Feature

- **Dual H-Bridge Motor Driver**
  - **Capable of Driving Two DC Motors or One Stepper Motor**
  - **Low-MOSFET ON-Resistance: HS+LS 305 mΩ**
- **1.5 A Maximum Drive Current Per H-Bridge**
- **Configure Bridges Parallel for 3 A Drive Current**
- **Separate Motor and Logic-Supply Pins**
  - **0V to 11V Motor-Operating Supply-Voltage**
  - **2V to 7V Logic Supply-Voltage**
- **Flexible PWM or PHASE/ENABLE Interface**
- **Low-Power Sleep Mode With 95nA Maximum Supply Current**
- **DFN 2mm x 3mm -12L Package**

Applications

- **Battery-Powered:**
  - **Cameras**
  - **DSLR Lenses**
  - **Consumer Products**
  - **Toys**
  - **Robotics**
  - **Medical Devices**

General Description

The SC8835 provides an integrated motor driver solution for cameras, consumer products, toys, and other low-voltage or battery-powered motion control applications. The device has two H-bridge drivers, and drives two DC motors or one stepper motor, as well as other devices like solenoids. The output driver block for each consists of N-channel power MOSFETs configured as an H-bridge to drive the motor winding. An internal charge pump generates gate drive voltages.

The SC8835 supplies up to 1.5A of output current per H-bridge and operates on a motor power supply voltage from 0V to 11V, and a device power supply voltage of 2V to 7V.

PHASE/ENABLE and IN/IN interfaces are compatible with industry-standard devices.

Internal shutdown functions are provided for overcurrent protection, short circuit protection, under voltage lockout, and over temperature.

The SC8835 is packaged in a 12-pin DFN package.

Package

The package of SC8835 is DFN 2*3 -12L.

Absolute Maximum Ratings

(If out of these ratings, the filter may be fail or damaged)

Table 1

SYMBOL	PARAMETER	MIN	MAX	UNITS
V_M	Motor power supply voltage	-0.3	12	V
V_{CC}	Power supply voltage	-0.3	7	V
T_A	Operating ambient Temperature Range	-40	125	℃
T_{STG}	Storage Temperature	-65	150	℃

Recommended Operating Conditions

Table 2

SYMBOL	PARAMETER	MIN	MAX	UNITS
V_{CC}	Device power supply voltage	2	7	V
V_M	Motor power supply voltage	0	11	V
V_{IN}	Logic level input voltage	0	V_{CC}	V
I_{OUT}	H-bridge output current	0	1.5	A
f_{PWM}	Externally applied PWM frequency	0	250	kHz
T_A	Operating ambient Temperature Range	-40	85	℃

Thermal Information

Table 3

SYMBOL	PARAMETER	VALUE	UNITS
R_{JA}	Junction-to-ambient thermal resistance	65.3	℃/W
R_{JC}	Junction-to-thermal resistance	45.8	℃/W

Electrical Characteristics

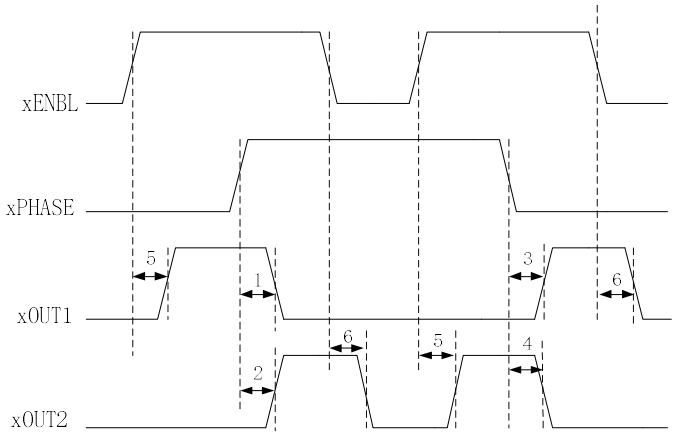
Specifications are at T_A=+25℃, V_M=5V, V_{CC}=3V (unless otherwise noted)

SYMBOL	PARAMETER	TEST CONDITIONS	SPEC			UNITS
			MIN	TYP	MAX	
I_{VM}	VM operating supply current	No PWM, no load		194		μA
		50 kHz PWM, no load		350		
I_{VMQ}	VM sleep mode supply current	V_M=2V, V_{CC}=0V, all inputs 0V		5		nA
		V_M=5V, V_{CC}=0V, all inputs 0V		10	95	
I_{VCC}	VCC operating supply current			372		μA
V_{UVLO}	VCC undervoltage lockout voltage	VCC rising		1.5		V
		VCC falling		1.7		
V_{IL}	Input low voltage				0.3 x V_{CC}	V
V_{IH}	Input high voltage		0.5 x V_{CC}			V
I_{IL}	Input low current	V_{IN}=0			5	μA
I_{IH}	Input high current	V_{IN}=3.3V			50	μA
R_{PD}	Pulldown resistance			100		KΩ
$R_{DS(ON)}$	HS+LS FET on resistance	V_{CC}=3V, V_M=3V, I_O=800mA, T_J=25℃		337	400	mΩ
		V_{CC}=5V, V_M=5V, I_O=800mA, T_J=25℃		300	360	
I_{OFF}	OFF-state leakage current				200	nA
I_{OCP}	Overcurrent protection trip level		1.6		3.5	A
t_{DEG}	Overcurrent de-glitch time			1		μs
t_{OCR}	Overcurrent protection retry time			1		ms
t_{DEAD}	Output dead time			100		ns
t_{TSD}	Thermal shutdown temperature		150	160	180	℃

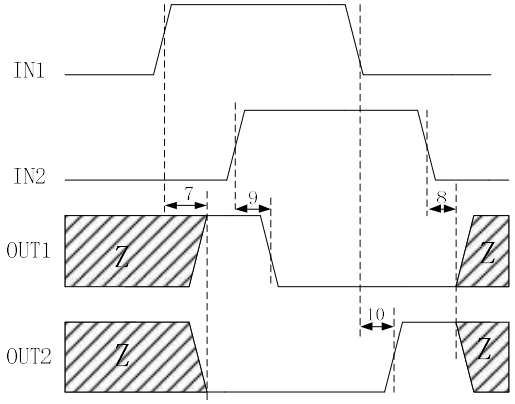
Timing Requirements

T_A=+25℃, V_M=5V, V_{CC}=3V, R_L=20Ω

NO.			MIN	MAX	UNIT
1	t_1	Delay time, xPHASE high to xOUT1 low		300	ns
2	t_2	Delay time, xPHASE high to xOUT2 high		200	ns
3	t_3	Delay time, xPHASE low to xOUT1 high		200	ns
4	t_4	Delay time, xPHASE low to xOUT2 low		300	ns
5	t_5	Delay time, xENBL low to xOUTx high		200	ns
6	t_6	Delay time, xENBL low to xOUTx low		300	ns
7	t_7	Output enable time		300	ns
8	t_8	Output disable time		300	ns
9	t_9	Delay time, xINx high to xOUTx high		160	ns
10	t_{10}	Delay time, xINx low to xOUTx low		160	ns
11	t_R	Output rise time	30	188	ns
12	t_F	Output fall time	30	188	ns



PHASE/ENBL mode



IN/IN mode

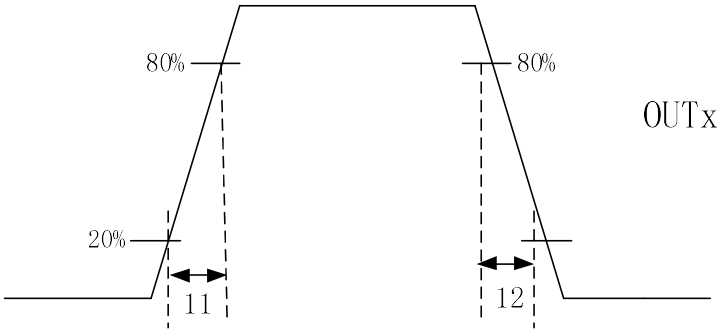


Fig. 1 Timing Requirements

PAD Definition

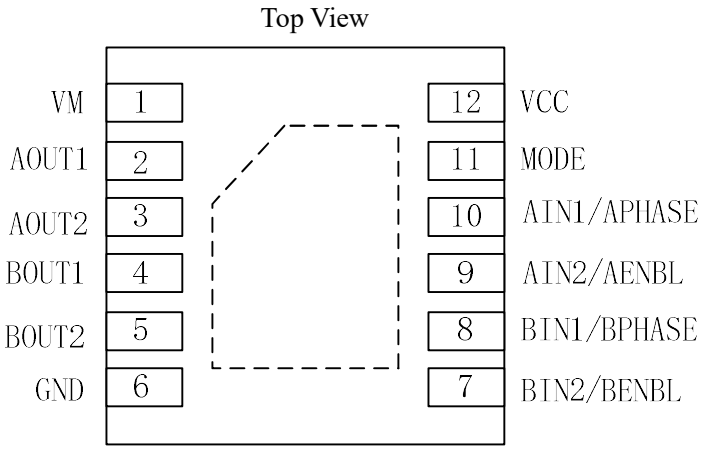


Fig 2. Pad definition of SC8835

Table 7. Pad definition

No.	Name	I/O	Description	EXTERNAL COMPONENTS OR CONNECTIONS
1	VM	POWER	Motor supply	Bypass to GND with 0.1μF (minimum) ceramic capacitor
2	AOUT1	O	Bridge A output 1	Connect to motor winding A
3	AOUT2	O	Bridge A output 2	
4	BOUT1	O	Bridge B output 1	Connect to motor winding B
5	BOUT2	O	Bridge B output 2	
6	GND	GROUND	Device ground	
7	BIN2/BENBL	I	Bridge B input 2/ENABLE input	IN/IN mode: Logic high sets BOUT2 high PH/EN mode: Logic high enables H-bridge B Internal pulldown resistor
8	BIN1/BPHASE	I	Bridge B input 1/PHASE input	IN/IN mode: Logic high sets BOUT1 high PH/EN mode: Sets direction of H-bridge B Internal pulldown resistor
9	AIN2/AENBL	I	Bridge A input 2/ENABLE input	IN/IN mode: Logic high sets AOUT2 high PH/EN mode: Logic high enables H-bridge A Internal pulldown resistor
10	AIN1/APHASE	I	Bridge A input 1/PHASE input	IN/IN mode: Logic high sets AOUT1 high PH/EN mode: Sets direction of H-bridge A Internal pulldown resistor
11	MODE	I	Input mode select	Logic low selects IN/IN mode Logic high selects PH/EN mode Internal pulldown resistor
12	VCC	POWER	Device supply	Bypass to GND with 0.1μF(minimum) ceramic capacitor

Feature Description

The SC8835 is an integrated motor-driver solution used for brushed motor control. The device integrates two H-bridges, and drives two DC motor or one stepper motor. The output driver block for each H-bridge consists of N-channel power MOSFETs. An internal charge pump generates the gate drive voltages. Protection features include overcurrent protection, short circuit protection, undervoltage lockout, and overtemperature protection.

The bridges connect in parallel for additional current capability.

The SC8835 allows separation of the motor voltage and logic voltage if desired. If VM and VCC are less than 7 V, the two voltages can be connected.

The mode pin allow selection of either a PHASE/ENABLE or IN/IN interface.

Protection Circuits

The SC8835 is fully protected against undervoltage, overcurrent, and overtemperature events.

1) Overcurrent Protection (OCP)

An analog current limit circuit on each FET limits the current through the FET by removing the gate drive. If this analog current limit persists for longer than the OCP time, all FETs in the H-bridge disable. After approximately 1 ms, the bridge re-enable automatically.

Overcurrent conditions on both high-side and low-side devices; a short to ground, supply, or across the motor winding result in an overcurrent shutdown.

2) Thermal Shutdown (TSD)

If the die temperature exceeds safe limits, all FETs in the H-bridge disable. Operation automatically resumes once the die temperature falls to a safe level.

3) Undervoltage Lockout (UVLO)

If at any time the voltage on the VCC pins falls below the undervoltage lockout threshold voltage, all circuitry in the device disable, and internal logic resets. Operation resumes when VCC rises above the UVLO threshold.

Table 1. Device Protection

FAULT	CONDITION	ERROR REPORT	H-BRIDGE	INTERNAL CIRCUITS	RECOVERY
VCC undervoltage (UVLO)	VCC < VUVLO	None	Disabled	Disabled	VCC > VUVLO
Overcurrent (OCP)	IOUT > IOCP	None	Disabled	Operating	tOCR
Thermal Shutdown (TSD)	TJ > TTSD	None	Disabled	Operating	TJ < TTSD – THYS

1) Bridge Control

Two control modes are available in the SC8835: IN/IN mode, and PHASE/ENABLE mode. IN/IN mode is selected if the MODE pin is driven low or left unconnected; PHASE/ENABLE mode is selected if the MODE pin is driven to logic high. Table 3 and Table 4 show the logic for these modes.

Table 3. IN/IN Mode

MODE	xIN1	xIN2	xOUT1	xOUT2	FUNCTION (DC MOTOR)
0	0	0	Z	Z	Coast
0	0	1	L	H	Reverse
0	1	0	H	L	Forward
0	1	1	L	L	Brake

Table 4. Phase/Enable Mode

MODE	xENABLE	xPHASE	xOUT1	xOUT2	FUNCTION (DC MOTOR)
1	0	X	L	L	Brake
1	1	1	L	H	Reverse
1	1	0	H	L	Forward

2) Sleep Mode

If the VCC pin reaches 0 V, the SC8835 enters a low-power sleep mode. In this state all unnecessary internal circuitry powers down. For minimum supply current, all inputs should be low (0 V) during sleep mode.

Application and Implementation

Application Information

The SC8835 is used in one or two motor control applications. Configure the SC8835 in parallel to provide double the current to one motor. The following design procedure can be used to configure the SC8835 in a brushed motor application.

Typical Application

The two H-bridges in the SC8835 drivers 1x Stepper motor or 2x DC motor. Figure 2 shows the connections.

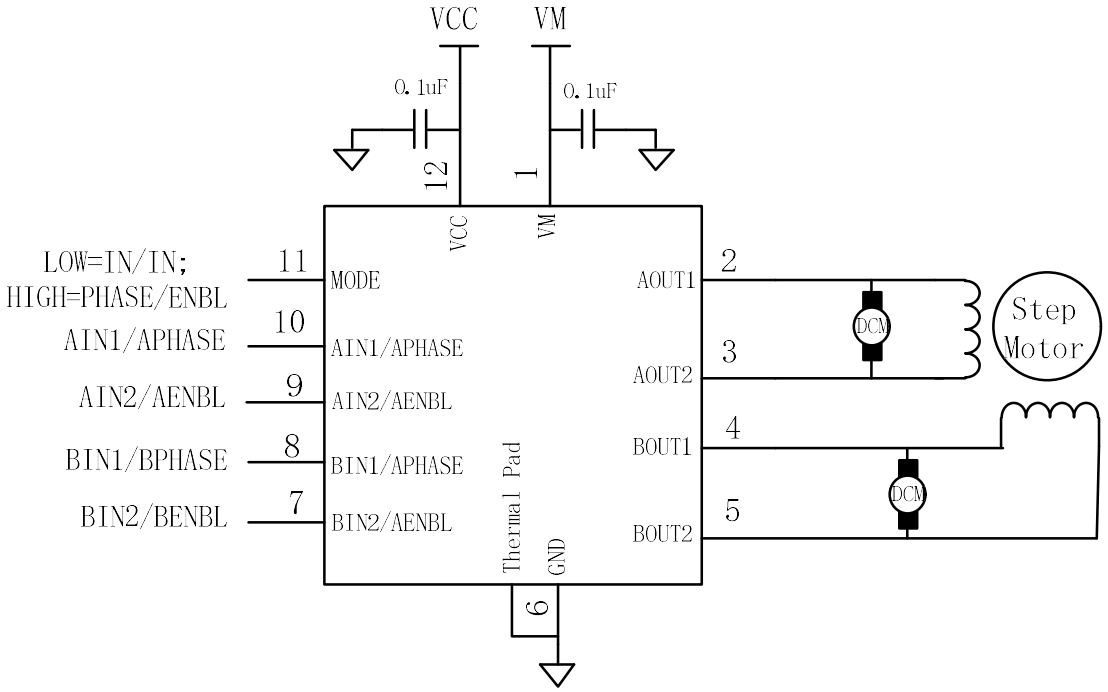


Fig.2 Drivers 1x Stepper motor or 2x DC motor

The two H-bridges in the SC8835 connect in parallel for double the current of a single H-bridge. Figure 6 shows the connections.

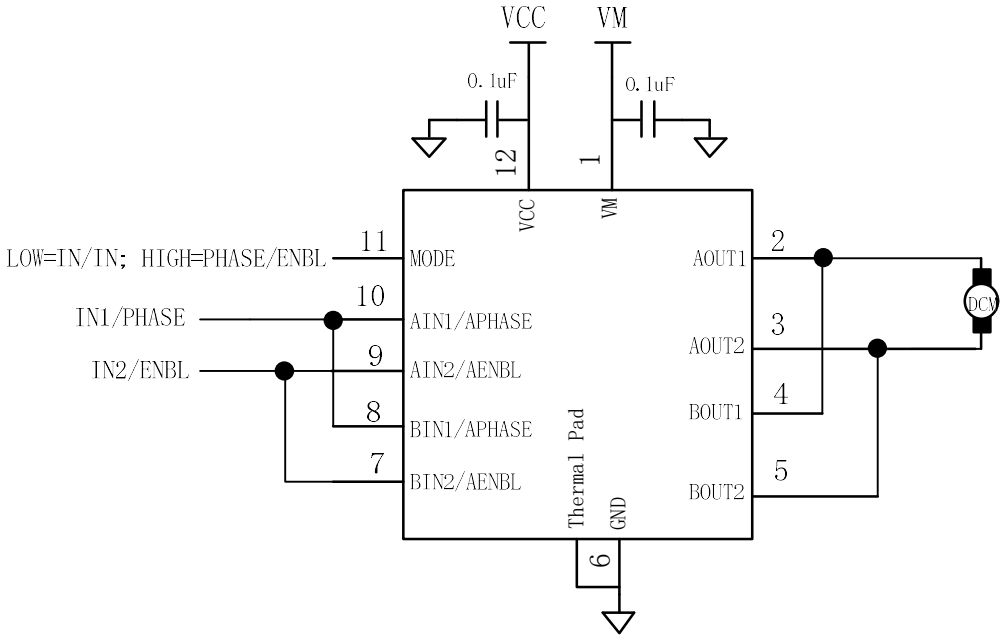
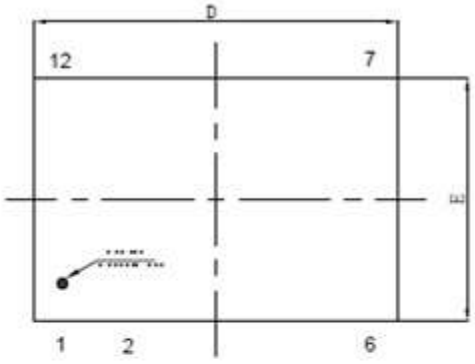


Fig.3 Parallel Mode Connections

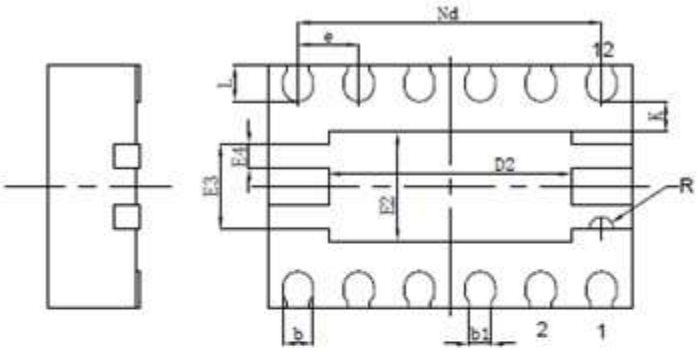
Package

DFN 2*3-12L

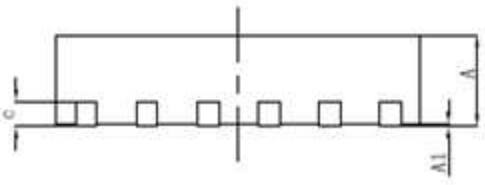
Symbol	Millimeters		
	MIN	NOM	MAX
A	0.70	0.75	0.80
A1	0	0.02	0.05
b	0.20	0.25	0.30
b1	0.18REF		
c	0.203REF		
D	2.90	3.00	3.10
D2	1.90	2.00	2.10
E	1.90	2.00	2.10
E2	0.80	0.90	1.00
E3	0.60	0.70	0.80
E4	0.10	0.20	0.30
e	0.50BSC		
Nd	2.50BSC		
L	0.25	0.30	0.35
R	0.05	0.10	0.15
K	0.25REF		



TOP VIEW



BOTTOM VIEW



SIDE VIEW