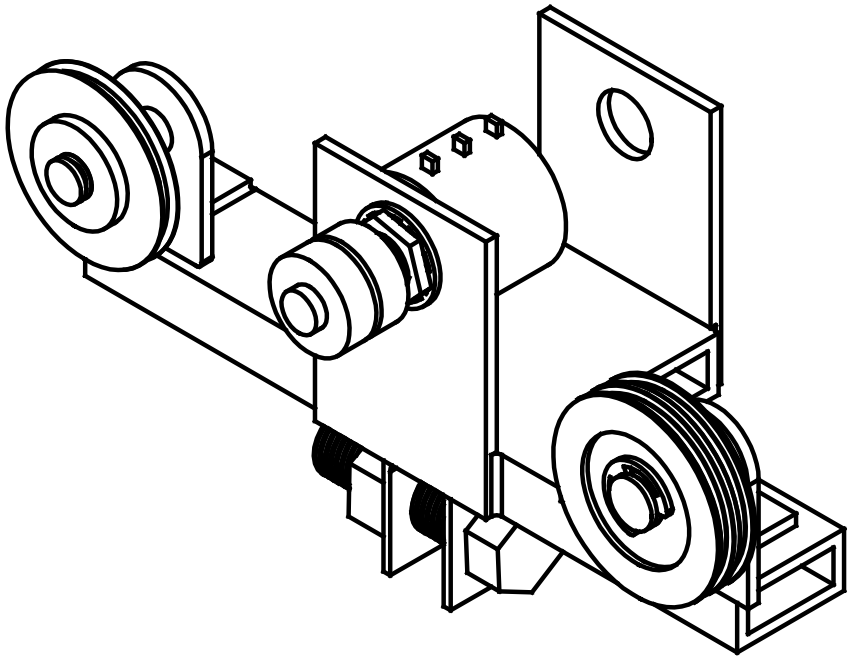
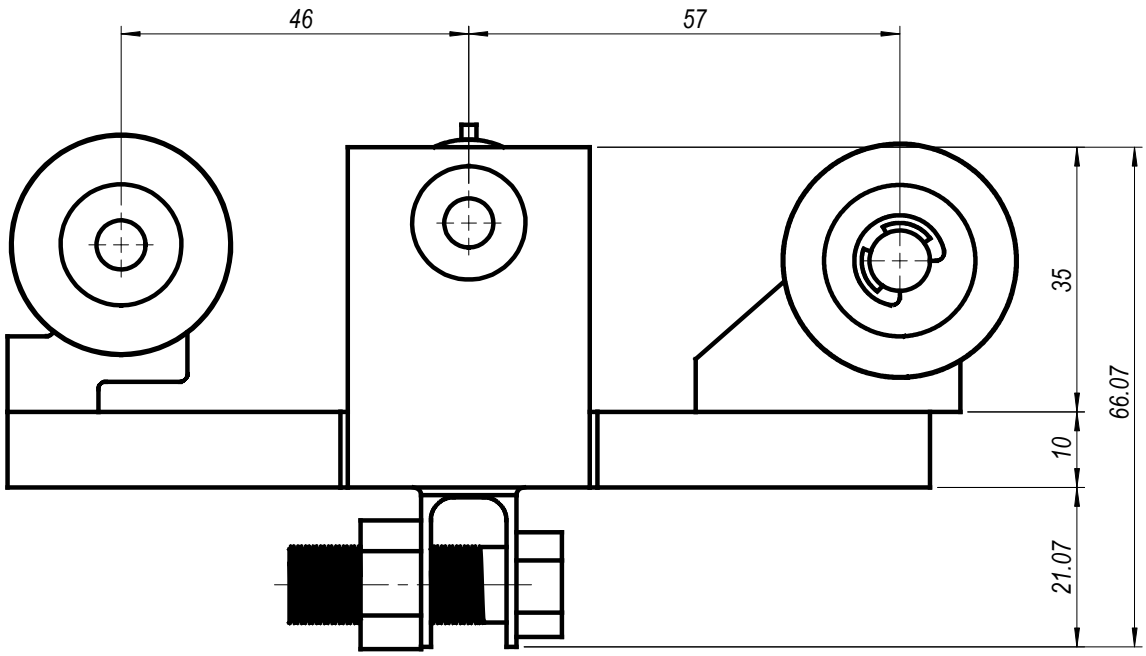
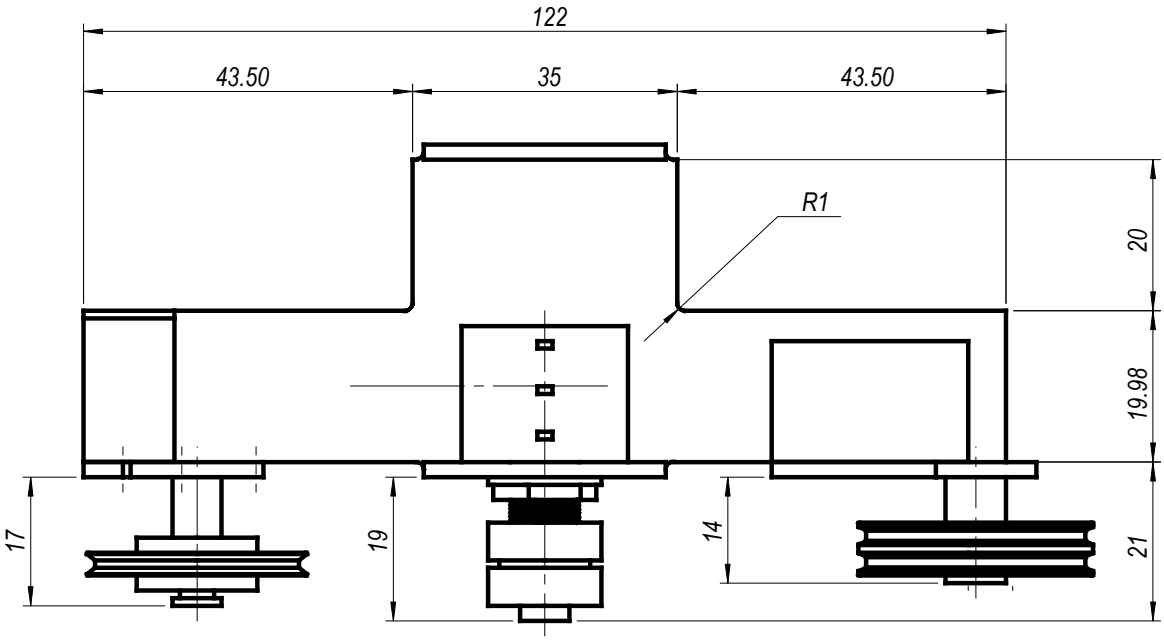
Anexo A

Planos del Sensor

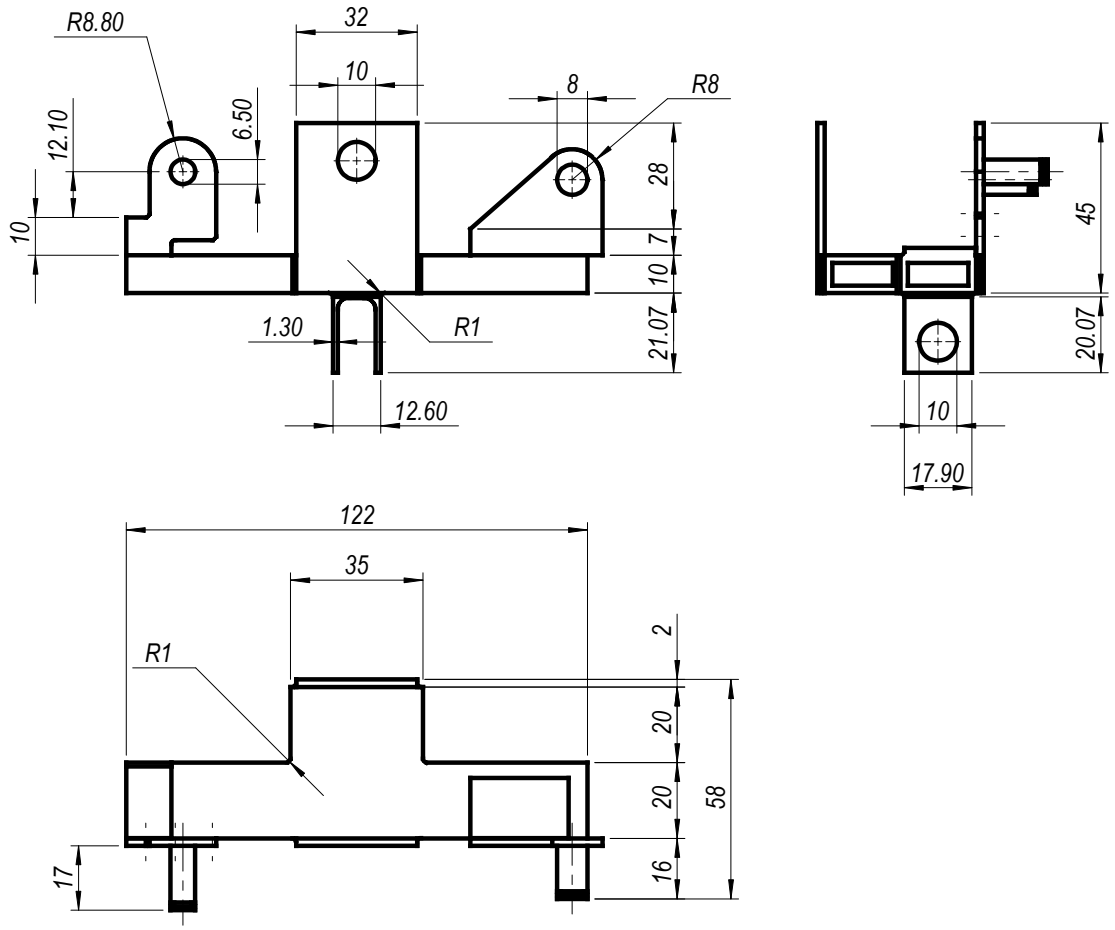


Tolerancias Generales:	Proyectó:	20-06-2014	Pablo Saiz		Código de Pieza: SN1
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Sensor.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 1:1	Denominación: Sensor en Isométrica			N º Plano Cliente: 01
	Formato: A4				N º Plano: 01 / Pág: 01





Tolerancias Generales:	Proyectó:	20-06-2014	Pablo Saiz	UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: SN1
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Sensor.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 1:1	Denominación: Sensor-Vistas			
	Formato: A4				N º Plano Cliente: 02
					N º Plano: 02 — Pág: 02



Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / Facultad de Ingeniería	Código de Pieza: BS11
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Bastidor.SLDPRT
	Revisó:				
	Aprobó:				
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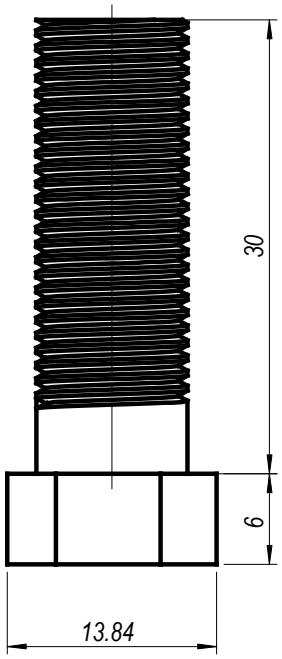
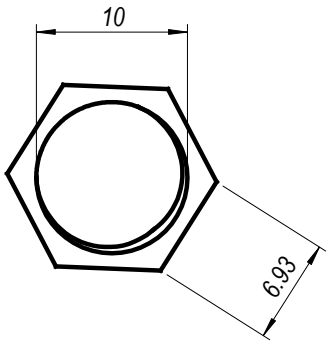
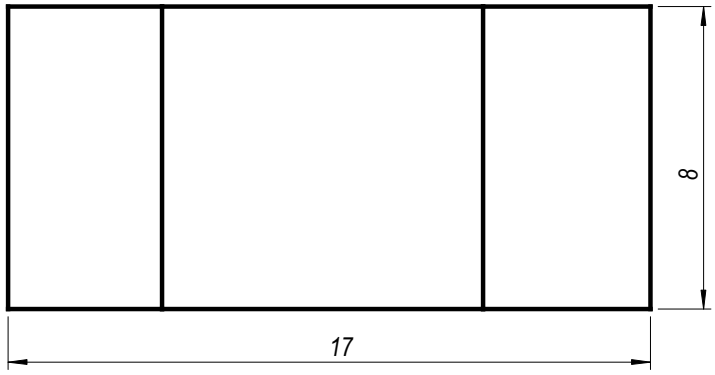
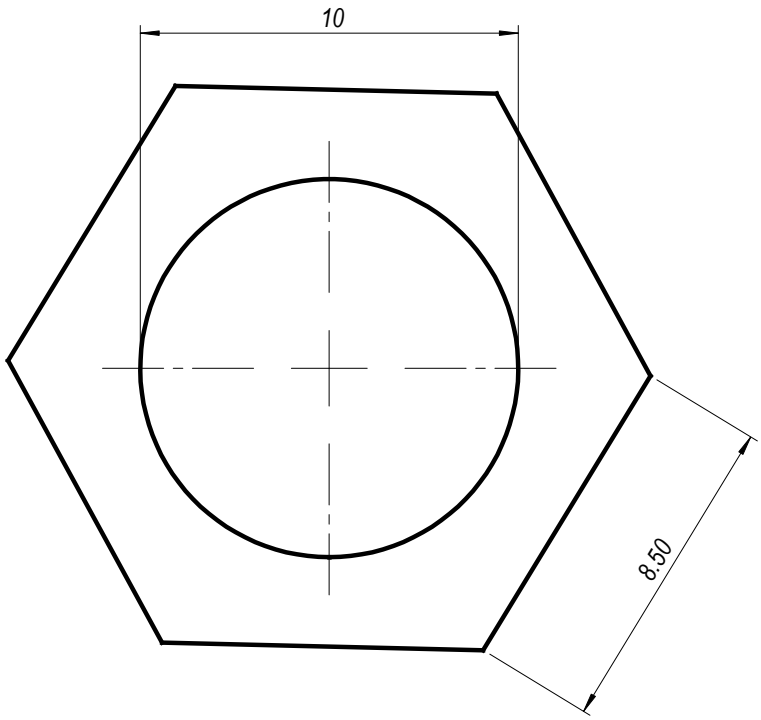
	Formato: A4				N º Plano Cliente: 03
					N º Plano: 01 — Pág: 03



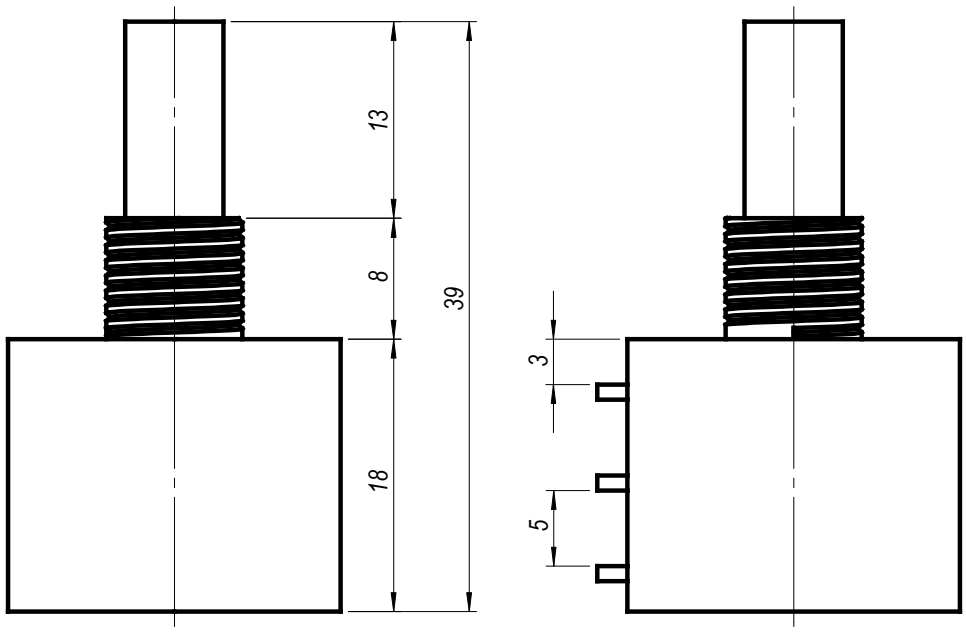


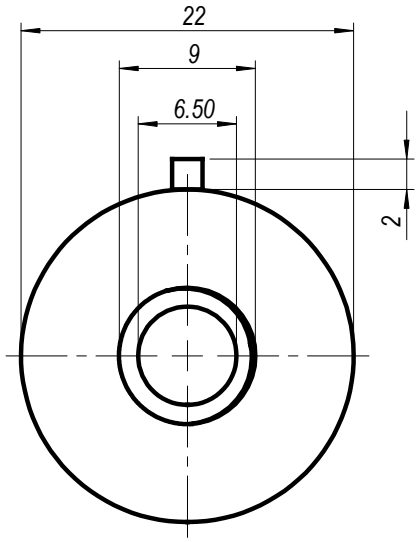
Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: TBS112
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Tornillo_Bastidor.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 2:1	Denominación: Tornillo de Sujeción para Bastidor			
	Formato: A4				N º Plano Cliente: 04
					N º Plano: 01 / Pág: 04



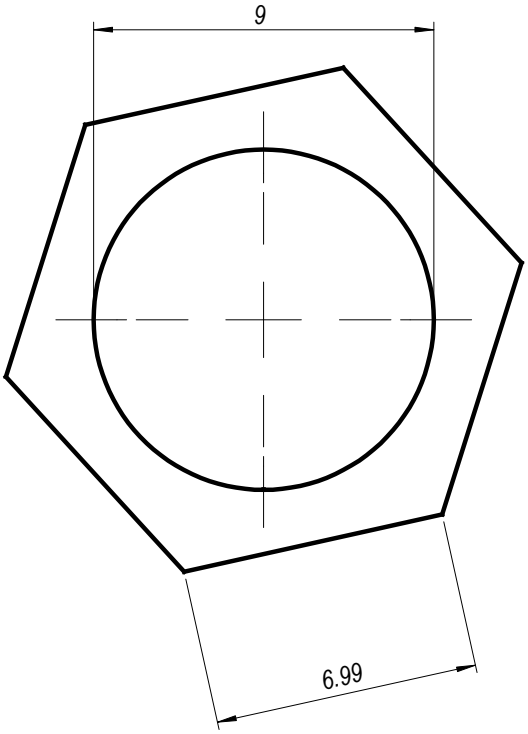


Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: HBS113
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Tuerca_Bastidor.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 5:1	Denominación: Tuerca Hexagonal para Bastidor			
	Formato: A4				N º Plano Cliente: 05
					N º Plano: 01 — Pág: 05





Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: PC12
	Dibujó:	16-06-2014	Pablo Saiz		
	Revisó:				Nombre Formato Informático: Potenciometro.SLDPRT
	Aprobó:				
	Escala: 2:1	Denominación: Potenciómetro			
	Formato: A4				N º Plano Cliente: 06
					N º Plano: 01 — Pág: 06



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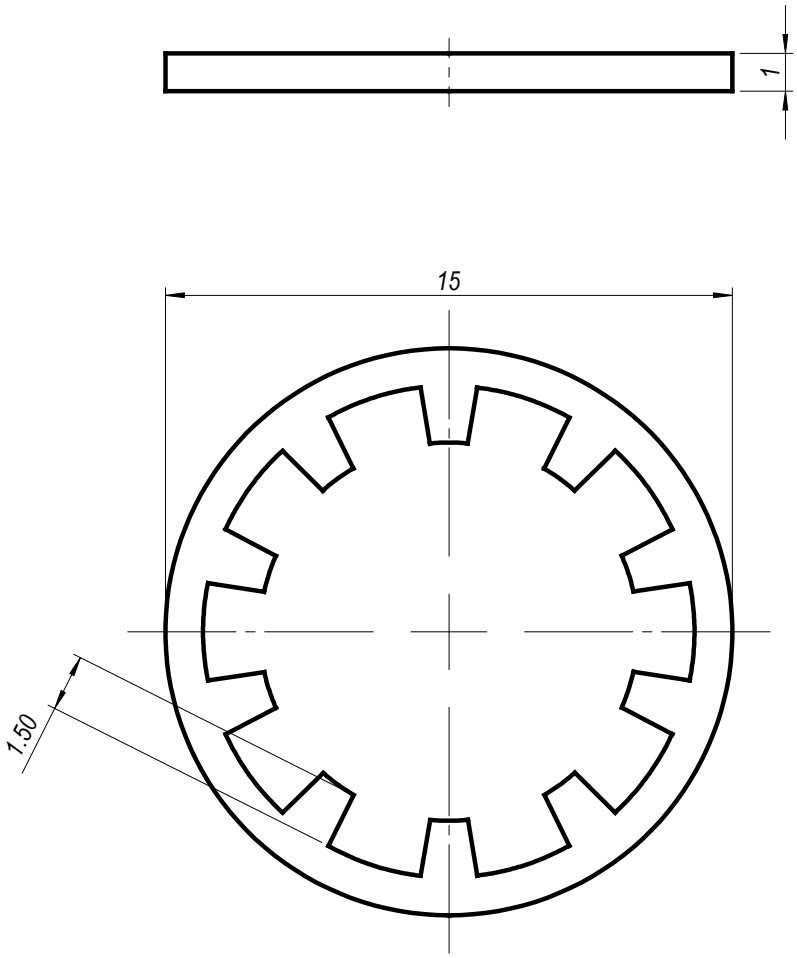
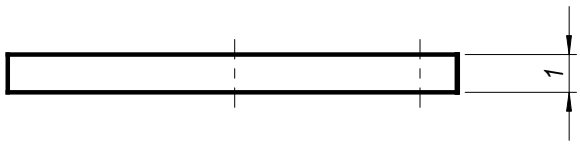
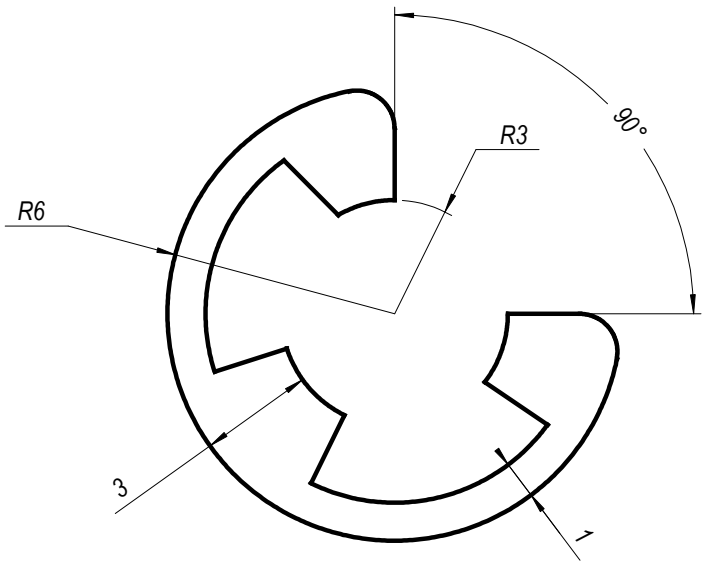
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Tuerca_Potenciometro.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 5:1	Denominación: Tuerca Hexagonal de Potenciómetro			
	Formato: A4				N º Plano Cliente: 07
					N º Plano: 01 — Pág: 07

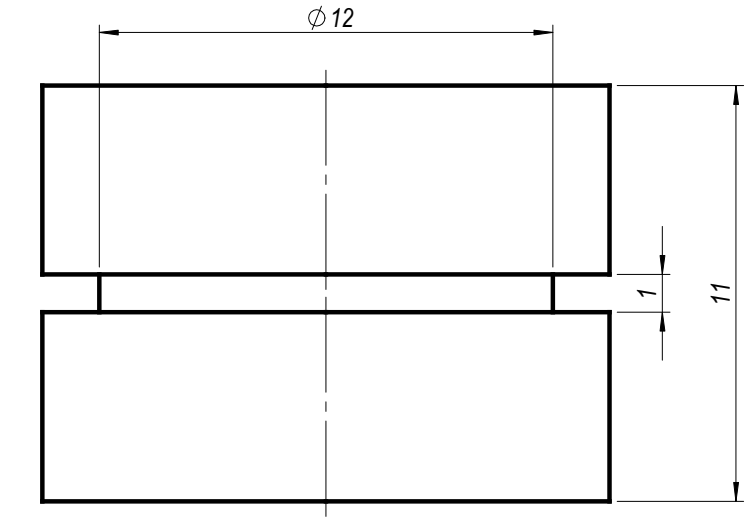


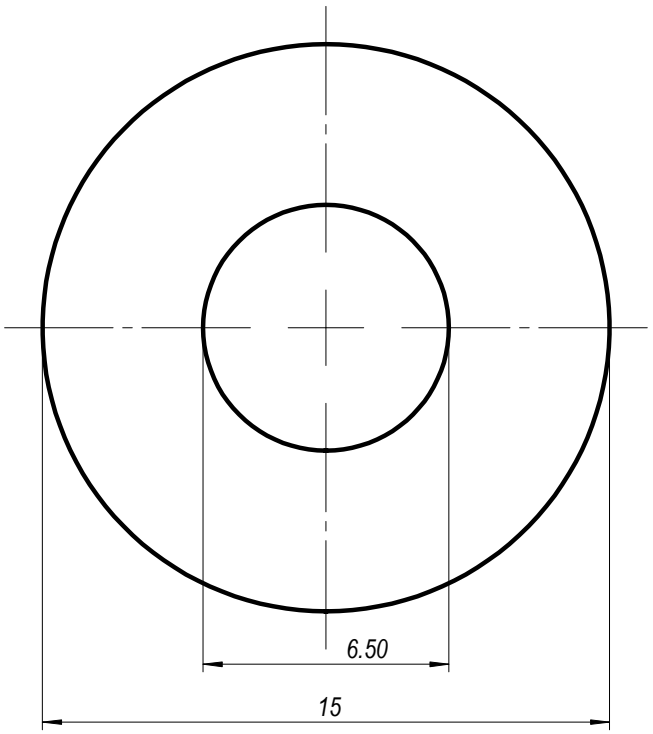
Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: APC122
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Arandela_Potenciometro.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 5:1	Denominación: Arandela de Potenciómetro			N º Plano Cliente: 08
	Formato: A4				N º Plano: 01 / Pág: 08



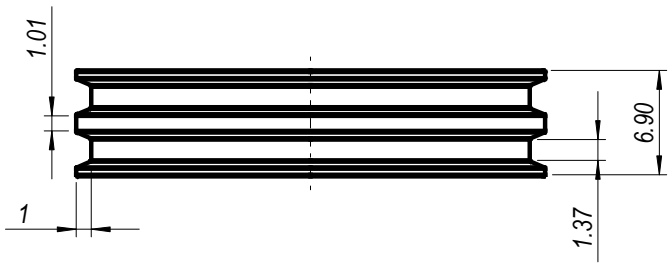


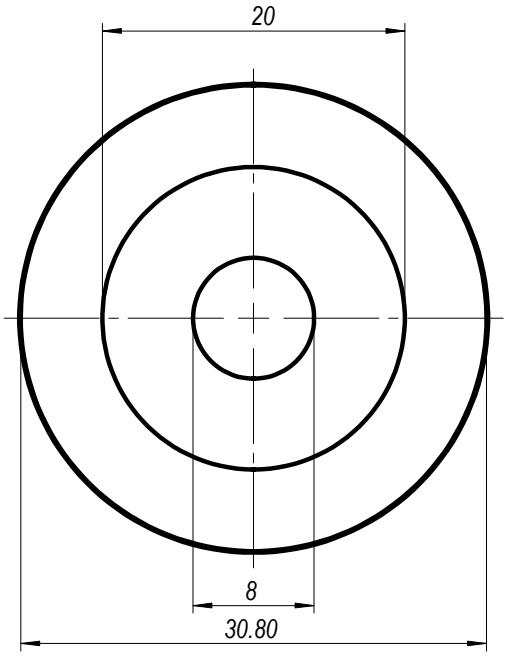
Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: GPC123
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Arandela_Grover.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 5:1	Denominación: Arandela Grover			
	Formato: A4				N º Plano Cliente: 09
					N º Plano: 01 / Pág: 09



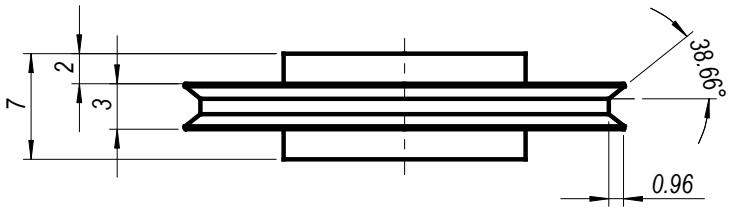


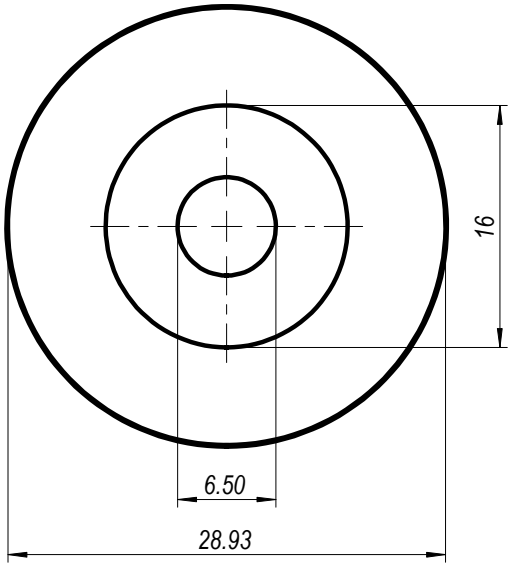
Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: PLC114
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Polea_Conductora.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 5:1	Denominación: Polea Conductora			
	Formato: A4				N º Plano Cliente: 10
					N º Plano: 01 — Pág: 10





Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / FACULTAD DE INGENIERIA	Código de Pieza: PMA115
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Polea_eje_mayor.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 2:1	Denominación: Polea Soporte de Eje Mayor			
	Formato: A4				N º Plano Cliente: 11
					N º Plano: 01 — Pág: 11





Tolerancias Generales:	Proyectó:	20-05-2014	Pablo Saiz	Cliente: UNLPam / Facultad de Ingeniería	Código de Pieza: PME116
	Dibujó:	16-06-2014	Pablo Saiz		Nombre Formato Informático: Polea_eje_menor.SLDPRT
	Revisó:				
	Aprobó:				
	Escala: 2:1	Denominación: Polea Soporte de Eje Menor			
	Formato: A4				N º Plano Cliente: 12
					N º Plano: 01 — Pág: 12

Anexo B

Hoja de Datos de:

Potenciómetro

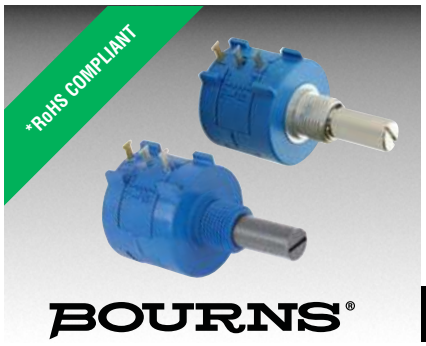
Operacional LM324

Fototriac MOC3040

Contactor

Anexo B-I

Hoja de Datos de Potenciómetro



BOURNS®

Features

- Bushing mount
- Optional AR pin feature
- Plastic or metal shaft and bushings
- Wirewound
- Solder lugs or PC pins
- Sealable (Full body seal)
- Designed for use in HMI applications
- RoHS compliant*

3590 - Precision Potentiometer

Electrical Characteristics[1]

Standard Resistance Range ..... 200 to 100 K ohms
Total Resistance Tolerance ..... ±5 %
Independent Linearity ..... ±0.25 %
Effective Electrical Angle ..... 3600 ° +10 °, -0 °
Absolute Minimum Resistance ..... 1 ohm or 0.1 % maximum (whichever is greater)
Noise ..... 100 ohms ENR maximum
Dielectric Withstanding Voltage (MIL-STD-202, Method 301)
  Sea Level ..... 1,500 VAC minimum
Power Rating (Voltage Limited By Power Dissipation or 450 VAC, Whichever is Less)
  +40 °C ..... 2 watts
  +125 °C ..... 0 watt
Insulation Resistance (500 VDC) ..... 1,000 megohms minimum
Resolution ..... See recommended part numbers

Environmental Characteristics[1]

Operating Temperature Range ..... -40 °C to +125 °C
Storage Temperature Range ..... -55 °C to +125 °C
Temperature Coefficient Over Storage Temperature Range[2] ..... ±50 ppm/°C maximum/unit
Vibration ..... 15 G
  Wiper Bounce ..... 0.1 millisecond maximum
Shock ..... 50 G
  Wiper Bounce ..... 0.1 millisecond maximum
Load Life ..... 1,000 hours, 2 watts
  Total Resistance Shift ..... ±2 % maximum
Rotational Life (No Load) ..... 1,000,000 shaft revolutions
  Total Resistance Shift ..... ±5 % maximum
Moisture Resistance (MIL-STD-202, Method 103, Condition B)
  Total Resistance Shift ..... ±2 % maximum
IP Rating
  Sealed Versions (-3, -4, -7, and -8) ..... IP 65
  Unsealed Versions (-1 -2, -5, and -6) ..... IP 40

Mechanical Characteristics[1]

Stop Strength ..... 45 N-cm (64 oz.-in.) minimum
Mechanical Angle ..... 3600 ° +10 °, -0 °
Torque (Starting & Running) ..... 0.35 N-cm (0.5 oz.-in.) maximum (unsealed)
1.1 N-cm (1.5 oz.-in.) maximum (sealed)
  Mounting ..... 55-80 N-cm (5-7 lb.-in.) (plastic)
90-113 N-cm (8-10 in.-lb.) (metal)
Shaft Runout ..... 0.13 mm (0.005 in.) T.I.R.
Lateral Runout ..... 0.20 mm (0.008 in.) T.I.R.
Shaft End Play ..... 0.25 mm (0.010 in.) T.I.R.
Shaft Radial Play ..... 0.13 mm (0.005 in.) T.I.R.
Pilot Diameter Runout ..... 0.08 mm (0.003 in.) T.I.R.
Backlash ..... 1.0 ° maximum
Weight ..... Approximately 19 G
Terminals ..... Solder lugs or PC pins
Soldering Condition
  Manual Soldering ..... 96.5Sn/3.0Ag/0.5Cu solid wire or no-clean rosin cored wire; 370 °C (700 °F) max. for 3 seconds
  Wave Soldering ..... 96.5Sn/3.0Ag/0.5Cu solder with no-clean flux; 260 °C (500 °F) max. for 5 seconds
  Wash processes ..... Not recommended
Marking ..... Manufacturer's name and part number, resistance value and tolerance, linearity tolerance, wiring diagram, and date code.
Ganging (Multiple Section Potentiometers) ..... 1 cup maximum
Hardware ..... One lockwasher and one mounting nut is shipped with each potentiometer.

NOTE: For Anti-rotation pin add 91 after configuration dash number. Example: -2 becomes -291 to add AR pin.
[1]At room ambient: +25 °C nominal and 50 % relative humidity nominal, except as noted.
[2]Consult manufacturer for complete specification details for resistances below 1k ohms.

Recommended Part Numbers

(Printed Circuit)	(Solder Lug)	(Solder Lug)	Resistance (Ω)	Resolution (%)
3590P-2-102L	***3590S-2-102L***	3590S-1-102L	**1,000**	**.029**
3590P-2-202L	***3590S-2-202L***	3590S-1-202L	**2,000**	**.023**
3590P-2-502L	***3590S-2-502L***	3590S-1-502L	**5,000**	**.025**
3590P-2-103L	***3590S-2-103L***	3590S-1-103L	**10,000**	**.020**
3590P-2-203L	***3590S-2-203L***	3590S-1-203L	**20,000**	**.019**
3590P-2-503L	***3590S-2-503L***	3590S-1-503L	**50,000**	**.013**
3590P-2-104L	***3590S-2-104L***	3590S-1-104L	**100,000**	**.009**

BOLDFACE LISTINGS ARE IN STOCK AND READILY AVAILABLE THROUGH DISTRIBUTION. FOR OTHER OPTIONS CONSULT FACTORY.

ROHS IDENTIFIER:
L = COMPLIANT

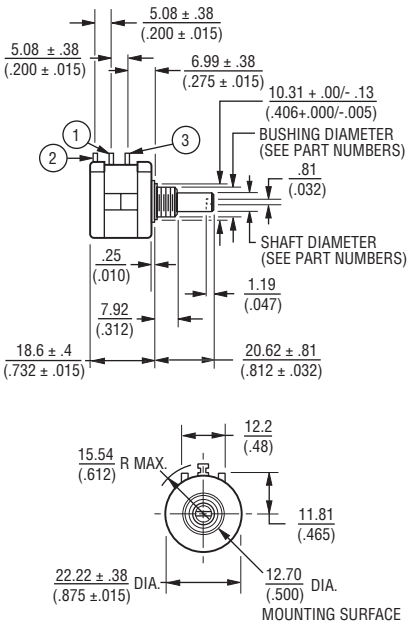
*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

3590 - Precision Potentiometer

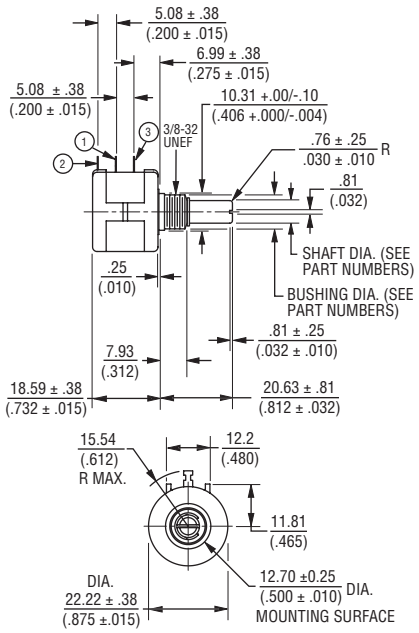
BOURNS®

Product Dimensions

-1, -3, -5, -7 Configurations

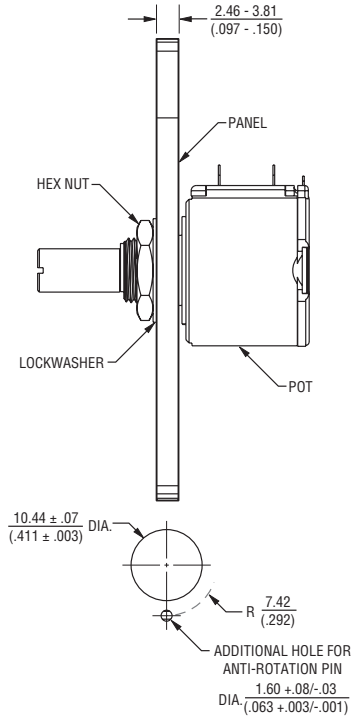


-2, -4, -6, -8 Configurations



Panel Thickness Dimensions

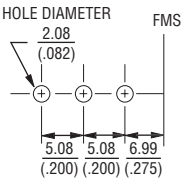
(For Bushing Mount Only)



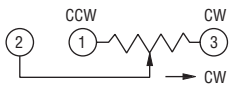
Anti-rotation pin hole is shown at six o'clock position for reference only. The actual location is determined by the customer's application. Refer to the front view of the potentiometer to see the location of the optional A/R pin.

Panel thickness and hole diameters are recommended for best fit. However, customers may adjust the dimensions to suit their specific application.

Recommended PCB Layout



Schematic



TOLERANCES: EXCEPT WHERE NOTED

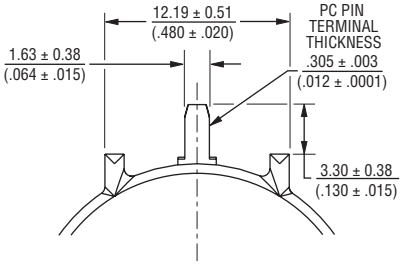
DECIMALS: .XX ± .508 (.02), .XXX ± .127 (.005)

FRACTIONS: ±1/64

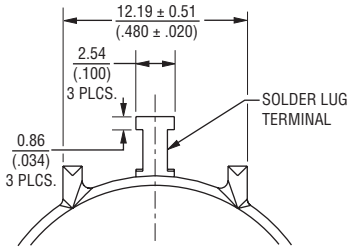
DIMENSIONS: MM (IN.)

Terminal Styles

"P" Terminal Style



"S" Terminal Style



Shaft & Bushing Configurations

(Bushing - DxL, Shaft - D):

(-1) Plastic Bushing (3/8 " x 5/16 ") and Shaft (.2480 + .001, - .002)

(-2) Metal Bushing (3/8 " x 5/16 ") and Shaft (.2497 + .0000, - .0009)

(-3) Sealed, Plastic Bushing (3/8 " x 5/16 ") and Shaft (.2480 + .001, - .002)

(-4) Sealed, Metal Bushing (3/8 " x 5/16 ") and Shaft (.2497 + .0000, - .0009)

(-5) Metric, Plastic Bushing (9 mm x 7.94 mm) and Shaft (6 mm + 0, - .076 mm)

(-6) Metric, Metal Bushing (9 mm x 7.94 mm) and Shaft (6 mm + 0, - .023 mm)

(-7) Metric, Sealed, Plastic Bushing (9 mm x 7.94 mm) and Shaft (6 mm + 0, - .076 mm)

(-8) Metric, Sealed, Metal Bushing (9 mm x 7.94 mm) and Shaft (6 mm + 0, - .023 mm)

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Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Bourns:

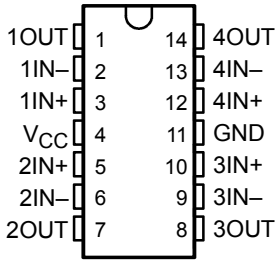
3590S-4-103 3590S-4-104 3590S-4-101 3590S-4-202 3590S-4-203 3590S-4-201 3590P-2-103 3590S-2-102 3590S-2-104 3590P-2-104 3590S-1-203 3590P-1-203 3590S-1-201 3590S-1-202 3590S-3-502 3590S-1-503 3590S-1-501 3590P-1-502 3590S-1-502 3590P-1-503 3590S-6-203 3590S-6-201 3590S-6-202 3590S-2-252 3590P-1-103 3590P-1-102 3590S-1-102 3590P-291-103 3590S-2-201 3590S-4-101L 3590S-2-102L 3590S-6-201L 3590S-4-202L 3590S-1-104L 3590P-2-103L 3590S-6-102L 3590S-1-203L 3590S-4-102L 3590S-6-101L 3590S-4-503L 3590S-2-252L 3590S-6-202L 3590S-1-103L 3590S-2-501L 3590P-2-203L 3590S-6-203L 3590S-2-203L 3590S-4-201L 3590P-1-203L 3590S-2-202L 3590P-6-102L 3590S-6-502L 3590S-1-501L 3590S-A67-103L 3590S-6-103L 3590S-4-104L 3590P-1-503L 3590S-2-503L 3590S-4-203L 3590P-1-102L 3590S-1-502L 3590S-2-103L 3590P-1-103L 3590S-4-501L 3590P-1-502L 3590P-2-104L 3590P-291-103L 3590S-1-202L 3590P-6-103L 3590S-1-201L 3590S-6-501L 3590S-4-502L 3590S-1-102L 3590P-2-202L 3590S-1-503L 3590S-2-104L 3590S-3-502L 3590S-4-103L 3590S-2-201L 3590S-2-101L 3590S-6-104L 3590S-6-503L 3590S-A67-103 3590P-2-203 3590P-2-202 3590S-2-202 3590S-2-203 3590S-4-503 3590S-4-501 3590S-4-502 3590S-2-502 3590S-2-503 3590S-2-501 3590P-6-103 3590S-6-103 3590S-6-101 3590P-6-102 3590S-6-102 3590S-6-502 3590S-6-501

Anexo B-II

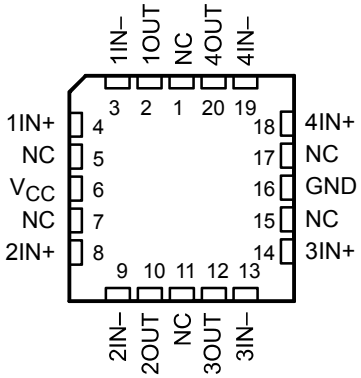
Hoja de Datos de Operacional LM324

- **Wide Range of Supply Voltages:**
  Single Supply . . . 3 V to 30 V
  (LM2902, 3 V to 26 V) or Dual Supplies
- **Low Supply-Current Drain Independent of Supply Voltage . . . 0.8 mA Typ**
- **Common-Mode Input Voltage Range Includes Ground, Allowing Direct Sensing Near Ground**
- **Low Input Bias and Offset Parameters:**
  - **Input Offset Voltage . . . 3 mV Typ**
    A Versions . . . 2 mV Typ
  - **Input Offset Current . . . 2 nA Typ**
  - **Input Bias Current . . . 20 nA Typ**
    A Versions . . . 15 nA Typ
- **Differential Input Voltage Range Equal to Maximum-Rated Supply Voltage . . . 32 V (26 V for LM2902)**
- **Open-Loop Differential Voltage Amplification . . . 100 V/mV Typ**
- **Internal Frequency Compensation**

LM124 . . . D, J, OR W PACKAGE
LM124A . . . J PACKAGE
LM224, LM224A . . . D OR N PACKAGE
LM324 . . . D, N, NS, OR PW PACKAGE
LM324A . . . D, DB, N, NS, OR PW PACKAGE
LM2902 . . . D, N, NS, OR PW PACKAGE
(TOP VIEW)



LM124, LM124A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description/ordering information

These devices consist of four independent high-gain frequency-compensated operational amplifiers that are designed specifically to operate from a single supply over a wide range of voltages. Operation from split supplies also is possible when the difference between the two supplies is 3 V to 30 V (for the LM2902, 3 V to 26 V) and V_{CC} is at least 1.5 V more positive than the input common-mode voltage. The low supply-current drain is independent of the magnitude of the supply voltage.

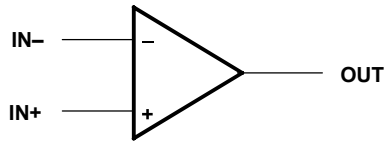
Applications include transducer amplifiers, dc amplification blocks, and all the conventional operational-amplifier circuits that now can be more easily implemented in single-supply-voltage systems. For example, the LM124 can be operated directly from the standard 5-V supply that is used in digital systems and easily provides the required interface electronics without requiring additional ±15-V supplies.

ORDERING INFORMATION

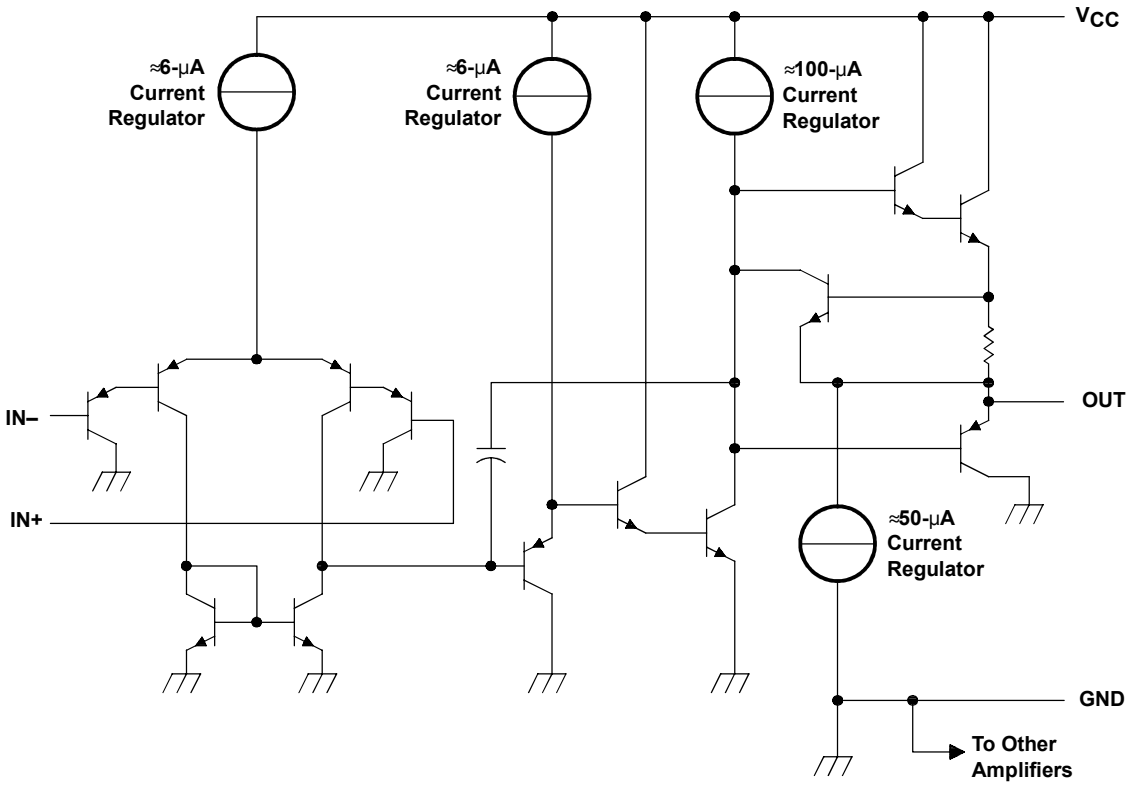
T_A	V_{IO}max AT 25°C	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	7 mV	PDIP (N)	Tube	LM324N	LM324N
		SOIC (D)	Tube	LM324D	LM324
			Tape and reel	LM324DR	
		SOP (NS)	Tape and reel	LM324NSR	LM324
		TSSOP (PW)	Tape and reel	LM324PWR	L324
	3 mV	PDIP (N)	Tube	LM324AN	LM324AN
		SOIC (D)	Tube	LM324AD	LM324A
			Tape and reel	LM324ADR	
		SOP (NS)	Tape and reel	LM324ANSR	LM324A
		SSOP (DB)	Tape and reel	LM324ADBR	LM324A
		TSSOP (PW)	Tape and reel	LM324APWR	L324A
–25°C to 85°C	5 mV	PDIP (N)	Tube	LM224N	LM224N
		SOIC (D)	Tube	LM224D	LM224
			Tape and reel	LM224DR	
	3 mV	PDIP (N)	Tube	LM224AN	LM224AN
		SOIC (D)	Tube	LM224AD	LM224A
			Tape and reel	LM224ADR	
–40°C to 125°C	7 mV	PDIP (N)	Tube	LM2902N	LM2902N
		SOIC (D)	Tube	LM2902D	LM2902
			Tape and reel	LM2902DR	
		SOP (NS)	Tape and reel	LM2902NSR	LM2902
		TSSOP (PW)	Tape and reel	LM2902PWR	L2902
–55°C to 125°C	5 mV	CDIP (J)	Tube	LM124J	LM124J
			Tube	LM124JB	LM124JB
		CFP (W)	Tube	LM124W	LM124W
		LCCC (FK)	Tube	LM124FKB	LM124FKB
		SOIC (D)	Tube	LM124D	LM124
			Tape and reel	LM124DR	
	2 mV	CDIP (J)	Tube	LM124AJ	LM124AJ
			Tube	LM124AJB	LM124AJB
		LCCC (FK)	Tube	LM124AFKB	LM124AFKB

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.

symbol (each amplifier)



schematic (each amplifier)



COMPONENT COUNT (total device)	
Epi-FET	1
Transistors	95
Diodes	4
Resistors	11
Capacitors	4

absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

		LM124, LM124A LM224, LM224A LM324, LM324A	LM2902	UNIT
Supply voltage, V_{CC} (see Note 1)		32	26	V
Differential input voltage, V_{ID} (see Note 2)		±32	±26	V
Input voltage, V_I (either input)		–0.3 to 32	–0.3 to 26	V
Duration of output short circuit (one amplifier) to ground at (or below) T_A = 25°C, V_{CC} ≤ 15 V (see Note 3)		Unlimited	Unlimited	
Operating virtual junction temperature, T_J		150	150	°C
Package thermal impedance, θ_{JA} (see Notes 4 and 5)	D package	86	86	°C/W
	DB package	96		
	N package	80	80	
	NS package	76	76	
	PW package	113	113	
Package thermal impedance, θ_{JC} (see Notes 6 and 7)	FK package	5.61		°C/W
	J package	15.05		
	W package	14.65		
Case temperature for 60 seconds	FK package	260		°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds	J or W package	300	300	°C
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	N package	260	260	°C
Storage temperature range, T_{stg}		–65 to 150	–65 to 150	°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES:
1. All voltage values (except differential voltages and V_{CC} specified for the measurement of I_{OS}) are with respect to the network GND.
2. Differential voltages are at IN+ with respect to IN–.
3. Short circuits from outputs to V_{CC} can cause excessive heating and eventual destruction.
4. Maximum power dissipation is a function of $T_J(max)$, θ_{JA}, and T_A. The maximum allowable power dissipation at any allowable ambient temperature is $P_D = (T_J(max) – T_A)/\theta_{JA}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
5. The package thermal impedance is calculated in accordance with JESD 51-7.
6. Maximum power dissipation is a function of $T_J(max)$, θ_{JC}, and T_C. The maximum allowable power dissipation at any allowable case temperature is $P_D = (T_J(max) – T_C)/\theta_{JC}$. Operating at the absolute maximum T_J of 150°C can affect reliability.
7. The package thermal impedance is calculated in accordance with MIL-STD-883.

electrical characteristics at specified free-air temperature, V_{CC} = 5 V (unless otherwise noted)

PARAMETER		TEST CONDITIONS†	T_A‡	LM124, LM224			LM324			LM2902			UNIT
				MIN	TYP§	MAX	MIN	TYP§	MAX	MIN	TYP§	MAX	
V_{IO}	Input offset voltage	V_{CC} = 5 V to MAX, V_{IC} = V_{ICR}min, V_O = 1.4 V	25°C		3	5		3	7		3	7	mV
			Full range			7			9			10	
I_{IO}	Input offset current	V_O = 1.4 V	25°C		2	30		2	50		2	50	nA
			Full range			100			150			300	
I_{IB}	Input bias current	V_O = 1.4 V	25°C		–20	–150		–20	–250		–20	–250	nA
			Full range			–300			–500			–500	
V_{ICR}	Common-mode input voltage range	V_{CC} = 5 V to MAX	25°C	0 to V_{CC}–1.5			0 to V_{CC}–1.5			0 to V_{CC}–1.5			V
			Full range	0 to V_{CC}–2			0 to V_{CC}–2			0 to V_{CC}–2			
V_{OH}	High-level output voltage	R_L = 2 kΩ	25°C	V_{CC}–1.5			V_{CC}–1.5						V
		R_L = 10 kΩ	25°C							V_{CC}–1.5			
		V_{CC} = MAX, R_L = 2 kΩ	Full range	26			26			22			
		V_{CC} = MAX, R_L ≥ 10 kΩ	Full range	27	28		27	28		23	24		
V_{OL}	Low-level output voltage	R_L ≤ 10 kΩ	Full range		5	20		5	20		5	20	mV
A_{VD}	Large-signal differential voltage amplification	V_{CC} = 15 V, V_O = 1 V to 11 V, R_L = ≥ 2 kΩ	25°C	50	100		25	100			100		V/mV
			Full range	25			15			15			
CMRR	Common-mode rejection ratio	V_{IC} = V_{ICR}min	25°C	70	80		65	80		50	80		dB
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)		25°C	65	100		65	100		50	100		dB
V_{O1}/V_{O2}	Crosstalk attenuation	f = 1 kHz to 20 kHz	25°C		120			120			120		dB
I_O	Output current	V_{CC} = 15 V, V_{ID} = 1 V, V_O = 0	25°C	–20	–30	–60	–20	–30	–60	–20	–30	–60	mA
			Full range	–10			–10			–10			
		V_{CC} = 15 V, V_{ID} = –1 V, V_O = 15 V	25°C	10	20		10	20		10	20		
			Full range	5			5			5			
		V_{ID} = –1 V, V_O = 200 mV	25°C	12	30		12	30			30		µA
I_{OS}	Short-circuit output current	V_{CC} at 5 V, GND at –5 V, V_O = 0,	25°C		±40	±60		±40	±60		±40	±60	mA
I_{CC}	Supply current (four amplifiers)	V_O = 2.5 V, No load	Full range		0.7	1.2		0.7	1.2		0.7	1.2	mA
		V_{CC} = MAX, V_O = 0.5 V_{CC}, No load	Full range		1.4	3		1.4	3		1.4	3	

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified. MAX V_{CC} for testing purposes is 26 V for LM2902, 30 V for the others.
‡ Full range is –55°C to 125°C for LM124, –25°C to 85°C for LM224, 0°C to 70°C for LM324, and –40°C to 125°C for LM2902.
§ All typical values are at T_A = 25°C.

electrical characteristics at specified free-air temperature, V_{CC} = 5 V (unless otherwise noted) (continued)

PARAMETER		TEST CONDITIONS†	T_A‡	LM124A			LM224A			LM324A			UNIT
				MIN	TYP§	MAX	MIN	TYP§	MAX	MIN	TYP§	MAX	
V_{IO}	Input offset voltage	V_{CC} = 5 V to 30 V, $V_{IC} = V_{ICR}$min, V_O = 1.4 V	25°C			2		2	3		2	3	mV
			Full range			4			4			5	
I_{IO}	Input offset current	V_O = 1.4 V	25°C			10		2	15		2	30	nA
			Full range			30			30			75	
I_{IB}	Input bias current	V_O = 1.4 V	25°C			–50		–15	–80		–15	–100	nA
			Full range			–100			–100			–200	
V_{ICR}	Common-mode input voltage range	V_{CC} = 30 V	25°C	0 to V_{CC}–1.5			0 to V_{CC}–1.5			0 to V_{CC}–1.5			V
			Full range	0 to V_{CC}–2			0 to V_{CC}–2			0 to V_{CC}–2			
V_{OH}	High-level output voltage	R_L = 2 kΩ	25°C	V_{CC}–1.5			V_{CC}–1.5			V_{CC}–1.5			V
		V_{CC} = 30 V, R_L = 2 kΩ	Full range	26			26			26			
		V_{CC} = 30 V, R_L ≥ 10 kΩ	Full range	27			27	28		27	28		
V_{OL}	Low-level output voltage	R_L ≤ 10 kΩ	Full range			20		5	20		5	20	mV
A_{VD}	Large-signal differential voltage amplification	V_{CC} = 15 V, V_O = 1 V to 11 V, R_L= ≥2 kΩ	Full range	25			25			15			V/mV
CMRR	Common-mode rejection ratio	$V_{IC} = V_{ICR}$min	25°C	70			70	80		65	80		dB
k_{SVR}	Supply-voltage rejection ratio ($\Delta V_{CC}/\Delta V_{IO}$)		25°C	65			65	100		65	100		dB
V_{O1}/V_{O2}	Crosstalk attenuation	f = 1 kHz to 20 kHz	25°C		120			120			120		dB
I_O	Output current	V_{CC} = 15 V, V_{ID} = 1 V, V_O = 0	25°C	–20			–20	–30	–60	–20	–30	–60	mA
			Full range	–10			–10			–10			
		V_{CC} = 15 V, V_{ID} = –1 V, V_O = 15 V	25°C	10			10	20		10	20		
			Full range	5			5			5			
		V_{ID} = –1 V, V_O = 200 mV	25°C	12			12	30		12	30		μA
I_{OS}	Short-circuit output current	V_{CC} at 5 V, GND at –5 V, V_O = 0	25°C		±40	±60		±40	±60		±40	±60	mA
I_{CC}	Supply current (four amplifiers)	V_O = 2.5 V, No load	Full range		0.7	1.2		0.7	1.2		0.7	1.2	mA
		V_{CC} = 30 V, V_O = 15 V, No load	Full range		1.4	3		1.4	3		1.4	3	

† All characteristics are measured under open-loop conditions with zero common-mode input voltage unless otherwise specified.
‡ Full range is –55°C to 125°C for LM124A, –25°C to 85°C for LM224A, and 0°C to 70°C for LM324A.
§ All typical values are at T_A = 25°C.

operating conditions, V_{CC} = ±15 V, T_A = 25°C

PARAMETER		TEST CONDITIONS	TYP	UNIT
SR	Slew rate at unity gain	R_L = 1 MΩ, C_L = 30 pF, V_I = ±10 V (see Figure 1)	0.5	V/μs
B_1	Unity-gain bandwidth	R_L = 1 MΩ, C_L = 20 pF (see Figure 1)	1.2	MHz
V_n	Equivalent input noise voltage	R_S = 100 Ω, V_I = 0 V, f = 1 kHz (see Figure 2)	35	nV/√Hz

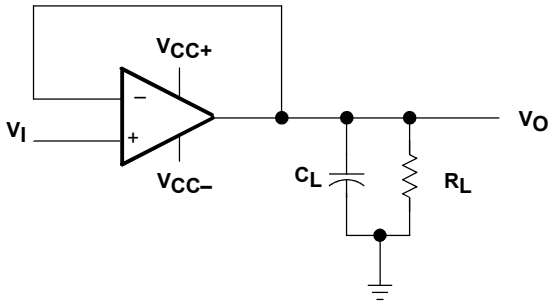


Figure 1. Unity-Gain Amplifier

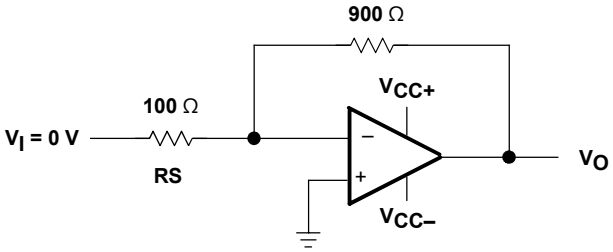


Figure 2. Noise-Test Circuit

Anexo B-III

Hoja de Datos de Fototriac MOC3040

MOC3040, MOC3041, MOC3042, MOC3043
MOC3040X, MOC3041X, MOC3042X, MOC3043X

OPTICALLY COUPLED BILATERAL SWITCH LIGHT ACTIVATED ZERO VOLTAGE CROSSING TRIAC

'X' SPECIFICATION APPROVALS

- VDE 0884 in 3 available lead form : -
  - STD
  - G form
  - SMD approved to CECC 00802

DESCRIPTION

The MOC304_ Series are optically coupled isolators consisting of a Gallium Arsenide infrared emitting diode coupled with a monolithic silicon detector performing the functions of a zero crossing bilateral triac mounted in a standard 6 pin dual-in-line package.

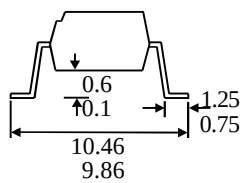
FEATURES

- Options :-
  10mm lead spread - add G after part no.
  Surface mount - add SM after part no.
  Tape&reel - add SMT&R after part no.
- High Isolation Voltage ($5.3kV_{RMS}$,$7.5kV_{PK}$)
- Zero Voltage Crossing
- 400V Peak Blocking Voltage
- All electrical parameters 100% tested
- Custom electrical selections available

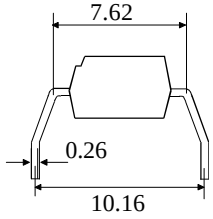
APPLICATIONS

- CRTs
- Power Triac Driver
- Motors
- Consumer appliances
- Printers

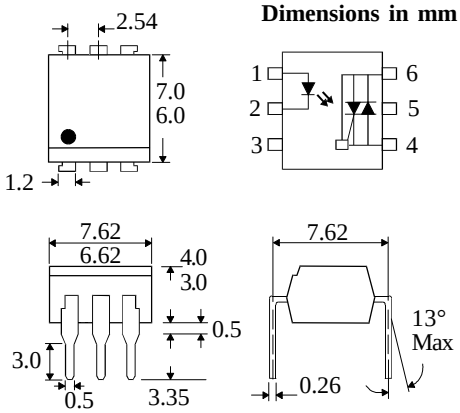
OPTION SM
SURFACE MOUNT



OPTION G



Dimensions in mm



ABSOLUTE MAXIMUM RATINGS
(25 °C unless otherwise noted)

Storage Temperature	-55°C - +150°C
Operating Temperature	-40°C - +100°C
Lead Soldering Temperature (1.6mm from case for 10 seconds)	260°C

INPUT DIODE

Forward Current	50mA
Reverse Voltage	6V
Power Dissipation (derate linearly 1.41mW/°C above 25°C)	120mW

OUTPUT PHOTO TRIAC

Off-State Output Terminal Voltage	400V
Forward Current (Peak)	1A
Power Dissipation (derate linearly 1.76mW/°C above 25°C)	150mW

POWER DISSIPATION

Total Power Dissipation (derate linearly 2.94mW/°C above 25°C)	250mW

ISOCOM COMPONENTS LTD
Unit 25B, Park View Road West,
Park View Industrial Estate, Brenda Road
Hartlepool, TS25 1YD England Tel: (01429)863609
Fax : (01429) 863581 e-mail sales@isocom.co.uk
http://www.isocom.com

ISOCOM INC
1024 S. Greenville Ave, Suite 240,
Allen, TX 75002 USA
Tel: (214) 495-0755 Fax: (214) 495-0901
e-mail info@isocom.com
http://www.isocom.com

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise noted)

PARAMETER		MIN	TYP	MAX	UNITS	TEST CONDITION
Input	Forward Voltage (V_F) Reverse Current (I_R)		1.2	1.4 10	V µA	I_F = 20mA V_R = 6V
Output	Peak Off-state Current (I_{DRM}) Peak Blocking Voltage (V_{DRM}) On-state Voltage (V_{TM}) Critical rate of rise of off-state Voltage (dv/dt)	 400 600	 1500	500 3.0 	nA V V V/µs	V_{DRM} = 400V (note 1) I_{DRM} = 500nA I_{TM} = 100mA (peak)
Coupled	Input Current to Trigger (I_{FT})(note 2) MOC3040 MOC3041 MOC3042 MOC3043 Holding Current , either direction (I_H) Input to Output Isolation Voltage V_{ISO}	 5300 7500	 400	 30 15 10 5 	 mA mA mA mA µA V_{RMS} V_{PK}	 V_{TM} = 3V (note 2) See note 3 See note 3
Zero Crossing Charact--eristic	Inhibit Voltage (V_{IH}) Leakage in Inhibited State (I_S)			20 500	V mA	I_F = Rated I_{FT} MT1-MT2 Voltage above which device will not trigger I_F = Rated I_{FT} V_{DRM} = Rated V_{DRM} Off-state

Note 1. Test voltage must be applied within dv/dt rating.

Note 2. Guaranteed to trigger at an I_F value less than or equal to max. I_{FT}, recommended I_F lies between Rated I_{FT} and absolute max. I_F.

Note 3. Measured with input leads shorted together and output leads shorted together.

CHARACTERISTIC CURVES

Fig.1 Forward Current vs. Ambient Temperature

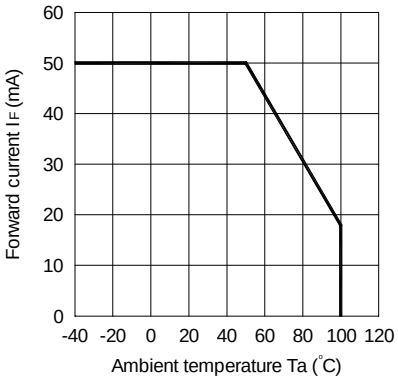


Fig.2 On-state Current vs. Ambient Temperature

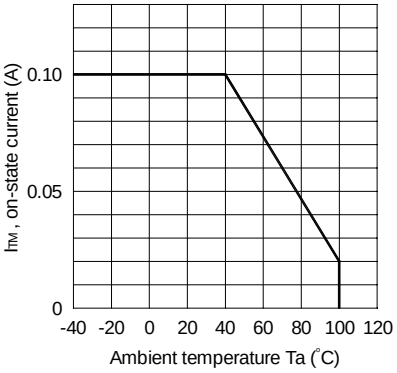


Fig.3 Minimum Trigger Current vs. Ambient Temperature

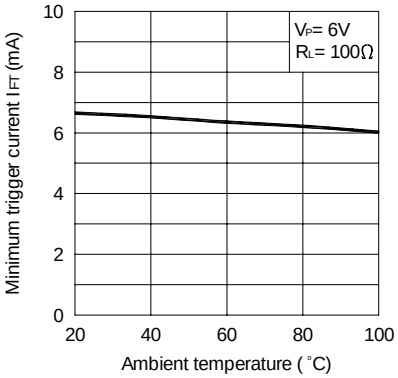


Fig.4 Forward Current vs. Forward Voltage

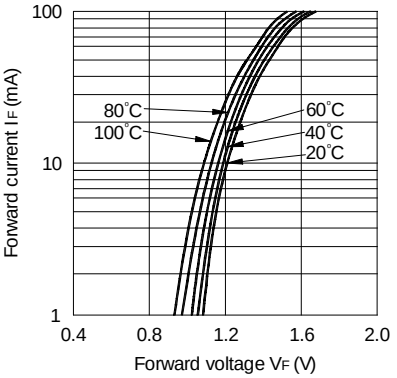


Fig.5 On-state Voltage vs. Ambient Temperature

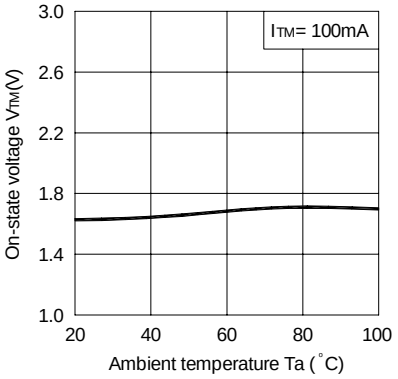
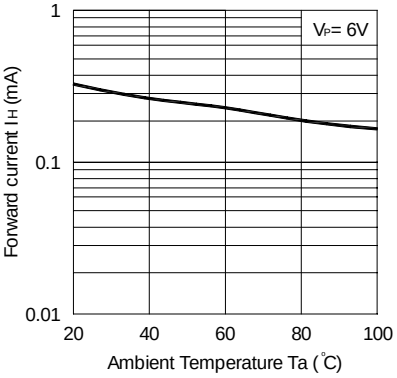


Fig.6 Holding Current vs. Ambient Temperature



CHARACTERISTIC CURVES

Fig.7 Turn-on Time vs. Forward Current

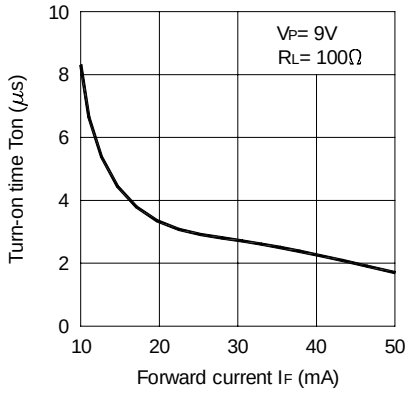


Fig.8 Repetitive Peak Off-state Current vs. Temperature

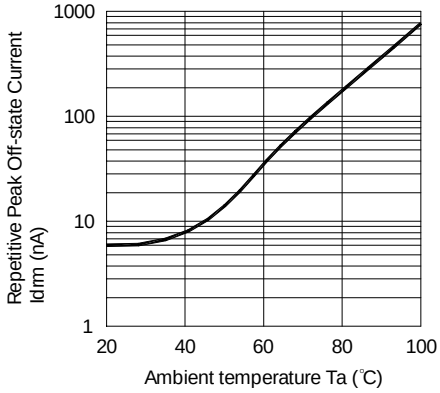
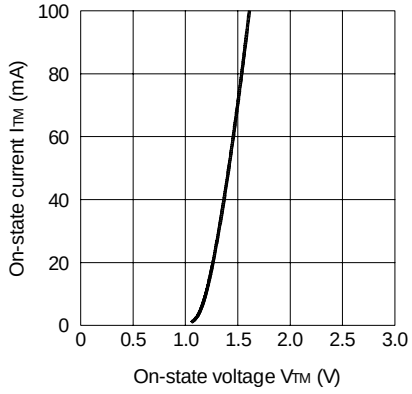
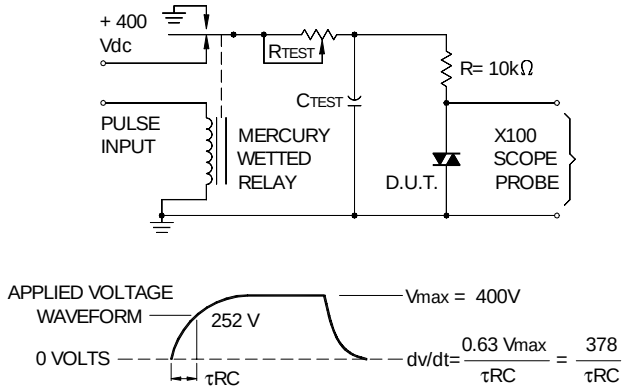


Fig.9 On-state Current vs. On-state Voltage



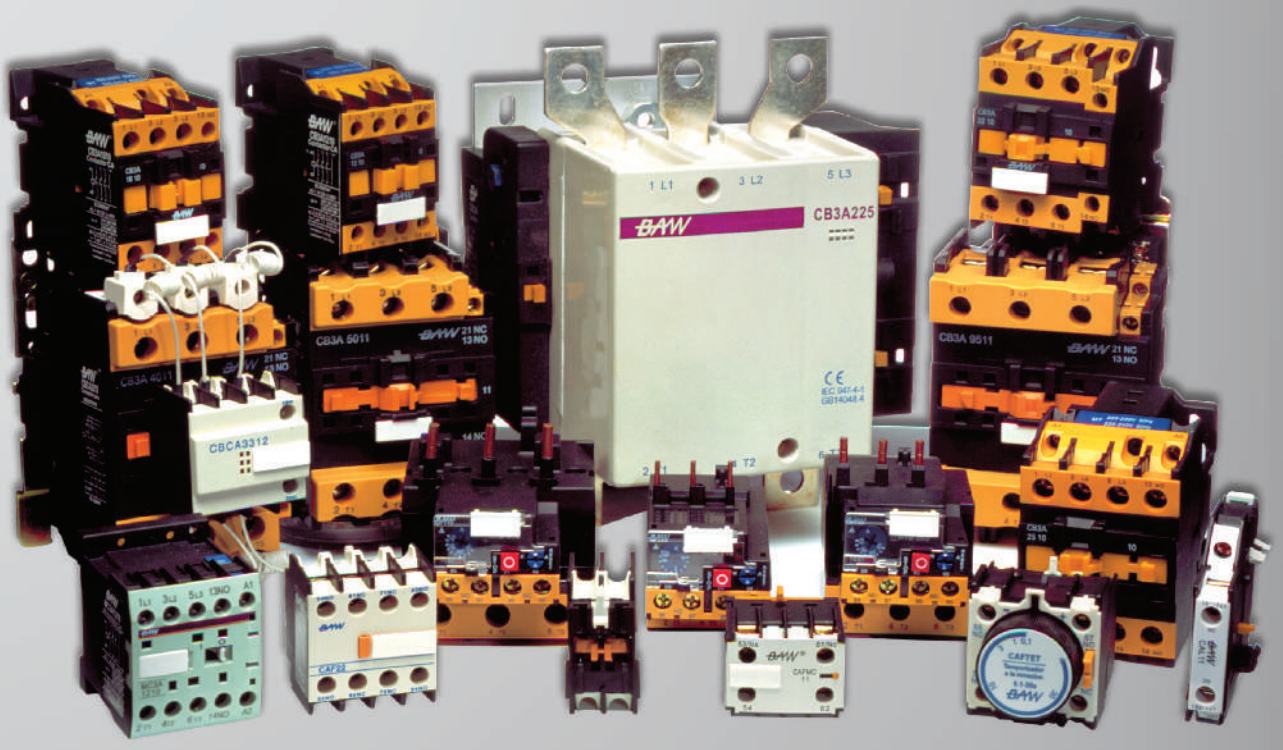
Static dv/dt Test Circuit



Anexo B-IV

Hoja de Datos de Contactor

Contactores de 12 a 630A.
Relés de protección.



SERIES CB, MCB & RTB

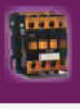
- Contactores de 3 y 4 polos
- Minicontactores de 3 y 4 polos
- Relés térmicos diferenciales
- Arrancadores directos
- Arrancadores estrella / triángulo
- Maniobra y protección de motores
- Maniobra de transformadores
- Maniobra de alumbrado
- Maniobra de capacitores
- Gama completa de accesorios y auxiliares
- Conforme a IEC947-4 e IEC70
- Certificación IRAM y Sello de Seguridad Eléctrica

Equipamiento BAW
Tel/Fax: (54 11) 4381-2239 (rot.)
ventas@etaelectro.com
etaelectro.com

BAW
buena energía

Series CB, MCB y RTB

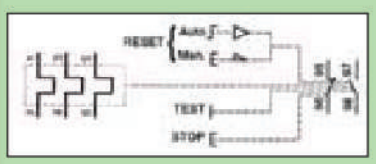


AC3 3~	Ie max Ue=440V	A	12	12	18	25	32
IEC947-4	220/230V	kW	3	3	4	5,5	7,5
Motores de jaula de ardilla: arranque / desconexión durante su funcionamiento (IEC185)	380/400V	kW	5,5	5,5	7,5	11	15
	415V	kW	5,5	5,5	9	11	15
	500V	kW	7,5	7,5	10	15	18,5
	660/690V	kW	-	7,5	10	15	18,5
AC3 3~ (UL)	230V	Hp	3	3	5	7,5	10
	460/480V	Hp	7,5	7,5	10	15	20
	575V	Hp	-	10	15	20	25
AC1 Cargas resistivas ó débilmente inductivas	Ie max (<40°C)	A	20	25	32	40	50
10 / 4 / 11		CA	MC3A1210 ▪▪ ••	CB3A12 ▪▪ ••	CB3A18 ▪▪ ••	CB3A25 ▪▪ ••	CB3A32 ▪▪ ••
		CC	MC3D1210 ▪▪ ••	CB3D12 ▪▪ ••	CB3D18 ▪▪ ••	CB3D25 ▪▪ ••	CB3D32 ▪▪ ••
				11	11	10 01 11	10 01 11
		CA	MC4A12 00 ••	CB4A12 00 ••	—	CB4A25 00 ••	—
Conductor (máximo)		mm²	4	4	6	10	10
Dimensiones CBA 3P/4P (Ancho x Alto x Largo)		mm	45x52x57	45x74x93	45x74x85	56x84x93	56x84x98

Relés térmicos bimetálicos Manual - Automático

Clase 10



0,16-0,25 RTB102
0,25-0,40 RTB103
0,40-0,63 RTB104
0,63-1 RTB105
1-1,6 RTB106
1,25-2 RTB1x6

1,6-2,5 RTB107
2,5-4 RTB108
4-6 RTB110
5,5-8 RTB112
7-10 RTB114
9-13 RTB116

12-18 RTB121

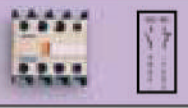
17-25 RTB1222

28-86 RTB255
28-86 RTB255

Contactos auxiliares

CACMC11
CAFMC22

CAF20
CAF11
CAF02

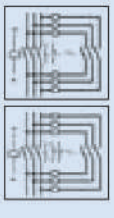


CAF40
CAF31
CAF22
CAF13

Accesorios

Contactores para conexión de capacitores

Los contactores CBC están destinados para la maniobra de baterías trifásicas de capacitores, su empleo evita la utilización de inductancias adicionales. Están equipados con un bloque frontal de tres contactos auxiliares de precierre que operan conjuntamente con 2 resistores por fase a través de los cuales se preconectan los capacitores amortiguando los picos de la cobrecorriente de conexión (8Inc.) Una vez logrado su cometido los contactos principales cortocircuitan las resistencias y milisegundos después los contactos auxiliares se abren, garantizando la circulación de corriente únicamente por los contactos principales.



Ith máxima a 40°C		A
	230/240V	kVAr
IEC70 IEC831 **AC6B 3~** Conexión de capacitores (IEC185)	400/440V	kVAr
		CA
Fusible NT gL máximo		A
Conductor máximo		mm²
Dimensiones Ancho x Alto x L		mm



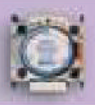
	40	50	65	80	95	115	150	185	225
	11	15	18,5	22	25	30	40	55	63
	18,5	22	30	37	45	55	75	90	110
	22	25	37	45	45	59	80	100	110
	22	30	37	55	55	75	90	110	129
	30	33	37	45	45	80	100	110	129
	10	15	20	30	30	40	50	60	88
	30	40	50	60	60	75	100	125	170
	30	40	50	60	60	100	125	150	200
	60	80	80	125	125	200	250	275	315
	CB3A40 ▪▪ ••	CB3A50 ▪▪ ••	CB3A65 ▪▪ ••	CB3A80 ▪▪ ••	CB3A95 ▪▪ ••	CB3A115 ▪▪ ••	CB3A150 ▪▪ ••	CB3A185 ▪▪ ••	CB3A225 ▪▪ ••
	CB3D40 ▪▪ ••	CB3D50 ▪▪ ••	CB3D65 ▪▪ ••	CB3D80 ▪▪ ••	CB3D95 ▪▪ ••	CB3D115 ▪▪ ••	CB3D150 ▪▪ ••	CB3D185 ▪▪ ••	CB30225 ▪▪ ••
	10 01 11	10 01 11	11	11	11	Permite hasta 8 auxiliares	Permite hasta 8 auxiliares	Permite hasta 8 auxiliares	Permite hasta 8 auxiliares
	CB4A40 00 ••	—	CB4A65 00 ••	CB4A80 00 ••	—	CB4A115 00 ••	CB4A150 00 ••	CB4A185 00 ••	CB4A22500
	25	25	25	50	50	95	120	150	185
	75/85x127x114			85/96x127x125		164/201x162x171		169/209x174x181	169/209X174X181

23-32 RTB353
30-40 RTB355
37-50 RTB357
48-65 RTB359
55-70 RTB361
63-80 RTTB363
80-93 RTB365

90-120 RTB466
110-135 RTB467
120-150 RTB468
125-200 RTTB571
160-225 RTTB571



CAL11




CAFT0
CAFT2
CAFT4


CAFTD0
CAFTD2
CAFTD4

Interbloqueo Mecánico
EME1232 (12-32)
EME4095 (40-95)
EME115150 (115-150)
EME185225 (185-225)

	32	60	125
	8,5	20	40
	16,7	33,3	60
	CBCA16 11 ••	CBCA33 12 ••	CBCA60 12 ••
	35	63	125
	6	25	50
	45x74x123	75x127x150	85x127x200

Tensión de bobina ••	Corriente alterna (ca) 50/60Hz	Corriente Continua (cc)
24V	B7	BD
48V	E7	ED
110V	F7	FD
220V	M7	MU
230V	P7	MD
250V		UD
380V	Q7	MD

Arrancadores directos.
Arrancadores Estrella / Triángulo
Relés Auxiliares

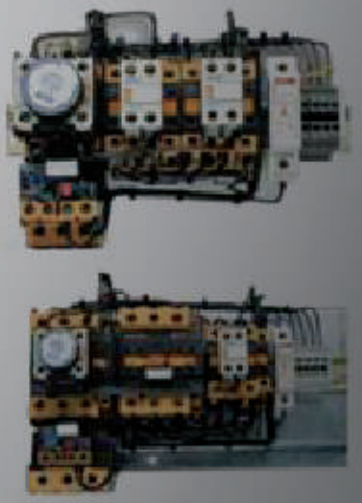
ARRANCADORES DIRECTOS TRIFÁSICOS

En caja de policarbonato IP54 con pulsadores de mando y reset.

Series ADBA - AET - RA

			M				
		(A)	3x380V~	3x220V~	220V~	aM	GL
506	A12	1-1,6	0,37			2	4
507	A12	1,6-2,5	0,75	0,37		4	6
508	A12	2,5-4	1,1-1,5	0,55-0,75		6	10
510	A12	4-6	2,2	1,1	0,37-0,55	8	16
512	A12	5,5-8	3	1,5	0,75	12	20
514	A12	7-10	4	2,2		12	20
516	A12	9-13	5,5	3	1,1-1,5	12	25
521	A18	12-18	7,5	4	1,8	20	32
522	A25	17-25	11	5,5	2,2	25	50
523	A32	23-32	15	7,5	3-4	40	63

ADBA 506-516 *ADBA 521-523*



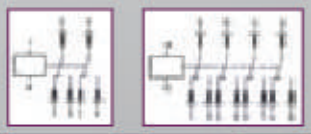
ARRANCADORES ESTRELLA/TRIÁNGULO

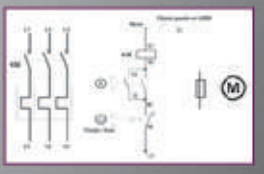
	(kW)							
AET7-••	7,5	10	16	114	12	12	2	
AET11-••	11	15	22,5	116	18	12	2	
AET15-••	15	20	30	122	25	18	2	
AET18-••	8,5	25	37	122	32	18	2	
AET22-••	22	30	44	253	32	25	2	
AET25-••	25	35	50	255	32	25	1	1
AET30-••	30	40	60	355	40	32	1	1
AET37-••	37	50	72	357	50	32	1	1
AET45-••	45	60	85	359	50	32	1	1
AET55-••	55	75	105	359	65	40	1	1
AET75-••	75	100	138	363	95	65	1	1
AET90-••	90	125	170	367	115	65	2	2
AET110-••	110	150	205	369	150	95	1	1
AET132-••	132	180	245	369	150	95	2	2
AET160-••	160	220	295	369	185	115	2	2

•• *Tensión de comando*

RELÉS AUXILIARES MINIATURA

Con terminales planos para inserción en zócalos, ejecución extraíble.
Modelos provistos de pulsador para accionamiento manual y LED de señalización óptica de bobina energizada.





Ith máxima Ue=220Vca	A	10/4		5/2	
Ue=250Vca	A	7/2 *		5/1*	
Ue=30Vcc	A	10		5	
Polos inversores	Cant.	2		4	
Código		RA2P10-••	RA2P10TL-••	RA4P05-••	RA4P05TL-••
Botón de accionamiento		-	Si	-	Si
LED de señalización		-	Si	-	Si
Consumo de bobina	VA/W	0,9 a 1,4			
Tensión bobina	V	•• 0,8 a 1,1 Un			
Dimen. Zócalo + rele	mm	28x78x65		29x72x65	

ZA4P05B *ZA2P10B*

Zócalos para montaje en riel DIN ó panel.

••	CA 50/60Hz	CC
24V	B7	BD
48V	E7	ED
110V	F7	FD
220V	M7	MD