

ELECTRONIC VALVE SPECIFICATION  
CV7169-CV7177

ISSUE 1 DATED, SEPTEMBER, 1961  
AMENDMENT No. 1

Page 1

J.S. Catalogue Numbers:- Amend to read as follows

CV7169	5960-99-037-2460
CV7170	5960-99-037-2461
CV7171	5960-99-037-2462
CV7172	5960-99-037-2463
CV7173	5960-99-037-2464
CV7174	5960-99-037-2465
CV7175	5960-99-037-2466
CV7176	5960-99-037-2467
CV7177	5960-99-037-2468

February, 1962  
(10660)

GENERAL POST OFFICE: E-IN-C(S)

General Post Office E in C(S)

Specification: G.P.O./CV 7169 - CV 7177 Issue No 1 Dated September 1961 To be used in conjunction with K 1007.	<b>SECURITY.</b>	
	<u>Specification</u> Unclassified	<u>Valve</u> Unclassified.

← Indicates a change

<p><b>TYPE OF DEVICE</b> - Silicon Voltage Reference Diode. (Note A)</p> <p><b>PROTOTYPE</b> - VR-B series</p>	<p style="text-align: center;"><b>MARKING</b></p> <p>CV Number, Polarity marking, Factory and date code. See K 1007/4</p>																																																																								
<p style="text-align: center;"><u>RATINGS AND CHARACTERISTICS</u> (Not for Inspection purposes)</p> <p><u>All limiting Values are absolute.</u></p>	<p style="text-align: center;"><u>DIMENSIONS</u></p> <p>K1007/A1/D10</p>																																																																								
<p style="text-align: right;">Note.</p> <p>Max. dissipation at 25°C ambient air (W) 2</p> <p>Max. Continuous forward current at 25°C ambient air. (A) 2.75</p> <p>Operating ambient temperature range - 55°C to + 150°C.</p> <p>Nominal reference voltage at 25°C ambient air, I<sub>R</sub> = 20 mA</p>	<p style="text-align: center;"><u>MOUNTING POSITION</u></p> <p>Any.</p>																																																																								
<table border="0"> <tr> <td>CV 7169 (V)</td> <td>3.50</td> <td></td> </tr> <tr> <td>CV 7170</td> <td>4.25</td> <td></td> </tr> <tr> <td>CV 7171</td> <td>4.75</td> <td></td> </tr> <tr> <td>CV 7172</td> <td>5.25</td> <td></td> </tr> <tr> <td>CV 7173</td> <td>5.75</td> <td></td> </tr> <tr> <td>CV 7174</td> <td>6.25</td> <td></td> </tr> <tr> <td>CV 7175</td> <td>7.00</td> <td></td> </tr> <tr> <td>CV 7176</td> <td>8.00</td> <td></td> </tr> <tr> <td>CV 7177</td> <td>9.00</td> <td></td> </tr> </table> <p>Max. continuous reference current at 25°C ambient air.</p> <table border="0"> <tr> <td>CV 7169 (mA)</td> <td>525</td> <td>B</td> </tr> <tr> <td>CV 7170</td> <td>470</td> <td>B</td> </tr> <tr> <td>CV 7171</td> <td>430</td> <td>B</td> </tr> <tr> <td>CV 7172</td> <td>400</td> <td>B</td> </tr> <tr> <td>CV 7173</td> <td>370</td> <td>B</td> </tr> <tr> <td>CV 7174</td> <td>345</td> <td>B</td> </tr> <tr> <td>CV 7175</td> <td>285</td> <td>B</td> </tr> <tr> <td>CV 7176</td> <td>235</td> <td>B</td> </tr> <tr> <td>CV 7177</td> <td>210</td> <td>B</td> </tr> </table>	CV 7169 (V)	3.50		CV 7170	4.25		CV 7171	4.75		CV 7172	5.25		CV 7173	5.75		CV 7174	6.25		CV 7175	7.00		CV 7176	8.00		CV 7177	9.00		CV 7169 (mA)	525	B	CV 7170	470	B	CV 7171	430	B	CV 7172	400	B	CV 7173	370	B	CV 7174	345	B	CV 7175	285	B	CV 7176	235	B	CV 7177	210	B	<p style="text-align: center;"><u>PACKAGING</u></p> <p>K1007/14</p> <p>J.S. Catalogue Numbers are:-</p> <table border="0"> <tr> <td>CV 7169</td> <td>5960 - 99 - 2460</td> </tr> <tr> <td>CV 7170</td> <td>5960 - 99 - 2461</td> </tr> <tr> <td>CV 7171</td> <td>5960 - 99 - 2462</td> </tr> <tr> <td>CV 7172</td> <td>5960 - 99 - 2463</td> </tr> <tr> <td>CV 7173</td> <td>5960 - 99 - 2464</td> </tr> <tr> <td>CV 7174</td> <td>5960 - 99 - 2465</td> </tr> <tr> <td>CV 7175</td> <td>5960 - 99 - 2466</td> </tr> <tr> <td>CV 7176</td> <td>5960 - 99 - 2467</td> </tr> <tr> <td>CV 7177</td> <td>5960 - 99 - 2468.</td> </tr> </table>	CV 7169	5960 - 99 - 2460	CV 7170	5960 - 99 - 2461	CV 7171	5960 - 99 - 2462	CV 7172	5960 - 99 - 2463	CV 7173	5960 - 99 - 2464	CV 7174	5960 - 99 - 2465	CV 7175	5960 - 99 - 2466	CV 7176	5960 - 99 - 2467	CV 7177	5960 - 99 - 2468.
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<u>RATINGS &amp; CHARACTERISTICS Cont'd</u>			NOTE
Typical Slope resistance at $I_R = 20\text{mA}$ at $25^\circ\text{C}$ ambient air.			
CV7169	( $\Omega$ )	17.2	C
CV7170		16.0	C
CV7171		14.4	C
CV7172		11.0	C
CV7173		4.5	C
CV7174		1.8	C
CV7175		1.5	C
CV7176		1.5	C
CV7177		1.6	C
Typical Mean Temperature coefficients of reference voltage at $I_R = 20\text{mA}$ Temperature range, $25^\circ\text{C}$ to $60^\circ\text{C}$ ambient air			
CV7169	(%/°C)	-.053	D
CV7170		-.039	D
CV7171		-.026	D
CV7172		-.011	D
CV7173		+.015	D
CV7174		+.033	D
CV7175		+.045	D
CV7176		+.057	D
CV7177		+.065	D
Max. reverse leakage current at $-2\text{V}$ $T_{\text{amb}} = 100^\circ\text{C}$ .			
CV7169	( $\mu\text{A}$ )	200	
CV7170		200	
CV7171		150	
CV7172		150	
CV7173		100	
CV7174		100	
CV7175		50	
CV7176		20	
CV7177		20	

NOTES

- (A) These devices are primarily intended as close tolerance reference diodes and for this purpose they should be operated with reference currents of  $20\text{mA}$  or greater.
- (B) For derating above  $25^\circ\text{C}$  ambient air see Figure 1.
- (C) For the typical variation of slope resistance with reference current see Figure 2
- (D) For typical changes in reference voltage with ambient temperature above  $25^\circ\text{C}$  see Figures 3 - 11 incl. For limit diodes, whose reference voltage lies between two nominal values, interpolation between two curves will give an indication of voltage change. Similarly, interpolation between current curves is useful for intermediate values of current.

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K1007	TEST	TEST CONDITIONS	AQL %	INSE LEVEL	SYM- BOL	LIMITS		UNITS
						MIN	MAX.	
5.F.2	<u>GROUP A.</u> Reference Voltage	Tamb. = 25±5°C I <sub>R</sub> = 20mA. CV7169 CV7170 CV7171 CV7172 CV7173 CV7174 CV7175 CV7176 CV7177		100%	V <sub>Z</sub>	2.9 3.9 4.4 4.9 5.4 5.9 6.4 7.4 8.4	4.1 4.6 5.1 5.6 6.1 6.6 7.6 8.6 9.6	V V V V V V V V V
5.F.3	Slope Resistance	Tamb. = 25±5°C I <sub>R</sub> = 20mA. CV7169 CV7170 CV7171 CV7172 CV7173 CV7174 CV7175 CV7176 CV7177		100%	r <sub>Z</sub>	15 14 12 6 0 0 0 0 0	20 19 18 17 10 4 4 4 4	Ω Ω Ω Ω Ω Ω Ω Ω Ω
	<u>GROUP B.</u>	OMITTED						
5.F.5	<u>GROUP C.</u> Reverse Leakage Current	V <sub>R</sub> = -2V Tamb. = 100±5°C CV7169 CV7170 CV7171 CV7172 CV7173 CV7174 CV7175 CV7176 CV7177	2.5	1	I <sub>R</sub>	- - - - - - - - -	200 200 150 150 100 100 50 20 20	μA μA μA μA μA μA μA μA μA
5.F.4	<u>GROUP D</u> Mean Temperature Coefficient of Reference Voltage.	I <sub>R</sub> = 20mA Tamb. = +25°C and +60°C. CV7169 CV7170 CV7171	6.5	1A	S <sub>Z</sub>	-0.07 -0.056 -0.042	-0.040 -0.025 -0.010	%/°C

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K1007	TEST	TEST CONDITIONS	AQL %	INSP. LEVEL	SYM- BOL	LIMITS		UNITS
						MIN	MAX.	
	<u>GROUP D Cont'd</u>	CV7172 CV7173 CV7174 CV7175 CV7176 CV7177				-.030 -.015 0 +.025 +.040 +.050	+.025 +.040 +.048 +.058 +.075 +.080	
	<u>GROUP E</u>							
10.2	Temperature Cycling	No Voltage. Three Cycles -55°C to +100°C.		1C				
10.3	Climatic Cycling	No Voltages, Note 1						
	<u>Post Temperature and Climatic Cycling Tests</u>	Combined AQL.	10					
8	Inoperatives Reference Voltage	As in Group A	6.5		V <sub>Z</sub>	Note 2		V
	Slope Resistance	As in Group A	6.5		r <sub>Z</sub>	Note 2		Ω
11.3	Fatigue	No Voltages.		1C				
	<u>Post Fatigue Tests</u>							
8	Inoperatives Reference Voltage	As in Group A	6.5		V <sub>Z</sub>	Note 2		V
	Slope Resistance	As in Group A	6.5		r <sub>Z</sub>	Note 2		Ω
11.4	Shock	No Voltages, Hammer Angle = 60°		T.A.				
10.1	Lead Fragility	No Voltages, Note 3	6.5	1C				
11.5	Soldering		6.5	1C				
	<u>GROUP F</u>							
13	Life	Tamb. range +25°C to +150°C, d.c. reference current not less than the value corresponding to the chosen Tamb. according to the derating curve on Figure 1.		1A				
13.3	<u>Life Test End point 1000 Hours</u>							
	Reference Voltage.	As in Group A.	6.5		V <sub>Z</sub>	Note 2		V

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K1007	TEST	TEST CONDITIONS	AQL %	INSP. LEVEL	SYM- BOL	LIMITS		UNITS
						MIN	MAX.	
13.4 13.5	<u>GROUP F (Contd)</u>							
	Slope Resistance	As in Group A.	6.5		r <sub>Z</sub>	Note 2		Ω
	Storage Life (1)	t = 150 hours, T <sub>amb</sub> = -55°C		1				
	Storage Life (2)	t = 150 hours, T <sub>amb</sub> = +100°C			1			
	<u>Post Storage Life Tests</u>							
		COMBINED AQL FOR STORAGE (1) POST TESTS		6.5				
	COMBINED AQL FOR STORAGE (2) POST TESTS		6.5					
	Reference Voltage	As in Group A	4.0		V <sub>Z</sub>	Note 2		V
	Slope Resistance	As in Group A	4.0		r <sub>Z</sub>	Note 2		Ω
8	<u>GROUP G</u>							
	Retest after 28 days holding period							
	Inoperatives		0.5					
	Reference Voltage	As in Group A	1.0		V <sub>Z</sub>	Note 2		V
	Slope Resistance	As in Group A.	1.0		r <sub>Z</sub>	Note 2		Ω

NOTES

- (1) The samples of diodes shall be subjected to conditioning in accordance with K1007 Section 10.1 and shall then be subjected to temperature cycling and climatic cycling in sequence and shall then pass the post temperature and climatic cycling tests.
- (2) To Group A test limits of reference voltage or slope resistance.
- (3) Diodes used for this test must have undergone at least 28 cycles of the climatic test in accordance with K1007 Section 10.3.1 or 10.3.2 or 6 cycles in accordance with Section 10.3.3.

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# DATA SHEET

## VOLTAGE REFERENCE DIODE DERATING CURVE

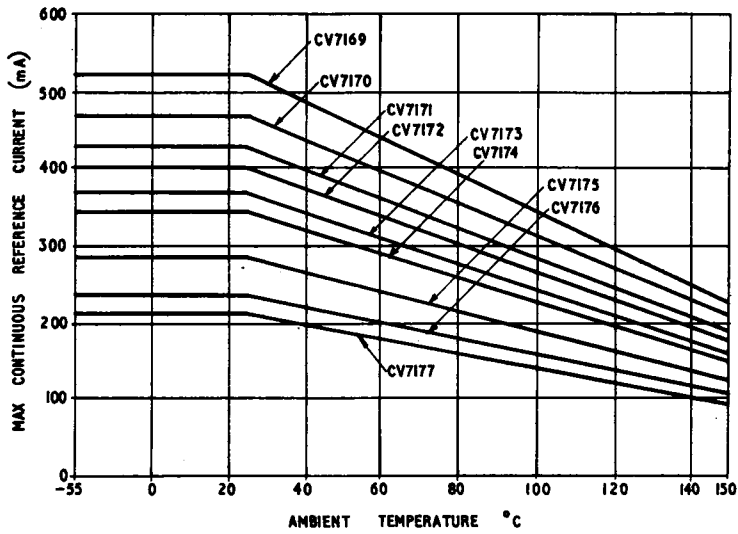
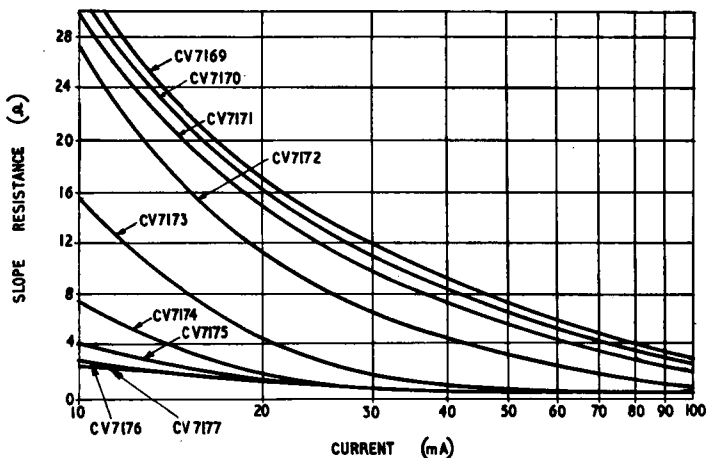


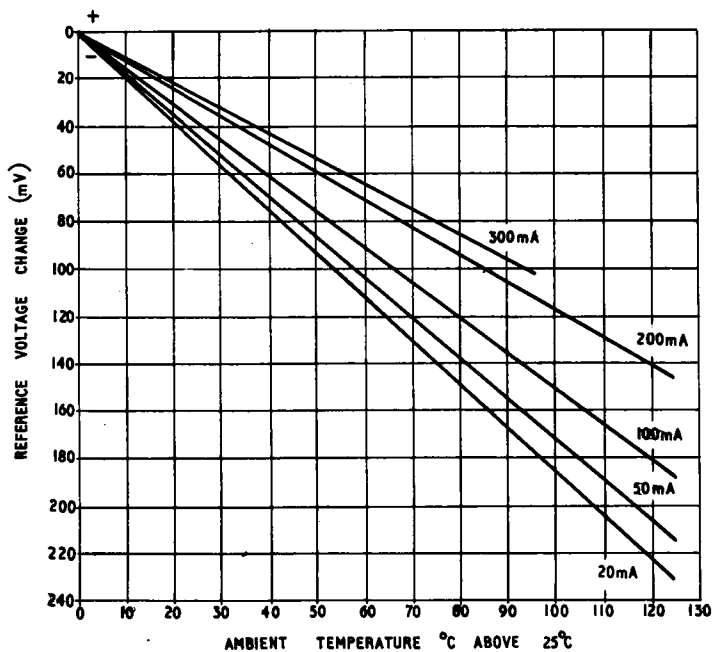
FIG. 1 CV7169 - CV7177

**DATA SHEET**  
**TYPICAL VARIATIONS OF SLOPE RESISTANCE**  
**WITH REFERENCE CURRENT**

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**CV7169-**  
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**FIG.2 CV7169 - CV7177**



**FIG.3 CV7169**  
**TYPICAL VARIATION OF REFERENCE VOLTAGE**  
**WITH AMBIENT TEMPERATURE**



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# DATA SHEET

## TYPICAL VARIATIONS OF REFERENCE VOLTAGE WITH AMBIENT TEMPERATURE

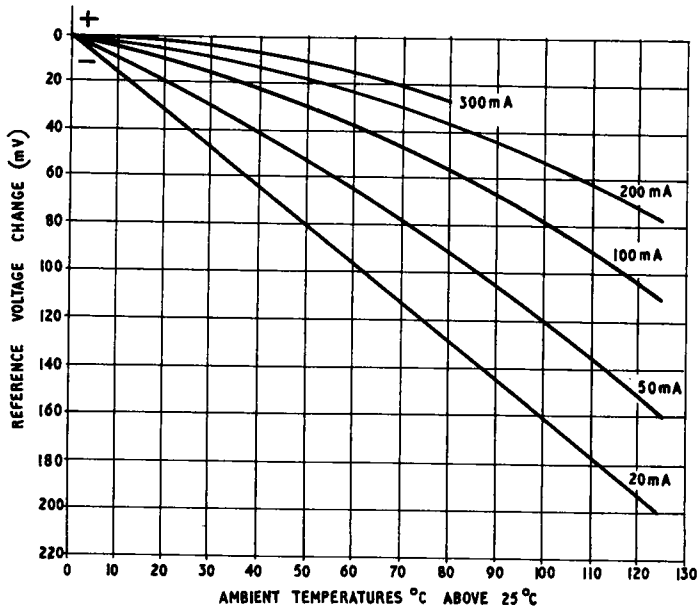


FIG. 4 CV 7170

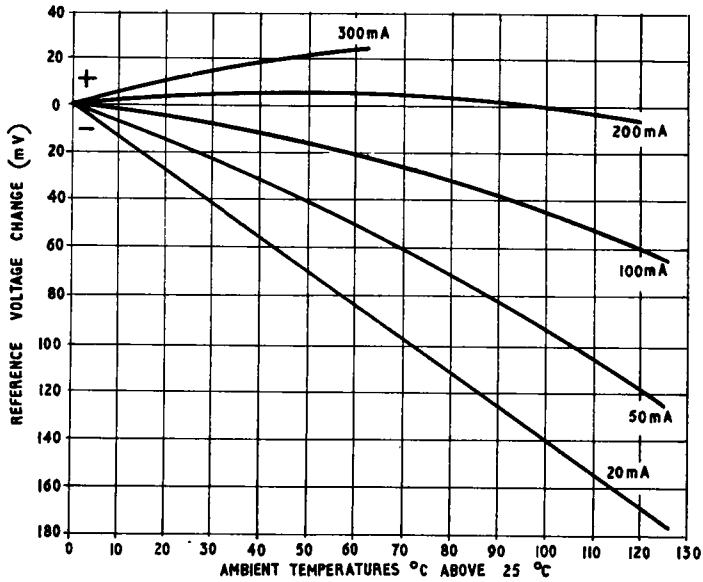
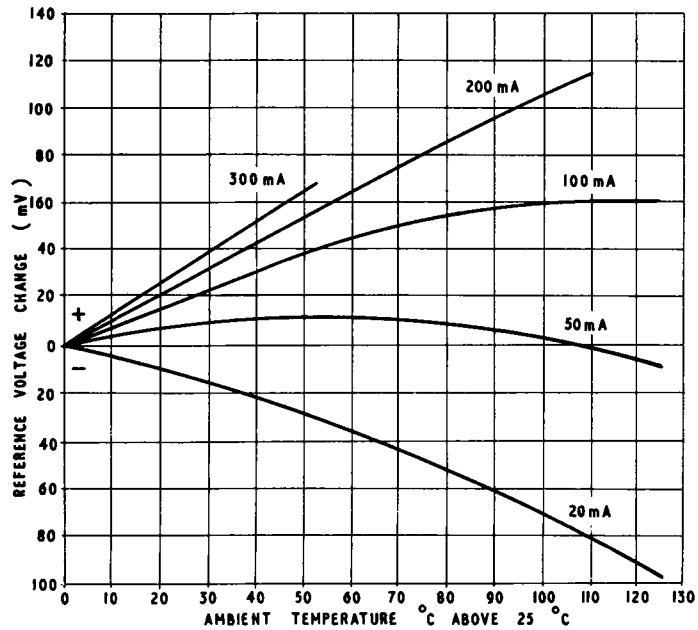


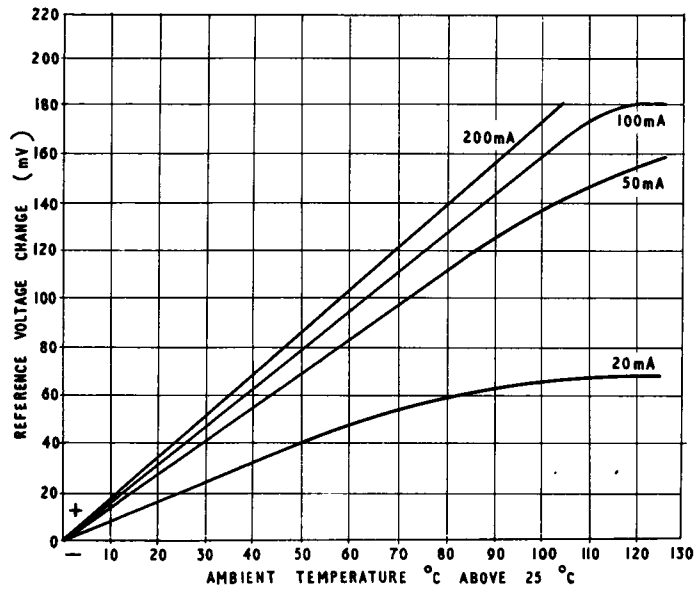
FIG. 5 CV 7171

**DATA SHEET**  
**TYPICAL VARIATIONS OF REFERENCE VOLTAGE**  
**WITH AMBIENT TEMPERATURE**

**CV 7169**  
**- CV 7177**



**FIG. 6 CV7172**



**FIG. 7 CV7173**

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### DATA SHEET

TYPICAL VARIATIONS OF REFERENCE VOLTAGE  
WITH AMBIENT TEMPERATURE

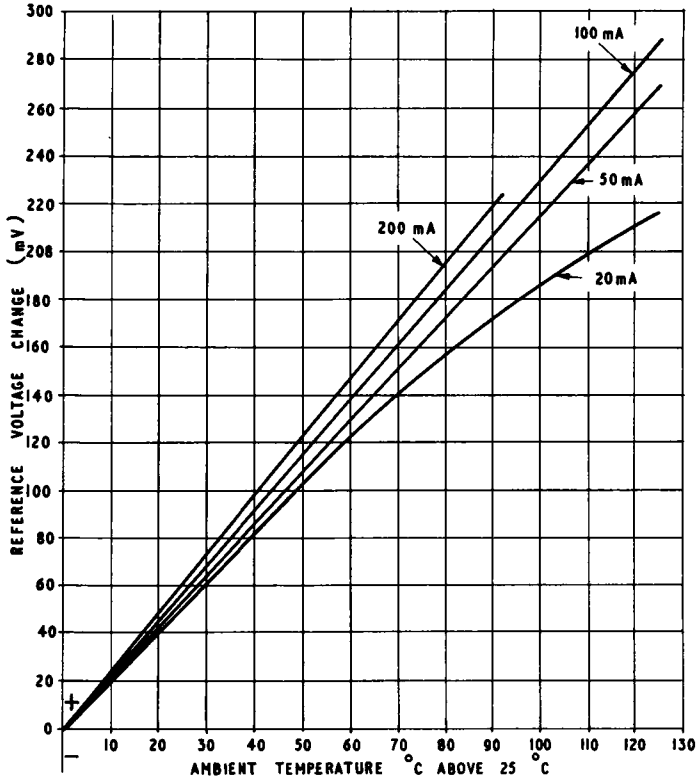


FIG. 8 CV7174

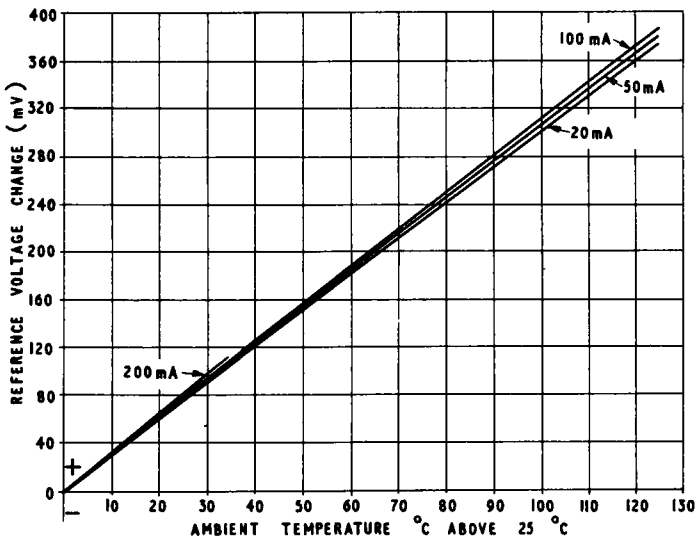


FIG. 9 CV7175

# DATA SHEET

## TYPICAL VARIATIONS OF REFERENCE VOLTAGE WITH AMBIENT TEMPERATURE

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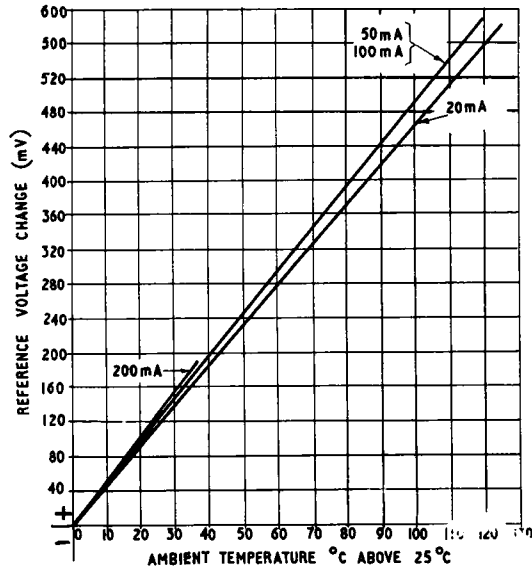


FIG. 10 CV 7176

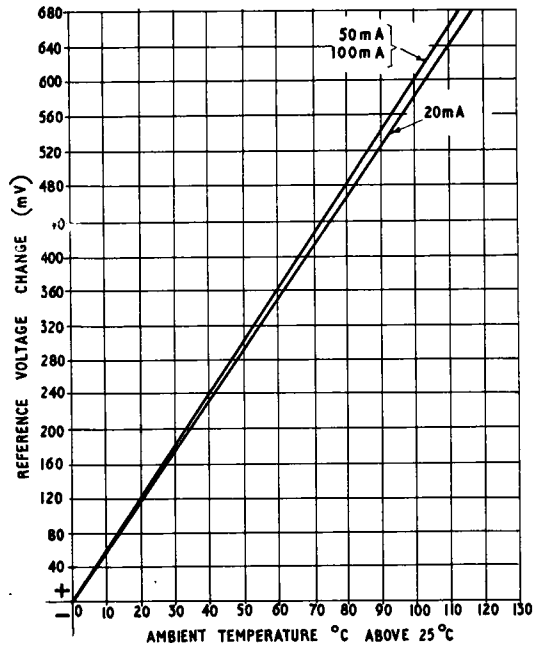


FIG. 11 CV 7177