AN6608, AN6609N, AN6609NS

DC Motor Forward/Reverse Dual Speed Electronic Governors

■ Overview

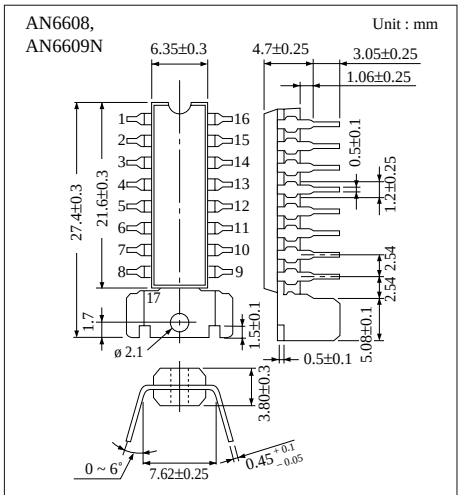
The AN6608, the AN6609N and the AN6609NS are the electronic governors which incorporate the forward /reverse rotation and double speed controls of the DC motors used for radio/cassette tape recorder, and the functions such as fast forward, rewind, brake, and pause. They are also available for controlling the video tape deck mechanisms such as the VCRs and DATs. The AN6608, the AN6609N and the AN6609NS are identical with each other except the operating logic by 3-bit input.

■ Features

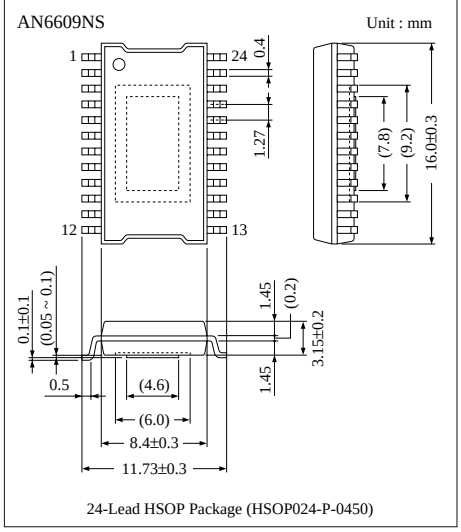
- Operating supply voltage range ; Vcc = 8V to 16V
- Stable reference voltage (1.27V) and easy speed adjustment
- Large starting torque and maximum control torque
- Built-in power transistor
- Forward/reverse constant speed and double speed controls, and fast forward, brake, and pause functions available by 3-bit input

■ Applications

VCRs, cassette decks, radio/cassette tape recorders, car cassette tape players, tape loading DC motor con trol such as DATs.



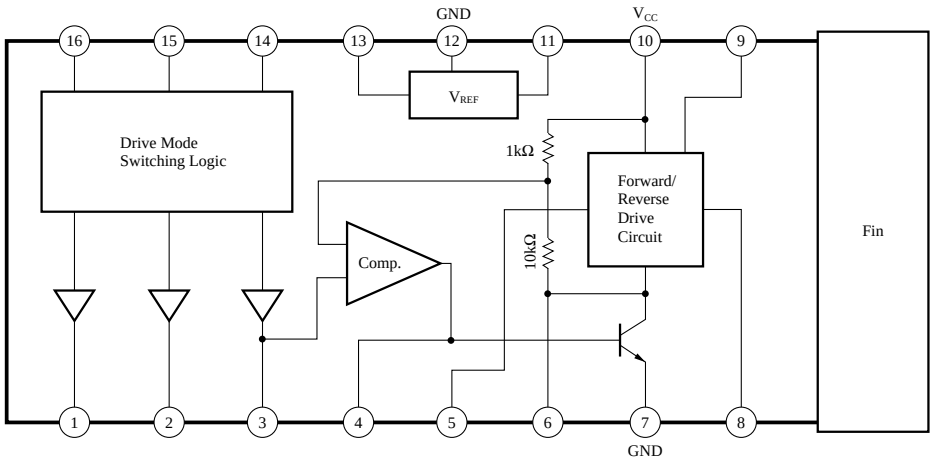
16-Lead DIP Package with Fin (HDIP016-P-300)



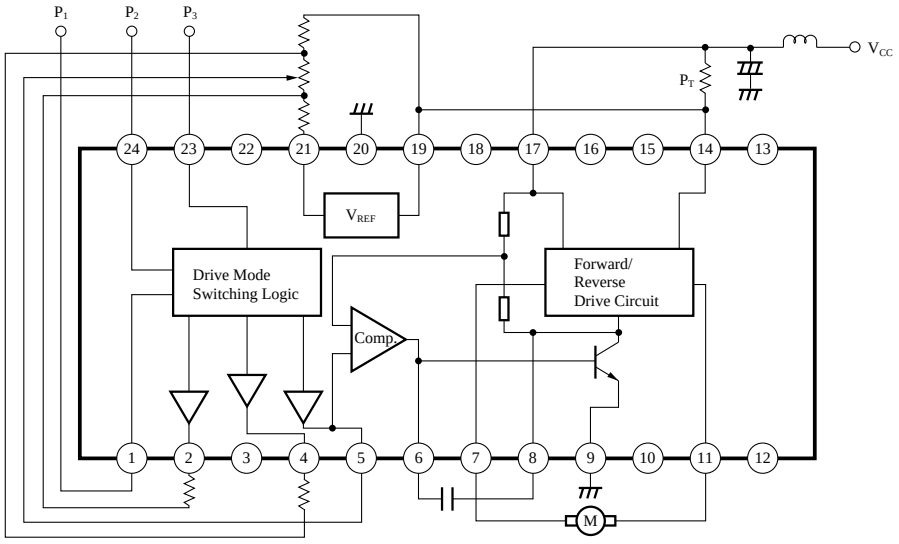
24-Lead HSOP Package (HSOP024-P-0450)

■ Block Diagram

AN6608, AN6609N



AN6609NS



Note) For motor lock, V_{CC} =13V or less, Motor coil resistance = 8Ω or more,
Lock time =1s or less.

■ Absolute Maximum Ratings (Ta= 25˚C)

Parameter	Symbol	Rating		Unit
Supply Voltage	V_{CC}	18		V
Supply Current	I_{CC}	1800 Note 1)		mA
Power Dissipation	P_D	AN6608, AN6609N	2 Note 2)	W
		AN6609NS	2.08 Note 3)	
Operating Ambient Temperature	T_{opr}	–20 ~ + 70		˚C
Storage Temperature	T_{stg}	–50 ~ +150		˚C

Note 1) t ≤ 200ms
Note 2) Mounting on PCB (20mm × 20mm of copperfoil is used for heat sink)
Note 3) Glass epoxy PCB (50mm × 50mm × 1.2mm)

■ Recommended Operating Range (Ta = 25˚C)

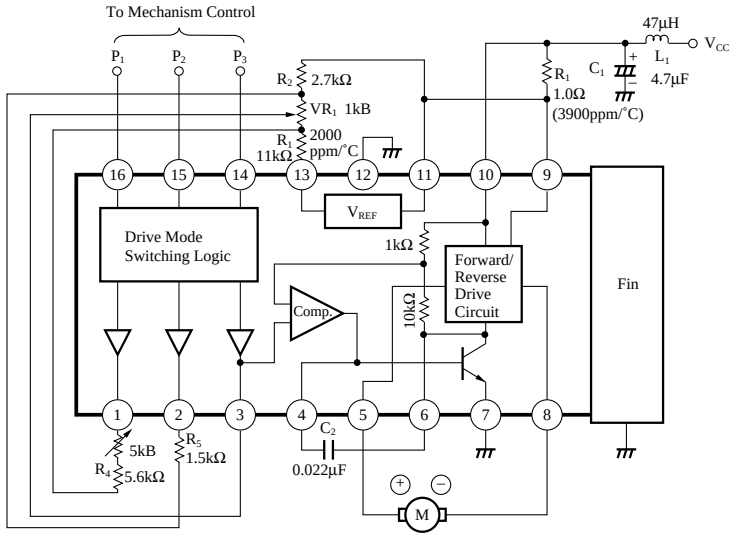
Parameter	Symbol	Range
Operating Supply Voltage Range	V_{CC}	8V ~ 16V

■ Electrical Characteristics (Ta = 25˚C)

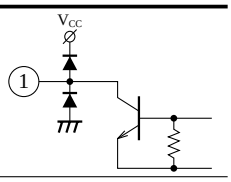
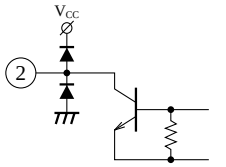
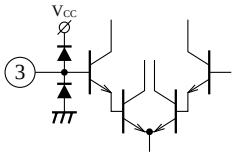
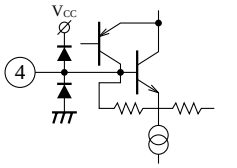
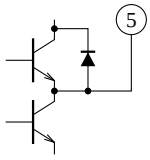
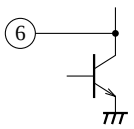
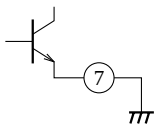
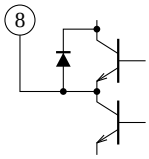
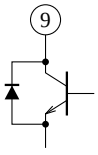
Parameter	Symbol	Condition	min.	typ.	max.	Unit
Bias Current at No Load	I_{bias}	V_{CC}=12V	—	7	15	mA
Reference Voltage	V_{ref}	V_{CC}=12V	1.15	1.27	1.4	V
Rated Load Start Voltage	$V_{CC\,(s)}$	Supply voltage with which a motor starts rotating	6.5	—	—	V
Rated r.p.m.	N_L	V_{CC}=12V, N=1600rpm	–8.75	—	8.75	%
r.p.m. Characteristics on Load Change	DN_L	V_{CC}=8V, I_L=55mA ~ 120mA	–100	—	100	rpm
r.p.m. Characteristics on Voltage Change	DN_V	V_{CC}=8V ~ 16V, N=1600rpm	–22	0	22	rpm
Double Speed Forward/Reverse r.p.m. Difference	DN_{Logi}	V_{CC}=12V, N=3200rpm	–3	0	3	%
Output Saturation Voltage 1	$V_{sat\,(1)}$	V_{CC}=8V, I_O=1A	—	—	2	V
Output Saturation Voltage 2	$V_{sat\,(2)}$	V_{CC}=8V, I_O=1A	—	—	1.5	V
r.p.m. Characteristics on Temperature Change	DN_A	V_{CC}=12V, Ta= –10˚C ~ + 60˚C	—	100	—	rpm/˚C
r.p.m. Drift Characteristics by Time	DN_T	V_{CC}=12V, t=15s ~ 10ms	—	0.4	—	%

■ Application Circuit

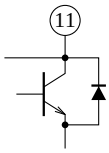
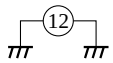
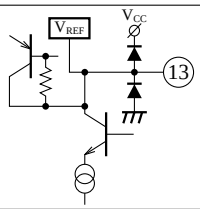
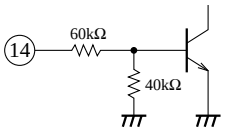
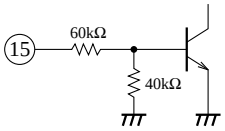
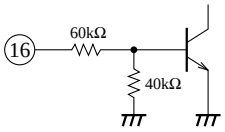
AN6608
AN6609N



■ Pin Descriptions

Pin No. AN6608 AN6609N	Pin No. AN6609NS	Pin Name	Typ. Waveform	Description	Input Impedance	Equivalent Circuit
1	2	Double Speed Setting	—	Pin to set the double speed r.p.m.	Tr_C	
2	4	FF, REW Speed Setting	—	Pin to set the FF/REW r.p.m.	Tr_C	
3	5	Speed Control	—	Speed control pin A fixed resistor will do if fine adjustment is unnecessary.	Tr_E	
4	6	Phase Adjustment	—	Phase adjustment pin for oscillation prevention	Tr_E	
5	7	Motor Connection ⊕		Pin to connect the motor ⊕ side	Tr_E Tr_C	
6	8	Phase Adjustment		Phase adjustment pin for oscillation prevention	Tr_C	
7	9	GND	—	GND pin for the power section inside the IC	Tr_E	
8	11	Motor Connection ⊖		Pin to connect the motor ⊖ side	Tr_E Tr_C	
9	14	Load Characteristics Setting		Pin to set the load characteristics (S–T curve) of the motor	Tr_C	

■ Pin Descriptions (Cont.)

Pin No. AN6608 AN6609N	Pin No. AN6609NS	Pin Name	Typ. waveform	Description	Input Impedance	Equivalent Circuit
10	17	V_{CC}	—	IC power pin	—	
11	19	Connect to Pin9 . Ref. Voltage ⊕ Output		Reference voltage⊕ output pin when connecting to the pin9.	Tr_C	
12	20	GND	—	GND pin for the IC bias section	—	
13	21	Ref. Voltage ⊖ Output		Reference voltage⊖ output pin	Tr_C	
14	23	Logic Input P_3	—	Logic input pin P_3 to set the motor control state	60kΩ	
15	24	Logic Input P_2	—	Logic input pin P_2 to set the motor control state	60kΩ	
16	1	Logic Input P_1	—	Logic input pin P_1 to set the motor control state	60kΩ	

■ Supplementary Explanation

• Operating Logic

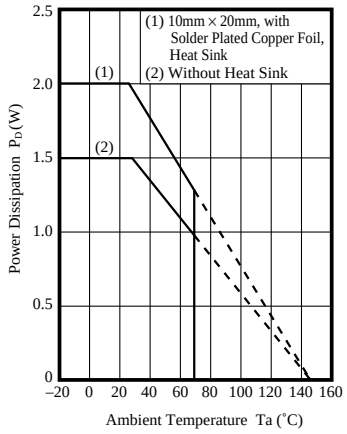
Input Pins			Output Pins (AN6608)					Output Pins (AN6609N)				
14	15	16	5	8	1	2	Operating Mode	5	8	1	2	Operating Mode
H	H	H	H	L	OFF	ON	FF	—	—	OFF	OFF	Pause
L	H	H	L	H	OFF	ON	REW	H	L	ON	OFF	Double speed
H	L	H	H	L	OFF	OFF	Constant speed	H	L	OFF	OFF	Constant speed
H	H	L	H	H	OFF	OFF	Brake	H	H	OFF	OFF	Brake
L	L	H	H	L	ON	OFF	Double speed	H	L	OFF	ON	FF
L	H	L	L	H	ON	OFF	Reverse double speed	L	H	ON	OFF	Reverse double speed
H	L	L	L	H	OFF	OFF	Reverse constant speed	L	H	OFF	OFF	Reverse constant speed
L	L	L	—	—	OFF	OFF	Pause	—	—	OFF	OFF	Pause

* Input level H : 3V or more, Input level L : 0.7V or less
For the AN6609NS, the above pin numbers must be replaced.

• Characteristics Curve

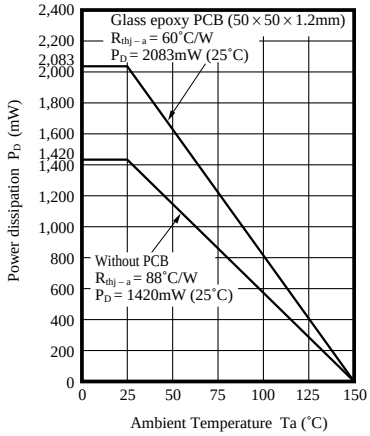
AN6608, AN6609N

P_D – Ta



AN6609NS

P_D – Ta



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