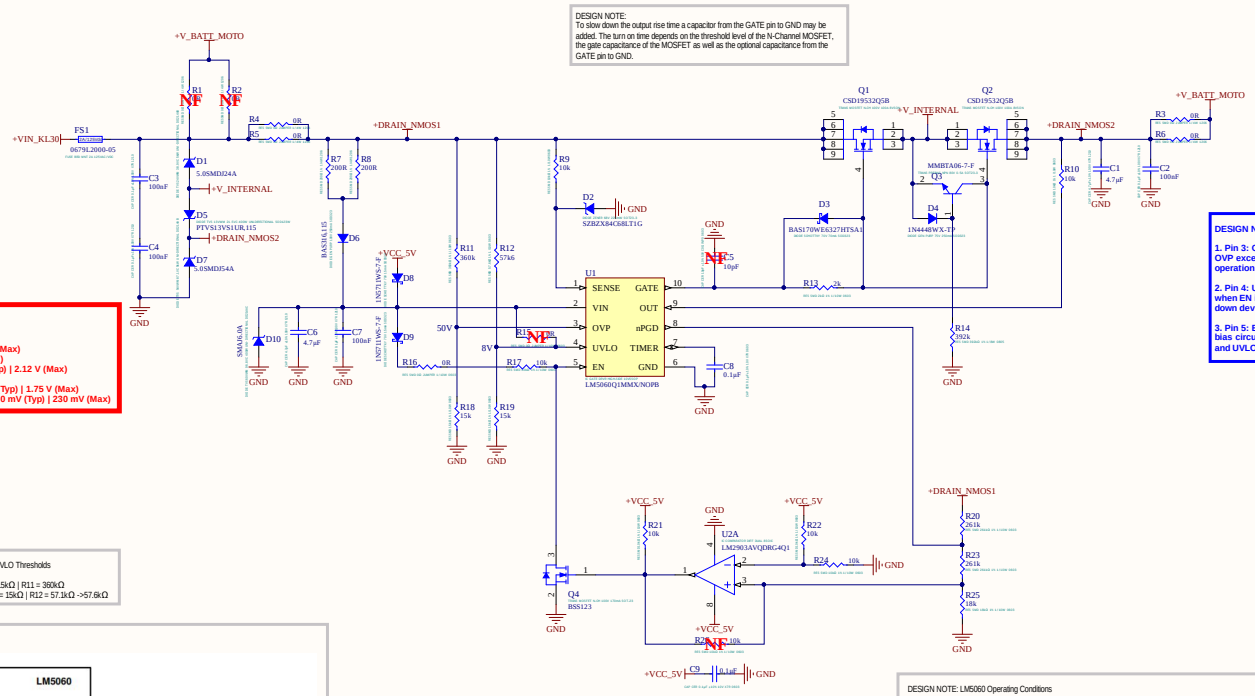
HIGH-SIDE PROTECTION CONTROLLER



DESIGN NOTE:

Vin Min = 5.5 Volts | Vin Max = 65 Volts
Input Quiescent Current: 1.4 mA (Typ) | 1.7 mA (Max)
Input Shutdown Current: 9 µA (Typ) | 15 µA (Max)
OVPTH (OVP threshold): 1.88 V (Min) | 2.0 V (Typ) | 2.12 V (Max)
OVPHYS (OVP hysteresis): 240 mV (Typ)
UVLOTH (UVLO threshold): 1.45 V (Min) | 1.6 V (Typ) | 1.75 V (Max)
UVLOHYS (UVLO hysteresis): 120 mV (Min) | 180 mV (Typ) | 230 mV (Max)

DESIGN NOTE:

1. Pin 3: OVP - Over-voltage protection comparator input: The GATE pin is pulled low when OVP exceeds the typical 2.0-V threshold, but the controller is not latched off. Normal operation resumes when the OVP pin falls below typically 1.76 V.

2. Pin 4: UVLO - Under-voltage lock-out comparator input: The UVLO comparator is activated when EN is high. A voltage greater than typically 1.6 V at the UVLO pin will release the pull down devices on the GATE pin and allow the output to gradually rise.

3. Pin 5: EN - Enable input: A voltage greater than 2.0 V on the EN pin enables the internal bias circuitry and the UVLO comparator. The GATE pin pull-up bias is enabled when both EN and UVLO are in the high state.

DESIGN NOTE: Programm OVP and UVLO Thresholds

- VOVP= 2V and Vin = 50V -> R18 = 15kΩ | R11 = 360kΩ
- VUVLO = 1.6V and Vin = 8V -> R19 = 15kΩ | R12 = 57.1kΩ ->57.6kΩ

DESIGN NOTE: Programm OVP and UVLO Thresholds

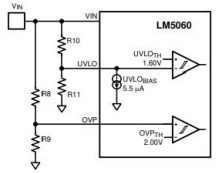


Figure 30. Programming the Thresholds with Resistors R8-R11

Choose the upper UVLO thresholds to ensure operation down to the lowest required operating input voltage (V_{INMIN}). Select R11 based on resistive divider current consumption and noise sensitivity. A value less than 100 kΩ is recommended, with lower values providing improved immunity to variations in $ULVO_{BIAS}$.

$$R10 = \frac{V_{INMIN} - UVLO_{TH}}{\left(UVLO_{BIAS} + \frac{UVLO_{TH}}{R11}\right)} \quad (12)$$

To calculate the UVLO low threshold including its hysteresis, use ($UVLO_{TH}$-$UVLO_{HYS}$) instead of $UVLO_{TH}$ in the formula above. Choose the lower OVP threshold to ensure operation up to the highest VIN voltage required (V_{INMAX}). Select R9 based on resistive divider current consumption A value less than 100 kΩ is recommended.

$$R8 = R9 \times \left(\frac{V_{INMAX} - OVP_{TH}}{OVP_{TH}}\right) \quad (13)$$

To calculate the OVP low threshold including hysteresis, use (OVP_{TH}-OVP_{HYS}) instead of OVP_{TH}. Where the R9-R11 resistor values are known, the threshold voltages are calculated from the following:

$$V_{INMAX} = OVP_{TH} + \frac{R8 \times OVP_{TH}}{R9}$$

$$V_{INMIN} = UVLO_{TH} + \left[R10 \times \left(UVLO_{BIAS} + \frac{UVLO_{TH}}{R11}\right)\right] \quad (14)$$

Also in these two formulas, the respective low value including the threshold hysteresis is calculated by using ($UVLO_{TH}$-$UVLO_{HYS}$) instead of $UVLO_{TH}$ and (OVP_{TH}-OVP_{HYS}) instead of OVP_{TH}. The worst case thresholds, over the operating temperature range, can be calculated using the respective minimum and maximum values in bold font in the *Electrical Characteristics*.

Option C: The OVP function can be disabled by grounding the OVP pin. The UVLO thresholds are set as described in Figure 30.

LAYOUT NOTE:

Review layout notes in the TI Designs: TIDA-01167 (TIDUC41A) on the page 33.

DESIGN NOTE:

Review differents tests in the TI Designs: TIDA-01167 (TIDUC41A) aplication note.

LAYOUT NOTE:

Review layout notes in the data sheet on the page 31.

DESIGN NOTE: LM5060 Operating Conditions

Table 1. Overview of Operating Conditions

INPUTS						OUTPUTS					STATUS
EN	UVLO	OVP (typ)	VIN (typ)	SENSE-OUT	GATE -OUT	VIN Current (typ)	GATE Current (typ)	TIMER	GATE after TIMER > 2 V	nPGD	
L	L	–	>5.10 V	–	–	0.009 mA	2.2 mA sink	Low	–	–	Disabled
L	H	–	>5.10 V	–	–	0.009 mA	2.2 mA sink	Low	–	–	Disabled
H	L	<2 V	>5.10 V	SENSE>OUT	–	0.56 mA	2.2 mA sink	Low	–	H	Standby
				SENSE<OUT						L	
H	L	>2 V	>5.10 V	SENSE>OUT	–	0.56 mA	80 mA sink	Low	–	H	Standby
				SENSE<OUT						L	
H	H	<2 V	>5.10 V	SENSE>OUT	<5 V	1.4 mA	24-µA source	6-µA source	80 mA sink	H	Enabled
				SENSE<OUT				Low	–	L	
H	H	<2 V	>5.10 V	SENSE>OUT	>5 V	1.4 mA	24-µA source	11-µA source	80 mA sink	H	Enabled
				SENSE<OUT				Low	–	L	
H	H	>2 V	>5.10 V	SENSE>OUT	–	1.4 mA	80 mA sink	Low	–	H	Over-voltage
				SENSE<OUT						L	
H	H	<2 V	<5.10 V	–	–	1.4 mA	2.2 mA sink (see (1))	Low	–	H	Power on reset

(1) The 2.2 mA sink current is valid for with the VIN pin ≥ 5.1 V. When the VIN pin < 5.1 V the sink current is lower. See 'GATE Pin Off Current vs. VIN' plot in *Typical Characteristics*.

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