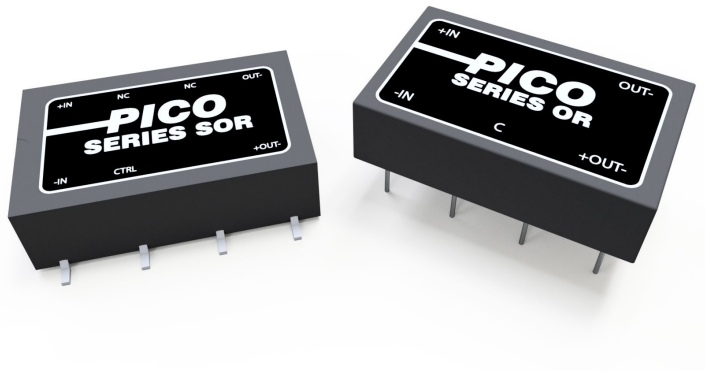
# Series **OR** & **SOR**

2.5W Isolated Regulated Low Profile DC-DC Converter

PICO Electronics, Inc.

## PRODUCT OVERVIEW

The OR & SOR series are isolated DC-DC converter with wide input range, tight regulation in a low profile package and feature shutdown control. Single and dual isolated output models are standard. They can operate up to 2.5W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.




## FEATURES

- Up to 2.5W output at +70°C ambient
- Low profile – 0.300" height
- Up to 3:1 input voltage range
- 3.3 to 28V output models
- Control feature
- 1500V Input/output isolation
- Single and dual isolated output
- No heat sink or derating required

Contact Pico for part number of available options:

- Expanded operating temp: -55°C to +85°C
- Select screening per MIL-STD-883:
  - Stabilization Bake
  - Temperature Cycle
  - Burn-In
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

| OR | E | 28 | S |
|---|---|---|---|
| MOUNTING TYPE | INPUT VOLTAGE RANGE | NOM. OUTPUT VOLTAGE | NUMBER OF OUTPUTS |
| **OR** = THROUGH HOLE<br>**SOR** = SURFACE MOUNT | **E** = 5 to 15V<br>**F** = 8 to 24V<br>**A** = 18 to 36V | **3.3** = 3.3V<br>**5** = 5V<br>**5.2** = 5.2V<br>**9** = 9V<br>**12** = 12V<br>**15** = 15V<br>**24** = 24V<br>**28** = 28V | **S** = SINGLE<br>**D** = DUAL |

## MODEL LIST

### SINGLE OUTPUTS

| Through Hole | Surface Mount | Output Voltage [VDC] | Output Current Min. [mA] | Output Current Max. [mA] | Output Power [W] | Efficiency (1) [%] typ. | Input Current (1) [%] typ. | Line Regulation [±%] max | Load Regulation 25-100% [±%] max | Output Voltage Tolerance (1) [±%] |
|---|---|---|---|---|---|---|---|---|---|---|
| ORE3.3S | SORE3.3S | 3.3 | 36.4 | 364 | 1.2 | 69 | 174 | 2.00 | 2.50 | 1.50 |
| ORE5S | SORE5S | 5 | 30 | 300 | 1.5 | 70 | 215 | 1.75 | 1.75 | 0.75 |
| ORE5.2S | SORE5.2S | 5.2 | 28.8 | 288 | 1.5 | 70 | 215 | 1.75 | 1.75 | 0.75 |
| ORE9S | SORE9S | 9 | 16.7 | 167 | 1.5 | 75 | 200 | 1.50 | 1.25 | 0.50 |
| ORE12S | SORE12S | 12 | 12.5 | 125 | 1.5 | 77 | 195 | 1.25 | 1.00 | 0.50 |
| ORE15S | SORE15S | 15 | 10 | 100 | 1.5 | 77 | 195 | 1.25 | 1.00 | 0.50 |
| ORE24S | SORE24S | 24 | 6.3 | 63 | 1.5 | 77 | 195 | 1.00 | 0.75 | 0.50 |
| ORE28S | SORE28S | 28 | 5.4 | 54 | 1.5 | 78 | 190 | 0.75 | 0.75 | 0.50 |
| ORF3.3S | SORF3.3S | 3.3 | 45.5 | 455 | 1.5 | 72 | 130 | 3.00 | 3.00 | 2.00 |
| ORF5S | SORF5S | 5 | 40 | 400 | 2.0 | 74 | 170 | 1.50 | 1.75 | 0.75 |
| ORF5.2S | SORF5.2S | 5.2 | 38.4 | 384 | 2.0 | 74 | 170 | 1.50 | 1.75 | 0.75 |
| ORF9S | SORF9S | 9 | 22.2 | 222 | 2.0 | 76 | 165 | 1.25 | 1.25 | 0.50 |
| ORF12S | SORF12S | 12 | 16.7 | 167 | 2.0 | 77 | 160 | 1.00 | 1.00 | 0.50 |
| ORF15S | SORF15S | 15 | 13.3 | 133 | 2.0 | 78 | 160 | 1.00 | 1.00 | 0.50 |
| ORF24S | SORF24S | 24 | 8.3 | 83 | 2.0 | 78 | 160 | 1.00 | 0.75 | 0.50 |
| ORF28S | SORF28S | 28 | 7.1 | 71 | 2.0 | 79 | 155 | 0.75 | 0.75 | 0.50 |
| ORA3.3S | SORA3.3S | 3.3 | 45.5 | 455 | 1.5 | 72 | 77 | 2.00 | 3.00 | 2.00 |
| ORA5S | SORA5S | 5 | 40 | 400 | 2.0 | 76 | 98 | 1.00 | 1.75 | 0.75 |
| ORA5.2S | SORA5.2S | 5.2 | 38.4 | 384 | 2.0 | 76 | 98 | 1.00 | 1.75 | 0.75 |
| ORA9S | SORA9S | 9 | 27.8 | 278 | 2.5 | 78 | 120 | 0.75 | 1.25 | 0.50 |
| ORA12S | SORA12S | 12 | 20.8 | 208 | 2.5 | 78 | 120 | 0.75 | 1.00 | 0.50 |
| ORA15S | SORA15S | 15 | 16.7 | 167 | 2.5 | 79 | 115 | 0.75 | 1.00 | 0.50 |
| ORA24S | SORA24S | 24 | 10.4 | 104 | 2.5 | 80 | 115 | 0.75 | 0.75 | 0.50 |
| ORA28S | SORA28S | 28 | 8.9 | 89 | 2.5 | 80 | 115 | 0.50 | 0.75 | 0.50 |

Note 1: Tested at nominal input voltage and full output load.

## MODEL LIST

### DUAL OUTPUT

| Through Hole | Surface Mount | Output Voltage Per Output [VDC] | Output Current Per Output Min. [mA] | Output Current Per Output Max. [mA] | Output Power Per Output [W] | Efficiency (1) [%] typ. | Input Current (1) [%] typ. | Line Regulation [±%] max | Load Regulation 25-100% [±%] max | Output Voltage Tolerance (1) [±%] |
|---|---|---|---|---|---|---|---|---|---|---|
| ORE5D | SORE5D | 5 | 15 | 150 | 0.75 | 70 | 215 | 1.75 | 1.75 | 0.75 |
| ORE9D | SORE9D | 9 | 8.4 | 84 | 0.75 | 75 | 200 | 1.50 | 1.25 | 0.50 |
| ORE12D | SORE12D | 12 | 6.3 | 63 | 0.75 | 77 | 195 | 1.25 | 1.00 | 0.50 |
| ORE15D | SORE15D | 15 | 5 | 50 | 0.75 | 77 | 195 | 1.25 | 1.00 | 0.50 |
| ORE24D | SORE24D | 24 | 3.2 | 32 | 0.75 | 77 | 195 | 1.00 | 0.75 | 0.50 |
| ORE28D | SORE28D | 28 | 2.7 | 27 | 0.75 | 78 | 190 | 0.75 | 0.75 | 0.50 |
| ORF5D | SORF5D | 5 | 20 | 200 | 1.00 | 74 | 170 | 1.50 | 1.75 | 0.75 |
| ORF9D | SORF9D | 9 | 11.1 | 111 | 1.00 | 76 | 165 | 1.25 | 1.25 | 0.50 |
| ORF12D | SORF12D | 12 | 8.4 | 84 | 1.00 | 77 | 160 | 1.00 | 1.00 | 0.50 |
| ORF15D | SORF15D | 15 | 6.7 | 67 | 1.00 | 78 | 160 | 1.00 | 1.00 | 0.50 |
| ORF24D | SORF24D | 24 | 4.2 | 42 | 1.00 | 78 | 160 | 1.00 | 0.75 | 0.50 |
| ORF28D | SORF28D | 28 | 3.6 | 36 | 1.00 | 79 | 155 | 0.75 | 0.75 | 0.50 |
| ORA5D | SORA5D | 5 | 20 | 200 | 1.00 | 76 | 98 | 1.00 | 1.75 | 0.75 |
| ORA9D | SORA9D | 9 | 13.9 | 139 | 1.25 | 78 | 120 | 0.75 | 1.25 | 0.50 |
| ORA12D | SORA12D | 12 | 10.4 | 104 | 1.25 | 78 | 120 | 0.75 | 1.00 | 0.50 |
| ORA15D | SORA15D | 15 | 8.4 | 84 | 1.25 | 79 | 115 | 0.75 | 1.00 | 0.50 |
| ORA24D | SORA24D | 24 | 5.2 | 52 | 1.25 | 80 | 115 | 0.75 | 0.75 | 0.50 |
| ORA28D | SORA28D | 28 | 4.5 | 45 | 1.25 | 80 | 115 | 0.50 | 0.75 | 0.50 |

Note 1: Tested at nominal input voltage and full output load.
Note 2: Dual output loads must be balanced.

## SPECIFICATIONS (Nominal $V_{IN}$, Full Load, $T_A$ = +25°C, 1 hour warm up unless otherwise specified)

### INPUT

| Parameter | Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Input Voltage Range | ORE/SORE models | 5 | 10 | 15 | VDC |
| | ORF/SORF models | 8 | 16 | 24 | |
| | ORA/SORA models | 18 | 27 | 36 | |

### OUTPUT

| Parameter | Condition | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Output Ripple | 1MHz bandwidth, with 0.1µF ceramic capacitor | 9V to 24V output models | - | - | 150 | mVp-p |
| | | All other output models | - | - | 200 | |

### ENVIRONMENTAL

| Parameter | Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Operating Temperature Range | Ambient without derating | -25 | - | +70 | °C |
| Storage Temperature Range | Ambient | -55 | - | +125 | °C |
| Temperature Coefficient | | - | - | 0.02 | %/°C |
| Cooling | Free Air Convection | | | | |

### GENERAL

| Parameter | Condition | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Isolation Voltage | Input to output | 500 | - | - | VDC |
| | OUT1 to OUT2 | 500 | - | - | |
| Switching Frequency | | - | 100 | - | kHz |
| Size (L x W x H) | Series OR | 1.12 x 0.7 x 0.3 (28.448 x 17.78 x 7.62) | | | inches (mm) |
| | Series SOR | 1.12 x 0.7 x 0.35 (28.448 x 17.78 x 8.89) | | | |
| Weight | Series OR | - | 8.5 | - | grams |
| | Series SOR | - | 10 | - | |
| Case | Glass Reinforced Polymer | | | | |
| Potting | Vacuum Impregnated Epoxy | | | | |
| Tube Packaging (W x H x L) | 1.03 x 0.74 x 20 (26.162 x 18.796 x 508) | | | | inches (mm) |
| Moisture Sensitivity Level | Series SOR | IPC / JEDEC J-STD-020, Level 3 | | | |

### PROTECTION & FEATURES

| Parameter | Condition | | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Short Circuit | Temporary | | | | | |
| Shutdown (C) | Non-latched shutdown, Self-recovery | Shutdown | Connect to -IN | | | |
| | | Restart | OPEN | | | |

## SPECIFICATIONS (Nominal $V_{IN}$, Full Load, $T_A$ = +25°C, 1 hour warm up unless otherwise specified)

### DESIGNED TO MEET

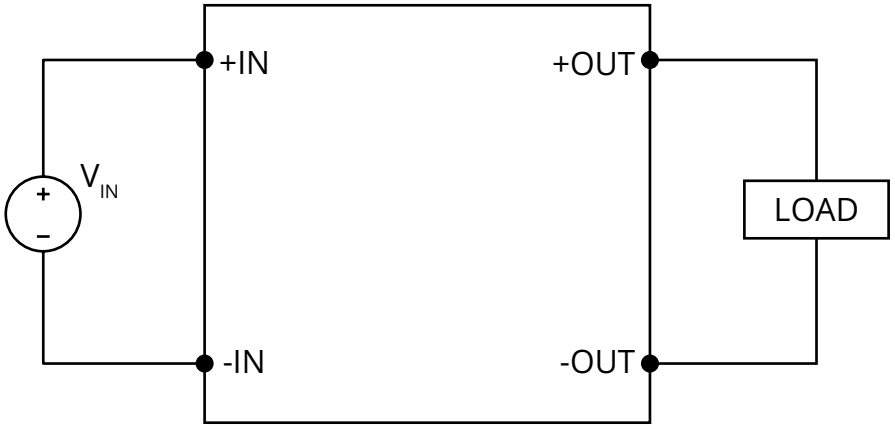
| Test | Referenced Standard | Description |
|---|---|---|
| Vibration | MIL-STD-202 | Method 204, Vibration, High Frequency, Condition D |
| Shock | MIL-STD-202 | Method 213, Shock (Specified Pulse), Condition I |
| Humidity | MIL-STD-202 | Method 106, Moisture Resistance |
| Altitude | MIL-STD-202 | Method 105, Barometric Pressure (Reduced), Condition D |

### OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER

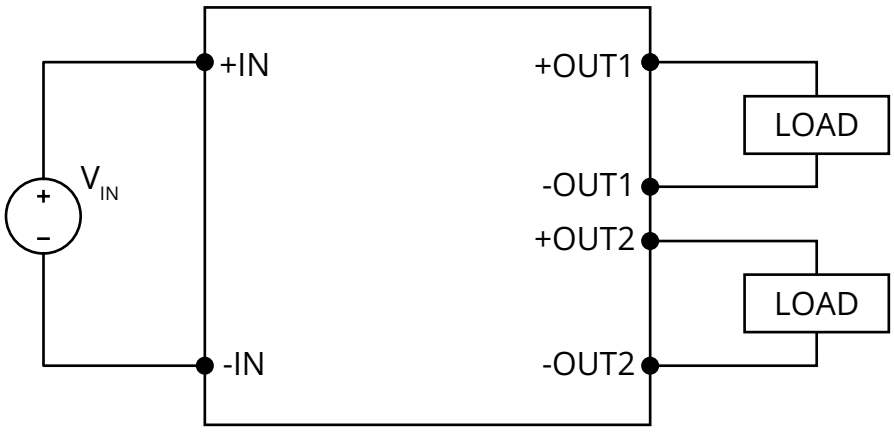
| Parameter | Referenced Standard | Description |
|---|---|---|
| Stabilization Bake | MIL-STD-883 | Referenced Method 1008<br>Non-operating maximum storage temperature for 24 hours |
| Temperature Cycle | MIL-STD-883 | Referenced Method 1010<br>Non-operating at temperature extremes, 15 mins/temp, 10 cycles |
| Burn-In | MIL-STD-883 | Referenced Method 1015<br>Max operating temperature for 160 hours |
| Expanded Ambient Operating Temperature | -55°C to +85°C | |

## TYPICAL CONNECTION CIRCUIT

### SINGLE OUTPUT



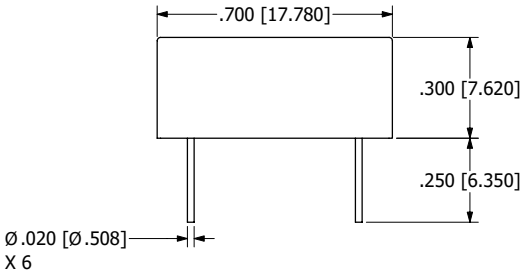

### DUAL OUTPUT

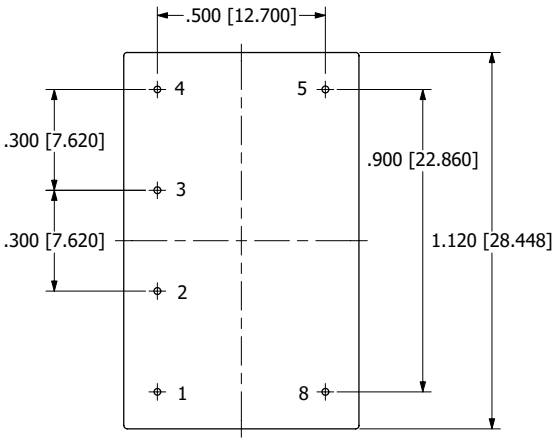


## MECHANICAL DRAWINGS

### SERIES OR - THROUGH HOLE

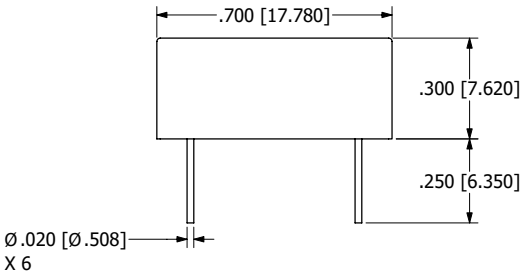
#### SINGLE OUTPUT

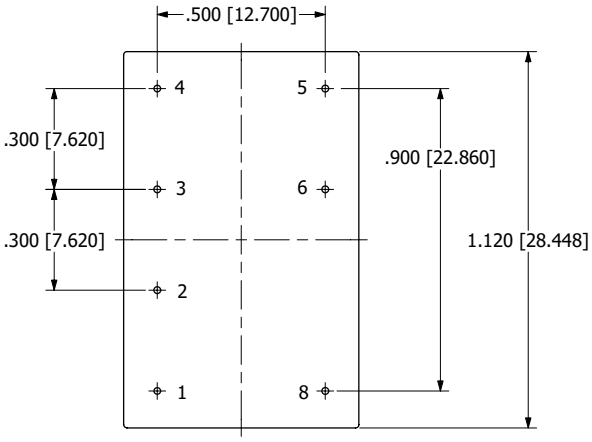



**BOTTOM VIEW**

#### DUAL OUTPUT

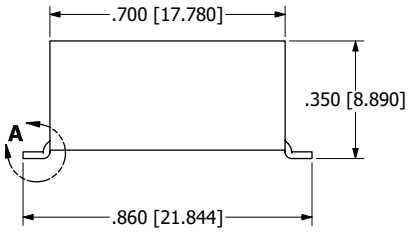


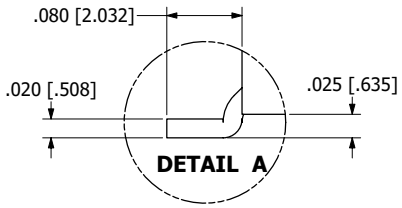

**BOTTOM VIEW**

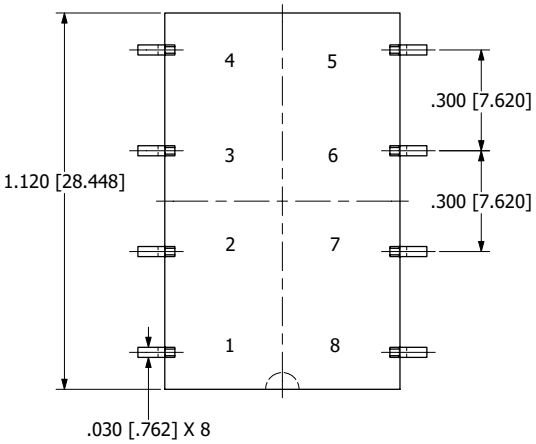
## MECHANICAL DRAWINGS

### SERIES SOR - SUFRACE MOUNT




**LEAD DETAILS**



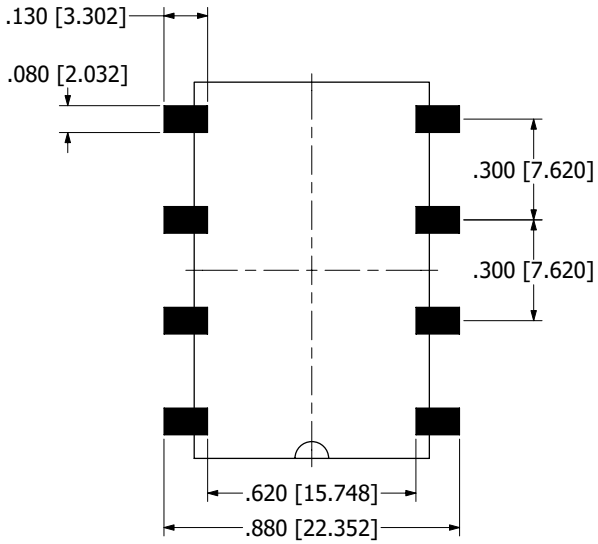




**BOTTOM VIEW**

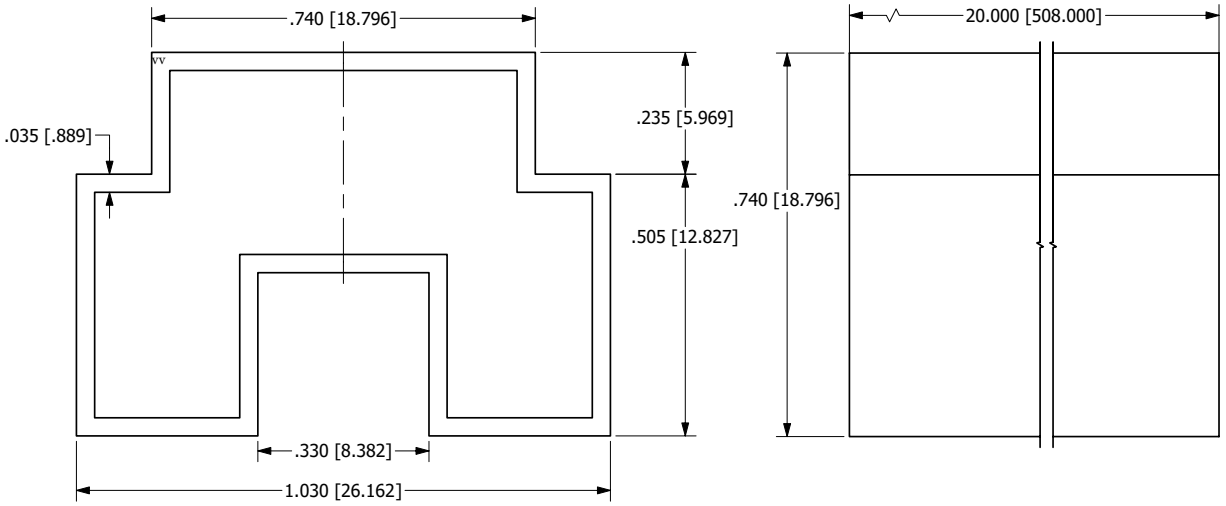
| PIN | FUNCTION | |
|---|---|---|
| | SINGLE | DUAL |
| 1 | -IN | |
| 2 | CTRL | |
| 3 | +OUT | +OUT1 |
| 4 | -OUT | -OUT1 |
| 5 | -OUT | -OUT2 |
| 6 | N/C | +OUT2 |
| 7 | N/C | |
| 8 | +IN | |

**NOTES**
a. ALL DIMENSIONS ARE IN INCHES, [ ] = MM

## RECOMMENDED LAND PATTERN DIMENSIONS - SERIES SOR



## TUBE PACKAGING




**PLAN VIEW** **ELEVATION VIEW**