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Intelligent power switches (IPS)

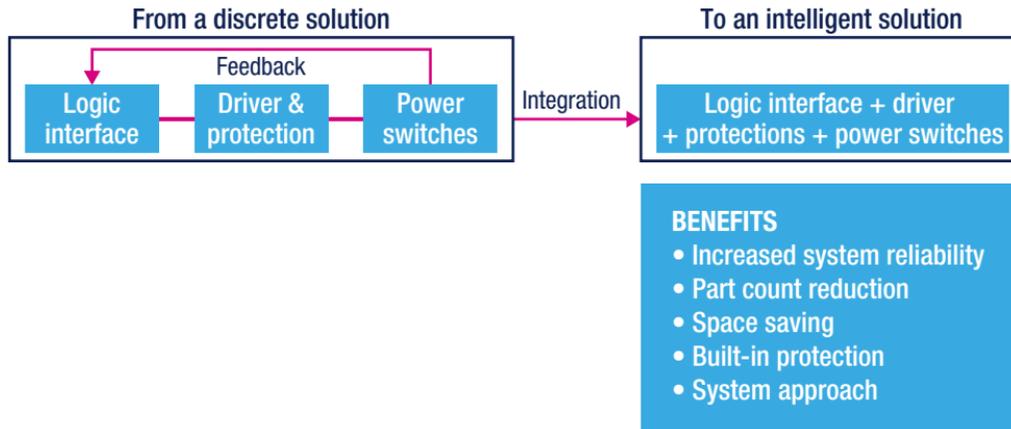


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Intelligent power switch concept



TECHNOLOGY

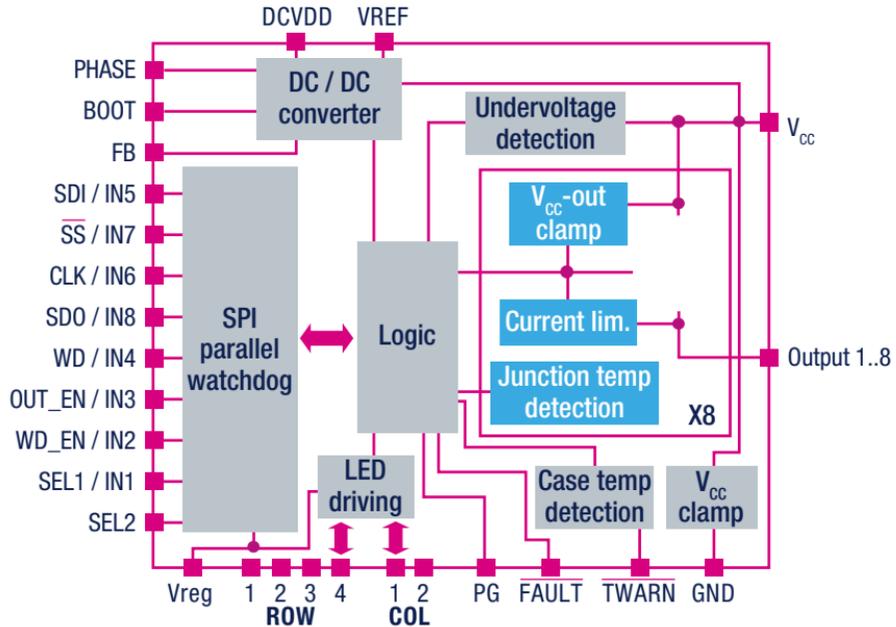
STMicroelectronics offers an industrial series of intelligent power switches (IPS) for high-side and low-side configurations. An IPS integrates a control part (logic interface, drivers, and protection) with a power stage. IPSs are based on the well consolidated bipolar, multipower BCD and VIPower MO technologies.

Devices in development are designed using the latest versions of the above technologies, thus offering state-of-the-art solutions in any application field.

FEATURES

- Galvanic isolation on chip
- Short-circuit and overcurrent protection
- Undervoltage protection and overvoltage shutdown
- Fast demagnetization of inductive loads
- Loss of ground protection
- Supply voltage up to 65 V
- Very low supply current
- Diagnostic output
- Thermal protection: junction and case
- Open load detection

EXAMPLE OF INTELLIGENT POWER SWITCH ARCHITECTURE



PACKAGES

Technological evolution has led to smaller IPS devices that are housed in tiny, flat, no-lead plastic packages (DFN, QFN, HTSSOP). The high thermal capacitance of the power packages such as PowerSO-36, PowerSS036, PowerSS024 and PowerSS012, allows the absorption of high-energy pulses when an inductive load is driven without any external freewheeling diode.

PRODUCT RANGE

| Part number | Supply voltage (V) | R _{resistor} (Ω) | Output current (In/Ilim) (A) | Technology | Package | Output mode |
|--------------|--------------------|---------------------------|------------------------------|------------------|--------------|---------------|
| L6370D | 9.5 to 50 | 0.1 | 2.5/Adjust | MultiBCD | PowerSO-20 | H.S.S. |
| L6370Q | 9.5 to 50 | 0.1 | 2.5/Adjust | MultiBCD | QFN 48L 7x7 | H.S.S. |
| L6374FP | 10.8 to 50 | 4 x 4.000 | 0.1/0.2 | MultiBCD | SO-20 | H.S.S. |
| L6375D | 8 to 50 | 0.4 | 0.5/0.75 | MultiBCD | SO-20 | H.S.S. |
| L6375S | 8 to 50 | 0.4 | 0.5/0.75 | MultiBCD | SO-8 | H.S.S. |
| L6376D | 9.5 to 50 | 4 x 0.640 | 0.5/0.65 | MultiBCD | PowerSO-20 | H.S.S. |
| L6377D | 8 to 50 | 0.4 | 0.5/Adjust | MultiBCD | SO-14 | H.S.S. |
| TDE17078FP | 6 to 50 | - | 0.5/0.7 | Bipolar | SO-8 | H.S.S./L.S.S. |
| TDE1708DFT | 6 to 50 | - | 0.2/0.25 | Bipolar | DFN 8L 4x4 | H.S.S./L.S.S. |
| TDE1737DP | 8 to 50 | - | 0.5/Adjust | Bipolar | DIP-8 | L.S.S. |
| TDE1747FP | 10 to 60 | - | 0.45/Adjust | Bipolar | SO-14 | H.S.S. |
| TDE1787ADP | 6 to 60 | - | 0.3/Adjust | Bipolar | DIP-8 | H.S.S. |
| TDE1798DP | 6 to 50 | - | 0.5/0.7 | Bipolar | DIP-8 | H.S.S. |
| TDE1897RFPT | 18 to 50 | 0.4 | 0.5/0.75 | MultiBCD | SO-20 | H.S.S. |
| TDE1898CFP | 18 to 50 | 0.4 | 0.5/0.75 | MultiBCD | SO-20 | H.S.S. |
| TDE3247FP | 10 to 36 | - | 0.2/Adjust | Bipolar | SO-14 | H.S.S. |
| VN330SP-E | 10 to 45 | 4 x 0.200 | 0.5/0.7 | VIpower | PowerSO-10 | H.S.S. |
| VN340SP-33-E | 10 to 45 | 4 x 0.200 | 0.5/1 | VIpower | PowerSO-10 | H.S.S. |
| VN340SP-E | 10 to 45 | 4 x 0.200 | 0.5/0.7 | VIpower | PowerSO-10 | H.S.S. |
| VN540-E | 10 to 45 | 0.050 | 2.5/2.8 | VIpower | PENTAWATT | H.S.S. |
| VN540SP-E | 10 to 45 | 0.050 | 2.5/2.8 | VIpower | PowerSO-10 | H.S.S. |
| VN751PT | 5.5 to 41 | 0.060 | 2/2.5 | VIpower | PPAK | H.S.S. |
| VN751S | 5.5 to 41 | 0.060 | 2/2.5 | VIpower | SO-8 | H.S.S. |
| VN808CM-E | 10.5 to 45 | 8 x 0.160 | 0.5/0.7 | VIpower | PowerSO-36 | H.S.S. |
| VN808CM-32-E | 10.5 to 45 | 8 x 0.160 | 0.5/1 | VIpower | PowerSO-36 | H.S.S. |
| VN808-E | 10.5 to 45 | 8 x 0.150 | 0.5/0.7 | VIpower | PowerSO-36 | H.S.S. |
| VN808-32-E | 10.5 to 45 | 8 x 0.150 | 0.5/1 | VIpower | PowerSO-36 | H.S.S. |
| VNI2140J | 9 to 45 | 2 x 0.080 | 0.5/1 | VIpower | PowerSSO-12 | H.S.S. |
| VNI4140K | 10.5 to 41 | 4 x 0.080 | 0.5/0.7 | VIpower | PowerSSO-24 | H.S.S. |
| VNI4140K-32 | 10.5 to 41 | 4 x 0.080 | 0.5/1 | VIpower | PowerSSO-24 | H.S.S. |
| VNI8200XP | 10.5 to 45 | 8 x 0.110 | 0.5/0.7 | VIpower | PowerSSO-36 | H.S.S. |
| VNI8200XP-32 | 10.5 to 45 | 8 x 0.110 | 0.5/1.05 | VIpower | PowerSSO-36 | H.S.S. |
| VNQ860-E | 5.5 to 41 | 4 x 0.270 | 0.25/0.35 | VIpower | SO-20 | H.S.S. |
| VNQ860SP-E | 5.5 to 41 | 4 x 0.270 | 0.25/0.35 | VIpower | PowerSO-10 | H.S.S. |
| ISO8200B | 10.5 to 45 | 8 x 0.110 | 0.5/0.7 | MultiBCD+VIpower | PowerSO-36 | H.S.S. |
| ISO8200BQ | 10.5 to 45 | 8 x 0.110 | 0.5/0.7 | MultiBCD+VIpower | QFN 9x11 32L | H.S.S. |
| IPS4260L * | 8 to 55 | 4 x 0.260 | 1/Adjust | MultiBCD | HTSSOP-20 | L.S.S. |
| IPS160H | 7.5 to 65 | 1 x 0.060 | 2/2.6 | VIpower | PowerSSO-12 | H.S.S. |
| IPS161H | 7.5 to 65 | 1 x 0.060 | 0.5/0.7 | VIpower | PowerSSO-12 | H.S.S. |

IPS for detectors

INDUSTRIAL TRANSCEIVER ICS FOR IO-LINK AND SIO MODE

By using a state-of-the-art technology (MultiPower BCD) that allows the design of the logic part, and robust LV power MOSFETs in the same chip, ST offers an efficient, compact and cost-effective solution to drive any 3-wire digital sensor. Modern sensors and actuators require:

- remote service
- standardization
- sensor functionality verification
- diagnostics
- monitoring

The L6360 and L6362A I/O industrial transceiver ICs meet all these requirements. These new ICs offer the market IO-Link sensors/actuators that work without special cables. They feature an advanced solution that can be integrated even in old systems, that is neutral to any field bus, and keeps the point-to-point communication. Industrial transceiver ICs are designed in order to be compliant with burst tests, surge tests and ESD immunity tests, based on the IO-Link specification and SIO mode requirements.

INDUSTRIAL TRANSCEIVER IC PRODUCT RANGE

| Part number | Supply voltage (V) | V _{DD} (V) | Output current (A) | I _{max} linear reg. (mA) | Technology | Output channels | Input channels | Package |
|------------------------|--------------------|---------------------|--------------------|-----------------------------------|------------|-----------------|----------------|-----------------|
| L6360 (Master) | 18 to 32.5 | 3.3/5 | 0.5 | 65 | MultiBCD | 2 | 2 | QFN 26L 3.5 x 5 |
| L6362A (Device) | 5 to 40 | 3.3/5 | 0.25 | 8 | MultiBCD | 1 | 1 | DFN 12L 3 x 3 |

IO-LINK EVALUATION BOARDS

| Order code | Description | Application notes |
|------------------------|--|-------------------|
| STEVAL-IFP016V2 | IO-Link communication master transceiver demonstration board based on the L6360 | AN4075 |
| STEVAL-IFP017V3 | IO-Link communication device transceiver demonstration board based on the L6362A | AN4828 |



IPS FOR 3-WIRE INDUSTRIAL SENSORS

The TDE1707 and TDE1708 are specific IPSs developed to match any type of industrial detector. They can be coupled with inductive, capacitive, ultrasonic or optical detectors. They can be used in high-side or in low-side driver configuration in 3-wire networks.

IPS compliance with international standards

IPS devices are designed to safely drive every kind of load in low-voltage applications (up to 55 V), handling data in and out of the microcontroller by means of status/input signals. IPS devices are designed to comply with the following international standards for EMC and PLC equipments:

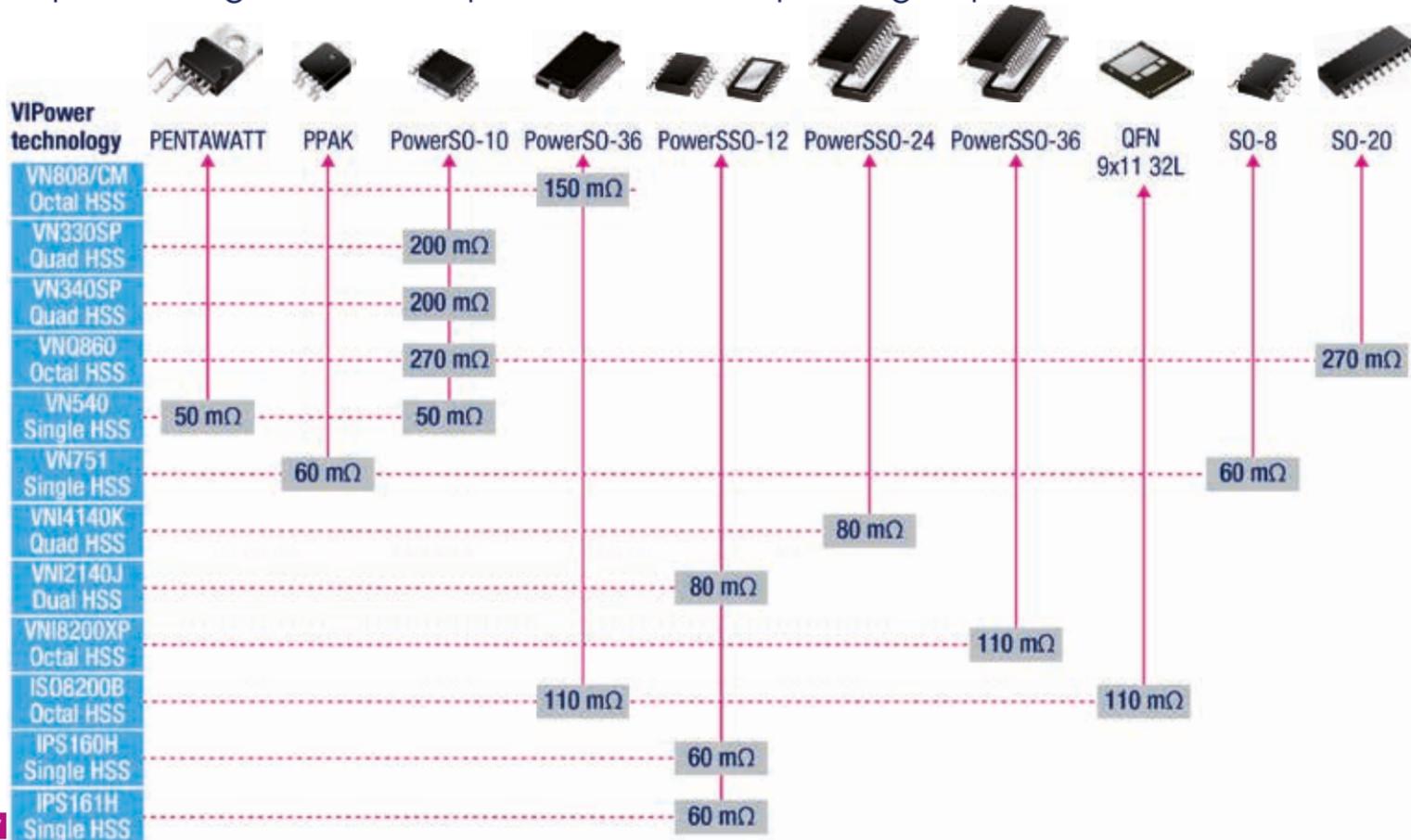
- IEC 61000-4-4 (electrical fast transient/burst)
- IEC 61000-4-2 (ESD, immunity test contact/air)
- IEC 61000-4-5 (surge test immunity requirements)
- IEC 61000-4-6 (current injection test)
- IEC 61131-2 (programmable controller, equipment requirements and tests)

Concerning ISO8200B and ISO8200BQ, they are designed to comply with the following international standards for insulation characteristics and tests:

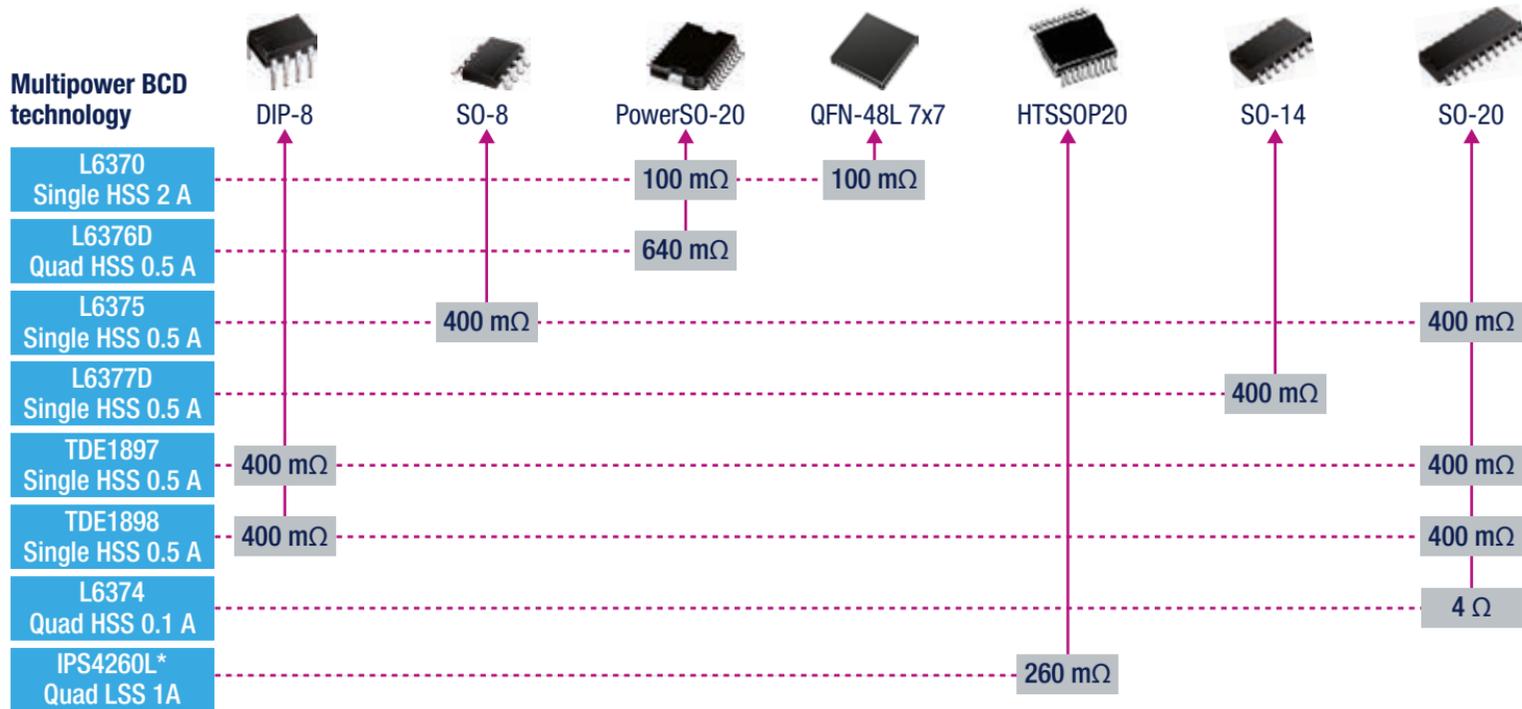
- UL 1577 (isolation voltage)
- IEC 61000-4-8 (power frequency magnetic field immunity test)
- IEC 60747-5-2 (Optoelectronic devices characteristics)



IPS power stage resistance per channel and package options



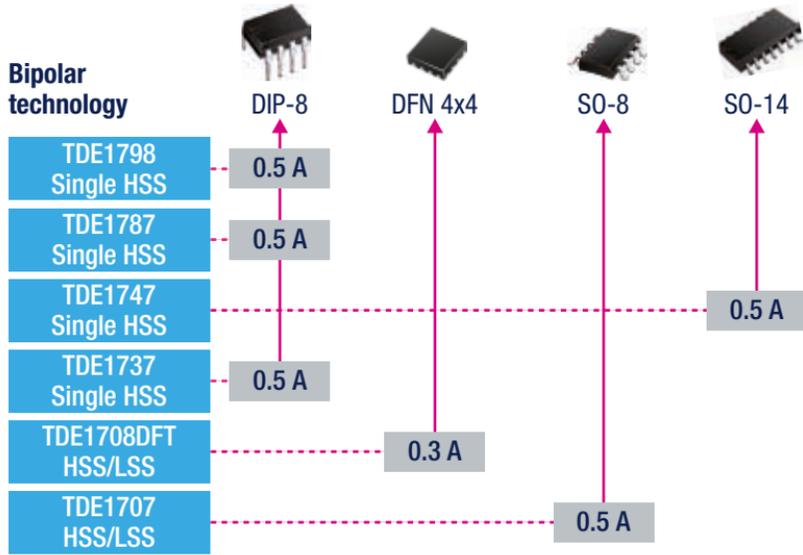
IPS power stage resistance per channel and package options (cont'd)



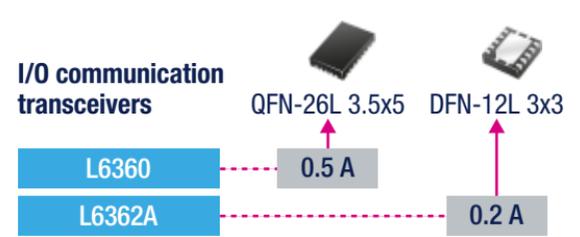
*In development

IPS current ratings and package options

Bipolar technology



I/O communication transceivers



Application notes and reference boards

- AN2443: PLC actuator high-side driver solution with CMOS interface based on VN808CM high-side driver
- AN1213: TDE1707 noise immunity, short-circuit and reverse-output protection characterization
- AN1351: VIPower and Multipower BCD: Making life easier with ST's high-side drivers
- AN453: How the TD1897/98 behaves in extreme overload conditions
- AN495: Effective filtering of TDE1707
- AN2208: Designing industrial applications with VN808/VN340SP high-side drivers and L5970D DC-DC converter
- AN2684: Designing with VNI4140K quad high-side smart-power solid-state relay IC
- AN4075: IO-Link communication master transceiver demonstration board
- AN3978: Designing a digital output module with the L6370Q intelligent power switch
- AN2679: Smart inductive proximity switch
- AN4373 : Galvanically-isolated 8 channel high-side driver based on the IS08200B
- AN4284: STEVAL-IFP022V1 demonstration board for the VNI8200XP octal high-side driver
- AN4781 : STEVAL-IFP028V1 demonstration board for single high side driver IPS160H

IPS REFERENCE BOARDS

Control Board
STEVAL-PCC009V2



USB Interface to PC
GUI Application available

ISO8200B



STEVAL-IFP015V2

VNI8200XP



STEVAL-IFP022V1

VN4140K



STEVAL-IFP006V1

TDE1708DFT



STEVAL-IFS006V2

VNI4140K-32



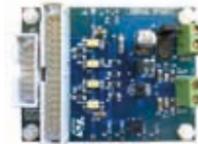
STEVAL-IFP019V1

VN751PT



STEVAL-IFP005V1

VNI2140J



STEVAL-IFP010V2

L6370Q



STEVAL-IFP020V1

L6360



STEVAL-IFP016V2

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