



# LV5051T

Bi-CMOS IC  
For portable CD players  
Power Supply IC

## Overview

The LV5051T is a power supply IC for portable CD players.

## Function

- 2.5V step-up/down DC-DC converter
- VG step-up circuit for POWER MOSFET driving
- 2.8V/3.9V regulator control circuit (with switching terminal)
- Undervoltage lockout (UVLO) circuit (PVCC1)
- ACDET detection output terminal
- Microcontroller RESET output terminal
- 2.5V (OUT2) pin control input terminal

## Specifications

### Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Battery supply voltage	VPVCC1 max		4.6	V
AC adaptor voltage	VPVCC2 max		9	V
Predriver voltage	VG max		9.6	V
Output current 1	I <sub>OUT1</sub> max		0.1	A
Output current 2	I <sub>OUT2</sub> max		0.1	A
Allowable power dissipation	Pd max1		800	mW
Operating temperature	Topr	Ta = 25°C *	-20 to +85	°C
Storage temperature	Tstg		-40 to +150	°C
Reset output current	IRSTOUT		400	μA

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

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## Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Battery supply voltage	VPV <sub>CC1</sub>		1.5 to 4.4	V
AC adapter supply voltage	VPV <sub>CC2</sub>		2.0 to 8.0	V

## Electrical Characteristics Ta = 25°C, PV<sub>CC1</sub> = 2.4V, PV<sub>CC2</sub> = 4.5V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
<b>Common</b>						
Supply current 1 (power save mode battery current)	IPV <sub>CC11</sub>	STBYIN1 = 2.5V, PV <sub>CC1</sub> = 2.4V See test circuit diagram A.	0.04	0.1	0.2	mA
Supply current 2 (power save mode adaptor current)	IPV <sub>CC21</sub>	STBYIN1 = 2.5V, PV <sub>CC2</sub> = 4.5V See test circuit diagram B.	0.08	0.2	0.4	mA
Supply current 3 (normal mode battery current)	IPV <sub>CC12</sub>	STBYIN1 = 0V, PV <sub>CC1</sub> = 2.4V See test circuit diagram C.	0.6	1.3	2.6	mA
Supply current 4 (normal mode adaptor current)	IPV <sub>CC22</sub>	STBYIN1 = 0V, PV <sub>CC2</sub> = 4.5V See test circuit diagram D.	0.8	1.6	3.2	mA
Supply current 5 (PV <sub>CC1</sub> UV mode current)	IPV <sub>CC13</sub>	PV <sub>CC1</sub> = 1.4V, STBYIN1 = 0V See test circuit diagram E.	1		20	μA
Charge pump consumption current	IVG	= IPV <sub>CC12</sub> - IPV <sub>CC11</sub>	0.6	1.2	2.4	mA
Charge pump output voltage	VG	See test circuit diagram C. V <sub>DD2P51</sub> = 2.5V	PV <sub>CC1</sub> +3.5	PV <sub>CC1</sub> +4.6	PV <sub>CC1</sub> +4.9	V
<b>2.5V step up/down DC/DC converter</b>						
Efficiency 1(*)	η1	STBYIN1 = 2.5V, I <sub>O</sub> = 0.2mA		60		%
Efficiency 2(*)	η2	STBYIN1 = 0V, I <sub>O</sub> = 50mA		90		%
Switching frequency 1	f1	STBYIN1 = 2.5V	160	200	260	kHz
EI pin threshold voltage	VEITH		0.47	0.50	0.53	V
EI pin input current	IEI		-0.1	-0.01		μA
EO pin output voltage	VEOL	IEO = 0.05mA			0.4	V
Normal mode SW1 pin on-resistance H	RSW1H			0.6	1.0	Ω
Normal mode SW2 pin on-resistance H	RSW2H			0.6	1.0	Ω
Normal mode SW2 pin on-resistance L	RSW2L			0.6	1.0	Ω
Power save mode SW1 pin on-resistance H	RSW1UL			5	20	Ω
Power save mode SW2 pin on-resistance L	RSW2DL			3	10	Ω
2.5VOUT2 pin on-voltage	ROUT2			0.3	0.8	Ω
SW1 pin leakage current H	ISW1LKH				2	μA
SW1 pin leakage current L	ISW1LKL		-2			μA
SW2 pin leakage current H	ISW2LKH				2	μA
SW2 pin leakage current L	ISW2LKL		-2			μA
2.5VOUT2 pin leakage current	IOUT2LK				2	μA
STBYIN1 pin H-level voltage	VSTBYIN1H		1.5			V
STBYIN1 pin L-level voltage	VSTBYIN1L				0.5	V
STBYIN1 pin input current	ISTBYIN1	VSTBYIN1 = 2.5V		20	30	μA
SOFT pin current	IS1		0.5	1	2	μA
REF pin voltage	VREF		1.16	1.22	1.30	V
<b>2.5V step-up/down stop circuit</b>						
Detection voltage	UVLO21		1.4	1.5	1.6	V
Reset voltage	UVLO22		1.85	2.0	2.15	V

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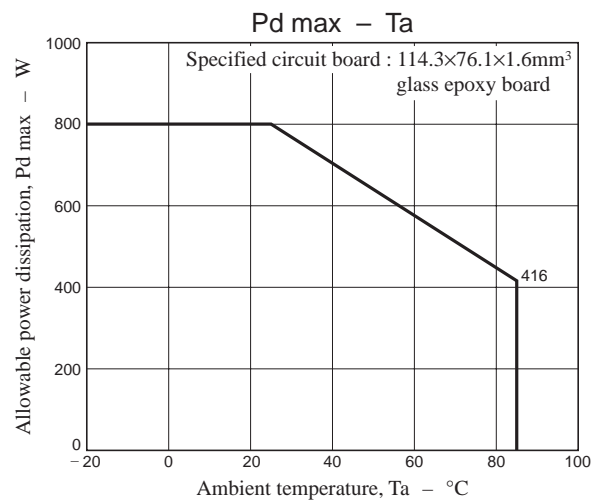
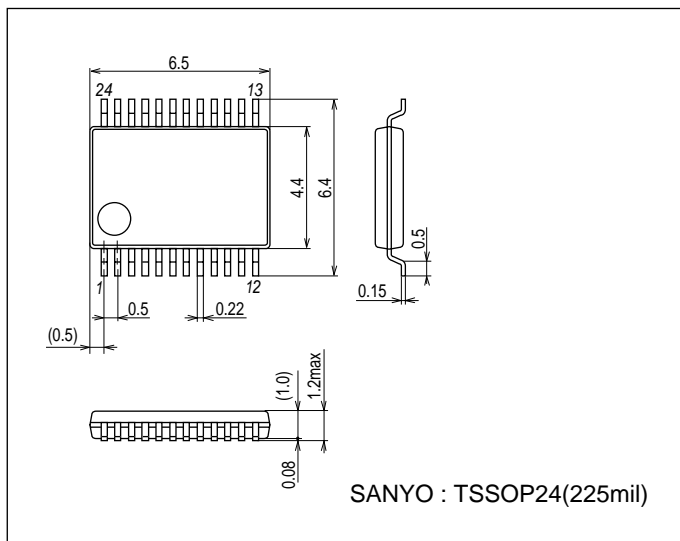
Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
<b>Microcontroller RESET 2.3V detection circuit</b>						
Reference voltage	RST1		1.16	1.22	1.28	V
Reset reference voltage	RST2		1.23	1.29	1.35	V
Reference voltage hysteresis width	RST3		30	70	120	mV
Detection output L voltage	VRSTOL	IRSTOUT = 400 $\mu$ A			0.5	V
Detection output leakage current	ILKRST				1	$\mu$ A
RSTIN input current	IRSTIN	VRSTIN = 2.5V		0.01	0.1	$\mu$ A
<b>Regulator control circuit</b>						
Regulator voltage 1	VPV <sub>CC11</sub>	VPV <sub>CC2</sub> = 4.5V, SEL = H	3.7	3.9	4.1	V
Regulator voltage 2	VPV <sub>CC12</sub>	VPV <sub>CC2</sub> = 4.5V, SEL = L	2.65	2.8	2.95	V
Voltage selecting SEL pin H-level voltage	VSELH	VPV <sub>CC2</sub> = 4.5V	1.5			V
Voltage selecting SEL pin L-level voltage	VSELL	VPV <sub>CC2</sub> = 4.5V			0.5	V
SEL pin input current	ISEL	VSEL = 2.5V		20	30	$\mu$ A
REGB pin leakage current	ILKREGB				1	$\mu$ A
REGB pin current	IREGB		5			mA
ACDET output L voltage	VACDETL	VPV <sub>CC2</sub> = 4.5V, IACDET = 1mA			1	V
ACDET leakage current	ILKACD				1	$\mu$ A

(\*) : Design target values.

## Package Dimensions

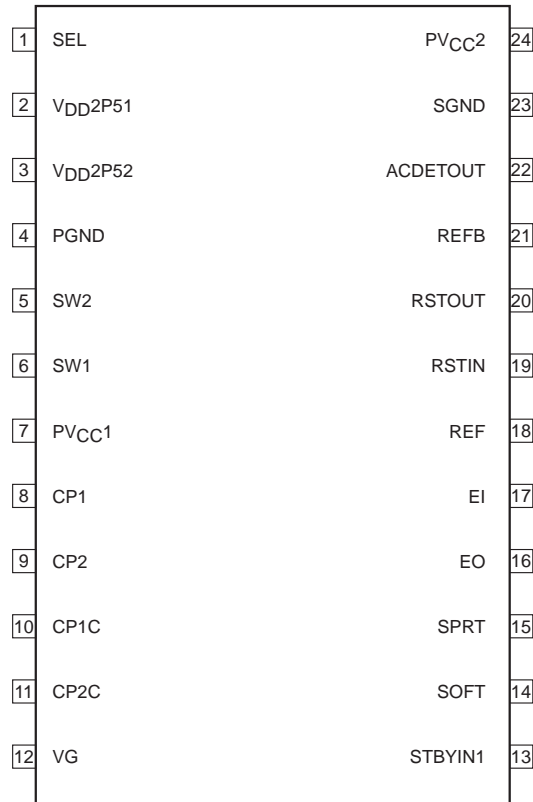
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3260A



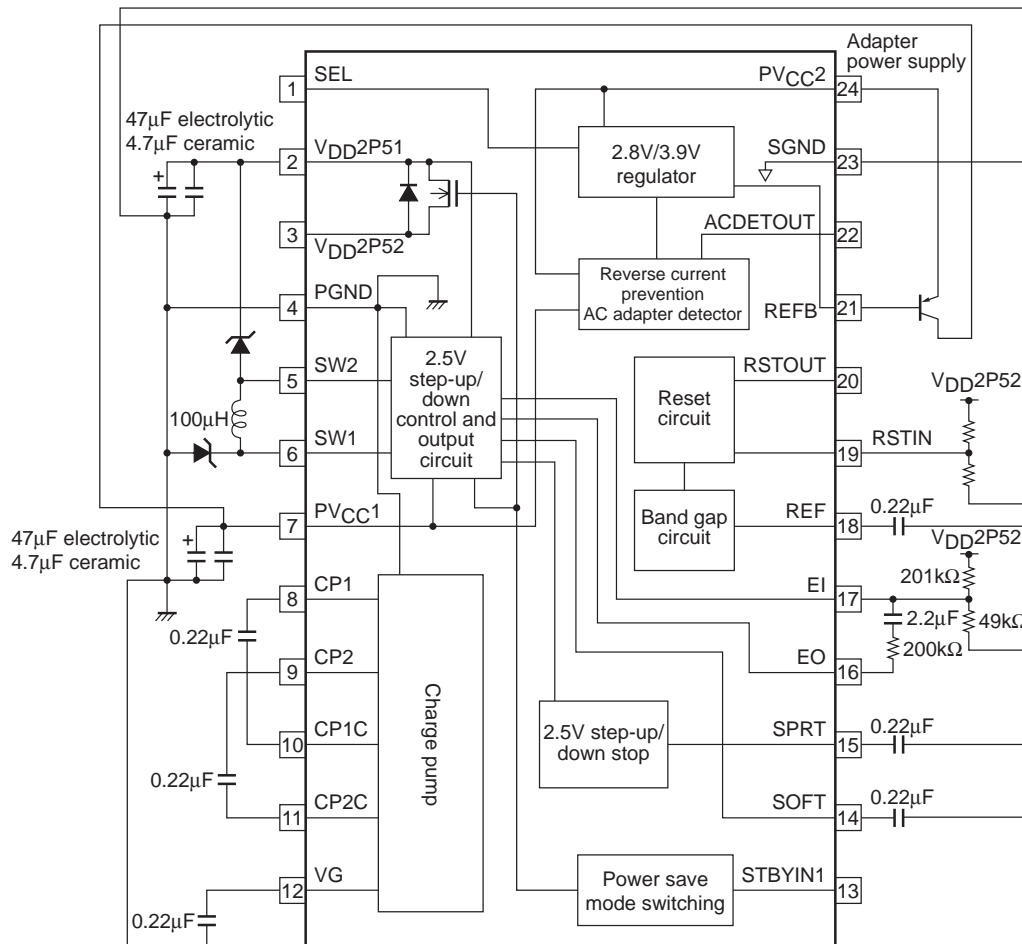
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## Pin Assignment



Top view

## Block Diagram and Sample Application Circuit



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## Pin Description

Pin No.	Pin Name	Description	Equivalent circuit
1	SEL	Selects the AC adaptor regulator output voltage. H : 3.9V, L : 2.8V	
2	V <sub>DD</sub> 2P51	Switching regulator output Be sure to connect a 4.7μF ceramic capacitor between this pin and PGND.	
3	V <sub>DD</sub> 2P52	0.3Ω switching output	
4	PGND	Power ground	
5	SW2	Switching regulator coil connection pin 2	
6	SW1	Switching regulator coil connection pin 1	
7	PVCC1	Input power supply Be sure to connect a 4.7μF ceramic capacitor between this pin and PGND near the IC chip.	
8	CP1	Charge pump step-up output. Connect a capacitor between this pin and CP1C (pin 10).	
9	CP2	Charge pump step-up output. Connect a capacitor between this pin and CP2C (pin 11).	
10	CPC1	Charge pump step-up output. Connect a capacitor between this pin and CP1 (pin 8).	
11	CPC2	Charge pump step-up output. Connect a capacitor between this pin and CP2 (pin 9).	
12	VG	Charge pump step-up output. Connect a capacitor between this pin and PGND.	
13	STBYIN1	Normal and power save mode switching pin	

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Pin No.	Pin Name	Description	Equivalent circuit
14	SOFT	Soft start capacitor connection. Connect a capacitor between this pin and SGND.	
15	SPRT	2.5V step-up/down stop circuit external capacitor pin.	
16	EO	Switching regulator control amplifier output. Connect a feedback capacitor and a feedback resistor between this pin and the EI pin.	
17	EI	Switching regulator control amplifier input. Sets the output voltage at the V <sub>DD2P51</sub> pin (pin 2) by the resistor divider voltage.	

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Pin No.	Pin Name	Description	Equivalent circuit
18	REF	Internal reference voltage. Connect a capacitor between this pin and SGND.	
19	RSTIN	Reset circuit input. Input a resistor-divided voltage of the level at which the reset function is to be activated.	
20	RSTOUT	Reset circuit output (open drain).  This pin is forced low when the 2.5V step-up/down stop circuit is activated. Choose an appropriate pull-up resistor that prevents currents of 400μA or greater from flowing.	
21	REFB	External PNP transistor base connection for the AC adapter regulator.	
22	ACDETOUT	AC power detector circuit (open drain). Detects the voltage applied to the PVCC2 power supply and generates a low output.	
23	SGND	Control system ground	
24	PVCC2	AC adapter power input	

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