LOW VOLTAGE OPERATION DUAL H BRIDGE DRIVER

■ GENERAL DESCRIPTION

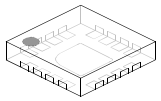
The NJU7382A is a dual H-bridge driver IC that features low voltage operation and low quiescent current.

The control method is Phase & Enable inputs type.

The independent comparator circuit can be used for position sensing signal processing and the others.

Small package makes the NJU7382A suitable for small stepper motor, such as portable applications.

■ PACKAGE OUTLINE

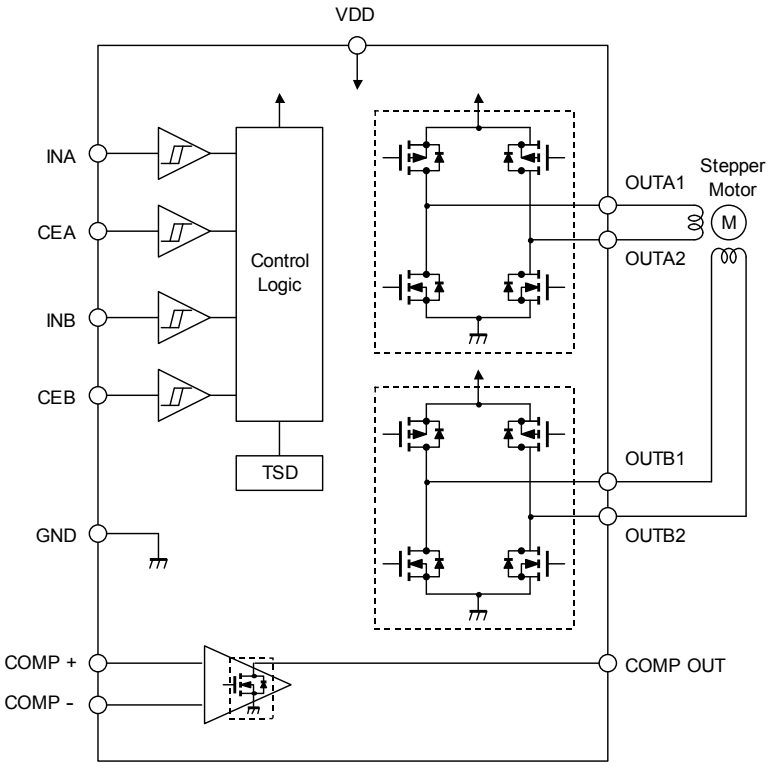


NJU7382AMJE
(EQFN16-JE)

■ FEATURES

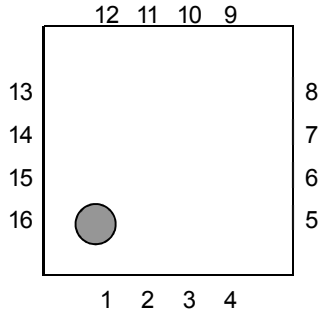
- Supply Voltage : V_{DD}=1.8V to 5.5V
- Output Current : I_O=200mA (Continuous)
  I_O=400mA (Peak)
- Output ON Resistance : $R_{O(H+L)}$=1.25Ω typ. at V_{DD}=3.3V
  $R_{O(H+L)}$=1.95Ω typ. at V_{DD}=1.8V
- Low Quiescent Current : 60μA typ. at V_{DD}=3.3V
- Phase & Enable Inputs Control
- Built-in Comparator Circuit
- Protection Circuit : Thermal Shutdown Circuit (TSD)
- Package Outline : EQFN16-JE

■ BLOCK DIAGRAM

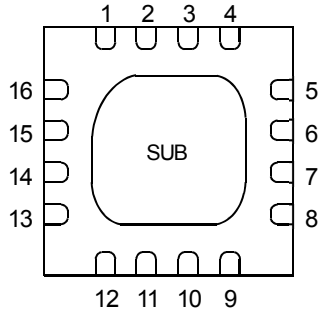


■ PIN CONFIGURATION

EQFN16-JE



Top View



Bottom View

■ PIN DESCRIPTION

PIN No. EQFN16	PIN NAME	FUNCTION	NOTES
1	INB	Bch Phase Input Pin 1	-
2	CEB	Bch Enable Input Pin 2	-
3,11	VDD	Power Supply Pin	Both pins must be connected together externally.
4	CEA	Ach Enable Input Pin 2	-
5	INA	Ach Phase Input Pin 1	-
6	OUTA2	Ach Output Pin 2	-
7,15	GND	Ground Pin	Both pins must be connected together externally.
8	OUTA1	Ach Output Pin 1	-
9	COMP OUT	Comparator Output Pin	When not using, it should be set to open.
10	NC	No Connection	Not Internally Connected
12	COMP+	Comparator Non-inverted Input Pin	When not using, it should be connected to VDD.
13	COMP-	Comparator Inverted Input Pin	When not using, it should be connected to GND.
14	OUTB1	Bch Output Pin 1	-
16	OUTB2	Bch Output Pin 2	-
SUB	SUB	Back Side Thermal PAD (SUB)	The PAD is connected with the internal VDD. It must be set to open or connected to VDD.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25ºC)

PARAMETER	SYMBOL	RATINGS	UNIT	NOTES
Supply Voltage	V_{DD}	7	V	-
Logic Input Voltage	V_{ID}	-0.3 to V_{DD}+0.3	V	-
Motor Output Current (Peak)	I_{OPEAK}	400	mA	Per channel
Comparator Output Current	I_{CO}	10	mA	-
Comparator Output Voltage	V_{CO}	7	V	-
Operating Ambient Temperature	Topr	-40 to + 85	ºC	-
Junction Temperature	Tj	-40 to +150	ºC	-
Storage Temperature	Tstg	-50 to +150	ºC	-
Power Dissipation (EQFN16-JE)	P_D	720	mW	2 Layers on PCB (*1)
		1800		4 Layers on PCB (*2)

*1: Mounted on glass epoxy board based on EIA/JEDEC. (101.5×114.5×1.6mm, FR-4, 2Layers, connected exposed PAD)

*2: Mounted on glass epoxy board on EIA/JEDEC. (101.5×114.5×1.6mm, FR-4, 4Layers, Inner Cu area : 99.5×99.5mm, In addition thermal via holes, connected exposed PAD)

■ RECOMMENDED OPERATING CONDITIONS

(V_{DD}=3.3V, Ta=25ºC)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Supply Voltage 1	V_{DD1}	Not using comparator block (*3)	1.8	-	5.5	V
Supply Voltage 2	V_{DD1}	Using comparator block (*3)	2.0	-	5.5	V
Motor Output Current (Continuous)	I_O	Per channel	-	-	200	mA

*3: Output voltage may not be provided enough depending on output current level, please review output ON resistance spec.

■ ELECTRICAL CHARACTERISTICS

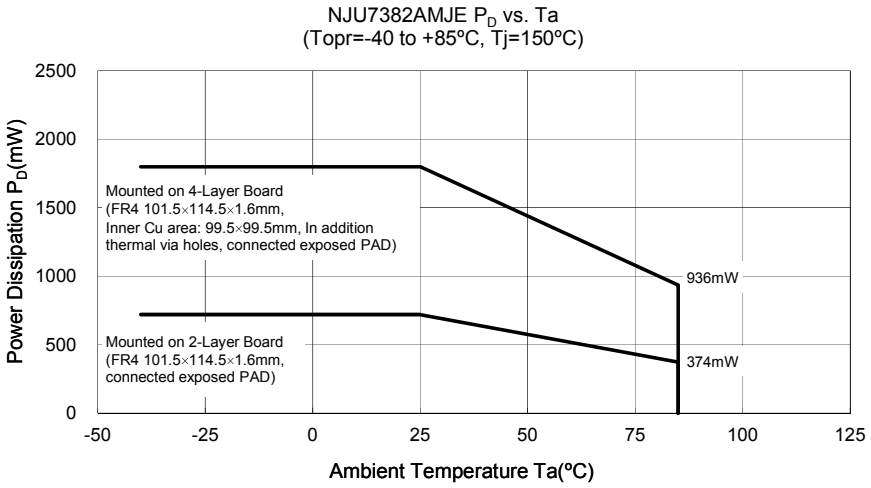
(V_{DD}=3.3V, Ta=25ºC)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
■ GENERAL						
Quiescent Current 1	I_{DD1}		-	60	120	µA
Quiescent Current 2	I_{DD2}	V_{DD}=1.8V	-	50	100	µA
Thermal Shutdown Temperature	T_{TSD}		-	190	-	ºC
Thermal Shutdown Hysteresis	T_{HYS}		-	40	-	ºC
■ LOGIC BLOCK						
H Level Input Voltage 1	V_{IH1}		2.4	-	V_{DD}	V
H Level Input Voltage 2	V_{IH2}	V_{DD}=1.8V	1.4	-	V_{DD}	V
L Level Input Voltage 1	V_{IL1}		0	-	0.8	V
L Level Input Voltage 2	V_{IL2}	V_{DD}=1.8V	0	-	0.4	V
Input Hysteresis Width	V_{IHYS}		-	0.2	-	V
Input Current	I_I	Per 1 Input	-200	-	200	nA
Input Pulse Width	tp		2	-	-	µs
■ DRIVER BLOCK						
High Side Output ON Resistance 1	R_{ONH1}	I_O=200mA	-	0.75	1.0	Ω
High Side Output ON Resistance 2	R_{ONH2}	V_{DD}=2.1V, I_O=200mA	-	1.0	1.35	Ω
High Side Output ON Resistance 3	R_{ONH3}	V_{DD}=1.8V, I_O=200mA	-	1.2	1.6	Ω
Low Side Output ON Resistance 1	R_{ONL1}	I_O=200mA	-	0.5	0.7	Ω
Low Side Output ON Resistance 2	R_{ONL2}	V_{DD}=2.1V, I_O=200mA	-	0.65	0.9	Ω
Low Side Output ON Resistance 3	R_{ONL3}	V_{DD}=1.8V, I_O=200mA	-	0.75	1.05	Ω
R_{ONH} Temperature Coefficient	$\Delta R_{ONH}/\Delta Tj$	Tj=40~125ºC, I_O=200mA	-	4.0	-	mΩ/ºC
R_{ONL} Temperature Coefficient	$\Delta R_{ONL}/\Delta Tj$	Tj=40~125ºC, I_O=200mA	-	3.0	-	mΩ/ºC
High Side Reverse Voltage	V_{ORH}	I_O=-200mA	-	0.85	1.0	V
Low Side Reverse Voltage	V_{ORL}	I_O=-200mA	-	0.75	0.9	V
High Side Leak Current	I_{OLEAKH}	V_{DD}=7.0V	-	-	1	µA
Low Side Leak Current	I_{OLEAKL}	V_{DD}=7.0V	-	-	1	µA
Output Turn On Time	t_{ON}		-	400	-	ns
Output Turn Off Time	t_{OFF}		-	30	-	ns
Dead Time	td		-	370	-	ns
■ COMPARATOR BLOCK						
Input Offset Voltage	V_{IO}		-12	-	+12	mV
Input Bias Current	I_{IB}		-	1	-	pA
Common Mode Input Voltage Range	V_{ICM}		0	-	V_{DD}-0.5	V
Output Voltage	Vsat	RL=10kΩ	-	0.1	-	V
Output Leak Current	I_{COLEAK}	V_{CO}=5.5V	-	-	1	µA

■ THERMAL RESISTANCE

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Junction - Ambient Thermal Resistance 1	θ_{ja_1}	Mounted on glass epoxy board based on EIA/JEDEC. (101.5×114.5×1.6mm, FR-4, 2Layers, connected exposed PAD)	-	-	173	ºC/W
Junction – Case Surface Thermal Resistance 1	Ψ_{jt_1}		-	21	-	ºC/W
Junction - Ambient Thermal Resistance 2	θ_{ja_2}	Mounted on glass epoxy board based on EIA/JEDEC. (101.5×114.5×1.6mm, FR-4, 4Layers, Inner Cu area : 99.5×99.5mm, In addition thermal via holes, connected exposed PAD)	-	-	69	ºC/W
Junction – Case Surface Thermal Resistance 2	Ψ_{jt_2}		-	11	-	ºC/W

■ POWER DISSIPATION vs. AMBIENT TEMPERATURE



■ INPUT - OUTPUT TRUTH TABLE

INPUT				OUTPUT				Comparator Circuit	NOTES	
INA	CEA	INB	CEB	OUTA1	OUTA2	OUTB1	OUTB2			
L	L	-		OFF	OFF	-		Normal Operation	Ach	OFF(Fast Decay)
H										
L	H			L	H					CCW
H				H	L					CW
-		L	L	-		OFF	OFF		Bch	OFF(Fast Decay)
		H								
		L	H			L	H			CCW
		H				H	L			CW
Don't Care				OFF	OFF	OFF	OFF		TSD	

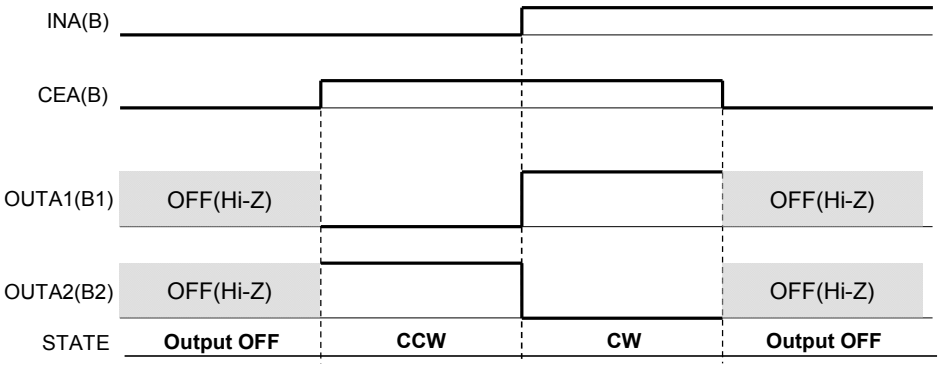
*OFF=Hi-Z

■ COMPARATOR TRUTH TABLE (Normal Operation)

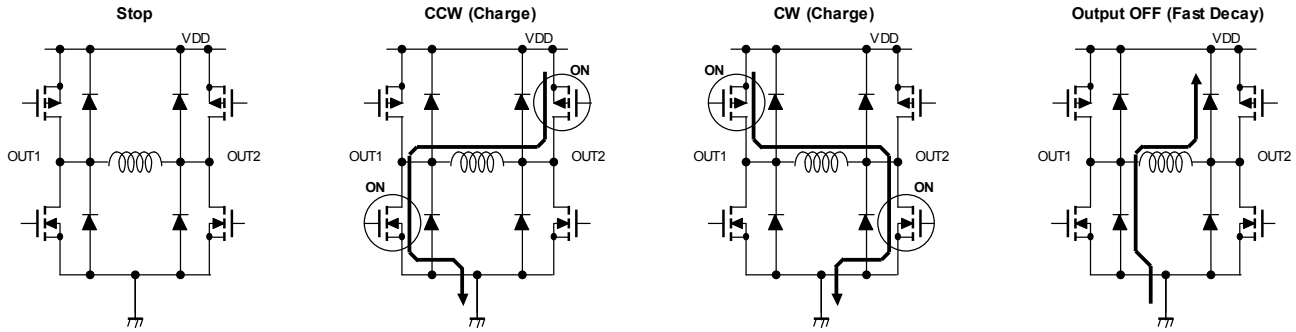
INPUT		OUTPUT	NOTES
COMP+	COMP-	COMPOUT	
H	L	OFF	FET: OFF Operation
L	H	L	FET: ON Operation

*OFF=Hi-Z

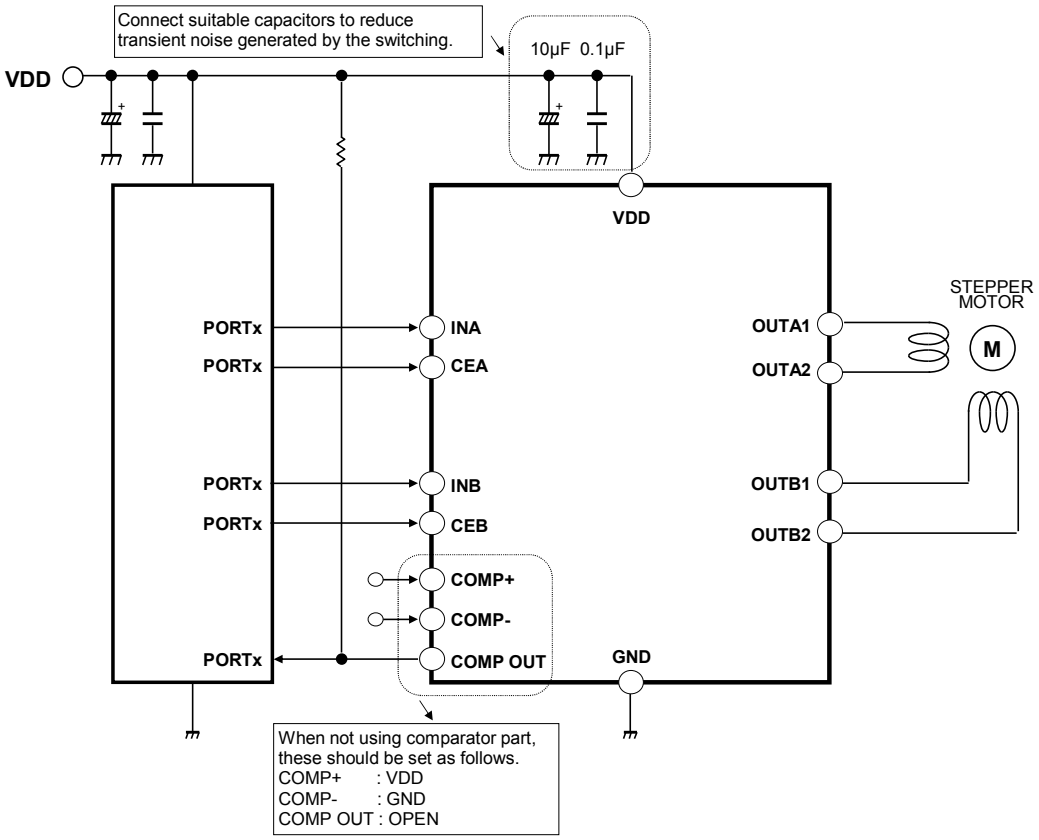
■ BASIC OPERATION TIMING CHART



■ BASIC OUTPUT OPERATION PATTERN

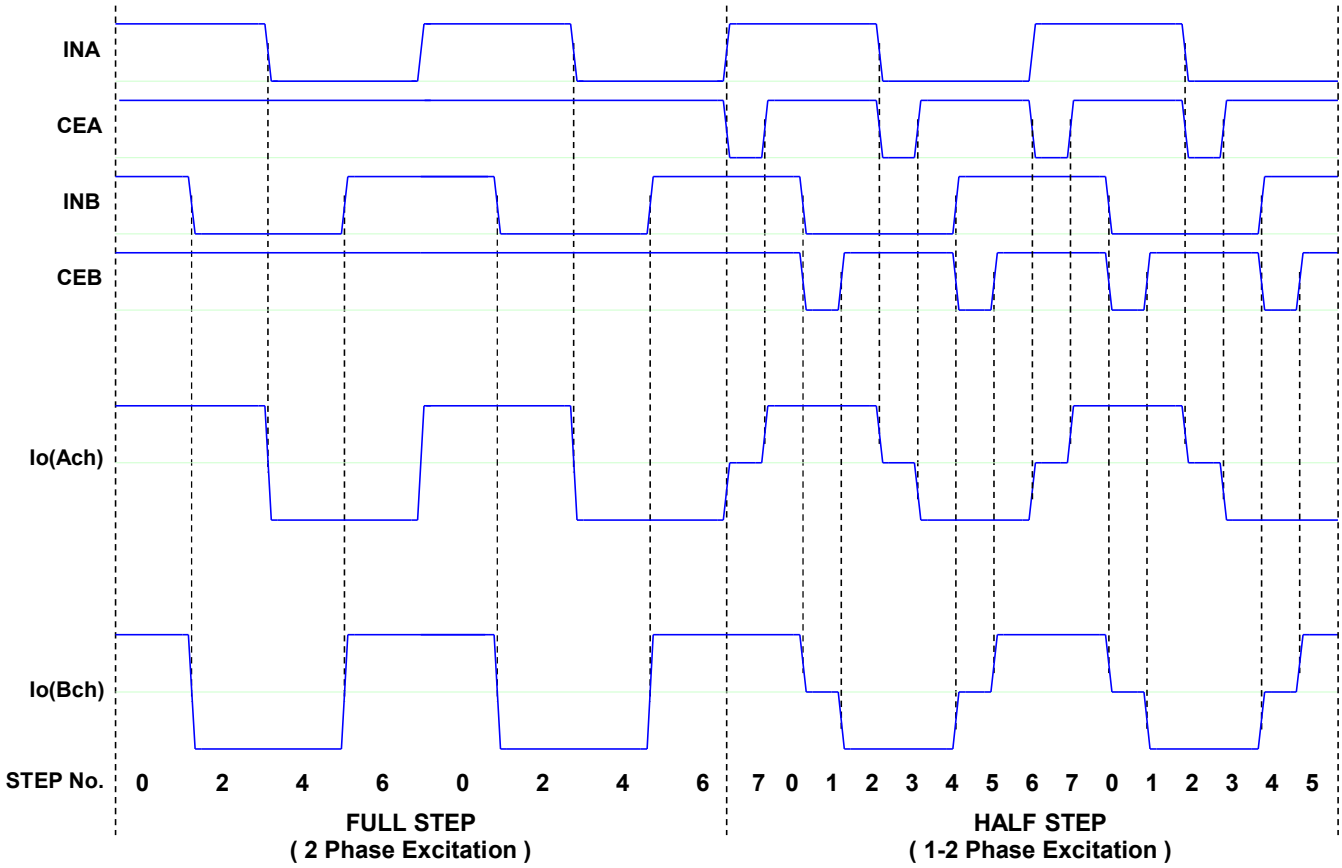


■ TYPICAL APPLICATION

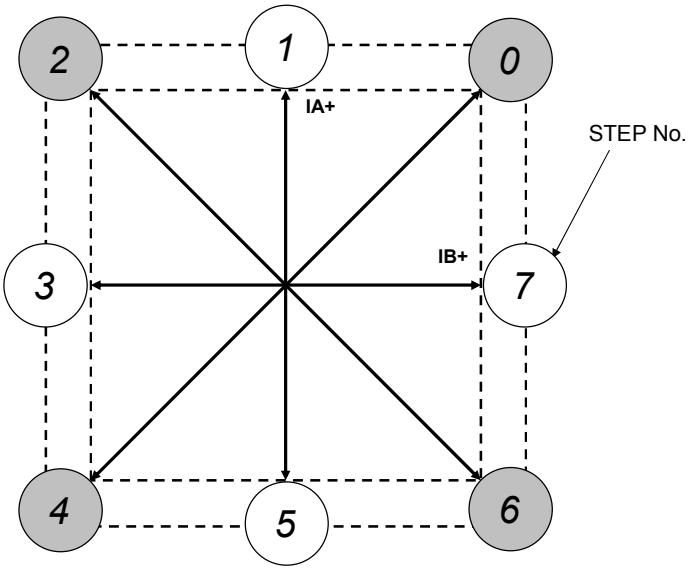


■ STEPPER MOTOR DRIVE APPLICATION

• TIMIG CHART

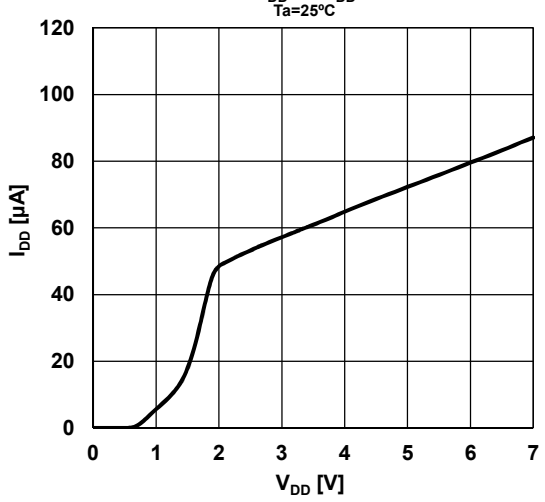


• ROTER POSITION (STEP No.)

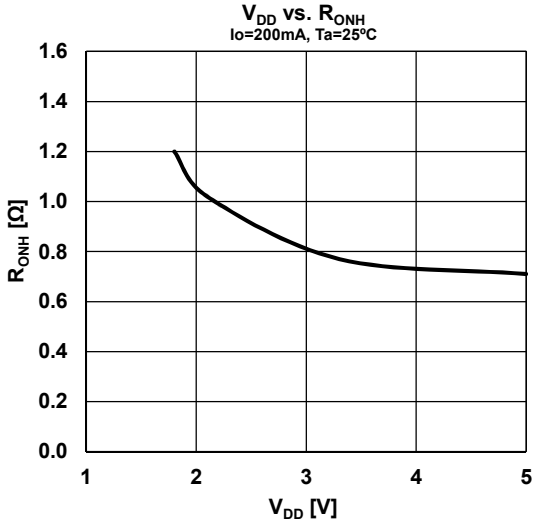


■ TYPICAL CHARACTERISTICS

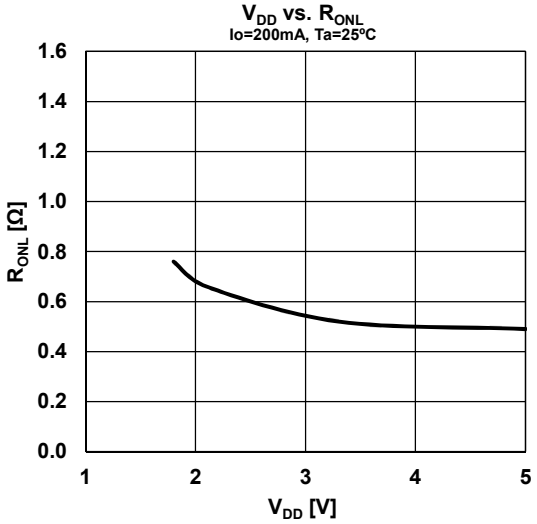
V_{DD} vs. I_{DD}
Ta=25°C



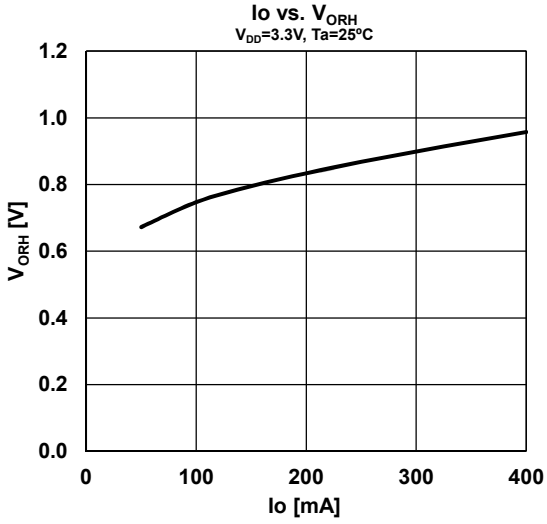
V_{DD} vs. R_{ONH}
Io=200mA, Ta=25°C



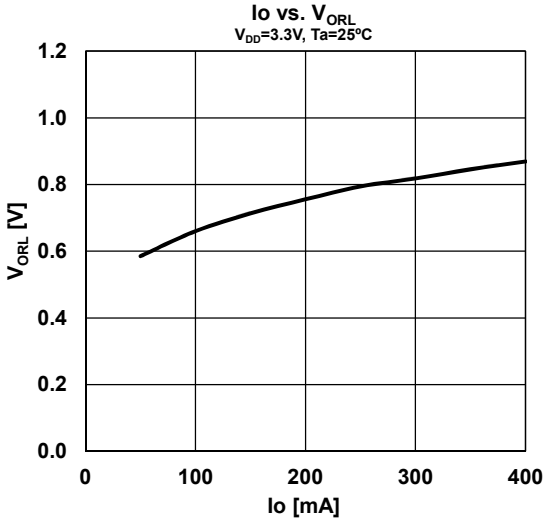
V_{DD} vs. R_{ONL}
Io=200mA, Ta=25°C



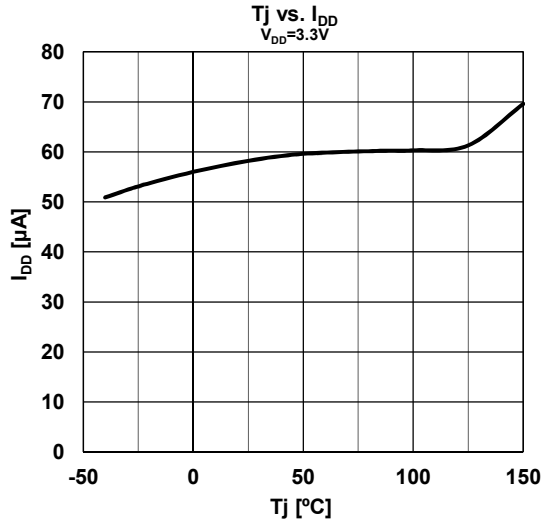
Io vs. V_{ORH}
V_{DD}=3.3V, Ta=25°C

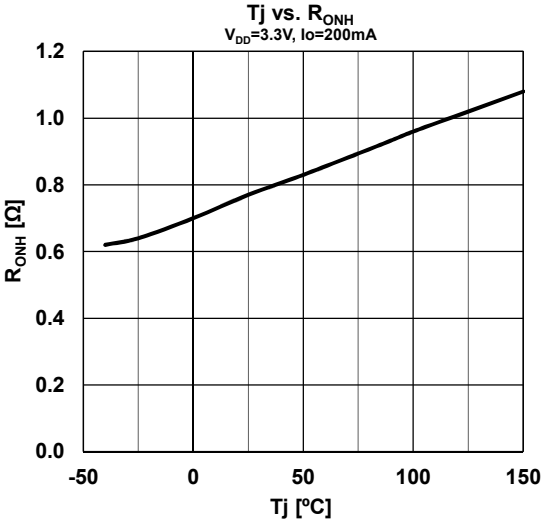


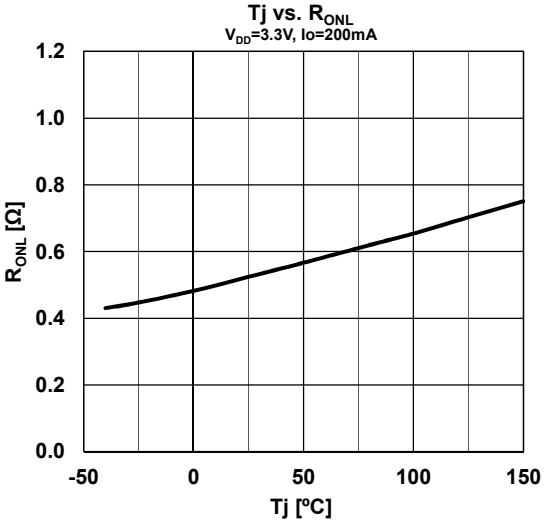
Io vs. V_{ORL}
V_{DD}=3.3V, Ta=25°C



■ TYPICAL CHARACTERISTICS







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