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# LV5744V

Bi-CMOS LSI

## 2-channel Step-down Switching Regulator

### Overview

The LV5744V is a 2-channel step-down switching regulator.

### Features

- Provides dual switching regulator control circuits integrated on the chip.
- Output-stage push-pull structure enabling high efficient operation.
- Provides power supply ( $V_{CC}-5V$ ) for protecting the external P channel MOS gate.
- Built-in timer latch type SCP (short-circuit protection circuit)
- Built-in UVLO (Low voltage malfunction prevention circuit)
- Built-in reference voltage circuit
- Max\_On\_Duty is adjustable.

### Specifications

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

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}$ max		35	V
Output voltage	$V_O$ max		33	V
Allowable power dissipation	$P_d$ max	Mounted on a specified board *	0.74	W
Operating temperature	$T_{opr}$		-40 to +85	$^\circ\text{C}$
Storage temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$
Allowable pin voltage				
1	CT, NON1, NON2, INV1, INV2, FB1, FB2, DT1, DT2, SCP, VREF		7	V
2	$V_{CC}-5V$		30	V
3	GND, OUT1, OUT2, $V_{CC}$		35	V

\* : Specified board : 114.3×76.1×1.6mm<sup>3</sup>, glass epoxy board

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

# LV5744V

## Allowable Operating Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	V <sub>CC</sub>		8 to 33	V
Error amplifier input voltage	V <sub>IN</sub>		0 to 3.3	V
Timing capacitance	C <sub>CT</sub>		50 to 5000	pF
Oscillation frequency	F <sub>CT</sub>		20k to 1M	Hz

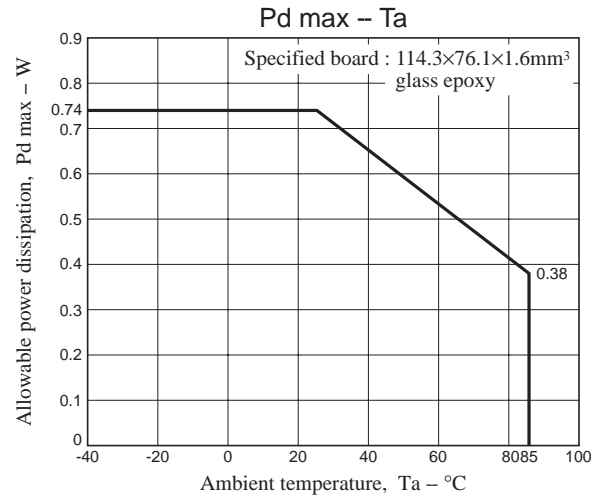
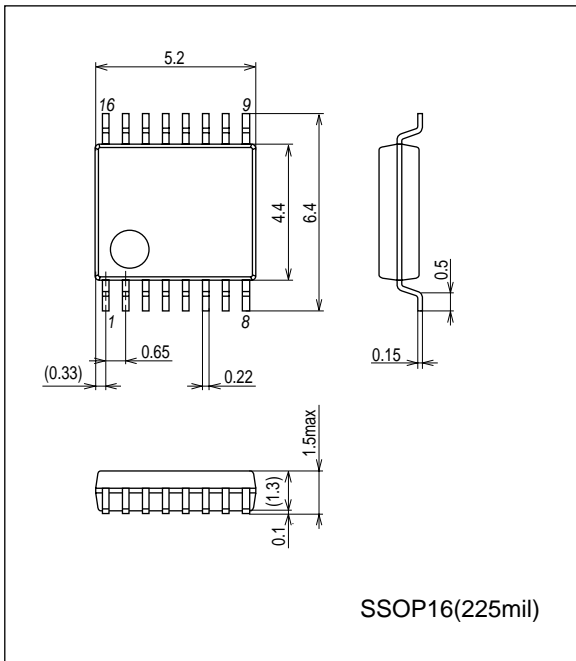
## Electrical Characteristics at Ta = 25°C, V<sub>CC</sub> = 12V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
<b>Reference voltage block</b>						
Output voltage	V <sub>ref</sub>	I <sub>ref</sub> = 1mA	2.4948	2.520	2.5452	V
Input stability	V <sub>DLI</sub>	V <sub>CC</sub> = 8 to 33V		1	10	mV
Load stability	V <sub>DLO</sub>	I <sub>ref</sub> = 0 to 5mA		1	10	mV
V <sub>IN</sub> -5V supply voltage	V <sub>N5</sub>	I <sub>OUT</sub> = -5mA	V <sub>CC</sub> -5.5	V <sub>CC</sub> -5.0	V <sub>CC</sub> -4.5	V
<b>Triangular wave oscillator block</b>						
Oscillation frequency	F <sub>OSC</sub>	C <sub>CT</sub> = 220pF	320	400	480	kHz
Frequency fluctuation	F <sub>DV</sub>	V <sub>CC</sub> = 8 to 33V		1		%
<b>Protection circuit block</b>						
Threshold voltage	V <sub>IT</sub>		1.5	1.7	1.9	V
Standby voltage	V <sub>STB</sub>			50	100	mV
Latch voltage	V <sub>LT</sub>			30	100	mV
Source current	I <sub>SCP</sub>		1.6	2.1	2.6	μA
Comparator threshold voltage	V <sub>CT</sub>		1.4	1.5	1.6	V
<b>Quiescent time adjustment circuit block</b>						
Input threshold voltage (fosc = 20kHz)	V <sub>t0</sub>	Duty cycle = 0%	0.45	0.5	0.55	V
	V <sub>t100</sub>	Duty cycle = 100%	0.95	1.0	1.05	V
Input bias current	I <sub>BDT</sub>	DT1, DT2 = 0V		0.1	1	μA
<b>Low voltage malfunction prevention circuit block</b>						
Threshold voltage	V <sub>UT</sub>		6.5	7	7.5	V
<b>Error amplifier</b>						
Input offset voltage	V <sub>IO</sub>				6	mV
Input offset current	I <sub>IO</sub>				30	nA
Input bias current	I <sub>IB</sub>			15	100	nA
Open gain	A <sub>V</sub>			85		dB
Common mode input voltage range	V <sub>OM</sub>	V <sub>CC</sub> = 8 to 33V	0		3.3	V
Common mode rejection ratio	CMRR			80		dB
Maximum output voltage	V <sub>OH</sub>			2.6		V
Minimum output voltage	V <sub>OL</sub>			0.2	0.4	V
Output sink current	I <sub>OI</sub>	FB = 1.25V		1		mA
Output source current	I <sub>OO</sub>	FB = 1.25V		85		μA
<b>PWM comparator</b>						
Input threshold voltage (fosc = 20kHz)	V <sub>t0</sub>	Duty cycle = 0%	0.45	0.5	0.55	V
	V <sub>t100</sub>	Duty cycle = 100%	0.95	1.0	1.05	V
<b>Output block</b>						
Output stage on resistance (upper)	R <sub>ONH</sub>			7		Ω
Output stage on resistance (lower)	R <sub>ONL</sub>			2		Ω
<b>Overall device characteristics</b>						
Standby current	I <sub>CCS</sub>	When output is off			10	mA

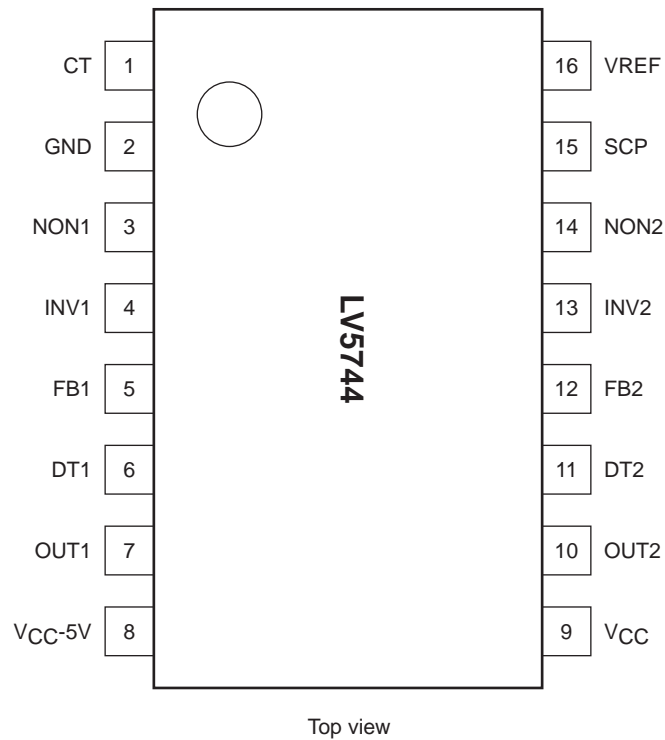
# LV5744V

## Package Dimensions

unit : mm (typ)  
3178B



## Pin Assignment

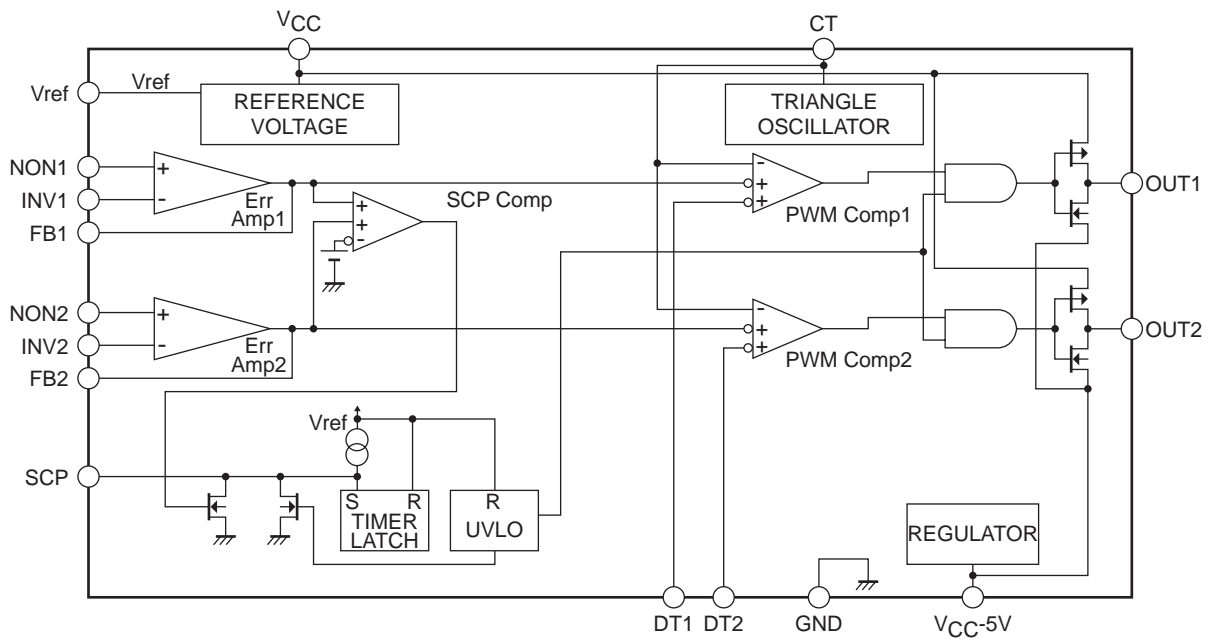


# LV5744V

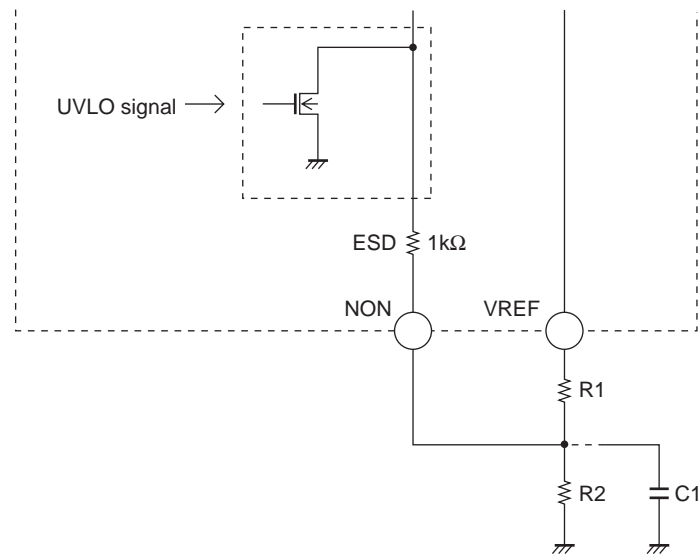
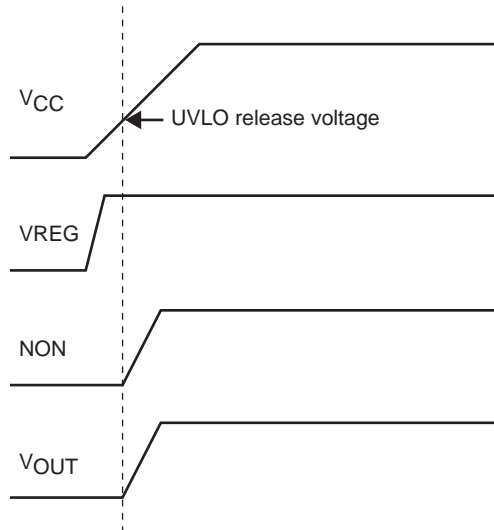
## Pin Function

Pin No.	Pin Name	Description
1	CT	External timing capacitor connection pin
2	GND	Ground
3	NON1	Error amplifier 1 input (+)
4	INV1	Error amplifier 1 input (-)
5	FB1	Error amplifier 1 output
6	DT1	Output 1 maximum duty setting
7	OUT1	Output 1
8	V <sub>CC-5V</sub>	Power supply for output stage drive
9	V <sub>CC</sub>	Power supply
10	OUT2	Output 2
11	DT2	Output 2 maximum duty setting
12	FB2	Error amplifier 2 input (+)
13	INV2	Error amplifier 2 input (-)
14	NON2	Error amplifier 2 output
15	SCP	Timer latch setting
16	VREF	Reference voltage output

## Block Diagram

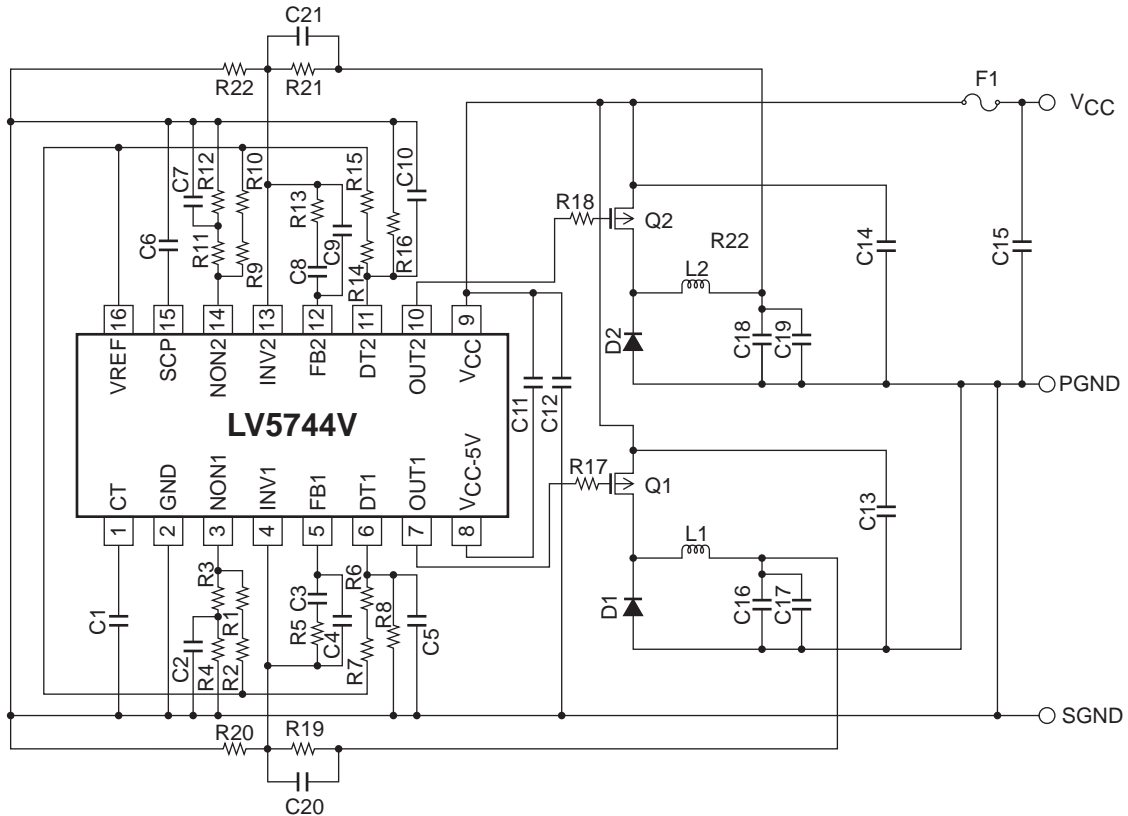


## Timing Chart



\* The voltage at the NON pin is  $\{VREF/(R1+1k)\} \times 1k$  in UVLO mode.



Application Circuit Example



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