

## DUAL H BRIDGE DRIVER

### ■ GENERAL DESCRIPTION

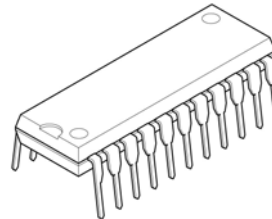
The NJM2670 is a general-purpose 60V dual H-bridge drive IC. It consists of a pair of H-bridges, a thermal shut down circuit and its alarm output. The alarm output can detect application problems and the system reliability will be significantly improved if monitored by Micro Processor.

Therefore, it is suitable for two-phase stepper motor application driven by microprocessor.

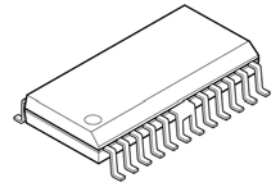
### ■ FEATURES

- Wide Voltage Range 4V to 60V
- Wide Range of Current Control 5 to 1500mA
- Thermal overload Protection
- Dead Band Protector
- Package Outline DIP22, SOP24-E3 (Batwing)

### ■ PACKAGE OUTLINE

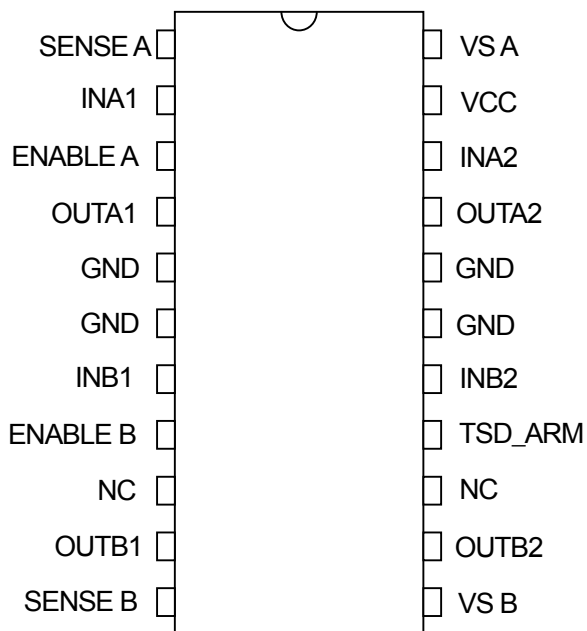


**NJM2670D2**  
( DIP22 )

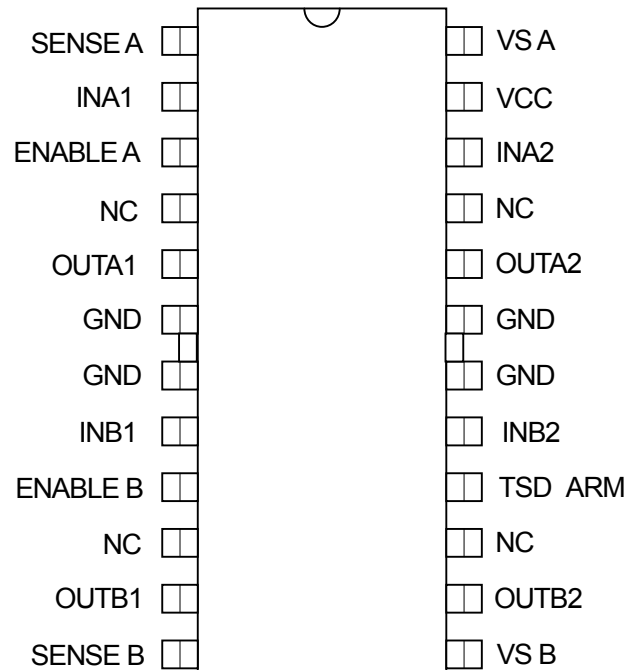


**NJM2670E3**  
( SOP24-E3 Batwing )

### ■ PIN CONNECTION



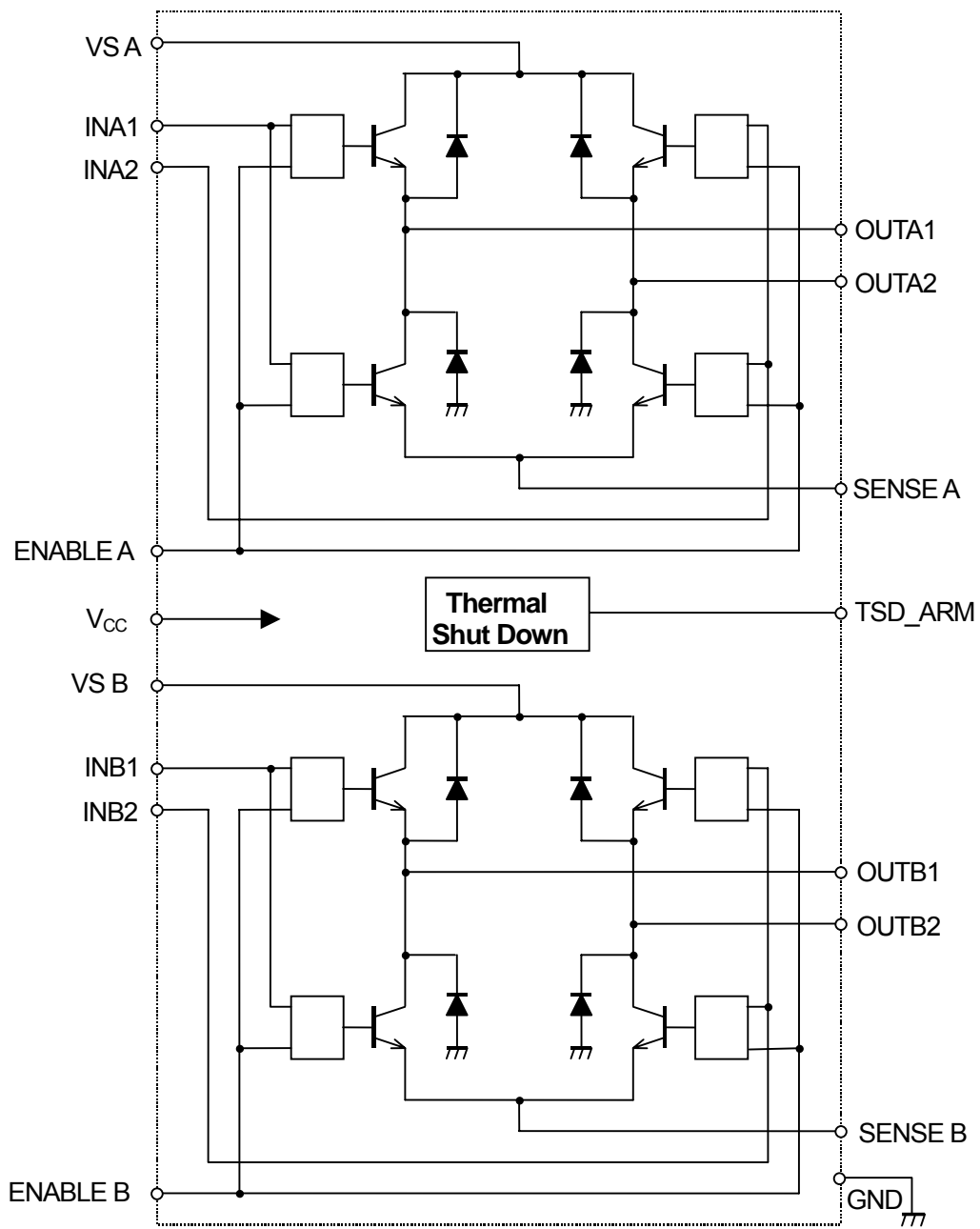
**DIP-22**



**SOP24-E3**

# NJM2670

## ■ BLOCK DIAGRAM



## ■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

PARAMETER	SYMBOL	RATINGS	UNIT
Maximum Supply Voltage	V <sub>MM</sub>	60	V
Logic Supply Voltage	V <sub>CC</sub>	7	V
Input Voltage Range	V <sub>IN</sub>	-0.3 to 7	V
Output Current	I <sub>OUT</sub>	1.5	A
Power dissipation at T <sub>GND</sub> =+25°C,DIP and SOP package	P <sub>D25</sub>	5	W
Power dissipation at T <sub>GND</sub> =+125°C,DIP package	P <sub>D125</sub>	2.2	W
Power dissipation at T <sub>GND</sub> =+125°C,SOP package	P <sub>D125</sub>	2	W
Operating Junction Temperature	T <sub>opr</sub>	-40 ~ 85	°C
Storage Temperature	T <sub>stg</sub>	-55 ~ 150	°C

## ■ RECOMENDDO OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply Voltage	V <sub>MM</sub>		4	-	55	V
Logic Voltage Range	V <sub>CC</sub>		4.75	5.00	5.25	V
Maximum Output Current	I <sub>OUT</sub>		-	-	1.3	A
Operating junction temperature	T <sub>j</sub>		-20	-	125	°C

## ■ THERMAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Thermal resistance	R <sub>thj-GND</sub>	DIP22 package.	-	11	-	°C/W
	R <sub>thj-A</sub>	DIP22 package. Note	-	40	-	°C/W
	R <sub>thj-GND</sub>	SOP24 package.	-	13	-	°C/W
	R <sub>thj-A</sub>	SOP24 package. Note	-	42	-	°C/W

Note : All ground pins soldered onto a 20 cm<sup>2</sup> PCB copper area with free air convection, T<sub>A</sub>=+25°C

# NJM2670

## ■ ELECTRICAL CHARACTERISTICS

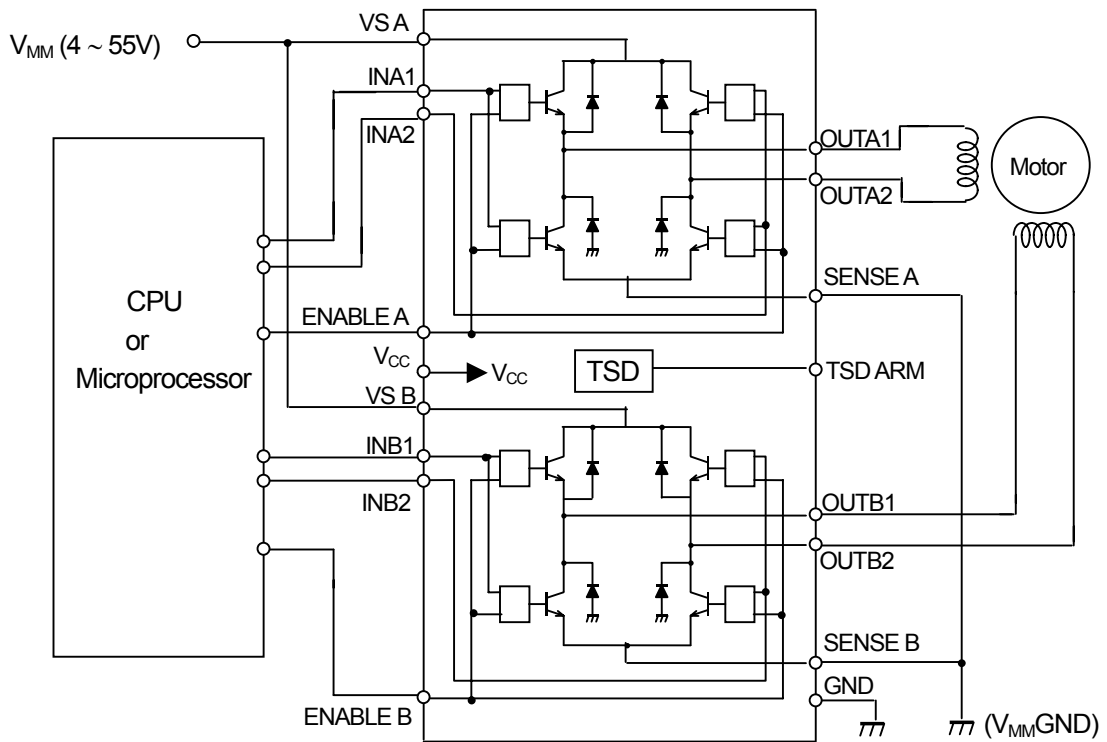
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
GENERAL						
Quiescent current	I <sub>cc</sub>	Enable=H, IN1=IN3=L, IN2=IN4=H	-	40	-	mA
Thermal shutdown	T <sub>tsd</sub>		-	170	-	°C
Off-State leak current	I <sub>tsd-LEAK</sub>	TSD ARM=5V	-	-	50	μA
Thermal alarm output saturation	V <sub>tsd</sub>	I <sub>o</sub> =5mA	-	0.5	0.7	V
Dead time protection	T <sub>d</sub>		-	1	-	μs
LOGIC						
Input LOW voltage	V <sub>IL</sub>		-	-	0.6	V
Input HIGH voltage	V <sub>IH</sub>		2	-	-	V
Input HIGH current	I <sub>IH</sub>	V <sub>i</sub> =2.4V	-	-	20	μA
Input LOW current	I <sub>IL</sub>	V <sub>i</sub> =0.4V	-0.4	-	-	mA
OUTPUT						
Upper transistor saturation	V <sub>OU1</sub>	I <sub>o</sub> =1000mA	-	1.3	1.5	V
	V <sub>OU2</sub>	I <sub>o</sub> =1300mA	-	1.5	1.8	V
Lower transistor saturation	V <sub>OL1</sub>	I <sub>o</sub> =1000mA	-	0.5	0.8	V
	V <sub>OL2</sub>	I <sub>o</sub> =1300mA	-	0.8	1.3	V
Upper diode forward	V <sub>FU1</sub>	I <sub>o</sub> =1000mA	-	1.3	1.6	V
	V <sub>FU2</sub>	I <sub>o</sub> =1300mA	-	1.6	1.9	V
Lower diode forward	V <sub>FL1</sub>	I <sub>o</sub> =1000mA	-	1.3	1.6	V
	V <sub>FL2</sub>	I <sub>o</sub> =1300mA	-	1.6	1.9	V
Output leakage current	I <sub>LO-LEAK</sub>	V <sub>MM</sub> =50V	-	-	1	mA
Upper diode recovery time	T <sub>rrU</sub>		-	250	-	ns
Lower diode recovery time	T <sub>rrL</sub>		-	250	-	ns

## ■ TRUTH TABLE

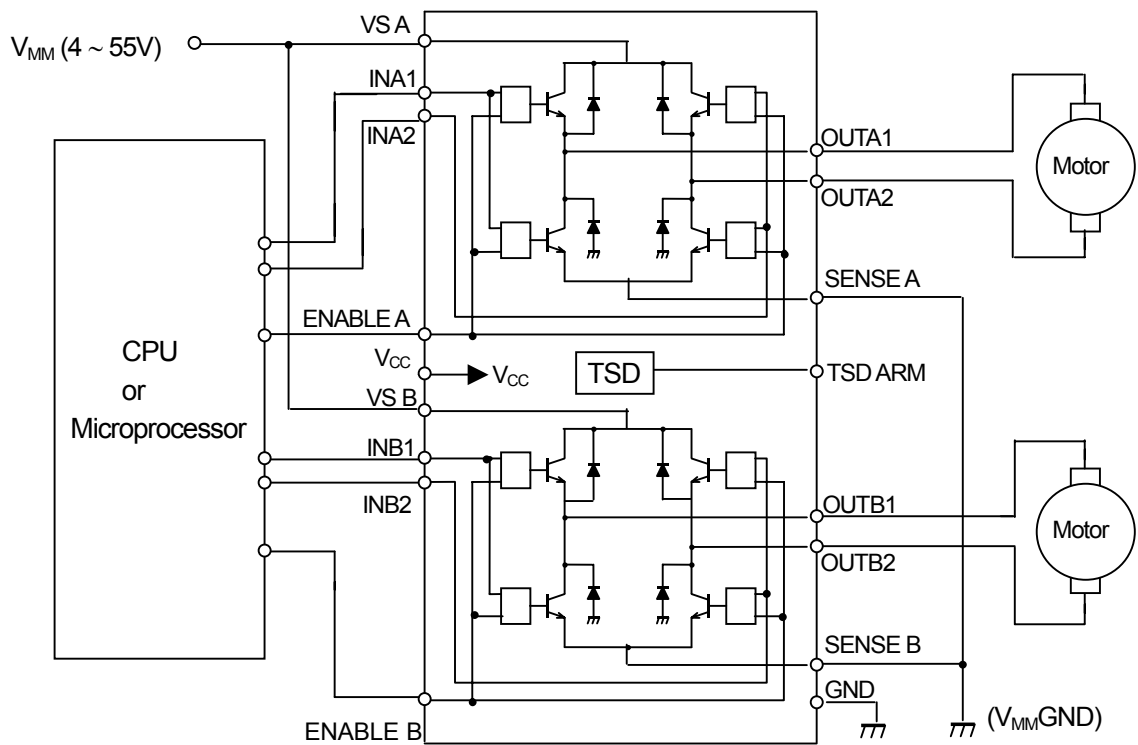
INPUT (L=Low, H=High, X=Don't care)			OUTPUT (H=Source, L=Sink)		OUTPUT mode
ENABLE A=H ENABLE B=H	INA1 INB1	INA2 INB2	OUTA1 OUTB1	OUTA2 OUTB2	
	L	L	L	L	short break mode
	L	H	L	H	CW
	H	L	H	L	CCW
	H	H	H	H	short break mode
ENABLE A=L ENABLE B=L	X	X	All Transistor turned OFF		

## ■ TYPICAL APPLICATION

### 1). Bipolar Stepper Motor

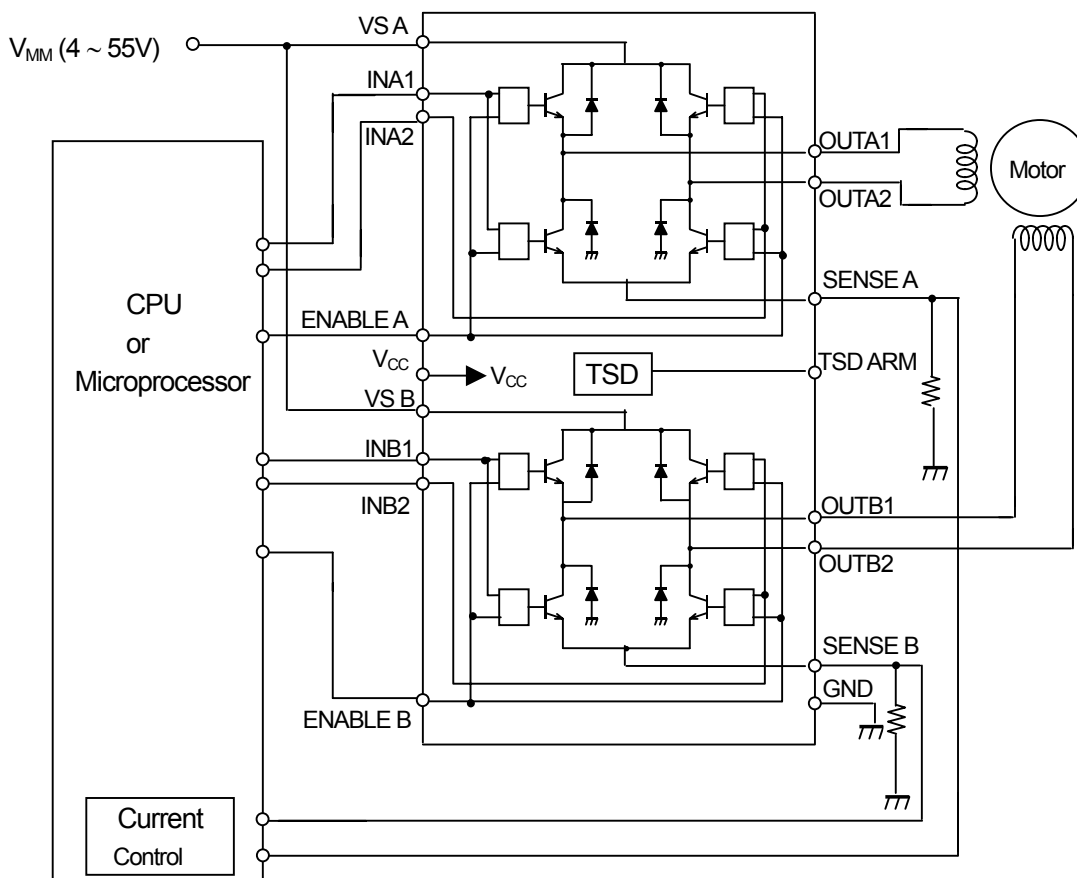


### 2). Single Phase DC Motor

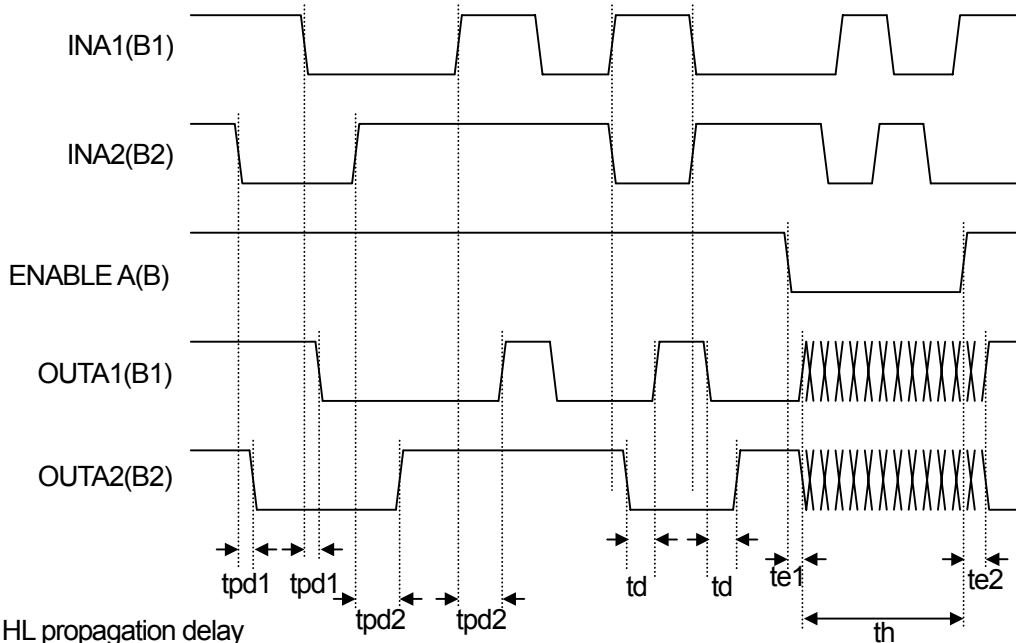


# NJM2670

## 3) Current Control Application for Bipolar Stepper Motor



### ■ TIMING CHART

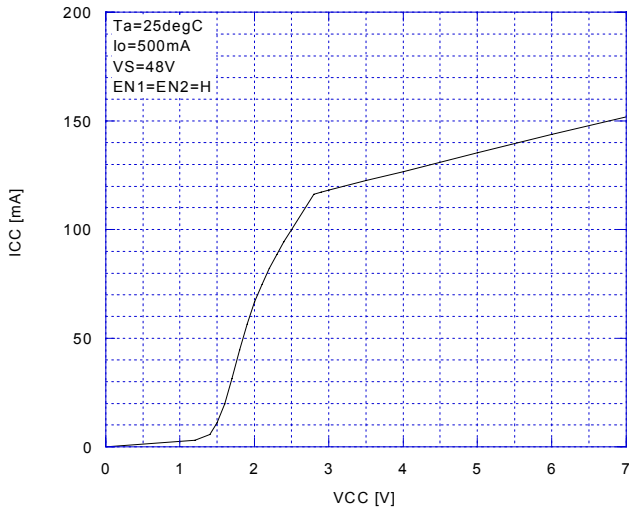


- tpd1:IN\_HL propagation delay
- tpd2:IN\_LH propagation delay
- td :Output dead band protection delay
- te1 :ENABLE\_HL propagation delay
- te2 :ENABLE\_LH propagation delay
- th :Output High impedance section

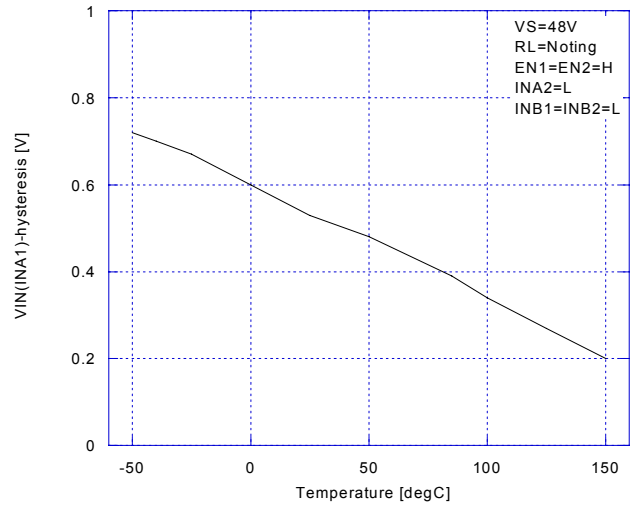
	Reference value	unit
tpd1	1.0	us
tpd2	2.5	us
td	1.5	us
te1	3.5	us
te2	2.0	us

## ■ TYPICAL APPLICATION 1

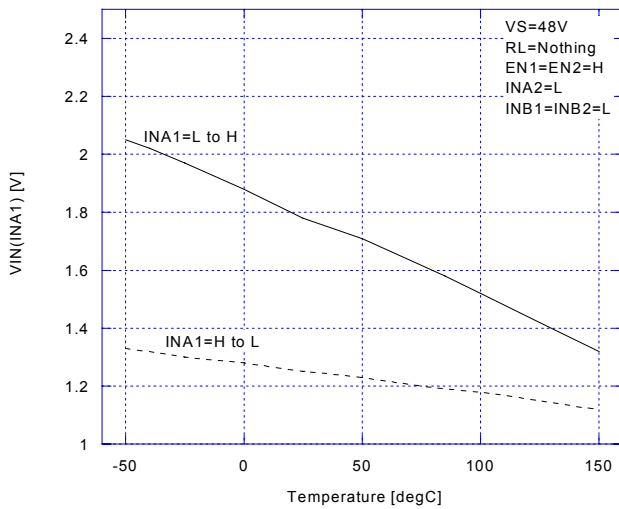
### ICC vs. VCC



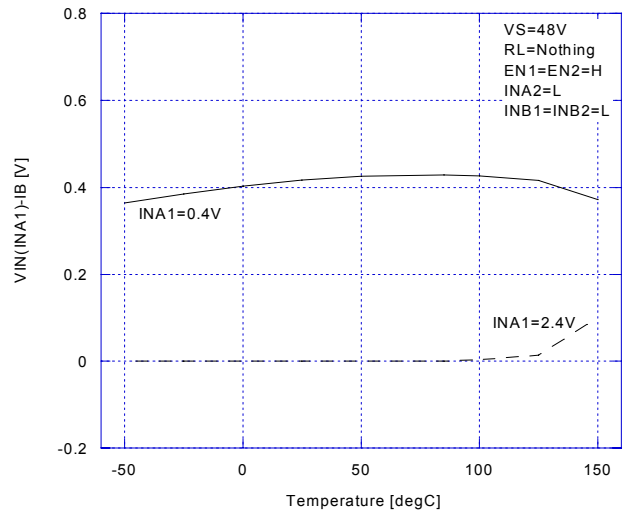
### VIN(INA1)-hysteresis vs. Temperature



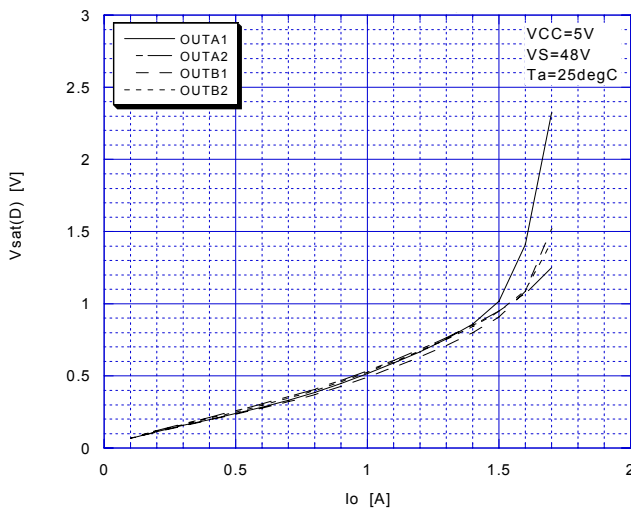
### VIN(INA1) vs. Temperature



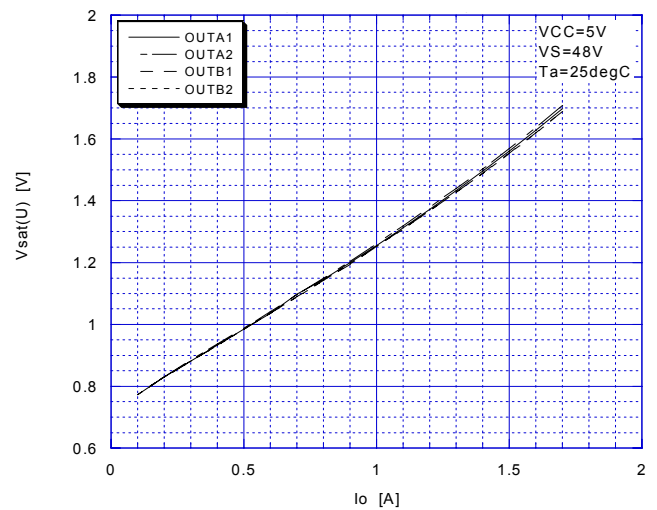
### VIN(INA1)-IB vs. Temperature



### Vsat(D) vs. Io



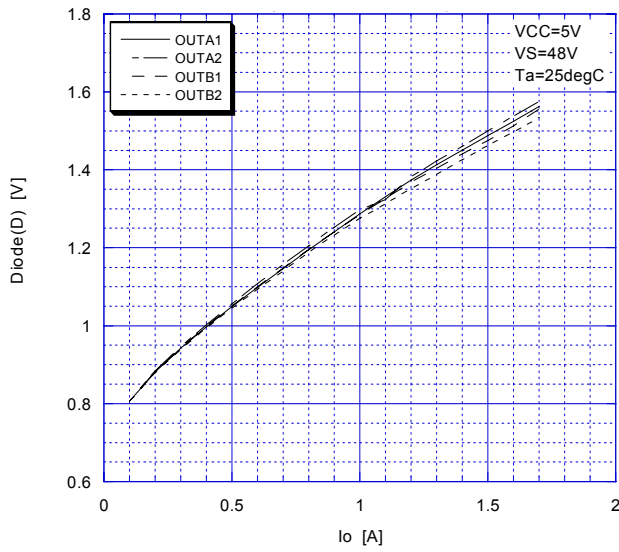
### Vsat(U) vs. Io



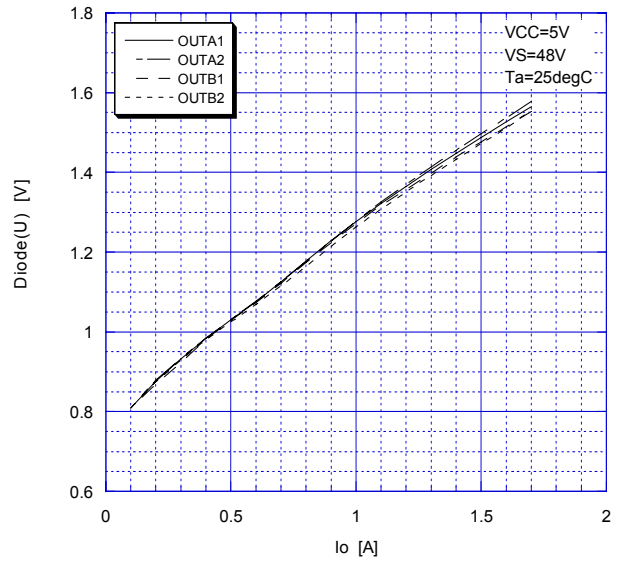
# NJM2670

## ■ TYPICAL APPLICATION 2

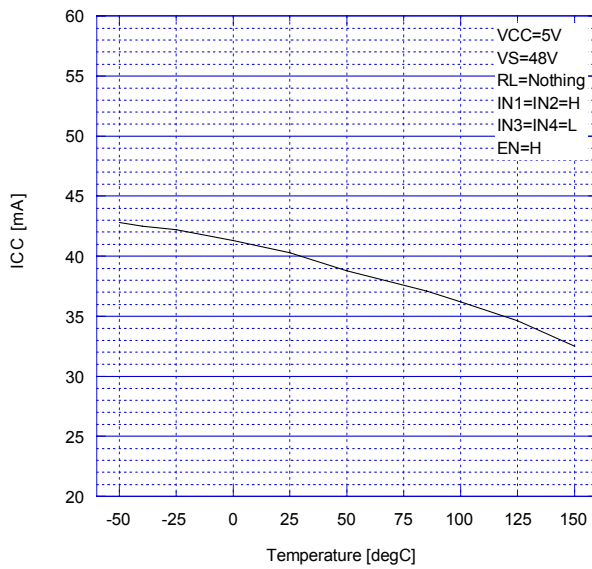
Diode(D) vs.  $I_o$



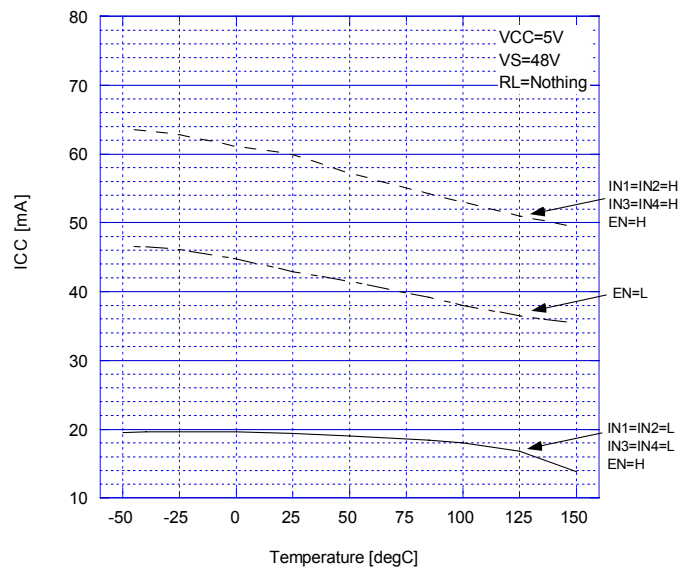
Diode(U) vs.  $I_o$



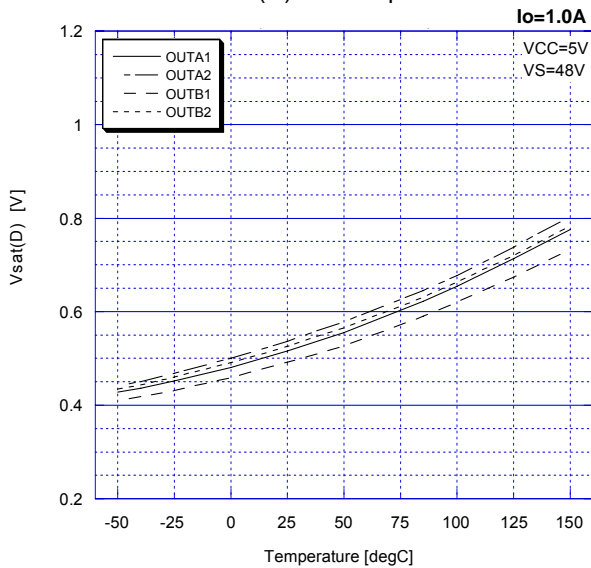
ICC vs. Temperature



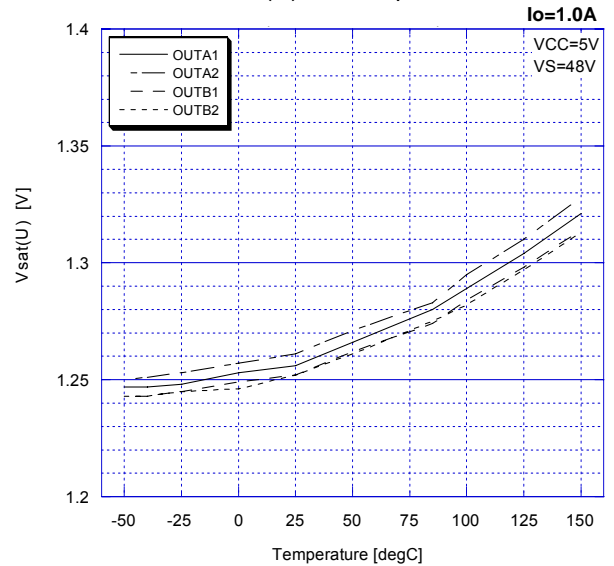
ICC vs. Temperature



Vsat(D) vs. Temperature



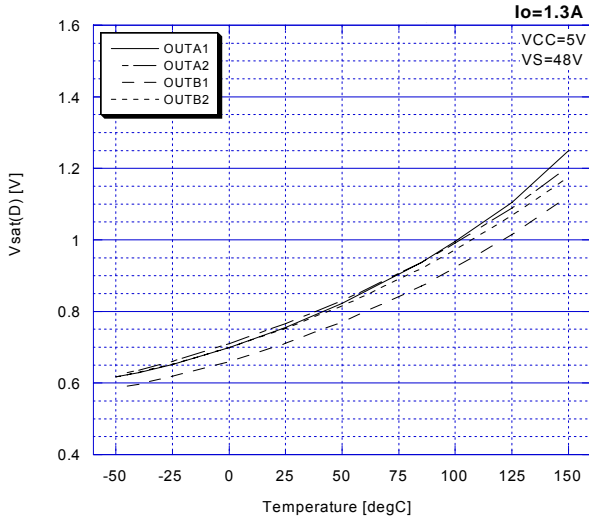
Vsat(U) vs. Temperature



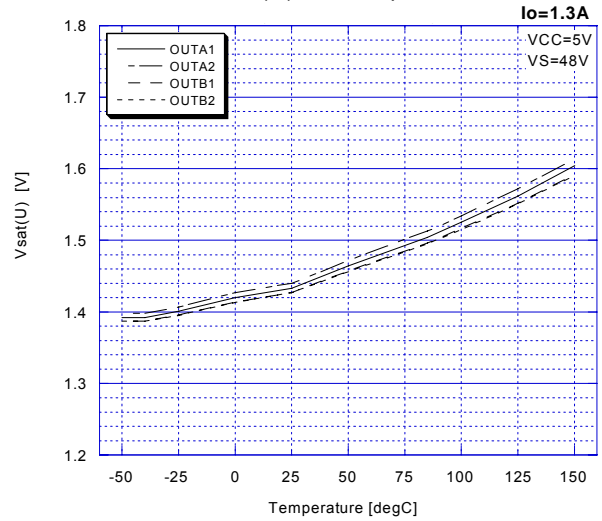


## ■ TYPICAL APPLICATION 3

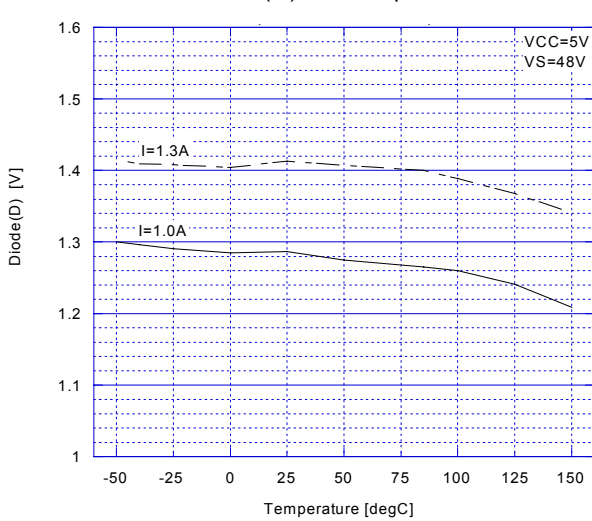
Vsat(D) vs. Temperature



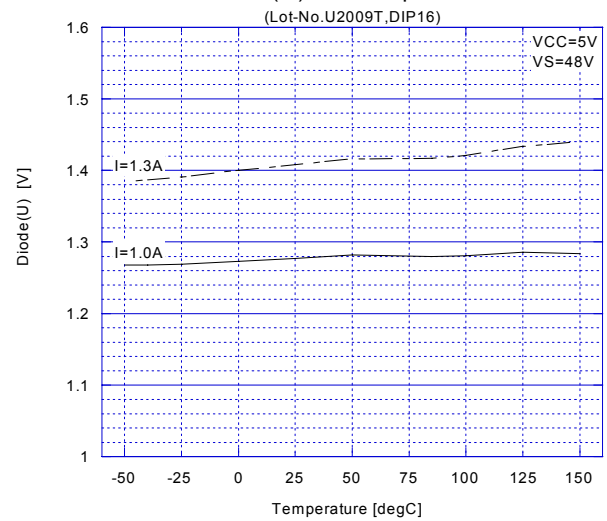
Vsat(U) vs. Temperature



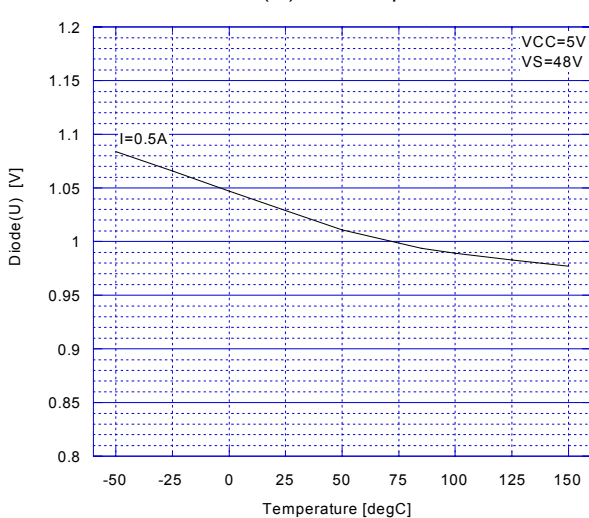
Diode(D) vs. Temperature



NJM2670  
Diode(U) vs. Temperature



Diode(U) vs. Temperature



**[CAUTION]**

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