



Family of Single Channel LED Drivers



Lumissil provides several families of single channel Constant Current Regulators (CCR) designed for diverse LED applications, including the IS32LT3177/3178, IS32LT3151A/B/C/D/E, IS32LT3140A/B/C/D, and IS32LT3141A/B. This article outlines the key differences among these families and explains variations across their suffix versions.

ADVANTAGES OF LUMISSIL CCR DEVICES

Lumissil's constant-current drivers utilize a bandgap pilot reference, unlike legacy CCRs from Infineon's BCR4xx family (now end-of-life) or comparable parts from Diodes Inc., Nexperia, and onsemi, which rely on the V_{BE} of a discrete transistor. Lumissil's temperature-compensated reference ensures stable output current despite variations in supply voltage or temperature. It delivers precise current regulation, avoiding the negative temperature coefficient and line sensitivity common in older V_{BE} -based designs. The closed-loop design inherently incorporates protections like current limiting, thermal roll-off, thermal shutdown, and undervoltage lockout (UVLO), resulting in reliable and accurate performance under adverse conditions. Additionally, the bandgap-pilot approach achieves lower headroom voltage for a given current, which reduces power dissipation, eases calibration, and enhances durability in real-world use. See figure 1.

IS3xLT3177/3178

The IS3xLT3177 and IS3xLT3178 (Industrial or Automotive) are 40V, single-channel, low-side linear current sinks that use an external resistor to set LED current, supporting up to 150mA [SOT23-6] or 200mA [SOP-8-EP]. Both include a pilot reference, output current limiting, managed thermal roll-off, and thermal shutdown with hysteresis. They typically require just 1.2V headroom at 150mA, which simplifies power and thermal designs. The main difference is in their control methods: the IS3xLT3177 handles high-voltage enable signals and can connect directly to VBAT for power-supply modulation (PSM), whereas the IS3xLT3178 uses logic-level inputs (3–5V) for straightforward MCU integration and supports PWM dimming up to around 1kHz.

There are two similar high-side current source families to select from, IS32LT3140x and IS32LT3151x. The IS32LT3140x family is an earlier, very low-IQ, PWM or PSM dimmable regulator optimized for low headroom, while IS32LT3151x is a newer similar family that adds analog current control (ICTRL) and ISO 26262/ASIL-B on select versions.

IS32LT3140x

The IS32LT3140 family of 4 addresses high-side LED sourcing where up to 450mA and minimal headroom are required. Operating from 4.5–40V, all four versions support PWM or PSM dimming and report faults on a shared FAULTB line so multiple channels can be wired in a “one-fail-all-fail” scheme. The A and C options [eTSSOP-14] add single-LED-short (SLS) detection via SDL/SDH comparators that reference the forward voltage of the last cathode grounded LED in a string. The B and D options [SOP-8-EP] omit SLS for a smaller footprint and efficiency; the D variant further reduces both headroom (560mV max at 150mA) and operating current, improving thermal margin during continuous duty or hot-soak conditions. The A/C versions are chosen when explicit SLS diagnostics are required, while B/D fit minimal PCB area and string open/short and over-temperature coverage is sufficient.

IS32LT3151x

The newer IS32LT3151x family of 5 adds diagnostics and thermal-management features while keeping the 40V, single-channel, up-to-450mA high-side architecture with low dropout (typically 700mV at 300mA), PWM/PSM dimming, thermal-shunt support, and FAULTB functionality. The key difference is the ICTRL pin and integrated single-LED-short support available on the higher-pin-count eTSSOP-14 devices (A, C, & E), which enable off-board current binning or NTC-based LED derating and resistor programmable SLS thresholds. The SOP-8-EP devices (B and D) are meant for compact thermal-shunt implementations without ICTRL, while maintaining basic protections and low shutdown current. For designs requiring a safety path, the C, D, and E versions are functional-safety-capable to ISO 26262 (ASIL-B), with the E option providing the most deterministic SLS handling via latch-off behavior.

IS32LT3141x

IS32LT3141A/B introduces a simple asynchronous Onewire control, ideal when the wiring harness or styling concept can benefit from a serialized on/off rather than conventional PWM dimming. The devices remain single-channel, high-side current sources for 4.5–40V and are intended to be cascaded up to roughly thirty nodes, with the MCU sending ON, OFF, and LATCH command frames at 10–100 kbps and issuing a line-level reset to initialize the chain. The A-suffix is the diagnostics-rich option; it includes single-LED-short detection with programmable thresholds, a choice of “one-fail-all-fail” or “one-fail-other-on” fault behavior through FMODE. The B-suffix comes in a smaller SOP-8-EP package and focuses on the core Onewire on/off and fault aggregation without the extra SLS thresholding pins.

Which to Select?

Selecting between these single channel parts is dependent on three questions. If you want the fewest components and low side of the LED string, select IS32LT3177/3178 based on whether the EN pin will carry MCU PWM or will operate with PSM. If you need a high-side source with minimal footprint and shared-fault behavior, and you need thermal shunt and optional safety-capable, the IS32LT3151 family provides SOP-8-EP or eTSSOP-14 features to fit your diagnostics and production-binning plan. If lamp-level diagnostics are the main requirements, then the IS32LT3140A/C with single-LED-short detection and configurable fault actions. Finally consider the IS32LT3141A/B when Onewire serial communication across many nodes simplifies harnessing and sequencing while maintaining fault aggregation for “one-fail-all-fail” compliance.

LUMISSIL FAMILY OF SINGLE CHANNEL LED DRIVER COMPARISON TABLE

Part Number	Control	Diagnostic Highlights	Selection Cue
IS3xLT3177	EN [PSM]	Current-limit, thermal roll-off, TSD	Tie enable to VBAT; simple, stable sink on battery rail
IS3xLT3178	EN [MCU PWM ≤ 1 kHz]	Same protections	Logic-level/PWM dimming without extra level shifting
IS32LT3140A	PWM / PSM	Single-LED-short [SLS], open/short, FAULTB	Use when SLS and configurable fault actions are required [eTSSOP-14]
IS32LT3140B	PWM / PSM	Open/short, FAULTB	Compact without SLS [SOP-8-EP]
IS32LT3140C	PWM / PSM	SLS, open/short, FAULTB	SLS + higher-pin package [eTSSOP-14] for diagnostics depth
IS32LT3140D	PWM / PSM	Open/short, FAULTB	Best thermal/headroom, no SLS [SOP-8-EP]
IS32LT3141A	Onewire on/off [~100 kbps]	SLS, FAULTB; chain up to ~30 nodes	Serialized lamp control with per-LED diagnostics [eTSSOP-14]
IS32LT3141B	Onewire on/off [~100 kbps]	FAULTB; chain up to ~30 nodes	Smallest Onewire node; no SLS [SOP-8-EP]
IS32LT3151A	PWM + ICTRL	Open/short, SLS, FAULTB	Add ICTRL for binning or NTC derating [eTSSOP-14]
IS32LT3151B	PWM; thermal-shunt	Open/short, FAULTB	Cost/footprint focus; thermal-shunt path [SOP-8-EP]
IS32LT3151C	PWM + ICTRL	Functional-Safety-Capable [ISO 26262], SLS, FAULTB	Safety-capable eTSSOP-14 with ICTRL & SLS
IS32LT3151D	PWM; thermal-shunt	Functional-Safety-Capable, FAULTB	Safety-capable SOP-8-EP; no ICTRL or SLS
IS32LT3151E	PWM + ICTRL	SLS with latch-off, Functional-Safety-Capable, FAULTB	Most deterministic SLS handling; safety-capable eTSSOP-14

Common: All devices are 40V, high-side source 450mA, use a bandgap-referenced pilot current, are AEC-Q100 Grade-1, support PWM/EN control, and integrate IC protections [current-limit, thermal roll-off, TSD, UVLO]. High-side families add FAULTB for “one-fail-all-fail.”

Note: IS3xLT3177/3178 are low-side sink @ 150mA in SOT23-6 and 200mA in SOP-8-EP.

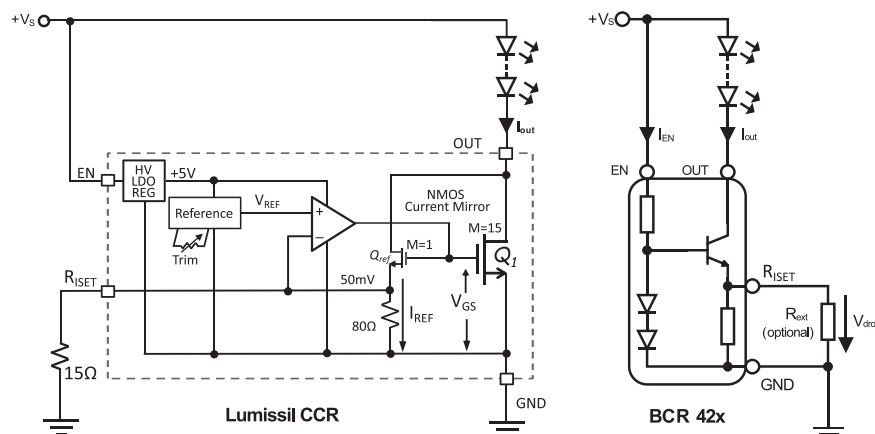


Figure 1: Bandgap Pilot Reference vs BJT V_{BE} Reference