

Gate Driver Unit 2LG02xCxC11M

■ Overview

2LG02xCxC11M is a dual channel gate driver designed for Mitsubishi Electric's IGBT power module CM1200DW-24T .

This gate driver unit contains a built-in isolated DC/DC converter and gate drive circuit. It is ready to use by mounting it on the IGBT power module.

■ Features

- Ideal for drive of IGBT Power module CM1200DW-24T(Mitsubishi Electric)
- Gate voltage : +15V/-10V
- Gate resistor : +1.2Ω/-4.7Ω(TYP)
- Short circuit detection voltage : 9.5V(TYP)
- ALL-IN-ONE (Built-in isolated DC / DC converter and gate drive circuit)
- Low parasitic capacitance (18pF(TYP)) ; highly resistant to common-mode noise.
- Fast response : about 140ns(TYP)
- The isolation for primary-secondary signal used fast response isolator.
- Dielectric withstand voltage : AC5000V
- Insulation distance (clearance / creepage) : 14mm/16mm (As for Gate driver module PCB)
- DC/DC converter input voltage : 13~28V
- Power supply for gate driver input voltage : 13~28V
- Signal input voltage : 3.3~15V or 15V
- The DC / DC converter has built-in overheat protection and overload protection.
- Desaturation protection (Gate drive circuit)
- Soft turn-off function (Gate drive circuit)
- Fault signal output function (Gate drive circuit)
- Under-voltage lockout(UVLO) (Gate drive circuit)
- Direct mode / Half bridge mode can be switched. (Gate drive circuit)
- Parallel drive possible by connected a slave unit
- Thermistor isolated amplifier output function (Option)
- Safety standards : UL508(file no.E243511) (DC/DC converter only)
- Reinforced isolation according to IEC 60664-1 (IEC61800-5-1, IEC62477-1, IEC62109-1, etc.)
- UL compliant (UL1741, UL508, etc.)
- Insulating moistureproof coating

■ Application

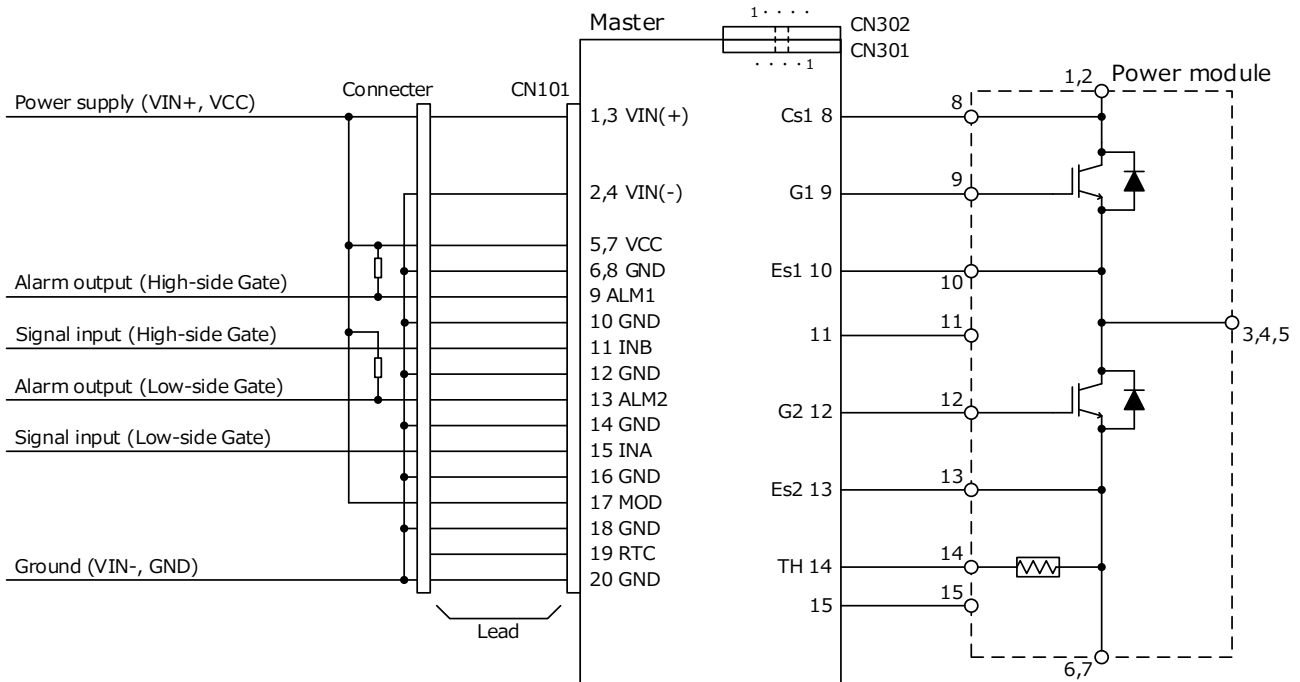
Industrial inverter, power conditioner, etc. ...

■ Module Information

Part number	Part number (Uncoated)	Signal input voltage	Active clamp	TH Isolated amplifier	Status
2LG02ACCC11M	2LG02ACCN11M	3.3~15V	None	Yes	Planning
2LG020CCC11M	2LG020CCN11M	3.3~15V	None	None	Planning
2LG02ACDC11M	2LG02ACDN11M	15V	None	Yes	Active
2LG020CDC11M	2LG020CDN11M	15V	None	None	Planning

*Uncoated type is sample only

*Refer to the [2LG02xCZC11S] data sheet for slave units.

■ Circuit Image (No thermistor isolated amplifier output function)

■ Pin Connection (No thermistor isolated amplifier output function)

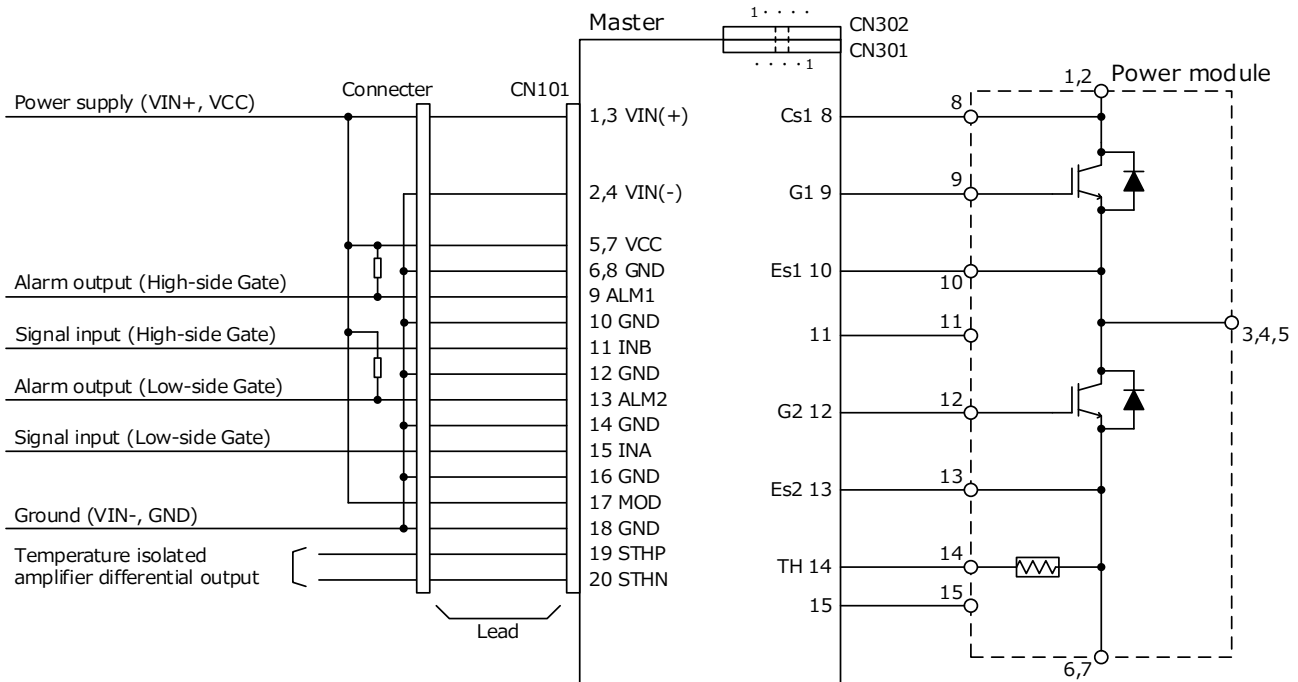
CN101 : RA-H201TD (JST)

Pin No.	Name	Function	Pin No.	Name	Function
1	VIN(+)	Power supply for DC/DC converter(+)	2	VIN(-)	Power supply for DC/DC converter(-)
3	VIN(+)	Power supply for DC/DC converter(+)	4	VIN(-)	Power supply for DC/DC converter(-)
5	VCC	Power supply for signal control circuit	6	GND	Ground for drive circuit
7	VCC	Power supply for signal control circuit	8	GND	Ground for drive circuit
9	ALM1	Alarm signal output 1 (High side)	10	GND	Ground for drive circuit
11	INB	Control input B (High side)	12	GND	Ground for drive circuit
13	ALM2	Alarm signal output 2 (Low side)	14	GND	Ground for drive circuit
15	INA	Control input A (Low side)	16	GND	Ground for drive circuit
17	MOD	Mode select	18	GND	Ground for drive circuit
19	RTC	Restart time of protection circuit control	20	GND	Ground for drive circuit

※Reference receptacle : RA-S201T (JST)

Connection on the power module

No.	Name	CH	Function	No.	Name	CH	Function
8	Cs1	1(H)	Collector connection, High side	12	G2	2(L)	Gate connection, Low side
9	G1	1(H)	Gate connection, High side	13	Es2	2(L)	Emitter connection, Low side
10	Es1	1(H)	Emitter connection, High side	14	TH	2(L)	Thermistor connection, Low side
11	None	-	Electrical connection is not allowed	15	None	-	Electrical connection is not allowed

■ Circuit Image (With thermistor isolated amplifier output function)

■ Pin Connection (With thermistor isolated amplifier output function)

CN101 : RA-H201TD (JST)

Pin No.	Name	Function	Pin No.	Name	Function
1	VIN(+)	Power supply for DC/DC converter(+)	2	VIN(-)	Power supply for DC/DC converter(-)
3	VIN(+)	Power supply for DC/DC converter(+)	4	VIN(-)	Power supply for DC/DC converter(-)
5	VCC	Power supply for signal control circuit	6	GND	Ground for drive circuit
7	VCC	Power supply for signal control circuit	8	GND	Ground for drive circuit
9	ALM1	Alarm signal output 1 (High side)	10	GND	Ground for drive circuit
11	INB	Control input B (High side)	12	GND	Ground for drive circuit
13	ALM2	Alarm signal output 2 (Low side)	14	GND	Ground for drive circuit
15	INA	Control input A (Low side)	16	GND	Ground for drive circuit
17	MOD	Mode select	18	GND	Ground for drive circuit
19	STHP	Noninverting analog output of the isolated amplifier	20	STHN	Inverting analog output of the isolated amplifier

※Reference receptacle : RA-S201T (JST)

Connection on the power module

No.	Name	CH	Function	No.	Name	CH	Function
8	Cs1	1(H)	Collector connection, High side	12	G2	2(L)	Gate connection, Low side
9	G1	1(H)	Gate connection, High side	13	Es2	2(L)	Emitter connection, Low side
10	Es1	1(H)	Emitter connection, High side	14	TH	2(L)	Thermistor connection, Low side
11	None	-	Electrical connection is not allowed	15	None	-	Electrical connection is not allowed

■ Pin Connection for Parallel

CN301 : B10(14-6.7.8.9)B-PASK(LF)(SN) (JST)

Pin No.	Name	CH	Function
1	CC1A1	1	Connect the communication line for parallel drive 2LG02xxZx11S series
2	CC1A2	1	
3	CC1A3	1	
4	CC1A4	1	
5	CC1A5	1	
6	None	-	Pin removal for insulation distance between CH1 and CH2
7	None	-	
8	None	-	
9	None	-	
10	CC2A5	2	Connect the communication line for parallel drive 2LG02xxZx11S series
11	CC2A4	2	
12	CC2A3	2	
13	CC2A2	2	
14	CC2A1	2	

※Recommend receptacle : PAP-14V-S (JST)

CN302 : B10(14-6.7.8.9)B-PASK(LF)(SN) (JST)

Pin No.	Name	CH	Function
1	CC2B1	2	Connect the communication line for parallel drive 2LG02xxZx11S series
2	CC2B2	2	
3	CC2B3	2	
4	CC2B4	2	
5	CC2B5	2	
6	None	-	Pin removal for insulation distance between CH1 and CH2
7	None	-	
8	None	-	
9	None	-	
10	CC1B5	1	Connect the communication line for parallel drive 2LG02xxZx11S series
11	CC1B4	1	
12	CC1B3	1	
13	CC1B2	1	
14	CC1B1	1	

※Recommend receptacle : PAP-14V-S (JST)

■ I/O Condition Table

No.	Status	Input						Output				Note
		OUT(H)	Cs1(H)	Es1(L)	MOD	INB	INA	ALM1	ALM2	G1(H)	G2(L)	
1	V _{OUT} UVLO	UVLO	X	X	X	X	X	L	L	L	L	Output state in UVLO (V _{out} < UVLO _{th})
2	G-E short	○	X	X	X	X	X	L	L	SD	SD	Output state in Gate-Emitter short
3	Normal operation	○	-	L	H	-	L	-	Hi-Z	-	L	Low side I/O state in direct mode (MOD pin H)
4		○	-	L	H	-	H	-	Hi-Z	-	H	
5		○	L	-	H	L	-	Hi-Z	-	L	-	High side I/O state in direct mode (MOD pin H)
6		○	L	-	H	H	-	Hi-Z	-	H	-	
7		○	L	L	L	L	X	Hi-Z	Hi-Z	L	L	I/O state in half-bridge mode (MOD pin L)
8		○	L	L	L	H	L	Hi-Z	Hi-Z	H	L	
9		○	L	L	L	H	H	Hi-Z	Hi-Z	L	H	
10	Short circuit detection (L)	○	-	Hi-Z	H	-	L	-	Hi-Z	-	L	I/O state during low side DESAT protection in direct mode
11		○	-	Hi-Z	H	-	H	-	L	-	L	
12	detection (L)	○	-	Hi-Z	L	H	L	-	Hi-Z	-	L	I/O state during low side DESAT protection in half-bridge mode
13		○	-	Hi-Z	L	H	H	-	L	-	L	
14	Short circuit detection (H)	○	Hi-Z	-	H	L	-	Hi-Z	-	L	-	I/O state during high side DESAT protection in direct mode
15		○	Hi-Z	-	H	H	-	L	-	L	-	
16		○	Hi-Z	-	L	H	H	Hi-Z	-	L	-	I/O state during high side DESAT protection in half-bridge mode
17		○	Hi-Z	-	L	H	L	L	-	L	-	

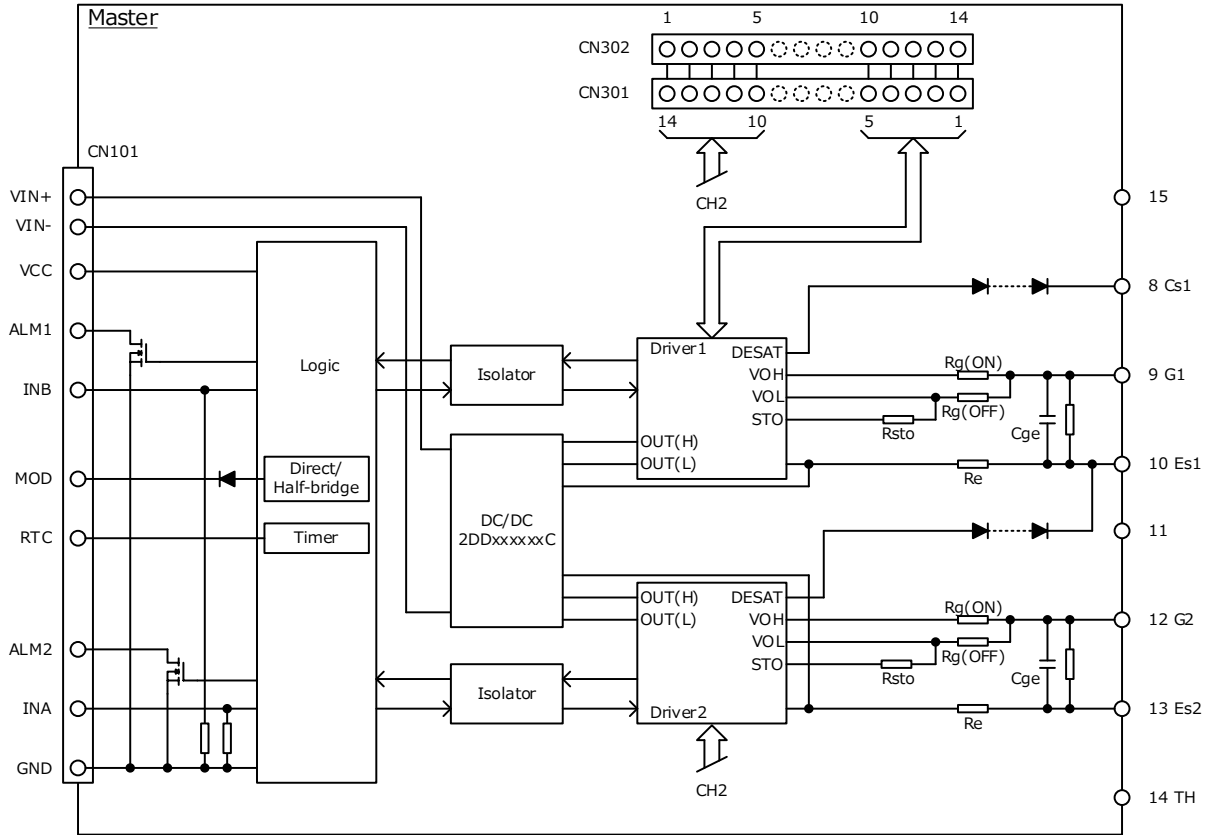
○ : OUT(H) > UVLO,

X : Don't care

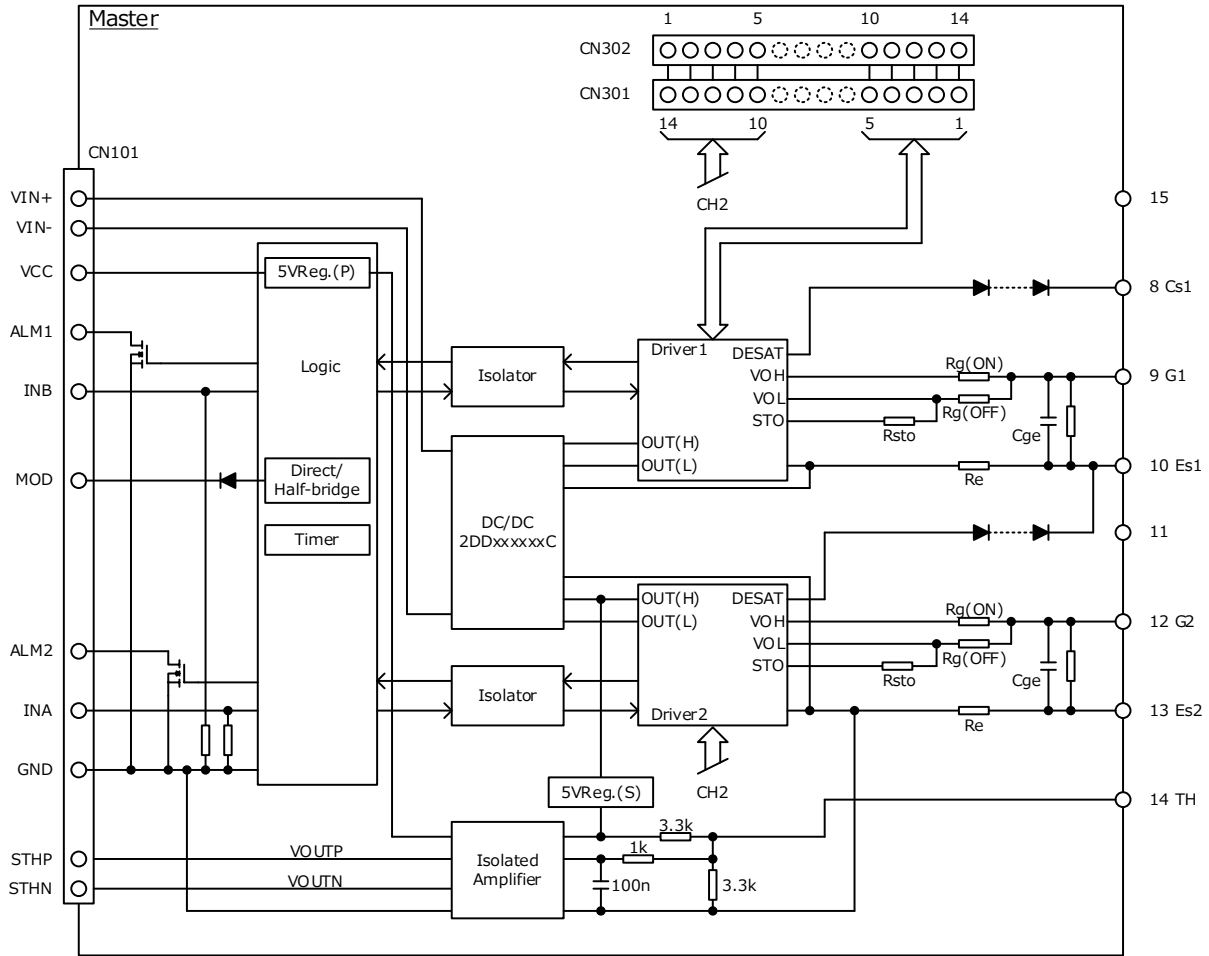
SD : Shut down (Gate-Emitter short)

- : Specified in other items

Internal Block Diagram (No thermistor isolated amplifier output function)



Internal Block Diagram (With thermistor isolated amplifier output function)



■ Absolute Maximum Ratings

Item	Symbol	Min	Max	Unit	Conditions · Note	
Input voltage for DC/DC converter	V_{IN}	-0.3	28	Vdc	Between VIN(+) to VIN(-)	
Input voltage for Gate driver	V_{CC}	-0.3	28	Vdc	Between VCC to GND	
Input-side signal voltage	V_{SG}	-0.3	$V_{CC}+0.3$ or 18 *	V	INA, INB *Whichever is less	
	V_{MOD}	-0.3	28	V	MOD	
	V_{RTC}	-0.3	5	V	RTC	
Maximum gate current	I_{GPEAK}	-	43	A	Excluding gate resistor	
Switching frequency	F_{SW}	-	12	kHz	See the permissible frequency curve	
Short circuit detection pin voltage	V_{SD}	0	1200	V		
Alarm signal output pin maximum voltage	V_{ALM}	-	$V_{CC}+0.3$ or 28 *	V	ALM1,2 *Whichever is less	
Input-side signal maximum current	I_{ALM}	-	5	mA	ALM1,2	
Operating temperature range	$V_{IN}=13.5-18V$	T_{OP}	-40	85	°C	See the permissible frequency curve
	$V_{IN}=18-26.4V$	T_{OP}	-40	75	°C	
Operating humidity	RH_{OP}	20	95	%RH	No condensation	
Storage temperature range	T_{STG}	-40	90	°C		
Storage humidity	RH_{STG}	5	95	%RH	No condensation	
With thermistor isolated amplifier output function						
Output voltage of isolated amplifier	V_{STHO}	-0.3	5.3	V	STHP, STHN	

Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions · Note	
Input voltage range for DC/DC converter	V_{IN}	13.5	26.4	Vdc		
Input voltage range for gate driver	V_{CC}	13.5	26.4	Vdc		
Driver circuit number	N	-	2	-		
Maximum gate charge	Q_G	-	14000	nC	*1	
Switching frequency	Device n : 1	F_{SW}	-	3	kHz	Test load : 0.33Ω/560nF *2
	Device n : 2	F_{SW}	-	2.8	kHz	
MOD pin high input voltage	V_{MODH}	3.3	26.4	V		
MOD pin low input voltage	V_{MODL}	-0.3	0.5	V		
2LGxxxxDx11M						
Logic high level input voltage	V_{SGH}	13	$V_{CC}+0.3$ or 16 *	V	INA, INB *Whichever is less	
Logic low level input voltage	V_{SGL}	-0.3	0.5	V	INA, INB	
Source current of control signal	I_{SG}	3.3	-	mA	INA, INB $V_{SG}=15V$	
2LGxxxxCx11M						
Logic high level input voltage	V_{SGH}	3.3	$V_{CC}+0.3$ or 16 *	V	INA, INB *Whichever is less	
Logic low level input voltage	V_{SGL}	-0.3	0.5	V	INA, INB	
Source current of control signal	I_{SG}	3.2	-	mA	INA, INB $V_{SG}=15V$	

*1 If the gate charge exceeds the allowable value, the gate voltage at turn-on and turn-off will drop, which may affect the switching performance of the Device.

If you are considering using it under conditions other than the recommended conditions, please contact us.

*2 Use below the recommended Conditions.

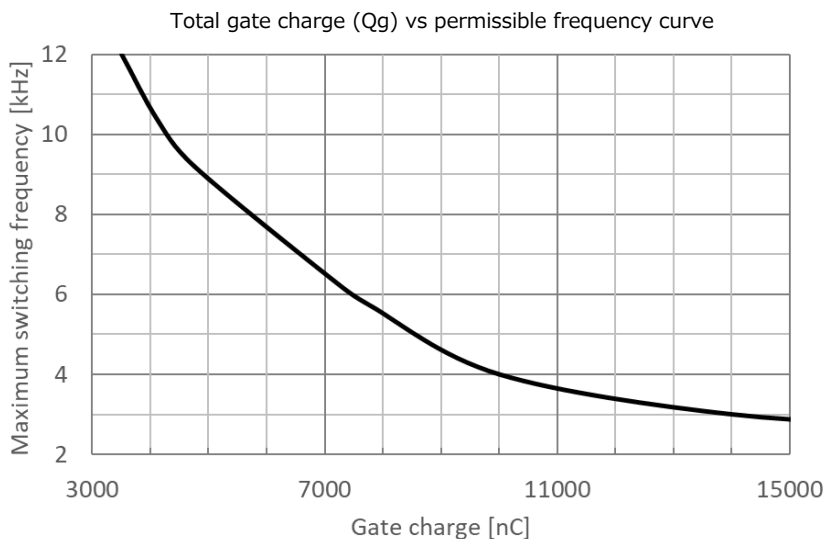
If you are considering using it under conditions other than the recommended conditions, please contact us.

Permissible frequency curve

Internal gate resistor of device = 0.33Ω

*The permissible frequency curve changes with the ratio of the device internal gate resistance to the gate resistance.

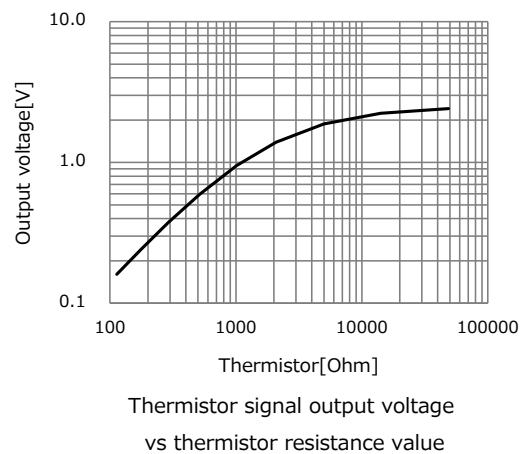
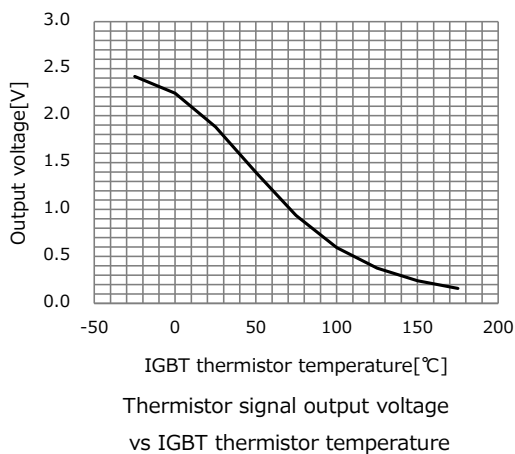
Therefore, as the internal resistance of the IGBT decreases, the allowable frequency also decreases.



Rg: +1.2ohm/-4.7ohm

■ Electrical Specification (Vin=Vcc=15V, Ta=25°C, Unless otherwise specified)

Item	Symbol	Min	Typ	Max	Unit	Conditions · Note	
DC/DC converter							
Start-up voltage	V _{START}	-	11.5	12.5	V		
Input current	Device n : 1	I _{IN}	-	0.3	-	A	Fsw=3.0kHz, Test load : 0.33Ω/560nF
	Device n : 6		-	0.75	-		Fsw=1.6kHz, Test load : 0.33Ω/560nF
Standby power	Device n : 1	P _{STBY}	-	1.6	-	W	No load
	Device n : 6		-	2.8	-		No load
Logic inputs for 2LGxxxxDx11M							
Turn-on threshold	V _{SGH}	-	10	11.7	V	INA, INB / Guaranteed by design	
Turn-off threshold	V _{SGL}	3.9	5	-	V	INA, INB / Guaranteed by design	
Logic pull-down resistance	R _{SGD}	-	4500	-	Ω	INA, INB	
Logic inputs for 2LGxxxxCx11M							
Turn-on threshold	V _{SGH}	-	2	2.3	V	INA, INB / Guaranteed by design	
Turn-off threshold	V _{SGL}	0.8	1	-	V	INA, INB / Guaranteed by design	
Logic pull-down resistance	R _{SGD}	-	4700	-	Ω	INA, INB	
Gate driver output							
Output pin voltage(High)	V _{OUTH}	14	15	16	V	No load	
Output pin voltage(Low)	V _{OUTL}	-11	-10	-9	V	No load	
Gate resistor	Rg(ON)	-	1.2	-	Ω		
	Rg(OFF)	-	4.7	-			
Auxiliary gate capacitor	Cge	-	10	-	nF		
Emitter resistor	Re	-	0.1	-	Ω		
Delay time	Turn ON time	t _{PON}	-	140	-	ns	
	Turn OFF time	t _{POFF}	-	140	-	ns	
Dead time	t _{DEAD}	-	3	-	us	Half bridge mode	
2LG01Axxx11M (With thermistor isolated amplifier output function)							
Thermistor signal output voltage	TH = 5000Ω	V _{STHP-N}	-	1.88	-	V	STHP-STHN
	TH = 300Ω		-	0.39	-	V	

■ Thermistor Signal Output Voltage Curve (With thermistor isolated amplifier output function)


■ Protection

Item	Symbol	Min	Typ	Max	Unit	Conditions · Note
DC/DC converter						
Overload protection	-	10.5	-	-	W	Auto recovery
Overheat protection	-	120	-	150	°C	Auto recovery, Internal temperature
Gate driver						
Output voltage(H) UVLO OFF voltage	V_{UVLOOH}	13.2	13.5	13.8	V	Guaranteed by design
Output voltage(H) UVLO ON voltage	V_{UVLOOH}	12.2	12.5	12.8	V	Guaranteed by design
Short circuit detection voltage	V_{SD}	-	9.5	-	V	
Short circuit detection filter time	$t_{SHORTFIL}$	-	6.6	-	us	Collector open
Alarm signal output L voltage	V_{ALML}	-	-	0.5	V	$I_{ALM}=5mA$
Alarm signal output time	t_{ALM}	-	0.2	-	us	
Restart time	$t_{RESTART}$	-	110	-	ms	
Soft turn-off resistance	R_{STO}	-	7.5	-	Ω	
Soft turn-off duration	t_{STO}	-	6	-	us	

■ Insulation

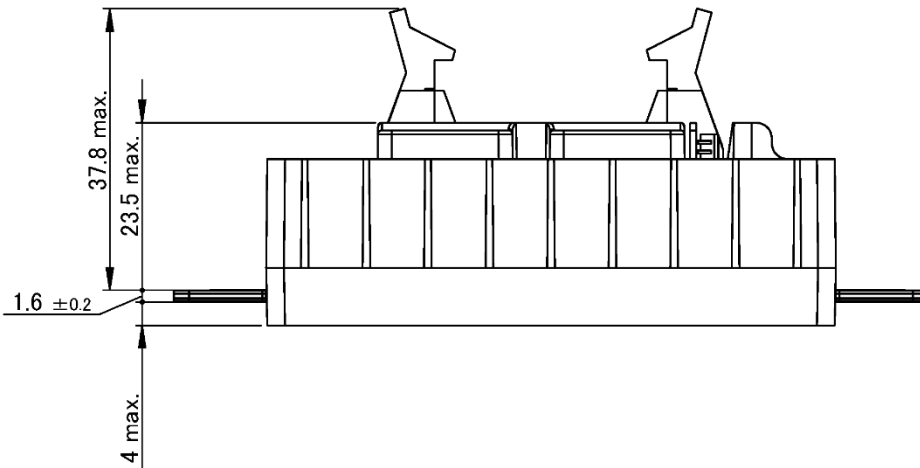
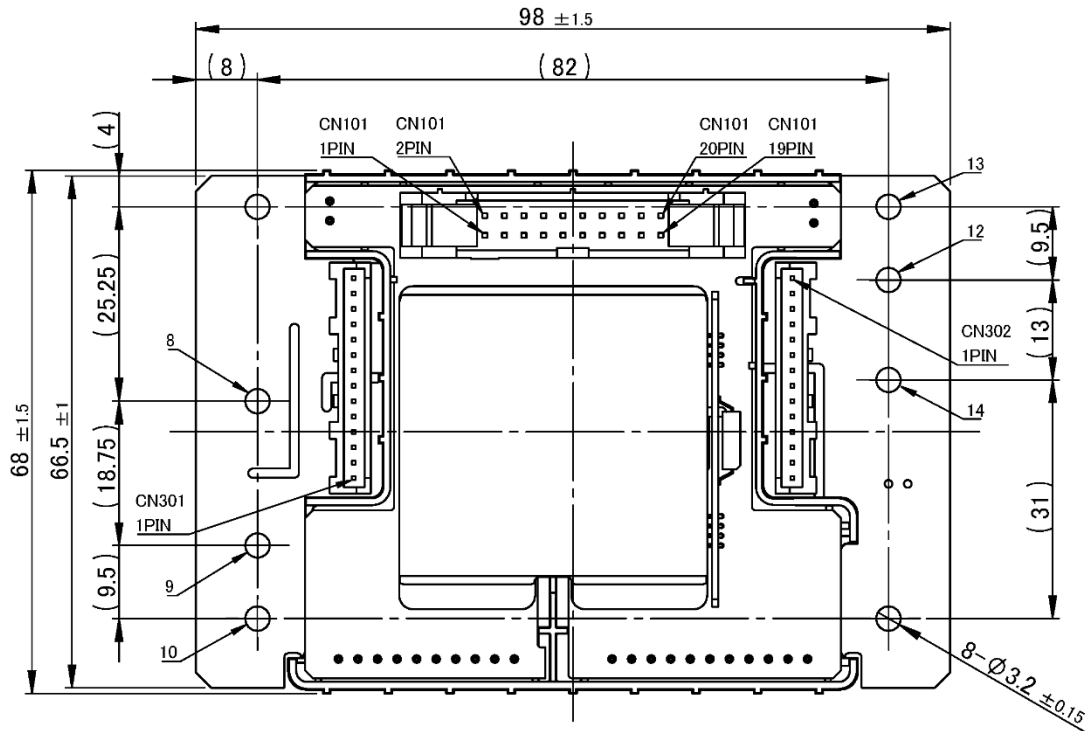
Item	Specification	Conditions · Note
Between Input-Output		
Dielectric withstand voltage	AC5000V	1min, Cutoff 2mA
Insulation resistance	100M Ω or more	DC500V
Partial discharge extinction voltage	1875Vpeak or more	According to EN50178/IEC 60270
Common-mode transient immunity (CMTI)	70kV/us	
Minimum clearance distances	14mm	As for Gate driver PCB
Minimum creepage distances	16mm	
Between CH1-CH2		
Minimum clearance distances	8mm	Excluding electrical connections point
Minimum creepage distances	8mm	
Between Input-Thermistor (With thermistor isolated amplifier output function)		
Minimum clearance distances	8.5mm	
Minimum creepage distances	8.5mm	

■ Storage Conditions

Item	Min	Max	Unit	Conditions · Note
Storage temperature	-25	60	°C	A packing state

With Thermistor insulation circuit

■ Outline Dimensional Drawing



Unit: mm

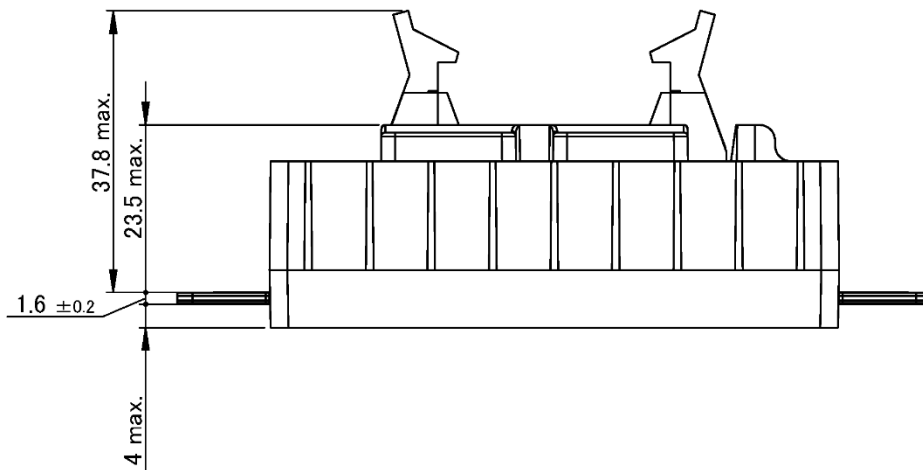
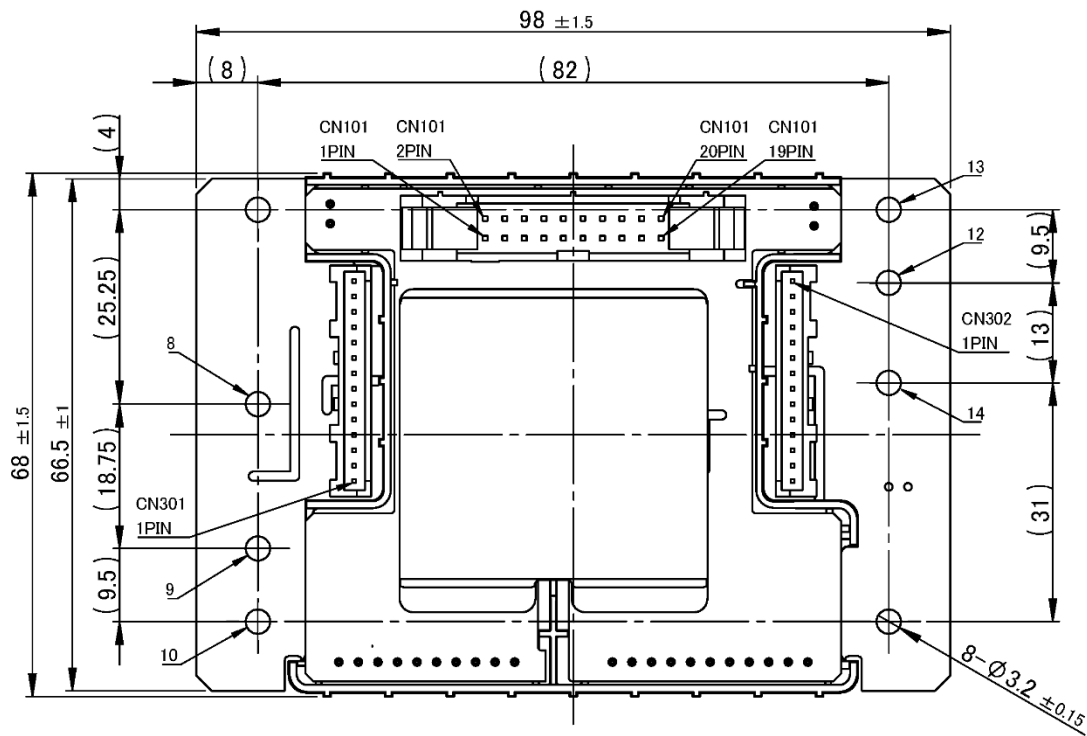
Note: 1. The dimensional tolerance without directions is $\pm 0.5\text{mm}$.

■ Product Weight

96.0g(typ)

■ Outline Dimensional Drawing

Without Thermistor insulation circuit



Unit: mm

Note: 1. The dimensional tolerance without directions is ± 0.5 mm.

■ Product Weight

96.0g(typ)

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 - Use that involves exposure to direct sunlight, outdoor exposure, or dusty conditions.
 - Use in locations where corrosive gases such as salt air, C12, H2S, NH3, SO2, or NO2, are present.
 - Use in environments with strong static electricity or electromagnetic radiation.
 - Use that involves placing inflammable material next to the product.
 - Use of this product either sealed with a resin filling or coated with resin.
 - Use of water or a water soluble detergent for flux cleaning.
 - Use in locations where condensation is liable to occur.
- This product is not designed to resist radiation.
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