

High-Efficiency, Step-Up DC/DC Controller

FEATURES

- 4V to 20V Input Voltage Operation.
- Adjustable Output Voltage.
- Low Quiescent Current at 100 μ A.
- Pulse-Skipping and Pulse-Frequency Modulation Maintain High Efficiency (max. 95%).
- 90KHz to 250KHz Oscillator Frequency.
- Power-Saving Shutdown Mode (8 μ A Typical).
- Push-Pull Driver Output.
- V_{REF} Pin Available.
- Current Limit Function Available.

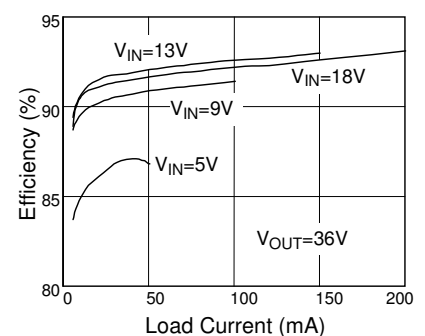
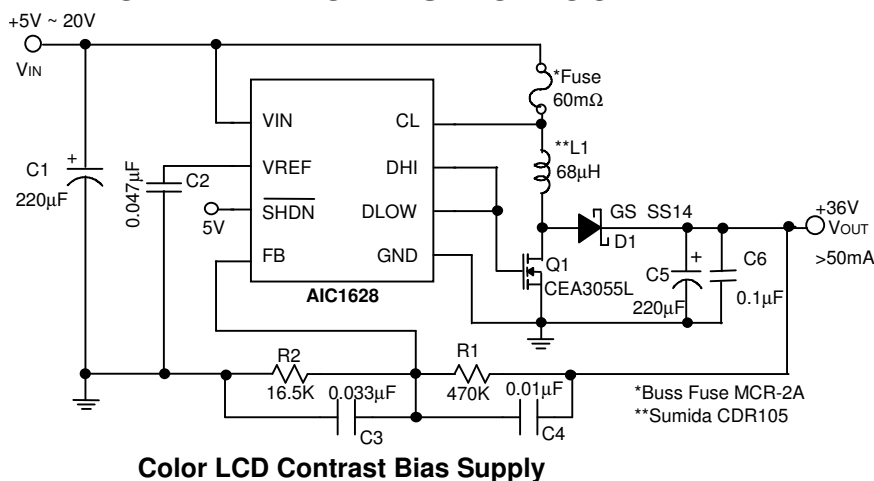
APPLICATIONS

- Flash Memory Programming Power Supply.
- Positive LCD Contrast Bias for Notebook & Palmtop Computers.
- Step-Up DC/DC Converter Module.
- Telecom Power Supply.

DESCRIPTION

The AIC1628 is a high performance step-up DC/DC controller, designed to drive an external power switch to generate programmable positive voltages. In the particularly suitable LCD contrast bias and flash memory programming power supply applications, typical full-load efficiencies are 85% to 95%. 4V to 20V input operation range allows the AIC1628 to be powered directly by the battery pack in the most battery-operated applications for greater efficiency. Output voltage can be scaled to 40V or greater by two external resistors. A Pulse-Frequency Modulation scheme is employed to maintain high efficiency conversion under wide input voltage range. Quiescent current is about 100 μ A and can be reduced to 8 μ A in shutdown mode. Switching frequency being around 90KHz to 250KHz range, small size switching components are ideal for battery powered portable equipments, like notebook and palmtop computers.

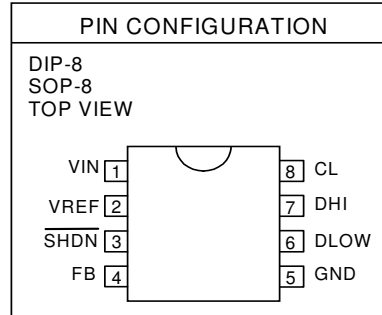
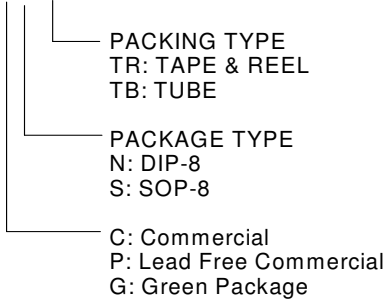
TYPICAL APPLICATION CIRCUIT



Efficiency vs. Output Current

ORDERING INFORMATION

AIC1628XXXX



EX: AIC1628CSTR
 → in SOP-8 Package & Tape & Reel Packing Type
 (CN is not available in TR packing type.)
 AIC1628PSTR
 → in SOP-8 Lead Free Package & Tape & Reel
 Packing Type

ABSOLUTE MAXIMUM RATINGS

VIN Supply Voltage (VIN Pin)	20V
SHDN Pin Voltage	15V
Operating Temperature Range	-40°C ~ 85°C
Junction Temperature	125°C
Storage Temperature Range	-65°C~ 150°C
Lead Temperature (Soldering, 10 sec)	260°C

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

TEST CIRCUIT

Refer to Typical Application Circuit

■ **ELECTRICAL CHARACTERISTICS** ($V_{IN}=13V$, $T_A=25^{\circ}C$, unless otherwise specified.) (Note1)

PARAMETERS	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Input Voltage		4		20	V
Quiescent Current	$V_{FB} = 1.5V$		100	200	μA
Shutdown Mode Current	$V_{\overline{SHDN}} = 0V$		8	20	μA
VREF Voltage	$I_{SOURCE} = 250\mu A$	1.16	1.22	1.28	V
VREF Source Current		250			μA
DLOW "ON Resistance"			15		Ω
DHI "ON Resistance"			10		Ω
CL Threshold	$V_{IN} - V_{CL}$	50	70	90	mV
Shutdown Threshold		0.8	1.5	2.4	V
Shutdown Input Leakage Current	$V_{\overline{SHDN}} < 15V$			1	μA

Note 1: Specifications are production tested at $T_A=25^{\circ}C$. Specifications over the $-40^{\circ}C$ to $85^{\circ}C$ operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

TYPICAL PERFORMANCE CHARACTERISTICS

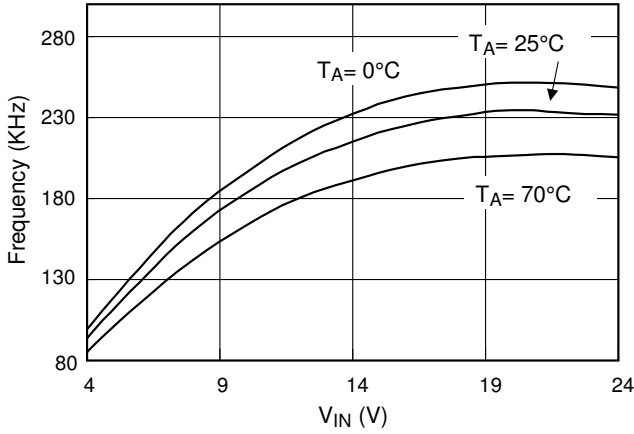


Fig. 1 Frequency vs. V_{IN} Voltage

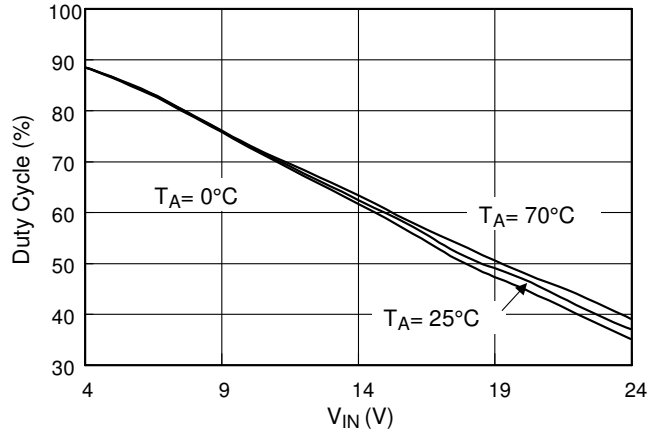


Fig. 2 Duty Cycle vs. V_{IN} Voltage

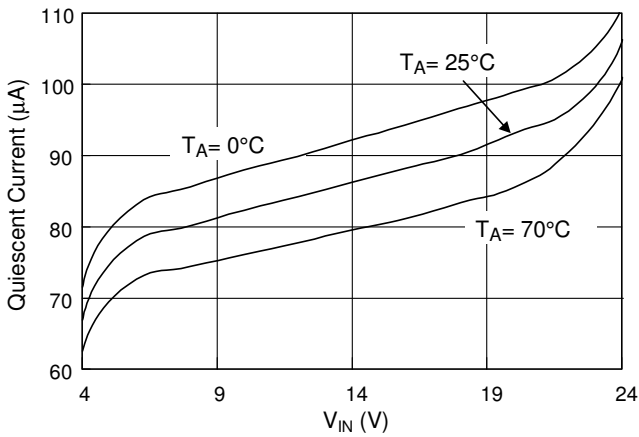


Fig. 3 Quiescent Current vs. V_{IN} Voltage

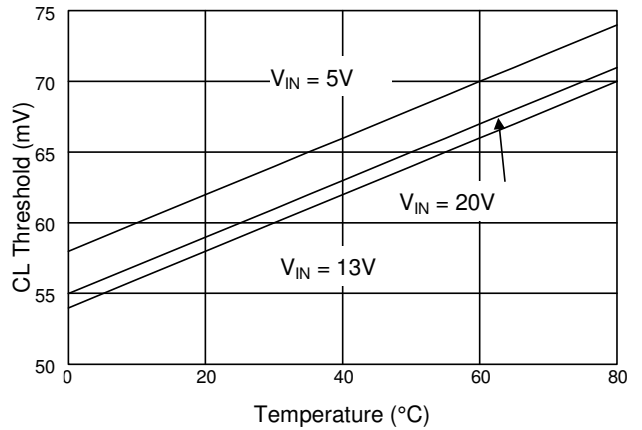


Fig. 4 Current Limit Threshold vs. Temperature

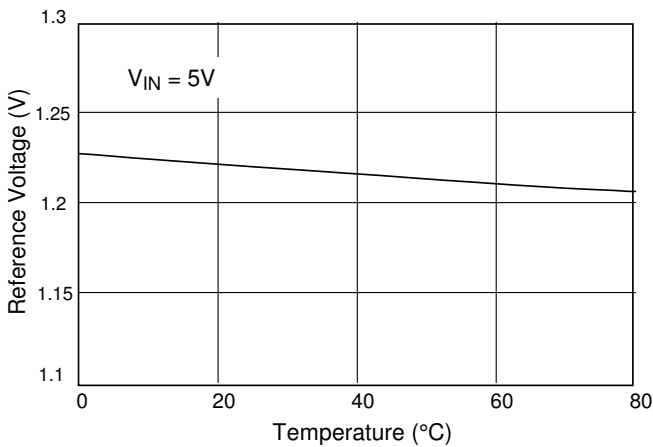
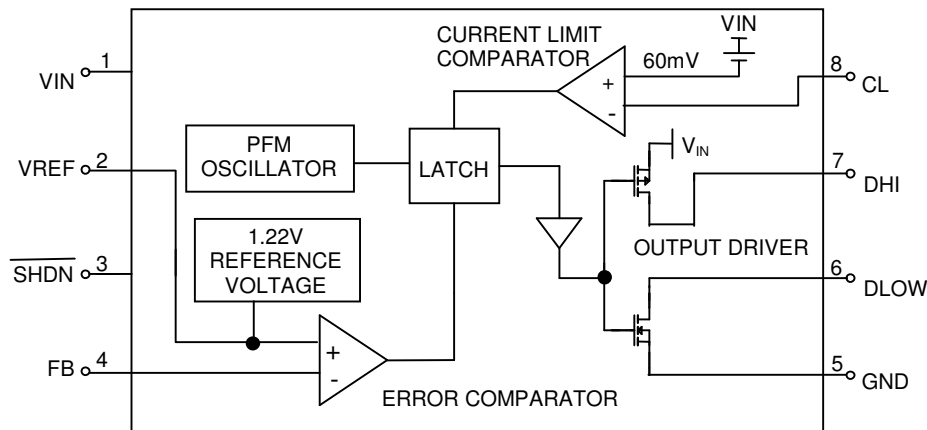


Fig. 5 Reference Voltage vs. Temperature

■ BLOCK DIAGRAM



■ PIN DESCRIPTIONS

PIN 1: VIN - Input supply voltage is from 4V to 20V.

PIN 2: VREF - Reference output is 1.22V. Bypass with a 0.047 μ F capacitor to GND. Sourcing capability is guaranteed to be greater than 250 μ A.

PIN 3: $\overline{\text{SHDN}}$ - Logical input to shutdown the chip.
 >1.5V = normal operation,
 GND = Shutdown,
 Cannot be floating or forced greater than 15V. In shutdown mode DLOW and DHI pins are at low level.

PIN 4: FB - Feedback signal input to sense VREF. Connecting a resistor R1 to V_{OUT} and a resistor R2 to GND yields the output voltage:

$$V_{\text{OUT}} = (R1+R2)/R2 \times V_{\text{REF}}$$

(Refer to typical application circuit)

PIN 5: GND - Power ground.

PIN 6: DLOW- Connected to gate of the external N-channel MOSFET or base of the NPN bipolar transistor.

PIN 7: DHI - Driver sourcing output. Connected to DLOW when using an external N-channel MOSFET. When using an external NPN bipolar transistor, connect a base resistor RB from this pin to DLOW. RB value depends on V_{IN} , inductor and NPN current gain.

PIN 8: CL - Current-limit input. Threshold voltage is 60mV from V_{IN} . This pin clamps the switch peak current to prevent over-current damage to the external switch, under abnormal conditions.

APPLICATION EXAMPLES

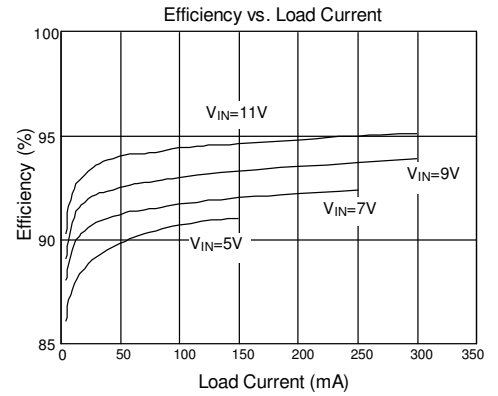
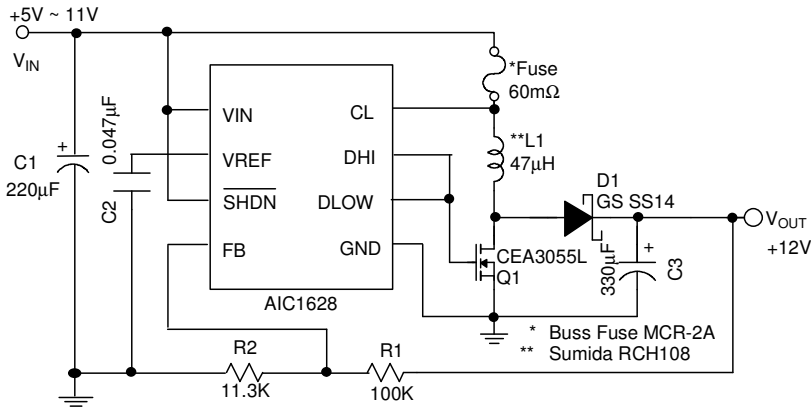


Fig. 6 Flash memory Programming Supply

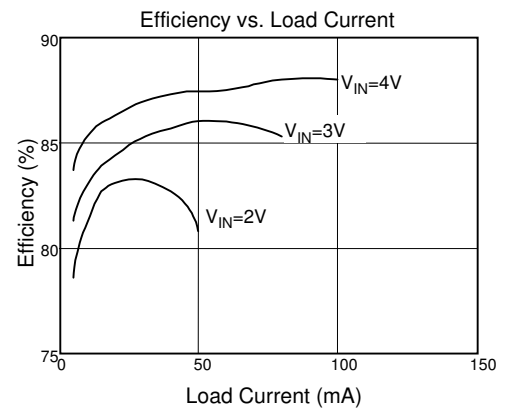
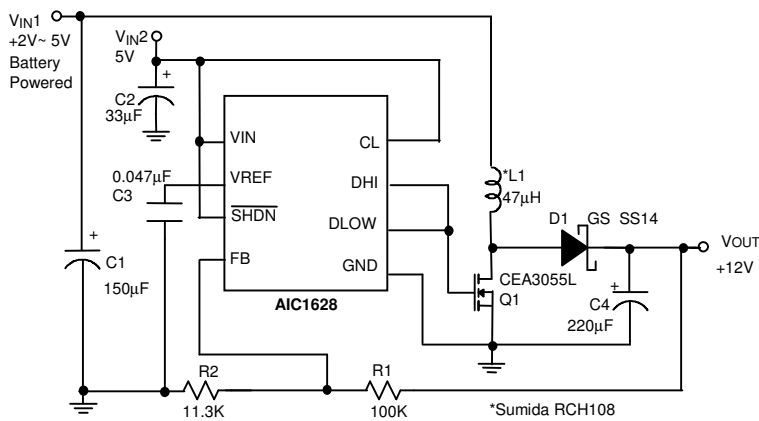


Fig. 7 2-Cells to +12V Flash Memory Programmer

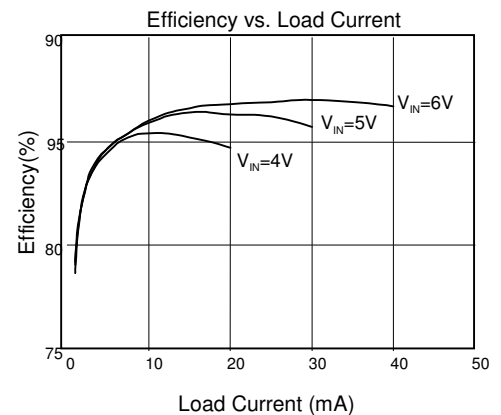
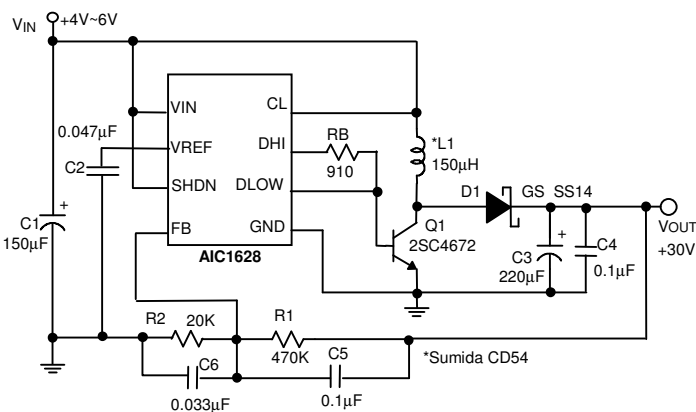


Fig. 8 4-Cells to +30V Power Supply

APPLICATION EXAMPLES (Continued)

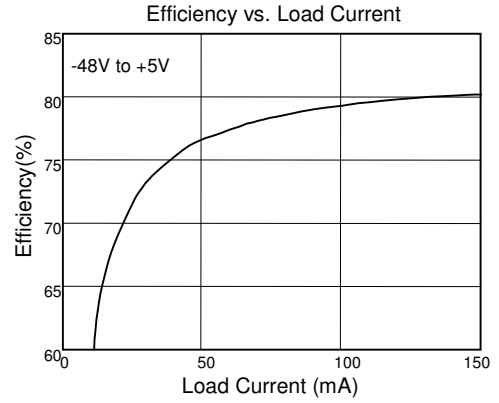
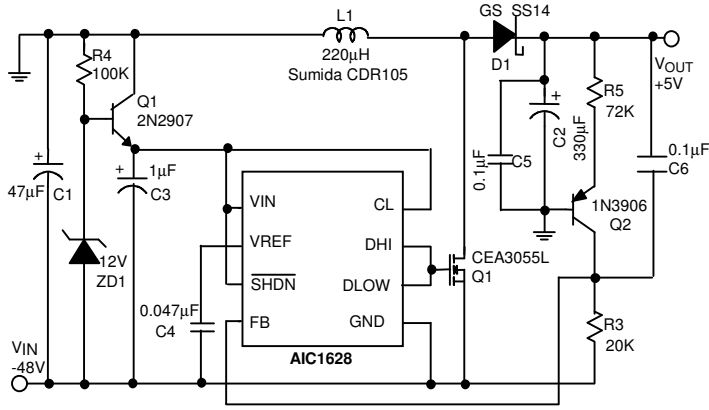


Fig. 9 Telecom +5V Supply

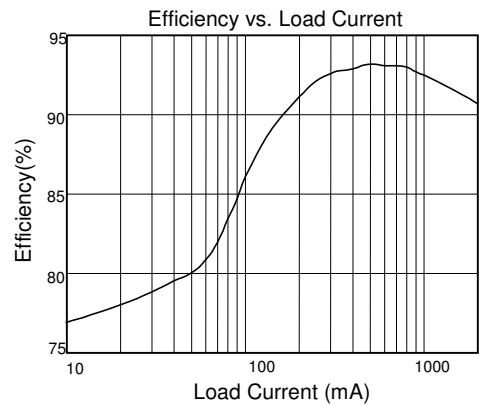
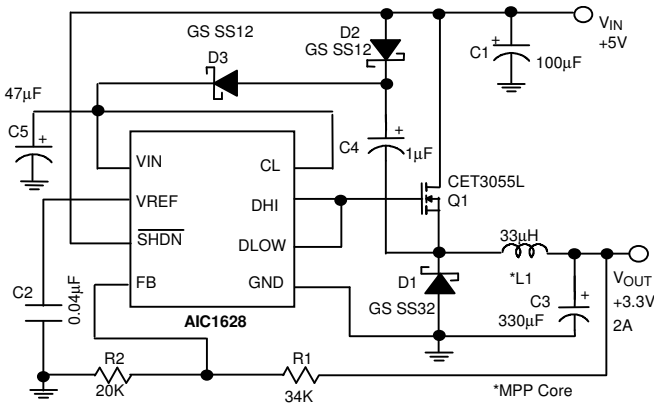
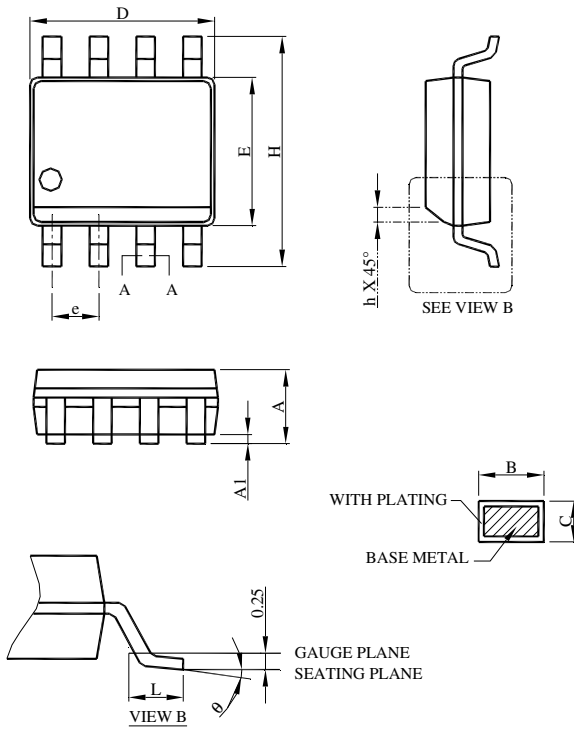


Fig. 10 5V to 3.3V Step-Down Converter

■ PHYSICAL DIMENSIONS (unit: mm)

● SOP-8

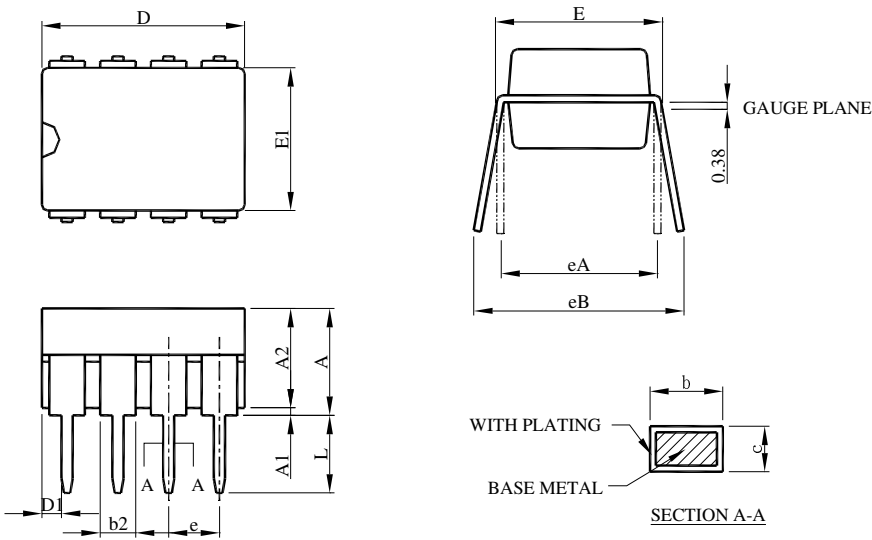


SYMBOL	SOP-8	
	MILLIMETERS	
	MIN.	MAX.
A	1.35	1.75
A1	0.10	0.25
B	0.33	0.51
C	0.19	0.25
D	4.80	5.00
E	3.80	4.00
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
θ	0°	8°

Note:

- 1.Refer to JEDEC MS-012AA.
- 2.Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side.
- 3.Dimension "E" does not include inter-lead flash or protrusions. Inter-lead flash or protrusion shall not exceed 10 mil per side.
- 4.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

● DIP-8



SYMBOL	DIP-8	
	MILLIMETERS	
	MIN.	MAX.
A		5.33
A1	0.38	
A2	2.92	4.95
b	0.36	0.56
b2	1.14	1.78
c	0.20	0.35
D	9.01	10.16
D1	0.13	
E	7.62	8.26
E1	6.10	7.11
e	2.54 BSC	
eA	7.62 BSC	
eB		10.92
L	2.92	3.81

Note:

- 1.Refer to JEDEC MS-001BA.
- 2.Dimension D, D1 and E1 do not include mold flash or protrusions. Mold flash or protrusion shall not exceed 10 mil.
- 3.Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

Note:

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