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MASTERGAN5

Data brief

High power density 600 V Half bridge driver with two enhancement mode GaN Power HEMT



Features

- 600 V system-in-package integrating half-bridge gate driver and high-voltage GaN power transistors:
  - QFN 9 x 9 x 1 mm package
  - $R_{DS(ON)}$ = 450 mΩ
  - $I_{DS(MAX)}$ = 4 A
- Reverse current capability
- Zero reverse recovery loss
- UVLO protection on low-side and high-side
- Internal bootstrap diode
- Interlocking function
- Dedicated pin for shutdown functionality
- Accurate internal timing match
- 3.3 V to 15 V compatible inputs with hysteresis and pull-down
- Overtemperature protection
- Bill of material reduction
- Very compact and simplified layout
- Flexible, easy and fast design.

Application

- Switch-mode power supplies
- Chargers and adapters
- High-voltage PFC, DC-DC and DC-AC converters

Product status link

MASTERGAN5

Product label

SUSTAINABLE TECHNOLOGY

Description

The MASTERGAN5 is an advanced power system-in-package integrating a gate driver and two enhancement mode GaN power transistors.

The integrated GaN power transistors have 650 V drain-source blocking voltage and RDS(ON) of 450 mΩ, while the high-side of the embedded gate driver can be easily supplied by the integrated bootstrap diode

The MASTERGAN5 features UVLO protection on both the lower and upper driving sections, preventing the power switches from operating in low efficiency or dangerous conditions, and the interlocking function avoids cross-conduction conditions.

The input pins extended range allows easy interfacing with microcontrollers, DSP units or Hall effect sensors.

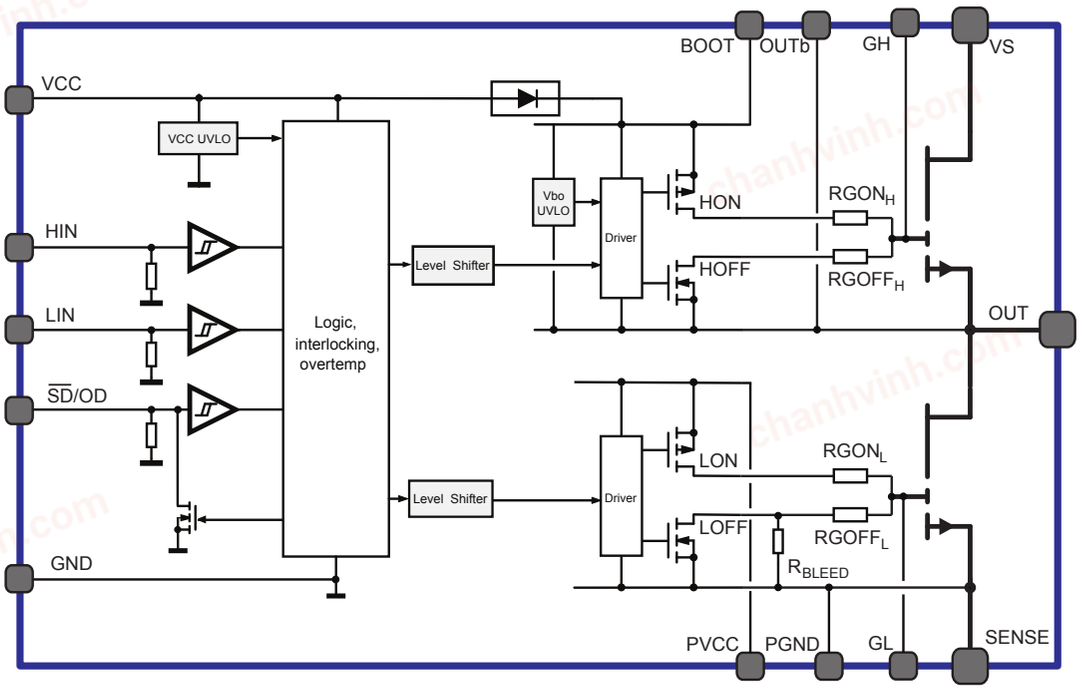
The MASTERGAN5 operates in the industrial temperature range, -40°C to 125°C.

The device is available in a compact 9x9 mm QFN package.

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1 Block diagram

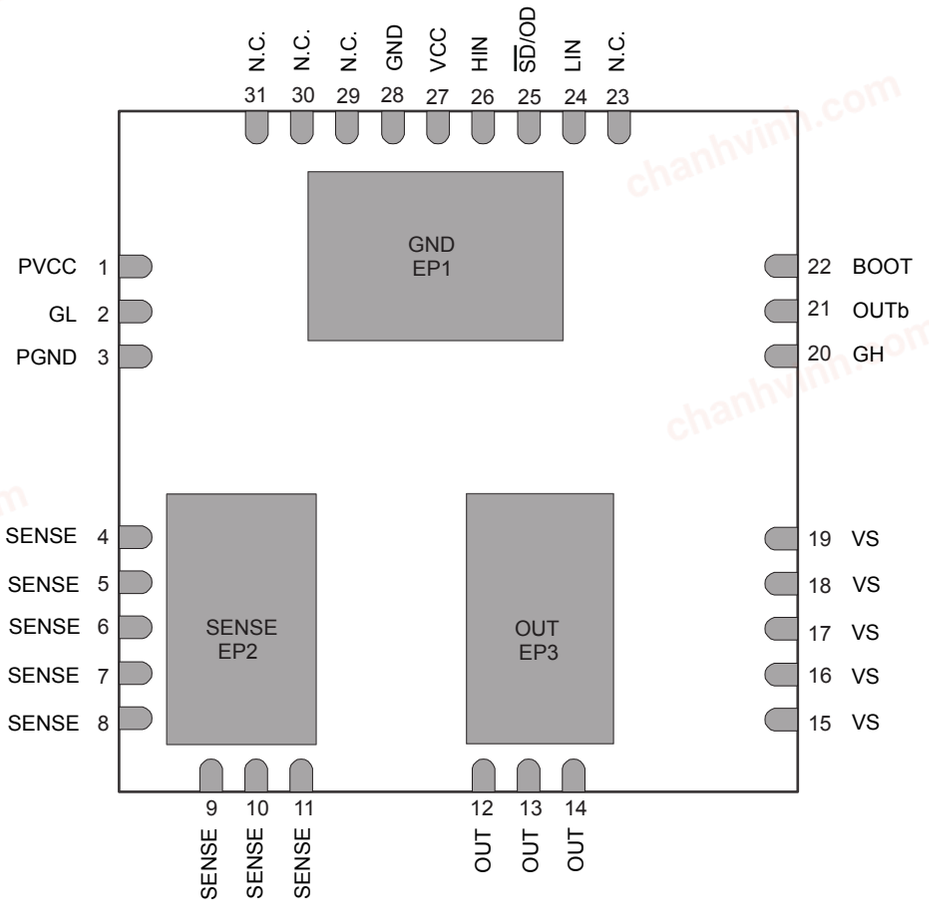
Figure 1. **Block Diagram**



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2 Pin description and connection diagram

Figure 2. **Pin connection (top view)**



2.1 Pin list

Table 1. **Pin description**

Pin Number	Pin Name	Type	Function
15, 16, 17, 18, 19	VS	Power Supply	High voltage supply (high-side GaN Drain)
12, 13, 14, EP3	OUT	Power Output	Half-bridge output
4, 5, 6, 7, 8, 9, 10, 11, EP2	SENSE	Power Supply	Half-bridge sense (low-side GaN Source)
22	BOOT	Power Supply	Gate driver high-side supply voltage
21	OUTb	Power Supply	Gate driver high-side supply voltage, used only for Bootstrap capacitor connection. Internally connected to OUT.
27	VCC	Power Supply	Logic supply voltage
1	PVCC	Power Supply	Gate driver low-side supply voltage

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Pin Number	Pin Name	Type	Function
28, EP1	GND	Power Supply	Gate driver ground
3	PGND	Power Supply	Gate driver low-side buffer ground. Internally connected to SENSE.
26	HIN	Logic Input	High-side driver logic input
24	LIN	Logic Input	Low-side driver logic input
25	SD/OD	Logic Input-output	Driver shutdown input and fault open-drain
2	GL	Output	Low-side GaN gate.
20	GH	Output	High-side GaN gate.
23, 29, 30, 31	N.C.	Not connected	Leave floating

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3 Typical application diagrams

Figure 3. **Typical application diagram – Resonant LLC converter**

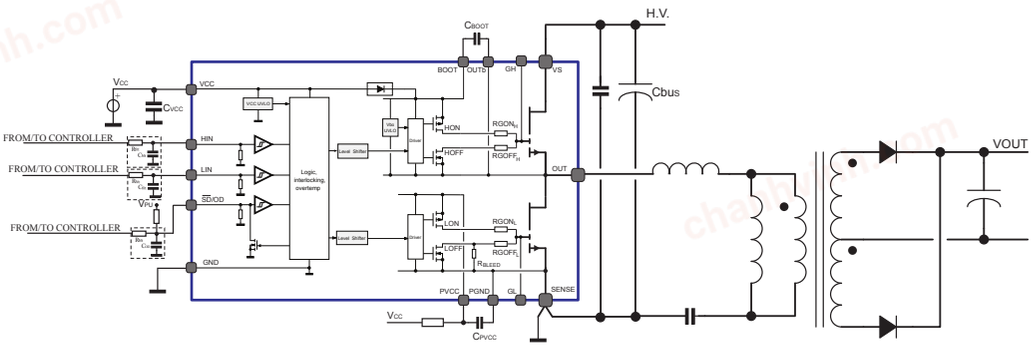
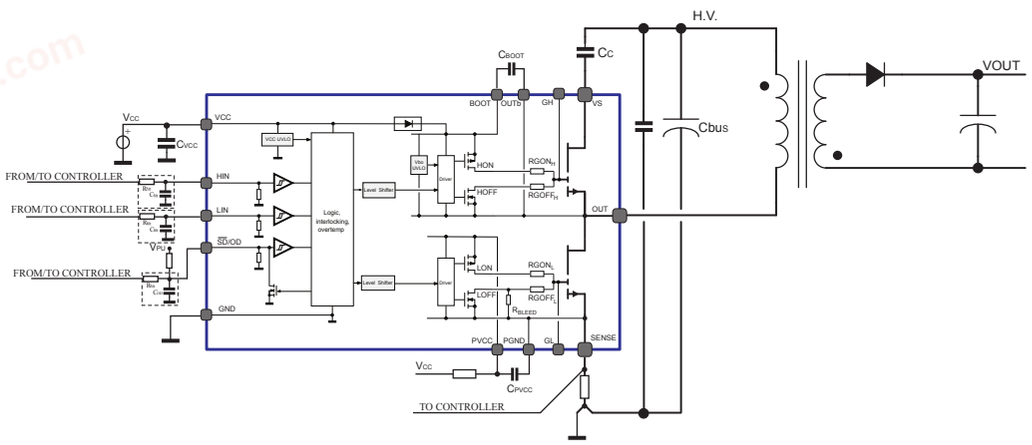


Figure 4. **Typical application diagram – Active clamp flyback**



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4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

4.1 QFN 9 x 9 x 1 mm, 31 leads, pitch 0.6 mm package information

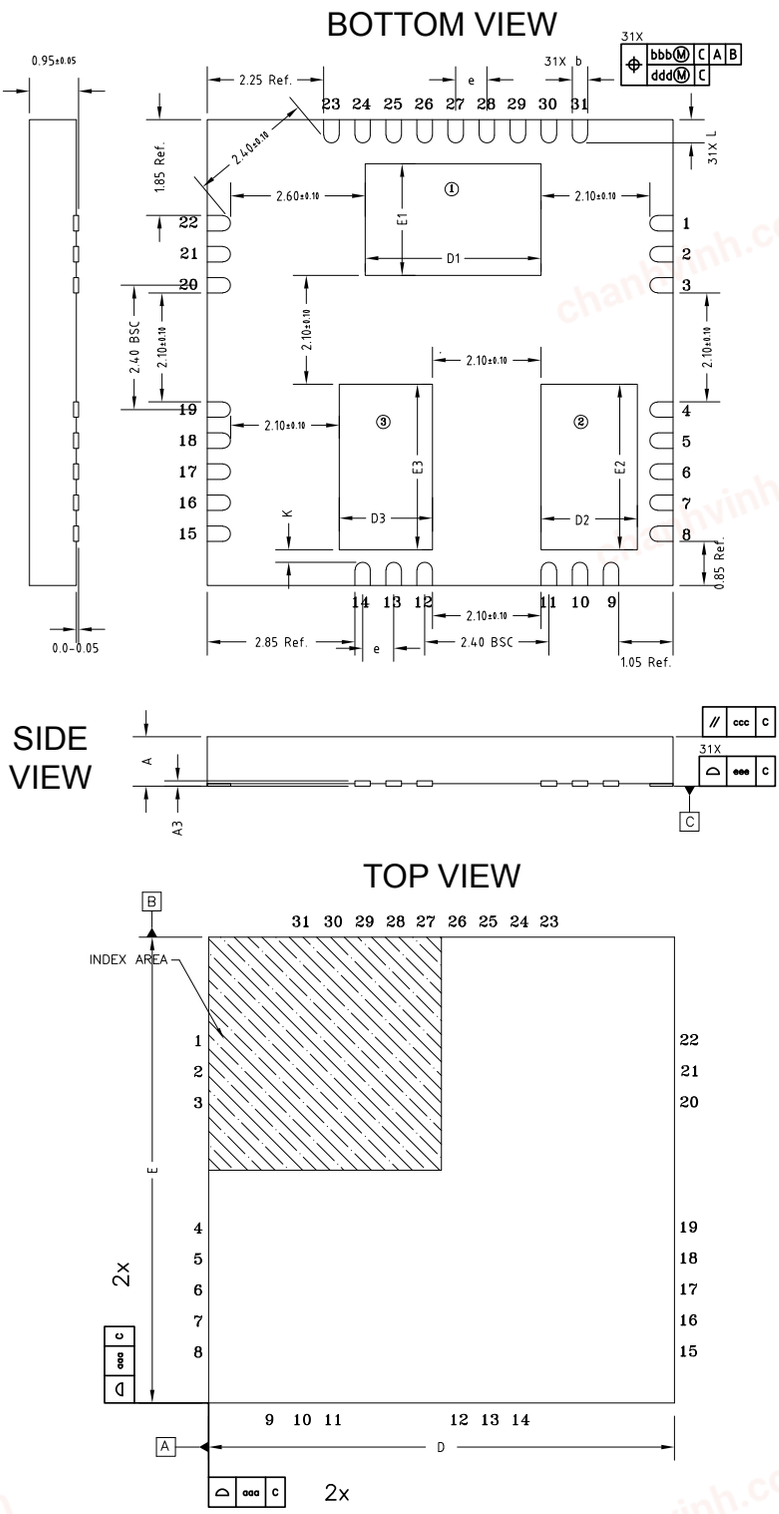
Table 2. QFN 9 x 9 x 1 mm package dimensions

Symbol	Dimensions (mm)		
	Min.	Typ.	Max.
A	0.90	0.95	1.00
A3		0.10	
b	0.25	0.30	0.35
D	8.96	9.00	9.04
E	8.96	9.00	9.04
D1	3.30	3.40	3.50
E1	2.06	2.16	2.26
D2	1.76	1.86	1.96
E2	3.10	3.20	3.30
D3	1.70	1.80	1.90
E3	3.10	3.20	3.30
e		0.60	
K		0.24	
L	0.35	0.45	0.55
N	31		
aaa	0.10		
bbb	0.10		
ccc	0.10		
ddd	0.05		
eee	0.08		

Note:
1. *Dimensioning and tolerances conform to ASME Y14.5-2009.*
2. *All dimensions are in millimeters.*
3. *N total number of terminals.*
4. *Dimensions do not include mold protrusion, not to exceed 0.15 mm.*
5. *Package outline exclusive of metal burr dimensions.*

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Figure 5. **QFN 9 x 9 x 1 mm package dimensions**



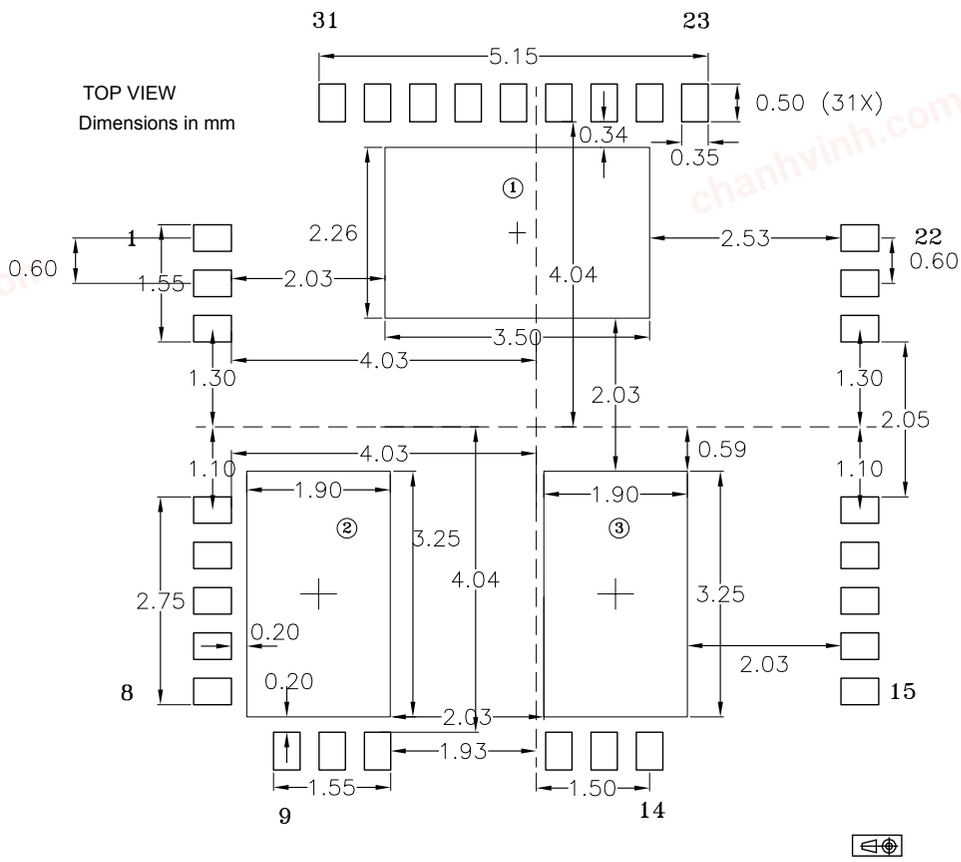
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5 Suggested footprint

The MASTERGAN5 footprint for the PCB layout is usually defined based on several design factors like assembly plant technology capabilities and board component density. For easy device usage and evaluation, ST provides the following footprint design, which is suitable for the largest variety of PCBs.

The following footprint indicates the copper area which should be free from the solder mask, while the copper area is to extend beyond the indicated areas especially for EP2 and EP3. To aid thermal dissipation, it is recommended to add thermal vias under these EPADs to transfer and dissipate device heat to the other PCB copper layers. A PCB layout example is available with the MASTERGAN5 evaluation board.

Figure 6. Suggested footprint (top view drawing)



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6 Ordering information

Table 3. **Order codes**

Order code	Package	Package marking	Packaging
MASTERGAN5	QFN 9 x 9 x 1 mm	MASTERGAN5	Tray
MASTERGAN5TR	QFN 9 x 9 x 1 mm	MASTERGAN5	Tape and Reel

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Revision history

Table 4. **Document revision history**

Date	Version	Changes
29-Mar-2021	1	Initial release.

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