

## Single-Phase DC Brushless Motor Pre-driver IC

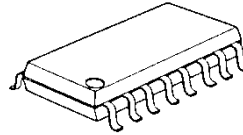
### ■ GENERAL DESCRIPTION

The NJM2660A is a Single-phase DC brushless motor pre-driver IC. It incorporates Lock Detect / Auto Protection Circuit and totem-pole pre - drivers for external power MOS-FET.

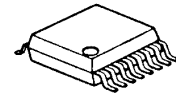
The turn ON / turn OFF ratio at Auto Protection Release was set in 1:10 easy-to-use.

Two comparators are built into NJM2660A for the temperature adjustable speed control or over current detection.

### ■ PACKAGE OUTLINE



NJM2660AM

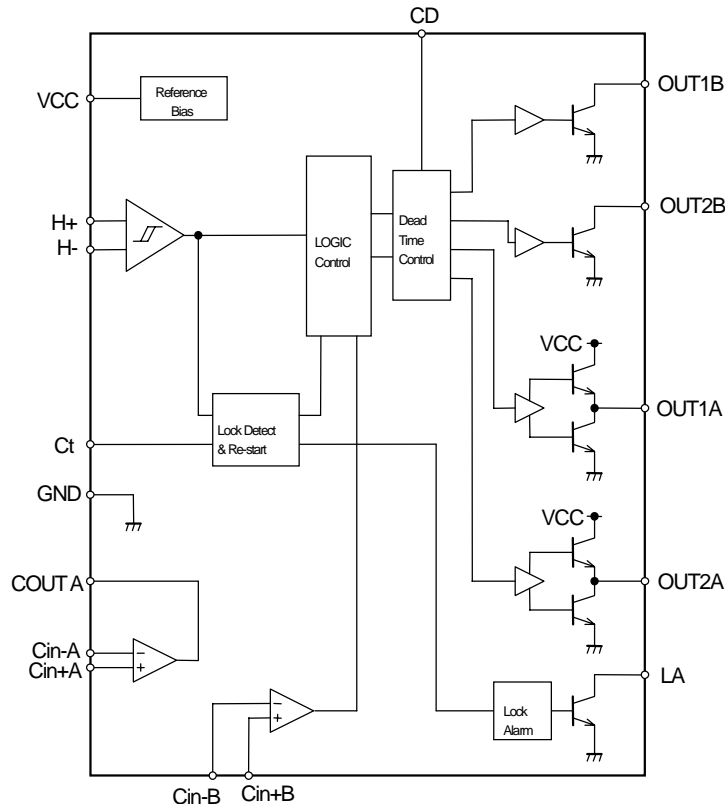


NJM2660AV

### ■ FEATURES

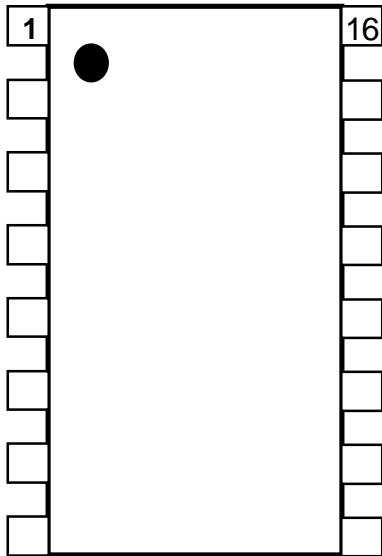
- Operating Voltage 4.5 to 30V
- Absolute Maximum Voltage 36V
- Totem-pole Output (Lower Arm)
- Internal Lock Detect /Auto Protection Release Circuit
- Lock Alarm Output Terminal
- Internal comparator 2 circuit
- Package Outline DMP16 SSOP16

### ■ PIN CONFIGURATION



# NJM2660A

## ■ BLOCK DIAGRAM



- |           |           |
|-----------|-----------|
| 1: Vcc    | 9: GND    |
| 2: H1     | 10: Ct    |
| 3: H2     | 11: Cin-B |
| 4: LA     | 12: Cin+B |
| 5: COUT A | 13: OUT2B |
| 6: Cin+A  | 14: OUT1B |
| 7: Cin-A  | 15: OUT2A |
| 8: CD     | 16: OUT1A |

## ■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT	NOTE
Supply Voltage	Vcc	36	V	-
Hall Input Voltage Range	VHcmr	-0.3 ~ Vcc	V	-
Hall Input Differential Voltage	VHdff	2	V	-
A ch Output Current	IoMA	50	mA	-
B ch Output Current	IoMB	50	mA	-
Lock Alarm Output Voltage	VLA	36	V	-
Lock Alarm Output Current	IoLA	20	mA	-
Comparator Input Voltage Range	VCcmr	-0.3 ~ Vcc	V	-
Comparator Output Voltage	VoC	36	V	-
Comparator Output Current	IoC	20	mA	-
Power Dissipation	Pd	435(DMP)	mW	Device it self
		375(SSOP)	mW	
Operating Temperature Range	Topr	-40 ~ 85	°C	-
Operating Junction Temperature Range	Tj	-40 ~ 150	°C	-
Storage Temperature Range	Tstg	-55 ~ 150	°C	-

## ■ RECOMMENDED OPERATING CONDITIONS

(Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT	NOTE
Supply Voltage	Vcc	4.5 ~ 30	V	Ct=0
Hall Input Voltage Range	Vhi	0 ~ Vcc-2	V	-
Comparator Input Voltage Range	Vci	0 ~ Vcc-2	V	-
Junction Temperature	Tj	-20 ~ 125	°C	-

## ■ ELECTRICAL CHARACTERISTICS

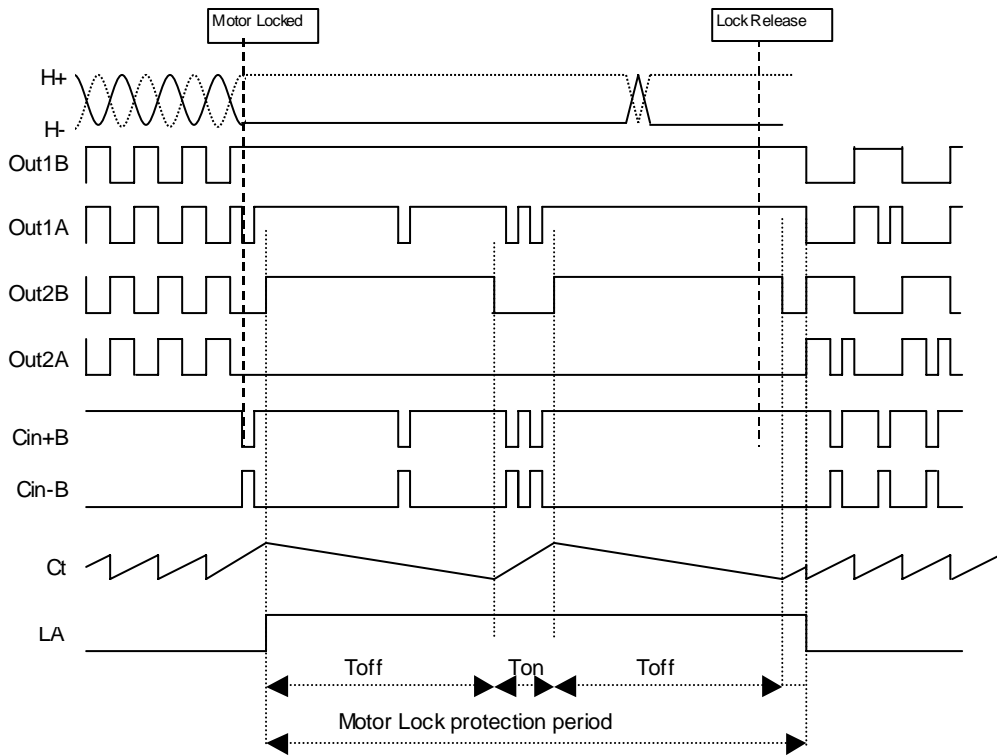
(Ta=25°C, Vcc=12V)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP.	MAX.	UNIT
<b>■ Total</b>						
Operating Current	I <sub>cc</sub>	V <sub>cc</sub> =12V	-	8	12	mA
		V <sub>cc</sub> =24V	-	10	15	mA
<b>■ Input / Output</b>						
Hall Input Hysteresis Voltage	V <sub>hys</sub>	-	-	20	-	mV
Hall Input Bias Voltage	I <sub>hbias</sub>	-	-	0.5	-	μA
A Upper Output Voltage	V <sub>OHA</sub>	I <sub>o</sub> =-20mA	V <sub>cc</sub> -2	V <sub>cc</sub> -1.7	-	V
A Lower Output Voltage	V <sub>OLA</sub>	I <sub>o</sub> =10mA	-	0.3	0.7	V
		I <sub>o</sub> =50mA	-	1.8	2.2	V
B Output Voltage	V <sub>OLB</sub>	I <sub>o</sub> =20mA	-	0.3	0.7	V
Ach Output Crump Voltage	V <sub>CLMP</sub>	V <sub>cc</sub> =30V	-	16	20	V
Bch Output Leak Voltage	I <sub>oleak</sub>	V <sub>o</sub> =30V	-	1	3	μA
Dead Time	T <sub>d</sub>	C <sub>d</sub> =10nF	-	350	-	μs
<b>■ Lock Detection</b>						
Lock Protect Operation Voltage	V <sub>LOP</sub>		5.0	-	-	V
Lock Alarm Output Voltage	V <sub>lock</sub>	Lock Alarm ON, I <sub>LA</sub> =5mA	-	-	0.5	V
Lock Alarm Leak Current	I <sub>LAleak</sub>	V <sub>LA</sub> =30V	-	1	3	μA
Charge Current	I <sub>c</sub>	V <sub>CT</sub> =1.5V	-	4.0	5.5	μA
Discharge Current	I <sub>dc</sub>	V <sub>CT</sub> =1.5V	-	0.4	0.6	μA
Charge / Discharge Current Ratio	I <sub>c</sub> /I <sub>dc</sub>	-	-	10	-	
H Level Cense Voltage	V <sub>ch</sub>	-	3.0	3.3	3.6	V
Reversal Voltage	V <sub>cl</sub>	-	0.70	0.85	1.00	V
Auto Protection Release ON Time	T <sub>on</sub>	C <sub>t</sub> =0.47μF	-	0.25	-	s
Auto Protection Release OFF Time	T <sub>off</sub>	C <sub>t</sub> =0.47μF	-	2.5	-	s
<b>■ Comparator Ach</b>						
Input Offset Voltage	V <sub>ioA</sub>	-	-	2	7	mV
Input Bias Current	I <sub>ibA</sub>	-	-	30	200	nA
Input Common Mode Voltage Range	V <sub>icmA</sub>	-	0 ~ 10	-	-	V
Output Sink Current	I <sub>sink</sub>	V <sub>o</sub> =1.5V	6	10	-	V
Output Saturation Voltage	V <sub>sat</sub>	I <sub>sink</sub> =3mA	-	80	300	mV
Output Leak Current	I <sub>CLEAK</sub>	V <sub>o</sub> =30V	-	1	3	uA
<b>■ Comparator Bch</b>						
Input Offset Voltage	V <sub>ioB</sub>	-	-	2	-	mV
Input Bias Current	I <sub>ibB</sub>	-	-	30	-	nA

A charge and discharge current ratio is set in general to a minimum of 7 and a maximum of 14.

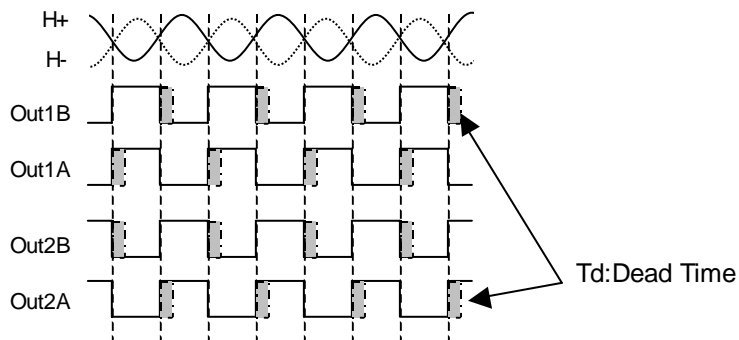
# NJM2660A

## TIME CHART



$$T_{on} = C_t \times \frac{V_{ch} - V_{cl}}{I_c} [S] \quad T_{off} = C_t \times \frac{V_{ch} - V_{cl}}{I_{dc}} [S]$$

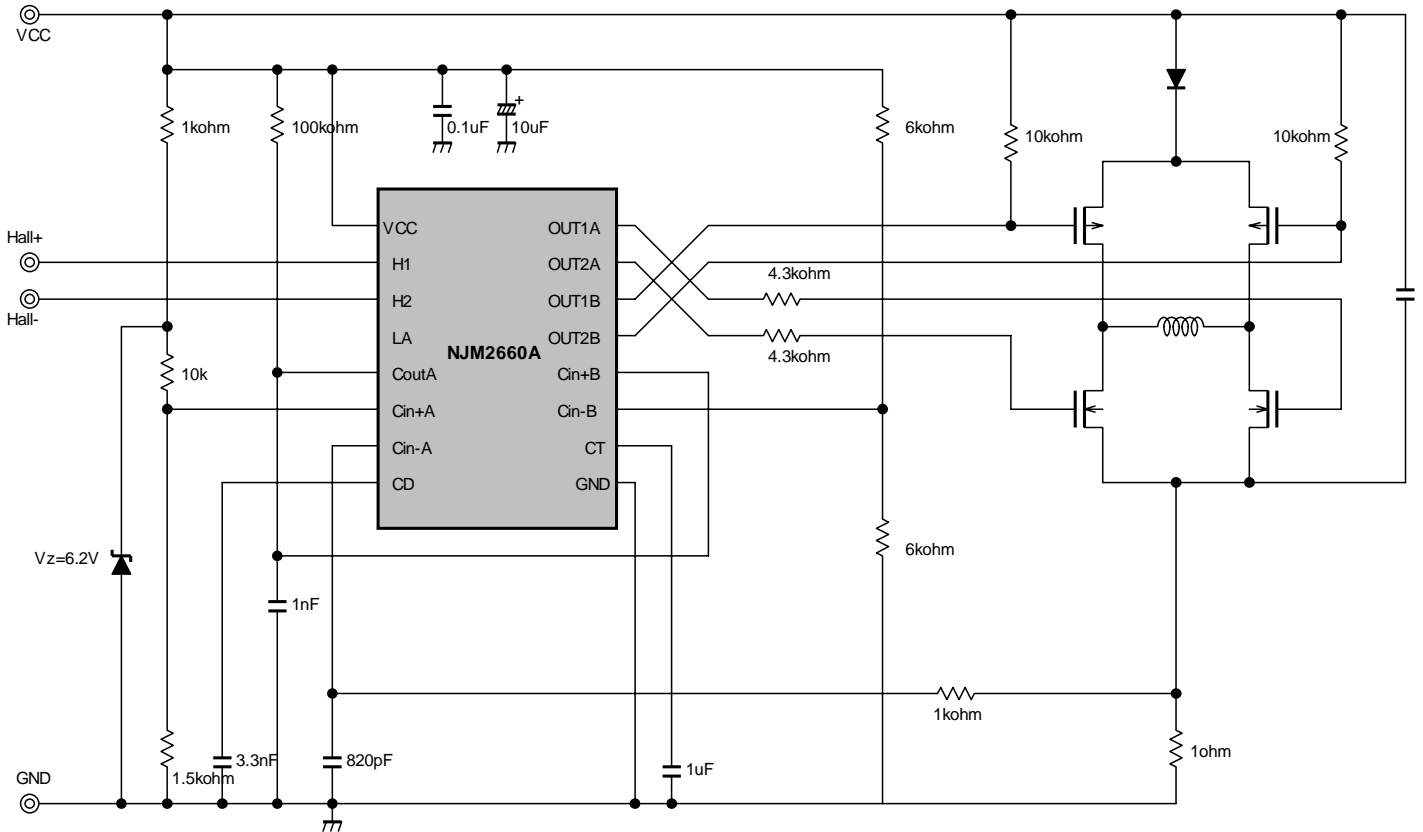
## DEAD TIME



$$T_d = 35.4 \times 10^3 \times C_d [S]$$

## ■ TYPICAL APPLICATIONS 1

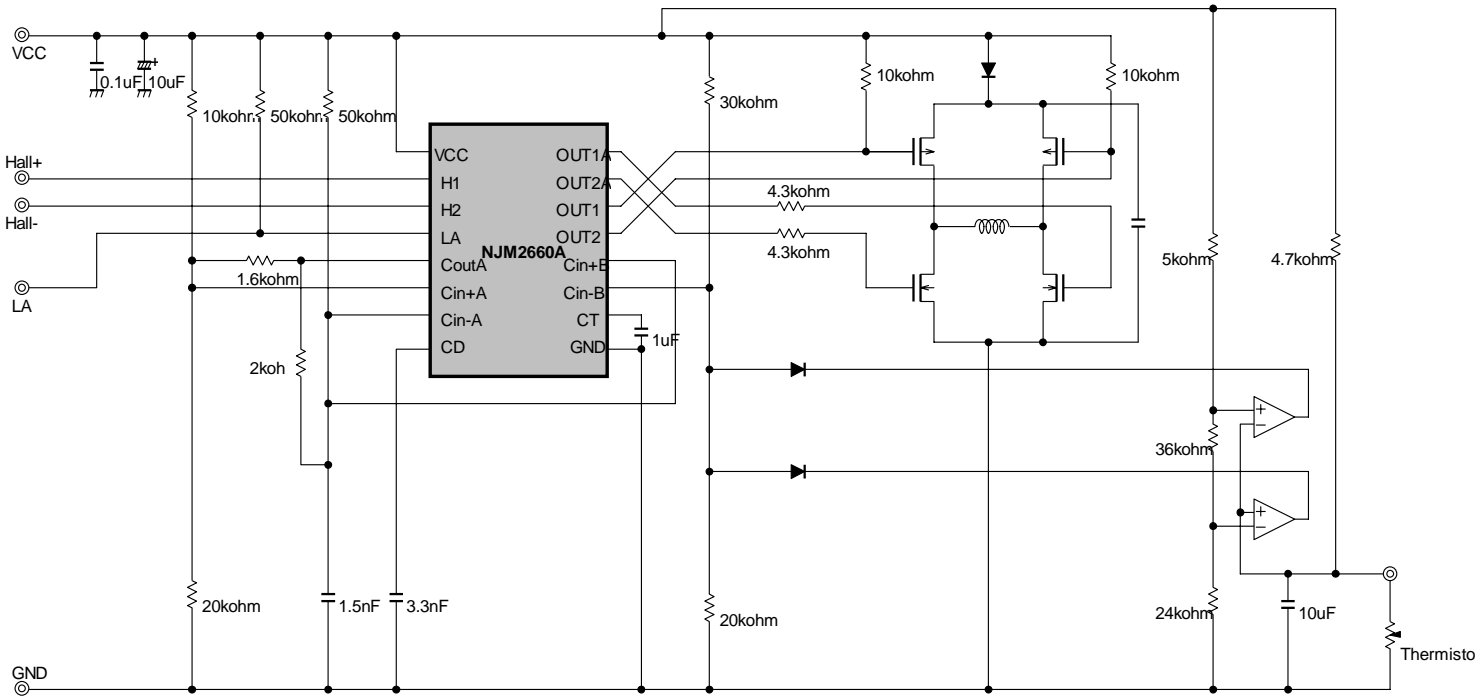
- Over Current Protection Application Circuit



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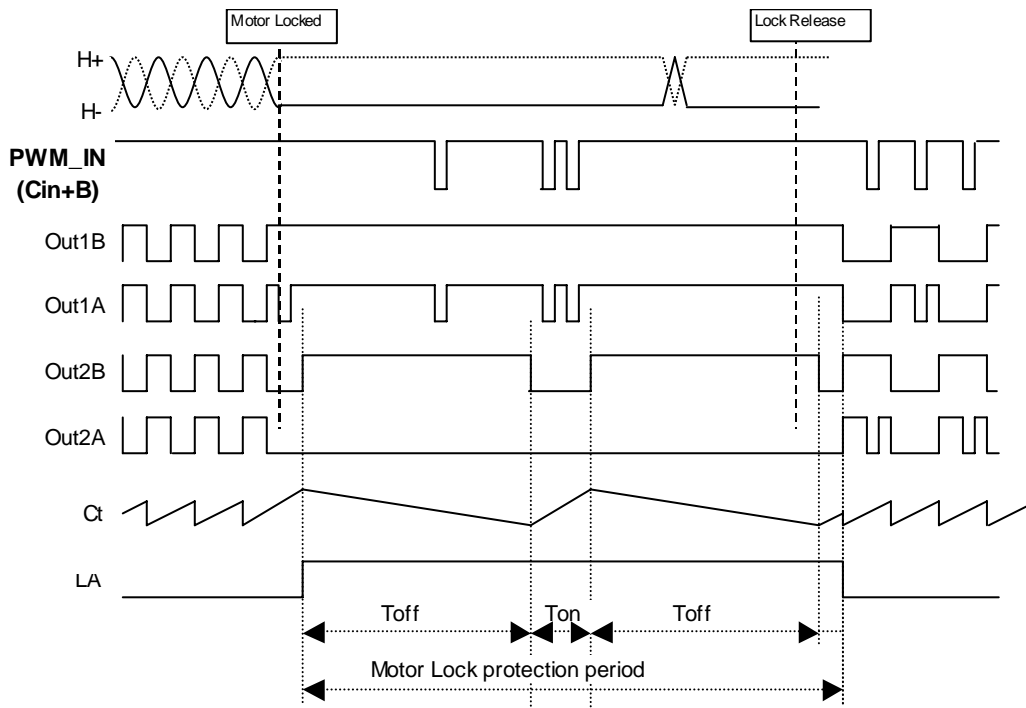
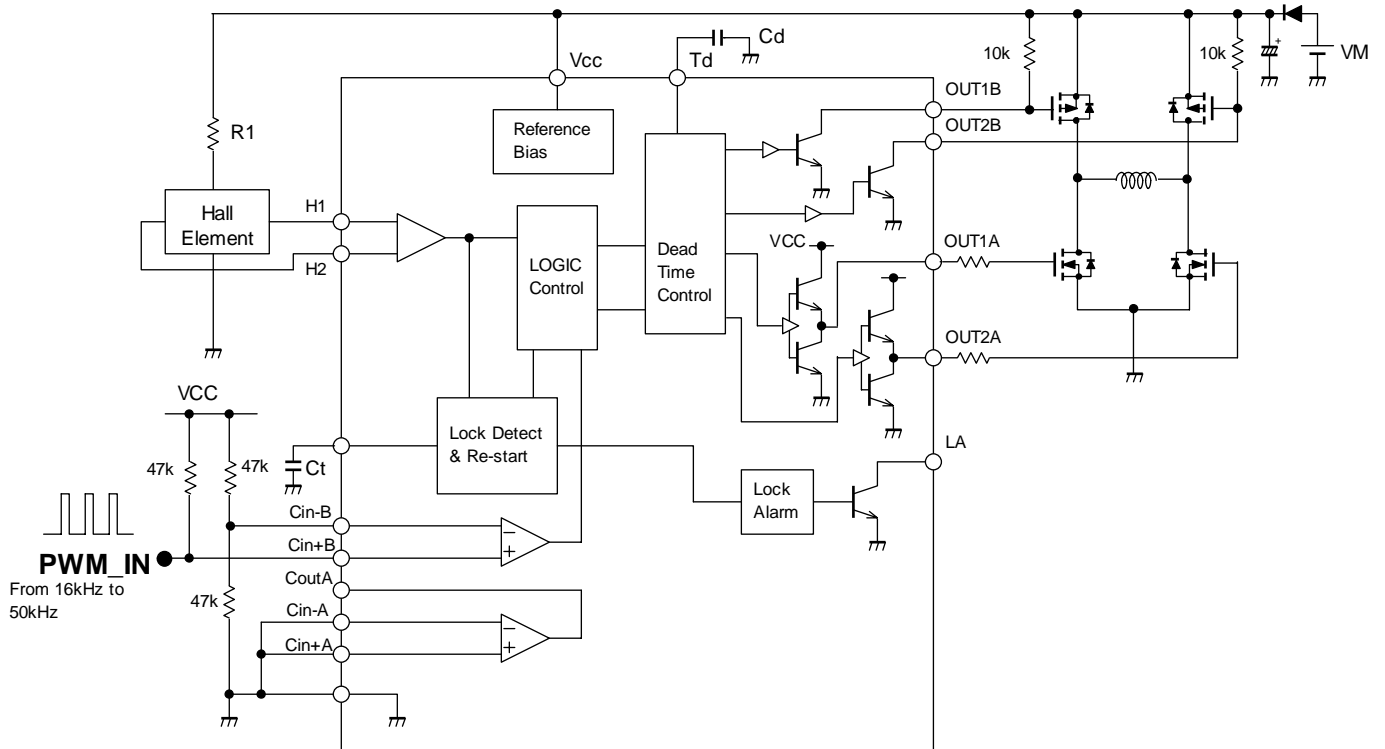
## TYPICAL APPLICATIONS 2

- Temperature Speed Control Application Circuit



## ■ TYPICAL APPLICATIONS 3

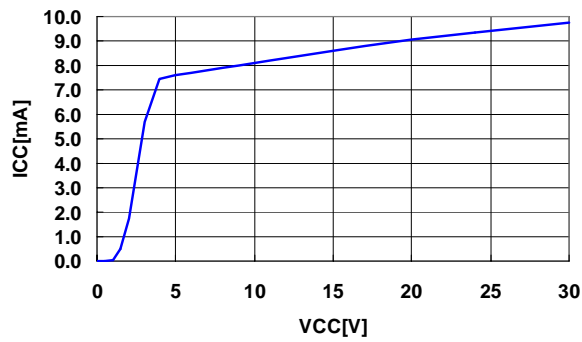
- Direct PWM Speed Control Application Circuit



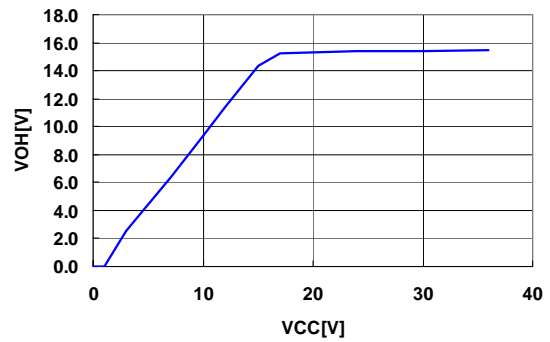
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## TYPICAL CHARACTERISTICS

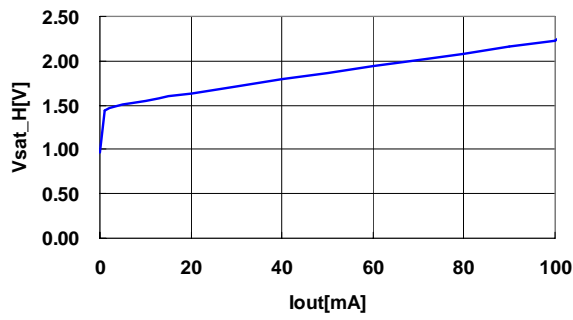
VCC vs ICC



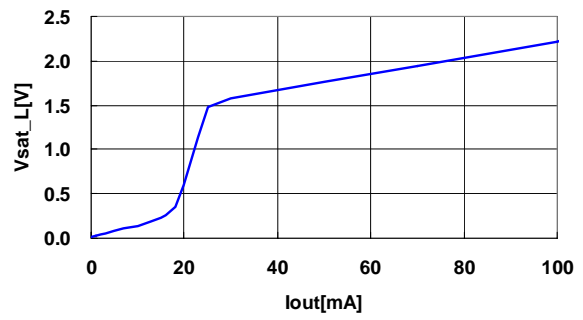
VCC vs VOH



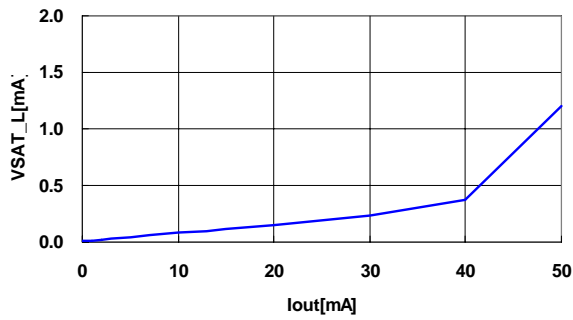
Iout vs Vsat\_H(Ach)  
VCC=12V



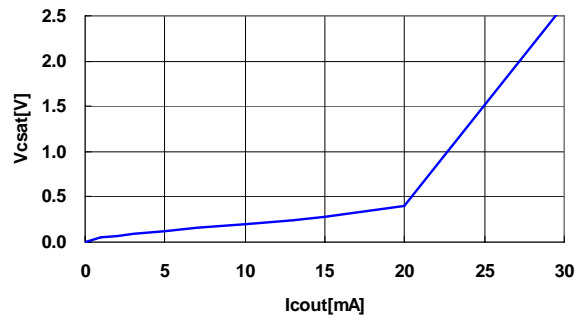
Iout vs Vsat\_L(Ach)  
VCC=12V



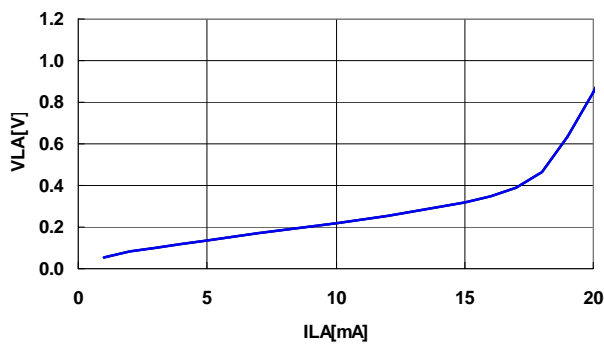
Iout vs Vsat\_L(Bch)  
VCC=12V



Icout vs Vcsat(Ach)  
VCC=12V



ILA vs VLA  
VCC=12V



**[CAUTION]**

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