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SANYO Semiconductors

# DATA SHEET

An ON Semiconductor Company

## LV5026M — Bi-CMOS IC LED Driver IC

### Overview

LV5026M is a High Voltage LED drive controller which drives LED current up to 3A with external MOSFET. LV5026M is realized very simple LED circuits with a few external parts. It corresponds to various wide dimming controls including the TRIAC dimming control.

### Functions

- High Voltage LED Controller
- Various Dimming Control
  - TRIAC & Analog Input & PWM Input
- Soft Start function
- Built-in TRIAC stabilized function
- Built-in circuit of detection of overvoltage of CS pin.
- Selectable Switching frequency [50 kHz or 70 kHz, open: 50 kHz]
- Short Protection Circuit
- Selectable reference Voltage
  - Internal 0.605V & External Input Voltage
- Low noise switching system
  - 5 stages skip mode Frequency
  - Soft driving

### Specifications

#### Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum Input voltage	V <sub>IN</sub> max		-0.3 to 42	V
REF_OUT, REF_IN, RT, CS, PWM_D, ACS			-0.3 to 7	V
OUT1 pin	V <sub>OUT_abs</sub>		-0.3 to 42	V
OUT2 pin	V <sub>OUT2_abs</sub>		-0.3 to 42	V
Allowable power dissipation	P <sub>d</sub> max	With specified board*	1.0	W
Junction temperature	T <sub>j</sub>		150	°C
Operating temperature	T <sub>opr</sub>		-30 to +125	°C
Storage temperature	T <sub>stg</sub>		-40 to +150	°C

\*Specified board: 58.0×54.0×1.6mm (glass epoxy board)

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# LV5026M

## Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Input voltage	V <sub>IN</sub>		8.5 to 42	V

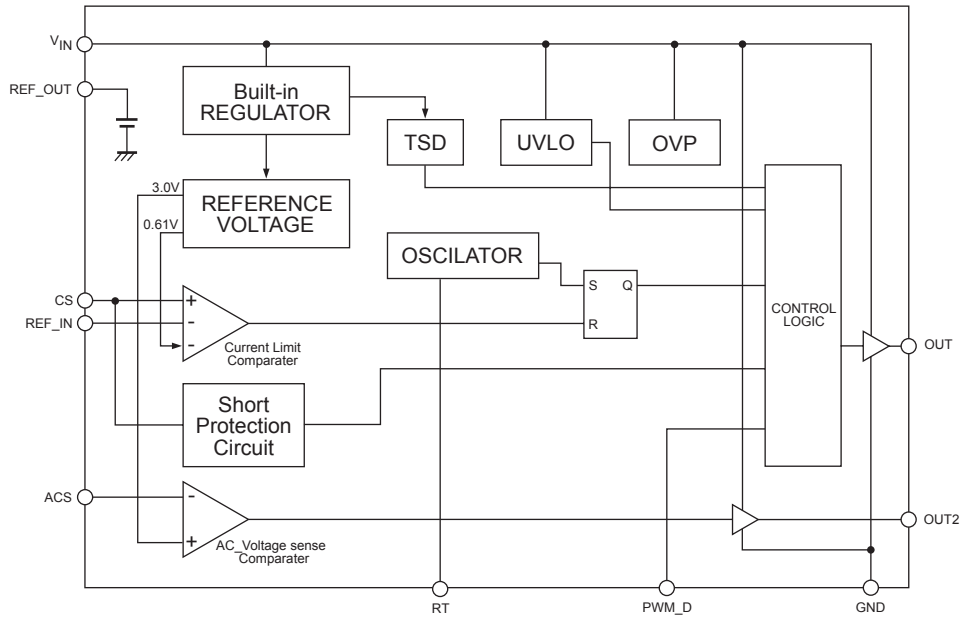
## Electrical Characteristics at Ta = 25°C, V<sub>IN</sub> = 12V, unless otherwise specified.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
<b>Reference Voltage block</b>						
Built-in Reference Voltage	VREF		0.585	0.605	0.625	V
VREF V <sub>IN</sub> regulation	VREF_LN	V <sub>IN</sub> = 8.5 to 24V		±0.5		%
Reference Output Voltage	REFOUT	I <sub>REFOUT</sub> = 0.5mA		3.0		V
- Maximum load	REFOUT_MAX		0.5			mA
- equivalent output impedance	REFOUT_RO			10		Ω
<b>Under Voltage Lockout</b>						
Operation Start Input Voltage	UVLOON		8	9	10	V
Operation Stop Input Voltage	UVLOOFF		6.3	7.3	8.3	V
Hysteresis Voltage	UVLOH			1.7		V
<b>Oscillation</b>						
Frequency	FOSC1	RT = OPEN	40	50	60	kHz
	FOSC2	RT=REF_OUT	55	70	85	kHz
FOSC1 Switch voltage	V <sub>OSC1</sub>		2		5	V
FOSC2 Switch voltage	V <sub>OSC2</sub>				0.5	V
Maximum Duty	MAXDuty			93		%
<b>Comparator</b>						
Input offset Voltage (Between CS and VREF)	V <sub>IO_VR</sub>			1	10	mV
Input offset Voltage (Between CS and REFOUT)	V <sub>IO_RI</sub>			1	10	mV
Input current	I <sub>IOCS</sub>			160		nA
	I <sub>IOREF</sub>			80		nA
CS pin max voltage	V <sub>OM</sub>				1	V
malfunction prevention mask time	T <sub>MSK</sub>			150		ns
<b>PWM_D Circuit</b>						
OFF voltage	V <sub>OFF</sub>		2		5	V
ON voltage	V <sub>ON</sub>		0		0.6	V
<b>Thermal protection Circuit</b>						
Thermal shutdown temperature	T <sub>SD</sub>	*Design guarantee		165		°C
Thermal shutdown hysteresis	ΔT <sub>SD</sub>	*Design guarantee		30		°C
<b>Drive Circuit</b>						
OUT sink current	I <sub>O1</sub>		500	1000		mA
OUT source current	I <sub>O0</sub>			120		mA
Minimum On time	T <sub>MIN</sub>			200	300	ns
<b>TRIAC Stabilization Circuit</b>						
Threshold of OUT2	V <sub>ACS</sub>	OUT2=High [ less than right record ]	2.8	3.0	3.2	V
OUT2 sink current	I <sub>O2I</sub>	V <sub>IN</sub> =12V, OUT2=6V		0.6		mA
OUT2 source current	I <sub>O2O</sub>	V <sub>IN</sub> =12V, OUT2=6V		0.6		mA
<b>V<sub>CC</sub> current</b>						
UVLO mode V <sub>IN</sub> current	I <sub>CCOFF</sub>	V <sub>IN</sub> <UVLOON		80	120	μA
Normal mode V <sub>IN</sub> current	I <sub>CCON</sub>	V <sub>IN</sub> >UVLOON, OUT = OPEN		0.6		mA
<b>V<sub>IN</sub> Over Voltage Protection Circuit</b>						
V <sub>IN</sub> over voltage protection voltage	V <sub>INOVP</sub>		24	27	30	V
V <sub>IN</sub> Current at OVP	I <sub>INOVP</sub>	V <sub>IN</sub> =30V	0.7	1.0	1.5	mA
<b>CS terminal abnormal sensing circuit</b>						
Abnormal sensing voltage	CSOCP			1.9		V

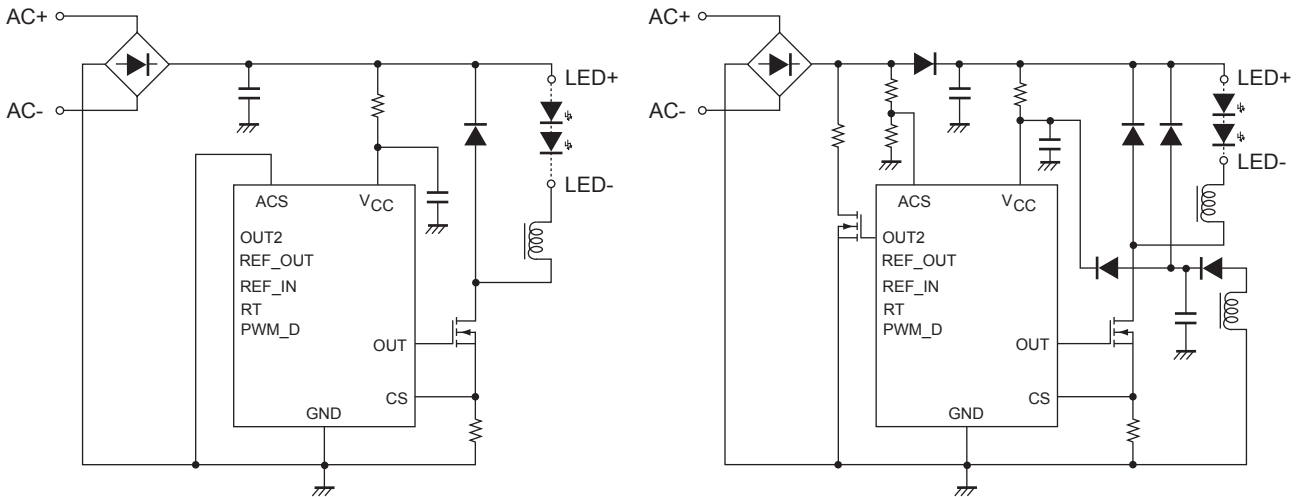
\*: Design guarantee (value guaranteed by design and not tested before shipment)

# LV5026M

## Block Diagram



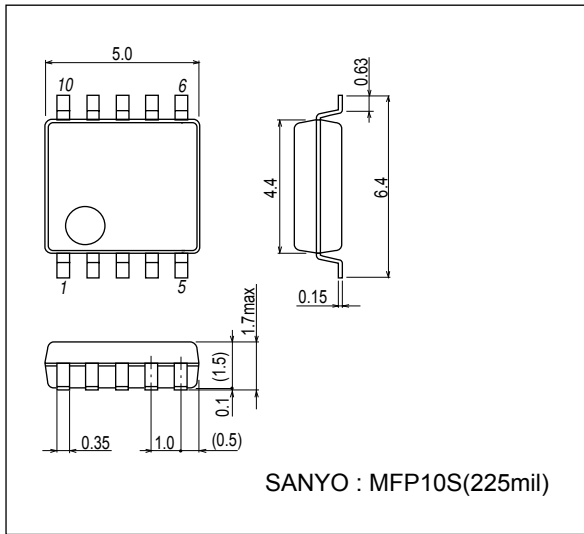
## Sample Application Circuit



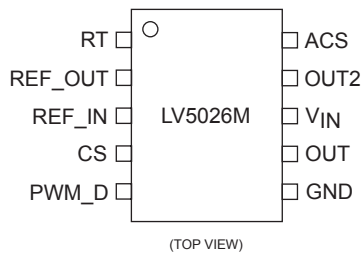
# LV5026M

## Package Dimensions

unit : mm (typ)  
3086B



## Pin Assignment



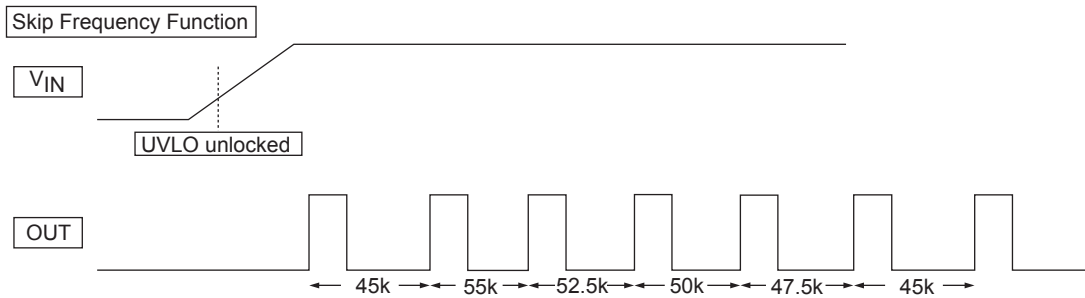
## Pin Function

Pin No.	Pin name	Function
1	RT	Switching Frequency selection Pin. [ L or Open : 50kHz Switching / H(2V – 5V) : 70 kHz Switching ]
2	REF_OUT	Built-in 3V Regulate out Pin. [If this function isn't used, please connect GND or no connection.]
3	REF_IN	External LED current Limit Setting Pin. If less than VREF (0.605V) voltage is input, Peak current value is used at the input voltage. If more than Vref voltage is input, it is done at VREF voltage. [If this function isn't used, please connect nothing.]
4	CS	LED current sensing pin. When this pin voltage exceeds VREF (or REF_IN), external FET is OFF. And if the voltage of the pin exceeds 1.9V, LV5026M turns to latch-off mode.
5	PWM_D	PWM DIMMING pin. [L or open :normal operation, H: Stop operation ]
6	GND	GND pin
7	OUT	Driving the external FET Gate pin.
8	V <sub>IN</sub>	Power supply pin. Operation: V <sub>IN</sub> > UVLOON Stop: V <sub>IN</sub> < UVLOOFF Switching Stop: V <sub>IN</sub> > V <sub>IN</sub> OVP
9	OUT2	This terminal is driving the FET which is stabilized the TRIAC application. If ACS is less than 3V, OUT2 outputs VIN. [If this function isn't used, please connect nothing.]
10	ACS	This terminal is sensing the AC Voltage. [If this function isn't used, please connect GND.]



## Skip frequency function

LV5026M contains the skip frequency function for reduction of the peak value of conduction noise. This function changes the frequency as follows.



Switching frequency is changed as follows.  
 ...  $\times 0.9 \rightarrow \times 1.1 \rightarrow \times 1.05 \rightarrow \times 1 \rightarrow \times 0.95 \rightarrow \times 0.9 \rightarrow \times 1.1$  ...  
 It's repeated by this loop.

## CS pin abnormal stop function

If the voltage of the pin exceeds 1.9V, LV5026M turns to latch-off mode and switching is stopping.

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