2FHD0115x Data Sheet

Abstract

The 2FHD0115x is a high-performance, dual-channel, plug-and-play gate driver developed by Firstack based on intelligent chip technology for EconoDual™ packages, and can support up to 1700V IGBT modules.

Plug-and-play, drive IGBT modules safely and reliably without other peripheral circuits.

The 2FHD0115V is equipped with optical interface(plastic fiber-optic)(left side of the picture).

The 2FHD0115S is equipped with optical interface(glass fiber-optic)(right side of the picture).

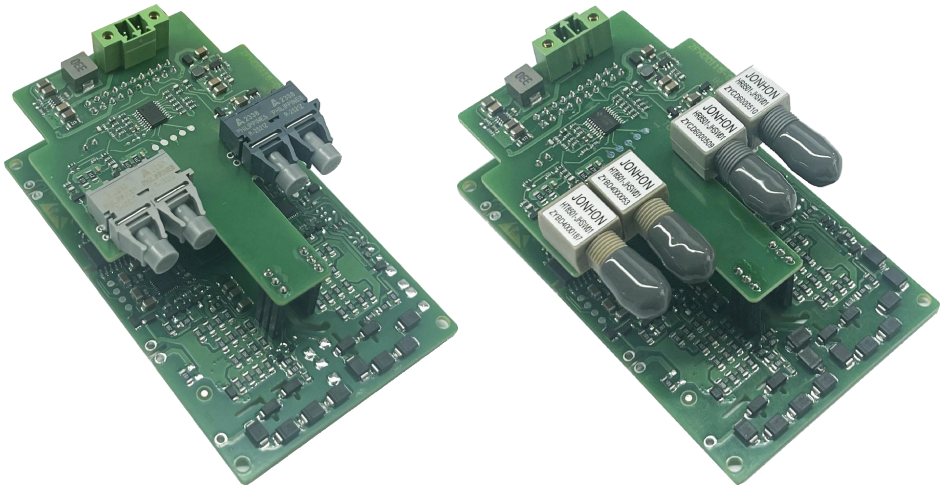

Fig. 1 Product picture

Core advantages:

√1.2W/20A, support up to 50kHz applications

√Support up to 1700V modules

√Short-circuit protection (soft shut down)

√Digital control method

√Support multi-level applications

√Support temperature sampling

Typical applications:

√ APF/SVG

√ ESS

√ Industrial power supply

Functional block diagram

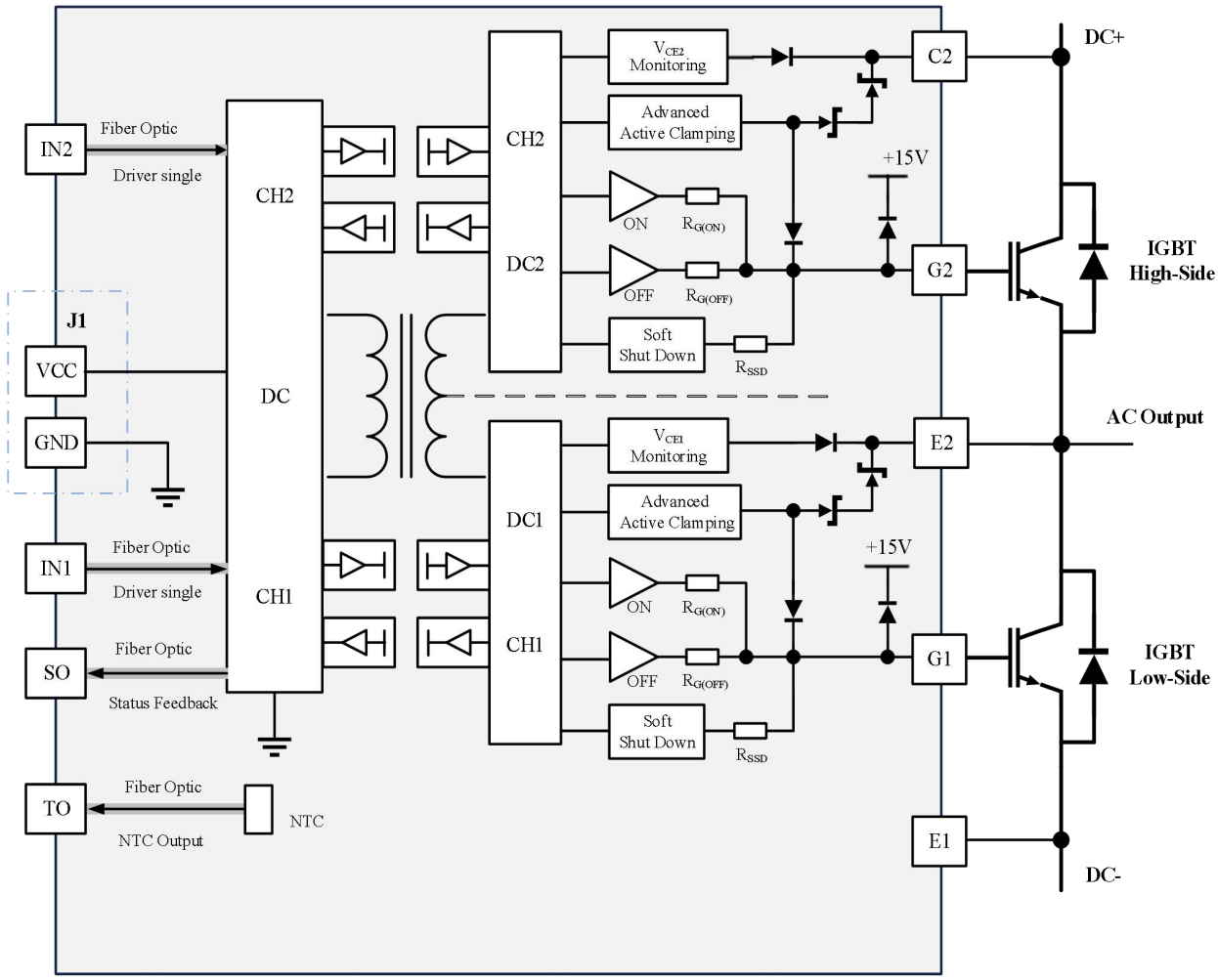

Fig. 2 Functional block diagram

J1 terminal pin definition

Pin	Definition	Function	Pin	Definition	Function
1	V_{DC}	Primary side power supply	2	GND	Primary side reference ground

Technical Parameters

Maximum Permissible Value

Parameters	Description	Min.	Max.	Unit
Power supply V_{DC}	V_{DC} to GND	0	24	V
Logic input and output voltages	@85℃		1.2	W
Gate peak current	@85℃	-20	20	A
Test voltage(50Hz/1min)	Primary to secondary side	5000		V_{RMS}
Operating temperature		-40	85	℃
Storage temperature		-40	90	℃

Recommended Operating Conditions

Parameters	Description	Min.	Typ.	Max.	Unit
Power supply V_{DC}	V_{DC} to GND	22	24	25.5	V
Supply current I_{DC}	Without load		90		mA
Coupling capacitance C_{IO}	Primary to secondary side		20		pF
Primary side undervoltage threshold	Input power supply		12.5		V
Secondary side undervoltage threshold	Positive supply voltage on the secondary side		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	-8.5	-7.5	V

Logic Input & Output Voltages

Parameters	Description	Min.	Typ.	Max.	Unit
Input impedance			10		kΩ
Turn-on threshold	INx		Light		
Turn-off threshold	INx		No light		
Fault output SOx	Protection state		No light		
Temperature output TOx ①	Temperature data output F_{TO}				Hz

Short-circuit Protection

Parameters	Description	Min.	Typ.	Max.	Unit
V_{CE} monitoring threshold	Short-circuit monitoring threshold		11		V
Response time②	CH1		8		us
	CH2		8		us
Soft shut down time	Soft shut down action time		4.16		us

Timing Characteristics

Parameters	Min.	Typ.	Max.	Unit
Turn-on delay③		650		ns
Turn-off delay④		700		ns
Rise time⑤		15		ns
Fall time⑥		15		ns
Fault blocking time		80		ms
Fault return time⑦		10		ms

Electrical Isolation

Parameters	Description	Min.	Typ.	Max.	Unit
Creepage distance®	Primary to secondary side	8			mm
	Secondary to secondary side	6.5			mm
Clearance distance	Primary to secondary side	8			mm
	Secondary to secondary side	5			mm

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

Note:

1. Temperature output: Temperature sampling output of NTC, F_{TO} unit: Hz
   a) $F_{TO}=0.1*F_{CLINK}+0.8*h*F_{CLINK}$
   b) $F_{CLINK}=32768Hz$
   c) $h=R/(R+1.5K\Omega)$
   d) $R=R_{NTC}//10K\Omega$
2. Response time: the time from the occurrence of the fault to the start of soft shut down;
3. 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;
4. 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;
5. Rise time: the amount of time from 10% of the gate turn-off voltage (-8.5V) to 90% of the gate turn-on voltage (+15V);
6. Fall time: the amount of time from 90% of the gate turn-on voltage (+15V) to 10% of the gate turn-off voltage (-8.5V);
7. Fault return time: the time is the fault hold time under SC fault;
8. Creepage distance: refer to IEC61800-5-1-2007, meet the basic isolation requirements for altitudes below 2km and pollution level 2; the value takes the creepage distance of the isolation device.

Gate resistor and capacitor position

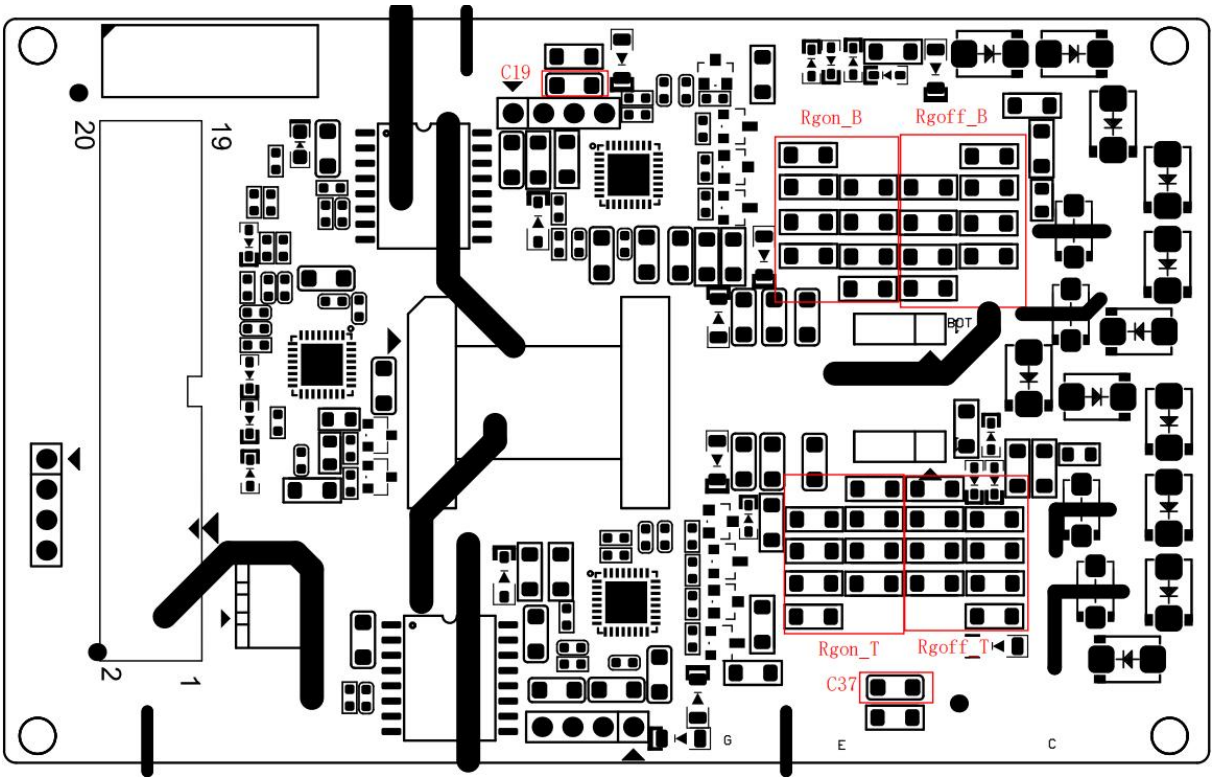

Fig. 3 Gate resistor and capacitor position

Gate Resistor and Capacitor Calculation Formula

Parameter	R_{GON}	R_{GOFF}	C_{GE}
CH1(top IGBT)	Rgon_T	Rgoff_T	C37
CH2(bottom IGBT)	Rgon_B	Rgoff_B	C19

Table of Gate Resistance Values of Commonly Used Modules

IGBT part number	R_{GON} (Ω)	R_{GOFF}(Ω)	C_{GE}(nF)
FF900R12ME7	1.2	1.8	/
FF600R17ME4	1.2	1.8	/
FF600R12ME7	1.2	1.8	/
FF450R12ME7	1.2	1.8	/
FF300R12ME7	1.2	1.8	/
2MBI600XNG170-50	1.2	1.8	/
2MBI600VN-170P-50	1.2	1.8	/

2MBI600VX-120-50	1.2	1.8	/
2MBI450VN-120-50	1.2	1.8	/
2MBI450VN-170-50	3.3	4.3	/
DIM600M1HS17-PA500	1.2	1.8	/
DIM450M1HS17-PA500	3.3	4.3	/
TG600HF17M1-S300	1.2	1.8	/
TG450HF17M1-S3A00	4.3	6.2	/
TG450HF12M1-S300	3.3	4.3	/
SEMiX603GB17E4p	1.2	1.8	/
SEMiX453GB17E4p	3.3	4.3	/

Mechanical dimensions

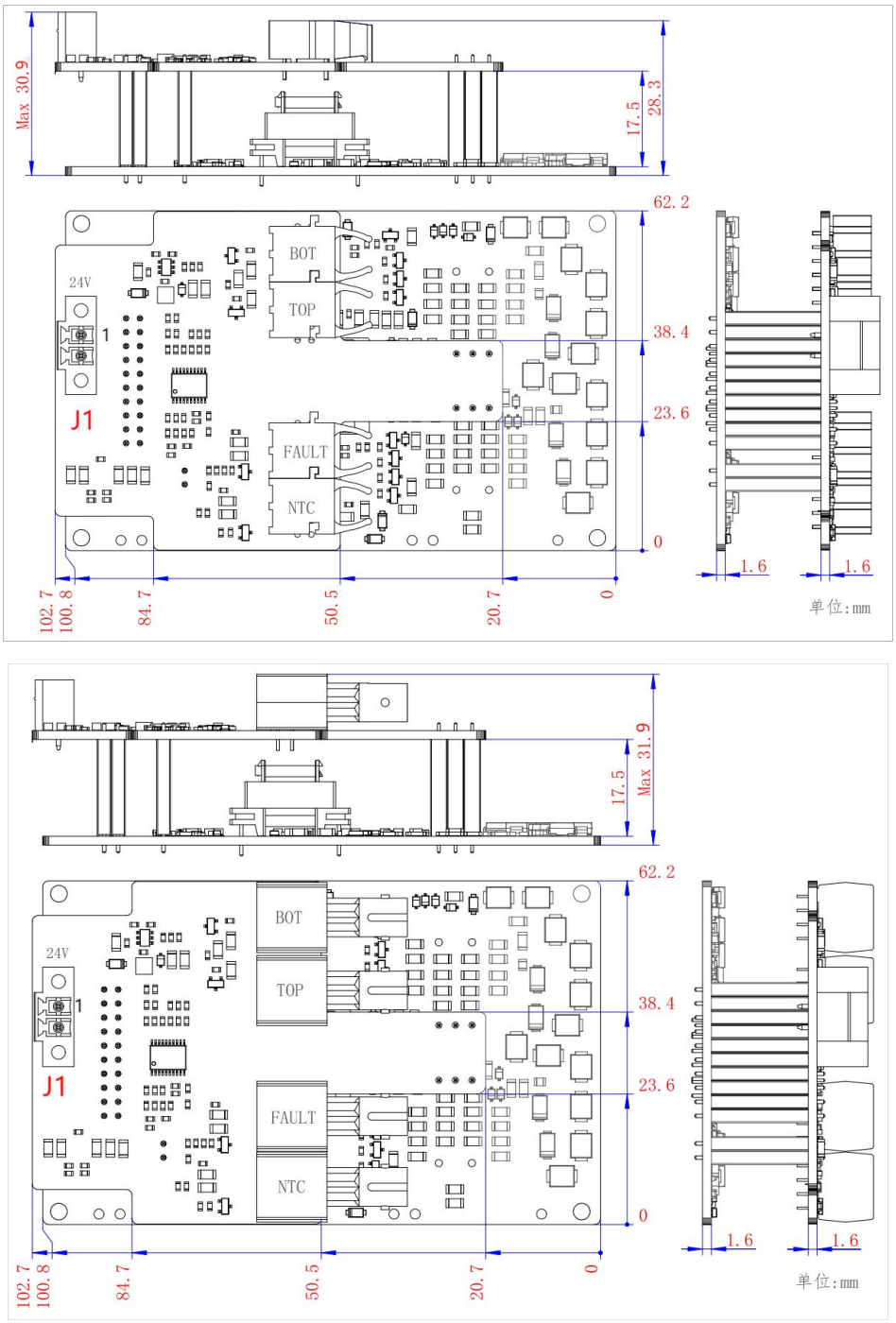

Fig. 4 2FHD0115V(top) and 2FHD0115S(bottom)(unit: mm)

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

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

Ref	Description	Manufacturer	Part number
J1	2Pin terminal	WE	691323300002

Ordering Information

The 2FHC0115x can support different part numbers of EconoDual™ modules from multiple manufacturers. If the products in the selection list below do not meet your needs, please contact the Firstack sales department for customization.

Gate driver part number	R_{GON}	R_{GOFF}	IGBT voltage	Function description
2FHD0115S17A1C-Y0002	20/8	20/8	1700V/600	Glass fiber-optic, no TVS
2FHD0115V17A1C-Y0001	20/8	39/8	1700V/600	Standard plastic fiber-optic, TVS 1300V
2FHD0115V17A1C-Y0003	20/8	130/8(TOP)	1700V/600	Plastic fiber-optic, TVS 1300V Top IGBT turn-off resistance is 130/8, bottom IGBT is 39/8
2FHD0115V17A1C-Y0002	33/8	51/8	1700V/450	Plastic fiber-optic, TVS 1300V
2FHD0115V17A1C-Y0004	20/8	39/8	1700V/600	No fibre-optic, negative pressure only
2FHD0115V17A1C-Y0005	20/8	39/8	1700V/600	Plastic fiber-optic, TVS 1300V, with interlock function
2FHD0115V17A1C-Y0006	20/8	130/8(BOT)	1700V/600	Plastic fiber-optic, TVS 1300V Top IGBT turn-off resistance is 130/8, bottom IGBT is 39/8

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

This manual gives a detailed introduction about the product, but cannot promise to provide specific parameters. No warranty or guarantee, express or implied, is given herein as to the delivery, performance or applicability of the product.

Firstack reserves the right to modify technical data and product specifications at any time without prior notice. Firstack's general payment terms and conditions apply.

Contact Information

Tel: +86-571 8817 2737

Fax: +86-571 8817 3973

Postcode: 310011

Website: www.firstack.com

Email: fsales@firstack.com

Address: 4-5/F, Building/5, Xizi Wisdom Park, No.1279 Tongxie Road, Hangzhou, China