Ordering number : EN7895B

SANYO Semiconductors
DATA SHEET

LB8650T — Monolithic Digital IC
Driver for Digital Still Cameras

Overview

LB8650T is a driver for digital still cameras.

Features

- Two direct nickel hydride batteries for digital cameras embedded in one chip.
  - (1) Constant voltage control for AF - Stepping motor driver.
    1-2 phase excitation, 2 phase excitation possible.
  - (2) Constant current control for SH - Solenoid coil driver → Built-in start-up correction circuit.
- No standby current consumption (or zero).
- Low voltage driving possible (1.9V to).
- Low saturation output.
- Built-in thermal protection circuitry.

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum power source voltage	VB max	VB power source	10.5	V
Maximum input applied voltage	V_{IN} max		10.5	V
Maximum output applied voltage	V_{OUT} max		10.5	V
Maximum output current	I_O max	per CH	600	mA
Allowable power dissipation	Pd max	Mounted on a specified board (*1)	800	mW
Operating temperature	Topr		-10 to +80	°C
Storage temperature	Tstg		-55 to +150	°C

(*1) Mounted on a specified board: 114.3mm×76.1mm×1.6mm, glass epoxy resin.

Allowable Operating Range at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Power source voltage range	VB		1.9 to 10	V
Input pin high level voltage	$V_{IN}H$	(*2)	1.8 to 10	V
Input pin low level voltage	$V_{IN}L$		-0.3 to 0.4	V
Constant voltage setting input range	VOC	VOC	0.1 to VB	V

(*2) No hierarchical relationship between VB and V_{IN}.

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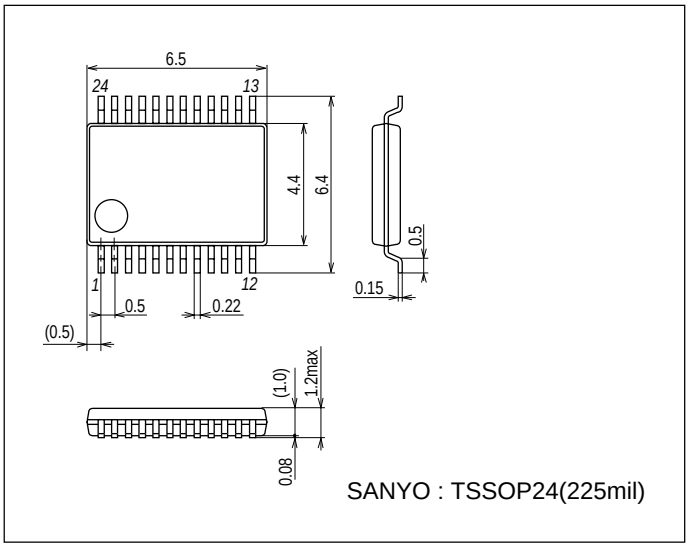
Electrical Characteristics at Ta = 25°C, VB = V_{CC} = 2.4V, Rf = 0.5Ω

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Standby current consumption	$I_{CC}0$	VB = V_{CC} = 4.0V		0.1	5.0	μA
Operating current consumption	$I_{CC}1$	IN1 = IN3 = 2V, VC1 = 0.4V		3.5	6.0	mA
	$I_{CC}2$	IN4 = IN5 = 2V, ICI = 0.2V		3.5	6.0	
	IB1	IN1 = IN3 = 2V, VC1 = 0.4V		5.5	9.0	
Reference voltage	Vref	Iref = -1mA	875	905	935	mV
Control pin iInput current	I_{IN}	V_{IN} = 5.0V		60	90	μA
Overheat protection operation temperature	THD	Design guaranteed (*3)	150	180	210	°C
Constant current stepping motor driver for AF/STP (OUT1, 2, 3, 4, 5P)						
Output constant voltage	V_O1	VC1 = 0.4V	1.57	1.66	1.74	V
Output saturation voltage	VSAT1	I_O = 0.2A (upper)		0.2	0.3	V
	VSAT2	I_O = 0.2A (lower)		0.15	0.22	
SH driver (OUT5N)						
Output constant current	I_O1	IC1 = 0.20V, Rf = 1Ω	178	190	202	mA
	I_O2	IC1 = 0.20V, Rf = 1Ω, HOLD mode	113	126	140	
Output saturation voltage 2	VSAT2	I_O = 0.25A (lower)		0.15	0.22	V

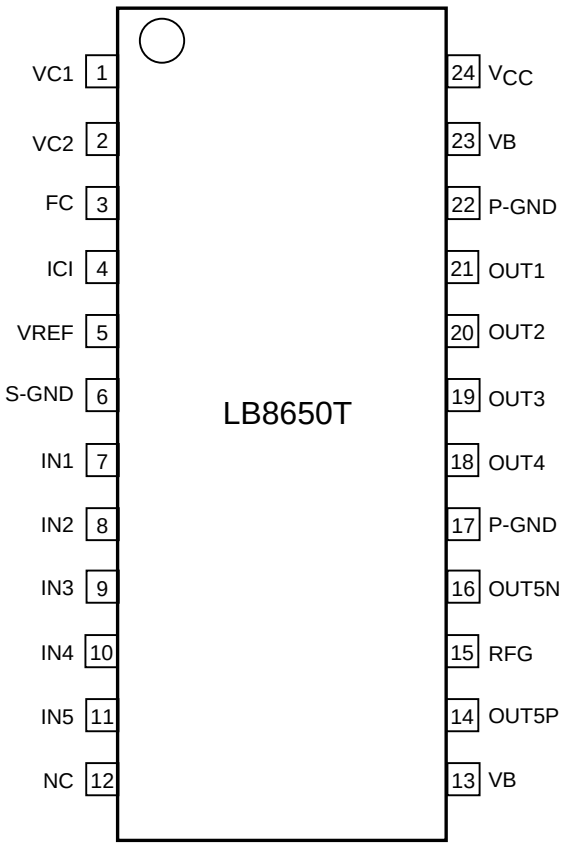
(*3) For the characteristic within the guaranteed temperature range, shipping check is performed at Ta = 25°C.
For all temperature range, these are design guarantee and are not tested.

Package Dimensions

unit : mm (typ)
3260A



Pin Assignment



Top view

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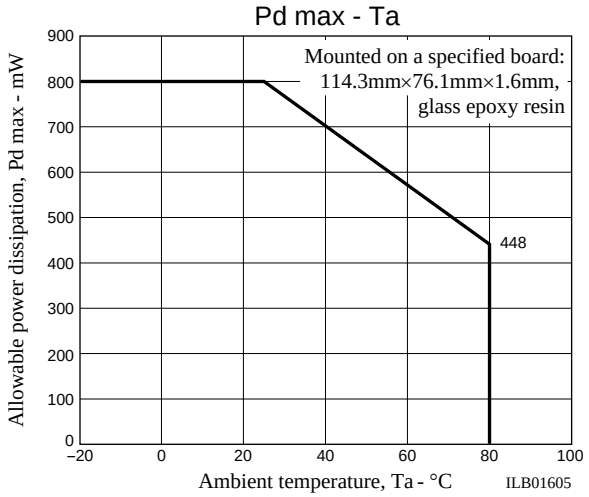
(Note) P-GND and VB, both 2-pins are connected.



Truth Table (for AF/SH)

Input					Output								Mode
IN1	IN2	IN3	IN4	IN5	OUT1	OUT2	OUT3	OUT4	OUT5P	OUT5N	Vref	ICI	
L	L	L	L	L	-	-	-	-	-	-	-	-	Standby
H	L	L	L	L	H	L	-	-	-	-	0.9V	L	AF or AE
H	L	H	L		H	L	H	L					
L	L	H	L		-	-	H	L					
L	H	H	L		L	H	H	L					
L	H	L	L		L	H	-	-					
L	H	L	H		L	H	L	H					
L	L	L	H		-	-	L	H					
H	L	L	H		H	L	L	H					
H	H	*	*		H	H							Brake
*	L	L	L	H	-	-	-	-	-	-	0.9V	L	SH-ready
		L	H					H	-	L		-	SH
		H	L					L	H	-			
	H	L	H					H	-	L	0.6V	-	Hold
		H	L					L	H	-			

* : Don't care.

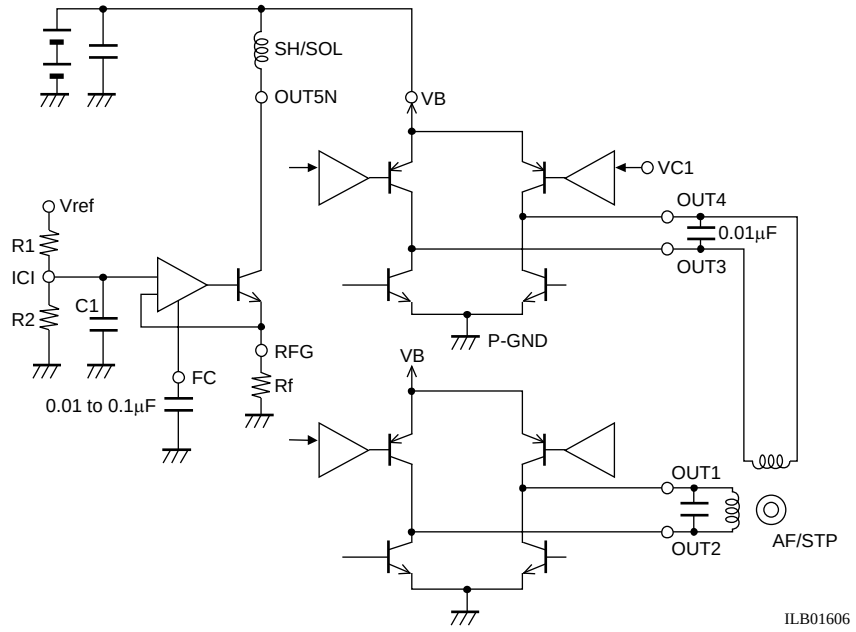
- : Output OFF.

H : Constant voltage control with the constant voltage output (VC pin input voltage) 4 times.
OUT1, 2, 3, and 4 outputs are set by VC1 input.
OUT5P output is set by VC2 input.
It is necessary to place the oscillation-stopping capacitor (0.01μF) between the output pins.

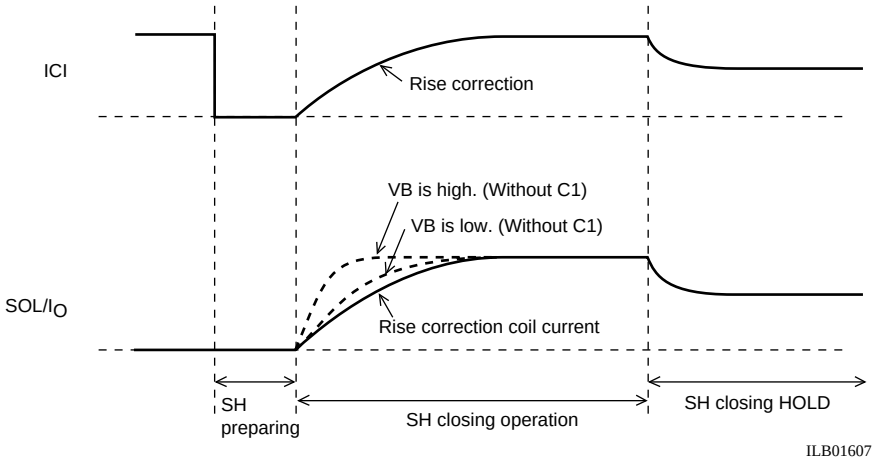
L : The formula for calculating the constant current output setting is as given below.
IRFG = (ICI pin input voltage) / (RFG resistance value+0.05Ω)
This 0.05Ω is for a common impedance of the output Tr emitter which drives constant current in the RFG pin and the sensing wiring for the constant current control amplifier.

Application Example

(1) Solenoid (constant current drive), stepping motor (constant voltage drive)



Timing chart for solenoid SH



(1) ICI pin voltage is set to 0V in shutter ready mode of *LLLH input.

(2) At *LLHH input, solenoid is driven by constant current control. The ICI pin input voltage is set with the decay time constant to be larger than the coil decay time constant by using the external CR and the rise correction occurs with respect to the coil wave. By doing this, stable shutter operation can be carried out with respect to the power source variations.

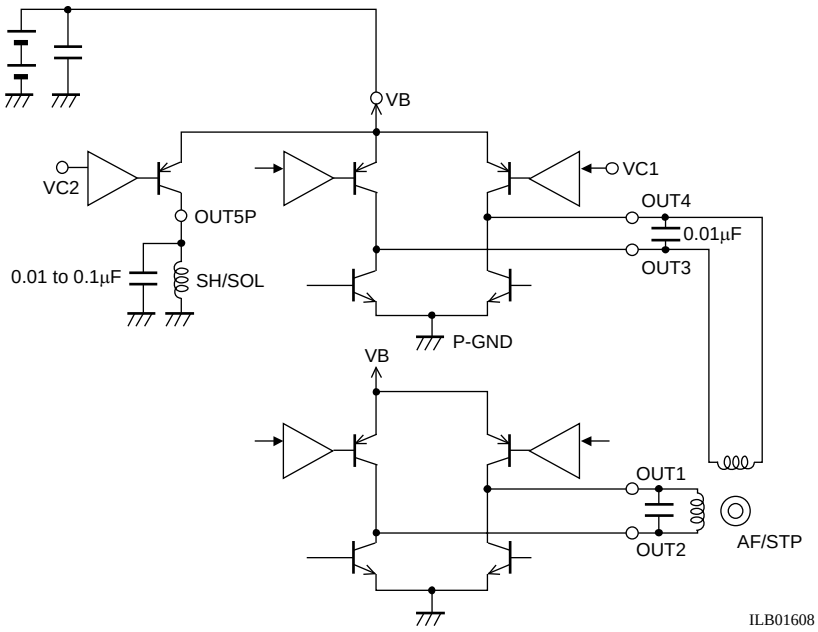
(Note) ICI pin rise compensation is made without C1 and the rise waveform of coil current is made at decrease of VB power. C1 is set to the time constant lower than this waveform.

(3) At *HLHH input, solenoid current is controlled by 2/3, and it becomes HOLD state.

- Constant current value setting: ICI voltage/Rf

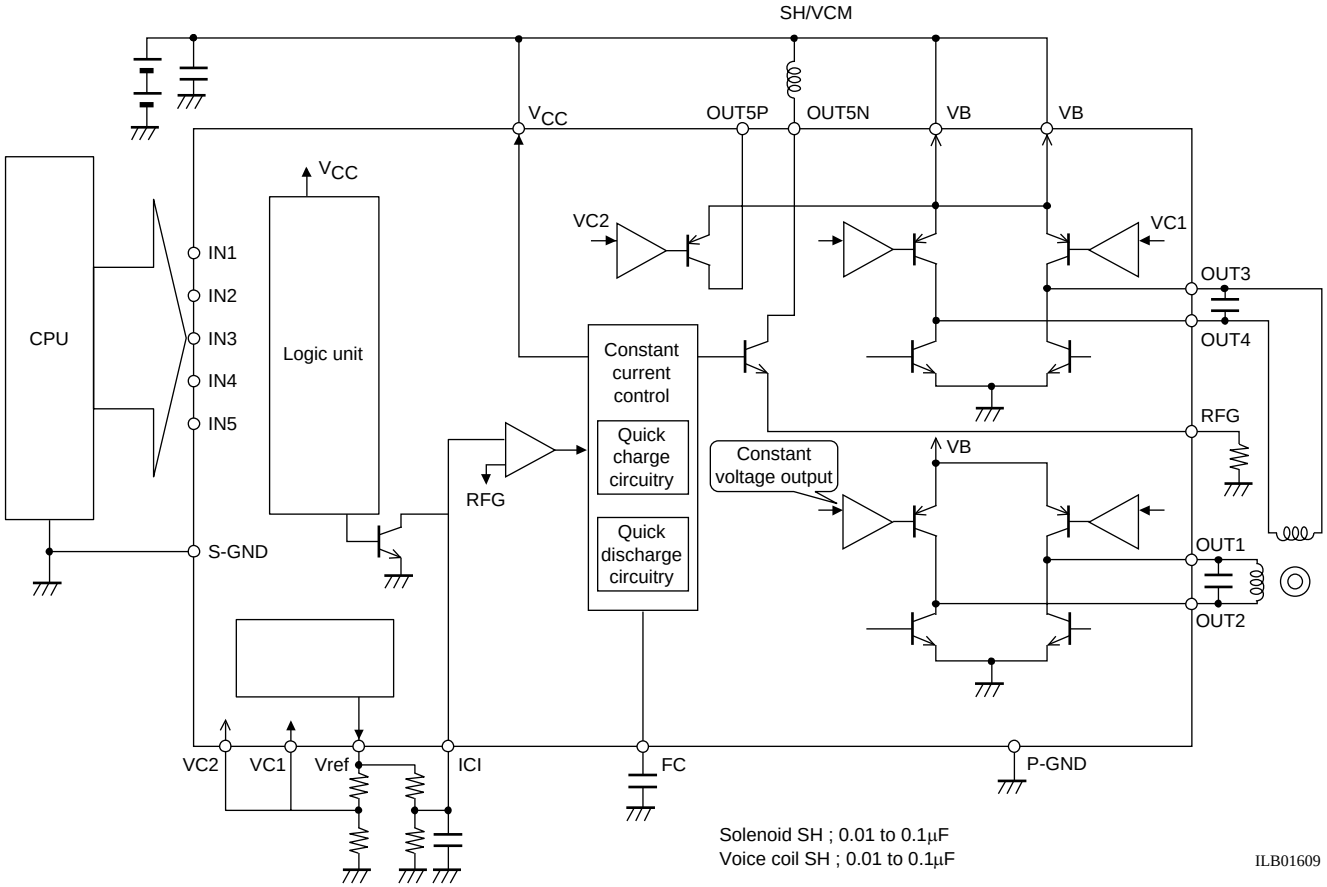
(Note1) Consider the FC capacitor between 0.01 to 0.1μF to set the capacitance value that ensure no oscillation problem at transfer to the HOLD mode. In particular, the solenoid with high inductance should have an allowance for capacitance.

(2) Solenoid (constant voltage drive), stepping motor (constant voltage drive)



The shutter mode is ON at *LLLH input. The solenoid is driven by constant voltage at LHLH.
The constant voltage output is 4 times the VC2 pin input voltage.
The voltage is controlled by 2/3 in HOLD mode.
OUT1, 2, 3, and 4 outputs are set by VC1 input, and it becomes 4 times the constant voltage output.

Internal equivalent circuit diagram



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