

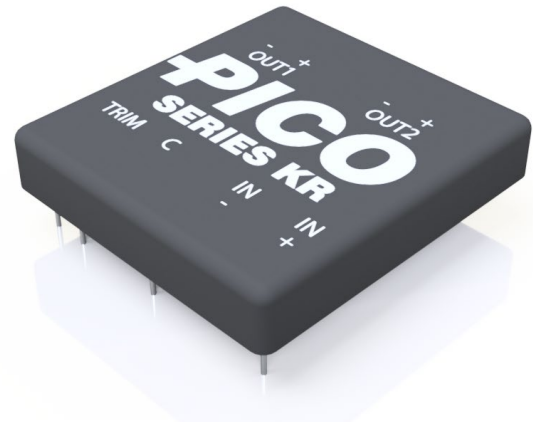
# Series KR

20W Isolated Regulated Low Profile DC-DC Converter

**PICO**  
Electronics, Inc.

## PRODUCT OVERVIEW

The KR series is an isolated DC-DC converter with wide input range, tight regulation and six-sided shielded case. These modules have trim and control features. Single and dual isolated output models are standard. They can operate up to 20W over the temperature range of -25°C to +70°C without derating, a heat sink or active cooling.



## FEATURES

- Up to 20W output at +70°C ambient
- Low profile – 0.500" height
- Up to 3.33:1 input voltage range
- 3.3 to 100V output models
- Six-sided shielded case
- Control feature
- Trimmable output
- Input/output isolation
- Single and dual isolated output
- No external components required
- 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

**KR**

SERIES NAME

**KR**

**A**

INPUT VOLTAGE RANGE

**A** = 18 to 36V  
**B** = 36 to 60V  
**C** = 18 to 60V

**28**

NOM. OUTPUT VOLTAGE

**3.3** = 3.3V  
**5** = 5V  
**5.2** = 5.2V  
**9** = 9V  
**12** = 12V  
**15** = 15V  
**24** = 24V  
**28** = 28V  
**48** = 48V  
**100** = 100V

**S**

NUMBER OF OUTPUTS

**S** = SINGLE  
**D** = DUAL

**MODEL LIST****SINGLE OUTPUT**

Pico Part Number	Output Voltage [VDC]	Output Current		Efficiency <sup>(1)</sup> [%] typ.	Input Current <sup>(1)</sup> [%] typ.	Line Regulation <sup>(2)</sup>		Load Regulation <sup>(3)</sup>		Output Ripple @ 1MHz BW [mVp-p]	Output Voltage Tolerance <sup>(1)</sup> [±%]
		Min. [mA]	Max. [mA]			Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]		
KRA3.3S	3.3	606.1	6061	78	950	2.5	2.5	3	3	60	1
KRA5S	5	400	4000	78	950	1.5	1.5	2.5	2.5	60	0.75
KRA5.2S	5.2	384.6	3846	78	950	1.5	1.5	2.5	2.5	60	0.75
KRA9S	9	222.2	2222	80	925	0.75	0.75	1.25	1.25	60	0.5
KRA12S	12	166.7	1667	78	950	0.5	0.5	1	1	60	0.5
KRA15S	15	133.3	1333	78	950	0.5	0.5	1	1	60	0.5
KRA24S	24	83.3	833	81	915	0.25	0.25	0.5	0.5	60	0.5
KRA28S	28	71.4	714	82	905	0.25	0.25	0.5	0.5	60	0.5
KRA48S	48	41.7	417	83	890	0.25	0.25	0.5	0.5	80	0.5
KRA100S	100	20	200	83	890	0.25	0.25	0.5	0.5	100	0.5
KRB3.3S	3.3	606.1	6061	78	534	2.5	2.5	3	3	60	1
KRB5S	5	400	4000	78	535	1	1	2.5	2.5	60	0.75
KRB5.2AS	5.2	384.6	3846	78	535	1	1	2.5	2.5	60	0.75
KRB9S	9	222.2	2222	80	520	0.5	0.5	1.25	1.25	60	0.5
KRB12S	12	166.7	1667	78	535	0.5	0.5	1	1	60	0.5
KRB15S	15	133.3	1333	78	535	0.5	0.5	1	1	60	0.5
KRB24S	24	83.3	833	81	515	0.25	0.25	0.5	0.5	60	0.5
KRB28S	28	71.4	714	82	510	0.25	0.25	0.5	0.5	60	0.5
KRB48S	48	41.7	417	83	500	0.25	0.25	0.5	0.5	80	0.5
KRB100S	100	20	200	83	500	0.25	0.25	0.5	0.5	100	0.5
KRC3.3S	3.3	606.1	6061	78	657	2.5	2.5	3	3	60	1
KRC5S	5	400	4000	78	660	2	2	2.5	2.5	60	0.75
KRC5.2S	5.2	384.6	3846	78	660	2	2	2.5	2.5	60	0.75
KRC9S	9	222.2	2222	80	640	1	1	1.25	1.25	60	0.5
KRC12S	12	166.7	1667	78	660	0.75	0.75	1	1	60	0.5
KRC15S	15	133.3	1333	78	660	0.75	0.75	1	1	60	0.5
KRC24S	24	83.3	833	81	635	0.5	0.5	0.5	0.5	60	0.5
KRC28S	28	71.4	714	82	625	0.5	0.5	0.5	0.5	60	0.5
KRC48S	48	41.7	417	83	615	0.5	0.5	0.5	0.5	80	0.5
KRC100S	100	20	200	83	615	0.5	0.5	0.5	0.5	100	0.5

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

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

**MODEL LIST****DUAL OUTPUT**

Pico Part Number	Output Voltage Per Output [VDC]	Output Current Per Output		Efficiency <sup>(1)</sup> [%] typ.	Input Current <sup>(1)</sup> [%] typ.	Line Regulation <sup>(2)</sup>		Load Regulation <sup>(3)</sup>		Output Ripple Per Output @ 1MHz BW [mVp-p]	Output Voltage Tolerance <sup>(1)</sup> [±%]
		Min. [mA]	Max. [mA]			Nom.-Min. [-%]	Nom.-Max. [%]	60%-25% [%]	60%-100% [-%]		
KRA5D	5	200	2000	78	950	1.5	1.5	2.5	2.5	60	0.75
KRA9D	9	111.1	1111	80	925	0.75	0.75	1.25	1.25	60	0.5
KRA12D	12	83.3	833	78	950	0.5	0.5	1	1	60	0.5
KRA15D	15	66.7	667	78	950	0.5	0.5	1	1	60	0.5
KRA24D	24	41.7	417	81	915	0.25	0.25	0.5	0.5	60	0.5
KRA28D	28	35.7	357	82	905	0.25	0.25	0.5	0.5	60	0.5
KRA48D	48	20.8	208	83	890	0.25	0.25	0.5	0.5	80	0.5
KRB5D	5	200	2000	78	535	1	1	2.5	2.5	60	0.75
KRB9D	9	111.1	1111	80	520	0.5	0.5	1.25	1.25	60	0.5
KRB12D	12	83.3	833	78	535	0.5	0.5	1	1	60	0.5
KRB15D	15	66.7	667	78	535	0.5	0.5	1	1	60	0.5
KRB24D	24	41.7	417	81	515	0.25	0.25	0.5	0.5	60	0.5
KRB28D	28	35.7	357	82	510	0.25	0.25	0.5	0.5	60	0.5
KRB48D	48	20.8	208	83	500	0.25	0.25	0.5	0.5	80	0.5
KRC5D	5	200	2000	78	660	2	2	2.5	2.5	60	0.75
KRC9D	9	111.1	1111	80	640	1	1	1.25	1.25	60	0.5
KRC12D	12	83.3	833	78	660	0.75	0.75	1	1	60	0.5
KRC15D	15	66.7	667	78	660	0.75	0.75	1	1	60	0.5
KRC24D	24	41.7	417	81	635	0.5	0.5	0.5	0.5	60	0.5
KRC28D	28	35.7	357	82	625	0.5	0.5	0.5	0.5	60	0.5
KRC48D	48	20.8	208	83	615	0.5	0.5	0.5	0.5	80	0.5

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

Note 2: Line regulation is specified at full output load, nominal to minimum input voltage (-%) and nominal to maximum input voltage (+%).

Note 3: Load regulation is specified at nominal input voltage, 60% to 25% load (+%) and 60% to 100% load (-%).

Note 4: Dual outputs must be balanced.

**SPECIFICATIONS (Nominal  $V_{IN}$ , Full Load,  $T_A = +25^\circ\text{C}$ , 1 hour warm up unless otherwise specified)****INPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Input Voltage Range	KRA models	18	27	36	VDC
	KRB models	36	48	60	
	KRC models	18	39	60	

**SPECIFICATIONS (Nominal  $V_{IN}$ , Full Load,  $T_A = +25^{\circ}\text{C}$ , 1 hour warm up unless otherwise specified)****OUTPUT**

Parameter	Condition	Min.	Nom.	Max.	Units
Output Power	Single output models	2	-	20	W
	Dual output models per output	1	-	10	

**ENVIRONMENTAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient without derating	-25	-	+70	$^{\circ}\text{C}$
Storage Temperature Range	Ambient	-55	-	+105	$^{\circ}\text{C}$
Temperature Coefficient		-	-	0.02	$\%/^{\circ}\text{C}$
Cooling	Free Air Convection				

**GENERAL**

Parameter	Condition	Min.	Typ.	Max.	Units
Isolation Voltage	Input to output	500	-	-	VDC
	OUT1 to OUT2	500	-	-	
Switching Frequency		-	40	-	kHz
Size (L x W x H)		2.8 x 2.6 x 0.5 (71.12 x 66.04 x 12.7)			inches (mm)
Weight		-	165	-	grams
Case	6-Sided Epoxy Insulated Metal				
Potting	Vacuum Impregnated Epoxy				
Box Packaging (W x L x H)	8 x 7.5 x 1.5 (203.2 x 190.5 x 38.1) or 12 x 9 x 1.5 (304.8 x 228.6 x 38.1)				inches (mm)

**PROTECTION & FEATURES**

Parameter	Condition	Min.	Typ.	Max.	Units
Shortcircuit	Temporary				
Shutdown (C)	Non-latched shutdown, Self-recovery	Shutdown	Connect to -IN		
		Restart	OPEN		
Output Voltage Trim (TRIM)	Trim up only	0	-	5	%

**DESIGNED TO MEET**

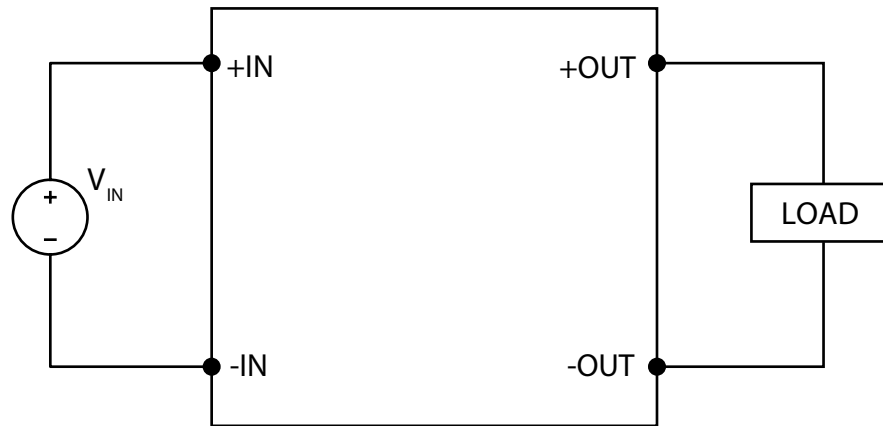
Test	Referenced Standard	Description
Vibration	MIL-STD-202	Method 204, Vibration, High Frequency, Condition D
Shock	MIL-STD-202	Method 213, Shock (Specified Pulse), Condition I
Humidity	MIL-STD-202	Method 106, Moisture Resistance
Altitude	MIL-STD-202	Method 105, Barometric Pressure (Reduced), Condition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

**OPTIONS AVAILABLE – CONTACT PICO FOR PART NUMBER**

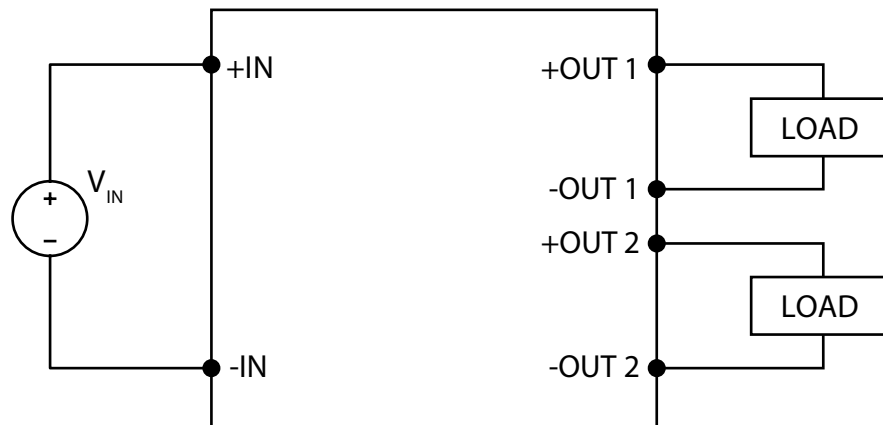
Parameter	Referenced Standard	Description
Stabilization Bake	MIL-STD-883	Referenced Method 1008 Non-operating maximum storage temperature for 24 hours
Temperature Cycle	MIL-STD-883	Referenced Method 1010 Non-operating at temperature extremes, 15 mins/temp, 10 cycles
Burn-In	MIL-STD-883	Referenced Method 1015 Max operating temperature for 160 hours
Expanded Ambient Operating Temperature		-55 $^{\circ}\text{C}$ to +85 $^{\circ}\text{C}$

TYPICAL CONNECTION CIRCUIT

SINGLE OUTPUT

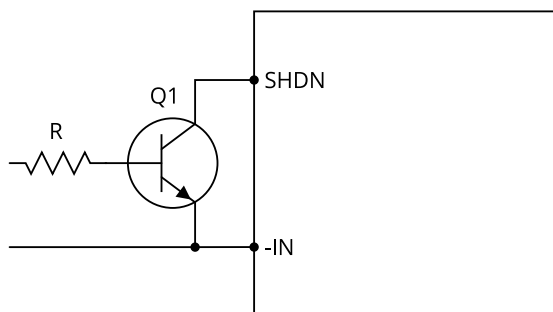


DUAL OUTPUT

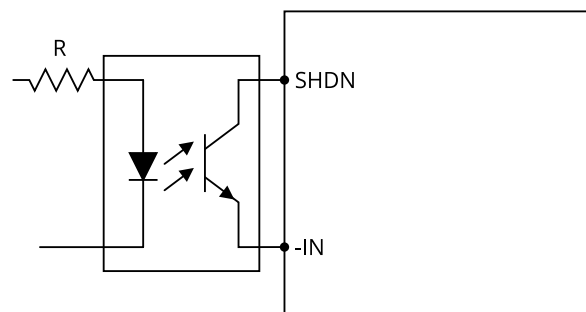


SHUTDOWN

NON-ISOLATED



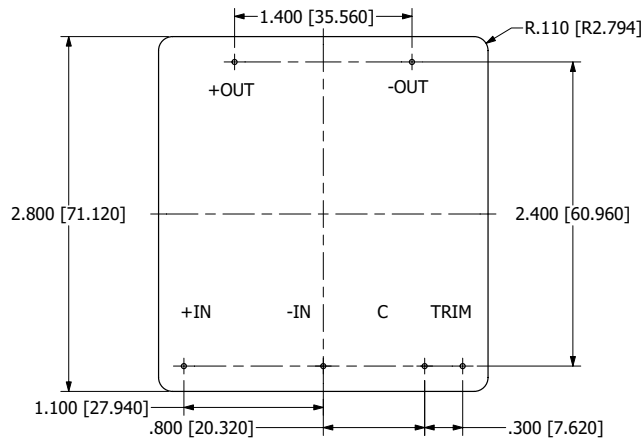
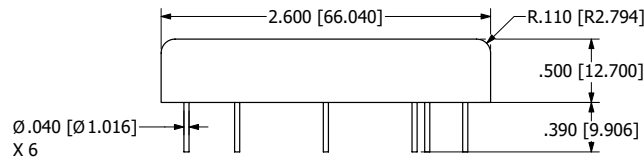
ISOLATED



**Please note:** During shutdown mode, 475V input and no load condition, the output voltage may increase up to 5% of nominal output voltage. Shutdown is enabled when SHDN pin is pulled low (<1V) relative to -IN. OPEN will automatically restart the module. When floating, the maximum voltage of SHDN is limited to 22VDC.

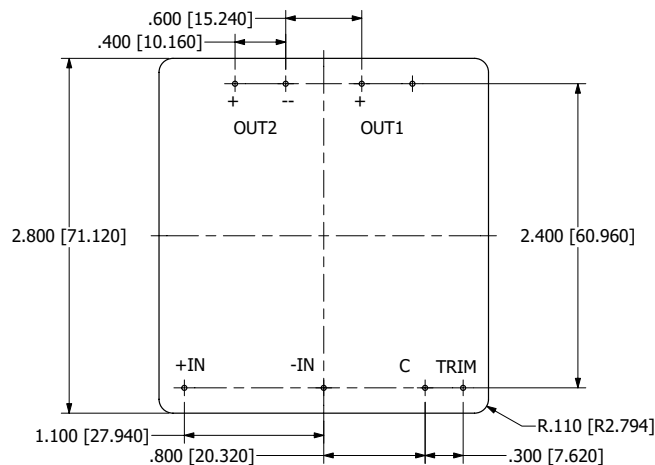
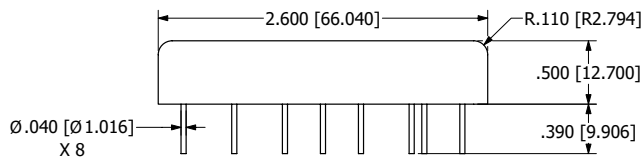
MECHANICAL DRAWINGS

SINGLE OUTPUT



**BOTTOM VIEW**

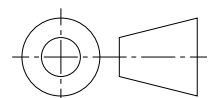
DUAL OUTPUT

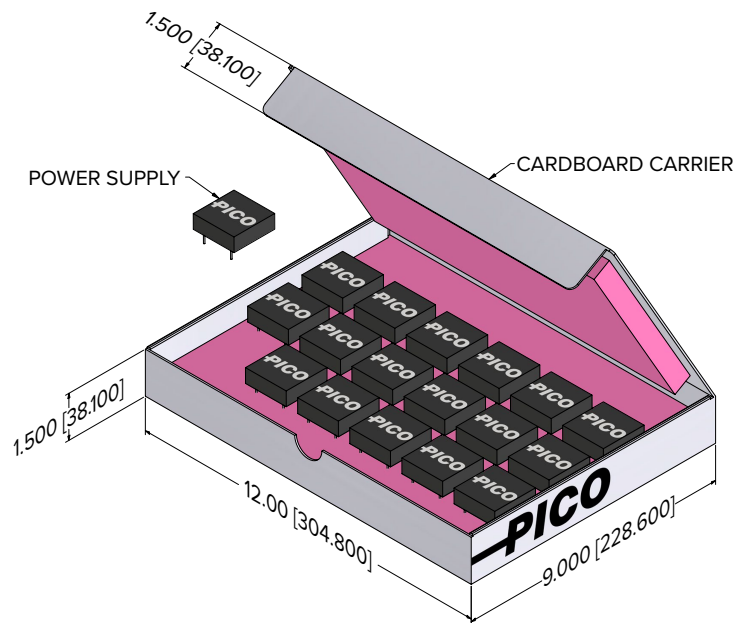
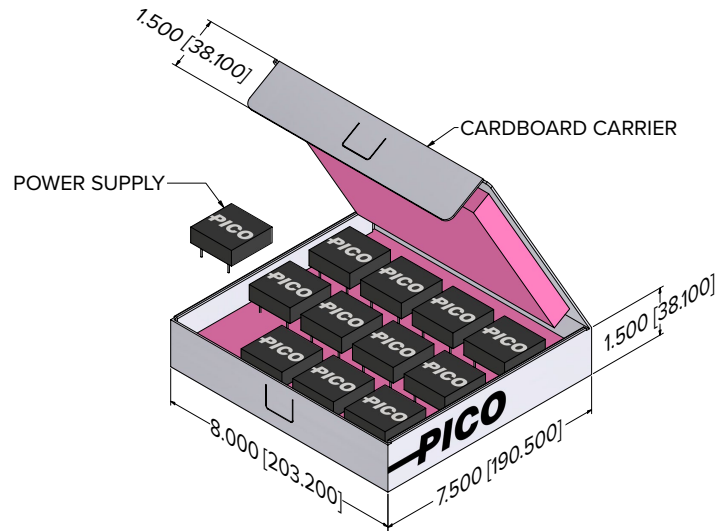


**BOTTOM VIEW**

NOTES

- a. ALL DIMENSIONS ARE IN INCHES, [ ] = MM
- b. C IS CONTROL PIN





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