

2FHC0660 Data Sheet

Abstract

The 2FHC0660 is a high-performance, dual-channel gate driver core developed independently by Firstack based on intelligent chip technology, and supports up to 3300V IGBT modules. The peripheral application circuits are simple, so customers can drive IGBTs safely and reliably without extra configuration.

Highlights:

- 6W per channel, $\pm 60\text{A}$
- Support up to 30kHz application
- Short-circuit protection(soft shut down)
- Support muti-level application
- Intelligent fault management

Applications:

- Power quality
- Special power supply
- Switching power supply
- Converter
- Energy storage converter

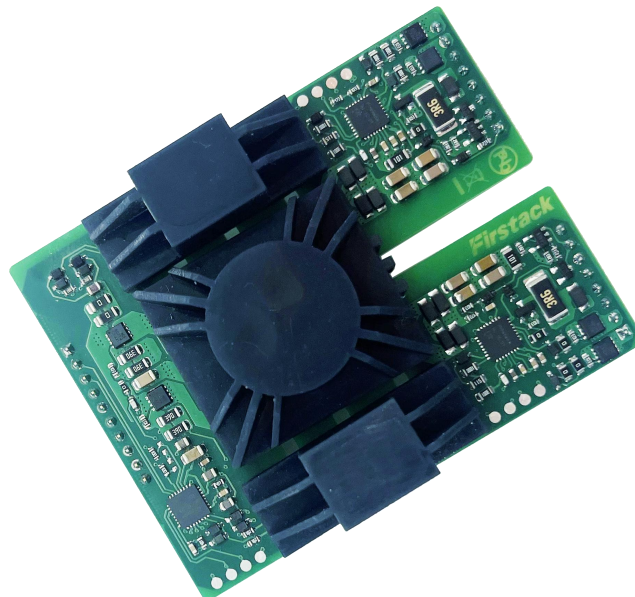


Fig.1 2FHC0660

Functional block diagram

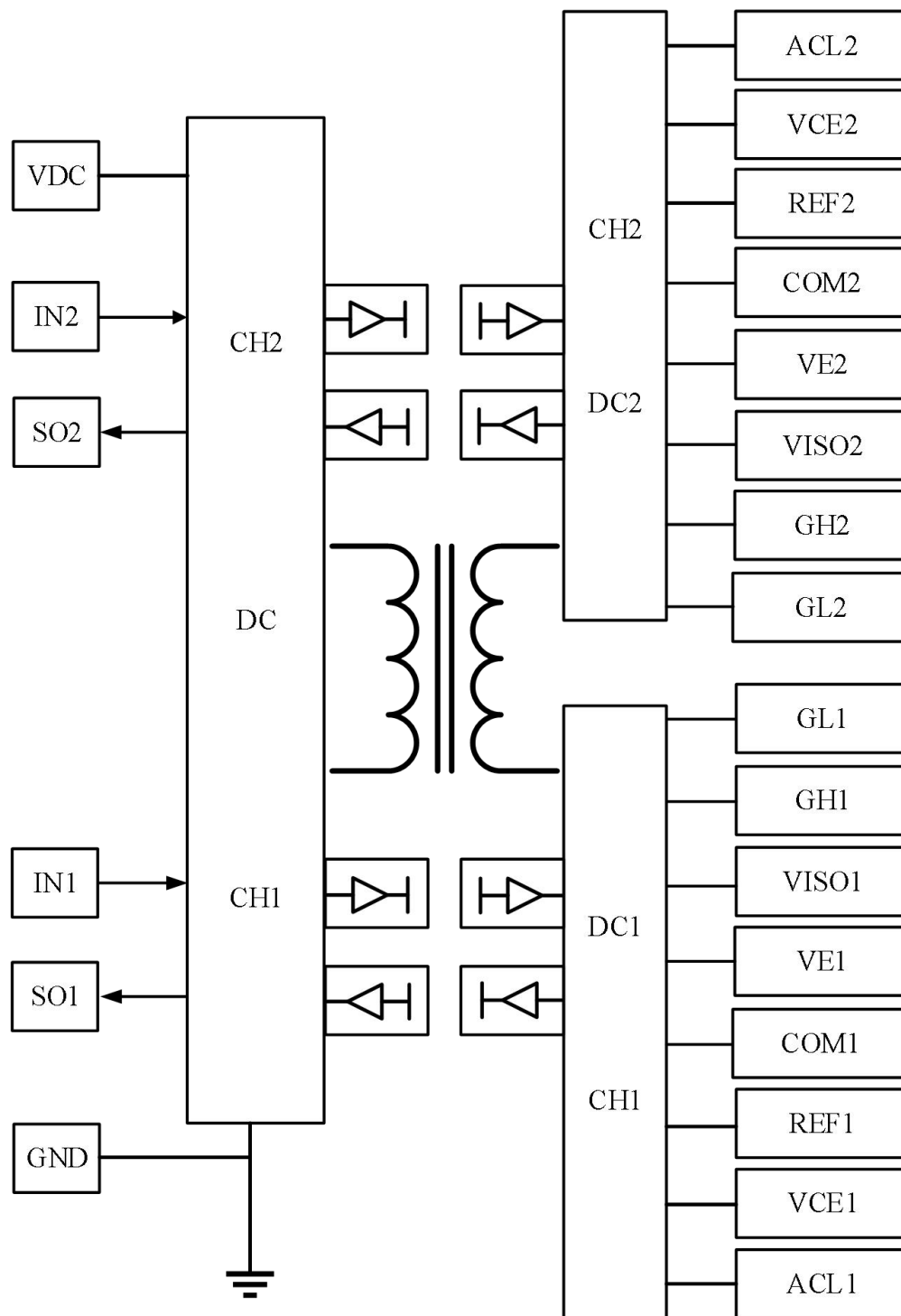


Fig.2 Functional block diagram

Pin designation

Terminal	Pin	Definition	Function
P1	1	VDC	Power supply
	2	SO1	States output channel 1, normal is high-impedance, fault is low
	3	SO2	States output channel 2, normal is high-impedance, fault is low
	4	NC	Free
	5	NC	Free
	6	VCC	Primary side control power supply
	7	GND	Ground
	8	IN1	Signal input channel 1
	9	IN2	Signal input channel 2
	10	GND	Ground
P2	1	GL1	Gate turn-off channel 1
	2	GH1	Gate turn-on channel 1
	3	VISO1	Positive supply channel 1
	4	VE1	Emitter channel 1: (auxiliary) emitter connect to the power device
	5	COM1	Negative supply channel 1
	6	REF1	Set the VCE sense threshold of Channel 1: connect to VE1 through the resistors(Rthx)
	7	VCE1	VCE sense channel 1: connect to IGBT collector of the module through diodes or resistor network
	8	ACL1	Active clamping channel 1
P3	1	ACL2	Active clamping channel 2
	2	VCE2	VCE sense channel 2: connect to IGBT collector of the module through diodes or resistors network
	3	REF2	Set the VCE sense threshold of channel 2: Connect to VE1 through the resistors(Rthx)
	4	COM2	Negative supply channel 2
	5	VE2	Emitter channel 2: (auxiliary) emitter connect to the power device
	6	VISO2	Positive supply channel 2
	7	GH2	Gate turn-on channel 2
	8	GL2	Gate turn-off channel 2

Technical parameters

Absolute Maximum Ratings

Parameters	Description	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 state	0	10	mA
Output power per channel	@85°C		6	W
	@70°C		7.5	W
Gate peak current	@85°C	-60	60	A
Test voltage(50Hz/1min)	Primary to secondary side	9100		V_{RMS}
	Secondary to secondary side	6000		V_{RMS}
Operating temperature		-40	85	°C
Storage temperature		-40	90	°C

Supply Parameters

Parameters	Description	Min	Typ	Max	Unit
Power supply V_{DC}	V_{DC} to GND	14.5	15	15.5	V
Supply current I_{DC}	Without load		0.12		A
Coupling capacitance C_{IO}	Primary to secondary side		15		pF
Undervoltage threshold	Primary side voltage		12		V

Gate Driver Parameters

Output level	Description	Min	Typ	Max	Unit
Gate voltage V_{GE}	Turn on (ON)	14.5	15	15.5	V
Gate voltage V_{GE}	Turn off (OFF)	-9.5	-10.5	-11.5	V

Input & Output Logic

Parameters	Description	Min	Typ	Max	Unit
Input signal INx	GND	4.5	15	15.5	V
Input impedance	GND		240		k Ω
Turn-on threshold	$V(INx)$	3.2			V
Turn-off threshold	$V(INx)$			1.1	V
Fault output SOx	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

Parameters	Description	Min	Typ	Max	Unit
V_{CE} monitoring threshold	Short-circuit protection monitoring threshold		10.1		V
Response time ^①	CH1		8		μs
	CH2		8		μs
Soft shut down time	Soft shut down action time		4.16		μs

Timing Characteristics

Parameters	Description	Min	Typ	Max	Unit
Turn-on delay ^②			1100		ns
Turn-off delay ^③			1100		ns
Rise time ^④			50		ns
Fall time ^⑤			100		ns
Fault blocking time	Secondary side gate blocks signal		80		ms
Fault return time ^⑥	Fault low level time		10		ms

Electrical Isolation

Parameters	Description	Min	Typ	Max	Unit
Creepage distance ^⑦	Primary to secondary side ^⑧	44			mm
	Secondary to secondary side	25			mm
Clearance distance	Primary to secondary side ^⑧	30			mm
	Secondary to secondary side	14			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 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 (-10.5V) 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 (-10.5V);

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.

Mechanical Dimensions

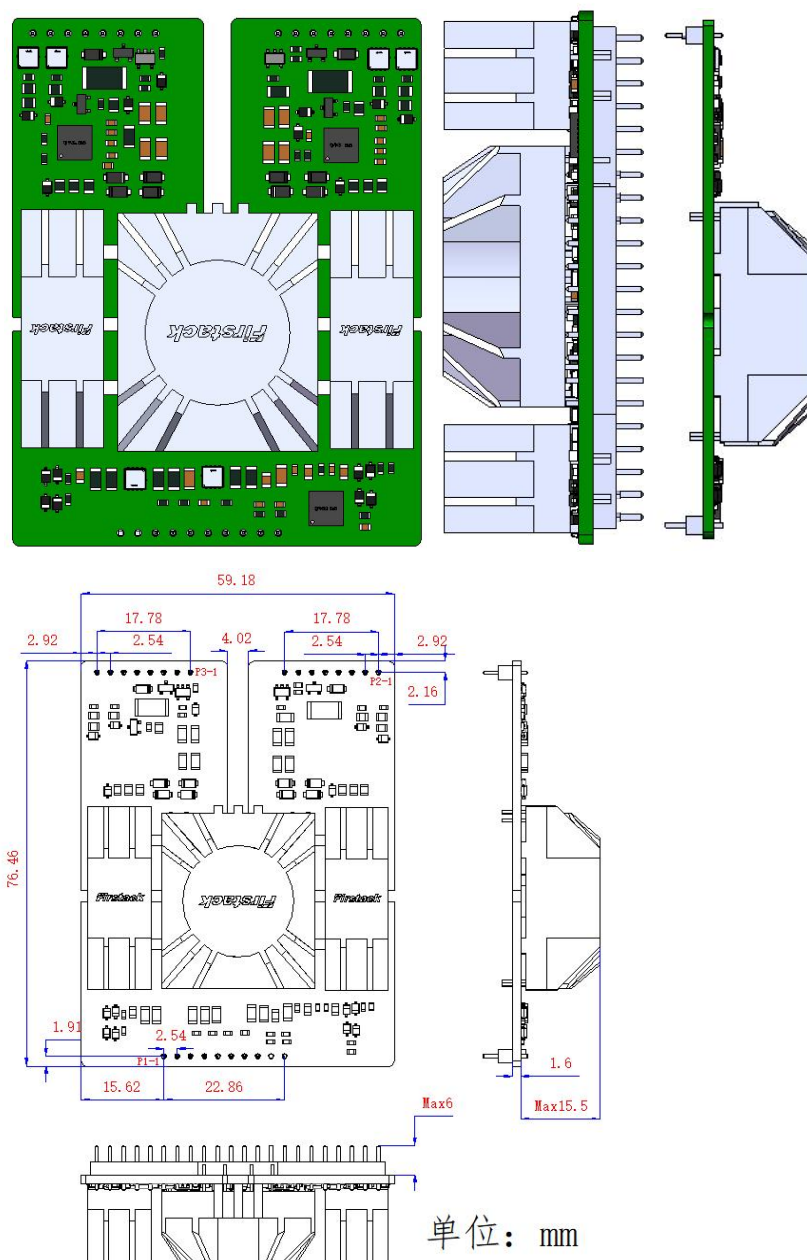


Fig. 4 Mechanical dimensions (unit: mm)

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 2FHC0660 can support different part numbers of modules from multiple manufacturers. The products in the selection list are suitable for general delivery conditions.

Gate driver part number	Operating mode	INx	SOx	IGBT voltage
2FHC0660M33A1	Direct mode	5-15V	OD	3300V

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.

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