

50mm tubes S, S-11, S-13 cathodes

The 6097 series are 50 mm (2 in.) nominal diameter end-on types providing a very useful combination of high gain, low dark current and good cathode sensitivity at relatively low cost. The highly stable dynode system utilises 11 venetian blind dynodes with CsSb secondary emitting surfaces.

The 6097B has an S-11 cathode and finds extensive use in flying spot scanning systems and similar applications where light levels are reasonable and dark current is not a limitation.

The 6097L is a variant of the 6097B and is useful in those scintillation counting applications where resolution is of prime importance. Each tube is tested with our standard factory NaI-Tl crystal (2 in. x 2 in.) and must give a peak to valley ratio for Co⁶⁰ of not less than 7:1. This corresponds roughly to a Cs¹³⁷ resolution of 7.8%.

The 6097S utilises the unique "S" cathode which is specially processed for low thermionic emission. It finds its main use in low level scintillation counting and in applications which are dark current limited.

The above types are available overcapped (e.g. 6097KB) to special order and a ruggedised variant is also available as type 9647NB (see page 59).

The 9514B has an S-11 photocathode and 13 venetian blind dynodes giving very high gains of the order of 10⁸. For low light level applications where the limitation is the tube dark current, the 9514S, which employs the unique EMI "S" cathode, is available.

For applications in the UV down to 1650Å, the 9514B and S are available with Spectrosil (fused silica) windows as types 6255B and 6255S respectively. They are also suitable for certain nucleonic applications due to the low natural radioactivity in the window.

The normal low dark currents of these tubes can be further reduced by cooling and a reduction of 10:1 is easily obtained by cooling to dry ice temperature. (See R/P021/CP5475 available on request.)

Note: The 6255B is being superseded by the 9634QB and new instruments or equipments should be designed with the 9634QB in mind. In addition, intending users of the 6097B should consider the 9656B as an alternative.

Notes

- 1 a) Each tube is individually calibrated and the test ticket furnished with the tube specifies the cathode sensitivity in $\mu\text{A}/\text{lm}$, the overall voltage at 200 A/lm (6097) or 2000 A/lm (6255, 9514) and the dark current at that overall sensitivity at 20°C.
- b) Test data is obtained with cathode -D1 volts held at 150V and a "Standard" dynode chain.*
- c) In general, when setting up experiments or designing for equipment, it is desirable to work at, or below, the ticket voltage of the individual tube.
- d) For highest stability in d.c. conditions, mean anode current should not exceed 10 μA .
- 2 Any material in contact with the glass envelope must be held at cathode potential. Failure to do so may result in erratic operation and high dark current.
- 3 Take great care in clamping tubes, particularly those with Spectrosil (fused silica) windows. Excess pressure may fracture the glass in which case the warranty is void.
- 4 Photomultipliers are affected by magnetic fields and mu-metal shields should be used, (see page 64).
- 5 When cooling below -40°C the standard Teflon socket should not be used as it may deform and crack the glass. Instead, each pin should be connected separately and individual hyperboloidal contacts are available from EMI for this purpose.

* For recommended dynode chains refer to Groups H, I, J (6097) or Groups K, L, M (6255, 9514) on page 14.



MECHANICAL CHARACTERISTICS

Max. envelope dia.	51.5 mm (2.02 in)	
Nom. cathode dia.	44 mm (1.73 in)	
Cathode type	6097B 9514B 6255B	6097L S-11 9514S "S" 6255S "S" (Q)
Window material	6097	9514 Lime Soda or Borosilicate 6255 Spectrosil (fused silica)
Dynodes	6097 (11 stages); 9514, 6255 (13 stages): venetian blind dynodes with CsSb secondary emitting surfaces	
Base	Low loss 15-pin pressed glass base furnished with high quality Teflon socket type B15B	

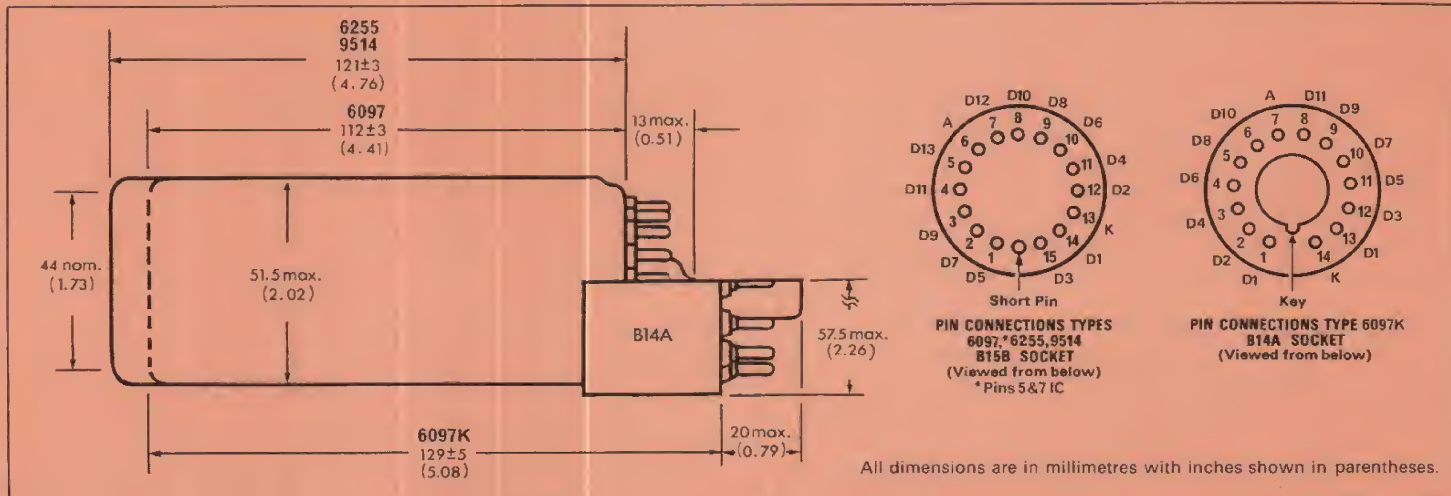
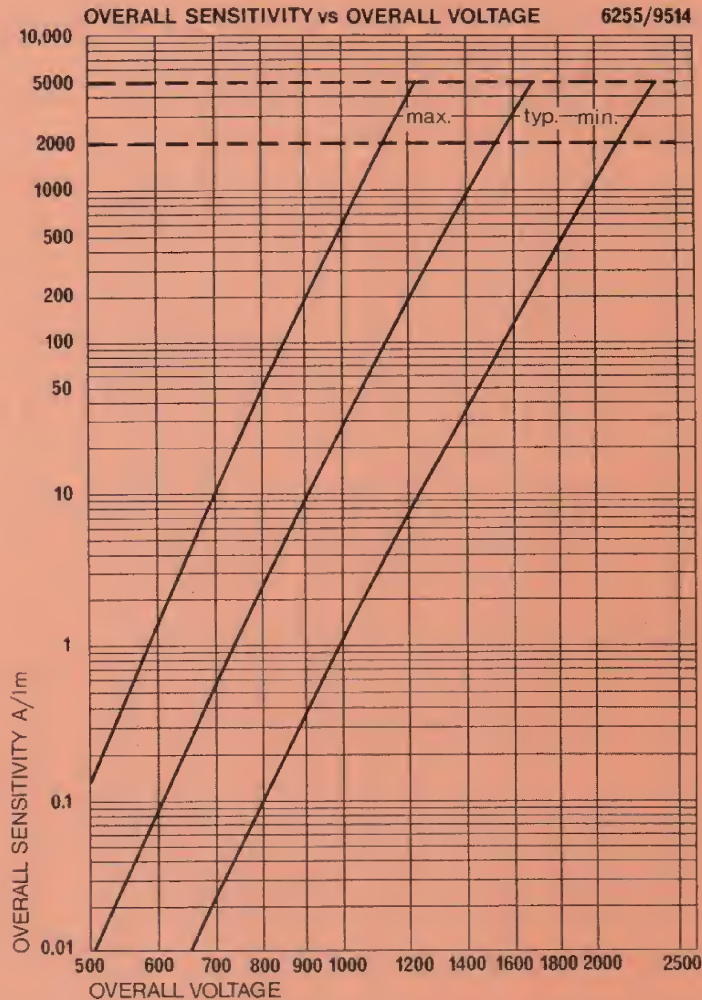
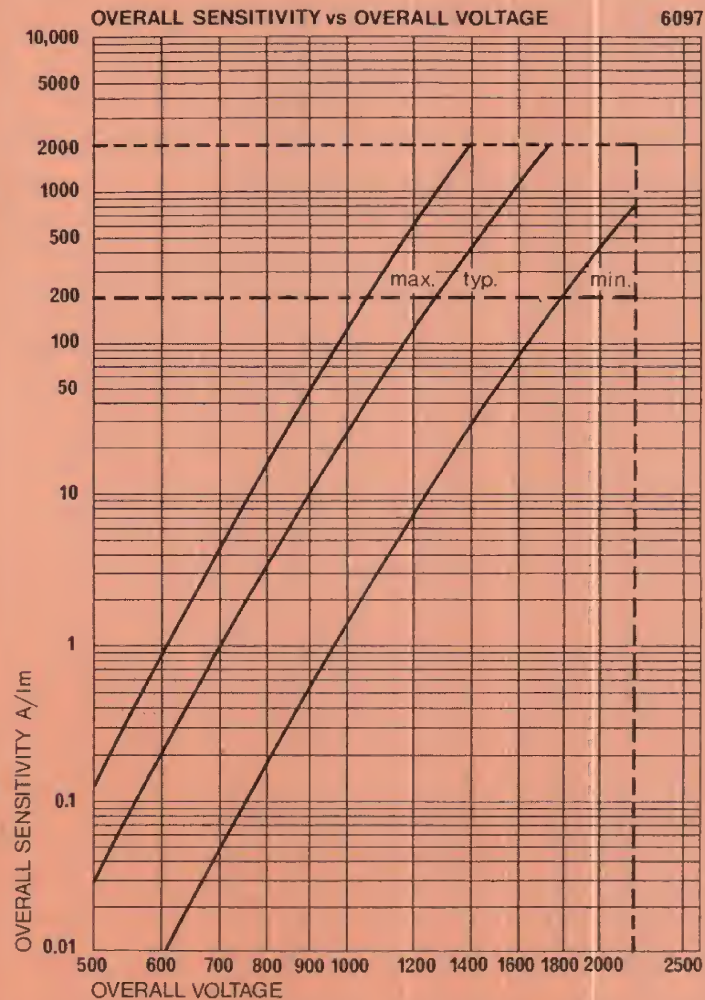
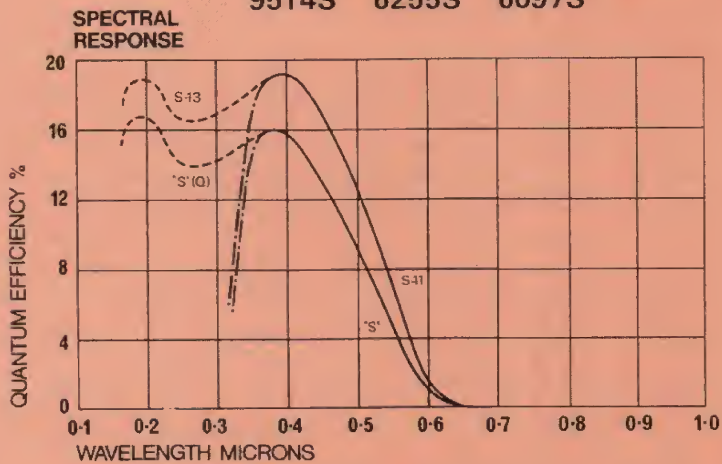
ELECTRICAL RATINGS

	6097	6255 9514	
Cathode to D1	300V Max.	300V Max.	
Recommended cathode to D1 voltage	150V	150V	
Cathode to anode (subject to not exceeding)	2200V Max. 2000A/lm	2500V Max. 5000A/lm	
Overall sensitivity: Rated Max.	200A/lm 2000A/lm	2000A/lm 5000A/lm	
Max. anode current (mean)	1 mA	1 mA	
Max. anode dissipation	1 W	1 W	
Max. tolerable cathode current	0.3 μA	0.3 μA	
Max. operating temperature	60°C	60°C	
Min. operating temperature	-80°C	-80°C	
Anode pulse rise time	10 ns	9 ns	
Anode pulse f.w.h.m.	14 ns	15 ns	
Transit time	55 ns	60 ns	
Capacitance, anode to all dynodes	8 pF	8 pF	
Dark current shot noise Typical (λ peak)	6097B 6255B 9514B	6097S 6255S 9514S	6097L
lumens:	3.4×10^{-13}	1.6×10^{-13}	2.9×10^{-13}
watts:	4.0×10^{-16}	2.0×10^{-16}	4.6×10^{-16}

Cathode Sensitivity $\mu\text{A}/\text{lm}$ Min. Typ.	V Overall Typ. Max.	Overall Sensitivity 200A/lm		Dark Current nA Typ. Max.		V Overall Typ. Max.		Dark Current nA Typ. Max.	
		Typ.	Max.	Typ.	Max.	Typ.	Max.	Typ.	Max.
6097B	50 70	1250	1800	5	50	1750	—	50	—
6097L	50 95	1200	1800	5	50	1700	—	50	—
6097S	40 60	1300	1800	1	4	1800	—	10	—
6255B 9514B	50 70	1500	2100	50	500	1650	—	125	—
6255S 9514S	40 60	1600	2100	10	40	1800	—	25	—

Resolution: 6097L must give a minimum peak/valley ratio for Co^{60} of 7:1 with standard factory crystal.

9514B 6255B 6097B 6097L
9514S 6255S 6097S



All dimensions are in millimetres with inches shown in parentheses.