

Bias Power Supply for TV and Monitor TFT LCD Panels Using the TPS65160

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ABSTRACT

The reference design and application examples shown in this document help implement a positive-charge pump doubler, show how to drive an isolation FET, and show how to perform voltage conversion with the TPS65160.

The TPS65160 offers a compact power supply solution to provide all four voltages required by thin-film transistor (TFT) LCD panel. With its high current capabilities, the device is ideal for large screen monitor panels and LCD TV applications.

1 Features

- 8-V to 14-V Input Voltage Range
- V_S Output Voltage Range up to 20 V
- 1% Accurate Boost Converter With 2.8-A Switch Current
- 1.5% accurate 1.8-A Step-Down Converter
- 500-kHz/750-kHz Fixed Switching Frequency
- Negative Charge Pump Driver for VGL
- Positive Charge Pump Driver for VGH
- Adjustable Sequencing for VGL, VGH
- Gate Drive Signal to Drive External MOSFET
- Internal and Adjustable Soft Start
- Short-Circuit Protection
- 23-V (TPS65160) Overvoltage Protection
- 19.5-V (TPS65160A) Overvoltage Protection
- Thermal Shutdown
- Available in TSSOP-28 Package

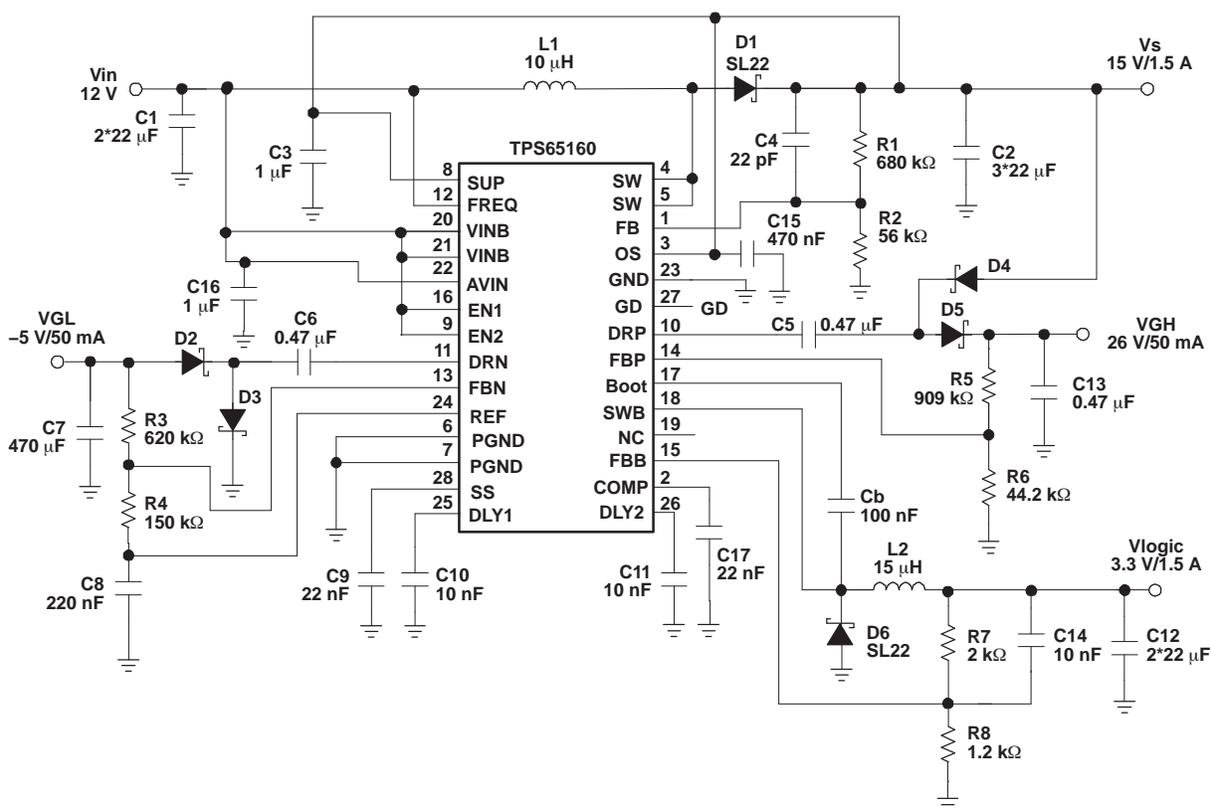
2 TPS65160 Reference Design

The reference design takes an 8-V to 14-V input rail and provides the four bias supply voltages that typically are required for TV monitors and TFT LCD panels. The TPS65160 has one boost converter with integrated low-side FET, one buck converter with integrated high-side FET, one positive charge pump controller, and one negative charge pump controller, each requiring external Schottky diodes.

2.1.2 Bill of Materials
Table 1. PR551 Bill of Materials

COUNT	Ref Des	Value	Description	Size	Part Number	MFR
2	C1, C3	0.022 μ F	Capacitor, Ceramic, 50V, X7R	0805	UMK212BJ223KD-T	Taiyo Yuden
3	C10, C20, C25	22 μ F	Capacitor, Ceramic, 16V, X5R, 20%	1210	EMK325BJ226MM-T	Taiyo Yuden
1	C11	0.1 μ F	Capacitor, Ceramic, 50V, X7R, 10%	0805	UMK212BJ104KG-T	Taiyo Yuden
2	C12, C13	22 μ F	Capacitor, Ceramic, 6.3V, X5R, 20%	0805	JMK212BJ226MG-T	Taiyo Yuden
8	C2, C8, C14, C16, C17, C19, C22, C24	0.47 μ F	Capacitor, Ceramic, 35V, X5R, 10% 0805		GMK212BJ474KG-T	Taiyo Yuden
3	C28, C29, C30	22 μ F	Capacitor, Ceramic, 16V, X5R, 20%	1812	EMK432BJ226MM-T	Taiyo Yuden
0	C21	22 μ F	Capacitor, Ceramic, 16V, X5R, 20%	1812	EMK432BJ226MM-T	Taiyo Yuden
3	C4, C5, C15	0.01 μ F	Capacitor, Ceramic, 50V, X7R, 10%	0805	GRM216R71H103KA01	Murata
0	C27	0.01 μ F	Capacitor, Ceramic, 50V, X7R, 10%	0805	GRM216R71H103KA01	Murata
1	C6	10 pF	Capacitor, Ceramic, 50V, C0G, 5%	0805	GRM2165C1H100JZ01	Murata
2	C7, C18	1.0 μ F	Capacitor, Ceramic, 35V, X7R, 10%	1206	GMK316BJ105KL-T	Taiyo Yuden
1	C9	0.22 μ F	Capacitor, Ceramic, 50V, X5R, 10%	0805	UMK212BJ224KG-T	Taiyo Yuden
0	C23	0.22 μ F	Capacitor, Ceramic, 50V, X5R, 10%	0805	UMK212BJ224KG-T	Taiyo Yuden
2	D1, D2		Diode, Schottky Rectifier, 2A, 20V	SMC	SL22	Vishay
3	D4D5, D4D6, D4D7		Diode, Dual Schottky, 200mA, 30V	SOT23	BAT54S	Zetex
6	J1, J2, J3, J4, J8, J12		Header, 3 pin, 100mil spacing, (36-pin strip)	0.100 \times 3	PTC36SAAN	Sullins
5	J5, J6, J7, J10, J11		Header, 4 pin, 100mil spacing, (36-pin strip)	0.100 \times 4	PTC36SAAN	Sullins
1	L1	6.8 μ H	Inductor, SMT, 6.8 μ H, 2.75A, 44 m Ω		7447789006	WUERTH
1	L2	15 μ H	Inductor, SMT, 15 μ H, 1.75A, 130 m Ω		7447789115	WUERTH
0	Q1		MOSFET,P-ch, \sim 30 V, 4 A, 51 m Ω	SOT23	Si2343DS	Vishay
6	R1, R2, R11, R13, R14, R17	0	Resistor, Chip, 1/10W, 1%	0805	Std	Std
0	R15	100k	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	R3	619k	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	R4	150k	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	R5	681k	Resistor, Chip, 1/10W, 1%	0805	Std	Std
2	R6, R10	56.2k	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	R7	2.00k	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	R8	1.20k	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	R9	1.00M	Resistor, Chip, 1/10W, 1%	0805	Std	Std
0	R12	1.00M	Resistor, Chip, 1/10W, 1%	0805	Std	Std
1	U1		IC, Bias Power Supply for TV and Monitor TFT LCD Panels	PWP-28	TPS65160PWP	TI
1	–		PCB, 3.8 In \times 2.3 In \times 0.062 In		TPS65160	Any
6	–		Shunt, 100mil, Black	0.100	929950-00	3M

2.2 Application Examples Using the TPS65160



**Figure 2. Positive-Charge Pump Doubler Running From the Output V_S ($SUP = V_S$)
 Required When Higher V_{GH} Voltages Are Needed.**

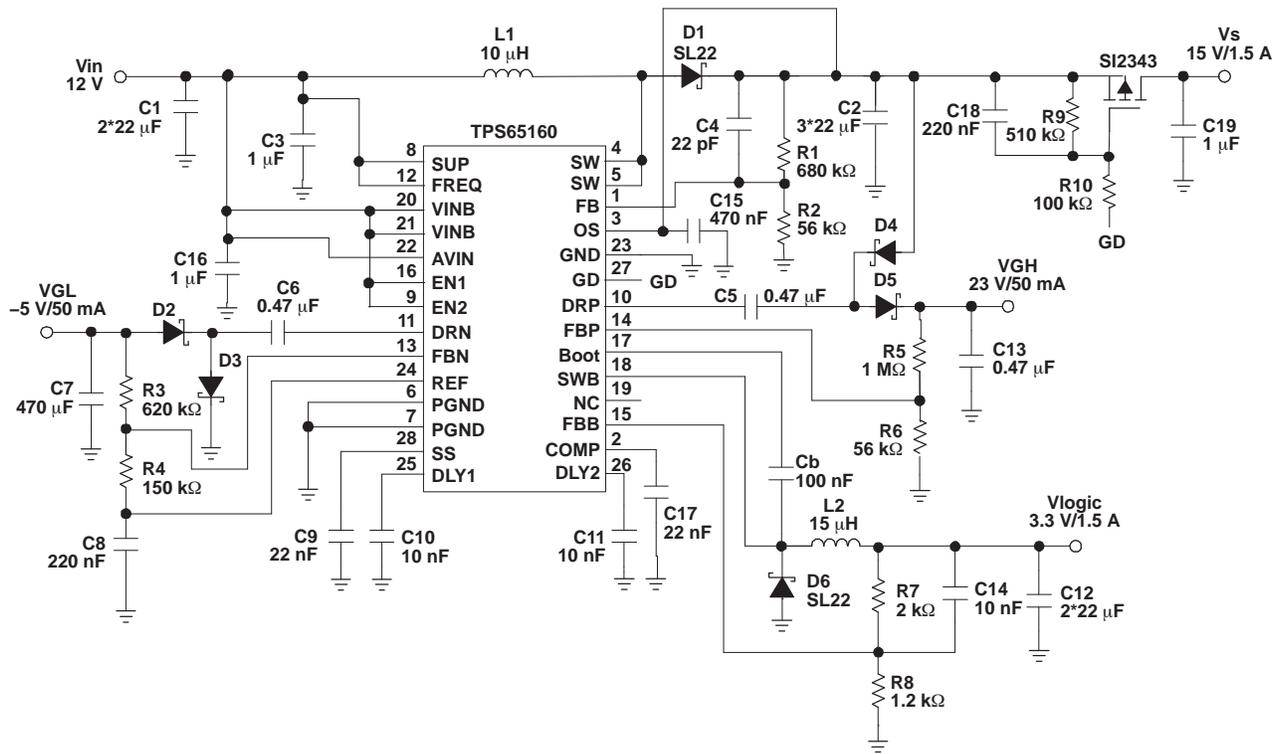


Figure 3. Driving an Isolation FET for V_S using the GD Pin

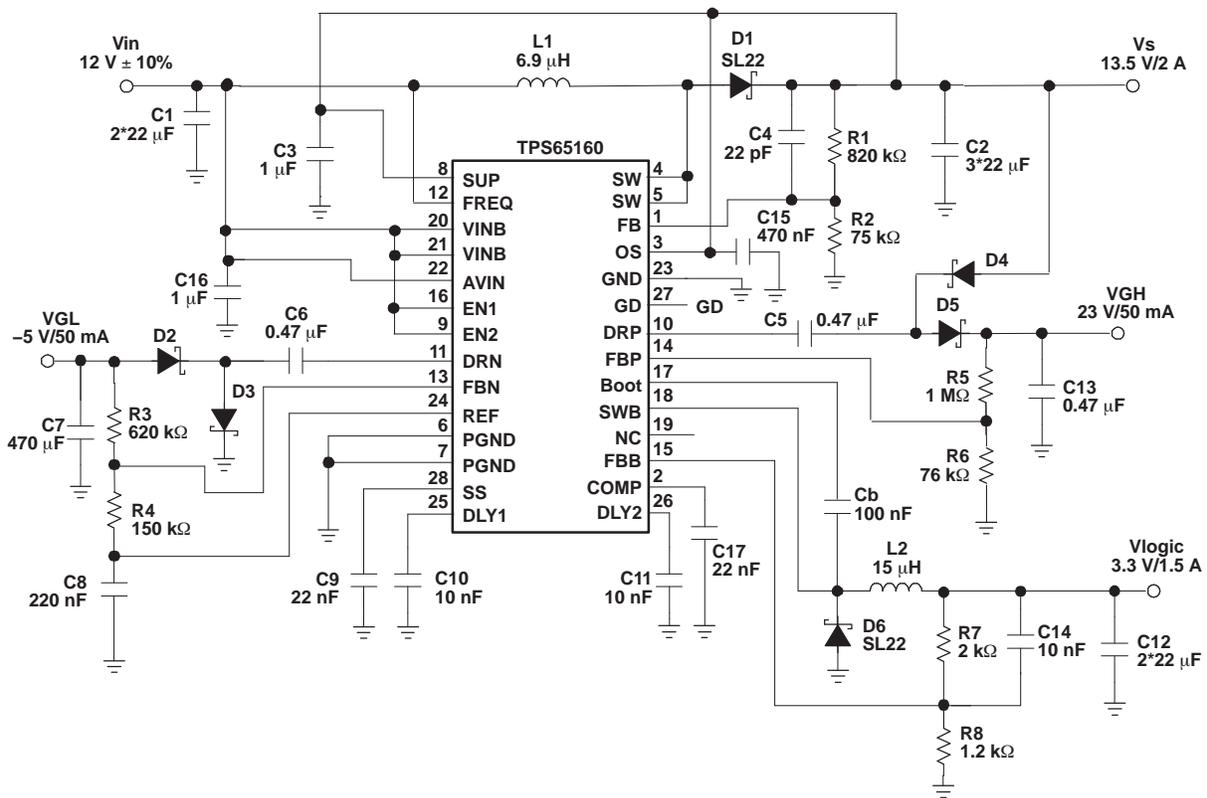


Figure 4. 12-V to 13.5-V Conversion

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