# 130 mm (5″) photomultiplier 9823B series data sheet

ET Enterprises electron tubes

## 1 description

The 9823B is a 130mm (5″) diameter end-window photomultiplier with blue-green sensitive bialkali photocathode on a plano-concave window. It has 14 BeCu dynodes of linear focused design for good linearity and timing. The 9823WB and 9823QB are variants for applications requiring uv sensitivity.

## 2 applications

- high energy physics studies

## 3 features

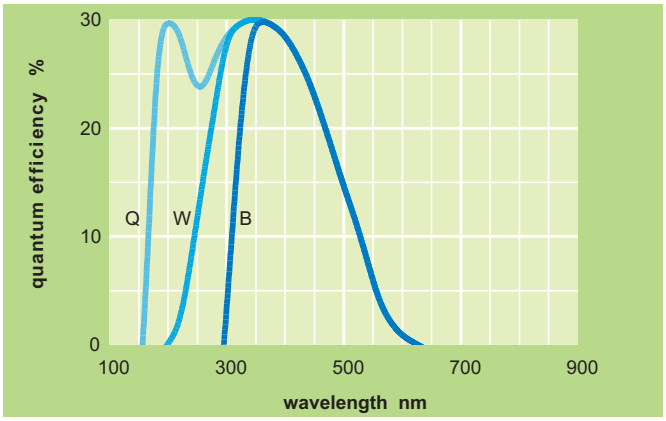
- high gain
- high pulsed linearity
- large active area

## 4 window characteristics

| | 9823B borosilicate | 9823WB uv glass | 9823QB* fused silica |
|---|---|---|---|
| spectral range**(nm) | 290 - 630 | 205 - 630 | 165 - 630 |
| refractive index ($n_d$) | 1.47 | 1.48 | 1.46 |
| radiopurity: | | | |
| K (ppm) | 300 | 8500 | <10 |
| Th (ppb) | 550 | 30 | <10 |
| U (ppb) | 450 | 30 | <10 |

* note that the sidewall of the envelope contains graded seals of high K content
** wavelength range over which quantum efficiency exceeds 1 % of peak

## 5 typical spectral response curves

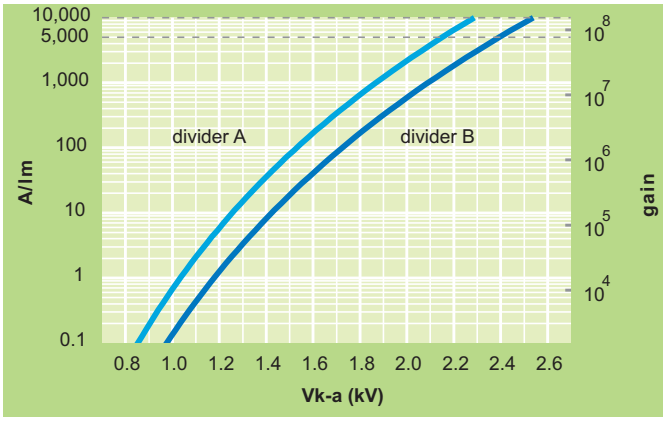



## 6 characteristics

| | unit | min | typ | max |
|---|---|---|---|---|
| **photocathode: bialkali** | | | | |
| active diameter | mm | | 110 | |
| quantum efficiency at peak | % | | 30 | |
| luminous sensitivity | µA/lm | | 65 | |
| with CB filter | | 7 | 11 | |
| with CR filter | | | 1 | |
| **dynodes: 14LFBeCu** | | | | |
| **anode sensitivity in divider B:** | | | | |
| nominal anode sensitivity | A/lm | | 5000 | |
| max. rated anode sensitivity | A/lm | | 10000 | |
| overall V for nominal A/lm | V | | 2400 | 3000 |
| overall V for max. rated A/lm | V | | 2550 | |
| gain at nominal A/lm | x $10^6$ | | 80 | |
| **dark current at 20 °C:** | | | | |
| dc at nominal A/lm | nA | | 100 | 1000 |
| dc at max. rated A/lm | nA | | 200 | |
| dark count | $s^{-1}$ | | 1500 | |
| **pulsed linearity (-5% deviation):** | | | | |
| divider A | mA | | 50 | |
| divider B | mA | | 150 | |
| **rate effect ( $I_a$ for $\Delta g/g$=1%):** | µA | | 1 | |
| **magnetic field sensitivity:** | | | | |
| the field for which the output decreases by 50 % | | | | |
| most sensitive direction | T x $10^{-4}$ | | 0.8 | |
| **temperature coefficient**: | % $°C^{-1}$ | | ± 0.5 | |
| **timing:** | | | | |
| multi electron rise time | ns | | 3.5 | |
| multi electron fwhm | ns | | 6 | |
| single electron rise time | ns | | 2.7 | |
| single electron fwhm | ns | | 3.6 | |
| single electron jitter (fwhm) | ns | | 2.4 | |
| transit time | ns | | 55 | |
| **weight:** | g | | 1000 | |
| **maximum ratings:** | | | | |
| anode current | µA | | | 100 |
| cathode current | nA | | | 500 |
| gain | x $10^6$ | | | 150 |
| sensitivity | A/lm | | | 10000 |
| temperature | °C | -30 | | 60 |
| V (k-a)(1) | V | | | 2500 |
| V (k-d1) | V | | | 650 |
| V (d-d)(2) | V | | | 300 |
| ambient pressure (absolute) | kPa | | | 202 |

(1) subject to not exceeding max. rated sensitivity (2) subject to not exceeding max rated V(k-a)

## 7 typical voltage gain characteristics



## 8 voltage divider distribution

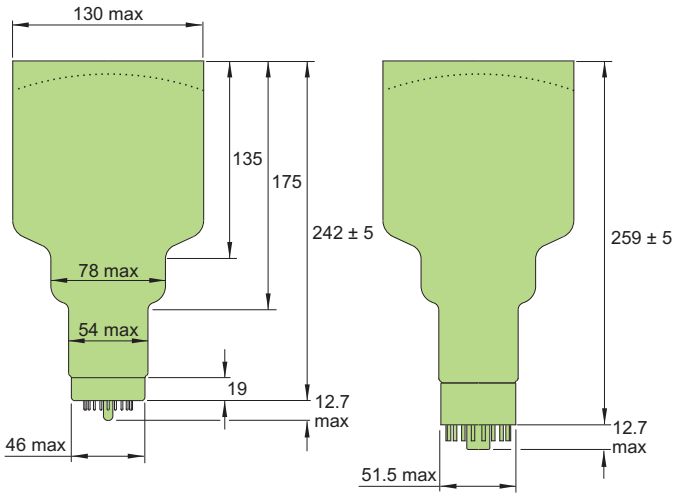
| | k | f | $d_1$ | $d_2$ | $d_3$ | .... | $d_{11}$ | $d_{12}$ | $d_{13}$ | $d_{14}$ | a | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A | 2.8R | 1.2R | R | 2R | R | ···· | R | R | R | R | R | Standard |
| B | 2.8R | 1.2R | R | 2R | R | ···· | R | 1.25R | 1.5R | 2R | 3R | High Pulsed linearity |

note: V (f-$d_1$) = 30% of V (k-$d_1$)

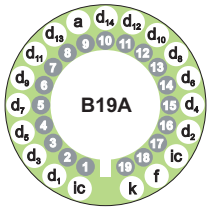
Characteristics contained in this data sheet refer to divider B unless stated otherwise.

## 9 external dimensions mm

The drawings below show the 9823B in hardpin format and the 9823KB with the B20 cap fitted.

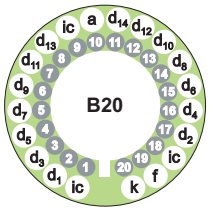



## 10 base configuration (viewed from below)




B19A hardpin base
(for 9823B)
'ic' indicates an internal connection

note: V (f-$d_1$) = 30% of V (k-$d_1$)




B20 cap
(for 9823KB)
'ic' indicates an internal connection

note: V (f-$d_1$) = 30% of V (k-$d_1$)

Our range of B19A sockets is available to suit the hardpin base. Our range of B20 sockets is available to suit the B20 cap. Both socket ranges include versions with or without a mounting flange, and versions with contacts for mounting directly onto printed circuit boards.

## 11 ordering information

The 9823B meets the specification given in this data sheet. You may order **variants** by adding a suffix to the type number. You may also order **options** by adding a suffix to the type number. You may order product with **specification options** by discussing your requirements with us. If your selection option is for one-off order, then the product will be referred to as 9823A. For a repeat order, Electron Tubes will give the product a two digit suffix after the letter B, for example B21. This identifies your specific requirement.

**9823** □ □ □ □

**window variants**
**W** uv glass
**Q** fused silica

**base options**
**K** capped

**options**
**M** supplied with spectral response calibration

**specification options**
**B** as given in data sheet
**A** single order to selected specification
**Bnn** repeat order to selected specification

## 12 voltage dividers

The standard voltage dividers available for the hardpin variants of these pmts are tabulated below:

| | k | f | $d_1$ | $d_2$ | $d_3$ | $d_4$ ··· $d_{10}$ | $d_{11}$ | $d_{12}$ | $d_{13}$ | $d_{14}$ | a |
|---|---|---|---|---|---|---|---|---|---|---|---|
| C638J | 2.8R | 1.2R | R | 2R | R | ····· | R | R | R | R | R |
| C638K | 300V | 150 V | R | 2R | R | ····· | R | R | R | R | R |
| C638L | 2.8R | 1.2R | R | 2R | R | ····· | R | 1.25R | 1.5R | 2R | 3R |
| C638M | 300V | 150 V | R | 2R | R | ····· | R | 1.25R | 1.5R | 2R | 3R |

R = 300 kΩ
note: V (f-$d_1$) = 30% of V (k-$d_1$)
300 V and 150 V zener stabilised

**ET Enterprises Limited**
45 Riverside Way
Uxbridge UB8 2YF
United Kingdom
tel: +44 (0) 1895 200880
fax: +44 (0) 1895 270873
e-mail: sales@et-enterprises.com
web site: www.et-enterprises.com

**Electron Tubes**
100 Forge Way Unit F
Rockaway NJ 07866 USA
tel: (973) 586 9594
toll free: (800) 521 8382
fax: (973) 586 9771
e-mail: sales@electrontubes.com
web site: www.electrontubes.com

choose accessories for this pmt on our website

**an ISO 9001 registered company**

The company reserves the right to modify these designs and specifications without notice. Developmental devices are intended for evaluation and no obligation is assumed for future manufacture. While every effort is made to ensure accuracy of published information the company cannot be held responsible for errors or consequences arising therefrom.

© ET Enterprises Ltd, 2009