
Crompton 9W LED Bulb PRO: Teardown

Executive Summary

Executive summary of photographic teardown TD-2026-CRM-001 (RFC 1, Level 4)



Product family: Crompton's current 9 W B22 lamp, Dynaray Ecoglo CDL (manufacturer's packshot). The unit torn down is the earlier 9W LED Bulb PRO, CDL, date code 02/19.

Document number	TD-2026-CRM-001-EXECUTIVE-SUMMARY
Revision	1.6.1
Issue date	October 12, 2026
Status	DRAFT
Classification	PUBLIC
Prepared by	Written by copperhead; human review pending
Source	<code>executive-summary.md</code>

Prepared from 54 photographs of one unit, datasheets and online research. Not affiliated with Crompton Greaves Consumer Electricals or Bright Power

Semiconductor. Inference is labelled as inference; nothing is verified against the physical unit.

TD-2026-CRM-001 · RFC 1 v1.5 · declared Level 4, completeness 0.70 · photographs only · draft, unreviewed · full report: `report.md`

Evidence states, following RFC 1 §4:

Label	Meaning
OBSERVED	Read from a photograph.
DERIVED	Computed from observed values.
INFERRED	Engineering judgement.
CONFLICTING	The evidence disagrees.

Nothing here is verified against the physical unit.

1. What the product is

A Crompton "9W LED Bulb PRO, CDL" GLS lamp (B22 cap), dated 02/19. The housing prints 220–240 V 50 Hz, 855 lm, PF > 0.90, BEE 3-star, IS 16102 (Part 1) and BIS R-76000108 (OBSERVED). That gives 95 lm/W, consistent with the 3-star band (DERIVED).

Inside are two boards:

- a single-sided driver in the neck, NBL-DR180425V0.1, 48×24 mm;
- a square, aluminium-backed LED board, NBL7W9S1P2835V1.0, with nine 2835 LEDs in series, screwed to an aluminium cup.

Online. No written teardown of any Crompton bulb exists. Repair videos show the same LED board in a second, flickering unit with a burnt LED, and a sibling 9 W CDL lamp made for the government UJALA scheme (09LBS09-9, 900 lm) with the same print layout. They show the driver too coarsely to confirm its IC.

2. Core architecture

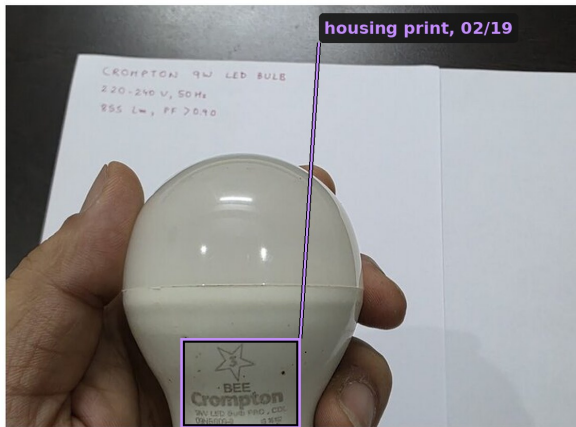
The driver is a single-stage, non-isolated, high-power-factor buck (INFERRED 0.80):

The rectified bus carries no electrolytic capacitor. The controller follows the rectified sine, which is how a buck reaches PF > 0.9. The low string voltage helps: the dead zone is only 14° per zero crossing. All bulk capacitance sits on the LED side.

3. Most important components

Part	Identification	State	Conf.
U1	Bright Power BP2336J APFC buck, 500 V MOSFET (best guess). Marking BP2+6/8+3+5/6, 1BD96CS, H1AM46J	INFERRED	0.75
R4	2R0: 2.0Ω current-sense resistor, giving $I_{LED} = 0.200 \text{ V} \div 2.0 \Omega \approx 100 \text{ mA}$	DERIVED	0.75
C3	$68 \mu\text{F}$ 100 V 105 °C output electrolytic, the only bulk storage	OBSERVED	0.90
LED1–9	2835, about 9 V class, $\approx 0.9 \text{ W}$ each, on a board printed 7W	DERIVED	0.60
Input	68Ω fusible resistor, 07D511K MOV, MB10F bridge, two $0.1 \mu\text{F}$ film caps (WEIDY); freewheel diode ES1J	DERIVED / OBSERVED	0.75–0.95

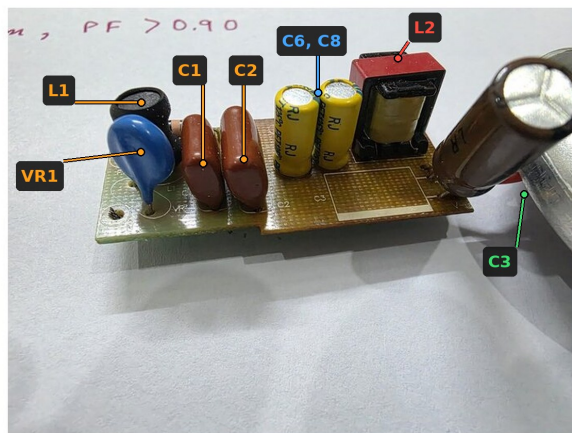
Overview: the lamp, its LED board and both faces of the driver



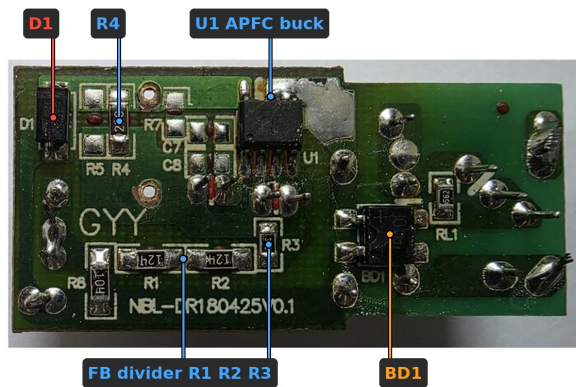
(a) Lamp and housing print



(b) LED board, 9 x 2835 in series



(c) Driver, component face



(d) Driver, copper/SMD face

■ mechanical, identity
 ■ finding
 ■ input and protection
 ■ control, sense, feedback
 ■ power stage
 ■ output and LEDs
 Each part is shown in detail with its role in §3, §5, §9 and §10.

Overview, labelled: (a) lamp and housing print, (b) LED board, (c) driver component face, (d) driver copper/SMD face

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mains → 68 Ω fusible resistor → MOV 07D511K → MB10F bridge
        → π filter 0.1 μF – L – 0.1 μF (no bulk capacitor on the bus)
        → BP2336J APFC buck (best guess; 2.0 Ω sense)
        → 68 μF 100 V → 9 × 2835 LEDs in series, ≈ 81 V at ≈ 100 mA
    
```

U1 is BP2336J by best guess.

- **The circuit** fits a BP233x-class high-PF buck and no other part in hand:
 - two 50 V capacitors (COMP and VCC);
 - a 240 k / 3.6 k feedback divider giving a 108 V over-voltage limit;
 - "PF > 0.90" with no bus electrolytic.
- **Line 3 of the marking** ends in J, the BP233xJ format.
- **Against it:** line 1 reads "BP2" + 6/8 + 3 + 5/6, and the package has 7 leads. The parts line 1 alone would allow are ruled out by the board:
 - BP2636 is a boost stage, which can't drive an 81 V string through a 100 V capacitor;
 - BP2836D and BP2836DJ are through-hole.
- **Two continuity checks would confirm it:** which U1 pins the yellow capacitors land on, and whether pin 4 meets the divider.

4. What the design does well

- About 20 parts. PF > 0.9 with no bus electrolytic. One wave-solder pass.
- An Indian-market input stage: a fusible resistor in place of fuse plus NTC, a MOV, and a π filter.
- Dual THT/SMD footprints and a sense-resistor trim position: one board can serve several variants and suppliers.
- Datasheet layout rules followed where visible: VCC and COMP capacitors at the pins, an enlarged drain pour, and a two-resistor FB upper leg for voltage stress.

5. Largest engineering risks

Id	Sev.	Conf.	Finding
RISK-01	high	0.65	LEDs driven ~16% over their board's printed 7 W, ~0.9 W per 2835. A burn spot over a die is visible on the centre LED, and a public repair video of a flickering Crompton lamp shows the same LED board with the same mark. In a series string, one open die darkens the lamp.
RISK-02	medium	0.45	The open-LED overvoltage setpoint, $1.6 \text{ V} \times 243.6 \text{ k} / 3.6 \text{ k} \approx \mathbf{108 \text{ V}}$, sits above C3's 100 V rating. This depends on R1+R2/R3 being the FB divider.
RISK-03	medium	0.45	Surge margin unverified: the 510 V MOV's clamp against the 500 V MOSFET, with only 0.2 μF on the bus. This 2019 unit prints no surge claim.
RISK-04	medium	0.35	Estimated 17–25% flicker at 100 Hz from single-stage PFC into 68 μF (weak estimate).

6. How complete the teardown is

Completeness is **0.70** against Level 4.

- **Strong:** product (0.90), architecture (0.85), components (0.80), power tree (0.80).
- **Weak:** connectivity (0.40), because all 16 nets are mapped from the reference design and the copper under the green mask could not be read. PCB routing is also weak (0.40).

Self-assessed quality is 0.81. Nothing was measured, so Level 5 is not claimed. Of 19 tracked unknowns, three would move the analysis most:

Id	Unknown	How to resolve
UNK-002	U1 identity: best guess BP2336J (0.75)	Continuity checks 1 and 5; a raking-light macro of line 1
UNK-003	Whether the reconstructed nets are real	~40-probe continuity pass after discharging the capacitors
UNK-004	LED current and voltage	Powered measurement by a qualified operator with an isolation transformer; the board is non-isolated and live at mains

7. What an engineer should learn from it

- **Pattern.** A low-voltage LED string ($\approx \frac{1}{4}$ of line peak) plus an APFC buck gives $PF > 0.9$ with no bus electrolytic. The cost is 100 Hz ripple on the output capacitor.
- **Candidate check rules for Copperhead Check:**
 - output capacitor voltage rating $\geq 1.1 \times$ OVP setpoint;
 - power per LED package against its rating, never the LED board's label;
 - a flicker estimate for designs without bulk capacitance;
 - working voltage per resistor in HV divider chains;
 - MOV clamp voltage against MOSFET BVDSS.
- **Process.** Marking reads disagreed, by camera and by eye alike. A shared marking format briefly passed for proof; it isn't, because several BPS families print the same form. A part number needs the marking and the circuit to agree, or a continuity check to settle it.