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# Features

# Regulated Converters

- Compact 10.3x7.5mm SMD package
- 5kVAC reinforced isolation
- 2MOPP (4kVAC)
- 5V or 3.3V post-regulated, selectable outputs
- Low EMI emissions
- Ultra-wide temperature range (-40°C to +140°C)
- Low profile (2.6mm)

RECOM
DC/DC Converter

# RxxCTxxS

## 0.5 Watt 16-Pin SOIC Single Output

3 YEAR Warranty




IEC/EN62368-1 certified
IEC/EN60601-1 certified
ANSI/AAMI ES60601-1 certified
CAN/CSA C22.2 No- 60601-1-14 certified
CB Report

## Description

Low cost, low profile, 500mW SMD isolated DC/DC single output converter ideal for applications such as communication, current sensing, and medical applications which require robust isolation. The R05CT05S is a single solution with 5V input and a user-definable single, regulated 3.3V or 5V output. There is no minimum load requirement. Standard isolation is 5kVAC/1min with a 2MOPP rating for medical applications. The operating temperature is from -40°C up to +140°C with derating.

## Selection Guide

| Part Number | Input Voltage Range [VDC] | Selectable Output Voltage [VDC] | Output Power [mW] | Efficiency typ. (1) [%] |
|---|---|---|---|---|
| R05CT05S | 4.5-5.5 | 3.3 or 5 | 500 | 60 |

**Notes:**

Note1: nom. $V_{IN}$= 5VDC, $V_{OUT}$ set to 5VDC, load= 100mA

## Model Numbering

R__CT__S-__

- nom. Input Voltage
- nom. Output Voltage
- Packaging (2)
- Single Output

**Notes:**

Note2: add suffix "-CT" for bag packaging for more details refer to ***"PACKAGING INFORMATION"***
without suffix, standard tape and reel packaging

## Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

**ABSOLUTE MAXIMUM RATINGS (3)**

| Parameter | Condition | Min. | Typ. | Max. |
|---|---|---|---|---|
| Absolute Maximum Voltage | $+V_{IN}$ to $-V_{IN}$ | -0.3VDC | | 6VDC |
| | CTRL, SYNC, SYNC_OK to $-V_{IN}$ | -0.3VDC | | $+V_{IN}$ + 0.3VDC |
| | $+V_{OUT}$ to $-V_{OUT}$ | -0.3VDC | | 6VDC |
| | SEL to $-V_{OUT}$ | -0.3VDC | | $V_{OUT}$ + 0.3VDC |
| Operating IC Junction Temperature ($T_J$) | | -40°C | | +150°C |
| Operating Ambient Temperature ($T_{AMB}$) | | -40°C | | +150°C |
| Storage Temperature ($T_{STO}$) | | -65°C | | +150°C |

**Notes:**

Note3: Stresses beyond those listed under absolute maximum ratings can cause permanent damage to the device. (Values are at non-operating)

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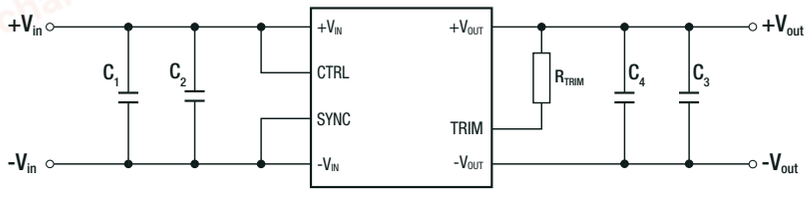
# RxxCTxxS Series

## Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### BASIC CHARACTERISTICS

| Parameter | Condition | Min. | Typ. | Max. |
|---|---|---|---|---|
| Input Voltage Range | nom. $+V_{IN}$= 5VDC | 4.5VDC | 5VDC | 5.5VDC |
| Under Voltage Lockout (UVLO) | DC-DC ON<br>DC-DC OFF | | 4.2VDC<br>3.7VDC | |
| Under Voltage Lockout Hysteresis | | | 0.5VDC | |
| Input Current Range | | 0mA | | 200mA |
| Quiescent Current | SEL pin shorted to $V_{ISO}$ ($V_{OUT}$= 5VDC) | | 45mA | |
| | SEL pin with 100kΩ connected to $V_{ISO}$ ($V_{OUT}$= 5.4VDC) | | 40mA | |
| | SEL pin shorted to $-V_{OUT}$ ($V_{OUT}$= 3.3VDC) | | 80mA | |
| | SEL pin with 100kΩ connected to $-V_{IN}$ ($V_{OUT}$= 3.7VDC) | | 75mA | |
| Minimum Load | | 0% | | |
| Start-up Time | power up<br>using CTRL function | | 1.5ms<br>1.2ms | |
| Rise time | | | 750µs | |
| ON/OFF CTRL | DC-DC ON<br>DC-DC OFF | 2.2VDC<br>0VDC | | 5.5VDC<br>0.8VDC |
| Input Current of CTRL Pin | CTRL voltage= 5VDC | | 5µA | 10µA |
| Standby Current | DC-DC OFF | | | 100µA |
| Internal Operating Frequency | | 7.2MHz | 8MHz | 8.8MHz |
| Output Ripple and Noise (20MHz BW) | 10uF + 0.1uF $V_{OUT}$ set to 5.4VDC, load = 90mA | | 50mVp-p | |
| | 10uF + 0.1uF $V_{OUT}$ set to 5.0VDC, load = 100mA | | | |
| | 10uF + 0.1uF $V_{OUT}$ set to 3.7VDC, load = 130mA | | | |
| | 10uF + 0.1uF $V_{OUT}$ set to 3.3VDC, load = 150mA | | | |

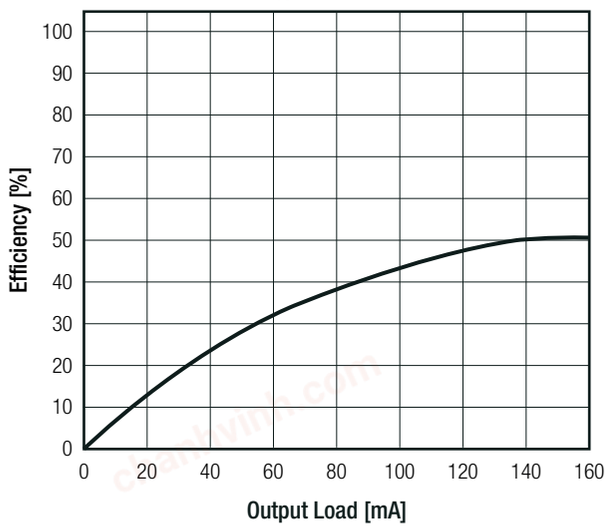
### Typical Application Circuit



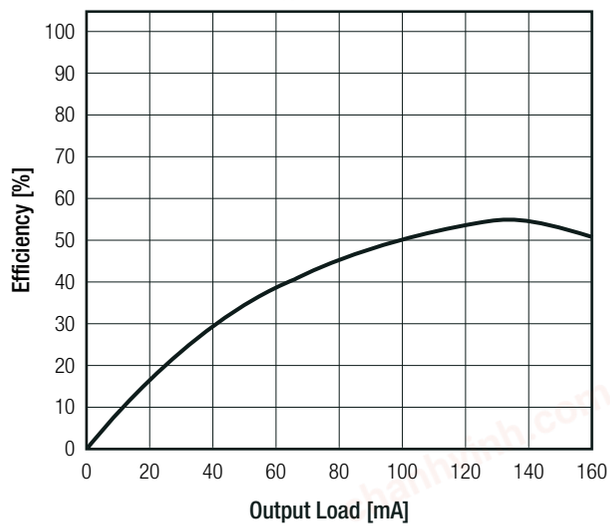

| CTRL | $R_{TRIM}$ | $Vout_{set}$ |
|---|---|---|
| high | shorted to $+V_{OUT}$ | 5.0VDC |
| high | 100kΩ to $+V_{OUT}$ | 5.4VDC |
| high | shorted to $-V_{OUT}$ | 3.3VDC |
| high | 100kΩ to $-V_{OUT}$ | 3.7VDC |
| high | open | unsupported |
| low | X | 0VDC |

### Efficiency vs. Load

$V_{OUT}$= 3.3VDC




$V_{OUT}$= 3.7VDC

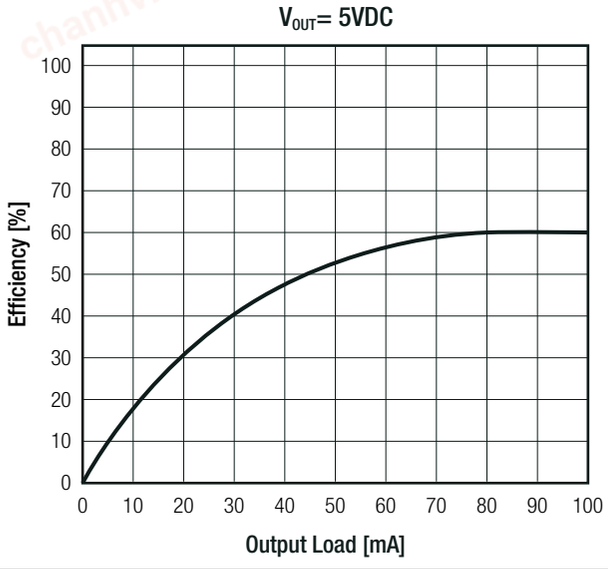


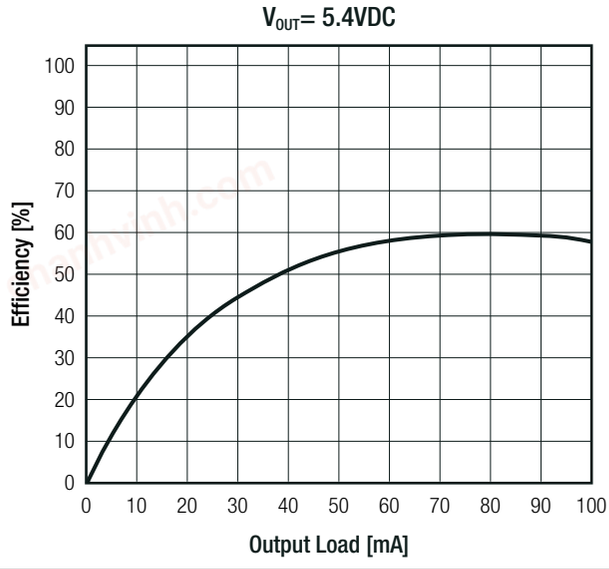

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## Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)




### SYNC FUNCTION (4)

| Parameter | Condition | Min. | Typ. | Max. |
|---|---|---|---|---|
| SYNC Pin Input Current | SYNC Voltage= 5VDC | | 0.02µA | 1µA |
| SYNC OK Output Voltage | I SYNC_OK= -2mA | | 150mV | |
| SYNC OK pin leakage current | V SYNC_OK= 5VDC | | | 1µA |

**Notes:**

Note4: Synchronous clock input pin. Provide a clock signal to synchronize multiple RxxCTxxS devices or connect to -$V_{IN}$ for standalone operation using the internal oscillator. If the SYNC pin is left open it should be separated from any switching noise to avoid false clock coupling.
Active-low, open-drain diagnostic output. Pin is asserted LOW if an no external SYNC clock or one that is outside of the operating range of the RxxCTxxS is detected. In this state, the external clock is ignored and the DC-DC converter is clocked by the device's internal oscillator. The pin is in high-impedance if a good clock is applied on SYNC.

### REGULATION

| Parameter | Condition | Min. | Typ. | Max. |
|---|---|---|---|---|
| Output Voltage Accuracy | $V_{OUT}$ set to 5VDC; load= 0mA to 75mA, $V_{IN}$= 4.5VDC | 4.7VDC | 5VDC | 5.3VDC |
| | $V_{OUT}$ set to 5VDC; load= 0mA to 100mA, $V_{IN}$= ≥5VDC | 4.7VDC | 5VDC | 5.3VDC |
| | $V_{OUT}$ set to 5.4VDC; load= 0mA to 60mA, $V_{IN}$= 4.5VDC | 5.1VDC | 5.4VDC | 5.7VDC |
| | $V_{OUT}$ set to 5.4VDC; load= 0mA to 90mA, $V_{IN}$= ≥5VDC | 5.1VDC | 5.4VDC | 5.7VDC |
| | $V_{OUT}$ set to 3.3VDC; load= 0mA to 110mA, $V_{IN}$= 4.5VDC | 3.1VDC | 3.3VDC | 3.5VDC |
| | $V_{OUT}$ set to 3.3VDC; load= 0mA to 150mA, $V_{IN}$= ≥5VDC | 3.1VDC | 3.3VDC | 3.5VDC |
| | $V_{OUT}$ set to 3.7VDC; load= 0mA to 100mA, $V_{IN}$= 4.5VDC | 3.5VDC | 3.7VDC | 3.9VDC |
| | $V_{OUT}$ set to 3.7VDC; load= 0mA to 130mA, $V_{IN}$= ≥5VDC | 3.5VDC | 3.7VDC | 3.9VDC |
| Line Regulation | low line to high line | | 1% | |
| Load Regulation | 0% to 100% load | | 1.5% | |

### PROTECTIONS

| Parameter | Condition | Values |
|---|---|---|
| Short Circuit Protection (SCP) | | power limiting, continuous protection |
| Short Circuit Input Current | $V_{IN}$= 4.5VDC | 215mA |
| | $V_{IN}$= 5VDC | 240mA |
| | $V_{IN}$= 5.5VDC | 260mA |
| Isolation Voltage | 1 minute | 5kVAC |

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# RxxCTxxS Series

## Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

| Parameter | Condition | Values |
|---|---|---|
| Maximum repetitive peak isolation voltage | | 1.414kV peak |
| Maximum working isolation voltage | | 1kVAC |
| | | 1.414kVDC |
| Maximum transient isolation voltage | 1 minute | 7.071kV peak |
| Maximum surge isolation voltage | according IEC62368-1= 1.2/50us | 6.25kV peak |
| Isolation Resistance | $V_{ISO}$= 500VDC, 25°C | $10^{12}\Omega$ typ. |
| Isolation Capacitance | | 3.5pF typ. |
| Insulation Grade | | reinforced |
| Common mode transient immunity | | ±100V/ns |
| Internal Clearance | solid insulation | >0.12mm |
| External Creepage | | >8mm |
| Distance through the insulation | minimum internal gap (internal clearance) | >120µm |
| Comparative tracking index | DIN EN 60112 (VDE 0303-11); IEC 60112 | >600V |
| Insulation Material Group | according to IEC 60664-1 | I |

## ENVIRONMENTAL

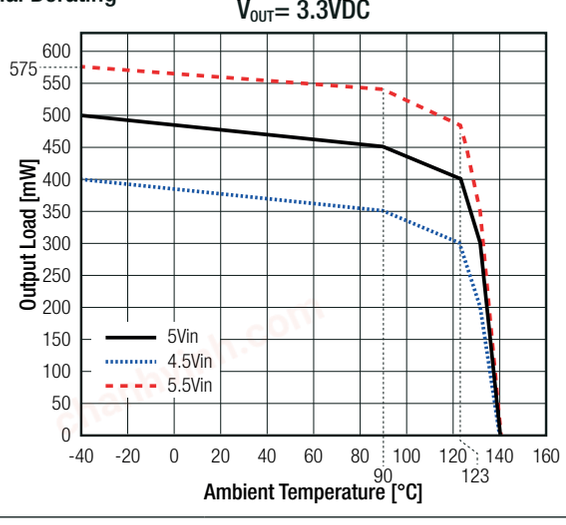
| Parameter | Condition | | Value |
|---|---|---|---|
| Operating Temperature Range | @ natural convection 0.1m/s; refer to ***"Thermal Derating (6)"*** | with derating<br>without derating | -40°C to +140°C<br>-40°C to +55°C |
| ESD | human-body model (HBM), ANSI/ESDA/JEDEC JS-001 | | ±3.0kV |
| | charged-device model (CDM), JEDEC JESD22-C101 | | ±0.5kV |
| Moisture Sensitive Level | MSL peak temp. (5) | | Level 3, 260°C, 168hrs |
| Temperature Coefficient | | | 50ppm/K |
| Thermal Impedance (6) | junction to $T_{AMB}$ | | 63.8K/W |
| | junction to case (top) | | 21.4K/W |
| | junction to case (bottom) | | 37.2K/W |
| | junction to board | | 38.5K/W |
| Operating Altitude | | | 5000m |
| Operating Humidity | | | 95% RH max. |
| Pollution Degree | | | PD1 |
| MTBF | according to TR-332, 50% stress G.B. | +55°C | 2500 x $10^6$ hours |

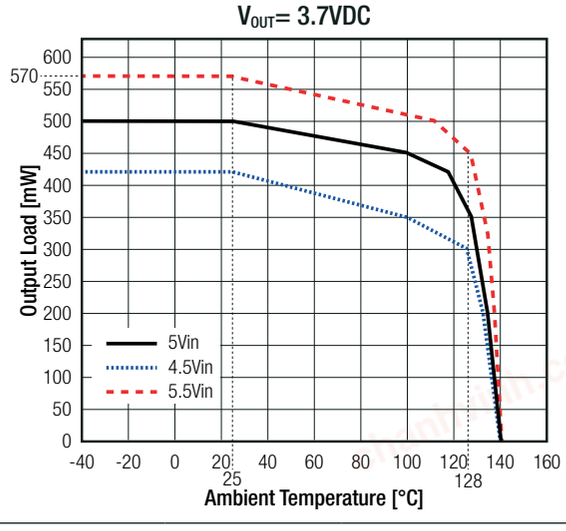
**Notes:**

Note5: The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature

Note6: Tested with 54.0 x 85.6mm 2 layer PCB with 105µm copper

**Thermal Derating (6)**



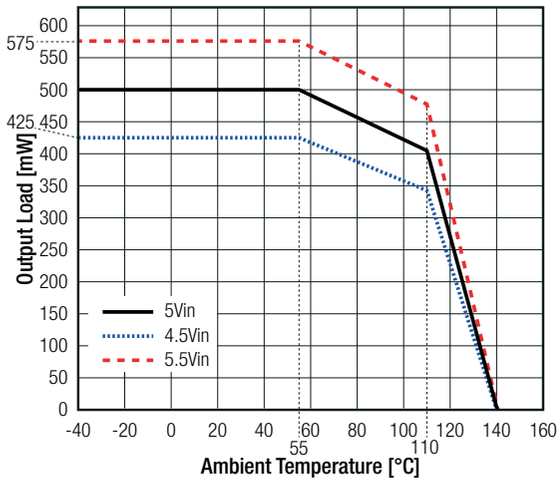



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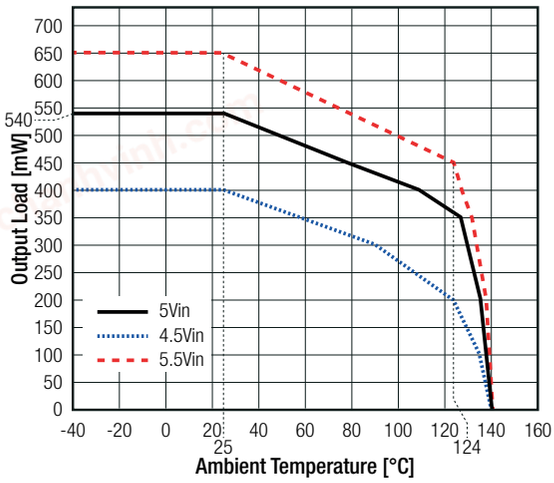


## Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

$V_{OUT}$= 5VDC




$V_{OUT}$= 5.4VDC




| SAFETY AND CERTIFICATIONS | | |
|---|---|---|
| **Certificate Type (Safety)** | **Report Number** | **Standard** |
| Information Technology Equipment - General Requirements for Safety (CB Scheme) | E224736-A6022-CB-1 | IEC60950-1:2005 2nd Edition + A2:2013 |
| Information Technology Equipment - General Requirements for Safety | | EN60950-1:2006 + A2:2013 |
| Medical electrical equipment Part 1: General requirements for basic safety and essential performance | E314885 | ANSI/AAMI ES60601-1:2005 + A2:2010/(R)2012<br>CAN/CSA-C22.2 No. 60601-1:14, 3rd Edition |
| Medical electrical equipment Part 1: General requirements for basic safety and essential performance (CB Scheme) | E314885-D1008-1-A0-C0-CB | IEC60601-1:2005, 3rd Edition + AM1:2012 |
| Medical electrical equipment Part 1: General requirements for basic safety and essential performance (LVD) | | EN60601-1:2006 + A1:2013 |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements (CB Scheme) | E224736-A6021-CB-1 | IEC62368-1:2018 3rd Edition |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements | | EN IEC 62368-1:2020 + A11:2020 |
| RoHS2 | | RoHS 2011/65/EU + AM2015/863 |

| DIMENSION AND PHYSICAL CHARACTERISTICS | | |
|---|---|---|
| **Parameter** | **Type** | **Value** |
| Dimension (LxWxH) | | 10.3 x 7.5 x 2.65mm |
| Weight | | 0.1g typ. |

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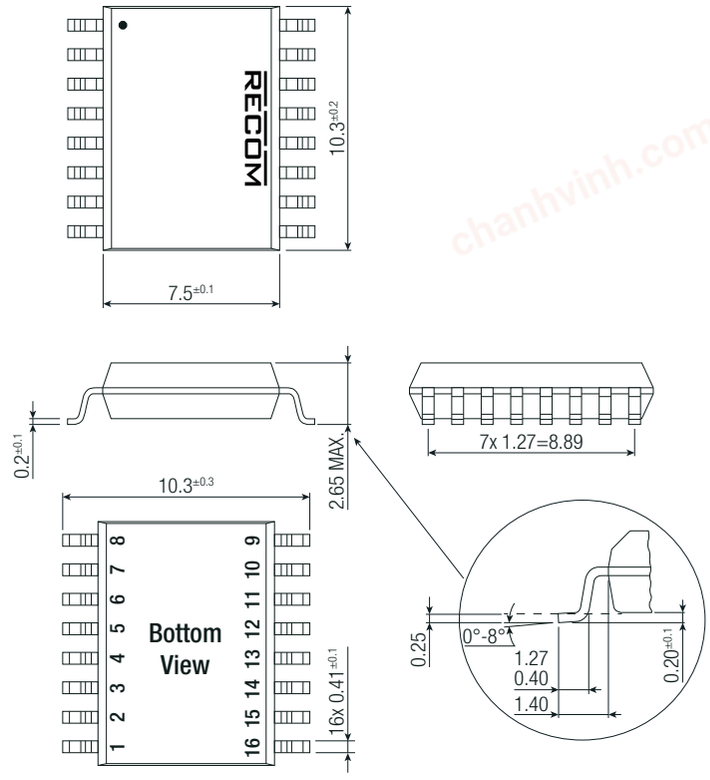
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# RxxCTxxS Series

## Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### Dimension Drawing (mm)

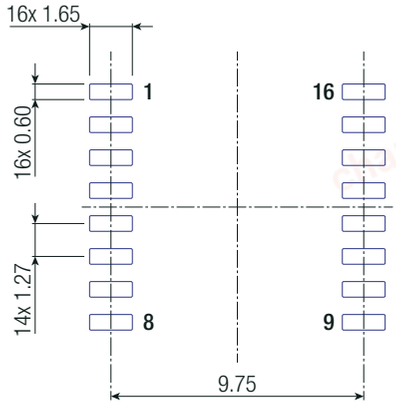



### Pad Information

| Pad # | Function |
|---|---|
| 1 | CTRL |
| 2 | $-V_{IN}$ |
| 3 | $+V_{IN}$ |
| 4 | SYNC |
| 5 | SYNC OK |
| 6, 7, 8, 10, 11, 12 | NC |
| 9, 15, 16 | $-V_{OUT}$ |
| 13 | TRIM |
| 14 | $+V_{OUT}$ |

Tolerances: x.x= ±0.1mm
x.xx= ±0.05mm

### Recommended Footprint Details (Top View)




| PACKAGING INFORMATION | | |
|---|---|---|
| **Parameter** | **Type** | **Value** |
| Packaging Dimension (LxWxH) | reel (diameter + width) | Ø177.8 x 16.4mm |
| | tape and reel (carton) | 260.0 x 240.0 x 60.0mm |
| | moisture barrier bag ("-CT") | 100.0 x 100.0 x 30mm |
| Tape Width | | 24mm |
| Packaging Quantity | tape and reel | 500pcs |
| | moisture barrier bag ("-CT") | 10pcs |
| Storage Temperature Range | | -65°C to +150°C |

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