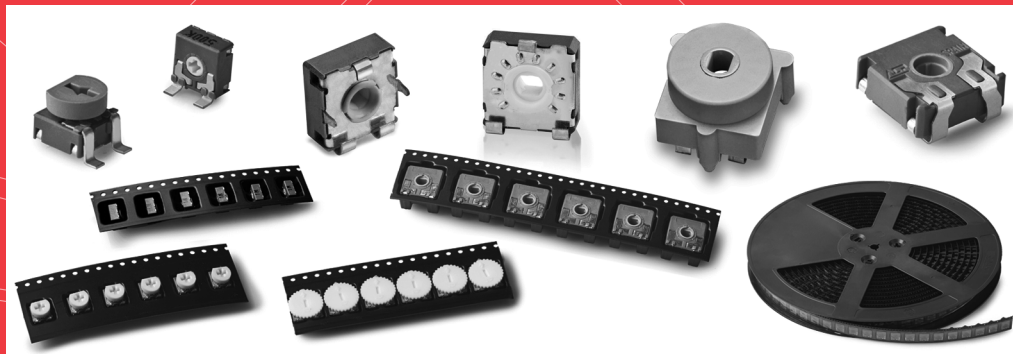


ACP Reflowable Potentiometers



Technical information



Aragonesa de Componentes Pasivos

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INTRODUCTION

ACP brand is worldwide recognized as a reliable and cost effective component manufacturer of SMD potentiometers. This catalogue describes the extended range we offer in this format on both, thick film carbon and cermet technologies. The majority of the standard and special features that the traditional THT (Through Hole Technology) series offer can be supplied also in SMD format. The potentiometers can be packed either in bulk, or Tape-n-Reel for automated assembly onto the PCB.

In addition to the SMD range, THT Pin in Paste options can also be available under demand, with the possibility to be Tape-n-Reel packed.

We welcome you to go through this catalogue to select the most adequate option to suit your needs. Please, contact our sales and technical support network for any assistance. If you do not find what you want, remember that we are specialized in building custom solutions.

Carbon and cermet technologies

ACP SMD potentiometers, like the traditional THT mount, can be manufactured using two different thick film technologies regarding the resistive element: carbon (6, 9 and 14 mm sizes) and cermet (9 and 14mm sizes).

Cermet is more robust and is recommended in high temperature and high power dissipation requirements. The nature of the resistive element and the plastic and metal materials, used in their configuration, are sturdy enough to go through the reflow process with no risk to get damaged.

For less demanding environment and power dissipation requirements, carbon element is the most common used technology. It is a very cost effective product, but on the other hand it is more sensitive to the reflow heat stress. Here is where our engineers propose materials and processes to make a carbon based potentiometer suitable for SMD.

HOW TO ORDER

Example: CA14DVSM-D-T&R-10KA2020 LV10 DTF CY WT-14003

Standard features

1	2	3	4	5	6	7	8	
Series	Rotor ¹	Model	Pack.	Value ²	Taper	Tolerance CA Series CE Series	Life	
■ CA6	D,M,N,X	HSMD VSMD VESMD VS5...PIP	Bulk: Blank	Lin(A) 100 ≤ Rn ≤ 5M Log (B) Alog (C) 1K ≤ Rn ≤ 1M	Linear: A Log: B Alog: C Others: Special code	100 ≤ Rn ≤ 1M: ±25% 1M<Rn≤ 5M ±50%	N.A.	
■ CA9 / CE9	C,D,J,K,M,P,R,Y, KA*, MA*, MT* (*No detents possible)	HSMD; VSMD VSMD...CY V7,5...PIP V10...PIP V10...PIP TP25 VR10; HS3,8 H5...PIP TP25 H2,5... PIP TP25				100 ≤ Rn ≤ 100K ±30% 100K < Rn ≤ 1M: ±40% 1M < Rn ≤ 5M: ±50%	100 ≤ Rn ≤ 1M: ±20% 1M < Rn ≤ 5M ±30%	Standard, 1K cycles: Blank Others: LVXX
■ CA14 / CE14	B,D,E,F,G,K, M,N,P,T,X,Z	VSMD; VSMD...CY; HSMD (on request)						
■ RS9	C,D,E,J,K,M, P,R,Y	Idem CA9	15" reel: T&R15	Lin(A):10K	Linear: A	±30%	Standard, 25K-50K cycles: LVXX	
■ RS14	D,F,N,T,Z						Up to 1M cycles (please specify the cycles)	
■ CS14	B,D*,E,F*,G,K, M,N*,P,T*,X,Z* (* only these rotors for LV>15K turns)	Idem CA14					Standard, 15K turns: Blank Others: LVXX	

Extra features

Assembled accessory

9	10	11	12	13	14	15	16
Track	Collector: Detents Center. pins	Terminals	Housing	Rotor	Wiper	Linearity	Assembly Ref # ³ Color
■ CA6	N.A.	N.A.				Standard, not controlled: Blank	
■ CA9 / CE9	Cut track, Initial: PCI Final: PCF	Initial: DTI Central: DTC Final: DTF X detents: XDT					
■ CA14 / CE14	Pin in Paste: PIP		Standard, Brass: Blank	Standard color, Grey: Blank	Position Central: Blank Initial: PI Final: PF Others: Special code	Standard, not controlled: Blank	Accessory reference -V0 (optional)
■ RS9	Other track features: Special code		Optional. Steel: SH	For other colors than standard: RT - color	For rotors N,T, Z of CS14: RSN	Indep. X%: LNx% Absolute X%: LAX%	T&R only on V style mount with 6030 6035 6037 9002 14003
■ RS14		N.A.					
■ CS14	N.A.	X detents: XDT					

¹ Rotor drawings, ² Standard ohmic values, ³ Accessory drawings : please refer to the General Catalogue at www.acpttechnologies.com

Color chart, for rotor, housing and accessories HT

Grey	Neutral	Red	Blue
GS	IN	RO	AZ

Color chart, for accessories (NO HT)

Black	White	Red
NE	BA	RO

Note: Rotor and Housing are according to UL 94V0.
HT accessories are recommended, V0 versions under request.

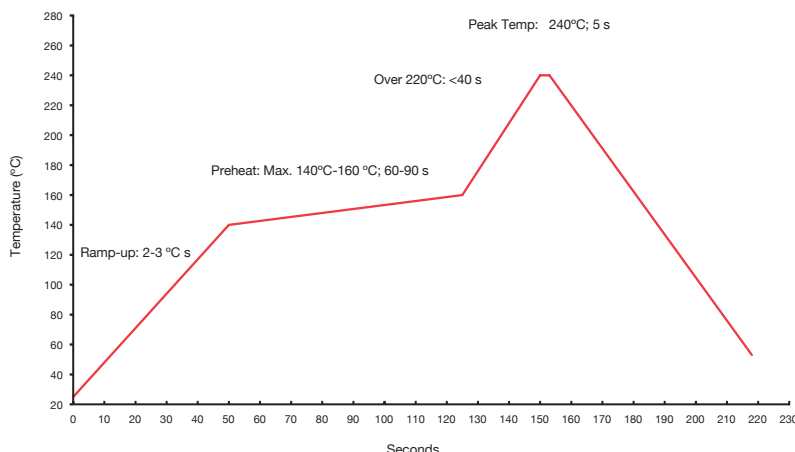
Note: Should the potentiometers be submitted to double reflow, please provide details. We have version readily available for that.

The first challenge that SMD potentiometers must overcome is the reflow soldering profile. Like every other component in this format, potentiometers must be able to withstand the severe heat stress experienced during that process. Our engineers have selected the most adequate metals, plastics and resistive elements to make sure that after that process the electrical and mechanical properties are kept to secure proper functioning in the application.

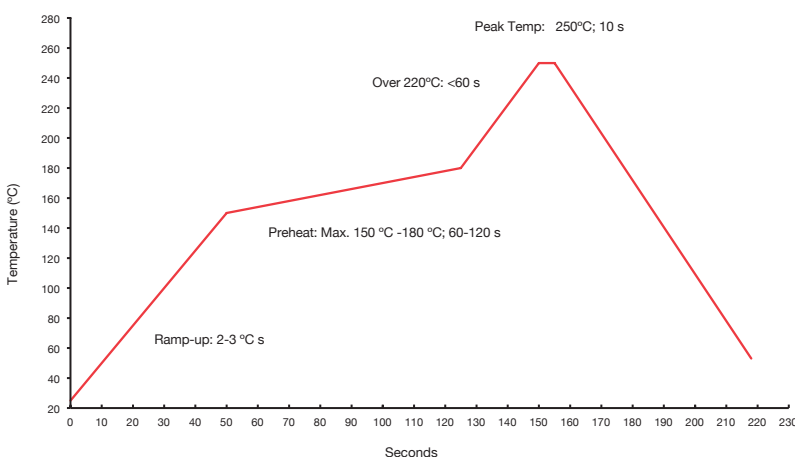
A compromise must always be found in order to secure good functional performance and good solder joints. Solder profiles are set by customer depending on the PCB layout and component density. To avoid damaging the components there are limits that every manufacturer establishes based on studies and tests. At ACP, we feature the SMD potentiometers according to the European Standard EN 60068-2-58. Based on the results obtained, we propose our recommended soldering profiles.

ACP recommended profiles

Carbon Potentiometers



Cermet potentiometers



	Pre-heating		Heating (above liquidous)		Peak	
	Temp (°C)	Time (sec)	Temp (°C)	Time (sec)	Temp (°C)	max. Time(sec)
CA	140-160	60-90	Over 220	<40	240	5
CE	150-180	60-120	Over 220	<60	250	10

Value shift after reflow

The nature of polymer thick film (carbon) resistive elements is such that they are sensitive to temperatures above 150°C. In their manufacturing process the inks deposited on the different substrates are cured at high temperatures for a certain period of time in order to polymerize them and obtain a stabilized value.

You can imagine that submitting them during the reflow soldering process to temperatures of 240°C and higher, even for a few seconds, is a heat stress that may modify the polymer structure and originate a value shift. The value change that a carbon potentiometer may experience depends on the resistive value. This has a consequence, tight resistive tolerances on carbon potentiometers will suffer a shift that may result in real resistive values beyond the limits.

This effect is only present on the carbon resistive elements. Cermet Thick film based resistive tracks are very stable and the reflow process does not affect them at all, there are no value changes after that.

		CA			CE	
		6	9	14	9	14
Range of resistance value*	Lin (A)	$100\Omega \leq R_n \leq 5M\Omega$			$100\Omega \leq R_n \leq 5M\Omega$	
	Log (B),Antilog (C)	$1 K\Omega \leq R_n \leq 1 M\Omega$			$1 K\Omega \leq R_n \leq 2M2\Omega$	
Tolerance*	$R_n < 100\Omega$:	-			-	
	$100\Omega \leq R_n \leq 100K\Omega$	$\pm 25\%$	$\pm 30\%$		$\pm 20\%$	
	$100K < R_n \leq 1M\Omega$:	$\pm 25\%$	$\pm 40\%$		$\pm 20\%$	
	$1M\Omega < R_n \leq 5M\Omega$:	$\pm 50\%$	$\pm 50\%$		$\pm 30\%$	
	$R_n > 5M\Omega$:	-			-	
Variation laws		Lin (A), Log (B), Antilog (C) *			Lin (A), Log (B), Antilog (C) *	
Residual resistance		Minimum value 2Ω			$\leq 2\Omega$	
CRV - Contact Resistance Variation (dynamic)		$\leq 3\% R_n$	$\leq 3\% R_n$	$\leq 3\% R_n$	$\leq 3\% R_n$	$\leq 3\% R_n$
CRV - Contact Resistance Variation (static)		$\leq 5\% R_n$	$\leq 5\% R_n$	$\leq 5\% R_n$	$\leq 5\% R_n$	$\leq 5\% R_n$
Maximum power dissipation	Lin (A)	at 50°C 0.10W	at 50°C 0.15W	at 50°C 0.25W	at 70°C 0.5W	at 70°C 0.7W
	Log (B),Antilog (C)	at 50°C 0.06W	at 50°C 0.10W	at 50°C 0.13W	at 70°C 0.20W	at 70°C 0.30W
Maximum voltage	Lin (A)	100VDC	200VDC	250VDC	200VDC	250VDC
	Log (B),Antilog (C)	60VDC	150VDC	200VDC		200VDC
Operating temperature*		$-25^\circ\text{C} \dots +70^\circ\text{C}$ (+ 85°C on request)			$-40^\circ\text{C} \dots +90^\circ\text{C}$ (+ 125°C on request)	
Temperature coefficient	$100\Omega \leq R_n \leq 10K\Omega$	$+200/-500$ ppm			± 100 ppm	
	$10K\Omega < R_n \leq 5M\Omega$	$+200/-1000$ ppm			± 100 ppm	
Resistive element		Carbon technology			Cermet	
Angle of rotation (mechanical)		$235^\circ \pm 10^\circ$	$240^\circ \pm 5^\circ$	$265^\circ \pm 5^\circ$	$240^\circ \pm 5^\circ$	$265^\circ \pm 5^\circ$
Angle of rotation (electrical)		$215^\circ \pm 20^\circ$	$220^\circ \pm 20^\circ$	$245^\circ \pm 20^\circ$	$220^\circ \pm 20^\circ$	$245^\circ \pm 20^\circ$
Wiper standard delivery position		$50\% \pm 15^\circ$			$50\% \pm 15^\circ$	
Max. stop torque		4 Ncm	5 Ncm	10 Ncm	5 Ncm	10 Ncm
Max. push/pull on rotor		9.8 N	40 N	50 N	40 N	50 N
Wiper torque*		< 2 Ncm	< 2 Ncm	< 2.5 Ncm	< 2 Ncm	< 2.5 Ncm
Wiper torque with detents*		NA	< 2.5 Ncm	< 3.5 Ncm	< 2.5 Ncm	< 3.5 Ncm
Mechanical life		1.000 cycles (Long life 10,000 cycles)				

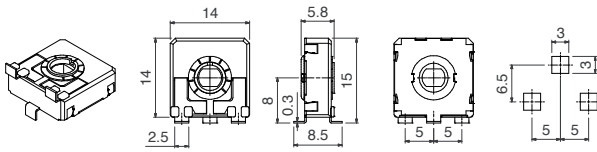
*Other (tapers, resistance value, operating temperature, wiper torque and mechanical life) please inquire.

		RS9 SMD	RS14 SMD	CS14 SMD (upon availability)
Range of resistance value*	Lin (A)	Standard value is 10K*		100Ω ≤ Rn ≤ 1MΩ
	Log (B),Antilog (C)	-		1 KΩ ≤ Rn ≤ 1 MΩ
Tolerance*	100Ω ≤ Rn ≤ 100KΩ	±30%		
	100K< Rn ≤ 1MΩ:	-		±40%
	1MΩ < Rn ≤5MΩ:	-		±50%
Variation laws		Lin (A) *		
Residual resistance		Minimum value 2Ω		-
CRV - Contact Resistance Variation (dynamic)		≤ 3% Rn		
CRV - Contact Resistance Variation (static)		≤ 5% Rn		
Max. power dissipation	Lin (A)	at 50°C 0.15W		
Maximum voltage	Lin (A)	200VDC	250VDC	
Operating temperature*		-25°C ... +70°C (+85°C on request)	-25°C ... +85°C	-25°C ... +70°C (+120°C on request)
Temperature coefficient	100Ω ≤ Rn ≤ 10KΩ	+200/ -300 ppm	+200/ -500 ppm	
	10KΩ < Rn ≤ 5MΩ	+200/ -1000 ppm	+200/ -1000 ppm	
Resistive element		Carbon technology		
Angle of rotation (mechanical)		240° ± 5°	265° ± 5°	360°
Angle of rotation (electrical)		220° ± 20°	245° ± 20°	330° ± 20°
Wiper standard delivery position		50% ± 20°		
Max. stop torque		5 Ncm	10 Ncm	-
Max. push/pull on rotor		40 N	50 N	35 N / 50 N
Wiper torque*		<2 Ncm	<1.5 Ncm	15.000 turns <2.5 Ncm, >15.000 turns <1.5Ncm
Wiper torque with detents*		NA		<3.5 Ncm
Mechanical life		Standard: between 25.000 and 50.000cycles. Long life: up to 200.000cycles *	100.000 cycles. Up to 1.000.000 cycles	15.000 turns. Up to 1

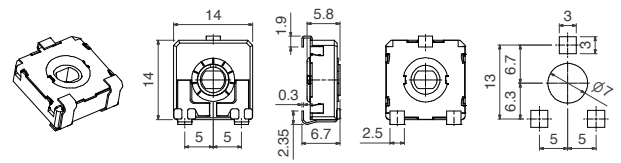
*Other (tapers, resistance value, operating temperature, wiper torque and mechanical life) please inquire.

CA14-CE14

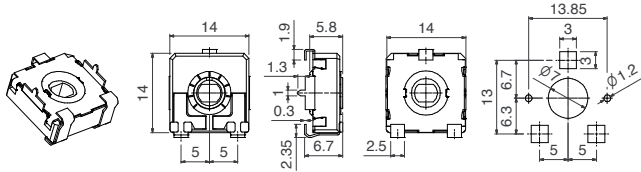
HSMD*



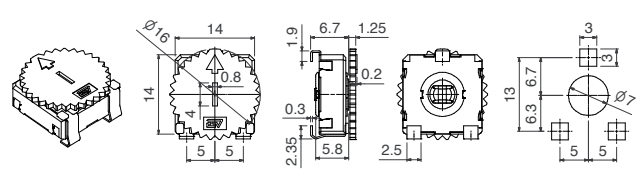
VSMD



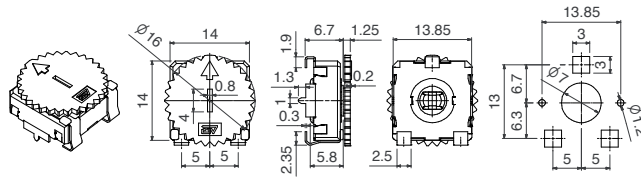
VSMD...CY



VSMD WT-14003



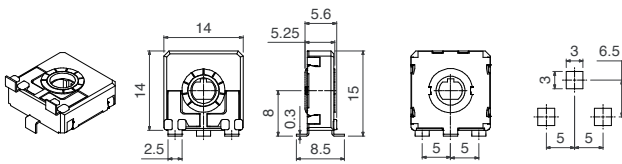
VSMD...CY WT-14003



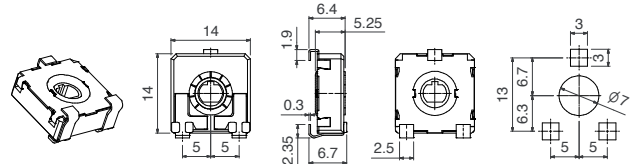
*Under request.

RS14

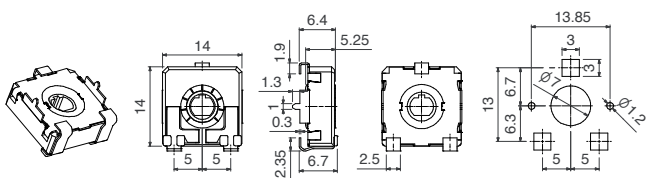
HSMD*



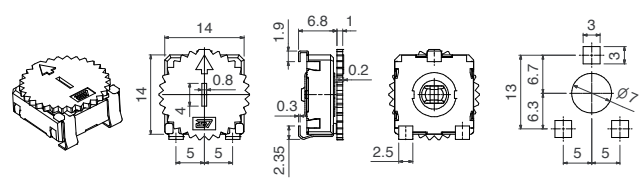
VSMD



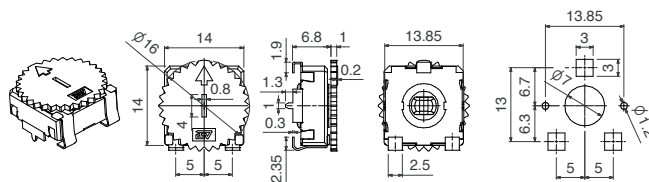
VSMD...CY



VSMD WT-14003

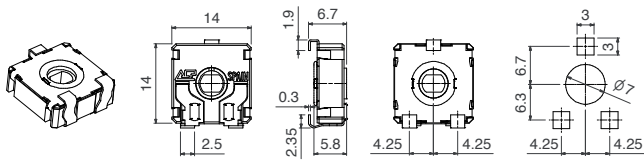


VSMD...CY WT-14003



*Under request.

VSMD



VSMD...CY

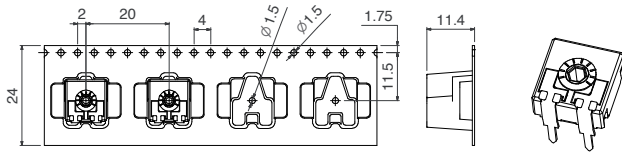
SMD

	Accessory
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CA6

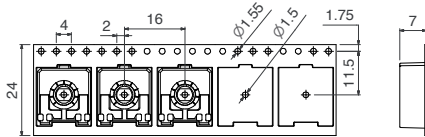
VSMD-T&R

V7,5-T&R...PIP



RS14

VSMD-T&R



ACP's patented detent (DT) feature is especially suitable for control applications where the end user will turn a knob inserted in the potentiometer. Detents add a click feeling to the turning of the potentiometer and a control of the

Q16

SMD Rotary Potentiometer Switch

Q16 is a particular application of the

