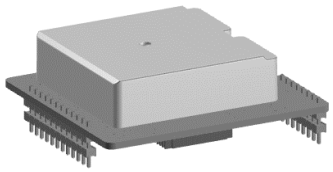
Gate Driver 2DMB80206CC

■Overview

Gate driver 2DMBxxxxxCC is a dual channel gate driver designed for IGBT and SiC MOSFET. The high breakdown voltage and low parasitic capacitance make it suitable for gate drives such as SiC MOSFET and IGBT.



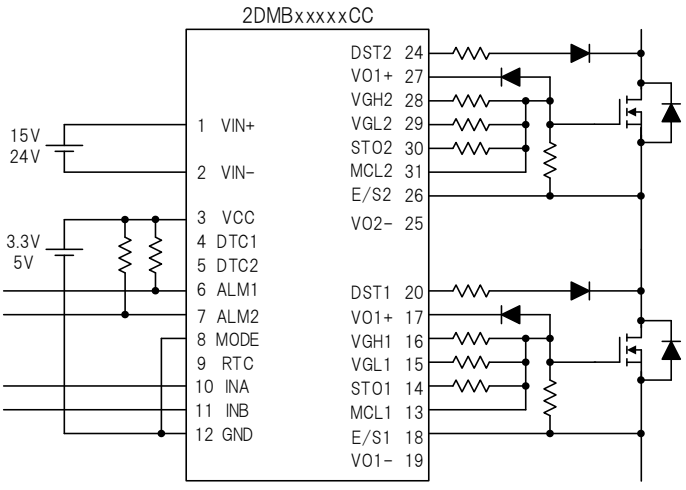
■Features

- ·Ideal for drive of IGBT and SiC MOSFET
- ·Gate voltage : +18V/-2V
- ·ALL-IN-ONE (Built-in isolated DC / DC converter and gate drive circuit)
- ·Low parasitic capacitance (about 12pF) ; highly resistant to common-mode noise.
- ·Fast response : about 100nsec(typ)
- ·The gate drive circuit used a isolator.
- ·Input-to-Output dielectric withstand voltage : AC5000V
- ·Output CH1-to-Ouput CH2 dielectric withstand voltage : AC4000V
- ·Input-to-Output insulation distance : 14mm (clearance·creepage)
- ·Output CH1-to-Output CH2 insulation distance : 7mm (clearance), 12mm(creepage)
- ·DC/DC converter input voltage :13～28V
- ·Signal input voltage : 3.3V,5V
- ·Overload protection (DC/DC converter)
- ·Overheat protection (DC/DC converter)
- ·Half bridge mode (Gate drive circuit)
- ·Desaturation protection (Gate drive circuit)
- ·Soft turn-off function (Gate drive circuit)
- ·Fault signal output function (Gate drive circuit)
- ·Miller clamp function (Gate drive circuit)
- ·Under-voltage lockout(UVLO) (Gate drive circuit)
- ·Safety satndards : UL508 (certification pending)

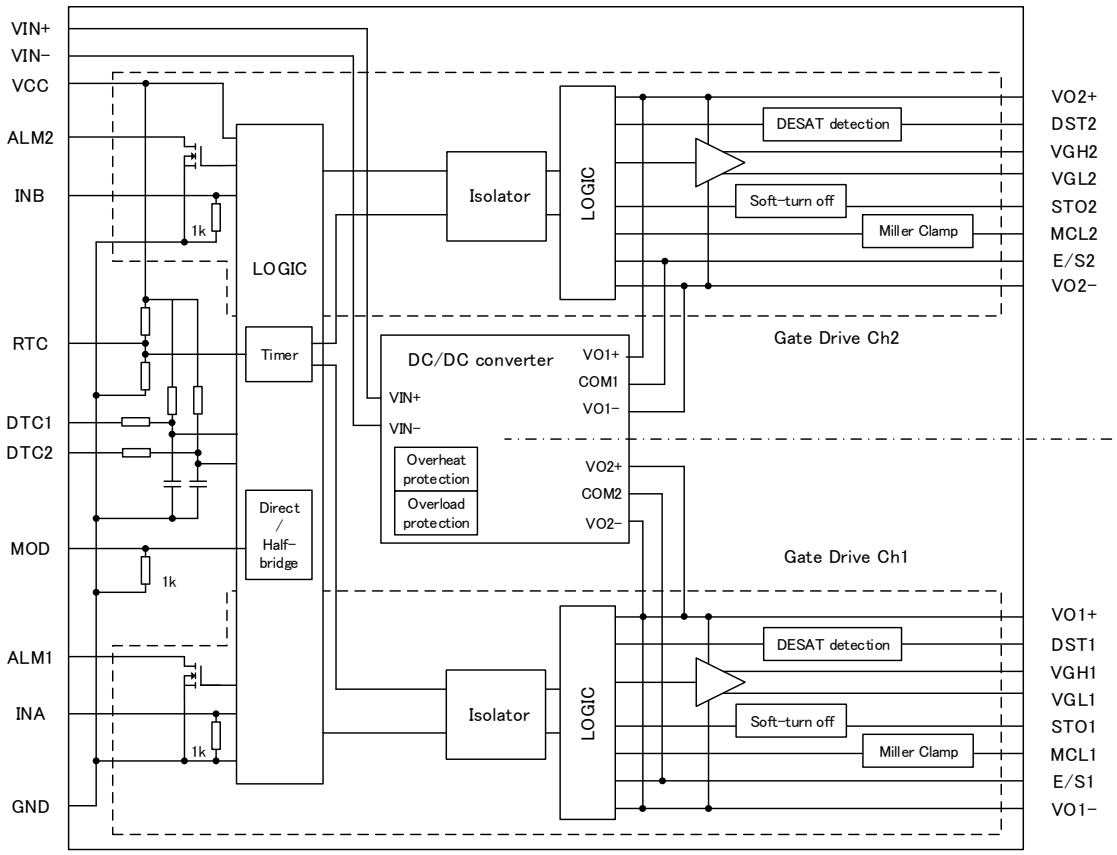
■Application

Industrial inverter, power conditioner, etc …

■Ciruit Image



■Internal Block Diagram



■Pin Connection

Input

Pin No.	Name	Function	
1	VIN+	Common	Power supply for DC/DC converter(+)
2	VIN−	Common	Power supply for DC/DC converter(−)
3	VCC	−	Power supply for drive circuit
4	DTC1	1	Dead time adjustment
5	DTC2	2	Dead time adjustment
6	ALM1	1	Alarm signal output
7	ALM2	2	Alarm signal output
8	MOD	−	Mode select
9	RTC	−	Recovery time of protection circuit cont
10	INA	1	Control input A
11	INB	2	Control input B
12	GND	−	Ground for drive circuit

Output

Pin No.	Name	CH	Function
13	MCL1	1	Miller clamp pin
14	STO1	1	Soft turn off pin
15	VGL1	1	Gate OFF side pin
16	VGH1	1	Gate ON side pin
17	VO1+	1	DC/DC converter output pin
18	E/S1	1	Emitter･source connection pin
19	VO1−	1	DC/DC converter output pin
20	DST1	1	Desaturation protection pin
21	NONE	−	None
22	NONE	−	None
23	NONE	−	None
24	DST2	2	Desaturation protection pin
25	VO2−	2	DC/DC converter output pin
26	E/S2	2	Emitter･source connection pin
27	VO1+	2	DC/DC converter output pin
28	VGH2	2	Gate ON side pin
29	VGL2	2	Gate OFF side pin
30	STO2	2	Soft turn off pin
31	MCL2	2	Miller clamp pin

■I/O Condition Table

No.	Status	Input						Output(CH1)					Output(CH2)				
		VO+	DST1	DST2	MOD	INA	INB	ALM1	VGH1	VGL1	STO1	MLC1	ALM2	VGH2	VGL2	STO2	MLC2
3	VO1+,VO2+ UVLO	UVLO	X	X	X	X	X	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z
4		UVLO	X	Hi-Z	X	X	X	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	L	Hi-Z	Hi-Z	Hi-Z	Hi-Z
5		UVLO	Hi-Z	X	X	X	X	L	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z
6	Normal operation	○	X	L	L	X	L	X	X	X	X	X	Hi-Z	Hi-Z	L	L	L
7		○	X	L	L	X	H	X	X	X	X	X	Hi-Z	H	Hi-Z	Hi-Z	Hi-Z
8		○	L	X	L	L	X	Hi-Z	Hi-Z	L	L	L	X	X	X	X	X
9		○	L	X	L	H	X	Hi-Z	H	Hi-Z	Hi-Z	Hi-Z	X	X	X	X	X
10	Normal operation (HBM)	○	L	L	H	X	L	Hi-Z	Hi-Z	L	L	L	Hi-Z	Hi-Z	L	L	L
11		○	L	L	H	L	H	Hi-Z	Hi-Z	L	L	L	Hi-Z	H	Hi-Z	Hi-Z	Hi-Z
12		○	L	L	H	H	H	Hi-Z	H	Hi-Z	Hi-Z	Hi-Z	Hi-Z	Hi-Z	L	L	L
13	Desaturation protection 1	○	X	Hi-Z	L	X	X	X	X	X	X	X	L	Hi-Z	Hi-Z	L	L
14		○	L	Hi-Z	H	X	L	Hi-Z	Hi-Z	L	L	L	L	Hi-Z	Hi-Z	L	L
16		○	L	Hi-Z	H	L	H	Hi-Z	Hi-Z	L	L	L	L	Hi-Z	Hi-Z	L	L
17		○	L	Hi-Z	H	H	H	Hi-Z	H	Hi-Z	Hi-Z	Hi-Z	L	Hi-Z	Hi-Z	L	L
18	Desaturation protection 2	○	Hi-Z	X	L	X	X	L	Hi-Z	Hi-Z	L	L	X	X	X	X	X
20		○	Hi-Z	L	H	X	L	L	Hi-Z	Hi-Z	L	L	Hi-Z	Hi-Z	L	L	L
21		○	Hi-Z	L	H	L	H	L	Hi-Z	Hi-Z	L	L	Hi-Z	H	Hi-Z	Hi-Z	Hi-Z
22		○	Hi-Z	L	H	H	H	L	Hi-Z	Hi-Z	L	L	Hi-Z	Hi-Z	L	L	L

○ : VO UVLO > UVLO, X : Don't care

■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-side signal voltage	V_{SG}	-0.3	5.5	V	ALM1, ALM2, RTC, MOD, INA, INB
Input-side signal maximum current	I_{SG}	-	5	mA	ALM1, ALM2
DESAT pin input voltage	V_{DESAT}	-0.3	V_{GH}+0.3	V	
Miller clamp pin input voltage	V_{CLAMP}	V_{GL}-0.3	V_{GH}+0.3	V	
Maximum gate current	I_{GPEAK}	-	(43)	A	Guaranteed by design
DC/DC converter output power	P_{OUT}	-	3.2	W	Per output circuit
Switching frequency	F_{SW}	-	(200)	kHz	
Operating temperature range	T_{OP}	-40	85	℃	See the derating curve
Operating humidity	RH_{OP}	20	95	%RH	No condensation
Storage temperature range	T_{STG}	-40	90	℃	
Storage humidity	RH_{STG}	5	95	%RH	No condensation

■Recommended Operating Conditons

Item	Symbol	Min	Max	Unit	Conditions・Note
Input voltage range for DC/DC converter	V_{IN}	13.5	26.4	Vdc	
Input-side signal voltage range	V_{CC}	3	5.5	Vdc	
Driver circuit number	N	-	2	-	
Logic high level input voltage	V_{SGH}	V_{CC} x0.7	-	V	MOD, INA, INB
Logic low level input voltage	V_{SGL}	-	V_{CC} x0.3	V	MOD, INA, INB
Source current of control signal	I_{SG}	5	-	mA	MOD, INA, INB V_{SG}=5V
Maximum gete drive capability(200kHz)	Q_{MAX}	-	(750)	nC	I_{GAVE}= 160mA Reference value
Maximum gete drive capability(50kHz)	Q_{MAX}	-	(3000)	nC	I_{GAVE}= 160mA Reference value
Maximum gete charge amount	Q_G	-	(6000)	nC	
Minimum input pulse width	t_{INMSK}	-	(60)	ns	

■Ambient Temperature Derating Curve

Reduce the switching frequency according to the following temperature derating table.

TBD

■Electrical Specification (Vin=24V, Vcc=5V.Ta=25℃, Unless otherwise specified)

DC/DC converter block

Item	Symbol	Min	Typ	Max	Unit	Conditions・Note
Start-up voltage	V_{START}	-	-	13	V	
Max input current	I_{INMAX}	-	T.B.D	-	A	Fsw=
Standby power	P_{STBY}	-	(1.1)	-	W	No load

Gate drive block

Item		Symbol	Min	Typ	Max	Unit	Conditions・Note
Logic							
Logic high level input voltage		V_{SGH}	V_{CC} x0.7	-	-	V	MOD, INA, INB
Logic low level input voltage		V_{SGL}	-	-	V_{CC} x0.3	V	INA, INB
Logic pull-down resistance		R_{SGD}	-	1000	-	Ω	INA, INB
Output							
Gate ON side pin voltage		V_{GH}	17	18	19	V	No load
Gate OFF side pin voltage		V_{GL}	-3	-2	-1	V	No load
Miller clamp voltage		V_{CLAMP}	-	1.2	-	V	I_{CLAMP}=500mA, Guaranteed by design
Miller clamp ON threshold voltage		V_{CLPON}	-	V_{GL}+2	-	V	
Delay time	Turn ON time	t_{PON}	-	(100)	-	ns	
	Turn OFF time	t_{POFF}	-	(100)	-	ns	
Dead time		t_{DEAD}	-	(4.1)	-	us	Half bridge mode
Common-mode transient immunity		CMTI	-	-	T.B.D	kV/us	

■Protection

DC/DC converter block

Item	Symbol	Min	Typ	Max	Unit	Conditions・Note
Overload protection	-	8.4	-	-	W	Auto recovery
Overheat protection	-	120	-	150	℃	Auto recovery,CASE temperature

Gate drive block

Item	Symbol	Min	Typ	Max	Unit	Conditions・Note
Gate ON side UVLO OFF voltage	$V_{UVLOGHH}$	13.2	13.5	13.8	V	
Gate ON side UVLO ON voltage	$V_{UVLOGHL}$	12.2	12.5	12.8	V	
DESAT charge current	I_{DESAT}	200	240	280	uA	
DESAT detection voltage	V_{SD}	6.0	6.35	7.0	V	
DESAT detection filter time	t_{DSTFIL}	-	(300)	-	us	Guaranteed by design
DESAT detection time	t_{DSTOUT}	-	(380)	-	us	Guaranteed by design
Alarm signal output L voltage	V_{ALML}	-	-	0.5	V	I_{ALM}=5mA
Alarm signal output time	t_{ALM}	-	(350)	-	us	
Restart time	$t_{RESTART}$	-	(100)	-	ms	
Soft turn off duration	t_{STO}	-	(4)	-	us	

■Insulation

Item	Specification	Conditions・Note
Between Input-Output		
Dielectric withstand voltage	AC5000V	1min, Cutoff 2mA
Insulation resistance	100MΩ or more	DC500V
Minimum clearance distances	14mm	
Minimum creepage distances	14mm	
Partial discharge extinction volt.	T.B.D	According to EN50178/IEC 60270
Between CH1-CH2		
Dielectric withstand voltage	AC4000V	1min, Cutoff 2mA
Insulation resistance	100MΩ or more	DC500V
Minimum clearance distances	7mm	
Minimum creepage distances	12mm	
Partial discharge extinction volt.	T.B.D	According to EN50178/IEC 60270

■Pin Function

・Vin(+), Vin(−) (Power supply pin for DC/DC converter)

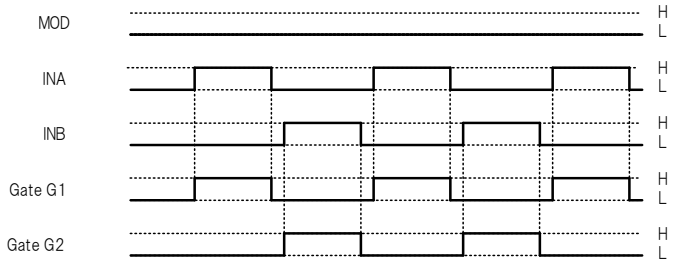
・VCC(Power supply pin for drive curcuit)

・GND(Ground pin for drive curcuit)

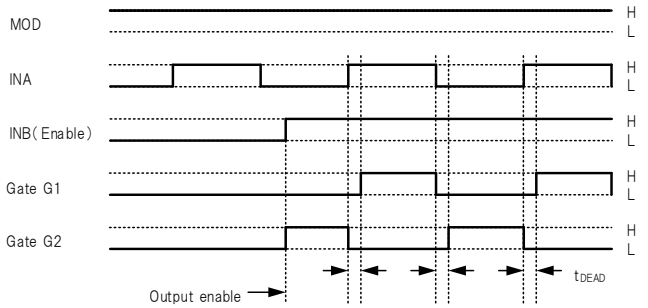
・MOD, INA, INB(Mode switching pin, Control input pin)

The INA, INB and MOD pin is a pin used to determine output logic.
Direct mode / Half bridge mode can be switched by MOD pin.
In Half bridge mode, it functions as INA: gate signal, INB: enable signal.

MOD	INA	INB	Gate G1	Gate G2	Mode
L	L	X	L	X	Direct mode
L	H	X	H	X	
L	X	L	X	L	
L	X	H	X	H	
H	X	L	L	L	Half bridge mode
H	L	H	L	H	
H	H	H	H	L	



Timing chart of Direct mode



Timing chart of Half bridge mode

・DTC1,2(Dead time adjustment pin)

When half-bridge mode, this pin is adjust the dead time of gate output G1,G2

・RTC(Recovery time of protection circuit control pin)

When abnormality occurs (UVLO, short circuit detected),this pin is used to adjust the recovery time.

・ALM1,2(Alarm signal output pin)

When abnormality occurs (UVLO, short circuit detected),This pin outputs an alarm signal. (Open-Drain)

Status	ALM1,2
While in normal operation	Hi-Z
UVLO, When detecting short circuit	L

・MCL1,2(Miller clamp pin)

The MCL pin is a pin for preventing inrease in gate voltage due to the miller current of the power device connected to Gate pin.

・VGL1,2(Gatte OFF side pin)

The VGL pin is a pin for gate drive of low signal. VGL pin connect to the gate pin through gate resistor of OFF side.

・DST1,2(Desaturaion protection pin)

The DESAT pin is a pin used to detect desaturation. When the DESAT pin voltage exceeds V_{DESAT}, the DESAT function will be activated. This may cause the IC to malfunction in an open state. To avoid such trouble, short-circuit the DESAT pin to the E/S pin if the desaturation protection is not used. In order to prevent the wrong detection due to noise, the noise mask time $t_{DESATFIL}$ is set.

・E/S1,2(Emitter/source pin)

E/S pin connect to the emitter / source of the power device.

・VGH1,2(Gate ON side pin)

The VGH pin is a pin for gate drive of high signal. VGH pin connect to the gate pin through gate resistor of ON side.

・STO1,2(Soft turn off pin)

The STO pin is a pin for gradually decrease gate voltage in operating desaturation protection.

STO pin connect to the gate pin though a resistance value higher than the resistance value connected to VGL 1 and 2.

・VO1+,VO2+,VO1-,VO2-(DC/DC converter output pin)

The VO+,VO2+,VO1-,VO2- pin is a output pin of built-in DC/DC converter. If necessary, connect a capacitor.

■Description

1. Gate voltage rise prevention function (Miller clamp function)

If gate output Gx=L and the Miller clamp pin voltage < V_{CLPON}, the internal MOSFET of the miller clamp pin turns on.

Gate Gx	MCL	Internal MOSFET of the MCL pin
L	Less than V_{CLPON}	ON
L	Not less than V_{CLPON}	OFF
H	X	OFF

2. Undervoltage Lockout (UVLO) function

The control circuit incorporates the undervoltage lockout (UVLO) function both on the output voltage + sides.

When the output voltage+ drops to the UVLO ON voltage, the gate ON/OFF side pin and the ALM pin both will output the “L”signal.

When the output voltage+ rises to the UVLO OFF voltage, these pins will be reset.

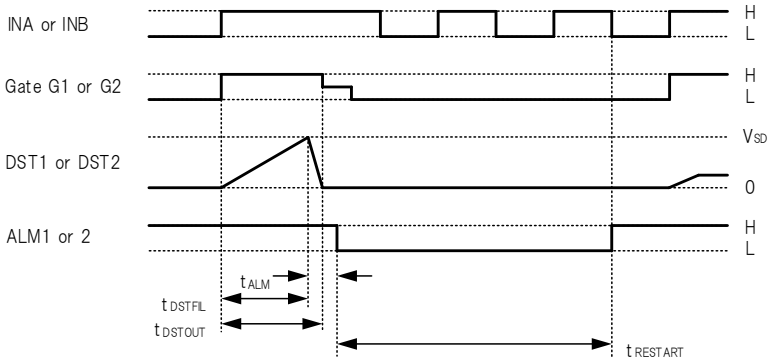
3. Short circuit protection function, Soft turn-off function

When the collector/drain pin voltage exceeds V_{SD}, the short circuit protection function will be activated.

When the short circuit protection function is activated, the gate ON/OFF side pin will be set to the "Hi-Z" level, and then the ALM pin voltage to the "L" level.

Also, soft turn-off function works to reduce collector/drain voltage surge due to short circuit current.

Short circuit protection is automatically canceled after the abnormal state recovery time.



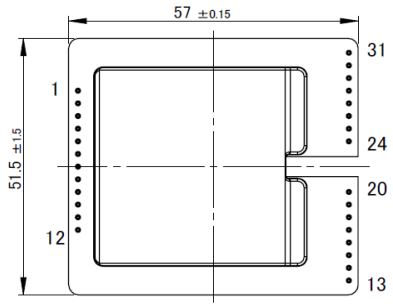
Timing chart of short circuit protection function

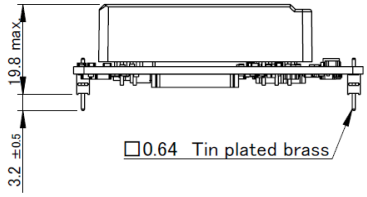
■Reliability

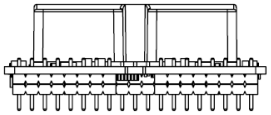
Item	Test condition and acceptance criterion
Exposure in high temperature	90℃, 240H, ※
Exposure in low temperature	-40℃, 240H, ※
Exposure in high temperature and high humidity	60℃, 90～95%RH, 240H, ※
Thermal shock	-40℃/30min to 100℃/30min, 500cycles, ※
Low temperature operation	Input voltage:DC24V, Output current:Rated Load -40℃, 240H, ※
High temperature operation	Input voltage:DC24V, Output current:Rated Load 85℃, 240H, ※
high temperature and high humidity operation	Input voltage:DC24V, Output current:Rated Load 85℃, 85%RH, 240H, ※
Vibration	Vibration amplitude:1.5mm(peak to peak), Vibration Frequency:10 to 55Hz, Sweeping:1min. In each X, Y and Z direction:once, 120min. ※
Impact	Acceleration:490m/s^2 (50G), Operating time:11ms In each ±X, Y and Z direction:3 times, ※
Drop test for packaged freights	Dorp to concrete. Height:40cm Dorp surface:1 corner, 3 spines, 6 surfaces, 1 time each.
Solderblity	Sample shall be dipped into the solution of Methanol and Rosin (having 75% Methanol and having 25% Rosin by weight measuring) and shall be dippend into the solder bath having the solder Sn-3Ag-0.5Cu of 250±5℃ to the position to 3mm from the end of terminal for 3.0±0.5 seconds, and pulled up. After above treatment, the sample shall be coveredby solder uniformly at more than 75% of circumference and shall not show any unusual appearance.
Resistance to soldering heat	Sample shall be dipped into the solution of Methanol and Rosin (having 75% Methanol and having 25% Rosin by weight measuring) and shall be dippend into the solder bath having the solder Sn-3Ag-0.5Cu of 260±5℃ to the position to 3mm from the end of terminal for 10.0±0.5 seconds, and pulled up. After that sample shall be replace in normal ambient for 1～2 hours and shall not show any unusual appearance.

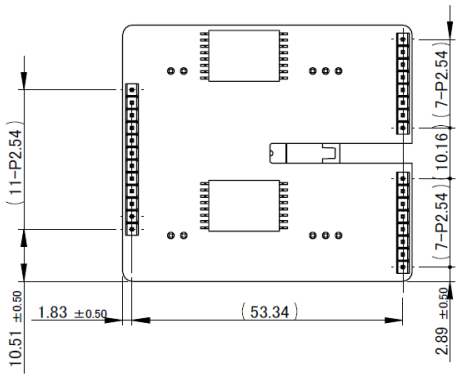
※After each test, exposure at room temperature and humidity condition for 24 hours.
There shall be no abnormality on the electrical specification and appearance.

■Outline Dimensional Drawing









Unit：mm

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

■Product Weight

45g(TYP)

■Recommended Soldering Condition

・Flow soldering condition : 255±3℃ Less than 3sec
Temperature of preheating 110℃～130℃
End temperature of preheating 110℃±10℃

・Soldering condition of hand work : 360℃(MAX) Less than 3sec

■Storage Conditions

Item	Min	Max	Unit	Conditions・Note
Storage temperature	-25	60	℃	A packing state

※If you want to use past the long period there is a concern that the solder non-wetting by terminal oxidation to occur.
Therefore, please use from taking enough tests.

■Usage Cautions

● Always mount fuse on the plus side of input for ensuring safety because the fuse is not built-in the product.
Please select the fuse considering conditions such as steady current, inrush current, and ambient temperature.
When using a fuse having large rated current or high capacity input electrolytic condenser, by combining
another converter and input line and input electrolytic condenser, fuse may not blow off in the case of abnormality.
Do not combine high voltage line and fuse.

● Make sure the rise/fall time of the input signal is 500ns or less.

● Please do not apply excessive stress to this product when attaching to power module.

■Important Notice

- The content of this information is subject to change without prior notice for the purpose of improvements, etc.
  Ensure that you are in possession of the most up-to-date information when using this product.

- The operation examples and circuit examples shown in this document are for reference purposes only, and TAMURA Corporation disclaims all responsibility for any violations of industrial property rights, intellectual property rights and any other rights owned by TAMURA Corporation or third parties that these may entail.

- The circuit examples and part constants listed in this document are provided as reference for the verification of characteristics. You are to perform design, verification, and judgment at your own responsibility, taking into account the various conditions.

- TAMURA has evaluated the efficiency and performance of this product in a usage environment determined by us.
  Depending on your usage environment or usage method, there is the possibility that this product will not perform sufficiently as shown in the specifications, or may malfunction.
  When applying this product to your devices or systems, please ensure that you conduct evaluations of their state when integrated with this product. You are responsible for judging its applicability.
  TAMURA bears no responsibility whatsoever for any problems with your devices,
  systems or this product which are caused by your usage environment or usage method.

- TAMURA Corporation constantly strives to improve quality and reliability, but malfunction or failures are bound to occur with some probability in power products. To ensure that failures do not cause accidents resulting in injury or death, fire accidents, social damage, and so on, you are to thoroughly verify the safety of their designs in devices and/or systems, at your own responsibility.

- This product is intended for use in consumer electronics (electric home appliances, business equipment, Information equipment, communication terminal equipment, measuring devices, and so on.) If considering use of this product in equipment or devices that require high reliability (medical devices, transportation equipment, traffic signal control equipment, fire and crime prevention equipment, aeronautics and space devices, nuclear power control, fuel control, in-vehicle equipment, safety devices, and so on), please consult a TAMURA sales representative in advance. Do not use this product for such applications without written permission from TAMURA Corporation.

- This product is intended for use in environments where consumer electronics are commonly used.
  It is not designed for use in special environments such as listed below, and if such use is considered,
  you are to perform thorough safety and reliability checks at your own responsibility.
  - Use in liquids such as water, oil, chemical solutions, or organic solvents, and use in locations where the product will be exposed to such liquids.
  - 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.

- This product is not designed to be connected in series or parallel.
  Do not operate this product in a series, parallel, or N+1 redundant configuration.

- Do not use or otherwise make available the TAMURA products or the technology described in this document for any military purposes, including without limitation, for the design, development, use, stockpiling or manufacturing of mass destruction weapons (e.g. nuclear, chemical, or biological weapons or missile technology products).
  When exporting and re-exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations including, without limitation, Japan -Foreign Exchange and Foreign Trade Control Law and U.S.- Export Administration Regulations.
  The TAMURA products and related technology should not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.

- Please contact your TAMURA sales office for details as to environmental matters such as the RoHS compatibility of product.
  Please use TAMURA products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive.
  TAMURA assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.

- TAMURA assumes no liability for damages or losses incurred by you or third parties as a result of unauthorized use of TAMURA products.

- This document and any information herein may not be reproduced in whole or in part without prior written permission from TAMURA.

X-ON Electronics

Largest Supplier of Electrical and Electronic Components

Click to view similar products for Gate Drivers ***category:***

Click to view products by Tamura ***manufacturer:***

Other Similar products are found below :

00053P0231 56956 57.404.7355.5 LT4936 57.904.0755.0 5882900001 00600P0005 00-9050-LRPP 00-9090-RDPP 5951900000 01-1003W-10/32-15 0131700000 00-2240 LTP70N06 LVP640 5J0-1000LG-SIL LY1D-2-5S-AC120 LY2-US-AC240 LY3-UA-DC24 00576P0020 00600P0010 LZN4-UA-DC12 LZNQ2M-US-DC5 LZNQ2-US-DC12 LZP40N10 00-8196-RDPP 00-8274-RDPP 00-8275-RDNP 00-8722-RDPP 00-8728-WHPP 00-8869-RDPP 00-9051-RDPP 00-9091-LRPP 00-9291-RDPP 0207100000 0207400000 01312 0134220000 60713816 M15730061 61161-90 61278-0020 6131-204-23149P 6131-205-17149P 6131-209-15149P 6131-218-17149P 6131-220-21149P 6131-260-2358P 6131-265-11149P CS1HCPU63