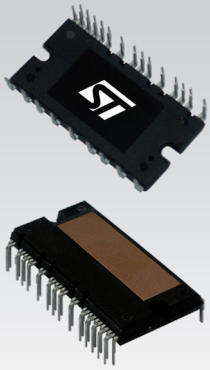
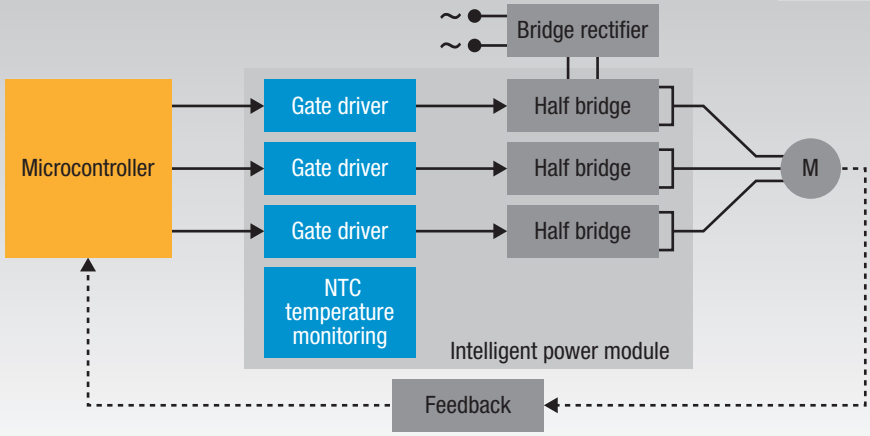
IGBT intelligent power modules





STMicroelectronics

Compact and high-performance AC motor drive for simple and rugged designs up to 2 kW

IGBT intelligent power modules (IPMs) extend ST's appliance-control product range with a thermally efficient solution that simplifies design by combining application specific IGBTs and diodes, proprietary control functions, smart protections and extra optional features.

Directly connected to the microcontroller, IPMs convert microcontroller output into the correct high-power waveform to drive the motor. One module can replace more than 30 discrete components, thereby increasing reliability while reducing size and cost.

ST's IPMs use direct-bond copper (DBC) packaging and a vacuum soldering process which guarantee better thermal and conductivity management, allowing for higher power density and improved system reliability.

Key features

- 600 V, 3-phase IGBT inverter bridge including gate-driving control ICs and freewheeling diodes
- Short-circuit protected IGBTs
- DBC fully-isolated package for enhanced thermal behavior
- Smart shutdown function
- Comparator for fault protection against overcurrent and short circuits
- Op-amps for advanced current sensing
- Integrated bootstrap diode
- Small form factor

Key benefits

- Easy to drive through microcontroller
- High efficiency and reliability
- Very low R_{th}:
  - 3.8 °C/W on STGIPS10K60A
  - 3.0 °C/W on STGIPS14K60
  - 2.8 °C/W on STGIPL14K60
  - 2.4 °C/W on STGIPS20K60
- Reduced component count, cost-saving solution
- Optimized layout
- PCB space reduction (compact design)
- Lower failure rate (fewer components and solder joints)
- Easy sensorless field-oriented control (FOC)

Targeted applications

- 3-phase inverters for motor drives up to 2 kW
- Home appliances: washing machines, air conditioners, dryers

Embedded functions: undervoltage lockout, interlocking function, bootstrap diode.

Optional extra features: smart shutdown, NTC, one to three comparators for fault protection, three op-amps for advanced current sensing (field-oriented control for motor speed).

ST's four new IPMs are the STGIPS10K60A, STGIPS14K60, STGIPL14K60 and the STGIPS20K60. The STGIPS14K60, STGIPL14K60, and the STGIPS20K60 are characterized by an embedded comparator for fault sensing purposes, allowing to immediately turn-off the output gate driver in case of overcurrent / overtemperature (smart shutdown function).

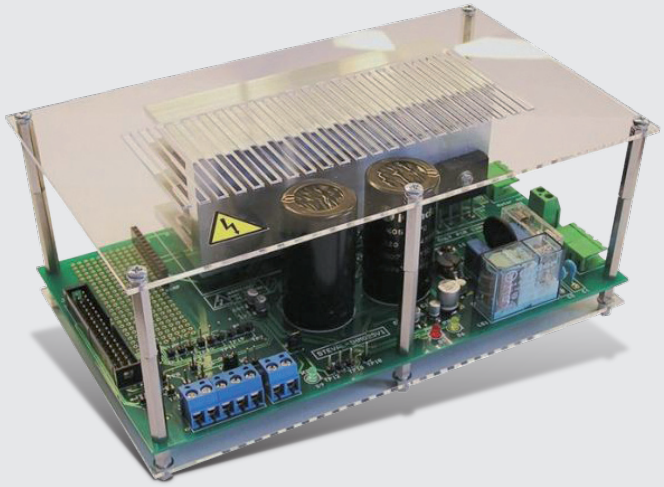
The STGIPL14K60 also benefits from an embedded operational amplifier for easy sensorless field oriented control (FOC), allowing designers to eliminate external current sensing components normally required to control motor speed. The sensorless FOC technique also overcomes restrictions placed on some applications where position or speed sensors cannot be deployed.

STEVAL-IHM027V1: 1 kW 3-phase motor control demonstration board based on STGIPS10K60A.

STEVAL-IHM025V1: 1 kW 3-phase motor control demonstration board based on STGIPL14K60.

An evaluation board based on the STGIPS20K60 will be available in Q4 2010.

For mounting instructions, please refer to the technical note TN0107 available on our website.



STEVAL-IHM025V1: 1 kW 3-phase motor control demonstration board based on STGIPL14K60

IGBT intelligent power modules

Part number	Package	R_{th} (°C/W)	BV_{CES} (V)	I_C @ T_C = 25 °C (A)	NTC	Comparators	Op-amps
STGIPS10K60A	SDIP-25L	3.8	600	10	Yes	No	No
STGIPS14K60	SDIP-25L	3.0	600	12	No	Yes (1x)	No
STGIPL14K60	SDIP-38L	2.8	600	14	Yes	Yes (3x)	Yes (3x)
STGIPS20K60	SDIP-25L	2.4	600	17	No	Yes (1x)	No