Ordering number : EN5388

Monolithic Digital IC

No. 5388

LB8112V

Loading Motor Driver with Built-in Sensor Amplifiers

Overview

The LB8112V integrates a driver for a video cassette deck loading motor and the associated peripheral sensor amplifiers in a single chip. The LB8112V can implement circuits with low saturation voltages and low power levels since it can directly drive power transistors from the V_M power supply.

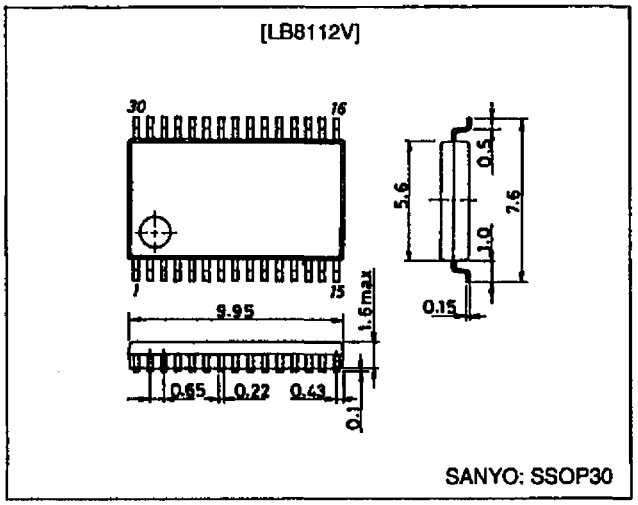
Functions and Features

- Built-in output current control and detection circuits for the loading motor
- Two reel motor FG amplifiers
- Two top-end sensors
- Two buffer amplifiers and an overcurrent protection circuit
- Thermal shutdown

Package Dimensions

unit: mm

3191-SSOP30



Specifications

Absolute Maximum Ratings at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Maximum supply voltage	$V_{CC}1$ max		7	V
	$V_{CC}2$ max		11	V
	V_M max		$V_{CC}2$	V
Maximum output current	I_M max	Continuous, Pd < 0.5 W	600	mA
Input voltage	V_{IN}		−0.3 to $V_{CC}1$ +0.3	V
Allowable power dissipation	Pd max	Independent device, Tj = 150°C	0.5	W
Operating temperature	Topr		−20 to +80	°C
Storage temperature	Tstg		−55 to +150	°C

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Allowable Operating Ranges at Ta = 25°C

Parameter	Symbol	Conditions	Ratings	Unit
Supply voltage	$V_{CC}1$		2.7 to 4.0	V
	$V_{CC}2$	$V_{CC}2 \geq V_{CC}1$	2.7 to 9	V
V_M voltage	V_M		2.2 to $V_{CC}2$	V

Electrical Characteristics at Ta = 25°C, $V_{CC}1$ = 3 V, $V_{CC}2$ = 4.75 V, V_M = 3.0 V

Parameter		Symbol	Conditions	min	typ	max	Unit
$V_{CC}1$ current drain		$I_{CC}11$	Standby mode		2.3	4	mA
		$I_{CC}12$	Forward/reverse mode, LIMIT and EN = low		14	19	mA
		$I_{CC}13$	Brake mode, LIMIT and EN = low		10	14	mA
$V_{CC}2$ current drain		$I_{CC}21$	Standby mode ($V_{CC}1$ = open)		0.1	20	µA
		$I_{CC}22$	Standby mode ($V_{CC}1$ = 3.0 V)		0.460	1	mA
		$I_{CC}23$	Forward/reverse mode		18.5	25	mA
V_M current drain			Standby mode		0.1	20	µA
[Logic Inputs (the DEC1, DEC2, LIMIT, and EN pins)]							
Input high-level voltage		V_{INH}	$V_{CC}1$ = 2.7 to 4.0	2.0			V
High-level input current		I_{INH}	V_{IN} = 3.0 V		46	65	µA
Input low-level voltage		V_{INL}	$V_{CC}1$ = 2.7 to 4.0			0.6	V
Low-level input current		I_{INL}	V_{IN} = 0.6 V		4.6	10	µA
[Logic Outputs (the LIMITOUT, TOPOUT, and ENDOUT pins)]							
Output high-level voltage		V_{OUTH}	$V_{CC}1$ = 2.7 to 4.0, source current: 10 µA	$V_{CC}1$ – 0.5			V
Output low-level voltage		V_{OUTL}	$V_{CC}1$ = 2.7 to 4.0, sink current: 10 µA			0.4	V
[Loading Motor Driver]							
Output saturation voltage		$V_{(sat)}1$	I_O = 200 mA (vertical addition)		0.2	0.3	V
		$V_{(sat)}2$	I_O = 400 mA (vertical addition)		0.4	0.6	V
Limit current		I_{Limi}	V_{RS} = 200 mV, R_F = 1.0 Ω, R_L = 7.5 Ω	172	192	212	mA
Detection current		I_{DET}				400	mA
Limit current setting range		ΔI_{Lim}	V_{RS} = 0.1 to 0.3 V, R_F = 0.5 Ω, R_L = 4.7 Ω, V_M = 4.6 V	100		600	mA
[Reel FG Amplifier]							
Input offset voltage		V_{IO}			±1	±5	mA
Input bias current		V_B	V_{IN} = 0.3 V			250	nA
Common-mode input voltage range		V_{ICM}		1		2	V
Open-loop gain		G_V1	*		55		dB
Loop gain		G_V2		27	29	30.5	dB
Common-mode rejection ratio		C_{MR}	*	65	80		dB
Source output saturation voltage		V_{OU}	I_O = –40 µA		0.1	0.25	V
Sink output saturation voltage		V_{OD}	I_O = 40 µA		0.1	0.25	V
[LPF Buffer]							
Input offset		V_{IO}			±1	±7	mV
Input bias current		I_B	V_{IN} = 0 V			250	nA
Common-mode input voltage range		V_{ICM}		0		$V_{CC}2$ – 1.5	V
Open loop gain		G_V1	*		55		dB
Common-mode rejection ratio		C_{MR}	*	65	80		dB
Output voltage range		$V_{OUT}1$		0		$V_{CC}2$ – 1.5	V
Output current	Source	I_{SO}	V_O = 0 V	10			mA
	Sink	$I_{SI}1$	V_O = 1.0 V	1			mA
		$I_{SI}2$	V_O = 0.2 V	18	36	45	µA
Bandwidth			*		1		MHz
[LPF Buffer Limiter]							
Input offset		V_{IO}			±1	±7	mV
Input bias		I_B	V_{IN} = 0.2 V			250	nA
Common-mode input voltage range		V_{ICM}		0		$V_{CC}1$ – 1.5	V

Note: * Items marked with an asterisk are design target values and are not tested.

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Parameter	Symbol	Conditions	min	typ	max	Unit
[TOP/END sensor]						
Input resistance	R_{IN}	*	4	5	6	kΩ
Minimum input sensitivity	ΔV		±27	±35	±43	mV
Thermal shutdown operating temperature	T_{TSD}	*	150	180	210	°C
Thermal shutdown hysteresis	ΔT_{TSD}	*		15		°C

Note: * Items marked with an asterisk are design target values and are not tested.

Truth Tables

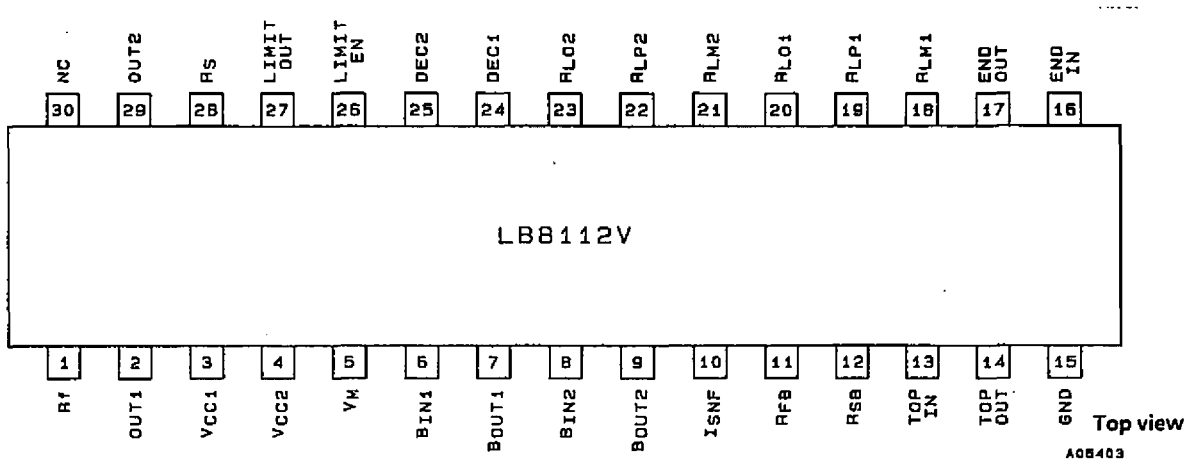
1. Loading motor truth table

Input		Output		Mode
DEC1	DEC2	OUT1	OUT2	
L	L	off	off	Standby
H	L	H	L	Forward
L	H	L	H	Reverse
H	H	L	L	Brake

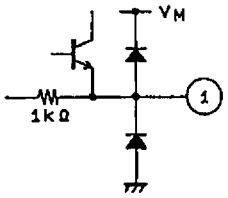
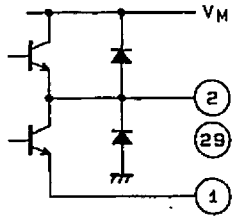
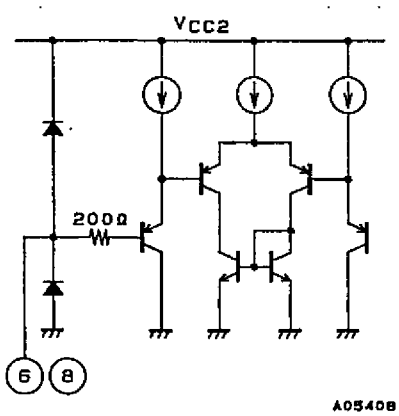
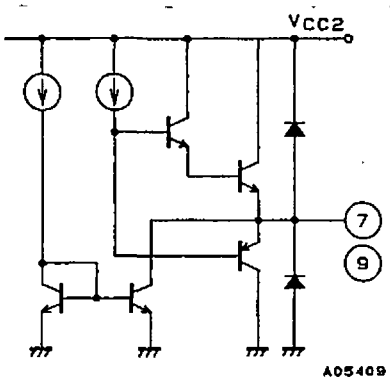
2. Loading motor current limiter detection modes

LIMIT EN	OUT output	LIMIT OUT
H	LIMIT	L
	NONLIMIT	H
L	Saturation	H

Pin Assignment



Pin Functions

Pin No.	Symbol	Pin voltage	Equivalent circuit	Function
1	Rf			• P-ground for the output transistor • The output current is detected by a resistor inserted between the Rf pin and ground for motor current control.
2 29	OUT1 OUT2	0 to V_M		• Outputs • Connect these pins to the motor.
3	$V_{CC}1$	2.7 to 4.0 V		• Power supply for circuit other than the loading output block and the LPF buffer • This power supply must be stabilized so that noise does not enter at this pin.
4	$V_{CC}2$	2.7 to 9 V		• Power supply for the loading motor pre-driver and LPF buffer. • As is the case for $V_{CC}1$, this power supply must be stabilized so that noise does not enter at this pin.
5	V_M	2.2 to $V_{CC}2$		• Loading motor power supply • As is the case for $V_{CC}2$, this power supply must be stabilized so that noise does not enter at this pin.
6 8	$B_{IN}1$ $B_{IN}2$			• LPF buffer input • This pin is used to form a low-pass filter as shown in the peripheral circuit example.
7 9	$B_{OUT}1$ $B_{OUT}2$			• LPF buffer output • Outputs a voltage identical to that applied to the buffer IN pin.

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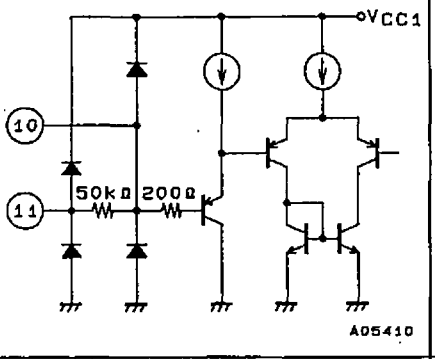
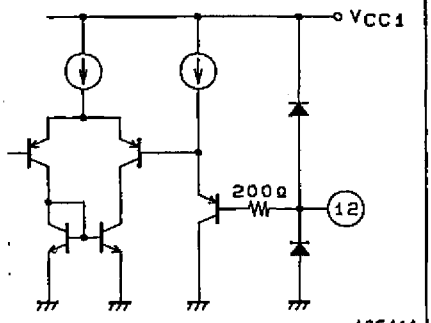
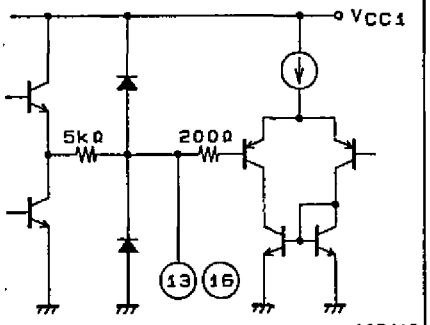
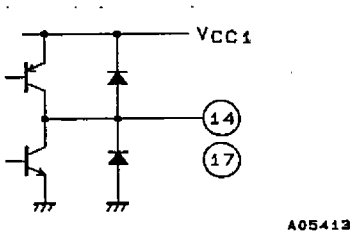
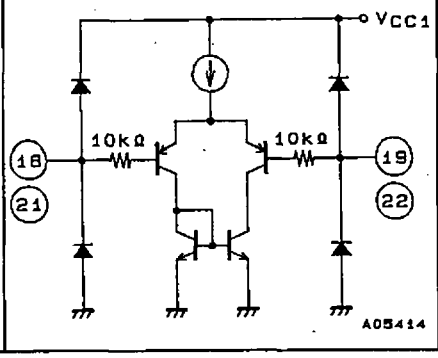
Pin No.	Symbol	Pin voltage	Equivalent circuit	Function
10 11	ISNF RFB			• ISNF is the connection for the limiter oscillation prevention capacitor. • RBF is the LPF current limiter current detection pin.
12	RSB			RSB is used to set the LPF limiter. The RSB pin voltage is determined by external circuits.
13 16	TOP_{IN} END_{IN}			• Sense amplifier input block • Internal resistance: 5 kΩ • The output is inverted if a pulse in excess of ±35 mV is input to the IN pin.
15	GND			Ground that is common to P-GND and SGND.
14 17	TOP_{OUT} END_{OUT}	0 to $V_{CC}1$		The top and end sensor outputs.
18 19 21 22	RLM1 RLP1 RLM2 RLP2			• The L-FG amplifier inputs • RLM1 and RLM2 are negative inputs. • RLP1 and RLP2 are positive inputs.

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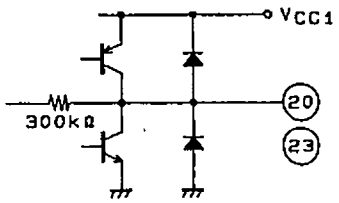
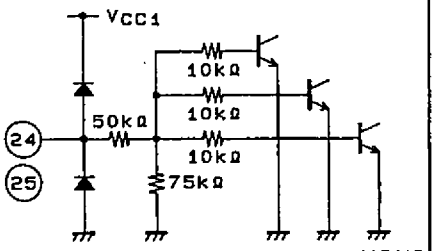
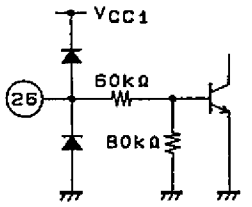
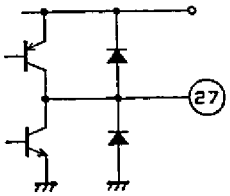
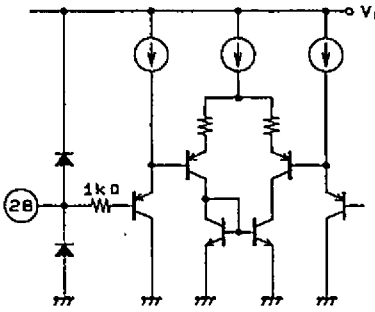
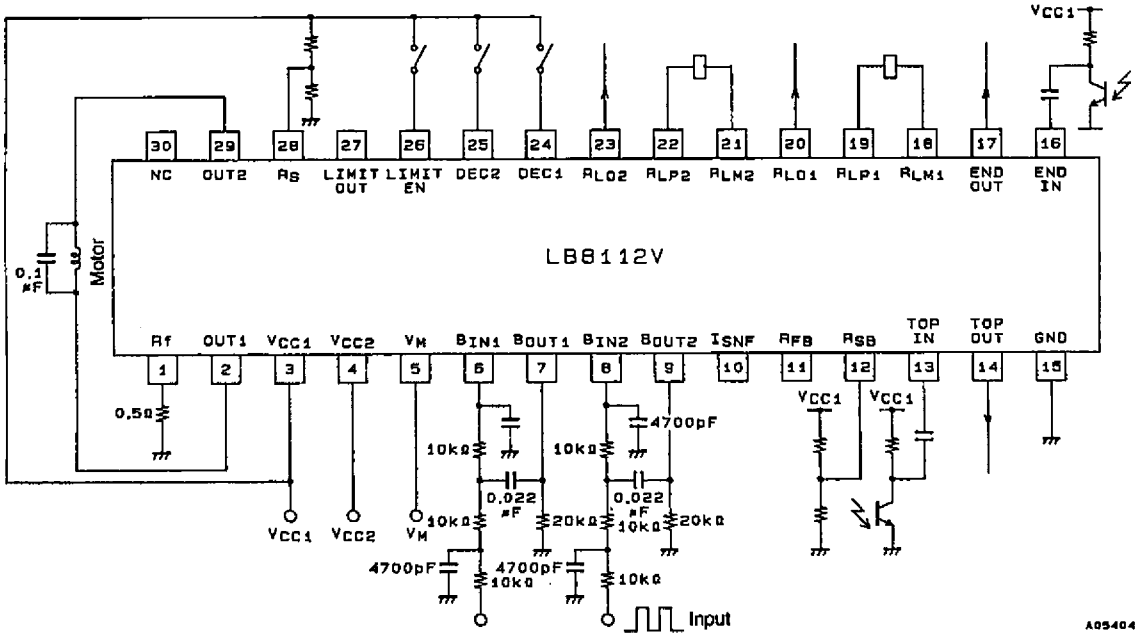
Pin No.	Symbol	Pin voltage	Equivalent circuit	Function
20 23	RLO1 RLO2	0 to $V_{CC}1$		The R-FG amplifier outputs
24 25	DEC1 DEC2	0 to $V_{CC}1$		Loading motor inputs When $V_{CC}1$ = 3.0 V: 2.0 V or higher is high, and 0.6 V or lower is low.
26	LIMIT EN	0 to $V_{CC}1$		Current limiter on/off control When $V_{CC}1$ = 3.0 V, if this pin is: 2.0 V or higher: The current limiter will be on. 0.6 V or lower: The current limiter will be off.
27	LIMIT OUT	0 to $V_{CC}1$		Current limiter detection output When $V_{CC}1$ = 3.0 V, if this pin is: 2.5 V or higher: The current limiter will be off. 0.4 V or lower: The current limiter will be on.
28	RS	0 to $V_{CC}1$–1.5 V		• Current limiter setting • Sets the limit current by setting the voltage between the Rf pin and GND.
30	NC			Unused pin (Must be left open.)

Peripheral Circuit Example



Equivalent Circuit Block Diagram