

# CM4-1W Series



*1W Regulated Single output*

## Features

- SIP7 / DIP14 Package
- 1000 VDC Isolation, Up to 3000 VDC Isolation
- Continuous Short Circuit Protection
- Operation Temperature Range -40 ~ 80°C max.



## PART NUMBER STRUCTURE

**CM4- 12 05 S H**

(1) (2) (3) (4) (5)

### (1) Series

### (2) Input Voltage Range

**05** - 4.5-5.5 V  
**12** - 10.8-13.2 V  
**24** - 21.6-26.4 V

### (4) Case Type

**S** - SIP Case  
**D** - DIP Case

### (5) Isolation Voltage

**Blank** - 1K VDC  
**H** - 3K VDC

### (3) Output Voltage

**3R3** - 3.3 V  
**05** - 5.0 V  
**7R2** - 7.2 V  
**09** - 9.0 V  
**12** - 12 V  
**15** - 15 V

# CM4-1W Series

ALL SPECIFICATIONS ARE TYPICAL AT 25°C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED

| Model Number | Input Voltage Range (VDC) | Input Current      |                      | Output Voltage (VDC) | Output Current |                | Efficiency @FL (% , typ.) | Capacitive Load (µF, max.) |
|--------------|---------------------------|--------------------|----------------------|----------------------|----------------|----------------|---------------------------|----------------------------|
|              |                           | No-Load (mA, max.) | Full Load (mA, typ.) |                      | Min. load (mA) | Full load (mA) |                           |                            |
| CM4-053R3S   | 4.5-5.5                   | 45                 | 334                  | 3.3                  | 0              | 303            | 60                        | 220                        |
| CM4-0505S    | 4.5-5.5                   | 35                 | 308                  | 5                    | 0              | 200            | 65                        | 220                        |
| CM4-057R2S   | 4.5-5.5                   | 45                 | 299                  | 7.2                  | 0              | 139            | 67                        | 220                        |
| CM4-0509S    | 4.5-5.5                   | 40                 | 299                  | 9                    | 0              | 111            | 67                        | 220                        |
| CM4-0512S    | 4.5-5.5                   | 45                 | 304                  | 12                   | 0              | 83             | 66                        | 220                        |
| CM4-0515S    | 4.5-5.5                   | 55                 | 308                  | 15                   | 0              | 67             | 65                        | 220                        |
| CM4-123R3S   | 10.8-13.2                 | 20                 | 137                  | 3.3                  | 0              | 303            | 61                        | 220                        |
| CM4-1205S    | 10.8-13.2                 | 25                 | 137                  | 5                    | 0              | 200            | 61                        | 220                        |
| CM4-127R2S   | 10.8-13.2                 | 25                 | 127                  | 7.2                  | 0              | 139            | 66                        | 220                        |
| CM4-1209S    | 10.8-13.2                 | 25                 | 125                  | 9                    | 0              | 111            | 67                        | 220                        |
| CM4-1212S    | 10.8-13.2                 | 30                 | 125                  | 12                   | 0              | 83             | 67                        | 220                        |
| CM4-1215S    | 10.8-13.2                 | 25                 | 121                  | 15                   | 0              | 67             | 69                        | 220                        |
| CM4-243R3S   | 21.6-26.4                 | 10                 | 67                   | 3.3                  | 0              | 303            | 63                        | 220                        |
| CM4-2405S    | 21.6-26.4                 | 15                 | 64                   | 5                    | 0              | 200            | 66                        | 220                        |
| CM4-247R2S   | 21.6-26.4                 | 15                 | 62                   | 7.2                  | 0              | 139            | 68                        | 220                        |
| CM4-2409S    | 21.6-26.4                 | 15                 | 62                   | 9                    | 0              | 111            | 68                        | 220                        |
| CM4-2412S    | 21.6-26.4                 | 15                 | 62                   | 12                   | 0              | 83             | 68                        | 220                        |
| CM4-2415S    | 21.6-26.4                 | 15                 | 64                   | 15                   | 0              | 67             | 66                        | 220                        |
| CM4-053R3D   | 4.5-5.5                   | 45                 | 334                  | 3.3                  | 0              | 303            | 60                        | 220                        |
| CM4-0505D    | 4.5-5.5                   | 35                 | 308                  | 5                    | 0              | 200            | 65                        | 220                        |
| CM4-057R2D   | 4.5-5.5                   | 45                 | 299                  | 7.2                  | 0              | 139            | 67                        | 220                        |
| CM4-0509D    | 4.5-5.5                   | 40                 | 299                  | 9                    | 0              | 111            | 67                        | 220                        |
| CM4-0512D    | 4.5-5.5                   | 45                 | 304                  | 12                   | 0              | 83             | 66                        | 220                        |
| CM4-0515D    | 4.5-5.5                   | 55                 | 308                  | 15                   | 0              | 67             | 65                        | 220                        |
| CM4-123R3D   | 10.8-13.2                 | 20                 | 137                  | 3.3                  | 0              | 303            | 61                        | 220                        |
| CM4-1205D    | 10.8-13.2                 | 25                 | 137                  | 5                    | 0              | 200            | 61                        | 220                        |
| CM4-127R2D   | 10.8-13.2                 | 25                 | 127                  | 7.2                  | 0              | 139            | 66                        | 220                        |
| CM4-1209D    | 10.8-13.2                 | 25                 | 125                  | 9                    | 0              | 111            | 67                        | 220                        |
| CM4-1212D    | 10.8-13.2                 | 30                 | 125                  | 12                   | 0              | 83             | 67                        | 220                        |
| CM4-1215D    | 10.8-13.2                 | 25                 | 121                  | 15                   | 0              | 67             | 69                        | 220                        |
| CM4-243R3D   | 21.6-26.4                 | 10                 | 67                   | 3.3                  | 0              | 303            | 63                        | 220                        |
| CM4-2405D    | 21.6-26.4                 | 15                 | 64                   | 5                    | 0              | 200            | 66                        | 220                        |
| CM4-247R2D   | 21.6-26.4                 | 15                 | 62                   | 7.2                  | 0              | 139            | 68                        | 220                        |
| CM4-2409D    | 21.6-26.4                 | 15                 | 62                   | 9                    | 0              | 111            | 68                        | 220                        |
| CM4-2412D    | 21.6-26.4                 | 15                 | 62                   | 12                   | 0              | 83             | 68                        | 220                        |
| CM4-2415D    | 21.6-26.4                 | 15                 | 64                   | 15                   | 0              | 67             | 66                        | 220                        |

# CM4-1W Series



| INPUT SPECIFICATIONS                                                                                                      |                                         |           |      |      |         |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------|------|------|---------|
| Parameter                                                                                                                 | Conditions                              | Min.      | Typ. | Max. | Unit    |
| Input Voltage Range                                                                                                       | 5V Input                                | 4.5       | 5    | 5.5  | VDC     |
|                                                                                                                           | 12V Input                               | 10.8      | 12   | 13.2 |         |
|                                                                                                                           | 24V Input                               | 21.6      | 24   | 26.4 |         |
| Input Filter                                                                                                              |                                         | Capacitor |      |      |         |
| Input Reflected Ripple Current (1)                                                                                        |                                         |           | 20   |      | mApk-pk |
| Start up Time                                                                                                             | Nominal Vin and constant resistive load |           | 20   |      | ms      |
| Recommended input fuse ( slow blow )                                                                                      | 5V Input                                | 0.4       |      |      | A       |
|                                                                                                                           | 12V Input                               | 0.2       |      |      |         |
|                                                                                                                           | 24V Input                               | 0.1       |      |      |         |
| Note :<br>1. Measured with a simulated source inductance of 12μH and a source capacitor Cin ( 47μF, ESR<1.0Ω at 100kHz ). |                                         |           |      |      |         |

| OUTPUT SPECIFICATIONS    |                                         |              |      |       |         |
|--------------------------|-----------------------------------------|--------------|------|-------|---------|
| Parameter                | Conditions                              | Min.         | Typ. | Max.  | Unit    |
| Output Voltage Accuracy  |                                         | -2.0         |      | +2.0  | %       |
| Line Regulation          |                                         | -0.5         |      | +0.5  | %       |
| Load Regulation          | From 0% to 100% Load                    | 3.3V Output  | -1.0 | +1.0  | %       |
|                          |                                         | Other Output | -0.5 | +0.5  |         |
| Ripple & Noise           | 20MHz bandwidth                         |              |      | 50    | mVpk-pk |
| Short Circuit Protection |                                         | Continuous   |      |       |         |
| Temperature Coefficient  |                                         | -0.02        |      | +0.02 | %/°C    |
| Maximum Capacitive Load  | Minimum Vin and constant resistive load | See Table    |      |       |         |

| ABSOLUTE MAXIMUM RATINGS                                                                                                    |                            |      |      |      |      |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------|------|------|------|------|
| Parameter                                                                                                                   | Conditions                 | Min. | Typ. | Max. | Unit |
| Input Surge Voltage ( 100 ms )                                                                                              | 5V Input                   |      |      | 7    | VDC  |
|                                                                                                                             | 12V Input                  |      |      | 15   |      |
|                                                                                                                             | 24V Input                  |      |      | 28   |      |
| Soldering Temperature                                                                                                       | 1.5mm from case 10sec max. |      |      | 260  | °C   |
| Note : These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. |                            |      |      |      |      |

| GENERAL SPECIFICATIONS   |                                   |                  |      |      |         |
|--------------------------|-----------------------------------|------------------|------|------|---------|
| Parameter                | Conditions                        | Min.             | Typ. | Max. | Unit    |
| Isolation Voltage        | Input-output, and rated for 60sec | Standard Type    | 1000 |      | VDC     |
|                          |                                   | Suffix "H"       | 3000 |      |         |
| Isolation Resistance     | Input-output                      | 1000             |      |      | MΩ      |
| Isolation Capacitance    | Input-output                      |                  | 60   |      | pF      |
| Switching Frequency      |                                   |                  | 50   |      | kHz     |
| MTBF                     | MIL-HDBK-217 F @ 25°C             | 3500             |      |      | k hours |
| Safety Standard          | IEC / EN / UL 62368-1             | Designed to meet |      |      |         |
| Environmental compliance |                                   | RoHS             |      |      |         |

# CM4-1W Series



## ENVIRONMENT SPECIFICATIONS

| Parameter                     | Conditions             | Min.      | Typ. | Max. | Unit     |
|-------------------------------|------------------------|-----------|------|------|----------|
| Operating Ambient Temperature | See the Derating Curve | -40       |      | 80   | °C       |
| Maximum Case Temperature      |                        |           |      | 100  | °C       |
| Thermal Impedance             |                        | 55        |      |      | °C/W     |
| Storage Humidity              |                        |           |      | 95   | % rel. H |
| Storage Temperature           |                        | -55       |      | 125  | °C       |
| Cooling                       | Natural Convection     | 30-65 LFM |      |      |          |

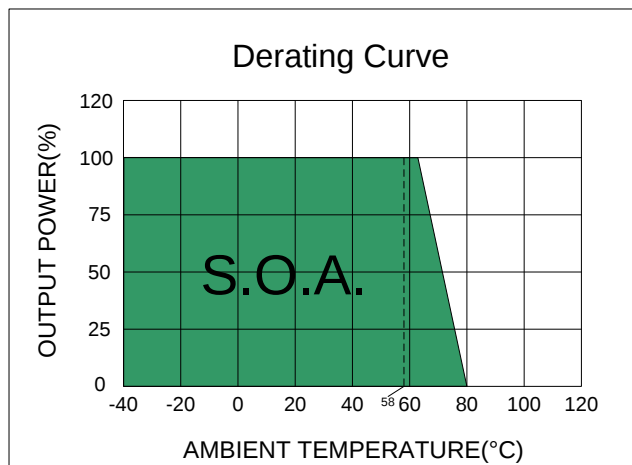
## EMC SPECIFICATIONS

| Parameter           | Standard      | Condition                              | Criterion |
|---------------------|---------------|----------------------------------------|-----------|
| Conducted Emissions | EN55032       | with external components               | B         |
| Radiated Emissions  | EN55032       | with external components               | B         |
| ESD                 | IEC 61000-4-2 | Contact: ±4kV with external components | A         |
| RS                  | IEC 61000-4-3 | 3V/m with external components          | A         |
| EFT                 | IEC 61000-4-4 | ±0.5kV with external components        | A         |
| CS                  | IEC 61000-4-6 | 3Vrms with external components         | A         |
| PFMF                | IEC 61000-4-8 | 1A/m with external components          | A         |

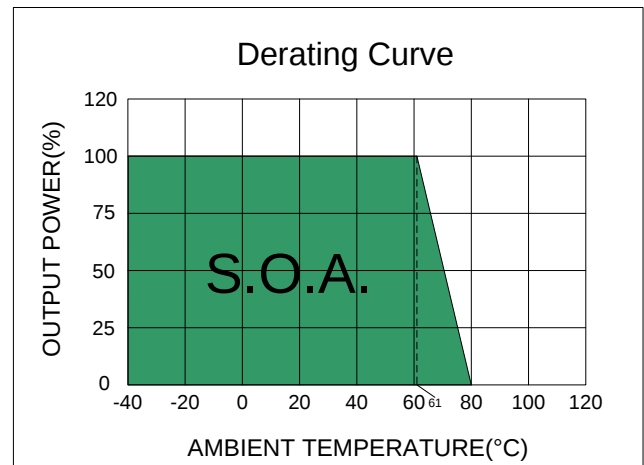
## PHYSICAL SPECIFICATIONS

| Parameter        |          | Value                                         |
|------------------|----------|-----------------------------------------------|
| Case Material    |          | Nonconductive Black Plastic ( UL94V-0 rated ) |
| Pin Material     |          | Alloy 42                                      |
| Potting Material |          | Epoxy ( UL94V-0 rated )                       |
| Weight           | SIP Case | 2.7 g, typ.                                   |
|                  | DIP Case | 2.7 g, typ.                                   |
| Dimensions       | SIP Case | 0.76" x 0.28" x 0.39"                         |
|                  | DIP Case | 0.80" x 0.40" x 0.27"                         |

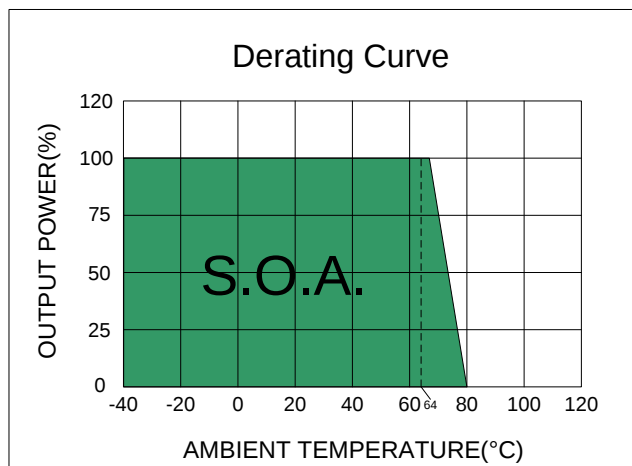
## ELECTRICAL CHARACTERISTIC CURVES



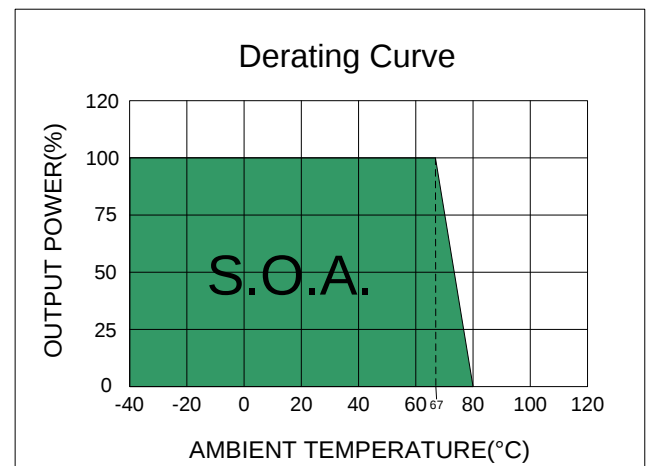
Efficiency 60% ~ 61% Models



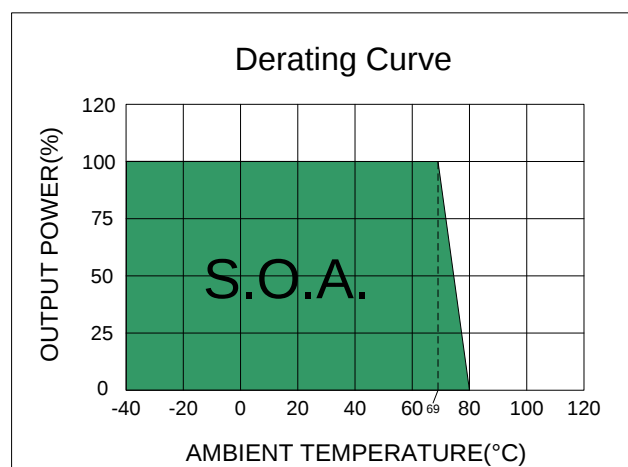
Efficiency 63% Models



Efficiency 65% Models



Efficiency 66 ~ 67% Models

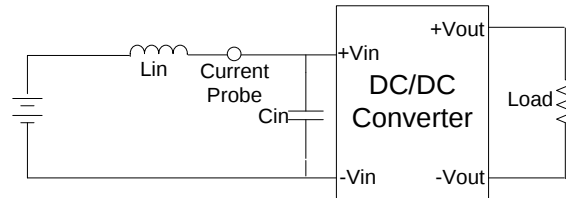


Efficiency 68% ~ 69% Models

## TEST CONFIGURATIONS

### Input Reflected Ripple Current Test Step

Input reflected ripple current is measured with a source inductor  $L_{in}$  (  $12\mu H$  ) and a source capacitor  $C_{in}$  (  $47\mu F$ ,  $ESR < 1.0\Omega$  at  $100kHz$  ) at nominal input and full load.



## DESIGN & FEATURE CONFIGURATIONS

### Isolation Voltage

This series is designed to meet the functional insulation of UL, both input and output should be maintained within SELV limits ( less than  $42.4V$  peak, or  $60V_{dc}$  ).

The isolation test voltage represents a measure of immunity to transient voltages and the part should never be used as an element of a safety isolation system. The part could be expected to function correctly with hundreds of volts offset applied continuously across the isolation barrier; but then the circuitry on both sides of the barrier must be regarded as operating at an unsafe voltage and further isolation/insulation systems must form a barrier between these circuits and any user-accessible circuitry according to safety standard requirements.

### Repeated High-Voltage Isolation Testing

Repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment.

This series has isolation transformers without additional insulation between primary and secondary windings of enameled wire.

While parts can be expected to withstand several times the stated test voltage, the isolation capability does depend on the wire insulation.

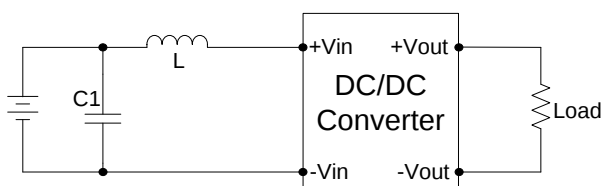
Any material including the enamel ( typically polyurethane ) is susceptible to eventual chemical degradation when subject to very high applied voltage, thus implying that the number of tests should be strictly limited.

We strongly advise against repeated high voltage isolation testing, but if it is absolutely required, the isolation test voltage should be reduced by 20% from specified test voltage.

## DESIGN & FEATURE CONFIGURATIONS

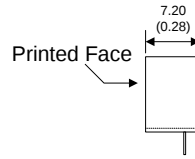
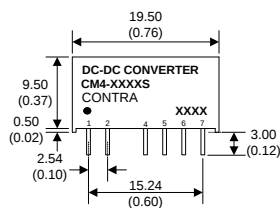
### EMC Filter

The Circuit is used to meet EMC test.



|           | C1                                                     | L          |
|-----------|--------------------------------------------------------|------------|
| CM4-05XXX | NIPPON<br>Chemi-con<br>KY series<br>470 $\mu F$ , 100V | 12 $\mu H$ |
| CM4-12XXX |                                                        |            |
| CM4-24XXX |                                                        |            |

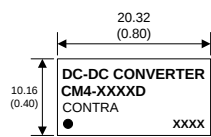
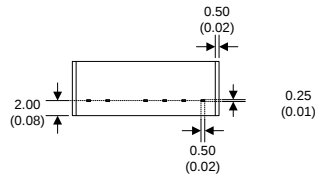
## MECHANICAL SPECIFICATIONS



### SIP7 Package

Notes : All dimensions are typical in millimeters ( inches ).

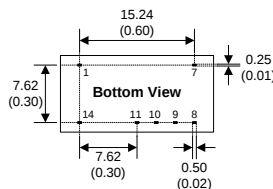
1. Pin dimension tolerance:  $\pm 0.05$  (  $\pm 0.002$  )
2. Pin pitch and length tolerance:  $\pm 0.35$  (  $\pm 0.014$  )
3. Pin to case tolerance:  $\pm 0.5$  (  $\pm 0.02$  )
4. Case Tolerance:  $\pm 0.5$  (  $\pm 0.02$  )



### DIP14 Package

Notes : All dimensions are typical in millimeters ( inches ).

1. Pin dimension tolerance:  $\pm 0.05$  (  $\pm 0.002$  )
2. Pin pitch and length tolerance:  $\pm 0.35$  (  $\pm 0.014$  )
3. Pin to case tolerance:  $\pm 0.5$  (  $\pm 0.02$  )
4. Case Tolerance:  $\pm 0.5$  (  $\pm 0.02$  )



#### PIN CONNECTIONS

| PIN NUMBER | SINGLE | SINGLE-H |
|------------|--------|----------|
| 1          | +Vin   | +Vin     |
| 2          | -Vin   | -Vin     |
| 4          | -Vout  | N.P.     |
| 5          | N.P.   | -Vout    |
| 6          | +Vout  | N.P.     |
| 7          | N.P.   | +Vout    |

\*N.P. : No PIN

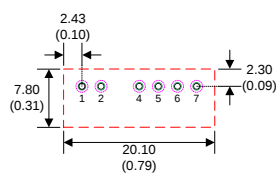
#### PIN CONNECTIONS

| PIN NUMBER | SINGLE | SINGLE-H |
|------------|--------|----------|
| 1          | -Vin   | -Vin     |
| 7          | N.C.   | N.C.     |
| 8          | N.P.   | +Vout    |
| 9          | +Vout  | N.P.     |
| 10         | N.P.   | -Vout    |
| 11         | -Vout  | N.P.     |
| 14         | +Vin   | +Vin     |

\*N.P. : No PIN

\*N.C. : No Connection

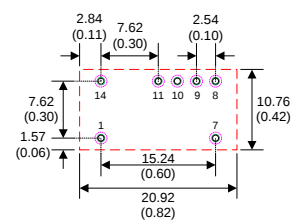
## RECOMMENDED FOOTPRINT DETAILS



### SIP7 Package

Notes : 1. All dimensions are typical in millimeters ( inches ).

- Through hole ( black ) 1 ~ 7:  $\varnothing 0.80$  ( 0.031 )
- Top view pad ( green ) 1 ~ 7:  $\varnothing 1.00$  ( 0.039 )
- Bottom view pad ( pink ) 1 ~ 7:  $\varnothing 1.60$  ( 0.063 )



### DIP14 Package

Notes : 1. All dimensions are typical in millimeters ( inches ).

- Through hole ( black ) 1 ~ 14:  $\varnothing 0.80$  ( 0.031 )
- Top view pad ( green ) 1 ~ 14:  $\varnothing 1.00$  ( 0.039 )
- Bottom view pad ( pink ) 1 ~ 14:  $\varnothing 1.60$  ( 0.063 )