

## 2FHD0620 Data Sheet

### Abstract

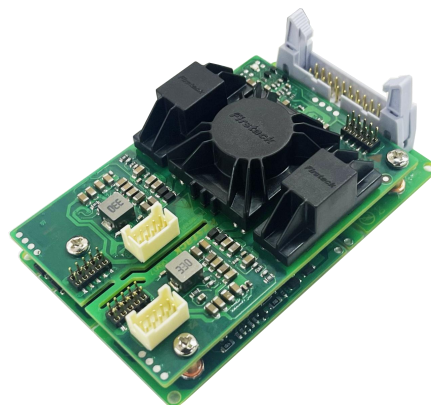
The 2FHD0620 is a high-performance, dual-channel SiC gate driver developed based on intelligent chip technology by Firstack. It supports SiC modules up to 1700V. The 2FHD0620 can be used individually or in combination, connected by a set of cables, easily parallelise SiC modules with configurable gate voltages for single modules in the EconoDual™ package or 4 in parallel. The architecture is able to safely and reliably drive the SiC modules with high flexibility and system scalability.

### Highlights:

- Support max. 4 in parallel
- Support up to 1700V SiC module
- Distributed NTC sampling
- Short-circuit protection(soft shut down)
- Miller clamping
- Configurable drive voltage
- Intelligent fault feedback
- UVLO

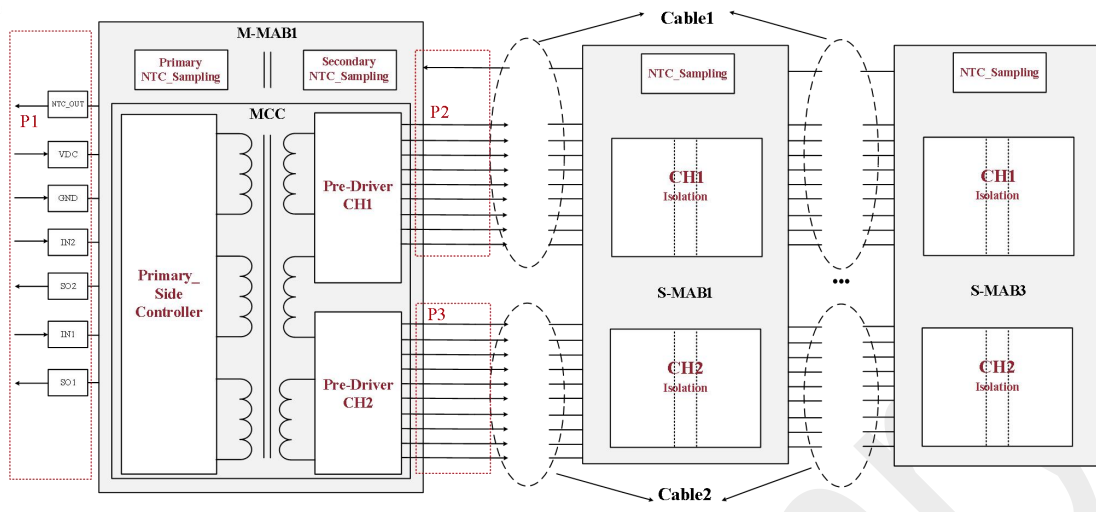
### Applications:

- ESS
- Rail
- Motor drives

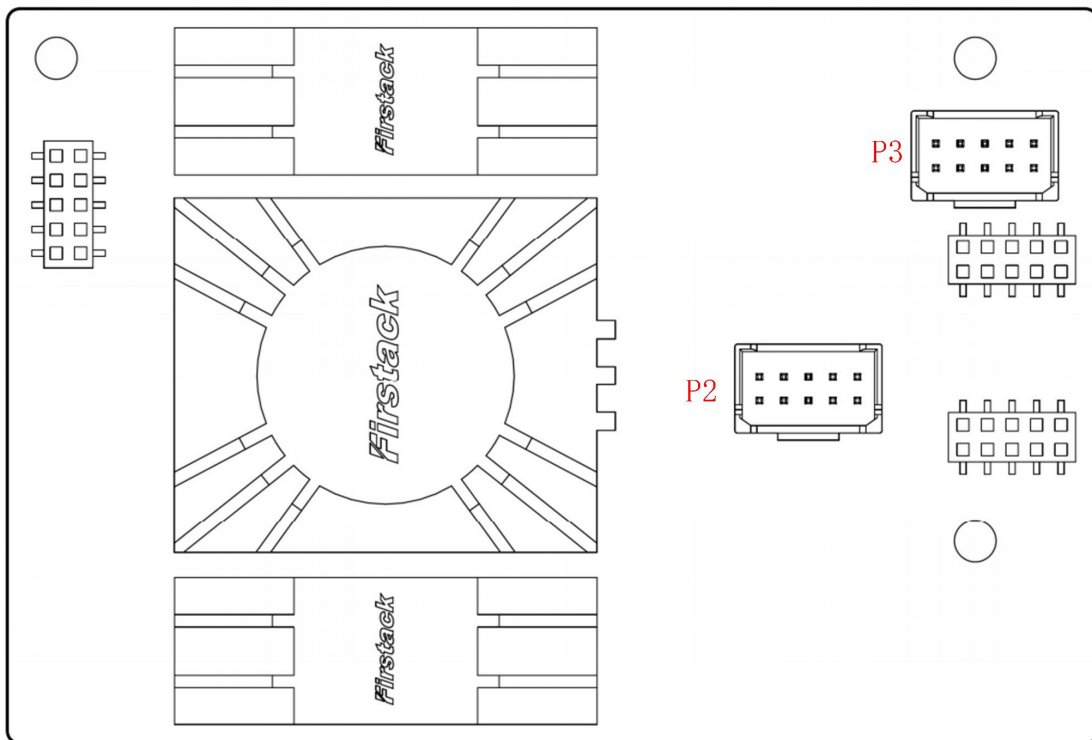


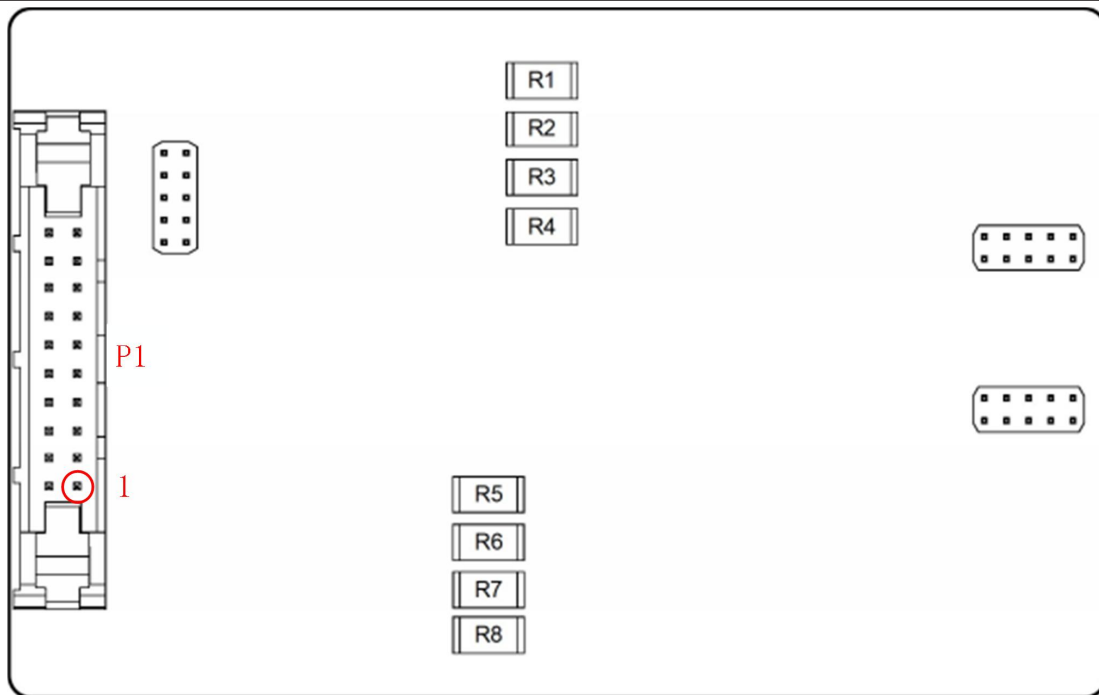
**Fig.1** 2FHD0620

**Functional Block Diagram**



**Fig.2** Functional block diagram



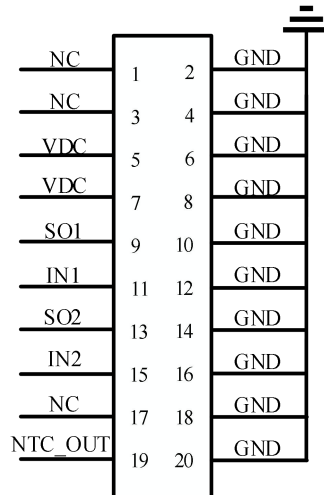


**Fig.3** Connector interface location

### Resistors Replacement Instructions

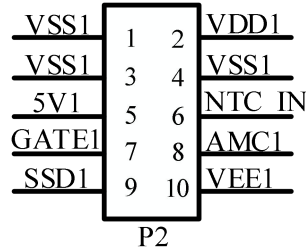
Resistors	Definition
R1,R2 & R7,R8	Turn-on resistor
R3,R4 & R5,R6	Turn-off resistor

## Connector Interface Definition



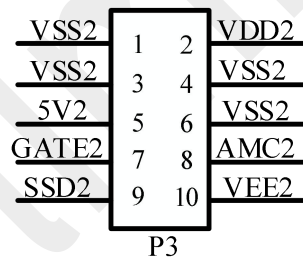
### P1 terminal pin designation

Pin	Definition	Function	Pin	Definition	Function
1	NC	Free	2	GND	Primary side ground
3	NC	Free	4	GND	Primary side ground
5	V <sub>DC</sub>	Power supply input	6	GND	Primary side ground
7	V <sub>DC</sub>	Power supply input	8	GND	Primary side ground
9	SO1	Status output channel 1	10	GND	Primary side ground
11	IN1	Signal input channel 1	12	GND	Primary side ground
13	SO2	Status output channel 2	14	GND	Primary side ground
15	IN2	Signal input channel 2	16	GND	Primary side ground
17	NC	Free	18	GND	Primary side ground
19	NTC_OUT	NTC sampling	20	GND	Primary side ground



**P2 terminal pin designation**

Pin	Definition	Function	Pin	Definition	Function
1	VSS1	Secondary side negative voltage channel 1	2	VDD1	Secondary side positive supply channel 1
3	VSS1	Secondary side negative voltage channel 1	4	VSS1	Secondary side negative voltage channel 1
5	5V1	5V supply channel 1	6	NTC_IN	NTC sampling signal channel 1
7	GATE1	Gate signal channel 1	8	AMC1	Miller clamping signal channel 1
9	SSD1	SSD signal channel 1	10	VEE1	Secondary side ground channel 1



**P3 terminal pin definition**

Pin	Definition	Function	Pin	Definition	Function
1	VSS2	Secondary side negative voltage channel 2	2	VDD2	Secondary side positive supply channel 2
3	VSS2	Secondary side negative voltage channel 2	4	VSS2	Secondary side negative voltage channel 2
5	5V2	5V supply channel 2	6	VSS2	Secondary side negative voltage channel 2
7	GATE2	Gate signal channel 2	8	AMC2	Miller clamping signal channel 2
9	SSD2	SSD signal channel 2	10	VEE2	Secondary side ground channel 2

## Technical Parameters

### Absolute Maximum Ratings

Parameter	Remarks	Min	Max	Unit
Supply voltage $V_{DC}$	$V_{DC}$ to GND	0	15.5	V
Gate peak current	@85°C	-15	20	A
Output power per channel	@85°C		6	W
Test voltage (50Hz/1min)	Primary to secondary side	5000		$V_{RMS}$
Operating temperature		-40	85	°C
Storage temperature		-40	85	°C

### Recommended Operating Conditions

Parameter	Remarks	Min	Typ	Max	Unit
Supply voltage $V_{DC}$	$V_{DC}$ to GND	14.5	15	15.5	V
Supply current $I_{DC}$	Without load		0.12		A
Coupling capacitor $C_{IO}$	Primary to secondary side		/		pF
Primary side undervoltage threshold	Supply voltage		12		V
Secondary side undervoltage threshold	Secondary side positive voltage		12.5		V

### Gate Driver Parameters

Output voltage	Remarks	Min	Typ	Max	Unit
Total gate voltage	Turn on (ON) - off (OFF) voltage	19.5	22	24.5	V
Gate positive voltage $V_{GSon}$	Turn on (ON)	14.5	18	19.5	V
Gate negative voltage $V_{GSoff}$	Turn off (OFF)	-9.5	-4	-0.5	V

## Logic Inputs & Outputs

Parameter	Remarks	Min	Typ	Max	Unit
Input signal INx	INx to GND	14.5	15	15.5	V
Input impedance			240		kΩ
Turn-on threshold	V(INx)	7.5			V
Turn-off threshold	V(INx)			5	V
Fault output SOx	Protection state @Io<10mA			0.35	V
MOD mode	Direct mode	Set by software, no configuration required			
	Half-bridge mode	Set by software, no configuration required			

## Short-circuit protection

Parameter	Remarks	Min	Typ	Max	Unit
V <sub>DS</sub> monitoring threshold	Short-circuit protection monitoring	Configurable	11	Configurable	V
Response time	CH1, Note 1	Configurable	1.2	Configurable	μs
	CH2, Note 1	Configurable	1.2	Configurable	μs
Soft shut down time	Soft shut down action time	Configurable	6.24	Configurable	μs

## Miller Clamping

Parameter	Remarks	Min	Typ	Max	Unit
Time from drive signal turn-off to clamp turn-on		Configurable	500	Configurable	ns
Time from clamp turn-off to drive signal turn-on			500		ns
Clamp voltage			VSS (negative voltage)		

## Timing Characteristics

Parameter	Remarks	Min	Typ	Max	Unit
Turn-on delay	Note 2		1.2		μs

Turn-off delay	Note 3	1.3	μs
Rise time	Note 4	12	ns
Fall time	Note 5	12	ns
Fault blocking time		80	ms
Fault return time	Note 6	10	ms

### NTC Sampling

Parameter	Remarks	Duty cycle for temperature output	Unit
Temperature output	Fixed frequency 4K, variable duty cycle, output the highest temperature	Note 7	μs

### Electrical Isolation

Parameter	Remarks	Min	Typ	Max	Unit
Creepage distance	Primary to secondary side, Note 8		15		mm
	Secondary to secondary side, Note 8		12.5		mm
Clearance distance	Primary to secondary side		8		mm
	Secondary to secondary side		6		mm

Unless otherwise specified, all data are based on tests at +25°C ambient temperature and  $V_{DC}=15V$ .

Note:

1. Response time: the time from the occurrence of the fault to the start of soft shut down;
2. Turn-on delay: the time required to transmit the rising edge of the PWM signal input from the primary side to the rising edge of the secondary side of the gate driver;
3. Turn-off delay: the time required to transmit the falling edge of the PWM signal input from the primary side to the falling edge of the secondary side of the gate driver;
4. Rise time: the amount of time from 10% of the gate turn-off voltage (-4V) to 90% of the gate turn-on voltage (+18V);



5. Fall time: the amount of time from 90% of the gate turn-on voltage (+18V) to 10% of the gate turn-off voltage (-4V);
6. Fault return time: short-circuit 10ms, secondary side undervoltage 20ms, primary side undervoltage 40ms;
7. Temperature output duty cycle: (refer to Infineon NTC)

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<b>Temperature(°C)</b>	<b>Rntc(kΩ)</b>	<b>Duty Cycle (%)</b>
-40	99.092	6.0%
-35	75.144	8.0%
-30	57.533	10.0%
-25	44.448	12.0%
-20	34.610	14.0%
-15	27.156	16.0%
-10	21.483	18.0%
-5	17.120	20.0%
0	13.727	22.0%
5	11.082	24.0%
10	9.003	26.0%
15	7.359	28.0%
20	6.049	30.0%
25	5.000	32.0%
30	4.156	34.0%
35	3.472	36.0%
40	2.914	38.0%
45	2.458	40.0%
50	2.083	42.0%
55	1.773	44.0%
60	1.515	46.0%

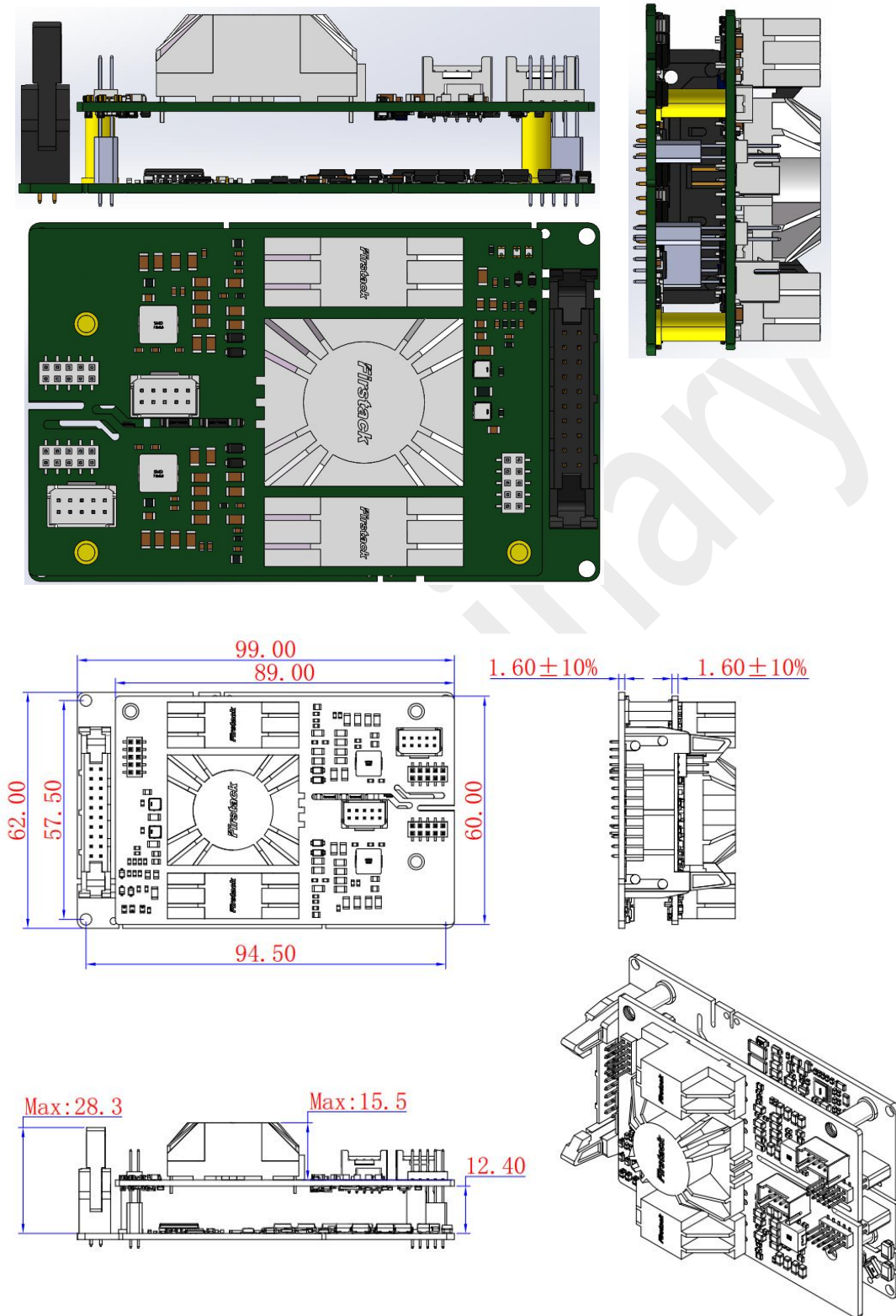
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65	1.300	48.0%
70	1.120	50.0%
75	0.968	52.0%
80	0.840	54.0%
85	0.732	56.0%
90	0.640	58.0%
95	0.561	60.0%
100	0.493	62.0%
105	0.435	64.0%
110	0.385	66.0%
115	0.342	68.0%
120	0.304	70.0%
125	0.271	72.0%
130	0.243	74.0%
135	0.217	76.0%
140	0.195	78.0%
145	0.176	80.0%
150	0.158	82.0%

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8. Creepage distance: refer to IEC61800-5-1-2007, and meet the basic isolation requirements of below 2km altitude and pollution level 2; this value is the creepage distance of the isolation device.

### 3D and Mechanical Dimensions



**Fig.4** 3D and mechanical dimensions (unit: mm)

Note: 1. The thickness tolerance of the board is  $\pm 10\%$ ;

2. Other dimensional tolerances refer to GB/T1804-m.

## Ordering Information

The 2FHD0620 can support different models of packaged modules from multiple manufacturers. If you have a purchase request, please add the module part number after the gate driver part number so that we can provide the gate driver that best meets your needs.

Gate driver part number	Voltage	R <sub>GON</sub> (Ω)	R <sub>GOFF</sub> (Ω)	R <sub>SSD</sub> (Ω)	Coating	SOx
2FHD0620M17A1C-Y0002	1700V	4.7/2	4.7/2	15	Yes	15V
2FHD0620M17A1-Y0002	1700V	4.7/2	4.7/2	15	No	15V

## Technical Support

Firstack's professional team will provide you with business consultation, technical support, product selection, price, lead time and other related information, and guarantee to answer your questions within 48 hours.

## Legal Disclaimer

The instruction manual provides a detailed description of the product but does not commit to providing specific parameters regarding the delivery, performance, or applicability of the product. This document does not offer any express or implied warranties or guarantees.

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