

### CS8816(AF/AN/CP/AM/AN-1)

#### 16-Bit Constant current LED driver with 3.0V to 5.5V supply voltage

#### ■ Description

The CS8816 is a 16-Bit constant current LED driver IC which is designed for LED displays. The output current can be adjusted by using an external resistor. All outputs will have the same current drive level which is crucial in LED display application. This driver has built-in 16-bit constant current outputs, a 16-bit shift register, and a 16-bit latch circuit. These drivers have been designed by using CMOS process.

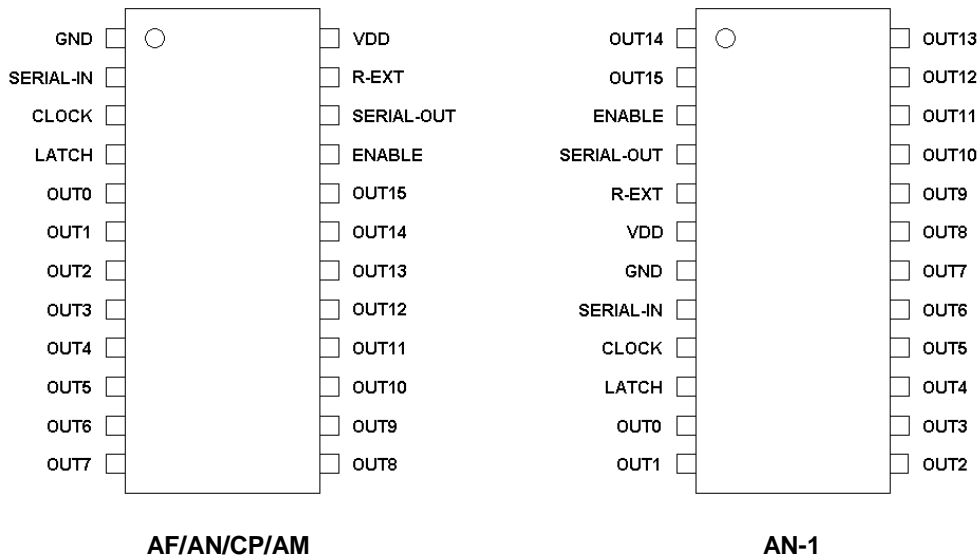
#### ■ Feature

- Output current capability: 70mA each output
- Constant current range: 5mA to 70mA
- For common anode LED application
- Power supply voltage range VDD=3.0V to 5.5V
- Maximum output drain voltage 7.0V
- Serial data transfer rate: 25Mhz(Cascade Connection)
- Operating temperature range: -40 to 85 degree C
- Output current accuracy:
  - Between Bits : < +-1.5 %
  - Between ICs: < +-4 %

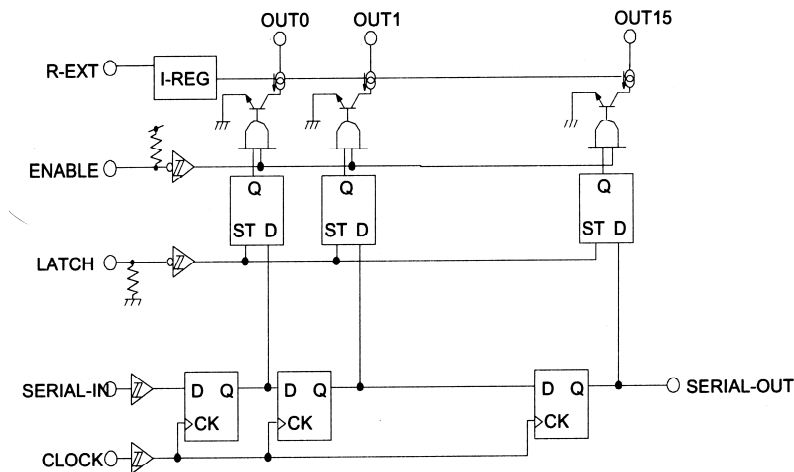
#### ■ Product Family

- CS8816AF ----- 24SSOP(236mil, 1.0mm lead-pitch)
- CS8816AN ----- 24SSOP(150mil, 0.64mm lead-pitch)
- CS8816CP ----- 24Shrink PDIP(300mil, 1.78mm lead-pitch)
- CS8816AM ----- 24SOP(300mil, 1.27mm lead-pitch)
- CS8816AN-1 ----- 24SSOP(150mil, 0.64mm lead-pitch)

### Pin Assignment



### Block Diagram



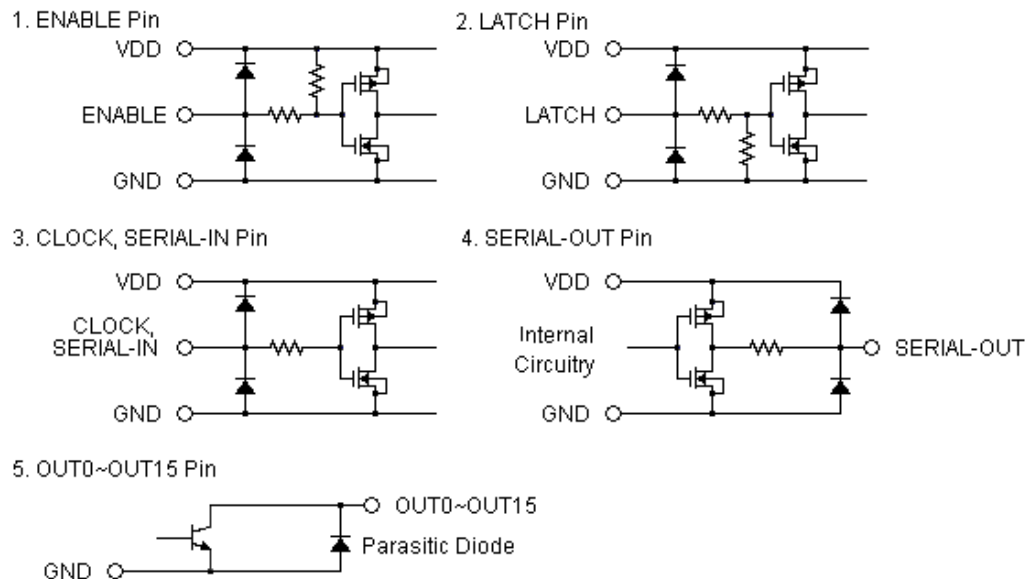
### Truth Table

CLOCK	LATCH	ENABLE	SERIAL-IN	OUT0---OUT7---OUT15	SERIAL-OUT
Positive edge	H	L	Dn	/Dn---/Dn-7---/Dn-15	Dn-15
Positive edge	L	L	Dn+1	No Change	Dn-14
Positive edge	H	L	Dn+2	/Dn+2---/Dn-5---/Dn-13	Dn-13
Negative edge	X	L	Dn+3	/Dn+2---/Dn-5---/Dn-13	Dn-13
Negative edge	X	H	Dn+3	Off	Dn-13

### ■ Pin Description

Pin No.	Pin Name	Function
1	GND	GND Pin
2	SERIAL-IN	Serial input data pin
3	CLOCK	Clock input terminal for shift register, rising edge trigger
4	LATCH	Data latch input pin. When LATCH=High-level, data is passed to OUT0~OUT15, when LATCH=Low-level, data is latched.
5~20	OUT0~OUT15	16 constant current output pin to drive common anode LEDs
21	ENABLE	Data output enable pin, when ENABLE=High-level, all OUT0~OUT15 are turned off, and when ENABLE=Low-level, all OUT0~OUT15 are enabled.
22	SERIAL-OUT	Serial data output pin for cascade operation
23	R-EXT	The external resistor connection pin to adjust the output current
24	VDD	3.0V~5.5V supply voltage pin

### ■ Equivalent circuits of I/O pins



### ■ Absolute Maximum Ratings

Characteristics	Symbol	Rating	Unit
Supply Voltage	VDD	+7.0	V
Input Voltage	Vin	-0.4 to VDD+0.4	V
Output Current	Iout	+70	mA
Output Voltage	Vout	-0.5 to 7.0	V
GND Pin current	IGND	1120	mA
Clock Frequency	fCLK	25	Mhz
Power Dissipation (On PCB, Ta=45C)	Pd	AF: 2.36 AN: 1.94 CP: 1.91 AM: 1.76	W
Thermal Resistance (On PCB, Ta=45C)	Rth(j-a)	AF: 44.4 AN: 54.25 CP: 55.07 AM: 59.6	°C/W
Operating Temperature	Top	-40 to 85	°C
Storage Temperature	Tstg	-55 to 150	°C

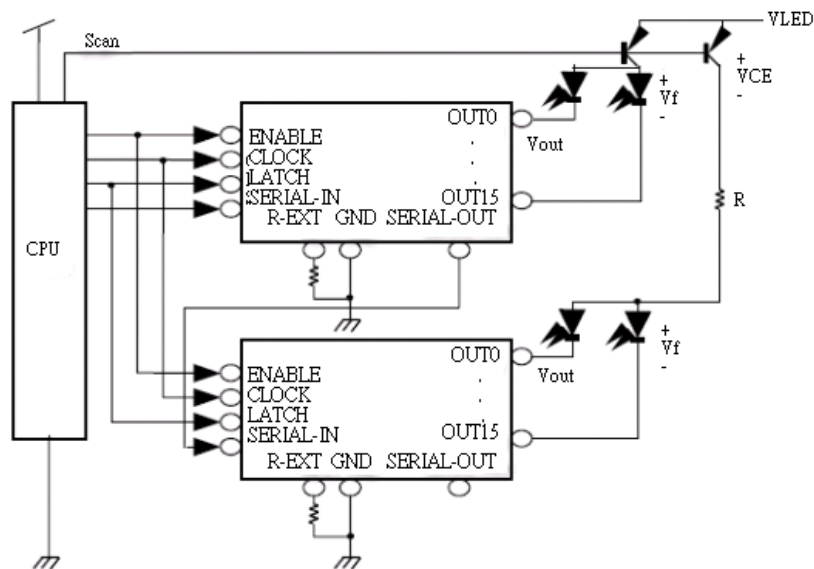
### ■ Typical Application

LED supply voltage is set-up by following equation:

$$V_{LED} = V_{CE} + V_f + V_o$$

To prevent too much power dissipated by driver due to the higher  $V_{LED}$ , an additional R can be introduced to reduce the  $V_o$  when output is consuming current.

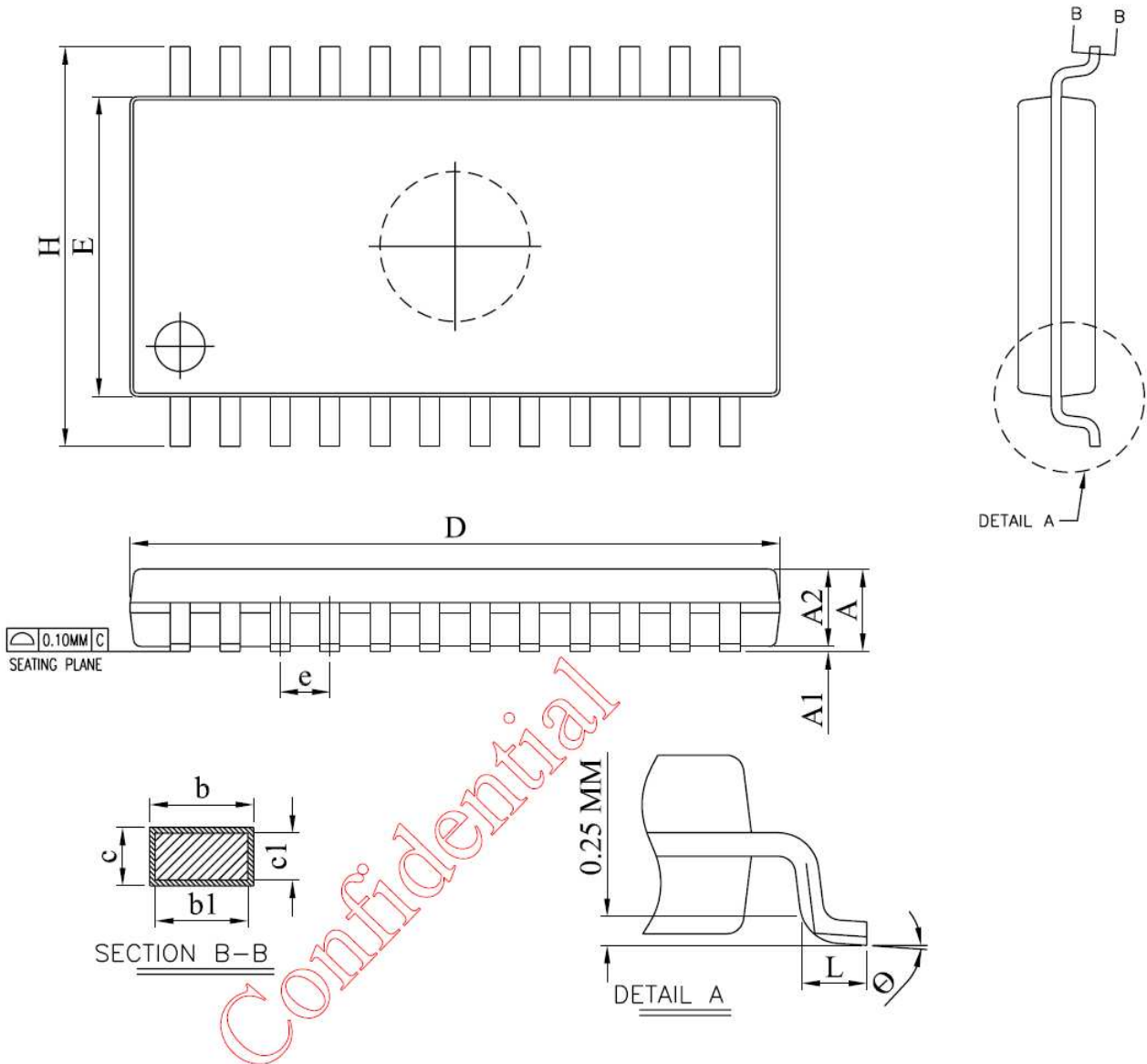
$$R = (V_{LED} - V_{CE} - V_f - V_{o\ min}) / (I_{o\ max} * Bit\ max)$$



### ■ Order information

Part No.	Package Type	Lead Pitch
CS8816AF	24SSOP(236mil)	1.0 mm
CS8816AN	24SSOP(150mil)	0.64 mm
CS8816CP	24Shrink PDIP(300mil)	1.78 mm
CS8816AM	24SOP(300mil)	1.27mm
CS8816AN-1	24SSOP(150mil)	0.64 mm

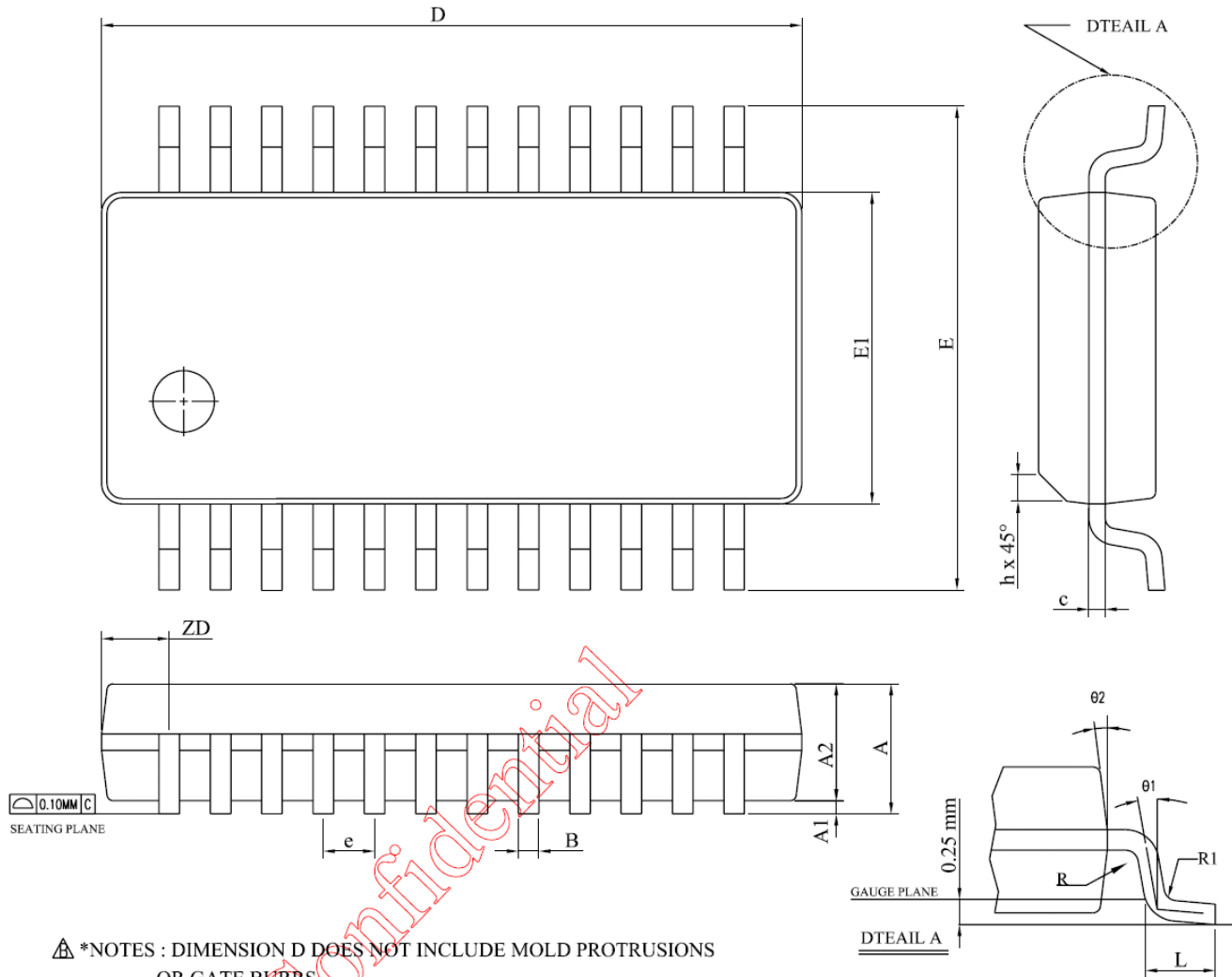
Title: Package outline for 24 SSOP-236 mil



Note: Plating thickness spec : 0.3 mil ~ 0.8 mil.

SYMBOL		A	A1	A2	b	b1	c	c1	D	e	E	H	L	$\theta^\circ$
UNIT														
mm	Min.	-	0.05	1.30	0.30	0.30	0.10	0.10	12.80	1.00 BSC	5.80	7.70	0.25	0
	Nom.	-	0.10	1.50	0.40	0.40	0.15	0.15	13.00		6.00	8.00	0.45	-
	Max.	1.90	0.15	1.70	0.52	0.50	0.27	0.25	13.20		6.20	8.30	0.65	10

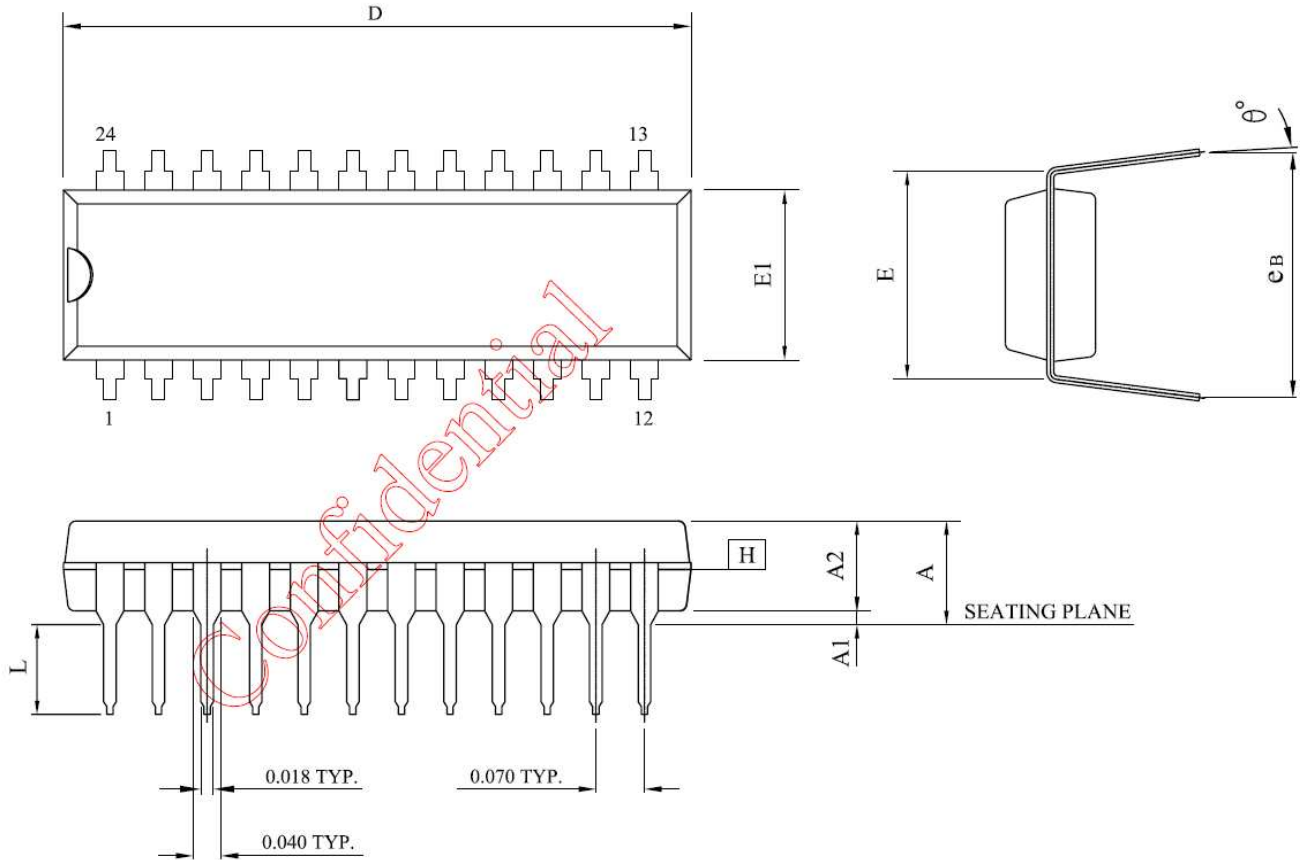
Title: Package outline for 24 SSOP-150 mil



**\*NOTES :** DIMENSION D DOES NOT INCLUDE MOLD PROTRUSIONS OR GATE BURRS.  
 MOLD PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.006 INCH PER SIDE.  
 Plating thickness spec : 0.3 mil ~ 0.8 mil.

SYMBOL		A	A1	A2	B	c	e	D	E	E1	L	h	ZD	R1	R	θ	θ1	θ2		
mm	Min.	1.35	0.10	-	0.20	0.18	0.635 BSC	8.56	5.79	3.81	0.41	0.25	0.838 REF	0.20	0.20	0°	0°	5°		
	Nom.	1.63	0.15	-	-	-		8.66	5.99	3.91	0.635	-		-	-	-	-	-	-	10°
	Max.	1.75	0.25	1.50	0.30	0.25		8.74	6.20	3.99	1.27	0.50		0.33	-	8°	-	-	15°	

Title: Package outline for 24Shrink PDIP-300mil (Pitch 0.07 inch)



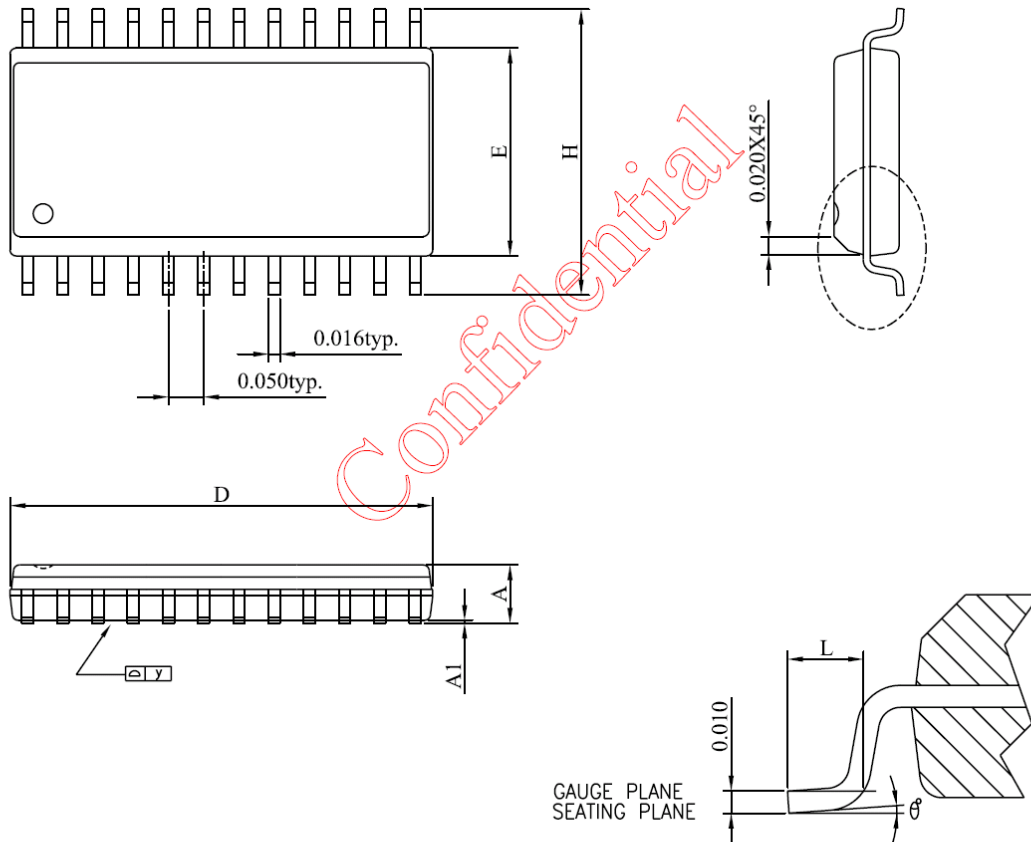
**NOTES:**

1. JEDEC OUTLINE : MS-019 AF
2. "D", "E1" DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS. MOLD FLASH OR PROTRUSIONS SHALL NOT EXCEED .010 INCH.
3. e<sub>B</sub> IS MEASURED AT THE LEAD TIPS WITH THE LEADS UNCONSTRAINED.
4. POINTED OR ROUNDED LEAD TIPS ARE PREFERRED TO EASE INSERTION.
5. DISTANCE BETWEEN LEADS INCLUDING DAM BAR PROTRUSIONS TO BE .005 INCH MINIMUM.
6. DATUM PLANE [H] COINCIDENT WITH THE BOTTOM OF LEAD, WHERE LEAD EXITS BODY.
7. PLATING THICKNESS : 0.3 ~ 0.8 MIL.

SYMBOL UNIT		A	A1	A2	D	E	E1	L	e <sub>B</sub>	θ°
inch	Min.	-	0.015	0.125	0.880	0.300 BSC.	0.245	0.115	0.335	0°
	Nom.	-	-	0.130	0.900		0.250	0.130	0.355	7°
	Max.	0.210	-	0.135	0.920		0.255	0.150	0.375	10°



Title: Package outline for 24L SOP-300mil



Note: Plating thickness spec : 0.3 mil ~ 0.8 mil.

SYMBOL		A	A1	D	E	H	L	$\theta^\circ$
inch	Min.	-	0.004	0.599	0.291	0.394	0.016	0
	Nom.	-	-	0.600	0.295	0.406	0.035	4
	Max.	0.104	-	0.624	0.299	0.419	0.050	8