2FHC0435RE Data Sheet

Abstract

The 2FHC0435RE is a high-performance, dual-channel gate driver core developed independently by Firstack based on intelligent chip technology, and supports up to 1700V IGBT modules. The peripheral application circuits are simple, so customers can drive IGBTs safely and reliably without extra configuration.

Core Features:

- 4W per channel, ±35A
- Support up to 30kHz application
- Short-circuit protection(soft shut down)
- Support muti-level application
- Intelligent fault management
- Compliant with UL 61800-5-1

Applications:

- Motor drives
- ESS



Fig.1 2FHC0435RE

Functional Block Diagram

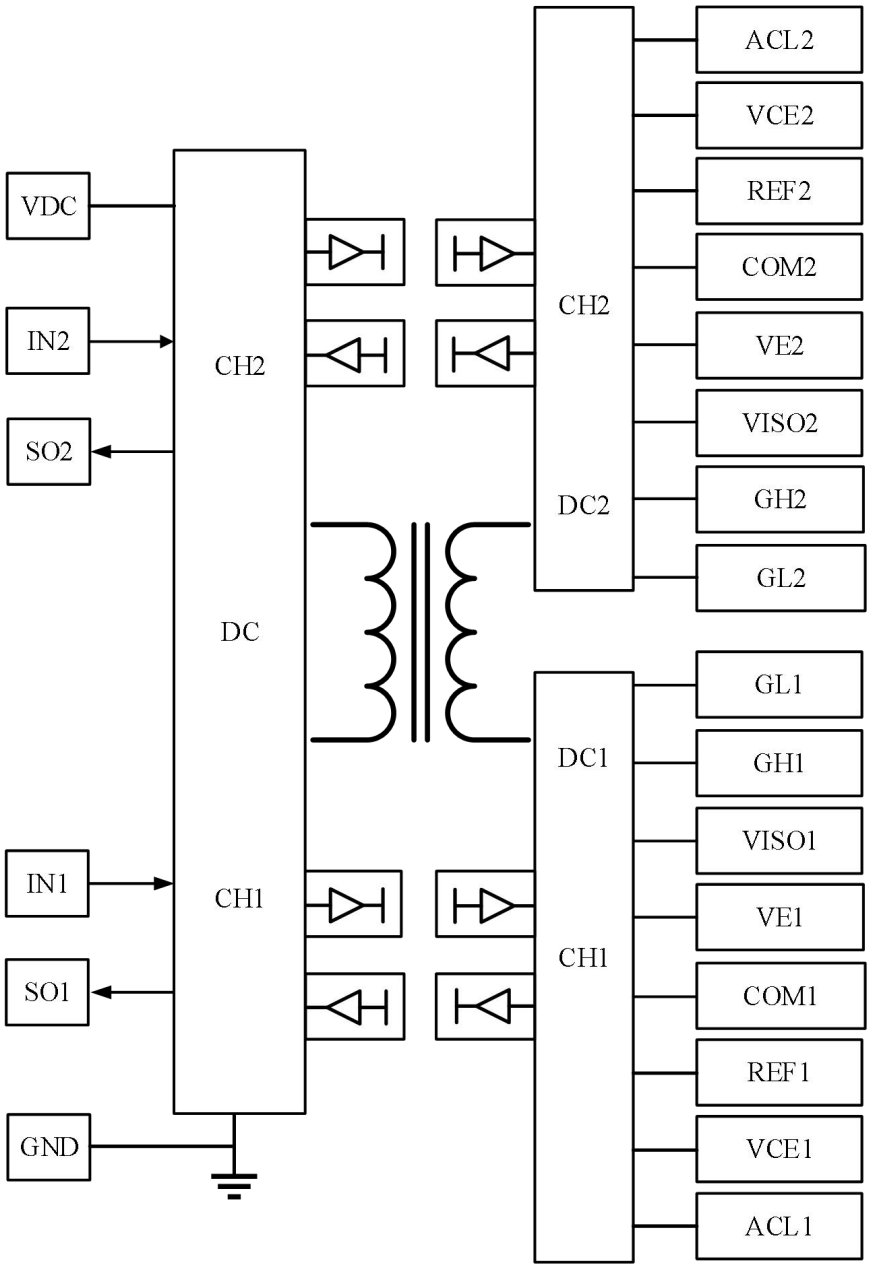


Fig.2 Functional block diagram

Pin Definition

Terminal	Pin	Definition	Function
P1	1	VDC	Supply voltage
	2	SO1	Status output channel 1, normal is high-impedance, fault is low
	3	SO2	Status output channel 2, normal is high-impedance, fault is low
	4	NC	NC
	5	NC	NC
	6	VCC	Primary side supply voltage
	7	GND	Ground
	8	IN1	Signal input channel 1
	9	IN2	Signal input channel 2
	10	GND	Ground
P2	11	ACL1	Active clamping feedback channel 1
	12	VCE1	V_{CE} sense channel 1: connect to IGBT collector of the module through diodes or resistor network
	13	REF1	Set V_{CE} detection threshold channel 1: resistor (Rthx) to VE1
	14	COM1	Negative power supply channel 1
	15	VE1	Emitter channel 1: (auxiliary) emitter connect to the power device
	16	VISO1	Positive power supply channel 1
	17	GH1	Gate high channel 1
	18	GL1	Gate low channel 1
P3	22	ACL2	Active clamping feedback channel 2
	23	VCE2	V_{CE} sense channel 2: connect to IGBT collector of the module through diodes or resistor network
	24	REF2	Set V_{CE} detection threshold channel 2: resistor (Rthx) to VE1
	25	COM2	Negative power supply channel 2
	26	VE2	Emitter channel 1: (auxiliary) emitter connect to the power device
	27	VISO2	Positive power supply channel 2
	28	GH2	Gate high channel 2
	29	GL2	Gate low channel 2

Technical Parameters

Absolute Maximum Ratings

Parameter	Remarks	Min	Max	Unit
Power supply V_{DC}	V_{DC} to GND	0	15.5	V
Logic input, note 1	Primary side, to GND	0	15.5	V
Logic output, note 2	Primary side, to GND	0	15	V
Fault return current capability	Fault condition	0	10	mA
Output power per channel	@85℃		4	W
	@70℃		6	W
Gate peak current	@85℃	-35	35	A
Test voltage (50Hz/1min)	Primary to secondary side	5000		V_{RMS}
	Secondary to secondary side	4000		V_{RMS}
Operating temperature		-40	85	℃
Storage temperature		-40	90	℃

Power Supply

Parameter	Remarks	Min	Typ	Max	Unit
Power supply V_{DC}	V_{DC} to GND	14.5	15	15.5	V
Supply current I_{DC}	Without load		0.11		A
Coupling capacitance C_{IO}	Primary to secondary side		14		pF
UVLO threshold, note 3	Primary side voltage		12		V

Gate Driver Parameters

Output level	Remarks	Min	Typ	Max	Unit
Gate voltage V_{GE}	Turn on (ON)	14.5	15	15.5	V
Gate voltage V_{GE}	Turn off (OFF)	-9	-10	-11	V

Logic Inputs & Outputs

Parameter	Remarks	Min	Typ	Max	Unit
Input signal INx	GND	4.5	15	15.5	V
Input impedance	GND		10		KΩ
Turn-on threshold, note 4	5V PWM	2.3	2.6	2.8	V
	15V PWM	6.75	7.50	8.25	V
Turn-off threshold, note 4	5V PWM	1.44	1.60	1.76	V
	15V PWM	4.41	4.90	5.39	V
Fault output SOx	Protection state @Io< 10mA		0.35		V
Operating mode, note 5	Direct mode	Set via software, cannot be modified by hardware			
	Half-bridge mode	Set via software, cannot be modified by hardware			

Short-Circuit Protection

Parameter	Remarks	Min	Typ	Max	Unit
V_{CE} monitoring threshold	Short-circuit protection monitoring threshold @Rthx=68KΩ		10.1		V
Response time	CH1, Note 6		4		μs
	CH2, Note 6		4		μs
Soft shut down time	Soft shut down action time		4.16		μs

Timing Characteristics

Parameter	Remarks	Min	Typ	Max	Unit
Turn-on delay	Note 7		680		ns
Turn-off delay	Note 8		760		ns
Rise time	Note 9		6		ns
Fall time	Note 10		10		ns

Fault blocking time	Secondary side gate blocking signal		80		ms
Fault return time	Fault low level time, Note 11		10		ms

Electrical Isolation

Parameter	Remarks	Min	Typ	Max	Unit
Creepage distance	Primary to secondary side, Note 12		15		mm
	Secondary to secondary side		5.5		mm
Clearance distance	Primary to secondary side, Note 12		14.5		mm
	Secondary to secondary side		5.5		mm
PDEV	Test according to IEC 60270			2.8	kV_{AC}

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

Note:

1. Max. input (PWM signal) is 15V. But the actual voltage level of them is configurable by SW;
2. SOx is open drain (OD), the maximum allowed voltage is 40V, normally this pin will be pulled up to V_{DC};
3. During the power-on process of 2FHC0435, there is a fault signal of undervoltage because at the beginning the the voltage in primary side is lower than 12V, therefore the driver will recognize it as a fault. A 500ms filter time is recommended to ignore this fault;
4. Turn on/off threshold is decided by the software, it can not be changed by hardware;
5. The operating mode can not be adjusted by hardware, please refer to the ordering information;
6. Response time: the time from the occurrence of the fault to the start of soft shut down, this parameter (4us) is measured based on "2FHC0435 Application Manual" Fig. 6 with Rax=120 kΩ and Cax=0pF;
7. Turn-on delay: the time required to transmit from the rising edge of the PWM signal from the primary input to the rising edge of the secondary of the gate driver;
8. Turn-off delay: the time required to transmit from the falling edge of the PWM signal from the primary input to the falling edge of the secondary side of the gate driver;
9. Rise time: the amount of time from 10% of the gate turn-off voltage (-10V) to 90% of the gate turn-on voltage (+15V);
10. Fall time: the amount of time from 90% of the gate turn-on voltage (+15V) to 10% of the gate turn-off voltage (-10V);
11. Fault return time: short-circuit=10ms，secondary side undervoltage=20ms，primary side undervoltage=40ms;
12. Creepage distance: refer to IEC61800-5-1-2007, meet the basic isolation requirements for altitudes below 2km and pollution level 2

3D and Mechanical Dimensions

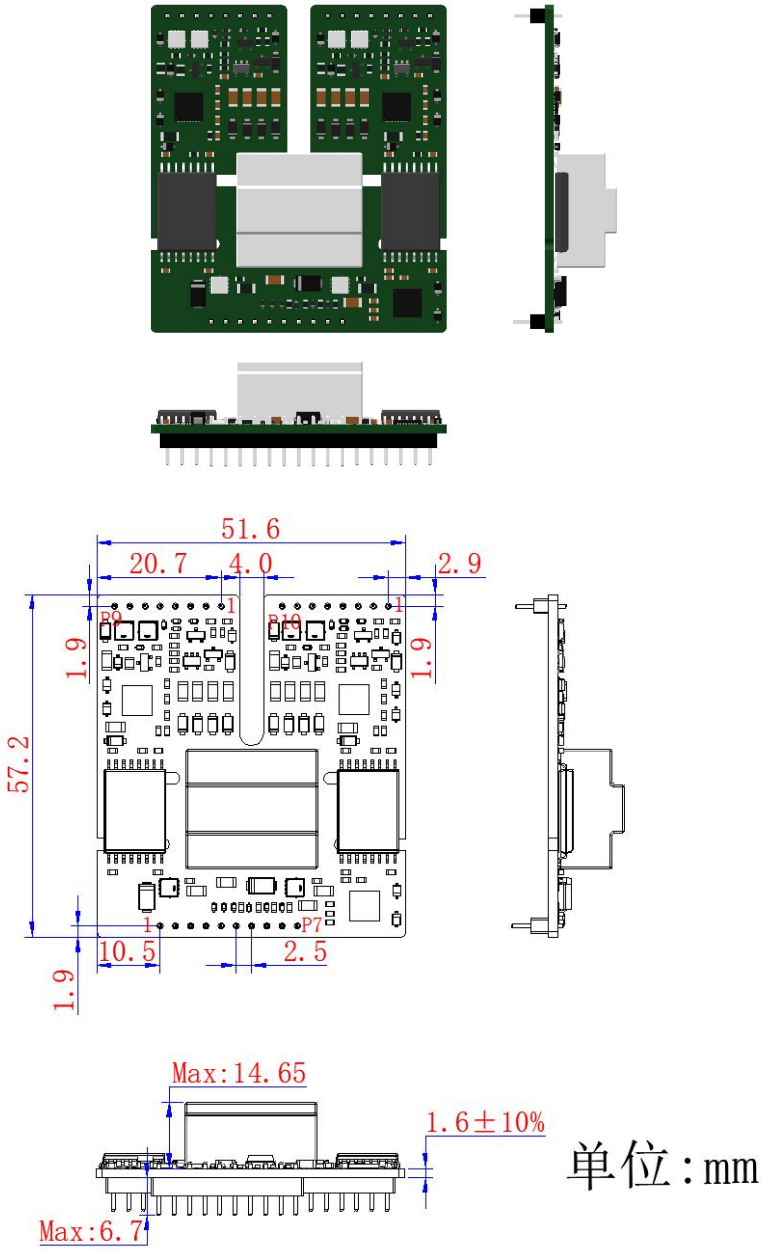


Fig.4 3D and mechanical dimensions (unit: mm)

Note: 1.The thickness tolerance of the board is ±10%;

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

Recommended dimensions

Recommended pin pad size	Recommended through-hole size
Φ=2mm	Φ=1.02mm

Update Information

Date	Description	Version
2026.04.20	Preliminary version	V0.1
2026.09.18	Update description	V0.2

Ordering Information

The 2FHC0435 can support different part numbers of modules from multiple manufacturers. The products in the selection list are suitable for general delivery conditions.

Part number	Operating Mode	Pin Length	Coating
2FHC0435C17RED3	Direct	3.1mm	No
2FHC0435C17RED3C	Direct	3.1mm	Yes
2FHC0435C17REH3	Half-bridge	3.1mm	No
2FHC0435C17REH3C	Half-bridge	3.1mm	Yes

Technical Support

Firstack's professional team will provide you with business consultation and technical support. Please contact the Firstack technical sales team if you require the application manual for further information of the technical application.

Legal Disclaimer

1.All parameters listed in this Specification Sheet were measured under specific laboratory conditions and are provided for reference only. Due to variations in installation conditions and operating environments, the actual performance of the Product may deviate from the nominal values. Users are advised to conduct independent verification under their own operating conditions.

2.This Specification Sheet reflects the product characteristics as of the date of issuance, based on the then-existing condition and to the best of our knowledge. No representation or warranty is made that all

performance characteristics under all operating conditions have been exhaustively tested or verified.

3.We reserve the right to modify this Specification Sheet and technical parameters for product improvement without prior notice. Products already sold shall be governed by the Sales Contract between the parties and the Specification Sheet effective at the time of delivery.

4.This Specification Sheet is a technical descriptive document. Its binding effect is limited to the Sales Contract, and it shall not create any independent warranty obligation outside the Contract.

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