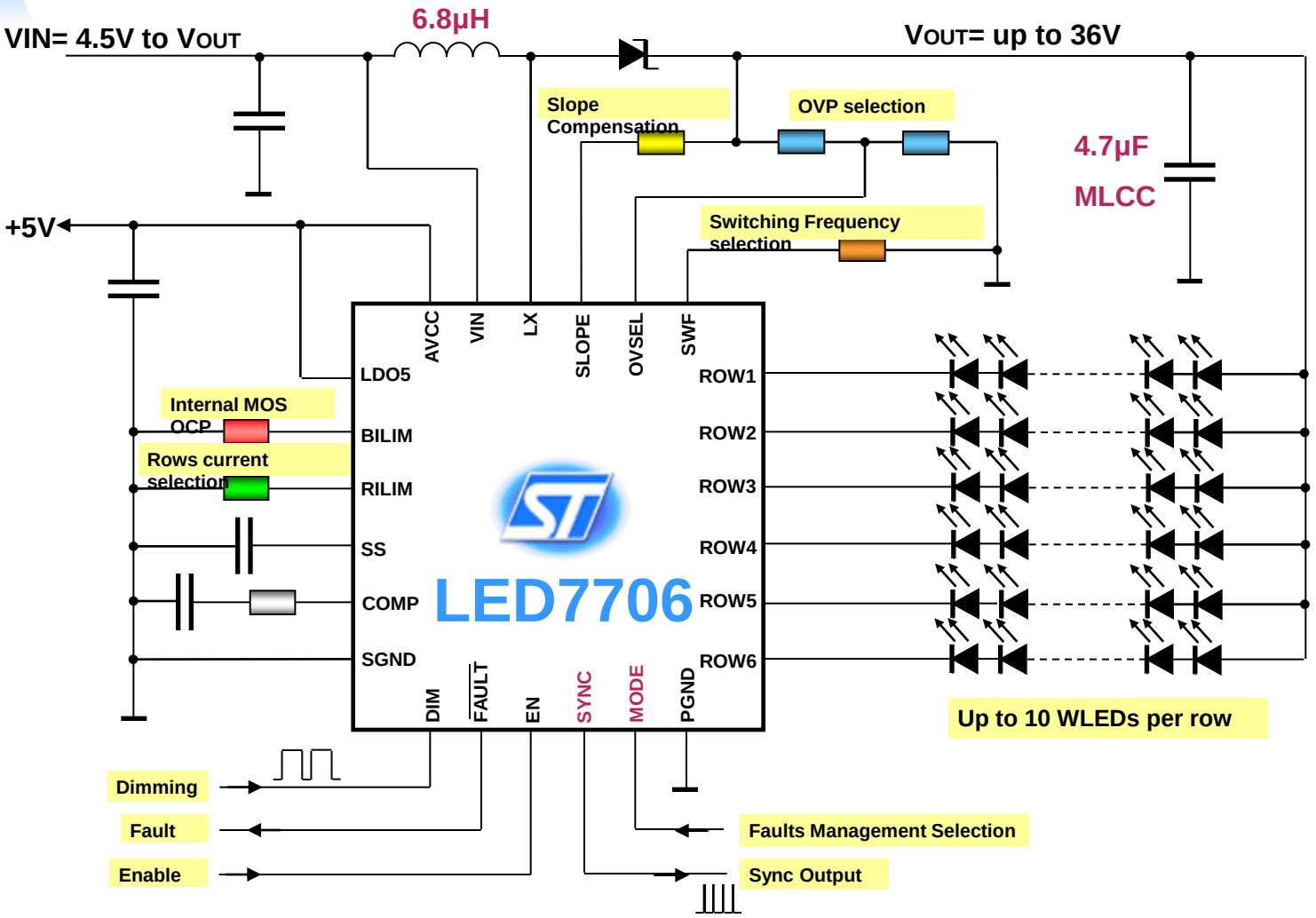
Backlight driver Section

- Six rows with 30mA (85mA)* maximum current capability (Adjustable)
- Up to 60 White LEDs
- Parallelable rows for higher current (LED7707)
- Rows disable option
- Less than 500ns (10µs)* minimum dimming time (1% minimum dimming duty-cycle at 20kHz)
- ±2% current matching between rows
- LED failure (open and short circuit) detection

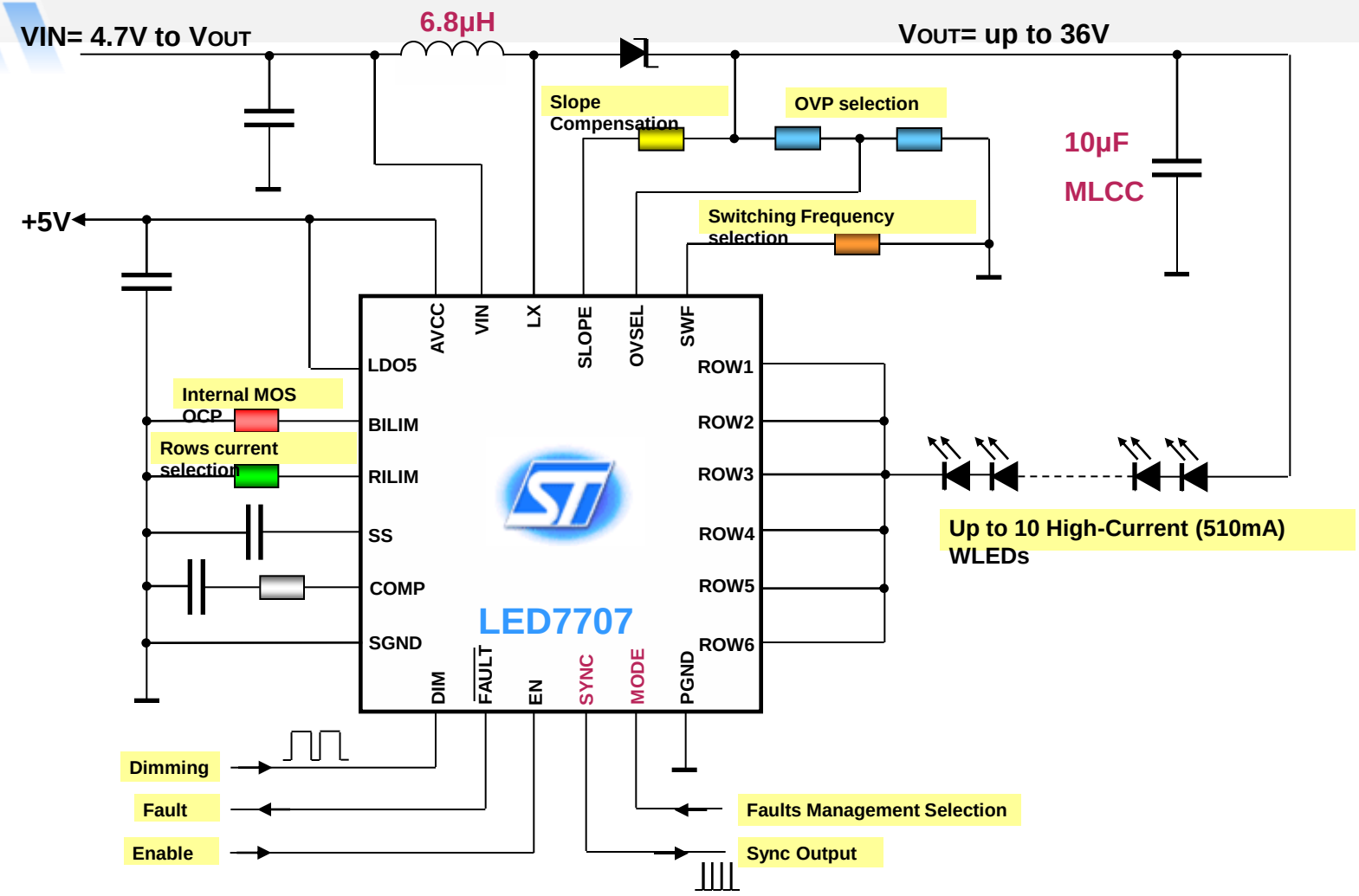
(* LED7707 only)



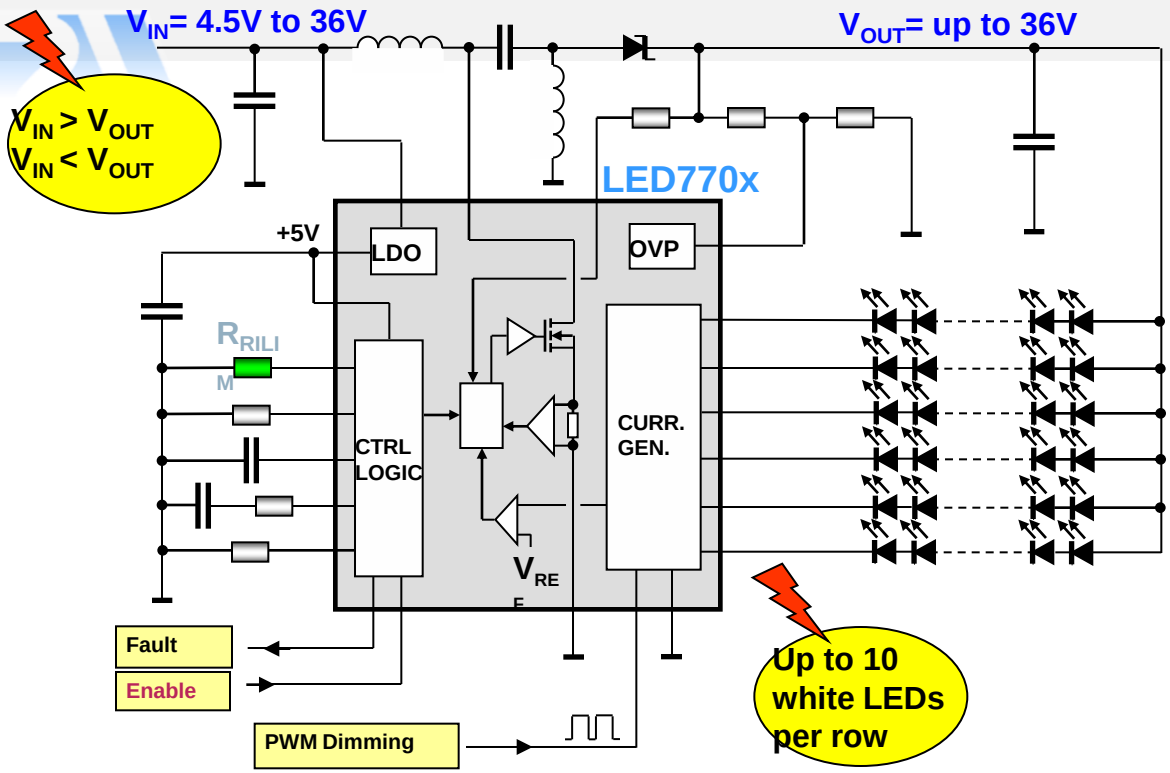
LED7706 application schematic



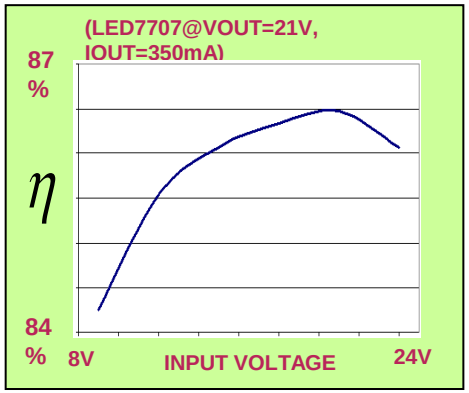
LED7707 HB LEDs Driving Solution



LED7706/7: SEPIC topology



Good efficiency



Input voltage: 4.5V to 36V

Maximum RMS switch current: 2.5A

Parallelable channels for higher current (LED7707)

$$I_{LED} = \frac{K_R}{R_{RILIM}}$$

LED current:
up to 85mA/ch (LED7707)

Channel to channel current mismatch:
±2%

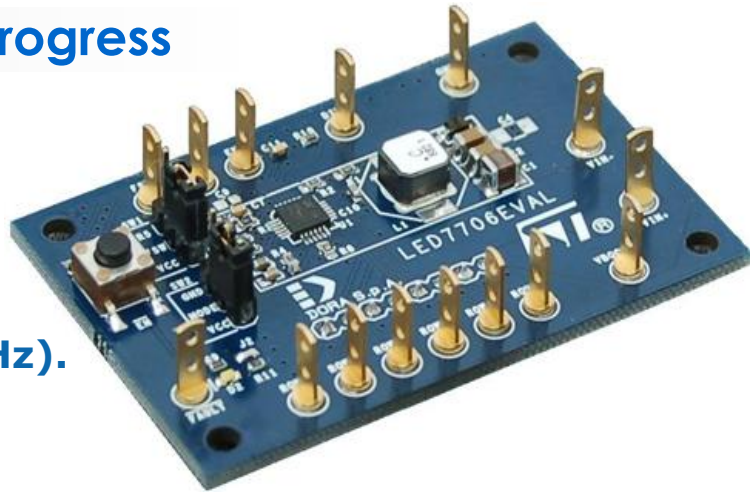
Up to 20kHz PWM dimming (1%-100%, LED7706)

EVALED7706

6-rows 30mA LEDs driver with boost regulator for LCD panels backlight

In stock

Documentation: AN2809 publishing in progress



- LED7706 (VFQFPN-4x4) driver onboard set for 20mA/channel.
- 4.5V to 32V input voltage range.
- Up to 10 White-LEDs (36V) in series on each channel.
- Selectable switching frequency (660kHz or 825kHz).
- Selectable fault management.
- Onboard test point for each important signal for laboratory evaluation.
- Onboard reset button.
- 8-pins header for external LEDs array connection.
- Fault LED indicator.

Key Product:
- ✓ LED7706 (VFQFPN-4x4)

Typical Applications:
- ✓ LCD monitors & TV Panels
- ✓ PDAs Panel Backlight
- ✓ GPS Panel Backlight
- ✓ Emergency Lightning

Board Purpose:
Compact solution with high dimming and control performance for driving LEDs in 6 strings 30mA each.

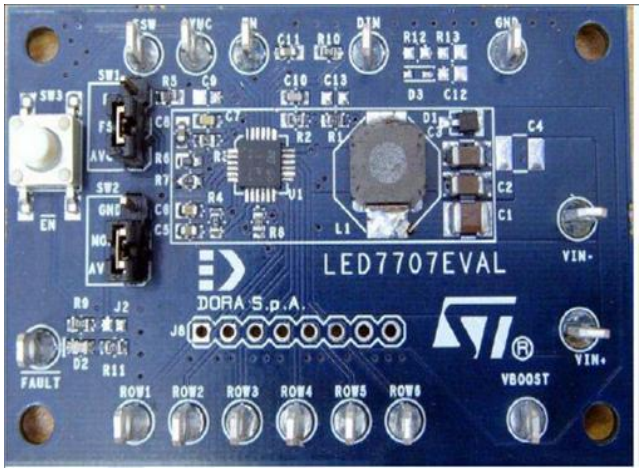
EVALED7707

6-rows 85mA LEDs driver with boost regulator for LCD panels backlight

In stock soon

Documentation: AN2810 publishing in progress

- LED7707 (VFQFPN-4x4) driver onboard set for 60mA/channel.
- 4.5V to 32V input voltage range.
- Up to 10 White-LEDs (36V) in series on each channel.
- Selectable switching frequency (660kHz or 825kHz).
- Selectable fault management.
- Onboard test point for each important signal for laboratory evaluation.
- Onboard reset button.
- 8-pins header for external LEDs array connection.
- Fault LED indicator.



Key Product:
✓ LED7707 (VFQFPN-4x4)

Typical Applications:
✓ LCD monitors & TV Panels
✓ PDAs Panel Backlight
✓ GPS Panel Backlight
✓ Emergency Lightning

Board Purpose:
Compact solution with high dimming and control performance for driving LEDs in not only 6 strings 85mA each, but even one string at 500mA.

AC DC Converter LED DRIVER

HVLED805
one chip solution for LED driving

Evaluation board

EVALHVLED805

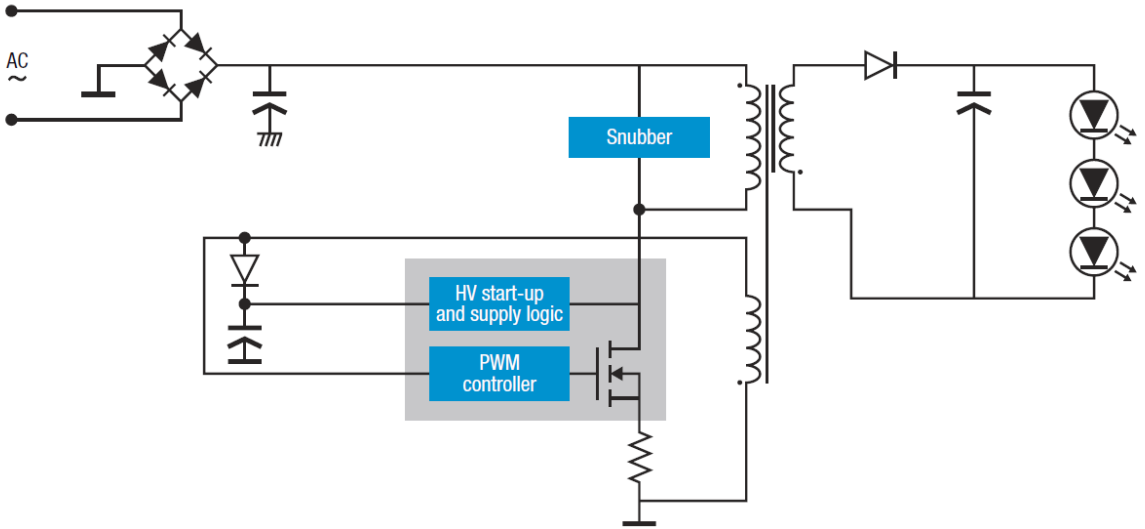
Main applications

- AC-DC LED drivers
- LED retrofit lamps (i.e. E27, GU10)

Key benefits

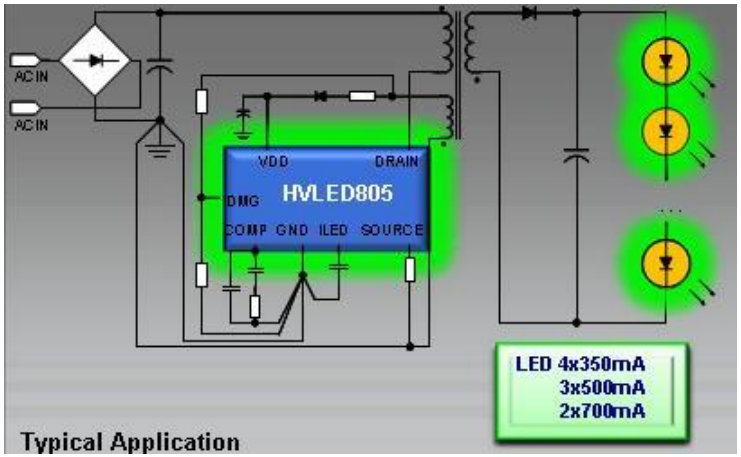
- Accurate primary-current control avoids the use of secondary sensing, reducing costs and complexity
- Internal power MOSFET high-voltage start-up allows compact applications
- Zero-voltage switching operation improves efficiency
- Reduced external part count allows very small form factors

Application diagram



HVLED805…

- **Offline LED Driver - dual-chip:**
  - **800-V Avalanche Rugged MOS**
  - **High Performance Controller**
- **Applications**
  - **Fixed-Light Lamp Retrofit for Power up to 5 W ***

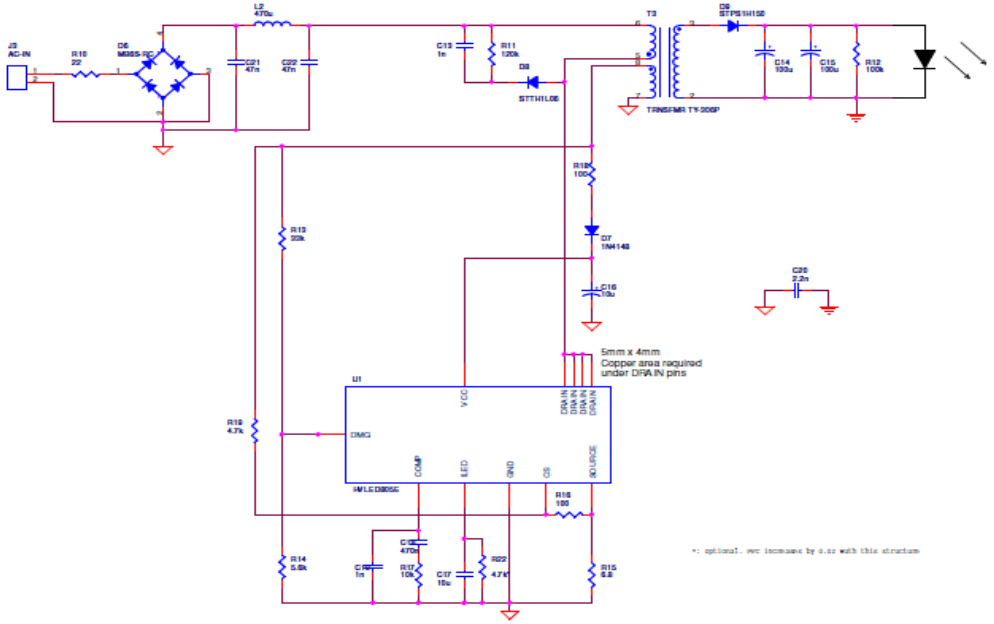


- **5% Current ACCURACY** → **State-of-the-Art LED Current Precision**
- **No Opto-coupler & CC controller** → **Low BOM**
- **Internal 800-V MOSFET** → **High Reliability (Market Benchmark)**
- **Adjustable OV Protection** → **Protection against LED String Open**
- **Quasi-Resonant OM** → **High Efficiency**
- **Automatic Self Supply** → **Operation with variable number of LEDs**

- **EVALHVLED805: Up to 4.2 W, 350 mA**
- **STEVAL-ILL037V1: 3.2 W, 200 mA**

**in wide V_{IN} range*

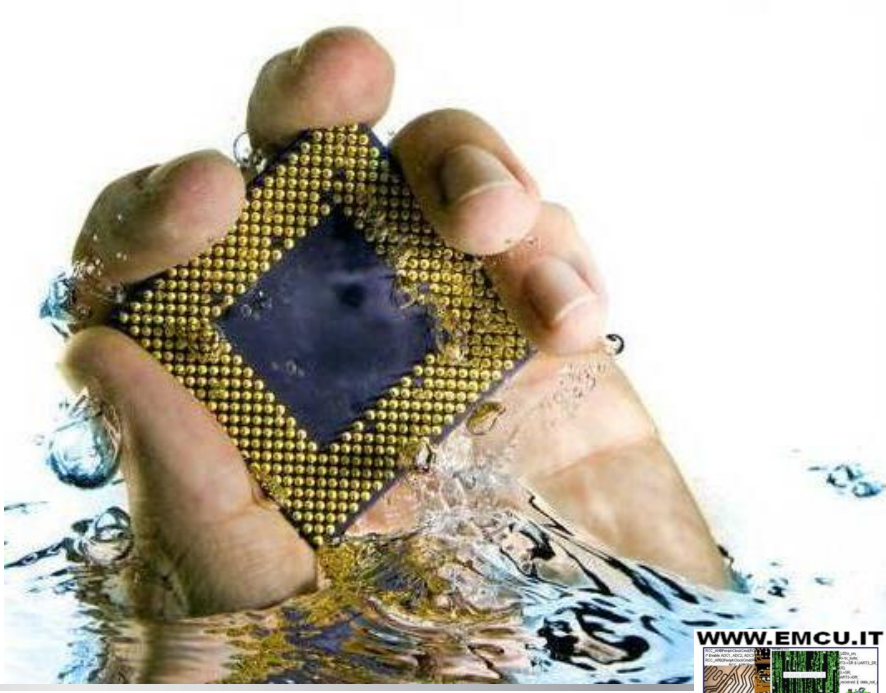
Flyback with current and voltage primary control for LED APPLICATIONS



EVALHVLED805

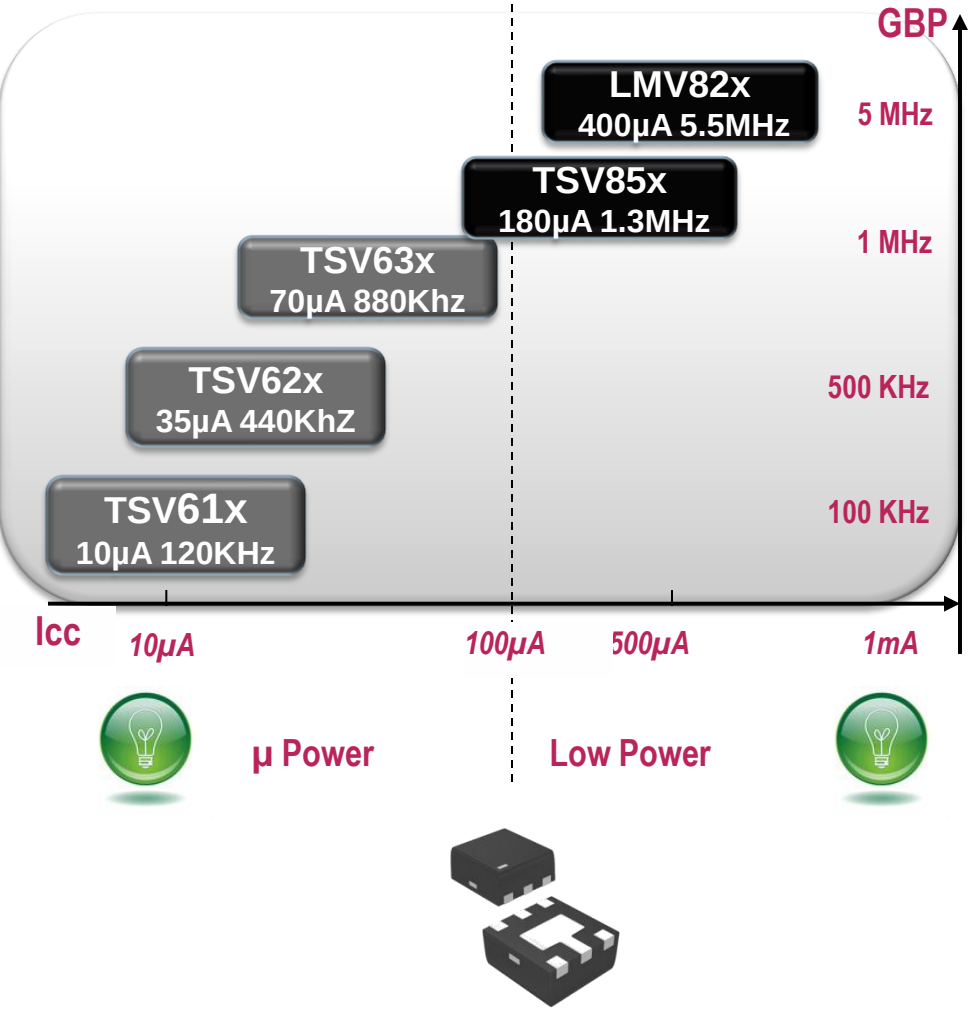
- Control of output voltage and current entirely from primary side
- Accuracy 5% the best in primary control
- Benefit: Save all secondary regulation components (voltage reference, error amplifier(s), optocoupler, sense resistor)
- HVLED807 & HVLED815 working without Electrolitic imput capacitors performing HIGH PF >0.9

OpAmp & Comparator



LMV/TSV8 Series:Low Power Op amps

When Icc versus Frequency matters

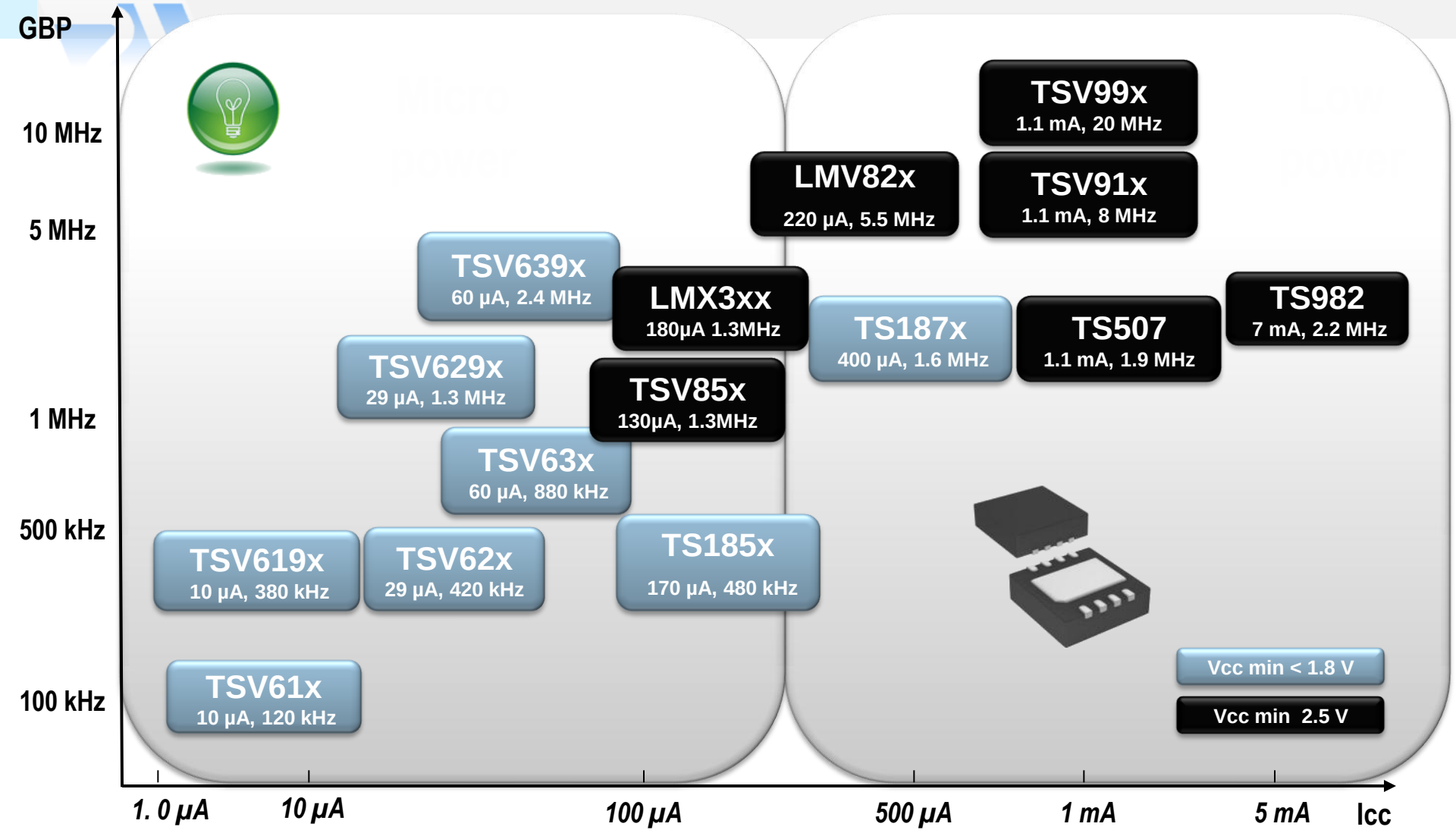


LMV82x (NS&TI)	LMV321/358/324 (NS&TI)
General purpose families Well-Known in the market	

offering

LMV82x	TSV85x
Drop in Solution Enhanced performances	
Wider Vcc range from 2.5V to 6V	
Stand by function	
DFN 2x2 package for dual	
Precision Vio 0.8mV	
4KV ESD	
Automotive grade in 2012	

ST op-amp portfolio: low –voltage (6V)



ST OpAmp portfolio:Mid–voltage (10V-16V)

SILICA An Avnet Company

GBP

10 MHz

5 MHz

1 MHz

100 kHz

LMX3xx
180µA 1.3MHz

TS922x
1.2mA 4MHz / Vio 500µV

TS92x
1.5mA 4MHz / Vio 3mV

TS9511
1.2mA 3MHz / Vio 500µV

TS95x
1.3mA 3MHz / Vio 6mV

TS46x
-20°C to 70°C

TS97x
2.8mA 12MHz

TS91x
200µA 1MHz

TS93x 33µA
100kHz

TS94x
1.2µA 10kHz

Vcc 10V

Vcc 12V

Vcc 16V

1. 0µA | 10µA | 100µA | 500µA | 1mA | 3mA | Icc

Order Code Rules

T	S	V	6	2	9	1	A	I	Y	C	T

Series root name
TSV6: micro power
TSV8: low power
TSV5: high merit factor
TSZ1: zero drift

Icc typ 25ºC
0: <10
1: <20
2: <40
3: <80
5: <150
6: <250
7: <400
8: <600
9: <850

None: standard device
(unity gain stable)
9: higher GBW
(stable for gain >5)

1: single
2: dual
4: quad
0: single with SHDN
3: dual with SHDN
5: quad with SHDN

None: standard device
A: enhanced Vio

I: industrial temperature range -40 to 125ºC
H: high temperature range -40 to 150ºC

None: standard qualification
Y: automotive grade

Package
C: SC70
L: SOT23
Q: DFN/QFN
S: MiniSO
P: TSSOP
D: SO

Tape and reel

ST Comparator Portfolio

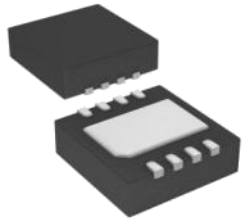
RR: rail-to-rail inputs,
OD/PP: open-drain/push-pull output

TS339/393 OD
TS3702/3704
7 µA, 1.5 µs PP

LM2901/2903 OD
-40 to +125 °C
TS391 OD
LM393/339
200 µA, 1.3 µs OD

TS7211 PP RR
TS7221 OD RR
TS86x
6 µA, 500 ns PP RR

TS372/374
150 µA, 600 ns OD



TS331/332/334
30 µA (max), 200 ns OD RR

LMV331/393/339
100 µA (max), 200 ns OD

TS3021/3022
70 µA, 40 ns PP RR

TS3011
500 µA, 8 ns PP RR

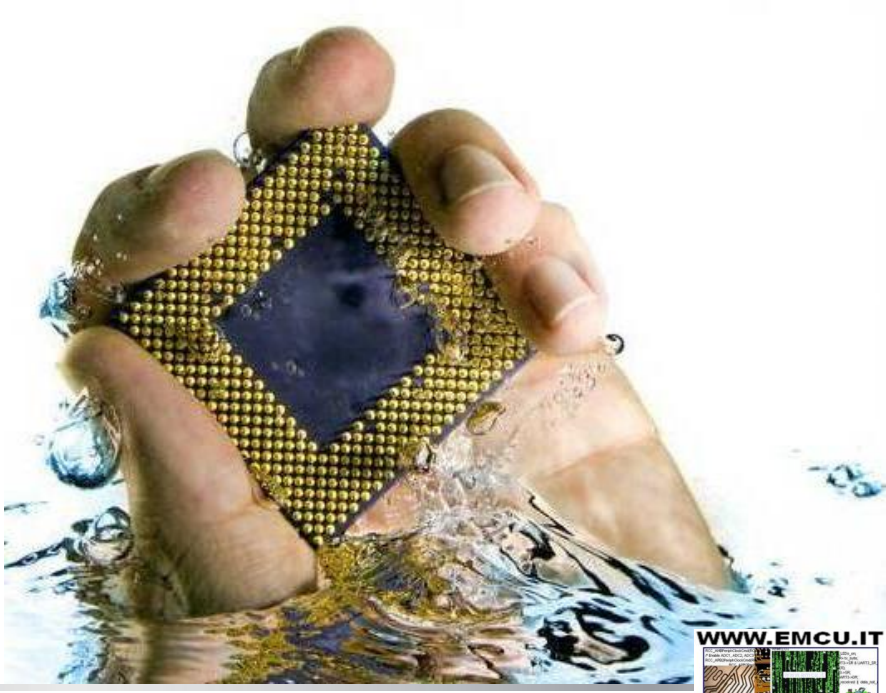
Response time

1 µs
500 ns
100 ns
10 ns

1. 0 µA
10 µA
50 µA
100 µA
500 µA
Icc

Vcc 5 V
Vcc 10 V
Vcc 16 V
Vcc 36 V

Power Transistor Division (PTD)



ST Mosfet Portfolio

	Voltage	Main applications	
SAFeFET ™	Clamped @ 33V	Motor Control, Traction, Fork lift, Green Cars, ABS / ESP, Valve Control System, Injection	
STripFET™ II / III / V	12 - 250V	DC-DC for SMPS & Telecom, Power train, DC-DC driving / LED TV, Load switch. MB, Starter Alternator, Diesel Injection, Transmission Valve Control System, ECU, Battery Protection, Door Locking, Motor control, Power tools, Adapter ,UPS, Solar Boost & Micro-inverters.	
STripFET™ VI / VII DeepGATE	30 - 150V	SMPS, Adapter, Motor control, DC to DC converters for MB, NB and server UPS, Wiper, Windows Lift, Sun Roof, Pump Control, Electric Parking Brake, Gear Box, UPS, Solar boost & Micro-inverters	
MDmesh™ II / V	200 - 700V	HID , LED Lighting, LED TV , LCD Adapters, SMPS, for Desktop , Battery Charger, PFC, Solar Inverter & Microinverter,	DC/DC Converter for HEV , SMPS for Servers Desktop & TV, PFC & LLC / LCD –LED, Adapter, Chargers , PFC, Solar Inverters & Micro-inverters, UPS,
FDmesh™ II / V	500 - 650V	S/DC Converter for HEV, Solar Inverters, S,MPS Server ZVS configuration. LLC..	DC/DC Converter for HEV, Solar Inverters, S,MPS Server ZVS configuration. LLC..
SuperMESH™ 3 / 5	500 – 1200V	HID, HF Ballast, LED lighting, SMPS, Monitor & TV,.Auxiliary Power Supply, Battery Chargers, Medical, UPS, Metering,	SMPS , LED Lighting/ Auxiliary Power Supply , metering , Micro-inverters,
SuperFREDmesh™ / 3	500 – 650 V	HID, HF Ballast, SMPS, LLC Converters	HID, HF Ballast, SMPS, LLC Converters
UltraFASTmesh™	500 – 520 V	HID, HF Ballast, SMPS, LLC Converters	
PowerMESH™ (1500V)	1500V	Auxiliary Power Supply, Metering	

ST Mosfet Portfolio

	Voltage V	Key Products
SAFeFET ™	Clamped @ 33V	STxnnNSnnZC
STripFET™ II / III / V	12 - 250	STxnnNFnn STxnnNHnn STxnnNnnH5/F3/F5
STripFET™ VI / VII (*) DeepGATE	30 – 150	STxnnNnnH6 STxnnNnnF6 STxnnNnnF7
MDmesh™ II / V	200 – 700	STxnnNMnn STxnnNnnM5
FDmesh™ II / V(*)	500 – 650	STxnnNMnnND STxnnNnnDM5
SuperMESH™ 3 / 5	500 – 1200	STxnnNnnK3 STxnnNnnK5
SuperFREDmesh™ / 3	500 – 900	STxnnNKnnZD STxnnNnnDK3
UltraFASTmesh™	500 – 520	STxnnNnnU
PowerMESH™ (1500V)	1500V	STxxnNnn

ST IGBT Portfolio

		Main Applications	Key Products
Low Drop	600V 1200V	Dimmer, HID	**STGxnnNBnnSD**
Medium Frequency	600V	Lighting, Vacuum Cleaners, Refrigerators	**STGxnnNC60SD**
Very Fast	600V 1200V/1300V	White Goods, IH, Aircon, PFC, Industrial Drives	**STGxnnNCnnH/VD** **STGW38IH130D**
Ultra Fast	600V	IH, Photovoltaic, UPS, Welding, PFC	**STGWnnHF60WD**
Short Circuit Rugged	600V 1200V	White Goods, Aircon, Industrial Drives Electronic Ignition, Piezo-Injection	**STGxnnNC60KD** **STGxnnN120KD**
Clamped	Up to 430V	Electronic Ignition, Piezo-Injection	**STGxnnNnnLZ**
SLLIMM (IPM)	600V	White Goods, Sewing machines, Motor Control, Aircon, PFC	**STGIPxnnK60x**
SLLIMM-nano (IPM)	600V	Low power motor control, fans, pumps, compressors	**STGIPN3H60** **STGIPN3H60A**
Trench Gate Field Stop	650V *1200V**	Photovoltaic, UPS, Welding, PFC, EV, High Frequency Inverter/Converters	**STGW50H65F** **STGW25H120DF**

ST Bipolar Portfolio

	Main Applications	Key Products
PNP 20V – 50V	Charger	STNxxx 2STNxxx, STDxxx STXxxx,STBVxx
	XDSL Router	
	Cell. / Cordless Phones	
NPN 700V	Power Line Switch / Battery charger	
NPN / PNP 20V – 50V 1.5A – 5A	MB & HDD	STTxxx,2STRxxx 2STNxxx, 2ST1480 2ST2480, STWx040 STWH13xxx
	Notebook	
	Peripheral	
	Printer	
NPN 700V	SMPS (180 W – 500 W)	
NPN 700 V	SMPS	STSxxDTPxx ST4460FX, ST1510FX MDxxx / HDxxx 2STAxxx / 2STCxxx
NPN 1200V-1700V	Horizontal Deflection for CRT	
NPN / PNP 15V- 100V	DVD & Set of Box	
NPN / PNP 80V / 160V	Audio	
NPN / PNP 100 V Darlington 300 – 450V	Ignition / Injection	BDXxxx / BDWxxx ST2625A,BUT100 BU941ZPFI
	Alternator / Regulator	
	Small Engine	
NPN 700V – 1500V	Lighting	STD8xxCP40 BULxxx / ESMxxx / BUVxxx 2STF1360 2STF2360
NPN / PNP 60V – 100V	Metering / gate drivers	

New PowerFLAT 8x8 HV

This innovative HV, 1 mm thick, SMD package is now featured with 550/650V MDmesh™ V and in future with 850V SuperMESH™ 5 Technos

Features

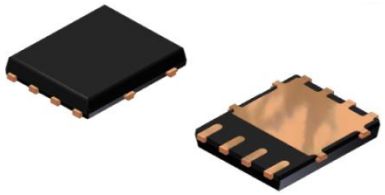
- Maximum thickness: 1 mm
- Extremely low $R_{DS(on)}$ x area
- Creepage distance: 2.7 mm
- Lead finishing: pure tin plating (Sn 100%)

Benefits

- Compactness
- Higher power density
- Reliability at high V_{DSS} rating
- High thermal performance
- Increased efficiency

The same maximum silicon die size of TO-220 within a leadless 8x8 mm² outline !!

Power FLAT 5X6 Product portfolio



Legend

- STripFET V
- STripFET VI DeepGATE
- STripFET VII DeepGATE

Application

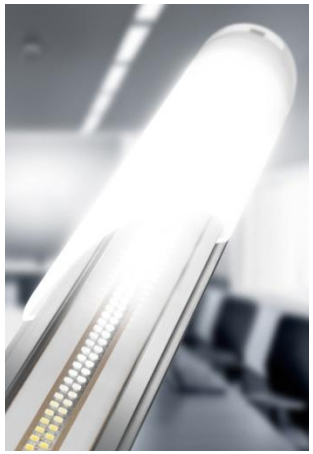
- Industrial
- Server
- Telecom
- Computer

Product portofolio						
PN	BV_{DSS} [V]	R_{DS}(on) (max) [mOhm]		Qg (typ) [nC]	Ciss [pF]	Status
		10V	4.5V			
STL51N3LLH5	30	14.5	17.5	5	724	Prod.
STL56N3LLH5	30	9	11.2	6.5	950	Prod.
STL60N3LLH5	30	7.1	9.5	8	1290	Prod.
STLxxN3LLH7	30	6	8	6	TBD	Q3 '12
STL65N3LLH5	30	5.8	7.5	12	1500	Prod.
STL80N3LLH6	30	5.2	7.6	17	1700	Prod.
STL90N3LLH6	30	4.5	7.3	17	1700	Prod.
STL100N3LLH7	30	3	4.5	14	1700	Q3'12
STL150N3LLH6	30	2	3.4	40	4040	Prod.
STLxxN3LLH7	30	2	3.5	18	1950	Q3 '12
STL150N3LLH5	30	1.75	2.4	40	5800	Prod.
STL160N3LLH6	30	1.3	2	61	6376	Prod

SuperMESHTM 5

- **“K5” Family - Breakthrough in Very High Voltage Power MOSFETs**

SuperMESHTM5:
Very High Voltage MOSFET revolution



Breakthrough in Very High Voltage

- 800V-1200V Voltage Range
- Designed for Best Efficiency
- LED & HID Driving
- High Input Voltage PV Inverter
- 3-Phase PSU

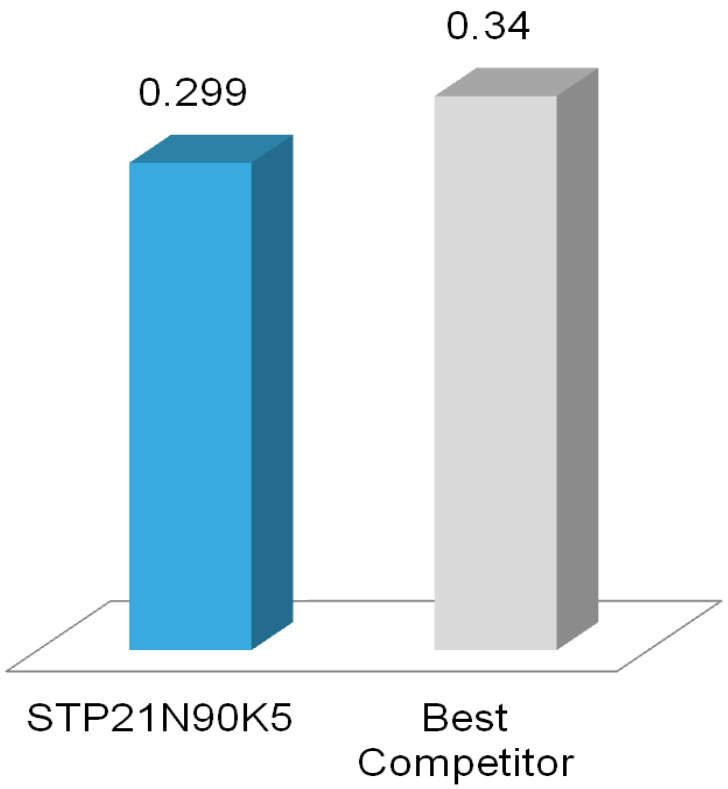
NOW: first
900V & 950V
K5 devices in
Mass Production!

Main Features & Benefits

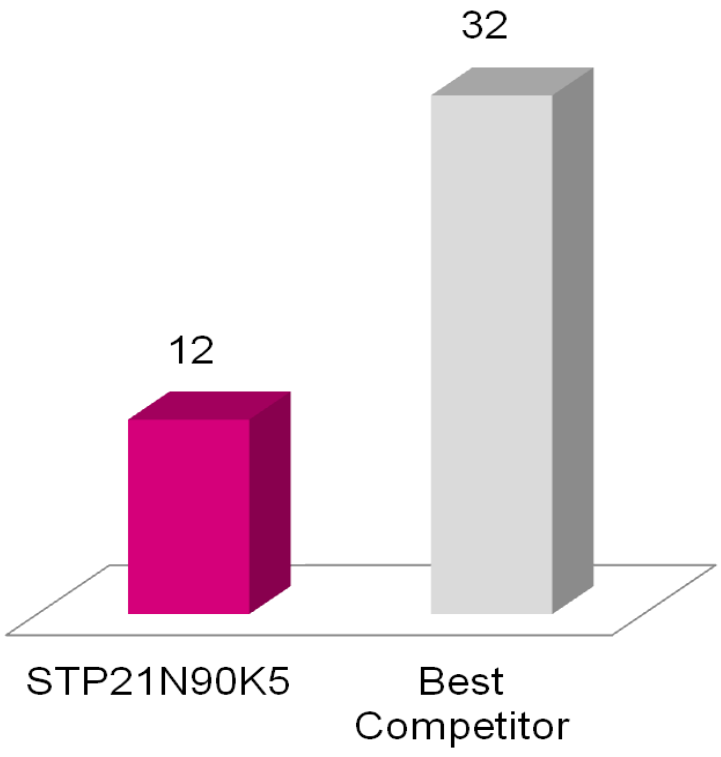
- Lowest $R_{DS(on)}$ x area
- Lowest FOM ($R_{DS(on)}$*Q_g)
- Increased Safety Margin
- Lowest Power Losses
- Higher Energy Savings
- Faster Switching Speed

SuperMESHTM5: Best-in-Class

$R_{DS(on)\ MAX}$ (Ω)



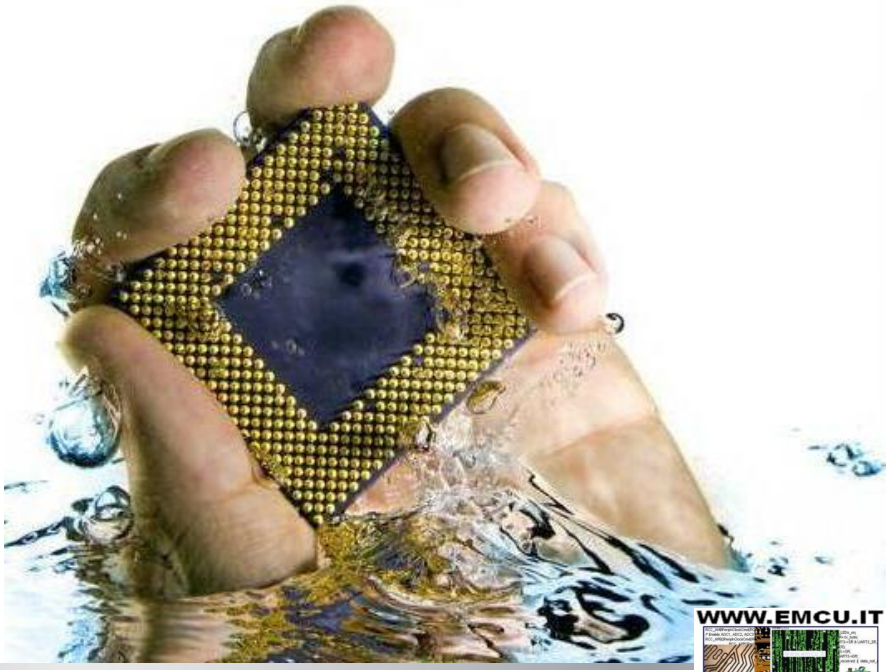
FoM = $R_{DS(on)}$ •Q_g (Ω•nC)



900V in TO-220 Package Benchmark

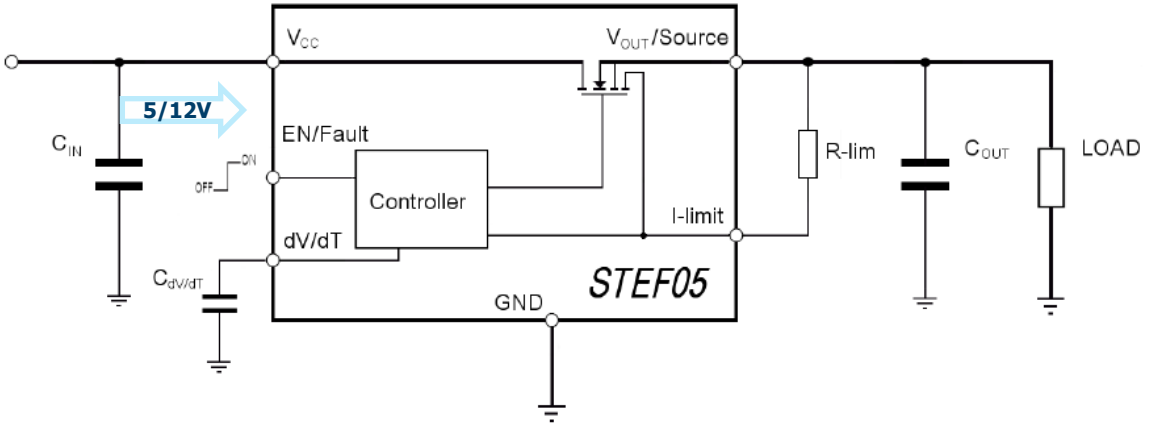
Protections: STEF05 / STEF12

Low voltage electronic fuse for 5V and 12V lines

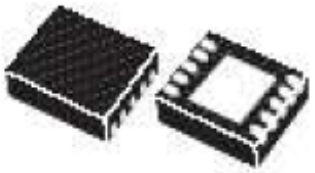


STEF05, STEF12 – Key Features

- **Output Clamping Voltage**
  - **6.65V for STEF05**
  - **15V for STEF12**
- **Very Low ON Resistance**
  - **40mOhm for STEF05**
  - **53mOhm for STEF12**
- **Current Limit**
  - **Set internally to 4.4A typ. (3.3A min to 5.5A max.)**
  - **Adjustable by external resistor**
- **No Degradation after a Trip Event**
- **Enable/Fault Functions**
- **Over Temperature Protection**

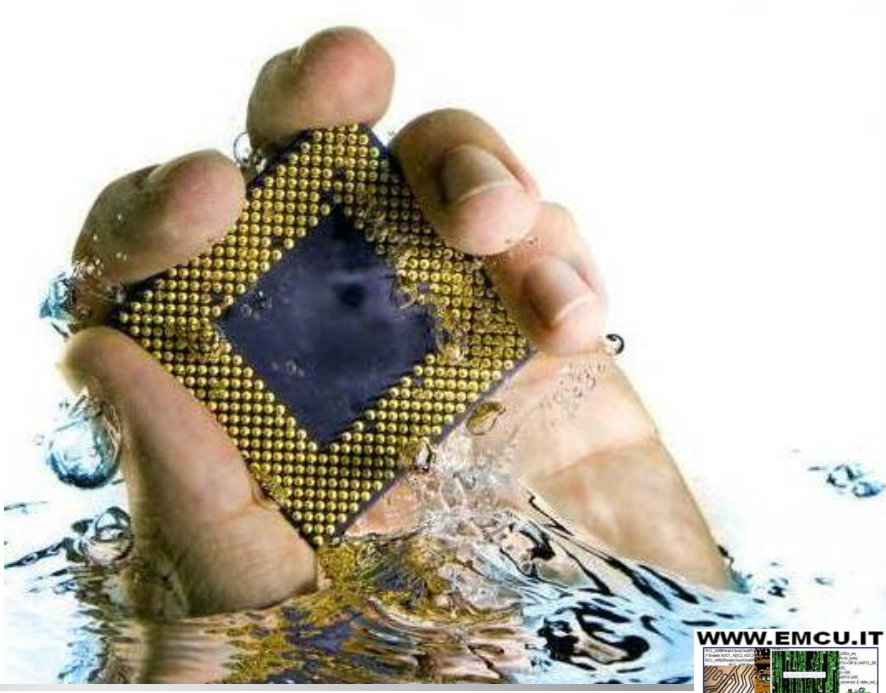


Typical application circuit



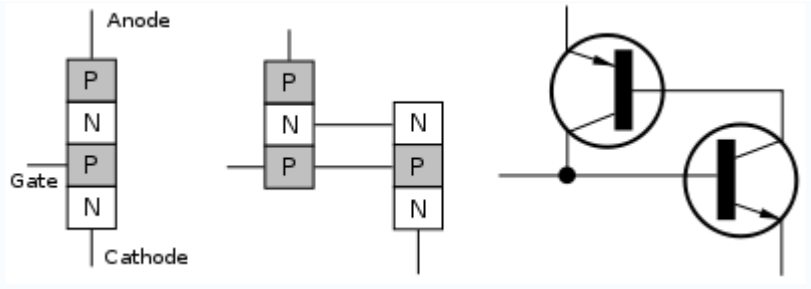
DFN 3x3 10L

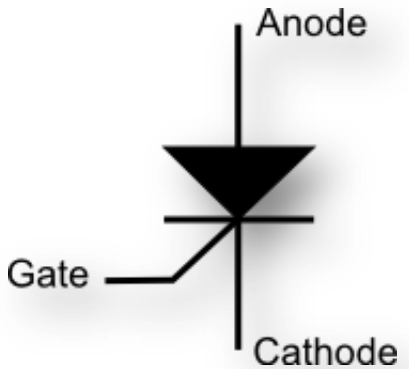
ACTUATORS

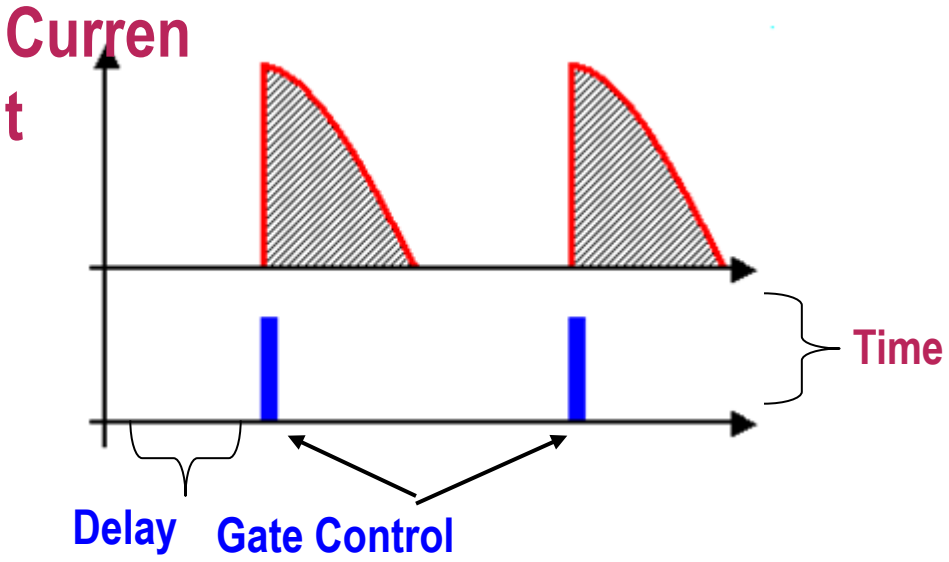


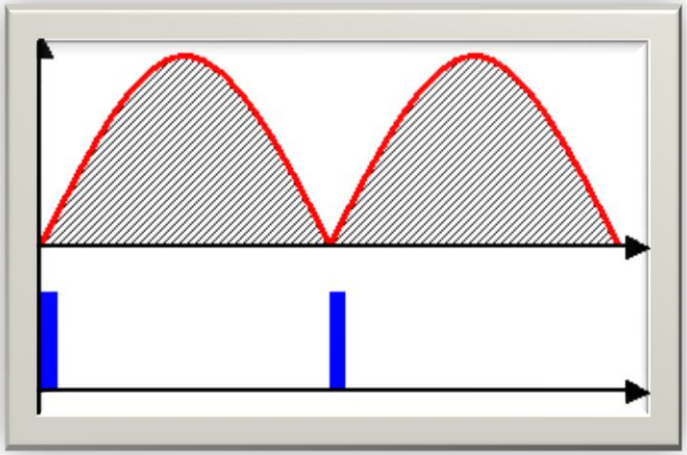
What is a SCR & basic operation

SCR: Silicon Controlled Rectifier



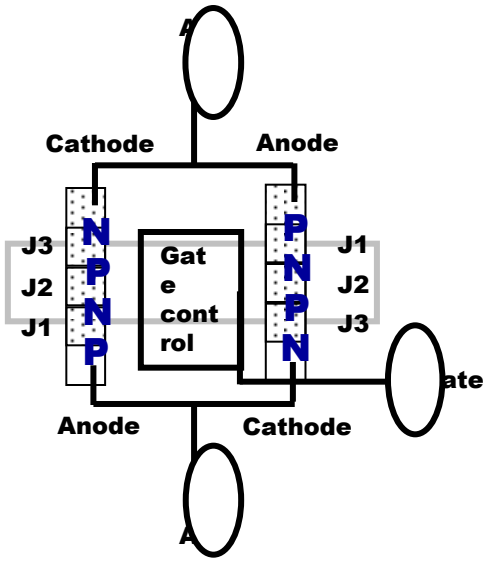


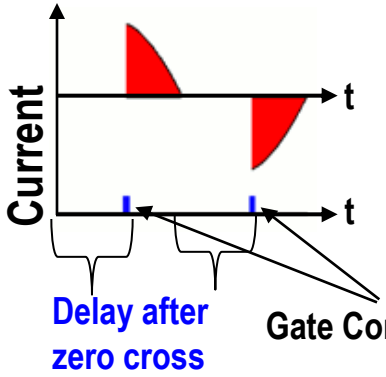


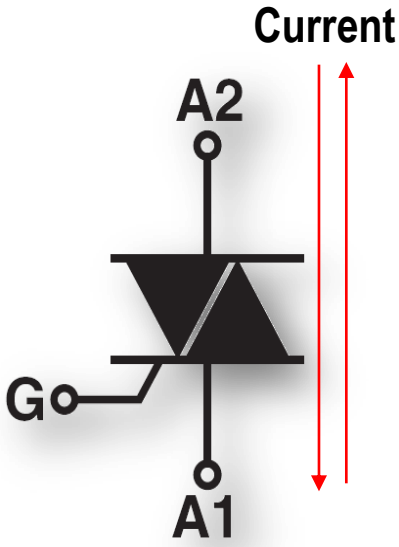


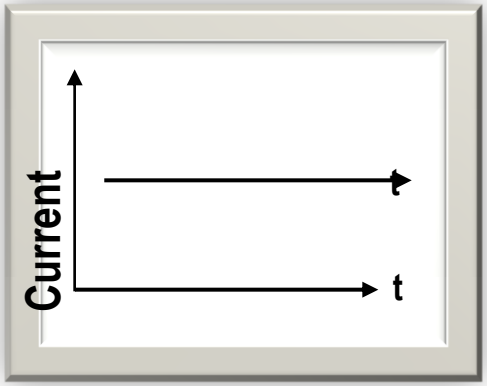
What is a TRIAC & basic operation

Triode for Alternating Current (A bidirectional switching device containing two thyristor structures assembled/built in back-to-back)



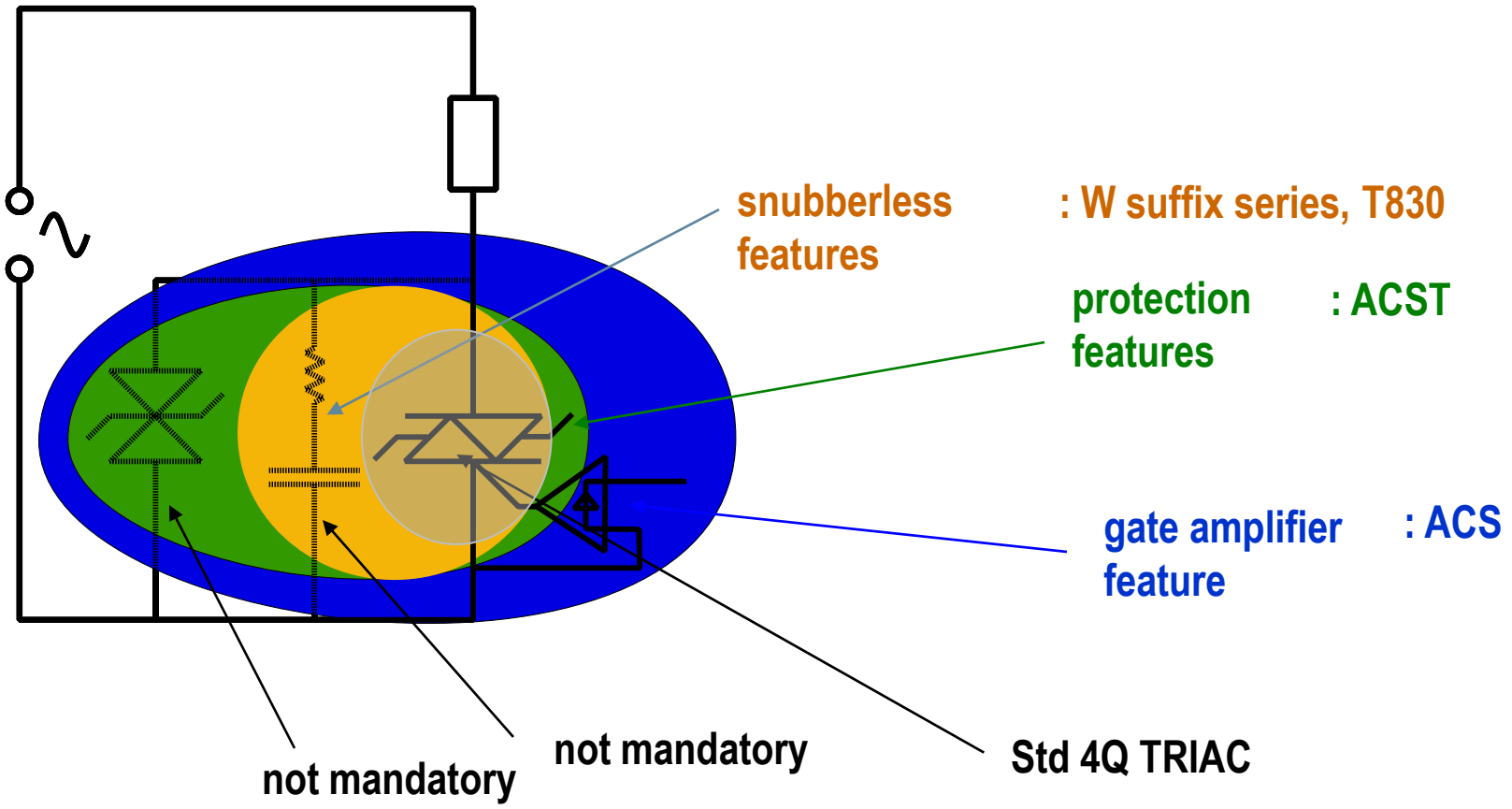






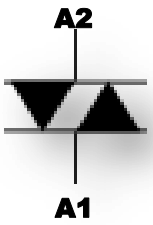
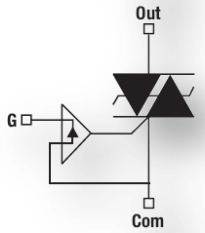
What is ACS, ACST

From BTA/BTB TRIACs to :



Thyristor & AC Switches portfolio range

A.S.D.®

DB	SCR	Triac	ACST	ACS	A.S.D.®
					**Application Specific Devices**
Diac (DB3, DB4, TMMDB3)	Sensitive	Standard (4Q)	Overvoltage protected High T_J	Overvoltage protected & level shifter	Ignitors for industrial (FLC)
	Standard High T_J	Snubberless (3Q) High T_J (35/50 mA I_{GT}) Alternistor (1 to 1.2 kV)	Snubberless & Logic Level	Snubberless & Logic Level (I_{GT} = 10mA)	Ignitors for Lighting (LIC)
		Logic Level High T_J (10 mA I_{GT})		Snubberless & Super Logic Level (I_{GT} = 5 mA)	Power Control Circuit (STCC)

AC switches highlights

- **SMBflat**
  - 4 times more compact than SOT-223
  - ➡ For home appliance, coffee machine, circuit breaker
- **800 V T series Triacs**
  - increased noise immunity and commutation
  - 2 working conditions : 800 V 125°C / 600 V 150°C
  - ➡ For inductive load : drum motor, power tool
- **150°C devices**
  - Triacs : up to 30 A
  - SCR : 12 A with I_{GT} 5 mA
  - ➡ For water heater, high-end power tool, inrush current limiter, voltage regulator
- **ACST**
  - 16 A 800 V 150°C
  - ➡ For both resistive and inductive loads

Package portfolio & halogen free status

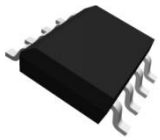
Axial, SMD,through hole and screw mounting

Axial

Mini-Melf

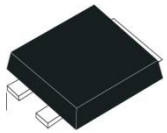
SOT-23

SO-8

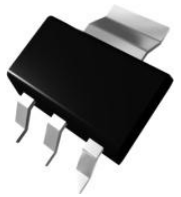


TO-92

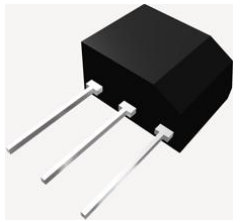
SMBflat-3L



SOT-223

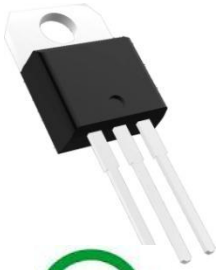


TO202-3
TO202-1



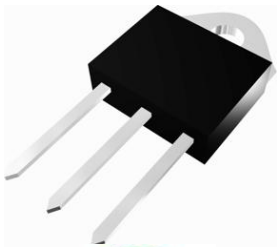
New package
1 A Triac & SCR

TO-220AB
insulated and
non-insulated



TO-220FPAB

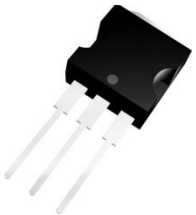
TOP-3
insulated and
non-insulated



RD-91

IPAK

I²PAK

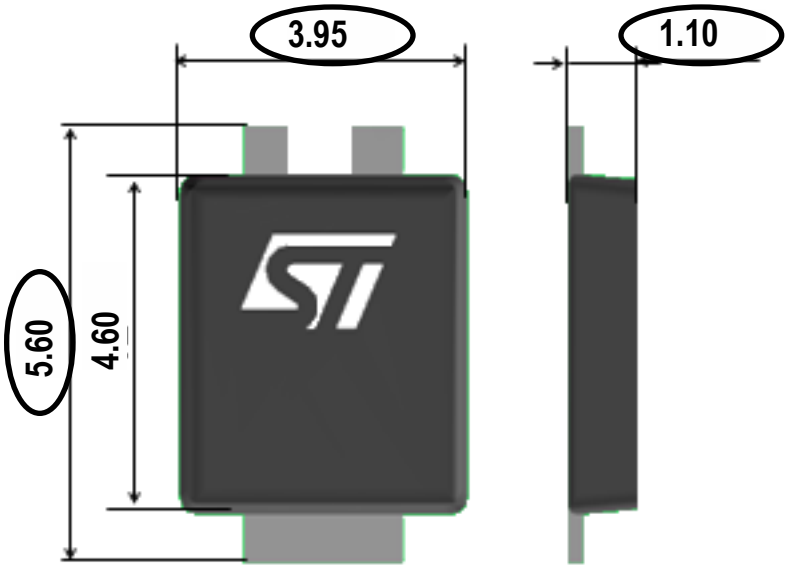


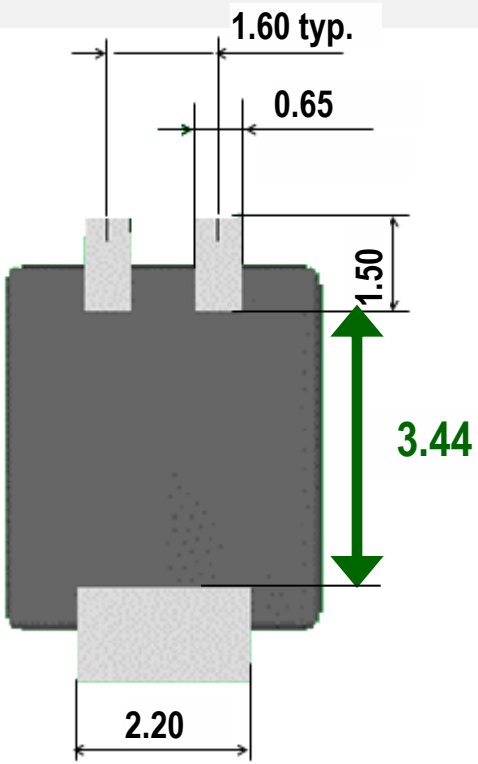
DPAK

D²PAK

SMB flat 3 leads - Overview

Length : 5.6 mm
Width : 3.95 mm
Height : 1.10 mm

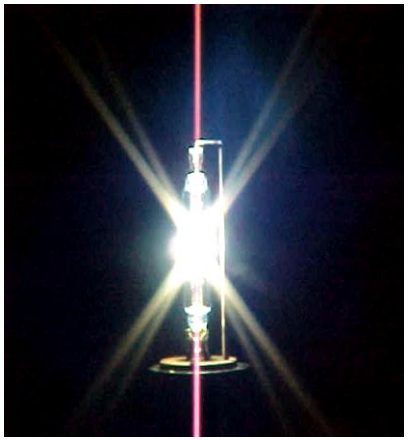




Smallest SMD alternative to SOT-223
ST genuine : design and production by ST
MSL-1, Halogen Free
Creepage > 3.4 mm (for Z01 and X02)

Application examples

LIGHTING

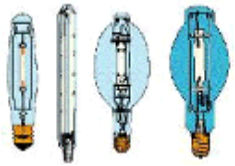


DIMMER

HID IGNITOR

CFL

ELECTRONIC BALLAST

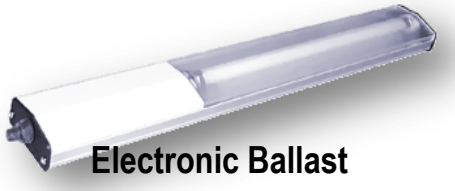


HID Ignitor

Street Lighting Ignitor

Dimmer

CFL Protection



Electronic Ballast

Application examples

HOME APPLIANCES

FRIDGE

WASHER

DISHWASHER

SMALL APPLIANCE

VACUUM CLEANER

HV & AIR-CONDITIONING

V/C

Fridge

Horizontal W/M

Vertical W/M

Coffee machine

HOB

Air Cond.

Iron

Dish Washer

Oven

Bidet

Water heater

Application examples

INDUSTRIAL

IGNITION

HEATERS

POWER TOOL

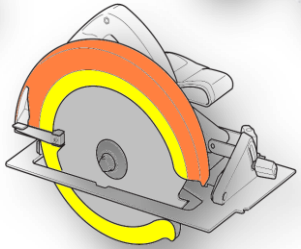
POWER-SUPPLY

SOLID STATE RELAY

VOLTAGE REGULATOR

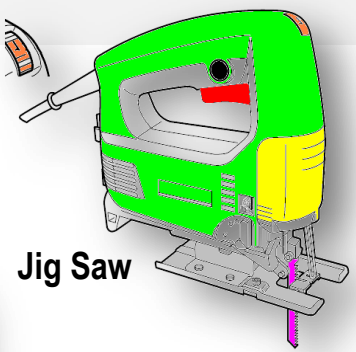
Fans speed control

Heater

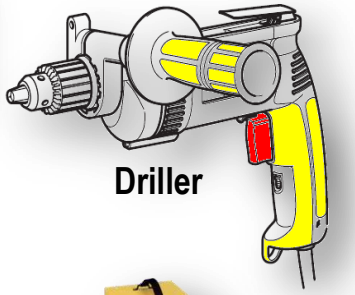


Circular Saw

Solid State Relay



Jig Saw

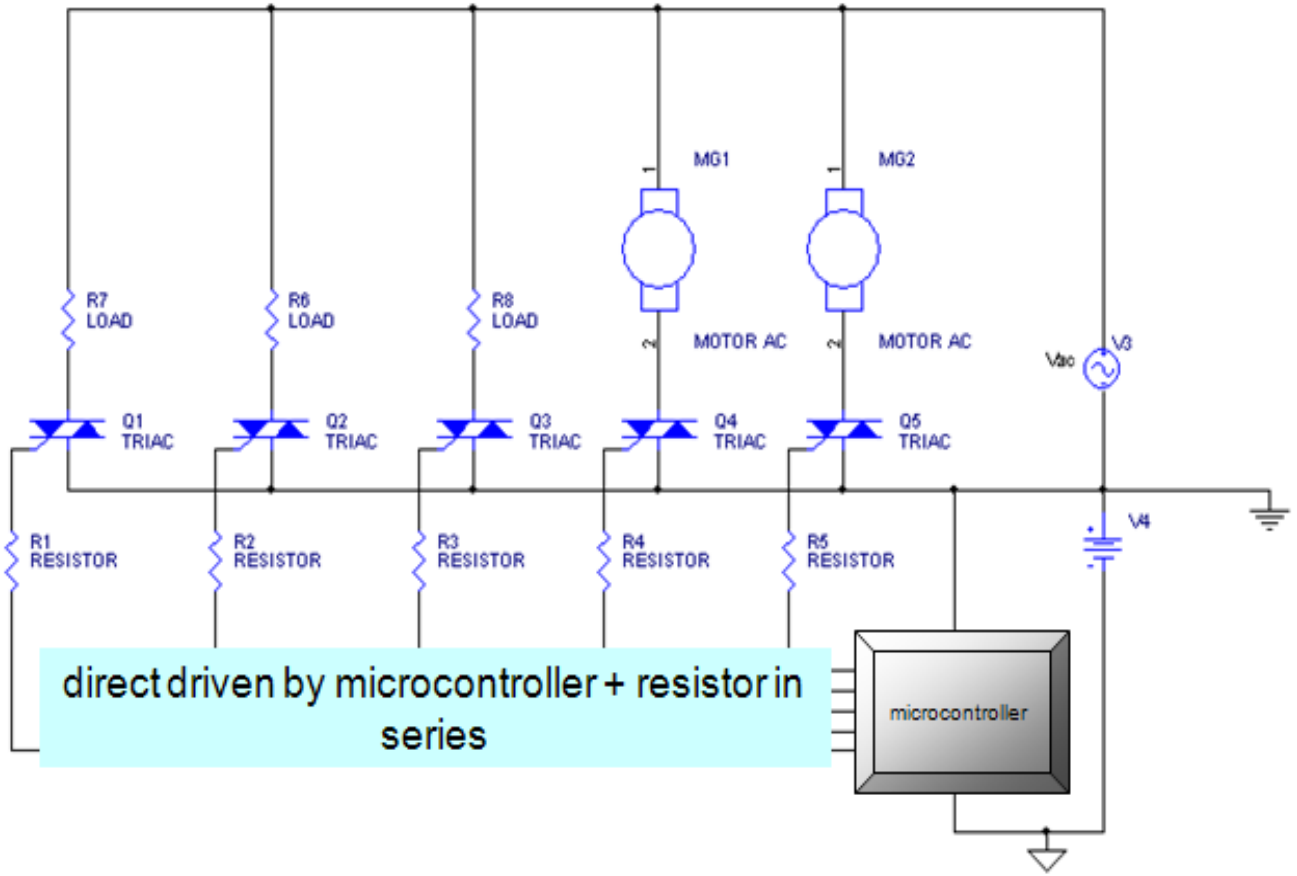


Driller

Welding

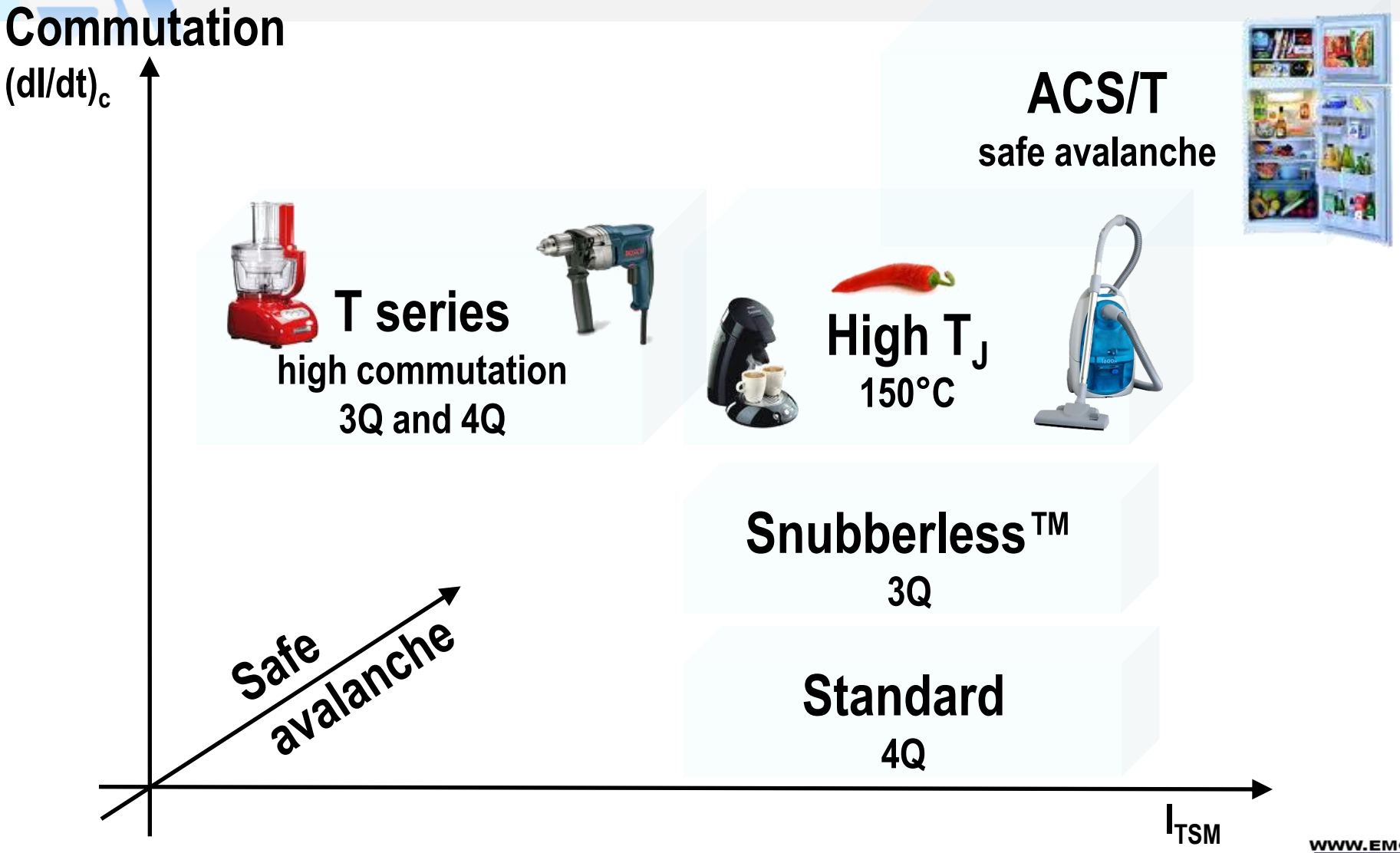
Motorbike

Example of usage of Triacs



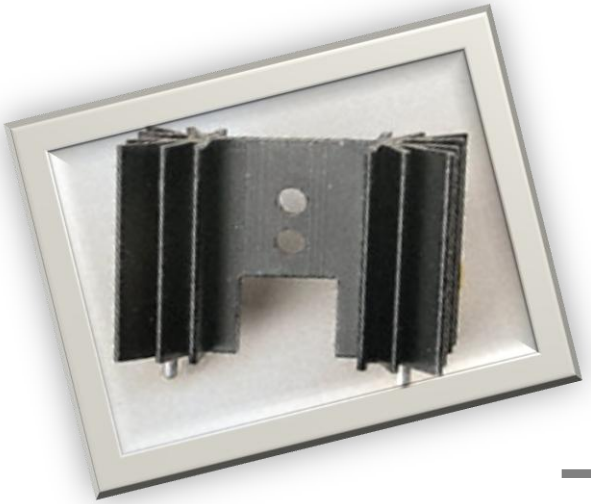
Sensitive gate Triacs leads to energy saving (SMPS current reduction) and no need of additional gate drivers

Triacs positioning



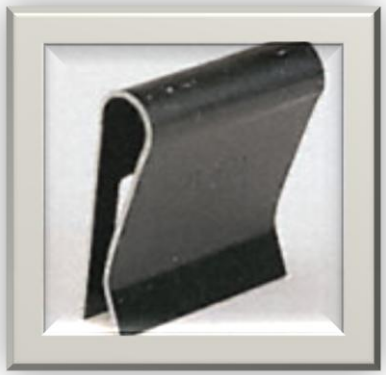
High Junction Temp. Triacs 150°C

OVERPASS POWER DISSIPATION LIMITS



5A RMS / Tamb 55°C

Divide Heatsink Cost by **2**



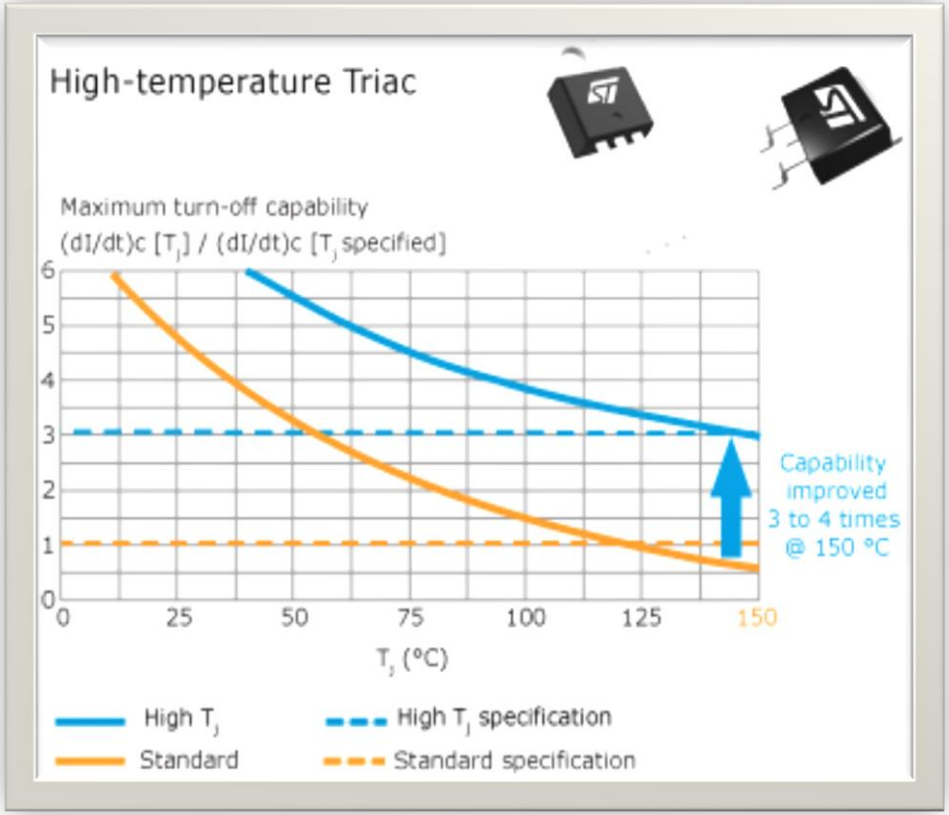
14°C/W
STANDARD 12A TRIAC
BTB12 or BTA12

20°C/W
NEW High Tj
T1235H

UL 1557 qualified
(certificate E81734)

Benefits of new Txx35/50H series

Maximal turn-off capability: depends on the junction temperature…



UL 1557 qualified (certificate E81734)

- Standard Triacs: increasing by 25°C the junction temperature from 125°C causes a 40% reduction of the maximal turn-off capability
- New design of High T_J provides better performances @ 150°C

High Tj family summary table

$I_{T(RMS)}$	V_{RRM}/V_{DRM}	I_{TSM} (2)(3)	I_{GT} max(2)	(di/dt)c min (4)	dV/dt min(4)	Quadrants	T_j	Packages		
(A)	(V)	(A)	(mA)	(A/ms)	(V/µs)		(°C)	D²PAK(1)	TO-220AB	TO-220AB Ins.
4	600	40	10	5.7	75	I - II - III	150		T410H-6T	
6	600	60	10	8.7	75	I - II - III	150		T610H-6T	
8	600	80	10	11.4	75	I - II - III	150	T810H-6G	T810H-6T	
8	600	80	35	11.0	1000	I - II - III	150	T835H-6G	T835H-6T	T835H-6I
8	600	80	50	14.0	1500	I - II - III	150	T850H-6G	T850H-6T	T850H-6I
10	600	100	10	14.4	75	I - II - III	150	T1010H-6G	T1010H-6T	
10	600	100	35	13.0	1000	I - II - III	150	T1035H-6G	T1035H-6T	T1035H-6I
10	600	100	50	18.0	1500	I - II - III	150	T1050H-6G	T1050H-6T	T1050H-6I
12	600	120	35	16.0	1000	I - II - III	150	T1235H-6G	T1235H-6T	T1235H-6I
12	600	120	50	21.0	1500	I - II - III	150	T1250H-6G	T1250H-6T	T1250H-6I
16	600	160	35	21.0	1000	I - II - III	150	T1635H-6G	T1635H-6T	T1635H-6I
16	600	160	50	28.0	1500	I - II - III	150	T1650H-6G	T1650H-6T	T1650H-6I
20	600	200	35	27.0	1000	I - II - III	150	T2035H-6G	T2035H-6T	T2035H-6I
20	600	200	50	36.0	1500	I - II - III	150	T2050H-6G	T2050H-6T	T2050H-6I
30	600	270	35	33.0	1000	I - II - III	150		T3035H-6T	T3035H-6I
30	600	270	50	44.0	1500	I - II - III	150		T3050H-6T	T3050H-6I

(1) tape and reel please add suffix -TR

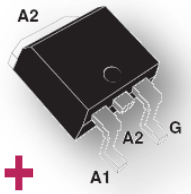
(2) I_{TSM} specified at $T_{J\ initial}$ = 25 °C, I_{GT} specified at T_J = 25 °C

(3) t_p = 10 ms

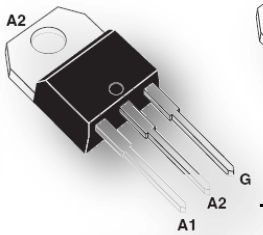
(4) specified at T_J = 150 °C

10 mA contributes to A++

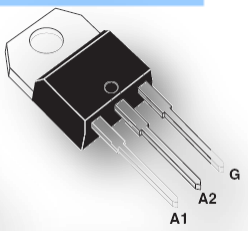
UL 1557 qualified (certificate E81734)



D²PAK



TO-220AB



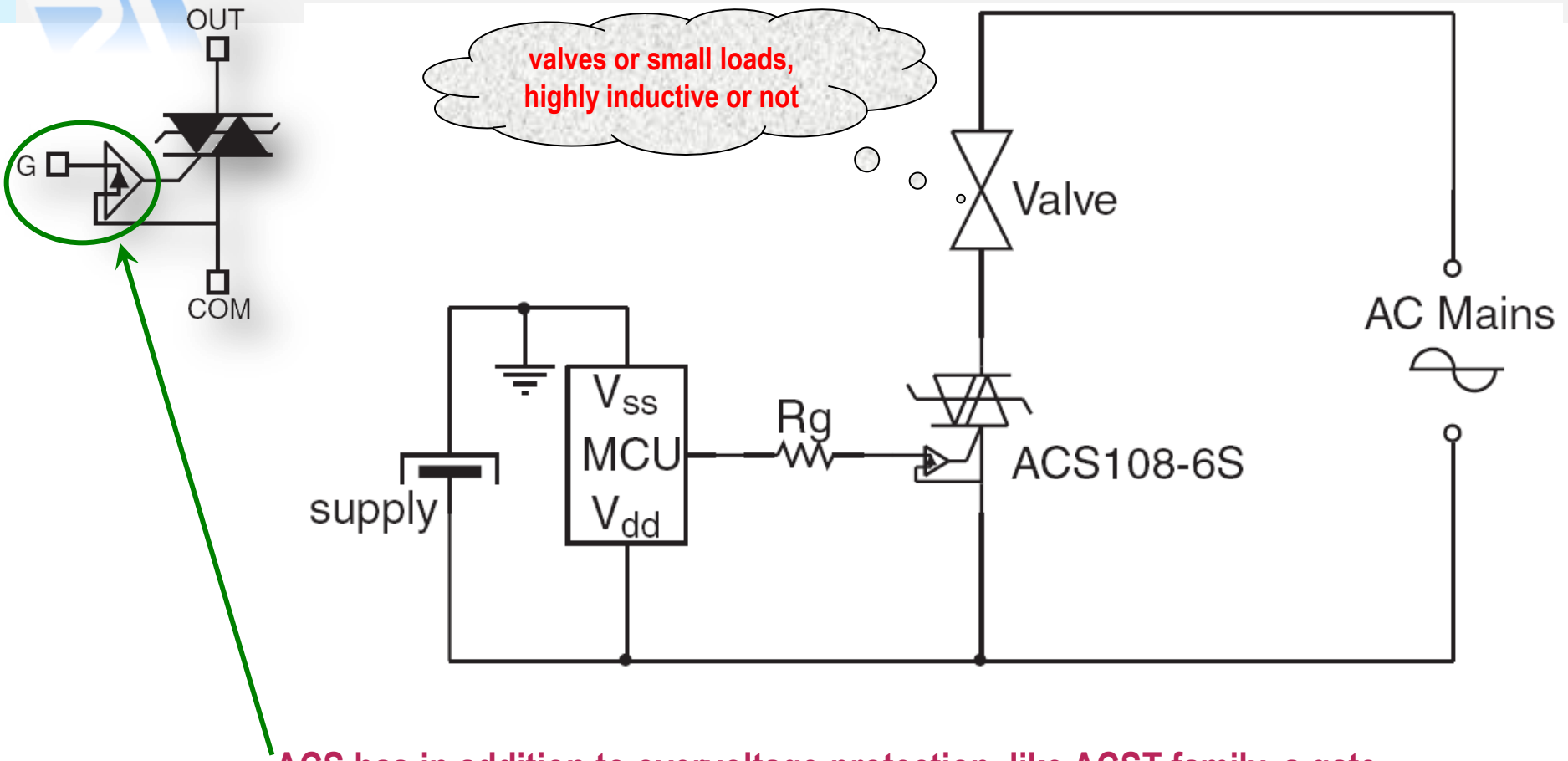
TO-220AB Insulated

ACS & ACST

- **Overvoltage protected**
  - **no need of varistor or snubber as opposed to other TRIACs**

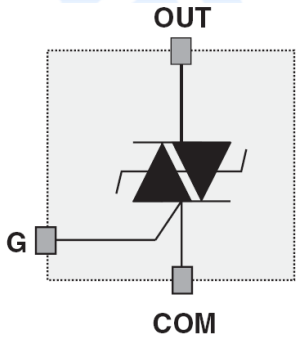
- **IEC 61000-4-4 & IEC61000-4-5**
  - **easy analysis due to FMEA simplification**
  - **standard: varistor will not be accepted soonest, today has to be removed during test.**

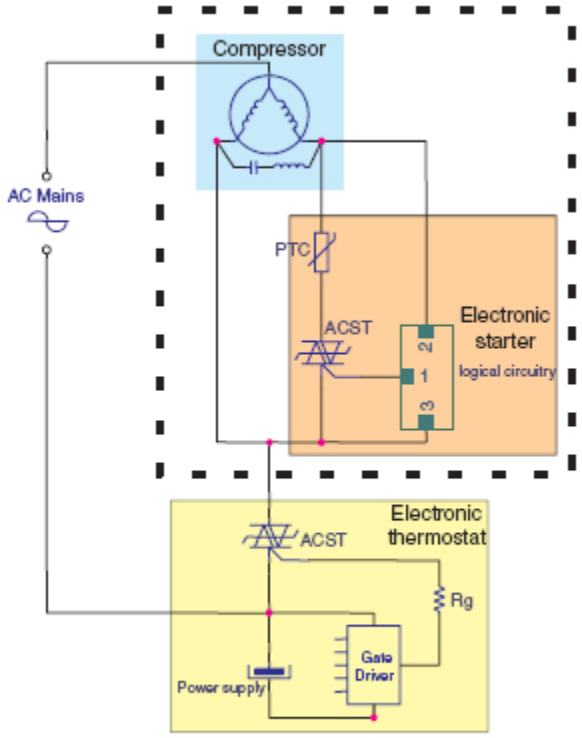
ACS typical appication



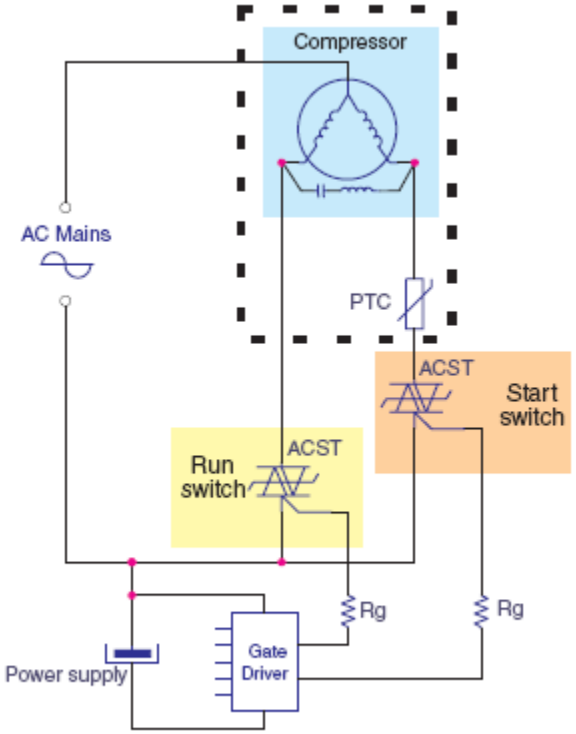
ACS has in addition to overvoltage protection, like ACST family, a gate driver able to provide immunity not surpassed by any 1A device. Closest is 4 Amp but with I_{GT} of 35 mA

ACST
Typical compressor application





Compressor with integrated e-starter

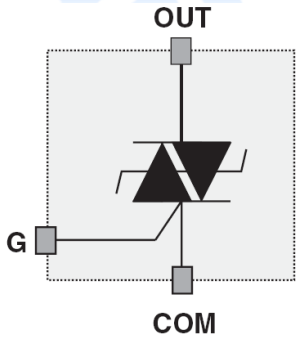


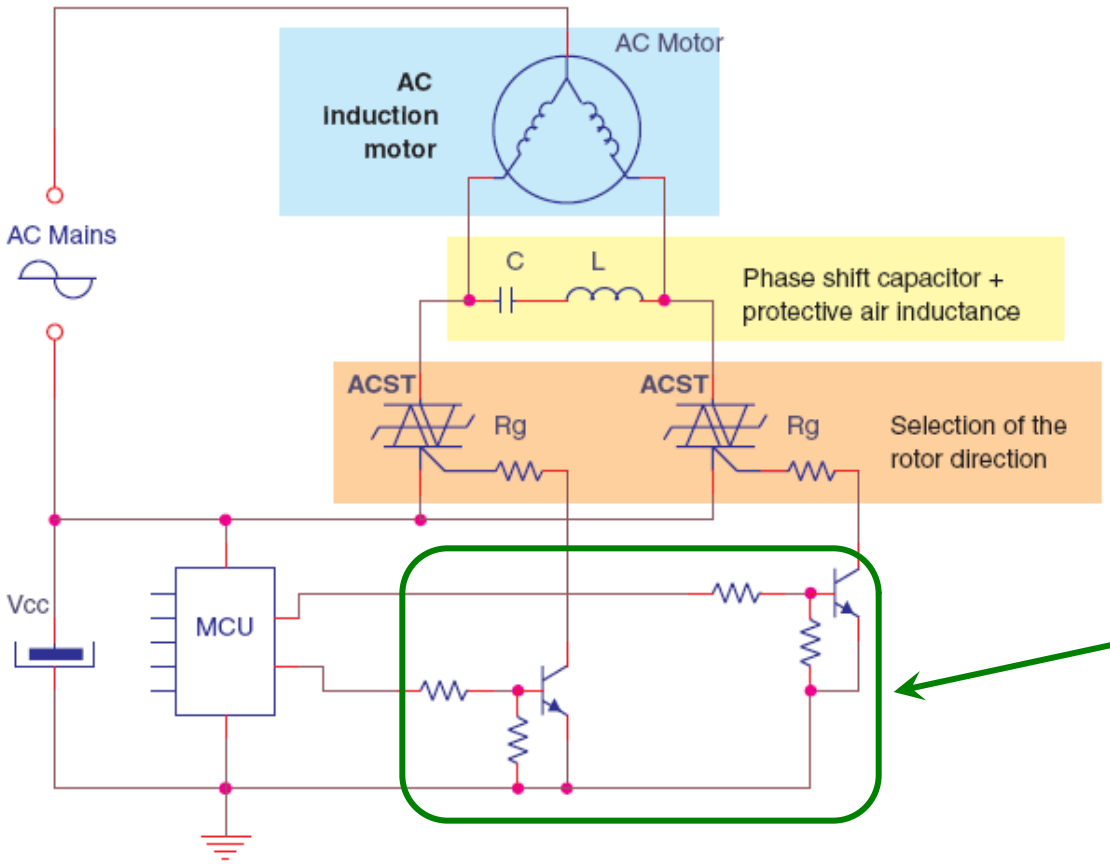
Compressor with external electronic drive

- ACST devices are ideal for 24/7 mains connected
- IEC61000-4-5 up to 2kV guaranteed in datasheet:

V_{PP}	Non repetitive line peak pulse voltage (1)	T_j = 25 °C	2	kV

ACST
Typical AC ind. motor application



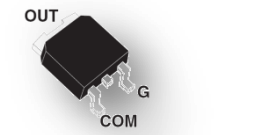


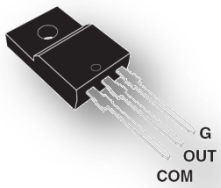
Drivers may be removed or not depending on ACST selected and MCU (driver) cabapility of sink current.

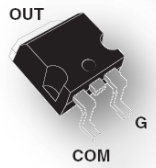
ACST has:

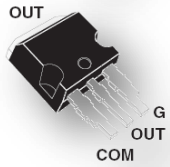
- high immunity against fast transients described in IEC61000-4-4
- triac structure with high voltage clamping device, guaranteed in datasheet parameter called VCL, able to absorb the inductive turn-off energy and able to withstand line transients such as described in IEC61000-4-5

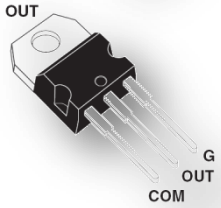
ACST product portfolio











ACST	$I_{T(RMS)}$ (Amp)	V_{DRM} / V_{RRM} (1) (Volt)	I_{GT} mA	dV/dt V/µs	(dI//dt)c A/ms	Junction Temper. °C	Package (10)
ACST210-8x(9)	2	800	10	500	0.5 (2)	125	8, 4
ACST410-8x(9)	4	800	10	500	2 (2)	125	8, 4
ACST435-8x(9)			35	1000	5 (3)		
ACST610-8x(9)	6	800	10	500	3.5 (2)	125	4, 5, 6, 7
ACST830-8x(9)	8	800	30	2000	8 (3)	125	4, 5, 6
ACST1010-7x(9)	10	700 800V in dev.	10	200	4.4 (2)	125	4, 5
ACST1035-7x(9)			35	2000	12 (3)		
ACST1210-7x(9)	12	700 800V in dev.	10	200	5.3 (2)	125	5, 6
ACST1235-7x(9)			35	2000	14 (3)		
ACST1635-8x(9) (11)	16	800	35	2000	16	**150**	4

(1) self-protection against overvoltage, clamping @ min. 850 V

(2) snubber @ 15 V/µs

(3) without snubber

(11) under development

(9) suffix x: (4) = FP, (5) = T, (6) = G, (7) = I, (8) = B

(10) packages: (4) TO-220FPAB, (5) TO-220AB, (6) D2PAK, (7) I2PAK, (8) DPAK

Thank You!!!

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