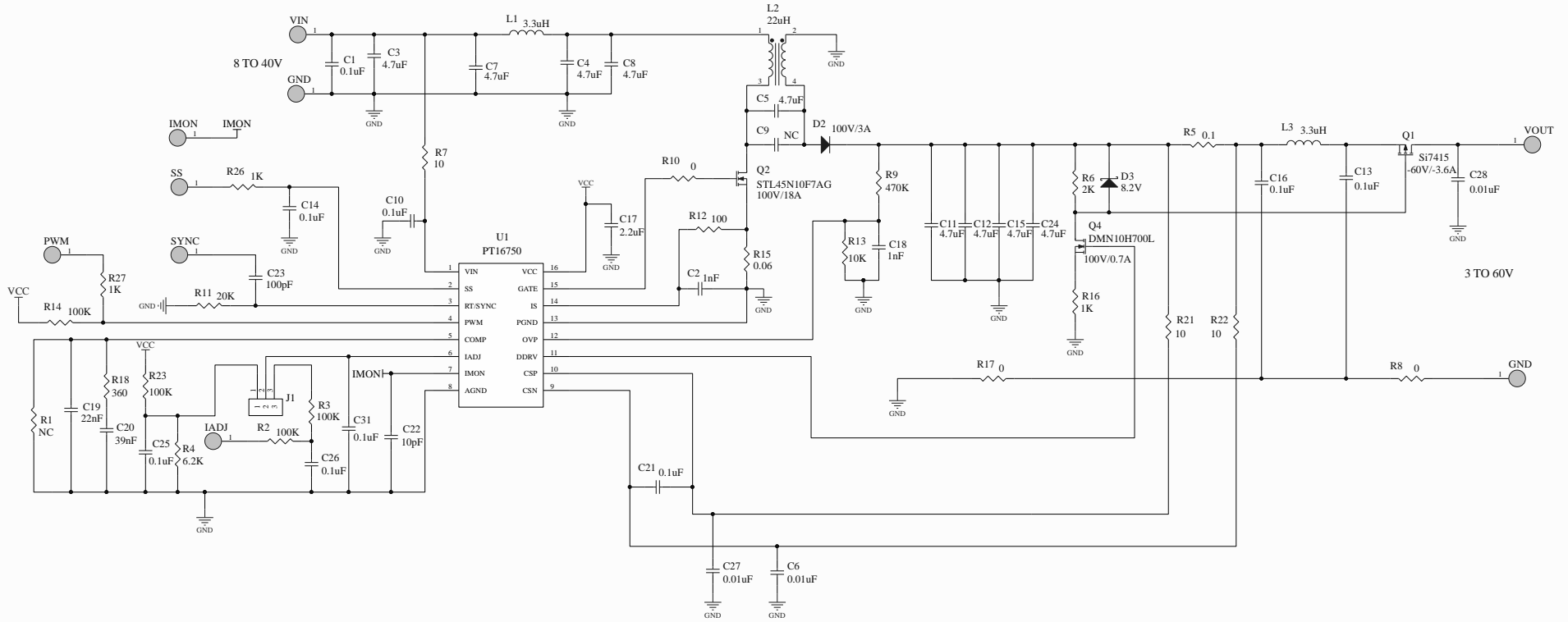




## PT16750 LED Driver test report

| Parameter   | Specifications   |
|---|------------------|
| Topology  | SEPIC            |
| Input voltage range   | 8~40V            |
| Output voltage range  | 9~27V (3~9 LEDs) |
| Output current  | 100~1500mA       |
| Efficiency<br>(Input voltage = 14 V, 7 LEDs, ILED = 700 mA) | ≈90%             |
| Switching frequency   | 400 kHz          |
| Over-voltage protection                                     | 60V              |

# 1. Schematic



## 2. BOM

| Designator                             | Qty | Value          | Description   | Package        |
|--|-----|----------------|---|----------------|
| C1, C10, C13, C16                      | 4   | 0.1uF          | CAP, CERM, 0.1 $\mu$ F, 100 V, +/- 10%, X7R                     | 0805           |
| C2, C18                                | 2   | 1nF            | CAP, CERM, 1nF, 50 V, +/- 10%, X7R                              | 0805           |
| C3, C4, C5, C7, C8, C11, C12, C15, C24 | 9   | 4.7uF          | CAP, CERM, 4.7 $\mu$ F, 100 V, +/- 10%, X7S                     | 1210           |
| C6, C27, C28                           | 3   | 0.01uF         | CAP, CERM, 0.01uF, 50 V, +/- 10%, X7R                           | 0805           |
| C9                                     |     | NC             |   |                |
| C14, C21, C25, C26, C31                | 5   | 0.1uF          | CAP, CERM, 0.1 $\mu$ F, 50 V, +/- 10%, X7R                      | 0805           |
| C17                                    | 1   | 2.2uF          | CAP, CERM, 2.2uF, 50 V, +/- 10%, X7R                            | 0805           |
| C19                                    | 1   | 22nF           | CAP, CERM, 22nF, 50 V, +/- 10%, X7R                             | 0805           |
| C20                                    | 1   | 39nF           | CAP, CERM, 39nF, 50 V, +/- 10%, X7R                             | 0805           |
| C22                                    | 1   | 10pF           | CAP, CERM, 10pF, 50 V, +/- 10%, X7R                             | 0805           |
| C23                                    | 1   | 100pF          | CAP, CERM, 100pF, 50 V, +/- 10%, X7R                            | 0805           |
| D2                                     | 1   | PDS3100Q       | Diode, Schottky, 100 V, 3 A, AEC-Q101                           | PowerDI5       |
| D3                                     | 1   | 8.2V           | Diode, Zener, 8.2 V, 200 mW                                     | SOD-323        |
| L1, L3                                 | 2   | SRN6045TA-3R3Y | Inductor, Shielded, Ferrite, 3.3 $\mu$ H, 5 A                   | 6mmX4.2mm      |
| L2                                     | 1   | SRF1280A-220M  | Coupled inductor, 22 $\mu$ H, 7.57 A (MSD1278T-223MLB AEC-Q200) | 12.5mmX12.5mm  |
| Q1                                     | 1   | Si7415         | MOSFET, P-CH, -60V, -3.6 A                                      | 1212-8         |
| Q2                                     | 1   | STL45N10F7AG   | MOSFET, N-CH, 100V, 18 A, AEC-Q10 (STL8N10LF3,AEC-Q101)         | PowerFLAT™ 5x6 |
| Q4                                     | 1   | DMN10H220L     | MOSFET, N-CH, 100V, 1.4 A                                       | SOT-23         |
| R1                                     |     | NC             |   |                |
| R2, R3, R14, R23                       | 4   | 100K           | RES, 100k, 1%, 0.125 W  | 0805           |
| R4                                     | 1   | 6.2K           | RES, 6.2k, 1%, 0.125 W  | 0805           |
| R5                                     | 1   | 0.1            | RES, 0.1 OHM, 1%, 0.75 W  | 1812           |
| R6                                     | 1   | 2K             | RES, 2k, 1%, 0.125 W  | 0805           |
| R7                                     | 1   | 10             | RES, 10k, 1%, 0.25 W  | 1206           |
| R8, R10                                | 2   | 0              | RES, 0 OHM, 1%, 0.25 W  | 1206           |
| R9                                     | 1   | 470K           | RES, 470k, 1%, 0.125 W  | 0805           |
| R17                                    | 1   | 0              | RES, 0 OHM, 1%, 0.75 W  | 1812           |
| R11                                    | 1   | 20K            | RES, 20k, 1%, 0.125 W   | 0805           |
| R12                                    | 1   | 100            | RES, 100, 1%, 0.125 W   | 0805           |
| R13                                    | 1   | 10K            | RES, 10k, 1%, 0.125 W   | 0805           |
| R15                                    | 1   | 0.06           | RES, 0.06 OHM, 1%, 1W   | 2512           |
| R16, R26, R27                          | 3   | 1K             | RES, 1k, 1%, 0.125 W  | 0805           |



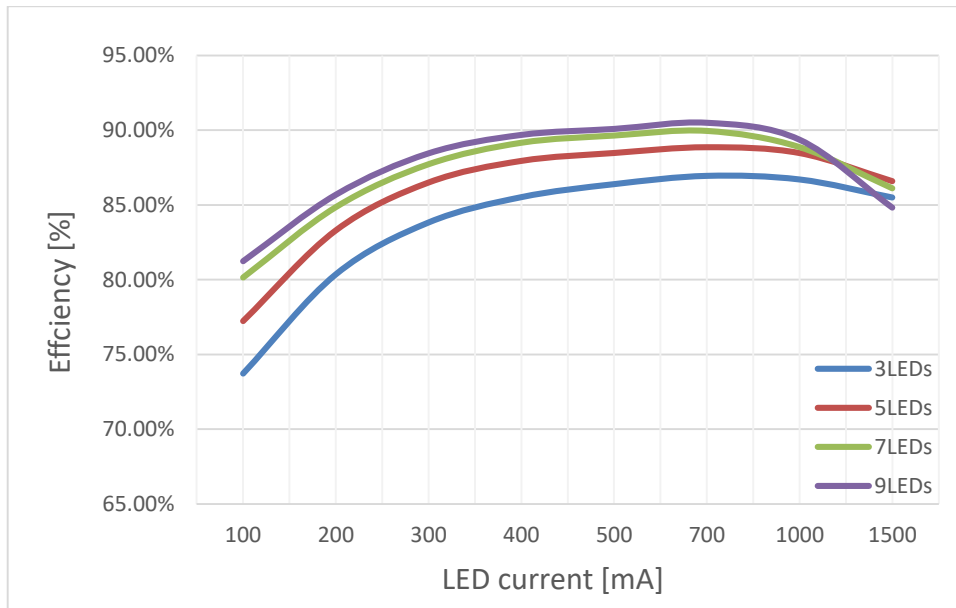
|          |   |         |   |          |
|----------|---|---------|---|----------|
| R18      | 1 | 360     | RES, 360, 1%, 0.125 W                             | 0805     |
| R21, R22 | 2 | 10      | RES, 10, 1%, 0.125 W                              | 0805     |
| U1       | 1 | PT16750 | Multi-Topology Automotive<br>Headlight LED Driver | HTSSOP16 |

### 3. Performance Data and Typical Characteristic Curves

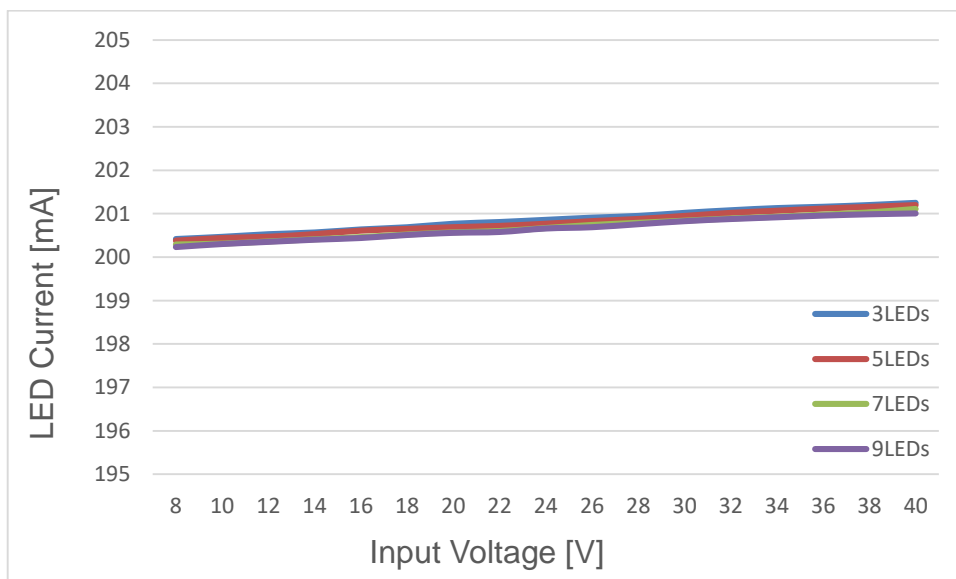
#### 3.1 Efficiency

Test condition: VIN=14V

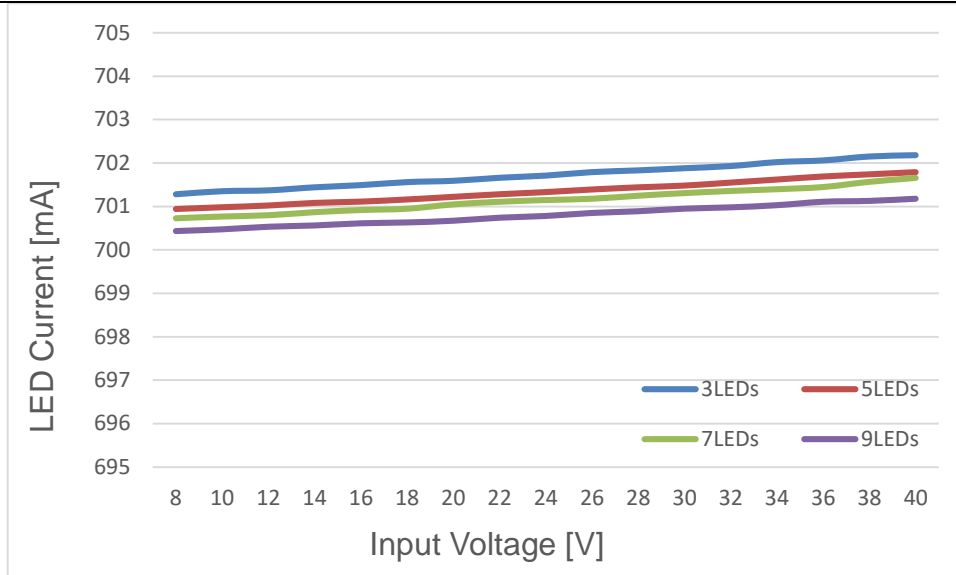
|              | I <sub>LED</sub> [mA] | 100    | 200    | 300    | 400    | 500    | 700    | 1000   | 1500   |
|--------------|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| <b>3LEDs</b> | Eff [%]               | 73.72% | 80.36% | 83.82% | 85.52% | 86.39% | 86.94% | 86.70% | 85.49% |
| <b>5LEDs</b> |                       | 77.24% | 83.30% | 86.50% | 87.95% | 88.47% | 88.86% | 88.47% | 86.59% |
| <b>7LEDs</b> |                       | 80.15% | 84.85% | 87.72% | 89.16% | 89.64% | 89.95% | 88.87% | 86.11% |
| <b>9LEDs</b> |                       | 81.24% | 85.69% | 88.46% | 89.69% | 90.09% | 90.50% | 89.37% | 84.83% |



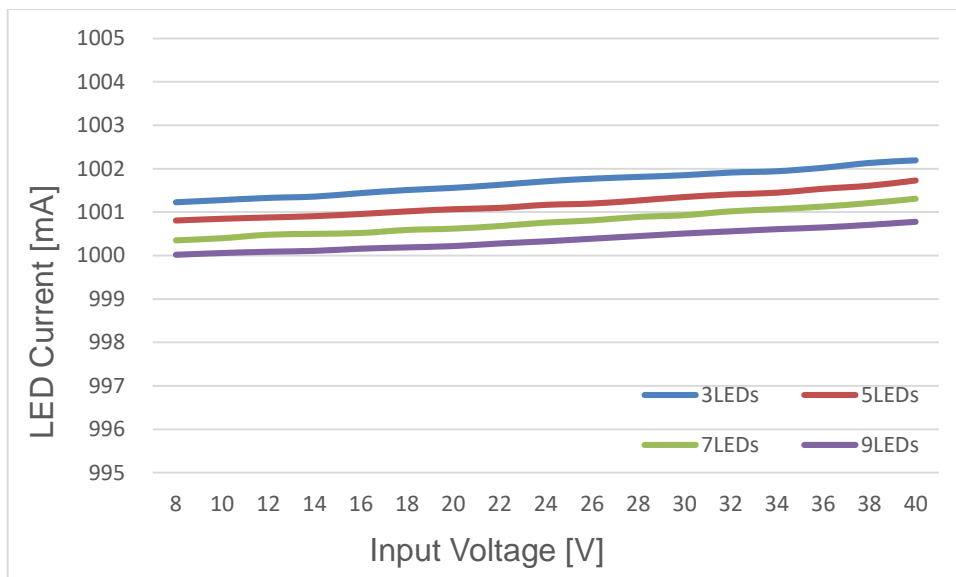
#### 3.2 Line Regulation



**Output LED Current vs. Input Voltage (I<sub>LED</sub>=200mA)**



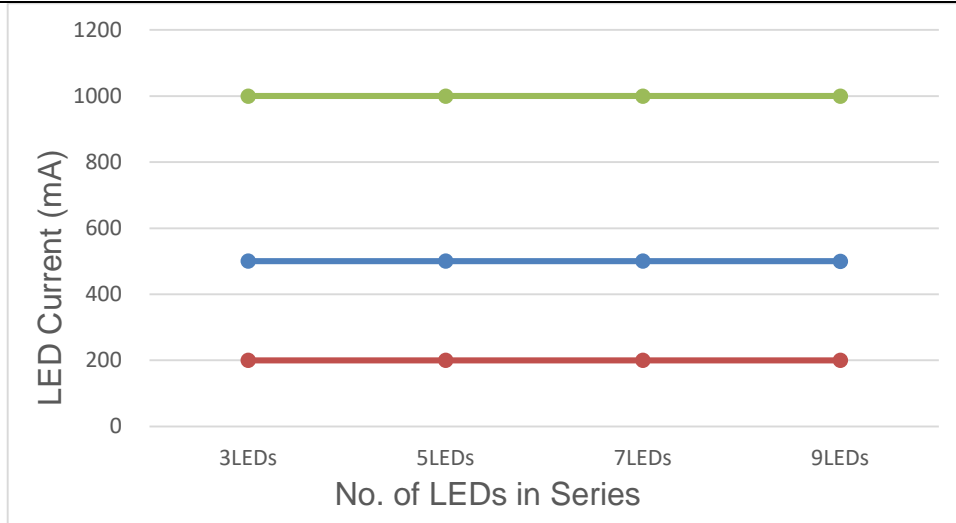
**Output LED Current vs. Input Voltage (I<sub>LED</sub>=700mA)**



**Output LED Current vs. Input Voltage (I<sub>LED</sub>=1000mA)**

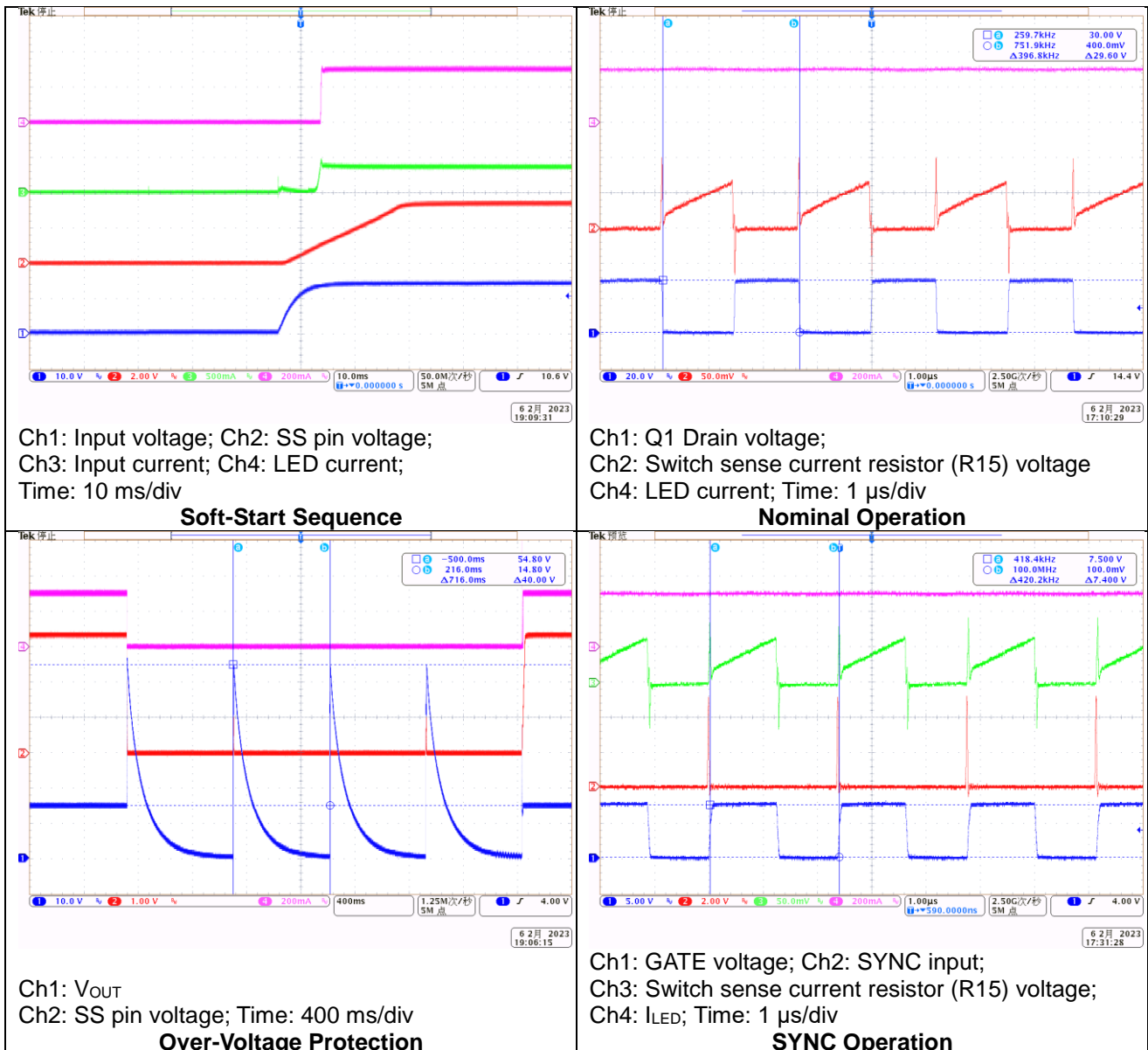
### 3.3 Load Regulation

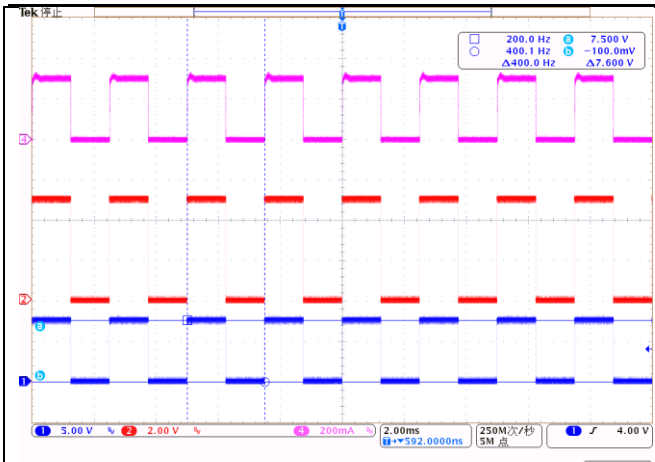
| I <sub>LED</sub> | 3LEDs  | 5LEDs  | 7LEDs  | 9LEDs  |
|------------------|--------|--------|--------|--------|
| 100              | 100.5  | 100.4  | 100.4  | 100.3  |
| 200              | 200.3  | 200.3  | 200.2  | 200.2  |
| 300              | 300.1  | 300.0  | 299.9  | 299.9  |
| 400              | 400.5  | 400.5  | 400.5  | 400.5  |
| 500              | 500.4  | 500.4  | 500.4  | 499.8  |
| 700              | 700.0  | 700.0  | 700.0  | 700.0  |
| 1000             | 1000.0 | 1000.1 | 1000.1 | 1000.1 |
| 1500             | 1500.0 | 1500.1 | 1500.1 | 1500.0 |



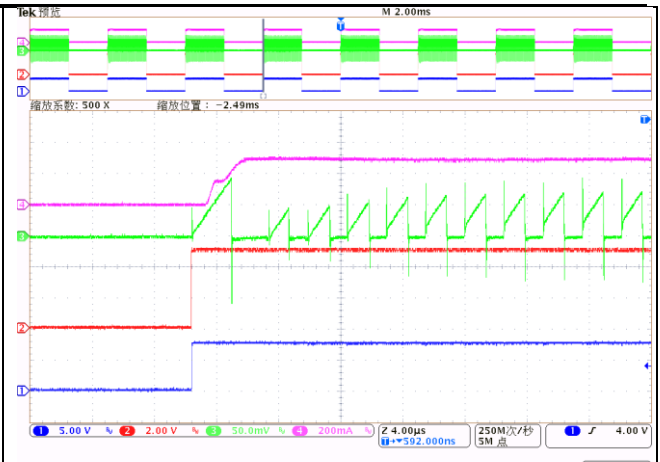
**Output LED Current vs. LED String Configuration**

### 4. Typical Waveforms

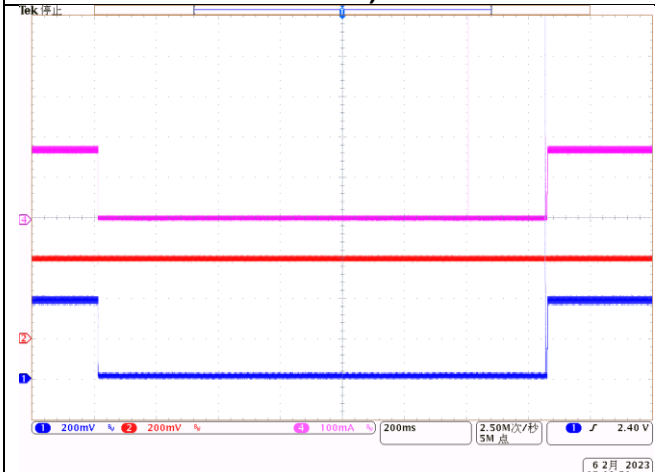




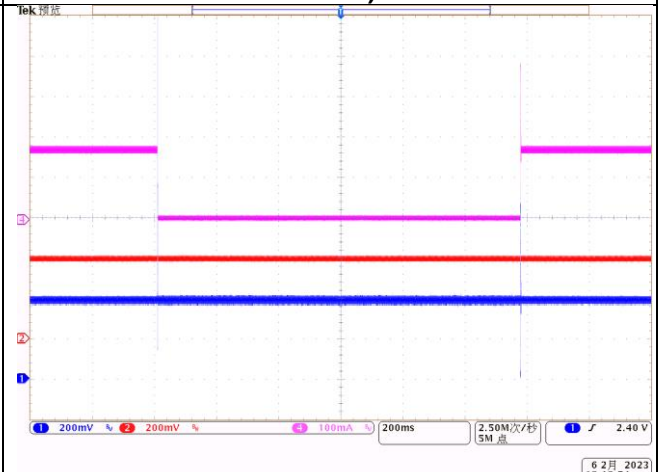
Ch1: DDRV voltage; Ch2: PWM input;  
Ch4: LED current; Time: 2ms/div  
**PWM Dimming (Duty cycle = 50%, Frequency = 400 Hz)**



Ch1: DDRV voltage; Ch2: PWM input;  
Ch3: Switch sense current resistor (R15) voltage;  
Ch4: LED current; Time: 4 us/div  
**PWM Dimming (Duty cycle = 50%, Frequency = 400 Hz)**



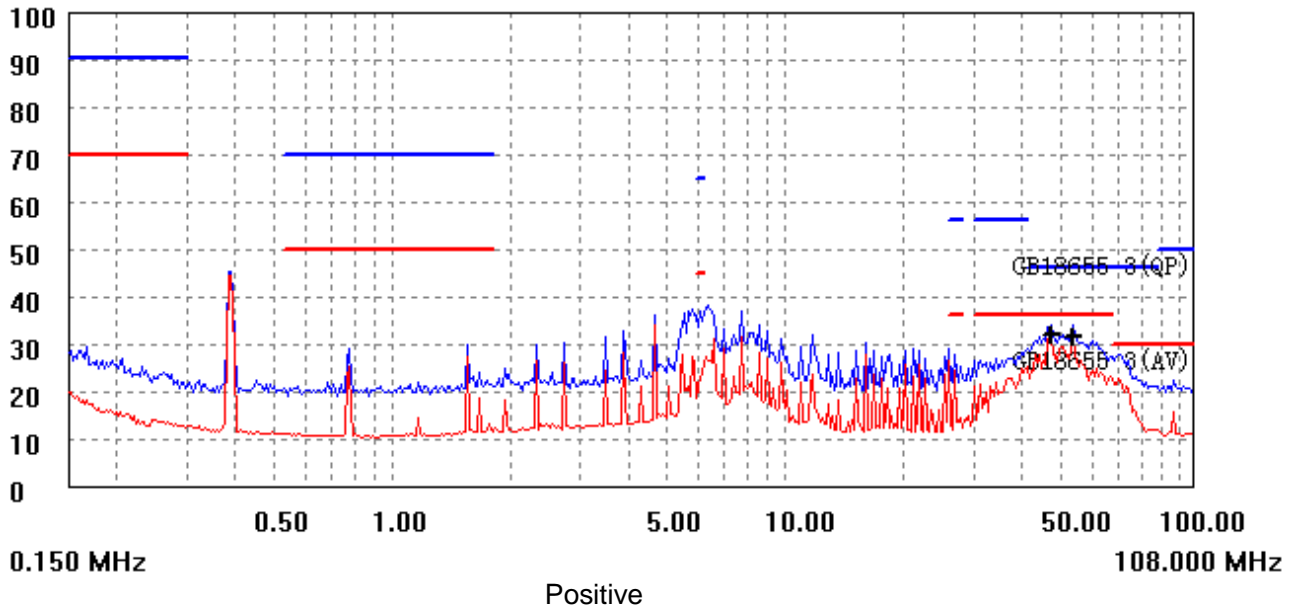
Ch1: IMON voltage; Ch2: IADJ; Ch4: LED current;  
Time: 200 ms/div  
**IMON Response to LED Open-Circuit Fault**



Ch1: IMON voltage; Ch2: IADJ; Ch4: LED current;  
Time: 200 ms/div  
**IMON Response to LED Short-Circuit Fault**

## 5. EMI Conducted Emission

dBuV



dBuV

