Factory automation system
Solutions for Industry 4.0

Robin Feng
Industrial Automation Competence Center
AP Region, STMicroelectronics
1. Factory automation structure
2. PLC system applications
3. Servo / inverter applications in factory automation
4. Industrial robots in factory automation
5. Industrial machines & tools
6. Condition monitoring and actuators
7. Q&A
Main applications in factory automation

1. Programmable logic controller
2. Servo and inverter drivers
3. Industrial robots and AGV
4. Industrial machines & tools
5. Condition monitoring
6. Machine vision and safety guards
Program Logic Control (PLC) system applications
PLC system architecture

**Sensing**
- Proximity, Temperature, pressure, flow, pH...

**Actuation**
- Valves, pumps, lamps, relays, contactors...

**Distributed IO modules**
- Analog: 4-20mA, 0-10V ±10V...
- Digital: HART, Binary 24V, IO-Link

**Human Machine Interface**

**Industrial Ethernet**

**Fieldbus**
- CAN

**Industrial Internet of Things**

**IO**

**IPC**

**IO-Link**

**RF**

**Safety Relays, Circuit Breakers**
## Intelligent Power Switches
### Family Portrait

<table>
<thead>
<tr>
<th>Output Current/Channel (A)</th>
<th>Single Channel</th>
<th>Dual Channels</th>
<th>Quad Channels</th>
<th>Octal Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 A</td>
<td>IPS1025H-32*</td>
<td>IPS2050H-32*</td>
<td>≤ 60V</td>
<td></td>
</tr>
<tr>
<td>2 A</td>
<td>IPS160H, IPS160HF*, IPS1025H*, IPS1025HF*</td>
<td>IPS2050H*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 A</td>
<td>IPS161H, IPS161HF*</td>
<td>VNI2140J</td>
<td>VNI4140K-32</td>
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<tr>
<td>2 A</td>
<td>IPS161H, IPS161HF*</td>
<td>IPS2050H*</td>
<td>VN340SP-33</td>
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</tr>
<tr>
<td>0.5 A</td>
<td>IPS1025H-32*</td>
<td>IPS2050H*</td>
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<tr>
<td>1 A</td>
<td>IPS160H, IPS160HF*, IPS1025H*, IPS1025HF*</td>
<td>VNI4140K</td>
<td>ISO808-1*, ISO808A-1*</td>
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<tr>
<td>&lt; 0.5 A</td>
<td>IPS160H, IPS160HF*, IPS1025H*, IPS1025HF*</td>
<td>IPS4260L</td>
<td>ISO8200AQ, ISO8200B, ISO8200BQ, ISO808*</td>
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<td></td>
<td>IPS160H, IPS160HF*, IPS1025H*, IPS1025HF*</td>
<td>VNQ860</td>
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<td>IPS160H, IPS160HF*, IPS1025H*, IPS1025HF*</td>
<td>L6374</td>
<td>ISO8200AQ, ISO8200B, ISO8200BQ, ISO808*</td>
<td></td>
</tr>
</tbody>
</table>

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(*) In Development

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*(Low Side)*

*(Isolated)*
**Factory automation yesterday**

**Typical application environment**

**Sensing**
- Temperature, pressure, flow, proximity…

**Actuation**
- Valves, pumps, lamps, relays, contactors…

**System attributes:**
- Limited modularity (system upgrade)
- Sensitivity to noise
- Difficult to modify/adapt the system
- Painful maintenance (long downtimes!)

**Many different standards in terms of signal levels and communication protocols**

**Various transfer principles**
- Analog information transfer
- Low configuration options
- No diagnostics

**Signal levels and communication protocols**
- 4-20mA
- 0-10V

**DIN mounting**

**Industrial Ethernet**
Factory automation tomorrow with IO-Link

Typical application environment

**Sensing**
- Temperature, pressure, flow, proximity…

**Actuation**
- Valves, pumps, lamps, relays, contactors…

**System attributes:**
- Unified access to sensors & actuators
- Digital information transfer
- Bidirectional communication
- Simplified & modular system structure
- Reliable communication
- Allows use of smart sensors & actuators!
- Easy monitoring & system diagnostics (minimized downtimes)
A smart way of driving 3-wire digital sensors and actuators

- First standardized technology for digital communication with sensors and actuators: IEC 61131-9
- **3-wire point-to-point digital** communication compatible with the conventional binary sensors & actuators (Standard IO) including the cable material and connectors!

![Diagram of L6360 & L6362A devices](image)
<table>
<thead>
<tr>
<th>Evalboard code</th>
<th># Channels</th>
<th>I_{OUT} (A)</th>
<th>Product</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEVAL-IFP028V1</td>
<td>1</td>
<td>2.5</td>
<td>IPS160H</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP034V1</td>
<td>1</td>
<td>0.7</td>
<td>IPS161H</td>
<td>High side Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP029V1</td>
<td>4</td>
<td>0.5 ÷ 3</td>
<td>IPS4260L</td>
<td>Low side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP005V2</td>
<td>1</td>
<td>2.5</td>
<td>VN751PT</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP001V1</td>
<td>8</td>
<td>0.7</td>
<td>VN808CM</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP010V3</td>
<td>2</td>
<td>1</td>
<td>VNI2140J</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP006V1</td>
<td>4</td>
<td>0.7</td>
<td>VNI4140K</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP019V1</td>
<td>4</td>
<td>1</td>
<td>VNI4140K-32</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP022V1</td>
<td>8</td>
<td>0.7</td>
<td>VNI8200XP</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>X-NUCLEO-PLC01A1</td>
<td>8</td>
<td>1</td>
<td>VNI8200XP-32</td>
<td>High side, Non Isolated</td>
</tr>
<tr>
<td>STEVAL-IFP032V1</td>
<td>8</td>
<td>0.7</td>
<td>ISO8200B</td>
<td>High side, Isolated output</td>
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<tr>
<td>STEVAL-IFP015V2</td>
<td>8</td>
<td>0.7</td>
<td>ISO8200BQ</td>
<td>High side, Isolated output</td>
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<tr>
<td>STEVAL-IFP033V1</td>
<td>8</td>
<td>0.7</td>
<td>ISO8200AQ</td>
<td>High side, Isolated output</td>
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<tr>
<td>X-NUCLEO-OUT01A1</td>
<td>8</td>
<td>0.7</td>
<td>ISO8200AQ</td>
<td>High side, Isolated output</td>
</tr>
</tbody>
</table>
Servo and inverter applications in factory automation
Variable-frequency drive (VFD) Inverter (open-loop)

**Opportunity** | **Device**
--- | ---
Temp Sensor | STTS751
Supervisor | STM706
RS-485/422 | ST3485
Digital Input | CLT01-38
Digital Output | ISO8200BQ
CAN Transceiver | L9616
ESD for CAN | ESDCAN06
4-ch op amp | LMX324
2-ch op amp | LMX358
Comparator | TXS393
Voltage Ref | TL431
Rectifier | STTH15L06
SLLIMM2 IPM | STGIF7CH60
Gate Driver, IGBT | STGAP2D *3
| STGD6M62DF2 *6
Rectifier *6 | STTH15L06
# High-voltage AC Servo function matrix

<table>
<thead>
<tr>
<th>AC Servo Power level</th>
<th>Driver Stage</th>
<th>Power stage</th>
<th>Controller</th>
<th>Position/Current feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>General AC Servo:</td>
<td>L638X</td>
<td>SLIMM 2&lt;sup&gt;nd&lt;/sup&gt; ACEPACK Module</td>
<td>STM32</td>
<td>Isolated sensor: STISOSD61</td>
</tr>
<tr>
<td></td>
<td>L639X</td>
<td>HV MOSFET</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>L649X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>STGAP2S/D</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High Power AC Servo:</td>
<td>STGAP1AS</td>
<td>Discrete IGBT</td>
<td>STM32</td>
<td>HALL/ STISOSD61</td>
</tr>
<tr>
<td>&gt;3KW</td>
<td>STGAP2S/D</td>
<td>HV MOSFET</td>
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<td></td>
</tr>
</tbody>
</table>
High-power Servo

- 3 Phase
- AC 380V

ACEPACK IPM

Isolated Gate Driver

STTS751
STM706
L9616
ST3485

MCU/DSP

Comp
Comp
ADC

ESDCAN04
L9616
ST3485

STTS751
STM706

Hall Current Sensing

Position Sensing Encoder

3-Phase Motor

Hall
U
V
W

Comp
Comp
ADC

NTC

Buffer

Gate Driver

Brake

STGAP2S

E2PROM
## Motor drive solutions in factory automation

<table>
<thead>
<tr>
<th>DC Servo Power level</th>
<th>Gate Driver</th>
<th>Power stage</th>
<th>Controller</th>
<th>Position sensor and feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>24~48V Low-voltage Servo system</td>
<td>L64XX STDRIVE101</td>
<td>LV MOSFET</td>
<td>Integrate solution STPIN32</td>
<td>Amps Encoder</td>
</tr>
<tr>
<td></td>
<td>Or integrate in controller STSPIN32G4</td>
<td>Or Integrated solution (Currently ST does not have)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stepper Motor Driver</td>
<td>STSPIN220, 10V</td>
<td>Integrated solution: STSPINX20</td>
<td>STM32/DSP</td>
<td>amps</td>
</tr>
<tr>
<td></td>
<td>STSPIN820, 45V</td>
<td>POWERSTEP01 or LVMOSFET</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HV Servo system</td>
<td>L649X STGAP2S/D</td>
<td>PWD13F30</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Or HV MOSFET</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
24~48V/750W integrated Servo solution with SPIN32G4 integrated 3-phase driver
New solution: Redundant dual-channel safe torque-off for servo and inverter
STSPIN, drivers, and power devices

**DC & BLDC**
- Dual Full Bridge: L6205, L6206, L6207, L6225, L6226, L6227, L6206Q, L6207Q, L6226Q, L6227Q, STSPIN840*
  - 3 phase Bridge: L6229, L6230, L6234, L6235, STSPIN830*
  - STSPIN820
- Single Full bridge: L6201, L6202, L6203

**Stepper**
- Dual Full bridge with controller: L6208, L6228, L6208Q, L6228Q
- Dual Full Bridge: L6219
- µStepper DRIVER: STSPIN220
- µStepper DRIVER with motion engine: L6470, L6472, PowerSTEP01
- µStepper Controller with motion engine: L6480, L6482

**µStepper**
- µStepper DRIVER with motion engine: STSPIN230
- Single Full Bridge: STSPIN240
- Dual Full Bridge: STSPIN250

**Low Voltage DC, BLDC & Stepper**
- Scalable 600V – 80V System In Package: PWD13F60, PWD5F60
- Isolated 4k / 6k Drivers for IGBT/PMOS: STGAP1AS, STGAP2S*, STGAP2D*
- Fully protected Single MOS/IGBT Gate Driver: TD350, TD351, TD352, TD310

**High Density Power Drivers SiP for DC, BLDC & Stepper**
- High Power DC, AC & BLDC
- Dual Full bridge with controller: L6208, L6228, L6208Q, L6228Q
- Dual Full Bridge: L6219
- µStepper DRIVER: STSPIN220
- µStepper DRIVER with motion engine: L6470, L6472, PowerSTEP01
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**High Power DC, AC & BLDC**
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<table>
<thead>
<tr>
<th>Evalboard order code</th>
<th># Channels</th>
<th>$I_{\text{out}}$ (A)</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVALSTGAP2HSM</td>
<td>1</td>
<td>4</td>
<td>STGAP2HS</td>
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<tr>
<td>EVALSTGAP2SM</td>
<td>1</td>
<td>4</td>
<td>STGAP2S</td>
</tr>
<tr>
<td>EVALSTGAP2DM</td>
<td>2</td>
<td>4</td>
<td>STGAP2D</td>
</tr>
<tr>
<td>STEVAL-HKI001V2</td>
<td>1</td>
<td>5</td>
<td>STGAP1AS A2C35S12M3 STM32F303</td>
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<tr>
<td>EVALSTDRIVE601</td>
<td>3</td>
<td>Depends power stage</td>
<td>STDRIVE601, STGD6M65DF2, TSV912,TS3021</td>
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<td>EVALSTDRIVE101</td>
<td>3</td>
<td>Depends Power stage</td>
<td>STDRIVE101, STL110N10F7, TSV991AIQ</td>
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<td>EVAL6498L</td>
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<td>2-2.5A</td>
<td>L6498L</td>
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<tr>
<td>EVALPWD5F60</td>
<td>2</td>
<td>1A</td>
<td>PWD5F60</td>
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<tr>
<td>EVALPWD13F60</td>
<td>2</td>
<td>3A</td>
<td>PWD13F60</td>
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<tr>
<td>STEVAL-IHM035V2</td>
<td>3</td>
<td>20A</td>
<td>STGIPN3H60,TS302, LD1117,VIPER16LD BAT54/60,STTH1R04</td>
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Mobile robot main board

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Device</th>
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<tr>
<td>Temp Sensor</td>
<td>STTS751</td>
</tr>
<tr>
<td>Supervisor</td>
<td>STM706</td>
</tr>
<tr>
<td>RS-485/422</td>
<td>ST3485</td>
</tr>
<tr>
<td>Digital Input</td>
<td>CLT01-38</td>
</tr>
<tr>
<td>Digital Output</td>
<td>ISO8200BQ</td>
</tr>
<tr>
<td>CAN Transceiver</td>
<td>L9616</td>
</tr>
<tr>
<td>ESD for CAN</td>
<td>ESDCAN06</td>
</tr>
<tr>
<td>4-ch op ap</td>
<td>LMX324</td>
</tr>
<tr>
<td>2-ch op amp</td>
<td>LMX358</td>
</tr>
<tr>
<td>Comparator</td>
<td>TXS393</td>
</tr>
<tr>
<td>Voltage Ref</td>
<td>TL431</td>
</tr>
<tr>
<td>Gate Driver</td>
<td>STGAP2D *3</td>
</tr>
<tr>
<td>ACEPACK 2 IPM</td>
<td>A2C50S65M2</td>
</tr>
<tr>
<td>*Discrete Rectifier, IGBT</td>
<td>STGB10H60DF, STGB10/15M65 DF2*6</td>
</tr>
</tbody>
</table>
AGV Block Diagram

Control Unit
nVidia GPU

IR
Ultrasonic Module
Camera Module
LIDAR Module
Accelrometer
RF ID Reader

Backlight LED Driver
LCD Display
Switch/Touch Panel

Wireless AP
Wifi
Audio Codec
Audio Power Amp
Speaker (Warning Sound)

DC Servo Driver Module 1
DC Servo Driver Module 2

STM32 MCU
Control Box

BLDC Motor (Left Wheel)
BLDC Motor 3 (Right Wheel)
LED (Warning Light)

Navigating Control

TVS
24V: SMA4F28A
48V: SMA4F58A

Servo Motor Driver Modules

DC-DC

24V/48V Battery

BMS

IR

Ultrasonic Module

Camera Module

LIDAR Module

Accelrometer

RF ID Reader

USB

USBL6-C2SC6

PROTECTION
Ethernet Primary: SLVU2.8-4A1
Ethernet Secondary: USLC6-4SC6

Flash

DDR

Navigate Control

STM32 MCU

Ethernet Primary:
SLVU2.8-4A1
Ethernet Secondary:
USLC6-4SC6

TVS
24V: SMA4F28A
48V: SMA4F58A

DC-DC

24V/48V Battery

BMS

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Camera Module

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DC-DC

24V/48V Battery

BMS

IR

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Camera Module

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Navigate Control

STM32 MCU

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BMS

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Ultrasonic Module

Camera Module

LIDAR Module

Accelrometer

RF ID Reader

USB

USBL6-C2SC6

PROTECTION
Ethernet Primary: SLVU2.8-4A1
Ethernet Secondary: USLC6-4SC6

Flash

DDR

Navigate Control

STM32 MCU

Ethernet Primary:
SLVU2.8-4A1
Ethernet Secondary:
USLC6-4SC6

TVS
24V: SMA4F28A
48V: SMA4F58A

DC-DC

24V/48V Battery

BMS

IR

Ultrasonic Module

Camera Module

LIDAR Module

Accelrometer

RF ID Reader

USB

USBL6-C2SC6

PROTECTION
Ethernet Primary: SLVU2.8-4A1
Ethernet Secondary: USLC6-4SC6

Flash

DDR

Navigate Control

STM32 MCU

Ethernet Primary:
SLVU2.8-4A1
Ethernet Secondary:
USLC6-4SC6

TVS
24V: SMA4F28A
48V: SMA4F58A

DC-DC
### Evaluation boards for industrial robots

<table>
<thead>
<tr>
<th>Evalboard order code</th>
<th># Channels</th>
<th>Product</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEVAL-SPIN3204</td>
<td>3</td>
<td>STSPIN32F0B, LD3985, STM32F103, STD140N6F7, STPS0560</td>
<td>3-phase brushless DC motor driver board based on the STSPIN32F0B 3-phase BLDC controller with triple half-bridge gate driver</td>
</tr>
<tr>
<td>EVAL6491HB</td>
<td>1</td>
<td>L6491, MOSFETs/IGBTs</td>
<td>Gate driver with smart shutdown feature</td>
</tr>
<tr>
<td>SL-MCAMC01001V1</td>
<td>3</td>
<td>L9907, STD105N10, L9777, L5300, SPC560</td>
<td>Electric traction for small vehicles 48V</td>
</tr>
<tr>
<td>EVALSTDRV600HB8</td>
<td>1</td>
<td>L638XE, L639X, MOSFETs/IGBTs</td>
<td>Single-chip half-bridge gate drivers for N-channel power MOSFET or IGBT.</td>
</tr>
<tr>
<td>EVALSTDRIVE101</td>
<td>3</td>
<td>STDRIVE101, STL110N10F7, TSV991AIQ</td>
<td>Demonstration board for 3-phase brushless motors</td>
</tr>
</tbody>
</table>
Computer numerical control (CNC) system

**Power Protection**
- Efuse: STEF01
- Hot swap

**Control Panel (HMI)**
- DSP/MPU
  - Memory/EEPROM
  - CLK/RTC
  - REF
  - Supervisor

**Main power supply**
- 3 Phase AC Mains

**Position**
- X Step/Servo Motor Driver
- Z Step/Servo Motor Driver
- Main Motor Driver

**Supervisor**
- STM706

**Opportunity**
<table>
<thead>
<tr>
<th>Device</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>STTS751</td>
<td>Temp Sensor</td>
</tr>
<tr>
<td>STM706</td>
<td>Supervisor</td>
</tr>
<tr>
<td>ST3485</td>
<td>RS-485/422</td>
</tr>
<tr>
<td>ESDA14V2</td>
<td>ESD for RS-485</td>
</tr>
<tr>
<td>USBLC6</td>
<td>ESD for Ethernet</td>
</tr>
<tr>
<td>L9616</td>
<td>CAN Transceiver</td>
</tr>
<tr>
<td>ESDCAN06</td>
<td>ESD for CAN</td>
</tr>
<tr>
<td>ESDAULC5</td>
<td>ESD for IO</td>
</tr>
<tr>
<td>STSPIN820/ PWD13F60 *2</td>
<td>Motor Driver/ High Voltage</td>
</tr>
<tr>
<td>STGAP2D <em>4, STD10/13N60D M2</em>8</td>
<td>Gate Driver, MOSFET</td>
</tr>
<tr>
<td>LMX324</td>
<td>4-ch op amp</td>
</tr>
<tr>
<td>TXS393</td>
<td>2-ch op amp</td>
</tr>
<tr>
<td>TL431</td>
<td>Voltage Ref</td>
</tr>
</tbody>
</table>
Laser cutter/marker

Control Panel (HMI)

- Power Protection Efuse: STEF01
- Hot swap

Back-up Power

- Memory/EEPROM
- CLK/RTC

3 Phase AC Mains

Main power supply

- DSP/MPU
- REF
- Supervisor

DCDC:A59XX L79XX, etc

LDO:LD1117 LM317, etc

Position

- X Step/Servo Motor Driver
- Y Step/Servo Motor Driver

Isolator

- Main Motor Driver

Opportunity
- Temp Sensor
- Supervisor
- RS-485/422
- ESD for RS-485
- ESD for Ethernet
- CAN Transceiver
- ESD for CAN
- ESD for IO
- Motor Driver/High Voltage
- Gate Driver, MOSFET
- 4-ch op amp
- 2-ch op amp
- Voltage Ref

Device
- STTS751
- STM706
- ST3485
- ESDA14V2
- USBLC6
- L9616
- ESDCAN06
- ESDAULC5
- STSPIN820/PWD13F60 *2
- STGAP2D *4, STD10/13N60D M2*8
- LMX324
- TXS393
- TL431
<table>
<thead>
<tr>
<th>Evalboard order code</th>
<th># Channels</th>
<th>Product</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVALSTDRV600HB8</td>
<td>1</td>
<td>L638XE, L639X, MOSFETs/IGBTs</td>
<td>single chip half-bridge gate drivers for N-channel power MOSFET or IGBT.</td>
</tr>
<tr>
<td>EVAL6491HB</td>
<td>1</td>
<td>L6491, MOSFETs/IGBTs</td>
<td>Gate driver with smart shut down feature</td>
</tr>
<tr>
<td>STEVAL-IHM028V2</td>
<td>3</td>
<td>STGIPS20C60, TS391ILT, TS372ID L78M05AB</td>
<td>2 kW 3-phase motor control evaluation board use STGIPS20C60 IGBT intelligent power module</td>
</tr>
<tr>
<td>EVALSTDRIVE601</td>
<td>3</td>
<td>STDRIVE601, STGD6M65DF2, TSV912, TS3021</td>
<td>Demonstration board for STDRIVE601 triple gate driver</td>
</tr>
<tr>
<td>STEVAL-HKI001V2</td>
<td>1</td>
<td>STGAP1AS A2C35S12M3 STM32F303</td>
<td>Industrial drive system kit based on ACEPACK 2 power module</td>
</tr>
<tr>
<td>EVALPWD5F60</td>
<td>2</td>
<td>PWD5F60</td>
<td>An advanced power system-in-package integrating gate drivers and four N-channel power MOSFETs in a compact QFN package</td>
</tr>
</tbody>
</table>
Condition monitoring and actuators
Field transmitter and process sensors

- Power Protection: STEF01
- Non Isolated DCDC: A59x
- Isolated DCDC
- LDO: LM317/LD1117, etc
- Isolated ACDC: VIPER 26K
- Wide input AC power
- STM32
- PROTECTION
  - Ethernet Primary: SLVU2.8-4A1
  - Ethernet Secondary: USBLC6-4SC6
  - Ethernet PHY
- RS-232
- RS-485
- ESD
- E2PROM
- Flash
- DDR
- STM706
- ST3232E
- ST3485
- ISO+ST3 485
- L6362A
- 4-20mA HART
- Digital Isolator: ISO621
- ESD for CAN: ESDCAN06
- High performance Amp: TSX7XX
- ACDC: VIPER26K
- Supervisor: STM706
- RS-232: ST3232E
- RS-485/422: ST3485 * 2
- DCDC: A59XX
- Digital Isolator: ISO621
- LDO: LD1117
- ESD for CAN: ESDCAN06
- High performance Amp: TSX7XX

Opportunity - Device

- MCU: ST M3
- ACDC: VIPER26K
- Supervisor: STM706
- RS-232: ST3232E
- RS-485/422: ST3485 * 2
- DCDC: A59XX
- Digital Isolator: ISO621
- LDO: LD1117
- ESD for CAN: ESDCAN06
- High performance Amp: TSX7XX
Actuator

24V Field power

- Power Protection Efuse: STEF01
- Non Isolated DCDC:A59x
- Isolated DCDC
- LDO:LM317 LD1117,etc

Power stage
- FET
- Driver
- Current/Voltage sense
- INA
- ADC

STM32L071x
- Wireless
- RS-232
- RS-485
- HMI Display LED7707
- L6362A
- ST3232E
- ST3485
- ESD

Opportunity | Device
---|---
MCU | ST M3
Supervisor | STM706
RS-232 | ST3232E
RS-485/422 | ST3485 * 2
DCDC | A59XX
Digital Isolator | ISO621
LDO | LD1117
ESD for CAN | ESDCAN06
Amp | TSX7XX
Motor Driver/High Voltage | STSPIN820/PWD13F60 *2
Gate Driver, MOSFET | STGAP2D *4, STD10/13N60D M2*8
Current sense | TSC2012

Power stage
- Driver
- Current/Voltage sense
- INA
- ADC

Current sense
- TSC2012
## Evaluation Boards for condition monitoring and actuators

<table>
<thead>
<tr>
<th>Evalboard order code</th>
<th>Key part</th>
<th>End Equipments</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEVAL-IOD003V1</td>
<td>L6362A</td>
<td>IO LINK Sensor</td>
<td>Basic evaluation</td>
</tr>
<tr>
<td>P-NUCLEO-IOD01A1</td>
<td>L6362A</td>
<td>IO LINK Sensor</td>
<td>Stack embedded(**) + Sensor management.</td>
</tr>
<tr>
<td>STEVAL-IDP003V1</td>
<td>STM32L071CZ, L6362A, STTS751, IIS2DH, IIS328DQ, VL6180X</td>
<td>IO LINK Sensor</td>
<td>Stack embedded(**) + Sensor management.</td>
</tr>
<tr>
<td>SL-BFA001V2B</td>
<td>STM32F469, L6362A, IIS3DWB, LPS22HB, HTS221, IMP34DT05, LDK220</td>
<td>Sensor node with IO-Link device stack for predictive maintenance and condition monitoring</td>
<td>Full suite of smart, low power industrial grade sensors</td>
</tr>
<tr>
<td>STEVAL-AKI001V1</td>
<td>ADC120, LDK220M33, TS3421, TSX711, TSZ122, STLM20W87, TSU111</td>
<td>Analog-to-digital converter</td>
<td>8-channel, 50ksps to 1Mmps, 12-bit ADC with amps</td>
</tr>
</tbody>
</table>
Thank you