

MAX. Power 10.0W Isolated DC-DC Converter

## D10 Series Encapsulated PCB Type DC-DC Converter



### Features

- Encapsulated Compact Size
- High Efficiency
- Isolated Input – Output
- 300kHz fixed frequency and Current mode Control
- Low output Ripple & Noise
- Built-in over current protection circuit
- Wide 2 : 1 input range
- Safety : Meets UL/CE Standard (Approvals pending)
- RoHS compatible design

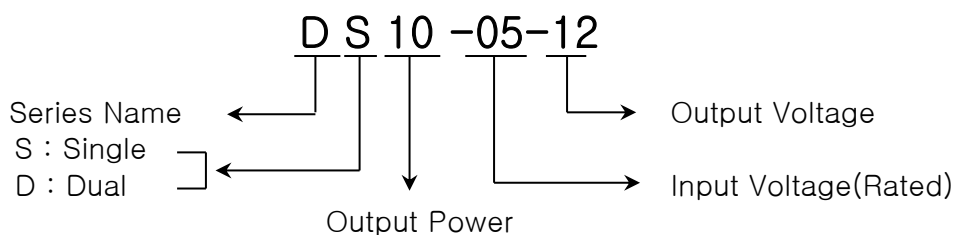
### Applications

- Data and telecommunication
- FA control
- Datacommunication electronic equipments

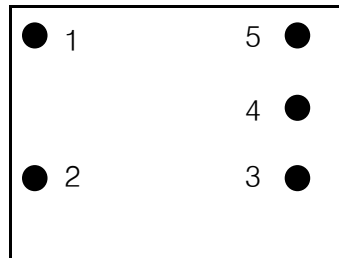
### Environment

- Operating Temperature : -20°C ~ 71°C
- Operating Humidity : 20% ~ 90% RH (Non condensing)
- Storage Temperature : -40°C ~ 105°C
- Cooling : Free-Air Convection
- MTBF : 6.0 x 10<sup>5</sup> hrs

### Model Name Structure



## Pin assignments & Function



<Top View>

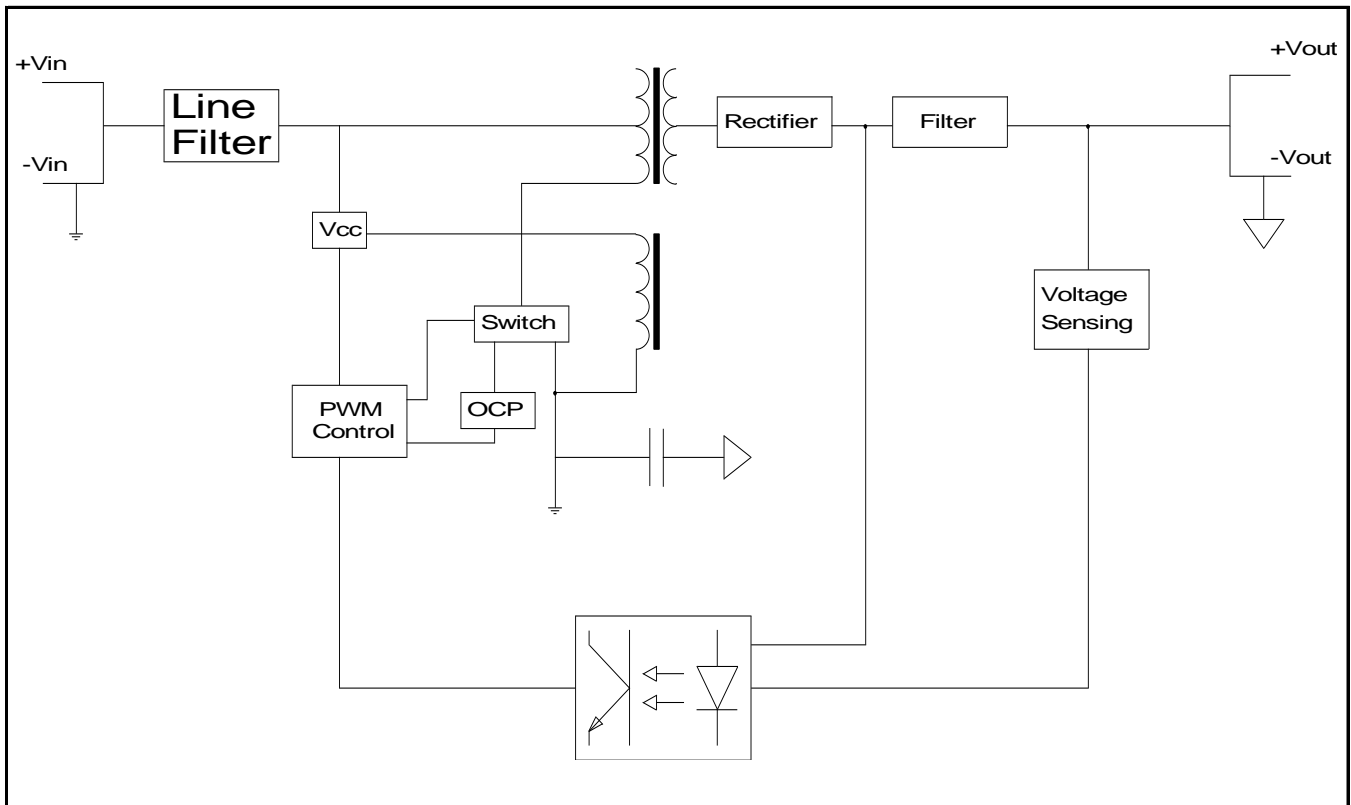
### - Single Output Name & Function

PIN No.	NAME	FUNCTION
1	+Vin	Positive terminal for Vin
2	-Vin	Negative terminal for Vin
3	-Vout	Negative terminal for Vout
4	No Pin	
5	+Vout	Positive terminal for Vout

### - Dual Output Name & Function

PIN No.	NAME	FUNCTION
1	+Vin	Positive terminal for Vin
2	-Vin	Negative terminal for Vin
3	-Vout	Negative terminal for Vout
4	Com	The common ground of Vout
5	+Vout	Positive terminal for Vout

## Internal Circuit Architecture



## Maximum Ratings

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Input Voltage Continuis	DS10 - 05 - XX	Vin	4.5	-	7.2	VDC
	DS10 - 12 - XX		8.0	-	16.5	
	DS10 - 24 - XX		18.0	-	32.0	
	DS10 - 48 - XX		32.0	-	63.0	
Input Voltage Continuis	DD10 - 05 - XXXX		4.5	-	7.2	VDC
	DD10 - 12 - XXXX		8.0	-	16.5	
	DD10 - 24 - XXXX		18.0	-	32.0	
	DD10 - 48 - XXXX		32.0	-	63.0	
Operating Ambient Temperature		Ta	-20	-	71	°C
Storage Temperature		Tstg	-40	-	105	°C
Withstand Voltage			-	-	500	Vac

## Electrical Characteristics

### - Input Section

Ta : 25°C, Vin : Typical Input Voltage

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Operating Voltage Range	D()10 - 05 - XX	Vin	4.5	5.0	7.2	VDC
	D()10 - 12 - XX		8.0	12.0	16.5	
	D()10 - 24 - XX		18.0	24.0	32.0	
	D()10 - 48 - XX		32.0	48.0	63.0	
Maximum Input Current (Vin : rated, Io : 100%)	D()10 - 05 - XX	Iin		2.667		A
	D()10 - 12 - XX			1.300		
	D()10 - 24 - XX			0.635		
	D()10 - 48 - XX			0.321		
Maximum No Load Input Current (Vin : rated)	D()10 - 05 - XX					mA
	D()10 - 12 - XX					
	D()10 - 24 - XX					
	D()10 - 48 - XX					

### - Output Section

Ta : 25°C, Vin : Minimum, Typical, Maximum Input Voltage

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Single	Vo	-	-	±2	%
	Dual		-	-	±3	
Regulation	Line Regulation (From min. Vin to max. Vin, constant load)		-	-	±0.5	%
	Load Regulation (From no load to maximum load)		-	-	±1 ±2.5	%(@Single) %(@Dual)
Output Ripple and Noise (Vin : Rated, Io : Max., BW : 20MHz)		mVp-p	-	-	1% of Vout	mV (peak to peak)

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Output Current	DS10 - XX - 3R3 (05)	I <sub>o</sub>	-	-	2.3 (1.8)	A
	DS10 - XX - 05 (05)		-	-	2.0 (1.6)	
	DS10 - XX - 09 (05)		-	-	1.2 (0.8)	
	DS10 - XX - 12 (05)		-	-	0.9 (0.7)	
	DS10 - XX - 15 (05)		-	-	0.7 (0.6)	
	DS10 - XX - 24 (05)		-	-	0.45 (0.33)	
	DD10 - XX - 0505 (05)	I <sub>o</sub>	-	-	1.0 (0.8)	
	DD10 - XX - 1212 (05)		-	-	0.45 (0.35)	
	DD10 - XX - 1515 (05)		-	-	0.35 (0.3)	
Output Current Limit (OCP : Over Current Protection, recovers automatically)			105	-	-	%
Dynamic Load Response (V <sub>in</sub> : rated, I <sub>o</sub> : from 50% to 100%, from 100% to 50%, BW : 20MHz, Freq. : 100Hz, Duty : 0.5, Tr/Tf : 100us use the external capacitor(1uF) between +V <sub>o</sub> and -V <sub>o</sub> )			-	-	3% of V <sub>out</sub>	mV (peak to peak)
Start - Up Time		T <sub>start</sub>				ms
Turn - on Overshoot			-	-	5	%
Efficiency (V <sub>in</sub> : Rated, I <sub>o</sub> : Max.)	DS10 - 05 - 3R3		-	77	-	%
	DS10 - 05 - 05		-	79	-	
	DS10 - 05 - 09		-	79	-	
	DS10 - 05 - 12		-	81	-	
	DS10 - 05 - 15		-	81	-	
	DS10 - 05 - 24		-	80	-	
	DD10 - 05 - 0505		-	79	-	
	DD10 - 05 - 1212		-	81	-	
	DD10 - 05 - 1515		-	81	-	

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Efficiency (Vin : Rated, Io : Max.)	DS10 - 12 - 3R3		-	80	-	%
	DS10 - 12 - 05		-	82	-	
	DS10 - 12 - 09		-	83	-	
	DS10 - 12 - 12		-	83	-	
	DS10 - 12 - 15		-	83	-	
	DS10 - 12 - 24		-	83	-	
	DD10 - 12 - 0505		-	82	-	
	DD10 - 12 - 1212		-	83	-	
	DD10 - 12 - 1515		-	83	-	
	DS10 - 24 - 3R3		-	80	-	
	DS10 - 24 - 05		-	82	-	
	DS10 - 24 - 09		-	85	-	
	DS10 - 24 - 12		-	85	-	
	DS10 - 24 - 15		-	85	-	
	DS10 - 24 - 24		-	85	-	
	DD10 - 24 - 0505		-	84	-	
	DD10 - 24 - 1212		-	85	-	
	DD10 - 24 - 1515		-	85	-	
	DS10 - 48 - 3R3		-	80	-	
	DS10 - 48 - 05		-	82	-	
	DS10 - 48 - 09		-	84	-	
	DS10 - 48 - 12		-	84	-	
	DS10 - 48 - 15		-	84	-	
	DS10 - 48 - 24		-	84	-	
	DD10 - 48 - 0505		-	82	-	
	DD10 - 48 - 1212		-	84	-	
	DD10 - 48 - 1515		-	84	-	

## Isolation Characteristics

Characteristics		Symbol	Min.	Typ.	Max.	Unit
Withstand Voltage (AC500V, 1minute)	Input – Output		–	–	500	Vac
	Input – Case		–	–	500	Vac
	Output – Case		–	–	500	Vac
Isolation Resistance (DC500V at 25°C and 70%RH)	Output – Case	Riso	100	–	–	MΩ

## General Characteristics

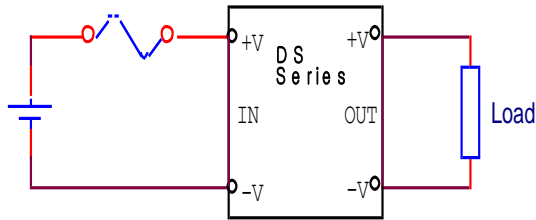
Characteristics	Symbol	Min.	Typ.	Max.	Unit
Remote on / off control (CNT Pin, Negative Logic Module on : Logic Low or Short to –Vin Module off : Logic High or open)	CNT				
External Trim Adj. Range (TRM Pin, Vout variation by external parts)	TRM				
Switching Frequency			300		kHz
MTBF (MIL-HDBK-217F)			6.0 x 10 <sup>5</sup>		hrs
Dimension (W x H x L)			47.0 x 9.0 x 42.0		mm
Weight		–	–	30	grams

## Environment

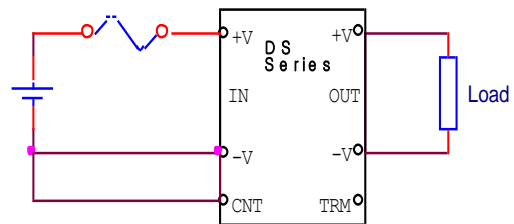
Characteristics	Symbol	Min.	Typ.	Max.	Unit
Operating Temperature Range	Ta	–20	–	71	°C
Operating Humidity (non Condensing)		20	–	90	%RH
Storage Temperature	Tstg	–40	–	105	°C

# Application Sheet

## Basic Connection



D Series(D1R5, D3, D6, D10)



D Series(D15, D25, D30)

## Input Section

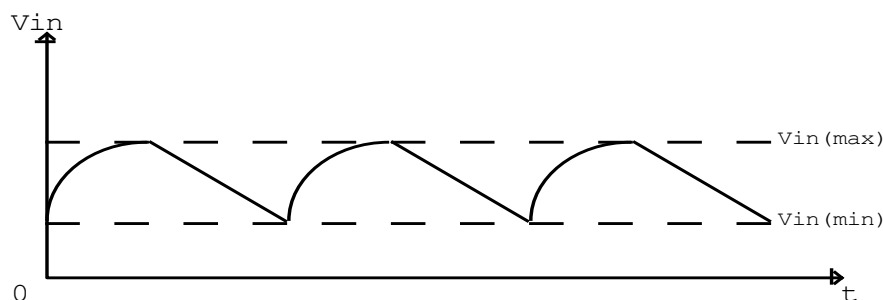
### - Input fuse

Generally, encapsulated power supplies do not have internal fuse. To ensure safe operation, an external fuse(Regular or Slow Blow Type) is recommended.

	5Vdc	12Vdc	24Vdc	48Vdc
D1R5	2A	1A	0.5A	0.5A
D3	3A	2A	1A	1A
D6	4A	3A	2A	1A
D10	6A	3A	2A	1A
D15	7A	5A	3A	1.5A
D25	12A	7A	4A	2A
D30			5A	2.5A

### - Unstable Input

Input voltage is comprised of both the DC voltage(average rectified voltage)and the peak to peak ripple voltage. Peak to peak ripple voltage should be minimized so that the input voltage is within the standard input voltage range as follows.



< Unstable Input >

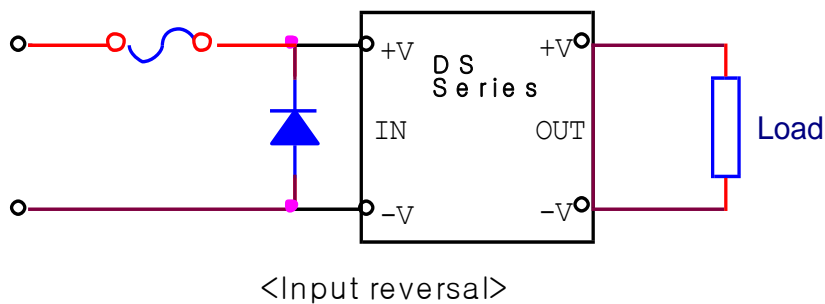


**- Battery Input**

When using a battery as the input power supply, make sure that the maximum and minimum input voltage do not away out of the standard input voltage range.

**- Input Reverse-polarity voltage protection**

Accidently reversing the input connections could damage the module. Thus. If the connections may be accidentally reversed. Use a protective diode and an input fuse as shown below.



**- Remote On/Off Control(CNT) (D15, D25, D30 Series)**

Without switching the input on/off, the output can be enabled and disabled using this function. This function is useful for sequence control when building multiple output power supplies. This control circuit is on the input side using the CNT pin. Ground of CNT pin is the input -V terminal. When not using this function, short CNT to input -V terminal.

CNT level for -Vin		OUTPUT
Low level	Short to -Vin	ON
High level	Open	OFF

< Negative Logic on/off Control >

**Output Section**

**- Output Ripple and Noise Measurement Method**

The measurement for output ripple and noise are based on normal probe with 20MHz bandwidth scope. Upon measurement of the ripple voltage, make sure that the scope probe leads are not too long. If a precise measurement can be made, the noise occurs from circumference must be reduced.

**- Line Regulation**

The line regulation means to the change in output voltage when the input voltage is varied within the input voltage range, at constant load and constant ambient temperature. The measurement point for the input and output voltage are  $\pm V_{in}$  pins,  $\pm V_{out}$  pins respectively.

**- Load Regulation**

The load regulation means to the change in output voltage when the load is changed from minimum load to maximum load, at constant input voltage and constant ambient temperature. The measurement point for the input and output voltage are  $\pm V_{in}$  pins,  $\pm V_{out}$  pins respectively.

**- Output Voltage adjustment (TRM) (D15, D25, D30 Series)**

The output voltage can be varied within  $\pm 10\%$  of the standard output voltage when use the external parts-resistors and variable resistor.

External Resistors :

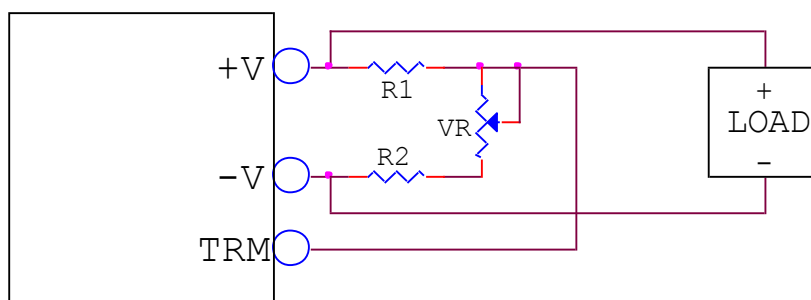
Resistance tolerance  $\pm 5\%$

Variable Resistor(VR) :

Total resistance toloatace  $\pm 20\%$

Remaining Resistance : Value less than 1%

Vo	R1	R2	VR
3.3V	150 $\Omega$	240 $\Omega$	1 k $\Omega$
5V	1 k $\Omega$	680 $\Omega$	1 k $\Omega$
9V	3 k $\Omega$	680 $\Omega$	1 k $\Omega$
12V	3.9 k $\Omega$	680 $\Omega$	1 k $\Omega$
15V	5.6 k $\Omega$	750 $\Omega$	1 k $\Omega$
$\pm 5(10V)$	3.3 k $\Omega$	680 $\Omega$	1 k $\Omega$
$\pm 12(24V)$	12 k $\Omega$	1 k $\Omega$	1 k $\Omega$
$\pm 15(30V)$	15 k $\Omega$	1 k $\Omega$	1 k $\Omega$



< Trim Method >

**- Over Current Protection**

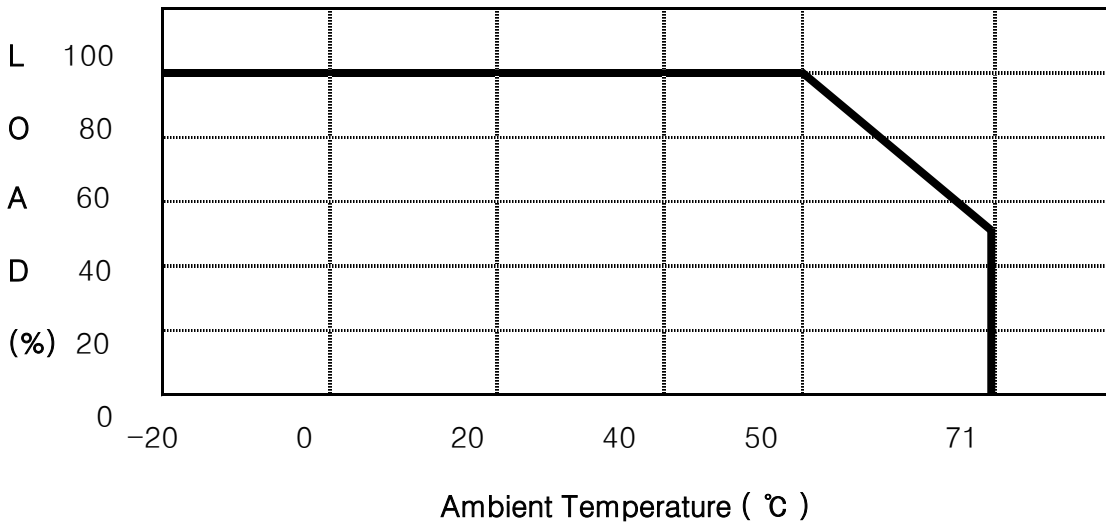
The SDS series is built into an OCP(Over Current Protection) circuit. When the OCP triggers, the output voltage will be fall. If overload condition is removed, the output will automatically recover.

## Environment

### - Temperature

#### Operation Temperature

The range of ambient temperature in °C over which a module can be operated safely at either rated or derated output power. Refer to derating curve as shown below.



※ Operating Temperature Range : From -20°C to 71°C

< Derating Curve >

#### Storage Temperature

The range of ambient temperature in °C over which a module may be stored long term without damage. The storage temperature range is from -40°C to 105°C.

### - Humidity

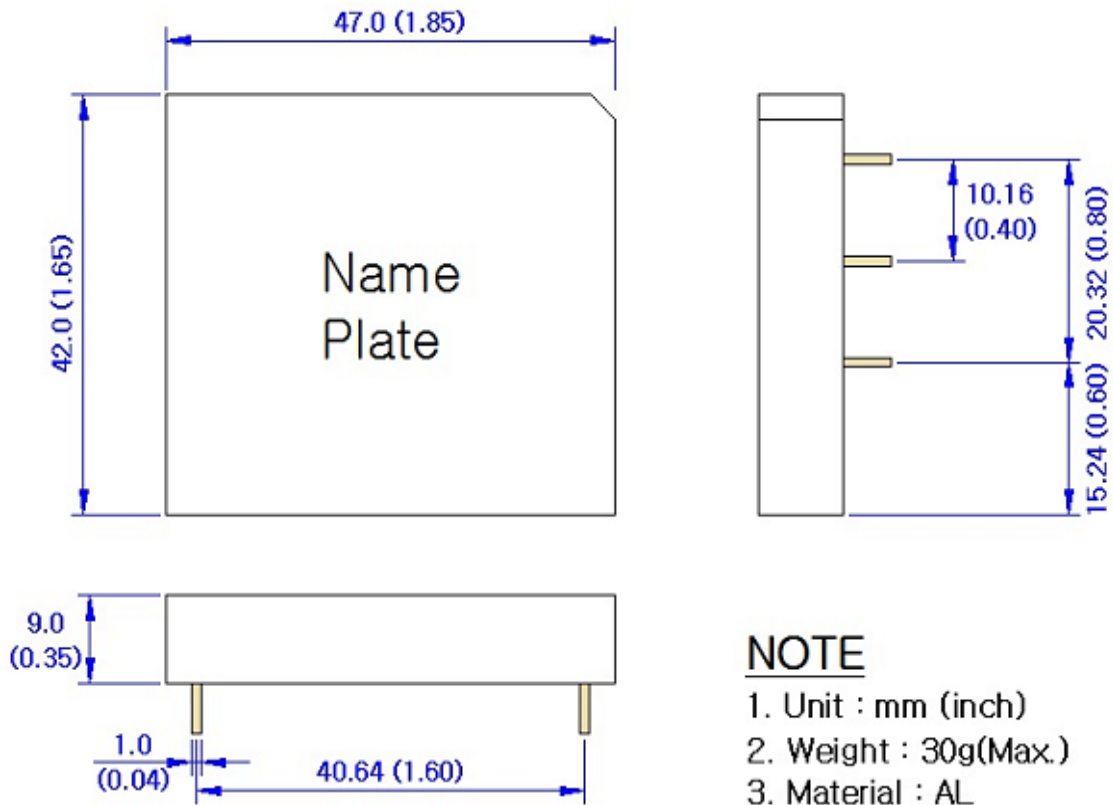
#### Operation Humidity

The range of ambient humidity in % over which a module can be operated safely at either rated or derated output power. Refer to derating curve as shown below. The operating humidity range is from 20% to 90%RH.

#### Storage Humidity

The range of ambient humidity in % over which a module may be stored long term without damage. The storage humidity range is from 10% to 95%RH.

Outline Dimensions <Unit : mm (inch)>



**NOTE**

1. Unit : mm (inch)
2. Weight : 30g(Max.)
3. Material : AL

**Mounting Hole <Top View>**

