**Data Columns in Kepler Objects of Interest Table**

The following table lists all of the data columns in the Kepler Objects of Interest table (cumulative) that can be returned through the Exoplanet Archive's [Application Programming Interface (API)](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html).

These column definitions apply to all deliveries of the KOI table. There are similar documents for [other data sets](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html#defcols).

For the Q1-6 delivery (Batalha et al., 2013) some values entered as 99 or -99 in the tables to indicate issues with processing have been entered as NULLS in the Kepler planet candidate table to allow better sorting and filtering. The Q1-6 table also includes the corresponding false positive list from MAST.

The number of significant digits displayed for each parameter is the same for all KOI deliveries. Given the different input data and analysis methods used for different deliveries, users are advised to use the uncertainties to understand the significance of a given parameter value.

Additional Links:

* [Kepler Extended Mission Archive Philosophy](https://exoplanetarchive.ipac.caltech.edu/docs/ExoPlanArchPhilosophy.html)
* [Exoplanet Archive Kepler Mission Resources](https://exoplanetarchive.ipac.caltech.edu/docs/KeplerMission.html)

Questions about the structure and use of this table in the archive format should be submitted through the Exoplanet Archive's [Helpdesk](https://exoplanetarchive.ipac.caltech.edu/cgi-bin/Helpdesk/nph-genTicketForm). Questions about the content descriptions should be sent to the [Kepler Science Center](https://keplerscience.arc.nasa.gov/).

**Skip to a section:**

* [Identification Columns](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#id_col)
* [Exoplanet Archive Information](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#exo_arch_info)
* [Project Disposition Columns](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#proj_disp_col)
* [Transit Properties](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#transit_prop)
* [Threshold-Crossing Event (TCE) Information](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#tce_info)
* [Stellar Parameters](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#stellar_param)
* [KIC Parameters](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#kic_param)
* [Pixel-Based KOI Vetting Statistics](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#pixel_koi_vet)

**Identification Columns**

|  |  |  |
| --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** |
| kepid† | Kepler Identification or KepID | Target identification number, as listed in the [Kepler Input Catalog (KIC)](http://adsabs.harvard.edu/abs/2011AJ....142..112B). The KIC was derived from a ground-based imaging survey of the Kepler field conducted prior to launch. The survey's purpose was to identify stars for the Kepler exoplanet survey by magnitude and color. The full catalog of 13 million sources can be searched at the [MAST archive](http://archive.stsci.edu/kepler/kic10/search.php). The subset of 4 million targets found upon the Kepler CCDs can be searched via the [Kepler Target Search form](http://archive.stsci.edu/kepler/kepler_fov/search.php). The Kepler ID is unique to a target and there is only one Kepler ID per target. |
| kepoi\_name† | KOI Name | A number used to identify and track a Kepler Object of Interest (KOI). A KOI is a target identified by the Kepler Project that displays at least one transit-like sequence within Kepler time-series photometry that appears to be of astrophysical origin and initially consistent with a planetary transit hypothesis. A KOI name has an integer and a decimal part of the format KNNNNN.DD. The integer part designates the target star; the two-digit decimal part identifies a unique transiting object associated with that star. It is not necessarily the planetary candidate listed in that order within a DV report, nor does it indicate the distance of the planet from the the host star relative to other planets in the system. |

† Default column: These columns display in the interactive table when the table is first loaded and when **Reset Filters** is clicked. They are also the default set of columns returned in the [API](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) if none are specified. More information about default columns is given in the archive's [FAQ](https://exoplanetarchive.ipac.caltech.edu/docs/faq.html#missing_params).

**Exoplanet Archive Information**

|  |  |  |
| --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** |
| kepler\_name† | Kepler Name | Kepler number name in the form "Kepler-N," plus a lower-case letter, identifying the planet. In general, these numbers are easier to remember than the corresponding KOI or KIC/KepID designations and are intended to clearly indicate a class of objects that have been confirmed or validated as planets—a step up from the planet candidate designation. |
| koi\_disposition† | Exoplanet Archive Disposition | The category of this KOI from the Exoplanet Archive. Current values are CANDIDATE, FALSE POSITIVE, NOT DISPOSITIONED or CONFIRMED. All KOIs marked as CONFIRMED are also listed in the Exoplanet Archive Confirmed Planet table. Designations of CANDIDATE, FALSE POSITIVE, and NOT DISPOSITIONED are taken from the [Disposition Using Kepler Data](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#pdisposition). |

† Default column: These columns display in the interactive table when the table is first loaded and when **Reset Filters** is clicked. They are also the default set of columns returned in the [API](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) if none are specified. More information about default columns is given in the archive's [FAQ](https://exoplanetarchive.ipac.caltech.edu/docs/faq.html#missing_params).

**Project Disposition Columns**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** | **Uncertainties Column (positive +) (negative -)** | **Displayed String Name** |
| koi\_pdisposition† | Disposition Using Kepler Data | The pipeline flag that designates the most probable physical explanation of the KOI. Typical values are FALSE POSITIVE, NOT DISPOSITIONED, and CANDIDATE. The value of this flag may change over time as the evaluation of KOIs proceeds to deeper levels of analysis using Kepler time-series pixel and light curve data, or follow-up observations. A not dispositioned value corresponds to objects for which the disposition tests have not yet been completed. A false positive has failed at least one of the tests described in [Batalha et al. (2012)](http://adsabs.harvard.edu/abs/2012arXiv1202.5852B" \t "_blank). A planetary candidate has passed all prior tests conducted to identify false positives, although this does not a priori mean that all possible tests have been conducted. A future test may confirm this KOI as a false positive. False positives can occur when: 1) the KOI is in reality an eclipsing binary star, 2) the Kepler light curve is contaminated by a background eclipsing binary, 3) stellar variability is confused for coherent planetary transits, or 4) instrumental artifacts are confused for coherent planetary transits. |  |  |
| koi\_score† | Disposition Score | A value between 0 and 1 that indicates the confidence in the KOI disposition. For CANDIDATEs, a higher value indicates more confidence in its disposition, while for FALSE POSITIVEs, a higher value indicates less confidence in that disposition. The value is calculated from a Monte Carlo technique such that the score's value is equivalent to the frction of iterations where the Robovetter yields a disposition of CANDIDATE. |  |  |
| koi\_fpflag\_nt† | Not Transit-Like Flag | A KOI whose light curve is not consistent with that of a transiting planet. This includes, but is not limited to, instrumental artifacts, non-eclipsing variable stars, and spurious (very low SNR) detections. |  |  |
| koi\_fpflag\_ss† | Stellar Eclipse Flag | A KOI that is observed to have a significant secondary event, transit shape, or out-of-eclipse variability, which indicates that the transit-like event is most likely caused by an eclipsing binary. However, self-luminous, hot Jupiters with a visible secondary eclipse will also have this flag set, but with a disposition of PC. |  |  |
| koi\_fpflag\_co† | Centroid Offset Flag | The source of the signal is from a nearby star, as inferred by measuring the centroid location of the image both in and out of transit, or by the strength of the transit signal in the target's outer (halo) pixels as compared to the transit signal from the pixels in the optimal (or core) aperture. |  |  |
| koi\_fpflag\_ec† | Ephemeris Match Indicates Contamination Flag | The KOI shares the same period and epoch as another object and is judged to be the result of flux contamination in the aperture or electronic crosstalk. |  |  |

† Default column: These columns display in the interactive table when the table is first loaded and when **Reset Filters** is clicked. They are also the default set of columns returned in the [API](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) if none are specified. More information about default columns is given in the archive's [FAQ](https://exoplanetarchive.ipac.caltech.edu/docs/faq.html#missing_params).

**Transit Properties**

Transit parameters delivered by the Kepler Project are typically best-fit parameters produced by a [Mandel-Agol (2002)](http://adsabs.harvard.edu/abs/2002ApJ...580L.171M) fit to a multi-quarter Kepler light curve, assuming a linear orbital ephemeris. Some of the parameters listed below are fit directly, other are derived from the best-fit parameters. Limb-darkening coefficients are fixed and pre-calculated from host star properties. Orbital Period, Transit Epoch, Planet-Star Radius Ratio, Planet-Star Distance over Star Radius and Impact Parameter are the free parameters in the fit. Matrix covariances are adopted as errors to the fit parameters; they therefore ignore the effects of correlation between the fit parameters and are likely to be underestimates.

See the links in the [Purpose of KOI](https://exoplanetarchive.ipac.caltech.edu/docs/PurposeOfKOITable.html) document for each activity table for more details on the fits for each delivery.

Scaled planetary parameters combine the dimensionless fit parameters with physical stellar parameters to produce planet characteristics in physical units.

Best-fit planetary transit parameters are typically normalized to the size of the host star. Physical planet parameters may be derived by scaling to the star's size and temperature. Transit parameters also depend weakly upon the limb-darkening coefficients which are derived from the stellar parameters (e.g., [Claret and Bloemen 2011)](http://adsabs.harvard.edu/abs/2011A%26A...529A..75C).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** | **Uncertainties Column (positive +) (negative -)** | **Displayed String Name** |
| koi\_period† | Orbital Period (days) | The interval between consecutive planetary transits. | koi\_period\_err1, koi\_period\_err2 | koi\_period\_str |
| koi\_time0bk† | Transit Epoch (BJD - 2,454,833.0) | The time corresponding to the center of the first detected transit in Barycentric Julian Day (BJD) minus a constant offset of 2,454,833.0 days. The offset corresponds to 12:00 on Jan 1, 2009 UTC. | koi\_time0bk\_err1, koi\_time0bk\_err2 | koi\_time0bk\_str |
| koi\_longp | Long. of Periastron (deg) | Longitude of Periastron | koi\_longp\_err1, koi\_longp\_err2 | koi\_longp\_str |
| koi\_impact† | Impact Parameter | The sky-projected distance between the center of the stellar disc and the center of the planet disc at conjunction, normalized by the stellar radius. | koi\_impact\_err1, koi\_impact\_err2 | koi\_impact\_str |
| koi\_duration† | Transit Duration (hours) | The duration of the observed transits. Duration is measured from first contact between the planet and star until last contact. Contact times are typically computed from a best-fit model produced by a [Mandel-Agol (2002)](http://adsabs.harvard.edu/abs/2002ApJ...580L.171M) model fit to a multi-quarter Kepler light curve, assuming a linear orbital ephemeris. | koi\_duration\_err1, koi\_duration\_err2 | koi\_duration\_str |
| koi\_ingress† | Ingress Duration (hours) | The time between first and second contact of the planetary transit. Contact times are typically computed from a best-fit model produced by a [Mandel-Agol (2002)](http://adsabs.harvard.edu/abs/2002ApJ...580L.171M) model fit to a multi-quarter Kepler light curve, assuming a linear orbital ephemeris. | koi\_ingress\_err1, koi\_ingress\_err2 | koi\_ingress\_str |
| koi\_depth† | Transit Depth (parts per million) | The fraction of stellar flux lost at the minimum of the planetary transit. Transit depths are typically computed from a best-fit model produced by a [Mandel-Agol (2002)](http://adsabs.harvard.edu/abs/2002ApJ...580L.171M) model fit to a multi-quarter Kepler light curve, assuming a linear orbital ephemeris. | koi\_depth\_err1, koi\_depth\_err2 | koi\_depth\_str |
| koi\_ror | Planet-Star Radius Ratio | The planet radius divided by the stellar radius. | koi\_ror\_err1, koi\_ror\_err2 | koi\_ror\_str |
| koi\_srho | Fitted Stellar Density [g/cm\*3] | Fitted stellar density is a direct observable from the light curve that, in the small-planet approximation, depends only on the transit's period, depth, and duration (see Seager and Mallen-Ornelas 2003). This quantity is directly fitted in the LS and MCMC methods, and is completely independent from the listed stellar mass and radius, which are derived using ground-based photometry, spectroscopy, and other observations. | koi\_srho\_err1, koi\_srho\_err2 | koi\_srho\_str |
| koi\_fittype | Planetary Fit Type | Type of Fit for planetary parameters. Options are:   * **LS** (Least Squares fit) * **MCMC** (Markov Chain Monte Carlo fit) * **DV** (Data Validation pipeline fit) * **none** (fit is not provided, only orbital period, transit epoch and transit duration are reported) * **LS+MCMC** (Least Squares Fit with Markov Monte Carlo error bars) |  |  |
| koi\_prad† | Planetary Radius (Earth radii) | The radius of the planet. Planetary radius is the product of the planet star radius ratio and the stellar radius. | koi\_prad\_err1, koi\_prad\_err2 | koi\_prad\_str |
| koi\_sma | Orbit Semi-Major Axis (Astronomical Unit (AU)) | Half of the long axis of the ellipse defining a planet's orbit. For a circular orbit this is the planet-star separation radius. The semi-major axis is derived based on Kepler's third law, i.e., utilizing the orbital period and stellar mass, not scaling the planet-star separation by the stellar radius. | koi\_sma\_err1, koi\_sma\_err2 | koi\_sma\_str |
| koi\_incl | Inclination (deg) | The angle between the plane of the sky (perpendicular to the line of sight) and the orbital plane of the planet candidate. | koi\_incl\_err1, koi\_incl\_err2 | koi\_incl\_str |
| koi\_teq† | Equilibrium Temperature (Kelvin) | Approximation for the temperature of the planet. The calculation of equilibrium temperature assumes a) thermodynamic equilibrium between the incident stellar flux and the radiated heat from the planet, b) a Bond albedo (the fraction of total power incident upon the planet scattered back into space) of 0.3, c) the planet and star are blackbodies, and d) the heat is evenly distributed between the day and night sides of the planet. | koi\_teq\_err1, koi\_teq\_err2 | koi\_teq\_str |
| koi\_insol\_str† | Insolation Flux [Earth flux] | Insolation flux is another way to give the equilibrium temperature. It depends on the stellar parameters (specifically the stellar radius and temperature), and on the semi-major axis of the planet. It's given in units relative to those measured for the Earth from the Sun. |  |  |
| koi\_dor | Planet-Star Distance over Star Radius | The distance between the planet and the star at mid-transit divided by the stellar radius. For the case of zero orbital eccentricity, the distance at mid-transit is the semi-major axis of the planetary orbit. | koi\_dor\_err1, koi\_dor\_err2 | koi\_dor\_str |
| koi\_limbdark\_mod | Limb Darkening Model Name | A reference to the limb-darkening model used to calculate stellar limb-darkening coefficients. |  |  |
| koi\_ldm\_coeff1, koi\_ldm\_coeff2, koi\_ldm\_coeff3, koi\_ldm\_coeff4 | Limb Darkening Coefficients | Up to four coefficients (a1, a2, a3, a4) that define stellar limb darkening (e.g., [Claret 2000](http://adsabs.harvard.edu/abs/2000A%26A...363.1081C)). Limb darkening is the variation of specific intensity of the star as a function of μ = cos(θ). θ is the angle between the line-of-sight of an observer and a line perpendicular to the stellar surface at an observed point. Coefficients are dependent upon stellar temperature, surface gravity and metallicity. Adopted coefficients are required input for [Mandel-Agol (2002)](http://adsabs.harvard.edu/abs/2002ApJ...580L.171M) fits and are extracted from archived tables (e.g., [Claret and Bloemen 2011)](http://adsabs.harvard.edu/abs/2011A%26A...529A..75C). Limb-darkening coefficients remain fixed during fit minimization. Note that the dependence of limb-darkening coefficients on stellar parameters implies that planet radius does not scale linearly with stellar radius. If new stellar parameters are adopted, the most-correct approach is to re-fit the transit with new limb-darkening coefficients in order to re-measure planet size. |  |  |
| koi\_parm\_prov | KOI Parameter Provenance | KOI Parameter Provenance |  |  |

† Default column: These columns display in the interactive table when the table is first loaded and when **Reset Filters** is clicked. They are also the default set of columns returned in the [API](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) if none are specified. More information about default columns is given in the archive's [FAQ](https://exoplanetarchive.ipac.caltech.edu/docs/faq.html#missing_params).

**Threshold-Crossing Event (TCE) Information**

The [Transiting Planet Search (TPS) module](http://archive.stsci.edu/kepler/manuals/KSCI-19081-001_Data_Processing_Handbook.pdf) of the Kepler data analysis pipeline performs a detection test for planet transits in the multi-quarter, gap-filled flux time series. The TPS module detrends each quarterly PDC light curve to remove edge effects around data gaps and then combines the data segments together, filling gaps with interpolated data so as to condition the flux time series for a matched filter. The module applies an adaptive, wavelet-based matched filter ([Jenkins 2002](http://adsabs.harvard.edu/abs/2002ApJ...575..493J), [Jenkins et al. 2010](http://adsabs.harvard.edu/abs/2010ApJ...713L..87J) and [Tenenbaum et al. (2012)](http://adsabs.harvard.edu/abs/2012ApJS..199...24T)) to perform a joint characterization of observation noise and detection of transit-like features in the light curve.

The TPS module estimates the Power Spectral Density of the flux time series as a function in time. This provides coefficients for a whitening filter to accommodate non-stationary, non-white noise and yields Single Event Statistic (SES) time series components. These can be interpreted as measurements of the statistical significance of the presence of a transit of trial duration at each point in the time series.

Single Event Statistics are folded at each trial orbital period and the maximum Multiple Event Statistic (MES) is obtained over all trial periods and phases. The MES estimates the signal to noise ratio of the putative transit-like sequence against the measurement noise. The MES threshold for defining the sample of [Threshold Crossing Events (TCEs)](http://adsabs.harvard.edu/abs/2012ApJS..199...24T) is provided within the Release Notes. For reference, a lower MES threshold of 7.1σ limits the number of false positives in the TCE sample due to statistical random noise to less than 1 over the primary mission ([Jenkins, Caldwell and Borucki 2002](http://adsabs.harvard.edu/abs/2002ApJ...564..495J)).

|  |  |  |
| --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** |
| koi\_max\_sngle\_ev | Maximum Single Event Statistic | The maximum calculated value of the SES. Maximum SES statistics for different TCEs from the same target differ because the most significant TCE is removed from the time series before repeating the test for further, weaker transit signals. |
| koi\_max\_mult\_ev | Maximum Multiple Event Statistic | The maximum calculated value of the MES. TCEs that meet the maximum MES threshold criterion and other criteria listed in the TCE release notes are delivered to the [Data Validation (DV) module](http://archive.stsci.edu/kepler/manuals/KSCI-19081-001_Data_Processing_Handbook.pdf) of the Kepler data analysis pipeline for transit characterization and the calculation of statistics required for disposition. A TCE exceeding the maximum MES threshold are removed from the time-series data and the SES and MES statistics recalculated. If a second TCE exceeds the maximum MES threshold then it is also propagated through the DV module and the cycle is iterated until no more events exceed the criteria. Candidate multi-planet systems are thus found this way. Users of the TCE table can exploit the maximum MES statistic to help filter and sort samples of TCEs for the purposes of discerning the event quality, determining the likelihood of planet candidacy, or assessing the risks of observational follow-up. |
| koi\_model\_snr† | Transit Signal-to-Noise | Transit depth normalized by the mean uncertainty in the flux during the transits. |
| koi\_count | Number of Planets | Number of planet candidates identified in a system. |
| koi\_num\_transits | Number of Transits | The number of expected transits or partially-observed transits associated with the planet candidate occurring within the searched light curve. This does not include that fall completely within data gaps. |
| koi\_tce\_plnt\_num† | TCE Planet Number | TCE Planet Number federated to the KOI. |
| koi\_tce\_delivname† | TCE Delivery Name | TCE delivery name corresponding to the TCE data federated to the KOI. |
| koi\_quarters | Quarters | A bit string indicating which quarters of Kepler data were searched for transit signatures. Reading from left to right, the bits indicate the quarters, starting with quarter 1. A value of 1 for any bit means the designated quarter was searched for transits; a value of 0 means that quarter was not included in the transit search. |
| koi\_trans\_mod | Transit Model Name | A reference to the transit model used to fit the data (e.g., [Mandel-Agol 2002](http://adsabs.harvard.edu/abs/2002ApJ...580L.171M)). |
| koi\_model\_dof | Model Degrees of Freedom (DOF) | The number of degrees of freedom used when fitting the transit model to the data. |
| koi\_model\_chisq | Model Goodness of Fit | The goodness of the transit fit to the data. Within the TCE table, this quantity is the χ2 statistic. Within the KOI table this quantity is the reduced-χ2 statistic, e.g., divided by the number of degrees of freedom in the fit. |
| koi\_datalink\_dvr | Link to DV Report | This is the relative path for the data validation report; use it when retrieving individual reports through the archive's [application programming interface](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) with wget. You must append the following URL to the file name in your wget query:  http://exoplanetarchive.ipac.caltech.edu/data/KeplerData/ |
| koi\_datalink\_dvs | Link to DV Summary | This is the relative path for the data validation summary; use it when retrieving individual reports through the archive's [application programming interface](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) with wget. You must append the following URL to the file name in your wget query: http://exoplanetarchive.ipac.caltech.edu/data/KeplerData/ |

† Default column: These columns display in the interactive table when the table is first loaded and when **Reset Filters** is clicked. They are also the default set of columns returned in the [API](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) if none are specified. More information about default columns is given in the archive's [FAQ](https://exoplanetarchive.ipac.caltech.edu/docs/faq.html#missing_params).

**Stellar Parameters**

Stellar effective temperature, surface gravity, metallicity, radius, mass, and age should comprise a consistent set. Associated error estimates are 1-σ uncertainties.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** | **Uncertainties Column (positive +) (negative -)** | **Displayed String Name** |
| koi\_steff† | Stellar Effective Temperature (Kelvin) | The photospheric temperature of the star. | koi\_steff\_err1, koi\_steff\_err2 | koi\_steff\_str |
| koi\_slogg† | Stellar Surface Gravity (log10(cm s-2) | The base-10 logarithm of the acceleration due to gravity at the surface of the star. | koi\_slogg\_err1, koi\_slogg\_err2 | koi\_slogg\_str |
| koi\_smet | Stellar Metallicity | The base-10 logarithm of the Fe to H ratio at the surface of the star, normalized by the solar Fe to H ratio | koi\_smet\_err1, koi\_smet\_err2 | koi\_smet\_str |
| koi\_srad† | Stellar Radius (solar radii) | The photospheric radius of the star | koi\_srad\_err1, koi\_srad\_err2 | koi\_srad\_str |
| koi\_smass | Stellar Mass (solar mass) | The mass of the star | koi\_smass\_err1, koi\_smass\_err2 | koi\_smass\_str |
| koi\_sage | Stellar Age (Gigayears) | The age of the star | koi\_sage\_err1, koi\_sage\_err2 | koi\_sage\_str |
| koi\_sparprov | Provenance of Stellar Parameters | A flag describing the source of the stellar parameters.   * **KIC** = The parameters are extracted from the Kepler Input Catalog ([Brown et al. 2011](http://adsabs.harvard.edu/abs/2011AJ....142..112B)). Uncertainties of Teff = 200 K, log(g) = 0.3 dex and [Fe/H] = 0.4. * **J-K** = The star is unclassified in the KIC, J-K has been used to estimate temperature. The host star is assumed to be on the ZAMS with corresponding log(g) based on the Schmidt-Kaler relation. * **Solar** = The star is unclassified in the KIC, so the host star is assumed to have solar properties. * **SME** = Spectroscopic parameters derived from SME analysis ([Valenti and Piskunov 1996](http://adsabs.harvard.edu/abs/1996A%26AS..118..595V" \t "_blank)). Stellar parameters are derived based on stellar evolution models. * **SPC** = Spectroscopic parameters derived from SPC analysis ([Buchhave et al. 2012](http://adsabs.harvard.edu/abs/2012Natur.486..375B" \t "_blank)). Stellar parameters are derived based on stellar evolution models. * **Pinsonneault** = Uses a revised Teff scale from [Pinsonneault et al. (2012)](http://adsabs.harvard.edu/abs/2012ApJS..199...30P" \t "_blank) with [Fe/H] fixed at -0.2. The quantity log(g) is taken from the KIC. Values are then revised by fitting to Yonsei-Yale stellar evolution models ([Yi et al. 2001)](http://adsabs.harvard.edu/abs/2001ApJS..136..417Y). * **Astero** = Host star properties have been measured by comparison with astroseismologial models. |  |  |

† Default column: These columns display in the interactive table when the table is first loaded and when **Reset Filters** is clicked. They are also the default set of columns returned in the [API](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) if none are specified. More information about default columns is given in the archive's [FAQ](https://exoplanetarchive.ipac.caltech.edu/docs/faq.html#missing_params).

**KIC Parameters**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** | **Uncertainties Column (positive +) (negative -)** | **Displayed String Name** |
| ra† | RA (deg) | KIC Right Ascension | ra\_err |  |
| dec† | Dec (deg) | KIC Declination | dec\_err |  |
| koi\_kepmag† | Kepler-band (mag) | Kepler-band (mag) | koi\_kepmag\_err | koi\_kepmag\_str |
| koi\_gmag | KIC g'-band mag | g'-band mag from KIC | koi\_gmag\_err | koi\_gmag\_str |
| koi\_rmag | KIC r'-band mag | r'-band mag from KIC | koi\_rmag\_err | koi\_rmag\_str |
| koi\_imag | KIC i'-band mag | i'-band mag from KIC | koi\_imag\_err | koi\_imag\_str |
| koi\_zmag | KIC z'-band mag | z'-band mag from KIC | koi\_zmag\_err | koi\_zmag\_str |
| koi\_jmag | KIC J-band mag | J-band mag from 2MASS | koi\_jmag\_err | koi\_jmag\_str |
| koi\_hmag | KIC H-band mag | H-band mag from 2MASS | koi\_hmag\_err | koi\_hmag\_str |
| koi\_kmag | KIC K-band mag | K-band mag from 2MASS | koi\_kmag\_err | koi\_kmag\_str |

† Default column: These columns display in the interactive table when the table is first loaded and when **Reset Filters** is clicked. They are also the default set of columns returned in the [API](https://exoplanetarchive.ipac.caltech.edu/docs/program_interfaces.html) if none are specified. More information about default columns is given in the archive's [FAQ](https://exoplanetarchive.ipac.caltech.edu/docs/faq.html#missing_params).

**Pixel-Based KOI Vetting Statistics**

Planetary transit false positives are commonly caused by [light curve contamination](https://keplerscience.arc.nasa.gov/PyKEprimerWalkthroughA.shtml) from an eclipsing binary falling partially within the target aperture (i.e., the pixels used to collect and sum target flux). Two pixel analysis methods are used to identify such eclipsing binaries for unsaturated target stars: flux-weighted centroiding, which measures how the center of light in the collected pixels changes during a transit, and PRF-fit difference images, which localize the source of the transit signal. Both methods provide an estimate of the location of the source of the transit signal. When that source location is offset from the target star by more than 3-σ, it is likely the transit signal is due to a background source (note the caveats due to crowding described below). These analysis techniques use pixel-level data, available in the [Target Pixel Files (TPFs)](https://keplerscience.arc.nasa.gov/DataAnalysisTargetPixels.shtml). The resulting position measurements are compared with the [Kepler Input Catalog](https://archive.stsci.edu/kepler/kepler_fov/search.php) (KIC) ([Brown et al. 2011](http://adsabs.harvard.edu/abs/2011AJ....142..112B)). Details on these centroid methods are found in [Bryson et. al. 2013](http://adsabs.harvard.edu/abs/2013PASP..125..889B).

When the target star is saturated (Kepler magnitude larger than about 11.5) the centroid results given in this section are invalid. In this case manual inspection of the data validation reports can identify well-offset background binaries - see Section 5 of [Bryson et. al. 2013](http://adsabs.harvard.edu/abs/2013PASP..125..889B)for details.

In flux-weighted centroid analysis, when more than one source is present within a pixel aperture, either fully or partially, then the combined center of light within the collected pixels will occur between the locations of the sources. When the flux from either the target or one of the nearby contaminants varies in a transit or eclipse, then the combined center of light within the aperture will move across the focal plane. This motion is called a centroid shift. The location of the varying source can often be inferred from the centroid shift. The size and direction of the centroid shift is measured using the flux-weighted (FW) mean, (e.g., the first moment of the pixel data). This mean is computed with every flux measurement (30-minute long cadence), creating a time series of flux-weighted means. The centroid shift is measured by comparing portions of the flux-weighted mean time series that are Out-Of-Transit (OOT) with portions that are In-Transit (IT). The flux-weighted shift of the IT mean from the OOT mean is given as Right Ascension and Declination shifts. The offset of the transiting source object from the OOT flux-weighted mean is computed by taking the product of the FW shift and the factor [1 - 1 / (fractional transit depth)]. The [Right Ascension, α (J2000)](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#FWDa), and [Declination, δ (J2000)](https://exoplanetarchive.ipac.caltech.edu/docs/API_kepcandidate_columns.html#FWDd), of the transiting object calculated in this way are reported in the table. The α and δ offsets of the resulting source location from the KIC target star position are also reported. The uncertainties and significance of the FW shifts and offsets are provided but do not reflect systematics caused by crowding. The flux-weighted method can be very accurate when the target star is well isolated and the transit source is located (well) within the flux aperture associated with the target star.

The PRF-fit difference image method uses three images: 1) an average of Out-Of-Transit (OOT) Target Pixel File images from data that were obtained near but not during transit events, 2) an average of In-Transit (IT) image Target Pixel File images that were collected during transit events, and 3) a Difference Image (DIFF) that is the difference between the Out-Of-Transit and In-Transit average images. The difference image provides an image of the transit source (neglecting variability of field stars). The Pixel Response Function (PRF) is a convolution of the Kepler Point Spread Function model with a model of typical spacecraft pointing jitter, providing a system point spread function ([Bryson et al. 2010)](http://adsabs.harvard.edu/abs/2010ApJ...713L..97B). The PRF is fit separately to the OOT and DIFF images, providing a measured location of the target star (fit to the OOT image) and a measured location of the transit source (fit to the DIFF image). The offset of the transit source location from the target star is given in the table as Right Ascension and Declination offsets (Δα,Δδ) as well as magnitude (sky offset Δθ).

PRF offsets can only be computed on a per-quarter basis. The single quarter (SQ) PRF offsets are combined by a weighted mean.

The target position measured by the PRF fit to the OOT images is vulnerable to crowding. Therefore an alternative PRF offset of the transit source (measured by the PRF fit to the DIFF image) from the KIC position of the target star is provided. Both the flux-weighted and PRF-fit methods will have systematic errors due to crowding when other stars appear in the aperture's pixels, though these error are smaller for the PRF-fit method compared to the flux-weighted method.

The associated error estimates are 1-σ uncertainties.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Database Column Name** | **Table Label** | **Description** | **Uncertainties Column (positive +) (negative -)** | **Displayed String Name** |
| koi\_fwm\_sra | **FW Sourceα(OOT)**  *units: hours* | The Right Ascension (J2000) of the location of the transiting object calculated from the flux-weighted centroids. This result does not reflect the systematics due to crowding which can introduce significant errors in the calculated position. | koi\_fwm\_sra\_err | koi\_fwm\_sra\_str |
| koi\_fwm\_sdec | **FW Source δ(OOT)** *units: degrees* | The Declination (J2000) of the location of the transiting object calculated from the flux-weighted centroids. This result does not reflect the systematics due to crowding which can introduce significant errors in the calculated position. | koi\_fwm\_sdec\_err | koi\_fwm\_sdec\_str |
| koi\_fwm\_srao | **FW Δα(OOT)** *units: seconds (not arcseconds)* | The RA (J2000) flux-weighted centroid shift. This is the RA of the in-transit flux weighted centroid minus the RA of the out-of-transit flux weighted centroid. | koi\_fwm\_srao\_err | koi\_fwm\_srao\_str |
| koi\_fwm\_sdeco | **FW Δδ(OOT)** *units: arcseconds* | The Dec (J2000) flux-weighted centroid shift. This is the Dec of the in-transit flux weighted centroid minus the Dec of the out-of-transit flux weighted centroid. | koi\_fwm\_sdeco\_err | koi\_fwm\_sdeco\_str |
| koi\_fwm\_prao | **FW Source Δα(OOT)** *units: seconds (not arcseconds)* | The calculated Right Ascension offset of the transiting or eclipsing object from the KIC location of the target star. The accuracy of this calculation degrades when the transit source has significant flux that falls outside the photometric aperture + a halo of pixels around it. | koi\_fwm\_prao\_err | koi\_fwm\_prao\_str |
| koi\_fwm\_pdeco | **FW Source Δδ(OOT)**  *units: arcseconds* | The calculated Declination offset of the transiting or eclipsing object from the KIC location of the target star. The accuracy of this calculation degrades when the transit source has significant flux that falls outside the photometric aperture + a halo of pixels around it. | koi\_fwm\_pdeco\_err | koi\_fwm\_pdeco\_str |
| koi\_fwm\_stat\_sig | Flux-Weighted Offset Significance (percent) | Indicates whether there is a statistically significant flux-weighted offset between in-transit and out-of-transit images. 100% indicates there is no offset and there is confidence that the transit is on the target star. The accuracy of this calculation degrades when the transit source has significant flux that falls outside the photometric aperture + a halo of pixels around it. |  | koi\_fwm\_stat\_sig\_str |
| koi\_dicco\_mra | **PRF ΔαSQ(OOT)** *units: arcseconds* | The angular offset in the RA (J2000) direction between the best-fit PRF centroids from the Out-Of-Transit image and the Difference Image by averaging the weighted single-quarter measurements. The out-of-transit centroids are subtracted from the difference image centroids. | koi\_dicco\_mra\_err | koi\_dicco\_mra\_str |
| koi\_dicco\_mdec | **PRF ΔδSQ(OOT)**  *units: arcseconds* | The angular offset in the Dec (J2000) direction between the best-fit PRF centroids from the Out-Of-Transit image and the Difference Image by averaging the weighted single-quarter measurements. The out-of-transit centroids are subtracted from the difference image centroids. | koi\_dicco\_mdec\_err | koi\_dicco\_mdec\_str |
| koi\_dicco\_msky | **PRF ΔθSQ(OOT)** *units: arcseconds* | The angular offset on the plane of the sky between the best-fit PRF centroids from the Out-Of-Transit image and the Difference Image by averaging the weighted single-quarter measurements. The out-of-transit centroids are subtracted from the difference image centroids. | koi\_dicco\_msky\_err | koi\_dicco\_msky\_str |
| koi\_dikco\_mra | **PRF ΔαSQ(KIC)** *units: arcseconds* | The angular offset in the RA (J2000) direction between the best-fit PRF centroids from the difference image and the [Kepler Input Catalog](http://archive.stsci.edu/kepler/kepler_fov/search.php)position by averaging the weighted single-quarter measurements. The KIC position is subtracted from the difference image centroids. | koi\_dikco\_mra\_err | koi\_dikco\_mra\_str |
| koi\_dikco\_mdec | **PRF ΔδSQ(KIC)** *units: arcseconds* | The angular offset in the Dec (J2000) direction between the best-fit PRF centroids from the difference image and the [Kepler Input Catalog](http://archive.stsci.edu/kepler/kepler_fov/search.php)position by averaging the weighted single-quarter measurements. The KIC position is subtracted from the difference image centroids. | koi\_dikco\_mdec\_err | koi\_dikco\_mdec\_str |
| koi\_dikco\_msky | **PRF ΔθSQ(KIC)** *units: arcseconds* | The angular offset in the plane of the sky between the best-fit PRF centroids from the difference image and the [Kepler Input Catalog](http://archive.stsci.edu/kepler/kepler_fov/search.php)position by averaging the weighted single-quarter measurements. The KIC position is subtracted from the difference image centroids. | koi\_dikco\_msky\_err | koi\_dikco\_msky\_str |

Last updated: 31 August 2017