High-Side OR-ing FET Controller

1 Features

- **Available in Standard and AEC-Q100 Qualified Versions BM180 (up to 150°C T_J)**
- **Functional safety capable**
  - **Documentation available to aid functional safety system design**
- **Wide Operating Input Voltage Range, V_{IN}: 1 V to 60 V (V_{BIAS} required for V_{IN} < 5 V)**
- **100-V Transient Capability**
- **Charge Pump Gate Driver for External N-Channel MOSFET**
- **Fast 50-ns Response to Current Reversal**
- **2-A Peak Gate Turnoff Current**
- **Minimum V_{DS} Clamp for Faster Turnoff**
- **Package: SOT-6 (Thin SOT-23-6)**

2 Applications

Active OR-ing of Redundant (N+1) Power Supplies

3 多路并联控制，防倒灌，低损耗

脚对脚替代LM5050

3 Description

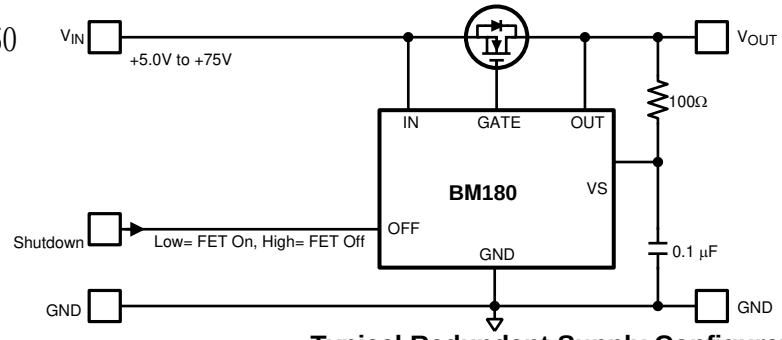
The BM180 High Side OR-ing FET Controller operates in conjunction with an external MOSFET as an ideal diode rectifier when connected in series with a power source. This ORing controller allows MOSFETs to replace diode rectifiers in power distribution networks thus reducing both power loss and voltage drops.

The BM180 controller Provides charge pump gate drive for an external N-Channel MOSFET and a fast response comparator to turn off the FET when current flows in the reverse direction. The BM180 can connect power supplies ranging from 5V to 60V and can withstand transients up to 100 V.

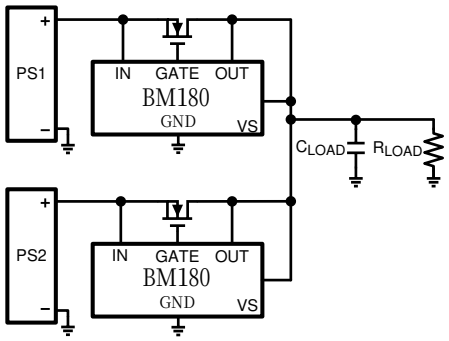
Device Information(1)

PART NUMBER	PACKAGE	BODY SIZE (NOM)
BM180	SOT (6)	2.90 mm × 1.60 mm

Full Application

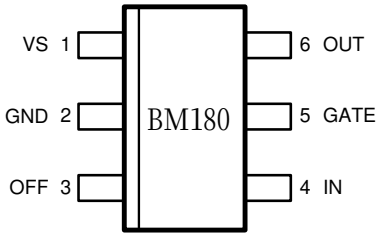


Typical Redundant Supply Configuration



5 Pin Configuration and Functions

DDC Package
6-Pin SOT
Top View



Pin Functions

PIN		I/O	DESCRIPTION
NO.	NAME		
1	VS	I	The main supply pin for all internal biasing and an auxiliary supply for the internal gate drive charge pump. Typically connected to either V_{OUT} or V_{IN}; a separate supply can also be used.
2	GND	PWR	Ground return for the controller
3	OFF	I	A logic high state at the OFF pin will pull the GATE pin low and turn off the external MOSFET. Note that when the MOSFET is off, current will still conduct through the FET's body diode. This pin should may be left open or connected to GND if unused.
4	IN	I	Voltage sense connection to the external MOSFET Source pin.
5	GATE	O	Connect to the Gate of the external MOSFET. Controls the MOSFET to emulate a low forward-voltage diode.
6	OUT	O	Voltage sense connection to the external MOSFET Drain pin.

8.2.2 Using a Separate VS Supply for Low Vin Operation

In some applications, it is desired to operate BM180 from low supply voltage. The BM180 can operate with a 1-V rail voltage, provided its VS pin is biased from 5 V to 60 V. The detail of such application is depicted in Figure 27.

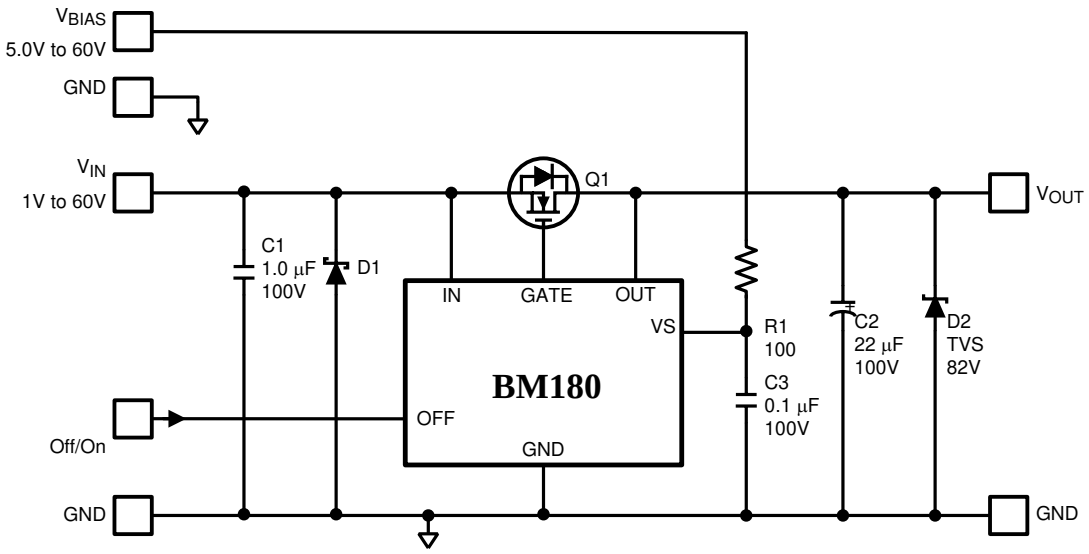


Figure 27. Using a Separate vs Supply for Low Vin Operation Schematic

8.2.3 ORing of Two Power Sources

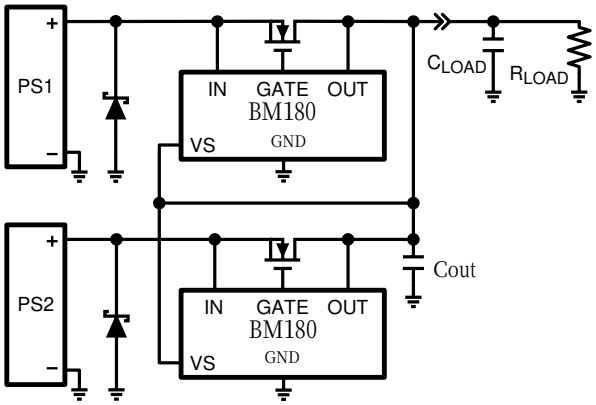


Figure 28. ORing of Two Power Sources

8.2.4 Reverse Input Voltage Protection With IQ Reduction

If Vs is powered while IN is floating or grounded, then about 0.5 mA will leak from the Vs pin into the IC and about 3 mA will leak from the OUT pin into the IC. From this leakage, about 50 uA will flow out of the IN pin and the rest will flow to ground. This does not affect long term reliability of the IC, but may influence circuit design.

In battery powered applications, whenever BM180 functionality is not needed , the supply to the BM180 can be disconnected by turning “OFF” Q2, as shown in Figure 29. This disconnects the ground path of the BM180 and eliminates the current leakage from the battery.

The quiescent current of BM180 can be also reduced by disconnecting the supply to VS pin,whenever BM180 function is not needed.

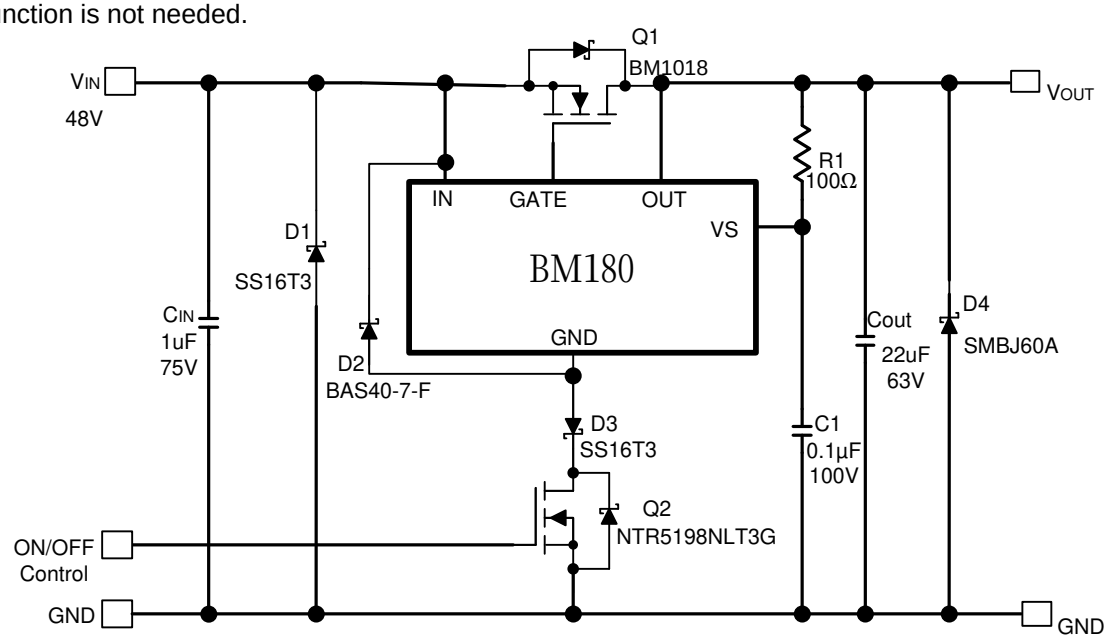


Figure 29. Reverse Input Voltage Protection With IQ Reduction Schematic

8.2.5 Basic Application With Input Transient Protection

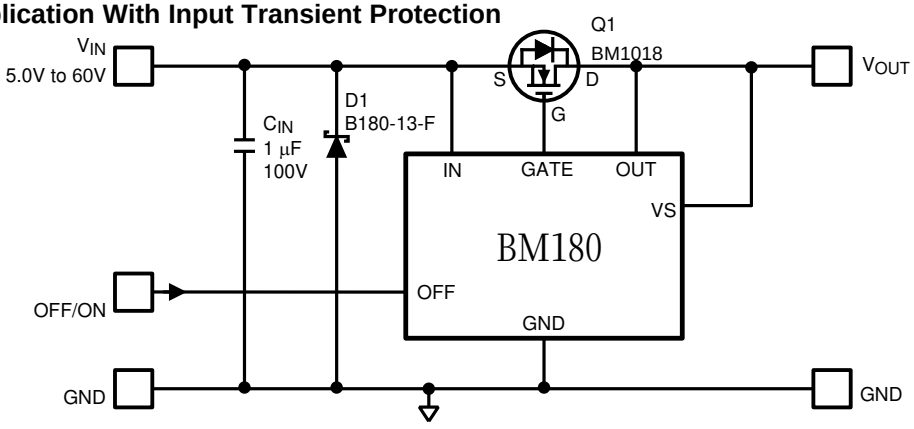


Figure 30. Basic Application With Input Transient Protection Schematic

8.2.6 48-V Application With Reverse Input Voltage (V_{IN} = –48 V) Protection

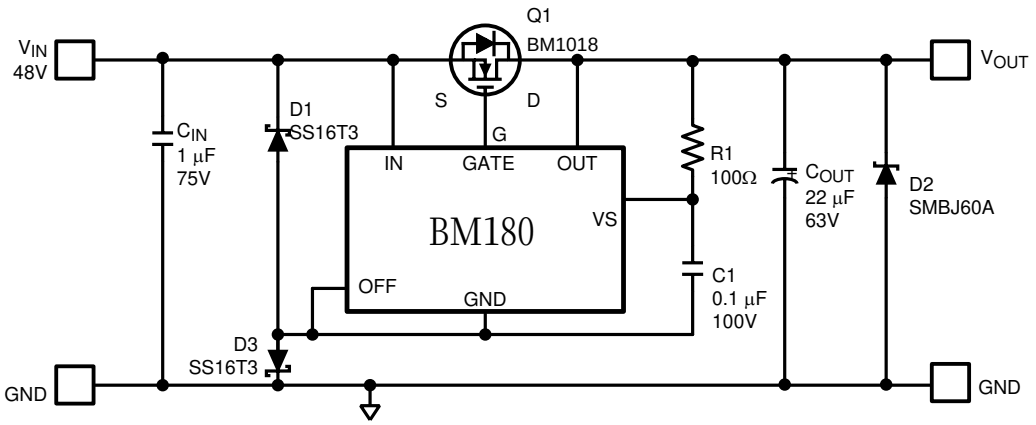


Figure 31. 48-V Application With Reverse Input Voltage (V_{IN} = –48 V) Protection Schematic

8.2.6.1 Application Curves

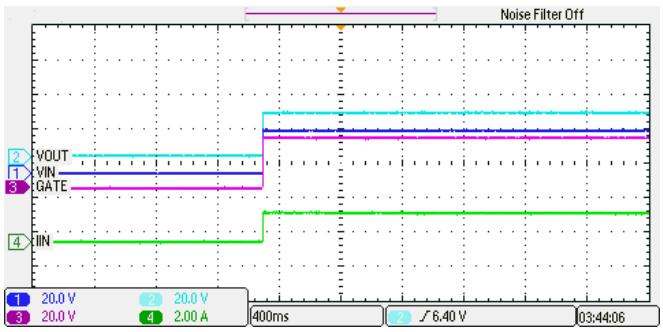


Figure 32. Operation With Positive Polarity Input With (VIN = 25 V)

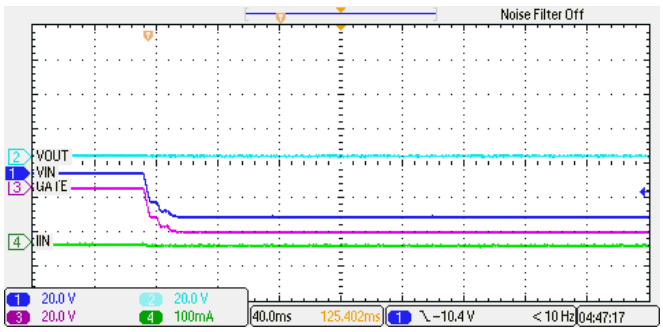


Figure 33. Operation With Negative polarity Input With (VIN = –25 V)

9 Power Supply Recommendations

When the BM180 shuts off the external MOSFET, transient voltages will appear on the input and output due to reverse recovery, as discussed in Short Circuit Failure of an Input Supply.To prevent BM180 and surrounding components from damage under the conditions of a direct input short circuit, it is necessary to clamp the negative transient at IN, and OUT pins with TVS.

10 Layout

10.1 Layout Guidelines

The typical PCB layout for BM180 is shown in Figure 34. TI recommends connecting the IN, Gate and OUT pins close to the source and drain pins of the MOSFET. Keep the traces of the MOSFET drain wide and short to minimize resistive losses. Place surge suppressors (D1 and D4) components as shown in the example layout of BM180 in Layout Example.

10.2 Layout Example

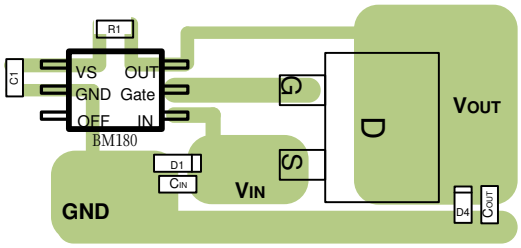
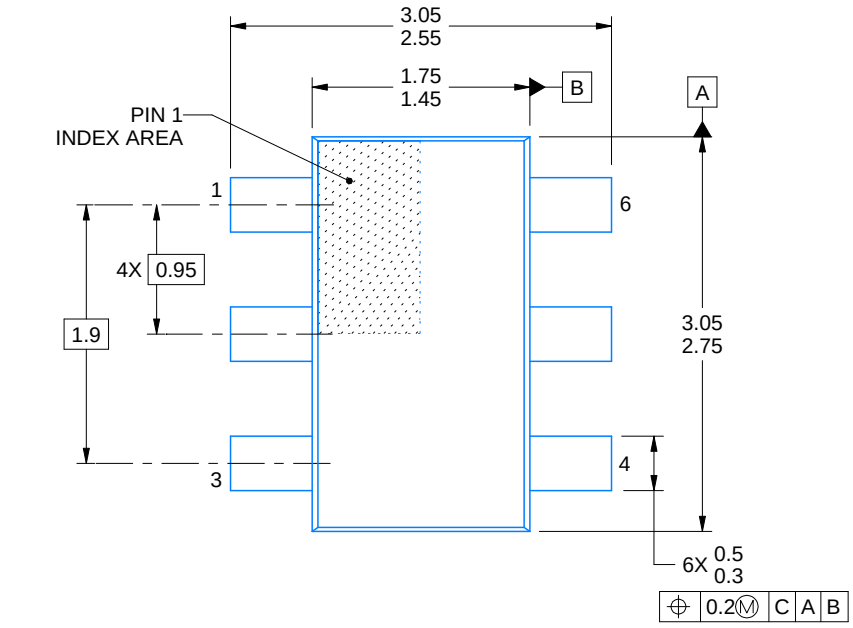
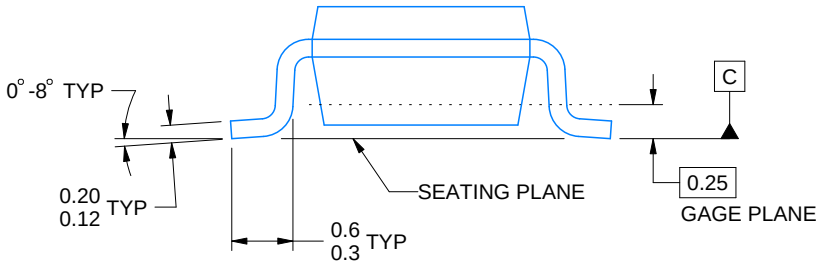


Figure 34. Typical Layout Example With D2PAK N-MOSFET





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NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. Reference JEDEC MO-193.