Ordering number : ENA0594

SANYO Semiconductors
DATA SHEET

LA6504H — Monolithic Linear IC DVD System motor Drives

Overview

The LA6504H is a DVD system motor drives.

Functions

- PWM H bridge driver (3CH) + power operation amplifier (2CH)

Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Output block supply voltage	V_M1, 2 max		16.0	V
Output current 1	I_O max1	FOCUS, TRACKING, LOADING	1.0	A
Output current 2	I_O max2	FOCUS, TRACKING : 1msec	1.8	A
Output current 3	I_O max3	SLED	0.7	A
Allowable power dissipation 1	Pd max1	Independent IC	0.8	W
Allowable power dissipation 2	Pd max2	Mounted on a board.	1.8	W
Operating temperature	Topr		-20 to +85	°C
Storage temperature	Tstg		-55 to +150	°C

* Specified substrate : 114.3mm×76.1mm×1.6mm, glass epoxy board.

Recommended Operating Conditions at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Output block supply voltage	V_M1, 2		8 to 14	V

SANYO Semiconductor Co., Ltd.
TOKYO OFFICE Tokyo Bldg., 1-10, 1 Chome, Ueno, Taito-ku, TOKYO, 110-8534 JAPAN

Electrical Characteristics at Ta = 25°C, VM1 = VM2 = 12V, VREF = 1.75V

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Supply current 1	$I_{CC}1$	MUTE pin H at no load		20	35	mA
Supply current 2	$I_{CC}2$	MUTE pin L *1 at no load		45	60	mA
Supply current 3	$I_{CC}3$	MUTE pin L *2 at no load		70	110	mA
Standby current	$I_{CC}4$	MUTE pin L *3 at no load		0.2	0.4	mA
Overheat protection circuit						
Heat protection circuit operation temperature	TSD	Design target value *5	150	180		°C
Temperature hysteresis width	ΔTSD	Design target value *5		40		°C
SLED, loading input pin						
H level input voltage range	V_{IH}		2.5		5.0	V
L level input voltage range	V_{IL}		0		0.6	V
Input current	I_{IN}			0.1	0.15	mA
MUTE pin						
H level input voltage range	$V_{MU}H$	MUTE OFF	2.5		5.0	V
L level input voltage range	$V_{MU}L$	MUTE ON	0		0.6	V
Input current	I_{INM}			0.1	0.15	mA
Output block						
Saturation voltage 1	VSAT1	FOCUS, TRACKING : I_O = 0.5A		1.5	2.3	V
Saturation voltage 2	VSAT2	SLED : I_O = 0.5A		2.2	3.0	V
Saturation voltage 3	VSAT3	LOADING : I_O = 0.5A		1.5	2.3	V
BTL block						
Output offset voltage	VOFF	Voltage difference between outputs of each channel R_L = 12Ω *4	-50		50	mV
Maximum output amplitude	V_OA	R_L = 12Ω	7.9	10		V
Voltage gain	VGAIN	Gain between input and output R_L = 12Ω *4	16	18	20	dB
Input OPAMP block						
Common-phase input range	V_{IN}OP		0.5		4.0	V
Input offset voltage	V_{OFF}OP	*4	-6.0		6.0	mV
Input bias current	I_{BIAS}OP				300	nA
Output high level voltage	V_OHOP		3.7	4.0		V
Output low level voltage	V_OLOP			0.2	0.5	V
TD OFST output offset voltage	V_{OFF}TD	*4	-40		40	mV
TD OFST pin maximum voltage	V_{TD}MAX		2.7	3.0	3.3	V

*1 : During LD motor rotation. IN4F = Hi, IN4R = Low.

*2 : At braking of LD motor. IN4F = Hi, IN4R = Hi.

*3 : At standby. IN4F = Low, IN4R = Low.

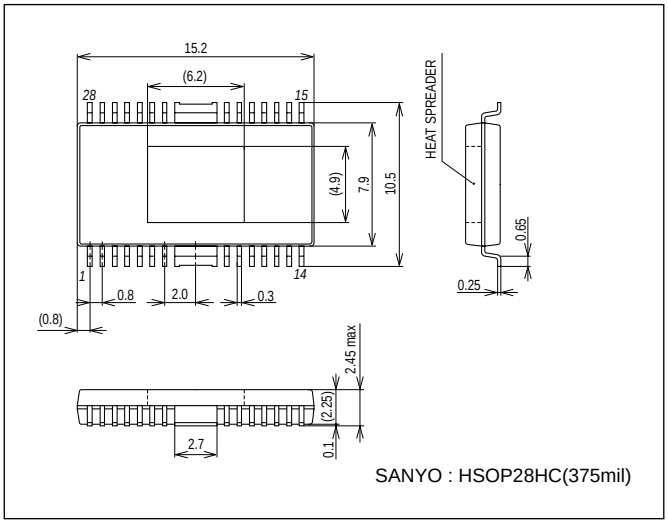
*4 : Pre-OPAMP is used as buffer.

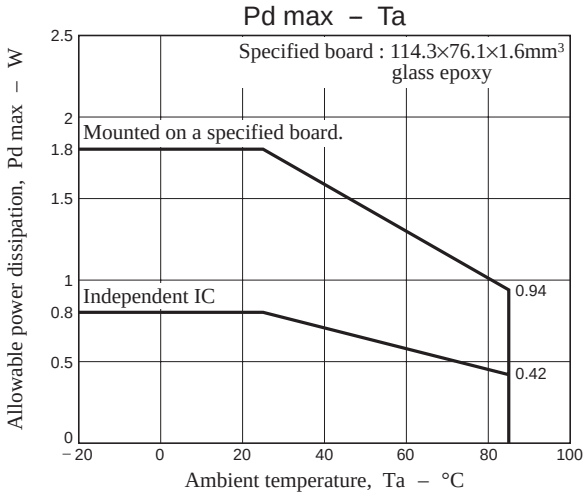
*5 : Design target value. It doesn't measurement.

Package Dimensions

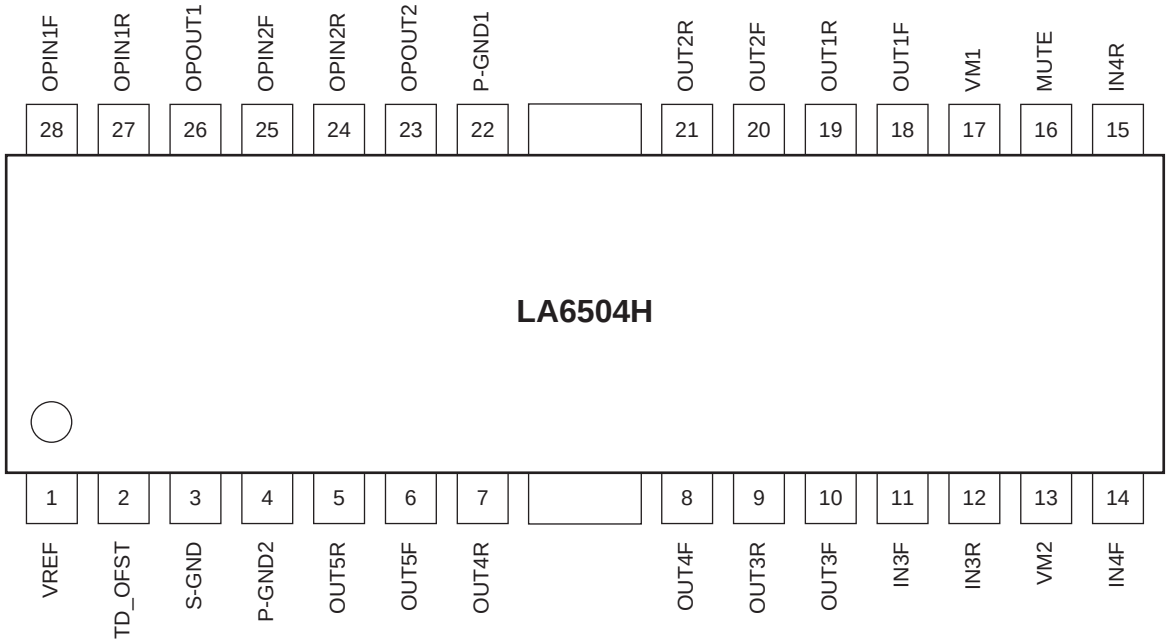
unit : mm (typ)

3234B

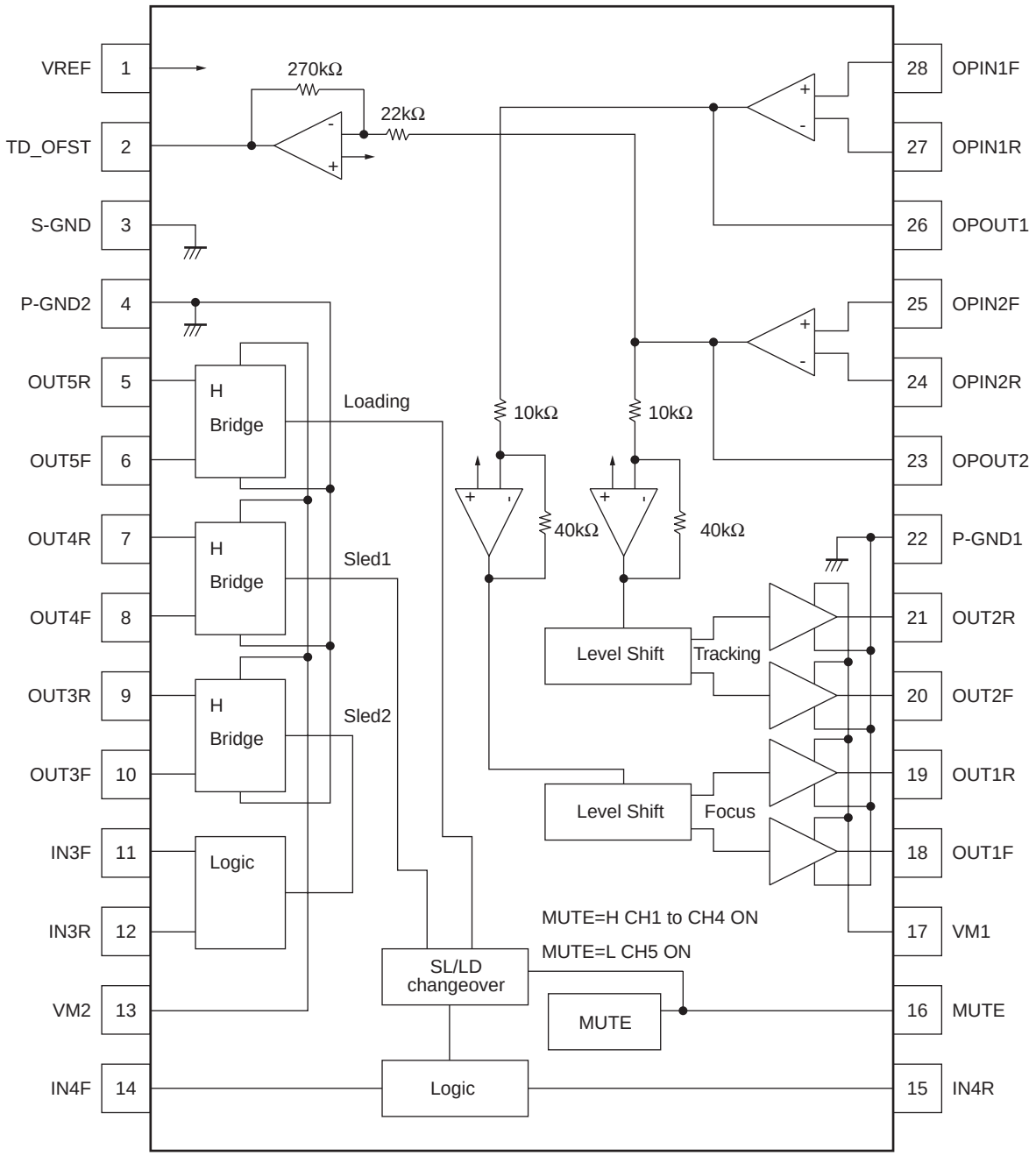




Pin Assignment



Block Diagram

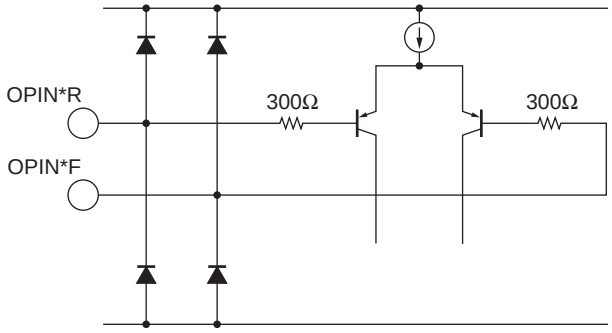
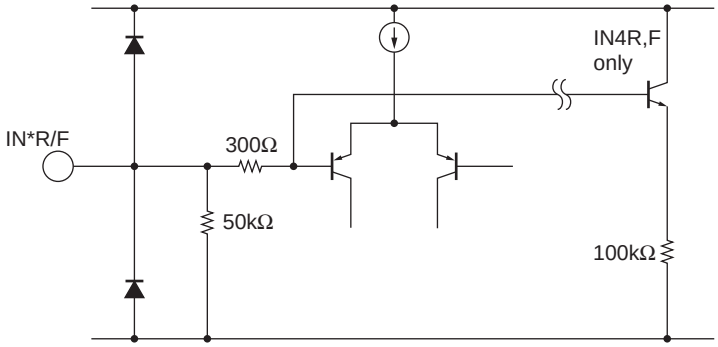
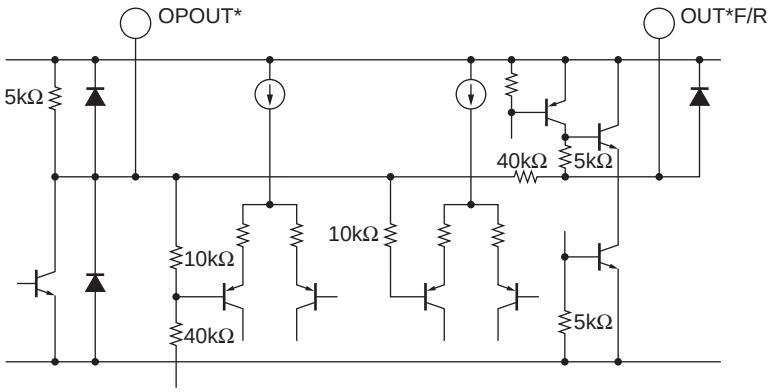
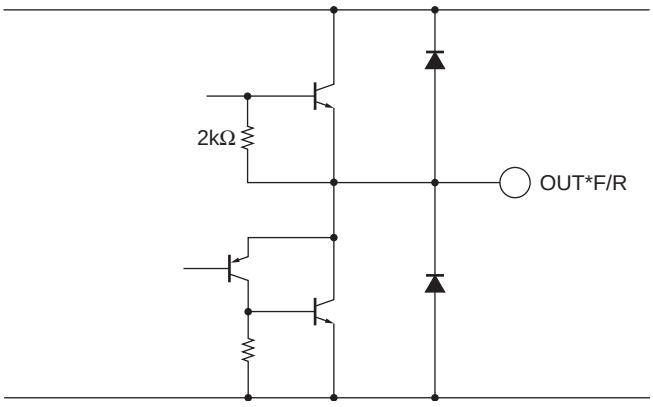


Pin Functions

Pin No.	Pin Name	Description (Function)
1	VREF	Reference voltage pin
2	TD_OFST	TD_OFST pin
3	S-GND	Signal system GND
4	P-GND2	Power system GND for CH3, 4, and 5
5	OUT5R	Loading output (-)
6	OUT5F	Loading output (+)
7	OUT4R	CH4 output pin (-)
8	OUT4F	CH4 output pin (+)
9	OUT3R	CH3 output pin (-)
10	OUT3F	CH3 output pin (+)
11	IN3F	CH3 input pin (+)
12	IN3R	CH3 input pin (-)
13	VM2	Power system power supply for CH3, 4, and 5
14	IN4F	CH4 input pin (+)
15	IN4R	CH4 input pin (-)
16	MUTE	MUTE pin
17	VM1	Power supply for the power and other systems for CH1 and 2
18	OUT1F	CH1 BTL AMP output pin (+)
19	OUT1R	CH1 BTL AMP output pin (-)
20	OUT2F	CH2 BTL AMP output pin (+)
21	OUT2R	CH2 BTL AMP output pin (-)
22	P-GND1	Power system GND for CH1 and 2
23	OPOUT2	OP-AMP output pin for CH2
24	OPIN2R	OP-AMP input pin (-) for CH2
25	OPIN2F	O-AMP input pin (+) for CH2
26	OPOUT1	OP-AMP output pin for CH1
27	OPIN1R	OP-AMP input pin (-) for CH1
28	OPIN1F	OP-AMP input pin (+) for CH1

* The center frame (FR) functions as the power system GND. Set it to the minimum potential together with S-GND.

Pin description

Pin No.	Pin name	Function	Equivalent circuit
27 28 24 25	OPIN1R OPIN1F OPIN2R OPIN2F	Input pin (CH1 to 2)	
11 12 14 15	IN3F IM3R IN4F IN4R	CH3(PWM) input CH4, 5(PWM) input	
26 23 18 19 20 21	OPOUT1 OPOUT2 OUT1F OUT1R OUT2F OUT2R	CH1 and 2 outputs	
10 9 8 7	OUT3F OUT3R OUT4F OUT4R	CH3(PWM) output CH4(PWM) output	

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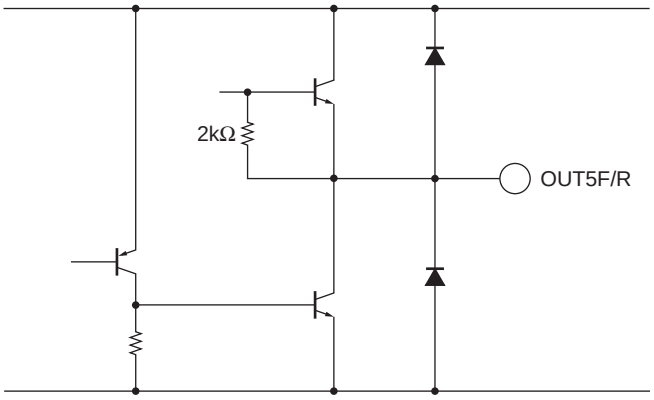
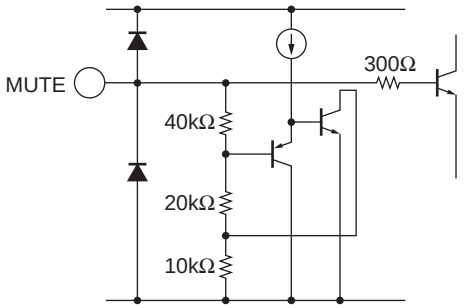
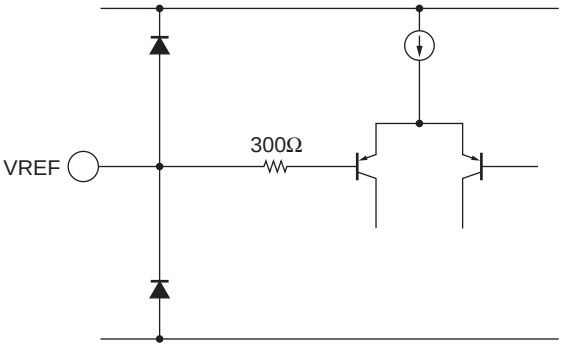
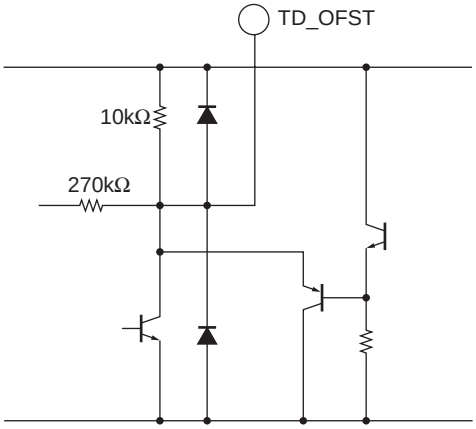
Pin No.	Pin name	Function	Equivalent circuit
6 5	OUT5F OUT5R	CH5(PWM) output	
16	MUTE	MUTE pin	
1	VREF	VREF pin	
2	TD_OFST	TD_OFST pin	

Actuator truth table

Loading block

MUTE	IN4F	IN4R	OUT5F	OUT5R
L	L	L	Z	Z
L	H	L	H	L
L	L	H	L	H
L	H	H	L	L
H	×	×	Z	Z

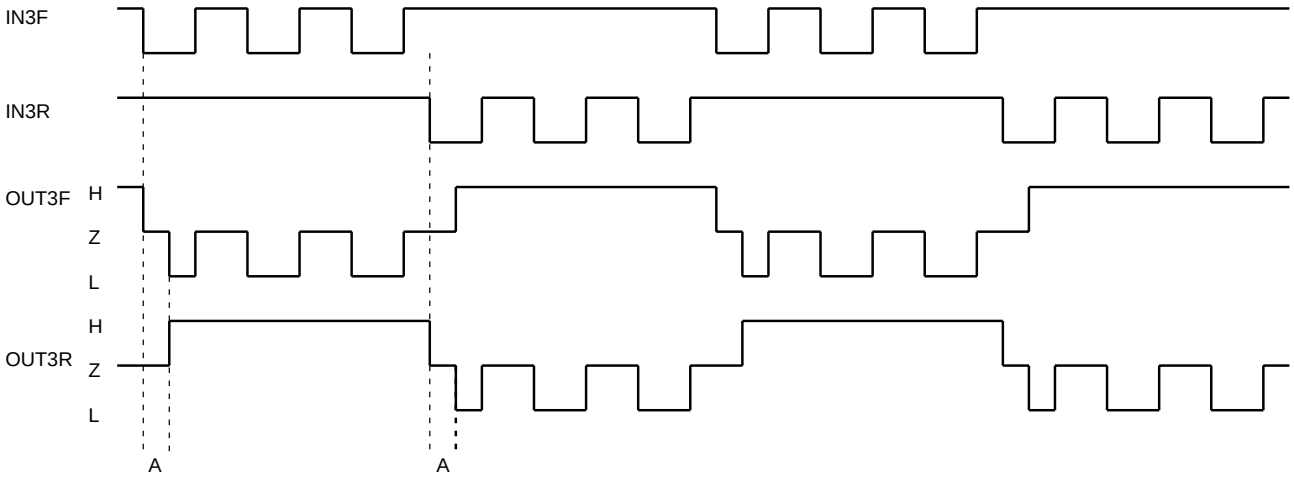
SLED block

MUTE	IN3, 4F	IN3, 4R	OUT3, 4F	OUT3, 4R
H	L	L	H	H
H	H	L	H	L
H	L	H	L	H
H	H	H	H	H
L	×	×	Z	Z

Z : open

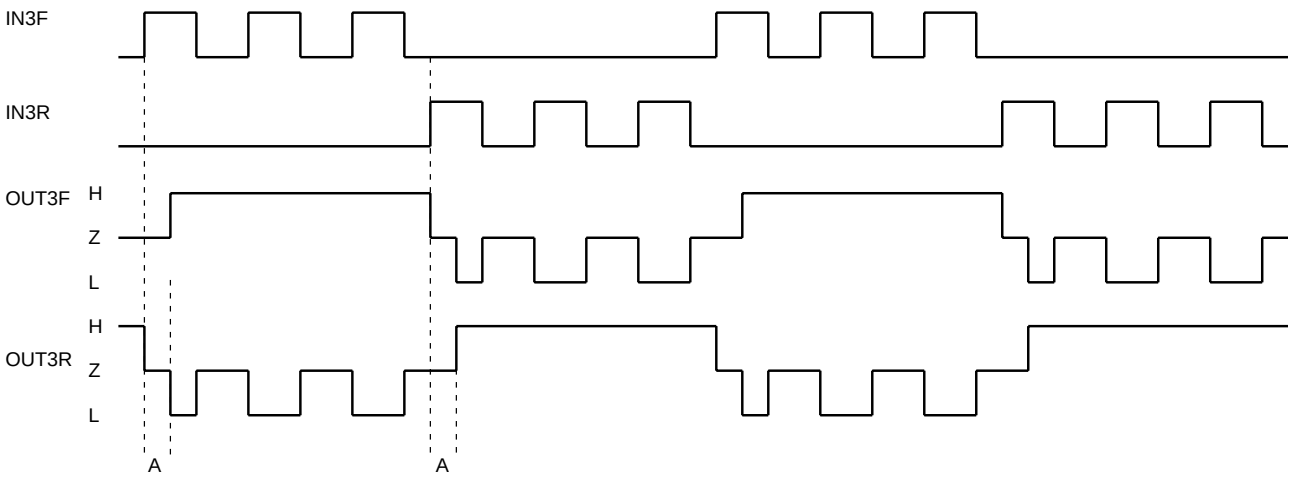
Loading input is shared also by the SLED input pin (IN4F/IN4R pin).

SLED timing chart



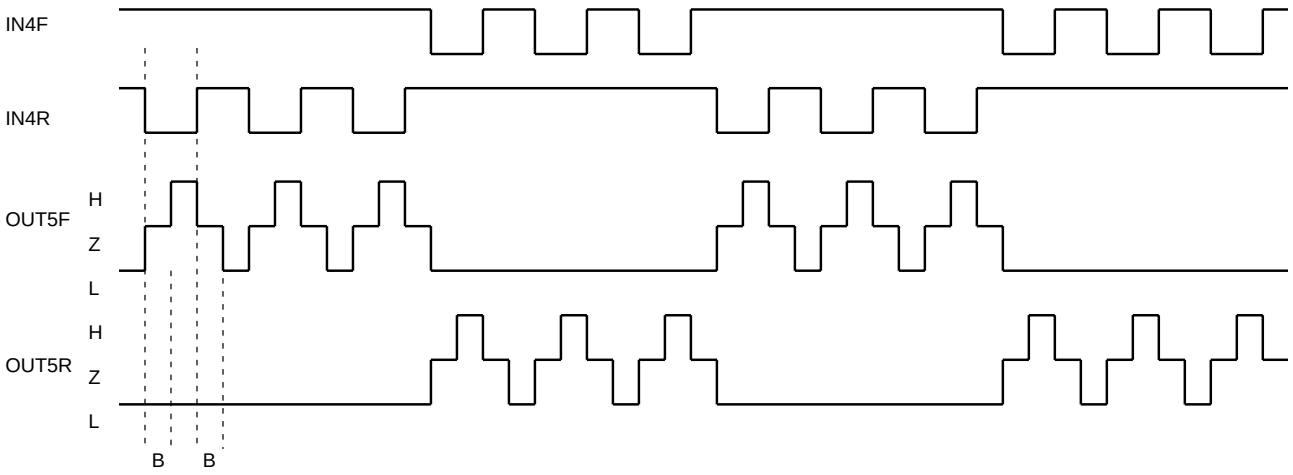
SLED performs PWM on the lower side. In this case, the upper side of another phase is always ON. Only initial changeover contains the OFF section A (about 1μs) as a measure for through operation. OUT4F and R do the same operation.

SLED timing chart



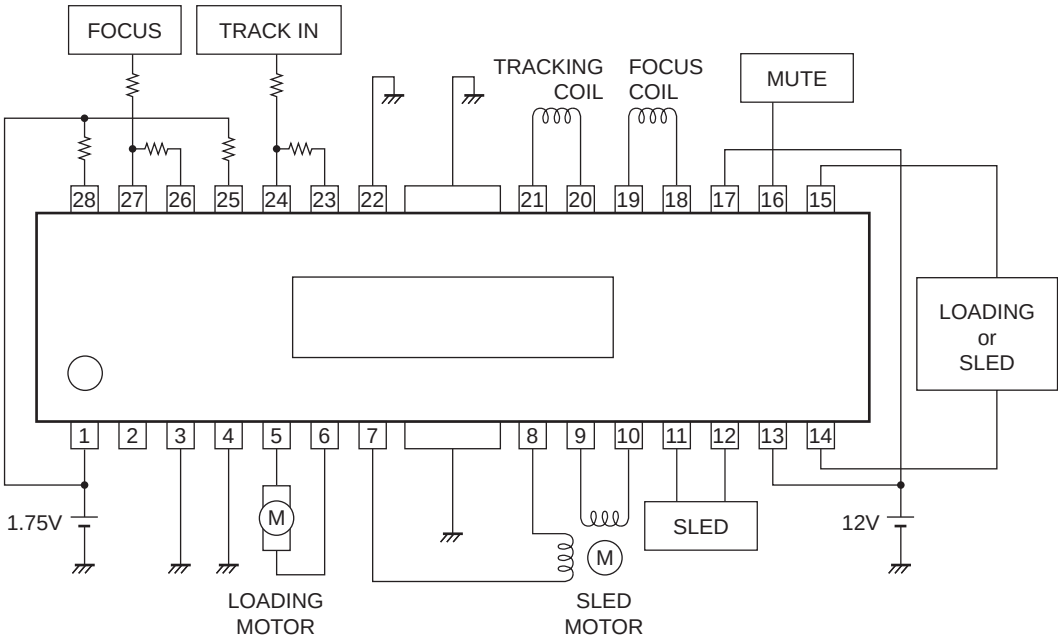
SLED performs PWM on the lower side. In this case, the upper side of another phase is always ON.
Only initial changeover contains the OFF section A (about 1µs) as a measure for through operation.
OUT4F and R do the same operation.

SLED timing chart



LOADING contains the OFF section B (about 1µs) on both edges for changeover of the input.
With the input at HH, the short braking occurs on the lower side.

Sample Application Circuit



Cautions for use

1. GND
   The center frame (FR) functions as a power system GND. Set it to the minimum potential together with S-GND.
2. Bypass capacitor
   For power supply, connect the bypass capacitor immediately near the pin of this IC.
3. Lightening, ground fault, and short-circuit between outputs
   Avoid short-circuit between the output pin and power supply (lightening), short-circuit between the output pin and GND (ground fault), and short-circuit between output pins (load short-circuit). When mounting IC to the substrate, pay attention to the direction of IC. Mounting in the wrong direction may cause damage to IC, and fuming in certain cases.