TIC 330608786: nine irregular fades in one TESS sector, unconfirmed

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Tustin, California. Research note from the 2.4 degree repeating-dip scan around V345 Lac, 18 November 2026.

Status: Unconfirmed dips. Not a planet claim. Found 18 Nov 2026. Not filed with VSX. Not yet checked from the ground.

Abstract

TIC 330608786 (Tmag 10.854) showed 9 clean dips of at least 0.5 percent in TESS Quick-Look Pipeline photometry, median depth 1.80 percent, median duration 2.3 hours. The dips are shallow enough that, on a star of the TIC radius 1.25 $R_\odot$, a dark body of about 1.67 R_{Jup} could produce them. That is a depth conversion only; it is not a planet measurement. The star is 2.364 degrees from V345 Lac, in the 2.30–2.40° ring. No single period from the gaps fits all 9 dips. This uses the longest gap between consecutive dips, 5.0277 days, as the period, counted from the dip at BTJD 2859.124. As of 18 November 2026, 12:00 UTC, the next listed time is 22 Nov 2026, 22:21 UTC with a window of ± 13.4 days. That window is huge and is not usable for planning an observation. Nothing in this note has been checked from the ground or submitted to VSX. This is not a planet claim.

1. How the star was found

A repeating-dip scan of TESS stars around V345 Lacertae (TIC 421726141) ran on 18 November 2026. It covered every TESS Input Catalog star within 2.4 degrees of V345 Lac with a TESS magnitude of 13.0 or brighter, 20,840 stars. The light curves are QLP SAP_FLUX, cadences with a quality flag of exactly zero, each sector divided by its own median. The period search uses the multiharmonic χ^2 periodogram approach of Rutkowski & Poleski (2026), run with 12 harmonics: a 12-term Fourier series is fitted at every trial frequency. Rutkowski & Poleski (2026) also introduced the fast Toeplitz-solver technique that accelerates this periodogram (their Toeplitz-LS code). The scan did not run the Toeplitz-LS code. It computed the same 12-harmonic periodogram with the finufft_chi2 backend of nifty-ls (Garrison et al. 2024), a separate package, which matched the Toeplitz-LS results in a test on our own TESS eclipsing binaries on 17 November 2026 and ran about twice as fast. The trial periods run from 0.4 to 30 days, with a frequency step of 1/(10T), where T is the time span of the light curve. The periodogram uses the median-normalized flux with no detrending. A box least-squares (BLS) search (Kovács, Zucker & Mazeh 2002), as implemented in Astropy, is the cross-check. It runs on a copy divided by a one-day running median and binned to 30 minutes, with trial durations of 1.5, 3, 5 and 8 hours. A star is kept as a candidate when at least two separate eclipses fall on the adopted period, the folded eclipse has a signal-to-noise ratio of at least 8, and the depth is at least 0.2 percent. TIC 330608786 did not pass as a periodic eclipse candidate under those cuts, but it had 9 clean dips of at least 0.5 percent. Its median dip depth was small enough that, on a star of its TIC radius, the body that would cause a transit of that depth could be under two Jupiter radii, so it is listed on the Planet-sized dips page. That page is a depth test only. None of these stars is a confirmed planet. The measurements below are made again from the scan's cached QLP light curves (Huang et al. 2020; Kunimoto et al. 2021). Sectors 16 and 17 are 30-minute cadence; later sectors used here are 200-second cadence. SAP_FLUX is used with the quality flag exactly zero, and each sector is divided by its own median. No detrending is applied unless a caption says otherwise. Catalog values are from the TESS Input Catalog (Stassun et al. 2019) as held in the scan catalog. No new observations were obtained.

2. The star

TIC 330608786 is Gaia DR3 2198482918613882752 in the scan catalog. The TIC v8.2 position used by the scan is 22h 15m 26.47s, +56° 59′ 40.1″ (J2000), RA 333.86028°, Dec +56.99447°. The TIC lists Tmag = 10.854, R = 1.25 $R_{\odot}$, and a contamination ratio of 0.314. T_{eff} = 6184 K from TIC v8.2. The TIC record used by the scan does not give a spectral type, so the spectral type is unknown here. Those catalog values assume a single star and are copied as published. From the scan positions of this star and of V345 Lac, the separation is 2.364 degrees, 141.8 arcmin, at position angle 349°, to the north. In 0.1-degree rings around V345 Lac it sits in the 2.30–2.40° ring. There is no VSX entry within 30 arcsec and no Gaia DR3 eclipsing binary within 5 arcsec recorded in the scan.

Quantity	Value
TESS sectors in the cached light curve	16, 17, 56, 57, 83, 84
Sectors with a counted dip	57
12-harmonic χ^2 periodogram peak	23.02327 d, SNR 139
BLS peak	25.43293 d, SNR 38.9, depth 0.49%
Clean dips ≥ 0.5%, off systematic times	9, depths 1.17–3.92%, median 1.80%
Median listed duration	2.3 h
BTJD range of the counted dips	2853.696 – 2860.434
TIC radius and implied body (depth only)	1.25 R_sun, about 1.67 R_Jup
TIC contamination ratio	0.314
Scan flags	none
Period confidence on the page	low; window wider than ±10 hours (very low confidence list)
Adopted period used for the listed next time	5.0277 ± 0.0445 days; fallback reason: nofit

Table 1. Scan quantities for TIC 330608786, from the scan's own result file and the Planet-sized dips records. Depths are not corrected for light from other stars.

3. Dip times and shape

Each counted dip below is taken from the scan's dip list: barycentric time, depth in percent of the local light, a duration in hours, and the TESS sector. The shapes are judged by eye from the individual panels of Figure 2, each normalized to a line or median through the nearby light. An automatic comparison of box, V, U and sine models was also computed; it is not used as the verdict, because a sine can appear to fit a shallow, noisy fade. The verdicts below are the visual ones.

#	BTJD	Sector	Depth (%)	Duration (h)
1	2853.696	57	1.60	1.6
2	2853.812	57	1.85	2.3
3	2853.953	57	1.68	2.2
4	2854.020	57	1.42	0.9
5	2854.097	57	1.17	1.2
6	2859.124	57	1.80	4.1
7	2859.805	57	3.07	15.1
8	2860.224	57	3.92	9.7
9	2860.434	57	3.66	5.2

Table 2. Counted dips of TIC 330608786 from the 18 November 2026 scan.

All nine counted dips fall in sector 57, within about seven days. Their depths run from 1.17 to 3.92 percent and the listed durations from 0.9 to 15.1 hours, so they are not a set of similar, repeating eclipse shapes. None is clearly flat-bottomed. Several of the longer events, including those listed at 15.1 and 9.7 hours, look like parts of a wandering or irregular light curve rather than discrete box-shaped eclipses. The shorter events are noisy fades of a few hours. A fold on the 5.0277-day longest-gap fallback does not produce a coherent eclipse; that fold is not a test of a real period.

4. The adopted period and the next times

The Planet-sized dips page predicts a next time for every star when the page loads. The method is the one written on that page: gaps between dips are divided by 1 through 10, trial periods of 0.4 days or longer that fit every dip and are not ruled out by TESS coverage come first, and when none survive the page falls back to a low-confidence period, either the one that missed the fewest predicted times or the longest gap. A period is ruled out when the TESS light curve has good data at another predicted time and shows no dip there. The window is four hours either side, or the timing error carried forward to that cycle if that is larger: σ_t (hours) = 24 × √(v_{T0} + E^2 v_P + 2 E cov), using the values stored with the period. For TIC 330608786 the period used for the listed next time is low confidence and the window is wider than ±10 hours, so the star sits in the Very low confidence section of the page. The times below are computed for 18 November 2026, 12:00 UTC, BTJD 4363.0, the same clock zero as the pages, without a new fit. The live pages recompute the next cycle when they load.

Min ≈ BTJD 2859.12430 + E × 5.02770000, with P ± 0.04450002 d.

No single period from the gaps fits all 9 dips. This uses the longest gap between consecutive dips, 5.0277 days, as the period, counted from the dip at BTJD 2859.124.

The window is as wide as the period, or wider, so the dip could come at almost any time.

E	BTJD	UTC	Pacific	Window (1σ floor 4 h)
300	4367.4343	22 Nov 2026, 22:21 UTC	22 Nov 2026, 14:21 PST	± 13.4 days (σ = 13.4 days)
301	4372.4620	27 Nov 2026, 23:01 UTC	27 Nov 2026, 15:01 PST	± 13.4 days (σ = 13.4 days)
302	4377.4897	2 Dec 2026, 23:41 UTC	2 Dec 2026, 15:41 PST	± 13.5 days (σ = 13.5 days)
303	4382.5174	8 Dec 2026, 00:22 UTC	7 Dec 2026, 16:22 PST	± 13.5 days (σ = 13.5 days)

Table 3. The next four times on the adopted period for TIC 330608786, as of 18 November 2026, 12:00 UTC. Times are converted from BTJD for this star's position, as on the pages. Pacific times are America/Los_Angeles.

5. Light curves and a finder chart

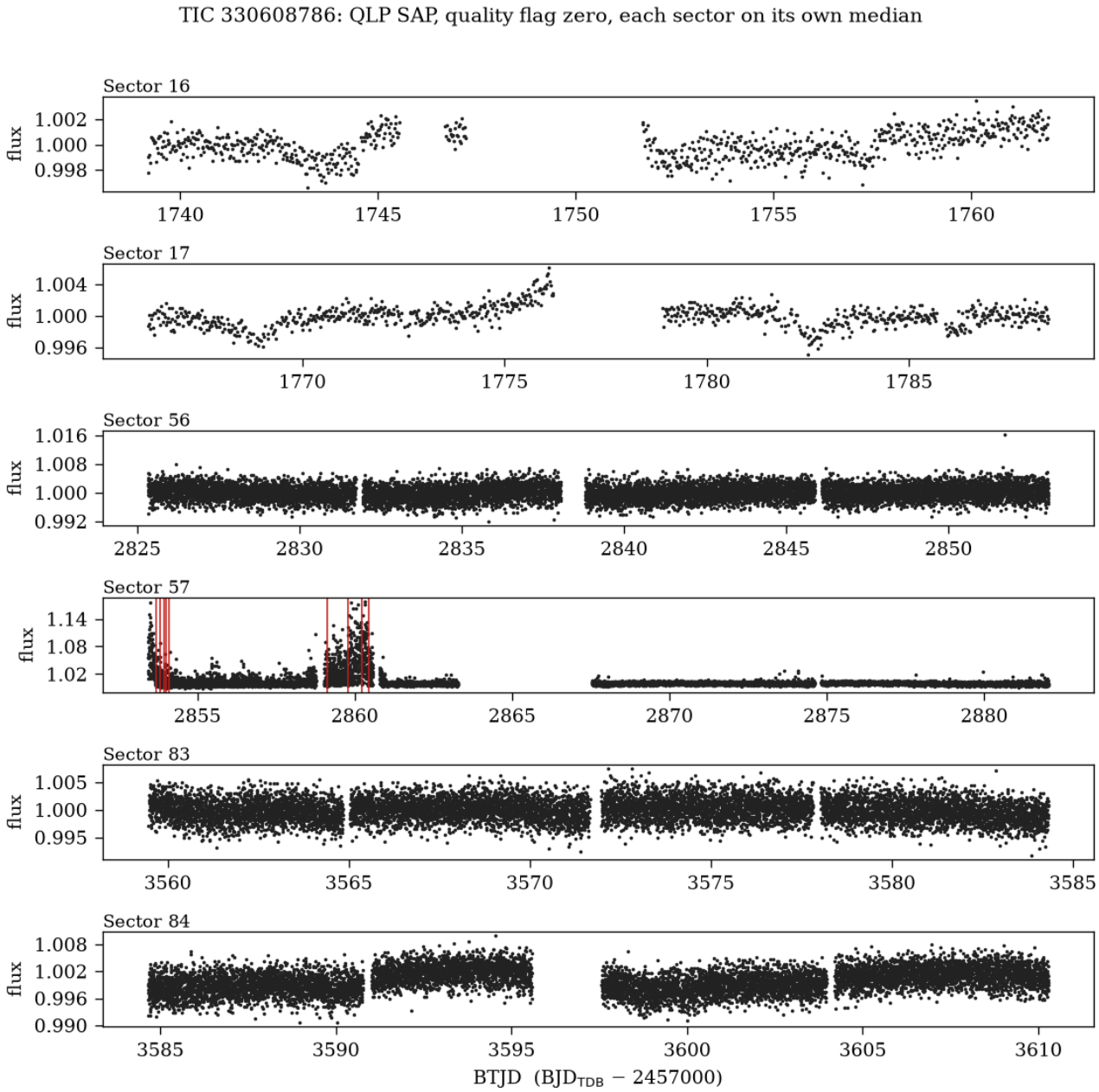


Figure 1. QLP SAP light curves of TIC 330608786, quality flag zero, each sector on its own median. Red lines mark the counted dips of Table 2.

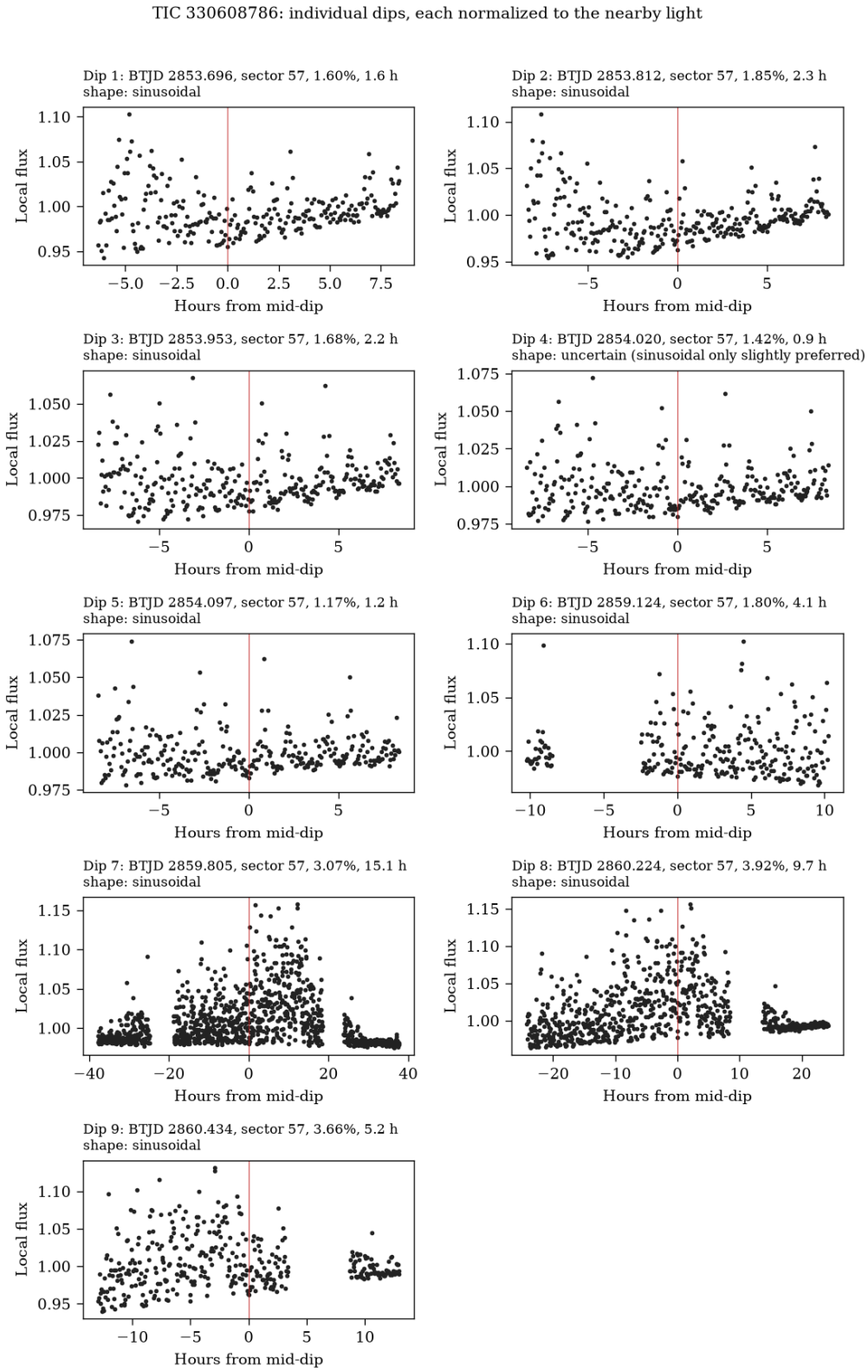


Figure 2. Individual counted dips of TIC 330608786, each normalized to the nearby light. The vertical line is the scan mid-time. These panels, not the fold, are the basis of the shape notes in Section 3.

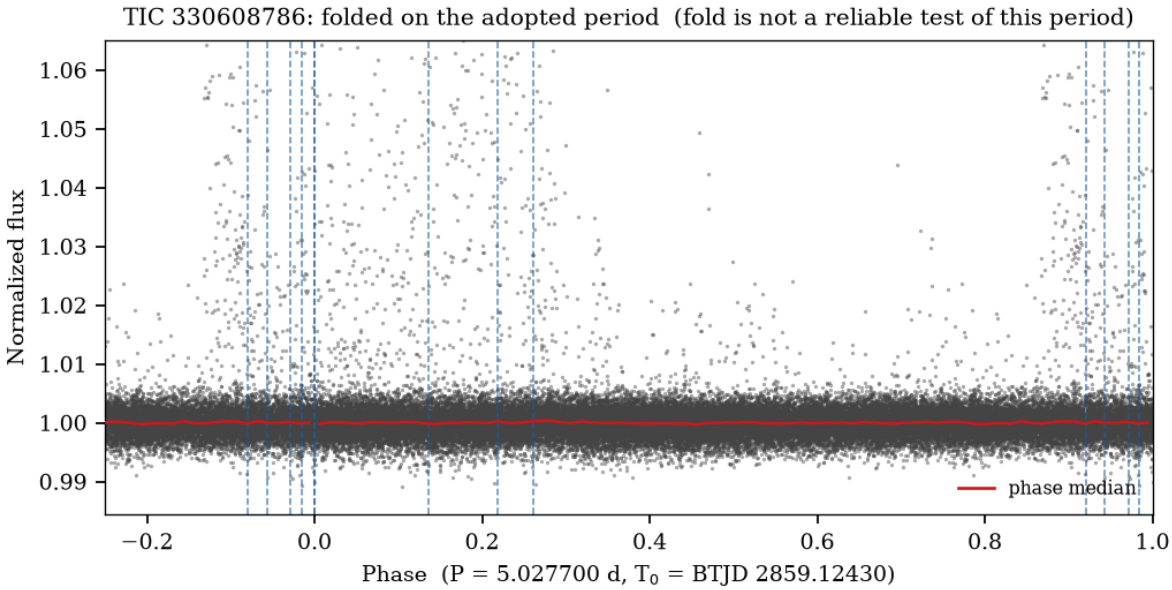


Figure 3. TIC 330608786 folded on the adopted period P = 5.027700 d, counted from BTJD 2859.12430. Black points are the cached QLP cadences; the red line is a phase median; the dashed blue lines are the phases of the counted dips. This fold is not a reliable test of the period: the period is a fallback, or a two-dip alias, or already ruled out. The individual dips in Figure 2 should be used instead.

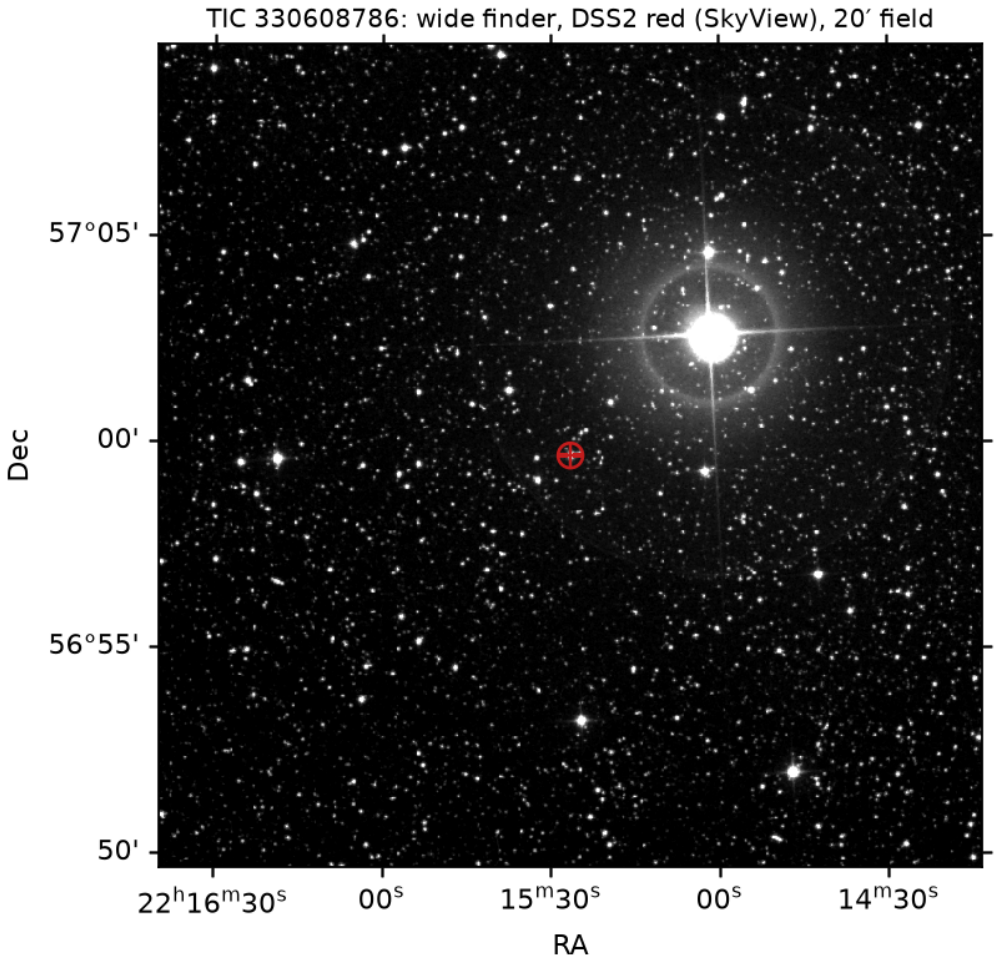


Figure 4. Wide finder for TIC 330608786, DSS2 red via NASA SkyView, 20 arcmin field. The red marks are the TIC position. TESS pixels are 21 arcseconds wide.

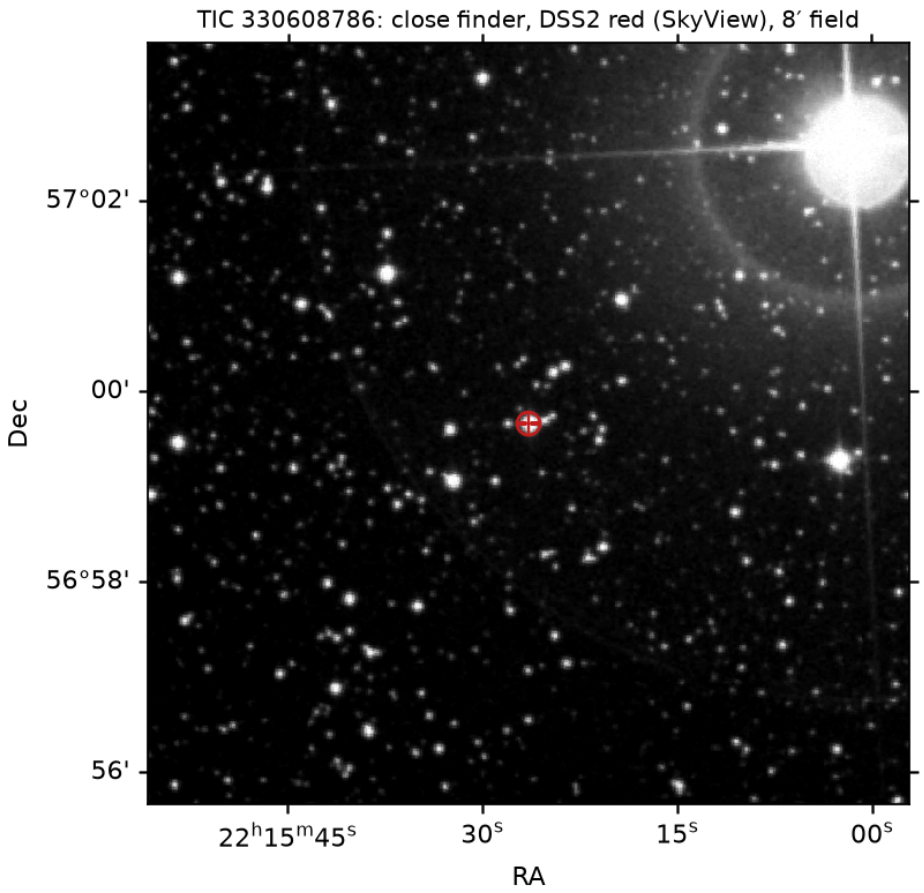


Figure 5. Close finder for TIC 330608786, DSS2 red, 8 arcmin field, to pick out the target and its nearest neighbors.

6. Best-guess classification

Unconfirmed irregular fades in a single sector, period not established. Low confidence. No single period from the gaps fits all nine dips, which is why the pages mark the prediction low confidence and use the longest gap, 5.0277 days, only as a fallback. Carried forward by 300 cycles, that fallback has a timing window of ±13.4 days, wider than the period itself, so the dip could come at almost any time. The window is too wide to plan an observation. The irregular depths and durations, all in one sector, are also consistent with stellar variability or with residual systematics. This is not a planet claim.

This classification uses the TESS light curve and catalog values only. TESS pixels are 21 arcseconds wide, so the star that fades may be a neighbor, and the TIC temperature and radius are photometric estimates. The depths are not corrected for light from other stars. None of this has been checked from the ground. A depth that is consistent with a planet-sized body is not evidence that the body is a planet, or that the dip belongs to this star. This is not a planet claim.

7. Follow-up

Useful next steps are time-series photometry that covers a predicted time, with the close neighbors in the field and with a record of which star was in the aperture, and a low-resolution spectrum for the spectral type, which is not given in the TIC fields used here.

Because the present window is days or weeks wide, a single short visit is not enough; a long series, or a wait for a tighter period, is more useful. Nothing here has been submitted to VSX.

References

Brasseur C. E. et al., 2019, Astrocut: Tools for creating cutouts of TESS images, ascl:1905.007 (TESScut)
Gaia Collaboration, 2023, Astron. Astrophys., 674, A1 (DR3)
Garrison L. H., Foreman-Mackey D., Shih Y., Barnett A., 2024, Research Notes of the AAS, 8, 250 (nifty-ls)
Huang C. X. et al., 2020, Research Notes of the AAS, 4, 204 (QLP)
Kovács G., Zucker S., Mazeh T., 2002, Astron. Astrophys., 391, 369 (BLS)
Kunimoto M. et al., 2021, Research Notes of the AAS, 5, 234
Rutkowski K., Poleski R., 2026, Faster χ^2 periodogram: Accelerating linear algebra with fast Toeplitz solvers, arXiv:2611.20300
Stassun K. G. et al., 2019, Astron. J., 158, 138 (TIC)
Watson C., Henden A., Price A., 2006–, AAVSO International Variable Star Index (VSX)