

Features

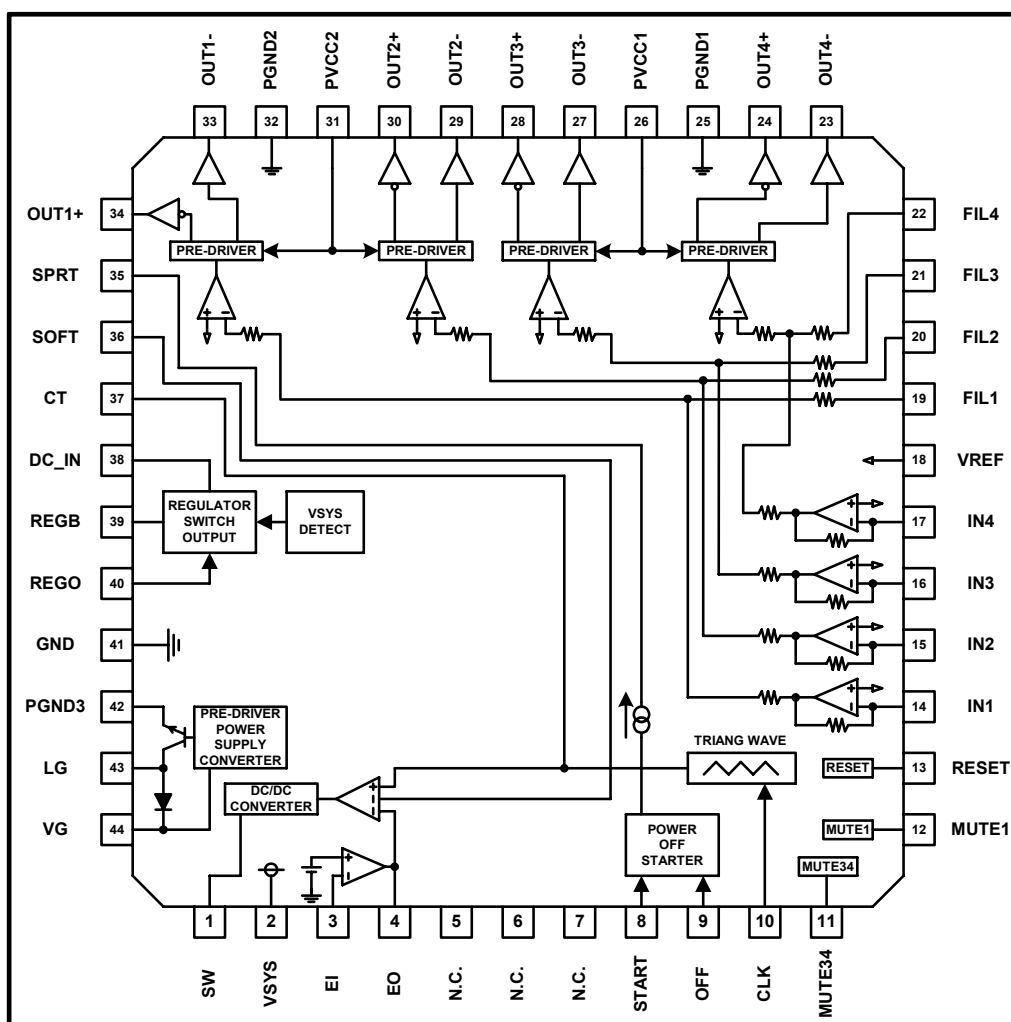
- 4 channels of Power-Mos H-bridge drivers.
- Built-in DC/DC converter control circuit.
- Built-in reset circuit.
- Built-in VG booster circuit.
- Built-in voltage down regulator circuit.
- Built-in On/OFF function
- Low power consumption.
- Direct PWM drive system.
- QFP44 package.

Description

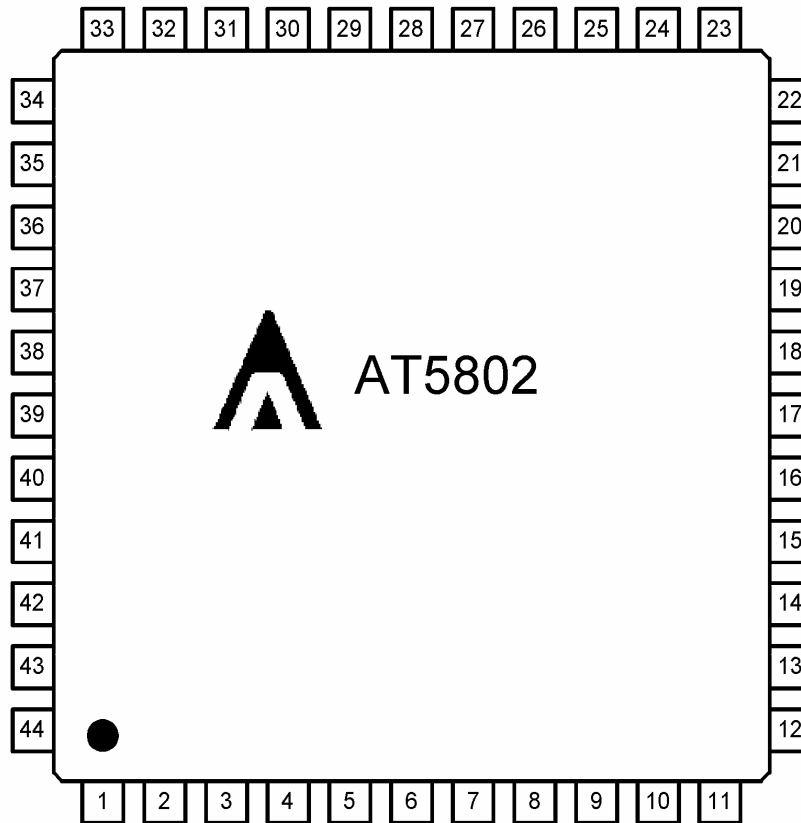
The AT5802 is a 4-channel driver and power controller for portable CD players on a single chip. The driver block power supply uses the on-chip switching regulator, making this component an ideal choice for low-power sets.

Applications

Disc-man
 Portable compact disc players (CDP)
 Portable Mini disc player (MD)
 Other portable compact disc media

Block Diagram

Pin Assignments



Pin Descriptions

Pin No.	Pin name	Function
1	SW	Booster transistor drive
2	VSYS	Control circuit power supply input
3	EI	DC/DC converter error amplifier input
4	EO	DC/DC converter error amplifier output
5	N.C.	-
6	N.C.	-
7	N.C.	-
8	START	DC/DC converter starting input
9	OFF	DC/DC converter off input
10	CLK	External clock synchronization input
11	MUTE34	CH3 CH4 mute input
12	MUTE1	CH1 mute input
13	RESET	Reset output
14	IN1	CH1 input
15	IN2	CH2 input
16	IN3	CH3 input
17	IN4	CH4 input
18	VREF	Reference power supply input
19	FIL1	CH1 feedback filter
20	FIL2	CH2 feedback filter
21	FIL3	CH3 feedback filter
22	FIL4	CH4 feedback filter
23	OUT4-	CH4 negative output
24	OUT4+	CH4 positive output
25	PGND1	Power unit ground 1
26	PVCC1	H-bridge power supply input 1
27	OUT3-	CH3 negative output
28	OUT3+	CH3 positive output
29	OUT2-	CH2 negative output
30	OUT2+	CH2 positive output
31	PVCC2	H-bridge power supply input 2
32	PGND2	Power unit ground 2
33	OUT1-	CH1 negative output
34	OUT1+	CH1 positive output
35	SPRT	Short-circuit protection setting input
36	SOFT	Soft-start setting input
37	CT	Triangular wave output
38	DC IN	AC adapter power supply input
39	REGB	TR driving terminal for regulator
40	REGO	Battery power supply input
41	GND	Pre-Unit Power supply ground
42	PGND3	Power unit ground 3
43	LG	Drive coil for boosting VG terminal
44	VG	Drive the power-Mos circuit power supply input

Absolute maximum ratings (Ta = 25°C)

Parameter	Symbol	Limits	unit
H-bridge power Supply voltage	PVCC1, 2	7	V
Battery power Supply voltage	REGO	7	V
System power Supply voltage	VSYS	7	V
AC adapter power Supply voltage	DC_IN	7	V
Pre-driver power Supply voltage	VG	7	V
Power dissipation	Pd	1000*	mW
Operating temperature range	Topr	-30~+85	°C
Storage temperature range	Tstg	-55~+150	°C

* Derating is done 5mW/°C for operation above Ta=25°C.

Recommended operating conditions (Ta = 25°C)

Parameter	Symbol	Min.	Typ.	Max.	unit
H-bridge power Supply voltage	PVCC1, 2	1.5	2.4	6.5	V
Battery power Supply voltage	REGO	1.5	2.4	6.5	V
System power Supply voltage	VSYS	2.0	2.5	6.5	V
AC adapter power Supply voltage	DC_IN	2.0	4.5	6.5	V
Pre-driver power Supply voltage*	VG	5.0	6.0	6.9	V
Ambient temperature	Ta	-10	25	70	°C

* The built-in booster circuit is not used, but the voltage is supplied from outside.

Electrical characteristics

(Unless specified particular, Ta = 25°C, PVCC1, 2=REGO=2.4V, VSYS=2.5V, VG=6V, VREF=1.25V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Common section						
REGO stand-by current	I _{REGOST}	-	-	3	μA	VSYS=0V
VG stand-by current	I _{VGST}	-	-	3	μA	VSYS=0V
REGO supply current	I _{REGO}	-	0.45	1.0	mA	
DC_IN supply current	I _{DC_IN}	-	1.4	3.0	mA	DC_IN=5V
VSYS supply current	I _{VSYS}	-	4.5	9.0	mA	
VG supply current	I _{VG}	-	0.35	0.7	mA	CT=470PF, f _{CLK} =88.2KHz VIN=1.49V
LG leak current	I _{LGLK}	-	-	3	μA	LG=6V, VSYS=0V
PWM driver						
Output on-resistance	RON	-	1.9	4	Ω	Sum of on-resistance of top and that of bottom
Output offset voltage	V _{OO}	-50	0	50	mV	
Output voltage gain	GVC	11.5	14.0	16.5	dB	RIN=30KΩ
Input dead zone CH1,2 (one side)	V _{DB12}	2	20	40	mV	CH1,2
Input dead zone CH3,4 (one side)	V _{DB34}	0	5	15	mV	CH3,4

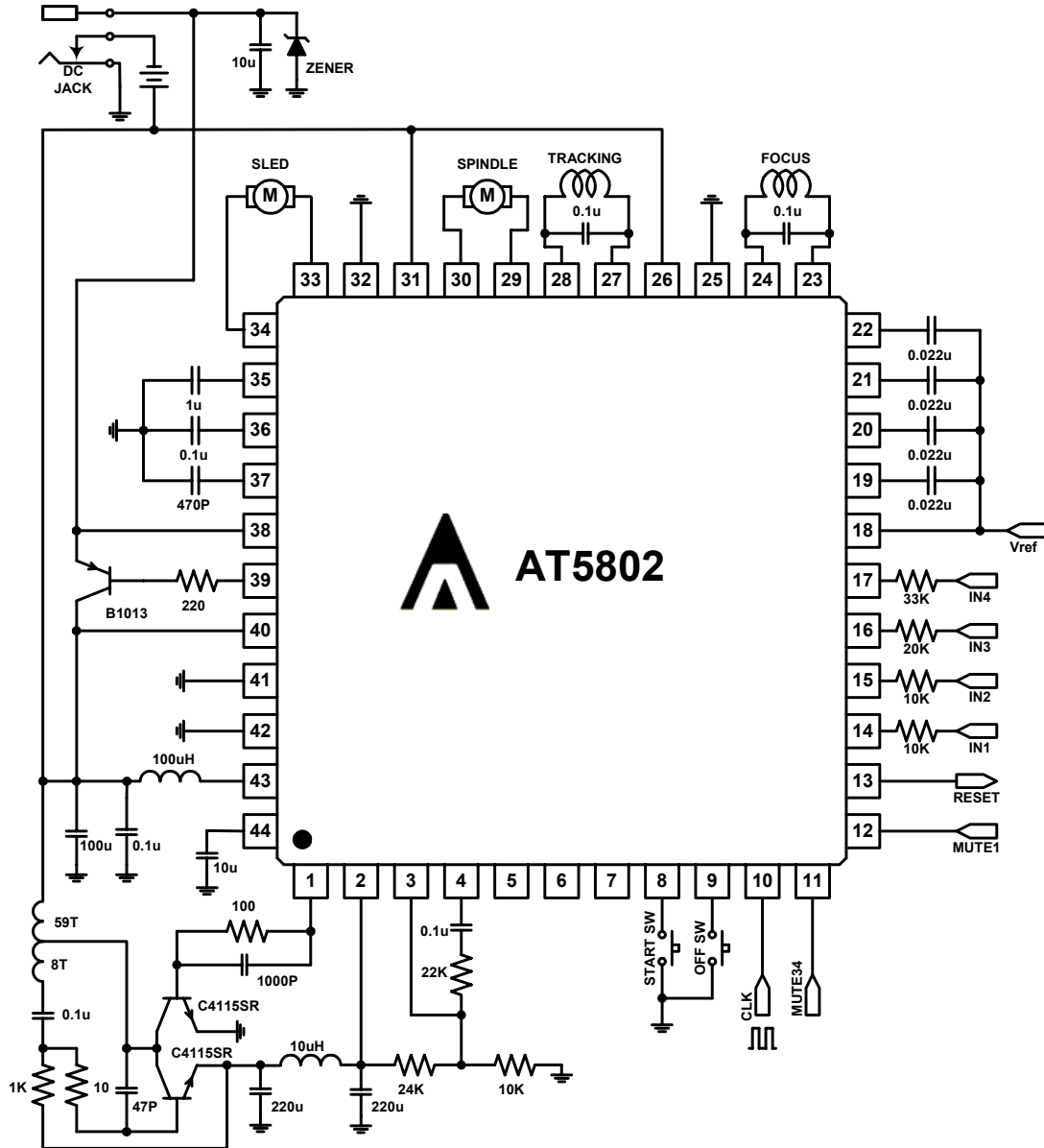
Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Control pin threshold						
Mute 1 ON threshold voltage	V_{MON1}	1.5	-	-	V	
Mute 1 OFF threshold voltage	V_{MOFF1}	-	-	0.5	V	
Mute 34 ON threshold voltage	V_{MON34}	-	-	0.5	V	
Mute 34 OFF threshold voltage	V_{MOFF34}	1.5	-	-	V	
Up / down voltage converter section						
EI pin threshold voltage	V_{EITH}	0.85	0.90	0.95	V	
EO pin output voltage H	V_{EOTH}	1.1	1.3	-	V	IEO=100 μ A
EO pin output voltage L	V_{EOL}	-	-	0.4	V	IEO=-60 μ A
Short-circuit protection						
SPRT pin voltage(normal)	V_{SPRTN}	-	-	0.2	V	
SPRT pin current 1,EO=H	I_{SPRT1}	3.8	5.8	8.8	μ A	
SPRT pin current 2, OFF mode	I_{SPRT2}	7.5	11.5	17.5	μ A	
SPRT pin impedance	R_{SPRT}	210	300	390	K Ω	
SPRT pin threshold voltage	V_{SPRTH}	0.4	0.5	0.6	V	
Soft start section						
SOFT pin output voltage	V_{SOFT}	1.22	1.67	2.12	V	
SOFT pin current	I_{SOFT}	3	6	9	μ A	SOFT=0V
Interface section						
OFF pin ON threshold voltage	V_{OFFTH1}	-	-	VSYS -1.5	V	
OFF pin OFF threshold voltage	V_{OFFTH2}	VSYS -0.6	-	-	V	
OFF pin bias current	I_{OFF}	30	60	90	μ A	OFF=0V
START pin ON threshold voltage	V_{STATH1}	-	-	REGO -1.0	V	
START pin OFF threshold voltage	V_{STATH2}	REGO -0.3	-	-	V	
START pin bias current	I_{START}	-	30	34	μ A	VSYS=0V,START=0V
CLK pin threshold voltage H	V_{CLKTHH}	1.5	-	-	V	CT=470PF, f_{CLK} =88.2KHz
CLK pin threshold voltage L	V_{CLKTHL}	-	-	0.5	V	CT=470PF, f_{CLK} =88.2KHz
CLK pin bias current	I_{CLK}	11	16	21	μ A	CLK=2.5V
Starter circuit section						
LG pin oscillating frequency	f_{LG}	75	100	125	KHz	VG=LG=5V
LG pin maximum pulse duty	t_{LGMAX}	84	87	90	%	VG=LG=5V
LG pin output voltage L	V_{LGL}	-	0.1	0.2	V	VG=LG=5V
VG pin starter detect	V_{VGSTTH}	3.7	4.5	5.3	V	VG=3.5V→5.5V sweep

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
VG pin threshold voltage	V _{VGTH}	6.0	6.5	7.0	V	LG=5V
DC/DC converter						
SW pin output voltage H	V _{SWH}	1.3	1.8	-	V	CT=0.2V, I _{SW} =-5mA, EI=0.7, V _{SPRT} =0V
SW pin output voltage L	V _{SWL}	-	0.5	1.0	V	CT=2V, I _{SW} =1mA
SW pin oscillating frequency at start	t _{SWSTA}	75	100	125	KHz	VSYS=1.6V, VG=5V
SW pin oscillating frequency (self-running)	f _{SW1}	46	58	70	KHz	EI=0.7, CT=470PF, V _{SPRT} =0V
SW pin oscillating frequency (CLK synchronization)	f _{SW2}	-	88.2	-	KHz	EI=0.7, f _{CLK} =88.2KHz, V _{SPRT} =0V
SW pin pulse duty at start	D _{SWSTA}	40	50	60	%	VSYS=1.6V, VG=5V
SW pin oscillating maximum pulse duty (self-running)	D _{SW1}	80	90	95	%	EI=0.7, CT=470PF, V _{SPRT} =0V, CLK=0V
SW pin oscillating maximum pulse duty (CLK synchronization)	D _{SW2}	80	90	95	%	EI=0.7, CT=470PF, V _{SPRT} =0V
Triangular wave generation circuit						
CT pin threshold voltage H	V _{CTTHH}	0.5	0.6	0.7	V	CT=0.5V→0.8V sweep
CT pin threshold voltage L	V _{CTTHL}	0.14	0.2	0.26	V	CT=0.3V→0V sweep
CT pin sink current	I _{CTSIN}	80	92	104	μA	CT=1.0V
CT pin output current ratio	H _{CT}	6.5	8	9.5	-	Sink current/source current
VSYS circuit section						
Discharge release voltage	V _{DIS}	1.40	1.51	1.62	V	
Starter→normal switching voltage	V _{STN}	1.65	1.75	1.85	V	VSYS=1.5V→2V sweep
Normal→starter switching voltage	V _{NST}	1.57	1.67	1.77	V	VSYS=2V→1.5V sweep
Starter→normal switching hysteresis voltage	V _{STNHIS}	40	80	120	mV	V _{STN} -V _{NST}
Reset section						
EI pin reset voltage threshold ratio	H _{RST}	80	85	90	%	Ratio of EI pin threshold ratio
Reset pin output voltage	V _{ORESE T}	-	-	0.5	V	I _{RESET} =-1mA
Reset pin leak current	I _{LKRESE T}	-	-	2	μA	V _{RESET} =2.5V
Regulator circuit section						
Regulator output voltage	V _{REG}	2.9	3.2	3.5	V	REGO=OPEN, DC IN=6V
REGB pin output voltage	V _{OREGB}	-	-	1.4	V	DC IN=6V, I _{REG} =10mA
REGB pin leak current	I _{LKREGB}	-	-	3	μA	REGO=3.5V, DC_IN=6V, REGB=6V
REGB pin limit current	I _{LMREGB}	10	15	20	mA	DC_IN=6V

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
DC_IN low-voltage mute ON voltage	V_{DC-INL} V	-	-	1.3	V	
DC_IN low-voltage mute OFF voltage	V_{DC-INO} F	1.9	-	-	V	

* This product is not designed for protection against radioactive rays.

Application circuit

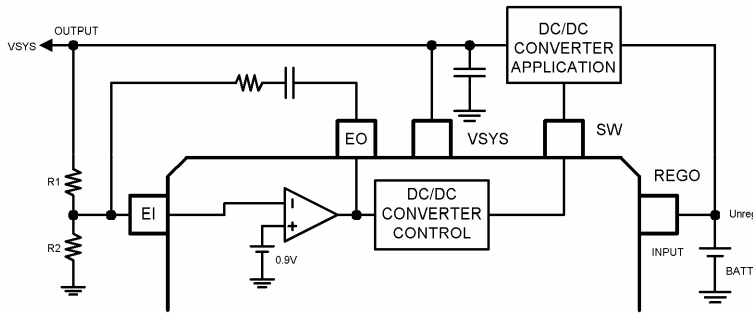


Application explanation

1. DC/DC converter

To set the output voltage, use the following R1 and R2.

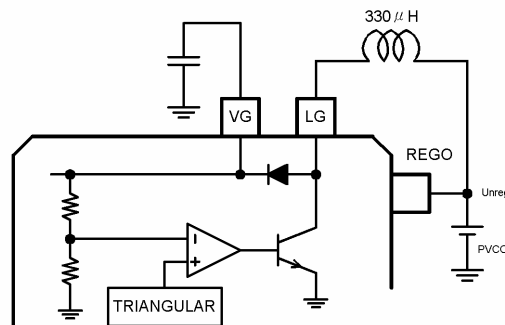
$$V_{SYS} = 0.9 \times \frac{R1 + R2}{R2}$$



2. Booster circuit for driving the Power-Mos

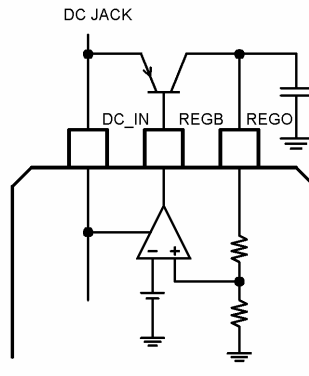
This circuit can generate a power source VG necessary for driving the built-in Power-Mos transistor. Oscillation frequency of LG terminal is independent and different from that of the main DC/DC converter.

When system start-up, this circuit activates at first.



3. Down voltage regulator circuit

The DC_IN is the power source of regulator circuit. If PNP transistor is externally attached, it allows the regulator circuit with the REGO set as the output voltage. Output voltage is 3.2V, this regulator output voltage depends on the built-in resistance. This circuit unable to control ON/OFF.



4. Soft start

The soft-start is functioned by putting a capacitor between SOFT terminal and GND.

5. Short circuit protection

If the voltage of SPRT terminal has reached 0.5V, switching of SW terminal is disabled. The main DC/DC converter can be turned off only through the activation of timer latch circuit. Accordingly be sure to attach the capacitor on the SPRT terminal.

- ⊙ While the error amp output of EO is being completely set at “H”, SPRT terminal can be charged.

The time until stopping the switching is determined by the following formula for the capacitor of SPRT terminal.

$$t = C_{SPRT} \times \frac{V_{TH}}{I_{SPRT}} \quad (\text{sec}) \quad (V_{TH}=0.5\text{V}, I_{SPRT}=5.8 \mu\text{A})$$

- ⊙ While the OFF terminal is being set at below VSYS-1.5V, SPRT terminal can be charged. The time until stopping the switching is determined by the following formula for the capacitor of SPRT terminal.

$$t = C_{SPRT} \times \frac{V_{TH}}{I_{SPRT}} \quad (\text{sec}) \quad (V_{TH}=0.5\text{V}, I_{SPRT}=11.5 \mu\text{A})$$

6. PWM driver

H-bridge driver using 4 pieces of N-channel Mos transistor on output stage. Polarity of output and PWM duty are changed in proportion to differential voltage and absolute value of input sandwiching Vref. Load is direct-PWM driven by square wave of this changing duty. This driver is voltage feedback type, so, voltage gain is invariable in spite of fluctuation of battery voltage.

7. Thermal shut down

When the chip temperature has been 150°C (Typ.), the output current is muted. And when the chip temperature has dropped to 130°C (Typ.), the driver circuit starts up.

Note in use

1. Between power supplies, attach a by-pass capacitor (approx. 0.1 μ F) at the root of this IC.
2. In principle, do not apply voltage below sub-potential of IC to terminal. Examine in consideration of operation margin, when each driver output falls below sub-voltage of IC (GND) due to counter-electromotive-force of choke coil, etc.
3. Output pin is to avoid short-circuiting with PVCC, GND, and other output pins. And, be fully careful in the direction of an integrated circuit on the substrate.
4. When use AC adapter, if apply beyond 7V to DC_IN pin, connect Z-Di with DC_IN pin. So keep voltage of DC_IN being below 7V. To protect IC, once the voltage to be applied on the DC_IN terminal exceeded 7.5V (Typ.), SPRT terminal can be charged.($I_{SPRT}=11.5 \mu$ A, see short circuit protection)

Package Outlines (units:mm): QFP-44

