

2FHD0320C Data Sheet

Abstract

The 2FHD0320C is a high-performance, dual-channel plug-and-play gate driver developed by Firstack based on intelligent chip technology for PrimePACK™ packages, it supports IGBT modules up to 1700V. It can drive IGBT modules safely and reliably without other peripheral circuits.

Highlights:

- 3W/20A, support up to 50kHz applications
- Support up to 1700V module
- Short-circuit protection (soft shut down)
- Digital control method

Applications:

- Motor drives
- ESS

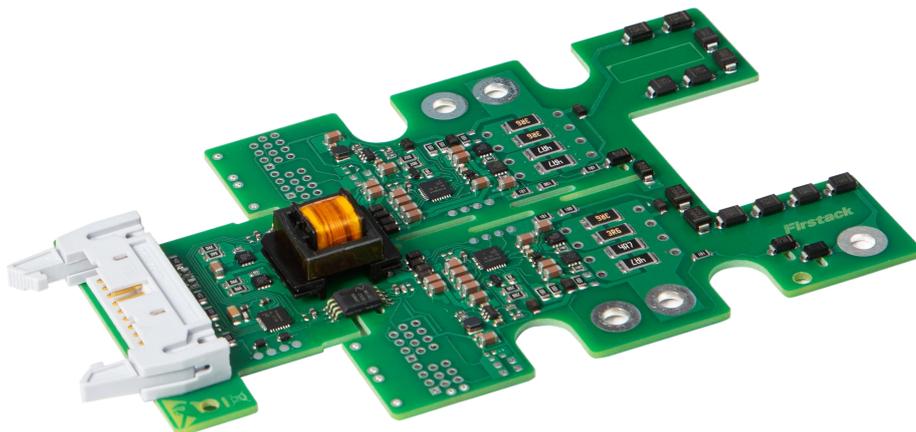


Fig.1 2FHD0320C

Functional Block Diagram

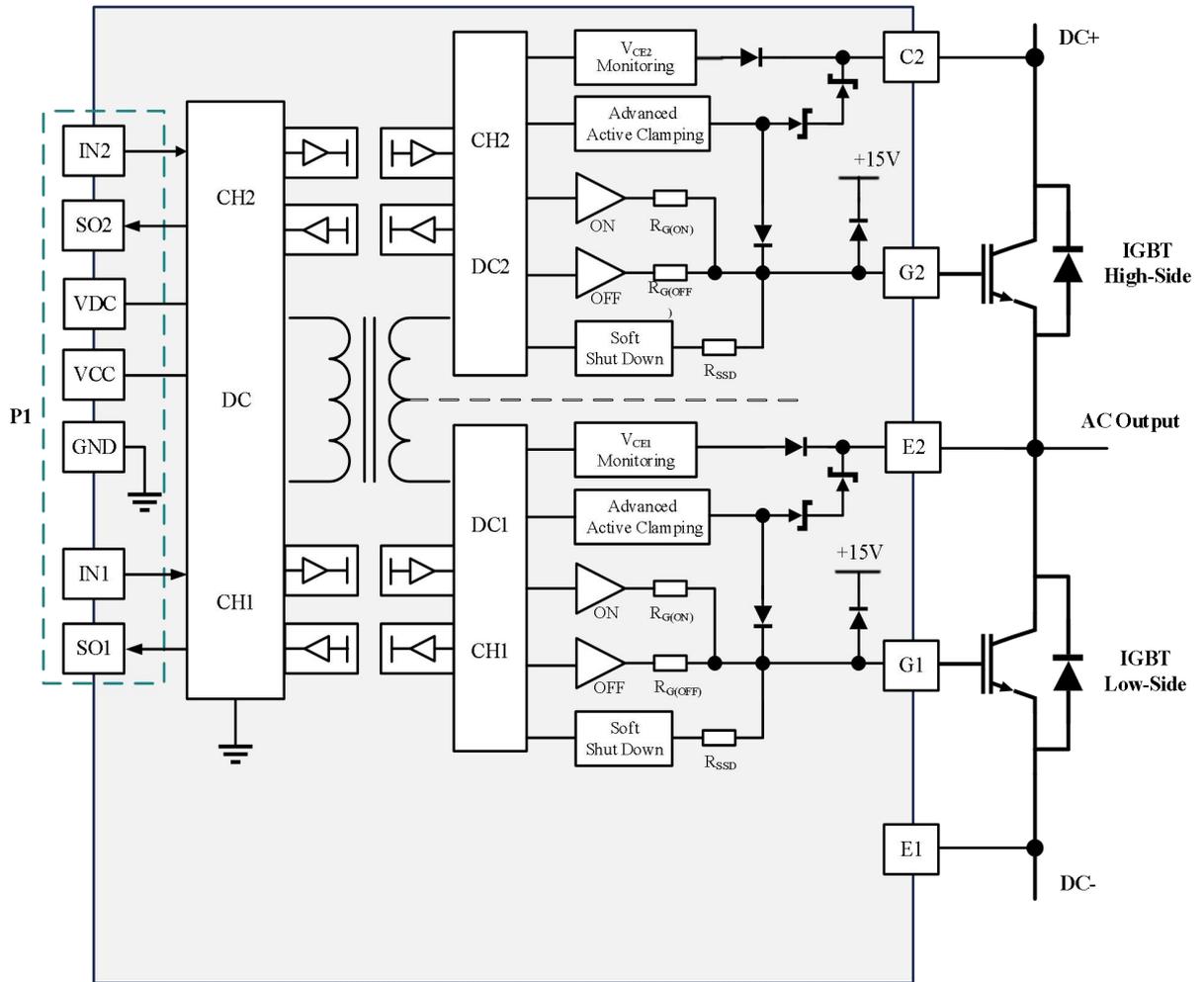
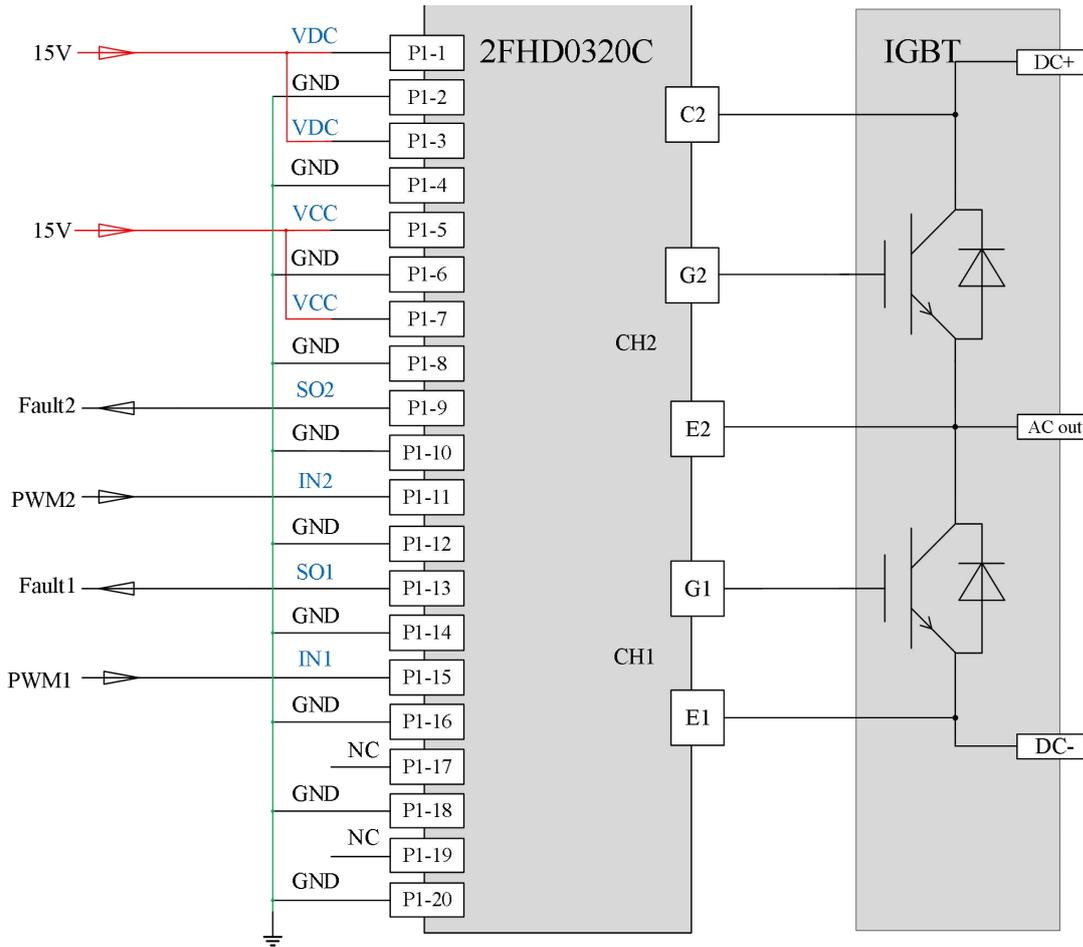


Fig.2 Functional block diagram

Connector P1 Recommended Interface Circuitry



P1 terminal pin designation

Pin	Definition	Function	Pin	Definition	Function
1	VDC	For DC/DC power supply +15V	2	GND	Primary side ground
3	VDC	For DC/DC power supply +15V	4	GND	Primary side ground
5	VCC	For primary side power supply +15V	6	GND	Primary side ground
7	VCC	For primary side power supply +15V	8	GND	Primary side ground
9	SO2	Top IGBT fault return (high normal, low fault)	10	GND	Primary side ground
11	IN2	Top IGBT drive input signal (high turn on, low turn off)	12	GND	Primary side ground
13	SO1	Bottom IGBT fault return (high normal, low fault)	14	GND	Primary side ground

15	IN1	Bottom IGBT drive input signal (high turn on, low turn off)	16	GND	Primary side ground
17	NC	Free	18	GND	Primary side ground
19	NC	Free	20	GND	Primary side ground

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	$V_{DC}+0.5V$	V
Output power per channel	@85°C		3	W
Gate peak current	@85°C	-20	20	A
Test voltage(50Hz/1min)	Primary to secondary side	5000		V_{RMS}
Maximum DC bus voltage	2FHD0320		1300	V
Operating temperature		-40	85	°C
Storage temperature		-40	90	°C

Recommended Operating Conditions

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		0.08		A
Coupling capacitance C_{IO}	Primary to secondary side		20		pF
Supply undervoltage threshold	Primary side		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)	-8.5	-8	-7.5	V

Logic Inputs & Outputs

Parameter	Remarks	Min	Typ	Max	Unit
Input signal INx	GND	4.5	15	15.5	V
Input impedance			10		kΩ
Turn-on threshold	V(INx) - 5V		2.6		V
	V(INx) - 15V		7.4		
Turn-off threshold	V(INx) - 5V		1.6		V
	V(INx) - 15V		4.8		
Fault output SOx	Protection state@ Io<10 mA			0.35	V
MOD mode	Direct mode	Set via software, no configuration required			
	Half-bridge mode	Set via software, no configuration required			

Short-Circuit Protection

Parameter	Remarks	Min	Typ	Max	Unit
V _{CE} monitoring threshold	Short-circuit monitoring threshold		10		V
Response time	CH1, Note 1		8		μs
	CH2, Note 1		8		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		700		ns
Turn-off delay	Note 3		900		ns
Rise time	Note 4		15		ns
Fall time	Note 5		100		ns
Fault blocking time			80		ms
Fault return time	Note 6		10		ms

Electrical Isolation

Parameter	Remarks	Min	Typ	Max	Unit
Creepage distance	Primary to secondary side, Note 7	8			mm
	Secondary to secondary side, Note 7	8			mm
Clearance distance	Primary to secondary side	8			mm
	Secondary to secondary side	7			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 (-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: the fault hold time under SC fault;
7. Creepage distance: refer to IEC61800-5-1-2007, meet the basic isolation requirements for altitudes below 2km and pollution level 2; this value takes the creepage distance of the isolation device.

Gate Resistor & Capacitor Indication

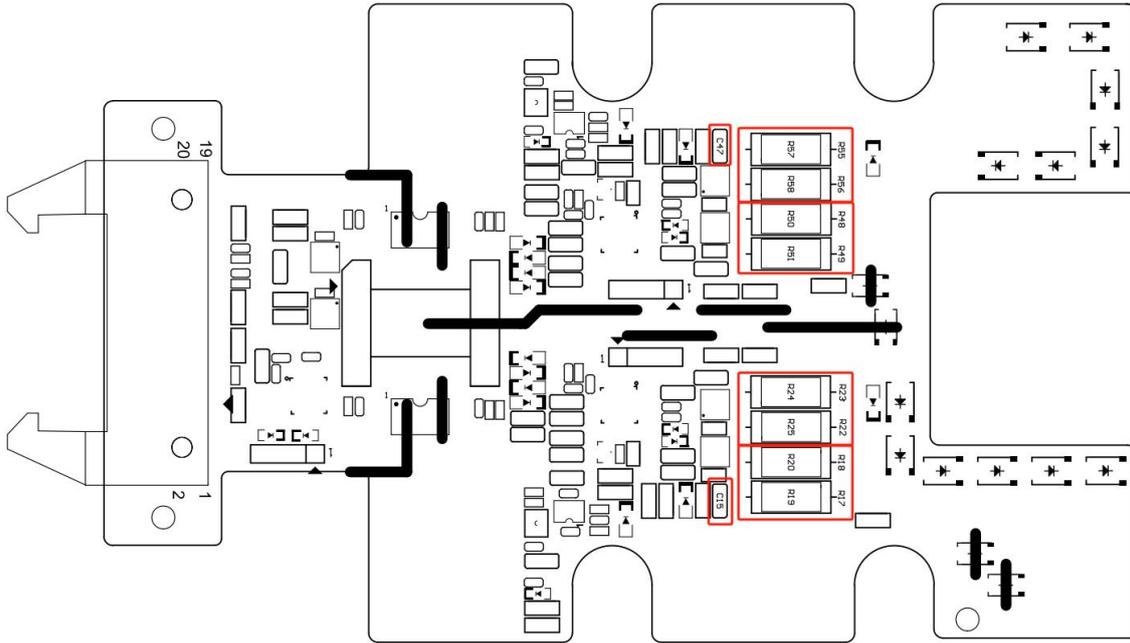


Fig.3 Gate resistor & capacitor indication

Gate resistor & capacitor calculation formula

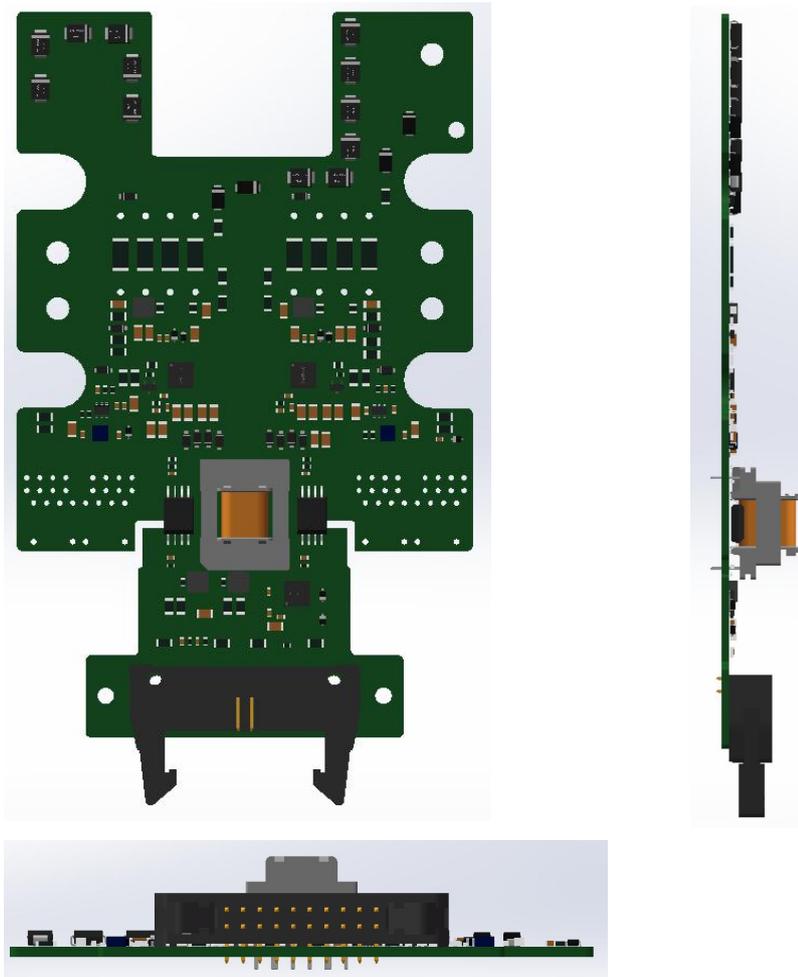
Parameter	R _{GON}	R _{G_{OFF}}	C _{GE}
CH1	R50//R51(SMT) R48//R49(DIP)	R57//R58(SMT) R55//R56(DIP)	C47
CH2	R19//R20(SMT) R17//R18(DIP)	R24//R25(SMT) R22//R23(DIP)	C15

Recommended resistor specifications

Option	Driving power	Manufacturer	Package type	Individual resistor power	Dimension
1	<1W	YAGEO	2512 SMT	1W	Length*Width: 3.2mm × 1.6mm
2	1W<P<3W	Double Circle	DIP	2W	Diameter*Length: 4.5mm × 11mm
3	1W<P<3W	TY-OHM	DIP	2W	Diameter*Length: 4.5mm × 11mm

Note: For product models in the 2FHD0320C series featuring gate resistors, the default factory configuration is through-hole resistors. Unless otherwise specified, resistors are typically supplied by either TY-OHM or Double Circle. Due to factors such as original manufacturer lead times, shipments may contain a mix of both brands (Double Circle resistors are blue, TY-OHM are gray). Actual delivery may vary; please refer to the physical items received.

3D and Mechanical Dimensions



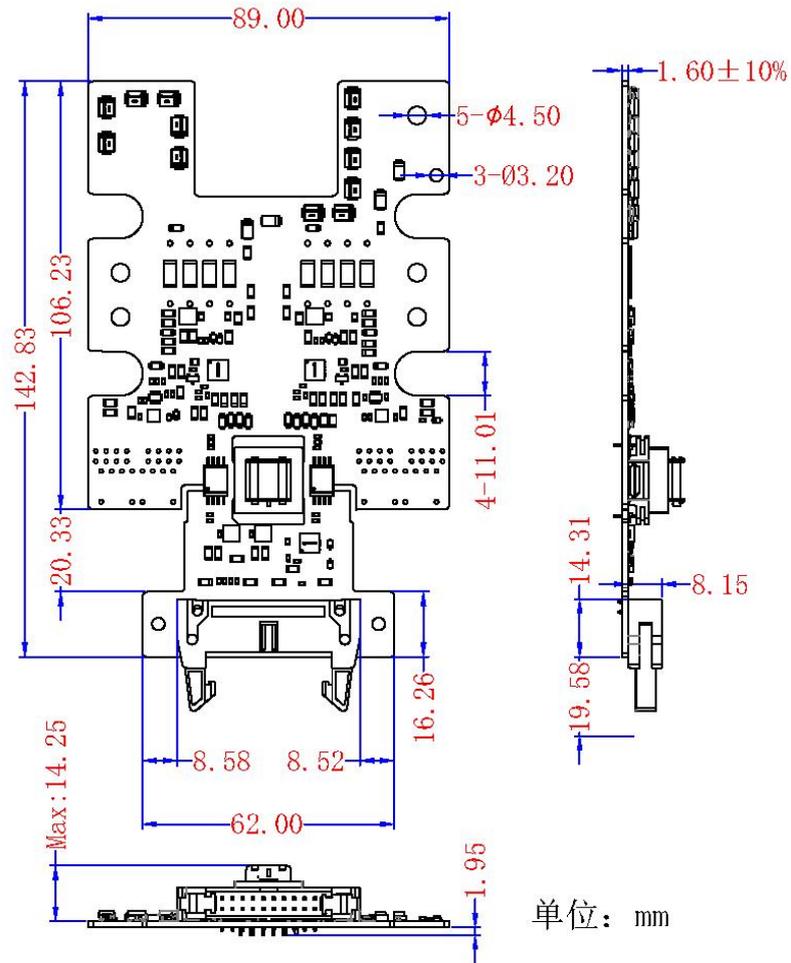


Fig.4 3D and mechanical dimensions (unit: mm)

- Note: 1. The thickness tolerance of the board is $\pm 10\%$;
 2. Other dimensional tolerances refer to GB/T1804-m.

No.	Description	Manufacturer	Part number	Recommended terminal	Harness
P1	20Pin connector	Nextron	Z-230011820209	Z-81020100124000	/

Ordering information

The 2FHD0320C can support PrimePACK™ modules from multiple manufacturers. If the products in the selection list below cannot meet your needs, please contact the Firststack sales department for customization.

Part number	Operating mode	SOx	Function description
2FHD0320C17A1	Direct	OD	1700V with TVS, NC, lead free
2FHD0320C17B1	Direct	15V	1700V with TVS, NC, lead free
2FHD0320C17B1C-Y0100	Direct	15V	1700V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free
2FHD0320C17A1-Y0100	Direct	OD	1700V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free
2FHD0320C17A1C-Y0100	Direct	OD	1700V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free, with coating
2FHD0320C12A1	Direct	OD	1200V with TVS, NC, lead free
2FHD0320C12A1-Y0100	Direct	OD	1200V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free
2FHD0320C12A1C-Y0100	Direct	OD	1200V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free, with coating
2FHD0320C17D1	Half-bridge	OD	1700V with TVS, NC, lead free
2FHD0320C17D1-Y0100	Half-bridge	OD	1700V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free
2FHD0320C17D1C-Y0100	Half-bridge	OD	1700V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free, with coating
2FHD0320C12D1	Half-bridge	OD	1200V with TVS, NC, lead free
2FHD0320C12D1-Y0100	Half-bridge	OD	1200V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free
2FHD0320C12D1C-Y0100	Half-bridge	OD	1200V with TVS, Rgon=2.35, Rgoff=1.8, C _{GE} =NC, lead free, with coating

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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