

Confirmed

NOV 1986

This Standard is obsolescent.
See the BSI Catalogue for details.

BS 9300 C678-721

ISSUE 1 MARCH 1971

ELECTRONIC PARTS OF ASSESSED QUALITY

SILICON VOLTAGE REGULATOR DIODES

1. Specifications CV7678-CV7721 Issue 1 dated February 1967 with their existing amendments which are reproduced below are hereby adopted as BS 9300 C678-721.
2. Devices inspected, released and supplied to this specification shall be marked CV7678-CV7721 as appropriate and where applicable, with the letters KB.
3. The references to 'Military specification', 'Commercial equivalents', 'Reliability assurance provisions' or requirements and 'Preparation for delivery' shall be disregarded.
4. In the Groups A, B and C inspection tables the references in the 'K1007/NATO Ref' column shall be superseded by the appropriate reference given in BS 9300 Appendix C (Tables 1 to 5 inclusive).
5. Additional requirements not covered by BS 9300 Appendix C are:

Page 3. NATO stock numbers.

Against each CV type number, delete '5960' and substitute '5961'.

6. Published amendments (consolidated)

Page 1. Amend date of issue to read 'February 1967'.

MILITARY SPECIFICATION

CV 7678-7721

SEMICONDUCTOR DEVICE

Description:- This specification covers the detail requirements for Silicon Voltage Regulator Diodes and is in accordance with K1007, Issue 3, except as otherwise stated.

Mechanical Dimensions and Outlines:- K1007, Section B, 10.3.3.3. Thread $\frac{1}{4}$ -28 UNF 2 A.

Connections:- CV7678 - CV7699 Stud Cathode
CV7700 - CV7721 Stud Anode

Absolute Maximum Ratings:-

Rating	P _{tot}	P _{tot} (surge)	T _{stud}	T _{stg}	Shock	Vibration	Torque
Unit	W	W	°C	°C	g	g	in lbs
Min.	-	-	-	-55	-	-	15
Max.	75	4400	175	175	1500	20	30
Note	A	B			C		

- Notes:-
- A. See derating curve, Page 9.
 - B. See application data, Page 31.
 - C. Duration 0.5 ms.
 - D. Commercial equivalents - BZY91 Series.

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Primary Electrical Characteristics

1	2	3	4	5	6	7	8	9	10	11
CV Number	$V_{(BR)}$	$V_{(BR)}$	$V_{(BR)}$	$V_{(BR)}$	I_R	$Z_{(BR)}$	$Z_{(BR)}$	I_R	V_R	V_F
	Nominal	Min.	Max.	Max.	Test	Max.	Max.	Max.	Test	Max.
	V	V	V	V	A	Ω	Ω	mA	V	V
7678, 7700	10	9.4	10.6	12.0	2.0	0.4	90	1.0 All Types	6.8	1.5 All Types
7679, 7701	11	10.4	11.6	13.0	2.0	0.4	91		7.5	
7680, 7702	12	11.4	12.6	14.0	2.0	0.5	91		8.2	
7681, 7703	13	12.4	14.1	16.0	2.0	0.5	92		9.1	
7682, 7704	15	13.9	15.6	17.5	2.0	0.6	92		10	
7683, 7705	16	15.4	17.1	19.0	2.0	0.6	93		11	
7684, 7706	18	16.9	19.1	21.5	2.0	0.7	93		12	
7685, 7707	20	18.9	21.2	23.5	1.0	0.8	94		13	
7686, 7708	22	20.8	23.3	26.0	1.0	0.8	95		15	
7687, 7709	24	22.7	25.9	29.0	1.0	0.9	96		16	
7688, 7710	27	25.1	28.9	32.0	1.0	1.0	97		18	
7689, 7711	30	28.0	32.0	35.5	1.0	1.1	98		20	
7690, 7712	33	31.0	35.0	39.0	1.0	1.2	100		22	
7691, 7713	36	34.0	38.0	42.5	1.0	1.3	101		24	
7692, 7714	39	37.0	41.0	45.5	0.5	1.4	103		27	
7693, 7715	43	40.0	45.0	50.0	0.5	1.5	106		30	
7694, 7716	47	44.0	50.0	55.5	0.5	1.7	110		33	
7695, 7717	51	48.0	54.0	60.0	0.5	1.8	114		36	
7696, 7718	56	53.0	60.0	67.0	0.5	2.0	120		39	
7697, 7719	62	58.0	66.0	73.5	0.5	2.2	133		43	
7698, 7720	68	64.0	72.0	80.0	0.5	2.4	150		47	
7699, 7721	75	71.0	79.0	88.0	0.5	2.6	170		51	
Conditions	I_R A	See Col. 6	See Col. 6	See Col. 6	See Col. 6	-	See Col. 6	5 mA	-	I_F 10
	T_{stud} °C	25	25	25	100	-	25	25	25	- 25

APPLICABLE DOCUMENTS:-

T.V.C. Information Sheets Nos. 9 and 10.

REQUIREMENTS:-

Marking: K1007, Section B, 1.3.4.1.

QUALITY ASSURANCE PROVISIONS:-

Destructive Tests: The tests listed in Table II, Group B Inspection, Sub-group 3 and in Table III, Group C Inspection, Sub-group 2 are considered destructive.

Group C Inspection: Inspection shall be conducted on the initial lot and thereafter every ninety days or every fifth lot whichever occurs first.

PREPARATION FOR DELIVERY:-

Packaging: The device shall be packed according to K1007, Section A, 1.2(c). Nut and crinkle washer to be packed with each diode.

NATO STOCK NUMBERS:-

CV7678	5960-99-037-4511	CV7693	5960-99-037-4526	CV7708	5960-99-037-4541
CV7679	5960-99-037-4512	CV7694	5960-99-037-4527	CV7709	5960-99-037-4542
CV7680	5960-99-037-4513	CV7695	5960-99-037-4528	CV7710	5960-99-037-4543
CV7681	5960-99-037-4514	CV7696	5960-99-037-4529	CV7711	5960-99-037-4544
CV7682	5960-99-037-4515	CV7697	5960-99-037-4530	CV7712	5960-99-037-4545
CV7683	5960-99-037-4516	CV7698	5960-99-037-4531	CV7713	5960-99-037-4546
CV7684	5960-99-037-4517	CV7699	5960-99-037-4532	CV7714	5960-99-037-4547
CV7685	5960-99-037-4518	CV7700	5960-99-037-4533	CV7715	5960-99-037-4548
CV7686	5960-99-037-4519	CV7701	5960-99-037-4534	CV7716	5960-99-037-4549
CV7687	5960-99-037-4520	CV7702	5960-99-037-4535	CV7717	5960-99-037-4550
CV7688	5960-99-037-4521	CV7703	5960-99-037-4536	CV7718	5960-99-037-4551
CV7689	5960-99-037-4522	CV7704	5960-99-037-4537	CV7719	5960-99-037-4552
CV7690	5960-99-037-4523	CV7705	5960-99-037-4538	CV7720	5960-99-037-4553
CV7691	5960-99-037-4524	CV7706	5960-99-037-4539	CV7721	5960-99-037-4554
CV7692	5960-99-037-4525	CV7707	5960-99-037-4540		

This specification has been prepared by and the Qualification Approval Authority is:-

Admiralty Surface Weapons Establishment,
Portsdown, Cosham,
Portsmouth, Hants,
England.

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GROUP A INSPECTIONTable I

Page 4.

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB-GROUP 1</u>			0.65	I				
Visual and Mechanical Inspection	5.1.1.							
<u>SUB-GROUP 2</u>			0.65	II				
Breakdown Voltage (1)	8A.2.4.	$T_{stud} = 25^{\circ}\text{C}$ $I_R = \text{Col. 6, Page 2}$ Pulse Test Duty cycle $< 1\%$ Duration $< 100 \mu\text{s}$			$V_{(BR)}$	Col. 3 Page 2	Col. 4 Page 2	V
Small Signal Breakdown Impedance (1)	8A.4.1.	$T_{stud} = 25^{\circ}\text{C}$ $I_R = \text{Col. 6, Page 2}$ Pulse Test Duty cycle $< 1\%$ Duration $< 100 \mu\text{s}$			$Z_{(BR)}$	-	Col. 7 Page 2	Ω
Reverse Current	8A.2.2.1.	$T_{stud} = 25^{\circ}\text{C}$ $V_R = \text{Col. 10, Page 2}$			I_R	-	1.0	mA

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Table I

GROUP A INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB-GROUP 4</u>								
Forward Voltage Drop	8A.3.2.	$T_{stud} = 25\text{ }^{\circ}\text{C}$ $I_F = 10\text{ A}$	4.0	S4	V_F	-	1.5	V
Breakdown Voltage (2)	8A.2.4.	$T_{stud} = 100\text{ }^{\circ}\text{C}$ $I_R = \text{Col. 6, Page 2}$ Pulse Test Duty cycle $\leq 1\%$ Duration $\leq 100\text{ }\mu\text{s}$			$V_{(BR)}$		Col. 5 Page 2	V
Small Signal Breakdown Impedance (2)	8A.4.1.	$T_{stud} = 25\text{ }^{\circ}\text{C}$ $I_R = 5\text{ mA}$			$Z_{(BR)}$		Col. 8 Page 2	Ω
Temperature Coefficient of Operating Voltage	8A.7.3.	$I_R = \text{Col. 6, Page 2}$ Pulse Test Duty cycle $\leq 1\%$ Duration $\leq 100\text{ }\mu\text{s}$ $T_1 = 25\text{ }^{\circ}\text{C}$ $T_2 = 100\text{ }^{\circ}\text{C}$			S_Z	0.05	0.15	$^{\circ}\text{C}$

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GROUP B INSPECTION

(See Page 3. Quality Assurance Provisions)

Table II

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB-GROUP 1</u>			6.5	S2				
Physical Dimensions	5.1.2.	According to Drawing 10.3.3.3.						
<u>SUB-GROUP 2</u>			4.0	S4				
Temperature Cycling	5.5.	-55 °C to +175 °C						
Moisture Resistance	5.3.							
<u>SUB-GROUP 3</u>			4.0	S2				
Vibration Fatigue	5.15.	Non-operating						
<u>SUB-GROUP 4</u>			6.5	S4				
Torque (Stud)	5.12.1.	Torque applied = 30 in lbs						
<u>SUB-GROUP 5</u>								
Omitted								
<u>SUB-GROUP 6</u>								
Omitted								

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Table II

GROUP B INSPECTION

Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB-GROUP 7</u> High Temperature Life (Non-operating)	6.2.1. 6.6.1.2.1.	$T_{amb} = 175\text{ }^{\circ}\text{C}$ $t = 1000\text{ hours}$	4.0	I				
<u>SUB-GROUP 8</u> Operation Life	6.3.4. 6.5.	T_{stud} between $60\text{ }^{\circ}\text{C}$ and $140\text{ }^{\circ}\text{C}$ $I_R = \text{max. value given by the derating curve Fig. 1, Page 9 corresponding to the chosen } T_{stud}$ See Appendix A						
<u>Post Test End Points for Sub-groups 2, 3, 7 and 8</u>								
Breakdown Voltage (1)	8A.2.4.	As in Group A, Sub-group 2			$V_{(BR)}$	Col. 3 Page 2 (-2%)	Col. 4 Page 2 (+2%)	V
Small Signal Breakdown Impedance (2)	8A.7.3.	As in Group A, Sub-group 4			$Z_{(BR)}$		Col. 8 Page 2 (+2%)	Ω

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GROUP C INSPECTION

(See Page 3. Quality Assurance Provisions)

Table III

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Examination or Test	Test Conditions		AQL %	Insp. Level	Symbol	Limits		Units
	K1007/ NATO Ref.	Specific Conditions				Min.	Max.	
<u>SUB-GROUP 1</u> Omitted								
<u>SUB-GROUP 2</u> Shock	5.17.	Five blows in each direction	6.5	S2				
<u>Post Test End Points for Sub-group 2</u>								
Breakdown Voltage (1)	8A.2.4.	As in Group A, Sub-group 2			V (BR)	Col. 3 Page 2 (-2%)	Col. 4 Page 2 (+2%)	V
Small Signal Breakdown Impedance (2)	8A.7.3.	As in Group A, Sub-group 4			Z (BR)		Col. 8 Page 2 (+2%)	Ω

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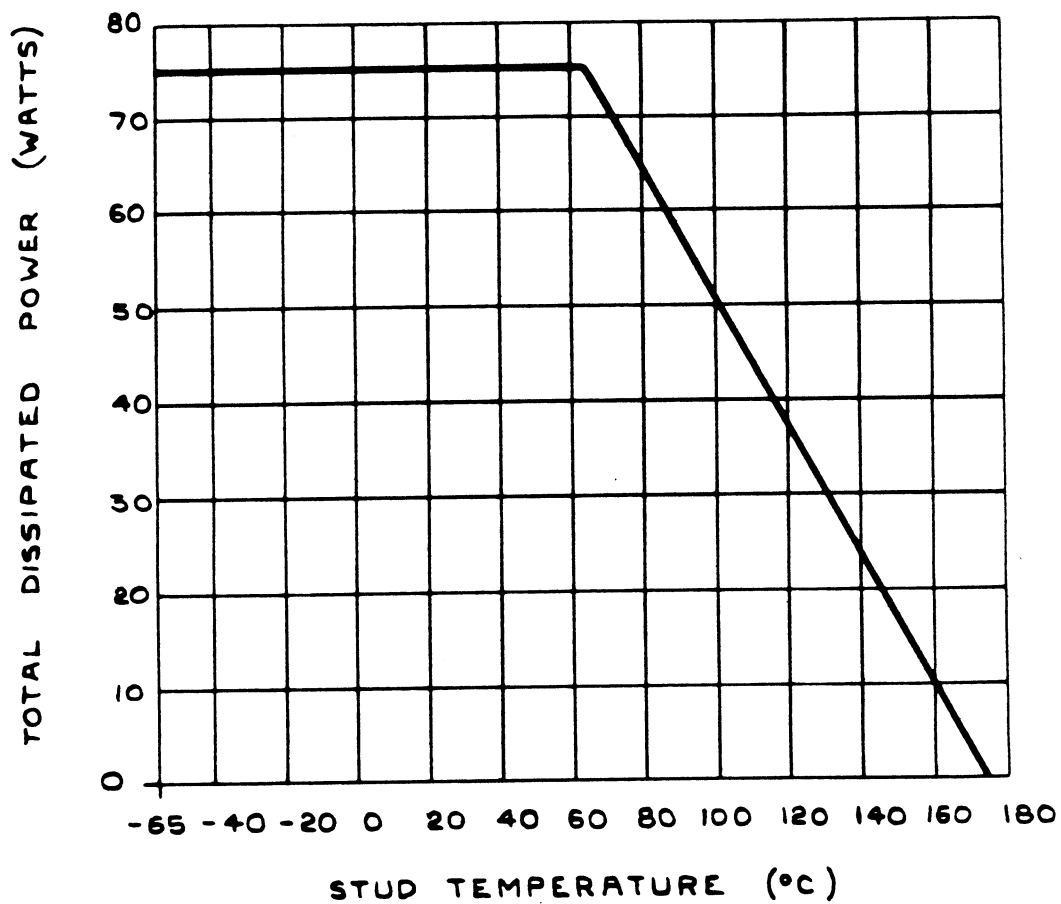


FIG.1 POWER DERATING CURVE

CV 7678-7721 APPLICATION DATA

OPERATING NOTES

1. Dissipation and heatsink considerations.

(a) Steady-state conditions.

The maximum allowable steady-state dissipation P_s is given by the relationship

$$P_{s \text{ max.}} = \frac{T_{j \text{ max.}} - T_{\text{amb}}}{\Theta_{j-\text{amb}}}$$

when $T_{j \text{ max.}}$ is the maximum permissible operating junction temperature.

T_{amb} is the ambient temperature.

$\Theta_{j-\text{amb}}$ is the total thermal resistance between junction and ambient ($\Theta_{j-\text{mb}} + \Theta_i + \Theta_h$).

Θ_i is the thermal contact resistance between the mounting base and heatsink, that is 0.2 deg C/W.

Θ_h is the thermal resistance of the heatsink. (See page 30)

(b) Pulse conditions

The maximum pulse power P_p is given by the formula

$$P_p = \frac{(T_{j \text{ max.}} - T_{\text{amb}}) - (P_s \Theta_{j-\text{amb}})}{\Theta_t + d \cdot \Theta_{\text{mb-amb}}}$$

where P_s is the steady-state dissipation, excluding that in the pulses, Θ_t is the effective transient thermal resistance of the device between junction and mounting base and is a function of the pulse duration t and duty cycle d .

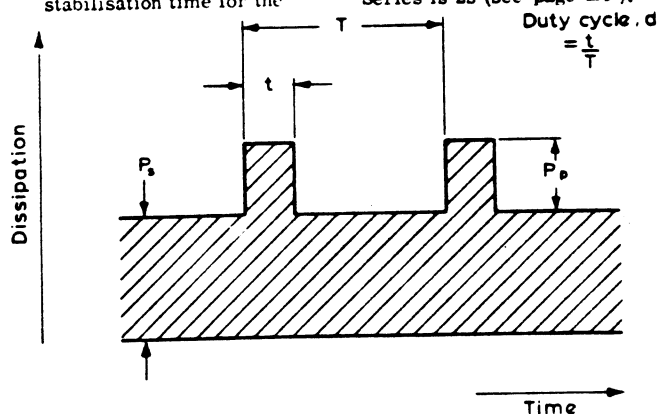
d is the duty cycle and is equal to the pulse duration.

t divided by the periodic time T .

$\Theta_{\text{mb-amb}}$ is the total thermal resistance between the mounting base and ambient (i.e. $\Theta_i + \Theta_h$).

With the additional pulsed power dissipation P_p calculated from the above expression, the total peak zener power dissipation P_{tot} is $P_s + P_p$.

From page 31 the maximum allowable peak zener current at P_{tot} can now be read. This peak zener current is subject to the absolute maximum rating. For pulse durations larger than the temperature stabilisation time of the diode t_{stab} , the maximum allowable pulse power is equal to the steady-state power $P_{s \text{ max.}}$. The temperature stabilisation time for the Series is 2s (see page 29).



2. Care must be taken to ensure that the connecting lug is not bent or twisted. FEBRUARY 1966