



# LV58063MC

Bi-CMOS IC

## Step-down Switching Regulator

ON Semiconductor®

<http://onsemi.com>

### Overview

LV58063MC is a 1ch step-down switching regulator. 0.13Ω FET is incorporated on the upper side to achieve high-efficiency operation for large output current.

Low-heat resistance and compact-package SOP8L (200mil) employed.

Current mode control gives superior load current response with easy phase compensation.

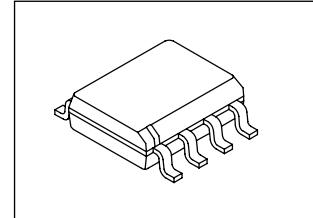
EN pin, allowing the standby mode with the current drain of 70µA.

Pulse-by-pulse over-current protection and overheat protection available for protection of load devices.

Externally adjustable soft start time.

### Function

- 3A 1ch step-down switching regulator
- Thermal shutdown
- Wide input range (8 to 28V)
- Reference voltage: 0.8V
- High efficiency (90%  $I_{OUT}=1A$ ,  $V_{IN}=12V$ ,  $V_{OUT}=5V$ )
- Fixed frequency: 370kHz
- Standby mode
- Soft start
- Over-current protection
- Compact package: SOP8L (200mil) with exposed pad
- Overshoot control after over-current protection event



SOP8L (200mil)

### Application

- LCD/PDP-TV
- STB
- White Goods
- Office equipment
- General consumer electronics

### ORDERING INFORMATION

See detailed ordering and shipping information on page 6 of this data sheet.

## Specifications

### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Maximum input $V_{IN}$ voltage	$V_{IN}$ max		32	V
BOOT pin maximum voltage	$V_{BT}$ max		37	V
SW pin maximum voltage	$V_{SW}$ max		$V_{IN}$ max	V
BOOT pin-SW pin maximum voltage	$V_{BS-SW}$ max		7	V
FB, EN, COMP, SS pin maximum voltage	$V_{fs}$ max		7	V
Allowable power dissipation	$P_d$ max	Mount on a specified board *	2.05	W
Junction temperature	$T_j$ max		150	$^\circ\text{C}$
Operating temperature	$T_{opr}$		-20 to +80	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-40 to +150	$^\circ\text{C}$

\* Specified board: 46.4mm  $\times$  31.8mm  $\times$  1.7mm, glass epoxy.

Note: Plan the maximum voltage while including coil and surge voltages, so that the maximum voltage is not exceeded even for an instant.

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### Recommended Operating Conditions at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
$V_{IN}$ pin voltage	$V_{IN}$		8 to 28	V
BOOT pin voltage	$V_{BT}$		-0.3 to 34	V
SW pin voltage	$V_{SW}$		-0.4 to $V_{IN}$	V
BOOT pin-SW pin voltage	$V_{BS-SW}$		6.5	V
FB, EN, COMP, SS pin voltage	$V_{FSO}$		6	V

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.

### Electrical Characteristics at $T_a = 25^\circ\text{C}$ $V_{IN} = 12\text{V}$ , unless otherwise specified.

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
IC current drain in standby	$I_{CC1}$	$EN=0\text{V}$		70		$\mu\text{A}$
IC current drain in operation	$I_{CC2}$	$EN=\text{open}$ , $FB=1\text{V}$		5		mA
Efficiency	$\text{Effcy}$	$V_{IN}=12\text{V}$ , $I_{OUT}=1\text{A}$ , $V_{OUT}=5\text{V}$ Design target: *1		90		%
Reference voltage	$V_{ref}$	$V_{IN}=8\text{V}$ to $28\text{V}$ ( $\pm 2\%$ )	-2%	0.8	+2%	V
FB pin bias current	$I_{ref}$	$FB=0.8\text{V}$ application		10	100	nA
High-side ON resistance	$R_{onH}$	$BOOT=5\text{V}$		0.13		$\Omega$
Low-side ON resistance	$R_{onL}$			7		$\Omega$
Oscillation frequency	$F_{OSC}$		296	370	444	kHz
Oscillation frequency during short-circuit protection	$F_{OSC_S}$		30	38	46	kHz
EN high-threshold voltage	$V_{enH}$				1.9	V
EN low-threshold voltage	$V_{enL}$		0.8			V
EN pull-up current	$I_{en}$	$EN=0\text{V}$		16		$\mu\text{A}$
Maximum ON DUTY	$D_{max}$			80		%
Current limit peak value	$I_{cl}$	$V_{IN}=12\text{V}$ , $V_{OUT}=5\text{V}$ , $L=10\mu\text{H}$	3.8			A
Thermal shutdown temperature	$T_{tsd}$	*Design guarantee *2		160		$^\circ\text{C}$
Thermal shutdown temperature hysteresis	$D_{tsd}$	*Design guarantee *2		40		$^\circ\text{C}$
Soft start current	$I_{SS}$	$SS=0\text{V}$	6	10	14	$\mu\text{A}$

\*1: Design target (not tested before shipment)

\*2: Design guarantee (value guaranteed by design and not tested before shipment)

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

## Package Dimensions

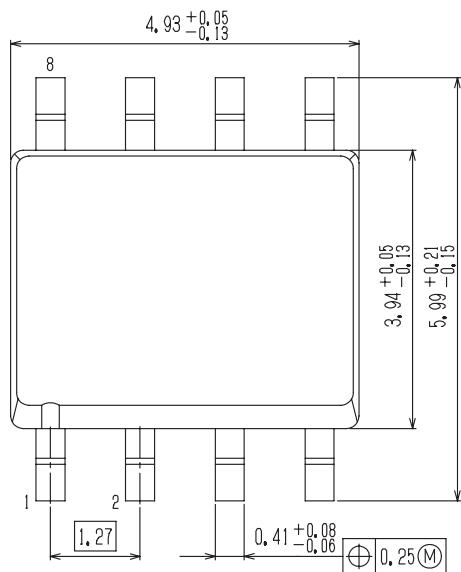
unit : mm

## SOIC8 N EP / SOP8L (200 mil)

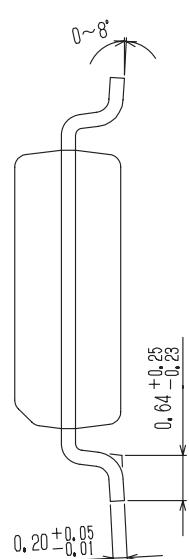
CASE 751DM

ISSUE 0

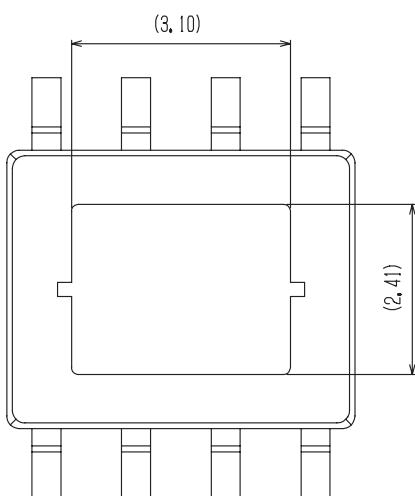
TOP VIEW



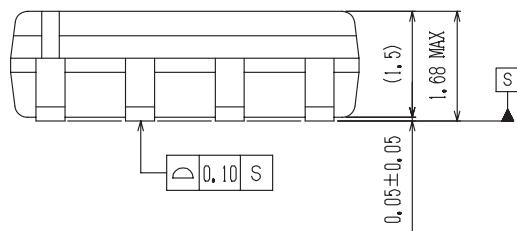
SIDE VIEW

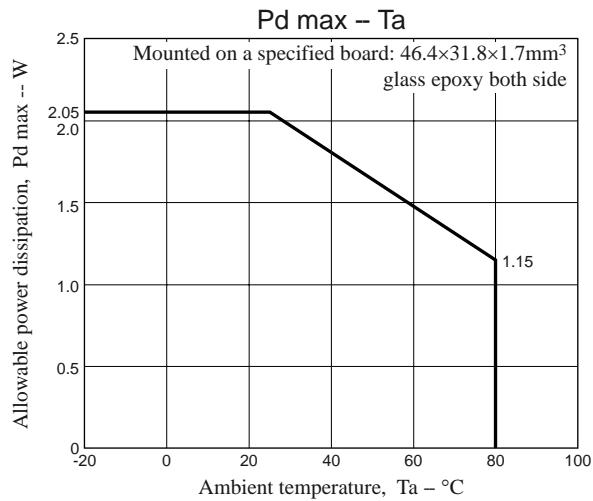


BOTTOM VIEW

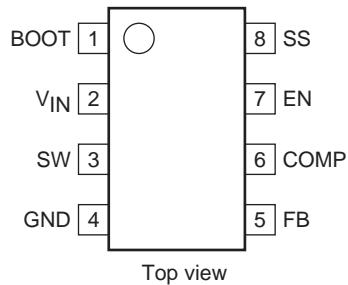


SIDE VIEW

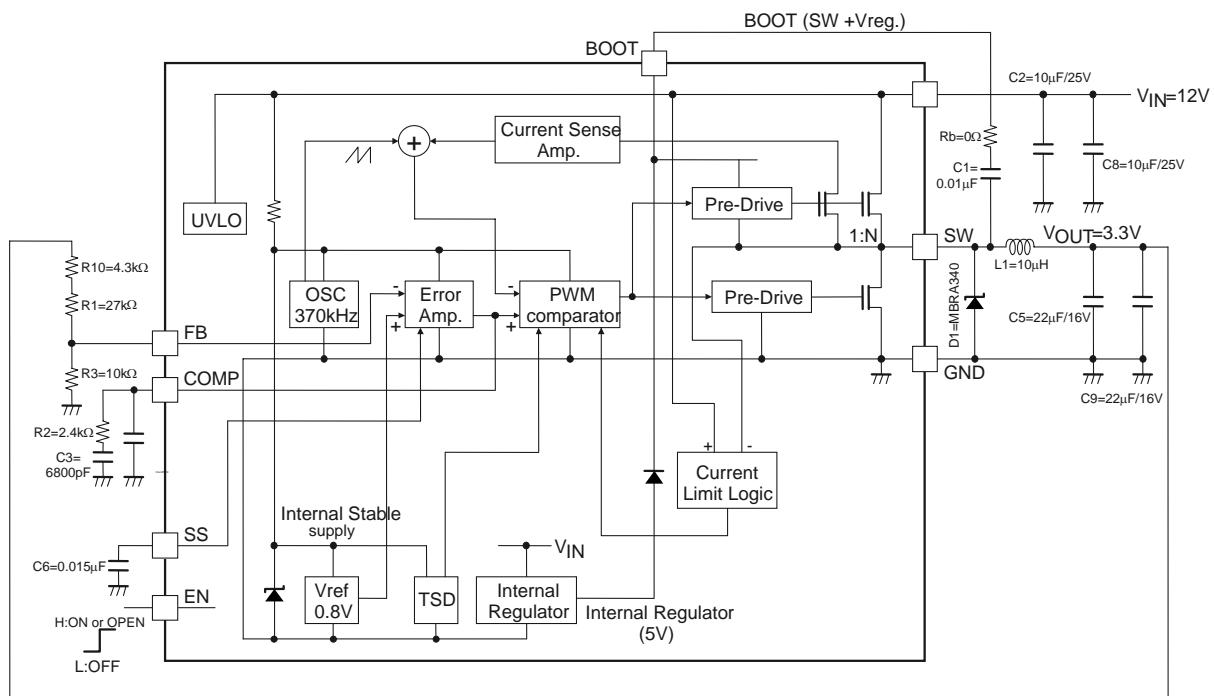




## Pin Assignment



## Block Diagram and Sample Application Circuit (3.3V output)



•  $C_1, C_8, C_5, C_9$  = Ceramic capacitor  
 •  $L_1$  = CDRH105RNP-100NC (sumida)

## Pin Function

Pin No.	Pin name	Description	Equivalent Circuit
1	BOOT	Internal high side mos fet boot strap capacitor Pin. Connect around $0.01\mu\text{F}$ capacitor or greater between SW and BOOT. To operate within absolute maximum rating of SW, to keep stable operation, and to reduce switching noise, please use a series resistor, $R_b$ (value is around $100\Omega$ ) is recommended to use.	
2	V <sub>IN</sub>	Input Voltage Pin. Large Filter Capacitor (equal or larger than $20\mu\text{F}$ ) should be connected between V <sub>IN</sub> and GND to eliminate noise on the input and to operate properly.  When using electrolytic capacitors, it is recommended to add a ceramic capacitor of about $0.1\mu\text{F}$ between V <sub>IN</sub> -GND for stability.	See BOOT
3	SW	Power Switching Pin. Connect the output LC filter. Connect the above-mentioned capacitor between this pin and BOOT pin.	See BOOT
4	GND	Ground pin.	
5	FB	Feedback pin. Connect a voltage divider resistor across FB to set the regulated output voltage. The output voltage is given by next equation. $V_{OUT} = V_{ref} \times \left\{ 1 + \frac{(R_1 + R_{10})}{R_3} \right\}$ $V_{ref} = 0.8V$ Example: 3.3V output voltage (See Block Diagram and Sample Application Circuit) $V_{OUT} = 0.8 \times \left\{ 1 + \frac{(27k + 4.3k)}{10k} \right\}$ $=3.304V$	
6	COMP	Phase compensation pin. Connect an external capacitor and a resistor for the DC DC converter close loop-phase compensation.	

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Pin No.	Pin name	Description	Equivalent Circuit
7	EN	<p>Enable Pin. If applying logically high voltage, or left open, the converter operates.</p> <p>If connected to GND, the converter's operation stops.</p> <p>It is not applied to the EN before VIN is applied.</p>	
8	SS	<p>Soft start Pin Internal source current (10μA) and external capacitor will make soft start time. Soft start capacitor, C6 is given by next equation,  <math display="block">C6 = 10\mu A \times \frac{T_{ss}}{V_{ref}}</math> Where, Tss : soft start time, Vref : reference voltage Example : soft start time 1.2ms  <math display="block">C6 = 10\mu A \times \frac{1.2ms}{0.8 V} = 0.015\mu F</math></p>	See FB

## Considerations for the design

- Insertion of serial beads in the Schottky diode for removal of noise may cause generation of the negative voltage on SW pin deviating from the absolute maximum rating at the SW pin, resulting in failure of normal operation. Please, do not insert beads as above described. Instead, remove noise by Rb resistor.
- Exposed pad on the bottom side of the IC should be soldered. We cannot recommend other usages of the exposed pad.

## ORDERING INFORMATION

Device	Package	Shipping (Qty / Packing)
LV58063MC-AH	SOP8L (200mil) (Pb-Free / Halogen Free)	2000 / Tape & Reel
LV58063MCZ-AH	SOP8L (200mil) (Pb-Free / Halogen Free)	2000 / Tape & Reel

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