

# DC to DC Converters

Conformity to RoHS Directive

## Insulation Type, Ultra Compact Size, 1.5 to 25W Output, 5-year Warranty Period

### CC-E Series

#### FEATURES

- Compact size(almost half floor space of existing product).
- No tantalum capacitor and no aluminum electrolytic capacitor are used.
- Remote ON/OFF control.
- Output voltage tolerance  $\pm 3\%$ (under 10W, at single output).
- Light weight(no potting).
- It is a product conforming to RoHS directive.
- These are PWB halogen-free products.
- Both mountings of DIP type and SMD type are available.
- UL60950-1, C-UL CSA 60950-1 and EN60950-1 approved (partial approved).



#### PART NUMBERS AND RATINGS

Output power	Input voltage	Output voltage					
		3.3V	5V	12V	15V*	$\pm 12V$ (24V)	$\pm 15V^*$ (30V)
1.5W	5V	CC1R5-0503SF-E	CC1R5-0505SF-E	CC1R5-0512SF-E	CC1R5-0512SF-E	CC1R5-0512DF-E	CC1R5-0512DF-E
	12V	CC1R5-1203SF-E	CC1R5-1205SF-E	CC1R5-1212SF-E	CC1R5-1212SF-E	CC1R5-1212DF-E	CC1R5-1212DF-E
	24V	CC1R5-2403SF-E	CC1R5-2405SF-E	CC1R5-2412SF-E	CC1R5-2412SF-E	CC1R5-2412DF-E	CC1R5-2412DF-E
	48V	CC1R5-4803SF-E	CC1R5-4805SF-E	CC1R5-4812SF-E	CC1R5-4812SF-E	CC1R5-4812DF-E	CC1R5-4812DF-E
3W	5V	CC3-0503SF-E	CC3-0505SF-E	CC3-0512SF-E	CC3-0512SF-E	CC3-0512DF-E	CC3-0512DF-E
	12V	CC3-1203SF-E	CC3-1205SF-E	CC3-1212SF-E	CC3-1212SF-E	CC3-1212DF-E	CC3-1212DF-E
	24V	CC3-2403SF-E	CC3-2405SF-E	CC3-2412SF-E	CC3-2412SF-E	CC3-2412DF-E	CC3-2412DF-E
	48V	CC3-4803SF-E	CC3-4805SF-E	CC3-4812SF-E	CC3-4812SF-E	CC3-4812DF-E	CC3-4812DF-E
6W	5V	CC6-0503SF-E	CC6-0505SF-E	CC6-0512SF-E	CC6-0512SF-E	CC6-0512DF-E	CC6-0512DF-E
	12V	CC6-1203SF-E	CC6-1205SF-E	CC6-1212SF-E	CC6-1212SF-E	CC6-1212DF-E	CC6-1212DF-E
	24V	CC6-2403SF-E	CC6-2405SF-E	CC6-2412SF-E	CC6-2412SF-E	CC6-2412DF-E	CC6-2412DF-E
	48V	CC6-4803SF-E	CC6-4805SF-E	CC6-4812SF-E	CC6-4812SF-E	CC6-4812DF-E	CC6-4812DF-E
10W	5V	CC10-0503SF-E	CC10-0505SF-E	CC10-0512SF-E	CC10-0512SF-E	CC10-0512DF-E	CC10-0512DF-E
	12V	CC10-1203SF-E	CC10-1205SF-E	CC10-1212SF-E	CC10-1212SF-E	CC10-1212DF-E	CC10-1212DF-E
	24V	CC10-2403SF-E	CC10-2405SF-E	CC10-2412SF-E	CC10-2412SF-E	CC10-2412DF-E	CC10-2412DF-E
	48V	CC10-4803SF-E	CC10-4805SF-E	CC10-4812SF-E	CC10-4812SF-E	CC10-4812DF-E	CC10-4812DF-E
15W	24V	CC15-2403SF-E	CC15-2405SF-E				
25W	24V	CC25-2403SF-E	CC25-2405SF-E				

\* TRM and -Vout are shorted.

- It is possible to use the  $\pm 12V$  output as a single 24V output. It is also possible to use the  $\pm 15V$  output as a single 30V output.
- The product names in the above chart are DIP type. For SMD type, the "F" becomes an "R".

#### PRODUCT IDENTIFICATIONS

CC 1R5 - 24 05 S F - E  
(1) (2) (3) (4) (5) (6) (7)

(1) Series name

(2) Output power

1R5: 1.5W

3: 3W

6: 6W

10: 10W

15: 15W

25: 25W

(3) Input voltage

05: 5V(4.5 to 9V)

12: 12V(9 to 18V)

24: 24V(18 to 36V)

48: 48V(36 to 76V)

(4) Output voltage\*

03: 3.3V(3.15 to 3.6V)

05: 5.0V(4.75 to 6.0V)

12: 12V(11.4 to 15.0V)

\* 1.5, 3, 6, 10W: Output voltage variable function is possible.

(5) Output

S: Single output

D: Double outputs

(6) Terminal structure

F: Flow (DIP) type

R: Reflow (SMD) type

(7) Generation

E: Fifth generation

- Conformity to RoHS Directive: This means that, in conformity with EU Directive 2002/95/EC, lead, cadmium, mercury, hexavalent chromium, and specific bromine-based flame retardants, PBB and PBDE, have not been used, except for exempted applications.

• All specifications are subject to change without notice.

## CC1R5 Type

### ELECTRICAL CHARACTERISTICS

Part No.	Input voltage (V)	Output voltage <sup>*1</sup> (V)	Output current (mA)	Voltage stability			Output ripple noise voltage <sup>*3</sup> (mVp-p) typ./max.	Efficiency <sup>*4</sup> (%)	Input-output insulation
				Input (mV)max.	Load <sup>*2</sup> (mV)max.	Temperature (mV)max.			
CC1R5-0503SF-E	4.5 to 9	3.3±3%	0 to 400	20	40	80	40/120	71	Withstand voltage AC.500V 1min Resistance DC.500V 50MΩ min.
CC1R5-0505SF-E	4.5 to 9	5±3%	0 to 300	20	40	80	40/120	77	
CC1R5-0512SF-E	4.5 to 9	12±3%	0 to 125	40	100	200	30/120	80	
	4.5 to 9	15±3% <sup>*6</sup>	0 to 100	40	100	200	30/120	80	
CC1R5-0512DF-E <sup>*5</sup>	4.5 to 9	±12±5%	±0 to 60	80	600	300	30/120	79	
	4.5 to 9	±15±5% <sup>*6</sup>	±0 to 50	80	600	300	30/120	79	
CC1R5-1203SF-E	9 to 18	3.3±3%	0 to 400	20	40	80	40/120	73	
CC1R5-1205SF-E	9 to 18	5±3%	0 to 300	20	40	80	40/120	78	
CC1R5-1212SF-E	9 to 18	12±3%	0 to 125	40	100	200	30/120	82	
	9 to 18	15±3% <sup>*6</sup>	0 to 100	40	100	200	30/120	82	
CC1R5-1212DF-E <sup>*5</sup>	9 to 18	±12±5%	±0 to 60	80	600	300	30/120	81	
	9 to 18	±15±5% <sup>*6</sup>	±0 to 50	80	600	300	30/120	81	
CC1R5-2403SF-E	18 to 36	3.3±3%	0 to 400	20	40	80	40/120	72	
CC1R5-2405SF-E	18 to 36	5±3%	0 to 300	20	40	80	40/120	77	
CC1R5-2412SF-E	18 to 36	12±3%	0 to 125	40	100	200	30/120	81	
	18 to 36	15±3% <sup>*6</sup>	0 to 100	40	100	200	30/120	81	
CC1R5-2412DF-E <sup>*5</sup>	18 to 36	±12±5%	±0 to 60	80	600	300	30/120	79	
	18 to 36	±15±5% <sup>*6</sup>	±0 to 50	80	600	300	30/120	79	
CC1R5-4803SF-E	36 to 76	3.3±3%	0 to 400	20	40	80	40/120	70	
CC1R5-4805SF-E	36 to 76	5±3%	0 to 300	20	40	80	40/120	76	
CC1R5-4812SF-E	36 to 76	12±3%	0 to 125	40	100	200	30/120	80	
	36 to 76	15±3% <sup>*6</sup>	0 to 100	40	100	200	30/120	80	
CC1R5-4812DF-E <sup>*5</sup>	36 to 76	±12±5%	±0 to 60	80	600	300	30/120	79	
	36 to 76	±15±5% <sup>*6</sup>	±0 to 50	80	600	300	30/120	79	

\*1 Total output voltage is including input, load, and temperature regulation.

\*2 When the condition is 2-output, it is the balance load (balance load means the condition when the load current of +output and -output is equal).

\*3 Measurement bandwidth: 50MHz

\*4 Typical input voltage, maximum output current.

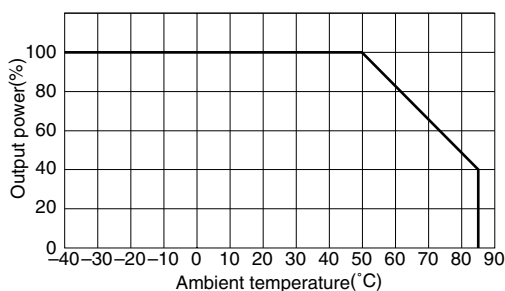
\*5 2-output products may be used as 24-30V single output with COM. terminal open.

\*6 TRM and -Vout are shorted.

• Trim range: 3.3Vout is 3.15 to 3.6V, 5Vout is 4.75 to 6V, 12Vout is 11.4 to 15V, ±12Vout is ±11.4 to ±15V (22.8 to 30V).

• The product names in the above chart are for DIP type. For SMD type, the "F" becomes an "R".

### OUTPUT POWER - AMBIENT TEMPERATURE(DERATING)



### COMMON SPECIFICATIONS

Overcurrent protection	Output current limitation system, auto recovery type
Operating temperature range	-40 to +85°C [Derating is necessary when operating environment temperature exceed 50°C]
Storage temperature range	-40 to +85°C
Humidity range	95(%)RH max. [Maximum wet-bulb temperature: 38°C]
Vibration	10 to 55Hz, all amplitude 1.52mm, sweep time 15min. [3 directions of X, Y, Z, each 2h]
Amplitude	980m/s <sup>2</sup> (100G) 6ms [6 directions, each 3 times]
Withstand voltage Eac	Input to output, input to case, output to case: 500V, 1min.
Insulation resistance	Input to output, input to case, output to case: 50MΩ min. [DC.500V]
Safety standards	UL60950-1, C-UL(CSA22.2 No.60950-1), EN60950-1 certified
Weight	3.2g



## CC3 Type

### ELECTRICAL CHARACTERISTICS

Part No.	Input voltage (V)	Output voltage <sup>*1</sup> (V)	Output current (mA)	Voltage stability			Output ripple noise voltage <sup>*3</sup> (mVp-p) typ./max.	Efficiency <sup>*4</sup> (%)	Input-output insulation
				Input (mV)max.	Load <sup>*2</sup> (mV)max.	Temperature (mV)max.			
CC3-0503SF-E	4.5 to 9	3.3±3%	0 to 800	20	40	80	40/120	73	Withstand voltage AC.500V 1min Resistance DC.500V 50MΩ min.
CC3-0505SF-E	4.5 to 9	5±3%	0 to 600	20	40	80	40/120	77	
CC3-0512SF-E	4.5 to 9	12±3%	0 to 250	40	100	200	30/120	82	
	4.5 to 9	15±3% <sup>*6</sup>	0 to 200	40	100	200	30/120	82	
CC3-0512DF-E <sup>*5</sup>	4.5 to 9	±12±5%	±0 to 125	80	600	300	30/120	81	
	4.5 to 9	±15±5% <sup>*6</sup>	±0 to 100	80	600	300	30/120	81	
CC3-1203SF-E	9 to 18	3.3±3%	0 to 800	20	40	80	40/120	74	
CC3-1205SF-E	9 to 18	5±3%	0 to 600	20	40	80	40/120	79	
CC3-1212SF-E	9 to 18	12±3%	0 to 250	40	100	200	30/120	82	
	9 to 18	15±3% <sup>*6</sup>	0 to 200	40	100	200	30/120	82	
CC3-1212DF-E <sup>*5</sup>	9 to 18	±12±5%	±0 to 125	80	600	300	30/120	81	
	9 to 18	±15±5% <sup>*6</sup>	±0 to 100	80	600	300	30/120	81	
CC3-2403SF-E	18 to 36	3.3±3%	0 to 800	20	40	80	40/120	73	
CC3-2405SF-E	18 to 36	5±3%	0 to 600	20	40	80	40/120	78	
CC3-2412SF-E	18 to 36	12±3%	0 to 250	40	100	200	30/120	82	
	18 to 36	15±3% <sup>*6</sup>	0 to 200	40	100	200	30/120	82	
CC3-2412DF-E <sup>*5</sup>	18 to 36	±12±5%	±0 to 125	80	600	300	30/120	81	
	18 to 36	±15±5% <sup>*6</sup>	±0 to 100	80	600	300	30/120	81	
CC3-4803SF-E	36 to 76	3.3±3%	0 to 800	20	40	80	40/120	73	
CC3-4805SF-E	36 to 76	5±3%	0 to 600	20	40	80	40/120	79	
CC3-4812SF-E	36 to 76	12±3%	0 to 250	40	100	200	30/120	81	
	36 to 76	15±3% <sup>*6</sup>	0 to 200	40	100	200	30/120	81	
CC3-4812DF-E <sup>*5</sup>	36 to 76	±12±5%	±0 to 125	80	600	300	30/120	80	
	36 to 76	±15±5% <sup>*6</sup>	±0 to 100	80	600	300	30/120	80	

\*1 Total output voltage is including input, load, and temperature regulation.

\*2 When the condition is 2-output, it is the balance load (balance load means the condition when the load current of +output and -output is equal).

\*3 Measurement bandwidth: 50MHz

\*4 Typical input voltage, maximum output current.

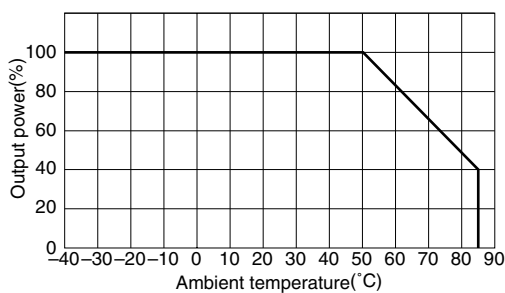
\*5 2-output products may be used as 24-30V single output with COM. terminal open.

\*6 TRM and -Vout are shorted.

• Trim range: 3.3Vout is 3.15 to 3.6V, 5Vout is 4.75 to 6V, 12Vout is 11.4 to 15V, ±12Vout is ±11.4 to ±15V (22.8 to 30V).

• The product names in the above chart are for DIP type. For SMD type, the "F" becomes an "R".

### OUTPUT POWER - AMBIENT TEMPERATURE(DERATING)



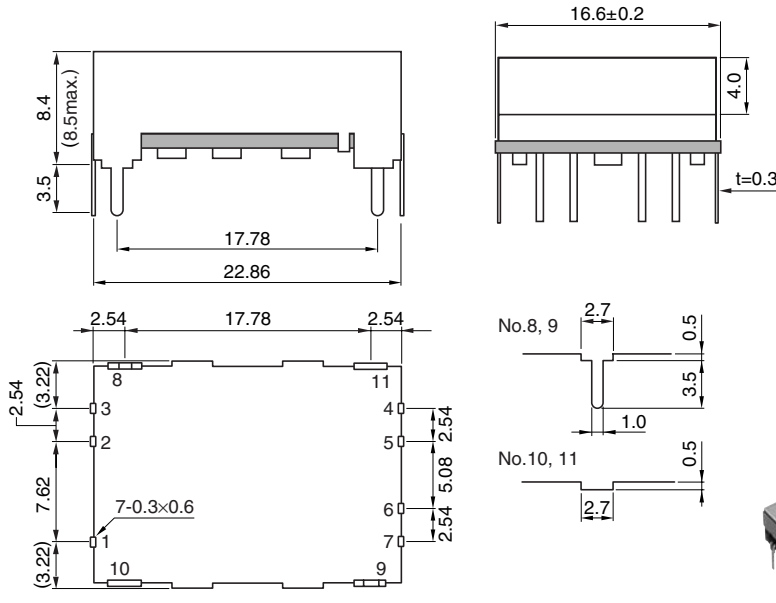
### COMMON SPECIFICATIONS

Overcurrent protection	Output current limitation system, auto recovery type
Operating temperature range	-40 to +85°C [Derating is necessary when operating environment temperature exceed 50°C]
Storage temperature range	-40 to +85°C
Humidity range	95(%)RH max. [Maximum wet-bulb temperature: 38°C]
Amplitude	10 to 55Hz, all amplitude 1.52mm, sweep time 15min. [3 directions of X, Y, Z, each 2h]
Vibration	980m/s <sup>2</sup> (100G) 6ms [6 directions, each 3 times]
Withstand voltage Eac	Input to output, input to case, output to case: 500V, 1min.
Insulation resistance	Input to output, input to case, output to case: 50MΩ min. [DC.500V]
Safety standards	UL60950-1, C-UL(CSA22.2 No.60950-1), EN60950-1 certified
Weight	4.5g

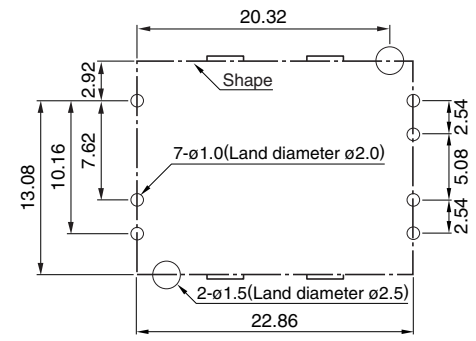
# CC3 Type

## SHAPES AND DIMENSIONS

### CC3-□□□□F-E (DIP TYPE)

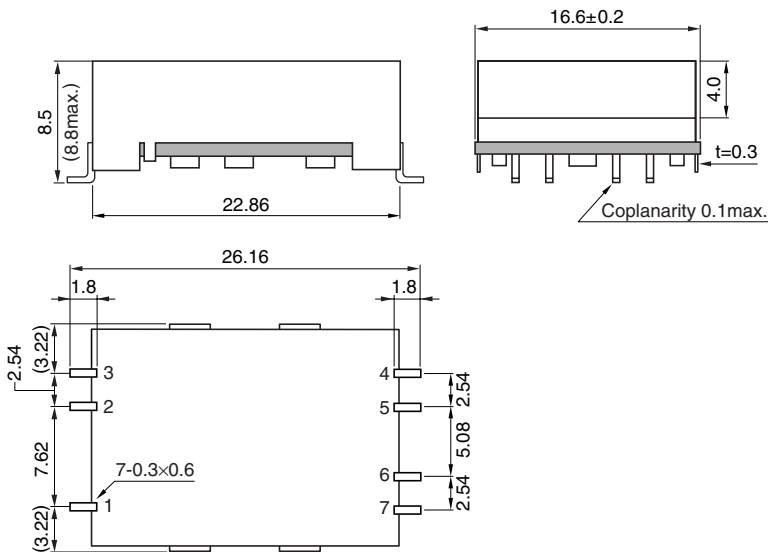


### RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]

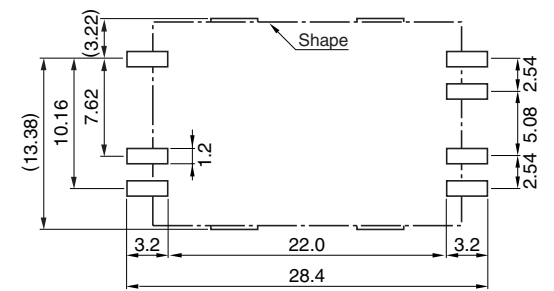


Dimensions in mm  
Tolerance: ±0.5

### CC3-□□□□R-E (SMD TYPE)



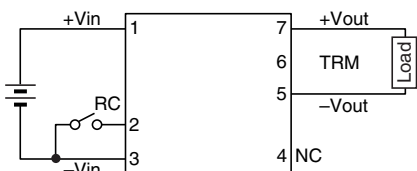
### RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]



Dimensions in mm  
Tolerance: ±0.5

## CONNECTIONS

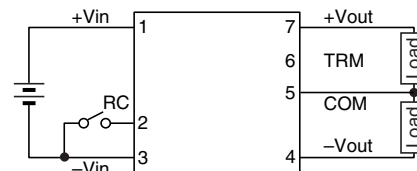
### CC3-□□□□S□-E



### TERMINAL PIN CONFIGURATION

No.1	+Vin
No.2	RC
No.3	-Vin
No.4	NC
No.5	-Vout
No.6	TRM
No.7	+Vout

### CC3-□□□□D□-E



### TERMINAL PIN CONFIGURATION

No.1	+Vin
No.2	RC
No.3	-Vin
No.4	-Vout
No.5	Common out
No.6	TRM
No.7	+Vout

• All specifications are subject to change without notice.

## CC6 Type

### ELECTRICAL CHARACTERISTICS

Part No.	Input voltage (V)	Output voltage <sup>*1</sup> (V)	Output current (mA)	Voltage stability			Output ripple noise voltage <sup>*3</sup> (mVp-p) typ./max.	Efficiency <sup>*4</sup> (%)	Input-output insulation
				Input (mV)max.	Load <sup>*2</sup> (mV)max.	Temperature (mV)max.			
CC6-0503SF-E	4.5 to 9	3.3±3%	0 to 1200	20	40	80	40/120	76	Withstand voltage AC.500V 1min Resistance DC.500V 50MΩ min.
CC6-0505SF-E	4.5 to 9	5±3%	0 to 1000	20	40	80	40/120	79	
CC6-0512SF-E	4.5 to 9	12±3%	0 to 500	40	100	200	30/120	82	
	4.5 to 9	15±3% <sup>*6</sup>	0 to 400	40	100	200	30/120	82	
CC6-0512DF-E <sup>*5</sup>	4.5 to 9	±12±5%	±0 to 250	80	600	300	30/120	82	
	4.5 to 9	±15±5% <sup>*6</sup>	±0 to 200	80	600	300	30/120	82	
CC6-1203SF-E	9 to 18	3.3±3%	0 to 1200	20	40	80	40/120	78	
CC6-1205SF-E	9 to 18	5±3%	0 to 1200	20	40	80	40/120	82	
CC6-1212SF-E	9 to 18	12±3%	0 to 500	40	100	200	30/120	85	
	9 to 18	15±3% <sup>*6</sup>	0 to 400	40	100	200	30/120	85	
CC6-1212DF-E <sup>*5</sup>	9 to 18	±12±5%	±0 to 250	80	600	300	30/120	85	
	9 to 18	±15±5% <sup>*6</sup>	±0 to 200	80	600	300	30/120	85	
CC6-2403SF-E	18 to 36	3.3±3%	0 to 1200	20	40	80	40/120	77	
CC6-2405SF-E	18 to 36	5±3%	0 to 1200	20	40	80	40/120	81	
CC6-2412SF-E	18 to 36	12±3%	0 to 500	40	100	200	30/120	87	
	18 to 36	15±3% <sup>*6</sup>	0 to 400	40	100	200	30/120	87	
CC6-2412DF-E <sup>*5</sup>	18 to 36	±12±5%	±0 to 250	80	600	300	30/120	86	
	18 to 36	±15±5% <sup>*6</sup>	±0 to 200	80	600	300	30/120	86	
CC6-4803SF-E	36 to 76	3.3±3%	0 to 1200	20	40	80	40/120	77	
CC6-4805SF-E	36 to 76	5±3%	0 to 1200	20	40	80	40/120	81	
CC6-4812SF-E	36 to 76	12±3%	0 to 500	40	100	200	30/120	86	
	36 to 76	15±3% <sup>*6</sup>	0 to 400	40	100	200	30/120	86	
CC6-4812DF-E <sup>*5</sup>	36 to 76	±12±5%	±0 to 250	80	600	300	30/120	86	
	36 to 76	±15±5% <sup>*6</sup>	±0 to 200	80	600	300	30/120	86	

\*1 Total output voltage is including input, load, and temperature regulation.

\*2 When the condition is 2-output, it is the balance load (balance load means the condition when the load current of +output and -output is equal).

\*3 Measurement bandwidth: 50MHz

\*4 Typical input voltage, maximum output current

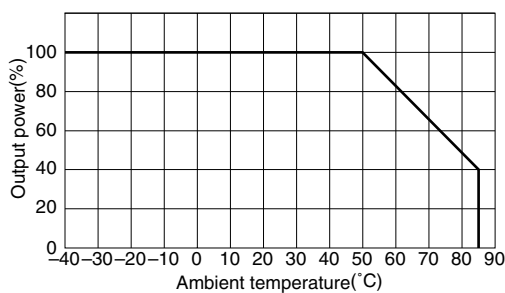
\*5 2-output products may be used as 24-30V single output with COM. terminal open.

\*6 TRM and -Vout are shorted.

• Trim range: 3.3Vout is 3.15 to 3.6V, 5Vout is 4.75 to 6V, 12Vout is 11.4 to 15V, ±12Vout is ±11.4 to ±15V (22.8 to 30V).

• The product names in the above chart are for DIP type. For SMD type, the "F" becomes an "R".

### OUTPUT POWER - AMBIENT TEMPERATURE(DERATING)



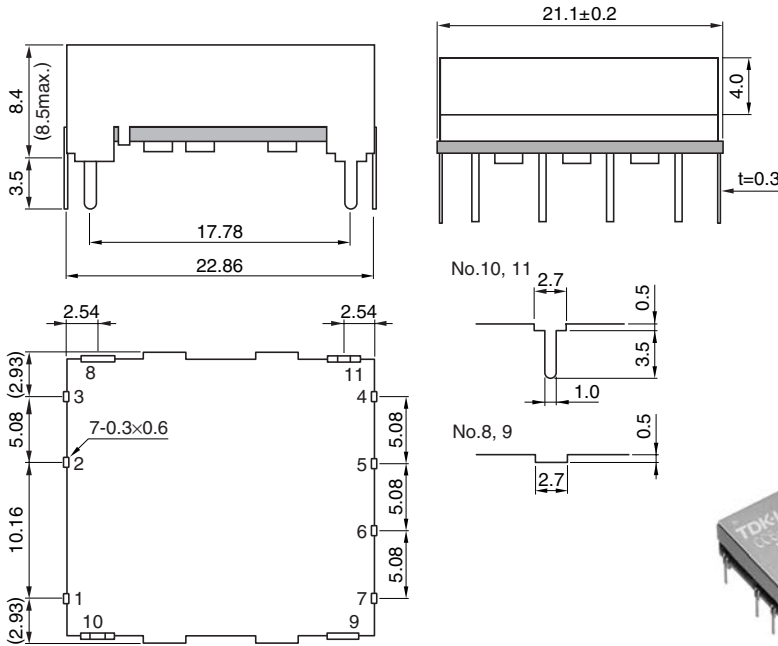
### COMMON SPECIFICATIONS

Overcurrent protection	Output current limitation system, auto recovery type
Operating temperature range	-40 to +85°C [Derating is necessary when operating environment temperature exceed 50°C]
Storage temperature range	-40 to +85°C
Humidity range	95(%)RH max. [Maximum wet-bulb temperature: 38°C]
Amplitude	10 to 55Hz, all amplitude 1.52mm, sweep time 15min. [3 directions of X, Y, Z, each 2h]
Vibration	980m/s <sup>2</sup> (100G) 6ms [6 directions, each 3 times]
Withstand voltage Eac	Input to output, input to case, output to case: 500V, 1min.
Insulation resistance	Input to output, input to case, output to case: 50MΩ min. [DC.500V]
Safety standards	UL60950-1, C-UL(CSA22.2 No.60950-1), EN60950-1 certified
Weight	5.8g

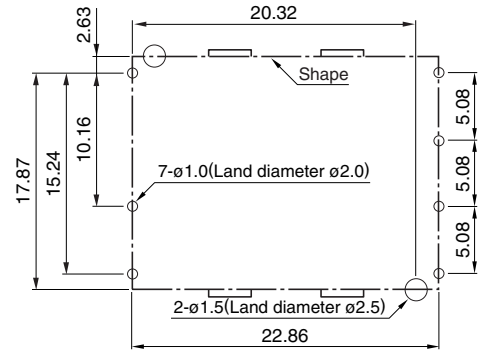
# CC6 Type

## SHAPES AND DIMENSIONS

### CC6-□□□□F-E (DIP TYPE)

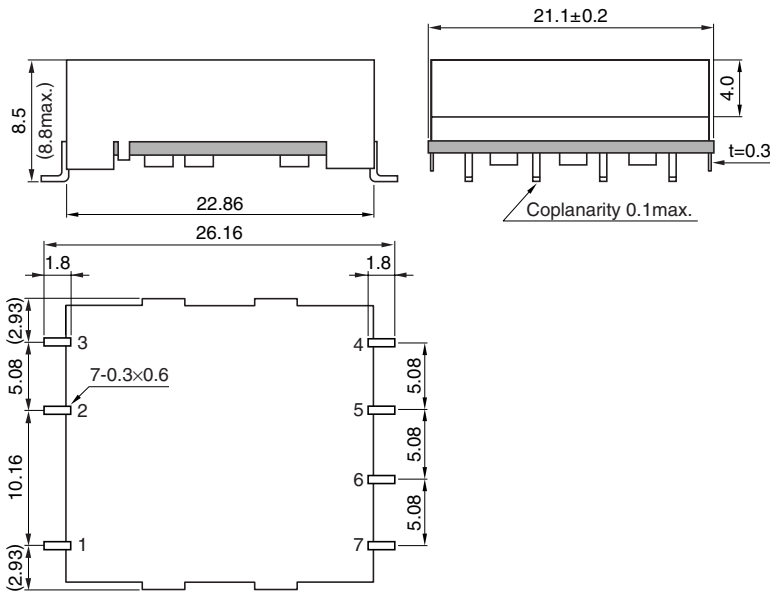


### RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]

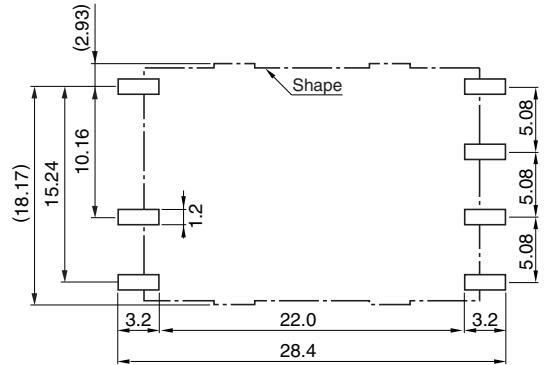


Dimensions in mm  
Tolerance: ±0.5

### CC6-□□□□R-E (SMD TYPE)



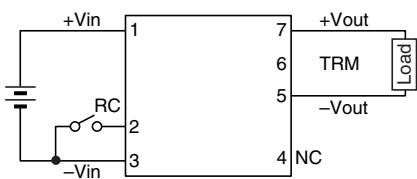
### RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]



Dimensions in mm  
Tolerance: ±0.5

## CONNECTIONS

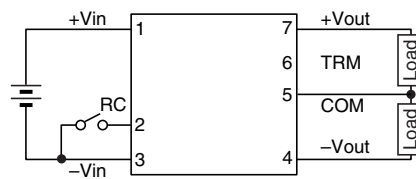
### CC6-□□□□S□-E



### TERMINAL PIN CONFIGURATION

No.1	+Vin
No.2	RC
No.3	-Vin
No.4	NC
No.5	-Vout
No.6	TRM
No.7	+Vout

### CC6-□□□□D□-E



### TERMINAL PIN CONFIGURATION

No.1	+Vin
No.2	RC
No.3	-Vin
No.4	-Vout
No.5	Common out
No.6	TRM
No.7	+Vout

• All specifications are subject to change without notice.

## CC10 Type

### ELECTRICAL CHARACTERISTICS

Part No.	Input voltage (V)	Output voltage <sup>*1</sup> (V)	Output current (mA)	Voltage stability			Output ripple noise voltage <sup>*3</sup> (mVp-p) typ./max.	Efficiency <sup>*4</sup> (%)	Input-output insulation
				Input (mV)max.	Load <sup>*2</sup> (mV)max.	Temperature (mV)max.			
CC10-0503SF-E	4.5 to 9	3.3±3%	0 to 2500	20	40	80	40/120	84	Withstand voltage AC.500V 1min Resistance DC.500V 50MΩ min.
CC10-0505SF-E	4.5 to 9	5±3%	0 to 2000	20	40	80	40/120	84	
CC10-0512SF-E	4.5 to 9	12±3%	0 to 800	40	100	200	30/120	84	
	4.5 to 9	15±3% <sup>*6</sup>	0 to 640	40	100	200	30/120	84	
CC10-0512DF-E <sup>*5</sup>	4.5 to 9	±12±5%	±0 to 400	80	600	300	30/120	83	
	4.5 to 9	±15±5% <sup>*6</sup>	±0 to 320	80	600	300	30/120	83	
CC10-1203SF-E	9 to 18	3.3±3%	0 to 2500	20	40	80	40/120	84	
CC10-1205SF-E	9 to 18	5±3%	0 to 2000	20	40	80	40/120	86	
CC10-1212SF-E	9 to 18	12±3%	0 to 1000	40	100	200	30/120	88	
	9 to 18	15±3% <sup>*6</sup>	0 to 800	40	100	200	30/120	88	
CC10-1212DF-E <sup>*5</sup>	9 to 18	±12±5%	±0 to 450	80	600	300	30/120	86	
	9 to 18	±15±5% <sup>*6</sup>	±0 to 360	80	600	300	30/120	86	
CC10-2403SF-E	18 to 36	3.3±3%	0 to 2500	20	40	80	40/120	84	
CC10-2405SF-E	18 to 36	5±3%	0 to 2000	20	40	80	40/120	86	
CC10-2412SF-E	18 to 36	12±3%	0 to 1000	40	100	200	30/120	87	
	18 to 36	15±3% <sup>*6</sup>	0 to 800	40	100	200	30/120	87	
CC10-2412DF-E <sup>*5</sup>	18 to 36	±12±5%	±0 to 450	80	600	300	30/120	86	
	18 to 36	±15±5% <sup>*6</sup>	±0 to 360	80	600	300	30/120	86	
CC10-4803SF-E	36 to 76	3.3±3%	0 to 2500	20	40	80	40/120	84	
CC10-4805SF-E	36 to 76	5±3%	0 to 2000	20	40	80	40/120	86	
CC10-4812SF-E	36 to 76	12±3%	0 to 1000	40	100	200	30/120	88	
	36 to 76	15±3% <sup>*6</sup>	0 to 800	40	100	200	30/120	88	
CC10-4812DF-E <sup>*5</sup>	36 to 76	±12±5%	±0 to 450	80	600	300	30/120	86	
	36 to 76	±15±5% <sup>*6</sup>	±0 to 360	80	600	300	30/120	86	

\*1 Total output voltage is including input, load, and temperature regulation.

\*2 When the condition is 2-output, it is the balance load (balance load means the condition when the load current of +output and -output is equal).

\*3 Measurement bandwidth: 50MHz

\*4 Typical input voltage, maximum output current

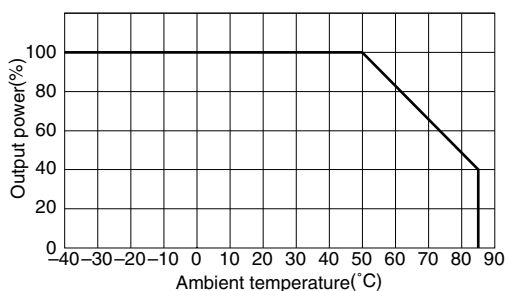
\*5 2-output products may be used as 24-30V single output with COM. terminal open.

\*6 TRM and -Vout are shorted.

• Trim range: 3.3Vout is 3.15 to 3.6V, 5Vout is 4.75 to 6V, 12Vout is 11.4 to 15V, ±12Vout is ±11.4 to ±15V (22.8 to 30V).

• The product names in the above chart are for DIP type. For SMD type, the "F" becomes an "R".

### OUTPUT POWER - AMBIENT TEMPERATURE(DERATING)



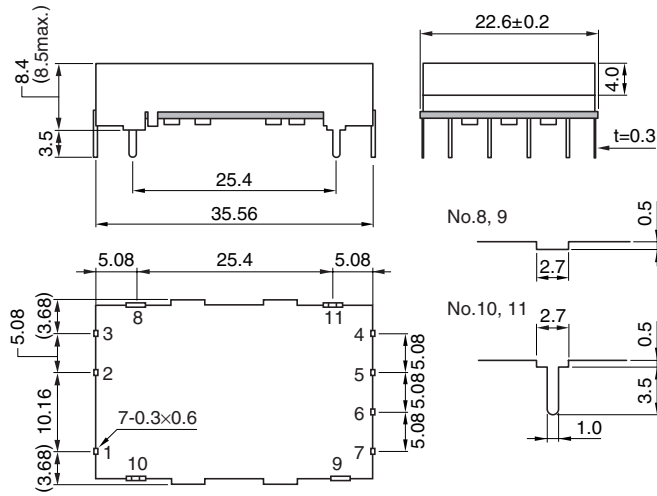
### COMMON SPECIFICATIONS

Overcurrent protection	Output current limitation system, auto recovery type
Operating temperature range	-40 to +85°C [Derating is necessary when operating environment temperature exceed 50°C]
Storage temperature range	-40 to +85°C
Humidity range	95(%)RH max. [Maximum wet-bulb temperature: 38°C]
Amplitude	10 to 55Hz, all amplitude 1.52mm, sweep time 15min.[3 directions of X, Y, Z, each 2h]
Vibration	980m/s <sup>2</sup> (100G) 6ms[6 directions, each 3 times]
Withstand voltage Eac	Input to output, input to case, output to case: 500V, 1min.
Insulation resistance	Input to output, input to case, output to case: 50MΩ min.[DC.500V]
Safety standards	UL60950-1, C-UL(CSA22.2 No.60950-1), EN60950-1 Acquisition will be made.
Weight	10.0g

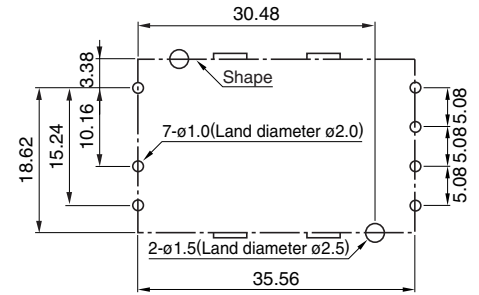
# CC10 Type

## SHAPES AND DIMENSIONS

### CC10-□□□□□F-E (DIP TYPE)

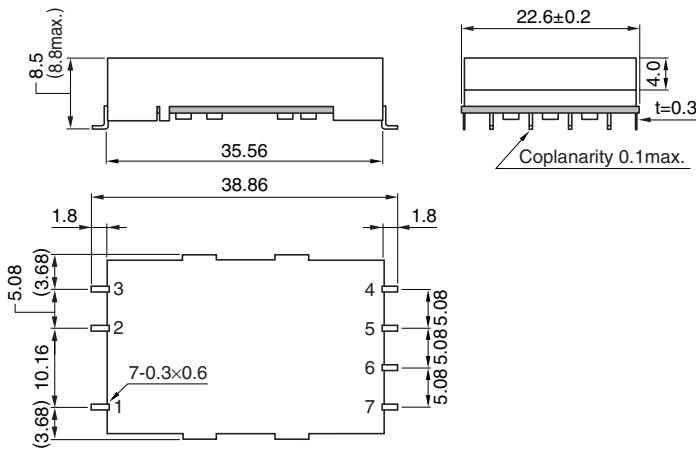


### RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]

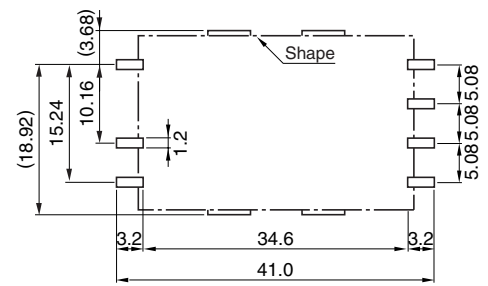


Dimensions in mm  
Tolerance: ±0.5

### CC10-□□□□□R-E (SMD TYPE)



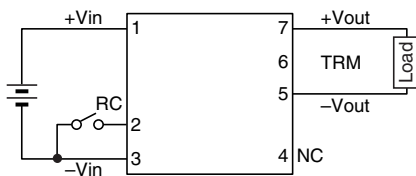
### RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]



Dimensions in mm  
Tolerance: ±0.5

## CONNECTIONS

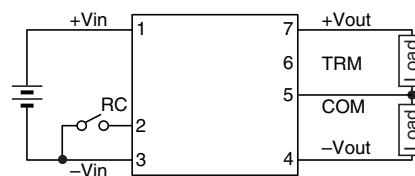
### CC10-□□□□□S□-E



#### TERMINAL PIN CONFIGURATION

No.1	+Vin
No.2	RC
No.3	-Vin
No.4	NC
No.5	-Vout
No.6	TRM
No.7	+Vout

### CC10-□□□□□D□-E



#### TERMINAL PIN CONFIGURATION

No.1	+Vin
No.2	RC
No.3	-Vin
No.4	-Vout
No.5	Common out
No.6	TRM
No.7	+Vout

• All specifications are subject to change without notice.

## CC15 Type

### ELECTRICAL CHARACTERISTICS

Part No.	Input voltage (V)	Output voltage <sup>*1</sup> (V)	Output current (mA)	Voltage stability			Output ripple noise voltage <sup>*2</sup> (mVp-p) typ./max.	Efficiency <sup>*3</sup> (%)	Input-output insulation
				Input (mV)max.	Load (mV)max.	Temperature (mV)max.			
CC15-2403SF-E	18 to 36	3.3/-3 to +5%	0 to 4500	40	120	80	40/120	89	Withstand voltage AC.500V 1min Resistance DC.500V 50MΩ min.
CC15-2405SF-E	18 to 36	5.0/-3 to +5%	0 to 3000	50	200	80	40/120	89	

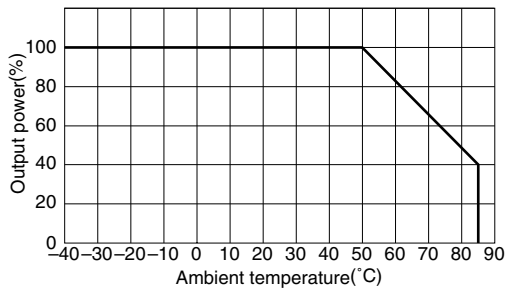
\*1 Total output voltage is including input, load, and temperature regulation.

\*2 Measurement bandwidth: 50MHz

\*3 Typical input voltage, maximum output current

• The product names in the above chart are for DIP type. For SMD type, the "F" becomes an "R".

### OUTPUT POWER - AMBIENT TEMPERATURE(DERATING)

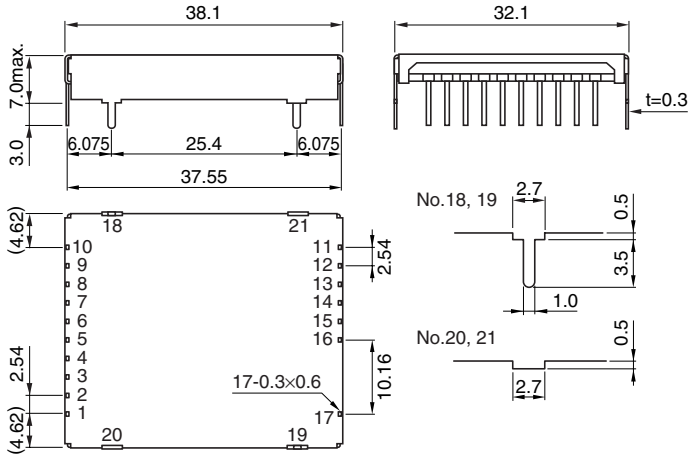


### COMMON SPECIFICATIONS

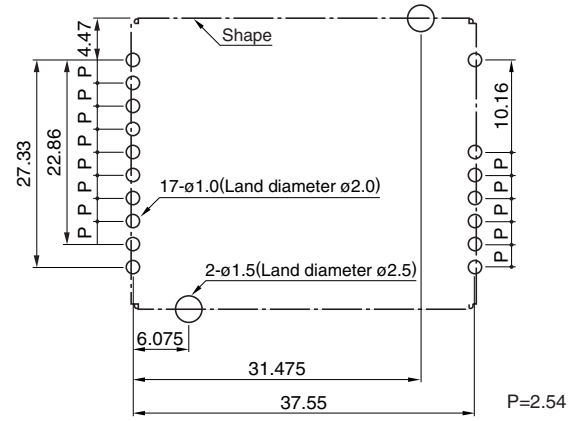
Overcurrent protection	Output current limitation system, Output voltage shut-down type
Operating temperature range	-40 to +85°C [Derating is necessary when operating environment temperature exceed 50°C]
Storage temperature range	-40 to +85°C
Humidity range	95(%)RH max. [Maximum wet-bulb temperature: 38°C]
Amplitude	10 to 55Hz, all amplitude 1.52mm, sweep time 15min.[3 directions of X, Y, Z, each 2h]
Vibration	980m/s <sup>2</sup> (100G) 6ms[6 directions, each 3 times]
Withstand voltage Eac	Input to output, input to case, output to case: 500V, 1min.
Insulation resistance	Input to output, input to case, output to case: 50MΩ min.[DC.500V]
Safety standards	UL60950-1, C-UL(CSA22.2 No.60950-1), EN60950-1 certified
Weight	12.5g

# CC15 Type

## SHAPES AND DIMENSIONS CC15-□□□□SF-E (DIP TYPE)

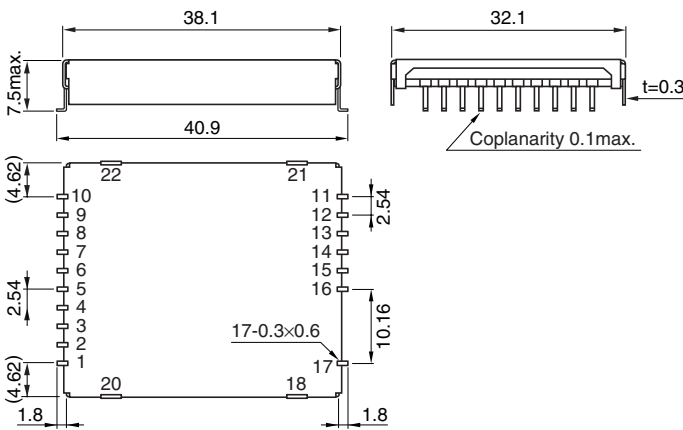


## RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]

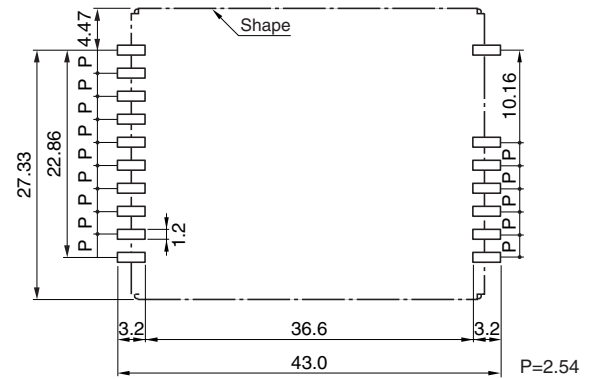


Dimensions in mm  
Tolerance: ±0.5

## CC15-□□□□SR-E (SMD TYPE)

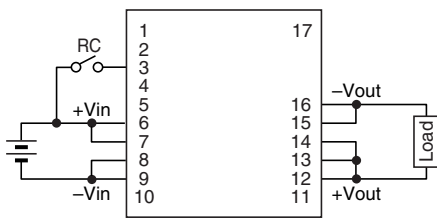


## RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]



Dimensions in mm  
Tolerance: ±0.5

## CONNECTION



## TERMINAL PIN CONFIGURATION

No.1	NC	No.10	NC
No.2	NC	No.11	NC
No.3	RC	No.12	+Vout
No.4	NC	No.13	+Vout
No.5	NC	No.14	+Vout
No.6	+Vin	No.15	-Vout
No.7	+Vin	No.16	-Vout
No.8	-Vin	No.17	NC
No.9	-Vin		



• All specifications are subject to change without notice.

## CC25 Type

### ELECTRICAL CHARACTERISTICS

Part No.	Input voltage (V)	Output voltage <sup>*1</sup> (V)	Output current (mA)	Voltage stability			Output ripple noise voltage <sup>*2</sup> (mVp-p) typ./max.	Efficiency <sup>*3</sup> (%)	Input-output insulation
				Input (mV)max.	Load (mV)max.	Temperature (mV)max.			
CC25-2403SF-E	18 to 36	3.3/-3 to +5%	0 to 7500	40	120	80	40/120	90	Withstand voltage AC.500V 1min Resistance DC.500V 50MΩ min.
CC25-2405SF-E	18 to 36	5.0/-3 to +5%	0 to 5000	50	200	80	40/120	90	

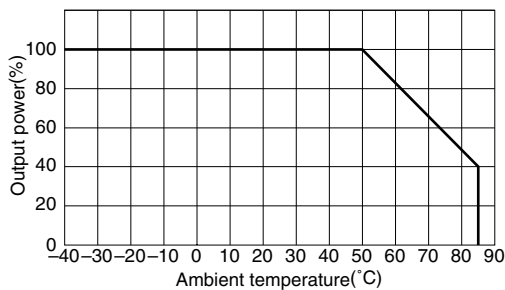
\*1 Total output voltage is including input, load, and temperature regulation.

\*2 Measurement bandwidth: 50MHz

\*3 Typical input voltage, maximum output current

• The product names in the above chart are for DIP type. For SMD type, the "F" becomes an "R".

### OUTPUT POWER - AMBIENT TEMPERATURE(DERATING)

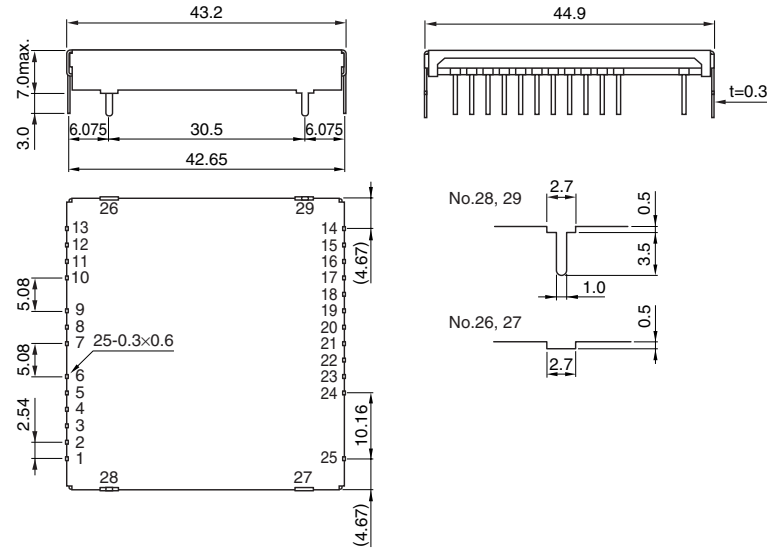


### COMMON SPECIFICATIONS

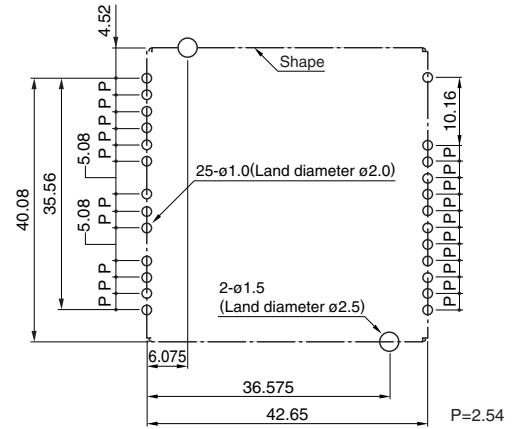
Overcurrent protection	Output current limitation system, Output voltage shut-down type
Operating temperature range	-40 to +85°C [Derating is necessary when operating environment temperature exceed 50°C]
Storage temperature range	-40 to +85°C
Humidity range	95(%)RH max. [Maximum wet-bulb temperature: 38°C]
Amplitude	10 to 55Hz, all amplitude 1.52mm, sweep time 15min.[3 directions of X, Y, Z, each 2h]
Vibration	980m/s <sup>2</sup> (100G) 6ms[6 directions, each 3 times]
Withstand voltage Eac	Input to output, input to case, output to case: 500V, 1min.
Insulation resistance	Input to output, input to case, output to case: 50MΩ min.[DC.500V]
Safety standards	UL60950-1, C-UL(CSA22.2 No.60950-1), EN60950-1 certified
Weight	20.0g

# CC25 Type

## SHAPES AND DIMENSIONS CC25-□□□□SF-E (DIP TYPE)

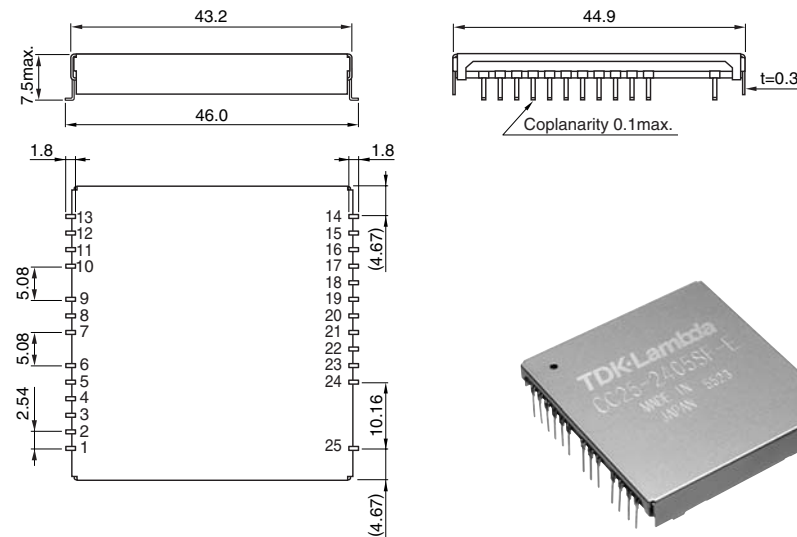


## RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]

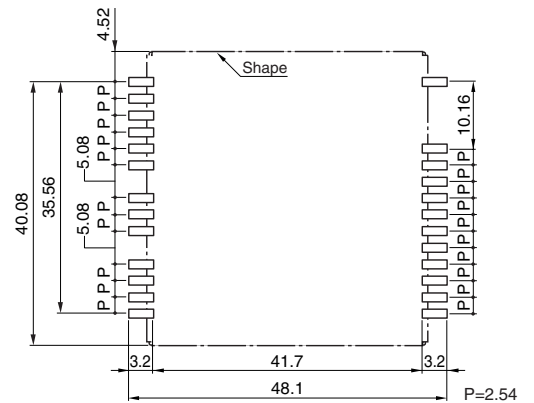


Dimensions in mm  
Tolerance: ±0.5

## CC25-□□□□SR-E (SMD TYPE)

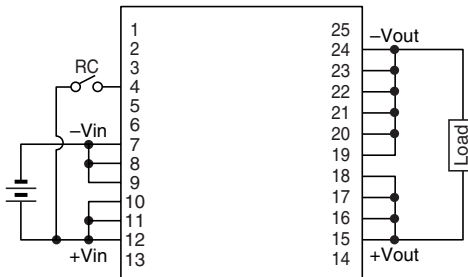


## RECOMMENDED PWB HOLE SIZE, LOCATION [TOP VIEW]



Dimensions in mm  
Tolerance: ±0.5

## CONNECTION



## TERMINAL PIN CONFIGURATION

No.1 NC	No.10 +Vin	No.19 -Vout
No.2 NC	No.11 +Vin	No.20 -Vout
No.3 NC	No.12 +Vin	No.21 -Vout
No.4 RC	No.13 NC	No.22 -Vout
No.5 NC	No.14 NC	No.23 -Vout
No.6 NC	No.15 +Vout	No.24 -Vout
No.7 -Vin	No.16 +Vout	No.25 NC
No.8 -Vin	No.17 +Vout	
No.9 -Vin	No.18 +Vout	

## Characteristics, Functions, and Applications

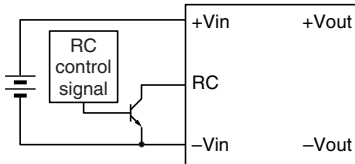
### REMOTE CONTROL TERMINAL(RC)

#### 1.5 to 10W TYPES

When the RC terminal is open, the output is OFF, and when the RC terminal and  $-V_{in}$  are shorted (0 to 0.4V) the output is ON. It is recommended to use an open collector as the control method for the remote control terminal. If other methods are necessary, please contact TDK first.

In addition, please use a transistor with  $V_{CE}$ : Over  $V_{in}$  and  $I_c$ : Over 1mA.

Also, if the remote control function is not used, please short the RC terminal and  $-V_{in}$ .

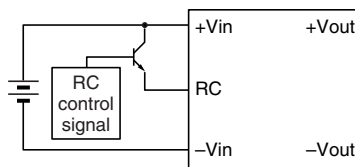


#### 15, 25W TYPES

When the RC terminal is open, the output is ON, and when the RC terminal is HIGH (connected to  $+V_{in}$ ) the output is OFF.

It is recommended to use an open collector as the connection method. If other methods are necessary, please contact TDK first. In addition, please use a transistor with  $V_{CE}$ : Over  $V_{in}$  and  $I_c$ : Over 1mA.

Also, if this function is not used, be sure to leave the RC terminal open.



### OUTPUT VARIABLE TERMINAL(TRM)(1.5 to 10W TYPE)

If the TRM terminal is connected to the plus output terminal ( $+V_{out}$ ) or minus output terminal ( $-V_{out}$ ), it is possible to output the following output voltages.

If the output voltage is not variable, please leave this terminal open.

Product name	Open	$-V_{out}$ & short
xx03Sx	3.3V	3.6V
xx05Sx	5.0V	6.0V
xx12Sx	12V	15V
xx12Dx	$\pm 12V$	$\pm 15V$

Also, if these terminals are connected to the resistor and not the short, it is possible to change the voltage as shown below.

Product name	Open	$-V_{out}$ & resistance connection	$+V_{out}$ & resistance connection
xx03Sx	3.3V	3.3 to 3.6V <sup>*1</sup>	3.15 to 3.3V <sup>*5</sup>
xx05Sx	5.0V	5 to 6V <sup>*2</sup>	4.75 to 5V <sup>*6</sup>
xx12Sx	12V	12 to 15V <sup>*3</sup>	11.4 to 12V <sup>*7</sup>
xx12Dx	$\pm 12V$	$\pm 12$ to $\pm 15V$ <sup>*4</sup>	$\pm 11.4$ to $\pm 12V$ <sup>*8</sup>

#### Calculation Formula

Connection resistance:  $R_a, R_b(k\Omega)$

$$*1 V_{out} = 1.26 \times (91.5 + 2.62R_a) / (32 + R_a)$$

$$*2 V_{out} = 1.26 \times (84.8 + 3.98R_a) / (17.8 + R_a)$$

$$*3 V_{out} = 1.26 \times (201 + 9.53R_a) / (16.9 + R_a)$$

$$*4 V_{out} = \{1.26 \times (429 + 19.1R_a) / (18 + R_a)\} / 2$$

$$*5 V_{out} = 1.26 \times (91.5 + 2.62R_b) / (39.6 + R_b) \quad (R_b \geq 62)$$

$$*6 V_{out} = 1.26 \times (84.8 + 3.98R_b) / (31.8 + R_b) \quad (R_b \geq 160)$$

$$*7 V_{out} = 1.26 \times (201 + 9.53R_b) / (57 + R_b) \quad (R_b \geq 620)$$

$$*8 V_{out} = \{1.26 \times (429 + 19.1R_b) / (103 + R_b)\} / 2 \quad (R_b \geq 1500)$$

$R_a$  &  $R_b$  calculation based on the specified output voltage

$$*1 R_a = (115.29 - 32V_o) / (V_o - 3.30)$$

$$*2 R_a = (106.85 - 17.8V_o) / (V_o - 5.01)$$

$$*3 R_a = (253.26 - 16.9V_o) / (V_o - 12.01)$$

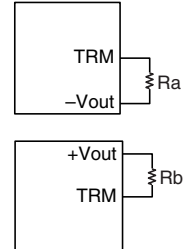
$$*4 R_a = (540.54 - 36V_o) / (2V_o - 24.07)$$

$$*5 R_b = (39.6V_o - 115.29) / (3.30 - V_o)$$

$$*6 R_b = (31.8V_o - 106.85) / (5.01 - V_o)$$

$$*7 R_b = (57V_o - 253.26) / (12.01 - V_o)$$

$$*8 R_b = (206V_o - 540.54) / (24.07 - 2V_o)$$



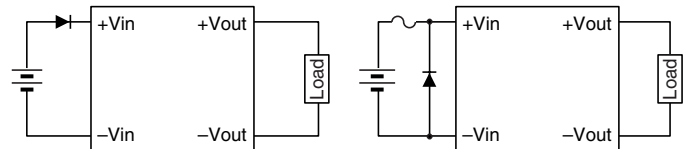
Please keep in mind that if the output voltage becomes greater, it is necessary to derate the output current according to the maximum electrical power.

### HOW TO CONNECT DUAL OUTPUTS(1.5 to 10W TYPE)

Dual output converters can be used for single output voltages of 24 to 30V if the COM terminal is open and the load is connected between the plus output and minus output.

### CONNECTING WHEN THE REVERSE POLARITY VOLTAGE MAY BE IMPRESSED TO THE INPUT

When reverse polarity voltage is impressed to the input, the fuse that connects to the input may melt and be damaged. Also, even if it is not damaged, there is a possibility that other internal components may deteriorate. Therefore, in that situation, it is recommended to use one of the connections shown in the following diagrams.

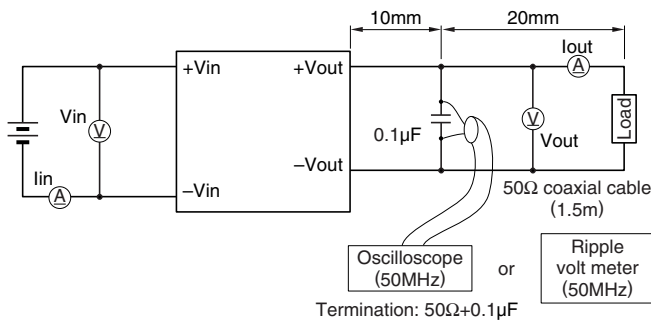


## Characteristics, Functions, and Applications

### REDUCING RIPPLE NOISE

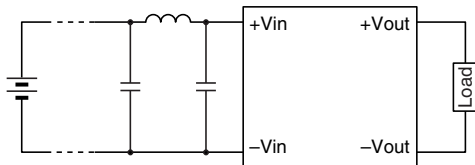
If ripple noise from the converter is not measured correctly, the results may differ greatly depending on the measurement method. Therefore, when measuring ripple noise, be sure to measure the noise from the root part of the terminal and not to make a loop so that magnetic flux is not collected when connecting the probe. Please keep in mind that spike voltage may vary greatly depending on the ripple voltmeter and the frequency range of the oscilloscope.

TDK measures noise using the following wiring at a frequency range of 50MHz.



### INPUT RIPPLE NOISE

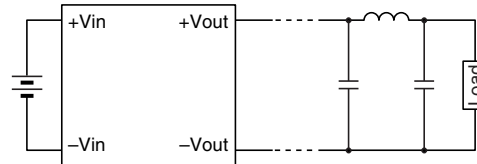
This series contains a capacitor at the input location. Therefore, it is possible for it to be operated without an external capacitor for the input. However, if a capacitor is connected, it is possible to reduce input ripple noise and input return noise. Input ripple noise can be reduced even further when a  $\pi$  type filter is used as shown in the following diagram.



When the distance between the input power source and the input location of the converter is great, the impedance of the input line becomes high and spike noise may also increase. Therefore, in such cases, it is recommended to connect the capacitor as close to the input location of the DC to DC converter as possible.

### OUTPUT RIPPLE NOISE

In order to reduce output ripple noise, connect the capacitor to the output portion of the converter. Output ripple noise can be reduced even further when a  $\pi$  type filter is used as shown in the following diagram. If such a filter is used, please use a coil with 0 to  $100\mu\text{H}$ .



To reduce output spike noise, connect a ceramic capacitor with 0 to  $1\mu\text{F}$  to the output portion of the converter. When the distance between the converter output and the load is great, connect the capacitor to the root portion of the load.

### OUTPUT EXTERNAL CAPACITANCE RANGES

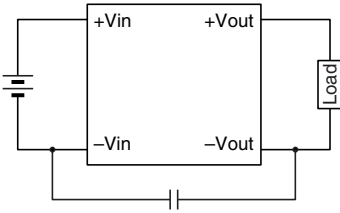
Please keep in mind that if the capacitor installed at the output location has a larger capacity than shown in the following chart, or if capacitors with low impedance are connected parallel to each other, converter operation may be unstable.

Product name	Output capacitance range
CC1R5-xx03Sx-E	0 to $100\mu\text{F}$
CC1R5-xx05Sx-E	0 to $100\mu\text{F}$
CC1R5-xx12Sx-E	0 to $47\mu\text{F}$
CC1R5-xx12Dx-E	0 to $22\mu\text{F}$
CC3-xx03Sx-E	0 to $220\mu\text{F}$
CC3-xx05Sx-E	0 to $220\mu\text{F}$
CC3-xx12Sx-E	0 to $100\mu\text{F}$
CC3-xx12Dx-E	0 to $47\mu\text{F}$
CC6-xx03Sx-E	0 to $470\mu\text{F}$
CC6-xx05Sx-E	0 to $470\mu\text{F}$
CC6-xx12Sx-E	0 to $220\mu\text{F}$
CC6-xx12Dx-E	0 to $10\mu\text{F}$
CC10-xx03Sx-E	0 to $47\mu\text{F}$
CC10-xx05Sx-E	0 to $470\mu\text{F}$
CC10-xx12Sx-E	0 to $220\mu\text{F}$
CC10-xx12Dx-E	0 to $100\mu\text{F}$
CC15-xxxxxx-E	0 to $470\mu\text{F}$
CC25-xxxxxx-E	0 to $470\mu\text{F}$

## Characteristics, Functions, and Applications

### COMMON MODE NOISE

Products with under 10W contain capacitors that are not connected between the first and second. Therefore, in order to reduce common mode noise, please connect a capacitor with about 1,000pF between the first and second GND as shown in the following diagram. Also, please keep in mind that if the connected capacitor is too large, the coupling capacitance between the input and output will become too high. Be sure to also keep in mind the capacitor's withstand voltage (over 500V is recommended based on insulation withstand voltage).



Products with 10W contain capacitors with 1,000pF connected between the first and second.

### RADIATION NOISE

It is possible to reduce the converter's radiation noise by connecting a case terminal to the input or output GND. However, efficiency will be different depending on the equipment being used. Therefore, confirm this by using your actual equipment.

In addition, please wire the bottom of the converter to the GND line and wire using a wide surface.

### OVERCURRENT PROTECTION

#### 1.5 to 10W TYPES

This series is equipped with an overcurrent protection circuit. This means that when the output current begins to flow over the starting point of the overcurrent, the output voltage becomes lower. The output voltage is recovered automatically by releasing the overcurrent and short circulation status. However, please keep in mind that if the overcurrent status continues for over 30 seconds, internal elements of the converter may deteriorate or be damaged. The start point of the overcurrent is never lower than the rated current.

If auto recovery is not executed when the overcurrent status is released for some reason, please restart it after turning the electrical power or the remote OFF one time.

#### 15 to 25W TYPES

This series is recovery with an overcurrent protection circuit. This means that when the output current begins to flow over the rated current, the output voltage causes latch decrease. If the overcurrent and the short circuit are released, the output voltage can not be recovered automatically. Please restart the power source to recover the output voltage. The start point of the overcurrent is never lower than the rated current.

### OVERVOLTAGE PROTECTION

This series is not equipped with an overvoltage protection function. Please keep in mind that if overvoltage is impressed externally over the rated voltage, it may cause damage.

### LOW INPUT VOLTAGE PROTECTION

This series is equipped with low voltage input protection in order to prevent errors caused by low input voltage. This means that the converter stops operating when the voltage is below the specified voltage. The following chart shows the specified range.

Product name	Specified range for low input voltage protection
CCx*-05xxxx-E	3.0 to 4.5V
CCx*-12xxxx-E	6.0 to 9.0V
CCx*-24xxxx-E	13 to 18V
CCx*-48xxxx-E	27 to 36V
CC15-xxxxx-E	12 to 18V
CC25-xxxxx-E	12 to 18V

\* 1R5: 1.5W type, 3: 3W type, 6: 6W type, 10: 10W type

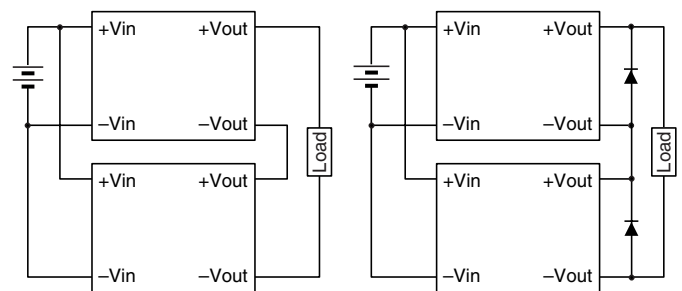
### WITHSTAND VOLTAGE TEST

The withstand voltage between the input and output, and between the terminal and the casing is AC.500V.

### SERIES & PARALLEL CONNECTIONS

#### SERIES CONNECTION

It is possible to have a series connection by using the wiring shown in the following diagram on the left. However, if the output voltage does not begin with this connection, connect the schottky barrier diode, which has low forward voltage, as shown in the following diagram on the right. In this case, be sure to use a schottky barrier diode that has a forward current larger than the converter's rated current and that has a reverse withstand voltage at least two times larger than the voltage between the +Vout and -Vout. Also, make sure that the output current is below the rated current of the smaller converter.



#### PARALLEL CONNECTION

It is not possible to have a parallel connection for increasing currents.

## Characteristics, Functions, and Applications

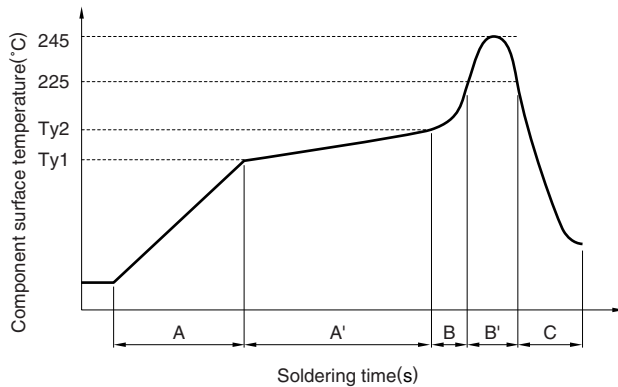
### SOLDERING CONDITIONS

1) Solder DIP products (CCx-xxxxF-E) on the base material according to the following conditions.

Soldering DIP: 260°C, for 10 seconds max.

Soldering iron: 380°C, for 3 seconds max.

2) Use SMD products (CCx-xxxxR-E) according to the following reflow profile conditions.



A	1.0 to 3.0°C/s Ty1: 150±10°C
A'	Ty2: 170±10°C Ty1 to Ty2: 40 to 100s
B	1.0 to 4.0°C/s
B'	TP: 245°C max. Over 225°C: 20 to 60s
C	1.0 to 5.0°C/s

### CLEANING CONDITIONS

It is recommended that the PC board should not be cleaned after soldering. It, however, has already been checked that there is no problem as a result of the following cleaning tests.

When cleaning with one of the following cleaning agents, it should be used under these conditions. When using cleaning agent other than the following, please consult TDK before use.

#### • CLEANING AGENTS AND TEST CONDITIONS

Clean Through 750H (Kao Corporation)

- (1) Cleaning (Agitation) 60°C/4min
- (2) Rinsing (Agitation, water) 60°C/4+4min
- (3) Drying 70°C/6min

Pine Alpha ST100S (Arakawa Chemical Industries, Ltd.)

- (1) Cleaning (Agitation) 60°C/5min
- (2) Rinsing (Agitation, water) 30°C/10min
- (3) Drying 70°C/6min

Terpene Cleaner EC-7R

- (1) Cleaning (Agitation) 60°C/5min
- (2) Rinsing (Agitation, IPA) 30°C/10min
- (3) Drying 70°C/6min

Isopropyl Alcohol (Tokuyama Corp., etc.)

- (1) Ultrasonic cleaning 60°C/1min
- (2) Cooling bath cleaning R.T./1min
- (3) Vapor cleaning 83°C/1min

Asahi Clean AK225AES

- (1) Ultrasonic cleaning 50°C/2min
- (2) Cooling bath cleaning R.T./2min