

2A, 18V input, 500KHz efficient synchronous step-down DC-DC converter

■ DESCRIPTION

HM2259G is a high-efficiency synchronous rectifier step-down converter with switching frequency of 500KHz. The input voltage range of HM2259G is 4.5V to 18V, and the output voltage range is 0.6V to 5V. The built-in power switch has a very low on resistance, making it very efficient when the output current reaches 2A.

HM2259G adopts constant on time (COT) mode control architecture, which has very fast transient response characteristics. At the same time, it uses on-chip compensation circuit, which makes the peripheral application circuit simpler.

Internal current limiting, short circuit protection circuit, over temperature protection circuit, etc. prevent chips and external devices from being damaged when they are overloaded or overheated; 500KHz operating frequency and SOT-23-6 packaging minimize the board area of the overall solution.

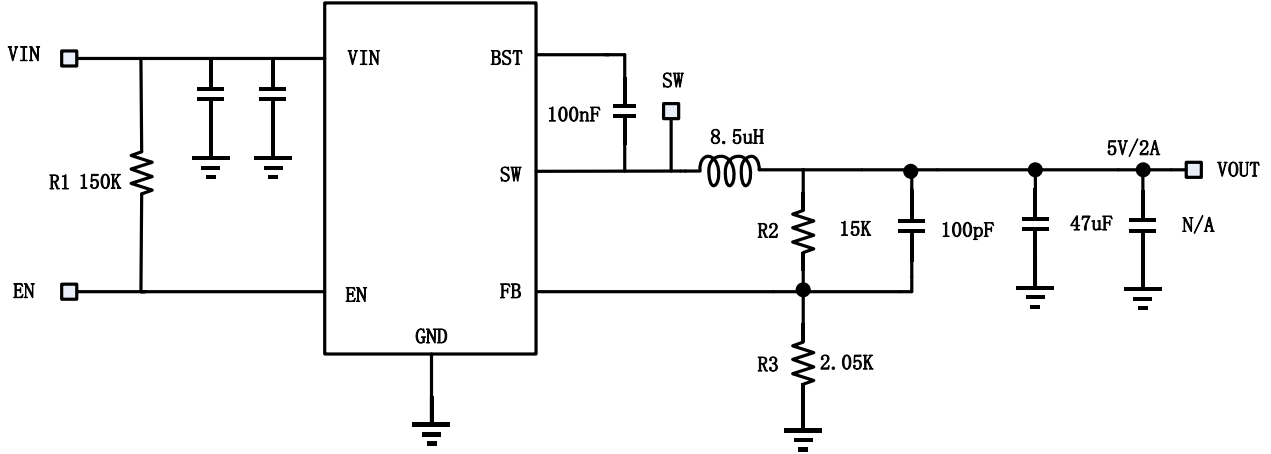
■ FEATURES

- $\pm 2\%$ output voltage accuracy
- 4.5V-18V input voltage range
- Output current of maximum 2A
- Output voltage range 0.6V~5V
- High efficiency synchronous rectification mode
- 500KHz switching frequency
- Fast transient response characteristics
- Built in HICCUP function
- Output short-circuit protection function
- Current limiting protection
- Short circuit protection
- Built in soft start
- Input undervoltage lockout
- Output overvoltage and undervoltage protection
- Over temperature protection
- SOT-23-6 package

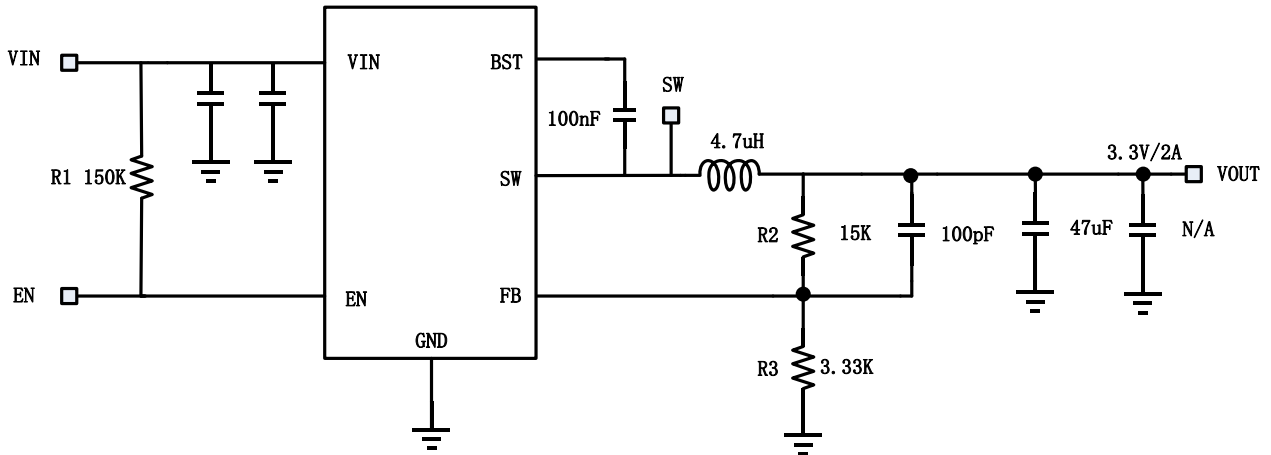
■ APPLICATIONS

- Digital STB
- Display
- Router

■ Typical Application Circuit



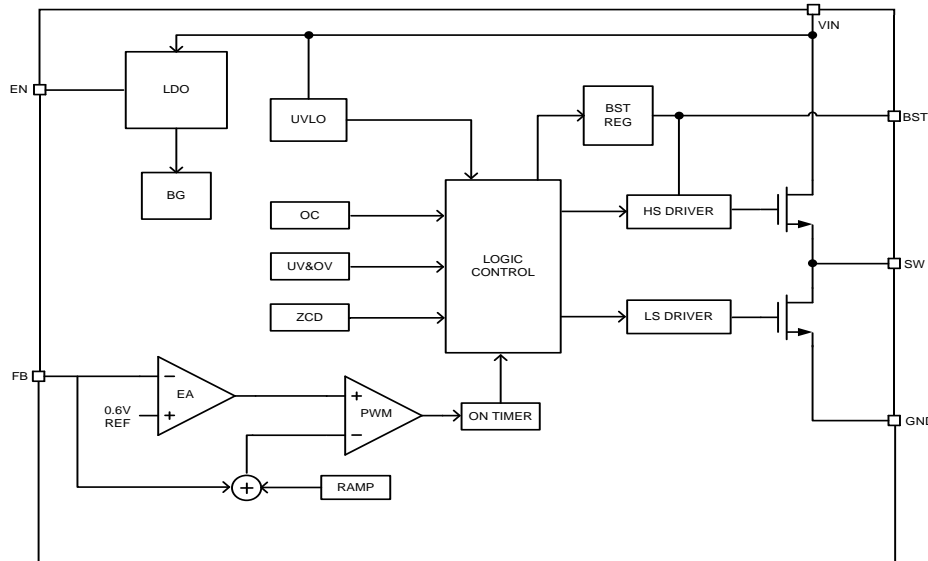
Vin=12V, Vout=5V, IL=2A Typical application circuit



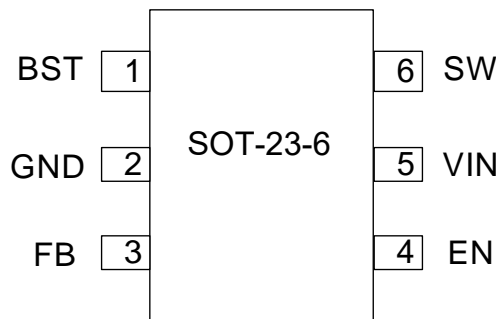
Vin=12V, Vout=3.3V, IL=2A Typical application circuit

Note: The above lines and parameters are for reference only. For the actual application circuit, please set the parameters on the basis of full measurement.

■ **BLOCK DIAGRAM**



■ **RECOMMEND PACKAGE TYPE**



Pin No.	Pin Name	Pin Function
1	BST	Bootstrap pin, connect a 0.1uF capacitor between BST and SW
2	GND	Ground
3	FB	Output voltage feedback input terminal
4	EN	Chip enable pin, pulled up to high effective, cannot be suspended
5	VIN	Chip voltage input
6	SW	Switch terminal

■ **ABSOLUTE MAXIMUM RATINGS** $T_{amb}=25^{\circ}\text{C}$

Parameter	Symbol	Parameter range	Unit
Operating voltage range of input	V_{IN}	-0.3~20	V
Operating voltage range of switch	V_{SW}	-0.6 ~ $V_{IN}+0.3$	V
Bootstrap terminal voltage range	V_{BS}	$V_{SW}+4$	V
Operating voltage range of feedback	V_{FB}	-0.3 ~ +4	V
Operating voltage range of enabling	V_{EN}	-0.3 ~ +4	V
Junction temperature	T_{amb}	150	$^{\circ}\text{C}$
Storage temperature range	T_{STG}	-65 ~ +150	$^{\circ}\text{C}$

■ **ELECTRICAL CHARACTERISTICS**

$T_{amb}=25^{\circ}\text{C}$, $V_{IN}=12\text{V}$, $V_{OUT}=3.3\text{V}$, Load=0, unless otherwise specified

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Input voltage	V_{IN}	V_{IN} terminal voltage	4.5	--	18	V
Reference voltage of feedback terminal	V_{FB}	$T_A=-20^{\circ}\text{C}$ to 85°C	0.588	0.6	0.612	V
Leakage current of feedback terminal	I_{FB}			-0.1		μA
Quiescent current (no switch state)	$I_{switch\ off}$	$V_{FB}=1.5\text{V}$	--	200	300	μA
Quiescent current (off state)	I_{IN}	EN=0V		6	10	μA
Upper pipe Ron	R_{ON_H}			140		$\text{m}\Omega$
Lower pipe Ron	R_{ON_L}			90		$\text{m}\Omega$
Switching frequency	F_s		400	500	600	KHz
Zero crossing detection threshold ^{note1}	I_{ZCD}	$V_{OUT}=3.3\text{V}$, LO=4.7 μH		50		mA
Minimum conduction time ^{note1}	T_{ON_MIN}			50		ns
Minimum off time ^{note1}	T_{OFF_MIN}			160		ns
Current limiting value ^{note1}	I_{limit}		2.5	3		A
Undervoltage lockout input voltage rise threshold	$V_{IN(rising)}$		--	4.2	--	V
Undervoltage lockouthysteresis voltage	$V_{IN(hyst)}$		--	0.5	--	V
Output overvoltage protection	V_{ovp}	$V_{FB}>V_{BG}^*110\%$		$V_{BG}^*120\%$		V
Rising edge enable threshold voltage	$V_{EN(rising)}$			1.5		V
Enable threshold hysteresis voltage	$V_{EN(hyst)}$			0.2		V
Thermal shutdown temperature	$T_{j(sd)}$		--	150	--	$^{\circ}\text{C}$
Thermal shutdown hysteresis temperature	T_{hyst}		--	30	--	$^{\circ}\text{C}$
Soft start time	T_{ss}		--	1.8	--	mS

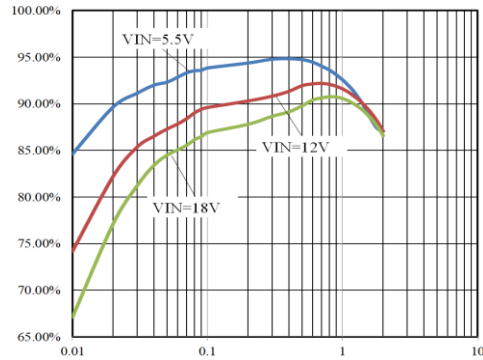
Note: note1 represents the design guarantee and does not require testing.

TYPICAL CHARACTERISTICS

$V_{IN}=12V, V_{OUT}=3.3V, L=4.7\mu H, T_A=25^\circ C$, unless otherwise specified.

Efficiency

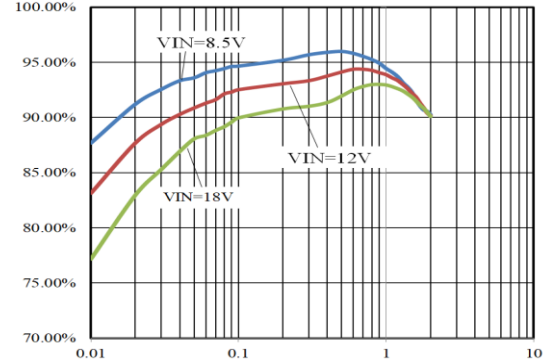
$V_{OUT}=3.3V, L=4.7\mu H$



OUTPUT CURRENT (A)

Efficiency

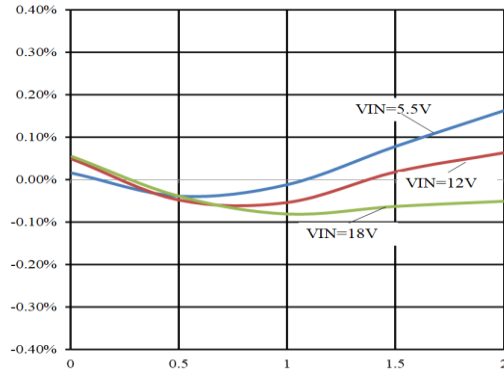
$V_{OUT}=5V, L=8.5\mu H$



OUTPUT CURRENT (A)

Load Regulation

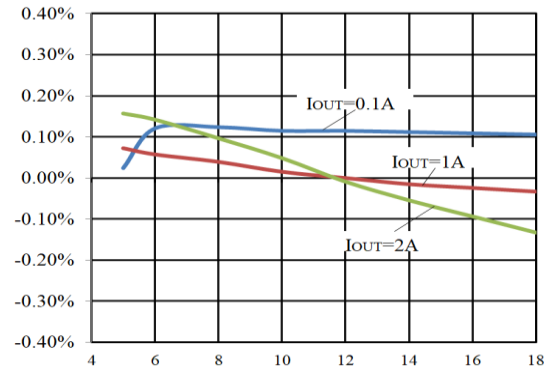
$I_{OUT}=0.1A$ to $2A$



OUTPUT CURRENT (A)

Line Regulation

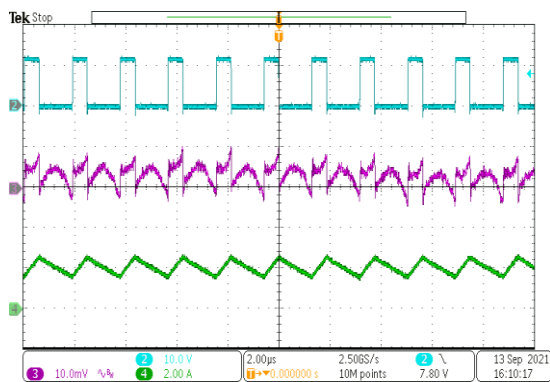
$I_{OUT}=0.1A$ to $2A$



INPUT VOLTAGE (V)

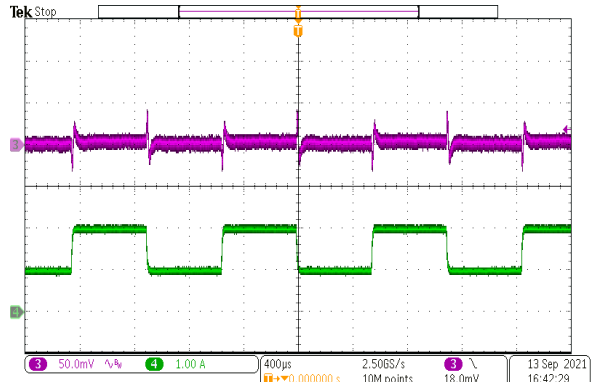
Input/output Ripple

$I_{OUT}=2A$



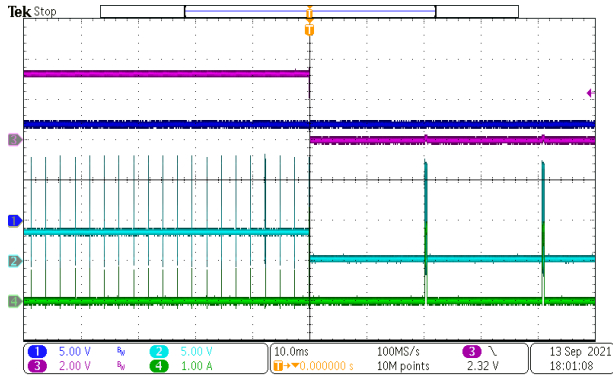
Transient Response

$I_{OUT}=1A$ to $2A$



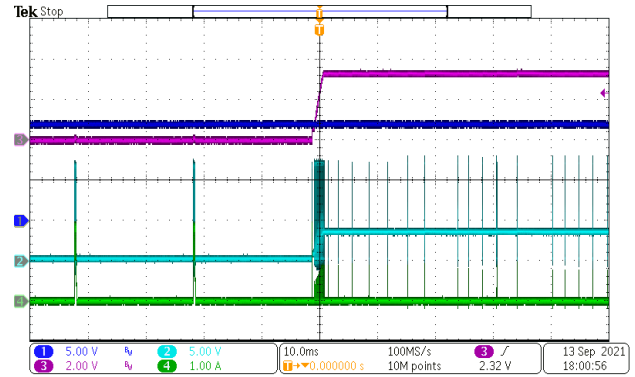
Short Circuit Entry

$I_{OUT}=0A$



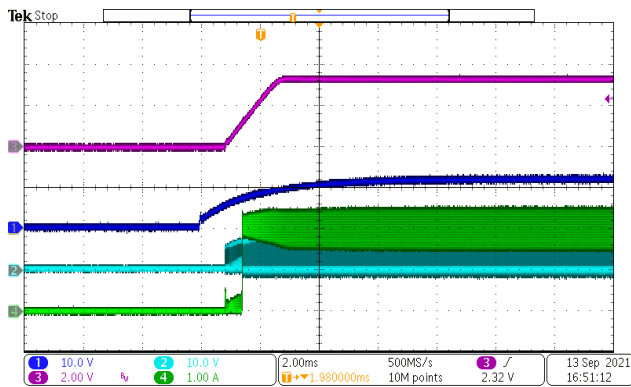
Short Circuit Recovery

$I_{OUT}=0A$



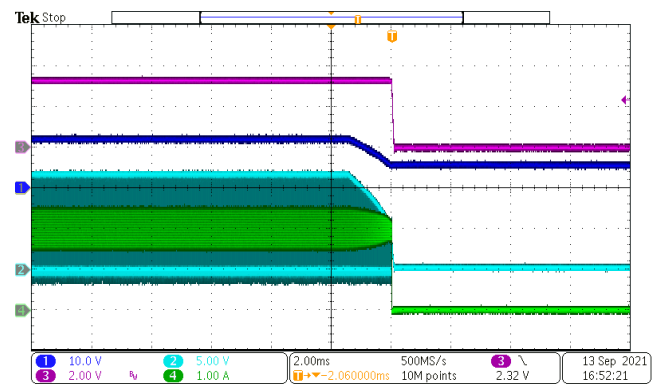
Startup through Input Voltage

$I_{OUT}=2A$



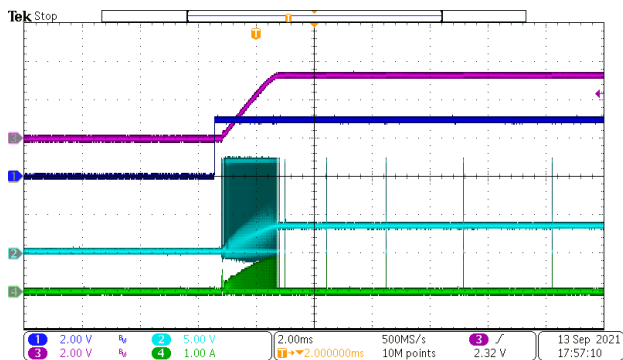
Shutdown through Input Voltage

$I_{OUT}=2A$



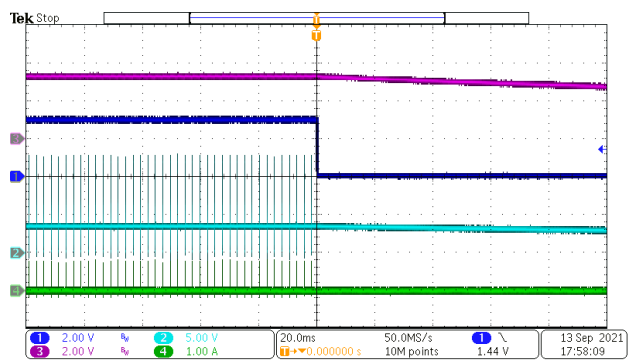
Startup through Enable

$I_{OUT}=0A$



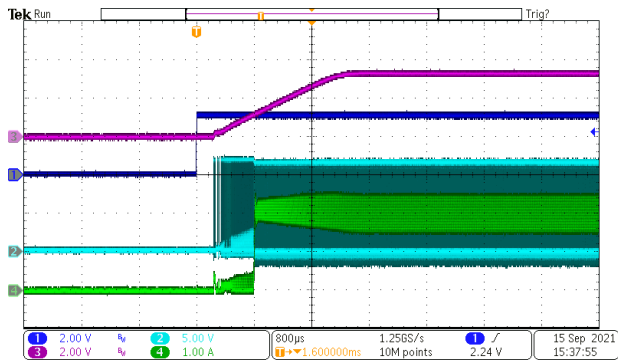
Shutdown through Enable

$I_{OUT}=0A$



Startup through Enable

$I_{OUT}=2A$



Shutdown through Enable

$I_{OUT}=2A$

