A 5.204-day eclipsing binary in the 2.20° ring: TIC 467546768

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Tustin, California. Research note from the 2.10°–2.20° ring around V345 Lac, 10 November 2026. Nothing in this note has been submitted to VSX.

Abstract. TESS QLP aperture photometry of TIC 467546768 shows two minima. Thirty-six primary minima give the ephemeris below, with an O−C scatter of 7.9 minutes. The aperture falls to 0.953 of its sector median at the primary, 0.052 mag, and to 0.962 at the secondary, 0.042 mag. The secondary follows 2.615 days later, at phase 0.502. A star of G = 13.45 lies 13 arcsec away. The centroid shift is 0.02 pixel and does not decide which star fades. The note is not a VSX submission.

The star

TIC 467546768 is TYC 3983-01343-1 and Gaia DR3 2001557293708235264. The catalog place is 22h 29m 29.46s, +53° 13′ 30.3″ (J2000). V = 12.271 and the TESS magnitude is 10.939. The star is 2.128° from V345 Lac, 128 arcmin to the southeast, in the 2.10°–2.20° ring. Gaia DR3 gives G = 11.63, BP − RP = 1.36, parallax 0.673 ± 0.013 mas, and RUWE 0.87. That parallax is about 1480 parsecs. The absolute G magnitude, with no dust correction, is about 0.8, which is a giant. The TESS catalog lists 4947 K and a radius of 10.71 solar radii. Surface gravity and mass in that header are the blank value −1 and are not used. The TIC row used here has no contamination ratio.

How it was found

Public TESS Quick-Look Pipeline light curves around V345 Lacertae were searched on stars brighter than about V = 12.5. This star is one of 414 stars in the 2.10°–2.20° ring that were not already in an inner ring. A dip was kept when quality-zero cadences fell about 1.2 percent or more below the local median and stayed down for several cadences. Sectors 16, 17, 56, 57, 76, 77, 83, and 84 have QLP files. Sectors 76 and 77 are the v02 files. The curves in this note are SAP_FLUX divided by the sector median, with the quality flag exactly zero. The same minima are in the detrended column. A first fit at 2.602 days put every minimum at phase 0. The minima alternate in depth, 0.953 then 0.962, in every sector. The period below is twice that spacing. Catalog values are from the TESS Input Catalog and Gaia DR3. No new observations were obtained.

Ephemeris

$$\text{Min I} = \text{BTJD } 1739.67380 + 5.204252\ E$$

Thirty-six primary minima, from BTJD 1740 to 3608, were fit by linear least squares. The root-mean-square residual is 7.9 minutes. The largest residual is 15.7 minutes. Sectors 16 and 17 are sampled every 30 minutes. The 200-second sectors scatter by a few minutes. The median primary minimum is 0.953 of the sector median, 4.7 percent of the light, 0.052 mag. In sector 77 the light stays under 98 percent for 2.6 hours and under half that depth for 2.0 hours. Thirty-one secondary minima were timed. Their median phase is 0.5025, which is 2.615 days after the primary, and their median flux is 0.962, 0.042 mag. The two depths keep the same offset in every sector from 2019 through 2024. A phase shift of 0.0025 is not used to call the orbit eccentric.

Sector	Cycle	BTJD	UTC	Min. flux	O−C (min)
16	0	1739.681	2019-09-13 04:20	0.955	+9.7
16	1	1744.889	2019-09-18 09:20	0.956	+15.7
16	3	1755.285	2019-09-28 18:50	0.953	-2.4
16	4	1760.493	2019-10-03 23:50	0.956	+3.5
17	6	1770.889	2019-10-14 09:20	0.958	-14.8
17	7	1776.097	2019-10-19 14:20	0.964	-9.0
17	8	1781.306	2019-10-24 19:19	0.957	-3.3
17	9	1786.514	2019-10-30 00:19	0.957	+2.4
56	209	2827.363	2022-09-04 20:42	0.953	+0.4
56	210	2832.569	2022-09-10 01:39	0.951	+3.1
56	211	2837.770	2022-09-15 06:29	0.953	-0.9
56	212	2842.976	2022-09-20 11:26	0.954	+1.8

Sector	Cycle	BTJD	UTC	Min. flux	O−C (min)
56	213	2848.171	2022-09-25 16:06	0.955	-12.3
57	215	2858.581	2022-10-06 01:56	0.955	-10.5
57	217	2869.004	2022-10-16 12:06	0.952	+11.2
57	218	2874.196	2022-10-21 16:42	0.954	-6.4
57	219	2879.409	2022-10-26 21:49	0.951	+6.0
76	313	3368.600	2024-02-28 02:23	0.952	-6.8
76	314	3373.801	2024-03-04 07:13	0.951	-11.1
76	315	3379.019	2024-03-09 12:26	0.951	+7.9
76	316	3384.227	2024-03-14 17:26	0.952	+13.6
76	317	3389.431	2024-03-19 22:19	0.953	+12.7
76	318	3394.618	2024-03-25 02:49	0.951	-11.5
77	319	3399.833	2024-03-30 07:59	0.949	+4.4
77	320	3405.035	2024-04-04 12:49	0.949	+0.3
77	323	3420.651	2024-04-20 03:38	0.952	+6.1
83	350	3561.162	2024-09-07 15:53	0.951	+0.0
83	351	3566.364	2024-09-12 20:43	0.951	-3.9
83	352	3571.572	2024-09-18 01:43	0.952	+2.1
83	353	3576.778	2024-09-23 06:40	0.954	+4.7
83	354	3581.972	2024-09-28 11:20	0.951	-9.6
84	355	3587.183	2024-10-03 16:23	0.952	-0.1
84	356	3592.382	2024-10-08 21:10	0.954	-7.6
84	357	3597.595	2024-10-14 02:16	0.954	+4.9
84	358	3602.792	2024-10-19 07:00	0.955	-6.0
84	359	3608.007	2024-10-24 12:10	0.954	+9.7

Which star fades

Gaia DR3 2001557293708234752 lies 13 arcsec from the target, inside one 21-arcsec TESS pixel. G = 13.45, about 1.8 mag fainter than the target, so it has about one sixth of the combined light if both stars are in the pixel. A total eclipse of that neighbor would remove more light than the 4.7 percent dip, and a partial eclipse of the neighbor could still match the dip. The centroid, SAP_X and SAP_Y, shifts by 0.019 pixel between the minima and the light an hour away. That shift does not decide between two stars 13 arcsec apart. The QLP aperture is centered on the target. A ground aperture that keeps the G = 13.45 star out is the measurement that assigns the eclipse. The comparison stars on the finder are 1.3, 2.1, and 2.7 arcmin away.

On the catalog radius of 10.7 solar radii, a 4.7 percent eclipse is a companion about 2.3 solar radii across. A Jupiter-sized body in front of a star that large removes about 0.01 percent of the light. The parallax and the absolute magnitude agree with a giant, and the header leaves surface gravity blank, so the 10.7 solar radii is the catalog value and not a new measurement. Either reading leaves a stellar eclipse. The nearest VSX object is ZTF J222923.36+531215.0, type BY, period 2.185 days, 93 arcsec away. That clock is not this one.

Figures

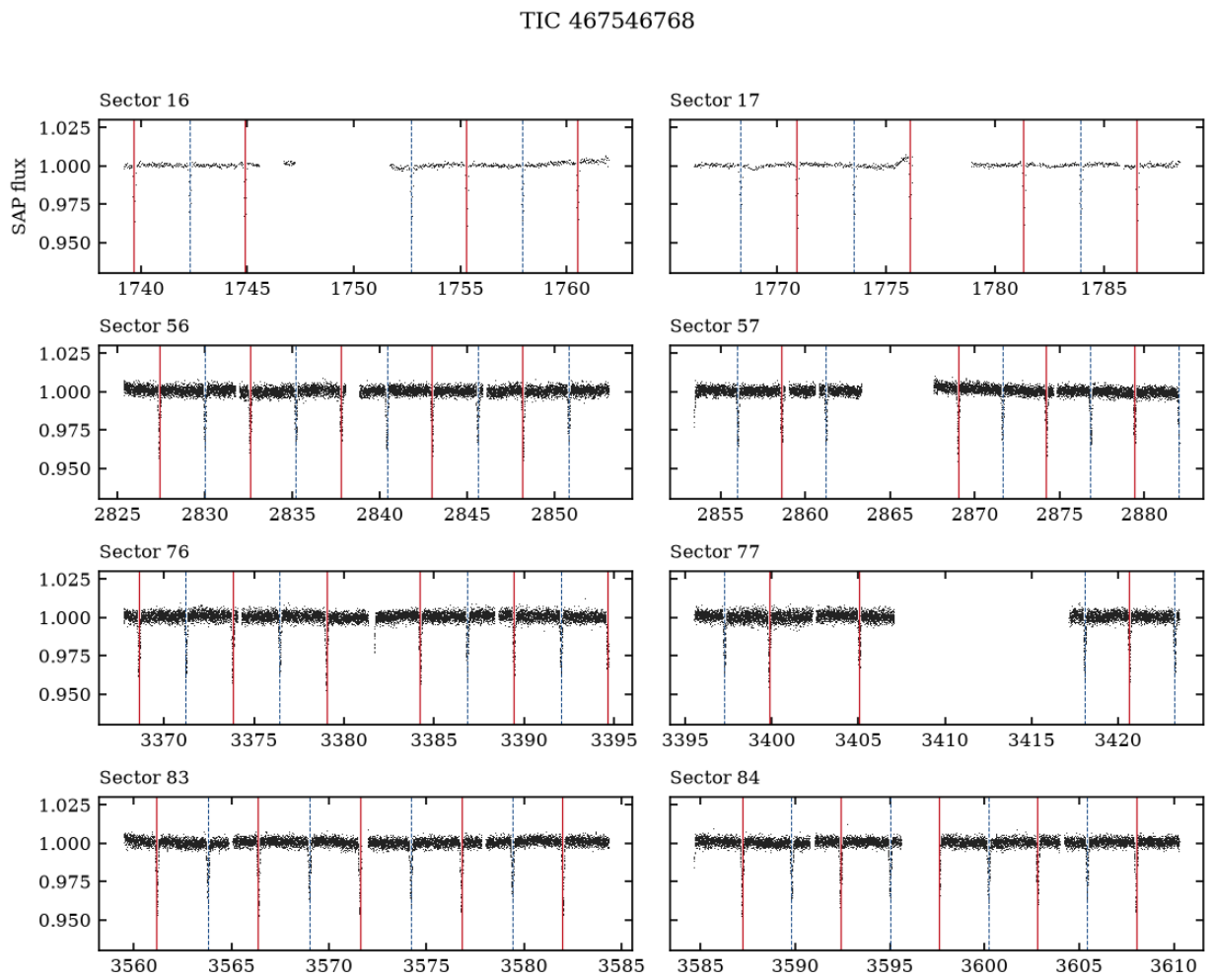


Figure 1. Eight TESS sectors. QLP SAP flux divided by the sector median, quality flag zero. Red lines are primary minima. Dashed blue lines are secondary minima.

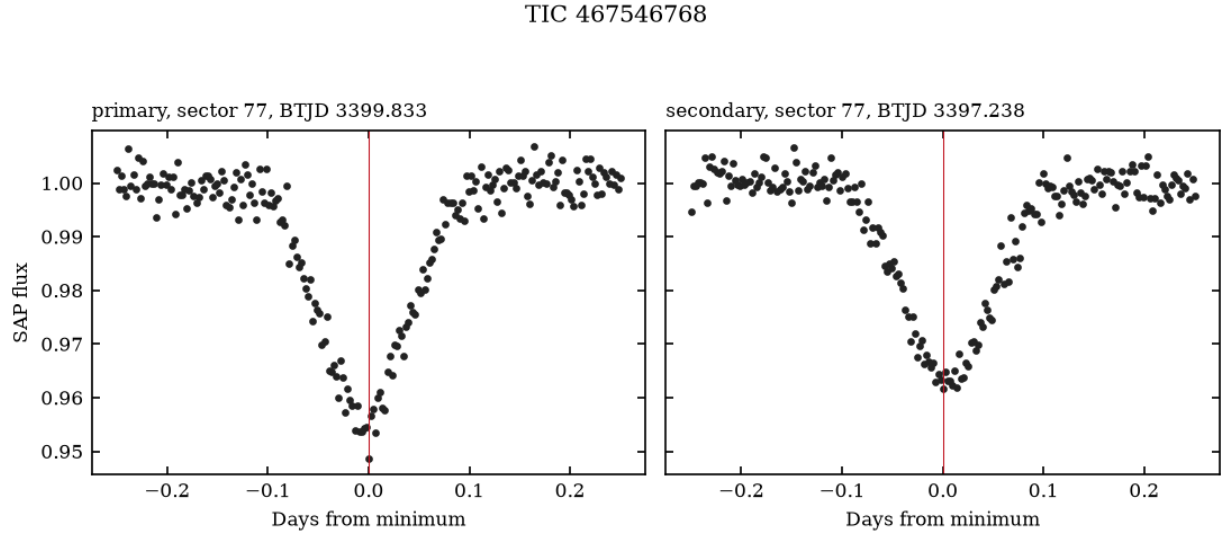


Figure 2. A primary and a secondary at 200-second cadence. The secondary is the shallower one.

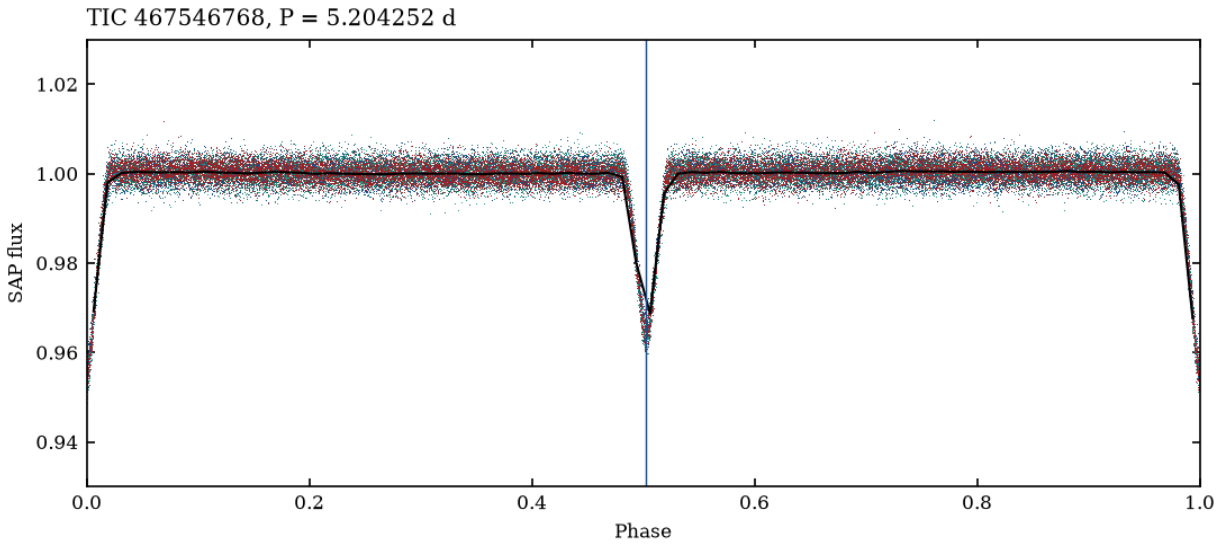


Figure 3. Folded on 5.204252 days. The black line is the phase median. The blue line is the secondary at phase 0.502.

Nothing in this note has been submitted to VSX. TIC 330739083 is still the one New submission on this account, so this star stays unfiled.

References

Gaia Collaboration, 2023, Astron. Astrophys., 674, A1 (DR3)
Huang C. X. et al., 2020, Research Notes of the AAS, 4, 204 (QLP)
Stassun K. G. et al., 2019, Astron. J., 158, 138 (TIC)
Watson C., Henden A., Price A., 2006–, AAVSO International Variable Star Index (VSX)