

Series SAR & SAR-SM

3W Isolated Adjustable High Voltage DC-DC Converter

PICO
Electronics, Inc.

PRODUCT OVERVIEW

The SAR series modules are isolated DC-DC converters with 0% to 100% output voltage programmable by internal reference or external voltage. These modules have an internal reference voltage and shutdown. Protections include input over/undervoltage, over temperature and over programming.

Through hole and surface mount packages are available. Every single output has a center tap for a dual output configuration. Due to a resonant design, it exhibits a very low load effect.



FEATURES

- 0-100% programmable output feature
- Up to 3W output power
- 2:1 wide input voltage range with 0.5% line regulation
- Protected against input over/undervoltage, over temperature and over programming
- Internal reference voltage feature
- Shutdown feature
- Single or dual output configuration

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
- Available RoHS Compliant module
- Special Input Voltage, Output Voltage, Isolation Voltage or Output Power

24

SAR

100

SM

INPUT VOLTAGE RANGE

SERIES NAME

NOM. OUTPUT VOLTAGE

MOUNTING

5 = 5 - 10V

12 = 7.5 - 15V

24 = 18 - 36V

SAR

100 = 100V

250 = 250V

500 = 500V

1000 = 1000V

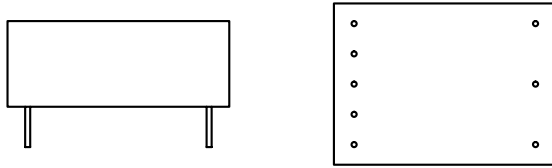
1500 = 1500V

BLANK = THROUGH HOLE

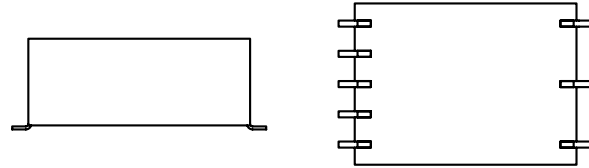
SM = SURFACE MOUNT

MODEL LIST

THROUGH HOLE



SURFACE MOUNT



Through Hole	Surface Mount	Output Voltage [VDC]	Output Current		Efficiency ⁽¹⁾ [%] typ.	Input Current ⁽²⁾		Load Regulation 0-100% [%] typ.	Output Ripple @ 1MHz BW [%]
			Min. [mA]	Max. [mA]		No Load [mA] typ.	Full Load [mA] typ.		
5SAR100	5SAR100SM	100	0	30	78	45	510	8	0.2
5SAR250	5SAR250SM	250		12	78	56	512	5	0.15
5SAR500	5SAR500SM	500		6	77	76	517	4	0.15
5SAR1000	5SAR1000SM	1000		3	75	76	530	5	0.2
5SAR1500	5SAR1500SM	1500		2	74	71	546	5	0.3
12SAR100	12SAR100SM	100		30	80	55	310	5	0.2
12SAR250	12SAR250SM	250		12	81	56	309	3	0.15
12SAR500	12SAR500SM	500		6	79	44	315	4	0.4
12SAR1000	12SAR1000SM	1000		3	79	50	320	4	0.25
12SAR1500	12SAR1500SM	1500		2	78	51	318	4	0.3
24SAR100	24SAR100SM	100		30	75	35	168	5	0.35
24SAR250	24SAR250SM	250		12	75	32	165	3	0.3
24SAR500	24SAR500SM	500		6	77	29	165	4	0.2
24SAR1000	24SAR1000SM	1000		3	76	30	167	4	0.2
24SAR1500	24SAR1500SM	1500		2	73	39	170	4	0.2

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

Note 2: Tested at nominal input voltage.

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

INPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Input Voltage Range	5SAR models	5	7.5	10	VDC
	12SAR models	7.5	12	15	
	24SAR models	18	24	36	

OUTPUT

Parameter	Condition	Min.	Typ.	Max.	Units
Line Regulation	24SAR models	-	-	0.5	%
	All other models	-	-	0.1	
Output Power	5SAR models	5.5-5V input	Derate 50% power per input voltage from 5.5V input		
		5.5-10V input	0	-	3
	All other models	0	-	3	
Output Voltage Tolerance	Nominal V_{IN} Full Load	-	-	3	±%

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				

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

GENERAL

Parameter	Condition	Min.	Typ.	Max.	Units
Operating Frequency	Fixed, model dependent	125	-	450	kHz
Isolation Voltage	Input to output	1500	-	-	VDC
Insulation Resistance		100	-	-	MΩ
Size (L x W x H)	Through hole	1.1 x 0.8 x 0.425 (27.94 x 20.32 x 10.795)			inches (mm)
	Surface mount	1.1 x 0.8 x 0.45 (27.94 x 20.32 x 11.43)			
Weight		-	12	-	grams
Case	Glass Reinforced Polymer				
Potting	Vacuum Impregnated Epoxy				
Tube Packaging (W x H x L)		1.645 x 0.74 x 20 (41.783 x 18.796 x 508)			inches (mm)
Moisture Sensitivity Level	Surface mount	IPC / JEDEC J-STD-020, Level 3			

PROTECTIONS & FEATURES

Parameter	Condition	Min.	Typ.	Max.	Units	
Overtemperature	Internal, Non-latched shutdown, self-recovery	-	105	-	°C	
Input Under Voltage	Non-latched shutdown, Self-recovery	5SAR models	-	4	-	VDC
		12SAR models	-	7	-	
		24SAR models	-	16	-	
Input Over Voltage	Non-latched shutdown, Self-recovery	5SAR models	-	10.5	-	VDC
		12SAR models	-	16	-	
		24SAR models	-	38	-	
Shutdown (SHDN)	Non-latched shutdown Self-recovery	-	0.4	-	VDC	
Output Voltage Programming (ADJ)	Voltage, Linear 0-100% Vout	0	-	3	VDC	
Programming Reference (REF)	Voltage	2.85	3	3.15	VDC	
	Current	0	-	1	mA	

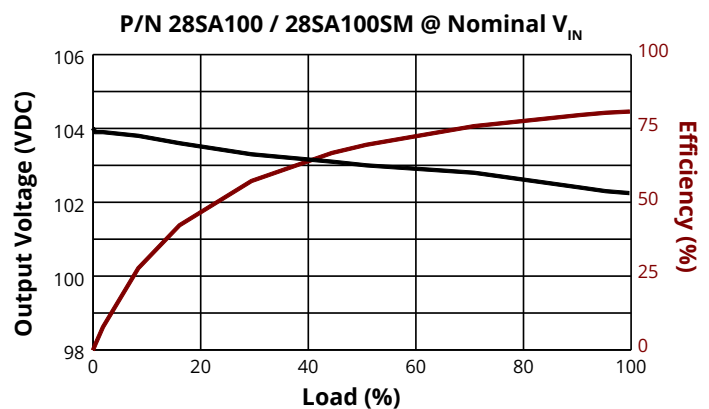
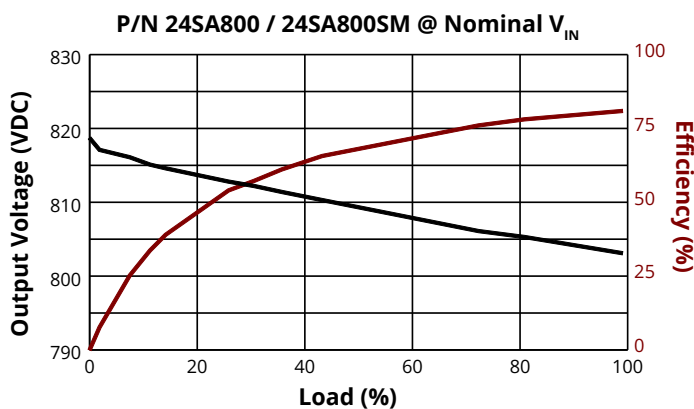
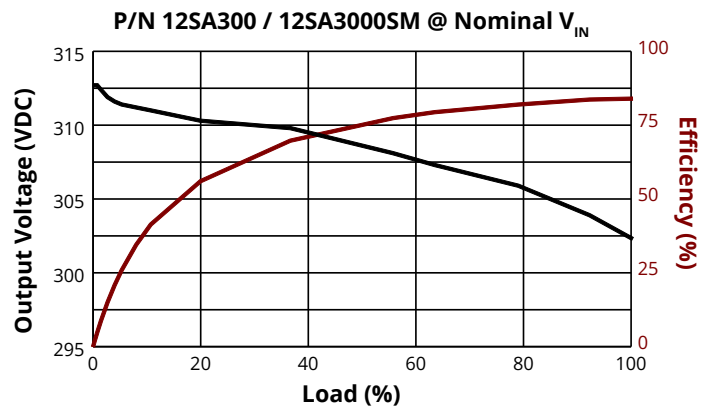
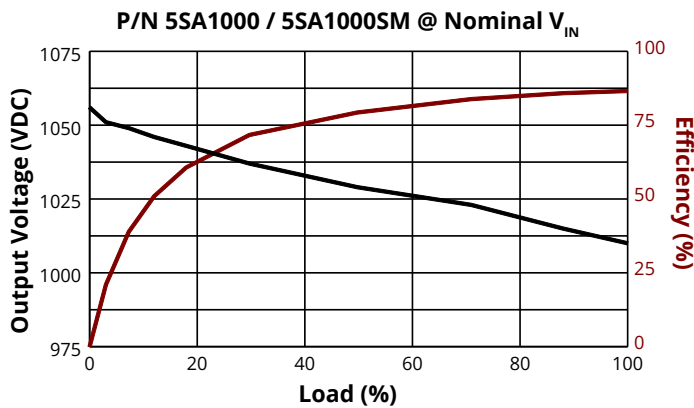
DESIGNED TO MEET

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°C to +85°C
RoHS Compliance		-

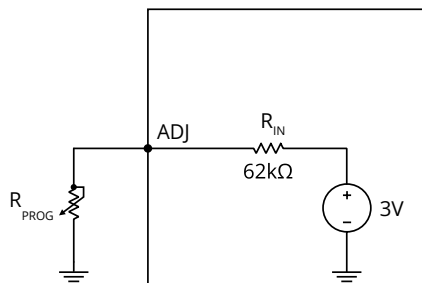
DATA CURVES (Nominal V_{IN} , $T_A = +25^\circ\text{C}$, 1 hour warm up unless otherwise specified)



TYPICAL CONNECTION CIRCUIT

OUTPUT PROGRAMMING

RESISTOR - 5SAR & 12SAR MODELS ONLY



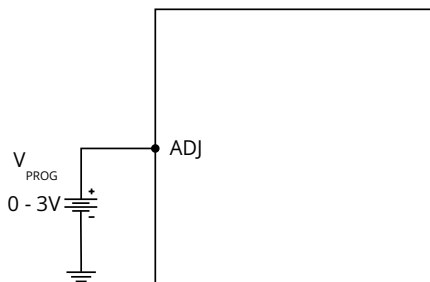
$$\frac{V_{OUT}}{V_{NOM}} = \frac{1.61}{\frac{1}{R_{PROG}} + \frac{1}{62}}$$

V_{OUT} = Programmed Output Voltage

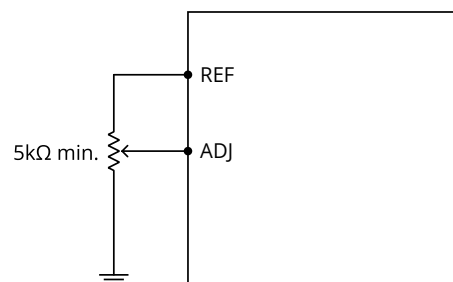
V_{NOM} = Nominal Output Voltage

R_{PROG} = Resistance in $k\Omega$

EXTERNAL VOLTAGE - ALL MODELS



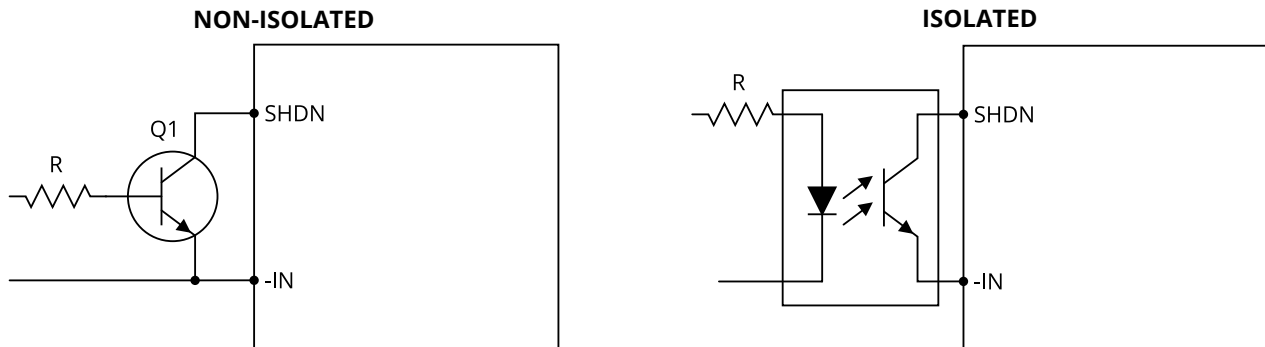
INTERNAL VOLTAGE REFERENCE - ALL MODELS



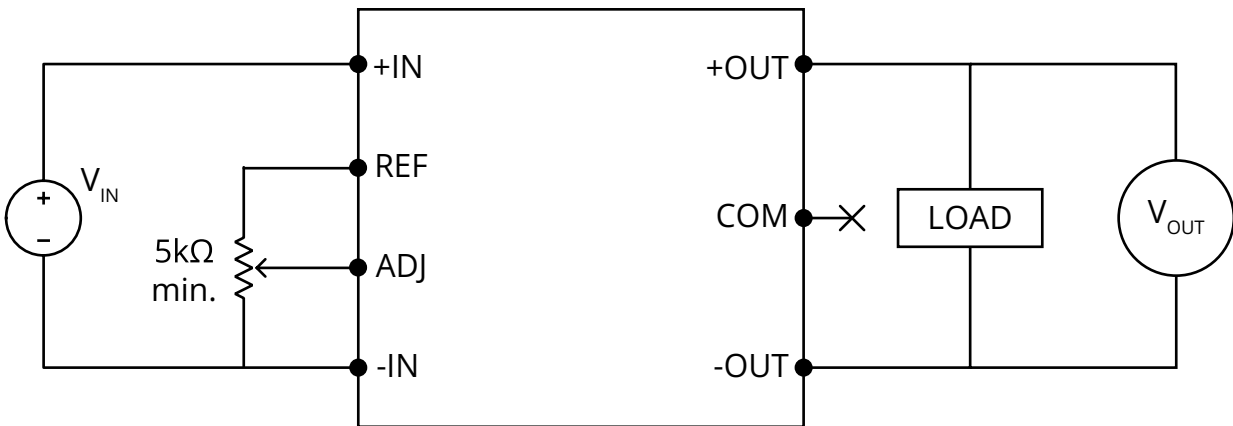
Note: A voltage source at ADJ will program the output voltage linearly.

TYPICAL CONNECTION CIRCUIT

SHUTDOWN

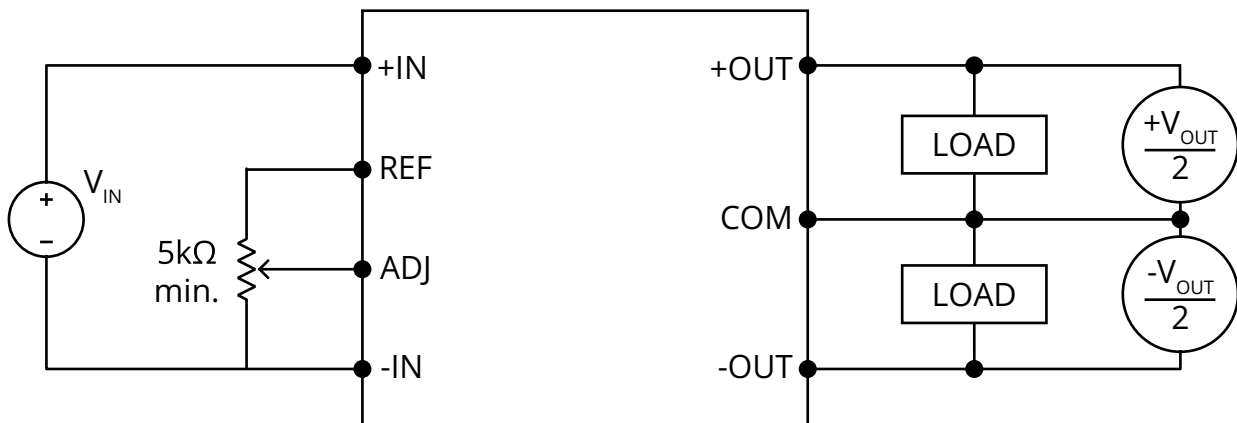


SINGLE OUTPUT OPERATION



Nominal output voltage is measured between +OUT and -OUT. For single output, COM should be disconnected.

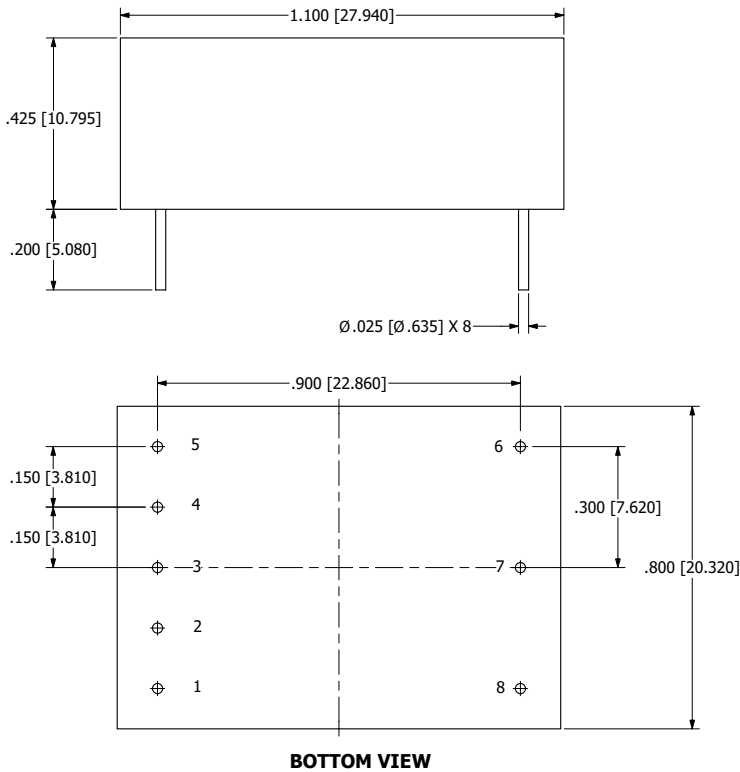
DUAL OUTPUT OPERATION



Nominal output voltage is measured between +OUT and -OUT. For dual outputs, COM will be half of the voltage between +OUT and -OUT. Both loads must be balanced.

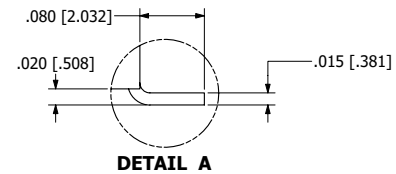
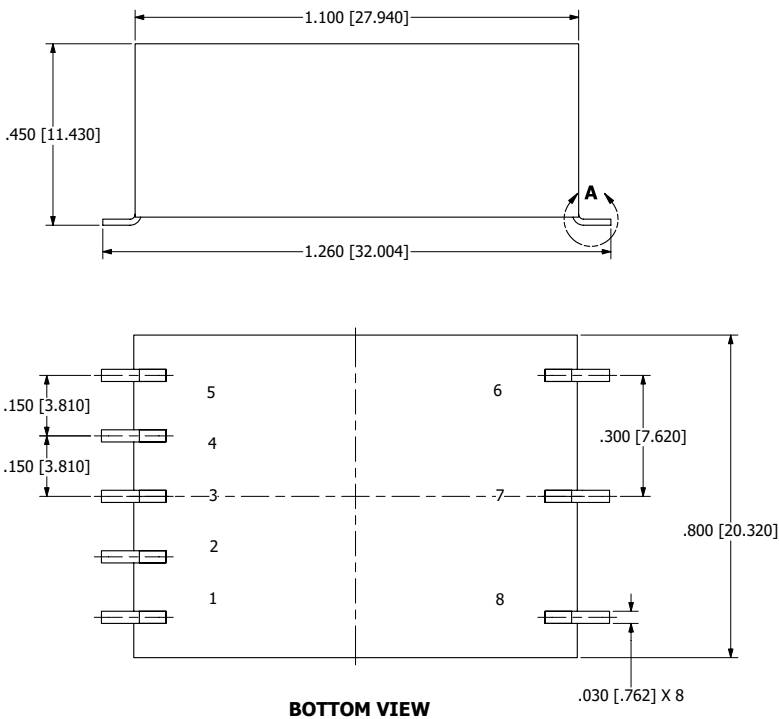
MECHANICAL DRAWINGS

THROUGH HOLE



PIN	FUNCTION
1	-IN
2	ADJ
3	REF
4	SHDN
5	+IN
6	+OUT
7	COM
8	-OUT

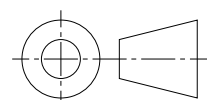
SURFACE MOUNT



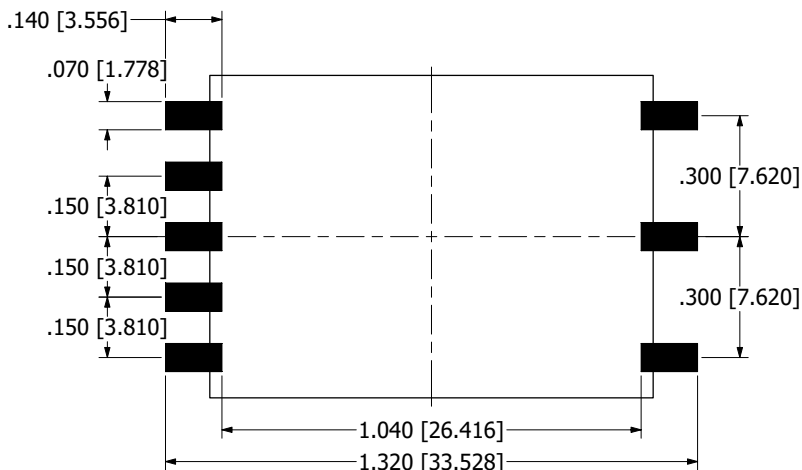
PIN	FUNCTION
1	-IN
2	ADJ
3	REF
4	SHDN
5	+IN
6	+OUT
7	COM
8	-OUT

NOTES

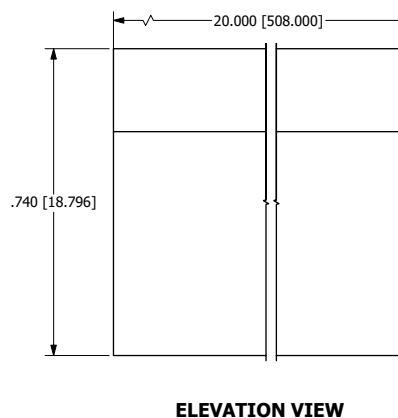
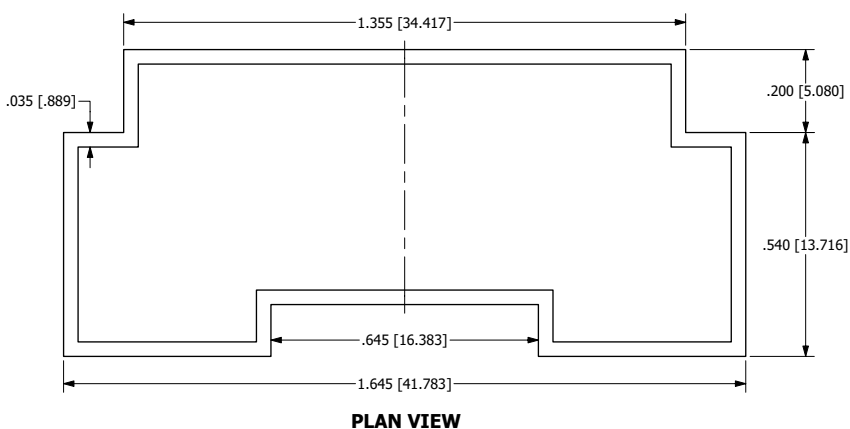
a. ALL DIMENSIONS ARE IN INCHES, [] = MM



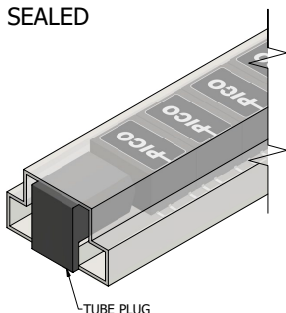
RECOMMENDED LAND PATTERN DIMENSIONS



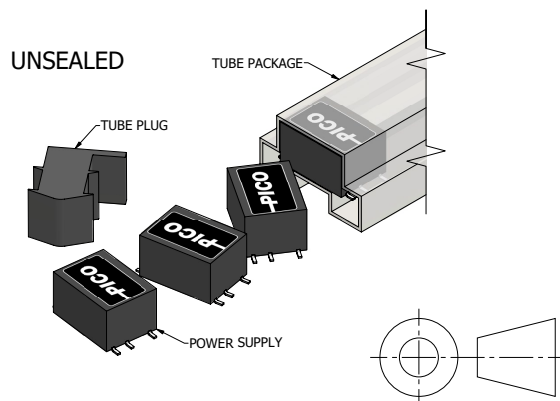
TUBE PACKAGING



SEALED



UNSEALED



Pico warrants each product manufactured by us and sold by us or an authorized representative, to be free from defects in material and workmanship. If properly used, it will perform within its applicable specifications for a period of one year after original shipment. Pico's obligation under this guarantee is limited to repairing or replacing our product to the original purchaser. This warranty is in lieu of all other warranties, express or implied and constitutes fulfillment of our obligations to the purchaser. We do not guarantee that the products can be used for a particular purpose other than those solely covered by the product's specifications. Pico must be notified if the product must meet particular certifications and/or standards. We assume no liability, in any event, for consequential damages, for anticipated or lost profits, incidental damages or loss of time or other losses incurred by the purchaser or any third party in connection with products covered by this warranty or otherwise. The purchaser will indemnify and hold Pico harmless for any damages, losses, costs, etc. from usage not within the product's specifications. Pico must be consulted before usage of its products in a nuclear, radioactive or space environment.

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