An 11.813-day eclipsing binary candidate: TIC 328038154

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Tustin, California. Research note from the 1.80°–2.00° ring around V345 Lac, 5 November 2026. Nothing in this note has been submitted to VSX.

Abstract. TESS QLP aperture photometry of TIC 328038154 shows two minima. Twelve primary minima give the ephemeris below, with an O−C scatter of 4.5 minutes. The aperture falls to 0.80 of its sector median, 0.24 mag. A second minimum, about 0.05 mag, falls at phase 0.271. The secondary comes early, so the orbit is eccentric. The note is not a VSX submission.

The star

TIC 328038154 is TYC 3973-02590-1 and Gaia DR3 2005726092050118656. The TESS Input Catalog v8.2 place is 22h 05m 46.77s, +54° 54′ 14.4″ (J2000). Gaia DR3 lies 0.1 arcsec from that place. V = 12.042 and the TESS magnitude is 11.787. The star is 1.880° from V345 Lac, 113 arcmin to the west, in the 1.80°–2.00° ring. Gaia DR3 gives G = 12.05, BP − RP = 0.55, parallax 0.803 ± 0.010 mas, and RUWE 0.90. The GSP-Phot solution is Teff 8260 K, log g 3.84, and radius 2.76 solar radii. The TESS catalog lists 8045 K, log g 3.84, mass 1.95 solar masses, and radius 2.79 solar radii. The contamination ratio is 0.236, so other light is about a fifth of the target inside the aperture.

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 747 stars in the 1.80°–2.00° 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, 77, 83, and 84 have QLP files. Sector 77 is the v02 file. 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, so the eclipse is not a spline artifact. Catalog values are from the TESS Input Catalog and Gaia DR3. No new observations were obtained.

Ephemeris

$$\text{Min I} = \text{BTJD } 1742.20084 + 11.81327\ E$$

Twelve primary minima, from BTJD 1742 to 3609, were fit by linear least squares. The root-mean-square residual is 4.5 minutes. The largest residual is 7.8 minutes. Cycle 95, near BTJD 2864.5, falls in a gap between sectors 56 and 57. Cycle 141, near BTJD 3407.9, falls in the sector 77 gap. Both are missing data, not missed eclipses. The aperture minimum is 0.799 of the sector median, 0.24 mag. In the 200-second sectors the light stays under 98 percent for 4.7 hours and under half that depth for 2.9 hours. The 30-minute sectors show the same eclipse, with the bottom sampled by one or two cadences. The bottom is short. Sector 84, at 200 seconds, shows a steep V rather than a long flat floor.

Sector	Cycle	BTJD	UTC	Min. flux	O−C (min)
16	0	1742.201	2019-09-15 16:49	0.805	+0.5
16	1	1754.014	2019-09-27 12:19	0.809	-0.5
56	92	2829.025	2022-09-06 12:35	0.801	+4.0
56	93	2840.835	2022-09-18 08:02	0.795	-0.1
56	94	2852.643	2022-09-30 03:25	0.800	-7.8
57	96	2876.279	2022-10-23 18:42	0.800	+6.3
77	140	3396.053	2024-03-26 13:16	0.800	-7.8
77	142	3419.684	2024-04-19 04:25	0.798	-1.7
83	154	3561.444	2024-09-07 22:39	0.794	-0.6
83	155	3573.259	2024-09-19 18:13	0.794	+2.0
84	156	3585.076	2024-10-01 13:49	0.795	+7.5
84	158	3608.696	2024-10-25 04:42	0.796	-1.8

Fifteen shallower minima fall at phase 0.271, which is 3.205 days after the primary. Their aperture flux runs from 0.943 to 0.961, about 0.04 to 0.06 mag, and the median is 0.05 mag. The same phase in sectors 16, 17, 56, 57, 77, 83, and 84 is the reason the second minimum is kept.

Secondary minima. Cycle is counted from the primary epoch, and O−C is against phase 0.271.

Sector	Cycle	BTJD	UTC	Min. flux	O−C (min)
16	0	1745.410	2019-09-18 21:49	0.960	+5.5
16	1	1757.222	2019-09-30 17:19	0.957	+4.5
17	2	1769.014	2019-10-12 12:19	0.959	-26.7
17	3	1780.826	2019-10-24 07:49	0.961	-28.0
56	92	2832.214	2022-09-09 17:08	0.950	-17.6
56	93	2844.034	2022-09-21 12:49	0.954	-8.5
57	94	2855.854	2022-10-03 08:29	0.955	+0.5
57	95	2867.680	2022-10-15 04:18	0.957	+19.2
57	96	2879.494	2022-10-26 23:52	0.948	+21.2
77	140	3399.271	2024-03-29 18:30	0.943	+10.5
77	142	3422.890	2024-04-22 09:21	0.954	+0.0
83	154	3564.641	2024-09-11 03:23	0.952	-12.2
83	155	3576.449	2024-09-22 22:46	0.950	-19.8
84	156	3588.292	2024-10-04 18:59	0.951	+22.5
84	157	3600.086	2024-10-16 14:03	0.952	-5.5

The orbit

The secondary at phase 0.271 comes early. On the V345 Lac page the same reading is $e \cos \omega \approx (\pi/2)(\varphi - 0.5)$. That formula gives $e \cos \omega \approx -0.36$. At a shift this large the small-eccentricity formula is only a guide. The early secondary is the evidence that the orbit is eccentric. No radial-velocity orbit is attempted here.

Which star fades

The nearest Gaia star is the target itself. Inside 15 arcsec the other stars are G ≈ 20, except Gaia DR3 2005632255602766080 at 15.0 arcsec, G = 15.09. That neighbor is 3.0 magnitudes fainter, about 6 percent of the target’s light. A total eclipse of it would be a 6 percent dip. The observed dip is 20 percent of the aperture. The centroid, SAP_X and SAP_Y, shifts by 0.027 pixel between the minima and the light an hour away. The eclipse belongs to this aperture. The contamination ratio of 0.24 means the star’s own fade is deeper than 0.24 mag if the extra light stays constant. The nearest VSX object is Gaia DR3 2005632049444340864, a rotator at G = 13.03–13.05, 62 arcsec away. It is not this clock.

Figures

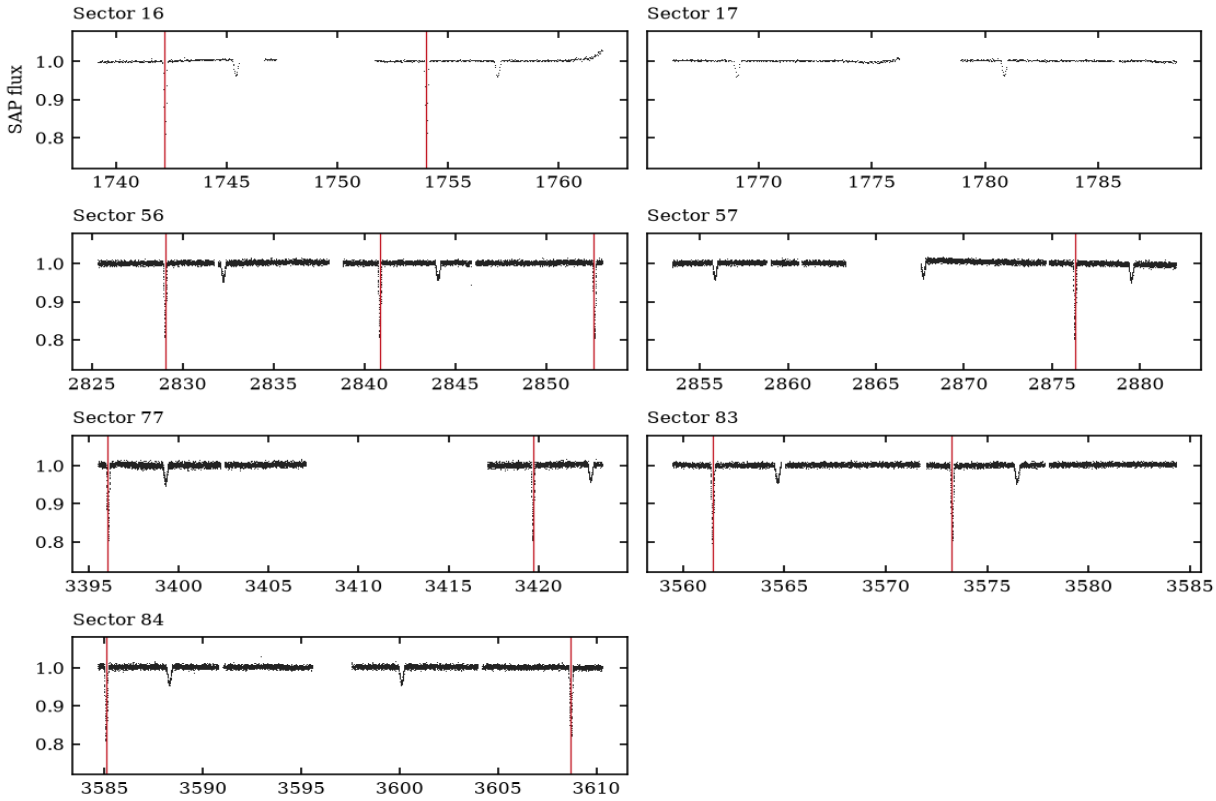


Figure 1. Seven TESS sectors. QLP SAP flux divided by the sector median, quality flag zero. Red ticks are the primary minima.

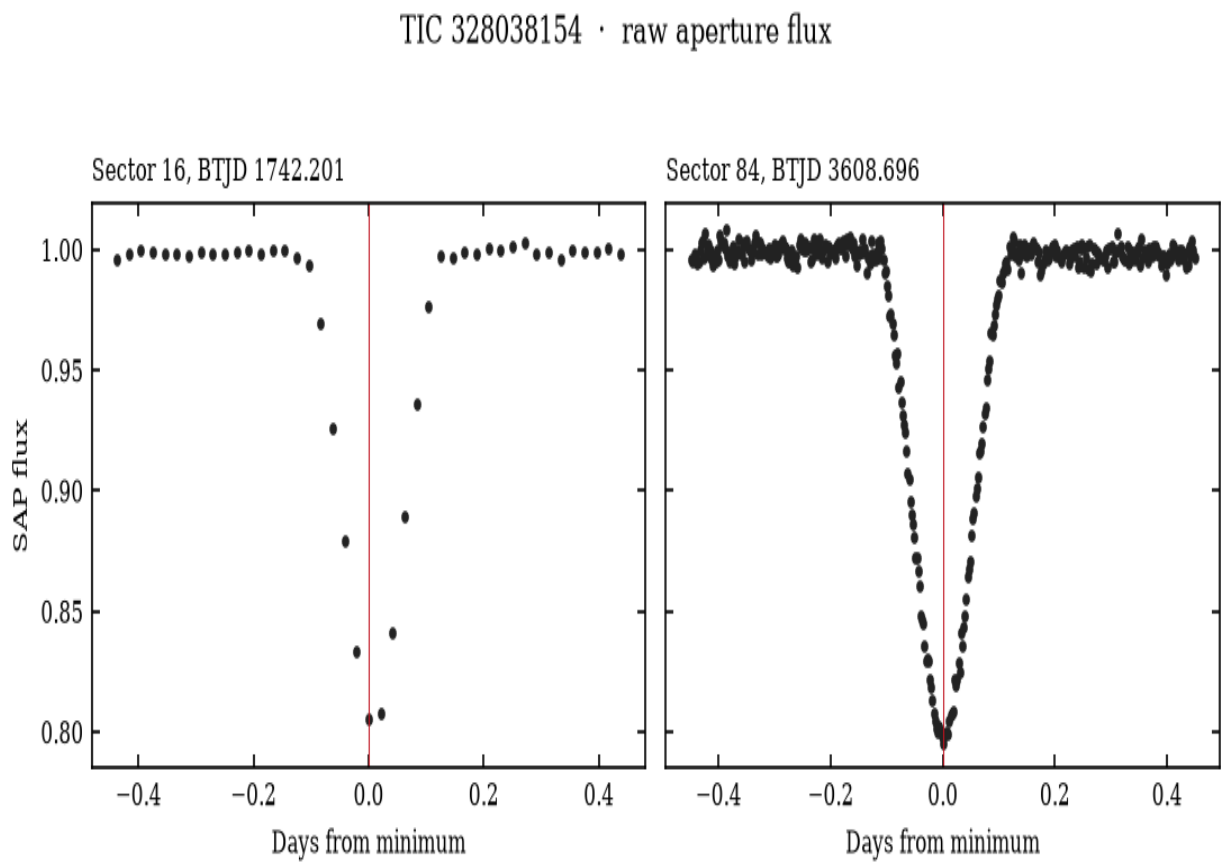


Figure 2. The first primary, sector 16 at 30 minutes, and a sector 84 primary at 200 seconds. The bottom is short.

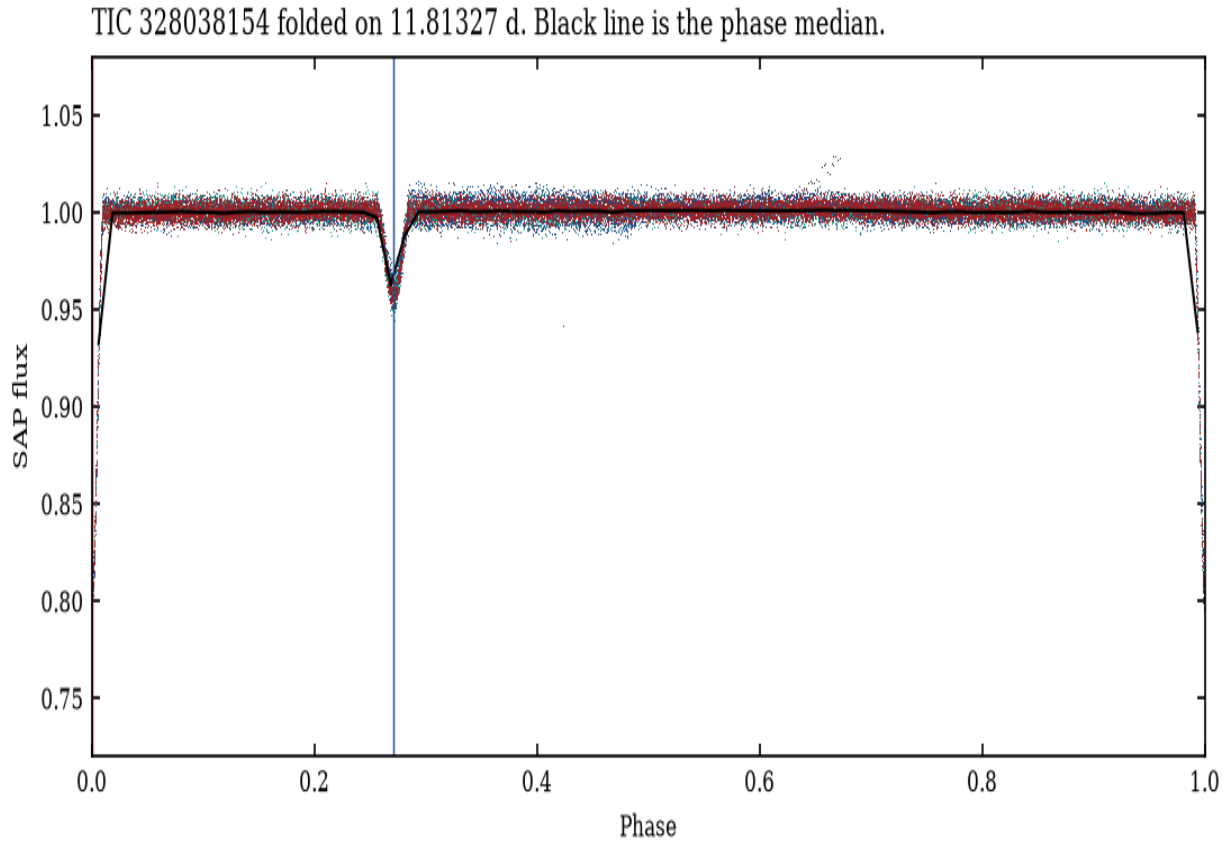


Figure 3. Folded on 11.81327 days. The black line is the phase median. The blue line is phase 0.271.

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

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Stassun K. G. et al., 2019, Astron. J., 158, 138 (TIC)
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