



PT16752 LED Driver test report

Parameter	Specifications
Topology	SEPIC
Input voltage range	8~40V
Output voltage range	9~39V (3~13 LEDs)
Output current	100~1000mA
Efficiency (Input voltage = 14 V, 8 LEDs, ILED = 500 mA)	≈90%
Switching frequency	400 kHz
Over-voltage protection	55V

1. Schematic

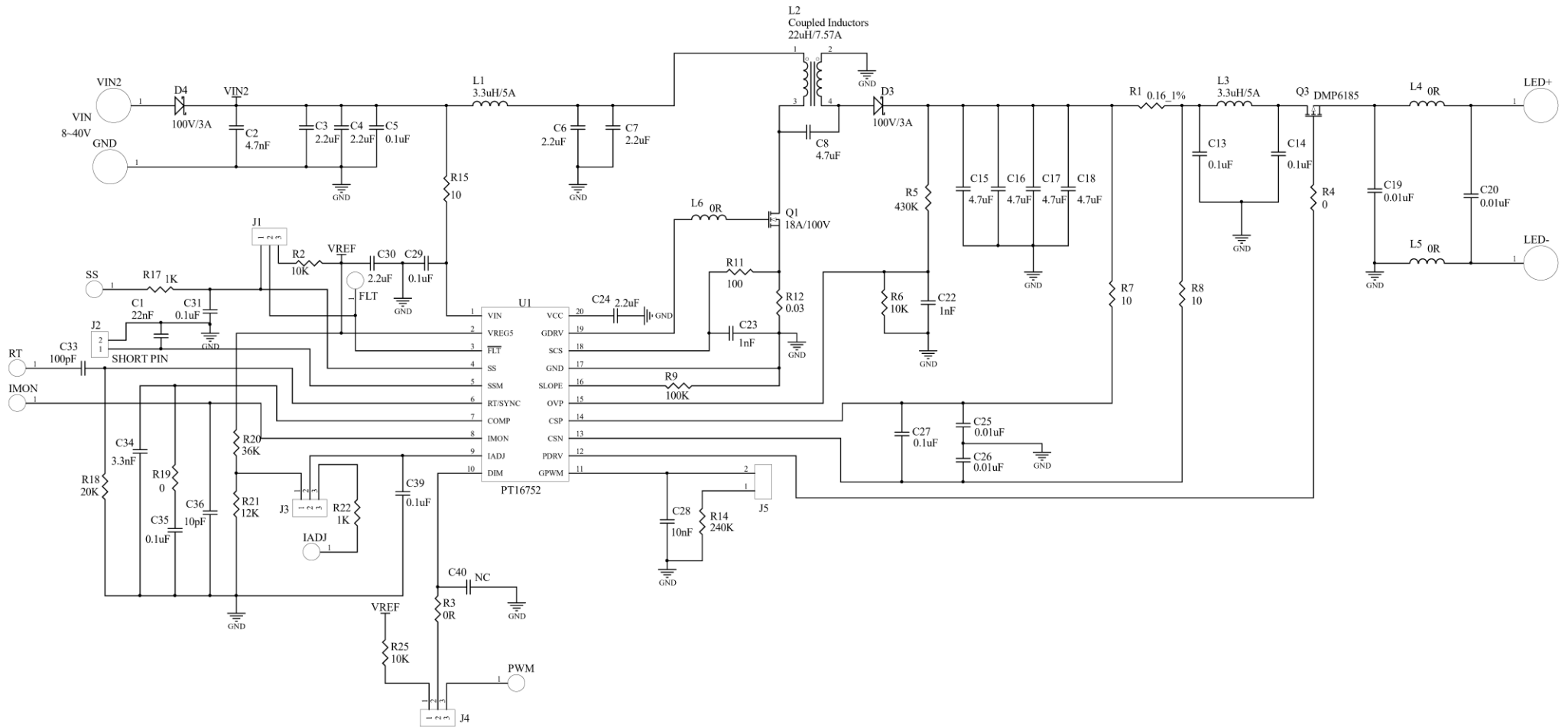


Figure 1. Schematic

2. BOM

Designator	Qty	Value	Description	Package
C1	1	22nF	CAP, CERM, 22nF, 50 V, +/- 10%, X7R	0805
C2	1	4.7nF	CAP, CERM, 4.7n,100V, +/- 10%, X7R	0805
C3, C4, C6, C7	4	2.2uF	CAP, CERM, 2.2 μ F, 100 V, +/- 10%, X7R	1210
C5, C13, C14, C29	4	0.1uF	CAP, CERM, 0.1u,100V, +/- 10%, X7R	0805
C8, C15, C16, C17, C18	5	4.7uF	CAP, CERM, 4.7 μ F, 100 V, +/- 10%, X7R	1210
C19, C20, C25, C26,	4	10nF	CAP, CERM, 10nF, 100 V, +/- 10%, X7R	0805
C22, C23	2	1nF	CAP, CERM,1nF, 50 V, +/- 10%, X7R	0805
C24, C30	2	2.2uF	CAP, CERM, 2.2 μ F, 25 V, +/- 10%, X7R	0805
C28	1	10nF	CAP, CERM, 10nF, 50 V, +/- 10%, X7R	0805
C27,C31, C35, C39	4	0.1uF	CAP, CERM, 0.1u,25V, +/- 10%, X7R	0805
C33,C42	2	100pF	CAP, CERM, 100pF, 50 V, +/- 10%, X7R	0805
C34	1	3.3nF	CAP, CERM, 3.3nF, 50 V, +/- 10%, X7R	0805
C36	1	10pF	CAP, CERM, 10pF, 50 V, +/- 10%, X7R	0805
D3,D4	2	PDS3100Q	Diode, Schottky, 100 V, 3 A, AEC-Q101	PowerDI5
L1, L3	2	SRN6045TA-3R3Y	Inductor, Shielded, Ferrite, 3.3 uH, 5 A	6mmX4.2mm
L2	1	SRF1280A-220M	Coupled inductor, 22 uH, 7.57 A (MSD1278T-223MLB AEC-Q200)	12.5mmX12.5mm
L4, L5, L6	4	0 Ω	RES, 0 OHM, 1%, 0.25 W	1206
Q1	1	STL45N10F7AG	MOSFET, N-CH, 100V, 18 A, AEC-Q101 (STL8N10LF3,AEC-Q101)	PowerFLAT™ 5x6
Q3	1	DMP6185SEQ-13	MOSFET, P-CH, 60V, 3 A, AEC-Q10	SOT223
R1	1	0.16 Ω	RES, 0.16 OHM, 1%, 0.5 W	1210
R2, R6, R25	3	10K	RES, 10k, 1%, 0.125 W	0805
R17, R22	2	1K	RES, 1k, 1%, 0.125 W	0805
R3, R4, R19	3	0 Ω	RES, 0 Ω , 1%, 0.125 W	0805
R5	1	430K	RES, 430k, 1%, 0.125 W	0805
R7, R8	2	10 Ω	RES, 10 OHM, 1%, 0.125 W	0805
R9	1	100K	RES, 100k, 1%, 0.125 W	0805
R11	1	100 Ω	RES, 100 OHM, 1%, 0.125 W	0805
R12	1	0.03 Ω	RES, 0.03 OHM, 1%, 1W	2512
R14	1	240K	RES, 240k, 1%, 0.125 W	0805
R15	1	10 Ω	RES, 10 OHM, 1%, 0.25 W	1206



R18	1	20K	RES, 20K, 1%, 0.125 W	0805
R20	1	30K	RES, 30K, 1%, 0.125 W	0805
R21	3	9.1K	RES, 9.1k, 1%, 0.125 W	0805
U1	1	PT16752	Multi-Topology Automotive Headlight LED Driver	HTSSOP20

3. Performance Data and Typical Characteristic Curves

3.1 Efficiency (D4 removed)

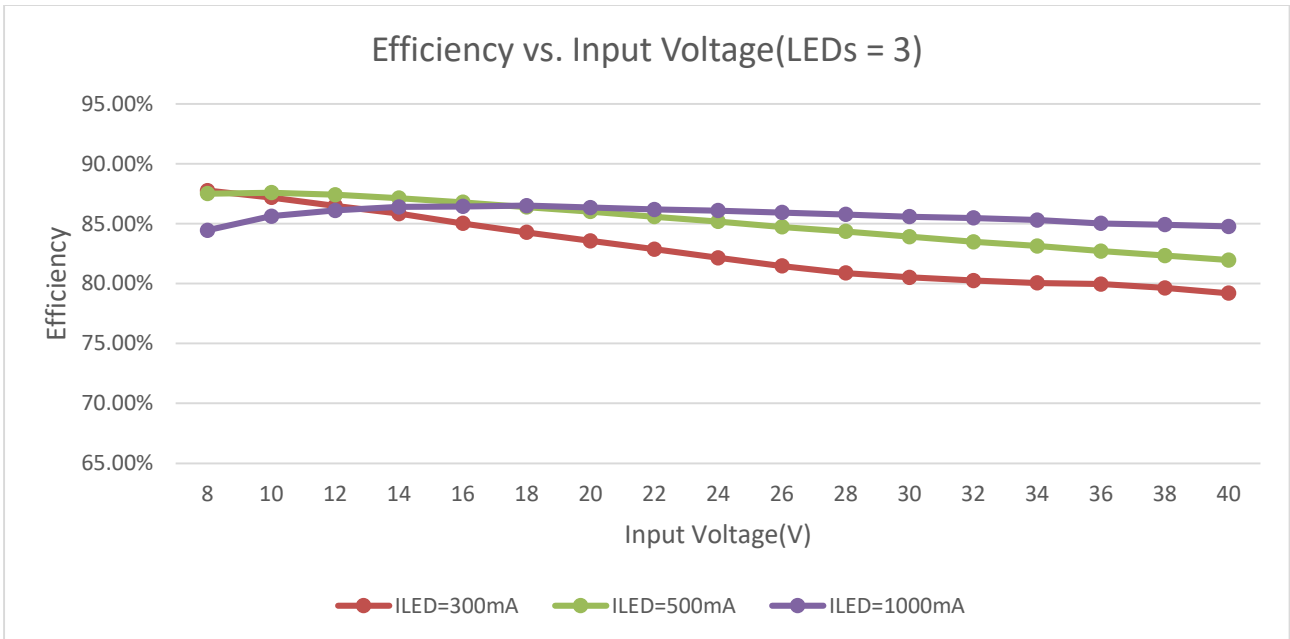


Figure 2. Efficiency vs Input Voltage (Number of Series-Connected LEDs = 3)

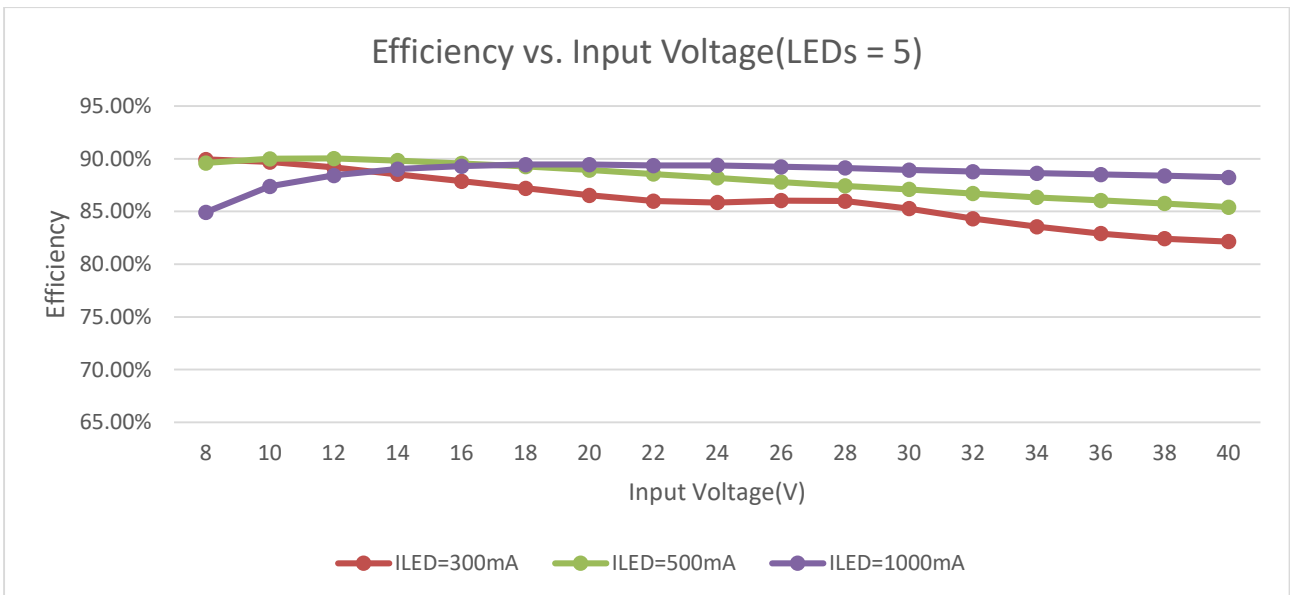


Figure 3. Efficiency vs Input Voltage (Number of Series-Connected LEDs = 5)

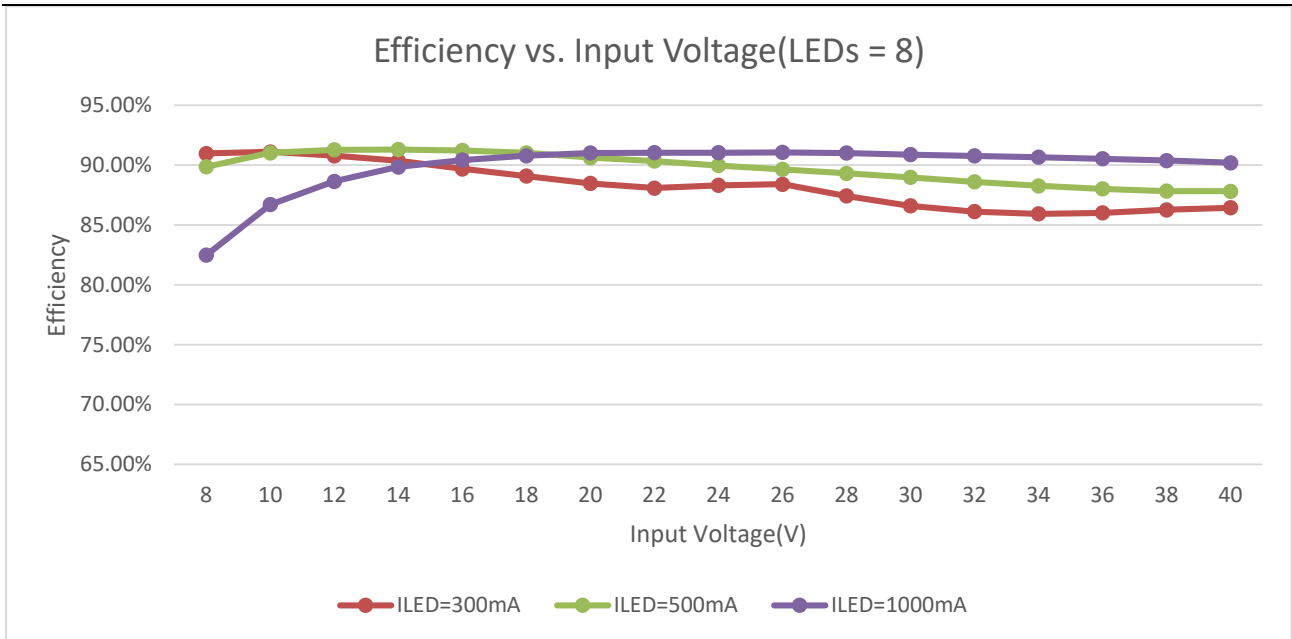


Figure 4. Efficiency vs Input Voltage (Number of Series-Connected LEDs = 8)

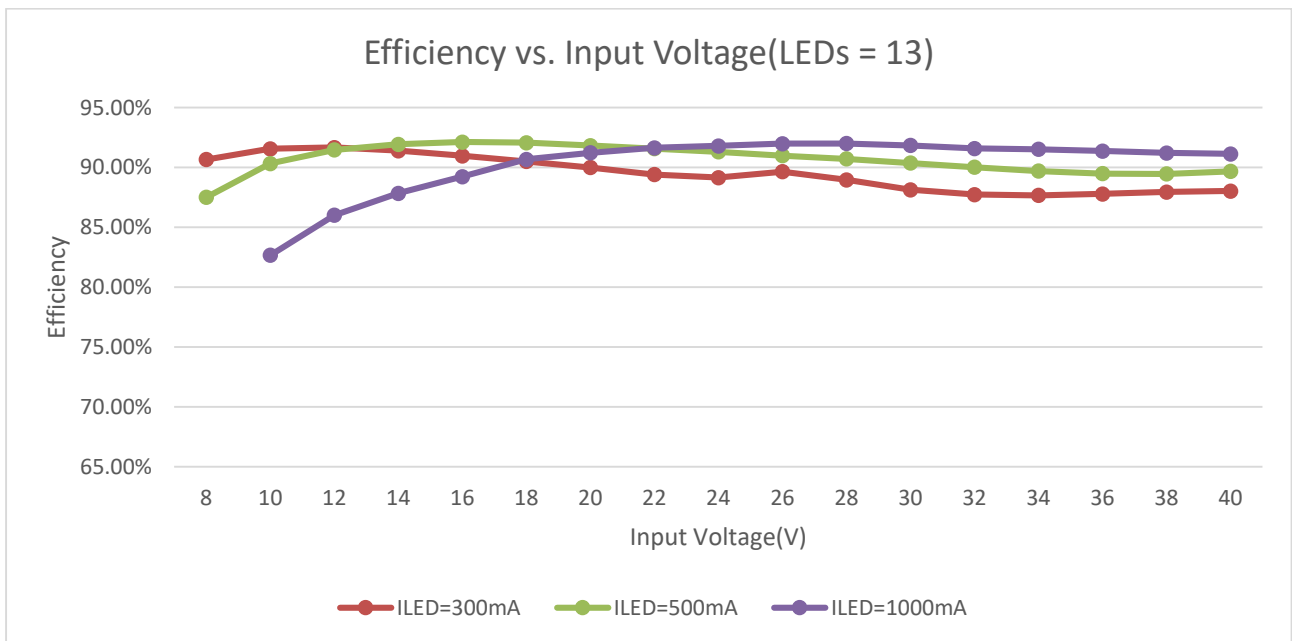


Figure 5. Efficiency vs Input Voltage (Number of Series-Connected LEDs = 13)

3.2 Line Regulation

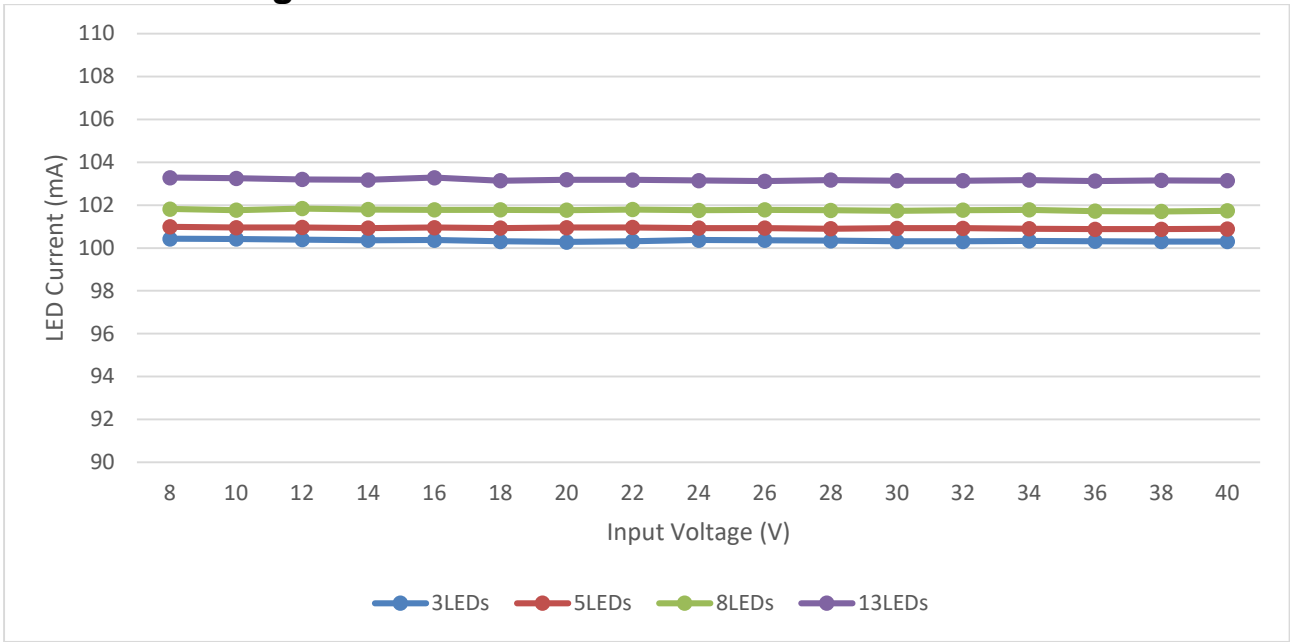


Figure 6. Output LED Current vs Input Voltage (VIADJ = 216 mV)

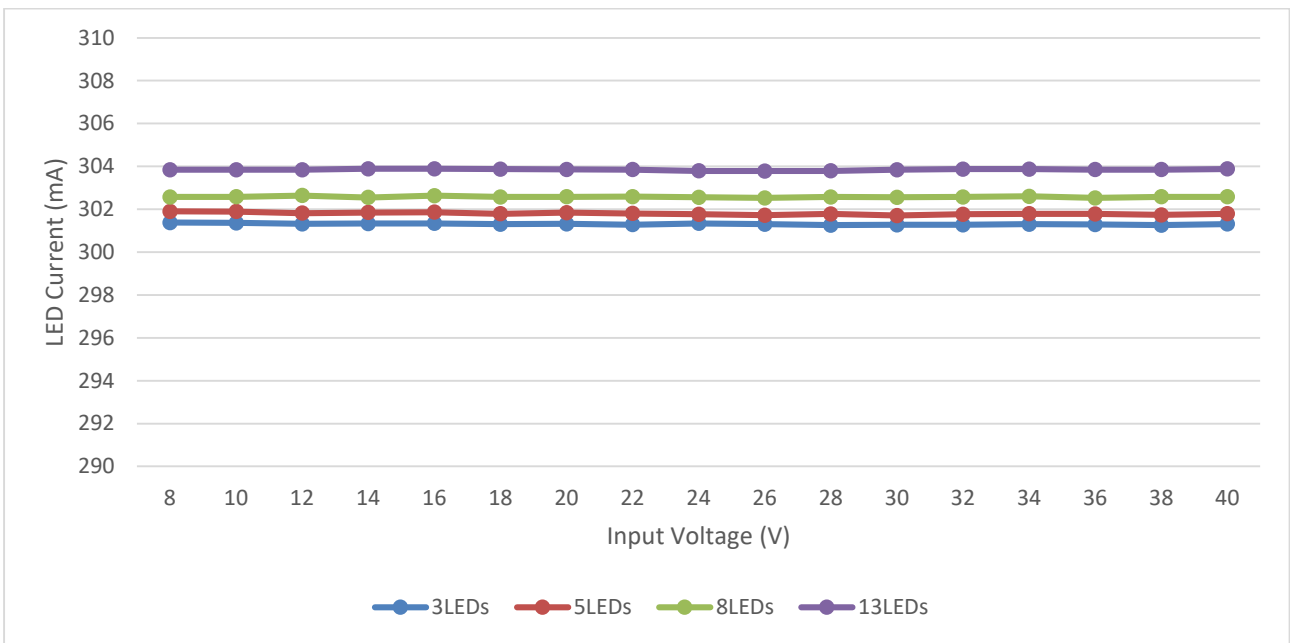


Figure 7. Output LED Current vs Input Voltage (VIADJ = 670 mV)

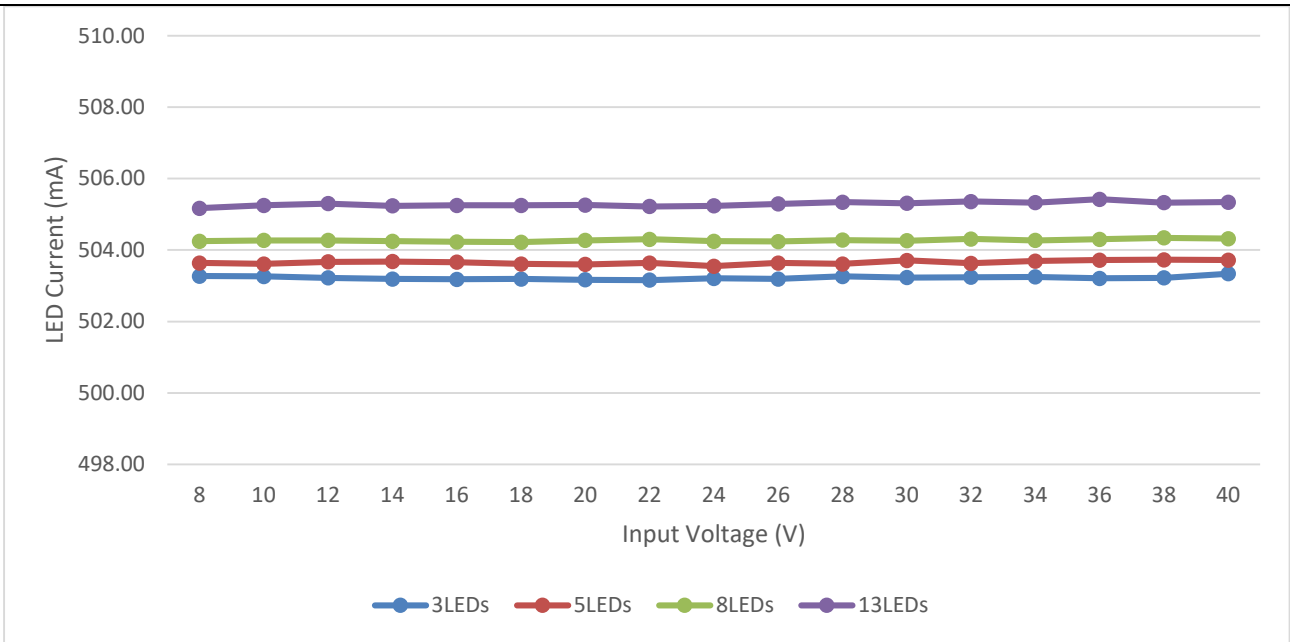


Figure 8. Output LED Current vs Input Voltage (VIADJ =1128 mV)

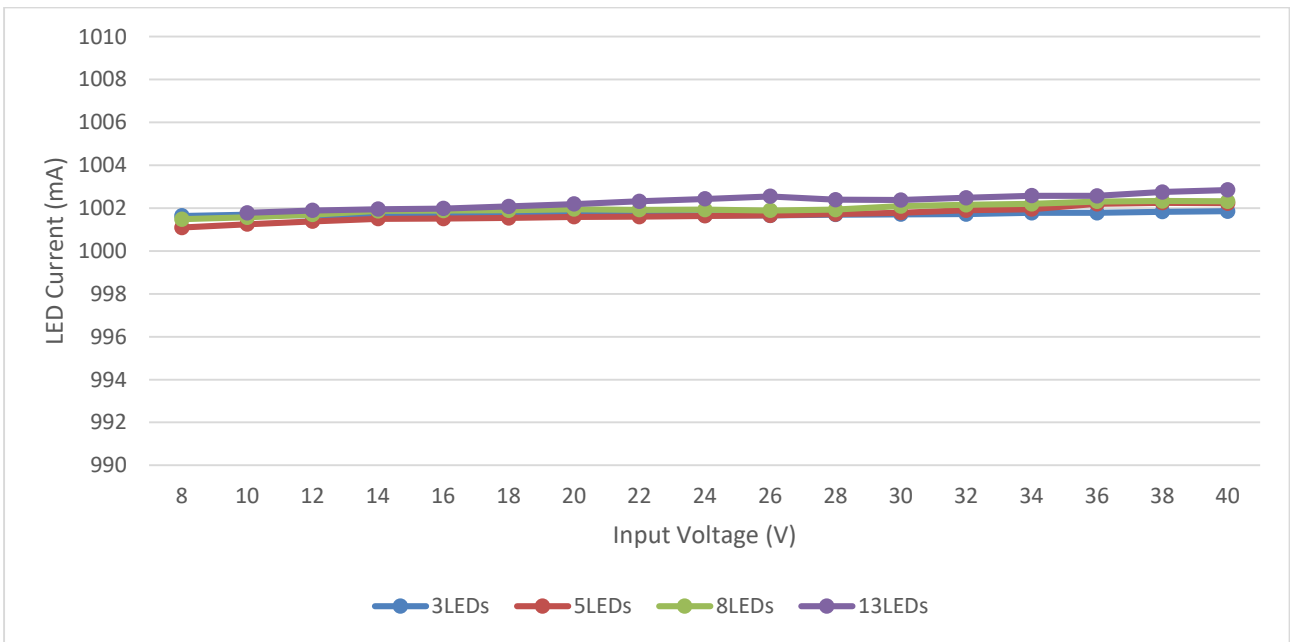


Figure 9. Output LED Current vs Input Voltage (VIADJ =2268 mV)

3.3 Load Regulation

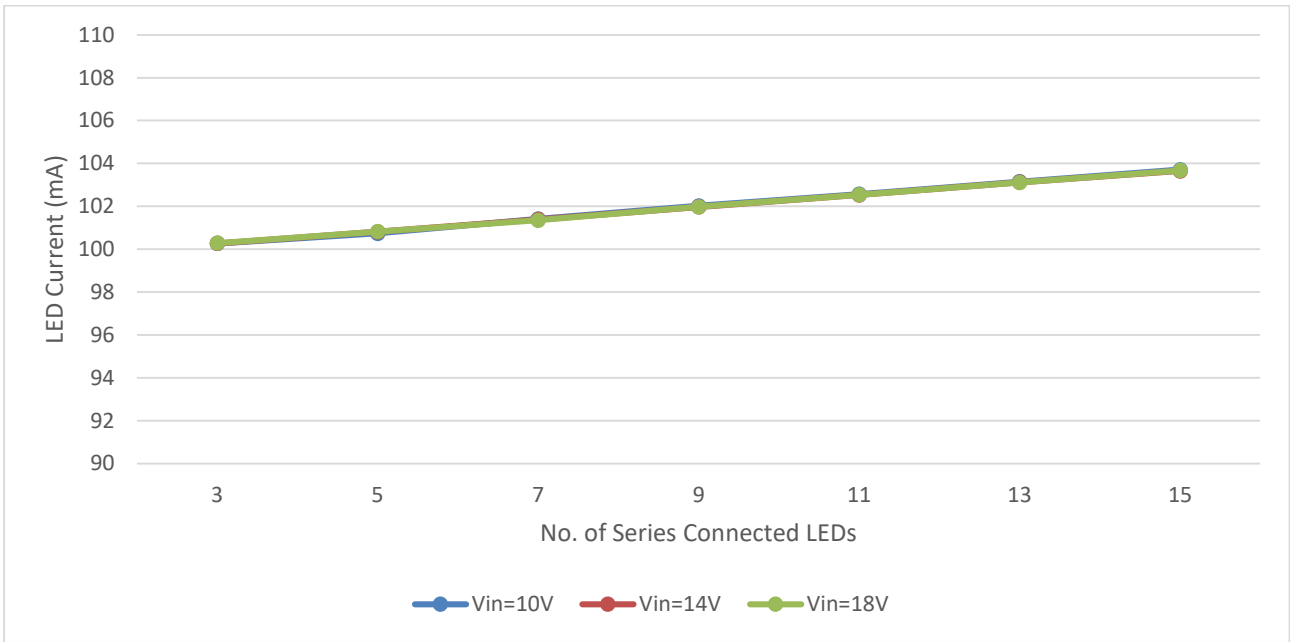


Figure 10. Output LED Current vs LED String Configuration (VIADJ = 216 mV)

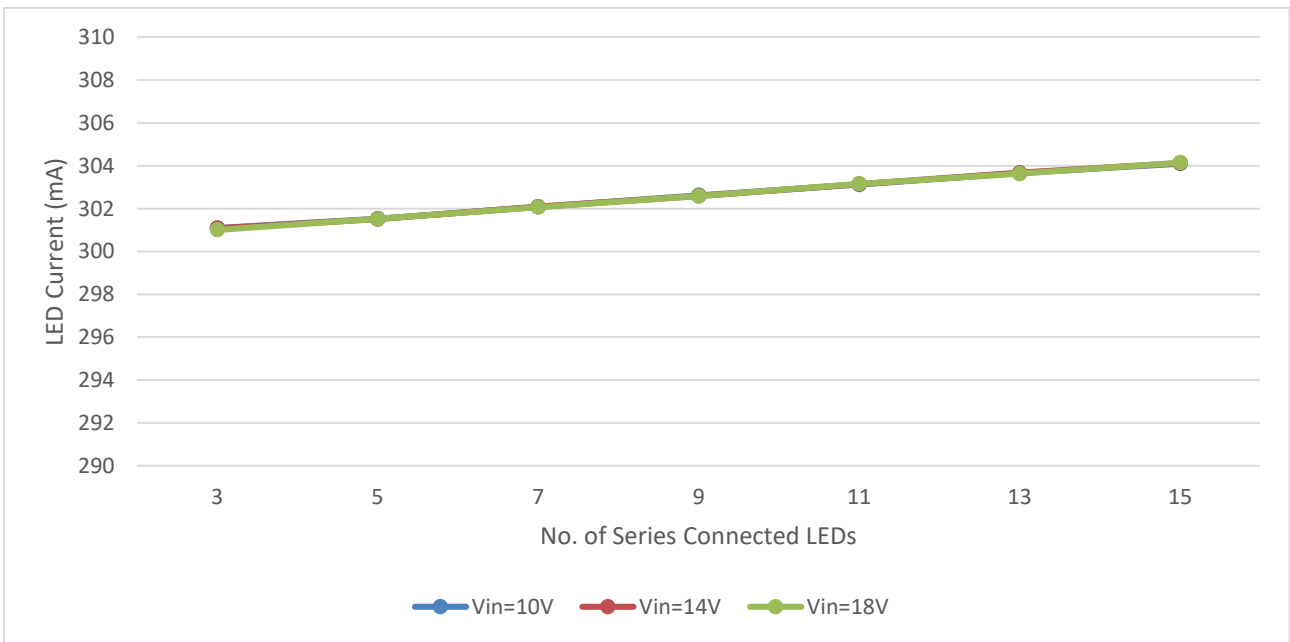


Figure 11. Output LED Current vs LED String Configuration (VIADJ = 670 mV)

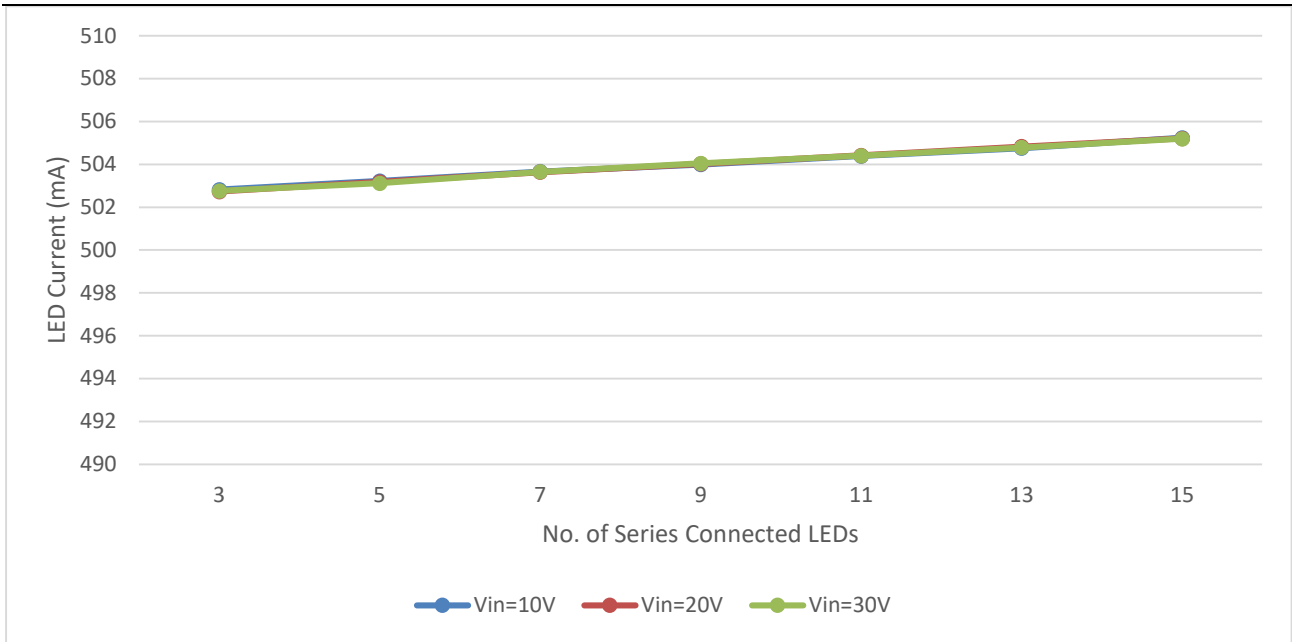


Figure 12. Output LED Current vs LED String Configuration (VIADJ = 1128 mV)

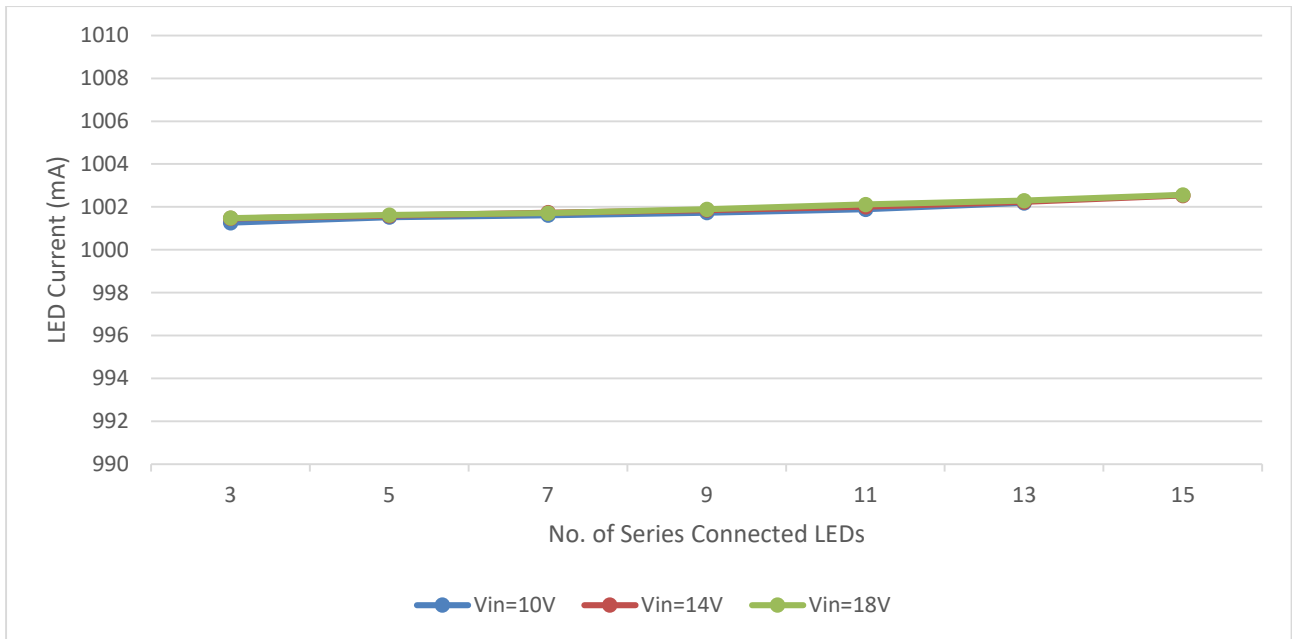


Figure 13. Output LED Current vs LED String Configuration (VIADJ = 2268 mV)

3.4 PWM Dimming

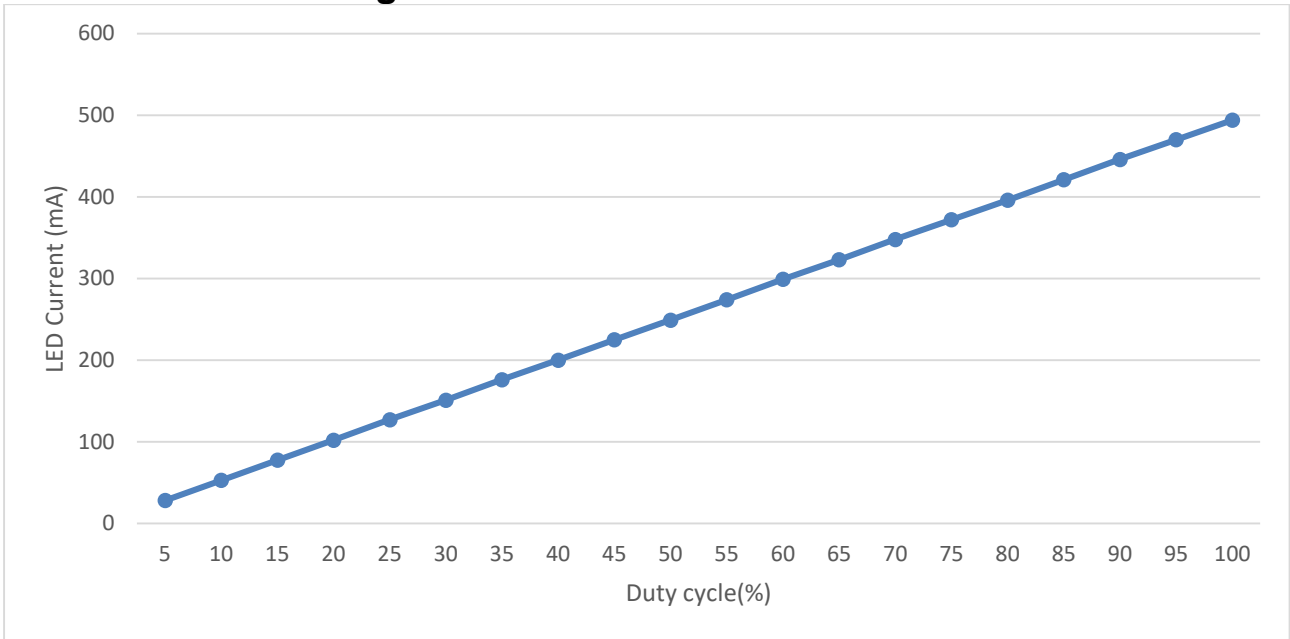


Figure 14. Output LED Current vs PWM Duty cycle ($V_{in}=14V$, Number of LED Series=6)

3.5 Analog to PWM Dimming

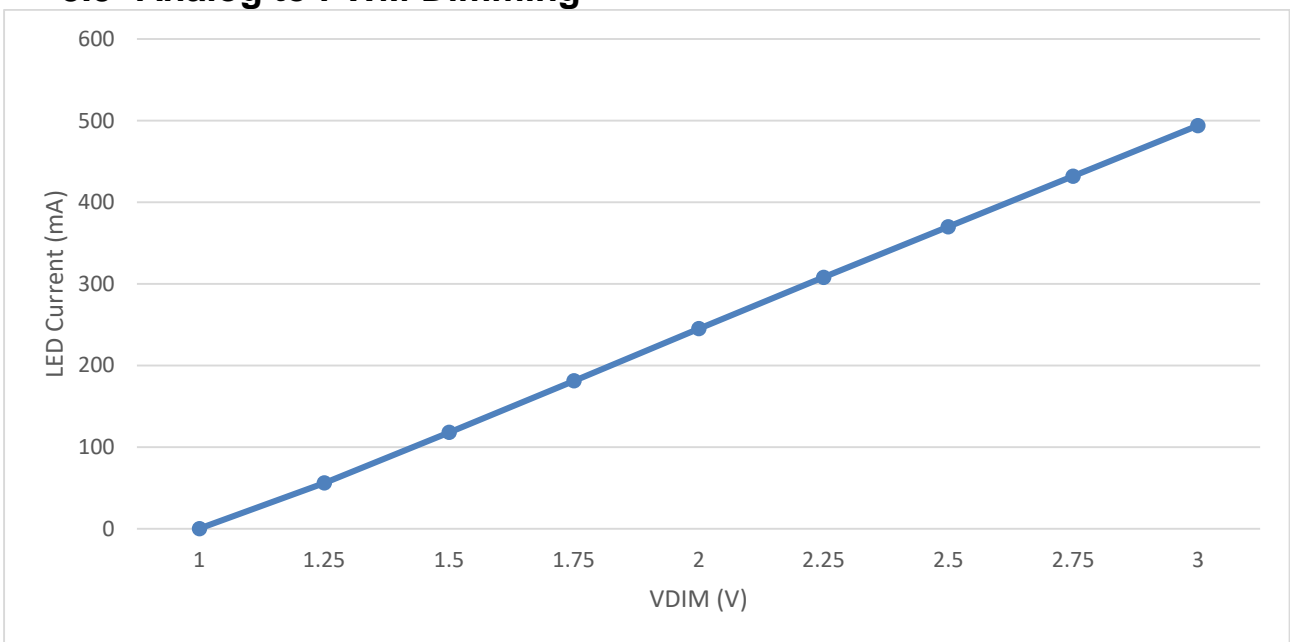


Figure 15. LED Current vs DIM/PWM Voltage ($V_{in}=14V$, Number of LED Series=6)

3.6 Analog Dimming

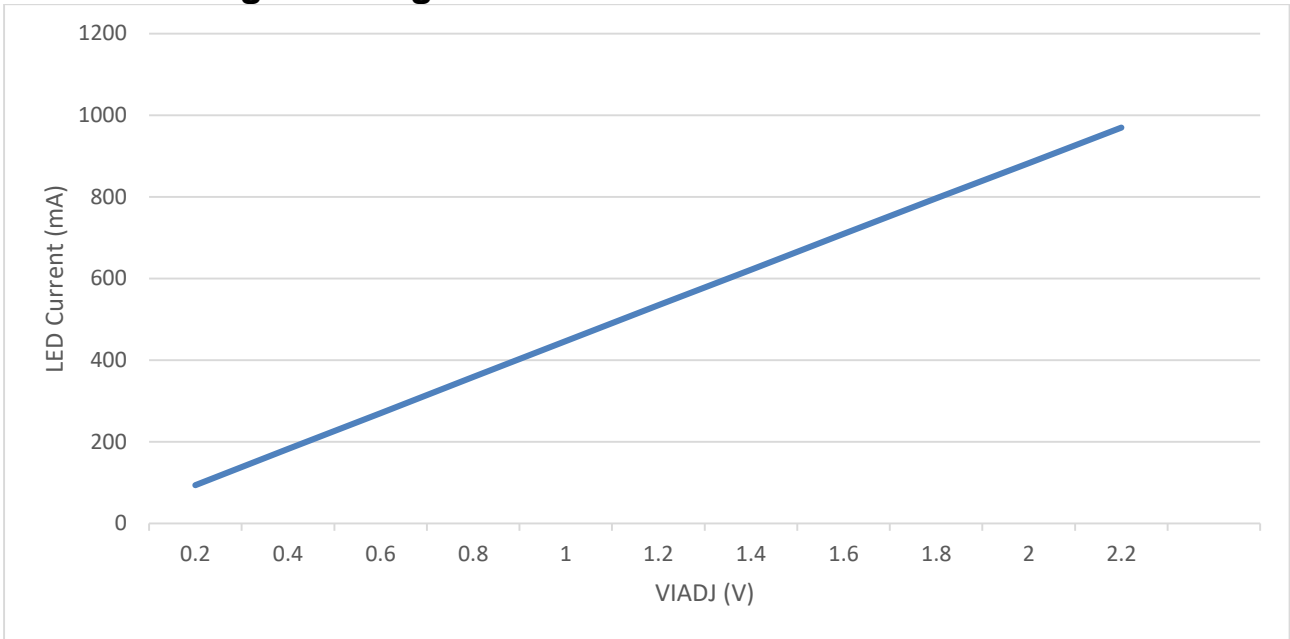


Figure 16. LED Current vs IADJ Voltage (Vin=14V, Number of LED Series=6)

4. Temperature Characteristics

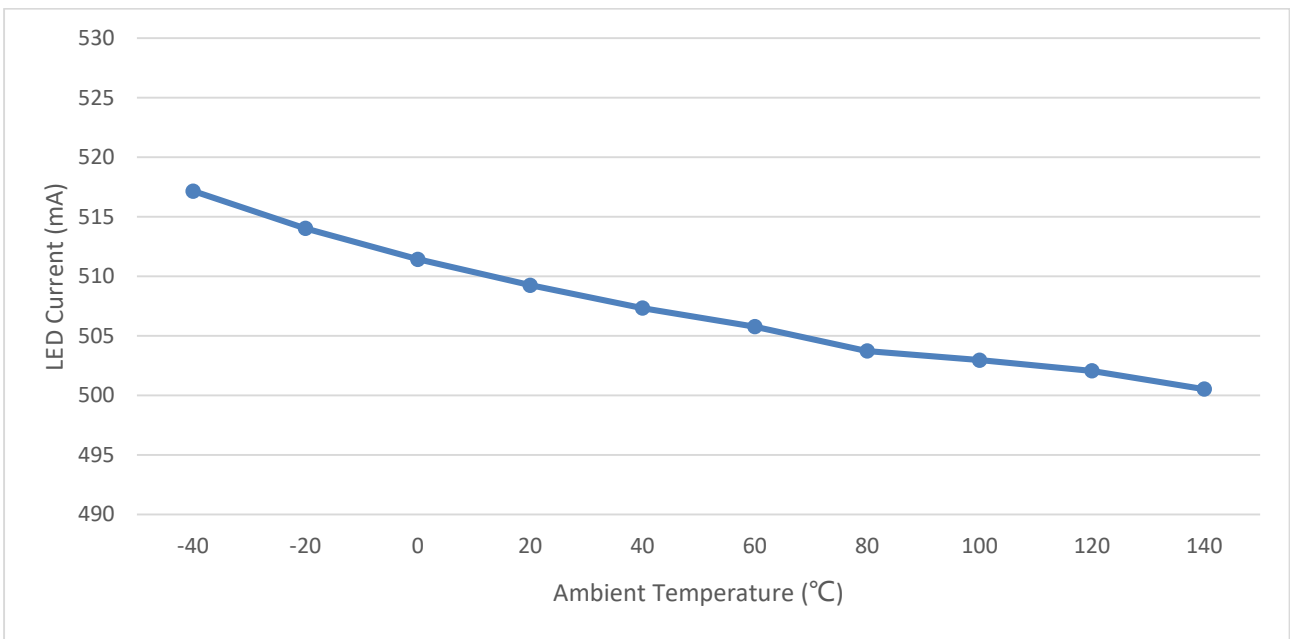
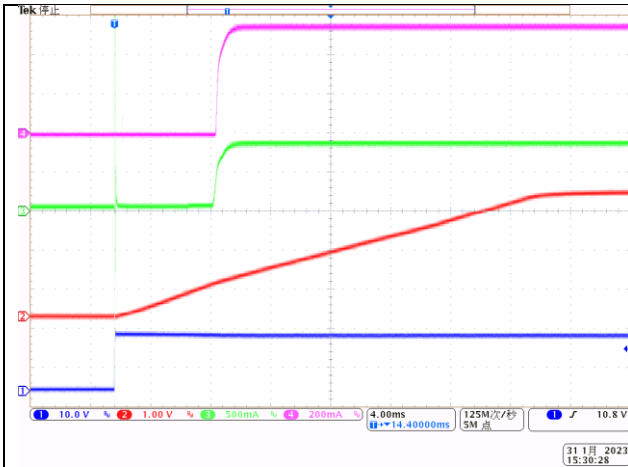


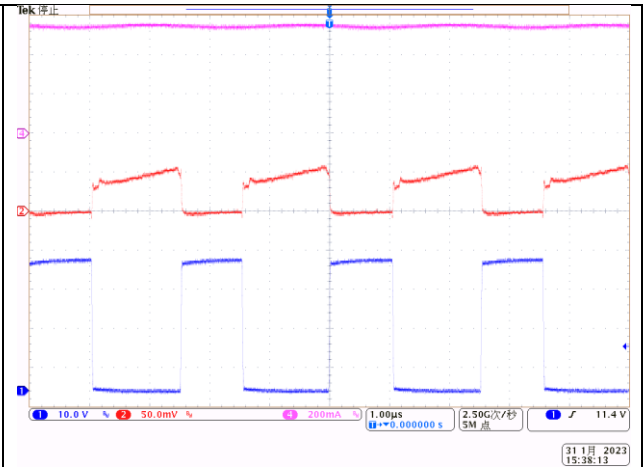
Figure 17. LED Current vs Ambient Temperature (VIN = 14 V, Number of LEDs in Series = 6)

5. Typical Waveforms



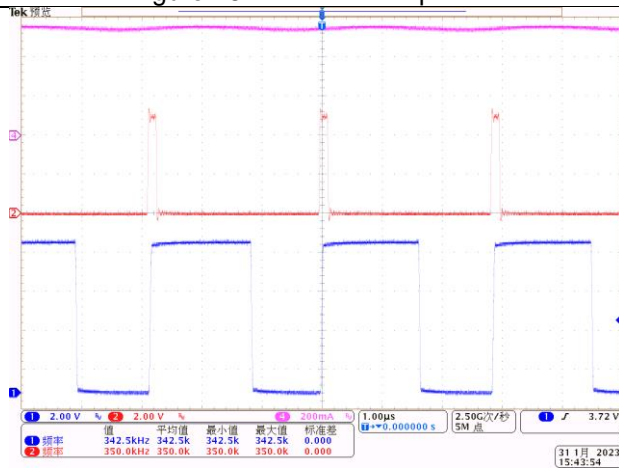
CH1: Vin
CH2: SS Voltage,
CH3: lin
CH4: Iout
Time: 4 ms/div

Figure 18. Soft-Start Sequence



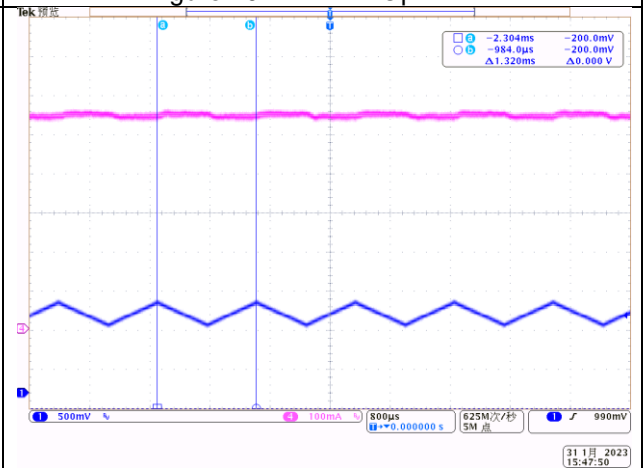
CH1: Drain voltage,
CH2: SCS voltage,
CH4: Iout
Time: 1us/div

Figure 19. Nominal Operation



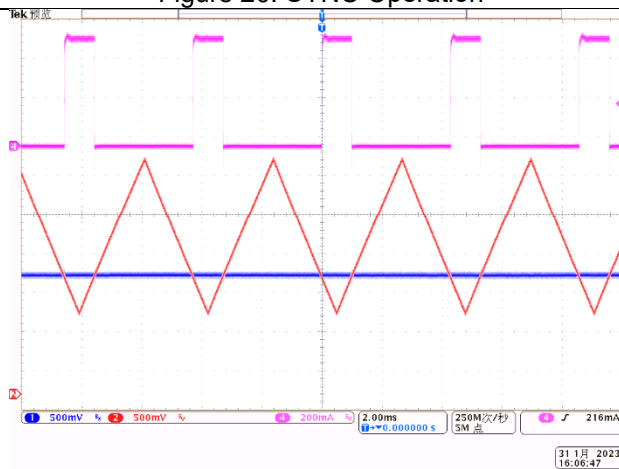
CH1: GATE voltage,
CH2: SYNC input,
CH4: Iout
Time: 1us/div

Figure 20. SYNC Operation



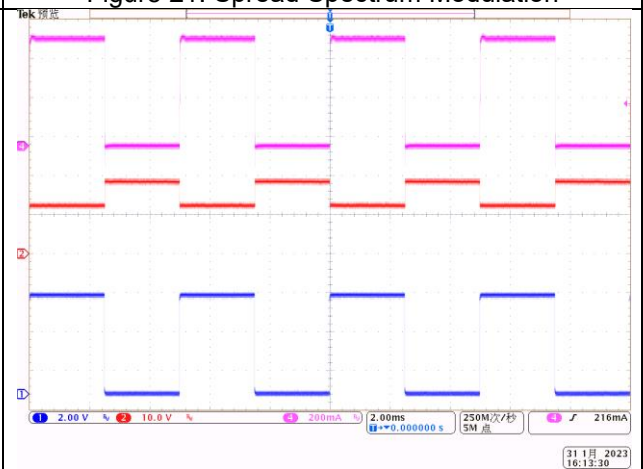
CH1: SSM voltage;
CH4: Iout;
Time: 800 μ s/div

Figure 21. Spread Spectrum Modulation



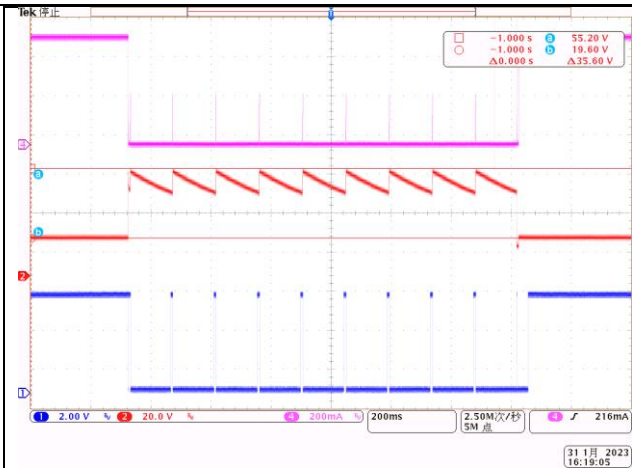
CH1: DIM voltage,
CH2: GPWM pin voltage,
CH4: Iout
Time: 2ms/div

Figure 22. Analog-to-PWM Dimming Transient

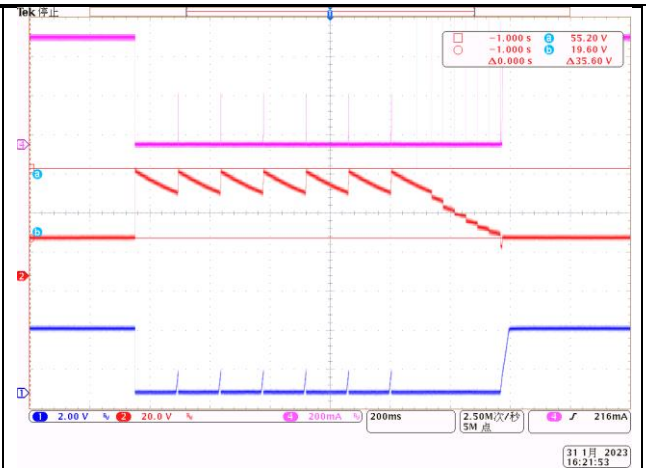


CH1: External PWM input signal;
CH2: PDRV voltage;
CH4: Iout;
Time: 2ms/div

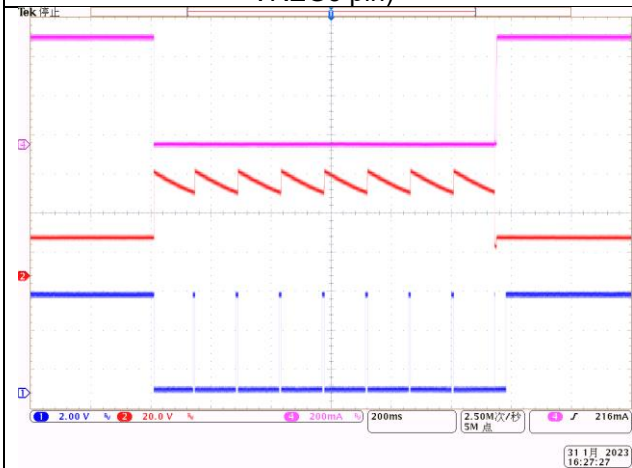
Figure 23. Direct PWM Dimming Transient



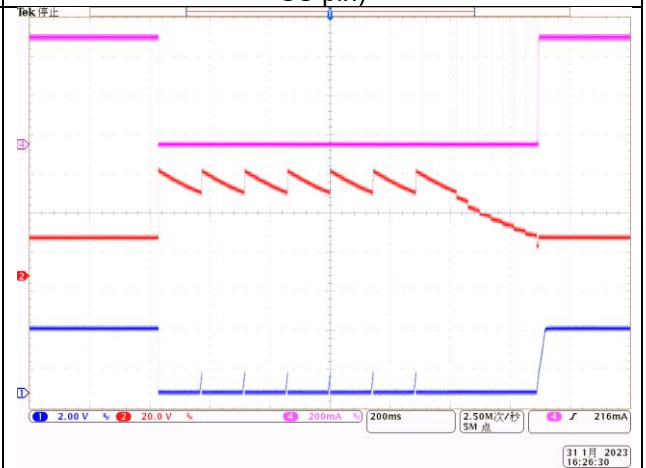
CH1: /FLT Output,
CH2: CSP Voltage,
CH4: Iout
Time: 200ms/div
Figure 24. LED Over Voltage Fault(/FLT connect to VREG5 pin)



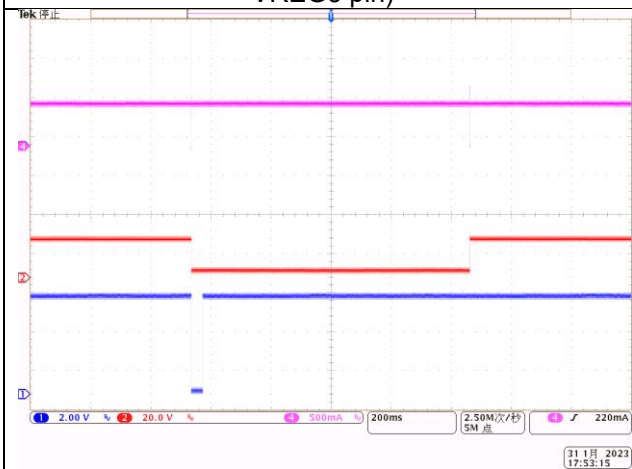
CH1: /FLT Output,
CH2: CSP Voltage,
CH4: Iout
Time: 400ms/div
Figure 25. LED Over Voltage Fault(/FLT connect to SS pin)



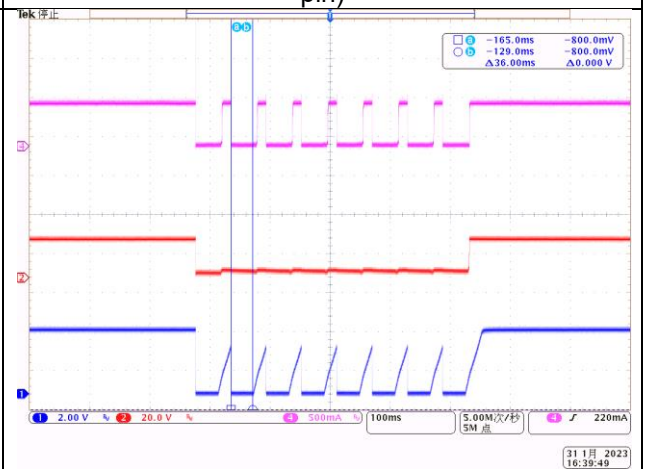
CH1: /FLT Output
CH2: CSP Voltage
CH4: Iout
Time: 200ms/div
Figure 26. LED OPEN Fault(/FLT Connected to VREG5 pin)



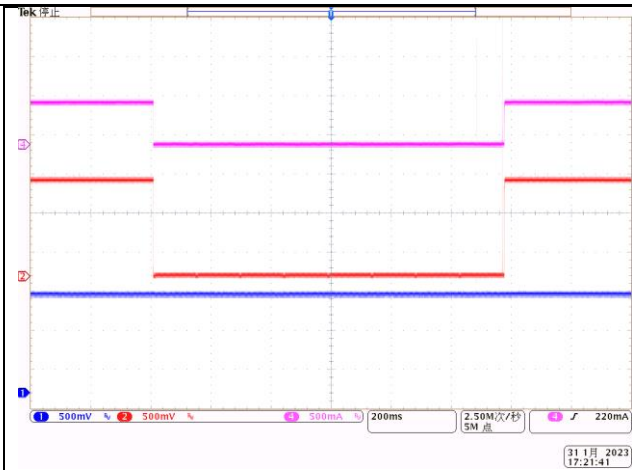
CH1: /FLT Output
CH2: CSP Voltage
CH4: Iout
Time: 200ms/div
Figure 27. LED OPEN Fault(/FLT Connected to SS pin)



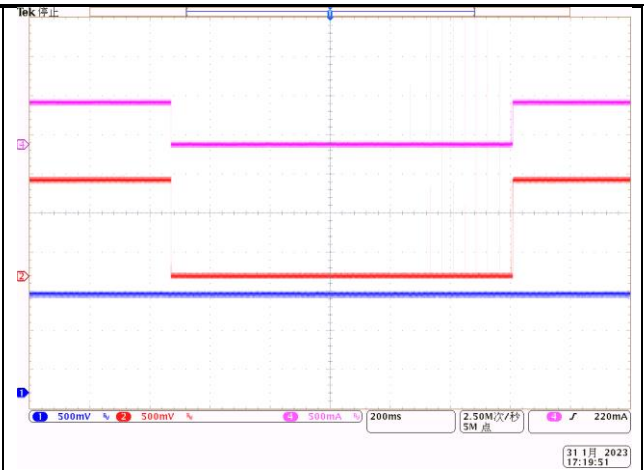
CH1: /FLT Output
CH2: CSP Voltage
CH4: Iout
Time: 200 ms/div
Figure 28. LED Shorted Fault (/FLT Connected to VREG5 pin)



CH1: /FLT Output
CH2: CSP Voltage
CH4: Iout
Time: 100 ms/div
Figure 29. LED Shorted Fault (/FLT Connected to SS pin)



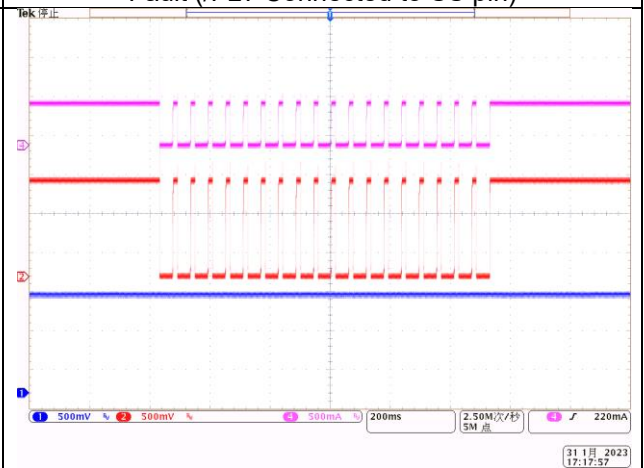
CH1: IADJ Voltage,
CH2: IMON Voltage,
CH4: Iout Time: 200 ms/div
Figure 30. IMON Response to LED Open-Circuit
Fault (/FLT Connected to VREG5 pin)



CH1: IADJ Voltage,
CH2: IMON Voltage,
CH4: Iout Time: 200 ms/div
Figure 31. IMON Response to LED Open-Circuit
Fault (/FLT Connected to SS pin)



CH1: IADJ Voltage,
CH2: IMON Voltage,
CH4: Iout Time: 200 ms/div
Figure 32. IMON Response to LED Short-Circuit
Fault (/FLT Connected to VREG5 pin)



CH1: IADJ Voltage,
CH2: IMON Voltage,
CH4: Iout Time: 200 ms/div
Figure 33. IMON Response to LED Short-Circuit
Fault (/FLT Connected to SS pin)

6. EMI

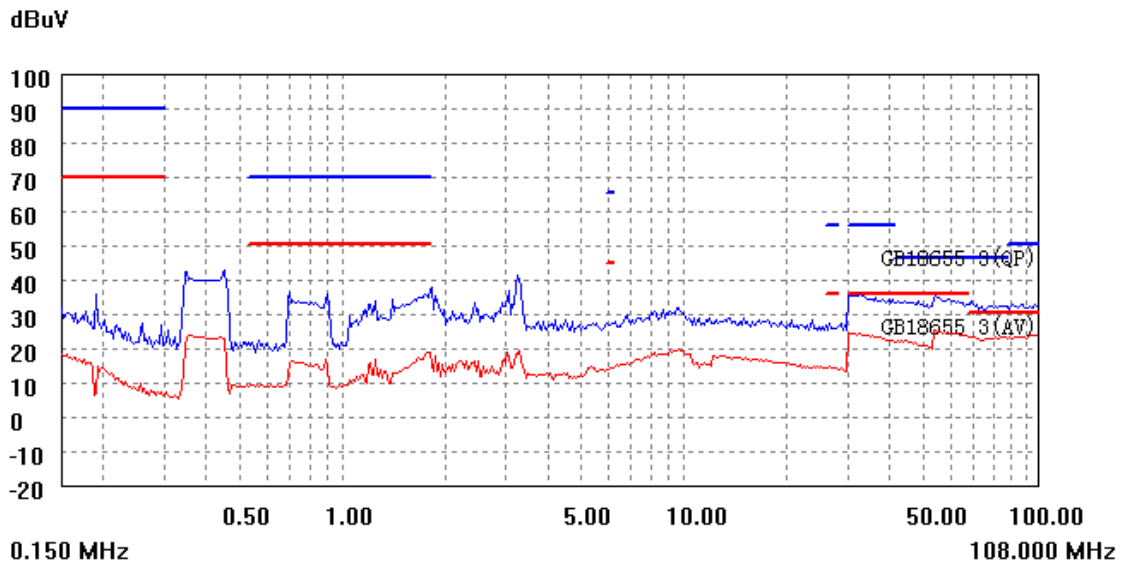


Figure 34. Conducted EMI of VIN Based on GB18655 Class 3 Limits (Spread Spectrum Modulation Enabled)

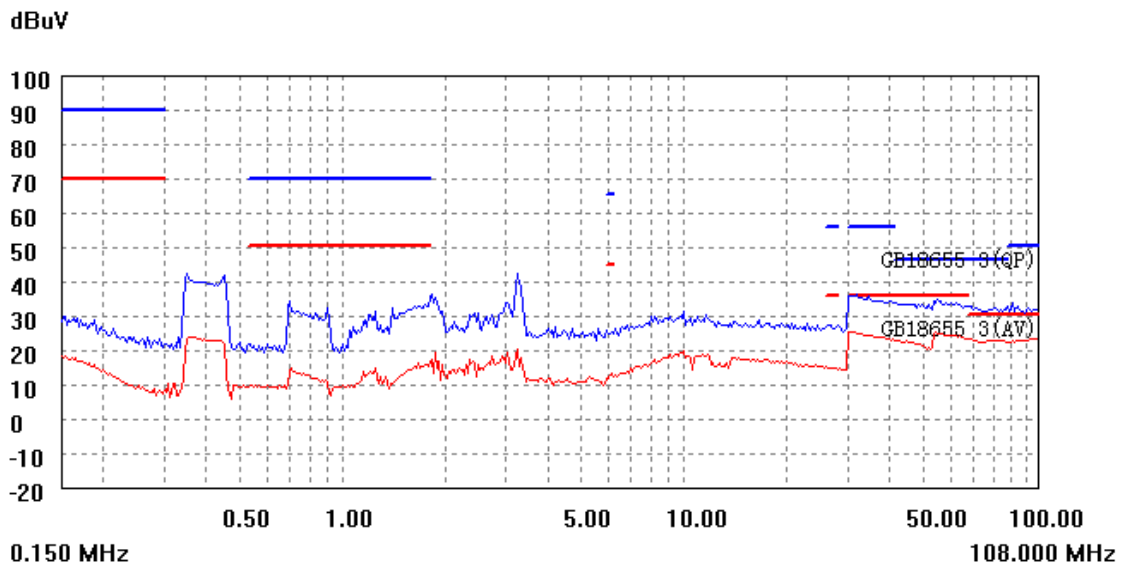


Figure 35. Conducted EMI of GND Based on GB18655 Class 3 Limits (Spread Spectrum Modulation Enabled)