400mA Low Dropout Linear Regulator with Voltage Detector Function

FEATURES

- Including MOSFET for V_{OUT1}, LDO for V_{OUT2}, voltage detector, and shutdown control
- Low Dropout Voltage of 550mV(Typ.) at 400mA Output Current (V_{OUT2}).
- Guaranteed 700mA Output Current for V_{OUT1} and 400mA for V_{OUT2}.
- Low Ground Current at 120μA.
- 2% Accuracy Output Voltage of V_{OUT2}.
- Current Limit Function.
- Built in Voltage Detector
- Shutdown Control for V_{OUT1} and V_{OUT2}

APPLICATIONS

- Voltage Regulator for DVD-ROM and CD-ROM Drivers.
- Voltage Regulator for HDD and Floppy Drivers.
- Voltage Regulator for circuits with Stepping Motor or Servo Motor.

DESCRIPTION

The AIC1729 is a low dropout linear regulator with voltage detection function.

It can be divided into 4 main function blocks, including MOSFET for V_{OUT1}, LDO for V_{OUT2} ,voltage detector, and two shutdown controls.

Voltage detector can be use to detect Vcc. The detecting voltage of the voltage detector is from 3.0V to 4.6V with 0.1V step. And the output (DOUT) of detecting voltage for Vcc with delay time adjustment function to indicate V_{CC} low. User only adds one external capacitor to finish it. When V_{CC} pin is under the set detection voltage. D_{OUT} pin is logic low.

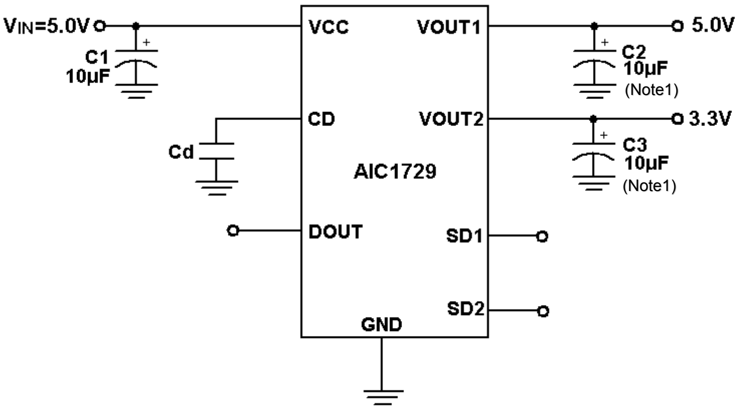
V_{OUT1} is controlled by SD1 pin. When SD1 is logic high, the internal MOSFET for V_{OUT1} will be switched off, vice versa.

The LDO output voltage (V_{OUT2}) is from 1.8V to 4.0V with 0.1V step for different application. It is also controlled by SD2 pin. When SD2 is logic high, the internal LDO for V_{OUT2} will be shutdown, vice versa.

The superior characteristics of the AIC1729 include very low dropout voltage, and 2% accuracy output voltage. Typical ground current remains 120μA, from no load to maximum loading conditions. Dropout voltage of V_{OUT2} is 550mV at 400mA output current. Output current limiting is provided at V_{OUT1} and V_{OUT2}.

AIC1729 comes in the popular SO8 package.

TYPICAL APPLICATION CIRCUIT



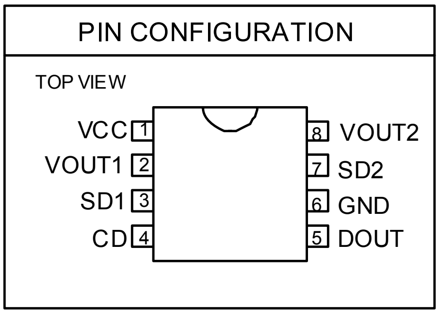
Power Source for CD-drivers and DVD-drivers

ORDERING INFORMATION

AIC1729-XX XXXXXX

- PACKING TYPE
  TB: TUBE
  TR: TAPE & REEL (not available for DIP-8 package)
- PACKAGE TYPE
  N: DIP-8
  S: SOP-8
- P: Lead Free Commercial
  G:Green Package
- LDO OUTPUT VOLTAGE
  18: 1.8V
  :
  :
  40: 4.0V
- VOLTAGE DETECTOR VOLTAGE
  30: 3.0V
  :
  :
  46: 4.6V

* LDO Output Voltage and Voltage Detector voltage with every 0.1V a step.



Example: AIC1729-3018PN
→ 3.0V Voltage Detector Voltage, 1.8V LDO Output Voltage, in DIP-8 Lead Free Package Type

AIC1729-3018GN
→ 3.0V Voltage Detector Voltage, 1.8V LDO Output Voltage, in DIP-8 Green Package Type

■ ABSOLUTE MAXIMUM RATINGS

Input Supply Voltage .... -0.3~8V
Control Input (V_{CTL}) .... -0.3V ~7V
Operating Temperature Range .... -40°C~85°C
Junction Temperature .... 125°C
Storage Temperature Range .... -65°C ~ 150°C
Lead Temperature (Soldering, 10sec) .... 260°C
Thermal Resistance, $R\theta_{JC}$ (Junction to Case) DIP-8 .... 60°C /W
SOP-8 .... 40°C /W
Thermal Resistance, $R\theta_{JA}$ (Junction to Ambient) DIP-8 .... 100°C/W
(Assume no Ambient Airflow, no heatsink) SOP-8 .... 160°C/W

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

■ ELECTRICAL CHARACTERISTICS (TA=25°C, V_{IN}=5.0V, I_{OUT1}=I_{OUT2} =400mA, SD1=SD2=Low, unless otherwise specified.) (Note2)

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Ground Current	I_{OUT1}=0.1mA~700mA I_{OUT2}=0.1mA~400mA V_{IN}= 4.0V~8.0V		120	200	µA
Output Voltage Temperature Coefficiency	(Note 3)		100		PPM/°C
VOUT1					
Output MOSFET Resistance	V_{IN}= 5.0V		370	450	mΩ
Current Limit(Note 4)		700	950		mA
Output Turn-on Rise Delay			100		µS
Output Turn-on Rise Time			1000		µS
SD1 Pin Voltage	V_{SD}=Logic"0"			0.8	V
	V_{SD}=Logic"1"	2.4			V
VOUT2 (1.8V ~ 4.0V with 0.1V step)					
LDO Output Voltage	No Load	V_{SET} × 0.98	V_{SET}	V_{SET} × 1.02	V
Line Regulation	I_L=1mA,V_{IN}=4.0V~8.0V		3	10	mV
Load Regulation (Note 5)	V_{IN}=5V,I_L=0.1mA~400mA		50	90	mV
Current Limit (Note 4)		400	650		mA

■ ELECTRICAL CHARACTERISTICS (Continued)

PARAMETER	TEST CONDITIONS		MIN.	TYP.	MAX.	UNIT
Dropout Voltage (Note 6)	$V_{OUT} \geq 3.3V$	I_L=100mA		140	200	mV
		I_L=200mA		280	350	
		I_L=300mA		420	500	
		I_L=400mA		550	700	
	$2.5V \leq V_{OUT} < 3.3V$	I_L=100mA		250	300	
		I_L=200mA		420	500	
		I_L=300mA		600	700	
		I_L=400mA		780	900	
	$V_{OUT} < 2.5V$	I_L=100mA		700	800	
		I_L=200mA		880	950	
		I_L=300mA		1050	1150	
		I_L=400mA		1220	1400	
SD2 Pin Voltage	V_{SD}=Logic"0"				0.8	V
	V_{SD}=Logic"1"		2.4			
Voltage Detector (3.0V ~ 4.6V with 0.1V step)						
Detect Voltage(V_{DET})			$V_{DSET} \times 0.98$	V_{DSET}	$V_{DSET} \times 1.02$	V
Detect Threshold Hysteresis				$V_{DET} \times 1.05$		V
V_{DOUT}	When V_{DET} is Detected				0.6	V
	When V_{DET} is not Detected		1.65			
Delay Time	CD Pin Open			1	3	mS

Note 1: To avoid output oscillation, aluminum electrolytic output capacitor is recommended and ceramic capacitor is not suggested.

Note 2: Specifications are production tested at T_A=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

Note 3: Guaranteed by design.

Note 4: Current limit is measured by pulsing a short time.

Note 5:Regulation is measured at constant junction temperature, using pulse testing with a low ON time.

Note 6: Dropout voltage is defined as the input to output differential at which the output voltage drops 100mV below the value measured with a 1V differential.

TYPICAL PERFORMANCE CHARACTERISTICS

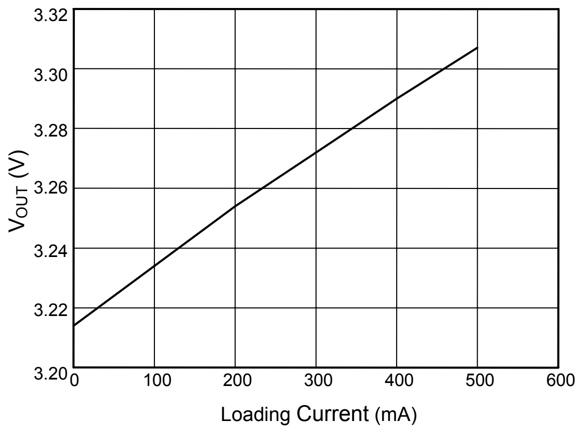


Fig. 1 Output voltage vs. Loading Current

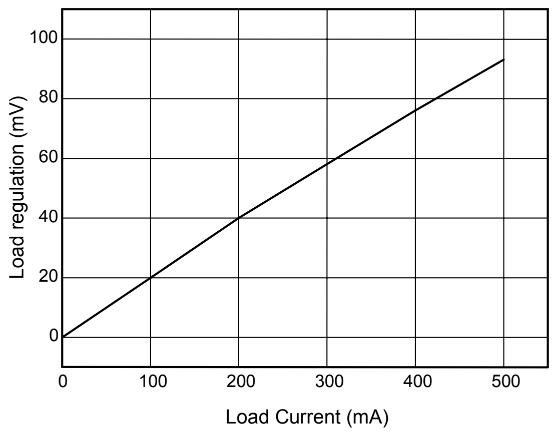


Fig. 2 Load Regulation

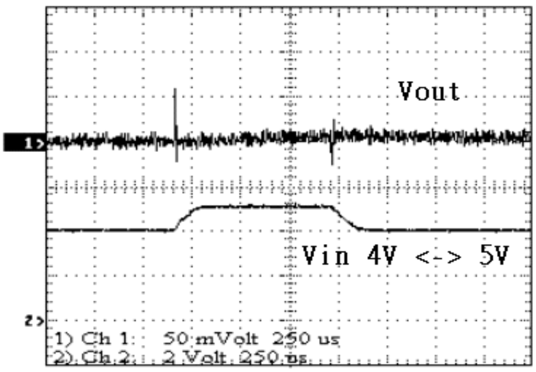


Fig. 3 Line Transient

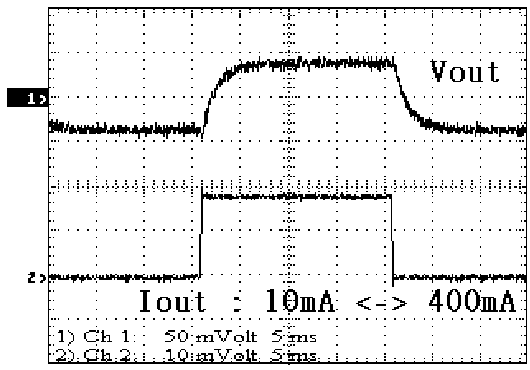


Fig. 4 Load Transient

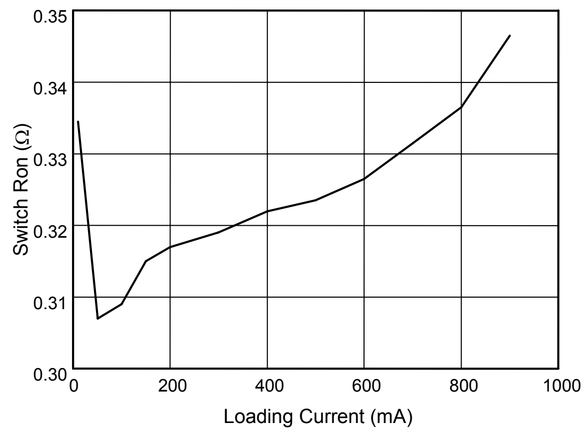


Fig. 5 Switch Ron vs. Loading current (mA)

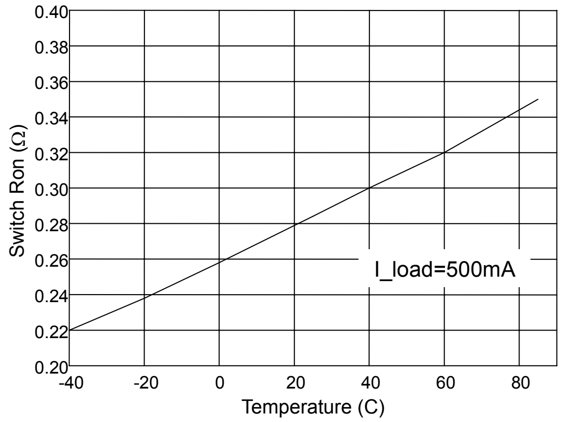


Fig. 6 Switch Ron vs. Temperature

TYPICAL PERFORMANCE CHARACTERISTICS (Continued)

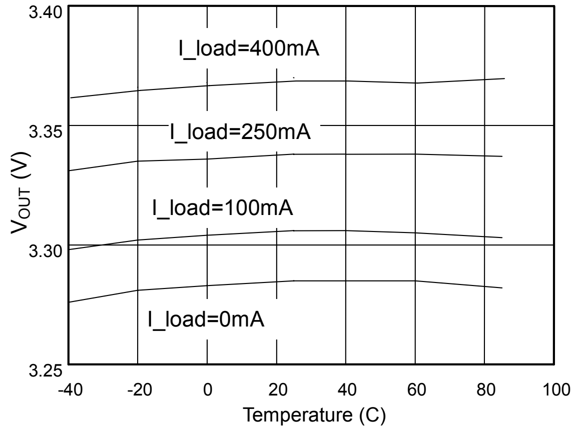


Fig. 7 Output voltage vs. Temperature

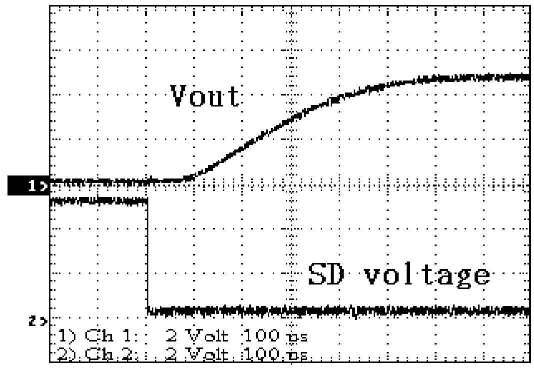


Fig. 8 Output Turn-on Rise Time

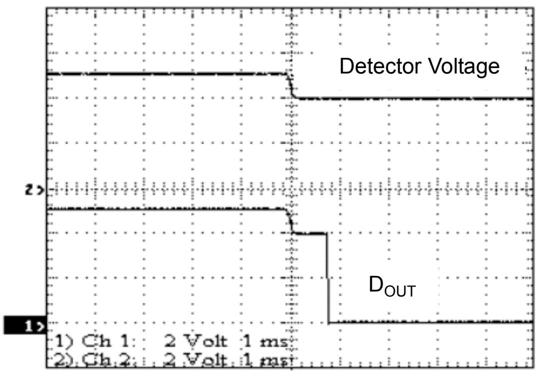


Fig. 9 Built-in Delay Time Waveform

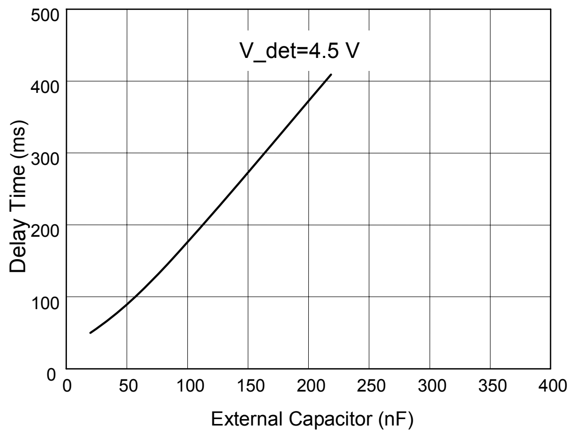
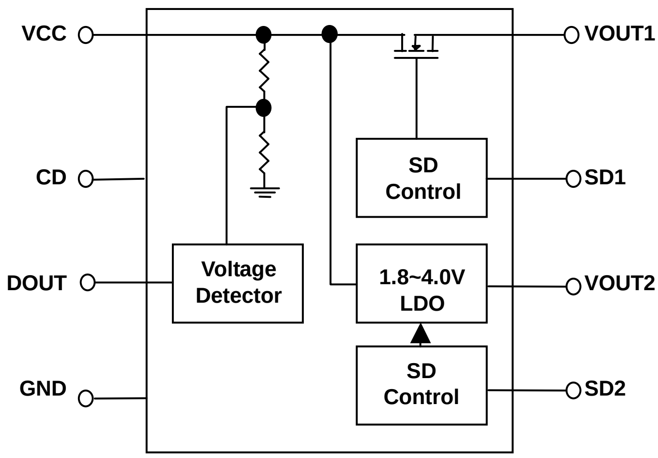


Fig. 10 Delay Time vs. External Capacitor

BLOCK DIAGRAM



PIN DESCRIPTION

PIN 1: VCC- This pin is the main input supply for the IC, normally 5V

PIN 2: VOUT1- This pin is the voltage output which is connected to Vcc directly via internal MOSFET switch, normally 5V

PIN 3: SD1- VOUT1 shutdown pin. Logic high input for disabling the internal MOS Switch.

PIN 4: CD- This pin is to determine delay time by attaching a capacitor

PIN 5: DOUT- This pin is voltage detector output, pulled low when V_{IN} detected

PIN 6: GND- IC ground pin

PIN 7: SD2- VOUT2 shutdown pin. Logic high input for disabling LDO output.

PIN 8: VOUT2- This pin is 3.3V LDO voltage output

APPLICATION INFORMATION

INPUT-OUTPUT CAPACITORS

Linear regulators require input and output capacitors to maintain stability. Input capacitor at 10μF with 10uF aluminum electrolytic output capacitor is recommended.

POWER DISSIPATION

The maximum power dissipation of AIC1729 depends on the thermal resistance of its case and circuit board, the temperature difference between the die junction and ambient air, and the rate of airflow. The rate of temperature rise is greatly affected by the mounting pad configuration on the PCB, the board material, and the ambient temperature. When the IC mounting with good thermal conductivity is used, the junction temperature will be low even when large power dissipation applies.

The power dissipation across the device is

$P = I_{OUT} (V_{IN}-V_{OUT})$.

The maximum power dissipation is:

$$P_{MAX} = \frac{(T_{J-max} - T_A)}{R\theta_{JA}}$$

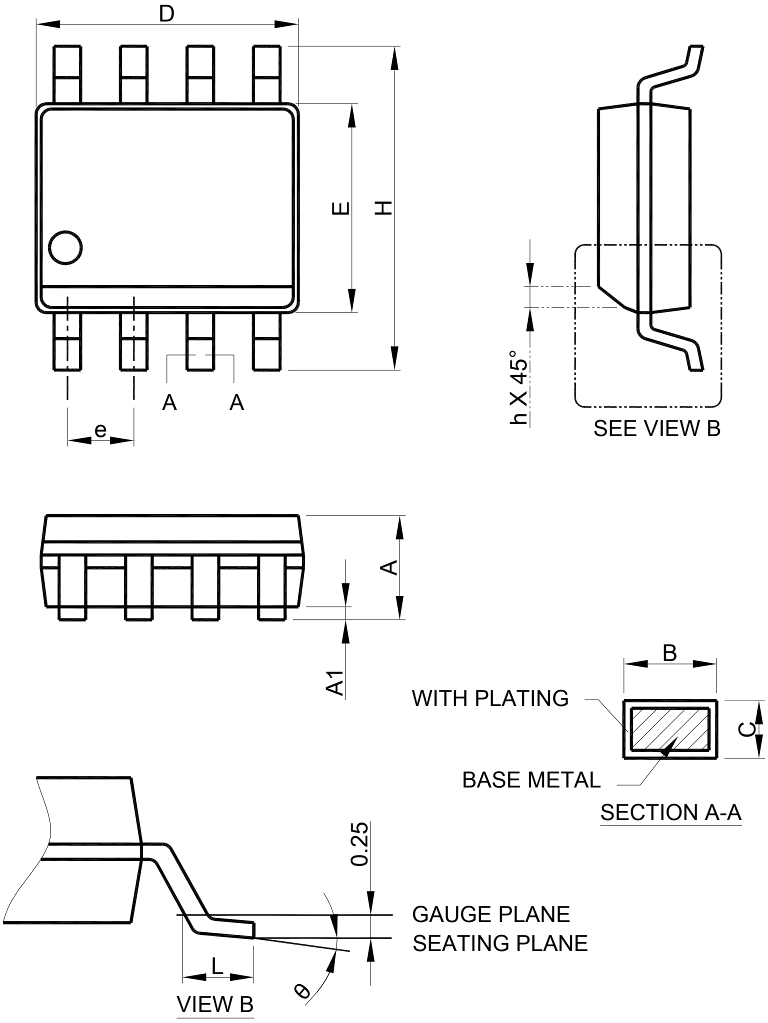
Where T_{J-max} is the maximum allowable junction temperature (125°C), and T_A is the ambient temperature suitable in application.

As a general rule, the lower temperature is, the better reliability of the device is. So the PCB mounting pad should provide maximum thermal conductivity to maintain low device temperature.

GND pin performs a dual function for providing an electrical connection to ground and channeling heat away. Therefore, connecting the GND pin to ground with a large pad or ground plane would increase the power dissipation and reduce the device temperature.

PHYSICAL DIMENSIONS (unit: mm)

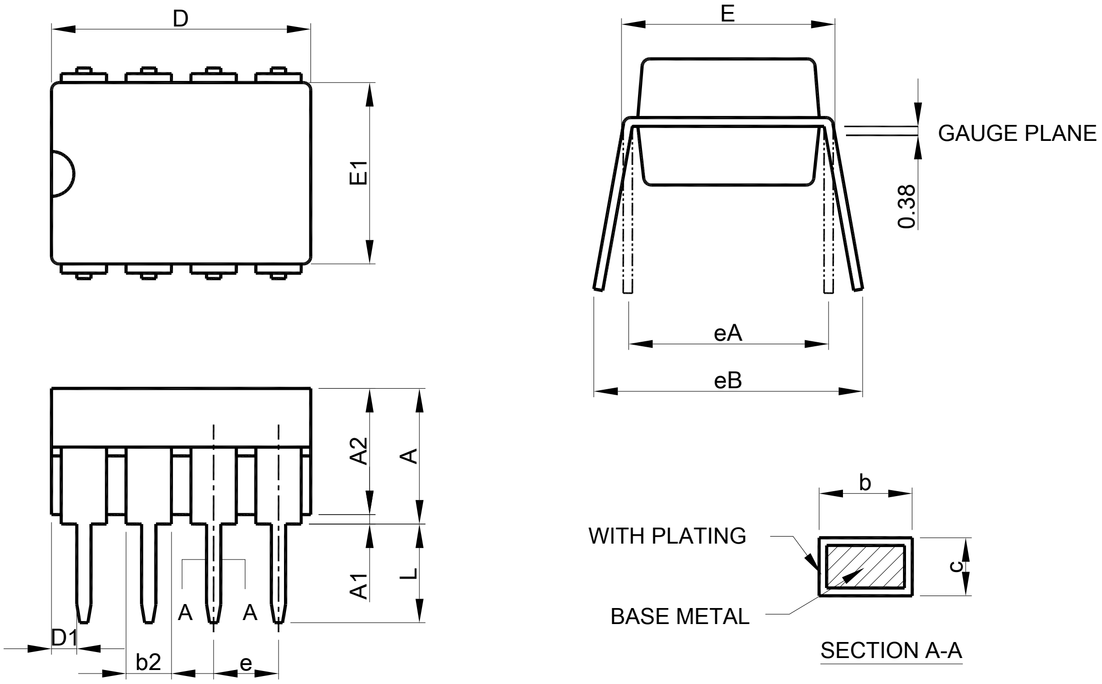
- **SOP-8**



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.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

- **DIP-8**



Note: 1. Refer to JEDEC MS-001BA
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 10 mil per side .
3. Dimension "D1"and "E1" do not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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