

Description

The MIK3526 is a dual integrated high-side power switch with independent enable and flag functions, optimized for self-powered and bus-powered Universal Serial Bus (USB) applications. The MIK3526 satisfies the following USB requirements: each switch channel supplies up to 500 mA; the switch's low on-resistance meets USB voltage drop requirements; fault current is limited to typically 1200mA, and a flag output is available to indicate fault conditions to the local USB controller. Additional features include thermal shutdown to prevent catastrophic switch failure from high-current loads, undervoltage lockout (UVLO) to ensure that the device remains off unless there is a valid input voltage present, and 3.3V and 5V logic compatible enable inputs. The MIK3526 is available in active-high and active-low versions in 8-pin DIP and SOIC packages.

Features

- 2 independent switches
- Individual open-drain fault flag pins
- 2.7V to 5.5V input
- 500mA continuous load current per port
- 140mΩ maximum on-resistance
- 1μA Maximum Standby Supply Current
- Thermal shutdown
- Undervoltage lockout (UVLO)
- Active-high or active-low enable versions

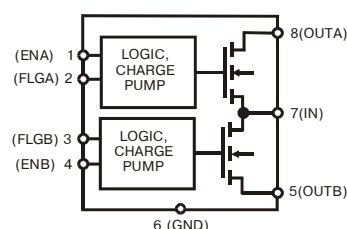
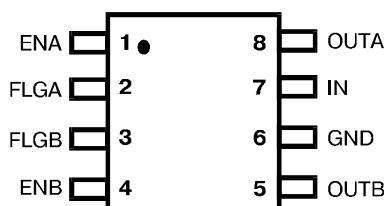
Applications

- USB Power Management
- Hot plug-in power supplies
- Battery - Charger circuits

Ordering Information

Part Number	Enable	Temperature Range
MIK3526-H	Active High	-40°C to +85°C
MIK3526-L	Active Low	-40°C to +85°C

Pin configuration MIK3526–X



Pin Description

Pin Number	Pin Name	Pin Function
1, 4	EN(A/B)	Enable (Input): Logic-compatible enable input. High input > 2.1V typical. Low input <1.9V typical (H active high, L active low).
2, 3	FLG(A/B)	Fault Flag (Output): Active-low, open-drain output. Indicates overcurrent, and thermal shutdown, UVLO, OVLO.
6	GND	Ground.
7	IN	Supply Input: Output MOSFET drain. Also supplies IC's internal circuitry.
8, 5	OUT(A/B)	Switch Output: Output MOSFET source. Typically connect to switched side of load.

Detailed description

Power switch

The power switch is an N-channel MOSFET with a maximum on-state resistance of 500 mΩ ($V_{IN}=5V$). The power switch supplies a minimum of 100 mA per switch.

Enable (EN or EN)

The logic enable disables the power switch and the bias for the charge pump, driver, and other circuitry to reduce the supply current to less than 1μA when a logic high is present on EN (MIK3526-L) or a logic low is present on \overline{EN} (MIK3526-H). The enable input is compatible with both TTL and CMOS logic levels.

Driver

The driver controls the gate voltage of the power switch. To limit large current surges the driver incorporates circuitry that controls the rise times and fall times of the output voltage.

Charge pump

An internal charge pump supplies power to the driver circuit and provides the necessary voltage to pull the gate of the MOSFET above the source.

Fault Flag FLG (A/B)

FLG is an N-channel, open-drain MOSFET output. The fault-flag is active (low) for one or more of the following conditions: undervoltage, current limit, or thermal shutdown. The flag output MOSFET is capable of sinking a 10 mA load to typically 100mV above ground. Multiple FLG pins may be "wire NO Red" to a common pull-up resistor.

Thermal shutdown

An internal thermal-sense circuit shuts off the power switch when the junction temperature rises to approximately 150°C. Hysteresis is built into the thermal sense circuit.

Current sense (CS)

A sense FET monitors the current supplied to the load. When an overload or short circuit is encountered, the current-sense circuitry sends a control signal to the driver. The driver in turn reduces the gate voltage and sends the power FET into its saturation region, which switches the output into a constant current mode.

Undervoltage lockout

UVLO (undervoltage lockout) prevents the output MOSFET from turning on until V_{IN} exceeds approximately 2.3V. In the undervoltage state, the FLAG will be low. After the switch turns on, if the voltage drops below approximately 2.1V, UVLO shuts off the output MOSFET and signals fault flag. Undervoltage detection functions only when at least one switch is enabled.

Overvoltage lockout

OVLO (overvoltage lockout) prevents the output MOSFET from turning on if V_{IN} exceeds approximately 6.5V. Overvoltage detection functions only when at least one switch is enabled.

Absolute Maximum Ratings (Note 1)

Parameter	Maximum	Units
Supply Voltage (V_{IN})	6	V
Fault Flag Voltage (V_{FLAG})	6	
Fault Flag Current (I_{FLAG})	50	mA
Output Voltage (V_{OUT})	6	V
Output Current (I_{OUT})	Internally Limited	A
Control input (V_{EN})	-0.3 to 12	V
Storage Temperature (T_S)	-65 to 150	°C

Operating Ratings (Note 2)

Parameter	MIK3526
Supply Voltage (V_{IN})	2.7V to 5.5V
Ambient Operating Temperature (T_A)	-40°C to +85°C

Electrical Characteristics

$T_A = 25^\circ\text{C}$, $V_{IN} = +5\text{V}$; unless noted

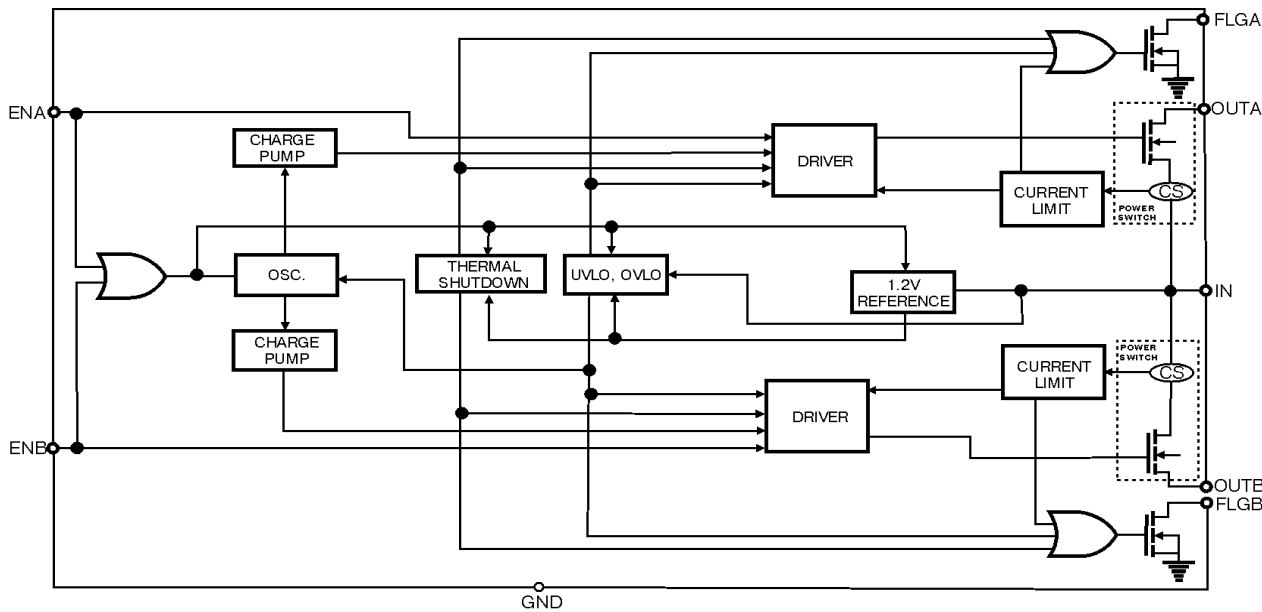
Parameter	Condition	Min	Typ	Max	Units
Supply Current	Note 3, switch off, OUT = open,		0.5	1	μA
	Note 3, all switches on, OUT = open,		120	200	
Enable Input Threshold	Low-to-high transition		2.1	2.4	V
	High-to-low transition, Note 3	0.8	1.9		
Enable Input Current	$V_{EN} = 0\text{V} \div 5.5\text{V}$	-0.5	± 0.01	0.5	μA
Enable Input Capacitance			1		pF
Switch Resistance	$V_{IN} = 5\text{V}$, $I_{OUT} = 500\text{mA}$, each switch		100	140	m Ω
	$V_{IN} = 2.7\text{V}$, $I_{OUT} = 500\text{mA}$, each switch		140	180	
Output Turn-On Delay	$R_L = 10\ \Omega$, each output		0.5		ms
Output Turn-On Rise Time	$R_L = 10\ \Omega$, each output		1		ms
Output Turn off Delay	$R_L = 10\ \Omega$, each output		1	20	μs
Output Turn off Fall Time	$R_L = 10\ \Omega$, each output		1	20	μs
Output Leakage Current	each output (output disabled)			10	μA
Continuous Load Current	each output	0.5			A
Short-Circuit Current Limit	each output (enable into load) $V_{OUT} = 4.0\text{V}$	0.5	1.2	1.9	A
	each output (enable into load) $V_{OUT} = 0.1\text{V}$		1	1.5	
Current-Limit Threshold	Ramped load applied to enabled output, $V_{OUT} \leq 4.0\text{V}$		1.6	2.2	A
Over temperature Shutdown Threshold	T_J increasing		135		°C
	T_J decreasing		125		
Error Flag Output Resistance	$V_{IN} = 5.0\text{V}$, $I_L = 10\text{mA}$		10	25	Ω
	$V_{IN} = 3.3\text{V}$, $I_L = 10\text{mA}$		11	35	
	$V_{IN} = 2.7\text{V}$, $I_L = 10\text{mA}$		12	40	
Error Flag Off Current	$V_{FLAG} = 5\text{V}$		0.01	1	μA
UVLO Threshold	V_{IN} increasing		2.3		V
	V_{IN} decreasing		2.1		
OVLO Threshold	V_{IN} increasing		6.5		V
	V_{IN} decreasing		6.3		

Note 1: Exceeding the absolute maximum rating may damage the device.

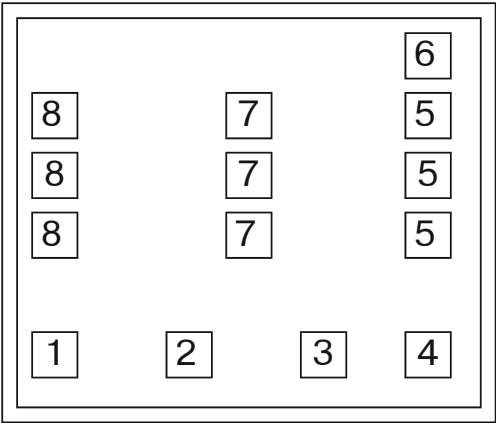
Note 2: The device is not guaranteed to function outside its operating rating

Note 3: Off is $\leq 0.8\text{V}$ and on is $\geq 2.4\text{V}$ for the MIK3526-H. Off is $\geq 2.4\text{V}$ and on is $\leq 0.8\text{V}$ for the MIK3526-L. The enable input has approximately 200mV of hysteresis.

Block Diagram



Pad Location MIK3526



Chip size 3.3 x 2.15 mm

Pad Location Coordinates

N	Pad Name	Pad size ($\mu\text{m} \times \mu\text{m}$)	Coordinates, μm	
			X	Y
1	ENA	136 x 120	323.5	220
2	FLGA	136 x 120	1111.5	237.5
3	FLGB	136 x 120	2187.5	237.5
4	ENB	136 x 120	2975.5	220
5	OUTB	140 x 130	3079	1260.5
5	OUTB	140 x 130	3079	1465.5
5	OUTB	140 x 130	3079	1664
6	GND	140 x 130	3079	1943.5
7	IN	140 x 130	1650	1260.5
7	IN	140 x 130	1650	1462.5
7	IN	140 x 130	1650	1664
8	OUTA	140 x 130	220	1259
8	OUTA	140 x 130	220	1465.5
8	OUTA	140 x 130	220	1664.5