Application Report

Selecting the Correct LP8860-Q1 EEPROM Version

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ABSTRACT

The LP8860-Q1 device is an automotive LED driver to support infotainment display, automotive cluster, and lighting applications. The LP8860-Q1 has numerous features that are configured by storing different values in the EEPROM. This document explains the individual EEPROM configuration settings for all released LP8860-Q1 devices so that the user can select the correct device for a customer application.

1 LP8860-Q1 Version Summary

Table 1-1 below compares key features and operating conditions for all orderable versions of the LP8860-Q1. Boost switching frequency, the number of channels, maximum LED current, and input brightness control method are considered critical specs and are highlighted in bold.

Table 1-1. Summary of LP8860A - LP8860H EEPROM Configurations

PARAMETER		A	B	C	D	E	F	G	H
Boost	f_{SW}	**300 kHz**	**300 kHz**	**2.2 MHz**	**400 kHz**	**400 kHz**	**400 kHz**	**400 kHz**	**800 kHz**
	Switching Current Limit	9 A	9 A	9 A	9 A	4 A	4 A	4 A	4 A
	VDD	5 V	3.3 V	5 V	5 V	5 V	5 V	5 V	5 V
LED Driver	Number of Channels	**4 strings**	**3 strings**	**3 strings**	**4 strings**	**1 string**	**2 strings**	**1 string**	**4 strings**
	Maximum LED Current per Channel	130 mA	70 mA	104 mA	150 mA	400 mA	90 mA	400 mA	80 mA
	ISET Resistor Control	Disabled	Enabled	Enabled	Enabled	Disabled	Disabled	Disabled	Disabled
	Input Brightness Control Method	**I²C/SPI BRT Register**	**PWM Pin Input**	**PWM Pin Input**	**PWM Pin Input**	**I²C/SPI BRT Register**	**PWM Pin Input (Direct)**	**I²C/SPI BRT Register**	**PWM Pin Input**
	LED Output Dimming Method	PWM	PWM	PWM	PWM	Hybrid Dimming	PWM	Hybrid Dimming	PWM
	Output PWM Dimming Frequency	4.883 kHz	Depends on VSYNC	4.883 kHz	4.883 kHz	= 11 × F_VSYNC	= F_PWMIN	4.883 kHz	4.883 kHz
	Dimming Ratio	1024:1	1024:1	1024:1	1024:1	15000:1	> 32000:1	> 4096:1	1024:1
Fault Handling	Short LED Fault Threshold	10.6 V	10.6 V	10.6 V	10.6 V	10.6 V	10.6 V	10.6 V	6.9 V
	VIN OVP Level	22.5 V	22.5 V	Disabled	22.5 V	22.5 V	22.5 V	Disabled	22.5 V
	VIN UVLO Level	3 V	3 V	3 V	3 V	3 V	3 V	3 V	5 V
	VDD UVLO	3 V	3 V	3 V	3 V	3 V	3 V	3 V	3V
	Input OCP Limit	8 A	8 A	8 A	8 A	6 A	6 A	6 A	6 A
TEMP COMP	Internal Temperature Compensation	Disabled	Enabled, 100°C	Disabled	Disabled	Disabled	Disabled	Disabled	Disabled
	External Temperature Compensation	Disabled	Enabled, current	Enabled, current	Disabled	Disabled	Disabled	Disabled	Disabled
SYNC	VSYNC Input	Disabled	Enabled	Disabled	Disabled	Enabled	Disabled	Disabled	Disabled

Table 1-2. Summary of LP8860J - LP8860L EEPROM Configurations

PARAMETER		J	L	N	R
Boost	f_{SW}	**2.2 MHz**	**400 kHz**	**2.2 MHz**	**2.2 MHz**
	Switching Current Limit	6 A	3 A	9 A	9 A
	VDD	3.3 V	3.3 V	3.3 V	3.3 V

Table 1-2. Summary of LP8860J - LP8860L EEPROM Configurations (continued)

PARAMETER		J	L	N	R
LED Driver	Number of Channels	**3 strings**	**3 strings**	**2 strings**	**4 strings**
	Maximum LED Current per Channel	80 mA	80 mA	150 mA	150 mA
	ISET Resistor Control	Enabled	Enabled	Enabled	Enabled
	Input Brightness Control Method	**I²C/SPI BRT Register**	**PWM Pin Input**	**I²C/SPI BRT Register**	**PWM Pin Input**
	LED Output Dimming Method	PWM	Hybrid Dimming	PWM	PWM
	Output PWM Dimming Frequency	9.766 kHz	4.883 kHz	= 11 × F_VSYNC	4.883 kHz
	Dimming Ratio	1024:1	4096:1	8192:1	1024:1
Fault Handling	Short LED Fault Threshold	6.9 V	10.6 V	10.6 V	10.6 V
	VIN OVP Level	22.5 V	Disabled	22.5 V	Disabled
	VIN UVLO Level	5 V	3 V	3 V	3 V
	VDD UVLO	3 V	3 V	2.5 V	2.5 V
	Input OCP Limit	6 A	6 A	8 A	8 A
TEMP COMP	Internal Temperature Compensation	Disabled	Disabled	Disabled	Disabled
	External Temperature Compensation	Enabled, current	Disabled	Disabled	Disabled
SYNC	VSYNC Input	Disabled	Disabled	Enabled	Disabled

Detailed configuration information and reference schematics for each LP8860-Q1 version is listed in the rest of the document. The full bit descriptions for the EEPROM registers are found in the LP8860-Q1 data sheet.

2 Specific EEPROM Versions

2.1 A Version

The LP8860A-Q1 is configured for four strings × 130 mA using a 5-V VDD and I²C or SPI to control brightness. Table 2-1 lists detailed configurations and full EEPROM information for the LP8860A-Q1.

Table 2-1. Detailed EEPROM Configuration: LP8860A-Q1

A		
Boost	Switching Current Limit	9 A
	SYNC Input	Disabled
	2 × Charge Pump	Disabled
	Spread Spectrum	Disabled
	f_{SW}	300 kHz
	VDD	5 V
	Initial Boost Voltage	31.5 V
LED Driver	Input Brightness Control Method	I²C/SPI BRT Register
	Maximum LED Current per Channel	130 mA
	ISET Resistor Control	Disabled
	Number of Channels	4 strings
	Channel Phase Shift	90 degrees (4 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	4.883 kHz
	Dimming Resolution	10-bit PWM + 4-bit dither
	Drive Strength and Rise Time	200 ns
	Dimming Ratio	1024:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	22.5 V
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	8 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-1. Detailed EEPROM Configuration: LP8860A-Q1 (continued)

A		
VSYNC and PLL	PLL	Disabled
	VSYNC input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-2. EEPROM Register Values: LP8860A-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11101101	ED
61	11011111	DF
62	11011100	DC
63	11110000	F0
64	11011111	DF
65	11100101	E5
66	11110010	F2
67	01110111	77
68	01110111	77
69	01110001	71
6A	00111111	3F
6B	10110111	B7
6C	00010111	17
6D	11101111	EF
6E	10110000	B0
6F	10000111	87
70	11001110	CE
71	01110010	72
72	11100101	E5
73	11011111	DF
74	00110101	35
75	00000110	06
76	11011100	DC
77	10001000	88
78	00111110	3E

Figure 2-1 shows the use case for the LP8860A-Q1

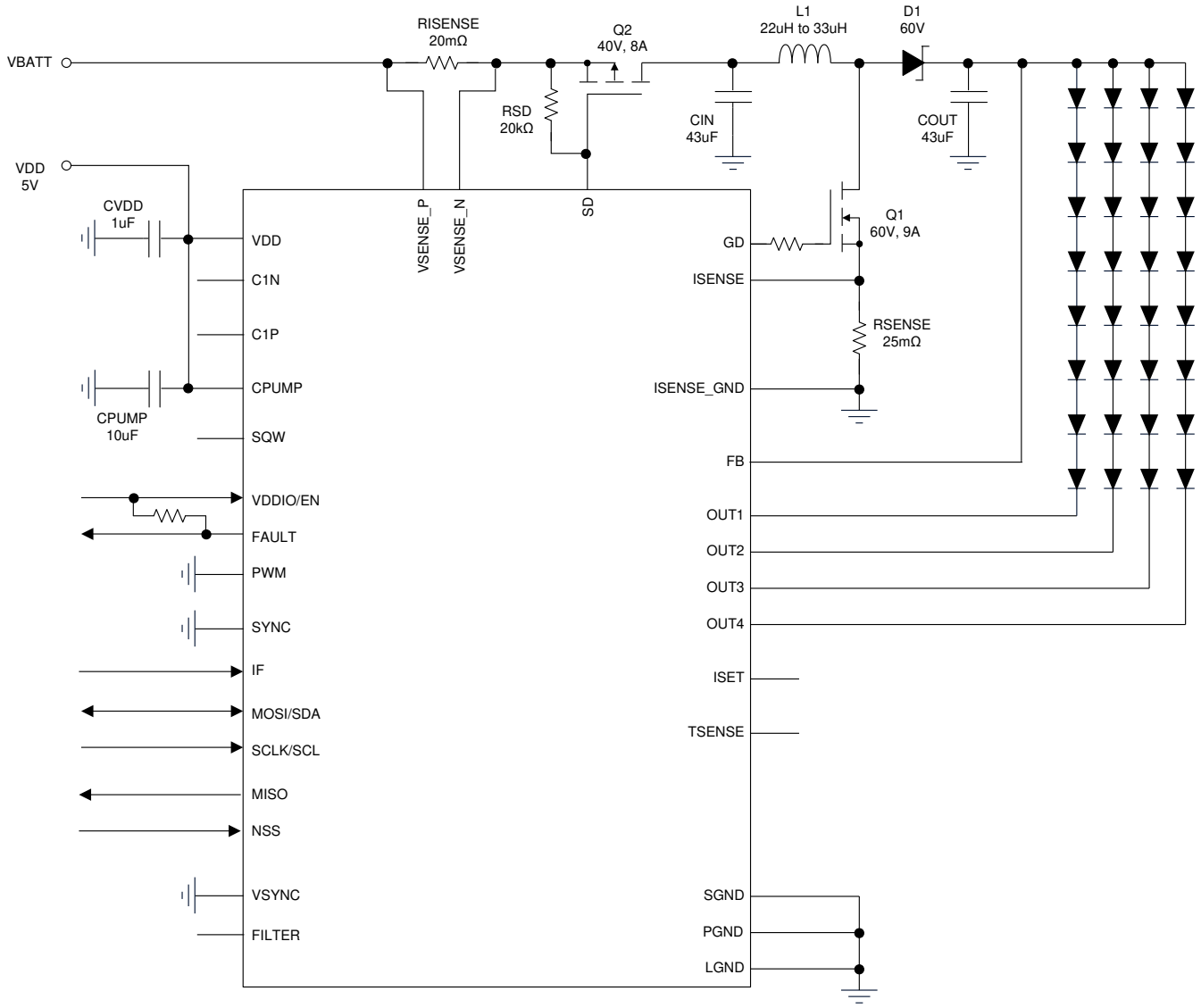

Figure 2-1. Use Case for LP8860A-Q1

2.2 B Version

The LP8860B-Q1 is configured for three strings × 70 mA using a 3.3-V VDD and PWM pin to control brightness. LED current can be adjusted using an ISET resistor. Table 2-3 lists detailed configurations and full EEPROM information for the LP8860B-Q1.

Table 2-3. Detailed EEPROM Configuration for LP8860B-Q1

B		
Boost	Switching Current Limit	9 A
	SYNC Input	Disabled
	2 × Charge Pump	Enabled
	Spread Spectrum	Enabled
	f_{SW}	300 kHz
	VDD	3.3 V
	Initial Boost Voltage	24 V
LED Driver	Input Brightness Control Method	PWM pin input
	Maximum LED Current per Channel	70 mA
	ISET Resistor Control	Enabled
	Number of Channels	3 strings
	Channel Phase Shift	120 degrees (3 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	4.883 kHz
	Dimming Resolution	Depends on VSYNC
	Drive Strength and Rise Time	200 ns
	Dimming Ratio	1024:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 450 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	22.5 V
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	8 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Enabled, 100°C
	External Temperature Compensation	Enabled, current dimming mode
	Current Dimming Knee Point	6 µA
	EXT_TEMP_GAIN[3:0]	14
	EXT_TEMP_LEVEL_HIGH[3:0]	6.69 kΩ
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-3. Detailed EEPROM Configuration for LP8860B-Q1 (continued)

B		
VSYNC and PLL	PLL	Enabled, 10-MHz PLL
	VSYNC input	Enabled
	SYNC or HSYNC	HSYNC
	PWM_SYNC	1
	Pre-divider	7
	Slow PLL Divider	0
	R_SEL	3
	SEL_Divider	Fast
	PWM_FREQ	0
	PWM_RES	1

Table 2-4. EEPROM Register Values: LP8860B-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	01101110	6E
61	00000010	02
62	01011100	5C
63	11000010	C2
64	01011100	5C
65	11101100	EC
66	01111000	78
67	01110111	77
68	01110111	77
69	11100001	E1
6A	10111111	BF
6B	00000000	00
6C	11000000	C0
6D	11110111	F7
6E	00000000	00
6F	00000111	07
70	00001111	0F
71	11110010	F2
72	11100101	E5
73	00010000	10
74	00110101	35
75	00000110	06
76	10001010	8A
77	11011111	DF
78	10000001	81

Figure 2-2 shows the use case for the LP8860B-Q1.

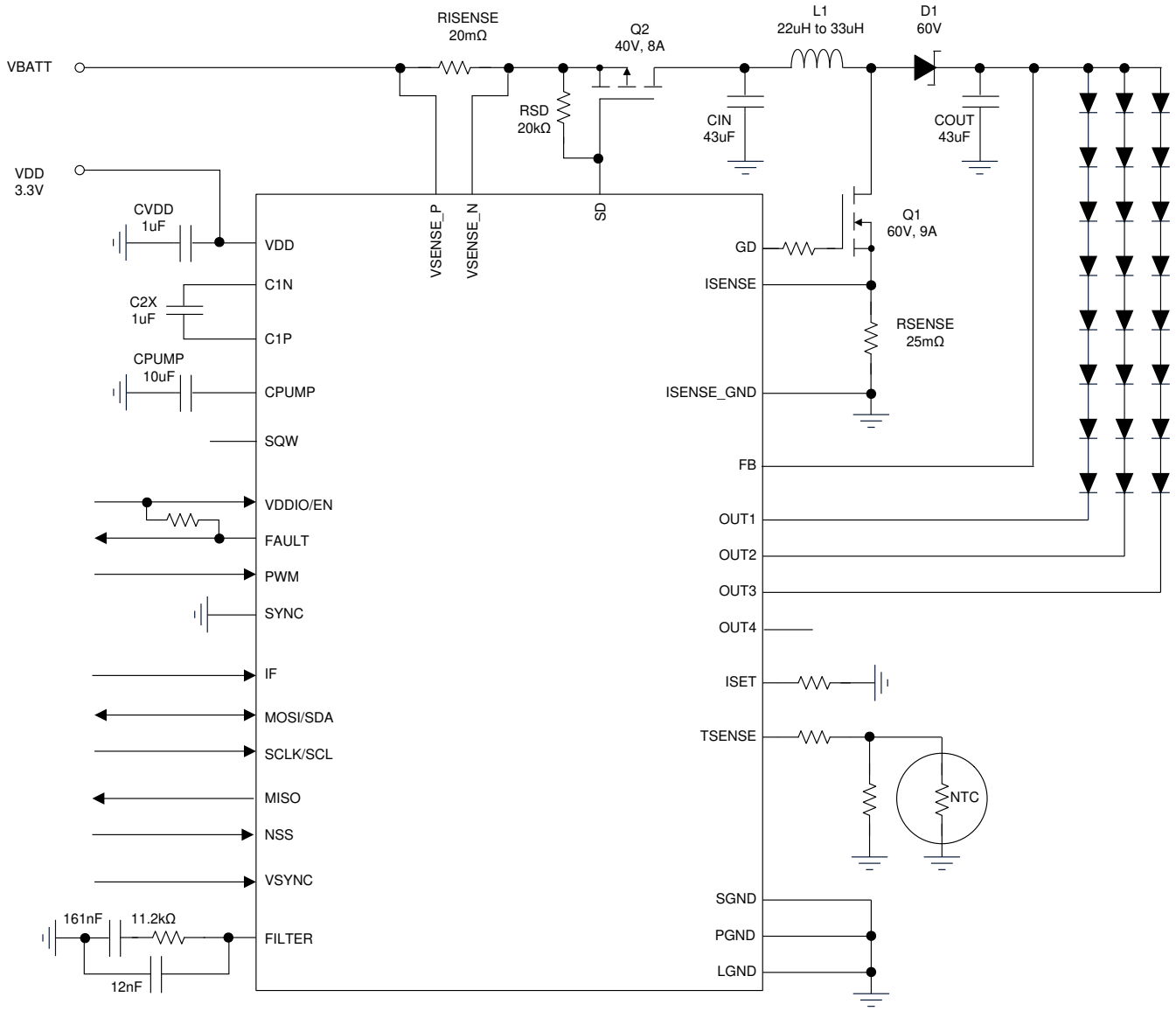

Figure 2-2. Use Case for LP8860B-Q1

2.3 C Version

The LP8860C-Q1 is configured for three strings × 104 mA using a 5-V VDD and PWM pin to control brightness. LED current can be adjusted using an ISET resistor. Table 2-5 lists detailed configurations and full EEPROM information for the LP8860C-Q1.

Table 2-5. Detailed EEPROM Configuration for LP8860C-Q1

C		
Boost	Switching Current Limit	9 A
	SYNC Input	Disabled
	2 × Charge Pump	Disabled
	Spread Spectrum	Disabled
	f_{SW}	2.2 MHz
	VDD	3.3 V
	Initial Boost Voltage	46 V
LED Driver	Input Brightness Control Method	PWM pin input
	Maximum LED Current per Channel	125 mA
	ISET Resistor Control	Enabled
	Number of Channels	3 strings
	Channel Phase Shift	120 degrees (3 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	4.883 kHz
	Dimming Resolution	10-bit PWM + 4-bit dither
	Drive Strength and Rise Time	200 ns
	Dimming Ratio	1024:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	Disabled
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	8 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Enabled, current dimming mode
	Current Dimming Knee Point	5 µA
	EXT_TEMP_GAIN[3:0]	5
	EXT_TEMP_LEVEL_HIGH[3:0]	22.67 kΩ
	EXT_TEMP_LEVEL_LOW[3:0]	22.67 kΩ

Table 2-5. Detailed EEPROM Configuration for LP8860C-Q1 (continued)

C		
VSYNC and PLL	PLL	Disabled, 5-MHz oscillator
	VSYNC input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-6. EEPROM Register Values for LP8860C-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	01101101	6D
61	01011100	5C
62	11011100	DC
63	11110010	F2
64	01011111	5F
65	11100101	E5
66	11111000	F8
67	01110111	77
68	01110111	77
69	10110001	B1
6A	10111111	BF
6B	11111111	FF
6C	00010111	17
6D	11101111	EF
6E	10110000	B0
6F	00000100	04
70	11001110	CE
71	00000111	07
72	11100101	E5
73	11111100	FC
74	00110101	35
75	10101110	AE
76	11011100	DC
77	00110011	33
78	00111111	3F

Figure 2-3 shows the use case for the LP8860C-Q1.

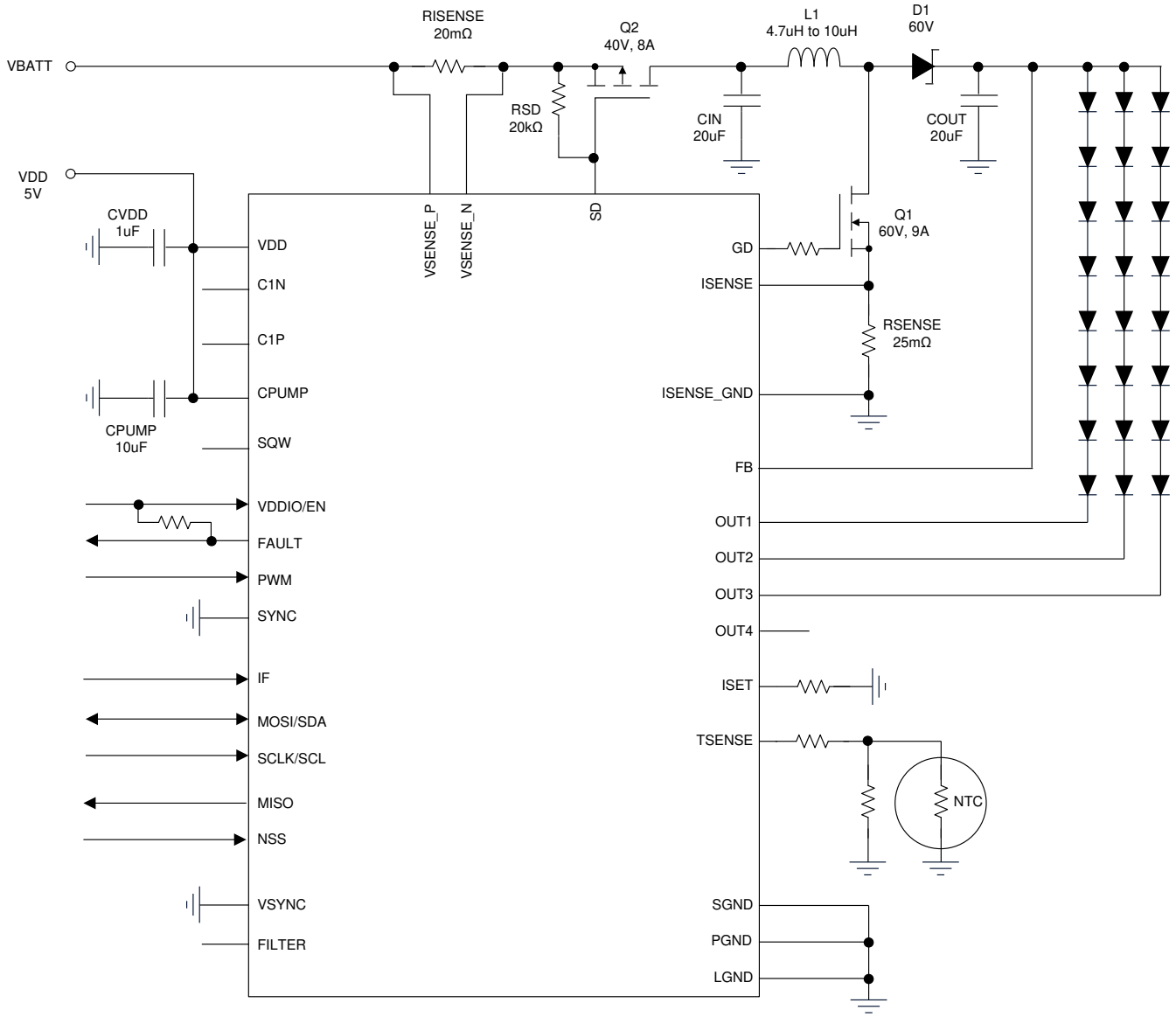

Figure 2-3. Use Case for LP8860C-Q1

2.4 D Version

The LP8860D-Q1 is configured for four strings × 150 mA using a 5-V VDD and PWM pin to control brightness. LED current can be adjusted using an ISET resistor. Table 2-7 lists detailed configurations and full EEPROM information for LP8860D-Q1.

Table 2-7. Detailed EEPROM Configuration for LP8860D-Q1

D		
Boost	Switching Current Limit	9 A
	SYNC Input	Disabled
	2 × Charge Pump	Disabled
	Spread Spectrum	Disabled
	f_{SW}	400 kHz
	VDD	5 V
	Initial Boost Voltage	25 V
LED Driver	Input Brightness Control Method	PWM pin input
	Max LED current per channel	150 mA
	ISET Resistor Control	Enabled
	Number of Channels	4 strings
	Channel Phase Shift	90 degrees (4 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	4.883 kHz
	Dimming Resolution	10-bit PWM + 4-bit dither
	Drive Strength and Rise Time	200 ns
	Dimming Ratio	1024:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	22.5
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	8 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-7. Detailed EEPROM Configuration for LP8860D-Q1 (continued)

D		
VSYNC and PLL	PLL	Disabled, 5-MHz oscillator
	VSYNC Input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-8. EEPROM Register Values for LP8860D-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11101111	EF
61	11111111	FF
62	11011100	DC
63	11110000	F0
64	11011111	DF
65	11100101	E5
66	11111000	F8
67	01110111	77
68	01110111	77
69	01110001	71
6A	00111111	3F
6B	10110111	B7
6C	00010111	17
6D	11101111	EF
6E	10110000	B0
6F	10000111	87
70	11001110	CE
71	01110011	73
72	11100101	E5
73	11010010	D2
74	00110101	35
75	00000110	06
76	11011100	DC
77	11111111	FF
78	00111110	3E

Figure 2-4 shows the use case for the LP8860D-Q1.

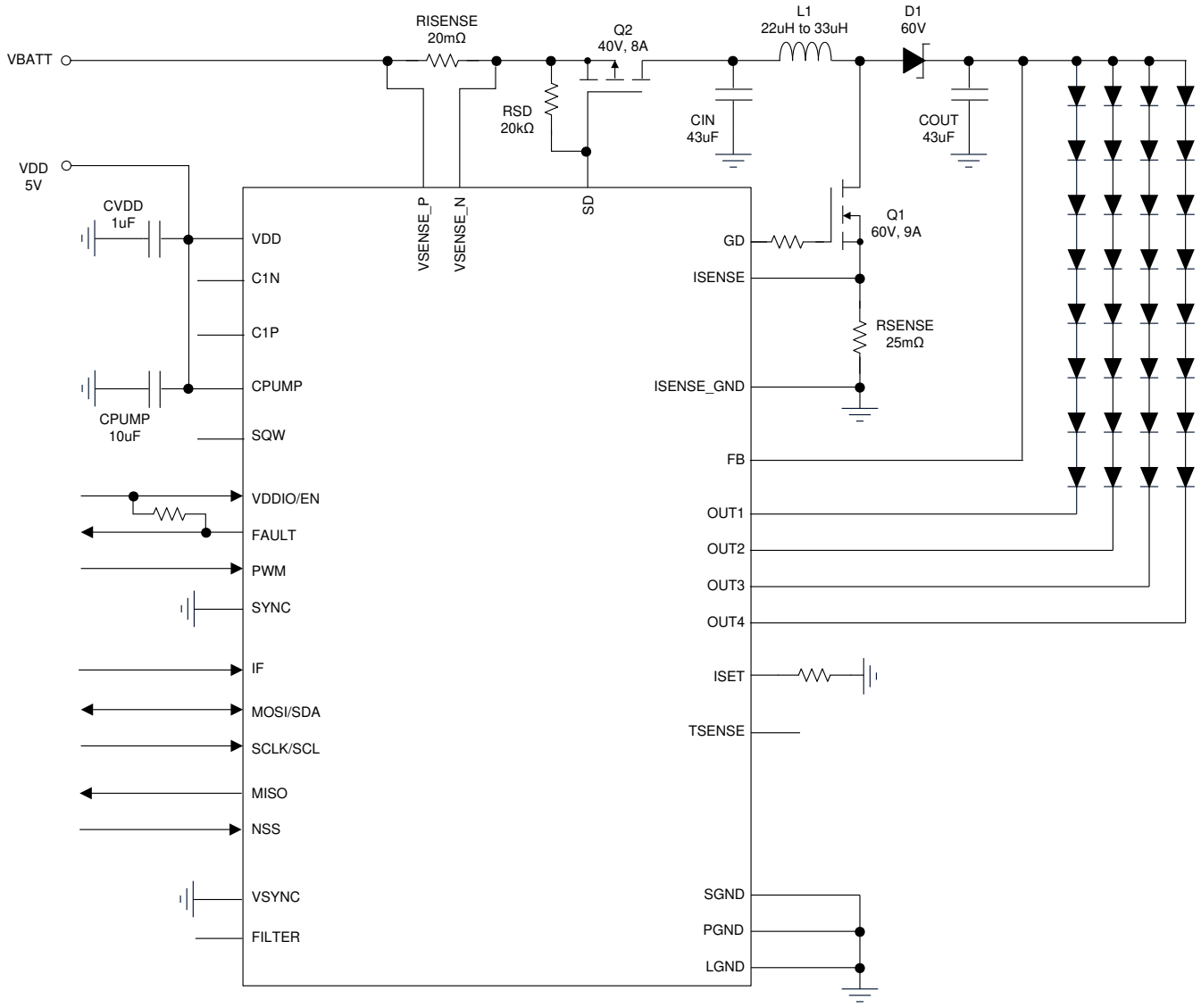

Figure 2-4. Use Case for LP8860D-Q1

2.5 E Version

The LP8860E-Q1 is configured to use all four outputs to drive a single 400-mA LED string using a 5-V VDD and I^2C or SPI to control brightness. Table 2-9 lists detailed configurations and full EEPROM information for the LP8860E-Q1.

Table 2-9. Detailed EEPROM Configuration for LP8860E-Q1

E		
Boost	Switching Current Limit	4 A
	SYNC Input	Disabled
	2 × Charge Pump	Disabled
	Spread Spectrum	Enabled
	f_{SW}	400 kHz
	VDD	5 V
	Initial Boost Voltage	30 V
LED Driver	Input Brightness Control Method	I^2C/SPI BRT Register
	Maximum LED Current per Channel	400 mA
	ISET Resistor Control	Disabled
	Number of Channels	1 string (4 channels combined)
	Channel Phase Shift	No phase shift
	LED Output Dimming Method	Hybrid dimming
	Current to PWM Switch Point	0.125
	Current Linearity Correction Slope	1
	Output PWM Dimming Frequency	= 11 × F_VSYNC
	Dimming Resolution	13-bit PWM + 4-bit dither
	Drive Strength and Rise Time	100 ns
	Dimming Ratio	15000:1 (F_SYNC = 60 Hz)
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	22.5
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	6 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-9. Detailed EEPROM Configuration for LP8860E-Q1 (continued)

E		
VSYNC and PLL	PLL	Enabled = 8192 × 11 × F_VSYNC
	VSYNC Iinput	Enabled
	SYNC or HSYNC	VSYNC
	PWM_SYNC	1
	Pre-divider	0
	Slow PLL Divider	10
	R_SEL	0
	SEL_Divider	Slow
	PWM_FREQ	0
	PWM_RES	3

Table 2-10. EEPROM Register Values: LP8860E-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11110010	F2
61	00000000	00
62	11010100	D4
63	11011011	DB
64	11011111	DF
65	00011101	1D
66	01110010	72
67	01110111	77
68	01110111	77
69	01110001	71
6A	00111011	3B
6B	00000000	00
6C	11001010	CA
6D	00010000	10
6E	10110000	B0
6F	10000100	84
70	11000100	C4
71	11110011	F3
72	11100101	E5
73	11011100	DC
74	00110101	35
75	00000110	06
76	11011100	DC
77	11111111	FF
78	00111110	3E

Figure 2-3 shows the use case for the LP8860E-Q1.

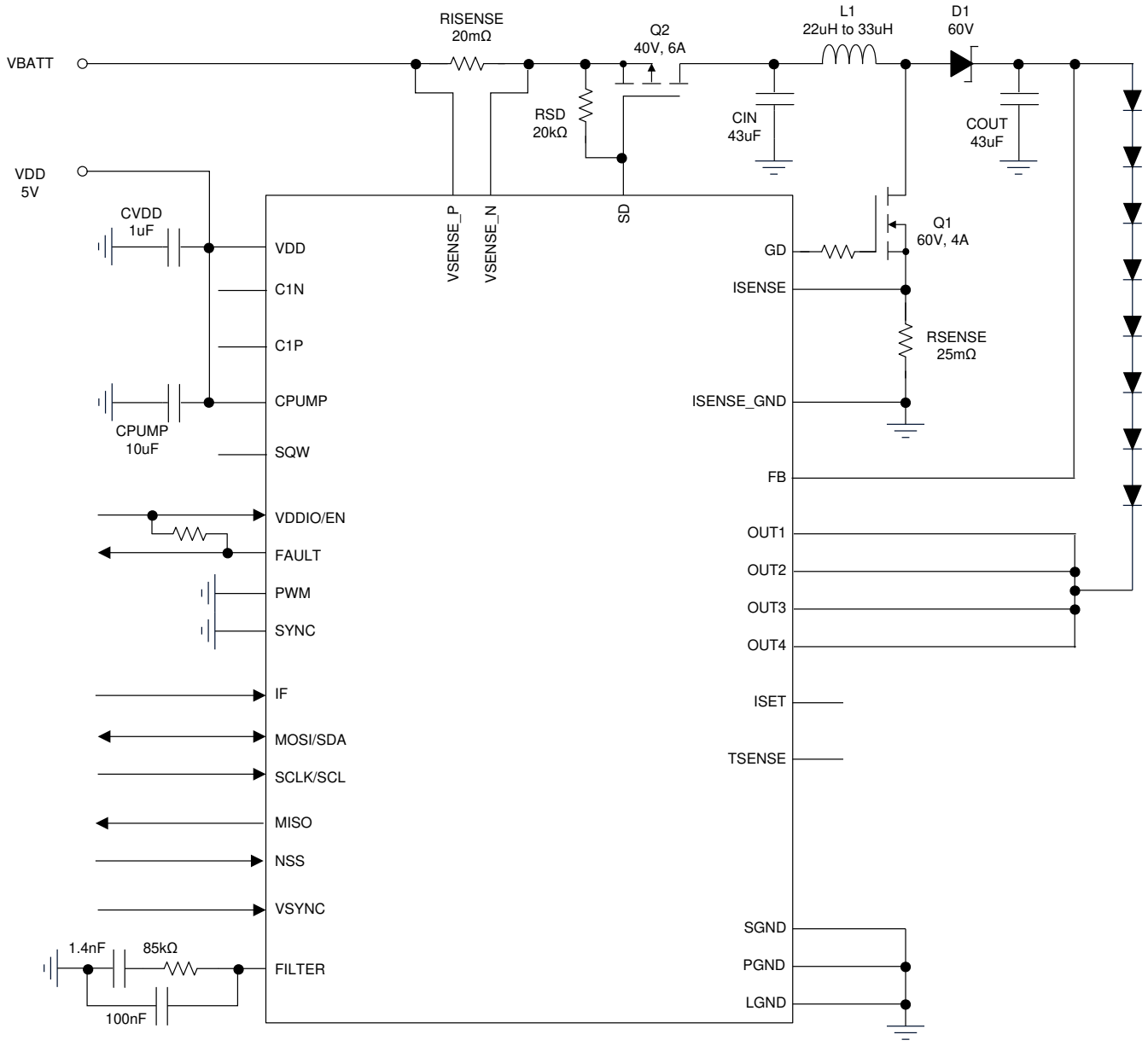

Figure 2-5. Use Case for LP8860E-Q1

2.6 F Version

The LP8860F-Q1 is configured for two strings × 90 mA using a 5-V VDD and PWM pin to control brightness. LP8860F-Q1 is configured into direct-PWM mode, which bypasses mode brightness path features similar to the LP8861-Q1. Table 2-11 lists detailed configurations and full EEPROM information for the LP8860F-Q1.

Table 2-11. Detailed EEPROM Configuration: LP8860F-Q1

F		
Boost	Switching Current Limit	4 A
	SYNC Input	Disabled
	2 × Charge Pump	Disabled
	Spread Spectrum	Enabled
	f_{SW}	400 kHz
	VDD	5 V
	Initial Boost Voltage	26 V
LED Driver	Input Brightness Control Method	PWM pin input (direct)
	Maximum LED Current per Channel	90 mA
	ISET Resistor Control	Disabled
	Number of Channels	2 strings
	Channel Phase Shift	No phase shift
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	= F_PWMIN
	Dimming Resolution	N/A
	Drive Strength and Rise Time	100 ns
	Dimming Ratio	> 32000:1
	Sloper	N/A
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	22.5
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	6 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-11. Detailed EEPROM Configuration: LP8860F-Q1 (continued)

F		
VSYNC and PLL	PLL	Disabled 5-MHz oscillator
	VSYNC input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-12. EEPROM Register Values for LP8860F-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11111110	FE
61	01100110	66
62	11010100	D4
63	11010100	D4
64	11011111	DF
65	00000101	05
66	01110011	73
67	01110111	77
68	01110111	77
69	01110001	71
6A	00111011	3B
6B	00000000	00
6C	00001010	0A
6D	00100000	20
6E	10110100	B4
6F	10000100	84
70	11000100	C4
71	11110011	F3
72	11100101	E5
73	11010100	D4
74	00110101	35
75	00000000	00
76	11011100	DC
77	11111111	FF
78	00111110	3E

Figure 2-6 shows the use case for the LP8860F-Q1.

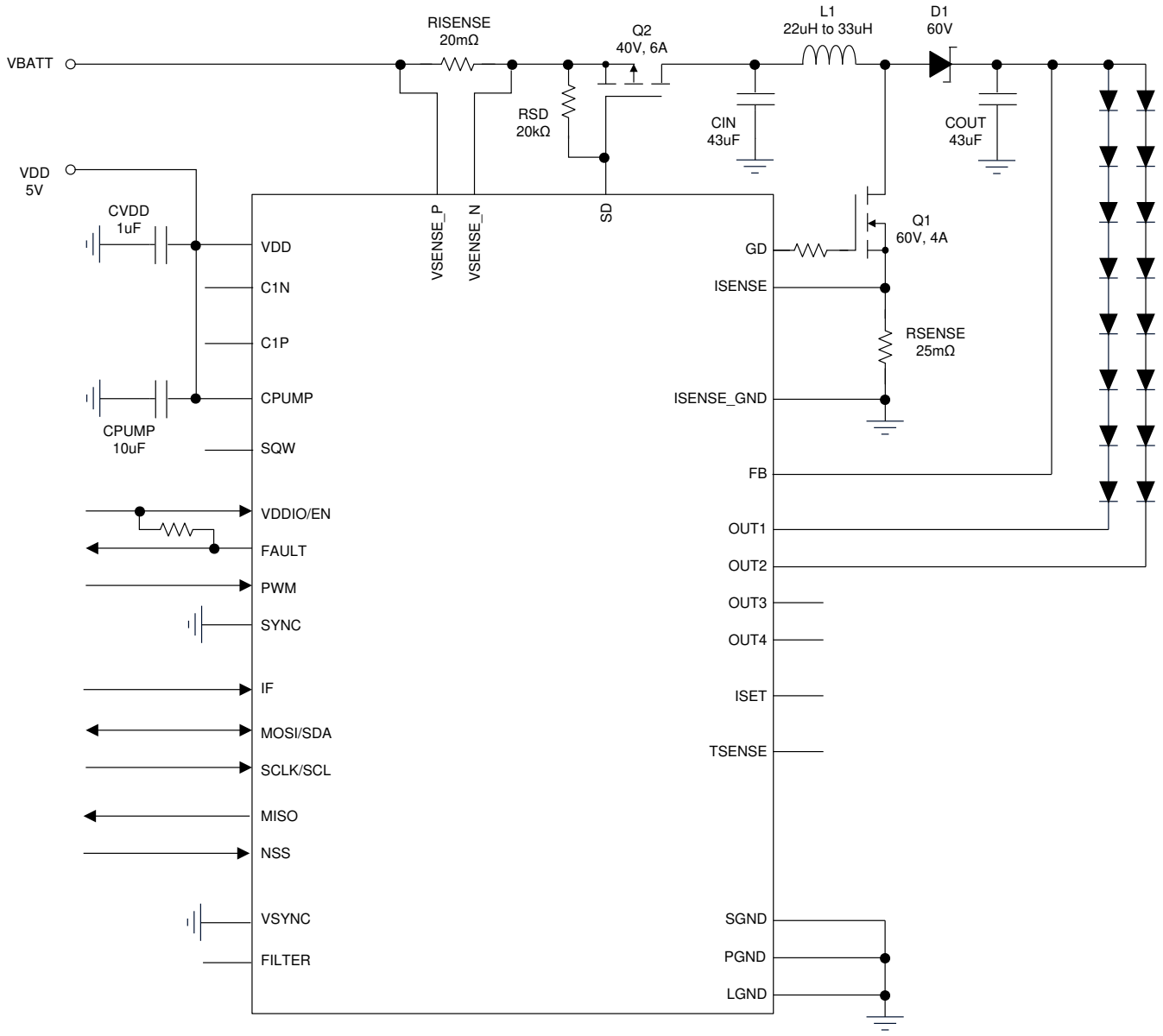

Figure 2-6. Use Case for LP8860F-Q1

2.7 G Version

The LP8860G-Q1 is configured for one string × 400 mA using a 5-V VDD and I²C or SPI to control brightness. Table 2-13 lists detailed configuration and full EEPROM information for the LP8860G-Q1.

Table 2-13. Detailed EEPROM Configuration: LP8860G-Q1

A		
Boost	Switching Current Limit	4 A
	SYNC Input	Disabled
	2 × Charge Pump	Disabled
	Spread Spectrum	Disabled
	f_{SW}	400 kHz
	VDD	5 V
	Initial Boost Voltage	35 V
LED Driver	Input Brightness Control Method	I²C/SPI BRT Register
	Maximum LED current per Channel	400 mA
	ISET Resistor Control	Disabled
	Number of Channels	1 string (4 channels combined)
	Channel Phase Shift	Single phase
	LED Output Dimming Method	Hybrid dimming
	Current to PWM Switch Point	12.5%
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	4.883 kHz
	Dimming Resolution	13-bit PWM + 4-bit dither
	Drive Strength and Rise Time	100 ns
	Dimming Ratio	4096:1
	Sloper	105 ms
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	Disabled
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	6 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A
VSYNC and PLL	PLL	Enabled
	VSYNC input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-14. EEPROM Register Values: LP8860G-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11110010	F2
61	00000000	00
62	11010100	D4
63	11011011	DB
64	11011111	DF
65	00011101	1D
66	01110010	72
67	01110111	77
68	01110111	77
69	01110001	71
6A	00111011	3B
6B	00000000	00
6C	00001010	0A
6D	00110000	30
6E	10110000	B0
6F	10000100	84
70	11000100	C4
71	11110011	F3
72	11100101	E5
73	11100110	E6
74	00110101	35
75	00000110	06
76	11011100	DC
77	11111111	FF
78	00111110	3E

Figure 2-7 shows the use case for the LP8860G-Q1

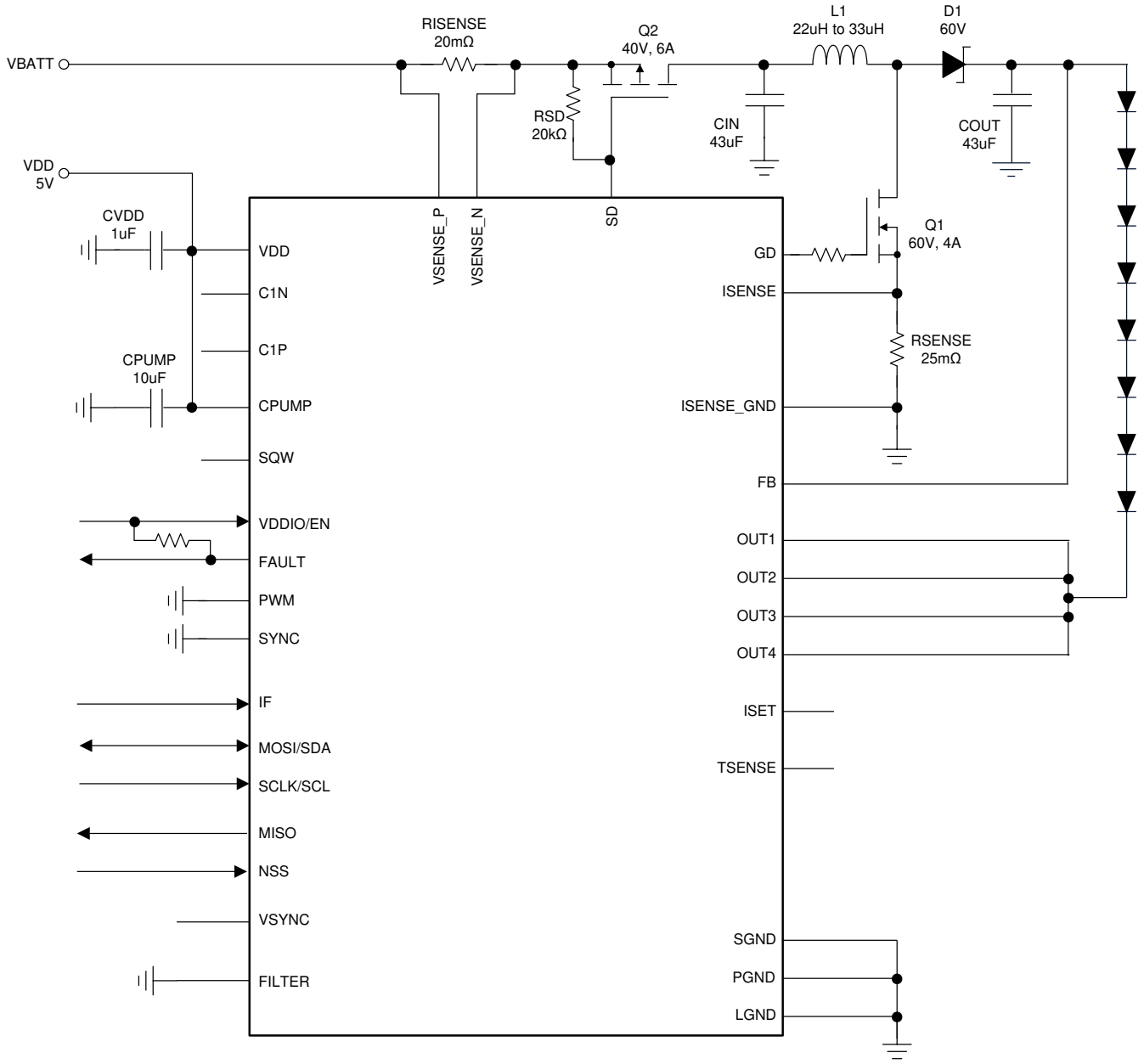

Figure 2-7. Use Case for LP8860G-Q1

2.8 H Version

The LP8860H-Q1 is configured for four strings × 80 mA using a 5-V VDD and PWM pin to control brightness. Table 2-15 lists detailed configurations and full EEPROM information for LP8860H-Q1.

Table 2-15. Detailed EEPROM Configuration: LP8860H-Q1

H		
Boost	Switching Current Limit	4 A
	SYNC Input	Disabled
	2 × Charge Pump	Disabled
	Spread Spectrum	Disabled
	f_{SW}	800 kHz
	VDD	5 V
	Initial Boost Voltage	25 V
LED Driver	Input Brightness Control Method	PWM pin input (direct)
	Maximum LED current per channel	80 mA
	ISET Resistor Control	Disabled
	Number of Channels	4 strings
	Channel Phase Shift	90 degrees (4 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	4.883 kHz
	Dimming Resolution	10-bit PWM + 4-bit dither
	Drive Strength and Rise Time	200 ns
	Dimming Ratio	1024:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	6.9 V
	VIN OVP Level	22.5
	VIN UVLO Level	5 V
	VDD UVLO	3 V
	Input OCP Limit	6 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A
VSYNC and PLL	PLL	Disabled 5-MHz oscillator
	VSYNC input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-16. EEPROM Register Values: LP8860H-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11101100	EC
61	11001100	CC
62	01011100	5C
63	11010000	D0
64	11010111	D7
65	11100101	E5
66	01110000	70
67	01110111	77
68	01110111	77
69	01110001	71
6A	00111011	3B
6B	10110111	B7
6C	00010111	17
6D	11101111	EF
6E	00010000	10
6F	10001011	8B
70	11000100	C4
71	00110101	35
72	11100101	E5
73	00010010	12
74	01000101	45
75	11000110	C6
76	10001100	8C
77	11111111	FF
78	00111110	3E

Figure 2-8 shows the use case for the LP8860H-Q1.

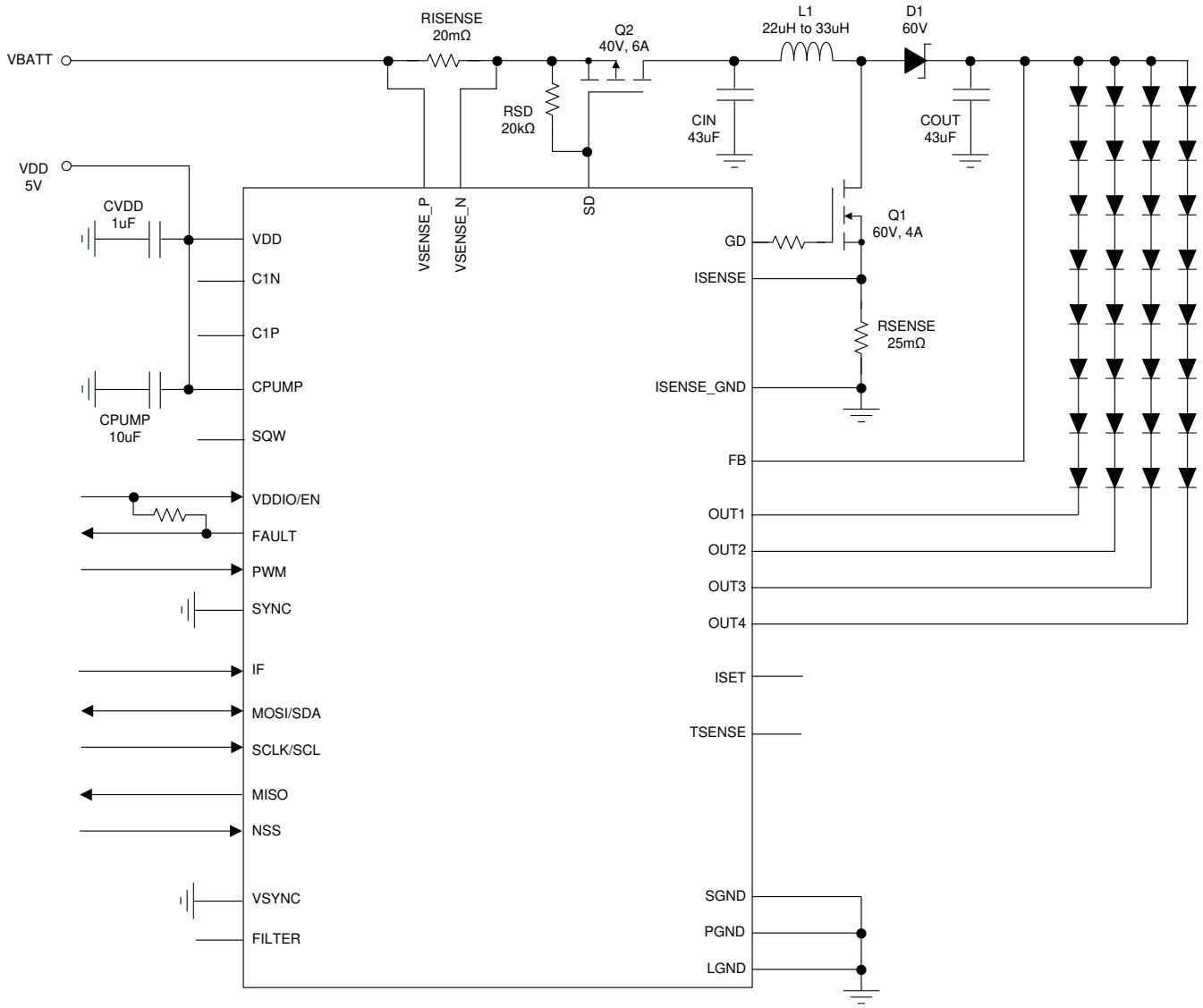

Figure 2-8. Use Case for LP8860H-Q1

2.9 J Version

The LP8860J-Q1 is configured for three strings × 80 mA using a 3.3-V VDD and I^2C or SPI to control brightness. LED current can be adjusted using an ISET resistor. Table 2-17 lists detailed configurations and full EEPROM information for LP8860J-Q1.

Table 2-17. Detailed EEPROM Configuration: LP8860J-Q1

J		
Boost	Switching Current Limit	6 A
	SYNC Input	Disabled
	2 × Charge Pump	Enabled
	Spread Spectrum	Enabled
	f_{SW}	2.2 MHz
	VDD	3.3 V
	Initial Boost Voltage	28 V
LED Driver	Input Brightness Control Method	I^2C/SPI BRT Register
	Max LED current per channel	80 mA
	ISET Resistor Control	Enabled
	Number of Channels	3 strings
	Channel Phase Shift	120 degrees (3 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	9.766 kHz
	Dimming Resolution	10-bit PWM + 4-bit dither
	Drive Strength and Rise Time	200 ns
	Dimming Ratio	1024:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	6.9 V
	VIN OVP Level	22.5
	VIN UVLO Level	5 V
	VDD UVLO	3 V
	Input OCP Limit	6 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Enabled current dimming mode
	Current Dimming Knee Point	6 µA
	EXT_TEMP_GAIN[3:0]	14
	EXT_TEMP_LEVEL_HIGH[3:0]	8.49 kΩ
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-17. Detailed EEPROM Configuration: LP8860J-Q1 (continued)

J		
VSYNC and PLL	PLL	Disabled 5-MHz oscillator
	VSYNC input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-18. EEPROM Register Values: LP8860J-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	01101111	6F
61	11111111	FF
62	11011100	DC
63	11000010	C2
64	11010111	D7
65	11100101	E5
66	11111010	FA
67	01110111	77
68	01110111	77
69	11100001	E1
6A	10111011	BB
6B	10110111	B7
6C	00010111	17
6D	11101111	EF
6E	10110001	B1
6F	10001011	8B
70	11001001	C9
71	10000111	87
72	11100101	E5
73	11011000	D8
74	01000101	45
75	10000110	86
76	11011110	DE
77	10101111	AF
78	00111111	3F

Figure 2-9 shows the use case for the LP8860J-Q1.

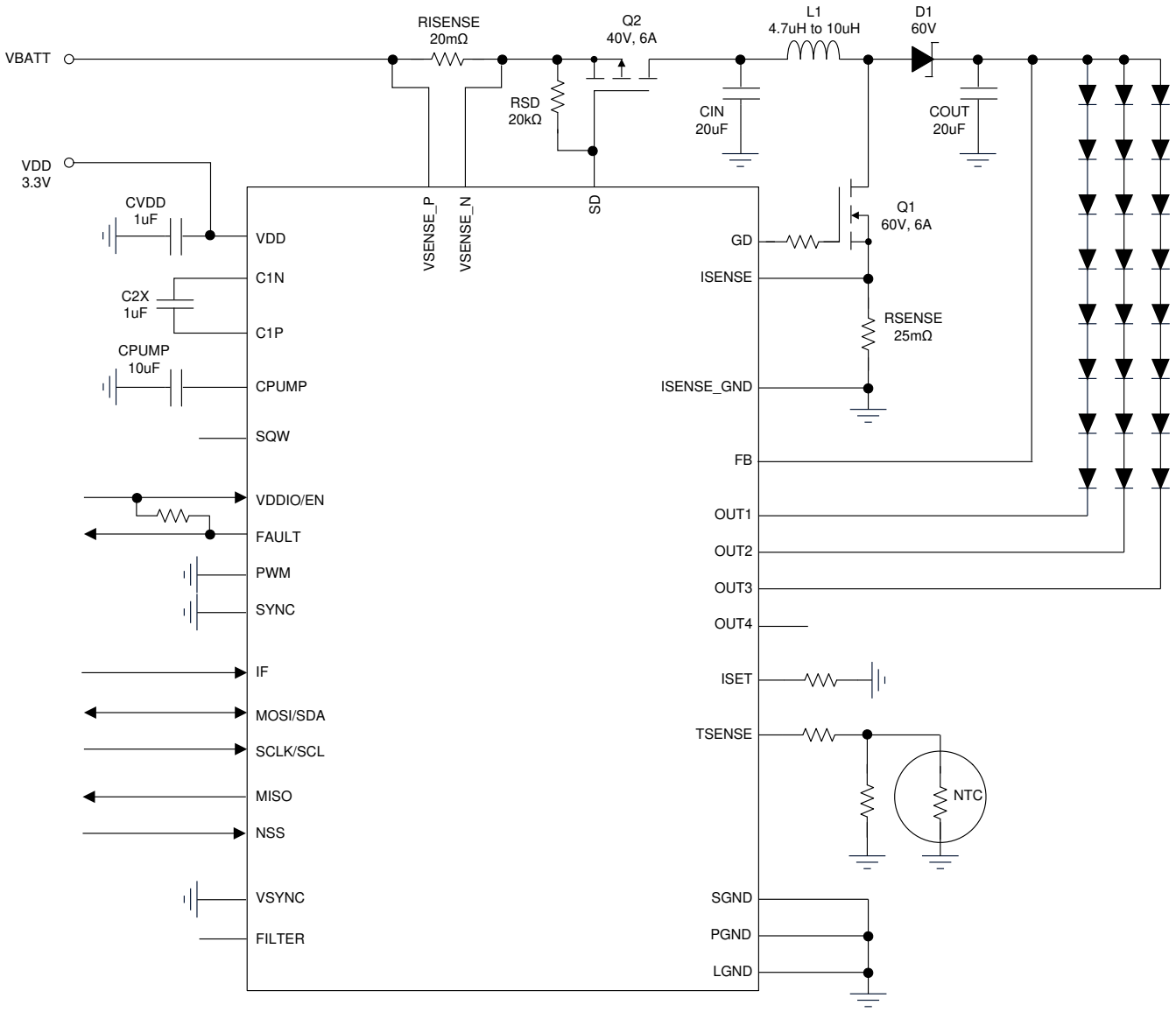

Figure 2-9. Use Case for LP8860J-Q1

2.10 L Version

The LP8860L-Q1 is configured for 3 strings × 80 mA using a 3.3-V VDD with charge pump and PWM input to control the brightness. LED current can be adjusted using an ISET resistor. Table 2-19 lists detailed configurations and full EEPROM information for LP8860L-Q1.

Table 2-19. Detailed EEPROM Configuration: LP8860L-Q1

L		
Boost	Switching Current imit	3 A
	SYNC Input	Disabled
	2 × Charge Pump	Enabled
	Spread Spectrum	Enabled
	f_{SW}	400 kHz
	VDD	3.3 V
	Initial Boost Voltage	28.5 V
LED Driver	Input Brightness Control Method	PWM pin input
	Maximum LED current per channel	80 mA
	ISET Resistor Control	Enabled
	Number of Channels	3 strings
	Channel Phase Shift	120 degrees (3 phases)
	LED Output Dimming Method	Hybrid dimming
	Current to PWM Switch Point	0.125
	Current Linearity Correction Slope	1
	Output PWM Dimming Frequency	4.883 kHz
	Dimming Resolution	12-bit PWM + 4-bit dither
	Drive Strength and Rise Time	100 ns
	Dimming Ratio	4096:1
	Sloper	105 ms
	Driver Headroom Voltage	V_{SAT} + 300 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	Disabled
	VIN UVLO Level	3 V
	VDD UVLO	3 V
	Input OCP Limit	6 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-19. Detailed EEPROM Configuration: LP8860L-Q1 (continued)

L		
VSYNC and PLL	PLL	Enabled
	VSYNC input	Disabled
	SYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-20. EEPROM Register Values: LP8860L-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11110100	F4
61	00001001	09
62	01000011	43
63	11000011	C3
64	01011101	5D
65	00010100	14
66	00111100	3C
67	01110111	77
68	01110111	77
69	00000000	00
6A	00001011	0B
6B	00000000	00
6C	00000000	00
6D	00110000	30
6E	00010000	10
6F	10000100	84
70	00000011	03
71	10101011	AB
72	01100000	60
73	00011001	19
74	01000101	45
75	00000000	00
76	10000010	82
77	00000000	00
78	00000000	00

Figure 2-10 shows the use case for the LP8860L-Q1

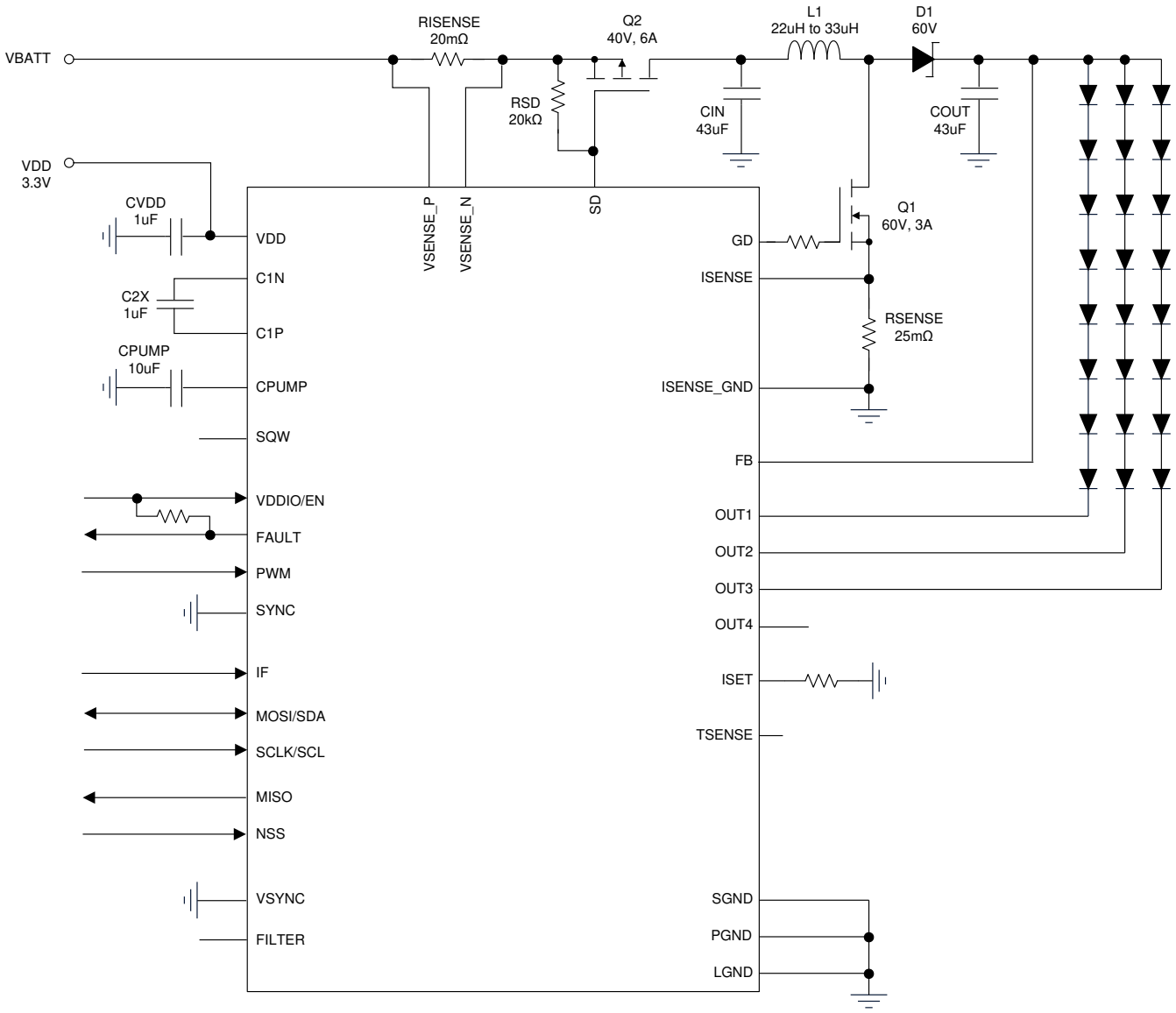

Figure 2-10. Use Case for LP8860L-Q1

2.11 N Version

The LP8860N-Q1 is configured for two strings × 150 mA using a 3.3-V VDD and I²C or SPI to control brightness. LED current can be adjusted using an ISET resistor. Table 2-21 lists detailed configuration and full EEPROM information for LP8860N-Q1.

Table 2-21. Detailed EEPROM Configuration: LP8860N-Q1

J		
Boost	Switching Current Limit	9 A
	SYNC Input	Enabled
	2 × Charge Pump	Enabled
	Spread Spectrum	Enabled
	f_{SW}	2.2 MHz
	VDD	3.3 V
	Initial Boost Voltage	34 V
LED Driver	Input Brightness Control Method	I²C/SPI BRT Register
	Max LED current per channel	150 mA
	ISET Resistor Control	Enabled
	Number of Channels	2 strings
	Channel Phase Shift	180 degrees (2 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	= 11 × F_VSYNC
	Dimming Resolution	10-bit PWM + 4-bit dither
	Drive Strength and Rise Time	100 ns
	Dimming Ratio	8192:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	22.5 V
	VIN UVLO Level	3 V
	VDD UVLO	2.5 V
	Input OCP Limit	8 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-21. Detailed EEPROM Configuration: LP8860N-Q1 (continued)

J		
VSYNC and PLL	PLL	Enabled = 8192 × 11 × F_VSYNC
	VSYNC input	Enabled
	VSYNC or HSYNC	VSYNC
	PWM_SYNC	1
	Pre-divider	0
	Slow PLL Divider	10
	R_SEL	0
	SEL_Divider	Slow
	PWM_FREQ	0
	PWM_RES	3

Table 2-22. EEPROM Register Values: LP8860N-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	11111111	FF
61	11111111	FF
62	11011100	DC
63	11110100	F4
64	01011111	5F
65	11111011	FB
66	11111010	FA
67	01110111	77
68	01110111	77
69	01110000	70
6A	00111111	3F
6B	00000000	00
6C	11001010	CA
6D	11010000	D0
6E	10110000	B0
6F	10000111	87
70	11001111	CF
71	10100111	A7
72	11100101	E5
73	11100100	E4
74	00110101	35
75	10101110	AE
76	01010010	52
77	11111111	FF
78	00111110	3E

Figure 2-11 shows the use case for the LP8860N-Q1.

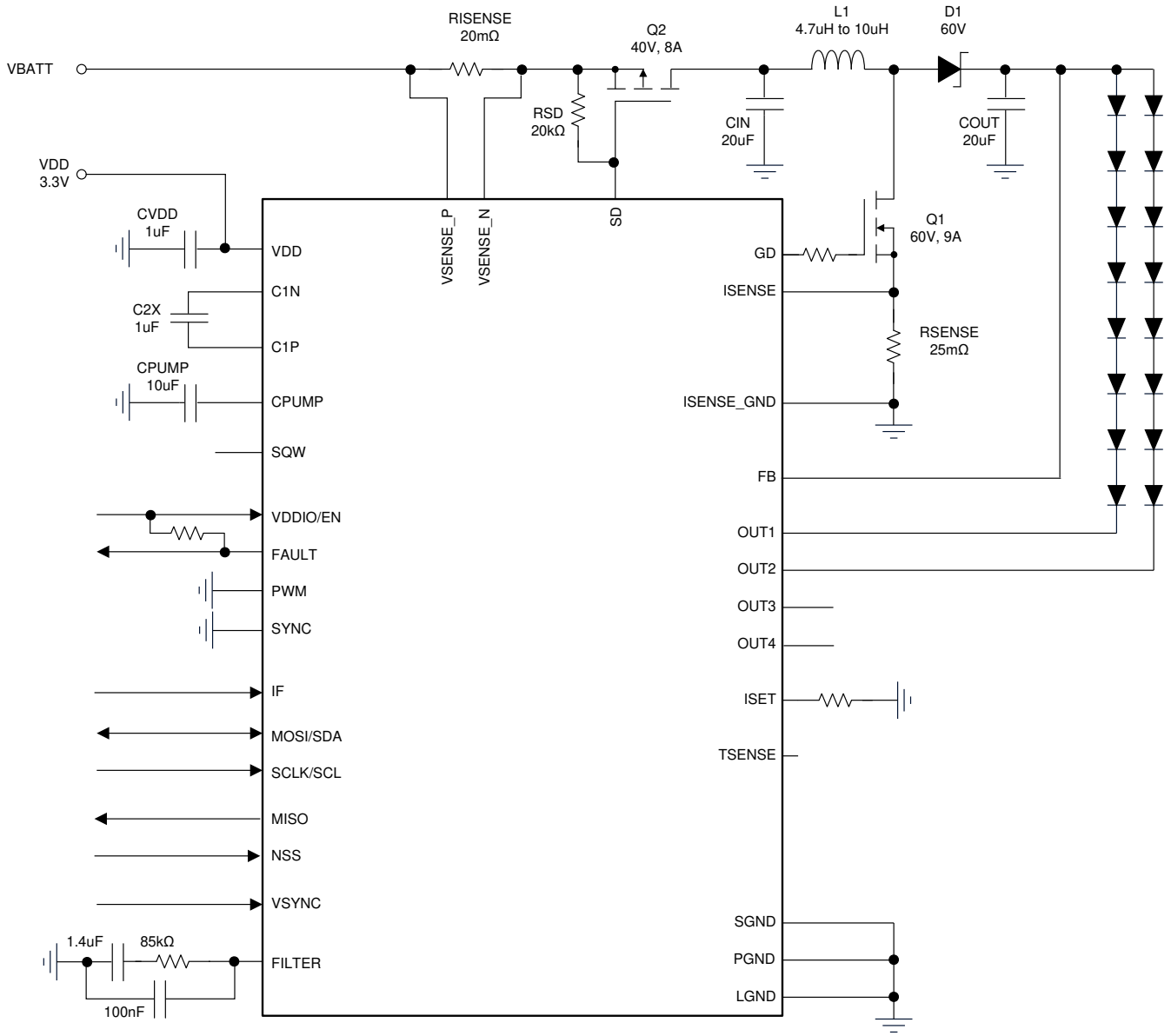

Figure 2-11. Use Case for LP8860N-Q1

2.12 R Version

The LP8860R-Q1 is configured for four strings × 150mA using a 3.3-V VDD and PWM input to control brightness. LED current can be adjusted using an ISET resistor. Table 2-23 lists detailed configuration and full EEPROM information for the LP8860R-Q1.

Table 2-23. Detailed EEPROM Configuration: LP8860R-Q1

J		
Boost	Switching Current Limit	9 A
	SYNC Input	Disabled
	2 × Charge Pump	Enabled
	Spread Spectrum	Enabled
	f_{SW}	2.2 MHz
	VDD	3.3 V
	Initial Boost Voltage	30 V
LED Driver	Input Brightness Control Method	PWM pin input
	Max LED current per channel	150 mA
	ISET Resistor Control	Enabled
	Number of Channels	4 strings
	Channel Phase Shift	90 degrees (4 phases)
	LED Output Dimming Method	PWM
	Current to PWM Switch Point	N/A
	Current Linearity Correction Slope	N/A
	Output PWM Dimming Frequency	4.833 kHz
	Dimming Resolution	12-bit PWM + 4-bit dither
	Drive Strength and Rise Time	200 ns
	Dimming Ratio	1024:1
	Sloper	105 ms + advanced slope
	Driver Headroom Voltage	V_{SAT} + 50 mV
Fault Handling	Short LED Fault Threshold	10.6 V
	VIN OVP Level	Disabled
	VIN UVLO Level	3 V
	VDD UVLO	2.5 V
	Input OCP Limit	8 A
	Powerline FET Type	PMOS
	SD Pulldown Current	440 µA
Temperature Compensation	Internal Temperature Compensation	Disabled
	External Temperature Compensation	Disabled
	Current Dimming Knee Point	N/A
	EXT_TEMP_GAIN[3:0]	N/A
	EXT_TEMP_LEVEL_HIGH[3:0]	N/A
	EXT_TEMP_LEVEL_LOW[3:0]	N/A

Table 2-23. Detailed EEPROM Configuration: LP8860R-Q1 (continued)

J		
VSYNC and PLL	PLL	Enabled, 20-MHz PLL
	VSYNC input	Disabled
	VSYNC or HSYNC	N/A
	PWM_SYNC	N/A
	Pre-divider	N/A
	Slow PLL Divider	N/A
	R_SEL	N/A
	SEL_Divider	N/A
	PWM_FREQ	N/A
	PWM_RES	N/A

Table 2-24. EEPROM Register Values: LP8860R-Q1

ADDRESS (HEX)	VALUE (BIN)	VALUE (HEX)
60	00101111	2F
61	11111111	FF
62	11011100	DC
63	11110000	F0
64	11011111	DF
65	11110101	F5
66	11111000	F8
67	01110111	77
68	01110111	77
69	11100001	E1
6A	00111111	3F
6B	10110111	B7
6C	00010111	17
6D	11111111	FF
6E	10110000	B0
6F	10000100	84
70	11001111	CF
71	11000111	C7
72	11100101	E5
73	11011100	DC
74	00110101	35
75	10000110	86
76	01011110	5E
77	10111111	BF
78	00111110	3E

Figure 2-12 shows the use case for the LP8860R-Q1.

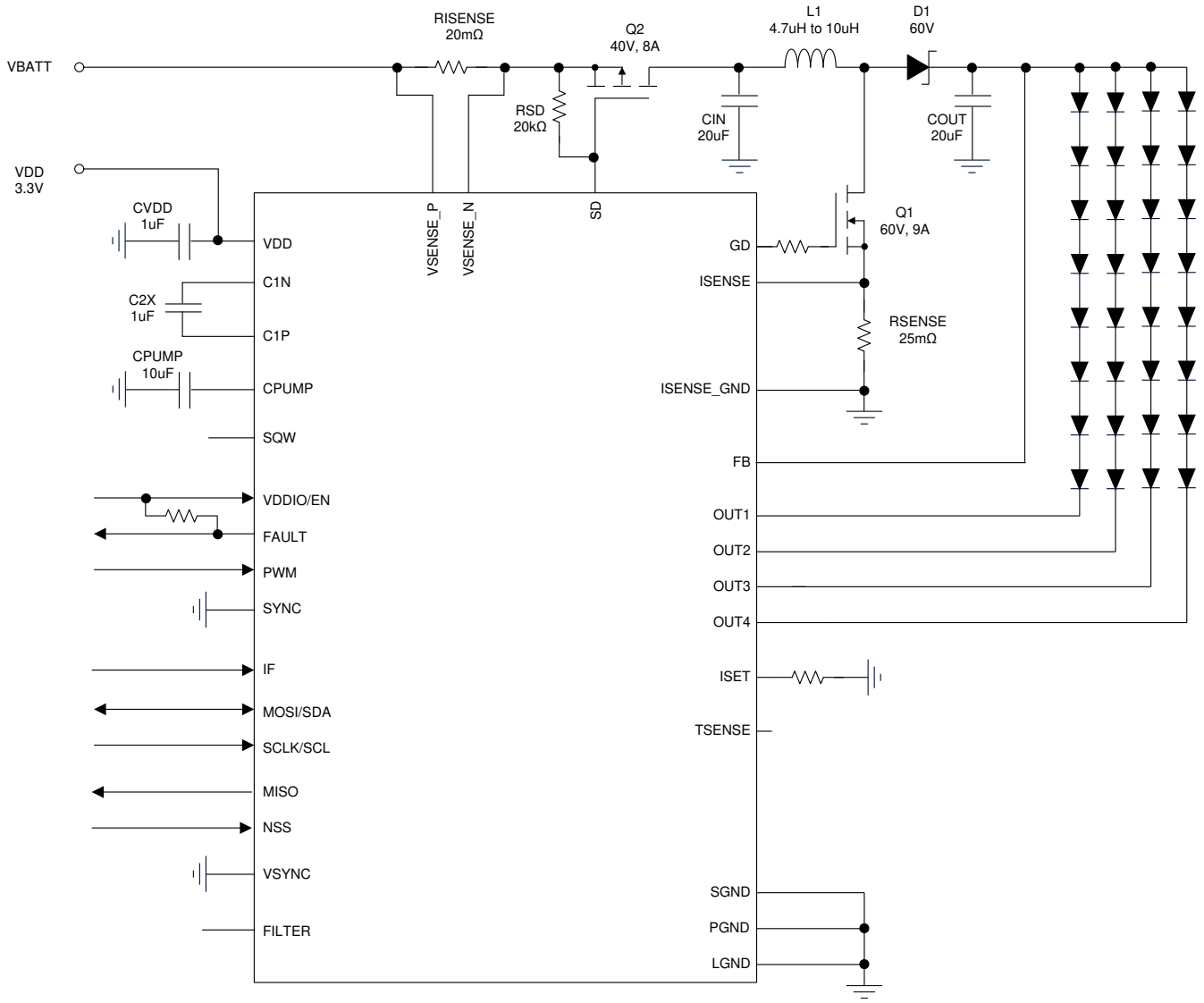

Figure 2-12. Use Case for LP8860R-Q1

3 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision C (August 2017) to Revision D (September 2020)	Page
• Change RevA register information to fit real product (0x77)	3
• Change RevC register information to fit real product (0x60/0x61/0x63/0x69/0x77/0x78)	10
• Change RevC Maximum LED current per Channel from 104mA to 125mA	10
• Change RevC EXT_TEMP_LEVEL_HIGH[3:0] from 7.2kΩ to 22.67kΩ	10
• Change RevC EXT_TEMP_LEVEL_LOW[3:0] from N/Ato 22.67kΩ	10

Changes from Revision B (June 2017) to Revision C (August 2017)	Page
• update Table 2 to add information regarding "N" and "R" EEPROM options	1
• Changed f_{SW} boost value (G) from 800 kHz to 400 kHz	1
• Changed number of LED driver channels (E) from 4 strings to 1 string	1
• Changed maximum LED currents per channel (E) from 100 mA to 400 mA	1
• Changed LED driver dimming ratio (N) from 1024:1 to 8192:1	1
• Changed LED driver (E) value from 100 mA to 400 mA	16
• Changed LED driver number of channels (E) from 4 strings to 1 string (4 channels combined)	16
• Changed LED driver current to PWM switch point value from N/A to 12.5%	22
• Added *Section 2.11* section	34
• Changed LED driver dimming ratio from 1024:1 to 8192:1	34
• Changed binary value of address 65 from 11100011 to 11111011	34
• Changed 161 nF to 1.4 µF in Figure 2-11	34
• Changed 11.2 kΩ to 85 kΩ in Figure 2-11	34
• Changed 12 nF to 100 nF in Figure 2-11	34
• Added *Section 2.12* section	37

Changes from Revision A (April 2017) to Revision B (June 2017)	Page
• Added split table 2 into Tables 2 and 3 to accommodate additional information; added column to Table 2 for "L" EEPROM option	1
• Added Section 2.10 for L version	31

Changes from Revision * (September 2016) to Revision A (April 2017)	Page
• Added column to Table 1 for "G" EEPROM option; updated all graphics	1
• Added Section 2.7 for G version	22

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