ISOLATION TYPE DC/DC CONVERTER 1DD170506C

■Overview

1DD series are insulated DC/DC converters for gate drivers such as SiC MOSFET and IGBT.

The high breakdown voltage and low parasitic capacitance make it suitable for gate drives such as SiC MOSFET and IGBT.

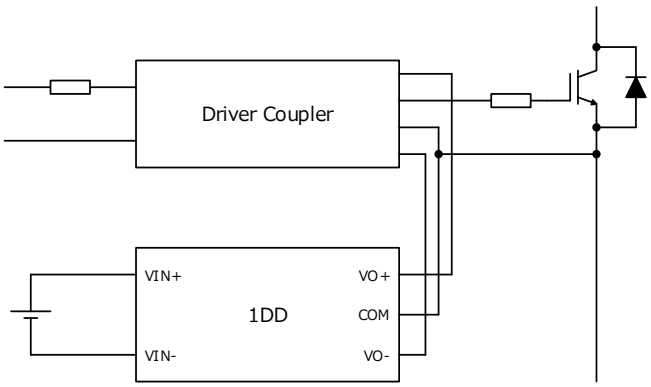
■Feature

- Ideal for gate drive power supply
- Output voltage : +17V/-5V
- Low parasitic capacitance (typ. 12 pF); highly resistant to common-mode noise.
- Dielectric withstand voltage : AC10.8kV
- Input voltage : 15V , 24V
- Over load protection
- Over heat protection
- Filling structure
- Reinforced isolation according to IEC 60664-1

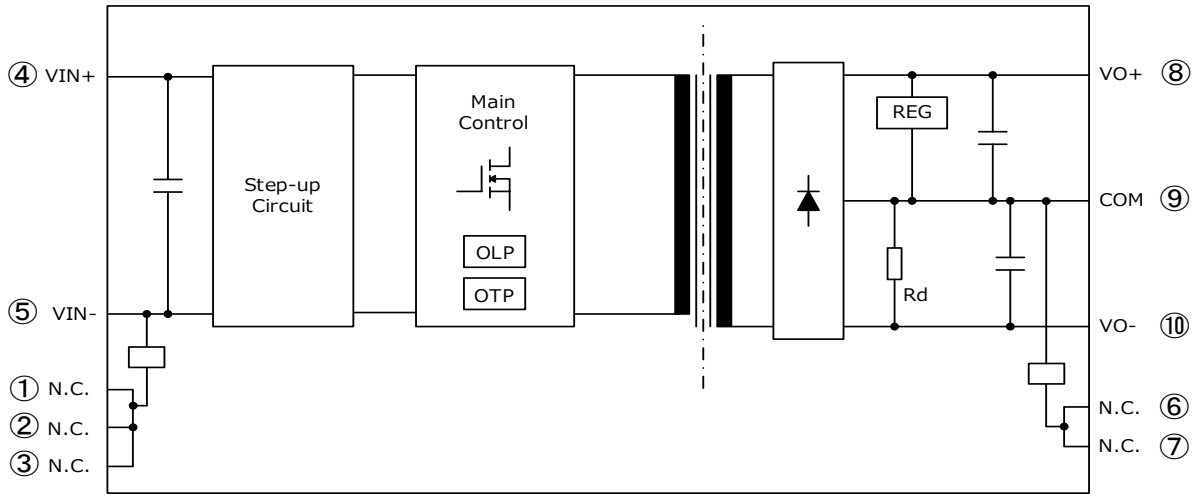
■Applications

Inverters for industrial equipment, power conditioners, etc.…

■Circuit example



■Block diagram



Rd : 1.0kΩ

■Pin connection

Pin No.	Name	Explanation of pins
①	N.C.	Unused ※Product test terminal. Unable to connect to other circuits.
②	N.C.	Unused ※Product test terminal. Unable to connect to other circuits.
③	N.C.	Unused ※Product test terminal. Unable to connect to other circuits.
④	VIN+	Input voltage (+)
⑤	VIN-	Input voltage (-)
⑥	N.C.	Unused ※Product test terminal. Unable to connect to other circuits.
⑦	N.C.	Unused ※Product test terminal. Unable to connect to other circuits.
⑧	VO+	Output voltage (+)
⑨	COM	Output common
⑩	VO-	Output voltage (-)

■ **Absolute maximum rating**

Item	Symbol	Min.	Max.	Unit	Conditions / Note
Input voltage	V_{IN}	-0.3	26.4	Vdc	Between VIN+－VIN-
Output current	I_{OUT}	0	250	mA	Ta=-40～85℃
COM sink current	I_{COM}	0	4	mA	
Operating ambient temperature range	Top	-40	85	℃	Output current=250mA or less
Operating ambient humidity range	RH_{OP}	20	95	%RH	No condensation
Storage temperature range	T_{STG}	-40	90	℃	
Storage humidity range	RH_{STG}	5	95	%RH	No condensation

■ **Recommended Operating Voltage**

Item	Symbol	Min.	Max.	Unit	Conditions / Note
Input voltage range	V_{IN}	14.2	25.2	Vdc	
Output current	I_{OUT}	20	250	mA	I_{COM}=0A
COM sink current	I_{COM}	0	2	mA	

■Electrical Specification (V_{IN}=15V, I_{OUT}=250mA, I_{COM}=0A, Ta=25℃. Unless otherwise specified)

Item		Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Start-up voltage		V_{START}	-	-	13	V	
Efficiency	V_{IN}=15V	Effi	-	82	-	%	
	V_{IN}=24V		-	83	-		
Standby power	V_{IN}=15V	P_{STBY}	-	0.55	-	W	No-load
	V_{IN}=24V		-	0.6	0.9		
Output voltage (+)	Range	V_{OUT+}	16.3	17.3	18.3	V	
	Line regulation	dV_{L+}	-	-	20	mV	
	Load regulation	dV_{r+}	-	-	50	mV	I_{OUT}=20-250mA
	Ripple	$V_{ripple+}$	-	-	250	mVp-p	
	Ripple noise	V_{noise+}	-	-	300	mVp-p	
Output voltage (-)	Range	V_{OUT-}	-5.1	-4.1	-3.1	V	I_{OUT}=250mA
			-6.5	-4.8	-	V	I_{OUT}=20mA
			-	-5.3	-	V	I_{OUT}=0A *1
	Line regulation	dV_{L-}	-	-	50	mV	
	Load regulation	dV_{r-}	-	-	1500	mV	I_{OUT}=20-250mA
	Ripple	$V_{ripple-}$	-	-	300	mVp-p	
	Ripple noise	V_{noise-}	-	-	350	mVp-p	

*1 To ensure output voltage accuracy, operation at Iout = 0A shall be avoided.

■Protection function

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions / Note
Over load protection	-	260	-	-	mA	Auto recovery
Over heat protection	-	-	-	150	℃	Auto recovery / Case surface temperature

■Insulation

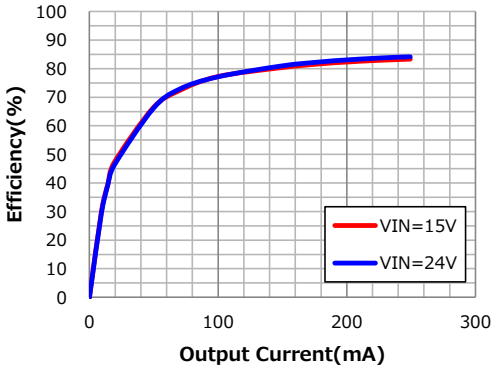
Item	Specification	Conditions / Note
Dielectric withstand voltage (Type test)	AC10.8kV	1min, Leak Current 2mA or less
Insulation resistance	100MΩ or more	DC500V
Partial discharge extinction voltage	4.95kVpeak or more	According to EN50178/IEC 60270
Common-mode transient immunity (CMTI)	70kV/us	
Minimum clearance distances	23.8mm (Outside of the filling)	
	15.1mm (Inside of the filling)*3	
Minimum creepage distances	45mm (Outside of the filling)	PCB: CTI PLC0, Case: CTI PLC0
	15.1mm (Inside of the filling)*2 *3	

*2 The inside of the filling assumes PD1.

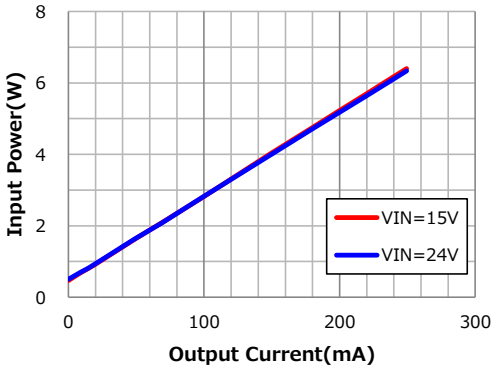
*3 Regarding the inside of the filling, type 2 protection or solid insulation may be applicable depending on the standard. Please contact us.

■Typical characteristics (Ta=25℃, I_{COM}=0A)

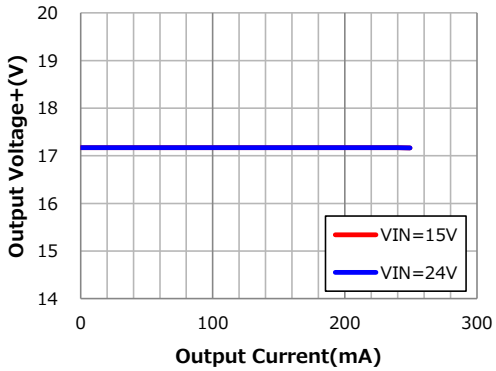
Output Current vs. Efficiency



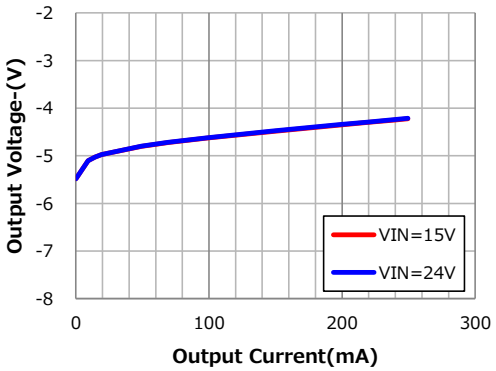
Output Current vs. Input Power



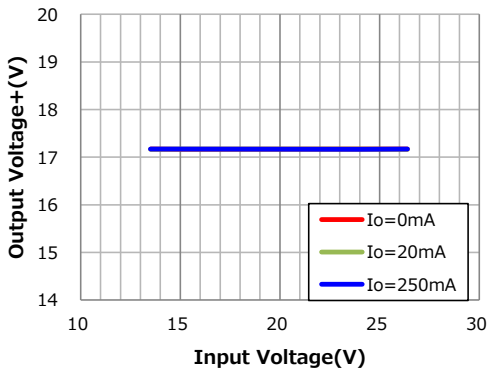
Output Current vs. Output Voltage +



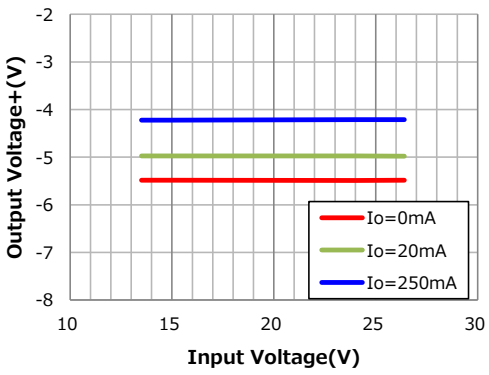
Output Current vs. Output Voltage -



Input Voltage vs. Output Voltage +

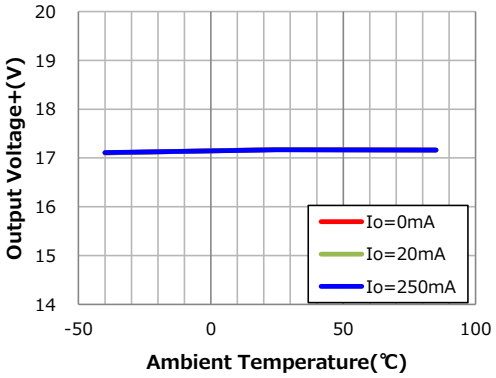


Input Voltage vs. Output Voltage -

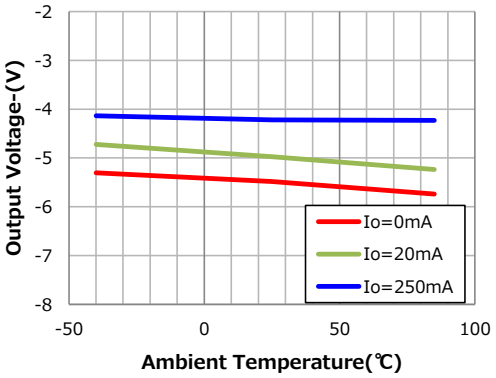


■Typical characteristics (Ta=25℃, I_{COM}=0A)

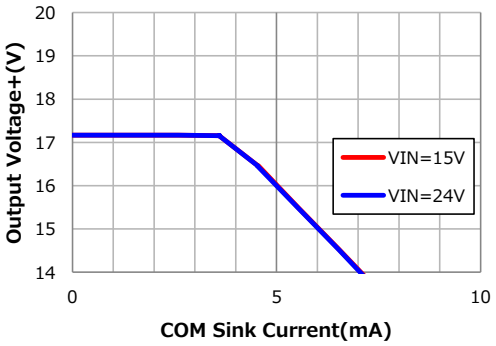
Ambient Temperature vs. Output Voltage +



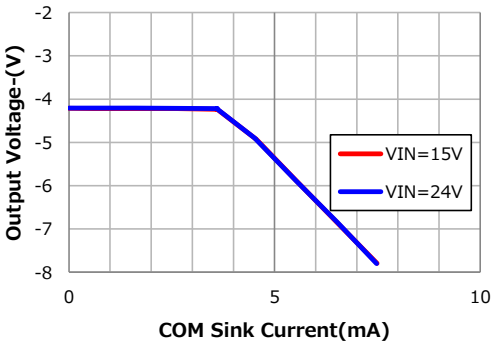
Ambient Temperature vs. Output Voltage -



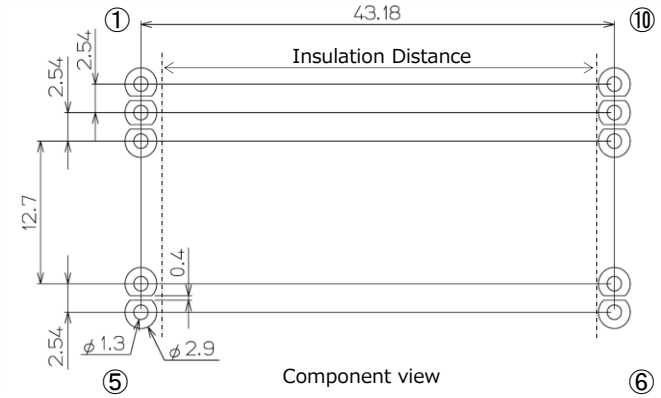
COM Sink Current vs. Output Voltage +
(IOUT=250mA)



COM Sink Current vs. Output Voltage -
(IOUT=250mA)



■Recommended hole diameter and land size



Component view

Unit : mm

※ For PIN ①,②,③,⑥ and ⑦ TAMURA suggests these PINs to be fixed to the board with lands to ensure mechanical strength.
If these PINs are not fixed, there is a risk of the mechanical strength decreasing.

※ When mounted on the board, the “Insulation Distance” as on the diagram may be the shortest distance.
Please ensure the necessary insulation distance by using methods such as creating slits in the board.

■Recommended Soldering Condition

・Flow solder conditions : 255±3℃ 5sec or less
Preheat temperature 110℃～130℃
Preheat end 110℃±10℃

・Soldering condition of hand work : 350℃(MAX) 4sec or less

■Storage condition

Item	Min.	Max.	Unit	Conditions / Note
Storage temperature	-25	60	℃	Packing condition

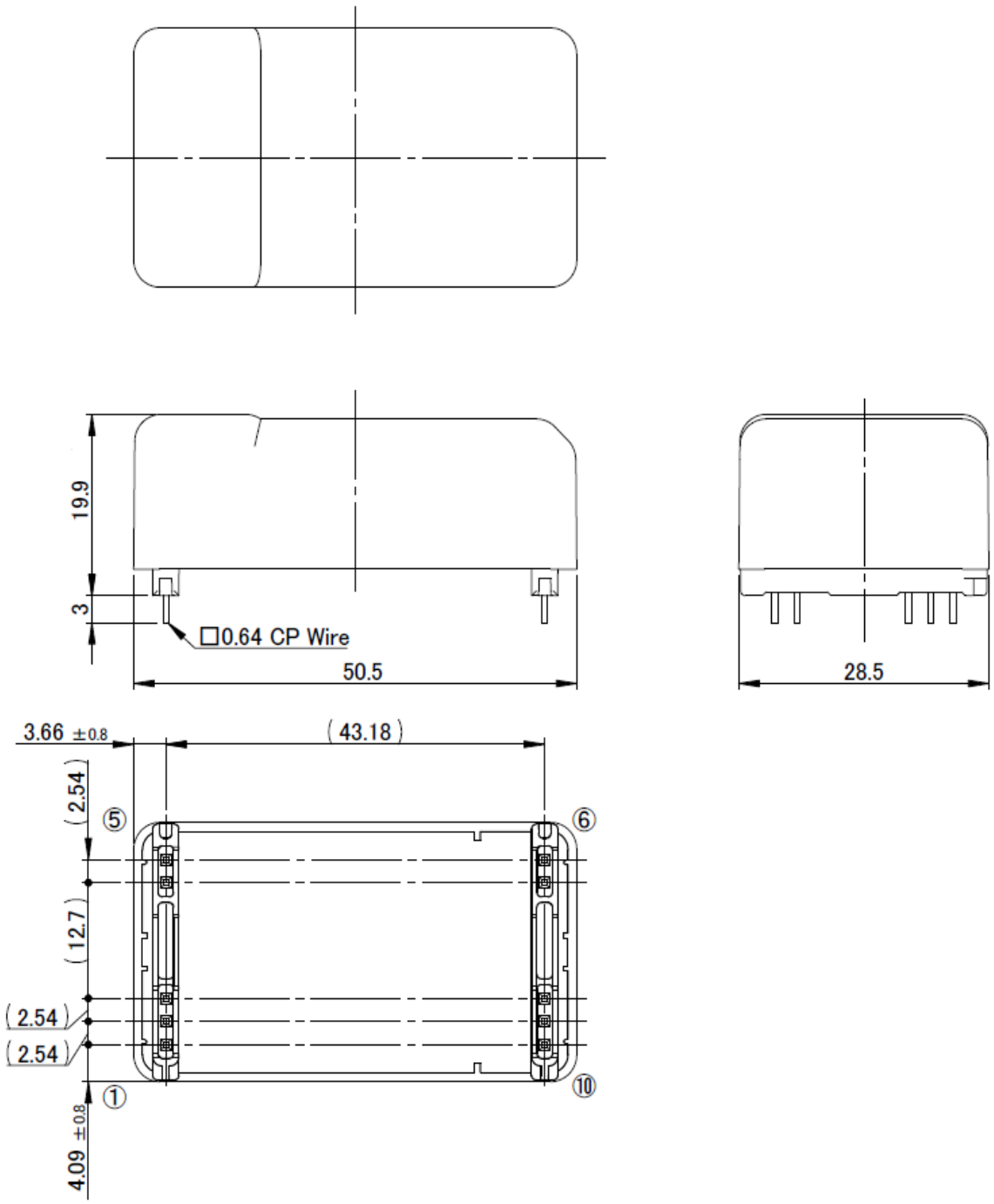
※If you want to use past the long period there is a concern that the solder non-wetting by terminal oxidation to occur.
Therefore, please use from taking enough tests.

■Usage Cautions

- Always mount fuse on the plus side of input for ensuring safety.
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.

- The output voltage accuracy may be affected by the COM sink current.
If you want to maintain the accuracy of the output voltage, adjust the current value between VO+～COM and COM～Vo- by adding a resistor or the like so that the current value is the same between VO+～COM and COM～VO-.

■Outline Dimensional Drawing



Unit:mm

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

■Product Weight

45g (typ.)

■Important Notice

- This information and product are 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.

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  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.

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