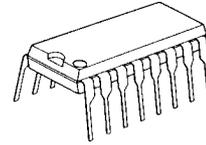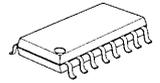# BRUSH LESS DC MOTOR PRE-DRIVER

■GENERAL DESRIPTION

The **NJM2624A** is a 3-phase brushless DC motor pre-driver which requires external power-transistors suited to drive current of the motor.

The Run Enable function is used as PWM control besides of ON/OFF switched function.
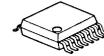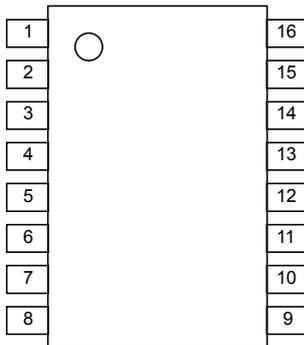
■PACKAGE OUTLINE

NJM2624AD   **NJM2624AM**

NJM2624AV

■FEATURES

- ●Operating Voltage $(V^+=4.5V$ to $18V)$
- ●Low Operating Current   (10mA max.)
- ●Run Enable
- ●Forward or Reverse Direction
- ●Output Switch Current   (90mA typ.)
- ●Bipolar Technology
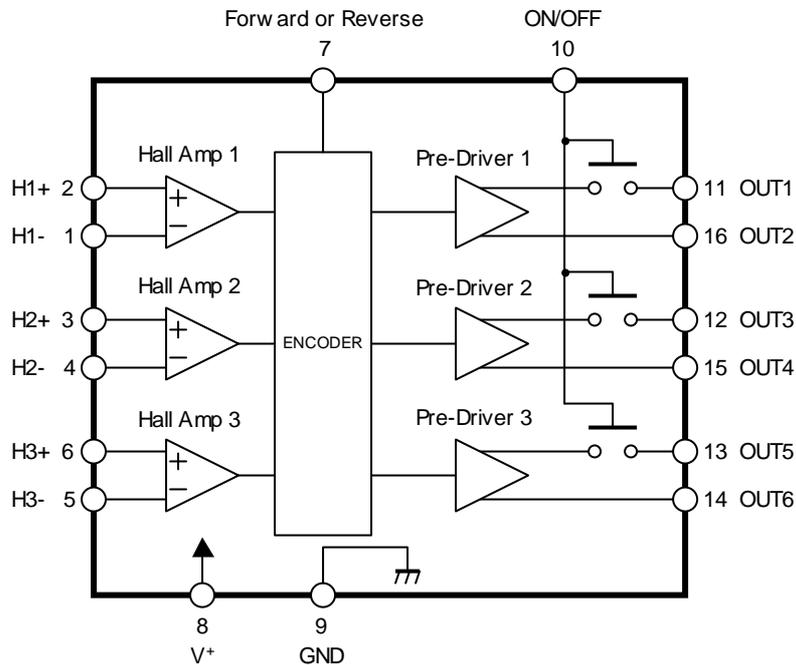- ●Package Outline   DIP16, DMP16, SSOP16

■PIN CONFIGURATION

PIN FUNCTION

1.H1-	9.GND
2.H1+	10.ON/OFF
3.H2+	11.OUT1
4.H2-	12.OUT3
5.H3-	13.OUT5
6.H3+	14.OUT6
7.FR	15.OUT4
8.V$^+$	16.OUT2

NJM2624A

■ BLOCK DIAGRAM

■ ABSOLUTE MAXIMUM RATINGS   (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Supply Voltage	V^+	20	V
Output Current	Io	100	mA
Power Dissipation	P_D	(DIP16) 700 (DMP16) 350 (SSOP16) 300	mW
Operating Temperature Range	Topr	-25 to +85	°C
Storage Temperature Range	Tstg	-40 to +150	°C

■ RECOMMENDED OPERATING CONDITIONS   (Ta=25°C)

PARAMETER	SYMBOL	MIN.	TYP.	MAX.	UNIT
Input Common Mode Voltage Range (*1)	V_{ICM}	1.5	-	V^+ - 1.5	V

(*1) The input voltage should set within V_{ICM} range in consideration of the peak magnitude.
   When the input voltage exceeds V_{ICM} range, unusual operation may be caused.

■ELECTRICAL CHARACTERISTICS   (V^+=12V, Ta=25°C)

Total Device

PARAMETER	SYMBOL	TEST CONDTIONS	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V^+		4.5	–	18	V
Supply Current	I_{CC}	RL=∞ ON/OFF Terminal=OPEN	–	3.7	10	mA

Hall Sensor Section

PARAMETER	SYMBOL	TEST CONDTIONS	MIN.	TYP.	MAX.	UNIT
Input Offset Voltage	V_{IO}	RL=470Ω	-4.2	–	4.2	mV
Input Common mode Voltage range	V_{ICM}	RL=470Ω	1.5	–	10.5	V
Input Bias Current	I_B		–	–	600	nA

Output Section

PARAMETER	SYMBOL	TEST CONDTIONS	MIN.	TYP.	MAX.	UNIT
Output Voltage 1	V_{OUT1}	RL=470Ω, V^+=12V	8.9	9.5	–	V
Output Voltage 2	V_{OUT2}	RL=470Ω, V^+=5V	–	3.5	–	V
Maximum Output Current 1	I_{OUT1}	RL=100Ω, V^+=12V	50	90	–	mA
Maximum Output Current 2	I_{OUT2}	RL=100Ω, V^+=5V	–	30	–	mA
Output Leak Current	I_{LEAK}		–	–	5	µA

Run Enable Section

PARAMETER	SYMBOL	TEST CONDTIONS	MIN.	TYP.	MAX.	UNIT
Run Enable Voltage	V_{ON}	RL=470Ω	$1/2V^++0.5$	–	–	V
Run Disable Voltage	V_{OFF}	RL=470Ω	–	–	$1/2V^+-0.5$	V
Output Voltage Undefined Area	$V_{O-undef}$	RL=470Ω	$1/2V^+-0.5$	$1/2V^+$	$1/2V^++0.5$	V
Source Current 1	I_{ON1}	ON/OFF Terminal=GND	–	250	400	µA

Forward or Reverse Direction Section

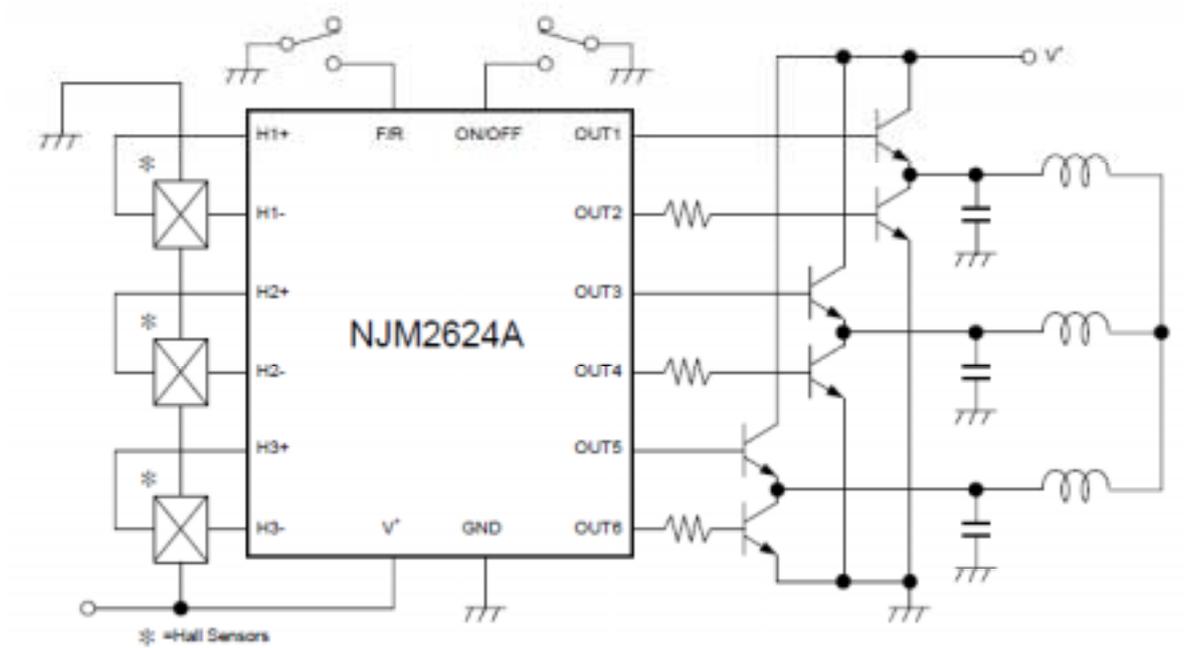| PARAMETER	SYMBOL	TEST CONDTIONS	MIN.	TYP.	MAX.	UNIT
Forward Direction	V_F	RL=470Ω	$1/2V^++0.5$	–	–	V
Reverse Direction	V_R	RL=470Ω	–	–	$1/2V^+-0.5$	V
F/R Logic Undefined Area	$V_{SW-undef}$	RL=470Ω	$1/2V^+-0.5$	$1/2V^+$	$1/2V^++0.5$	V
Source Current 2	I_{ON2}	Forward or Reverse Terminal=GND	–	250	400	µA

NJM2624A

■TERMINAL DESCRIPTION

Pin No,	SYMBOL	FUNCTION	INSIDE EQUIVALENT CIRCUIT
2	H1+	Sensor Input 1 Non-Inverting Terminal	
3	H2+	Sensor Input 2 Non-Inverting Terminal	
6	H3+	Sensor Input 3 Non-Inverting Terminal	
1	H1-	Sensor Input 1 Inverting Terminal	
4	H2-	Sensor Input 2 Inverting Terminal	
5	H3-	Sensor Input 3 Inverting Terminal	
7	F/R	Forward or Reverse Direction Terminal	

NJM2624A

■TERMINAL DESCRIPTION

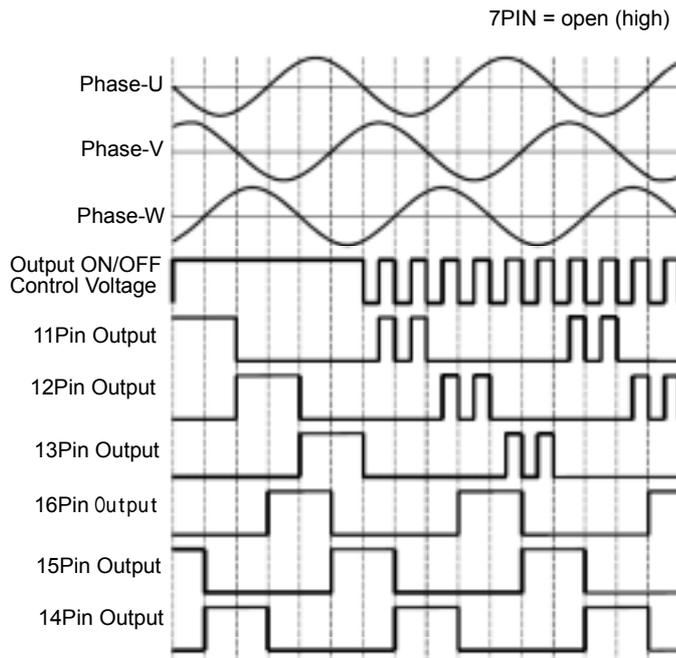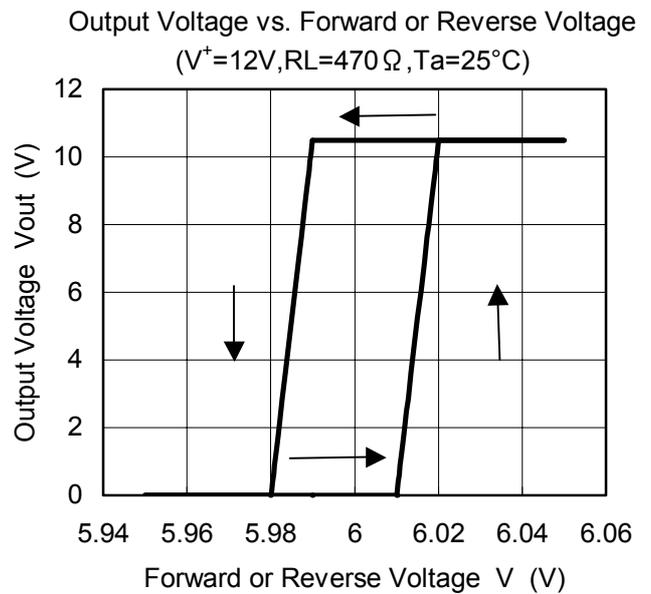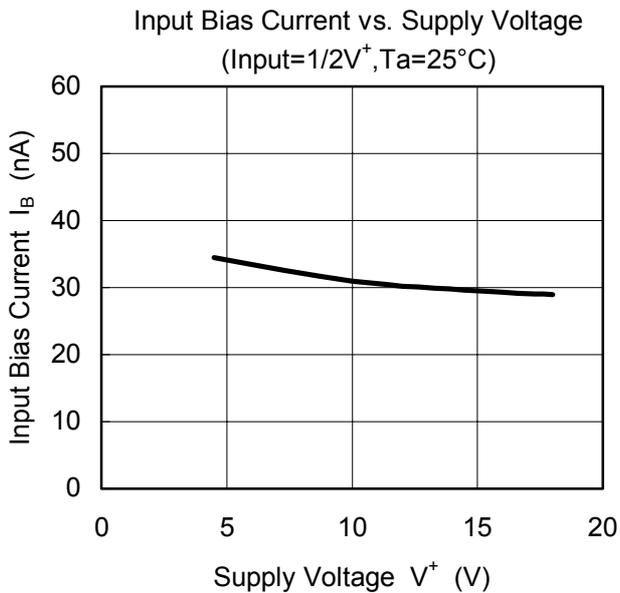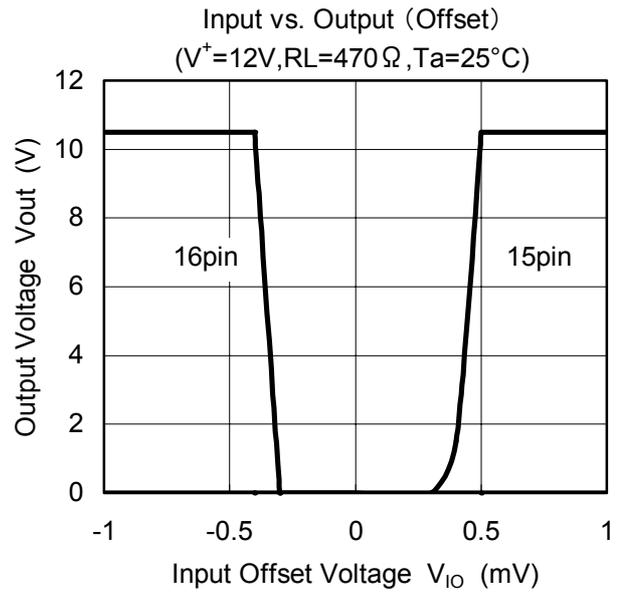| Pin No,	SYMBOL	FUNCTION	INSIDE EQUIVALENT CIRCUIT
8	V+	Power Supply	–
9	GND	Ground	–
10	ON/OFF	Output Run Enable Terminal	
11 16 12 15 13 14	OUT1 OUT2 OUT3 OUT4 OUT5 OUT6	Internal Switching Transistor Emitter Follower	

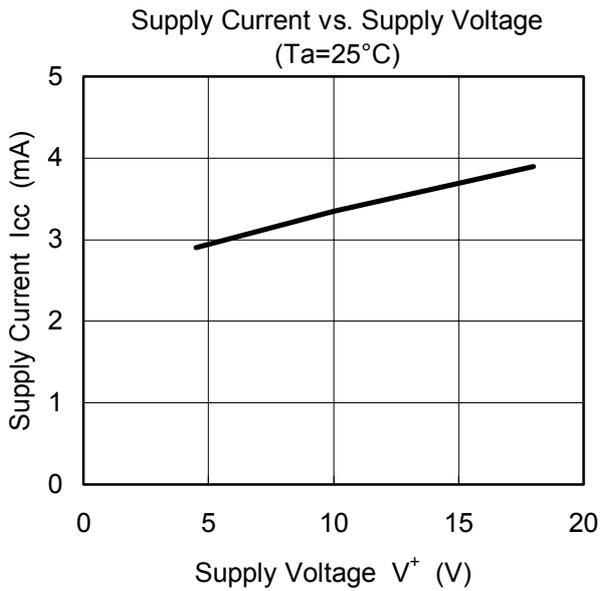*New Japan Radio Co.,Ltd.*

NJM2624A

■ TYPICAL APPLICATION

· A rotation direction change must be made after motor stopped completely.

· When PWM duty is extremely small, two or more switching elements can not be driven entirely. In such case, switching elements will generate excess heat and it may cause destruction of the switching devices. Therefore, extensive heat evaluation is necessary for switching device selection particularly in consideration of the area of safety operation (ASO).

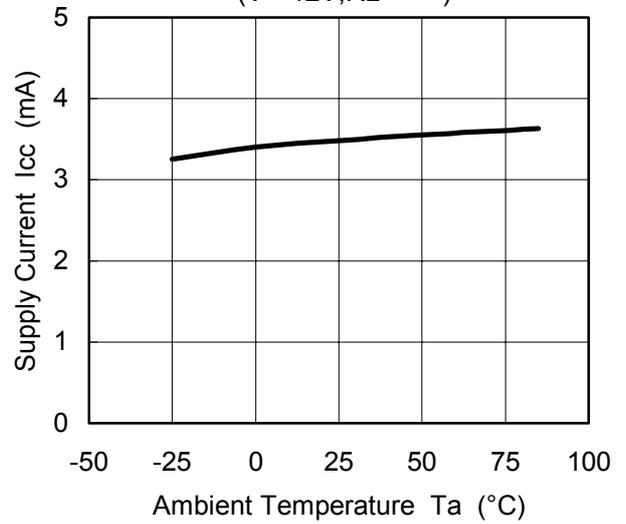■ TIMING CHART

■TYPICAL CHARACTERISTICS

Supply Current vs. Supply Voltage
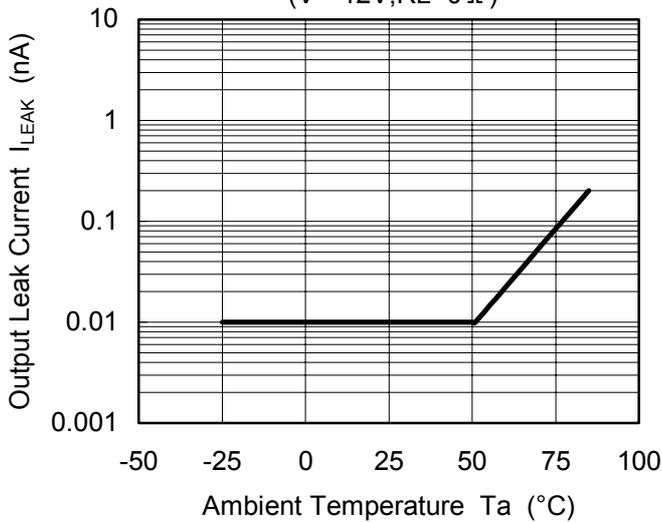(Ta=25°C)

Supply Current Icc (mA) vs. Supply Voltage V⁺ (V)

Input vs. Output（Offset）
(V⁺=12V,RL=470Ω,Ta=25°C)

Output Voltage Vout (V) vs. Input Offset Voltage V_{IO} (mV)

16pin   15pin

Input Bias Current vs. Supply Voltage
(Input=1/2V⁺,Ta=25°C)

Input Bias Current I_B (nA) vs. Supply Voltage V⁺ (V)

Output Voltage vs. Forward or Reverse Voltage
(V⁺=12V,RL=470Ω,Ta=25°C)

Output Voltage Vout (V) vs. Forward or Reverse Voltage V (V)

Output Voltage vs. Output ON/OFF Voltage
(V⁺=12V,RL=470Ω,Ta=25°C)

Output Voltage Vout (V) vs. Output ON/OFF Voltage (V)

NJM2624A

■TYPICAL CHARACTERISTICS

Maximum Output Current vs.Temperature
(V^+=12V,RL=100Ω)

Maximum Output Current Iout (mA) vs. Ambient Temperature Ta (°C)
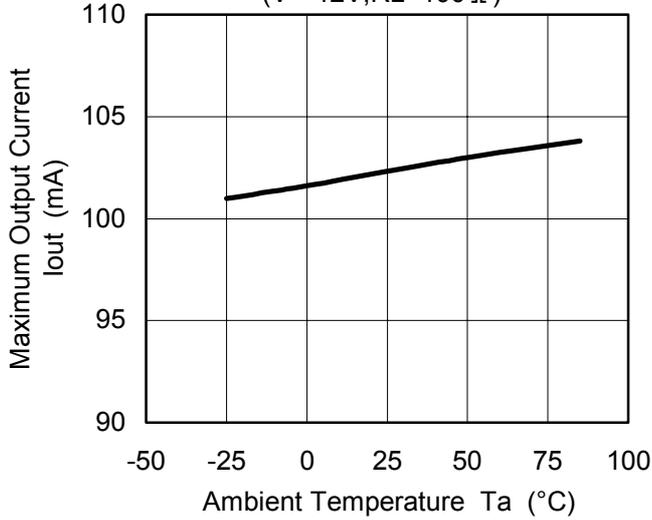
Supply Current vs.Temperature
(V^+=12V,RL=∞)

Supply Current Icc (mA) vs. Ambient Temperature Ta (°C)

Output Leak Current vs.Temperature
(V^+=12V,RL=0Ω)

Output Leak Current I_{LEAK} (nA) vs. Ambient Temperature Ta (°C)

Input Bias Current vs.Temperature
(V^+=12V,Input=1/2V^+)

Input Bias Current I_B (nA) vs. Ambient Temperature Ta (°C)

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