

Bipolar Stepping Motor Driver IC

Description

The AP8101W is 2 phase stepping motor driver IC.

The IC can control two-phase stepping motor forward and reverse by bipolar driving. It consists of TTL compatible input circuits, dual bridge driver outputs with flyback diodes and stand-by circuit.



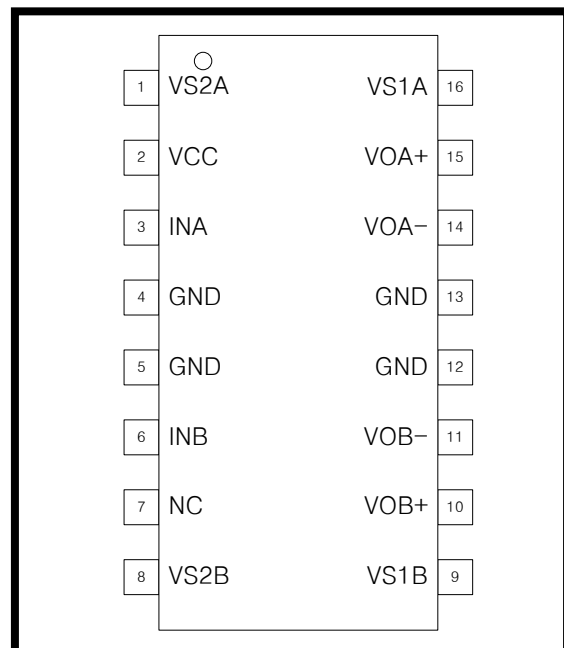
Features

- One Chip 2 Phase Stepping Motor Driver including two bridge drivers
- Stand-by Operation
- Short-Through Current Restriction Circuit
- TTL Compatible Inputs
- Output Current up to 400mA(Peak)
- Over Current Shutdown Circuit
- Thermal Shutdown Circuit
- Under Voltage Lockout Circuit
- Pull-down Resistance for Input

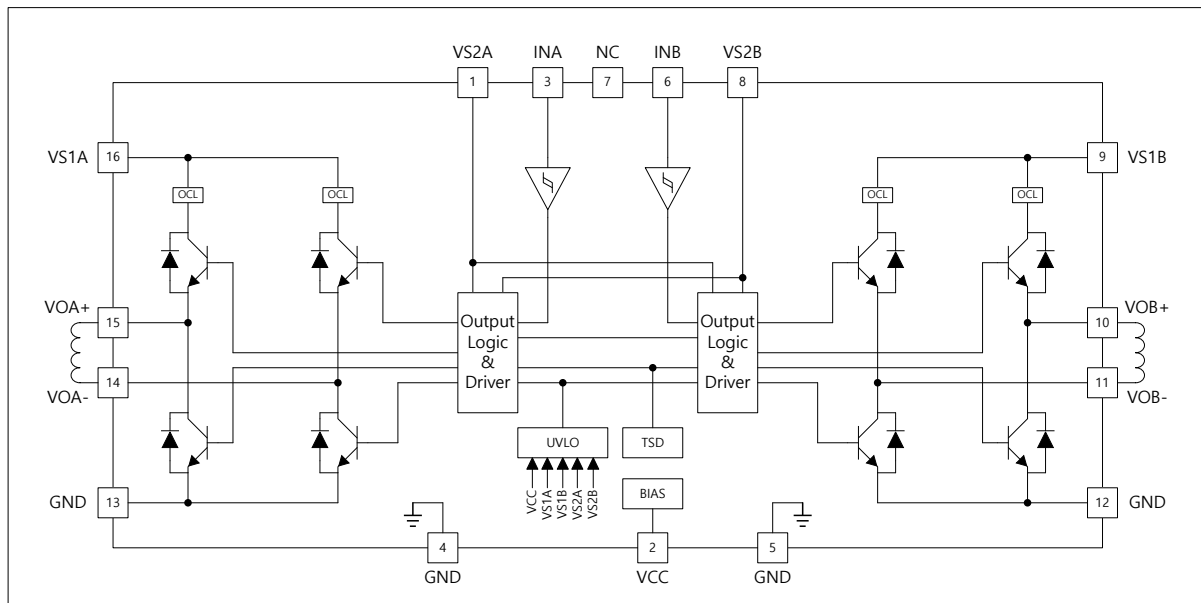
Application

- Refrigerator Damper motor driver
- Robotics
- Printers
- Scanners

Pin Configuration



Block Diagram



Note : Pin 4, 5, 12 and 13 are internally connected.

Pin Description

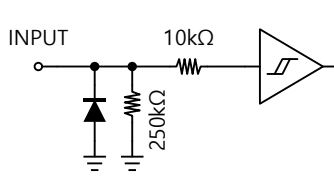
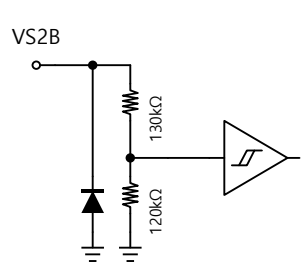
Pin No	Symbol	Functional Description
1	VS2A	Low-voltage power supply terminal
2	VCC	Power voltage supply terminal for control
3	INA	A-ch forward rotation / reverse rotation signal input terminal, Truth Table 1
6	INB	B-ch forward rotation / reverse rotation signal input terminal, Truth Table 1
7	NC	No Connect
8	VS2B	Stand-by signal input terminal, Truth Table 1
9	VS1B	High-voltage power supply terminal
10	VOB+	Output B+
11	VOB-	Output B-
14	VOA-	Output A-
15	VOA+	Output A+
16	VS1A	High-voltage power supply terminal
4, 5, 12, 13	GND	GND terminal (Logic and Power GND)

Truth Table 1.

VS2B	IN _x	Output (x : A, B)		
		VO _{x+}	VO _{x-}	Mode
L	X	Hi-Z	Hi-Z	POWER OFF (Stand-by mode)
L	X	Hi-Z	Hi-Z	
H	L	L	H	OPERATION
H	H	H	L	

Note : Apply 5V to VS2A as a supply terminal.

Terminal Circuit

Input terminal (INA, INB)	Input terminal (VS2B)
	

The diagram is partly-provided and omitted or simplified for explanatory purposes.



Maximum Ratings Characteristics

(TA = 25°C unless otherwise specified)

Characteristics		Symbol	Value	Unit
Supply voltage		VCC	7.0	V
		VS1	17.0	
		VS2	VCC	
Output current		IO (PEAK)	±400	mA
		IO (START)	±350	
		IO (HOLD)	±100	
Input voltage		VINx (X=A,B)	VCC	V
Power dissipation	SOPW-16L	PD_ SOPW16L	1.3	W
Operating temperature		Topr	-30 ~ 75	°C
Storage temperature		Tstg	-55 ~ 150	°C

ESD Rating

Characteristics		Value	Unit
Electrostatic discharge	HBM : Human body model (Ref : JS-001-2017)	±6000	V
	MM : Machine Model (Ref : JESD22-A115C : 2010)	±600	
	CDM : Charged Device Model (Ref : JS-002-2018)	±1500	

Recommended Operating Conditions

(TA = 25°C unless otherwise specified)

Characteristics	Symbol	Min	Typ.	Max	Unit
Supply voltage	VCC	4.5	5.0	5.5	V
	VS1A	8.5	12.0	15.5	
	VS1B	8.5	12.0	15.5	
	VS2A	2.7	5.0	5.5	
	VINx	-	-	VCC	



Electrical Characteristics

($T_A = 25^\circ\text{C}$, $V_{CC} = 5\text{V}$, $V_{S1} = 12\text{V}$, $V_{S2A} = 5\text{V}$, $V_{S2B} = 5\text{V}$ unless otherwise specified)

Characteristics	Symbol	Condition	Min	Typ.	Max	Unit
UNDER VOLTAGE LOCKOUT SECTION						
VCC UVLO Recovery Voltage	VUV_VCCH	VCC Increasing	3.7	4.2	4.5	V
VCC UVLO Hysteresis	VUV_VCC_Hys	-	-	0.1	-	V
SUPPLY CURRENT SECTION						
VCC Supply Current	IVCC_1	VS2B : H	-	3.5	4.5	mA
	IVCC_2	VS2B : L	-	65	100	μA
VS1 Supply Current	IVS1_1	VS2B : H	-	1.5	3	mA
	IVS1_2	VS2B : L	-	200	300	μA
VS2A Supply Current	IVS2A_1	VS2B : H	-	1.6	2.4	mA
	IVS2A_2	VS2B : L	-	120	200	μA
INPUT VOLTAGE SECTION						
Input Logic High Level	VINH	VS2B = 5V	2.0	-	V _{CC}	V
Input Logic Low Level	VINL		0	-	0.8	
INPUT CURRENT SECTION						
Logic Input Current	IIN	VIN = 5V	-	20	30	μA
VS2B Input Current	IVS2B	VS2B = 5V	-	30	50	μA
OUTPUT VOLTAGE SECTION						
Output Saturation Voltage	VSATH1	I _{OUT} = 30mA	-	1.00	3.00	V
	VSATL1		-	0.17	0.30	
	VSATH2	I _{OUT} = 100mA	-	1.20	3.05	
	VSATL2		-	0.30	0.40	
	VSATH3	I _{OUT} = 400mA	-	1.70	3.10	
	VSATL3		-	0.60	0.70	
DIODE SECTION						
Diode Forward Voltage	VFU1	IF = 30mA	-	0.95	1.30	V
	VFD1		-	0.75	1.10	
	VFU2	IF = 100mA	-	1.10	1.55	
	VFD2		-	0.90	1.40	
	VFU3	IF = 350mA	-	1.50	1.85	
	VFD3		-	1.20	1.75	
OUTPUT DELAY SECTION						
Delay Time	TPLH	Input Rising to Output Rising	4.0	7.0	10.0	us
	TPHL	Input Falling to Output Falling	0.2	0.7	5.0	
PROTECTION SECTION*						
Thermal Shutdown	TSD	-	-	170	-	°C
TSD Hysteresis	TSDhys	-	-	25	-	
Output Limit Current	Ilimit	-	0.4	0.8	-	A

*: These parameters, although guaranteed, are not 100% tested in production.

Under voltage Lockout Circuit (UVLO)

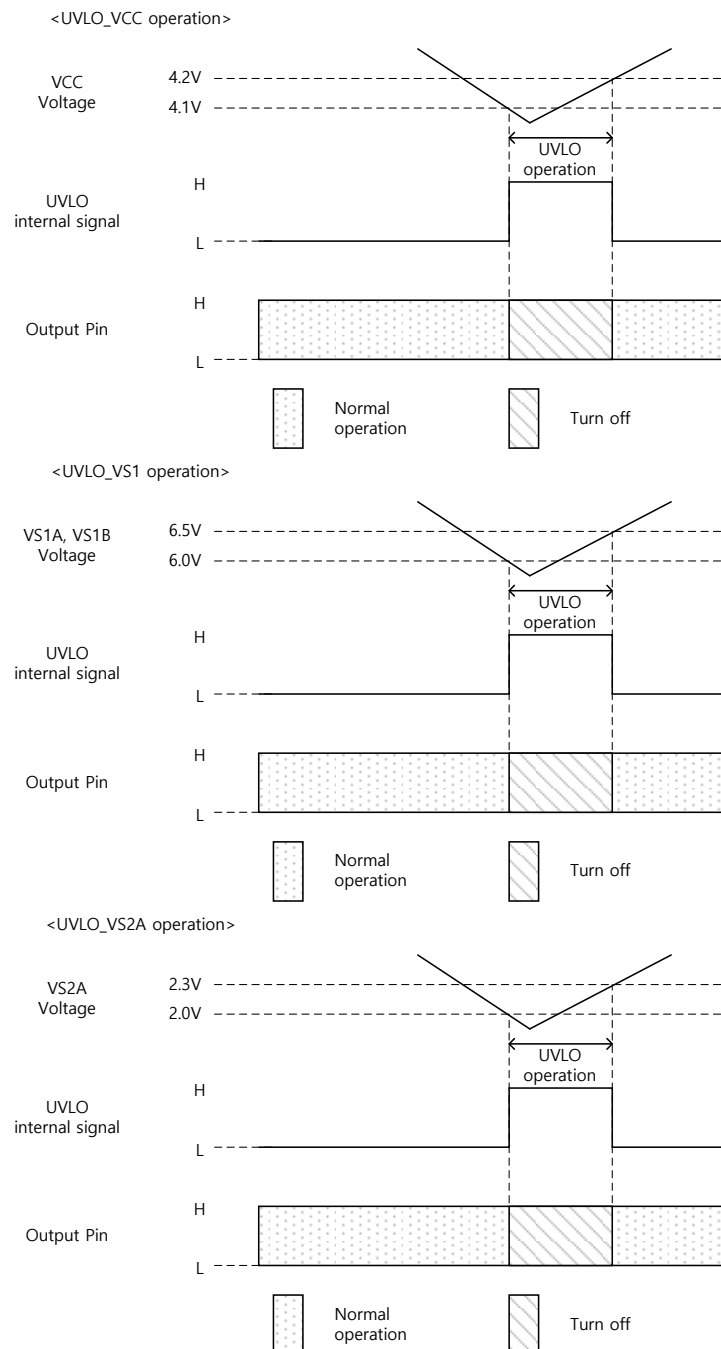
An under voltage lockout circuit is included.

Outputs are turned off under the conditions as follows;

$VCC \leq 4.1V$ (Design target) or $VS1A \leq 6.0V$ (Design target) and $VS1B \leq 6.0V$ (Design target) or $VS2A \leq 2.2V$ (Design target)

The UVLO circuit has a hysteresis and the function recovers under the conditions as follows;

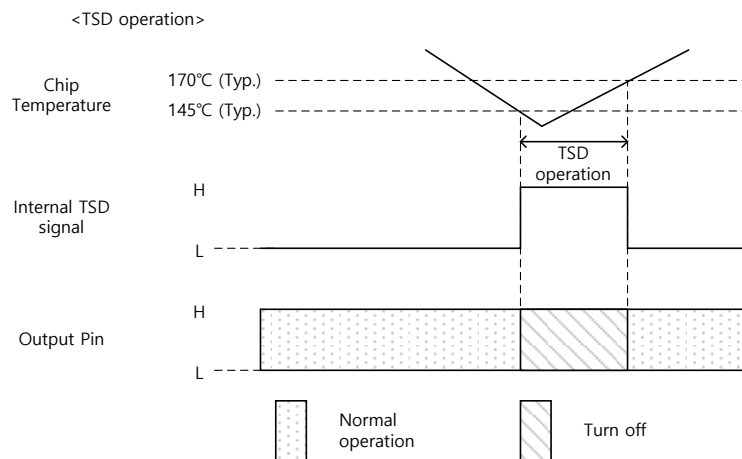
$VCC = 4.2V$ (Design target), $VS1A/VS1B = 6.5V$ (Design target), $VS2A = 2.3V$ (Design target)



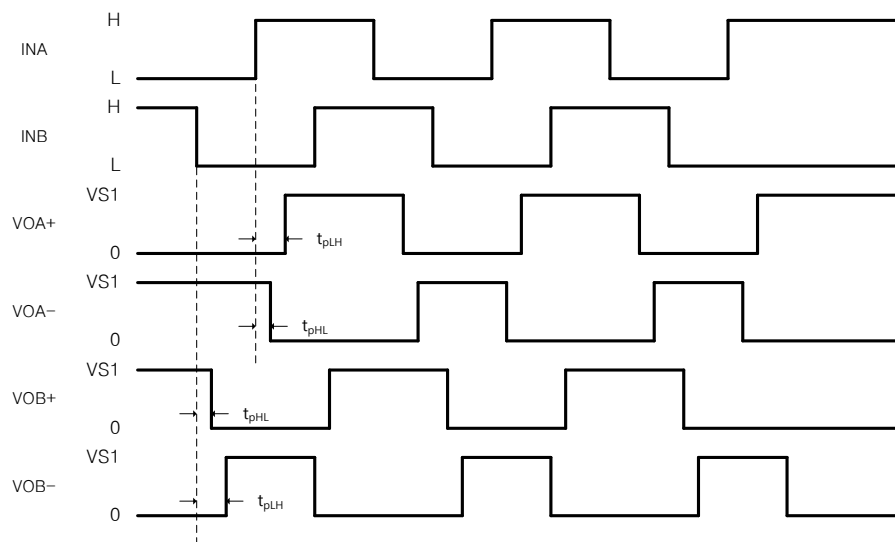
Thermal Shutdown Circuit (TSD)

The AP8101W has a thermal shutdown circuit. If the junction temperature (T_j) exceeds 170°C (design target only), all the outputs are turned off.

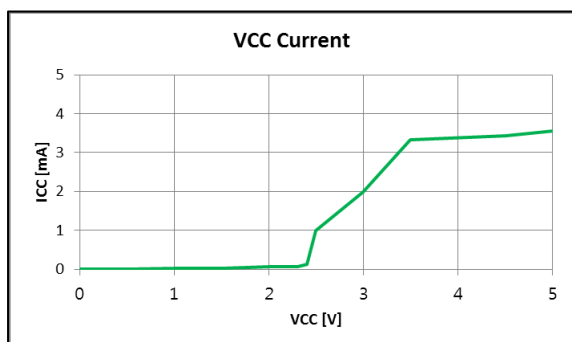
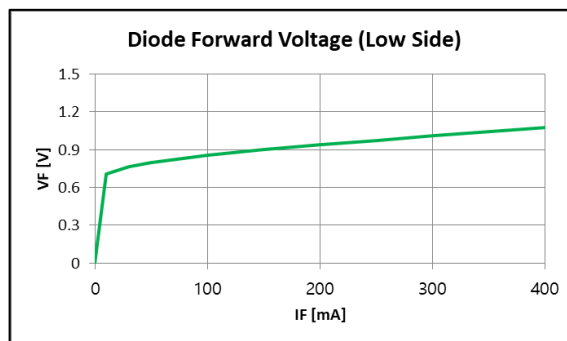
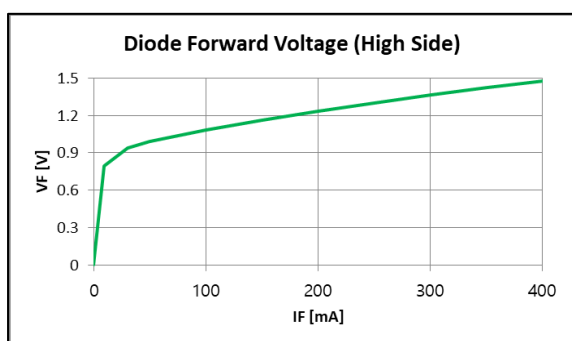
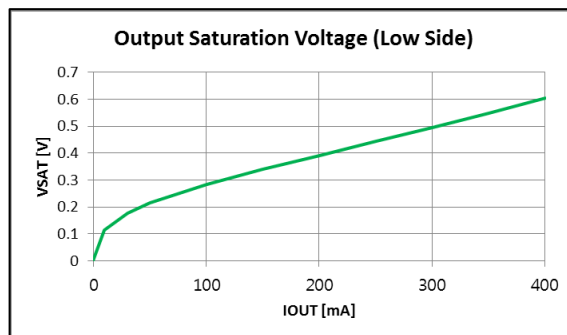
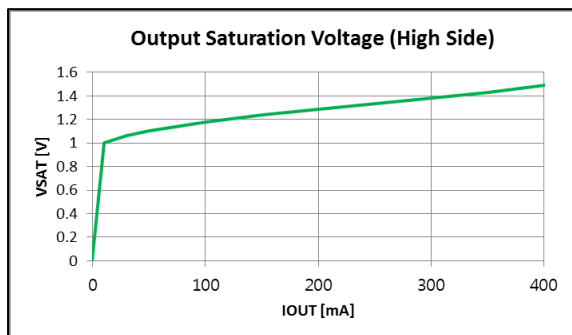
It recovers automatically at 145°C. It has a hysteresis width of 25°C.



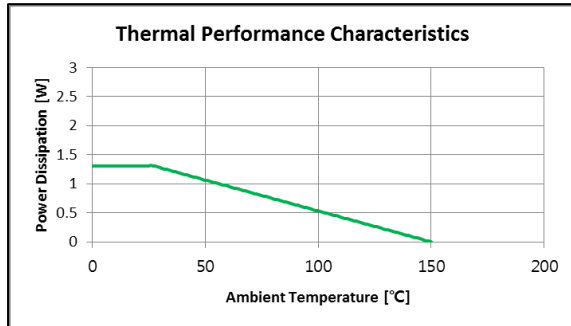
Timing Chart



Typical Performance Characteristics

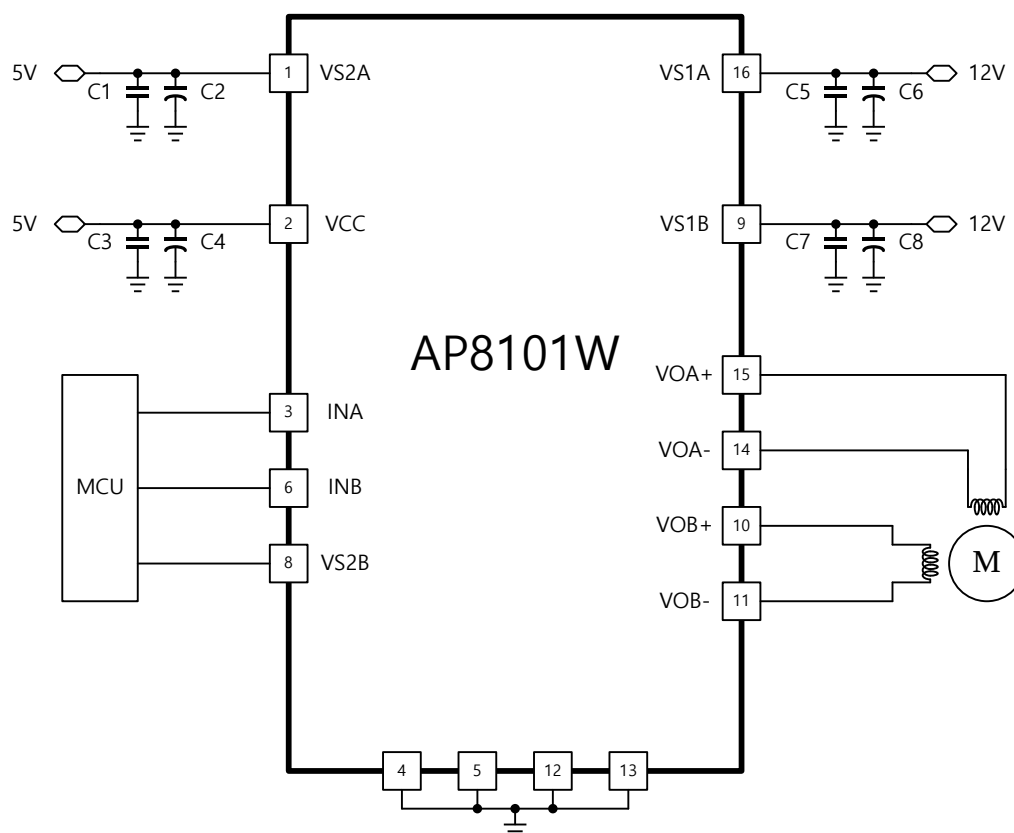


Thermal Performance Characteristics



Application Circuit

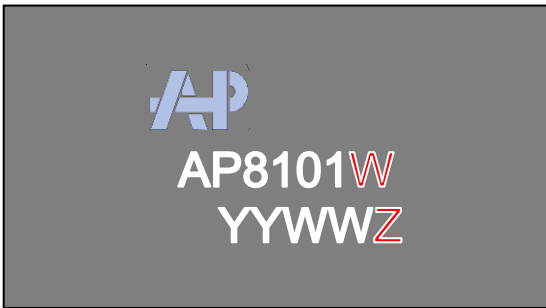
Information in the following application Circuits is not part of the APsemi component specification, and APsemi does not warrant its accuracy or completeness. APsemi's customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.



Ordering Information

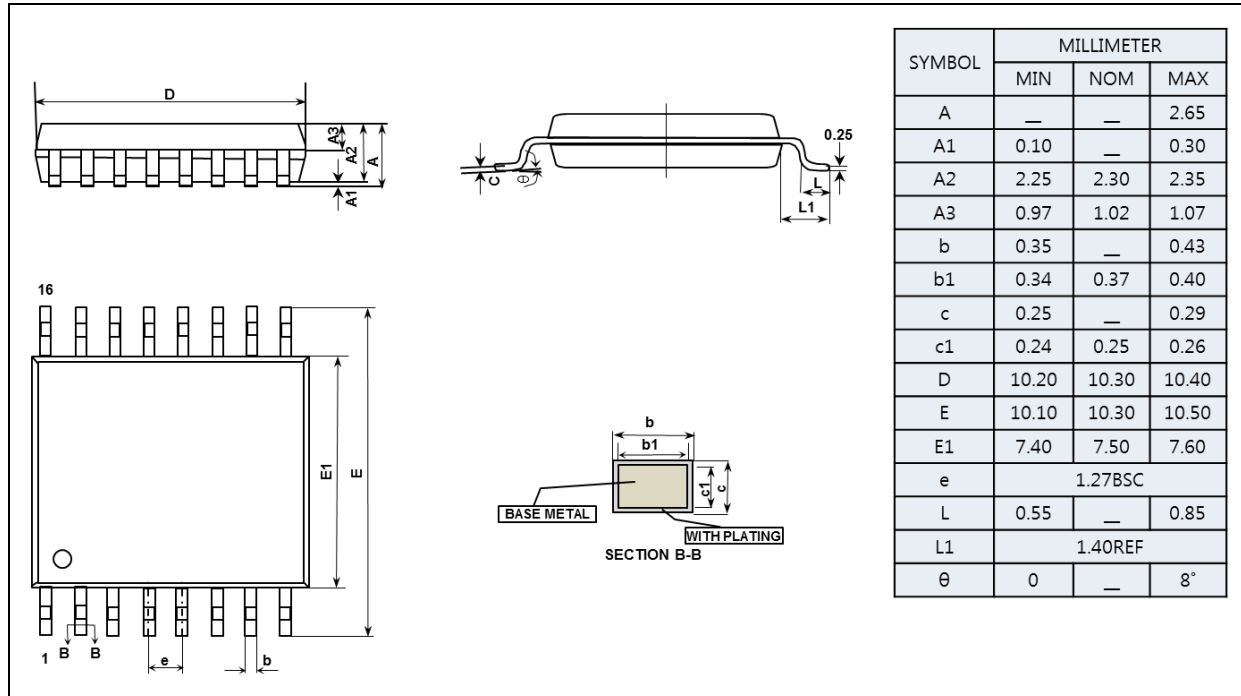
Part No	Package	Packing	Finish	Halogen	Packing Unit
AP8101W	SOPW-16L	1,500 pcs/REEL 3,000 pcs/INBOX	Sn	Free	24,000pcs (8 INBOX, 16 REEL)

Marking Layout

AP8101W

1ST Line : Company logo 2nd Line : Device name - W : SOPW-16L PKG code 3rd Line : Date code - YY : Last two digits of calendar year - WW : Work week calendar - Z : ASSEMBLY SITE

Package Dimensions

SOPW-16L Type (AP8101W)



Revision History

No	Date	Contents
REV00	2020-10-01	Initial Datasheet Release
REV01	2022-10-28	Ordering Information added . Packing : 1,500 pcs/REEL, 3,000 pcs/INBOX . Packing Unit : 24,000 pcs (8 INBOX, 16 REEL)

<http://www.apsemi.com>

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