

2FHC0435 Data Sheet

Abstract

The 2FHC0435 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.

Highlights:

- 4W per channel, $\pm 35A$
- Support up to 30kHz application
- Short-circuit protection(soft shut down)
- Support muti-level application
- Intelligent fault management

Applications:

- Motor drives
- ESS

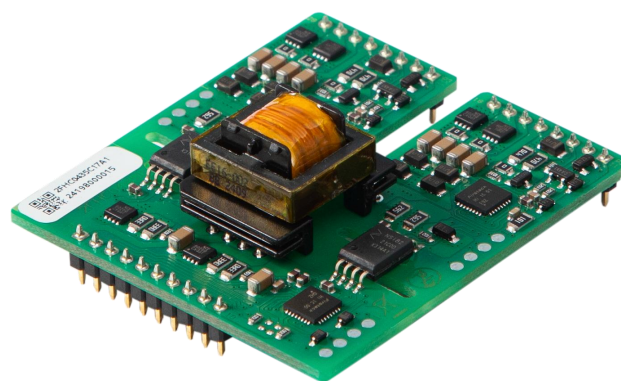


Fig.1 2FHC0435

Functional block diagram

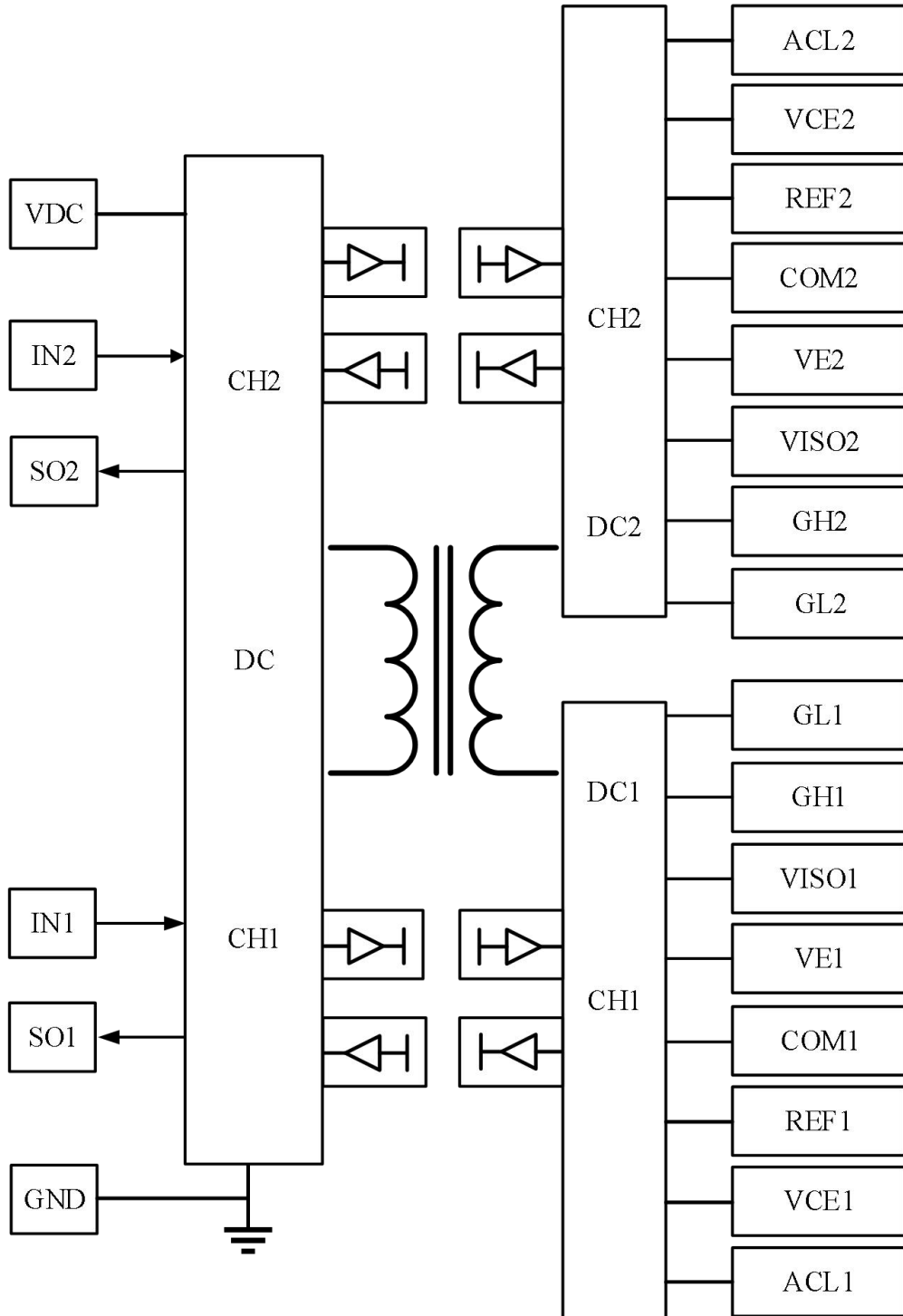


Fig.2 Functional block diagram

Pin designation

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	Free
	5	NC	Free
	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 and output voltages	Primary side, to GND	0	15.5	V
Fault return current capability	Fault condition	0	10	mA
Output power per channel	@85°C		4	W
	@70°C		6	W
Gate peak current	@85°C	-35	35	A
Test voltage (50Hz/1min)	Primary to secondary side	5000		V_{RMS}
	Secondary to secondary side	4000		V_{RMS}
Maximum DC bus voltage			1200	V
Operating temperature		-40	85	°C
Storage temperature		-40	90	°C

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		18		pF
Undervoltage threshold	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)	-7	-8	-9	V

Logic Inputs & Outputs

Parameter	Remarks	Min	Typ	Max	Unit
Input signal IN_x	GND	4.5	15	15.5	V
Input impedance	GND		240		K Ω
Turn-on threshold	$V(IN_x)$	3.2			V
Turn-off threshold	$V(IN_x)$			1.1	V
Fault output SO_x	Protection state @ $I_o < 10mA$			0.35	V
MOD mode	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 @ $R_{thx}=68K\Omega$		10.1		V
Response time	CH1, Note 1		4		μs
	CH2, Note 1		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 2		650		ns
Turn-off delay	Note 3		650		ns
Rise time	Note 4		10		ns
Fall time	Note 5		20		ns
Fault blocking time	Secondary side gate blocking signal		80		ms
Fault return time	Fault low level time, Note 6		10		ms

Electrical Isolation

Parameter	Remarks	Min	Typ	Max	Unit
Creepage distance, Note 7	Primary to secondary side, Note8	8			mm
	Secondary to secondary side	12			mm
Clearance distance	Primary to secondary side, Note 8	8			mm
	Secondary to secondary side	6.5			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, this parameter (4us) is measured based on "2FHC0435 Application Manual" Fig. 6 with $R_{ax}=120\text{ k}\Omega$ and $C_{ax}=0\text{pF}$;
2. 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;
3. 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;
4. Rise time: the amount of time from 10% of the gate turn-off voltage (-8V) to 90% of the gate

turn-on voltage (+15V);

5. Fall time: the amount of time from 90% of the gate turn-on voltage (+15V) to 10% of the gate turn-off voltage (-8V);
6. Fault return time: short-circuit=10ms , secondary side undervoltage=20ms , primary side undervoltage=40ms;
7. Creepage distance: refer to IEC61800-5-1-2007, meet the basic isolation requirements for altitudes below 2km and pollution level 2;
8. The value refers to the creepage/clearance distance parameter of the isolation device, creepage distance between the primary and secondary side of PWB is 12mm.

3D and Mechanical Dimensions

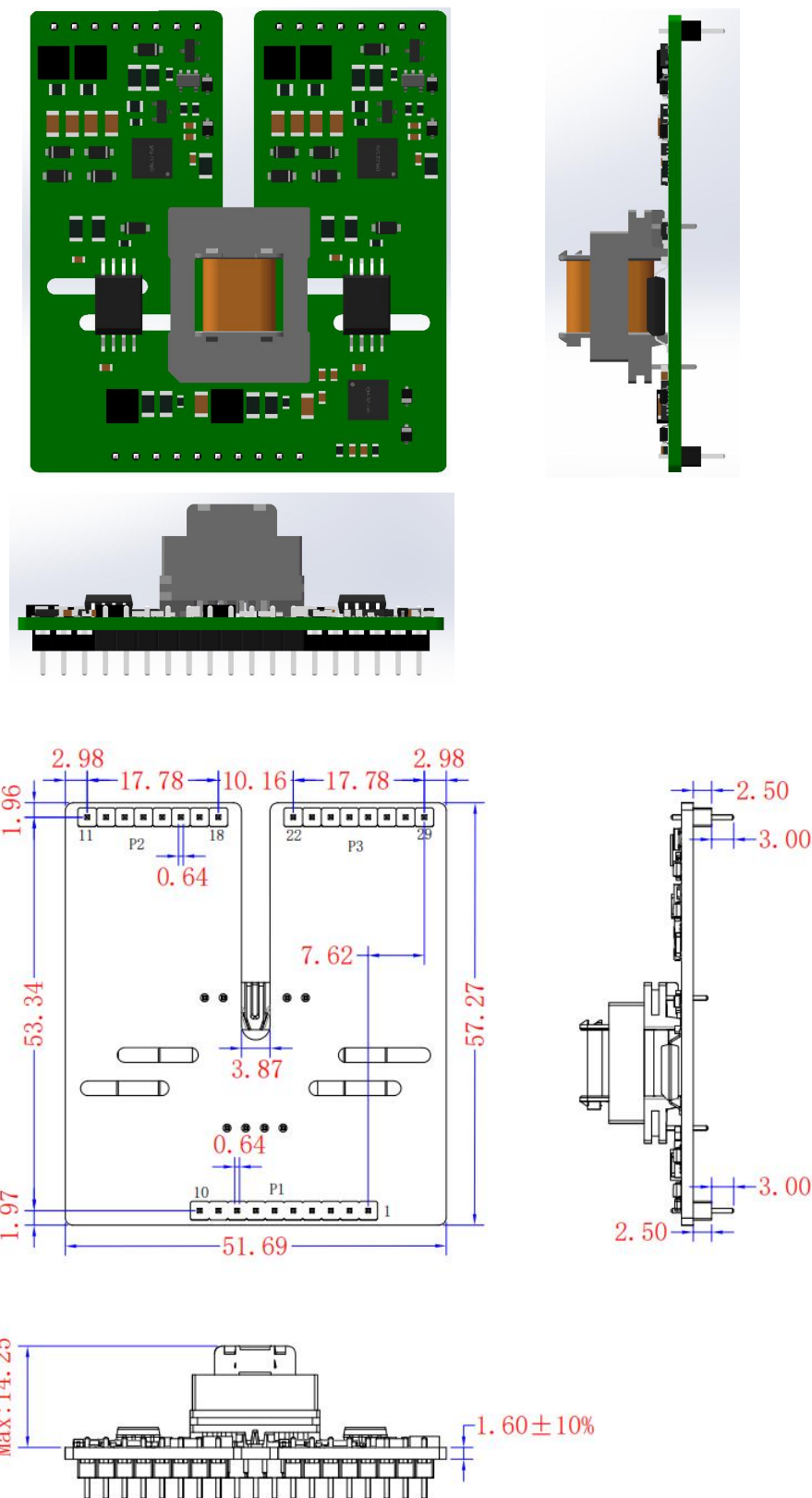


Fig.4 3D and mechanical dimensions (unit: mm)

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

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

Recommended dimensions

Serial number	Recommended pin pad size	Recommended through-hole size
1	$\Phi=2\text{mm}$	$\Phi=1.02\text{mm}$

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	INx	Sox	IGBT voltage
2FHC0435C17A1	Direct mode	5-15V	OD	1700V
2FHC0435C17B1	Half-bridge mode	5-15V	OD	1700V

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

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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